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BENTON COUNTY

Utility Assessment

November 2021

Utility Assessment

Benton County, Oregon

November 2021

RENEWS 12-31-22

Murraysmith

701 NW Arizona Avenue, Suite 200
Bend, OR 97703

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Section 1

Introduction

1.1 Authorization and Purpose

Benton County Public Works (County) currently operates and maintains six small utility service districts:

- Alpine Sewer District
- Alsea Sewer District
- Alsea Water District
- Hidden Valley Water District
- Cascade View Water District
- South Third Sewer District (Administration Only)

The County has authorized Murraysmith, Inc. (Murraysmith) to perform a physical and financial assessment of each utility. For the purposes of this assessment the South Third Sewer District was excluded because the district is operated by the City of Corvallis and may be incorporated into their system in the future.

Figure 1 identifies the location of these districts within Benton County.

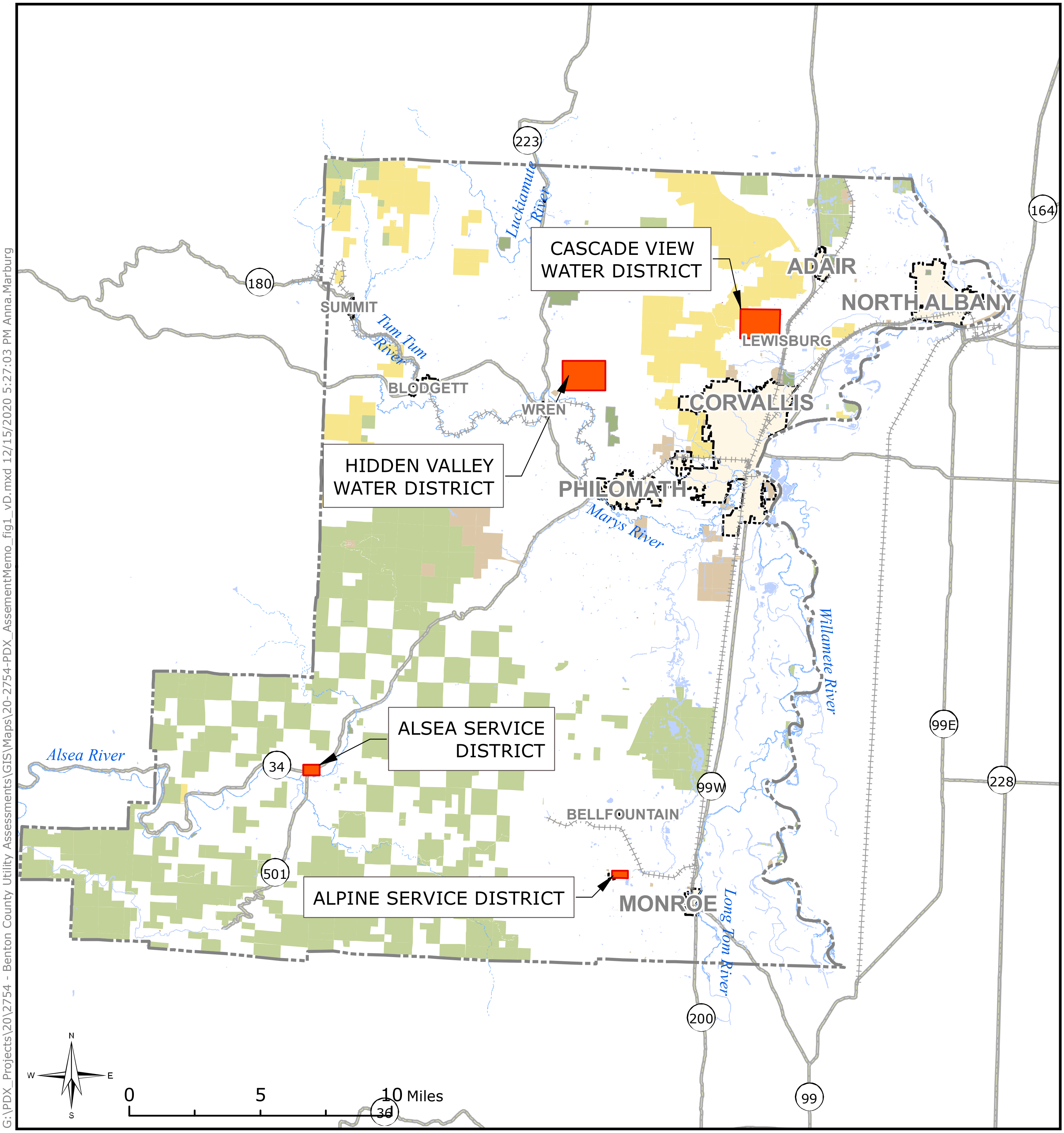
1.2 Scope of Services

The scope of services for this project includes the following tasks:

- Task 1, Project Management – Coordination, monitoring and controlling the project resources to meet the technical, communications and contractual obligations required for implementing the scope of services.

- Task 2, Physical Assessment – Identifying the potential needs of each utility through site visits, discussions with operation staff and review of existing documentation. The goal of the physical assessment will be to aid in the development of a planning and operational framework for the utilities that will be used in the Financial Assessment Task.

- Task 3, Financial Assessment – The financial assessment, which includes a rate and fee study, will identify long-term funding plans for the utilities operated by the County. The funding plans will evaluate current revenue sufficiency in the context of projected capital and O&M needs and potential rate increase options. The financial assessment also includes a review and update of other fees, such as hookup fees.



Legend

- Detail Map
- Cities
- County
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- Railroads
- Parks

Public Lands

- Federal and State
- City and County
- OSU
- OTHER
- RFPD
- Water

Project No. 20-2754

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Benton County OREGON

Water and Sewer Utility Assessment

Figure 1
Benton County Utilities Map

December 2020

Data Sources: Benton County Nov 2020, Murraysmith Nov 2020. Service Layer Credits:
Coordinate System: NAD 1983 HARN StatePlane Oregon North FIPS 3601 IntlFeet
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1.3 Basis of Assessment Report

This assessment report, completed as part of Task 2, is based on site visits, observations of existing conditions, discussions with operations staff and review of existing documents. The report provides background and description of each utility, review of existing performance, condition assessment of key system components, review of demands and capacity, regulatory compliance, and recommended improvements with preliminary costs and scheduling.

The assessments are based on the visual inspection of facilities that were accessible at the time of the site visit, discussions with operational staff during the site visits, and documentation provided by the County. No testing of equipment or materials, or water quality sampling were performed during the site visits.

Recommendations for improvements to the existing facilities and their operation based on observations and current best practices to maintain facility performance, support operations, and assure compliance with regulatory requirements. Prioritization of improvements is given by defining recommendations as immediate, short-term, and long-term, and are defined as follows.

- **Immediate** – Recommendations that should be pursued immediately and implemented as soon as particle to improve performance, reliability, operations, or safety of the utility.
- **Short-term** – Recommendation that should be implemented in the next 1-5 years to improvement and maintain performance, operations, and longevity of the utility.
- **Long-term** – Recommendations that should be implemented int the next 5-10 years to maintain performance and longevity of the utility.

Opinions of cost are provided for the recommended facility improvements. Cost estimates are prepared to American Association of Cost Engineers (AACE) Class 5 estimate standards for planning-level evaluations with a range of accuracy of -30 percent to +45 percent. Construction costs for each recommendation is based on recent construction costs for similar facilities, published standard construction cost data, and the Engineer's experience on similar projects. Standard mark-ups applied to conceptual construction cost estimates, where applicable, are summarized in **Table 1-1.**

Table 1-1 Applied Mark-ups for Conceptual Opinions of Cost

Item	Mark-up as Percent Cost
Mobilization	10%
General Conditions	10%
Contractor Overhead & Profit	15%
Construction Contingency	30%
Engineering, Legal, Permitting and Administrative	30%

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Section **2**

Section 2

Alpine Sewer District

2.1 Service Area

The Alpine County Service District collects and treats wastewater for the unincorporated community of Alpine. The population of Alpine at the 2010 Census was 171. The approximate number of connections is 45.

2.2 Background

Prior to 1988 the community was served by individual on-site sewage disposal systems. In Summer of 1988, a gravity collection system and treatment plant were constructed in two phases under separate contracts. Schedule I construction included all gravity sewer lines and Schedule II included the influent pump station, treatment plant, and outfall structure. Disinfected flow from the treatment plant is discharged to adjacent Muddy Creek during winter months. Dechlorination facilities were added to the treatment process in 2006. A map of the facilities is presented in **Figure 2-1**.

2.3 System Description and Observations

2.3.1 Collection System

The sewage collection system consists of 2,385 feet (ft) of 6-inch and 2,465 ft of 8-inch polyvinyl chloride (PVC) pipe installed during the 1988 project. All flow is conveyed by gravity to the influent pump station on the plant site. Operations staff have not observed any major breaks in the collection system. Infiltration/inflow has not been studied but not thought to be a major issue.

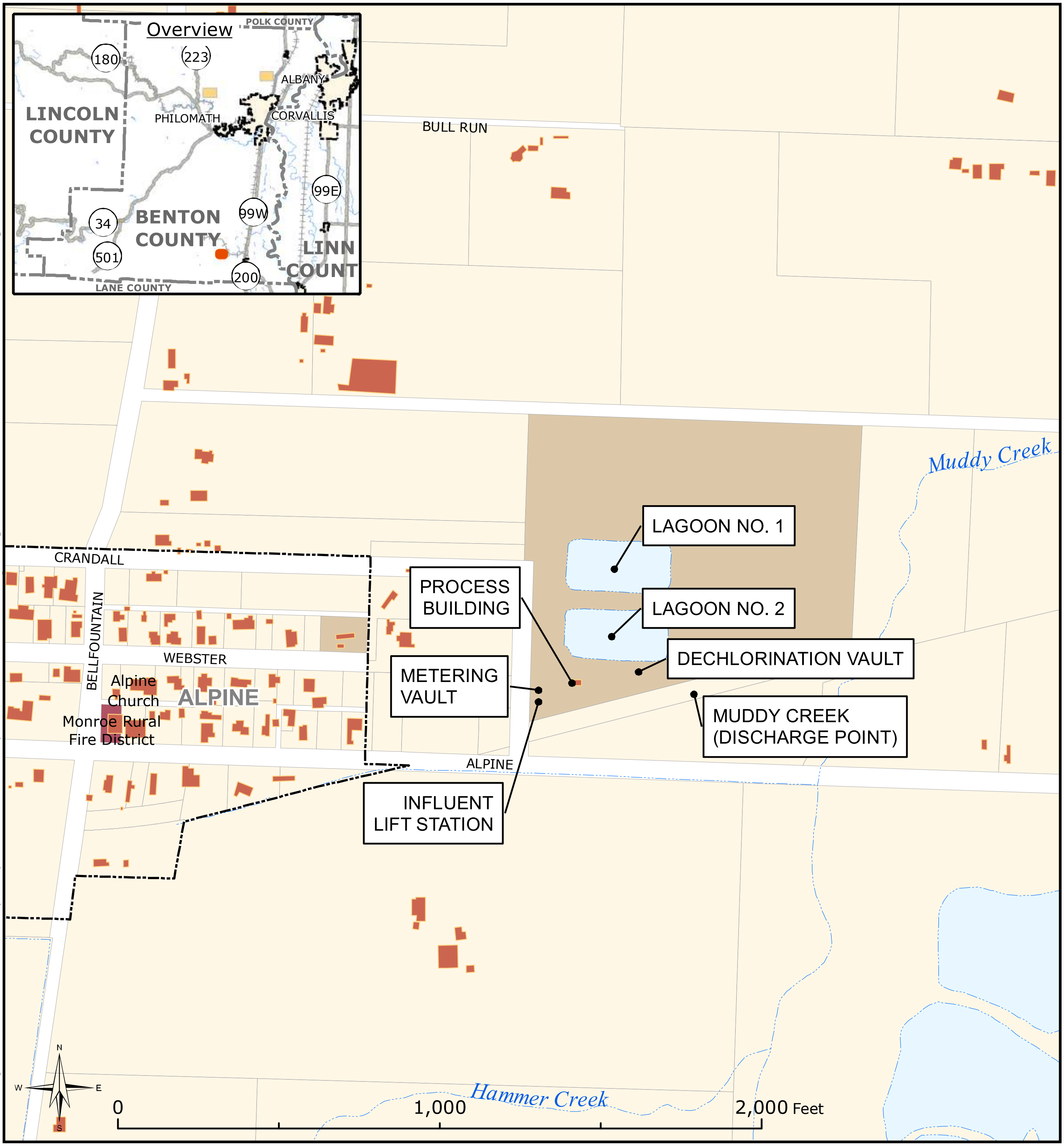
Observations: Collection system components were not observed during the site visit.

Recommendations: None.

2.3.2 Wastewater Treatment Facilities

2.3.2.1 Influent Pump Station

The influent pump station was built as part of the Schedule II construction in 1988 and sits on plant property. The pump station consists of two 2-1/2 horsepower (hp) submersible pumps located in a precast manhole. The pump station conveys flow through an adjacent meter vault that houses



Legend

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- RFPD
- Private land
- Buildings
- Cities
- County
- Railroads
- Highways
- Streams

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Benton County OREGON

Water and Sewer Utility Assessment

Figure 2-1
Alpine Sewer District System Map

December 2020

Project No. 20-2754

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an in-line meter. Average daily flows are sent to the County for reporting. After metering flow is conveyed to a lagoon system for treatment.

Observations: Corrosion of the piping within the wet well was observed. Check valves on the pump discharge piping are located in the wet well, partially submerged in the wastewater, isolation valves are in valve boxes adjacent to the wet well. Debris was observed in the wet well, the type or accumulation of debris did not seem unusual for a wastewater pump station.

Both the pump station and meter vault are in a low-lying area prone to flooding at the plant site and vegetation surrounds the meter vault. At the time of the visit, the meter vault was not accessible.

Figure 2-2 Influent Pump Station (In Foreground) and Meter Vault

Figure 2-3 Influent Pump Station Interior

2.3.2.2 Lagoon System

The influent pump station directs flow to the lagoons through a splitter box, there is no screening of the raw sewage at the site. The lagoon system consists of two stabilization lagoons that are approximately 7.66 acre-ft in size each. Flow is always routed to the North (Primary) Lagoon first, from the spitter box, and then to the South (Secondary) Lagoon through two 8-inch diameter ductile iron pipes. The lagoons are hydraulically connected. A concrete effluent structure is located in the South Lagoon that houses the submersible effluent pumps.

The lagoons have a max depth of nine feet and are used for storage in the non-discharge season, April 14th through November 30th, and therefore usually operate at lower depths except prior to discharging. Sludge in the primary lagoons was last measured approximately 3 years ago and measured 1 to 1.5 inches in depth. Oregon Association of Water Utilities (OAWU) was previously scheduled to test the sludge in both lagoons, but statewide lockdowns due to COVID have postponed this to a later date.

Figure 2-4 North (Primary) Lagoon

Figure 2-5 South (Secondary) Lagoon, Support Building in Background, Left

Recommendations: Remove vegetation from lagoons at least annually or as needed to control growth. Locate and make operable all valves in the system, replace valve boxes as needed. Continue with plans to measure solids accumulation in both lagoons.

2.3.2.3 Disinfection/Discharge

After treatment, flow is pumped to the chlorine contact chamber by two 1-1/2 hp submersible pumps located in the effluent structure in the south lagoon. A portion of flow is sent to the chlorination system, dosed with chlorine, and send back into a chlorine contact chamber to mix with the majority of the flow. The chlorine contact chamber is a 24-inch diameter, 150 feet long buried pipeline. After the appropriate contact time, the flow is dechlorinated by dosing liquid calcium thiosulfate before the discharge manhole and flows by gravity to Muddy Creek. Discharge to the creek occurs from December 1st through April 15th and is controlled by an outfall weir.

The chlorination system consists of gaseous chlorine and feed equipment housed in separate room located in the support building. The gas feed system consists of a V-Notch type gas feeder design to control and meter the flow of gas under vacuum and to mix the gas with water. The system consists of only one gas feeder, there is no redundancy in the system. The system uses 150 pound chlorine gas cylinders that are properly chained to the wall for safety.

The dechlorination system uses liquid calcium thiosulfate and is also located in the support building, in the garage area. The system consists of a single chemical metering pump that pulls from a 50 gallons barrel of calcium thiosulfate. No chemical containment is provided.

Figure 2-6 Gas Chlorination System

Figure 2-7 Dechlorinate system

Observations: At the time of the visit, the treatment plant was not discharging to the creek and the chlorination and dechlorination systems were not in use, however both systems appear to be in good working condition. During the inspection of facilities, a manhole with equipment and piping was observed near the end of the chlorine contact chamber, adjacent to the discharge manhole. It was unclear what the purpose of this equipment was, or how it functions with respect to the operation of the plant. It appeared to be a tablet type dechlorination system that is no longer in use, no records were found to explain its function or if it is associated with the current dechlorination system.

Recommendations: Due to safety concerns with the storage and use of chlorine gas, it is recommended that the chlorination system be converted to a liquid sodium hypochlorite system. A sodium hypochlorite system would be similar to the current dechlorination system, with chemical metering pump pulling form drums or tots. It is recommended the system be provided with two metering pumps for redundancy, containment and piping for calibration.

Investigate the purpose and need for the equipment and piping in the manhole adjacent to the discharge manhole. Remove equipment that is no longer in service.

2.3.2.4 Support Building

The process support building consists of a small wooden structure with three separate rooms that house the chlorination equipment, dechlorination equipment, and electrical and controls. The electrical and controls equipment is in a separate room with a desk/work bench and associated control and electrical panels. The controls system was upgraded recently and is in good working order.

The gaseous chlorine and feed equipment is located in a small, ventilated room in the middle of the building. The room has a separate entrance, ventilation near the floor directed to the back of the building and there is a leak detection system with alarm.

The third room is a garage type area which houses dechlorination equipment, a sink and the plant water supply's backflow device. The room has a separate doorway and a small rollup door for access from the outside. The ventilation fan for this room is located on a timer on the wall and is not automated.

Figure 2-8 Support Building

Figure 2-9 Electrical and Controls Room

Observations: The structure appears to be in good condition. The room housing the electrical and controls equipment is small and space is limited to desk/work bench area, as well as storage of records and manuals. The process building does not currently have any eye wash stations but the County is currently in the process of ordering equipment for all facilities where applicable. There are no restroom facilities on site.

Recommendations: With implementation of the recommendation to convert the gas chlorination system to liquid sodium hypochlorite, the new system should be located adjacent to the dechlorination equipment, in the garage area. This will free up space in the building and consideration should be given to expand the electrical and controls room to provide more desk/workspace and storage. Consider the need for a work bench in the garage area to run simple tests and conduct minor equipment repairs or servicing. Consider the need for a restroom at the site.

2.3.2.5 Power Service

Power loads at the plant are minor, with the majority of demand coming from the influent pump station, effluent pump and support building. The facility does not have backup power generation, or the provisions to connect a portable generator. Power reliability appears to be good, current operations staff has not observed any loss of power in the last 3 years.

Observations: The treatment plant has no provisions for a standby power supply. Due to the configuration of the plant, with significant storage and effluent pumping, standby power supply to maintain plant operation is not needed. When a power outage occurs, effluent pumps will not operate and discharge to the creek is discontinued, and the lagoons have adequate storage to accommodate an outage. However, with the loss of power at the site, the influent pump station will cease to work, and it is not clear how much storage exists at the station and in the adjacent piping until an overflow will occur.

Recommendations: Provide provisions for standby power to serve the influent pump station.

2.3.2.6 Site Conditions/Security

The wastewater treatment plant (WWTP) site is fenced and has a lockage gate. The access road entering the site and surrounding the lagoons are graveled. There are no electronic security measures at the site.

Observations: The access roads entering the site and surrounding the lagoons are in good condition and well maintained. Heavy vegetation surrounds the site and appear to follow the fence line.

Recommendations: Control vegetation along the fence line to maintain a secure site. Consider intrusion alarms for the support building.

2.3.3 Operations and Maintenance

Operations staff typically visit the system once a day. The plant site has internet access and influent Hydrogen potential (pH) and flow measurements are sent to the County daily for reporting. Discharge must be measured manually and recorded during winter months.

A review of maintenance activity logs for 2017 through 2019 documents routine operations and maintenance (O&M) activities by staff, inspection of system components, collection of samples, etc.

Observations: As noted previously, equipment and piping were observed adjacent to the discharge manhole and their purpose and function was unclear. No records or O&M instructions were found to explain their function or if it is associated with the current dechlorination system.

Recommendations: Investigate the purpose and need for this equipment. Update the operation and maintenance manual to reflect current facility operations.

2.4 Wastewater Flows and Capacity Analysis

Wastewater flows are monitored daily by the influent flow meter downstream of the influent pump station. Below is a summary for flows based on plant's daily monitoring reports (DMR's) for 2018, 2019 and 2020.

Table 2-1 Flow Summary

Parameter	2018	2019	2020
Average Annual Flow (AAF)	7,238 gpd	6,690 gpd	6,569 gpd
Max Month Wet Weather[1] Flow (MMWWF)	12,146 gpd	9,682 gpd	9,604 gpd
Max Month Dry Weather[2] Flow (MMDWF)	6,719 gpd	7,485 gpd	6,499 gpd
Peak Day Flow (PDF	20,581 gpd	33,613 gpd	30,118 gpd

Notes:

1. The wet weather season is from November 1 through April 30.
2. The dry weather season is from May 1 through October 31.

Observations: Flows appear to be consistent over the years observed. Based on the review of the flow records, flow increases during the wet weather season as a result of infiltration and inflow (I&I). Peak day flows appear to be associated with rainfall events, with the flow quickly dissipating after the peak flow event. This is an indication that a large portion of the I&I is a result of direct inflow into the system, which could be a result of storm drains, building down spouts or other direct sources of stormwater flow into the system.

The average dry weather design flow for the facility is 20,000 gallons per day(gpd). Over the three years observed, the maximum month dry weather flows are less than half the design flow.

Recommendations: Check the system for I&I during rainfall events to determine possible sources for inflow.

2.5 Regulatory Requirements

2.5.1 NPDES Permit

The County operates the Alpine facility under a Nation Pollution Discharge System Permit (NPDES Permit) issued through the Oregon State Department of Environmental Quality (DEQ). The NPDES Permit, Permit Number 101923, was issued on July 24, 2006 and includes wastewater discharge limits, monitoring requirements, reporting and record keeping requirements, and other conditions to maintain in-stream water quality. The NPDES Permit's expiration date is June 30, 2011 but is extended until the permit is renewed. A renewal application has been submitted to DEQ.

The following table is a summary of effluent limitations for the Alpine facility with an outfall on Muddy Creek. The permit is based on a discharge rate of 0.07 million gallons per day (MGD) (70,000 gpd) from December 1 to April 15. A copy of the NPDES permit is included in **Appendix A**.

Table 2-2 Summary of NPDES Effluent Limitations

Parameter	Average Effluent Concentration		Monthly Average	Weekly Average	Daily Maximum
	Monthly	Weekly			
BOD5	30 mg/l	45 mg/l	18 lb/day	27 lb/day	36 lb
TSS	50 mg/l	75 mg/l	29 lb/day	44 lb/day	58 lb
Other Parameters	Limitation				
E. coli Bacteria	126 per 100 mL monthly mean; 406 per 100 mL maximum				
pH	6.0 – 9.0				
BOD/TSS efficiently	85% monthly average BOD; 65% monthly average TSS				
Total Chlorine	0.04 mg/l daily maximum; 0.07 mg/l monthly average				

2.5.2 System Performance

A review of the DMR's from 2018, 2019 and 2020, indicate general conformance with the permit limitations. The following is a summary of the treatment plant performance with respect to biological oxygen demand (BOD) and total suspended solids (TSS) removal.

Table 2-3 Summary of Performance

Year	Average Influent		Average Effluent	
	BOD	TSS	BOD	TSS
2018	262 mg/l	155 mg/l	8 mg/l	12 mg/l
2019	315 mg/l	171 mg/l	-	5 mg/l
2020	277 mg/l	155 mg/l	16 mg/l	10 mg/l

Observations: Wastewater loadings appear to be consistent over the past three years, with concentrations typical of domestic wastewater flows. Based on records, the lagoon system appears to be performing well, effectively treating the wastewater and complying with permit conditions.

Recommendations: None.

2.6 Recommendations

The following are recommendations for improvements to the existing facility and its operation based on observations and current best practices to maintain facility performance, support operations and assure compliance with the current NPDES Permit requirements.

Influent Pump Station

- Replace discharge piping and locate check and isolation valves in separate vault.
- Provide gravel surfacing to control vegetative growth, grade to drain site as much as practical.
- Provide a standby generator at the influent pump station.

Lagoon System

- Locate and make operable all valves in the system, replace damaged valve boxes and any non-functioning valves.
- Measure solids accumulation in both lagoons. Based on accumulation, plan for solids removal in the future. Based on the last measurement of solids accumulation 3 years ago of 1 to 1.5 inches, it is anticipated removal of solids will not be necessary for at least 5 years. Consider removal when solids depths are greater than 1 foot or solids accumulation is impacting the performance of the lagoon.

Disinfection/Discharge

- Convert the gas chlorination system to a liquid sodium hypochlorite system. Locate in the garage area, provide dual chemical feed pumps, containment and piping and appearances to accommodate flow measurement and pump calibration.
- Provide a redundant chemical feed pump for the dechlorination system. Provide containment and piping and appearances to accommodate flow measurement and pump calibration.
- Provide electronic effluent flow monitoring to measure the discharge.

Support Building

- Once the gas chlorination system is removed, provide building improvements that include expanding the electrical and controls room to provide more desk/workspace and storage, and provide a work bench in garage area.
- Construct a restroom at the site.
- Install intrusion alarms on all doorways into the building.

Operations and Maintenance

- Clear the area around the influent pump station and meter vaults.
- Access the meter vault and inspect its condition.

- Remove vegetation from lagoons at least annually or as needed to control growth.
- Investigate the purpose and need for the equipment and piping in the manhole adjacent to the discharge manhole. Remove equipment that is no longer in service.
- Update O&M manual to reflect current chlorination and dechlorination practices.

2.7 Opinion of Cost and Preliminary Improvements Schedules

Opinion of costs for the recommended improvements are summarized in **Table 2-4**. Costs are categorized as immediate, short-term and long-term based on system needs.

Table 2-4 Recommended Improvements

Recommended Improvement	Opinion of Cost		
	Immediate	Short-Term	Long-Term
Influent Pump Station			
Piping and valving replacement		$29,400	
Gravel surfacing		$1,000	
Standby generator		$118,000	
Lagoon System			
Replace valves and valve boxes		$4,500	
Solids removal			$266,000
Disinfection/Discharge			
Chlorination system conversion	$24,300		
Redundant dechlorination pump and piping		$21,800	
Effluent flow monitoring		$11,800	
Support Building			
Building Improvements		$15,900	
Restroom			$17,200
Intrusion alarm	$3,000		
TOTAL	**$27,300**	**$202,400**	**$283,200**

Section **3**

Section 3

Alsea Sewer District

3.1 Service Area

The Alsea Sewer District collects and treats wastewater for the unincorporated community of Alsea. The population of Alsea at the 2010 Census was 164. The approximate number of connections is 85.

3.2 Background

The collection and treatment system for Alsea was constructed in 1986. A map of the facilities is presented in **Figure 3-1**.

3.3 System Description and Observations

The following system descriptions and observations are based on a site visit conducted on August 6, 2020, discussions with operations staff and review of existing documents.

3.3.1 Collection System

The sewage collection system consists of approximately 5,300 feet of PVC sewer pipe installed during the 1986 project. All flow is conveyed by gravity to a lift station behind the Alsea Community School.

Observations: Collection system component were not observed during the site visit. Operations staff believe infiltration and inflow (I&I) in the collection system contributes to wastewater flows.

Recommendations: Further investigate the I&I flow contributions.

3.3.2 Wastewater Treatment Facilities

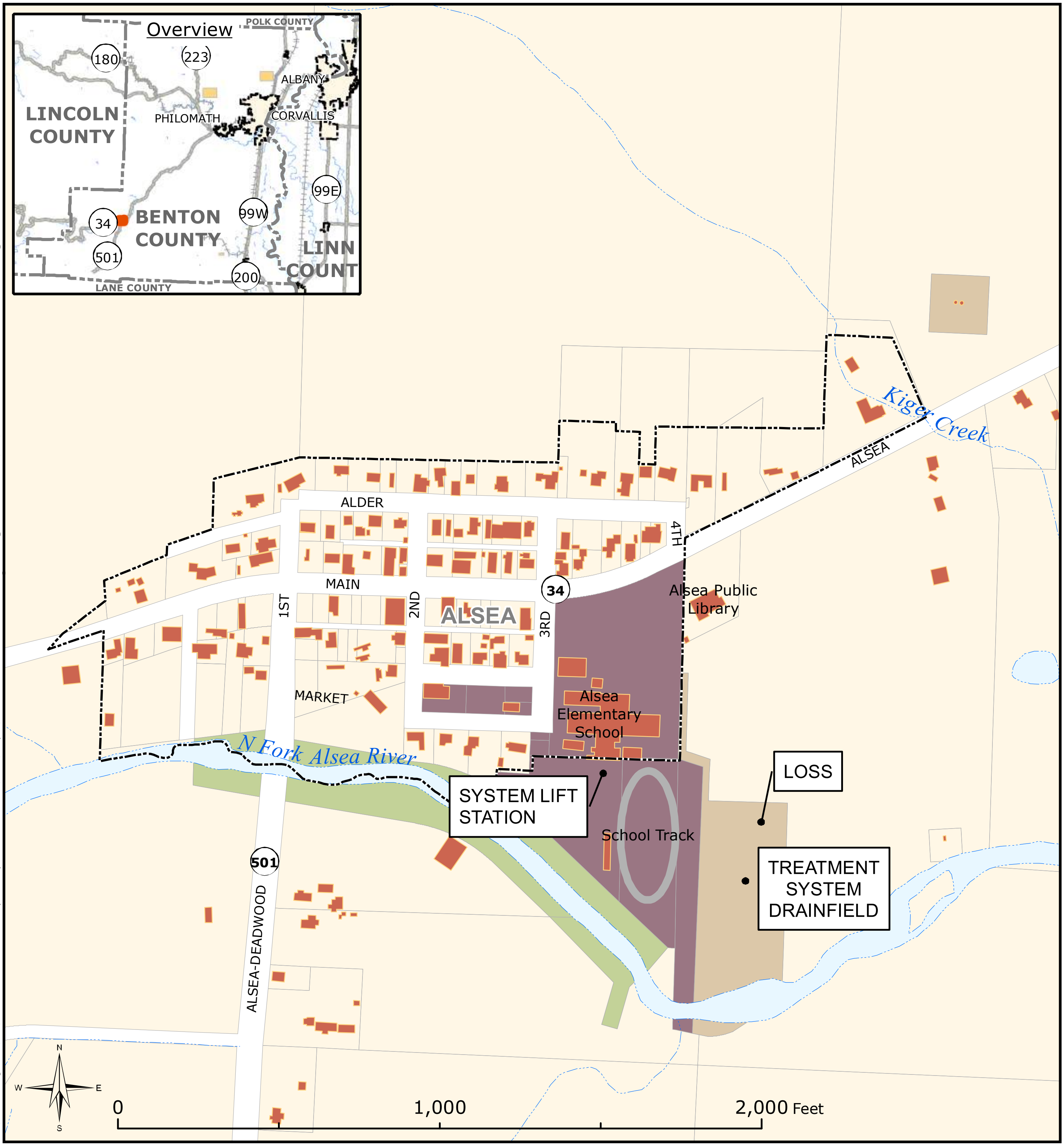
3.3.2.1 Influent Lift Station

All collection system flow is received at the influent lift station, which pumps flow to the wastewater treatment facility. The station is a duplex submersible station and consists of two submersible pumps installed in a precast manhole. Wastewater flows cascade into a basket system on the influent side of the manhole to remove large items. This basket must be manually cleaned by operations staff and does not provide adequate screening when clogged. The County is currently under contract to replace the existing submersible pumps with auto-reversing Flygt pumps and replace the corroded pump brackets.

Pump station electrical equipment and controls are located adjacent to the lift station in a small wooden shed, open on two sides. Electrical service at the pump station also serves the wastewater treatment facilities. The lift station does not have backup power generation on site, however there are provisions at the station to connect a generator and switch to generator power at the electrical panel. Station overflows are directed to the school's old drainfield.

The lift station is located behind the Alsea Community School, adjacent to the track and athletic field. There is no security fencing to prevent access to the station's electrical equipment and controls. The wet well hatch was locked, and some railing is provided around the wet well's opening for fall protection.

Observations: The concrete wet well structure and access hatch appeared to be in good condition. Minor corrosion was observed on the pump's guide rails. Debris was observed in the screening basket and floating in the wet well, the type or accumulation of debris did not seem unusual for a wastewater pump station. The electrical equipment and controls appear to be operable; the electrical equipment appears to be lacking adequate clearance in the space per code. The wooden structure needs to be painted and does not provide any security for the electrical equipment and controls.



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Legend

Public Lands

- Federal and State
- City and County
- School District
- Private land
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Figure 3-1
Alsea Sewer District System Map

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Figure 3-2 Influent Lift Station

Figure 3-3 Lift Station Electrical and Controls Enclosure

Recommendations: Continue to pursue replacement of the pumps with the Flygt pumps. With the new pumps, the need for the screening basket should be eliminated and it should be removed from the wet well. The Flygt pumps should be able to pass the debris through to the septic tanks where it will be capture and disposed of with the solids.

Consider providing a standby generator at the site with an automatic transfer switch. With the installation of the Flygt pumps and their associated controllers, as well as a standby generator, the electrical panel will likely need to be replaced.

Provide an enclosed, secured structure for the electrical equipment and controls with adequate clearance complying with current codes.

Recirculating Gravel Filter

Flows from the lift station are conveyed to the treatment facilities, located east of the athletic field, by two parallel force mains, one from each pump. Each force main discharges into a septic tank where solids and floatables are separated from the liquid stream. From the septic tanks, wastewater flows by gravity to a single dosing tank where the septic tank effluent is mixed with the return flow from the gravel filter bed. Flow from the dosing tank is pumped up to the gravel filter bed by two submersible pumps located at the end of the doing tank.

The gravel filter is a large open concrete basin with walls and floor containing rock media. Distribution piping in the filter is in the upper portion of the media, divided into four quadrants, each capable of being supplied by one of the submersible pumps in the dosing tank. Valving downstream of the pumps allows for the supply to each quadrant and the rotation between quadrants. The distribution piping has holes to evenly distribute the wastewater over the media in each quadrant. Underdrain piping located near the bottom of the filter collects water after it passes through the media and sends it to the splitter box.

The spitter box collects the effluent from the underdrain system and splits the flow, which returns approximately 80 percent of the flow back to the head of the dosing tank and 20 percent of the flows to the drainfield system.

Figure 3-4 Septic Tank in Foreground, Wooden Structure Housing Controls

Observations: The interior of the concrete tanks and below grade structures were not observed since they were in service. From the exterior and at access manways, the tanks and structures appeared to be in good condition, with typical wear of concrete. PVC pipes entering the filter structure are exposed. The stairway leading up to the gravel filter is dilapidated and no longer usable. The cover on the splitter box is plywood and not secure.

Distribution and underdrain piping in the filter basin could not be observed. There is some vegetation on top of the filter. Heavy vegetation surrounds the filter structure.

Figure 3-5 Recirculating Gravel Filter Basin with PVC Piping, Wooden Cover to Spitter Box in Foreground

Recommendations: During the next septic tank pumping cycle, clean and conduct a video inspection of all the tanks to document the condition of the interior. Replace PVC pipes and valves entering the filter structure with piping that is ultraviolet (UV) resistant or provide a cover for the exposed piping. Replace the stairway at the filter structure and provide a secure cover for the spitter box. Remove vegetation on top of the filter and around all tanks and structures.

3.3.3 Drain Field System

The drain field system consists of the drain field tank that receives flow from the splitter box and houses two submersible pumps. Each pump discharges to a pipe manifold that consists of four distribution pipes that gravity flow to four separate drain fields. The pipe manifold for each pump is in a separate concrete distribution box with removable lid.

The drain field system consists of eight separate drain fields, four drain fields for each pump. Each drain field consist of lateral piping and has an approximate area of 3,675 square feet based on the operational data. There appear to be no monitoring ports or access points in the drain fields. According to staff, the drain field area is mowed 1 or 2 times a year.

Observations: The drain field tank and distribution boxes are in good condition, showing typical wear of the concrete and hatches. The interior of the drain field tank was not observed since it was in service. The lids on the distribution boxes were not secure.

Figure 3-6 Distribution Box with Lid

The drain fields were not observed since all components are below grade. A review of aerial imagery of the area reveals a vegetative pattern that is similar to the drain field layout, flow appears to be distributed to the eight individual drain field cells.

Recommendations: As part of the next septic tank pumping cycle, clean and conduct a video inspection of the drain field tank. Secure the lids on the distribution boxes. Install monitoring ports in the drain fields to monitor performance.

Treatment System Controls

Electrical equipment and controls for the recirculating gravel filter and drain field equipment, mainly the pumps in the dosing tank and the drain field tank, are located in a wooden shed, open on two sides, similar to the structure at the influent pump station. Electrical service is provided from the influent pump station.

Observations: The electrical equipment and controls appear to be operable; the electrical panels are showing some corrosion on the exterior and there appears to be inadequate clearance in the space per code. The wooden structure needs to be painted.

Figure 3-7 Electrical Equipment and Controls Structure

Recommendations: Provide an enclosed, secured building or structure for the electrical equipment and controls with adequate clearance complying with current codes. Provide additional space to accommodate operation and maintenance activities at the site, such as a work bench/desk and storage for records and documents.

Site Conditions/Security

The influent lift station site is not secure, no fencing or other security measures existing to prevent access to pump station electrical and control equipment.

The site containing the septic tanks, gravel filter and drain field pumps is fenced and has a locked gate. A portion of the site is graveled. The drain field site is not fenced.

Observations: The site containing the septic tanks, gravel filter and drain field pumps has heavy vegetation in some areas near or adjacent to the structures. Uneven earth suggests animal activity.

Recommendations: Clear vegetation away from all structures and provide gravel surfacing to control vegetative growth and provide access.

3.3.4 Operations and Maintenance

Staff typically visit the site once a week. Effluent flow is monitored by recording the runtime on the effluent pumps which feed the drain fields. All flows between system treatment components are controlled manually and must be physically monitored by operations staff.

A review of maintenance activity logs for 2018 and 2019 confirm weekly site visits to log pump run times and perform other operation and maintenance activities. Staff frequently flushes the distribution piping in the filter bed quadrants to remove solids accumulation.

Observations: The frequency of flushing the solids build-up in the distribution piping in the filter bed quadrants appears to be excessive and could be an indication of solids accumulation in the system.

Recommendations: Pump septic tanks and dosing tanks on a regular basis, at least annually, and monitor solids accumulation.

3.4 Wastewater Flows and Capacity Analysis

Wastewater flows are monitored by recording the runtimes of the effluent pumps in the drain field and converting runtimes to gallon per day (gpd) based on the listed pump performance.

A review of flow data from 2018 and 2019 system report to the Department of Environmental Quality is presented below.

Table 3-1 Flow Summary

Parameter	2018	2019
Average Annual Flow (AAF)	10,143 gpd	8,051 gpd
Max Month Wet Weather* Flow (MMWWF)	18,270 gpd	17,034 gpd
Max Month Dry Weather** Flow (MMDWF)	8,884 gpd	8,307 gpd
Peak Day Flow (PDF)	50,444 gpd	24,002 gpd

Notes:
1. The wet weather season is from November 1 through April 30.
2. The dry weather season is from May 1 through October 31.

Observations: Based on the review of the flow records, flow increases during the wet weather season as a result of infiltration and inflow (I&I), with average flows over double when compared to dry weather flows. Flows may also be influenced by the operation of the school, reducing summertime flows when school is not in session.

Maximum day flows appear to come close to and exceed the rated capacity of the system of 30,000 gallons per day, with 50,444 gpd in March of 2018 and 29,409 gpd in January and February of 2018.

Flow values appear to be inconsistent. Days before and after the peak flow of 50,444 gpd in March of 2018, flows were measured at 6,100 gpd and 10,800 gpd, respectively, and rainfall was minimal during this period. Flow in July 2019 averaged 1,700 gpd for the month, significantly less than the previous year and low for a community the size of Alsea.

Recommendations: Using pump runtimes for flow measure can be highly inaccurate. Particularly with a low head pump application in which slight changes in pumping conditions, such as water level in the tank or partial blockages or obstructions, can significantly impact pump output. Also, pumps will ware over time and output will decrease. It is recommended the County conduct a drawdown test of the pumps to measure their actual performance.

The County may want to consider installing a flow meter on the system. The type of flow meter would have to be further investigated giving the hydraulic conditions at the site. Magnetic flow meters on the pump discharge piping or a weir prior to the drain field tank would likely be the most viable options.

3.5 Regulatory Requirements

3.5.1 WPCF Permit

The County operates the Alsea facility under a Water Pollution Control Facilities Permit (WPCF Permit) issued by the Oregon State Department of Environmental Quality (DEQ). The WPCF Permit, Permit Number 101648, was issued on October 5, 2005 and includes wastewater effluent limits, monitoring requirements, reporting and record keeping requirements, and other conditions to protect the environment. The WPCF Permit's expiration date is September 30, 2015 but is extended until the permit is renewed.

The flowing table is a summary of waste disposal limitations for the Alsea facility with disposal facilities consisting of a recirculating gravel filter with soil absorption drain fields. A copy of the WPCF permit is included in **Appendix B**.

Table 3-2 Summary of WPCF Permit Limitations

Parameter	Limitation
Maximum Daily Flow	30,000 GPD
Influent	
BOD5	300 mg/l
Grease and Oil	25 mg/l
TSS	150 mg/l
TKN	150 mg/l
Effluent	
BOD5	20 mg/l
TSS	20 mg/l

3.5.2 System Performance

A review of flow data from 2018 and 2019 system reports to the Department of Environmental Quality indicates potential exceedance of some of the water quality parameters. The following is a summary of the system performance.

Table 3-3 Summary of performance

Period	Influent (mg/l)		Effluent (mg/l)	
	BOD	TSS	BOD	TSS
March 2018	377	206	42	19
June 2018	433	256	37	17
Sept. 2018	342	260	14	30
Dec. 2018	415	192	19	88
March 2019	3870	3500	12	15
June 2019	937	484	29	16
Sept. 2019	406	256	8	-
Dec. 2019	284	214	11	23

Observations: From the influent tests, some values for BOD and TSS are extremely high, 3,870 milligrams per liter (mg/l) and 3,500 mg/l in March 2019, respectively. Domestic wastewater flow is typically in the 100 – 300 mg/l range for these parameters. The high concentration could be a result of not getting a representative sample of the influent coming into the system or actively in the collection system, industry or other activity, discharging high strength wastewater.

Effluent tests indicated exceedance of BOD and TSS levels. In June 2019 BOD was measured at 29 mg/l and in December 2019 TSS was measured at 23 mg/l. This is an indication of poor performance of the treatment system, that could also be associated with the need to routinely flush the distribution piping in the gravel filter quadrants. Solids may be built up in the system, particularly if the septic and dosing tanks have not been pumped out on a regular basis. In addition, if high strength wastewater is entering the system, as noted above, the treatment system would not likely be capable of consistently meeting permit limitations.

Recommendations: Review the location and protocols for influent sampling. Solids and scum can accumulate in the influent lift station, making collection of a representative sample difficult. Consider relocation of the sampling point to get a more representative sample coming into the treatment system, potentially the manhole upstream of the influent lift station. If influent sampling continues to show elevated water quality parameters, investigate the service area to determine and eliminate the source of the high strength wastewater flow.

Pump all septic and dosing tanks, clean and conduct a video inspection of all the tanks to document the condition of the interior, this includes the splitter box and drain field tank. Prior to pumping tanks, flush all quadrants in the gravel filter to purge solids from the system. Pump septic tanks on an annual basis or more frequently based on solids accumulation and system performance.

3.6 Recommendations

The following are recommendations for improvements to the existing facility and its operation based on observations and current best practices to maintain facility performance, support operations and assure compliance with the current Permit requirements.

Influent Lift Station

- It is anticipated that the County is pursuing or has already install the Flygt pumps and controllers, screening basket should be removed from the wet well.
- Provide a standby generator with an automatic transfer switch.
- Provide an enclosed structure to house electrical equipment and controls with adequate clearances and security.

Recirculating Gravel Filter

- As part of the next septic and dosing tank pump out, clean and inspect all tanks on site. Prior to cleaning and inspection, flush all quadrants in the gravel filter to purge solids from the system.
- Replace exposed PVC piping and valves entering the gravel filter.
- The gravel filter bed is approaching 35 years of service and consideration should be given to replacing the media and internal piping. Prior to replacing, consideration should be given to alternative technologies that may be more efficient.
- Replace stairs leading up to the gravel filter.
- Provide an adequate, secure cover for the slitter box.

Drain Field System

- Consider installation of a flow meter to eliminate the need to use pump runtimes to calculate flow to drain fields.
- Secure lids on the distribution boxes.
- Install monitoring ports in the drain field to monitor performance, two per field for a total of 16.

Treatment System Controls

- Provide an enclosed building to house electrical equipment and controls with adequate clearances and workspace.
- The electrical equipment and controls are approaching 35 years of service and consideration should be given for replacement.

Site Conditions and Security

- Provide gravel surfacing around all structures to control vegetation and accommodate access.

Operation and Maintenance

- Pump out solids for septic and dosing tank on a regular basis, at least annually.
- Review the location and protocols for influent sampling. Consider relocation of the sampling point to get a more representative sample coming into the treatment system, potentially the manhole upstream of the influent lift station.
- If influent sampling continues to show elevated water quality parameters, investigate the service area to determine and eliminate the source. Additional sampling may be required until the source is identified.
- Clear vegetation away from all structures.
- Remove vegetation in gravel filter.
- Conduct drawdown tests to determine flow rate of each effluent pump to use in the calculation of system flows. Reevaluate flows once pump flow rates are determined.
- Investigate sources of I&I.

3.7 Opinion of Cost and Preliminary Improvements Schedules

Opinion of costs for the recommended improvements are summarized in Table 3-4. Costs are categorized as immediate, short-term, and long-term based on system needs.

Table 3-4 Recommended Improvements

Recommended Improvement	Opinion of Cost		
	Immediate	Short-Term	Long-Term
Influent Lift Station			
Standby Generator		$118,000	
Electrical Equipment & Controls Enclosure		$32,200	
Recirculating Gravel Filter			
Tank cleaning and inspection	$13,700		
Replace PVC piping and valves		$9,400	
Gravel media and piping replacement			$223,400
Replace stairs		$1,800	
Cover for splitter box		$2,100	
Drain Field System			
Flow meter and Dist. Box lids		$19,800	
Monitoring ports		$7,200	
Treatment System Controls			
New Electrical and Controls building		$36,900	
Replacement of electrical and controls			$64,400
Site Condition and Security			
Gravel surfacing		$38,900	
TOTAL	$13,700	$266,300	$287,800

Section **4**

Section 4

Alsea Water District

4.1 Service Area

The Alsea Water District provides potable water for the unincorporated community of Alsea. Current County records indicate a population of 202 with approximately 83 connections.

4.2 Background

The original water system was constructed in 1965 and consisted of a surface water intake on the Alsea river, an adjacently located pumphouse, a welded steel storage tank and gravity fed distribution system. In 1986 the existing two wells were drilled to replace the surface water intake near the location of the existing pumphouse. In 1993 the distribution system was rehabilitated, and the existing pipe replaced with new PVC pipe. A second, bolted steel, storage tank was constructed in 1997. A map of the facilities is presented in **Figure 4-1**.

4.3 System Description and Observations

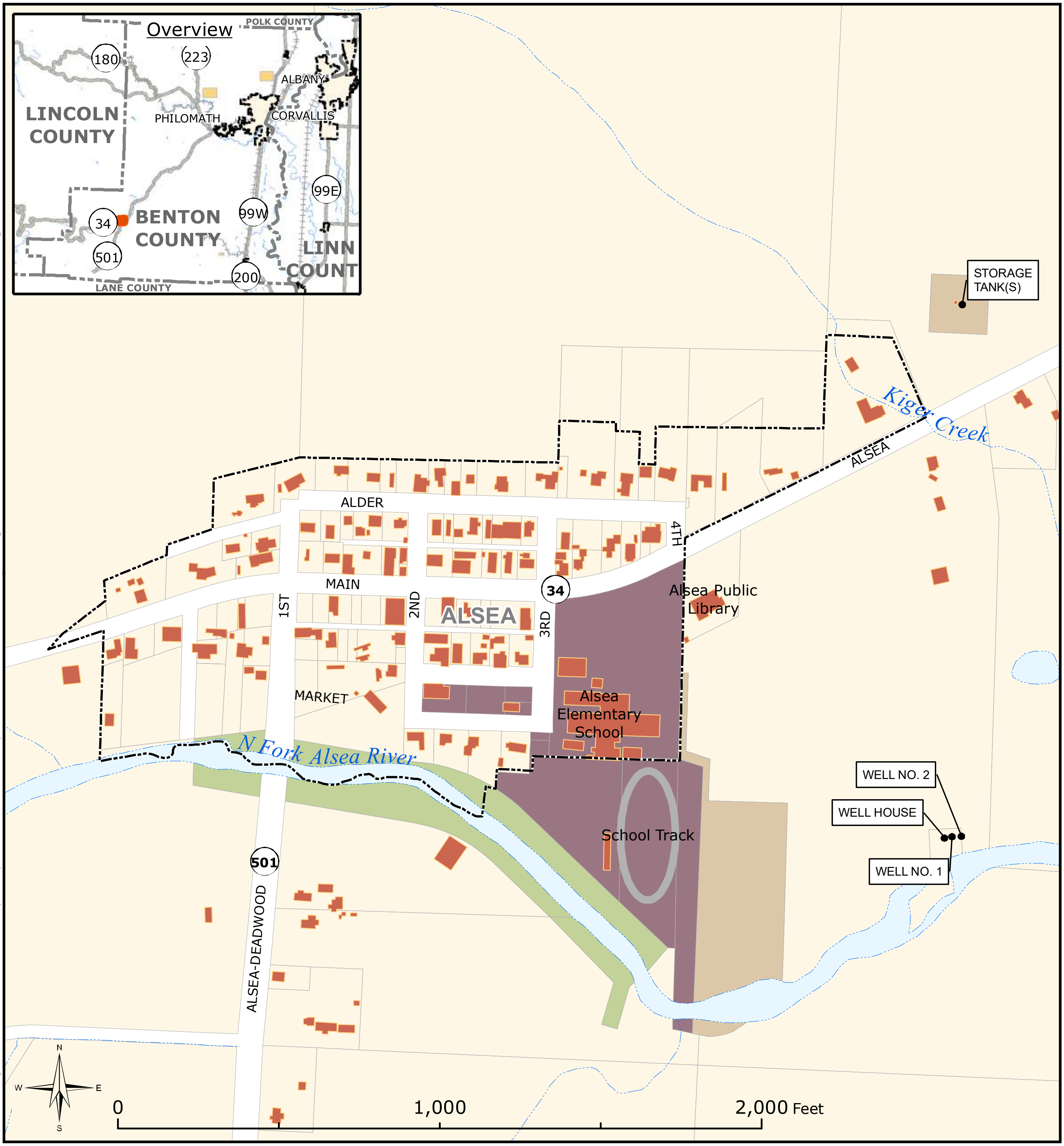
The following system descriptions and observations are based on a site visit conducted on August 6, 2020, discussions with operations staff and review of existing documents.

4.3.1 Groundwater Wells/Wellhouse

4.3.1.1 Groundwater Wells

Water is provided to the system by two adjacent ground water wells that are housed in insulated fiberglass covers located near the Alsea River. Both wells are contained in 6-inch diameter casings and contain submersible well pumps. Well 1 is 185 feet deep and had a yield of 3 gpm at the time of drilling. Well 2 is 155 feet in depth and had a yield of 35 gpm at the time of drilling. Both yields were determined by a 1-hr drawdown test performed at the time of construction. The approximate depth to the aquifer in wells 1 and 2 was measured at 45 ft and 39 ft respectively. Measurements were taken approximately one day apart during spring conditions in March 1986.

Observations: Vegetation has encroached around the wellheads. The yield of Well 1 as recorded during initial drawdown tests is very low and could cause system capacity issues if the initial yield is still valid. No recent drawdown tests have been performed.



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Project No. 20-2754

Legend

Public Lands

- Federal and State
- City and County
- School District
- Private land
- Buildings
- Cities
- County
- Railroads
- Highways
- Streams

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Benton County OREGON

Water and Sewer Utility Assessment

Figure 4-1
Alsea Water District System Map

December 2020

Data Sources: Benton County Nov 2020, Murraysmith Nov 2020. Service Layer Credits:
Coordinate System: NAD 1983 HARN StatePlane Oregon North FIPS 3601 IntlFeet
Disclaimer: Murraysmith and Benton Co. make no representations, express or implied, as to the accuracy, completeness and timeliness of the information displayed. This map is not suitable for legal, engineering, or surveying purposes. Notification of any errors is appreciated.

Figure 4-2 One of Two Wellheads Located Adjacent to the Wellhouse

Recommendations: A drawdown test of Well 1 should be performed to confirm system capacity.

4.3.1.2 Well House

Discharge lines from the two wells combines outside the well house into a single discharge line located in the well house. The well house consists of a small wood framed structure with two rooms. The first room houses control equipment and the water meter, and the chlorination equipment is housed in the second room. The structure is located adjacent to the wellheads near the north bank of the Alsea River.

Observations: The existing wood structure is showing signs of aging on both the exterior and interior, but no apparent structural issues were observed. The paint on both the interior and exterior of the building is showing signs of wear along with the building roof.

Figure 4-3 Alsea Well House

Recommendations: The existing well house structure should be repainted, and the roof cleaned and inspected. Regular maintenance of the building should be undertaken in the future to preserve its lifespan.

4.3.1.3 System Controls

Controls for the well pumps are located in the well house. The pumps are controlled by water level in the reservoirs. Pumps are called to run when the level in the system reservoirs drops. The two well pumps operate in a lead-lag configuration and are alternated on a weekly basis. Electrical service is provided by the local service provider and there are no backup power provisions.

Observations: Control equipment and power provisions appear to be in good working condition at the site.

Recommendations: None.

4.3.1.4 Chlorination System

The well water is chlorinated by a liquid chlorine system to maintain a target chlorine residual at the well houses of approximately 0.8 mg/L. The chlorination system consists of a single chemical feed pump, pumping out of a batch tank into the discharge piping from the wells located inside the well house. Chlorine is batched mixed in an NSF approved polyethylene trash can with sodium hypochlorite, from barrels, and water.

Observations: The sodium hypochlorite does not have any provisions for containment. Chemical dosing is dependent on the resident’s measurement. The single chemical feed pump has no redundancy or provisions for calibration.

Figure 4-4 Chlorine Dosing System

Recommendations: Provide one additional chemical feed pump for redundancy, adequate piping to accommodate two chemical feed pumps and calibration chamber, and containment.

4.3.1.5 Site Conditions/Security

The well site is accessed through private road and property. There is no security fencing or security provisions on site, but the private access road has several locked cattle gates to which County Staff have keys.

Observations: Access to the site is haphazard and requires driving through an open cattle pasture and unlocking multiple gates on private property. Vegetation has grown around the well heads and the well house.

Recommendation: Vegetation around the wellheads and well house should be removed and the wellhead covers cleaned. Gravel surfacing should be placed around all the facilities to control vegetation and provide access.

An access easement was not found on the County GIS website. The County should investigate the creation of a new access road between the wastewater treatment facilities system and the groundwater wells to mitigate access issues through the private property or secure an easement for the current access.

4.3.2 Storage

Chlorinated water from the wells is conveyed to two storage tanks that run on a shared hydraulic gradeline at an elevation 133 ft above the well site. The original tank is welded steel and the tank built in 1997 is glass lined, bolted steel tank. Operations staff are not aware of any recent cleanings and believe the tanks might have a buildup of sediment. To staff knowledge, the tanks have not been drawn down and cleaned. Both tanks have external sight gauges, overflows, drains, and access bolted access hatches. Overflows from each tank discharge to a common daylight drain on the hillside south of the tanks.

Observations: The tanks are located in a heavily forested area and have several large trees that have grown around the perimeter which could cause damage if the trees were to fall in a large storm.

The welded steel tank has some pitting and rusting spots and should be evaluated by an inspector to assess its structural integrity. Given the age of both tanks, it is anticipated that neither tank complies with current seismic codes.

Figure 4-5 Access Hatch and Pitting on Welded Steel Storage Tank

Figure 4-6 Vegetation Overhanging Bolted Steel Storage Tank

Recommendations: A professional arborist should be hired to remove branches and trees overhanging the tanks or that are in danger of falling onto the tanks.

Both tanks should be cleaned, interior and exterior. A formal tank inspection program should be performed including seismic analysis of both tanks. Any consequent recommendations for repair or seismic mitigation should be performed.

Lastly, the original welded steel storage tank should be professionally painted to preserve its lifespan.

4.3.3 Distribution System

Water leaving the storage tanks is conveyed through an 8-inch diameter ductile iron line to the distribution system consisting of 6-inch and 3-inch diameter PVC pipe. Chlorine residuals are taken by a local café owner at the end of the system and are typically 0.2 to 0.25 mg/L. There are four fire hydrants on the line which are flushed on occasion by the fire department. Operations staff have not experienced any major issues with the system since being rehabilitated. Individual connections are metered but the date of meter replacements in the system is currently unknown. The distribution system only has one pressure zone and does not require any pressure reducing systems.

Observations: Distribution components were not observed during the site visit.

Recommendations: None

4.3.4 Operations and Maintenance

Plant staff visit the site on a weekly basis to observe system components and manually record pump run times and observe tank levels. There are no communication protocols in place and all data is tracked manually.

4.4 Water Demand/Wastewater Flows

System demands are monitored and tracked by the flowmeter located in the well house. Total water usage in cubic feet is logged 2-3 times per week. Usage was converted to gallons per day and Average Daily Demand (ADD) of the system was determined for the past 3 years. Individual meter data at each connection was not provided to compare against the well usage to analyze for leakage and calibration issues. A peaking factor of 3 was applied to the ADD to determine peak hour demand (PHD) of the system.

Table 4-1 Flow Summary

Parameter	2017	2018	2019
Average Daily Demand (ADD)	25,442 gpd	26,488 gpd	35,246 gpd
Per Capita Use	126 gpd	131 gpd	175 gpd
Peak Hour Demand (PHD)	53 gpm	55 gpm	73 gpm

Observations: Based on an estimated population of 202, the gallons per day per capita appears to be slightly high, typical demands for a domestic system are in the 80 – 100 range. The demand per capita could be influenced by the transient population associated with the school. System demand typically peaks in July/August due to irrigation.

Recommendation: Conduct a leakage evaluation using individual meters compared to well production to determine water loss.

4.5 Capacity Analysis

Source

A recent drawdown analysis has not been performed to determine the capacity of the existing wells. Based on initial capacity testing, Well 1 has a low yield and could cause capacity issues if testing at the time of construction is still valid. No indications of air entrapment or supply issues has been observed, however.

Distribution

At the highest peak flow calculated in 2019, velocities in the system reached 3.3 feet per second (ft/s) in the distribution laterals and are well within accepted velocity criteria for sizing distribution mains. Hydraulic modeling of the system was not performed, however, given the size of piping, the system does not appear to have the capacity to accommodate fire flows (1,000 gallons per minute).

Storage

The combined volume of the two existing storage tanks is 64,000 gallons. Given the size of tanks, fire flow storage for a residential community, 120,000 gallons (1,000 gallons per minute for 2 hours), cannot be provided by the system, therefore storage for fire flows was not included in the storage capacity analysis.

Required storage was analyzed using the following parameters:

- Operational Storage (OS), defined as volume required to minimize excessive pump starts, calculated as pump supply (gpm) capacity times 20 minutes.
- Equalizing Storage (ES), defined as storage required for on call demand during peak hour demand flows.
- Standby Storage (SB), defined as the standby storage required during a power outage or other event causing a service disruption in the supply, and calculated as 200 gpd times 1 day times number of residences.
- Dead Storage (DS), defined as the storage not available for system capacity due to hydraulic limitations and assumed to be the bottom 2-ft of the storage tanks for this analysis.

The required storage components are summarized below in Table 4-2.

Table 4-2 Storage Analysis

Storage Component	
Operational Storage (OS)	400 gal
Equalizing Storage (ES)	3,600 gal
Standby Storage (SB)	17,000 gal
Dead Storage (DS)	4,000
Minimum Required Storage	25,000 gal

The existing storage capacity of 64,000 gal exceeds the minimum required storage calculated above, without consideration of storage for fire flow. Based on the required operational, equalizing, and dead storage, the system can maintain water service for 2 days at average daily demand in case of a supply failure.

4.6 Regulatory Requirements

The Alsea Water System operates under the Oregon Health Authority (OHA) as system 41-00978. Chlorine residual is required to be maintained in the distribution system and is currently monitored by residents at a local Café and reported to local and federal agencies. Alsea is classified as a community water system and is required to submit bacteriological samples monthly and test for inorganic and organic chemicals on a yearly basis.

No samples have met or exceeded Maximum Contaminant Levels (MCLs), nor has any monthly sample for total coliform yielded a positive sample.

4.7 Recommendations

The following are recommendations for improvements to the existing District facilities and their operations based on observations and current best practices to maintain facility performance, support operations and assure compliance with the current EPA/OHA requirements.

Wells

- Perform drawdown analysis.

Well House

- Paint interior and exterior building and perform any required building maintenance.

Chlorination System

- Provide redundant pumps and calibration provisions on pump discharge.
- Provide containment system for liquid sodium hypochlorite.

Site Conditions and Security

- Provide gravel surfacing to control vegetative growth.
- Construct access road to site to avoid the need of access through private property.

Storage Tanks

- Contract a licensed arborist to remove trees/branches that are in risk of falling on tanks.
- Clean interior and exterior of tanks.
- Conduct a structural inspection of the tanks.
- Paint the welded steel tank.

Operation and Maintenance

- Conduct a leakage evaluation using individual meters compared to well production to determine water loss.

- Clear vegetation around wellheads and well house.

4.8 Opinion of Cost and Preliminary Improvements Schedule

Opinions of costs for the recommended improvements in **Section 4.7** are summarized below in Table. Costs are categorized as immediate, short-term, and long-term based on system needs.

Table 4-3 Recommended Improvements

Recommended Improvement	Opinion of Cost		
	Immediate	Short-Term	Long-Term
Groundwater Wells			
Drawdown Analysis		$2,000	
Chlorination System			
Pump Redundancy and Containment		$24,300	
Site Conditions and Security			
Gravel surfacing		$1,100	
Access road			$53,400
Storage Tanks			
Tank Cleaning		$26,000	
Tank inspection		$13,000	
1965 Tank Painting		$36,800	
Tree removal		$3,100	
TOTAL	$0	**$106,300**	**$53,400**

Section **5**

Section 5

Hidden Valley Water District

5.1 Service Area

The Hidden Valley Water District provides potable water for the platted sub-division of Hidden Valley located northeast of Wren in Benton County. Current County records indicate a population of 24. The District currently serves 15 connections, however, one house in the district has two connections.

5.2 Background

The water system was constructed in 1975 to serve the sub-division. In 1988 ownership of the system was taken over by the County. The County changed the designation to a non-community water system due to the number of connections. A map of District facilities is presented in **Figure 5-1.**

5.3 System Descriptions and Observations

The following system descriptions and observations are based on a site visit conducted on August 25, 2020, discussions with operations staff and review of existing documents.

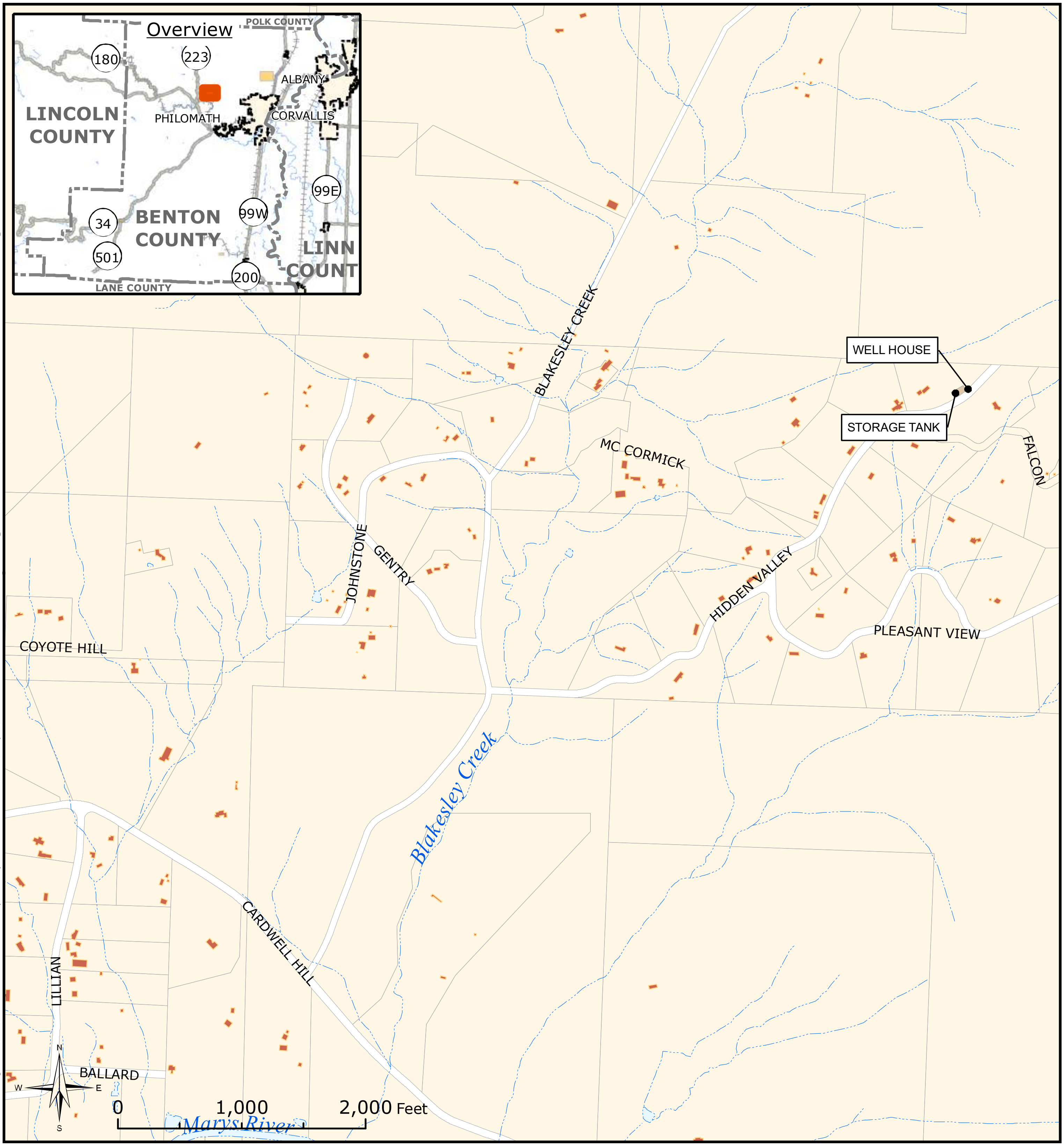
5.3.1 Groundwater Well/Wellhouse

Groundwater Well

The original wellhead was believed to be installed by Grandview Farms in 1974 prior to the community sub-division being built. Files for that well indicate a depth of 600 ft with a rated flow of 23 gpm rated from an 80 hour well test. The original 5 hp well pump has recently been replaced with a new pump of the same size. The well is housed in a small wooden structure that includes the well piping, meter, sample tap and isolation valves. Readings from the pump are recorded manually for usage along with individual meters. No treatment of the well water is provided.

Observations:

Source water is supplied by a single wellhead and pump. There is no redundancy in the system.



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Legend

Public Lands

- City and County
- Private land
- Buildings
- Cities
- County
- Railroads
- Highways
- Streams

Project No. 20-2754

Water and Sewer Utility Assessment

Figure 5-1
Hidden Valley Water Dist.
System Map

Data Sources: Benton County Nov 2020, Murraysmith Nov 2020. Service Layer Credits:
Coordinate System: NAD 1983 HARN StatePlane Oregon North FIPS 3601 IntlFeet
Disclaimer: Murraysmith and Benton Co. make no representations, express or implied, as to the accuracy, completeness and timeliness of the information displayed. This map is not suitable for legal, engineering, or surveying purposes. Notification of any errors is appreciated.

December 2020

Figure 5-2 Hidden Valley Wellhouse

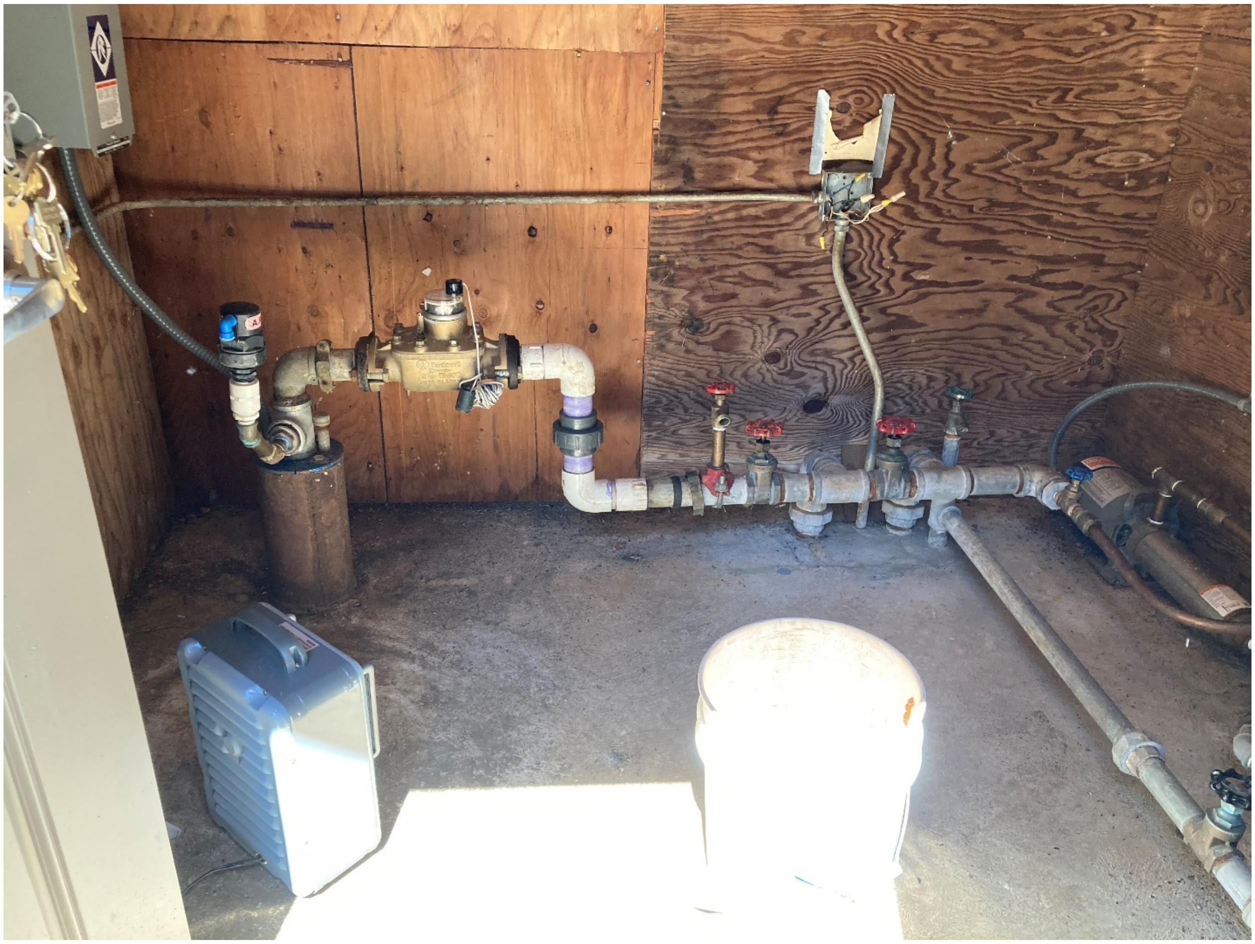
Recommendations: Keep spare pump and/or parts in stock in case of a pump or system failure.

Well house

The wellhead, controls, and pressure system are located inside a one-room wooden structure located adjacent to the storage tank.

Observation: The exterior of the structure is in good working order and the roof has recently been replaced. The interior consists of plywood sheeting on the walls and concrete floor. A portable heater is located in the building for freeze protection.

Figure 5-3 Hidden Valley Well House Interior



Recommendations: Paint the building interior to preserve building lifespan.

Pressure System

The pressure system that serves a single elevated residential connection is fed from the discharge line of the pump inside the well house. Flow is conveyed to another 5 hp pump and pumped into a pre-charged 35 gallon pressure tank which feeds the service line to the residence.

Figure 5-4 Pressure System

Observation: The pump and pressure tank are in good working order.

Recommendations: None.

System Controls

System controls are located inside the well house. The well pump is called to run when the low level switch is triggered in the nearby storage tank and turned off when the high level switch is triggered. Electrical service is provided by the local service provider and no backup power provisions exist.

Observations: Control equipment and power provisions appear to be in good working condition at the site. An electrical junction box does not have a cover and unused conduit and wiring terminate near the pressure system tank. In the event of a power outage, the service on the pressure system will lose service once the pressure in the 35 gallon pressure tank is depleted.

Recommendations: Provide electrical cover and remove unused conduit and wiring.

5.3.2 Storage

Water from the well is fed to an adjacent 18,000 gallon steel storage tank. The tank is approximately 8 feet in diameter and lays in the horizontal position. The tank is surrounded by a wooden fence. The tank has low and high level floats that control the nearby well pump. In case of a pump failure the tank also has a connection that can be used to fill the tank if needed. The tank was originally intended for pressure service and consequently the access point is a 24-inch blind flange located at the top of the tank.

Figure 5-5 Hidden Valley Storage Tank

Observations: The existing coating on the tank has failed in a number of locations. The surrounding trees are encroaching over the tank and appear to be contributing to the debris and moss build-up on the tank and most likely are causing issues with the coating system. The trees could cause a structural issue if trees or limbs were damaged during a storm event. The fence around the tank is in poor condition and vegetation is growing against the tank.

Figure 5-6 Hidden Valley Storage Tank and Fence

Figure 5-7 Storage Coating Failure

Recommendations: A formal tank inspection should be undertaken to assess the structural integrity of the tank and determine its remaining service life. If it is determined that there is remaining service life, the tank's interior and exterior should be painted. If the service life is limited, less than 20 years, replacement of the tank should be considered.

The surrounding trees should be limbed by a professional arborist to protect the tank and its coating system. New gravel surfacing should be placed around and under the storage tank to prevent vegetation growth, and the fence should be replaced.

5.3.3 Distribution System

The distribution system consists of 3,600 ft of solvent welded 2-inch and 2-1/2-inch PVC pipe. All but one connection are served by gravity from the storage tank with pressures as high as 108 pounds per square inch (psi) at the bottom of the system. No line breaks have been observed by the current operation staff. All individual connections are metered, and usage is recorded by staff. Replacement of the existing individual meters is not known.

Observations: Distribution components were not observed during the site visit.

Recommendations: None.

5.4 Water Demand/Wastewater Flows

System demands are monitored and tracked by the flowmeter located in the well house. Total water usage in cubic feet is logged and provided monthly. Average Daily Demand (ADD) of the system was determined for the past 2 years. An assumed peaking factor of 3 was applied to the ADD to determine peak hour demand (PHD) of the system. System demands are summarized below in **Table 5-1**.

Table 5-1 System Demands

Parameter	2018	2019
Average Daily Demand (ADD)	2,347 gpd	2,321 gpd
Per Capita Use	98 gpd	97 gpd
Peak Hour Demand (PHD)	4.9 gpm	4.8 gpm

Individual meter use data was also provided and compared against the monthly system demands. A discrepancy was found between metered use recorded at the wellhead and total individual meter reading with the well use consistently being 25 percent higher.

Observations: Based on an estimated population of 24, the gallons per day per capita appears to be within the typical range of demands for a domestic system of the 80 – 100. Metered use at the wellhead was an average of 25 percent higher than the total usage at the individual meters. This discrepancy indicates a potential calibration issue between the meters and/or leakage in the system.

Recommendations: Continue to monitor the discrepancy between the well meter and individual meters. Depending on the age, service meters may need to be replaced.

5.5 Capacity Analysis

Source

The most recent well drawdown test was performed in 1998 by Alpine Pump yielded an average flow of 15.4 gpm which adequately meets the max demand on the system of 4 gpm.

Distribution System

At the peak hour demand velocities in the system piping is 0.5 ft/s, which is well within accepted velocity criteria for sizing distribution mains. Given the size of piping, the system does not have the capacity to accommodate fire flows.

Storage

The volume of the storage tank is 18,000 gallons. Given the size of tank, fire flow storage for a residential community, 120,000 (1,000 gallons per minute for 2 hours), cannot be provided by the system, therefore storage for fire flow was not included in the storage capacity analysis.

Required storage was analyzed using the following parameters:

- Operational Storage (OS), defined as minimum volume required to minimize excessive pump starts, calculated as pump supply (gpm) capacity times 20 minutes.
- Equalizing Storage (ES), defined as storage required for on call demand during peak hour demand flows.
- Standby Storage (SB), defined as the standby storage required during a pump failure or other event causing a service disruption in the supply and calculated as 200 gpd times 1 day times number of residences.
- Dead Storage (DS), defined as the storage not available for system capacity due to hydraulic limitations and assumed to be the bottom 1-ft of the storage tanks for this analysis.

The required storage components are summarized below in **Table 5-2**.

Table 5-2 Storage Analysis

Storage Component	
Operational Storage (OS)	460 gal
Equalizing Storage (ES)	0 gal
Standby Storage (SB)	2,800 gal
Dead Storage (DS)	1,300 gal
Minimum Required Storage	**4,560 gal**

The existing storage capacity of 18,000 exceeds the minimum required storage calculated above, without consideration of storage for fire flow. Based on the required operational, equalizing, and dead storage the system can maintain water service of 7 days at average daily demand in case of a supply failure.

5.6 Regulatory Requirements

The Hidden Valley Water System operates under the Oregon Health Authority (OHA) as system 41-01303. The system is classified as a Non-EPA (State Regulated) Water System ("Non-Public") and is regulated by Oregon Health Authority as a non-community water system. The system is required to submit bacteriological samples quarterly and yearly samples for nitrate. Other monitored contaminants were sampled at the beginning of operations of the system and are not required on a reoccurring basis.

No samples have met or exceeded Maximum Contaminant Levels (MCLs), nor has any quarterly sample for total coliform yielded a positive sample.

5.7 Recommendations

The following are recommendations for improvements to the existing District facilities and their operations based on observations and current best practices to maintain facility performance, support operations.

Well

- Consider keeping spare pump or parts in stock in case of a pump failure.

Well House

- Consider interior painting.

Control System

- Provide covers for electrical junction boxes and remove unused conduit.

Storage Tank

- Contract licensed arborist to remove trees/branches that overhang and are at risk of falling on tank.
- Conduct a structural inspection of the tank to determine remaining service life.
- Paint the exterior of the tank.
  - If service life is limited, replace with a new steel tank.
- Provide gravel surfacing around and under the storage tank.
- Provide new security fence around storage tank.

Operation and maintenance

- Inspect and clean interior and exterior of tank annually.

5.8 Cost Estimates and Preliminary Improvements Schedules

Opinions of costs for the recommended improvements in Section 5.7 are summarized below in Table 5-3. Costs are categorized as immediate, short-term, and long-term based on system needs.

Table 5-3 Recommended Improvements

Recommended Improvement	Opinion of Cost		
	Immediate	Short-Term	Long-Term
Wells			
Spare parts/pump			$2,800
Storage Tanks			
Tank inspection		$7,800	
Tank Coating		$31,300	
Tree removal		$1,600	
Gravel surfacing		$1,000	
Security fence		$5,400	
TOTAL		**$47,100**	**$2,800**

Section **6**

Section 6

Cascade View Water District

6.1 Service Area

The Cascade View Water District provides potable water for the sub-division of Cascade View located just north of Corvallis in Benton County. Current County records indicate a population of 113 with 52 connections in the system.

6.2 Background

The water system was constructed to serve the Cascade View sub-division. The system was constructed in 1991 and is the newest of the systems owned and operated by Benton County. The system provides potable water to the sub-division from two well. Two additional well exist for aquifer observation. Water is stored in a glass lined steel reservoir. The majority of customers are served by gravity from the reservoir but a small pressure system adjacent to the storage tank serves several houses that exist on a higher gradeline. A map of the facilities is presented in **Figure 6-1.**

6.3 System Descriptions and Observations

The following system descriptions and observations are based on a site visit conducted on August 25, 2020, discussions with operations staff and review of existing documents.

6.3.1 Groundwater Wells

Groundwater Well

Water is provided to the system by two ground water wells. Well 2 is the primary supply for the water system and well 1 augments the system during high demands. Well logs for well 2 are not available, and thus the well capacity is not known. Well 1 was drilled to depth of 405 ft with a 6-inch diameter casing. Initial drawdown testing of the well yielded a capacity of 35 gpm. Depth to the aquifer was found to be 245 to 250 ft.

Both supply wells provide water to the storage tank from 7.5 hp submersible pumps. Pump usage is tracked by autodialers housed in each well house.

The system also contains two wells (Wells 3 and 4) that are not currently connected to the storage or distribution system and are primarily used for observational purposes

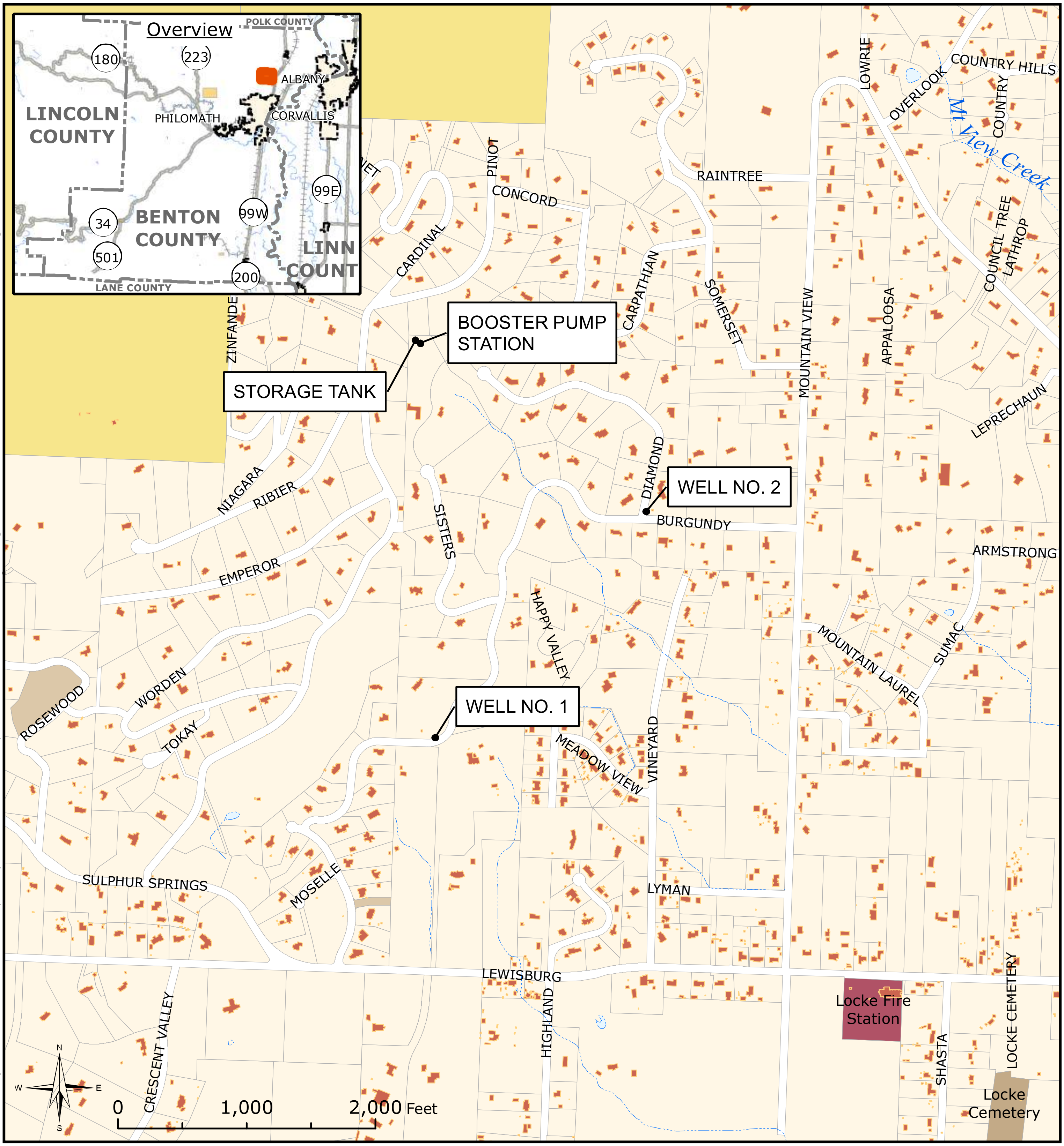
Observations: Both wells have been observed to have entrapped air coming from the discharge.

Recommendations: The primary service wells should continue to be monitored for air entrapment and a drawdown test be performed to ensure the wells can continue to provide water in the future.

Well houses

Each wellhead, well pump, and associated controls are housed in individual CMU buildings located in the district. Both well houses contain discharge piping that include a water meter, air release valve and piping to accommodate pumping to waste. The well houses are heated for freeze protection.

Observation: All the well houses are in good condition due to their relatively recent construction. Well house 1 has trees and vegetation encroaching up the structure.



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Legend

Public Lands

- City and County
- OSU
- OTHER
- RFPD
- Private land
- Buildings
- Cities
- County
- Railroads
- Highways
- Streams

Project No. 20-2754

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Benton County OREGON

Water and Sewer Utility Assessment

Figure 6-1
Cascade View District System Map

December 2020

Data Sources: Benton County Nov 2020, Murraysmith Nov 2020. Service Layer Credits:
Coordinate System: NAD 1983 HARN StatePlane Oregon North FIPS 3601 IntlFeet
Disclaimer: Murraysmith and Benton Co. make no representations, express or implied, as to the accuracy, completeness and timeliness of the information displayed. This map is not suitable for legal, engineering, or surveying purposes. Notification of any errors is appreciated.

Figure 6-2 Well 1 Well House Exterior

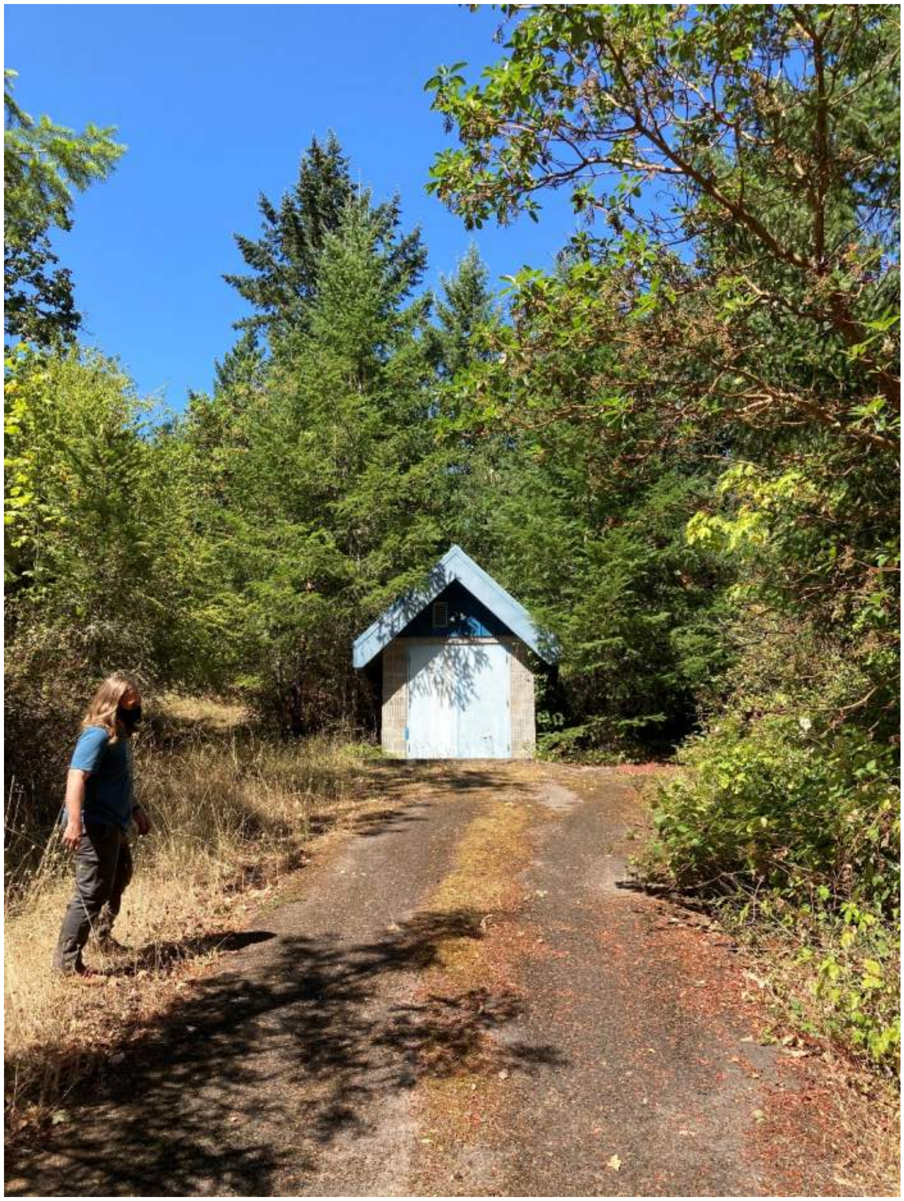

Figure 6-3 Well 2 Wellhead and Flowmeter

System Controls

System controls are located inside the individual well houses. The Well 2 pump is called to run when the low level switch is triggered and turned off when the high level switch is triggered at the reservoir. The secondary well is called to run by another low level switch in case the primary well is not keeping up with demands. Electrical service is provided by the local service provider and no backup power provisions exist.

Observation: Control equipment and power provisions appear to be in good working condition at the site.

Figure 6-4 Well 2 Controls and Electrical Equipment

Site Conditions/Security

The well houses are located inside the community and do not have any security provisions. All well houses are located adjacent to roadways and provide good access.

Observations: Well 2 is located in a high traffic area and is very visible to road traffic. The site does not have any security fencing or other security provisions such as intrusion alarms, cameras or lights.

Figure 6-5 Well 2 Wellhouse

Pressure System

A small CMU structure located adjacent to the storage tank houses a pressure system for several houses that sit on a higher hydraulic grade line than the tank. The pressure system consists of two 7.5 hp pumps which feed two pre-charged bladder tanks. Pressurized flow discharges from the two tanks to feed the elevated customers.

Observations: The pressure system is in good working order and no issues have been experienced recently. There was a sawcut patch in the building floor during the initial observation. The hole in the floor had a small hose connected to the discharge line on the duplex pumps.

Figure 6-6 Pressure System

6.3.2 Storage

A single 71,000 gallon storage reservoir feeds the distribution system. The tank is a glass lined, bolted steeltank sitting at an elevation approximately 375 ft above the main supply well. The tank was recently inspected by a dive team and is in good condition.

Observations:

The storage facilities are in very good condition but there are no redundant facilities in case the tank needs to be drawn down in the future. The tank overflow to daylight could not be found during the site visit.

Figure 6-7 Cascade View Storage Tank

The tank's overflow should be located and investigated to make sure there is no blockage, and the outfall has adequate screening.

6.3.3 Distribution System

The distribution system consists of a gravity portion and a pressure portion. The gravity system is fed by a 6-inch PVC line that immediately reduces to 4-inch PVC pipe that is found throughout the system. The gravity system is split into north and south legs that are interconnected creating a loop system to provide water throughout the system in case of a main break. There is one air relief valve found in the highest point in the system.

The pressure distribution system is supplied by booster pump station adjacent to the storage tank and consists of 2-inch diameter PVC pipe.

Observations: Distribution components were not observed during the site visit.

Recommendations: None.

6.4 Water Demand/Wastewater Flows

Meter data at the wellhouse was analyzed over the last 3years to determine Average Daily Demand (ADD) of the system. Individual meter data at each connection was not provided to compare against the well usage to analyze for leakage and calibration issues. A peaking factor of 3 was applied to the ADD to determine peak hour demand (PHD) of the system.

Table 6-1 Flow Summary

Parameter	2017	2018	2019
Average Daily Demand (ADD)	18,982 gpd	21,272 gpd	19,403 gpd
Per Capita Use	168 gpd	188 gpd	172 gpd
Peak Hour Demand (PHD)	40 gpm	44 gpm	40 gpm

Observations: Based on an estimated population of 113, the gallons per day per capita appears to be high, typical demands for a domestic system are in the 80 – 100 range. County Staff noted there are several users in the system who use excess water compared to other residents, especially during summer months.

System demand typically peaks in July/August due to irrigation demands.

Recommendation: Evaluate surcharge fees for high use customers to keep system demands at reasonable values.

6.5 Capacity Analysis

Source

A recent drawdown analysis has not been performed to determine the capacity of the existing wells. Air entrapment was observed at Well 2 during a site visit. A drawdown test should be performed to investigate capacity of the existing primary wells in the system.

Distribution System

At peak hour demand velocities in the distribution system laterals reach 1.13 ft/s and are well within accepted velocity criteria for sizing distribution mains. Hydraulic modeling of the system was not performed, however, given the size of piping, the system does not appear to have the capacity to accommodate fire flows (1,000 gallons per minute).

Storage

The volume of the storage tank 71,000 gallons. Given the size of tank, a fire flow storage for a residential community, 120,000 gallons (1,000 gallons per minute for 2 hours), cannot be provided by the system, therefore storage for fire flow was not included in the storage capacity analysis.

Required storage was analyzed using the following parameters:

- Operational Storage (OS), defined as the volume required to minimize excessive pump starts, or pump supply (gpm) capacity times 20 minutes.
- Equalizing Storage (ES), defined storage required for on call demand during peak hour demand flows.
- Standby Storage (SB), defined as the standby storage required during a pump failure or other event causing a service disruption in the supply and calculated as 200 gpd times 1 day times number of residences.
- Dead Storage (DS), defined as the storage not available for system capacity due to hydraulic limitations and assumed to be the bottom 2-ft of the storage tank for this analysis.

The required storage components are summarized below in Table 6-2.

Table 6-2 Storage Analysis

Storage Component	
Operational Storage (OS)	700 gal
Equalizing Storage (ES)	1,400 gal
Standby Storage (SB)	10,400 gal
Dead Storage (DS)	7,350
Minimum Required Storage	**19,850 gal**

The existing storage capacity of 71,000 gallons exceeds the minimum required storage calculated above, without consideration of storage for fire flow. Based on the required operational, equalizing, and dead storage calculated above, the system can maintain water service for approximately 3 days at average daily demand in case of a supply failure.

6.6 Regulatory Requirements

The Hidden Valley Water System operates under the Oregon Health Authority (OHA) as system 41-01456. The system is classified as a community water system and is required to submit bacteriological samples monthly and test for inorganic and organic chemicals on a yearly basis.

No samples have met or exceeded Maximum Contaminant Levels (MCLs), nor has any monthly sample for total coliform yielded a positive sample.

6.7 Recommendations

The following are recommendations for improvements to the existing District facilities and their operations based on observations and current best practices to maintain facility performance, support operations.

Wells

- Perform drawdown analysis.

Well Houses

- Remove vegetation and trees that are in close proximity to Well House 1.

Site Conditions and Security

- Provide intrusion alarms at all well houses.

Storage Tank

- Locate tank overflow and ensure adequate screening and no blockage is present.

6.8 Cost Estimates and Preliminary Improvements Schedules

Opinions of costs for the recommended improvements in **Section 6.7** are summarized below in Table. Costs are categorized as immediate, short-term, and long-term based on system needs.

Table 6-3 Recommended Improvements

Recommended Improvement	Opinion of Cost		
	Immediate	Short-Term	Long-Term
Wells			
Drawdown analysis		$2,000	
Site Conditions and Security			
Intrusion Alarms		$6,450	
TOTAL		**$8,350**	

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