4-15-19

ROSEBURG PUBLIC WORKS COMMISSION AGENDA
THURSDAY, APRIL 11, 2019

3:30 Regular Meeting **City Hall Third Floor Conference Room**
900 SE Douglas Avenue, Roseburg, Oregon 97470

NOTE: IT IS UP TO EACH OF YOU AS COMMISSIONERS TO CALL 541-492-6730 AND LET STAFF KNOW BEFORE THE DAY OF THE MEETING IF YOU WILL NOT BE ATTENDING. THANK YOU.

I. CALL TO ORDER

II. ROLL CALL:

Chair:	Bob Cotterell		
Commissioners:	Vacant	Stuart Liebowitz	Noel Groshong
	John Seward	Vern Munion	Fred Dayton
	Ken Hoffine	Roger Whitcomb	

III. APPROVAL OF MINUTES

A. March 14, 2019

IV. DISCUSSION ITEMS

A. Downtown Corridor Improvements Phase 3 – 19UR02 Authorization to Purchase Streetlights and Fixtures

B. ARTS and Signal Interconnect Projects, 19GR14 and 16UR05 Bid Results and Recommendation to Award Construction

C. Storm Drainage Utility – User Fee Update

D. Water Treatment Plant Chlorination Project Alternative Analysis Recommendation, 19wa03

AUDIENCE PARTICIPATION – At this time, anyone wishing to address the Commission concerning items of interest not included in the agenda may do so. The person addressing the Commission shall, when recognized, give his/her name for the record. All remarks shall be directed to the whole Commission. The Commission reserves the right to delay any action, if required, until such time when they are fully informed on the matter.

V. INFORMATIONAL

VI. BUSINESS FROM THE COMMISSION

VII. NEXT MEETING DATE: May 9, 2019

VIII. ADJOURNMENT

*** * * AMERICANS WITH DISABILITIES ACT NOTICE * * ***

Please contact the Office of the City Recorder, Roseburg City Hall, 900 SE Douglas Avenue, Roseburg, OR 97470-3397 (Phone 541-492-6700) at least 48 hours prior to the scheduled meeting time if you need an accommodation. TDD users please call Oregon Telecommunications Relay Service at 1-800-735-2900.

CITY OF ROSEBURG
PUBLIC WORKS COMMISSION MEETING
MARCH 14, 2019
MINUTES

CALL TO ORDER: The meeting of the City of Roseburg Public Works Commission was called to order at 3:30 p.m. Thursday, March 14, 2019 in the Third Floor Conference Room at City Hall.

ROLL CALL: Present: Chair Bob Cotterell, Commissioners John Seward, Ken Hoffine (arrived 3:37pm) Vern Munion, Roger Whitcomb, Noel Groshong and Fred Dayton

Absent: Stuart Liebowitz

Others Present: None

Attending Staff: City Manager Lance Colley, Public Works Director Nikki Messenger, City Engineer Loree Pryce, Engineer Daryn Anderson, and Department Technician Chanelle Rogers

APPROVAL OF MINUTES: Commissioner Groshong moved to approve the minutes of the February 14, 2019 Public Works Commission meeting. Motion was seconded by Commissioner Whitcomb and approved with the following vote: Chair Cotterell and Commissioners Seward, Hoffine, Munion, Whitcomb, Groshong, and Dayton voted yes. No one voted no.

DISCUSSION ITEMS:

Phase 3 – Water System SCADA Improvements Construction Bids: Pryce informed the City received bids for Phase 3 of the Water SCADA Improvements project. This phase of the project will include the replacement of the existing water treatment plant automatic control system, installation of electrical, control system, and water quality monitoring equipment throughout the water treatment plant, and installing radio system equipment, antenna masts, solar power system, pressure transmitters & telemetry equipment and software at one of the pump stations and a reservoir. Pryce stated four bids were received and the low bid from Pacific Electrical Contractors, Inc. came in under the engineer's estimate. Whitcomb asked if there was anything to be concerned about since they were quite a bit lower than the other bids. Pryce said staff looked into that and the engineer called the contractor to discuss it, the contractor is not using sub-contractors, which is saving them some money.

MOTION: Commissioner Groshong moved to recommend the City Council award the Phase 3 – Water System SCADA Improvements Project to the lowest responsible bidder, Pacific Electrical Contractors, Inc., for $535,610. Motion was seconded by Commissioner Munion and approved with the following vote: Chair Cotterell and Commissioners Seward, Hoffine, Munion, Whitcomb, Groshong, and Dayton voted yes. No one voted no.

Phase 3 – Water System SCADA Improvements Engineering Task Order Authorization: Pryce informed the City has a master contract with RH2 Engineering, Inc. for engineering services related to the SCADA system project. Proposed Task Order #10 provides services during construction and control system software development for Phase 3 implementation of the City's new SCADA system. This phase includes adding new SCADA communication equipment to the following facilities: Boyer Reservoir, Joanne Pump Station, Sunshine Park Repeater, and Winchester Water Treatment Plant. Groshong questioned if everything will be able to be controlled from the Treatment Plant along with controls at each location. Anderson said that was correct. Whitcomb asked who would be responsible for the system after it is installed. Anderson replied that there is a 1-year warranty then it will be the City. Messenger said staff is looking for a qualified local consultant that would be available

for any issues that may come up after that 1-year warranty period. In addition, staff would still be able to contact RH2 for help trouble shooting any issues. Whitcomb inquired about the security. Anderson stated that it does have security protection; each employee that has access will have a separate pin so you can tell who logged in. Colley praised Messenger and her staff for getting the project done sooner than anticipated.

MOTION: Commissioner Seward moved to recommend the City Council authorize a task order for engineering services for Phase 3 of the Water System SCADA Improvements with RH2 Engineering, Inc. for an amount not to exceed $364,381. Motion was seconded by Commissioner Groshong and approved with the following vote: Chair Cotterell and Commissioners Seward, Hoffine, Munion, Whitcomb, Groshong, and Dayton voted yes. No one voted no.

AUDIENCE PARTICIPATION:

INFORMATIONAL ITEMS: Messenger informed she had received an email from Commissioner Seward asking how the power outage had affected City functions. Messenger said a lot was learned from that event. One item that staff will be looking at budgeting for is back-up power at the treatment plant and possibly some of the pump stations in addition to other locations such as fire stations. Staff informed there were also some issues with the phones and computers. Hoffine stated the hospital had some issues and learned some things with the storm too. Discussion ensued regarding reservoir levels.

BUSINESS FROM THE COMMISSION: Whitcomb said he is working with Blue Zones on the bike program and wanted to know if the City had a map of where all the bike racks are located within the City. Messenger said there are bike racks located both on public and private properties and that the Bike/Ped group had said they were going to map them all but there is not currently a map. Whitcomb also mentioned the Bike/Walk to work day is May 8th and invited anyone to participate that wanted to. Messenger said a proclamation is usually done at City Council meeting also. Groshong asked if there was any follow up regarding the condition of Military Ave. Messenger said staff would continue to address the potholes. Colley also stated it would be a major construction to do anything other than fill the potholes.

NEXT MEETING DATE: April 11, 2019

ADJOURNMENT: Meeting adjourned at 4:14 p.m.

Chanelle Rogers

Chanelle Rogers, Public Works Department Technician

CITY OF ROSEBURG
MEMORANDUM

DATE: April 11, 2019

TO: Public Works Commission

FROM: Loree Pryce, P.E., City Engineer

VIA: Nikki Messenger, P.E., Public Works Director

SUBJECT: **Downtown Corridor Improvements Phase 3 – 19UR02**
Authorization to Purchase Streetlights and Fixtures

ISSUE STATEMENT/SUMMARY/BACKGROUND

The final Urban Renewal funded phase of downtown lighting improvements is currently in design. In order to save time, staff is seeking authorization to purchase the lights and pole assemblies concurrently with bidding the project. The issue for the Commission is whether to recommend the Urban Renewal Board authorize the purchase of the required materials prior to the award of the construction contract.

BACKGROUND/ANALYSIS

Replacing existing streetlights downtown with antique style lighting was identified in the Downtown Master Plan adopted in May of 2000. The lighting improvements began in 2001 and have continued since that time. In 2005, the Urban Renewal Agency modified the boundaries of the North Roseburg Urban Renewal Area to include downtown. Since that time, the City has made significant improvements to both lighting and other features within the downtown core. That Urban Renewal area is set to expire in September of 2019.

At the December 2018 Public Works Commission meeting, staff presented the Commission with a limited number of options to expend the remaining Urban Renewal funds. The Commission recommended a grind/inlay project on Stewart Parkway and additional phase of lighting improvements downtown. Council concurred with this recommendation and included those improvements in the adopted Capital Improvement Plan.

i.e. Engineering was hired to complete the bid plans and specifications for the Phase 3 Downtown Corridor Lighting project. The project is scheduled to be advertised for construction on April 4, 2019 with a bid opening date of April 30, 2019. Given the time constraints associated with the expiration of the Urban Renewal area, staff believes it would be advantageous to purchase the lights, poles and related materials concurrently with the bidding process. Lead time for the lights may be as high as 12 weeks, which could put the project schedule at risk if it is bid as a contractor purchased items.

The project will include installing 33 new light poles and replacing the remaining existing high pressure sodium fixtures with LED fixtures and new globes to accommodate those.

Staff has requested a quote to purchase fourteen 14-foot tall poles, sixty-one globes and LED assemblies and nineteen 10-foot poles.

FINANCIAL AND/OR RESOURCE CONSIDERATIONS

Total project cost is estimated at approximately $425,000. The FY 2019-20 Urban Renewal budget includes $300,000 to complete this project. The remainder is expected to be spent in the current fiscal year. Staff has requested a quote to purchase the poles and appurtenances utilizing Oregon Procurement Information Network (ORPIN) contract pricing and will present that information at the Commission meeting.

TIMING ISSUES

If the Commission provides a recommendation to purchase the street lights and assemblies, it will be presented to the Urban Renewal Board at their April 22, 2019 meeting. It is staff's intent to complete construction of Downtown Corridor Improvements Phase 3 by the end of August. Construction bid results are scheduled for presentation to the Commission at the May 9th meeting.

Commission options, a staff recommendation, and suggested motion will be presented at the meeting.

CITY OF ROSEBURG
MEMORANDUM

DATE: April 11, 2019

TO: Public Works Commission

FROM: Loree Pryce, P.E.

VIA: Nikki Messenger, P.E., Public Works Director

SUBJECT: **ARTS and Signal Interconnect Projects, 19GR14 and 16UR05**
Bid Results and Recommendation to Award Construction

ISSUE STATEMENT AND SUMMARY

The City is currently out to bid for the aforementioned project and will provide the bid results at the April 11th meeting. The issue for the Commission will be whether to recommend that City Council and the Urban Renewal Board award the construction contract.

BACKGROUND/ANALYSIS

Staff has been working on two different traffic signal projects and made a decision to combine them to increase efficiency and eliminate potential conflicts that may have occurred if the projects were bid separately. Separate bid schedules were used in order to track the costs.

In 2015, the Oregon Department of Transportation implemented the All Roads Transportation Safety Program (ARTS) with the intent of identifying and funding projects that will reduce Fatal and Injury A crashes. The ARTS program has two types of projects – systemic and hotspot. In 2015, the City worked with a consultant to identify projects that were eligible for one or both of these categories. The City submitted two grant applications, both of which were funded and combined into one grant. The ARTS portion of the project includes the following improvements:

a. A pedestrian activated warning system and raised median refuge on Stephens Street near Roseland Avenue,
b. Pedestrian countdown signal heads on Stephens Street at Edenbower Blvd., Newton Creek Road and Stewart Parkway.
c. Pedestrian countdown signal heads on Harvard Avenue at Stewart Parkway, Keady Court, Centennial Drive and Umpqua Street,
d. Reflectorized signal backplates on all approaches on Stewart Parkway at the Walmart entrance, Renann, Mercy Drive, Aviation Drive and Airport Road,
e. Convert the Stewart Parkway approach from protected/permitted doghouse signal heads to flashing yellow arrow heads at Mercy Drive, Renann Avenue and Airport Road and to protected-only heads at the Walmart entrance and Aviation Drive.

The Traffic Signal Coordination and Interconnect portion of the project involves the installation of electrical, telecommunications and programming of existing signals on Stewart Parkway from Walmart to Edenbower. The intent is to coordinate and improve green wave timing to reduce traffic congestion and improve corridor efficiency. ODOT will be coordinating

the programming with the Contractor and maintaining thereafter under an existing Intergovernmental Agreement with the City.

The combined project was advertised for bid on March 19, 2019. Bid opening is scheduled for April 9, 2019. Staff will present the bid results at the April 11th meeting.

FINANCIAL AND/OR RESOURCE CONSIDERATIONS

The City received a grant in the amount of $462,946 for the ARTS portion of the project. The matching funds are programmed in the Transportation and Urban Renewal Funds. The Traffic Signal Coordination portion of the project is programmed for Urban Renewal Funding.

TIMING ISSUES

This project involves Urban Renewal Funding. The North Roseburg Urban Renewal Area expires on September 30, 2019. The intent is to get all Urban Renewal funded work completed by August 30, 2019. Any recommendation made by the Commission will be presented to the City Council and Urban Renewal Board at their April 22nd meetings.

The Commission options, staff recommendation and suggested motion will be presented at the meeting.

CITY OF ROSEBURG
MEMORANDUM

DATE: April 11, 2019

TO: Public Works Commission

FROM: Nikki Messenger, P.E., Public Works Director

SUBJECT: **Storm Drainage Utility – User Fee Update**

ISSUE STATEMENT AND SUMMARY

Staff is in the process of updating the City wide fee schedule. The issue for Commission is whether to forward a recommendation to the City Council to include an increase to the storm drainage user fees.

BACKGROUND/ANALYSIS

The Storm Drainage Fund is an enterprise fund that was created in 1989-90 to account for the revenues and operations of the City's storm drainage utility. This fund has two primary revenue components, user fees and system development charges, both of which are based on impervious surface area. An equivalent residential unit (ERU) is established at 3,000 square feet of impervious surface area. For ease of administration, all single family homes are charged for one ERU.

In late 2012 and early 2013, the Commission took a detailed look at the Storm Drainage Utility Fund including projections of revenue and expenses for the upcoming five years. At that time, the monthly storm fee was $3.77 per ERU. After much discussion, the Commission recommended raising the fee to $5/month per ERU beginning July 1, 2013 with an annual increase of 10 percent through FY18-19. Council adopted that recommendation into the fee schedule, and the last approved increase occurred on July 1, 2018 bringing the rate up to $8.05/month per ERU.

Typically, the City's fee schedule is revisited twice per year, in April and in November. Staff is in that process and wanted to give the Commission the opportunity to consider a moderate increase to adjust for inflation. Many of the City's fees are indexed to the Consumer Price Index for all Urban Consumers – Western Region (CPI-U West). The CPI-U West Index has increased 3.3% this year over last. If that index were used, the storm drainage monthly fee would go up to $8.32/ERU (with rounding).

System Development Charges (SDC) are currently indexed to the Construction Cost Index as published by the Engineering News Record. This year's increase will be 2.45%. Storm drainage SDCs can only be used to make capacity improvements, so indexing to construction pricing makes sense. The remainder of the revenues in the Storm Fund pay for costs associated with maintaining and improving the utility. This includes transfers to the General Fund to compensate for employee costs associated with maintenance, engineering, and management (including billing) of the utility. Other non-capital costs include materials and supplies, vehicle maintenance, storm drainage maintenance costs, franchise fees, software

fees, banking fees, and insurance. Many of these costs are better associated with a CPI type index.

FINANCIAL AND/OR RESOURCE CONSIDERATIONS
Revenues for the current fiscal year, including user fees, SDCs, and interest, are projected to be $2,368,491. Expenditures for the upcoming fiscal year have been budgeted (in draft budget) at $2,477,136. Without any fee increase, expenditures are expected to exceed revenues by 4.59%. This includes an assumption that Storm SDCs will remain flat and that no new accounts would be added, which are both conservative estimates.

The fund is projected to have a healthy beginning fund balance of approximately $3.3 million at July 1, 2019. The fund balance grew in the past year as staff concentrated on delivering Urban Renewal Projects and was not able to deliver as many storm improvements as anticipated.

TIMING ISSUES
The fee schedule update is scheduled to go to the City Council at their April 22nd meeting. Staff recognizes this does not give the Commission a lot of time to make a decision, so multiple options have been provided below.

COMMISSION OPTIONS
The Commission has the following options:

1. Recommend the City Council increase the storm drainage user fees for the fiscal year beginning July 1, 2019 by the CPI-U West to $8.32/ERU per month; or
2. Recommend the City Council include an annual increase in storm drainage user fees indexed to the CPI-U West. This would increase the fee by the index amount annually until further action changed this. Usually, if there is an automatic increase it is capped at a percentage. (The SDC increase is capped at 5%); or
3. Recommend the City Council increase storm drainage user fees by another amount; or
4. Not recommend a fee increase at this time and provide staff direction for future consideration.

STAFF RECOMMENDATION
The Commission has previously stated a desire to ensure we do not have to do large increases in the future due to lack of periodic increases. As such, staff recommends that the Commission recommend that the City Council index the storm drainage user fees to the CPI-U West index capped at 5% per year. This will prevent the utility from falling behind. Additional analysis could be performed in the future to ensure the financial health of the utility.

SUGGESTED MOTION
I move to recommend that the City Council institute an annual increase to the storm drainage user fees tied to the CPI-U West Index and capped at no more than five percent per year beginning July 1, 2019.

ATTACHMENTS
None

CITY OF ROSEBURG
MEMORANDUM

DATE: April 11, 2019

TO: Public Works Commission

FROM: Loree Pryce, P.E.

VIA: Nikki Messenger, P.E., Public Works Director

SUBJECT: **Water Treatment Plant Chlorination Project Alternative Analysis Recommendation, 19WA03**

ISSUE STATEMENT AND SUMMARY

The water treatment facility's disinfection system is aged and in need of replacement. The City contracted with a consultant to analyze and design a new chlorination system. The evaluation is complete and the issue for the Commission is to whether to accept the recommendation which would allow the project to move into the design phase.

BACKGROUND/ANALYSIS

In 2002, the City installed a system for on-site generation of disinfectant to replace the existing chlorine gas disinfection system. The equipment generates a "mixed oxidant solution" (MOS). In general terms, the system uses salt to generate a chlorine solution which is then used to disinfect the water. The system initially consisted of two units, each producing 100 pounds per day (ppd) of free available chlorine (FAC), for a total capacity of 200 ppd FAC. In 2005 an additional unit was installed and the MOS capacity was increased from 200 ppd to 300 ppd. The system is now over sixteen years old and is at the end of its useful life.

In 2017 the City hired Murraysmith to conduct an alternative analysis for the replacement of the existing MOS disinfection system. A technical memorandum was produced that analyzed the existing system and future needs. Bulk sodium hypochlorite was recommended as the preferred alternative. This report was shared with the Commission at the September 2017 meeting. At that meeting, the Commission recommended that staff program resources in the Capital Improvement Plan to proceed with design and construction of a replacement disinfection system, with the stipulation that when a design consultant was selected that they review the findings in the Murraysmith report and provide their own analysis.

In the fall of 2018, the City went through a qualifications based selection to contract for the study, design, bidding and construction management services for the replacement of the chlorination system. RH2 Engineering, Inc. (RH2) was the highest ranked proposer. At the December 2018 meeting, the Commission recommended that Council award a contract for engineering services to RH2. The City Council made the award at their December 10, 2018 meeting.

RH2's first task was to review the previous technical memorandum prepared by Murraysmith and provide an independent analysis and recommendation. As part of this

process, RH2 reviewed the water treatment plant's chlorination and production data to ensure current technical information was used in their evaluation. Staff requested the chlorination study consider expandability in the event the plant was ever expanded from the current capacity of 12 million-gallon per day (MGD) to a future 18 MGD production rate.

The attached technical memorandum outlines the advantages and disadvantages of each system. The initial construction cost for the bulk hypochlorite system is estimated at just over $600,000. The initial construction cost for the on-site generation system is estimated at $1.2 million. As outlined in the memo, the operating cost for the bulk hypochlorite system is slightly higher than the on-site generation, but does not overcome the difference in the initial investment. In other words, given current production rates and the adopted population growth rate of 1.2%, the predicted 20-year life cycle cost for the bulk hypochlorite system is lower than for the on-site generation system.

The matrix presented as Table 7 compares the two options based on capital costs, operational/maintenance costs, safety considerations, system redundancy, and system footprint and complexity. As outlined, RH2 ranked hypochlorite slightly higher than onsite generation. This is consistent with the Murraysmith recommendation from 2017.

FINANCIAL AND/OR RESOURCE CONSIDERATIONS
The current contract with RH2 is for $139,745 and includes services through final design and bidding. The draft FY 19-20 Water Capital Fund budget includes $1.2 million for design and construction of these improvements.

TIMING ISSUES
If the Commission concurs with the consultant's recommendation, the project can proceed to the design phase with the intent to bid the construction in the next fiscal year (FY 19-20).

COMMISSION OPTIONS
The Public Works Commission has the following options:

1. Accept the recommendation from RH2 to replace the existing system with a bulk hypochlorite system; or
2. Request additional information prior to making a decision.

STAFF RECOMMENDATION
Money has been budgeted and is available to complete the design of the recommended option.

SUGGESTED MOTION
I move to accept the recommendation from RH2 Engineering, Inc. to replace the existing disinfection system at the water treatment plant with a bulk sodium hypochlorite disinfection system.

ATTACHMENTS
Technical Evaluation from RH2

TECHNICAL MEMORANDUM

Client:	City of Roseburg
Project:	Water Treatment Plant Chlorination System Improvements
Project File:	ROS 1018.190.01.102 Project Manager: Dan Mahlum, PE
Composed by:	Ryan Deem and Barney Santiago, PE
Reviewed by:	Dan Mahlum, PE
Subject:	Alternatives Analysis and Basis of Design
Date:	April 2, 2019

EXPIRES: 12/31/2020

BACKGROUND AND INTRODUCTION

The City of Roseburg (City) owns and operates the Winchester Water Treatment Plant (WTP), which includes an aging disinfection system that needs replacement. The existing disinfection system generates a mixed oxidant (MIOX) solution on site by electrolyzing brine solution and provides up to 300 pounds of free available chlorine. An outdoor brine tank stores salt, and two indoor product tanks store the generated solution. Chemical metering pumps withdraw from the product tanks and inject mixed oxidant at two locations: upstream of the filter; and at the entrance to the clear well. The cost of replacement parts for the disinfection system has been increasing over time, and the City is upgrading the chlorination system to modernize the system and reduce costs spent on upkeeping obsolete equipment. RH2 Engineering, Inc., (RH2) was retained by the City to assist in the selection and design of an alternative chlorination system. The purpose of this technical memorandum is to establish a basis of design for the City's chlorination system improvements and recommend a disinfection alternative.

The WTP's current capacity is 12 million gallons per day (MGD). The City has plans to expand the plant to a capacity of 18 MGD in the future and prefers the proposed chlorination system to accommodate this expansion with minimal modifications. **Table 1** presents the latest monthly flow data in the year 2018 in both average daily flows in gallons per minute (gpm) and

maximum daily production in MGD. **Table 2** compares these demands with the current and future capacities of the WTP.

Table 1: Average and Maximum Daily Production

Month (2018)	Average Daily Flow Rate (gpm)	Max Daily Production (MGD)
January	2,109	3.47
February	2,143	3.59
March	2,187	3.55
April	2,214	3.19
May	3,087	5.94
June	4,205	7.28
July	5,116	8.25
August	4,983	8.39
September	4,116	6.84
October	2,901	6.96
November	2,321	4.26
December	2,199	3.62

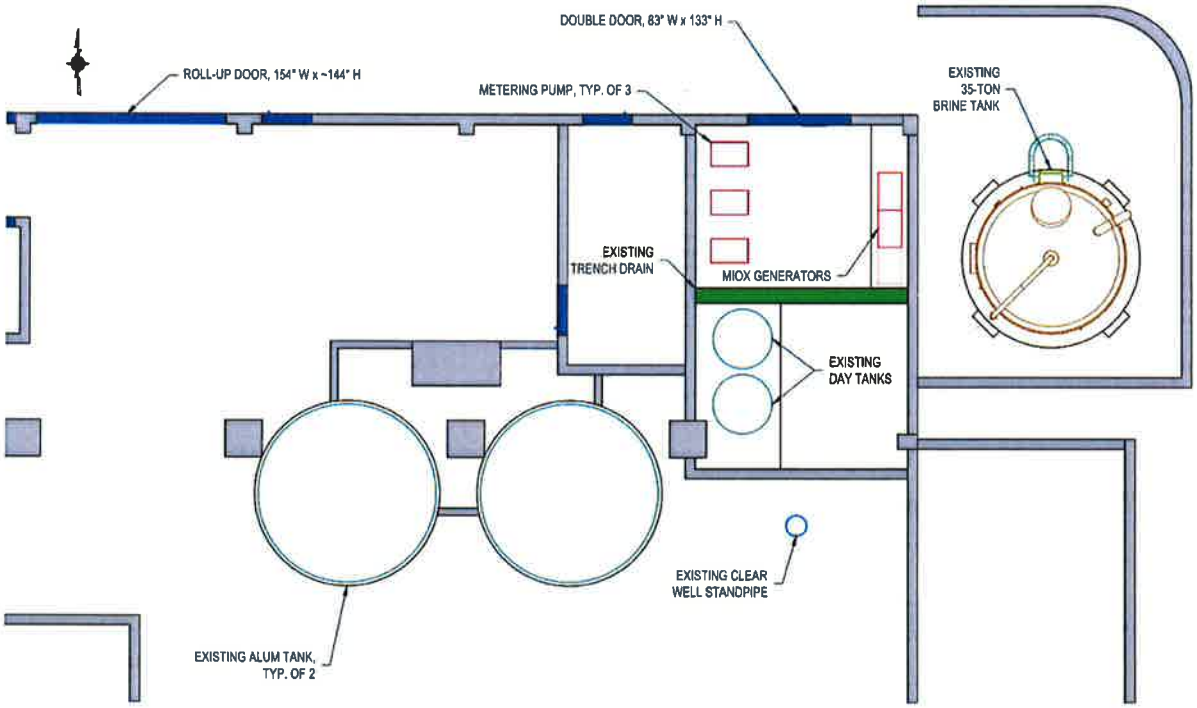
Table 2: Summary of Water Production

Water Treatment Plant Capacity			
Current	12.0 MGD	or	8,333 gpm
Future	18.0 MGD	or	12,500 gpm
2018 Water System Demands			
Non-Peak Average Day Demand (ADD)	2,170 gpm		
Average Day Demand (ADD)	3,132 gpm		
Peak Hour Demand (PHD)	5,828 gpm		

The two main disinfection system alternatives considered for the City are bulk sodium hypochlorite (bulk hypo) or on-site sodium hypochlorite generation (OSHG). Other chlorination options include chlorine gas and solid calcium hypochlorite. However, the City transitioned away from chlorine gas in 2000, and calcium hypochlorite is difficult to control and more appropriate for small, remote systems with limited access to chemical deliveries.

The City intends to maintain functionality of the existing MIOX system as long as possible, to ensure continuous water production throughout construction until the new disinfection system is phased in. **Figure 1** shows the disinfection area of the existing WTP. The roll-up door (154 inches wide by 144 inches tall) represents the maximum size of any equipment that can be placed easily inside the building. The existing MIOX system, metering pumps, day tanks, brine tank, and associated pipe, fittings, and appurtenances will be demolished, and certain non-load bearing walls also may be demolished to allow for various equipment layouts within the building.

Figure 1: Existing Chlorination Infrastructure



ALTERNATIVES SUMMARY

BASIS OF DESIGN

The *Water Treatment Plan Chlorination Study* technical memorandum, dated September 6, 2017, assumed a chlorine dose of 2.2 mg/L now and 2.3 mg/L in the future. RH2 requested that the City perform actual bench-scale testing to verify a dose with sodium hypochlorite. This test was performed in February 2019, and it was determined that the pre-chlorination dose would be 0.5 milligrams per liter (mg/L) to provide initial disinfectant upstream of the filters, and that the post-chlorination dose would be 2.2 mg/L into the clear well to result in the City's preferred 1.0 to 1.1 mg/L free chlorine residual leaving the plant. This is a combined dose of 2.7 mg/L that the proposed chlorination system must provide, which in total is a slightly higher dose for the design basis.

Disinfection chemical currently is injected into a motive water pipeline that is then injected into the process. This is a holdover from the City's previous gas chlorination system. The motive water line is currently at 95 pounds per square inch (psi) and the City is experimenting with lowering this pressure, which will increase the metering pump technologies under consideration.

Table 3 summarizes the proposed chlorine doses and current system pressure and presents design criteria for the bulk sodium hypochlorite and OSHG chlorination alternatives for current and future WTP flow rates.

Table 3: Chlorination System Alternatives Design Criteria

		2018 Non-Peak 3.1 MGD	2018 ADD 4.5 MGD	2018 MDD 8.4 MGD	Current Max 12 MGD	Future Max 18 MGD	
	Process Parameter	2,170 gpm	3,132 gpm	5,828 gpm	8,333 gpm	12,500 gpm	**Units**
Common Plant Parameters	System Pressure at Injection Point	95					psi
	Pre-Chlorination Design Dose	0.5					mg/L
	Post-Chlorination Design Dose	2.2					mg/L
12.5% Bulk Sodium Hypochlorite	Product Tank Storage	6,650					gallons
	Duration of Total Volume	118	82	44	31	21	days
	Duration Between Tanker Deliveries	89	62	33	23	15	days
	(1) 500-Gallon Day Tank	500					gallons
	Duration of Total Volume	213	148	79	56	37	hours
	(2) 500-Gallon Day Tanks	1,000					gallons
	Duration of Total Volume	426	295	159	111	74	hours
	Pre-Cl2 Min. Metering Pump Feed Rate	0.4	0.6	1.2	1.7	2.5	gph
	Post-Cl2 Min. Metering Pump Feed Rate	1.9	2.8	5.1	7.3	11.0	gph
	Watson Marlow qdos Pump	0.01 - 15.85 (Provides up to 3 ppm dose @ 18 MGD)					gph
	Blue-White M3 Pump	0.0022 - 22.3 (Provides up to 4.2 ppm dose @ 18 MGD)					gph
0.8% On-Site Sodium Hypochlorite Generation	Min. OSHG System Size	80	110	190	270	410	ppd
	20% OSHG System Safety Factor	96	132	228	324	492	ppd
	Proposed PSI MicroClor OSHG	500 (provides 2.77 ppm dose @ 18 MGD)					ppd
	Proposed OSEC B-Pak	500 (provides 2.77 ppm dose @ 18 MGD)					ppd
	Brine Tank	36					tons
	Duration of Total Volume	11.2	7.8	4.2	2.9	1.9	months
	Duration Between Salt Deliveries	6.2	4.3	2.3	1.6	1.1	months
	(2) 1,715-Gallon Product Tanks	3,430					gallons
	Duration of Total Volume	80	56	30	21	14	hours
	(1) 4,000-Gallon Product Tank	4,000					gallons
	Duration of Total Volume	94	65	35	24	16	hours
	(2) 4,000-Gallon Product Tanks	8,000					gallons
	Duration of Total Volume	188	130	70	49	33	hours
	Pre-Cl2 Min. Metering Pump Feed Rate	7.9	11	21	30	46	gph
	Post-Cl2 Min. Metering Pump Feed Rate	35	50	93	133	200	gph
	Bredel Hose Pump Apex 28	6 - 798 (Provides up to 8.5 ppm dose @ 18 MGD)					gph
	W&T Encore 700 Pump	3.75 - 180 (Provides up to 2.8 ppm dose @ 12 MGD)					gph

Notes: ppm = parts per million
gph = gallons per hour
12.5% sodium hypochlorite is assumed to have a density of 10 lb/gal
0.8% sodium hypochlorite is assumed to have a density of 8.59 lb/gal

BULK SODIUM HYPOCHLORITE

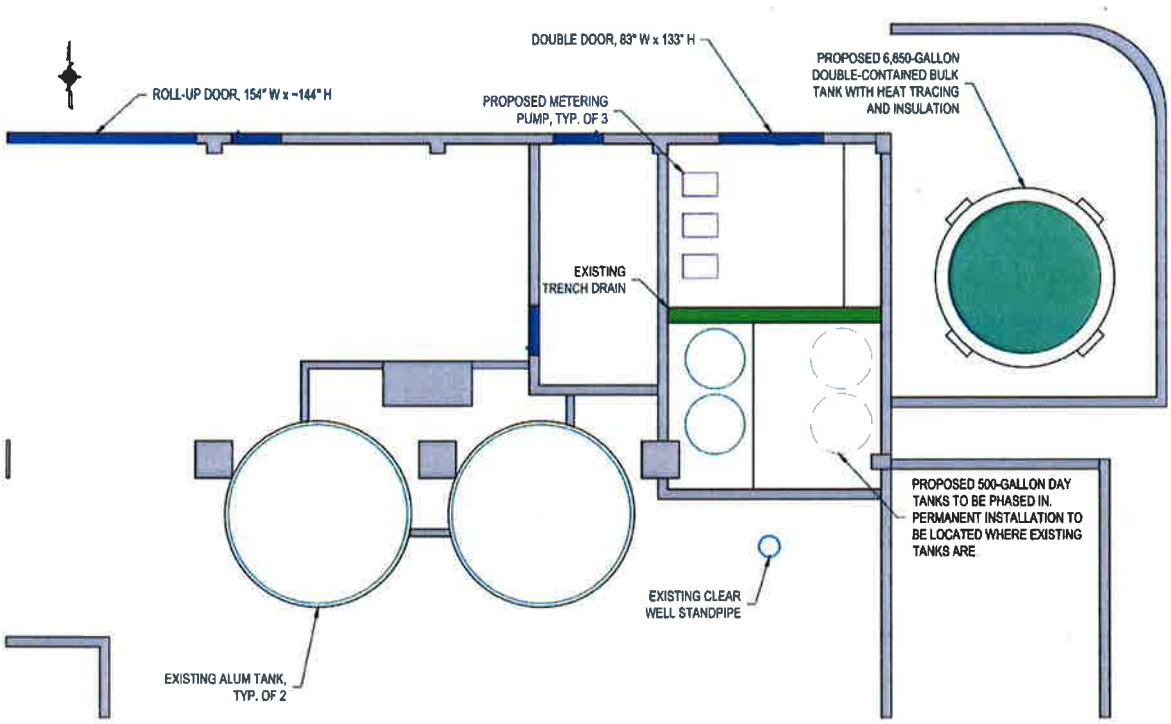
The bulk hypo option requires tanker truck deliveries of 12.5-percent sodium hypochlorite into large storage tanks. This chemical is unstable at this concentration and will decay in strength over time. As the chemical decays, it forms byproducts, including chlorates, and creates vapor. Since its decay products are considered harmful, it is not recommended to be stored longer than 30 to 45 days. There is a low-salt version of bulk sodium hypochlorite produced by HASA that is more stable, but it is more expensive and recommended during low demand times when the City is not able to consume a full tanker volume within a month. A full tanker truck can hold about 5,000 gallons of bulk hypo.

The City purchases chemicals from Cascade Columbia, one chemical distribution company. Cascade Columbia sources bulk hypo from manufacturing facilities in Longview, WA and Tacoma, WA. The low-salt sodium hypochlorite by HASA is also manufactured in Longview, WA. Cascade Columbia orders chemical from these locations and keeps inventory in their Sherwood, OR warehouse for deliveries in Oregon. If Cascade Columbia is not able to deliver to Roseburg from the north, they have partners in California who can deliver chemical from the south. Another emergency option is that Cascade Columbia can deliver tote tanks in vans and small trucks up to 1,000 gallons at a time if a tanker truck delivery is not possible.

Additionally, bulk hypo solution forms vapor upon decaying, which can cause problems with the pumping equipment. In suction pipelines for pumps, the high spaces are quickly filled with vapor. Eventually, this causes metering pumps and transfer pumps to become "vapor-locked," and they lose their prime. This situation requires manual intervention before the chemical pumps can operate again. Peristaltic metering pumps handle the off-gassing of sodium hypochlorite well over time; however, these pumps operate with longer tube life when feeding lines 60 psi or less. Otherwise, a diaphragm metering pump with de-gassing head can be used. Generally, the advantages of using a bulk hypo system for treatment are a lower capital cost, a lower footprint in terms of space taken up by equipment/storage tanks, and less effort required to operate and maintain the system.

Figure 2 shows the proposed equipment layout for the bulk hypo option. In this scenario, the outdoor brine tank would be removed. A 6,650-gallon, double-contained polyethylene tank would be installed in place of the brine tank and would accept full tanker truck volumes of bulk hypo. This tank size includes integral double containment, heat tracing, and insulation, and is the most appropriate fit for the existing outdoor pad. Locating the bulk hypo tank outside allows for easy access for tanker trucks, minimal indoor demolition and phasing requirements, and the ability to store a large volume of chemical without indoor space constraints. However, exposing higher strength sodium hypochlorite to the elements poses a risk of accelerated degradation of its containment tank. Therefore, RH2 recommends the existing building be structurally retrofitted to provide a cover over the proposed bulk tank. As shown in **Table 3**, at current average day demand (ADD), a full tanker truck would be required every 62 days, and at the future 18 MGD maximum capacity, a full tanker truck would be required every 15 days.

Figure 2: Proposed Bulk Hypochlorite Alternative



In addition to the outdoor bulk tank, RH2 recommends two 500-gallon indoor day tanks for system redundancy. A transfer pump will transfer chemical from the bulk tank to one of the indoor tanks each day. Only one indoor tank will be used normally to comply with the corrosive chemical limitations of the International Fire Code (IFC) of up to 500 gallons of a corrosive chemical per control area. As shown in **Table 3**, one 500-gallon tank provides at least 6 days of chemical at current ADD, and 37 hours of chemical at future 18 MGD maximum capacity.

When the bulk tank is offline for maintenance or replacement, a tanker truck will have the ability to fill both indoor tanks directly. The City would need to coordinate with the local fire marshal in these instances when the volume of corrosive chemical in a single control area exceeds the limitations of the IFC. As shown in **Table 3**, two 500-gallon tanks provides at least 12 days of chemical at current ADD and 74 hours of chemical at future 18 MGD maximum capacity.

The indoor day tanks would be phased in individually to be located where the current MIOX product tanks are. The proposed metering pumps would withdraw from the day tanks and inject into the existing motive water lines. Three metering pumps are proposed that will match the City's existing chemical injection process. One pump will provide the pre-chlorination dose, a second will provide the post-chlorination dose, and the third will be on active standby if another pump fails. All three pumps should be sized similarly and be able to turn down to accurately feed the entire range of flows for both the pre- and post-chlorination doses. Minimum pump sizes and initial pump selections are provided in **Table 3**.

Table 4 provides a probable capital cost for the construction of the bulk hypo alternative.

Table 4: Bulk Sodium Hypochlorite Engineer's Estimate of Probable Capital Cost

Item	Cost
Mobilization, Demobilization, Site Prep, and Cleanup (10%)	$43,000
Existing OSHG System Temporary Phasing, Demo, and Mechanical Retrofits	$99,000
HVAC Improvements	$21,000
6,650-Gallon Double-Contained Bulk Tank w/Heat Tracing	$61,000
500-Gallon Day Tank	$13,000
Metering Pumps w/ Valve Board	$35,000
Miscellaneous Mechcanical (25%)	$38,000
Structural Cover for Outdoor Tank	$69,000
Electrical	$50,000
Automatic Control	$35,000
Construction Cost Subtotal	**$464,000**
Construction Contingency (30%)	$140,000
Total Estimated Construction Cost	**$604,000**

ON-SITE SODIUM HYPOCHLORITE GENERATION

Based on the current flows and chlorine doses presented in **Table 3**, the City needs an OSHG system that can provide at least 270 pounds of chlorine per day (ppd). By adding a 20-percent safety factor, the recommended chlorination system size is 324 ppd. When the City expands the plant to 18 MGD capacity, the required OSHG system will need to provide at least 410 ppd. RH2 recommends a 500 ppd OSHG system for the City to meet current and future needs. If OSHG is selected, system turndown and intermittent operations during lower demand periods will need to be determined during design.

The OSHG process is similar to the existing MIOX system in that it uses salt, water, and electricity; however, it solely manufactures a low 0.8-percent concentration sodium hypochlorite solution rather than a mixed oxidant solution. This solution is stored in product tanks and pumped into the water supply for disinfection. The generated sodium hypochlorite is typically considered an irritant and not corrosive or hazardous since it is less than 1-percent concentration. Therefore, it is not regulated by Chapter 27 of the IFC, and volumes greater than 500 gallons can be contained within a control area without a sprinkler system or double containment.

The process of converting a brine solution to sodium hypochlorite through electrolysis can be broken down into three steps. In the first step, water from the building's water supply passes through a water heater and water softener to remove any calcium and magnesium minerals that may be present. Once the water has been properly conditioned, it is then fed into a salt saturator tank, where sodium chloride is combined with water to create a saturated brine solution. During the second step, the saturated brine solution is combined via a bellows pump with additional softened water to dilute the brine solution. This solution is then heated before entering the electrolyzer, where an electric current is applied between the positive and negative electrodes, electrolyzing the sodium chloride solution. This produces chlorine gas at the positive electrode,

and sodium hydroxide and hydrogen gas at the negative electrode. The chlorine further reacts with hydroxide to form sodium hypochlorite. When the solution exits the electrolyzer, it is approximately a 0.8-percent by weight concentration.

During the third step, sodium hypochlorite solution and hydrogen gas are discharged into the product storage tank. To dilute and purge the hydrogen gas, a blower is used to force vent the product tank outdoors into the atmosphere. Chemical metering pumps then withdraw from the product tanks to inject hypochlorite solution to the point of application.

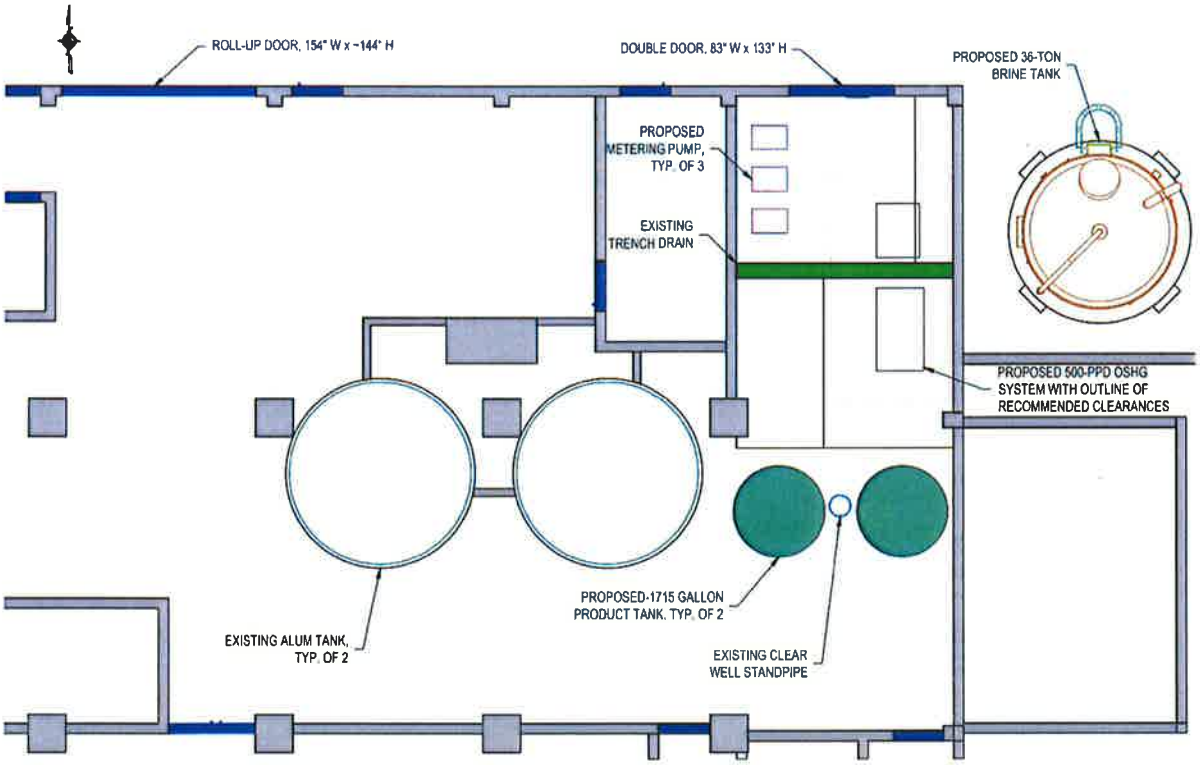
If OSHG is selected, RH2 highly recommends pre-selecting a manufacturer early in the design process to reduce design unknowns and streamline design and construction. Each OSHG system is unique and has its own requirements; it is difficult to design for more than one system not knowing which will be selected during the bidding phase. Generally, the advantages of OSHG are lower operation and maintenance costs and the lower health risks associated with operators only handing salt and dilute sodium hypochlorite.

If OSHG is implemented, there are two product tank options for the City that cover the range of viable storage. From **Table 3**, two smaller 1,715-gallon tanks can be installed now, or one large 4,000-gallon tank can be installed now, and a duplicate 4,000-gallon tank can be installed in the future when the WTP is expanded. The main considerations are the volume of chemical the City prefers to have readily available and the footprint of the tanks in the WTP. During design, a structural evaluation is required to determine the impact of these additional loads on the floor, which is located above the clear well.

OSHG with Two Smaller Product Tanks

Figure 3 shows the proposed OSHG system with two smaller product tanks. The existing brine tank would be removed and replaced with a new brine tank of similar size. Generally, the brine tank should be sized for at least 1.5 times the size of a full tanker delivery. A full tanker truck can hold about 50,000 pounds (25 tons) of salt, so a 36-ton brine tank would be acceptable. The OSHG system would be installed in roughly the same location as the existing MIOX system. The south wall in the chlorination room (room with existing MIOX system, metering pumps, and day tanks) would be removed for ease of access. Two 1,715-gallon tanks would be installed on new concrete pads just south of the removed wall. Each tank can be installed through the existing chlorination room's double door.

Figure 3: Proposed OSHG Alternative (Two 1,715-Gallon Tanks)



As shown in **Table 3**, the 36-ton brine tank would require full tanker truck salt deliveries every 4.3 months at current ADD and every 1.1 months at future 18 MGD maximum capacity. At current ADD, the two 1,715-gallon product tanks would provide 56 hours of operational chemical, and at the future 18 MGD max capacity, would provide only 14 hours of operational chemical.

Similar to the bulk hypo system, the product tanks would connect to three metering pumps to match the City's existing chemical injection process. All three pumps will be sized similarly and should be able to turn down to accurately feed the entire range of flows for both the pre- and post-chlorination doses. Minimum pump sizes and initial pump selections are provided in **Table 3**.

Table 5 provides a probable capital cost for the construction of the OSGH alternative with two smaller product tanks.

Table 5: OSHG with Smaller Product Tanks Engineer's Estimate of Probable Capital Cost

Item	Cost
Mobilization, Demobilization, Site Prep, and Cleanup (10%)	$77,000
Existing OSHG System Temporary Phasing, Demo, and Mechanical Retrofits	$99,000
Structural Modfifications (i.e. equipment pads, wall removal)	$38,000
HVAC Improvements	$21,000
(2) 1,715-Gallon Product Tanks	$44,000
Metering Pumps w/ Valve Board	$51,000
500-ppd OSHG System	$371,000
Miscellaneous Mechanical (25%)	$138,000
Electrical	$50,000
Automatic Control	$35,000
Construction Cost Subtotal	**$924,000**
Construction Contingency (30%)	$278,000
Total Estimated Construction Cost	**$1,202,000**

OSHG with Larger Product Tanks

Figure 4 shows the proposed OSHG system with one larger product tank, likely to be installed through the roll-up door. All other OSHG equipment remains the same as before, except that one 4,000-gallon product tank will be installed instead of two smaller 1,715-gallon tanks. Space will be reserved in the WTP to install a duplicate tank for additional chemical storage in the future. This option would require demolishing more walls to accommodate the larger tanks. As shown in **Table 3**, one 4,000-gallon product tank would provide 65 hours of operational chemical at current ADD, and 16 hours of operational chemical at future 18 MGD maximum capacity. These durations would double with the addition of the second product tank.

Figure 4: Proposed OSHG Alternative (One 4,000-Gallon Tank)

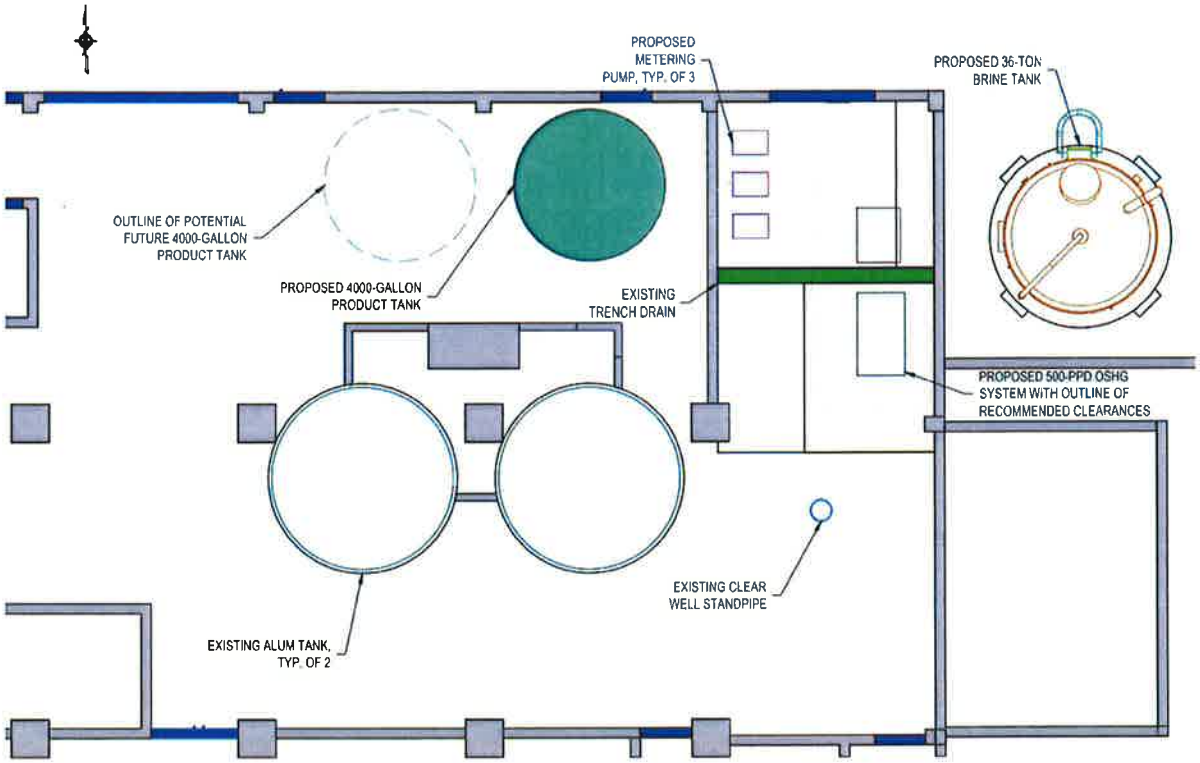


Table 5 provides a probable capital cost for the construction of the OSGH alternative with one larger product tank.

Table 6: OSHG with One Large Product Tank Engineer's Estimate of Probable Capital Cost

Item	Cost
Mobilization, Demobilization, Site Prep, and Cleanup (10%)	$76,000
Existing OSHG System Temporary Phasing, Demo, and Mechanical Retrofits	$99,000
Structural Modfifications (i.e. equipment pads, wall removal)	$51,000
HVAC Improvements	$21,000
(1) 4,000-Gallon Tank	$29,000
Metering Pumps w/ Valve Board	$51,000
500-ppd OSHG System	$371,000
Miscellaneous Mech (25%)	$134,000
Electrical	$50,000
Automatic Control	$35,000
Construction Cost Subtotal	**$917,000**
Construction Contingency (30%)	$276,000
Total Estimated Construction Cost	**$1,193,000**

LIFE-CYCLE ANALYSIS

The capital cost estimates were analyzed with recurring operation and maintenance costs to develop 20-year life-cycle costs. Polyethylene tanks are estimated to have a 10 to 15 year life cycle; therefore, both the bulk hypo and OSHG scenarios account for every proposed tank being replaced once over a 20-year duration.

The operating cost of bulk hypo is mainly the cost of the bulk chemical. Standard sodium hypochlorite solution was estimated to cost $1.35 per gallon, and the low-salt HASA solution was estimated to cost $1.40 per gallon.

The operating costs for OSHG consist of salt and electricity. Bulk solar salt was estimated at $0.16 per pound, and electricity was conservatively estimated at $0.09 per kilowatt hour. In addition to tank replacement, electrolytic cells in the OSHG system are estimated to have a lifespan between 7 and 14 years; therefore, these life-cycle scenarios account for two cell replacements over 20 years.

RH2 prepared three different life-cycle analyses. The intent of these analyses was to examine the range of possible future conditions and to review the sensitivities to the life-cycle costs for each scenario. This provides a holistic way to compare the options factoring in various future trends, such as inflationary cost increases and changes in water production. **Figure 5** represents a basic scenario in which current conditions (2018 flows and value of money) remain constant over time. In this analysis, the bulk hypo option outperforms the OSHG option in terms of cost. Spikes in the graph represent the discrete replacement of equipment, such as tanks or electrolytic cells. The main conclusion of this graph is that the lower amount of water the plant produces, the more favorable bulk hypo is in terms of cost.

Figure 5: Bulk Hypo vs. OSHG Basic Cost Comparison

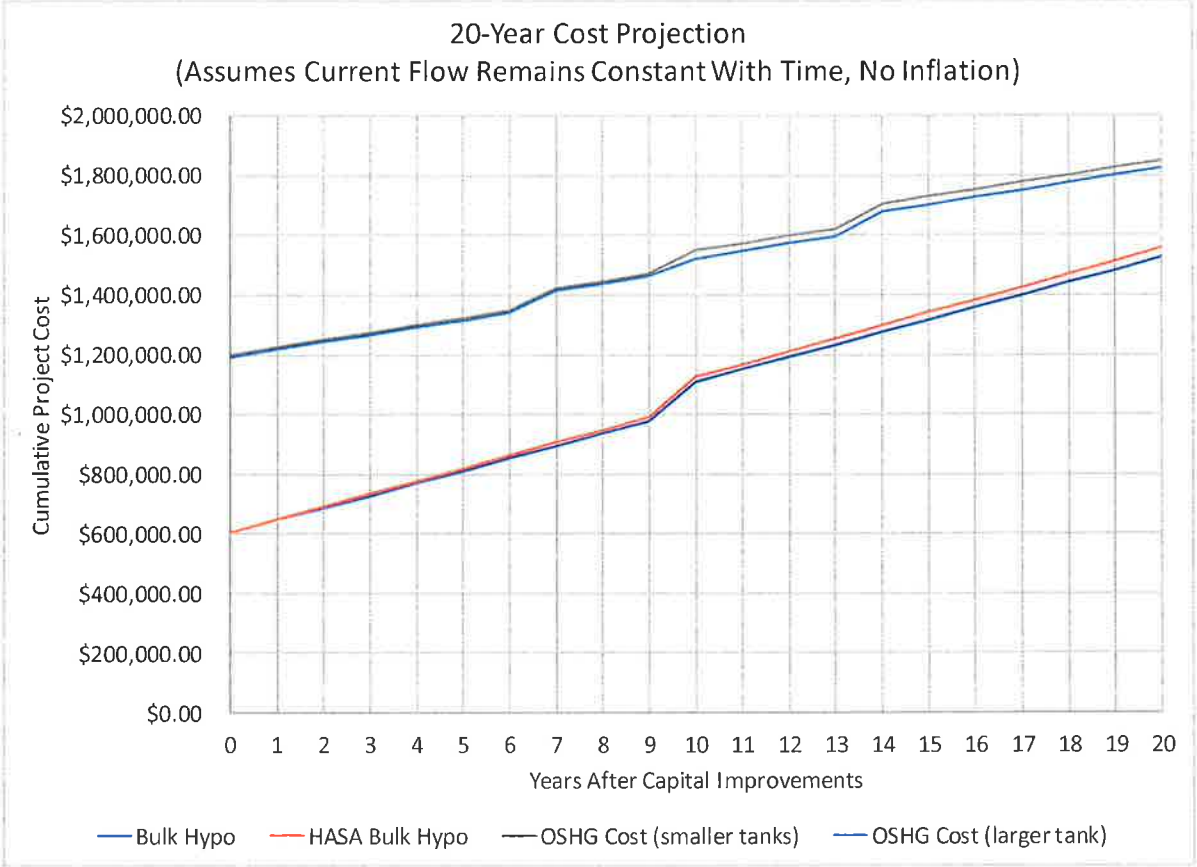


Figure 6 represents a scenario where water demand increases by 50 percent, while the dollar value remains constant over time. In other words, ADD will increase from 5.13 MGD to 7.7 MGD over the course of 20 years. This increase in population seems reasonable based on the assumptions of population increase in the City's *Long Range Water Supply Plan*. Bulk hypo again outperforms OSHG in this scenario, as it would take the City more than 20 years to compensate for the initial higher capital cost of the OSHG options.

Figure 6: Bulk Hypo vs. OSHG Cost Comparison with Growth

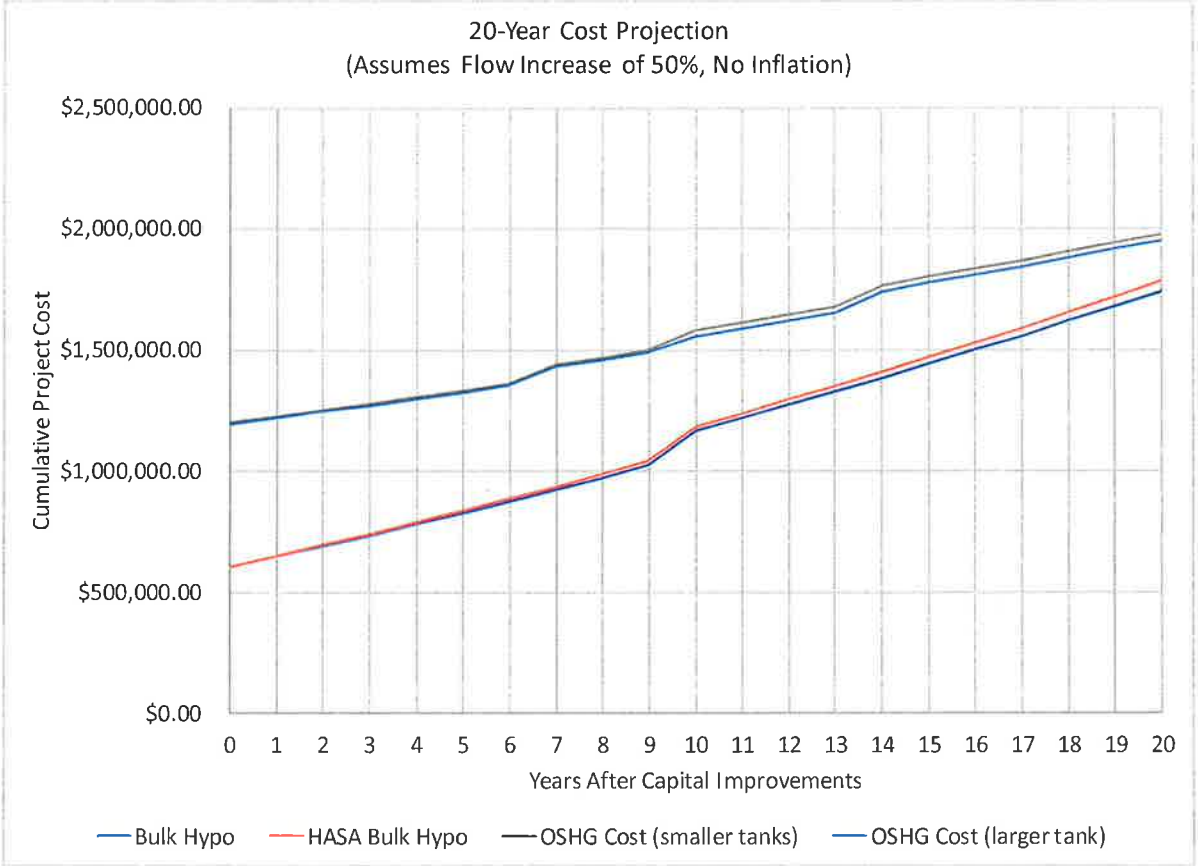
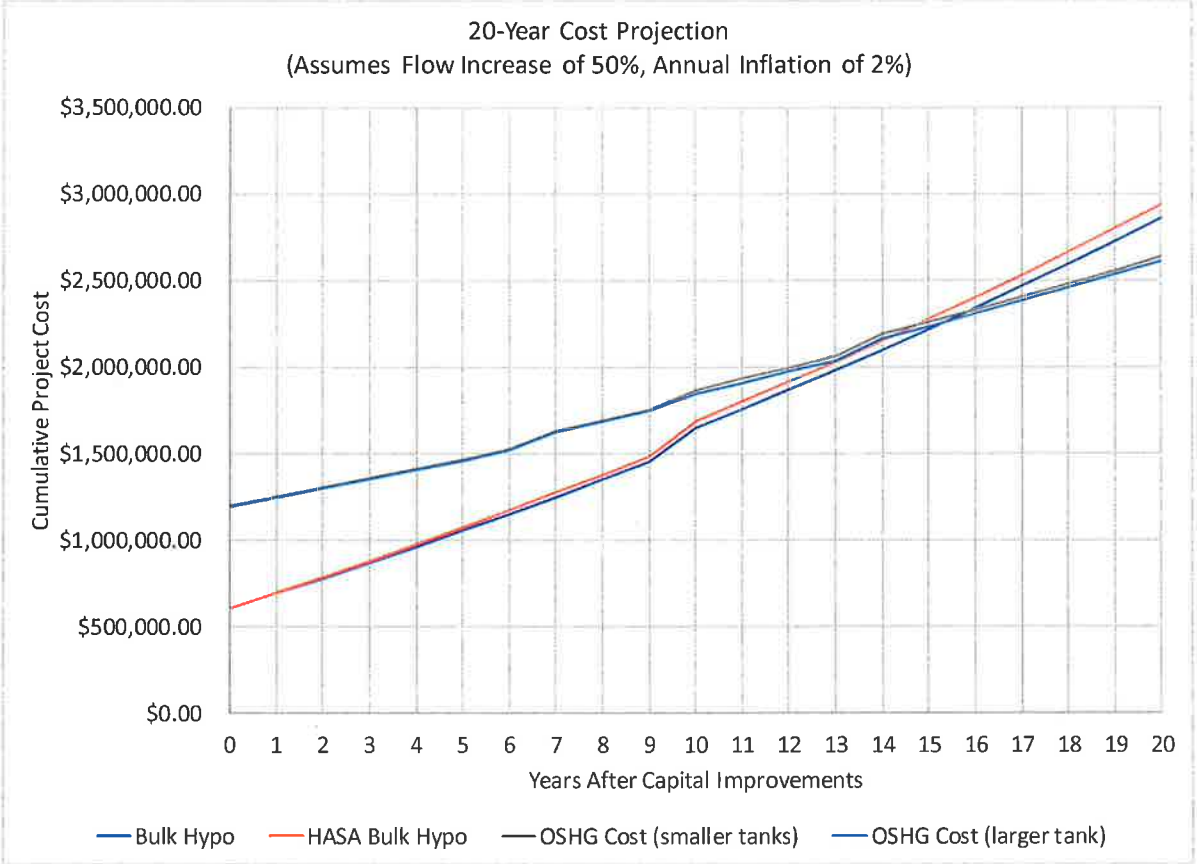


Figure 7 shows a scenario identical to that of **Figure 6**, with the exception that it accounts for 2-percent inflation. The operation and maintenance costs are most affected in this scenario, as the cost of bulk hypo rapidly increases over time. In this scenario, the costs of bulk hypo exceed those of OSHG after about 15 years. However, since it is difficult to accurately predict costs beyond 10 years, bulk hypo is still considered the more favorable option for this scenario.

Figure 7: Bulk Hypo vs. OSHG Cost Comparison With Growth and Inflation



DECISION MATRIX AND RECOMMENDATION

A decision matrix was created to develop a recommendation from the alternatives. The selection criteria were based on capital and operational costs, as well as subjective, non-cost items. **Table 7** displays this matrix and each alternative's weighted score.

Table 7: Decision Matrix

Selection Criteria	Weight Factor	Score Range[1]	OSHG		Bulk Hypo	
			Score	Weighted Score[2]	Score	Weighted Score[2]
Capital Cost	4	1 - 5	1	4	5	20
Operation/Maintenance Cost	3	1 - 5	4	12	2	6
Safety Considerations	5	1 - 5	5	25	3	15
System Redundancy	3	1 - 5	4	12	3	9
System Footprint and Complexity	2	1 - 5	2	4	5	10
		Total Weighted Score		**57**		**60**

Notes:
1) A score of 1 would mean the alternative was judged inferior to the other.
A score of 5 would mean the alternative was judged superior to the other.
2) Weighted score is calculated by multiplying the alternative's score by the weight factor for each category.

Based on RH2's weighted decision matrix, it is recommended that the City proceed with implementing bulk hypo for its chlorination improvements. Although OSHG has lower operation costs and is a safer process to handle, bulk hypo has a much lower capital cost and will have a lower footprint at the WTP. Bulk hypo also can be more easily phased into the treatment process as the existing MIOX system is demolished since the City currently uses bulk hypo as a backup when the MIOX system is offline for maintenance. The bulk hypo process and the proposed metering pumps will be able to grow with the City as the plant expands in the future.