

City of Port Orford

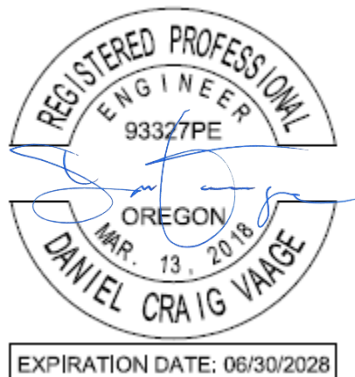
Water Treatment Plant Feasibility Study

This project is a feasibility study for the City of Port Orford Water Treatment Plant. The study will assess the existing plant's condition, regulatory compliance issues, operational challenges, and treatment performance. The report will compare repair, rehabilitation, and replacement alternatives. The final report will identify a preferred alternative, estimated project cost, funding options, implementation schedule, and recommended next steps.

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1. Executive Summary

The City of Port Orford is completing a feasibility study to evaluate the condition, performance, and long-term viability of its existing Water Treatment Plant. The study will review existing facilities, including building and site infrastructure, treatment equipment, chemical feed systems, mechanical systems, and electrical and controls systems.

The evaluation will identify existing deficiencies, operational challenges, safety concerns, and treatment performance issues. The study will also review current and future drinking water regulations, applicable Oregon Health Authority requirements, compliance history, sanitary survey findings, monitoring and reporting obligations, and regulatory drivers that may affect future plant improvements.

Three alternatives will be evaluated: repairing the existing plant, fully rehabilitating the existing plant, and relocating and replacing the existing plant with a new water treatment plant. Each alternative will be compared based on its ability to address identified deficiencies, improve reliability, meet regulatory requirements, support future operations, and provide long-term value to the City.

The report will identify a recommended alternative and provide an opinion of probable project cost, including construction, engineering and administrative costs, contingency, and total project cost. The economic comparison will incorporate operation and maintenance costs and salvage value at the end of the planning period. Net present value will then be used to evaluate the alternatives on a consistent life-cycle cost basis. Funding opportunities, implementation schedule, and recommended next steps will also be presented to support the City's decision-making and future project development.

1.1 Existing Deficiencies

The existing Water Treatment Plant has multiple deficiencies that affect treatment reliability, operator safety, maintainability, and the City's ability to consistently operate the facility at its intended capacity. Although major treatment components remain serviceable, the plant is aging and has limited automation. Several treatment process, mechanical, chemical feed, electrical, and building systems also require repair, rehabilitation, or replacement.

Key treatment-related deficiencies include damaged tube settler plates and supports, filter media of unknown age with recurring mudballing, and suspected damage or displacement of the filter underdrain systems. These conditions reduce settling and filtration reliability, require more frequent backwashing than would normally be expected, and contribute to the reported need to operate the plant below its original design capacity. The additional backwashing increases staff time, consumes more treated water, and results in substantial avoidable operating costs and wasted resources for the City. The plant was designed for 555 gpm and later rated by OHA at

450 gpm; however, current reliable operation is limited to approximately 350 gpm due to turbidity, clarification, alarms, and process-control limitations.

The chemical feed systems also have significant deficiencies, including inadequate secondary containment, poor chemical labeling, recurring soda ash feedline clogging, limited chemical feed redundancy, inadequate eyewash pressure, lack of an emergency shower, and a MiOx hypochlorite generator that is beyond its useful service life. These issues increase operator safety risk and reduce the reliability and controllability of chemical dosing.

Mechanical deficiencies include broken raw water piping, broken backwash basin piping and drainage components, inoperable or air-operated-only process valves, deteriorated process and backwash piping, aging pumps, reliance on a single air compressor for pneumatic valving, and lack of HVAC in portions of the facility.

Electrical and controls deficiencies include outdated electrical panels and controls, unreliable automation and emergency call-out functions, limited SCADA capability, no automatic transfer switch, and no onsite backup generator.

Building and site deficiencies include exterior deterioration, peeling paint, localized dry rot, broken or missing windows, roof moss, and deteriorated site gates.

Together, these conditions limit reliable operation to approximately 350 gpm, increase operator safety and maintenance risks, reduce treatment and process-control reliability, and constrain the City's ability to maintain service and adapt to future regulatory requirements.

1.2 Regulatory Drivers

As a surface water treatment facility, the WTP must consistently meet turbidity, disinfection, monitoring, reporting, and public notification requirements. Deficiencies in clarification, filtration, chemical feed, controls, and emergency power increase the risk of treatment interruptions, inadequate process control, elevated turbidity, and compliance or reporting failures.

The most immediate concern is maintaining reliable treatment during changing raw water conditions and peak demand. Although recent violations were reporting-related rather than health-based, aging instrumentation, limited SCADA, unreliable alarms, and manual operations increase the potential for missed data, delayed response, and incomplete records.

1.3 Alternatives Evaluated

Three alternatives were evaluated to address the WTP's treatment, reliability, safety, regulatory, capacity, and resiliency needs. The alternatives range from targeted repair of urgent deficiencies, to comprehensive rehabilitation of the existing facility, to construction of a new plant on higher ground near Hubbard Creek. They were compared based on initial and life-cycle cost, treatment performance, useful life, operational reliability, constructability, regulatory flexibility, service continuity, and exposure to coastal hazards.

1.3.1 Repair Existing WTP

This alternative would complete targeted repairs to critical treatment, chemical feed, mechanical, electrical, controls, emergency power, building, and operator-safety systems while retaining the existing plant configuration and major structures. With a preliminary construction cost of approximately \$2.1 million, it is the lowest-cost option and could stabilize near-term operations, but it would retain the aging 1978 facility, constrained layout, limited expansion capability, and tsunami exposure. It is therefore best suited as an interim or contingency approach rather than the preferred long-term solution.

1.3.2 Rehabilitate Existing WTP

This alternative would comprehensively renew the existing WTP by replacing or upgrading major treatment, chemical feed, piping, pumping, electrical, controls, emergency power, building, and safety systems while reusing serviceable basins, contact tanks, structures, and site improvements. Its preliminary construction cost is approximately \$6.5 million. Rehabilitation could improve capacity, reliability, and useful life more substantially than repair, but it would remain constrained by the existing site, hydraulics, building footprint, construction within an operating plant, and tsunami exposure.

1.3.3 Replace Existing WTP

This alternative would construct a new WTP on higher ground near Hubbard Creek, including new treatment processes, site improvements, raw- and finished-water connections, chemical systems, controls, emergency power, residuals handling, and provisions for future treatment needs. Its preliminary construction cost is approximately \$13.0 million. Although it has the highest initial cost and implementation complexity, it provides the longest service life, greatest reliability and regulatory flexibility, best service-continuity strategy, and strongest reduction in coastal-hazard risk.

1.4 Recommended Alternative

Alternative 2, comprehensive rehabilitation of the existing WTP, is recommended as the selected alternative. Rehabilitation provides a substantial improvement over targeted repair by renewing the major treatment, chemical feed, mechanical, electrical, controls, emergency power, building, and operator-safety systems while reusing serviceable portions of the existing facility.

Note that Alternatives 1 and 2 are separate implementation paths, not sequential projects. If funding is secured for Alternative 2, the City should proceed directly with rehabilitation rather than first completing the full \$2.1 million Alternative 1 repair program; the \$6.5 million rehabilitation cost is therefore not intended to be added to the Alternative 1 cost. Before rehabilitation is constructed and commissioned, the City should complete only those limited interim repairs necessary to maintain regulatory compliance, operator safety, and reliable

service, and that work should be incorporated into the rehabilitation scope where practical to avoid duplicate or stranded investment.

Although Alternative 3 would provide greater long-term resiliency and eliminate the existing plant's tsunami exposure, its preliminary project cost is considered cost prohibitive, and the City is unlikely to secure a funding package sufficient to implement it at affordable user rates. Alternative 2 therefore represents the most practical and fundable approach for improving treatment reliability, capacity, safety, maintainability, and regulatory compliance. Final implementation should be contingent on confirming that the existing structures, basins, and hydraulic configuration can support the required capacity and useful life.

1.5 Estimated Cost and Schedule

Alternative 2 has a preliminary total project cost of approximately \$6.5 million. An implementation period of approximately 30 to 36 months is anticipated after authorization to proceed: 3 to 6 months for focused confirmation of existing structural and hydraulic suitability, design criteria, preliminary design, funding development, and construction sequencing; 9 to 12 months for final design, permitting, OHA plan review, bidding, and financing; and 18 to 24 months for phased construction, temporary operations, startup, performance testing, commissioning, and final approval. Front-end evaluations should be limited to information needed to confirm rehabilitation feasibility and advance design, with investigations performed concurrently where practical. The schedule will depend on funding availability, agency review, construction phasing within the operating plant, and long-lead equipment. Essential repairs should be completed as needed to maintain reliable operation until the rehabilitation improvements are commissioned.

2. Existing Water Treatment Plant

2.1 WTP Overview

The City of Port Orford owns and operates a community public water system serving approximately 1,200 people through 745 connections. The WTP was constructed in 1978 and upgraded in 1996 and 2001. North Fork Hubbard Creek is the permanent surface-water source, and Garrison Lake is maintained as an emergency source. Raw water is treated through prechlorination, chemical addition and rapid mixing, flocculation, sedimentation, rapid-sand filtration, pH and alkalinity adjustment, and post-disinfection before entering storage and the distribution system. The plant includes a standalone flocculation tank and two parallel aluminum Keystone treatment units. It was originally designed for 555 gpm and later rated by the Oregon Health Authority at 450 gpm based on a filtration rate of approximately 3 gpm/ft²; current reliable operation is limited to approximately 350 gpm because of treatment-process, controls, and equipment limitations.

Note: this section describes existing facilities and major systems, for greater detail, please see Section 4 “Condition Assessment of WTP”.

2.2 Existing Facilities

2.2.1 Building and Site Infrastructure

The existing water treatment plant building includes a main treatment area measuring approximately 70 feet by 45 feet, an attached office area measuring approximately 40 feet by 12 feet, and an attached chemical room measuring approximately 25 feet by 18 feet. The building is stick-built construction supported on a perimeter foundation, with wood truss roof framing used for roof support.

The main treatment area and attached office are constructed slab-on-grade. The chemical room floor is set approximately 2.5 feet below grade, which provides primary containment in the event of a chemical spill.

The main treatment area houses the primary treatment process equipment. The attached office provides space for operator activities, records, routine plant administration, the main power panel, and a limited SCADA system. The chemical room provides dedicated space for chemical storage and feed equipment and is separated from the main treatment area to support chemical handling and operator safety.

2.2.2 Treatment Equipment

The WTP uses a conventional surface-water treatment train in which chemical conditioning is followed by filtration and disinfection. Raw water first receives prechlorination to help manage seasonal color and support oxidation ahead of treatment. Alum, polymer, and soda ash are then introduced through a static mixer. Alum destabilizes fine suspended and colloidal material so it can agglomerate; polymer supports formation and strengthening of floc and may also serve as a filter aid; and soda ash adjusts pH and alkalinity to promote effective coagulation and stabilize finished-water quality.



Conditioned water enters the single hydraulically mixed flocculation basin, where gentle mixing promotes collisions between destabilized particles and forms larger, settleable floc. Water then divides between the two parallel Keystone treatment units. In each unit, it flows upward through a sedimentation cell fitted with inclined tube settlers, which increase the effective settling area and allow floc to separate from the water over a compact footprint.

Clarified water then gravity flows to the adjacent mixed-media gravity filters. The filter media retain fine particles and residual floc that pass through sedimentation, providing the final physical barrier for turbidity and particle removal. Each filter includes surface scour and backwash equipment used to loosen and remove accumulated solids so the media can be returned to service. Filtered water is conveyed by dedicated centrifugal pumps to the chlorine contact facilities.

The existing MiOx system generates dilute sodium hypochlorite onsite for post-disinfection. The disinfectant is applied before the water passes through three contact tanks, which provide storage and the detention time needed for microbial inactivation before finished water is pumped to the distribution system. Together, coagulation, flocculation, sedimentation, filtration, and disinfection provide multiple treatment barriers for turbidity and microbial control. The principal equipment and operating characteristics of each treatment stage are described below.

2.2.2.1 Flocculation Basin

Flocculation is provided in a single hydraulically mixed cylindrical flocculation basin that has a volume of approximately 10,000 gallons and provides a theoretical hydraulic detention time of 24 minutes at 450 gpm.

2.2.2.2 Sedimentation/Settling

Flocculated water flows by gravity from the flocculation basin to two parallel sedimentation cells equipped with inclined tube settlers. As the water rises through the tube-settler modules, the reduced settling distance and increased effective settling area promote separation of floc from the clarified water. Each cell has a plan surface area of approximately 144 square feet, providing a combined area of 288 square feet. At the OHA-rated plant flow of 450 gpm, the corresponding surface overflow rate is approximately 1.6 gpm/ft², which is within the typical 1.0 to 2.0 gpm/ft² range used for tube-settler clarification. Clarified water then flows by gravity to the adjacent mixed-media filters.

2.2.2.3 Filtration

Clarified water from each sedimentation cell flows by gravity to an adjacent mixed-media gravity filter. The two filters have a combined surface area of approximately 144 square feet. At the OHA-rated plant flow of 450 gpm, the resulting filtration rate is approximately 3.1 gpm/ft². Each filter is equipped with surface-scour and backwash systems that loosen and remove accumulated solids from the media. Filtered water is conveyed to the chlorine contact facilities by two centrifugal pumps, one serving each filter. Each pump is rated at approximately 290 gpm at 30 feet of total dynamic head, providing a reported combined capacity of approximately 550 gpm when both pumps operate. The pump discharge piping includes a non-slam check valve, rate-of-flow control valve, and knife gate isolation valve.

2.2.2.4 Chlorination

The water treatment plant currently utilizes a MiOx unit to make 0.8% sodium hypochlorite onsite. Contact time is achieved with three contact tanks, two 19,000 gallon tanks and a 30,000 gallon baffled tank.

2.2.3 Chemical Feed Systems

Chemicals used for the treatment (excluding chlorination) include alum, polymers (1986-N), flocculants, and soda ash. Alum is used as the primary coagulant, while the polymer serves as a supplemental coagulant and filter aid. Soda ash is used for pH control to maintain neutral pH for proper coagulation and suitable final water quality. Kemira Superfloc N-300LMW is used for flocculation. The on site chemical storage tanking in the chemical storage structure include:

- A 200-gallon soda ash tank (black polyethylene)



- A 150-gallon polymer tank (black polyethylene)
- A 3,000-gallon aluminum sulphate tank (black polyethylene)

2.2.4 Mechanical Systems

2.2.4.1 Pumps

Finished water is pumped from the chlorine contact tanks to the Port Orford distribution system by two 25-horsepower centrifugal pumps. The pumps are rated at approximately 290 gpm at 210 feet of total dynamic head. The pumps normally operate independently but may be operated in parallel to provide a reported combined flow of up to approximately 550 gpm. Pump operation is manually controlled by WTP staff. The discharge piping from each pump includes a spring-loaded non-slam check valve, flow-control valve, and manual wafer butterfly isolation valve. A two-inch combination air/vacuum release valve is installed on the common discharge header. Interconnecting piping also allows the finished-water pumps to supply the filters for emergency backwashing.

2.2.4.2 Process Piping and Valves

The two distribution system pump discharges are equipped with standard spring-loaded, non-slam check valves, a flow rate control valve, and manual wafer butterfly valves for isolation. A single two-inch combination air/vacuum release valve is located on the combined discharge pipe. Piping from the treated water pumps is provided so that the pumps back to the filter units can be used for filter backwashing in an emergency.

2.2.4.3 Backwashing System

Backwashing of the media filters is done by using treated water from the distribution system. There are no backwash pumps, only valves that open and allow finished water from distribution to backwash the filters using the static head from the Coast Guard Hill reservoir.

2.2.4.4 HVAC and Compressed Air Systems

The WTP does not have a building-wide heating, cooling, or temperature-control system. Mechanical ventilation is provided in the chemical room to remove chemical vapors and support safe chemical storage and handling; however, the treatment area, laboratory, and operations spaces have limited environmental control.

Pneumatic actuators operate the treatment-process valves and are supplied by a single air compressor. Because no standby compressor is provided, failure of the compressor or associated air system could prevent operation of multiple process valves and disrupt treatment. A redundant compressor or temporary-air connection should therefore be considered for continued operation or rehabilitation.

2.2.4.5 Maintenance

The WTP includes a shop that is sufficient to make basic repairs and replacements of distribution system components and smaller WTP components. There are stores of miscellaneous replacement parts for the distribution system and WTP stored inside the WTP along the southern wall.

2.2.5 Electrical and Controls

The WTP electrical system is centered on the original Furnas power distribution panel installed when the facility was constructed in 1978. Subsequent control upgrades added a programmable logic controller and a limited SCADA system that provide basic process monitoring, alarm indication, and data display.



3. Regulatory Framework

3.1 Responsibilities as a Water Supplier

Per OAR 333-061-0025, water suppliers are responsible for taking all reasonable precautions to assure that:

- Water delivered to water users does not exceed maximum contaminant levels
- Water system facilities are free of public health hazards
- Water system operation and maintenance are performed as required by both these rules and the equipment manufacturer's requirements

The list of reasonable precautions includes the following tasks:

1. Routinely collecting and submitting water samples for laboratory analyses at the frequencies prescribed by OAR 333-061-0036.
2. Taking immediate corrective action when the results of analyses or measurements indicate that maximum contaminant levels have been exceeded and report the results of these analyses as prescribed by OAR 333-061-0040.
3. Reporting as prescribed by OAR 333-061-0040, the results of analyses or measurements which indicate that maximum contaminant levels have not been exceeded.
4. Notifying the public and all customers of the water system, as prescribed by OAR 333-061-0042, when any maximum contaminant levels have been exceeded.
5. Notifying all customers served by the water system, as prescribed by OAR 333-061-0042, when reporting requirements are not being met, when public health hazards are found to exist in the system, or when the operation of the system is subject to a permit or a variance.
6. Maintaining monitoring, operating records, and making these records available for review when the system is inspected.
7. Maintaining a pressure of no less than 20 pounds per square inch (psi) at all service connections.
8. Following up on complaints relating to water quality from users and maintaining records and reports on actions undertaken.
9. Conducting an active program for identifying and controlling cross connections.
10. Submitting to OHA, plans prepared by a professional engineer registered in Oregon for review and approval before undertaking the construction of new water systems or major modifications to existing water systems, unless exempted from this requirement.
11. Assuring that the water system is in compliance with OAR 333-061-0032 relating to water treatment.
12. Assuring that the water system is in compliance with OAR 333-061-0210 through OAR 333-061-0272 relating to certification of water system operators.

In the last five years, the City of Port Orford has had no health-based violations and 4 violations for non-reporting. For a more detailed explanation of the City of Port Orford water system data, refer to the Oregon Public Health Drinking Water Data Online Website:

<https://yourwater.oregon.gov/violsum.php?pwsno=00670>

3.2 Public Water System Regulations

Water providers should always be informed of current standards, which can change over time and should be aware of pending future regulations. As of this writing, OAR Chapter 333, Division 061 covering Public Water Systems is over 300 pages in length, with the most recent version effective as of (May 26th, 2025). This section is not meant to be a comprehensive list of all requirements but a general overview of the requirements. Refer to OAR 333-061 for further clarification on any subject in this section.

Drinking water regulations were established in 1974 with the signing of the Safe Drinking Water Act (SDWA). This act and subsequent regulations were the first to apply to all public water systems in the United States. The Environmental Protection Agency (EPA) was authorized to set standards and implement the Act. With the enactment of the Oregon Drinking Water Quality Act in 1981, the State of Oregon accepted primary enforcement responsibility for all drinking water regulations within the state. Requirements are detailed in OAR Chapter 333, Division 061. The SDWA and associated regulations have been amended several times since inception with the goal of further protection of public health.

SDWA requires the EPA to regulate contaminants which present health risks, are known or are likely, to occur in public drinking water supplies. For each contaminant requiring federal regulation, EPA sets a non-enforceable health goal, or maximum contaminant level goal (MCLG). This is the level of contamination in drinking water below which there is no known or expected health risk. The EPA is then required to establish an enforceable limit, or maximum contaminant level (MCL), which is as close to the MCLG as is technologically feasible, taking cost into consideration. Analytical methods are not sufficiently developed to measure the concentration of certain contaminants in drinking water, the EPA specifies a treatment technique instead of an MCL to protect against these contaminants.

Water systems are required to collect water samples at designated intervals and locations. The samples must be tested in State approved laboratories. The test results are then reported to the State, which determines whether the water system complies or is in violation of the regulations.

There are three main types of violations:

- **Maximum Contaminant Level (MCL)** – Violation occurs when tests indicate that the level of a contaminant in treated water is above the EPA or State's Legal Limit (states may set standards equal to, or more protective than, EPA's). These violations indicate a potential health risk, which may be immediate or long-term.
- **Treatment Technique (TT)** – Violation occurs when a water system fails to treat its water in the way prescribed by EPA (for example, by not disinfecting). Like MCL violations, treatment technique violations indicate a potential health risk to consumers.

- **Monitoring and Reporting (M&R)** – Violation occurs when a system fails to test its water for certain contaminants or fails to report test results in a timely fashion. If a water system does not monitor its water properly, no one can know whether its water poses a health risk to consumers.

If a water system violates EPA/State rules, it is required to notify the State and the Public. States are primarily responsible for taking appropriate enforcement actions if systems with violations do not return to compliance. States are also responsible for reporting violation and enforcement information to the EPA quarterly. To comply with the regulations, water systems must provide adequate treatment techniques, operate treatment processes to meet performance standards, and properly protect treated water to prevent subsequent contamination after treatment. A separate set of standards exists to address the beneficial use of public water, conservation, curtailment, and water planning. Governed by the Oregon Water Resource Department, OAR 690-086 includes provisions governing water consumption and conservation in Oregon. Section 690-086 requires that all public water systems develop and maintain a planning document known as a Water Management and Conservation Plan (WMCP). The WMCP includes four major components:

- Water System Description
- Water Conservation Plan
- Water Curtailment Plan
- Long-Range Water Supply Plan

The purpose of the plan is to help an agency plan for and responsibly and beneficially utilize public water resources for human demands. The goal of the planning is to reduce or eliminate water demand that is not beneficial through efficiencies, conservation, education, and other practices.

3.3 Current Standards

The EPA-established, National Primary Drinking Water Regulations lists 87 contaminants. The list is broken down into size categories as follows, with the number of contaminants in parentheses: microorganisms (7), Disinfection Byproduct (4), Disinfectant (3), Inorganic Chemical (16), Organic Chemical (53), and Radionuclides (4). These standards either have established MCLs or treatment techniques. In addition, there is a list of National Secondary Drinking Water Regulations that include 15 contaminants and the desired goals, and in the case of fluoride, may require special public notice.

3.3.1 Surface Water Treatment Rules

The Surface Water Treatment Rules (SWTR's) are a group of rules that have been developed by the EPA to protect drinking water communities whose source is surface water. The rules include the following:

- Surface Water Treatment Rule – June 1989
- Interim Enhanced Surface Water Treatment Rules (IESWTR) – December 1998
- Filter Backwash Recycling Rule (FBRR) – June 2001
- Long Term 1 Enhanced Surface Water treatment Rule (LT1ESWTR) – January 2002
- Long Term 2 Enhanced Surface Water Treatment Rules (LT2ESWTR) – January 2006

All water systems using surface water must provide a total level of filtration and disinfection treatment to remove/inactivate 99.9 percent or 3-log of *Giardia lamblia*, and to remove/inactivate 99.99 percent or 4-log of viruses. In addition, filtered water systems must physically remove 99 percent or 2-log of *Cryptosporidium*. Systems with source water *Cryptosporidium* levels exceeding specified limits must install and operate additional treatment processes.

Filtered water systems must meet specified performance standards for combined filter effluent turbidity levels. Water systems using conventional and direct filtration must also record individual filter effluent turbidity and take action if specified action levels are exceeded. When more than 1 filter exists, each filter's effluent turbidity must be monitored continuously and recorded at least every 15 minutes. The combined flow from all filters must have a turbidity measurement at least every four hours by grab sampling or continuous monitoring. Turbidity monitoring must occur prior to any storage such as a clearwell or contact tank. General requirements for systems utilizing conventional or direct filtration are:

- Individual filter turbidity monitored continuously and recorded every 15 minutes or less.
- Combined filter turbidity monitored continuously or grab sample taken at least every 4 hours
- Combined filter turbidity less than 1 NTU in 100% of measurements
- Combined filter turbidity less than or equal to 0.3 NTU in 95% of measurements in a month
- Specific follow-up actions if individual turbidity exceeds 1.0 NTU twice

Filtered water systems that recycle spent filter backwash water or other waste flows must return those flows through all treatment processes in the filtration plant. Systems wishing to recycle filter backwash water must provide notice to the State including a plant schematic showing the origin, conveyance, and return location of recycled flows. Design flows, observed flows, and typical recycle flows are also required along with a state-approved plant operating capacity.

3.3.2 Long-Term 2 Enhanced Surface Water Treatment Rule (LT2SWTR)

LT2SWTR was published by the EPA on January 5, 2006. The rule requires source water monitoring for public water systems that use surface water or ground water under the direct influence of surface water (GWUDI). Based on the system size and filtration type, systems must

monitor *Cryptosporidium*, *E.coli*, and turbidity. Source water monitoring data will be used to categorize the source water Crypto concentration into four “bin” classifications that have associated treatment requirements.

Systems serving fewer than 10,000 people are required to conduct 12 months of *E.coli* monitoring and 12-24 months of Crypto monitoring if *E.coli* trigger levels are exceeded. The rule provides other options to comply with the initial source water monitoring that includes either submitting previous *Cryptosporidium* data meeting (grandfathered data) the requirements or committing to provide a total of at least 5.5-log treatment for *Cryptosporidium*. A second round of source water monitoring will follow 6 years after the system makes its initial bin determination.

3.3.3 Disinfectant and Disinfection Byproducts

Disinfection treatment chemicals used to kill microorganisms in drinking water can react with naturally occurring organic and inorganic matter in source water called “DBP precursors” to form disinfection byproducts (DBPs). Some disinfection byproducts have been shown to cause cancer and reproductive effects in lab animals and suggested bladder cancer and reproductive effects in humans. The challenge is to apply levels of disinfection treatment needed to kill disease-causing microorganisms while limiting the levels of disinfection byproducts produced. The primary disinfection byproducts of concern in Oregon are the total trihalomethanes (TTHM) and the haloacetic acids (HAA5).

Disinfection byproducts must be monitored throughout the distribution system at frequencies of daily, monthly, quarterly, or annually. This depends on the population served, type of water source, specific disinfectant applied and in accordance with an approved monitoring plan. Disinfectant residuals must be monitored at the same location and frequency as coliform bacteria.

Total organic carbon (TOC) is an indicator of the levels of DBP precursor compounds in the source water. Systems using surface water sources and conventional filtration treatment must monitor source water for TOC and alkalinity monthly and practice enhanced coagulation to remove TOC if it exceeds 2.0 mg/L as a running annual average.

Compliance is determined based on meeting maximum contaminant levels (MCL's) for disinfection byproducts and maximum levels for disinfectant residual (MRDL) over a running annual average of the sample results, computed quarterly. A summary is as follows:

- TTHM/HAA5 monitoring required in distribution system. One sample per quarter for systems serving 500-9,999 persons. One sample per year in warmest month required for systems serving less than 500
- MCL for TTHM is 0.080 mg/L. MCL for HAA5 is 0.060 mg/L
- Any system having TTHM > 0.064 mg/L or HAA5 > 0.048 based on a running annual average must conduct disinfection profiling
- TOC and alkalinity monitoring in source water monthly. Enhanced coagulation if TOC greater than 2.0 mg/L

- Comply with MRDL. Limit for chlorine (free Cl₂ residual) is 4.0 mg/L. Limit for chloramines is 4.0 mg/L (as total Cl₂ residual). Limit for chlorine dioxide is 0.8 mg/L (as ClO₂)
- Bromate MCL of 0.010 mg/L
- Chlorite MCL of 1.0 mg/L

3.3.4 Stage 2 Disinfectants and Disinfection Byproducts Rule (DBPR)

The Stage 2 DBPR was published by the EPA on January 4, 2006. The rule builds on existing regulations by requiring water systems to meet disinfection byproduct (DBP) MCL's at each monitoring site in the distribution system. The Stage 1 Rule controls average DBP levels across distribution systems, and the Stage 2 Rule controls the occurrence of peak DBP levels within distribution systems.

The rule requires all community water systems to conduct an Initial Distribution System Evaluation (IDSE). The goal of the IDSE is to characterize the distribution system and identify monitoring sites where customers may be exposed to high levels of TTHM and HAA5. There are four ways to comply with the IDSE requirements: Standard Monitoring, System Specific Study, 40/30 Certification and Very Small System (VSS) Waiver.

Standard monitoring (SM) is one year of increased monitoring for TTHM and HAA5 in addition to the data collected under Stage 1 DBPR. This data will be used with the Stage 1 data to select Stage 2 DBPR TTHM and HAA5 compliance monitoring locations. Any system may conduct standard monitoring to meet the Initial Distribution System Evaluation (IDSE) requirements of the Stage 2 DBPR. The number of monitoring sites, the monitoring periods and monitoring frequency vary depending on population served.

Systems that have extensive TTHM and HAA5 data (including Stage 1 DBPR compliance data) or technical expertise to prepare a hydraulic model may choose to conduct a system specific study (SSS) to select the Stage 2 DBPR compliance monitoring locations.

The term "40/30" refers to a system that during a specific period has all individual Stage 1 DBPR compliance samples less than or equal to 0.040 mg/L for TTHM and 0.030 mg/L for HAA5 and no monitoring violations during the same period. These systems have no IDSE monitoring requirements but will still need to conduct Stage 2 DBPR compliance monitoring.

The Very Small System (VSS) Waiver applies to systems that serve fewer than 500 people and have eligible TTHM and HAA5 data. The VSS eligibility does not depend on the actual TTHM and HAA5 sample results. These systems also have no IDSE monitoring requirements but will still need to conduct Stage 2 DBPR compliance monitoring. 40/30 certifications were previously due for systems larger than 10,000 people.

3.3.5 Total Coliform Rule (TCR) and Revised Total Coliform Rule (RTCR)

The total coliform rule was established by the EPA in 1989 to reduce the risk of waterborne illness resulting from disease-causing organisms associated with animal or human waste. This rule was recently revised and effective on April 1, 2016, and is called the Revised Total Coliform Rule. Routine samples collected by Oregon public water suppliers are analyzed for total coliform

bacteria. The number of monthly samples required varies based on population served. For the City of Port Orford, currently a minimum of two samples per month are required.

Compliance is based on the presence or absence of total coliforms in any calendar month. Sample results are reported as “coliform-absent” or “coliform-present.” If any routine sample is coliform-present, a set of at least three repeat samples must be collected within 24 hours. If any repeat sample is total coliform-present, the system must analyze that culture for fecal coliforms or *E. coli*, and must then collect another set of repeat samples, unless the MCL has been violated and the system has notified the state. Following a positive routine or repeat total coliform result, the system must collect a minimum of three routine samples the following month only for those who monitor quarterly and there is no longer required for those monitoring monthly. Both seasonal and non-community water systems will monitor monthly instead of quarterly.

Systems which collect fewer than 40 samples per month are allowed no more than one coliform-present sample per month including any repeat sample results. Larger systems (40 or more samples per month) allow no more than five percent coliform-present samples in any month including any repeat sample results. Confirmed presence of fecal coliform or *E. coli* presents a potential acute health risk and requires immediate notification of the public to take protective actions such as boiling or using bottled water. Any fecal coliform-positive repeat sample or *E. coli*-positive repeat sample, or any total coliform-positive repeat sample following a fecal or *E. coli*-positive routine sample is a violation of the MCL. For more information on the Revised Total Coliform Rule please visit the Oregon Health Authority (OHA) website. No *E. coli* samples were positive in the last 20 years, according to the OHA Drinking Water website.

3.3.6 Lead and Copper Rules (LCR)

Excessive levels of lead and copper are harmful, and rules exist to limit exposure through drinking water. Lead and copper enter drinking water from corrosion of plumbing materials containing lead and copper. Lead comes from solder and brass fixtures. Copper comes from copper piping and brass fixtures. Protection is provided by limiting the corrosivity of water sent to the distribution system. Treatment alternatives include pH adjustment, alkalinity adjustment, or by adding passivating agents such as orthophosphates.

Samples from community systems are collected from homes built prior to the 1985 prohibition of lead solders in Oregon. One-liter samples of standing water (first drawn after a minimum of 6 hours of non-use) are collected at homes identified in the water system sampling plan. Two rounds of initial sampling are required, collected at 6-month intervals. Subsequent annual sampling from a reduced number of sites is required after demonstration that lead and copper action levels are met. After three rounds of annual sampling, samples are required every 3 years. The number of initial and reduced samples required is dependent on the population served by the water system.

In each sampling round, 90% of samples from homes must have lead levels less than or equal to the Action Level of 0.015 mg/L and copper levels less than or equal to 1.3 mg/L. Water systems with lead above the Action Level must conduct periodic public education, and either install corrosion control treatment, change water sources, or replace plumbing. Testing requirements are as follows:

- Have a sampling plan for applicable homes
- Collect required samples
- Meet Action Levels for Lead and Copper (0.015 mg/L for Lead and 1.3 mg/L for Copper)
- Rule out source water as a source of significant lead levels
- If Action Levels are not met, provide corrosion control treatment and other steps

On October 8, 2024, EPA published the 2020 Final Revisions to the Lead and Copper Rule. The latest rule notes the following revisions:

- Using science-based testing protocols to find more sources of lead in drinking water
- Establishing a trigger level to jumpstart mitigation earlier and in more communities
- Drive more LSL replacements
- Required testing in schools and childcare facilities
- Requiring water systems to identify and make public the locations of lead service lines

Currently, the City of Port Orford needs to sample 10 sites every 3 years.

3.3.7 Inorganic Contaminants

The level of many inorganic contaminants is regulated for public health protection. These contaminants are both naturally occurring and can result from agriculture or industrial operations. Inorganic contaminants most often come from the source water supply but can also enter water from contact with materials used for pipes and storage tanks. Regulated inorganic contaminants include arsenic, asbestos, fluoride, mercury, nitrate, nitrite, and others. A possible future MCL for nickel is currently being evaluated by the EPA. Manganese may also become a primary drinking water contaminant in the future.

Compliance is achieved by meeting the established MCLs for each contaminant. Systems that cannot meet one or more MCL must either install treatment systems (such as ion exchange or reverse osmosis) or develop alternate sources of water. Various sampling schedules are applicable for inorganic contaminants, but a minimum of annual sampling should be completed.

3.3.8 Organic Contaminants

Organic contaminants are regulated to reduce exposure to harmful chemicals through drinking water. Examples include acrylamide, benzene, 2,4-D, styrene, toluene, and vinyl chloride. Major types of organic contaminants are Volatile Organic Chemicals (VOCs) and Synthetic Organic Chemicals (SOCs). Organic contaminants are usually associated with industrial or agricultural

activities that affect sources of drinking water supply, including industrial and commercial solvents and chemicals, and pesticides. These contaminants can also enter from materials in contact with the water such as pipes, valves, paints, and coatings used inside water storage tanks.

At least one test for each contaminant from each water source is required during every 3-year compliance period. Public water systems serving more than 3,300 people must test twice during each 3-year compliance period for SOCs. Public water systems using surface water sources must test for VOCs annually.

Compliance is achieved by meeting the established MCL for each contaminant. Quarterly follow up testing is required for any contaminants that are detected above the specified MCL. Only those systems determined by the State to be at risk must monitor for dioxin. Water systems using polymers containing acrylamide or epichlorohydrin in their water treatment process must keep their dosages below specified levels. Systems that cannot meet one or more MCL must either install or modify water treatment systems (such as activated carbon and aeration) or develop alternate sources of water. A summary of organic chemicals is as follows:

- At least one test for each contaminant (for each water source) every 3-year compliance period
- Sample twice each compliance period for each SOCs when system over 3,300 people
- Test VOCs annually
- Quarterly follow-up testing is required for any detections above MCL
- Maintain polymer dosages in treatment process below specified levels
- MCLs vary based on contaminant

3.4 Future Water System Regulations

The 1996 Safe Drinking Water Act (SDWA) requires the EPA to review and revise as appropriate each current standard at least every six years. Data is continually collected on contaminants currently unregulated to support development of future drinking water standards. Drinking water contaminant candidate lists (CCL) are prepared and revised every five years. The first DWCCCL (CCL1) was published on March 2, 1998 which included 51 chemicals and 9 microbials. In 2003, the EPA decided not to regulate any of the 9 microbials from the initial list. In 2005 the EPA published the second CCL (CCL2) consisting of the remaining 51 contaminants from the first list. The Agency published the preliminary regulatory determinations for 11 of the 51 contaminants listed on the second CCL in April of 2007. In 2008 EPA published the draft third Contaminant Candidate List (CCL 3) to help identify unregulated contaminants that may require a national drinking water regulation in the future. The 4th CCL was announced on November 17, 2016. Preliminary determinations for CCL4 were announced on February 20, 2020. The EPA must publish a decision on whether to regulate at least five contaminants from the CCL every 5 years. As a result, additional contaminants can and will become regulated in the future.

Water suppliers should be aware of and familiar with these mandates and deadlines, and plan strategically to meet them. OHA, under the Primacy Agreement with the EPA, has up to two years to adopt each federal rule after it is finalized. Water suppliers generally have at least three years to comply with each federal rule after it is finalized; however, some of these rules will likely establish a significant number of compliance dates for water suppliers that will occur prior to state adoption of the rules. These “early implementation” dates will likely have to be implemented in Oregon directly by the EPA, because the state program will not yet have the rules in place or the resources to carry them out.

The lead and copper rule is currently in revision. Systems will need to build inventories of lead service lines LSLs. LSLs then must be identified/replaced at a rate of 3% of the total inventory per year. The trigger level will be set at 10 parts per billion. This will likely be a very costly effort for many towns in the western US.

These anticipated rules are described generally below. Additional details will be found in the final EPA rules once they are promulgated.

3.4.1 RTCR Distribution Rule

In April of 2016, the requirements for coliform bacteria have been revised, emphasizing fecal coliforms and *E. coli*, and focusing on protection of water within the distribution system. The new rule will apply to all public water systems and will involve identifying and correcting sanitary defects and hazards in water systems and using best management practices for disinfection to control coliform bacteria in the system.

3.4.2 PFAS Rule

In April 2024, the requirements for PFAS were added by the EPA to the primary contaminants list. Specifically, PFOA and PFOS have a MCL of 4 ppt, and an MCLG of (0 mg/L). PFHxS, PFNA, HFPO-DA, have a MCL of 10 ppt and an MCLG of 10ppt. Additionally, the EPA’s hazard index was applied to PFNA, PFBS, HFPO, and PFHxS in mixtures containing two or more of the constituents. This will require water systems to monitor each of these PFAS in their system and compare the values to their associated Health-Based Water Concentrations (HWBCs), the level at which no health effect is to be expected.

The rule requires public water systems to regularly monitor the listed PFAS compounds. Systems will have three years to complete initial monitoring, followed by ongoing compliance monitoring. Water systems will be required to provide the public with information on the levels of PFAS compounds in their drinking water beginning 2027. They will then have five years to implement solutions to reduce the six PFAS compounds regulated by the EPA if they exceed the current set MCLs.

Oregon Health Authority (OHA) is responsible for ensuring that residents of Oregon are complying with the recently released EPA PFAS regulations. All testing done for PFAS contamination will be reported to OHA and the Department of Environmental Quality (DEQ).

3.5 Regulatory Drivers for Improvements

3.5.1 Treatment performance requirements

Treatment performance requirements for a surface water treatment plant are generally driven by applicable filtration, turbidity, disinfection, and monitoring requirements. A treatment facility must be capable of consistently producing finished water that meets current drinking water standards under a range of source water and operating conditions. Improvements intended to enhance treatment performance should therefore focus on maintaining reliable process control, providing adequate treatment capacity, supporting consistent finished water quality, and allowing operators to respond effectively to changing raw water conditions and regulatory requirements.

General treatment performance improvements that may be considered as part of future repair, rehabilitation, or replacement alternatives include the following:

- Treatment process optimization: Evaluate the overall treatment process to identify opportunities to improve coagulation, flocculation, sedimentation, filtration, and disinfection performance.
- Filtration performance: Assess filter condition, media condition, backwash effectiveness, and filter loading rates to determine whether improvements are needed to maintain consistent turbidity removal.
- Chemical feed reliability: Review chemical feed systems for accuracy, reliability, redundancy, containment, and compatibility with current and anticipated treatment objectives.
- Disinfection performance: Confirm that the disinfection system provides adequate dose, contact time, residual control, and monitoring capability under normal and peak operating conditions.
- Process monitoring and controls: Consider improvements to instrumentation, alarms, data collection, and automation to support consistent operation and timely response to changing water quality conditions.
- Operational flexibility: Evaluate whether the plant can accommodate seasonal water quality changes, demand fluctuations, maintenance activities, and equipment outages without compromising finished water quality.
- Capacity and reliability: Confirm that the treatment facility can meet current and projected demand while maintaining compliance with applicable performance standards.
- Regulatory adaptability: Consider whether future improvements provide flexibility to address changing drinking water regulations, monitoring requirements, and treatment expectations over time.

Collectively, these types of improvements can help strengthen treatment reliability, improve finished water consistency, reduce operational risk, and support continued compliance with

current and future drinking water requirements. The extent to which each improvement is incorporated should be evaluated during development of the repair, rehabilitation, and replacement alternatives.

3.5.2 Reliability and redundancy expectations

Oregon drinking water rules do not prescribe a single universal redundancy standard for every treatment plant component; however, they establish clear expectations that public water systems be operated and maintained in a manner that assures continuous production and delivery of potable water. Under OAR 333-061-0065, water suppliers must operate all phases and components of the system effectively, promptly repair leaks and broken or malfunctioning equipment, keep proper equipment, tools, and parts readily available and in good condition, and implement actions to assure safe drinking water during emergencies. These requirements make reliability and redundancy important planning considerations for any surface water treatment plant improvement project.

Reliability and redundancy expectations should be evaluated in the context of the system's ability to maintain compliance during routine operation, maintenance activities, equipment failures, power outages, source water changes, and other reasonably anticipated emergency conditions. For treatment facilities, this generally includes consideration of the following:

- Critical treatment processes: Key process components should be configured, maintained, or backed up so the system can continue to meet applicable treatment technique and performance standards for filtration, turbidity removal, disinfection, and finished water quality.
- Equipment repair and replacement: The system should maintain access to replacement parts, tools, and repair resources needed to promptly address broken or malfunctioning equipment and minimize interruptions to treatment or water service.
- Chemical feed systems: Chemical storage, feed, containment, and control systems should be reliable enough to maintain treatment objectives and should include appropriate backup equipment or operational provisions for chemicals that are essential to compliance.
- Disinfection reliability: Disinfection systems should be capable of maintaining required residuals and contact time during normal and peak operating conditions and should include provisions for continued operation during equipment outages or other disruptions.
- Monitoring and controls: Instrumentation, alarms, operational records, and control systems should support timely identification of treatment problems and allow operators to respond before water quality or service continuity is affected.
- Emergency response capability: The system's emergency response planning should address reasonably anticipated events, including loss of power, loss of pressure, treatment disruption, contamination events, emergency disinfection, system isolation,

customer notification, and coordination with local emergency management where needed.

- Operator and managerial capacity: The system should have qualified operators, current operating procedures, and sufficient technical, managerial, and financial capacity to maintain reliable operation and implement corrective actions when needed.
- Plan review and construction compliance: Major treatment plant modifications must be submitted for OHA review and approval before construction and must be designed to meet applicable construction standards and drinking water performance requirements.

For purposes of this feasibility study, reliability and redundancy should be considered regulatory-driven evaluation criteria rather than optional enhancements. Alternatives that rely on single points of failure for critical treatment, disinfection, monitoring, power, or control functions may present a higher compliance risk than alternatives that provide operational flexibility, backup equipment, emergency response capability, and maintainable systems. These considerations should be incorporated into the evaluation of repair, rehabilitation, and replacement alternatives to confirm that future improvements support continuous delivery of potable water and long-term compliance with Oregon drinking water requirements.

3.5.3 Emerging regulations (e.g., PFAS, LCRI, as applicable)

Emerging drinking water regulations are an important consideration when evaluating long-term improvements to the WTP. Although existing regulatory compliance is typically based on current monitoring and treatment requirements, future rules can affect source water monitoring, finished water quality objectives, treatment process selection, chemical feed systems, corrosion control practices, operational records, public notification, and capital improvement priorities. Alternatives should therefore be evaluated not only for their ability to address current requirements, but also for their flexibility to accommodate future regulatory changes without requiring substantial additional reconstruction.

PFAS regulation: EPA has finalized national drinking water limits for certain PFAS compounds, including PFOA, PFOS, PFHxS, PFNA, and HFPO-DA, as well as a hazard index approach for mixtures of selected PFAS. Public water systems must complete initial monitoring, report results, notify the public of detected levels, and comply with applicable MCLs within the required compliance schedule. If PFAS are detected at levels of concern, future improvements may need to consider treatment technologies such as granular activated carbon, ion exchange, membrane treatment, source management, or treatment process modifications.

Lead and Copper Rule Improvements: The Lead and Copper Rule Improvements increase the importance of corrosion control, service line material inventories, public communication, tap sampling protocols, and long-term lead service line replacement planning. For treatment plant planning, these requirements reinforce the need to maintain stable finished water chemistry, including pH, alkalinity, disinfectant residual, and other water quality conditions that can affect corrosion potential in the distribution system.

Monitoring and reporting obligations: Emerging rules generally increase the importance of accurate monitoring data, consistent recordkeeping, timely reporting, and clear public notification. Treatment alternatives should include instrumentation, sampling access, data management, and operator procedures that support reliable compliance documentation.

Treatment flexibility: Future regulations may require additional treatment capability, revised chemical feed strategies, or changes in operating targets. Alternatives that provide space, hydraulic flexibility, chemical feed flexibility, electrical capacity, and adaptable controls will be better positioned to respond to future regulatory requirements.

Financial and implementation planning: Compliance with emerging regulations may require phased capital improvements, additional monitoring, pilot testing, engineering evaluation, funding applications, and coordination with OHA and EPA. These considerations should be included in the comparison of repair, rehabilitation, and replacement alternatives.

For this feasibility study, emerging regulations should be treated as long-term planning drivers. The preferred alternative should provide a practical path for meeting current requirements while preserving the ability to add monitoring, treatment, corrosion control, or operational improvements if future source water data, distribution system data, or regulatory changes indicate that additional measures are needed.

3.5.4 Implications for repair, rehabilitation, or replacement

Sections 3.5.1 through 3.5.3 establish the regulatory basis for evaluating whether the existing WTP should be repaired, rehabilitated, or replaced. At a minimum, each alternative must be capable of maintaining current treatment performance requirements for filtration, turbidity control, disinfection, and monitoring. Alternatives should also be evaluated based on whether they reduce operational risk, improve reliability, provide appropriate redundancy for critical treatment and control functions, and preserve flexibility to address future regulatory requirements such as PFAS monitoring or treatment, Lead and Copper Rule Improvements, corrosion control, and expanded monitoring and reporting obligations.

The implications for the alternatives analysis are summarized as follows:

- **Repair alternative:** A repair-focused alternative may be appropriate for addressing discrete deficiencies or restoring selected components to serviceable condition. However, repairs should be evaluated carefully to confirm that they do not simply extend the life of individual assets while leaving unresolved limitations related to treatment performance, process control, redundancy, emergency response, or future regulatory adaptability.
- **Rehabilitation alternative:** A rehabilitation alternative may provide a broader opportunity to renew major process, mechanical, electrical, chemical feed, and control systems while continuing to use portions of the existing facility. This approach should be evaluated based on its ability to restore reliable treatment capacity, improve monitoring and

automation, reduce single points of failure, and provide enough flexibility for future treatment or regulatory modifications.

- Replacement alternative: A replacement alternative may provide the greatest opportunity to incorporate current design standards, improve treatment reliability, provide appropriate redundancy, improve operator safety, simplify maintenance, and reserve space and infrastructure for future regulatory-driven improvements. The higher initial capital cost should be weighed against long-term compliance confidence, operational resiliency, maintainability, and reduced risk of future retrofit limitations.

The preferred alternative should not be selected solely on the basis of near-term construction cost. It should also be evaluated for its ability to provide durable compliance with current drinking water requirements, maintain reliable operation during routine and emergency conditions, support effective monitoring and reporting, and accommodate future treatment or regulatory changes without major disruption to plant operations. These criteria provide the regulatory foundation for the repair, rehabilitation, and replacement alternatives presented in the alternatives analysis.

4. Condition Assessment of WTP

The WTP is limited to approximately 350 gpm and must operate up to seven days per week during peak demand. Additional reliable capacity is needed to meet current and projected maximum day demand while reducing extended and weekend operation.

Although designed for 555 gpm and rated by OHA at 450 gpm, flows in excess of 350 gpm cause elevated turbidity, unreliable clarification, frequent alarms, and increased call-outs. The following assessment identifies improvements needed to address treatment, building, chemical feed, mechanical, electrical, and control deficiencies.

4.1 WTP Building and Site Infrastructure Assessment

Overall, the WTP building is in fair condition given its age, proximity to the ocean, and apparent lack of preventative maintenance. However, the building exterior does exhibit the following general deficiencies:

- There is peeling paint throughout the exterior of the building.
- There is dry rot in specific areas of the wooden fascia.
- There is dry rot in specific areas of the wooden siding.
- Some windows are broken and/or missing.
- Moss is present on the roof shingles on the north side of the building.



The building interior is generally in good condition except for evidence of water intrusion in several locations of the roof. Discussion with the operator confirmed that said leaks have been repaired. In general, the water treatment plant building appears to be secure from unauthorized entry. The only conditional exception is that the gates are in poor condition and should be replaced.

Overall, building and site improvements are needed to address exterior deterioration, maintain weather protection, and improve site security.

4.2 Water Treatment Equipment Assessment

Most of the water treatment base infrastructure appears to be in serviceable condition. The aluminum flocculation tank and water treatment basins are in good condition for their age. The following items were noted for repair or replacement:

- The plastic tube settler plates are in deleterious condition, the plates themselves and mounts to the inside of the treatment basin are broken in several places and are making it difficult to run the water treatment plant. At a minimum these plates should be replaced as soon as possible.
- The media in the filters is of unknown vintage and needs to be replaced, the operator notes that there is a constant issue with “mudballing” in the filter media.
- It is believed that the underdrain structure is dislocated, broken or both in several places on both filters. The underdrains need to be rebuilt as soon as possible.

Repair and replacement of key treatment components are needed to restore reliable settling and filtration performance and support sustained operation at the plant’s intended capacity.

4.3 Chemical Feed Equipment Assessment

The chemical feed equipment and chemical room both require several improvements to address containment, safety, redundancy, and process control. The following deficient items were noted:

- Secondary containment should be provided in the chemical room.
- Chemical labeling should be improved throughout the chemical room.
- Soda ash feed lines should be modified or replaced to address recurring clogging issues.
- Chemical feed equipment lacks pump redundancy. At a minimum, replacement pumps and motors should be stocked on site.
- Chemical feed equipment should be integrated with the WTP control system and flow paced where feasible.
- An emergency shower should be provided in the chemical room.
- The existing eyewash station should be repaired or replaced to provide adequate operating pressure.
- The existing MiOx hypochlorite generator is beyond its service life and should be replaced.
- The chemical dosing piping and valving is not ideally configured and should be replaced.

Overall, upgrades to the chemical feed systems are needed to improve operator safety, provide reliable chemical dosing, and better integrate chemical feed operations with plant controls.

4.4 Mechanical Equipment Assessment

The mechanical systems require several improvements to address broken piping, inoperable valves, aging pumps, pneumatic controls, and building climate control. The following deficient items were noted:

- Raw water piping beneath the slab near the flocculation tank is broken and should be replaced.
- The bypass to the backwash basin is broken and should be repaired or replaced.
- The backwash basin valve and drain are broken, leaving decanting through the overflow culvert as the only current option.
- Many process valves are air-operated only and cannot be operated manually.
- Most process piping is in poor condition and should be replaced.
- The backwash pond drain is inoperable, and the backwash piping should be replaced.
- Several process pumps are beyond their useful service life and should be replaced.
- Replacement pumps and motors should be stocked at the WTP to support timely repairs.
- The WTP relies on a single air compressor for pneumatic process valving; a backup compressor should be installed.
- The WTP has no heating or air conditioning. At a minimum, treatment area ventilation should be installed along with a heat pump for the lab and operations room.

Repair and replacement of mechanical piping, valves, pumps, pneumatic controls, and building climate control systems are needed to improve reliability, maintainability, and safe operation of the treatment plant.

4.5 Electrical and Controls Assessment

The electrical and controls systems require several improvements to address outdated equipment, limited automation, emergency call-out limitations, lack of backup power, and unreliable process control. The following deficient items were noted:

- The treatment plant control system does not function as intended.
- Inoperable automation and emergency call-out features require manual operation and frequent on-site checks, including after hours.
- Limited automation is believed to be a primary factor limiting plant throughput to about 60 percent of design capacity due to reliability concerns and frequent alarms.
- A streaming current monitor should be considered to automatically adjust chemical feed rates in response to turbidity changes.
- Automated coagulant dosing, emergency callout, and a human-machine interface should be added to improve operations and help restore plant throughput to design capacity.
- The electrical panel and controls in the operations room are outdated and should be replaced.

- A recently failed variable frequency drive failed catastrophically and could have started a fire or damaged nearby equipment.
- The existing electrical and controls system has been primarily serviced after failures, resulting in a patchwork or “band-aid” approach to maintenance.
- If the plant is refurbished, the electrical and control systems should be replaced with modern equipment.
- The WTP has no automatic transfer switch or onsite backup generator to provide emergency power.

Replacement of outdated electrical equipment, modernization of controls, improved automation, and provision of emergency power are needed to improve plant reliability, reduce operator burden, and support safe operation at the plant’s intended capacity.

4.6 Treatment Performance History

Recent compliance records indicate that the City of Port Orford Water Treatment Plant has experienced several reporting-related violations rather than documented health-based treatment violations. The recent history includes late or nonreporting events for monthly Surface Water Treatment Rule reporting in January 2024 and January 2026, a disinfection byproducts reporting violation for the fourth quarter of 2024, and a Consumer Confidence Report reporting violation in 2024. Each of these items was returned to compliance, with corrective dates ranging from August 2024 through March 2026. Based on the available records, the plant’s recent performance history appears to reflect administrative and reporting deficiencies rather than confirmed exceedances of drinking water quality standards.

4.7 Operational Challenges

The Port Orford WTP faces several operational challenges that limit reliable production and increase operator burden. The plant is limited to approximately 350 gpm, well below its design capacity, because higher rates result in unreliable performance, frequent alarms, and poor treatment conditions associated with turbidity and clarification limitations. Operators must also backwash frequently due to mudballing in the filter media, manually operate the plant because automation and emergency call-out functions are unreliable, and make frequent on-site checks, including after hours. Limited equipment redundancy, aging pumps and valves, dependence on a single air compressor for pneumatic valving, lack of backup power, and difficulty obtaining replacement parts in Port Orford further complicate plant operation and increase the risk of extended downtime. Recent pressure-loss events, boil water advisories, and regulatory follow-up actions also indicate that the WTP and water system require ongoing operational response and coordination.

4.8 Safety Concerns

Several safety concerns were identified throughout the WTP assessment, with the most significant issues related to chemical handling, electrical equipment, and emergency response capability.

The chemical room lacks secondary containment, spill protection, and an emergency shower, and the existing eyewash station does not provide adequate operating pressure. These deficiencies increase the risk of operator exposure during chemical unloading, feed system maintenance, or spill response. Chemical labeling also needs improvement so operators and emergency responders can quickly identify stored chemicals, feed lines, and associated hazards. Electrical safety concerns include outdated electrical panels and controls, as well as a recently failed variable frequency drive that failed catastrophically and could have started a fire or damaged nearby equipment. Additional safety concerns include broken or missing windows, deteriorated site gates, broken process piping and valves, reliance on a single air compressor for pneumatic valving, lack of onsite backup power, and no heating or air conditioning in the treatment area. These conditions may affect facility security, operator working conditions, emergency response, and the ability to safely maintain treatment during equipment failures, power outages, or adverse weather.

Collectively, the identified safety concerns support the need for targeted near-term improvements and should be considered a major factor in evaluating whether repair, rehabilitation, or replacement of the WTP provides the most appropriate long-term solution.

5. Alternative Analysis and Cost Estimates

The feasibility-level cost estimates for all alternatives include allowances for compliance with applicable Build America, Buy America (BABA) requirements, including the use of domestically produced iron, steel, manufactured products, and construction materials where required by the anticipated funding programs. Final costs should be refined during design based on current BABA guidance, product availability, documentation requirements, and any approved waivers.

5.1 Repair Existing Plant – Alternative #1

The repair alternative would focus on correcting the most immediate deficiencies at the existing WTP while retaining the current treatment process, building configuration, hydraulic arrangement, and major treatment basins. This alternative is intended to restore serviceability, reduce near-term operational risk, and address deficiencies that directly affect treatment performance, operator safety, and continued operation. It would not substantially change the overall treatment approach, plant layout, or rated capacity of the facility.

Based on the existing facility description and condition assessment, the repair alternative would generally include the following work items:

1. Building and site repairs: Repair exterior deterioration, including peeling paint, localized dry rot in fascia and siding, broken or missing windows, and roof or site conditions that affect building weather protection and security. Replace deteriorated site gates to improve protection from unauthorized entry.
2. Treatment equipment repairs: Replace damaged tube settler plates and supports, replace filter media, and rebuild or repair damaged filter underdrains to improve sedimentation and filtration performance. These repairs are the minimum treatment-related improvements needed to support more reliable operation of the existing package treatment equipment.
3. Chemical feed repairs: Improve chemical room containment, labeling, and safety; repair or replace the eyewash station; provide an emergency shower; modify or replace soda ash feed piping to address recurring clogging; improve chemical feed piping and valving; stock critical replacement pumps and motors; and replace the MiOx hypochlorite generation system that is beyond its stated service life.
4. Mechanical repairs: Replace broken raw water piping near the flocculation tank, repair or replace the bypass to the backwash basin, restore the backwash basin drain and valve, replace deteriorated process piping and backwash piping, repair or replace inoperable valves, replace aging pumps, stock critical pump and motor components, and install a backup air compressor for pneumatic process valves.
5. Electrical and controls repairs: Replace outdated electrical panels and controls where needed for safe operation, restore reliable automation and emergency call-out functions,

add an operator interface and improved alarm capability, consider streaming current monitoring or other process-control improvements, and provide emergency power through an automatic transfer switch and onsite backup generator.

6. Building mechanical and operator safety repairs: Provide ventilation in the treatment area and climate control for the lab and operations room to improve working conditions, protect equipment, and support routine plant operation.

The repair alternative would address urgent deficiencies in treatment equipment, chemical feed, piping, pumps, controls, and emergency systems, improving near-term reliability, operator safety, monitoring, and regulatory compliance. This alternative is therefore best suited for near-term stabilization rather than as a comprehensive long-term solution.

The repair alternative is technically feasible if the building, aluminum basins, underdrains, tube settlers, piping, and electrical systems can be repaired without major structural reconstruction. Major modifications would require OHA plan review, and phased shutdowns or temporary operations would be needed to maintain service during construction.

This alternative has the lowest initial cost, can prioritize urgent deficiencies, reuse serviceable infrastructure, and be phased to match available funding.

Repair would retain the constrained 1978 building, aging basins, limited expansion space, low-elevation site, and tsunami exposure. Hidden deterioration and construction within an operating plant could increase cost and service-continuity risk. Even after repairs, the facility would likely have less redundancy, a shorter remaining service life, and less flexibility than the rehabilitation or replacement alternatives.

The repair alternative should be retained as the minimum-cost, near-term option and a potential first phase if broader improvements cannot be funded. Please see the following page for the cost estimation for Alternative #1.

Alternative #1 - Repair Existing Water Treatment Plant

Capital Cost

#	Item Description	Quantity	Units	Unit Cost (\$)	Item Cost (\$)
1	Building and Site Repairs	1	LS	\$175,000	\$175,000
2	Treatment Equipment Repairs	1	LS	\$225,000	\$225,000
3	Chemical Feed Repairs	1	LS	\$65,000	\$65,000
4	Mechanical Repairs	1	LS	\$175,000	\$175,000
5	Electrical and Controls Repairs	1	LS	\$775,000	\$775,000
6	HVAC Upgrade	1	LS	\$35,000	\$35,000
Labor and Materials Subtotal					\$1,450,000
Mobilization, Insurance, Overhead, Bonds (10%)					\$145,000
Administration and Legal (5%)					\$72,500
Contingency (10%)					\$145,000
Engineering (20%)					\$290,000
Estimated Construction Costs (2026\$)					\$2,102,500

Operations & Maintenance

#	Item Description	Quantity	Units	Unit Cost (\$)	Item Cost (\$)
1	Operator Labor	220	h	\$100	\$22,000
2	Electrical	1	LS	\$18,000	\$18,000
3	Treatment Chemicals	1	LS	\$22,000	\$22,000
4	Routine Maintenance	1	LS	\$18,000	\$18,000
5	Electrical and Controls Maintenance	1	LS	\$6,000	\$6,000
6	HVAC and Building Maintenance	1	LS	\$5,000	\$5,000
7	Replacement Parts Reserve	1	LS	\$17,000	\$17,000
8	Laboratory and Regulatory Compliance	1	LS	\$5,000	\$5,000
Estimated Annual O&M (2026\$)					\$113,000

Salvage Value

#	Item Description	Construction Cost	Useful Life	Planning Period	Salvage Value (\$)
1	Building and Site Repairs	\$175,000.00	40	20	\$87,500
2	Treatment Equipment Repairs	\$225,000.00	30	20	\$75,000
3	Chemical Feed Repairs	\$65,000.00	15	20	(\$21,667)
4	Mechanical Repairs	\$175,000.00	40	20	\$87,500
5	Electrical and Controls Repairs	\$775,000.00	30	20	\$258,333
6	HVAC Upgrade	\$35,000.00	25	20	\$7,000
Estimated Salvage Value (2046\$)					\$265,333

Net Present Value

Discount Rate (November 2024, OMB Circular No. A-94)				2.20%
Capital Costs (2026\$) [C]				\$2,102,500
O&M Unified Series Net Worth (2026\$) [OM]				\$1,812,541
Salvage Value Present Worth (2026\$) [S]				\$171,701
Net Present Value (2026\$) [C+OM-S]				\$3,743,340

5.2 Rehabilitate Existing Plant – Alternative #2

The rehabilitation alternative would retain the existing WTP site, building, treatment basins, and general process configuration to the extent practical, while replacing or substantially upgrading the major systems that limit treatment performance, reliability, operator safety, and long-term maintainability. Unlike the repair alternative, which focuses on discrete deficiencies and near-term stabilization, rehabilitation would be intended to renew the existing facility as an integrated treatment plant and extend its useful service life.

Based on the available information in the report, the rehabilitation alternative would generally include a comprehensive renewal of the following facility systems:

1. Building and site rehabilitation: Repair or replace deteriorated exterior building materials, address localized dry rot, repair or replace broken windows, restore weather protection, improve site security, replace deteriorated gates, and complete building improvements needed to support continued use of the existing structure.
2. Treatment process rehabilitation: Replace the tube settler plates and supports, replace filter media, rebuild filter underdrains, restore surface wash and air scour, evaluate the condition and performance of the existing flocculation, sedimentation, and filtration basins, and complete process improvements needed to restore reliable clarification and filtration performance.
3. Chemical feed rehabilitation: Reconfigure chemical feed piping and valving, address recurring soda ash feedline clogging, improve chemical storage and containment, provide clear chemical labeling, add or stock redundant feed pumps and motors, improve flow-paced chemical dosing where feasible, and replace the MiOx hypochlorite generation system with a reliable disinfection system.
4. Mechanical system rehabilitation: Replace deteriorated process piping and backwash piping, repair or replace broken raw water and backwash basin piping, restore the backwash basin drain and valves, replace inoperable or air-only valves with valves that can be maintained and operated reliably, replace aging pumps, and install a backup air compressor for pneumatic process valves.
5. Electrical and controls rehabilitation: Replace outdated electrical panels and controls, modernize the PLC and SCADA-lite system, add a functional human-machine interface, restore automated process control and emergency call-out features, improve alarm reliability, and provide an automatic transfer switch and onsite backup generator for emergency power.
6. Operator safety and working conditions: Provide an emergency shower, repair or replace the eyewash station, improve chemical room safety, add ventilation in the treatment area, provide heating and cooling for the lab and operations room, and improve conditions that affect safe operation, maintenance, and emergency response.

The primary objective of rehabilitation would be to restore the existing plant to a level of performance consistent with its intended function and regulatory obligations. The existing WTP

was designed for 555 gpm, was later OHA-rated at 450 gpm, and is limited to approximately 350 gpm under current operating conditions due to reliability and treatment performance concerns. Rehabilitation would recover as much practical treatment capacity as possible by improving clarification, filtration, chemical feed control, automation, backwash capability, disinfection reliability, and operator response capability.

This alternative would provide a more comprehensive response to the regulatory drivers described in Section 3.5 than the repair alternative. Rehabilitation would improve treatment performance by renewing the major components that affect sedimentation, filtration, chemical dosing, and disinfection. It would improve reliability and redundancy by replacing deteriorated mechanical and electrical systems, adding backup equipment for critical functions, and improving emergency power and call-out capability. It would also improve monitoring and reporting support by modernizing controls, alarms, instrumentation, and operational data collection.

Rehabilitation will also provide some flexibility for emerging regulatory requirements. Improvements to chemical feed, finished water stability, monitoring, controls, and available process connections could help support future corrosion control adjustments, expanded monitoring, or future treatment modifications if additional requirements arise.

The primary advantage of the rehabilitation alternative is that it will address many of the current deficiencies while reusing portions of the existing plant. This will reduce capital cost compared to full replacement and will allow for improvements to be phased around continued plant operation. Rehabilitation would also allow the City to preserve existing site improvements and treatment infrastructure that remains serviceable, including the building, flocculation tank, sedimentation basins, filter basins, and contact tanks.

For feasibility-level planning, the rehabilitation alternative should be carried forward as an intermediate alternative between targeted repair and full replacement. It provides the potential to address the major deficiencies identified in the condition assessment and improves regulatory compliance confidence. We feel that based on the conditional assessment of the water treatment plant that the existing facility can be renewed to provide reliable treatment capacity, adequate redundancy, safe working conditions, and reasonable flexibility for future regulatory requirements.

Rehabilitation provides a balanced approach between targeted repair and full replacement. It would retain serviceable major infrastructure while renewing most systems that currently limit capacity, reliability, safety, and maintainability. Compared with repair, it offers greater opportunity to restore practical treatment capacity, add redundancy and emergency power, modernizes automation and data collection, improves chemical handling, and extends the facility's useful service life. The work may also be phased to align with funding availability, although extensive phasing could increase total cost and prolong construction impacts.

Based on the feasibility-level evaluation, rehabilitation is likely the most cost-effective and sustainable alternative because it would reuse serviceable major infrastructure while

comprehensively renewing the systems that currently limit capacity, reliability, safety, and maintainability. Compared with targeted repair, it would provide greater long-term value, a longer useful life, improved regulatory adaptability, and reduced recurring maintenance and renewal needs. Compared with full replacement, it would require substantially less capital investment and avoid much of the material use, site disturbance, permitting complexity, and new infrastructure associated with constructing a new plant. Please see the following page for the cost estimate for Alternative 2.

Alternative #2 - Refurbish Existing Water Treatment Plant

Capital Cost

#	Item Description	Quantity	Units	Unit Cost (\$)	Item Cost (\$)
1	Building and Site Rehabilitation	1	LS	\$550,000	\$550,000
2	Treatment Equipment Rehabilitation	1	LS	\$950,000	\$950,000
3	Chemical Feed Rehabilitation	1	LS	\$450,000	\$450,000
4	Mechanical System Rehabilitation	1	LS	\$900,000	\$900,000
5	Electrical and Controls Rehabilitation	1	LS	\$1,300,000	\$1,300,000
6	Operator Safety/Condition Upgrades	1	LS	\$320,000	\$320,000
Labor and Materials Subtotal					\$4,470,000
Mobilization, Insurance, Overhead, Bonds (10%)					\$447,000
Administration and Legal (5%)					\$223,500
Contingency (10%)					\$447,000
Engineering (20%)					\$894,000

Estimated Construction Costs (2026\$) **\$6,481,500**

Operations & Maintenance

#	Item Description	Quantity	Units	Unit Cost (\$)	Item Cost (\$)
1	Operator Labor	180	h	\$100	\$18,000
2	Electrical	1	LS	\$17,000	\$17,000
3	Treatment Chemicals	1	LS	\$20,000	\$20,000
4	Routine Maintenance	1	LS	\$12,000	\$12,000
5	Electrical and Controls Maintenance	1	LS	\$8,000	\$8,000
6	HVAC and Building Maintenance	1	LS	\$8,000	\$8,000
7	Replacement Parts Reserve	1	LS	\$12,000	\$12,000
8	Laboratory and Regulatory Compliance	1	LS	\$5,000	\$5,000

Estimated Annual O&M (2026\$) **\$100,000**

Salvage Value

#	Item Description	Construction Cost	Useful Life	Planning Period	Salvage Value (\$)
1	Building and Site Rehabilitation	\$550,000.00	40	20	\$275,000
2	Treatment Equipment Rehabilitation	\$950,000.00	30	20	\$316,667
3	Chemical Feed Rehabilitation	\$450,000.00	15	20	(\$150,000)
4	Mechanical System Rehabilitation	\$900,000.00	40	20	\$450,000
5	Electrical and Controls Rehabilitation	\$1,300,000.00	30	20	\$433,333
6	Operator Safety/Condition Upgrades	\$320,000.00	25	20	\$64,000

Estimated Salvage Value (2046\$) **\$497,333**

Net Present Value

Discount Rate (November 2024, OMB Circular No. A-94)		2.20%
Capital Costs (2026\$) [C]		\$6,481,500
O&M Unified Series Net Worth (2026\$) [OM]		\$1,604,019
Salvage Value Present Worth (2026\$) [S]		\$321,832
Net Present Value (2026\$) [C+OM-S]		\$7,763,686

5.3 Relocate and Replace Existing Plant – Alternative #3

The replacement alternative would construct a new WTP on higher ground adjacent to the Hubbard Creek source. This alternative would replace the existing 1978 plant and 1996-era upgrades with a new facility designed primarily to address the City's treatment capacity, reliability, operator safety, regulatory compliance, and long-term operational needs. Locating the new plant near Hubbard Creek would improve the connection to the City's primary surface water source and could also reduce exposure to coastal hazards, depending on the final site selected.

A replacement facility near Hubbard Creek would be planned as a complete treatment and resiliency project rather than a like-for-like equipment replacement. The new WTP would be sized to meet current and projected maximum day demand requirements, restore reliable production capacity beyond the current reported operating limitation of approximately 350 gpm, and provide a facility layout that supports safe operation, efficient maintenance, reliable process control, and future regulatory flexibility. Key components of the replacement alternative would include the following:

- Provide new treatment processes for coagulation, flocculation, clarification, filtration, disinfection, backwash, and residuals handling that are capable of treating Hubbard Creek water under a range of source water conditions. The facility should be designed to meet applicable filtration, turbidity, disinfection, and monitoring requirements while providing reliable capacity for current and projected demands.
- Site the new WTP above the tsunami inundation zone and adjacent to Hubbard Creek. The site evaluation should consider property availability, access, constructability, geotechnical conditions, environmental constraints, source protection, permitting requirements, raw water intake hydraulics, and connection to the City's existing treated water transmission, storage, and distribution infrastructure.
- Evaluate raw water conveyance from Hubbard Creek, treatment plant elevation, finished water pumping, pressure control, transmission capacity, and connections back to the existing storage and distribution system. These improvements should be coordinated with the desired plant capacity and the City's long-term maximum day demand planning needs.
- Chemical feed and disinfection systems: Provide modern chemical storage, secondary containment, feed pumps, piping, valves, dosing controls, safety equipment, and reliable disinfection facilities. Chemical feed systems should support flow-paced or otherwise controlled dosing for coagulant, polymer, pH adjustment, and disinfectant chemicals as needed for stable treatment performance.
- Mechanical systems: Provide new process piping, valves, pumps, backwash facilities, residuals handling provisions, HVAC, compressed air if needed, and other mechanical systems arranged for reliable operation and maintainable access. Critical mechanical systems should be configured to reduce single points of failure and support timely maintenance.

- Electrical, controls, and emergency power: Provide new electrical service equipment, motor controls, instrumentation, alarms, operator interface, automated process controls, emergency call-out capability, and onsite backup power with an automatic transfer switch and generator. Controls should support reliable operation, data collection, monitoring, and reporting.
- Provide a layout that improves operator access, chemical handling safety, ventilation, climate control, spill response, equipment maintenance, and site security. The new facility should include appropriate eyewash and emergency shower provisions, chemical containment, clear labeling, and safer working conditions than the existing plant.
- Reserve space, hydraulic capacity, electrical capacity, chemical feed flexibility, and controls integration for future treatment or operational modifications. This flexibility would help the City respond to PFAS monitoring results, corrosion control needs, Lead and Copper Rule Improvements, expanded monitoring or reporting requirements, and other future drinking water regulations without major reconstruction.

The primary advantage of replacement is that it would eliminate dependence on the aging, constrained existing facility and allow the City to design a new WTP around verified capacity, source-water conditions, current OHA expectations, projected demand, operator safety, and future regulatory needs.

A suitable higher-ground site could provide a secondary resiliency benefit by reducing coastal-hazard exposure. The primary drivers for replacement remain treatment capacity, reliability, operator safety, modernized systems, and flexibility for future needs.

Compared with repair and rehabilitation, replacement provides the greatest improvement in treatment performance, reliability, redundancy, monitoring, emergency response, operator safety, and maintainability. A new facility could integrate modern treatment processes, chemical feed, residuals handling, electrical and control systems, emergency power, climate control, safer chemical handling, and maintainable equipment access in a purpose-built layout.

The primary disadvantages are the substantially higher capital cost and greater implementation complexity. At an estimated \$13.0 million, replacement would cost approximately twice as much as rehabilitation and more than six times as much as targeted repair, substantially exceeding the City's estimated debt capacity. It would likely require significant grants, principal forgiveness, and long-term financing to maintain affordable user rates. Additional requirements may include site control, land-use approvals, environmental and geotechnical work, permitting, utility extensions, residuals management, and raw- and finished-water conveyance. Unforeseen finished-water transmission costs could arise because the route, length, elevation profile, pressure requirements, easements, utility conflicts, and distribution-system connection points have not been fully defined. The existing WTP would also need to remain in service through construction and commissioning, creating temporary overlapping capital and operating costs.

For feasibility-level planning, replacement should be retained as the highest-performing long-term alternative. It offers the most comprehensive response to capacity, reliability, safety,

maintainability, and regulatory adaptability, with reduced coastal-hazard exposure as a secondary benefit. These advantages must be weighed against its substantially higher cost, funding challenges, and implementation requirements.

Replacement is technically feasible if a suitable site near Hubbard Creek can be secured and connected to the existing system. Preliminary design would need to confirm source and intake hydraulics, treatment performance, finished-water pumping and transmission, residuals management, site access, geotechnical and environmental constraints, utilities, and land-use approvals. OHA review and approval would be required before construction, and a transition plan would be needed for final tie-ins, startup, testing, and commissioning.

The replacement alternative should be retained as the highest-performing long-term option, subject to confirmation of site control, site conditions, conveyance requirements, treatment performance, utilities, permitting, and refined project cost. If selected, only repairs needed to maintain the existing plant through design, funding, construction, and commissioning should be completed in the interim. Please see the following page for the cost estimate for Alternative 3.

Alternative #3 - Relocate and Replace Existing Water Treatment Plant

Capital Cost

#	Item Description	Quantity	Units	Unit Cost (\$)	Item Cost (\$)
1	Property acquisition and site development	1	LS	\$350,000	\$350,000
2	Hubbard Creek gravity intake	1	LS	\$550,000	\$550,000
3	Finished water transmission	1	LS	\$1,400,000	\$1,400,000
4	Conventional treatment equipment	1	LS	\$2,200,000	\$2,200,000
5	Chemical feed and disinfection systems	1	LS	\$650,000	\$650,000
6	Pre-engineered insulated steel building	1	LS	\$970,000	\$970,000
7	Mechanical piping, valves, HVAC, and plumbing	1	LS	\$900,000	\$900,000
8	Electrical, controls, SCADA, and instrumentation	1	LS	\$1,300,000	\$1,300,000
9	Generator and emergency power	1	LS	\$455,000	\$455,000
10	Startup, commissioning, and training	1	LS	\$163,000	\$163,000
Labor and Materials Subtotal					\$8,938,000
Mobilization, Insurance, Overhead, Bonds (10%)					\$893,800
Administration and Legal (5%)					\$446,900
Contingency (10%)					\$893,800
Engineering (20%)					\$1,787,600

Estimated Construction Costs (2026\$) **\$12,960,100**

Operations & Maintenance

#	Item Description	Quantity	Units	Unit Cost (\$)	Item Cost (\$)
1	Operator Labor	150	h	\$100	\$15,000
2	Electrical	1	LS	\$16,000	\$16,000
3	Treatment Chemicals	1	LS	\$18,000	\$18,000
4	Routine Maintenance	1	LS	\$8,000	\$8,000
5	Electrical and Controls Maintenance	1	LS	\$9,000	\$9,000
6	HVAC and Building Maintenance	1	LS	\$10,000	\$10,000
7	Replacement Parts Reserve	1	LS	\$8,000	\$8,000
8	Laboratory and Regulatory Compliance	1	LS	\$5,000	\$5,000

Estimated Annual O&M (2026\$) **\$89,000**

Salvage Value

#	Item Description	Construction Cost	Useful Life	Planning Period	Salvage Value (\$)
1	Hubbard Creek intake modifications	\$550,000	40	20	\$275,000
2	Finished water transmission	\$1,400,000	50	20	\$840,000
3	Conventional treatment equipment	\$2,200,000	40	20	\$1,100,000
4	Chemical feed and disinfection systems	\$650,000	15	20	(\$216,667)
5	Pre-engineered insulated steel building	\$970,000	50	20	\$582,000
6	Mechanical piping, valves, HVAC, and plumbing	\$900,000	40	20	\$450,000
7	Electrical, controls, SCADA, and instrumentation	\$1,300,000	30	20	\$433,333
8	Generator and emergency power	\$455,000	35	20	\$195,000

Estimated Salvage Value (2046\$) **\$3,658,667**

Net Present Value

Discount Rate (November 2024, OMB Circular No. A-94)		2.20%
Capital Costs (2026\$) [C]		\$12,960,100
O&M Unified Series Net Worth (2026\$) [OM]		\$1,427,577
Salvage Value Present Worth (2026\$) [S]		\$2,367,581
Net Present Value (2026\$) [C+OM-S]		\$12,020,095

5.4 Alternative Comparison

The three alternatives vary substantially in how effectively and affordably they address the existing WTP deficiencies, regulatory drivers, operational challenges, and long-term needs. Alternative 1 has the lowest initial cost but is primarily a near-term stabilization measure and would leave many aging systems and facility constraints unresolved. Alternative 3 would provide the greatest overall performance and flexibility, but its estimated \$13.0 million cost, funding requirements, implementation complexity, and potential conveyance uncertainties make it the least affordable option. Alternative 2 provides the best overall balance by comprehensively renewing the plant, extending its useful life, and improving capacity, reliability, safety, controls, and regulatory adaptability while reusing serviceable structures and infrastructure. Based on this balance of cost, performance, useful life, and resource conservation, Alternative 2 is the most cost-effective and sustainable alternative.

Table 5-1. Qualitative Comparison of WTP Alternatives

Evaluation Criteria	Alternative 1: Repair Existing WTP	Alternative 2: Rehabilitate Existing WTP	Alternative 3: New WTP Near Hubbard Creek
Treatment performance	Addresses the most immediate sedimentation, filtration, chemical feed, and disinfection deficiencies, but remains limited by the existing process configuration and current operating constraints.	Provides broader renewal of treatment components and may restore practical capacity closer to the plant's intended performance if existing basins and hydraulics remain suitable.	Provides the greatest opportunity to design treatment processes for Hubbard Creek water, current standards, projected demand, and reliable long-term performance.
Capacity	May improve day-to-day operation but is unlikely to fully restore reliable operation at the original 555 gpm design capacity or 450 gpm OHA-rated capacity.	Will recover a significant portion of capacity by improving clarification, filtration, controls, and backwash reliability.	Can be sized to meet current and projected maximum day demand requirements and eliminate dependence on the existing 350 gpm reported operating limitation.
Reliability and redundancy	Improves selected weak points, but single points of failure and aging infrastructure would likely remain.	Improves reliability through major system renewal and selected redundancy, subject to space, configuration, and construction limitations.	Provides the highest reliability and redundancy because critical systems can be designed with backup equipment, emergency power, and maintainable access from the outset.
Controls, monitoring, and reporting	Adds targeted improvements to alarms, call-out, and selected process controls, but may retain limitations of the existing system architecture.	Allows modernization of electrical systems, PLC, operator interface, alarms, and data collection within the existing facility.	Allows full integration of modern controls, instrumentation, alarms, data collection, and reporting tools in a new facility layout.

Operator safety and maintainability	Addresses near-term safety concerns, including chemical handling, eyewash, emergency shower, ventilation, and selected electrical hazards.	Provides broader safety and maintainability improvements while retaining portions of the existing building and treatment equipment.	Provides the best opportunity to create a safer, more maintainable facility layout with improved chemical handling, access, ventilation, climate control, and site security.
Coastal-hazard resiliency	Retains the existing site and does not materially change coastal-hazard exposure.	Retains the existing site; coastal-hazard exposure remains but is a secondary consideration relative to treatment reliability, affordability, and long-term service needs.	A suitable higher-ground site could reduce coastal-hazard exposure as a secondary resiliency benefit.
Future regulatory flexibility	Limited flexibility for PFAS treatment, corrosion control changes, expanded monitoring, or other future regulatory-driven improvements.	Moderate flexibility if adequate space, hydraulics, electrical capacity, and process connections can be provided within or near the existing facility.	Highest flexibility because space, hydraulics, power, chemical feed systems, and controls can be planned to accommodate future regulatory needs.
Constructability and service continuity	Generally easiest to implement in discrete phases, but may require repeated shutdowns and continued operation of aging systems.	More complex because work must occur within and around existing treatment processes while maintaining service.	Most complex overall, but may allow the existing WTP to remain in service while the new plant is constructed and commissioned.
Initial capital cost	Preliminary total project cost: \$2.1M. Assumes targeted repairs to critical treatment, chemical feed, mechanical, electrical, controls, safety, and emergency-response components.	Preliminary total project cost: \$6.5M. Assumes comprehensive renewal of existing treatment, process piping, chemical feed, electrical, controls, safety, and building systems while reusing major existing facilities.	Preliminary total project cost: \$13.0M. Assumes a new WTP near Hubbard Creek above the tsunami inundation zone, including treatment facilities, site work, utilities, transmission connections, controls, emergency power, and resiliency provisions.
Long-term value and sustainability	Lowest; primarily stabilizes existing assets and leaves significant long-term renewal, capacity, and adaptability needs unresolved.	Highest overall value; comprehensively renews the plant at approximately half the cost of replacement while reusing serviceable structures and infrastructure, reducing material use, site disturbance, and future renewal needs.	Highest technical performance and longest potential service life, but the substantially higher cost, new infrastructure requirements, and implementation risks reduce overall cost-effectiveness and affordability.

The costs shown in Table 5-1 are feasibility-level total project estimates for comparison. Alternative 1 is estimated at \$2.1 million and includes targeted repairs needed to stabilize the existing facility. Alternative 2 is estimated at \$6.5 million and includes comprehensive renewal of

the existing treatment, mechanical, electrical, controls, chemical feed, safety, and building systems while reusing the existing site, basins, contact tanks, structures, and other serviceable infrastructure. Alternative 3 is estimated at \$13.0 million and includes a new WTP near Hubbard Creek, site development, utilities, raw- and finished-water conveyance, controls, and emergency power. Alternative 2 therefore provides substantially broader and more durable improvements than repair at approximately half the cost of replacement, while also avoiding much of the new material use, site disturbance, permitting, utility extension, and conveyance work associated with relocation.

Based on this comparison, Alternative 2 is the most cost-effective and sustainable alternative. Alternative 1 has the lowest initial cost but provides limited long-term value and would likely require continued investment as retained assets deteriorate. Alternative 3 offers the greatest technical performance but costs approximately twice as much as rehabilitation, exceeds the City's estimated debt capacity, requires extensive new infrastructure, and carries additional site, transmission, permitting, and funding risks. Alternative 2 provides the most practical balance by renewing the systems that limit capacity, reliability, safety, and maintainability; extending the useful life of the WTP; preserving serviceable major infrastructure; reducing waste and site disturbance; and maintaining greater affordability and fundability than full replacement.

5.5 Preferred Alternative

Alternative 2, comprehensive rehabilitation of the existing WTP, is recommended as the preferred alternative. It provides the most practical balance of treatment performance, useful life, operating reliability, regulatory adaptability, operator safety, affordability, and fundability. Alternative 1 has the lowest initial cost but is primarily a near-term stabilization measure and would leave many aging systems and facility limitations unresolved. Alternative 3 provides the greatest technical performance and removes the plant from the tsunami inundation zone, but its high cost, funding requirements, and implementation complexity make it cost prohibitive for the City. Alternative 2 would comprehensively renew the systems that limit capacity, reliability, safety, and maintainability while reusing serviceable structures and infrastructure at approximately half the cost of full replacement.

5.5.1 Life Cycle Cost and Value

The alternatives should be compared on a life-cycle cost basis rather than initial construction cost alone. This evaluation considers capital cost, operation and maintenance expenses, replacement of short-lived equipment, remaining useful life, and salvage value at the end of the planning period. Alternative 2 has a preliminary total project cost of approximately \$6.5 million and would comprehensively renew the major treatment, mechanical, chemical feed, electrical, controls, emergency power, building, and safety systems while retaining serviceable basins, contact tanks, structures, and site improvements. This reuse of major infrastructure reduces capital cost, material consumption, site disturbance, and permitting complexity compared with replacement. Although Alternative 3 would provide a longer service life and greater remaining value, its approximately \$13.0 million cost is not offset sufficiently by those benefits to make it

the most affordable or practical investment. Alternative 2 therefore provides the best overall life-cycle value for the City.

5.5.2 Sustainability and Resiliency

Alternative 2 provides the most sustainable and practical approach by reusing serviceable major infrastructure while replacing the systems responsible for poor performance, excessive maintenance, safety concerns, and operational limitations. Rehabilitation would improve chemical and energy efficiency, backwash performance, automation, emergency power, equipment redundancy, operator access, and maintainability without the material use, new site development, utility extensions, and conveyance construction required for a new plant. The existing site would remain exposed to coastal hazards; however, that limitation is outweighed by the alternative's substantially lower cost, reduced environmental disturbance, and greater likelihood of implementation. The rehabilitation design should incorporate practical measures to protect critical equipment, improve emergency response, and maintain service during construction and future disruptions.

5.5.3 Affordability and Phased Implementation

Because the approximately \$6.5 million rehabilitation cost exceeds the water system's estimated debt capacity, implementation will require grants, principal forgiveness, low-interest financing, or a combination of assistance that maintains affordable user rates. The City should proceed directly with Alternative 2 rather than first completing the full Alternative 1 repair program. Rehabilitation should be phased as needed to align with funding and maintain plant operation: confirm existing structural and hydraulic suitability; advance preliminary design, construction sequencing, and funding; complete final design and agency review; and construct the improvements in coordinated phases. Only interim repairs needed to maintain regulatory compliance, operator safety, and reliable service should be completed before rehabilitation, and those repairs should be incorporated into the final project where practical to avoid duplicate or stranded investment.

5.5.4 Conditions of Recommendations

Alternative 2 is recommended, and the City should proceed with funding and preliminary design for comprehensive rehabilitation. Initial confirmation work should refine the scope, cost, phasing, and temporary operations rather than reopen the alternatives analysis. Alternative 1 should be limited to essential interim repairs if funding is unavailable for Alternative 2. Alternative 3 can remain a secondary option and be reconsidered only if financial assistance makes full replacement economically feasible without unacceptable user-rate impacts.

6. Funding and Implementation

6.1 Funding Opportunities

The preferred alternative will likely require a coordinated funding package because the preliminary project cost exceeds the City's estimated debt capacity. The City should pursue grants, principal forgiveness, and low-interest financing in parallel and should structure the project so planning, site acquisition, design, and construction can be funded in phases.

The primary funding source should be Oregon's Safe Drinking Water Revolving Loan Fund, administered jointly by Business Oregon and OHA. The program can finance planning, design, land or easement acquisition, treatment facilities, pumping, transmission improvements, instrumentation, security, seismic improvements, and projects that increase reliability and redundancy. Projects are ranked based on health risk, Safe Drinking Water Act compliance, system size, affordability, and related criteria. The City should submit the required pre-application by the annual February 15 deadline and document health, reliability, emergency power, treatment-capacity, and affordability needs to support project ranking and eligibility for subsidized financing or principal forgiveness.

USDA Rural Development's Water and Waste Disposal Loan and Grant Program is another strong candidate because Port Orford is within the program's population threshold for rural communities. The program can fund drinking water source, treatment, storage, distribution, land, engineering, legal, environmental, and related project costs through long-term, low-interest loans and grants when needed to maintain reasonable user charges. Applications are accepted on an ongoing basis, allowing the City to coordinate USDA review with preliminary engineering, environmental documentation, and rate planning.

Business Oregon's Water/Wastewater Financing Program may provide supplemental below-market loans, reduced interest rates, partial grants, or technical-assistance funding for eligible drinking water planning, design, and construction.

The City should prepare a funding plan that identifies eligible costs, local match, anticipated grants or principal forgiveness, borrowing capacity, annual debt service, rate impacts, cash-flow timing, and interim financing needs. The funding plan should avoid duplicating reimbursement of the same cost across programs and should align procurement, environmental review, and construction requirements before expenses are incurred.

6.2 Project Schedule

An implementation period of approximately 30 to 36 months is anticipated after authorization to proceed. The schedule should be advanced in three coordinated phases consistent with Section 1.5, with front-end evaluations limited to confirming rehabilitation feasibility and supporting design.

- Phase 1—Focused confirmation, preliminary design, funding development, and construction sequencing (approximately 3 to 6 months):
- Confirm the existing structures, basins, and hydraulic configuration are suitable for rehabilitation; establish design criteria; complete preliminary design; develop construction sequencing and temporary-operations requirements; refine project cost; and advance funding applications. Structural, hydraulic, process, and equipment investigations should be targeted to known decision points and performed concurrently where practical. Essential repairs should be prioritized to maintain reliable operation during project development.
- Phase 2—Final design, permitting, agency review, bidding, and financing (approximately 9 to 12 months):

Complete final plans and specifications, permitting and environmental documentation, OHA plan review and approval, funding and financing commitments, bidding, and construction contract award. Final design should incorporate phased construction and temporary-operating provisions needed to maintain treatment and water service.
- Phase 3—Phased construction, startup, and commissioning (approximately 18 to 24 months):

Complete phased rehabilitation of the treatment, mechanical, chemical feed, electrical, controls, emergency power, building, and safety systems while maintaining plant operation. Complete temporary operations, equipment installation and testing, operator training, startup, performance testing, commissioning, record documentation, and final regulatory approval.

The schedule will depend on funding availability, agency review, construction phasing within the operating plant, and long-lead equipment procurement. Early coordination with OHA and funding agencies, concurrent design and review activities, and timely equipment preselection should be used to maintain the accelerated schedule. The City should complete essential repairs as needed to maintain reliable operation until the rehabilitation improvements are commissioned.

6.3 Next Steps

The City has already submitted an SDWSRF letter of interest (LOI) and has been invited to submit a full application. This feasibility study is being completed as part of the SDWSRF application requirements and documents the need, alternatives, recommended project, preliminary cost, schedule, and implementation approach. The following actions are recommended to complete the application and advance Alternative 2 while maintaining reliable service:

1. Adopt the feasibility study and authorize development of Alternative 2, comprehensive rehabilitation of the existing WTP, as the preferred project.
2. Submit the completed feasibility study with the full SDWSRF application and address any follow-up information requested by Business Oregon or OHA.

3. Coordinate with Business Oregon and OHA to confirm the full application schedule, eligible project costs, environmental review, affordability documentation, procurement requirements, principal-forgiveness opportunities, and other conditions needed to complete the SDWSRF funding package.
4. Complete the required SDWSRF application materials, including the project scope, cost estimate, implementation schedule, environmental documentation, financial information, rate and affordability analysis, and demonstration of the City's technical, managerial, and financial capacity.
5. Complete detailed structural, hydraulic, process, and equipment evaluations needed to confirm the rehabilitation design criteria, practical treatment capacity, construction phasing, and temporary-operating requirements.
6. Prepare preliminary design documents for rehabilitation of the treatment, mechanical, chemical feed, electrical, controls, emergency power, building, and operator-safety systems, including provisions for maintaining water service during construction.
7. Refine the rehabilitation cost estimate using site-specific quantities, current equipment quotations, escalation, operation and maintenance costs, construction phasing, temporary operations, and SDWSRF funding assumptions.
8. Prepare a public-engagement and rate-communication program that explains the need for rehabilitation, the funding and affordability strategy, the implementation schedule, and interim reliability measures.
9. Implement the highest-priority interim repairs needed to maintain regulatory compliance, operator safety, and service continuity until the rehabilitation improvements are constructed and commissioned.

As the SDWSRF application and preliminary design advance, the City should continue coordinating with Business Oregon and OHA to resolve application comments, confirm eligible scope and costs, document affordability, and establish the conditions for financing and project implementation. At the end of preliminary design, the City should confirm that the rehabilitation scope, construction phasing, project cost, funding package, and temporary-operating plan are ready to proceed into final design.

