



City of
Boardman, Oregon
WASTEWATER FACILITIES PLAN
2021



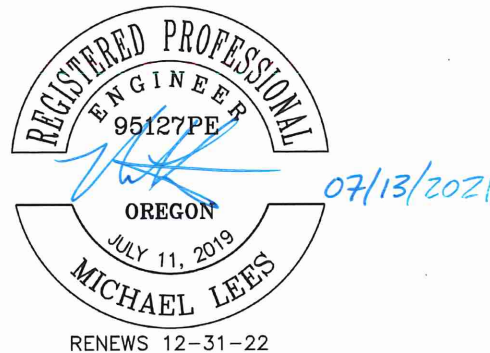
**ap anderson
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LA GRANDE, OR. WALLA WALLA, WA. REDMOND, OR. HERMISTON, OR.

1901 N. Fir Street
La Grande, Oregon 97850
(541) 963-8309
www.andersonperry.com

**WASTEWATER FACILITIES PLAN
FOR
CITY OF BOARDMAN, OREGON**

JULY 2021



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ANDERSON PERRY & ASSOCIATES, INC.

La Grande, Redmond, and Hermiston, Oregon
Walla Walla, Washington

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Executive Summary

Overview

This Executive Summary briefly summarizes the Wastewater Facilities Plan (WWFP) prepared by Anderson Perry & Associates, Inc., for the City of Boardman, Oregon. The recommendations outlined hereafter have been developed in cooperation with the Boardman City Council and City staff. The focus of this WWFP is on the overall wastewater system, including the collection, treatment, and disposal systems. This WWFP includes an analysis of the existing system and its performance, an analysis of historical wastewater data, development of design criteria, an evaluation of system deficiencies and needs, an evaluation of improvement options, and development of a financial plan. Included in this Executive Summary is a brief discussion of the existing wastewater system, the recommended wastewater system improvements for a 20-year design period, the current financial status and loan capacity of the City's Sewer Department, and an implementation plan. The reader is encouraged to refer to the chapters of this WWFP for a more detailed discussion of the topics briefly outlined hereafter. This WWFP has been approved by the Oregon Department of Environmental Quality. The approval letter is presented in Appendix G.

Existing Wastewater Collection and Treatment

Wastewater Collection System

Boardman's wastewater collection system is a combination of a conventional gravity sewer network combined with a pressure sewer system feeding into a main interceptor sewer at various points along the length of the interceptor. Three primary wastewater lift stations are located along the interceptor sewer to assist conveyance of wastewater to the City's treatment lagoons. The wastewater collection system converges at Lift Station No. 3, where the wastewater is metered and conveyed to the wastewater treatment facility (WWTF). The Existing Wastewater System Map can be found at the back of this WWFP and shows the location of the WWTF, collection system main lines, and lift stations.

Wastewater Treatment Facility

The City's WWTF consists of a three-cell aboveground facultative lagoon system as shown on Figure 4-1 in Chapter 4. The original WWTF was constructed in 1979 and consisted of a two-cell facultative treatment lagoon system. In 2001, Lagoon No. 3 was constructed to meet system demands. Lagoons No. 1 and 2 are each approximately 14 acres in area with minimum and maximum operating levels of 3 feet and 7 feet, respectively. This results in an operating storage capacity of approximately 36.5 million gallons (MG). Lagoon No. 3 is also approximately 14 acres in area and has minimum and maximum operating levels of 3 feet and 8.5 feet, respectively. The operating storage capacity of Lagoon No. 3 is approximately 25.1 MG. The total storage capacity of the WWTF is 61.6 MG.

Wastewater entering the WWTF is normally directed to the primary Cell No. 1 (the east cell). Overflow from Cell No. 1 enters the secondary Cell No. 2 (the west cell). From Cell No. 2, wastewater enters the tertiary Cell No. 3 (the south cell). Lagoons No. 1 and 2 are lined with 6 inches of bentonite to limit seepage. Wastewater in Lagoon No. 3 is contained by a 30-mil polyvinyl chloride lining protected by geotextile fabric, and a layer of backfill topped with riprap.

During periods of irrigation, effluent from Lagoon No. 3 is dosed with chlorine from the hypochlorite generation system prior to being gravity fed into the irrigation pump station. The hypochlorite generation system was installed in 2002.

Effluent Disposal and Land Application System

The City is permitted to dispose of treated wastewater via land application. The irrigation pump station building located south of Lagoon No. 3 and the single 75 horsepower centrifugal pump distribute wastewater through a pressure main where it is metered prior to being filtered and land-applied through the center pivot irrigation system. The City replaced the center pivot irrigation system in 2015. The original design flow through the pumping equipment and pressure filter is 800 gallons per minute or 1.15 million gallons per day. Groundwater monitoring, soil monitoring, application rates, etc., are managed by the City to meet the requirements of the City's Recycled Water Use Plan. Refer to Appendix A for a copy of the City's Water Pollution Control Facilities (WPCF) Permit.

Existing Wastewater System Evaluation Summary

Collection System Evaluation

Boardman Public Works staff report only minor problems and deficiencies in the existing gravity sewer collection network. The capacity of existing gravity lines appears to be adequate to serve foreseeable future needs, although this is dependent on the type and location of any new developments in the community. Most of the gravity sewer collection system is buried in very deep, excessively drained, fine loam or sand. Given these soil conditions, groundwater infiltration into the collection system is presumed not to be a widespread problem. It is recommended that the City develop an annual cleaning and inspection program to manage maintenance activities and to assist with the annual Inflow and Infiltration Report requirements included in the City's WPCF Permit.

Lift Station Evaluation

Lift Stations No. 1, 2, and 3

- Each lift station is equipped with two surface-mounted suction lift pumps and one submersible sewage pump in the wetwell. Periodic issues with duplex operation have resulted in overuse of one pump versus the others, and operators have concluded a programmable logic controller (PLC) is likely malfunctioning and needs replaced.
- The vacuum priming systems for the surface-mounted pumps are old and malfunction frequently, which is another reason operators resort to using the submersible pumps. Due to the many failure mechanisms associated with the vacuum priming system and the pump suction headers, it is recommended the pump configuration be modified so all pumps are submersible.
- The foul air ventilation systems for each lift station are original from the time of installation, are failing, and should be replaced.
- Level controls in Lift Stations No. 1 and 2 have malfunctioned on occasion and should be replaced.

- Operators suspect the check valves in Lift Station No. 3 are inoperable and allow backflow into the wetwell when in the closed position. The check valves at every lift station should be inspected and replaced as necessary.
- The magnetic flowmeter in Lift Station No. 3 was installed in 2002 and verified for accuracy in 2020. Due to the age of the flowmeter and potential inconsistencies with flowmeter valves, it is recommended the flowmeter be replaced to accurately record influent to the lagoon system.

Lift Stations No. 4, 5, 6, and 7

- Lift Stations No. 4, 5, 6, and 7 were installed without isolation valves or emergency bypass piping. It is recommended portable pump bypass piping be installed so operators can bypass wastewater flows while performing lift station maintenance.

Wastewater Treatment Facility Evaluation

The following deficiencies were noted:

- The City of Boardman has never removed biosolids from their lagoon system, which is unique considering that Lagoons No. 1 and 2 have been in operation for more than 38 years. Results from a sludge survey indicate that the sludge in Lagoon No. 1 has accumulated to depths ranging from 1 to 4 feet. Comparison of the lagoon bottom surface to the top of sludge surface shows approximately 52,520 cubic yards of accumulated sludge in Lagoon No. 1. It is recommended that the City remove the biosolids to regain treatment volume. Biosolids removal will need to be performed in accordance with the requirements outlined in the City's WPCF Permit.

Treated Wastewater Disposal System Evaluation

The following deficiencies were noted:

- The magnetic flowmeter was installed in 2002 and verified for accuracy in 2020. Due to the age of the flowmeter and potential inconsistencies with flowmeter values, it is recommended the flowmeter be replaced to accurately record effluent to the land application site.

Wastewater System Selected Improvements

Chapter 5 of this WWFP summarizes three improvement alternatives to meet the City's wastewater collection, treatment, and effluent disposal/reuse needs for the 20-year planning period (to 2042). An improvement alternative was selected by the City after careful consideration of the various impacts, objectives, and criteria discussed in Chapter 5 and review, evaluation, and consideration of associated cost estimates.

Lift Stations No. 1, 2, and 3 need various immediate improvements and are a priority for the City. The wastewater treatment and disposal alternative selected by the City, Alternative C, involves construction of a new wastewater storage lagoon. Once the new storage lagoon is operational, the City can remove Lagoon No. 1 from service and have the biosolids removed after they have had adequate time to dewater. The selected improvements are shown on Figure 6-1 in Chapter 6.

Lift Station Improvements

All three primary lift stations will be upgraded by reconfiguring the pumping systems by installing submersible pumps in the wetwells. This will eliminate the need for the pump suction headers and the problematic vacuum priming system. In addition to the pump and piping modifications, the City is planning to repair or replace the following items:

- PLC
- Foul air ventilation systems
- Wetwell level control systems
- Miscellaneous gate and check valves
- Magnetic flowmeter

Portable pump bypass piping on Lift Stations No. 4 through 7 will be installed for emergency situations and for ease of maintenance. The improvements to the secondary lift stations can be phased in over time.

Wastewater Treatment Facility Improvements

The proposed improvements to the City's existing WWTF consist of the following:

- Construction of a new storage lagoon (approximately 9.5 acres in surface area and 27.3 MG of storage volume). Since all treatment will occur in the City's existing lagoon system, the City will be able to utilize the new lagoon solely for storage.
- The new storage lagoon will be lined with a synthetic liner to prevent seepage.
- Lagoon No. 1 is anticipated to be dewatered and allowed to dry for approximately 1 to 2 years once the new storage lagoon is operational.
- The City plans to dispose of all the biosolids in a landfill due to all the known plastics and inorganics in the biosolids.

Summary of Estimated Costs

- The total estimated cost for the selected alternative is summarized on Figure 6-1. The total project cost was projected to the year 2021, as this is likely the year construction would occur. The total estimated year 2021 project cost is \$5,866,000.

Current Financial Status and Loan Capacity

Over the past four years the City has been able to meet annual expenditures. The expenditures are variable and show an upward trend over time as shown on Figure 7-1 in Chapter 7. It is typically expected that expenditures should be increasing with time as the costs to own and operate a WWTF continually increase, and considering the age of the existing facility and equipment.

The new system will likely have similar annual costs to operate and maintain. For the purposes of this WWFP, it has been assumed that overall annual operation, maintenance, and replacement (OM&R)

expenditures will increase at a constant rate for the next several years. Historically, OM&R expenditures have increased at approximately 5 percent per year. Further discussion of future expenditures is presented in Chapter 7.

Existing Debt

The City of Boardman is currently paying off a general obligation (GO) bond obtained in 2003 with payoff scheduled in 2029. However, the outstanding debt from the 2003 GO bond is being assumed by the recently passed 2020 GO bond.

Although a detailed analysis of the City's current sewer rate structure is beyond the scope of this WWFP, some discussion of the existing rate structure and current and future wastewater system budgets is as follows:

- The current wastewater rate is \$27.50 per month inside city limits and \$40.00 per month outside city limits, as shown on Table 7-1 in Chapter 7.
- Wastewater user fee revenue is based on 902 equivalent residential units, as shown on Table 7-2 in Chapter 7.
- Total revenue from sewer service fees and investment income was \$736,997 in the budget year 2019-20, as shown on Table 7-3 in Chapter 7.

Project Implementation

Should the City wish to proceed with the Wastewater System Improvements project, the following Implementation Plan outlines the key steps the City would need to undertake for project implementation. The following outlines only the major steps that need to be followed.

Item No.	Implementation Item	Time Frame
1.	Land acquisition.	March 2021
2.	Submit draft WWFP to City and agencies for review.	May 2021
3.	Finalize and adopt the WWFP.	July 2021
4.	Design system improvements.	Spring/Summer 2021
5.	Permitting process.	Summer 2021
6.	Submit design documents for agency(ies) review.	Summer 2021
7.	Advertise, bid, and award construction project.	Fall 2021
8.	Project construction.	Fall 2021 through Summer 2022
9.	Project startup and construction completion.	Summer 2022
10.	Project closeout.	Fall 2022
11.	Monitor system performance to determine impact of improvements, report impacts to the Oregon Department of Environmental Quality, and determine the need for future improvements.	Two years after project closeout

Wastewater system improvements as outlined in this WWFP will provide the City with a reliable, quality wastewater system that is anticipated to meet the City's needs for many years to come.

Chapter 1 - Introduction

General Services Overview

Since 1979, the City of Boardman, Oregon, has operated a facultative lagoon system and effluent land application facilities to serve the City's wastewater needs. Wastewater generated by City residents and local businesses, and domestic wastewater from the Port of Morrow is conveyed to the wastewater treatment facility (WWTF) by a series of three primary wastewater lift stations and the 3-mile-long interceptor sewer main. The wastewater collection, treatment, and disposal system operate under the authority of a Water Pollution Control Facilities (WPCF) Permit issued by the Oregon Department of Environmental Quality (DEQ).

The City's WPCF Permit was renewed effective March 4, 2020, and the City needs to evaluate the wastewater system for adequacy to provide wastewater treatment and disposal that meets permit requirements during the 20-year planning period.

Authorization

An Agreement for Engineering Services was entered on July 18, 2016, authorizing Anderson Perry & Associates, Inc., to prepare this Wastewater Facilities Plan (WWFP). This WWFP is completed in accordance with the DEQ's guidance document "Preparing Wastewater Planning Documents and Environmental Reports for Public Utilities," dated July 2018.

Project Purpose

This WWFP has been prepared for the purposes of determining the existing wastewater collection, treatment, and disposal system's ability to handle anticipated growth, and provide the City with a comprehensive planning document that outlines recommended wastewater system improvements. This WWFP outlines existing system deficiencies and provides a summary of feasible improvement alternatives and estimated costs.

Scope

To meet the intentions and goals of the WWFP, the following scope was identified in the Agreement for Engineering Services:

- A statement of purpose, background, and need for the WWFP.
- A review and update of the current wastewater flows and loads, as well as the 20-year projection of future population, wastewater flows, and waste loads. Design criteria are to be developed based on this information.
- A review of the evaluation of the existing wastewater lagoon treatment system and an update of the identified deficiencies based on the review.
- An evaluation of the feasibility of various improvement options and cost-effectiveness analysis of the alternatives over a 20-year period. Treatment standards and cost estimates for each alternative are to be identified. The evaluation will not include an infiltration/inflow (I/I) study but will identify estimated amounts of I/I in the system.

- An evaluation and detailed description of a preferred improvements alternative. Treatment and regulatory standards are to be identified and estimated costs are to be outlined.
- An analysis of financing options and review of a possible financing plan for both construction and long-term operation, including projected sewer use charges.
- A preliminary environmental analysis. *Note: This Scope of Work does not include the preparation of environmental reports for design and construction funding applications, biological assessments, wetland delineations, cultural resources evaluations, mitigation plans, or other related environmental documents.*

Presentation of Recommendations

Based on a review with the City, recommended system improvements are identified for treatment and disposal. Included with these recommendations are a prioritization of needs, cost estimates, and a preliminary environmental analysis of the preferred option.

Location and Study Area

The City of Boardman is in northern Morrow County, adjacent to the Columbia River. Boardman is situated along the Interstate 84 (I-84) corridor between Arlington and Pendleton. Boardman anchors the west end of the Mid-Columbia River Basin area of Oregon that also includes the communities of Hermiston, Umatilla, Stanfield, Echo, and Irrigon. The location and vicinity maps are shown on Figure 1-1.

The City of Boardman can be geographically divided into two regions, north and south Boardman. North Boardman, situated between I-84 and the Columbia River, contains residential and commercial areas, as well as Riverside High School. North Boardman also includes the Port of Morrow Industrial Area, which was annexed into the City in 1994. South Boardman includes those residential, commercial, and public facilities south of I-84, including City Hall. The City's zoning map is shown on Figure 1-2.

Wastewater Facilities Plan Outline

The following provides a general description of Chapters 2 through 7 of this WWFP:

Chapter 2 describes in general the existing wastewater system, environmental and demographic conditions, and the WPCF Permit requirements.

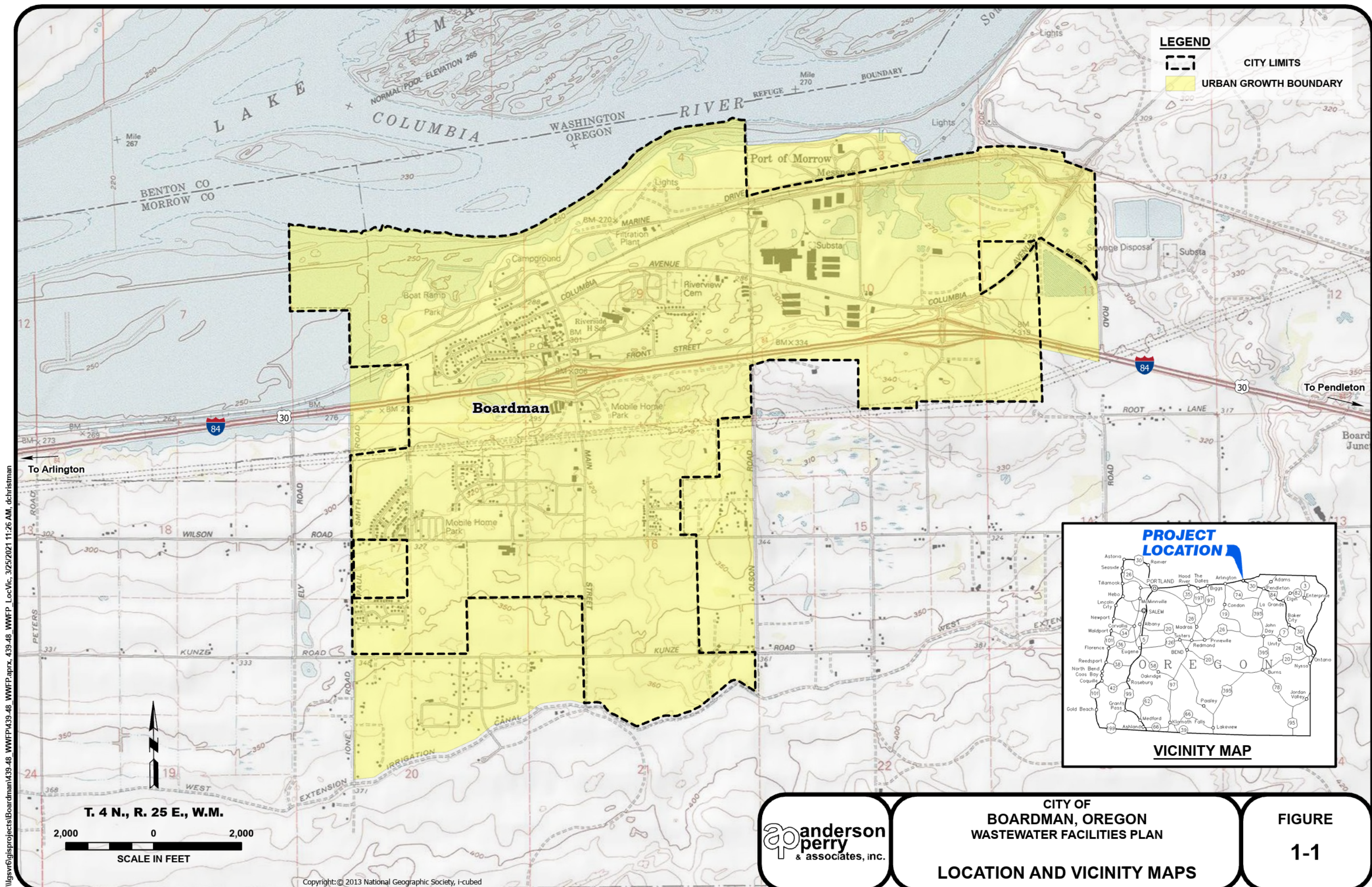
Chapter 3 describes the current population and population projections, historical flow data, and design criteria to be used for the wastewater treatment and disposal systems. It also discusses and evaluates the regulatory requirements that must be met by all viable options.

Chapter 4 details the evaluation of the WWTF and disposal system and the brief collection system evaluation.

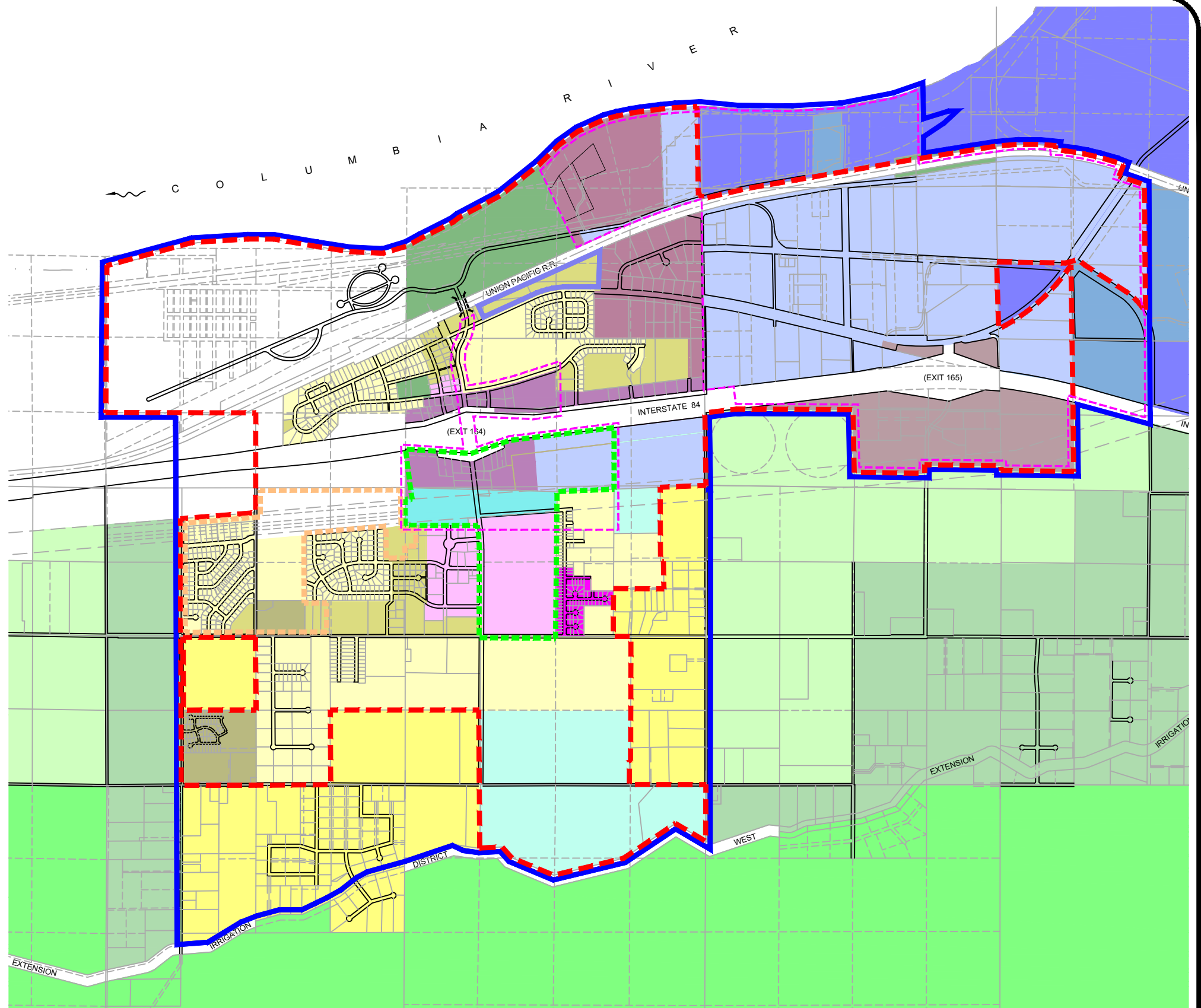
Chapter 5 develops and evaluates the improvement alternatives.

Chapter 6 discusses the selected options and improvements to be implemented, including a preliminary environmental review of the selected alternative.

Chapter 7 describes the implementation schedule and potential funding methods.



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Chapter 2 - Background Information

General

In this chapter, environmental, demographic, and land use conditions in and around the City of Boardman are described to provide background information pertinent to decisions discussed in this Wastewater Facilities Plan. Environmental conditions are described in a general nature. The existing wastewater collection, treatment, and disposal facilities are also described as an introduction to subsequent chapters detailing wastewater system design criteria and capacity and operational deficiencies within the existing wastewater system.

Environmental Conditions

The City of Boardman is situated in the arid Mid-Columbia River Basin. Today, this region is characterized by a diversified agricultural economy developed around the Columbia River. The greater Boardman-Hermiston area has developed as a major center for irrigated agriculture. To a lesser extent, dryland farming operations are also present in this area. The environmental landscape reflects this tie to agriculture. The gently rolling landscape surrounding Boardman has been shaped by agriculture to include cultivated fields, manmade canals and drainage features, and power transmission corridors interspersed by natural grass and sagebrush plant communities.

Topography

The City of Boardman lies between 280 and 370 feet above mean sea level (MSL). City Hall in south Boardman lies at approximately 300 feet above MSL, and the City's wastewater lagoon site lies at elevation 325 feet above MSL. To the north, the average operating water surface of the Columbia River is at elevation 268 feet above MSL for the John Day Pool (Lake Umatilla). Four miles south of Boardman, the ground surface gradually rises to elevations in the range of 500 to 600 feet above MSL.

Geology

The City of Boardman lies within the Columbia Basalt Plain, or Columbia Basin Physiogeographic Province. Massive basalt formations ranging to more than 5,000 feet in total thickness are characteristic of the area. In and around the City of Boardman, basalt bedrock is overlain by varying layers of sedimentary deposits including silts, sands, gravels, and volcanic ash. The "Soil Survey of Morrow County, Oregon," published by the Natural Resources Conservation Service, indicates that most soils in the study area are composed of windblown fine sand, loamy sand, sandy loam, and alluvial gravels.

Climate

Boardman lies in one of the more arid regions of Oregon, with an average precipitation of approximately 8.9 inches per year, according to the Oregon Climate Service. Typically, only three months (January, November, and December) receive more than 1 inch of precipitation, with no

month averaging more than 1.3 inches of precipitation. The mean temperature is 53°F with historic minimum and maximum temperatures of -15°F and 108°F, respectively.

Surface Water

The only perennial surface water stream in the Boardman area is the Columbia River. The City of Boardman lies adjacent to Lake Umatilla at Columbia River Mile (RM) 269. Lake Umatilla is formed by the John Day Lock and Dam, approximately 56 miles downstream. The John Day Dam is operated for flood control and power generation. The water level in Lake Umatilla can be manipulated to provide approximately 0.5 million acre-feet of flood water storage. When the John Day Lock and Dam was constructed, portions of the City of Boardman were abandoned and/or moved to higher ground prior to filling Lake Umatilla.

The Columbia River, due to its size and relatively good water quality, is the most important and most utilized surface waterbody in the Pacific Northwest. Human uses of the river include power production, transportation, irrigation, navigation, flood control, recreation, domestic water consumption, industrial water consumption, and sport fishing. The river supports a wide variety of fish, birds, and other wildlife and serves to drain much of the Inland Northwest to the Pacific Ocean. The City of Boardman withdraws potable water for municipal use from two collector wells adjacent to the river. The collector wells are near each other, located at approximately RM 268.

The City of Boardman does not discharge treated municipal wastewater to the Columbia River. Any potential effluent discharge to the Columbia River would need to comply with Oregon Administrative Rules (OARs) 340-41-645 and 655, at a minimum. These rules establish minimum water quality standards in and around the Umatilla River Basin, including the Columbia River near Boardman. These rules also establish minimum design criteria for the treatment and control of wastewater discharged to the Columbia River. The City's existing lagoon system would not qualify for Columbia River discharge under these rules, primarily due to excessive organic material and solids in the lagoon effluent.

Additional surface water features in the Boardman area include several small inlets and ponds formed or influenced by the Columbia River, manmade canals, irrigation return wasteways utilized in the irrigated agriculture industry, and wastewater and irrigation storage lagoons operated by the Port of Morrow (POM) and the City of Boardman.

Groundwater and Wetlands

Groundwater is present below the Boardman area in both basalt and unconsolidated surface formations. Multiple water-bearing zones in subsurface basalt include minor aquifers fed by surface precipitation and recharge, and a major aquifer system supplied by precipitation and runoff on a regional scale, including snowmelt runoff from the Blue Mountains.

Unconfined groundwater can be found throughout the Boardman area on a permanent or temporary basis depending on location. The POM maintains an extensive groundwater monitoring well network in the east Boardman area to monitor potential groundwater impacts from industrial wastewater land application practices. The POM currently monitors groundwater for the City's land application site. However, in 2020 the City began developing its own groundwater monitoring plan for the wastewater lagoons and land application site.

Since 1987, the POM has generated an extensive volume of groundwater contour and quality data in and around the City's existing lagoon site and POM-controlled fields. Based on these data, it appears that groundwater fluctuates between 20 and 40 feet below ground surface (BGS) in the vicinity of the City's wastewater site. Immediately north of the City's wastewater treatment facility (WWTF), groundwater levels become shallower near the Columbia River, with groundwater depths approximately 15 to 20 feet BGS. Northeast of the City's WWTF, depth to groundwater increases to approximately 60 to 80 feet BGS. South of the City's WWTF and Interstate 84 (I-84), groundwater levels rise to near the ground surface under the influence of crop irrigation.

Based on the experiences of City staff, groundwater is anticipated to lie more than 10 feet BGS in most residential and commercial areas of Boardman. Two exceptions are the lands near the Umatilla National Wildlife Refuge, which borders Boardman to the west, and the east Boardman area surrounding Lift Station No. 3, where groundwater lies between the surface and 10 feet in depth.

Groundwater quality is a significant concern in Morrow County and the Boardman area. The Oregon Department of Environmental Quality has designated northern portions of both Morrow and Umatilla Counties into the Lower Umatilla Basin Groundwater Management Area (LUBGMA). The primary pollutant addressed by the LUBGMA is nitrate nitrogen, which can affect the health of infants and young children (Blue Baby Syndrome). Nitrate nitrogen management efforts under the LUBGMA are particularly aimed at the region's agricultural practices but also could impact the City of Boardman's wastewater treatment and land application practices.

Operation of the Columbia River as a series of reservoirs, including Lake Umatilla, has altered the natural extent and distribution of wetlands along the river's length. Local plant communities have established under normal pool fluctuations of 3 to 5 feet. New wetland, riparian, and shallow water habitats have formed along the Columbia River, including the reach fronting the City of Boardman. In general, wetland vegetation in the region consists of rushes, sedges, and cattails in an emergent environment. Wetlands or wetland-like areas in the Boardman area include portions of the Umatilla National Wildlife Refuge west of downtown Boardman and the Coyote Springs Wildlife Area, approximately 0.5 mile east of the City's land application site. The Coyote Springs Wildlife Area functions as an irrigation return collection area.

Flood Hazards

The City of Boardman lies outside the 100-year floodplain of the Columbia River. Beginning when the City was moved as part of the John Day Lock and Dam construction project, development has occurred in areas situated well above the river. Flooding is not a significant concern in Boardman.

Fish and Wildlife

The Columbia River supports numerous runs of anadromous fish, including spring, summer, and fall Chinook; sockeye salmon; coho salmon; steelhead trout; white sturgeon; American shad; and lamprey. Other noteworthy game and non-game fish species in the Columbia River include bass, crappie, blue gill, walleye, perch, suckers, northern squawfish, and shiners.

Riparian areas and agricultural areas bordering the Columbia River provide valuable habitat for a variety of waterfowl, raptors, and upland game birds. Ducks, geese, quail, mourning doves, and ringneck pheasants can be found throughout the Boardman area. The Umatilla National Wildlife

Refuge provides important nesting sites for Swainson's hawk, red-tailed hawk, great horned owl, and northern pigmy owl. Peregrine falcons and bald eagles have also been sighted in the area.

Mammals common to upland and riparian areas include the black-tailed jackrabbit, mule deer, Washington ground squirrel, coyote, and deer mouse. Skunks, muskrats, raccoons, and cottontail rabbits are also found, principally along riparian corridors.

Air Quality

Generally, air quality in the Boardman area is excellent. Occasional nuisance impacts (visibility and odors) in the Boardman area can generally be attributed to the area's agricultural and industrial presence. Although the City of Boardman's wastewater lagoons are a source of minor odors at times (principally during the lagoon turnover period in the spring), the lagoons are not thought to significantly impact air quality. Typically, prevailing winds are from west to east in the Boardman area, so minor odors are carried away from populated areas and diluted without social impact.

Water Supply

Potable water service in the City of Boardman is supplied by two collector wells adjacent to the Columbia River that pull water from the alluvial aquifer and pump water to the City's water system. The existing collectors are in the central area of north Boardman approximately 1 mile west of the City's wastewater disposal site.

Land Use Conditions

Economy

Historically, Boardman's economy has been fueled by the agriculture industry and agribusiness enterprises in and around the community. The Boardman/Hermiston region of northeast Oregon is a major center for irrigated agriculture. Water supply and water delivery projects carried out over the past several decades allowed for the conversion of nonproductive farm and rangeland to irrigated fields producing high value and specialty crops. Major crops in the area include potatoes, alfalfa, corn, and melons.

As the agricultural potential of the Boardman/Hermiston area was developed, food processing industries moved into the area. In Boardman, companies such as Lamb-Weston, Oregon Potato, and Boardman Foods expanded the job market in the community. Other industries not directly tied to agriculture have also located in Boardman, including a Bigfoot Travel Trailer manufacturing facility, the Portland General Electric (PGE) Coyote Springs Co-generation Facility, and PGE's coal-fired power plant.

Much of the industrial development in the Boardman area has occurred in and around the POM. The POM continues to attract interest from agribusiness and manufacturing industries, and economic development in the area is expected to continue. Recently, data centers have begun operation in the POM. Data centers are an emerging economic development in Oregon bringing significant capital investment to its communities. With a diverse supply of inexpensive, large commercial lots, and an increasing demand for large data center facilities, the POM is a likely destination for other data centers.

In addition to the industrial base developed in Boardman and the POM, regional facilities add to the population and economy of Morrow County. These facilities include the Umatilla Army Depot, the Union Pacific Railroad (UPRR) facility at Hinkle, the Two Rivers Correctional Institute in Umatilla, and a Wal-Mart Distribution Center in Hermiston.

Land Use

Residential

Residential development in Boardman has occurred in all four quadrants of the City as seen on the zoning map on Figure 1-2 in Chapter 1. The northwest and southwest quadrants contain the larger residential clusters in the community. These two quadrants combined hold approximately 70 percent of the land classed for single-family, multi-family, and mobile home park residential use.

New subdivision development for single-family residences, either underway or proposed, is generally focused in south Boardman. However, single- and multi-family residential infill is occurring on undeveloped lots in north Boardman, with large developments occurring in both sectors. This development pattern needs to be recognized as the capacity of the collection system is evaluated.

Commercial

General commercial development has occurred in a north-south alignment surrounding the Main Street corridor in both north and south Boardman. A second commercial corridor, running perpendicular to Main Street and fronting I-84, is geared toward tourism and regional travelers. Commercial development along the I-84 corridor includes restaurants, gas stations, convenience stores, and motels. Future commercial development is expected principally in these two existing commercial areas. Limited commercial development is also possible in northeast Boardman.

Industrial

The majority of industrial development has occurred east of Main Street. Industries in the POM area are generally clustered into one large industrial block in the northeast portion of Boardman and along the I-84 corridor. Industrial expansion is expected to remain focused in these areas. No lands west of Main Street are currently classed for industrial use.

Transportation

The City of Boardman straddles I-84, the main transportation link in northeast Oregon. Highway access to Boardman is also provided by U.S. Highway 730. In addition to a well-developed road system, Boardman is served by a UPRR line and the Columbia River. Industries in the POM area heavily utilize rail and barge services to transport goods into and out of the region.

Existing Wastewater System

The City owns and operates a conventional gravity wastewater collection system, eight lift stations, and an approximately 42-acre facultative lagoon WWTF. Treated wastewater is stored in the lagoons during non-irrigation months. During summer months, treated wastewater from the lagoons is dosed with

chlorine from the hypochlorite generation system prior to being dispersed by a center pivot on a 104-acre land application site located east of the WWTF. The WWTF and land application site are located east of the City.

South of I-84, the City's wastewater collection system is gravity fed to Lift Station No. 1; the first of three primary lift stations located in a series along the forcemain to the WWTF. The forcemain leaves Lift Station No. 1 and travels north under I-84 to 2nd Street before turning east onto Columbia Avenue en route to Lift Station No. 2. Lift Station No. 2 also collects wastewater from the gravity collection system in northeast Boardman and receives wastewater from four secondary lift stations (two are private). The forcemain continues along Columbia Avenue until reaching Lift Station No. 3, approximately one-third mile west of the WWTF. This section of forcemain collects domestic wastewater from the POM by gravity and through smaller forcemains from four secondary lift stations (one is private). Lift Station No. 3 transfers all the wastewater through a forcemain prior to discharging into the three-cell facultative treatment lagoons. The WWTF and collection system, including the lift stations, are discussed in greater detail in Chapter 4.

Water Pollution Control Facilities Permit

The City's wastewater system is permitted as an evaporation and land application system; no direct discharge to surface Waters of the State is permitted. The WWTF is regulated under a Water Pollution Control Facilities (WPCF) Permit. The WPCF Permit (No. 102277) is authorized and administered by the Oregon Department of Environmental Quality (DEQ). Current effluent management requirements for the City's WWTF are provided in the City's WPCF Permit. The City's WPCF Permit was renewed in March 2020. A few modifications were made to the reclaimed water reporting requirements, and the effluent monitoring requirements remained relatively unchanged compared to the previous WPCF Permit.

The City's land application site (Circle 52) is a shared use site between the City and the POM. The City applies reclaimed water as needed to maintain adequate storage in the lagoons, and the POM applies industrial wastewater and supplemental well water to maintain a healthy crop and meet agronomic rates. Groundwater monitoring, soil monitoring, application rates, etc., are managed by the City to meet the requirements of the City's Recycled Water Use Plan. Refer to Appendix A for a copy of the WPCF Permit.

Accumulation of biosolids (sewage sludge) in the wastewater treatment lagoon is permitted under the WPCF Permit on a year-round basis until such time that biosolids must be removed to maximize wastewater treatment efficiency. Biosolids land application and management must comply with Oregon biosolids rules and guidelines, including OAR 340-050 and all other applicable statutes, rules, and federal regulations. Land application activities would be conducted in accordance with an approved Biosolids Management Plan, if necessary.

Liquid Treatment

The City's existing three-cell facultative lagoon WWTF provides treatment of the City's wastewater. Current effluent management requirements for the City's WWTF are provided in the City's WPCF Permit. Groundwater monitoring and disposal of the City's reclaimed water are based on groundwater concentration limits as established in OAR 340-040-0030 and in accordance with the City's Recycled Water Use Plan and Groundwater Monitoring Plan.

Solids Treatment

As required by the Clean Water Act Amendments of 1987, the U.S. Environmental Protection Agency (EPA) developed a regulation to protect public health and the environment from reasonably anticipated adverse effects of certain pollutants that might be present in municipal sewage biosolids. This regulation, “The Standards for the Use or Disposal of Sewage Biosolids” (40 Code of Federal Regulations [CFR], Part 503), was published in the Federal Register (FR) (58 FR 9248 to 9404) on February 19, 1993, and became effective on March 22, 1993. The regulations that govern the recycling and disposal of sewage biosolids in Oregon are contained in OAR 340-050 and follow 40 CFR, Part 503.

The provisions of the Part 503 rule are consistent with the EPA’s policy of promoting beneficial uses of biosolids (refer to 49 FR 24358, June 12, 1984, for further information). Land application takes advantage of the soil conditioning and fertilizing properties of biosolids.

The Part 503 rule includes five subparts: Subpart A - General Provisions; Subpart B - Requirements for Land Application; Subpart C - Surface Disposal; Subpart D - Pathogen and Vector Attraction Reduction; and Subpart E - Incineration. For each of the three use or disposal options (e.g., land application, surface disposal, and incineration), a Part 503 standard includes general requirements, pollutant limits, management practices, operational standards and requirements for the frequency of monitoring, recordkeeping, and reporting. Since Boardman would likely benefit from the use of their biosolids through land application, the only regulations pertaining to the City would be Subparts A, B, and D, as Subparts C and E pertain to disposal and incineration of the biosolids.

Part 503 separates biosolids into two classifications, Classes A and B, related to pathogen densities contained within the biosolids at the time of land application. Class A biosolids have much more stringent requirements related to pathogen density levels than do Class B biosolids. Biosolids meeting Class A requirements can be sold in bags or bulk and applied on public areas such as lawns and home gardens. Class B biosolids are restricted to bulk application on agricultural land, rangeland, forest, public contact sites, or reclamation sites.

Biosolids are a natural byproduct of the wastewater treatment process. The solids accumulate as sludge on the bottom of the lagoons until they are deep enough that it becomes necessary to dispose of them.

Once solids have accumulated to the point where they reach the system storage capacity or modifications to the existing WWTF are undertaken, the City may submit a Biosolids Management Plan to the DEQ so the solids can be removed and disposed of in a DEQ-authorized manner or in a landfill. Biosolids have not been removed from Boardman’s WWTF since construction of Lagoons No. 1 and 2 in 1979 and Lagoon No. 3 in 2001. The City completed a sludge survey in 2020 that shows that biosolids accumulation in Lagoon No. 1, the primary cell, has reached levels that are affecting wastewater treatment by decreasing volumes and reducing detention times. A more in-depth discussion on the capacity of the City’s wastewater system follows in Chapter 4.

Chapter 3 - Basic Planning and Design Data

This chapter presents the basic planning and design data necessary to evaluate the City's existing wastewater collection, treatment, and disposal facilities. These data are used to determine the facilities' ability to serve the wastewater system needs of Boardman for the selected planning period and form the basis for evaluating options for required improvements. First, population information and year 2042 population projections for the City of Boardman are presented. This is followed by a section that lists the year 2042 design criteria used for this Wastewater Facilities Plan (WWFP). Also, a discussion on treatment and regulatory agency requirements is provided.

Population

To estimate future wastewater system demands, population projections must be made. Projections are usually made based on an annual percentage increase estimated from past growth rates tempered by future expectations. Significant population fluctuations are typical in small communities, as demonstrated by the population history of Boardman, and it is difficult to accurately predict the population of a community over any extended period. Furthermore, residential developments have increased significantly, potentially adding approximately 1,200 new residents to the City as construction of a 240-unit apartment complex is complete, another 240-unit apartment/townhome complex is planned, and five single-family housing developments consisting of approximately 140 lots are being developed.

The period over which the population is to be projected usually depends on the type of improvements to be considered. Improvements that will require long-term financing should be designed for no less than the term of the financing. Facilities that are readily expanded or modified are normally designed for a period of 10 to 20 years. Facilities that are not easily modified or expanded, such as buried pipelines and storage reservoirs, may be designed for their expected life, which is usually 40 to 50 years or more. This WWFP has been written for a 20-year planning period and projects population to year 2042 due to improvement projects anticipated in year 2022.

The population of the City of Boardman, according to the July 1, 2020, estimate by the Portland State University Population Research Center (PRC), is 4,580. Past population trends for the City, comparing official Census data from 1980 through the present, show the population has increased significantly from 1,261 in 1980 to 4,580 in 2020.

The City expanded rapidly in the late 1970s and early 1980s with the advent of the Portland General Electric coal-fired power plant. Additionally, the pumping of water from the Columbia River for irrigation use began around this period allowing for the development of thousands of acres of farmland in the Boardman area. The City flourished still in the 1990s with increasing opportunities in the area. The PRC recently published the Coordinated Population Forecast for Morrow County for 2019 and assigned an average annual growth rate (AAGR) to Boardman of 1.3 percent. In accordance with Oregon Revised Statutes (ORS) 195.033, the PRC is responsible for establishing and maintaining population forecasts for cities in Oregon. Boardman's historical population data is presented on Table 3-1.

**TABLE 3-1
HISTORICAL POPULATION**

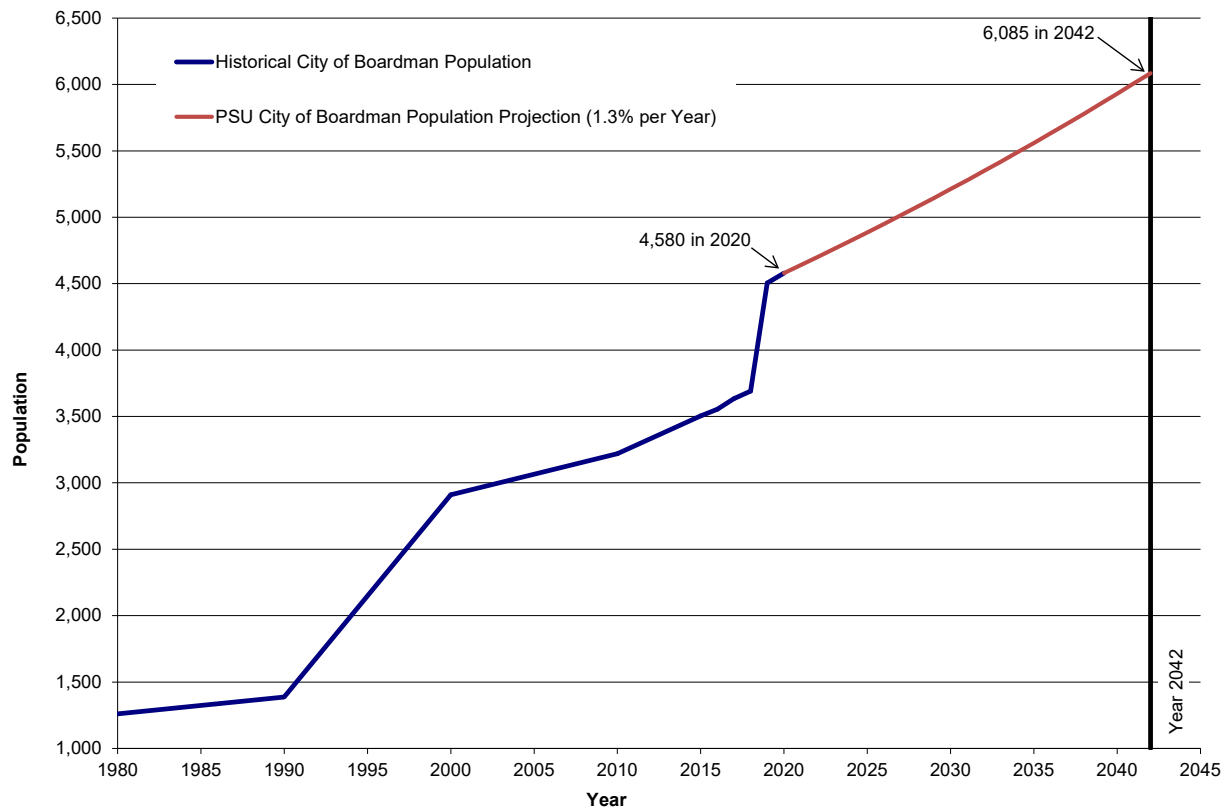
Year¹	Population	AAGR (Percent)¹	Population Change
1980	1,261	---	---
1990	1,387	0.96	126
2000	2,855	7.49	1,468
2010	3,400	1.76	545
2014	3,445	0.33	45
2015	3,505	1.74	60
2016	3,555	1.40	50
2017	3,635	2.25	80
2018	3,690	1.51	55
2019	4,505	22.09	815
2020	4,580	1.66	75
1980 to 2020	---	3.28	3,319

¹ The time between successive rows is variable. The AAGR is calculated based on the time span between each successive population shown.

As Table 3-1 demonstrates, the City of Boardman experienced an AAGR of 3.28 percent over the last 40 years of population history. Significant population growth occurred from 1990 to 2000. Currently, the City is experiencing similar conditions to the 1990 to 2000 period, specifically considerable interest in residential development within the City and industrial expansion at the Port of Morrow (POM). This WWFP provides a review of the past, present, and anticipated future of the City's wastewater system, and is intended to analyze the wastewater system over an extended period to properly forecast future wastewater system needs. With the historic average of approximately 3.28 percent annual population growth in Boardman, the steady increases in wastewater production, business expansion within the POM and the City's service area, and the considerable residential development being planned and underway, the City believes an assumed 3.0 percent annual population growth rate is justified for this WWFP. However, a 1.3 percent growth rate will be used in this WWFP in conformance with ORS 195.033 and the Oregon Department of Environmental Quality's guidance document for preparing WWFPs.

Based on a 2020 population of 4,580 and a 1.3 percent growth rate, the population projection results in 6,085 people by the year 2042. The population projection in year 2042 is being utilized for estimating the City's wastewater demands as it is anticipated that the wastewater system improvements will be completed in year 2022. It should be recognized that over the planning period of this WWFP, actual growth could exceed or fall below the projection presented on Chart 3-1.

**CHART 3-1
HISTORICAL AND PROJECTED POPULATION**



Historical Wastewater Data

This section provides a review of the historical wastewater data for the City of Boardman's wastewater treatment facility (WWTF). Information provided in this section was obtained from the City's Discharge Monitoring Reports and lift station records.

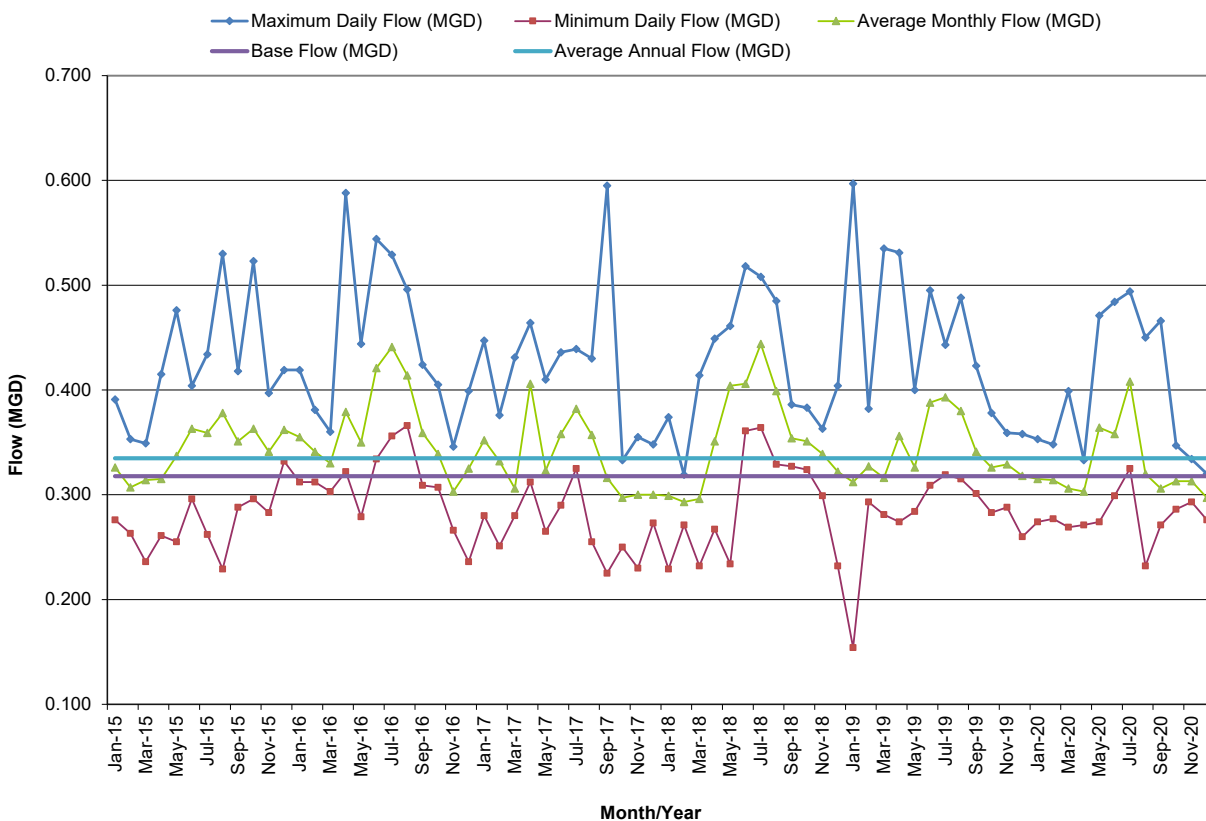
Wastewater Flows

Historical influent flows, including maximum daily flows, minimum daily flows, base flows, and average monthly flows for the period between January 2015 and December 2020, are shown on Chart 3-2. According to the data, the maximum daily flow occurred in January 2019 and was 597,000 gallons per day (gpd), which equates to approximately 133 gallons per capita day (gpcd) using the 2019 population of 4,505. The average monthly wet weather flow is calculated by averaging the six consecutive high flow months throughout the year. For some cities in eastern Oregon, the wet weather flows are centered around high precipitation months, spring runoff, and elevated groundwater periods. However, in Boardman, the high flow months are historically between April and September when precipitation is the least but irrigation is at its peak. The average monthly wet weather flow between 2015 and 2020 was 367,000 gpd and the maximum wet weather flow was 444,000 gpd in July 2018. The average annual flow for the analysis period was 335,000 gpd.

The City's base flow was calculated as the average of the six minimum average monthly flows in 2020 (306,000 gpd). This seems to be a reasonable approximation of the City's base flow due to the historical variation of system demands. The peaks and lulls in maximum monthly flows and average monthly flows shown on Chart 3-2 make it difficult to make a connection between the peak flows with wet weather flow months or elevated groundwater periods due to spring runoff or irrigation activities in the area.

Using the population estimate in 2020 of 4,580 and the average annual flow in 2020 (326,000 gpd) equates to an average per capita daily flow of approximately 71 gpcd. Data collected from many domestic wastewater systems like Boardman's indicate that average annual flows usually range from 65 to 90 gpcd. The per capita average daily flow, arid climate, and excessively draining soil type (sand) are indicators that the collection system is not impacted by infiltration and inflow (I/I). Further discussion on I/I is presented hereafter.

**CHART 3-2
HISTORIC MONTHLY INFLUENT FLOWS**



MGD = million gallons per day

Infiltration and Inflow Evaluation

Wastewater collection, treatment, and disposal facilities are intended to serve the sanitary wastewater needs of a community. However, stormwater and groundwater are often introduced into wastewater collection systems, usually through deficiencies in collection system piping and manholes or direct connections of inflow sources. This additional flow in either form of I/I consumes

wastewater system capacity. In cases where I/I is significant, collection, treatment, or disposal systems may need to be enlarged to account for the extraneous flows, or efforts to reduce I/I must be undertaken to restore capacity for sanitary wastewater needs.

I/I in a collection system can occur during different events at different times of the year. Elevated groundwater in the Boardman area can occur either during spring runoff periods or during the summer as irrigation in the area elevates shallow groundwater levels. During elevated groundwater periods, the collection system is susceptible to I/I if the collection system piping or structures are compromised. Specifically, the components of I/I are defined as follows:

- Infiltration - Water entering the collection system and service connections from the ground through such means as, but not limited to, defective pipes, pipe joints, and defective service line connections or manhole walls. Infiltration does not include, and is distinguished from, inflow.
- Inflow - Water discharged into a collection system and service connections from such sources as, but not limited to, roof drains, cellars, yard and area drains, foundation drains, sump pumps, cooling water discharges, drains from springs and swampy areas, manhole covers, cross connections from storm sewers and combined sewers, catch basins, stormwater, surface runoff, and street washes or drainage.
- I/I - The total quantity of water from both I/I without distinguishing the source.

Most cities have some I/I contributing to their wastewater collection systems. Excessive I/I is defined as the quantity of I/I that can be economically eliminated from a collection system by rehabilitation or other means, as determined by a cost analysis that compares the cost-effectiveness of correcting the I/I conditions with the total cost for transportation and treatment of I/I.

For projection purposes, it was assumed the current I/I flows experienced in the system would remain constant throughout the design period. Year 2042 I/I flows were not decreased for the following reasons:

- The nature of I/I corrective work in general is such that it is difficult to accurately predict future success.
- The magnitude of the City's I/I is such that results may not be seen for an extended period.

The U.S. Environmental Protection Agency's (EPA) "Guide for Estimating Infiltration and Inflow," dated June 2014, provides methods for analyzing WWTF influent data to estimate the I/I impact from the collection system. However, the data needed to follow the EPA methods for estimating base flow and I/I were not available nor does the City have the resources or equipment to collect the data needed. Therefore, the EPA requirements for estimating I/I cannot be met.

As part of the EPA Water Infrastructure Outreach Program, guidelines for I/I evaluation were developed. One specific guideline developed with this program states "no further infiltration/inflow analysis will be required if domestic wastewater plus non-excessive infiltration does not exceed 120 gallons per capita day (gpcd) during periods of high groundwater, and if the total daily flow during a storm does not exceed 275 gpcd, and there are no operational problems such as surcharges, bypasses, or poor treatment performance resulting from hydraulic overloading of the treatment works during storm events."

The average annual flow in 2020 was 326,000 gpd (71 gpcd, which is calculated by dividing 326,000 gpd by the 2020 population of 4,580). The amount of I/I was estimated by subtracting the base flow (306,000 gpd) from the average annual flow (326,000 gpd), equating to approximately 20,000 gpd.

The maximum daily flow of 597,000 gpd recorded in January 2019 resulted in a per capita flow in 2019 of 133 gpcd, which is significantly lower than the 275 gpcd allowed by the EPA for total daily flow during a storm. The maximum average monthly flow was 444,000 gallons in July 2018, which equates to approximately 120 gpcd using the 2018 population of 3,690. While 120 gpcd is at the threshold for further I/I analysis, it does not exceed the threshold. Per EPA guidelines, the City's per capita flows indicate that no further I/I analysis work is required.

City staff had little information to report on suspected problem areas in the collection system or areas of known I/I. City staff do not have a maintenance schedule for the collection system since they have very little problems. When problems do arise, they handle them on a case by case basis.

One source of inflow is known to the City, which is a splash pad located at a City park on the corner of Front Street N.E. and 3rd Street N.E. The splash pad was constructed in 2016 and contributes to the average monthly flows during the summer months. The City is aware of the problems associated with the inflow source and is working on a solution to remove it.

Other than the identified point source inflow, it does not appear that I/I is excessive in Boardman's collection system, and City operators do not suspect that I/I is a significant contributor to daily flows. Additionally, it does not appear that I/I is impacting the capacity of the wastewater systems. However, the identification of I/I sources and their removal from the system through manhole and pipeline repair could reduce the total volume of water the City must treat and dispose of. This reduction would provide a cost savings to the City. However, the costs savings may not be realized, considering the cost of identifying the I/I sources could easily exceed the cost savings from removing the I/I source(s).

Wastewater Concentrations and Loads

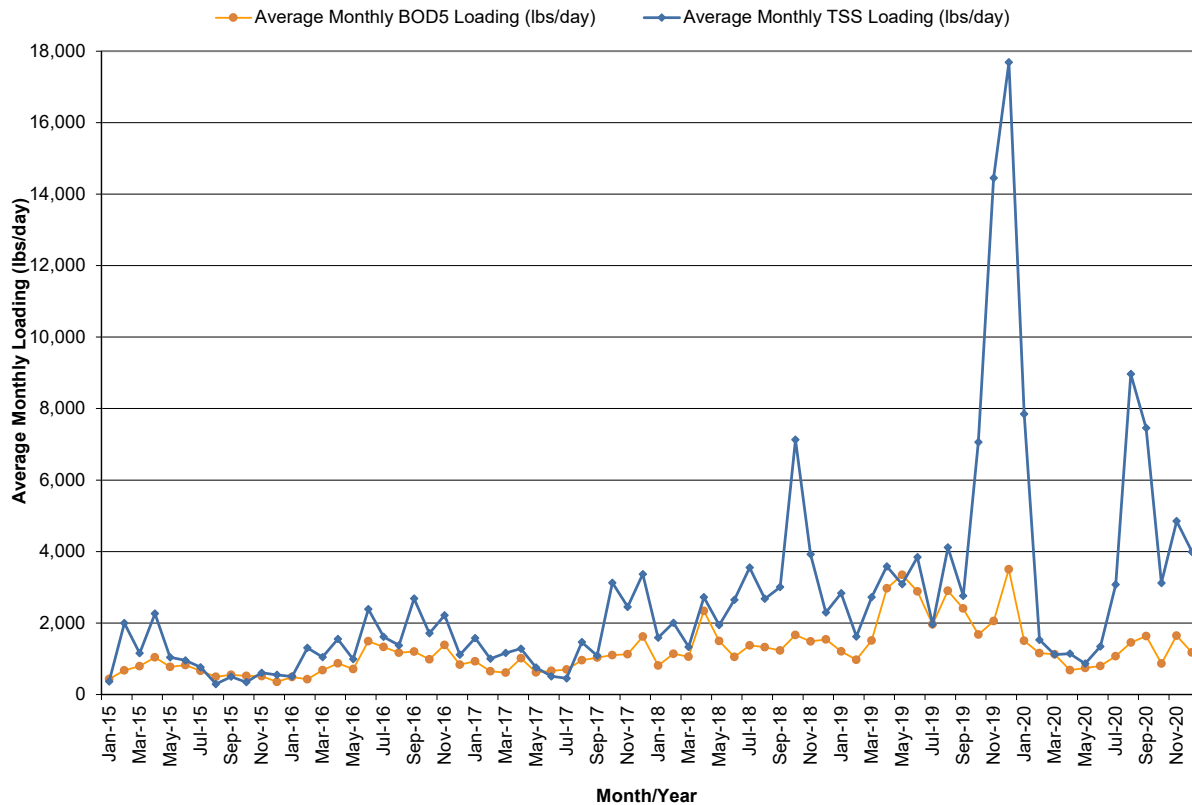
The City's facultative lagoon system has aerobic, facultative (combination of aerobic and anaerobic), and anaerobic portions. The treatment cells employ all portions in the decomposition of organic matter in wastewater. This organic decomposition is essential in the stabilization of the waste found in the water prior to disposal. Facultative lagoons with appropriate detention times, surface area, and controlled flow through the lagoons have proven to provide effective secondary treatment and waste stabilization.

All of Boardman's treated wastewater is currently evaporated or land applied on crops at Circle 52. With evaporation and land application as the system discharges, the influent and effluent five-day biochemical oxygen demand (BOD₅) and total suspended solids (TSS) data are good indicators for analyzing treatment efficiencies or determining if a problem exists in the treatment system.

Chart 3-3 shows average influent BOD₅ loadings range from 354 pounds per day (lbs/day) in December 2015 to a high of 3,503 lbs/day in December 2019, with average influent TSS loadings ranging from 291 lbs/day in August 2015 to a high of 17,687 lbs/day in December 2019. The average mass loadings of BOD₅ and TSS in 2020 were 1,155 lbs/day (0.25 pounds per capita per day [ppcd])

and 3,776 lbs/day (0.82 ppcd), respectively. Typical BOD₅ and TSS per capita contributions in domestic wastewater systems like Boardman's range from 0.15 to 0.25 ppcd.

CHART 3-3
HISTORICAL AVERAGE MONTHLY INFLUENT BOD₅ AND TSS LOADING



The upward trend of loadings, starting in the fall of 2017 and then spiking in both fall 2019 and 2020, is notable on Chart 3-3. The only new discharge sources added to the City's system recently have been from residential development. Since no high loading sources have been added to the system, the City suspected that the increase in loadings may be coming from the POM (even though they should only be receiving their domestic sewage). In October 2019, the City began pulling additional samples from the manhole just upstream of where the POM connects to the City's system (on Columbia Avenue near Olson Road) concurrently with the composite samples taken from Lift Station No. 3 (after the POM connections) for comparison. A summary of the 2019 test results and copies of the laboratory tests can be found in Appendix B.

Large variances between the two test locations were seen so the POM was contacted to investigate potential sources of industrial waste being conveyed to the City's system. Before a source could be identified, the loadings returned to more typical values. However, in fall 2020 the City began seeing spikes in the loadings again and resumed taking samples from the Columbia Avenue manhole concurrently with composite samples taken from Lift Station No. 3. The POM was contacted again, and they began weekly grab samples from vaults within their private system, concurrently with the City's tests in an attempt to pinpoint a source. A summary of the 2020 test results and copies of the laboratory tests can be found in Appendix B.

The POM test results came back consistent with domestic sewage, so the City decided to take a closer look at other potential reasons for the high-strength waste. From an operations standpoint, the City washes down the primary lift station wetwells and removes all grease/debris buildup every Monday with composite samples scheduled for Tuesdays. However, the sample day was changed to Wednesday as the City believes that slugs of concentrated waste were being sampled due to the wetwell cleaning activities. Additionally, it was discovered that the location of the hose that draws the samples in Lift Station No. 3 was adjacent to the wetwell wall where most grease/debris buildup occurs. The City relocated the sample tube to the center of the wetwell. After the operational adjustments were made, BOD₅ and TSS loadings returned to typical values.

BOD₅ and TSS loadings for communities like Boardman typically range between 0.15 and 0.25 ppcd. These typical loadings translate to approximate loadings between 687 and 1,145 lbs/day at the City's 2020 population of 4,580. As discussed previously, the City's historic loadings for BOD₅ and TSS in 2020 are 1,155 and 3,776 lbs/day, respectively. It is anticipated that the historic loading values have been influenced by the questionable sampling data and are not representative to actual system loadings, making it difficult to project loadings throughout the planning period. Regardless, the City must eliminate the spikes in loadings to properly plan for and size any future wastewater system improvements. Therefore, it seems appropriate to exclude the spiky BOD₅ and TSS data points (exceeding 2,000 lbs/day) to calculate an "adjusted" historic average. After doing so, the adjusted historic average for BOD₅ and TSS are 1,025 lbs/day and 1,092 lbs/day, respectively. Using the 2020 population of 4,580 and the adjusted historic averages, the per capita loading rates for BOD₅ and TSS are approximately 0.22 ppcd and 0.23 ppcd, respectively. Considering the significant population increases throughout the analysis period, a 0.25 ppcd loading rate will be used for loading projections.

Wastewater Flow and Loading Projections

Figure 3-1 summarizes basic wastewater design criteria used in this WWFP for the year 2020 and design year 2042. Figure 3-1 shows the year 2042 design population, design flows, and expected future influent wastewater strength characteristics projected from 2020 data or from data from within the year of occurrence. Figure 3-1 should be referred to during review of subsequent chapters of this WWFP, as it provides key information on which wastewater system options were developed and evaluated.

Domestic

Wastewater flow projections for the year 2042 were made using the existing base per capita wastewater contributions (67 gpcd) extrapolated to the end of the planning period using the year 2042 design population of 6,085 and adding the estimated I/I flow contribution ($6,085 \times 67 \text{ gpd} + 20,000 \text{ gpd} = 428,000 \text{ gpd}$). This assumes that I/I will remain constant over the 20-year planning period because I/I does not generally increase proportionally with population.

Industrial

The domestic wastewater flow projections are based solely on growth within the residential and commercial sectors. Industrial expansion in Boardman is highly likely, but industrial wastewater treatment falls under the regulations of a separate Water Pollution Control Facilities Permit through the POM and a separate treatment facility.

Mass Loadings

Domestic and Commercial

The domestic and commercial design mass loadings (BOD₅ and TSS) to the WWTF were estimated based on the upper threshold of average influent per capita BOD₅ and TSS contributions similar to Boardman projected to the end of the 20-year planning period using the year 2042 design population of 6,085 (i.e., mass loading [BOD₅ or TSS] = 0.25 [BOD₅ or TSS] ppcd x 6,085). Using the design mass loading of 0.25 ppcd for BOD₅ and TSS yields a year 2042 domestic mass loading of 1,521 lbs/day.

Industrial

Similar to industrial flow projections, the industrial mass loading component has been excluded from future projections.

DESIGN CRITERIA

	Boardman 2020	Future 2042
Population ¹	4,580	6,085
AAF, MGD ²	0.326	0.428
Per Capita Flow (gpcd)	71	71
I/I ³ , gpd	0.020	0.020
Base Wastewater Flow, MGD ⁴	0.306	0.408
Per Capita Flow, gpcd	67	67
Maximum Daily Flow, MGD ⁵	0.597	1.115
Per Capita Flow (gpcd)	133	133
Peak Hourly Flow, MGD ⁶	1.271	1.668
Per Capita Flow (gpcd)	278	278
Average Influent BOD ₅ , mg/L ⁷	421	426
lbs/day	1,145	1,521
ppcd	0.25	0.25
Average Influent TSS, mg/L ⁷	421	426
lbs/day	1,145	1,521
ppcd	0.25	0.25

Notes:

- ¹ Current population based on 2020 population as reported by the Portland State University Population Research Center, July 1, 2020. The 2042 population was projected using an average annual increase of 1.3 percent per year.
- ² Based on average monthly flow from DMRs from January 2020 to December 2020.
- ³ I/I assumed not to change from 2020 to 2042. I/I calculated by subtracting the AAF from the base flow.
- ⁴ Based on the average of the six minimum average monthly flows between January 2020 and December 2020.
- ⁵ Based on a flow recorded on January 3, 2019 and the 2019 population of 4,505.
- ⁶ Based on the 10-state standards, 3.9 times the AAF.
- ⁷ Bases on the upper threshold of typical per capita loadings for communities similar to Boardman.

AAF = average annual flow
 BOD₅ = five-day biochemical oxygen demand
 DMR = Discharge Monitoring Report
 gpcd = gallons per capita per day
 I/I = infiltration and inflow
 lbs/day = pounds per day
 ppcd = pounds per capita per day
 mg/L = milligrams per liter
 MGD = million gallons per day
 TSS = total suspended solids



CITY OF
 BOARDMAN, OREGON
 WASTEWATER FACILITIES PLAN
 DESIGN CRITERIA

FIGURE
3-1

Chapter 4 - Existing Wastewater System Characteristics

General

In this chapter, the existing wastewater collection, treatment, and disposal facilities are described and evaluated. Additionally, a brief construction history of the existing system is presented.

Wastewater Collection System Description

Boardman's wastewater collection system is a combination of a conventional gravity sewer network combined with a pressure sewer system feeding into a main interceptor sewer at various points along the length of the interceptor. Three primary wastewater lift stations are situated along the interceptor sewer to assist in the conveyance of wastewater to the City's treatment lagoons. Eight secondary lift stations are distributed throughout north Boardman, including four lift stations operated by the City and four private lift stations operated by the Boardman Parks and Recreation Department, the Union Pacific Railroad (UPRR), and the Port of Morrow (POM). A detailed collection system map located in the back of this Wastewater Facilities Plan (WWFP) shows the collection system, locations of the City's main interceptor sewer, and all lift stations.

Pipe Network

Based on City records, approximately 76,000 linear feet of sanitary sewer mains are located in Boardman, including gravity sewer mains and the interceptor sewer. Gravity sewer mains range in size from 6 to 12 inches in diameter in residential and commercial areas. Portions of the interceptor sewer include pipe up to 18 inches in diameter. The collection system network is summarized on Table 4-1.

**TABLE 4-1
WASTEWATER COLLECTION SYSTEM***

Type	Pipe Diameter (inches)	Length (feet)		
		North Boardman	South Boardman	Total
Gravity Collectors	6	800	1,500	2,300
	8	24,800	21,600	46,400
	10	1,100	6,200	7,300
	12	---	2,800	2,800
	6 to 12 Total	26,700	32,100	58,800
Interceptor Sewer	8 to 18, variable	16,800	300	17,100
Total	6 to 18	43,500	32,400	75,900

**Collection system information is based on City records and available drawings. This table does not include private sewer segments, including industrial sanitary sewer lines.*

In the gravity collection system, principal pipe materials include asbestos cement, polyvinyl chloride (PVC), and concrete. PVC and ductile iron pipe were used along pressurized portions of the interceptor sewer and in forcemains from the various smaller lift stations in the study area. A large

portion of the gravity sewer system was installed in the 1960s and 1970s. The interceptor sewer was placed in 1979.

It should be noted that Boardman's collection system is relatively large compared to the City's population. This situation arose from the way in which Boardman developed into two core areas: a north half and a south half, which are separated by Interstate 84 (I-84). This development pattern requires more collection system piping than in a more centralized community. Due to the collection system's large size, Boardman's north and south halves were separated into five different basins. The north half is composed of Basins D and E and is separated by Olson Road. The south half is composed of Basins A, B, and C. The south half of Boardman is composed of a large gravity collection system, all converging at Lift Station No. 1 near I-84 at the west end of Front Street. Due to the nature of the gravity collection system, the borders of these basins follow the general peaks in land topography as they converge on Lift Station No. 1. Figure 4-1 provides a visual aid in locating the extent of each basin. Further discussion on the City's lift stations is presented hereafter.

The size of Boardman's collection system is important to consider because, as the collection system ages, a well-organized and adequately financed collection system monitoring and repair program may be needed to maintain the integrity of the expansive pipe network.

Currently, the City does not have a regular maintenance schedule for the collection system but rather addresses collection system problems as they occur. Historically, the City has had very few problems with the pipe network aside from a few pipe segments in the southwest part of town. In 2018, the City completed an improvements project that replaced approximately 1,900 feet of sewer main lines and seven manholes, correcting problematic pipe segments. The City does not have any collection system improvement projects planned during the study period and, as such, no project costs have been included in this WWFP. Discussed hereafter are recommendations for the City to adopt an annual cleaning and inspection program.

The three primary lift stations along the City's interceptor sewer are designated as Lift Stations No. 1, 2, and 3. Lift Station No. 1, located at the west end of Front Street west of the I-84 Main Street off-ramp, receives wastewater from the gravity collection system in south Boardman. Lift Station No. 1 conveys wastewater underneath the freeway to the head end of a gravity portion of the interceptor sewer that begins at the intersection of Boardman Avenue and Second Street. From this point, the interceptor sewer runs north along Second Street before turning east along Columbia Avenue, where wastewater is gravity fed to Lift Station No. 2.

Lift Station No. 2, located at the intersection of North Main Street and Columbia Avenue, delivers wastewater eastward through a 10-inch pressure sewer section of the interceptor main. Wastewater from most of north Boardman enters the interceptor at Lift Station No. 2. From Lift Station No. 2, the interceptor continues along Columbia Avenue to Lift Station No. 3, which is approximately 0.25 mile west of the City's wastewater treatment and disposal site. Between Lift Stations No. 2 and 3, the interceptor sewer varies in diameter from 10 inches to 18 inches and collects wastewater from developments in northeast Boardman, including the domestic sewage from the POM. Lift Station No. 3 delivers all wastewater flows to the lagoon site through a 10-inch pressure sewer and flows are monitored by a magnetic flowmeter.

Lift Stations No. 1, 2, and 3 were originally constructed during the 1979 improvements project. During the 2001 Wastewater System Improvements - Phase I project, Lift Station No. 3 received

improvements that included the addition of a new electrical room onto the existing building, allowing separation of the electrical components from the corrosive environment of the wetwell area. Also, a new emergency generator, two surface-mounted and one submersible sewage pumps, and process piping were also installed to update the aging components.

Lift Stations No. 1 and 2 were upgraded during the 2006 Water and Wastewater System Improvements project. The work involved replacing the pumps and motors, motor controls, and minor piping. Electrical controls were relocated to the exterior of the building to prolong the integrity of these components by removing them from the corrosive wetwell environment.

The primary lift station wetwells are cleaned weekly. The City pumps down the fluid levels and hoses off any debris or buildup on the wetwell walls. The wetwells are reportedly in good structural condition, and improvements are not anticipated to be needed. One overflow was reported at Lift Station No. 2 in 2012 due to a fault in the fluid level monitoring instrumentation. The overflow was contained on site and immediately cleaned with a lime treatment.

All three lift stations have the following features:

- Dual surface-mounted suction lift pumps
- Backup submersible lift pump in the wetwell
- Standby emergency power generator
- Pump control panel and bubbler-type level sensing equipment
- Alarm telemetry
- Emergency bypass piping for pumping around the lift station

Wastewater flows are measured at Lift Station No. 3 using a magnetic flowmeter. The flowmeter measures pump output on the downstream side of Lift Station No. 3. Critical operating data for the three primary lift stations are shown on Table 4-2.

TABLE 4-2
EXISTING LIFT STATIONS NO. 1, 2, AND 3 DESIGN CRITERIA

Item	Lift Station No. 1	Lift Station No. 2	Lift Station No. 3
Pump Hp	15	15	60
Individual Pump Capacity	625 gpm 0.90 MGD	850 gpm 1.22 MGD	1,400 gpm 2.02 MGD
Pump Controls	Duplex	Duplex	Duplex

gpm = gallons per minute

Hp = horsepower

MGD = million gallons per day

Lift Station No. 4 is a secondary package lift station with two 5 Hp pumps, each with a 150 gpm pumping rate operating in duplex mode. This lift station is located just inside the Umatilla National Wildlife Refuge boundary serving portions of northwest Boardman near the Dodge City Inn and delivers wastewater to Lift Station No. 2.

Lift Station No. 5 is located along Olson Road north of Columbia Avenue. This lift station serves an industrial park that is relatively undeveloped aside from the Umatilla Electric Cooperative's office and collects wastewater from a POM-operated lift station serving the Vector Control District, the POM's office, and the River Lodge and Grill. Lift Station No. 5 is equipped with two 5 Hp pumps, each with a 125 gpm pumping rate operating in duplex mode.

Lift Station No. 6 is located near the UPRR and the Oregon Potato Company on Columbia Avenue and is used to transfer the industries' domestic wastewater to the interceptor on Columbia Avenue. The 2006 Water and Wastewater System Improvements project included installation of a new package lift station that located the pumps and controls on the ground level for ease of operation and maintenance (O&M). The lift station is equipped with two 5 Hp pumps, each with a 110 gpm pumping rate operating in duplex mode.

Lift Station No. 7 is in the Boardman Marina and RV Park. Lift Station No. 7 was funded and installed by the Bureau of Indian Affairs (BIA). This lift station serves the fish cleaning station located in the Marina. The City has taken over the O&M of Lift Station No. 7 from the BIA. The lift station is equipped with two 5 Hp pumps, each with a 150 gpm pumping rate operating in duplex mode.

The City cleans the secondary lift station wetwells semi-annually. The fluid levels are pumped down and any debris or buildup on the wetwell walls is cleaned off. The City's vac truck is then used to remove all debris and sediment that has accumulated at the bottom. During these maintenance activities, the City inspects the structural condition of the wetwells and, to date, no problems have been reported. Therefore, improvements are not anticipated to be needed to the secondary lift station wetwells.

Four private lift stations are also connected to Boardman's wastewater collection system. These include two lift stations operated by the Boardman Parks and Recreation Department, a small pump-out lift station operated by the UPRR, and the POM's industrial area domestic wastewater lift station. No information was provided on the private lift stations.

Collection System Deficiencies

Boardman Public Works staff report only minor problems and deficiencies in the existing gravity sewer collection network. The capacity of existing gravity lines appears to be adequate to serve foreseeable future needs, although this is dependent on the type and location of any new developments in the community. Most of the gravity sewer collection system is buried in very deep, excessively drained, fine loam or sand. Given these soil conditions, groundwater infiltration into the collection system is presumed not to be a widespread problem.

Public Works staff are under the assumption that the 18-inch transmission line between Lift Stations No. 2 and 3 has accumulated sediment on the bottom, reducing its volume. Near the Conagra food processing plant, the transmission line was installed approximately 14 feet below the ground surface to maintain the grade to Lift Station No. 3. The City's cleaning equipment is inadequate to clean this section of pipe due to the size and depth of installation. It is recommended the City hire a contractor to clean the pipe and regain the full volume.

The scope of work for this WWFP does not include a detailed collection system evaluation including extensive collection system flow monitoring or collection system video inspections. Rather, a

quantitative system-wide infiltration and inflow (I/I) assessment was completed, as described in Chapter 3. However, the cleaning and inspection of sewer lines is essential to maintaining a properly functioning system, determining current sewer conditions, and aiding in maintenance strategies.

Annual cleaning and inspection programs are typically centered around known problematic areas in the collection system, maintenance requirements and budgets, and overall system performance. The primary benefit of implementing a cleaning and inspection program is the reduction of sewer backups and/or sanitary sewer overflows. Secondary benefits include prolonging the integrity of the collection systems, improving performance, and the identification or correction of compromised areas. It is recommended that the City develop an annual cleaning and inspection program to manage maintenance activities and to assist with the annual I/I Report requirements included in the City's Water Pollution Control Facilities (WPCF) Permit. Chapter 5 includes proposed budgetary costs for the City's annual cleaning and inspection program.

Lift Station Evaluation

As part of this WWFP, operations of the City's lift stations were investigated. The following is a summary of the deficiencies found.

Lift Stations No. 1, 2, and 3

Each lift station is equipped with two surface-mounted suction lift pumps and one submersible sewage pump in the wetwell. When installed, all three pumps had the option to operate with an automatic, alternating "lead/lag" cycle. Lead/lag or "duplex" operation balances the run time between pumps, thereby increasing pump life. Periodic issues with duplex operation have resulted in overuse of one pump versus the others. Reviewing Lift Station No. 3 flow records included in Appendix B shows that approximately 64 percent of all wastewater pumped over the last five years has been with the submersible pump. Discussions with City operators have concluded that the programmable logic controller (PLC) is likely malfunctioning and will not allow the pumps to operate in duplex mode. The City has had multiple service personnel examine the issue, but none have been successful at resolving the problem. It is recommended the City upgrade the PLC to current technology so normal pump operation can be restored.

The vacuum priming systems for the surface-mounted pumps are old and malfunction frequently, which is another reason operators resort to using the submersible pumps. The priming system was designed to operate automatically when the surface-mounted pumps are called to run. Should the surface-mounted pumps lose their prime, the pumps will shut down, signaling an alarm, requiring manual reset by an operator. Due to the many failure mechanisms associated with the vacuum priming system, it is recommended the pump configuration be modified so all pumps are submersible.

The foul air ventilation systems for each lift station are original from the time of installation and are failing. City staff have attempted to repair the original components, but the systems are in a constant state of repair. It is recommended new foul air ventilation systems be installed.

Level controls in Lift Stations No. 1 and 2 have malfunctioned on different occasions. The level controls are a bubbler style system that use a steady feed of compressed air and a pressure transmitter to read the pressure differential in the wetwell as wastewater levels fluctuate.

Bubbler systems are generally reliable due to their simplistic components. However, it is likely the bubbler systems have surpassed their service life and should be replaced.

Operators suspect the check valves in Lift Station No. 3 are inoperable and allow for backflow into the wetwell when in the closed position. This results in backflow into the wetwell, additional run time for the pumps, and inaccurate flowmeter readings since the water re-entering the wetwell is pumped twice. It is recommended new check valves be installed in Lift Station No. 3 and the check valves in Lift Stations No. 1 and 2 be checked for proper operation.

The magnetic flowmeter in Lift Station No. 3 was installed in 2002 and verified for accuracy in 2020. Due to the age of the flowmeter and potential inconsistencies with flowmeter valves, it is recommended the flowmeter be replaced to accurately record influent to the lagoon system.

Lift Stations No. 4, 5, 6, and 7

Lift Stations No. 4, 5, 6, and 7 were installed without isolation valves or emergency bypass piping. This is problematic when performing maintenance on these lift stations since there is no way to easily stop flow from entering the wetwells or to bypass the lift stations during emergency situations. It is recommended portable pump bypass piping be installed so operators can bypass wastewater flows while performing lift station maintenance.

Lagoon Treatment Facility

Treatment Facility Description

Boardman's wastewater treatment facility (WWTF) consists of a three-cell aboveground facultative lagoon system and a 104-acre land application site called Circle 52. The City's WPCF Permit limits land application to the months of March through September. Between October and February, wastewater is stored in the facultative lagoons with evaporation as the only method of disposal. During land application periods, a hypochlorite generation system is used to disinfect wastewater prior to being applied to Circle 52. A map showing the treatment and land application site is included as Figure 4-1. Lagoons No. 1 and 2 are approximately 14 acres each in area with minimum and maximum operating levels of 3 feet and 7 feet, respectively. This results in an operating storage capacity of approximately 36.5 million gallons (MG). Lagoon No. 3, constructed during the 2001 Wastewater System Improvements - Phase I project, is also approximately 14 acres in area and has minimum and maximum operating levels of 3 feet and 8.5 feet, respectively. The operating storage capacity of Lagoon No. 3 is approximately 25.1 MG. The total storage capacity of the WWTF is approximately 61.6 MG.

Wastewater entering the WWTF is normally directed to primary Cell No. 1 (the east cell). Overflow from Cell No. 1 enters the secondary Cell No. 2 (the west cell). From Cell No. 2, wastewater enters the tertiary Cell No. 3. Lagoons No. 1 and 2 are lined with 6 inches of bentonite to limit seepage. Wastewater in Lagoon No. 3 (the south cell) is contained by a 30 mil PVC lining protected by geotextile fabric, a layer of backfill, and topped with riprap. The City performed a leak test on all three lagoons in 2020 in conformance with their WPCF Permit requirements. A more in-depth discussion on the leak test is provided hereafter.

During periods of irrigation, effluent from Lagoon No. 3 is dosed with chlorine from the hypochlorite generation system prior to being gravity fed into the irrigation pump station. The hypochlorite generation system was installed in 2002 and reportedly works well with no anticipated improvements needed within the study period.

An effluent lift pump in the irrigation pump station distributes wastewater through a pressure main where it is metered with a magnetic flowmeter prior to being filtered and land applied through the center pivot irrigation system. The center pivot irrigation system was replaced in 2015 by the City. The original design flow through the pumping equipment and pressure filter is 800 gpm or 1.15 MGD. The City reported no issues with the generation system, the effluent pump station, or the center pivot irrigation system. The magnetic flowmeter was installed in 2002 and verified for accuracy in 2020. Due to the age of the flowmeter and potential inconsistencies with flowmeter values, it is recommended the flowmeter be replaced to accurately record effluent to the land application site.

Wastewater Treatment Facility Deficiencies

As part of this WWFP, a list of operational deficiencies at the City's WWTF was developed with input from City staff. Operational deficiencies are described below.

Lagoon Biosolids Accumulation

Biosolids are a product of waste digestion that naturally takes place in facultative lagoons. Biosolids accumulate in the lagoons over time and must be periodically removed and disposed of. The City of Boardman has never removed biosolids from their lagoon system, which is unique considering that Lagoons No. 1 and 2 have been in operation for more than 38 years.

The City performed a sludge survey of Lagoon No. 1 in June 2020 to estimate the volume of accumulated biosolids to meet the special condition outlined in Schedule D of the City's WPCF Permit and because biosolids could be seen surrounding the perimeter of Lagoon No. 1 during fall drawdown periods. A memo summarizing the sludge survey methods and equipment, as well as the sludge survey results, can be found in Appendix C. The biosolids accumulation in Lagoons No. 2 and 3 are not believed to be an issue since Lagoon No. 1 has acted as the primary lagoon since its installation in 1979.

Results from the sludge survey indicate that the sludge in Lagoon No. 1 has accumulated to depths ranging from 1 to 4 feet. Comparison of the lagoon bottom surface to the top of sludge surface show approximately 52,520 cubic yards (CY) of accumulated sludge in Lagoon No. 1. It is recommended that the City remove the biosolids to regain treatment volume. Biosolids removal will need to be performed in accordance with the requirements outlined in the City's WPCF Permit. A more detailed discussion on the importance of removing the biosolids is provided hereafter in the Lagoon Capacity section of this chapter.

Current Capacity Status

In this section, the capacity status of critical wastewater collection, treatment, and disposal components is discussed. The available capacity evaluation is based on historical flows and pollutant loadings.

Lift Station Capacity Status

The City's operators manage eight public lift stations by performing regularly scheduled maintenance and repairs and recording pump operation information (including pump run hours). Although pump run hours cannot be used to obtain accurate flow data, they can be used to estimate the capacity status of the lift stations to serve future development. The City provided pump run hours between January 2017 through December 2019 for analysis. The data summary and analysis can be seen in the Lift Station Run Hours Compiled spreadsheets in Appendix D. For ease of reference, Table 4-3, below, has been provided to show the average daily run hours during the maximum month and the associated flows considering the design pumping rate. It should be noted that the flows indicated on Table 4-3 vary from the design criteria on Figure 3-1 in Chapter 3, except for the projected maximum daily flow. This can be attributed to pump impeller wear or reduction in general pump efficiency. However, the value in this capacity analysis comes from the comparison of the run hours versus the theoretical gallons pumped.

TABLE 4-3
LIFT STATION CAPACITY SUMMARY

Lift Station	Design Pumping Rate (gpm)	Maximum Month Average Daily Run Hours (2017 to 2019) ¹	Gallons Pumped (2017 to 2019)		Projected - 2042	
			Maximum Daily Flow (MGD) ²	Percentage of Total Flow Pumped ³	Estimated Maximum Daily Flow (MGD) ⁴	Estimated Run Hours per Day (Maximum) ⁴
1	1,250	8.88	0.666	63 Percent	0.704	9.38
2	1,700	8.53	0.870	82 Percent	0.919	9.01
3	2,800	6.28	1.055	100 Percent	1.115	6.64
4	300	3.83	0.069	6.5 Percent	0.073	4.04
5	250	1.46	0.022	2.1 Percent	0.023	1.54
6	220	6.92	0.091	8.7 Percent	0.097	7.31
7	300	1.36	0.025	2.3 Percent	0.026	1.44

¹ Maximum Month Average Daily Run Hours (2017 through 2019) taken from actual lift station run hours during the analysis period.

² Maximum Daily Flow calculated from the Design Pump Rate and the Maximum Month Average Daily Run Hours (2017 through 2019).

³ Percentage of Total Flow Pumped calculated by dividing the Maximum Daily Flow (MGD) by the calculated Maximum Daily Flow from Lift Station No. 3.

⁴ Estimated Maximum Daily Flow for Lift Station No. 3 was taken from Figure 3-1, Design Criteria. The Estimated Run Hours per Day (Maximum) were calculated using the Design Pumping Rate and the Percentage of Total Flow Pumped.

Prior to discussing the design capacity of a lift station, a discussion on sewage flow rates entering a lift station is warranted. Although sewage flows entering a lift station are dependent upon the type of sewer services (i.e., residential, commercial, industrial), sewage flow rates are typically highest in the morning and evening hours, lower during mid-day, and lowest during the night. Therefore, the pump run times are cyclical throughout the day to meet demand fluctuations.

Generally, lift station capacity is dependent on two variables: wetwell operational volume and the pump flow rate. Wetwell operational volumes should be large enough to prevent rapid pump cycling, yet small enough to prevent long detention times and associated odor release due to septic conditions. On average, typical detention times for a lift station range between 20 and 30 minutes and pump operation times range between five and ten minutes per hour.

Another design parameter for lift stations is the number of pumps installed to handle flow demands. The number of pumps to be installed in a lift station depends on the anticipated demand, flow variations, and reliability standards. In small lift stations, it is customary to install two pumps each with the capacity to handle peak demands. Therefore, the pumps alternate operation (lead-lag) to equalize wear and tear on the pumps. For larger lift stations, the number of pumps installed needs to handle the variation in influent flow rates without frequent pump cycles and without excessive wetwell storage volumes. This is typically achieved by installing three pumps, two pumps operating in parallel, to meet peak demands and one for backup.

Looking at a 24-hour snapshot and considering the design parameters noted herein, lift stations should operate for approximately two to four hours per day under normal operating conditions. However, lift stations are designed with a peaking factor of approximately three to four to meet peak demands. This means that during maximum daily flow events for small lift stations, the total daily pump run hours should not exceed 8 hours of operation per day (4 hours per day for each pump) because each pump can theoretically pump the maximum daily flow and alternate operation. Total daily pump run hours of more than 8 hours for small lift stations indicate that modifications to the pump capacities or operational wetwell volumes should be considered. Since wetwell operational volumes are not easily modified, the preferred option is to increase lift station capacity by increasing pump flow rates.

For the large lift stations, pump run hours should not exceed 16 hours per day (8 hours per pump) because two pumps are dedicated to meet maximum daily flow events. Pump run hours nearing 16 hours per day indicate pump modifications should be considered because both pumps operating together need to meet maximum daily flow demands.

Table 4-3 and the capacity analysis that follows use the maximum run hours per day that were taken from the maximum month for each lift station between January 2017 and December 2019 to analyze lift station capacities. These values are included in the Lift Station Run Hours Compiled included in Appendix D. The maximum month for Lift Stations No. 1 through 7 were July 2019, June 2017, July 2018, July 2018, August 2017, May 2017, and June 2017, respectively. The gallons pumped for each lift station were calculated using the design pumping rate.

The primary lift stations operate in lead-lag control, which means two pumps can operate to meet high demand periods. Additionally, the primary lift stations meet Class 2 reliability by having three pumps with the capacity to pump half of the maximum daily flow (one pump can be out of operation and still meet demands in lead-lag control). The secondary lift stations meet Class 2 reliability and operate in lead-lag control; however, only two pumps are installed in these lift stations and each pump is capable of pumping the maximum daily flow.

This means that during maximum daily flow events the total pump run hours for the primary lift stations should be approximately 16 hours per day (8 hours per day for each pump). Because the secondary lift stations have two pumps capable of pumping maximum daily flows, each pump can

theoretically pump 4 hours per day, or the lift station can operate up to 8 hours per day. By using the projected maximum daily flow (1.115 MGD), the percentage of sewage each pump station handles, and a maximum pump run time of 8 hours per day per pump (primary lift stations) or 4 hours per day per pump (secondary lift stations), the future capacity status of the lift stations can be estimated.

Lift Station No. 1

Lift Station No. 1 pumps (combined) had an average maximum daily run time of 8.88 hours per day in July 2019. The average run times of the surface-mounted Pumps No. 1 and 2 and the submersible pump were 2.8, 3.0, and 0.1, respectively. These run hours demonstrate that the pumps are operating as designed in lead-lag control. The individual pump capacity of the pumps installed at Lift Station No. 1 is 625 gpm. Considering two pumps can operate at the same time, the design capacity of Lift Station No. 1 is 1,250 gpm. With a maximum daily run time of 8.88 hours, Lift Station No. 1 is theoretically pumping approximately 0.666 MGD, or 63 percent of the maximum daily flow.

Lift Station No. 1 operated 8.88 hours per day, or approximately 55 percent of its capacity. Assuming Lift Station No. 1 continues pumping approximately 63 percent of the City's wastewater during maximum daily demand periods, the future capacity status can be estimated by using the projected maximum daily flow in 2042 of 1.115 MGD. Considering the current pump station capacity of 1,250 gpm, Lift Station No. 1 would pump approximately 0.704 MGD during maximum daily demand flow and the pumps combined would run for approximately 9.38 hours per day, or 59 percent of capacity.

Lift Station No. 2

Lift Station No. 2 had an average maximum daily run time of 8.53 hours in June 2017. In March 2018, the data show the average pump hours were 11.4 hours per day, but the data were excluded from the analysis and considered an outlier since the numbers suggest Lift Station No. 2 would have pumped more wastewater than Lift Station No. 3. The average run times of the surface-mounted Pumps No. 1 and 2 and the submersible pump were 2.0, 2.2, and 0.1, respectively. Like Lift Station No. 1, pump operation is being evenly distributed to the surface-mounted pumps. The original design capacity of the pumps at Lift Station No. 1 is 850 gpm. With a maximum daily run time of 8.53 hours and a design pumping rate of 1,700 gpm, Lift Station No. 2 is theoretically pumping approximately 0.870 MGD, or 82 percent of the City's wastewater.

Lift Station No. 2 operated 8.53 hours on average during the maximum month, or 53 percent of capacity. If Lift Station No. 2 continues pumping approximately 82 percent of the City's wastewater through year 2042, the pumps combined would need to operate for approximately 9.01 hours per day and pump approximately 0.919 MGD. This results in Lift Station No. 2 operating at approximately 56 percent of capacity.

Lift Station No. 3

Lift Station No. 3 had an average maximum daily run time of 6.28 hours in July 2018. The average run times of the surface-mounted Pumps No. 1 and 2 and the submersible pump were

0.04, 1.7, and 3.0, respectively. Operators reported difficulties with operating the surface-mounted pumps as mentioned before. Therefore, most of the pumping is performed by the submersible pump. Normal operation needs to be restored so the submersible pump can be serviced or replaced before failure occurs due to overuse. The original design capacity of the pumps at Lift Station No. 3 is 1,400 gpm. With a maximum daily run time of 6.28 hours and a design pumping rate of 2,800 gpm, Lift Station No. 3 is theoretically pumping approximately 1.055 MGD. As mentioned before, Lift Station No. 3 pumps 100 percent of the City's wastewater.

The estimated maximum daily flow in year 2042 is 1.115 MGD. Using the current pumping capacity, Lift Station No. 3 pumps would need to operate 6.64 hours per day, or operate at 41 percent of capacity.

Lift Stations No. 4, 5, and 7

Lift stations No. 4, 5, and 7 had average run times of less than 2 hours each day. It appears that these lift stations are operating comfortably below capacity and no future capacity analysis was performed. As the City continues to develop in the areas serviced by these lift stations, it may be necessary to evaluate individual capacities. Due to the lower capacity of these lift stations, a large commercial or residential service connection, such as a hotel or apartment complex, could easily consume their capacity.

Lift Station No. 6

Lift Station No. 6 is a package lift station with two self-priming sewage pumps operating in duplex mode. In 2016, the City corrected a problem with the pump controller that inhibited duplex operation. The original design capacity of the pumps at Lift Station No. 6 is 110 gpm. With a maximum daily run time of 6.92 hours and a design pumping rate of 220 gpm, the lift station is theoretically pumping approximately 91,000 gallons per day (gpd), or 2.3 percent of the City's wastewater.

Current maximum daily run times indicate that the lift station is operating at approximately 87 percent of capacity. Assuming Lift Station No. 6 continues to pump 2.3 percent of the City's wastewater through year 2042, the pumps combined would need to operate for approximately 7.31 hours per day and pump approximately 96,500 gpd. This results in Lift Station No. 6 operating at approximately 91 percent of capacity. It is recommended the City monitor pump operating hours as the City develops the area that Lift Station No. 6 serves, since it is anticipated to operate near capacity at the end of the planning period.

Lagoon Capacity

Wastewater flows and pollutant loads received at the City's WWTF are submitted monthly to the Oregon Department of Environmental Quality (DEQ) and a summary of the flows received from January of 2015 to December 2020 are shown on Figure 4-2.

Boardman's wastewater lagoons serve two purposes. First, each cell provides facultative lagoon treatment. Second, each cell includes a wastewater storage component. The analysis of capacity in the lagoon system must be based on each of these two functions.

Lagoon Treatment Capacity

Boardman's WPCF Permit contains no numeric effluent quality limitations for the lagoon treatment process. Rather, the City must satisfy the more descriptive goal of oxidized, stabilized wastewater prior to disinfection and irrigation. The lagoons do not need to produce an effluent with a prescribed five-day biochemical oxygen demand (BOD₅) or total suspended solids concentration. Under these circumstances, adequate treatment can be expected if the typical BOD₅ loading rate across the lagoon system is maintained at or below approximately 35 pounds BOD₅ per acre per day (lbs BOD₅/acre/day) for all lagoons. The treatment capacity for the City's lagoons under normal operating conditions is 1,470 pounds of BOD₅ per day (lbs BOD₅/day) (35 lbs BOD₅/acre/day x 42 acres = 1,470 lbs BOD₅/day).

However, the values presented above assume that the entire treatment volume is available (bottom 3 feet of the lagoon area) as treatment volume. The biosolids accumulation in Lagoon No. 1 is consuming the vital treatment volumes. The sludge survey (Appendix C) shows that Lagoon No. 1 has approximately 52,520 CY of accumulated sludge in varying depths from 1 to 4 feet. This equates to approximately 11 acres (out of the 14 acres available) of the treatment area being consumed by sludge and ineligible for estimating the current loading capacity of the existing lagoon system. The current loading capacity considering the sludge accumulation is 1,085 lbs BOD₅/day (35 lbs BOD₅/acre/day x 31 acres = 1,085 lbs BOD₅/day).

As shown on Figure 4-2, the average influent BOD₅ loading on the lagoon system in 2020 was 1,155 lbs BOD₅/day. This represents an average BOD₅ loading rate of approximately 37 lbs BOD₅/acre/day across the effective 31-acre lagoon system utilizing approximately 106 percent of the lagoon capacity considering the system capacity of 1,085 lbs BOD₅/day. This analysis shows the importance of removing the biosolids in Lagoon No. 1 and regaining the full treatment volume of 1,470 lbs BOD₅/day.

The projected BOD₅ loading in year 2042 is 1,521 lbs BOD₅/day equating to an average loading rate for the lagoon system of approximately 37 lbs BOD₅/acre/day (assuming the City regains full treatment capacity), or 104 percent of the lagoon capacity. If the City's high strength waste trend continues, the City may need to increase biological activity in the lagoon system to augment treatment (aeration in the primary lagoon). In addition to aeration, the City would need to install primary treatment (headworks) to remove rags to ensure proper aerator operation. It is much more feasible for the City to remove sources of high strength waste than make improvements to the wastewater treatment system to treat the waste. However, a cost estimate for constructing a headworks and installing an aeration system has been included in Chapter 5.

Chapter 3 discussed the questionable historic sampling data believed to be caused by operation and maintenance activities performed by the City. It is anticipated that test results may return to more typical values as seen in communities similar to Boardman due to the operational adjustments made by the City (revising the sample hose location in Lift Station No. 3 and moving the sampling date to Wednesdays to avoid sampling around wetwell cleaning days). It may not be known if the operation and maintenance adjustments will be effective until fall/winter 2021-22.

Detention time is another important factor in lagoon treatment capacity. Facultative lagoons are designed to hold wastewater long enough for solids to settle and for reduction of the organic

strength through the biological breakdown of nutrients. The lagoon inlet and outlet configuration are also important considerations so wastewater entering and exiting the lagoons are not allowed to “short-circuit” reducing overall detention time. The City’s lagoon inlets and outlets are configured as such that short-circuiting is not a concern.

Detention time in a lagoon system varies as water levels fluctuate because detention time is dependent on the lagoon volume and flow entering the system. Therefore, the minimum detention time for the lagoon system is calculated when water levels have reached minimum levels, otherwise known as the treatment volume. With a total lagoon area of 42 acres and a minimum water level depth of 3 feet in each lagoon, the treatment volume for the City’s lagoon system is approximately 41 MG. As discussed herein, the sludge accumulation in Lagoon No. 1 is consuming vital treatment volumes and the current treatment volume is approximately 30 MG.

Facultative lagoons are designed to hold wastewater anywhere from 80 to 120 days. In cold weather, however, biological treatment processes in all lagoons slow down, making longer detention times necessary. Because the City stores all wastewater during the winter months, detention time during cold weather periods is not a concern.

At the City’s 2020 average annual flow (AAF) of 0.326 MGD and accounting for the modified treatment volume of 30 MG due to accumulated sludge, the detention time is approximately 92 days. The projected AAF is 0.428 MGD and considering a treatment volume of 41 MG (assuming the City regains the entire treatment volume of Lagoon No. 1), the projected detention time for the City’s lagoon system is approximately 96 days. Therefore, the City’s detention times are adequate at the current and projected flow rates.

Hydraulic Capacity

To assess the City’s lagoon storage capacity and overall operation of the wastewater system, a water balance is developed to account for all water entering and leaving a lagoon system. Prior to the City renewing the WPCF Permit in March 2020, the City’s water balance showed a discrepancy. The water balance was showing a positive cumulative storage volume of approximately 23 MG. If the water balance were correct, the City would have an excess of water in the lagoons going into the winter storage months; this was not representative of actual system operation. To compound the issue, the City did not irrigate in 2018 due to a problem with the irrigation suction pipe; however, the City was able to store all the City’s wastewater from July 2017 to February 2019. It appeared there was an unaccounted for loss in the system from either inaccurate flowmeter readings, lagoon or lagoons seepage, underestimated evaporation rates, or a combination of these.

Due to the water balance discrepancies, the City’s new WPCF Permit contained requirements to perform annual flowmeter verifications and complete a lagoon leak test. The City verified flowmeter accuracies and leak tested all lagoons between July and August 2020. The results of the flowmeter verifications and lagoon leak tests can be found in Appendix E. The flowmeter verifications concluded that the influent flowmeter at Lift Station No. 3 and the irrigation flowmeter were not defective and that the readings should be relatively accurate. However, the flowmeter verifications did indicate that the meters may be reading higher than actual flows, which would show more water coming into the lagoons than actual. To minimize errors and remove flowmeter inaccuracies during the leak tests, City staff isolated the lagoons from one

another at the control structures and ceased irrigating (i.e., no effluent measurements to consider). Secondly, the City completed two tests to remove the influent variable from the water balance by routing all influent flow to Lagoon No. 2 during the leak test for Lagoons No. 1 and 3. Then routing all influent flow to Lagoon No. 1 while leak testing Lagoons No. 2 and 3.

The lagoon leak tests were performed in accordance with the DEQ's guidelines for estimating leakage from existing sewage lagoons. The test results were submitted to the DEQ and DEQ staff confirmed the testing was completed within DEQ guidelines and the testing was valid based on the testing criteria.

The lagoon leak tests provided key information regarding the water balance discrepancies as the results showed that Lagoons No. 1 and 2 are seeping approximately 0.142 inch per day and 0.084 inch per day, respectively. The results also showed that the liner in Lagoon No. 3 has maintained its integrity with little to no seepage recorded. Therefore, the City's 2019 water balance, shown on Figure 4-3, includes a seepage value of 0.113 inch per day (average of the Lagoons No. 1 and 2 seepage values) applied to the area of Lagoons No. 1 and 2 (28 acres). The resulting seepage volume amounts to 31.6 MG per year.

The City's past water balances used historic evaporation data from the Pendleton Experimental Station with a pan coefficient adjustment of 0.7. The Pendleton evaporation data for the months of July and August are 8.25 inches and 7.60 inches (0.7 pan coefficient), respectively. The average daily evaporation rate collected during the tests were approximately 0.37 inch per day or 11.5 inches per month. Although the leak tests were just a small snapshot versus the years of historical data from the Pendleton Experimental Station, the evaporation data collected showed it may be appropriate to apply a "local site adjustment" to the pan coefficient. Therefore, a pan coefficient of 0.8 has been applied to the historic evaporation data to better represent the anticipated evaporation conditions at Boardman's lagoon site.

Lagoons No. 1 and 2 were designed to provide wastewater storage between elevations of 3 feet and 7 feet, for a total of 36.5 MG of storage capacity. Lagoon No. 3 operates between 3 and 8.5 feet, providing an additional 25.1 MG, for a total of approximately 61.6 MG of storage capacity.

By using the data reported on the City's 2020 Discharge Monitoring Reports for influent flows and irrigation quantities, accounting for the lagoon seepage, and making the pan coefficient adjustment, the 2020 water balance shows a positive cumulative storage of 5.86 MG. Although the balance does not sum to zero, it is believed that the 2020 water balance closely resembles actual lagoon operation.

The projected water balance for year 2042 uses the 2020 average influent monthly flow data and the projected population to estimate the monthly volume of water entering the lagoons in year 2042. Further details on the assumptions used in the water balance are provided on the bottom of the figures.

Two projected water balances have been provided and are shown on Figures 4-4 and 4-5. Figure 4-4 is the projected water balance (with seepage) assuming the seepage rate continues throughout the planning period, and Figure 4-5 shows the projected water balance without

seepage. Both projected water balances show that additional storage volume (fourth lagoon) is needed to meet future demands, and the size of the fourth lagoon varies under each scenario.

It is important to provide both water balances because it is possible that the lagoons could either seal up or the seepage could impact groundwater quality. The City is currently working with the DEQ to develop a Groundwater Monitoring Plan (GMP) per the requirements of the City's WPCF Permit. One component of the GMP is the installation of groundwater monitoring wells in 2021, upgradient and downgradient of Circle 52 and the lagoon system. After installation of the groundwater monitoring wells, the City will collect groundwater samples quarterly in the upgradient and downgradient wells to compare specific groundwater parameters. If the comparison shows that the groundwater downgradient of the lagoon system has degraded due to lagoon seepage, the City may need to reline Lagoons No. 1 and 2. The City will not know the impacts of the lagoon seepage, if any, until the groundwater monitoring wells are installed, and a trend can be developed from the groundwater sample comparisons. Further discussion on the recommended improvements will be provided in Chapter 5.

Irrigation System

The capacity of the 104-acre irrigation site is determined by two factors: hydraulic loading and nitrogen loading. The City manages the irrigation rates for Circle 52 and monitors soil moisture and groundwater constituents to meet the requirements of the City's Recycled Water Use Plan (RWUP).

Hydraulic Loading

In the Boardman area, the annual alfalfa crop water requirement is approximately 32.2 inches. Between March and October, the crop-growing season, approximately 4 inches of water falls as precipitation. The net required irrigation rate is 30.6 inches, and the gross annual irrigation rate of 38.2 inches is needed for a healthy crop. Over the 104-acre irrigation site, this net application rate yields a volume of 331 acre-feet, or approximately 108 MG. This annual application volume establishes the hydraulic capacity of Circle 52.

Referring to Figure 4-2, on average, the City reportedly land applied approximately 45 MG of treated wastewater on average between 2015 and 2020 at Circle 52. According to these numbers, the City is utilizing approximately 42 percent of the hydraulic loading capacity of Circle 52, and the City has historically supplemented the hydraulic deficit with either industrial water and/or well water to produce a healthy crop. After the 2018 growing season, the City has used only well water to make up the hydraulic deficit.

The year 2042 water balance shown on Figure 4-4 (with seepage) indicates that the City is anticipated to need supplemental irrigation throughout the planning period to meet the gross irrigation requirements for a healthy crop. Figure 4-4 shows that an approximate 5-acre lagoon is needed to meet the projected demands equating to an approximate total storage volume of 74.0 MG. The total storage volume is the amount of water available from the lagoons that is available for crop irrigation. Therefore, the City would utilize approximately 69 percent of the hydraulic loading capacity of Circle 52 under this scenario.

Likewise, Figure 4-5 (without seepage) also shows supplemental irrigation is anticipated to be needed to meet gross irrigation requirements. The proposed 15-acre lagoon, under this

scenario, would provide approximately 95.7 MG of water available as crop irrigation. Therefore, the City would utilize approximately 89 percent of the hydraulic loading capacity of Circle 52. If projected growth within the community of Boardman is exceeded, additional irrigation area may be needed.

Nitrogen Loading

The City of Boardman's RWUP outlines the crop-specific agronomic rate for total nitrogen. The total nitrogen available to an individual crop between crop start and harvest is the sum of all nitrogen from the following sources:

1. All nitrate (NO_3) in the crop-specific root zone as measured by soil sampling (1- to 5-foot depth) at the crop start.
2. All ammonium (NH_4) in the crop-specific root zone as measured by soil sampling (1- to 5-foot depth) at the crop start.
3. Seventy percent of the total Kjeldahl nitrogen (TKN) in applied irrigation water from all sources.
4. All nitrate plus nitrite nitrogen ($\text{NO}_3 + \text{NO}_2\text{-N}$) applied in irrigation water from all sources.
5. All nitrogen applied as commercial fertilizer.

For crops grown on Circle 52, best agricultural crop management practices must be followed to achieve yield goals and, most importantly, to minimize any nitrate loss to groundwater.

Table 4-4 provides the approved fertilizer rates and recommendations for the various crops to be grown.

TABLE 4-4
NITROGEN RECOMMENDATION FOR IRRIGATED PASTURES

Crop	Yield	Nitrogen Rate
Alfalfa	6 tons per acre	420 pounds per acre
Triticale	3.75 tons per acre	250 pounds per acre
Field Corn	6 tons per acre	300 pounds per acre

The average nutrient levels measured for the effluent irrigated at Circle 52 between 2015 and 2019 are presented on Table 4-5, with the resulting calculated plant available nitrogen (PAN).

TABLE 4-5
AVERAGE RECYCLED WATER NUTRIENT CHARACTERISTICS

Description	Concentration (mg/L)	Amount (pounds per MG)
Nitrate	0.45	3.75
Ammonia	6.88	57.38
TKN	13.38	111.59
Organic Nitrogen	6.50	54.21
PAN	9.82	81.87

$\text{Amount} = \text{Concentration} \times 8.34$

$\text{Organic nitrogen} = \text{TKN} - \text{ammonia}$

$\text{PAN} = (\text{TKN} \times 0.70) + (\text{nitrate} + \text{nitrite} - [\text{nitrogen}])$

The POM applies industrial process water and well water at Circle 52 to make up the water deficit. Therefore, the POM provided the wastewater nutrient characteristics for the period between January 2011 and December 2018 that are representative of the wastewater applied at Circle 52. Since the City must ensure proper monitoring and reporting for all applied water and nutrient sources at Circle 52, the average wastewater nutrient characteristics for the POM are provided on Table 4-6.

TABLE 4-6
PORT OF MORROW
AVERAGE INDUSTRIAL WASTEWATER NUTRIENT CHARACTERISTICS

Description	Concentration (mg/L)	Amount (pounds per MG)
Nitrate	0.58	4.84
Ammonia	46.39	386.89
TKN	92.18	768.78
Organic Nitrogen	45.79	381.89
PAN	65.11	542.98

For example, in 2019 the City had a spring crop of triticale between March and May where 31.84 MG of water was applied. The total nitrogen applied on the triticale crop was 56.97 pounds per acre, well below the nitrogen rate for triticale. The triticale crop was followed by an alfalfa crop between June and October where 70.98 MG of water and 65.57 pounds per acre of nitrogen was applied. Again, well below the nitrogen rate for alfalfa.

The water sources applied on Circle 52 have significantly different water characteristics and the volume irrigated from each source varies yearly. Additionally, each crop has a different nitrogen rate that governs the nitrogen loading. If the City follows the requirements outlined in the RWUP, the nitrogen loading capacity of Circle 52 should not be reached. If there are further inquiries regarding nitrogen loadings, it is recommended the reader refer to the City's RWUP.

Capacity Status Summary

The current capacity status and estimated year 2042 capacity status of each major component of Boardman's wastewater system is summarized on Table 4-7. Estimated year 2042 capacity values assume the City continues operating the wastewater system as-is with no improvements.

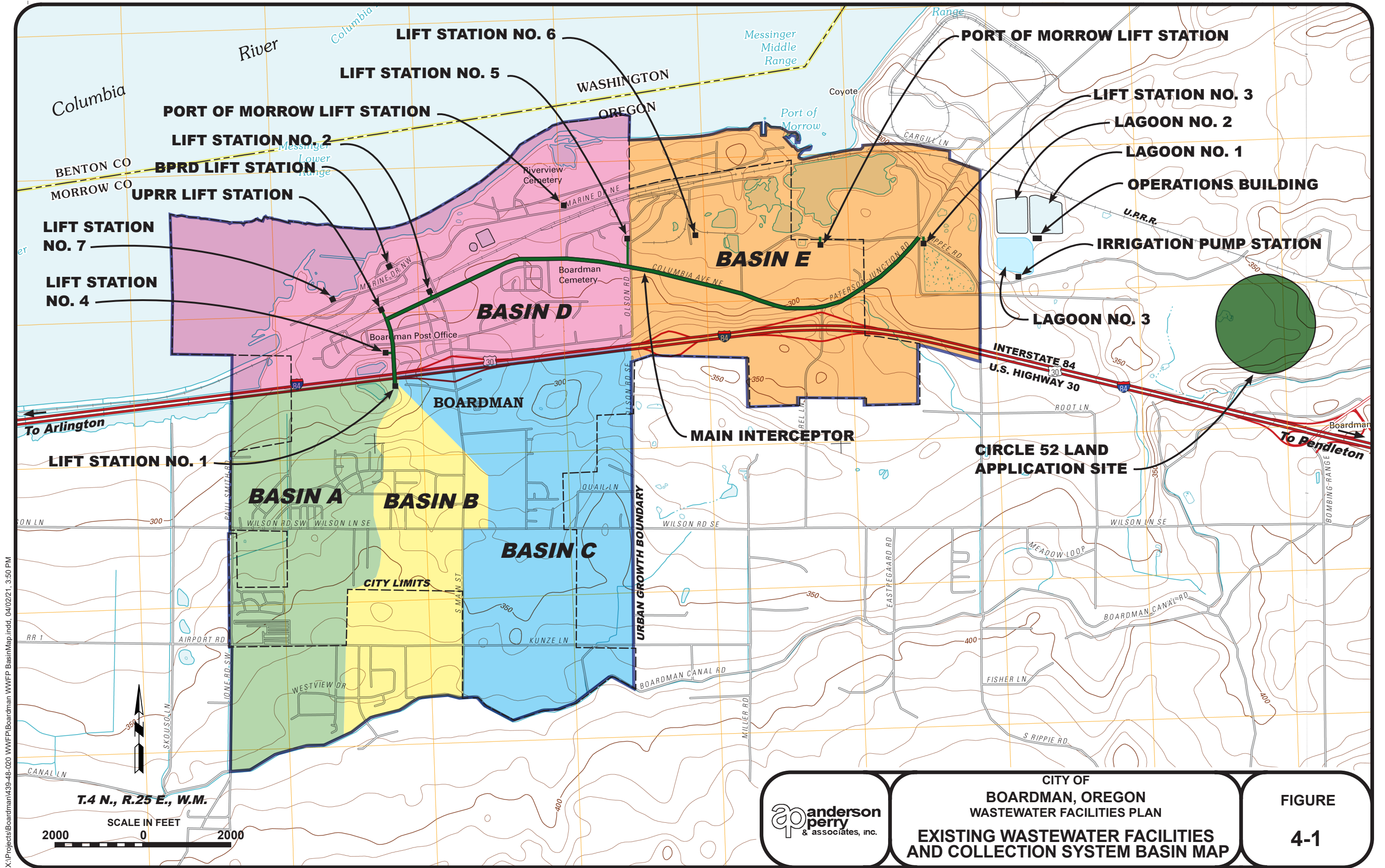
TABLE 4-7
WASTEWATER SYSTEM CAPACITY STATUS

Unit	Parameter	Capacity	Current Capacity Used (Percent)	Estimated 2042 Capacity (Percent)
Lift Station No. 1	Average Run Time	8 hours	55	59
Lift Station No. 2	Average Run Time	8 hours	53	56
Lift Station No. 3	Average Run Time	8 hours	39	41
Lift Station No. 4	Average Run Time	16 hours	48	51
Lift Station No. 5	Average Run Time	16 hours	18	19
Lift Station No. 6	Average Run Time	16 hours	87	91
Lift Station No. 7	Average Run Time	16 hours	17	18

Unit	Parameter	Capacity	Current Capacity Used (Percent)	Estimated 2042 Capacity (Percent)
Lagoons	Hydraulic Capacity	61.6 MG	1	1
Lagoons	BOD ₅ Loading	1,470 lbs/day	1	1
Irrigation System	Hydraulic Loading	108 MG per year	42	1

¹ For current capacity and the estimated 2042 capacity, refer to the appropriate section in this chapter.

As Table 4-7 indicates, the estimated 2042 capacity of Lift Stations No. 1 through 3 and the hydraulic capacity of the lagoons and irrigation system are projected to be exceeded. A more in-depth discussion on the recommended improvements is outlined in Chapter 5.



CITY OF BOARDMAN, OREGON
DISCHARGE MONITORING REPORT SUMMARY
JANUARY 2015 THROUGH DECEMBER 2020

	INFLUENT										EFFLUENT					CHLORINE		COLIFORM	RECLAIMED WATER			
	Maximum Daily Flow (MGD)	Minimum Daily Flow (MGD)	Average Monthly Flow (MGD)	Average Monthly BOD ₅ (mg/L)	Average Monthly BOD ₅ Loading (lb/day)	Average Monthly TSS (mg/L)	Average Monthly TSS Loading (lb/day)	Monthly Max. pH	Monthly Min. pH	Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L)	Nitrate + Nitrite Nitrogen (mg/L)	Avg. Daily Chlorine Used (gal)	Avg. Daily Chlorine Residual (mg/L)	Dissolved Solids (mg/L/100mL)	Total Quantity Irrigated (in./Acre)	Total Quantity Irrigated (MG)	Monthly Max. pH	Monthly Min. pH	
Date																						
Jan-15	0.391	0.276	0.326	167	434	140	364	8.1	7.9													
Feb-15	0.353	0.263	0.307	260	677	792	1,997	8.1	7.9													
Mar-15	0.349	0.236	0.314	297	791	437	1,155	8.1	7.9													
Apr-15	0.415	0.261	0.315	393	1,038	805	2,264	8.1	8.0	12.10	6.96	1.75	1.75		419.55	1.81	597	3.99	11.43	8.5	8.3	
May-15	0.476	0.255	0.337	293	772	400	1,042	8.4	8.0	10.60	6.61	0.76	0.76		548.00	2.20	554	5.79	16.49	8.4	8.2	
Jun-15	0.404	0.296	0.363	257	821	299	953	8.4	8.0	5.62	0.84	1.40	1.40		497.00	1.99	561	2.35	6.75	8.4	8.3	
Jul-15	0.434	0.262	0.359	225	659	262	762	8.2	8.0													
Aug-15	0.530	0.229	0.378	152	494	89	291	8.2	8.0													
Sep-15	0.418	0.288	0.351	189	553	167	498	8.1	8.0	5.49	2.42	0.29			539.00	2.30	700	2.51	7.22	8.2	8	
Oct-15	0.523	0.296	0.363	161	521	106	344	8.2	8.0													
Nov-15	0.397	0.283	0.341	190	513	222	607	8.1	8.0													
Dec-15	0.419	0.332	0.362	114	354	173	549	8.1	7.9													
Jan-16	0.419	0.312	0.355	158	488	160	505	8.1	7.9													
Feb-16	0.381	0.312	0.341	152	424	461	1,303	8.1	7.9													
Mar-16	0.360	0.303	0.330	234	680	360	1,046	8.1	7.9													
Apr-16	0.588	0.322	0.379	249	870	444	1,551	8.1	8.0													
May-16	0.444	0.279	0.350	259	710	366	987	8.1	8.0													
Jun-16	0.544	0.334	0.421	400	1,493	638	2,388	8.2	8.1	9.29	5.19				545.00	1.86		2.75	7.76			
Jul-16	0.529	0.356	0.441	364	1,328	445	1,612	8.4	8.0	8.90	3.14				511.20	2.20	572	16.14	19.82	9	8.2	
Aug-16	0.496	0.366	0.414	345	1,171	404	1,374	8.4	8.1						501.80	2.40	571	11.48	14.10	8.8	8.4	
Sep-16	0.424	0.309	0.359	400	1,203	901	2,683	8.2	8.1													
Oct-16	0.405	0.307	0.339	355	985	619	1,712	8.3	8.0													
Nov-16	0.346	0.266	0.303	528	1,389	844	2,216	8.2	8.0													
Dec-16	0.399	0.236	0.325	295	835	399	1,113	8.3	8.0													
Jan-17	0.447	0.280	0.352	311	929	533	1,580	8.2	8.0													
Feb-17	0.376	0.251	0.332	244	649	375	1,000	8.1	8.0													
Mar-17	0.431	0.280	0.306	243	613	459	1,161	8.2	7.8													
Apr-17	0.464	0.312	0.406	295	1,014	373	1,283	7.2	6.8	15.40	12.50			0.40	583.38	2.88	477	20.13	16.40	7.2	6.8	
May-17	0.410	0.265	0.323	223	616	268	753	7.4	6.8	14.90	11.80			0.90	509.00	2.54	455	3.98	11.24	7.8	6.8	
Jun-17	0.436	0.290	0.358	216	664	161	510	7.2	6.9	15.30	13.40			0.20	530.00	2.30	472	18.46	15.04	7.4	6.9	
Jul-17	0.439	0.325	0.382	225	698	147	452	7.2	6.8													
Aug-17	0.430	0.255	0.357	317	956	483	1,466	7.2	6.9													
Sep-17	0.595	0.225	0.316	350	1,033	379	1,088	7.2	6.8													
Oct-17	0.333	0.250	0.297	425	1,099	1,186	3,126	7.1	6.8													
Nov-17	0.355	0.230	0.300	418	1,128	901	2,453	7.2	6.8													
Dec-17	0.348	0.273	0.300	655	1,620	1,352	3,369	7.1	6.9													
Jan-18	0.374	0.229	0.299	320	808	633	1,588	7.2	7.0													
Feb-18	0.319	0.271	0.293	454	1,138	796	2,007	7.1	7.0													
Mar-18	0.414	0.232	0.296	432	1,059	541	1,331	7.2	7.0													
Apr-18	0.449	0.267	0.351	729	2,338	957	2,722	7.1	6.8													
May-18	0.461	0.234	0.404	441	1,498	563	1,943	7.1	6.9													
Jun-18	0.518	0.361	0.406	318	1,051	813	2,646	7.2	7.0													
Jul-18	0.508	0.364	0.444	358	1,371	907	3,552	7.1	6.8													
Aug-18	0.485	0.329	0.399	420	1,325	846	2,677	7.1	7.0													
Sep-18	0.386	0.327	0.354	421	1,232	1,035	3,007	7.2	7.0													
Oct-18	0.383	0.324	0.351	573	1,662	2,462	7,127	7.2	7.0													
Nov-18	0.363	0.299	0.339	523	1,485	1,375	3,921	7.1	7.0													
Dec-18	0.404	0.232	0.322	596	1,540	858	2,294	7.1	7.0													
Jan-19	0.597	0.154	0.312	413	1,204	985	2,832	7.1	7.0													
Feb-19	0.382	0.293	0.327	354	974	595	1,622	7.1	7.0													
Mar-19	0.353	0.281	0.316	579	1,509	1,041	2,724	7.1	7.0	9.20	4.60			0.41	474.00	2.22	680	6.50	5.30	7.4	7.3	
Apr-19	0.531	0.274	0.356	1,042	2,970	1,277	3,586	7.2	7.0	13.50	0.00			0.00	457.18	2.77	598	20.79	16.94	7.4	6.6	
May-19	0.400	0.284	0.326	1,199	3,350	1,118	3,087	7.2	7.0	11.90	3.91			0.00	440.00	2.58	612	5.10	1.81	7.4	7.3	
Jun-19	0.495	0.309	0.388	768	2,553	1,153	3,842	7.4	7.0	11.10	7.11			1.71	316.00	2.60	607	27.69	22.56	7.4	7	
Jul-19	0.443	0.319	0.393	590	1,962	580	1,966	7.6	7.4	15.70	1.70			0.00	345.00	2.65	646	18.67	15.21	7.5	7.2	
Aug-19	0.448	0.315	0.380	950	2,900	1,340	4,114	7.6	7.4													
Sep-19	0.423	0.301	0.341	815	2,406	924	2,762	7.7	7.4													
Oct-19	0.378	0.283	0.326	624	1,679	2,612	7,061	7.5	7.2													
Nov-19	0.359	0.288	0.329	710	2,056	4,977	1															

**CITY OF BOARDMAN, OREGON
WASTEWATER FACILITIES PLAN
2020 WATER BALANCE**

	LAGOONS										IRRIGATION AREA					
Month	Influent ¹		Precipitation ²		Evaporation ³		Seepage ⁴	Crop Irrigation ⁵	Storage Volume (+/-)	Cumul. Strg. Volume ⁶	Crop Water Use ⁷	Net Irrg. Rqmnt. ⁷	Gross Irrigation Requirement		Volume from Lagoons	
	Average Flow (MGD)	Volume (MG)	Average Monthly (in)	Volume (MG)	Average Monthly (in)	Volume (MG)	Volume (MG)	Volume (MG)	(MG)	(MG)	(in)	(in)	(in)	(MG)	(MG)	(in/acre)
October	0.326	10.11	0.6	0.68	3.04	3.47	2.66	0.00	4.66	4.66	0	0	0		0	0
November	0.329	9.87	1.14	1.30	1.00	1.14	2.58	0.00	7.45	12.11	0	0	0		0	0
December	0.318	9.86	1.32	1.51	1.00	1.14	2.66	0.00	7.56	19.67	0	0	0		0	0
January	0.315	9.77	1.23	1.40	1.00	1.14	2.66	0.00	7.36	27.04	0	0	0		0	0
February	0.314	8.79	0.85	0.97	1.00	1.14	2.41	0.00	6.22	33.25	0	0	0		0	0
March	0.306	9.49	0.67	0.76	2.73	3.11	2.66	7.07	-2.59	30.66	0	0	0		7.07	2.50
April	0.303	9.09	0.65	0.74	4.07	4.64	2.58	18.76	-16.15	14.51	2.68	2.44	3.05	8.61	18.76	6.64
May	0.364	11.28	0.69	0.79	5.54	6.32	2.66	0.00	3.09	17.59	5.67	5.12	6.40	18.07	0	0.00
June	0.358	10.74	0.5	0.57	7.05	8.04	2.58	10.63	-9.94	7.66	6.34	5.91	7.39	20.86	10.63	3.77
July	0.408	12.65	0.22	0.25	9.42	10.75	2.66	0.00	-0.51	7.15	7.13	7.13	8.91	25.17	0	0.00
August	0.320	9.92	0.29	0.33	8.68	9.90	2.66	0.00	-2.31	4.83	6.22	6.02	7.53	21.25	0	0.00
September	0.306	9.18	0.39	0.44	5.62	6.40	2.58	0.00	1.02	5.86	4.17	3.94	4.93	13.91	0	0.00
TOTALS		120.74	8.55	9.75	50.15	57.19	31.36	36.46	5.86		32.21	30.56	38.20	107.87	36.46	12.91

Existing
Total Storage Volume = 61.6 MG
Existing Acreage to be Irrigated = 104 Acres
Existing Lagoon Surface Area for Precipitation and Evaporation Calculations = 1,829,520 Sq. Ft.
42 Acres

- NOTES:
1. Influent flow data from October 2019 through September 2020.
 2. Average annual precipitation for Boardman, Oregon, from 1971 to 2012 as published by the Oregon Climate Service.
 3. Average monthly evaporation rates are 80 percent of PAN values recorded for the Pendleton BR Experimental Station (1956 to 2005), as reported by the Western Regional Climate Center.
 4. Assumes 0.113 inch of seepage per day from Lagoons No. 1 and 2 based on the leak tests performed in August 2020.
 5. Crop irrigation is based on actual irrigation quantities from the 2018-19 growing season and shows supplemental water is needed to meet agronomic rates.
 6. Equals influent + precipitation - evaporation - seepage - irrigation. Existing usable lagoon storage capacity (above 3-foot minimum depth).
 7. Taken from Oregon State University Extension Service "Oregon Crop Water Use and Irrigation Requirements," October 1992, region = Hermiston, crop = alfalfa hay, probability = 7 out of 10 years.

in = inches
MG = million gallons
MGD = million gallons per day
Sq. Ft. = square feet



CITY OF
BOARDMAN, OREGON
WASTEWATER FACILITIES PLAN

2020 WATER BALANCE

**FIGURE
4-3**

**CITY OF BOARDMAN, OREGON
WASTEWATER FACILITIES PLAN
2042 WATER BALANCE WITH SEEPAGE**

	LAGOONS										IRRIGATION AREA						
Month	Influent ¹		Precipitation ²		Evaporation ³		Seepage ⁴	Available Crop Irrigation ⁵	Storage Volume (+/-)	Cumul. Strg. Volume ⁶	Crop Water Use ⁷	Net Irrg. Rqmnt. ⁷	Gross Irrigation Requirement ⁸		Volume from Lagoons		
	Average Flow (MGD)	Volume (MG)	Average Monthly (in)	Volume (MG)	Average Monthly (in)	Volume (MG)	Volume (MG)	Volume (MG)	(MG)	(MG)	(in)	(in)	(in)	(MG)	(MG)	(in/acre)	(Acre-feet)
October	0.416	12.89	0.6	0.77	3.04	3.92	2.66	0.00	7.09	7.09	0	0	0	0	0	0	0
November	0.416	12.48	1.14	1.47	1	1.14	2.58	0.00	10.23	17.31	0	0	0	0	0	0	0
December	0.395	12.23	1.32	1.70	1	1.14	2.66	0.00	10.13	27.44	0	0	0	0	0	0	0
January	0.419	12.97	1.23	1.58	1	1.14	2.66	0.00	10.75	38.20	0	0	0	0	0	0	0
February	0.417	11.68	0.85	1.09	1	1.14	2.41	0.00	9.23	47.43	0	0	0	0	0	0	0
March	0.407	12.60	0.67	0.86	2.73	3.51	2.66	0.00	7.29	54.71	0	0	0	0	0	0	0
April	0.403	12.08	0.65	0.84	4.07	5.25	2.58	5.91	-0.82	53.90	2.68	2.44	3.05	8.61	5.91	2.09	18.14
May	0.484	14.99	0.69	0.89	5.54	7.14	2.66	12.40	-6.33	47.57	5.67	5.12	6.40	18.07	12.40	4.39	38.06
June	0.476	14.27	0.5	0.64	7.05	9.08	2.58	14.32	-11.06	36.51	6.34	5.91	7.39	20.86	14.32	5.07	43.94
July	0.542	16.80	0.22	0.28	9.42	12.14	2.66	17.27	-14.99	21.53	7.13	7.13	8.91	25.17	17.27	6.12	53.01
August	0.425	13.18	0.29	0.37	8.68	11.18	2.66	14.58	-14.87	6.65	6.22	6.02	7.53	21.25	14.58	5.16	44.75
September	0.407	12.20	0.39	0.50	5.62	7.23	2.58	9.54	-6.66	0.00	4.17	3.94	4.93	13.91	9.54	3.38	29.29
TOTALS		158.38	8.55	11.01	50.15	64.01	31.36	74.0	0.00		32.21	30.56	38.20	107.87	74.0	26.2	227.19

	Existing	Proposed	Total	
Total Storage Volume =	61.6	12.4	74.0	MG
Acreage to be Irrigated =	104	0	104	Acres
Approximate Lagoon Surface Area for Precipitation and Evaporation Calculations =	1,829,520	237,000	2,066,520	Sq. Ft.
	42	5	47	Acres

Notes:

1. Influent flow data have been estimated by using monthly flow data from 2020, converting to a per capita flow, and then multiplying by the projected population in 2042.
2. Average annual precipitation for Boardman, Oregon, from 1971 to 2012 as published by the Oregon Climate Service.
3. Average monthly evaporation rates are 80 percent of PAN values recorded for the Pendleton BR Experimental Station (1956 to 2005), as reported by the Western Regional Climate Center.
4. Assumes 0.113 inch of seepage per day from Lagoon No. 1 and 2 based on the leak tests performed in August 2020.
5. Available crop irrigation is based on the volume of storage water available for application and shows supplemental water is needed to meet agronomic rates.
6. Equals influent + precipitation - evaporation - seepage - irrigation.
7. Taken from Oregon State University Extension Service "Oregon Crop Water Use and Irrigation Requirements," October 1992, region = Hermiston, crop = alfalfa hay, probability = 7 out of 10 years.
8. Gross Irrigation Requirement calculated assuming a 20 percent loss of irrigation water due to sprinkler application and evaporation

in = inches

MG = million gallons

MGD = million gallons per day

Sq. Ft. = square feet



CITY OF
BOARDMAN, OREGON
WASTEWATER FACILITIES PLAN
2042 WATER BALANCE
WITH SEEPAGE

**FIGURE
4-4**

**CITY OF BOARDMAN, OREGON
WASTEWATER FACILITIES PLAN
2042 WATER BALANCE WITHOUT SEEPAGE**

	LAGOONS										IRRIGATION AREA							
Month	Influent ¹		Precipitation ²		Evaporation ³		Seepage ⁴	Available Crop Irrigation ⁵	Storage Volume (+/-)	Cumul. Strg. Volume ⁶	Crop Water Use ⁷	Net Irrg. Rqmnt. ⁷	Gross Irrigation Requirement ⁸		Volume from Lagoons			
	Average Flow (MGD)	Volume (MG)	Average Monthly (in)	Volume (MG)	Average Monthly (in)	Volume (MG)	Volume (MG)	Volume (MG)	(MG)	(MG)	(in)	(in)	(in)	(MG)	(MG)	(in/acre)	(Acre-feet)	
October	0.416	12.89	0.6	0.93	3.04	4.70	0.00	0.00	9.12	9.12	0	0	0		0			
November	0.416	12.48	1.14	1.76	1	1.14	0.00	0.00	13.10	22.22	0	0	0		0		0	
December	0.395	12.23	1.32	2.04	1	1.14	0.00	0.00	13.13	35.35	0	0	0		0		0	
January	0.419	12.97	1.23	1.90	1	1.14	0.00	0.00	13.74	49.08	0	0	0		0		0	
February	0.417	11.68	0.85	1.31	1	1.14	0.00	0.00	11.85	60.94	0	0	0		0		0	
March	0.407	12.60	0.67	1.04	2.73	4.22	0.00	0.00	9.42	70.36	0	0	0		0		0	
April	0.403	12.08	0.65	1.01	4.07	6.30	0.00	7.64	-0.85	69.51	2.68	2.44	3.05	8.61	7.64	2.71	23.44	
May	0.484	14.99	0.69	1.07	5.54	8.57	0.00	16.03	-8.54	60.97	5.67	5.12	6.40	18.07	16.03	5.68	49.19	
June	0.476	14.27	0.5	0.77	7.05	10.90	0.00	18.50	-14.36	46.61	6.34	5.91	7.39	20.86	18.50	6.55	56.78	
July	0.542	16.80	0.22	0.34	9.42	14.57	0.00	22.32	-19.75	26.86	7.13	7.13	8.91	25.17	22.32	7.90	68.51	
August	0.425	13.18	0.29	0.45	8.68	13.42	0.00	18.85	-18.64	8.22	6.22	6.02	7.53	21.25	18.85	6.67	57.84	
September	0.407	12.20	0.39	0.60	5.62	8.68	0.00	12.33	-8.22	0.00	4.17	3.94	4.93	13.91	12.33	4.37	37.86	
TOTALS		158.38	8.55	13.22	50.15	75.92	0.00	95.7	0.00		32.21	30.56	38.20	107.87	95.7	33.9	293.63	

	Existing	Proposed	Total	
Total Storage Volume =	61.6	34.1	95.7	MG
Acreage to be Irrigated =	104	0	104	Acres
Approximate Lagoon Surface Area for Precipitation and Evaporation Calculations =	1,829,520	651,000	2,480,520	Sq. Ft.
	42	15	57	Acres

Notes:

1. Influent flow data have been estimated by using monthly flow data from 2020, converting to a per capita flow, and then multiplying by the projected population in 2042.
2. Average annual precipitation for Boardman, Oregon, from 1971 to 2012 as published by the Oregon Climate Service.
3. Average monthly evaporation rates are 80 percent of PAN values recorded for the Pendleton BR Experimental Station (1956 to 2005), as reported by the Western Regional Climate Center.
4. Assumes no seepage.
5. Available crop irrigation is based on the volume of storage water available for application and shows supplemental water is needed to meet agronomic rates.
6. Equals influent + precipitation - evaporation - seepage - irrigation.
7. Taken from Oregon State University Extension Service "Oregon Crop Water Use and Irrigation Requirements," October 1992, region = Hermiston, crop = alfalfa hay, probability = 7 out of 10 years.
8. Gross Irrigation Requirement calculated assuming a 20 percent loss of irrigation water due to sprinkler application and evaporation.

in = inches

MG = million gallons

MGD = million gallons per day

Sq. Ft. = square feet



CITY OF
BOARDMAN, OREGON
WASTEWATER FACILITIES PLAN
2042 WATER BALANCE
WITHOUT SEEPAGE

**FIGURE
4-5**

Chapter 5 - Improvement Alternatives

General

In this chapter, improvements to the City of Boardman's wastewater collection, treatment, and effluent disposal facilities are described and evaluated to address the deficiencies identified in Chapter 4. First, the wastewater collection system improvements are presented. Next, the operational improvements to the wastewater treatment facility (WWTF) are discussed and the treatment and effluent disposal alternatives considered in this Wastewater Facilities Plan (WWFP) are presented. Feasible options deserving further consideration are identified and further discussion and evaluation of the feasible treatment and disposal options are provided. Based on a comparison of the feasible options, a recommended improvement package is presented. Selected improvements are detailed further in Chapter 6.

Collection System Improvements

Annual Cleaning and Inspection Program

As discussed in Chapter 4, it is recommended that the City develop an annual cleaning and inspection program to manage maintenance activities and to assist with the annual infiltration and inflow (I/I) reporting requirements included in the City's Water Pollution Control Facilities (WPCF) Permit. Although I/I does not appear to be excessive (26,000 gallons per day), the annual cleaning and inspection program would be beneficial in maintaining a properly functioning collection system, identifying potential problematic areas, and developing maintenance strategies.

To account for the costs associated with the annual cleaning and inspection program, it is recommended that the City begin budgeting \$20,000 per year for video inspections and repairs to the collection system. To facilitate the investigation approach, the City's Existing Wastewater System Map has been divided into Basins A through E. The City can perform preliminary analysis to identify potential problem areas in each basin and isolate sections for further investigation via video inspection. As investigations are performed, the recommended values for collection system repairs may increase or decrease depending on the identified deficiencies. As improvements to the collection system are made and the deficiencies are corrected, estimated costs per year decrease. Taking this approach will allow the City to continually assess and repair the collection system as funds are available and allocate costs for collection system improvements in the annual budget.

Lift Station Improvements

As indicated in Chapter 4, the primary lift station's piping and pumping arrangement should be reconfigured for submersible pumps in the wetwell. Updating the primary lift stations with submersible pumps would bring the City up to current industry standards and alleviate the need for the problematic vacuum priming systems. Additionally, the City should have the following components repaired or replaced:

- Programmable logic controller
- Foul air ventilation systems

- Wetwell level control systems
- Miscellaneous gate and check valves
- Magnetic flowmeter calibration or replacement

It is recommended the City install portable pump bypass piping on Lift Stations No. 4 through 7 for emergency situations and ease of maintenance.

The total estimated project cost for the lift station improvements is approximately \$1,180,000 (year 2021), as shown on Figure 5-1.

Wastewater Treatment Facility Operational Improvements

To improve lagoon treatment efficiency and regain the original storage capacity, Lagoon No. 1 needs the biosolids removed. The City will need to either develop a Biosolids Management Plan and submit it to the Oregon Department of Environmental Quality (DEQ) for approval prior to biosolids removal or dispose of the biosolids in a landfill.

The estimated project costs for the lagoon dredging vary depending on the removal method selected by the City. The City can either wet dredge the primary lagoon or allow the lagoon to dry up and remove the biosolids with equipment. For the second option to work, the City would need to reconfigure the flow path through the lagoon system and construct a fourth lagoon to meet hydraulic capacity requirements. It is anticipated the City would realize a cost benefit of approximately 60 percent by removing the biosolids with equipment versus wet dredging. The estimated project costs are shown on Figure 5-2.

The projected five-day biochemical oxygen demand loadings discussed in Chapter 4 show that the lagoon system will exceed its treatment capacity during the planning period. This is a result of higher than normal waste strengths being recorded at the City's WWTF. The high strength waste is believed to be caused by operation and maintenance (O&M) activities performed by the City (sampling hose location and wetwell cleaning activities). It appears that the loadings have normalized after the City made the O&M adjustments. However, in 2019 and 2020 the loadings peaked in the fall/winter months and then normalized in the spring/summer months. Therefore, the City may not know the effectiveness of the O&M adjustments until the fall/winter of 2021-22.

Continued overloading of the lagoons would lead to odor issues and improper wastewater treatment prior to land application. The City may need to install aerators in the primary lagoon to increase biological activity and augment treatment or find and remove the high strength waste source from the system. The City would also need to install primary treatment (headworks screen) to remove rags and inorganic material from the wastewater for proper aerator operation.

The headworks screen would consist of a simple screw-type screen with a washer compactor installed at the lagoon site. The headworks screen would be configured to accept influent flows from Lift Station No. 3 and then gravity flow into Lagoon No. 1. It is recommended that a fine bubble partial mix system be installed in Lagoon No. 1 to increase the lagoon treatment capacity. The system would generally consist of diffusers installed near the lagoon floor, air feed piping, and blowers installed in the operation building to supply air to the system. Figure 5-3 shows a total estimated project cost of \$1,062,000 for installing the headworks screen and aerators. Assuming the O&M adjustments have corrected the high

strength waste problem, the City's current lagoon system is anticipated to be adequate to treat the projected loads.

As discussed in Chapter 4, the City completed a lagoon leak test in 2020 that showed Lagoons No. 1 and 2 were seeping approximately 0.113 inch per day across the 28 acres of lagoons. The City will be installing City groundwater monitoring wells upgradient and downgradient of Circle 52 and the lagoon system to monitor the water quality parameters identified in the City's Groundwater Monitoring Plan. If the groundwater samples show that the groundwater downgradient of the lagoon system has degraded due to lagoon seepage, the DEQ may require Lagoons No. 1 and 2 to be relined. Therefore, Figure 5-4 shows a total estimated cost of \$1,600,000 for installing impermeable liners in Lagoons No. 1 and 2. The City may not need to reline Lagoons No. 1 and 2 depending on analysis of the groundwater samples.

Wastewater Treatment Facility Alternative Analysis

The City's existing treatment lagoon system has served the City effectively for many years. However, as discussed in Chapter 4, it is anticipated that the lagoon system will exceed its hydraulic capacity within the planning period and the City will need to make improvements to the treatment lagoons soon to meet the growing wastewater demands. This section presents, develops, and analyzes the different improvement alternatives for the City.

In evaluating improvement alternatives, existing system flows, permit conditions, and capacity parameters were considered. Facilities are generally sized using projected average annual flows or peak daily flows. Criteria used to evaluate the alternatives are described in cost estimates prepared for each of the feasible alternatives.

Description of Alternatives

Following is a brief description of the WWTF improvement alternatives considered for the City of Boardman to meet the anticipated year 2042 design conditions. The treatment and disposal options are as follows:

- The "Do Nothing" Alternative
- Alternative A - Construct a Mechanical Treatment Facility
- Alternative B - Lagoon Modifications to Increase Evaporation
- Alternative C - Expand Lagoon Storage Capacity

The "Do Nothing" Alternative

With this alternative, the City would continue to operate the WWTF in its current condition. The advantages and disadvantages of this alternative include:

Advantages

- Least cost alternative: no capital improvements required.

Disadvantages

- Potential non-compliance with permit requirements. The City would risk violating its WPCF Permit and potentially face penalty.
- Potential water quality issues. The City could potentially jeopardize water quality in the Boardman area if the lagoons were to overflow, placing the community at risk.

No mitigation measures or improvements to the WWTF are provided with this alternative. Therefore, this alternative has not been evaluated.

Alternative A - Construct a Mechanical Treatment Facility

Alternative A involves constructing a new mechanical treatment facility at the current lagoon site with winter effluent discharge to the Columbia River. During the irrigation season, existing irrigation practices would be utilized.

A new WWTF could be located at the existing lagoon site, with an outfall directed north to the Columbia River. One major concern with such a layout is that the City's potable water supply, collector wells adjacent to the Columbia River, is downstream of the potential outfall location.

During development of the City's 1999 WWFP, a mechanical treatment facility alternative was thoroughly analyzed by the City and the DEQ. At that time, it was indicated that neither party would support discharge to the Columbia River and that switching to a river discharge would not be a viable alternative for the City or community.

Boardman's practice of managing treated wastewater through effluent irrigation has served the City well over the past 42 years. The current system has operated effectively with little controversy due to irrigation practices or permit compliance issues.

While this alternative would allow the City to effectively treat and dispose of the anticipated 2042 wastewater demands, the construction costs to install such a mechanical treatment facility would be very high.

The advantages and disadvantages of this alternative include:

Advantages

- Meet future demands. This alternative would allow the City to meet the anticipated 2042 wastewater demands.
- Land acquisition would not be needed.

Disadvantages

- A federal National Pollutant Discharge Elimination System Permit would be required.
- Lack of support from the City and the DEQ. Previous analysis of this alternative indicate that it is not a viable alternative.

- Cost. Installation of a mechanical treatment facility and the required modification to the existing WWTF to incorporate a mechanical treatment facility would be very high.
- Increased O&M cost. Annual O&M costs would increase due to the complexity of a mechanical treatment facility. Also, it is likely that additional operator certification would be required to operate the mechanical treatment facility.

During a City Council work session, the mechanical treatment facility was discussed, and the City showed no interest. The City prefers to take advantage of and build on its existing infrastructure to meet future demands. Since Alternative A is not supported by the City and would likely not be permitted by the DEQ, this alternative was not considered viable, and no cost estimate is provided.

Alternative B - Lagoon Modifications to Increase Evaporation

Alternative B evaluated the potential modification of Lagoons No. 2 and 3 to increase wastewater disposal through evaporation (fountains).

Since the City currently operates the WWTF without a headworks facility to remove rags, inorganics, etc., prior to Lagoon No. 1, Alternative B includes aeration units installed in Lagoons No. 2 and 3 to limit clogging of the aeration units.

The period in which the fountains would provide the most benefit for the City is during the winter months when wastewater disposal through irrigation is not permitted. Unfortunately, the City would not be able to effectively operate fountains during this period due to the cold climate conditions in the Boardman area and the fountains would be of little use to the City. The fountains would typically operate during periods of effluent disposal by land application, reducing the volume of wastewater applied at Circle 52. Also, the City lowers the lagoons water surface elevations to minimum levels heading into winter storage so fountain use during fall months would be minimal and not necessary. For these reasons, this alternative was given consideration but not examined further due to the limitations.

Alternative C - Expand Lagoon Storage Capacity

Alternative C involves increasing the wastewater storage capacity to meet future demands by building a new wastewater storage lagoon.

The water balances developed for Alternative C can be referenced on Figures 4-4 and 4-5 in Chapter 4. The need for two water balances emerged as the results of the lagoon leak test performed by the City in 2020 showed that Lagoons No. 1 and 2 are seeping at a rate of approximately 0.113 inch per day across the 28 acres of lagoons. Therefore, Figure 4-4 shows the projected water balance assuming the seepage rate continues, and the water balance on Figure 4-5 assumes no seepage. Under each scenario, the water balances indicate that additional storage is needed in the amount of either 12.4 or 34.1 million gallons (MG), depending on seepage. The storage volumes were calculated assuming the impoundment dikes would be 10 feet high and have a maximum water height of 7 feet, leaving 3 feet of freeboard. The resulting area of the lagoons under each scenario considering the above assumptions would range between 9 and 18 acres.

Land to build a wastewater storage lagoon near the City's existing lagoon system is becoming scarce due to industrial and utility developments or farming activity. Another limiting factor is a large portion of land in the area is a dedicated wildlife refuge. Therefore, the City approached the Port of Morrow and is negotiating the purchase of a 13.5-acre parcel adjacent to Lagoon No. 1 as seen on Figure 5-5. The proposed parcel of land for the proposed wastewater storage lagoon is preferred because it is adjacent to the existing lagoon system and no farmland would be permanently converted. The City would be able to construct an approximately 9.5-acre lagoon, deducting the land needed to construct the impoundment dikes. Due to the topographic features of the parcel, the depth of the lagoon would be approximately 13 feet to keep the same operating water surface elevation as the existing lagoon system. Three feet of freeboard would be maintained and the resulting storage volume would be approximately 27.3 MG. Recognizing that the proposed lagoon volume is less than the required storage volume indicated in Chapter 4 on Figure 4-5 (34.1 MG), it is recommended that the City evaluate the groundwater impacts from the groundwater monitoring and then update this WWFP to identify an additional lagoon location if Lagoons No. 1 and 2 need lined.

According to the Oregon Administrative Rules in Chapter 690, a lagoon with impoundment dikes that exceed 10 feet in height and impound more than 3 MG is considered a dam and fall under the dam safety regulations administered by the Oregon Water Resources Department (OWRD). Therefore, the City will need to work with OWRD and the DEQ to obtain construction approval.

The estimated project cost for Alternative C is approximately \$3,292,000 (year 2021) as shown on Figure 5-6.

Summary

The wastewater collection system improvements, WWTF improvements, and effluent disposal options discussed in this chapter were presented to the City for discussion and selection. The improvements selected by the City are discussed in Chapter 6.

**CITY OF BOARDMAN, OREGON
WASTEWATER FACILITIES PLAN
LIFT STATION IMPROVEMENTS
PRELIMINARY COST ESTIMATE**

NO.	DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	\$ 41,000	All Req'd	\$ 41,000
2	Temporary Protection and Direction of Traffic/Project Safety	LS	10,000	All Req'd	10,000
3	Lift Station No. 1 Pumps	LS	70,000	All Req'd	70,000
4	Lift Station No. 2 Pumps	LS	80,000	All Req'd	80,000
5	Lift Station No. 3 Pumps	LS	90,000	All Req'd	90,000
6	Programmable Logic Controllers for Lift Stations No. 1, 2, and 3	LS	150,000	All Req'd	150,000
7	Piping Modifications for Lift Stations No. 1, 2, and 3	LS	60,000	All Req'd	60,000
8	Foul Air Ventilation for Lift Stations No. 1, 2, and 3	LS	90,000	All Req'd	90,000
9	Wetwell Level Control for Lift Stations No. 1, 2, and 3	LS	45,000	All Req'd	45,000
10	Miscellaneous Gate and Check Valves	EA	6	3,000	18,000
11	Secondary Lift Station Bypass Systems	LS	220,000	All Req'd	220,000
Total Estimated Construction Cost					\$ 874,000
Administration, Legal, Engineering, and Contingencies @ 35%					306,000
TOTAL ESTIMATED PROJECT COST (2021)					\$ 1,180,000
TOTAL ESTIMATED PROJECT COST (2022)					\$ 1,227,000

Note: Total estimated project cost was projected from 2021 to 2022 assuming 4 percent annual inflation.



CITY OF
BOARDMAN, OREGON
WASTEWATER FACILITIES PLAN

**LIFT STATION IMPROVEMENTS
PRELIMINARY COST ESTIMATE**

**FIGURE
5-1**

**CITY OF BOARDMAN, OREGON
WASTEWATER FACILITIES PLAN
BIOSOLIDS REMOVAL
PRELIMINARY COST ESTIMATE**

NO.	DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	\$ 132,000	All Req'd	\$ 132,000
2	Lagoon Biosolids Removal, Dewatering, Hauling, and Disposal (Wet Dredging)	Dry Ton	1,000	2,655	2,655,000
Total Estimated Construction Cost					\$ 2,787,000
Administration, Legal, Engineering, and Contingencies @ 25%					697,000
TOTAL ESTIMATED PROJECT COST (2021)					\$ 3,484,000
TOTAL ESTIMATED PROJECT COST (2022)					\$ 3,623,000

Note: Dry ton estimated quantity was calculated using the approximate 52,520 cubic yards of sludge determined by the sludge survey assuming 6 percent solids concentration.

NO.	DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	\$ 53,000	All Req'd	\$ 53,000
2	Lagoon Biosolids Removal, Dewatering, Hauling, and Disposal (Dry Solids Removal with Equipment)	Dry Ton	400	2,655	1,062,000
Total Estimated Construction Cost					\$ 1,115,000
Administration, Legal, Engineering, and Contingencies @ 25%					279,000
TOTAL ESTIMATED PROJECT COST (2021)					\$ 1,394,000
TOTAL ESTIMATED PROJECT COST (2024)					\$ 1,568,000

Note: Total estimated project cost was projected assuming 4 percent annual inflation.



CITY OF
BOARDMAN, OREGON
WASTEWATER FACILITIES PLAN

BIOSOLIDS REMOVAL
PRELIMINARY COST ESTIMATE

**FIGURE
5-2**

**CITY OF BOARDMAN, OREGON
WASTEWATER FACILITIES PLAN
HEADWORKS AND AERATORS
PRELIMINARY COST ESTIMATE**

NO.	DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	\$ 37,000	All Req'd	\$ 37,000
2	Headworks Screen	LS	250,000	All Req'd	250,000
3	Aerator System	LS	450,000	All Req'd	450,000
4	Pipe, Valves, and Appurtenances	LS	50,000	All Req'd	50,000
Total Estimated Construction Cost					\$ 787,000
Administration, Legal, Engineering, and Contingencies @ 35%					275,000
TOTAL ESTIMATED PROJECT COST (2021)					\$ 1,062,000

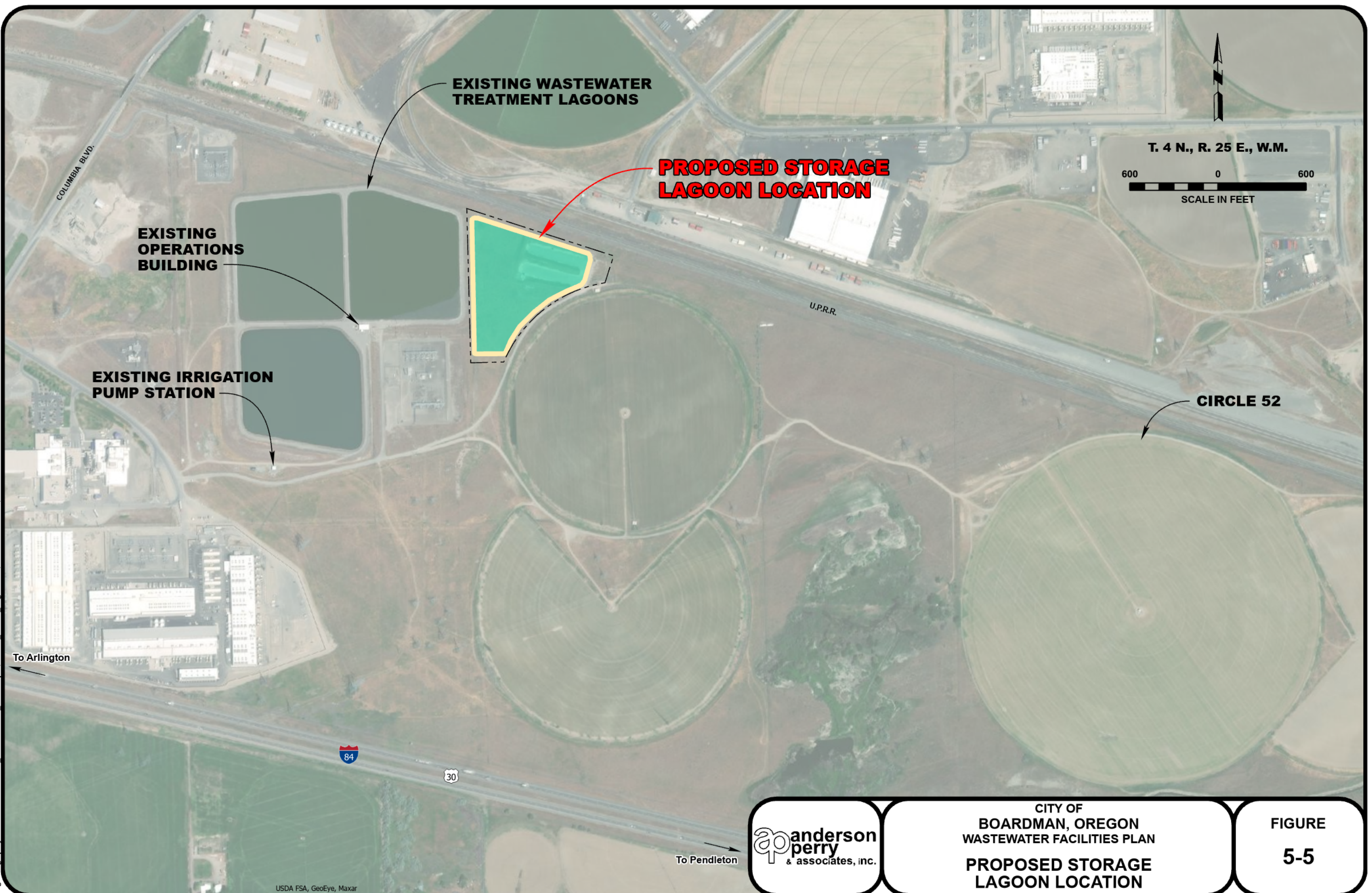
Note: The total estimated project cost (2021) should be projected at an appropriate annual inflation rate to the year when the project is constructed.

**CITY OF BOARDMAN, OREGON
WASTEWATER FACILITIES PLAN
LAGOON NO. 1 AND NO. 2 LINER
PRELIMINARY COST ESTIMATE**

NO.	DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	\$ 60,000	All Req'd	\$ 60,000
2	Lagoon Liner	LS	1,220,000	All Req'd	1,220,000
Total Estimated Construction Cost					\$ 1,280,000
Administration, Legal, Engineering, and Contingencies @ 25%					320,000
TOTAL ESTIMATED PROJECT COST (2021)					\$ 1,600,000

Note: The total estimated project cost (2021) should be projected at an appropriate annual inflation rate to the year when the project is constructed.

\\gsrv01\projects\Boardman\439-48 WWFP\439-48 WWFP.aprx, 439-48 WWFP Lagoon Loc. 3/25/2021 3:11 PM, dchristman



**anderson
perry**
& associates, inc.

FIGURE
5-5

**CITY OF BOARDMAN, OREGON
WASTEWATER FACILITIES PLAN
WASTEWATER STORAGE LAGOON
PRELIMINARY COST ESTIMATE**

NO.	DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	\$ 102,000	All Req'd	\$ 102,000
2	Earthwork	LS	700,000	All Req'd	700,000
3	Liner Subgrade and Backfill	LS	165,000	All Req'd	165,000
4	Lagoon Liner	LS	360,000	All Req'd	360,000
5	Geotextile Fabric	LS	50,000	All Req'd	50,000
6	Riprap Liner Protection	LS	260,000	All Req'd	260,000
7	Lagoon Access Road	LS	70,000	All Req'd	70,000
8	Lagoon Piping, Valves, and Appurtenances	LS	450,000	All Req'd	450,000
Total Estimated Construction Cost					\$ 2,157,000
Administration, Legal, Engineering, and Contingencies @ 35%					755,000
Other Estimated Project Costs					
Permitting					50,000
Land Acquisition					270,000
Environmental Reports					60,000
TOTAL ESTIMATED PROJECT COST (2021)					\$ 3,292,000
TOTAL ESTIMATED PROJECT COST (2022)					\$ 3,424,000

Note: Total estimated project cost was projected from 2021 to 2022 assuming 4 percent annual inflation.



CITY OF
BOARDMAN, OREGON
WASTEWATER FACILITIES PLAN

**WASTEWATER STORAGE LAGOON
PRELIMINARY COST ESTIMATE**

**FIGURE
5-6**

Chapter 6 - Selected Improvements

General

This chapter presents the selected improvements to the City of Boardman's wastewater collection, treatment, and effluent disposal needs for the planning period. These improvements were selected by the City after careful consideration of the various impacts, objectives, and criteria discussed in Chapter 5 and review, evaluation, and consideration of associated cost estimates.

Selected Improvements

Lift Stations No. 1, 2, and 3 need various immediate improvements, including new submersible pumps, updated pump controls, and wetwell level controls. The building's ventilation systems are failing and no longer provide proper air circulation. Miscellaneous valves need inspection and/or replacement, the flowmeter at Lift Station No. 3 needs replaced, and the secondary lift stations need bypass piping installed. Some improvements can be phased in over time. However, the primary lift station improvements are a priority for the City.

The wastewater treatment and disposal alternative selected by the City, Alternative C, involves construction of a new wastewater storage lagoon. Once the new storage lagoon is operational, the City can remove Lagoon No. 1 from service and have the biosolids removed after they have had adequate time to dewater. The selected improvements are shown on Figure 6-1.

Lift Station Improvements

All three primary lift stations will be upgraded by reconfiguring the pumping systems by installing submersible pumps in the wetwells. This would eliminate the need for the pump suction headers and the problematic vacuum priming system. In addition to the pump and piping modifications, the City is planning to repair or replace the following items:

- Programmable logic controller
- Foul air ventilation systems
- Wetwell level control systems
- Miscellaneous gate and check valves
- Magnetic flowmeter

Portable pump bypass piping on Lift Stations No. 4 through 7 will be installed for emergency situations and for ease of maintenance. The improvements to the secondary lift stations can be phased in over time.

Lagoon Expansion

A new storage lagoon will be constructed. The new lagoon will be approximately 9.5 acres in surface area and contain approximately 27.3 million gallons of active storage volume. The storage lagoon impoundment dikes will have a depth of approximately 13 feet, and approximately 10 feet of this depth will be used for wastewater storage, leaving 3 feet for freeboard. Since all treatment will occur in the City's existing lagoon system, the City will be able to utilize the entire 10 feet for storage.

Existing test pit data from the original lagoon construction project indicate that sand and silty sand is encountered in the proposed lagoon construction area. The new storage lagoon will be lined with a synthetic liner to prevent seepage. Rock excavation for lagoon construction is not anticipated, but additional test pits will be completed during design to confirm earthwork expectations.

Wastewater Treatment Facility Operational Improvements

It is anticipated that Lagoon No. 1 will be dewatered and allowed to dry for approximately 1 to 2 years once the new storage lagoon is operational. The flow path through the lagoon system will need to be modified allowing the sludge to dry for an extended period increasing the solids content of the sludge and decreasing removal volumes. Also, the construction methods in removing dried sludge are much less expensive than removing saturated sludge. The City plans to dispose of all the biosolids in a landfill due to all the known plastics and inorganics in the biosolids.

Summary of Estimated Costs

Each major improvement cost is summarized below on Table 6-1.

**TABLE 6-1
SUMMARY OF ESTIMATED COSTS**

Lift Station Improvements Estimated Construction Costs	\$874,000
Administration, Legal, Engineering, and Contingency	\$306,000
Lift Station Improvements Total Estimated Project Costs (2021)	\$1,180,000
Biosolids Removal Estimated Construction Costs	\$1,115,000
Administration, Legal, Engineering, and Contingency	\$279,000
Biosolids Removal Total Estimated Project Costs (2021)	\$1,394,000
Wastewater Storage Lagoon Estimated Construction Costs	\$2,157,000
Administration, Legal, Engineering, and Contingency	\$755,000
Other Project Costs	\$380,000
Wastewater Storage Lagoon Total Estimated Project Costs (2021)	\$3,292,000
TOTAL ESTIMATED CONSTRUCTION COSTS	\$4,146,000
ADMINISTRATION, ENGINEERING, AND CONTINGENCY	\$1,340,000
OTHER PROJECT COSTS	\$380,000
TOTAL ESTIMATED PROJECT COSTS (2021)	\$5,866,000

The total project costs are presented in 2021 dollars. The construction costs should be increased by 4 percent annually to account for inflation depending on the year improvements occur.

Preliminary Environmental Review

A preliminary environmental review of the selected wastewater system improvements was completed as part of this Wastewater Facilities Plan and can be found in Appendix F. After review of available information, no major environmental challenges were identified. As the project is further developed and funding is sought, a more detailed report may be required to meet specific agency requirements.

Chapter 7 - Financing and Implementation

This chapter evaluates the financial status of the City of Boardman's Sewer Department. A summary of state and federal funding programs is presented, including a review of funding options available to the City.

Although a detailed analysis of the City's current sewer rate structure is beyond the scope of this Wastewater Facilities Plan (WWFP), some discussion of the existing rate structure and current and future wastewater system budgets is included. Generally, most utility rate structures include funding for periodic minor system improvements and maintenance items, payroll costs for staff, and a set-aside for future improvements. A summary of the current sewer rate structure is presented hereafter.

In anticipation of completing the selected wastewater improvements, the City of Boardman proposed a Water/Wastewater General Obligation (GO) bond to the citizens of Boardman in May 2020. The GO bond passed allocating approximately \$4.86 million for wastewater system improvements. This money is earmarked to complete the lift station improvements and construct the wastewater storage lagoon. The City plans to utilize reserves in the sewer fund to pay for the biosolids removal in Lagoon No. 1.

Current Sewer Rates and Revenue

Operation and maintenance of the existing wastewater system is financed through the City's annual budget. Revenue is obtained primarily from sewer user fees. The current monthly wastewater rates are summarized on Table 7-1.

TABLE 7-1
MONTHLY WASTEWATER RATE INFORMATION

Type of User	Current Wastewater Rate
Inside City Limits	\$27.50 per month
Outside City Limits	\$40.00 per month

As of June 2020, the City served a total of 902 users, with 18 users outside city limits. The users billed are further broken down by account type on Table 7-2, below. The data presented on Table 7-2 were provided by the City.

TABLE 7-2
SEWER SERVICE ACCOUNTS

Account Type	Total Number of Accounts
Residential	815
Industrial ¹	59
Commercial/Other	28
TOTAL	902

¹ City receives only domestic sewage from industrial sewer services.

Revenue generated from the City's sewer service fees and connection fees is presented on Table 7-3. Rates are reviewed annually and revised periodically to ensure sufficient revenue is generated to pay the total operation, maintenance, and replacement (OM&R) costs of the wastewater system.

**TABLE 7-3
SEWER SERVICE REVENUE**

Fiscal Year	Total Revenue from Sewer Service Fees and Investment Income
2015-16	\$560,674
2016-17	\$627,159
2017-18	\$645,739
2018-19	\$654,277
2019-20	\$736,997

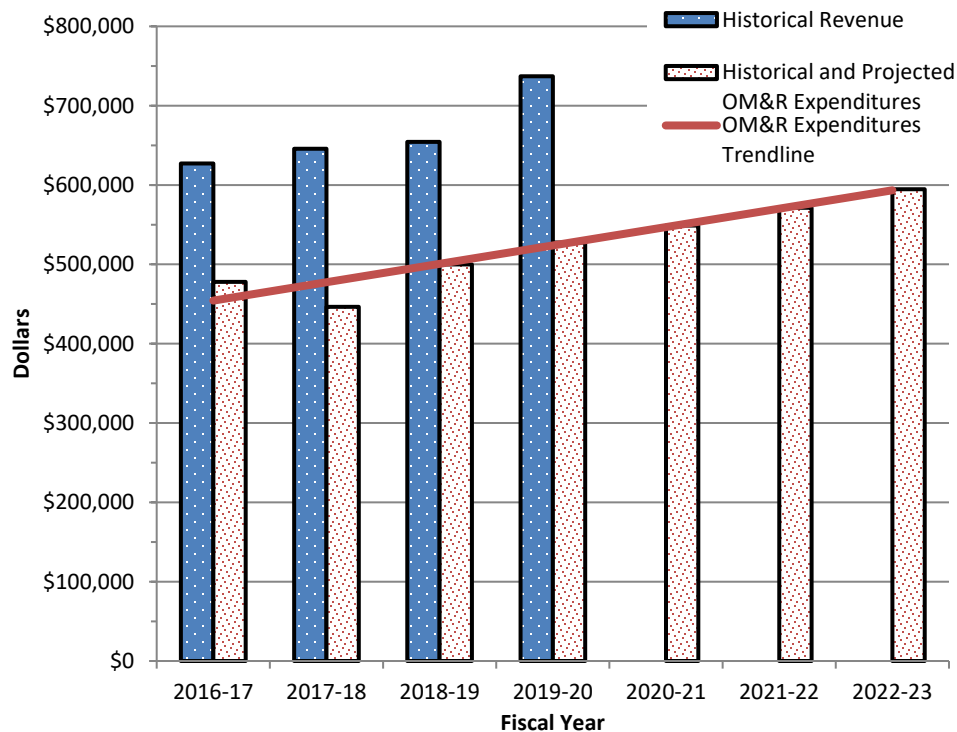
Current Financial Status

The annual cost of operating and maintaining the City's wastewater system is summarized on Figure 7-1. The costs presented were obtained from the City's financial statements and include all costs for the wastewater system, such as OM&R, personnel services, and capital outlay. These data are presented to provide insight into the magnitude of costs required to operate the City's existing wastewater system. For funding and other financial analysis, it is recommended that the financial statements be reviewed in detail to refine the costs prior to considering any available revenue for future debt purposes.

Historical and Projected Budget Trends

A graphical plot of the City of Boardman's wastewater system budget, with revenue and expenditures, is shown on Chart 7-1, below. The expenditures shown on Chart 7-1 are variable and show an upward trend over time. It is typically expected that the expenditures should be increasing with time as the costs to own and operate a wastewater treatment facility (WWTF) continually increase. It is anticipated the proposed improvements will be constructed in the year 2022. The new system will likely have similar annual costs to operate and maintain. For the purposes of this WWFP, it has been assumed that overall annual OM&R expenditures will increase at a constant rate for the next several years. Historically, OM&R expenditures have increased at approximately 5 percent per year.

CHART 7-1
HISTORICAL REVENUE AND EXPENDITURES AND PROJECTED EXPENDITURES



The City currently budgets reserve account funds for sewer system OM&R costs. Because the City already has a reserve account, they are better prepared to deal with future sewer system expenses and emergencies. Pump replacement, line repairs, lift station work, etc., are items that require funds from time to time.

Existing Debt

The City of Boardman is currently paying off a GO bond obtained in 2003 with payoff scheduled in 2029. However, the outstanding debt from the 2003 GO bond is being assumed by the recently passed 2020 GO bond.

Preliminary Equivalent Residential Unit Analysis

When projecting future revenue for a wastewater system, an equivalent residential unit (ERU) analysis is usually completed. One ERU is intended to represent the average residential wastewater contribution for a “typical” user for a given city. As an example, each residential connection in Boardman would represent one ERU. A commercial or industrial connection user with wastewater flows like the average residential flow would also be considered one ERU. A commercial connection such as a café, with three times the typical wastewater flows as an average residential sewer connection, would be considered three ERUs.

The City's sewer service accounts, as of June 2020, were analyzed to provide a preliminary ERU determination, as shown on Table 7-4. The number of ERUs has been estimated based on current rates being charged to commercial and other users.

**TABLE 7-4
PRELIMINARY ERU ANALYSIS**

Connection Type	Total Number of Accounts	Estimated ERUs
Residential	815	815
Industrial	59	1,209
Commercial	16	20
Hotels, Motels, RV Parks	3	80
Schools/Churches	9	26
Total	902	2,150

Based on the above ERU analysis, the City has 902 wastewater system accounts that represent approximately 2,150 ERUs. Most funding agencies will use this type of ERU analysis as a basis for estimating future yearly revenues and debt capabilities for a city. The ERU determination is intended to equitably distribute wastewater system costs among all users. The ERU determination helps funding agencies determine the maximum loan (debt) amount a city can afford to service.

State and Federal Grant and Loan Programs

Several state and federal grant and loan programs can aid with municipal improvement projects to Oregon cities. These programs offer various levels of funding aimed at different types of projects. These include programs administered by the U.S. Department of Agriculture Rural Development (RD), the U.S. Economic Development Administration (EDA), Business Oregon, the Oregon Department of Environmental Quality (DEQ), and others. These agencies can provide low interest loan funding, and possibly grant funding, to assist communities with public works projects. Most of these agencies will require an increase in sewer rates to support a loan for wastewater system improvements, both as a condition of receiving monies and prior to being considered for grant funds. It should be noted that the monthly user rates discussed in this section can represent a combination of monthly usage fees and taxes. The following section briefly summarizes the primary funding programs available.

Summary of State Funding Programs

Business Oregon Finance Programs

Community Development Block Grant Program

The primary objective of the Community Development Block Grant (CDBG) program is the development of viable (livable) urban communities by expanding economic opportunities and providing decent housing and a suitable living environment principally for persons of low and moderate income.

This is a grant program. The state receives an annual allocation from the U.S. Department of Housing and Urban Development for the CDBG program. Grant funding is subject to applicant need, availability of funds, and any other restrictions in the state's Method of Distribution (i.e.,

program guidelines). It is not possible to determine how much, if any, grant funds may be awarded prior to an analysis of the application and financial information.

Eligibility for the CDBG program requires a low to moderate percent income of more than 51 percent. The City of Boardman's percentage of low to moderate income is 49.55 percent, based on the 2019 Low to Moderate Income Summary data used by the CDBG program, so funding from the CDBG program is not available to the City at this time.

Water/Wastewater Financing Program

This is a loan and grant program that provides for the design and construction of public infrastructure when needed to ensure compliance with the Safe Drinking Water Act (SDWA) or the Clean Water Act (CWA). To be eligible, a system must have received, or is likely to soon receive, a Notice of Non-Compliance by the appropriate regulatory agency associated with the SDWA or the CWA.

While primarily a loan program, grants are available for municipalities that meet the eligibility criteria. The loan/grant amounts are determined by a financial analysis of the applicant's ability to afford a loan (debt capacity, repayment sources, current and projected utility rates, and other factors). One criterion utilized by Business Oregon finance programs is an affordability index rate. The affordability index rate is calculated by taking a City's median household income (MHI), multiplying it by 1.25 percent, and dividing by 12 months to obtain an estimated monthly cost. The calculated cost is assumed to be what the users in the community can afford to pay in utility charges. The affordability index is often utilized as a minimum threshold for eligibility for grants and low interest loans.

The maximum loan term for this program is 25 years or the useful life of the infrastructure financed, whichever is less. Loan amounts are determined by financial review and may be offered through a combination of direct and/or bond funded loans. Loans are generally repaid with utility revenues or voter approved bond issues. A limited tax general obligation pledge may also be required. "Creditworthy" borrowers may be funded through the sale of state revenue bonds.

The maximum grant available through the Water/Wastewater Financing Program is \$750,000 per project based on a financial analysis. To qualify for grants, the sewer rate would need to be 115 percent of the City's affordability index rate. The City's current affordability index rate is \$54.53. The current interest rate is between 3.5 and 4 percent with a 25-year loan term.

Special Public Works Fund

The Special Public Works Fund program was established by the Oregon Legislature in 1985 to provide primarily loan funding for municipally owned infrastructures and other facilities that support economic and community development in Oregon. Loans and grants are available to municipalities for planning, designing, purchasing, improving, and constructing municipally owned facilities.

For design and construction projects, loans are primarily available; however, grants are available for projects that will create and/or retain traded-sector jobs. A traded-sector industry sells its goods or services into nationally or internationally competitive markets. Loans range in size from

less than \$100,000 to \$10 million. The Special Public Works Fund can offer very attractive interest rates that reflect tax-exempt market rates for very good quality creditors. Loan terms can be up to 25 years or the useful life of the project, whichever is less. The maximum grant award is \$500,000 or 85 percent of the project cost, whichever is less. The grant amount per project is based on up to \$5,000 per eligible job created or retained.

For Business Oregon Programs - Contact Regional Development Officer

Since program eligibility and funds availability may change from year to year, potential applicants are encouraged to contact their respective regional development officer to obtain the most accurate and up-to-date information for each program.

Clean Water State Revolving Fund Loan Program

Oregon's Clean Water State Revolving Fund (CWSRF) program, administered by the DEQ, supports communities by funding projects that improve water quality and environmental outcomes for the state of Oregon. The program is dedicated to working with small communities and on projects that increase financial and environmental sustainability, climate resiliency, and water and energy efficiency.

The CWSRF program offers below-market rate loans and bond purchases to public agencies for planning, design, construction, and implementation of the following water quality improvement projects:

- Wastewater collection, treatment, water reuse, and disposal systems.
- Nonpoint source water pollution control projects.
- Development and implementation of management plans for federally designated estuaries in Oregon (Tillamook Bay and the lower Columbia River).

The U.S. Environmental Protection Agency requires the CWSRF program to develop a project priority list. Currently, the DEQ awards funding without regard to project score or ranking because the program has sufficient funds to finance all projects ready to proceed. This ensures the fund is utilized in a timely manner. In the event the program does not have sufficient funds available to offer funding to all projects that are ready to proceed, the DEQ will award funding to projects that are ready to proceed in priority order based on project score.

The CWSRF program charges interest rates that are calculated based on criteria defined in Oregon Administrative Rules 340-054-0065. Different interest rates and other financial terms apply to different types of loans and to loans of differing repayment periods. Rates are adjusted quarterly, based on the average Bond Buyer rates of the previous quarter, as published by the Federal Reserve. The average interest rate on CWSRF loans in 2020 was less than 1 percent on a 30-year CWSRF loan for small communities below the MHI. Current interest rates can be found on the DEQ's website: <https://www.oregon.gov/deq/wq/cwsrf/Pages/CWSRF-Rates.aspx>. Once a loan is signed, the interest rate is fixed for the life of the loan.

For design and construction loans, an annual fee equal to 0.5 percent of the unpaid balance is collected once annually. A loan reserve equal to one-half of the debt service is called out in the borrower's financial statements.

The CWSRF program can also sometimes provide principal forgiveness in combination with a loan for eligible communities. To be eligible, the project must either support a community with below the statewide MHI or meet Green Project guidelines. The CWSRF program has a limited amount of money available for principal forgiveness each year. If the community is eligible and money is available at the time of loan signing, the DEQ can offer principal forgiveness for 50 percent of the loan amount, for a maximum amount of \$500,000.

Summary of Federal Grant and Loan Programs

Rural Development

This agency can provide financial assistance to communities with a population of less than 10,000 through both loans and direct grants. Under the loan program, the agency purchases local bonds. The interest rate for these bonds is dependent on the MHI of the community and other factors and varies from year to year based on other economic factors nationally. The market interest rate varies but has recently been approximately 3.25 percent with a repayment period of up to 40 years. Applying for this type of funding is a lengthy process involving development of an environmental report and a detailed funding application.

RD presently requires communities to establish average residential user costs in the range of similar systems with similar demographics. According to RD staff, the most recent sewer user cost requirements have been around \$45 to \$50 per month before a community qualifies for grant funds. It should be noted that loans without grant funds may be acquired from RD that may not require rates to reach this level, depending on the results of an RD funding analysis. The user costs must provide sufficient revenue to pay for all system OM&R costs and pay for the local debt service incurred because of the project. All project costs above this level may be paid for by grant funds, up to given limits, which are typically between 25 and 45 percent of total project cost. The objective of the RD loan/grant program is to keep the cost for utilities in small, rural communities at a level like what other communities are paying.

Another of the agency's requirements is that loan recipients establish a reserve fund of 10 percent of the bond repayment during the first 10 years of the project, which can make the net interest rate higher. The RD program requires either revenue or general obligation bonds to be established through the agency for the project (refer to the Local Financing Options section of this chapter for further discussion). These bonds can usually be purchased for a period of 40 years if grant funding is also received.

U.S. Economic Development Administration

The EDA has grants and loan funds like those available through Business Oregon's Special Public Works Fund program. Monies are available to public agencies to fund projects that stimulate the economy of an area, and the overall goal of the program is to create or retain jobs. The EDA helps fund public works improvement projects in areas where new industries are locating or plan to locate in the future. In addition, the agency has a program known as the Public Works Impact Program to fund projects in areas with extremely high rates of unemployment. This program is targeted toward creating additional jobs and reducing the unemployment rate in the area.

Funding Summary

If the City ends up needing to engage a federal or state funding agency, it is important to consult with funding agencies early in the project development stages to understand which funding programs would provide the most attractive funding package. This consultation with funding agencies is usually done at a One Stop meeting, which is described in more detail later hereafter.

Project One Stop Meeting

To evaluate all potential project funding options, a One Stop meeting is generally requested by a city. One Stop meetings are often scheduled in Salem or the city, upon request, where representatives of RD, Business Oregon, and other funding agencies meet with the city to discuss the project and funding needs. This joint meeting provides a forum to evaluate and identify the most suitable funding package for the project and the city. After the meeting, the city is usually invited to submit a funding application to the preferred funding program(s) identified in the One Stop meeting.

Project Implementation

The DEQ has approved this WWFP, as shown in Appendix G. The City agrees with the recommended improvements. Should the City wish to proceed with the wastewater system improvements project, the following Implementation Plan outlines the key steps the City would need to undertake for project implementation. The following outlines only the major steps that need to be followed.

Item No.	Implementation Item	Time Frame
1.	Land acquisition.	March 2021
2.	Submit draft WWFP to City and agencies for review.	May 2021
3.	Finalize and adopt the WWFP.	July 2021
4.	Design system improvements.	Spring/Summer 2021
5.	Permitting process.	Summer 2021
6.	Submit design documents for agency(ies) review.	Summer 2021
7.	Advertise, bid, and award construction project.	Fall 2021
8.	Project construction.	Fall 2021 through Summer 2022
9.	Project startup and construction completion.	Summer 2022
10.	Project closeout.	Fall 2022
11.	Monitor system performance to determine impact of improvements, report impacts to the DEQ, and determine the need for future improvements.	Two years after project closeout

Wastewater system improvements as outlined in this WWFP will provide the City with a reliable, quality wastewater system that is anticipated to meet the needs of the City for many years to come.

**CITY OF BOARDMAN, OREGON
WASTEWATER FACILITIES PLAN
HISTORICAL WASTEWATER SYSTEM FUNDS**

Fiscal Year	Sewer Fees Revenue	Additional Revenue¹	Personal Services²	Materials and Services³	Capital Outlay	Total OM&R Expenditures	Debt Service	Total Expenditures	Net Fund Balance^{4, 5}
2015-16	\$533,858	\$26,815	\$309,367	\$128,496	\$12,320	\$450,183	\$163,484	\$613,667	(\$52,994)
2016-17	\$595,438	\$31,721	\$338,197	\$127,228	\$12,451	\$477,875	\$157,444	\$635,319	(\$8,160)
2017-18	\$619,489	\$26,250	\$331,672	\$110,581	\$4,208	\$446,461	\$151,982	\$598,443	\$47,296
2018-19	\$628,027	\$26,250	\$356,632	\$134,559	\$8,750	\$499,941	\$150,774	\$650,715	\$3,562
2019-20	\$709,194	\$27,804	\$394,769	\$126,874	\$5,833	\$527,476	\$151,543	\$679,019	\$57,978

¹ Additional revenue includes interest income, user fees, hook-up fees, sales of materials and services, and system development charges.

² Includes sewer and administration personal services.

³ Includes sewer and administration materials and services.

⁴ Parentheses indicate a deficit in net operating income.

⁵ Net fund balance does not include annual cash carryover or capital reserve transfers into fund.



CITY OF
BOARDMAN, OREGON
WASTEWATER FACILITIES PLAN
HISTORICAL WASTEWATER
SYSTEM FUNDS

**FIGURE
7-1**

Appendices

Appendix A	Water Pollution Control Facilities Permit
Appendix B	Laboratory Test Results
Appendix C	Primary Wastewater Lagoon Sludge Survey
Appendix D	Lift Station Run Hours Compiled
Appendix E	Wastewater Treatment Facility Lagoon Leak Testing
Appendix F	Cursory Environmental Review
Appendix G	Oregon Department of Environmental Quality Approval Letter

APPENDIX A

Water Pollution Control Facilities Permit



WATER POLLUTION CONTROL FACILITIES PERMIT

Oregon Department of Environmental Quality
800 SE Emigrant Ave., Suite 330, Pendleton, OR 97801
Telephone: 541-276-4063
Fax: (541) 278-0168
Issued pursuant to ORS 468B.050

ISSUED TO:

City of Boardman
P.O. Box 229
Boardman, OR 97818

SOURCES COVERED BY THIS PERMIT:

Type of Waste	Outfall Number	Location
Recycled Water	001	Specified in Recycled Water Use Plan
Biosolids	N/A	Specified in Biosolids Management Plan

FACILITY TYPE AND LOCATION:

Facultative Lagoon System with
Recycled Water Irrigation
79581 Rippee Road
Boardman, OR 97818

RIVER BASIN INFORMATION:

WRD Basin: Umatilla
USGS Sub basin: Middle Columbia/Lake Wallula
LLID: 1196651458422 - RM 1.2
Lat/Long: 45.846585 /- 119.649672
County: Morrow

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

Nearest surface stream which would receive waste if it were to
discharge: Columbia River

Issued in response to application #978313 received May 12, 2006 and based on the land use compatibility statement in the permit record.

Chad P. Gubala, Ph.D.
Eastern Region Water Quality Manager

February 13, 2020

Signature Date

March 4, 2020

Effective 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 in conformance with all the requirements, limitations, and conditions set forth in the attached schedules.

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

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SCHEDULE A Waste Discharge Limits

1. Permitted System

The City of Boardman is permitted to operate and maintain a domestic wastewater treatment facility consisting of facultative treatment lagoons with an effluent disinfection system and to land apply recycled water for beneficial use in accordance with a DEQ approved Recycled Water Use Plan (RWUP).

2. Use of Recycled Water

The permittee is authorized to distribute and land apply recycled water if it is:

- a. Treated and used according to the criteria listed in Table A1.
- b. Managed in accordance with a current DEQ-approved Recycled Water Use Plan (RWUP).
- c. The recycled water use plan must account for all sources of nutrient and hydraulic loading to the land application site—including irrigation with supplemental water, industrial process water, and application of additional fertilizer.
- d. Only irrigated on land between during the crop growing season(s) of March 1 through October 31 unless otherwise approved in writing by DEQ. This includes all water sources applied to the land application site.
- e. Used in a manner and applied at a rate that does not have the potential to adversely impact groundwater quality.
- f. Not applied to land that is frozen, snow covered, saturated, or during precipitation periods.
- g. Applied at a rate and in accordance with DEQ approved site management practices that ensure continued agricultural, horticultural, or silvicultural production and which does not reduce the productivity of the site.
- h. Stored during months when irrigation is not approved. The wastewater lagoons must have adequate storage capacity during the non-irrigation months.
- i. Irrigated using sound irrigation practices to prevent:
 - i. Prolonged ponding of treated recycled water on the ground surface;
 - ii. Offsite surface runoff or subsurface drainage through drainage tile;
 - iii. Creation of odors, fly and mosquito breeding, or other nuisance conditions; and
 - iv. Overloading of land with nutrients, organics, or other pollutants.

Table A1: Recycled Water Limits

Class	Level of Treatment (after disinfection)	Beneficial Uses
D	Class D recycled water must be oxidized and disinfected. <i>E. coli</i> may not exceed: • A 30-day log mean of 126 organisms per 100 mL. • 406 organisms per 100 mL in any single sample.	Class D recycled water may be used for: • Nondisinfected uses: Fodder, fiber, seed crops not intended for human ingestion, commercial timber. • Irrigation of firewood, ornamental nursery stock, Christmas trees, sod, or pasture for animals.

3. Agronomic Rates for Nutrient Loading

Crop and site specific agronomic loading rates for nutrients, specifically nitrogen, will be approved by DEQ only after consideration of agronomic rates published in appropriate, region specific, fertilizer guides and proposed by the Permittee. DEQ may adjust the allowable agronomic rate after review of annual reporting and to ensure adequate protection of public waters, including groundwater. The Recycled Water Use Plan must list the approved agronomic rates for each proposed crop.

The permittee is prohibited from exceeding the crop-specific agronomic rates for total nitrogen listed in the approved RWUP using the measurement and calculation methods provided below. For this permit, the total nitrogen available to an individual crop between crop start and harvest is the sum total of all nitrogen from the following sources:

- a. All nitrate (NO_3) in the crop-specific root zone as measured by soil sampling (1-5 foot depth) at the crop start at the land application site,
- b. All ammonium (NH_4) in the crop-specific root zone as measured by soil sampling (1-5 foot depth) at the crop start at the land application site,
- c. 70% of the Total Kjeldahl Nitrogen (TKN) in applied irrigation water from all sources
- d. All nitrate + nitrite nitrogen ($\text{NO}_3 + \text{NO}_2\text{-N}$) applied from all sources of irrigation water
- e. All nitrogen applied as commercial fertilizer, and
- f. All nitrogen from any other source applied during the year.

The calculated value of the total nitrogen sum must be below the maximum crop-specific agronomic rates listed in the approved RWUP.

4. Groundwater Protection

The permittee must manage and land apply all authorized wastewater in compliance with the terms and conditions of this permit and in a manner that will prevent:

- a. A violation of the Groundwater Quality Protection Rules (OAR 340-0040), and
- b. A violation of any permit-specific groundwater concentration limits, established pursuant to OAR 340-0030, which will be incorporated into the permit by addendum.

5. Hydraulic Loading and Leaching

During the growing season, hydraulic loading from all water sources applied at the land application site must not exceed the crop-specific evapotranspiration (ET) rate reported at Hermiston Agrimet (HERO) on a monthly basis. Leaching below the root zone is prohibited without prior written approval from the department. During the non-growing season (November through February), all irrigation is prohibited without prior written approval from DEQ. This prohibition includes irrigation with well water and any sources of industrial wastewater.

6. Biosolids

The permittee may land apply biosolids or provide biosolids for sale or distribution, subject to the following conditions:

- a. The permittee must manage biosolids in accordance with a DEQ-approved Biosolids Management Plan and Land Application Plan.
- b. Except when used for land reclamation and approved by DEQ, biosolids must be applied at or below the agronomic rate required for crop yield.
- c. The permittee must obtain written site authorization from DEQ for each land application site prior to land application and follow the site-specific management conditions in the DEQ-issued site authorization letter.
- d. Biosolids must meet one of the pathogen reduction standards under 40 CFR §503.32 and one of the vector attraction reduction standards under 40 CFR §503.33.
- e. Pollutants in biosolids may not exceed the ceiling concentrations shown in Table A2 below. Biosolids exceeding the pollutant concentrations in Table A2 must be applied at a rate that does not exceed the corresponding cumulative pollutant loading rates.

Table A2: Biosolids Limits

Pollutant	Ceiling concentrations¹ (mg/kg)	Pollutant concentrations¹ (mg/kg)	Cumulative pollutant loading rates¹ (kg/ha)
Arsenic	75	41	41
Cadmium	85	39	39
Copper	4300	1500	1500
Lead	840	300	300
Mercury	57	17	17
Molybdenum	75	N/A	N/A
Nickel	420	420	420
Selenium	100	100	100
Zinc	7500	2800	2800
Note: 1. Biosolids pollutant limits are described in 40 CFR Part 503.13, which uses the terms <i>ceiling concentrations</i> , <i>pollutant concentrations</i> , and <i>cumulative pollutant loading rates</i> . Biosolids containing pollutants in excess of the ceiling concentrations may not be applied to the land. Biosolids containing pollutants in excess of the pollutant concentrations, but below the ceiling concentrations, may be applied to the land; however, the total quantity of biosolids applied may not exceed the cumulative pollutant loading rates.			

7. Hauled Waste Requirements

Hauled wastes, including but not limited to wastewater solids from another treatment facility, domestic septage, grease trap wastes, portable and chemical toilet wastes, landfill leachate, groundwater remediation wastewater, and commercial or industrial wastewater, may not be accepted at this facility for treatment or processing unless DEQ has approved a hauled waste management plan and given the permittee written approval.

SCHEDULE B

Minimum Monitoring and Reporting Requirements

1. Monitoring and Reporting Protocols

The permittee must monitor the operation and efficiency of all treatment and disposal facilities. Sampling data and measurements taken as required in this permit must be representative of the nature of the wastewater and must be taken under normal operating conditions. Unless otherwise agreed to in writing by DEQ, data collected and submitted must include but not necessarily be limited to the following parameters and minimum frequencies.

2. Influent Monitoring and Reporting Requirements

The permittee must monitor the quality and quantity of flow into the treatment system as listed in Table B1 below. The sampling location for the influent must be representative of all inflow into the treatment lagoon system.

Table B1: Influent Monitoring and Reporting

Item or Parameter	Minimum Frequency	Sample Type/Required Action	Report
Total Flow (MGD)	Daily	Measurement	1. Daily values 2. Monthly total 3. Monthly average
Flow Meter Verification	Annual	Verification	Written report that verification was completed.
BOD ₅ (mg/L)	Weekly	Composite	Weekly Values
TSS (mg/L)	Weekly	Composite	Weekly Values
pH (S.U.)	3/Week	Grab	Daily values
Hauled Waste received (septage, chemical toilet, landfill leachate, etc., as described in Schedule A)	Upon receipt	Record the waste type, source and quantity	Monthly total by type

3. Lagoon Site Monitoring

The permittee must assess the following parameters of the lagoon and waste accumulation as described in Table B2 below:

Table B2: Lagoon Monitoring and Reporting

Item or Parameter	Minimum Frequency	Type of Sample	Report
Perimeter Inspection (See Note 1)	5 days/week	Observation/Log Entry	Report inspection completed
Depth of Wastewater per Lagoon	Weekly	Staff gauge measurement	Record Measurement
Lagoon Solids Accumulation (See Note 2)	Once/permit cycle	Measurement	Record Measurement
Notes: 1. A perimeter inspection is a visual surveillance of the lagoon dikes looking for the presence of muskrats, ground hogs, or other rodents whose burrowing activities could threaten the structural integrity of a dike. 2. See Schedule D compliance requirement for required assessment of lagoon solids.			

4. Recycled Water Monitoring and Reporting Requirements

The permittee must monitor and report results as listed in Table B3 below when irrigating with recycled domestic wastewater. The samples must be representative of the recycled water delivered for beneficial use at all locations identified in the Recycled Water Use Plan. Specific monitoring requirements are listed in the tables below:

Table B3: Recycled Water Monitoring

Item or Parameter	Minimum Frequency	Sample Type/Required Action	Report
Total Flow of Recycled Water (MGD)	Daily	Measurement	Daily Total Monthly Total
Irrigation Volume (in/ac)	Daily	Calculation	Daily Total Monthly Total
Flow Meter Calibration	Annually	Verification	Written report that verification was completed.
Chlorine, Total Residual (mg/L)	Daily	Grab	Daily Value
pH	3/Week	Grab	Daily Value
Total Dissolved Solids, TDS (mg/L)	Monthly	Grab	Monthly Value
E. coli Bacteria	Weekly	Grab	Weekly Value
Total Kjeldahl Nitrogen, TKN (mg/L)	Monthly	Grab	Monthly Value
Total Ammoniacal Nitrogen (mg/L)	Monthly	Grab	Monthly Value
Nitrate + Nitrite – Nitrogen, NO ₃ + NO ₂ -Nitrogen (mg/L)	Monthly	Grab	Monthly Value

5. Land Application Site Monitoring and Reporting Requirements

In addition to monitoring for recycled water, the following additional parameters must be monitored and reported to account for each source of hydraulic and nutrient loading at the land application site(s) approved in the RWUP when irrigating with each source. Samples must be collected at the sample port located at the irrigation pivot.

Table B4: Land Application Site Monitoring

Item or Parameter	Minimum Frequency	Sample Type/Required Action	Report
Flow Measurements • Supplemental Water • Industrial Wastewater	Daily	Measurement	Daily Total Monthly Total
Irrigation Volume (in/ac) • Supplemental Water • Industrial Wastewater	Daily	Calculation	Daily Total Monthly Total
Inspection of backflow prevention devices	Annually	Verification	Completed or not completed (Pass, Fail)
Industrial Wastewater Parameters • pH • Total Dissolved Solids (TDS) • Total Kjeldahl Nitrogen (TKN) • Total Ammoniacal Nitrogen (TAN) • Nitrate + Nitrite – Nitrogen (NO₃ + NO₂-N)	Monthly	Grab	Monthly Values
Supplemental Water Parameters • pH • Total Dissolved Solids (TDS) • Total Kjeldahl Nitrogen (TKN) • Total Ammoniacal Nitrogen (TAN) • Nitrate + Nitrite – Nitrogen (NO₃ + NO₂-N)	Annually	Grab	Annual Values
Commercial Fertilizer Nitrogen, lbs/ac	As applied	Report	Record Amounts
Hydraulic, Nitrogen, and TDS Loadings (See Note 1)	Monthly	Calculation	Monthly Totals
Notes:			
1. The permittee must monitor, record, and totalize loading at each application site as follows: a. Hydraulic loading from each source of water, totalized monthly and reported in inches/acre			

Item or Parameter	Minimum Frequency	Sample Type/Required Action	Report
b. Nitrogen loading from each source of water, fertilizer, and soil testing using the nutrient loading calculation process described in Schedule A, Condition 2. Totalize monthly as lbs/acre showing loading, calculations, and analytical data from each source during the monitoring and reporting period. Nitrogen loading from any additional sources not described above must be included in the calculations of total loading in lbs/acre.			
c. For each reporting period, the permittee must report the crop-specific evapotranspiration (ET) rate reported at Hermiston Agrimet (HERO station) for the crop in use.			
d. Total Dissolved Solids (TDS) loading must be totalized monthly as lbs/acre/month.			

6. Soil Monitoring

At each approved recycled water land application site, the Permittee must collect representative soil samples from each of the top 5-feet of the soil column and analyze each, by accepted laboratory methods, for the parameters in Table B5. A representative sample requires that at least three locations in the field are collected and composited according to depth.

Table B5: Application Site Soil Monitoring

Item or Parameter, Units	Minimum Frequency	Sample Type/Action
Soil Moisture (field measurement)	Weekly March 1 – October 31	Approved soil moisture monitoring device installed through the root zone
Soil Water Holding Capacity(See Note 1)	Annually	Report Value for each foot (inches water/ft for top 5 feet of soil)
Soil Monitoring Parameters - Nitrate – Nitrogen (NO₃ – N) - Ammonium-Nitrogen (NH₄-N) - pH (see Note 2)	After harvest of each crop and prior to planting next crop (See Note 3)	In Accordance with RWUP
Notes: - The soil water holding capacity must be determined by a scientific method standard to the agricultural industry and approved by DEQ. Once approved by DEQ, the water holding capacity for each of the top five feet of the soil column for each land application site may not be changed or modified without DEQ approval. - pH is to be monitored in the top six (6) inches of soil. - If the next crop is planted less than 7 days after harvest of the previous crop, a second soil sample is not required.		

7. Crop Monitoring

The Permittee must monitor and record crop information, for each crop and authorized application site, as follows:

Table B6: Application Site Crop Monitoring

Item or Parameter	Minimum Frequency	Sample Type/Action
Crops grown	When planted and harvested	Record dates
Nitrogen removal (plant tissue)	Each crop at harvest	Record amounts
Crop Yield (lb/ac or tons/ac)	Each crop at harvest	Record amounts

8. Groundwater Monitoring

The Permittee must monitor groundwater in accordance with an approved Groundwater Monitoring Plan and any amendments to the plan approved by the Department in writing. Minimum groundwater monitoring must include the following parameters at monitoring well locations specified in the plan:

Table B7: Site Groundwater Monitoring

Item or Parameter	Minimum Frequency	Type of Sample
pH (field measurement)	Quarterly	Grab
Nitrate-Nitrogen, NO ₃ -N (mg/L)	Quarterly	Grab
Chloride (mg/L)	Quarterly	Grab
Sulfate (mg/L)	Quarterly	Grab
TDS (mg/L)	Quarterly	Grab

9. Biosolids Monitoring Requirements

The permittee must monitor biosolids that are land applied or produced for sale or distribution as listed in table B8 below. The samples must be representative of the quality and quantity of biosolids generated and undergo the same treatment process used to prepare the biosolids.

Table B8: Biosolids Monitoring

Item or Parameter	Minimum Frequency	Sample Type/Required Action
Nutrient and conventional parameters (% dry weight unless otherwise specified): 1) Total Kjeldahl Nitrogen (TKN) 2) Nitrate-Nitrogen (NO ₃ -N) 3) Ammonium Nitrogen (NH ₄ -N) 4) Total Phosphorus (P) 5) Potassium (K) 6) pH (S.U.) 7) Total Solids 8) Volatile Solids	As described in the DEQ-approved Biosolids Management Plan	As described in the DEQ-approved Biosolids Management Plan
Pollutants: As, Cd, Cu, Hg, Mo, Pb, Ni, Se, Zn, mg/kg dry weight	As described in the DEQ-approved Biosolids Management Plan	As described in the DEQ-approved Biosolids Management Plan

Item or Parameter	Minimum Frequency	Sample Type/Required Action
Pathogen reduction	As described in the DEQ-approved Biosolids Management Plan	As described in the DEQ-approved Biosolids Management Plan
Vector attraction reduction	As described in the DEQ-approved Biosolids Management Plan	As described in the DEQ-approved Biosolids Management Plan
Record of biosolids land application: date, quantity, location.	Each event	Record the date, quantity, and location of biosolids land applied on site location map or equivalent electronic system, such as GIS.

10. Minimum Reporting Requirements

The permittee must report monitoring results as listed in Table B9 below.

Table B9: Reporting Requirements and Due Dates

Reporting Requirement	Frequency	Due Date	Report Form (unless otherwise specified in writing)	Submit To:
1. Table B1: Influent Monitoring 2. Table B2: Lagoon Monitoring 3. Table B3: Recycled Water Monitoring 4. Table B4: Application Site Monitoring	Monthly	15 th day of the month following data collection	1-hardcopy of DEQ-approved discharge monitoring report (DMR) form.	DEQ Regional Office
5. Table B7: Groundwater Monitoring	Quarterly	15 th day of the month following data collection	1-hardcopy of DEQ-approved forms	DEQ Regional Office

Reporting Requirement	Frequency	Due Date	Report Form (unless otherwise specified in writing)	Submit To:
6. Table B5: Soil Moisture Monitoring 7. Table B6: Application site crop monitoring 8. Recycled water annual report	Annually	February 1	2 hard copies, Recycled Water Annual Report DEQ Form, Table B5 and Table B6 information as appendix	One each to: • DEQ Regional Office • DEQ Water Reuse Program Coordinator
9. Biosolids land application annual report 10. Table B8: Biosolids Monitoring	Annually	February 19	2 hard copies of DEQ approved form.	One each to: • DEQ Regional Office • DEQ Biosolids Program Coordinator
Inflow and infiltration Annual Report	Annually	February 1	1 hard copy, DEQ approved form	DEQ Regional Office
Notes: - Name, certificate classification, and grade level of each responsible principal operator as well as identification of each system classification must be included on DMRs. - Equipment breakdowns, overflows, and bypass events must be noted on DMRs. - Annual reports must include a narrative summary to describe if the permittee has complied with all the terms and conditions of the permit in relation each condition specified in the report. - The Recycled Water Annual report must include a summary of all land application activities at the approved land application site and include inputs from industrial process water, supplemental water, and fertilizer for which required monitoring is performed. The report must be written to provide DEQ the information needed to understand and demonstrate compliance with the approved recycled water use plan, crop utilization of wastewater, and the requirements of this permit.				

SCHEDULE C

Compliance Schedule

1. By no later than thirty (30) days after the effective date of this permit, the permittee shall submit a workplan to the Department to leak test the three wastewater lagoons and to verify the accuracy of inflow and effluent flow measuring devices. The submitted workplan must include a schedule for testing and schedule for submittal of results to the Department. The plan shall be implemented upon approval by DEQ and according to the schedule approved in the plan.

Guidelines for estimating lagoon leakage are available from the Department. Use of the guidelines is recommended to expedite Department review and approval of the workplan.

2. The permittee is expected to meet the compliance dates that have been established in this schedule. Either prior to or no later than 14 days following any lapsed compliance date, the permittee shall submit to the Department a notice of compliance or noncompliance with the established schedule. The Director or his authorized representative may revise a schedule of compliance if he determines good and valid cause resulting from events over which the permittee has little or no control.

SCHEDULE D

Special Conditions

1. Groundwater Monitoring Plan

Within 180 days of the effective date of this permit, the permittee must submit a Groundwater Monitoring Plan to DEQ that is specific to the City's land application site and wastewater lagoons. The permittee must implement any required revisions to the groundwater monitoring plan upon DEQ approval. An updated plan must be submitted if new land application sites are proposed during the permit term.

2. Recycled Water Use Plan

In order to distribute recycled water for reuse, the permittee must develop, maintain, and implement a DEQ-approved Recycled Water Use Plan meeting the requirements in OAR 340-055-0025. The permittee must submit substantial modifications to an existing plan to DEQ for approval at least 60 days prior to making the proposed changes. Prior to the use of any new land application sites, the plan must be revised and submitted to DEQ. Conditions in the Plan are enforceable requirements under this permit.

3. Lagoon Solids

The permittee must conduct an evaluation of wastewater solids in the primary lagoon treatment cell. Written documentation of this evaluation must be provided to DEQ within 180 days of the effective date of this permit. If solids build-up indicates a need for removal and land application of biosolids is pursued, the permittee must submit a written biosolids management plan as described in Schedule D.5.

4. Hauled Waste Management

The City must submit a hauled waste plan for DEQ review and approval prior to acceptance of any hauled waste during this permit term.

5. Inflow and Infiltration

An annual inflow and infiltration report must be submitted to DEQ as directed in Schedule B. The report must include the following:

- a. Details of activities performed in the previous year to identify and reduce inflow and infiltration.
- b. Details of activities planned for the following year to identify and reduce inflow and infiltration.
- c. A summary of sanitary sewer overflows that occurred during the previous year.

6. Construction and Facility Modification

Prior to constructing or modifying the city's wastewater management, treatment and disposal facilities, or groundwater monitoring facilities, detailed plans and specifications must be submitted to, and be approved in writing by, the department.

7. Emergency Response and Public Notification Plan

The permittee must develop, and maintain and implement an Emergency Response and Public Notification Plan (the Plan) per Schedule F, Section B, and Conditions 5 & 6. The permit holder must develop the plan within six months of permit issuance and update the Plan annually to ensure that telephone and email contact information for applicable public agencies are current and accurate. An updated copy of the plan must be kept on file at the wastewater treatment facility for Department review. The latest plan revision date must be listed on the Plan cover along with the reviewer's initials or signature.

The permittee must notify the Department's Eastern Region Office at (541) 276-4063 in accordance with the response times contained in the General Conditions of this permit in the event of any malfunction of the wastewater system to enable coordination of corrective action between the Permittee and DEQ.

8. Irrigation Site Maintenance

Sprinkler devices, above and underground wastewater lines, auto-samplers, and flow measuring devices must be maintained to ensure system integrity.

9. Exempt Wastewater Reuse at the Treatment System

The permittee is exempt from the recycled water use requirements in OAR 340 Division-055 when recycled water is used at the wastewater treatment system for landscape irrigation or for in-plant processes at a wastewater treatment system and all of the following conditions are met:

- 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 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.
- d. Public access to the site is restricted.

10. Monitoring Well Management/Maintenance

- a. The Permittee must protect and maintain each groundwater monitoring well so that samples can be collected that are representative of actual conditions.
- b. All monitoring well abandonment, replacement and installation must be conducted to comply with the Water Resources Department Rules (OAR Chapter 690, Division 240) and with the Department's Guidelines for Groundwater Monitoring Well Drilling, Construction, and Decommissioning. All monitoring well repairs, abandonments, replacements and installations must be documented in a report prepared by an Oregon-registered geologist.
- c. If a monitoring well becomes damaged or inoperable, the Permittee must notify the Department in writing within 14 days. The written report must describe what problem has occurred, the remedial measures that have been taken to correct the problem, and the measures taken to prevent its recurrence. The Department can require the replacement of inoperable monitoring wells.
- d. All new and replacement monitoring well locations and designs must be approved in writing by the Department prior to well installation. Well logs and well completion reports must be submitted to the Department within thirty (30) days of well installation. Reports must include land survey drawings that depict actual location of all monitoring wells, land application areas, and surface waters.
- e. Modification and/or abandonment plans must be submitted to and approved in writing by the Department prior to modification and/or abandonment of any existing monitoring well.

11. Biosolids Management Plan

No later than six months prior to the removal of accumulated biosolids from the lagoons for land application, the permittee must submit an updated Biosolids Management Plan for DEQ review and approval. The permittee must maintain and implement an approved Biosolids Management Plan meeting the requirements in OAR 340-050-0031(5). The permittee must keep the plan updated and submit substantial modifications to an existing plan to DEQ for approval at least 60 days prior to making the proposed changes. Conditions in the plan are enforceable requirements under this permit.

12. Biosolids Land Application

The permittee must obtain written authorization from DEQ for each land application site prior to its use. Conditions in site authorizations are enforceable requirements under this permit. The permittee may land

apply biosolids to a DEQ-approved site only as described in the site authorization, while this permit is effective and with the written approval of the property owner. DEQ may modify or revoke a site authorization following the procedures for a permit modification described in OAR 340-045-0055.

13. Groundwater Monitoring Plan

The Groundwater Monitoring Plan must be reviewed at least annually and be revised as necessary to ensure compliance with the conditions of this permit. The Permittee must submit Groundwater Monitoring Plan revisions to the Department for review and approval. The Permittee must implement revisions to the Groundwater Monitoring Plan upon Department approval.

14. Operator Certification

- a. Definitions
 - i. "Supervise" means to have full and active responsibility for the daily on-site technical operation of a wastewater treatment system or wastewater collection system.
 - ii. "Supervisor" or "designated operator, means the operator delegated authority by the permittee for establishing and executing the specific practice and procedures for operating the wastewater treatment system or wastewater collection system in accordance with the policies of the owner of the system and any permit requirements.
 - iii. "Shift Supervisor" means the operator delegated authority by the permittee for executing the specific practice and procedures for operating the wastewater treatment system or wastewater collection system when the system is operated on more than one daily shift.
 - iv. "System" includes both the collection system and the treatment systems.
- b. The permittee must comply with OAR Chapter 340, Division 49, "Regulations Pertaining to Certification of Wastewater System Operator Personnel" and designate a supervisor whose certification corresponds with the classification of the collection and/or treatment system as specified on p. 1 of this permit.
- c. The permittee must have its system supervised full-time by one or more operators who hold a valid certificate for the type of wastewater treatment or wastewater collection system, and at a grade equal to or greater than the wastewater system's classification as specified on p. 1 one of this permit.
- d. The permittee's wastewater system may not be without the designated supervisor for more than 30 days. During this period, there must be another person available to supervise who is certified at no more than one grade lower than the classification of the wastewater system. The permittee must delegate authority to this operator to supervise the operation of the system.
- e. If the wastewater system has more than one daily shift, the permittee must have another properly certified operator available to supervise operation of the system. Each shift supervisor, if any, must be certified at no more than one grade lower than the system classification.
- f. The permittee is not required to have a supervisor on site at all times; however, the supervisor must be available to the permittee and operator at all times.
- g. The permittee must notify DEQ in writing of the name of the system supervisor. The permittee may replace or re-designate the system supervisor with another properly certified operator at any time and must notify DEQ in writing within 30 days of replacement or re-designation of operator in charge. As of this writing, the notice of replacement or re-designation must be sent to Water Quality Division, Operator Certification Program, 2020 SW 4th Avenue, Suite 400, Portland, OR 97201. This address may be updated in writing by DEQ during the term of this permit.

Upon written request, 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 a justification for the time needed, schedule for recruiting and hiring, date the system supervisor availability ceased, and name of the alternate system supervisor as required by above.

SCHEDULE F

WPCF GENERAL CONDITIONS – DOMESTIC FACILITIES

SECTION A. STANDARD CONDITIONS

1. 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 grounds for an enforcement action. Failure to comply is also grounds for the Department to modify, revoke, or deny renewal of a permit.

2. Property Rights and Other Legal Requirements

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 rights, or any infringement of federal, tribal, state, or local laws or regulations.

3. Liability

The Department of Environmental Quality or its officers, agents, or employees may not sustain any liability on account of the issuance of this permit or on account of the construction or maintenance of facilities or systems because of this permit.

4. Permit Actions

After notice by the Department, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including but not limited to the following:

- a. Violation of any term or condition of this permit, any applicable rule or statute, or any order of the Commission;
- b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts.

5. Transfer of Permit

This permit may not be transferred to a third party without prior written approval from the Department. The Department may approve transfers where the transferee acquires a property interest in the permitted activity and agrees in writing to fully comply with all the terms and conditions of this permit and the rules of the Commission. A transfer application and filing fee must be submitted to the Department.

6. Permit Fees

The permittee must pay the fees required by Oregon Administrative Rules.

SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

At all times the permittee must maintain in good working order and properly operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to comply with the terms and conditions of this permit.

2. Standard Operation and Maintenance

All waste collection, control, treatment, and disposal facilities or systems must be operated in a manner consistent with the following:

- a. At all times, all facilities or systems must be operated as efficiently as possible in a manner that will prevent discharges, health hazards, and nuisance conditions.
- b. All screenings, grit, and sludge must be disposed of in a manner approved by the Department to prevent any pollutant from the materials from reaching waters of the state, creating a public health hazard, or causing a nuisance condition.
- c. Bypassing untreated waste is generally prohibited. Bypassing may not occur without prior written permission from the Department except where unavoidable to prevent loss of life, personal injury, or severe property damage.

3. Noncompliance and Notification Procedures

If the permittee is unable to comply with conditions of this permit because of surfacing sewage; a breakdown of equipment, facilities or systems; an accident caused by human error or negligence; or any other cause such as an act of nature, the permittee must:

- a. Immediately take action to stop, contain, and clean up the unauthorized discharges and correct the problem.
- b. Immediately notify the Department's Regional office so that an investigation can be made to evaluate the impact and the corrective actions taken, and to determine any additional action that must be taken.
- c. Within 5 days of the time the permittee becomes aware of the circumstances, the permittee must submit to the Department a detailed written report describing the breakdown, the actual quantity and quality of waste discharged, corrective action taken, steps taken to prevent a recurrence, and any other pertinent information.

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

4. Wastewater System Personnel

The permittee must provide an adequate operating staff that is duly qualified to carry out the operation, maintenance, and monitoring requirements to assure continuous compliance with the conditions of this permit.

5. 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 (e.g., public water systems) about the extent and nature of the discharge in accordance with the notification procedures developed under General Condition B.6. 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.

6. 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.

SECTION C. MONITORING AND RECORDS

1. Inspection and Entry

The permittee must at all reasonable times allow authorized representatives of the Department to:

- a. Enter upon the permittee's premises where a waste source or disposal system is located or where any records are required to be kept under the terms and conditions of this permit;
- b. Have access to and copy any records required by this permit;
- c. Inspect any treatment or disposal system, practices, operations, monitoring equipment, or monitoring method regulated or required by this permit; or
- d. Sample or monitor any substances or permit parameters at any location at reasonable times for the purpose of assuring permit compliance or as otherwise authorized by state law...

2. Averaging of Measurements

Calculations of averages of measurements required for all parameters except bacteria must use an arithmetic mean; bacteria must be averaged as specified in the permit.

3. Monitoring Procedures

Monitoring must be conducted according to test procedures specified in the most recent edition of **Standard Methods for the Examination of Water and Wastewater**, unless other test procedures have been approved in writing by the Department and specified in this permit.

4. Representative Sampling

Sampling and measurements taken as required herein must be representative of the volume and nature of the monitored discharge when discharging or land applying. Monitoring points must not be changed without notification to and the approval of DEQ.

5. Retention of Records

The permittee must retain records of all monitoring and maintenance information, including all calibrations, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. The Department may extend this period at any time.

SECTION D. REPORTING REQUIREMENTS

1. Plan Submittal

Pursuant to Oregon Revised Statute 468B.055, unless specifically exempted by rule, construction, installation, or modification of disposal systems, treatment works, or sewerage systems may not commence until plans and specifications are submitted to and approved in writing by the Department. All construction, installation, or modification shall be in strict conformance with the Department's written approval of the plans.

2. Change in Discharge

Whenever a facility expansion, production increase, or process modification is expected to result in a change in the character of pollutants to be discharged or in a new or increased discharge that will exceed the conditions of this permit, a new application must be submitted together with the necessary reports, plans, and specifications for the proposed changes. A change may not be made until plans have been approved and a new permit or permit modification has been issued.

3. Signatory Requirements

All applications, reports, or information submitted to the Department must be signed and certified by the official applicant of record (owner) or authorized designee.

4. 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 DEQ or to the 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 DEQ.
 - 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 (e.g., 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 Department's Regional office within 24 hours, or during normal business hours, whichever is first:
 - a) The OERS incident number (if applicable) along with a brief description of the event.

(2) Written reporting within 5 days.

- i. The following information must be provided in writing to the Department's 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.

The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

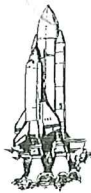
- b. Other instances of noncompliance.
 - (1) The following instances of noncompliance must be reported:
 - i. Any unanticipated bypass that exceeds any effluent limitation in this permit;
 - ii. Any upset that exceeds any effluent limitation in this permit;
 - iii. Violation of maximum daily discharge limitation for any of the pollutants listed by the Department in this permit; and
 - iv. Any noncompliance that may endanger human health or the environment.
 - (2) During normal business hours, the Department's Regional office must be called. Outside of normal business hours, the Department 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 B.6.
 - (4) The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

SECTION E. DEFINITIONS

- 1. *BOD₅* means five-day biochemical oxygen demand.
- 2. *TSS* means total suspended solids.
- 3. *FC* means fecal coliform bacteria.
- 4. *NH₃-N* means Ammonia Nitrogen.
- 5. *NO₃-N* means Nitrate Nitrogen.
- 6. *NO₂-N* means Nitrite Nitrogen.
- 7. *TKN* means Total Kjeldahl Nitrogen.
- 8. *Cl* means Chloride.
- 9. *TN* means Total Nitrogen.
- 10. "*Bacteria*" includes but is not limited to fecal coliform bacteria, total coliform bacteria, and *E. coli* bacteria.
- 11. *Total residual chlorine* means combined chlorine forms plus free residual chlorine.
- 12. *mg/l* means milligrams per liter.
- 13. *ug/l* means micrograms per liter.
- 14. *kg* means kilograms.
- 15. *GPD* means gallons per day.
- 16. *MGD* means million gallons per day.
- 17. *Grab sample* means an individual discrete sample collected over a period of time not to exceed 15 minutes.
- 18. *Composite sample* means a combination of samples collected, generally at equal flow or time intervals over a 24-hour period.
- 19. *Week* means a calendar week of Sunday through Saturday.
- 20. *Month* means a calendar month.
- 21. *Quarter* means January through March, April through June, July through September, or October through December.

APPENDIX B

Laboratory Test Results

**UMPQUA Research Company**

626 NE Division St. - P.O. Box 609
Myrtle Creek, Oregon 97457
(541) 863-5201 Fax: (541) 863-6199
E-mail: Lab@URCmail.net
Internet: http://ChemLab.cc
ORELAP ID# OR100031

ANALYSIS REPORT**URC # 9102315**

Boardman, City of	Project: No Project	Date Reported: 11/04/19
PO Box 229	Project #: No Project	Date Sampled: 10/22/19 07:30
Boardman, OR 97818		Date Received: 10/23/19 12:36
	Client Contact: Boardman, City of	Sampled By: Guy

Sample Location: LS #3

URC Sample #: 9102315-01

Matrix: Aqueous

Inorganics

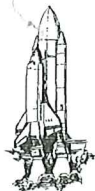
Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		630	mg/L	14.3		10/28/19	10/30/19	MWT	
SM 5210B									
5-day BOD		600	mg/L	2		10/23/19 16:18	10/28/19	TDL	

UMPQUA Research Company/MC

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Tom Williams, Laboratory Manager



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Myrtle Creek, Oregon 97457
(541) 863-5201 Fax: (541) 863-6199
E-mail: Lab@URCmail.net
Internet: http://ChemLab.cc
ORELAP ID# OR100031

ANALYSIS REPORT

URC # 9102315

Boardman, City of	Project: No Project	Date Reported: 11/04/19
PO Box 229	Project #: No Project	Date Sampled: 10/22/19 08:35
Boardman, OR 97818	Client Contact: Boardman, City of	Date Received: 10/23/19 12:36
		Sampled By: Guy

Sample Location: Rec Center/Main Line

URC Sample #: 9102315-02

Matrix: Aqueous

Inorganics

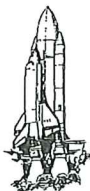
Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		174	mg/L	14.3		10/28/19	10/30/19	MWT	
SM 5210B									
5-day BOD		230	mg/L	2		10/23/19 16:18	10/28/19	TDL	

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Internet: http://ChemLab.cc
ORELAP ID# OR100031

ANALYSIS REPORT**URC # 9110717**

Boardman, City of	Project: General	Date Reported: 11/22/19
PO Box 229	Project #: No Project	Date Sampled: 11/06/19 07:45
Boardman, OR 97818	Client Contact: Boardman, City of	Date Received: 11/07/19 11:30
		Sampled By: Guy

Sample Location: LS #3

URC Sample #: 9110717-01

Matrix: Aqueous

Inorganics

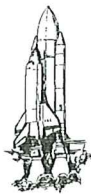
Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		638	mg/L	16.7		11/08/19	11/11/19	MWT	
SM 5210B									
5-day BOD		390	mg/L	2		11/07/19 14:43	11/12/19	TDL	

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Myrtle Creek, Oregon 97457
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Internet: <http://ChemLab.cc>
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ANALYSIS REPORT

URC # 9110612

Boardman, City of	Project: General	Date Reported: 11/19/19
PO Box 229	Project #: No Project	Date Sampled: 11/05/19 11:30
Boardman, OR 97818	Client Contact: Boardman, City of	Date Received: 11/06/19 12:00
		Sampled By: Guy

Sample Location: Rec Center Manhole

URC Sample #: 9110612-01

Matrix: Aqueous

Inorganics

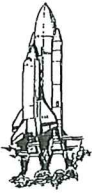
Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		166	mg/L	11.1		11/08/19	11/11/19	MWT	
SM 5210B									
5-day BOD		220	mg/L	2		11/06/19 14:19	11/11/19	TDL	

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Myrtle Creek, Oregon 97457
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E-mail: Lab@URCmail.net
Internet: <http://ChemLab.cc>
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ANALYSIS REPORT

URC # 9111313

Boardman, City of	Project: General	Date Reported: 12/03/19
PO Box 229	Project #: Rec Center/Manhole	Date Sampled: 11/12/19 10:00
Boardman, OR 97818	Client Contact: Kevin Kennedy	Date Received: 11/13/19 12:37
		Sampled By: Guy

Sample Location: Rec Center Manhole

URC Sample #: 9111313-01

Matrix: Aqueous

Inorganics

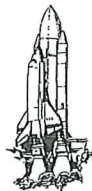
Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		298	mg/L	16.7		11/14/19	11/18/19	MWT	
SM 5210B									
5-day BOD		290	mg/L	2		11/13/19 16:27	11/18/19	CAO	

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ANALYSIS REPORT**URC # 9111312**

Boardman, City of	Project: General	Date Reported: 12/03/19
PO Box 229	Project #: LS#3	Date Sampled: 11/12/19 08:20
Boardman, OR 97818	Client Contact: Kevin Kennedy	Date Received: 11/13/19 12:37
		Sampled By: Guy

Sample Location: LS #3

URC Sample #: 9111312-01

Matrix: Aqueous

Inorganics

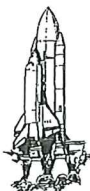
Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		14700	mg/L	40.0		11/14/19	11/18/19	MWT	QR-04
SM 5210B									
5-day BOD		1200	mg/L	2		11/13/19 16:27	11/18/19	CAO	

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Internet: http://ChemLab.cc
ORELAP ID# OR100031

ANALYSIS REPORT

URC # 9112711

Boardman, City of	Project: General	Date Reported: 12/10/19
PO Box 229		Date Sampled: 11/26/19 09:00
Boardman, OR 97818		Date Received: 11/27/19 11:45
	Client Contact: Kevin Kennedy	Sampled By: Guy

Sample Location: LS #3

URC Sample #: 9112711-01

Matrix: Aqueous

Inorganics

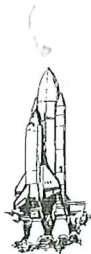
Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		3260	mg/L	25.0		11/27/19	12/10/19	MWT	
SM 5210B									
5-day BOD		800	mg/L	2		11/27/19 12:00	12/02/19	CAO	

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ANALYSIS REPORT

URC # 9112711

Boardman, City of	Project: General	Date Reported: 12/10/19
PO Box 229		Date Sampled: 11/26/19 08:00
Boardman, OR 97818		Date Received: 11/27/19 11:45
	Client Contact: Kevin Kennedy	Sampled By: Guy

Sample Location: Rec Center Manhole Olsen & Columbia

URC Sample #: 9112711-02

Matrix: Aqueous

Inorganics

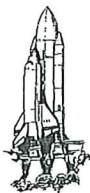
Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		286	mg/L	14.3		11/27/19	12/10/19	MWT	
SM 5210B									
5-day BOD		520	mg/L	2		11/27/19 12:00	12/02/19	CAO	

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ANALYSIS REPORT

URC # 9120411

Boardman, City of	Project: General	Date Reported: 12/19/19
PO Box 229	Project #: Boardman	Date Sampled: 12/03/19 08:25
Boardman, OR 97818	Client Contact: Kevin Kennedy	Date Received: 12/04/19 12:00
		Sampled By: Guy

Sample Location: Rec Center Manhole (Columbia Olson)

URC Sample #: 9120411-02

Matrix: Aqueous

Inorganics

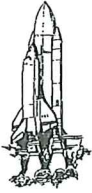
Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		182	mg/L	10.0		12/10/19	12/10/19	MWT	
SM 5210B									
5-day BOD		85	mg/L	2		12/04/19 13:34	12/09/19	CAO	

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Internet: <http://ChemLab.cc>
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ANALYSIS REPORT**URC # 9120411**

Boardman, City of
PO Box 229
Boardman, OR 97818

Project: General
Project #: Boardman
Client Contact: Kevin Kennedy

Date Reported: 12/19/19
Date Sampled: 12/03/19 08:10
Date Received: 12/04/19 12:00
Sampled By: Guy

Sample Location: LS #3

URC Sample #: 9120411-01

Matrix: Aqueous

Inorganics

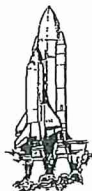
Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		17800	mg/L	50.0		12/10/19	12/10/19	MWT	
SM 5210B									
5-day BOD		1500	mg/L	2		12/04/19 13:34	12/09/19	CAO	

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Myrtle Creek, Oregon 97457
(541) 863-5201 Fax: (541) 863-6199
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Internet: http://ChemLab.cc
ORELAP ID# OR100031

ANALYSIS REPORT**URC # 9121123**

Boardman, City of	Project: General	Date Reported: 12/30/19
PO Box 229	Project #: Boardman	Date Sampled: 12/10/19 07:20
Boardman, OR 97818	Client Contact: Kevin Kennedy	Date Received: 12/11/19 12:52
		Sampled By: Guy

Sample Location: LS #3

URC Sample #: 9121123-02

Matrix: Aqueous

Inorganics

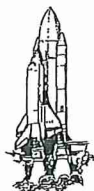
Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		2990	mg/L	45.5		12/13/19	12/16/19	MWT	
SM 5210B									
5-day BOD		1200	mg/L	2		12/11/19 13:00	12/16/19	CAO	

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Myrtle Creek, Oregon 97457
(541) 863-5201 Fax: (541) 863-6199
E-mail: Lab@URCmail.net
Internet: <http://ChemLab.cc>
ORELAP ID# OR100031

ANALYSIS REPORT**URC # 9121123**

Boardman, City of	Project: General	Date Reported: 12/30/19
PO Box 229	Project #: Boardman	Date Sampled: 12/10/19 07:45
Boardman, OR 97818	Client Contact: Kevin Kennedy	Date Received: 12/11/19 12:52
		Sampled By: Guy

Sample Location: Rec Center Manhole A & Olson

URC Sample #: 9121123-01

Matrix: Aqueous

Inorganics

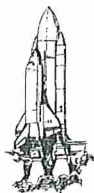
Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		124	mg/L	10.0		12/13/19	12/16/19	MWT	
SM 5210B									
5-day BOD		<45	mg/L	2		12/11/19 13:00	12/16/19	CAO	BOD-1

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UMPQUA Research Company - Table Rock

419 SW 5th Street
Pendleton, Oregon 97801
541) 276-0385 Fax: (541) 276-2024
E-mail: TRLab@urcmail.net
Website: www.umpquaresearch.com
ORELAP ID# OR100061

ANALYSIS REPORT

URC # T9L1807

Boardman, City of	Project: Wastewater	Date Reported: 01/13/20
PO Box 229	Project #: General Testing	Date Sampled: 12/17/19 07:40
Boardman, OR 97818	Client Contact: Kevin Kennedy	Date Received: 12/17/19 10:30
		Sampled By: Guy

Sample Location: Rec Center, Olsen Manhole

URC Sample #: T9L1807-01

Matrix: Aqueous

Inorganics

Analyte	Method	Code	Result	Units	MRL	MCL	Prepared	Analyzed	Analyst	Qualifier
5-day BOD	SM 5210B		Invalid	mg/L	2		12/18/19 18:37	12/23/19	BLR	A-01
* TSS	SM 2540D		114	mg/L	10.0		12/20/19	12/23/19	MWT	

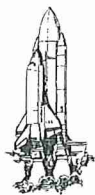
UMPQUA Research Company/TR

Beth L. Read

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Beth Read



UMPQUA Research Company - Table Rock

419 SW 5th Street
Pendleton, Oregon 97801
541) 276-0385 Fax: (541) 276-2024
E-mail TRLab@urcmail.net
Website: www.umpquaresearch.com
ORELAP ID# OR100061

ANALYSIS REPORT

URC # T9L1807

Boardman, City of	Project: Wastewater	Date Reported: 01/13/20
PO Box 229	Project #: General Testing	Date Sampled: 12/17/19 07:20
Boardman, OR 97818	Client Contact: Kevin Kennedy	Date Received: 12/17/19 10:30
	41-00130	Sampled By: Guy

Sample Location: LS #3

URC Sample #: T9L1807-02

Matrix: Aqueous

Inorganics

Analyte	Method	Code	Result	Units	MRL	MCL	Prepared	Analyzed	Analyst	Qualifier
5-day BOD	SM 5210B		1100	mg/L	2		12/18/19 18:37	12/23/19	BLR	
* TSS	SM 2540D		2030	mg/L	33.3		12/20/19	12/23/19	MWT	

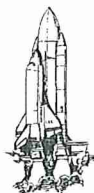
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E-mail TRLab@uremail.net
Website: www.umpquaresearch.com
ORELAP ID# OR100061

ANALYSIS REPORT

URC # T9L2403

Boardman, City of	Project: Wastewater	Date Reported: 01/13/20
PO Box 229	Project #: General Testing	Date Sampled: 12/24/19 08:21
Boardman, OR 97818	Client Contact: Kevin Kennedy	Date Received: 12/24/19 09:53
	41-00130	Sampled By: Luis C.

Sample Location: Rec Center Manhole

URC Sample #: T9L2403-02

Matrix: Aqueous

Inorganics

Analyte	Method	Code	Result	Units	MRL	MCL	Prepared	Analyzed	Analyst	Qualifier
5-day BOD	SM 5210B		Invalid	mg/L	2		12/24/19 13:00	12/29/19	BLR	A-01
* TSS	SM 2540D		90.0	mg/L	10.0		12/28/19	12/30/19	MWT	

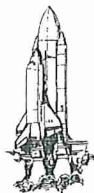
UMPQUA Research Company/TR

Beth L. Read

Beth Read

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Pendleton, Oregon 97801
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E-mail TRLab@uremail.net
Website: www.umpquaresearch.com
ORELAP ID# OR100061

ANALYSIS REPORT

URC # T9L2403

Boardman, City of	Project: Wastewater	Date Reported: 01/13/20
PO Box 229	Project #: General Testing	Date Sampled: 12/24/19 08:05
Boardman, OR 97818	Client Contact: Kevin Kennedy	Date Received: 12/24/19 09:53
	41-00130	Sampled By: Luis C.

Sample Location: LS #3

URC Sample #: T9L2403-01

Matrix: Aqueous

Inorganics

Analyte	Method	Code	Result	Units	MRL	MCL	Prepared	Analyzed	Analyst	Qualifier
5-day BOD	SM 5210B		1200	mg/L	2		12/24/19 13:00	12/29/19	BLR	
* TSS	SM 2540D		1350	mg/L	33.3		12/28/19	12/30/19	MWT	

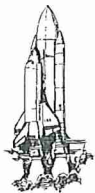
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Beth L. Read

Beth Read

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419 SW 5th Street
Pendleton, Oregon 97801
(541) 863-5201 Fax: (541) 863-6199
E-mail: TRLab@URCmail.net
Internet: www.umpquaresearch.com
ORELAP ID# OR100061

ANALYSIS REPORT**URC # T0A0708**

Boardman, City of	Project: Wastewater	Date Reported: 01/16/20
PO Box 229	Project #: General Testing	Date Sampled: 01/07/20 08:20
Boardman, OR 97818	Client Contact: Kevin Kennedy	Date Received: 01/07/20 10:20
		Sampled By: Guy

Sample Location: Rec. Center

URC Sample #: T0A0708-02

Matrix: Aqueous

Inorganics

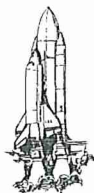
Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		180	mg/L	20.0		01/08/20	01/10/20	BLR	
SM 5210B									
5-day BOD		180	mg/L	2		01/08/20 15:30	01/13/20	BLR	

UMPQUA Research Company/TR

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Lara Henry-Ostler For Beth Read



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Pendleton, Oregon 97801
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E-mail: TRLab@URCmail.net
Internet: www.umpquaresearch.com
ORELAP ID# OR100061

ANALYSIS REPORT

URC # T0A0708

Boardman, City of	Project: Wastewater	Date Reported: 01/16/20
PO Box 229	Project #: General Testing	Date Sampled: 01/07/20 08:10
Boardman, OR 97818	Client Contact: Kevin Kennedy	Date Received: 01/07/20 10:20
		Sampled By: Guy

Sample Location: LS #3

URC Sample #: T0A0708-01

Matrix: Aqueous

Inorganics

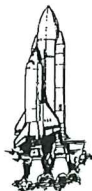
Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		924	mg/L	40.0		01/08/20	01/10/20	BLR	
SM 5210B									
5-day BOD		260	mg/L	2		01/08/20 15:30	01/13/20	BLR	

UMPQUA Research Company/TR

Lara Henry-Ostler For Beth Read

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E-mail: TRLab@URCmail.net
Internet: www.umpquaresearch.com
ORELAP ID# OR100061

ANALYSIS REPORT

URC # T0A2102

Boardman, City of	Project: Wastewater	Date Reported: 01/29/20
PO Box 229	Project #: General Testing	Date Sampled: 01/21/20 07:05
Boardman, OR 97818	Client Contact: Kevin Kennedy	Date Received: 01/21/20 12:08
	41-00130	Sampled By: Guy

Sample Location: LS #3

URC Sample #: T0A2102-01

Matrix: Aqueous

Inorganics

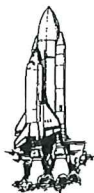
Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		1000	mg/L	28.6		01/22/20	01/22/20	BLR	
SM 5210B									
5-day BOD		580	mg/L	2		01/22/20 13:55	01/27/20	BLR	

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Pendleton, Oregon 97801
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Internet: www.umpquaresearch.com
ORELAP ID# OR100061

ANALYSIS REPORT

URC # T0A2102

Boardman, City of	Project: Wastewater	Date Reported: 01/29/20
PO Box 229	Project #: General Testing	Date Sampled: 01/21/20 10:30
Boardman, OR 97818	Client Contact: Kevin Kennedy	Date Received: 01/21/20 12:08
	41-00130	Sampled By: Guy

Sample Location: Rec Center and Olson

URC Sample #: T0A2102-02

Matrix: Aqueous

Inorganics

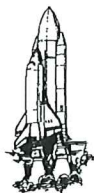
Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		164	mg/L	20.0		01/22/20	01/22/20	BLR	
SM 5210B									
5-day BOD		240	mg/L	2		01/22/20 13:55	01/27/20	BLR	

UMPQUA Research Company/TR

Lara Henry-Ostler For Beth Read

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Pendleton, Oregon 97801
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E-mail: TRLab@URCmail.net
Internet: www.umpquaresearch.com
ORELAP ID# OR100061

ANALYSIS REPORT

URC # T0B0406

Boardman, City of	Project: Wastewater	Date Reported: 02/12/20
PO Box 229	Project #: General Testing	Date Sampled: 02/04/20 07:35
Boardman, OR 97818	Client Contact: Kevin Kennedy	Date Received: 02/04/20 10:15
		Sampled By: Guy

Sample Location: LS #3

URC Sample #: T0B0406-01

Matrix: Aqueous

Inorganics

Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		500	mg/L	40.0		02/05/20	02/06/20	BLR	
SM 5210B									
5-day BOD		650	mg/L	2		02/05/20 15:00	02/10/20	JJH	

UMPQUA Research Company/TR

Beth L. Read

Beth Read

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BOARDMAN WASTEWATER SAMPLE ANALYSIS 2020

Pendleton Wastewater Lab
4300 SW Houtama Rd. Pendleton OR 97801

DATE RECEIVED: 2/4/2020

RESULTS

Sample ID	S.S. mg/l	B.O.D. mg/l
Influent	2200	333
Effluent	-	-
%Removal	-	-
Method	Note #1	Note #2

Meets 48 hour BOD holding time
Meets 6 hour coliform holding time
Evidence of cooling (same day)
Meets laboratory QA

Yes	No
x	
x	
x	

Method Detection Limits:

TSS: at least 5 milligrams/volume retained on filter
BOD: 2 milligrams/liter

Methods:

"Standard Methods for the Examination of Water and Wastewater" 22nd edition 2012

Note 1: Ibid., #2540 D Total suspended solids dried at 103-105 C

Note 2: Ibid., # 5210 5 Day BOD test: all effluent samples are seeded and dechlorinated



UMPQUA Research Company - Table Rock

419 SW 5th Street
Pendleton, Oregon 97801
(541) 863-5201 Fax: (541) 863-6199
E-mail: TRLab@URCmail.net
Internet: www.umpquaresearch.com
ORELAP ID# OR100061

ANALYSIS REPORT

URC # T0B0406

Boardman, City of	Project: Wastewater	Date Reported: 02/12/20
PO Box 229	Project #: General Testing	Date Sampled: 02/04/20 07:35
Boardman, OR 97818	Client Contact: Kevin Kennedy	Date Received: 02/04/20 10:15
		Sampled By: Guy

Sample Location: Rec Center Manhole

URC Sample #: T0B0406-02

Matrix: Aqueous

Inorganics

Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		78.0	mg/L	20.0		02/05/20	02/06/20	BLR	
SM 5210B									
5-day BOD		140	mg/L	2		02/05/20 15:00	02/10/20	JJH	

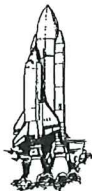
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Beth L. Read

Beth Read



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419 SW 5th Street
Pendleton, Oregon 97801
(541) 863-5201 Fax: (541) 863-6199
E-mail: TRLab@URCmail.net
Internet: www.umpquaresearch.com
ORELAP ID# OR100061

ANALYSIS REPORT

URC # T0B1110

Boardman, City of	Project: Drinking Water	Date Reported: 02/24/20
PO Box 229	Project #: General Testing	Date Sampled: 02/11/20 08:35
Boardman, OR 97818	Client Contact: Kevin Kennedy	Date Received: 02/11/20 10:56
	41-00130	Sampled By: Guy

Sample Location: Rec Center/Olson

URC Sample #: T0B1110-02

Matrix: Aqueous

Inorganics

Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		93.0	mg/L	10.0		02/14/20	02/14/20	BLR	
SM 5210B									
5-day BOD		130	mg/L	2		02/12/20 15:48	02/17/20	BLR	

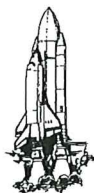
UMPQUA Research Company/TR

Beth L. Read

Beth Read

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Pendleton, Oregon 97801
(541) 863-5201 Fax: (541) 863-6199
E-mail: TRLab@URCmail.net
Internet: www.umpquaresearch.com
ORELAP ID# OR100061

ANALYSIS REPORT**URC # T0B1110**

Boardman, City of	Project: Drinking Water	Date Reported: 02/24/20
PO Box 229	Project #: General Testing	Date Sampled: 02/11/20 08:15
Boardman, OR 97818	Client Contact: Kevin Kennedy	Date Received: 02/11/20 10:56
	41-00130	Sampled By: Guy

Sample Location: LS #3

URC Sample #: T0B1110-01

Matrix: Aqueous

Inorganics

Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
SM 2540D									
TSS		1770	mg/L	55.6		02/14/20	02/14/20	BLR	
SM 5210B									
5-day BOD		660	mg/L	2		02/12/20 15:48	02/17/20	BLR	

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Beth Read

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BOARDMAN WASTEWATER SAMPLE ANALYSIS 2020

Pendleton Wastewater Lab
4300 SW Houtama Rd. Pendleton OR 97801

DATE RECEIVED: 2/11/2020

RESULTS

Sample ID	S.S. mg/l	B.O.D. mg/l
Influent	972	459
Effluent	-	-
%Removal	-	-
Method	Note #1	Note #2

Meets 48 hour BOD holding time
Meets 6 hour coliform holding time
Evidence of cooling (same day)
Meets laboratory QA

Yes	No
x	
x	
x	

Method Detection Limits:

TSS: at least 5 milligrams/volume retained on filter
BOD: 2 milligrams/liter

Methods:

"Standard Methods for the Examination of Water and Wastewater" 22nd edition 2012

Note 1: Ibid., #2540 D Total suspended solids dried at 103-105 C

Note 2: Ibid., # 5210 5 Day BOD test: all effluent samples are seeded and dechlorinated

APPENDIX C

Primary Wastewater Lagoon Sludge Survey

MEMO

To: Justin Sterger, Oregon Department of Environmental Quality
From: Michael Lees, P.E. 
Subject: **City of Boardman, Oregon - Primary Wastewater Lagoon Sludge Survey**
Date: September 1, 2020
Job/File No. 439-62-02 (w/encl.)
cc: Karen Pettigrew, City of Boardman (w/encl.)
Kevin Kennedy, City of Boardman (w/encl.)

The City of Boardman, Oregon, completed a bathymetric sludge survey of their primary wastewater lagoon (Lagoon No. 1 and the northeast lagoon shown in Appendix A) on June 17, 2020, to meet the special condition outlined in Schedule D of the City's Water Pollution Control Facilities (WPCF) Permit. The results of the sludge survey are included in Appendix A.

The equipment used to complete the bathymetric sludge survey consisted of a radio-controlled vessel equipped with single-beam sonar and a survey-grade GPS (see Photo 1 below). The survey vessel navigated throughout Lagoon No. 1 in an approximate 10-foot grid, recording readings every 10 feet.

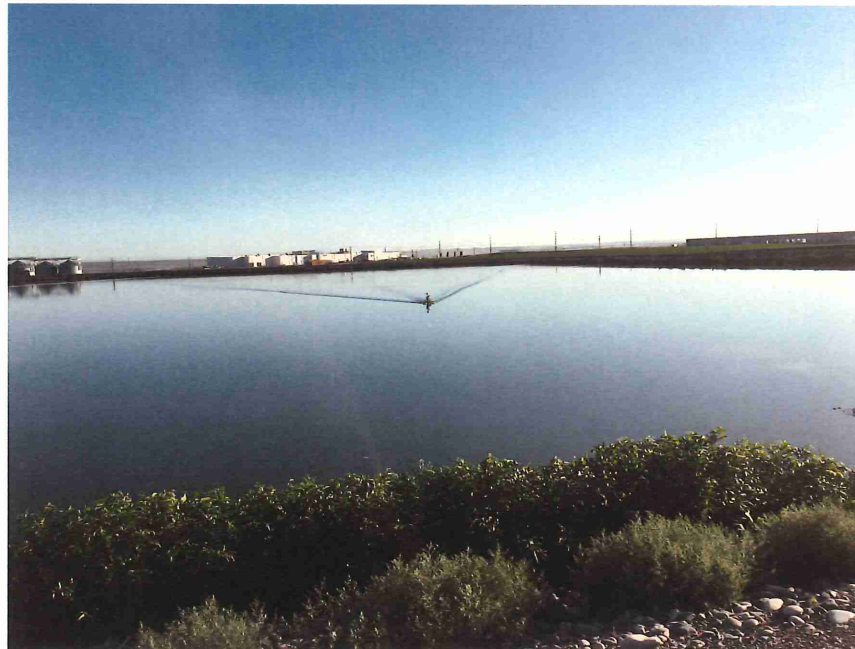


Photo 1: Lagoon No. 1 and the survey vessel.

Justin Sterger
September 1, 2020
Page -2-

The original design Drawings of Lagoon No. 1 were utilized to create the existing lagoon bottom surface for comparison to the surveyed sludge surface. Existing survey control at the lagoon site was used to localize the sludge survey equipment and to prepare AutoCAD Civil 3D drawing files of the site depicting the top of sludge surface. The sheets in Appendix A show the approximate depths of sludge and the sludge surface throughout Lagoon No. 1.

To verify the existing lagoon bottom surface created from the original design Drawings coincided with the survey data, surveyors entered Lagoon No. 1 in a boat and pulled three core samples of the sludge depth at different locations. The core samples corresponded closely to that of the surveyed sludge depth.

As suspected, the sludge in Lagoon No. 1 has accumulated to depths ranging from 1 to 4 feet. Comparison of the lagoon bottom surface to the top of sludge surface indicates there is approximately 52,520 cubic yards of accumulated sludge in Lagoon No. 1.

The City is planning to remove the accumulated sludge in 2023, after a wastewater system improvements project is completed in 2022. This will allow the City to maintain current treatment levels without disrupting operations. The City will follow the requirements outlined in the WPCF Permit and provide the Oregon Department of Environmental Quality proper notification of when the sludge will be removed.

ML/jg

Enclosure

G:\Clients\Boardman\Wastewater\439-62\Correspondence\Sterger-Memo.doc

APPENDIX A

Lagoon Sludge Survey - 2020

LAGOON SLUDGE SURVEY

2020



SHEET INDEX

1	COVER SHEET
2	LAGOON OVERVIEW
3	LAGOON SLUDGE VOLUME
4	LAGOON SLUDGE SURFACE

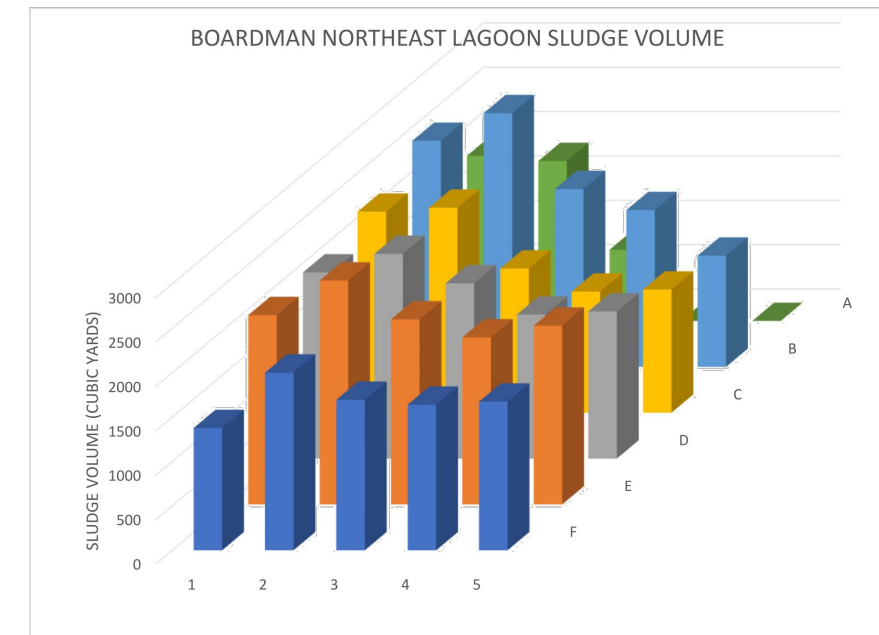
LAGOON SLUDGE SONAR TOPO SURVEY FOR CITY OF BOARDMAN	COVER PAGE	No.	REVISION	DATE	BY
AL ADKINS ENGINEERING & SURVEYING 1435 ESPLANADE AVENUE, KLAMATH FALLS, OR 97601 SERVING S. OREGON & N. CALIFORNIA ENGINEERING • SURVEYING • PLANNING • TESTING		DATE: 7/8/2020			
		PROJECT: 2511-20			
		FILE: SLUDGE VOLUME			
		DESIGNED BY: N/A			
		DRAWN BY: SBR			
		CHECKED BY: DBS			
		SURVEYED BY: ACE			
		SCALE: AS SHOWN			
		SHEET: 1 OF 4			
1					

CITY OF BOARDMAN LAGOON OVERVIEW



 A-E ADKINS ENGINEERING & SURVEYING ☎ / 541.384.4666 W / AdkinsEngineering.com 1435 ESPLANADE AVENUE, KLAMATH FALLS, OR 97601 SERVING S. OREGON & N. CALIFORNIA ENGINEERING • SURVEYING • PLANNING • TESTING		LAGOON SLUDGE SONAR TOPO SURVEY FOR CITY OF BOARDMAN LAGOON OVERVIEW		No. _____ REVISION _____ DATE _____ BY _____
DATE: 7/8/2021 PROJECT: 2511-2 FILE: SLUDGE VOLUM DESIGNED BY: N/ DRAWN BY: SB CHECKED BY: DB SURVEYED BY: AC SCALE: AS SHOW SHEET: 2 OF 4				

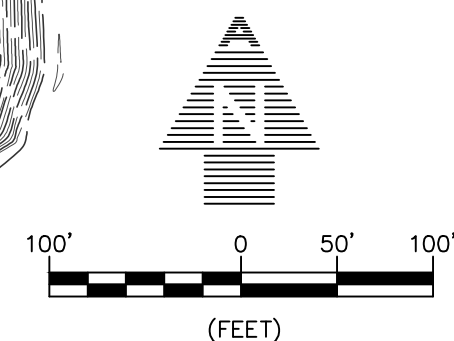
CITY OF BOARDMAN NORTHEAST LAGOON SLUDGE VOLUME



DEPTH OF SLUDGE			
Number	Minimum Depth	Maximum Depth	Color
1	0.0	0.5	
2	0.5	1.0	
3	1.0	1.5	
4	1.5	2.0	
5	2.0	2.5	
6	2.5	3.0	
7	3.0	3.5	
8	3.5	4.0	

LEGEND

- | | |
|---|------------------------|
|  | CONTROL POINT |
|  | GUY WIRE |
|  | SANITARY SEWER MANHOLE |
|  | POWERPOLE |
|  | CLEANOUT |
|  | WATER VALVE |



ACE: 21
330.70'
FND 1/2 IR RPC

GATE VALVE

ACE: 20
335.01'
FND PUNCH

STORAGE TANK

- MAINTENANCE BUILDING

TOTALS

SLUDGE VOLUME: 52,520 CU. YD.
AREA: 12.92 ACRES

[illegible]

**LAGOON SLUDGE
SONAR TOPO SURVEY
FOR
CITY OF BOARDMAN
NORTHEAST LAGOON
SLUDGE VOLUME**

ALF ADKINS • 541.824.4666
ENGINEERING & SURVEYING W / AdkinsEngineering.com

1435 ERIANADE AVENUE, KLAMATH FALLS, OR 97601

SERVING S. OREGON & N. CALIFORNIA
ENGINEERING • SURVEYING • PLANNING • TESTING

DATE: 7/8/2020

PROJECT:	2511-20
----------	---------

FILE: SLUDGE VOLUME

DESIGNED BY: N/A

DRAWN BY:	SBR
------------------	-----

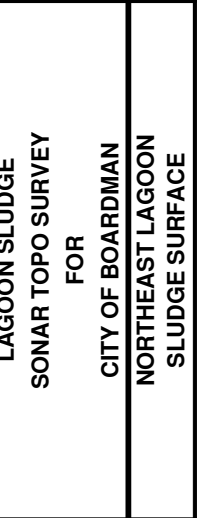
CHECKED BY: DBS

SURVEYED BY: ACE

SCALE: AS SHOWN

SHEET: 3 OF 4

3

[illegible]

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w / AdkinsEngineering.com
1435 ESPLANADE AVENUE, KLAMATH FALLS, OR 97601
SERVING S. OREGON & N. CALIFORNIA
ENGINEERING • SURVEYING • PLANNING • TESTING

DATE:	7/8/2020
PROJECT:	2511-20
TITLE:	SLUDGE VOLUME
DESIGNED BY:	N/A
DRAWN BY:	SBR
CHECKED BY:	DBS
SURVEYED BY:	ACE
SCALE:	AS SHOWN
SHEET:	4 OF 4

TOP OF SLUDGE PERSPECTIVE
(10X VERTICAL EXAGGERATION)

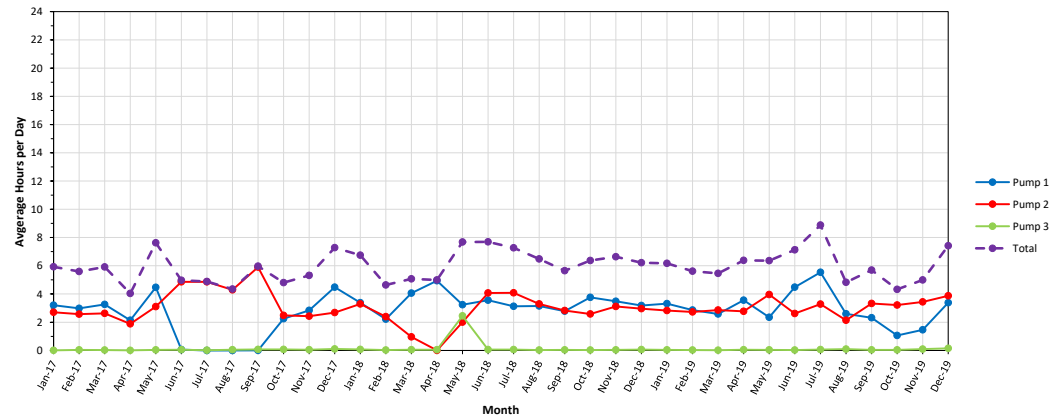
APPENDIX D

Lift Station Run Hours Compiled

Lift Station No. 1 Summary																																	
Month	Extra text	Pump 1										Pump 2										Pump 3										Total of Average	
		Hours Operated	Hours Per Day			Gallons Pumped	Gallons Per Day			Hours Operated	Hours Per Day			Gallons Pumped	Gallons Per Day			Hours Operated	Hours Per Day			Gallons Pumped	Gallons Per Day			Hours per Day	Gallons per Day						
			Avg	Max	Min		Avg	Max	Min		Avg	Max	Min		Avg	Max	Min		Avg	Max	Min		Avg	Max	Min								
Jan-17	2017	99.5	3.2	22.4	8.9	3731250	120363	838875	332625	83.9	2.7	19.9	6.7	3144375	101431	745125	252375	0.3	0.0	0.1	0.0	10875	351	4875	0	5.9	222145						
Feb-17	2017	83.7	3.0	14.0	6.9	3137250	112045	525375	258750	72.0	2.6	11.2	5.2	2699625	96415	418500	195000	1.0	0.0	0.5	0.0	36375	1299	17625	0	5.6	209759						
Mar-17	2017	101.1	3.3	31.4	5.9	3790125	122262	1176375	220875	81.4	2.6	25.2	1.0	3054375	98528	944625	37875	0.8	0.0	0.5	0.0	31125	1004	17625	0	5.9	221794						
Apr-17	2017	64.2	2.1	10.7	6.3	2409000	80300	399750	237375	56.6	1.9	10.1	5.2	2121000	70700	379500	196125	0.3	0.0	0.1	0.0	10125	337	2625	0	4.0	151338						
May-17	2017	138.8	4.5	27.5	6.0	5203875	167867	1032000	226875	96.4	3.1	18.0	5.2	3616125	116649	674250	194625	1.1	0.0	0.5	0.0	40500	1306	17625	1500	7.6	285823						
Jun-17	2017	1.9	0.1	1.9	0.0	72000	2400	70875	0	145.8	4.9	24.0	3.8	5467875	182263	901125	142125	1.6	0.1	0.6	0.0	58500	1950	22875	0	5.0	186613						
Jul-17	2017	0.0	0.0	0.0	0.0	750	24	750	0	150.6	4.9	29.8	6.2	5649000	182226	1116750	233250	0.5	0.0	0.2	0.0	19875	641	7125	750	4.9	182891						
Aug-17	2017	0.0	0.0	0.0	0.0	0	0	0	0	133.3	4.3	39.8	2.4	4997625	161214	1492125	90000	1.7	0.1	0.6	0.0	62250	2008	22875	1875	4.4	163222						
Sep-17	2017	0.2	0.0	0.1	0.0	6750	225	5625	0	177.0	5.9	49.2	7.9	6639000	221300	1844625	297000	2.1	0.1	0.5	0.0	76875	2563	19500	1500	6.0	224087						
Oct-17	2017	69.9	2.3	22.0	0.2	2621625	84569	824625	6375	76.9	2.5	15.6	3.9	2885250	93073	583875	145875	2.2	0.1	0.7	0.0	81375	2625	27000	0	4.8	180266						
Nov-17	2017	85.0	2.8	20.9	10.2	3188625	106287	785625	381750	72.8	2.4	19.7	6.2	2730750	91025	738750	231000	1.6	0.1	0.6	0.1	58875	1962	21000	4500	5.3	199275						
Dec-17	2017	139.1	4.5	38.2	7.2	5217000	168290	1432875	271125	83.2	2.7	23.9	0.0	3120750	100669	895875	0	3.2	0.1	1.1	0.1	121125	3907	42750	1875	7.3	272867						
Jan-18	2018	104.8	3.4	31.0	5.0	3931125	126810	1161750	187125	102.1	3.3	26.2	5.0	3828375	123496	982875	189375	2.3	0.1	0.8	0.0	84750	2734	31875	0	6.7	253040						
Feb-18	2018	61.9	2.2	10.1	4.9	2323125	82969	377625	181875	67.0	2.4	10.7	4.7	2512125	89719	400500	176250	0.9	0.0	0.5	0.0	34875	1246	18750	750	4.6	173933						
Mar-18	2018	126.0	4.1	46.3	5.8	4723500	152371	1737375	217500	29.7	1.0	10.1	0.0	1114875	35964	378750	0	1.5	0.0	0.5	0.0	57750	1863	20250	0	5.1	190198						
Apr-18	2018	148.0	4.9	19.2	13.9	5550000	185000	718500	520125	0.2	0.0	0.1	0.0	7875	262	4500	0	1.6	0.1	0.6	0.0	59625	1988	20625	0	5.0	187250						
May-18	2018	100.4	3.2	34.4	0.0	3763125	121391	1291875	0	62.0	2.0	27.5	0.0	2326500	75048	1030125	0	75.9	2.4	27.8	0.2	2844375	91754	1042500	7500	7.7	288194						
Jun-18	2018	106.8	3.6	22.9	7.7	4004250	133475	859125	289875	122.0	4.1	29.4	8.6	4575375	152513	1101750	321000	1.8	0.1	0.7	0.0	67875	2263	24750	0	7.7	288250						
Jul-18	2018	97.1	3.1	28.0	0.0	3639375	117399	1049625	750	126.7	4.1	30.9	7.5	4749750	153218	1159125	281250	1.8	0.1	0.7	0.0	67500	2177	24375	0	7.3	272794						
Aug-18	2018	97.8	3.2	43.8	6.3	3665625	118246	1643250	236250	102.2	3.3	45.2	12.5	3832500	123629	1695000	467625	1.0	0.0	0.5	0.0	39000	1258	19125	1500	6.5	243133						
Sep-18	2018	83.4	2.8	28.8	6.2	3127125	104237	1081500	231375	84.9	2.8	29.9	6.8	3183750	106125	1120500	254625	1.0	0.0	0.5	0.0	39000	1300	20625	1125	5.6	211662						
Oct-18	2018	116.5	3.8	29.5	5.0	4369125	140940	1106625	187500	80.1	2.6	35.9	0.0	3002250	96847	1346250	1125	1.0	0.0	0.4	0.0	37500	1210	16875	0	6.4	238996						
Nov-18	2018	104.5	3.5	34.1	6.0	3918750	130625	1277250	224250	93.4	3.1	32.0	5.1	3501375	116712	1200750	190875	1.2	0.0	0.6	0.0	43875	1463	21375	0	6.6	248800						
Dec-18	2018	98.8	3.2	28.0	5.8	3704625	119504	1051125	219000	91.9	3.0	20.5	5.3	3447750	111218	768000	198000	1.8	0.1	0.8	0.0	67875	2190	29625	0	6.2	232911						
Jan-19	2019	102.7	3.3	22.7	5.4	3852000	124258	850875	200625	87.5	2.8	23.0	5.8	3282000	105871	861000	217875	1.1	0.0	0.7	0.0	42750	1379	27750	0	6.2	231508						
Feb-19	2019	80.2	2.9	18.2	5.3	3007500	107411	682500	199500	76.3	2.7	12.0	6.0	2860875	102174	448500	223875	0.8	0.0	0.5	0.0	31875	1138	19125	375	5.6	210723						
Mar-19	2019	80.2	2.6	35.2	6.0	3006750	96992	1320375	223500	88.7	2.9	39.5	10.4	3325875	107286	1482750	391125	0.4	0.0	0.1	0.0	16125	520	4875	1500	5.5	204798						
Apr-19	2019	106.7	3.6	32.3	2.6	4002375	133413	1211625	98100	83.2	2.8	29.1	4.0	3120375	104012	1092375	151875	1.7	0.1	1.0	0.0	62625	2087	36375	0	6.4	239513						
May-19	2019	73.0	2.4	35.0	0.0	2736375	88270	1311375	0	122.8	4.0	31.4	5.7	4605000	148548	1176750	214125	1.3	0.0	0.5	0.0	48375	1560	17250	0	6.4	238379						
Jun-19	2019	134.4	4.5	51.4	0.0	5041125	168038	1926750	0	78.4	2.6	23.2	4.7	2938500	97950	871500	176250	0.9	0.0	0.5	0.0	34500	1150	20625	1875	7.1	267138						
Jul-19	2019	171.6	5.5	55.1	0.0	6434625	207569	2066250	0	101.8	3.3	21.3	5.0	3818250	123169	798375	188625	1.8	0.1	0.6	0.1	69000	2226	21750	1875	8.9	332964						
Aug-19	2019	80.4	2.6	28.9	0.1	3016125	97294	1084500	5250	66.3	2.1	18.3	0.6	2484375	80141	687375	20625	2.9	0.1	1.0	0.0	108375	3496	38625	0	4.8	180931						
Sep-19	2019	69.5	2.3	22.5	0.0	2607750	86925	844500	0	99.9	3.3	21.9	8.4	3747375	124913	822375	313125	1.2	0.0	0.5	0.0	44625	1488	19125	0	5.7	213325						
Oct-19	2019	33.0	1.1	14.8	0.0	1239375	39980	553125	0	99.7	3.2	14.7	5.1	3739875	120641	552000	191625	1.3	0.0	0.5	0.0	46875	1512	18000	0	4	162133						
Nov-19	2019	43.9	1.5	15.8	0.0	1647000	54900	594375	0	103.3	3.4	21.3	2.7	3874125	129137	800400	99750	2.7	0.1	1.8	0.0	102375	3412	67875	0	5	187450						
Dec-19	2019	105.0	3.4	33.8	0.0	3939000	127065	1267500	375	120.1	3.9	26.8	5.6	4503750	145282	1005000	209625	4.6	0.1	2.8	0.0	173625	5601	106875	0	7	277948						
Average:		86.4	2.8	25.3	3.8	3239667	106381	948948	143298	92.2	3.0	24.1	4.8	3458573	113594	903379	180385	3.6	0.1	1.4	0.0	134250	4360	53125	792	5.982	224335						
Maximum:		171.6	5.5	55.1	13.9	6434625	207569	2066250	520125	177.0	5.9	49.2	12.5	6639000	221300	1844625	467625	75.9	2.4	27.8	0.2	2844375	91754	1042500	7500	8.879	332964						
Minimum:		0.0	0.0	0.0	0.0	0	0	0	0	0.2	0.0	0.1	0.0	7875	262	4500	0	0.3	0.0	0.1	0.0	10125	337	2625	0	4.036	151338						
Std Dev:		41.0	1.3	13.4	3.6	1537855	49960	504150	136077	32.2	1.1	10.2	2.9	1208869	39403	383716	110187	12.2	0.4	4.5	0.0	459210	14808	168189	1486	1.122	42077						

lier Z Score: 2.68

Average Daily Pump Hours

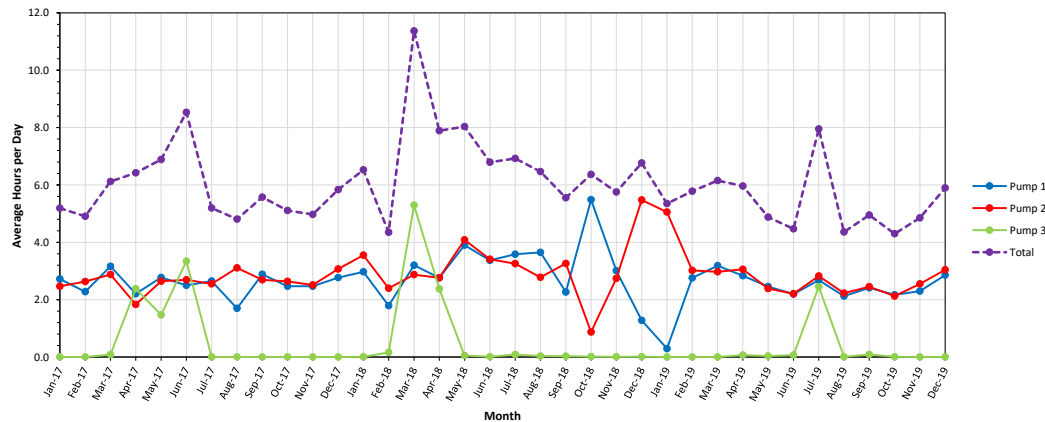


Average without outliers:

Lift Station No. 2 Summary																																						
Month	Pump 1												Pump 2												Pump 3												Total of Average	
	Hours Operated	Hours Per Day				Gallons Pumped	Gallons Per Day				Hours Operated	Hours Per Day				Gallons Pumped	Gallons Per Day				Hours Operated	Hours Per Day				Gallons Pumped	Gallons Per Day											
		Avg	Max	Min	Avg		Max	Min	Avg	Max		Min	Avg	Max	Min		Avg	Max	Min	Avg		Max	Min	Avg	Max		Min	Avg	Max	Min	per day	per day						
Jan-17	84.3	2.7	18.9	6.3	4301850	138769	961860	321300	76.5	2.5	17.7	5.3	3902520	125888	900150	272850	0.0	0.0	0.0	0.0	510	16	510	0	5.2	264674												
Feb-17	63.7	2.3	11.8	6.8	3246660	115952	601800	346800	73.7	2.6	14.2	7.9	3759720	134276	722670	404430	0.0	0.0	0.0	0.0	0	0	0	0	4.9	250228												
Mar-17	98.1	3.2	33.1	6.0	5003100	161390	1689630	305490	89.1	2.9	32.9	5.3	4546650	146666	1676880	271830	2.5	0.1	2.5	0.0	129540	4179	128010	0	6.1	312235												
Apr-17	66.2	2.2	28.0	3.0	3375690	112523	1428510	153510	55.0	1.8	17.8	0.1	2805000	93500	909330	6120	71.5	2.4	71.5	0.0	3644970	121499	3644970	0	6.4	327522												
May-17	85.9	2.8	67.1	18.8	4381920	141352	3422610	959310	82.0	2.6	64.4	17.6	4181490	134887	3284910	896580	45.5	1.5	38.9	6.6	2319990	74838	1981350	338640	6.9	351077												
Jun-17	75.0	2.5	69.9	5.1	3823470	127449	3563370	260100	80.7	2.7	75.9	4.8	4115700	137190	3869880	245820	100.2	3.3	100.2	0.0	5112240	170408	5112240	0	8.5	435047												
Jul-17	82.2	2.7	73.5	8.7	4190160	135166	3746460	443700	79.0	2.5	72.7	6.3	4027470	129918	3708720	318750	0.0	0.0	0.0	0.0	0	0	0	0	5.2	265085												
Aug-17	52.7	1.7	42.7	10.0	2685150	86618	2176680	508470	96.4	3.1	86.0	10.4	4916910	158610	4384470	532440	0.0	0.0	0.0	0.0	0	0	0	0	4.8	245228												
Sep-17	86.5	2.9	62.9	23.6	4414050	147135	3209430	1204620	80.7	2.7	59.8	20.9	4115700	137190	3049800	1065900	0.0	0.0	0.0	0.0	0	0	0	0	5.6	284325												
Oct-17	76.6	2.5	72.1	4.5	3905070	125970	3676080	228990	81.8	2.6	72.6	9.1	4169760	134508	3703620	466140	0.0	0.0	0.0	0.0	0	0	0	0	5.1	260478												
Nov-17	73.9	2.5	64.0	10.0	3771450	125715	3263490	507960	75.3	2.5	66.0	9.2	3838260	127942	3367530	470730	0.0	0.0	0.0	0.0	0	0	0	0	5.0	253657												
Dec-17	85.9	2.8	75.7	10.2	4379880	141286	3858660	521220	95.1	3.1	85.8	9.3	4850100	156455	4377840	472260	0.0	0.0	0.0	0.0	0	0	0	0	5.8	297741												
Jan-18	92.0	3.0	20.1	4.1	4692510	151371	1026630	206550	110.0	3.5	33.9	5.3	5612040	181034	1728390	272340	0.3	0.0	0.3	0.0	15300	494	15300	0	6.5	332898												
Feb-18	50.2	1.8	10.1	4.9	2558160	91363	517650	248880	67.1	2.4	20.1	4.9	3421590	122200	1024590	249900	4.5	0.2	4.5	0.0	231030	8251	231030	0	4.3	221814												
Mar-18	99.2	3.2	21.0	6.1	5060730	163249	1070490	311610	89.0	2.9	16.6	6.2	4540530	146469	846600	317220	164.2	5.3	95.2	0.0	8373180	270103	4856220	0	11.4	579821												
Apr-18	82.8	2.8	20.3	3.9	4224840	140828	1034790	200430	82.8	2.8	18.4	6.6	4224330	140811	938910	337620	71.2	2.4	70.8	0.0	3629160	120972	3609270	0	7.9	402611												
May-18	120.8	3.9	35.9	0.2	6162840	198801	1830900	9180	126.7	4.1	29.8	14.8	6459150	208360	1520820	756330	1.6	0.1	0.8	0.0	80580	2599	41820	1020	8.0	409760												
Jun-18	101.1	3.4	22.9	7.1	5156610	171887	1167900	362610	102.3	3.4	24.3	7.8	5217810	173927	1237770	398310	0.4	0.0	0.2	0.0	19890	663	7650	0	6.8	346477												
Jul-18	111.1	3.6	33.2	10.8	5665080	182745	1691160	551310	101.0	3.3	34.5	7.1	5149980	166128	1757460	364140	2.6	0.1	1.9	0.0	131070	4228	96390	510	6.9	353101												
Aug-18	113.1	3.6	44.0	0.0	5769630	186117	2245530	2040	86.2	2.8	42.1	0.3	4396200	141813	2147610	13260	1.1	0.0	0.7	0.0	58650	1892	35190	510	6.5	329822												
Sep-18	67.9	2.3	24.0	0.0	3462390	115413	1225530	0	97.8	3.3	33.0	0.0	4985760	166192	1681470	0	0.9	0.0	0.5	0.0	46920	1564	26010	0	5.6	283169												
Oct-18	170.0	5.5	76.4	5.3	8670510	279694	3896910	272850	27.0	0.9	14.9	0.0	1377510	44436	759900	1530	0.3	0.0	0.2	0.0	17340	559	8670	0	6.4	324689												
Nov-18	90.2	3.0	27.2	5.2	4599690	153323	1388220	266730	82.3	2.7	26.0	5.0	4196280	139876	1326510	252960	0.2	0.0	0.1	0.0	8160	272	4590	0	5.8	293471												
Dec-18	39.5	1.3	20.5	0.0	2014500	64984	1047540	0	169.7	5.5	37.8	9.8	8656230	279233	1926780	500310	0.4	0.0	0.4	0.0	21930	707	20910	0	6.8	344925												
Jan-19	9.1	0.3	7.8	0.0	464100	14971	395760	0	156.7	5.1	42.9	7.8	7993230	257846	2189940	395250	0.0	0.0	0.0	0.0	1020	33	1020	0	5.3	272850												
Feb-19	77.2	2.8	16.3	6.0	3937710	140633	833340	303960	84.5	3.0	18.4	5.9	4311030	153965	936360	302430	0.1	0.0	0.0	0.0	4080	146	1530	0	5.8	294744												
Mar-19	98.6	3.2	39.3	8.0	5030130	162262	2003280	409020	92.1	3.0	35.3	8.0	4694550	151437	1798770	406890	0.1	0.0	0.1	0.0	6630	214	5610	0	6.2	313913												
Apr-19	85.1	2.8	16.1	4.6	4338060	144602	823140	236640	91.8	3.1	17.8	3.6	4681290	156043	906780	184110	2.0	0.1	1.8	0.0	99960	3332	90780	0	6.0	303977												
May-19	76.1	2.5	10.3	6.2	3883650	125279	526320	316710	74.0	2.4	10.0	5.4	3775020	121775	510510	273360	1.0	0.0	0.8	0.0	51000	1645	40800	0	4.9	248699												
Jun-19	65.9	2.2	25.5	7.6	3360390	112013	1302030	388110	66.2	2.2	23.6	7.8	3374160	112472	1202580	396270	2.1	0.1	1.9	0.0	106590	3553	95880	0	4.5	228038												
Jul-19	83.1	2.7	23.2	4.6	4237080	136680	1183200	235620	87.5	2.8	18.6	4.8	4463010	143968	949110	246840	76.0	2.5	71.6	0.0	3873450	124950	3653640	510	8.0	405598												
Aug-19	65.9	2.1	15.1	2.6	3359370	108367	769590	134640	69.1	2.2	16.3	1.9	3522570	113631	832830	96390	0.1	0.0	0.0	0.0	7650	247	2550	0	4.4	222245												
Sep-19	72.4	2.4	30.1	7.1	3690360	123012	1537140	359550	73.6	2.5	29.7	7.0	3752070	125069	1516740	356490	2.6	0.1	1.3	0.0	134130	4471	63750	0	5.0	252552												
Oct-19	67.2	2.2	11.3	4.5	3425415	110497	574515	227970	65.8	2.1	11.0	3.6	3357840	108317	558960	182070	0.2	0.0	0.1	0.0	9690	313	5100	0	4.3	219127												
Nov-19	68.9	2.3	10.1	7.1	3516195	117207	516120	362610	76.5	2.5	12.0	8.0	3899970	129999	613020	405960	0.1	0.0	0.1	0.0	5610	187	3570	0	4.9	247393												
Dec-19	88.6	2.9	18.7	6.4	4516560	145695	954720	325380	94.2	3.0	20.4	7.7	4805730	155024	1039890	393720	0.0	0.0	0.0	0.0	1530	49	1530	0	5.9	300768												
Average:	81.3	2.7	33.3	6.3	4146527	136120	1698916	319274	87.2	2.9	34.8	6.8	4447143	146029	1775225	347990	15.3	0.5	13.0	0.2	781717	25622	660719	9478	6.035	307771												
Maximum:	170.0	5.5	76.4	23.6	8670510	279694	3896910	1204620	169.7	5.5	86.0	20.9	8656230	279233	4384470	1065900	164.2	5.3	100.2	6.6	8373180	270103	5112240	338640	8.530	435047												
Minimum:	9.1	0.3	7.8	0.0	464100	14971	395760	0	27.0	0.9	10.0	0.0	1377510	44436	510510	0	0.0	0.0	0.0	0.0	0	0	0	0	4.297	219127												
Std Dev:	25.6	0.8	21.7	4.7	1303384	41498	1106314	237413	24.7	0.8	22.4	4.3	1259804	40017	1141984	220990	36.0	1.2	28.8	1.1	1835090	59892	1469092	55639	1.409	71864												

lier Z Score: 2.68

Average Daily Pump Hours



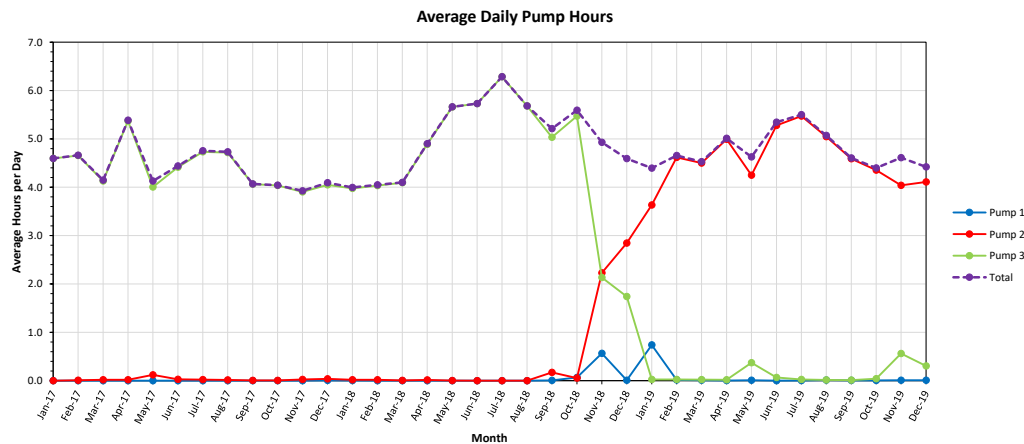
Average without outliers:

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Lift Station No. 3 Summary																										
Month	Pump 1								Pump 2								Pump 3								Total of Average	
	Hours Operated	Hours Per Day			Gallons Pumped	Gallons Per Day			Hours Operated	Hours Per Day			Gallons Pumped	Gallons Per Day			Hours Operated	Hours Per Day			Gallons Pumped	Gallons Per Day			Hours per Day	Gallons per Day
		Avg	Max	Min		Avg	Max	Min		Avg	Max	Min		Avg	Max	Min		Avg	Max	Min		Avg	Max	Min		
Jan-17	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	0.0	0.0	1680	54	1680	0	142.5	4.6	7.4	2.5	11967480	386048	618240	214200	4.6	386102
Feb-17	0.0	0.0	0.0	0.0	0	0	0	0	0.2	0.0	0.0	0.1	18480	660	8400	0	130.3	4.7	6.4	2.9	10947720	390990	538440	245280	4.7	391650
Mar-17	0.0	0.0	0.0	0.0	0	0	0	0	0.5	0.0	0.1	0.0	46200	1490	6720	0	128.0	4.1	5.0	3.0	10752000	346839	423360	250320	4.1	348329
Apr-17	0.0	0.0	0.0	0.0	0	0	0	0	0.5	0.0	0.1	0.0	42000	1400	9240	0	161.1	5.4	10.1	1.6	13534080	451136	845040	136080	5.4	452536
May-17	0.0	0.0	0.0	0.0	0	0	0	0	3.8	0.1	1.9	0.0	315840	10188	158760	0	124.2	4.0	6.9	0.7	10430280	336461	579600	57960	4.1	346649
Jun-17	0.0	0.0	0.0	0.0	0	0	0	0	0.8	0.0	0.1	0.0	67200	2240	11760	0	132.4	4.4	8.5	0.0	11121600	370720	716520	4200	4.4	372960
Jul-17	0.0	0.0	0.0	0.0	0	0	0	0	0.7	0.0	0.1	0.0	57120	1843	7560	0	146.7	4.7	5.8	3.9	12321120	397455	486360	328440	4.8	399298
Aug-17	0.0	0.0	0.0	0.0	0	0	0	0	0.5	0.0	0.1	0.0	39480	1274	7560	0	146.2	4.7	10.7	0.0	12284160	396263	895440	0	4.7	397537
Sep-17	0.0	0.0	0.0	0.0	0	0	0	0	0.1	0.0	0.0	0.0	10920	364	3360	0	121.9	4.1	4.8	3.0	10240440	341348	399000	252840	4.1	341712
Oct-17	0.0	0.0	0.0	0.0	0	0	0	0	0.1	0.0	0.0	0.0	10920	352	3360	0	125.2	4.0	6.0	3.3	10514280	339170	499800	280560	4.0	339523
Nov-17	0.0	0.0	0.0	0.0	0	0	0	0	0.7	0.0	0.5	0.0	62160	2072	42840	0	117.0	3.9	5.0	1.7	9832200	327740	420000	143640	3.9	329812
Dec-17	0.2	0.0	0.1	0.0	17640	569	8400	0	1.2	0.0	0.4	0.0	98280	3170	31080	0	125.6	4.1	5.9	2.2	10547040	340227	493080	186480	4.1	343966
Jan-18	0.1	0.0	0.0	0.0	5880	190	3360	0	0.5	0.0	0.1	0.0	43680	1409	9240	0	123.2	4.0	5.2	2.4	10351320	333914	435120	199080	4.0	335512
Feb-18	0.0	0.0	0.0	0.0	0	0	0	0	0.5	0.0	0.1	0.0	42000	1500	10080	0	112.9	4.0	4.4	3.7	9483600	338700	372120	309960	4.0	340200
Mar-18	0.0	0.0	0.0	0.0	0	0	0	0	0.2	0.0	0.0	0.0	15120	488	3360	0	126.9	4.1	4.9	3.1	10657920	343804	413280	260400	4.1	344292
Apr-18	0.0	0.0	0.0	0.0	0	0	0	0	0.4	0.0	0.1	0.0	34440	1148	9240	0	146.6	4.9	6.3	3.8	12316920	410564	528360	315840	4.9	411712
May-18	0.0	0.0	0.0	0.0	0	0	0	0	0.1	0.0	0.0	0.0	7560	244	4200	0	175.4	5.7	6.4	4.2	14736960	475386	537600	349440	5.7	475630
Jun-18	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	171.9	5.7	7.3	3.4	14437920	481264	613200	286440	5.7	481264
Jul-18	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	194.8	6.3	7.1	5.2	16363200	527845	598080	433440	6.3	527845
Aug-18	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	176.1	5.7	7.6	4.7	14794920	477255	639240	395640	5.7	477255
Sep-18	0.2	0.0	0.1	0.0	13440	448	12600	0	5.2	0.2	4.8	0.0	433440	14448	401520	0	151.0	5.0	5.7	0.5	12682320	422744	482160	44520	5.2	437640
Oct-18	2.0	0.1	1.1	0.0	168840	5446	94080	0	1.7	0.1	0.5	0.0	141120	4552	42000	0	169.6	5.5	6.2	4.6	14249760	456970	518280	387240	5.6	469668
Nov-18	17.0	0.6	2.5	0.0	1424640	47488	214200	0	66.9	2.2	5.0	0.0	5617920	187264	420000	0	64.0	2.1	5.5	0.0	5377680	179256	464520	0	4.9	414008
Dec-18	0.2	0.0	0.1	0.0	18480	596	11760	0	88.2	2.8	5.2	0.0	7408800	238994	439320	0	53.9	1.7	6.2	0.0	4527600	146052	519960	0	4.6	385641
Jan-19	22.9	0.7	4.3	0.0	1921080	61970	362040	0	112.6	3.6	7.5	0.0	9459240	305137	625800	0	0.8	0.0	0.1	0.0	67200	2168	10080	0	4.4	369275
Feb-19	0.4	0.0	0.1	0.0	35280	1260	8400	0	129.3	4.6	5.8	4.1	10858680	387810	485520	341040	0.7	0.0	0.1	0.0	58800	2100	11760	0	4.7	391170
Mar-19	0.3	0.0	0.1	0.0	21000	677	7560	0	139.5	4.5	8.5	0.0	11718840	378027	713160	0	0.6	0.0	0.2	0.0	52080	1680	17640	0	4.5	380385
Apr-19	0.1	0.0	0.1	0.0	5880	196	5880	0	149.7	5.0	7.3	3.7	12577320	419244	616560	307440	0.5	0.0	0.2	0.0	42840	1428	15960	0	5.0	420868
May-19	0.3	0.0	0.2	0.0	22680	732	16800	0	131.7	4.2	5.7	1.5	11066160	356973	477120	122640	11.5	0.4	2.7	0.0	961800	31026	227640	0	4.6	388730
Jun-19	0.0	0.0	0.0	0.0	0	0	0	0	158.3	5.3	9.8	2.0	13299720	443324	822360	169680	2.0	0.1	1.0	0.0	169680	5656	81480	0	5.3	448980
Jul-19	0.1	0.0	0.0	0.0	6720	217	3360	0	169.6	5.5	6.5	4.3	14248080	459615	548520	361200	0.8	0.0	0.3	0.0	67200	2168	21840	0	5.5	462000
Aug-19	0.3	0.0	0.1	0.0	26880	867	7560	0	156.4	5.0	6.1	4.2	13140120	423875	513240	349440	0.5	0.0	0.1	0.0	37800	1219	7560	0	5.1	425961
Sep-19	0.2	0.0	0.1	0.0	15120	504	7560	0	137.7	4.6	7.1	3.0	11565960	385532	593880	251160	0.3	0.0	0.2	0.0	26880	896	13440	0	4.6	386932
Oct-19	0.1	0.0	0.1	0.0	11760	379	7560	0	135.0	4.4	6.5	1.6	11337480	365725	546000	131040	1.3	0.0	0.4	0.0	105000	3387	35280	0	4.4	369492
Nov-19	0.3	0.0	0.1	0.0	21000	700	6720	0	121.2	4.0	5.2	0.0	10179960	339332	437640	0	16.9	0.6	5.5	0.0	1417080	47236	457800	0	4.6	387268
Dec-19	0.3	0.0	0.2	0.0	22680	732	12600	0	127.4	4.1	5.1	0.0	10700760	345186	424200	0	9.4	0.3	4.3	0.0	788760	25444	365400	0	4.4	371361
Average:	1.2	0.04	0.3	0.0	104417	3416	21957	0	51.1	1.7	2.8	0.7	4296297	141248	234313	56490	92.0	3.0	4.7	1.7	7729657	254035	397297	141167	4.746	398699
Maximum:	22.9	0.7	4.3	0.0	1921080	61970	362040	0	169.6	5.5	9.8	4.3	14248080	459615	822360	361200	194.8	6.3	10.7	5.2	16363200	527845	895440	433440	6.284	527845
Minimum:	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0	0.3	0.0	0.1	0.0	26880	896	7560	0	3.926	329812
Std Dev:	4.6	0.1	0.8	0.0	385910	12595	68650	0	65.2	2.1	3.2	1.4	5478915	180128	268290	114577	67.6	2.2	2.9	1.8	5679027	186132	247204	147467	0.587	49327

Average without outliers:

lier Z Score: 2.68

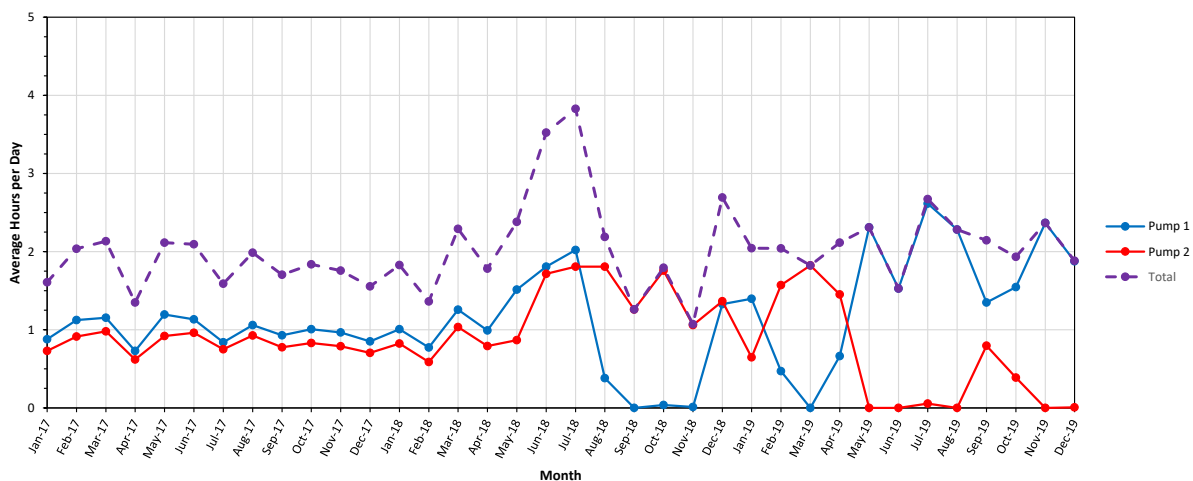


Lift Station No. 4 Summary																
Month	Pump 1								Pump 2							
	Hours Operated	Hours Per Day			Gallons Pumped	Gallons Per Day			Hours Operated	Hours Per Day			Gallons Pumped	Gallons Per Day		
		Avg	Max	Min		Avg	Max	Min		Avg	Max	Min		Avg	Max	Min
Jan-17	27.2	0.9	8.4	0.0	245070	7905	75240	0	22.6	0.7	9.6	0.0	203400	6561	86490	0
Feb-17	31.5	1.1	4.4	2.3	283230	10115	39600	20700	25.6	0.9	3.9	1.7	230220	8222	35010	15300
Mar-17	35.8	1.2	10.7	0.7	322020	10388	96210	6570	30.3	1.0	8.7	1.1	273150	8811	78300	9450
Apr-17	21.9	0.7	4.7	1.7	196830	6561	42210	15300	18.6	0.6	4.1	1.5	167580	5586	36990	13500
May-17	37.0	1.2	12.5	1.7	333270	10751	112230	15480	28.5	0.9	10.2	1.2	256860	8286	91620	11160
Jun-17	34.0	1.1	10.3	0.8	306000	10200	92520	7560	28.8	1.0	8.7	0.6	259470	8649	78120	5310
Jul-17	26.1	0.8	3.8	1.7	234630	7569	34110	15030	23.2	0.7	3.5	1.5	209070	6744	31410	13500
Aug-17	32.9	1.1	6.5	1.7	295830	9543	58500	15660	28.7	0.9	5.8	1.5	258480	8338	51840	13770
Sep-17	27.9	0.9	4.9	1.7	250740	8358	44460	14850	23.3	0.8	3.9	1.2	209430	6981	35190	10890
Oct-17	31.2	1.0	5.5	1.7	280980	9064	49590	15480	25.8	0.8	4.4	1.4	231750	7476	39690	12510
Nov-17	29.0	1.0	5.4	0.9	261000	8700	48600	8370	23.7	0.8	4.4	1.3	213210	7107	39420	12060
Dec-17	26.4	0.9	5.9	1.3	237690	7667	52920	12150	21.8	0.7	4.9	1.2	196380	6335	44100	10350
Jan-18	31.2	1.0	7.0	1.6	280710	9055	63360	14130	25.5	0.8	6.0	1.3	229590	7406	53640	11250
Feb-18	21.7	0.8	5.8	1.7	194940	6962	52200	15480	16.5	0.6	3.7	1.3	148230	5294	33210	11520
Mar-18	38.9	1.3	7.6	1.6	350550	11308	68040	14400	32.1	1.0	5.8	1.3	288540	9308	52470	11880
Apr-18	29.7	1.0	5.9	2.0	267660	8922	52830	18270	23.8	0.8	4.9	1.4	213840	7128	43740	13050
May-18	46.9	1.5	18.0	2.4	422280	13622	162000	21510	26.9	0.9	8.7	1.4	241830	7801	78660	12510
Jun-18	54.2	1.8	16.4	0.0	488070	16269	147420	0	51.5	1.7	19.0	1.3	463320	15444	170910	11700
Jul-18	62.6	2.0	18.5	0.0	563670	18183	166500	0	56.0	1.8	9.8	2.6	504000	16258	87750	23130
Aug-18	11.8	0.4	5.5	0.0	106290	3429	49230	0	56.0	1.8	25.4	2.4	504270	16267	228150	21330
Sep-18	0.0	0.0	0.0	0.0	0	0	0	0	37.8	1.3	13.9	5.4	340200	11340	125190	48330
Oct-18	1.1	0.0	1.1	0.0	10350	334	10350	0	54.4	1.8	24.3	2.3	490050	15808	218700	20700
Nov-18	0.4	0.0	0.4	0.0	3240	108	3240	0	31.8	1.1	14.4	2.2	286290	9543	129600	20160
Dec-18	41.2	1.3	9.4	0.0	370620	11955	84600	270	42.3	1.4	10.9	1.9	380880	12286	98550	16650
Jan-19	43.3	1.4	16.0	0.0	389970	12580	144450	0	20.0	0.6	7.7	0.0	180270	5815	69120	0
Feb-19	13.2	0.5	10.1	0.0	118440	4230	90540	0	44.0	1.6	7.5	0.0	396090	14146	67410	0
Mar-19	0.0	0.0	0.0	0.0	0	0	0	0	56.5	1.8	16.4	2.8	508680	16409	148050	25380
Apr-19	19.9	0.7	14.7	0.0	179370	5979	132120	0	43.5	1.5	24.1	0.0	391770	13059	216720	0
May-19	71.6	2.3	36.8	1.8	644310	20784	330750	15750	0.0	0.0	0.0	0.0	0	0	0	0
Jun-19	45.8	1.5	27.4	4.0	412200	13740	246780	36360	0.0	0.0	0.0	0.0	0	0	0	0
Jul-19	81.1	2.6	33.5	3.7	729720	23539	301770	33480	1.8	0.1	1.1	0.0	15750	508	10170	0
Aug-19	70.7	2.3	26.1	3.5	636660	20537	234450	31770	0.0	0.0	0.0	0.0	0	0	0	0
Sep-19	40.4	1.3	16.7	0.0	363960	12132	150480	0	23.9	0.8	11.9	0.0	215100	7170	107100	0
Oct-19	47.9	1.5	20.3	0.0	431190	13909	182430	0	12.0	0.4	5.1	0.0	108360	3495	45450	0
Nov-19	71.0	2.4	33.0	4.2	638910	21297	296910	37440	0.0	0.0	0.0	0.0	0	0	0	0
Dec-19	58.2	1.9	25.3	4.2	523710	16894	228060	37800	0.2	0.0	0.2	0.0	1800	58	1800	0
Average:	35.1	1.1	12.2	1.3	315948	10350	109575	11772	26.6	0.9	8.1	1.2	239385	7879	73182	10428
Maximum:	81.1	2.6	36.8	4.2	729720	23539	330750	37800	56.5	1.8	25.4	5.4	508680	16409	228150	48330
Minimum:	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0
Std Dev:	20.4	0.7	9.8	1.3	184028	5953	88170	11945	16.4	0.5	6.8	1.1	147894	4845	60906	9986

Average without outliers:

lier Z Score

Average Daily Pump Hours

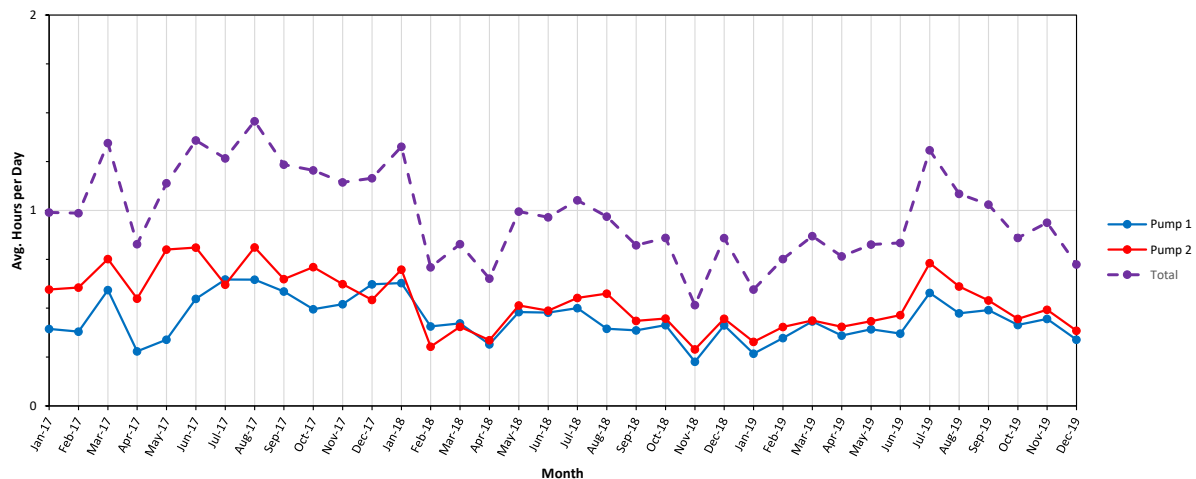


Lift Station No. 5 Summary																		
Month	Pump 1								Pump 2								Total of Average	
	Hours Operated	Hours Per Day			Gallons Pumped	Gallons Per Day			Hours Operated	Hours Per Day			Gallons Pumped	Gallons Per Day			Hours per Day	Gallons per Day
		Avg	Max	Min		Avg	Max	Min		Avg	Max	Min		Avg	Max	Min		
Jan-17	12.2	0.4	4.6	0.6	91575	2954	34200	4350	18.5	0.6	4.4	0.2	138600	4471	32775	1725	0.99	7425
Feb-17	10.7	0.4	2.3	0.1	79950	2855	17100	825	17.0	0.6	3.1	0.9	127275	4546	23550	6675	0.99	7401
Mar-17	18.4	0.6	5.3	0.9	137850	4447	39675	6525	23.3	0.8	6.1	1.1	174825	5640	45750	8550	1.34	10086
Apr-17	8.4	0.3	1.6	0.7	62775	2093	11850	5250	16.5	0.5	4.2	1.3	123450	4115	31725	9600	0.83	6207
May-17	10.5	0.3	5.8	0.0	78900	2545	43875	0	24.8	0.8	8.4	1.3	186000	6000	63000	9975	1.14	8545
Jun-17	16.4	0.5	3.6	0.1	123300	4110	26850	750	24.3	0.8	6.9	0.9	182325	6077	51975	6375	1.36	10188
Jul-17	20.1	0.6	3.1	1.1	150375	4851	23025	8175	19.2	0.6	3.0	1.0	144225	4652	22500	7875	1.27	9503
Aug-17	20.0	0.6	3.1	1.1	150150	4844	23175	8025	25.2	0.8	4.7	1.1	188625	6085	35175	8400	1.46	10928
Sep-17	17.6	0.6	3.5	1.0	131700	4390	26175	7575	19.5	0.6	3.4	1.2	146100	4870	25425	9075	1.23	9260
Oct-17	15.3	0.5	3.3	0.8	115125	3714	24975	6375	22.0	0.7	3.5	1.1	165150	5327	26325	8250	1.21	9041
Nov-17	15.6	0.5	2.6	0.7	117150	3905	19650	5550	18.7	0.6	3.2	1.1	140325	4678	23700	8250	1.14	8582
Dec-17	19.3	0.6	2.1	1.0	144675	4667	15825	7725	16.8	0.5	2.0	0.9	126150	4069	14925	6600	1.16	8736
Jan-18	19.5	0.6	4.8	1.0	146250	4718	35700	7350	21.6	0.7	4.4	1.1	162150	5231	32925	8475	1.33	9948
Feb-18	11.4	0.4	2.8	0.7	85350	3048	21375	5025	8.5	0.3	1.9	0.6	63675	2274	14550	4500	0.71	5322
Mar-18	13.1	0.4	2.6	0.6	98250	3169	19350	4725	12.6	0.4	3.1	0.5	94125	3036	23475	3900	0.83	6206
Apr-18	9.5	0.3	2.0	0.4	70950	2365	15150	2925	10.1	0.3	1.8	0.3	75675	2522	13575	1950	0.65	4887
May-18	14.9	0.5	4.6	0.6	111750	3605	34875	4500	15.9	0.5	4.2	0.8	119475	3854	31800	5625	0.99	7459
Jun-18	14.3	0.5	3.4	0.6	107400	3580	25200	4200	14.6	0.5	3.5	0.6	109725	3658	25875	4800	0.96	7237
Jul-18	15.5	0.5	6.0	0.9	116250	3750	45150	6600	17.1	0.6	6.9	0.9	128400	4142	51450	6375	1.05	7892
Aug-18	12.2	0.4	4.9	0.8	91725	2959	37125	5625	17.8	0.6	7.1	0.5	133650	4311	53400	3600	0.97	7270
Sep-18	11.6	0.4	4.7	1.6	86925	2898	35400	11775	13.1	0.4	5.3	1.7	98025	3268	39600	12975	0.82	6165
Oct-18	12.8	0.4	6.5	0.5	96075	3099	48900	3450	13.8	0.4	5.5	0.9	103875	3351	41025	6525	0.86	6450
Nov-18	6.8	0.2	3.8	0.4	50850	1695	28275	3150	8.7	0.3	5.6	0.6	65175	2173	41925	4650	0.52	3868
Dec-18	12.8	0.4	4.1	0.2	95925	3094	30825	1125	13.8	0.4	5.2	0.2	103800	3348	38775	1275	0.86	6443
Jan-19	8.3	0.3	2.1	0.5	62100	2003	15900	3900	10.2	0.3	2.5	1.1	76350	2463	18750	8025	0.60	4466
Feb-19	9.7	0.3	1.8	0.5	72975	2606	13425	3975	11.3	0.4	1.7	0.6	84825	3029	13050	4800	0.75	5636
Mar-19	13.4	0.4	3.4	0.8	100575	3244	25800	6225	13.5	0.4	3.6	0.7	101550	3276	27225	5100	0.87	6520
Apr-19	10.8	0.4	6.6	0.7	81075	2702	49800	4950	12.1	0.4	5.8	1.2	91050	3035	43125	8775	0.77	5738
May-19	12.2	0.4	8.5	0.4	91125	2940	63825	2775	13.4	0.4	9.7	0.3	100800	3252	72900	2475	0.83	6191
Jun-19	11.1	0.4	5.8	1.1	83250	2775	43875	7875	13.9	0.5	6.7	0.9	104475	3482	50475	6675	0.83	6257
Jul-19	17.9	0.6	6.5	0.7	134400	4335	48525	5550	22.6	0.7	8.8	1.3	169800	5477	66300	9600	1.31	9813
Aug-19	14.7	0.5	6.3	0.7	110100	3552	47550	5175	19.0	0.6	7.2	1.2	142200	4587	54225	8775	1.09	8139
Sep-19	14.7	0.5	4.1	0.7	110250	3675	30450	5550	16.2	0.5	4.2	0.8	121500	4050	31200	6225	1.03	7725
Oct-19	12.9	0.4	1.8	0.8	96375	3109	13800	5700	13.8	0.4	2.3	0.0	103575	3341	17475	0	0.86	6450
Nov-19	13.4	0.4	5.9	0.5	100275	3342	44475	3825	14.8	0.5	5.6	1.1	110775	3693	41925	7950	0.94	7035
Dec-19	10.5	0.3	2.9	0.5	78825	2543	21975	3375	11.9	0.4	3.3	0.9	89475	2886	24675	6975	0.72	5429
Average:	13.6	0.4	4.1	0.7	101738	3338	30642	5013	16.3	0.5	4.7	0.9	122144	4007	35181	6427	0.98	7346
Maximum:	20.1	0.6	8.5	1.6	150375	4851	63825	11775	25.2	0.8	9.7	1.7	188625	6085	72900	12975	1.46	10928
Minimum:	6.8	0.2	1.6	0.0	50850	1695	11850	0	8.5	0.3	1.7	0.0	63675	2173	13050	0	0.52	3868
Std Dev:	3.4	0.1	1.7	0.3	25727	812	12697	2365	4.5	0.1	2.0	0.4	33792	1077	15273	2763	0	1731

Average without outliers: 7407

lier Z Score: 2.68

Average Daily Pump Hours

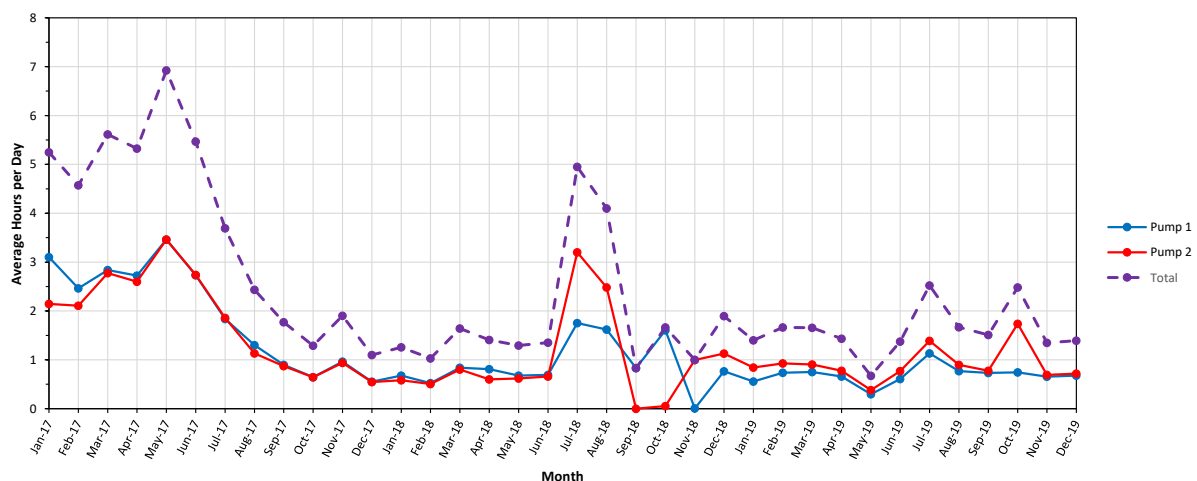


Lift Station No. 6 Summary																
Month	Pump 1								Pump 2							
	Hours Operated	Hours Per Day			Gallons Pumped	Gallons Per Day			Hours Operated	Hours Per Day			Gallons Pumped	Gallons Per Day		
		Avg	Max	Min		Avg	Max	Min		Avg	Max	Min		Avg	Max	Min
Jan-17	96.2	3.1	36.1	4.9	634656	20473	237930	32472	66.5	2.1	17.0	4.4	439098	14164	112200	28842
Feb-17	69.0	2.5	15.7	4.9	455532	16269	103686	32670	59.0	2.1	9.6	5.0	389466	13910	63624	33264
Mar-17	87.9	2.8	27.1	4.1	580338	18721	179058	27324	86.1	2.8	27.1	4.2	568194	18329	178662	27918
Apr-17	81.8	2.7	19.3	7.9	539616	17987	127116	51876	77.9	2.6	19.2	7.0	514404	17147	126786	45870
May-17	107.3	3.5	44.5	4.8	708444	22853	293898	31416	107.3	3.5	46.2	4.2	707916	22836	305052	27588
Jun-17	81.9	2.7	25.5	2.0	540606	18020	168498	12936	82.1	2.7	25.1	2.0	541992	18066	165660	13464
Jul-17	56.9	1.8	9.2	3.1	375474	12112	60786	20130	57.6	1.9	9.8	3.0	379962	12257	64746	19800
Aug-17	40.4	1.3	8.1	1.8	266442	8595	53460	11550	35.1	1.1	6.0	1.4	231924	7481	39468	9174
Sep-17	26.9	0.9	5.0	0.9	177606	5920	33000	6138	26.2	0.9	4.3	1.6	172722	5757	28644	10230
Oct-17	20.0	0.6	3.1	0.5	131736	4250	20790	3102	20.0	0.6	3.2	0.9	131868	4254	20790	5874
Nov-17	28.9	1.0	5.0	2.0	190938	6365	32802	12936	28.1	0.9	5.1	1.8	185724	6191	33792	12144
Dec-17	17.1	0.6	3.0	0.9	113058	3647	19800	5874	16.9	0.5	2.8	0.7	111738	3604	18150	4620
Jan-18	21.0	0.7	5.3	1.1	138534	4469	34848	6996	18.0	0.6	2.1	1.1	118734	3830	13992	7128
Feb-18	14.7	0.5	3.9	1.0	96756	3456	25542	6930	14.1	0.5	3.1	1.1	93324	3333	20526	7260
Mar-18	26.0	0.8	5.4	1.2	171270	5525	35310	7722	24.9	0.8	5.9	1.0	164472	5306	38808	6666
Apr-18	24.3	0.8	4.9	1.3	160116	5337	32670	8448	18.0	0.6	3.3	0.0	118536	3951	21846	0
May-18	21.0	0.7	5.0	1.0	138336	4462	32868	6732	19.2	0.6	4.4	0.5	126456	4079	29304	3564
Jun-18	20.8	0.7	6.9	0.5	137082	4569	45342	3366	19.8	0.7	6.1	0.9	130812	4360	39996	5742
Jul-18	54.3	1.8	12.3	3.0	358248	11556	80850	19536	99.2	3.2	44.1	0.0	654522	21114	291192	132
Aug-18	50.2	1.6	21.4	1.5	331122	10681	141372	9966	77.0	2.5	74.4	0.0	507936	16385	491304	0
Sep-18	24.9	0.8	18.4	1.0	164274	5476	121242	6270	0.0	0.0	0.0	0.0	0	0	0	0
Oct-18	49.8	1.6	20.4	2.1	328746	10605	134706	13662	1.7	0.1	1.7	0.0	11352	366	11154	0
Nov-18	0.1	0.0	0.1	0.0	924	31	528	0	29.9	1.0	18.5	2.1	197274	6576	122034	13596
Dec-18	23.8	0.8	9.8	0.3	156816	5059	64416	1650	35.0	1.1	14.2	0.4	231000	7452	93522	2376
Jan-19	17.3	0.6	4.2	0.4	114114	3681	27852	2640	26.1	0.8	7.1	1.1	172194	5555	46662	7260
Feb-19	20.6	0.7	3.2	1.9	136092	4860	21252	12540	26.0	0.9	4.4	2.1	171270	6117	29040	13860
Mar-19	23.3	0.8	6.3	1.3	153846	4963	41316	8250	28.0	0.9	7.6	1.9	184800	5961	50028	12804
Apr-19	19.7	0.7	9.6	2.0	130152	4338	63624	12870	23.3	0.8	11.2	2.2	153780	5126	74118	14784
May-19	9.2	0.3	6.0	0.2	60456	1950	39402	1254	11.7	0.4	7.6	0.6	77484	2499	50160	3696
Jun-19	18.2	0.6	9.9	2.1	119988	4000	65538	14124	23.1	0.8	12.6	3.1	152196	5073	83094	20262
Jul-19	35.1	1.1	15.9	1.8	231396	7464	104808	11682	43.1	1.4	19.1	2.5	284328	9172	125928	16764
Aug-19	23.9	0.8	9.6	1.0	157740	5088	63096	6864	27.8	0.9	9.8	1.0	183678	5925	64944	6798
Sep-19	22.0	0.7	5.8	1.3	145332	4844	38016	8514	23.3	0.8	6.1	1.3	153450	5115	40128	8580
Oct-19	23.0	0.7	3.8	1.0	151998	4903	25344	6732	53.9	1.7	16.2	1.1	355674	11473	106854	6930
Nov-19	19.6	0.7	9.8	1.1	129624	4321	64680	7392	20.8	0.7	10.1	1.2	137148	4572	66396	7656
Dec-19	21.0	0.7	5.1	1.0	138270	4460	33594	6666	22.2	0.7	6.1	0.3	146586	4729	39996	1848
Average:	36.1	1.2	11.2	1.8	237936	7814	74140	12201	37.5	1.2	13.1	1.7	247278	8113	86350	11292
Maximum:	107.3	3.46	44.5	7.9	708444	22853	293898	51876	107.3	3.46	74.4	7.0	707916	22836	491304	45870
Minimum:	0.1	0.0	0.1	0.0	924	31	528	0	0.0	0.0	0.0	0.0	0	0	0	0
Std Dev:	26.1	0.9	9.7	1.6	172588	5651	64126	10719	27.0	0.9	14.7	1.6	178312	5802	97143	10415

Average without outliers: 17993

lier Z Score: 2.68

Average Daily Pump Hours

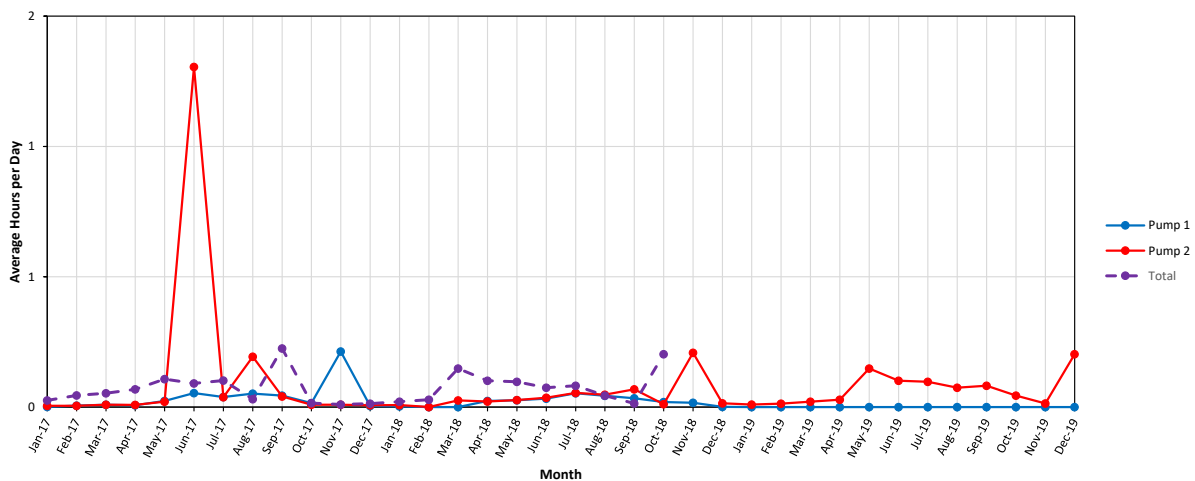


Lift Station No. 7 Summary																		
Month	Pump 1								Pump 2								Total of Average	
	Hours Operated	Hours Per Day			Gallons Pumped	Gallons Per Day			Hours Operated	Hours Per Day			Gallons Pumped	Gallons Per Day			Hours per Day	Gallons per Day
		Avg	Max	Min		Avg	Max	Min		Avg	Max	Min		Avg	Max	Min		
Jan-17	0.0	0.0	0.0	0.0	270	9	270	0	0.1	0.0	0.1	0.0	1350	44	1080	0	0.01	52
Feb-17	0.2	0.0	0.1	0.0	1440	51	720	0	0.1	0.0	0.1	0.0	1260	45	630	0	0.01	96
Mar-17	0.3	0.0	0.1	0.0	2520	81	630	0	0.3	0.0	0.1	0.0	2430	78	630	0	0.02	160
Apr-17	0.2	0.0	0.1	0.0	1890	63	630	0	0.3	0.0	0.1	0.0	2340	78	630	0	0.02	141
May-17	0.7	0.0	0.2	0.0	6480	209	1890	0	0.6	0.0	0.1	0.0	5850	189	1260	0	0.04	398
Jun-17	1.6	0.1	0.5	0.0	14490	483	4410	0	39.2	1.3	23.5	0.0	352440	11748	211320	0	1.36	12231
Jul-17	1.2	0.0	0.3	0.0	10800	348	2340	0	1.2	0.0	0.3	0.1	10620	343	2340	540	0.08	691
Aug-17	1.6	0.1	0.3	0.0	14400	465	2610	0	6.0	0.2	5.1	0.0	54000	1742	45540	0	0.25	2206
Sep-17	1.3	0.0	0.2	0.1	11880	396	2160	630	1.2	0.0	0.2	0.1	10980	366	1890	630	0.08	762
Oct-17	0.5	0.0	0.1	0.0	4230	136	1170	0	0.3	0.0	0.1	0.0	2520	81	1260	0	0.02	218
Nov-17	6.4	0.2	6.4	0.0	57510	1917	57510	0	0.3	0.0	0.1	0.0	2520	84	720	0	0.22	2001
Dec-17	0.1	0.0	0.1	0.0	1260	41	1170	0	0.2	0.0	0.1	0.0	1890	61	990	0	0.01	102
Jan-18	0.1	0.0	0.1	0.0	720	23	720	0	0.2	0.0	0.1	0.0	2070	67	810	0	0.01	90
Feb-18	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	0.0	0.0	90	3	90	0	0.00	3
Mar-18	0.0	0.0	0.0	0.0	0	0	0	0	0.8	0.0	0.2	0.0	7200	232	2070	0	0.03	232
Apr-18	0.7	0.0	0.3	0.0	6300	210	3060	0	0.6	0.0	0.3	0.0	5850	195	3060	0	0.04	405
May-18	0.8	0.0	0.3	0.0	7380	238	2430	0	0.8	0.0	0.3	0.0	7470	241	2430	0	0.05	479
Jun-18	1.0	0.0	0.4	0.0	8730	291	3150	0	1.1	0.0	0.4	0.1	9720	324	3330	630	0.07	615
Jul-18	1.6	0.1	0.9	0.1	14760	476	8010	540	1.7	0.1	0.8	0.1	15120	488	7560	1170	0.11	964
Aug-18	1.3	0.0	0.5	0.0	12060	389	4860	0	1.5	0.0	0.8	0.0	13320	430	6840	0	0.09	819
Sep-18	1.0	0.0	0.4	0.1	9090	303	3420	810	2.0	0.1	1.2	0.1	18360	612	10800	720	0.10	915
Oct-18	0.6	0.0	0.3	0.0	5400	174	2520	0	0.3	0.0	0.2	0.0	3060	99	1530	0	0.03	273
Nov-18	0.5	0.0	0.4	0.0	4410	147	3420	0	6.3	0.2	5.9	0.0	56340	1878	53010	0	0.23	2025
Dec-18	0.0	0.0	0.0	0.0	180	6	180	0	0.4	0.0	0.2	0.0	4050	131	2070	0	0.02	136
Jan-19	0.0	0.0	0.0	0.0	0	0	0	0	0.3	0.0	0.1	0.0	2790	90	720	0	0.01	90
Feb-19	0.0	0.0	0.0	0.0	0	0	0	0	0.4	0.0	0.1	0.0	3240	116	720	0	0.01	116
Mar-19	0.0	0.0	0.0	0.0	0	0	0	0	0.6	0.0	0.1	0.0	5850	189	1350	0	0.02	189
Apr-19	0.0	0.0	0.0	0.0	0	0	0	0	0.9	0.0	0.3	0.0	7650	255	3060	90	0.03	255
May-19	0.0	0.0	0.0	0.0	0	0	0	0	4.6	0.1	3.6	0.0	41220	1330	32670	0	0.15	1330
Jun-19	0.0	0.0	0.0	0.0	0	0	0	0	3.0	0.1	3.0	3.0	27270	909	27270	27270	0.10	909
Jul-19	0.0	0.0	0.0	0.0	0	0	0	0	3.0	0.1	1.0	0.1	27000	871	8550	1350	0.10	871
Aug-19	0.0	0.0	0.0	0.0	0	0	0	0	2.3	0.1	0.9	0.1	20790	671	8190	630	0.07	671
Sep-19	0.0	0.0	0.0	0.0	0	0	0	0	2.5	0.1	0.5	0.2	22140	738	4410	1350	0.08	738
Oct-19	0.0	0.0	0.0	0.0	0	0	0	0	1.4	0.0	0.4	0.0	12330	398	3600	0	0.04	398
Nov-19	0.0	0.0	0.0	0.0	0	0	0	0	0.4	0.0	0.2	0.0	3780	126	1620	0	0.01	126
Dec-19	0.0	0.0	0.0	0.0	0	0	0	0	6.3	0.2	6.1	0.0	56700	1829	55350	0	0.20	1829
Average:	0.6	0.0	0.3	0.0	5450	179	2980	55	2.5	0.1	1.6	0.1	22823	752	14150	955	0.10	932
Maximum:	6.4	0.2	6.4	0.1	57510	1917	57510	810	39.2	1.3	23.5	3.0	352440	11748	211320	27270	1.36	12231
Minimum:	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	0.0	0.0	90	3	90	0	0.00	3
Std Dev:	1.1	0.0	1.0	0.0	10072	335	9391	185	6.4	0.2	4.0	0.5	57843	1926	36389	4465	0.22	2000

Average without outliers: 654

lier Z Score: 2.68

Average Daily Pump Hours



APPENDIX E
Wastewater Treatment Facility
Lagoon Leak Testing

MEMO

To: Justin Sterger, Oregon Department of Environmental Quality
From: Michael Lees, P.E.
Subject: City of Boardman, Oregon - Wastewater Treatment Facility
Lagoon Leak Testing
Date: August 26, 2020
Job/File No. 439-61-02 (w/encl.)
cc: Karen Pettigrew, City of Boardman (w/encl.)
Kevin Kennedy, City of Boardman (w/encl.)



The City of Boardman completed an 11-day lagoon leak test for Lagoon No. 2 between July 20 and July 31, 2020, and a ten-day lagoon leak test for Lagoon No. 1 between August 3 and August 12, 2020. The results of the leak tests are included as Appendix A. The tests were performed in accordance with the Oregon Department of Environmental Quality's guidelines for estimating leakage from existing sewage lagoons. A copy of the guidelines is included as Appendix B.

The following equipment was used to perform the testing: hook gauge, levelled water pan, anemometer, and rain gauge. A detailed equipment list can be found in Appendix C. For the pan evaporation, the levelled water pan was placed in a location with few obstructions, and readings were taken daily at approximately the same time (see Photo 1). Precipitation readings were taken and recorded daily as well. The anemometer was intended to record wind speed at the lagoon site every minute during the duration of the testing. However, the memory on the device was reached on August 7, 2020. Wind speed data from the same local weather station used for temperature data (referenced below) was compared to the recorded anemometer data recorded at the lagoon site. The wind speed data from the weather station was significantly lower than that recorded at the lagoon site. Therefore, it was determined that the wind speed data from the weather station was not applicable. Daily average and maximum temperatures were taken from a local Boardman weather station. Historic weather information can be found at <https://www.wunderground.com/dashboard/pws/KORBOARD11>.



Photo 1: Leak test equipment setup.

The City also had the influent and effluent flowmeters verified for accuracy prior to the start of the lagoon leak tests. These tests show possible concerns with the accuracy of the meters. Results of the flowmeter tests can be found in Appendix D.

To minimize errors and remove flowmeter inaccuracies during the leak tests, City staff isolated the lagoons from one another at the control structures and ceased irrigating (i.e., no effluent measurements to consider). Secondly, the City completed two tests to remove the influent variable from the water balance. This was accomplished by leak testing Lagoons No. 2 and 3, while all the influent was sent to Lagoon No. 1. The second test consisted of testing Lagoons No. 1 and 3 with all influent being sent to Lagoon No. 2. The reason for the two tests was to simplify the calculations by removing the influent variable from the calculations and, thus, increasing accuracy since the flowmeter verification test revealed the flowmeters were recording higher than actual flows. The City also attached a more precise graduated tape to the staff gauges as seen in Photo 2. Photo 2 shows the graduations on the existing staff gauges have deteriorated. Attaching the more accurate graduated tape allowed the City to obtain a more precise measurement of the lagoon water surface elevations throughout the testing duration.



Photo 2: Lagoon staff gauge.

A pan coefficient of 0.76 was used to determine the net evaporation values. Since the liner in Lagoon No. 3 is relatively new (installed in 2002), it was assumed it has maintained its integrity and there is no seepage. Therefore, a 0.76 pan coefficient is justified. Also, a pan coefficient of 0.76 is within the published range of 0.70 and 0.80.

The first leak test on Lagoons No. 2 and 3 resulted in a total seepage of 1.564 inches and 0.244 inch, respectively. The resulting average seepage for Lagoons No. 2 and 3 was 0.142 inch per day and 0.022 inch per day, respectively.

The second leak test on Lagoons No. 1 and 3 resulted in a total seepage of 0.840 inch and 0.000 inch, respectively. The resulting average seepage for Lagoons No. 1 and 3 was 0.084 inch per day and 0.000 inch per day, respectively. The resulting seepage for Lagoon No. 3 was 0.000 inch for the second test because the pan coefficient was adjusted as discussed previously.

In summary, the lagoon leak tests were successful because errors were minimized to that of human error when recording measurements and accurate measurements were taken that are believed to be representative of actual field conditions.

ML/jg

Enclosures

G:\Clients\Boardman\Wastewater\439-61 WW Lagoon Leak Testing\Correspondence\Leak Test Memo\Sterger-Memo.doc

APPENDIX A

Leak Test Results



City of Boardman, Oregon
Lagoon Leak Test
August 26, 2020



Pan coefficient = 0.76

Temperature Information: <https://www.wunderground.com/dashboard/pws/KORBOARD11>

Lagoon No. 2 and Lagoon No. 3 Leak Test

Cell Water Depth (feet) at:				Test Start	3.79	4.19					
				Test End	3.32	3.83					
		Pan Evaporation (inches per day)	Net Evaporation (inches per day)	Rain Gauge Measurement (inches)	Difference in Lagoon No. 2 cell water depth (inches per day)	Difference in Lagoon No. 3 cell water depth (inches per day)	Maximum Temperature (Fahrenheit)	Minimum Temperature (Fahrenheit)	Average Temperature (Fahrenheit)	LAGOON 2 NET SEEPAGE (inches per day)	LAGOON 3 NET SEEPAGE (inches per day)
Date	Time										
20-Jul	8:40	0.385	0.293	0	-0.24	-0.12	100.2	65.8	83.8	0.053	0.173
21-Jul	8:42	0.664	0.505	0	-1.32	-0.72	104.2	66.7	86.1	-0.815	-0.215
22-Jul	8:53	0.756	0.575	0	-0.72	-0.36	98	71.3	83.7	-0.145	0.215
23-Jul	8:40	0.517	0.393	0	-0.48	-0.24	94	67.3	80.1	-0.087	0.153
24-Jul	8:47	0.541	0.412	0	-0.12	-0.60	88.1	63.1	74.4	0.292	-0.188
25-Jul	8:15	0.247	0.188	0	-0.48	-0.24	87.9	57.7	73	-0.292	-0.052
26-Jul	8:20	0.413	0.314	0	-0.48	-0.60	96.6	56.6	77.2	-0.166	-0.286
27-Jul	8:58	0.312	0.237	0	-0.60	-0.72	99.5	60.3	81.6	-0.363	-0.483
28-Jul	8:54	0.698	0.531	0	-0.48	-0.24	102.7	73.5	80.9	0.051	0.291
29-Jul	9:05	0.371	0.282	0	-0.36	-0.24	103.9	73.4	87.5	-0.078	0.042
30-Jul	8:59	0.458	0.348	0	-0.36	-0.24	108.7	85.7	98.4	-0.012	0.108
		Total Evaporation (inches)= 4.076		Total Difference in Lagoon Water Depth (inches)= -5.64 -4.32			Total Lagoon Seepage (inches) = -1.564			-0.244	
							Average Seepage (inches per day) =			-0.142 -0.022	

Lagoon No. 1 and Lagoon No. 3 Leak Test

Cell Water Depth (feet) at:				Test Start	5.47	3.87					
				Test End	5.09	3.56					
		Pan Evaporation (inches per day)	Net Evaporation (inches per day)	Rain Gauge Measurement (inches)	Difference in Lagoon No. 1 cell water depth (inches per day)	Difference in Lagoon No. 3 cell water depth (inches per day)	Maximum Temperature (Fahrenheit)	Minimum Temperature (Fahrenheit)	Average Temperature (Fahrenheit)	LAGOON 1 NET SEEPAGE (inches per day)	LAGOON 3 NET SEEPAGE (inches per day)
Date	Time										
3-Aug	8:40	0.492	0.374	0	-0.24	-0.24	93.6	67.9	80.4	0.134	0.134
4-Aug	8:51	0.315	0.239	0	-0.48	-0.24	94.8	63.3	79.2	-0.241	-0.001
5-Aug	8:57	0.563	0.428	0	-0.72	-0.36	98.9	61.6	81.1	-0.292	0.068
6-Aug	9:02	0.563	0.428	0	-0.48	-0.48	83.8	63.5	74.9	-0.052	-0.052
7-Aug	9:02	0.318	0.242	0	-0.24	-0.36	81.3	56.6	70	0.002	-0.118
8-Aug	8:50	0.562	0.427	0	-0.36	-0.36	89.2	72.4	81.5	0.067	0.067
9-Aug	8:52	0.193	0.147	0	-0.36	-0.24	89.2	72.4	81.5	-0.213	-0.093
10-Aug	8:55	0.538	0.409	0	-0.60	-0.48	96.9	59.7	79.1	-0.191	-0.071
11-Aug	8:56	0.865	0.658	0	-0.72	-0.60	91.8	66.5	79.7	-0.062	0.058
12-Aug	8:58	0.481	0.366	Trace	-0.36	-0.36	82	74.4	78.5	0.006	0.006
		Total Evaporation (inches)= 3.720		Total Difference in Lagoon Water Depth (inches)= -4.56 -3.72			Total Lagoon Seepage (inches) = Average Seepage (inches per day) =			-0.840 -0.004	0.000 0.000

Anemometer Wind Speed Data

Date	Average Wind Speed (mph)	Maximum Wind Speed (mph)
20-Jul	20.4	6.6
21-Jul	36.7	19.4
22-Jul	36.7	24.3
23-Jul	36.7	23.0
24-Jul	37.2	21.9
25-Jul	17.7	6.3
26-Jul	20.5	7.5
27-Jul	41.1	5.7
28-Jul	36.7	15.9
29-Jul	20.5	7.0
30-Jul	24.1	8.5
31-Jul	38.1	28.1
1-Aug	36.7	21.9
2-Aug	41.1	14.8
3-Aug	36.7	11.5
4-Aug	25.3	5.9
5-Aug	36.7	19.4
6-Aug	44.5	24.8
7-Aug	20.4	9.4

City of Boardman Lagoon Leak Test

Anemometer Data

APPENDIX B
Oregon Department of Environmental
Quality Guidelines

State of Oregon

Department of Environmental Quality Guidelines

Guidelines for Estimating Leakage from Existing Sewage Lagoons

PURPOSE AND SCOPE

EXCLUSIONS

GENERAL APPROACH

EQUIPMENT REQUIREMENTS

MEASUREMENTS AND CALCULATIONS

REPORT FORMAT

ANNUAL WATER BALANCE

NEW LAGOONS

PURPOSE AND SCOPE

These guidelines provide for relatively inexpensive test equipment and procedures to be used for prioritizing problem lagoons used for treating domestic sewage. Such tests are not definitive. They should be considered preliminary and approximate.

Tests based on these guidelines can only indicate whether the seal on an existing lagoon probably remains intact, or approximately how much it may be leaking. Preliminary tests of this type are not suitable for sewage lagoons where there is a strong likelihood of contamination, or an immediate urgency to protect a priority aquifer.

EXCLUSIONS

Such preliminary testing is not suitable for various types of lagoons which may contain stronger wastes than sewage. For example, leak tests for sludge, septage, strong industrial wastes, and landfill leachate lagoons may warrant a higher level of accuracy. To attain greater accuracy entails considerable time and expense, requires more equipment to develop wind and temperature records, and involves calculations outside the scope of these guidelines.

Such accuracy is seldom warranted for sewage lagoons. In critical groundwater pollution situations, where lagoon seepage is a known concern, immediate installation of monitoring wells and a formal program of groundwater monitoring are normally warranted. In such situations, no program of leak testing is probably accurate enough to substitute for direct groundwater monitoring. Leak testing would only delay the definitive determinations that must be made.

GENERAL APPROACH

The general objective of a leak test is to estimate the average rate of seepage through the bottom of the lagoon. Normally each lagoon cell is isolated and tested separately, which better pinpoints the location of any major leaks. The rate of seepage is expressed in inches per day or centimeters per second.

Leak testing should be restricted to July and August, when rainfall is minimal and the ground is dry enough to exclude significant runoff. Tests conducted at other times will have more variables and may underreport seepage due to runoff effects.

To obtain reasonable precision, each cell of a lagoon should be isolated and tested over a period of 10 - 15 days. Cell depth and pan evaporation measurements should be taken daily. If the lagoon cell cannot be isolated, then daily influent/effluent flows must also be measured. Daily measurements are preferred over weekly to improve precision and to minimize random measurement errors.

Lagoon liquid depth should suit the purpose of the test. To determine average seepage rates, lagoons should be at average operating depth.

In priority areas, any rate of seepage greater than zero may warrant direct sampling and monitoring of the groundwater. Seepage of 1/8" per day or less is normal. However, this low rate can cause groundwater contamination where lagoon contents are strong and background levels are high quality. Seepage exceeding 1/4" per day indicates a seal failure, or absence of adequate initial seal.

EQUIPMENT REQUIREMENTS

Each cell of a lagoon needs to be equipped with a staff gauge for level measurements. Stilling wells to dampen wave action are recommended, and will allow a staff gauge to be read to 1/8" - 1/16". Precipitation can be measured to about 1/100" with a good rain gauge. Evaporation can be measured to roughly 1/1000" with a hook gauge.

The following specifications for rainfall and evaporation equipment are based on Weathertronics equipment manufactured by Qualimetrics, Inc. of Sacramento, and available in Oregon through International Reforestation Supply, Eugene (345-0597). Equivalent equipment is acceptable.

1. Rain Gauge. Qualimetrics Model 6330. This is a plastic gauge with 11" capacity and 0.01" graduations, designed for post mounting.
2. Evaporation Pan. Qualimetrics Model 6821. This is a standard US Weather Bureau steel pan, 47.5" diameter by 10" deep.
3. Hook Gauge. Qualimetrics Model 6831. This is a brass gauge with 0.02" graduations.

To obtain accurate measurements, the equipment needs to be set up level and plumb in an unsheltered area near the lagoon. Equipment may have to be fenced to exclude animals.

The above list is a minimum. Various equipment needed to attain higher levels of accuracy is not listed. For example:

- Recording anemometer
- Max/min thermometers for air, for the evaporation pan, and for the lagoon surface

- Upwind and downwind evaporation pans

- Barometric pressure

If such equipment is available, its use will add precision and accuracy to the results. However, its use is not mandatory for preliminary leak tests used to screen and prioritize existing sewage treatment lagoons.

MEASUREMENTS AND CALCULATIONS

Measurements should be made on a schedule, at the same time each day, so that each set of data represents the duration of exactly one day. All measurements should be tabulated to aid calculation and reporting. We recommend using the attached form or a similar format.

Computations should be converted to compatible units of depth. Influent volume (gallons per day) is converted to inches per day through measurement of the actual water surface area. Rainfall will normally be near zero in July and August, but should be verified daily.

Evaporation will vary with wind and temperature. It should be measured daily, and the pan should be kept well filled.

Lagoon evaporation rates are invariably less than pan evaporation rates. Pan correction factors generally vary from 0.7 to 0.9. The larger the lagoon, the more its evaporation rate lags behind pan evaporation, so the smaller the numerical value of the pan correction factor.

In hot and windy summer weather, evaporation can be substantial. An erroneous pan correction factor can inject significant error. The result of computing seepage rates without any correction for pan evaporation is to overcalculate the evaporation rate. The effect of this error would be to underreport the seepage rate.

REPORT FORMAT

Leakage reports should be short and to the point. The main conclusion is to estimate the seepage rate from each lagoon cell, and from the lagoon as a whole. The methodology and equipment need to be described briefly but thoroughly. A copy of all field measurements and calculations should be tabulated and attached as supporting documentation.

Reports should be certified and signed by a registered engineer or professional hydrologist.

ANNUAL WATER BALANCE

The annual water balance prepared for each lagoon requires determinations of both seepage and evaporation. Leak tests performed according to these guidelines at average liquid depth can establish an average rate of seepage for the water balance. The rate of seepage will tend to vary with liquid level, and will remain constant if the level stays constant.

For the purpose of making water balance calculations, a monthly average evaporation rate should be obtained from local climatological records. Such records may then be applied with a suitable pan correction factor between 0.7 and 0.9, as previously described.

Rate of evaporation and pan correction factors both tend to vary throughout the year. To make accurate adjustments requires additional measurements be taken of all the pertinent factors. These include wind, water

temperature, air temperature, and atmospheric pressure. Pan evaporation corrections should conform to established calculation methods, as presented in standard hydrology texts.

NEW LAGOONS

New sewage and sludge lagoons are designed to be effectively watertight and nearly leak-free. Lagoons which may jeopardize groundwater because of their contents, uses, or location are routinely installed with groundwater monitoring wells. In such applications, leak testing is not a practical or reliable alternative to direct monitoring of the groundwater.

All of the measurements in leak tests are approximations, especially liquid level, and the pan correction factor is usually a rough estimate. Consequently, seepage computed from a leak test cannot be used to prove or substantiate the existence of any actual leak. Leak testing as a basis for acceptance of lagoon construction is not feasible, too often has led to fruitless litigation, and should be discouraged.

As a practical matter, the engineer must design each lagoon for watertightness. Then the engineer must conduct thorough, intensive, and continuous construction inspection to verify that watertight construction is being attained. Inspection may include compaction, infiltrometer, smoke, and spark tests, and constant observation of workmanship and materials.

If leakage and contamination occurred from a properly inspected and certified lagoon, it would indicate a damaged liner or a failure of design. Assuming good design and inspection, the engineer's written certification of proper construction carries a presumption of watertightness. No leak testing program should be approved as a substitute for diligent construction inspection.

INQUIRIES

Inquiries about these guidelines should be directed to DEQ regional water-quality plan review engineers.

DSM:LAGOON2.TST

Orig. V.93

Rev1. VIII.94

LAGOON LEAK TEST

CITY OF _____

CELL NO. _____ WATER SURFACE AREA _____

CELL WATER DEPTH @ TEST START _____ @ TEST END _____

Date	INFLUENT (in/day)	+PRECIP (in/day)	-EVAP (in/day)	- EFFLUENT (in/day)	=NET SEEPAGE

NOTES:

APPENDIX C

Detailed Equipment List

City of Boardman, Oregon
Lagoon Leak Test Equipment List

1. Rain Gauge. 6330 Stratus Rain Gauge. This is a plastic gauge with an 11-inch capacity and 0.01-inch graduations, designed for post mounting.
2. Evaporation Pan. Qualimetrics Model 6821. This is a standard U.S. Weather Bureau steel pan, 47.5-inch diameter with a 10-inch depth.
3. Hook Gauge. Qualimetrics Model 6831. This is a metal gauge with 0.002-inch graduations.
4. Staff gauge for each lagoon to determine water levels. The City's lagoons were designs with staff gauge vaults hydraulically connected to the lagoons. Due to the age of the staff gauges, the existing graduations were hard to read accurately. Therefore, the staff gauges were equipped with measuring sticks with 0.1-inch graduations to obtain more accurate measurements.
5. Anemometer. PCE-ADL 11. This anemometer is a data logger for recording wind speeds.

APPENDIX D

Flowmeter Test Results



Customer:
City of Boardman
200 City Center Circle
Boardman, OR 97818

Report Date: 6/23/20, 7/16/20
Service Dates: 5/13/20, 5/14/20, 6/30/20
Service Order: SO-09188, SO-10802

Technician:
Rocky Desai
Cell: 503-730-6104
Seattle Office: 206-762-6050
rdesai@branom.com

Clamp-On Comparison Testing (see meter list for complete information):

TAG	Make/Model
Irrigation Pump	Siemens
Lift Station #3	Siemens
Collector #1	Yokogawa ADMAG
Collector #2	Yokogawa ADMAG

Test Instruments:

Test Instrument	Serial Number	Calibration Date	Calibration Due
Siemens FUP1010 Ultrasonic Flowmeter	35526	NA	NA

Procedure:

On 5/13/20 (SO-09188) the "Irrigation Pump" meter could not be tested. The FUP-1010 went into fault whenever the pump was run. This is likely due to the pipe not being completely full, and/or possible excessive aeration or turbulence. The meter was tested again on 6/30/20 (SO-10802) with the irrigator on. Numerous readings were observed, and the average percent difference flow and total flow calculated for the meter.

The "Collector #1" and "Collector #2" meters could not be tested. There was insufficient length of unobstructed straight pipe to install the FUP-1010.

Testing of the "Lift Station #3" meter was successful. Flow comparison tests were performed between this meter and the Siemens FUP-1010 Ultrasonic Clamp-On Flowmeter. Numerous readings were observed, and the average percent difference calculated for the meter.



The accuracy of the FUP-1010 is limited without known pipe wall thickness and fluid temperature. Fluid properties differing from pure water (suspended solids, viscosity, S.G., etc.) may also affect accuracy as well as deposits/corrosion on the inside or outside of the pipe. In addition, the best accuracy is achieved under standard conditions defined by Siemens as "measurements taken on a straight run of 15 diameters upstream and 5 diameters downstream; flow rate above 1 fps; non-aerated Newtonian liquids flowing at Reynolds numbers <2000 or >10000".

The FUP-1010 reports the velocity of sound measured through the fluid (Vs), the signal strength (ALC), and the level of aeration (AER) which may include suspended particles and turbulence. Layers of paint and corrosion on the inside or outside of the pipe affect the signal strength. A Vs close to the estimated Vs indicates the physical installation and programmed parameters are likely correct. Low ALC and/or high AER may indicate that the accuracy is limited. Clamp-on comparison testing does not reference a known standard or determine how close the flow observed is to the actual flow. In practice, comparison results within 5% indicate that the meter in question is very likely functioning accurately and as intended. Results within 10% may indicate an issue with the meter but may also be due to less than ideal test conditions. Results greater than 10% may indicate an issue with the meter or significant issues with the test conditions, parameters, or installation.

Data and Discussion:

The flow test data summary is show below:

TAG	FUP-1010 AVG (GPM)	Lift Station #3 AVG (GPM)	Difference (GPM)	Difference (%)
Lift Station #3	1094	1341	248	20.4
Irrigation Pump	747	843	96	12.1

The total test data summary is show below:

TAG	FUP-1010 AVG (Gallons)	Irrigation Pump AVG (Gallons)	Difference (Gallons)	Difference (%)
Irrigation Pump	9078	10432	1354	13.9

The FUP1010 Diagnostic Parameters are show below:

TAG	Vs Est.	Vs	ALC	AER
Irrigation Pump	1482	1462	54	4
Lift Station #3	1482	1447	38	4

Lift Station #3:

The measured velocity of sound (Vs) was relatively close to the estimated velocity of sound. The signal strength (ALC) was excellent, and the aeration (AER) was very low. All these factors indicate a good

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installation of the FUP-1010 and readings that should be relatively accurate. It is possible that the meter is reading higher than the actual flow, but the percent difference observed does not indicate a defective meter. If possible, the flow tube should be cleaned as buildup on the electrodes can affect the performance of the meter. Any buildup will also reduce the inside diameter of the meter and result in the meter reading high.

Irrigation Pump:

On 6/30/20 (SO-10802) the meter was tested successfully with the irrigator on. The measured velocity of sound (V_s) was close to the estimated velocity of sound. The signal strength (ALC) was excellent, and the aeration (AER) was very low. All these factors indicate a good installation of the FUP-1010 and readings that should be relatively accurate. It is possible that the meter is reading higher than the actual flow, but the percent difference observed does not indicate a defective meter. If possible, the flow tube should be cleaned as buildup on the electrodes can affect the performance of the meter. Any buildup will also reduce the inside diameter of the meter and result in the meter reading high.

Recommendations:

Annual testing or testing as required. Clean flow tubes.

APPENDIX F

Cursory Environmental Review

MEMO

To: Karen Pettigrew, City Manager, City of Boardman
From: Dana Kurtz, Environmental Scientist, and Lindsay Costigan, Archaeological Technician
Subject: **Boardman Wastewater Facilities Plan - Cursory Environmental Review**
Date: August 31, 2018, Updated June 1, 2021
Job/File No. 439-48-02 (w/encl.)
cc: Mike Lees, P.E., AP (w/encl.)

Project Description

Since 1979, the City of Boardman has been operating a facultative lagoon system and effluent land application facilities to serve the City's wastewater needs. The City of Boardman renewed its Oregon Department of Environmental Quality (DEQ) Water Pollution Control Facilities Permit in March 2020 and needs to evaluate the wastewater system for adequacy to provide wastewater treatment and disposal that meets permit requirements during the 20-year planning period.

The proposed improvements to the City of Boardman's wastewater system include:

- The primary lift stations (Lift Stations No. 1 through 3) will be upgraded with new electrical, controls, instrumentation, and submersible pumps. Portable pump bypass piping on Lift Stations No. 4 through 7 will be installed for emergency situations and for ease of maintenance.
- A new wastewater storage lagoon having a surface area of approximately 9.5 acres with a storage capacity of approximately 27.3 million gallons will be constructed.

The locations of the improvements are shown on Figure 5-5, Proposed Storage Lagoon Location, and Figure 6-1, Selected Improvements, from the City of Boardman, Oregon, Wastewater Facilities Plan - 2021, prepared by Anderson Perry & Associates, Inc. These figures are attached to this memo. The proposed storage lagoon and wastewater facilities operational improvements are both included in the project area, as discussed in this memo.

Cursory Environmental Review

This memo provides a desktop level evaluation of features in the vicinity of the project area, which generally includes the area between the Union Pacific Railroad (UPRR) tracks and Interstate 84 (I-84) near the existing wastewater lagoons east of the Boardman urban growth boundary (UGB) and west to Lift Station No. 1 just south of I-84.

The proposed storage lagoon and secondary lift station portable bypass piping will require ground disturbance; however, improvements to the primary lift stations will not.

This review is preliminary and is based on an evaluation of existing data. The following environmental conditions and concerns exist or are associated with the project area.

Waterways and Wetlands

According to the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory Map, and the Oregon Department of State Lands (DSL) Statewide Wetlands Inventory Map, wetlands are mapped within the City of Boardman. Lift Station No. 1 is located within a mapped freshwater forested/shrub wetland; however, the storage lagoon and other proposed improvements do not occur within wetland areas (USFWS, 2018a, and DSL, 2021) (see Attachment 1, U.S. Fish and Wildlife Service National Wetlands Inventory Map and Oregon Department of State Lands Statewide Wetlands Inventory Map). Based on the proposed project layout, and because no ground disturbance is proposed at the primary lift stations, no impact to wetlands is anticipated. However, a wetland determination/delineation may be required to verify that wetlands are not present in the project area.

While no wetlands are anticipated to be impacted by the project as designed, there are wetlands in the vicinity of the proposed project area. One freshwater emergent wetland exists 0.02 mile southwest of Lift Station No. 4. One freshwater pond, freshwater emergent wetland, and freshwater forested/shrub wetland exist directly west of Lift Station No. 1. One freshwater pond lies between Lift Stations No. 5 and 6, and five more lie east of Lift Station No. 6. Some of these ponds appear to be artificially constructed and are used for water storage. Among the latter ponds are freshwater emergent wetlands, freshwater forested/shrub wetlands, and a lake. The area east of Lift Station No. 3 and west of the proposed lagoon consists mostly of surface mapped ponds. Two ponds mapped adjacent to the proposed lagoon site are the existing wastewater lagoons. A wetland southeast of the proposed lagoon site contains freshwater ponds, a freshwater emergent wetland, and a freshwater forested/shrub wetland.

According to the Federal Emergency Management Agency (FEMA), Lift Station No. 6 falls within Zone A, meaning this area is within the 100-year floodplain and must be designed to meet 100-year floodplain requirements (FEMA, 2018) (see Attachment 2, Federal Emergency Management Agency Floodplain Map). If ground disturbance occurs within the flood zones identified by FEMA, a local floodplain development permit may be required; however, this should be verified with a local planning official.

Federally Listed Species and Critical Habitat

Lists of federally protected species for this area were obtained from the USFWS and the National Marine Fisheries Service (NMFS). Bull trout (*Salvelinus confluentus*), steelhead (*Oncorhynchus mykiss*), Chinook salmon (*Oncorhynchus tshawytscha*), and sockeye salmon (*Oncorhynchus nerka*) are present in the Columbia River near the project area (USFWS, 2018b, and NMFS, 2021a) (see Attachment 3, U.S. Fish and Wildlife Service Trust List). No in-water work is anticipated for this project, so these species are unlikely to be affected.

The Columbia River is considered critical habitat for steelhead, Chinook salmon, sockeye salmon, and bull trout. The Columbia River is located approximately 1 mile north of the project area and will not be affected by the proposed improvements (NMFS, 2021b). The Columbia River near the project area is not considered essential salmonid habitat but is considered Pacific Salmon Essential Fish Habitat (DSL, 2017, and NMFS, 2021c).

As designed, the project is not anticipated to have an impact on federally listed species and critical habitat; however, a No Effect Memo or other documentation may be required depending on whether a federal nexus is identified for the project (federal permits, federal funding, and/or federal land).

Migratory Birds

The Migratory Bird Treaty Act (MBTA) of 1918 is a federal law implemented to protect migratory birds. The MBTA makes it unlawful to pursue, hunt, take, capture, kill, or sell listed migratory birds without a waiver. Migratory birds may seek refuge on the ground, in trees, or on cliffs and structures such as buildings and bridges. The MBTA prohibits the removal of all listed species and their parts (feathers, eggs, nests, etc.) from such property.

The Bald and Golden Eagle Protection Act, as amended, is a similar law that prohibits anyone without a permit from molesting, disturbing, or possessing parts, nests, or eggs of bald and golden eagles. Once the specific corridor alignment is developed for the Boardman project, if eagles or their nests are located within the alignment, the applicable current regulations regarding activity restrictions near eagle nesting and roosting sites should be followed during construction.

Cultural Resources and Historic Properties

The Oregon Archaeological Records Remote Access (OARRA) Database lists one cultural resource survey and no previously recorded archaeological sites within the footprint of the proposed lagoon (OARRA, 2021). This survey was conducted in 2013 by the URS Corporation for the Portland General Electric Company. According to the OARRA Database, there are numerous historic and pre-contact archaeological sites located within 1 mile of the proposed lagoon, none of which are located within the project area.

The project areas for Lift Stations No. 1, 3, and 6 contain one survey and no cultural resources. The project areas for Lift Stations No. 2 and 4 contain two surveys and no cultural resources. The project area for Lift Station No. 5 contains three surveys and no cultural resources. Lift Station No. 7 is located within the Boardman Townsite archaeological site and has been included in three surveys. All surveys overlapping lift station project areas cover the project area completely.

Seventy cultural resource surveys have resulted in the identification of 33 cultural resources within 1 mile of the project areas. Components of sites within a 1-mile radius range from lithic flakes and animal bone fragments to abandoned cars and historic refuse. Surveys near Boardman generally consist of reconnaissance surveys conducted for expansion of the Port of Morrow, recording of the historic Boardman Townsite, and utility installation. The area in which disturbance is planned to occur has a high potential for pre-contact and historic archaeological sites.

Potential impacts to archaeological resources because of construction include excavation, sediment disturbance, sediment compaction, and other ground-disturbing construction activities. Additional examination of historic maps should occur as specific plans and designs are made to ascertain if such work could potentially impact historical archaeological deposits and the City should mitigate for such impacts. Additionally, efforts may be required to identify previous areas of disturbance within proposed work areas so undisturbed areas may be avoided or investigated for archaeological materials. The proposed project occurs within an area that is generally assumed to have a high potential for pre-contact and historic cultural resources. The Oregon State Historic Preservation Office (SHPO) and Native American tribes with an interest in the area should be consulted prior to finalizing the project design.

Additional requirements may be necessary depending on federal involvement (funding or permits), which may necessitate compliance with Section 106 of the National Historic Preservation Act (NHPA). If no federal nexus is identified, the project must still comply with Oregon Revised Statutes (ORS) (ORS 97.740, ORS 358.905-358.961, and ORS 390.235) and Oregon Administrative Rules 736-051-0090, which protect Native American cairns, graves, and associated items; items of cultural patrimony; and archaeological sites on non-federal and private lands. Additional archaeological surveying, testing, and/or permitting may be required to comply with state laws.

Parks and Natural Areas

There are no parks within the vicinity of the proposed lagoon. Lift Station No. 7 is adjacent to a park at the marina. Other parks in the vicinity include open grassy spaces and ball parks at Riverside High School (0.2 mile east of Lift Station No. 4) and an unnamed park bounded by West Park Avenue, 1st Street Northwest, Boardman Avenue Northwest, and 2nd Street Northwest (adjacent to Lift Station No. 4). No parks are anticipated to be impacted by the proposed improvements.

Land Use

The land in the vicinity of the project is a mixture of residential, commercial, and industrial.

The lift station improvements will occur within the city limits on City-owned properties near areas zoned residential, commercial, and industrial. The proposed lagoon is outside the City's UGB; Morrow County zones this area as port industrial. Lift Station No. 6 is zoned general industrial, Lift Station No. 5 is zoned light industrial, and Lift Station No. 4 is zoned commercial.

City and County permits are anticipated to be required to complete work within these rights-of-way.

The proposed 27.3 million gallon lagoon will be located south of UPRR tracks and north of I-84 adjacent to three existing wastewater lagoons. This area is zoned port industrial. A Conditional Use Permit is anticipated to be required for the installation of the proposed lagoon.

At this time, improvements to lift stations are not anticipated to have any direct or indirect impacts on land use.

Important Farmland

The soils throughout the City of Boardman and adjacent areas are designated as fine sands and loamy sands underlain by basalt bedrock. According to a web soil survey of the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) website for the area around the City of Boardman, the study area consists of Quincy fine sand, 2 to 12 percent slopes; Quincy loamy fine sand, 2 to 12 percent slopes; and Burbank loamy fine sand, 2 to 5 percent slopes (NRCS, 2018). Table 1 lists the mapped soils in the project area.

TABLE 1
SOILS CLASSIFICATION, BOARDMAN, OREGON

Map Unit Symbol	Map Unit Name	Rating
39C	Quincy fine sand, 2 to 12 percent slopes	Not prime farmland
40C	Quincy loamy fine sand, 2 to 12 percent slopes	Not prime farmland
8B	Burbank loamy fine sand, 2 to 5 percent slopes	Not prime farmland

None of the areas of the proposed improvements are listed as prime farmland. The proposed lagoon will be located on land northwest of the existing City-owned irrigation pivot, on which treated wastewater is irrigated, and east of the existing lagoons.

If more than 0.5 acre of farmland is permanently converted from farmland by this project, consultation with the NRCS under the Farmland Protection Policy Act would need to be initiated to determine if mitigation is required. This project is not anticipated to convert farmland; therefore, the AD-1006 form is not anticipated to be necessary.

Hazardous Materials

Environmental records were reviewed for identified hazardous and solid waste sites, cleanup sites, underground storage tanks (UST), and leaking underground storage tanks (LUST) using information on the DEQ Environmental Cleanup Site Information Database and DEQ Facility Profiler (DEQ, 2018). For a map of facilities, see Attachment 4, Oregon Department of Environmental Quality Map.

Within approximately 1 mile of the proposed lagoon are two environmental cleanup sites, one UST site, no hazardous waste generators, no LUST sites, no active air emissions permits, no water quality site permits, and no underground injection permits. Based on the proximity and current statuses of each of the sites, no adverse impact to the proposed project is anticipated.

A Phase I Environmental Site Assessment is being completed to evaluate the potential environmental records associated with the proposed lagoon site. These include a former gun range, presence of a substation with a recorded spill adjacent to the property, and refuse (including a caboose) present on the lagoon property. Proposed approaches to mitigate risk (particularly associated with lead presence at the former gun range) are described in the Phase I Environmental Site Assessment. With appropriate mitigation, this site is anticipated to be acceptable for use as a lagoon. All recommendations of an environmental nature should be verified with the DEQ prior to implementation.

One barge unloading facility listed west of Lift Station No. 7 will not impact the project. One UST and one LUST are located at gas stations east of Lift Station No. 4 and south of Lift Station No. 2. One LUST and two hazardous waste sites are located at Lamb-Weston, Inc., and Port of Morrow Special District south of Lift Station No. 6. One LUST and one UST are located at a gas station east of Lift Station No. 1. One UST is located at Morrow Power LLC. north of Lift Station No. 3. No facilities are listed in the vicinity of Lift Station No. 5. These sites are not located within the project area of disturbance and, because of the localized nature of any potential remaining contamination to soil, they are unlikely to affect project construction.

Permits

The National Environmental Policy Act (NEPA) states that if there is a federal action (i.e., funding, permitting, etc.), the project must comply with NEPA requirements.

The proposed project is not anticipated to impact wetlands. If work is performed below the ordinary high water elevation or within wetlands, permits may be required from the U.S. Army Corps of Engineers (USACE) and the DSL. If a USACE permit is required, it will trigger a federal nexus requiring compliance with Section 7 of the Endangered Species Act (ESA), as well as Section 106 of the NHPA. Compliance with Section 7 will require an analysis of the potential impact on ESA-listed species and consultation with the USFWS and NMFS.

Depending on the area of disturbance, a 1200-C Stormwater Construction Permit may be required. If the project increases impervious surfaces, a Stormwater Management Plan may be required.

A Conditional Use Permit is anticipated to be required for the construction of the proposed lagoon.

Environmental requirements for the proposed lagoon site may require documentation and approval through the DEQ (including mitigation for lead presence and potential deed restrictions on the site). These requirements should be verified with the DEQ.

Conclusion

The proposed Boardman Wastewater System Improvements project has been inferred, through database research, to have potential impacts to resources and may require the following environmental compliance measures:

Waterways and Wetlands

- No work within waterways or wetlands is anticipated. Lift Station No. 1 appears to be located within a wetland; however, no ground disturbance is anticipated to occur at the primary lift stations. A site visit is recommended to be conducted to document the occurrence of wetlands in areas where ground disturbance will occur, and a wetland delineation may be required if wetlands will be impacted by the project.
- Impacts to wetlands may require compensatory mitigation.

- It appears that Lift Station No. 6 is located in the 100-year floodplain. If ground disturbance occurs in the 100-year floodplain, FEMA standards may need to be considered and a local floodplain development permit may need to be obtained.

Federally Listed Species and Critical Habitat

- Consultation with the USFWS and NMFS may be required if a federal nexus is identified (federal permits, federal funding, and/or federal land). As designed, it appears that the project will not affect these resources, and a No Effect Memo may be sufficient to document this finding.

Migratory Birds

- Current regulations regarding activity restrictions near eagle nesting and roosting sites should be followed during construction. It is unlikely the project will affect migratory birds.

Cultural Resources and Historic Properties

- Known cultural resource sites should be avoided so as not to disturb sensitive cultural resources.
- If a federal nexus is anticipated, Section 106 of the NHPA requirements may apply.
- The SHPO officer and local tribal historic preservation officers should be consulted to identify any potential concerns or important resources.
- A cultural resource survey may be required for any ground disturbance at the proposed lagoon site or for any part of the lift station improvements that occurs on land that has not been previously surveyed or disturbed.
- Recommendations provided by SHPO and Native American tribes should be followed.
- If cultural resources are discovered during construction, all work should halt, and SHPO should be notified.

Parks and Natural Areas

- The project is not anticipated to affect parks and natural areas.

Land Use

- A Conditional Use Permit is anticipated to be required for the proposed lagoon.

Hazardous Materials

- Environmental requirements for the proposed lagoon site may require documentation and approval through the DEQ (including mitigation for lead presence and potential deed restrictions on the site). These requirements should be verified with the DEQ.
- Depending on funding requirements, additional assessment of hazardous materials may be required.

Stormwater

- It is anticipated that ground disturbance for the construction of the new storage lagoon will be greater than 1 acre; therefore, a 1200-C Stormwater Construction Permit may be required.
- It is anticipated that a gravel road will be installed around the proposed storage lagoon. The gravel road will increase the project area's impervious surfaces; therefore, a Stormwater Management Plan may be required.

Best management practices should be applied to all construction activities.

References

Federal Emergency Management Agency (2018). *Flood Map Service Center: City of Boardman*. Department of Homeland Security.

National Marine Fisheries Service (NMFS) (2021a). Status of ESA Listings & Critical Habitat Designations for West Coast Salmon and Steelhead. Accessed May 26, 2021. <https://www.fisheries.noaa.gov/>

NMFS (2021b). Protected Resources App. Accessed May 26, 2021. <https://www.habitat.noaa.gov/protection/efh/efhmapper/>

NMFS (2021c). EFH Mapper. Accessed May 26, 2021. <https://www.habitat.noaa.gov/protection/efh/efhmapper/>

Natural Resources Conservation Service (2018). Web Soil Survey. Accessed June 12, 2018. <http://websoilsurvey.nrcs.usda.gov/app/>

Oregon Archaeological Records Remote Access Database (2021). Accessed May 26, 2021. <http://www.oregon.gov/oprd/HCD/ARCH/Pages/index.aspx>

Oregon Department of Environmental Quality Facility Profiler-Lite Permitted Sites (2018). Accessed June 12, 2018. <http://deq14.deq.state.or.us/Html5viewer261/?viewer=FacilityProfilerLite>

Oregon Department of State Lands (DSL) (2017). *Essential Salmonid Habitat Map (2015 listing)*. Accessed June 12, 2018. <http://chetco-new.dsl.state.or.us/esh2017/>

DSL (2021). Statewide Wetlands Inventory. Accessed May 26, 2021. <https://maps.dsl.state.or.us/swi/>

U.S. Fish and Wildlife Service (USFWS) (2018a). *National Wetlands Inventory*. Retrieved June 12, 2018, from: <https://www.fws.gov/wetlands/>

USFWS (2018b). List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project (2018). Accessed June 12, 2018. Fish and Wildlife Service. Oregon Fish and Wildlife Office, Portland, Oregon.

Enclosures

Figures

Figure 5-5 - Proposed Storage Lagoon Location
Figure 6-1 - Selected Improvements

Attachments

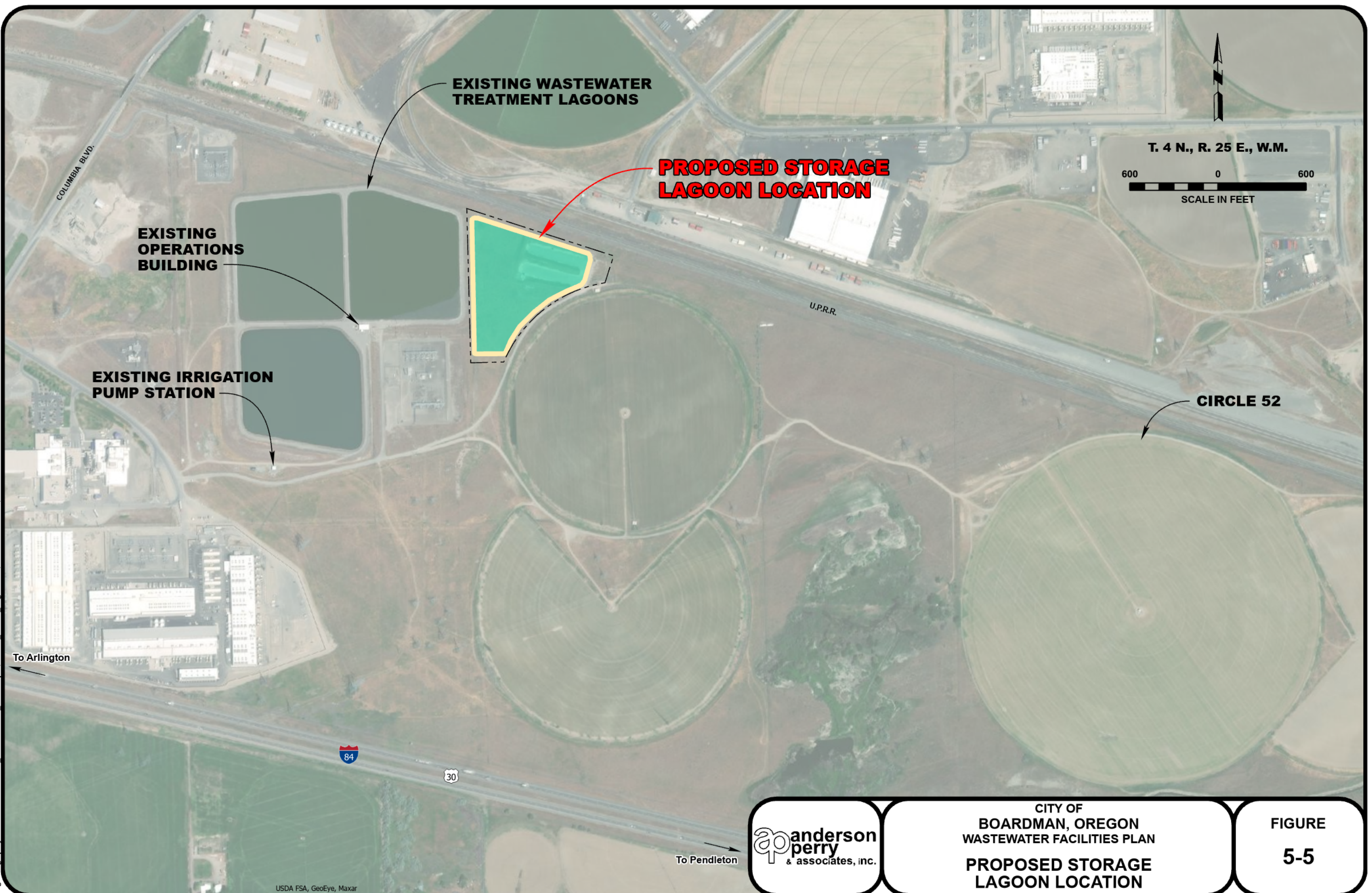
Attachment 1 - U.S. Fish and Wildlife Service National Wetlands Inventory Map and Oregon
Department of State Lands Statewide Wetlands Inventory Map
Attachment 2 - Federal Emergency Management Agency Floodplain Map
Attachment 3 - U.S. Fish and Wildlife Service Trust List
Attachment 4 - Oregon Department of Environmental Quality Map

LC/cd

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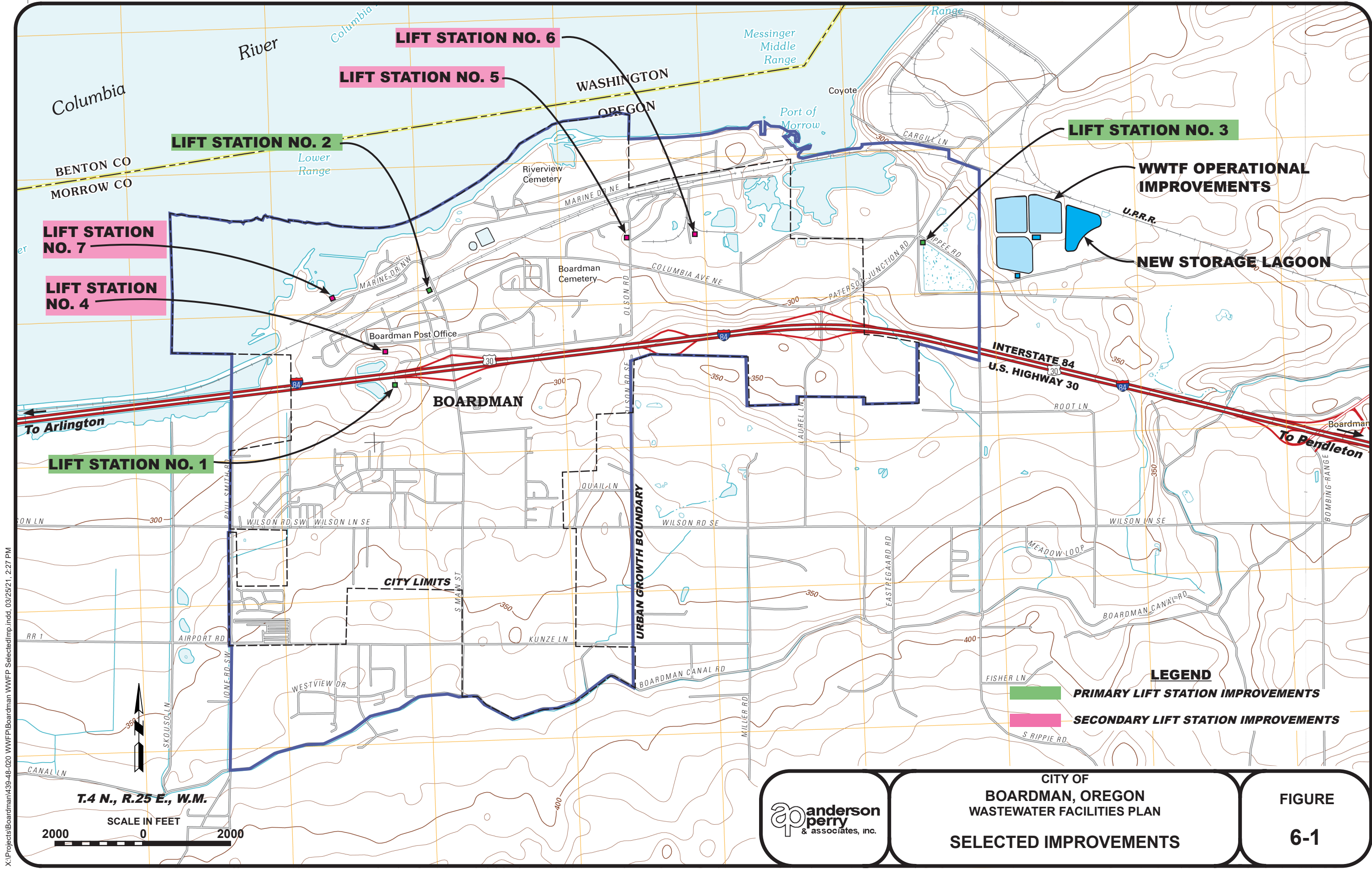
FIGURES

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perry
& associates, inc.**

**FIGURE
5-5**



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anderson perry & associates, inc.

CITY OF BOARDMAN, OREGON
WASTEWATER FACILITIES PLAN
SELECTED IMPROVEMENTS

FIGURE 6-1

ATTACHMENT 1
U.S. Fish and Wildlife Service
National Wetlands Inventory Map and
Oregon Department of State Lands
Statewide Wetlands Inventory Map



U.S. Fish and Wildlife Service

National Wetlands Inventory

Boardman WWFP



June 12, 2018

Wetlands

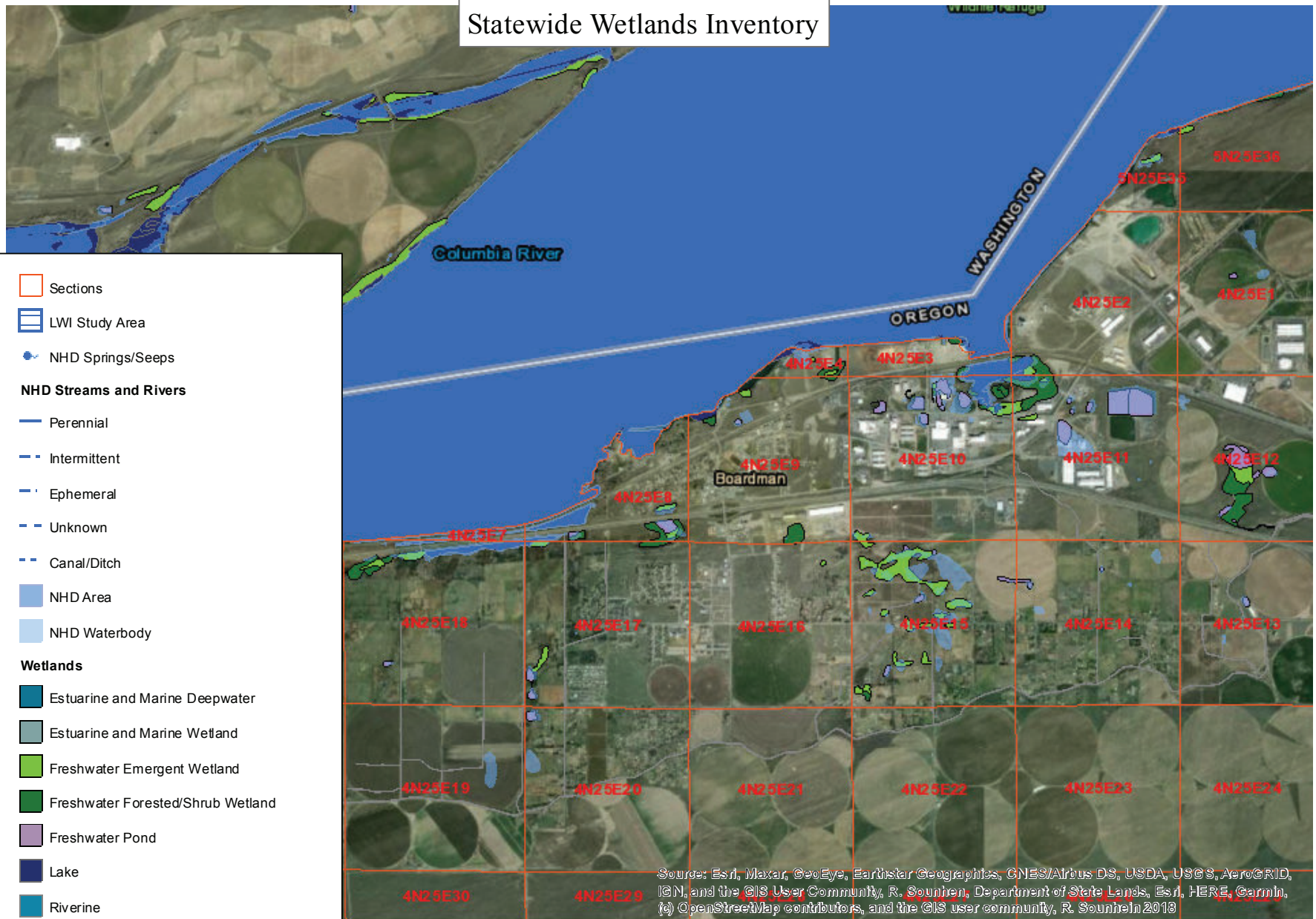
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Statewide Wetlands Inventory



1 inch = 1.14 miles

0 0.475 0.95 1.9 2.85 3.8

The Statewide Wetlands Inventory (SWI) represents the best data available at the time this map was published and is updated as new data becomes available. In all cases, actual field conditions determine the presence, absence and boundaries of wetlands and waters (such as creeks and ponds). An onsite investigation by a wetland professional can verify actual field conditions.

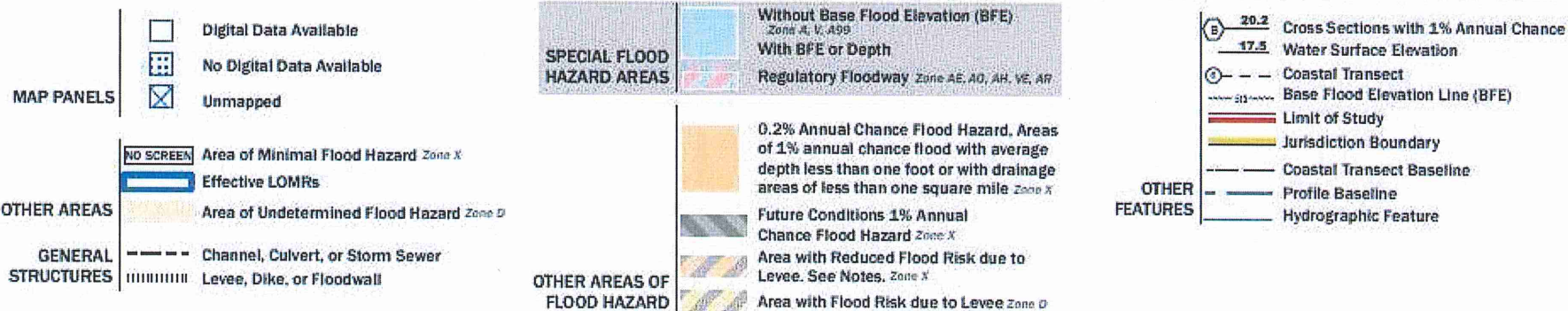


Date: 5/25/2021



State of Oregon
Department of State Lands
775 Summer Street, NE, Ste 100
Salem, OR 97301-1279
(503) 986-5200

ATTACHMENT 2
Federal Emergency Management Agency
Floodplain Map



ATTACHMENT 3
U.S. Fish and Wildlife Service Trust List



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Oregon Fish And Wildlife Office
2600 Southeast 98th Avenue, Suite 100
Portland, OR 97266-1398
Phone: (503) 231-6179 Fax: (503) 231-6195

<https://www.fws.gov/oregonfwo/articles.cfm?id=149489416>



In Reply Refer To:

June 12, 2018

Consultation Code: 01EOFW00-2018-SLI-0475

Event Code: 01EOFW00-2018-E-00799

Project Name: Boardman

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>; <http://www.towerkill.com>; and <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to investigate opportunities for incorporating conservation of threatened and endangered species into project planning processes as a means of complying with the Act. If you have questions regarding your responsibilities under the Act, please contact the Endangered Species Division at the Service's Oregon Fish and Wildlife Office at (503) 231-6179. For information regarding listed marine and anadromous species under the jurisdiction of NOAA Fisheries Service, please see their website (http://www.nwr.noaa.gov/habitat/habitat_conservation_in_the_nw/habitat_conservation_in_the_nw.html).

Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Oregon Fish And Wildlife Office
2600 Southeast 98th Avenue, Suite 100
Portland, OR 97266-1398
(503) 231-6179

Project Summary

Consultation Code: 01EOFW00-2018-SLI-0475

Event Code: 01EOFW00-2018-E-00799

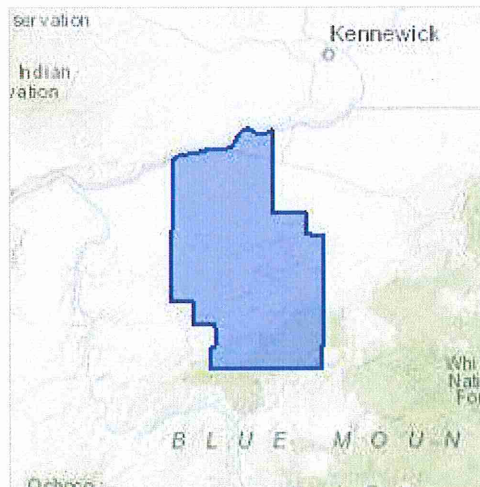
Project Name: Boardman

Project Type: WASTEWATER FACILITY

Project Description: WWS

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/place/45.45947906091412N119.57517899563204W>



Counties: Morrow, OR

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Fishes

NAME	STATUS
Bull Trout <i>Salvelinus confluentus</i> Population: U.S.A., conterminous, lower 48 states There is final critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8212	Threatened

Critical habitats

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Bull Trout <i>Salvelinus confluentus</i> https://ecos.fws.gov/ecp/species/8212#crithab	Final

ATTACHMENT 4
Oregon Department of
Environmental Quality Map



Oregon Dept. of Environmental Quality

DEQ Facility Profiler-Lite Permitted Sites

Search...



Sign in



Navigation

Tools



Zoom In



Zoom Out



Full Extent



Initial View



Previous Extent



Mobile Search



Pan



Bookmarks



Tool Labels



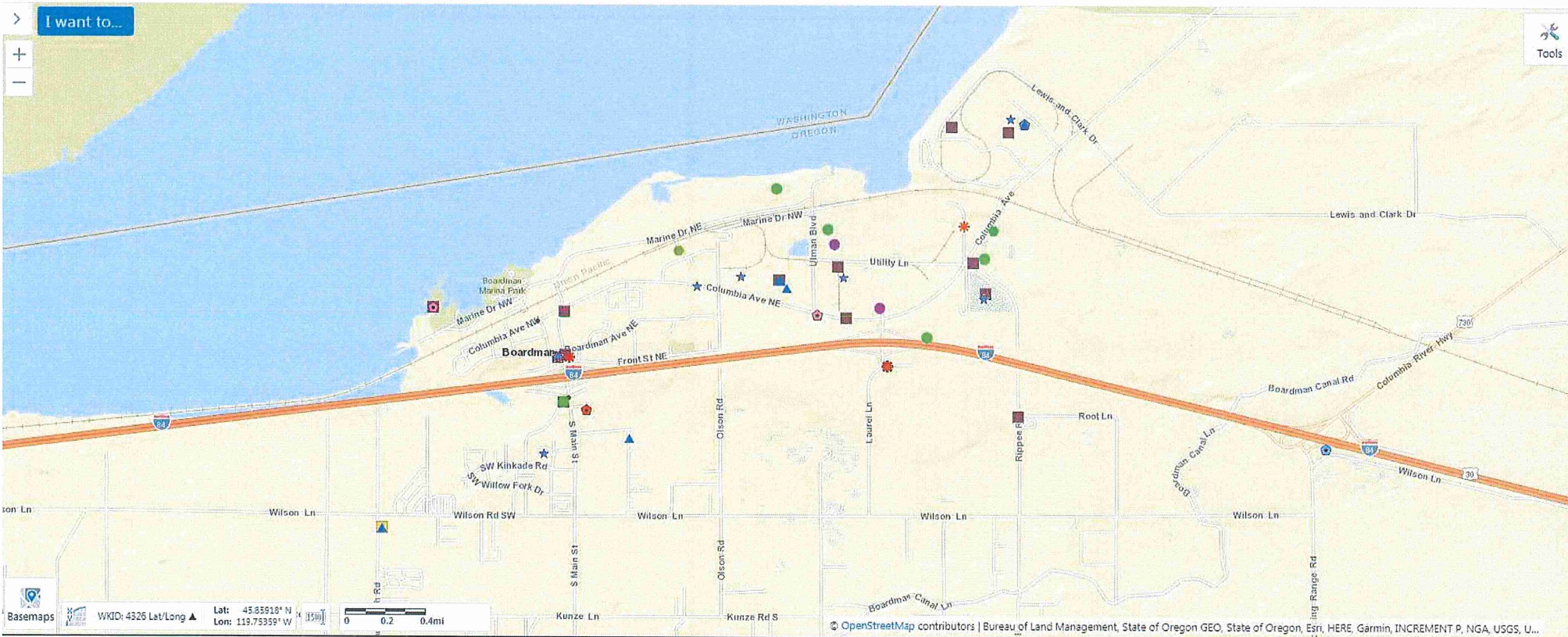
Navigation



I want to...



Tools



APPENDIX G
Oregon Department of Environmental Quality
Approval Letter



Oregon

Kate Brown, Governor

Department of Environmental Quality

Eastern Region Bend Office

475 NE Bellevue Dr., Suite 110

Bend, OR 97701

(541) 388-6146

FAX (541) 388-8283

TTY 711

June 28, 2021

Karen Pettigrew
City Manager
City of Boardman
PO Box 229
Boardman, OR 97818

Re: City of Boardman
WQ – Morrow County
File No. 9104, WPCF No. 102277
Wastewater Facilities Plan 2021

Dear Ms. Pettigrew,

The Department of Environmental Quality (Department) has reviewed the Wastewater Facilities Plan revised in May, 2021. The plan was received electronically on June 4, 2021 from Mike Lees, PE, with Anderson Perry.

The selected improvements include upgrades to the City's lift stations as well as the Wastewater Treatment Facility. The recommended upgrades include:

- Installation of new submersible pumps and controls in lift stations 1, 2, & 3;
- Repair/replacement of ventilation equipment, valves, and flowmeters at lift stations 1, 2, & 3;
- Installation of bypass pump piping at lift stations 4 through 7;
- Construction of a new 9.5 acre lagoon with approximately 27.3 million gallons of storage capacity;
- Biosolids removal from the existing Lagoon No. 1.

Selected improvements to the wastewater collection and treatment facility are scheduled to be implemented in year 2022 at an anticipated cost of \$5,866,000.

The May, 2021 Wastewater Facilities Plan is approved. Please call me in Bend at (541) 639-9556 or email me at ransom.horner-richardson@deq.state.or.us if you have questions regarding this letter.

Respectfully,

Ransom Horner-Richardson
CWSRF Circuit Rider, Eastern Region

cc: WQ Permit File, DEQ Pendleton Office

ec: Barry Beyeler, Kevin Kennedy, City of Boardman
Mike Lees, P.E., Anderson Perry & Associates, inc