Council Study Session

April 19, 2021

Agenda Item	Water Treatment Plant Design Envision Program Update	
From	Scott Fleury PE Kevin Caldwell PMP	Public Works Director Senior Project Manager
Contact	Scott.fleury@ashland.or.us Kevin.Caldwell@ashland.or.us	541-552-2412 541-552-2414
Item Type	Requested by Council ☐ Update ☒ Request for Direction ☒ Presentation ☒	

SUMMARY

Before the Council is a full status update of the design of a new 7.5 million gallons a day (MGD) Water Treatment Plant. The project is currently at the 60 percent design phase and has been on a soft pause since the Summer 2020 while staff and HDR navigate numerous project related items that need to be resolved moving forward.

POLICIES, PLANS & GOALS SUPPORTED

City Council Goals:

- Essential Service-Drinking Water System
- Emergency Preparedness
- Address Climate Change

CEAP Goals:

Natural Systems: Air, water, and ecosystem health, including opportunities to reduce emissions and prepare for climate change through improved resource conservation and ecosystem management.

- Strategy NS-2: Manage and conserve community water resources
- Strategy NS-3: Conserve water use within City operations

Department Goals:

- Maintain existing infrastructure to meet regulatory requirements and minimize life-cycle costs
- Deliver timely life cycle capital improvement projects
- Maintain and improve infrastructure that enhances the economic vitality of the community
- Evaluate all city infrastructure regarding planning management and financial resources

BACKGROUND AND ADDITIONAL INFORMATION

Staff has included a memo (attachment 1) that details the history of decision points with respect to the development of the Water Treatment Plant project. This memo provides links to contextual background for additional information on how things have changed and evolved since the project was originally envisioned in the 2012 Water Master Plan. Discussions regarding Water Treatment Plant planning by the City Council, the original Water Advisory Group and the Ashland Water Advisory Committee (AWAC) for have occurred for some time now.

Council discussions in the early 1990's involved the potential to construct a new Water Treatment Plant due plant age, treatment capability (algae) and locational risk. There was even reference to a Parks site known as the upper swimming hole that is directly adjacent to the proposed "Granite Pit" site that was vetted by a formal siting study previously completed.

March 21, 1991 Council Minutes:

Report by Director of Public Works on taste and odor problems.
Hall referenced his memo dated March 19th and a report from Brown and Caldwell dated March 15th. The problem that occurred back in September had conditions Ashland has never seen before. He suggested to Almquist that we seek an outside opinion, and Hall introduced Dennis Eckhardt of Brown and Caldwell who summarized the report. He said the problem is mostly climatic. There are new drinking water standards that staff has to meet, which is difficult because there is less margin for error. He said algae is unpredictable. Reid referenced Phase 3 and asked about a new plant. The existing plant is 40+ years old and in a bad location. There has been some investment over a period of years to keep it going. Council dedicated a piece of land to Parks up on Granite Street. Reid asked if we are developing a park where we should be developing a drinking water plant. There is a limited amount of space in the canyon. Laws said it seems the City needs a Master Plan for water treatment. Eckhardt said parts of the plant have never been used. Hall said there are funds in next year's budget to handle some of the immediate needs. Laws moved that staff bring back recommendations on a long range proposal for an appropriate approach to future water treatment. Reid seconded, all ayes on voice vote.

April 2, 1991 Council Minutes:

BACKGROUND
At the March 21, 1991 meeting the Council received a report from Mr. Dennis Eckhardt of Brown and Caldwell in reference to the September, 1990 taste and odor incident.

The report was intended to serve two functions:

- to give the Council and staff an independent critique and analysis of the taste and odor incident.

- to deal with the reasons for the incident and potential changes that could be made in testing and processing water in relation to algae blooms in Reeder Reservoir.

The Council began expressing concerns about the condition and lifespan of the existing plant. As a result of those concerns, the Council directed staff to return with a recommended course of action including a "master plan" for the water treatment plant.

Current Project Status, Sizing Optimization and Costs:
Staff and HDR provided a project update to the Council at the August 15, 2019 Study Session (Minutes, Staff Report). The update provided Council with information regarding project development to the 30 percent design stage.

After this informational update, the Council subsequently authorized a professional services contract with HDR at the October 1, 2019 Business Meeting to move forward with the final design of a 7.5 MGD Water Treatment Plant. Final design included development of 60 percent, 90 percent and 100 percent plans, specifications and estimates for the Water Treatment Plant in order to develop a biddable project. In addition to the plans, specifications and estimates portion of design, the final engineering phase also included a water quality study. HDR through its subconsultant Confluence Engineering has conducted a water quality study that accounts for the three sources of water entering the City's distribution system (Reeder Reservoir, TID, TAP). This study helped define treatment parameters for the new plant to produce the highest water quality for the community when any and all of the sources are utilized, for current and pending regulations. The Water Quality Technical Memorandum is included as an attachment for reference.

With respect to moving forward with the design process, staff and HDR have been focused on scenario planning that provides for an adaptable design, reduces risk, increases resiliency, minimizes environmental construction impacts, accommodates surrounding community park and trail uses and accounts for climate change impacts from the construction standpoint of a new facility, but also with respect to future water supplies and demand.

Since the authorization in October (2019), HDR has moved forward with developing the 60 percent iteration of plans and associated cost estimates along with itemizing components of the Envision program to move the project from a silver to platinum status. The change in project status is dependent on choices made by Council based on increased costs for additional measures.

After HDR developed the 60 percent design documentation, Mortenson Construction developed another construction cost estimate of the project. The 60 percent design construction cost estimate was $43.9 million (no additional owner contingency), a significant increase relative to the 30 percent estimate. The 60 percent estimate did include a 186KW solar facility ($1.4 million, including additional structural modifications), that was not specifically part of the 30 percent cost estimate. Energy generation and other items have been itemized separately with respect to the Envision program and detailed in the Envision section of the staff report.

At this point, HDR understanding the City's budget concerns and original cost expectations spent two weeks evaluating additional value engineering (VE) options that again would not limit project goals and water treatment quality expectations. HDR presented VE options and cost reductions to the City via a video conference in May 2020. The updated 60 percent VE construction cost estimate reduced down to $35.3 million for a 7.5 MGD facility.

There has also been concern expressed that the initial facility sizing is to large based on updated supply/demand forecasts generated in the 2020 Water Master Plan Update. The 2020 plan forecasts demand without additional conservation based on the current per-capita usage. The demand is projected to be 6.6 MGD by 2040. With respect to the plant sizing question, HDR and City staff reviewed multiple years of demand and production data for the Water Treatment Plant to formally address these concerns moving forward.

Water demands and facility sizing were initially analyzed in August 2020 prior to the Almeda Fire. These pre-Almeda Fire demands also included potential climate impacts on water supply as part of the maximum day demand forecasting. The August projection and recommendation by HDR was to develop an initial facility size of 6.5 MGD (50-year life) expandable to 8.5 MGD (100-year life).

After the Almeda Fire HDR revised the demand projections and provided an updated recommendation for an initial facility size of 7.0 MGD expandable to 9.0 MGD in part due to actual production during the fire period (September 9 maximum day demand was 5.84 MGD). Reference Table 1 for maximum day demand updated forecast.

Table 1: Maximum Day Demand (September 2020 Update)

Year	Maximum Day Demand (mgd)			
	MDD	MDD with Conservation	MDD with Climate Change	MDD with Conservation + Climate Change
2020	5.84	5.56	5.84	5.56
2025	6.02	5.47	6.05	5.51
2030	6.18	5.37	6.25	5.44
2040	6.28	5.35	6.43	5.49
2050	6.28	5.24	6.51	5.46
2060	6.36	5.30	6.67	5.61
2070	**6.37**	**5.45**	**6.93**	**5.84**
2080	6.81	5.68	7.30	6.17
2090	7.10	5.92	7.70	6.51
2100	7.40	6.17	8.11	6.88
2110	7.72	6.43	8.55	7.27
2120	**8.05**	**6.70**	**9.02**	**7.68**

This reduced initial facility capacity would still mean City water demands are safely meet through 2070, the next 50 years, before the Water Treatment Plant must be expanded to 9.0 MGD. The expanded facility would then provide water through 2120 (100 years), at which time the Water Treatment Plant would be expanded again or replaced. The capacity reductions from 7.5 MGD to 7.0 MGD result in an estimated $2.5 million construction cost savings with no changes in treated water quality, resiliency, or public health protection and acceptance, see Table 2 below for cost summary. The revised Plant Capacity Technical Memorandum (TM), and a Revised Plant Capacity Design Criteria TM are attached as references.

Table 2: Cost Estimate Summary*

Cost Estimating Timeline for the WTP in Ashland		
		Cost Estimate
Timeline	Design Stage	(in millions)
Jan-19	Initial concept analysis	$ 42.1
May-19	Revised concept analysis	$ 45.3
Jun-19	Draft 30% design submittal	$ 43.3
Jul-19	Value engineering session	$ 36.0
Sep-19	Final 30% design submittal	$ 35.9
Apr-20	Initial 60% cost estimate	$ 43.9
May-20	Inclusion of Ashland Creek Culvert	$ 44.6
May-20	Value engineering session and equipment bids	$ 35.3
Sep-20	Facility resizing to 7.0 MGD	$ 32.8

***Note-these costs exclude additional capital for solar power generation components or increasing the target Envision recognition level beyond Silver status.**

Envision Program Evaluation

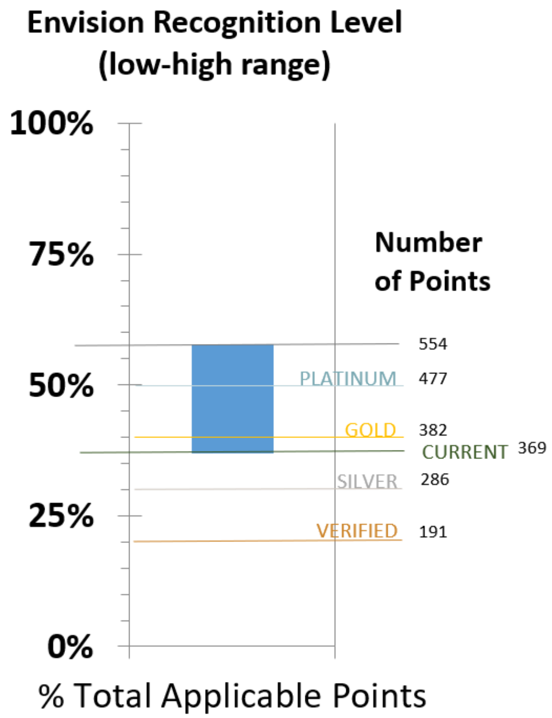
The ISI Envision program is a nationally recognized framework for designing and constructing community-focused environmentally sustainable infrastructure projects.

As directed by Council at the November 1, 2019 Business Meeting, HDR has focused on improving the estimated Envision status from Silver to Platinum with a focus on electrical energy conservation and renewable energy generation within the 30 percent to 60 percent design iterations. Currently based on the design HDR estimates the City is at Silver status with 369 total points. To achieve Gold, 382 points are needed, and Platinum status requires 477 points (see Figure 1 below). Figure 2 below details additional program and capital components with their associated point value and cost that could be necessary to meet Platinum level status for the treatment plant project.

Envision Options:

1. Solar Energy generation (10 Envision points for estimated $2.0 million) (See Figure 3 & 4)
    a. 55 kW rooftop system – main building (part of initial construction)
    b. 35 kW rooftop system – outbuildings (part of initial construction
    c. 25 kW carport – additional new construction (not part of primary project)
    d. 85 kW rooftop system – additional new construction (roof addition over filters, not part of original construction)
2. Additional site solar (5 Envision points for an estimated $1.7 million)
    a. 150 kW ground array with battery storage potential (would require BPA approval)
3. Increase storm drain retention and treatment (15 Envision Points for estimated $150,000)
4. Develop sustainability management plan (16 Envision points for estimated $50,000)
    a. Inherent to project with O&M manual development for all systems
    b. Can be include in final design/construction phases
5. Prepare end of life analysis (15 Envision points for estimated $100,000)
    a. Inherent to project with O&M manual development
    b. Can be included in final engineering/construction administration phases
6. Restart AWAC (15 Envision points)
    a. Reestablish meeting schedule

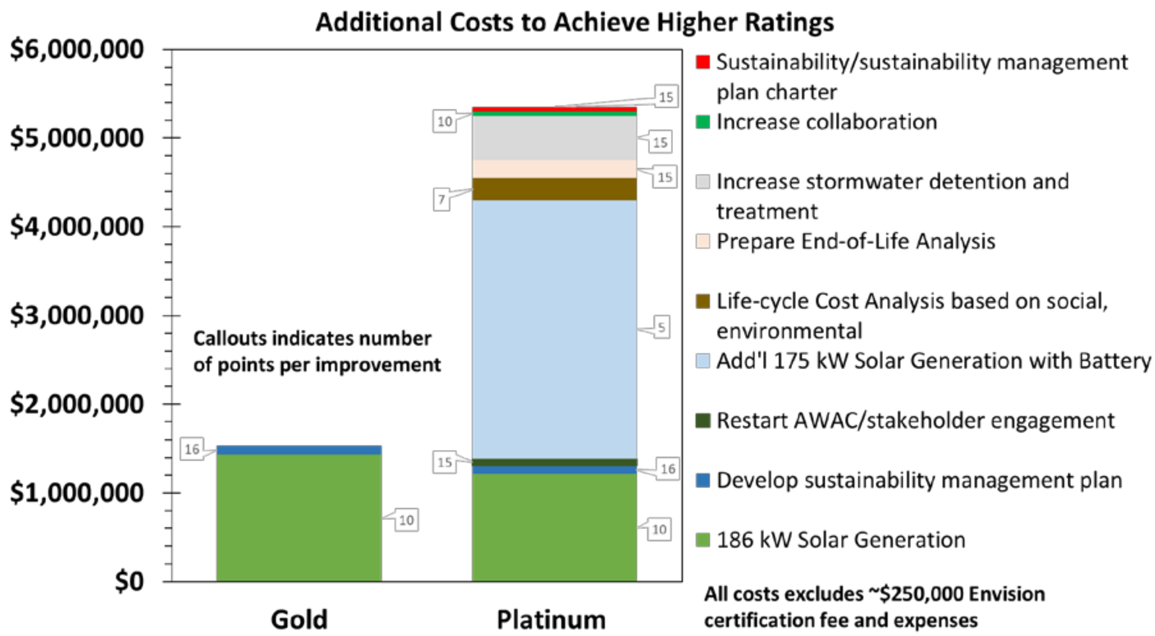
Figure 1: Current Envision Status



New Water Treatment Plant already achieving Silver Status with the following major components:

- Long-term project identification and planning through master plans
- Input with Ashland Water Advisory Committee
- Restoring fish passage with new bridge
- Evaluation of treatment options and site layouts

Figure 2: Additional Envision Components (points vs. cost)



CITY OF ASHLAND

Figure 3: Solar Potential

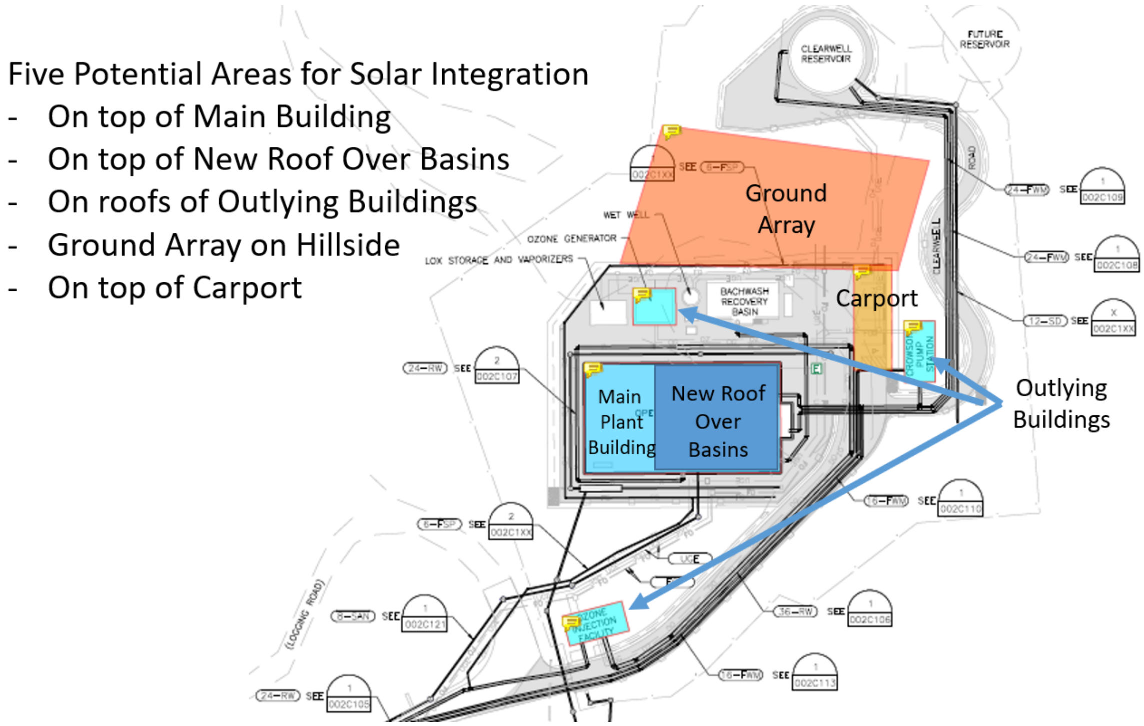


Figure 4: Estimated Solar Costs Per Component Addition

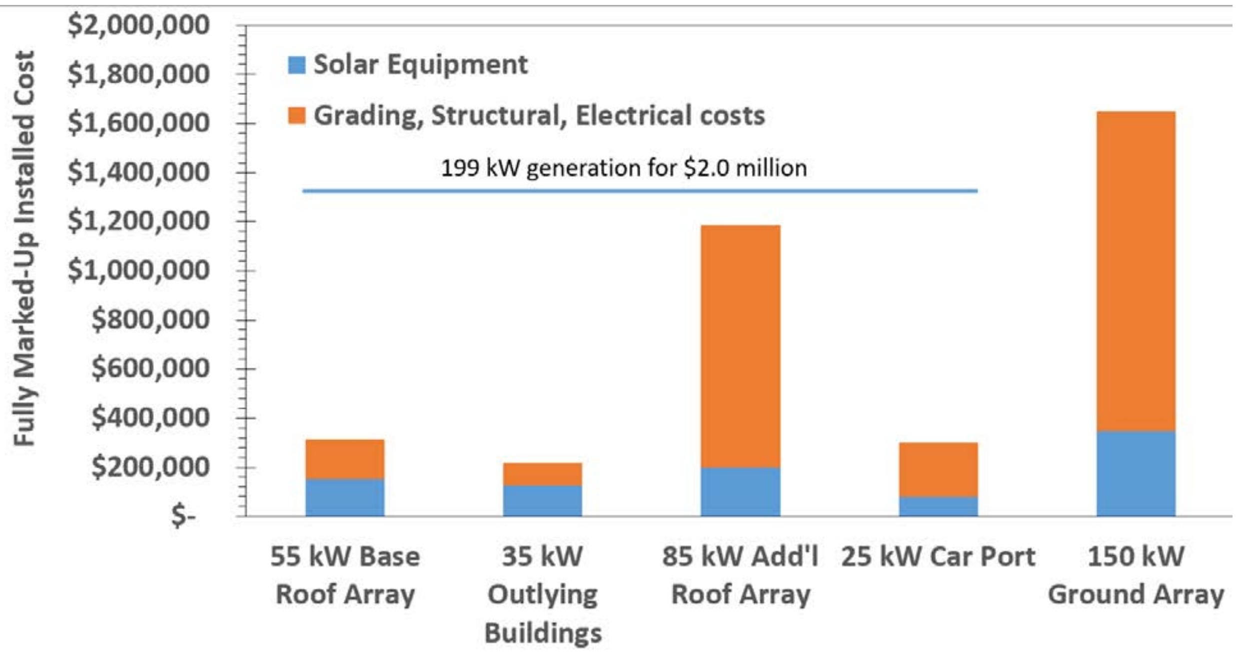


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Figure 5: Water Treatment Plan Electrical Demand vs. 199 kW System

WTP Electrical Demand vs. Demand

Water Production	Power Demand (kW)	Daytime Result with 199 kW System
Winter (1.5 MGD)	167	Sell 32 kW to grid
Average day (3.0 MGD)	250	Buy 51 kW from grid
Max capacity (6.5 MGD)	516	Buy 307 kW from grid

199 kW system would have provided 178 days of net daytime generation in 2019

Envision Recommendations:
Based on the current design status for the plant, the project currently rates at Silver status with 369 points. 382 points are required to reach gold status and Platinum required 477 points. The original request by Council was to focus on energy with respect to the Envision program, but there are also additional lower cost items that add points moving towards Platinum status and some are inherent to engineering phase.

Staff has the following recommendations for the Envision program to reach Gold level and include in the final design:
1. 199 kW rooftop solar on buildings
2. Increase storm drain retention and treatment
3. Develop sustainability management plan
4. Prepare End of Life Analysis
5. Restart AWAC as a formal City Commission that meets as needed (twice per year/minimum)*

***Note**: Restarting AWAC can also provide additional benefits, including working with staff to make recommendations to Council on priority Capital Improvement Projects (CIP) that focus on minimizing risk and increasing resiliency as was previously discussed by Council during the CIP adoption process.

These recommendations increase the proposed score from 369 to 440 and meet the Gold level status while minimizing overall cost.

Envision Additions	Cost	Points
199 kW rooftop solar on buildings	$2,000,000	10
Increase storm drain retention and treatment	$ 150,000	15
Develop sustainability management plan	$ 50,000	16
Prepare End of Life Analysis	$ 100,000	15
Restart AWAC as a formal City Commission	$ -	15
Totals	$2,300,000	71
Current Silver Status (60% design)		**369**
Projected Gold Total		**440**

Risk and Resiliency:
The Water Treatment Plant is being designed following guidelines in the 2013 Oregon Resilience Plan-water systems. The new Water Treatment Plant will be designed to meet current seismic building codes, approved by building permit through the City's building division and inspected as required to ensure compliance with all applicable codes and specifications. The building codes were updated in January 2020 and seismic requirements are even more stringent. The current plant is constructed from unreinforced masonry and susceptible to earthquake damage as it was designed and built during a time when earthquake resiliency was not a consideration. The new Water Treatment Plant has been specifically placed at a location and elevation that it allows it to survive and continue operating after either a 100-year flood as well as a catastrophic breach of Hosler Dam.

In addition, the Water Infrastructure Act of 2018 requires community water systems that serve more than 3,300 people complete a risk and resilience assessment and develop an emergency response plan. The assessment must be completed by June 30, 2021 and the emergency response plan completed by December 30, 2021. The assessment is meant to identify all physical assets of the water system including electronic, computer and automated systems with a focus on developing improvement needs for risk resilience. The emergency response plan is meant to develop strategies to improve resilience, provide response for a malevolent action or natural hazard and strategies to detect each. The design of the new water plant is taking this into account with the goal to operate a resilient, redundant, efficient plant.

KEY TO THE TABLE

TARGET TIMEFRAME FOR RECOVERY:

Desired time to restore component to 80–90% operational	G
Desired time to restore component to 50–60% operational	Y
Desired time to restore component to 20–30% operational	R
Current State (90% operational)	X

TARGET STATES OF RECOVERY: WATER & WASTEWATER SECTOR (COAST)

	Event occurs	0–24 hours	1–3 days	3–7 days	1–2 weeks	2 weeks – 1 month	1–3 months	3–6 months	6 months–1 year	1–3 years	3 + years
Domestic Water Supply											
Potable water available at supply source (WTP, wells, impoundment)				R		Y		G		X	
Main transmission facilities, pipes, pump stations, and reservoirs (backbone) operational			R	Y	G					X	
Water supply to critical facilities available				R		Y		G		X	
Water for fire suppression—at key supply points			R		Y			G		X	
Water for fire suppression—at fire hydrants						R	Y	G		X	
Water available at community distribution centers/points				R	Y	G	X				
Distribution system operational					R		Y	G			X

During the recent Capital Improvement Program presentation (2021-2023BN) and associated discussion, the City Council was interested in having staff provide more information regarding risk and liability associated with capital projects within the adopted plan to better prioritize projects on a programmatic level moving forward. Staff worked with HDR to provide the table below that details a comparative assessment of risk levels associated with construction of a new plant vs. continued operations and maintenance of the existing plant. This builds on the March 2018 Plant Evaluation Report developed by Black and Veatch that evaluated continued operation of the current plant for 20 years vs. construction of a new plant, reference attachment 4 (Staff Report, Minutes).

Issue	Continued Use of Existing WTP	Construction of a New WTP
Costs		
Capital/ Debt	Some required to address resiliency issues noted below.	Significant debt service to pay for new WTP
Annual Operating	Significant and increasing annual costs to maintain aging infrastructure	Lower maintenance costs for new system
Resiliency		
Ability to survive earthquakes	Very low – facility has been structurally deficient since the 1990s and will be damaged in an earthquake. Cost of making facility meet current codes near the cost of a new WTP.	High – new facility is constructed to current seismic design requirements for critical infrastructure.
Ability to survive flooding	Very low – facility has been extensively damaged by past floods and will likely do so again in the future. Rating increases to Medium if extensive floodwalls are constructed. Rating cannot go to High as flood risk always remain due to the site.	High – Facility is located much higher above Ashland Creek.
Ability to survive dam failure	Very low – facility is in the immediate floodway. No amount of improvements will prevent facility damage given the site.	High – Facility is located higher than projected dam failure flood zone.
Ability to survive wildfire	Low – the WTP is surrounded by tall, old trees and the long, narrow access road is also tree-covered. Facility lacks perimeter fire suppression system. Improved resiliency will result in removal of several hundreds of trees.	High – WTP site is already has few trees and is much closer to the City. New facility will have perimeter fire suppression system.
Public Health and Acceptance		
Ability to treat algae / algal toxins	Medium – system and operations address current toxin concentrations and regulations but with no remaining contingency for future conditions.	High – new WTP purposefully designed to remove algae and destroy multiple algal toxins if formed.
Ability to treat wildfire-impacted watersheds	Was Medium, now Low – 1995 facility retrofit to increase production capacity reduced WTP's ability to handle wildfire impacted waters.	High – new WTP purposefully designed to remove any silt, ash, color, and tastes that develop from burned watersheds.

Issue	Continued Use of Existing WTP	Construction of a New WTP
Ability to treat drought-impacted watersheds	Low – Facility was never designed to handle effects of potentially hotter, more turbid water with more organics.	High – while not specifically designed for drought impacts, the ability to deal with algae/algal toxins and wildfire-impacted waters also provides ability to treat drought-impacted waters.
Ability to remove seasonal taste- and-odor issues	Medium – Currently optimized operations still result in seasonal taste-and-odor issues in late summer.	High – improved taste-and-odor is a side benefit of ability to removing algal toxins.
Operations and Safety		
Chemical Safety	Medium – Facility in compliance through a combination of operations and grandfathered clauses.	High – Facility designed to current Fire Department and State requirements for chemical handling
Accessibility/ Evacuation	Low – Facility is an area of known flooding, dam failure, and fire risks that limits evacuation.	High – Facility purposely located away from risks and is much closer to town.
Ability to Use Equipment	Very high – staff has been using equipment and setup since 1998.	Initially Medium and Increasing – Staff will need to learn new operations and equipment.
Maintenance Needs	High and Increasing – Staff taking more time to find replacement parts for aging equipment and to install them.	Initially Very Low – New equipment that is covered by Contractor and Equipment Vendor warranties.

FISCAL IMPACTS

Public Works staff is working with the Infrastructure Financing Authority (IFA) on potential funding mechanisms for the remaining need and is hopeful that Federal stimulus monies in the form of low interest loans and/or grants will become available specifically to support needed water and wastewater infrastructure improvements. Staff believes that having a shovel ready or near shovel ready project of this nature will be viewed favorably when it comes to potential stimulus funding.

Staff is coordinating an update to the previous rate analysis done by Hansford Economic attached to the Water Master Plan update in order to better understand the financial/rate implications for the current capital plan, future materials and services requirements and inclusion of maintenance and improvement projects for the TAP system.

All of this information will be compiled and reviewed with Administration and Finance to determine a recommended course of action that provides complete funding for the project while minimizing rate impacts to the Community. This information will be presented before Council at a date TBD. Currently the City has a loan with the IFA of $14.8 million with a 30-year term at 1.79 percent to partially fund the new water treatment plant. Additional funding projections include 30 to 35-year terms and interest rates of 2.4-2.5 percent, depending on source.

DISCUSSION QUESTIONS

1. Does the Council agree with the new optimized sizing plan for the Water Treatment Plant?
2. Does the Council have any recommendations on Envision program implementation parameter for the final design?
3. Does the Council have any request for additional information to be provided as part of the design process?

4. Does the Council have any general direction or comments to provide staff?

SUGGESTED NEXT STEPS

Next steps include moving forward with finalizing the value engineering associated with the 60 percent design phase along with the final recommended Envision program inclusions and completing the 90 percent and 100 percent design phases. Additional actions include finalizing the rate model forecast and developing a recommended course of action for complete project funding.

REFERENCES & ATTACHMENTS

Attachment 1: Revised Plant Capacity Technical Memorandum
Attachment 2: Revised Plant Capacity Design Criteria Technical Memorandum
Attachment 3: Water Quality Technical Memorandum
Attachment 4: Plant Evaluation Report (2018)
Attachment 5: Water Treatment Plant Decision History Memo

Memo

Date:	Friday, September 18, 2020
Project:	City of Ashland, OR 7.5 MGD Water Treatment Plant Final Design
To:	Scott Fleury, Kevin Caldwell
From:	Pierre Kwan, P.E.; Verena Winter, P.E.; Katie Walker, P.E.; Harshit Joshi, EIT
Subject:	Revised Plant Capacity TM (UPDATED)

Introduction

The City of Ashland (City) is currently designing a new water treatment plant (WTP) to replace their existing aging plant. The WTP is planned for a maximum production of 7.5 million gallons per day (mgd) with a future expansion to 10 mgd. This memo reviews and updates the current City water demand projections, and recommends revised initial and ultimate plant production capacities.

Revised Plant Capacity

Current Demand Projects

The City's Water Master Plan (WMP) was updated in August 2019 (City of Ashland, Water Master Plan Update 2019, RH2 Engineering, Inc.). The WMP bases future population growth through 2065 on Portland State University's Population Research Center (PRC) estimates. Projected population for intermediate years was calculated by assuming a uniform population growth rate between the available PRC estimates for 2020, 2025, 2030, 2035, and 2040. Table 1 summarizes Average Annual Growth Rate (AAGR) used for determining the future population.

Table 1. WMP Population Projections

Year	AAGR
2020 to 2025	0.680%
2026 to 2030	0.576%
2031 to 2035	0.290%
2036 to 2040	0.073%
2041 to 2050*	1 person per year
2051 to 2065*	0.140%

*Growth rate calculated from "COA Adjustable Demand Projections" spreadsheet provided by RH2 Engineering

To forecast future water demands, the WMP used a consumption of 125 gallons per day (gpd) per capita to calculate the average daily demand (ADD). Equation 1 presents the future water demand calculation; population growth is based on using the AAGR in Table 1.

Equation 1: Future Water Demand

Water Demand in Year Z = *Water Demand in 2018 + (Population in Year Z – Population in Year 2018) x 125*

- Water Demand is in gpd
- Year 2018 is used as the base year
- 2018 < Year Z

Table 2 references the peaking factors used in the WMP.

Table 2. WMP Peaking Factors

Description	Peaking Factor
Maximum Day Demand/Average Day Demand (MDD/ADD)	2
Peak Hour Demand/Maximum Day Demand (PHD/MDD)	2.4
Peak Hour Demand/Average Day Demand (PHD/ADD)	4.8

In the WMP, future demand projections were computed with and without water savings expected from implementing conservation measures. The City's conservation program presents a goal to reduce the system-wide ADD from projected non-conservation demand by 5 percent by 2020, 15 percent by 2030, and 20 percent by 2050. Table 3 represents the resulting demand projections

Table 3. WMP Demand Projections

	Average Day Demand (mgd)		Maximum Day Demand (mgd)	
Year	ADD	ADD with Conservation	MDD	MDD with Conservation
2020	3.05	2.90	6.09	5.80
2025	3.14	2.85	6.28	5.71
2030	3.22	2.80	6.45	5.60
2040	3.28	2.79	6.56	5.58
2065	3.34	2.78	6.68	5.57

Revised Demand Projections

During WMP update development, complete information was not available for the City's 2018 and 2019 water demand. To calculate revised demand projections, the City's water demand in 2019 was used as the base year with demand projections based on the AAGR presented in Table 1. Water demands were projected from 2066 to 2100 based on an AAGR of 0.14 percent, which was calculated as the average population projection between 2019 and 2045, to account for a 100-year WTP lifespan. In addition, conservation was assumed held at 20 percent per the City's goal.

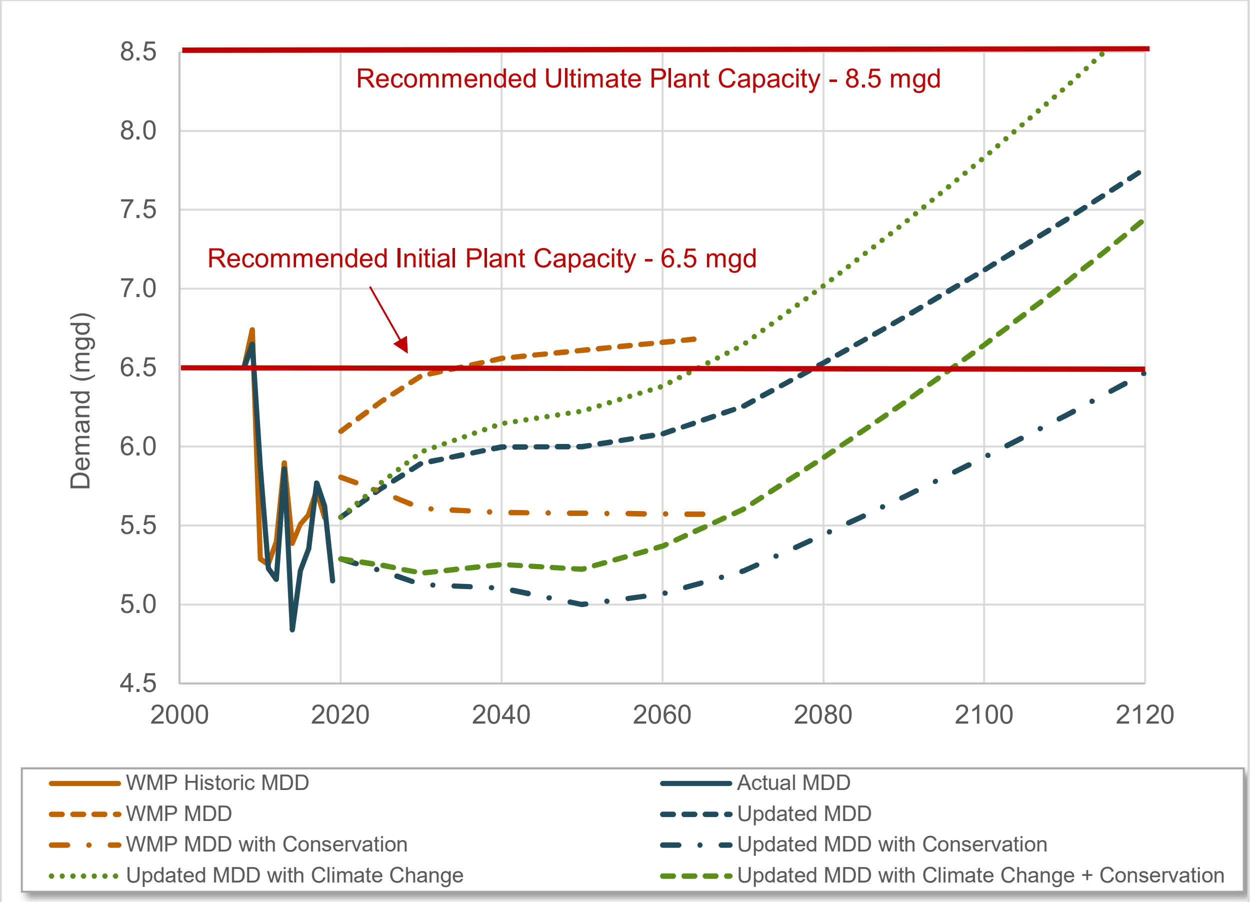
Finally, additional water demands due to climate change were calculated. The Oregon Climate Assessment Report indicates a 4 to 9 deg-F temperature increase by 2100, resulting in a climate-related demand between 280,000 and 900,000 gpd. To account for climate change increases, the median demand of 550,000 gpd by 2100 based on 2019 population was used to project the impact of climate change on maximum daily demands.

Table 4 and Figure 1 present the revised demand projects through 2120.

Table 4: Revised Demand Projections (August 2020)

Year	Average Day Demand (mgd)		Maximum Day Demand (mgd)			
	ADD	ADD with Conservation	MDD	MDD with Conservation	MDD with Climate Change	MDD with Conservation + Climate Change
2020	2.78	2.64	5.55	5.29	5.55	5.29
2025	2.87	2.61	5.74	5.21	5.77	5.25
2030	2.95	2.56	5.90	5.13	5.97	5.20
2040	3.00	2.55	6.00	5.11	6.15	5.25
2050	3.00	2.50	6.00	5.00	6.23	5.22
2060	3.04	2.53	6.08	5.07	6.38	5.37
2070	3.13	2.61	6.26	5.21	6.65	5.60
2080	3.27	2.72	6.53	5.44	7.02	5.93
2090	3.41	2.84	6.82	5.68	7.42	6.28
2100	3.56	2.97	7.12	5.93	7.83	6.65
2110	3.72	3.10	7.43	6.20	8.27	7.03
2120	3.88	3.23	7.76	6.47	8.74	7.44

Figure 1. Comparison of WMP and Revised MDD Projections



August 2020 Recommendation

As shown in Figure 1, the revised demand projections start at approximately 0.5 mgd less capacity than in the WMP. Based on this revised starting point, the City is projected to have an MDD of 6.26 mgd and 7.76 mgd in 2070 and 2120, respectively. Revising the WTP capacity to the following is recommended:

- Initial Phase (50-year life) – 6.5 mgd
- Ultimate Phase (100-year life) – 8.5 mgd

While the initial WTP phase has the potential for more than a 50-year lifespan if the City achieves conservation efforts, treatment equipment typically has a 20- to 25-year lifespan and would likely need to be replaced at more frequent intervals. Conversely, if the City experiences increased water demands due to climate change the initial WTP phase may have a lifespan closer to 40-years.

Forest Fire Update and Recommendation (September 2020)

During early September, southern Oregon experienced unprecendented forest fires that significantly impacted the City's water demand. Based on water use through the week of September 14, 2020, the demand projections were again updated. The forest fire demand projections indicate maximum daily demands with climate change would exceed 6.5 MGD in less than 30 years. To reach a 50-year lifespan based on the most recent water demand data and incorporating the impact of climate change, it is recommended that the plant capacity should be 7.0 MGD with an ultimate capacity of 9.0 MGD (see Table 5).

Table 5. Revised Demand Projections with Forest Fire Impacts (September 2020)

Year	Maximum Day Demand (mgd)			
	MDD	MDD with Conservation	MDD with Climate Change	MDD with Conservation + Climate Change
2020	5.84	5.56	5.84	5.56
2025	6.02	5.47	6.05	5.51
2030	6.18	5.37	6.25	5.44
2040	6.28	5.35	6.43	5.49
2050	6.28	5.24	6.51	5.46
2060	6.36	5.30	6.67	5.61
2070	**6.37**	**5.45**	**6.93**	**5.84**
2080	6.81	5.68	7.30	6.17
2090	7.10	5.92	7.70	6.51
2100	7.40	6.17	8.11	6.88
2110	7.72	6.43	8.55	7.27
2120	**8.05**	**6.70**	**9.02**	**7.68**

Memo

Date:	Friday, September 18, 2020
Project:	City of Ashland, OR 7.5 MGD Water Treatment Plant Final Design
To:	Scott Fleury, Kevin Caldwell
From:	Pierre Kwan, P.E.; Verena Winter, P.E.; Katie Walker, P.E.; Harshit Joshi, EIT
Subject:	Revised Plant Capacity Design Criteria TM

Introduction

The City of Ashland (City) is currently designing a new water treatment plant (WTP) to replace their existing aging plant. The WTP is currently planned for a maximum production of 7.5 million gallons per day (mgd) with a future expansion to 10 mgd. In a previous technical memorandum, HDR recommended the following revisions to the WTP capacity:

- Initial Phase (50-year life) – 6.5 mgd
- Ultimate Phase (100-year life) – 8.5 mgd

The purpose of this technical memorandum is to identify changes to the current WTP design criteria and cost estimate based on the revised recommended capacity.

Impact to WTP Design

Design Criteria

A reduction in plant capacity has a signficiant impact on the WTP design and cost. As documented in the Basis of Design Report, several plant components are sized for the ultimate phase due to either the cost or complexity of upsizing in the future. In general, a plant reduction results in a decrease of the following:

- Treatment equipment sizes
- Pumping capacity
- Pipe sizes
- Basin/wet well sizes
- Chemical systems

Table 1 presents the criteria for the following design scenarios:

1. 60% Design – April 2020: original 60% design.
2. 60% Design – May 2020: revised 60% design to account for value engineering.
3. Revised Capacity Design: incorporates update to the 60% Design – May 2020 based on a revised capacity

Table 1: WTP Design Criteria

Process/Plant Component	Design Criteria	1. 60% Design – April 2020	2. 60% Design – May 2020	3. Revised Capacity Design
Plant Capacity	Initial; Ultimate (mgd)	7.5; 10	No change	6.5; 8.5
Treatment Equipment				
Strainers	Number of strainers – initial; ultimate Capacity of each (gpm)	2, 3 2,865	No change No change	2, 3 2,483
Ozone Contact Pipeline	Length (feet) Diameter (inches)	665 36	305 48	264 48
Ballasted Flocculation	Number of trains – initial; ultimate Capacity, each (mgd)	2; 3 4.5	No change No change	2; 2 No change
Filtration	Number of filters – initial; ultimate Area per filter (sf); Length (ft) x Width (ft) Filtration rate (gpm/sf) - initial; ultimate Blower size (cfm); motor (hp) Wet well operating depth (ft)	4; 5 325; 13 x 25 5.5; 5.5 1,300; 100 5.25	4; 4 No change 5.5; 7.1 No change 4.4	4; 4 276; 12 x 23 5.5; 6.7 1,110; 85 3.8
Clearwell*	Capacity (MG) Diameter (ft)	0.85 60	No change No change	No change No change
Backwash Recovery Basins	Volume (gal)	340,000	320,000	240,000
Pump Stations				
Intermediate Pump Station	Number of pumps – initial; ultimate Pump capacity, each (gpm) Motor size, each (hp)	3; 4 2,865 100	No change No change No change	3; 3 2,485 No change
Crowson Pump Station	Number of pumps – initial; ultimate Pump capacity, each (gpm) Motor size, each (hp)	2 small + 2 large; 4 large Small – 800; Large – 1,505 Small – 50; Large – 75	3; 3 2,260 100	3; 3 1,565 75
Filter to Waste Pump Station	Number of pumps – initial; ultimate Pump capacity, each (gpm) Motor size, each (hp)	2; 2 1,910 15	Removed pump station	No pump station
Backwash Recovery Pump Station	Number of pumps – initial; ultimate Pump capacity, each (gpm) Motor size, each (hp)	2; 2 710 10	No change No change No change	No change No change No change
Pipelines				
Raw Water Pipe	Diameter (inches)	24	No change	20

Filter Effluent Pipe	Diameter (inches)	24	No change	20
Combined Finished Water Pipe	Diameter (inches)	30	No change	30
Potable Water to Crowson	Diameter (inches)	16	No change	16
Potable Water to Granite	Diameter (inches)	16	No change	16
Backwash Supply Pipe	Diameter (inches)	24	No change	20
Chemical Systems				
Ozone System	Average production – initial (lb/day) Maximum production – initial; ultimate (lb/day)	72 165; 219	No change No change	69 149; 183
Alumuminum Chlorohydrate System	Type of storage tank Storage tank capacity (gal)	Bulk tank 6,100	No change 5,050	No change 5,050
Settling Aid Polymer	Type, number of storage tank Storage tank capacity, each (gal)	Tote, 2 330	No change No change	No change No change
Filter Aid Polymer	Type of storage tank Storage tank capacity (gal)	Tote, 1 330	No change No change	No change No change
Sodium Hypochlorite System	Type of storage tank Storage tank capacity (gal)	Bulk tank 3,150	No change 2,750	No change 2,750
Caustic System	Type of storage tank Storage tank capacity (gal)	Bulk tank 1,250	Tote 330	Tote 330

*Clearwell size to be evaluated further; size of clearwell is dependent on disinfection requirements and backwash volume storage, which can be reduced if the plant capacity decreases

Future Ultimate Plant Expansion

To expand from the revised initial plant capacity of 6.5 mgd to the ultimate plant capacity of 8.5 mgd, the following will be required:

- Filters re-rated from an initial capacity of 5.5 gpm/sf to 7.1 gpm/sf
- Add ozone generation/addition capacity
- Increase ozone contact pipeline from approximately 264 feet to 380 feet
- Add pumping capacity at the intermediate pump station and Crowson pump station

Unlike the 60% Design - May 2020, the revised plant capacity design would not require the treatment building to be expanded for a third ballasted flocculation system.

Revised Cost Estimate

Appendix A presents the revised cost estimate prepared by Mortenson. The total construction without Owner Contingency is now approximately $32.8M, which represents a reduction of $2.5M from the previous cost estimate of $35.3M.

Following the forest fires in early September, the recommended capacity was revisited. A new recommendation was developed based on maximum daily demand with climate change impacts:

- Initial Phase (50-year life) – 7.0 mgd
- Ultimate Phase (100-year life) – 9.0 mgd

Linearly scaling the $2.5M cost savings between the 60% Design – May 2020 (7.5 mgd capacity) and the Revised Capacity Design (6.5 mgd capacity), a 7.0 mgd WTP is expected to be approximately $34.1M, which represents a reduction of $1.25M.

Appendix A –

Revised Cost Estimate (Mortenson)

Ashland Water Treatment Plant

City of Ashland

Ashland, OR

Mortenson

60% Design Estimate - Rev 3 - Reduced Capacity

Estimate Date: September 10, 2020

	UniFormat System Level 2			Total Project – Total Price	Comparison Project: 60% Estimate Rev 2 - May 14, 2020, Total Project – Total Price	GSF Unit Price	Delta	
B1	***Superstructure***			$ 3,418,646	$ 3,524,347		$ (105,701)	filters and wetwell walls
B2	***Exterior Enclosure***			$ 219,453	$ 219,453		$ -	
B3	***Roofing***			$ 14,033	$ 14,033		$ -	
C1	***Interior Construction***			$ 348,920	$ 348,920		$ -	
C2	***Stairs***			$ 148,545	$ 148,545		$ -	
C3	***Interior Finishes***			$ 268,023	$ 268,023		$ -	
D1	***Elevator***			$ 103,500	$ 103,500		$ -	
D2	***Mechanical Systems***			$ 6,941,106	$ 7,241,032		$ (299,926)	deleted 10% cont on Ozone and Ballasted Floc equipment
D3	***HVAC***			$ 147,600	$ 147,600		$ -	
D4	***Fire Protection***			$ 97,465	$ 97,465		$ -	
D5	***Electrical and I&C Systems***			$ 6,063,251	$ 6,413,251		$ (350,000)	market reduction
E1	***Equipment***			$ -	$ -		$ -	
E2	***Furnishings***			$ 1,200	$ 1,200		$ -	
F1	***Special Construction***			$ 601,476	$ 669,184		$ (67,708)	reduced $/sf
G1	***Site Preparation***			$ 1,623,313	$ 1,778,115		$ (154,802)	wetwell SOG moved up 7", market reduction
G2	***Site Improvements***			$ 845,062	$ 878,522		$ (33,460)	reviewed unit prices
G3	***Site Civil / Mechanical Utilities***			$ 4,235,615	$ 4,809,910		$ (574,295)	revised scope, unit prices, market reduction
G4	***Site Electrical Utilities***			$ 768,242	$ 768,642		$ (400)	
Z1	***General Requirements***			$ 2,823,500	$ 2,823,500		$ -	
Z3	***Plant Startup & Testing***			$ 350,000	$ 350,000		$ -	
	Subtotal Direct Construction Price			$ 29,018,950	$ 30,605,242		$ (1,586,292)	
	Cost Escalation to 2nd Qrtr 2021		0.000%	$ -	$ 612,105		$ (612,105)	deleted escalation
	Estimating/Design Contingency		5.500%	$ 1,596,042	$ 1,716,954		$ (120,912)	
	Subtotal			$ 30,614,992	$ 32,934,301		$ (2,319,309)	
	Design/Engineering	*by others*	0.000%	$ -	$ -		$ -	
	Contractor Design Phase Services	*by others*	0.000%	$ -	$ -		$ -	
	Bldg Permits/Plan Check Fees	*by others*	0.000%	$ -	$ -		$ -	
	Testing/Inspection	*by others*	0.000%	$ -	$ -		$ -	
	Subtotal			$ 30,614,992	$ 32,934,301		$ (2,319,309)	
	Sub Bonds		0.500%	$ 153,075	$ 164,672		$ (11,597)	
	Contractor's Liability Insurances		0.750%	$ 246,161	$ 264,809		$ (18,648)	
	Builder's Risk Insurances		0.500%	$ 164,107	$ 176,540		$ (12,432)	
	Payment/Performance Bond		0.700%	$ 229,750	$ 247,155		$ (17,405)	
	Subtotal			$ 31,408,085	$ 33,787,477		$ (2,379,391)	
	Contractor's Fee including CAT		4.500%	$ 1,413,364	$ 1,520,436		$ (107,073)	
	TOTAL CONSTRUCTION COST			$ 32,821,449	$ 35,307,913		$ (2,486,464)	
	Owner Contingency		10.000%	$ 3,282,145	$ 3,530,791			
	TOTAL CONSTRUCTION COST			$ 36,103,594	$ 38,838,705		$ (2,735,111)	

Ashland Water Treatment Plant

City of Ashland
Ashland, OR

EXPANDED SUMMARY

Mortenson

60% Design Estimate - Rev 3 - Reduced Capacity

Estimate Date: September 10, 2020

	UniFormat System Level 2			Total Project Total Price	BASIC TREATMENT PLANT: BASIC PLANT TOTAL Total Price	BASIC TREATMENT PLANT: 20 - OPERATIONS BUILDING Total Price	BASIC TREATMENT PLANT: 30 - SITEWORK Total Price	40 - CLEARWELL Total Price	50 - BACKWASH EQ Total Price	60 - SOLAR ARRAY Total Price	70 - YARDPIPING AND PIPLINE Total Price	90 - PLANT TESTING Total Price	92 - ASHLAND CREEK CROSSING Total Price	94 - ELECTRICAL SERVICE TO SITE Total Price	95 - OFFSITE WORK AT EXISTING PLANT Total Price	COMPARISON PROJECT 60% Estimate Rev 2 - May 14, 2020 Total Project Total Price	GSF Unit Price	Delta
B1	*Superstructure*			$ 3,418,646	$ 3,418,646	$ 3,418,646	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,524,347		$ (105,701)
B2	*Exterior Enclosure*			$ 219,453	$ 219,453	$ 219,453	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 219,453		$ -
B3	*Roofing*			$ 14,033	$ 14,033	$ 14,033	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 14,033		$ -
C1	*Interior Construction*			$ 348,920	$ 348,920	$ 348,920	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 348,920		$ -
C2	*Stairs*			$ 148,545	$ 148,545	$ 148,545	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 148,545		$ -
C3	*Interior Finishes*			$ 268,023	$ 268,023	$ 268,023	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 268,023		$ -
D1	*Elevator*			$ 103,500	$ 103,500	$ 103,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 103,500		$ -
D2	*Mechanical Systems*			$ 6,941,106	$ 6,880,042	$ 6,880,042	$ -	$ 28,656	$ 32,408	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,241,032		$ (299,926)
D3	*HVAC*			$ 147,600	$ 147,600	$ 147,600	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 147,600		$ -
D4	*Fire Protection*			$ 97,465	$ 97,465	$ 97,465	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 97,465		$ -
D5	*Electrical and I&C Systems*			$ 6,063,251	$ 5,999,568	$ 5,454,445	$ 545,123	$ 57,387	$ 6,296	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,413,251		$ (350,000)
E1	*Equipment*			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		$ -
E2	*Furnishings*			$ 1,200	$ 1,200	$ 1,200	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,200		$ -
F1	*Special Construction*			$ 601,476	$ 481,476	$ 481,476	$ -	$ 120,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 669,184		$ (67,708)
G1	*Site Preparation*			$ 1,623,313	$ 635,830	$ -	$ 635,830	$ 169,056	$ 86,142	$ -	$ -	$ -	$ 732,285	$ -	$ -	$ 1,778,115		$ (154,802)
G2	*Site Improvements*			$ 845,062	$ 830,302	$ 108,660	$ 721,642	$ 14,760	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 878,522		$ (33,460)
G3	*Site Civil / Mechanical Utilities*			$ 4,235,615	$ -	$ -	$ -	$ 910,000	$ 424,400	$ -	$ 2,331,215	$ -	$ -	$ -	$ 570,000	$ 4,809,910		$ (574,295)
G4	*Site Electrical Utilities*			$ 768,242	$ 768,242	$ -	$ 768,242	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 768,642		$ (400)
Z1	*General Requirements*			$ 2,823,500	$ 2,171,995	$ 1,948,420	$ 223,575	$ 135,887	$ 149,271	$ -	$ 252,500	$ 28,997	$ 37,625	$ -	$ 47,225	$ 2,823,500		$ -
Z3	*Plant Startup & Testing*			$ 350,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 350,000	$ -	$ -	$ -	$ 350,000		$ -
	Subtotal Direct Construction Price			$ 29,018,950	$ 22,534,840	$ 19,640,428	$ 2,894,412	$ 1,435,746	$ 698,517	$ -	$ 2,583,715	$ 378,997	$ 769,910	$ -	$ 617,225	$ 30,605,242		$ (1,586,292)
	Cost Escalation to 2nd Qrtr 2021		0.000%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 612,105		$ (612,105)
	Estimating/Design Contingency		5.500%	$ 1,596,042	$ 1,239,416	$ 1,080,224	$ 159,193	$ 78,966.03	$ 38,418	$ -	$ 142,104	$ 20,845	$ 42,345	$ -	$ 33,947	$ 1,716,954		$ (120,912)
	Subtotal			$ 30,614,992	$ 23,774,256	$ 20,720,652	$ 3,053,605	$ 1,514,712	$ 736,935	$ -	$ 2,725,819	$ 399,842	$ 812,255	$ -	$ 651,172	$ 32,934,301		$ (2,319,309)
	Design/Engineering	*by others*	0.000%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		$ -
	Contractor Design Phase Services	*by others*	0.000%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		$ -
	Bldg Permits/Plan Check Fees	*by others*	0.000%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		$ -
	Testing/Inspection	*by others*	0.000%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		$ -
	Subtotal			$ 30,614,992	$ 23,774,256	$ 20,720,652	$ 3,053,605	$ 1,514,712	$ 736,935	$ -	$ 2,725,819	$ 399,842	$ 812,255	$ -	$ 651,172	$ 32,934,301		$ (2,319,309)
	Sub Bonds		0.500%	$ 153,075	$ 118,871	$ 103,603	$ 15,268	$ 7,574	$ 3,685	$ -	$ 13,629	$ 1,999	$ 4,061	$ -	$ 3,256	$ 164,672		$ (11,597)
	Contractor's Liability Insurances		0.750%	$ 246,161	$ 191,158	$ 166,605	$ 24,553	$ 12,179	$ 5,925	$ -	$ 21,917	$ 3,215	$ 6,531	$ -	$ 5,236	$ 264,809		$ (18,648)
	Builder's Risk Insurances		0.500%	$ 164,107	$ 127,438	$ 111,070	$ 16,368	$ 8,119	$ 3,950	$ -	$ 14,611	$ 2,143	$ 4,354	$ -	$ 3,491	$ 176,540		$ (12,432)
	Payment/Performance Bond		0.700%	$ 229,750	$ 178,414	$ 155,498	$ 22,916	$ 11,367	$ 5,530	$ -	$ 20,456	$ 3,001	$ 6,096	$ -	$ 4,887	$ 247,155		$ (17,405)
	Subtotal			$ 31,408,085	$ 24,390,138	$ 21,257,428	$ 3,132,709	$ 1,553,951	$ 756,026	$ -	$ 2,796,433	$ 410,200	$ 833,297	$ -	$ 668,041	$ 33,787,477		$ (2,379,391)
	Contractor's Fee including CAT		4.500%	$ 1,413,364	$ 1,097,556	$ 956,584	$ 140,972	$ 69,928	$ 34,021	$ -	$ 125,839	$ 18,459	$ 37,498	$ -	$ 30,062	$ 1,520,436		$ (107,073)
	TOTAL CONSTRUCTION COST			$ 32,821,449	$ 25,487,694	$ 22,214,012	$ 3,273,681	$ 1,623,879	$ 790,047	$ -	$ 2,922,272	$ 428,659	$ 870,795	$ -	$ 698,103	$ 35,307,913		$ (2,486,464)
	Owner Contingency		10.000%	$ 3,282,145												$ 3,530,791		
	TOTAL CONSTRUCTION COST			$ 36,103,594												$ 38,838,705		$ (2,735,111)

60 - SOLAR ARRAY: Not Part of This Estimate - CML #3

94 - ELECTRICAL SERVICE TO SITE: Not Part of This Estimate - CML #14

confluence ENGINEERING GROUP LLC
517 NE 92nd Street, Seattle, WA 98115 ph (206) 527-6832 fx (206) 527-3148 confluence-engineering.com

To:	Verena Winter, PE, Pierre Kwan, PE; HDR	Subject:	Technical Memorandum
From:	Virpi Salo-Zieman, PE, Stephen Booth, Ph.D., Melinda Friedman, PE; Confluence Engineering Group, LLC	Project:	City of Ashland Water Quality Review: Optimal Corrosion Control Treatment Evaluation - New WTP Design Project
Date:	August 18, 2020		

1. Introduction

The City of Ashland, Oregon (City) has contracted with HDR Engineering, Inc (HDR) to design a new 7.5-million gallon per day (MGD) water treatment plant (WTP) to replace the City's existing facility. As part of this project, Confluence Engineering Group, LLC (Confluence) is serving as a subconsultant to HDR to perform a study to develop finished water quality goals for the new WTP. This study focused on compatibility with existing supplies and determining Optimal Corrosion Control Treatment (OCCT) under the Lead and Copper Rule (LCR). Once the WTP is fully operational, the City will conduct two rounds of tap monitoring for lead and copper, as well as Water Quality Parameter (WQP) monitoring in the distribution system. The Oregon Health Authority (OHA) will determine if CCT is optimized, based on that monitoring, and designate Optimal WQPs.

This study was a desk-top evaluation of existing conditions and chemical equilibria modeling to select and recommend Optimal WQPs. Specifically, this study included the elements listed below. Design documents, refined cost estimates, and other project deliverables are being prepared by HDR.

- Develop data request, review information provided and develop system understanding.
- Summarize existing distribution system water quality especially for key parameters related to corrosion control and pipe scale stability.
- Develop water quality monitoring plan to fill data gaps.
- Perform water quality modeling analysis to select finished water quality goals that will support optimal corrosion control at the new WTP.
- Perform a blending analysis to assess water quality resulting from the mixing of sources in the distribution system.
- Determine dosages of caustic soda to be applied at the new WTP to provide the needed pH and alkalinity adjustment, across the range of finished water quality anticipated.
- Prepare a draft/final Technical Memorandum.

2. Lead and Copper Rule Background

The Lead and Copper Rule (LCR), first promulgated in 1991, established maximum contaminant level goals (MCLGs) of zero for lead and 1.3 mg/L for copper. It also established Action Levels (ALs) of 0.015 mg/L and

1.3 mg/L for lead and copper, respectively. With a population of approximately 20,000 people, Ashland is considered a medium size system under the LCR (*i.e.* a population between 10,000 and 50,000 people). Since the initial LCR promulgation, there have been significant changes in corrosion theory, especially related to lead and optimal corrosion control treatment (OCCT) and advances have also been made in understanding factors impacting copper corrosion (AWWA M58, 2017; Schock and Lytle, 2011). Current lead and copper corrosion concepts are summarized below.

- Copper solubility and release due to uniform corrosion in the system is not only related to water quality characteristics and conditions, but also to the aging process of the pipe materials and scales. The plumbing materials present in the water system are likely at different stages of aging and experience different dominant scale types, and therefore, the conservative approach is to assume fresh copper surfaces and the presence of cupric hydroxide, the more soluble intermediate copper scale.
- The scales that have already formed on pipe surfaces over time control the effectiveness of (and ability to optimize) corrosion control treatment.
- The characteristics of the scale and its structure determine how much metal could be released into the water. The most desirable conditions support the formation of insoluble and adherent scales (such as lead and copper oxides).
- Water quality plays a major role in scale stability and corrosion; increased release from scales can be expected with changing water quality conditions when scales are re-equilibrating. Solubility models can be used to predict metal solubility trends from scales in equilibrium with the prevailing water quality.
- Stable pH is a key component of an effective corrosion control program.
- Adequate dissolved inorganic carbon (DIC) is needed to form carbonate-based scales.
- Buffer intensity in the water environment is dominated by carbonate chemistry.

2.1. Optimal Corrosion Control Treatment Strategies

Key strategies for OCCT are as follows:

1) Passivation through pH/alkalinity adjustment
2) Passivation through use of phosphate- or silicate-based inhibitors
3) Specifically, for lead corrosion, formation of a Pb(IV) scale through maintenance of a sufficient free chlorine residual/oxidation-reduction potential (ORP)

While still included in the existing LCR, calcium carbonate precipitation is no longer a recommended treatment technology for lead and copper control since it has been found to be non-uniform across plumbing surfaces. These OCCT strategies focus on controlling soluble lead and copper; however, OCCT can also reduce particulate lead to some degree when stable scales are formed and maintained.

Copper corrosion is mainly managed by controlling pH and alkalinity. In general, copper solubility tends to decrease with decreasing DIC, at a given pH. Copper solubility also generally decreases as pH increases.

ORP is largely controlled by secondary disinfectant type and residual and it affects the formation of lead (IV) scales, iron release, manganese release, and co-occurring lead present in iron and manganese-rich scales. Although not included in the existing or proposed LCR, it is understood that formation of Pb(IV) scales is highly desirable and can contribute to very low lead levels at the tap. ORP does not have a similar effect on copper scale.

2.2. Potential Long Term LCR Revisions (LCRR)

The proposed Long-Term Lead and Copper Rule Revisions (LCRR) were posted in the Federal Registry in the fall of 2019. The proposed revisions include significant changes in monitoring, treatment options, treatment optimization, and lead service line replacement. The revisions are largely focused on lead mitigation. No significant changes were proposed for copper.

Key changes proposed by EPA in the LCRR include:

- Establishing a lead Trigger Level (TL) of 0.010 mg/L. If the 90th percentile of the lead tap sample results is above this TL, large systems (i.e. those with a population above 50,000) would be required to re-optimize or install additional corrosion control treatment. The requirements for systems classified as medium in size under the LCR, like Ashland, are less stringent. Reduced monitoring under the LCR is limited to those system that maintain a 90th percentile lead result below the TL.
- The requirement to develop a lead service line inventory that includes galvanized service lines that are or may have been served by a lead service line. All service lines of unknown material will be considered lead service lines. An annual notice of potential health implications is required to customers with known or possible lead service lines.
- New tiering criteria for tap sample monitoring sites targeting lead service lines.
- Revisions to reduced monitoring criteria.
- Removal of calcium carbonate stabilization from the acceptable treatment list.
- Requiring data for evaluating treatment efficiency and ruling out orthophosphate treatment (for instance, pipe loops/rigs must include two separate doses of orthophosphate).
- Adding a find and fix-requirement as a follow up on each individual sample result for lead that is above the AL of 0.015 mg/L.
- Requiring a Tier 1 Public Notice for a lead AL exceedance, 24-hr notice to all customers with results above the AL, and a separate notice to customers served by lead service lines with results above the TL.
- A separate lead monitoring program for schools and daycare facilities.

It is not known at this time if each of these proposed changes will be included in the final rule language. A final rule is expected later in 2020.

3. Water Quality

3.1. Ashland WTP Finished Water Quality

Historical water quality data for the finished water at the Ashland WTP for the period from January 2013 to August 2018 are presented in Table 1.

Table 1: Ashland WTP Finished Water Data Summary

Parameter	Unit	Percentiles			Average
		10th	50th	90th	
pH	s.u.	7.2	7.5	7.6	7.4
Temperature	°C	4.0	9.0	18.0	10.1
Alkalinity	mg/L as $CaCO_3$	28	40	52	41
Hardness	mg/L as $CaCO_3$	20	25	33	26
Free Chlorine Residual – WTP	mg/L	0.93	1.18	1.36	1.17
Free Chlorine residual - Crowson	mg/L	0.65	0.89	1.13	0.89
Dissolved Inorganic Carbon (DIC)	mg/L as C	-	-	-	12[1]

Notes:

1. Most commonly occurring DIC level.

The finished water pH varied only slightly from the average of 7.4. Temperature typically varies seasonally from 4°C in the winter to 18°C in the summer. Alkalinity also varies throughout the year with an average of 41 mg/L and typical range between of 30 to 50 mg/L. Based on paired pH and alkalinity data, a DIC range of 5-16 mg/L as C was calculated for the finished water. The most common DIC was 12 mg/L as C. Hardness varies to a lesser degree with an average of 26 mg/L and range between the 90th and 10th percentiles of 33 to 20 mg/L. Chlorine residuals are generally around 1 mg/L in the finished water with 90th and 10th percentiles of 1.36 and 0.93 mg/L, respectively. There is some decay of chlorine residual between the WTP and Crowson Reservoir with the average chlorine residual decreasing from 1.17 to 0.89 mg/L between those two locations.

A water quality monitoring plan was initiated in the spring of 2020 to fill identified data gaps and to provide the water quality data required for the corrosion control evaluation. Table 2 presents finished water quality data for the Ashland WTP collected on six separate days between March 4 and April 27, 2020. There was a small difference between free and total chlorine residuals and ORP levels remain high and consistently above 650 mV. The chloride to sulfate mass ratio (CSMR) was found to be quite low, between 0.1 and 0.2. Calcium and magnesium levels were low and reflected the low hardness of the source water. TDS levels were similarly low for the surface water supply.

Table 2: Ashland WTP Finished Water Quality Data from Spring 2020 Monitoring

Parameter	Unit	Min	Average	Max
Free Chlorine Residual	mg/L	0.96	1.05	1.13
Total Chlorine Residual	mg/L	1.04	1.10	1.15
ORP	mV	655	684	712
Chloride	mg/L	1.66	1.82	2.01
Sulfate	mg/L	10.6	11.8	12.8
CSMR	-	0.1	0.2	0.2
Calcium	mg/L	9.8	10.4	10.9
Magnesium	mg/L	1.75	1.86	1.95
TDS	mg/L	70	78	84
CCPP[1]	mg/L as $CaCO_3$	-	-10.5	-
LSI[2]	s.u.	-	-1.5	-

Notes:

1. Calcium carbonate precipitation potential calculated from historical data.
2. Langelier saturation index calculated from historical data.

3.2. Medford Water Commission Water Quality

The Medford Water Commission (MWC) provides treated water to more than 136,000 customers in the City of Medford, White City, Central Point, Eagle Point, Jacksonville, Phoenix, Talent, and Ashland as well as the Water Districts of Elk City and Charlotte Ann. MWC uses two source waters, 45 mgd of Rogue River water treated at the Robert A. Duff Water Treatment Plant (Duff WTP) and approximately 26 mgd from Big Butte Springs (BBS). During the winter months, the MWC system is supplied entirely by BBS water. When summer demands exceed the capacity of the BBS source, water from the Rogue River is treated at the Duff WTP as a supplemental supply, which is typically in service from May to October.

The City of Ashland has historically received mostly BBS water from the MWC via the Talent-Ashland-Phoenix (TAP) Pipeline and, therefore, this analysis was based on BBS water quality. We understand that when the BBS supply is out of service and under other future conditions Ashland may receive a blend of Duff WTP and BBS waters and that change may affect the blending analysis provided herein. This analysis could be revisited if the water quality provided at the TAP intertie varies significantly from that presented within this document in the future; however, since the TAP connection has been used for approximately 2-weeks per year (or less), the analysis presented herein is considered representative of historical and near-term operating conditions.

Water quality data for the BBS supply for the period from 2013 to 2017 are presented in Table 3. Water quality data measured at Sample Station N, near the point-of-entry of this supply to the Ashland system are presented in Table 4. The pH of the BBS water is typically around 7.0 with a narrow range between minimum and maximum values of 6.9 to 7.1. The temperature of the BBS water tends to vary to a lesser degree than the surface water at the Ashland WTP, with a range of 7.5 to 10.5°C. Alkalinity was also reasonably stable with an average of 46 mg/L and range of 39 to 49 mg/L. Hardness was similarly found to be stable with an average of 36 mg/L. The average DIC was 14.3 mg/L and the average TDS was found to be 67 mg/L. The average CSMR was 1.9, approximately one order of magnitude higher than for the Ashland WTP.

Chlorine residuals at Sample Station N were found to have an average winter residual of 0.6 mg/L and average summer residual of 0.5 mg/L. Ashland has a booster chlorination system at the TAP intertie and typically, the chlorine residual level is increased to a free chlorine residual of 0.9 mg/L, upstream of the point-of-entry to the Ashland distribution system. Despite the lower residuals at Sample Station N compared to the Ashland WTP, ORP levels were similar and varied between 600 and 730 mV.

Table 3: Water Quality for the TAP Supply at Ashland

Parameter	unit	Min	Average	Max
pH	s.u.	6.9	7.0	7.1
Temperature	°C	7.5	8.6	10.5
Alkalinity	mg/L as $CaCO_3$	39	46	49
Hardness	mg/L as $CaCO_3$	33	36	39
Calcium	mg/L as $CaCO_3$	23	27	39
DIC	mg/L as C	-	14.3	-
ORP	mV	600	694	730
TDS	mg/L	53	67	71
Chloride	mg/L	1.9	2.3	2.6
Sulfate	mg/L	0.9	1.2	1.5
CSMR	-	-	1.9	-
CCPP	mg/L	-	-26.1	-
LSI	s.u.	-	-1.8	-
Silica	mg/L	-	41	-

Table 4: Water Quality at Sample Station N

Parameter	Unit	Winter Average	Summer Average
pH	s.u.	7.0	7.1
Temperature	°C	8.7	11.7
Free Chlorine Residual	mg/L	0.60	0.50

3.3. Distribution System Water Quality Data

The water quality monitoring plan initiated in the spring of 2020 to fill identified data gaps and to provide the water quality data required for the corrosion control evaluation, included water sample collection in the distribution system. The following six distribution system sample sites were selected for that short-term monitoring plan:

- SS #4 – 1275 Green Meadows (Alsing Zone 1)
- SS #5 – 710 Oak Knoll (Crowson Zone 2)
- SS #6 – 617 Elkader (Crowson Zone 1)
- SS #3 – 361 Coventry (Granite Zone 2)
- SS #8 – 442 Normal Ave (Granite Zone 1)
- SS #9 – 307 E Main (Granite Zone 1)

The selected sites are currently being used for the collection of coliform samples and other regulatory compliance data and represented a reasonable geographic spread across the system. Table 5 presents average data for the six distribution system sites included in that short-term monitoring (six monitoring events over a two month period). A complete list of the water quality data collected in the distribution system is presented in Appendix A.

Table 5: Average Water Quality from Water Quality Monitoring Performed in the Spring of 2020

SS#	Address	Water Age (2007)	pH	Temp	ORP	Free Cl_2	Total Cl_2	Ca	Mg	Alk.	DIC
			s.u.	°C	mV	mg/L	mg/L	mg/L	mg/L	mg/L as $CaCO_3$	mg/L as C
3	361 Coventry	1-2d	8.1	12.6	610	0.45	0.50	11.4	1.7	50	12.1
4	1275 Green Meadows	>4d	7.7	9.4	645	0.43	0.48	11.1	1.8	48	12.3
5	710 Oak Knoll	1-2d	7.8	11.5	657	0.66	0.73	11.1	1.7	48	12.1
6	617 Elkader	<1d	7.6	11.0	665	0.63	0.69	10.5	1.8	47	12.2
8	442 Normal Ave	1-2d	7.5	8.9	686	0.77	0.82	10.5	1.8	46	12.0
9	307 E Main	1-2d	7.6	8.0	684	0.74	0.83	10.5	1.9	48	12.4

pH was found to be generally consistent throughout the distribution system with the exception of sample site #3, at 361 Coventry, which had an average pH of 8.1 compared to 7.6 for the other sample sites. The higher pH is likely the result of contact with cement-lined pipes. Although the estimated water age at that site was not significantly different than the other sites based on an analysis conducted in 2007, site #3 has had the highest historical levels of DBPs. It is likely that under existing conditions the water age is among the highest in the Ashland distribution system at site #3. As expected, temperature was generally found to be reasonably consistent throughout the distribution system. Higher temperatures were found at sample site #3 and also indicate higher water age at that location than at the other locations for which data were collected.

There was little difference between free and total chlorine residuals for all of the sample sites. Lower chlorine residuals were found at sample site #3, again indicating higher water age at that location. As expected, calcium and alkalinity did not vary significantly throughout the distribution system. Very low levels of iron and manganese were detected in the distribution system and most samples were below the laboratory reporting limit. Based on this data set, accumulation and release of iron and manganese do not appear to be problematic. However, the WTP does use permanganate as a pre-oxidant at times, typically when a supplemental raw water source is used during mid- to late-summer. Its use has corresponded to discolored water complaints by customers in previous years. Permanganate use was not occurring during the period of this study.

ORP levels were found to be generally consistent throughout the distribution system, with slightly lower levels at sample site #3, corresponding with the somewhat lower chlorine residuals at that location. The high and consistent levels of ORP across the distribution system are consistent with maintaining stable conditions with respect to the presence of iron and manganese-containing scales.

4. Historical LCR Data

Historical LCR monitoring data for the Ashland system are presented in Table 6. Lead levels decreased from 1992 through 1999, and since that time have remained very low with the highest 90th percentile of 0.003 mg/L occurring in 2005. Similarly, copper levels have generally decreased since 1992 but remained variable between 2002 and 2011. The two most recent rounds from 2014 and 2017 were found to have the lowest copper levels since LCR monitoring began. Maximum copper levels in those two rounds were found to be approximately 0.3 mg/L and well below the AL of 1.3 mg/L. These data indicate excellent compliance with the lead AL of 0.015 mg/L and good compliance with respect to copper, especially in the most recent two rounds of sampling performed in 2014 and 2017. The lead results have also been below the proposed lead TL of 0.010 mg/L (USEPA).

In the analysis of historical Ashland WTP pH data, there was shift to a higher finished water pH between 2012 and 2013 and is likely the result of an increased dose of soda ash at the existing WTP and possibly a higher dose of sodium hypochlorite. Soda ash is now used to increase the pH of the finished water to a target of 7.5. The median pH ranged from 7.2 to 7.3 prior to 2013 and since that time the median pH has increased to 7.5 in the WTP finished water. That pH increase appears to have lowered and stabilized copper levels. Lead levels did not appear to be significantly affected by the pH increase of the finished water, likely due to the low lead inventory within the distribution system and premise plumbing of the Ashland distribution system, and that lead solubility is not highly sensitive at this pH/DIC range, as discussed below. Drinking water department staff are not aware of any lead service lines or goosenecks within the Ashland system.

The TAP supply from MWC has been used for only approximately two weeks each year since 2015, so the effect of that supply on Ashland LCR monitoring results could not be evaluated. Based on the available water quality data, the existing supply from MWC is theoretically more corrosive to lead and copper compared to the Ashland WTP supply, as discussed further below.

Table 6: Summary of Ashland LCR Compliance Data

Year	Sample Count	Lead (mg/L)				Copper (mg/L)		
		90th Percentile	% of AL	% of TL	Max.	90th Percentile	% of AL	Max.
2017	30	0.002	10%	15%	0.003	0.21	16%	0.33
2014	30	0.001	9%	13%	0.003	0.14	11%	0.30
2011	31	0.002	13%	20%	-	0.65	50%	-
2008	30	0.002	14%	21%	-	0.40	31%	-
2005	30	0.003	21%	32%	-	0.76	59%	-
2002	32	0.002	10%	15%	-	0.49	38%	-
1999	30	0.003	17%	26%	-	0.91	70%	-
1996	60	0.004	27%	40%	-	1.08	83%	-
1995	60	0.005	33%	50%	-	0.94	72%	-
1994	30	0.009	60%	90%	-	1.34	103%	-
1993	60	0.003	20%	30%	-	1.29	99%	-
1992	60	0.007	47%	70%	-	0.75	57%	-

5. Solubility and Blending Modeling

WaterPro_6.75 was used to model lead and copper solubility for Ashland's finished water supplies and to conduct a blending analysis. This theoretical model generally tends to over-predict soluble metals concentrations, and therefore, can be considered conservative. The model results have been used to evaluate trends in solubility. Additional considerations for interpreting model results include:

- The model assumes conditions are at equilibrium. The time required to reach equilibrium under varying distribution system water quality conditions is not known. Frequent changes in system operations/sources likely prevent equilibrium from being achieved in many cases.
- The model does not consider impacts of competing ions, other chemical, physical, and microbial conditions that affect scale formation and stability in distribution systems.
- The solubility model does not account for the presence or release of particulate lead or copper.

5.1. Lead and Copper Solubility Modeling

Water quality parameters used in this analysis are presented in Table 7. An analysis was performed to determine the ranges and most commonly occurring water quality conditions. The most common co-occurring pH and alkalinity values were used rather than the calculated median or average value of the individual pH and alkalinity data sets. For the Ashland WTP finished water, historical levels of DIC have varied and because of the importance of that parameter on corrosion characteristics, two alternate conditions were considered: a low level of DIC of 5 mg/L; and higher level of 16 mg/L. Those two water quality conditions are compared to the most common water quality condition (DIC of 12 mg/L) in Table 7. For the supply from MWC, pH-adjusted BBS water was included and an alternate scenario in which the pH was increased to 7.4 to reflect future corrosion control treatment by the MWC. That condition was selected to show intermediate effects on corrosion control treatment being implemented by the MWC. Based on discussions with the MWC, the pH of the BBS water will be initially increased to 7.4 to better match Duff WTP and then, once treatment is available at both sources, the pH will be further incrementally adjusted up to a pH in the range of pH 7.7-8.0, depending on LCR monitoring results.

Table 7: Water Quality Conditions used in Blending Analysis

Parameter	Ashland WTP			MWC Water	
	DIC 12	DIC 5	DIC 16	Existing DIC 14	Treated DIC 14
TDS (mg/L)	78	78	78	67	67
pH	7.5	7.5	7.5	7.0	7.4
Alkalinity (mg/L as $CaCO_3$)	45	19	61	46	53
Calcium (mg/L)	10.4	10.4	10.4	10.9	10.9
Temperature (°C)	8	8	8	8.6	8.6
Chloride (mg/L)	1.8	1.8	1.8	2.3	2.3
Sulfate (mg/L)	11.8	11.8	11.8	1.2	1.2
CCPP (mg/L as $CaCO_3$)	-8.9	-5.3	-10.9	-24.6	-11.9
LSI	-1.3	-1.7	-1.2	-1.8	-1.32

Modeled lead and copper solubility at 25°C for the observed source and distribution system water quality conditions are presented in Figures 1 and 2, respectively. Three curves were developed to show trends in lead and copper levels as an increasing amount of caustic soda was added at the Ashland WTP to raise the pH (shown as solid lines). Each of the three curves represents a different DIC (as presented in Table 7). Existing lead and copper solubilities for several sample sites within the Ashland system are also shown. Calculated solubilities for the existing MWC water and MWC water treated with caustic soda to a pH of 7.4 are shown. The MWC water adjusted to a pH of 7.4 illustrates the anticipated effect on lead and copper for that supply once corrosion control treatment has begun to be implemented. That pH target was selected to reflect the effect of initial corrosion control treatment by the MWC, but not the ultimate pH endpoint (likely to be pH = 7.7-8.0).

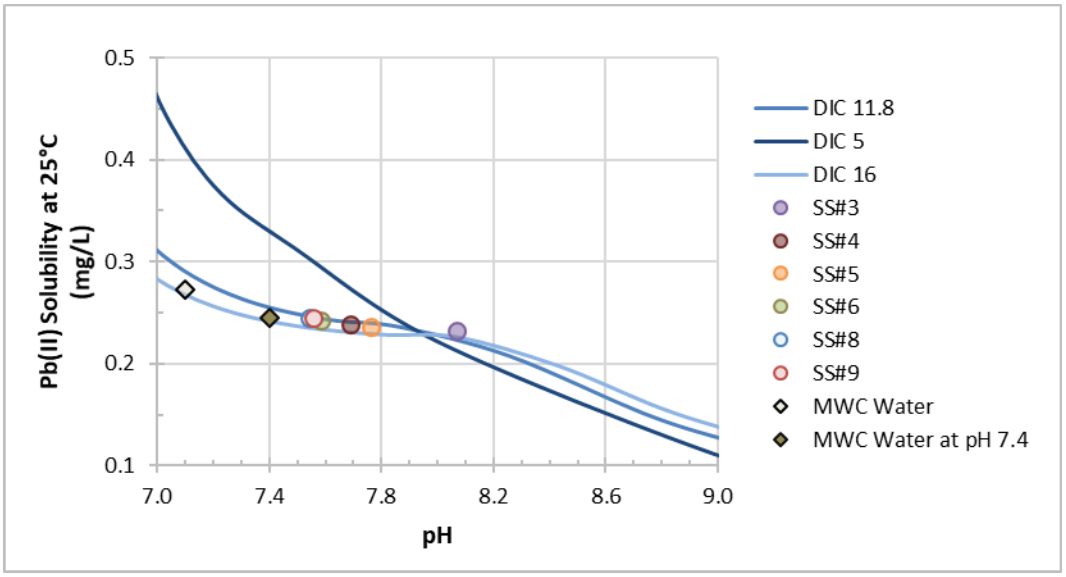


Figure 1. Model-Predicted Lead Solubility

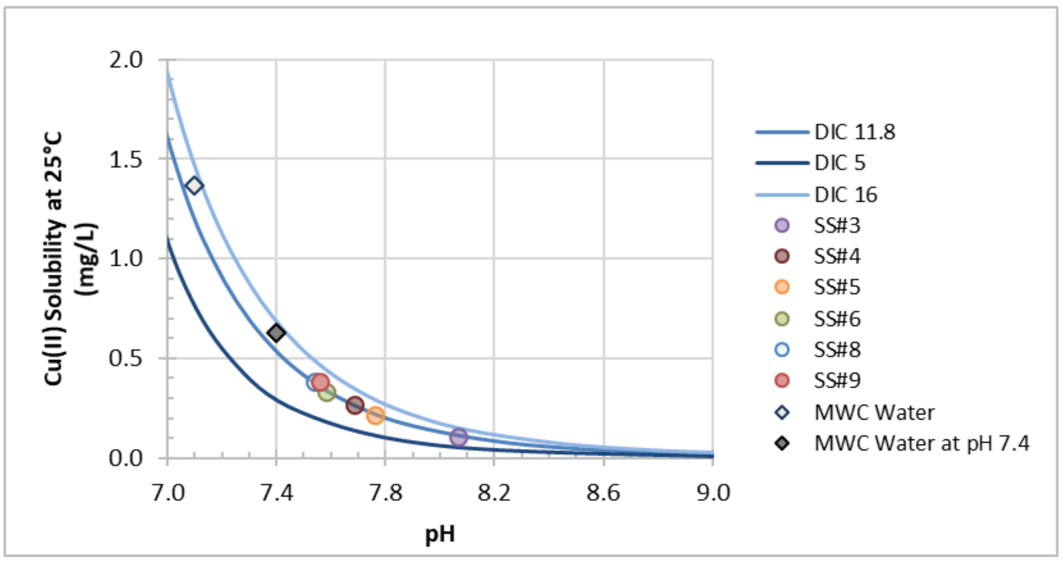


Figure 2. Model-Predicted Copper Solubility

Lead solubility did not vary significantly for either Ashland or MWC water between a pH of 7.4 and 8.0 for the two higher DIC levels investigated. At the lower DIC level of 5 mg/L as C, lead solubility was more sensitive to pH with significantly higher solubility than the other conditions below a pH of 7.9, and lower solubility at a pH above 7.9.

The greatest variability in copper solubility occurred between a pH of 7.0 and 7.6 for all three DIC levels. Copper solubility decreased as a function of DIC, with the DIC level of 5 mg/L condition having the lowest solubility of copper throughout the pH range evaluated. The predicted copper solubility for each of the six sample sites within the Ashland system varied with the pH found at those locations in the Spring 2020 water quality monitoring, with higher pH levels corresponding to lower copper solubility. Both the MWC and treated MWC waters had higher predicted solubility of copper than any of the sites within Ashland. CCT of the MWC supply with caustic soda to adjust the pH to 7.4 significantly reduced model-predicted copper solubility and any additional pH increases will further lower the predicted copper solubility.

The model predictions confirm that pH can have a dramatic effect on copper solubility. The pH shift from pre-2013 of approximately 7.2 to the current condition (median pH of 7.5) reduced model-predicted copper solubility by up to two-thirds. The model results support the hypothesis that higher pH levels since 2013 have contributed to much lower and stable copper levels observed within the Ashland system.

5.2. Blending Analysis

A blending evaluation was conducted to evaluate shifts in water chemistry and metals solubility for blends of Ashland WTP and MWC water, assuming those two supplies blend at different levels in the distribution system. The results of a blending analysis for pH, lead, and copper are presented in Figures 3, 4, and 5, respectively. Each graph progresses from 100% Ashland water on the left through various blends with MWC water to 100% MWC water on the right, and include a comparison with the existing MWC water with a pH of 7.0 and treated MWC water with a pH of 7.4.

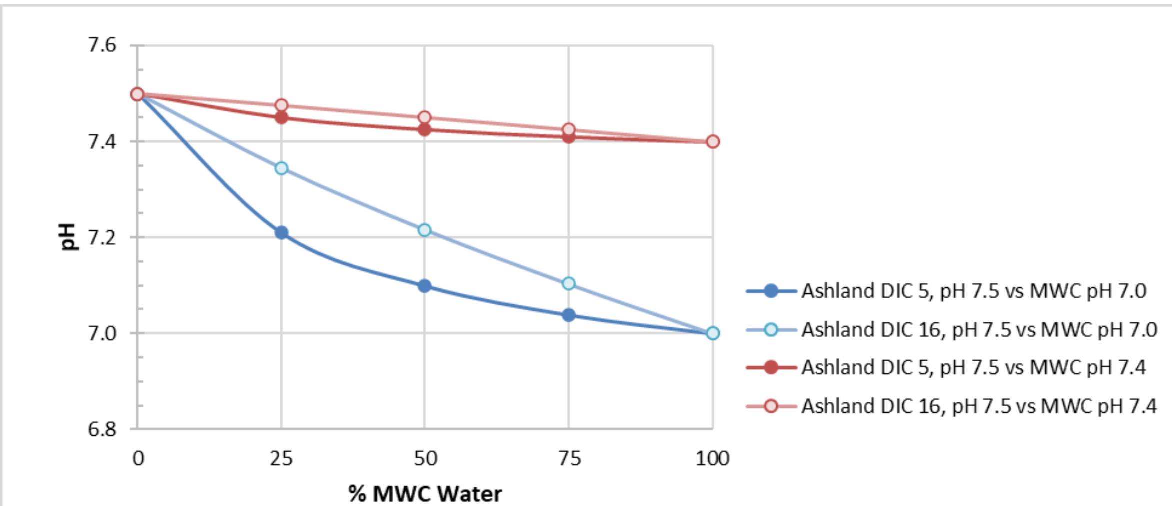


Figure 3. Modeled pH as a Function of Blend Ratio

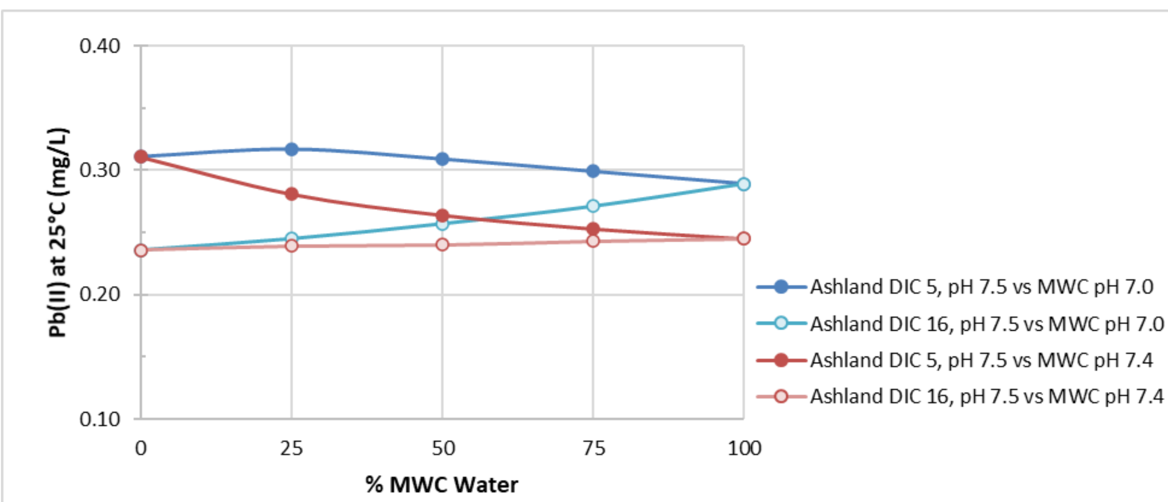


Figure 4. Modeled Lead Solubility as a Function of Blend Ratio

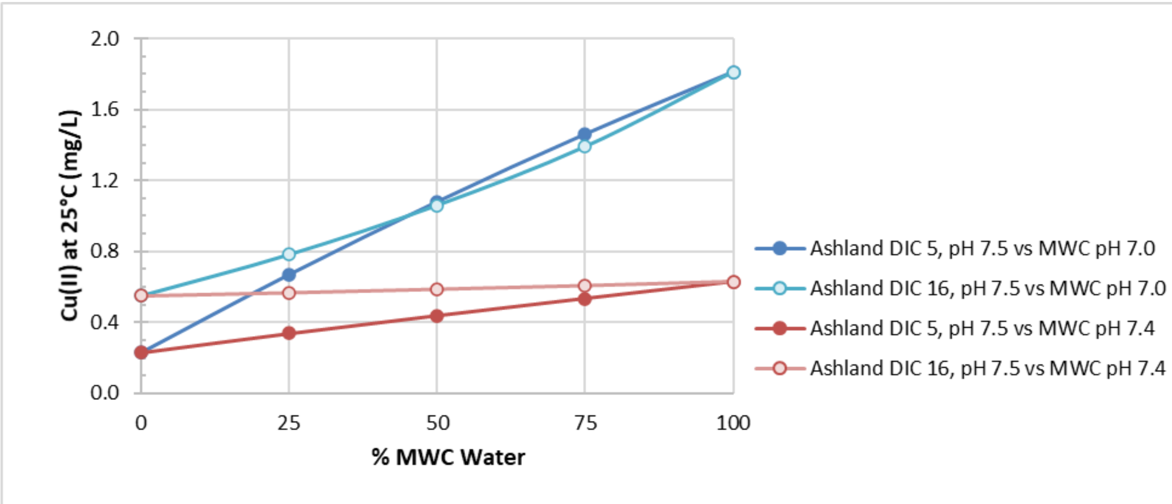


Figure 5. Modeled Copper Solubility as a Function of Blend Ratio

Variations in pH for blends of Ashland water with the existing MWC water were a function of DIC. The higher DIC Ashland water with its associated higher alkalinity tended to control pH resulting in a higher pH for a given blend compared to the lower DIC Ashland water. Blending of both Ashland WTP DIC levels with the treated MWC water resulted in very little pH variation as a function of blend ratio. For the MWC water, pH decreased as a function of increasing percent MWC water, as anticipated.

Lead solubility for the low DIC Ashland water did not vary significantly across the blends with existing MWC water. Lead solubility decreased when blended with treated MWC water. However, lead solubility is predicted to increase when blending Ashland WTP water with a DIC of 16 mg/L as C with existing MWC water. Although there are differences in the theoretical, calculated solubility, all blends fell into a fairly narrow range of lead levels. Nonetheless, minimization of lead release is an important objective of any CCT program.

Copper solubility varied significantly as a function of blend ratio and resultant pH. Both the current and treated MWC water were found to be more corrosive to copper than the Ashland waters, primarily due to the lower pH of the MWC water. The DIC of the Ashland water had a larger effect on copper solubility for blends of less than 50% MWC water, with higher copper solubility associated with the higher DIC Ashland water. For blends of greater than 50% MWC water, DIC was not found to have a significant effect on copper levels. The increased pH of the treated MWC water resulted in lower copper levels for all blend ratios. Further pH increases in the future will likely lower copper solubility levels.

6. Recommendations

The existing Ashland WTP uses soda ash for CCT to achieve a target pH of 7.5. This evaluation considered corrosion control treatment with caustic soda, for the new WTP, and did not consider other types of corrosion control treatment, because the City has selected caustic soda as the preferred option.

It is our understanding that the new WTP will have a small soda ash system to offset alkalinity consumed during coagulation. By compensating for alkalinity consumed during treatment it is anticipated that finished water alkalinities at the new WTP may be the same or only slightly lower than historical levels (with a 10^{th} percentile of 28 mg/L as $CaCO_3$).

Lead levels have remained very low in the Ashland system and the solubility modeling suggested that lead solubility is not significantly impacted between pH 7.4 and 8.0 for the typical DIC range of between 11 and 16 mg L as C. However, lead solubility is significantly higher when the DIC of the finished water drops to 5 mg/L as C. Copper levels have historically been of greater concern for Ashland; however, with the higher pH of the Ashland WTP finished water since 2013, copper levels are much lower and appear to have stabilized.

Although both lead and copper are far below the ALs, lead levels are below the TL proposed in the Draft LCRR, and there are no known lead service lines, goosenecks, or pigtails in the Ashland system, the existing pH of 7.5 may not be adequate for long term LCR compliance with respect to lead. When lower alkalinity water is produced and the DIC drops to 5 mg/L as C, lead solubility increases relative to that at a higher DIC. It is unclear if LCR compliance monitoring has ever occurred during low DIC periods.

Figure 6 compares modeled lead levels for finished water pH targets of 7.5 and 7.8 for Ashland WTP water at its low DIC level of 5 mg/L as C blended with current and treated MWC water. The pH 7.8 Ashland WTP finished water had significantly lower lead levels (shown as 0% MWC water) compared to the pH 7.5 alternative. This is important since Ashland operates with 0% MWC water for the majority of the year. Lower lead levels are predicted for pH 7.8 compared to pH 7.5 up to a 50% blend with treated or current MWC water.

To provide lower lead solubility levels under the full range of historical water qualities, the following finished water quality targets are recommended for OCCT:

- pH target = 7.8
- Minimum pH = 7.6

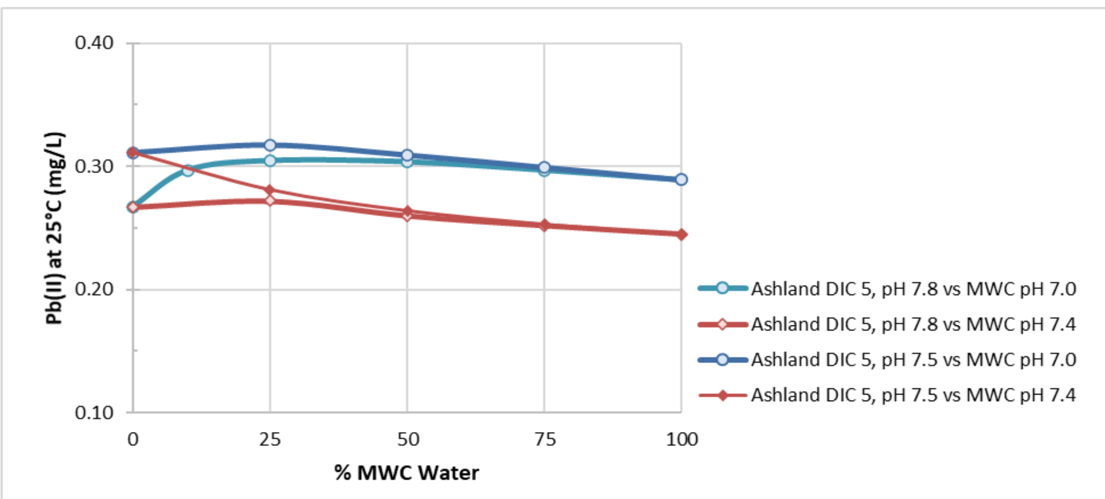


Figure 6. Comparison of Modeled Lead Solubility for pH Targets of 7.5 and 7.8 at a DIC of 5 mg/L

The pH of the water within the distribution system generally increases with water age, likely due to contact with cement-lined pipes, especially in areas where recent pipe replacements have occurred. Many locations in the distribution system have a higher pH than the finished water at the WTP. This increase in pH as a function of water age in the distribution system provides a further benefit in reducing copper levels but may not be ideal for cement-lined pipes. Increasing the pH at the plant, and the associated increased alkalinity could help reduce some of this pH drift within the distribution system. Maintaining the pH at 7.8 should not cause calcium carbonate precipitation or other water quality concerns.

6.1. Caustic Soda Treatment Evaluation

The estimated doses of caustic soda to achieve a pH of 7.8 at the new Ashland WTP for a range of water qualities upstream of corrosion control treatment are presented in Table 8. As a comparison to current practice, the estimated caustic soda doses to achieve a pH of 7.5 are also included Table 8.

Table 8: Estimated Caustic Soda Doses to Achieve pH Target

pH Upstream of CCT	7.0			7.2		
Alkalinity[1] Upstream of CCT DIC[1] Upstream of CCT	21 6.5	45 13.9	55 17.0	23 6.5	45 12.8	55 15.6
Dose to Achieve pH = 7.5[2]	3.1	6.6	8.0	1.5	3.0	3.7
Final Alkalinity at pH = 7.5[1]	25	53	65	25	49	59
Dose to Achieve pH = 7.8[2]	4.0	8.5	10.4	2.5	4.8	5.9
Final Alkalinity at pH = 7.8[1]	26	56	68	26	51	62

Notes:

1. Alkalinity expressed as mg/L as $CaCO_3$ and DIC expressed as mg/L as C.
2. Expressed as mg/L 100% caustic soda.

7. References

AWWA, 2017, Internal Corrosion Control in Water Distribution Systems, Manual of Water Supply Practices M-58, 2nd edition.

Schock, M.R and Lytle, D.A. 2011. "Internal Corrosion and Deposition Control". Water Quality and Treatment: A Handbook of Drinking Water, 6th Ed., New York: McGraw-Hill.

USEPA, 2016. Optimal Corrosion Control Treatment Evaluation Technical Recommendations for Primacy Agencies and Public Water Systems. EPA 816-B-16-003. March 2016.

Appendix A:
Results from the Water Quality Monitoring Performed in the Spring 2020

Table A1: Water Quality Data for Finished Water at the Ashland WTP

Date	SS#	TDS	ORP	Free Cl_2	Total Cl_2	Calcium	Magnesium	Chloride	Sulfate
		mg/L	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
3/4/2020	EP-A	71.2	712	1.09	1.12	10.4	1.9	1.75	11.5
3/13/2020	EP-A	81.2	704	1.04	1.08	10.7	1.95	1.87	11.1
3/23/2020	EP-A	70	685	1.02	1.08	10.5	1.9	1.81	12.8
4/6/2020	EP-A	78.8	668	1.13	1.15	10.9	1.87	2.01	12.8
4/16/2020	EP-A	83.8	681	0.96	1.04	10.1	1.79	1.66	10.6
4/27/2020	EP-A	80	655	1.07	1.15	9.76	1.75	1.79	12.1

Table A2: Distribution System Water Quality Data

Date	SS#	pH	Temp	ORP	Free Cl_2	Total Cl_2	Ca	Fe[1]	Mg	Mn[1]	Alk
		s.u.	°C	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L as $CaCO_3$
3/4/2020	SS#3	8.3	10.1	606	0.39	0.44	11.6	0.007	1.75	0.0003	50
3/13/2020	SS#3	8.3	10.5	599	0.41	0.49	12.1	ND	1.70	ND	50
3/23/2020	SS#3	7.7	11.4	639	0.50	0.54	11.1	ND	1.72	ND	48
4/6/2020	SS#3	7.9	12.2	629	0.43	0.51	12.0	ND	1.80	ND	52
4/16/2020	SS#3	8.3	14.7	579	0.39	0.43	10.9	0.027	1.69	ND	52
4/27/2020	SS#3	8.0	16.6	607	0.59	0.61	10.8	ND	1.70	ND	46
3/4/2020	SS#4	7.7	6.6	690	0.73	0.78	11.1	0.003	1.93	0.0016	48
3/13/2020	SS#4	7.8	8.5	628	0.21	0.29	11.4	ND	1.70	ND	50
3/23/2020	SS#4	7.4	7.5	685	0.80	0.80	10.3	ND	1.83	ND	44
4/6/2020	SS#4	7.8	9.6	620	0.25	0.29	11.5	ND	1.71	ND	50
4/16/2020	SS#4	7.8	11.6	625	0.25	0.30	11.0	ND	1.70	ND	48
4/27/2020	SS#4	7.6	12.8	624	0.33	0.40	11.0	ND	1.78	ND	50
3/4/2020	SS#5	7.9	9.3	663	0.60	0.65	11.2	ND	1.69	0.0004	48
3/13/2020	SS#5	7.8	10.0	660	0.56	0.63	11.6	ND	1.69	ND	48
3/23/2020	SS#5	7.7	10.6	653	0.62	0.71	11.2	ND	1.64	ND	48
4/6/2020	SS#5	7.7	11.7	660	0.71	0.78	11.6	ND	1.69	ND	50
4/16/2020	SS#5	7.7	13.3	658	0.66	0.75	10.7	ND	1.65	ND	48
4/27/2020	SS#5	7.7	13.8	649	0.82	0.85	10.5	ND	1.69	ND	48
3/4/2020	SS#6	7.7	9.1	670	0.53	0.62	10.4	0.010	1.84	0.0014	50
3/13/2020	SS#6	7.5	9.8	658	0.45	0.55	11.0	0.019	1.91	ND	46
3/23/2020	SS#6	7.4	11.5	650	0.56	0.60	10.4	0.018	1.83	ND	44
4/6/2020	SS#6	7.6	10.1	675	0.76	0.79	10.9	ND	1.84	ND	50
4/16/2020	SS#6	7.6	12.8	667	0.71	0.74	10.3	ND	1.78	ND	48
4/27/2020	SS#6	7.7	12.8	667	0.78	0.84	10.1	ND	1.77	ND	46
3/4/2020	SS#8	7.6	6.7	699	0.73	0.74	10.2	ND	1.85	0.0006	50
3/13/2020	SS#8	7.6	7.5	683	0.67	0.76	10.8	ND	1.91	ND	48
3/23/2020	SS#8	7.5	8.0	684	0.78	0.81	10.4	ND	1.85	ND	46
4/6/2020	SS#8	7.4	8.4	690	0.85	0.87	10.8	ND	1.84	ND	46
4/16/2020	SS#8	7.5	10.6	-	0.75	0.85	10.1	ND	1.77	ND	44
4/27/2020	SS#8	7.6	11.9	672	0.83	0.90	10.5	ND	1.81	ND	44
3/4/2020	SS#9	7.7	6.8	686	0.72	0.81	10.5	ND	1.90	0.0012	48
3/13/2020	SS#9	7.6	6.4	694	0.70	0.81	10.9	ND	1.94	ND	48
3/23/2020	SS#9	7.5	7.3	683	0.73	0.78	10.3	ND	1.86	ND	48
4/6/2020	SS#9	7.5	7.5	685	0.77	0.88	10.7	ND	1.85	ND	48
4/16/2020	SS#9	7.5	9.4	684	0.75	0.83	10.1	ND	1.79	ND	48
4/27/2020	SS#9	7.6	10.6	670	0.77	0.86	10.7	ND	1.84	ND	46

Notes:

1. ND indicates result was below the method reporting limit. The reporting limits were 0.015 mg/L for iron and 0.020 mg/L for manganese. The lab reported some results below those limits and those data are included in the table above as reported by the lab.

CITY OF ASHLAND
WATER TREATMENT PLANT

Plant Evaluation Report

FINAL

B&V PROJECT NO. 197823

City of Ashland

26 MARCH 2018

BLACK & VEATCH
Building a world of difference.

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1.0 Executive Summary

The City of Ashland is evaluating the rehabilitation costs associated with continued operation of the existing surface water plant as compared to the costs associated with construction of a new treatment plant. Black & Veatch reviewed available facility information and performed a site walk of the facility to determine the rehabilitation needed at the existing plant to maintain its operation for a 20-year planning horizon. Costs for rehabilitation were compared to a non-site specific cost to build a new water treatment plant similar to the existing plant.

Background

The City's primary source of raw water comes from the Ashland Creek watershed. Raw water is supplied to the existing plant from Reeder Reservoir on Ashland Creek, located approximately two miles southwest of the city. The existing Ashland WTP site is approximately 0.6 acres in size, and is constrained by the Ashland Creek roughly to the east and south, and by a cliff to the north. Water is conveyed from reservoir through a penstock from Hosler Dam to supply water to the Reeder Gulch hydroelectric power plant. The powerhouse is located immediately upstream of the existing WTP. After flow passes through the powerhouse, it discharges into a tailrace structure where a portion of the water is diverted to feed the existing WTP.

Existing WTP Risks and Limitations

In its current location, the plant faces several challenges/risks to its safe operation. These include; the risk of flooding due to rain or Dam failure, risk of a seismic event/damage due to landslide and inability to meet future treatment requirements,. Based on the evaluation, it was determined that mitigating these risks in a cost-effective and practical manner is not possible. Consequently, it is not possible to develop comparable alternatives due to the inability to rehabilitate the existing plat in a manner that mitigates these three major risks; the risk of flooding, risk of a seismic event and the inability to meet future treatment requirements. The limitations associated with mitigating these risks are summarized below

Flood Risk. The existing WTP is susceptible to flooding due to rain or dam failure. It has experienced flooding three times in its last 60 years of operation. The flood risk could potentially be mitigated by constructing a flood wall; however, its ability to withstand a major flood event is questionable. Constructing a flood wall next to existing basins and structures along the creek is risky because it could potentially damage the existing facilities due to vibration related to construction activities. As such, the cost to mitigate the flood risk cannot be determined with reasonable certainty and therefore not included in the cost comparison.

Seismic Risk and Landslide Risk. Regarding the seismic risk, a detailed structural assessment of the existing structures is outside the scope of this document; however, a cursory review indicates that the existing structures do not meet the current seismic code requirements. Assuming that the current loading on the existing structures remains the same, it is not required to upgrade the existing structures to meet the current seismic codes. However, in a seismic event, these structures could suffer significant damage and impair the ability of the plant to produce potable water. Due to the age and condition of the facilities it is not feasible to upgrade the existing structures to current seismic standards in a cost effective manner. Depending on the severity of a seismic event, the time to repair and make the plant functional could range from days to months. In its current location in the canyon, the existing plant is susceptible to damage from landslides. Similar to the seismic risk, the extent of damage that the plant could suffer will depend on the severity of a landslide event.

Treatment Limitations. The existing plant is able to produce high quality drinking water using the current microfloc/filtration treatment process. It is currently unknown if additional treatment would be required by EPA as the regulations evolve in the future. However, due to lack of space, it is not possible to construct additional treatment processes or modify existing facilities to accommodate new treatment while keeping the plant in operation. Additionally, exposure of any new facilities to other risks (flooding, seismic, landslide) cannot be practically mitigated. As such, the existing plant does not have the ability to meet any additional treatment requirements such as treatment of algal toxins, if required by future regulations. Any additional treatment would need to be located offsite and would require associated infrastructure investment for pumps, piping, and storage to convey to the distribution system. Since this additional offsite treatment would be needed for both alternatives (existing and new plant configuration), it has not been included in the cost comparison.

Capital Cost Comparison

The cost comparison presented below does not take into account the risks outlined above since these cannot be mitigated cost-effectively. The cost purely focuses on the rehabilitation of the existing plant in its current condition. The capital cost comparison of the two alternatives shows the rehabilitation cost of the existing plant to be approximately 25% of the construction costs of a new plant. The base cost comparisons are demonstrated in Table 1-1 below. It assumes that the new plant will have the same capacity of 7.5 mgd and identical treatment processes as the existing water treatment plant.

A cost escalation is applied for both alternatives assuming that these costs will be incurred roughly 5 years from today's date. The cost escalation for both alternatives is determined to be the same as further explained in Section 4.1.3.

Table 1-1 Capital Cost Comparisons (Level 5 AACE Cost Estimate)

ITEM	NEW PLANT*	EXISTING PLANT
Facility Construction Cost	**$12,148,000**	**$3,047,500**
Contractor Markups	*$2,915,000*	*$731,400*
Subtotal Total Construction Cost	**$15,063,000**	**$3,778,900**
Total Non-Construction Costs	*$5,475,000*	*$1,284,826*
Escalation (2%/yr. @ 5 yrs. = 10%)	$2,053,000	$506,373
Total Project Cost	**$22,591,000**	**$5,570,099**
Total Project Cost (Rounded to nearest $1000)[1,2]	**$22,591,000**	**$5,570,000**
1 Level of Accuracy corresponds to AACE Level 5		
2 The major risk factors (Flooding, Seismic, Landslide, and Treatment) are not addressed in the cost.		

*-Non-site specific estimate.

Conclusion

While it is feasible to continue operating the existing facility over the 20-year planning horizon at a lower initial investment, the existing plant has some negative considerations that present a risk to continued operation. The City has the opportunity to accept or mitigate these risks in the decision process. Ultimately, the existing facility has a definitive life span and will reach a point where continual investment is no longer financially prudent or will not achieve the desired level of service for the City. Deferring construction of a new plant beyond the 20-year planning horizon will impose a greater overall cost to the City.

2.0 Introduction

The City of Ashland is evaluating future improvements needed at the current surface water treatment plant (WTP) (Figure 2-1) to provide reliable service over a planning horizon of the next 20 years. The purpose of the assessment is to evaluate the costs associated with continued operation of the existing plant as compared against the costs associated with construction of a new treatment plant. In addition to condition related inputs, the study considers adherence to future regulations, treatment capabilities, capacity, and external/environmental risks with continued operation of the existing plant.

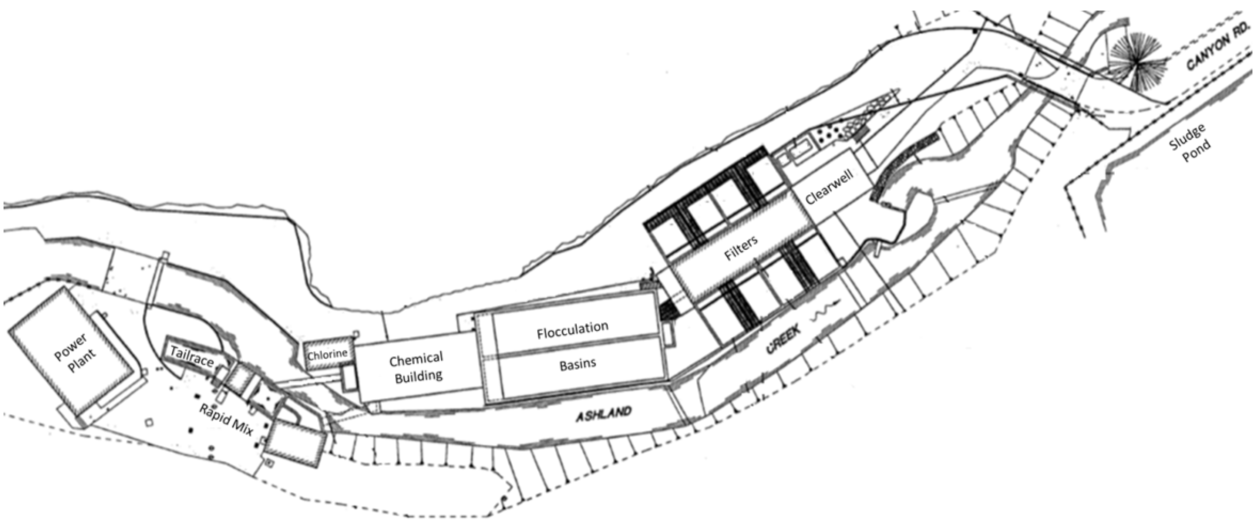


Figure 2-1 Existing Water Treatment Plant Site

2.1 EXISTING INFORMATION

Data request forms were developed with a basic questionnaire for WTP staff to complete with any additional information and past reports. The City staff responded with relevant information for each plant system. A hierarchy of evaluated systems was developed from the drawings provided by the City. Information provided by the City on the various systems was incorporated as a reference during the site evaluation.

2.2 PROJECT APPROACH

This report summarizes the key points of the evaluation with recommendations for improvements needed at the existing plant to maintain its operation, cost opinions for a new plant construction with features duplicating the existing plant, and further evaluation recommendations as necessary. The findings from the existing plant evaluation are compared against a typical generic cost (national cost) to build a new 7.5 Million Gallon/Day (mgd) water treatment plant employing similar treatment technologies.

2.2.1 Treatment Plant Process Areas

As part of the evaluation, Black & Veatch reviewed available facility information and performed a site walk of the facility to determine the existing condition of the major process structures and equipment. To facilitate the assessment, the WTP was subdivided into the following areas:

- Administration
- Pretreatment
- Plant Influent
- Dual Media Filters
- Chemical Feed
- Clearwell/Product Water

Assessments were categorized by discipline as followings:

- Process Mechanical
- Instrumentation and Controls
- Electrical
- Civil/Structural

Black & Veatch performed a walk-through condition assessment of the facilities on February 7, 2018 to document materials of construction and evaluate potential concerns and systems performance. Visual inspections of the facilities were performed to document conditions. Documentation of conformance with current design standards and codes were noted. The following hierarchy represents the major facilities at the plant that were included in the assessment:

Table 2-1 Asset Hierarchy

AREA	ASSET
Administration	Operations Building, building mechanical systems
	Plant roadways
	Fire Protection Systems
Plant Influent	Intake/Headworks Piping and feed from the dam
	Talent Irrigation District Piping
Chemical Feed	Alum, Soda Ash, Carbon, Potassium Permanganate & Cationic Polymer Feed Pumps
	Filter Polymer Aid Feed Pumps
	Building Structure
	Sodium Hypochlorite Tanks
	Old Chemical Storage Building
Pretreatment	East & West Flocculation Basin (incl. gates/valves)
	Flow Control Box (incl. gates/valves)
Dual Media Filters	Filter Basin Structures 1 through 8
	Backwash Pumps 1-3 (incl. associated valves, meters and instrumentation)
	Blower Motor
	Potable Detention Tank
	Hydro-pneumatic Tank
Clearwell	Clearwell Basin Structure
	Potable Pumps
	Finished Water Flow Meter

2.2.2 External Considerations

With the existing plant, there are several external considerations that have the potential to disrupt or impact the WTP operation. Although out of scope for this project, it is recommended that the City perform an in-depth evaluation of these potential risks to quantify their impacts to maintaining operation of the existing WTP. The intent of this section is to describe the external factors for further consideration and action by the City to mitigate risk.

A new plant would obviously provide provisions for increased capacity, redundancy, and improved effluent water quality. Furthermore, an alternate location would be sited in an area that is less susceptible to damage from periodic flooding, landslides, and wildfire. The two primary considerations for addressing existing facility treatment constraints and addressing natural hazards are presented below.

2.2.2.1 Treatment Constraints

A new plant could be designed to improve finished water quality by reducing taste and odor concerns, and treating any future regulated contaminants. Although generally a seasonal issue, the raw water occasionally contains a high concentration of algae. In previous years, the City cleaned the upstream reservoir to remove sediment which can contribute to algae growth. City also routinely sends algae samples to the lab for toxicity analysis.

Although historically non-toxic, the reservoir can contain algae that can produce cyanotoxins. This potential water quality concern is something that a new plant could be designed to be able to address through additional treatment. The existing site lacks the area to expand treatment capabilities to mitigate algal toxins to address EPAs anticipated Algae Guidance that is currently being developed.

The algae are also the source for the seasonal taste and odor issues that the City currently experiences. The existing plant uses powdered activated carbon (PAC) on a seasonal basis to attempt to remove tastes and odors. The past performance of PAC has not been adequate in removing Geosmin low enough to avoid customer taste and odor complaints. Furthermore, PAC can be difficult to manage; it is messy to handle and feed and PAC dust can create an explosive atmosphere around the feed equipment. PAC feed facilities are typically classified as explosive hazard areas. A new plant could be designed to be able to address these taste and odor issues. Furthermore, the following additional treatment considerations could be incorporated into the new plant design:

- Improved ability to remove iron and manganese
- Corrosion control by supplementing alkalinity and controlling pH
- Removal of color / control of disinfection byproduct formation

Other factors that should be considered include expanding the existing site to meet future capacity requirements. The existing 7.5 mgd plant is located on a constrained site with limited ability to expand. A new plant can be designed for an ultimate production capacity of 10 million gallons per day (mgd), which would provide the water needed to meet the City's demands for the next 20 years, and beyond.

Automation is an important consideration in the evaluation to maintain the existing plant as compared to constructing a new plant. A new plant would likely be automated which would benefit the City by being less labor-intensive (potentially increasing over time with facility age) to operate and maintain the existing plant over the 20-year planning horizon. Through the use of automation, it is anticipated that a new plant would require less operator attention than the existing plant.

2.2.2.2 Natural Hazards

The location of the existing plant places the facility at risk of flooding. Based on information from the City, high flows in Ashland Creek during 1997 caused significant damage to the plant and disrupted water supply to the City. The existing plant was also damaged in the flood events in 1964 and 1974. Because of its remote location within the steep walls of Reeder Gulch, it may not be practical to completely protect the plant from periodic flooding. However, a flood wall at the existing water treatment plant would improve reliability of the existing plant.

Construction of a flood wall at the existing water treatment plant was evaluated by Carollo Engineers in the Water Conservation & Reuse Study (WCRS) & Comprehensive Water Master Plan (CWMP) prepared in October 2010. The flood wall proposed by Carollo (Figure 2-2) would tie into the slope north of the existing plant then extend between the water treatment plant and Ashland Creek for a length of approximately 1,000 feet. The wall would have a height of 10 feet with a thickness of 2 feet and the construction assumes that the wall would tie into existing structures at the plant, rather than be free standing.

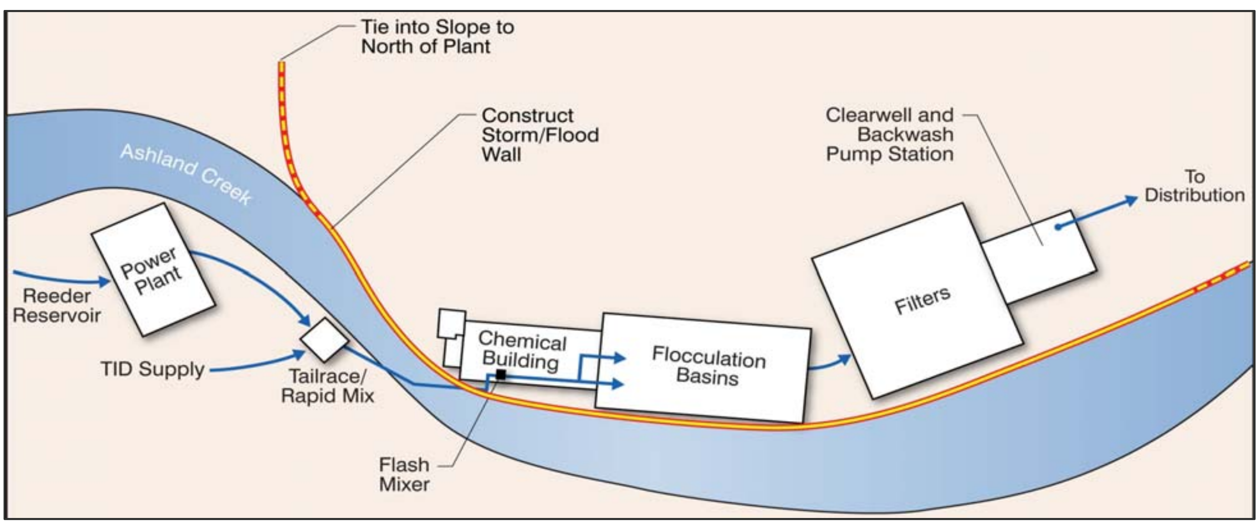


Figure 2-2 Proposed Water Treatment Plant Flood Wall (Carollo, 2010)

The existing plant is also susceptible to failure from a seismic event. The original plant was built in 1949 and has had one major renovation conducted in 1995. Considering the age of these facilities it is uncertain if the original design approach considered both static and dynamic loads. Since the original construction date, seismic loading design considerations have changed. Most water-retaining structures today are designed using ACI 350, which provides increased levels of reinforcing, closer rebar spacing, and limitations on crack width to prevent leakage. It is unlikely that ACI 350 or any of its principles were used to design the existing plant. The existing structures are likely unable to resist modern day seismic loads. These changes, coupled with a facility with concrete condition that has deteriorated due to normal use, makes the existing structures susceptible to failure from seismic activity. The plant basins and structural elements (such as walls) should be evaluated to determine if they can resist the current seismic acceleration and hydrodynamic forces per ACI 350. The City should consider whether existing facility should be upgraded to meet the requirements of the current seismic code.

2.2.2.3 Redundancy/Reliability

The City has some provisions for redundancy for up to 2.1 mgd treated water supplied from the Talent, Ashland and Phoenix (TAP) Pipeline. The TAP Pipeline benefits the City to provide supply during a treatment plant outage. The City has water rights for TAP through Lost Creek Lake up to 2.1 mgd only, but the TAP pumps can supply up to 3.0 MGD. Currently the TAP system has the ability to supply roughly one half of the population in the City. Additional improvements need to be made to the pumps and piping system to convert this into a full redundant supply. Although the City has provisions for an alternate source of finished water, the overall supply is not under the City's control.

3.0 Plant Evaluation

The following sections discuss the evaluation between the existing water treatment plant and a new water treatment plant. This includes the condition assessment and capital improvements to the existing plant, as well as new facility treatment assumptions and process description.

3.1 EXISTING WATER TREATMENT FACILITY

The City's primary source of raw water comes from the Ashland Creek watershed. Raw water is supplied to the existing plant from Reeder Reservoir on Ashland Creek, located approximately two miles southwest of the city. Water is conveyed from reservoir through a penstock from Hosler Dam to supply water to the Reeder Gulch hydroelectric power plant. The powerhouse is located immediately upstream of the existing WTP. After flow passes through the powerhouse, it discharges into a tailrace structure where a portion of the water is diverted to feed the existing WTP. Average water production is 2.9 mgd with peak summertime demands approaching 6.5 mgd. The WTP can also be fed using raw water supplied from the Talent Irrigation District's (TID) pipeline. TID water is used to supplement the WTP during low watershed conditions in reservoir.

The Ashland WTP site is approximately 0.6 acres in size, and is constrained by the Ashland Creek roughly to the east and south, and by a cliff to the north. The entire plant is gravity flow. Water is pulled from the Ashland Creek via a 36-inch raw water tailrace structure.

The treatment process consists of rapid mix, mechanical flocculation, granular media filtration, and chlorination. The water flows through a flash mixing process, then to the flocculation basins. The high rate filtration plant continues utilizing alum as a coagulant to aid particle agglomeration and soda ash for alkalinity adjustment and pH control. A chlorine solution is fed immediately ahead of the flocculation tanks. The chlorine feed is adjusted in response to the water temperature. Following flocculation, the water flows through the filter beds and then into a 168,000-gallon clearwell where the water is chlorinated and distributed to the system.

Alum, sodium hypochlorite, soda ash, and activated carbon can be mixed with the raw water in the flash mixing tank as part of the treatment process to aid in the removal of solid particles and other contaminants. Alum, soda ash, cationic polymer, and potassium permanganate are added via a mixer and the flow is sent through flocculation basins. The powdered activated carbon is used only seasonally when TID water is included in the system to treat any taste and odor problems or if the color is high. Color may be the result of organic matter, manganese, copper, or iron in the water. The activated carbon absorbs the organic material in the raw TID water, to remove the color.

The original plant construction included a previous sedimentation basin that was repurposed into the current chemical building. A separate chlorine building is located next to the old sedimentation basin structure. A 12.5% sodium hypochlorite solution is fed via a peristaltic pump to the influent mixer and the clearwell. All chemical pumps are located in the building basement level near the raw water pipeline and the flash mixer. Existing parallel sedimentation basins were repurposed into flocculation basins where redwood baffles and mechanical vertical flocculators were installed to help to grow the microfloc. Sediment from the flocculation basin and the filter backwash waste is piped to a sludge lagoon. After flowing through a flow control box at the end of the flocculation zone, the water is sent through one of six dual media filters that consist of sand and anthracite coal layers. There are two additional filter basins that have been abandoned. Each filter is equipped with automatic rate of flow controller valves. These filters remove remaining particles in the water before it enters the clearwell. A filter backwash system of tanks and pumps is also included. Backwash water for the filters is pumped from the clearwell. Beneath the filters, there is an air scour system and associated equipment. Above the filter gallery, there are administration offices and a SCADA workstation area.

Solids from the filters are routed to a pond, which is eventually sent to the sewer. After the filters, product water is flows to the clearwell. After the clearwell, the chlorinated effluent flows to the downstream Crowson Tank finished water reservoir located off site.

3.1.1 Summary of Existing Plant Evaluation by Discipline

From a broad perspective, the existing WTP is old with outdated facilities, is located in a hazardous flood and seismic zone, and does not have room to expand to meet future capacity requirements or the ability to provide additional treatment processes to address potential algal toxins or to fully remove taste and odor issues.

The current WTP was partially re-built in 1995. From an engineering discipline perspective, the existing plant contains electrical and control systems that will need replacement or are obsolete, as well as mechanical equipment that is nearing the end of its useful life. City input regarding condition, operations and maintenance issues, and recent improvements, was incorporated into defining the rehabilitation needs. Input from plant staff regarding functional needs was also evaluated. For example, if equipment requires replacement because it is no longer reliable or no longer meets functional needs, the rehabilitation needs reflect this input. Since the plant will need to continue to provide peak capacity into the foreseeable future, many components are slated for replacement in the 20-year planning horizon.

3.1.1.1 Structural

The concrete observed at the existing plant is performing as expected given its service, usage, surrounding environment, and age. Deteriorated and corroded concrete was observed. Minor defects observed included localized concrete spalling, scaling, and cracking.

The structural integrity of the tanks and floors has not yet been compromised due to the deterioration that has occurred to date. However, concrete degradation will continue to occur and spread if left unchecked. Potential repair and rehabilitation methods and mitigation strategies recommended for further evaluation include: performing localized, partial depth concrete crack repairs and protective coating systems.

3.1.1.2 Process Mechanical

To meet the criteria of extending the existing plant useful service life by approximately 20-years, it is recommended that the pumps, gearboxes, and motors be replaced. Based on their assessed condition and operability, it is recommended that process mechanical valves either be refurbished or replaced in the 20-year planning horizon.

In general, it is assumed that replacement would be based on equipment types and sizes to match existing. However, it may be appropriate to replace with a different type of pump, valve or other equipment to better meet plant requirements or City staff preference. In most cases, replacement rather than repair of pumps, valves and other equipment is recommended to achieve the objective of extending service life by 20 years. If an asset is in good condition, and replacement parts are readily available, refurbishment may be more cost effective than replacement. However, it is important to also consider the amount of time the equipment can be taken out of service if it is scheduled for refurbishment.

Process mechanical pipelines were assessed to be in varying condition states. Most piping systems require attention and improvements. Some extent of piping protective systems, coatings and linings will be required to extend piping system useful service life by 20-years.

3.1.1.3 Electrical

In general, it was observed that some electrical equipment is not expected to last another 20 years and is recommended for replacement. Some of the electrical equipment that provides power to pump motors, valves, instruments, and other process related electrical loads is considered obsolete and is due for eventual replacement. The equipment includes:

- Switchgear and motor control centers
- Panelboards
- Disconnects

Based on the evaluation, it was observed that the panelboards serving process-related loads had reached the end of their useful life, with parts becoming difficult, if not impossible, to find. Therefore, panelboards are assumed to be obsolete and are recommended for replacement.

3.1.1.4 Instrumentation and Controls

The existing equipment will not meet the targeted service life of an additional 20 years. Typical instrument service life is 15-25 years, which is within the planning timeframe used for instrumentation components of this assessment and subsequent improvements. Therefore, it is recommended that the equipment be replaced. Much of the existing I&C equipment is nearing the end of its service life or does not meet the desired level of service for I&C equipment.

3.1.2 Facility Evaluation

The inspection of the Ashland Water Treatment Plant relied primarily on visual inspection of the plant assets, with a particular focus on what it would take to maintain useful plant operation for the next 20 years. Digital photos of the plant were taken to document asset condition. Because the plant was in operation during the time of the inspection, the interiors of process structures were not able to be inspected.

Prior to the inspection, the City of Ashland had sent Black & Veatch information on known deficiencies, or desired improvements to the site. The following sections describe the observed condition of each of the process areas of the WTP, and incorporate a description of these known deficiencies.

3.1.2.1 Administration

The assets within Administration area were generally in good condition. This facility includes the control room, offices, lockers, and lab, as well as other miscellaneous site civil structures, such as facility roadways.

The offices were in good condition, with no visible defects, or known issues brought up by the WTP staff. Within the lab, the sample sink needs to be replaced. The metal shelf stands have begun to corrode, and the narrow sink might not effectively suit technicians' needs (Photo 3-1). It was brought up by the City that they would like the shower facilities to be updated in the locker room. Furthermore, the City voiced a desire to recoat the plant administration building.

Photo 3-1 – Lab in Administration Building

Photo 3-2 – Potable Water Storage Tank and Hydro-Pneumatic Tank

In terms of site civil assets, the plant roadways appeared in good condition, with no visible defects. However, the City would like for the roads to be improved to accept bulk chemical deliveries. The current chemical delivery truck is not able to provide reliable deliveries, and newer trucks might have trouble navigating the roads on site. With geological site constraints caused by the canyon walls, it is unlikely that the roads will be able to be enlarged enough to accommodate a larger truck. The potable detention tank is adequate and there were no observable defects. However, the hydro-pneumatic tank will require eventual replacement in the 20-year planning horizon. A photo of the potable water storage tank and the hydro-pneumatic tank are above (Photo 3-2). Lastly, there are several concerns with the safety equipment installed on site. The fire protection system has an alarm component only and it does not include any fire suppression measures. This system should be updated to meet NFPA code. There are two emergency eyewash/shower stations on site. They don't have freeze or scald protector valves installed, which would be recommended as a safety provision for the WTP staff. An emergency eyewash/shower should also be installed in the chlorine building (preferably inside the containment area). The WTP staff would currently have to exit the building and go to the adjacent chemical building to access an emergency eyewash/shower.

The City would like intercom and video feeds throughout the site to record video when the operators are not on site, as well as a remote controlled electric gate. This would be an optional improvement recommendation, and not viewed as essential for plant operation for the next 20 years.

3.1.2.2 Plant Influent

The WTP tailrace structure, influent weir, and influent line were all structurally in good condition. It was noted by the City that there is a desire to be able to actuate the influent weir electronically, instead of manually adjusting the weir height. Furthermore, the 36-inch butterfly valve on the plant influent line doesn't close completely or modulate effectively. This should be replaced. Lastly, the City would like the hydroelectric generator bypass to be redesigned to eliminate vibration issues and improve flows. They are currently limited to 5 mgd with this bypass pipe. Photos of the influent weir and 36-inch butterfly valve are below (Photo 3-3 and Photo 3-4).

Water from the Talent Irrigation District is used to supplement supply during periods of drought or low water years. A 24-inch steel water pipe feeds the WTP from the Terrace Street Pump Station. The pipe supports were not closely inspected; however, material under some of the supports appears to be washing away. Furthermore, when there are high-level flows, the pipe is submerged in the creek, subjecting it to damage from debris (Photo 3-5).

Photo 3-3 – Influent Weir

Photo 3-4 – Influent 36-inch Butterfly Valve

Photo 3-5 – Talent Irrigation District Influent Pipeline

3.1.2.3 Chemical Feed

The assets within the chemical feed process group were in fair condition. The individual chemical feed systems are discussed in the sections below. Some of the systems were in better condition than others, but, generally speaking, it is ultimately recommended to replace the entire Chemical Building and the equipment inside in the next 20 years.

Alum Feed

The alum feed system consists of one alum tank, two alum feed pumps, and two alum feed motors. The new chemical building was built around the existing alum tank, with little regard given to tank replacement or maintenance (Photo 3-6). It was reported to Black & Veatch that the transducer located in the tank isn't functioning. However, to replace this transducer, the tank top would need to be removed, and there is limited space within the chemical building to perform this work. Additionally, if the tank were ever needed to be replaced, the building and second floor would likely have to be modified to accommodate this work.

The older auto diaphragm feeder pump was replaced with a peristaltic pump 2 years ago, and the City is very satisfied with the performance (Photo 3-7). However, the older pump can only be manually operated and replacement should be considered.

Photo 3-6 – Top of Alum Tank

Photo 3-7 – Base and Pedestal of Alum Tank

Soda Ash

The solution tank, hopper, storage tanks, feed pumps, and feed motors are all part of the soda ash system. The soda ash is used to maintain or adjust pH for finished water, and the City has mentioned that they would like to develop an improved caustic soda feed system to replace the current one. The current system is functional, and there weren't any visible defects. However, the age and efficacy of the system should be taken into consideration, and B&V concurs with the City that the system should be replaced in the next 10 years. The current system will be unable to meet any future higher pH requirements. Furthermore, the lower level of the chemical building is susceptible to flooding. Photos of the soda ash system are below (Photo 3-8 and Photo 3-9).

Photo 3-8 – Soda Ash Hopper

Photo 3-9 – Soda Ash Hopper, Dissolving Tank, and Metering Pumps

Powdered Activated Carbon (PAC)

The PAC hopper, auger feed and motor, and an educator make up the PAC feed system (Photo 3-10). Similar to the Soda Ash system, the PAC system is susceptible to flooding since part of the hopper is located on the lower level of the chemical building. There were no significant observable defects with the PAC system. However, the PAC system does not meet the desired level of service, and has not been effectively treating taste and odor during high Geosmin events. Furthermore, handling PAC can pose a health risk. The MSDS lists that the primary concerns for occupational exposure are skin contact and inhalation in the form of dust. The dust may cause eye irritation, slight skin irritation, and possible respiratory tract irritation. In confined spaces, it can adsorb oxygen, and asphyxiation may result. The dust from loading PAC can also lead to an explosive environment. It is recommended that this system be replaced in the 10- to 15-year timeframe.

Photo 3-10 – Powdered Activated Carbon Hopper

Potassium Permanganate (KMnO4)

The potassium permanganate system is comprised of the hopper, auger feeder and motor and an educator feed system. It is located on the lower level of the new chemical building, which is prone to flooding. It has been noted by the City that the KMnO4 system does not meet the desired level of service, and has not been effective at treating taste and odor during high geosmin events. It is recommended to replace the potassium permanganate system altogether, either with a newer feed system, or with a better oxidation system.

Polymer

The polymer system is comprised of two tanks, filter polymer aid (Superfloc N-300) feed pumps and motors, and cationic polymer (Superfloc C-573) feed pumps. Overall there were no significant visible defects detected with the polymer feed system. There are no visible defects with the LMI Polymax feed system. However, the City is hoping to upgrade the current cationic polymer diaphragm feed pump with a peristaltic pump. At this time, they would also like to reevaluate alternate injection points other than mixer M015. Due to lifespan expectancy, it is recommended to replace this system in the next 10 years. The filter polymer aid system is functional, but obsolete. The City has also reported that it delivers polymer aid unevenly to the filter surfaces. It is recommended to replace this system in the next 10 years. The tanks for the polymer feed and mixing are functional and should be used until the end of their useful life. However, the City has stated that functionally only a third (approximately 33 gallons) of the working capacity of each tank are able to be used. In the 10- to 15-year timeframe, the current tanks should be replaced with smaller, more adequately sized tanks. The City currently has planned replacements for both polymer systems budgeted. Photos of the polymer system are below.

Photo 3-11 – Filter Polymer Aid Hopper and Mixing Tank

Photo 3-12 – Filter Polymer Aid Feed Tanks

Photo 3-13 – Cationic Polymer Feeder

Hypochlorite

One 3,000-gallon tank and three feed pumps make up the hypochlorite system. The current tank was installed in 2008 and is nearing the end of its life (Photo 3-14). It is recommended to replace the tank in the next 10 years. As seen in the photo below, there is corrosion near the floor on some of the concrete masonry unit (CMU) bracing angles, mostly likely due to sodium hypochlorite contact (Photo 3-15). If the CMU blocks are not internally reinforced, this corrosion could ultimately weaken the structure. For this reason, when the tank is replaced, this will trigger removal of the containment basin and a major building demolition and renovation due to structural and safety considerations. The City has also voiced that they would like bulk chemical delivery if possible. This is not feasible at the existing facility. Bulk deliveries would require construction of a transfer station on the plant access road downhill from the existing plant with pumps and piping installed to supply the tanks at the plant.

The City has reported that there are signal issues with some of the sodium hypochlorite feed pumps. Pump #2 has frequent operational issues, and Pump #3 has communication issues with the SCADA. It is recommended to replace these pumps in the next 10 years.

The hoist in the Chlorine Building appeared in good condition with no observable defects. Due to its useful life estimate, the hoist will likely require replacement in 10-15 years.

Photo 3-14 – Sodium Hypochlorite Tank and Hoist

Photo 3-15 – Corrosion in Chlorine Building

Miscellaneous

There are several miscellaneous components to the chemical feed process that are discussed in the list below. All replacements are suggested to occur in the next 10 years.

- Due to flooding concerns, and seismic events, the existing Chemical Building is a liability, and is recommended to be replaced in the next 10 years.
- The chemical feed piping is in good physical condition. However, reconfiguring the piping is recommended to add more injection points.
- The chemical feed flow indicators are not functioning correctly and require replacement.
- It is recommended to upgrade all pumps to peristaltic pumps. This upgrade will render many of the valves unnecessary, ultimately creating fewer assets for the City to manage.
- Motor actuators for valves are recommended to be replaced.
- The mixer appears in good physical condition. However, it is in a corrosive, continuous-duty environment, and it is also recommended to be replaced.

Lastly, the sump pumps are currently adequate, and appear in good physical condition. However, they will near the end of their useful life in the 10- to 15-year range, and are recommended to be replace in that window.

3.1.2.4 Pretreatment

The Pretreatment process is made up primarily of the Flocculation Basins. During the inspection, it was observed that the Flocculation Basin structures were in good condition. However, it is recommended that they be recoated within the next 10 years to preserve concrete integrity. The City has mentioned that they would like to upsize and relocate the drain, as it is currently not at the bottom of the basin. Upsizing and relocating the flocculation basin drain would trigger major structural modifications, and this recommendation should be considered optional. It was also reported by the City that there has been hydraulic short-circuiting in the Flocculation Basins. Black & Veatch would recommend rewiring the flocculation motors to spin in the opposite direction and disassembling and reversing the vertical paddle mixers to improve settlement (Photo 3-16). This should be done in the next 10 years.

The Flow Control Box Structure is in good condition structurally, but it is undersized, and it is doubtful that it would be able to handle peak flows of 7.5 mgd (Photo 3-17). Structural modifications to enlarge the overflow drainage box are recommended, including upsizing the drain piping and fixing the slide gate. This is recommended to be constructed in the next 10 years. Lastly, as an optional improvement, underwater lights could be installed in the basin for enhancing visualization of floc flow patterns.

Photo 3-16 – Flocculation Basin and Paddle Mixer

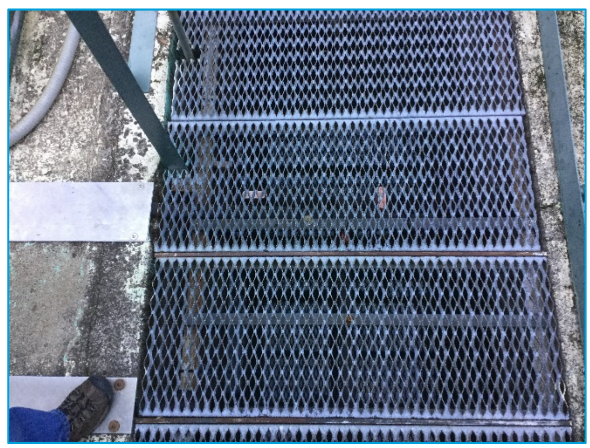


Photo 3-17 – Grating Above Overflow Box

3.1.2.5 Dual Media Filters

The Dual Media Filters were in fair condition (Photo 3-18). There is evidence of cracking within the filter structures, and possible leakage, visible from the efflorescence on the exterior of the filter concrete wall and from the leakage pattern staining around the air supply line on the exterior wall (Photo 3-20 and Photo 3-21). The coating is also failing in some areas. Concrete cracks should be repaired, and the filter basins should be recoated in the next 10 years. The City has mentioned that excessive debris falls into the basins during normal operation, affecting filter performance. Recent removal of overhanging trees has improved this situation. While not necessary for proper operation of the plant, a canopy structure over the Dual Media Filters would be considered an optional improvement to the plant to prevent the debris entering the filters. Filters 7 and 8 are currently not operational, and it is recommended to rehabilitate these filters in the 10- to 15-year timeframe to meet future treatment process demand (Photo 3-19). Rehabilitation would require concrete crack repair and surface restoration in addition to replacement of process mechanical equipment, launders and piping penetrations. In the same time frame, it is expected that existing filter media will reach the end of its useful life, and should be replaced. The filter influent pipe showed some signs of surface corrosion, and it should be recoated in the 10- to 15-year timeframe as well. When this effort is undertaken, it is recommended to perform a detailed condition assessment of the pipe.

The backwash pumps were in good condition, with no major observable defects detected. However, they are near the end of their useful life, and will require a major overhaul or should be replaced in the next 10 years. The backwash pump flow meters and instrumentation should also be replaced in the next 10 years. The backwash piping should be recoated and inspected for integrity during this same time. The backwash lagoon is expected to need cleaning in the next 20 years, and the backwash water samplers will also likely need to be replaced during this time. The City would like to remove the original steel backwash tanks on the slope above the WTP, which are no longer in use. These tanks present a dangerous risk to the facility if they were to fall. Although not critical to continued plant operation, removal of the steel backwash tanks should be considered.

There were no notable defects with the blower motor. However, it is subject to major overhaul or replacement due to reaching asset life expectancy during the 20-year planning horizon. This would occur in the 10- to 15-year timeframe. Similarly, the process air valves would need to be replaced in this same time frame.

Photo 3-18 – Dual Media Filters

Photo 3-19 – Abandoned Dual Media Filter #7

Photo 3-20 – Air Scour Air Supply (Evident Leakage)

Photo 3-21 – Efflorescence on Exterior Dual Media Filter Wall

3.1.2.6 Clearwell / Product Water

The Clearwell is a concrete tank located beneath the Backwash Pump Station. It was not physically able to be inspected, but the City informed Black & Veatch of operational issues related to the tank. The sealing material on the cold joints within the Clearwell are deteriorating, and should be re-caulked in the next 10 years. There are currently dead zones within the Clearwell resulting from poor dispersion of the sodium hypochlorite. It is recommended to improve delivery piping to improve dispersion within the Clearwell in the next 10 years. The City would like to add a drain pipe from the Clearwell to the sludge pond or plant sewer drain. However, Black & Veatch considers this an optional recommendation and not necessary for continued plant operation. The Clearwell sample pump should also be changed to a peristaltic type in the next 10 years to prevent loss of prime. It is recommended that the contact basin drain valves and slide gate be replaced, as the City reports that they currently leak.

The plant has a potable water system to serve the plant water needs (drinking water, restrooms, chemical feed systems etc.). Currently, the potable water pump suction line isn't accessible without entering the Clearwell, and it is recommended to reroute the piping to be able to replace the foot valve at some point. Furthermore, the potable water pumps will most likely have to be replaced in the 20-year planning horizon.

3.1.2.7 Electrical

Electrical equipment was visually inspected while the plant was in operation; because of safety considerations, none of the cabinets were opened. Black & Veatch relied on information from the plant operators to make plant improvement recommendations. The plant generators are currently adequate, and no observable defects were detected. However, it is expected that the generators will require a major overhaul or need to be replaced during the next 20 years. Similarly, transformers, MCCs, breakers, cabling, and power lines were all in good condition, but will likely need to be replaced in the next 20 years. The building and yard lighting should also be replaced with LEDs as the existing lighting fixtures are considered to be economically obsolete. The photos of the electrical equipment shows arc-flash related labels/stickers which would indicate that at some point, an arc-flash analysis or study was conducted. NFPA 70-E guidelines stipulate that an arc-flash analysis be conducted every five years. Representative photos of electrical equipment are below.

Photo 3-22 – Motor Control Center

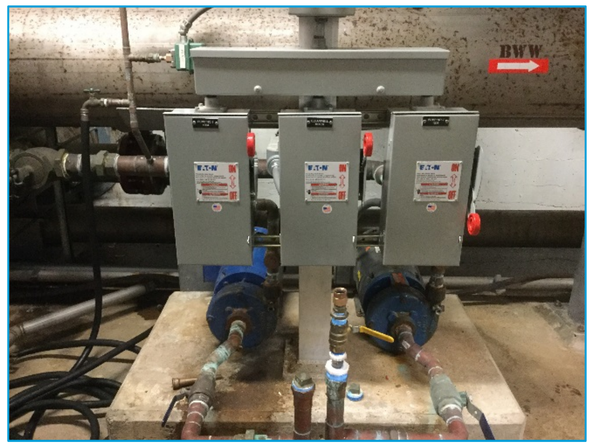


Photo 3-23 – Potable Water Pump Disconnects

3.1.2.8 Instrumentation & Control

Similar to the electrical assets, Black & Veatch relied on the plant operators to make improvement recommendations for I&C equipment. Instruments typically have a 10- to 20-year lifespan, so there are many instruments that will need to be replaced in the next 20 years. Specifically, the Flocculation Basin level sensor should be replaced in the 10- to 15-year timeframe. The following recommendations should all be addressed in the next 10 years:

- Plant-wide, the City would like to update the SCADA system and PLC telemetry to provide pressure and flow indication for plant water supply. The telemetry unit should also be relocated.
- In-line pH probes were in good condition, but will need replacement at the end of their useful life.
- Recommended to move the streaming current detector to the lower chemical room for faster response time. The instrument will also need to be replaced near the end of its life expectancy.
- Flowmeters were in good condition, but will need replacement at the end of their useful life.
- Turbidity meters were in good condition, but will need replacement at the end of their useful life.
- It is recommended to add a TOC in-line analyzer.

- Inflow meters should be replaced as they are nearing the end of their life expectancy.
- The WTP finished water effluent pipe empties as it flows to Crowson Tank during filter backwashes, resulting from inaccurate measurements. It is recommended to relocate the plant effluent flowmeter 1000-yards farther downstream to provide more accurate information.
- Upgrade Wonderware software on plant computers.

Representative photos of instruments are below.

Photo 3-24 – Dual Media Filter #1 Turbidity Meter

Photo 3-25 – PLC Telemetry Unit

3.1.3 Asset Life Expectancies

The age of an asset, together with its typical useful life, is an important characteristic used to assess an asset's condition. Because the actual installation date of most of the existing facility assets is unknown, the assumption of asset age was based on available drawings, field observations or staff input. Where assets appeared near or beyond their expected life, this factored into developing the rehabilitation needs. Assets that have exceeded their useful life are generally recommended for overhaul or replacement. Table 3-1 provides guidelines on typical life expectancies for plant assets.

Table 3-1 Asset Effective Life Expectancies

ASSET TYPE	EFFECTIVE LIFE (YRS.)
Civil structures	50-75
Pressure piping	60
Gravity pipelines	100
Pumps	40
Valves	30
Mechanical Systems / Motors	25-35
Electrical Systems / Components	30
Instrumentation and Controls	15-25
Building assets	30

3.1.4 Planning Horizon

This study needs to address reliable operation of the plant into the future based on a criterion set by the City for extending the remaining useful service life of the existing facilities by an estimated 20 years. The assumption is the existing plant would be required to remain operational for the next 20 years with no significant changes in its current treatment configuration. After this time, the existing plant may be decommissioned and replaced by a new plant. The assessment identified not only improvements required in the near term based on current condition, but also those improvements needed to maintain reliable operation over the 20-year planning horizon. Therefore, forward forecasts on replacement needs were developed for those assets that may not currently need work. For example, a motor that was very recently overhauled does not currently need work. However, the next improvement cycle, which may be in 15 years, has been included in the cost forecast.

3.2 NEW WATER TREATMENT FACILITY

This section presents the basis for developing a conceptual cost for constructing a 7.5 mgd new water treatment plant. The cost presented is an AACE Level 5 construction cost (with an accuracy range of -50% to +100%). The assumptions used to develop the conceptual cost are presented below.

3.2.1 Site and Hydraulics Considerations

The site identified to construct a new plant is located a couple of miles downstream of the existing plant site. The elevation of this site is lower than the existing plant site. This elevation difference would allow gravity flow of raw water into the new plant. However, because the new site is at a lower elevation, gravity flow of treated water into the existing downstream reservoir may not be possible. Additional analysis is warranted to confirm that gravity flow from the plant to the distribution system is not possible. It is envisioned that a part of the existing treated water pipeline from the existing plant could potentially be converted to convey raw water to the new treatment plant. Additional piping would be required to convey raw water to the plant site and treated water from the plant site to connect to the existing pipeline feeding the downstream reservoir.

The site is relatively flat with sufficient area to house the treatment facilities and auxiliary structures. Moderate site work would be needed construct the new treatment plant facilities.

3.2.2 Treatment Process Considerations

To provide a direct cost comparison with the existing plant, it is assumed that the new plant will employ the same treatment processes and chemical feed systems as the existing plant. These will include:

- A microfloc filtration plant that will employ in-line rapid mixing, flocculation followed by media filtration consisting of dual media filters

- Chemical systems will include PAC, Alum, KMnO4, soda ash, coagulant aid polymer, filter aid polymer and chlorine (12.5% sodium hypochlorite).It is assumed that the chemical systems (storage and feed systems) will be located indoors
- Administration building will be included to house offices/laboratory, electrical switchgear, as well as SCADA workstations

3.2.3 Cost Considerations

The conceptual costs for a new 7.5 mgd capacity plant that employs the same treatment processes as the existing plant are presented under Section 4. It should be noted that the costs associated with raw and finished water piping and a small filter effluent wetwell with associated high service pumps should be considered because these components will likely be required with the operation of the new plant. For planning purposes, it is assumed that approximately 0.25 mile of raw water piping and 0.25 mile of treated water piping would need to be constructed.

4.0 Cost Comparisons

Total life-cycle cost is evaluated based on the addition of the life-cycle O&M to the total project cost. The total life-cycle costs were developed for an equivalent 7.5 MGD WTP. This cost represents the total cost of ownership of the plant at the end of 20 years normalized to today's dollars.

The estimates presented in this report are order-of-magnitude estimates as defined by the Association for the Advancement of Cost Estimating (AACE). Typically, an order-of-magnitude estimate is expected be accurate within plus 100% to minus 50% of the estimated cost. Cost estimates are considered AACE Level Class 5 prepared with 0% to 2% project definition to be used as a general guideline for more specific and detailed studies.

The developed estimates have been prepared for guidance in evaluating the cost of maintaining the existing plant versus constructing a new plant. These cost estimates are derived from the information available at the time of the estimate. Detailed project costs will certainly depend on actual labor and material costs, competitive market conditions, final project costs, implementation schedule, and other variable factors. As a result, the actual costs can be expected to vary from the estimates presented herein.

There is a substantial amount of uncertainty in the opinions of probable construction cost, particularly with site development. Thus, the site considerations have been removed from this evaluation.

4.1 COST CATEGORIES

Order-of-magnitude estimates of costs (in 2018 dollars) were developed for plant rehabilitation. The cost estimates are comprised of several components described in this section:

- Equipment-specific improvement construction costs
- Rehabilitation costs based on site visit, industry knowledge and previous reports
- Cost allowances and contingencies

4.1.1 Equipment-Specific Construction Costs

To the extent possible, construction costs for equipment repairs, overhauls and replacements were developed. These costs represent installed costs, including purchase of equipment and labor to install. This methodology was implemented for expediency, as the project budget and schedule did not allow for development of construction cost estimates for each individual asset.

Asset replacement costs from equipment inventories from other projects were used as a starting point for determining the cost data. Typically, general equipment specifications (e.g. motor hp, valve size, etc.) would be used to assign replacement costs to individual assets. As this information was not readily available, replacement costs were assigned based on comparable equipment application and assumed size ranges. This approach represents a rapid means of compiling cost estimates. A more detailed approach, such as assigning replacement costs based on nameplate data for individual assets may be recommended for the future.

4.1.2 Rehabilitation Costs

Rehabilitation costs for the existing facility were based on results from site visit as well as Black & Veatch's knowledge and experience with similar projects across the United States. The rehabilitation recommendations and associated cost estimates are tabulated for reference in Attachment A.

4.1.3 Cost Factors and Contingencies

A number of cost factors, allowances and contingencies were applied to the construction costs to estimate an opinion for the total probable plant rehabilitation cost. These factors account for the conceptual nature of the base construction costs, project costs such as engineering, and escalation. The cost factors were applied consistent with industry assumptions. Table 4-1 describes the cost factors applied.

Table 4-1 Cost Factors to Develop Total Project Costs

COST FACTOR ITEM	FACTOR SUB ITEMS	PERCENT ALLOWANCE	NOTES	CUMULATIVE COST FACTOR
Site Work (misc. costs) Yard Piping Electrical Instrumentation and Controls		8% 9% 10% 2.5%	On Constr. Cost	1.08 1.17 1.27 1.30
Estimating Contingency		15%	On Total Const.	1.49
Contractor Mark Up Costs (Cumulative) ■ Overhead ■ Profit ■ Mobilization/Bonds/Insurance ■ Contingency	 7% 10% 3% 4%	24%	On Total Const. + Contingency	1.85
Planning, engineering, and const. management ■ Permitting ■ Environmental Review ■ Public Outreach ■ Engineering design ■ Engineering costs during construction ■ Const. management services ■ Commissioning/Startup ■ City costs ■ Construction change order allowance ■ Contingency	 1% 1% 1% 8% 2% 7% 3% 5% 5% 15%	48%		2.74
Escalation	2%	10%		2.84
			Final Factor	2.84

Costs presented in this table include contingencies (30% for estimating and non-construction related costs) and other soft costs (33% for planning, engineering, and const. management). The final project cost factor represents the cumulative cost percentages and is useful in comparing construction costs and overall project costs.

A cost escalation of 2% per year over year has been assumed. It is anticipated that the escalation would be applied to represent the costs at the time of construction. It is conceivable that a new treatment plant would be constructed within the next 10 years. Thus, a mid-point in construction escalation of 5 years is assumed to arrive at the escalation allowance of 10%. By comparison to the existing plant rehabilitation needs, it is estimated that many of the recommended actions are also grouped in the 0- to10-year time frame for implementation. This is further described in the next section (Section 4.2). Thus, the same cost escalation factor would be applied for the existing plant rehabilitation needs.

4.2 PRIORITIZATION OF IMPROVEMENTS

Rehabilitation recommendations were organized with both short-term (immediate repair and replacement activities) and long-term replacement needs. The City may continue to replace or rehabilitate existing plant assets aligned with real time conditions at the plant. Refinements were made to the rehabilitation recommendation time frames to maximize the remaining useful life of the existing facilities.

Rehabilitation recommendations for each subsystem are assigned a timeframe for implementation to ensure continuous and reliable operation. The timeframe considers the typical useful life of a given asset, its current condition, the service date, and City staff input.

Rehabilitation needs were developed at the asset level and summarized at the subsystem level. The recommendations and timeframe for improvements are presented at the subsystem level with the anticipation that improvements for all assets within a subsystem would occur within the same timeframe for cost efficiencies and to reduce impacts to plant operations.

Recommendations are presented with a proposed timeframe for implementation such that budget plans can be developed. Each recommendation is placed into one of three timing phases: short-term (0 to 10 years), mid-term (10 to 15 years), and long-term (15 to 20 years). The overall summary of the rehabilitation recommendations show that the majority of the work needs to be performed in the short-term as demonstrated in Figure 4-1.

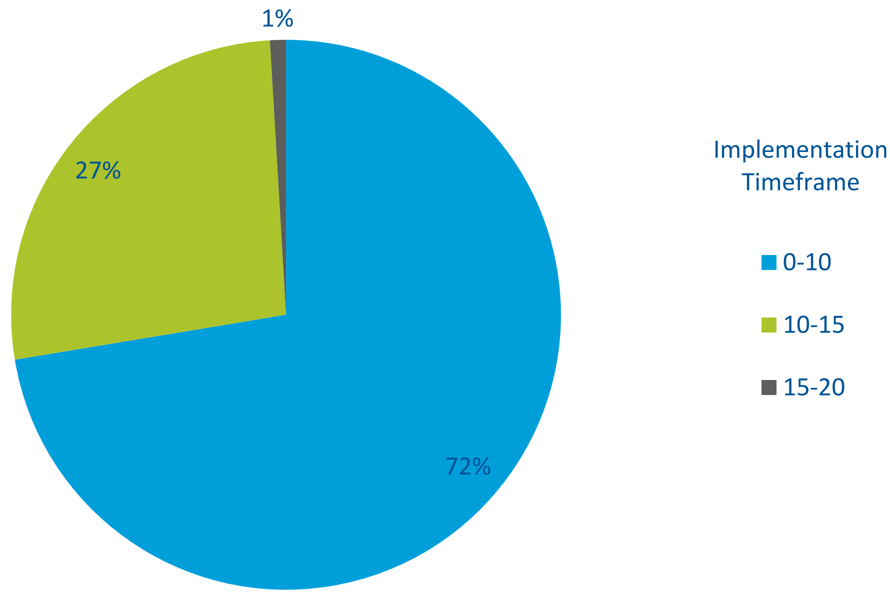


Figure 4-1 Itemization of Rehabilitation Cost Allocations Over Time

Figure 4-1 shows that approximately 72% of the rehabilitation needs are recommended to be performed in the short-term time frame. The graphic also shows that only a very small percentage of rehabilitation work (1%) could be performed at the end of the 20-year planning horizon. Some realignment of the timing intervals can be considered if asset run-to-failure strategies are employed. Although this strategy would only be viable if a new plant was ultimately decided as the City's future direction.

4.3 SUMMARY

The cost comparisons are provided for construction of a new plant versus the rehabilitation recommendations for the existing plant. The costs are organized in the following categories:

- Administration
- Plant Influent
- Chemical Feed
- Flocculation Basins
- Dual Media Filters
- Clearwell / Product Water
- Electrical
- Instrumentation & Controls

Costs were developed for the necessary rehabilitation required for the existing plant. The rehabilitation recommendations and associated cost estimates are provided in Attachment A. These costs were then grouped in the respective categories outlined above. Table 4-2 shows the comparative capital costs for the existing plant and a new 7.5 mgd capacity plant. Note the sub total amounts have been rounded to the nearest $1,000 dollars.

Table 4-2 Capital Cost Comparisons

ITEM	NEW PLANT	EXISTING PLANT
Flocculation Basins	$1,330,000	$472,000
Dual Media Filters	$3,637,000	$702,000
Chemical Feed	$923,000	$878,000
Administration	$1,000,000	$181,000
Plant Influent (Existing WTP) & Offsite Inf/Eff. Piping (New WTP)[1]	$550,000	$20,000
Clearwell/Product Water	$347,000	$83,000
High Service Pumps[2]	$400,000	
Site Work	$645,000	
Yard Piping	$725,000	
Electrical	$806,000	$186,000
Instrumentation & Controls	$201,000	$128,000
Estimating Contingency (15%)	$1,584,000	$397,500
Total Facility Cost	**$12,148,000**	**$3,047,500**
Contractor Mark Up Costs (Cumulative)		
Overhead (7%)	$850,000	$213,325
Profit (10%)	$1,214,000	$304,750
Mobilization/Bonds/Insurance (3%)	$365,000	$91,425
Contingency (4%)	$486,000	$121,900
Total Contractor Markups	*$2,915,000*	*$731,400*
Subtotal Construction Cost	**$15,063,000**	**$3,778,900**
Non-Construction Costs (Additive)		
Permitting (1%)	$150,000	$37,789
Environmental Review (1%)	$150,000	N/A
Public Outreach (1%)	$150,000	N/A
Engineering (8%)	$1,200,000	$302,312
Legal/Administration (0.5%)	$75,000	N/A
Construction Services (7%)	$1,050,000	$264,523
Commissioning/Startup (3%)	$450,000	$113,367
Contingency (15%)	$2,250,000	$566,835
Total Non-Construction Costs	*$5,475,000*	*$1,284,826*
Escalation (2%/yr. @ 5 yrs. = 10%)	$2,053,000	$506,373
Total Project Cost	**$22,591,000**	**$5,570,099**
Total Project Cost (Rounded to nearest $1000)	**$22,591,000**	**$5,570,000**

[1] Refer to Section 3.2.3. The length of influent and effluent piping used for cost estimating is 0.25 mile each.
[2] A finished water pumping station for the new plant site is expected to send flow to the downstream reservoir.

It should be noted in the above table that some costs are not applicable to rehabilitation of the existing plant. Non-construction related costs associated with environmental review, public outreach and legal/administrative functions are not expected to be incurred on the existing plant. As such these cost assumptions for non-construction are provided for reference as they apply to the new plant for comparison purposes but have not been included in the total project cost for a new plant.

Based on the comparison table the following trends are evident. Overall rehabilitation costs for the existing facility are approximately 25% of the construction costs of a new plant. Within the individual facility areas, the improvement cost for the existing chemical feed is nearly equivalent to the construction costs of a chemical feed area in a new facility. This intuitively reinforces the results of the existing plant evaluation as the chemical feed area was noted to require the most extensive amount of rehabilitation. Additionally, the rehabilitation costs associated with Instrumentation & Controls are also 64% of the new I&C plant construction cost. The City has kept up with upgrades of I&C equipment over time and these ongoing costs are expected going forward with the 20-year planning horizon of the existing facility as the life expectancy of these systems is shorter than other asset types.

From a broad perspective, it is feasible to continue to utilize the existing facility over the 20-year planning horizon at a lower initial investment than constructing a new treatment plant. For the purposes of this analysis, all efforts have been made to provide an equivalent cost comparison between the existing facility rehabilitation requirements to the construction costs associated with an equivalent new facility.

4.3.1 Additional Considerations

The capital cost comparison has worked toward providing an equivalent comparison between the two primary alternatives of rehabilitating the existing plant and constructing a new plant. However, it is prudent to provide discussion on the additional factors that should be included for the City's consideration. Follow up studies to further vet these considerations, including performing business case evaluations that factor in the importance of economic and non-economic factors should be performed. For brevity, the following table (Table 4-3) provides some of the additional considerations that may have either positive or negative impacts associated with either alternative. General discussions of these considerations are provided following the table. The potential impacts of these issues can be rated by the City according to their importance in a triple bottom line analysis that considers social, environmental and financial factors.

Table 4-3 Considerations with Positive/Negative Impacts

ISSUE	POSITIVE OR NEGATIVE CONTRIBUTION	
	Existing Plant	New Plant
Additional Rehabilitation Needs	-	+
Flood Risks	-	+
Seismic Risk	-	+
Operation Costs	+	-
Maintenance Costs	-	+
Treatment Requirements	-	+
Capacity	-	+

4.3.1.1 Additional Rehabilitation Needs

It should be noted that the rehabilitation needs were based on a cursory site assessment and that the actual extent of rehabilitation could be greater than what was identified based on visual inspection and input from operations staff. Based on the limited extent of inspection information available, this consideration could negatively impact the existing plant alternative as actual rehabilitation costs could be higher than anticipated.

4.3.1.2 Flood Risks

The existing plant is subject to flooding from the adjacent Ashland Creek. The existing plant has flooded on multiple occasions. Flooding presents a risk to the reliable operation of the existing facility. The impacts of flooding damage to the existing plant and the cost to mitigate flooding cannot be well quantified. It is recommended the City evaluate the acceptable risk tolerance for flooding impacts in the decision for rehabilitating the existing facility or construction of a new plant. A new plant would be located in an area less prone to flooding and thus has a positive contribution as compared to that of rehabilitating the existing facility.

Costs to construct a flood wall to mitigate flooding are provided in the City's WCRS & CWMP report prepared by Carollo. The report indicates the direct costs for construction of the flood wall are estimated at $1 Million dollars in 2010. The present cost of the flood wall in 2018 is $1.21 Million dollars using Engineering News Record average construction cost indices for present day adjustments. When applying the 2.84 cost factor developed in Section 4.1.2, the total present day project costs for the flood wall are estimated at $3.44 Million dollars.

The flood risk could potentially be mitigated by constructing a flood wall; however, its ability to withstand a major flood event is questionable. Constructing a flood wall next to existing basins and structures along the creek is risky because it could potentially damage the existing facilities due to vibration related to construction activities. As such, the cost to mitigate the flood risk cannot be determined with reasonable certainty and therefore not included in the cost comparison.

4.3.1.3 Seismic and Landslide Risks

The existing plant is vulnerable to failure from a seismic event. Rehabilitation recommendations presented in Table 4.2 do not reflect the costs to upgrade the existing facilities to current seismic standards. The original existing structures built in 1948 are lightly reinforced compared to the current ACI 350 requirements. Upgrades to the WTP structures have been performed since original construction. In general, an increase in the gravity loads by more than 5 percent from the original design would typically require a seismic upgrade to the current code standards. It is unclear if the previous upgrades resulted in the seismic resiliency improvements. Furthermore, any vibration or construction activity around these structures (e.g. construction of a flood wall next to the flocculation tanks and filter cells) could potentially result in concrete cracking and leakage. A detailed structural assessment of the existing structures is outside the scope of this document; however, a cursory review indicates that the existing structures do not meet the current seismic code requirements. Assuming that the current loading on the existing structures remains the same, it is not required to upgrade the existing structures to meet the current seismic codes. However, in a seismic event, these structures could suffer significant damage and impair the ability of the plant to produce potable water. Due to the age and condition of the facilities it is not feasible to upgrade the existing structures to current seismic standards in a cost effective manner. Depending on the severity of a seismic event, the time to repair and make the plant functional could range from days to months.

In its current location in the canyon, the existing plant is susceptible to damage from landslides. Similar to the seismic risk, the extent of damage that the plant could suffer will depend on the severity of a landslide event.

4.3.1.4 Operational Costs

Currently the existing plant benefits from gravity flow conditions which reduce operational costs associated with influent or effluent pumping. Proposed locations downstream may result in a new plant requiring some final effluent pumping to send treated water to the distribution system. Capital costs for a final effluent high-service pumping station have been estimated at $400,000 as presented in Table 4-2. The City would need to consider the additional operating costs of this facility as part of the new treatment plant design.

Furthermore, increased pumping costs and operational costs can be expected with enhanced treatment technologies (such as microfiltration, ozone or ultraviolet disinfection), should the City decide to employ these technologies in order to fully address the current taste and odor issues, future algal toxin treatment or other regulatory requirements. These costs are expected to be similar for both alternatives (existing plant vs new plant). Due to lack of space, it is envisioned that these facilities would need to be located offsite.

With new treatment technologies, it can be expected that some labor costs could increase. These may be partially offset through enhanced automation of the new facility which would require less staff oversight and control. The lower operational costs would seem to be a benefit for continued use of the existing plant. The possible opportunities for reducing operational costs at a new plant may make this consideration neutral between the two alternatives. Regardless of the result, additional financial analysis for operational costs should be undertaken as part of the pre-design effort for a new plant and included in the decision making process for alternatives.

4.3.1.5 Maintenance Costs

As opposed to the operational costs, the reduced maintenance costs would favor the new plant. Currently the City spends a greater extent of time and resources in maintaining the existing plant. A new facility would diminish the maintenance costs. Initially the new plant would incur low maintenance costs. Over time with any facility, routine maintenance is expected. The benefit for reduced maintenance of the new facility may only extend during the initial start-up, commissioning and warranty period of the new plant. Thus after this time, it can be expected that maintenance on the new facility would be somewhat comparable to the existing facility. However, the existing plant continues to age and will certainly require an increasing amount of maintenance over the 20-year planning horizon.

Situations can occur, such as at the existing facility, where maintenance activities are deferred. This can create a backlog of maintenance to restore the facility to suitable operating conditions. It should be noted that if a new plant is ultimately on the horizon for the City, the City may elect to defer maintenance in a strategy to run assets to failure. This strategy is not necessarily advisable for any assets critical to plant operation but could potentially reduce the City's cumulative investment in the existing plant.

4.3.1.6 Treatment Requirements

The existing plant is able to produce high quality drinking water using the current microfloc/filtration treatment process. It is currently unknown if additional treatment would be required by EPA as the regulations evolve in the future. However, due to lack of space, it is not possible to construct additional treatment processes or modify existing facilities to accommodate new treatment while keeping the plant in operation. Additionally, exposure of new facilities to other risks (flooding, seismic, landslide) cannot be practically mitigated. As such, the existing plant does not have the ability to meet any additional treatment requirements such as treatment of algal toxins, if required by future regulations. Any additional treatment would need to be located offsite and would require associated infrastructure investment for pumps, piping, and storage to convey to the distribution system.

4.3.1.7 Capacity Requirements

Projections for water treatment capacity needs for the City of Ashland have been prepared under previous master planning efforts. It is beyond the scope of this study to consider future capacity requirements. Hence, the comparison between the existing plant and the new plant only considers the current fixed water treatment capacity of 7.5 mgd. When considering the future capacity requirements, the existing plant may be able to be marginally expanded by rehabilitating the two abandoned filter basins (Filters #7 and #8) and returning these to service. Additionally, the City has redundant provisions for treated water supply from the TAP pipeline for up to 2.1 mgd (City's current water rights). However, the current understanding is that this pipeline is for emergency use and not intended to provide drinking water supply for an extended period of time to the City. The benefit when considering future capacity requirements clearly favors the construction of a new facility that by design could be made expandable to accommodate future capacity requirements.

4.4 CONCLUSIONS

A summary of cost comparisons show that rehabilitation costs for the existing facility are approximately 25% of the construction costs of a new plant. While it is feasible to continue operating the existing facility over the 20-year planning horizon at a lower initial investment, the existing plant has some negative considerations that present a risk to continued operation. The City has the opportunity to accept or mitigate these risks in the decision process. Ultimately, the existing facility has a definitive life span and will reach a point where continual investment is no longer financially prudent or will not achieve the desired level of service for the City. Deferring construction of a new plant beyond the 20-year planning horizon will impose a greater overall cost to the City.

Memo

CITY OF ASHLAND

Date: April 2021
From: Scott Fleury PE, Public Works Director
To: Adam Hanks, City Manager Pro Tem Administrator
RE: Water Treatment Plant Decision Points

Below is a list of items with specific decisions as actions through the City Council.

April 17, 2012 - 2012 Comprehensive Water Master Plan
Council adopted the master plan at the April 17, 2012 Business Meeting. The plan included development of a 2.5 MGD water treatment plant and 2.6 MG storage reservoir.
2.5 MGD Plant estimated at $12 million plus one additional employee requirement.
2.6 MG storage reservoir estimated at $6.7 million.
April 17, 2012 Minutes

April 7, 2015 - 2015-2017 Capital Improvement Program
Council approved the 2015-2017 Capital Improvement Program at the April 7, 2015 Business Meeting. The CIP included the 2.5 MGD water treatment plant and 2.6 MD water storage reservoir.
2.5 MGD Plant estimated at $14.5 million plus one additional employee requirement.*
2.6 MG storage reservoir estimated at $8.13 million.*
***Numbers inflated annually from the 2011 master plan project estimate.**
April 7, 2015 Minutes

June 16, 2015 - 2015-2017 Biennium Budget
Council approved the 2015-2017 Budget at the June 16, 2015 Business Meeting that included appropriations for the 2.5 MGD water treatment plant and 2.6 MD water storage reservoir.
2.5 MGD Plant estimated at $14.5 million plus one additional employee requirement.
2.6 MG storage reservoir estimated at $8.13 million.
June 16, 2015 Minutes

June 7, 2016 - Infrastructure Finance Authority Funding Resolution
Council approved a resolution at the June 7, 2016 Business meeting authorizing an Infrastructure Financing Authority loan for engineering and construction of a new 2.5 MGD water treatment plant. The terms of the loan include $14,811,865 in principal, $1,030,000 in loan forgiveness and an interest rate of 1.79% for thirty years
June 7, 2016 Minutes

December 6, 2016 - 2.6 MG Storage Reservoir Reimbursement Resolution
Council approved a reimbursement resolution at the December 6, 2016 Business Meeting associated with the 2.6 MG water storage reservoir recommended in the 2012 master plan. The reimbursement resolution allows the City to reimburse itself via loan proceeds for all engineering work completed prior to construction.

[December 6, 2016 Minutes](#)

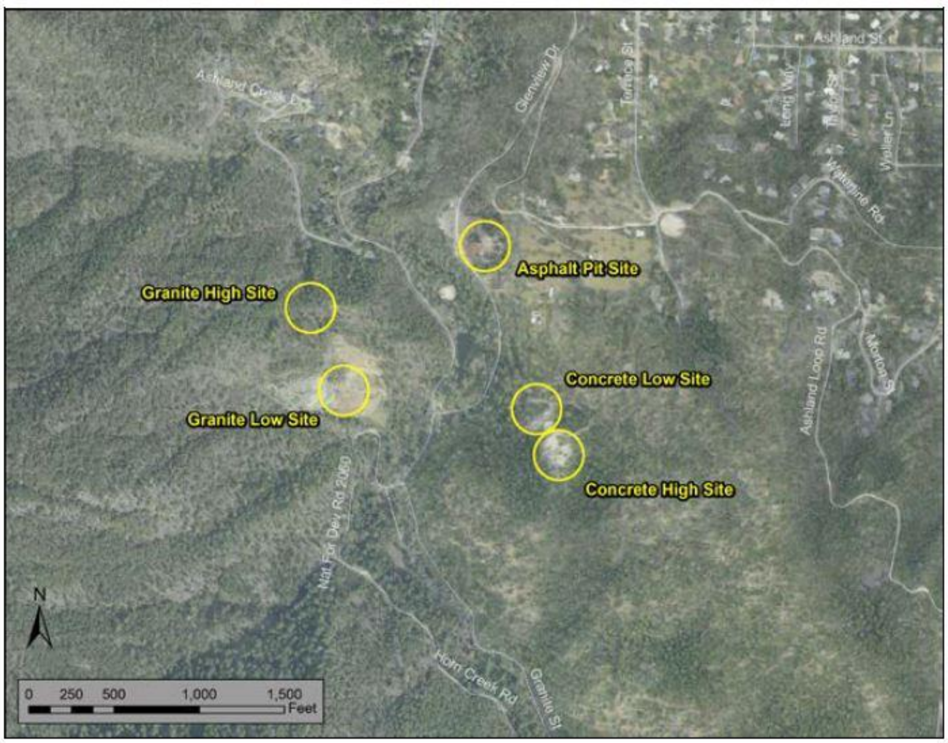
March 21, 2017 - 2.5 MGD Water Treatment Plant Preliminary Engineering

Council approved a professional services contract with Keller Associates at the March 21, 2017 Business Meeting for the design development of a 2.5 MGD water treatment plant and 2.6 MG water storage reservoir. The preliminary engineering included a siting study and treatment process analysis.

Initial site costs:*

1. Concrete Pit (high) $11.6 million
2. Concrete (low) $13.5 million
3. Granite (high) $14.7 million
4. Granite (low) $11.6 million
5. Asphalt Pit $15.4 million

*The initial site costs developed by Keller Associates in the preliminary phase only account for site work (grading/excavation), piping, pumping and electrical. Total cost was evaluated after the Granite low site was selected. All sites evaluated are on city owned property.



Total estimated cost of construction for the Granite low site:

1. Granite Low Membrane Filtration $26.2 million
2. Granite Low Membrane Filtration + UV $24.4 million
3. Granite Low Membrane Filtration + Ozone $29.4 million
4. Granite Low Conventional Filtration $30.7 million

[March 21, 2017 Minutes](#)

November 6, 2017 - 2.5 MGD Water Treatment Plant Project Review

Council received a presentation at the November 6, 2017 Study Session from the Director of Public Works who recommended a fresh look at the proposed 2.5 MGD water treatment plant. Options provided to Council where to analyze and compare costs and risks associated with rehabilitation of the existing plant to provide a 20-year useful life vs. construction of a brand new 7.5 MGD water treatment plant. The proposal was to compare the City's current water treatment

plant with a new one that would treat water in exactly the same way. At this time the City wasn't looking at other water treatment alternatives. In addition, prior to this meeting the Director discussed these options with the Ashland Water Advisory Ad-Hoc Committee (AWAC) at their regular meeting on September 26, 2017. The Committee unanimously supported the Director moving forward with the analysis.
Staff Report
November 6, 2017 Minutes

April 2, 2018 - Water Treatment Plant Next Steps
Council received a follow up presentation at the April 2, 2018 Study Session from the Director of Public Works regarding an analysis done by Black and Veatch and RH2 regarding improvements to the existing plant and risk mitigation compared to building a new 7.5 MGD facility at an alternate site.
Existing plant rehabilitation (20 year life) $5.57 million.
No feasible cost developed for risk mitigation (fire, flood, landslide, seismic).
7.5 MGD Plant (new) $22.59 million (direct filtration-same as existing plant).
Staff Report
April 2, 2018 Minutes

October 2, 2018 - Preliminary Engineering 7.5 MGD Water Treatment Plant
Council at the October 2, 2018 Business Meeting approved a professional services contract with HDR Engineering for the preliminary engineering phase for the new 7.5 MGD water treatment plant.
Staff Report
October 2, 2018 Minutes

April 2, 2019 - 2019-2039 Capital Improvement Program
Council approved the 20-year CIP at the April 2, 2019 Business Meeting. The 20-year CIP contained the proposed 7.5 MGD water treatment plant project in the water fund.
7.5 MGD water treatment plant 5% design opinion of cost $32 million.
April 2, 2019 Minutes

June 4, 2019 - 2019-2021 Biennium Budget
Council approved the 2019-2020 biennial budget at the June 4, 2019 Business meeting, which included appropriations for the 7.5 MGD Water Treatment Plant.
7.5 MGD water treatment plant 5% opinion of cost $32 million.
June 4, 2019 Minutes

June 4, 2019 - FY 2020 Water Rates
Council approved a 4% water rate increase at the June 4, 2019 Business meeting. Water rates/revenues support the water fund and in turn all water capital improvement projects including the 7.5 MGD water treatment plant.
June 4, 2019 Minutes

August 5, 2019 - 7.5 MGD Water Treatment Plant Progress Update
Council received a presentational update on the preliminary engineering phase for the new plant at the August 5, 2019 Study Session.
7.5 MGD water treatment plant 30% design cost estimate $36 million.

No proposed staffing increases.
August 5, 2019 Minutes
Staff Report
October 1, 2019 - 7.5 MGD Water Treatment Plant Final Engineering
Council approved a contract with HDR to complete final engineering for the water treatment plant project
October 1, 2019 Minutes
Staff Report

In addition to Council actions staff has continuously updated AWAC during their regularly scheduled public meetings on project status during 2019. This included a presentation by HDR similar to the one given before Council on August 5, 2019.