



**City of Grants Pass
Treatment System and Infrastructure
Report**

Final Draft

August 29, 2018



Prepared for:



The City of Grants Pass, Oregon

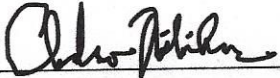


Prepared by:


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Sign-off Sheet

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Terms and Abbreviations

ACH	aluminum chlorohydrate
AOP	advanced oxidation process
CAC	citizen advisory committee
CEC	contaminant of emerging concern
cfs	cubic feet per second
CT	Disinfectant residual concentration × contact time (a measure of disinfection)
EBCT	empty bed contact time
FTE	full-time equivalent employee
GAC	Granular activated carbon
GMF	granular media filtration
HAB	harmful algal bloom
Log	log inactivation/removal
MCC	motor control center
MDD	maximum day demand
µg/L	micrograms per liter (parts per billion)
MG	million gallons
mg/L	milligrams per liter (parts per million)
MGD	million gallons per day
MIB	2- methylisoborneol
ng/L	nanograms per liter (parts per trillion)
NTP	notice to proceed
NTU	nephelometric turbidity units
OHA	Oregon Health Authority
OPCC	opinion of probable construction cost
OWUC	Oregon Water Utilities Council
PACI	polyaluminum chloride
PDB	progressive-design-build
PFAS	perfluorinated alkyl substances
PNWS-AWWA	Pacific Northwest Section - American Waterworks Association
PSU PRC	Portland State University Population Research Center

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ROM	rough order of magnitude
RWPS	raw water pump station
SCADA	supervisory control and data acquisition
T&O	tastes and odors
TDH	total dynamic head
TOC	total organic carbon
UCMR	unregulated contaminant monitoring rule
UV	ultraviolet light
VFD	variable frequency drive
WDSMP	Water Distribution System Master Plan
WMCP	Water Management and Conservation Plan
WTP	water treatment plant

1.0 PURPOSE

The purpose of this report is to define the treatment system and related infrastructure for the new WTP with enough detail to allow the development of a Class 4/5 Opinion of Probable Construction Cost (OPCC) to use as a baseline cost estimate. This report also defines finished water quality goals, and other performance requirements for a new treatment facility and finished water pump station, the intake and raw water pump station, and raw water and finished water pipelines.

2.0 INTRODUCTION AND BACKGROUND

The City of Grants Pass (City) has decided to build a new water treatment plant (WTP) to replace its aging, earthquake vulnerable plant. The existing WTP, nominally rated at 20 million gallons per day (MGD), is located on the north bank of the Rogue River in the City, and is at risk of significant damage from a moderate earthquake. The City engaged Stantec in October 2017 to provide Owner's Representative services as the initial step in the process to meet the goal of a new WTP being operational in 2023 or sooner. The following early tasks are being completed in 2018 by Stantec in close coordination with City staff and City Council, as part of the Owner's Representative services:

- Determine the appropriate method to deliver the new WTP including design, construction and operations
- Assist in selecting a site for the new WTP
- Evaluate alternative water treatment processes and plant layouts for consideration, including recommendation of initial capacity and finished water quality goals
- Evaluate the existing intake/raw water pump station for initial and future use to serve the new WTP, and consider a new Intake further upstream
- Develop a baseline construction cost estimate (OPCC) for the preferred baseline project
- Develop a baseline schedule to complete the project

Determining the appropriate treatment processes is an important first step in the planning for a new WTP as this will have many impacts on related aspects including space requirements, land acquisition, and costs (initial and life-cycle). The impacts of treatment process selection will be long-lasting as related to operations, maintenance and staffing requirements. The new WTP must be capable of being expanded/upgraded in the future to adapt to potential increases in water usage as well as potential future drinking water regulations.

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The existing WTP is a conventional plant (which uses coagulation, clarification and granular media filtration as the primary processes), and has produced excellent quality water for many years. Free chlorine is used for disinfection. Plant residual solids are dewatered using geotextile fabric bags (Geobags) prior to off-site disposal. The existing plant sits on an approximately 3.4-acre site adjacent to the Rogue River, as shown in **Figure 2-1**, and also uses the Mill Pond across the street to clarify the dirty backwash water from the filters. For this treatment technology evaluation, it was decided to evaluate and compare the following processes:

- Clarification
 - Flocculation and High Rate Sedimentation with plate settlers
 - Flocculation and Ballasted Sedimentation
- Filtration
 - High-rate granular media filtration
 - Membrane Filtration
- Organics Treatment Processes for taste and odor control, and algal toxin destruction/removal
 - Ozonation (also provides disinfection)
 - Granular activated carbon (GAC)
- Mechanical dewatering for solids handling

The initial capacity of the new WTP is an important part of the plant costs and layouts. Through analysis and council workshops, an initial capacity of 22.5 MGD has been selected. All of the alternatives assume that the ultimate plant capacity will be 45 MGD to match the recommendation in the most recent WTP Facility Plan Update. Recent water demands and planning for the future are further discussed in Section 3. The capacity and remaining useful life of the existing intake and raw water pump station is another important element which is discussed herein, in addition to potential pipeline alignments.

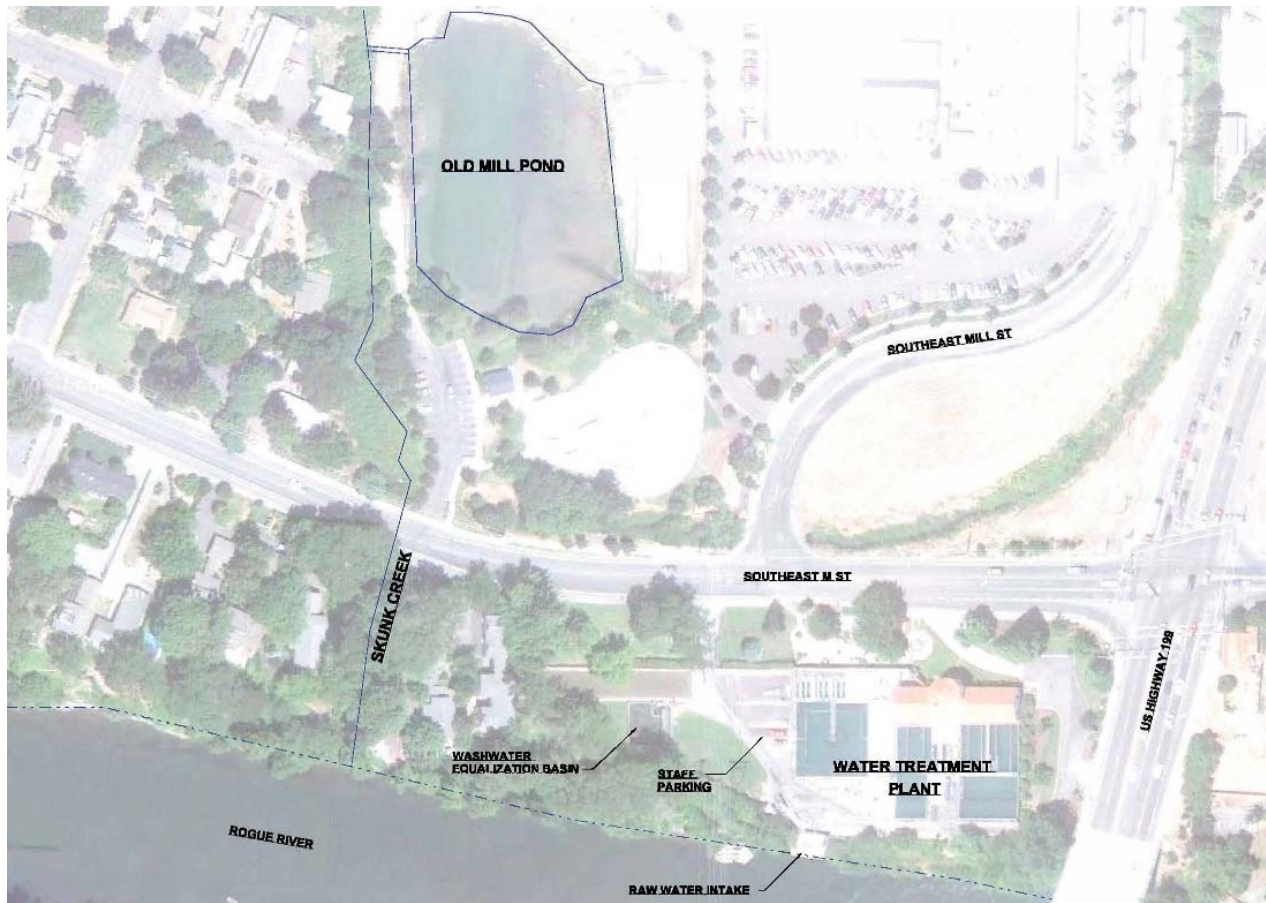


Figure 2-1 Aerial image of water treatment plant and surrounding area

3.0 CAPACITY OF WTP AND RELATED INFRASTRUCTURE

As stated prior, the ultimate capacity for a new WTP was recommended to be 45 MGD in the 2014 WTP Facility Plan Update. This was based on conservative (low-moderate) growth projections from the 2014 Water Management Conservation Plan (WMCP) that helped to demonstrate a plan to develop and protect Grants Pass' water rights. The City's water rights are summarized in **Table 3-1**. In early 2018, the Portland State University Population Research Center (PSU PRC) published revised Grants Pass and Josephine County population growth projections, which were lower than what was published during their last cycle in 2015. However, the revised PSU PRC projections still show more growth than was assumed in the 2014 WMCP.

With the increasing acceptance, availability, and affordability of water conservation methods and equipment, many utilities are not seeing good correlation with population growth and increased water demands. Other factors contributing to lower per capita use can be increased water rates and use of high-density housing with limited landscaping. Looking at all of these

factors and reviewing recent WTP demands (detailed further in Section 3.1), it seems prudent to keep the ultimate capacity of a new WTP at 45 MGD.

Table 3-1 City of Grants Pass Rogue River Water Rights Summary

Application Number	Permit Number / Certificate Number	Priority Date	Beneficial Use	Permit Rate (cfs)	Developed Rate (cfs)	Undeveloped Rate (cfs)	Current Completion Date
	D15829	1888	Municipal and domestic use, irrigation	12.5	12.5	0.0	
S34141	S26901	7/19/1960	Municipal use	25	17.2	7.8	2099
S41672	S45827	12/2/1965	Municipal use	25	0.0	25.0	2099
S64732	S47346	1/13/1983	Municipal use	25	1.3	23.7	2099
Total, cfs (MGD)				87.8 (56.5)	31.0 (20.0)	56.5 (36.5)	

3.1 EXISTING WTP PRODUCTION

WTP production is highly seasonal, as shown by **Figure 3-1**. Over the previous 5 years, the maximum day production (finished water) was 14.9 MGD. The max week production was 84 million gallons (MG) in July 2015 (12 MGD average), and the max month production was 318 MG in August 2017 (10.5 MGD average).

Figure 3-1 also shows the difference between raw water from the river and plant finished water. On the peak production day a raw water flow of 16.5 MG was required to produce the 14.9 MG on that day, approximately 10% water is lost through the treatment plant and processes. This is mainly due to the WTP not having the ability to recycle spent backwash water, and the loss of water through cracks in the deteriorating basins and piping. A new WTP with backwash recovery and watertight structures will be able to boost overall efficiency to 97% or greater.

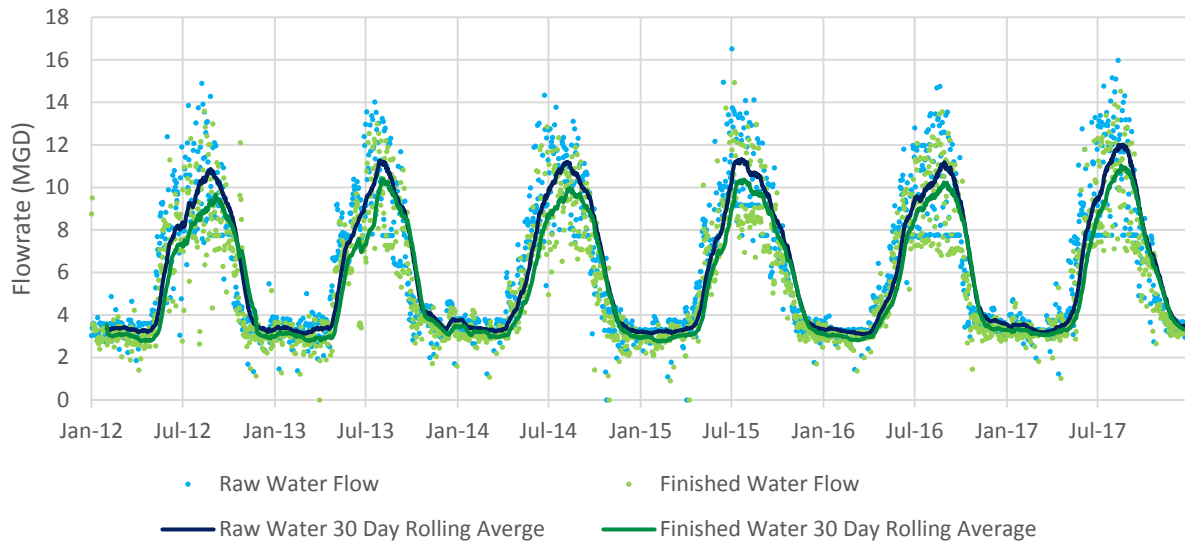


Figure 3-1 Raw Water and Finished Water Plant Flow in MGD

3.2 NEW PLANT PHASING AND SIZING

The new WTP would be sized to accommodate the maximum day water demand. Although instantaneous demands can be greater than the maximum day, these short-term peak demands are planned to be met through stored finished water in the City's distribution system reservoirs.

The 2014 WTP Facility Plan recommended a two phase approach for a new WTP. The first phase would be sized for 30 MGD, and then be followed up with an expansion to the ultimate capacity of 45 MGD. The 30 MGD size allowed for a high-level comparison of potential sites for a new WTP and to determine if the existing WTP site would be feasible to use long-term.

Using high-rate processes, it was deemed that the existing WTP site could accommodate up to 30 MGD, but would have arduous construction sequencing and impacts to existing operations with increased cost and schedule. Building the existing site to 45 MGD was not thought to be reasonable from a cost-perspective. The preferred option, which was confirmed by a Citizen Advisory Committee (CAC), was that a new site be acquired to facilitate more routine construction conditions and limit overall project risks.

While the WMCP and WTP Facility Plan focused on river withdrawals in relation to the WTP, the 2016 Water Distribution System Master Plan (WDSMP) categorized specific customer demands and their usage patterns. Based on the findings in the WDSMP, per capita water demands and growth in the future may be less aggressive than what was presented in prior documents. Planning for an ultimate capacity of 45 MGD is still prudent, but the near-term first phase could be reduced compared to the 30 MGD initial capacity recommendation.

The forecasted water demand using the WDSMP planning numbers is shown in **Figure 3-2**. By this prediction an initial WTP build of 22.5 MGD would provide sufficient water through to approximately 2043. Two additional phases (11.25 MGD expansions) could then be implemented to achieve ultimate capacity. The current thought is to try and avoid overbuilding the initial phase in case growth in the City stalls or if there is a change in economic conditions. Phase 1 would most likely consist of two process trains, so then Phase 2 and 3 expansions could achieve capacity increases through the addition of a single treatment process train, respectively.

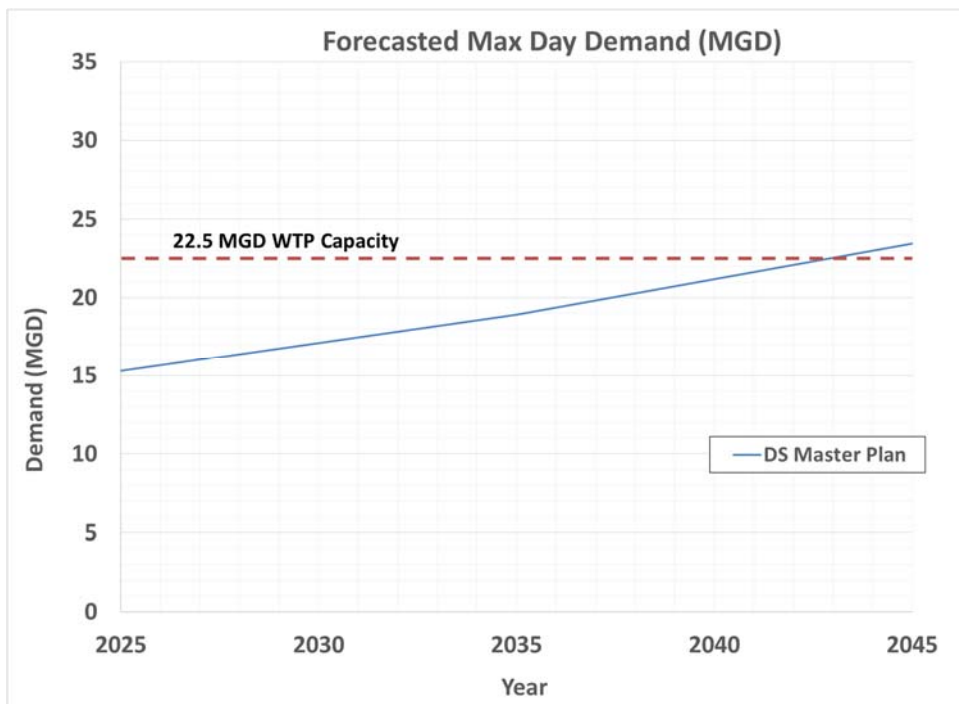


Figure 3-2 Forecasted Max Day Water Demand, MGD (WDSMP)

3.3 EXISTING INTAKE SCREEN AND RAW WATER PUMP STATION

Based on the analyses performed as part of the Site Evaluation task (Task Order 9 of the Owner’s Representative Services), and as directed by City Council, the existing intake and raw water pump station (RWPS) will continue to be used in the future to supply raw water to the new WTP. Per the work performed by the City when the existing intake screens were modified in 2006 to meet fish protection criteria, the maximum/ultimate design capacity of the intake screens is 30 MGD. This needs to be confirmed prior to design. The existing intake/RWPS should be capable of supporting the new WTP for a few decades until the plant capacity exceeds 30 MGD. Then,

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the City will have to decide whether to add intake/pumping capacity at or near the current location, or build a new intake facility further upriver.

The existing RWPS is equipped with four vertical turbine pumps, each rated at a nominal 5.0 MGD capacity with 75 Hp motors, for a total installed pumping capacity of 20 MGD. With one raw water pump out of service, the existing firm pumping capacity is 15 MGD. Two of the existing pumps are equipped with variable frequency drives (VFDs) that were installed in 2010, to provide more flexibility to operate the WTP over a wider range of flowrates. All of the electrical equipment (MCCs, soft-starters, VFDs) for the RWPS is located within the lower level of the existing WTP Building about 150 feet away from the pumps themselves. **Figure 3-3** shows some photos of the existing RWPS and MCC room.

An economical solution initially would be to continue using the existing power supply via the existing WTP for the expanded RWPS. Other power loads at the existing WTP will ultimately be eliminated once the new WTP is fully operational. However, the City prefers to build a new stand-alone power supply system for the expanded RWPS, separate from the existing WTP building, such that the WTP can be demolished and/or repurposed at any time in the future. The location of this new stand-alone power supply at the site needs to be carefully considered related to current and potential future uses at the WTP site.



Figure 3-3 Photos of Existing RWPS (left) and MCC Room (right)

There appears to be space to add 2 more pumps at the existing RWPS. Therefore, the most logical solution to expand the pumping capacity is to add two more pumps similar to the existing pumps. This would result in a total nominal capacity of 30 MGD and a firm capacity of 25 MGD. When the additional headloss to deliver the raw water to the new WTP is considered, the increased total dynamic head (TDH) might reduce the total pumping capacity by 10-15% compared to current conditions. Hence, the future total pumping capacity with 6 pumps may be in the range of 25 to 27 MGD, and the firm pumping capacity will be 21 to 22.5 MGD. The existing pumps will likely be approaching 40 years in age by the time the new WTP will be undergoing commissioning. The City will have to decide whether any of the existing pumps

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should be replaced prior to making final decisions about the number and size of pumps to be installed as part of the new WTP project.

The current approach is to construct a new raw water pipeline for the ultimate future WTP with a capacity of 45 MGD, which represents a single 42-inch pipeline. An issue that may arise from installation of a full capacity pipeline is that initial pipe velocities will be very low when the WTP is operating at lower flows during the winter. This can cause sediment accumulation in the pipeline that would have to be periodically inspected or flushed. The City may also consider building two unique raw water pipelines to the new WTP, in which case they would be approximately 30-inches in diameter each. This is a topic that will be investigated further as design progresses.

It is recommended that at least the 2 of the 6 raw water pumps be equipped with VFDs while the other pumps use constant speed motors. The City can consider re-locating the two existing VFDs for the raw water pumps, built in 2010, or install new VFDs with the reset of the new stand-alone electrical equipment.

As part of resiliency planning, a new, permanently installed backup power generator is included with the RWPS expansion project. The generator should be sized to produce at least 10 MGD of raw water to the new WTP. The WTP will have its own backup power system.

The type of telemetry (communications) for connecting the intake / raw water pump station to the new WTP has not yet been evaluated or selected. If a communications cable is selected, it could be installed along the raw water pipeline alignment. The City may also prefer to use radio or cellular communications between the RWPS and the new WTP.

Table 3-2 summarizes a high-level project cost estimate for the intake and RWPS expansion and raw water pipeline. Included in this estimate is a significant allocation for seismic and structural upgrades to the structure and surrounding area, to reduce damage during a significant seismic event. Costs for the new raw water pipeline to the new WTP are also included. While not directly related to the intake, RWPS, or raw water pipeline, costs were also included for a finished water pipeline to connect from the new WTP site to the distribution system. This full package would represent the work needing to be done outside the WTP fence. However, these costs depend on the final site acquired by the City and this table will need to be updated as the property acquisition process progresses.

Table 3-2 Estimated Construction Costs for Improvements and Expansion of the Existing Intake and RWPS, and New Raw Water Pipeline

Parameter	Cost (2018 \$)
Mobilization and general conditions (8% of subtotal)	\$350,000
Site Civil	\$100,000
Add 2 new raw water pumps (5 MGD each)	\$200,000
Electrical Improvements, including new MCC bldg. and new generator	\$500,000
Instrumentation and Controls (incl. SCADA to new WTP)	\$50,000
Piping, Valves and Flowmeter	\$50,000
2,000 feet of 42-inch Raw and Finished Water Piping to and from WTP	\$2,000,000
Structural and Seismic Improvements	\$1,000,000
Intake Screen Cleaning System Improvements	\$100,000
Subtotal: Construction without Contingency	\$4,350,000
Contingency (20%)	\$870,000
Total: Construction with Contingency	\$5,220,000

4.0 RAW WATER QUALITY AND FINISHED WATER QUALITY GOALS

Almost five years have passed since raw and finished water quality data was reviewed and analyzed as part of the 2014 WTP Facility Plan. Gold Ray Dam had just been removed a few years prior, and it was unknown if raw water quality in the Rouge River was going to be impacted long-term. Also, new regulations are on the horizon for algal toxins and other emerging contaminants of concern. In order to confirm treatment technology recommendations, data from the past five years was analyzed to provide any updates or insights for goals moving forward.

Cyanobacterial growth in the watershed is an important issue because they can impart algal toxins into the raw water. Due to rapidly increasing concern, algal toxins are the subject of new temporary rules issued by Oregon Health Authority in July 2018. Algal toxins require special treatment methods for removal or destruction and may warrant a “do not drink” health advisory if detected in the finished water at certain concentrations.

Lost Creek Lake is a reservoir operated by the US Army Corps of Engineers that feeds the Rogue River and has a history of cyanobacteria (blue-green algae) blooms. A bloom of anabaena flos-aquae and aphanizomenon and associated health advisory was reported by the Mail Tribune on December 4th, 2014. The same article references an earlier bloom that lasted 134

days in 2008-09. The City of Ashland operates Reeder Reservoir tributary to the Rogue River upstream from Grants Pass and reports the presence of cyanobacteria during summer months. Other large reservoirs with the potential for cyanobacteria growth include Applegate Lake, Emigrant Lake, and Fish Lake.

The Rogue River receives non-point source surface water runoff and treated wastewater effluent discharges from Central Point, Jacksonville, Phoenix, Talent, Eagle Point, and other unincorporated Jackson County areas. The two main stem Rogue River dams remaining include the William L. Jess Dam flood-control and hydroelectric structure impounding Lost Creek Lake operated by the US Army Corps of Engineers, and the Prospect Hydroelectric project operated by PacifiCorp. Between 2008 and 2010, the Gold Ray Dam, the Gold Hill Dam, and the Savage Rapids Dam were all removed from the Rogue River upstream from Grants Pass.

4.1 RAW WATER QUALITY DATA SUMMARY

This section analyzes the raw water quality data from January 2012 to December 2017. The raw water quality parameters minimum, maximum and annual average values are shown in **Table 4-1** and discussed below.

Table 4-1 Raw Water Flow and Quality Summary

	Minimum	Maximum	Annual Average
Raw Water Flow (MGD)	1.1	16.5	6.1
Turbidity (NTU)	1	423	7.0
pH	7	8.5	7.8
Temperature (°C)	-1.9	23.2	11.9

Raw water turbidity is one of the most important water quality parameters when evaluating plant performance and alternative process design criteria. The raw water turbidity in the Rogue River changes seasonally with higher turbidity water observed during the winter months. This is shown on **Figure 4-1**. The increase in turbidity generally coincides with low demand, as can be seen when comparing **Figure 3-1** with **Figure 4-1**.

The plant is capable of handling the higher turbidities during these periods as the clarification time is increased at lower plant flows. Typically the maximum allowable turbidity for direct filtration using granular media filters (without clarification) is between 5 to 10 NTU. At times the raw water turbidity is up to 10 times greater than that for extended periods of time, this confirms a need to include a sedimentation/clarification process prior to filtration.

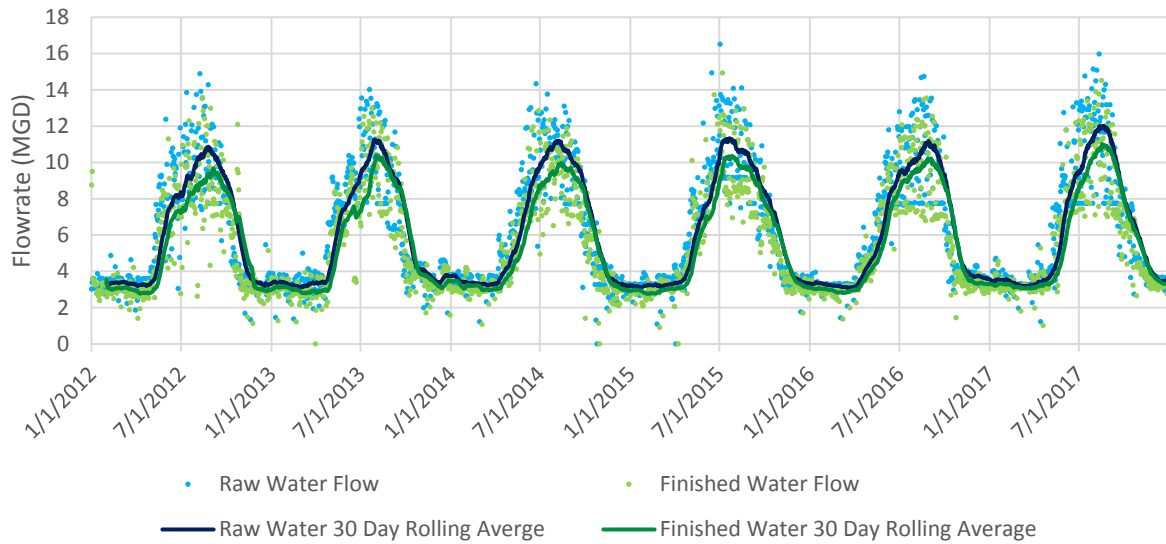


Figure 4-1 Raw Water Turbidity 2012 – 2017

Water temperature follows a cyclical range with a peak in July-August and lowest temperatures in January-February of each year, as shown by **Figure 4-2**. The raw water pH is less seasonal, however is generally higher in spring and fall, this can be seen in **Figure 4-3**.

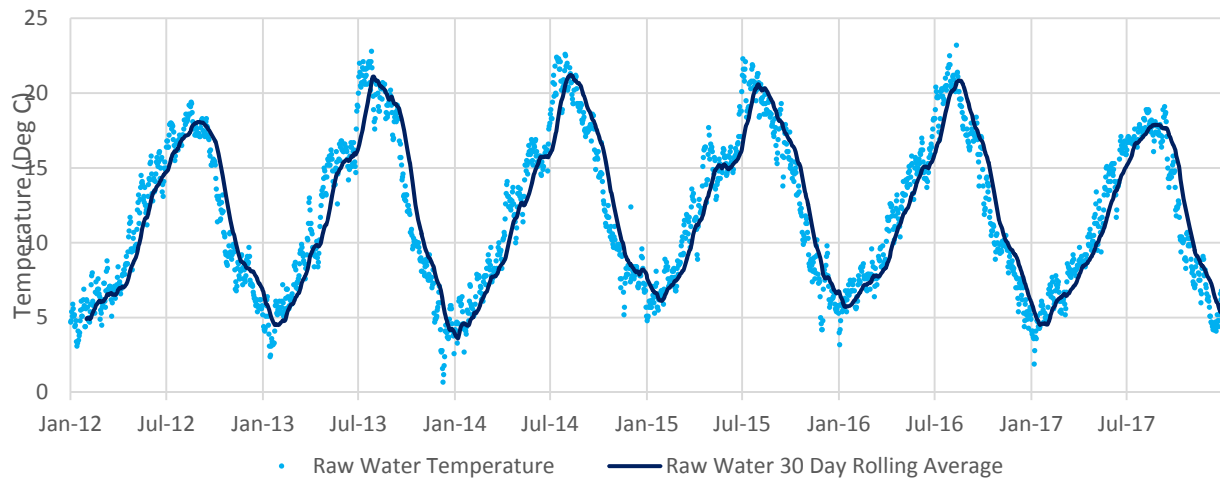


Figure 4-2 Raw Water Temperature (degrees Celsius) 2012-2017

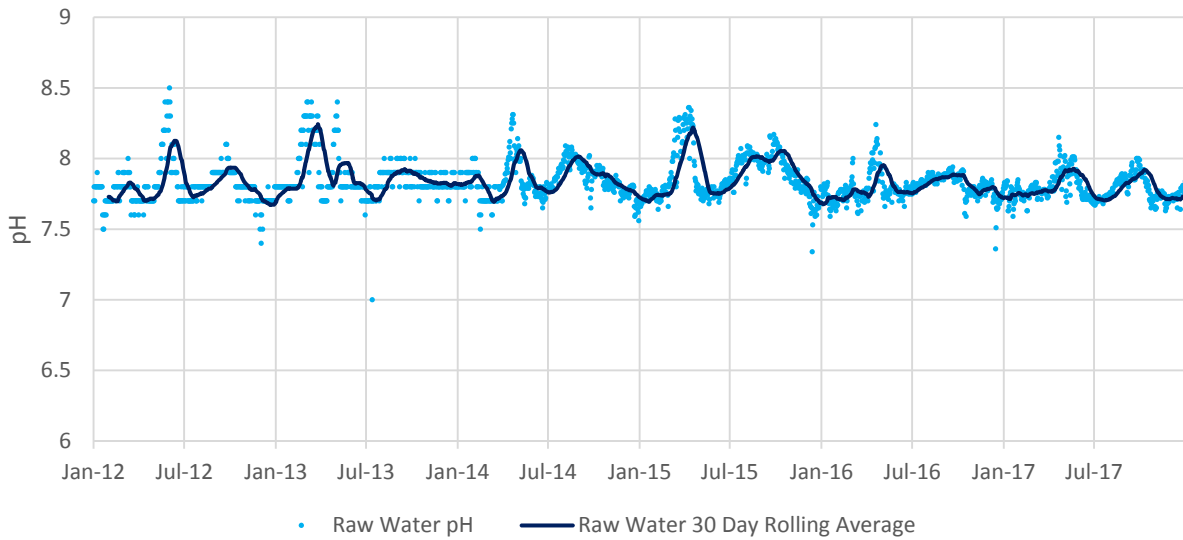


Figure 4-3 Raw Water pH 2012-2017

4.2 EXISTING PLANT FINISHED WATER QUALITY DATA SUMMARY

The existing treatment plant has been producing a good finished water quality for the past five years (Figure 4-4). The finished water turbidity is consistently below 0.06 NTU. The maximum finished water NTU recorded in the last 5 years was 0.11 NTU and the average was 0.02 NTU.

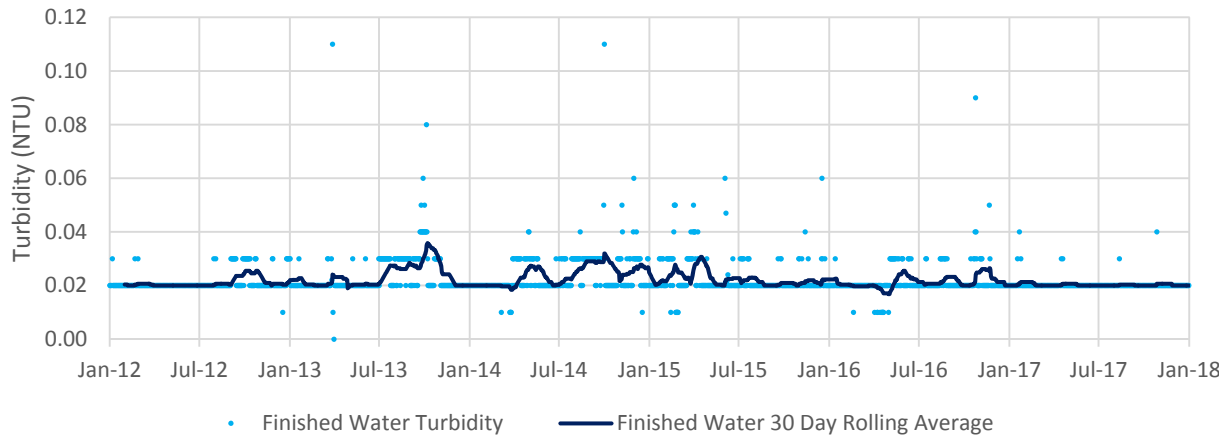


Figure 4-4 Plant Finished Water Turbidity

The finished water pH has stabilized in the last 2 years around an average of 7.2 (Figure 4-5). The finished water temperature (Figure 4-6) follows the same seasonal trend as the raw water and fluctuates between 0.2°C to a maximum recorded value of 54 °C, the average is 12.3 °C. The 54 °C (129.2 °F) reading was most likely an instrument or input error that should be deemed an outlier as only one other reading (also likely an error) was within 25°C.

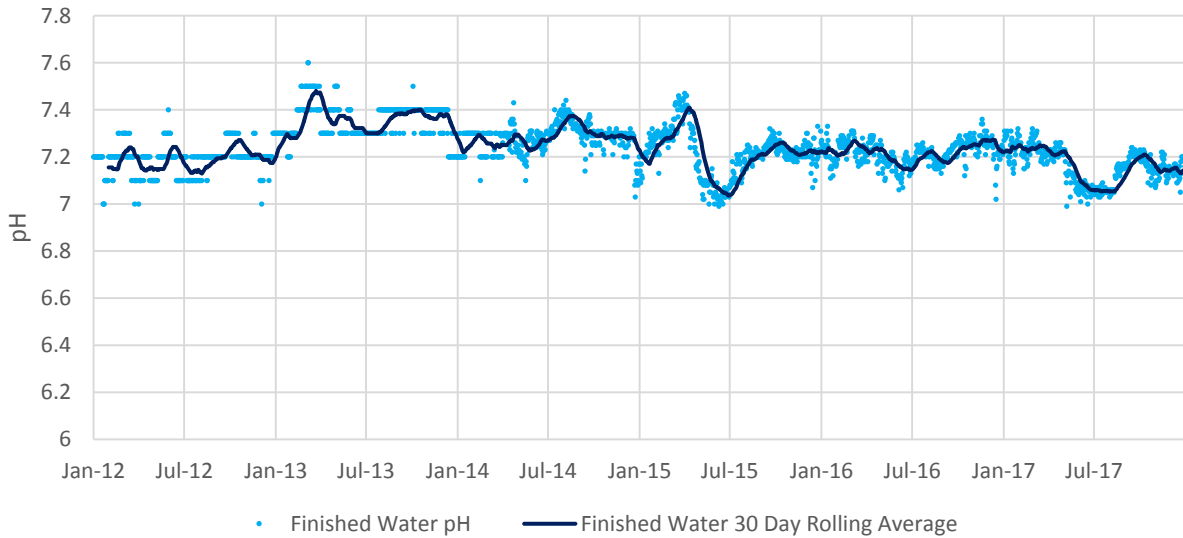


Figure 4-5 Plant Finished Water pH

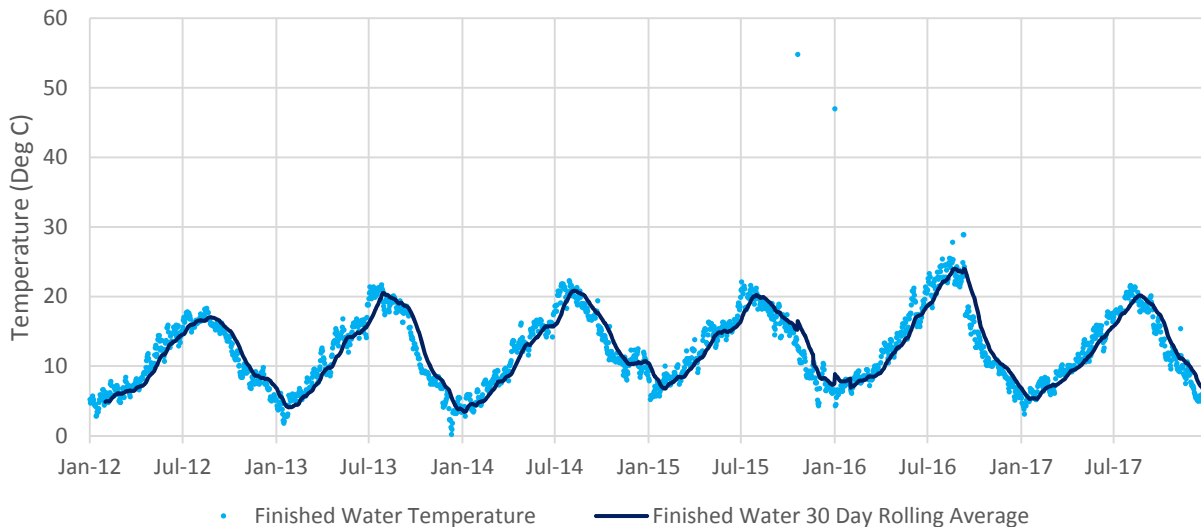


Figure 4-6 Plant Finished Water Temperature

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The raw and finished water alkalinity as shown on **Figure 4-7**, has ranged from 21 to 62 mg/L as CaCO₃. Alkalinity levels above 20 mg/L as CaCO₃ are generally considered adequate for aluminum sulfate coagulation and pH stability in the distribution system.

The alkalinity has varied seasonally, and trends seem to follow pH changes. During low alkalinity periods (and low pH), continued use of a coagulant that does not depress pH or affect alkalinity, should be investigated further as part of the new WTP design.

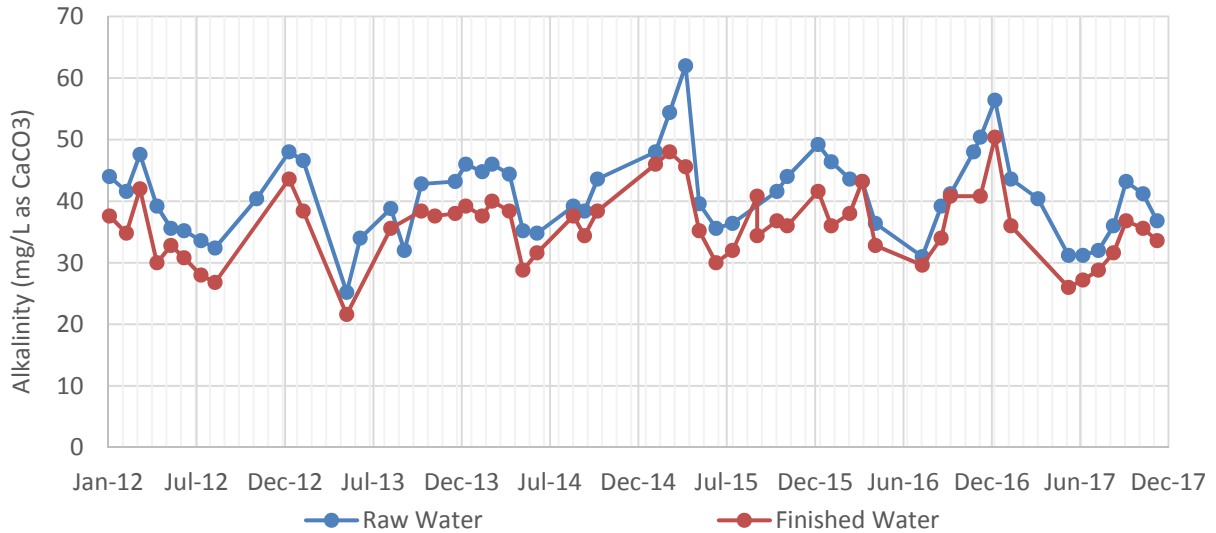


Figure 4-7 Raw Water and Finished Water Alkalinity

The raw and finished water TOC as shown on **Figure 4-8**, has ranged from 0.6 to 2.5 mg/L in the raw water and 0.5 to 1.8 mg/L in the finished water. The plant typically reduces the raw water TOC by approximately 40%.

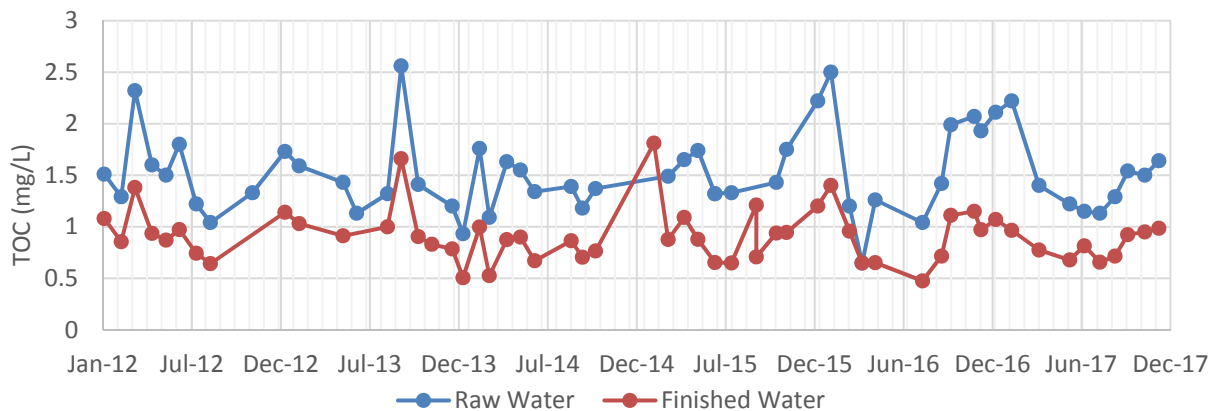


Figure 4-8 Raw Water and Finished Water TOC

4.3 CURRENT AND POTENTIAL FUTURE DRINKING WATER QUALITY REGULATIONS

The existing WTP continues to meet State and EPA requirements for safe drinking water. The processes implemented are proven for traditional treatment. However, there is a need to consider potential rule changes, upcoming regulatory actions, and future testing around:

- Harmful algal blooms (HABs) and algal toxins
- Metals -
 - Lead and copper
 - Manganese
- Disinfection byproducts
- Other Contaminants of Emerging Concern (CECs) that could include -
 - Unregulated Contaminant Monitoring Rule 4 (UCMR 4) compounds
 - Agricultural chemicals, endocrine disrupters, anti-biotic resistant genes
 - Perfluorinated alkyl substances (PFAS)
 - Nano-metals
 - Micro-beads / micro-plastics

The treatment process selection needs to weigh the risks posed by the items described above, against the cost of treatment plant construction and its resulting operational complexity. If any of these water quality impairments are identified in the Rogue River, it could drive the need for additional or modified treatment.

The most topical subject for the City is around HABs and algal toxins. HABs, consisting of blue-green algae / cyanobacteria, have been detected around the State in the past, but toxins had not been detected in the finished water of the public drinking water systems until earlier this spring by the City of Salem. Typical chlorine disinfection practices can destroy some algal toxins, but there are some toxins that are chlorine-resistant at distribution system doses. Also, if algal matter makes its way through granular media filters, chlorine could potentially cause toxin releases in the distribution system.

In response to Salem's detections, OHA has fast-tracked a temporary sampling rule requiring almost 100 water utilities (including Grants Pass) to routinely monitor for algal toxins through the end of the warm weather season. It appears that OHA's current plan will be to evaluate how this year's sampling goes while continuing to develop a permanent rule to be implemented in January 2019. The City has been involved with the Oregon Water Utilities Council (OWUC), legislative arm of the Pacific Northwest Section of the American Waterworks Association (PNWS-AWWA), to help proactively provide feedback during the rulemaking process.

It is anticipated that HABs will become more prevalent throughout the State with climate change causing more frequent drought and warm weather conditions from spring through fall. It is recommended that the City continue to be engaged with OWUC as cyanobacteria are

known to exist in Lost Creek Lake and other reservoirs in the Rogue River basin upstream from Grants Pass.

4.4 NEW PLANT WATER QUALITY GOALS

The new WTP will be designed to continue to produce low filtered water turbidities less than 0.10 NTU over a wide range of raw water turbidities. Disinfection byproduct formation will be limited by removing organics through coagulation/filtration and also avoiding pre-chlorination. Taste and odor may be improved by the inclusion of ozone or GAC processes. Corrosion monitoring in the distribution system will continue as with the existing plant. Finished water pH will be monitored and adjusted as needed. Overall water quality goals are presented in **Table 4-2**.

These proposed goals build on the proposed water quality goals that were developed for the 2014 Pilot Plant Study, which evaluated treatment processes including ballasted flocculation, intermediate ozonation, and high-rate granular media (GMF) filtration. High-rate GMF filtration was approved by OHA (rates up to 12 gpm/sf) following completion of the pilot study and proposed operational goals for new GMF filters are shown in **Table 4-3**.

Table 4-2 Proposed Water Quality Goals for the New WTP

Parameter	Location	Goal	Condition	Comments
Solids/metals				
Turbidity	Settled water	< 2.0 NTU	95% of time	For conventional process
	Individual FE	< 0.15 NTU	95% of time	LT2 microbial toolbox credit
	Combined FE	< 0.15 NTU	99% of time	LT2 microbial toolbox credit
Particle Count	Individual FE	<400 particles/mL at >2µm or 2.0-log removal from raw water for 3-5µm range	95% of time	Not regulated
	Combined FE	<200 particles/mL at > 2µm or 2.0 -log removal from raw water for 3-5µm range	95% of time	Not regulated
Total iron	Entry point	< 0.05 mg/L	95% of time	Secondary MCL = 0.3 mg/L
Total manganese	Entry point	< 0.04 mg/L	95% of time	Secondary MCL = 0.05 mg/L
Total aluminum	Entry point	< 0.05 mg/L	95% of time	Secondary MCL = 0.05–0.2 mg/L
Total lead	Dist. system	< 0.01 mg/L	95% of time	Meets LCR
Total copper	Dist. system	< 1.0 mg/L	95% of time	Meets LCR
Aesthetics				
Apparent color	Entry point	< 2 PCU	95% of time	
Taste and odor	Entry point	< 2 TON	95% of time	

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Table 4-2 Continued

Parameter	Location	Goal	Condition	Comments
MIB/Geosmin (T&O)	Entry point	< 0.003 mg/L	95% of time	3 ng/L is approximate perception threshold
Organics/DBPs				
TOC	Plant removal	> 25%	95% of time	No regulatory requirement if TOC annual ave. < 2.0 mg/L
TTHM	Dist. system	< 0.04 mg/L		Primary MCL = 0.08 mg/L
HAA5	Dist. system	< 0.03 mg/L		Primary MCL = 0.06 mg/L
Bromate	Dist. system	< 0.008 mg/L		Primary MCL = 0.01 mg/L
Disinfection/residuals				
Viruses	Entry point	4-log removal/ inactivation	100% of time	Per ESWTR Bin 1
<i>Giardia</i>	Entry point	3-log removal/ inactivation	100% of time	Per ESWTR Bin 1
Free chlorine residual	Entry point	> 0.8 mg/L	100% of time	
	Entry point	< 1.5 mg/L	100% of time	
	Dist. system	TBD	95% of time	
Corrosion Control				
pH	Entry point	7.2–8.0	95% of time	
Alkalinity	Entry point	20–30 mg/L as CaCO ₃	95% of time	Can exceed 30mg/L

Table 4-3 Granular Media Filter Operation Goals (Conventional or High-Rate Clarification)

Parameter	Goal	Comments
Maximum filtration rate	12 gallons per minute per square foot (gpm/sf)	Assumes 2 filters out of service
Minimum UFRV	5,000 gallons per square foot (gal/sf)-run	
Recommended UFRV	10,000 gal/sf-run	
Maximum turbidity	0.15 NTU	Allowed before backwash is initiated
Maximum available headloss	12 feet	Need to subtract clean bed headloss and piping headloss to determine operating headloss
Maximum runtime	72 hours	Backwash initiated if terminal headloss and/or turbidity breakthrough has not required a backwash.

5.0 EVALUATION OF TREATMENT TECHNOLOGIES

There are a number of different treatment processes and technologies that can be implemented for the new WTP. Most can be mixed and matched in various orders to meet different treatment objectives. However, based on the performance of the existing processes in place at the existing WTP, experience with other WTPs in the region, and prior City planning studies and reports, options were narrowed to three alternatives:

- **Conventional** - flocculation and sedimentation with plate settlers followed by ozone and granular media filtration (**Figure 5-1**)
- **High Rate Clarification** - ballasted sedimentation followed by ozone and granular media filtration (**Figure 5-2**)
- **Membrane Filtration** - flocculation and sedimentation with plate settlers followed by membrane filtration and GAC (**Figure 5-3**)

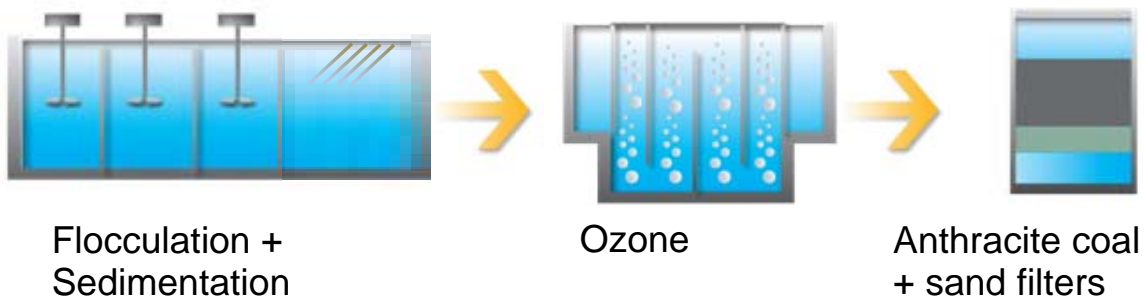


Figure 5-1 Main Process Schematic for Conventional Treatment Alternative

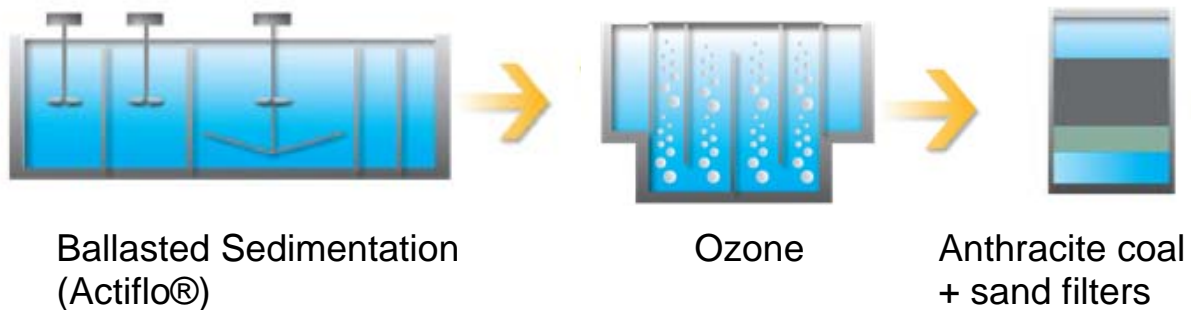


Figure 5-2 Main Process Schematic for High Rate Clarification Treatment Alternative

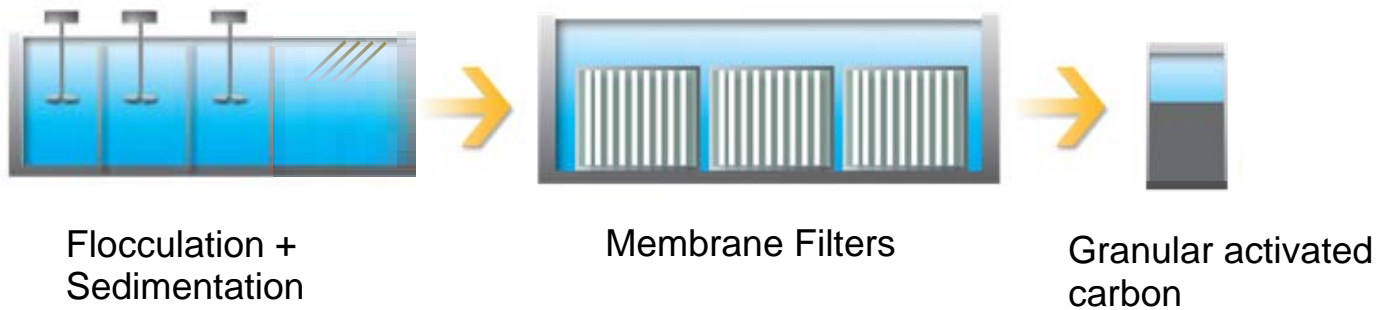


Figure 5-3 Main Process Schematic for Membrane Filtration Treatment Alternative

The conventional alternative most closely resembles the processes used at the existing WTP by incorporating clarification through flocculation and sedimentation basins and granular media filters (coal and sand). Intermediate ozone was added to the proposed process train to provide aesthetic water quality benefits and to help the City plan for any future water quality challenges.

The high rate clarification alternative replaces the traditional clarification (flocculation+ sedimentation) step from the conventional alternative with use of ballasted sedimentation (Actiflo®). This allows for a smaller overall footprint for a new WTP, but requires more mechanical equipment, monitoring and chemical usage.

The membrane filtration alternative would likely still require clarification due to high seasonal turbidities, and replaces the granular media filters (coal/sand) with manufactured hollow fiber membranes that remove particles based on size/pore exclusion. Typically, the use of strong oxidants (like ozone) or high doses of polymer /sand (for Actiflo®) are not recommended prior to most membrane filters. As a result, clarification using plate sedimentation was selected for this alternative, and ozone was removed. To achieve similar aesthetic treatment without ozone, use of pressurized granular activated carbon vessels for filtered water polishing was assumed.

To aid in comparative cost estimating and developing site footprints for the three alternatives, the space for other ancillary processes and features needed was assumed to be common to each alternative. Examples of common processes and features include: WTP residuals handling, chemical feed and storage, administration and operations, electrical and mechanical equipment rooms, and finished water storage and pumping. Layouts of the three treatment system process alternatives are included in **Appendix A**.

The remaining part of this section provides additional detail about the different features of the new WTP process alternatives, and develops the base assumptions for estimating construction and operations and maintenance costs.

5.1 CLARIFICATION TECHNOLOGIES

Clarification is the first physical removal process performed ahead of filtration to reduce a significant portion of sediment and TOC from the raw water to allow for an efficient filtration process. A conventional WTP will use separate chemical mixing, flocculation and sedimentation steps to achieve efficient clarification. The existing WTP currently employs three sedimentation basins directly following static, in-line chemical mixing.

Based on the historical raw water quality data reviewed and prior studies and reports, the following process technologies were considered for clarification:

- Flocculation, Sedimentation with Plate Settlers (**Figure 5-4**) – used in Conventional and Membrane Filtration Alternatives
- Ballasted Sedimentation (Actiflo® Schematic on **Figure 5-5**) – used in High Rate Clarification Alternative

The use of flocculation and high rate sedimentation would be most similar to the existing plant. This would be an improvement on the current process with addition of flocculation and plate settlers that would produce more consistent settled water turbidity throughout all seasons and over a wide range of water quality.

The main advantage to ballasted sedimentation is the smaller footprint. As stated previously this technology was successfully pilot tested by the City on Rogue River Water. **Table 5-1** presents a high-level comparison for the two clarification options.

Table 5-1 Comparison of Clarification Options

	Advantages	Disadvantages
Flocculation, High Rate Sedimentation with Plate Settlers	Proven treatment technique for Grants Pass Multiple processes offer level of operational flexibility Lower equipment cost Lower operating cost	Large foot print required Higher cost associated with basin construction
Ballasted Sedimentation – Actiflo®	Higher clarification rates per square foot Low footprint Lower overall capital cost	Higher operator attention required More mechanical components Higher operational costs



Figure 5-4 Sedimentation Basin with Plate Settlers

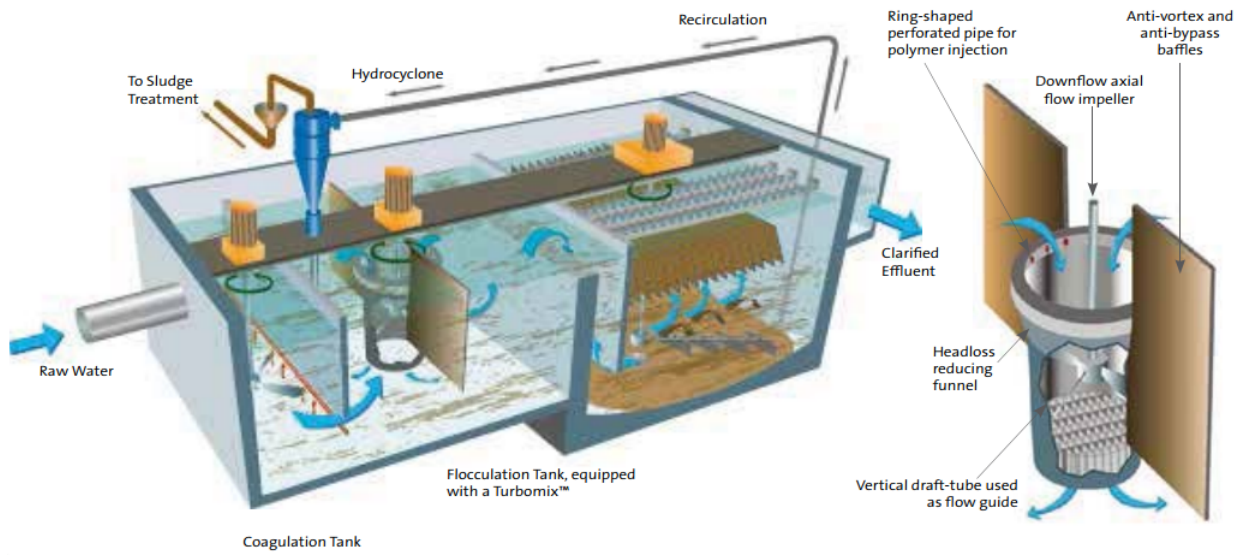


Figure 5-5 Schematic of Actiflo® (Turbo) System-courtesy of Kruger

5.2 FILTRATION TECHNOLOGIES

There are two filtration technologies considered for the new Grants Pass WTP:

- High-rate granular media filtration (GMF)
- Membrane filtration

Conventional treatment or high-rate clarification with GMF requires the use of a coagulant chemical(s), such as alum, ferric chloride or proprietary coagulants like aluminum chlorohydrate (ACH) or polyaluminum chloride (PACl), to destabilize the suspended particulate matter (turbidity) prior to clarification and filtration. If the coagulant dosing is not optimized, which is often dependent on source water quality conditions, the conventional treatment process cannot perform as desired. On-line control tools such as streaming current monitors and zeta potential analyzers are available to assist with maintaining the proper coagulant dose, as well as traditional off-line methods such as jar tests.

Membrane filtration is an “exclusion” process which removes particulates based on the pore size of the membranes and does not depend on optimized coagulation to remove particulate turbidity and protozoan microbial pathogens as desired. Although not required for particulate removal, coagulants are often combined with membrane filtration to remove dissolved contaminants such as organic matter, control fouling, and / or control DBPs. Membrane filtration systems generally produce lower and more consistent filtered water turbidity compared to conventional treatment. However, membranes do not usually perform well in direct filtration mode on water with sustained high turbidity, such as the Rogue River. Therefore a clarification stage is assumed to be required at Grants Pass at least seasonally to reduce the turbidity before membrane filtration. The clarification step will also improve membrane performance while simultaneously allowing larger doses of coagulant to control disinfection byproduct formation.

The footprint of the two alternatives is similar for Grants Pass, whereas at other plants membrane filtration may reduce the plant footprint. This is due to the need for clarification to reduce turbidity before the membrane filters. Further optimization may allow the clarification step to be reduced from that needed prior to granular media filters. **Table 5-2** presents a high-level comparison of the two options.

Table 5-2 Comparison of Filtration Options

	Advantages	Disadvantages
High-rate media filtration	High filtration rates Low operational cost No chemical cleaning systems required	Larger, instantaneous backwash volumes

Table 5-2 Continued

	Advantages	Disadvantages
Membrane filtration	Consistent high water quality Physical barrier against waterborne pathogens Pore size prevents particle breakthrough Lower chemical use for coagulation High level of redundancy	More instrumentation High capital cost High operational costs if pumping required Proprietary system Requires chemical cleaning to maintain capacity

5.3 ADDITIONAL ORGANICS TREATMENT

There are a variety of processes or process enhancements that can be made to further improve treatment of naturally occurring organic materials, algal toxins, tastes and odors, overall aesthetics, and help deal with other contaminants of emerging concern. The two most common enhancement approaches at WTPs include ozonation and activated carbon. Advanced oxidation processes (AOP) using ozone-peroxide, ultraviolet light (UV)-peroxide, or UV-chlorine can also be employed for specific, targeted applications. Presently, there are no large scale WTPs in the Pacific Northwest who are using AOP, but there are a number of plants that use ozone and/or GAC.

Ozone is more commonly used with conventional processes as an oxidant or as a disinfectant, while activated carbon (granular) is more commonly used for “polishing” post membrane filtration or as a biological filter media for conventional treatment applications. Both ozone and granular activated carbon (GAC) are discussed further below.

5.3.1 Ozone

Ozone is the enhanced process recommended for the conventional and high-rate clarification alternatives. It is a chemical oxidant used in the advanced treatment of potable water. Ozone was selected primarily for oxidation of any taste and odor forming constituents or algal toxins that could be present in the raw water. It is created by using electricity to split oxygen (O₂) gas molecules and cause them to reform into ozone (O₃).

Ozone can also be used to disinfect protozoa such as *Giardia* and *Cryptosporidium* under federal regulations. Although, in Oregon, a conventional treatment plant's disinfection credit is only given to processes that occur downstream of the filters. Therefore, ozone is not currently considered to contribute to the disinfection profile at a WTP. However, Grants Pass has been integral in efforts underway by a group of Oregon water utilities to petition OHA for a waiver to allow for credit to be given for disinfection prior to the filters. In the event that this effort is successful, an ozone system could be designed such that the new WTP would be able to provide at least 0.5 log disinfection credit for *Giardia* in addition to disinfection credit for viruses.

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This would allow for greater operational flexibility and potential construction cost savings by reducing the size of a chlorine contact basin.

A strong oxidant, ozone reacts with virtually all organic and inorganic constituents in water. Additional water quality improvements expected with primary treatment goals include: reduction of disinfection byproduct formation, removal of color, oxidation of metals into filterable precipitates, and non-credited disinfection as described above.

In WTPs, ozone can be dosed to raw water, prior to filtration (intermediate ozone) or after filtration. The City pilot tested intermediate ozone as depicted for the conventional and high-rate clarification alternatives. In this location the majority of solids along with some dissolved organic matter were removed from the water by the prior process, and the placement of ozone upstream of the filters helped improve filter performance. Ozone can increase the biodegradability of organic material in water. Use of ozone prior to filtration allows biology to develop within the filter media to remove the biodegradable organics before it enters the distribution system. As ozone can provide filtration benefits, post-filtration ozone was not considered. Pre-ozonation was not considered at the time because it increases chemical consumption, has the potential to disrupt clarification, and since current algal toxin treatment methods recommend against pre-ozonation. **Figures 5-6** and **5-7** depict an example ozone generator and liquid oxygen feed system.



Figure 5-6 Ozone Generator Skid System



Figure 5-7 Liquid Oxygen Storage for Ozone Generation

5.3.2 Granular Activated Carbon

Granular activated carbon (GAC) media is lighter than traditional anthracite filter media, and has open areas on its surface and within that facilitate adsorption ("sticking") of molecules/compounds. The adsorption removal performance of GAC depends on a lot of different variables, but the most important is the length of time that the water is in contact with the media and the amount of material that can be adsorbed. The primary design criteria for GAC adsorption of typical taste and odor (T&O) organics is empty bed contact time (EBCT). EBCT is calculated as the volume of the GAC divided by the flowrate. An optimal EBCT for T&O removal is 7.5 minutes (or greater), and the typical minimum suggested EBCT is 5 minutes. There are some installations of GAC as a filter media which use < 5 minutes of EBCT. In that case the GAC's adsorption capacity eventually exhausts and the GAC needs to be replaced, with the frequency of replacement depending on flow volumes treated and water quality; such as total organic carbon (TOC).

As mentioned earlier, GAC could be employed at a new WTP using two different methods:

1. As a filter media (conventional and high-rate clarification alternatives), or
2. As a stand-alone contactor arrangement, either in pressurized vessels or in open/gravity basins (membrane filtration alternative).

The primary purpose of multimedia filters is for particle removal, however the top layer of anthracite coal media can be replaced with GAC media to provide a dual role of particle removal and to facilitate geosmin and MIB removal. In order for GAC to be effective at removing selected organic compounds, including 2-methylisoborneol (MIB) and geosmin, sufficient EBCT must be provided. Therefore, the depth of GAC needs to be enough to provide a minimum EBCT to meet the removal requirements, at the maximum filtration rate.

The adsorption removal performance of the GAC will decrease over time, as it continues to remove TOC from the feed water. Hence, the GAC must be replaced or regenerated every 1 to 6 years depending on site-specific conditions and GAC type. Therefore, the T&O control ability of GAC decreases over time, until the media is replaced. This GAC replacement requirement is often considered a major disadvantage of using GAC as a direct filter media for T&O control, when compared with other options, since it disrupts plant operations and creates additional costs. GAC has the advantage of being passive in that it doesn't need to be turned on/monitored like an ozone system.

While GAC can provide an additional treatment barrier for the conventional and high-rate clarification options, it was not included at this time for lifecycle cost-savings (assuming GAC would be routinely replaced as it is exhausted). Also, typical filter media design depths would not provide optimal contact time at higher filtration rates. Another factor is that GAC filters would be required to be in operation whenever the WTP is running. Post-filter contactors or intermediate ozone can be turned on or off as needed and the WTP could still be operational.

For the membrane filtration alternative, post-filter pressurized GAC contactors were selected since they would be able to be designed with adequate contact time, can be installed without additional pumping, and presented an economical option for additional organics treatment. Ozone cannot be installed ahead of membrane filters. An example photo of GAC contactors is presented in **Figure 5-8**.



Figure 5-8 Pressurized GAC Contactors installed in San Antonio (photo courtesy of TIGG)

5.4 ANCILLARY WTP PROCESSES AND FACILITIES

The ancillary WTP processes facilities common to the alternatives are presented in **Table 5-3**. The table also provides comments about how preliminary decisions and sizing were determined. As the project progresses, these details will be further evaluated with City staff to determine sizing and recommendations for final design and construction.

Table 5-3 Common Ancillary WTP Processes and Facilities

Process / Facility	Purpose	Comments
Rapid mix system	Chemical injection system upstream of clarification process	To allow for greater turndown and consistent chemical mixing under different WTP flows, a pumped diffusion system is assumed.
Chlorine contact basin and Clearwell	Provides contact time for chlorine disinfection and finished water storage prior to delivery to distribution system	Sized for 1.0 million gallons (MG) of disinfection and 1.0 MG of storage to service the final 45MGD plant.
Finished water pump station	Delivers finished water to the distribution system, and also provides utility water and backwash water for WTP needs	Assuming 3+1 (duty+standby) for finished water pumps, 1+1 for backwashing, and 2+1 for utility water service.
Chemical building	Storage and feed equipment for treatment chemicals. Includes room for ozone generation equipment for conventional GMF option	Located close to main operations and process units. Chemical storage of about 30 days at max WTP capacity to be provided.
Washwater equalization (WWEQ)	Washwater from granular media filter (GMF) or membrane filter (MF) backwashes are stored before being recycled or disposed.	GMF will require a larger storage tank or basin than MF as depicted on the alternative site plans.
Solids Handling	A gravity thickener, washwater clarifiers, and mechanical dewatering building will thicken and dry WTP residuals for off-site disposal.	Use of mechanical dewatering allows for greater space savings than large traditional lagoon drying beds. Conservative mechanical dewatering building sizing assumes screw presses to be used. Centrifuges could reduce building footprint, but may increase O&M costs.
Overflow / Stormwater detention pond	Provides storage in case of WTP upset or overflow. Can also provide required stormwater detention.	Overflow detention to provide 15 minutes of storage at max WTP flow. Stormwater requirements to be defined once final site is selected.
Administration and Operations Building	Houses WTP office space, laboratory, locker rooms, kitchen, conference room, and main WTP controls.	Multi-level building to save footprint and allow for connection to other tall, above-grade structures (e.g. floc/sed basins).
Electrical Building	Dedicated space for major WTP electrical equipment.	Located towards heart of WTP or next to main power consumers to minimize conduit run length.
Maintenance Building	Shop, garage, and storage area for WTP equipment spares and repairs.	Can be co-located with chemical building or administration and operations.

6.0 DETERMINE WTP STAFFING AND O&M FUNCTIONS

The existing WTP typically operates between 8 to 24 hours per day throughout the year depending on system demands, and to meet daily water production requirements. The plant is staffed at all times when in operation, and employs six full-time-employees (FTEs) and up to five part-time, seasonal employees during the summer. An organizational chart for the Public Works Department is shown in **Figure 6-1**.

The staff has a well-rounded skill set and is able to perform most maintenance around the WTP. Specialized or major maintenance items, such as pump rebuilds are out-sourced. In addition to plant duties, the operations staff is also responsible for various off-site duties relating to the pump stations and reservoirs in the distribution system.

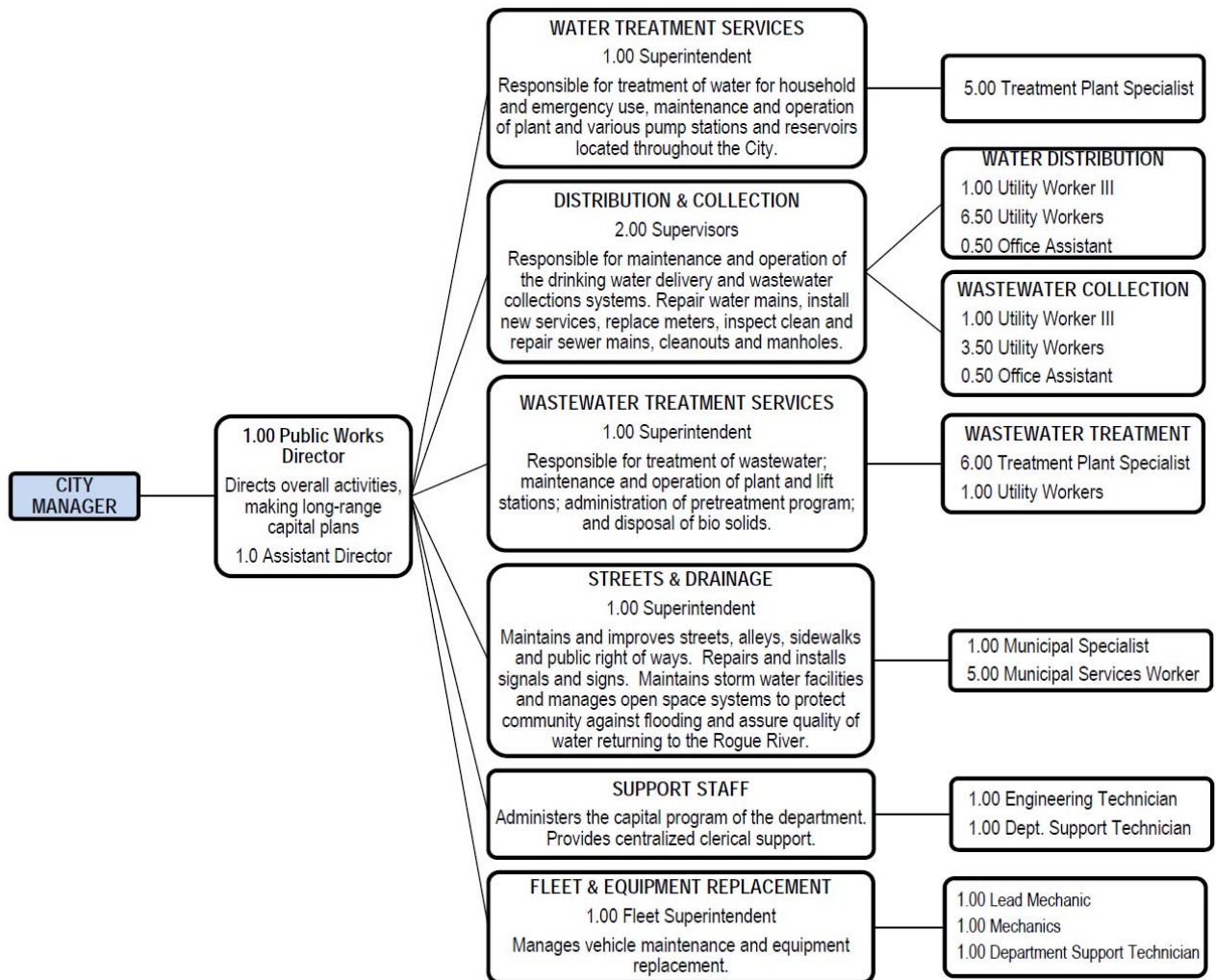


Figure 6-1 Grants Pass Public Works Organizational Chart

6.1 ANTICIPATED FUTURE PLANT STAFFING AND O&M REQUIREMENTS

The current seasonal start-stop operating program is expected to continue at the new WTP, so no new shifts will be required. However, additional operational “complexity” and maintenance may be added compared to the existing plant for new processes. For the conventional alternative this would include:

- Ozonation equipment and instrumentation
- Mechanical dewatering equipment
- Additional variable-speed pumping and electrical equipment

The new equipment associated with these processes, suggest that one new O&M staff member might need to be added for the new WTP. However, as there is significant time currently dedicated by WTP staff to repairs and maintenance at the existing WTP, there may be enough staff capacity at a new facility with fewer problems. For planning purposes it is recommended that an additional technician be brought on staff to assist with the ozone system.

The high-rate clarification alternative, with both ozone and ballasted sedimentation, may require one to two additional staff compared to existing facilities due to the increased mechanical equipment. As a comparison, the 38 MGD Lake Oswego-Tigard WTP and the 15 MGD Willamette River WTP (Wilsonville) both have similar processes to this alternative and have two to three more FTEs than the Grants Pass WTP has.

The membrane filtration alternative does not have ozone and the GAC contactors will operate passively. This alternative may require fewer operators than the other two. However, membrane filtration has much more instrumentation, so a change from a standard operator to a more specialized instrumentation technician may be beneficial.

The new WTP's staffing requirements will continue to be evaluated as the next phases of the project unfold, so that the City has adequate time to make appropriate labor decisions.

7.0 PROJECT COST DEVELOPMENT

In order to help make a recommendation, a rough order of magnitude (ROM) construction cost comparison estimate was completed and O&M costs were developed to compare the three alternatives (**Table 7-1**) A breakdown of the O&M estimate can be found In Appendix B. The O&M values were also used to project 40-year total lifecycle costs.

Construction costs of the three alternatives were within ROM estimating accuracy ranges. All three could be considered by a future progressive design builder for potential cost savings or value engineering. From an O&M perspective, Alternative 1 will be very similar to existing operations (plus the addition of ozone) whereas the other two bracket in cost.

Table 7-1 Construction and O&M Alternative Cost Comparisons

	Alternative 1 – Conventional	Alternative 2 – High-Rate Clarification	Alternative 3 – Membrane Filtration
Construction for 22.5 MGD	\$54,900,000	\$54,200,000	\$57,700,000
Construction Contingency (30%)	11,000,000	11,000,000	11,500,000
Annual O&M	Similar to existing but with ozone added	+7%, more chemicals and mechanical equipment	-7%, may reduce operations but expensive membrane replacement
Total O&M Cost, NPV	\$43,300,000	\$46,480,000	\$40,520,000
Total Lifecycle Cost, 40 years	\$106,170,000	\$111,530,000	\$109,710,000

7.1 TOTAL PROJECT BASELINE COST ESTIMATE

Aside from the WTP construction costs, there are many other project costs that need to be incorporated into the baseline total project cost estimate. Additional costs include: land acquisition, Phase 1 PDB, Phase 2 PDB, City administration, and owner’s representative services. These costs depend on the final new WTP site acquired by the City, and its associated land development costs. A summary list of components for the baseline project cost estimate is in **Table 7-2**.

Table 7-2 Total Project Costs

Component	Cost	Comments
WTP Construction	\$54.9M	Conventional alternative. Full Class 4/5 Opinion of Probable Cost (OPCC) found in the Appendix.
Intake, Raw Water Pump Station, and Raw Pipeline Construction	\$5.2M	Includes allowance of 2,000 feet of raw and finished water piping (42").
Property Acquisition and Development	\$5.0M	Includes land purchase, relocation (if required), and environmental investigation, site work, and development of utilities.
Phase 1 Progressive Design Builder (PDB)	\$5.0M	Design to develop guaranteed maximum price (GMP).
Phase 2 PDB	\$3.5M	Final design and engineering services during construction.
Owner’s Representative Services	\$4.5M	Indicative design and preparation of procurement documents. Assistance with geotechnical investigations and permitting for new site. Services for PDB selection, and review of PDB design. Construction inspection and management services. New WTP commissioning support.
City Bond Servicing and Administration	\$2.0M	Internal labor for project and for financing.
Total Project Cost	\$80.1M	

8.0 LEVEL OF SERVICE GOALS

The 2014 Facility Plan Update discussed the redundancy of the new WTP with the consideration that designing the treatment plant to produce full maximum day demand (MDD) capacity with any one treatment train for each process offline or out of service is costly. As a result, several redundancy strategies were discussed and the following can be considered for the new WTP:

- Minimum backup power supply through an on-site emergency generator sufficient for production of average day winter demands, or maximum of 50% WTP capacity
- Additional hydraulic capacity in basins and pipelines to provide operation at increased production rates for individual treatment trains over short periods of time.
- No redundancy in raw water pumping facilities at 22.5 MGD. There will be a minimum of five pumps required to meet this capacity, each rated at approximately 5 MGD. Space is available at the intake for no more than six pumps of this size.
- Redundancy to meet MDD for other pumping facilities that represent critical plant operations including chemical injection, finished water service, and backwash pumping. Redundancy of filters is also planned, as they represent a critical plant operation.
- No clarification and disinfection basin redundancy to meet MDD. Under this assumption, if only two treatment trains are planned for 22.5 MGD of clarification, more than 50 percent of MDD could be achieved from either train by running it at higher loading rates for short periods of time. Better raw water quality is anticipated to typically occur during periods of the year which coincide with peak demands. A Clearwell which provides adequate CT could be compartmentalized, so it would be possible to remove portions of the Clearwell from service for cleaning and inspection. This work could also be scheduled during a low demand period where CT is still adequately met.

Following a catastrophic event, within 48 hours, the WTP will deliver 50% of average day demand with water quality meeting minimum regulatory requirement. Potential catastrophic hazards include those shown in **Table 8-1**. Level of service goals and hazards should be revisited on a fairly regular basis to make sure they are still relevant, applicable, or demonstrate a need for corrective action.

Table 8-1 Potential service hazards

Hazard	Potential WTP Impacts
Seismic – Geotechnical	<ul style="list-style-type: none"> • Liquefaction at new site • Landslide at river bank by intake and RWPS
Seismic – Structural	<ul style="list-style-type: none"> • Raw Water Pump Station • Regional Power Outage • Intake, raw water, and finished water pipelines

Table 8-1 Continued

Hazard	<ul style="list-style-type: none"> • Potential WTP Impacts
Flood	<ul style="list-style-type: none"> • Erosion of river bank • Plugging of raw water intake
Water Quality	<ul style="list-style-type: none"> • Cyanobacteria bloom in Lost Creek Lake • Hydrocarbon / toxics spill from I5 crash • Raw sewage discharge from upstream communities • Oil spill • Other chemical spill
Wildfire	<ul style="list-style-type: none"> • Rogue basin watershed – loss of water quality • River bank – impacting raw water pump station
Wind, Ice, Snow	<ul style="list-style-type: none"> • Local or Regional Power outage • Staff availability
Terrorism / Cyber Attack	<ul style="list-style-type: none"> • Ransomware • Water Quality • Information Technology • Plant communications / control

9.0 CONCLUSIONS AND NEXT STEPS

Preliminary findings from this report were presented to City Council at the June 4, 2018, workshop. Slides from the workshop can be found in Appendix D. The direction and recommendation from the workshop was to continue and investigate whether or not the conventional or membrane filtration options would be best suited for the new WTP.

The total construction cost for a conventional WTP (including intake, RWPS, pipelines, and land acquisition) is estimated to be in the range of \$65M (+/- 20%). As the membrane filtration alternative would require almost an additional \$3M of initial capital, it is recommended to meet with City staff to determine if keeping the membrane filtration alternative in the mix of potential solutions is warranted. We recommend dismissing the High Rate Clarification (Ballasted Sedimentation) alternative from further consideration due to increased total life cycle cost and complexity, unless site acquisition poses size constraints.

The \$65M estimated construction cost is about \$14M more previously estimated due to planning for ozone plus the cost escalation of construction materials and land. With potential changes to regulations and raw water quality in the future, it was determined that planning should incorporate a way for the WTP to treat organics, tastes and odors, algal toxins, or other emerging contaminants (i.e.; ozone).

As part of the next phase of this project, the City intends to produce an indicative design to serve as the scope of work for the Design-Builder. The indicative design phase will evaluate the

TREATMENT SYSTEM AND INFRASTRUCTURE REPORT – FINAL DRAFT

costs and benefits of changes to the Basis of Design for review by the City and making final budgeting decisions.

Other near-term tasks that will need to be addressed further include:

- Review and development of a water quality sampling program to support design and optimization of the new WTP design
- Development of Overall project schedule
- Secure new WTP property
- New WTP property environmental and geotechnical investigations
- Basis of design report / indicative design for PDB procurement documents
- Determining City cash flow needs and getting approval of rate increase
- Investigation of the intake and raw water pump station, including pumping capacity once the site is acquired
- Confirmation of raw and finished pipeline alignments and lengths once the site is acquired

Assistance for these tasks will be addressed as part of the upcoming task order to start the next phase of Owner's Representative Services.

10.0 REFERENCES

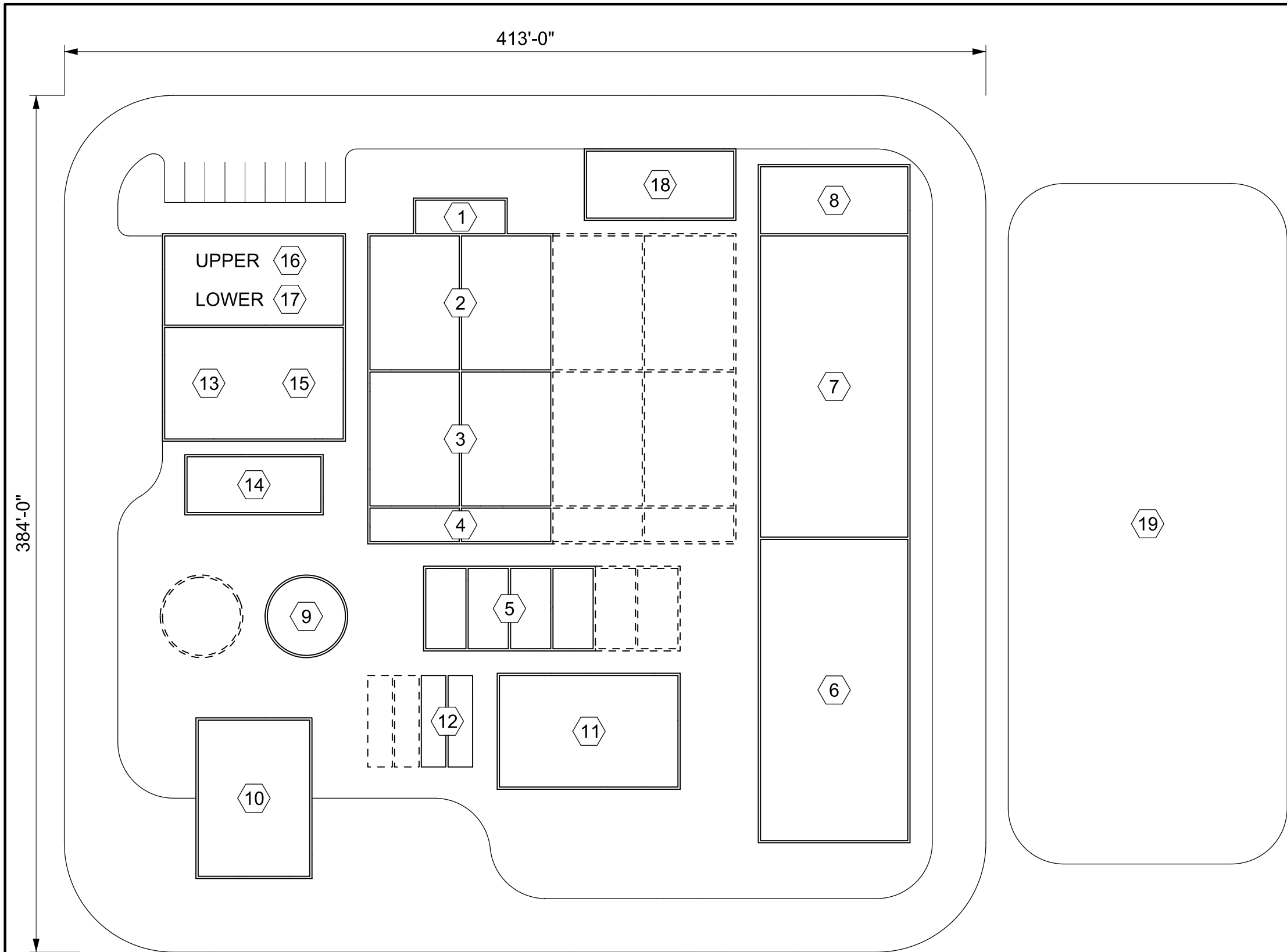
Murray Smith and Associates. *WTP Facility Plan Update - City of Grants Pass*. (2014)

Murray Smith and Associates. *Water Management and Conservation Plan - City of Grants Pass*. (2014)

Murray Smith and Associates. *Water Distribution System Master Plan - City of Grants Pass*. (2016)

MWH. *Grants Pass Water Treatment Plant - Pilot Plant Study*. (2015).

Appendix A – SITE LAYOUTS



LEGEND

1. FLASH MIX
2. FLOCCULATION 165' x 62'
3. SEDIMENTATION 165' x 62'
4. OZONE CONTACT 165' x 17'
5. FILTERS 77' x 38'
6. CHLORINE CONTACT TANK 137' x 68'
7. CLEARWELL 137' x 68'
8. FINISHED WATER PUMP STATION
9. GRAVITY THICKENER 35'Ø
10. DEWATERING BUILDING 52' x 72'
11. WASHWATER EQUALIZATION 82' x 52'
12. WASHWATER CLARIFICATION 49' x 43'
13. OZONE GENERATION
14. LOX STORAGE 62' x 27'
15. CHEMICAL BUILDING
16. ADMINISTRATION BUILDING 82' x 42'
17. SHOP AND GARAGE 82' x 42'
18. ELECTRICAL BUILDING 68' x 32'
19. OVERFLOW POND 125' x 305'

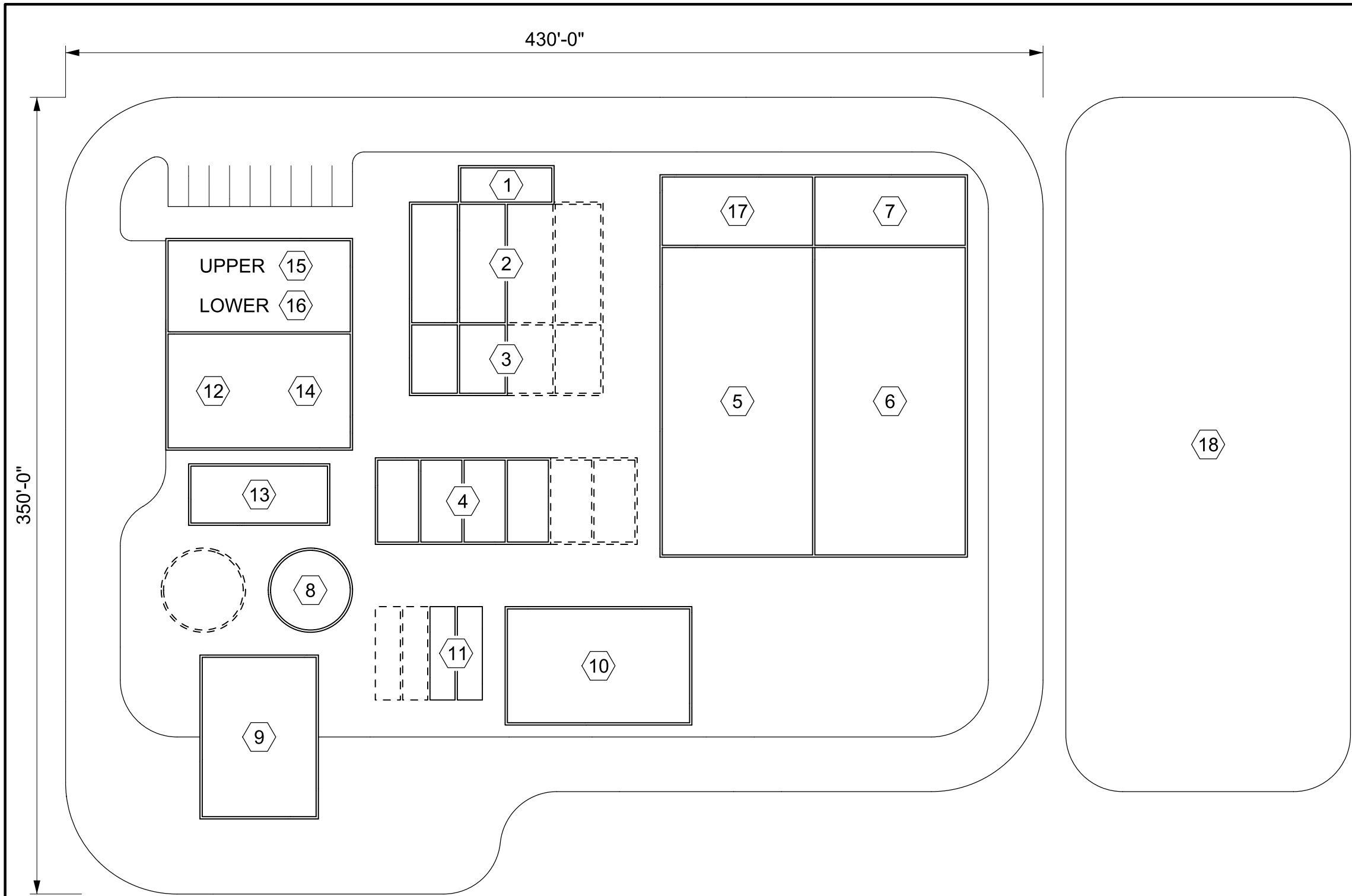
REV	DATE	BY	DESCRIPTION

SCALE
1" = 50'

WARNING
IF THIS BAR DOES NOT MEASURE 1/2" THEN DRAWING IS NOT TO SCALE

DESIGNED _____
DRAWN _____
CHECKED _____





LEGEND	
1.	FLASH MIX
2.	ACTIFLO 20' x 52' EACH
3.	OZONE CONTACT 20' x 30' EACH
4.	FILTERS 77' x 38'
5.	CHLORINE CONTACT TANK 137' x 68'
6.	CLEARWELL 137' x 68'
7.	FINISHED WATER PUMP STATION
8.	GRAVITY THICKENER 35'Ø
9.	DEWATERING BUILDING 52' x 72'
10.	WASHWATER EQUALIZATION 82' x 52'
11.	WASHWATER CLARIFICATION 49' x 43'
12.	OZONE GENERATION
13.	LOX STORAGE 62' x 27'
14.	CHEMICAL BUILDING
15.	ADMINISTRATION BUILDING 82' x 42'
16.	SHOP AND GARAGE 82' x 42'
17.	ELECTRICAL BUILDING 68' x 32'
18.	OVERFLOW POND 125' x 305'

REV	DATE	BY	DESCRIPTION

SCALE: 1" = 50'

WARNING: IF THIS BAR DOES NOT MEASURE 1/2" THEN DRAWING IS NOT TO SCALE

DESIGNED: _____

DRAWN: _____

CHECKED: _____

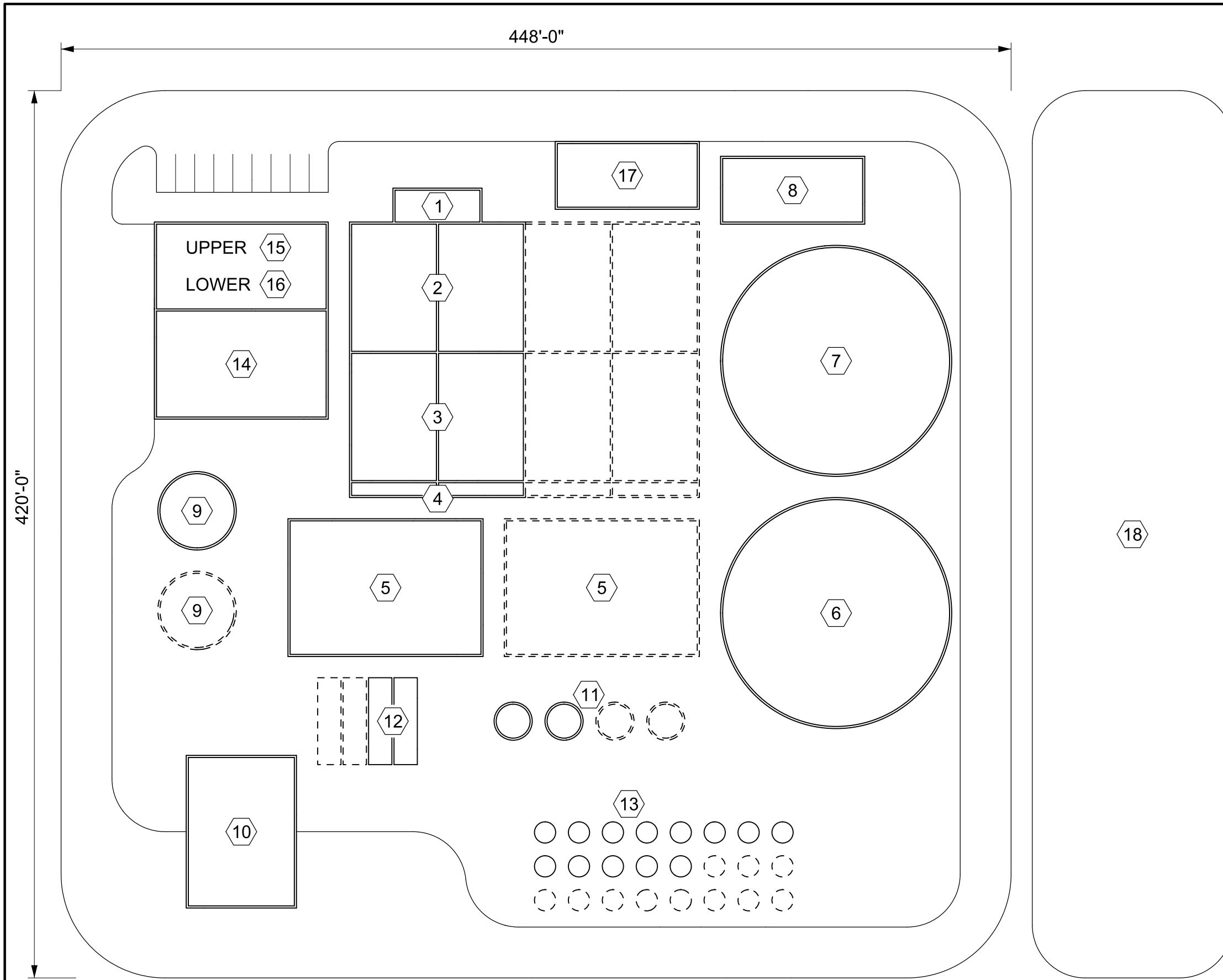
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PROJECT: High-Rate Clarification Alternative

SHEET: _____
JobNumber: _____



LEGEND	
1.	FLASH MIX
2.	FLOCCULATION 165' x 62'
3.	SEDIMENTATION 165' x 62'
4.	SETTLED WATER CLEARWELL 165' x 6'
5.	MEMBRANE FILTRATION 63' x 90'
6.	CHLORINE CONTACT TANK 107'Ø
7.	CLEARWELL 107'Ø
8.	FINISHED WATER PUMP STATION
9.	GRAVITY THICKENER 35'Ø
10.	DEWATERING BUILDING 52' x 72'
11.	BACKWASH WASTE TANKS 16'Ø
12.	WASHWATER CLARIFICATION 49' x 43'
13.	GAC CONTACTORS 10"Ø
14.	CHEMICAL BUILDING
15.	ADMINISTRATION BUILDING 82' x 42'
16.	SHOP AND GARAGE 82' x 42'
17.	ELECTRICAL BUILDING 68' x 32'
18.	OVERFLOW POND 95' x 420'

REV	DATE	BY	DESCRIPTION

SCALE
1" = 50'

WARNING
IF THIS BAR DOES NOT MEASURE 1/2" THEN DRAWING IS NOT TO SCALE

DESIGNED _____
DRAWN _____
CHECKED _____



Appendix B – ALTERNATIVE ROM COST INFORMATION

Rough order of magnitude alternative construction cost and O&M cost comparison (2018\$):

	Conventional	Membrane Filtration	High-Rate Clarification
Capacity – 22.5 MGD			
Mobilization and general conditions (8%)			
Site Civil	\$1,260,000	\$1,260,000	\$1,260,000
Administration Building	\$3,300,000	\$3,300,000	\$3,300,000
Electrical Distribution, Control, Building	\$7,000,000	\$7,000,000	\$7,000,000
Chemical Systems	\$12,610,000	\$8,290,000	\$12,610,000
Rapid Mix, Flocculation & Sedimentation	\$6,820,000	\$6,820,000	\$6,140,000
Ozone	\$1,350,000	N/A	\$1,350,000
Granular Media Filtration & Backwash EQ	\$7,600,000	N/A	\$7,600,000
Membrane filtration	N/A	\$12,040,000	N/A
Post membrane GAC	N/A	\$4,000,000	N/A
Chlorine Contact and Clearwell	\$5,960,000	\$5,960,000	\$5,960,000
Finished Water Pumps	\$4,090,000	\$4,090,000	\$4,090,000
Solids Handling	\$4,670,000	\$4,670,000	\$4,670,000
Overflow pond	\$230,000	\$230,000	\$230,000
Construction Cost Total	\$54,890,000	\$57,660,000	\$54,210,000
O&M Cost (NPV)	\$43,300,000	\$40,520,000	\$46,480,000
Total Lifecycle Cost (40 years)	\$106,170,000	\$109,710,000	\$111,530,000

Rough order of magnitude O&M cost break down comparison (2018\$):

	Conventional	Membrane Filtration	High-Rate Clarification
Capacity - 22.5 MGD			
Chemicals	\$280,000	\$190,000	\$330,000
Equipment Replacement and Maintenance	\$135,500	\$352,000	\$162,600
Residuals Handling and Disposal	\$95,000	\$95,000	\$104,500
Labor	\$705,000	\$605,000	\$705,000
Power	\$551,200	\$614,700	\$661,400
Miscellaneous	\$22,400	\$22,400	\$22,400
Annual O&M Cost	\$1,789,100	\$1,879,100	\$1,985,900

Appendix C – DRAFT OPCC FOR CONVENTIONAL ALTERNATIVE

Project Overview

Project	Grants Pass WTP		OPCC Completed	7-Jun-18	OPCC Accuracy Range	\$43,913,000 to \$71,359,000	
Location	Grants Pass, OR		Project Number	30504641	OPCC Range Base Cost	\$54,891,000	
Overview	Conventional treatment concept		Cost Code Number	61000001	Prime Contractor	GENERAL CONTRACTOR as CM	
Contact	Celia Schofield	Avg Daily Flow (MGD)	22.50	OPCC Prepared By	Jim Ward	Project Bid & Delivery	BID/BUILD with PRE-CON
Phone	(425) 896-6979	Max Daily Flow (MGD)	25.00	OPCC Version #	000	Construction Duration	86 weeks

OPCC Modeling Philosophy & Methodology

This proprietary model, developed on an Excel platform, is the primarily tool for preparing class 4-5 Opinion-of-Probable-Construction-Cost (OPCC) estimates, and follows the general principles within the AACE, International Recommended Practices publication # 18R-97. The absence of mature design deliverables and a comprehensive scope identity as typically encountered early in a project pursuit or design effort has driven the establishment of this model which continues to provide historically reliable and surprisingly detailed cost estimates through a "BASIS-OF-ESTIMATE" and "FORCED DETAIL" methodology by building an initial foundation of "estimatable" scope. After generating this "go-by" work, the model internally produces baseline costs through utilization of cost-analyses and parametric functions, manipulation of both historical and equipment size/capacity data, and traditional unit-cost methodologies using values of quantity, count, dimension, service, productivity, and/or end-use. These bare costs are then further "conditionalized" and "localized" based upon a combination of both perceived and known site/work issues as chosen within an "ASSUMPTIONS" section particular to each division of work. These subsequent direct costs are initially determined for the three primary installation elements of labor (MH\$), materials & construction equipment (M&CE\$), and major process/procured equipment items (EQ\$), and are summarized into a user-defined work breakdown structure for adjustment with select burdens & mark-ups. All supporting costs needed for completing the estimate are also applied, with the valuation based upon years of observed and proven ratios and/or percentages.

Glossary of Potential OPCC Sheets

BASIS-OF-ESTIMATE CHECKLIST: Matrix identifying the primary OPCC scope & project delivery issues, with an initial indication of either being included or excluded in the OPCC
BASIS-OF-ESTIMATE CLARIFICATIONS: Clarifications/ exceptions related specifically to the project scope and issues concerning content, execution, & constructability
OPCC MODEL CLARIFICATIONS: Clarifications/exceptions related specifically to the OPCC modeling & internal functionality
MODEL LABOR RATE STANDARDS: Development of the DIV manhour rates based on the initial baseline source, add-ons, anticipated tradesmen ratios, and work schedule
OPCC SUMMARY: One view of how the cost-of work build-up is accomplished, along with the Prime Contractor's estimated costs for staff, fee, insurance, engineering, and bonds
PROJECT COST BUILD-UP: Another view of how the overall project cost is built-up & developed starting from the Prime and Subcontractor(s) direct costs
WORK BREAKDOWN STRUCTURE: Breakdown of the project OPCC in either requested or arbitrary area/scope levels and presented in both direct costs and cost-of-work (i.e. to Owner)
WBS DIRECT COST DISTRIBUTION: Report presenting the installing Contractor's estimated direct (i.e. raw) costs (per div 1-17 sheets) by both WBS and CSI division
WBS COST-OF-WORK DISTRIBUTION: Report presenting the anticipated installing Contractors estimated cost-of-work (i.e. sell) prices by both WBS and CSI division
WBS MANHOURS DISTRIBUTION: Report presenting the installing Contractor's estimated final installation manhours by both WBS and CSI division
WBS QUANTITY-OF-WORK DISTRIBUTION: Report presenting the installing Contractor's estimated major construction quantities by both WBS and CSI division
PRELIMINARY SCHEDULE: Basic bar-chart presentation of the WBS line items, along with monthly projections of the cashflow and construction manpower loading
INSTALLATION OVERVIEW: Assignments of the construction baseline standards, assumptions, and localizing factors, including a bare cost roll-up of the CSI worksheets
DIV 1 (01) PRIME CONTRACTOR STAFF: Development of the anticipated Prime Contractor staff labor, travel/living needs, and camp costs (where applicable)
DIV 1 (01) GENERAL REQUIREMENTS: Development of the anticipated general conditions needs and tradesmen camp costs (where applicable)
DIV 2 (02 & 31-35) COMMON SITEWORK: Development of the "common" (i.e. typically self-performed) site/civil construction items by type, dimension, & quantity, along with allowances
DIV 2 (02 & 31-35) SPECIALTY SITEWORK: Development of the "specialty" (i.e. typically subcontracted) site/civil construction items by type, dimension, & quantity, along with allowances
DIV 2 (33) WELL WORK: Development of the subcontracted well construction items by type, dimension, & quantity, along with allowances
DIV 3 (03) CONCRETE: Development of the cast-in-place concrete construction items by type, dimension, & quantity, along with CY, tons of rebar, & allowances
DIV 4 (04) MASONRY: Development of the CMU work items by type, dimension, & quantity, along with SF & allowances
DIV 5 (05) MISCELLANEOUS METALS: Development of the misc metal items by type, dimension, & quantity, along with tons & allowances
DIVS 3 & 5-8 (03 & 05-08) BUILDINGS & COMPONENTS: Development of building systems/components by type, dimension, & quantity, along with tons, SF, & allowances
DIVS 9-10 (09-10) FINISHES: Development of the field-applied finishes by type, dimension, & quantity, along with SF & allowances
DIVS 13 (33) FIELD-ERECTED TANKS: Development of the field-erected metal tanks & components by type, dimension, & quantity, along with tons, SF, gallons, & allowances
DIVS 13 (33) SHOP-FABRICATED TANKS: Development of the shop-fabricated metal tanks & components by type, dimension, & quantity, along with tons, gallons, & allowances
DIVS 11-17 (40-45) PROCESS EQUIPMENT: Development of the project-specific process & mechanical equipment breakdown, including all related items, by size/capacity & quantity
DIV 15 (21-23) MECHANICAL INSTALLATION: Development of the mechanical installation work by parametrics, dimension, & quantity data, along with allowances
DIVS 16-17 (25-28 & 33) ELECTRICAL INSTALLATION: Development of the electrical installation by parametrics, dimension, & quantity data, along with allowances
DIVS 16-17 (25-28 & 33) ELECTRICAL EQUIPMENT: Development of the electrical equipment including switchboards, MCC's, transformers, control panels, and process control systems
WBS CONNECTED ELECTRICAL LOADS: Report presenting both the total and WBS-level connected amperage and KVA loads per the voltage selected
SIZE & QUANTITY CALCULATORS: Collection of small models for wire & pipe sizing based on load & flow, ductbank conductor assignments, and installation data for bus duct, vent duct, & PE pipe
MODEL COMMODITY STANDARDS: Construction commodity items listing with costs currently utilized in the OPCC model and based on monthly updates from ENR
O&M FORECAST CLARIFICATIONS: Clarifications/ exceptions related specifically to both the cost development and basis of the operation & maintenance details
O&M FORECAST SUMMARY: Roll-up of the initial operations & electrical power basis forecasts and development of the subsequent life cycle costs and net present value
O&M FORECAST DETAIL - OPERATIONS: Development of the process & mechanical operating costs for the OPCC project scope including an initial life-cycle cost
O&M FORECAST DETAIL - ELECTRICAL POWER: Development of the electrical operating KWH and cost for the OPCC project scope including an initial life-cycle cost



BASIS-OF-ESTIMATE CHECKLIST

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Estimator	Version	Date	Job #
Grants Pass WTP	Grants Pass, OR	Jim Ward	000	7-Jun-18	30504641

Basis-of-Estimate Items

NOTE: Item numbers in brown font indicate an auto-fill checkmark and/or variable text that adjusts with selection(s) made in other OPCC sheets

#	Work Scope & Estimate Content	OPCC Status		
		INCLUDED As OPCC Scope	EXCLUDED But By Others	EXCLUDED Or Not Required
1	This OPCC version # 000 replaces all previous estimate versions in their entirety for this specific project and/or scope	✓		
2	Estimator review of the project site and/or work area, either via a physical walk-through or photographic/video records			✓
3	Class 5 Opinion-of-Probable-Operating-Cost (OPOC) estimate with operating & maintenance forecasts			✓
4	January 2018 Means Construction Cost Indexes for Medford, OR utilized for initial baselining of local costs	✓		
5	March 2018 ENR Construction Economics data utilized for initial baselining of commodity costs	✓		
6	Labor rates established by the current MEANS Labor Rates annual publication for Eugene, OR	✓		
7	15% ESTIMATE contingency for potential issues related to Estimator judgements, take-offs, omissions, etc.	✓		
8	10% SCOPE contingency for potential growth related to design changes, preferences, regulatory issues, etc.	✓		
9	OPCC based upon a physical notice-to-proceed construction start on or about February 2019	✓		
10	2.8% composite escalation to mid-point of construction established per individual APR's for MH, M&CE, and EQ	✓		
11	Taxes, including (but not limited to) sales, gross-receipts, professional, use, and/or Value-Added			✓
12	General conditions allowances in DIV 1 for the work reasonably anticipated but not currently quantifiable	✓		
13	General allowances in DIVS 2-17 for the related support work reasonably anticipated but not currently quantifiable	✓		
14	Duties, tariffs, and/or import & export fees including any related expenses			✓
15	Commissions and/or royalties including any related expenses			✓
16	Liquidated damages including any related expenses			✓
17	Prime Contractor to be a GENERAL CONTRACTOR & CM firm (excluding EPCM firms)	✓		
18	Prime Contractor solicited, bid, & contracted based upon BID/BUILD with PRE-CON	✓		
19	Prime Contractor to pre-plan work sequencing, equipment pre-purchase, and/or early site mobilization as needed	✓		
20	Prime Contractor to provide staff (re: DIV 1) for the project management & construction oversight needs	✓		
21	Prime Contractor to self-perform select construction work and/or equipment procurement scope	✓		
22	Prime Contractor to provide Construction Manager (i.e. CM) services	✓		
23	Prime Contractor to provide Guaranteed Maximum Pricing (i.e. CMAR GMP)			✓
24	Prime Contractor to have direct contractual & reporting responsibilities to OWNER or OWNER'S Rep	✓		
25	Prime Contractor to provide a safety program including management, training, reporting, & mitigation responsibilities	✓		
26	Prime Contractor to provide a QA/QC program including testing, inspecting, reporting, & mitigation responsibilities	✓		
27	Oversight/management of the Prime Contractor by OWNER'S 2nd-party Engineer		✓	
28	Oversight/management of the Prime Contractor by OWNER'S 2nd-party safety and/or QC professional		✓	
29	Local market cost increase allowance due to anticipated issues with the regional economy and bid conditions			✓
30	Construction fair market pricing that anticipates competitive market conditions (i.e. 4+ qualified bidders)	✓		
31	Construction labor primarily at local Prevailing Wage/Davis Bacon rates	✓		
32	42-hour work week, based upon an anticipated schedule of (5)-8 hr days Mon-Fri + Incidental OT	✓		
33	Multiple-shift construction schedule			✓
34	Reduction of the construction duration due to an overtime work schedule			✓
35	Installation manhour rate adjustments due to anticipated issues with labor pool, location, and/or work conditions			✓
36	Installation manpower productivity adjustments due to anticipated issues with labor pool, location, and/or work conditions			✓
37	Installation manhour productivity adjustments due to shut-downs, phasing, demolition, and/or PPE requirements			✓
38	Remote site rotation allowance for eligible tradesmen, supervision, & Prime Contractor field staff			✓
39	Remote travel & camp allowance for eligible tradesmen, supervision, and/or Prime Contractor staff			✓
40	Project engineering & design services		✓	
41	Geotechnical testing, engineering, & design services		✓	
42	Engineering support services during construction & start-up		✓	
43	Supply & installation per standards typically anticipated for Municipal & Governmental work	✓		
44	OCIP (i.e. Owner-controlled-insurance-program) covering all insurance & bond costs at all tiers for this project			✓

BASIS-OF-ESTIMATE CHECKLIST

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Estimator	Version	Date	Job #
Grants Pass WTP	Grants Pass, OR	Jim Ward	000	7-Jun-18	30504641

Basis-of-Estimate Items

NOTE: Item numbers in brown font indicate an auto-fill checkmark and/or variable text that adjusts with selection(s) made in other OPCC sheets

#	Work Scope & Estimate Content	OPCC Status		
		INCLUDED As OPCC Scope	EXCLUDED But By Others	EXCLUDED Or Not Required
45	Property acquisitions, leases, easements, right-of-ways, and related fees, costs, & schedule impacts			✓
46	Financing, leasing, legal services, and related fees, costs, & schedule impacts			✓
47	Work permits, inspections, and related fees, costs, & schedule impacts			✓
48	Water-use permits, inspections, and related fees, costs, & schedule impacts			✓
49	Environmental/ecological permits, inspections, and related fees, costs, & schedule impacts			✓
50	Cultural/preservation work permits, inspections, and related fees, costs, & schedule impacts			✓
51	Effluent discharge (i.e. NPDES, POTW, etc.) permits, inspections, and related fees, costs, & schedule impacts		✓	
52	Water/wastewater/air sampling, collection, analysis, and/or pilot treatability studies			✓
53	Building and trades-work construction permits, inspections, and related fees & costs	✓		
54	Work anticipated within a Greenfield site assessed to be Clear Above & Below Grade	✓		
55	Consideration for both negligible congestion and moderate spread of existing yard and/or systems infrastructure	✓		
56	Hazardous materials/work conditions requiring personal protection and equipment			✓
57	High-work conditions requiring personal fall protection equipment			✓
58	Clean-room work conditions requiring personal protection and equipment			✓
59	Underwater work requiring diver(s) with surface support team and equipment			✓
60	Weather (i.e. precipitation) and/or temperature considerations during execution of the work	✓		
61	Disadvantaged and/or minority business enterprise considerations for select work	✓		
62	System/process oversight of operations and maintenance during start-up & training	✓		
63	System/process operations and maintenance during functional and/or performance testing		✓	
64	System/process operations and maintenance from commissioning & forward		✓	
65	Supply and/or procurement of major EQ items within DIVS 5-15	✓		
66	Domestic (US) overland shipping of procured items to project site	✓		
67	Stretch-wrapping of select EQ (excluding permanent materials) for shipping and/or on-site storage	✓		
68	Crating of select EQ (excluding permanent materials) for shipping and/or on-site storage			✓
69	Containerization of select EQ (excluding permanent materials) for shipping and/or on-site storage			✓
70	Primary excavation issue of Dust Control considered within the construction area(s)	✓		
71	Secondary excavation issue due to soil conditions and/or obstructions			✓
72	0.40-0.80 (x G) Peak acceleration consideration for construction of buildings & structures	✓		
73	Category IV - Essential facility risk consideration for construction of buildings & structures	✓		
74	Zone I - 130 MPH wind consideration for construction of buildings & structures	✓		
75	Minimum of 1,800 PSF uniform soil-bearing capacity in construction area(s)		✓	
76	Minimum of 200 PCI uniform soil modulus of subgrade in construction area(s)		✓	
77	Maximum of 0.500 INCH uniform soil settlement potential in construction area(s)		✓	
78	Maximum of 0.250 INCH differential soil settlement potential in construction area(s)		✓	
79	Slurry walls for select areas, excavation, and/or structures			✓
80	Deep foundations for select structures			✓
81	Soil pre-loading and/or over-excavation with recompaction (of excavated material) for select areas			✓
82	Shoring, lagging, and/or cribbing for select areas, excavations, and/or structures	✓		
83	Steel sheet piling for select areas, excavations, and/or structures			✓
84	Saw-cutting and/or core-drilling within select areas			✓
85	Potholing and/or utility locating within select areas	✓		
86	Traffic controls within select areas	✓		
87	Erosion controls within select areas	✓		
88	Dewatering due to excessive surface run-on, aquifers/springs, and/or high water table within select areas	✓		

BASIS-OF-ESTIMATE CHECKLIST

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Estimator	Version	Date	Job #
Grants Pass WTP	Grants Pass, OR	Jim Ward	000	7-Jun-18	30504641

Basis-of-Estimate Items

NOTE: Item numbers in brown font indicate an auto-fill checkmark and/or variable text that adjusts with selection(s) made in other OPCC sheets

#	Work Scope & Estimate Content	OPCC Status		
		INCLUDED As OPCC Scope	EXCLUDED But By Others	EXCLUDED Or Not Required
89	Removal/disposal of existing native topsoil, vegetation, trees, and/or fencing within select areas	✓		
90	Removal/disposal of existing EQ, piping, electrical, structures, rubble, and/or debris within select areas			✓
91	Relocation of existing utilities, ductbank, utilidors, chases/tunnels, pipe, and/or conduit/wiring			✓
92	Remediation due to hazardous materials within select areas			✓
93	Remediation due to cultural (i.e. historical, archaeological, etc.) content within select areas			✓
94	Landscaping, irrigation, seeding, sodding, mulching, plantings, and/or restoration within select areas	✓		
95	Temporary fencing system for safety/security/privacy purposes around select site/construction areas	✓		
96	Permanent fencing system for safety/security/privacy purposes around select system/project areas	✓		
97	Asphalt paving, patching, and/or repairing of select road, parking, and miscellaneous areas	✓		
98	Curb & gutter system for select road, parking, and/or landscaping areas	✓		
99	Outdoor lighting units for select areas	✓		
100	Concrete-filled steel pipe bollards/guardposts for protecting select equipment, area(s), and/or structure(s)	✓		
101	Secondary containment for select areas, tanks, and/or structures	✓		
102	Secondary containment of select piping systems			✓
103	Emergency diesel generator(s) including automatic transfer switching and on-board fuel system(s)			✓
104	Emergency power sized to maintain full operation of select treatment, building, & support systems			✓
105	Paralleling gear for multiple emergency generators			✓
106	Double-walled bulk diesel storage tank system with level indication and transfer pumping			✓
107	Sealing, waterproofing, and/or chemical-resistant finish for select field-constructed surfaces	✓		
108	Coating and/or galvanizing of select steel building and canopy structural components	✓		
109	LEED construction (with certification) of select building structures and/or components			✓
110	Usage cost of utilities (i.e. electric, water, natural gas, sewerage, etc.) utilized during construction		✓	
111	Assistance in removal, abatement, and/or disposal of existing fluids, sludges, and residuals			✓
112	PPE stations and placarding of project hazards including noise, moving machinery, and chemicals	✓		
113	Heat, light, ventilation, entry switches, utility outlets, and/or sump pumps for select vault structures	✓		
114	Fire protection systems, materials, equipment, and/or placarding within select areas	✓		
115	Grounding and/or lightning protection systems, materials, and/or equipment within select areas	✓		
116	Concrete strength (28 day minimum) provided at 4,500 PSI (7-8 sacks/CY)	✓		
117	Type II (lo heat & sulfate resist) cement utilized in structural concrete	✓		
118	A615-Plain Steel (qty in tons) reinforcement bar utilized in structural concrete	✓		
119	Aluminum Structure & Grate primarily utilized for personnel accessways	✓		
120	Piping and/or wiring supports primarily utilizing 304 SS Strut & Structural Shapes	✓		
121	Local safety disconnect switches for select motorized equipment	✓		
122	Local HOA and/or ON-OFF control stations for select equipment	✓		
123	Combination eyewash and shower stations (including tempered water system/supply) in select areas	✓		
124	ADA (Americans with Disabilities Act) accessibility in select areas			✓
125	Valved end-connections and/or by-passes for select in-line instrumentation and control valves			✓
126	Solenoid-controlled water stations for select sealwater and/or flushwater systems	✓		
127	Stairway access & perimeter handrailing for select building interior elevated spaces	✓		
128	Ductwork system for select equipment and/or tankage	✓		
129	Ductwork system for select areas and/or structures			✓
130	Coating of select pipe, fittings, and valves	✓		
131	Heat-tracing of select pipe, fittings, & valves	✓		
132	Insulation & jacketing of select pipe, fittings, & valves	✓		

BASIS-OF-ESTIMATE CHECKLIST

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Estimator	Version	Date	Job #
Grants Pass WTP	Grants Pass, OR	Jim Ward	000	7-Jun-18	30504641

Basis-of-Estimate Items

NOTE: Item numbers in brown font indicate an auto-fill checkmark and/or variable text that adjusts with selection(s) made in other OPCC sheets

#	Work Scope & Estimate Content	OPCC Status		
		INCLUDED As OPCC Scope	EXCLUDED But By Others	EXCLUDED Or Not Required
133	Heat-tracing of select tankage			✓
134	Insulation of select tankage			✓
135	Architectural treatments and/or finishes similar for all building structures	✓		
136	Permanent overhead crane/hoist system(s) that are stand-alone and/or integrated to select structure(s)	✓		
137	Field-erected tank(s) with either field-applied coating(s) or factory-applied finish(es)			✓
138	Scope-wide safety management system with communications/PA and health & safety monitoring	✓		
139	Scope-wide security management system with access controls and intrusion monitoring	✓		
140	Scope-wide surveillance management system with video monitoring & archiving	✓		
141	Access to the work area considered as Relatively Easy throughout the project execution	✓		
142	Patching, repairing, and/or restoring of select existing local infrastructure utilized during work	✓		
143	Location for stockpiling, spreading, and/or disposal of surplus soil < 5 mile radius from ISBL	✓		
144	Location for stockpiling, spreading, and/or disposal of clearing & grubbing waste < 5 mile radius from ISBL	✓		
145	Location for stockpiling, spreading, or disposal of demolition waste < 5 mile radius from ISBL	✓		
146	Payment of fee(s) associated with soil and waste stockpiling, spreading, and/or disposal	✓		
147	Continuous free & clear access, easement, and/or right-of-way to work area		✓	
148	Oversize, overweight, and/or drop-deck trailer accessibility to work area		✓	
149	Public and/or main access roads which are suitable and available throughout construction		✓	
150	Material and equipment laydown, staging, and/or storage area(s) within 100' of work area		✓	
151	Parking area(s) for installation personnel within 100' of work area		✓	
152	4.16 KV primary power supply/tie-in location (with sufficient ampacity) within 100' of work area		✓	
153	4.16 KV back-up power supply/tie-in location (with sufficient ampacity) within 100' of work area	✓		
154	Hydro-test water supply (with sufficient pressure & volume) or tie-in location within 100' of work area		✓	
155	Disposal location for hydro-test fluids within 100' of work area		✓	
156	Potable water supply (with sufficient pressure & volume) or tie-in location within 100' of work area		✓	
157	Utility and/or fire protection water supply (with sufficient pressure & volume) or tie-in location within 100' of work area		✓	
158	Sanitary waste piping tie-in location (with sufficient capacity) within 100' of work area		✓	
159	Compressed and/or instrument air supply (with sufficient pressure & volume) or tie-in location within 100' of work area			✓
160	Steam and/or fossil fuel supply (with sufficient pressure & volume) or tie-in location within 100' of work area			✓
161	Influent and/or effluent piping (of sufficient size) or tie-in location within 100' of work area		✓	
162	Return and/or recycle piping (of sufficient size) or tie-in location within 100' of work area			✓
163	Treatment chemical supply (of sufficient size & concentration) or tie-in location within 100' of work area			✓
164	Landline and/or high-speed internet service (of sufficient bandwidth) or tie-in location within 100' of work area		✓	
165	High-speed wireless internet service availability (with sufficient speed & bandwidth) within 100' of work area		✓	
166	Integration of existing power, process, and site (i.e. safety, security, and/or surveillance) controls to new systems		✓	
167	Integration of new power controls to existing systems	✓		
168	Integration of new process controls to existing systems	✓		
169	Integration of new site controls (i.e. safety, security, and/or surveillance) to existing systems	✓		
170	Remote monitoring, alarm, & control of new process and/or site management systems			✓
171	Local set-aside of equipment and/or piping, electrical, metals, and miscellaneous materials subject to demolition			✓
172	Salvaging/recovery of equipment and/or piping, electrical, metals, and miscellaneous materials subject to demolition			✓

END

BASIS-OF-ESTIMATE CLARIFICATIONS

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Estimator	Date	Version	Job #
Grants Pass WTP	Grants Pass, OR	Jim Ward	7-Jun-18	000	30504641

B-O-E Clarifications

NOTE: Item numbers in brown font indicate an auto-fill and/or variable text that adjusts with selection(s) made in other OPCC sheets

1	<p>This OPCC has been assigned a Class 5 (i.e. PLANNING or ORDER-OF-MAGNITUDE) level status per our judgement of the level of project definition, expected accuracy range, and other characteristics per AACE International Recommended Practice # 18R-97. The estimating methodologies primarily utilized within a class 5 OPCC typically involves capacity factoring, parametrics, simple modeling techniques, judgement, and analogy</p>
2	<p>The overall accuracy range limits for this specific OPCC class are defined by AACE International as follow: Low = (-)20% to (-)50%, and High = (+)30% to (+)100%, with a 90% confidence that the actual cost will fall within the bounds of these ranges after application of the appropriate contingencies.</p>
3	<p>NOTE: Considering the class of estimate, quality of scope definition, amount of contingency, and perceived OPCC reliability, it is the Estimator's judgement that the MINIMUM (i.e. low-end) class accuracy range limits should apply, specifically -20% to +30%. These percentages have been applied against the OPCC base cost (i.e Cost-of-Work) to establish the OPCC accuracy range of cost</p>
4	<p>This OPCC, including any evaluation of the Client's project budget, represents our best judgment as a professional familiar with the construction industry. Unless and to the extent otherwise indicated by us, such opinion or evaluation is based upon current market rates for labor, materials and equipment. Furthermore, this OPCC is based on stable market conditions that exhibit predictable supply/demand relationships and does not attempt to capture the impacts of hyper-inflationary or deflationary market cycles. Client further acknowledges that this OPCC is a "snapshot in time" and that the reliability of the OPCC will degrade over time.</p>
5	<p>NOTE: A combination of "ESTIMATE" and "SCOPE" contingencies has been included in this OPCC for covering not only the potential issues related to any Estimator judgements, take-offs, or omissions, but also providing for the potential project growth due to design changes/revisions, undefined regulatory considerations, Owner preferences, and general unknowns that could arise over the duration of the project.</p>
6	<p>The following scope definition deliverable(s) provided by Others comprise the primary resources utilized for the OPCC cost development:</p> <ul style="list-style-type: none"> a. Stantec scope information received via an email 15May18: <ul style="list-style-type: none"> i. Conventional treatment site arrangement drawing (1 PDF sheet) ii. Conventional treatment design criteria spreadsheet (4 pages) b. Various scope clarification emails, telecons, and/or discussions up through 06Jun18
7	<p>The Prime Contractor is anticipated to self-perform the following installation scope in this OPCC:</p> <ul style="list-style-type: none"> a. DIV 1 General Conditions b. DIV 1 Site Staffing for Project Management & Construction Oversight c. DIV 2 Common Sitework d. DIV 3 Concrete e. DIV 4 Masonry f. DIV 5 Install Miscellaneous Metals EQ g. DIVS 5-8 Buildings & Components
8	<p>Additionally, the Prime Contractor is anticipated to procure the following buy-outs direct from the Fabricators, Manufacturers, and/or Vendors:</p> <ul style="list-style-type: none"> a. DIV 5 Miscellaneous Metals Items b. DIVS 11-15 Process and Mechanical Equipment Items
9	<p>Specific issues regarding the OPCC include the following:</p> <ul style="list-style-type: none"> a. Site is presumed to be greenfield, with no considerations required for excessive grading/leveling, hard excavation, deep foundations, or groundwater b. Common piping costed for ultimate hydraulic capacity of 50 MGD c. Plant raw water supply is provided to flash mix vault area by Others as a pressurized supply d. Dimensions as scaled off site arrangement drawing were utilized in lieu of indicated sizes in legend as conflicts exist e. All supporting horizontal pumps and blowers are provided with slabs and housekeeping pads f. The solids dewatering building is anticipated to have (2) drive-thru trailer bays g. A 4.16KV main feeder (800 amps) ductbank with signals is presumed to be run 500 LF from a local source
10	<p>END</p>
11	
12	
13	
14	
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16	
17	

OPCC MODEL CLARIFICATIONS

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Estimator	Date	Version	Job #
Grants Pass WTP	Grants Pass, OR	Jim Ward	7-Jun-18	000	30504641

Model Clarifications

NOTE: Item numbers in brown font indicate an auto-fill and/or variable text that adjusts with selection(s) made in other OPCC sheets

1	<p>NOTE: Wage rates within this OPCC may have experienced certain adjustments in anticipation of allowing for the highest quality/skilled tradesmen for this project, and considers that the availability of this talent could otherwise be compromised with too low a rate structure depending on the current labor market conditions of the area.</p>
2	<p>The MODEL LABOR RATE STANDARDS sheet is provided to highlight the methodology behind development of the single blended rate which is then applied within each CSI division. The fringe benefits rate is anticipated to cover those paid by the employer and/or union such as vacation, pension, training, advancement funds, and health & welfare contributions. For any overtime work, the applicable overtime factor (i.e. multiplier) is applied to the MH base rate, while the fringe benefits cost is applied straight-up against each MH worked.</p>
3	<p>The percentages applied for the establishing the indirect costs are estimates based upon the Estimator's judgement concerning the scope of work, anticipated work schedule, and risk allocation deemed necessary at the time of this submittal.</p>
4	<p>NOTE: The absence of engineering costs is intended to represent that all engineering services are excluded, including design, permitting, procurement, geotechnical investigations, contractor solicitation, bid, and selection, and support/oversight during construction, start-up, and commissioning.</p>
5	<p>The designation of both the PROJECT DELIVERY method and PRIME CONTRACTOR has a direct bearing on the final OPCC cost, so the designation of these in the OPCC is important. For example, a typical local General Contractor executing the work as PRIME (and possibly CM as well) will require a cost structure that differs significantly from an EPCM as PRIME, most notably regarding the work being self-performed vs. subcontracted, the potential travel/living costs involved, and the tiers of mark-ups/burdens applied.</p>
6	<p>The "Assumptions" section at the top of each DIV sheet should be referenced for identifying a portion of the "forced-detail" utilized in the OPCC, including both perceived and known issues such as specific components, materials of construction, site concerns, and working conditions that could impact the cost basis of this OPCC.</p>
7	<p>The "General Conditions Allowances" section in the DIV 1 sheet, and the "General Allowances" section at the bottom of the DIVS 2-17 sheets, are all comprised of "potential" cost items initially based on the type & quantity of work occurring within each CSI division, with the intention of covering items that could be reasonably anticipated but cannot yet be fully defined and/or quantified.</p>
8	<p>NOTE: The totals for each of these Allowance sections identified above should be considered as more reliable and representative of an appropriate overall cost, rather than considering each individual line item cost (or absence thereof) that comprise this total, any of which may or may not actually end up being necessary.</p>
9	<p>The manhours developed for each work item reflects the total, whether it be executed by an "individual" or "crew", with the manhour rates depicted throughout the OPCC having been developed to reflect a blend of the anticipated ratios of trade labor and supervision for each CSI division. These individual blended DIV rates include adjustments for any overtime and/or shift work identified in the INSTALLATION OVERVIEW sheet.</p>
10	<p>NOTE: The overall composite rate provided in the MODEL LABOR RATE STANDARDS sheet is for informational purposes only and reflects the weighting effect due to the actual divisions and scope of work comprising the project.</p>
11	<p>The BASIS-OF-ESTIMATE CHECKLIST sheet is provided as a quick reference of those scope, execution, and cost items INCLUDED in the OPCC, those EXCLUDED from the OPCC but anticipated as necessary and the responsibility of Others, and those EXCLUDED from the OPCC because they are not required or believed to be unnecessary.</p>
12	<p>The DIV 1 costs are split up into separate sheets, with the DIV 1 PRIME CONTRACTOR STAFF sheet carried as part of the "Prime Contractor" section of the OPCC SUMMARY sheet, while the DIV 1 GENERAL REQUIREMENTS sheet costs are carried as part of the direct cost subtotal line within the "Cost-of-Work" section of the OPCC SUMMARY sheet. These separate DIV 1 sheet totals are also included as a line item in the WORK BREAKDOWN STRUCTURE sheet. This split is due to the anticipation that the general conditions would primarily be executed utilizing trades labor, construction tools/equipment, and consumable materials.</p>
13	<p>NOTE: When separate ALTERNATES are provided in the WORK BREAKDOWN STRUCTURE sheet, these are solely for purposes of making a screening/feasibility decision based upon a relative ROM (i.e. rough order-of-magnitude) cost comparison between the ALTERNATES.</p>
14	<p>The allocation of specific line items in the WORK BREAKDOWN STRUCTURE sheet is accomplished by the check-marks at the left side and is performed because these items are considered both appropriate and conducive to distribution across all other WBS items proportionally.</p>
15	<p>NOTE: The exception to the allocation method above is when separate ALTERNATES are provided, at which time each summary ALTERNATE line item cost receives a weighted allocation of the Electrical Dist & Control Equipment line item cost, established by the portion of the total amperage load attributable to the scope anticipated within that ALTERNATE</p>
16	<p>The DIV 15 sheet piping and DIVS 16-17 sheet raceway material selection drop-downs (5 each) at the top ASSUMPTIONS section, along with the associated percentage of utilization within the total installation, are intended to represent an overall materials profile anticipated across the project.</p>
17	<p>There may be instances where highly un-symmetrical or complex structures will be dimensionally and/or geometrically "smoothed" to establish more-simplified units that comply with the OPCC input cell templates, all in an attempt to maintain the overall component aspect ratios and overall size. This typically occurs in the DIV sheets utilizing dimensional data inputs.</p>
18	<p>The PRELIMINARY SCHEDULE sheet, if provided, attempts to present all the forecast and WBS totals in a means approximating the anticipated "normal" distribution over the job duration. Typically, the overall construction duration should be considered as more accurate than the individual WBS item durations.</p>
19	<p>The DIVS 3 & 5-8 BUILDINGS/COMPONENTS sheet includes a composite cost of all the structural & architectural scope required for the building shell, walls, or roof structure identified. All other building-related construction scope is costed elsewhere as required, such as sitework & excavation (re: DIV 2), concrete slabs & foundations (re: DIV 3), masonry (re: DIV 4), miscellaneous metals (re: DIV 5), finishes (re: DIVS 9-10), mechanical, HVAC, fire protection, utilities, & plumbing (re: DIV 15), and electrical, HVAC, fire protection, utilities, & lighting (re: DIVS 16-17).</p>
20	<p>With exception of those process equipment budget costs provided by Others, all buy-out equipment costs in the DIVS 11-17 sheets are anticipated to be of US origin and have been derived either through best judgement of the Estimator or extrapolation of similar items from an independent equipment quote/purchase database.</p>
21	<p>NOTE: Skidded equipment packages are anticipated to be procured as assembled, pre-piped, pre-valved, pre-wired, pre-switched, and pre-painted by the Manufacturer to the fullest extent possible, typically requiring only re-assembly of the required shipping breakdown, touch-up paint, & off-skid piping/wiring homeruns.</p>
22	<p>The DIVS 11-17 EQUIPMENT sheets provide equipment line-item breakdowns of the subtotal for the "Process Equipment Installation Summary" sections at the top of the DIV 15 and DIVS 16-17 sheets. Each field-installed process/mechanical equipment item within the DIVS 11-17 EQUIPMENT sheets provides parametric costing for all necessary DIV 15 mechanical work such as off-load, handle, set, anchor, grout, and needed hangars/brackets/supports, pipe, fittings, manual valves, check valves, pressure gauges, and sample ports, and for all necessary DIVS 16-17 electrical equipment such as off-load, handle, set, anchor, grout, and needed hangars/brackets/supports, disconnect/safety switches, raceway, flex-conduit, fittings, wire, terminations, and grounding.</p>
21	END
22	

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Assumptions

<p>Labor Classification Rate Basis</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td colspan="2" style="text-align: center;">Eugene, OR - Prevailing Wage/Davis Bacon</td></tr> <tr><td>Manhour Fringes Average</td><td style="text-align: center;">55%</td></tr> <tr><td>Manhour Adder for Supervision</td><td style="text-align: center;">\$2.00</td></tr> <tr><td>Incidental Overtime Allowance</td><td style="text-align: center;">5.00%</td></tr> <tr><td>Special Manhour Cost Allowance</td><td></td></tr> </table>	Eugene, OR - Prevailing Wage/Davis Bacon		Manhour Fringes Average	55%	Manhour Adder for Supervision	\$2.00	Incidental Overtime Allowance	5.00%	Special Manhour Cost Allowance		<p>Construction Work Schedule</p> <p style="text-align: center;">(5)-8 hr days Mon-Fri + Incidental OT ▼</p> <p>Base Labor Rate Source</p> <p><input type="checkbox"/> MEANS Construction Cost Indexing of 30-City Rates</p> <p><input checked="" type="checkbox"/> MEANS Annual Prevailing Labor Rates Publication</p> <p><input type="checkbox"/> STATE Prevailing Wage Determination Website</p>	<p>MH Rate Overtime Factors</p> <p style="text-align: center;">Work Day Schedule</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">Hours=8</td> <td style="width: 50%; text-align: center;">Hours>8</td> </tr> <tr> <td>Mon-Fri 1X Base ▼</td> <td>1½X Base ▼</td> </tr> <tr> <td>Saturday 1½X Base ▼</td> <td>2X Base ▼</td> </tr> <tr> <td>Sunday 2X Base ▼</td> <td>3X Base ▼</td> </tr> </table>	Hours=8	Hours>8	Mon-Fri 1X Base ▼	1½X Base ▼	Saturday 1½X Base ▼	2X Base ▼	Sunday 2X Base ▼	3X Base ▼	<p>Composite MH Rate (for information only)</p> <p style="text-align: center;">Weighted Rate by Scope & Schedule</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="width: 25%; text-align: center;">Straight</td> <td style="width: 25%; text-align: center;">Overtime</td> </tr> <tr> <td>Direct Rate</td> <td style="text-align: center;">\$52.59</td> <td style="text-align: center;">\$53.39</td> </tr> <tr> <td>Fringes *</td> <td style="text-align: center;">\$18.66</td> <td style="text-align: center;">\$18.66</td> </tr> <tr> <td>Base Rate</td> <td style="text-align: center;">\$33.93</td> <td style="text-align: center;">\$34.73</td> </tr> </table>		Straight	Overtime	Direct Rate	\$52.59	\$53.39	Fringes *	\$18.66	\$18.66	Base Rate	\$33.93	\$34.73
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Base Rate	\$33.93	\$34.73																															

* Fringes are anticipated as those benefits paid by the employer and/or union such as vacation, pension, training, advancement funds, and health & welfare contributions

Labor Rates by DIV

DIVS 1-2: General Requirements & Sitework					DIV 3: Concrete					DIV 4: Masonry				
Potential Labor Trades	Anticipated Work Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	TOTAL	Potential Labor Trades	Anticipated Work Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	TOTAL	Potential Labor Trades	Anticipated Work Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	TOTAL
Operator (crane)	2	\$58.07	\$58.96	\$117.92	Carpenter	4	\$51.34	\$52.13	\$208.51	Bricklayer	6	\$54.89	\$55.73	\$334.40
Operator (medium)	2	\$51.02	\$51.80	\$103.61	Rodman	4	\$61.15	\$62.09	\$248.36	Stone Mason	2	\$54.89	\$55.73	\$111.47
Driver (heavy)	2	\$45.81	\$46.51	\$93.03	Cement Finisher	3	\$49.87	\$50.64	\$151.91	Operator (light)	1	\$48.70	\$49.45	\$49.45
Operator (mechanic)	1	\$58.07	\$58.96	\$58.96	Operator (crane)	1	\$58.07	\$58.96	\$58.96	Helper/Apprentice	2	\$41.58	\$42.22	\$84.44
Operator (oiler)	1	\$45.48	\$46.18	\$46.18	Operator (medium)	1	\$51.02	\$51.80	\$51.80	Laborer	2	\$41.91	\$42.55	\$85.11
Helper/Apprentice	1	\$41.58	\$42.22	\$42.22	Helper/Apprentice	2	\$41.58	\$42.22	\$84.44					
Laborer	2	\$41.91	\$42.55	\$85.11	Laborer	2	\$41.91	\$42.55	\$85.11					
Supervision	2	\$60.07	\$60.99	\$121.99	Supervision	3	\$63.15	\$64.12	\$192.36	Supervision	2	\$43.58	\$44.25	\$88.50
Totals	13			\$669.01	Totals	20			\$1,081.45	Totals	15			\$753.37
Blended Rate Applied in DIVS 1-2 = \$51.46					Blended Rate Applied in DIV 3 = \$54.07					Blended Rate Applied in DIV 4 = \$50.22				
DIV 5: Miscellaneous Metals					DIVS 5-8: Buildings					DIVS 9-10: Finishes				
Potential Labor Trades	Anticipated Work Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	TOTAL	Potential Labor Trades	Anticipated Work Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	TOTAL	Potential Labor Trades	Anticipated Work Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	TOTAL
Welder/SS Worker	5	\$61.15	\$62.09	\$310.45	Welder/SS Worker	1	\$61.15	\$62.09	\$62.09	Painter (structural)	5	\$31.90	\$32.39	\$161.95
Operator (crane)	1	\$58.07	\$58.96	\$58.96	Operator (crane)	4	\$58.07	\$58.96	\$235.85	Tile Layers	1	\$48.92	\$49.67	\$49.67
Operator (medium)	3	\$51.02	\$51.80	\$155.41	Operator (medium)	1	\$51.02	\$51.80	\$51.80	Plasterer	1	\$49.87	\$50.64	\$50.64
Boilermaker	2	\$65.54	\$66.55	\$133.09	Sheetmetal Worker	2	\$69.23	\$70.29	\$140.59	Painter (ordinary)	3	\$31.90	\$32.39	\$97.17
Helper/Apprentice	2	\$41.58	\$42.22	\$84.44	Glazier	1	\$54.97	\$55.81	\$55.81	Lather	1	\$51.34	\$52.13	\$52.13
					Roofer (composition)	2	\$45.79	\$46.49	\$92.99	Helper/Apprentice	1	\$41.58	\$42.22	\$42.22
					Sprinkler Installer	1	\$70.68	\$71.77	\$71.77					
					Helper/Apprentice	2	\$41.58	\$42.22	\$84.44					
Supervision	2	\$67.54	\$68.58	\$137.15	Supervision	2	\$72.68	\$73.80	\$147.59	Supervision	2	\$43.58	\$44.25	\$88.50
Totals	15			\$879.51	Totals	16			\$942.93	Totals	14			\$542.28
Blended Rate Applied in DIV 5 = \$58.63					Blended Rate Applied in DIVS 5-8 = \$58.93					Blended Rate Applied in DIVS 9-10 = \$38.73				

MODEL LABOR RATE STANDARDS

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Labor Rates by DIV														
DIV 13: Field & Shop Tanks					DIV 15: Piping & Mechanical					DIVS 16-17: Power and I&C				
Potential Labor Trades	Anticipated Work Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	TOTAL	Potential Labor Trades	Anticipated Work Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	TOTAL	Potential Labor Trades	Anticipated Work Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	TOTAL
Welder/SS Worker					Millwright	1	\$51.85	\$52.65	\$52.65	Electrician	8	\$56.30	\$57.16	\$457.32
Operator (crane)					Steamfitter/Pipefitter	7	\$66.33	\$67.35	\$471.44	Operator (light)	1	\$48.70	\$49.45	\$49.45
Operator (medium)					Plumber	2	\$66.33	\$67.35	\$134.70	Helper/Apprentice	2	\$41.58	\$42.22	\$84.44
Boilermaker					Boilermaker	1	\$65.54	\$66.55	\$66.55					
Helper/Apprentice					Insulator	1	\$66.49	\$67.51	\$67.51					
					Operator (medium)	2	\$51.02	\$51.80	\$103.61					
					Welder/SS Worker	1	\$61.15	\$62.09	\$62.09					
					Helper/Apprentice	2	\$41.58	\$42.22	\$84.44					
Supervision					Supervision	3	\$67.54	\$68.58	\$205.73	Supervision	2	\$58.30	\$59.20	\$118.39
					<i>Totals</i>	20			\$1,248.72	<i>Totals</i>	13			\$709.60
					Blended Rate Applied in DIV 15 = \$62.44					Blended Rate Applied in DIVS 16-17 = \$54.58				

Overview of Composite Labor Rates Based on Work Schedule

#	Weekly Schedule	Monday thru Friday				Saturday				Sunday				Summary		
		Workday = 8 Hours		Workday > 8 Hours		Workday = 8 Hours		Workday > 8 Hours		Workday = 8 Hours		Workday > 8 Hours		TOTAL MH per Week	Composite MH Cost per Hour	
		MH per Week	MH Cost per Week	Added MH per Week	Added MH \$ per Week	MH per Week	MH Cost per Week	Added MH per Week	Added MH \$ per Week	MH per Week	MH Cost per Week	Added MH per Week	Added MH \$ per Week			
1	(4)-10 hr days Mon-Fri (w/o OT)	40	\$2,103	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	40	\$2,103	\$52.59
2	(5)-8 hr days Mon-Fri	40	\$2,103	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	40	\$2,103	\$52.59
3	(5)-8 hr days Mon-Fri + Incidental OT	40	\$2,103	2	\$139	0	\$0	0	\$0	0	\$0	0	\$0	42	\$2,243	\$53.39
4	(4)-10 hr days Mon-Fri (with OT)	32	\$1,683	8	\$556	0	\$0	0	\$0	0	\$0	0	\$0	40	\$2,239	\$55.98
5	(6)-8 hr days Mon-Sat	40	\$2,103	0	\$0	8	\$556	0	\$0	0	\$0	0	\$0	48	\$2,660	\$55.41
6	(4)-12 hr days Mon-Fri	32	\$1,683	16	\$1,113	0	\$0	0	\$0	0	\$0	0	\$0	48	\$2,796	\$58.24
7	(5)-10 hr days Mon-Fri	40	\$2,103	10	\$695	0	\$0	0	\$0	0	\$0	0	\$0	50	\$2,799	\$55.98
8	(7)-8 hr days Mon-Sun	40	\$2,103	0	\$0	8	\$556	0	\$0	8	\$692	0	\$0	56	\$3,352	\$59.86
9	(5)-10 hr days Mon-Fri + 8 hrs Sat	40	\$2,103	10	\$695	8	\$556	0	\$0	0	\$0	0	\$0	58	\$3,355	\$57.85
10	(5)-12 hr days Mon-Fri	40	\$2,103	20	\$1,391	0	\$0	0	\$0	0	\$0	0	\$0	60	\$3,494	\$58.24
11	(6)-10 hr days Mon-Sat	40	\$2,103	10	\$695	8	\$556	2	\$173	0	\$0	0	\$0	60	\$3,528	\$58.81
12	(5)-12 hr days Mon-Fri + 8 hrs Sat	40	\$2,103	20	\$1,391	8	\$556	0	\$0	0	\$0	0	\$0	68	\$4,051	\$59.57
13	(6)-10 hr days Mon-Sat + 8 hrs Sun	40	\$2,103	10	\$695	8	\$556	2	\$173	8	\$692	0	\$0	68	\$4,220	\$62.07
14	(7)-10 hr days Mon-Sun	40	\$2,103	10	\$695	8	\$556	2	\$173	8	\$692	2	\$241	70	\$4,461	\$63.73
15	(6)-12 hr days Mon-Sat	40	\$2,103	20	\$1,391	8	\$556	4	\$346	0	\$0	0	\$0	72	\$4,397	\$61.07
16	(6)-12 hr days Mon-Sat + 8 hrs Sun	40	\$2,103	20	\$1,391	8	\$556	4	\$346	8	\$692	4	\$482	80	\$5,089	\$63.61
17	(7)-12 hr days Mon-Sun	40	\$2,103	20	\$1,391	8	\$556	4	\$346	8	\$692	4	\$482	84	\$5,571	\$66.32

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Assumptions	
Project Delivery & Bid Scope	BID/BUILD with PRE-CON
Prime Contractor	GENERAL CONTRACTOR as CM
Construction Execution	PRIME with 54% of Direct Cost by SUBS
Payroll Deductions & Workers Compensation	32.00%
Small Tools & Personal Safety Gear	3.50%
Tax Type & Categories Applied	TAX EXCLUDED and/or EXEMPT
Tax Rate Applied	
Builders Risk Insurance - Carried by PRIME	0.70%
Liability Insurances - SUBS	0.55%
Umbrella & Vehicle Insurances - SUBS	0.25%
Bonds (payment-performance-supply) - SUBS	1.30%
Overhead & General Conditions - SUBS	5.00%
Profit - SUBS	10.00%
EQ Inspections & Start-Up Assistance	1.45%
EQ Spare Parts & Special Tools/Supplies	1.24% for Start-Up Supply Only
Packing & Freight Categories	EQ (excluding permanent materials)
Packing & Freight	3.50%
Labor (MH \$) Escalation APR	3.00%
Materials (M&CE \$) Escalation APR	2.00%
Equipment (EQ \$) Escalation APR	1.00%
Years of Escalation	1.50
Estimate Contingency	15.00%
Scope Contingency	10.00%
Local Market Issues - EXCLUDED	
Anticipated Construction Duration	86 weeks
Special Project Consideration	NOT APPLICABLE

Build-Up to Cost-of-Work

Description	Work Self-Performed by Prime Contractor				Work Performed by Subcontractors				TOTAL
	Install MH	MH \$	M&CE \$	EQ \$	Install MH	MH \$	M&CE \$	EQ \$	
Direct Cost (i.e. DIVS 1-17 less DIV 1 Staff cost)	85,276	\$4,543,653	\$4,573,057	\$10,793,354	40,668	\$2,103,099	\$5,500,068	\$3,395,719	\$30,908,949
Payroll Deductions & Workers Compensation		\$938,044				\$434,188			\$1,372,233
Small Tools & Personal Safety Gear		\$102,599				\$47,489			\$150,088
EQ Inspections & Start-Up Assistance - VENDORS				\$156,504				\$49,238	\$205,742
EQ Spare Parts & Special Tool/Materials - VENDORS				\$134,084				\$42,184	\$176,269
EQ Packing & Freight - VENDORS				\$377,767				\$118,850	\$496,618
SALES TAX - NOT APPLICABLE									
Subtotal A	85,276	\$5,584,296	\$4,573,057	\$11,461,709	40,668	\$2,584,777	\$5,500,068	\$3,605,991	\$33,309,897
Overhead & General Conditions - SUBS						\$129,239	\$275,003	\$180,300	\$584,542
Profit - SUBS						\$271,402	\$577,507	\$378,629	\$1,227,538
Subtotal B	85,276	\$5,584,296	\$4,573,057	\$11,461,709	40,668	\$2,985,417	\$6,352,578	\$4,164,920	\$35,121,977
Builders Risk Insurance (re: PRIME CONTRACTOR below)									
Liability Insurance - SUBS						\$16,420			\$16,420
Umbrella & Vehicle Insurances - SUBS						\$7,464	\$15,881		\$23,345
Bonds (payment, performance, & supply) - SUBS						\$39,121	\$82,790	\$54,144	\$176,055
Subtotal C	85,276	\$5,584,296	\$4,573,057	\$11,461,709	40,668	\$3,048,421	\$6,451,250	\$4,219,064	\$35,337,797
Escalation		\$252,379	\$137,448	\$171,825		\$137,771	\$193,899	\$63,249	\$956,571
Estimate Contingency	12,791	\$837,644	\$685,959	\$1,719,256	6,100	\$457,263	\$967,687	\$632,860	\$5,300,669
Scope Contingency	8,528	\$558,430	\$457,306	\$1,146,171	4,067	\$304,842	\$645,125	\$421,906	\$3,533,780
Local Market Issues - EXCLUDED									
Subtotal D	106,595	\$7,232,749	\$5,853,770	\$14,498,961	50,835	\$3,948,298	\$8,257,961	\$5,337,079	\$45,128,817
GROSS RECEIPTS TAX - NOT APPLICABLE									
Subtotal - Cost-of-Work	106,595	\$7,232,749	\$5,853,770	\$14,498,961	50,835	\$3,948,298	\$8,257,961	\$5,337,079	\$45,128,817

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641
Prime Contractor Cost, Burdens, & Mark-Ups					
Description	Basis	TOTAL			
Project Staff Labor	DIV 1 PRIME CONTRACTOR STAFF sheet	\$2,748,722			
Project Staff Travel, Living, & Other	DIV 1 PRIME CONTRACTOR STAFF sheet	\$140,967			
Project Staff Camp Allowance - NOT APPLICABLE					
Tradesmen & Supervision Camp Allowance - NOT APPLICABLE					
(TBD)					
Subtotal E		\$2,889,689			
Escalation	4.45% composite per Subtotal E components above	\$128,464			
Insurances (i.e. builders risk, liability, umbrella, & vehicle)	1.35% of Subtotal B above	\$474,147			
Subtotal F		\$3,492,299			
General & Administrative	4.5% of Cost-of-Work Subtotal & Subtotal F above	\$2,187,950			
Profit	7.5% of Cost-of-Work Subtotal & Subtotal F above	\$3,646,584			
Project Engineering - BY OTHERS					
(TBD)					
Subtotal G		\$9,326,833			
Bonds (payment, performance, & supply)	0.8% of Cost-of-Work Subtotal & Subtotal G above	\$435,645			
Subtotal H		\$9,762,478			
GROSS RECEIPTS TAX - NOT APPLICABLE					
Subtotal - Prime Contractor Burdens & Mark-Ups					\$9,762,478
Pass-Through Scope					
Description	Basis	TOTAL			
(TBD)					
EQ Inspections & Start-Up Assistance - NOT APPLICABLE					
EQ Extra Materials & Spare Parts - NOT APPLICABLE					
Packing & Freight - NOT APPLICABLE					
Subtotal I					
Escalation - NOT APPLICABLE					
Estimate Contingency - NOT APPLICABLE					
Scope Contingency - NOT APPLICABLE					
Subtotal J					
Bonds & Insurances					
Subtotal K					
SALES TAX - NOT APPLICABLE					
GROSS RECEIPTS TAX - NOT APPLICABLE					
Subtotal - Pass-Through Scope					
OPCC Total					
OPCC ACCURACT RANGE BASE COST					\$54,891,295

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Glossary of OPCC Summary Terms

PROJECT DELIVERY & BID SCOPE: Identifies the bid & installation work scope approach (i.e. Bid/Build or Design/Build), which subsequently establishes the baseline burdens and add-on rates.
PRIME CONTRACTOR: Identifies the entity having the overall construction oversight and/or construction management responsibilities, which adjusts a portion of the assigned burden & add-ons.
CONSTRUCTION EXECUTION: Identifies the entity actually performing the supply/install work scope, which finalizes the balance of the assigned burden and add-on rates.
PAYROLL DEDUCTIONS & WORKERS COMP: Percent applied to the supply/install Contractor(s) base MH rate (i.e. excluding fringes) to cover the payroll taxes (FICA, FUTA, & SUTA), payroll insurances, pension contributions, union assessments, bonus programs (excluding profit sharing), training funds, industry/administrative funds, and state workers compensation insurance.
SMALL TOOLS & PERSONAL SAFETY GEAR: Percent applied to the supply/install Contractor(s) base MH rate (i.e. excluding fringes) to cover the supply and/or replacement of the small "expendable" items (i.e. hand tools, hand-held power tools, etc.), and personal protection equipment, with any single item value anticipated to be no greater than \$250.
TAX TYPE & CATEGORIES APPLIED: Identifies the type of tax and the MH, M&CE, and/or EQ cost categories to which the tax percentage assigned below shall apply.
TAX RATE: Percent applied to the categories identified above which calculates the supply/install or Prime Contractor(s) tax burden.
BUILDERS RISK INSURANCE: Percent applied to the direct MH, M&CE, & EQ costs to cover the capital and installation risk insurance carried either by the Owner or Prime Contractor (carried under the Prime section).
LIABILITY INSURANCES: Percent applied to the supply/install Subcontractor(s) direct MH cost for the general liability insurances.
UMBRELLA & VEHICLE INSURANCES: Percent applied to the supply/install Subcontractor(s) direct MH & M&CE costs for the umbrella & vehicle insurances.
PAYMENT, PERFORMANCE, & SUPPLY BONDS: Percent applied to the supply/install Subcontractor(s) applicable direct MH, M&CE, & EQ costs for the bonds to ensure satisfactory completion and payment to the suppliers, Vendors, & Subcontractors.
OVERHEAD & GENERAL CONDITIONS: Percent applied to the supply/install Subcontractor(s) direct MH, M&CE, & EQ costs for direct & indirect field overhead expenses, the indirect home office expenses, and all general conditions incurred during execution of the installation.
PROFIT: Percent applied to the supply/install Subcontractor(s) direct MH, M&CE, & EQ costs for the profit.
EQ INSPECTIONS & START-UP ASSISTANCE: Percent applied to the direct EQ costs for the tax-exempt services provided by the Manufacturer/Vendor, such as installation inspections and start-up assistance, including all related T&L costs.
EQ EXTRA MATERIALS & SPARE PARTS: Identifies the additional buy-out EQ supplies to be provided by either the Manufacturer or Vendor, such as special tools, lubricants, & spare parts.
PACKING & FREIGHT CATEGORIES: Identifies the EQ and/or M&CE cost categories to which the freight percentage assigned below is applied.
PACKING & FREIGHT: Percent applied to the categories identified above for the supply/install Contractor(s) freight costs for packing, shrink-wrapping, crating, containerization and/or shipping expenses.
LABOR ESCALATION APR: Annual percentage rate applied to all direct labor and Prime Contractor staff travel and living costs, which is then pro-rated to the projected duration from the date of this OPCC to mid-point of construction.
MATERIALS ESCALATION APR: Annual percentage rate applied to all direct costs for construction materials, consumables, and construction equipment (M&CE), which is then pro-rated to the projected duration from the date of this OPCC to mid-point of construction.
EQUIPMENT ESCALATION APR: Annual percentage rate applied to all direct costs for process and buy-out equipment (EQ), which is then pro-rated to the projected duration from the date of this OPCC to mid-point of construction.
YEARS OF ESCALATION: Identifies the "life" of this OPCC (starting from the completion date of the OPCC), over which the APR escalation rates identified above will be applied, and reflecting the overall time anticipated to pass for executing pre-con issues that could include sampling, surveys/testing, bench tests, design development, Contractor solicitations/negotiations, Prime and/or Subcontractor site staffing, site set-up, submittals/approvals, early/long-lead equipment procurement, and planning/coordination for any special demolition, phasing, and/or shut-downs.
ESTIMATE CONTINGENCY: Percent applied to the direct MH, M&CE, & EQ costs for the purpose of covering the potential Estimator errors/omissions, variability with the take-off and quantification efforts, and misinterpretation of the design documents.
SCOPE CONTINGENCY: Percent applied to the direct MH, M&CE, & EQ costs for covering the potential growth due to design changes/revisions, Owner preferences, and unknown regulatory requirements.
LOCAL MARKET ISSUES: Percent applied to the supply/install Contractor(s) direct MH & M&CE costs for the local construction/bid climate issues such as bidder quantity, bidder quality, contractor risk appetite, project size/complexity, bonding capacity, availability of labor, materials, and/or equipment, local governmental/bureaucratic mandates, and perceived project execution issues.
ANTICIPATED CONSTRUCTION DURATION: Identifies the total construction duration (from physical notice-to-proceed mobilization through to substantial completion) either in weeks, months, or years for the project with the labor headcount and production efficiency assigned in this OPCC, and excluding time for testing & final completion/sign-off.
SPECIAL PROJECT CONSIDERATION: Identifies the anticipated special project considerations for demolition, rehabilitation, phasing, personal protective equipment (PPE), or combination of these.

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PROJECT STAFF LABOR: The costs attributable to the labor hours generated by all the Prime Contractor's on-site and home-office based personnel directly billable to the project.					
PROJECT STAFF TRAVEL, LIVING, & OTHER: The costs attributable to the travel, living, & miscellaneous related costs generated by all the Prime Contractor's on-site and home-office based personnel directly billable to the project.					
PROJECT STAFF CAMP ALLOWANCE: The anticipated total cost for providing all Tradesmen and Supervision with travel to/from a remote work site, as well as the establishment & maintenance of a remote camp					
TRADESMEN & SUPERVISION CAMP ALLOWANCE: The anticipated total cost for providing all Tradesmen and Supervision with travel to/from a remote work site, as well as the establishment & maintenance of a remote camp.					
ESCALATION: The anticipated increase in the Prime Contractor's Pre-Construction & Construction Staff labor, travel/living, and camp costs due to the project duration (i.e. years of escalation) and escalation APR's indicated above.					
INSURANCES: An allowance for the overall project builders risk insurance, as well as the miscellaneous umbrella, vehicle, and liability insurances carried by the Prime Contractor.					
GENERAL & ADMINISTRATIVE: The costs attributable to the Prime Contractor's indirect costs that are attributable to labor, supplies, materials, equipment, tools, facilities and/or overheads, both field and home office, during execution of the project.					
PROJECT & CONSTRUCTION MANAGEMENT FEE: The anticipated profit for the Prime Contractor in executing and/or managing the project.					
PROJECT ENGINEERING: The forecasted cost of the project engineering effort, which may include geotechnical testing and design, detailed project design, and/or support and oversight during construction.					
BONDS: Percent applied to the applicable overall project MH, M&CE, & EQ costs for the bonds to ensure satisfactory completion (to the Owner) and payment to the suppliers, Vendors, & Subcontractors.					

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Introduction

This breakdown presents another view of how the OPCC goes from DIRECT COSTS to COST-OF-WORK, and identifies the development of the overall project cost build-up.

NOTE: Costs reflect the OPCC direct cost values & percentages are figured against the previous subtotal and subsequent running totals.

Percentages are provided only for general informational purposes and do not represent how those individual costs were established in all cases

INSTALLATION COSTS							
CATEGORY	WBS	DESCRIPTION	Prime Contractor	Subcontractors	TOTAL	%	OPCC SOURCE
INSTALLING CONTRACTOR(S) DIRECT COSTS	1	General Conditions	\$1,452,398	\$0	\$1,452,398		INSTALLATION OVERVIEW & DIVS 1-17
	2	General Allowances	\$59,530	\$60,402	\$119,932		
	3	Electrical Dist & Control Equipment	\$0	\$3,085,936	\$3,085,936		
	4	Site/Civil Development	\$224,194	\$423,084	\$647,278		
	5	Flash Mixing	\$325,486	\$307,780	\$633,266		
	6	Flocculation & Sedimentation	\$2,620,172	\$480,378	\$3,100,550		
	7	Ozone Contactor	\$333,998	\$357,420	\$691,418		
	8	Filters	\$1,901,385	\$849,308	\$2,750,694		
	9	Chlorine Contact Basin	\$1,311,278	\$703,094	\$2,014,372		
	10	Clearwell	\$1,046,523	\$35,880	\$1,082,403		
	11	Finished Water Pump Station	\$1,273,000	\$918,744	\$2,191,744		
	12	Washwater System	\$1,030,280	\$352,191	\$1,382,470		
	13	Solids Handling & Dewatering	\$1,961,231	\$589,981	\$2,551,212		
	14	Admin & Shop/Garage	\$952,208	\$757,790	\$1,709,999		
	15	Electrical Building	\$264,615	\$140,423	\$405,037		
	16	Ozone & Chemicals	\$5,076,645	\$1,892,598	\$6,969,243		
	17	Overflow Pond	\$77,120	\$43,877	\$120,997		
Direct Costs Subtotal			\$19,910,064	\$10,998,885	\$30,908,949		
INSTALLING CONTRACTOR(S) BURDENS & MARK-UPS		Payroll Deducts & Workers Comp	\$938,044	\$434,188	\$1,372,233	4.4%	OPCC SUMMARY
		Small Tools & Personal Safety Gear	\$102,599	\$47,489	\$150,088	0.5%	
		Vendor Inspections & Start-Up Assistance	\$156,504	\$49,238	\$205,742	0.7%	
		Vendor Spare Parts & Special Tools	\$134,084	\$42,184	\$176,269	0.6%	
		Vendor Packing & Freight	\$377,767	\$118,850	\$496,618	1.6%	
		Sales Tax					
		Overhead & General Conditions		\$584,542	\$584,542	1.9%	
		Profit		\$1,227,538	\$1,227,538	4.0%	
		Builders Risk Insurance		\$0	\$0	0.0%	
		Liability Insurance		\$16,420	\$16,420	0.1%	
		Umbrella & Vehicle Insurances		\$23,345	\$23,345	0.1%	
		Bonds		\$176,055	\$176,055	0.6%	
Burdens & Mark-Ups Subtotal			\$1,708,998	\$2,719,849	\$4,428,847	14.3%	
Running Total			\$21,619,062	\$13,718,735	\$35,337,797	114.3%	
ESTIMATOR GROSS ADJUSTMENTS		Escalation	\$561,652	\$394,920	\$956,571	2.7%	OPCC SUMMARY
		Estimate Contingency	\$3,242,859	\$2,057,810	\$5,300,669	15.0%	
		Scope Contingency	\$2,161,906	\$1,371,873	\$3,533,780	10.0%	
		Local Market Issues					
		Gross Receipts Tax	\$0	\$0	\$0	0.0%	
	Gross Adjustments Subtotal			\$5,966,417	\$3,824,603	\$9,791,020	
Running Total			\$27,585,479	\$17,543,338	\$45,128,817	127.7%	
PRIME CONTRACTOR COSTS, BURDENS, & MARK-UPS		Field Staff Labor	\$2,748,722		\$2,748,722	6.1%	DIV 1 PRIME CONTRACTOR STAFF & OPCC SUMMARY (Prime Contractor Costs, Burdens, & Mark-Ups section)
		Field Staff Travel & Living	\$140,967		\$140,967	0.3%	
		Remote Camp (Field Staff & Tradesmen)	\$0		\$0	0.0%	
		Escalation	\$128,464		\$128,464	0.3%	
		Insurances	\$474,147		\$474,147	1.1%	
		General & Administration	\$2,187,950		\$2,187,950	4.8%	
		Profit	\$3,646,584		\$3,646,584	8.1%	
		Project Engineering	\$0		\$0	0.0%	
		Bonds	\$435,645		\$435,645	1.0%	
		Gross Receipts Tax					
Prime Contractor Subtotal			\$9,762,478	\$0	\$9,762,478	21.6%	
OPCC RANGE BASE COST			\$37,347,958	\$17,543,338	\$54,891,295		



WORK BREAKDOWN STRUCTURE

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

WBS Items																
Direct Costs					Cost-of-Work											
Costs compiled from WBS coded items in DIVS 1-17 sheets					Conversion of Direct Costs identified in OPCC SUMMARY & PROJECT COST BUILD-UP sheets											
WBS	Description	ALLOCATE TO OTHER WBS	ALTERNATE CODE	ALLOCATIONS EXCLUDED	ALLOCATE TO ALTERNATES	MH	MH \$	M&CE \$	EQ \$	DIRECT COST TOTAL	MH	MH \$	M&CE \$	EQ \$	LINE COST-OF-WORK (C-O-W) TOTAL	LINE C-O-W TOTAL with PROPORTIONAL ALLOCATION of CHECK-MARK WBS ITEMS
0	Prime Contractor	✓				37,587	\$2,748,722	\$140,967		\$2,889,689					\$9,762,478	
1	General Conditions	✓				5,400	\$277,898	\$1,174,500		\$1,452,398					\$1,945,794	
2	General Allowances	✓				880	\$46,914	\$58,082	\$14,936	\$119,932	1,100	\$80,751	\$80,351	\$22,809	\$183,911	
3	Electrical Dist & Control Equipment					3,174	\$173,250	\$381,789	\$2,530,897	\$3,085,936	3,967	\$325,255	\$573,229	\$3,977,831	\$4,876,316	\$6,224,949
4	Site/Civil Development					3,557	\$186,764	\$433,796	\$26,718	\$647,278	4,447	\$330,712	\$623,037	\$35,890	\$989,639	\$1,263,342
5	Flash Mixing					2,104	\$117,721	\$245,325	\$270,220	\$633,266	2,630	\$200,225	\$358,889	\$376,741	\$935,855	\$1,194,683
6	Flocculation & Sedimentation					12,709	\$697,853	\$686,680	\$1,716,018	\$3,100,550	15,886	\$1,140,437	\$956,318	\$2,311,447	\$4,408,202	\$5,627,369
7	Ozone Contactor					5,039	\$255,747	\$309,759	\$125,912	\$691,418	6,299	\$432,874	\$444,222	\$180,936	\$1,058,032	\$1,350,650
8	Filters					9,633	\$544,152	\$764,578	\$1,441,964	\$2,750,694	12,041	\$920,773	\$1,108,712	\$1,953,216	\$3,982,700	\$5,084,188
9	Chlorine Contact Basin					21,494	\$1,052,319	\$870,459	\$91,594	\$2,014,372	26,868	\$1,765,423	\$1,196,195	\$126,832	\$3,088,451	\$3,942,618
10	Clearwell					11,159	\$601,316	\$473,491	\$7,596	\$1,082,403	13,948	\$958,816	\$612,428	\$10,570	\$1,581,814	\$2,019,293
11	Finished Water Pump Station					5,819	\$319,397	\$535,499	\$1,336,848	\$2,191,744	7,274	\$531,635	\$769,837	\$1,900,042	\$3,201,514	\$4,086,951
12	Washwater System					4,242	\$233,513	\$378,827	\$770,130	\$1,382,470	5,303	\$386,359	\$537,397	\$1,049,116	\$1,972,872	\$2,518,505
13	Solids Handling & Dewatering					11,175	\$601,645	\$889,060	\$1,060,508	\$2,551,212	13,968	\$999,945	\$1,230,093	\$1,430,611	\$3,660,649	\$4,673,067
14	Admin & Shop/Garage					12,078	\$588,847	\$774,692	\$346,460	\$1,709,999	15,098	\$1,022,463	\$1,092,606	\$466,241	\$2,581,310	\$3,295,218
15	Electrical Building					3,202	\$170,139	\$230,416	\$4,483	\$405,037	4,003	\$286,188	\$314,127	\$6,022	\$606,336	\$774,030
16	Ozone & Chemicals					13,701	\$747,482	\$1,802,953	\$4,418,807	\$6,969,243	17,126	\$1,303,921	\$2,622,080	\$5,952,752	\$9,878,752	\$12,610,900
17	Overflow Pond					579	\$31,795	\$63,221	\$25,982	\$120,997	723	\$52,904	\$88,784	\$34,982	\$176,670	\$225,532
18																
19																
20																
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																
31																
WBS TOTAL						163,531	\$9,395,474	\$10,214,092	\$14,189,072	\$33,798,638	157,430	\$11,181,047	\$14,111,731	\$19,836,039	\$54,891,295	\$54,891,295



WBS DIRECT COST DISTRIBUTION

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name		Location				Date		Estimator		Version		Job #				
Grants Pass WTP		Grants Pass, OR				7-Jun-18		Jim Ward		000		30504641				
DIV Costs																
WBS	Description	General Requirements	Common Site Work	Specialty Site Work	Concrete	Masonry	Misc Metals EQ	Misc Metals Installation	Buildings & Components	Finishes	Field & Shop Tanks	Process & Mechanical EQ	Process & Mechanical Installation	Power and I&C EQ	Power and I&C Installation	DIRECT COST (DC) TOTAL
0	Prime Contractor	\$2,889,689														\$2,889,689
1	General Conditions	\$1,452,398														\$1,452,398
2	General Allowances		\$31,442	\$5,383	\$12,605	\$6,554	\$2,914	\$1,326	\$4,688	\$4,500			\$16,872	\$12,022	\$21,625	\$119,932
3	Electrical Dist & Control Equipment													\$2,530,897	\$555,039	\$3,085,936
4	Site/Civil Development		\$158,423	\$358,353	\$13,348		\$26,718	\$25,706							\$64,731	\$647,278
5	Flash Mixing		\$18,830		\$89,674		\$19,420	\$6,962				\$190,600	\$141,618	\$60,200	\$105,962	\$633,266
6	Flocculation & Sedimentation		\$18,542		\$867,411		\$57,518	\$45,701				\$1,631,000	\$142,507	\$27,500	\$310,371	\$3,100,550
7	Ozone Contactor		\$4,256		\$247,145		\$27,712	\$8,335		\$86,467		\$46,550	\$102,956	\$51,650	\$116,348	\$691,418
8	Filters		\$6,280		\$468,827		\$65,964	\$55,215				\$1,305,100	\$462,294	\$70,900	\$316,114	\$2,750,694
9	Chlorine Contact Basin		\$140,863		\$1,092,299		\$8,994	\$3,122		\$474,397		\$66,000	\$107,928	\$16,600	\$104,169	\$2,014,372
10	Clearwell		\$132,589		\$905,856		\$5,996	\$2,081					\$12,959	\$1,600	\$21,322	\$1,082,403
11	Finished Water Pump Station		\$66,567		\$324,895		\$2,998	\$1,041				\$877,500	\$220,244	\$456,350	\$242,149	\$2,191,744
12	Washwater System		\$10,800		\$309,670		\$12,280	\$3,530				\$694,000	\$147,166	\$63,850	\$141,175	\$1,382,470
13	Solids Handling & Dewatering		\$18,335		\$344,277	\$415,822	\$163,008	\$49,891	\$98,698			\$871,200	\$272,013	\$26,300	\$291,667	\$2,551,212
14	Admin & Shop/Garage		\$6,670		\$95,200	\$367,163	\$159,110	\$50,127	\$90,238	\$301,620		\$183,700	\$219,412	\$3,650	\$233,108	\$1,709,999
15	Electrical Building		\$4,395		\$42,635	\$156,133	\$4,483	\$1,980	\$54,989				\$79,185		\$61,238	\$405,037
16	Ozone & Chemicals		\$15,136		\$225,215	\$371,763	\$17,007	\$6,776	\$112,798	\$37,566		\$4,327,950	\$1,006,038	\$73,850	\$775,144	\$6,969,243
17	Overflow Pond		\$31,222		\$15,446		\$11,632	\$4,821				\$14,000	\$23,353	\$350	\$20,173	\$120,997
0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	DIRECT COST TOTAL	\$4,342,087	\$664,348	\$363,736	\$5,054,504	\$1,317,436	\$585,754	\$266,614	\$361,410	\$904,550		\$10,207,600	\$2,954,546	\$3,395,719	\$3,380,335	\$33,798,638



WBS COST-OF-WORK DISTRIBUTION

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name		Location					Date		Estimator		Version		Job #														
Grants Pass WTP		Grants Pass, OR					7-Jun-18		Jim Ward		000		30504641														
DIV Costs																											
WBS	Description	DIV 1		DIV 2		DIV 3		DIV 4		DIV 5		DIV 5-8		DIVS 9-10		DIV 13		DIV 15		DIV 15		DIVS 16-17		DIVS 16-17		COST-OF-WORK (COW) TOTAL	
		General Requirements	Common Site Work	Specialty Site Work	Concrete	Masonry	Misc Metals EQ	Misc Metals Installation	Buildings & Components	Finishes	Field & Shop Tanks	Process & Mechanical EQ	Process & Mechanical Installation	Power and I&C EQ	Power and I&C Installation												
0	Prime Contractor	\$9,762,478																								\$9,762,478	
1	General Conditions	\$1,945,794	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1,945,794	
2	General Allowances		\$47,725	\$7,913	\$20,019	\$10,146	\$4,450	\$2,180	\$6,918	\$7,086			\$25,942	\$18,359	\$33,173											\$183,911	
3	Electrical Dist & Control Equipment	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$3,977,831	\$898,484											\$4,876,316	
4	Site/Civil Development		\$243,429	\$545,313	\$21,311		\$35,890	\$42,213																\$101,483		\$989,639	
5	Flash Mixing	\$0	\$30,049	\$0	\$144,658	\$0	\$27,075	\$11,527	\$0	\$0	\$0	\$265,735	\$214,106	\$83,931	\$158,774											\$935,855	
6	Flocculation & Sedimentation		\$28,170		\$1,339,913		\$77,475	\$72,949				\$2,196,929	\$212,391	\$37,042	\$443,331											\$4,408,202	
7	Ozone Contactor	\$0	\$6,707	\$0	\$395,220	\$0	\$39,822	\$13,341	\$0	\$137,147	\$0	\$66,893	\$153,343	\$74,221	\$171,338											\$1,058,032	
8	Filters		\$9,939		\$752,971		\$89,352	\$91,551				\$1,767,826	\$705,277	\$96,038	\$469,747											\$3,982,700	
9	Chlorine Contact Basin	\$0	\$209,781	\$0	\$1,707,416	\$0	\$12,455	\$5,066	\$0	\$736,585	\$0	\$91,391	\$154,907	\$22,986	\$147,863											\$3,088,451	
10	Clearwell		\$186,682		\$1,335,309		\$8,343	\$3,205					\$17,513	\$2,226	\$28,534											\$1,581,814	
11	Finished Water Pump Station	\$0	\$103,331	\$0	\$513,270	\$0	\$4,261	\$1,689	\$0	\$0	\$0	\$1,247,178	\$326,871	\$648,603	\$356,311											\$3,201,514	
12	Washwater System		\$16,716		\$480,425		\$16,729	\$5,478				\$945,407	\$215,963	\$86,980	\$205,174											\$1,972,872	
13	Solids Handling & Dewatering	\$0	\$28,358	\$0	\$531,001	\$626,750	\$219,895	\$79,373	\$143,480	\$0	\$0	\$1,175,237	\$398,104	\$35,478	\$422,973											\$3,660,649	
14	Admin & Shop/Garage		\$10,598		\$148,065	\$578,047	\$214,119	\$82,878	\$134,680	\$476,628		\$247,210	\$335,181	\$4,912	\$348,993											\$2,581,310	
15	Electrical Building	\$0	\$6,764	\$0	\$64,220	\$238,171	\$6,022	\$3,196	\$79,382	\$0	\$0	\$0	\$117,213	\$0	\$91,368											\$606,336	
16	Ozone & Chemicals		\$24,423		\$361,451	\$595,694	\$22,911	\$11,223	\$172,287	\$61,042		\$5,830,354	\$1,529,729	\$99,486	\$1,170,151											\$9,878,752	
17	Overflow Pond	\$0	\$46,273	\$0	\$24,507	\$0	\$15,661	\$7,697	\$0	\$0	\$0	\$18,850	\$34,100	\$471	\$29,111											\$176,670	
0		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0											\$0	
0		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0											\$0	
0		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0											\$0	
0		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0											\$0	
0		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0											\$0	
0		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0											\$0	
0		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0											\$0	
0		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0											\$0	
COST-OF-WORK TOTAL		\$11,708,272	\$998,946	\$553,226	\$7,839,757	\$2,048,808	\$794,461	\$433,567	\$536,747	\$1,418,487		\$13,853,011	\$4,440,640	\$5,188,567	\$5,076,807												\$54,891,295

INSTALLATION OVERVIEW

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Assumptions			
<i>Project and Owner Market</i>	Municipal & Governmental		<i>Project Site Condition</i>
<i>Installation Labor Classification</i>	Prevailing Wage/Davis Bacon		<i>Site Condition Assessment</i>
<i>Installation Labor Work Schedule</i>	(5)-8 hr days Mon-Fri + Incidental OT		<i>Work Area Congestion</i>
<i>Installation Labor Work Shifts</i>	1 Shift (daylight)		<i>Work Area Spread</i>
<i>Installation Shift Differential Pay</i>			<i>Pipe & Raceway Layouts</i>
<i>Installation Labor Productivity</i>	90% (7.2 hrs production/8 hrs)		<i>Pipe & Raceway Supports</i>
<i>Bldg & Structure Risk Category</i>	Category IV - Essential facility		<i>High Work</i>
<i>Site Seismic Consideration</i>	0.40-0.80 (x G) Peak acceleration		<i>Clean Room Work</i>
<i>Site Frost Depth Consideration</i>	0"-5"		<i>Hazardous Work</i>
<i>Site Wind Speed Consideration</i>	Zone I - 130 MPH		<i>Hot Weather Work</i>
<i>Site Location Accessibility</i>	Relatively Easy		<i>Cold Weather Work</i>
<i>Owner's Project Representative</i>	Engineer		<i>Rain or Snow Work</i>
<i>Maximum Pipe Size & Flow Rate</i>	18"Ø: 1,580(g)-6,340(p) GPM		<i>Night Work</i>
<i>(un-assigned)</i>			<i>DBE & MBE Work</i>

Work Self-Performed by Prime Contractor		
<input checked="" type="checkbox"/> DIV 1 Site Mgmt & Oversight Staff	<input checked="" type="checkbox"/> DIV 4 Masonry	<input type="checkbox"/> DIVS 11-15 INSTALL EQ: Process and Mechanical
<input checked="" type="checkbox"/> DIV 1 General Conditions	<input checked="" type="checkbox"/> DIV 5 SUPPLY EQ: Miscellaneous Metals	<input type="checkbox"/> DIV 13 Field-Erected Tanks
<input checked="" type="checkbox"/> DIV 2 Common Site Work	<input checked="" type="checkbox"/> DIV 5 INSTALL EQ: Miscellaneous Metals	<input type="checkbox"/> DIV 13 Shop-Fabricated Tanks
<input type="checkbox"/> DIV 2 Specialty Site Work	<input checked="" type="checkbox"/> DIVS 5-8 Buildings & Components	<input type="checkbox"/> DIVS 16-17 INSTALL EQ: Process & Mechanical
<input type="checkbox"/> DIV 2 Well Work	<input type="checkbox"/> DIVS 9-10 Finishes	<input type="checkbox"/> DIVS 16-17 SUPPLY EQ: Electrical and I&C
<input checked="" type="checkbox"/> DIV 3 Concrete	<input checked="" type="checkbox"/> DIVS 11-15 SUPPLY EQ: Process & Mechanical	<input type="checkbox"/> DIVS 16-17 INSTALL EQ: Electrical and I&C

Direct Cost Roll-Up of DIVS 1-17 Sheets										
CSI 1995	CSI 2004	Description (NIS = not in scope)	SF	CY	TON	MH	MH \$	M&CE \$	EQ \$	TOTAL
DIV 1	01	General Conditions				5,400	\$277,898	\$1,174,500		\$1,452,398
DIV 2	02 & 31-35	Common Site Work				5,128	\$263,924	\$400,425		\$664,348
DIV 2	02 & 31-35	Specialty Site Work				1,806	\$92,951	\$270,785		\$363,736
DIV 2	33	Well Work - NIS								
DIV 3	03	Concrete		6,808		56,659	\$3,063,729	\$1,990,774		\$5,054,504
DIV 4	04	Masonry	26,750			12,776	\$641,676	\$675,759		\$1,317,436
DIV 5	05	EQ: Miscellaneous Metals			111.1				\$585,754	\$585,754
DIV 5	05	Miscellaneous Metals Installation				3,501	\$205,284	\$61,330		\$266,614
DIVS 5-8	05-08	Buildings & Components	12,650			1,811	\$91,142	\$270,268		\$361,410
DIVS 9-10	09-10	Finishes	60,637			13,209	\$511,651	\$392,899		\$904,550
DIV 13	33	Tanks: Field Erected - NIS								
DIV 13	33	Tanks: Shop Fabricated - NIS								
DIVS 11-15	40-45	EQ: Process & Mechanical							\$10,207,600	\$10,207,600
DIVS 11-15	21-23	Process & Mechanical Installation				12,515	\$781,374	\$2,173,172		\$2,954,546
DIVS 16-17	25-28 & 33	EQ: Electrical and I&C							\$3,395,719	\$3,395,719
DIVS 16-17	25-28 & 33	Electrical and I&C Installation				13,138	\$717,124	\$2,663,211		\$3,380,335
DIVS 1-17 DIRECT COST TOTAL						125,944	\$6,646,752	\$10,073,125	\$14,189,072	\$30,908,949

DIV 1 (01) PRIME CONTRACTOR STAFF

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Assumptions	
"Trips" Destination	Local Only
Per-Diem Option	
Meetings Coverage	Managers & Start-Up
Baggage Fees	
Airport Parking	
Personal Mileage	
Lodging (short vs. long)	
Vehicle (short vs. long)	\$50 vs. \$17 per Day
Fuel-Oil-Maintenance	\$10 per Day
Ride Sharing	
Meals (excludes meetings)	\$45 per Day
Incidentals	\$10 per Day

Prime Contractor Site Management & Oversight Staff

Labor Allowances

Anticipated Project Construction Duration

86 weeks

Labor During both Pre-Construction & Construction

Labor Category Allowance	Project Director	Project/Construct Manager	Construction Manager	Construction Superintendents	Construction & Safety Engineers	Scheduling & Estimating	Contracts & Procurement	Start-Up, Test & Commission	Clerical & Administrative
Head Count		1.0		2.5	4.5			1.0	1.0
Multiple Shift Coverage		NA		NA	NA			NA	NA
Travel & Living Classification		VEHICLE +		VEHICLE	VEHICLE			VEHICLE	EXEMPT
Work Hours per Week		42		42	42			40	40
Base Rate + Benefits at 38%		\$119		\$87	\$63			\$79	\$32
Meals/Meetings Coverage		Included		Excluded	Excluded			Excluded	Excluded
Travel & Living Cycle in Days		1		1	1			1	
Travel & Living Frequency		100%		100%	100%			100%	
Construction Coverage		115.0%		112.5%	112.5%			30.0%	115.0%

Labor Summary

Labor Metric	Project Director	Project/Construct Manager	Construction Manager	Construction Superintendents	Construction & Safety Engineers	Scheduling & Estimating	Contracts & Procurement	Start-Up, Test & Commission	Clerical & Administrative
LABOR Hours		4,154		10,159	18,286			1,032	3,956
LABOR Cost		\$494,307		\$886,508	\$1,160,506			\$81,869	\$125,532

Labor Total		Labor by WBS			
Labor Hours	Labor Cost	WBS	%	WBS Hours	WBS Cost
37,587	\$2,748,722				

DAY-BASED Travel Allowances

Expenses During both Pre-Construction & Construction

DAILY Expense Allowance	Project Director	Project/Construct Manager	Construction Manager	Construction Superintendents	Construction & Safety Engineers	Scheduling & Estimating	Contracts & Procurement	Start-Up, Test & Commission	Clerical & Administrative
Per-Diem Option									
Meals/Meetings		\$56							
Vehicle		\$17		\$17	\$17			\$17	
Fuel-Oil-Maintenance (FOM)		\$10		\$10	\$10			\$10	
Incidentals		\$10							

Travel Summary

Travel & Living Metric	Project Director	Project/Construct Manager	Construction Manager	Construction Superintendents	Construction & Safety Engineers	Scheduling & Estimating	Contracts & Procurement	Start-Up, Test & Commission	Clerical & Administrative
DAY Cost		\$93		\$27	\$27			\$27	
DAY Count		495		1,210	2,177			129	
DAYS Cost		\$46,035		\$32,670	\$58,779			\$3,483	

Day-Based Travel Total		Day-Based Travel by WBS			
Day Count	Day Cost	WBS	%	WBS Cost	
4,011	\$140,967				

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Glossary of Travel & Living Terms

<p>CONSTRUCTION DURATION COVERAGE: Any durations in excess of 100% indicates Pre-Construction time</p>
<p>SHORT VS. LONG: Identifies the anticipated short-term higher cost "rental" usually applying for (1) month or less, versus a longer term and less expensive "lease" option</p>
<p>EXEMPT: Personnel originating LOCAL to the project site who do not have a need or expectation of generating travel & living expenses.</p>
<p>HO: Home office personnel (i.e. Denver, CO based) originating either LOCAL or REMOTE to the project site who typically would not generate any travel & living expenses.</p>
<p>VEHICLE: Personnel originating LOCAL to the project site who are reimbursed 100% for the eligible daily expenses of a vehicle and related fuel-oil-maintenance throughout the individual's project time (re: "Construction Coverage").</p>
<p>VEHICLE +: Personnel originating LOCAL to the project site who are reimbursed 100% for the eligible daily expenses of meals, potential meetings coverage, and incidentals, all in addition to the vehicle and related fuel-oil-maintenance throughout the individual's project time (re: "Construction Coverage").</p>
<p>MIXED: Personnel originating LOCAL to the project site who are reimbursed 100% for the eligible daily expenses of a vehicle and related fuel-oil-maintenance, miscellaneous & incidental costs, and meals and potential meetings coverage (depending on staff position) at the indicated duration (re: "Travel & Living Cycle in Days"), as well as the eligible travel expenses to & from the home office location (i.e. Denver, CO based) at the indicated frequency (re: "Travel & Living Frequency") and project time (re: "Construction Coverage").</p>
<p>TRIPS: Personnel originating REMOTE to the project site who are reimbursed 100% for the eligible travel expenses to & from their remote home/home office location (i.e. Denver, CO based) at the indicated frequency (re: "Travel & Living Frequency") and durations (re: "Travel & Living Cycle in Days") throughout the individual's project time (re: "Construction Coverage").</p>
<p>PER-DIEM: Personnel originating REMOTE to the project site who receive a negotiated lump-sum daily stipend intended to cover 100% of the living costs for a full-time project area residence, as well as the travel expenses to & from their home/home office location (i.e. Denver, CO based) at the indicated/negotiated frequency throughout the individual's project time (re: "Construction Coverage").</p>
<p>REMOTE: Personnel originating REMOTE to the project site who are reimbursed 100% for the eligible living expenses related to a full-time project area residence, as well as the eligible travel expenses to & from their home/home office location (i.e. Denver, CO based) at the indicated frequency (re: "Travel & Living Cycle in Days") throughout the individual's project time (re: "Construction Coverage").</p>

DIV 1 (01) GENERAL REQUIREMENTS

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Assumptions	
General Conditions Level Standard	(un-assigned)

General Requirements

General Conditions Allowances									
Anticipated Project Construction Duration									
86 weeks									
Temporary Construction Facilities									
Prime Staff Trailers-1X Wide	Subcontractor Trailers-1X Wide	Owner/Rep Trailers-1X Wide	Meeting/Kitchen Trailers-1X Wide	Decon/Change Trailers-1X Wide	Material/Storage Containers	Equipment/Tool Containers	Portable Toilets	First-Aid & Sanitize Stations	
2	1		1		3	2	3	3	

Temporary Site & Project Conditions

WBS	Category	Potential Sub-Categories	Trades MH	MH @ \$51	M&CE \$	TOTAL
	Mobilization	Site occupancy and delivery/layout/staging coordination of facilities, utilities, equipment, & materials	380	\$19,556	\$14,500	\$34,056
	Field Office: Facilities	Lease, deliver, and set-up trailers, containers, toilets, & first-aid/sanitize stations	90	\$4,632	\$81,500	\$86,132
	Field Office: Carpentry	Supply/install facility decks, porches, canopies, ramps, stairways, landings, & misc accessways	90	\$4,632	\$15,000	\$19,632
	Field Office: Utilities	Install & connect electric, water (potable, utility, and/or fire), gas/propane, telecommunications, & internet	50	\$2,573	\$17,600	\$20,173
	Field Office: Equipment	Desks, chairs, tables, file cabinets, drawing racks, shelving, water coolers, refrigerators, & microwaves	20	\$1,029	\$11,800	\$12,829
	Field Office: Tools	Landline phones, computers, software, faxes, printers, copiers, & coffee makers	40	\$2,059	\$44,400	\$46,459
	Field Office: Supplies	Copy & printer paper, ink cartridges, pens/markers, coffee, tea, hot chocolate, bottled water, & cups	10	\$515	\$14,800	\$15,315
	Field Office: Incidentals	Petty cash, lockboxes, postage, Fedex, reproduction, meetings, meals, workshops, & janitorial services	390	\$20,070	\$14,800	\$34,870
	Field Staff: Safety	Training, certifications, personal protection equipment (>\$250), celebrations, events, & awards			\$7,700	\$7,700
	Field Staff: Communications	Cell phones, I-Pads, portable radios, LAN, pagers, docking/charging stations, & batteries			\$16,600	\$16,600
	Field Staff: Public Relations	Advertising, solicitations, public notices, MBE programs, community service/outreach, & progress meetings			\$25,800	\$25,800
	Construction: Accessibility	Bridges, cross-overs, scaffolds, decking, ramps, platforms, landings, docks, & stairways	170	\$8,749	\$20,300	\$29,049
	Construction: Aids	Large/Specialty hoists, cranes, forklifts, front-end loaders, trucks, conveyors, & elevators	940	\$48,375	\$290,100	\$338,475
	Construction: Aids Support	Mats, dunnage, spreaders, slings, rollers, dollies, maintenance, & FOG (fuel-oil-grease)	120	\$6,176	\$145,100	\$151,276
	Construction: Permitting	Applications, inspections, notifications, approvals, fees, & support documentation			\$58,000	\$58,000
	Construction: QA & QC	Samples, tests, inspections, & certifications, & miscellaneous consultants/subcontractors	490	\$25,217	\$147,700	\$172,917
	Construction: Utilities	Gensets, work lighting, heaters, fans, compressors, pumps, welders, & miscellaneous appliances	250	\$12,866	\$18,500	\$31,366
	Work Area: Accessibility	Road re-routes, turn-arounds, overpasses, haul routes, scaffolds, sidewalks, & parking/staging areas	100	\$5,146	\$8,000	\$13,146
	Work Area: Protection	Security lighting, visual barriers, fencing, barricades, & protection for existing trees, plants, and/or structures	160	\$8,234	\$12,300	\$20,534
	Work Area: Safety & Health	Signage, fall/debris nets, ventilation blowers, fire extinguishers, first-aid supplies, water, ice, & cups	90	\$4,632	\$7,300	\$11,932
	Work Area: Passive Security	Guard shacks, work-time entry/exit guards, & video surveillance & recording system				
	Work Area: Active Security	24-hour watchman & monitoring of video surveillance system				
	Work Area: Transportation	Golf carts, remote parking facilities, & daily transportation to/from remote parking				
	Work Area: Housekeeping	Handling of waste dunnage & crating, general trash collection, waste containers, & tipping/disposal fees	180	\$9,263	\$12,900	\$22,163
	Controls: Site	Surveys, layouts, benchmarks, monuments, aerial & progress photos/videos, & GPS			\$24,800	\$24,800
	Controls: Environmental	Stormwater, erosion, dirt, mud, dust, noise, ice, snow, excessive cold/heat, pollution, & pest	140	\$7,205	\$5,400	\$12,605
	Controls: EQ & Materials	Handling, transport, storage, staging, maintenance, & damage/loss management	120	\$6,176	\$7,400	\$13,576
	Controls: Passive Traffic	Barriers, cones, steel cover plates, traffic control signage/flashers, & long-term detours	110	\$5,661	\$6,500	\$12,161
	Controls: Active Traffic	Day flagmen & nightly changes in barriers, traffic control signage/flashers, & short-term detours				
	Startup: Initial	Install punchlists, alignments, gross adjustments, 1st fill oils & lubricants, loop checks, and functional testing	170	\$8,749	\$4,800	\$13,549
	Startup: Clean & Disinfect	Pipe, tank, and equipment flushing, cleaning, disinfecting & fluids/waste handling & disposal	230	\$11,836	\$8,700	\$20,536
	Startup: Final	Calibrations, fine adjustments, 1st fill of fuels & chemicals/reagents, & operational training/testing,	140	\$7,205	\$17,800	\$25,005
	Startup: Test & Commission	Functional & operational punchlisting, O&M manuals, on-line interfacing/coordination, & performance testing	160	\$8,234	\$27,200	\$35,434
	Close-Out: Project	Punchlist sign-offs, record/as-built documents, warranty initiation, & bond closure/sign-offs	380	\$19,556	\$72,500	\$92,056
	Close-Out: Site	Disconnect utilities and remove facilities, carpentry, construction equipment/tools, & surplus materials	80	\$4,117	\$8,900	\$13,017
	Demobilization	Remove utilities and vacate site, along with final housekeeping, & area restoration	300	\$15,439	\$5,800	\$21,239
1	Subtotal - General Conditions Allowances		5,400	\$277,898	\$1,174,500	\$1,452,398

DIV 1 (01) GENERAL REQUIREMENTS

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Camp Allowances for Tradesmen & Supervision

Considerations During both Pre-Construction & Construction

Travel Metric		Roundtrip Cost		Daily Cost		Daily Cost	
Work Days per Week	0	Air Transportation	\$0	Meals	\$0	Housekeep	\$0
Rotation Cycle - Weeks		Ground Transportation	\$0	Mobility & FOM	\$0	Laundry	\$0
1-Way Travel Time- Hours		Tips, Meals, & Miscellany	\$0	Lodging	\$0	Incidentals	\$0
Camp Summary				Camp by WBS			
<input type="checkbox"/> Report in OPCC SUMMARY in Prime Section				WBS	%	WBS Cost	
Camp Cost per Manhour	Eligible Manhours	TOTAL Camp Cost					

Miscellaneous Allowances

WBS	Description	Quantity	Trades MH	MH @ \$0	M&CE \$	EQ \$	TOTAL
				\$			
				\$			
				\$			
				\$			
				\$			
				\$			
				\$			
				\$			
				\$			
				\$			
				\$			
				\$			
				\$			
				\$			
Subtotal - Miscellaneous Allowances							

General Requirements Total

	MH	MH @ \$51 (avg)	M&CE \$	Camp \$	EQ \$	TOTAL
DIV 1(g) TOTAL	5,400	\$277,898	\$1,174,500			\$1,452,398

DIV 2 (02 & 31-35) COMMON SITE WORK

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Assumptions					
Clearing & Grubbing	Topsoil & Light Vegetation			Stormwater Control	Average (CB's, MH's, & pipe)
Primary Excavation Issue	Dust Control			Temporary Shoring	Shoring (walers & struts)
Secondary Excavation Issue				Temporary Dewatering	Full-time Low Point Pumping
Hauling & Disposal Distance	5.1 - 10.0 miles roundtrip			Temporary Erosion Control	(re: General Allowances)
Base, Bed, & Fill Supply	100% Import			Temporary Traffic Control	(re: General Allowances)
General Excavations	Excavate & Fill (balanced)			Saw-Cutting	
General Excavation Base & Fill				Core-Drilling	
Structural Excavations	Excavate & Fill w/ Partial Haul			Pot-Holing	(re: General Allowances)
Structural Excavation Base	Crushed Stone ¾"-1½"			Liners & Geo-Materials	
Trench Excavations				Random Base & Fill	Crushed Stone ¾"-1½"
Trench Excavation Bed & Fill				General Allowances	Low

Common Site Work Scope

Clearing & Grubbing													
WBS	Description	Qty	Type	Long	Wide/Ø	Acres	CY	MH	MH @ \$51	M&CE \$	TOTAL		
4	Overall site area	1	0.4	625.0	450.0	6.5	2,604	189	\$9,712	\$7,715	\$17,427		
4	Spoil Haul-Away	25%					977	43	\$2,204	\$5,936	\$8,141		
0		0	0.0	0.0	0.0								
0		0	0.0	0.0	0.0								
0		0	0.0	0.0	0.0								
Subtotal - Clearing & Grubbing						6.5	3,581	232	\$11,916	\$13,651	\$25,567		

General Excavations													
WBS	Description	Qty	Type	Lng-Iss	Wd-Bse	Deep	Cut °	CY	TON	MH	MH @ \$51	M&CE \$	TOTAL
4	Overall site grade & level	1	1.50	625.0	450.0	2.0	45	20,993	26,923	490	\$25,195	\$58,945	\$84,140
0		0	0.0	1.25	0.0								
17	Overflow pond	1	1.50	280.0	100.0	6.0	18	7,790	9,990	182	\$9,349	\$21,872	\$31,222
0		0	0.0	1.25	0.0								
0		0	0.0	0.0	0.0								
0		0	0.0	0.0	0.0								
0		0	0.0	0.0	0.0								
Subtotal - General Excavations								28,783	36,914	671	\$34,545	\$80,817	\$115,362

Structural Excavations													
WBS	Description	Qty	Type	Lng-Iss	Wd-Bse	Deep	Cut °	CY	TON	MH	MH @ \$51	M&CE \$	TOTAL
5	Flash mix vault area	1	1.30	55.0	20.0	10.0	90	407	523	79	\$4,063	\$1,885	\$5,948
5	Compacted Base	5%	1.2	1.3	3.0			20	28	3	\$152	\$432	\$585
6	Flocculation & sedimentation area	1	1.30	130.0	90.0	2.0	45	900	1,154	158	\$8,151	\$4,051	\$12,202
6	Compacted Base	25%	1.2	1.3	3.0			225	304	30	\$1,568	\$4,772	\$6,340
7	Contactor sidestream pump pad	1	1.30	18.0	15.0	1.5	45	18	23	4	\$192	\$85	\$276
7	Compacted Base	33%	1.2	1.3	3.0			6	8		\$47	\$127	\$174
7	Ozone contactor area	1	1.30	90.0	20.0	2.0	45	150	192	30	\$1,567	\$703	\$2,270
7	Compacted Base	25%	1.2	1.3	3.0			37	51	6	\$290	\$795	\$1,085
7	Contactor sidestream pump pad	1	1.30	18.0	15.0	1.5	45	18	23	4	\$192	\$85	\$276
7	Compacted Base	33%	1.2	1.3	3.0			6	8		\$47	\$127	\$174
8	Filter area	1	1.30	80.0	40.0	2.0	45	255	327	51	\$2,616	\$1,190	\$3,807
8	Compacted Base	25%	1.2	1.3	3.0			64	86	9	\$487	\$1,353	\$1,840
8	Filter blower pad	1	1.30	23.0	17.0	1.5	45	25	32	5	\$269	\$119	\$389
8	Compacted Base	33%	1.2	1.3	3.0			8	11	1	\$66	\$178	\$245
9	Chlorine contact basin area	1	1.30	145.0	86.0	17.0	83	8,158	10,462	231	\$11,899	\$28,359	\$40,258
9	Compacted Base	3%	1.2	1.3	3.0			240	324	13	\$663	\$5,091	\$5,754
10	Clearwell area	1	1.30	135.0	86.0	17.0	82	7,645	9,805	217	\$11,152	\$26,578	\$37,730
10	Compacted Base	3%	1.2	1.3	3.0			225	304	12	\$621	\$4,772	\$5,393
11	FWPS area	1	1.30	86.0	45.0	17.0	77	2,765	3,547	301	\$15,491	\$11,161	\$26,653
11	Compacted Base	3%	1.2	1.3	3.0			81	110	8	\$411	\$1,726	\$2,137

DIV 2 (02 & 31-35) COMMON SITE WORK

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name				Location				Date			Estimator		Version	Job #
Grants Pass WTP				Grants Pass, OR				7-Jun-18			Jim Ward		000	30504641
12	Wastewater EQ basin area	1	1.30	85.0	55.0	2.0	45	367	471	72	\$3,691	\$1,703	\$5,394	
12	Compacted Base	25%	1.2	1.3	3.0			92	124	13	\$690	\$1,949	\$2,639	
12	Wastewater clarifier slab area	1	1.30	50.0	30.0	2.0	45	123	158	25	\$1,294	\$579	\$1,873	
12	Compacted Base	25%	1.2	1.3	3.0			31	42	5	\$239	\$654	\$893	
13	Thickener area	1	1.30	0.0	45.0	6.0	45	454	582	87	\$4,488	\$2,095	\$6,584	
13	Compacted Base	8%	1.2	1.3	3.0			38	51	5	\$281	\$803	\$1,084	
13	Thickener overflow sump area	1	1.30	12.0	12.0	8.0	90	43	55	9	\$454	\$201	\$656	
13	Compacted Base	6%	1.2	1.3	3.0			3	4		\$21	\$57	\$78	
13	Thickener blowdown pump pad	1	1.30	15.0	11.0	1.5	45	12	15	2	\$123	\$54	\$177	
13	Compacted Base	33%	1.2	1.3	3.0			4	5		\$30	\$81	\$112	
13	Dewatering bldg area	1	1.30	75.0	55.0	2.0	45	325	417	64	\$3,292	\$1,511	\$4,803	
13	Compacted Base	25%	1.2	1.3	3.0			81	110	12	\$615	\$1,725	\$2,339	
14	Admin & shop/garage bldg area	1	1.30	85.0	45.0	2.0	45	303	388	60	\$3,080	\$1,409	\$4,489	
14	Compacted Base	25%	1.2	1.3	3.0			76	102	11	\$574	\$1,607	\$2,181	
15	Electrical bldg area	1	1.30	70.0	35.0	2.0	45	197	253	40	\$2,045	\$923	\$2,968	
15	Compacted Base	25%	1.2	1.3	3.0			49	67	7	\$379	\$1,047	\$1,426	
16	Ozone & chemical bldg area	1	1.30	85.0	55.0	2.0	45	367	471	72	\$3,691	\$1,703	\$5,394	
16	Compacted Base	25%	1.2	1.3	3.0			92	124	13	\$690	\$1,949	\$2,639	
16	LOX tank & vaporizer pad area	1	1.30	65.0	30.0	2.0	45	159	204	32	\$1,657	\$745	\$2,402	
16	Compacted Base	25%	1.2	1.3	3.0			40	54	6	\$307	\$843	\$1,149	
16	CO2 tank & vaporizer pad area	1	1.30	65.0	30.0	2.0	45	159	204	32	\$1,657	\$745	\$2,402	
16	Compacted Base	25%	1.2	1.3	3.0			40	54	6	\$307	\$843	\$1,149	
0		0	0.00	0.0	0.0	0.0	0							
0		0%	0.0	0.0	0.0									
0		0	0.00	0.0	0.0	0.0	0							
0		0%	0.0	0.0	0.0									
Subtotal - Structural Excavations								22,851	29,306	1,740	\$89,552	\$116,815	\$206,367	

Ductbank Excavations													
WBS	Description	Qty	Type	Lng-Iss	Wd-Bse	Deep	Cut °	CY	TON	MH	MH @ \$0	M&CE \$	TOTAL
4	4.16KV Ductbank	1	0.00	500	4.5	0.0	45						
0		0%	0.0	0.0	0.0								
0		0	0.00	0	0.0	0.0	0						
0		0%	0.0	0.0	0.0								
0		0	0.00	0	0.0	0.0	0						
0		0%	0.0	0.0	0.0								
Subtotal - Ductbank Excavations													

Stormwater Control											
WBS	Description	Qty	Type	Long	Wide	Acres	MH	MH @ \$51	M&CE \$	TOTAL	
4	Site area (30% of overall)	1	3.0	290.5	290.5	1.9	202	\$10,406	\$38,310	\$48,715	
		0	0.0	0.0	0.0						
		0	0.0	0.0	0.0						
		0	0.0	0.0	0.0						
		0	0.0	0.0	0.0						
Subtotal - Temporary Stormwater Control							1.9	202	\$10,406	\$38,310	\$48,715

Temporary Shoring													
WBS	Description	Qty	Type	Long	Wide/Ø	Deep	Comm	SF	LF	MH	MH @ \$51	M&CE \$	TOTAL
5	Flash mix vault area	1	10.0	55.0	20.0	10.0	2.00	1,500	150	94	\$4,856	\$2,875	\$7,731
9	CCB area	1	10.0	146.0	82.0	17.0	2.00	7,752	456	488	\$25,096	\$20,058	\$45,154
10	Cleanwell area	1	10.0	136.0	82.0	17.0	2.00	7,412	436	466	\$23,995	\$19,179	\$43,174
11	FWPS area	1	10.0	82.0	40.0	17.0	2.00	4,148	244	261	\$13,428	\$10,733	\$24,161
13	Thickener overflow sump area	1	10.0	12.0	12.0	8.0	2.00	384	48	24	\$1,243	\$662	\$1,906
		0	0.0	0.0	0.0	0.0	0.00						
		0	0.0	0.0	0.0	0.0	0.00						
		0	0.0	0.0	0.0	0.0	0.00						
		0	0.0	0.0	0.0	0.0	0.00						
Subtotal - Temporary Shoring								21,196	1,334	1,333	\$68,619	\$53,507	\$122,126

DIV 2 (02 & 31-35) COMMON SITE WORK

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name		Location		Date		Estimator		Version		Job #	
Grants Pass WTP		Grants Pass, OR		7-Jun-18		Jim Ward		000		30504641	
Temporary Dewatering											
WBS	Description	Qty	Type	Long	Wide/Ø	SF	MH	MH @ \$51	M&CE \$	TOTAL	
5	Flash mix vault area	1	2.0	55.0	20.0	1,100	28	\$1,447	\$3,119	\$4,566	
9	CCB area	1	2.0	146.0	82.0	11,972	306	\$15,749	\$33,947	\$49,696	
10	Clearwell area	1	2.0	136.0	82.0	11,152	285	\$14,670	\$31,622	\$46,293	
11	FWPS area	1	2.0	82.0	40.0	3,280	84	\$4,315	\$9,301	\$13,615	
13	Thickener overflow sump area	1	2.0	12.0	12.0	144	4	\$189	\$408	\$598	
		0	0.0	0	0						
		0	0.0	0	0						
		0	0.0	0	0						
		0	0.0	0	0						
Subtotal - Temporary Dewatering						27,648	707	\$36,371	\$78,398	\$114,769	
General Allowances											
This summary category is intended to provide coverage of the minor DIV 2 sitework and/or related items that could be needed but are currently either too small to consider or cannot yet be quantified. NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the identified scope items above when these DIV costs are exported to other worksheets.											
WBS							MH	MH @ \$51	M&CE \$	TOTAL	
2	Subtotal - General Allowances						243	\$12,515	\$18,927	\$31,442	
Common Site Work Total											
						MH	MH @ \$51	M&CE \$	TOTAL		
DIV 2(c) TOTAL						5,128	\$263,924	\$400,425	\$664,348		

DIV 2 (02 & 31-35) SPECIALTY SITE WORK

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Assumptions	
Primary Excavation Issue	Dust Control ▼
Secondary Excavation Issue	▼
Hauling & Disposal Distance	5.1 - 10.0 miles roundtrip ▼
Base, Bed, & Fill Supply	100% Import ▼
Mass Excavations	Excavate & Fill (balanced) ▼
Mass Excavation Base & Fill	Varies by Structure ▼
Deep Foundations	▼
Deep Foundation Services	▼
Sheet Piling	▼
Sheet Piling Services	▼

Specialty Site Work Scope

Asphalt Paving													
WBS	Description	Qty	Type	Lng-Bse	Wide/Ø	Dp-Cut°	Thick	GAL-SF	TON	MH	MH @ \$51	M&CE \$	TOTAL
4	Site roadways	1	1.2	212	212	0.0	0.42	45,000	1,370	345	\$17,773	\$104,799	\$122,573
4	Compacted Base	1	1.2	3	1.2	0.0	0.83	45,000	2,252	112	\$5,772	\$35,395	\$41,167
0		0	0.0	0	0.0	0.0	0.00						
0		0	0.0	0	0.0	0.0	0.00						
0		0	0.0	0	0.0	0.0	0.00						
Subtotal - Asphalt Paving								45,000	3,622	458	\$23,545	\$140,194	\$163,739

Curb & Gutter												
WBS	Description	Qty	Type	Long	Wide/Ø	LF	MH	MH @ \$51	M&CE \$	TOTAL		
4	Site roadways (50% of perimeter)	1	11.0	1500.0	0.0	1,500	55	\$2,845	\$12,940	\$15,785		
0		0	0.0	0.0	0.0							
0		0	0.0	0.0	0.0							
0		0	0.0	0.0	0.0							
Subtotal - Curb & Gutter							1,500		55	\$2,845	\$12,940	\$15,785

Fencing & Gates														
WBS	Description	Qty	Type	Long	Wide/Ø	High	SF	LF	MH	MH @ \$51	M&CE \$	TOTAL		
4	Overall site area fence & gates	1	1.2	625	450	8.0	17,200	2,150	726	\$37,343	\$76,245	\$113,588		
0		0	0.0	0	0.0	0.0								
0		0	0.0	0	0.0	0.0								
0		0	0.0	0	0.0	0.0								
Subtotal - Fencing & Gates								17,200	2,150		726	\$37,343	\$76,245	\$113,588

Landscaping & Restoration												
WBS	Description	Qty	Type	Long	Wide	Acres	MH	MH @ \$51	M&CE \$	TOTAL		
4	Site landscape (20% of overall)	1	14.0	237.2	237.2	1.3	541	\$27,837	\$37,404	\$65,241		
0		0	0.0	0.0	0.0							
0		0	0.0	0.0	0.0							
0		0	0.0	0.0	0.0							
Subtotal - Landscaping & Restoration							1.3		541	\$27,837	\$37,404	\$65,241

General Allowances										
This summary category is intended to provide coverage of the minor DIV 2 sitework and/or related items that could be needed but are currently either too small to consider or cannot yet be quantified. NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the identified scope items above when these DIV costs are exported to other worksheets.										
WBS	Description	MH	MH @ \$51	M&CE \$	TOTAL					
2	Subtotal - General Allowances	27	\$1,381	\$4,002	\$5,383					

Specialty Site Work Total										
WBS	Description	MH	MH @ \$51	M&CE \$	TOTAL					
DIV 2(s) TOTAL		1,806	\$92,951	\$270,785	\$363,736					

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Assumptions					
Cement Type	Type II (lo heat & sulfate resist)	Footer Width	3x Foundation Width		
Mix Additives	1 Admixture (generic)	Slope of Haunch Foundation	45° from horizontal		
Mix Strength	4,500 PSI (7-8 sacks/CY)	Base Slab Cantilever for Walls	1' Past Wall (all sides)		
ACI Install Code	ACI 350R (environmental)	Elevated Channels & Troughs			
Reinforcement	A615-Plain Steel (qty in tons)	Embedments	Typical Types & Densities		
Foundation Style	Thickened Slab or Pilecap	Rebar Density Above Grade	Normal		
Foundation Width	18" (excludes haunch slope)	Rebar Density Below Grade	Normal		
Foundation Depth	3' with top-mount (TS) slab	General Allowances	Low		

CIP Concrete Scope

Ductbank Structures														
WBS	Description	Qty	Type	Long	Wide	TON	CY	Component	Thick	MH	MH @ \$54	M&CE \$	TOTAL	
4	4.16KV Ductbank	1	5.0	488	1.50	0.76	28.3	Tinted Concrete	1.00	118	\$6,398	\$6,949	\$13,348	
0		0	0.0	0	0.00				0.00					
0		0	0.0	0	0.00				0.00					
Subtotal - Ductbanks						0.76	28			118	\$6,398	\$6,949	\$13,348	

Column Structures														
WBS	Description	Qty	Type	Long	Wd-Ø	PC	TON	CY	Component	Hi-Thk	MH	MH @ \$54	M&CE \$	TOTAL
6	Flocculator walkway supports	48	5.0	1.0	1.0	Yes	4.69	28.4	Rect Column	16.00	173	\$9,367	\$24,213	\$33,580
		Total \$		\$33,580		Tot CY		28						
10	Clearwell structure	24	5.0	1.5	1.5	Yes	5.27	32.0	Rect Column	16.00	170	\$9,201	\$25,418	\$34,618
		Total \$		\$34,618		Tot CY		32						
11	FWPS structure	6	5.0	1.5	1.5	Yes		8.0	Rect Column	16.00	61	\$3,322	\$7,296	\$10,618
		Total \$		\$10,618		Tot CY		8						
0		0	0.0	0.0	0.0									
0		0	0.0	0.0	0.0									
Subtotal - Columns						11.3	68.4			405	\$21,890	\$56,926	\$78,816	

Housekeeping Pad & Sidewalk Structures															
WBS	Description	Qty	Type	Long	Wd-Ø	Sides	Clear	TON	CY	Component	Thick	MH	MH @ \$54	M&CE \$	TOTAL
5	Flash mix pumps	3	5.0	6.0	2.5	4.0	0.00	0.03	0.8	Rectangular Pad	0.5	10	\$566	\$319	\$884
6	Sedimentation sludge pumps	2	5.0	6.0	1.5	4.0	0.00	0.01	0.3	Rectangular Pad	0.5	5	\$245	\$132	\$377
7	Sidestream O3 contact pumps	3	5.0	4.5	1.5	4.0	0.00	0.01	0.4	Rectangular Pad	0.5	5	\$261	\$145	\$406
7	O3 destruct skids (tanktop)	3	5.0	6.0	5.0	4.0	0.00	0.05	1.7	Rectangular Pad	0.5	20	\$1,083	\$625	\$1,708
8	Filter blowers	2	5.0	6.0	5.0	4.0	0.00	0.04	1.1	Rectangular Pad	0.5	14	\$767	\$429	\$1,196
12	Washwater clarifier legs	16	5.0	2.0	2.0	4.0	0.00	0.04	1.2	Rectangular Pad	0.5	9	\$467	\$365	\$832
12	Washwater sludge pumps	2	5.0	6.0	1.5	4.0	0.00	0.01	0.3	Rectangular Pad	0.5	5	\$245	\$132	\$377
13	Thickener sludge feed pumps	2	5.0	6.0	1.5	4.0	0.00	0.01	0.3	Rectangular Pad	0.5	5	\$245	\$132	\$377
13	Screw press legs	8	5.0	2.0	2.0	4.0	0.00	0.02	0.6	Rectangular Pad	0.5	5	\$285	\$196	\$481
13	Dry polymer skid	1	5.0	9.0	7.0	4.0	0.00	0.04	1.2	Rectangular Pad	0.5	14	\$767	\$444	\$1,211
15	Polymer feed pumps	3	5.0	2.0	2.0	4.0	0.00	0.01	0.2	Rectangular Pad	0.5	3	\$156	\$86	\$242
15	Electrical bldg SWGR	1	5.0	168.0	3.0	4.0	0.00	0.31	9.3	Rectangular Pad	0.5	34	\$1,863	\$2,566	\$4,428
15	Electrical bldg genset\	1	5.0	25.0	8.0	4.0	0.00	0.12	3.7	Rectangular Pad	0.5	24	\$1,313	\$1,150	\$2,463
16	LOX & CO2 tanks	2	5.0	30.0	8.0	4.0	0.00	0.29	8.9	Rectangular Pad	0.5	41	\$2,233	\$2,508	\$4,740
16	LOX & CO2 vaporizers	2	5.0	6.0	6.0	4.0	0.00	0.04	1.3	Rectangular Pad	0.5	17	\$903	\$511	\$1,414
16	Chlorohydrate tank	1	5.0	0.0	10.0	8.0	0.25	0.06	1.7	Octagonal Pad	0.5	19	\$1,006	\$619	\$1,625
16	Chlorohydrate feed pumps	2	5.0	2.0	2.0	4.0	0.00	0.00	0.1	Rectangular Pad	0.5	2	\$110	\$59	\$169
16	Alum tank	1	5.0	0.0	11.0	8.0	0.25	0.07	2.0	Octagonal Pad	0.5	21	\$1,125	\$723	\$1,849
16	Alum feed pumps	2	5.0	2.0	2.0	4.0	0.00	0.00	0.1	Rectangular Pad	0.5	2	\$110	\$59	\$169
16	Flocculant skid	1	5.0	9.0	7.0	4.0	0.00	0.04	1.2	Rectangular Pad	0.5	14	\$767	\$444	\$1,211
16	Flocculant pumps	4	5.0	2.0	2.0	4.0	0.00	0.01	0.3	Rectangular Pad	0.5	4	\$195	\$111	\$306
16	Hypochlorite tanks	2	5.0	0.0	9.0	8.0	0.25	0.09	2.8	Octagonal Pad	0.5	31	\$1,652	\$1,008	\$2,660
16	Hypochlorite feed pumps	3	5.0	2.0	2.0	4.0	0.00	0.01	0.2	Rectangular Pad	0.5	3	\$156	\$86	\$242
16	Caustic tank	1	5.0	0.0	10.0	8.0	0.25	0.06	1.7	Octagonal Pad	0.5	19	\$1,006	\$619	\$1,625
16	Caustic feed pumps	2	5.0	2.0	2.0	4.0	0.00	0.00	0.1	Rectangular Pad	0.5	2	\$110	\$59	\$169
0		0	0.0	0.0	0.0	0.0	0.00								
0		0	0.0	0.0	0.0	0.0	0.00								
Subtotal - Housekeeping Pads & Sidewalks						1.4	41.7			326	\$17,636	\$13,526	\$31,161		

Project Name				Location				Date	Estimator		Version	Job #			
Grants Pass WTP				Grants Pass, OR				7-Jun-18	Jim Ward		000	30504641			
7	Contactor baffle walls	2	5.0	35.0	0.0	16.0	0.0	0							
	Total \$		\$40,140					Cntlv	0.00						
	Tot CY		41					Wall Factor	0.00						
	TON		3.1					F&F Sides	2.00						
							41	Wall	1.00	510	\$27,564	\$12,576	\$40,140		
8	Filter structure (4 cells)	1	5.0	75.0	37.0	14.0	1.0	3	187	Slab	1.50	689	\$37,255	\$51,316	\$88,570
	Total \$		\$265,887					Cntlv	2.00						
	Tot CY		366					Wall Factor	2.00						
	TON		28.0					F&F Sides	2.00						
							179	Wall	1.50	2,262	\$122,301	\$55,016	\$177,317		
8	Filter influent channel wall	1	5.0	75.0	0.0	14.0	0.0	0							
	Total \$		\$38,536					Cntlv	0.00						
	Tot CY		39					Wall Factor	0.00						
	TON		2.8					F&F Sides	2.00						
							39	Wall	1.00	492	\$26,579	\$11,956	\$38,536		
8	Filter cell divider walls	3	5.0	35.0	0.0	14.0	0.0	0							
	Total \$		\$51,418					Cntlv	0.00						
	Tot CY		54					Wall Factor	0.00						
	TON		3.9					F&F Sides	2.00						
							54	Wall	1.00	650	\$35,144	\$16,274	\$51,418		
8	Filter effluent channel walls	4	5.0	35.0	0.0	14.0	0.0	0							
	Total \$		\$66,869					Cntlv	0.00						
	Tot CY		73					Wall Factor	0.00						
	TON		5.2					F&F Sides	2.00						
							73	Wall	1.00	841	\$45,480	\$21,389	\$66,869		
9	CCB (2 channels)	1	5.0	135.0	66.0	16.0	1.0	3	552	Slab	1.50	2,038	\$110,208	\$151,804	\$262,012
	Total \$		\$801,069					Cntlv	2.00						
	Tot CY		1,096					Wall Factor	3.00						
	TON		86.2					F&F Sides	2.00						
							544	Wall	1.50	6,876	\$371,804	\$167,253	\$539,057		
9	CCB channel baffle walls	4	5.0	114.0		16.0	0.0	0							
	Total \$		\$291,230					Cntlv	0.00						
	Tot CY		316					Wall Factor	0.00						
	TON		23.8					F&F Sides	2.00						
							316	Wall	1.17	3,663	\$198,077	\$93,153	\$291,230		
10	Clearwell	1	5.0	135.0	66.0	16.0	2.0	3	552	Slab	1.50	2,038	\$110,208	\$151,804	\$262,012
	Total \$		\$871,238					Cntlv	2.00						
	Tot CY		1,151					Wall Factor	2.00						
	TON		91.5					F&F Sides	2.00						
							236	Elevated Slab	0.67	3,259	\$176,222	\$73,633	\$249,854		
							363	Wall	1.50	4,584	\$247,869	\$111,502	\$359,371		
11	FWPS	1	5.0	66.0	30.0	16.0	2.0	3	138	Slab	1.50	510	\$27,552	\$37,951	\$65,503
	Total \$		\$314,276					Cntlv	2.00						
	Tot CY		384					Wall Factor	2.00						
	TON		30.5					F&F Sides	2.00						
							70	Elevated Slab	0.83	970	\$52,455	\$21,918	\$74,373		
							176	Wall	1.50	2,225	\$120,290	\$54,111	\$174,401		
12	Washwater EQ basin	1	5.0	86.0	50.0	11.0	1.0	3	275	Slab	1.50	1,017	\$54,975	\$75,725	\$130,700
	Total \$		\$282,151					Cntlv	2.00						
	Tot CY		427					Wall Factor	2.00						
	TON		32.4					F&F Sides	2.00						
							151	Wall	1.34	1,977	\$106,928	\$44,523	\$151,451		
13	Thickener overflow sump	1	5.0	6.0	6.0	6.0	1.0	3	5	Slab	1.34	19	\$1,012	\$1,369	\$2,382
	Total \$		\$8,605					Cntlv	2.00						
	Tot CY		11					Wall Factor	2.00						
	TON		0.7					F&F Sides	2.00						
							6	Wall	1.00	81	\$4,394	\$1,830	\$6,224		
13	Solids dewatering bldg	1	5.0	70.0	50.0	0.5	1.0	2	143	Slab	1.00	551	\$29,802	\$37,280	\$67,082
	Total \$		\$103,079					Cntlv	2.00						
	Tot CY		209					Wall Factor	2.00						
	TON		11.7					F&F Sides	2.00						
							63	Haunch	2.00	203	\$10,955	\$13,620	\$24,575		
							2	Curbing	0.50	193	\$10,420	\$1,003	\$11,423		

Project Name	Location	Date	Estimator	Version	Job #			
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641			
<i>General Allowances</i>								
<p style="font-size: small;">This summary category is intended to provide coverage of the minor DIV 3 concrete work and/or related items that could be needed but are currently either too small to consider or cannot yet be quantified. NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the identified scope items above when these DIV costs are exported to other worksheets.</p>								
WBS	Rebar	CY	MH	MH @ \$54	M&CE \$	TOTAL		
2	Subtotal - General Allowances		1.3	17	141	\$7,640	\$4,965	\$12,605
<i>CIP Concrete Total</i>								
	Rebar	CY	MH	MH @ \$54	M&CE \$	TOTAL		
DIV 3 TOTAL		508	6,808	56,659	\$3,063,729	\$1,990,774	\$5,054,504	

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Assumptions					
<i>Exterior Type & Finish</i>	10" CMU with Split or Rib Face			<i>Interior Type & Finish</i>	8" CMU with Paint/Seal Face (2)
<i>Exterior CMU Type/Quality</i>	3-Cell Units			<i>Interior CMU Type/Quality</i>	2-Cell Units
<i>Exterior Cell Fill</i>	Rebar & Concrete-Fill (total)			<i>Interior Cell Fill</i>	Rebar & Concrete-Fill (total)
<i>Exterior Wall Openings</i>	Varies by Structure			<i>Interior Wall Openings</i>	Very Low Density (10%)
<i>Exterior Cavity Treat</i>				<i>Interior Cavity Treat</i>	
<i>Exterior Architecture Treat</i>	Medium Enhancement			<i>Interior Architecture Treat</i>	
<i>Insulation & Liner</i>				<i>General Allowances</i>	Low

Masonry Scope

<i>Exterior Masonry Structures</i>																
WBS	Description	Qty	Type	Long	Wide	High	Cell	Open	Cavity	Corner	Gable	SF	MH	MH @ \$50	M&CE \$	TOTAL
13	Solids dewatering bldg	1	17	70	50	31	9	6	1	4	0.00	7,440	3,677	\$184,690	\$231,132	\$415,822
14	Admin & shop/garage bldg	1	17	80	40	31	9	5	1	4	0.00	7,440	3,677	\$184,690	\$182,472	\$367,163
15	Electrical bldg	1	17	65	30	17	9	5	1	4	0.00	3,230	1,459	\$73,272	\$72,392	\$145,664
16	Ozone & chemical bldg	1	17	80	50	27	9	5	1	4	0.00	7,020	3,399	\$170,690	\$168,640	\$339,331
							0	0	0	0	0.00					
							0	0	0	0	0.00					
							0	0	0	0	0.00					
							0	0	0	0	0.00					
							0	0	0	0	0.00					
							0	0	0	0	0.00					
Subtotal - Exterior Masonry Structures												25,130	12,212	\$613,342	\$654,637	\$1,267,979

<i>Interior Masonry Structures</i>																
WBS	Description	Qty	Type	Long	Wide	High	Cell	Open	Cavity	Corner	Gable	SF	MH	MH @ \$50	M&CE \$	TOTAL
15	Electrical bldg	1	7	30		14	9	4	1	4	0.00	420	122	\$6,135	\$4,334	\$10,470
16	Ozone & chemical bldg	1	7	50		24	9	4	1	4	0.00	1,200	378	\$19,006	\$13,427	\$32,433
							0	0	0	0	0.00					
							0	0	0	0	0.00					
							0	0	0	0	0.00					
							0	0	0	0	0.00					
							0	0	0	0	0.00					
							0	0	0	0	0.00					
							0	0	0	0	0.00					
							0	0	0	0	0.00					
Subtotal - Interior Masonry Structures												1,620	501	\$25,142	\$17,761	\$42,903

<i>Miscellaneous Work Allowances</i>																
WBS	Description	Qty	Each	Unit MH	Unit M&CE \$	Total Units	MH	MH @ \$0	M&CE \$	TOTAL						
Subtotal - Miscellaneous Work Allowances																

<i>Demolition & Disposal Allowances</i>																
WBS	Description	Qty	Each	Unit MH	Unit M&CE \$	Total Units	MH	MH @ \$0	M&CE \$	TOTAL						
Subtotal - Demolition & Disposal Allowances																

<i>General Allowances</i>																
This summary category is intended to provide coverage of the minor DIV 4 masonry and/or related work items that could be needed but are currently either too small to consider or cannot yet be quantified. NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the identified scope items above when these DIV costs are exported to other worksheets.																
WBS	Description	Qty	Each	Unit MH	Unit M&CE \$	Total Units	MH	MH @ \$0	M&CE \$	TOTAL						
2	Subtotal - General Allowances						64	\$3,192	\$3,362	\$6,554						

Masonry Total																
												SF	MH	MH @ \$50	M&CE \$	TOTAL
DIV 4 TOTAL												26,750	12,776	\$641,676	\$675,759	\$1,317,436

DIV 5 (05) MISCELLANEOUS METALS

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name		Location		Date	Estimator	Version	Job #						
Grants Pass WTP		Grants Pass, OR		7-Jun-18	Jim Ward	000	30504641						
Assumptions													
Supply Responsibility	Prime or Subcontractor			Guardposts & Bollards	8" Ø Coated Steel Pipe with Fndtn								
Access Assemblies	Aluminum Structure & Grate			Racks & Bents									
Gratings & Coverplates	Aluminum Structure & Grate			Elevated Decks	Coated Steel Structure & Concrete								
Hatches & Covers	Aluminum			Fabrications Level	Standard								
Hoist & Crane Rails	Coated Steel Bridge Rails			General Allowances	Low								
Miscellaneous Metals Scope													
Access Walkways - End Supported													
WBS	Description	Qty	Type	Long	Wide/Ø	SF	Erect MH	MH @ \$59	M&CE \$	TON	Assembly \$	TOTAL	
7	Ozone contactor to filters	1	2.60	12.0	3.5	42	8	\$455	\$682	0.29	\$5,457	\$6,595	
8	Filters to WW EQ basin	1	2.60	12.0	3.5	42	8	\$455	\$682	0.29	\$5,457	\$6,595	
12	WW basin to WW floc & sed	1	2.60	12.0	3.5	42	8	\$455	\$682	0.29	\$5,457	\$6,595	
14	Admin bldg to floc & sed	1	2.60	12.0	3.5	42	8	\$455	\$682	0.29	\$5,457	\$6,595	
17	Overflow pond outlet box access	1	2.60	15.0	3.5	53	10	\$559	\$843	0.36	\$6,748	\$8,150	
		0	0.00	0.0	0.0								
		0	0.00	0.0	0.0								
		0	0.00	0.0	0.0								
		0	0.00	0.0	0.0								
		0	0.00	0.0	0.0								
Subtotal - Access Walkways - End Supported							221	41	\$2,380	\$3,572	1.50	\$28,576	\$34,528
Access Stairways & Landings													
WBS	Description	Qty	Type	Wide	High	Style	Risers	Erect MH	MH @ \$59	M&CE \$	TON	Assembly \$	TOTAL
6	Flocculation & sedimentation	1	2.60	3.5	16.0	1.5	24	32	\$1,853	\$1,241	0.53	\$9,924	\$13,018
7	Ozone contactor	1	2.60	3.5	16.0	1.5	24	32	\$1,853	\$1,241	0.53	\$9,924	\$13,018
8	Filters	1	2.60	3.5	16.0	1.5	24	32	\$1,853	\$1,241	0.53	\$9,924	\$13,018
12	Washwater EQ basin	1	2.60	3.5	11.0	1.5	17	26	\$1,540	\$853	0.36	\$6,823	\$9,216
13	Dewatering bldg 2nd floor	2	2.60	3.5	16.0	1.5	48	63	\$3,707	\$2,481	1.06	\$19,849	\$26,037
14	Admin bldg stairways-exterior	1	2.60	3.5	16.0	1.5	24	32	\$1,853	\$1,241	0.53	\$9,924	\$13,018
14	Admin bldg stairways-interior	1	2.60	3.5	16.0	1.5	24	32	\$1,853	\$1,241	0.53	\$9,924	\$13,018
16	Chem containment access-FRP	6	3.42	3.5	3.0	1.0	30	49	\$2,889	\$1,460	0.31	\$11,684	\$16,034
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
Subtotal - Access Stairways & Landings							215	297	\$17,402	\$10,997	4.39	\$87,978	\$116,378
Access Ladders & Landings													
WBS	Description	Qty	Type	Wide	High	Style	LF	Erect MH	MH @ \$59	M&CE \$	TON	Assembly \$	TOTAL
5	Flash mix vault ship ladders	2	2.60	1.34	8.0	2.0	16	13	\$788	\$218	0.06	\$1,741	\$2,746
13	Dewatering building roof	1	2.60	1.34	31.0	1.5	31	29	\$1,697	\$625	0.16	\$4,997	\$7,319
14	Admin & shop/garage roof	1	2.60	1.34	31.0	1.5	31	29	\$1,697	\$625	0.16	\$4,997	\$7,319
15	Electrical building roof	1	2.60	1.34	17.0	1.5	17	16	\$930	\$285	0.07	\$2,276	\$3,490
16	Ozone & chemical bldg roof	1	2.60	1.34	27.0	1.5	27	26	\$1,516	\$527	0.13	\$4,220	\$6,263
		0	0.00	0.00	0.0	0.0							
		0	0.00	0.00	0.0	0.0							
		0	0.00	0.00	0.0	0.0							
Subtotal - Access Ladders & Landings							122	113	\$6,627	\$2,279	0.58	\$18,231	\$27,137
Handrails & Toeplates - CIP Walks & Stairs													
WBS	Description	Qty	Type	Long	Wide/Ø	Style	LF	Erect MH	MH @ \$59	M&CE \$	TON	Assembly \$	TOTAL
6	Flocculation wall walkway	1	2.60	60.0	3.5	2.0	127	21	\$1,211	\$592	0.17	\$4,737	\$6,541
6	Flocculator walkways	8	2.60	35.0	3.5	2.0	616	493	\$28,914	\$3,282	0.81	\$26,253	\$58,449
6	Sedimentation wall walkways	1	2.60	22.0	3.5	2.0	51	49	\$2,900	\$299	0.07	\$2,391	\$5,589
6	Plate separator walkways	3	2.60	60.0	3.5	2.0	381	62	\$3,633	\$1,777	0.50	\$14,212	\$19,622
8	Filter cells walkway	5	2.60	35.0	3.5	2.0	385	308	\$18,071	\$2,051	0.51	\$16,408	\$36,530
8	Filter cells walkway	4	2.60	13.0	3.5	2.0	132	143	\$8,412	\$822	0.17	\$6,576	\$15,810
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
Subtotal - Handrails & Toeplates - CIP Walks & Stairs							1,692	1,077	\$63,142	\$8,822	2.22	\$70,577	\$142,541

DIV 5 (05) MISCELLANEOUS METALS

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name		Location		Date		Estimator		Version		Job #			
Grants Pass WTP		Grants Pass, OR		7-Jun-18		Jim Ward		000		30504641			
Handrails & Toeplates - Areas & Structures													
WBS	Description	Qty	Type	Long	Wide/Ø	Style	LF	Erect MH	MH @ \$59	M&CE \$	TON	Assembly \$	TOTAL
7	Ozone contactor top perimeter	1	2.60	116.0	2.0	2.0	116	19	\$1,106	\$541	0.15	\$4,327	\$5,974
8	Filter top perimeter	1	2.60	76.0	38.0	2.0	228	37	\$2,174	\$1,063	0.30	\$8,505	\$11,742
8	Filter cell walkways	5	2.60	35.0	0.0	2.0	175	188	\$11,019	\$1,083	0.23	\$8,661	\$20,762
8	Filter cell walkways	4	2.60	13.0	0.0	2.0	52	63	\$3,711	\$345	0.07	\$2,761	\$6,817
17	Overflow pond outlet box perimeter	1	2.60	8.5	8.5	2.0	34	37	\$2,154	\$211	0.04	\$1,688	\$4,053
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
Subtotal - Handrails & Toeplates - Areas & Structures							605	344	\$20,164	\$3,243	0.79	\$25,942	\$49,348
Grating & Coverplates - Areas & Structures													
WBS	Description (NIS = not in scope)	Qty	Type	Long	Wide/Ø	Style	SF	Erect MH	MH @ \$59	M&CE \$	TON	Assembly \$	TOTAL
8	Filter influent channel	1	2.60	76.0	2.0	3.0	152	30	\$1,753	\$479	0.66	\$7,672	\$9,904
13	Thickener overflow sump	1	2.60	6.0	6.0	3.0	36	9	\$528	\$120	0.15	\$1,913	\$2,561
17	Overflow pond outlet box	1	2.60	8.0	8.0	3.0	64	15	\$855	\$200	0.25	\$3,196	\$4,251
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
Subtotal - Grating & Coverplates - Areas & Structures							252	53	\$3,136	\$799	1.06	\$12,781	\$16,715
Hatches & Covers - Areas & Structures													
WBS	Description	Qty	Type	Long	Wide/Ø	Style	SF	Erect MH	MH @ \$59	M&CE \$	TON	Assembly \$	TOTAL
5	Flash mix vault man hatches	2	2.60	5.0	2.5	2.5	25	19	\$1,141	\$252	0.12	\$4,026	\$5,418
5	Flash mix vault equipment hatches	2	2.60	10.0	5.0	2.5	100	63	\$3,711	\$853	0.42	\$13,653	\$18,217
7	Ozone contactor man hatches-FRP	4	3.42	3.0	3.0	2.5	36	33	\$1,956	\$500	0.12	\$8,003	\$10,460
9	CCB man hatches	6	2.60	3.0	3.0	2.5	54	44	\$2,559	\$562	0.27	\$8,994	\$12,116
10	Clearwell man hatches	4	2.60	3.0	3.0	2.5	36	29	\$1,706	\$375	0.18	\$5,996	\$8,077
11	Finished water PS man hatches	2	2.60	3.0	3.0	2.5	18	15	\$853	\$187	0.09	\$2,998	\$4,039
13	Dewatering building roof hatches	1	2.60	3.0	3.0	1.5	9	5	\$314	\$69	0.03	\$1,103	\$1,486
15	Admin & shop/garage roof hatches	1	2.60	3.0	3.0	1.5	9	5	\$314	\$69	0.03	\$1,103	\$1,486
15	Electrical building roof hatches	1	2.60	3.0	3.0	1.5	9	5	\$314	\$69	0.03	\$1,103	\$1,486
16	Ozone & chemical bldg roof hatches	1	2.60	3.0	3.0	1.5	9	5	\$314	\$69	0.03	\$1,103	\$1,486
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
Subtotal - Hatches & Covers - Areas & Structures							305	225	\$13,182	\$3,005	1.33	\$48,085	\$64,272
Hoist & Crane Rails													
WBS	Description	Qty	Type	Long	Wide/Ø	High	LF	Erect MH	MH @ \$59	M&CE \$	TON	Assembly \$	TOTAL
13	Solids dewatering bldg bridge crane	2	1.00	50.0	1.5	1.5	150	16	\$930	\$320	1.38	\$5,113	\$6,362
14	Shop/garage bldg bridge crane	2	1.00	80.0	1.5	1.5	240	48	\$2,831	\$503	2.21	\$8,042	\$11,376
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
Subtotal - Hoist & Crane Rails							390	64	\$3,761	\$822	3.60	\$13,155	\$17,738
Guardposts & Bollards													
WBS	Description	Qty	Type	Wide/Ø	High	Style	Erect MH	MH @ \$59	M&CE \$	TON	Assembly \$	TOTAL	
4	Overall site & structures	24	1.13	0.67	7.0	1.00	231	\$13,563	\$9,384	3.70	\$18,768	\$41,715	
		0	0.00	0.00	0.0	0.00							
		0	0.00	0.00	0.0	0.00							
		0	0.00	0.00	0.0	0.00							
		0	0.00	0.00	0.0	0.00							
Subtotal - Guardposts & Bollards							231	\$13,563	\$9,384	3.70	\$18,768	\$41,715	

DIV 5 (05) MISCELLANEOUS METALS

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name		Location		Date		Estimator		Version		Job #			
Grants Pass WTP		Grants Pass, OR		7-Jun-18		Jim Ward		000		30504641			
<i>Elevated Deck Assemblies with Legs</i>													
WBS	Description	Qty	Type	Long	Wide	High	SF	Erect MH	MH @ \$59	M&CE \$	TON	Assembly \$	TOTAL
13	Dewatering screw press floor	1	1.00	70.0	50.0	16.0	3,500	511	\$29,974	\$9,128	47.60	\$130,033	\$169,135
14	Admin bldg floor	1	1.00	80.0	40.0	16.0	3,200	489	\$28,670	\$8,477	43.52	\$120,764	\$157,911
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
Subtotal - Elevated Deck Assemblies with Leg Supports							6,700	1,000	\$58,644	\$17,605	91.12	\$250,797	\$327,046
<i>General Allowances</i>													
This summary category is intended to provide coverage of the minor DIV 5 miscellaneous metals and/or related work items that could be needed but are currently either too small to consider or cannot yet be quantified. NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the identified scope items above when these DIV costs are exported to other worksheets.													
WBS								Erect MH	MH @ \$59	M&CE \$	TON	Assembly \$	TOTAL
2	Subtotal - General Allowances							17	\$1,021	\$305	0.55	\$2,914	\$4,241
Miscellaneous Metals Total													
							Erect MH	MH @ \$59	M&CE \$	TON	Assembly \$	TOTAL	
DIV 5 TOTAL							3,501	\$205,284	\$61,330	111.08	\$585,754	\$852,368	

DIVS 3 & 5-8 (03 & 05-08) BUILDINGS & COMPONENTS

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Assumptions

PE Steel Building (SB)	▼	Arched Fabric (AF)	▼
SB Add-On's	▼	AF Services (re: DIVS 15-17)	▼
SB Services (re: DIVS 15-17)	▼	Precast & Tilt-Up System	▼
PE Steel Roof (SR)	▼	Interior Architectural Level	▼
SR Add-On's	▼	Exterior Architectural Level	▼
SR Services (re: DIVS 15-17)	▼	Climate Type for Services	▼
Flat Roof (FR)	▼	(un-assigned)	▼
FR Services (re: DIVS 15-17)	▼	General Allowances	▼
		Built-Up Roof on Galv Deck & Joists	▼
		Varies by Structure	▼
		Minimum Enhancement	▼
		Northwest US (or similar)	▼
		Low	▼

Buildings & Components Scope

Flat Roof System

WBS	Description	Qty	Type	Lng-Wall	Wd-Firs	Hi-OC	SF-Lev	Watt	MH	MH @ \$50	M&CE \$	TOTAL
13	Dewatering building	1	16	70.0	50.0	28.0	3,500		495	\$24,863	\$73,835	\$98,698
13	HV-Light-Plumb	1	6	2.00	1	4	1.15	8				
14	Administration & shop/garage building	1	16	80.0	40.0	28.0	3,200		453	\$22,732	\$67,506	\$90,238
14	HV-Part AC-Light-Plumb-Fire Protect	1	9	2.00	1	4	1.15	12				
15	Electrical building	1	16	65.0	30.0	14.0	1,950		276	\$13,852	\$41,137	\$54,989
15	HV-Part AC-Light-Plumb-Fire Protect	1	9	2.00	1	4	1.15	12				
16	Ozone & chemical building	1	16	80.0	50.0	24.0	4,000		566	\$28,415	\$84,383	\$112,798
16	HV-Light-Plumb-Fire Protect	1	7	2.00	1	4	1.15	9				
0		0	0	0.0	0	0	0.00					
0		0	0	0.00	0	0	0.00	0				
0		0	0	0.00	0	0	0.00	0				
0		0	0	0.00	0	0	0.00	0				
0		0	0	0.00	0	0	0.00	0				
0		0	0	0.00	0	0	0.00	0				
0		0	0	0.00	0	0	0.00	0				
0		0	0	0.00	0	0	0.00	0				
0		0	0	0.00	0	0	0.00	0				
0		0	0	0.00	0	0	0.00	0				
0		0	0	0.00	0	0	0.00	0				
0		0	0	0.00	0	0	0.00	0				
0		0	0	0.00	0	0	0.00	0				
0		0	0	0.00	0	0	0.00	0				
0		0	0	0.00	0	0	0.00	0				
Subtotal - Flat Roof System							12,650		1,789	\$89,862	\$266,861	\$356,722

General Allowances

This summary category is intended to provide coverage of the minor DIVS 5-8 buildings, components, and/or related work items that could be needed but are currently either too small to consider or cannot yet be quantified. ***NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the identified scope items above when these DIV costs are exported to other worksheets.***

WBS	Description	MH	MH @ \$59	M&CE \$	TOTAL
2	Subtotal - General Allowances	22	\$1,280	\$3,408	\$4,688

Buildings & Components Total

	SF	MH	MH @ \$50	M&CE \$	TOTAL
DIVS 3 & 5-8 TOTAL	12,650	1,811	\$91,142	\$270,268	\$361,410

DIVS 9-10 (09-10) FINISHES

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Assumptions					
CIP Concrete	Blast, Prime, & Epoxy	▼		Buildings - Exterior	▼
Tanks - Exterior		▼		EIFS Structural System	▼
Tanks - Interior		▼		EIFS Finish System	▼
Pipes & Ducts		▼		Finishes Level	▼
Buildings - Spaces	Varies by Structure	▼		Contain & Clean-Up (C&C)	▼
Buildings - Interior	Varies by Space	▼		General Allowances	▼
				Standard	▼
				Minimum	▼
				Low	▼

Finishes Scope

CIP Concrete Finishes - Areas & Structures													
WBS	Description	Qty	Type	Long	Wide/Ø	Hi/Dp	To/Bo	C&C	SF	MH	MH @ \$39	M&CE \$	TOTAL
7	Ozone contactor structure	2	11.0	40.0	15.0	16.0	2.00	1.2	5,920	953	\$36,894	\$25,836	\$62,731
7	Ozone contactor baffle walls	4	11.0	35.0	0.0	16.0	0.00	1.2	2,240	360	\$13,960	\$9,776	\$23,736
9	CCB structure influent channel	1	11.0	67.0	10.0	16.0	2.00	1.2	3,804	612	\$23,707	\$16,602	\$40,309
9	CCB flow channels	2	11.0	124.5	32.8	16.0	2.00	1.2	26,374	4,243	\$164,364	\$115,101	\$279,465
9	CCB baffle walls	8	11.0	114.0		16.0		1.2	14,592	2,348	\$90,940	\$63,683	\$154,623
16	Ozone generation area	1	11.0	50.0	40.0	0.5	1.00	1.2	2,090	290	\$11,243	\$7,873	\$19,117
16	Chem contain area-alum & chlorohydrate	1	11.0	30.0	17.0	3.0	1.00	1.2	844	117	\$4,540	\$3,179	\$7,720
16	Chem contain area-hypochlorite	1	11.0	27.0	15.0	3.0	1.00	1.2	700	97	\$3,766	\$2,637	\$6,403
16	Chem contain area-caustic	1	11.0	16.0	16.0	3.0	1.00	1.2	473	66	\$2,545	\$1,782	\$4,326
		0	0.0	0.0	0.0	0.0	0.00	0.0					
		0	0.0	0.0	0.0	0.0	0.00	0.0					
		0	0.0	0.0	0.0	0.0	0.00	0.0					
		0	0.0	0.0	0.0	0.0	0.00	0.0					
Subtotal - CIP Concrete Finishes - Areas & Structures									57,037	9,087	\$351,959	\$246,470	\$598,430

Building Finishes & Built-Ins - Interior													
WBS	Description	Qty	Space	Finish	SF	Wall LF	High	C&C	SF	MH	MH @ \$39	M&CE \$	TOTAL
Administration Building													
14	Restrooms-M&F	2	4	52	100	20	10.0	1.0	200	482	\$18,657	\$16,768	\$35,425
14	Kitchen	1	9	52	225	30	10.0	1.0	225	565	\$21,876	\$23,561	\$45,436
14	Lab	1	10	52	225	30	10.0	1.0	225	715	\$27,701	\$31,388	\$59,089
14	Meeting room	1	2	52	300	35	10.0	1.0	300	207	\$7,999	\$5,858	\$13,857
14	SCADA/control room	1	2	52	150	24	10.0	1.0	150	133	\$5,167	\$3,620	\$8,787
14	Server room	1	2	52	180	27	10.0	1.0	180	150	\$5,825	\$4,120	\$9,945
14	Storage room	1	2	52	150	24	10.0	1.0	150	133	\$5,167	\$3,620	\$8,787
14	Offices	3	2	52	120	22	10.0	1.0	360	354	\$13,698	\$9,448	\$23,145
14	Janitor closet	1	2	52	40	13	10.0	1.0	40	63	\$2,457	\$1,600	\$4,058
14	Hallways & entrance/foyer	1	2	52	1,370	74	10.0	1.0	1,370	570	\$22,070	\$18,233	\$40,302
		0	0	0	0	0	0.0	0.0					
		0	0	0	0	0	0.0	0.0					
		0	0	0	0	0	0.0	0.0					
		0	0	0	0	0	0.0	0.0					
		0	0	0	0	0	0.0	0.0					
Subtotal - Building Finishes & Built-Ins - Interior									3,600	4,057	\$157,146	\$144,474	\$301,620

General Allowances

This summary category is intended to provide coverage of the minor DIVS 9-10 finishes and/or related work items that could be needed but are currently either too small to consider or cannot yet be quantified. **NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the identified scope items above when these DIV costs are exported to other worksheets.**

WBS		MH	MH @ \$39	M&CE \$	TOTAL
2	Subtotal - General Allowances	66	\$2,546	\$1,955	\$4,500

Finishes Total					
	SF	MH	MH @ \$39	M&CE \$	TOTAL
DIVS 9-10 TOTAL	60,637	13,209	\$511,651	\$392,899	\$904,550



DIV 15 (21-23) MECHANICAL INSTALLATION

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Assumptions					
Piping System Material 1	Class 50 DIP-MJ-Cement Lined	▼	40%		Area & Structure Ductwork
Piping System Material 2	Sch 40 CS-Butt Weld	▼	20%		Air & Liquid Distributors
Piping System Material 3	Sch 40 Galv CS-Thread	▼	20%		Face Pipe Assemblies
Piping System Material 4	Sch 10 316 SS-Butt Weld	▼	10%		Media
Piping System Material 5	Sch 80 CPVC-Socket Weld	▼	10%		Media Supports
Pipe Installation Code	ASME B31.3 - Process Piping	▼			Tank Insulation
Pipe Insulation & Jacketing	2" Fiberglass & 0.01" 304 SS	▼			Tank Insulation Jacketing
Pipe Protection & Coating	Enamel or Acrylic Paint	▼			Tank Heat-Tracing
Equipment & Tank Ductwork	FRP Duct, Ftgs, & Dampers	▼			(un-assigned)
Tagging & Labeling	Standard (plastic & 316SS)	▼			General Allowances

Mechanical Installation Scope

Process Equipment Installation Summary

Breakdown of this section's subtotal by all the major equipment scope items is provided in the DIVS 11-17 PROCESS EQUIPMENT sheets

WBS	Description (NIS = not in scope)	Qty	Type	%	MH	MH @ \$62	M&CE \$	TOTAL
	Rigging & Setting Allowance	1	1.00		2,563	\$160,004	\$153,961	\$313,965
	Piping & Valving Allowance	1	1.00		5,365	\$334,954	\$1,688,525	\$2,023,480
	Piping Insulation Allowance	1	1.90	5%	229	\$14,319	\$30,124	\$44,443
	Pipe & EQ Coating Allowance	1	1.20	30%	657	\$40,998	\$15,221	\$56,219
	Dynamic Ventilation Allowance	2	3.50		107	\$6,677	\$17,553	\$24,230
	Static Ventilation Allowance	2	3.50		53	\$3,329	\$3,693	\$7,022
	Tagging & Labeling Allowance	1			115	\$7,189	\$4,803	\$11,992

Subtotal - Process Equipment Installation Summary	9,089	\$567,471	\$1,913,880	\$2,481,351
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Subtotal - DIVS 5-8 PE Steel Roof Mechanical				
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DIVS 5-8 Flat Roof Structure Mechanical, HVAC, Fire Protection, & Plumbing

WBS	Description	Qty	Type	Floors	A-Level	Scope	SF	MH	MH @ \$62	M&CE \$	TOTAL
13	Dewatering building	1	6	1	1.00	1.02	3,500	437	\$27,299	\$44,380	\$71,679
14	Administration & shop/garage building	1	9	1	1.00	1.02	3,200	769	\$48,007	\$77,696	\$125,704
15	Electrical building	1	9	1	1.00	1.02	1,950	428	\$26,747	\$39,630	\$66,377
16	Ozone & chemical building	1	7	1	1.00	1.02	4,000	771	\$48,135	\$76,803	\$124,938
0		0	0	0	0.00	0.00					

Subtotal - DIVS 5-8 Flat Roof Mechanical	12,650	2,405	\$150,189	\$238,509	\$388,698
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Air & Liquid Distributors (installation only)

WBS	Description	Qty	Type	Long	Wide/Ø	SF	MH	MH @ \$62	M&CE \$	TOTAL
8	Filter cells	4	1.00	35.0	18.0	2,520	272	\$17,004	\$2,334	\$19,337
0		0	0.00	0.0	0.0					
0		0	0.00	0.0	0.0					
0		0	0.00	0.0	0.0					

Subtotal - Air & Liquid Distributors	2,520	272	\$17,004	\$2,334	\$19,337
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Media (installation only)

WBS	Description	Qty	Type	Long	Wide/Ø	Deep	CF	MH	MH @ \$62	M&CE \$	TOTAL
8	Filter cells	4	2.50	35.0	18.0	4.5	11,340	289	\$18,020	\$4,718	\$22,738
0		0	0.00	0.0	0.0	0.0					
0		0	0.00	0.0	0.0	0.0					
0		0	0.00	0.0	0.0	0.0					

Subtotal - Media	11,340	289	\$18,020	\$4,718	\$22,738
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Media Supports (installation only)

WBS	Description	Qty	Type	Long	Wide/Ø	GAL/Minute	MH	MH @ \$62	M&CE \$	TOTAL
8	Filter cells	4	1.00	35.0	18.0	2,520	336	\$20,991	\$4,559	\$25,550
0		0	0.00	0.0	0.0					
0		0	0.00	0.0	0.0					
0		0	0.00	0.0	0.0					

Subtotal - Media Supports	2,520	336	\$20,991	\$4,559	\$25,550
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DIV 15 (21-23) MECHANICAL INSTALLATION

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641
<i>General Allowances</i>					
<small>This summary category is intended to provide coverage of the minor DIV 15 mechanical, piping, and/or related work items that could be needed but are currently either too small to consider or cannot yet be quantified. NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the scope items in the "Process & Mechanical EQ Installation" section above.</small>					
<small>WBS</small>		<small>MH</small>	<small>MH @ \$62</small>	<small>M&CE \$</small>	<small>TOTAL</small>
2	Subtotal - General Allowances	123	\$7,700	\$9,172	\$16,872
Mechanical Installation Total					
		<small>MH</small>	<small>MH @ \$62</small>	<small>M&CE \$</small>	<small>TOTAL</small>
	DIV 15 TOTAL	12,515	\$781,374	\$2,173,172	\$2,954,546

DIVS 16-17 (25-28 & 33) ELECTRICAL INSTALLATION

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641

Assumptions					
Raceway System Material 1	Rigid Aluminum-RAL (hung)	45%	Tagging & Labeling	Standard (plastic & 316SS)	
Raceway System Material 2	Rigid Galv Steel-RGS (hung)	25%	Site Lighting Units	16' FRP Pole w/ Base-400W-LED	
Raceway System Material 3	Sch 80 PVC (hung)	10%	Typical Motor Efficiency	90% (average)	
Raceway System Material 4	Sch 40 PVC/HDPE (In Slab/UG)	10%	Local Power Factor	0.80 (anticipated)	
Raceway System Material 5	Electric Metallic Tubing (hung)	10%	1Ø Controls Voltage	120V	
Local/Field Switches	HOA (motor & CV) & Disconnects		3Ø Low Voltage	480V	
Equipment Installed	All Electrical Gear & Equipment		3Ø Medium Voltage	4.16KV	
Grounding & Lightning	EQ & Structures		3Ø High Voltage		
Pipe & EQ Heat-Tracing	Self-Regulating Tape @ 9 W/LF		General Allowances	Low	

Electrical Installation Scope

Process Equipment Installation Summary

Breakdown of this section's subtotal by all the major equipment scope items is provided in the DIVS 11-17 PROCESS EQUIPMENT sheets

WBS	Description (N/S = not in scope)	Qty	Type	%	MH	MH @ \$55	M&CE \$	TOTAL
	Rigging & Setting Allowance	1	1.00		753	\$41,118	\$13,055	\$54,173
	Wiring & Switching Allowance	1	1.00		3,313	\$180,815	\$1,764,116	\$1,944,931
	Grounding & Lightning Allowance	1	6.00		1,803	\$98,424	\$84,893	\$183,317
	Piping Heat-Trace Allowance	1	0.60	5%	84	\$4,608	\$9,700	\$14,309
	Tagging & Labeling Allowance	1			77	\$4,224	\$4,712	\$8,937
Subtotal - Process Equipment Installation Summary					6,031	\$329,190	\$1,876,476	\$2,205,665

DIVS 5-8 Flat Roof Structure Electrical, Lighting, HVAC, & Fire Protection

WBS	Description	Qty	Type	Floors	A-Level	Scope	SF	MH	MH @ \$55	M&CE \$	TOTAL
13	Dewatering building	1	6	1	1.00	1.02	3,500	733	\$39,986	\$52,126	\$92,112
14	Administration & shop/garage building	1	9	1	1.00	1.02	3,200	774	\$42,267	\$58,416	\$100,683
15	Electrical building	1	9	1	1.00	1.02	1,950	431	\$23,549	\$29,796	\$53,345
16	Ozone & chemical building	1	7	1	1.00	1.02	4,000	900	\$49,112	\$65,558	\$114,670
0		0	0	0	0.00	0.00					
Subtotal - DIVS 5-8 Flat Roof Electrical							12,650	2,838	\$154,914	\$205,896	\$360,810

Site Lighting Units

WBS	Description	Qty	Type	Watts	MH	MH @ \$55	M&CE \$	TOTAL	
5	Vault area-16' alum pole LED units	2	12.0	120	28	\$1,542	\$8,850	\$10,393	
6	Floc & sed-handrail post LED units	12	8.0	900	85	\$4,627	\$29,200	\$33,827	
7	Ozonation-16' alum pole LED units	3	12.0	180	42	\$2,314	\$13,275	\$15,589	
8	Filters-handrail post LED units	8	8.0	600	57	\$3,085	\$19,467	\$22,552	
9	CCB-16' alum pole LED units	4	12.0	240	57	\$3,085	\$17,700	\$20,785	
10	Clearwell-16' alum pole LED units	2	12.0	120	28	\$1,542	\$8,850	\$10,393	
11	FWPS-16' alum pole LED units	4	12.0	240	57	\$3,085	\$17,700	\$20,785	
12	Washwater area-handrail post LED units	8	8.0	600	57	\$3,085	\$19,467	\$22,552	
16	LOX & CO2 area-16' alum pole LED units	2	12.0	120	28	\$1,542	\$8,850	\$10,393	
17	Overflow pond-handrail post LED units	1	12.0	60	14	\$771	\$4,425	\$5,196	
0		0	0.0						
Subtotal - Site Lighting Units					3,180	452	\$24,678	\$147,786	\$172,464

4.16KV Ductbank - 800 Amp Main Feeder from Local Souce

		Overall LF	Existing Duct LF										
		500		WBS	System Components	Tot Qty	Tot LF	Unit MH	Unit M&CE \$	MH	MH @ \$55	M&CE \$	TOTAL
4	4 inch PVC Sch 80 duct & ftgs	2	1,000	0.1200	\$5.90	133	\$7,281	\$7,247	\$14,528				
4	2 inch PVC Sch 80 duct & ftgs	2	1,000	0.0800	\$3.90	89	\$4,854	\$4,790	\$9,644				
4	350 kcmil load wire (1 per phase)	3	1,620	0.0615	\$8.40	111	\$6,049	\$16,713	\$22,763				
4	2/0 ground wire	1	540	0.0222	\$2.67	13	\$728	\$1,771	\$2,499				
4	CAT 6 cable	1	540	0.0143	\$0.85	9	\$469	\$564	\$1,032				
4	Fiber optic cable (24 strand)	1	540	0.0841	\$1.95	50	\$2,756	\$1,293	\$4,049				
4	#4/0 ground wire & rods	1	540	0.0351	\$5.00	21	\$1,150	\$3,316	\$4,466				
4	Termination & Connector Allowance	1	1	16	\$525	18	\$956	\$645	\$1,600				
4	Nylon pull rope	2	1,080	0.0080	\$0.15	10	\$524	\$199	\$723				
Subtotal - 4.16KV Ductbank					454	\$24,767	\$36,539	\$61,306					



DIVS 16-17 (25-28 & 33) ELECTRICAL INSTALLATION

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name		Location		Date		Estimator		Version		Job #			
Grants Pass WTP		Grants Pass, OR		7-Jun-18		Jim Ward		000		30504641			
<i>Precast Structures - Ductbanks</i>													
WBS	Description	Qty	Type	Long	Wide/Ø	SW	Walls	T/B	CF	MH	MH @ \$55	M&CE \$	TOTAL
4	4.16KV Ductbank handholes	4	5	3.00	3.00	3.00	0.50	0.50	116	13	\$686	\$2,739	\$3,425
0		0	0	0.00	0.00	0.00	0.00	0.00					
0		0	0	0.00	0.00	0.00	0.00	0.00					
0		0	0	0.00	0.00	0.00	0.00	0.00					
Subtotal - Precast Structures - Ductbanks									116	13	\$686	\$2,739	\$3,425
<i>General Allowances</i>													
This summary category is intended to provide coverage of the minor DIVS 16-17 electrical, wiring, and/or related work items that could be needed but are currently either too small to consider or cannot yet be quantified. NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the scope items in the "Divs 11-17 Process Equipment" installation section above.													
WBS										MH	MH @ \$55	M&CE \$	TOTAL
2	Subtotal - General Allowances									161	\$8,815	\$10,174	\$18,989
Electrical Installation Total													
									MH	MH @ \$55	M&CE \$	TOTAL	
DIVS 16-17(i) TOTAL									9,949	\$543,050	\$2,279,609	\$2,822,659	

DIVS 16-17 (25-28 & 33) ELECTRICAL EQUIPMENT

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name		Location		Date	Estimator	Version	Job #		
Grants Pass WTP		Grants Pass, OR		7-Jun-18	Jim Ward	000	30504641		
Assumptions									
480V EQ Rating	NEMA 1 Gasketed (Std)			120V EQ Rating	NEMA 12 (Std)				
4.16KV EQ Rating	NEMA 1 Gasketed (Std)			Process Controls EQ	Standard SCADA				
12.47KV EQ Rating				Site Controls EQ	Safety, Security, & Surveillance				
SWBRD Main Breakers	4.16KV: M-T-M (split)			Process & Site Controls	Local Monitor & Control Only				
MCC Main Breakers	480V: Main-Tie-Main			Power/Controls Siting	Centralized				
Walk-IN SWBRD & MCC				General Allowances	Add-On to Existing System				
Electrical Equipment Scope									
120V Power Equipment									
WBS	Description (NIS = not in scope)	Qty	AMP	MH	MH @ \$55	M&CE \$	EQ \$	TOTAL	
0	PNLBRD (panelboard) Package with Main Breaker - NIS	0							
0	ON-OFF Local Control Switches - NIS	0							
3	HAND-OFF-AUTO Local Control Switches	115		517	\$28,220	\$102,714	\$8,897	\$139,830	
0	LCP (local control panel) Components - NIS	0							
0	Fabrication, Assembly, Testing, & Enclosure(s) - NIS	0							
0	Engineering & Testing - NIS	0							
0	Lightning & Surge Protection Devices - NIS	0							
Subtotal - 120V Power Equipment				517	\$28,220	\$102,714	\$8,897	\$139,830	
480V Power Equipment									
WBS	Description (NIS = not in scope)	Qty	AMP	KW	MH	MH @ \$55	M&CE \$	EQ \$	TOTAL
0	PNLBRD (panelboard) Package with Main Breaker - NIS	0							
0	GENSET Package with ATS, Integral Fuel System, & Noise Enclosure - NIS	0						\$0	
0	GENSET Paralleling Gear Package - NIS	0							
3	SWBRD (switchboard) Package & Main Breaker(s) Allowance	1		70	\$3,828	\$5,205	\$62,400	\$71,433	
3	MCC (motor control center) Package & Main Breaker(s) Allowance - 35 section(s)	1		514	\$28,048	\$30,507	\$571,500	\$630,055	
3	XFRMR (transformer) Package & Main Breaker Allowance - 210 KVA	1		103	\$5,644	\$6,139	\$12,500	\$24,283	
3	Metering, Monitoring, & Communication Device Allowance	1					\$18,200	\$18,200	
3	Lightning & Surge Protection Device Allowance	1					\$9,100	\$9,100	
3	Integration Allowance (i.e. this power & control equipment to existing)	1		52	\$2,814	\$3,139	\$24,200	\$30,153	
Subtotal - 480V Power Equipment				739	\$40,334	\$44,990	\$697,900	\$783,223	
4.16KV Power Equipment									
WBS	Description (NIS = not in scope)	Qty		KW	MH	MH @ \$55	M&CE \$	EQ \$	TOTAL
0	GENSET Package with ATS, Integral Fuel System, & Noise Enclosure - NIS	0						\$0	
0	GENSET Paralleling Gear Package - NIS	0							
3	SSWBRD (switchboard) Package & Main Breaker(s) Allowance	1		138	\$7,531	\$11,263	\$111,600	\$130,394	
0	MCC (motor control center) Package & Main Breaker(s) - NIS	0							
3	XFRMR (transformer) Package & Main Breaker Allowance - 3880 KVA	1		192	\$10,473	\$12,531	\$217,600	\$240,604	
3	Metering, Monitoring, & Communication Device Allowance	1					\$9,300	\$9,300	
3	Lightning & Surge Protection Device Allowance	1					\$4,600	\$4,600	
3	Integration Allowance (i.e. this power & control equipment to existing)	1		25	\$1,350	\$1,785	\$12,300	\$15,435	
Subtotal - 4.16KV Power Equipment				355	\$19,354	\$25,578	\$355,400	\$400,333	
12.47KV Power Equipment									
WBS	Description (NIS = not in scope)	Qty		KW	MH	MH @ \$0	M&CE \$	EQ \$	TOTAL
0	GENSET Package with ATS, Integral Fuel System, & Noise Enclosure - NIS	0						\$0	
0	GENSET Paralleling Gear Package - NIS	0							
0	SWBRD (switchboard) Package & Main Breaker(s) - NIS	0							
0	MCC (motor control center) Package & Main Breaker(s) - NIS	0							
0	XFRMR (transformer) Package & Main Breaker - NIS	0							
0	Metering, Monitoring, & Communication Devices - NIS	0							
0	Lightning & Surge Protection Devices - NIS	0							
0	Integration - NIS	0							
Subtotal - 12.47KV Power Equipment									

DIVS 16-17 (25-28 & 33) ELECTRICAL EQUIPMENT

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #		
Grants Pass WTP	Grants Pass, OR	7-Jun-18	Jim Ward	000	30504641		
<i>Process Controls Equipment</i>							
WBS	Description (NIS = not in scope)	Qty	MH	MH @ \$55	M&CE \$	EQ \$	TOTAL
3	Process Control System, HMI, RTU, & Software Package Allowance	1	910	\$49,691	\$93,017	\$440,600	\$583,308
3	Fabrication, Assembly, Testing, & Indoor (coated steel) Enclosure(s)	1				\$114,700	\$114,700
3	Engineering, Programming, Testing, & Training Allowance	1				\$423,000	\$423,000
3	UPS, RTU, Antenna, Lightning, & Surge Protection Device Allowance	1				\$132,200	\$132,200
3	Integration Allowance (i.e. this process control system to existing)	1	68	\$3,727	\$6,976	\$33,000	\$43,703
Subtotal - Process Controls Equipment			979	\$53,418	\$99,993	\$1,143,500	\$1,296,911
<i>Site Controls Equipment</i>							
WBS	Description (NIS = not in scope)	Qty	MH	MH @ \$55	M&CE \$	EQ \$	TOTAL
3	Health & Safety System Components Package Allowance	1	88	\$4,785	\$16,265	\$19,500	\$40,550
3	Security System Components Package Allowance	1	146	\$7,975	\$27,108	\$32,500	\$67,583
3	Surveillance System Components Package Allowance	1	234	\$12,785	\$43,456	\$52,100	\$108,340
3	Remote Transmittance Components Package Allowance	1	117	\$6,380	\$21,686	\$26,000	\$54,066
3	Fabrication, Assembly, Testing, & Indoor (coated steel) Enclosure(s)	1				\$32,500	\$32,500
3	Engineering, Programming, Testing, & Training Allowance	1				\$97,600	\$97,600
3	UPS, RTU, Antenna, Lightning, & Surge Protection Device Allowance	1				\$65,000	\$65,000
0	Integration - NIS	0					
Subtotal - Site Controls Equipment			585	\$31,925	\$108,514	\$325,200	\$465,639
<i>General Allowances</i>							
This summary category is intended to provide coverage of the minor DIVS 16-17 electrical equipment and/or related work items that could be needed but are currently either too small to consider or cannot yet be quantified. NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the identified scope items above when these DIV costs are exported to other worksheets.							
WBS	Description	Qty	MH	MH @ \$55	M&CE \$	EQ \$	TOTAL
2	Subtotal - General Allowances		15	\$823	\$1,813	\$12,022	\$14,658
Electrical Equipment Total							
			MH	MH @ \$55	M&CE \$	EQ \$	TOTAL
DIVS 16-17(e) TOTAL			3,189	\$174,073	\$383,602	\$2,542,919	\$3,100,595

DIVS 11-17 (40-45) PROCESS EQUIPMENT

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name			Location				Estimator	Date	Version	Job #		
Grants Pass WTP			Grants Pass, OR				Jim Ward	7-Jun-18	000	30504641		
Equipment Scope												
DIVS 11-17 EQ & Related Components			DIVS 11-15 EQ Buyout	DIV 15 EQ & Piping Installation				DIVS 16-17 EQ Buyout	DIVS 16-17 Power and I&C Installation			
WBS	Item (NIS-not in scope)	Qty	TOTAL	MH	MH \$	M&CE \$	TOTAL	TOTAL	MH	MH \$	M&CE \$	TOTAL
Flash Mixing												
5	Vault structure piping-40' x 15' (divs 2,3,5)	1		85	\$5,309	\$24,248	\$29,557					
5	Power & control connectivity	1							50	\$2,719	\$15,496	\$18,215
5	Vault luminaires	4	\$1,000	8	\$512	\$446	\$958					
5	120 VAC power	4							27	\$1,450	\$8,265	\$9,715
5	Vault exhaust fan	1	\$2,000	9	\$576	\$502	\$1,078					
5	120 VAC power	1							7	\$362	\$2,066	\$2,429
5	Vault hatch position switches	4	\$600						22	\$1,208	\$6,887	\$8,096
5	Vault sump pumps-50 gpm @ 50'-SS (1+1)	2	\$5,000	33	\$2,039	\$7,943	\$9,982					
5	480 VAC power (1 hp)	2							25	\$1,353	\$7,714	\$9,067
5	120 VAC signal	2							11	\$604	\$3,444	\$4,048
5	PS & PI assembly (pipe mount w/ valve)	2		5	\$284	\$1,037	\$1,321	\$1,500				
5	120 VAC signal	2							11	\$604	\$3,444	\$4,048
5	HC flash mix pump-1,000 gpm @ 90' (1+1)	2	\$75,000	98	\$6,116	\$23,830	\$29,945					
5	480 VAC power	2							43	\$2,368	\$13,499	\$15,867
5	120 VAC signal	4							15	\$797	\$4,544	\$5,341
5	VFD unit (40 hp)	2						\$48,000	22	\$1,227	\$6,994	\$8,221
5	PS & PI assembly (pipe mount w/ valve)	2		5	\$284	\$1,037	\$1,321	\$1,500				
5	120 VAC signal	2							11	\$604	\$3,444	\$4,048
5	1/2" seal water solenoid assembly	2		9	\$577	\$2,247	\$2,823	\$500				
5	120 VAC power	2							7	\$362	\$2,066	\$2,429
5	1/2" seal water FS	2		3	\$190	\$691	\$881	\$200				
5	120 VAC FS signal	2							2	\$121	\$689	\$810
5	42" magnetic flowmeter FIT	1		58	\$3,604	\$14,042	\$17,646	\$8,500				
5	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
5	42" PRV assembly	1	\$60,000	47	\$2,938	\$10,713	\$13,651					
5	Mazzei chemical feed & injection assemblies	3	\$12,000	83	\$5,190	\$20,220	\$25,410					
5	42" static mixer assembly	1	\$35,000	24	\$1,516	\$5,529	\$7,046					
Flocculation & Sedimentation												
6	Structure piping-121' x 81' (divs 2,3,5)	1		72	\$4,483	\$20,476	\$24,960					
6	Power & control connectivity	1							42	\$2,296	\$13,086	\$15,382
6	Ultrasonic level LIT	2		8	\$512	\$446	\$958	\$3,200				
6	120 VAC power & signal	2							18	\$967	\$5,510	\$6,476
6	High/Low safety float switch assembly	2						\$700	11	\$604	\$3,444	\$4,048
6	Vertical shaft flocculator units	24	\$324,000	344	\$21,494	\$18,738	\$40,232					
6	480 VAC power (1 1/2 hp)	24							335	\$18,269	\$104,136	\$122,405
6	120 VAC signal	24							133	\$7,249	\$41,324	\$48,573
6	Slide gate-36" x 36"-manual-SS	2	\$28,000	40	\$2,495	\$2,175	\$4,670					
6	Ultrasonic level LIT	2		8	\$512	\$446	\$958	\$3,200				
6	120 VAC power & signal	2							18	\$967	\$5,510	\$6,476
EQ SHEET TOTAL			\$542,600	939	\$58,629	\$154,767	\$213,396	\$67,300	817	\$44,614	\$254,315	\$298,929
TOTAL: ALL DIVS 11-17 EQ SHEETS			\$10,207,600	9,089	\$567,471	\$1,913,880	\$2,481,351	\$852,800	6,031	\$329,190	\$1,876,476	\$2,205,665

DIVS 11-17 (40-45) PROCESS EQUIPMENT

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name			Location				Estimator	Date	Version	Job #		
Grants Pass WTP			Grants Pass, OR				Jim Ward	7-Jun-18	000	30504641		
Equipment Scope												
DIVS 11-17 EQ & Related Components			DIVS 11-15 EQ Buyout		DIV 15 EQ & Piping Installation				DIVS 16-17 EQ Buyout	DIVS 16-17 Power and I&C Installation		
WBS	Item (NIS-not in scope)	Qty	TOTAL	MH	MH \$	M&CE \$	TOTAL	TOTAL	MH	MH \$	M&CE \$	TOTAL
6	High/Low safety float switch assembly	2						\$700	11	\$604	\$3,444	\$4,048
6	Sed basin channel plate settler assemblies	4	\$1,120,000	164	\$10,235	\$8,923	\$19,158					
6	Cable-Vac hoseless sludge removal unit	4	\$100,000	143	\$8,956	\$7,808	\$16,763					
6	LCP	2							44	\$2,416	\$13,775	\$16,191
6	480 VAC power (1 hp)	4							56	\$3,045	\$17,356	\$20,401
6	PC sludge pumps-200 gpm @ 50' (1+1)	2	\$31,000	79	\$4,946	\$19,269	\$24,215					
6	480 VAC power	2							31	\$1,692	\$9,642	\$11,334
6	120 VAC signal	4							18	\$981	\$5,594	\$6,576
6	VFD unit (5 hp)-Free standing-NEMA 4	2						\$15,000	11	\$613	\$3,497	\$4,110
6	PS & PI assembly (pipe mount w/ valve)	2		5	\$284	\$1,037	\$1,321	\$1,500				
6	120 VAC signal	2							11	\$604	\$3,444	\$4,048
6	½" seal water solenoid assembly	2		9	\$577	\$2,247	\$2,823	\$500				
6	120 VAC power	2							7	\$362	\$2,066	\$2,429
6	½" seal water FS	2		3	\$190	\$691	\$881	\$200				
6	120 VAC FS signal	2							2	\$121	\$689	\$810
6	4" magnetic flowmeter FIT (common)	1		8	\$480	\$418	\$898	\$2,500				
6	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
6	Slide gate-36" x 36"-manual-SS	2	\$28,000	40	\$2,495	\$2,175	\$4,670					
Ozonation												
7	Contact structure piping-81' x 15' (divs 2,3,5)	1		43	\$2,655	\$12,124	\$14,779					
7	Power & control connectivity	1							25	\$1,359	\$7,748	\$9,107
7	Ultrasonic level LIT	2		8	\$512	\$446	\$958	\$3,200				
7	120 VAC power & signal	2							18	\$967	\$5,510	\$6,476
7	High/Low safety float switch assembly	2						\$700	11	\$604	\$3,444	\$4,048
7	Ozone detector AIT	2		10	\$640	\$558	\$1,197	\$7,000				
7	120 VAC power & signal	2							18	\$967	\$5,510	\$6,476
7	Ozone inline analyzer AIT	2		8	\$512	\$446	\$958	\$5,000				
7	120 VAC power & signal	2							18	\$967	\$5,510	\$6,476
7	Sidestream HC pumps-250 gpm @ 50' (1+1)	3	\$37,500	104	\$6,492	\$25,294	\$31,786					
7	480 VAC power	3							46	\$2,537	\$14,463	\$17,001
7	120 VAC signal	6							22	\$1,196	\$6,816	\$8,012
7	VFD unit (5 hp)-Free standing-NEMA 4	3						\$22,500	17	\$920	\$5,245	\$6,165
7	PS & PI assembly (pipe mount w/ valve)	3		7	\$426	\$1,555	\$1,982	\$2,250				
7	120 VAC signal	3							17	\$906	\$5,165	\$6,072
7	½" seal water solenoid & FS assembly	3	\$1,050	17	\$1,081	\$4,213	\$5,294					
7	120 VAC power & signal	3							27	\$1,450	\$8,265	\$9,715
7	6" magnetic flowmeter FIT	2		39	\$2,464	\$8,985	\$11,449	\$11,000				
7	120 VAC power & signal	2							25	\$1,353	\$7,714	\$9,067
7	Injection panels (part of O3 package)	2		61	\$3,790	\$13,824	\$17,614					
7	LCP	2							33	\$1,812	\$10,331	\$12,143
7	Mazzei chemical feed & injection assemblies	2	\$8,000	55	\$3,460	\$13,480	\$16,940					
EQ SHEET TOTAL			\$1,325,550	804	\$50,193	\$123,493	\$173,685	\$72,050	476	\$25,960	\$147,982	\$173,942

DIVS 11-17 (40-45) PROCESS EQUIPMENT

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name			Location				Estimator		Date		Version		Job #				
Grants Pass WTP			Grants Pass, OR				Jim Ward		7-Jun-18		000		30504641				
Equipment Scope																	
DIVS 11-17 EQ & Related Components			DIVS 11-15 EQ Buyout		DIV 15 EQ & Piping Installation				DIVS 16-17 EQ Buyout		DIVS 16-17 Power and I&C Installation						
WBS	Item (NIS-not in scope)	Qty	TOTAL	MH	MH \$	M&CE \$	TOTAL	TOTAL	MH	MH \$	M&CE \$	TOTAL	MH	MH \$	M&CE \$	TOTAL	
	<u>Filters</u>																
8	Filter structure piping-75' x 36' (divs 2,3,5)	1		168	\$10,500	\$47,958	\$58,458										
8	Power & control connectivity	1							99	\$5,377	\$30,648	\$36,025					
8	Slide gate-24" x 24"-manual (influent)	4	\$20,000	74	\$4,606	\$4,015	\$8,621										
8	Control console/panel (1 per 2 cells)	2	\$140,200						111	\$6,041	\$34,437	\$40,478					
8	Underdrain & air pipe-35' x 18'-630 SF (div 15)	4	\$378,000														
8	Sand media-630 SF-12" deep (div 15)	4	\$25,200														
8	GAC media-630 SF-42" deep (div 15)	4	\$308,700														
8	FRP trough assemblies-5 @ 18 LF	4	\$90,000	72	\$4,478	\$3,904	\$8,382										
8	Ultrasonic level LIT	4		16	\$1,024	\$892	\$1,916	\$6,400									
8	120 VAC power & signal	4							35	\$1,933	\$11,020	\$12,953					
8	Diff pressure DPIT (pipe mount w/ valves)	4		30	\$1,895	\$6,912	\$8,807	\$14,000									
8	120 VAC power & signal	4							35	\$1,933	\$11,020	\$12,953					
8	Turbidity AIT (pipe mount w/ valves)	4		30	\$1,895	\$6,912	\$8,807	\$20,000									
8	120 VAC power & signal	4							35	\$1,933	\$11,020	\$12,953					
8	Particle counter AIT (pipe mount w/ valves)	4		30	\$1,895	\$6,912	\$8,807	\$26,000									
8	120 VAC power & signal	4							35	\$1,933	\$11,020	\$12,953					
8	HC C/C sample pump-3 gpm @ 15' (1+0)	4	\$6,000	55	\$3,411	\$12,441	\$15,853										
8	120 VAC power	4							35	\$1,933	\$11,020	\$12,953					
8	30" BFV-motorized-WW	4	\$62,000	164	\$10,234	\$37,324	\$47,558										
8	480 VAC power (1 hp)	4							50	\$2,706	\$15,428	\$18,134					
8	120 VAC signal	4							22	\$1,208	\$6,887	\$8,096					
8	24" BFV-motorized-BW	4	\$44,000	146	\$9,097	\$33,177	\$42,274										
8	480 VAC power (0.5 hp)	4							50	\$2,706	\$15,428	\$18,134					
8	120 VAC signal	4							22	\$1,208	\$6,887	\$8,096					
8	20" BFV-motorized-FI	4	\$40,000	127	\$7,960	\$29,030	\$36,990										
8	480 VAC power (0.5 hp)	4							50	\$2,706	\$15,428	\$18,134					
8	120 VAC signal	4							22	\$1,208	\$6,887	\$8,096					
8	20" BFV-motorized-FE	4	\$40,000	127	\$7,960	\$29,030	\$36,990										
8	480 VAC power (0.5 hp)	4							50	\$2,706	\$15,428	\$18,134					
8	120 VAC signal	4							22	\$1,208	\$6,887	\$8,096					
8	10" BFV-motorized-AW	4	\$26,000	61	\$3,790	\$13,824	\$17,614										
8	120 VAC power & signal	4							35	\$1,933	\$11,020	\$12,953					
8	PD blowers & noise encl-2.26K cfm @ 8 psi (2	\$125,000	171	\$10,667	\$41,563	\$52,231										
8	480 VAC power (150 hp)	2							53	\$2,876	\$16,392	\$19,267					
8	120 VAC signal	4							18	\$981	\$5,594	\$6,576					
8	PS & PI assembly (pipe mount w/ valve)	2		5	\$284	\$1,037	\$1,321	\$1,500									
8	120 VAC signal	2							11	\$604	\$3,444	\$4,048					
8	Air intake filter assembly	2		83	\$5,190	\$20,220	\$25,410										
EQ SHEET TOTAL			\$1,305,100	1,360	\$84,888	\$295,151	\$380,039	\$67,900	790	\$43,137	\$245,892	\$289,029					

DIVS 11-17 (40-45) PROCESS EQUIPMENT

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name			Location				Estimator	Date	Version	Job #		
Grants Pass WTP			Grants Pass, OR				Jim Ward	7-Jun-18	000	30504641		
Equipment Scope												
DIVS 11-17 EQ & Related Components			DIVS 11-15 EQ Buyout	DIV 15 EQ & Piping Installation				DIVS 16-17 EQ Buyout	DIVS 16-17 Power and I&C Installation			
WBS	Item (NIS-not in scope)	Qty	TOTAL	MH	MH \$	M&CE \$	TOTAL	TOTAL	MH	MH \$	M&CE \$	TOTAL
8	Inlet & discharge silencer assembly	2		49	\$3,032	\$11,059	\$14,091					
8	Insertion air flowmeter FIT (common)	1		5	\$288	\$251	\$539	\$3,000				
8	120 VAC power & signal	1							12	\$677	\$3,857	\$4,534
Chlorine Contact Basin												
9	Structure piping-136' x 67" (divs 2,3,5,9)	1		144	\$8,967	\$40,953	\$49,919					
9	Power & control connectivity	1							84	\$4,591	\$26,172	\$30,763
9	4' x 6' gates-CCB tank inf & eff-motorized	4	\$66,000	137	\$8,529	\$31,103	\$39,632					
9	480 VAC power (0.5 hp)	4							54	\$2,960	\$16,874	\$19,834
9	120 VAC signal	4							28	\$1,510	\$8,609	\$10,119
9	Ultrasonic level LIT	3		12	\$768	\$669	\$1,437	\$4,800				
9	120 VAC power & signal	3							27	\$1,450	\$8,265	\$9,715
9	pH analyzer AIT	1		14	\$865	\$3,370	\$4,235	\$1,200				
9	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
9	Temperature TIT	1		14	\$865	\$3,370	\$4,235	\$1,200				
9	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
9	Chlorine analyzer AIT	1		14	\$865	\$3,370	\$4,235	\$3,400				
9	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
9	Auto-sampler-refrigerated	1		14	\$865	\$3,370	\$4,235	\$6,000				
9	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
Clearwell												
10	Structure piping-136' x 67" (divs 2,3,5,9)	1		36	\$2,242	\$10,238	\$12,480					
10	Power & control connectivity	1							21	\$1,148	\$6,543	\$7,691
10	Ultrasonic level LIT	1		4	\$256	\$223	\$479	\$1,600				
10	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
FWPS												
11	Structure piping-136' x 67" (divs 2,3,5,9)	1		36	\$2,242	\$10,238	\$12,480					
11	Power & control connectivity	1							21	\$1,148	\$6,543	\$7,691
11	Ultrasonic level LIT	1		4	\$256	\$223	\$479	\$1,600				
11	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
11	High/Low safety float switch assembly	1						\$350	6	\$302	\$1,722	\$2,024
11	VT filter BW pump-12,960 gpm @ 30' (1+1)	2	\$325,000	222	\$13,863	\$54,014	\$67,876					
11	480 VAC power	2							53	\$2,876	\$16,392	\$19,267
11	120 VAC signal	4							15	\$797	\$4,544	\$5,341
11	VFD unit (150 hp)	2						\$64,000	34	\$1,840	\$10,490	\$12,331
11	PS & PI assembly (pipe mount w/ valve)	2		5	\$284	\$1,037	\$1,321	\$1,500				
11	120 VAC signal	2							11	\$604	\$3,444	\$4,048
11	½" seal water solenoid assembly	2		9	\$577	\$2,247	\$2,823	\$500				
11	120 VAC power	2							7	\$362	\$2,066	\$2,429
11	½" seal water FS	2		3	\$190	\$691	\$881	\$200				
11	120 VAC FS signal	2							2	\$121	\$689	\$810
EQ SHEET TOTAL			\$391,000	720	\$44,951	\$176,426	\$221,377	\$89,350	427	\$23,286	\$132,738	\$156,025

DIVS 11-17 (40-45) PROCESS EQUIPMENT

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name			Location				Estimator	Date	Version	Job #		
Grants Pass WTP			Grants Pass, OR				Jim Ward	7-Jun-18	000	30504641		
Equipment Scope												
DIVS 11-17 EQ & Related Components			DIVS 11-15 EQ Buyout	DIV 15 EQ & Piping Installation				DIVS 16-17 EQ Buyout	DIVS 16-17 Power and I&C Installation			
WBS	Item (NIS-not in scope)	Qty	TOTAL	MH	MH \$	M&CE \$	TOTAL	TOTAL	MH	MH \$	M&CE \$	TOTAL
11	18" magnetic flowmeter FIT (common)	1		25	\$1,564	\$5,702	\$7,266	\$6,000				
11	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
11	VT FW pump-5,208 gpm @ 225' (3+1)	4	\$500,000	254	\$15,857	\$61,783	\$77,640					
11	480 VAC power	4							124	\$6,766	\$38,569	\$45,335
11	120 VAC signal	8							29	\$1,594	\$9,088	\$10,682
11	VFD unit (450 hp)	4						\$340,000	101	\$5,521	\$31,471	\$36,993
11	PS & PI assembly (pipe mount w/ valve)	4		9	\$569	\$2,074	\$2,642	\$3,000				
11	120 VAC signal	4							22	\$1,208	\$6,887	\$8,096
11	1/2" seal water solenoid assembly	4		18	\$1,153	\$4,493	\$5,647	\$1,000				
11	120 VAC power	4							13	\$725	\$4,132	\$4,857
11	1/2" seal water FS	4		6	\$379	\$1,382	\$1,761	\$400				
11	120 VAC FS signal	4							4	\$242	\$1,377	\$1,619
11	30" magnetic flowmeter FIT (common)	1		31	\$1,943	\$7,085	\$9,027	\$7,500				
11	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
11	VT service water pump-200 gpm @ 138' (2+1)	3	\$52,500	64	\$3,995	\$15,565	\$19,560					
11	480 VAC power	3							51	\$2,791	\$15,910	\$18,701
11	120 VAC signal	6							22	\$1,196	\$6,816	\$8,012
11	VFD unit (10 hp)	3						\$24,000	25	\$1,380	\$7,868	\$9,248
11	PS & PI assembly (pipe mount w/ valve)	3		7	\$426	\$1,555	\$1,982	\$2,250				
11	120 VAC signal	3							17	\$906	\$5,165	\$6,072
11	1/2" seal water solenoid assembly	3		14	\$865	\$3,370	\$4,235	\$750				
11	120 VAC power	3							10	\$544	\$3,099	\$3,643
11	1/2" seal water FS	3		5	\$284	\$1,037	\$1,321	\$300				
11	120 VAC FS signal	3							3	\$181	\$1,033	\$1,214
11	6" magnetic flowmeter FIT (common)	1		11	\$711	\$2,592	\$3,303	\$3,000				
11	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
Wastewater System												
12	EQ structure piping-80' x 50' (divs 2,3,5,9)	1		49	\$3,067	\$14,010	\$17,078					
12	Power & control connectivity	1							29	\$1,571	\$8,953	\$10,524
12	Ultrasonic level LIT	1		4	\$256	\$223	\$479	\$1,600				
12	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
12	High/Low safety float switch assembly	1						\$350	6	\$302	\$1,722	\$2,024
12	VT recycle pump-1,563 gpm @ 50' (1+1)	2	\$109,000	111	\$6,931	\$27,007	\$33,938					
12	480 VAC power	2							40	\$2,199	\$12,535	\$14,734
12	120 VAC signal	4							15	\$797	\$4,544	\$5,341
12	VFD unit (30 hp)	2						\$36,000	22	\$1,227	\$6,994	\$8,221
12	PS & PI assembly (pipe mount w/ valve)	2		5	\$284	\$1,037	\$1,321	\$1,500				
12	120 VAC signal	2							11	\$604	\$3,444	\$4,048
12	1/2" seal water solenoid assembly	2		9	\$577	\$2,247	\$2,823	\$500				
12	120 VAC power	2							7	\$362	\$2,066	\$2,429
12	1/2" seal water FS	2		3	\$190	\$691	\$881	\$200				
12	120 VAC FS signal	2							2	\$121	\$689	\$810
12	10" magnetic flowmeter FIT (common)	1		15	\$948	\$3,456	\$4,404	\$4,000				
12	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
EQ SHEET TOTAL			\$661,500	641	\$39,998	\$155,309	\$195,308	\$432,350	598	\$32,654	\$186,138	\$218,792

DIVS 11-17 (40-45) PROCESS EQUIPMENT

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name			Location				Estimator	Date	Version	Job #		
Grants Pass WTP			Grants Pass, OR				Jim Ward	7-Jun-18	000	30504641		
Equipment Scope												
DIVS 11-17 EQ & Related Components			DIVS 11-15 EQ Buyout	DIV 15 EQ & Piping Installation				DIVS 16-17 EQ Buyout	DIVS 16-17 Power and I&C Installation			
WBS	Item (NIS-not in scope)	Qty	TOTAL	MH	MH \$	M&CE \$	TOTAL	TOTAL	MH	MH \$	M&CE \$	TOTAL
12	Parkson flash mix, flocc, & plate clarifier-625 g	2	\$550,000	182	\$11,371	\$41,471	\$52,843					
12	LCP	2							66	\$3,625	\$20,662	\$24,287
12	480 VAC power	2							27	\$1,450	\$8,265	\$9,715
12	PC sludge pumps-250 gpm @ 50' (1+1)	2	\$35,000	85	\$5,300	\$20,652	\$25,953					
12	480 VAC power	2							31	\$1,692	\$9,642	\$11,334
12	120 VAC signal	2							11	\$604	\$3,444	\$4,048
12	VFD unit (5 hp)-Free standing-NEMA 4	2						\$15,000	11	\$613	\$3,497	\$4,110
12	PS & PI assembly (pipe mount w/ valve)	2		5	\$284	\$1,037	\$1,321	\$1,500				
12	120 VAC signal	2							11	\$604	\$3,444	\$4,048
12	1/2" seal water solenoid assembly	2		9	\$577	\$2,247	\$2,823	\$500				
12	120 VAC power	2							7	\$362	\$2,066	\$2,429
12	1/2" seal water FS	2		3	\$190	\$691	\$881	\$200				
12	120 VAC FS signal	2							2	\$121	\$689	\$810
12	4" magnetic flowmeter FIT (common)	1		8	\$521	\$1,901	\$2,422	\$2,500				
12	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
Solids Handling & Dewatering												
13	Thickener structure piping-35" Ø (divs 2,3,5,9)	1		55	\$3,421	\$15,627	\$19,048					
13	Power & control connectivity	1							32	\$1,752	\$9,987	\$11,739
13	Thickener rake mechanism	1	\$100,000	77	\$4,798	\$4,183	\$8,980					
13	LCP	1							22	\$1,208	\$6,887	\$8,096
13	480 VAC power (1 hp)	1							9	\$483	\$2,755	\$3,238
13	PC sludge feed pumps-50 gpm @ 50' (1+1)	2	\$25,000	52	\$3,262	\$12,709	\$15,971					
13	480 VAC power	2							31	\$1,692	\$9,642	\$11,334
13	120 VAC signal	2							11	\$604	\$3,444	\$4,048
13	VFD unit (5 hp)-Free standing-NEMA 4	2						\$15,000	11	\$613	\$3,497	\$4,110
13	PS & PI assembly (pipe mount w/ valve)	2		5	\$284	\$1,037	\$1,321	\$1,500				
13	120 VAC signal	2							11	\$604	\$3,444	\$4,048
13	1/2" seal water solenoid assembly	2		9	\$577	\$2,247	\$2,823	\$500				
13	120 VAC power	2							7	\$362	\$2,066	\$2,429
13	1/2" seal water FS	2		3	\$190	\$691	\$881	\$200				
13	120 VAC FS signal	2							2	\$121	\$689	\$810
13	2" magnetic flowmeter FIT (common)	1		6	\$379	\$1,382	\$1,761	\$2,000				
13	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
13	Ultrasonic level LIT	1		4	\$256	\$223	\$479	\$1,600				
13	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
13	High/Low safety float switch assembly	1						\$350	6	\$302	\$1,722	\$2,024
13	Slide rail overflow pump-250 gpm @ 50'-SS (1+1)	2	\$17,000	62	\$3,873	\$15,092	\$18,965					
13	480 VAC power (5 hp)	2							31	\$1,692	\$9,642	\$11,334
13	120 VAC signal	4							18	\$981	\$5,594	\$6,576
13	PS & PI assembly (pipe mount w/ valve)	2		5	\$284	\$1,037	\$1,321	\$1,500				
13	120 VAC signal	2							11	\$604	\$3,444	\$4,048
13	Dewatering bldg piping-70' x 50' (divs 2,3,5)	1		45	\$2,832	\$12,932	\$15,764					
13	Power & control connectivity	1							27	\$1,450	\$8,265	\$9,715
EQ SHEET TOTAL			\$727,000	615	\$38,399	\$135,159	\$173,558	\$42,350	421	\$22,990	\$131,049	\$154,039

DIVS 11-17 (40-45) PROCESS EQUIPMENT

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name			Location				Estimator	Date	Version	Job #		
Grants Pass WTP			Grants Pass, OR				Jim Ward	7-Jun-18	000	30504641		
Equipment Scope												
DIVS 11-17 EQ & Related Components			DIVS 11-15 EQ Buyout	DIV 15 EQ & Piping Installation				DIVS 16-17 EQ Buyout	DIVS 16-17 Power and I&C Installation			
WBS	Item (NIS-not in scope)	Qty	TOTAL	MH	MH \$	M&CE \$	TOTAL	TOTAL	MH	MH \$	M&CE \$	TOTAL
13	5 ton bridge crane package (div 5)	1	\$45,000	92	\$5,757	\$5,019	\$10,777					
13	LCP	1							33	\$1,812	\$10,331	\$12,143
13	480 VAC power (5+5 HP)	2							31	\$1,692	\$9,642	\$11,334
13	Ultrasonic level LIT	1		4	\$256	\$223	\$479	\$1,600				
13	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
13	High/Low safety float switch assembly	1						\$350	6	\$302	\$1,722	\$2,024
13	Slide rail sump pump-50 gpm @ 50'-SS	2	\$9,000	33	\$2,039	\$7,943	\$9,982					
13	480 VAC power (1 hp)	2							25	\$1,353	\$7,714	\$9,067
13	120 VAC signal	2							11	\$604	\$3,444	\$4,048
13	PS & PI assembly (pipe mount w/ valve)	2		5	\$284	\$1,037	\$1,321	\$1,500				
13	120 VAC signal	2							11	\$604	\$3,444	\$4,048
13	Eyewash/shower station-Indoor	2	\$1,700	18	\$1,153	\$4,493	\$5,647					
13	EW/S water FS	2		3	\$190	\$691	\$881	\$200				
13	120 VAC FS signal	2							11	\$604	\$3,444	\$4,048
13	Water tempering system	1	\$3,500	42	\$2,595	\$10,110	\$12,705					
13	120 VAC power & signal	1							12	\$677	\$3,857	\$4,534
13	Screw press package-50 gpm (1+1)	2	\$600,000	212	\$13,267	\$48,383	\$61,650					
13	LCP	2							66	\$3,625	\$20,662	\$24,287
13	480 VAC power (1 hp)	2							18	\$967	\$5,510	\$6,476
13	Truck bay scale package	2	\$70,000	82	\$5,118	\$4,462	\$9,579					
13	LCP	2							66	\$3,625	\$20,662	\$24,287
Admin & Shop/Garage												
14	Dewatering bldg piping-70' x 50' (divs 2,3,5)	1		45	\$2,832	\$12,932	\$15,764					
14	Power & control connectivity	1							27	\$1,450	\$8,265	\$9,715
14	5 ton bridge crane package (div 5)	1	\$50,000	102	\$6,397	\$5,577	\$11,974					
14	LCP	1							33	\$1,812	\$10,331	\$12,143
14	480 VAC power (5+5 HP)	1							17	\$930	\$5,303	\$6,234
14	Ultrasonic level LIT	1		4	\$256	\$223	\$479	\$1,600				
14	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
14	High/Low safety float switch assembly	1						\$350	6	\$302	\$1,722	\$2,024
14	Slide rail sump pump-50 gpm @ 50'-SS	2	\$9,000	33	\$2,039	\$7,943	\$9,982					
14	480 VAC power (1 hp)	2							25	\$1,353	\$7,714	\$9,067
14	120 VAC signal	2							11	\$604	\$3,444	\$4,048
14	PS & PI assembly (pipe mount w/ valve)	2		5	\$284	\$1,037	\$1,321	\$1,500				
14	120 VAC signal	2							11	\$604	\$3,444	\$4,048
14	Eyewash/shower station-Indoor	2	\$1,700	18	\$1,153	\$4,493	\$5,647					
14	EW/S water FS	2		3	\$190	\$691	\$881	\$200				
14	120 VAC FS signal	2							11	\$604	\$3,444	\$4,048
14	Water tempering system	1	\$3,500	42	\$2,595	\$10,110	\$12,705					
14	120 VAC power & signal	1							12	\$677	\$3,857	\$4,534
EQ SHEET TOTAL			\$793,400	743	\$46,403	\$125,368	\$171,771	\$7,300	461	\$25,168	\$143,462	\$168,630

DIVS 11-17 (40-45) PROCESS EQUIPMENT

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name			Location				Estimator	Date	Version	Job #		
Grants Pass WTP			Grants Pass, OR				Jim Ward	7-Jun-18	000	30504641		
Equipment Scope												
DIVS 11-17 EQ & Related Components			DIVS 11-15 EQ Buyout	DIV 15 EQ & Piping Installation				DIVS 16-17 EQ Buyout	DIVS 16-17 Power and I&C Installation			
WBS	Item (NIS-not in scope)	Qty	TOTAL	MH	MH \$	M&CE \$	TOTAL	TOTAL	MH	MH \$	M&CE \$	TOTAL
14	Kitchen appliances allowance	1	\$2,000	15	\$948	\$3,456	\$4,404		9	\$511	\$2,914	\$3,425
14	Meeting room furniture allowance	1	\$10,000	41	\$2,559	\$2,231	\$4,790					
14	Office furniture allowance	1	\$7,500	31	\$1,919	\$1,673	\$3,592					
14	Office equipment allowance	1	\$15,000						66	\$3,625	\$20,662	\$24,287
14	Office technology allowance	1	\$25,000						111	\$6,041	\$34,437	\$40,478
14	Storage shelving systems allowance	1	\$10,000	31	\$1,919	\$1,673	\$3,592					
14	Maintenance tools & equipment allowance	1	\$25,000	102	\$6,397	\$5,577	\$11,974					
14	Lab equipment & supplies allowance	1	\$25,000	23	\$1,421	\$5,184	\$6,605		14	\$767	\$4,371	\$5,138
	Electrical Building											
15	Bldg piping-65' x 30' (divs 2,3,5)	1		37	\$2,301	\$10,508	\$12,808					
15	Power & control connectivity	1							22	\$1,178	\$6,715	\$7,893
	Ozone & Chemicals											
16	Bldg structure piping-80' x 50' (divs 2,3,5,9)	1		49	\$3,067	\$14,010	\$17,078					
16	Power & control connectivity	1							29	\$1,571	\$8,953	\$10,524
16	Ultrasonic level LIT	1		4	\$256	\$223	\$479	\$1,600				
16	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
16	High/Low safety float switch assembly	1						\$350	6	\$302	\$1,722	\$2,024
16	Slide rail sump pump-50 gpm @ 50'-SS	2	\$9,000	33	\$2,039	\$7,943	\$9,982					
16	480 VAC power (1 hp)	2							25	\$1,353	\$7,714	\$9,067
16	120 VAC signal	2							11	\$604	\$3,444	\$4,048
16	PS & PI assembly (pipe mount w/ valve)	2		5	\$284	\$1,037	\$1,321	\$1,500				
16	120 VAC signal	2							11	\$604	\$3,444	\$4,048
16	Eyewash/shower station-Indoor	4	\$3,400	37	\$2,306	\$8,987	\$11,293					
16	EW/S water FS	4		6	\$379	\$1,382	\$1,761	\$400				
16	120 VAC FS signal	4							22	\$1,208	\$6,887	\$8,096
16	Water tempering system	1	\$3,500	42	\$2,595	\$10,110	\$12,705					
16	120 VAC power & signal	1							12	\$677	\$3,857	\$4,534
16	LOX tank (1+0)	1	\$80,000	92	\$5,766	\$22,467	\$28,233					
16	Pressure PIT	1		5	\$284	\$1,037	\$1,321					
16	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
16	2½" pressure control valve	1		4	\$237	\$864	\$1,101					
16	Ozone Vendor package-2x400 PPD (2+0)	1	\$3,250,000									
16	Master LCP	1							89	\$4,833	\$27,549	\$32,382
16	Vaporizer skid assembly (1+1)	2		231	\$14,415	\$56,167	\$70,582					
16	LCP	2							44	\$2,416	\$13,775	\$16,191
16	480 VAC power	2							40	\$2,199	\$12,535	\$14,734
16	Ozone generator skid package (2+1)	3		416	\$25,948	\$101,100	\$127,048					
16	LCP	3							66	\$3,625	\$20,662	\$24,287
16	480 VAC power	3							79	\$4,313	\$24,588	\$28,901
16	Dew point indicator/transmitter-AIT	1		18	\$1,137	\$4,147	\$5,284					
16	120 VAC power & signal	1							13	\$725	\$4,132	\$4,857
EQ SHEET TOTAL			\$3,465,400	1,220	\$76,178	\$259,775	\$335,953	\$3,850	687	\$37,519	\$213,870	\$251,389

DIVS 11-17 (40-45) PROCESS EQUIPMENT

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name			Location				Estimator	Date	Version	Job #		
Grants Pass WTP			Grants Pass, OR				Jim Ward	7-Jun-18	000	30504641		
Equipment Scope												
DIVS 11-17 EQ & Related Components			DIVS 11-15 EQ Buyout	DIV 15 EQ & Piping Installation				DIVS 16-17 EQ Buyout	DIVS 16-17 Power and I&C Installation			
WBS	Item (NIS-not in scope)	Qty	TOTAL	MH	MH \$	M&CE \$	TOTAL	TOTAL	MH	MH \$	M&CE \$	TOTAL
16	Particulate filter skid package	1		58	\$3,604	\$14,042	\$17,646					
16	LCP	1							22	\$1,208	\$6,887	\$8,096
16	Cooling water system skid package	1		139	\$8,649	\$33,700	\$42,349					
16	LCP	1							33	\$1,812	\$10,331	\$12,143
16	480 VAC power	1							22	\$1,184	\$6,750	\$7,934
16	Ozone destruct skid package (2+1)	3		312	\$19,461	\$75,825	\$95,286					
16	LCP	3							133	\$7,249	\$41,324	\$48,573
16	480 VAC power	3							65	\$3,552	\$20,249	\$23,801
16	Nitrogen boost skid package (1+0)	1		114	\$7,107	\$25,919	\$33,027					
16	LCP	1							44	\$2,416	\$13,775	\$16,191
16	480 VAC power	1							22	\$1,184	\$6,750	\$7,934
16	Ozone indicator/transmitter-AIT	1		18	\$1,137	\$4,147	\$5,284					
16	120 VAC power & signal	1							13	\$725	\$4,132	\$4,857
16	Ozone generator strobe & horn unit	1							9	\$483	\$2,755	\$3,238
16	Carbon dioxide tank (1+0)	1	\$80,000	92	\$5,766	\$22,467	\$28,233					
16	Pressure PIT	1		5	\$284	\$1,037	\$1,321					
16	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
16	2½" pressure control valve	1		4	\$237	\$864	\$1,101					
16	CO2 Vendor package-200 PPH (1+0)	1	\$450,000									
16	Master LCP	1							66	\$3,625	\$20,662	\$24,287
16	Vaporizer skid assembly (1+1)	2		185	\$11,532	\$44,933	\$56,466					
16	LCP	2							44	\$2,416	\$13,775	\$16,191
16	480 VAC power	2							40	\$2,199	\$12,535	\$14,734
16	Carrier HC pumps-250 gpm @ 50' (1+1)	3	\$37,500	104	\$6,492	\$25,294	\$31,786					
16	480 VAC power	3							46	\$2,537	\$14,463	\$17,001
16	120 VAC signal	6							22	\$1,196	\$6,816	\$8,012
16	VFD unit (5 hp)-Free standing-NEMA 4	3						\$22,500	17	\$920	\$5,245	\$6,165
16	PS & PI assembly (pipe mount w/ valve)	3		7	\$426	\$1,555	\$1,982	\$2,250				
16	120 VAC signal	3							17	\$906	\$5,165	\$6,072
16	½" seal water solenoid & FS assembly	3	\$1,050	17	\$1,081	\$4,213	\$5,294					
16	120 VAC power & signal	3							27	\$1,450	\$8,265	\$9,715
16	6" magnetic flowmeter FIT	2		39	\$2,464	\$8,985	\$11,449	\$11,000				
16	120 VAC power & signal	2							25	\$1,353	\$7,714	\$9,067
16	Injection panels (part of CO2 package)	2		61	\$3,790	\$13,824	\$17,614					
16	LCP	2							33	\$1,812	\$10,331	\$12,143
16	Mazzei chemical feed & injection assemblies	2	\$8,000	55	\$3,460	\$13,480	\$16,940					
EQ SHEET TOTAL			\$576,550	1,209	\$75,491	\$290,285	\$365,776	\$35,750	709	\$38,713	\$220,677	\$259,391

DIVS 11-17 (40-45) PROCESS EQUIPMENT

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name			Location				Estimator	Date	Version	Job #		
Grants Pass WTP			Grants Pass, OR				Jim Ward	7-Jun-18	000	30504641		
Equipment Scope												
DIVS 11-17 EQ & Related Components			DIVS 11-15 EQ Buyout	DIV 15 EQ & Piping Installation				DIVS 16-17 EQ Buyout	DIVS 16-17 Power and I&C Installation			
WBS	Item (NIS-not in scope)	Qty	TOTAL	MH	MH \$	M&CE \$	TOTAL	TOTAL	MH	MH \$	M&CE \$	TOTAL
16	Chlorohydrate truck unload panel	1						\$3,500	22	\$1,208	\$6,887	\$8,096
16	Storage tank-10' Ø HDPE	1	\$23,500	37	\$2,306	\$8,987	\$11,293					
16	Site gauge assembly-magnetic	1	\$1,800	11	\$711	\$2,592	\$3,303					
16	Differential pressure level transmitter DPIT	1		8	\$474	\$1,728	\$2,202	\$3,500				
16	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
16	High/Low safety float switch assembly	1						\$350	6	\$302	\$1,722	\$2,024
16	4" BFV fill control valve-motorized	1	\$5,500	9	\$569	\$2,074	\$2,642					
16	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
16	Motorized diaphragm meter pump-1 gpm (1+1/2 hp)	2	\$17,000	42	\$2,650	\$10,326	\$12,976					
16	480 VAC power (1 1/2 hp)	2							28	\$1,522	\$8,678	\$10,200
16	120 VAC signal	2							11	\$604	\$3,444	\$4,048
16	Flocculant aid mix & feed skid package-10 PF	1	\$65,000	76	\$4,738	\$17,280	\$22,018					
16	LCP	1							33	\$1,812	\$10,331	\$12,143
16	480 VAC power (15 amp)	1							17	\$930	\$5,303	\$6,234
16	Motorized diaphragm meter pump-1 gpm (2+1/2 hp)	3	\$25,500	52	\$3,246	\$12,647	\$15,893					
16	480 VAC power (1 1/2 hp)	3							42	\$2,284	\$13,017	\$15,301
16	120 VAC signal	3							17	\$906	\$5,165	\$6,072
16	Alum truck unload panel	1						\$3,500	22	\$1,208	\$6,887	\$8,096
16	Storage tank-11' Ø HDPE	1	\$25,500	39	\$2,451	\$9,548	\$11,999					
16	Site gauge assembly-magnetic	1	\$1,800	11	\$711	\$2,592	\$3,303					
16	Differential pressure level transmitter DPIT	1		8	\$474	\$1,728	\$2,202	\$3,500				
16	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
16	High/Low safety float switch assembly	1						\$350	6	\$302	\$1,722	\$2,024
16	4" BFV fill control valve-motorized	1	\$5,500	9	\$569	\$2,074	\$2,642					
16	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
16	Motorized diaphragm meter pump-1 gpm (1+1/2 hp)	2	\$17,000	42	\$2,650	\$10,326	\$12,976					
16	480 VAC power (1 1/2 hp)	2							28	\$1,522	\$8,678	\$10,200
16	120 VAC signal	2							11	\$604	\$3,444	\$4,048
16	Hypochlorite truck unload panel	1						\$4,500	28	\$1,510	\$8,609	\$10,119
16	Storage tank-9' Ø HDPE	2	\$39,000	69	\$4,325	\$16,850	\$21,175					
16	Site gauge assembly-magnetic	2	\$3,600	23	\$1,421	\$5,184	\$6,605					
16	Differential pressure level transmitter DPIT	2		15	\$948	\$3,456	\$4,404	\$7,000				
16	120 VAC power & signal	2							18	\$967	\$5,510	\$6,476
16	High/Low safety float switch assembly	2						\$700	11	\$604	\$3,444	\$4,048
16	4" BFV fill control valve-motorized	2	\$11,000	18	\$1,137	\$4,147	\$5,284					
16	120 VAC power & signal	2							18	\$967	\$5,510	\$6,476
EQ SHEET TOTAL			\$241,700	471	\$29,379	\$111,538	\$140,916	\$26,900	352	\$19,187	\$109,370	\$128,557

DIVS 11-17 (40-45) PROCESS EQUIPMENT

CLASS 5 OPCC - PRIVILEGED & CONFIDENTIAL

Project Name			Location				Estimator	Date	Version	Job #		
Grants Pass WTP			Grants Pass, OR				Jim Ward	7-Jun-18	000	30504641		
Equipment Scope												
DIVS 11-17 EQ & Related Components			DIVS 11-15 EQ Buyout	DIV 15 EQ & Piping Installation				DIVS 16-17 EQ Buyout	DIVS 16-17 Power and I&C Installation			
WBS	Item (NIS-not in scope)	Qty	TOTAL	MH	MH \$	M&CE \$	TOTAL	TOTAL	MH	MH \$	M&CE \$	TOTAL
16	Motorized diaphragm meter pump-1 gpm (2+1	3	\$25,500	52	\$3,246	\$12,647	\$15,893					
16	480 VAC power (1½ hp)	3							42	\$2,284	\$13,017	\$15,301
16	120 VAC signal	3							17	\$906	\$5,165	\$6,072
16	Caustic truck unload panel	1						\$3,500	22	\$1,208	\$6,887	\$8,096
16	Storage tank-10' Ø HDPE	1	\$23,500	37	\$2,306	\$8,987	\$11,293					
16	Site gauge assembly-magnetic	1	\$1,800	11	\$711	\$2,592	\$3,303					
16	Differential pressure level transmitter DPIT	1		8	\$474	\$1,728	\$2,202	\$3,500				
16	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
16	High/Low safety float switch assembly	1						\$350	6	\$302	\$1,722	\$2,024
16	4" BfV fill control valve-motorized	1	\$5,500	9	\$569	\$2,074	\$2,642					
16	120 VAC power & signal	1							9	\$483	\$2,755	\$3,238
16	Motorized diaphragm meter pump-1 gpm (1+1	2	\$17,000	42	\$2,650	\$10,326	\$12,976					
16	480 VAC power (1½ hp)	2							28	\$1,522	\$8,678	\$10,200
16	120 VAC signal	2							11	\$604	\$3,444	\$4,048
16	Dry polymer mix & feed skid package-10 PPH	1	\$65,000	76	\$4,738	\$17,280	\$22,018					
16	LCP	1							33	\$1,812	\$10,331	\$12,143
16	480 VAC power (15 amp)	1							17	\$930	\$5,303	\$6,234
16	Motorized diaphragm meter pump-1 gpm (2+1	3	\$25,500	52	\$3,246	\$12,647	\$15,893					
16	480 VAC power (1½ hp)	3							42	\$2,284	\$13,017	\$15,301
16	120 VAC signal	3							17	\$906	\$5,165	\$6,072
Overflow Pond												
17	Structure inf pipe-280' x 100' (divs 2,3,5)	1		60	\$3,775	\$17,243	\$21,019					
17	Power & control connectivity	1							35	\$1,933	\$11,020	\$12,953
17	High/Low safety float switch assembly	1						\$350	6	\$302	\$1,722	\$2,024
17	Slide gate-36" x 36"-manual-SS	1	\$14,000	20	\$1,247	\$1,087	\$2,335					
END												
EQ SHEET TOTAL			\$177,800	368	\$22,962	\$86,610	\$109,573	\$7,700	292	\$15,961	\$90,981	\$106,942

Appendix D – CITY COUNCIL WORKSHOP PRESENTATION

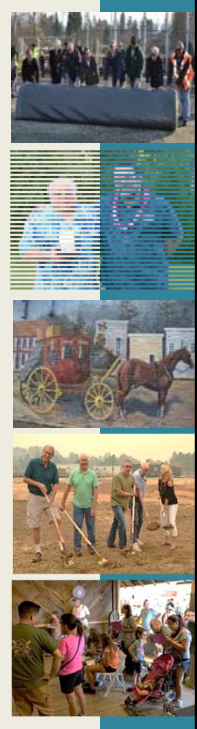


New Water Treatment Plant Technology Considerations

Jason Canady Bryan Black, PE
Public Works Stantec

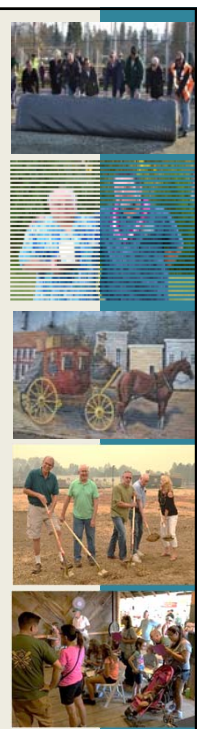


June 4, 2018



Subject Summary and Goals

- Continue to build on previous workshops and arrive at a preferred treatment technology and size for the new water treatment plant
 - Present detailed sizing information and recommended initial size
 - Present technology options and pros and cons
- Relationship to Council Goals:
 - Maintain, Operate and Expand our infrastructure to Meet Community Needs:
 - Ensure water infrastructure needs are met: Build a new water treatment plant (PAVE) ***





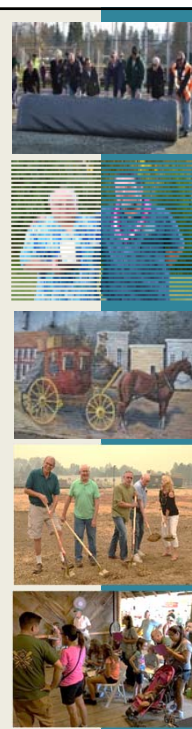
Subject Summary and Goals

- Continue to build on previous workshops and arrive at a preferred treatment technology and size for the new water treatment plant
 - Present detailed sizing information and recommended initial size
 - Present technology options and pros and cons
- Relationship to Council Goals:
 - Maintain, Operate and Expand our infrastructure to Meet Community Needs:
 - Ensure water infrastructure needs are met: Build a new water treatment plant (PAVE) ***



Background and History

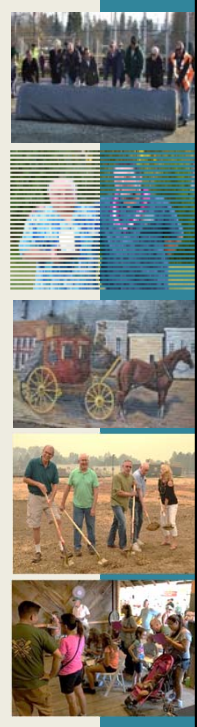
- Task Order No. 2 – Project Delivery Method
 - Two workshops to date covering introductions to project delivery options
 - Conventional Delivery, Alternate Project Delivery (ADP) and contract operations options have been presented and discussed
 - Project will be delivered as Progressive Design Build
- Task Order No. 6 – Treatment Systems
 - Stantec has been working on tech memo detailing various treatment options that would be appropriate for Grants Pass' new water treatment plant – draft memo to be delivered 6/1/2018
 - Presentation on Treatment Systems scheduled for June 4, 2018





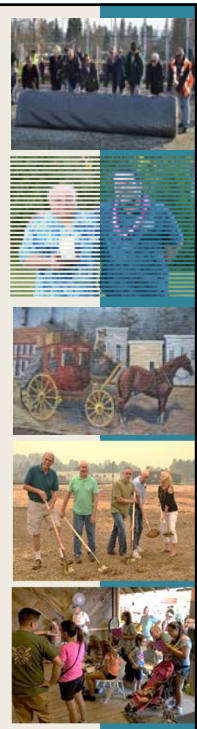
Background and History

- Task Order No. 7 – Cost Estimating
 - Work is being performed in conjunction with TO6 and TO9 to create comprehensive costs for new WTP
 - This will be used to create new water rate for potential bond funding options – after site selection, rate adjustment will be placed back before Council for consideration
- Task Order No. 9 – Water Treatment Plant Site Evaluations
 - Workshop held on May 14 to discuss East and West property options – including non-cost related benefits
 - Second workshop is scheduled for June 4, 2018



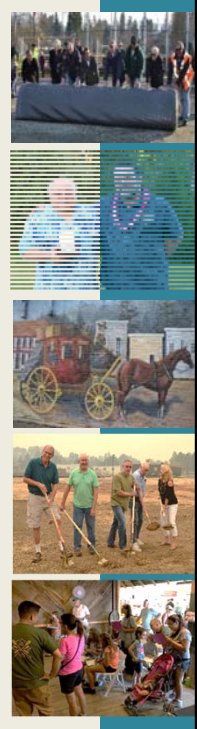
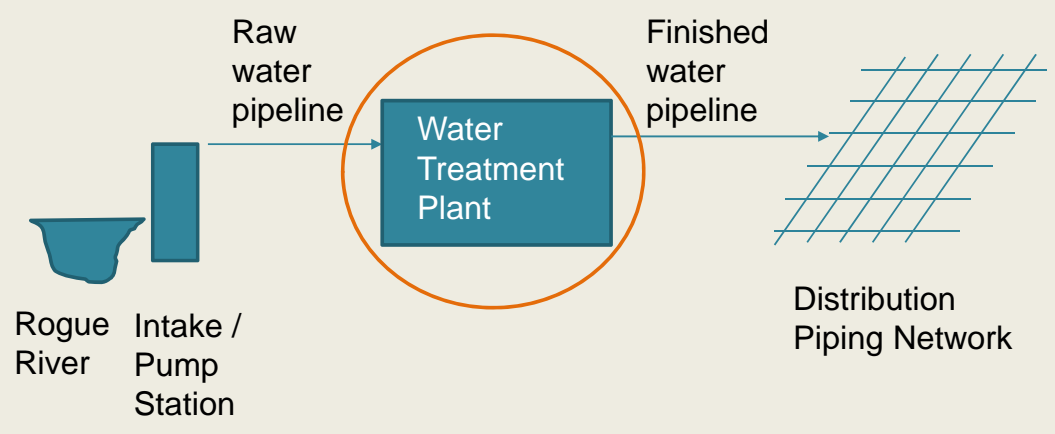
Goals for Today

- Provide information and answer questions
 - Background
 - Historical Data Review
 - Treatment Alternatives
 - Recommendation
- Relationship to Council Goals
 - Maintain, Operate and Expand our Infrastructure to Meet Community Needs
 - Build New Water Treatment Plant





Water Supply Components



Background

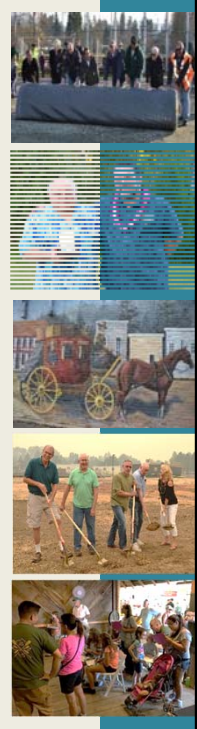
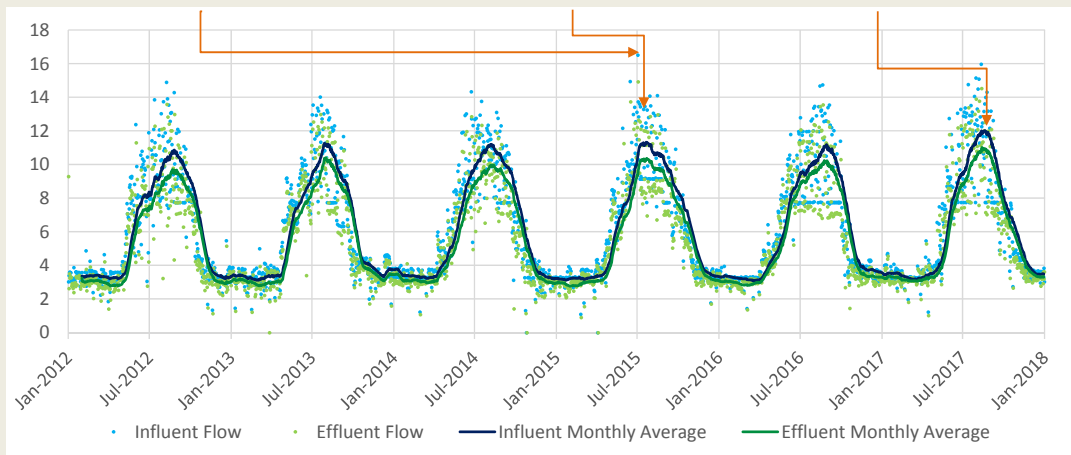
- Task objectives
 - To define infrastructure with sufficient detail to develop a cost estimate and start conceptual design
 - Determine initial and ultimate capacity of infrastructure
- Existing plant
 - Replacement required due to earthquake risk and age
 - Expansion required to meet future water demand
 - Conventional coagulation, clarification, granular media filtration
 - Nominal capacity of 20 MGD
- Treatment process selection impacts
 - Operations
 - Maintenance
 - Staffing Requirements
 - Future expansion



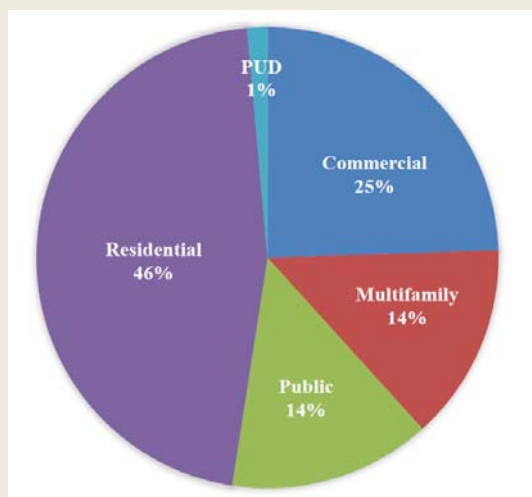


Capacity – Recent Use

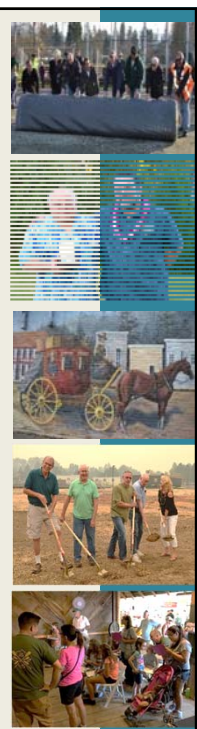
Max Day Raw: 16.5 MG Finished : 14.9 MG	Max Week – Jul 2015 Raw: 92 MG Finished : 84 MG	Max Month - Aug 2017 Raw: 350 MG Finished : 318 MG
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Capacity – Breakdown



- Drivers for water demand increases?
 - Residential - Approximately 1.0 MGD per 4,100 population increase (max day demand).
 - Commercial / Industrial large users - Tech or server farms could use > 1.0 MGD on consistent basis.
 - City or Public use for parks, filling stations, etc. - Impacts to summer/peak demands





Capacity – Water Rights

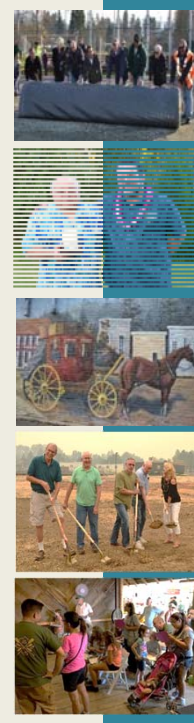


Table 2-8
City of Grants Pass Rogue River Water Rights Summary

Application Number	Permit Number	Certificate Number	Priority Date	Beneficial Use	Permit Rate (cfs)	Developed Rate (cfs)	Undeveloped Rate (cfs)	Status ²	Current Completion Date
--	--	D15839	1888	Municipal and domestic use, irrigation	12.5	12.5	0.0	NC	--
S34141	S26901	--	7/19/1960	Municipal use	25	17.2	7.8	NC	10/1/1999 ¹
S41672	S45827	--	12/2/1965	Municipal use	25	0.0	25.0	NC	10/1/1999 ¹
S64732	S47346	--	1/13/1983	Municipal use	25	1.3	23.7	NC	10/1/1999 ¹
Total cfs					87.5	31.0	56.5		
(mgd)					(56.5)	(20.0)	(36.5)		

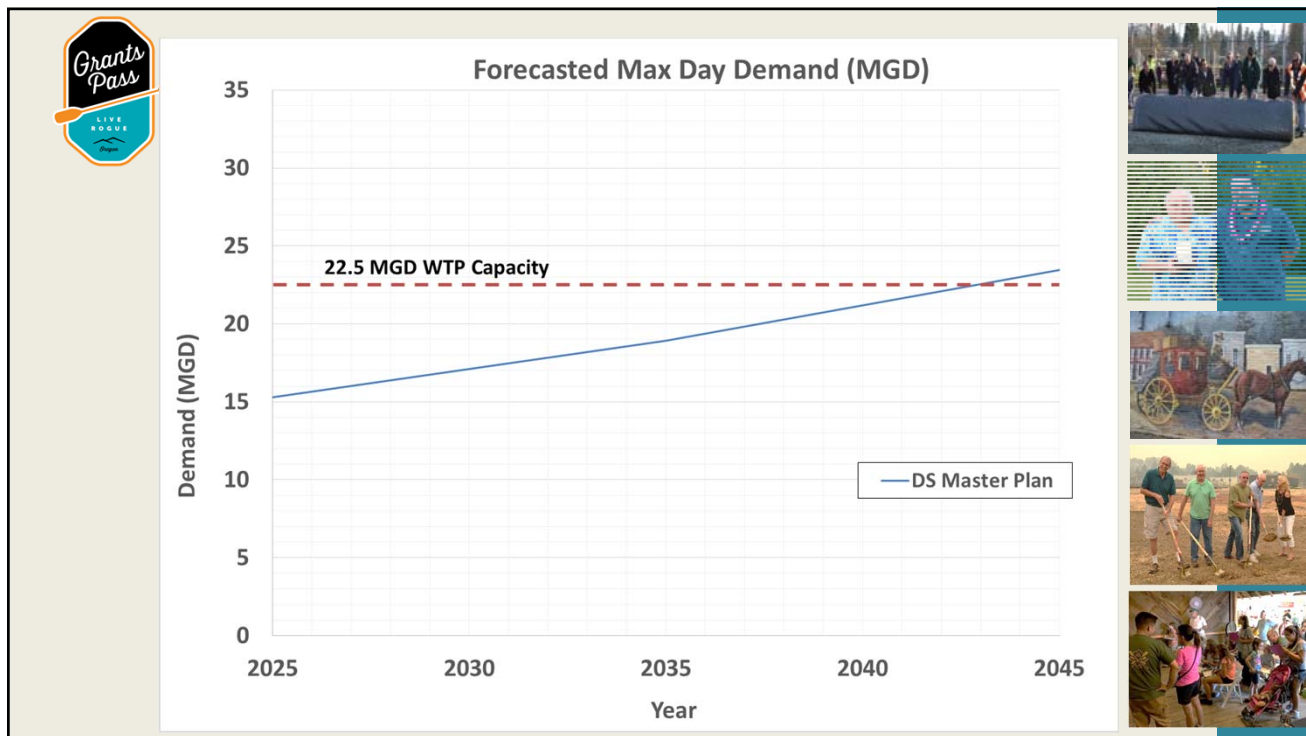
Note:
 1. Application for Extension of Time beyond 1999 currently under review by OWRD.
 2. "NC" = "not cancelled"



Table 2-7
Future Water Demand by Pressure Zone

Pressure Zone	10-Year				20-Year				Saturation (30-Year)			
	ERUs	ADD	MDD	PHD	ERUs	ADD	MDD	PHD	ERUs	ADD	MDD	PHD
1	14,068	4.53	9.51	16.17	16,894	5.44	11.42	19.41	22,112	7.12	14.95	25.42
1RR	-	-	-	-	-	-	-	-	12	0.004	0.01	0.02
2	2,360	0.76	1.60	2.72	2,484	0.80	1.68	2.86	2,547	0.82	1.72	2.92
2A	839	0.27	0.57	0.97	839	0.27	0.57	0.97	839	0.27	0.57	0.97
2FD	-	-	-	-	62	0.02	0.04	0.07	62	0.02	0.04	0.07
2HK	31	0.01	0.02	0.03	31	0.01	0.02	0.03	62	0.02	0.04	0.07
2HT	31	0.01	0.02	0.03	62	0.02	0.04	0.07	62	0.02	0.04	0.07
2MW	248	0.08	0.17	0.29	745	0.24	0.50	0.85	1,087	0.35	0.74	1.26
2NH	280	0.09	0.19	0.32	714	0.23	0.48	0.82	901	0.29	0.61	1.04
2SW	-	-	-	-	12	0.004	0.01	0.02	12	0.004	0.01	0.02
3	2,019	0.65	1.37	2.33	2,329	0.75	1.58	2.69	2,578	0.83	1.74	2.96
3BG	-	-	-	-	217	0.07	0.15	0.26	217	0.07	0.15	0.26
3MW	3	0.001	0.002	0.003	127	0.04	0.09	0.15	127	0.04	0.09	0.15
3P	31	0.01	0.02	0.03	31	0.01	0.02	0.03	31	0.01	0.02	0.03
3S	31	0.01	0.02	0.03	31	0.01	0.02	0.03	31	0.01	0.02	0.03
3SE	-	-	-	-	6	0.002	0.004	0.007	224	0.07	0.15	0.26
3WX	12	0.004	0.01	0.02	12	0.004	0.01	0.02	12	0.004	0.01	0.02
4	217	0.07	0.15	0.26	404	0.13	0.27	0.46	497	0.16	0.34	0.58
4GH	-	-	-	-	12	0.004	0.01	0.02	12	0.004	0.01	0.02
4LR	93	0.03	0.06	0.10	217	0.07	0.15	0.26	217	0.07	0.15	0.26
4N	-	-	-	-	93	0.03	0.06	0.10	93	0.03	0.06	0.10
4V	-	-	-	-	31	0.01	0.02	0.03	31	0.01	0.02	0.03
NV	2,236	0.72	1.56	2.65	2,516	0.81	1.77	3.01	2,578	0.83	1.82	3.09
RCC	-	-	-	-	-	-	-	-	186	0.06	0.13	0.22
Total	22,499	7.25	15.27	25.95	27,869	8.98	18.91	32.17	34,530	11.12	23.44	39.87

- What is our horizon for planning - how long will new WTP meet demands?
- 20 to 30 years?
- Capacity can impact operations.
- Will continue to track demand numbers throughout project



Capacity - Phasing

- Recommend 22.5 MGD Initial capacity (two trains)
 - Needs minimum of 20 MGD to protect existing water rights
 - Want to provide at least 20-30 years of growth capacity
- Phase 2 – add 11 MGD (one additional train; 2042)
- Phase 3 – 45 MGD Ultimate capacity (one additional train; 2062)



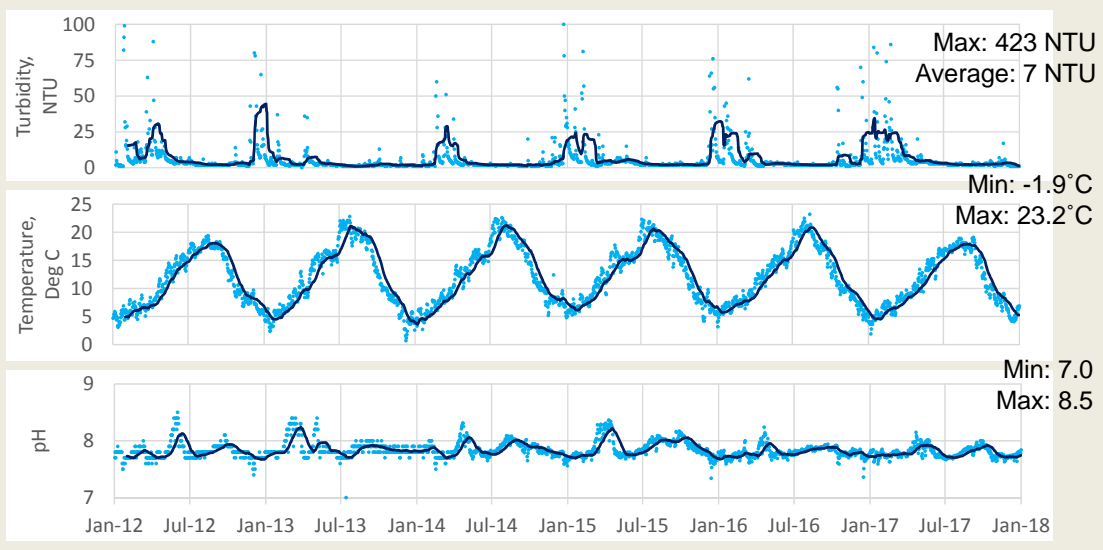


Historical Water Quality

- Has water quality changed since last master plan due to climate change, dam removal, or other factors?
 - Turbidity
 - Organics
 - Taste and odor events
- Can impact viability of different treatment approaches

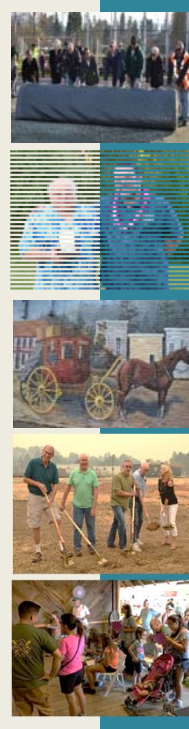
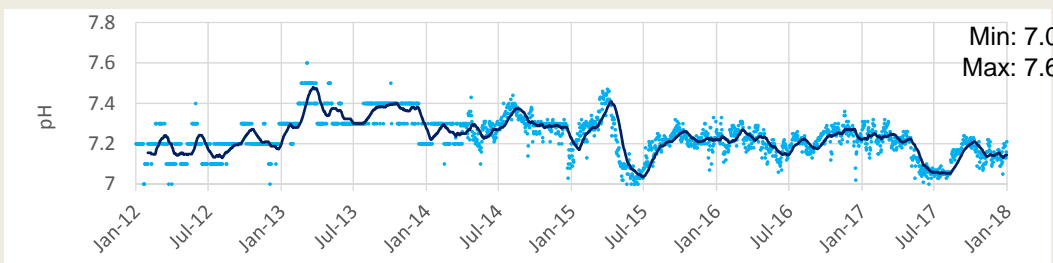
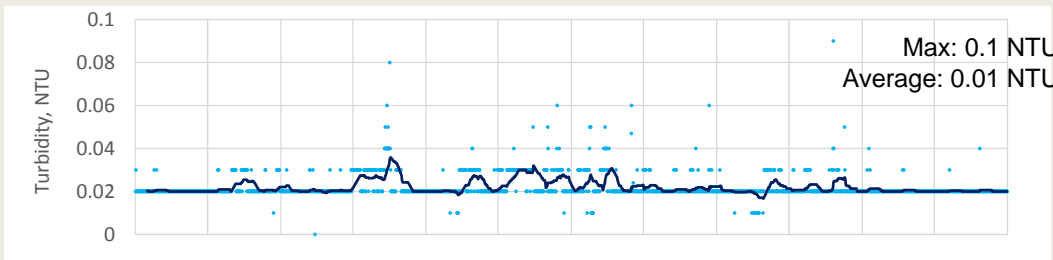


Water Quality - Raw





Water Quality - Finished



Water Quality Goals – Finished Water

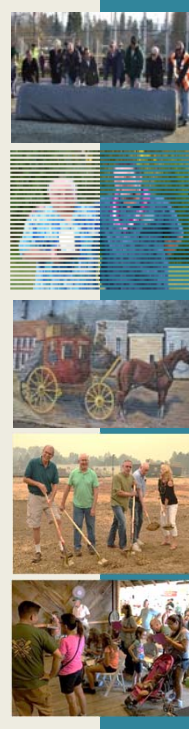
- Turbidity
 - Continue to meet low filtered water turbidities (routinely < 0.10 NTU)
- DBPs / TOC
 - Limit disinfection byproduct formation by removing organics
 - Disinfection practice to avoid pre-chlorination
- Taste and odor control
- Distribution system corrosion control
 - Continue to monitor and adjust as needed
- Future regulations?





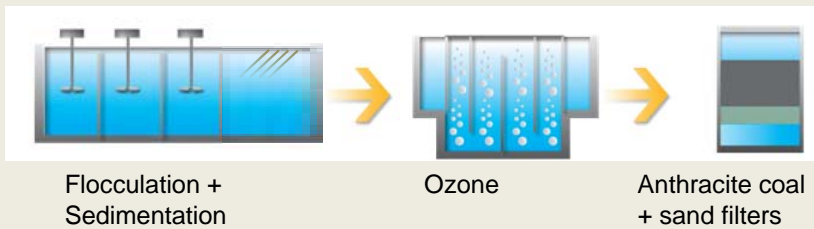
Water Treatment – 3 Options

- 1. Conventional
 - 2. High-Rate Clarification
 - 3. Membrane Filtration
- Site layouts plan for ultimate build-out
 - Performed parametric cost comparison on construction and O&M between the options



Water Treatment - Conventional

- Similar to existing WTP
- Moderate footprint
- Limited mechanical equipment
- Ozone integrated for advanced treatment





Filter deck photo



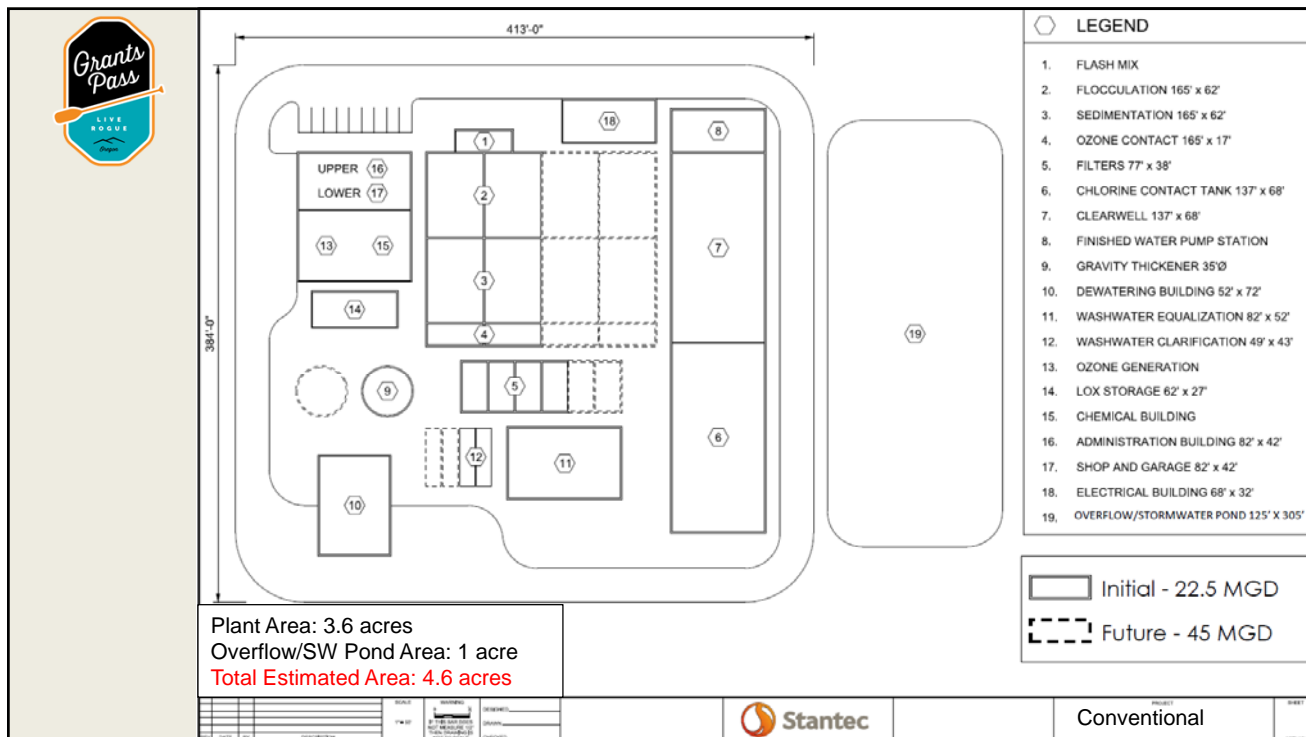
Liquid oxygen storage photo



Floc/sed basin with plates



Ozone generator photo

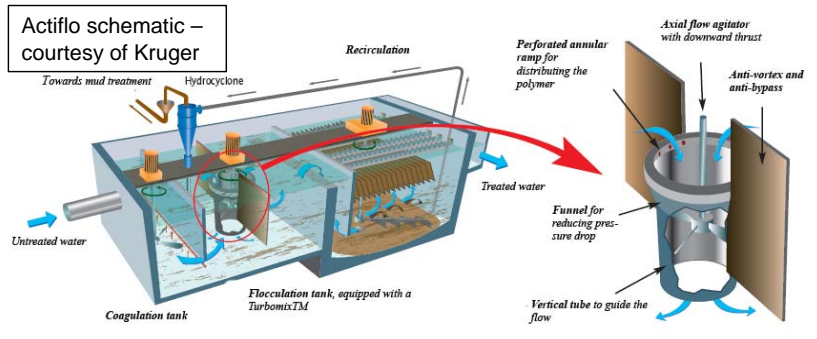
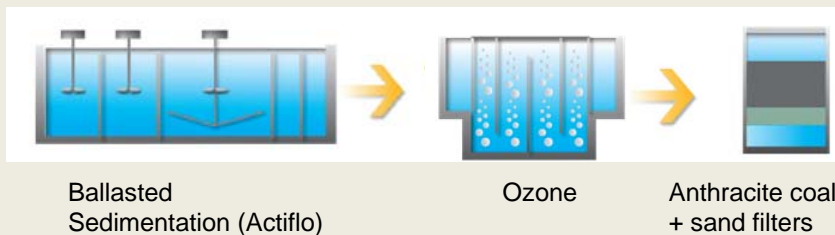


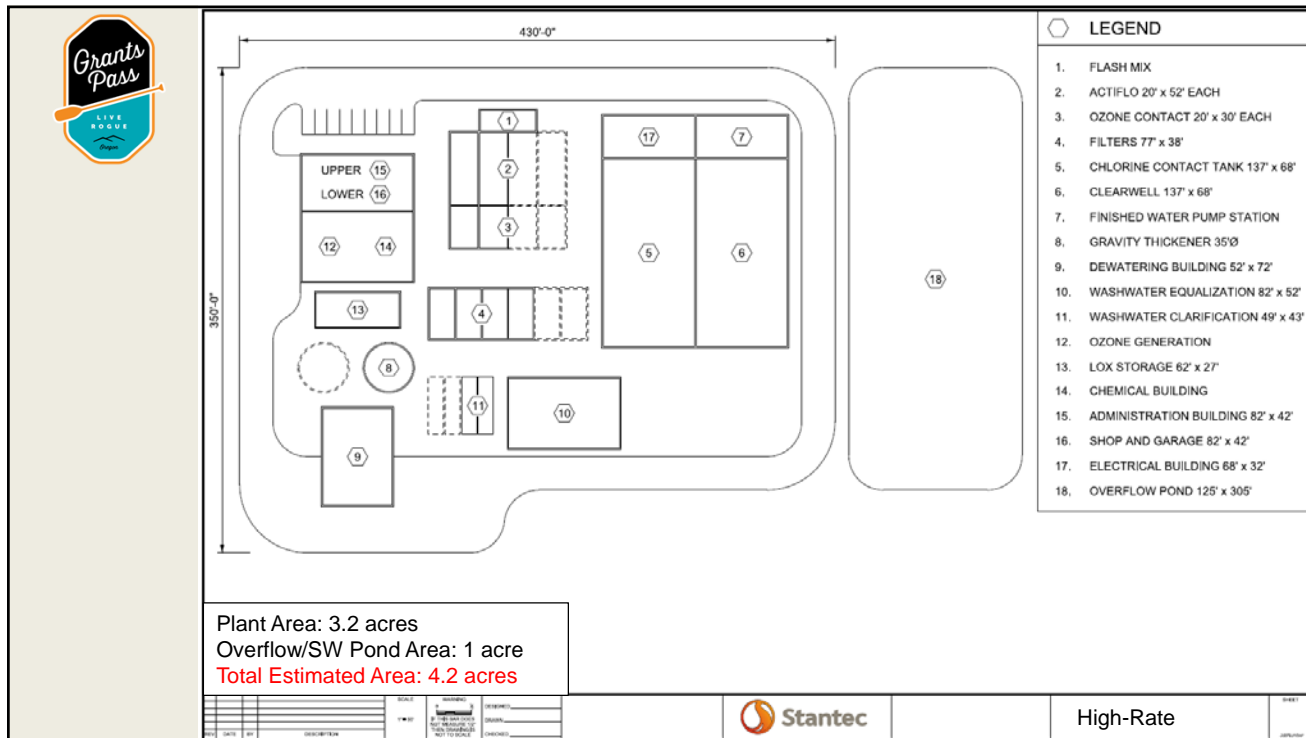
Conventional



Water Treatment – High rate Clarification

- Was successfully piloted on Rogue River water
- More mechanical equipment and chemicals
- Could save about 0.4 acres (at ultimate capacity) over conventional
- Ozone integrated for advanced treatment



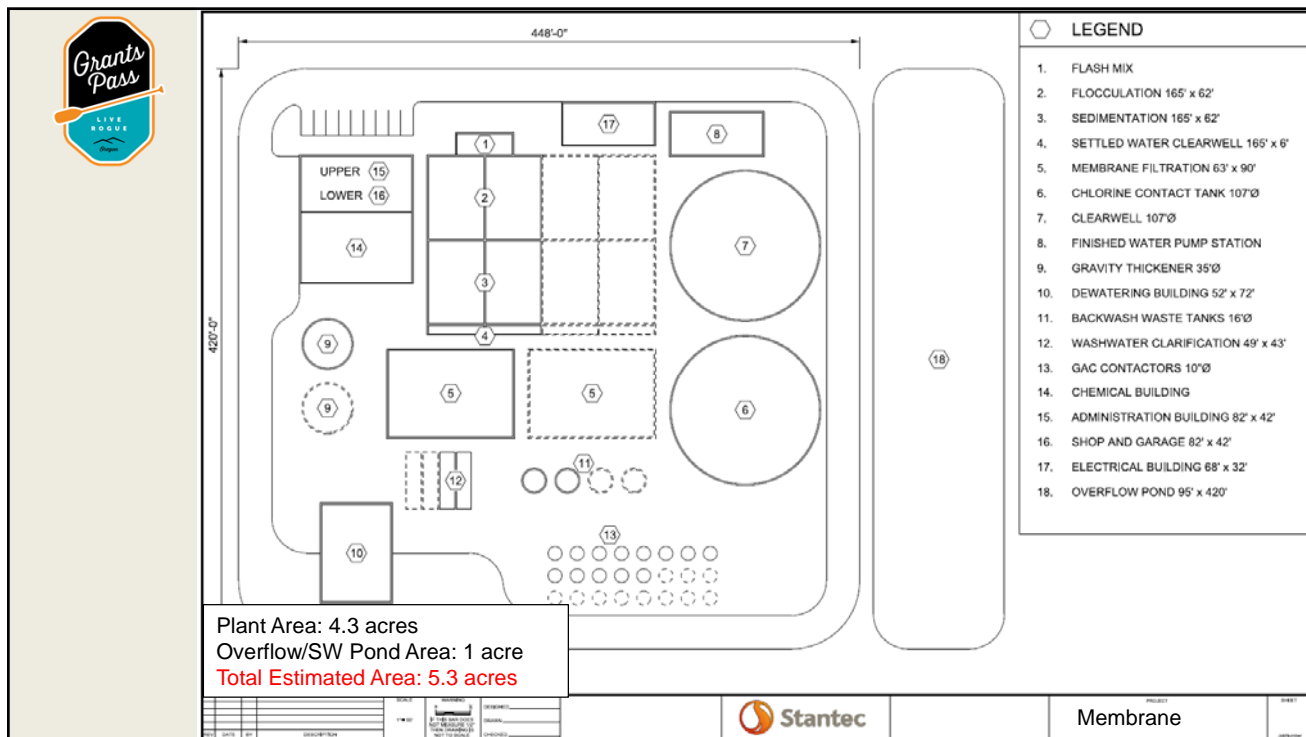


Water Treatment – Membrane Filtration

- More instrumentation than other alternatives
- Membrane pore-size prevents particle breakthrough; may require less day-to-day operations
- Most space-intensive due to need for flocculation+ sedimentation
- Granulated activated carbon could be incorporated for organics removal and improved water quality aesthetics

Flocculation + Sedimentation → Membrane Filters → Granular activated carbon

Grants Pass LIVE ROGUE





Parametric Cost Comparison

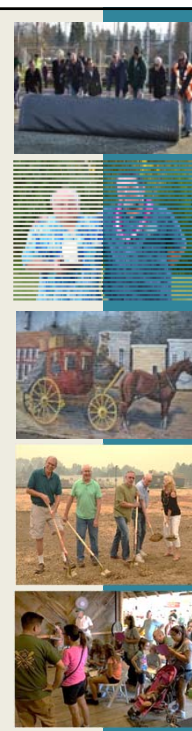
Uncertainty: +25% / -15%

Cost Category	Conventional	High-Rate Clarification	Membrane Filtration
Construction (22.5 MGD excluding property, design, off-site facilities)	\$48M +/-	\$46M +/-	\$51M +/-
Annual O&M	- Similar to Existing but ozone added	+11% More chemicals and mechanical equipment	+2% May reduce operations, but expensive membrane replacement
Life Cycle (40 years)	-	+2%	+2%



Evaluation Matrix

	Conventional	High-Rate Clarification	Membrane Filtration
Construction Cost	o	+	-
Operations	o	-	+
Maintenance	+	o	o
Equipment Replacement	+	-	-
Footprint	o	+	-





Call to Action

- Conventional Treatment or Membrane Treatment provide best future value to be carried forward for cost estimating and siting efforts
 - Provides flexibility for planning in the future; can mitigate from becoming space-limited
 - Proven treatment process existing staff can continue to operate; larger overall staffing pool for conventional
 - Cost competitive for construction and long term operations
 - Keep other options available in case site conditions or hydraulics dictate a change

