EXECUTIVE SUMMARY

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This report presents an update to the 2004 Water Treatment Plant Facility Plan (WTPFP) for the City of Grants Pass (City). The 2004 WTPFP provided guidance for improving the City's water treatment plant (WTP) and recommended a two-tiered capital improvement program (CIP). The City implemented a number of the recommended improvements which included addressing reliability and redundancy shortfalls and performing critical structural crack repairs in process basins.

Despite these improvements, conditions at the WTP have deteriorated since the 2004 WTPFP was created. In order to continue to reliably produce water for the community, a significant decision needs to be made in regards to the existing treatment facility. This WTPFP update provides the City with a sound basis for making the key decision: proceed with further major capital investments to maintain the existing facility or proceed with planning, design and construction of a new WTP to replace the aging facility. Both alternatives require immediate capital expenditures from the City to secure the water system's reliability. The final decision will lay the foundation for more than a hundred years of water system operations and will need to balance the economic, social, and environmental needs of the City.

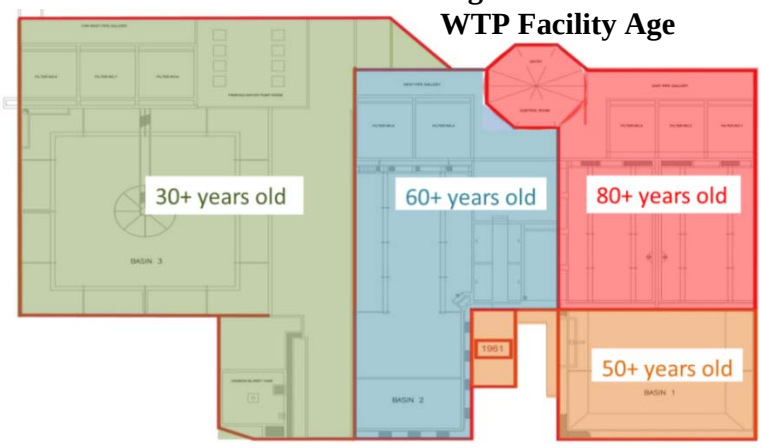
The primary objectives of this WTPFP update included:

- Evaluate the recent performance of the WTP in terms of quality and capacity
- Update the impacts of current drinking water regulations as they affect current and future treatment requirements
- Evaluation and documentation of the existing condition and remaining useful life of the WTP's structural systems
- Incorporation of recently updated water system demand projections to help identify potential WTP capacity deficiencies and the need for development of expanded capacity
- Evaluation of alternative approaches for maintaining the existing WTP and providing expanded capacity
- Evaluation of siting and construction of a new WTP
- Develop a CIP implementation plan based on community stakeholder input and triple bottom line analyses of existing and new facility improvement alternatives

Water Treatment Plant Overview

The Grants Pass WTP, located at 821 Southeast "M" Street, was originally built in 1931 and has undergone several upgrades and expansions to serve a growing population and to meet more stringent treatment standards. Capacity upgrades were completed in 1950, 1961, and 1983, as illustrated in Figure ES-1. The plant's current hydraulic capacity is approximately 20 mgd.

Figure ES-1
WTP Facility Age



Water Treatment Plant Condition

Several structures at the WTP continue to show increasing signs of deterioration as many parts of the WTP have reached or exceeded their expected service life. As highlighted in the pictures on this page, the deterioration includes:

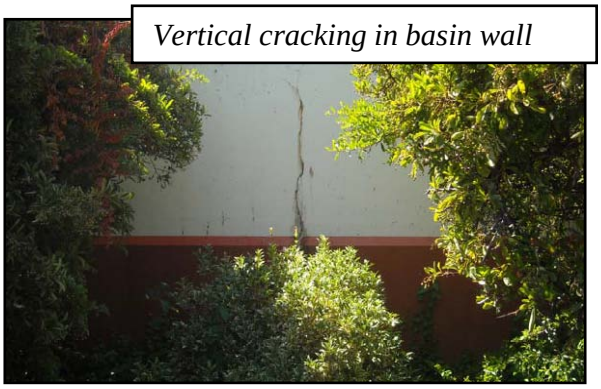
- Exposed rebar and concrete failure in sections of the clearwell.
- Spalling and cracking concrete in older primary process components of the WTP.
- Failure of submerged structural elements.

All of these elements are critical in supplying a reliable quantity and quality of drinking water to the citizens of Grants Pass.

A seismic and structural review of the Grants Pass WTP was completed in 2011 in response to the observed structural deteriorations. The review concluded that the WTP is at a high seismic risk and **is susceptible to collapse in a strong earthquake**. A planning-level project cost to address deficiencies observed during the review was estimated to be approximately $8.5 million. While these structural improvements would reduce the overall seismic vulnerability of the WTP, they do not improve the facilities to current building code standards for seismic events, and they do little to address the declining condition of the aging facility and would not increase WTP production capacity.

Spalled concrete and exposed rebar

Exposed rebar in clearwell beam



Vertical cracking in basin wall

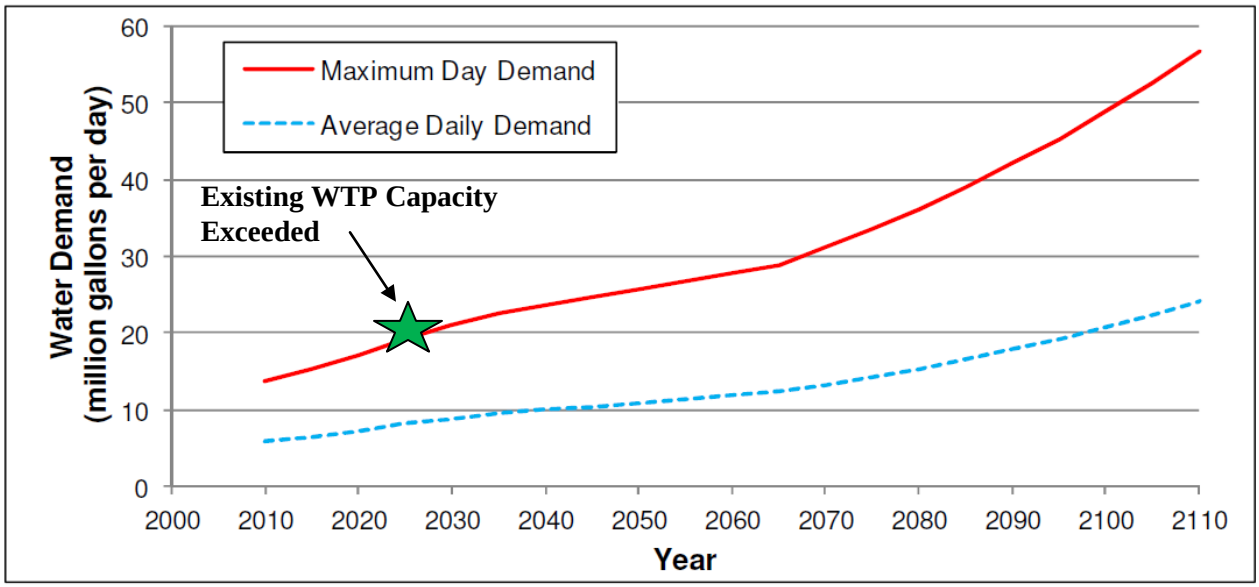
In February 2013, the Oregon Resilience Plan (Plan) was completed, highlighting the real risk of a major Cascadia Subduction Zone earthquake with a magnitude of 9.0. One of the key recommendations of the Plan is the completion of comprehensive assessment and mitigation plans for critical water system infrastructure. **For the City of Grants Pass, the WTP, as the City's sole source of water supply with no emergency backup, is the most critical facility in the water system.** The age and condition of the WTP, as described herein, emphasizes how vulnerable this facility is to catastrophic damage in a major earthquake.

Water Demand Projections and Capacity Needs

The design flow for WTP capacity is the maximum day demand (MDD) for water utilities that have adequate distribution system storage. Per regulatory requirements, the development of water demand projections consider the existing service area, future service areas, and trending of

historical population and water demand information. As illustrated in **Figure ES-2**, the MDD is projected to exceed the existing WTP capacity between 2025 and 2030, and will reach approximately 30 mgd by 2065. While continued reduction in water use through conservation and increased efficiency may delay the need for expanded capacity, water demands will continue to increase over time as the City's population grows, ultimately requiring expanded water treatment capacity.

Figure ES-2
Water Demand Projections



Capital Improvement Alternatives Overview

Five capital improvement alternatives were developed to represent a full range of potential space, cost, and risk scenarios that address the identified WTP deficiencies and promote reliable, long-term source of supply from the Rogue River. The alternatives are:

Alternative 1: Existing WTP Upgrade, Maximize Reuse of Existing Facilities

Alternative 2: Existing WTP Upgrade, Phased Replacement of Facilities

Alternative 3: Construct a New WTP with Consolidated Footprint

Alternative 4: Construct a New WTP with Large Footprint

Alternative 5: Construct a New WTP with Consolidated Footprint on Property already owned by the City

Capital Improvements Program Recommendation

An Advisory Committee of community leaders and City Council members was assembled to assist in the evaluation and recommendation of a preferred alternative from those presented above. City Public Works employees integral to the project also participated to offer information about operational impacts, zoning and land use implications, and necessary steps in the City approval process.

A series of four workshops was conducted over a three-month period with the Advisory Committee using an independent facilitator from the Grants Pass community. The Advisory Committee evaluated each alternative considering its economic, social, and environmental impacts.

For the benefit of the Advisory Committee, a list of suggested criteria was developed from similar projects to evaluate the alternatives. The committee then modified and finalized the criteria, establishing appropriate weighting for each through group discussion. **The members of the Advisory Committee independently scored the alternatives and Alternatives 3 and 4 - building a new WTP at a site to be determined - scored the highest**. These alternatives were selected by the Advisory Committee because they provide the City with a seismically secure, reliable WTP, with a treatment process able to provide improved water quality for existing and future generations, all at a cost to the community that is comparable to continuing to invest in the existing WTP.

Workshop results and scoring were presented to the City Council during its August 5, 2013 Workshop and then discussed further during its September 9, 2013 Workshop. In reviewing the materials developed and scoring performed, **the Council directed the completion of this Facility Plan Update with the recommendation to move forward in the planning process to construct a new WTP at a site to be determined**.

Capital Improvement Program Implementation Plan

The conceptual project cost to construct a new WTP is estimated to be approximately $56 million, with an accuracy range of –30 percent to + 50 percent. **It is recommended that the City establish a capital budget for this project which reflects this estimate and the level of uncertainty and risk associated with the current level of project definition**. This budget should be updated and refined over time as the implementation plan progresses and planning and design uncertainties are addressed.

The City should proceed with the processes necessary to construct the new WTP as quickly as possible to avoid extensive investments in the existing plant that are critical to ensuring the plant can continue to reliably meet water quality regulations. Delays in implementation would require the City to remain reliant upon the existing WTP. This presents not only significant structural and seismic reliability risks, but other production reliability and redundancy issues as highlighted in this WTPFP Update. The required capital investment in the existing WTP to mitigate these risks will increase over time, and represent stranded investments once the new WTP is constructed.

The recommended schedule to proceed with the planning, design and construction of the new WTP is presented in **Figure ES-3**. It is possible to have a new WTP online by the middle of 2019 using a traditional design-bid-build project delivery approach. **Table ES-1** presents a summary of anticipated capital expenditures (project costs) for the next 10 years to implement a new WTP based on this Implementation Schedule. While WTP construction would be completed in year 6, additional expenditure activities such as decommissioning of the existing WTP, reconfiguration of the WTP site, and the warranty period for the new WTP, will extend through the remainder of the 10-year timeframe.

Figure ES-3
Project Implementation Schedule

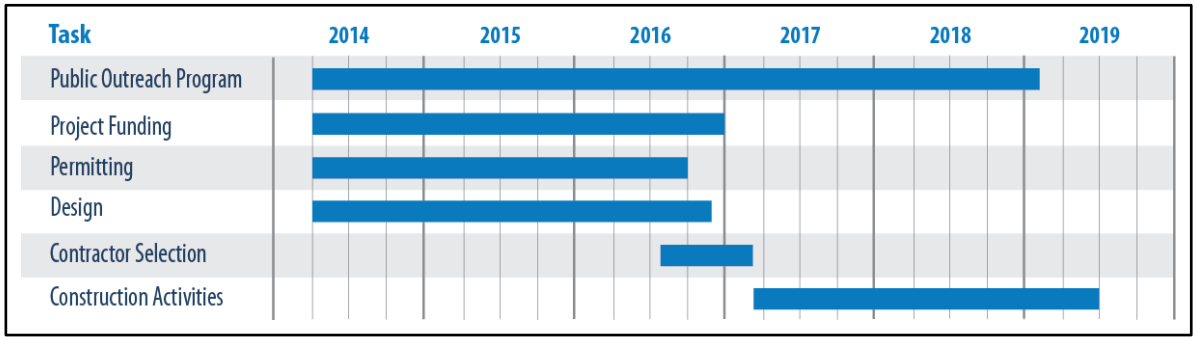


Table ES-1
Recommended Capital Improvement Program Summary

Capital Project	Capital Expenditure
New Water Treatment Plant Implementation	
Pilot Plant Study	$500,000
Siting Study and Property Acquisition	$1,300,000
Funding Study and Rate Impact Study	$200,000
Project Implementation Approach and Procurement Strategy	$50,000
Public Information/Involvement	$250,000
Permitting and Land-Use Approvals	$200,000
Preliminary Design	$1,000,000
Final Design	$4,000,000
Bidding and Award	$250,000
Construction	$47,200,000
Post-Construction and Warranty Period	$200,000
Existing Water Treatment Plant Investments	
Emergency Response Plan	$50,000
Decommission and Demolition of Existing Plant	$1,000,000
Total Anticipated Expenditures (2013 dollars)	**$56,200,000**

- Conduct a year-long pilot plant study to evaluate clarification, intermediate disinfection and high-rate filtration processes alternatives
- Confirm the project schedule and project delivery strategy
- Plan and implement a public outreach program
- Develop a permitting and regulatory approval plan

It is anticipated that the City will need to allocate approximately $1M to complete these activities. Once significant progress has been made on each of these tasks, the detailed design phase may begin. **Critical early planning activities should begin in the next fiscal year to avoid additional stranded capital investments in the existing WTP.**

CHAPTER 1
INTRODUCTION AND BACKGROUND

Purpose

This report presents an update to the 2004 WTPFP for the City. The 2004 WTPFP provided guidance for improving this major element of the City's water system and recommended a two-tiered CIP. The main elements of the CIP were developed after a review and evaluation of historical plant performance and regulatory requirements. Many of the recommended improvements have been completed since 2004. The objectives of this WTPFP update include:

- Update the impacts of current drinking water regulations as they affect current and future treatment requirements.
- Update the capacity evaluation of the WTP, incorporating facility improvements and operational changes that have been implemented since 2004.
- Review information presented in recent structural evaluations and additional tests to help determine the remaining useful life of the WTP's structural systems.
- Visually inspect and review equipment in terms of age, condition, and code compliance to assess the remaining useful life of electrical and mechanical equipment.
- Incorporate recently updated water system demand projections to help identify potential plant capacity deficiencies. These demands were developed to assist in the City's water rights extension process and will be adopted into upcoming water system master planning documents.
- Evaluate alternative improvements to address existing and potential future WTP deficiencies.
- Feasibility evaluation for siting and construction of a new WTP.
- Develop planning-level cost estimates associated with both existing and new WTP project alternatives.
- Assist in selecting a capital improvements implementation plan based on input from an Advisory Committee of community leaders and City Council members and an analysis of existing and new facility improvement alternatives.

Project Background

The WTP uses chemical and physical processes to treat water from the Rogue River to produce high-quality drinking water and is the City's sole source of potable water. The original WTP facilities were constructed in 1931 with subsequent expansion projects in 1950, 1961, and 1983.

Due to observed and on-going deterioration in some older structural elements of the WTP, a seismic and structural review of the Grants Pass WTP was completed in 2011. A review of geotechnical studies conducted at the plant site showed that ground shaking and slope

stability along the Rogue River bluff are the two most significant seismic geotechnical risks. A review of the construction documents of the plant shows that, overall, the structures appear to have been designed and detailed prior to consideration of seismic loads. Given this lack of seismic design consideration, the plant is judged to have a high seismic risk and is susceptible to collapse in a strong earthquake.

A planning-level project cost to retrofit the various structural deficiencies observed during the review was estimated to be approximately $8.5 million. These structural studies and observations led the City to initiate this update to the WTPFP to help guide the planning of the City's water treatment and supply system and to help the City prioritize improvements over the next 20 years. This updated WTPFP evaluates the advantages and disadvantages of continuing to invest in this older, structurally deficient facility considering that it may have limited remaining useful life.

Water Treatment Plant Overview

The Grants Pass WTP, located at 821 Southeast "M" Street, was originally built in 1931 with a single sedimentation basin and three filters for a design capacity of approximately 3.5 mgd. The plant has undergone several upgrades and expansions to serve a growing population and to meet more stringent treatment standards. Capacity upgrades were completed in 1950, 1961, and 1983, and the plant has received numerous process and safety upgrades over the past two decades as well. The plant's current hydraulic capacity is approximately 20 mgd, but the plant cannot operate at this rate throughout the year due to process and regulatory compliance constraints during the colder months of the year. These constraints have yet to affect the plant's ability to produce high-quality water while meeting the City's water demands. The 1983 expansion required extensive internal remodeling of the original building, while preserving its current listing as a Historic Landmark by the Grants Pass Historic Building and Sites Commission and the American Water Works Association's (AWWA) National Historic Water Landmarks.

Raw Water Supply

The plant draws water from the adjacent intake on the Rogue River. The City has been drawing water from the Rogue since 1888 and currently has a total water right of 82 cubic feet per second (CFS) or 53 mgd. The river is prone to turbidity events and yearly fluctuations in temperature and pH which create seasonal challenges to plant operations. The river flow and quality are also influenced by upstream dam operations, most notably the Lost Creek Reservoir. In 2010, the Gold Ray Dam on the Rogue River was removed and this has created additional challenges to plant operations, including increased sediment and turbidity which among other things, has negatively affected the performance of the intake and screen cleaning system.

Facilities and Processes

The WTP is operated and rated as a conventional filtration plant, although it lacks flocculation prior to sedimentation in its basins. Liquid residuals, including dirty backwash water and filter-to-waste water, are transferred to the old mill pond, located across the street from the plant which overflows to Skunk Creek. The majority of plant solids, which collect in the sedimentation basins, are now handled on-site, but were previously discharged to the old mill pond along with the backwash water and filter-to-waste water.

Figure 1-1 is a photographic overview of the City's Water Treatment System and Figure 1-2 provides a plan-view layout of the WTP's current configuration. Figure 1-3 is a Process Flow Schematic of the plant indicating key processes and chemical addition points. Major facilities and structures at the Grants Pass WTP include:

- Raw water intake and screening facility.
- Raw water pumping station which has four pumps, all with 75 HP motors and two with variable frequency drives (VFDs), a flow meter, and 36-inch diameter static mixer.
- One mixing basin, currently operating as a flow-through structure without mixing, servicing basins 1 and 2.
- Three sedimentation basins with a total surface area of 18,800 square feet and total volume of 1,835,300 gallons.
- Eight dual media gravity filters with 30 inches of media depth and a total of 2,493 square feet of surface area.
- A 433,000 gallon baffled clearwell. The clearwell's volume of 433,000 gallons represents the maximum volume at the overflow level. The actual operating volume varies from 362,000 gallons to 400,000 gallons.
- Two backwash pumps with VFDs, 16-inch diameter backwash supply pipeline and flow meter.
- A high service pumping station which has six pumps, one constant-speed pump with 300 HP motor, two constant-speed pumps with 250 HP motors, two pumps with VFD 250 HP motors, and one pump with VFD 200 HP motor.
- One 36-inch diameter finished water transmission pipeline with flow meter.
- One hydropneumatic surge tank with a volume of 11,300 gallons located on the finished water discharge.
- Chemical storage, metering, and rapid mixing systems for liquid alum, liquid proprietary coagulant, liquid sodium hypochlorite, and dry polymer. ACH is used as the primary coagulant, alum is used as a supplemental coagulant and to aid in pH adjustment, and filter aid polymer is added to the basin effluent to improve filter performance. Disinfection is achieved through both pre- and post-chlorination by addition of sodium hypochlorite.
- One 116,000-gallon equalization basin for backwash wastewater and filter-to-waste water.

- Equalization basin pumping station with three pumps, two pumps with 30 HP each with a combined capacity of 2,100 gpm at a TDH of 42 feet, and one pump with 60 HP motor rated at 1,750 gpm at a TDH of 60 feet.
- One residual solids lagoon, called the old mill pond, which discharges decant into Skunk Creek and eventually into the Rogue River.
- The old powdered activated carbon slurry tank was re-purposed as a solids conditioning tank to receive residual solids from sedimentation basins. After conditioning with polymer, the solids are pumped into geomembrane bags or "geobags" for on-site dewatering and hauled to off-site disposal.

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FULL SIZE: 1" = 50'
HALF SIZE: 1" = 100'

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SCALE: AS NOTED

DESIGNED A. NISHIHARA
DRAWN A. ORR
CHECKED P. KREFT

MSA | MWH | City of Grants Pass

WATER TREATMENT PLANT FACILITY PLAN UPDATE
FIGURE 1-1
EXISTING SYSTEM OVERVIEW

SOUTHEAST M ST

8" TO OLD MILL POND

30" FW

36" FW TO DISTRUBUTION

FW FLOW METER

MH 1

MH 2

MH 3

24" DR

SURGE TANK

16" BW

18" DR/6" FTW

24" DR

18" DR

36" DR

18"

18"

2" UW

42" FE

FILTERS 6-8

CLEARWELL AND HSPS (BELOW)

FILTERS 4-5

FILTERS 1-3

WASHWATER EQUALIZATION BASIN

30" OVERFLOW

6" DR

8" SUMP DISCHARGE

ELEC DUCT BANK

SEDIMENTATION BASIN 3

MIXING BASIN

SEDIMENTATION BASIN 2

SEDIMENTATION BASIN 1

STORM DR

24" RW

24" RW

30" RW

30" FW

SLUDGE EQ. BASIN

18" RW DR

18" RW DR

36" RW

24" RW

STATIC MIXER VAULT

RW FLOW METER

RW INTAKE AND PUMP STATION

ROGUE RIVER

US HIGHWAY 199

N

0 50 100

FULL SIZE: 1" = 20'
HALF SIZE: 1" = 40'

LEGEND

- BUILDINGS AND MAJOR PROCESS COMPONENTS
- RAW WATER PIPING
- FINISHED WATER PIPING
- WASTE/OVERFLOW PIPING
- ELECTRICAL DUCT BANK

BW	BACKWASH WATER
DR	DRAIN
FE	FILTER EFFLUENT
FW	FINISHED WATER
FTW	FILTER-TO-WASTE
MH	MANHOLE
OF	OVERFLOW
RW	RAW WATER

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CHECKED P. KREFT

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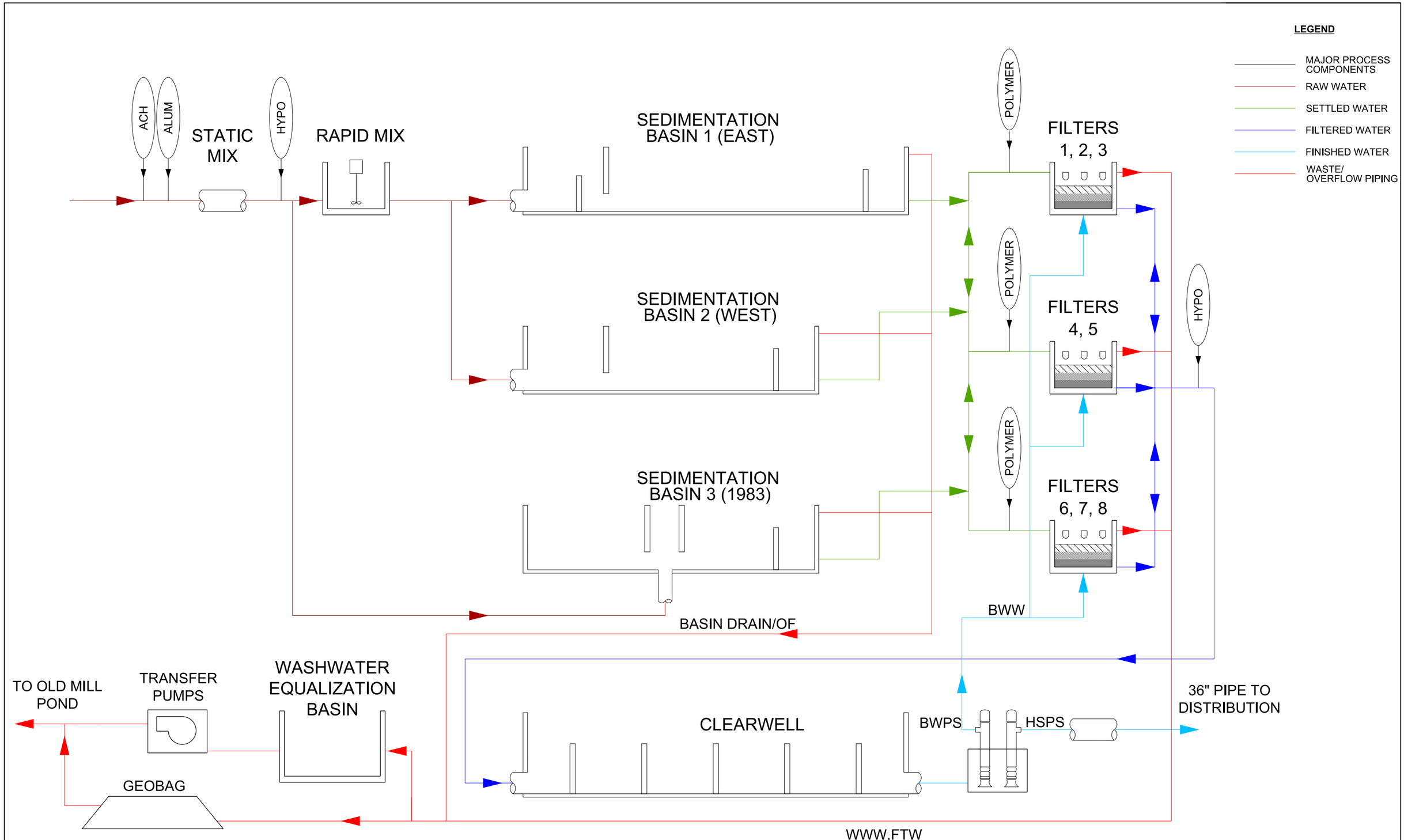
WATER TREATMENT PLANT FACILITY PLAN UPDATE
FIGURE 1-2
PLAN VIEW LAYOUT



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				NO SCALE	A. NISHIHARA	A. ORR	P. KREFT	1-6

MSA MWH City of Grants Pass

WATER TREATMENT PLANT FACILITY PLAN UPDATE
FIGURE 1-3
EXISTING SYSTEM PROCESS FLOW SCHEMATIC

The operations building includes a water quality laboratory for treatment process monitoring and control, the plant's electrical distribution equipment, main control board, and other instrumentation and control equipment. The operations building also has office and administrative spaces, a lunchroom, workshop, and meeting area.

The plant typically operates between 8 and 24 hours per day, depending on system demands. During the peak demand months of July through September, the plant is operated for up to 24 hours per day to meet peak day demands. The plant is staffed at all times when operating and employs six full-time employees (FTE) and five seasonal, part-time employees.

Plant Improvements Since 2004

The 2004 WTPFP recommended a two-tiered CIP to improve plant performance to meet regulatory requirements and improve overall plant operations and safety. Major improvements made at the WTP since the 2004 WTPFP include:

- Screening improvements at the Rogue River intake to meet fish protection criteria.
- Addition of VFDs to the raw water pumps to improve plant operating flexibility.
- Replacement of filter underdrains and media to improve plant performance.
- Addition of solids handling and dewatering facilities to reduce the volume of solids and liquids being discharged to the old mill pond across the street from the WTP; "Geobags" are now used to handle solids for dewatering.
- Incorporation of a new coagulation chemical scheme which has eliminated the need to add lime for pH adjustment; hence, the lime system has been demolished.
- Addition of a second filter backwash pump to improve plant reliability.
- Addition of a standby generator at the WTP to improve plant reliability and reduce vulnerability during power outages; to be completed in the spring of 2014.

A project involving solids removal systems in the sedimentation basins was investigated in 2009 and this work was deferred by the City due to high costs. The high cost was due to structural and seismic retrofitting required as part of the installation of the equipment.

Summary

Chapter 1 establishes the purpose of this Facility Plan update and provides background on activities leading up to its development. Subsequent chapters will review various aspects of the WTP's condition and performance. The evaluation of the existing plant includes a performance evaluation, regulatory review, capacity review, and facilities review. Each review is summarized in separate sections of this report. These reviews and analyses document potential improvements at the existing WTP which may be required for a number of reasons including maintaining existing capacity, increasing capacity, optimizing performance, meeting future drinking water regulations, extending remaining useful facility life, and improving safety and operational efficiency. Proposed WTP improvement

alternatives include estimated project costs and alternatives that consider construction of a new WTP at a site other than the existing WTP site.

The evaluation and final recommendation of the preferred capital improvement alternative was accomplished using a triple-bottom-line analysis. The City assembled an Advisory Committee of community leaders and City Council members to assist in the evaluation and recommendation of a preferred alternative. The Advisory Committee convened for four separate workshops during the summer of 2013 to review and discuss the alternatives before selecting a preferred alternative.