



Technical Memorandum

To: Santa Cruz Water Department

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Date: November 17, 2023

Subject: Comparison of Groundwater Treatment Alternatives for Aquifer Storage and Recovery (ASR) Groundwater at the Beltz Water Treatment Plant — FINAL

Executive Summary

This study has been conducted to evaluate treatment alternatives for Santa Cruz Water Department's (SCWD) Beltz Water Treatment Plant (WTP). The Beltz WTP currently treats water from groundwater wells #8, #9, and #10, and typically operates between April and October. The plant remains offline in the winter months when water demand is low.

The Beltz WTP is reaching the end of its useful life and rehabilitation is needed to improve reliability of the existing water treatment system. SCWD is currently in the planning process to implement aquifer storage and recovery (ASR) at the Beltz WTP. Rehabilitation strategies for the Beltz WTP were developed based on new and proposed drinking water regulations from the State of California and the Environmental Protection Agency (EPA) (see Section 2), the source water quality (see Sections 3 and 4), and treated water quality goals (see Section 5) and capacity goals (see Section 7).

Source water quality, treated water quality objectives, future treatment capacity, and the three ASR treatment alternatives were defined in collaboration with SCWD during four workshops¹ conducted between February and May 2023. The Beltz WTP source water quality is influenced by the native groundwater and the ASR recovery water quality, which is dependent on the Graham Hill Water Treatment Plant (GHWTP) finished water and the distribution system water quality. The water quality from these sources was evaluated to identify contaminants above regulatory requirements that need to be considered in the design of the treatment processes (see Section 6). This technical memorandum (TM) summarizes the decisions from these workshops and evaluates three t

¹ Workshop #1 (February 22, 2023): Existing Well Water Quality and Water Quality Goals for Native Groundwater Treatment
Workshop #2 (March 22, 2023): Treatment Alternatives for Native Groundwater Treatment
Workshop #3 (April 20, 2023): ASR Water Quality
Workshop #4 (May 12, 2023): Treatment Alternatives for ASR

reatment alternatives for the Beltz WTP assuming implementation of ASR to guide selection of the preferred treatment alternative.

The treatment alternatives assessed in this study, described in Section 10, include:

- Alternative #1: Chlorination + Aeration + GreensandPlus + Blending for PFAS Reduction
- Alternative #2: Chlorination + Aeration + GreensandPlus + Ion Exchange for PFAS Treatment
- Alternative #3: Chlorination + GreensandPlus + Ion Exchange for PFAS Treatment (maximum capacity)

The alternatives were evaluated using SCWD’s business case evaluation (BCE) tool, which compared the three alternatives based on their social, environmental, operational, and economic impacts. Based on the BCE scoring, Alternative 1 was selected as the preferred alternative (see Section 11). An opinion of probable construction cost (OPCC) and an estimated project schedule was developed for the preferred alternative (see Section 12).

1. Project Background

1.1 Project Location

The Beltz WTP is at 3701 Roland Drive in unincorporated Santa Cruz County, near the east boundary of the SCWD service area. The plant sits on a 17,511-square-foot parcel (APN: 03202131) surrounded by multi-family residences and mobile home parks (**Figure 1-1**). Access to the site is limited to two narrow driveways. The zoning is public and community facilities. The parcel is currently being used for a public facility, and a Conditional Use Permit from Santa Cruz County is not needed for the site. The site is located in the Coastal Zone and developments in the Coastal Zone will require a Coastal Development Permit.

The Beltz WTP currently treats water from groundwater Wells #8, #9, and #10 (**Figure 1-2**). Well #8 is at the plant. Typical current pumping rates for Wells #8, #9, and #10 are 250 gallons per minute (gpm), 400 to 500 gpm, and 100 to 150 gpm, respectively. The Beltz WTP typically operates between April and October, remaining offline in the winter months when water demand is low.



Figure 1-1 Site Location: Beltz Water Treatment Plant

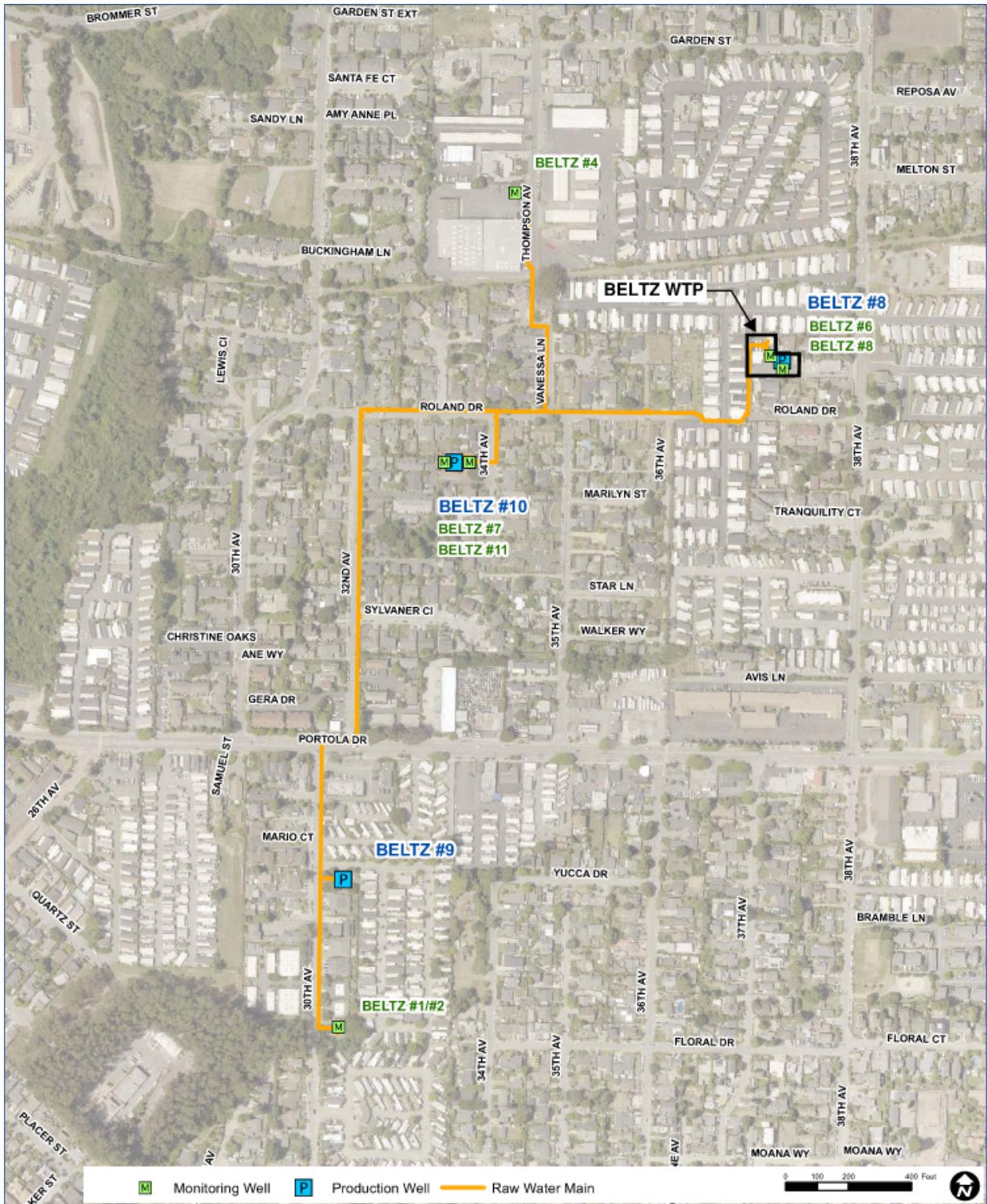


Figure 1-2 Location of Wells

1.2 Existing Treatment System

In 1967, the City of Santa Cruz acquired the Beltz Water Company comprising of six wells located in the southeastern portion of the SCWD service area. Subsequently, SCWD constructed the one million gallon per day Beltz WTP to provide iron and manganese treatment. The Beltz WTP was upgraded from one million gallons per day to two million gallons per day in 1985. SCWD currently uses aeration for oxidation followed by dual media filtration for iron and manganese treatment. The existing tray-type aerator provides oxidation of dissolved iron and manganese and removes entrained air from the well water. An on-site sodium hypochlorite (SHC) generation system was added to the plant in 2006 to provide chlorine for oxidation of iron and manganese and a disinfectant to maintain water quality in the distribution system. The SHC is injected directly upstream of the aeration to maintain a 1.0-1.5 mg/L free chlorine residual through the aeration process and filtration. The existing dry bag salt storage is inside the building. The 55 lb bags of high purity NSF salt are manually loaded into the saturator tank to produce a 25-27% saturated salt solution fed to the SHC generator.

In recent years, SCWD has completed upgrades to the Beltz WTP, including replacing the existing redwood tank with a bolted steel tank, replacing the packed-tower aerator blower and media, and updating plant controls. There are two media filters and each can be operated between 240 and 700 gpm based on equipment rating. Currently only one of the two treatment filters is operational. Because of declines in well capacity, current well pumping is also limited to approximately 800 gpm. The existing site layout and a schematic of the existing treatment process are shown in **Figures 1-3** and **1-4**, respectively.

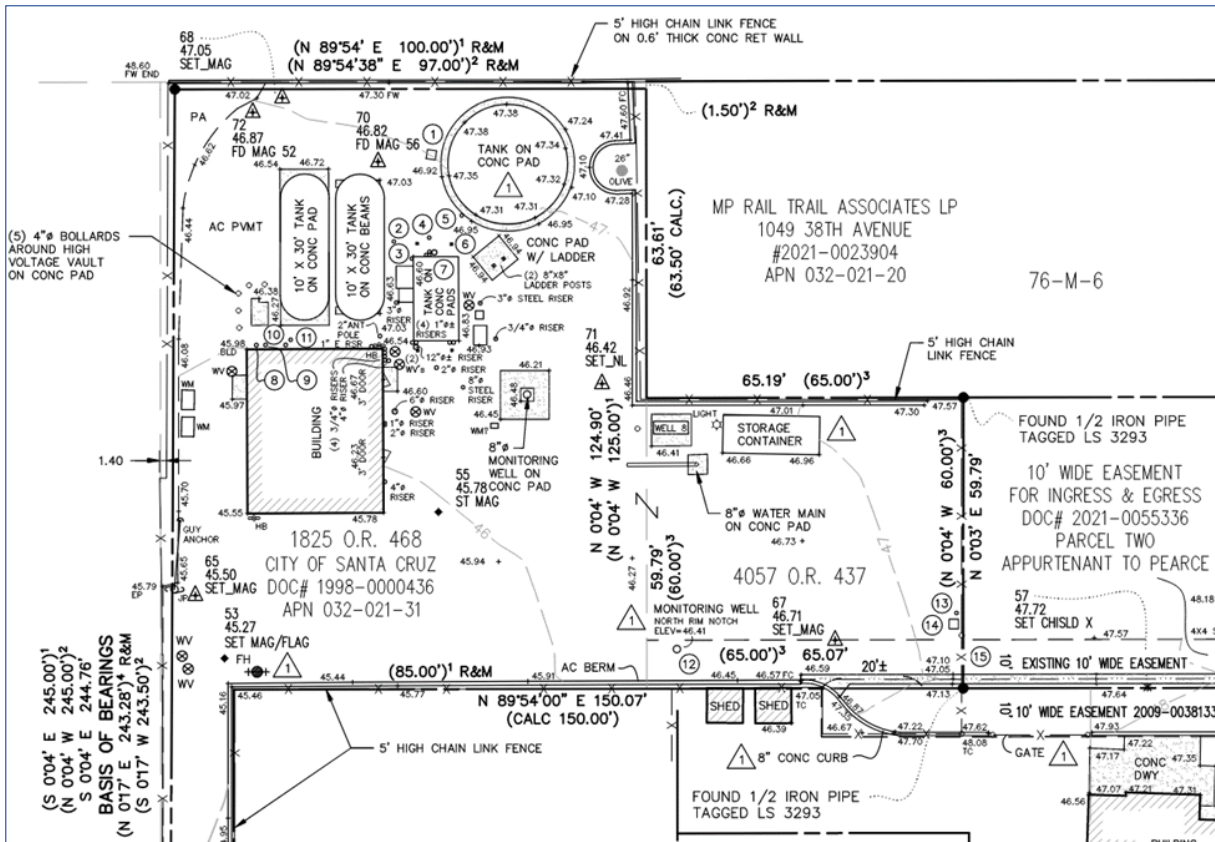


Figure 1-3 Existing Beltz WTP Site Layout

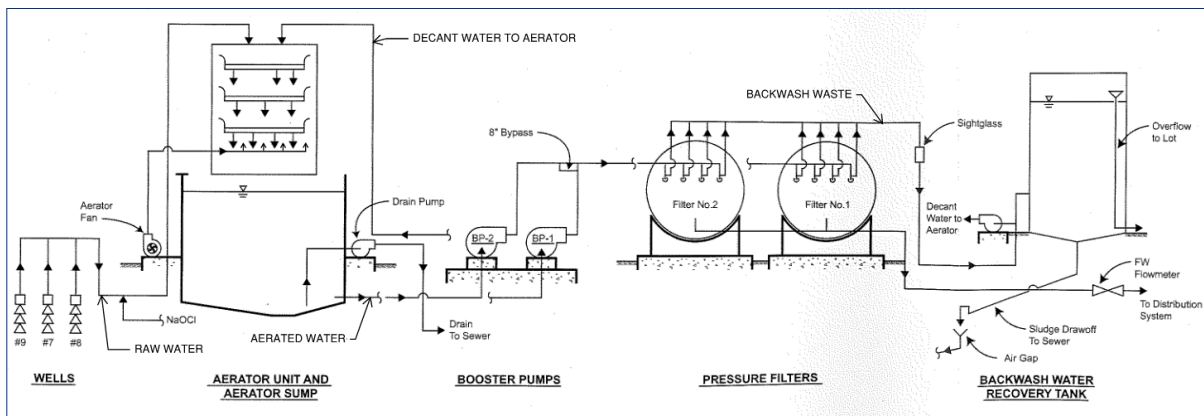


Figure 1-4 Existing Beltz WTP Process Schematic

1.3 Aquifer Storage and Recovery

SCWD is implementing ASR to “bank” water in an aquifer during times when excess surface water is available for storage (typically wet periods) and subsequent recovery of the water from the aquifer when needed (typically dry periods). For SCWD, ASR involves the diversion of “excess” winter and spring flows from SCWD’s North Coast sources and the San Lorenzo River (SLR), treated to potable standards at the GHWTP, then conveyed through the existing (and/or improved) water distribution system(s) to ASR wells located in the Santa Cruz Mid-County Groundwater Basin (MGB). In this context, “excess” flows are those flows that exceed SCWD demands, meet in-stream flow requirements and are within water rights.

ASR utilizes dual-purpose injection/recovery wells for the injection of water into aquifer storage and the subsequent recovery of the stored water by pumping. SCWD plans to convert existing Wells #8, #12, and #9 to ASR wells, and add one or more future ASR wells at locations of Wells #4 and/or #10. Based on the location and depth, it is possible for future ASR well(s) that will be treated at the Beltz WTP to have native water qualities similar to existing Wells #4, #10 or #12. Based on the current ASR implementation approach, Beltz #12 will be treated at a separate treatment system and not at the Beltz WTP. Under ASR, the plant will treat a range of water quality from injected water to native groundwater.

2. Groundwater Treatment Regulations

The Beltz WTP must continue to meet the California State Water Resources Control Board Division of Drinking Water (DDW) groundwater treatment regulations. Drinking water regulations are found in California Code of Regulations (CCR) Title 17, Division 1, Chapter 5, and CCR Title 22, Division 4. Understanding groundwater treatment regulations helps determine decisions regarding future treatment at Beltz WTP. Understanding groundwater treatment regulations helps determine decisions regarding future treatment at Beltz WTP.

2.1 National Primary and Secondary Drinking Water Standards

Water treatment and water quality regulations are separated into two distinct groups: primary standards and secondary standards. Primary standards are for the protection of public health. Primary standards include maximum contaminant levels (MCLs) for microorganisms, disinfectants, disinfection byproducts (DBPs), inorganic chemicals, organic chemicals, and radionuclides. Secondary standards are set for parameters that affect aesthetics, such as the appearance, taste, and odor of drinking water, but are not known to affect public health significantly. Secondary standards that affect the water quality at Beltz include iron, manganese, total dissolved solids, and sulfate. California has more stringent requirements than federal drinking water standards and generally requires water providers to comply with secondary drinking water standards (i.e., secondary MCLs [SMCLs]).

2.1.1 California Proposed Manganese Notification and Response Levels

In March 2023, the DDW issued proposed revisions to the manganese notification levels (NLs) and response levels (RLs) to 20 micrograms per liter ($\mu\text{g/L}$) and 200 $\mu\text{g/L}$, respectively. In comparison, the current NLs and RLs are 500 $\mu\text{g/L}$ and 5000 $\mu\text{g/L}$, respectively.

2.2 Disinfectants and Disinfection Byproduct Rule

Stage 1 and Stage 2 Disinfectants and Disinfection Byproducts Rules (DBPRs) were developed to limit exposure to DBPs. The Stage 1 DBPR established MCLs for certain DBPs and established minimum criteria for disinfection byproduct precursor (total organic carbon [TOC]) removal or additional treatment avoidance criteria. The Stage 2 DBPR strengthened compliance monitoring requirements for trihalomethanes (TTHMs) and haloacetic acids (HAA5s) by establishing locational running annual average MCLs and new criteria for selecting sampling sites.

2.3 Groundwater Rule

The Groundwater Rule requires systems to protect wellheads from contamination, monitor for microbiological contamination, and provide at least 4-log virus inactivation credit for well systems that (1) do not routinely monitor source waters for *E. coli* and/or total coliform, and (2) systems that detect *E. coli* and total coliform in routine and/or confirmation samples. No changes to the current chlorine disinfection practices are anticipated to be made at the Beltz WTP.

2.4 California Regulations for Per- and Polyfluoroalkyl Substances

In July 2018, DDW established interim drinking water NLs and RLs for perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS). In August 2019, DDW announced a new NL for PFOA and PFOS at 5.1 nanograms per liter (ng/L) and 6.5 ng/L, respectively. The current RLs are 10 ng/L for PFOA and 40 ng/L for PFOS, respectively based on a running four-quarter average. In March 2021, DDW issued the NL and RL for perfluorobutanesulfonic acid (PFBS) of 0.5 $\mu\text{g/L}$ and 5 $\mu\text{g/L}$, respectively. On October 31, 2022, DDW issued the NL and RL for perfluorohexanesulfonic acid (PFHxS) of 3 ng/L and 20 ng/L, respectively, based on toxicological endpoints.

In California, results above the NL require agencies to notify, within 30 days of receiving the verifying test results, the governing body of the areas where the water has been served. If the RL is exceeded in drinking water provided to consumers, DDW recommends that the water agency remove the water source from service or provide water treatment. **Table 2-1** lists the current status of per- and polyfluoroalkyl substances (PFAS) regulations in California.

Table 2-1 Current Status of PFAS Regulation in California

Abbreviation	Chemical Name	Notification Level	Response Level	Date Issued or Status
PFOA	Perfluorooctanoic acid	5.1 ng/L or 0.0051 µg/L	10 ng/L or 0.001 µg/L	February 6, 2020
PFOS	Perfluorooctane sulfonic acid	6.5 ng/L or 0.0065 µg/L	40 ng/L or 0.004 µg/L	February 6, 2020
PFBS	Perfluorobutane sulfonic acid	500 ng/L or 0.5 µg/L	5000 ng/L or 5 µg/L	March 5, 2021
PFHxS	Perfluorohexane sulfonic acid	3 ng/L or 0.003 µg/L	20 ng/L or 0.02 µg/L	October 31, 2022
PFHxA	Perfluorohexanoic acid			Requested
PFHpA	Perfluoroheptanoic acid			Requested
PFNA	Perfluorononanoic acid			Requested
PFDA	Perfluorodecanoic acid			Requested
ADONA	4,8-Dioxa-3H-perfluorononanoic acid			Requested

On October 31, 2022, the DDW issued General Order DW-2022-0001-DDW for monitoring 25 PFAS constituents at drinking water system sources that are at risk for potential contamination by PFAS because of their proximity to other water sources with confirmed PFAS detections. Sample collection and analysis is to be conducted quarterly, beginning with the first calendar quarter of 2023, and continuing until further notice. Sample analysis is to be performed using EPA Method 533. The 25 PFAS are shown in **Table 2-2**. Although SCWD did not receive this Order, SCWD is monitoring these 25 PFAS and additional PFAS compounds per EPA’s fifth Unregulated Contaminant Monitoring Rule (UCMR5), since SCWD needs to comply with CA’s NLs and RLs and future EPA regulations, described in Section 2.4.

Table 2-2 California Required PFAS Monitoring per General Order DW-2022-0001-DDW

	Constituent	Consumer Confidence Report Detection Levels (CCRD) (ng/L)	Notification Level (µg/L or ng/L) ¹	Response Level, (µg/L or ng/L)
1	11-chloroeicosafuoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	5		
2	1H,1H, 2H, 2H-perfluorodecane sulfonic acid (8:2FTS)	5		
3	1H,1H, 2H, 2H-perfluorohexane sulfonic acid (4:2FTS)	3		
4	1H,1H, 2H, 2H-perfluorooctane sulfonic acid (6:2FTS)	5		
5	ADONA	3		
6	9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	2		

	Constituent	Consumer Confidence Report Detection Levels (CCRD L) (ng/L)	Notification Level (µg/L or ng/L) ¹	Response Level, (µg/L or ng/L)
7	hexafluoropropylene oxide dimer acid (HFPO-DA) (GenX)	5		
8	nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20		
9	perfluoro (2-ethoxyethane) sulfonic acid (PFEEESA)	3		
10	perfluoro-3-methoxypropanoic acid (PFMPA)	4		
11	perfluoro-4-methoxybutanoic acid (PFMBA)	3		
12	perfluorobutanesulfonic acid (PFBS)	3	0.5 µg/L	5 µg/L
13	perfluorobutanoic acid (PFBA)	5		
14	PFDA	3		
15	perfluorododecanoic acid (PFDoA)	3		
16	perfluoroheptanesulfonic acid (PFHpS)	3		
17	PFHpA	3		
18	PFHxS	3	3 ng/L	20 ng/L
19	PFHxA	3		
20	PFNA	4		
21	PFOS	4	6.5 ng/L	40 ng/L
22	PFOA	4	5.1 ng/L	10 ng/L
23	perfluoropentanesulfonic acid (PFPeS)	4		
24	perfluoropentanoic acid (PFPeA)	3		
25	perfluoroundecanoic acid (PFUnA)	2		

Notes:

- Blanks indicate that a limit has not been established for that constituent.
- UCMR5 includes listed constituents and PERFLUOROTETRADECANOIC ACID (PFTA), N-ETHYL PERFLUOROOC T ANESULFONAMIDOACETIC ACID (NEtFOSAA), PERFLUOROTRIDECANOIC ACID (PFTrDA), and N-METHYL PERFLUOROOC T ANESULFONAMIDOACETIC ACI (NMeFOSAA)

2.5 Proposed EPA Regulations for PFAS in Drinking Water

On March 14, 2023, EPA proposed National Drinking Water Standards for six PFAS, including PFOA and PFOS as individual contaminants, and PFBS, PFHxS, PFNA and GenX Chemicals as a mixture of contaminants. The draft rule proposes a combination of traditional MCLs and a novel Hazard Index (HI) concept as shown in Figure 2-1. The Final Rule is anticipated by early 2024 and requires compliance by water purveyors three years after promulgation. In addition, EPA's fifth Unregulated Contaminant Monitoring Rule (UCMR5) requires sampling for 29 PFAS. SCWD is participating in the UCMR5 sampling, and the results are described in Section 3.1.3.

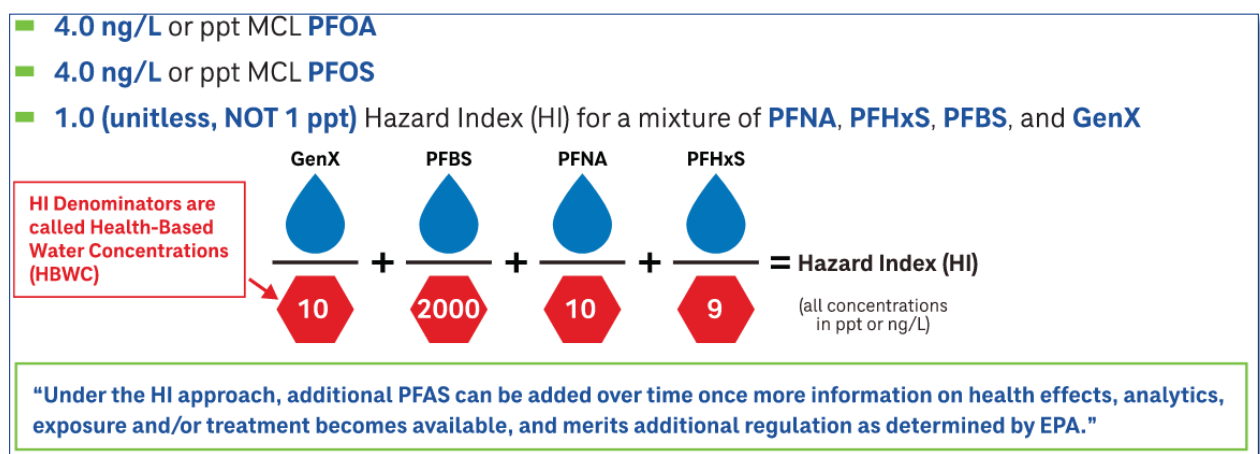


Figure 2-1 EPA HI Approach

3. Source Water Quality

The source water quality for Beltz WTP with ASR implementation will span the range of water quality for ASR injection water water quality to native groundwater. CDM Smith evaluated native water quality data for Wells #4, #8, #9, #10, #12. These wells are representative of native groundwater quality. CDM Smith also evaluated existing GHWTP finished water quality and distribution system water quality as this is representative of water used for ASR injection. It should be noted that SCWD is currently planning upgrades to the GHWTP which will change water quality.

SCWD conducted ASR pilot and demonstration testing at Well #8. Pilot testing was conducted from March 2020 to June 2021. The pilot testing consisted of three separate ASR cycles with approximately a one year gap between Cycles 2 and 3 for a geochemical analysis of arsenic. The demonstration study consisted of an injection from January to May 2022 and extraction from June to August 2022. Well #8 data from year 2022 are excluded from native groundwater quality analysis due to potential impact from ASR injection. Water quality data from both the ASR pilot and demonstration studies are included in the evaluation.

The focus of the water quality evaluation was to assess compliance with primary and secondary drinking water standards and current and proposed PFAS regulations. All water quality data are presented in **Appendix A**.

3.1 Native Groundwater

3.1.1 Primary Drinking Water Standards

Water quality data were available for all parameters with a NL and for all primary drinking standard parameters except for strontium, tritium, and 1,2-dibromo-3-chloropropane (DBCP). Based on the analysis of this data, water quality results for the wells were below the primary MCLs for all primary drinking standard parameters sampled.

3.1.2 Secondary Drinking Water Standards

Water quality results for selected secondary drinking water standards are shown in **Table 3-1**; values in bold red are greater than the SMCL (recommended if applicable), NL, and/or RL.

Table 3-1 Wells #4, #8, #9, #10, and #12 Native Groundwater Quality in Comparison to Secondary Drinking Water Standards

Contaminant	Units	SMCL	NL	RL	Well #4			Well #8			Well #9			Well #10			Well #12		
					Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max
Aluminum	mg/L	0.2			0	0	0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Color	CU	15			1	30	85	1	4.1	16	1	3.8	8	1	3.4	32	1	3	10
Copper	mg/L	1.0			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MBAS	mg/L	0.5			0	0.02	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	µg/L	300			3.5	7	14	ND	1,100	1,900	590	920	1,100	ND	1,080	3,000	65	380	1200
Manganese	Proposed µg/L		20	200	0.4	0.5	0.7	130	190	210	130	210	230	170	240	420	60	330	450
	Current µg/L	50	500	5,000															
Methyl-tert-butyl ether (MTBE)	mg/L	0.005			NR			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Odor	TON	3			0	2.8	12	1	1.3	6	1	1	1	1	1.4	8	1	3.5	24
Silver	µg/L	100			0	0	0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thiobencarb	mg/L	0.001			NR			ND	ND	ND	ND	ND	ND	ND	ND	ND	NR		
Turbidity	NTU	5			0.4	25	55	0.05	2.1	9.6	0.1	1.7	4.8	0.05	1.5	22	0.05	0.72	5.6
Zinc	µg/L	5,000			0	0.09	0.43	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Dissolved Solids (TDS)	mg/L	See Note 6			545	625	795	440	450	480	480	490	510	570	590	620	430	465	510
Specific Conductance	µS/cm	See Note 7			590	800	980	580	660	860	650	690	750	740	970	1,250	360	650	800
Chloride	mg/L	See Note 8			54	57	60	48	50	53	42	45	50	54	59	66	25	35	48
Sulfate	mg/L	See Note 9			170	195	245	110	115	120	130	135	140	150	190	320	80	105	130

Notes:

1. Well #4 data collected 1980–1992.
2. Wells #8 and 9 data collected 1998–2023.
3. Well #10 data collected 2009–2022.
4. Well #12 data collected 2018–2023.
5. Well #8 data from 2022 are excluded because of potential impact from ASR injection (January–April 2022).
6. California SMCL for TDS is 500 mg/L (recommended), 1,000 mg/L (upper limit), and 1,500 mg/L (short-term exposure).

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7. California SMCL for specific conductance is 900 $\mu\text{S}/\text{cm}$ (recommended), 1,600 $\mu\text{S}/\text{cm}$ (upper limit), and 2,200 $\mu\text{S}/\text{cm}$ (short-term exposure).
8. California SMCL for chloride is 250 mg/L (recommended), 500 mg/L (upper limit), and 600 mg/L (short-term exposure).
9. California SMCL for sulfate is 250 mg/L (recommended), 500 mg/L (upper limit), and 600 mg/L (short-term exposure).

avg – average

CU – color units

max – maximum

mg/L – milligrams per liter

min – minimum

NR – not reported

ND – non-detect

NTU – nephelometric turbidity units

TON – threshold odor number

$\mu\text{S}/\text{cm}$ – microSiemens per centimeter

Wells #8, #9, #10, and #12 have iron and manganese levels higher than the SMCL and the proposed manganese NL. These contaminants will be considered when designing the treatment process for the Beltz WTP in order to meet the SMCL.

Figure 3-1 presents iron concentrations and **Figure 3-2** presents manganese concentrations in Well #8, #9, #10, and #12 during periods that represent native groundwater, ASR injection, and ASR extraction. Well #8 data from 2022 are excluded from the water quality evaluation because of potential impact from ASR injection, which took place between January and April 2022.

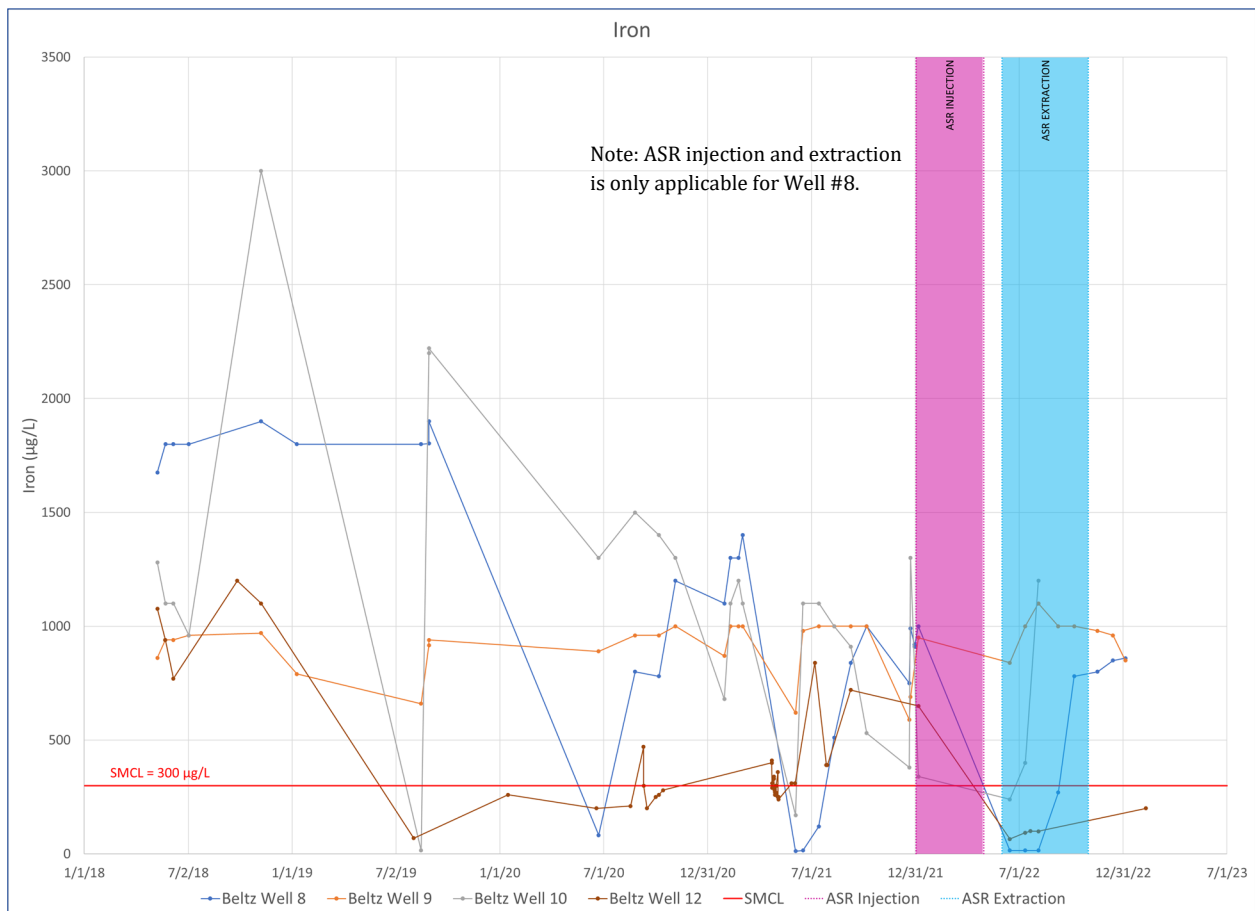


Figure 3-1 Wells #8, #9, #10, and #12 Iron Water Quality

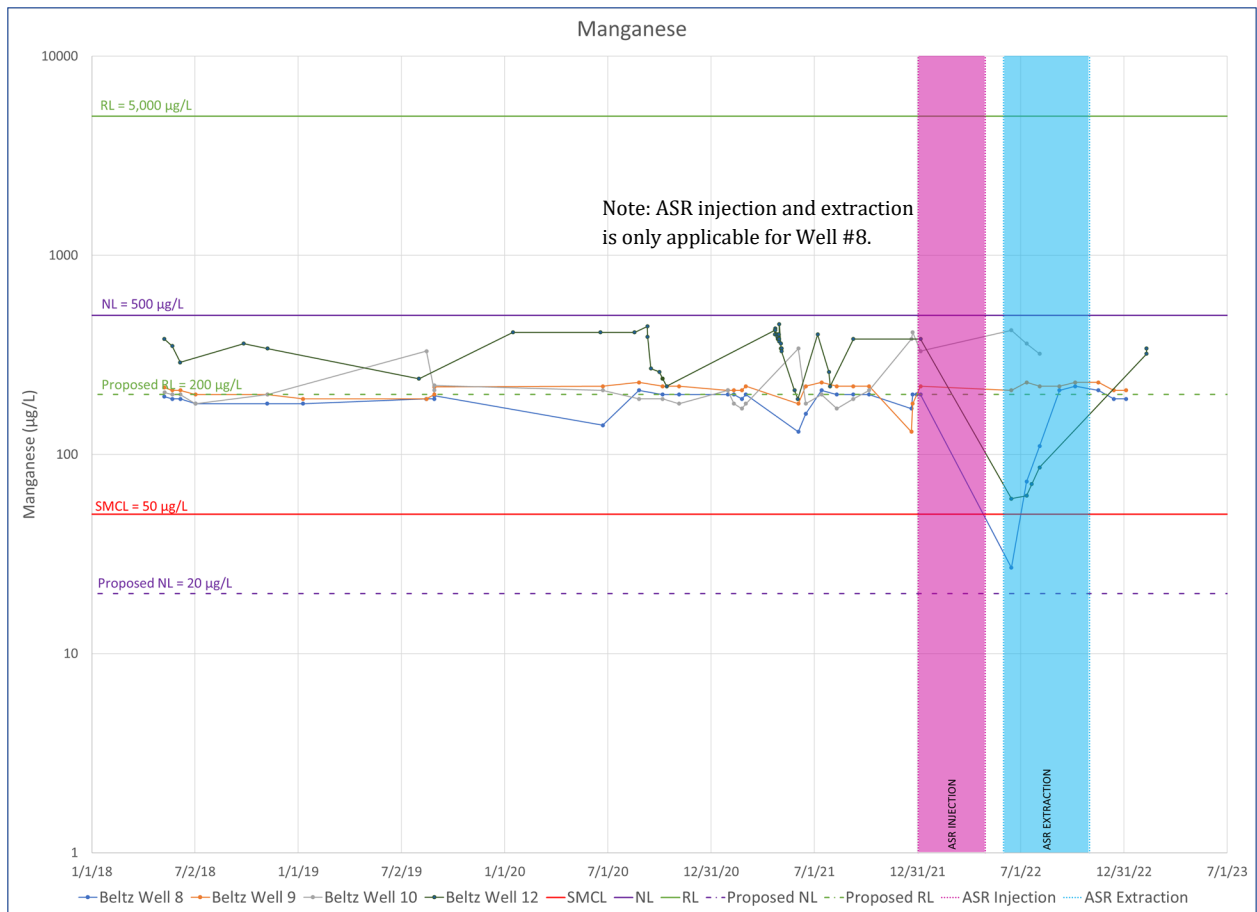


Figure 3-2 Wells #8, #9, #10, and #12 Manganese Water Quality

3.1.3 Per- and Polyfluoroalkyl Substances

SCWD voluntarily tests for PFAS. Water quality results for PFAS contaminants, in comparison to NLs and RLs are shown in **Table 3-2**. PFBS was detected in Well #8 below the RL. PFHxS was detected in Well #8 above the NL in five samples. All other PFAS contaminants sampled non-detect as shown in **Table 3-3**. PFAS data are not available for Well #4. PFAS treatment will be considered in the design of the Beltz WTP.

Table 3-2 Wells #8, #9, #10, and #12 PFAS Water Quality

Contaminant	Units	Draft EPA MCL	NL	RL	Well #8		Well #9		Well #10		Well #12	
					Number of Samples	Value	Number of Samples	Value	Number of Samples	Value	Number of Samples	Value
PFOA	ng/L	4.0	5.1	10	7	ND	6	ND	2	ND	5	ND
PFOS	ng/L	4.0	6.5	40	7	ND	6	ND	2	ND	5	ND
PFBS	ng/L	HI <1	500	5,000	7	ND-2.5	6	ND	2	ND	5	ND
PFHxS	ng/L	HI <1	3	20	7	ND-4.0	6	ND	2	ND	5	ND
GenX	ng/L	HI <1			7	ND	6	ND	2	ND	5	ND
PFNA	ng/L	HI <1			7	ND	6	ND	2	ND	5	ND
HI	NA	1			7	0-0.45	6	0	2	0	5	0

Notes:

1. Beltz 8 and 9 PFAS data collected from June 2020 to January 2023.
2. Beltz 10 and 12 data collected in June 2020 and January 2022.
3. Well #8 data from 2022 are excluded because of potential impact from ASR injection (January-April 2022).
4. Values shown in red are greater than the draft EPA MCL, the NL, and/or the RL.
5. $HI = \frac{GenX}{10} + \frac{PFBS}{2,000} + \frac{PFNA}{10} + \frac{PFHxS}{9}$, where all concentrations are in parts per trillion (ppt) or ng/L.

< - less than
 NA - not applicable
 HI - Hazard Index

Table 3-3 Wells #8, #9, #10, and #12 Additional PFAS Water Quality

Contaminant	Units	Well #8		Well #9		Well #10		Well #12	
		Number of Samples	Value	Number of Samples	Value	Number of Samples	Value	Number of Samples	Value
11Cl-PF3OUdS	ng/L	7	ND	6	ND	2	ND	5	ND
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	ng/L	5	ND	4	ND	1	ND	4	ND
1H, 1H, 2H, 2H-perfluorohexane sulfonic acid (4:2 FTS)	ng/L	5	ND	4	ND	1	ND	4	ND
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	ng/L	5	ND	4	ND	1	ND	4	ND
4, 8-dioxa-3H-perfluorononanoic acid (ADONA)	ng/L	7	ND	6	ND	2	ND	5	ND
9Cl-PF3ONS	ng/L	7	ND	6	ND	2	ND	5	ND
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ng/L	2	ND	2	ND	1	ND	1	ND
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ng/L	2	ND	2	ND	1	ND	1	ND
NFDHA	ng/L	5	ND	4	ND	1	ND	4	ND
PFEESA	ng/L	5	ND	4	ND	1	ND	4	ND
PFMPA	ng/L	5	ND	4	ND	1	ND	4	ND
PFMBA	ng/L	5	ND	4	ND	1	ND	4	ND
PFBA	ng/L	5	ND	4	ND	1	ND	4	ND
PFDA	ng/L	7	ND	6	ND	2	ND	5	ND
PFDoA	ng/L	7	ND	6	ND	2	ND	5	ND
PFHpS	ng/L	5	ND	4	ND	1	ND	4	ND
PFHpA	ng/L	7	ND	6	ND	2	ND	5	ND
PFHxA	ng/L	7	ND	6	ND	2	ND	5	ND
PFPeS	ng/L	5	ND	4	ND	1	ND	4	ND
PFPeA	ng/L	5	ND	4	ND	1	ND	4	ND
Perfluorotetradecanoic acid (PFTA)	ng/L	2	ND	2	ND	1	ND	1	ND
Perfluorotridecanoic acid (PFTrDA)	ng/L	2	ND	2	ND	1	ND	1	ND

Contaminant	Units	Well #8		Well #9		Well #10		Well #12	
		Number of Samples	Value	Number of Samples	Value	Number of Samples	Value	Number of Samples	Value
PfUnA	ng/L	7	ND	6	ND	2	ND	5	ND

Notes:

1. Beltz 8 and 9 PFAS data collected from June 2020 to January 2023.
2. Beltz 10 and 12 data collected in June 2020 and January 2022.

Figure 3-3 presents PFBS water quality and **Figure 3-4** presents PFHxS water quality in Well #8, #9, #10, and #12 during periods that represent native groundwater, ASR injection, and ASR extraction.

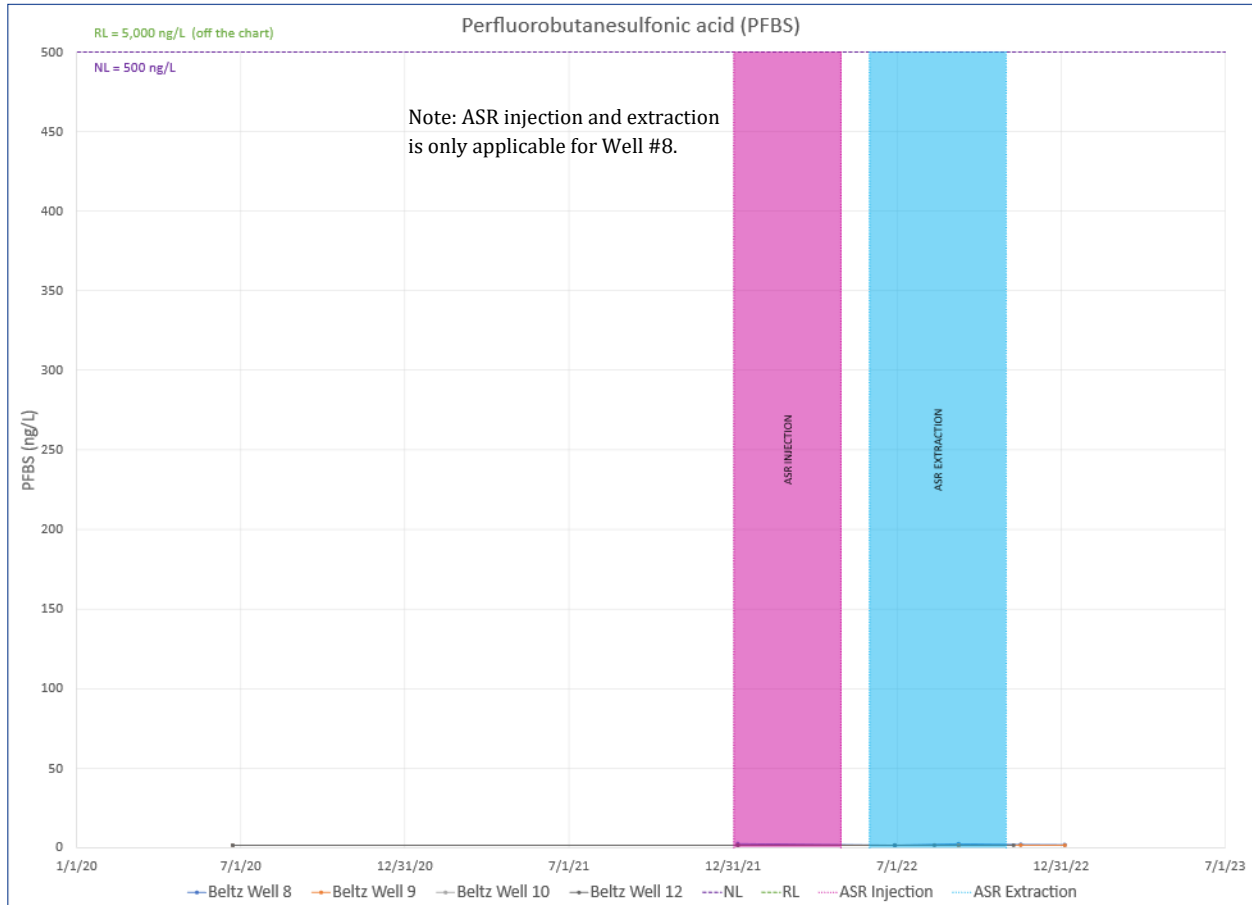


Figure 3-3 PFBS Water Quality

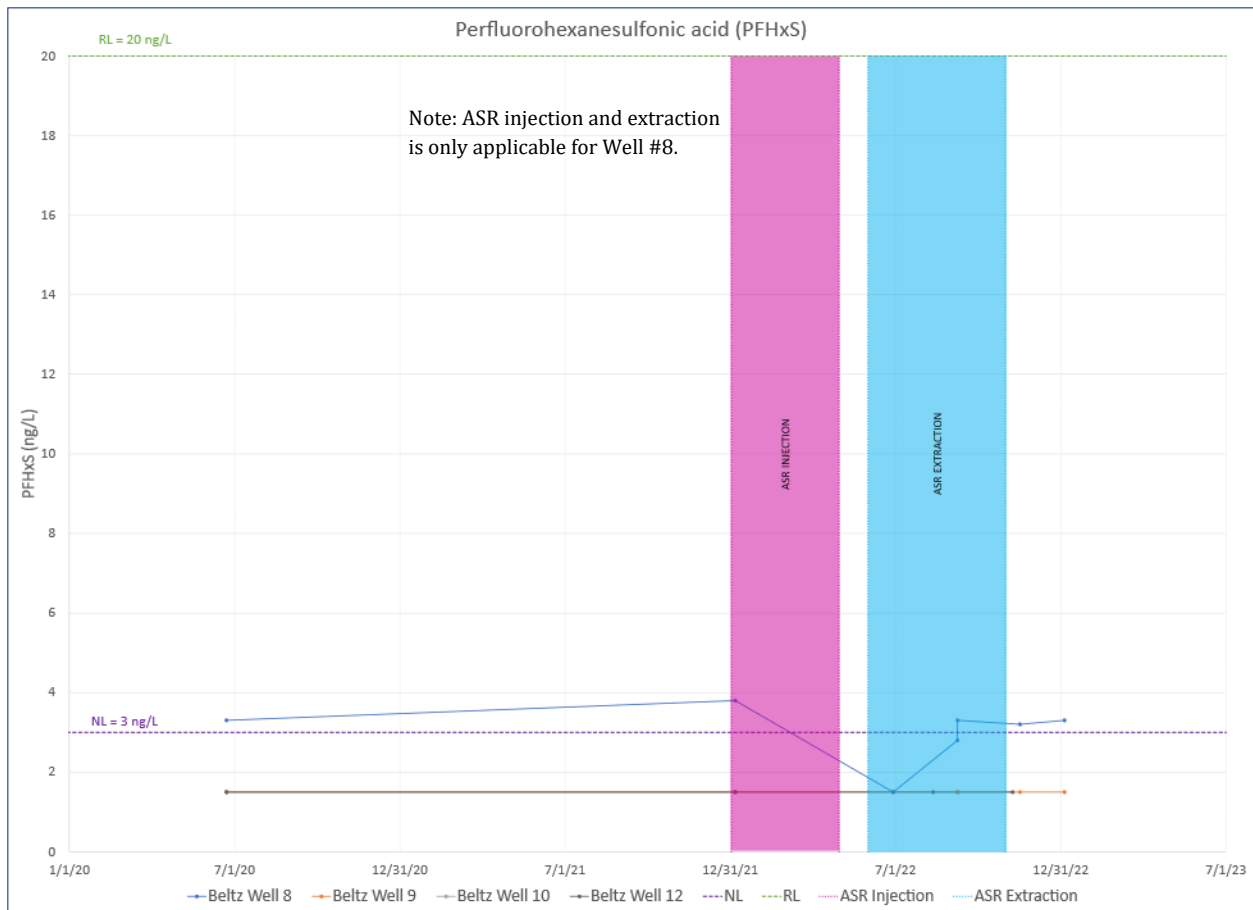


Figure 3-4 Well #8 PFHxS Water Quality

3.2 GHWTP Finished Water and Distribution System Water DBPs

3.2.1 Primary Drinking Water Standards

Table 3-4 shows the GHWTP finished water and distribution system water quality. The finished water quality results for GHWTP were below the primary MCLs for all primary drinking standard parameters sampled. ASR injection water will be similar to distribution system water. Site 105 is the sampling location closest to the Beltz WTP and most indicative of ASR injection water. DBP values can change in distribution water and can be reduced through aeration. GHWTP finished water quality is also expected to change in the future with the addition of ozone. GHWTP will not add granular activated carbon (GAC) contactors, but space will be retained for ability to add GAC in the future. TOC, dissolved organic carbon, manganese, and DBPs are expected to be equal or lower. Bromate may be formed with ozone but can be controlled with pH suppression and/or pre-chloramination to meet treatment goals. GHWTP will not add chloramination, but will retain the ability to pre-chlorinate in the sedimentation basins. GHWTP finished water quality and distribution system DBP water quality are similar with expected increase in chlorinated DBPs as water ages in the system, but DBPs do not exceed the SMCL.

Table 3-4 GHWTP Finished Water and Distribution System DBPs

Contaminant	Units	SMCL	GHWTP Finished Water			Distribution System			Distribution System (Site 105)		
			Min	Avg	Max	Min	Avg	Max	Min	Avg	Max
TTHMs	µg/L	80	19	31	57	5	35	79	8	37	63
HAA5s	µg/L	60	6	17	35	0	22	51	0	23	51
Bromate	µg/L	10	NR			NR			NR		
Chlorite	mg/L	1	3.5	7	14	NR			NR		

Notes:

1. GHWTP data collected 2018-2022.
2. Distribution system data collected 2018-2022.

3.2.2 Secondary Drinking Water Standards

GHWTP finished water quality results were below SMCLs for all secondary drinking water standards, as shown in **Table 3-5**.

Table 3-5 GHWTP Finished Water Quality in Comparison to Secondary Drinking Water Standards

Contaminant	Units	SMCL	NL	RL	GHWTP Finished Water		
					Min	Avg	Max
Aluminum	mg/L	0.2			ND	0.03	0.059
Color	CU	15			1	1.0	8
Copper	mg/L	1.0			ND	ND	0.01
MBAS	mg/L	0.5			ND	ND	ND
Iron	µg/L	300			ND	ND	29
Manganese	Proposed		20	200	ND	ND	8.6
	Current	50	500	5,000			
MTBE	mg/L	0.005			ND	ND	ND
Odor	TON	3			1	1.0	2
Silver	µg/L	100			ND	ND	ND
Thiobencarb	mg/L	0.001			ND	ND	ND
Turbidity	NTU	5			0.04	0.05	2
Zinc	µg/L	5,000			ND	ND	ND
TDS	mg/L	See Note 2			250	267	280
Specific Conductance	µS/cm	See Note 3			320	433	485
Chloride	mg/L	See Note 4			15	23	30
Sulfate	mg/L	See Note 5			56	70	110

Notes:

1. GHWTP data collected 2018-2022.
2. California SMCL for TDS is 500 mg/L (recommended), 1,000 mg/L (upper limit), and 1,500 mg/L (short-term exposure).

3. California SMCL for specific conductance is 900 µS/cm (recommended), 1,600 µS/cm (upper limit), and 2,200 µS/cm (short-term exposure).
4. California SMCL for chloride is 250 mg/L (recommended), 500 mg/L (upper limit), and 600 mg/L (short-term exposure).
5. California SMCL for sulfate is 250 mg/L (recommended), 500 mg/L (upper limit), and 600 mg/L (short-term exposure).

3.2.3 Per-and Polyfluoroalkyl Substances (PFAS)

Water quality results for PFAS contaminants in comparison to NLs and RLs are shown in **Table 3-6**. PFHxS, PFOA, and PFOS were detected in GHWTP finished water but below the NL. Results for the other PFAS contaminants sampled are summarized in **Table 3-7**. PFBA and PFHxA were detected in GHWTP finished water.

Table 3-6 GHWTP PFAS Water Quality

Contaminant	Units	Draft EPA MCL	NL	RL	GHWTP Finished Water	
					Number of Samples	Value
PFOA	ng/L	4.0	5.1	10	29	ND–2.2
PFOS	ng/L	4.0	6.5	40	29	ND–3.3
PFBS	ng/L	HI <1	500	5,000	29	ND
PFHxS	ng/L	HI <1	3	20	29	ND–2.2
GenX	ng/L	HI <1			29	ND
PFNA	ng/L	HI <1			29	ND
HI	NA	1			29	0–0.25

Notes:

1. GHWTP data collected 2019-2022.
2. $HI = \frac{GenX}{10} + \frac{PFBS}{2,000} + \frac{PFNA}{10} + \frac{PFHxS}{9}$, where all concentrations are in ppt or ng/L.

Table 3-7 GHWTP Additional PFAS Water Quality

Contaminant	Units	GHWTP Finished Water	
		Number of Samples	Value
11Cl-PF3OUdS	ng/L	29	ND
8:2 FTS	ng/L	27	ND
4:2 FTS	ng/L	27	ND
6:2 FTS	ng/L	27	ND
4, 8-dioxa-3H-perfluorononanoic acid (ADONA)	ng/L	28	ND
9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	ng/L	29	ND
NEtFOSAA	ng/L	2	ND
NMeFOSAA	ng/L	2	ND
NFDHA	ng/L	27	ND
PFEESA	ng/L	27	ND
PFMPA	ng/L	27	ND
PFMBA	ng/L	27	ND

Contaminant	Units	GHWTP Finished Water	
		Number of Samples	Value
PFBA	ng/L	27	ND-2.0
PFDA	ng/L	29	ND
PFDaA	ng/L	29	ND
PFHpS	ng/L	27	ND
PFHpA	ng/L	29	ND
PFHxA	ng/L	29	ND-6.4
PFPeS	ng/L	27	ND
PFPeA	ng/L	27	ND
PFTA	ng/L	2	ND
PFTrDA	ng/L	2	ND
PFUnA	ng/L	29	ND

Notes:

1. GHWTP data collected 2019-2022.

3.3 ASR Pilot and Demonstration Study

During the Pilot Study, SCWD conducted three ASR cycles from March 2020 to June 2021. Major findings from the pilot study² are summarized below.

- DBPs degraded during aquifer storage with no signs of increasing within the aquifer. With sufficient storage period, DBP levels in recovery water will be low.
- TTHMs and HAA5s degraded to near non-detect levels within 40 days of stopping injection (**Figures 3-5 and 3-6**).³
- Manganese gradually increased during storage period and increased at a higher rate during recovery period. As pumping continues, the concentration of manganese approaches native groundwater concentration (**Figure 3-7**). Manganese levels were still increasing during recovery period when testing stopped but is expected to approach native groundwater quality of 0.2 mg/L if pumping had continued.
- Arsenic concentrations were high in recovered water compared to preinjected water. A geochemical analysis concluded that the elevated levels were due to the dissolution of obsidian and pyrite minerals, and arsenic levels in recovered water is expected to be lower with repeated ASR cycles.

² "Summary of Operations Beltz 8 ASR Pilot Test Project", March 2023.

³ Dilution correction removes the effect of mixing between native groundwater and injected water which may affect the concentration of the constituents.

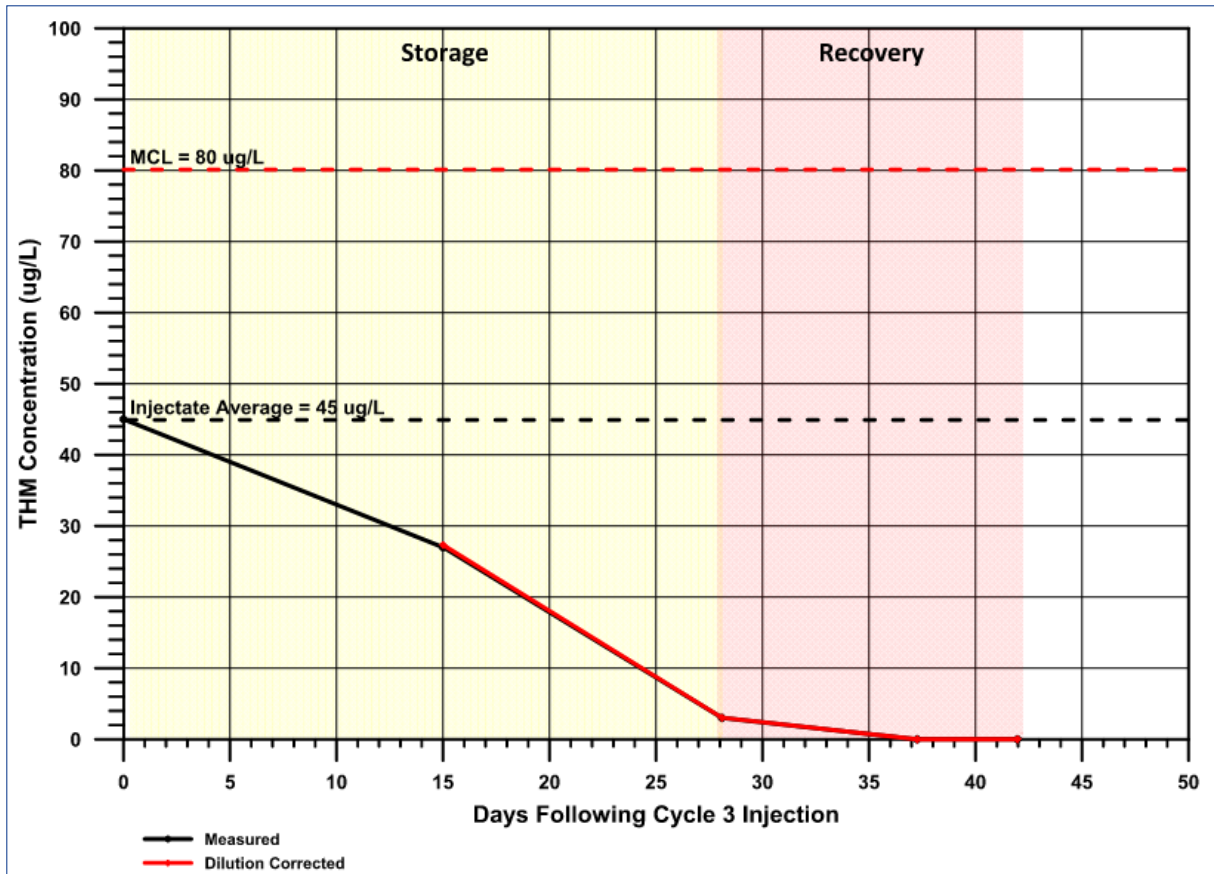


Figure 3-5 Beltz ASR Pilot Study TTHM Data

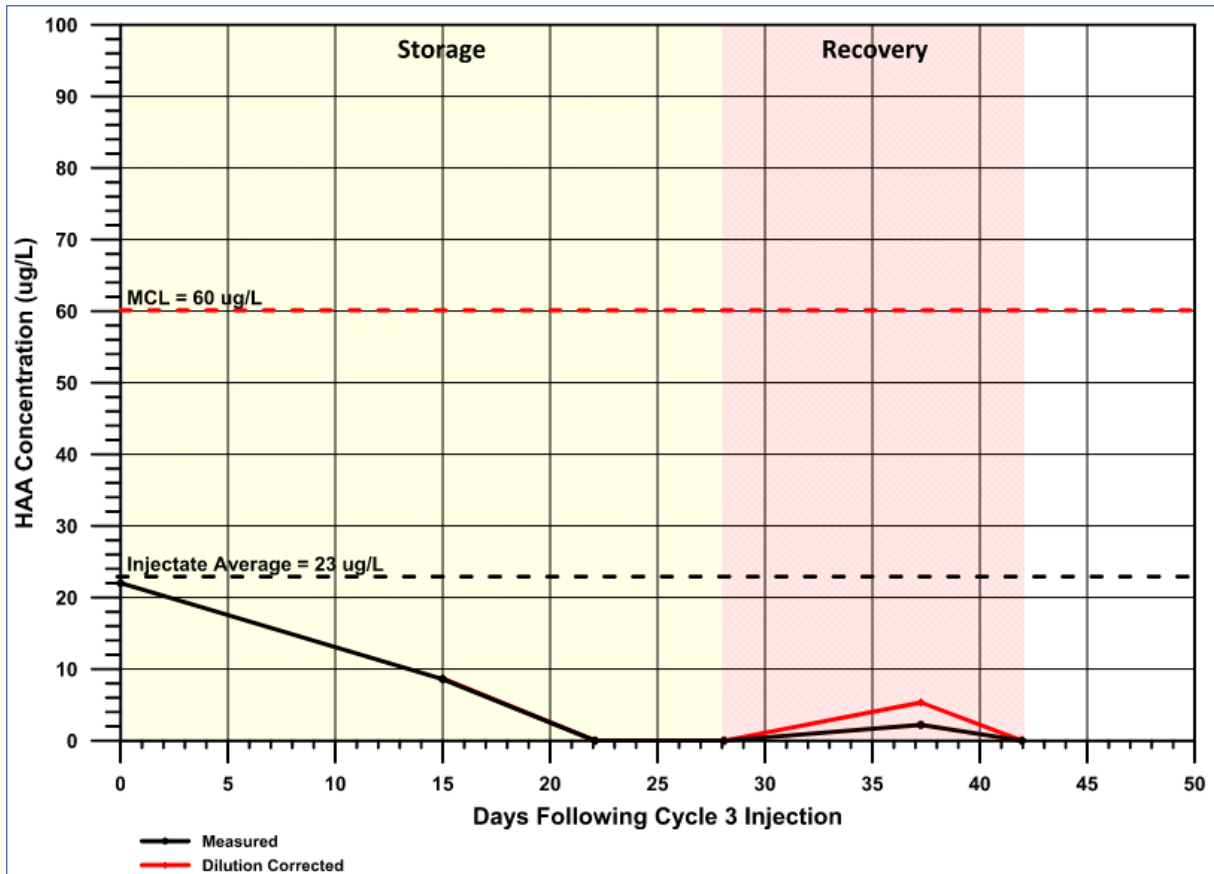


Figure 3-6 Beltz ASR Pilot Study HAA5 Data

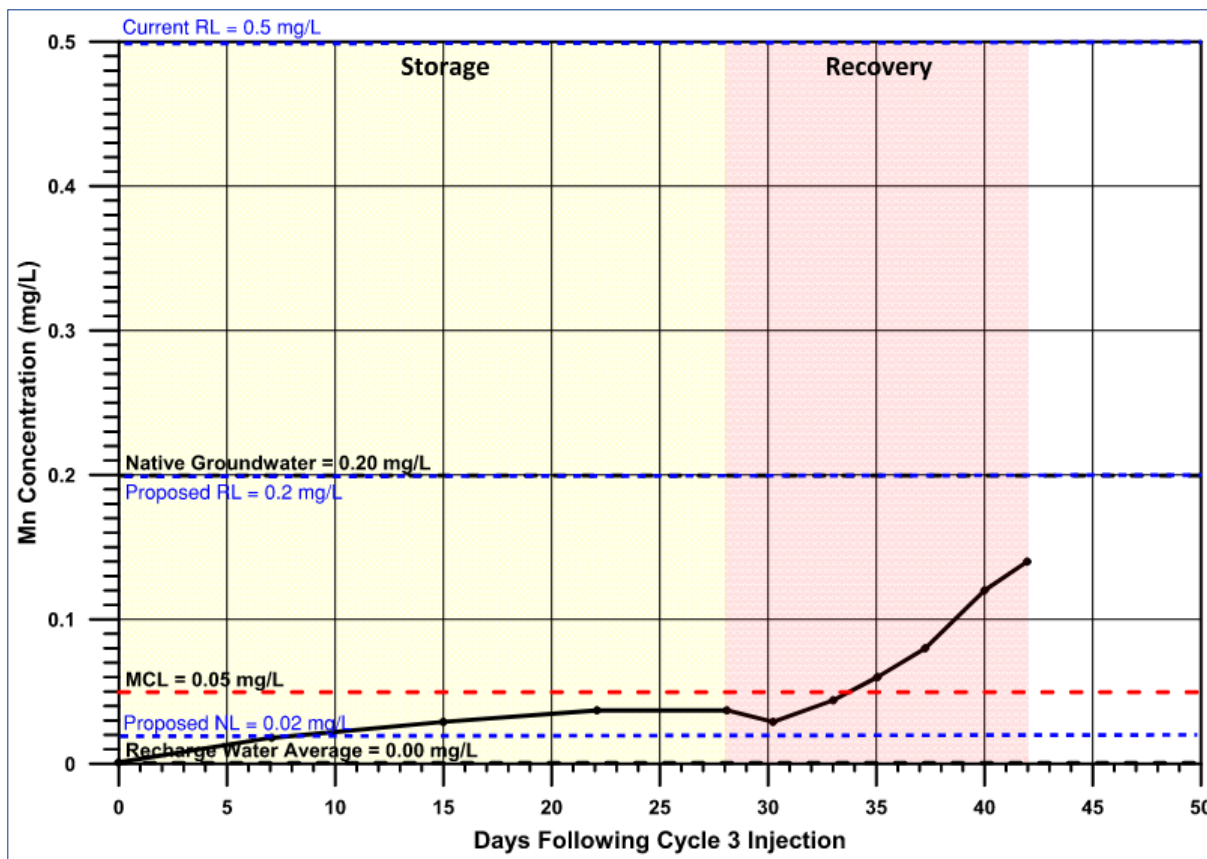


Figure 3-7 Beltz ASR Pilot Study Manganese Data

A longer demonstration study was performed in 2022. Major findings from the demonstration study⁴ are summarized below.

- Demonstration study results are similar to pilot study results.
- Water quality met all MCLs for the constituents monitored except for manganese. Manganese concentrations were similar to historical native groundwater quality and not impacted by ASR operations. Manganese approached native groundwater quality as recovery progressed.
- Results from the demonstration study support the conclusion from the pilot study that repeated ASR cycles will result in progressively lower arsenic concentrations in recovered water (**Figure 3-8**). Based on current available data, arsenic treatment at the Beltz WTP is not needed.

⁴ Pueblo Water Resources. 2023. *General WDRs for ASR Projects that Inject Drinking Water into Groundwater; Annual Self-Monitoring Report for: City of Santa Cruz Beltz 3 ASR Demonstration Project*. 2022 Annual Report WQO 2012-0010.

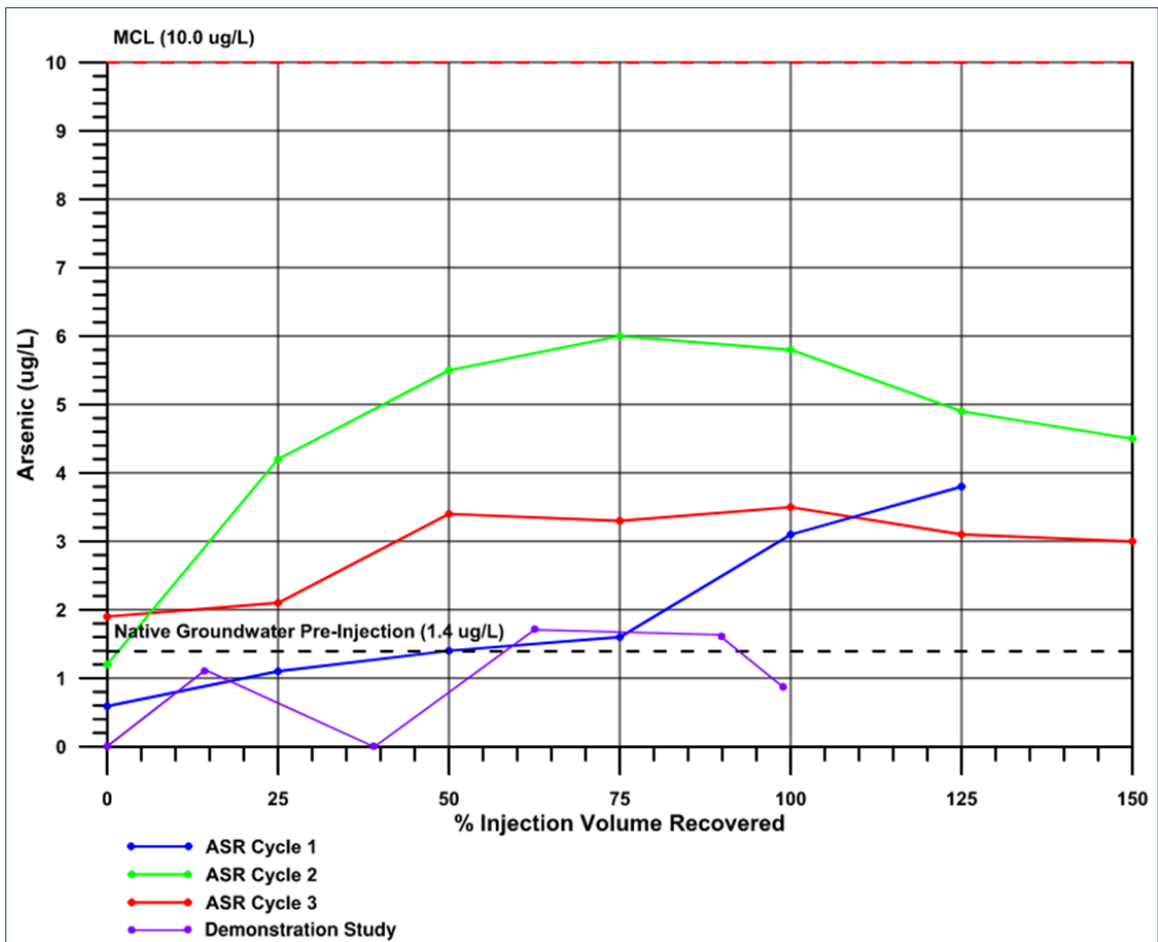


Figure 3-8 Beltz ASR Pilot and Demonstration Study Arsenic Data

Water quality data from the two studies are presented in **Table 3-8**. PFAS data were not collected during the ASR testing.

Table 3-8 ASR Pilot and Demonstration Water Quality

Contaminant	Units	MCL	Pilot Study			Demonstration Study		
			Injection Period	Storage Period	Recovery Period	Injection Period	Storage Period	Recovery Period
Ammonia	mg/L		ND	ND	ND-0.057	NR		
Arsenic	µg/L	10	ND	1.3-1.9	1.1-6	ND	ND-1.4	ND-1.7
Barium	mg/L		0.059	0.072-0.082	ND-0.076	0.055-0.067	--	--
Dissolved Oxygen	mg/L		9.06-10	0-0.1	0-0.02	9.3-9.88	0-0.33	0-0.05
Iron (Dissolved)	µg/L	300	ND	ND	ND-24	ND	ND	ND-81
Manganese (Dissolved) ⁶	µg/L	50	ND	17-33	19- 130	ND-0.17	0.98-69	50- 120
Nitrate (as Nitrogen)	mg/L	10	0.2-0.36	ND	0.12-0.14	0.37-0.39	NR	
Oxidation-Reduction Potential	mV		606-659.5	-33.6-500	-30.2-241.3	390.4-470.5	123.5-251.8	78.6-208.8
pH	SU		7.2-7.32	6.84-7.07	6.84-7.32	7.17-7.4	6.48-7.05	6.66-6.99
Sodium	mg/L		24-28	26-32	24-41	23-27	NR	
Sulfides	mg/L		ND	ND	ND	NR		
TDS	mg/L	See Note 2	260-300	340-420	290-460	250-270	NR	360
Specific Conductance	µS/cm	See Note 3	420-460	500-640	460-680	NR	570-830	470-610
Chloride	mg/L	See Note 4	21-30	25-30	24-56	22-26	27-29	NR
Sulfate	mg/L	See Note 5	69-72	110-150	74-120	66-74	NR	
HAA5s	µg/L	60	22-33	ND-19	ND-12	29-38	ND-10	ND-1.2
TTHMs	µg/L	80	44-52	27-40	ND-31	39-51	ND-50	ND-8.3

Notes:

1. Pilot study data includes samples from ASR Cycles 1-3. There is no storage period water quality data from ASR Cycle 1.
 2. California SMCL for TDS is 500 mg/L (recommended), 1,000 mg/L (upper limit), and 1,500 mg/L (short-term exposure).
 3. California SMCL for specific conductance is 900 µS/cm (recommended), 1,600 µS/cm (upper limit), and 2,200 µS/cm (short-term exposure).
 4. California SMCL for chloride is 250 mg/L (recommended), 500 mg/L (upper limit), and 600 mg/L (short-term exposure).
 5. California SMCL for sulfate is 250 mg/L (recommended), 500 mg/L (upper limit), and 600 mg/L (short-term exposure).
 6. Manganese levels during recovery period were still increasing when testing stopped.
- SU – standard units

4. Design Source Water Quality

Design source water quality was developed in conjunction with SCWD during the workshops. Design water quality is based on native groundwater quality for Wells #4, #8, #9, #10, and #12; GHWTP finished water quality; and ASR recovery water quality from the pilot and demonstration studies. Water quality will span the range of water quality from injected water to native groundwater. The native groundwater quality of the wells and the assumed design native groundwater quality is presented in **Table 4-1**. The assumed design native groundwater quality is the minimum and maximum value across the five wells. The design source water quality is also presented in **Table 4-1**. Values in bold red are greater than the SMCL, NL, and/or RL.

Table 4-1 Assumed Design Native Groundwater Water Quality Based on Well #4, #8, #9, #10, and #12 Native Groundwater Quality

Contaminant	Units	Well #4			Well #8			Well #9			Well #10			Well #12			Assumed Design Native Groundwater Quality		GHWTP Finished Water Quality (See Section 3.2)		ASR Recovery Water Quality (Pilot + Demonstration) (See Section 3.3)		Assumed Beltz WTP Source Water Quality (with ASR)	
		Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Max	Min	Max	Min	Max	Min	Max
Ammonia	mg/L	NR			ND	0.07	0.1	ND	0.07	0.08	0.07	0.11	0.26	ND	0.51	0.88	ND	0.88	ND	ND	ND	0.057	ND	0.88
Sulfide	mg/L	NR			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.85	ND	0.85	NR		ND	ND	ND	0.85
Arsenic	µg/L	0	0	0	1.4	2.3	3.1	ND	ND	ND	ND	1.4	3.2	ND	ND	ND	ND	3.2	ND	ND	ND	6	ND	6
Iron	µg/L	3.5	7	14	ND	1,100	1,900	590	920	1,100	ND	1,080	3,000	65	380	1,200	ND	3,000	ND	29	ND	81	ND	3,000
Manganese	µg/L	0.4	0.5	0.7	130	190	210	130	210	230	170	240	420	60	330	450	0.4	450	ND	8.6	19	130	ND	450
Turbidity	NTU	0.4	25	55	0.05	2.1	9.6	0.1	1.7	4.8	0.05	1.5	22	0.05	0.7	5.6	0.05	55	0.04	2	0	0	0	55
TDS	mg/L	545	625	795	440	450	480	480	490	510	570	590	620	430	465	510	430	795	250	280	290	460	250	795
Specific Conductance	µS/cm	590	800	980	580	660	860	650	690	750	740	970	1,250	360	650	800	360	1,250	320	485	460	680	320	1,250
Chloride	mg/L	54	57	60	48	50	53	42	45	50	54	59	66	25	35	48	25	66	15	30	24	56	15	66
Sulfate	mg/L	170	195	245	110	115	120	130	135	140	150	190	320	80	105	130	80	320	56	110	74	120	56	320
PFAS																								
PFOA	ng/L	NR			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	NR		ND	2.0
PFOS	ng/L	NR			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0	NR		ND	3.0
PFBS	ng/L	NR			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR		ND	ND
PFHxS	ng/L	NR			ND	3.0	4.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.0	ND	2.0	NR		ND	4.0
GenX	ng/L	NR			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR		ND	ND
PFNA	ng/L	NR			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR		ND	ND
Phosphate	mg/L	NR			NR			NR			NR			0.19	0.19	0.2	0.19	0.2	0.5	0.9	NR		0.19	0.9
Total Phosphorus	mg/L	NR			0.31	0.31	0.31	0.13	0.13	0.13	0.44	0.44	0.44	0.04	0.07	0.11	0.04	0.44	0.19	0.21	ND	0.17	ND	0.44
TTHMs		NR			NR			NR			NR			NR			NR		19	57	ND	31	ND	57
HAA5s		NR			NR			NR			NR			NR			NR		6	35	ND	12	ND	35
Chlorite		NR			NR			NR			NR			NR			NR		ND	ND	NR		ND	ND
pH	SU	6.8	7.3	7.6	6.7	7.1	7.3	7.2	7.4	7.7	6.7	7.3	7.8	7.0	7.4	7.6	6.7	7.8	7.0	7.6	6.7	7.3	6.7	7.8
Alkalinity	mg/L CaCO ₃	120	145	320	130	140	150	130	150	165	115	150	240	90	180	210	90	320	74	134	120	140	74	320
Hardness	mg/L CaCO ₃	210	295	400	200	240	355	200	250	285	260	325	450	140	250	295	140	450	122	200	170	280	122	450
TOC	mg/L	NR			0.4	3.0	7.6	NR			NR			0.82	0.83 (Note 6)	0.84	0.4	0.8 (Note 7)	0.8	2.8	0.4	1.2	0.4	2.8

Notes:

- Well #4 data collected from 1980-1992. Well #4 is currently decommissioned.
 - Well #8 and #9 data collected from 1998-2023. Well #8 data from 2022 are excluded because of potential impact from ASR injection (January–April 2022).
 - Well #10 data collected from 2009-2022.
 - Well #12 data collected from 2018-2023.
 - Minimum and maximum values for native groundwater quality are based on a range from all well data.
 - TOC data for Well #8 is from ASR Pilot Study Report. Samples were collected from Well #8 and Beltz 8 Monitoring Well on 3/18/20. 7.6 mg/L measured from Beltz 8 Monitoring Well appears to be an anomaly.
 - TOC data for Well #12 is based on two samples collected on 1/12/2020 and 2/9/2023.
- mg/L CaCO₃ – milligrams per liter calcium carbonate

5. Treated Water Quality Goals

Treated water quality goals were developed in conjunction with SCWD during the workshops. The water quality goals are summarized in **Table 5-1**. For PFAS, the treatment goal is the more stringent of California NLs or EPA’s proposed MCL/Hi. The orthophosphate residual goal was set by SCWD to inhibit corrosion in the SCWD distribution system and improve water quality.

Table 5-1 Treated Water Quality Goals for Beltz WTP

Contaminant	Units	MCL	SMCL	NL	RL	Treatment Goals		Comments
Ammonia	mg/L					<0.1		
Sulfide	mg/L					<0.024		
Arsenic	µg/L	10				<8		80% of MCL
Iron	µg/L		300			<50		
Manganese	Proposed µg/L			20	200	<16		80% of proposed NL
	Current µg/L		50	500	5,000			
Turbidity	NTU		5			<0.2		
Free Chlorine Residual	mg/L	4.0				1.0–1.5		
Combined Chlorine Residual	mg/L	4.0				<0.2 when free chlorine is 1.0–1.5		Ammonia is present in native well groundwater
TTHMs (7-day SDS)	µg/L	80				<64		80% of MCL in distribution system
HAA5s (7-day SDS)	µg/L	60				<48		80% of MCL in distribution system
Bromate	µg/L	10				<8		80% of MCL
pH	SU					7.2–8.0		Target = 7.2–8.0
Threshold Odor	TON		3			<1.5		
Orthophosphate Residual	mg/L as P ⁻					0.4–1.5		Normal operation 0.5
PFAS						Based on California NL	Based on Draft EPA MCL	<80% of NLs or proposed EPA limits; lower of the two standards
PFOA	ng/L	4		5.1	10	4.1	3.2	
PFOS	ng/L	4		6.5	40	5.2	3.2	
PFBS	ng/L	HI <1		500	5,000	400	HI <0.8*	
PFHxS	ng/L	HI <1		3.0	20	2.1	HI <0.8*	
GenX	ng/L	HI <1					HI <0.8*	
PFNA	ng/L	HI <1					HI <0.8*	

*HI = $\frac{GenX}{10} + \frac{PFBS}{2,000} + \frac{PFNA}{10} + \frac{PFHxS}{9}$, where all concentrations are in ppt or ng/L.

SDS – simulated distribution system

6. Determination of Treatment Requirements

Table 6-1 presents a summary of constituents requiring treatment at the Beltz WTP, and the contaminants exceeding treated water quality goals are presented in bold red text. Iron and manganese treatment will be required to meet SMCLs and the future NL for manganese. Ammonia and sulfide treatment will also be implemented. Treatment goals were not provided for some contaminants and are left blank.

Table 6-1 Design Water Quality – Determination of Constituents Requiring Treatment

Contaminant	Units	MCL	SMCL	NL	Treatment Goal	Assumed Treatment Plant Source Water Quality (with ASR)	
						Min	Max
Ammonia	mg/L				<0.1	ND	0.88
Sulfide	mg/L				<0.024	ND	0.85
Arsenic	µg/L	10			<8	ND	6
Iron	µg/L		300		<50	ND	3,000
Manganese	µg/L		50	20	<16	ND	450
Turbidity	NTU		5		<0.2	0	55
TDS	mg/L		See Note 1			250	795
Specific Conductance	µS/cm		See Note 2			320	1,250
Chloride	mg/L		See Note 3		<200	15	66
Sulfate	mg/L		See Note 4		<200	56	320
PFAS							
PFOA	ng/L	4.0		5.1	4.1	ND	2.0
PFOS	ng/L	4.0		6.5	5.2	ND	3.0
PFBS	ng/L	HI <1		500	400	ND	ND
PFHxS	ng/L	HI <1		3.0	2.4	ND	4.0
GenX	ng/L	HI <1				ND	ND
PFNA	ng/L	HI <1				ND	ND
Total Phosphorus	mg/L					ND	0.44
pH	SU			7.2 to 8		6.7	7.8
Alkalinity	mg/L CaCO ₃					74	320
Hardness	mg/L CaCO ₃					122	450
TOC	mg/L					0.4	2.8

Notes:

1. California SMCL for TDS is 500 mg/L (recommended), 1,000 mg/L (upper limit), and 1,500 mg/L (short-term exposure).
2. California SMCL for specific conductance is 900 µS/cm (recommended), 1,600 µS/cm (upper limit), and 2,200 µS/cm (short-term exposure).
3. California SMCL for chloride is 250 mg/L (recommended), 500 mg/L (upper limit), and 600 mg/L (short-term exposure).

- California SMCL for sulfate is 250 mg/L (recommended), 500 mg/L (upper limit), and 600 mg/L (short-term exposure).

*Hazard Index (HI) = $\frac{GenX}{10} + \frac{PFBS}{2000} + \frac{PFNA}{10} + \frac{PFHxS}{9}$, where all concentrations are in ppt or ng/L

6.1 Iron and Manganese

Iron levels are higher than the SMCL of 300 µg/mL and SCWD's treatment goal of less than 50 µg/mL. Manganese levels are higher than the SMCL of 50 µg/mL and SCWD's treatment goal of less than 16 µg/mL, which is based on the CA's proposed NL of 20 µg/mL. Treatment technologies for iron and manganese removal are presented in Section 8.1.

6.2 PFAS

PFHxS levels are higher than the NL of 3.0 ng/L and SCWD's treatment goal of 2.4 ng/L. PFHxS from Well #8 may be addressed by blending with another well. Pumping Well #8 groundwater by itself would require a PFAS treatment system to remove PFHxS to levels <80% of NL ($0.80 \times 3.0 = 2.4$ ng/L). PFAS treatment technologies are discussed in Section 8.2.

6.3 Ammonia

If ammonia is detected in the groundwater, breakpoint chlorination will be used. Chlorine (Cl_2) dose can be estimated as 8 mg/L Cl_2 required per 1.0 mg/L of ammonia (NH_3-N) to obtain free chlorine residual.

6.4 Hydrogen Sulfide

If hydrogen sulfide (H_2S) is detected in the groundwater, it will be removed through chlorination or aeration. H_2S will be oxidized with chlorine at an estimated ratio of 6 mg/L Cl_2 to 1 mg/L H_2S to provide complete oxidation of sulfide to sulfur. These ratios are the recommended values for GreensandPlus media.

Vapor phase removal would not be required since H_2S concentration is low. It is assumed that sufficient contact time (minimum of 20 minutes for hydrogen sulfide) would be provided through the aeration and filters, so no additional contact time would be required. A bench- or pilot-scale study is recommended to verify these assumptions.

6.5 Turbidity

Turbidity levels are higher than SCWD's treatment goal of less than 0.2 NTU. Turbidity will be reduced via filtration when iron and manganese treatment is implemented.

6.6 TDS, Specific Conductance and Sulfate

Maximum TDS, specific conductance, and sulfate levels may be greater than the SMCL. If any well exceeds the SMCL for TDS, specific conductance and/or sulfate, the respective well will not be operated by itself, and blending with other wells with lower TDS will be implemented.

6.7 DBPs

During Workshop #3, it was decided that additional treatment to limit formation of or remove DBPs at the Beltz WTP is not necessary. DBPs will be managed operationally with ASR strategy by providing minimum storage time to allow reduction of DBPs.

7. Design Capacity

The treatment capacity goals for the future Beltz WTP are presented in **Table 7-1**. These capacity goals were provided by SCWD in preparation for Workshop #3. Well #4 is not currently in operation but may be redrilled in the future. The future Beltz WTP should be able to run on one well at 200 gpm minimum, with the ability to operate up to three wells (Wells #8, #9, and either a future Well #4 or #10). Based on direction from SCWD, future Wells #4 or #10 are assumed to be like Wells #8 and #9 for both capacity and water quality.

Table 7-1 Treatment Capacity Goals for Beltz WTP

Well	Current Production Rate (gpm)	Design Recovery Rate (gpm) – ASR		
		Low	Typical	Maximum (Short-term Extraction for 2-4 weeks)
Well #8	250	200	250-450	730
Well #9	400 (Backwash at higher rate)	200	300-500	730
Well #10	100	0	N/A	NA
Well #4		2000	250-500	730
Total Plant Capacity		200		2,190

* Well #4 currently not in operation, but may be reconstructed as part of ASR project.

8. Selection of Treatment Technologies

This section presents an overview of potential treatment technologies. These technologies were reviewed with SCWD in Workshops #2 and #4. Descriptions of each treatment technology along with their advantages and disadvantages were presented in these workshops. The slides for the presentation are included in **Appendix B**.

8.1 Iron and Manganese Treatment

Treatment technologies available for iron and manganese removal involve oxidation and precipitation of the dissolved iron as insoluble iron hydroxides and manganese dioxide, followed by filtration to remove the precipitates using media filtration, ultrafiltration (UF) or microfiltration (MF) membrane filtration (**Figure 8-1**). Alternatives to oxidation, precipitation and filtration include: ion exchange to remove Fe⁺⁺, Fe⁺⁺⁺ and Mn⁺⁺ ions, and biological treatment to incorporate iron and manganese ions and precipitated in biological floc.

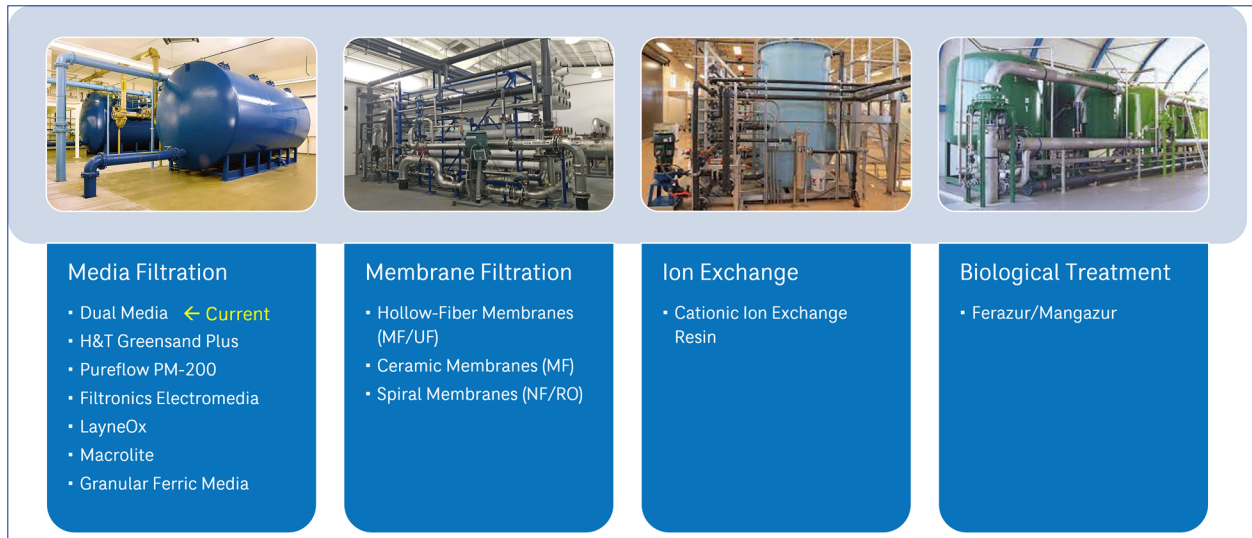


Figure 8-1 Overview of Available Treatment Technologies for Iron and Manganese

The selected treatment process needs to reliably achieve iron and manganese removal and be suitable for intermittent plant operation, since Beltz WTP is operated approximately 100 days per year in summer. Based on discussions with SCWD, the GreensandPlus was selected for further evaluation.

Other iron and manganese treatment processes were eliminated due to the limiting factors presented in **Table 8-1**.

Table 8-1 Eliminated Iron and Manganese Treatment Processes - Limiting Factors

Treatment Process	Limiting Factor
Macrolite Ceramic Media	Requires higher detention time and oxidant doses since media is non-adsorptive. Often ozone is used as oxidant to reduce detention time required.
Granular Ferric Oxide (GFO) Media	Non-regenerated and requires disposal of spent media. Does not do well for manganese removal since manganese “sticks” to media and does not come off during backwashing.
Polymeric MF/UF Membranes	Incomplete manganese oxidation can result in membrane fouling and dissolved manganese in the filtered water.
Ceramic UF Membranes	
NF/RO Membranes	Loses 15% to 20% of flow to brine. Requires brine management.
Ion Exchange	Adds sodium to system that already has TDS close to SMCL.
Biological Filtration	Requires reseeded and re-populating filters with bacteria. Not ideal for plants that are operated intermittently.

8.2 PFAS Treatment

Granular activated carbon (GAC), ion exchange (IX), and nanofiltration (NF)/reverse osmosis (RO) membranes are all proven treatment technologies for PFAS removal.

A comparison between GAC and single-use ion exchange is presented in **Table 8-2**. The ion exchange resin for PFAS removal (anionic, single use) is different from the ion exchange resin for iron/manganese removal (cationic, regenerable).

Table 8-2 GAC versus Ion Exchange

	GAC	Single-Use Ion Exchange
Footprint	Larger infrastructure footprint	Smaller infrastructure footprint
Bed Life	Typical bed life: 50,000–120,000 bed volumes	Typical bed life: 250,000–300,000 bed volumes
Cost	GAC media is less expensive than ion exchange resin. Life-cycle costs for GAC and ion exchange are often similar.	Ion exchange resin is more expensive than GAC. Life-cycle costs for GAC and ion exchange are often similar.
Effectiveness	Less effective for short-chain PFAS	Effective for a wider range of PFAS
Usage	Well-established technology for PFAS treatment. GAC is used for a wide range of VOC, SOCs and there is more experience treating groundwater with GAC.	Well-established technology for PFAS treatment.
Pretreatment	Pretreatment is needed to increase media life span.	Pretreatment is needed to increase media life span.
Backwash	Backwash is available	Backwash not recommended
Reactivation/Regeneration	Currently, disposal options for spent GAC include landfilling or incineration. Destruction of PFAS through thermal reactivation of GAC is being studied and reuse of regenerated GAC for PFAS removal may be allowed in the future.	Currently, disposal options for spent ion exchange resin include landfilling or incineration. Regeneration is not feasible.
Disposal	Disposal of spent GAC allowed at select landfills	Disposal of spent ion exchange resin allowed at select landfills ion exchange can be incinerated to destroy PFAS, but current spent ion exchange is disposed in landfills

Based on discussion with SCWD, GAC was eliminated based on large footprint requirements. NF/RO were also eliminated due to the generation of a PFAS-brine stream and potential disposal issues.

Based on preliminary discussions between SCWD and DDW, blending will be accepted for PFAS treatment at the Beltz WTP. However, wells that exceed water quality goals cannot be run by themselves. If blending is not possible, the plant would need to be shut down.

CDM Smith also analyzed if onsite ion exchange treatment is feasible within the existing treatment plant location (see section 8.2.1).

8.2.1 PFAS Treatment Evaluation

PFAS Treatment of Well #8

As PFAS was only detected in Well #8, wellhead ion exchange treatment for Well #8 was evaluated. The iron and manganese concentrations for Well #8 are higher than recommended for ion exchange treatment and would require treatment before the ion exchange process. Providing a separate treatment train dedicated to Well #8 was not considered desirable so this alternative was not further evaluated.

PFAS Ion Exchange Treatment at Beltz WTP

To evaluate the potential feasibility of PFAS treatment at the Beltz WTP, PFAS treatment of the entire treatment capacity was evaluated. Ion exchange resin requires unchlorinated water. Therefore, this treatment alternative includes a dechlorination process upstream of ion exchange followed by rechlorination downstream of ion exchange. This treatment alternative is further discussed in Section 10.2 and 10.3.

8.2.2 Site Access and Ion Exchange Resin Delivery Vehicle Tracking Analysis

There are several methods of resin delivery and replacement:

1. Utilizing the slurry trailer – Pushing the resin using an air compressor to pressurize the vessel to 20 psi, allowing the resin to flow into a slurry trailer. The slurry trailer has a total of four compartments that can hold up to 500 cubic feet (cf) of resin per compartment. For the resin to be removed utilizing this process, the vessel must have a resin out line located on the bottom of the vessel. The maximum amount of resin that the slurry trailer will carry at one time will be less than 1,000 cf.
2. Utilizing an air compressor to slurry directly into super sacks – Pushing the resin using an air compressor to pressurize the vessel to 20 psi, allowing the resin to flow into super sacks. A super sack holds 35 to 40 cf of media. Water needs to be drained from the super sacks off-site to dry the media prior to transportation. The vendor can also take the resin back in the slurry trailer.
3. Utilizing a hurricane “Vac” service to remove the resin into super sacks – This method allows the removal of resin that is hardened in the vessel or when the resin can only be removed from a top access point on a large vessel. Hardening of the resin can occur when resin is in the vessels for extended periods of time and has accumulated a lot of fines; this is not expected to occur at the Beltz WTP.

As discussed in Section 1, the project site is in the middle of a residential area, accessible on the east side via a narrow alley (174 ft of 20 ft wide easement) from Thirty-Eighth Avenue, or on the south side via a secondary access way (120 ft long, 10 ft wide) from Roland Drive. A vehicle tracking

analysis was performed using AutoTurn software to determine whether ion exchange resin delivery trucks can pull or back into the project site.

For method 1 utilizing the slurry trailer, which is a 40 ft long slurry tanker that sits on a tractor frame (40 ft chassis), the ion exchange resin delivery truck is 63 ft long overall. Based on AutoTurn analysis, a standard ion exchange resin delivery truck cannot access the site without driving onto a private property.

For methods 2 and 3, a service truck that has a 24 ft flatbed can be used to transport the super sacks. The same service truck can be used to bring a hurricane "Vac" onsite. As shown in **Figure 8-2**, a service truck with a hurricane "Vac" in tow would be able to access the site from the east side gate provided the full width of the road for 100 ft on 38th Avenue is available. The service truck would pull into the road across the street from the site and back into the driveway approaching the Beltz WTP. Traffic control would be required to stop traffic in both directions on 38th Avenue for a few minutes.



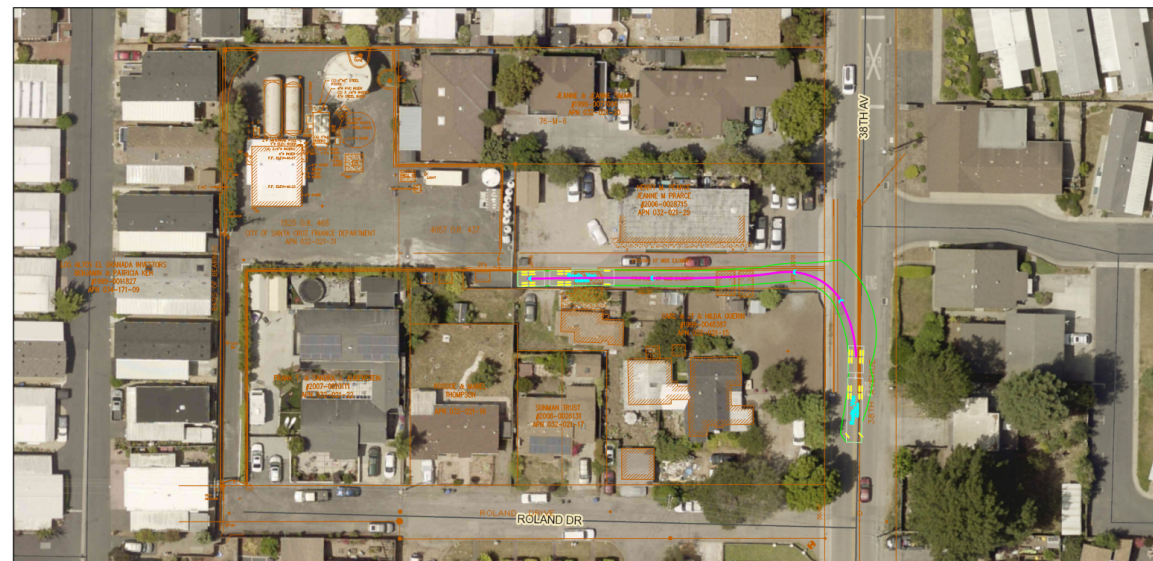
1:480
0 30 60 120 ft
0 5 10 20 m
County of Santa Cruz

HEADING NORTH, PULLING IN



1:480
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County of Santa Cruz

HEADING SOUTH, PULLING IN



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0 30 60 120 ft
0 5 10 20 m
County of Santa Cruz

HEADING SOUTH, BACKING IN



1:480
0 30 60 120 ft
0 5 10 20 m
County of Santa Cruz

HEADING SOUTH, BACKING IN FROM SIDE STREET

Figure 8-2 Vehicle Tracking Analysis for Ion Exchange Resin Delivery Truck

9. Selection of Treatment Alternatives

9.1 Treatment Alternatives for Evaluation

Based on discussion with SCWD during a follow-up meeting to Workshop #4, the following three treatment alternatives were selected for further evaluation:

- Alternative #1: Chlorination + Aeration + GreensandPlus + Blending for PFAS Reduction
- Alternative #2: Chlorination + Aeration + GreensandPlus + Ion Exchange for PFAS Treatment
- Alternative #3: Chlorination + GreensandPlus + Ion Exchange for PFAS Treatment (maximum capacity)

Alternative #3 was included to determine the maximum treatment capacity that could be accommodated on-site assuming additional wells are drilled or rehabilitated for ASR implementation.

It is recognized that Alternatives #1 and #3 do not provide PFAS treatment technology and rely on blending whereas Alternative #2 includes PFAS treatment. PFAS treatment may or may not be required depending on actual water quality from the wells. Alternative #3 focused on determining maximum potential treatment capacity at the Beltz WTP site so is not directly comparable to either Alternatives #1 and #2.

As the revised proposed manganese NLs and RLs were published during the preparation of this study, CDM Smith analyzed existing finished water quality data from the Beltz WTP to confirm the existing technology could meet the new proposed standards. Existing finished water quality data are shown in **Figure 9-1**. Based on review of this data, it was determined that the existing treatment process can meet the new proposed manganese standard. The SCWD operators noted that higher turbidity is observed toward the end of filter runs and more frequent backwashing may be required for consistent compliance with the new proposed manganese standard.

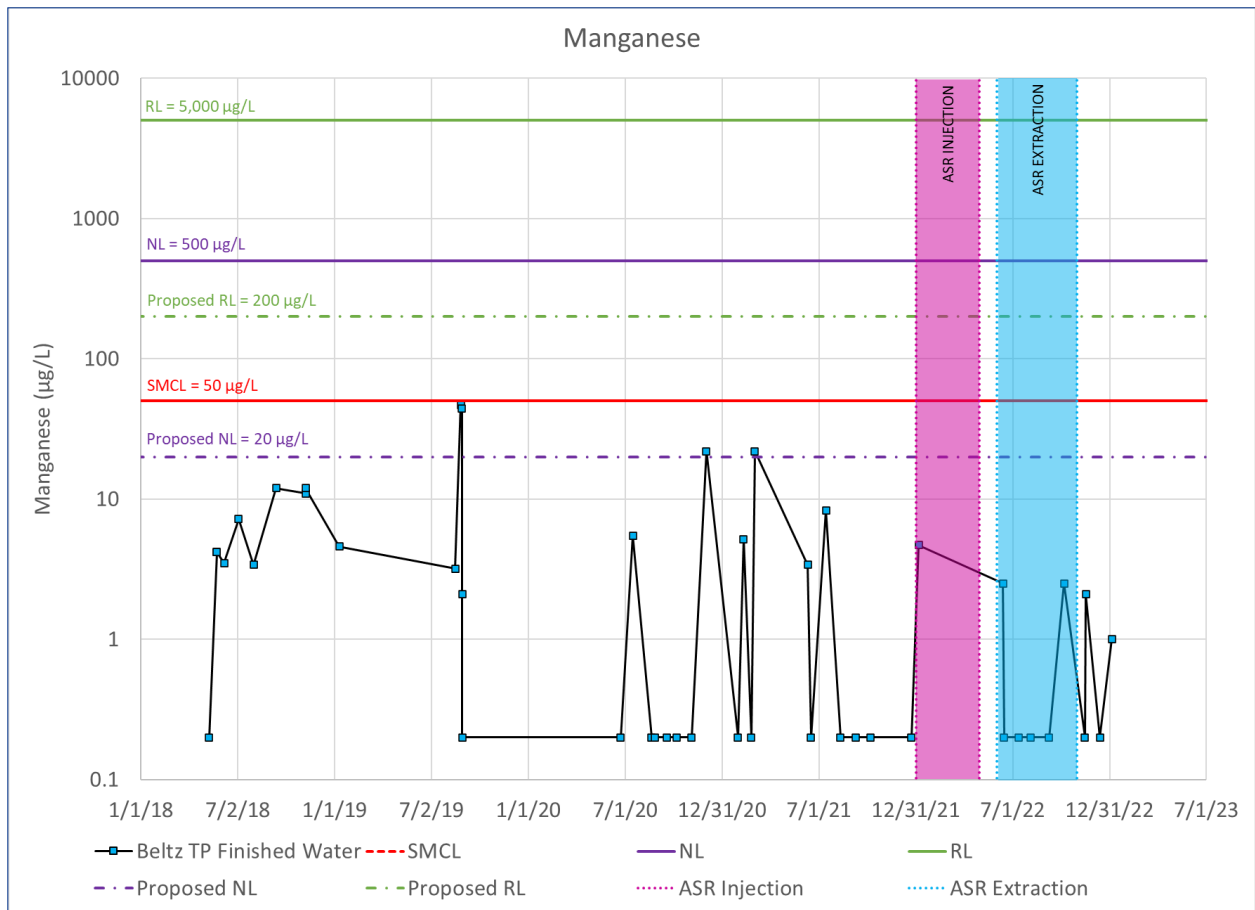


Figure 9-1 Current Beltz WTP Finished Water Quality

9.2 Aeration Treatment Process Alternatives

SCWD requested that different aerator technologies be evaluated with each alternative. Aeration provides oxidation of iron and manganese in the well water.

Two common types of aerators are tray type and packed tower. With tray-type aerators, water is introduced at the top of the unit and flows across a perforated tray, over a weir to the next lower tray, until it exits the bottom of the stripper. The unit may include three or more trays. Air is bubbled through the water via the perforations in the trays. SCWD currently uses a tray-type aerator at the Beltz WTP and at Graham Hills Water Treatment Plant (GHWTP).

Tray-type aerators are easier to clean because the trays can be pulled out of the unit through a hinged door. Tray-type aerators typically require more air than packed towers, which increases energy costs. However, tray-type aerators allow greater turn-down of flow rates than packed-tower aerators. The maximum capacity of tray type aerators is 1,000 gpm per unit.

In packed-tower aerators, water enters the top of the tower and flows down through packing material while air moves up through the tower. Packed-tower aerators are more difficult to clean, but have a lower pressure drop and use less air, which provides lower energy costs. Also, engineered packing that is resistant to clogging is available. Packed-tower aerators typically operate at 2:1 turn-down of flows, and require custom designed liquid distributors to achieve greater turn-down.

While either type of aerator may be used at Beltz WTP, due to the wide range of operating flows (200 gpm to 2,190 gpm), three tray-type aerators, each rated for 730 gpm, is recommended.

9.3 Booster Pumping Options

The booster pumps will be sized to provide sufficient head to overcome headlosses through the filters, and ion exchange treatment system (cartridge filters and lead-lag ion exchange vessels) if applicable, and provide 100 psi operating pressure in the distribution system. Due to low flow and high head requirements, horizontal split-case pumps and/or multi-stage vertical turbine pumps were considered. While both types of pumps may be used at Beltz WTP, vertical turbine pumps are shown in the site layouts, because horizontal split-case pumps generally require more space than vertical turbine pumps.

Vertical turbine pumps with submersible motors were also considered to reduce noise impacts but eliminated because the submersible motors require deeper sump.

9.4 Chemical Dose Assumptions

Chemical doses and assumptions are summarized in **Table 9-1**.

Table 9-1 Summary of Chemical Doses

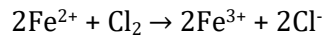
Chemical	Dose			Assumption	
		Alternative 1	Alternative 2		Alternative 3
Sodium Hypochlorite for Iron and Manganese Treatment	Minimum	2.0 mg/L	2.0 mg/L	2.0 mg/L	Assumes oxidation of 0.15 mg/L of iron, 0.13 mg/L of manganese and 1.5 mg/L excess chlorine dose.
	Average	3.9 mg/L	3.9 mg/L	3.9 mg/L	Assumes oxidation of 1.0 mg/L of iron, 0.2 mg/L of manganese and 1.5 mg/L excess chlorine dose.
	Maximum	13.1 mg/L	13.1 mg/L	18.5 mg/L	For Alternatives 1 and 2, assumes oxidation of 3.0 mg/L of iron and 0.45 mg/L of manganese; breakpoint chlorination of 0.9 mg/L of ammonia; and 1.5 mg/L excess chlorine dose. For Alternative 3, chlorine dose also includes oxidation of 0.9 mg/L of hydrogen sulfide.

Chemical	Dose			Assumption	
		Alternative 1	Alternative 2		Alternative 3
Sodium Bisulfite	Minimum	N/A	0.3 mg/L	0.3 mg/L	Assumes quenching 0.2 mg/L of chlorine residual in filter effluent.
	Average	N/A	1.6 mg/L	1.6 mg/L	Assumes quenching 1.0 mg/L of chlorine residual in filter effluent.
	Maximum	N/A	3.2 mg/L	3.2 mg/L	Assumes quenching 2.0 mg/L of chlorine residual in filter effluent.
Sodium Hypochlorite for Post-chlorination	Minimum	N/A	1.0 mg/L	1.0 mg/L	Based on SCWD's water quality goals (See Table 5-1)
	Average	N/A	1.2 mg/L	1.2 mg/L	
	Maximum	N/A	1.5 mg/L	1.5 mg/L	
Orthophosphate	Minimum	0.4 mg/L as P	0.4 mg/L as P	0.4 mg/L as P	Based on SCWD's water quality goals (See Table 5-1)
	Average	0.5 mg/L as P	0.5 mg/L as P	0.5 mg/L as P	
	Maximum	1.5 mg/L as P	1.5 mg/L as P	1.5 mg/L as P	

9.4.1 Sodium Hypochlorite

Sodium hypochlorite will be injected upstream of the aeration system for oxidation of iron and manganese as below.

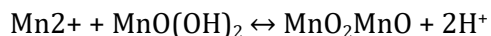
- Iron Oxidation: The oxidation of iron with chlorine can be described by the reaction:



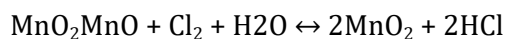
The amount of chlorine required for the oxidation of iron is 0.63 mg Cl₂/mg Fe²⁺ (MWH, 2005).

- Manganese Oxidation: The oxidation of manganese with chlorine enhanced by filtration through media coated with MnO₂ can be described by the following two-step reactions:

Step 1: Adsorption of Mn²⁺ on the MnO₂ surface:



Step 2: Oxidation of the adsorbed species by chlorine:

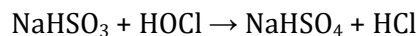


The amount of chlorine required for the oxidation of manganese is about 1.29 mg Cl₂/mg Mn²⁺ (MWH, 2005).

For GreensandPlus media filtration, chlorine doses recommended by manufacturer will be used: 1.0 mg Cl₂/mg Fe²⁺ and 3.0 mg Cl₂/mg Mn²⁺.

9.4.2 Sodium Bisulfite

If ion exchange for PFAS treatment is implemented, sodium bisulfite will be added to the filtered water upstream of the ion exchange system to quench the residual chlorine and prevent damage to the ion exchange resin. This reaction is summarized below.



The amount of sodium bisulfite required for quenching residual chlorine is about 1.47 mg NaHSO₃/mg Cl₂. Sodium bisulfite dose will be established conservatively based on 1.6 mg NaHSO₃/mg Cl₂. Assuming free chlorine residual in filtered water of 0.2 mg/L minimum, 1.0 mg/L average, and 2.0 mg/L maximum, the sodium bisulfite doses will be 0.3 mg/L minimum, 1.6 mg/L average, and 3.2 mg/L maximum.

9.4.3 Sodium Hypochlorite for Post-chlorination

If ion exchange for PFAS treatment is implemented, filtered water will be dechlorinated, and ion exchange effluent water will be re-chlorinated to provide free chlorine residual in the treated water. Sodium hypochlorite doses will be 1.0 mg/L minimum, 1.2 mg/L average, and 1.5 mg/L maximum to achieve SCWD's target free chlorine residual of 1.0 to 1.5 mg/L (see **Table 5-1**).

9.4.4 Orthophosphate

Orthophosphate doses will be 0.4 mg/L as P minimum, 0.5 mg/L as P average, and 1.5 mg/L as P maximum to achieve SCWD's target orthophosphate residual of 0.4 to 1.5 mg/L (see **Table 5-1**).

9.5 Beltz WTP General Improvements

For each alternative, the following general assumptions were made:

- The treatment facility does not need to remain online during construction.
- The existing treatment processes and building may be demolished. The new building, if needed, will be masonry construction. The new building, if needed, will include electrical and chemical rooms, and will be sized to allow for addition of future improvements (e.g., PFAS treatment). The new sodium hypochlorite generator will be located indoors.
- Reuse of the existing bolted steel tank should be considered, if possible.
- Standby power will be provided via a portable generator.
- Distribution system water will be used to supply the filter backwash at up to 1000 gpm for maximum of 30 minutes. Due to backwash rate of 15 gallons per minute per square foot (gpm/ft²), the diameter of vertical filters will be limited to 9 ft.
- Sound enclosures will be provided for outdoor equipment (blowers and/or pumps) to minimize noise impacts.

10. Treatment Alternatives

The three treatment alternatives are described in detail in this section. Detailed process design criteria for all three alternatives are summarized in Section 10.4.

- Alternative #1: Chlorination + Aeration + GreensandPlus + Blending for PFAS Reduction
- Alternative #2: Chlorination + Aeration + GreensandPlus + Ion Exchange for PFAS Treatment
- Alternative #3: Chlorination + GreensandPlus + Ion Exchange for PFAS Treatment (maximum capacity)

10.1 Alternative 1 – Chlorination + Aeration + GreensandPlus + Blending for PFAS Reduction

In Alternative 1, groundwater pumped from the Wells #8, #9 and #4/10 will be chlorinated with sodium hypochlorite upstream of aeration, as part of the iron and manganese treatment process. The chlorinated and aerated water will be pumped using vertical turbine booster pumps through the GreensandPlus media filters and discharged to the distribution system. The filtered water will be injected with orthophosphate for corrosion control prior to discharge to the distribution system. Filter backwash water will be collected in washwater recovery tanks and reclaimed to the plant influent water line.

The treatment capacity of Alternative 1 is 2,190 gpm. The process flow schematic for Alternative 1 is shown in **Figure 10-1**. A detailed process flow diagram and site layout for Alternative 1 are shown in **Figures 10-2** and **10-3**, respectively.

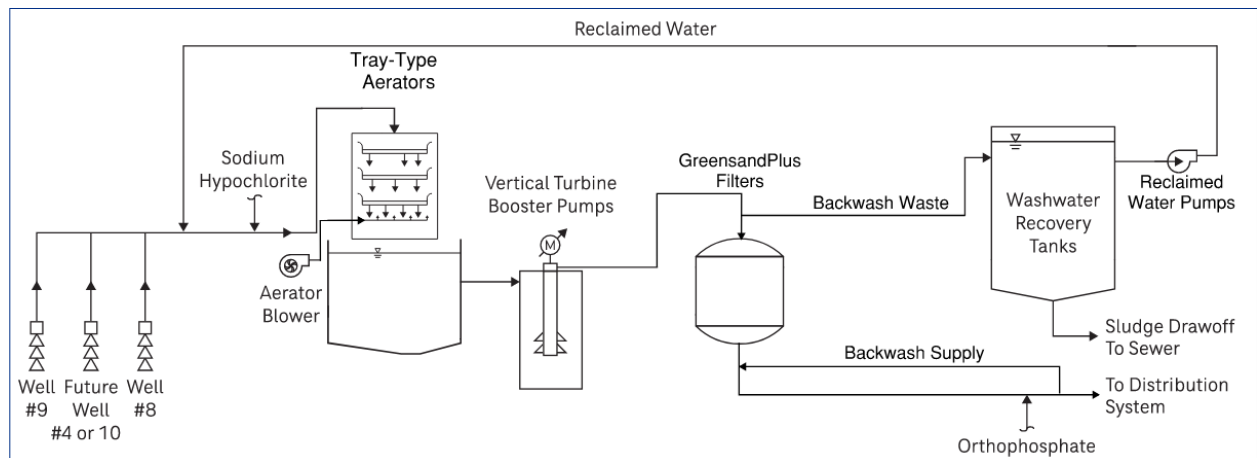


Figure 10-1 Alternative 1 Process Flow Schematic

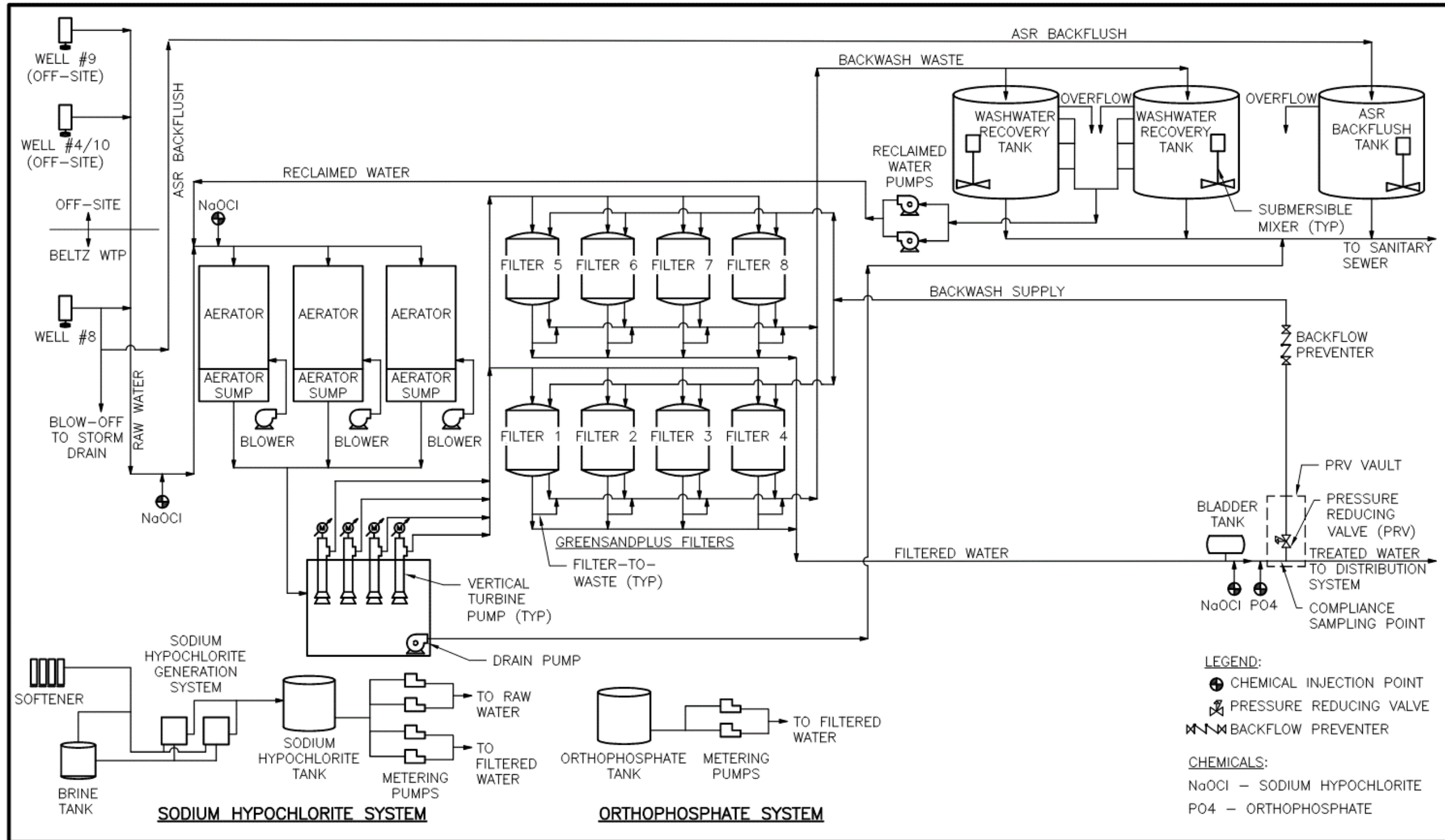


Figure 10-2 Alternative 1 Process Flow Diagram

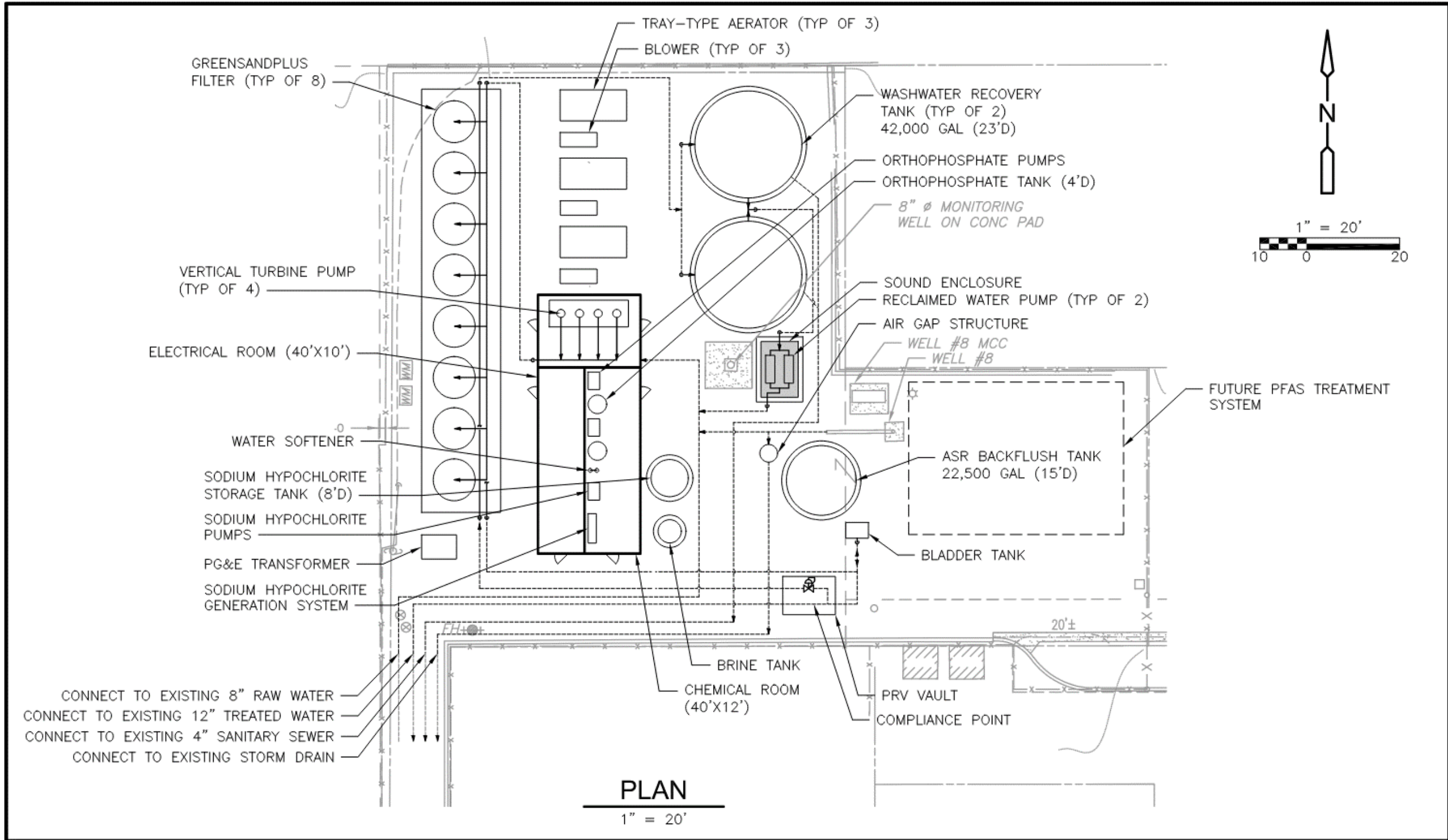


Figure 10-3 Alternative 1 Site Layout

Alternative 1 includes three tray-type aerators, each rated for 730 gpm capacity, with 40 hp blowers. Four vertical turbine pumps (three duty and one standby) will be 75 hp each with variable frequency drives (VFDs). The booster pumps will be sized to push water through the GreensandPlus media filters and provide 100 psi pressure in the distribution system.

GreensandPlus™ is a black filter media that has manganese dioxide coated surface that acts as a catalyst in the oxidation reduction reaction of iron and manganese. The published hydraulic flow rate for GreensandPlus media is 2 to 12 gpm/ft². For this project, since water quality of future Well #4/10 is currently unknown and pilot test using Beltz native groundwater has not been performed, the GreensandPlus filters will be sized for maximum hydraulic loading rate of 5 gpm/ft².

As shown in **Figures 10-2 and 10-3**, an ASR equalization tank will be provided to equalize ASR backwash water before discharging to the sanitary sewer at a slower controlled rate. Detailed process design criteria are provided in **Table 10-1** in Section 10.4.

Alternative 1 includes demolition of all on-site buildings, tanks and equipment, except the existing Well #8 and Beltz monitoring well. All new treatment process equipment will be provided, including new booster pumps, aeration system, filtration system, backwash recovery system, electrical building and chemical storage/feed facility. Sodium hypochlorite generation system is sized based on average chlorine dose required and anticipated average plant flow. Approximately 7 days of salt storage will be provided under average dose and flow conditions. Alternative 1 will rely on blending for compliance with PFAS regulations. However, space will be provided to add ion exchange system for PFAS treatment in the future should PFAS treatment be required due to changing water quality or regulations. The new electrical service and transformer will be sized to accommodate future addition of PFS treatment. A new transformer will be conservatively sized at 1,500 kVA to accommodate future electrical loads.

As shown in **Figure 10-3**, the entire site, 16,000 square feet (sf), will be disturbed.

10.2 Alternative 2 – Chlorination + Aeration + GreensandPlus + Ion Exchange for PFAS Treatment

Alternative 2 is similar to Alternative 1 with the addition of active PFAS treatment using ion exchange, in lieu of blending. Alternative 2, also rated for 2,190 gpm treatment capacity, will have two ion exchange trains, each with two vessels operating in lead-lag configuration. The ion exchange system will be sized assuming that the entire plant flow would be treated for PFAS.

The ion exchange system, including cartridge filters and two ion exchange vessels in lead-lag configuration, will add up to 50 psi of headloss. Due to limited space available on-site, it is assumed that the vertical turbine booster pumps, upstream of the dual media filters will be sized to pump water through the GreensandPlus media filters, cartridge filters, and the ion exchange vessels and provide 100 psi pressure in the distribution system. The four vertical turbine pumps (three duty and one standby) will be 125 hp each with VFDs.

Ion exchange media should not be exposed to oxidants, so dechlorination of filtered water is required upstream of ion exchange. Then the ion exchange effluent will be post-chlorinated to provide a residual in the distribution system. Additional chlorination feed system will be provided for post-chlorination.

A 1500 kVA transformer is required to accommodate the electrical loads of Alternative 2.

The process flow schematic for Alternative 2 is shown in **Figure 10-4**, and the design criteria are provided in **Table 10-1** in Section 10.4. A detailed process flow diagram and site layout for Alternative 2 are shown in **Figures 10-5** and **10-6**, respectively. As shown in **Figure 10-6**, the entire site, 16,000 sf, will be disturbed.

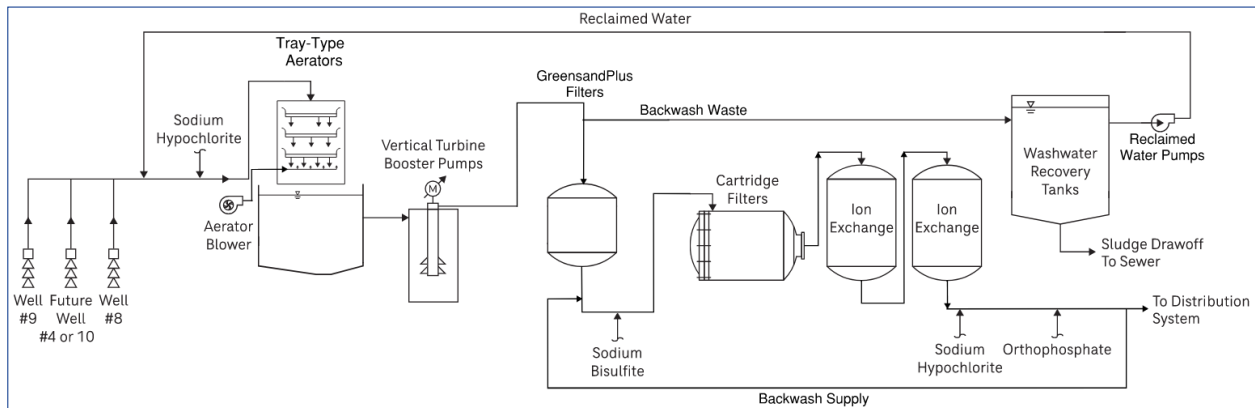


Figure 10-4 Alternative 2 Process Flow Schematic

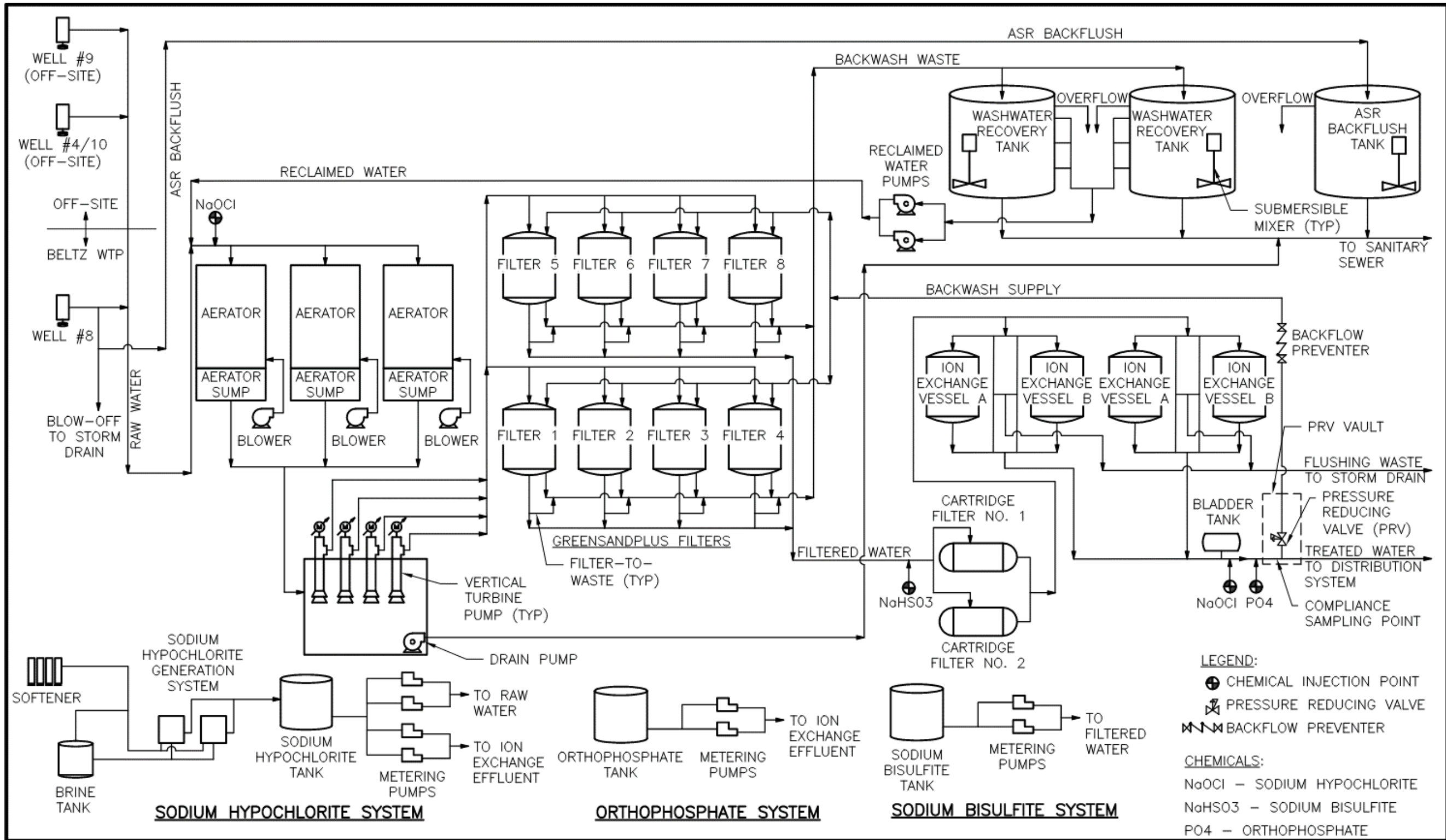


Figure 10-5 Alternative 2 Process Flow Diagram

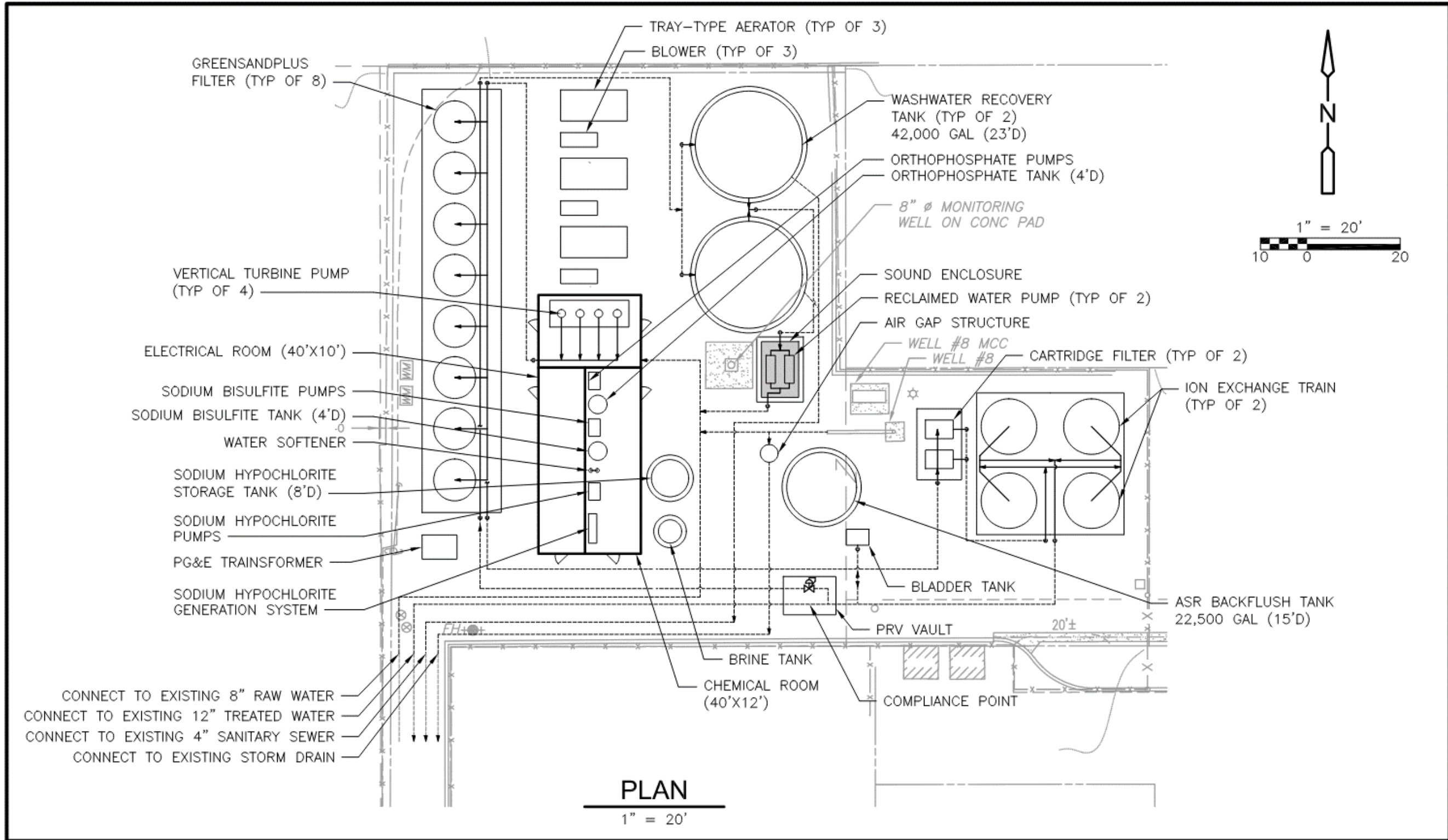


Figure 10-6 Alternative 2 Site Layout

10.3 Alternative 3 – Chlorination + GreensandPlus + Ion Exchange for PFAS Treatment

Alternative 3 was evaluated to estimate the maximum treatment capacity that can be provided at the Beltz WTP site, by simplifying the treatment processes. Alternative 3 is similar to Alternative 2 but does not include aeration system upstream of the GreensandPlus media filters. By eliminating the aeration system, Alternative 3 will provide a total of ten GreensandPlus filter vessels, with a n+1 treatment capacity of 2,800 gpm. The increase treatment capacity also increases the size of the ancillary equipment (e.g. backwash recovery tanks and recovery pumps, chemical storage and feed systems, etc.).

Although aeration can be provided upstream of GreensandPlus, it is not required as the GreensandPlus media catalyzes the oxidation reaction for iron and manganese. Without the aeration system, additional chlorine dose is required to oxidize hydrogen sulfide.

The process flow schematic for Alternative 3 is shown in **Figure 10-8**. A detailed process flow diagram and site layout for Alternative 3 are shown in **Figures 10-9** and **10-10**, respectively.

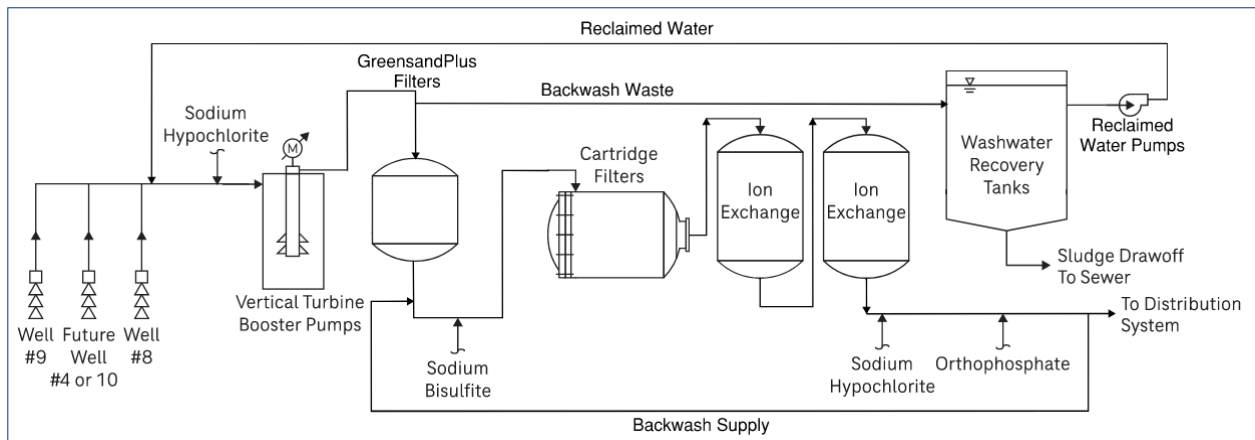


Figure 10-8 Alternative 3 Process Flow Schematic

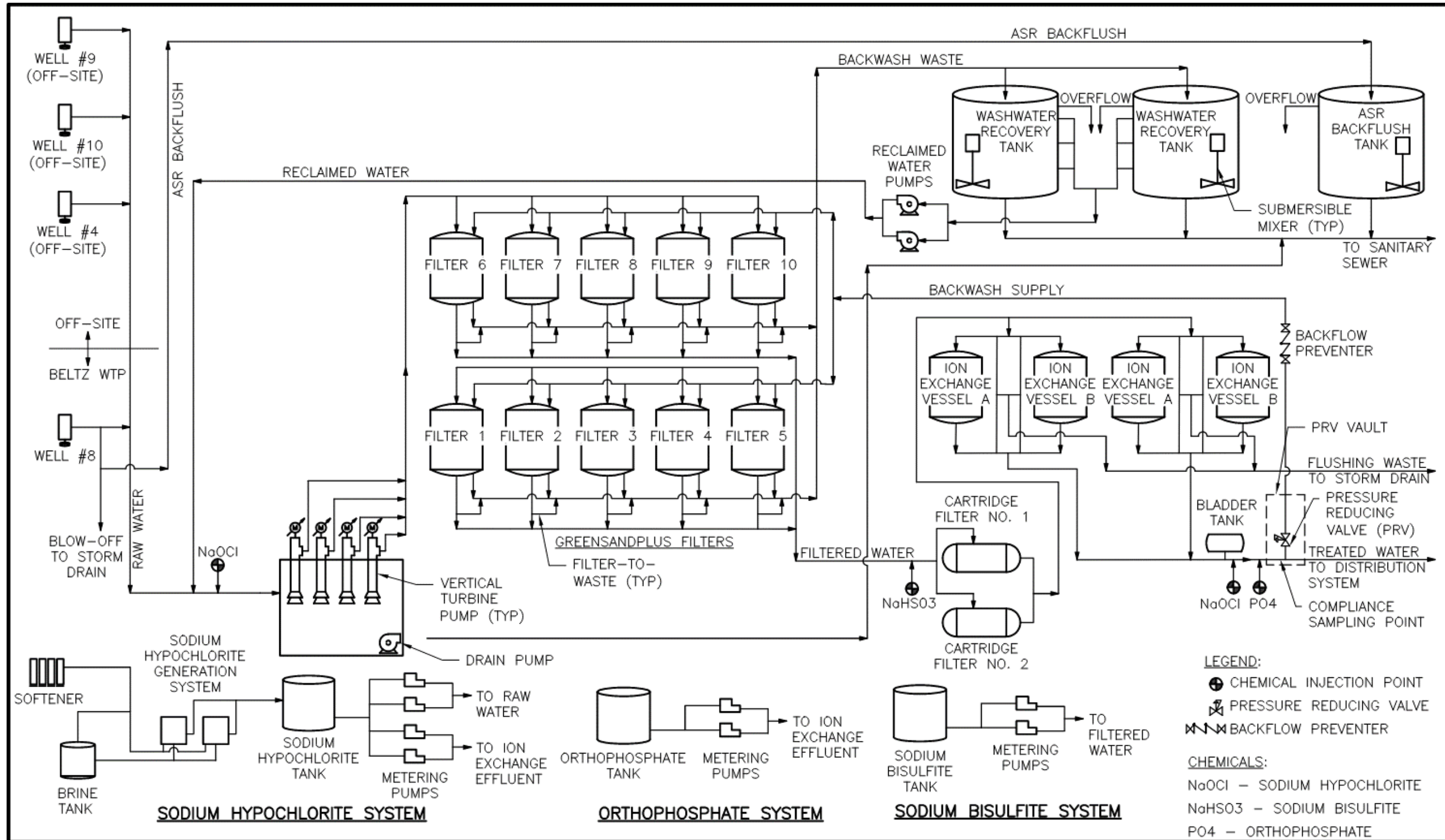


Figure 10-9 Alternative 3 Process Flow Diagram

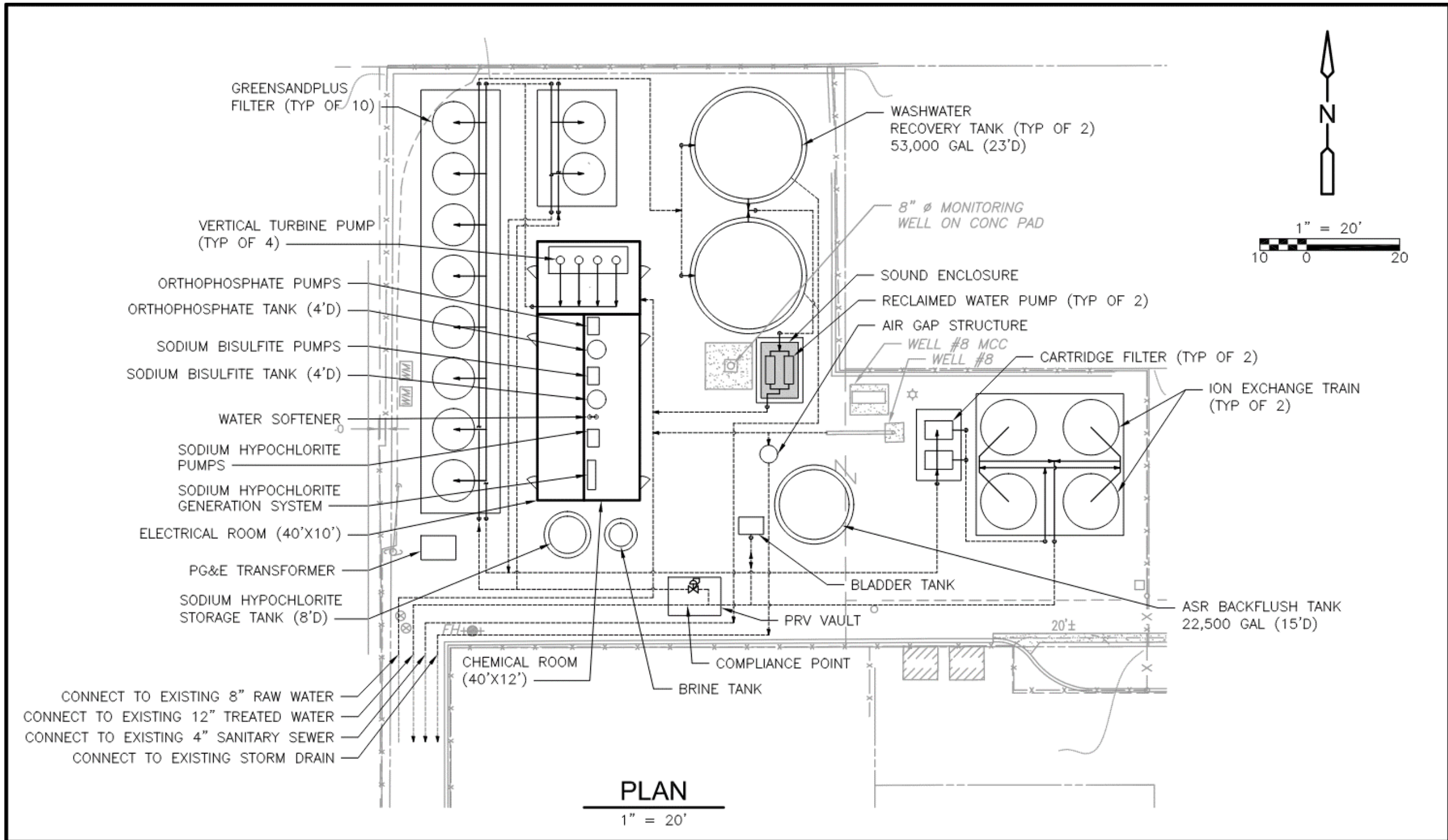


Figure 10-10 Alternative 3 Site Layout

At 2,800 gpm treatment capacity, Alternative 3 includes four vertical turbine pumps (three duty and one standby), each with a 125 hp motor with VFD. The booster pumps will be sized to push water through the Greensand media filters, cartridge filters, ion exchange vessels and provide 100 psi pressure in the distribution system.

A 1,500 kVA transformer is required to accommodate the loads of Alternative 3. Detailed process design criteria are provided in **Table 10-1** in Section 10.4. As shown in **Figure 10-3**, the entire site, 16,000 square feet (sf), will be disturbed.

10.4 Summary of Alternatives Design Criteria

The design criteria for Alternatives 1-3 are provided in **Table 10-1**.

Table 10-1 Summary of Alternatives Design Criteria

Process	Units	Alternative 1	Alternative 2	Alternative 3
Plant Capacity				
Minimum Plant Flow	gpm	200	200	200
Average Plant Flow	gpm	1,500	1,500	1,900
Maximum Plant Flow	gpm	2,190	2,190	2,800
Aeration				
Type		Tray Aerator	Tray Aerator	
Number of Aerators	each	3 (3 duty, 0 standby)	3 (3 duty, 0 standby)	
Capacity, each	gpm	750	750	
Number of Trays	each	4	4	
Blower Power	hp	40	40	
Approximate Overall Dimensions	W (ft) x L (ft) x H (ft)	12x13x8.3	12x13x8.3	
Wetwell				
Volume	gal	10,000	10,000	10,000
Detention Time	min	20	20	20
Booster Pumps				
Type		Vertical Turbine	Vertical Turbine	Vertical Turbine
Number	each	4 (3 duty, 1 standby)	4 (3 duty, 1 standby)	4 (3 duty, 1 standby)
Capacity, each	gpm	730	730	933
Total Head	ft	280	400	400
Horsepower	hp	75	125	125
Filtration				
Media Type		GreensandPlus	GreensandPlus	GreensandPlus
Diameter	ft	9	9	9

Process	Units	Alternative 1	Alternative 2	Alternative 3
Height	ft	20	20	20
Area	ft ²	64	64	64
Total No. Filters	each	8	8	10
Configuration		n+1	n+1	n+1
<u>Individual Filter Flow Rates</u>				
All Filters in Service	gpm	274	274	280
1 Filter in Backwash	gpm	313	313	311
<u>Hydraulic Loading Rates</u>				
All Filters in Service	gpm/ft ²	4.3	4.3	4.4
1 Filter in Backwash	gpm/ft ²	4.9	4.9	4.9
Backwash Rate	gpm/ft ² (water)	15	15	15
Backwash Rate Duration	min	10	10	10
Filter-to-Waste Duration	min	3	3	3
Backwash Volume per Filter	gallons	9,543	9,543	9,543
Airwash Blower				
Airwash Blower Capacity	scfm @ 5 psi	266	266	266
Airwash Blower Power	hp	15	15	15
Air Compressor (See Note 1)				
Compressor Capacity	acfm @ 80 psi	5	5	5
Compressor Power	hp	1	1	1
Dechlorination (See Section 9.4)				
Chemical			Sodium Bisulfite	Sodium Bisulfite
Storage Type			Vertical XLPE Tank	Vertical XLPE Tank
Capacity	gal		300	300
Minimum Dose	mg/L		0.3	0.3
Average Dose	mg/L		1.6	1.6
Maximum Dose	mg/L		3.2	3.2
Cartridge Filters				
Type			Cartridge Filtration	Cartridge Filtration
No. of Filter Housings	each		2 (1 duty, 1 standby)	2 (1 duty, 1 standby)
Height	ft			
Cartridge Filter Element Diameter	in		2.5	2.5
Cartridge Filter Element Length	in		40	40

Process	Units	Alternative 1	Alternative 2	Alternative 3
No. Cartridge Filter Elements Per Vessel	each		178	205
Loading Rate (n)	gpm/10"		1.5	1.7
Loading Rate (n-1)	gpm/10"		3.1	3.4
Inlet/Outlet Connection	in		14	14
Filtration Rating	microns		5	5
Filter Material			Polypropylene	Polypropylene
Vessel Material			SS304	SS304
Orientation			Horizontal	Horizontal
Pressure Rating	psi		150	150
Ion Exchange				
Treatment Capacity	gpm		2,190	2,800
No. of Vessel Pairs	each		2	2
No. of Vessels	each		4	4
Vessel Diameter, each	ft		12	12
Bed Depth	ft		3.0	3.4
Resin Volume, Each	ft ³		340	375
Minimum Flow for Ion Exchange Vessel	gpm		250	250
Empty Bed Contact Time Per Vessel Pair at Design Flow	min		2	2
Surface Loading Rate	gpm/ft ²		9.7	12.4
Specific Flow Rate	gpm/ft ³		3.7	3.7
Pressure Rating			125	125
Washwater Recovery Tanks				
Number	each	2	2	2
Type		Bolted steel	Bolted steel	Bolted steel
Volume, each	gal	42,000	42,000	53,000
Height	ft	16	16	20
Reclaimed Water Pumps				
Type		Horizontal End Suction	Horizontal End Suction	Horizontal End Suction
Number	each	2	2	2
Capacity, each	gal	219	219	280
Sodium Hypochlorite Generation				
Number of Units	each	1	1	1

Process	Units	Alternative 1	Alternative 2	Alternative 3
Capacity, each	ppd	200	200	300
Sodium Hypochlorite Storage				
Number of Tanks	each	1	1	1
Type		Vertical HDLPE	Vertical HDLPE	Vertical HDLPE
Capacity	gal	3,650	3,650	5,000
Height	ft	14	14	14
Brine Storage Tank				
Number of Tanks	each	1	1	1
Capacity	gal	575	575	5 ton
Height	ft	3.8	3.8	8.5
Sodium Hypochlorite Dosing (Oxidation) (See Section 9.4)				
Minimum Dose	mg/L	2.0	2.0	2.0
Average Dose	mg/L	3.9	3.9	3.9
Maximum Dose	mg/L	13.1	13.1	18.5
Sodium Hypochlorite Dosing (Distribution System Residual) (See Section 9.4)				
Minimum Dose	mg/L		1.0	1.0
Average Dose	mg/L		1.2	1.2
Maximum Dose	mg/L		1.5	1.5
Corrosion Control (See Section 9.4)				
Chemical		Orthophosphate	Orthophosphate	Orthophosphate
Storage Type		Vertical XLPE Tank	Vertical XLPE Tank	Vertical XLPE Tank
Capacity	gal	200	20	300
Minimum Dose	mg/L as P	0.4	0.4	0.4
Average Dose	mg/L as P	0.5	0.5	0.5
Maximum Dose	mg/L as P	1.5	1.5	1.5

Notes:

1. A receiver is needed to store 80 psi compressed air to provide enough air for 266 scfm at 5 psi.

acfm – actual cubic feet per minute
 cfm – cubic feet per minute
 ft – feet
 ft² – square feet
 gal – gallon
 gpm/ft² – gallons per minute per square foot
 HDLPE – high-density linear polyethylene
 HDPE – high-density polyethylene

hp – horsepower
 min – minute
 ppd – pounds per day
 psi – pounds per square inch
 scfm – standard cubic feet per minute
 XLPE – cross-linked polyethylene

11. Treatment Alternatives Evaluation – Business Case Evaluation

The Santa Cruz Water Program Management Plan includes a business case evaluation (BCE) process and a BCE tool. The BCE tool is being used to evaluate the three alternatives developed in this technical memorandum. Scoring criteria is arranged into four categories:

- Social: Impacts to people, whether they be customers, the general public, or employees,
- Environmental: Impacts to the environments,
- Economic: Capital and present value cost, and
- Operational: Impacts to the operation and maintenance.

Each criteria is given a weight, and each alternative is given a score for each criteria based on the scoring guidance. The alternative with the highest overall weighted score has the strongest business case. SCWD provided the tool to be used for this project, including the criteria, scoring guidance, and weighting. Based on discussions with SCWD, the scoring was finalized as part of the draft technical memorandum review process.

11.1 Redundancy and Reliability

Critical water treatment process units have redundant capabilities as listed in **Table 11-1**. For reliability of the chemical dosing, redundant chemical metering pumps will be provided. A redundant storage tank will not be provided. All alternatives provide same level of redundancy in process equipment.

Table 11-1 Equipment, Facility, and Chemical Redundancy

Process Equipment	Alternative 1 (2,190 gpm)		Alternative 2 (2,190 gpm)		Alternative 3 (2,800 gpm)	
	Number of Units	Firm Capacity (gpm) with Largest Unit Offline	Number of Units	Firm Capacity (gpm) with Largest Unit Offline	Number of Units	Firm Capacity (gpm) with Largest Unit Offline
Groundwater Wells	3	1,460	3	1,460	3+	1,460 to 2,070
Aeration	3	1,460	3	1,460	NA	NA
Booster Pumps	4 (3 duty, 1 standby)	2,190	4 (3 duty, 1 standby)	2,190	4 (3 duty, 1 standby)	2,800
Filtration	8	2,190 with one filter in backwash	8	2,190 with one filter in backwash	10	2,800 with one filter in backwash
Washwater Recovery Tanks	2	1,095	2	1,095	2	1,400

Process Equipment	Alternative 1 (2,190 gpm)		Alternative 2 (2,190 gpm)		Alternative 3 (2,800 gpm)	
	Number of Units	Firm Capacity (gpm) with Largest Unit Offline	Number of Units	Firm Capacity (gpm) with Largest Unit Offline	Number of Units	Firm Capacity (gpm) with Largest Unit Offline
Sodium Bisulfite Tank	N/A	N/A	1	0	1	0
Sodium Bisulfite Pumps	N/A	N/A	2 (1 duty, 1 standby)	2,190	2 (1 duty, 1 standby)	2,800
Cartridge Filters	N/A	N/A	2 (1 duty, 1 standby)	2,190	2 (1 duty, 1 standby)	2,800
Ion Exchange	N/A	N/A	2 trains (2 duty, 0 standby)	1,095	2 trains (2 duty, 0 standby)	1,400
Reclaimed Water Pumps	2 (1 duty, 1 standby)	2,190	2 (1 duty, 1 standby)	2,190	2 (1 duty, 1 standby)	2,800
ASR Backflush Tank	1	0	1	0	1	0
Sodium Hypochlorite Generation System	1	0	1	0	1	0
Sodium Hypochlorite Storage Tanks	1	0	1	0	1	0
Sodium Hypochlorite Pumps	2 (1 duty, 1 standby)	2,190	4 (2 duty, 2 standby)	2,190	4 (2 duty, 2 standby)	2,800
Orthophosphate Tank	1	0	1	0	1	0
Orthophosphate Pumps	2 (1 duty, 1 standby)	2,190	2 (1 duty, 1 standby)	2,190	2 (1 duty, 1 standby)	2,800

11.2 Water Quality and System Adaptability

All three alternatives can treat increased ranges of iron, manganese, hydrogen sulfide, and ammonia with additional chlorine dose. For extremely high concentrations, a lower flow rate will be required for equivalent run lengths.

With respect to PFAS, Alternatives 2 and 3 can adapt to future source water quality changes. Early breakthrough and bed life are a concern with increased PFAS levels. With increased PFAS levels, it is recommended to add additional resin volume to increase EBCT. Alternative 1 would require addition of PFAS treatment if PFAS levels increase in the future.

11.3 Technical Complexity, Ease of Operation, and Operational Flexibility

11.3.1 Operability

The ease of operation and the operational flexibility of each alternative are considered below in **Table 11-2**. All alternatives would be able to treat higher levels of key contaminants with higher chlorine dose. PFAS treatment can be added to Alternative 1. Based on the source water quality analysis, arsenic is not currently a concern, and treatment for arsenic is not required at Beltz WTP. However, should arsenic levels increase in the future, none of the alternatives can treat higher levels of arsenic without additional chemicals (e.g. ferric chloride). Alternatives 2 and 3 would occupy the entire site. Alternative 1 has identified and reserved limited space for addition of future equipment.

Table 11-2 Operational Advantages and Disadvantages

	Alternative 1	Alternative 2	Alternative 3
Ability to treat higher levels of iron and manganese	Advantage: Treatable with higher chlorine dose		
Ability to treat hydrogen sulfide and/or ammonia	Advantage: Treatable with higher chlorine dose		
Ability to treat higher levels of PFAS	Disadvantage: PFAS treatment would need to be added	Advantage: Treatable; throughput to breakthrough would be reduced with higher influent PFAS levels	Advantage: Treatable; throughput to breakthrough would be reduced with higher influent PFAS levels
Ability to treat arsenic	Disadvantage: Treatment process would need to be modified by adding ferric chloride feed to treat arsenic		
Footprint requirements	Advantage: Small footprint requirement	Disadvantage: Large footprint requirement	Advantage: Large footprint requirement
Ability to increase capacity	Advantage: Space available to add additional filters for increased capacity	Disadvantage: No space available to add additional filters for increased capacity	Disadvantage: No space available to add additional filters for increased capacity. Higher capacity than Alternatives 1 and 2

11.3.2 Sidestream Management

Table 11-3 summarizes the sidestreams for each alternative. Alternatives 2 and 3 have additional sidestreams from the ion exchange treatment process. Alternative 3 has more filters than Alternatives 1 and 2 and will generate more filter backwash waste.

Ion exchange flush waste will have high chloride-to-sulfate ratio (CSMR) immediately after resin change-out. The short-term change in CSMR could increase corrosion potential. To minimize impacts, the IX resin will be flushed to waste until the initial sulfate stripping subsides and CSMR returns to previous historical value.

Table 11-3 Summary of Sidestreams

Sidestream	Total Flow (gallons)			Discharge Location	Discharge to Sewer Flow Rate
	Alternative 1	Alternative 2	Alternative 3		
Well					
Well Backflush ¹	22,500 per well	22,500 per well	22,500 per well	ASR Backflush Tank for equalization, followed by discharge to sewer at slower rate	Discharge to sewer at slower rate (maximum 75 gpm)
Well Pump-to-Waste ²	22,500 per well	22,500 per well	22,500 per well	Storm Drain	
Filters					
Filter Backwash Waste	9,550 per filter	9,550 per filter	9,550 per filter	Washwater Recovery Tank for settling, followed by discharge of settled solids to sewer	Discharge settled solids to sewer (maximum 75 gpm, 1 to 3 times per week)
Filter-to-Waste Flow	920 per filter	920 per filter	920 per filter		
Ion Exchange					
Ion Exchange Flush Waste ³ (after resin change-out)	NA	10,500	10,500	Storm Drain	
Ion Exchange Flush Waste (after long-term shutdown)	NA	108,000	108,000	Storm Drain	

Notes:

1. Occurs only during ASR injection process.
2. Occurs only during well extraction process.
3. Expected resin bedlife is approximately 5 years.
4. Maximum sewer discharge flow rate of 75 gpm may be increased with new sewer pipe connection and sewer discharge permit amendment.

11.4 Assumptions for Comparative Equipment Cost

The equipment comparative capital cost estimates presented in **Table 11-4** include estimated costs for major equipment only. The costs were obtained from vendors during this stage of conceptual analysis and will change as the design progresses. A complete OPCC estimate is prepared for the preferred alternative only and presented in Section 12.2.

The comparative equipment cost includes replacement of major equipment every 15 years, and vessels and tanks every 20 years.

11.5 Assumptions for O&M Cost Estimates

The O&M cost estimates includes power cost, chemical cost, and ion exchange resin replacement cost (where applicable). Labor cost is not included. Labor is assumed to be same as for the current operation. Assumptions used for the O&M cost estimates include:

- Operating at 1,500 gpm for Alternatives 1 and 2 or 1,900 gpm for Alternative 3, 100 days per year (Memorial Day to Labor Day), and 24 hours per day
- Unit power cost of \$0.30 per kW-hr

11.6 Final Business Case Evaluation Scoring

Table 11-4 is the draft BCE summary table.

Table 11-4 BCE Criteria (shaded cells indicate criteria provided by SCWD)

Criteria ID	Criteria	Description	Scoring Guidance	Scoring Code	Weighting	Score			Weighted Score			Notes
						Alternative 1: Chlorination + Aeration + GreensandPlus + Blending (2,190 gpm)	Alternative 2: Chlorination + Aeration + GreensandPlus + Ion Exchange (2,190 gpm)	Alternative 3: Chlorination + GreensandPlus + Ion Exchange (2,800 gpm)	Alternative 1: Chlorination + Aeration + GreensandPlus + Blending (2,190 gpm)	Alternative 2: Chlorination + Aeration + GreensandPlus + Ion Exchange (2,190 gpm)	Alternative 3: Chlorination + GreensandPlus + Ion Exchange (2,800 gpm)	
Social												
SO1	Service Reliability	Directly maintains and improves reliability of service	10 – Allows (or supports) City to meet a service goal that it is currently unable to meet 5 – Project improves upon a service goal that the City currently meets 1 – Project improves service above targets that are already met 0 – Does not have recognizable contribution towards level of service criteria	R	7.0	5	5	7.5	35	35	53	All three alternatives improve upon a service goal that the City currently meets. Alternative 3: Increased capacity would provide added service (less reliance on GHWTP) and allow SCWD to reach 6 mgd goal. Alternative 3 does not score a 10, because Alternative 3 requires other projects (new wells and distribution system improvements) to achieve maximum capacity.
SO2	Impact to Homes or Businesses	Reduces short-term impact to service or access to homes or businesses due to construction	Duration of construction impact (in months) to neighboring homes and businesses with regard to disruption of service or limited access to property or facilities.	L	5.0	18	24	24	13	0	0	Construction impact for Alternative 1 will be around 1 to 1.5 years. Construction impact for Alternatives 2 and 3 will be around 1.5 to 2 years.
SO3	Visual Impacts	Visual impacts associated with building/structure heights and mass, landscaping, planting lighting, etc.	10 – Project improves visual impact compared to current site condition 5 – Project has no visual impact on current site conditions 1 – Project somewhat worsens visual impact 0 – Project significantly worsens visual impact	R	3.0	1	0	0	3	0	0	All three alternatives have tall vessels (e.g., filters, washwater tanks) close to the property line. All three alternatives include outdoor tanks and vessels of various sizes, within 5 ft from W, N and E property lines. Vertical greensand filter vessels are 20 ft tall; WW tanks are 16 ft tall; and IX vessels are 17 ft tall. All alternatives will be designed to minimize lighting impact to the neighbors.
SO4	Water Quality	Directly improves or enhances water quality or aesthetic water quality <ul style="list-style-type: none"> ▪ Water Quality: Ability to produce water that meets or exceeds water quality goals. Ability to improve perceived aesthetic quality of water being delivered to customers: taste, odor, color ▪ Ability to remove CECs ▪ Ability to reduce disinfection by products (DBPs) ▪ Ability to provide added disinfection factors of safety 	10 – Project significantly improves water quality beyond regulatory requirements 5 – Project somewhat improves water quality beyond regulatory requirements 1 – Project minimally improves water quality beyond regulatory requirements 0 – Project meets regulatory requirements	R	10.0	1	6	5	10	60	50	Alternative 1 provides same level of treatment as the existing plant, and could meet regulatory requirements for PFAS by blending. However, operational flexibility is restricted since Well #8 cannot be operated by itself. Alternatives 2 and 3 provide PFAS treatment in addition to manganese removal, and somewhat improves water quality beyond regulatory requirements. Alternatives 1 and 2 get additional 1 point for lower chlorine dose that reduces DBP formation potential.
Total Social Weight					25.0	Social Subtotal			61	95	103	

Criteria ID	Criteria	Description	Scoring Guidance	Scoring Code	Weighting	Score			Weighted Score			Notes
						Alternative 1: Chlorination + Aeration + GreensandPlus + Blending (2,190 gpm)	Alternative 2: Chlorination + Aeration + GreensandPlus + Ion Exchange (2,190 gpm)	Alternative 3: Chlorination + GreensandPlus + Ion Exchange (2,800 gpm)	Alternative 1: Chlorination + Aeration + GreensandPlus + Blending (2,190 gpm)	Alternative 2: Chlorination + Aeration + GreensandPlus + Ion Exchange (2,190 gpm)	Alternative 3: Chlorination + GreensandPlus + Ion Exchange (2,800 gpm)	
Environmental												
EV1	Chemical Environmental Footprint	Minimizes the amount of chemical or media usage, number of systems, and environmental footprint of chemical/media manufacture and disposal.	10 – No impact on environmental footprint from chemical/media use, manufacturing, or disposal 5 – Minimal impact on environmental footprint from chemical/media use, manufacturing, or disposal 1 – Moderate impact on environmental footprint from chemical/media use, manufacturing, or disposal 0 – Significant impact on environmental footprint from chemical use/manufacturing	R	6.0	5	1	1	30	6	6	All three alternatives require increased sodium hypochlorite generation to treat iron, manganese, sodium hypochlorite, and ammonia. Alternatives 2 and 3 require additional chemical use for dechlorination upstream of ion exchange and re-chlorination downstream. Alternatives 2 and 3 require manufacturing and disposal of ion exchange resin. Alternative 3 requires more chemical use than Alternatives 1 and 2 due to the higher capacity.
EV2	Greenhouse Gas Emission Reduction	Project promotes efficient use of resources in construction and operation <i>Health in All Policies, Sustainability Pillar</i> <ul style="list-style-type: none"> Operational energy consumption (power demand/use) 	Greenhouse gas emissions from power consumption (metric tons/year)	L	6.0	20.9	28.9	23.8	17	0	10	Greenhouse gas emissions are estimated based on power consumption of on-site treatment equipment, not including power consumption of well pumps. Alternative 1: No significant change in greenhouse gas emissions from the existing system. Alternative 2: Higher power consumption due to additional pumping head for IX. Alternative 3: Reduced power consumption due to elimination of aeration blowers. Higher power consumption due to additional pumping head for IX.
EV3	Noise	Reduces noise with respect to working environment and neighborhood, including consideration for the degree of mitigation required to reduce noise to acceptable levels	10 – No noise impact 5 – Minimal noise impact to working environment or neighborhood 1 – Moderate noise impact to working environment or neighborhood 0 – Significant noise impact to working environment and/or neighborhood	R	3.0	5	5	5	15	15	15	All alternatives will meet County noise ordinance at property line (document dB requirement) by implementing noise mitigation.
Total Environmental Weight					15.0	Environmental Subtotal			62	21	31	
Operational												

Criteria ID	Criteria	Description	Scoring Guidance	Scoring Code	Weighting	Score			Weighted Score			Notes
						Alternative 1: Chlorination + Aeration + GreensandPlus + Blending (2,190 gpm)	Alternative 2: Chlorination + Aeration + GreensandPlus + Ion Exchange (2,190 gpm)	Alternative 3: Chlorination + GreensandPlus + Ion Exchange (2,800 gpm)	Alternative 1: Chlorination + Aeration + GreensandPlus + Blending (2,190 gpm)	Alternative 2: Chlorination + Aeration + GreensandPlus + Ion Exchange (2,190 gpm)	Alternative 3: Chlorination + GreensandPlus + Ion Exchange (2,800 gpm)	
OP1	System Adaptability	<ul style="list-style-type: none"> Ability to adapt to future source water quality changes Ability to adapt to future regulations Space for future systems/structures 	<p>10 – Project can accommodate future changes to source water quality or regulations without additional facilities</p> <p>5 – Project can accommodate future changes to source water or regulations with minimal modifications</p> <p>1 – Project can accommodate future changes to source water or regulations with significant modifications</p> <p>0 – Project cannot accommodate future changes to source water quality or regulations</p>	R	10.0	5	10	6	50	100	60	<p>Alternative 1 would require significant modifications (addition of PFAS treatment) to adapt to changes to source water quality (detection of additional PFAS contaminants above regulatory requirements) or PFAS regulations.</p> <p>Alternatives 2 and 3 can adapt to future changes to source water quality and future PFAS regulations without additional treatment facilities.</p> <p>Alternative 3 scores lower than Alternative 2 because without aeration, may require significant change to meet any changes to DBP Regulations.</p>
OP2	Technical Complexity and Ease of Operation	<p>Reduces complexity of operation and maintenance</p> <ul style="list-style-type: none"> Ease of operation during power outages Reliability of the equipment to operate without excessive maintenance effort Ease of access to equipment and structures for maintenance activities Ability to automate systems to alleviate plant operator workload Complexity of process, including equipment. More complex processes require higher level of operator attention and potentially more modes of failure 	<p>10 – Significantly decreases complexity of operation</p> <p>5 – Slightly decreases or maintains current level of complexity of operation</p> <p>1 – Somewhat increases complexity of operation, normal operation and maintenance can be performed by persons with sufficient training</p> <p>0 – Significantly increases complexity of operation and maintenance, requires high levels of expertise for normal operation</p>	R	10.0	5	0	1	50	0	10	<p>All three alternatives have GreensandPlus, which cannot be idle for more than 2-3 days without a manual reoxidation process.</p> <p>Operational complexity of Alternative 1 is somewhat increased due to the GreensandPlus system being new.</p> <p>Operational complexity of Alternatives 2 and 3 is significantly increased by the addition of dechlorination system and IX. IX is a new treatment system and there are consequences (damage to IX resin) if dechlorination system fails.</p> <p>Operational complexity of Alternative 3 is slightly decreased by elimination of the aeration system.</p> <p>Alternatives 1 and 2 with aeration have lower chlorine dose than Alternative 3.</p>

Criteria ID	Criteria	Description	Scoring Guidance	Scoring Code	Weighting	Score			Weighted Score			Notes
						Alternative 1: Chlorination + Aeration + GreensandPlus + Blending (2,190 gpm)	Alternative 2: Chlorination + Aeration + GreensandPlus + Ion Exchange (2,190 gpm)	Alternative 3: Chlorination + GreensandPlus + Ion Exchange (2,800 gpm)	Alternative 1: Chlorination + Aeration + GreensandPlus + Blending (2,190 gpm)	Alternative 2: Chlorination + Aeration + GreensandPlus + Ion Exchange (2,190 gpm)	Alternative 3: Chlorination + GreensandPlus + Ion Exchange (2,800 gpm)	
OP3	Operational Flexibility	<ul style="list-style-type: none"> Increases options for Operations to maintain system service Increases options for Maintenance to maintain assets Resilience under intermittent operation, including ease and quickness of system startup and ability to shut down for long periods of time 	<p>10 – Provides redundancy or an alternate operating mode to a critical process in the system. System can be started quickly and indefinitely shut down without impact.</p> <p>5 – Provides redundancy or an alternate operating mode to a non-critical process in the system. System can be started quickly or shut down for several months without impact.</p> <p>1 – Provides a useful feature that allows additional flexibility in the system. System cannot be started quickly or be shut down for several months without moderate impact.</p> <p>0 – Does not provide tangible improvements to system flexibility. System cannot be started quickly or be shut down for several months without severe impact.</p>	R	10.0	5	1	1	50	10	10	<p>All three alternatives require soaking GreensandPlus in high concentration chlorine solution for long-term shutdown.</p> <p>Alternative 1 does not allow for operation of Well #8 by itself when ASR recovery water quality approaches native groundwater quality.</p> <p>Alternatives 2 and 3 allow operating Well #8 by itself. However, Alternatives 2 and 3 with IX require flushing IX system daily to keep resin fresh. Long-term shutdown of IX is feasible but requires flushing to waste upon restarting the system. IX is not ideal for intermittent operation.</p>
Total Operational Weight					25.0	Operational Subtotal			150	110	80	
Economic												
EC1	Present Value	The present value of the equipment cost, O&M cost, and replacement costs associated with implementing each alternative (see Appendix D)	Present values are taken from the Alternative Sheets.	L	30.0	\$9,116,000	\$14,325,000	\$12,875,000	109	0	30	See Appendix C for vendor quotes. See Appendix D for Present Value Cost calculations.
EC2	Capital (Comparative Equipment Costs)	The costs associated with implementing each alternative (see Appendix D)	Cost values are taken from the Alternative Sheets.	L	0.0	\$2,964,000	\$4,951,000	\$4,889,000	0	0	0	
Total Economic Weight					30.0	Economic Subtotal			109	0	30	
Total Weight					100	Total Score			381	226	244	

Scoring Codes:

- R – Rubric scoring using qualitative valuation; see "Scoring Guidance"
- H – Quantitative values available; HIGH values preferred
- L – Quantitative values available; LOW values preferred

Notes:

1. O&M cost estimates assume operating Beltz WTP at 1,500 gpm for Alternatives 1 and 2 or 1,900 gpm for Alternative 3, 24 hours per day, 100 days per year, and power unit cost of \$0.30 per kilowatt-hour (kW-hr). Labor costs are not included in the O&M cost estimate.
2. The capital cost used in the present value estimate includes the cost of major equipment only.

12. Preferred Alternative

Alternative 1 was selected as the preferred alternative by SCWD after review. Alternative 1 scored the highest in the business case evaluation and received the highest scores in the Environmental and Economic categories. Alternative 1 has lower chemical environmental impact and greenhouse gas emissions than Alternatives 2 and 3 and is the least expensive out of the three options while allowing for additional treatment to be added in the future.

12.1 Description of Preferred Alternative

12.1.1 Demolition

The existing tray aerator and ancillary equipment, horizontal pressure filters, booster pumps, sodium hypochlorite generation and feed system, reclaimed water tank and pumps, electrical gear, and building will be demolished. The olive tree located at the northeast corner of the site will also be removed. Existing Beltz Well #8, MCC, and the existing monitoring well will be protected in place.

12.1.2 Site Improvements

The existing site is entirely paved, draining to the southwest corner of the site toward the south entrance. No new stormwater management BMPs are assumed for this project.

12.1.3 Site Access and Site Security

The existing site fence and walls will be protected in place. No changes will be made to the site access, consisting of the 20 ft double-swing gate on the east entrance and a 10 ft gate on the south entrance.

12.1.4 Process Improvements

The treatment processes for the 2,190-gpm treatment plant include chlorination, aeration, and filtration through GreensandPlus filters. Ion Exchange for PFAS treatment is not included, but space is reserved for addition in the future, should the water quality or regulations change. Future improvements in PFAS treatment such as chlorine resistant resins, regenerable resins, more effective GAC and novel adsorbents should be considered prior to implementing a PFAS treatment solution. The process flow diagram and site layout for the preferred alternative are presented in **Figures 12-1 and 12-2**. An alternative site layout showing packed-tower aerator is shown in **Figure 12-3**.

Sound enclosures will be provided for outdoor pumps and blowers to minimize noise disturbance.

Site lighting (e.g., downward directed lighting) will be installed to minimize impacts to neighbors.

12.1.5 Electrical Improvements

The existing electrical service is powered from an overhead PG&E power line, riser pole, and an on-site pad mounted utility transformer. The existing service is 480V, 400 Amp main-fused switch with

provision for connection of a portable generator via a manual transfer switch. The internal plant distribution consists of a main "Panel P" and "Pump Panel" located in the existing facility building. The utility transformer feeds an existing MCC located outdoors which provides power to the existing well.

To accommodate the addition of electrical loads for this project, the electrical improvements will be designed to accommodate a new 1500kVA service transformer and electrical room. The proposed 40' x 10' electrical room will facilitate the integration of a new switchboard, ensuring seamless power transmission and control. The switchboard's critical role will be to efficiently allocate power to key systems including three 40 hp aeration blowers, four 75 hp VFD booster pumps, filter airwash blower, filter air compressor, and filter motorized valves. Additionally, the switchboard will supply power to lighting panels for ancillary loads i.e. lighting, HVAC loads, etc., the existing MCC, sodium hypochlorite generation system, hydrogen dilution blower, as well as influent and effluent sodium hypochlorite dosing pumps, orthophosphate dosing pumps, washwater mixing pumps, and two 30 hp VFD reclaimed water pumps. Furthermore, the electrical room can accommodate up to 25% spare of additional loads for future PFAS system (e.g., the 75 hp VFD booster pumps would need to be replaced with 125 hp VFD booster pumps if PFAS treatment system is added in the future). Existing portable generator and manual transfer switch may not be sufficient enough to accommodate the new electrical improvements.

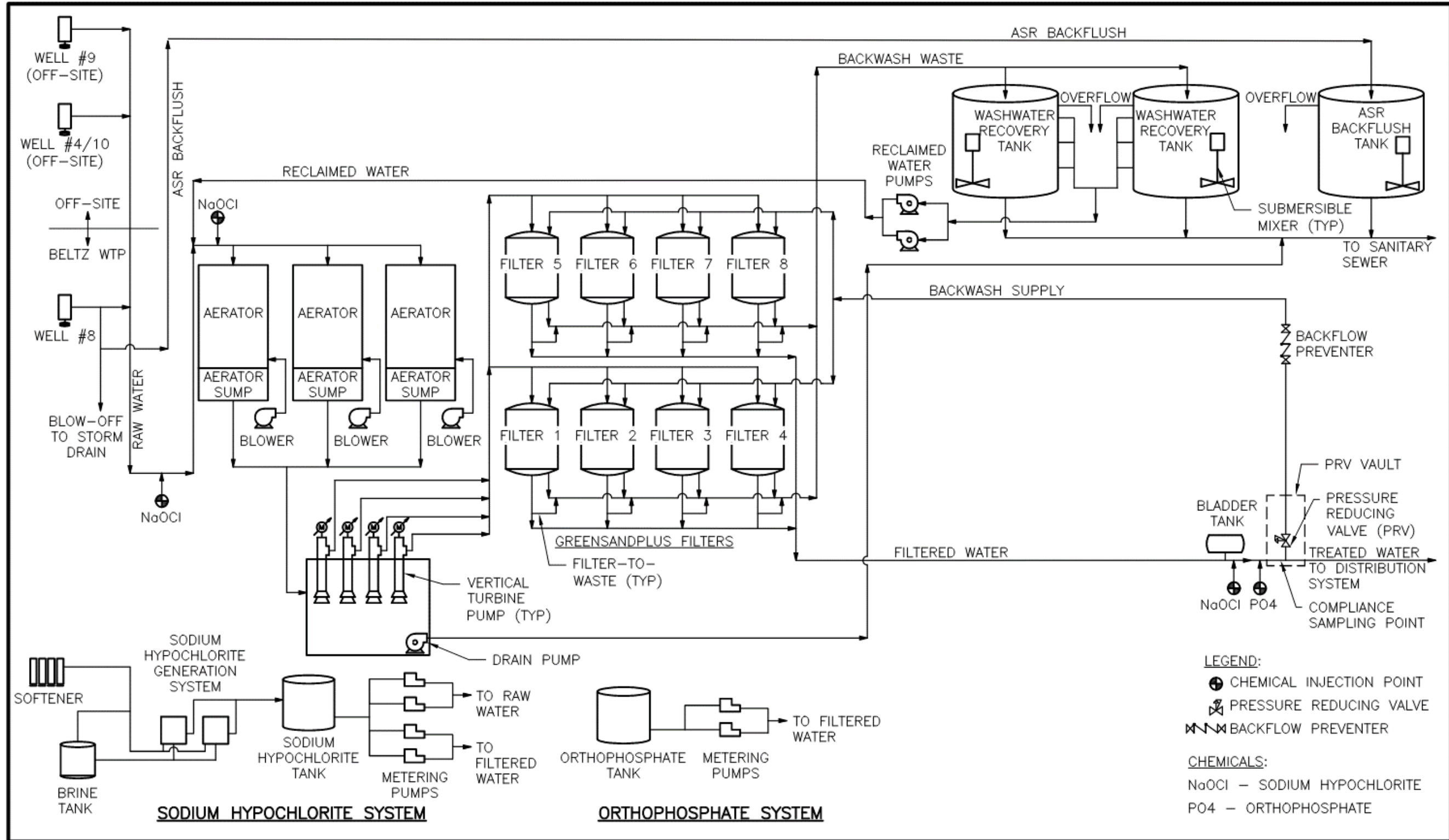


Figure 12-1 Preferred Alternative Process Flow Diagram

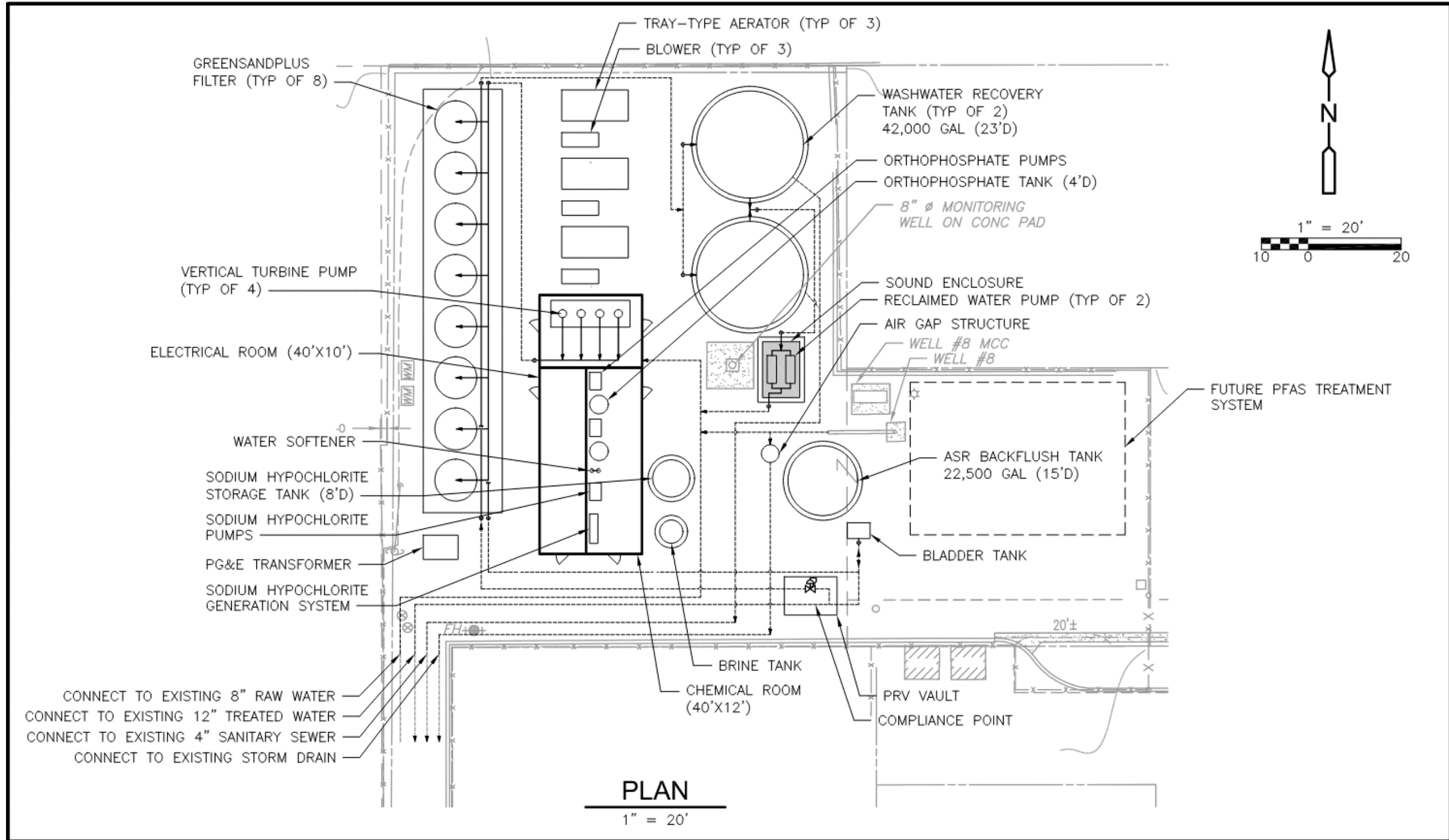


Figure 12-2 Preferred Alternative Site Layout with Tray-Type Aerator Option

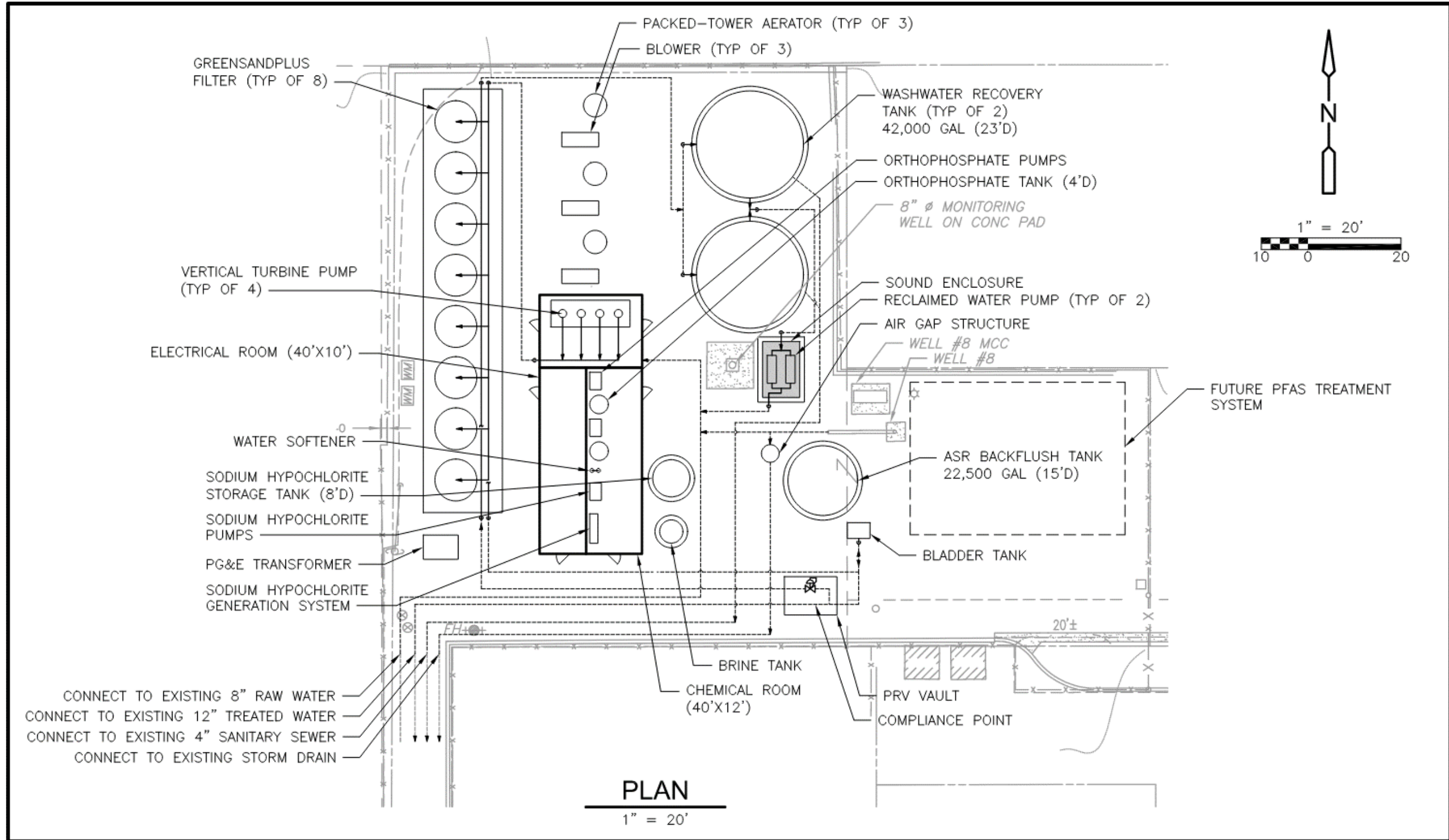


Figure 12-3 Preferred Alternative Site Layout with Packed-Tower Aerator Option

12.2 Opinion of Probable Construction Cost

The opinion of probable construction cost (OPCC) is \$21.3 million for the preferred alternative, and \$23.4 million including 10% construction contingency, as shown below. As ASCE Class 4 cost estimate for SCWD’s project delivery model stage D2, this estimate has -30% to +50% accuracy range, or \$14.9 million to \$32.0 million.

Table 12-1 Opinion of Probable Construction Cost Summary Table

Description		Alternative 1 - Chlorination + Aeration + GreensandPlus Filtration
Demolition		\$41,000
Aeration System		\$842,000
Booster Pumps		\$436,000
GreensandPlus Filtration System		\$1,761,000
Washwater Recovery Tanks		\$372,000
ASR Backflush Tank		\$137,000
Reclaimed Water Pumps		\$110,000
Chemical Systems		\$535,000
Electrical and Chemical Building		\$830,000
Sitework		\$164,000
Yard Piping		\$1,203,000
Electrical and Instrumentation		\$3,036,000
AG Process Piping Allowances		\$316,000
Subtotal Direct Costs		\$10,152,000
Construction Subtotal (Direct Costs + General Conditions)		\$11,617,000
Undefined Scope Estimate Cost	36%	\$4,147,000
Contractor Profit	13%	\$1,481,000
Bonds and Insurance	6%	\$725,000
Current Year Construction Estimate		\$17,970,000
OPCC Estimate (Escalated to Midpoint of Construction)		\$21,312,000
Construction Contingency (Owner’s Change Order Reserve)	10%	\$2,131,000
OPCC Estimate with Contingencies		\$23,443,000
OPCC Accuracy Range – Low	-30%	\$14,918,000
OPCC Accuracy Range – High	+50%	\$31,968,000

Notes:

1. Class 4 Opinion of Probable Construction Cost estimated in October 2023, assuming construction from October 2025 through June 2028.

12.3 Estimated Project Schedule

The estimated project implementation schedule for design-bid-build delivery is included in **Figure 12-4**.

ID	Task Name	Duration	Start	Finish	Predecessors	Fixed Cost	2024												2025			2026			2027		
							Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3					
1	SCWD Beltz WTP - ASR Groundwater Treatment (Aeration+Filtration, PFAS option) Design-Bid-Build	905 days	Wed 1/10/24	Tue 6/29/27		\$0.00																					
2	NTP	0 days	Wed 1/10/24	Wed 1/10/24		\$0.00																					
3	Design Plans and Specifications	280 days	Wed 1/10/24	Tue 2/4/25		\$0.00																					
4	Task 1 - 30% Design	85 days	Wed 1/10/24	Tue 5/7/24		\$500,000.00																					
5	Prepare Design Package & Opinion of Probable Construction Cost	60 days	Wed 1/10/24	Tue 4/2/24	2	\$0.00																					
6	Submit 30% Design Package	0 days	Tue 4/2/24	Tue 4/2/24	5	\$0.00																					
7	Submit Opinion of Probable Construction Cost	0 days	Tue 4/16/24	Tue 4/16/24	5FS+10 days	\$0.00																					
8	SCWD review and Comments	25 days	Wed 4/3/24	Tue 5/7/24	5	\$0.00																					
9	Design Review Meeting	0 days	Tue 5/7/24	Tue 5/7/24	8	\$0.00																					
10	Task 2 - 60% Design	95 days	Wed 5/8/24	Tue 9/17/24		\$550,000.00																					
11	Prepare Design Package & Opinion of Probable Construction Cost	70 days	Wed 5/8/24	Tue 8/13/24	9	\$0.00																					
12	Submit 60% Design Package	0 days	Tue 8/13/24	Tue 8/13/24	11	\$0.00																					
13	Submit Opinion of Probable Construction Cost	0 days	Tue 9/10/24	Tue 9/10/24	11FS+20 days	\$0.00																					
14	SCWD review and Comments	25 days	Wed 8/14/24	Tue 9/17/24	11	\$0.00																					
15	Design Review Meeting	0 days	Tue 9/17/24	Tue 9/17/24	14	\$0.00																					
16	Task 3 - 90% Design	75 days	Wed 9/18/24	Tue 12/31/24		\$260,000.00																					
17	Prepare Design Package & Opinion of Probable Construction Cost	50 days	Wed 9/18/24	Tue 11/26/24	14	\$0.00																					
18	Submit 90% Design Package	0 days	Tue 11/26/24	Tue 11/26/24	17	\$0.00																					
19	Submit Opinion of Probable Construction Cost	0 days	Tue 12/10/24	Tue 12/10/24	17FS+10 days	\$0.00																					
20	SCWD review and Comments	25 days	Wed 11/27/24	Tue 12/31/24	17	\$0.00																					
21	Design Review Meeting	0 days	Tue 12/31/24	Tue 12/31/24	20	\$0.00																					
22	Task 4 - Final Plans, Specs, and Estimate	20 days	Wed 1/1/25	Tue 1/28/25		\$150,000.00																					
23	Prepare Design Package & Opinion of Probable Construction Cost	10 days	Wed 1/1/25	Tue 1/14/25	21	\$0.00																					
24	Submit Final Design Package	0 days	Tue 1/14/25	Tue 1/14/25	23	\$0.00																					
25	Submit Opinion of Probable Construction Cost	0 days	Tue 1/28/25	Tue 1/28/25	23FS+10 days	\$0.00																					
26	Task 5 - Project Management	280 days	Wed 1/10/24	Tue 2/4/25	2	\$200,000.00																					
27	Weekly progress calls	280 days	Wed 1/10/24	Tue 2/4/25		\$0.00																					
28	Permitting	845 days	Wed 4/3/24	Tue 6/29/27		\$500,000.00																					
29	CEQA	150 days	Wed 5/8/24	Tue 12/3/24	9	\$0.00																					
30	Division of Drinking Water	845 days	Wed 4/3/24	Tue 6/29/27		\$0.00																					
31	DDW Review 30% Design	30 days	Wed 4/3/24	Tue 5/14/24	6	\$0.00																					

Project: SCWD Beltz WTP - ASR Groundwater Treatment (Aeration+Filtration) Design-Bid-Build
Date: Thu 11/2/23

Task Milestone Summary

Appendices:

Appendix A. Water Quality Data Summary

Appendix B. Treatment Technologies

Appendix C. Vendor Quotes

Appendix D. Present Value Calculations

Appendix A

Last Update: September 14, 2021

This table includes:
 California's maximum contaminant levels (MCLs)
 Detection limits for purposes of reporting (DLRs)
[Public health goals \(PHGs\) from the Office of Environmental Health Hazard](#)
 Also, the PHG for NDMA (which is not yet regulated) is included at the bottom of

Regulated Contaminant	Units					Beltz Well 4				Beltz Well 8 (excluding 2022 data)				Beltz Well 9				Beltz Well 10				Beltz Well 12				Finished Water				
		MCL	SMCL	NL	RL	No of Samples	Min	Avg	Max	No of Samples	Min	Avg	Max	No of Samples	Min	Avg	Max	No of Samples	Min	Avg	Max	No of Samples	Min	Avg	Max	No of Samples	Min	Avg	Max	
PRIMARY DRINKING WATER STANDARDS																														
<i>Chemicals with MCLs in 22 CCR §64431 – Inorganic Chemicals</i>																														
Aluminum	mg/L	1				2	0	0	0	6	ND	ND	ND	11	ND	ND	ND	10	ND	ND	ND	9	9	ND	ND	ND	12	ND	ND	ND
Antimony	mg/L	0.006				6				6	ND	ND	ND	11	ND	ND	ND	10	ND	ND	ND	9	9	ND	ND	ND	12	ND	ND	ND
Arsenic	mg/L	0.01				5	0	0	0	11	0.0014	0.0023	0.0031	16	ND	ND	ND	15	ND	ND	0.0032	31	31	ND	ND	ND	18	ND	ND	ND
Asbestos	MFL	7 MFL																												
Barium	µg/L	1,000				4	0	20	80	6	43	47	49	11	24	26	28	10	28	39	57	12	0	16	22	40	12	26	29	33
Beryllium	µg/L	4				6	ND	ND	ND	11	ND	ND	ND	10	ND	ND	ND	9	9	ND	ND	ND	12	ND	ND	ND	12	ND	ND	ND
Cadmium	µg/L	5				5	0	0	0	6	ND	ND	ND	11	ND	ND	ND	10	ND	ND	ND	9	9	ND	ND	ND	12	ND	ND	ND
Chromium	µg/L	50				5	0	0.78	3	6	ND	ND	ND	11	ND	ND	ND	10	ND	ND	ND	9	9	ND	ND	ND	12	ND	ND	ND
Chromium-Hexavalent	µg/L	--				3	ND	ND	ND	4	ND	ND	ND	3	ND	ND	ND	3	ND	ND	ND	4	3	ND	ND	0.058	5	ND	0.020	0.043
Cyanide	mg/L	0.15				3	ND	ND	ND	3	ND	ND	ND	3	ND	ND	ND					9	ND	ND	ND					
Fluoride	mg/L	2				5	0.2	0.27	0.31	12	0.054	0.064	0.076	15	0.11	0.13	0.15	13	0.10	0.13	0.21	38	0	0.2	0.5	0.7	15	ND	0.11	0.18
Mercury	µg/L	2				5	0	0	0	8	ND	ND	ND	12	ND	ND	ND	11	ND	ND	ND	8	8	ND	ND	ND	14	ND	ND	ND
Nickel	µg/L	100				6	ND	ND	ND	11	ND	ND	ND	10	ND	ND	ND	9	9	ND	ND	ND	12	ND	ND	ND	12	ND	ND	ND
Nitrate as N	mg/L as N	10								1	ND	ND	ND														1	ND	ND	ND
Nitrite as N	mg/L as N	1								1	ND	ND	ND														1	ND	ND	ND
Nitrate + Nitrite (as N)																														
Perchlorate	µg/L	6				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	3	3	ND	ND	ND	6	ND	ND	ND
Selenium	µg/L	50				4	0	0	0	6	ND	ND	ND	11	ND	ND	ND	10	ND	ND	ND	9	9	ND	ND	ND	12	ND	ND	ND
Thallium	µg/L	2				6	ND	ND	ND	11	ND	ND	ND	10	ND	ND	ND	9	9	ND	ND	ND	12	ND	ND	ND	12	ND	ND	ND
<i>Copper and Lead, 22 CCR §64672.3</i>																														
<i>Values referred to as MCLs for lead and copper are not actually MCLs; instead,</i>																														
Copper	mg/L	1.3				6	ND	ND	ND	8	ND	ND	ND	13	ND	ND	ND	12	ND	ND	ND	32	32	ND	ND	ND	14	ND	ND	ND
Lead	µg/L	15				5	0	0.52	2.4	6	ND	ND	ND	11	ND	ND	ND	10	ND	ND	ND	9	9	ND	ND	ND	12	ND	ND	ND
<i>Radionuclides with MCLs in 22 CCR §64441 and §64443 – Radioactivity</i>																														
<i>[units are picocuries per liter (pCi/L), unless otherwise stated; n/a = not</i>																														
Gross alpha particle activity	pCi/L	15				2	1.5	2.5	3.5	2	ND	ND	ND	2	ND	ND	ND	2	ND	ND	ND						2	ND	ND	ND
Gross beta particle activity	pCi/L	4 mrem/yr				1	6.3	6.3	6.3	1	9	9	9	1	5.24	5.24	5.24													
Radium-226	pCi/L	--				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND						1	ND	ND	ND
Radium-228	pCi/L	--				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND						1	ND	ND	ND
Radium-226 + Radium-228	pCi/L	5																												
Strontium	pCi/L	8																				5	0	0.29	0.36	0.46				
Tritium	pCi/L	20,000																												
Uranium	pCi/L	20				2	ND	ND	ND	2	ND	ND	ND	2	ND	ND	ND	2	ND	ND	ND	2	1	ND	0.35	0.5	2	ND	ND	ND
<i>Chemicals with MCLs in 22 CCR §64444 – Organic Chemicals</i>																														
<i>(a) Volatile Organic Chemicals (VOCs)</i>																														
Benzene	µg/L	1				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
Carbon tetrachloride	µg/L	0.5				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
1,2-Dichlorobenzene	µg/L	600				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
1,4-Dichlorobenzene	µg/L	5				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
1,1-Dichloroethane	µg/L	5				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
1,2-Dichloroethane	µg/L	0.5				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
1,1-Dichloroethylene	µg/L	6				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
cis-1,2-Dichloroethylene	µg/L	6				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
trans-1,2-Dichloroethylene	µg/L	10				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
Dichloromethane	µg/L	5				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
1,2-Dichloropropane	µg/L	5				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
1,3-Dichloropropene	µg/L	0.5				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
Ethylbenzene	µg/L	300				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
Methyl-tert-butyl ether	µg/L	13				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
Monochlorobenzene	µg/L	70				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
Styrene	µg/L	100				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/L	1				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
Tetrachloroethylene	µg/L	5				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
Toluene	µg/L	150				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
1,2,4-Trichlorobenzene	µg/L	5				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
1,1,1-Trichloroethane	µg/L	200				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
1,1,2-Trichloroethane	µg/L	5				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
Trichloroethylene	µg/L	5				1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	1	ND	ND	ND	2	2	ND	ND	ND	1	ND	ND	ND
Trichlorofluoromethane	µg/L																													

Regulated Contaminant	Units					Beltz Well 4					Beltz Well 8 (excluding 2022 data)				Beltz Well 9				Beltz Well 10				Beltz Well 12					Finished Water			
		MCL	SMCL	NL	RL	No of Samples	Min	Avg	Max	No of Samples	Min	Avg	Max	No of Samples	Min	Avg	Max	No of Samples	Min	Avg	Max	No of Samples	Min	Avg	Max	No of Samples	Min	Avg	Max		
Bentazon	µg/L	18								2	ND	ND	ND	2	ND	ND	ND	2	ND	ND	ND	4	4	ND	ND	ND	2	ND	ND	ND	
Benzo(a)pyrene	µg/L	0.2								8	ND	ND	ND	8	ND	ND	ND	8	ND	ND	ND	8	ND	ND	ND	6	ND	ND	ND		
Carbofuran	µg/L	18								2	ND	ND	ND	2	ND	ND	ND	2	ND	ND	ND	4	4	ND	ND	ND	2	ND	ND	ND	
Chlordane	µg/L	0.1								5	ND	ND	ND	6	ND	ND	ND	1	ND	ND	ND					2	ND	ND	ND		
Dalapon	µg/L	200								8	ND	ND	ND	8	ND	ND	ND	8	ND	ND	ND					6	ND	ND	ND		
1,2-Dibromo-3-chloropropane	µg/L	0.2																													
2,4-D	µg/L	70								2	ND	ND	ND	4	ND	ND	ND	2	ND	ND	ND	8	8	ND	ND	ND	4	ND	ND	ND	
Di(2-ethylhexyl) adipate	µg/L	400								8	ND	ND	ND	8	ND	ND	ND	8	ND	ND	ND					6	ND	ND	ND		
Di(2-ethylhexyl) phthalate (DEHP)	µg/L	4								8	ND	ND	ND	8	ND	ND	ND	8	ND	ND	ND					6	ND	ND	ND		
Dinoseb	µg/L	7								8	ND	ND	ND	8	ND	ND	ND	8	ND	ND	ND					6	ND	ND	ND		
Diquat	µg/L	20								2	ND	ND	ND	2	ND	ND	ND	2	ND	ND	ND	4	4	ND	ND	ND	2	ND	ND	ND	
Endothall	µg/L	100								3	ND	ND	ND	3	ND	ND	ND	1	ND	ND	ND					2	ND	ND	ND		
Endrin	µg/L	2								5	ND	ND	ND	5	ND	ND	ND	1	ND	ND	ND					2	ND	ND	ND		
Ethylene dibromide	µg/L	0.05								3	ND	ND	ND	3	ND	ND	ND	1	ND	ND	ND					2	ND	ND	ND		
Glyphosate	µg/L	700								3	ND	ND	ND	3	ND	ND	ND														
Heptachlor	µg/L	0.01								5	ND	ND	ND	6	ND	ND	ND	2	ND	ND	ND					2	ND	ND	ND		
Heptachlor epoxide	µg/L	0.01								5	ND	ND	ND	6	ND	ND	ND									2	ND	ND	ND		
Hexachlorobenzene	µg/L	1								8	ND	ND	ND	8	ND	ND	ND	8	ND	ND	ND					6	ND	ND	ND		
Hexachlorocyclopentadiene	µg/L	50								8	ND	ND	ND	8	ND	ND	ND	8	ND	ND	ND					6	ND	ND	ND		
Lindane	µg/L	0.2								4	ND	ND	ND	4	ND	ND	ND	5	ND	ND	ND					6	ND	ND	ND		
Methoxychlor	µg/L	30								4	ND	ND	ND	4	ND	ND	ND	5	ND	ND	ND					6	ND	ND	ND		
Molinate	µg/L	20								4	ND	ND	ND	4	ND	ND	ND	4	ND	ND	ND					2	ND	ND	ND		
Oxamyl	µg/L	50								2	ND	ND	ND	2	ND	ND	ND	2	ND	ND	ND	4	4	ND	ND	ND	2	ND	ND	ND	
Pentachlorophenol	µg/L	1								8	ND	ND	ND	8	ND	ND	ND	8	ND	ND	ND					6	ND	ND	ND		
Picloram	µg/L	500								8	ND	ND	ND	8	ND	ND	ND	8	ND	ND	ND					6	ND	ND	ND		
Polychlorinated biphenyls (PCBs)	µg/L	0.5								5	ND	ND	ND	5	ND	ND	ND	1	ND	ND	ND					2	ND	ND	ND		
Simazine	µg/L	4								2	ND	ND	ND	4	ND	ND	ND	2	ND	ND	ND	8	8	ND	ND	ND	4	ND	ND	ND	
Thiobencarb	µg/L	70								4	ND	ND	ND	4	ND	ND	ND	4	ND	ND	ND					2	ND	ND	ND		
Toxaphene	µg/L	3								5	ND	ND	ND	5	ND	ND	ND	1	ND	ND	ND					2	ND	ND	ND		
1,2,3-Trichloropropane	µg/L	0.005								13	ND	ND	ND	13	ND	ND	ND	13	ND	ND	ND	7	7	ND	ND	ND	11	ND	ND	ND	
2,3,7,8-TCDD (dioxin)	µg/L	3x10 ⁻⁵								2	ND	ND	ND	2	ND	ND	ND														
2,4,5-TP (Silvex)	µg/L	50								8	ND	ND	ND	8	ND	ND	ND	8	ND	ND	ND					6	ND	ND	ND		
Chemicals with MCLs in 22 CCR §64533 -- Disinfection Byproducts																															
Total Trihalomethanes	mg/L	0.080																													
Bromodichloromethane	mg/L	--																													
Bromoform	mg/L	--																													
Chloroform	mg/L	--																													
Dibromochloromethane	mg/L	--																													
Haloacetic Acids (five) (HAA5)	mg/L	0.060																													
Monochloroacetic Acid	mg/L	--																													
Dichloroacetic Acid	mg/L	--																													
Trichloroacetic Acid	mg/L	--																													
Monobromoacetic Acid	mg/L	--																													
Dibromoacetic Acid	mg/L	--																													
Bromate	mg/L	0.010																								1	ND	ND	ND		
Chlorite	mg/L	1.0																								6	ND	ND	ND		
SECONDARY DRINKING WATER STANDARDS																															
Color	CU		15			63	1	30	85	55	1	4.1	16	62	1	3.8	8	68	1	3.4	32	79	0	1	3.0	10	73	1	1.2	4	
MBAS	mg/L		0.5			7	0	0.02	0.05	2	ND	ND	ND	3	ND	ND	ND	2	ND	ND	ND	4	4	ND	ND	ND	2	ND	ND	ND	
Iron	µg/L		300			6	3.5	7	14	30	ND	1100	1,900	34	590	918	1,100	28	15	1,076	3,000	47	0	65	376	1200	43	12	53	470	
Manganese	µg/L		50	500	5,000	6	0.4	0.5	0.72	30	130	190	210	34	130	210	230	28	170	242	420	48	0	60	327	450	45	0.2	5.4	47	
Odor	TON		3			64	0.00	2.8	12	52	1	1.3	6	59	1	1	1	65	1	1.4	8	75	0	1	3.5	24	70	1	1.0	2	
Silver	µg/L		100			4	0.00	0.00	0.00	6	ND	ND	ND	11	ND	ND	ND	10	ND	ND	ND	31	31	ND	ND	ND	12	ND	ND	ND	
Turbidity	NTU		5			64	0.4	23	55	55	0.05	2.13	9.62	62	0.1	1.66	4.82	68	0.05	1.5	22	79	0	0.05	0.72	5.6	73	0.05	0.09	0.6	
Zinc	µg/L		5,000			5	0.00	0.09	0.43	6	ND	ND	ND	11	ND	ND	ND	10	ND	ND	ND	31	31	ND	ND	ND	12	ND	ND	ND	
Total Dissolved Solids	mg/L		500			6	544	627	794	3	440	453	480	4	480	493	510	3	570	590	620	28	0	430	465	510	10	440	492	520	
Specific Conductance	µS/cm		900			63	595	800	975	55	585	661	860	62	655	691	745	68	740	973	1,250	79	0	365	651	795	73	590	693	755	
Chloride	mg/L		250			7	54	57	60	12	48	50	53	15	42	45	50	13	54	59	66	38	0	25	35	48	15	39	54	60	
Sulfate	mg/L		250			6	172	196	246	12	110	114	120	15	130	136	140	13	150	186	320	38	0	81	104	130	15	120	132	140	
NOTIFICATION LEVELS																															
Boron	mg/L			1	10									2	ND	ND	ND	2	0.1	0.1	0.1	9	1	ND	0.1	0.26	2	ND	0.03	0.06	
n-Butylbenzene	µg/L			260	2,600																	1	1	ND	ND	ND					
sec-Butylbenzene	µg/L			260	2,600																	1	1	ND	ND	ND					
tert-Butylbenzene	µg/L			260	2,600																	1	1	ND	ND	ND					
Carbon disulfide	µg/L			160	1,600																	1	1	ND	ND	ND					
Chlorate	µg/L			800	8,000																	2	2	ND	ND	ND	6	200	410	680	
2-Chlorotoluene	µg/L			140	1,400																	1	1	ND	ND	ND					
4-Chlorotoluene	µg/L			140	1,400																	1	1	ND	ND	ND					
Diazinon	µg/L			1.2	12																	1	1	ND	ND	ND					
Dichlorodifluoromethane (Freon 12)	µg/L			1,000	10,000																	1	1	ND	ND	ND					
1,4-Dioxane	µg/L			1	35																										
Ethylene glycol	mg/L			14	140																	1	1	ND	ND	ND					
Formaldehyde	µg/L																														

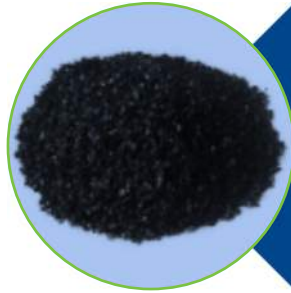
Regulated Contaminant	Units	MCL	SMCL	NL	RL	Beltz Well 4				Beltz Well 8 (excluding 2022 data)				Beltz Well 9				Beltz Well 10				Beltz Well 12					Finished Water				
						No of Samples		Min	Avg	Max	No of Samples	Min	Avg	Max	No of Samples	Min	Avg	Max	No of Samples	Min	Avg	Max	No of Samples		Min	Avg	Max	No of Samples	Min	Avg	Max
Ketorolac	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	N/A	7.5
Lidocaine	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Lincomycin	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Linuron	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Lopressor	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Meclofenamic Acid	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Meprobamate	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Metazachlor	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Metformin	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Methadone	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Methylparaben	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Metolachlor	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Molybdeum	µg/L														3	2.2	2.3	2.4	3	2.2	2.3	2.4	4	0	3.8	4.4	5.7	3	2.3	2.4	2.5
Morphine	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Naproxen	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Nifedipine	ng/L														2	ND	ND	ND					4	3	ND	ND	27	2	ND	ND	ND
Norethindrone	ng/L														2	ND	ND	ND					4	3	ND	ND	15	2	ND	ND	ND
OUST (Sulfometuron, methyl)	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Oxolinic Acid	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Oxybenzone	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Pentoxifyline	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Phenazone	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Primidone	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Progesterone	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Propranolol	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Propazine	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Propylparaben	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Salicylic Acid	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	155	260
Sucralose	ng/L														2	ND	65	120					4	2	ND	87.5	180	2	ND	ND	ND
Sulfachloropyridazine	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Sulfadiazine	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Sulfadimethoxine	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Sulfamerazine	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Sulfamethazine	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Sulfamethizole	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Sulfamethoxazole	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Sulfathiazole	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
TCEP	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
TDCPP	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
TDCPP	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Testosterone	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Theobromine	ng/L														2	ND	N/A	110					4	4	ND	ND	ND	2	ND	N/A	92
Theophylline	ng/L														2	ND	N/A	13					4	4	ND	ND	ND	2	ND	ND	ND
Thiobendazole	ng/L														2	ND	N/A	40					4	4	ND	ND	ND	2	ND	N/A	26
Triclocarban	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Triclosan	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Trimethoprim	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Venlafaxine	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND
Warfarin	ng/L														2	ND	ND	ND					4	4	ND	ND	ND	2	ND	ND	ND

Appendix B

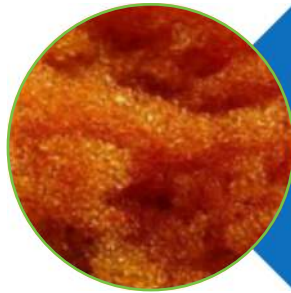


Treatment Technologies

Proven Treatment Technologies for PFAS Removal



Granular Activated Carbon (GAC)



Anion Exchange (AIX)



NF and RO Membranes

GAC vs. AIX

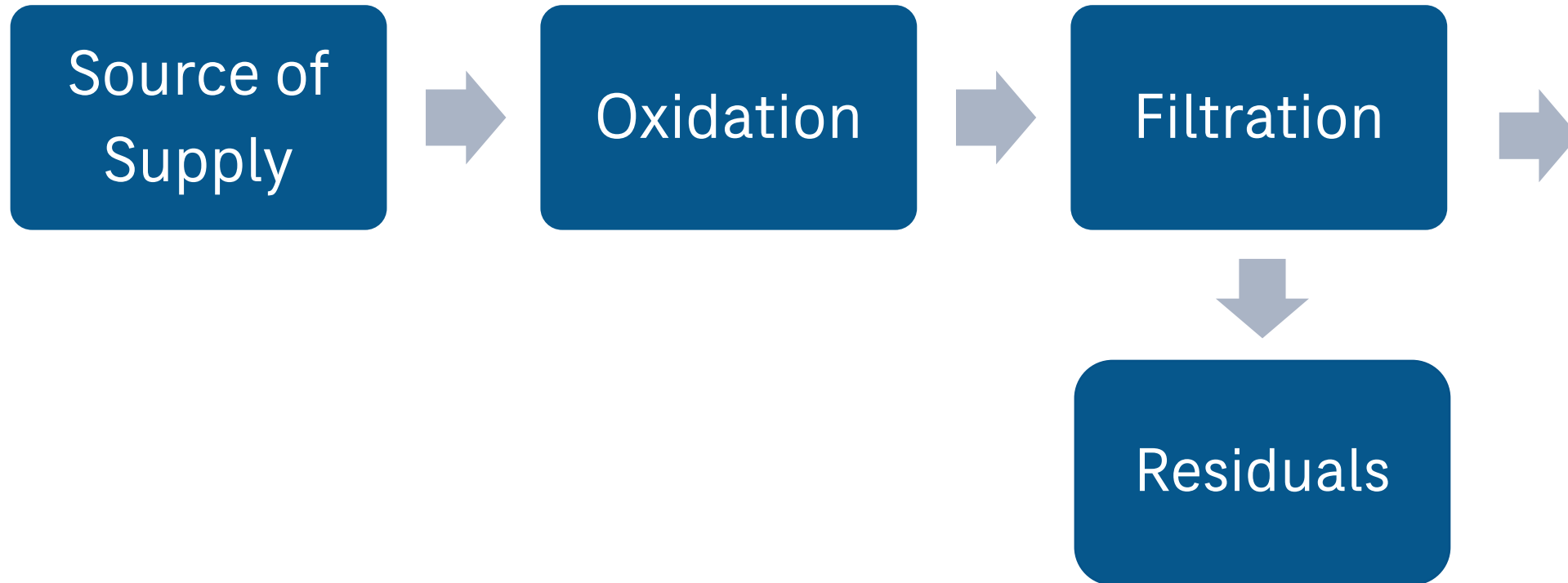


GAC	Single Use IX-R
7 to 20 minute EBCT	2-3 minute EBCT
Larger infrastructure footprint	Smaller infrastructure footprint
Typical bed life: 50,000-120,000 bed volumes	Typical bed life: 250,000-300,000 bed volumes
GAC media is less expensive	IX-R media is more expensive
Less effective for short chain PFAS	Effective for a wider range of PFAS, but less effective for PPCPs
Well established technology	Not as extensively practiced as GAC
Backwash is available	Backwash not recommended
<ul style="list-style-type: none">• Life cycle costs for GAC and IX-R are often similar• Both generate spent media requiring off-site reactivation (GAC) or incineration (IX-R)• Pretreatment may be needed for both technologies to increase media life span	

Notes:

- Size PFAS treatment system to treat 500 gpm from Well #8
- IX resin for PFAS removal (anionic, single use) is different from IX resin for Fe/Mn removal (cationic, regenerable)

Iron and Manganese Removal Treatment Process





Treatment Options

- Oxidation

- **Aeration** ← Current
- Chlorine
- Potassium Permanganate
- Sodium Permanganate
- Chlorine Dioxide
- Ozone

Available Treatment Technologies



Media Filtration

- Dual Media ← **Current**
- H&T Greensand Plus
- Pureflow PM-200
- Filtronics Electromedia
- LayneOx
- Macrolite
- Granular Ferric Media



Membrane Filtration

- Hollow-Fiber Membranes (MF/UF)
- Ceramic Membranes (MF)
- Spiral Membranes (NF/RO)



Ion Exchange

- MIEX/DOWEX



Biological Treatment

- Ferazur/Mangazur

Media Filtration

- Most common treatment technology for iron and manganese removal
- Employs treatment system of oxidation followed by media filtration
- Each system uses a different filtration medium contained in a pressure vessel
- Vessel can be configured horizontally or vertically



This is an example of the 1.5 MGD municipal filter installation with air/water wash, by Hungerford & Terry.



GreensandPlus Pretreatment for RO Filter System 4.2MGD

Catalytic Media Filtration - Greensand

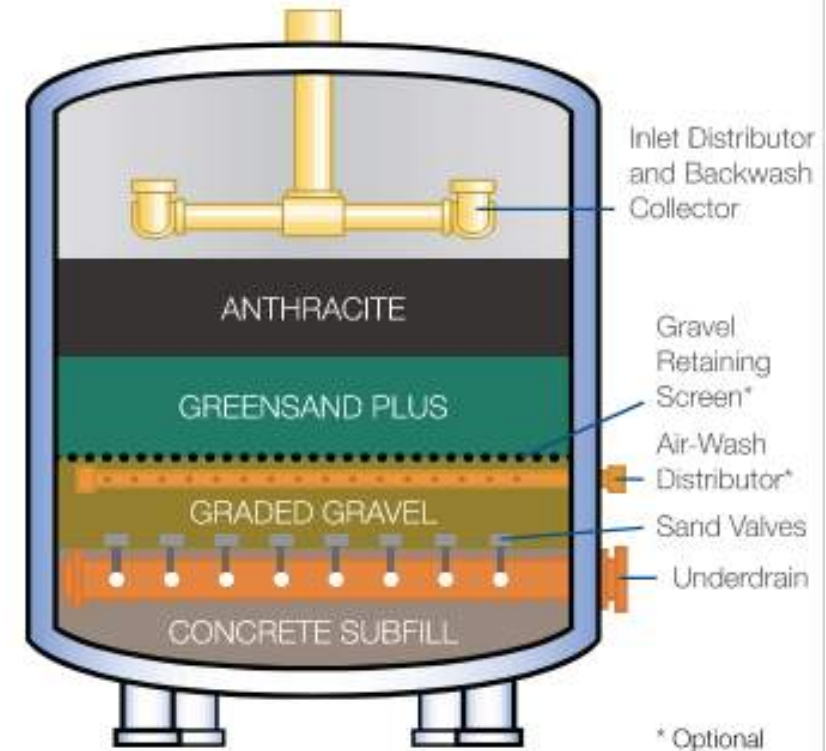
■ Manganese greensand

- Glaucinite (iron potassium silicate) core with MnO_2 coating
- Has been largely phased out by Greensand Plus

■ GreensandPlus

- Has silica sand core thermally bonded with MnO_2 coating
- Typical filtration rate 2 – 5 gpm/sf
- Backwash rate 12 gpm/sf

Cross-Section of a Typical Hungerford & Terry GreensandPlus Filtration System



Catalytic Media Filtration – Greensand (Continued)

■ Advantages

- Effective with Mn removal
- Can be conditioned and regenerated with chlorine
- Can be mothballed with high dose of chlorinated water

■ Disadvantages

- Low filtration rate < 5 gpm/sf (but higher than 3 gpm/sf for sand filters)



Catalytic Media Filtration – Other

■ Pureflow PM-200

- High rate catalytic/adsorptive media
- Not coated
- Relies on oxidation and precipitation
- Requires chemical pretreatment

Advantages

- Does not require regeneration of media
- Low headloss
- High filtration rate 10 gpm/sf

Disadvantages

- High backwash rate 20 gpm/sf

■ Filtronics Electromedia

- Granulated, naturally occurring, sand-like filter media
- Relies on oxidation and precipitation
- Requires chemical pretreatment

Advantages

- Does not require regeneration of media
- Small footprint
- High filtration rate 10 gpm/sf

Disadvantages

- High backwash rate 20 gpm/sf

Catalytic Media Filtration – Other

■ LayneOx

- High rate catalytic granular media
- High MnO_2 content

Advantages

- 10-30 second reaction time with oxidant
- Low headloss
- High filtration rate 8-15 gpm/sf

Disadvantages

- High backwash rate 25 gpm/sf
- Backwash water does not settle well



Membrane Filtration – Hollow Fiber Ultrafiltration

■ Advantages

- High removal efficiency of suspended & colloidal matter, turbidity, and microorganisms
- Small footprint

■ Disadvantages

- Mn oxidation is slow if pH is not optimized
- Incomplete Mn oxidation can result in membrane fouling and dissolved Mn in the filtered water



Membrane Filtration – Ceramic

■ Advantages

- Hydrophilic, and oxidant stable ceramic provides long life and resistance to fouling
- Can use strong oxidants, acids or bases for cleaning without damage to membranes
- High permeability, high flux structure and pore channels
- High removal efficiency of suspended & colloidal matter, turbidity, and microorganisms
- Small footprint

■ Disadvantages

- Mn oxidation is slow if pH is not optimized
- Incomplete Mn oxidation can result in membrane fouling and dissolved Mn in the filtered water



Membrane Filtration – Nanofiltration/Reverse Osmosis

■ Advantages

- Removes a wide range of contaminants, including PFAS
- Adaptable to future regulations
- Can bypass a portion of flow



■ Disadvantages

- Requires Fe and Mn to be dissolved
- If Fe or Mn is oxidized, would foul the membranes requiring frequent chemical cleaning
- Loses 15% to 20% of flow to brine ← Less finished water flow
- Requires brine management ← 6-inch sewer pipe near site does not have sufficient capacity

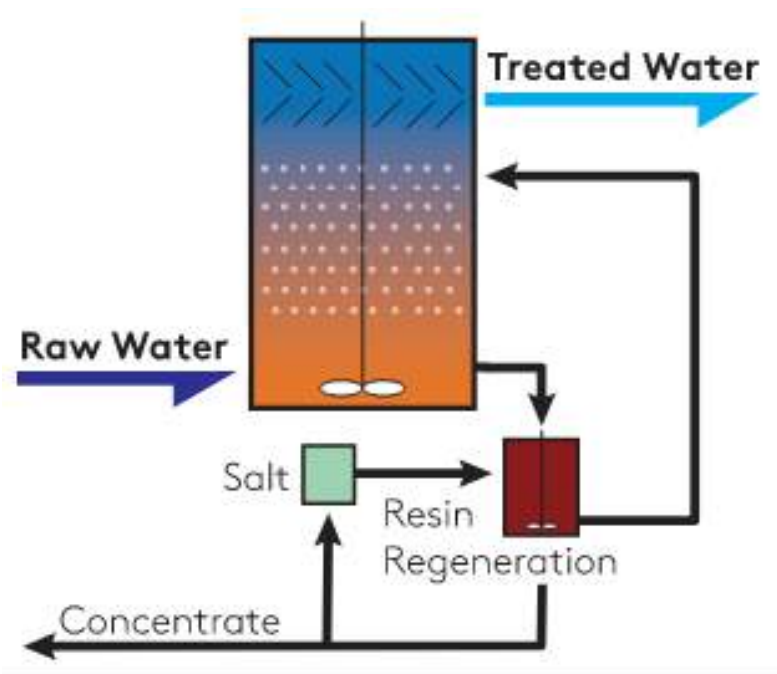
Ion Exchange (strong acid cation resin)

■ Advantages

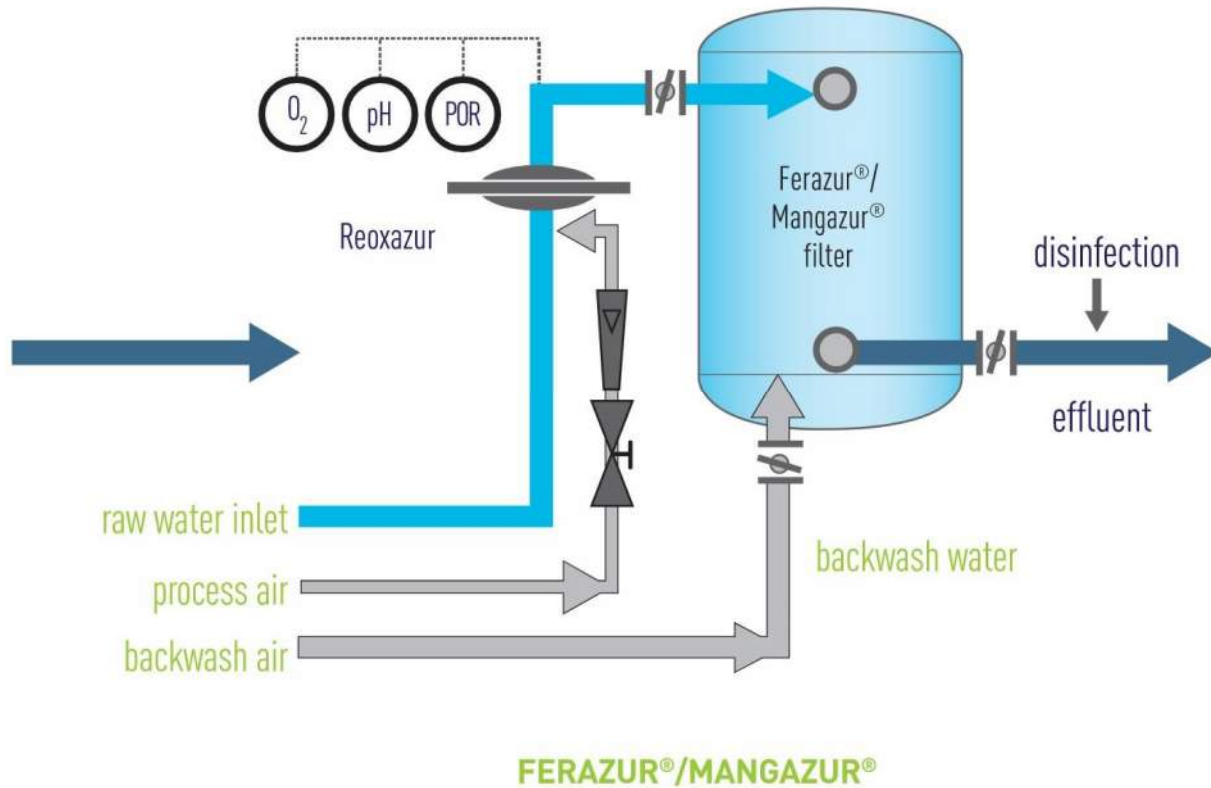
- Resin can be regenerated and re-used
- Lower backwash water than oxidizing filters
- Effectiveness not affected by pH

■ Disadvantages

- If Fe or Mn is allowed to oxidize during the process, the resulting solids can clog and foul the resin reducing efficiency
- Not effective if iron bacteria present
- Adds sodium to the water ← Not ideal for this system since TDS is already close to SMCL
- Requires sediment prefilter
- Produces waste brine
- Capacity of IX could increase or decrease after regeneration



Biological Filtration



- Uses inert filter media “Biolite S” developed specifically for organic removal of Fe and Mn
- Employs naturally-occurring bacteria in the water to accelerate oxidation of Fe and Mn
- Uses process air to increase DO in the water
- Optimal pH: 7.5 – 8.5



Biological Filtration (Continued)

■ Advantages

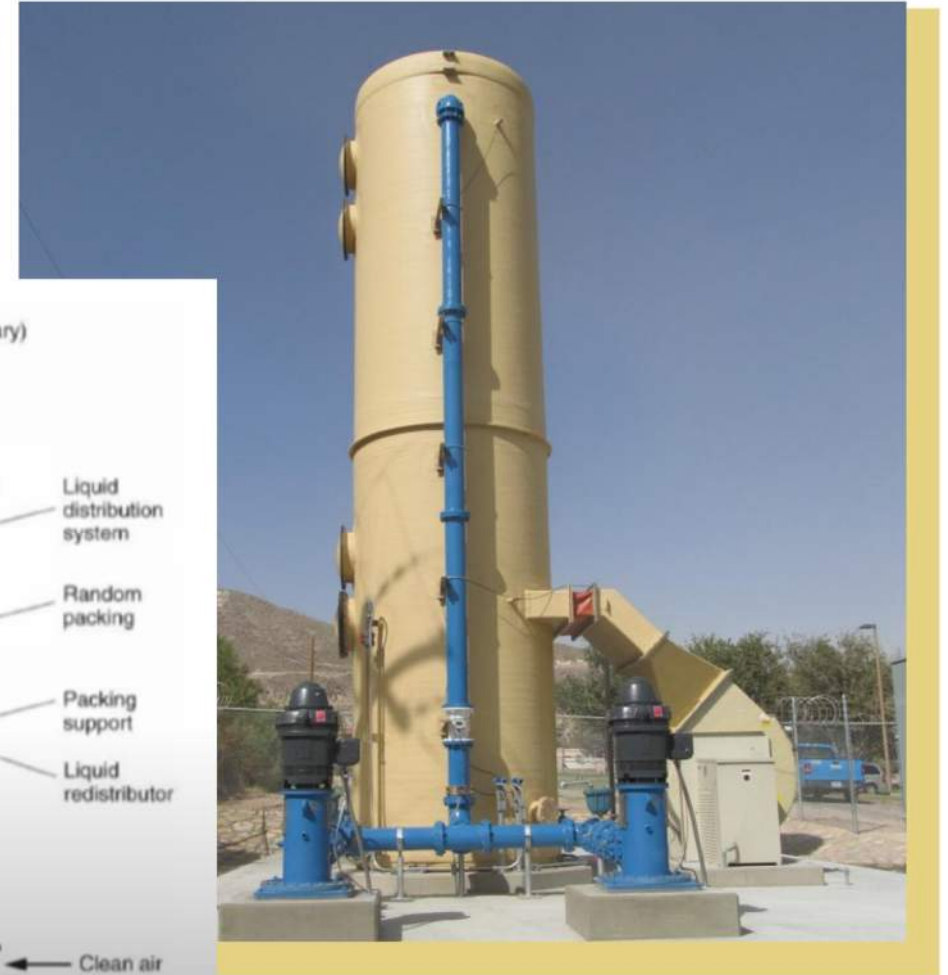
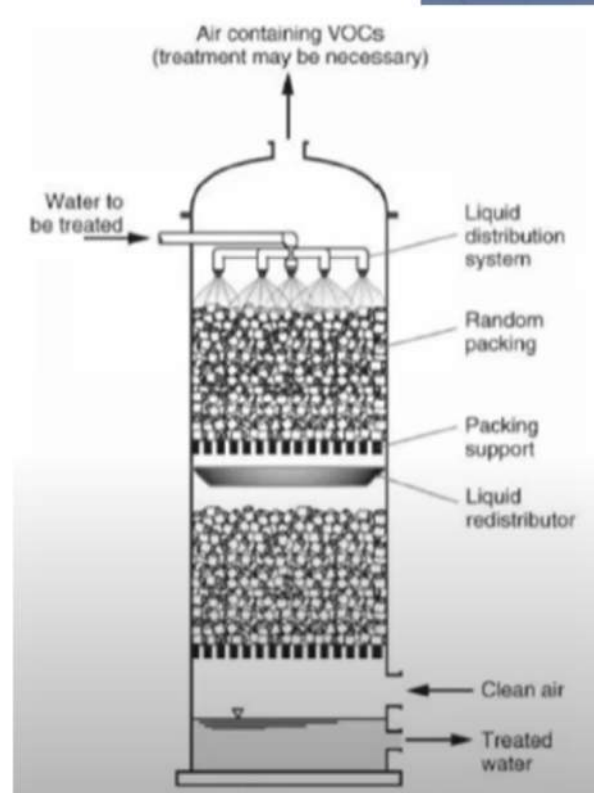
- Does not require pretreatment
- Higher filtration rate (up to 20 gpm/sf)
- Longer filter runs (3 to 5x than conventional)
- Consumes nutrients and reduces regrowth in distribution system
- Low operating cost

■ Disadvantages

- Requires time to reseed and re-populate filters with bacteria if offline for extended periods ← Not ideal for plants that are operated intermittently
- Reseeding for Mn-metabolizing bacteria can take time to re-populate the filter

DBP Treatment - Packed Tower Aerators

- Involves high air to water contact
 - Air is forced through contaminated groundwater, allowing volatile contaminants to strip out
- Advantages:
 - Effective at removing THMs
 - Small treatment footprint
- Disadvantages
 - Does not remove HAAs
 - Fouling of packing material
 - Requires pump and blowers
 - Effluent air may require treatment



Appendix C

Appendix C – Equipment Quotes

Appendix	Vendor	Equipment
C1	Monroe Environmental	Packed Tower Aerators
C2	QED	Tray-Type Aerators
C3	Peerless Pumps	Multi-Stage Vertical Turbine Booster Pumps
C4	H&T	GreensandPlus
C5	Superior Tank	Washwater Recovery Tanks + ASR Backflush Tank
C6	PSI	MicroClor On-Site Sodium Hypochlorite Generation System
C7	CP Crowley	Chemical Pumps and Horizontal End Suction Pumps
C8	Evoqua	Ion Exchange
C9	Sound Enclosures	Power Design Inc.
C10	Cartridge Filters	Fil-Trek

APPENDIX C1: MONROE ENVIRONMENTAL PACKED TOWER AERATORS

From: [Taylor Clifton](#)
To: [Nguyen, Hoa \(Kati\)](#)
Cc: [Prasad, Sumukhi S.](#)
Subject: RE: Monroe Environmental Quote #14009R2- Air Stripper
Date: Friday, July 7, 2023 7:41:39 AM
Attachments: [image001.jpg](#)
[image002.png](#)
[image003.png](#)
[image004.png](#)
[image005.png](#)
[image006.png](#)
[image007.jpg](#)
[image008.jpg](#)

Hi Kati-

Please see the following **revised** budgetary proposal for the (1) Monroe Air Stripper to assist with the removal of iron and manganese for the City of Santa Cruz, California.

Scope of Supply:

- 2,190 gpm at up to 70°F
- 7,300 CFM
- 12 ft diameter
- FRP construction
- Liquid distribution with flanged feed pipe – supply piping and pump by others
- Drain connection for gravity discharge of stripped liquid
- Flanged access doors
- 10 ft packing height, 2.3" Lanpac
- Mist eliminator
- Coated steel fan mounted on ground at air stripper inlet, up to 15 HP 3/60/460V motor
- **Fan includes an inlet silencer and a 4" insulated sound blanket to reach 60 dBA @ 5ft**
- Inlet air filter screen
- (3) Differential pressure gauges – packing, mist eliminator, air filter/fan
- (1) Pressure gauge for air flow on inlet of air stripper
- (1) Flowmeter for water flow on the inlet of the air stripper
- Combination motor starter/disconnect in a NEMA 4 enclosure for fan motor

Approximate System Dimensions: 13' W x 18' L x 25' H

Excludes: skid, installation, inlet/outlet ductwork and piping, stack, and freight

Budgetary Price: **\$580,000.00 ± 20%**

Lead Time: 4-6 weeks ARO for submittals. 26-28 weeks ARAD for delivery.

Please let us know how we can be of further assistance.

Regards,

Taylor Clifton

SALES & APPLICATIONS ENGINEER

Monroe Environmental

810 W. Front Street, Monroe, MI 48161

P | 1-800-992-7707 D | 734-342-2128

C | 734-790-5921 F | 734-242-5275

tclifton@mon-env.com

www.mon-env.com



APPENDIX C2: QED TRAY-TYPE AERATORS



Site Reference: Beltz WTP CO2

Prepared For:

Jason Yoshimura
949-752-5452
YoshimuraJT@cdmsmith.com

CDM SMITH INC
46 DISCOVERY
SUITE 250
IRVINE CA 92618

Represented By:

Dave Corder, Regional Sales Mgr
760-247-6305
dcorder@qedenv.com

Prepared By:

Dave Fischer
800-624-2026 ext 244
dfischer@qedenv.com

QTY	PART NO.	DESCRIPTION	UM	UNIT PRICE	EXTENSION
3	EZ-72.4SS	EZ-72.4SS Tray air stripper assembly, 4 tray 10-750 GPM. This EZ-Tray series 72 unit has a flow rate of 10-750 GPM, 304 stainless steel trays and shell with integral sump. INCLUDES: 4 tray levels, see-through front hatch, polypropylene de-mister, liquid level sight gauge and sump pressure gauge. Note: This price does not include the blower. Contact QED if dissolved chloride levels are greater than 80ppm.	EA	176,275.00	528,825.00
3	807327	Blower, pressure / mfg New York Blower. Motor: 40hp 460 volt 3 phase EXP. Inlet: 12" flange, Outlet: 12" Flange 150 lb. class. Standard on a EZ-72.X stainless steel air stripper.	EA	16,910.00	50,730.00
3	BLKIT12	Blower piping kit, 12" PVC pipe & flange (150# class). Designed for EZ-72.x and EZ-96.x stainless steel series air strippers. Blower to sump piping kit for QED skid mounted systems.	EA	5,475.00	16,425.00
3	807303	Skid, platform for QED EZ-96.x series stainless steel air stripper. Material: welded steel construction with forklift access holes. Finish: skid & chemically resistant polyurea coating. Designed for QED air stripper, blower, (2) pumps, and control panel.	EA	6,760.00	20,280.00
3	EZ-LOWP	Kit, blower low air pressure sump switch (explosion-proof). Includes: (1) EZPLOW pressure switch, tubing & fittings.	EA	440.00	1,320.00
3	EZ-HIGHLV	Sump high level float switch kit (non-exp). Includes: (1) 800065 warrick float switch & (1) cord strain relief. Note: Requires intrinsically-safe relay for explosive environments. QED p/n CPIS.	EA	285.00	855.00



3	CPANEL250	CONTROL PANEL STANDARD DESIGN 400A: Control panel is weatherproof (UL508A labeled NEC 2014 compliant , TYPE 4 rating), with air stripper blower motor starter, OFF/ON switch, green running light, red stripper sump high level alarm light, red low air pressure alarm light, circuit breakers and relays for controlling stripper and main disconnect. Unless indicated, the QED panel will control only the equipment listed in this quote. (72.X-96.X systems)	EA	14,195.00	42,585.00
3	EZ-L6	Multi-component / skid system assembly and testing. Standard on EZ-72.x, EZ-96.x (E-Z Tray) systems.		4,680.00	14,040.00
1	95293	EZ-TRAY MANUAL LARGE SYSTEM	EA	0.00	0.00
1	807203	EZ-Tray Disassembly Tool Kit	EA	220.00	220.00
3	807385	Liquid discharge flow regulator vessels. 304 L stainless steel construction. Flanged connection from air stripper sump to vessel / flange out from vessel. Stabilizes sump volume and sump pressure. Used on 72.x and 96.x, flows to 1000 GPM, 10" pipe size, flow vessel with skid.	EA	7,705.00	23,115.00
3	EZ-BLSIL12	Silencer for New York Blower, 12" flanged end / carbon steel. Includes: Silencer, 12" gasket, bolts kit. Silencers are typically shipped loose and cannot be installed directly to blower inlet flange without being properly supported.	EA	3,620.00	10,860.00
3	BLFIL12	Blower air filter, 12-inch (EZ-72.X and larger), standard	EA	5,135.00	15,405.00
				TOTAL	724,660.00

OPTIONAL ITEMS:

1	EZ- AIRFLOWDIG 12	Digital mass air flow meter, 0-5980 SCFM air flow range. Includes installation in a 12-inch PVC pipe section, with flange connection on one end, includes bolts and gasket. Power supply is 120VAC/60Hz and meter has two 4-20mA outputs and one high speed pulse output for interface to controls. Standard horizontal mount with air flow in the direction indicated on the pipe and meter. Alternative orientation is possible, but meter display DOES NOT rotate. Optional remote display is available.	EA	5,190.00	5,190.00
1	CIP-SYS- BASIC	CIP basic pump recirculation system - includes pump, panel and skid	EA	8,505.00	8,505.00



1	CIP4	CIP spray nozzle kit for E-Z Tray and E-Z Tray HF air strippers (72.X-96.X)	EA	1,200.00	1,200.00
---	------	-----------------------------------------------------------------------------	----	----------	----------

NOTES:

ASSUMES SITE POWER IS 480V, 3-PHASE

TERMS & CONDITIONS: Payment Terms: NET 30

Estimated Shipping Time: 8 - 12 weeks after receipt of Purchase Order and subsequent customer approval of engineering submittal package, unless custom equipment is included in the order. Final delivery date will be determined upon return of technical submittal package. A copy of your purchase order with a 30% deposit is required upon placing order. Balance is due per above payment terms, calculated from invoice date. Acceptance of customer quotes/purchase orders does not imply QED has agreed to sell on credit. A service charge of 1% per month will be applied on all past due invoices. Pricing is subject to change. All prices are in U.S dollars.

Unless shown as separate line item (s), total price shown DOES NOT include applicable sales tax or shipping & handling charges. Applicable sales taxes, shipping & handling charges will be added to the invoice. Customer specified freight carrier will incur a \$250 handling charge. Estimates available upon request. All shipments are FOB Dexter, MI, USA. Handling & off-loading of the air stripper unit is the responsibility of the buyer upon delivery. After seller accepts, NO order may be cancelled without Seller's written authorization and consent. Cancellation, if approved, is subject to reasonable restocking and / or handling fee. All products will be returned freight prepaid to Seller's facility. Once equipment is tested and ready to ship Customer has 30 days to authorize the shipment. Equipment kept at QED's facility for more than 30 days may incur additional monthly storage and handling fees.

Invoice To: _____ Ship To: _____

 _____ Attn: _____

Accepted by: _____ Title: _____
 Print Name: _____ Company: _____
 PO Number: _____ Date: _____

Check box if this order is necessary to your (or another contractors) contract with the federal government.

When placing orders, please make paperwork out to: QED Environmental Systems, Inc.

Mailing Address:
PO Box 3726
Ann Arbor, MI, 48106

Remit To Address:
PO Box 935668
Atlanta, GA 31193-5668

TOTAL BEING APPROVED \$724,660.00

APPENDIX C3: PEERLESS PUMPS MULTI-STAGE VERTICAL TURBINE BOOSTER PUMPS

Nguyen, Hoai (Kati)

From: Neil Kulkarni <neilkulkarni36@gmail.com>
Sent: Monday, October 30, 2023 4:23 PM
To: Nguyen, Hoai (Kati)
Cc: Keenan, John (Jack) P.
Subject: RE: Peerless Pump Quote Request
Attachments: CDM-Beltz-WTP-GW-TM-Alt 1-10GLME-Data Sheets-Oct-23.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Kati,

First pump selection for GW TM, alt. 1 is attached.

Budget price for pump, inverter duty VHS, WP1 motor, non-witness performance and hydro test, NSF61 construction and NSF61 coatings, fabricated steel discharge head, mechanical seal is \$60K each.

Neil Kulkarni

PumpTech, Inc.

Cell: 626-622-3762

300 E Bonita Ave, #5014

San Dimas, CA 91773

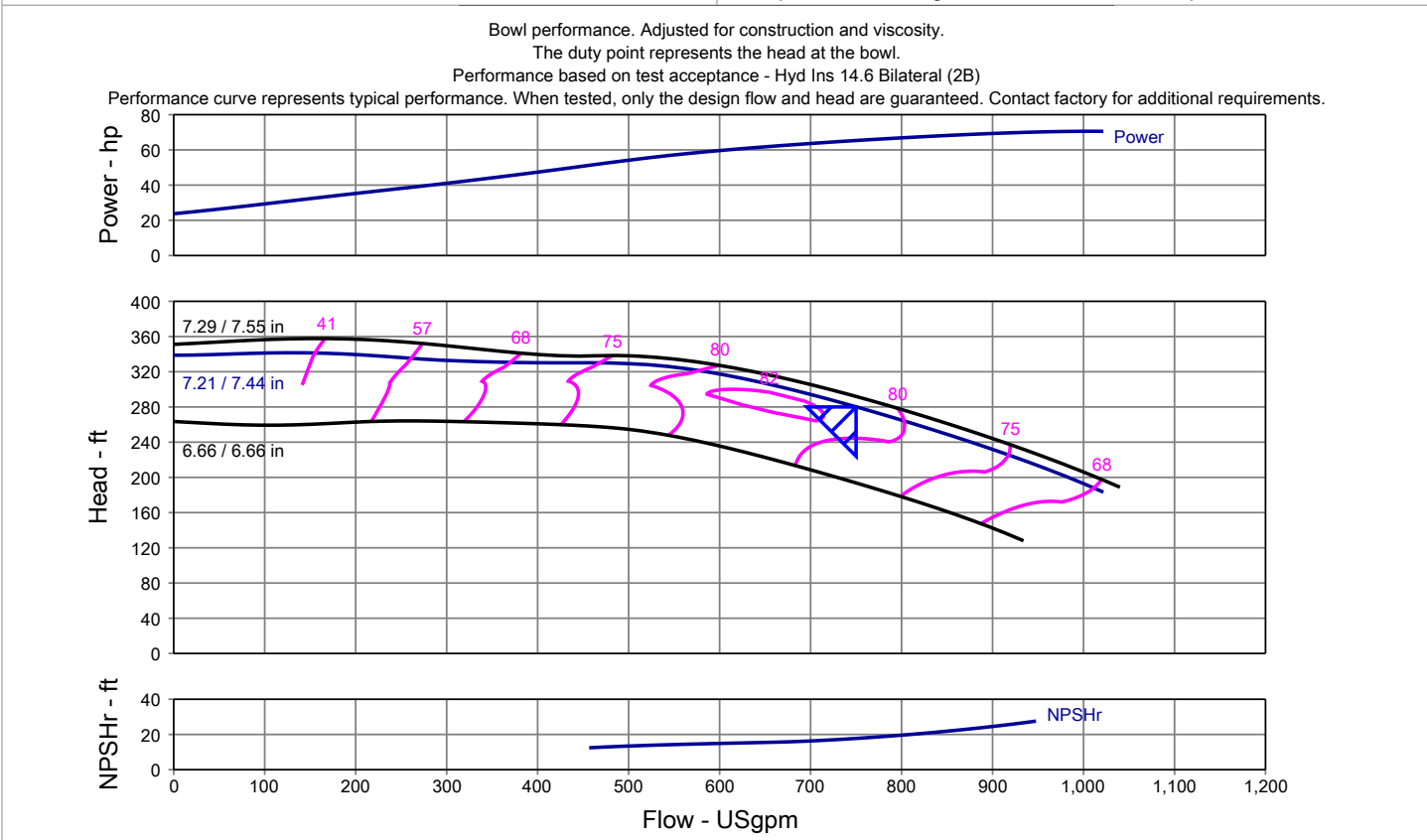


Pump Performance Datasheet

Customer :	Quote Number / ID : 2094172
Customer ref. / PO :	Peerless Model : GL10ME/HC
Tag Number : CDM-Beltz WTP-GW TM-Alt. 1	Stages : 6
Service :	Based on curve number : GL10MEHC4606314 Rev May 2020
Quantity : 3	Date last saved : 30 Oct 2023 10:55 PM

Operating Conditions		Liquid	
Flow, rated	: 750 USgpm	Liquid type	: Cold Water
Differential head / pressure, rated (requested)	: 280.0 ft	Additional liquid description	:
Differential head / pressure, rated (actual)	: 280.2 ft	Solids diameter, max	: 0.00 in
Suction pressure, rated / max	: 0.00 / 0.00 psi.g	Solids concentration, by volume	: 0.00 %
NPSH available, rated	: Ample	Temperature, max	: 68.00 deg F
Site Supply Frequency	: 60 Hz	Fluid density, rated / max	: 1.000 / 1.000 SG
		Viscosity, rated	: 1.00 cP
		Vapor pressure, rated	: 0.34 psi.a

Performance		Material	
Speed, rated	: 1785 rpm	Material selected	: Material Group, Standard
Impeller diameter, rated	: 7.21 / 7.44 in		
Impeller diameter, maximum	: 7.29 / 7.55 in		
Impeller diameter, minimum	: 6.66 / 6.66 in		
Efficiency (bowl / pump)	: 81.19 / 80.03 %		
NPSH required / margin required	: 17.7 / 0.0 ft		
Ns (imp. eye flow) / Nss (imp. eye flow)	: 2,463 / 5,920 US Units		
MCSF	: 249 USgpm		
Head, maximum, rated diameter	: 341.6 ft		
Head rise to shutoff (bowl / pump)	: 20.91 / 22.14 %		
Flow, best eff. point (bowl / pump)	: 687 / 678 USgpm		
Flow ratio, rated / BEP (bowl / pump)	: 109.19 / 110.59 %		
Diameter ratio (rated / max)	: 98.65 %		
Head ratio (rated dia / max dia)	: 95.96 %		
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00		
Selection status	: Acceptable		





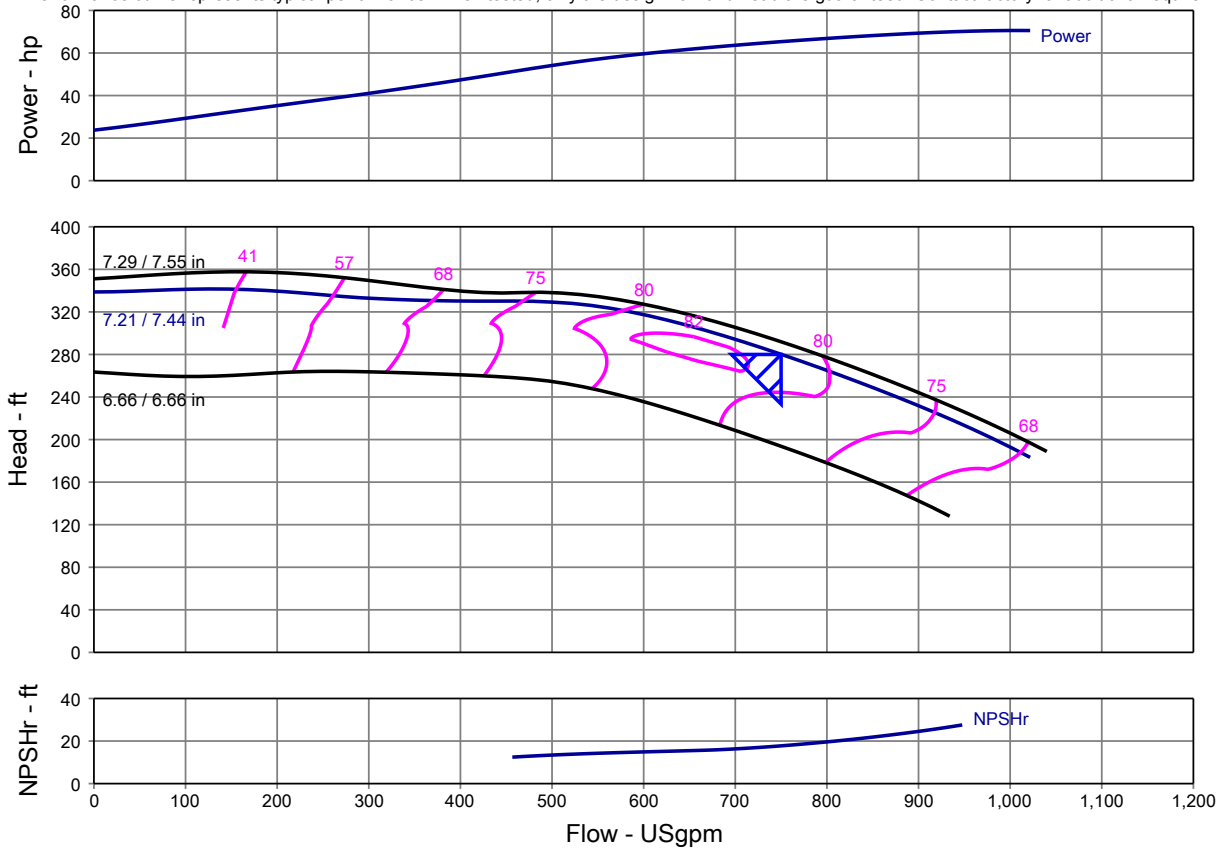
Pump Performance Curve

Bowl performance. Adjusted for construction and viscosity.

The duty point represents the head at the bowl.

Performance based on test acceptance - Hyd Ins 14.6 Bilateral (2B)

Performance curve represents typical performance. When tested, only the design flow and head are guaranteed. Contact factory for additional requirements.



Customer :	Peerless Model : GL10ME/HC
Customer ref. / PO :	Stages : 6
Tag Number : CDM-Beltz WTP-GW TM-Alt. 1	Speed, rated : 1785 rpm
Service :	Based on curve number : GL10MEHC4606314 Rev May 2020
Quantity : 3	Efficiency (bowl / pump) : 81.19 / 80.03 %
Quote Number / ID : 2094172	Power (bowl / pump) : 65.3 / 65.6 hp
Date last saved : 30 Oct 2023 10:55 PM	Max power (non-overloading) : 70.9 hp
Flow, rated : 750 USgpm	NPSH required : 17.7 ft
Differential head / pressure, rated : 280.0 ft	Viscosity : 1.00 cP
Fluid density, rated / max : 1.000 / 1.000 SG	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010] : 1.00 / 1.00 / 1.00 / 1.00

Flow (USgpm)	Head (ft)	Efficiency (%)	Power (hp)	NPSHr (ft)	Thrust, total (lbf)
0	338.7	0.00	23.7	-	2,428
114	341.5	32.49	30.1	-	2,202
227	337.8	52.59	36.8	-	2,007
341	331.4	65.44	43.5	-	1,788
454	330.2	74.14	51.1	-	1,566
568	322.9	79.68	58.1	14.5	1,302
681	299.2	81.73	62.9	15.9	996
795	266.7	80.23	66.7	19.4	702
908	228.9	75.52	69.5	25.0	409
1,022	183.3	67.00	70.6	-	75



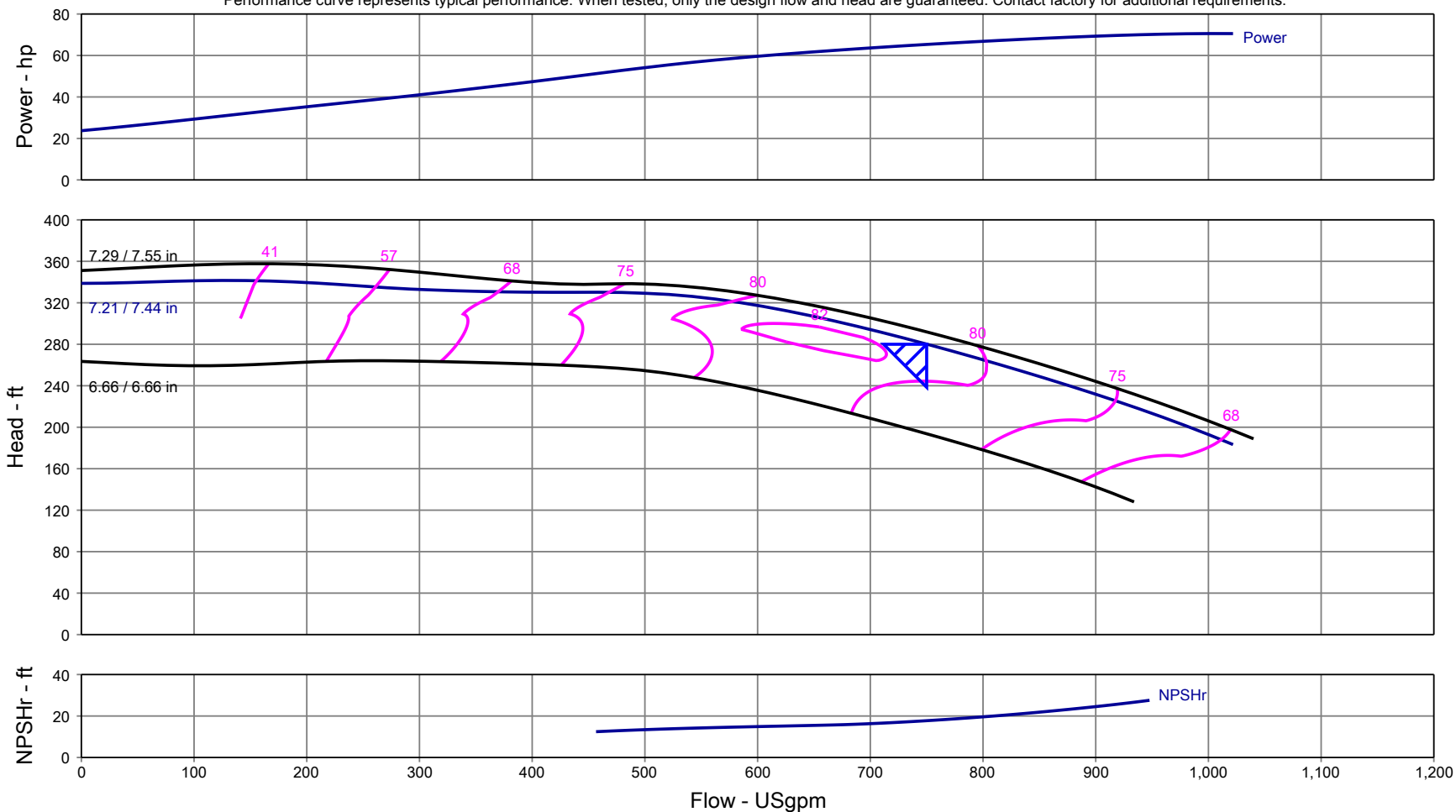
Pump Performance Curve

Bowl performance. Adjusted for construction and viscosity.

The duty point represents the head at the bowl.

Performance based on test acceptance - Hyd Ins 14.6 Bilateral (2B)

Performance curve represents typical performance. When tested, only the design flow and head are guaranteed. Contact factory for additional requirements.

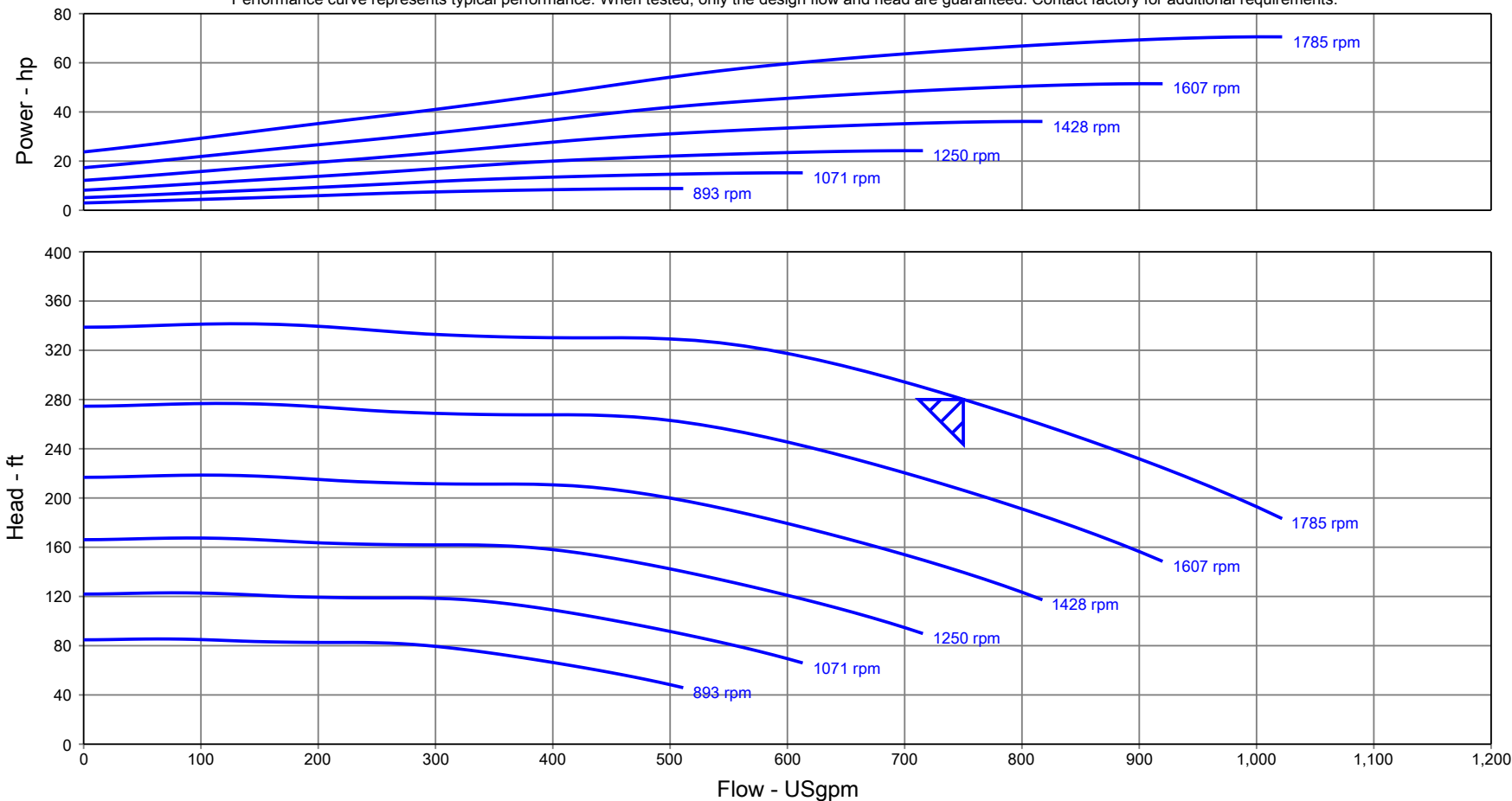


Project name	: CDM-Beltz WTP-GW TM-Alt. 1	Tag Number	: CDM-Beltz WTP-GW TM-Alt. 1	Speed, rated	: 1785 rpm
Commissioned	:	Service	:	Flow, rated	: 750 USgpm
Representative	:	Peerless Model	: GL10ME/HC	Differential head / pressure, rated	: 280.0 ft
Customer	:	Quantity	: 3	Power (bowl / pump)	: 65.3 / 65.6 hp
Customer ref. / PO	:	Quoted By (Sales Office)	: PUMPTech INC. - San Dimas, CA	Max power (non-overloading)	: 70.9 hp
Quote Number / ID	: 2094172	Quoted By (Sales Engineer)	: Neil Kulkarni	Efficiency (bowl / pump)	: 81.19 / 80.03 %
Date last saved	: 30 Oct 2023 10:55 PM	Stages	: 6	Based on curve number	: GL10MEHC4606314 Rev May 2020



Multi-Speed Performance Curve

Bowl performance. Adjusted for construction and viscosity.
 The duty point represents the head at the bowl.
 Performance based on test acceptance - Hyd Ins 14.6 Bilateral (2B)
 Performance curve represents typical performance. When tested, only the design flow and head are guaranteed. Contact factory for additional requirements.



Project name	: CDM-Beltz WTP-GW TM-Alt. 1	Tag Number	: CDM-Beltz WTP-GW TM-Alt. 1	Speed, rated	: 1785 rpm
Commissioned	:	Service	:	Flow, rated	: 750 USgpm
Representative	:	Peerless Model	: GL10ME/HC	Differential head / pressure, rated	: 280.0 ft
Customer	:	Quantity	: 3	Fluid density, rated / max	: 1.000 / 1.000 SG
Customer ref. / PO	:	Quoted By (Sales Office)	: PUMPTECH INC. - San Dimas, CA	Viscosity	: 1.00 cP
Quote Number / ID	: 2094172	Quoted By (Sales Engineer)	: Neil Kulkarni	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Date last saved	: 30 Oct 2023 10:55 PM	Stages	: 6	Based on curve number	: GL10MEHC4606314 Rev May 2020

**"Construction Datasheet"**

Customer	:	Quote Number	:	2094172
Customer Reference	:	Service	:	
Item Number	:	Date Last Saved	:	30 Oct 2023 10:55 PM
Pump Size - Stages	:	Quantity of Pumps	:	3

Construction**Motor Information**

Bowl construction	:	Discharge Case	Manufacturer	:	Aurora
Impeller type	:	Static (single plane) Balance	Vertical shaft type	:	VHS
Impeller fastening	:	316 Stainless Steel (lock collets)	Full load speed	:	1785 rpm
Strainer	:	N/A	Power	:	75.0 hp
Column construction	:	Threaded and Coupled	Service Factor	:	1
Column dia (nominal)	:	6.00 in	Volts / Phase / Hz	:	460 V / 3 / 60 Hz
Column pipe length	:	161.69 in	Frame size / Base diameter	:	16.50 in
Max column length	:	161.69 in	Enclosure	:	WP1
Lineshaft diameter	:	1.00 in	Duty Type	:	Continuous duty
Lineshaft construction	:	OLS	Inverter Duty Rated	:	0
Lineshaft lubrication	:	Product Lubrication	Efficiency Class, 100%/75%/50%	:	Premium, 0.00 % / 0.00 % / 95.00 %
Discharge	:	Above Base (floor)	Power factor	:	0 / 0 / 0

Materials

Bowl	:	Cast iron	Driver amp full load	:	0.000 A
Impeller	:	316LSS	NEMA design	:	B
Bowl bearing	:	Standard (Bronze/Rubber)	Motor starting	:	Full Volt
Bowl shaft	:	416 Stainless Steel	Insulation	:	F
Bowl wear ring	:	None	Ambient temperature	:	104.0 deg F
Impeller wear ring	:	None	Max altitude	:	3300
Strainer	:	-	Thrust rating	:	Standard High Thrust

Additional information

Column	:	Steel	Pit / sump depth	:	240 in
Lineshaft	:	416 SS	Pump length	:	234.00 in
Bearing retainer / ELS Tube	:	304SS	Max pump dia below mounting surface	:	10.00 in
Lineshaft bearing	:	Standard (Rubber)	Max sphere size	:	1.03 in
Discharge head	:	Fabricated Steel	Total / best lateral setting	:	0.78 / 0.375
Sole plate	:	None	Max suction pressure**	:	0.00 psi.g
Paint	:	Class I			

Testing

Approximate Weights		Hydraulic performance test	:	Factory Performance Test - Non Witness	
Complete pump	:	2,436 lb	Hydrostatic test	:	Factory Hydrostatic Pressure Test (bowl) - Non-Witness
Driver	:	1,333 lb	Curve approval	:	Yes
			NPSH test	:	None
			String test	:	None
			Test w/ motor	:	None



Pump Performance - Additional Data						
Project name	: CDM-Beltz WTP-GW TM-Alt. 1	Tag Number	: CDM-Beltz WTP-GW TM-Alt. 1			
Commissioned	:	Service	:			
Representative	:	Model	: GL10ME/HC			
Customer	:	Quantity	: 3			
Customer ref. / PO	:	Quoted By (Sales Office)	: PUMPTECH INC. - San Dimas, CA			
Quote Number / ID	: 2094172	Quoted By (Sales Engineer)	: Neil Kulkarni			
Date last saved	: 30 Oct 2023 10:55 PM	Speed, rated	: 1785 rpm			
Stages	: 6					
Performance Data			Stage, Speed and Solids Limits			
Head, maximum diameter, rated flow	: 291.9 ft	Stages, maximum	: 22			
Head, minimum diameter, rated flow	: 193.7 ft	Stages, minimum	: 1			
Head, maximum, rated diameter	: 341.6 ft	Pump speed limit, maximum	: 3600 rpm			
Efficiency adjustment factor, total	: 0.98	Pump speed limit, minimum	: 1 rpm			
Power adjustment, total	: 1.6 hp	Curve speed limit, maximum	: 3600 rpm			
Head adjustment factor, total	: 1.00	Curve speed limit, minimum	: 1 rpm			
Flow adjustment factor, total	: 1.00	Variable speed limit, maximum	: -			
NPSHR adjustment factor, total	: 1.00	Variable speed limit, minimum	: -			
NPSH margin dictated by pump supplier	: 0.0 ft	Solids diameter limit	: 1.03 in			
NPSH margin dictated by user	: 0.0 ft	Typical Driver Data				
NPSH margin used (added to 'required' values)	: 0.0 ft	Driver speed, full load	: 1780 rpm			
Mechanical Limits			Driver speed, rated load	: 1783 rpm		
Torque, rated power, rated speed	: 3.68 hp/100 rpm	Driver efficiency, 100% load	: N/A			
Torque, maximum power, rated speed	: 3.97 hp/100 rpm	Driver efficiency, 75% load	: N/A			
Torque, driver power, full load speed	: 4.21 hp/100 rpm	Driver efficiency, 50% load	: N/A			
Torque, driver power, rated speed	: 4.20 hp/100 rpm					
Torque, pump shaft limit	: -					
Radial load, worst case	: -					
Radial load limit	: -					
Impeller peripheral speed, rated	: -					
Impeller peripheral speed limit	: -					
Various Performance Data		Flow (USgpm)	Head (ft)	Efficiency (%)	NPSHr (ft)	Power (hp)
Shutoff, rated diameter		0	338.7	-	-	23.7
Shutoff, maximum diameter		0	351.1	-	-	27.1
MCSF		249	336.2	55.50	3.3	38.1
Rated flow, minimum diameter		750	193.7	77.60	-	47.3
Rated flow, maximum diameter		750	291.9	80.88	-	68.3
BEP flow, rated diameter		687	297.7	81.73	16.0	63.2
120% rated flow, rated diameter		900	231.8	75.98	24.5	69.3
End of curve, rated diameter		1,022	183.3	67.00	33.9	70.6
End of curve, minimum diameter		934	128.0	62.32	35.7	48.4
End of curve, maximum diameter		1,040	188.9	66.05	34.2	75.1
Maximum value, rated diameter		-	341.6	81.73	-	70.9
Maximum value, maximum diameter		-	-	81.42	-	75.1
System differential pressure		@ Density, rated		@ Density, max		
Differential pressure, rated flow, rated diameter (psi)		121.2		121.2		
Differential pressure, shutoff, rated diameter (psi)		146.6		146.6		
Differential pressure, shutoff, maximum diameter (psi)		151.9		151.9		
Discharge pressure		@ Suction pressure, rated	@ Suction pressure, max	@ Suction pressure, rated	@ Suction pressure, max	
Discharge pressure, rated flow, rated diameter (psi.g)		121.2	121.2	121.2	121.2	
Discharge pressure, shutoff, rated diameter (psi.g)		146.6	146.6	146.6	146.6	
Discharge pressure, shutoff, maximum diameter (psi.g)		151.9	151.9	151.9	151.9	
Ratios						
Maximum flow / rated flow, rated diameter	: 136.24 %	Head rated diameter / head minimum diameter, rated flow		: 144.64 %		



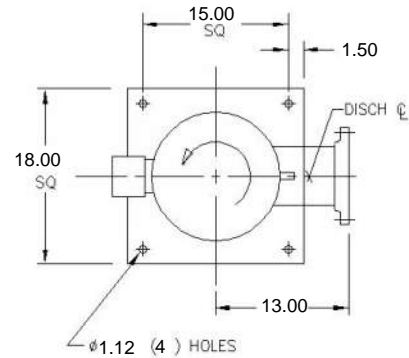
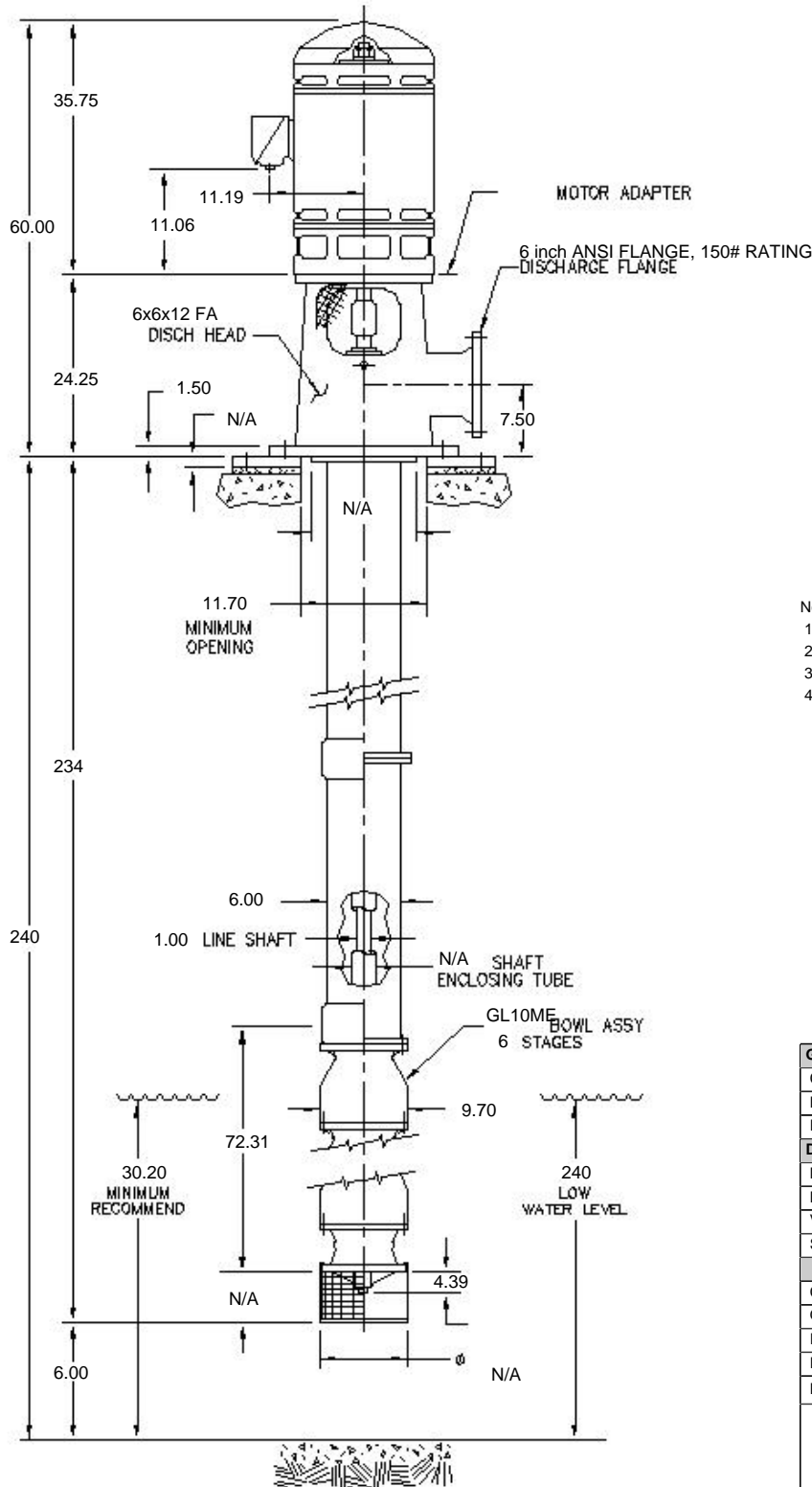
Pump Performance - Additional Data

Head and Power Losses				Dimensions		
Friction loss rate, column	: 4.66 %			Minimum clearance below suction bell lip/case	: 6.00 in	
Friction loss, column	: 0.63 ft			Minimum well diameter	: 10.01 in	
Friction loss, discharge head	: 1.71 ft			Suction nozzle centerline height	: -	
Friction loss, can/barrel	: -			Suction to first stage impeller centerline	: 5.62 in	
Friction loss, suction bell and strainer	: 0.00 ft			Bowl assembly length, first stage	: 22.31 in	
Friction loss, bowl/column adaptor	: 0.48 ft			Bowl assembly length, upper stage	: 10.00 in	
Friction loss, total	: 2.81 ft			Bowl assembly length, total	: 72.31 in	
Power loss, lineshaft bearings	: 0.1 hp			Suction bearing hub length	: 4.39 in	
Power loss, thrust bearing	: 0.2 hp			Strainer length	: 0.00 in	
Power loss, total	: 0.3 hp			Bowl to column adaptor length	: 0.00 in	
Bowl vs. Pump Performance				Discharge head stick-down	: 0.00 in	
Head (bowl / pump)	: 280.2 ft / 276.7 ft			Submersible motor adaptor length	: -	
Efficiency (bowl / pump)	: 81.19 % / 80.03 %			Submersible motor length	: -	
Power (bowl / pump)	: 65.3 hp / 65.6 hp			Column length	: 161.69 in	
NPSH required at first stage impeller eye	: 17.7 ft			Total pump length	: 234.00 in	
Weights and Down Thrust				Can / barrel length	: -	
Weight, lineshaft	: 0 lb			Stuffing box sleeve diameter	: 0.00 in	
Weight, bowl assembly rotating element	: 520 lb			Suction bell diameter	: -	
Thrust factor	: 2.92 lb/ft			Minimum submergence to prevent vortexing	: 0.00 in	
Thrust, hydraulic (rated / max)	: 815 / 2,428 lbf			Actual submergence (based on LLL)	: 234 in	
Thrust, bowl shaft end (rated / max)	: 0 / 0 lbf			Discharge head height	: 24.25 in	
Thrust, shaft step (rated / max)	: 37 / 37 lbf			Discharge nozzle centerline height	: 7.50 in	
Thrust, stuffing box sleeve (rated / max)	: 94 / 94 lbf			Min distance discharge nozzle centerline to suction bell	: 0.00	
Thrust, total (rated / max)	: 1,466 / 3,079 lbf			Lineshaft length	: 185.94 in	
Thrust bearing capacity	: -			Bowl shaft diameter	: 1.19 in	
* Rated thrust @ rated head, density, and suction pressure where applicable				Bowl diameter, outside	: 9.70 in	
* Max thrust @ max head, density, and suction pressure where applicable				Bowl diameter, exit	: 4.88 in	
Pressure Data		Maximum working pressure (psi.g)	Maximum allowable working pressure (psi.g)	Hydrostatic test pressure (psi.g)	Column diameter, inside	: 6.07 in
Bowl		147.8	400.0	N/A	Column internal obstruction diameter	: 1.00 in
Column		147.8	-	N/A	Can/barrel diameter, inside	: -
Discharge head		147.8	300.0	N/A	Can/barrel obstruction diameter	
Can/Barrel		-	-	-	NPSH	
					NPSH at bowl (available / required)	: Ample / 17.7 ft
					NPSH at low liquid level (available / required)	: Ample / -
					NPSH at suction flange (available / required)	: - / -
Torque Limits					Liquid Velocities	
Torque, lineshaft limit	: -				Column liquid velocity	: 8.56 ft/s
					Discharge head liquid velocity	: 8.56 ft/s
					Can liquid velocity	: -
					Suction nozzle liquid velocity	: -



Pump Performance - Additional Data					
Mixed Stage Performance	Set #1	Set #2	Set #3	Set #4	Alternate First Stage
Model	GL10ME/HC	-	-	-	-
Stages	6	-	-	-	-
Based on curve number	GL10MEHC4606314	-	-	-	-
Impeller diameter, rated	7.32 in	-	-	-	-
Impeller diameter, maximum	7.42 in	-	-	-	-
Impeller diameter, minimum	6.66 in	-	-	-	-
Limitations					
Tolerance Type	: Hyd Ins 14.6 Bilateral (2B)	Low liquid level (Measured from bottom of head)	: in		
Head measured at	: Bowl	NPSHa measured at	: Low liquid level		
Pump type	: Complete Pump	Velocity column	: 10.00 ft/s		
Direct connect	: No	Well inside diameter (Enter a value >0 if a diameter check is required)	: in		
Length strategy	: Sump depth	Maximum working pressure strategy	: Maximum head, rated diameter		
Length	: 240.00 in				
Product Line Options					
Suction type	: Bell	Drive shaft type	: VHS		
Bowl discharge type	: Discharge case	Discharge location	: Above ground		
Bowl shaft material	: 416 SS	Discharge head material	: Steel		
Bowl shaft diameter	: 1 3/16 inch	Discharge head design	: Type FA		
Impeller connection type	: Taper lock	Discharge head size	: 6x6x12		
Column diameter	: 6 inch	Sealing type	: Mechanical seal		
Column construction	: Threaded	Discharge flange rating	: 150lb ANSI flange		
Suction accessory	: None	Coupling design	: Threaded coupling		
Lineshaft material	: 416 SS	Top shaft material	: 416 SS		
Lineshaft diameter	: 1 inch	Top shaft diameter	: 1 3/16 inch		
Lineshaft lubrication	: Open Lineshaft				
Performance Adjustment Options					
Impeller polished	: Not polished	Effective impeller material for galling	: Al Brz C952		
Impeller wear ring	: None	Effective bowl material for galling	: Cast/Ductile Iron		
Bowl wear ring	: None	Effective impeller material for polishing	: Al-Brz		

General Arrangement Drawing



Notes

1. Unless otherwise specified, dimensions are in inches
2. Baseplate requires support on all sides.
3. Read instructions before beginning pump assembly or installation.
4. Drawing is preliminary until certified by factory.

APPROXIMATE DRY WEIGHT	
Driver	1,333 lb
Discharge Head	283 lb
Column / Shaft	269 lb / 40 lb
Bowl Assembly	510 lb
Total	2,436 lb

GENERAL DATA			
Capacity	750 USgpm	Liquid	Cold Water
Head	280.0 ft	Specific Gravity	1.000 SG
Pump Speed	1785 rpm		
DRIVER DATA			
MFGR	-	Shaft Type	OLS
Hp	75.0 hp	Enclosure / Type	WP1
Volt / Ph / Hz	460 / 3 / 60 Hz	Frame / Model	365TP
Service Factor	1		
Customer Name			
Quote No	2094172		
Item No.	CDM-Beltz WTP-GW TM-Alt. 1		
Project	CDM-Beltz WTP-GW TM-Alt. 1		
Date	30 Oct 2023 10:53 PM		



2094172-CDM-Beltz WTP-GW TM-Alt. 1



Customer Price Sheet Total Only

Project name	CDM-Beltz WTP-GW TM-Alt. 1	Quote Number / ID	2094172
Customer		Model / Stages	GL10ME/HC / 6
Tag Number	CDM-Beltz WTP-GW TM-Alt. 1	Flow, rated	750 USgpm
Customer ref. / PO		Differential head / pressure, rated	280.0 ft
		Speed, rated	1785 rpm

Total

Grand Total	Lead Time Total	ks
-------------	-----------------	----

Pump

Qty	Description
3	GL10ME/HC
	Bowl Assembly
	Pump Type: New Pump
3	Bowl Size: GL10ME
	Number of Stages: 6 stage
	Materials of Construction: Materials (Cast Iron, 316LSS)
	Bowl Material: Cast Iron
	Bowl Configuration (Connection)
	Top Bowl (Discharge Connection): Discharge Case
	Suction: Bell Suction
	Line Shaft Bowl Adder: Open Line Shaft (OLS)
	Shaft, Pump: 1 3/16 inch
	Pump shaft material (Bowl Shaft): 416 Stainless Steel
18	Efficiency: Standard Efficiency
	Impeller Wear Rings: None
	Bowl Wear Rings: None
	Suction Accessory: None
	Lateral Travel in Bowl Assembly: Standard
	Bowl Bearing Materials: Standard (Bronze/Rubber)
3	Impeller Balance: Static (single plane) Balance
	Dry Pit Application: No
18	Impeller Fastening: 316 Stainless Steel (lock collets)
18	Bowl Bolting: 316 Stainless Steel
	Bowl Flange Name Plate: Bowl Flange Name Plate for NSF 61 (99403016)
	Discharge Head Name Plate: Discharge Head Name Plate for NSF 61 (93003539)
	Column / Line Shaft / Coupling
	Column Material: Steel
	Column Pipe Design: Threaded and Coupled
	Column Diameter: 6 inch
	Column Pipe: 10 Ft Bearing Spacing
	Line Shaft Lubrication: Product Lubrication
	Line Shaft Sleeves: None
3	Line Shaft Material: 416 SS
	Line Shaft Coupling Design: Threaded Coupling
3	Line Shaft Coupling Material: 410 SS
3	Bearing Retainer: Drop In
	Line Shaft Bearing Material: Standard (Rubber)
	Top Shaft Diameter: 1 3/16 inch
	Top Shaft Material: 416 SS



Pump

Qty	Description
	Column Assembly
3	OLS Threaded Column 6 inch / 1 inch Shaft / 10 Ft Bearing Spacing, Length Base to Bowl 162 inch Column Bottom: (1) OLS Threaded Column 6 inch, Length 120 inch, Steel Column Top: (1) OLS Threaded Column 6 inch, Code Length to Base 42 inch, Steel
	Shaft Group of Column
	Shaft, Line, Bottom: (1) Threaded, D = 1 inch, L = 120 inch, 416 SS Shaft, Line, Top: (1) Threaded, D = 1 inch, L = 50.56 inch, 416 SS Shaft, Top (Motor shaft length) VHS only: (3) Threaded, D = 1.1875 inch, L = 39.5 inch, 416 SS Top Shaft and Nut
3	Top Shaft & Nut
	Discharge Head
3	Discharge Head Assembly: 6x6x12FA Discharge Head Flange Rating: 150# Discharge Head Material: Fabricated Steel Discharge Location: Above Base (floor) Line Shaft Construction: Open Line Shaft (OLS) Sealing Type: Mechanical Seal
3	Mechanical Seal: AES, Tp SCUSI Carbon/Ceramic
3	Column to Discharge Head Fastener Material: 316 Stainless Steel Sole Plate: None
3	Top Column Flange (TCF): Cast Iron - Threaded Stuffing Box Bearing Material: Standard (Bronze)
	Driver
	Driver Supplied By: Factory Efficiency: Premium Motor (Design Types): NEMA
	Coating / Painting Systems
	System: Class I Coating System per Section 510, page 1 (default Tnemec 21)
3	Outside Bowl Assembly: Class I Coating System Inside Bowl Assembly: Standard Coating: Glass or Scotchkote 134
3	Outside Column: Class I Coating System
3	Inside Column: Class I Coating System
3	Outside Discharge Head: Class I Coating System
3	Inside Discharge Head: Class I Coating System
	Assembly / Match Marking / Shipping
	Factory Assembly for Shipment: Not Factory Assembled

Testing

Qty	Description
3	Testing Tolerance Type: Hyd Ins 14.6 Bilateral (2B)
3	Factory Performance Test - Non Witness Guarantee Bowl Efficiency :
3	Non Overloading Motor:
3	Performance Test Data Sheets
3	Test Curve For Approval - submitted for customer approval (stop/hold of production)
3	Factory Hydrostatic Pressure Test (bowl) - Non-Witness



Certification & Documentation

Qty	Description
3	Bowl Assembly Drinking Water Approval
3	NSF 61 International Classification Nameplate (Subject to factory validation of design and materials)
3	Drinking Water Certification material selection must be verified before acceptance of order due to complexity check.
	Drawings, Curves, and Instructions
1	Project Management: Project Manager
	Engineering Data
1	Seismic Calculation - Standard Peerless Factory Calculations

Motor

Qty	Description
3	Driver
3	Motor: Motor-electric, 75hp, 1785rpm, 460/0/0/0V, 3Ph, 60Hz, 365TP, VHS, WP1, PremEff., Stock, Aurora, 46WP1HS75PE**D**X

Commercial

Qty	Description
1	Commercial Terms
1	Incoterms 2020: EXW Order is subject to storage fee if not picked up after 10 working days when goods are made ready. Named Place: Seller's Facility

Nguyen, Hoai (Kati)

From: Neil Kulkarni <neilkulkarni36@gmail.com>
Sent: Tuesday, October 31, 2023 9:32 AM
To: Nguyen, Hoai (Kati)
Cc: Keenan, John (Jack) P.
Subject: RE: Peerless Pump Quote Request
Attachments: CDM-Beltz-WTP-GW-TM-Alt 2&3-GL10ME-Data Sheets-Oct-23.pdf

Kati,

First pump selection for GW TM, alt. 2&3 is attached.

Budget price for pump, inverter duty VHS, WP1 motor, non-witness performance and hydro test, NSF61 construction and NSF61 coatings, fabricated steel discharge head, mechanical seal is \$70K each.

Neil Kulkarni

PumpTech, Inc.

Cell: 626-622-3762

300 E Bonita Ave, #5014

San Dimas, CA 91773



Pump Performance Datasheet

Customer :	Quote Number / ID :	2094750
Customer ref. / PO :	Peerless Model :	GL10ME/HC
Tag Number :	Stages :	9
Service :	Based on curve number :	GL10MEHC4606314 Rev May 2020
Quantity : 3	Date last saved :	31 Oct 2023 4:26 PM

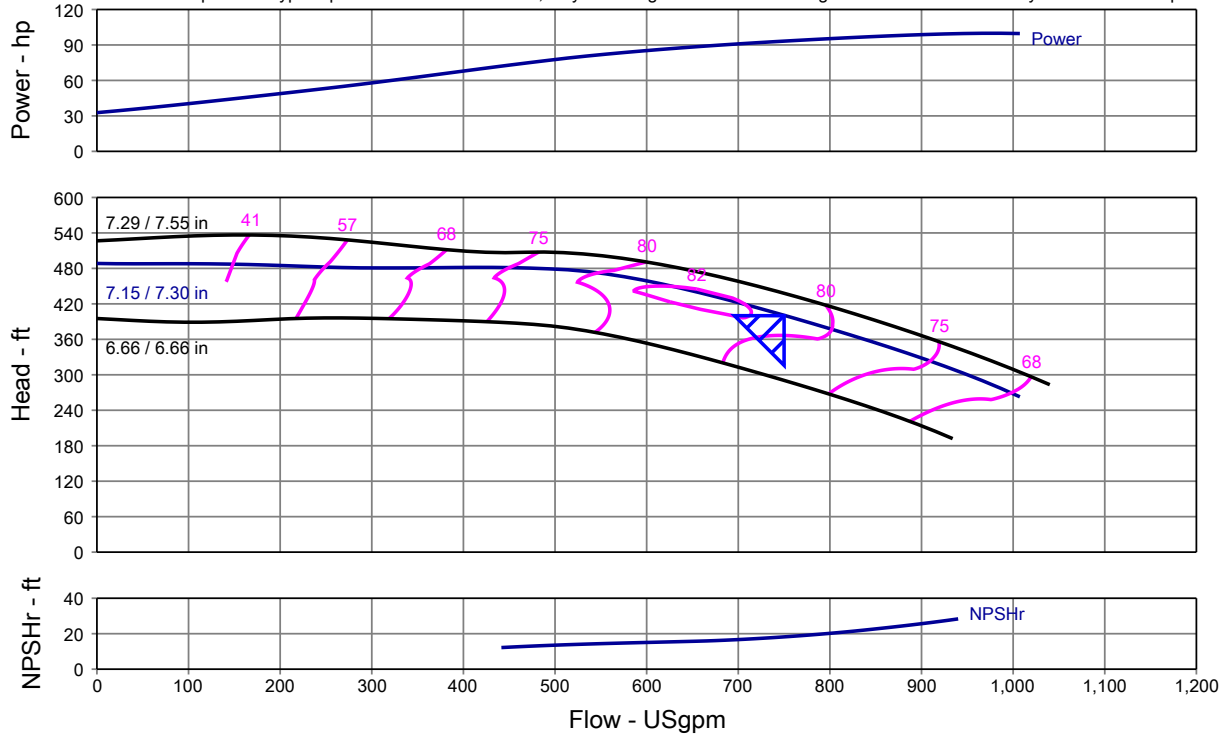
Operating Conditions		Liquid	
Flow, rated	: 750 USgpm	Liquid type	: Cold Water
Differential head / pressure, rated (requested)	: 400.0 ft	Additional liquid description	:
Differential head / pressure, rated (actual)	: 400.7 ft	Solids diameter, max	: 0.00 in
Suction pressure, rated / max	: 0.00 / 0.00 psi.g	Solids concentration, by volume	: 0.00 %
NPSH available, rated	: Ample	Temperature, max	: 68.00 deg F
Site Supply Frequency	: 60 Hz	Fluid density, rated / max	: 1.000 / 1.000 SG
		Viscosity, rated	: 1.00 cP
		Vapor pressure, rated	: 0.34 psi.a
Performance		Material	
Speed, rated	: 1785 rpm	Material selected	: Material Group, Standard
Impeller diameter, rated	: 7.15 / 7.30 in		
Impeller diameter, maximum	: 7.29 / 7.55 in	Pressure Data	
Impeller diameter, minimum	: 6.66 / 6.66 in	Maximum working pressure	: See the Additional Data page
Efficiency (bowl / pump)	: 81.36 / 80.47 %	Maximum allowable working pressure	: See the Additional Data page
NPSH required / margin required	: 18.2 / 0.0 ft	Maximum allowable suction pressure	: N/A
Ns (imp. eye flow) / Nss (imp. eye flow)	: 2,463 / 5,920 US Units	Hydrostatic test pressure	: See the Additional Data page
MCSF	: 245 USgpm	Driver & Power Data (@Max density)	
Head, maximum, rated diameter	: 488.3 ft	Motor sizing specification	: Max power (non-overloading)
Head rise to shutoff (bowl / pump)	: 21.88 / 22.74 %	Margin over specification	: 0.00 %
Flow, best eff. point (bowl / pump)	: 668 / 662 USgpm	Service factor	: 1.00 (used)
Flow ratio, rated / BEP (bowl / pump)	: 112.32 / 113.24 %	Power, hydraulic	: 75.9 hp
Diameter ratio (rated / max)	: 97.30 %	Power (bowl / pump)	: 93.2 / 93.6 hp
Head ratio (rated dia / max dia)	: 91.50 %	Max power (non-overloading)	: 100.3 hp
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00	Nameplate motor rating	: 125.0 hp / 93.2 kW
Selection status	: Acceptable		

Bowl performance. Adjusted for construction and viscosity.

The duty point represents the head at the bowl.

Performance based on test acceptance - Hyd Ins 14.6 Bilateral (2B)

Performance curve represents typical performance. When tested, only the design flow and head are guaranteed. Contact factory for additional requirements.





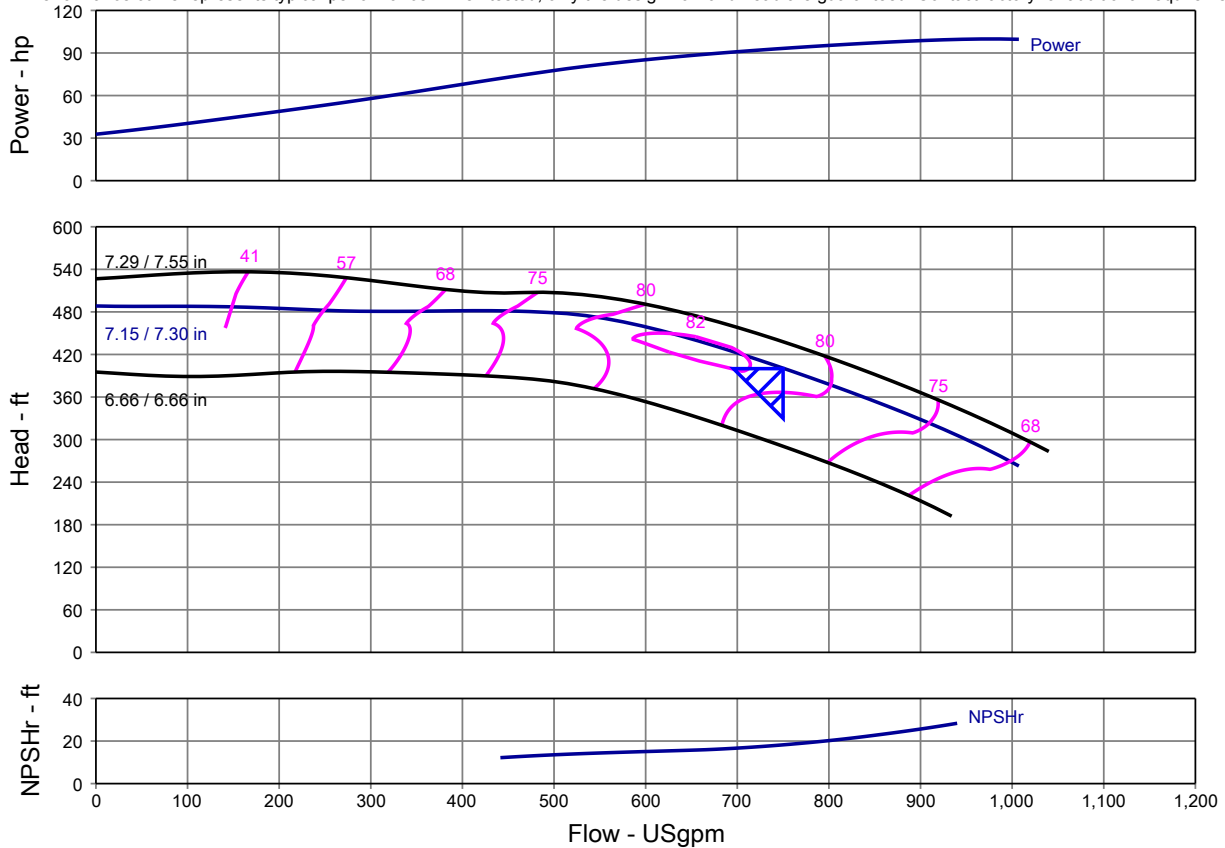
Pump Performance Curve

Bowl performance. Adjusted for construction and viscosity.

The duty point represents the head at the bowl.

Performance based on test acceptance - Hyd Ins 14.6 Bilateral (2B)

Performance curve represents typical performance. When tested, only the design flow and head are guaranteed. Contact factory for additional requirements.



Customer :	Peerless Model : GL10ME/HC
Customer ref. / PO :	Stages : 9
Tag Number : CDM-Beltz WTP-GW TM-Alt. 2&3	Speed, rated : 1785 rpm
Service :	Based on curve number : GL10MEHC4606314 Rev May 2020
Quantity : 3	Efficiency (bowl / pump) : 81.36 / 80.47 %
Quote Number / ID : 2094750	Power (bowl / pump) : 93.2 / 93.6 hp
Date last saved : 31 Oct 2023 4:26 PM	Max power (non-overloading) : 100.3 hp
Flow, rated : 750 USgpm	NPSH required : 18.2 ft
Differential head / pressure, rated : 400.0 ft	Viscosity : 1.00 cP
Fluid density, rated / max : 1.000 / 1.000 SG	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010] : 1.00 / 1.00 / 1.00 / 1.00

Flow (USgpm)	Head (ft)	Efficiency (%)	Power (hp)	NPSHr (ft)	Thrust, total (lbf)
0	488.3	0.00	32.7	-	3,501
112	487.8	33.34	41.3	-	3,150
224	483.6	53.67	50.9	-	2,881
336	480.8	66.37	61.4	-	2,606
448	481.4	74.84	72.7	12.3	2,302
560	469.8	80.46	82.5	14.5	1,919
672	433.7	82.19	89.4	16.0	1,469
783	385.6	80.56	94.7	19.5	1,042
895	330.8	75.85	98.6	25.4	629
1,007	262.7	67.04	99.7	-	167



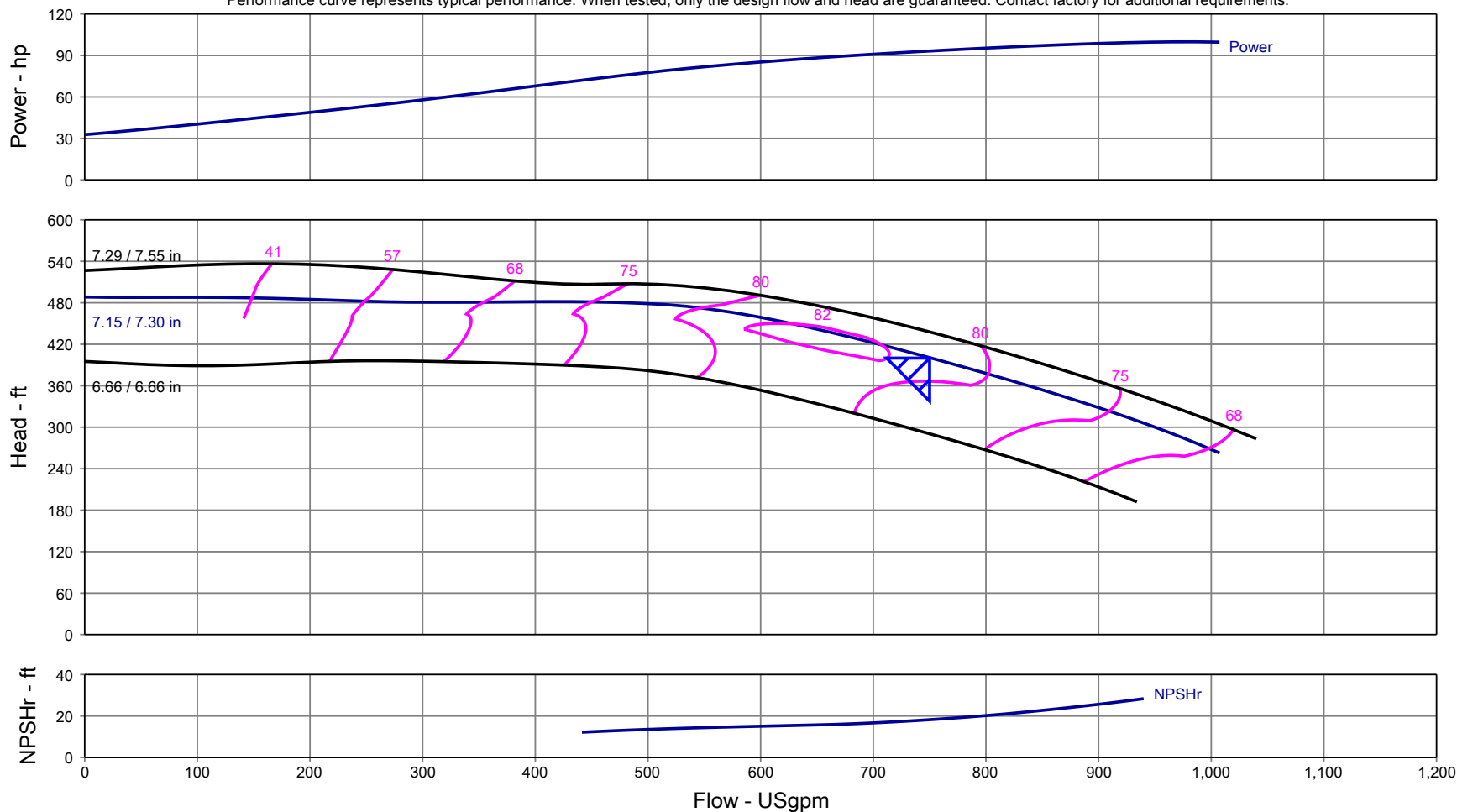
Pump Performance Curve

Bowl performance. Adjusted for construction and viscosity.

The duty point represents the head at the bowl.

Performance based on test acceptance - Hyd Ins 14.6 Bilateral (2B)

Performance curve represents typical performance. When tested, only the design flow and head are guaranteed. Contact factory for additional requirements.

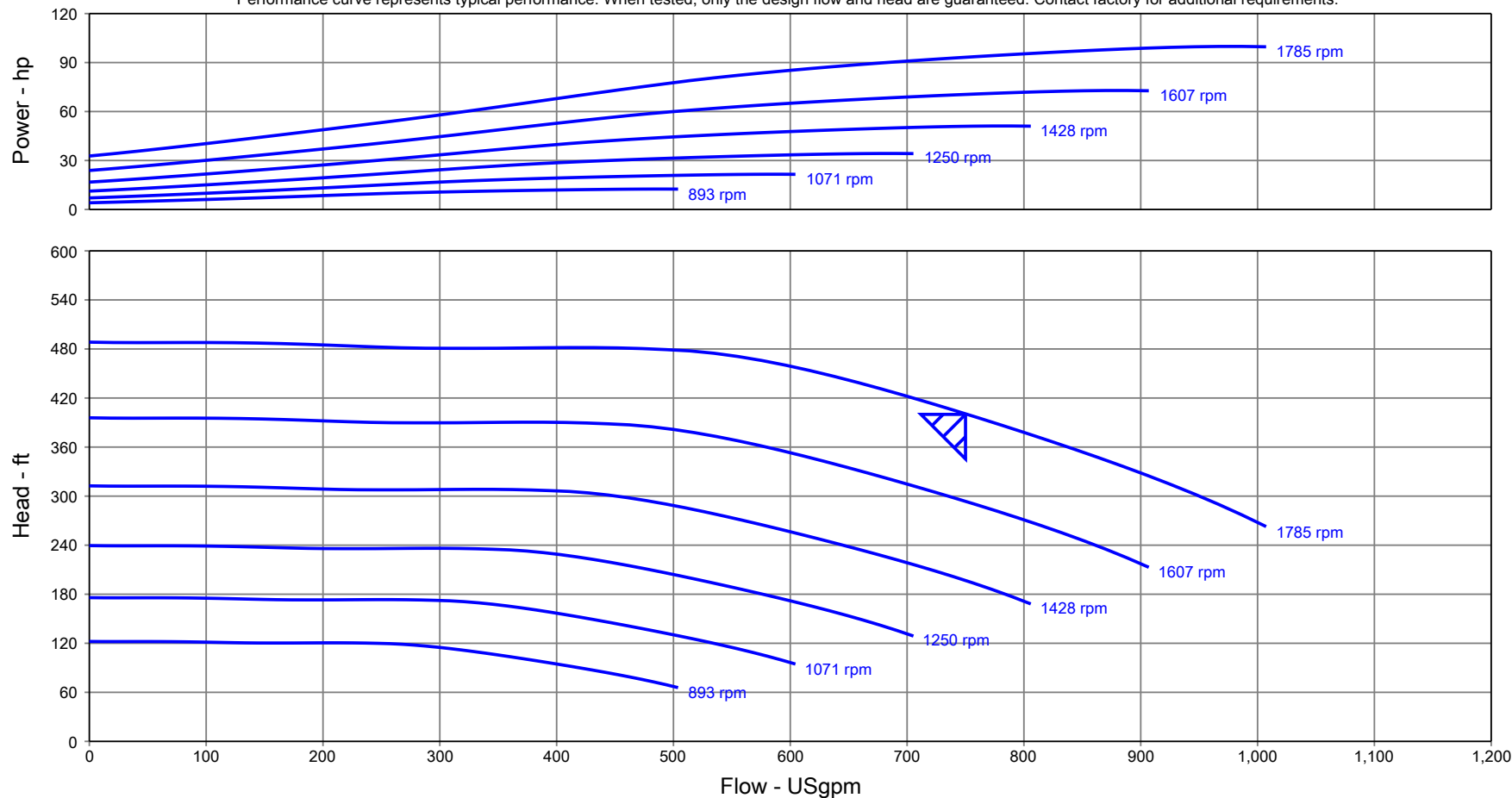


Project name	: CDM-Beltz WTP-GW TM-Alt. 2&3	Tag Number	: CDM-Beltz WTP-GW TM-Alt. 2&3	Speed, rated	: 1785 rpm
Commissioned	:	Service	:	Flow, rated	: 750 USgpm
Representative	:	Peerless Model	: GL10ME/HC	Differential head / pressure, rated	: 400.0 ft
Customer	:	Quantity	: 3	Power (bowl / pump)	: 93.2 / 93.6 hp
Customer ref. / PO	:	Quoted By (Sales Office)	: PUMPTech INC. - San Dimas, CA	Max power (non-overloading)	: 100.3 hp
Quote Number / ID	: 2094750	Quoted By (Sales Engineer)	: Neil Kulkarni	Efficiency (bowl / pump)	: 81.36 / 80.47 %
Date last saved	: 31 Oct 2023 4:26 PM	Stages	: 9	Based on curve number	: GL10MEHC4606314 Rev May 2020



Multi-Speed Performance Curve

Bowl performance. Adjusted for construction and viscosity.
 The duty point represents the head at the bowl.
 Performance based on test acceptance - Hyd Ins 14.6 Bilateral (2B)
 Performance curve represents typical performance. When tested, only the design flow and head are guaranteed. Contact factory for additional requirements.



Project name	: CDM-Beltz WTP-GW TM-Alt. 2&3	Tag Number	: CDM-Beltz WTP-GW TM-Alt. 2&3	Speed, rated	: 1785 rpm
Commissioned	:	Service	:	Flow, rated	: 750 USgpm
Representative	:	Peerless Model	: GL10ME/HC	Differential head / pressure, rated	: 400.0 ft
Customer	:	Quantity	: 3	Fluid density, rated / max	: 1.000 / 1.000 SG
Customer ref. / PO	:	Quoted By (Sales Office)	: PUMPTeCH INC. - San Dimas, CA	Viscosity	: 1.00 cP
Quote Number / ID	: 2094750	Quoted By (Sales Engineer)	: Neil Kulkarni	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Date last saved	: 31 Oct 2023 4:26 PM	Stages	: 9	Based on curve number	: GL10MEHC4606314 Rev May 2020

**"Construction Datasheet"**

Customer	:	Quote Number	:	2094750		
Customer Reference	:	Service	:			
Item Number	:	Date Last Saved	:	31 Oct 2023 4:26 PM		
Pump Size - Stages	:	Quantity of Pumps	:	3		
Construction		Motor Information				
Bowl construction	:	Discharge Case	:	Manufacturer	:	GE
Impeller type	:	Static (single plane) Balance	:	Vertical shaft type	:	VHS
Impeller fastening	:	316 Stainless Steel (lock collets)	:	Full load speed	:	1780 rpm
Strainer	:	N/A	:	Power	:	125.0 hp
Column construction	:	Threaded and Coupled	:	Service Factor	:	1
Column dia (nominal)	:	6.00 in	:	Volts / Phase / Hz	:	460 V / 3 / 60 Hz
Column pipe length	:	131.69 in	:	Frame size / Base diameter	:	16.50 in
Max column length	:	131.69 in	:	Enclosure	:	WP1
Lineshaft diameter	:	1.19 in	:	Duty Type	:	Continuous duty
Lineshaft construction	:	OLS	:	Inverter Duty Rated	:	0
Lineshaft lubrication	:	Product Lubrication	:	Efficiency Class, 100%/75%/50%	:	Premium, 94.86 % / 94.97 % / 94.56 %
Discharge	:	Above Base (floor)	:	Power factor	:	83.45 / 79.19 / 69.42
Materials		Driver amp full load	:	148.00 A		
Bowl	:	Cast iron	:	NEMA design	:	B
Impeller	:	316LSS	:	Motor starting	:	Full Volt
Bowl bearing	:	Standard (Bronze/Rubber)	:	Insulation	:	F
Bowl shaft	:	416 Stainless Steel	:	Ambient temperature	:	104.0 deg F
Bowl wear ring	:	None	:	Max altitude	:	3300
Impeller wear ring	:	None	:	Thrust rating	:	Standard High Thrust
Strainer	:	-	Additional information			
Column	:	Steel	Pit / sump depth	:	240 in	
Lineshaft	:	416 SS	Pump length	:	234.00 in	
Bearing retainer / ELS Tube	:	304SS	Max pump dia below mounting surface	:	10.00 in	
Lineshaft bearing	:	Standard (Rubber)	Max sphere size	:	1.03 in	
Discharge head	:	Fabricated Steel	Total / best lateral setting	:	0.78 / 0.375	
Sole plate	:	None	Max suction pressure**	:	0.00 psi.g	
Paint	:	Class I	Testing			
Approximate Weights		Hydraulic performance test	:	Factory Performance Test - Witness		
Complete pump	:	2,406 lb	Hydrostatic test	:	Factory Hydrostatic Pressure Test (bowl) - Non-Witness	
Driver	:	1,150 lb	Curve approval	:	Yes	
			NPSH test	:	None	
			String test	:	None	
			Test w/ motor	:	None	



Pump Performance - Additional Data						
Project name	: CDM-Beltz WTP-GW TM-Alt. 2&3	Tag Number	: CDM-Beltz WTP-GW TM-Alt. 2&3			
Commissioned	:	Service	:			
Representative	:	Model	: GL10ME/HC			
Customer	:	Quantity	: 3			
Customer ref. / PO	:	Quoted By (Sales Office)	: PUMPTECH INC. - San Dimas, CA			
Quote Number / ID	: 2094750	Quoted By (Sales Engineer)	: Neil Kulkarni			
Date last saved	: 31 Oct 2023 4:26 PM	Speed, rated	: 1785 rpm			
Stages	: 9					
Performance Data			Stage, Speed and Solids Limits			
Head, maximum diameter, rated flow	: 437.9 ft	Stages, maximum	: 22			
Head, minimum diameter, rated flow	: 290.5 ft	Stages, minimum	: 1			
Head, maximum, rated diameter	: 488.3 ft	Pump speed limit, maximum	: 3600 rpm			
Efficiency adjustment factor, total	: 0.98	Pump speed limit, minimum	: 1 rpm			
Power adjustment, total	: 2.2 hp	Curve speed limit, maximum	: 3600 rpm			
Head adjustment factor, total	: 1.00	Curve speed limit, minimum	: 1 rpm			
Flow adjustment factor, total	: 1.00	Variable speed limit, maximum	: -			
NPSHR adjustment factor, total	: 1.00	Variable speed limit, minimum	: -			
NPSH margin dictated by pump supplier	: 0.0 ft	Solids diameter limit	: 1.03 in			
NPSH margin dictated by user	: 0.0 ft	Typical Driver Data				
NPSH margin used (added to 'required' values)	: 0.0 ft	Driver speed, full load	: 1785 rpm			
Mechanical Limits		Driver speed, rated load	: 1789 rpm			
Torque, rated power, rated speed	: 5.24 hp/100 rpm	Driver efficiency, 100% load	: N/A			
Torque, maximum power, rated speed	: 5.62 hp/100 rpm	Driver efficiency, 75% load	: N/A			
Torque, driver power, full load speed	: 7.00 hp/100 rpm	Driver efficiency, 50% load	: N/A			
Torque, driver power, rated speed	: 7.00 hp/100 rpm					
Torque, pump shaft limit	: -					
Radial load, worst case	: -					
Radial load limit	: -					
Impeller peripheral speed, rated	: -					
Impeller peripheral speed limit	: -					
Various Performance Data		Flow (USgpm)	Head (ft)	Efficiency (%)	NPSHr (ft)	Power (hp)
Shutoff, rated diameter		0	488.3	-	-	32.7
Shutoff, maximum diameter		0	526.7	-	-	40.7
MCSF		245	482.5	56.50	4.1	52.8
Rated flow, minimum diameter		750	290.5	77.60	-	70.9
Rated flow, maximum diameter		750	437.9	80.88	-	102.5
BEP flow, rated diameter		668	435.1	82.20	16.0	89.2
120% rated flow, rated diameter		900	328.4	75.58	25.6	98.7
End of curve, rated diameter		1,007	262.7	67.04	34.1	99.7
End of curve, minimum diameter		934	192.0	62.32	35.7	72.7
End of curve, maximum diameter		1,040	283.3	66.05	34.2	112.6
Maximum value, rated diameter		-	488.3	82.20	-	100.3
Maximum value, maximum diameter		-	-	81.42	-	112.6
System differential pressure		@ Density, rated		@ Density, max		
Differential pressure, rated flow, rated diameter (psi)		173.4		173.4		
Differential pressure, shutoff, rated diameter (psi)		211.3		211.3		
Differential pressure, shutoff, maximum diameter (psi)		227.9		227.9		
Discharge pressure		@ Suction pressure, rated	@ Suction pressure, max	@ Suction pressure, rated	@ Suction pressure, max	
Discharge pressure, rated flow, rated diameter (psi.g)		173.4	173.4	173.4	173.4	
Discharge pressure, shutoff, rated diameter (psi.g)		211.3	211.3	211.3	211.3	
Discharge pressure, shutoff, maximum diameter (psi.g)		227.9	227.9	227.9	227.9	
Ratios						
Maximum flow / rated flow, rated diameter	: 134.31 %	Head rated diameter / head minimum diameter, rated flow		: 137.91 %		



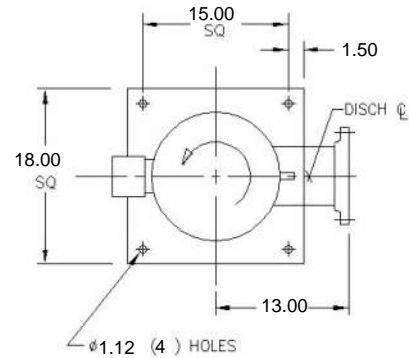
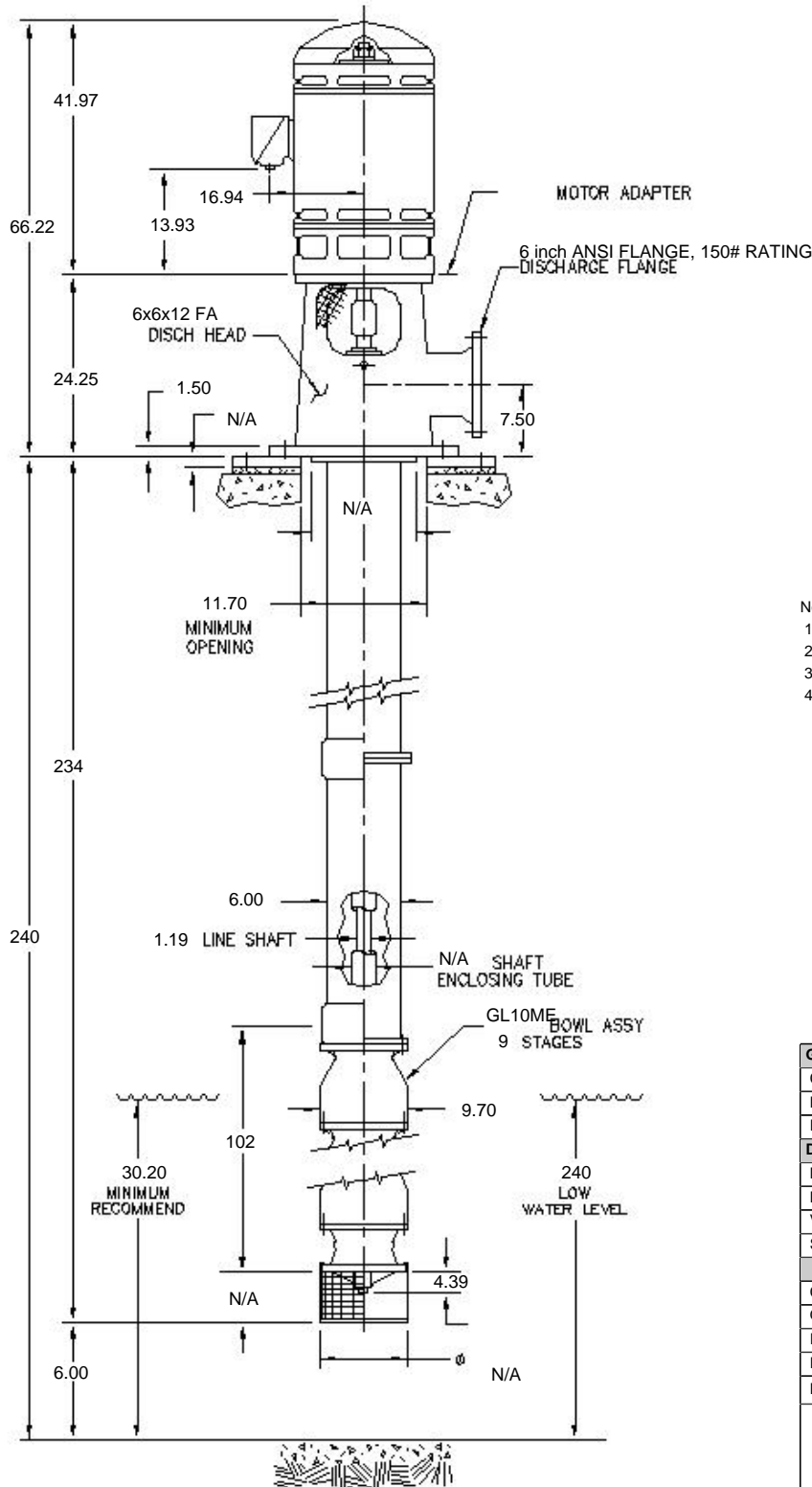
Pump Performance - Additional Data

Head and Power Losses				Dimensions	
Friction loss rate, column	: 5.00 %	Minimum clearance below suction bell lip/case	: 6.00 in		
Friction loss, column	: 0.55 ft	Minimum well diameter	: 10.01 in		
Friction loss, discharge head	: 1.75 ft	Suction nozzle centerline height	: -		
Friction loss, can/barrel	: -	Suction to first stage impeller centerline	: 5.62 in		
Friction loss, suction bell and strainer	: 0.00 ft	Bowl assembly length, first stage	: 22.31 in		
Friction loss, bowl/column adaptor	: 0.53 ft	Bowl assembly length, upper stage	: 10.00 in		
Friction loss, total	: 2.83 ft	Bowl assembly length, total	: 102 in		
Power loss, lineshaft bearings	: 0.1 hp	Suction bearing hub length	: 4.39 in		
Power loss, thrust bearing	: 0.3 hp	Strainer length	: 0.00 in		
Power loss, total	: 0.4 hp	Bowl to column adaptor length	: 0.00 in		
Bowl vs. Pump Performance				Discharge head stick-down	: 0.00 in
Head (bowl / pump)	: 400.7 ft / 397.2 ft	Submersible motor adaptor length	: -		
Efficiency (bowl / pump)	: 81.36 % / 80.47 %	Submersible motor length	: -		
Power (bowl / pump)	: 93.2 hp / 93.6 hp	Column length	: 131.69 in		
NPSH required at first stage impeller eye	: 18.2 ft	Total pump length	: 234.00 in		
Weights and Down Thrust				Can / barrel length	: -
Weight, lineshaft	: 0 lb	Stuffing box sleeve diameter	: 0.00 in		
Weight, bowl assembly rotating element	: 718 lb	Suction bell diameter	: -		
Thrust factor	: 2.92 lb/ft	Minimum submergence to prevent vortexing	: 0.00 in		
Thrust, hydraulic (rated / max)	: 1,166 / 3,501 lbf	Actual submergence (based on LLL)	: 234 in		
Thrust, bowl shaft end (rated / max)	: 0 / 0 lbf	Discharge head height	: 24.25 in		
Thrust, shaft step (rated / max)	: 0 / 0 lbf	Discharge nozzle centerline height	: 7.50 in		
Thrust, stuffing box sleeve (rated / max)	: 190 / 190 lbf	Min distance discharge nozzle centerline to suction bell	: 0.00		
Thrust, total (rated / max)	: 2,075 / 4,409 lbf	Lineshaft length	: 155.94 in		
Thrust bearing capacity	: -	Bowl shaft diameter	: 1.19 in		
* Rated thrust @ rated head, density, and suction pressure where applicable				Bowl diameter, outside	: 9.70 in
* Max thrust @ max head, density, and suction pressure where applicable				Bowl diameter, exit	: 4.88 in
Pressure Data	Maximum working pressure (psi.g)	Maximum allowable working pressure (psi.g)	Hydrostatic test pressure (psi.g)	Column diameter, inside	: 6.07 in
Bowl	211.3	400.0	N/A	Column internal obstruction diameter	: 1.19 in
Column	211.3	-	N/A	Can/barrel diameter, inside	: -
Discharge head	211.3	300.0	N/A	Can/barrel obstruction diameter	
Can/Barrel	-	-	-	NPSH	
Torque Limits				NPSH at bowl (available / required)	: Ample / 18.2 ft
Torque, lineshaft limit	: -			NPSH at low liquid level (available / required)	: Ample / -
				NPSH at suction flange (available / required)	: - / -
				Liquid Velocities	
				Column liquid velocity	: 8.66 ft/s
				Discharge head liquid velocity	: 8.66 ft/s
				Can liquid velocity	: -
				Suction nozzle liquid velocity	: -



Pump Performance - Additional Data					
Mixed Stage Performance	Set #1	Set #2	Set #3	Set #4	Alternate First Stage
Model	GL10ME/HC	-	-	-	-
Stages	9	-	-	-	-
Based on curve number	GL10MEHC4606314	-	-	-	-
Impeller diameter, rated	7.22 in	-	-	-	-
Impeller diameter, maximum	7.42 in	-	-	-	-
Impeller diameter, minimum	6.66 in	-	-	-	-
Limitations					
Tolerance Type	: Hyd Ins 14.6 Bilateral (2B)	Low liquid level (Measured from bottom of head)		: in	
Head measured at	: Bowl	NPSHa measured at		: Low liquid level	
Pump type	: Complete Pump	Velocity column		: 10.00 ft/s	
Direct connect	: No	Well inside diameter (Enter a value >0 if a diameter check is required)		: in	
Length strategy	: Sump depth	Maximum working pressure strategy		: Maximum head, rated diameter	
Length	: 240.00 in				
Product Line Options					
Suction type	: Bell	Drive shaft type		: VHS	
Bowl discharge type	: Discharge case	Discharge location		: Above ground	
Bowl shaft material	: 416 SS	Discharge head material		: Steel	
Bowl shaft diameter	: 1 3/16 inch	Discharge head design		: Type FA	
Impeller connection type	: Taper lock	Discharge head size		: 6x6x12	
Column diameter	: 6 inch	Sealing type		: Mechanical seal	
Column construction	: Threaded	Discharge flange rating		: 150lb ANSI flange	
Suction accessory	: None	Coupling design		: Threaded coupling	
Lineshaft material	: 416 SS	Top shaft material		: 416 SS	
Lineshaft diameter	: 1 3/16 inch	Top shaft diameter		: 1 1/2 inch	
Lineshaft lubrication	: Open Lineshaft				
Performance Adjustment Options					
Impeller polished	: Not polished	Effective impeller material for galling		: Al Brz C952	
Impeller wear ring	: None	Effective bowl material for galling		: Cast/Ductile Iron	
Bowl wear ring	: None	Effective impeller material for polishing		: Al-Brz	

General Arrangement Drawing



Notes

1. Unless otherwise specified, dimensions are in inches
2. Baseplate requires support on all sides.
3. Read instructions before beginning pump assembly or installation.
4. Drawing is preliminary until certified by factory.

APPROXIMATE DRY WEIGHT	
Driver	1,150 lb
Discharge Head	283 lb
Column / Shaft	219 lb / 48 lb
Bowl Assembly	705 lb
Total	2,406 lb

GENERAL DATA			
Capacity	750 USgpm	Liquid	Cold Water
Head	400.0 ft	Specific Gravity	1.000 SG
Pump Speed	1785 rpm		
DRIVER DATA			
MFGR	-	Shaft Type	OLS
Hp	125.0 hp	Enclosure / Type	WP1
Volt / Ph / Hz	460 / 3 / 60 Hz	Frame / Model	L405TP
Service Factor	1		
Customer Name			
Quote No	0		
Item No.	CDM-Beltz WTP-GW TM-Alt. 2&3		
Project	CDM-Beltz WTP-GW TM-Alt. 2&3		
Date	31 Oct 2023 4:19 PM		



0-CDM-Beltz WTP-GW TM-Alt. 2&3



Customer Price Sheet Total Only

Project name	CDM-Beltz WTP-GW TM-Alt. 2&3	Quote Number / ID	2094750
Customer		Model / Stages	GL10ME/HC / 9
Tag Number	CDM-Beltz WTP-GW TM-Alt. 2&3	Flow, rated	750 USgpm
Customer ref. / PO		Differential head / pressure, rated	400.0 ft
		Speed, rated	1785 rpm

Total

Grand Total	Lead Time Total
-------------	-----------------

Pump

Qty	Description
3	GL10ME/HC
	Bowl Assembly
	Pump Type: New Pump
3	Bowl Size: GL10ME
	Number of Stages: 9 stage
	Materials of Construction: Materials (Cast Iron, 316LSS)
	Bowl Material: Cast Iron
	Bowl Configuration (Connection)
	Top Bowl (Discharge Connection): Discharge Case
	Suction: Bell Suction
	Line Shaft Bowl Adder: Open Line Shaft (OLS)
	Shaft, Pump: 1 3/16 inch
	Pump shaft material (Bowl Shaft): 416 Stainless Steel
27	Efficiency: Standard Efficiency
	Impeller Wear Rings: None
	Bowl Wear Rings: None
	Suction Accessory: None
	Lateral Travel in Bowl Assembly: Standard
	Bowl Bearing Materials: Standard (Bronze/Rubber)
3	Impeller Balance: Static (single plane) Balance
	Dry Pit Application: No
27	Impeller Fastening: 316 Stainless Steel (lock collets)
27	Bowl Bolting: 316 Stainless Steel
	Bowl Flange Name Plate: Bowl Flange Name Plate for NSF 61 (99403016)
	Discharge Head Name Plate: Discharge Head Name Plate for NSF 61 (93003539)
	Column / Line Shaft / Coupling
	Column Material: Steel
	Column Pipe Design: Threaded and Coupled
	Column Diameter: 6 inch
	Column Pipe: 10 Ft Bearing Spacing
	Line Shaft Lubrication: Product Lubrication
	Line Shaft Sleeves: None
3	Line Shaft Material: 416 SS
	Line Shaft Coupling Design: Threaded Coupling
3	Line Shaft Coupling Material: 410 SS
3	Bearing Retainer: Drop In
	Line Shaft Bearing Material: Standard (Rubber)
	Top Shaft Diameter: 1 1/2 inch
	Top Shaft Material: 416 SS



Pump

Qty	Description
	Column Assembly
3	OLS Threaded Column 6 inch / 1.1875 inch Shaft / 10 Ft Bearing Spacing, Length Base to Bowl 132 inch Column Bottom: (1) OLS Threaded Column 6 inch, Length 120 inch, Steel Column Top: (1) OLS Threaded Column 6 inch, Code Length to Base 12 inch, Steel
	Shaft Group of Column
	Shaft, Line, Bottom: (1) Threaded, D = 1.1875 inch, L = 120 inch, 416 SS Shaft, Line, Top: (1) Threaded, D = 1.1875 inch, L = 20.56 inch, 416 SS Shaft, Top (Motor shaft length) VHS only: (3) Threaded, D = 1.5 inch, L = 8.5 inch, 416 SS Top Shaft and Nut
3	Top Shaft & Nut
	Discharge Head
3	Discharge Head Assembly: 6x6x12FA Discharge Head Flange Rating: 150# Discharge Head Material: Fabricated Steel Discharge Location: Above Base (floor) Line Shaft Construction: Open Line Shaft (OLS) Sealing Type: Mechanical Seal
3	Mechanical Seal: AES, Tp SCUSI Carbon/Ceramic
3	Column to Discharge Head Fastener Material: 316 Stainless Steel Sole Plate: None
3	Top Column Flange (TCF): Cast Iron - Threaded Stuffing Box Bearing Material: Standard (Bronze)
	Driver
	Driver Supplied By: Factory Efficiency: Premium Motor (Design Types): NEMA
	Coating / Painting Systems
	System: Class I Coating System per Section 510, page 1 (default Tnemec 21)
3	Outside Bowl Assembly: Class I Coating System Inside Bowl Assembly: Standard Coating: Glass or Scotchkote 134
3	Outside Column: Class I Coating System
3	Inside Column: Class I Coating System
3	Outside Discharge Head: Class I Coating System
3	Inside Discharge Head: Class I Coating System
	Assembly / Match Marking / Shipping
3	Factory Assembly for Shipment: Factory Assembled

Testing

Qty	Description
3	Testing Tolerance Type: Hyd Ins 14.6 Bilateral (2B)
3	Factory Performance Test - Witness Guarantee Bowl Efficiency :
3	Non Overloading Motor:
3	Performance Test Data Sheets
3	Test Curve For Approval - submitted for customer approval (stop/hold of production)
3	Factory Hydrostatic Pressure Test (bowl) - Non-Witness



Certification & Documentation

Qty	Description
3	Bowl Assembly Drinking Water Approval
3	NSF 61 International Classification Nameplate (Subject to factory validation of design and materials)
3	Drinking Water Certification material selection must be verified before acceptance of order due to complexity check.
	Drawings, Curves, and Instructions
1	Project Management: Project Manager
	Engineering Data
1	Seismic Calculation - Standard Peerless Factory Calculations

Motor

Qty	Description
3	Driver
3	Motor: Motor-electric, 125hp, 1780rpm, 460/0/0/0V, 3Ph, 60Hz, L405TP, VHS, WP1, PremEff., Stock, GE, V4424-CONV

Commercial

Qty	Description
1	Commercial Terms
1	Incoterms 2020: EXW Order is subject to storage fee if not picked up after 10 working days when goods are made ready. Named Place: Seller's Facility

Nguyen, Hoai (Kati)

From: Neil Kulkarni <neilkulkarni36@gmail.com>
Sent: Tuesday, October 31, 2023 2:30 PM
To: Nguyen, Hoai (Kati)
Cc: Keenan, John (Jack) P.
Subject: FW: Peerless Pump Quote Request
Attachments: CDM-Beltz-WTP-ASR-TM-Alt 3-M12MB-Data Sheets-Oct-23.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Kati,

Pump selection for ASR TM, alt. 3 is attached.

Budget price for pump, inverter duty VHS, WP1 motor, non-witness performance and hydro test, NSF61 construction and NSF61 coatings, fabricated steel discharge head, mechanical seal is \$80K each.

Neil Kulkarni

PumpTech, Inc.

Cell: 626-622-3762

300 E Bonita Ave, #5014

San Dimas, CA 91773



Pump Performance Datasheet

Customer :	Quote Number / ID : 2095195
Customer ref. / PO :	Peerless Model : M12MB/MC
Tag Number : CDM-Beltz WTP-ASR TM-Alt. 3	Stages : 9
Service :	Based on curve number : M12MBMC-4605507 Rev June 2022
Quantity : 4	Date last saved : 31 Oct 2023 9:11 PM

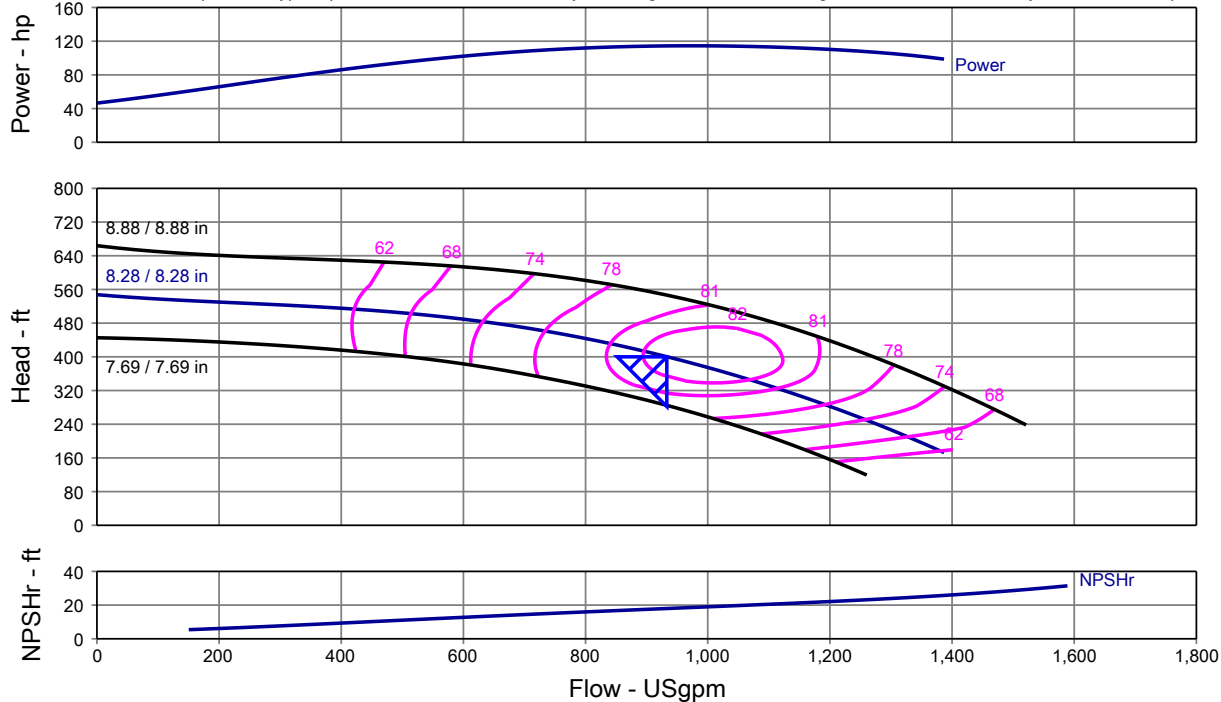
Operating Conditions		Liquid	
Flow, rated	: 933 USgpm	Liquid type	: Cold Water
Differential head / pressure, rated (requested)	: 400.0 ft	Additional liquid description	:
Differential head / pressure, rated (actual)	: 400.4 ft	Solids diameter, max	: 0.00 in
Suction pressure, rated / max	: 0.00 / 0.00 psi.g	Solids concentration, by volume	: 0.00 %
NPSH available, rated	: Ample	Temperature, max	: 68.00 deg F
Site Supply Frequency	: 60 Hz	Fluid density, rated / max	: 1.000 / 1.000 SG
		Viscosity, rated	: 1.00 cP
		Vapor pressure, rated	: 0.34 psi.a
Performance		Material	
Speed, rated	: 1785 rpm	Material selected	: Material Group, Standard
Impeller diameter, rated	: 8.28 / 8.28 in		
Impeller diameter, maximum	: 8.88 / 8.88 in	Pressure Data	
Impeller diameter, minimum	: 7.69 / 7.69 in	Maximum working pressure	: See the Additional Data page
Efficiency (bowl / pump)	: 82.44 / 81.52 %	Maximum allowable working pressure	: See the Additional Data page
NPSH required / margin required	: 18.0 / 0.0 ft	Maximum allowable suction pressure	: N/A
Ns (imp. eye flow) / Nss (imp. eye flow)	: 2,958 / 6,152 US Units	Hydrostatic test pressure	: See the Additional Data page
MCSF	: 60 USgpm	Driver & Power Data (@Max density)	
Head, maximum, rated diameter	: 547.6 ft	Motor sizing specification	: Max power (non-overloading)
Head rise to shutoff (bowl / pump)	: 36.77 / 37.25 %	Margin over specification	: 0.00 %
Flow, best eff. point (bowl / pump)	: 986 / 980 USgpm	Service factor	: 1.00 (used)
Flow ratio, rated / BEP (bowl / pump)	: 94.66 / 95.25 %	Power, hydraulic	: 94.3 hp
Diameter ratio (rated / max)	: 93.24 %	Power (bowl / pump)	: 114.4 / 115.3 hp
Head ratio (rated dia / max dia)	: 73.25 %	Max power (non-overloading)	: 115.4 hp
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00	Nameplate motor rating	: 125.0 hp / 93.2 kW
Selection status	: Acceptable		

Bowl performance. Adjusted for construction and viscosity.

The duty point represents the head at the bowl.

Performance based on test acceptance - Hyd Ins 14.6 Bilateral (2B)

Performance curve represents typical performance. When tested, only the design flow and head are guaranteed. Contact factory for additional requirements.





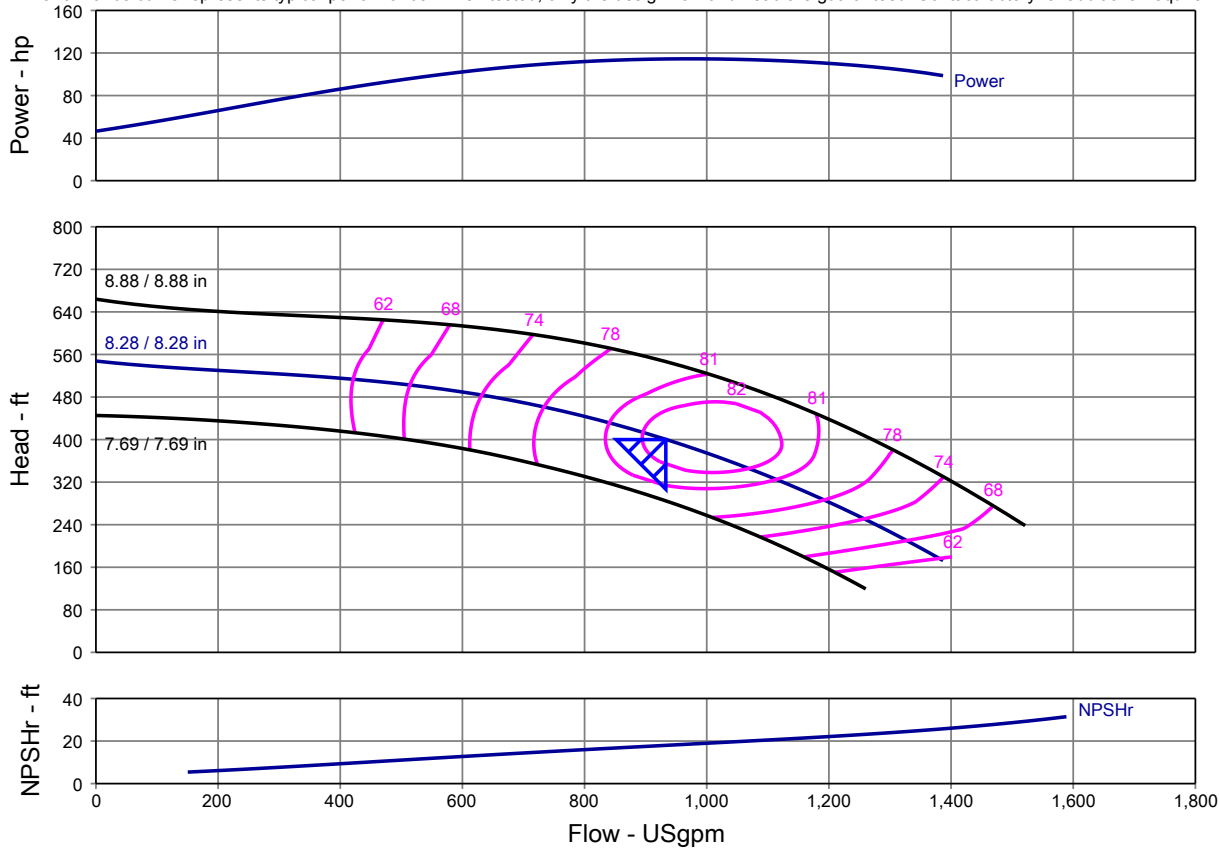
Pump Performance Curve

Bowl performance. Adjusted for construction and viscosity.

The duty point represents the head at the bowl.

Performance based on test acceptance - Hyd Ins 14.6 Bilateral (2B)

Performance curve represents typical performance. When tested, only the design flow and head are guaranteed. Contact factory for additional requirements.



Customer :	Peerless Model : M12MB/MC
Customer ref. / PO :	Stages : 9
Tag Number : CDM-Beltz WTP-ASR TM-Alt. 3	Speed, rated : 1785 rpm
Service :	Based on curve number : M12MBMC-4605507 Rev June 2022
Quantity : 4	Efficiency (bowl / pump) : 82.44 / 81.52 %
Quote Number / ID : 2095195	Power (bowl / pump) : 114.4 / 115.3 hp
Date last saved : 31 Oct 2023 9:11 PM	Max power (non-overloading) : 115.4 hp
Flow, rated : 933 USgpm	NPSH required : 18.0 ft
Differential head / pressure, rated : 400.0 ft	Viscosity : 1.00 cP
Fluid density, rated / max : 1.000 / 1.000 SG	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010] : 1.00 / 1.00 / 1.00 / 1.00

Flow (USgpm)	Head (ft)	Efficiency (%)	Power (hp)	NPSHr (ft)	Thrust, total (lbf)
0	547.6	0.00	46.5	-	7,609
154	533.2	33.91	61.2	5.5	7,232
308	522.8	52.75	77.1	7.8	6,717
462	509.0	64.82	91.7	10.4	6,292
616	486.5	73.30	103.3	13.0	5,717
771	451.8	79.18	111.0	15.5	4,825
925	403.4	82.36	114.3	17.8	3,744
1,079	341.3	81.82	113.6	20.2	2,744
1,233	264.9	75.70	108.9	22.7	1,901
1,387	172.6	61.23	98.7	25.7	942



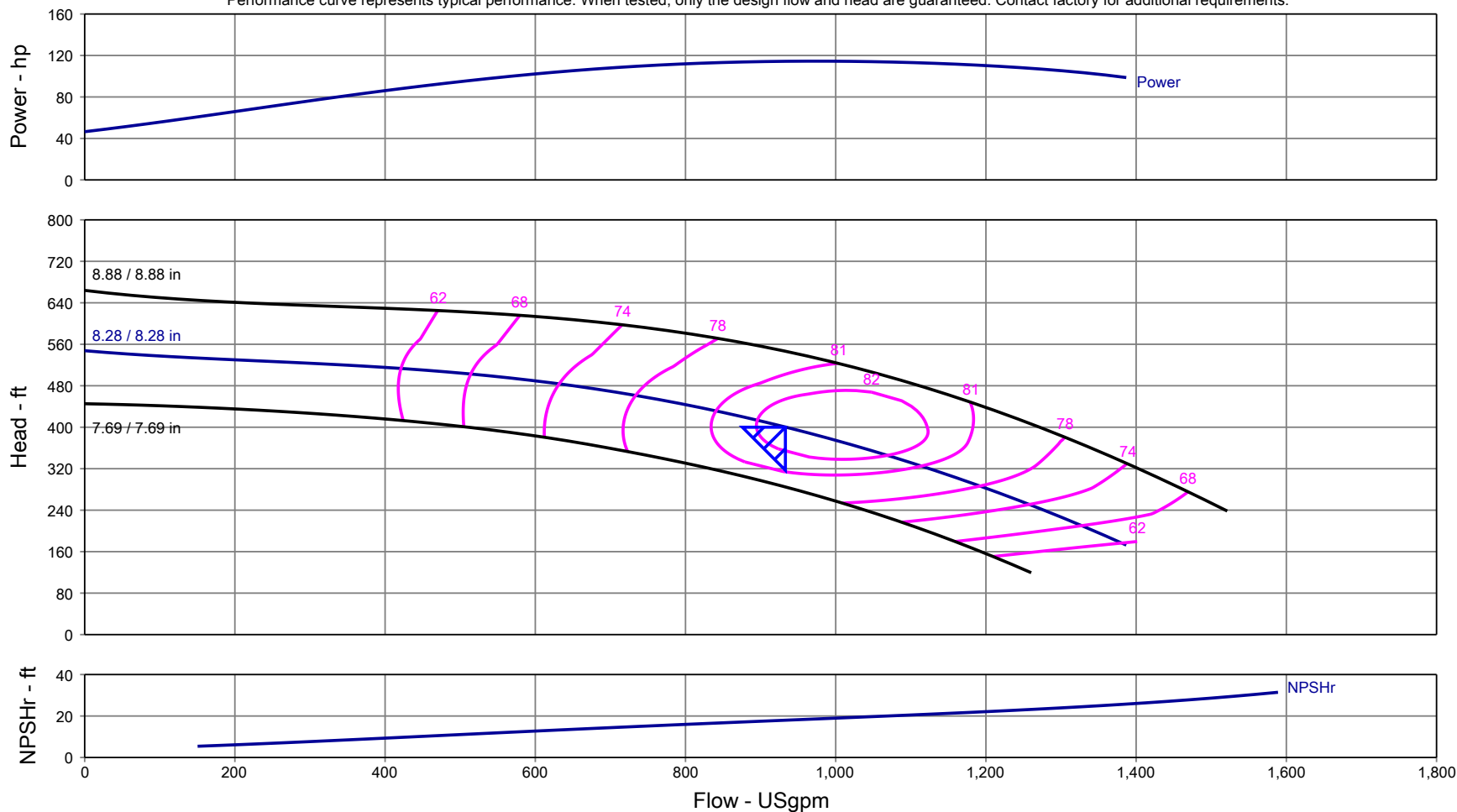
Pump Performance Curve

Bowl performance. Adjusted for construction and viscosity.

The duty point represents the head at the bowl.

Performance based on test acceptance - Hyd Ins 14.6 Bilateral (2B)

Performance curve represents typical performance. When tested, only the design flow and head are guaranteed. Contact factory for additional requirements.

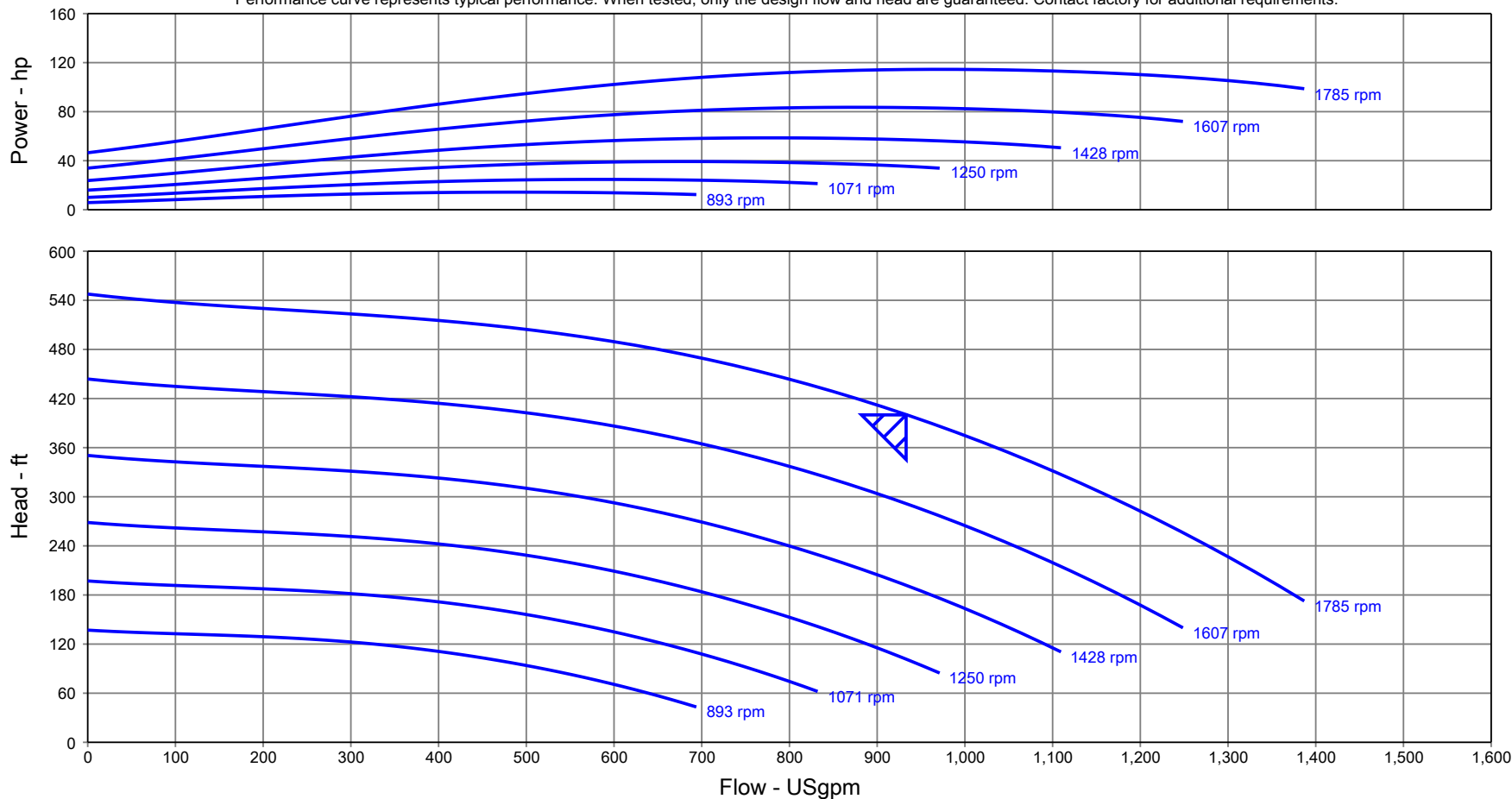


Project name	: CDM-Beltz WTP-ASR TM-Alt. 3	Tag Number	: CDM-Beltz WTP-ASR TM-Alt. 3	Speed, rated	: 1785 rpm
Commissioned	:	Service	:	Flow, rated	: 933 USgpm
Representative	:	Peerless Model	: M12MB/MC	Differential head / pressure, rated	: 400.0 ft
Customer	:	Quantity	: 4	Power (bowl / pump)	: 114.4 / 115.3 hp
Customer ref. / PO	:	Quoted By (Sales Office)	: PUMPTech INC. - San Dimas, CA	Max power (non-overloading)	: 115.4 hp
Quote Number / ID	: 2095195	Quoted By (Sales Engineer)	: Neil Kulkarni	Efficiency (bowl / pump)	: 82.44 / 81.52 %
Date last saved	: 31 Oct 2023 9:11 PM	Stages	: 9	Based on curve number	: M12MBMC-4605507 Rev June 2022



Multi-Speed Performance Curve

Bowl performance. Adjusted for construction and viscosity.
 The duty point represents the head at the bowl.
 Performance based on test acceptance - Hyd Ins 14.6 Bilateral (2B)
 Performance curve represents typical performance. When tested, only the design flow and head are guaranteed. Contact factory for additional requirements.



Project name	: CDM-Beltz WTP-ASR TM-Alt. 3	Tag Number	: CDM-Beltz WTP-ASR TM-Alt. 3	Speed, rated	: 1785 rpm
Commissioned	:	Service	:	Flow, rated	: 933 USgpm
Representative	:	Peerless Model	: M12MB/MC	Differential head / pressure, rated	: 400.0 ft
Customer	:	Quantity	: 4	Fluid density, rated / max	: 1.000 / 1.000 SG
Customer ref. / PO	:	Quoted By (Sales Office)	: PUMPTeCH INC. - San Dimas, CA	Viscosity	: 1.00 cP
Quote Number / ID	: 2095195	Quoted By (Sales Engineer)	: Neil Kulkarni	Cq/Ch/Ce/Cn [ANSI/Hi 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Date last saved	: 31 Oct 2023 9:11 PM	Stages	: 9	Based on curve number	: M12MBMC-4605507 Rev June 2022

**"Construction Datasheet"**

Customer	:	Quote Number	:	2095195		
Customer Reference	:	Service	:			
Item Number	:	Date Last Saved	:	31 Oct 2023 9:11 PM		
Pump Size - Stages	:	Quantity of Pumps	:	4		
Construction		Motor Information				
Bowl construction	:	Discharge Case	:	Manufacturer	:	GE
Impeller type	:	Static (single plane) Balance	:	Vertical shaft type	:	VHS
Impeller fastening	:	316 Stainless Steel (lock collets)	:	Full load speed	:	1785 rpm
Strainer	:	N/A	:	Power	:	150.0 hp
Column construction	:	Direct Connect (No Column Required)	:	Service Factor	:	1
Column dia (nominal)	:	8.00 in	:	Volts / Phase / Hz	:	460 V / 3 / 60 Hz
Column pipe length	:	240.00 in	:	Frame size / Base diameter	:	16.50 in
Max column length	:	240.00 in	:	Enclosure	:	WP1
Lineshaft diameter	:	1.19 in	:	Duty Type	:	Continuous duty
Lineshaft construction	:	OLS	:	Inverter Duty Rated	:	0
Lineshaft lubrication	:	Product Lubrication	:	Efficiency Class, 100%/75%/50%	:	Premium, 95.31 % / 95.20 % / 94.64 %
Discharge	:	Above Base (floor)	:	Power factor	:	83.76 / 79.42 / 69.58
Materials		Driver amp full load			:	176.00 A
Bowl	:	Cast iron	:	NEMA design	:	B
Impeller	:	Al Brz C952	:	Motor starting	:	Full Volt
Bowl bearing	:	Standard (Bronze/Rubber)	:	Insulation	:	F
Bowl shaft	:	416 Stainless Steel	:	Ambient temperature	:	104.0 deg F
Bowl wear ring	:	None	:	Max altitude	:	3300
Impeller wear ring	:	None	:	Thrust rating	:	Standard High Thrust
Strainer	:	-	Additional information			
Column	:	Steel	Pit / sump depth	:	240 in	
Lineshaft	:	416 SS	Pump length	:	342.00 in	
Bearing retainer / ELS Tube	:	304SS	Max pump dia below mounting surface	:	18.00 in	
Lineshaft bearing	:	Standard (Rubber)	Max sphere size	:	0.81 in	
Discharge head	:	Fabricated Steel	Total / best lateral setting	:	0.916 / 0.469	
Sole plate	:	None	Max suction pressure**	:	0.00 psi.g	
Paint	:	Class I	Testing			
Approximate Weights		Hydraulic performance test			:	Factory Performance Test - Non Witness
Complete pump	:	3,862 lb	Hydrostatic test	:	Factory Hydrostatic Pressure Test (bowl) - Non-Witness	
Driver	:	2,300 lb	Curve approval	:	Yes	
			NPSH test	:	None	
			String test	:	None	
			Test w/ motor	:	None	



Pump Performance - Additional Data						
Project name : CDM-Beltz WTP-ASR TM-Alt. 3			Tag Number : CDM-Beltz WTP-ASR TM-Alt. 3			
Commissioned :			Service :			
Representative :			Model : M12MB/MC			
Customer :			Quantity : 4			
Customer ref. / PO :			Quoted By (Sales Office) : PUMPTECH INC. - San Dimas, CA			
Quote Number / ID : 2095195			Quoted By (Sales Engineer) : Neil Kulkarni			
Date last saved : 31 Oct 2023 9:11 PM			Speed, rated : 1785 rpm			
Stages : 9						
Performance Data			Stage, Speed and Solids Limits			
Head, maximum diameter, rated flow : 546.6 ft			Stages, maximum : 22			
Head, minimum diameter, rated flow : 284.8 ft			Stages, minimum : 1			
Head, maximum, rated diameter : 547.6 ft			Pump speed limit, maximum : 1800 rpm			
Efficiency adjustment factor, total : 0.99			Pump speed limit, minimum : 1 rpm			
Power adjustment, total : 1.4 hp			Curve speed limit, maximum : 1800 rpm			
Head adjustment factor, total : 1.00			Curve speed limit, minimum : 1 rpm			
Flow adjustment factor, total : 1.00			Variable speed limit, maximum : -			
NPSHR adjustment factor, total : 1.00			Variable speed limit, minimum : -			
NPSH margin dictated by pump supplier : 0.0 ft			Solids diameter limit : 0.81 in			
NPSH margin dictated by user : 0.0 ft						
NPSH margin used (added to 'required' values) : 0.0 ft						
Mechanical Limits			Typical Driver Data			
Torque, rated power, rated speed : 6.46 hp/100 rpm			Driver speed, full load : 1785 rpm			
Torque, maximum power, rated speed : 6.47 hp/100 rpm			Driver speed, rated load : 1786 rpm			
Torque, driver power, full load speed : 7.00 hp/100 rpm			Driver efficiency, 100% load : N/A			
Torque, driver power, rated speed : 7.00 hp/100 rpm			Driver efficiency, 75% load : N/A			
Torque, pump shaft limit :-			Driver efficiency, 50% load : N/A			
Radial load, worst case :-						
Radial load limit :-						
Impeller peripheral speed, rated :-						
Impeller peripheral speed limit :-						
Various Performance Data		Flow (USgpm)	Head (ft)	Efficiency (%)	NPSHr (ft)	Power (hp)
Shutoff, rated diameter		0	547.6	-	-	46.5
Shutoff, maximum diameter		0	663.9	-	-	64.4
MCSF		60	540.9	15.87	4.3	51.9
Rated flow, minimum diameter		933	284.8	79.83	-	84.0
Rated flow, maximum diameter		933	546.6	80.01	-	160.9
BEP flow, rated diameter		986	380.5	82.67	18.8	114.5
120% rated flow, rated diameter		1,120	322.5	80.84	20.8	112.7
End of curve, rated diameter		1,387	172.6	61.23	25.7	98.7
End of curve, minimum diameter		1,260	119.4	54.24	0.0	70.0
End of curve, maximum diameter		1,521	238.3	62.81	29.3	145.7
Maximum value, rated diameter		-	547.6	82.67	-	115.4
Maximum value, maximum diameter		-	-	81.49	-	165.3
System differential pressure			@ Density, rated		@ Density, max	
Differential pressure, rated flow, rated diameter (psi)			173.3		173.3	
Differential pressure, shutoff, rated diameter (psi)			237.0		237.0	
Differential pressure, shutoff, maximum diameter (psi)			287.3		287.3	
Discharge pressure			@ Suction pressure, rated	@ Suction pressure, max	@ Suction pressure, rated	@ Suction pressure, max
Discharge pressure, rated flow, rated diameter (psi.g)			173.3	173.3	173.3	173.3
Discharge pressure, shutoff, rated diameter (psi.g)			237.0	237.0	237.0	237.0
Discharge pressure, shutoff, maximum diameter (psi.g)			287.3	287.3	287.3	287.3
Ratios						
Maximum flow / rated flow, rated diameter			: 148.65 %		Head rated diameter / head minimum diameter, rated flow : 140.58 %	



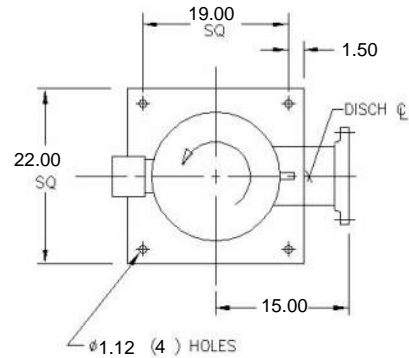
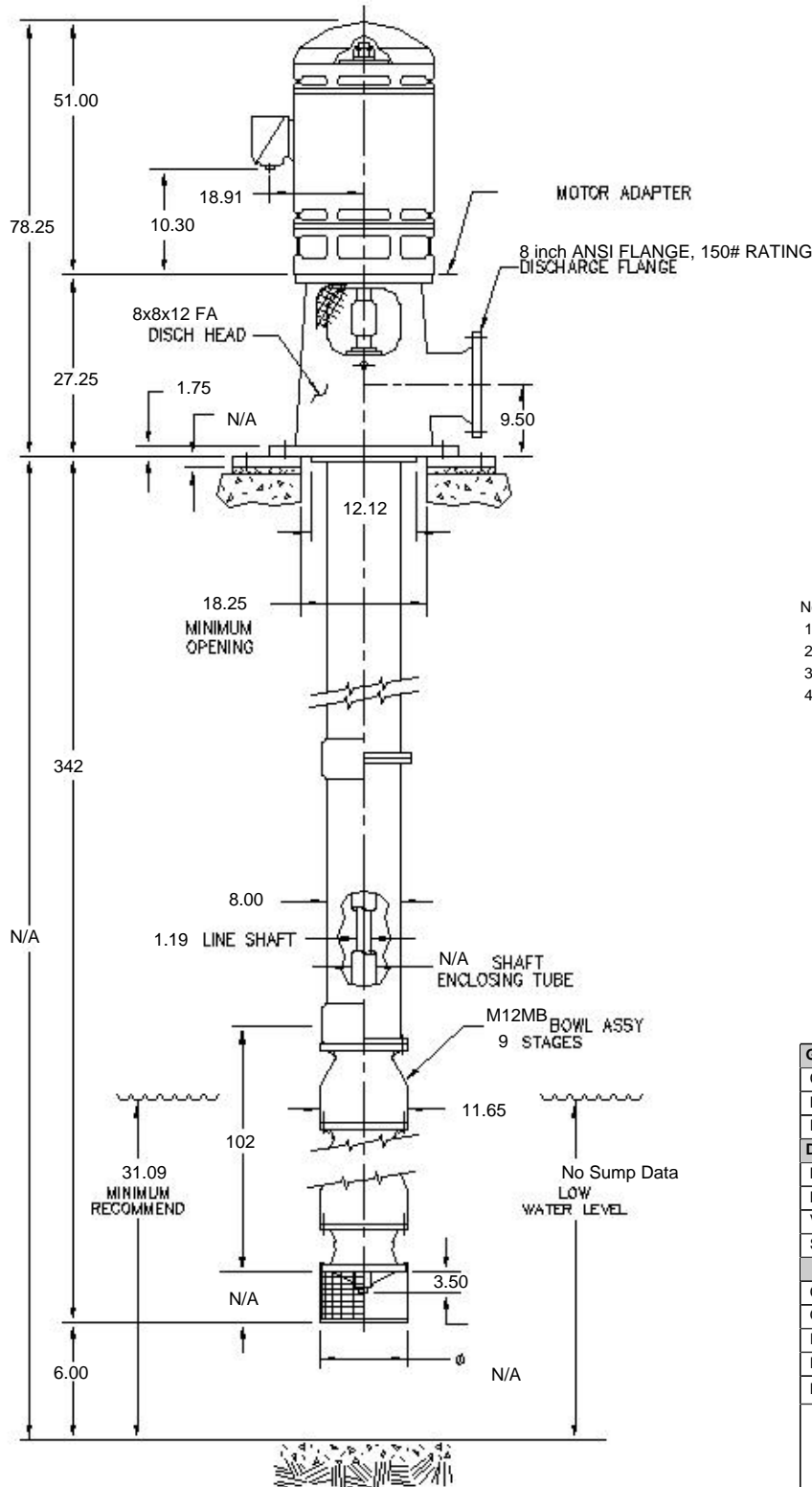
Pump Performance - Additional Data

Head and Power Losses				Dimensions	
Friction loss rate, column	: 1.64 %	Minimum clearance below suction bell lip/case	: 6.00 in		
Friction loss, column	: 0.33 ft	Minimum well diameter	: 12.00 in		
Friction loss, discharge head	: 0.83 ft	Suction nozzle centerline height	: -		
Friction loss, can/barrel	: -	Suction to first stage impeller centerline	: 5.42 in		
Friction loss, suction bell and strainer	: 0.00 ft	Bowl assembly length, first stage	: 26.00 in		
Friction loss, bowl/column adaptor	: 0.25 ft	Bowl assembly length, upper stage	: 9.50 in		
Friction loss, total	: 1.41 ft	Bowl assembly length, total	: 102 in		
Power loss, lineshaft bearings	: 0.2 hp	Suction bearing hub length	: 3.50 in		
Power loss, thrust bearing	: 0.7 hp	Strainer length	: 0.00 in		
Power loss, total	: 0.9 hp	Bowl to column adaptor length	: 0.00 in		
Bowl vs. Pump Performance				Discharge head stick-down	: 0.00 in
Head (bowl / pump)	: 400.4 ft / 378.2 ft	Submersible motor adaptor length	: -		
Efficiency (bowl / pump)	: 82.44 % / 81.52 %	Submersible motor length	: -		
Power (bowl / pump)	: 114.4 hp / 115.3 hp	Column length	: 240.00 in		
NPSH required at first stage impeller eye	: 18.0 ft	Total pump length	: 342.00 in		
Weights and Down Thrust				Can / barrel length	: -
Weight, lineshaft	: 0 lb	Stuffing box sleeve diameter	: 0.00 in		
Weight, bowl assembly rotating element	: 1,370 lb	Suction bell diameter	: -		
Thrust factor	: 9.22 lb/ft	Minimum submergence to prevent vortexing	: 0.00 in		
Thrust, hydraulic (rated / max)	: 3,685 / 7,609 lbf	Actual submergence (based on LLL)	: 102 in		
Thrust, bowl shaft end (rated / max)	: 0 / 0 lbf	Discharge head height	: 27.25 in		
Thrust, shaft step (rated / max)	: 109 / 109 lbf	Discharge nozzle centerline height	: 9.50 in		
Thrust, stuffing box sleeve (rated / max)	: 181 / 181 lbf	Min distance discharge nozzle centerline to suction bell	: 0.00		
Thrust, total (rated / max)	: 5,345 / 9,268 lbf	Lineshaft length	: 267.25 in		
Thrust bearing capacity	: -	Bowl shaft diameter	: 1.50 in		
* Rated thrust @ rated head, density, and suction pressure where applicable				Bowl diameter, outside	: 11.65 in
* Max thrust @ max head, density, and suction pressure where applicable				Bowl diameter, exit	: 6.38 in
Pressure Data	Maximum working pressure (psi.g)	Maximum allowable working pressure (psi.g)	Hydrostatic test pressure (psi.g)	Column diameter, inside	: 7.98 in
Bowl	237.0	357.0	N/A	Column internal obstruction diameter	: 1.19 in
Column	237.0	-	N/A	Can/barrel diameter, inside	: -
Discharge head	228.3	300.0	N/A	Can/barrel obstruction diameter	
Can/Barrel	-	-	-	NPSH	
Torque Limits				NPSH at bowl (available / required)	: Ample / 18.0 ft
Torque, lineshaft limit	: -			NPSH at low liquid level (available / required)	: Ample / 9.9 ft
				NPSH at suction flange (available / required)	: - / -
				Liquid Velocities	
				Column liquid velocity	: 6.12 ft/s
				Discharge head liquid velocity	: 5.98 ft/s
				Can liquid velocity	: -
				Suction nozzle liquid velocity	: -



Pump Performance - Additional Data					
Mixed Stage Performance	Set #1	Set #2	Set #3	Set #4	Alternate First Stage
Model	M12MB/MC	-	-	-	-
Stages	9	-	-	-	-
Based on curve number	M12MBMC-4605507	-	-	-	-
Impeller diameter, rated	8.28 in	-	-	-	-
Impeller diameter, maximum	8.88 in	-	-	-	-
Impeller diameter, minimum	7.69 in	-	-	-	-
Limitations					
Tolerance Type	: Hyd Ins 14.6 Bilateral (2B)	Low liquid level (Measured from bottom of head)	: 240.00 in		
Head measured at	: Bowl	NPSHa measured at	: Low liquid level		
Pump type	: Complete Pump	Velocity column	: 10.00 ft/s		
Direct connect	: Yes	Well inside diameter (Enter a value >0 if a diameter check is required)	: in		
Length strategy	: Column length	Maximum working pressure strategy	: Maximum head, rated diameter		
Length	: 240.00 in				
Product Line Options					
Suction type	: Bell	Drive shaft type	: VHS		
Bowl discharge type	: Discharge case	Discharge location	: Above ground		
Bowl shaft material	: 416 SS	Discharge head material	: Steel		
Bowl shaft diameter	: 1 1/2 inch	Discharge head design	: Type FA		
Impeller connection type	: Taper lock	Discharge head size	: 8x8x12		
Column diameter	: 8 inch	Sealing type	: Mechanical seal		
Column construction	: Threaded	Discharge flange rating	: 150lb ANSI flange		
Suction accessory	: None	Coupling design	: Threaded coupling		
Lineshaft material	: 416 SS	Top shaft material	: 416 SS		
Lineshaft diameter	: 1 3/16 inch	Top shaft diameter	: 1 1/2 inch		
Lineshaft lubrication	: Open Lineshaft				
Performance Adjustment Options					
Impeller polished	: Not polished	Effective impeller material for galling	: Al Brz C952		
Impeller wear ring	: None	Effective bowl material for galling	: Cast/Ductile Iron		
Bowl wear ring	: None	Effective impeller material for polishing	: Al-Brz		

General Arrangement Drawing



Notes

1. Unless otherwise specified, dimensions are in inches
2. Baseplate requires support on all sides.
3. Read instructions before beginning pump assembly or installation.
4. Drawing is preliminary until certified by factory.

APPROXIMATE DRY WEIGHT	
Driver	2,300 lb
Discharge Head	422 lb
Column / Shaft	-20 lb / -20 lb
Bowl Assembly	1,180 lb
Total	3,862 lb

GENERAL DATA			
Capacity	933 USgpm	Liquid	Cold Water
Head	400.0 ft	Specific Gravity	1.000 SG
Pump Speed	1785 rpm		
DRIVER DATA			
MFGR	-	Shaft Type	OLS
Hp	150.0 hp	Enclosure / Type	WP1
Volt / Ph / Hz	460 / 3 / 60 Hz	Frame / Model	L444TP
Service Factor	1		

Customer Name	
Quote No	0
Item No.	CDM-Beltz WTP-ASR TM-Alt. 3
Project	CDM-Beltz WTP-ASR TM-Alt. 3
Date	31 Oct 2023 9:01 PM



0-CDM-Beltz WTP-ASR TM-Alt. 3



Customer Price Sheet Total Only

Project name	CDM-Beltz WTP-ASR TM-Alt. 3	Quote Number / ID	2095195
Customer		Model / Stages	M12MB/MC / 9
Tag Number	CDM-Beltz WTP-ASR TM-Alt. 3	Flow, rated	933 USgpm
Customer ref. / PO		Differential head / pressure, rated	400.0 ft
		Speed, rated	1785 rpm

Total

Grand Total	Lead Time Total
-------------	-----------------

Pump

Qty	Description
4	M12MB/MC
	Bowl Assembly
	Pump Type: New Pump
4	Bowl Size: M12MB
	Number of Stages: 9 stage
	Materials of Construction: Materials (Cast Iron, Alum Bronze)
	Bowl Configuration (Connection)
	Top Bowl (Discharge Connection): Discharge Case
	Suction: Bell Suction
	Shaft, Pump: 1 1/2 inch
	Pump shaft material (Bowl Shaft): 416 Stainless Steel
36	Efficiency: Standard Efficiency
	Impeller Wear Rings: None
	Bowl Wear Rings: None
	Suction Accessory: None
	Lateral Travel in Bowl Assembly: Standard
	Bowl Bearing Materials: Standard (Bronze/Rubber)
4	Impeller Balance: Static (single plane) Balance
	Dry Pit Application: No
36	Impeller Fastening: 316 Stainless Steel (lock collets)
36	Bowl Bolting: 316 Stainless Steel
	Bowl Flange Name Plate: Bowl Flange Name Plate for NSF 61 (99403016)
	Discharge Head Name Plate: Discharge Head Name Plate for NSF 61 (93003539)
	Column / Line Shaft / Coupling
	Column Pipe Design: Direct Connect (No Column Required)
	Direct connection is required! The column length in the Selector must be set to 0. Please return to the Selector and enter in a 0 in the "Length" field.
	Column Diameter: 8 inch
	Line Shaft Lubrication: Product Lubrication
	Line Shaft Sleeves: None
4	Line Shaft Material: 416 SS
	Coupling Design: Threaded Coupling
4	Coupling Material: 410 SS
	Line Shaft Bearing Material: Standard (Rubber)
	Discharge Head
4	Discharge Head Assembly: 8x8x12FA
	Discharge Head Flange Rating: 150#
	Discharge Head Material: Fabricated Steel
	Discharge Location: Above Base (floor)
	Line Shaft Construction: Open Line Shaft (OLS)



Pump

Qty	Description
	Sealing Type: Mechanical Seal
4	Mechanical Seal: AES, Tp SCUSI, NSF, Carbon/Ceramic
4	Column to Discharge Head Fastener Material: 316 Stainless Steel
	Sole Plate: None
	Stuffing Box Bearing Material: Standard (Bronze)
	Driver
	Driver Supplied By: Factory
	Efficiency: Premium
	Motor (Design Types): NEMA
	Coating / Painting Systems
	System: Class I Coating System per Section 510, page 1 (default Tnemec 21, NSF)
4	Outside Bowl Assembly: Class I Coating System
	Inside Bowl Assembly: Standard Coating: Glass or Scotchkote 134
4	Outside Discharge Head: Class I Coating System
4	Inside Discharge Head: Class I Coating System
	Assembly / Match Marking / Shipping
	Not Factory Assembled

Testing

Qty	Description
4	Testing
	Tolerance Type: Hyd Ins 14.6 Bilateral (2B)
4	Factory Performance Test - Non Witness
	Guarantee Bowl Efficiency :
4	Non Overloading Motor:
4	Performance Test Data Sheets
4	Test Curve For Approval - submitted for customer approval (stop/hold of production)
4	Factory Hydrostatic Pressure Test (bowl) - Non-Witness

Certification & Documentation

Qty	Description
4	Bowl Assembly
	Drinking Water Approval
4	NSF 61 International Classification Nameplate (Subject to factory validation of design and materials)
4	Drinking Water Certification material selection must be verified before acceptance of order due to complexity check.
	Drawings, Curves, and Instructions
1	Project Management: Project Manager
	Engineering Data
1	Seismic Calculation - Standard Peerless Factory Calculations

Motor

Qty	Description
4	Driver
4	Motor: Motor-electric, 150hp, 1785rpm, 460/0/0/0V, 3Ph, 60Hz, L444TP, VHS, WP1, PremEff., Stock, GE, V4426-CONV



Commercial

Qty	Description
1	
	Commercial Terms
1	Incoterms 2020: EXW
	Order is subject to storage fee if not picked up after 10 working days when goods are made ready.
	Named Place: Seller's Facility

APPENDIX C4: H&T GREENSANDPLUS

HUNGERFORD & TERRY, INC.



PREPARED FOR: JASON YOSHIMURA, P.E. BCEE
CDM SMITH

PROJECT: SANTA CRUZ, CA EIGHT (8) 9'
DIAMETER GREENSAND PLUS FILTERS

PREPARED BY: CHRISTOPHER RALPH
SALES REPRESENTATIVE



HUNGERFORD & TERRY, Inc.
MANUFACTURERS OF WATER TREATMENT EQUIPMENT

**Santa Cruz, CA Eight (8) 9'
Diameter Greensand Plus
Filters**

H&T Proposal BDJ72738-GSP 8

June 27, 2023

Attention: Jason Yoshimura, P.E. BCEE
CDM Smith

Reference: Santa Cruz, CA Eight (8) 9' Diameter Greensand Plus Filters
H&T Proposal BDJ72738-GSP 8

In response to your request, Hungerford & Terry, Inc. is pleased to submit the attached Proposal BDJ72738-GSP 8 for your consideration. This proposal provides for eight (8) 9' diameter Greensand Plus filter systems designed to handle 12.5% of the design flow each.

This proposal is budgetary and is formulated using the available information. The design may be subject to change as more information becomes available. The specifications provided within is intended for securing funding for the project and contains contingency pricing to account for changes that may be necessary as the project progresses. Firm pricing will be available on bid day or upon request per intent to purchase.

We very much appreciate the opportunity to submit this proposal and we hope that it meets with your favorable consideration. Should you have any questions or need for additional information, please feel free to contact our local representative at the address and telephone number listed below, or this writer at our home office in Clayton, New Jersey.

Very truly yours,

HUNGERFORD & TERRY, INC.

Christopher Ralph
Sales Representative

Gierlich-Mitchell, Inc.

Angie McDaniel
135 S State College Blvd., Ste 226
Brea, CA 92821
Ph: 714-236-6070 x 1003
Cell: 916-996-1739
Fax: 714-236-6080
amcdaniel@gierlich-mitchell.com



1. SCOPE OF SUPPLY

Eight (8) 9' Dia Vertical Filter

- 9' diameter Pressure filter Vessel
- 100 PSI design, one (1) 14" x 18" manway, interior unlined, exterior prime.
- Sch. 40 integral steel inlet distributor/waste collector & header lateral underdrain with 304 stainless steel sandvalves and concrete fill
- 12" graded gravel support beds
- 18" Greensand Plus Filter Media
- 18" Anthracite
- Semi Automated Valve nest assembled
 - Bray series 3W valves w/ series 70 electric actuators for the following:
 - Inlet
 - Outlet
 - Backwash inlet
 - Backwash outlet
 - Rinse
 - Bray series 3W butterfly valves with manual operators for the following:
 - Inlet & Outlet isolation.
 - Filter air/pressure release valve with manual ball valves
 - air release isolating
 - drain
 - backwash telltale.
- Class 53 CLDI pipe for filter face & filter interconnecting.
- One (1) D/P switch with sixteen (16) pressure gauges w/ supply tubing, isolating valves and sampling valves for vessel inlet and outlet
- Eight (8) Magnetic bi-directional flow meters. One (1) for each filter inlet

Greensand Plus filters to be controlled by wall mounted NEMA 4X control panel with Allen Bradley PLC and OIT



2. PRICE SUMMARY

Price:

\$1,154,000

One Million One Hundred and Fifty Four Thousand Dollars

F.O.B. Shipping Points: With full motor freight allowed to the jobsite:
Payable in US currency, plus any applicable Municipal, State or Federal Taxes.

Payment Terms:

To Be Determined

Pricing will be valid for 30 days

Shipment:

Applicable freight to location is included in the price of the contract. Logistics of shipment will be advised as project proceeds.

Acceptance by Purchaser

Date _____
By _____

HUNGERFORD & TERRY, INC.

Christopher Ralph, Sales Representative

This proposal is hereby accepted by:
Hungerford & Terry, Inc. 6-27-23



3. Service

Hungerford and Terry will furnish a service technician for 18 days on site. If additional service is needed ,Hungerford & Terry, Inc., will furnish a Field Supervisor at USD-\$1,200.00 per weekday of 8 consecutive hours or USD-\$150.00 per hour, coinciding with the Purchaser's regular business hours during the normal work week of Monday through Friday including traveling time, plus living and traveling expenses from date of departure from Clayton, NJ, to destination and return. All time in excess of 8 hours shall be charged at 1-1/2 times the daily rate and all traveling and living expenses will be charged at cost. Meal charge is USD-\$50.00 per day. All overtime will be charged at 1-1/2 times the daily rate.

PLEASE NOTE: The Purchaser will be charged for the services of the Field Supervisor at the jobsite when service cannot be rendered because of delay or conditions beyond Hungerford & Terry's control. In cases of undue delay, Hungerford & Terry reserves the right to recall the supervisor.

HUNGERFORD & TERRY, INC.

PER: _____
Christopher Ralph, Sales Representative

DATE: _____

ACCEPTED: _____

PER: _____

TITLE: _____

DATE: _____



4. CONDITIONS

Prices are based on present day labor and material costs and subject to revision after fifteen(15) days from date of quotation. They do not include any Federal, State, Municipal or other tax or Government charge applicable to the sale, shipment or use of equipment quoted on.

Deliveries are contingent upon strikes, accidents, delays in manufacture and other causes beyond our control.

Any typographical or clerical errors in the prices or specifications are subject to correction.

Order shall be made out to Hungerford & Terry, Inc., Clayton, NJ, and shall be subject to acceptance by us at Clayton, NJ. After acceptance, orders may be cancelled only with our written consent and on terms that will indemnify us against loss. Equipment or material cannot be returned except by special permission and when so returned will be subject to discount.

The Company will, free of charge, replace or repair, after receipt f.o.b. its factory promptly and within one year from shipment by it, any part of equipment which, under normal or proper use proves to be defective in workmanship or material. In no event shall the Company be liable for consequential damages.

The Company shall not be liable for failure to perform or delay in performing any obligation if such failure or delay shall be caused directly or indirectly by invasion, insurrection, riot, war, military authority, or by fire, flood, strike, or labor difficulty or by any other cause, whether of the same or different nature from those enumerated, beyond our reasonable control.

From the time said machinery of apparatus or any part thereof arrives on the premises, and until Hungerford & Terry, Inc., for an amount equal to the unpaid portion of the purchase price of the same; such loss or damage to be payable to Hungerford & Terry, Inc., as its interests may appear. All losses by fire or other casualties for which Hungerford & Terry, Inc., is not indemnified and paid under such policies of insurance, shall be borne by the Purchaser on and after the arrival of said machinery or apparatus, or any part thereof on Purchaser's premises.

The title and right of possession of above described articles shall remain vested in Hungerford & Terry, Inc. until Purchaser shall have made full payment thereof in cash and this right shall not be waived by attachment of said articles to the real estate. Upon Purchaser's failure to make above agreed payments or any part thereof, Hungerford & Terry, Inc. is to retain any and all partial payments which may have been made as liquidated damages, and shall be entitled to take immediate possession of said materials.

This proposal, of which the Conditions of Sale are an integral part, shall not become a contract or become binding until it has been approved and signed by a representative of Hungerford & Terry, Inc. at its home office, Clayton, NJ. Persons signing on behalf of purchaser hereby represent that they are legally authorized to enter into this contract.

HUNGERFORD & TERRY, INC.



PREPARED FOR: KATI NGUYEN, EIT
CIVIL ENGINEER
CDM SMITH

PROJECT: SANTA CRUZ, CA SIX (6) 9' DIAMETER
GREENSAND PLUS FILTERS

PREPARED BY: CHRISTOPHER RALPH
SALES REPRESENTATIVE



HUNGERFORD & TERRY, Inc.
MANUFACTURERS OF WATER TREATMENT EQUIPMENT

**Santa Cruz, CA Ten (10) 9'
Diameter Greensand Plus
Filters**

H&T Proposal BDJ72738-GSP 10

October 26, 2023

Attention: Kati Nguyen, EIT- Civil Engineer
CDM SMith

Reference: Santa Cruz, CA Ten (10) 9' Diameter Greensand Plus Filters
H&T Proposal BDJ72738-GSP 10

In response to your request, Hungerford & Terry, Inc. is pleased to submit the attached Proposal BDJ72738-GSP 10 for your consideration. This proposal provides for ten (10) 9' diameter Greensand Plus filter systems.

This proposal is budgetary and is formulated using the available information. The design may be subject to change as more information becomes available. The specifications provided within is intended for securing funding for the project and contains contingency pricing to account for changes that may be necessary as the project progresses. Firm pricing will be available on bid day or upon request per intent to purchase.

We very much appreciate the opportunity to submit this proposal and we hope that it meets with your favorable consideration. Should you have any questions or need for additional information, please feel free to contact our local representative at the address and telephone number listed below, or this writer at our home office in Clayton, New Jersey.

Very truly yours,

HUNGERFORD & TERRY, INC.

Christopher Ralph
Inside Sales Manager

Gierlich-Mitchell, Inc.

Angie McDaniel
135 S State College Blvd., Ste 226
Brea, CA 92821
Ph: 714-236-6070 x 1003
Cell: 916-996-1739
Fax: 714-236-6080
amcdaniel@gierlich-mitchell.com



1. SCOPE OF SUPPLY

Ten (10) 9' Dia Vertical Filter

- 9' diameter Pressure filter Vessel
- 100 PSI design, one (1) 14" x 18" manway, interior unlined, exterior prime.
- Sch. 80 PVC inlet distributor/waste collector & hub curved radial lateral underdrain
- 12" graded gravel support beds
- 18" Greensand Plus Filter Media
- 18" Anthracite
- Semi Automated Valve nest assembled
 - Bray series 3W valves w/ series 70 electric actuators for the following:
 - Inlet
 - Outlet
 - Backwash inlet
 - Backwash outlet
 - Rinse
 - Bray series 3W butterfly valves with manual operators for the following:
 - Inlet & Outlet isolation.
 - Filter air/pressure release valve with manual ball valves
 - air release isolating
 - drain
 - backwash telltale.
- Class 53 CLDI pipe for filter face & filter interconnecting.
- One (1) D/P switch with twenty (20) pressure gauges w/ supply tubing, isolating valves and sampling valves for vessel inlet and outlet
- Ten (10) Magnetic bi-directional flow meters. One (1) for each filter inlet

Greensand Plus filters to be controlled by wall mounted NEMA 4X control panel with Allen Bradley PLC and OIT



2. PRICE SUMMARY

Price:

\$1,689,000

One Million Six Hundred and Eighty Nine Thousand Dollars

F.O.B. Shipping Points: With full motor freight allowed to the jobsite:
Payable in US currency, plus any applicable Municipal, State or Federal Taxes.

Payment Terms:

To Be Determined

Pricing will be valid for 30 days

Shipment:

Applicable freight to location is included in the price of the contract. Logistics of shipment will be advised as project proceeds.

Acceptance by Purchaser

Date _____
By _____

HUNGERFORD & TERRY, INC.

Christopher Ralph, Sales Representative

This proposal is hereby accepted by:
Hungerford & Terry, Inc. 10/26/2023



3. Service

Hungerford and Terry will furnish a service technician for 8 days on site. If additional service is needed ,Hungerford & Terry, Inc., will furnish a Field Supervisor at USD-\$1,200.00 per weekday of 8 consecutive hours or USD-\$150.00 per hour, coinciding with the Purchaser's regular business hours during the normal work week of Monday through Friday including traveling time, plus living and traveling expenses from date of departure from Clayton, NJ, to destination and return. All time in excess of 8 hours shall be charged at 1-1/2 times the daily rate and all traveling and living expenses will be charged at cost. Meal charge is USD-\$50.00 per day. All overtime will be charged at 1-1/2 times the daily rate.

PLEASE NOTE: The Purchaser will be charged for the services of the Field Supervisor at the jobsite when service cannot be rendered because of delay or conditions beyond Hungerford & Terry's control. In cases of undue delay, Hungerford & Terry reserves the right to recall the supervisor.

HUNGERFORD & TERRY, INC.

PER: _____
Christopher Ralph, Inside Sales Manager

DATE: _____

ACCEPTED: _____

PER: _____

TITLE: _____

DATE: _____



4. CONDITIONS

Prices are based on present day labor and material costs and subject to revision after fifteen(15) days from date of quotation. They do not include any Federal, State, Municipal or other tax or Government charge applicable to the sale, shipment or use of equipment quoted on.

Deliveries are contingent upon strikes, accidents, delays in manufacture and other causes beyond our control.

Any typographical or clerical errors in the prices or specifications are subject to correction.

Order shall be made out to Hungerford & Terry, Inc., Clayton, NJ, and shall be subject to acceptance by us at Clayton, NJ. After acceptance, orders may be cancelled only with our written consent and on terms that will indemnify us against loss. Equipment or material cannot be returned except by special permission and when so returned will be subject to discount.

The Company will, free of charge, replace or repair, after receipt f.o.b. its factory promptly and within one year from shipment by it, any part of equipment which, under normal or proper use proves to be defective in workmanship or material. In no event shall the Company be liable for consequential damages.

The Company shall not be liable for failure to perform or delay in performing any obligation if such failure or delay shall be caused directly or indirectly by invasion, insurrection, riot, war, military authority, or by fire, flood, strike, or labor difficulty or by any other cause, whether of the same or different nature from those enumerated, beyond our reasonable control.

From the time said machinery of apparatus or any part thereof arrives on the premises, and until Hungerford & Terry, Inc., for an amount equal to the unpaid portion of the purchase price of the same; such loss or damage to be payable to Hungerford & Terry, Inc., as its interests may appear. All losses by fire or other casualties for which Hungerford & Terry, Inc., is not indemnified and paid under such policies of insurance, shall be borne by the Purchaser on and after the arrival of said machinery or apparatus, or any part thereof on Purchaser's premises.

The title and right of possession of above described articles shall remain vested in Hungerford & Terry, Inc. until Purchaser shall have made full payment thereof in cash and this right shall not be waived by attachment of said articles to the real estate. Upon Purchaser's failure to make above agreed payments or any part thereof, Hungerford & Terry, Inc. is to retain any and all partial payments which may have been made as liquidated damages, and shall be entitled to take immediate possession of said materials.

This proposal, of which the Conditions of Sale are an integral part, shall not become a contract or become binding until it has been approved and signed by a representative of Hungerford & Terry, Inc. at its home office, Clayton, NJ. Persons signing on behalf of purchaser hereby represent that they are legally authorized to enter into this contract.

APPENDIX C5: SUPERIOR TANK WASHWATER RECOVERY TANKS + ASR BACKFLUSH TANK



June 29, 2023

LAM – 6030 Rev 2

Company: CDM Smith Engineers
Attention: Kati Nguyen, EIT
Fax No.: Email

Reference: Santa Cruz, Ca. Water Storage Tank(s)

Gentlemen:

Bid Item 1: To furnish labor, materials & equipment necessary to design, fabricate, deliver & erect on new tank pad (installed by others), the following powder epoxy factory coated cone deck bolted steel tanks per AWWA D-103 specifications, each including the following appurtenances;

- Shell, roof man-ways & roof vent
- 6” overflow nozzle w/down-comer
- Stamped drawings & calculations
- Exterior caged ladder w/FPC enclosure
- 6” outlet shell nozzle w/vortex breaker
- Anchor bolts (installed by others)
- Encapsulated hardware
- 6” inlet shell nozzle w/down-comer
- 6” drain shell nozzle
- (2) 5’ galvanized handrails w/safety gate
- Disinfection (Testing by others)
- Superior LLI

Approximate Selling Price Including Sales Tax:.....

- Two (2) 23’ dia. x 16’ ht., Approx. 36,000 Gal. Cap. FPC BT:.....\$ 94,986.00 PER TANK
- Two (2) 26’ dia. x 16’ ht., Approx. 42,000 Gal. Cap. FPC BT:....\$ 108,986.00 PER TANK
- Two (2) 34’ dia. x 16’ ht., Approx. 84,000 Gal. Cap. FPC BT:....\$ 122,986.00 PER TANK
- Two (2) 29’ dia. x 18’ ht., Approx. 63,000 Gal. Cap. FPC BT:....\$ 120,986.00 PER TANK

Interior Coating: Fusion Bonded Baked-On Powder Epoxy 5 -7 Mils Min. D.F.T. (N. S. F. 61 Approved) Axalta Tank Tan

Exterior Coating: Fusion Bonded Baked-On Powder Polyester 5 - 7 Mils Min. D.F.T. Axalta Superior Sand #EFT-609-S6

Delivery Time:

- 8 – 10 Weeks for Submittals for Tank & Foundation
- 8 – 10 Weeks After Receipt of Approved Drawings
- 1 – 2 Weeks to Erect Tank Per Tank

Terms:

- 10% Upon Receipt of Purchase Order
- 40% Upon Submittal Approval
- 45% Upon Tank Erection
- 5% Upon Tank Hydro-tested



General Notes:

Prevailing wage rates have been included in the erection labor. Included in the above prices is a water leak test by our erection crew. Filling the tank is the responsibility of the customer. Water for the initial filling and for any subsequent re-fillings required for water testing is also the responsibility of the customer.

Exclusions/Qualifications: AIS Material, Lightning Protection, Cathodic Protection, Foundation, Valves, Filling Tank, Pumps, Permits, Controls, Sensors, Sub-Base, Sub-grade Piping, Water For Hydro-Test, Electrical, Interior/Exterior Piping After First Flanged Nozzle (except where noted), and Flexible Couplings, Chlorinated Water Disposal If Required, Not Included.

Warranty:

Our materials and workmanship are warranted for a period of (1) one years. We encourage our customers to fill the tank immediately with water and hold the fluid in for a minimum of 24 – 48 hours. If you should experience any leakage, we will be happy to dispatch a repairman as quickly as possible. Thereafter, a certain amount of fluid should be kept in the tank at all times.

Thank you for the opportunity to be of service. If you have any questions, or need additional information, please give me a call at 661-392-0188.

Sincerely,

Lewis Marquez

Lewis A. Marquez
Bolted Tank Area Supervisor

Nguyen, Hoai (Kati)

From: Lewis Marquez <lewis.marquez@superiortank.com>
Sent: Thursday, October 26, 2023 10:30 AM
To: Nguyen, Hoai (Kati)
Subject: RE: Superior Tank Company: Your message has been received.

Follow Up Flag: Follow up
Flag Status: Completed

About \$ 118,000.00 per tank.

Do you need it on letterhead or will suffice?

Lewis

-----Original Message-----

From: Nguyen, Hoai (Kati) <nguyenh@cdmsmith.com>
Sent: Thursday, October 26, 2023 10:15 AM
To: Lewis Marquez <lewis.marquez@superiortank.com>
Subject: RE: Superior Tank Company: Your message has been received.

CAUTION:

The sender of this mail is from outside your organization. Please do not click on any links/attachments, unless you recognize the sender..

Thanks! And what is the cost of that 53,000 gal tank?

Kati Nguyen, EIT
Civil Engineer
46 Discovery #250, Irvine, CA 92618
T: 213.457.2157 | nguyenh@cdmsmith.com

-----Original Message-----

From: Lewis Marquez <lewis.marquez@superiortank.com>
Sent: Friday, October 20, 2023 11:53 AM
To: Nguyen, Hoai (Kati) <nguyenh@cdmsmith.com>
Subject: RE: Superior Tank Company: Your message has been received.

About 20' ht.

Nguyen, Hoai (Kati)

From: Lewis Marquez <lewis.marquez@superiortank.com>
Sent: Tuesday, October 31, 2023 8:44 AM
To: Nguyen, Hoai (Kati)
Subject: RE: Superior Tank Company: Your message has been received.

Follow Up Flag: Follow up
Flag Status: Flagged

I'd say about 15 x 20...about \$ 75K erected

Lewis

-----Original Message-----

From: Nguyen, Hoai (Kati) <nguyenh@cdmsmith.com>
Sent: Tuesday, October 31, 2023 8:19 AM
To: Lewis Marquez <lewis.marquez@superiortank.com>
Subject: RE: Superior Tank Company: Your message has been received.

CAUTION:

The sender of this mail is from outside your organization. Please do not click on any links/attachments, unless you recognize the sender..

Hi Lewis, let me know if you can provide a response today. Thank you!

Kati Nguyen, EIT
Civil Engineer
46 Discovery #250, Irvine, CA 92618
T: 213.457.2157 | nguyenh@cdmsmith.com

-----Original Message-----

From: Nguyen, Hoai (Kati) <nguyenh@cdmsmith.com>
Sent: Monday, October 30, 2023 8:48 AM
To: Lewis Marquez <lewis.marquez@superiortank.com>
Subject: RE: Superior Tank Company: Your message has been received.

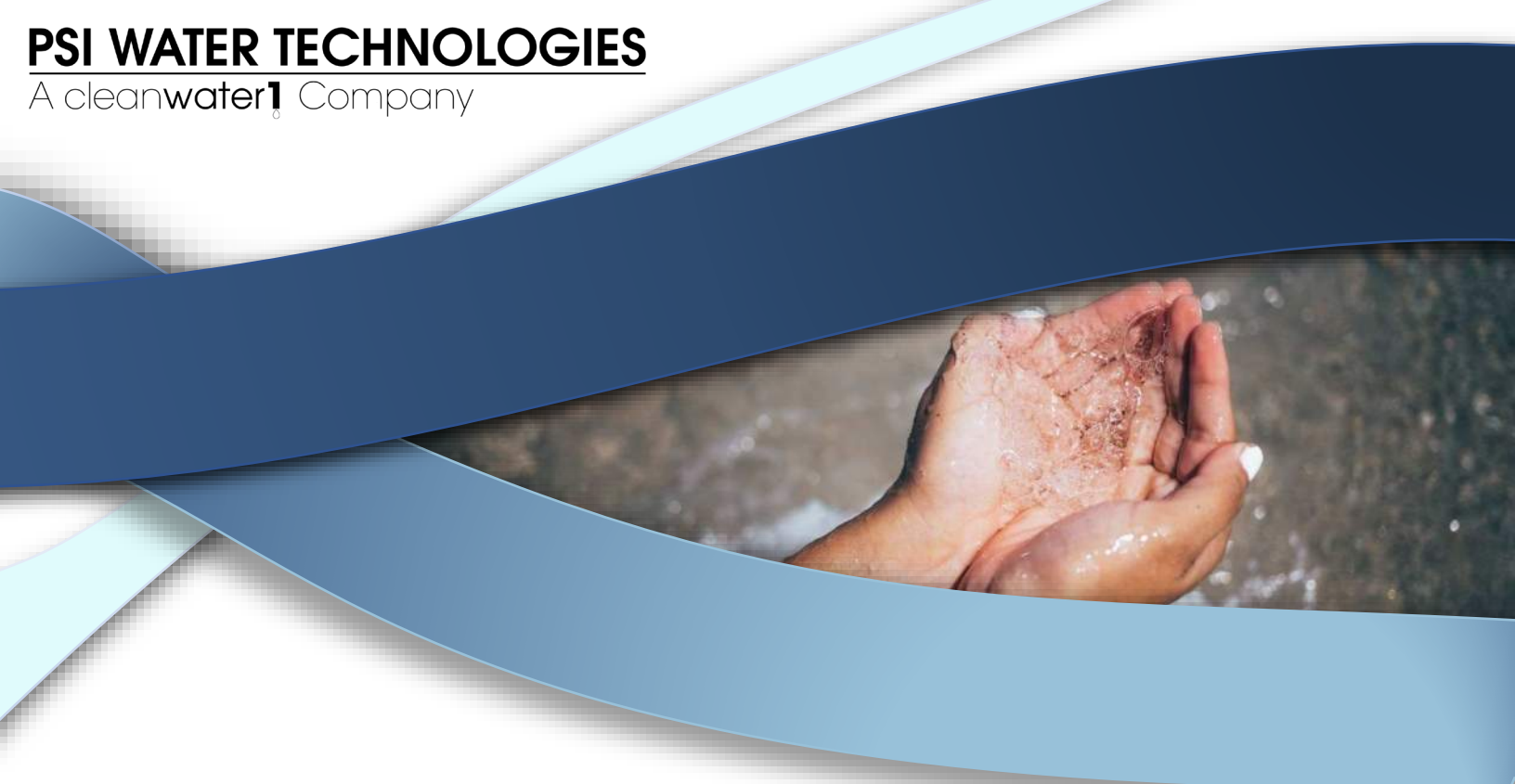
Hi Lewis, that is sufficient! Thanks so much.

Another question is, what is the diameter of a tank that has a capacity of 22,500 gal, keeping the height to about 20 ft??

APPENDIX C6: PSI MICROCLOR ON-SITE SODIUM HYPOCHLORITE GENERATION SYSTEM

PSI WATER TECHNOLOGIES

A cleanwater1 Company



BUDGET PROPOSAL

MICROCLOR® ON-SITE HYPOCHLORITE GENERATION SYSTEM

FOR City of Santa Cruz CA – Beltz Well No. 10

PSI Water Technologies, Inc.
File No.: P23-5884
CA Contractor's License: #877235

Prepared on: 10/22/23

SALES REPRESENTATIVE

Cleanwater1, Inc.
Ethan Brooke
550 Sycamore Dr.
Milpitas, CA 95035
Tel: (917) 501-7358
Email: ebrooke@cleanwater1.com

TABLE OF CONTENTS

Section 1:	Scope of Supply
Section 2:	Technical Information
Section 3:	Case Studies
Section 4:	Brochure



IMPORTANT NOTICE: All the information in this Proposal is confidential and has been prepared for Buyer's use solely in considering the purchase of the Equipment described. Transmission of all or any part of this Proposal to others or use by Buyer for other purposes is unauthorized without Seller's advance written consent.

PSI WATER TECHNOLOGIES

A cleanwater¹ Company

November 6, 2023

Mr. Jason Yakamura
CDM Smith
46 Discover #250
Irvine, CA 92618

Re: On-Site Hypochlorite Generation System for City of Santa Cruz CA – Beltz Well No. 10
PSI Water Technologies, Inc. File No.: P23-5884 (Rev 5)

Dear Jason,

Thank you for your interest in PSI Water Technologies, Inc. (PSI), a Cleanwater¹, Inc. Company. We have prepared this budgetary proposal for providing (1) Microclor[®] MC-200 and (1) Microclor[®] MC-300 On-Site Hypochlorite Generation System for City of Santa Cruz CA – Beltz Well No. 10. Our proposal is based on the following design criteria:

Design Criteria

Flow Rate, (Max) MGD	unknown
Flow Rate, (Average) MGD	unknown
Total Chlorine Demand (Peak), ppd	85
Power Supply	480VAC/3ph
System Rating, ppd	200 (Option 1)
System Rating, ppd	300 (Option 2)

Our on-site hypochlorite generation (OSHG) system is a skid-mounted system. It consists of electrolytic cells, a rectifier, brine pump, piping, valves, instrumentation, and controls. Each system is pre-assembled, piped, wired, and factory-tested to facilitate simple installation and start-up at the jobsite. Ancillary equipment necessary to make a complete and functional system includes a hydrogen dilution blower, water softener, water and brine filters, brine tank, hypochlorite storage tank, and metering pump.

A detailed scope of supply and budgetary price for the complete system is listed in Section 1 of this proposal. All pricing is based on equipment, as outlined in section 1 of this proposal.

Our proposal is for budgetary evaluation purposes only. This budgetary pricing is intended to be a guide based on current costs. **Budgetary pricing is valid for 30 days.**

System Features & Advantages

The PSI Water Technologies, Inc. Microclor[®] On-Site Hypochlorite Generation System incorporates many features and advantages, including:

- Passive hydrogen removal increases operator safety

PSI WATER TECHNOLOGIES

A cleanwater₁ Company

- Salt efficiency maximized by variable speed brine pump controlled by current feedback loop
- Constant current reliably achieved using an automated variable speed brine pump
- Advanced electrolytic cell design precludes the need for wet DC cable connections or internal baffles and gasketing
- Skid-mounted unique cell design and union connections allows for simple cell maintenance and replacement
- Reliable performance and robust construction reduces operator attention and lowers maintenance costs
- Pre-assembled, piped, wired, and tested at the factory prior to shipment
- Delivered and installed quickly, with minimal construction and installation cost
- Proven track record supported by years of successful operational experience

Our scope of supply follows in section 1 and our technical information in section 2. Section 3 includes our qualifications and experience, and sections 4 and 5 include case studies and our brochures.

We look forward to working with you on this project. If we can be of any further assistance, please do not hesitate to contact me at (917) 501-7358.

Thank you.

Sincerely,

Ethan Brooke
Regional Sales Manager

Cc: Miresh Chaudhari, cleanwater₁, Inc.
Zack Williams, cleanwater₁, Inc.

SECTION 1

SCOPE OF SUPPLY

Microclor® On-Site Hypochlorite Generation System

- A. Scope of Work by PSI Water Technologies, Inc. (Option 1)
- B. Scope of Work by PSI Water Technologies, Inc. (Option 2)
- C. Scope of Work by Others
- D. Clarifications/Exceptions



PSI WATER TECHNOLOGIES

A cleanwater1 Company

A. SCOPE OF SUPPLY BY PSI WATER TECHNOLOGIES, INC. (OPTION 1)

The following equipment and services are included in our scope of supply. All equipment will be manufactured in accordance with the descriptions below.

Breakdown below:

No	<u>Item Description</u>	<u>Qty.</u>
1.	<p>Microclor® MC-200 On-Site Hypochlorite Generation System Skid-Mounted, Pre-Assembled, Piped, Wired, and Factory-Tested, including:</p> <ul style="list-style-type: none"> • 40 ppd Electrolytic Cell (Qty. 5) • Stainless Steel Brine Gear Pump with Integral Speed Control • Water and Brine Rotameters • Digital Water Flow Meter with Integral Temp Sensor • Optical Level Switch (Qty. 5) • Temperature Switch (Qty. 4) • Product Temperature Sensor • Water and Brine Makeup Solenoid Valves • Brine Flush Circuit • 304 Stainless Steel, Electropolished Open Frame Equipment Skid 	1
2.	<p>Skid-Mounted Transformer Rectifier, including:</p> <ul style="list-style-type: none"> • NEMA 3R Enclosure – 304 Stainless Steel Construction • 24 kVA Step-Down Transformer – 300 VDC @ 80 ADC • DC Bridge Rectifier with Diode Assemblies and Aluminum Heat Sink with Cooling Fan • DC Current Transducer • Panel-Mounted Disconnect Switch 	1
3.	<p>Skid-Mounted Electrical Control Panel, including:</p> <ul style="list-style-type: none"> • NEMA 4X Enclosure – 304 Stainless Steel Construction • Allen-Bradley MicroLogix 1400 Programmable Logic Controller with Ethernet Communication • 7" Color Touchscreen HMI • 24 VDC Power Supply • Emergency Stop Pushbutton • Panel-Mounted Disconnect Switch • Current Sensor 	1
4.	<p>Hydrogen Dilution Blower, including:</p> <ul style="list-style-type: none"> • Volumetric Flow Rate: 406 cfm • Static Pressure: 3.19" • TEFC Motor • Air Flow Sensor Assembly 	1
5.	<p>Cartridge Filter Assembly</p> <ul style="list-style-type: none"> • Polypropylene Housing 	3

PSI WATER TECHNOLOGIES

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	<ul style="list-style-type: none">• 50 Micron Filter	
6.	Dual Tank Water Softener <ul style="list-style-type: none">• Kinetico Model CP208S	1
7.	Brine Storage Tank, including: <ul style="list-style-type: none">• HDLPE Construction• 575 Gallon (5,750 lbs Salt Storage)• Manual Salt Fill• Level Control Assembly• Under Drain with Valve• Dimensions: 60" D x 46"H <p><i>Note: Brine Tank is sized for 7 Days Storage</i></p>	1
8.	Hypochlorite Storage Tank, including: <ul style="list-style-type: none">• HDXLPE Construction• 3,650 Gallon Capacity• Radar Level Control• Top Manway• Tank Fittings• Dimensions: 10'-2" D x 8'-3"H (overall height) <p><i>Note: Hypo Tank is sized for 1 Day Storage</i></p>	1
9.	Hypochlorite Dosing Components (Loose), including: <ul style="list-style-type: none">• Metering Pump, 180 GPH @ 75 PSI with TEFC Inverter-Duty Motor (Duty/Standby)• NEMA 4X Variable Frequency Drive (Qty. 2)• Calibration Column• Pressure Relief Valve• Backpressure Valve• Pulsation Dampener• Wye Strainer• Pressure Gauge• PVC Pump Stand (Qty. 2)	1
10.	Hypochlorite Dilution Panel, including: <ul style="list-style-type: none">• 15 gpm Maximum Volumetric Flow Capacity• Venturi Injector• Flow Control Valve (Qty. 2)• Rotameter (Qty. 2)	1
11.	Acid Cleaning Cart	1

PSI WATER TECHNOLOGIES

A cleanwater1 Company

12.	Hydrogen Detector <ul style="list-style-type: none">• Conspec CNo6	1
13.	Manufacturer's Field Services , including: <ul style="list-style-type: none">• Installation Inspection• System Start-Up• Operator Training	Included
14.	Submittal and Operation & Maintenance Manual as Follows <ul style="list-style-type: none">• Submittal: Sent Electronically• O&M Manual: Sent Electronically	Included
15.	FOB Factory, Milpitas, CA with Full Freight Allowed to Jobsite, Santa Cruz CA	Included

BUDGET PRICE [ITEMS 1 – 15]

\$ 346,300

B. SCOPE OF SUPPLY BY PSI WATER TECHNOLOGIES, INC. (OPTION 2)

The following equipment and services are included in our scope of supply. All equipment will be manufactured in accordance with the descriptions below.

Breakdown below:

No	<u>Item Description</u>	<u>Qty.</u>
16.	<p>Microclor® MC-300 On-Site Hypochlorite Generation System Skid-Mounted, Pre-Assembled, Piped, Wired, and Factory-Tested, including:</p> <ul style="list-style-type: none"> • 60 ppd Electrolytic Cell (Qty. 5) • Stainless Steel Brine Gear Pump with Integral Speed Control • Water and Brine Rotameters • Digital Water Flow Meter with Integral Temp Sensor • Optical Level Switch (Qty. 5) • Temperature Switch (Qty. 4) • Product Temperature Sensor • Water and Brine Makeup Solenoid Valves • Brine Flush Circuit • 304 Stainless Steel, Electropolished Open Frame Equipment Skid 	1
17.	<p>Skid-Mounted Transformer Rectifier, including:</p> <ul style="list-style-type: none"> • NEMA 3R Enclosure – 304 Stainless Steel Construction • 36 kVA Step-Down Transformer – 300 VDC @ 120 ADC • DC Bridge Rectifier with Diode Assemblies and Aluminum Heat Sink with Cooling Fan • DC Current Transducer • Panel-Mounted Disconnect Switch 	1
18.	<p>Skid-Mounted Electrical Control Panel, including:</p> <ul style="list-style-type: none"> • NEMA 4X Enclosure – 304 Stainless Steel Construction • Allen-Bradley MicroLogix 1400 Programmable Logic Controller with Ethernet Communication • 7" Color Touchscreen HMI • 24 VDC Power Supply • Emergency Stop Pushbutton • Panel-Mounted Disconnect Switch • Current Sensor 	1
19.	<p>Hydrogen Dilution Blower, including:</p> <ul style="list-style-type: none"> • Volumetric Flow Rate: 406 cfm • Static Pressure: 3.19" • TEFC Motor • Air Flow Sensor Assembly 	1
20.	<p>Cartridge Filter Assembly</p> <ul style="list-style-type: none"> • Polypropylene Housing 	3

PSI WATER TECHNOLOGIES

A cleanwater1 Company

	<ul style="list-style-type: none">• 50 Micron Filter	
21.	Dual Tank Water Softener <ul style="list-style-type: none">• Kinetico Model CP2o8S	1
22.	Hypochlorite Dosing Components (Loose), including: <ul style="list-style-type: none">• Metering Pump, 18o GPH @ 75 PSI with TEFC Inverter-Duty Motor (Duty/Standby)• NEMA 4X Variable Frequency Drive (Qty. 2)• Calibration Column• Pressure Relief Valve• Backpressure Valve• Pulsation Dampener• Wye Strainer• Pressure Gauge• PVC Pump Stand (Qty. 2)	1
23.	Hypochlorite Dilution Panel, including: <ul style="list-style-type: none">• 50 gpm Maximum Volumetric Flow Capacity• Venturi Injector• Flow Control Valve (Qty. 2)• Rotameter (Qty. 2)	1
24.	Acid Cleaning System <ul style="list-style-type: none">• Polypropylene Tank 7-gallon Capacity• Manual Pump• Cam Lock Assembly	1
25.	Hydrogen Detector <ul style="list-style-type: none">• Conspec CNo6	1
26.	Manufacturer’s Field Services, including: <ul style="list-style-type: none">• Installation Inspection• System Start-Up• Operator Training	Included
27.	Submittal and Operation & Maintenance Manual as Follows <ul style="list-style-type: none">• Submittal: Sent Electronically• O&M Manual: Sent Electronically	Included
28.	FOB Factory, Milpitas, CA with Full Freight Allowed to Jobsite, Santa Cruz CA	Included

BUDGET PRICE [ITEMS 16 – 28]

\$ 335,500

FRP TANKS ADDER (MC-300)

<p>29. Brine Storage Tank, including:</p> <ul style="list-style-type: none"> • Pneumatic Fill • FRP Construction • 5 Ton Capacity • Stainless Steel Salt Fill Tube • Level Control Assembly • Pressure Transducer for Level Control • Dust Collection Assembly • Salt Level Indication • Under Drain with Valve • Top and Side Manways • Ladder • Heat Tracing and Insulation • Quartz Rock Filter Bed • Dimensions: 5'-0"D x 8'-6"H <p><i>Note: Brine Tank is sized for 7 Days Storage</i></p>	<p>1</p>
<p>30. Hypochlorite Storage Tank, including:</p> <ul style="list-style-type: none"> • FRP Construction • 5,000 Gallon Capacity • Pressure Transducer for Level Control • Top Manway • Tank Fittings • Ladder • Dimensions: 8'-0" D x 14'-0" H <p><i>Note: Hypo Tank is sized for 1 Day Storage</i></p>	<p>1</p>
<p>31. FOB Factory, Hamilton, OH with Full Freight Allowed to Jobsite, Santa Cruz CA</p>	<p>Included</p>

BUDGET PRICE [ITEMS 29 – 31]

\$ 382,800

C. SCOPE OF WORK BY OTHERS

1. Equipment unloading and installation.
2. All civil works and concrete pad for equipment.
3. Any underground or structural work.
4. Anchor bolts and seismic restraints.
5. All interconnecting piping, including between brine tank, OSHG skid, hypochlorite tank, metering pumps and accessories and point of hypochlorite injection.
6. Water supply piping to water connection- **1" at 50-80 psi**.
7. Valves, fittings, appurtenances not specifically listed under Scope of work by PSI Water Technologies, Inc.
8. Heat tracing and insulation of all interconnecting piping, if required.
9. Electrical power to control panel (120/208-240V/1Ph/60Hz for 30A) and transformer rectifier (480V/3Ph/60Hz for 50A), water chiller (208-40V/1Ph/60Hz for 10A).
10. Remote installation of control panel and interconnecting wiring from remote-mounted control panel to junction box, etc.
11. All power and control/signal, electrical conduit, wiring, electrical material, etc., including terminations, between control panel, brine tank, OSHG skid, hypochlorite tank, metering pumps, SCADA, etc.
12. Room ventilation, air conditioning, or lighting.
13. Any video recording.
14. All taxes, fees, lien waivers, bonds and licenses.
15. Any permitting or regulatory approvals.
16. Any items not explicitly listed under Scope of Work by PSI Water Technologies, Inc.

D. CLARIFICATIONS

1. Water to Generator must be Potable, 50 PSI and 55 – 78 Deg F.
2. If the incoming feed water to the generator is less than 55 °F, a heat exchanger will be required.
3. If the incoming feed water to the water softener is greater than 78 °F, a chiller will be required.
4. Control panel max ambient operating temperature 90F. If higher than 90 F then local panel AC will be required
5. The rectifier max ambient temperature 100F, if higher than 100F an AC will be required for the rectifier.
6. The Equipment pricing is based on email dated 10/26/23. In the event of additional specifications in future, the price will need to be repriced accordingly.
7. PSI can provide 3,650 Gallon cross-linked Poly Hypo Tank in lieu of 3,000 Gallon for MC-200 System.

SECTION 2

TECHNICAL INFORMATION

Microclor® On-Site Hypochlorite Generation System

- A. Process Description
- B. Major System Components
- C. Control Philosophy
- D. System Features & Advantages
- E. Utility and Connection Requirements

Attachments

FIGURE 1: Data Sheet

FIGURE 2: Typical General Arrangement Drawing

FIGURE 3: Typical Process & Instrumentation Diagram



A. PROCESS DESCRIPTION

A packaged on-site generation system will be provided that will manufacture a $0.8\% \pm 0.05\%$ solution of sodium hypochlorite (NaOCl) to be used as a disinfectant using salt, water and DC current. Equipment required for on-site hypochlorite generation includes consist the following major components (Fig. 1):

- One (1) Microclor[®] OSHG system including a programmable logic controller (PLC), rectifier, cells, brine pump, and hydraulic control equipment
- Water softener
- Brinemaker with makeup water solenoid valve, brine liquid level pressure transducer or switch, and remote display for both sensors
- Hypochlorite storage vessel(s) with ultrasonic level controls
- Chemical metering pump(s)
- Cast aluminum blower(s) with current and air flow switches

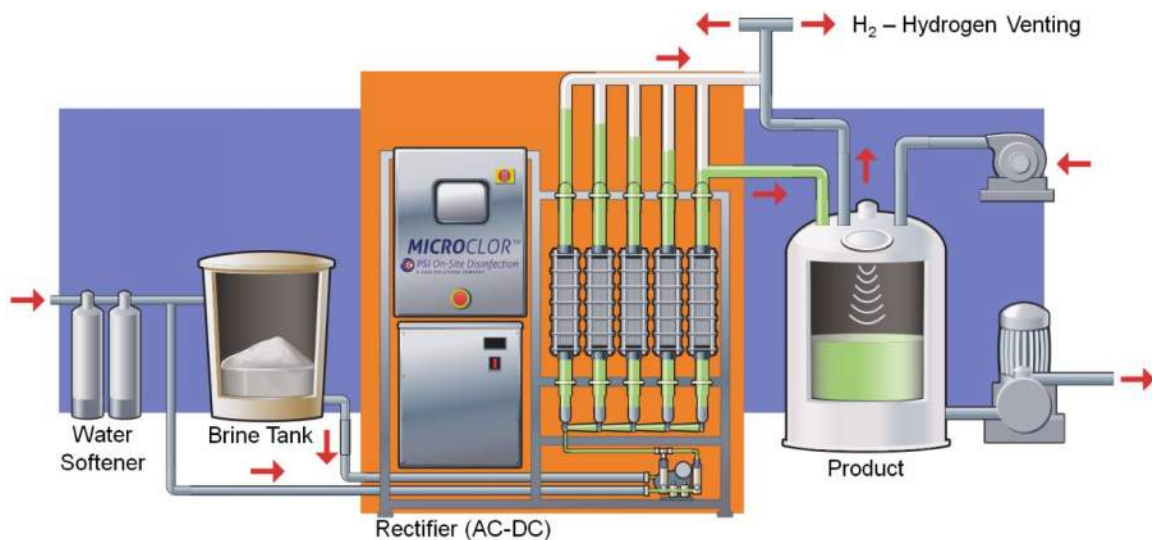


Figure 1. Diagram of the Microclor[®] process showing the placement of the ancillary equipment relative to the Microclor[®] system process skid.

The patented Microclor[®] system works by feeding softened water into the brine tank to form a saturated salt solution. This brine solution is pumped via a gear pump to a stream of softened water and diluted to approximately 3% salt concentration (a 10:1 ratio of softened water to concentrated brine). This 3% brine solution is fed into the electrolytic cells. DC current from the rectifier is applied to the electrolytic cell, and the brine solution is converted to a 0.8% concentration of sodium hypochlorite. During this conversion, a small amount of hydrogen is produced by the electrolytic process. This hydrogen is released safely through a vent pipe at the top of the electrolytic cell. The small amounts of hydrogen gas are further diluted at a minimum

ratio of 100:1 using a dilution air blower which reduces the hydrogen concentration to less than 25% of the Lower Explosive Limit (LEL) of hydrogen gas.

The Microclor[®] system under normal operation is designed to automatically start and stop sodium hypochlorite production based upon the storage tank level. The PLC will function to monitor the hypochlorite level sensor. When the level reaches a preset low level point, a signal is sent to the OSHG controller to turn the generator on. Generation will continue while the OSHG controller continually monitors the storage tank level sensor. When the tank is full, and the high level point is reached, the Microclor[®] system will cease generation. The system will then remain in standby mode, continuously monitoring the tank level until a low level is reached.

A variable speed pump alters cell feed rate of the brine, or electrolyte, solution, based on signals from the PLC and a current transducer. This operational strategy allows the Microclor[®] system to vary the electrolyte solution conductivity so as to indirectly provide constant current. This philosophy eliminates expensive electronics that would otherwise be necessary to operate in a less reliable fashion.

Instrumentation is included to continuously monitor operational permissives during generator operation (airflow, current draw, water flow, flooded cells, and temperature). If any permissive times out, generator operation is interrupted. If the fault clears, generator operation is again called to run. If the fault reoccurs three additional times, the generation system is shut down and an alarm condition is sent to plant SCADA.

B. MAJOR SYSTEM COMPONENTS

The Microclor® On-Site Hypochlorite Generation System is pre-assembled, piped, wired, and factory-tested prior to shipping to the job site. Following are the major system components. **Additional details are provided in our equipment specifications.**

1. Electrolytic Cells

The transparent acrylic design of the electrolytic cells provides quick visual indication of operation and condition. Each cell shall include Viton flexible couplings for quick disconnect an optical level switch, and a temperature switch or sensor. A cell spool is provided for installation should a cell need to be removed for maintenance or replacement. On systems using five electrolytic cells in series, 80% of the total generation capacity can be achieved when one cell is removed.

2. Rectifier

The transformer rectifier uses an innovative design that eliminates the need for the outdated and unreliable switching rectifier or phase angle fired SCR voltage correction technology. The rectifier will be skid-mounted and the cooling fan pre-wired prior to shipment.

3. Brine Pump

The brine pump supplies a saturated salt solution to a stream of softened water for further dilution. Reliable brine feed is required for precise control of solution concentration. The pump flow rate is controlled automatically via an analog output.

Parameter	Value
Type	Gear
Material (Housing/Gears/Seals)	316SS/PPS/PTFE
Drive Type	Electromagnetic
Power Requirements	24 VDC
Speed Control	0-5 VDC

4. Hydrogen Dilution Blower

A critical component of the enhanced safety system, the blower is provided to dilute the hydrogen gas byproduct. The blower is shipped loose for installation adjacent to the hypochlorite storage tank and arranged such that the tank will be under positive pressure. All air from the blower and any fumes from the hypochlorite will be vented outside the building.

Parameter	Value
Fan Type	Pressure Blower
Wheel Type	Radial
Material	Cast Aluminum
Drive Type	Direct
Motor Type	TEFC

5. Water Softener

A dual-tank automatically-regenerating water softener treats the water supply prior to entering either the brine tank or the electrolytic cells. An adjustable water meter will monitor the processed volume and initiate system regeneration. A flow-based hydraulic control valve operates all functions of the softener, eliminating the need for any electrical connections.

Parameter	Value
Material (Media Vessel)	Fiberglass-Wrapped Polyethylene
Media	Non-solvent Cationic Resin
Regeneration Type	Countercurrent
Outlet Hardness as CaCO ₃ (Max.), gpg (grain per gallon)	0.5

6. Brine Tank

A tank is used for salt storage and brine production. Both manually- and pneumatically-filled tanks are available. Brine tank water makeup is controlled by a level sensor or switch. Pneumatically-filled tanks use a stainless steel salt fill tube, dust collection

assembly, and salt level indicator. Depending on the tank dimensions, top and/or side access manways and a ladder with safety cage may be necessary to facilitate inspection.

7. Hypochlorite Tank

Hypochlorite storage tanks are sized for a specific amount of hypochlorite based on the peak generator capacity and project requirements. An ultrasonic level transmitter or pressure transducer continuously monitors the liquid level, initiating and ending operation of the generator. Hypochlorite fill, supply, drain, overflow, dilution air, and vent piping connections are typically included in the tank design. Depending on the tank dimensions, top and/or side access manways and a ladder with safety cage may be necessary to facilitate inspection.

8. Hypochlorite Metering Pump

A metering pump supplies disinfectant to the process from the hypochlorite storage tank. Reliable hypochlorite feed is required for precise control of chlorine residual. The pump flow rate is controlled automatically via 4-20 mA input signal sent to a variable frequency drive. Typical pump accessories are a calibration column, back pressure valve, pressure relief valve, pulsation dampener, wye strainer, and pressure gauge.

9. Electrical Control Panel

The Microclor® On-Site Hypochlorite Generation Feed System includes a complete, pre-wired, PLC system. If the controls are remote mounted, a local junction box is provided on the generator system equipment skid.

The control system is designed to function using the power supply available at the installation site.

The PLC system, as a minimum, shall have the following interfaces and features:

- Programmable logic controller with color touchscreen HMI
- Ethernet communication
- "Water Solenoid Status" display
- "Brine Solenoid Status" display
- "Blower Status" display
- "Rectifier Status" display
- "Cell Level Alarm Status" display
- "Blower Air Flow Alarm Status" display
- "Blower Current Switch Status" display

- "Cell Temperature Alarm Status" display
- "Hypochlorite Tank Level" display
- "Cell Amperage" display
- "Cell Temperature" display
- "Cell Flowrate" display
- "Brine Pump Manual-Auto" selection
- "Brine Pump Speed" display and manual adjustment
- "Emergency Stop" pushbutton

10. Instrumentation and Miscellaneous Accessories

The on-site hypochlorite generation system shall include the following instrumentation and accessories:

- Water and brine rotameters
- Water and brine makeup solenoid valves
- Water flow sensor
- Cell Temperature Sensor and Switches
- Blower current sensor
- Blower air flow switch (shipped loose)
- Stainless steel open frame equipment skid

Depending on project constraints or customer requests, the following optional instrumentation and accessories, all of which will ship loose, may be available or required:

- Heat exchanger
- Water chiller
- Hypochlorite dilution panel with a magnetically-driven pump, rotameters, flow control valves, and venturi eductor
- Acid cleaning system
- Hydrogen detector
- Water hardness monitor
- Chlorine analyzer

C. CONTROL PHILOSOPHY

GENERAL

The onsite hypochlorite system consists of a local control panel that monitors the cell racks' onboard local I/O, hypochlorite tank level, hydrogen dilution blower, and all the functions associated with the hardness monitor (if equipped), salt and brine levels in the brine tank, and the brine fill solenoid valve . The panel ensures all safety interlocks are satisfied prior to initiating generator operation. Ethernet hardware is also provided to communicate over the plant's network.

LOOP DESCRIPTIONS

Discrete Inputs

- Cell level switches
- Cell temp switch(es)
- Rectifier high temp switch
- Brine pump fault
- Hydrogen dilution blower air flow switch
- Hydrogen dilution blower current switch
- High water hardness (if equipped)
- Emergency stop pressed

Analog Inputs

- Brine tank salt level
- Brine tank brine level
- Cell DC amperage
- Cell flow
- Cell temperature
- Hypochlorite tank level
- Hydrogen monitor (if equipped)

Discrete Outputs

- Run signal to the hydrogen dilution blower
- Open brine makeup water solenoid
- 3-way pilot valve
- Water solenoid valve
- Rectifier primary contactor
- Rectifier soft start contactor
- Rectifier bypass contactor
- Rectifier cooling fans
- Metering pump VFD run

Analog Outputs

Brine pump speed

LOOP COMMENTS

Discrete inputs are self-explanatory and consist of 24 VDC inputs switched between field device normally closed contacts while in operation. Any open circuit indicates a fault and the PLC logic shuts down operation and attempts to restart the system up to four times at which point the process shuts down and signals a shutdown alarm.

Discrete outputs are also self-explanatory and consist of 24 VDC PLC outputs that energize control relays. The control relays are configured as dry contacts or are wetted with AC or DC voltage as appropriate per the project requirements.

All analog inputs are 4-20 mA devices. Salt level, rectifier current sensor, and hydrogen monitor (if equipped) are sourcing while the balance of the inputs are loop-powered from the control panel.

All analog outputs are sourcing 4-20 mA outputs.

SYSTEM OPERATION

The generator system operates as a batch process where generation is initiated upon a drop in sodium hypochlorite tank level that reaches the start level, and remains in operation until the stop level is reached.

System operational capacity is not variable and is only responsive to changes in tank level. System operation commences at nameplate rating and continues operating until the stop point level is reached.

SYSTEM SET POINTS

Operator intervention is via the control panel.

The primary display provides momentary virtual switches for start, stop, and reset plus a soft switch for enable/disable, which cannot be overridden remotely or by SCADA commands.

The set point display is password protected and allows for operation input of the following signals:

- Start point 0-100%
- Stop point 0-100%
- Amperage set point
- High amperage alarm
- Low amperage alarm
- Low flow alarm
- High flow alarm
- Tank high-high level
- Tank low-low level

D. SYSTEM FEATURES & ADVANTAGES

The Microclor[®] On-Site Hypochlorite Generation System offers maximum value measured by performance and reliability as well as capital, installation, maintenance, and operating costs. This is illustrated by the following system advantages:

1. **Passive Hydrogen Removal for Superior Safety**

Cells are configured in a vertical format with a recirculation loop for each cell that allows for optimized brine utilization and passive release of the hydrogen gas from each cell. Hydrogen gas is not allowed to pass from cell to cell. This design radically increases operator safety and substantially reduces the possibility of hydrogen gas build-up in the cell and the potential of catastrophic failure. Removing the hydrogen immediately from each cell eliminates the blinding of the electrodes by gas bubbles.

2. **Brine Conductivity Control Optimizes Salt Efficiency**

Constant current is achieved via a current feedback loop where the brine pump speed is controlled by the system programmable logic controller. This feedback loop accounts for variations in temperature, conductivity, and water flow. The titanium, Teflon impregnated gear pump is attached to a variable speed drive that continually provides a consistent blended electrolyte flow to the cells maximizing salt efficiency.

3. **Indirect Constant Current**

An active feedback loop which very slightly adjusts the brine flow rate achieves constant current in an indirect fashion. This innovative operational strategy eliminates the excessively high failure rate seen with forty year old switching rectifier or phase angle fired SCR voltage correction technology.

4. **No Cell Internal Baffles or Gaskets**

The electrolytic cells consist of thirteen internal bipolar electrodes. All anodic surfaces are coated with DSA catalytic coating. The design of the cell precludes the need for wet D.C. cable connections. There are no internal cell baffles, gaskets, or fasteners found

inside the cell. The cells are built with clear acrylic guides that support the internal bipolar plates and allow for direct visual inspection of the plates.

5. **Easy Access for Maintenance**

The Microclor[®] On-Site Hypochlorite Generation System is skid-mounted. The stainless steel skid construction provides superior structural strength while electrolytic polishing ensures ultimate passivation, chemical compatibility, and corrosion resistance. Use of an open frame design for the skid and a simple equipment layout facilitates access to each system component from multiple sides for easy inspection and maintenance. The vertical cell design allows for the cell to easily be removed from the cell carrier piping by simply breaking two coupled connections. This makes for simple cell maintenance and/or replacement. Custom-designed skid configurations and equipment layouts are available.

6. **Reliable Performance and Robust Construction**

The robust construction of the Microclor[®] On-Site Hypochlorite Generation System allows the electrolyte feed, cells, power supply, controls, and monitoring components to be subjected to minimum stress, lowering maintenance requirements.

7. **Factory-Tested**

Each system is pre-assembled, piped, and wired at the factory, allowing for thorough factory-testing of not just each component, but of the entire system prior to shipment. At a minimum, a factory quality control technician shall operate and calibrate the brine feed pump, verify calibrations for the instrumentation, and test the complete control system prior to running the unit in automatic mode for a minimum of four hours.

8. **Minimum Installation Cost and Time**

Most parts for the Microclor[®] On-Site Hypochlorite Generation System are inventoried at the factory, reducing lead times. By skid-mounting the system, installation is quick and straightforward, with minimum time and cost. Water line, brine feed, hypochlorite solution, and electrical connections are all predetermined and are clearly indicated.

9. Proven Track Record

The Microclor[®] On-Site Hypochlorite Generation System has been in production for over ten years. This system is a fully-developed, mature product supported by an extensive list of successful installations.

E. UTILITY AND CONNECTION REQUIREMENTS

Utility and connection requirements for the Microclor[®] On-Site Hypochlorite Generation System are detailed on the enclosed Process & Instrumentation Diagram. Please do not hesitate to contact us if additional detailed information is needed.

MICROCLOR®

On-Site Hypochlorite Generation

Model		MC-100	MC-200	MC-300
Capacity Free Available Chlorine (FAC)	lbs per day	100	200	300
	kgs per day	45	90	135
Hypochlorite Produced	gal per day	1,500	3,000	4,500
	liters per day	5,680	11,355	17,035
Chlorine Concentration	w/w%	0.80 ± 0.05		
Control Panel Service (120/208-240/1/60)				
	amps	30	30	30
Rectifier Service (460/3/60)				
	amps	25	50	70
Rectifier DC Power Rating				
	KVA	12	24	36
<i>NOTE: Configurations available for alternate electrical power supplies.</i>				
Cell Quantity		5	5	5
Skid Materials of Construction		304 Stainless Steel, Electropolished		
Electrical Control Panel		Allen-Bradley MicroLogix 1400 PLC, Ethernet Communications, 304 Stainless Steel, NEMA 4X		
Operator Interface		6" (15 cm) Color Touchscreen HMI		
<i>NOTE: Control systems using alternate PLC platforms available.</i>				
Salt Consumption	lbs per lb FAC	2.5 – 3.5		
	kgs per kg FAC	2.5 – 3.5		
Power Consumption	kWh (AC) per lb FAC	1.8 – 2.4		
	kWh (AC) per kg FAC	4.0 – 5.3		
Water Consumption	gal per lb FAC	14.0 – 17.0		
	liters per kg FAC	117 - 142		
Ambient Air Temperature Rating ¹	°F	35 – 90		
	°C	2 – 32		
Feed Water Temperature Rating ²	°F	55 – 78		
	°C	13 – 26		
Feed Water Pressure Rating	psi	50 – 80		
	kPa	345 – 552		
Skid Dimensions (W x D x H)	in	74 x 20 x 76	74 x 20 x 76	74 x 20 x 76
	cm	187 x 51 x 193	187 x 51 x 193	187 x 51 x 193

¹Thermal management available for environments above 90 °F (32 °C).

²Heat exchangers and chillers available for feed water outside the temperature range shown.

System Approvals



Electrical Control Panel Approvals



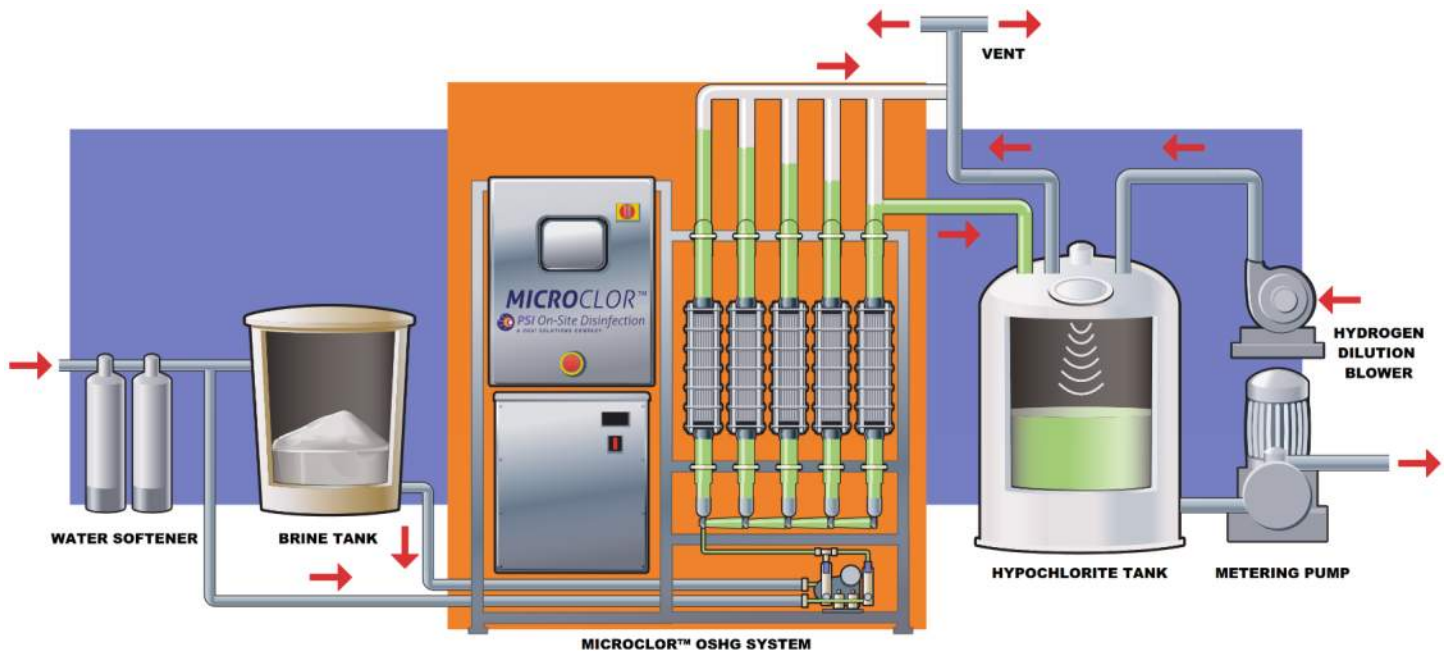
Transformer/Rectifier Approvals



MICROCLOR[®]

On-Site Hypochlorite Generation

Microclor[®] Process Flow Diagram



Microclor[®] MC-300 System

Features:

- Brine/salt tank(s), water softeners, solution tank(s), dosing pumps, and other ancillary equipment are available in various sizes to satisfy project requirements.
- System configurations available using alternate power supplies (380 VAC, 600 VAC, 50 Hz, etc.).
- Complete supply of equipment scope, system start up and installation inspection.
- Three-year warranty available.
- UL-, CE-, and CSA-Certified electrical control panel.



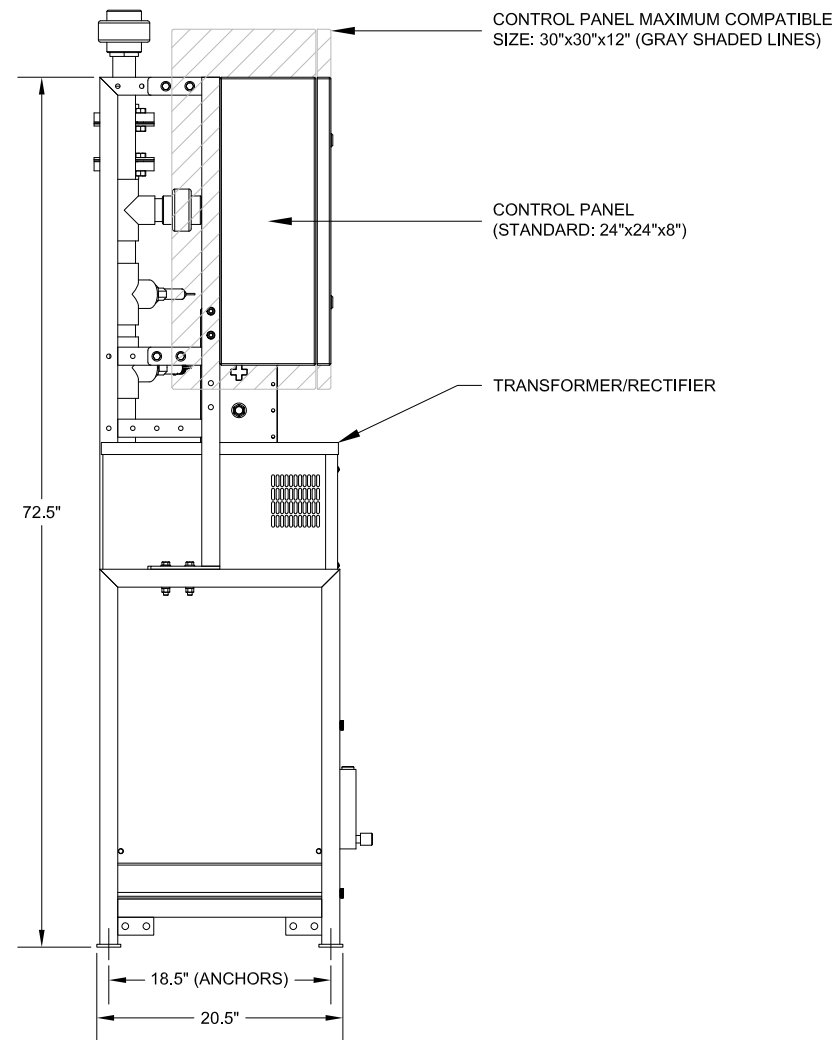
550 Sycamore Drive Milpitas, CA 95035 Toll Free: 888-774-4536 (PSI HELP) Tel: 408-370-6540 Fax: 408-866-4660
mail@4psi.net www.4psi.net

©2020 PSI Water Technologies, Inc. Subject to change without prior notice.

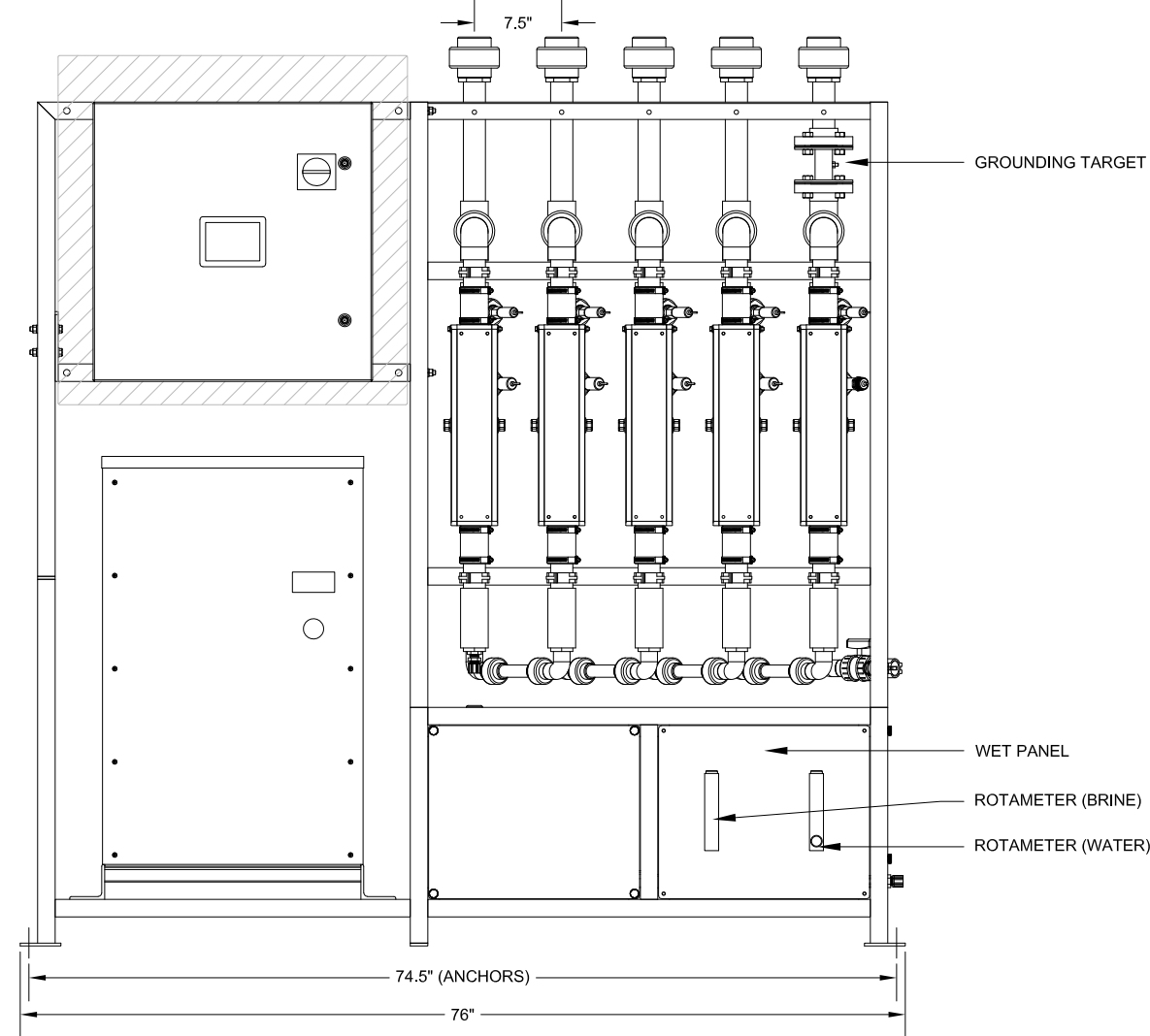
NOTES

1. WEIGHT OPERATING: 745 LB
2. INLETS AND OUTLETS
 - A. WATER INLET FEED SIZE/MATERIAL: 1/2" PE TUBE
 - B. BRINE INLET FEED SIZE/MATERIAL: 1/2" PE TUBE
 - C. BRINE TANK FILL SIZE/MATERIAL: 1/4" PE TUBE
 - D. VALVE VENT SIZE/MATERIAL: 1/4" PE TUBE
 - E. HYDROGEN VENT RISERS SIZE/MATERIAL: 2" PVC SCH80 (INSTALLED IN FIELD)
 - F. HYDROGEN HEADER SIZE/MATERIAL: 2" PVC SCH80 (INSTALLED IN FIELD)
 - G. HYPO OUTLET (ON RISERS) SIZE/MATERIAL: 2" PVC SCH80 (INSTALLED IN FIELD)
3. FRAME BASE DIMENSIONS: 6'-4"W x 1'-8.5"D
4. RECTIFIER ELECTRICAL REQUIREMENTS: 480VAC, 3Ø, 50A SERVICE
5. CELL ELECTRICAL REQUIREMENTS: 19.2KVA, 300VDC, 64ADC
6. CONTROL PANEL ELECTRICAL REQUIREMENTS: REFER TO CONTROL PANEL DRAWINGS

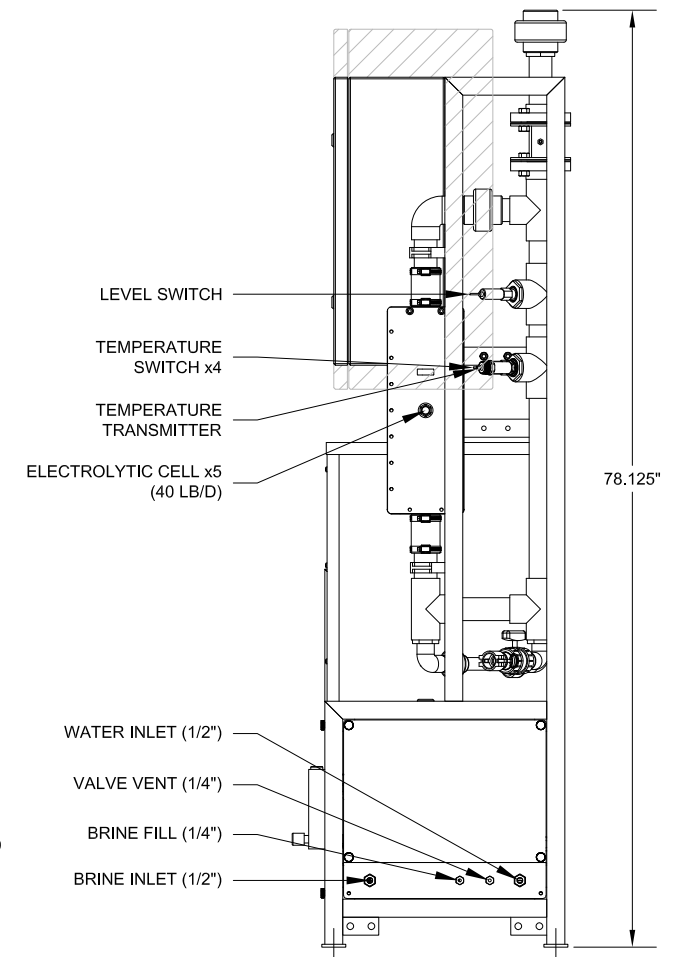
LEFT ELEVATION



FRONT ELEVATION



RIGHT ELEVATION



REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	08/22/18	CGS	CHANGED DWG # FROM 000000-MC9020-AB-J	△			
B	08/11/20	MK	REPLACED O&U WITH RENDERING OF 3D MODEL	△			
C	09/21/20	MK	ADDED CONTROL PANEL OPTIONS	△			
D	10/23/20	MK	UPDATED CELL ELECTRICAL REQUIREMENTS	△			

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PSI Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: C. STOTHERS DATE: 08/22/2018
 CHECKED BY: M. KUSHMAN DATE: 08/22/2018
 SCALE: 1-1/2"=1'-0"

PROJECT:	PSI WATER TECHNOLOGIES, INC. STANDARD DRAWING
SUBJECT:	MICROCLOR MC-200 OUTLINE & UTILITY DRAWING
DWG #:	000000-MC9020-OU
SHEET	1 OF 2
REV.	D

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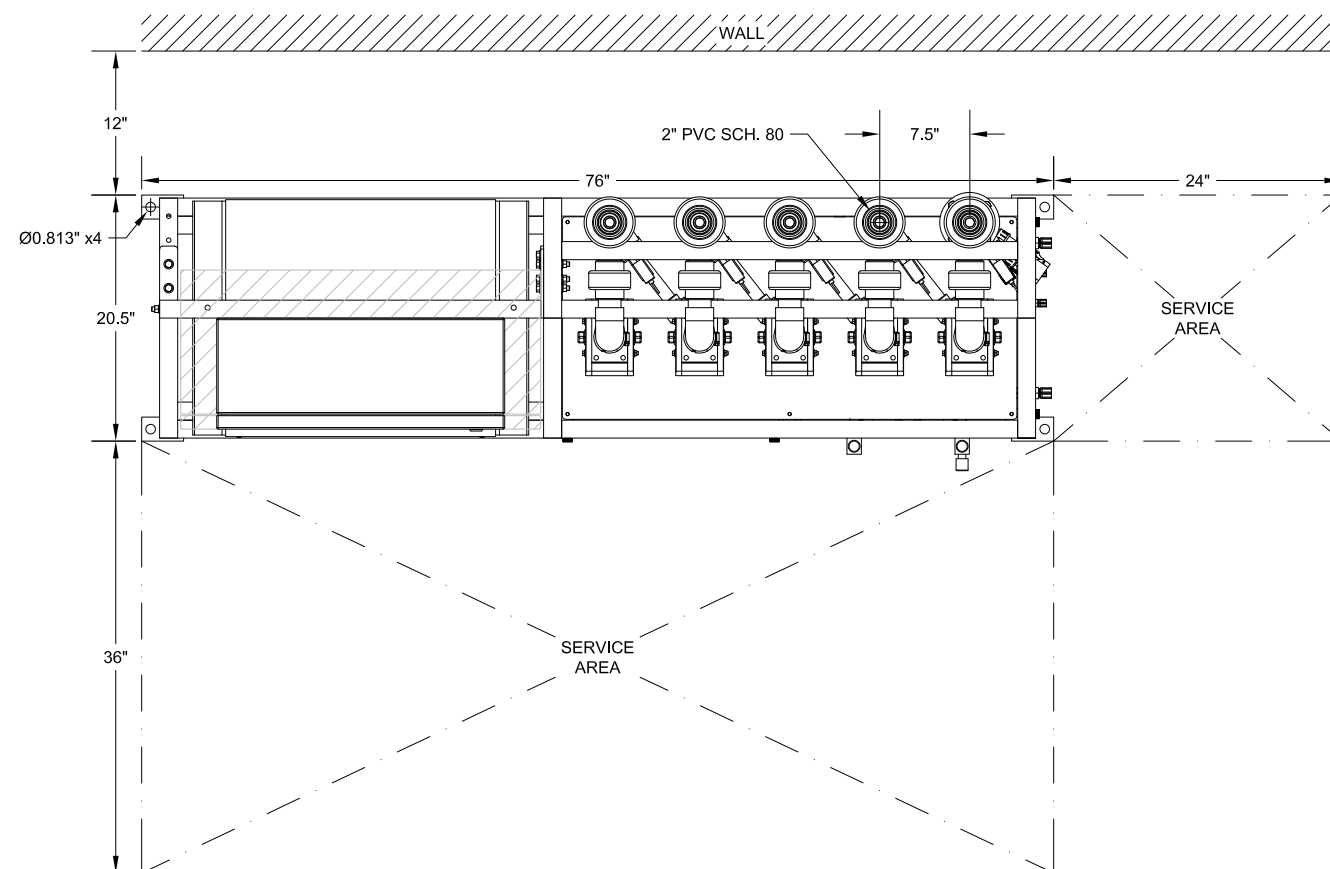
C

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PLAN VIEW



REV. \triangle	DATE	BY	DESCRIPTION	REV. \triangle	DATE	BY	DESCRIPTION
A	08/22/18	CGS	CHANGED DWG # FROM 000000-MC9020-AB-J	\triangle			
B	08/11/20	MK	REPLACED O&U WITH RENDERING OF 3D MODEL	\triangle			
C	09/21/20	MK	ADDED CONTROL PANEL OPTIONS	\triangle			
D	10/23/20	MK	UPDATED CELL ELECTRICAL REQUIREMENTS	\triangle			

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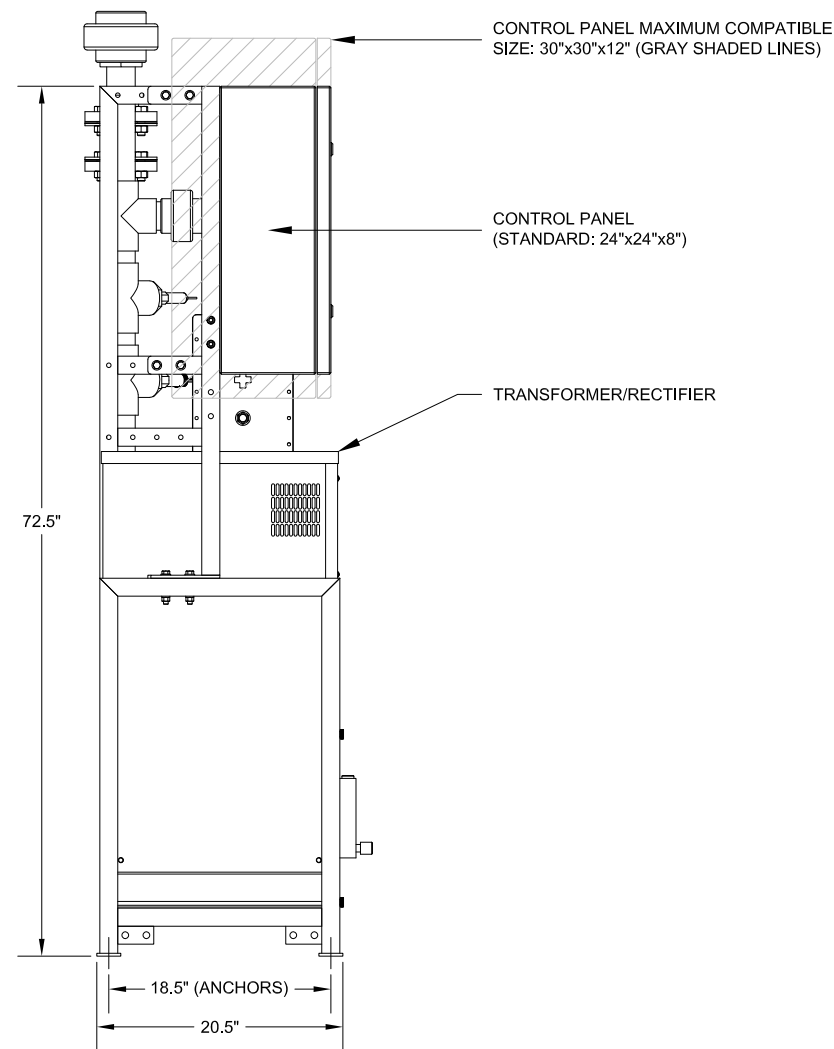
DRAWN BY:	C. STOTHERS	DATE:	08/22/2018
CHECKED BY:	M. KUSHMAN	DATE:	08/22/2018
SCALE:	1-1/2"=1'-0"	SIZE:	

PROJECT:	PSI WATER TECHNOLOGIES, INC. STANDARD DRAWING
SUBJECT:	MICROCLOR MC-200 OUTLINE & UTILITY DRAWING
DWG #:	000000-MC9020-OU
SHEET	2 OF 2
REV.	D

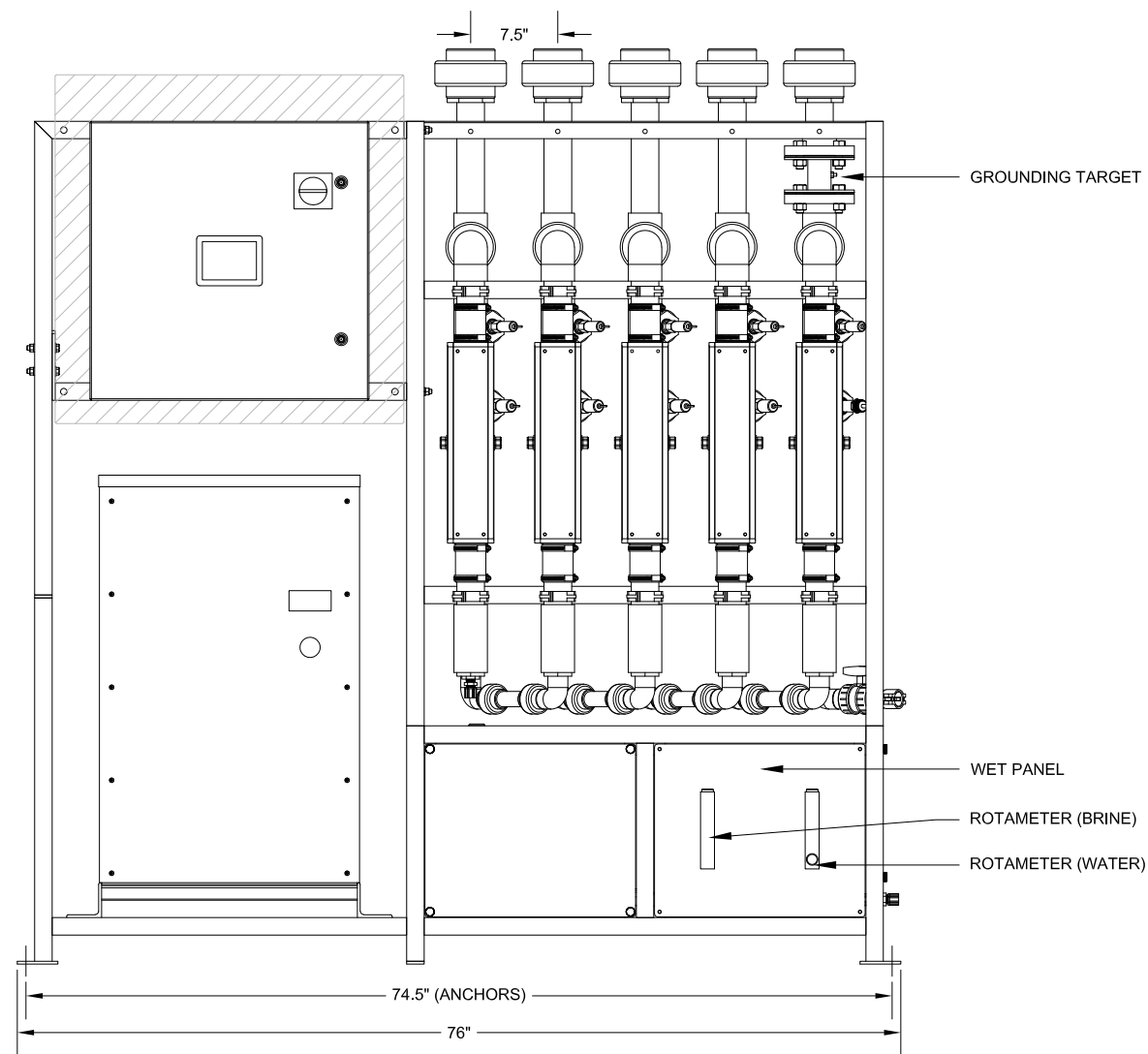
NOTES

1. WEIGHT OPERATING: 813 LB
2. INLETS AND OUTLETS
 - A. WATER INLET FEED SIZE/MATERIAL: 1/2" PE TUBE
 - B. BRINE INLET FEED SIZE/MATERIAL: 1/2" PE TUBE
 - C. BRINE TANK FILL SIZE/MATERIAL: 1/4" PE TUBE
 - D. VALVE VENT SIZE/MATERIAL: 1/4" PE TUBE
 - E. HYDROGEN VENT RISERS SIZE/MATERIAL: 3" PVC SCH80 (INSTALLED IN FIELD)
 - F. HYDROGEN HEADER SIZE/MATERIAL: 2" PVC SCH80 (INSTALLED IN FIELD)
 - G. HYPO OUTLET (ON RISERS) SIZE/MATERIAL: 2" PVC SCH80 (INSTALLED IN FIELD)
3. FRAME BASE DIMENSIONS: 6'-4"W x 1'-8.5"D
4. RECTIFIER ELECTRICAL REQUIREMENTS: 480VAC, 3Ø, 70A SERVICE
5. CELL ELECTRICAL REQUIREMENTS: 28.8KVA, 300VDC, 96ADC
6. CONTROL PANEL ELECTRICAL REQUIREMENTS: REFER TO CONTROL PANEL DRAWINGS

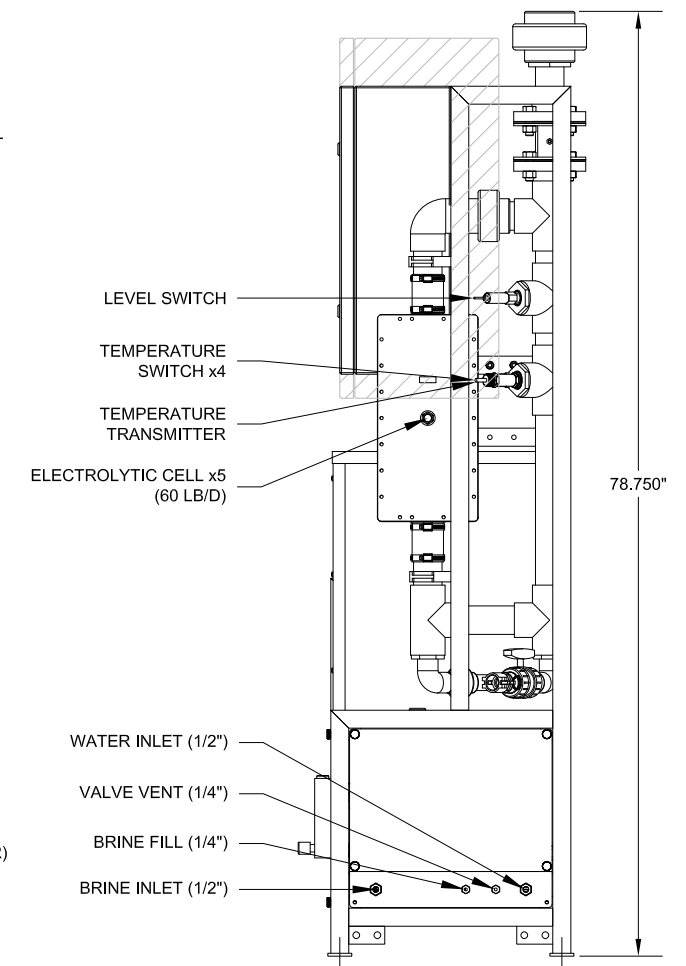
LEFT ELEVATION



FRONT ELEVATION



RIGHT ELEVATION



REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	08/22/18	CGS	CHANGED DWG # FROM 000000-MC9030-AB-J	△			
B	08/11/20	MK	REPLACED O&U WITH RENDERING OF 3D MODEL	△			
C	09/21/20	MK	ADDED CONTROL PANEL OPTIONS	△			
D	10/23/20	MK	UPDATED CELL ELECTRICAL REQUIREMENTS	△			

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PSI Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: C. STOTHERS DATE: 08/22/2018
 CHECKED BY: M. KUSHMAN DATE: 08/22/2018
 SCALE: 1-1/2"=1'-0"

PROJECT:	PSI WATER TECHNOLOGIES, INC. STANDARD DRAWING
SUBJECT:	MICROCLOR MC-300 OUTLINE & UTILITY DRAWING
DWG #:	000000-MC9030-OU
SHEET	1 OF 2
REV.	D

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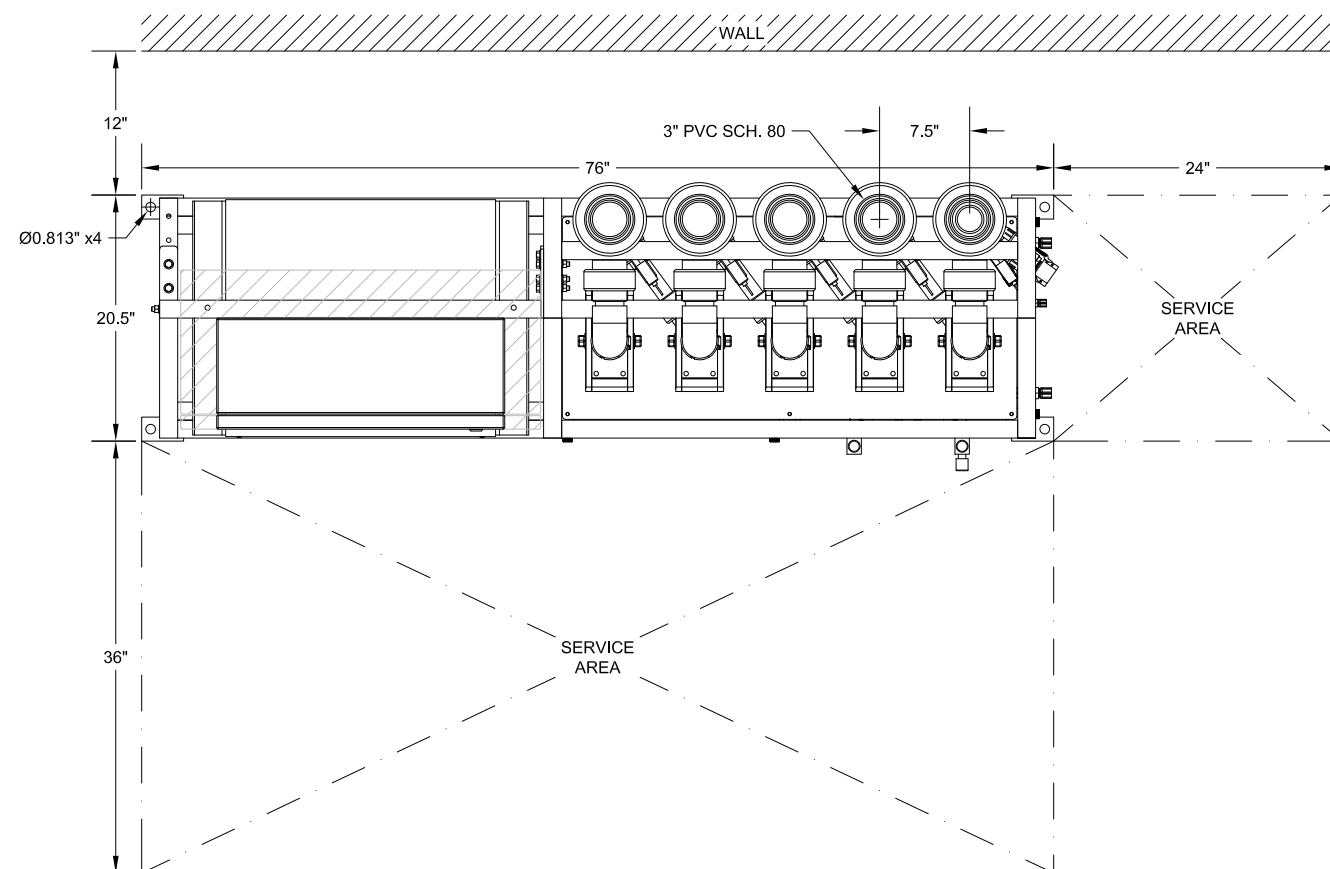
C

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PLAN VIEW



REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	08/22/18	CGS	CHANGED DWG # FROM 000000-MC9030-AB-J	△			
B	08/11/20	MK	REPLACED O&U WITH RENDERING OF 3D MODEL	△			
C	09/21/20	MK	ADDED CONTROL PANEL OPTIONS	△			
D	10/23/20	MK	UPDATED CELL ELECTRICAL REQUIREMENTS	△			

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CHECKED BY:	M. KUSHMAN	DATE:	08/22/2018
SCALE:	1-1/2"=1'-0"	SIZE:	

PROJECT:	PSI WATER TECHNOLOGIES, INC. STANDARD DRAWING
SUBJECT:	MICROCLOR MC-300 OUTLINE & UTILITY DRAWING
DWG #:	000000-MC9030-OU
SHEET	2 OF 2
REV.	D

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PSI WATER TECHNOLOGIES, INC. (PSI)
STANDARD DRAWING

MICROCLOR
ON-SITE HYPOCHLORITE GENERATION SYSTEM
MC-200 (200 LB/D) (91 KG/D)

PIPING & INSTRUMENTATION DIAGRAM

REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
△ J	08/07/19	CGS	UPDATED TAGGING	△ E	06/09/17	MK	UPDATED BLOWERS, VENTS, LOOPS
△ K	11/21/19	MK	ADDED INTEGRAL FLOW/TEMP. TRANSMITTER	△ F	06/26/17	MK	REMOVED STANDBY BLOWERS
△ L	11/25/19	MK	UPDATED TT TAG	△ G	09/13/17	MK	DRAWN IN NEW STANDARD FORMAT
△ M	07/22/21	MK	ADDED BRINE FLUSH, PGS, ETC.; UPDATED GEN. SERVICE	△ H	03/14/18	MK	ADDED FLOW SWITCH

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PSI Water Technologies
A UGSI SOLUTIONS COMPANY

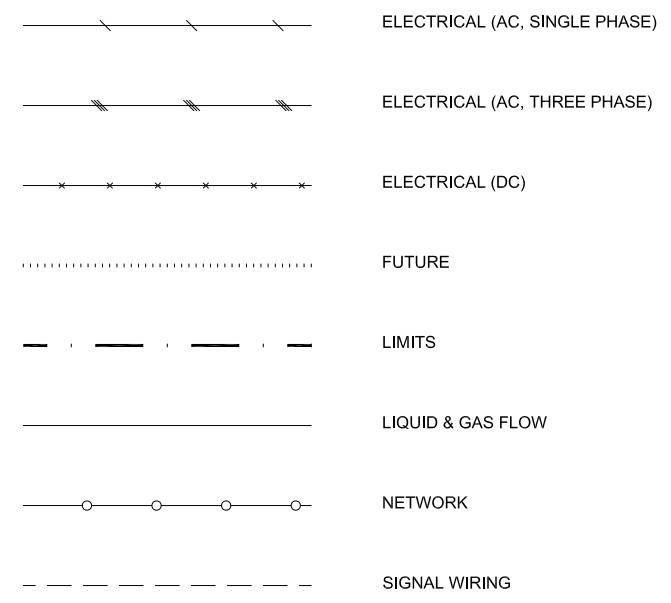
PROJECT: PSI WATER TECHNOLOGIES, INC.
STANDARD DRAWING

SUBJECT: MICROCLOR
MC-200
PIPING & INSTRUMENTATION DIAGRAM

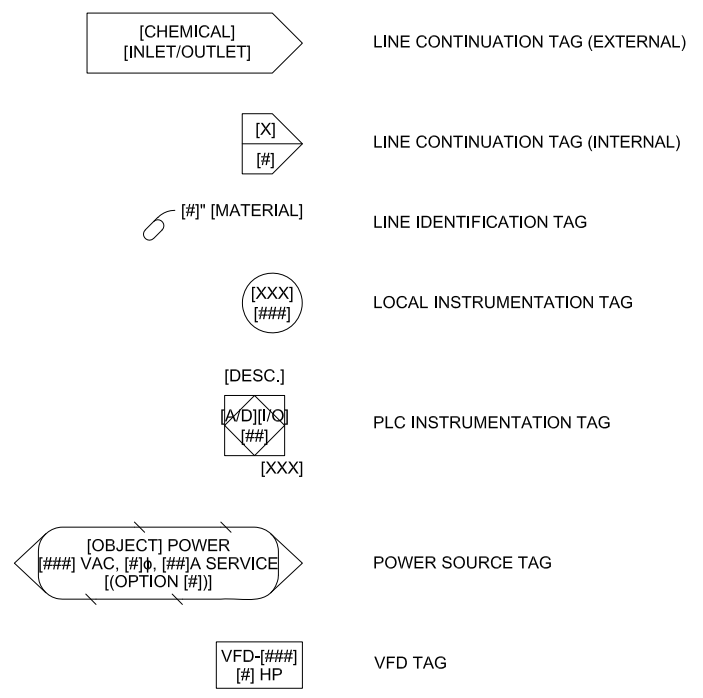
DWG #: 000000-MC0200-PI SHEET 1 OF 6 REV. M

DRAWN BY:	M. KUSHMAN	DATE:	09/13/2017
CHECKED BY:		DATE:	
SCALE:	N/A	SIZE:	

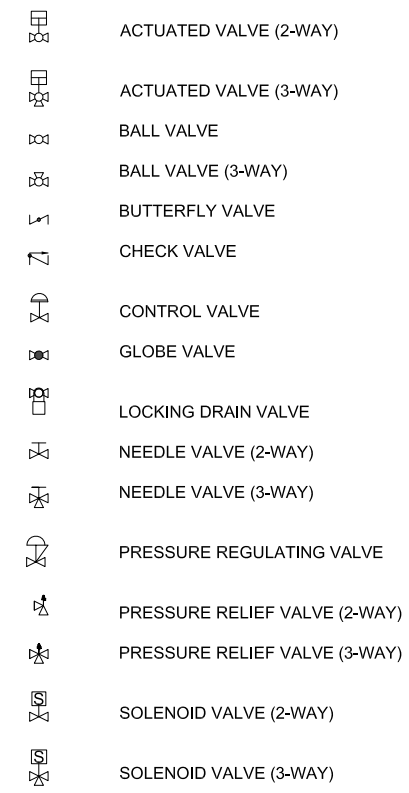
LINE TYPES



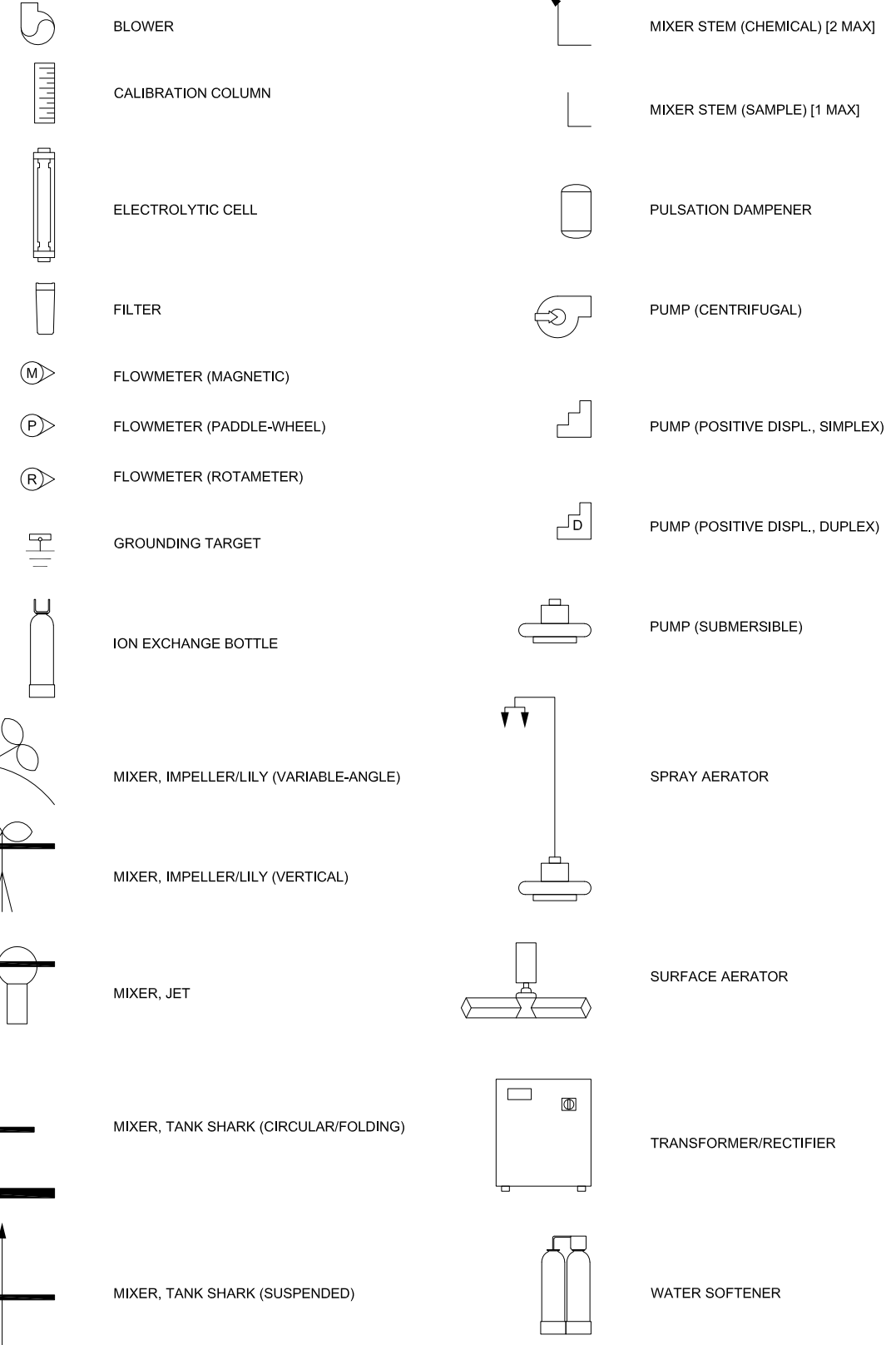
TAGS



VALVES



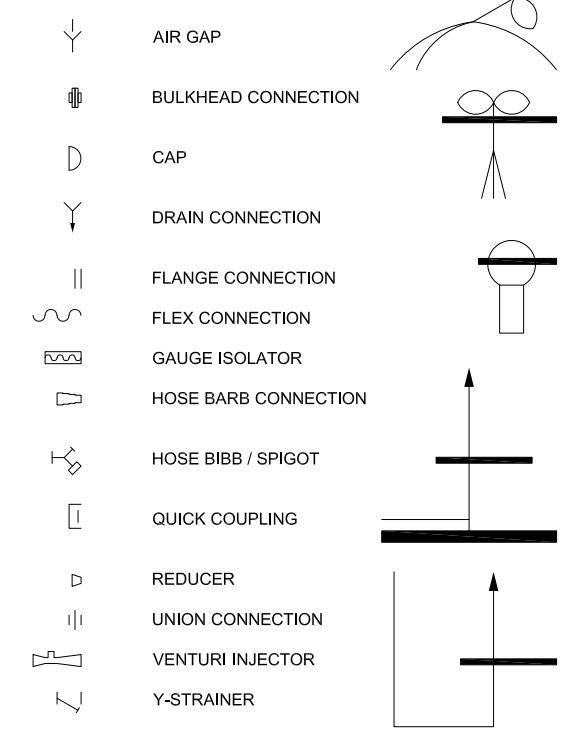
EQUIPMENT



ISA INSTRUMENT LETTER ID

LETTER	PROCESS VARIABLE	MODIFIER	READOUT/OUTPUT FUNCTION	MODIFIER
A	ANALYZER		ALARM	
B	BURNER		USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE	CONTROL	CONTROL	CLOSE
D	USER'S CHOICE	DIFFERENTIAL		
E	VOLTAGE		PRIMARY ELEMENT	
F	FLOW	RATIO		
G	USER'S CHOICE		GLASS	
H	HAND			HIGH
I	CURRENT		INDICATE	
J	POWER	SCAN		
K	TIME		CONTROL SITUATION	
L	LEVEL		LIGHT	LOW
M	USER'S CHOICE	MOMENTARY		INTERMEDIATE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE	OPEN
P	PRESSURE		POINT (TEST CONNECTION)	
Q	QUANTITY	INTEGRATE, TOTALIZE		
R	RADIATION	RELIEF	RECORD	
S	SPEED	SAFETY	SWITCH	
T	TEMPERATURE		TRANSMIT	
U	MULTI-VARIABLE		MULTI-FUNCTION	MULTI-FUNCTION
V	VIBRATION		VALVE, DAMPER	
W	WEIGHT, FORCE		WELL	
X	UNCLASSIFIED	X-AXIS	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE	Y-AXIS	RELAY, COMPUTE	
Z	POSITION	Z-AXIS	DRIVER, ACTUATOR, UNCL. F.C.E.	

FITTINGS



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		PROJECT: PSI WATER TECHNOLOGIES, INC. STANDARD DRAWING	
DRAWN BY: M. KUSHMAN	DATE: 09/13/2017	SUBJECT: MICROCLOR MC-200 PIPING & INSTRUMENTATION DIAGRAM	
CHECKED BY:	DATE:	DWG #: 000000-MC0200-PI	
SCALE: N/A	SIZE:	SHEET 2 OF 6 REV. M	

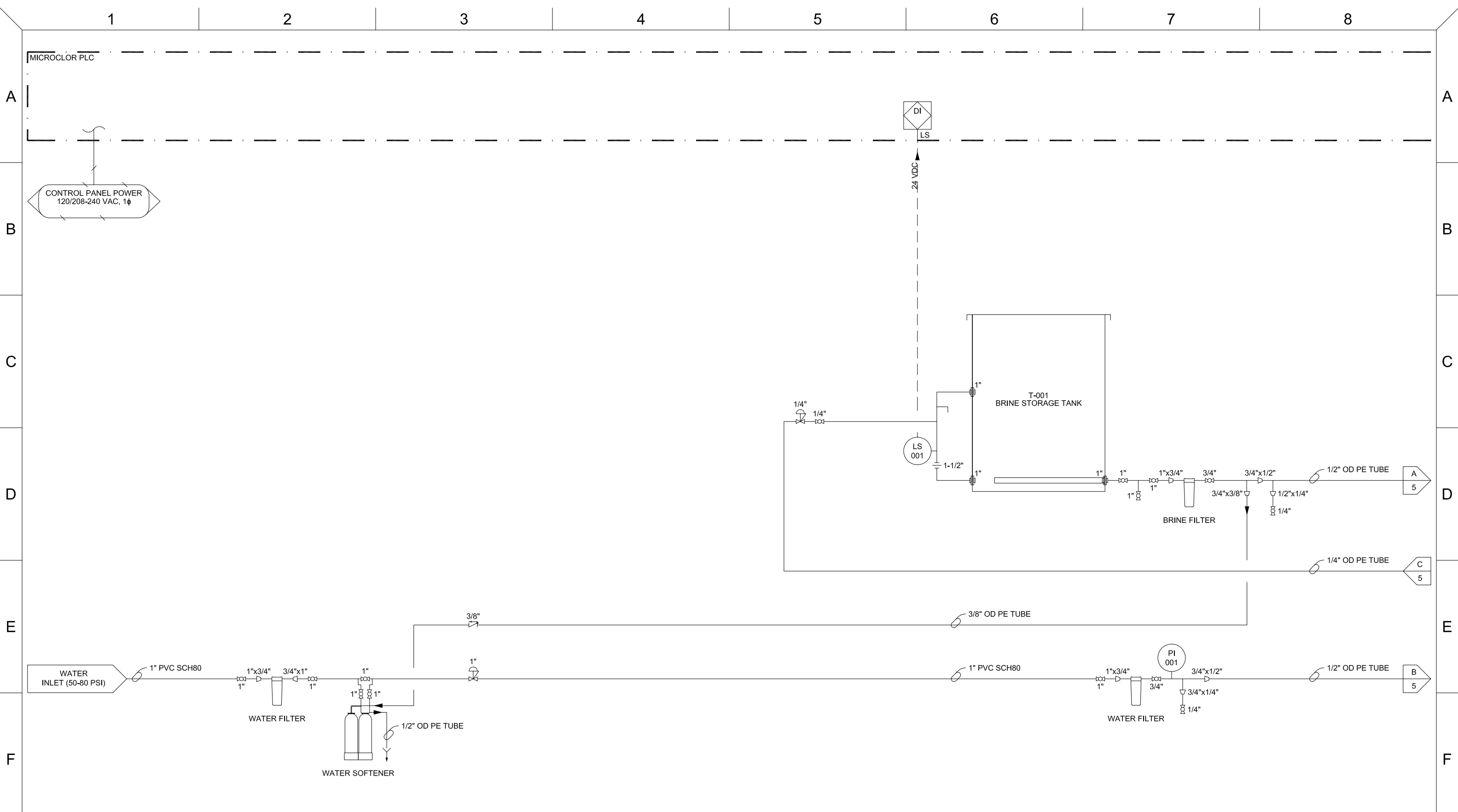
KEYED NOTES

- A** **1** SHT # 5 48" MINIMUM VERTICAL SEPARATION BETWEEN VENT HEADER (MEASURED AT LOW POINT) AND HYPOCHLORITE OUTLET (MEASURED AT HIGH POINT). MORE SEPARATION MAY BE NECESSARY IF HYPOCHLORITE OUTLET IS RAISED ABOVE TOP OF SKID, OR SKID IS RAISED ABOVE GROUND LEVEL.
- 2** SHT # 5 HYPOCHLORITE OUTLET PIPING SHALL HAVE MINIMUM DOWNWARD SLOPE TOWARD THE HYPOCHLORITE STORAGE TANK OF APPROXIMATELY 1/8" PER LINEAR FOOT FOR A STANDARD MICROCLOR ONLY. FOR SYSTEMS WITH A HEAT EXCHANGER OR APPLICATIONS WITH ELEVATION CHANGES CONSULT WITH PSI ENGINEERING.
- 3** SHT # 5 VENT PIPING SHALL HAVE MINIMUM UPWARD SLOPE TOWARD THE VENT OUTLET OF APPROXIMATELY 1/8" PER LINEAR FOOT.
- B** **4** SHT # 5 HYDROGEN DETECTOR MUST BE INSTALLED AT A HIGH POINT IN THE BUILDING NO MORE THAN ONE (1) FOOT BELOW THE CEILING.
- 5** SHT # 6 VENT TO ATMOSPHERE OUTDOORS. VENT STACK OUTLETS MUST BE AT LEAST TWO (2) FEET ABOVE THE ROOF LINE FOR AT LEAST FIFTEEN (15) FEET IN ALL DIRECTIONS. VENT OUTLET MUST NOT TERMINATE ANYWHERE PEOPLE CAN PASS BY OR CONGREGATE AND THERE MUST BE NO AIR INLETS, HEATERS, WINDOWS, AIR CONDITIONERS, OR OTHER SOURCES OF IGNITION WITHIN 15 FEET OF THE OUTLET. A SCREENED VENT CAP MUST BE USED TO TERMINATE THE HYDROGEN VENT STACKS TO THE ATMOSPHERE.
- C** **6** SHT # 6 REQUIRES OVERFLOW VENT TO ATMOSPHERE TO PREVENT SIPHONING OF TANK CONTENTS. REQUIRES DOWNCOMER TO PREVENT BACKFLOW OF HYDROGEN GAS THROUGH HYPOCHLORITE LINE.
- 7** SHT # 6 BLOWER MOUNTED 24" MAXIMUM ABOVE BASE OF GENERATOR SKID OR HYPOCHLORITE STORAGE TANK (DEPENDING ON WHICH ITS ROUTED THROUGH). IF BLOWER IS ROUTED THROUGH BOTH, DEFINE THIS LIMIT BY WHICHEVER IS LOWER IN ELEVATION.
- 8** SHT # 6 BLOWER DESIGN POINT: 406 CFM, 3.4" H₂O STATIC PRESSURE (50 FT. 6" PVC SCH. 40 PIPE RUN, 6 ELBOWS, 1 TANK ENTRANCE/EXIT).
- D** **9** SHT # 6 BLOWER REQUIRES 32" OF STRAIGHT PIPE ON OUTLET BEFORE ANY ELBOWS OR VALVES.


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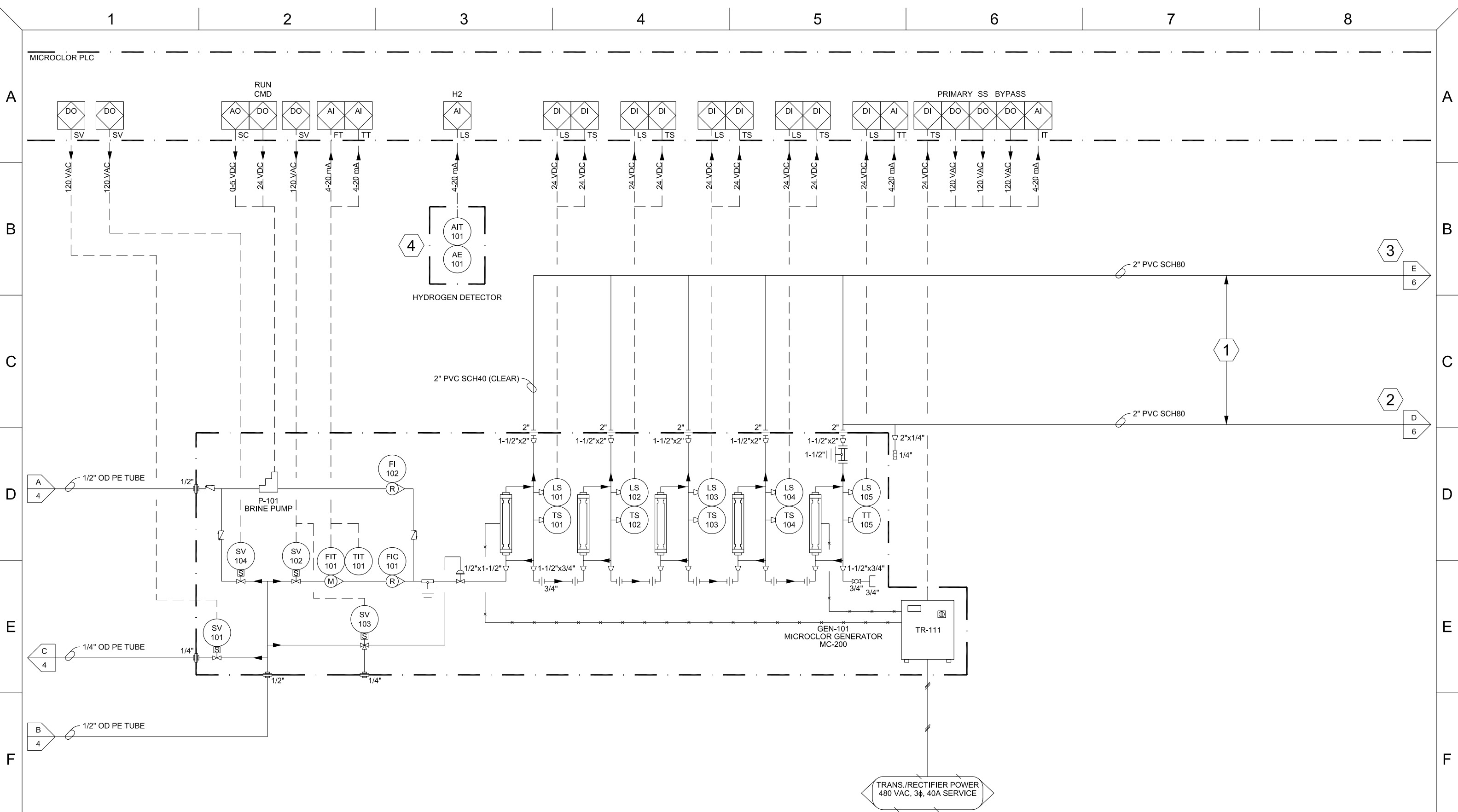
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	DRAWN BY: M. KUSHMAN	DATE: 09/13/2017	SUBJECT: MICROCLOR MC-200 PIPING & INSTRUMENTATION DIAGRAM	
	CHECKED BY:	DATE:	DWG #: 000000-MC0200-PI	
	SCALE: N/A	SIZE:	SHEET 3 OF 6 REV. M	



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		PROJECT:	
		PSI WATER TECHNOLOGIES, INC. STANDARD DRAWING	
DRAWN BY:	M. KUSHMAN	DATE:	09/13/2017
CHECKED BY:		DATE:	
SCALE:	N/A	SIZE:	

SUBJECT:	
MICROCLOR MC-200 PIPING & INSTRUMENTATION DIAGRAM	
B DWG #:	000000-MC0200-PI
SHEET	4 OF 6
REV.	M

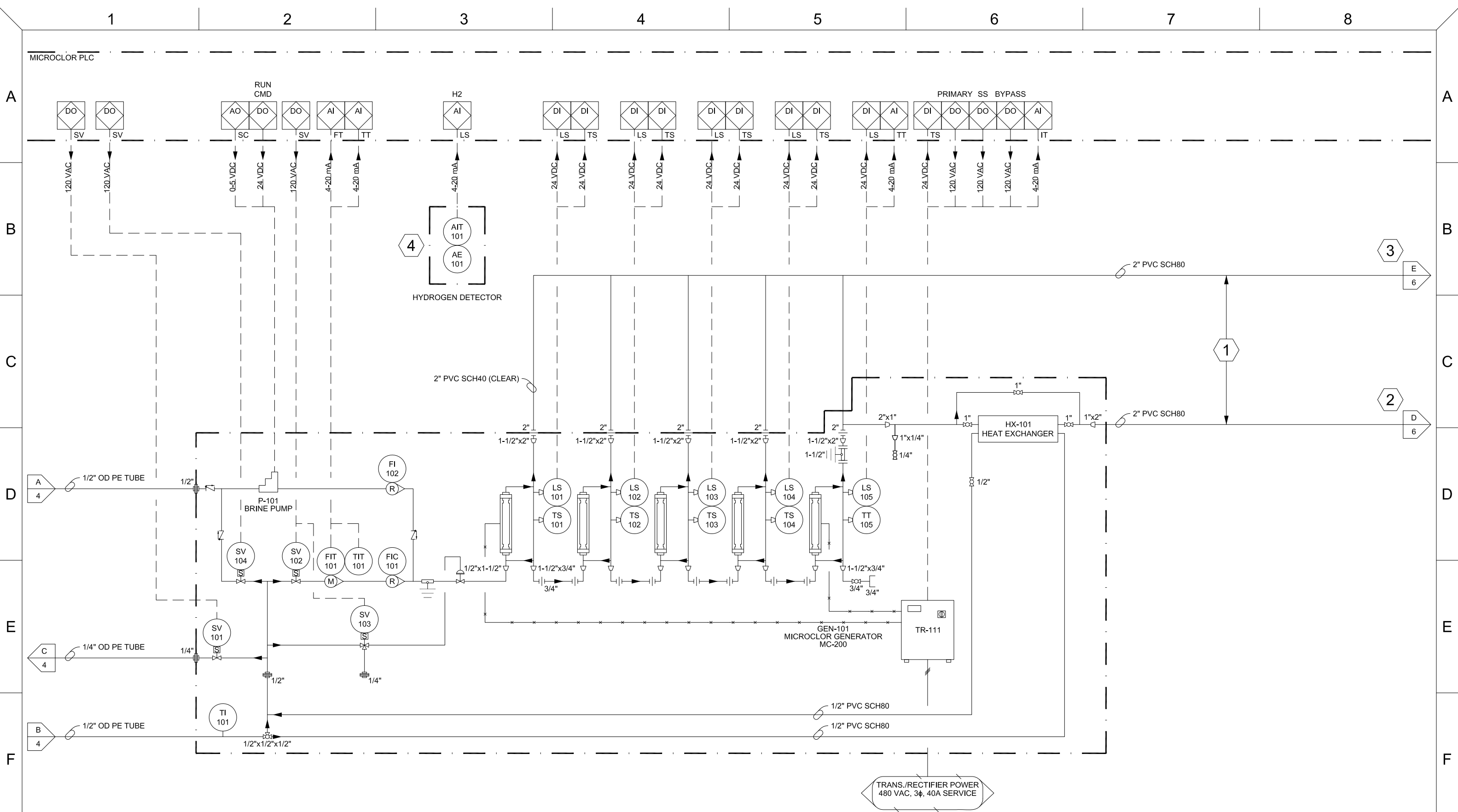


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PSI Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY:	M. KUSHMAN	DATE:	09/13/2017
CHECKED BY:		DATE:	
SCALE:		SIZE:	N/A

PROJECT:	PSI WATER TECHNOLOGIES, INC. STANDARD DRAWING		
SUBJECT:	MICROCLOR MC-200 PIPING & INSTRUMENTATION DIAGRAM		
DWG #:	000000-MC0200-PI	SHEET 5 OF 6	REV. M

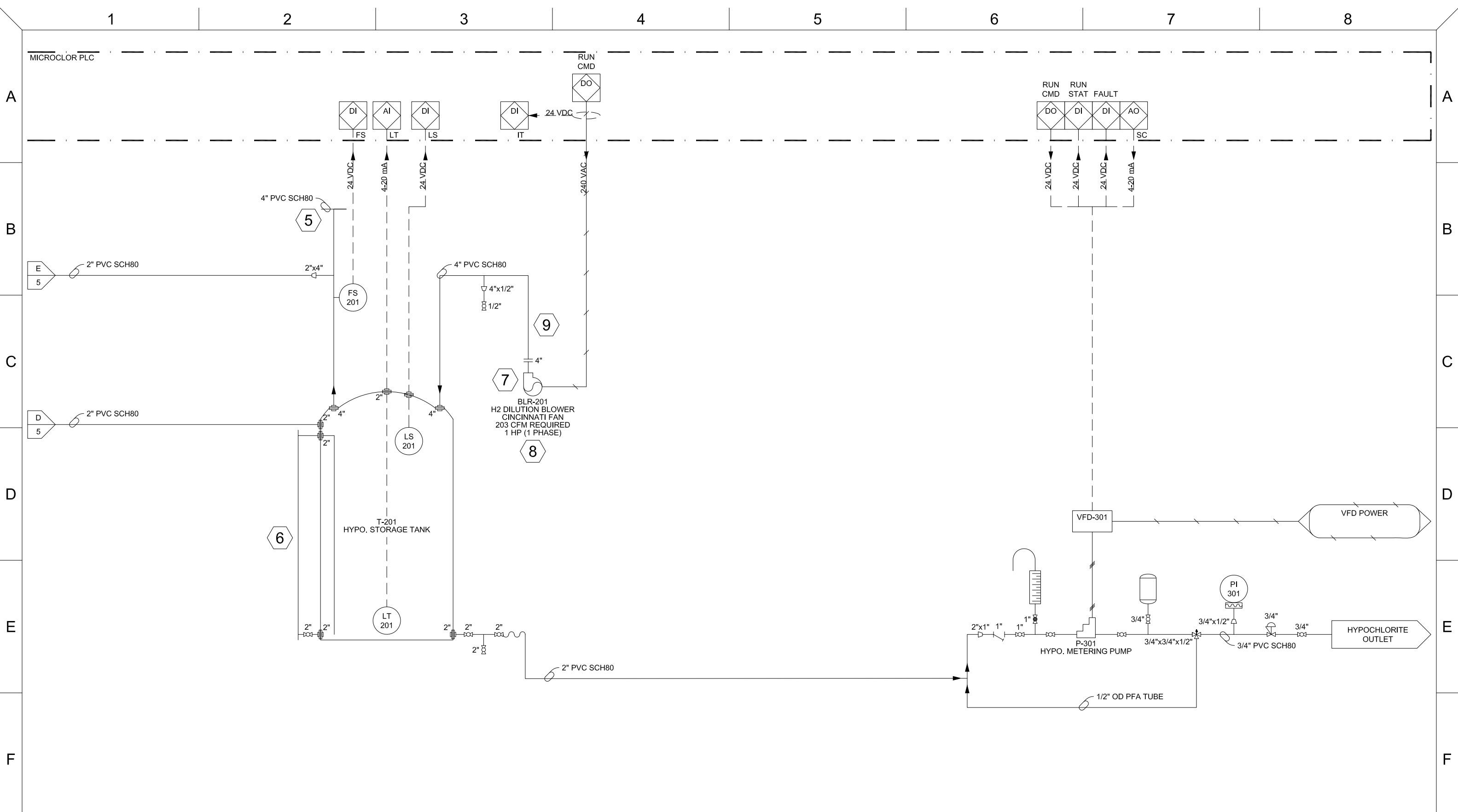



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CHECKED BY:		DATE:	
SCALE:		SIZE:	N/A

PROJECT:	PSI WATER TECHNOLOGIES, INC. STANDARD DRAWING		
SUBJECT:	MICROCLOR MC-200 PIPING & INSTRUMENTATION DIAGRAM		
DWG #:	000000-MC0200-PI	SHEET 5 OF 6	REV. M



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DRAWN BY: M. KUSHMAN		DATE: 09/13/2017		SUBJECT: MICROCLOR MC-200 PIPING & INSTRUMENTATION DIAGRAM	
CHECKED BY:		DATE:		SCALE:	
SCALE: N/A		SIZE: N/A		DWG #: 000000-MC0200-PI	
				SHEET 6 OF 6 REV. M	

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PSI WATER TECHNOLOGIES, INC. (PSI)
STANDARD DRAWING

MICROCLOR
ON-SITE HYPOCHLORITE GENERATION SYSTEM
MC-300 (300 LB/D) (136 KG/D)

PIPING & INSTRUMENTATION DIAGRAM

REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
△J	08/07/19	CGS	UPDATED TAGGING	△E	06/09/17	MK	UPDATED BLOWERS, VENTS, LOOPS
△K	11/21/19	MK	ADDED INTEGRAL FLOW/TEMP. TRANSMITTER	△F	06/26/17	MK	REMOVED STANDBY BLOWERS
△L	11/25/19	MK	UPDATED TT TAG	△G	09/13/17	MK	DRAWN IN NEW STANDARD FORMAT
△M	07/22/21	MK	ADDED BRINE FLUSH, PGS, ETC.; UPDATED GEN. SERVICE	△H	03/14/18	MK	ADDED FLOW SWITCH

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PSI Water Technologies
A UGSI SOLUTIONS COMPANY

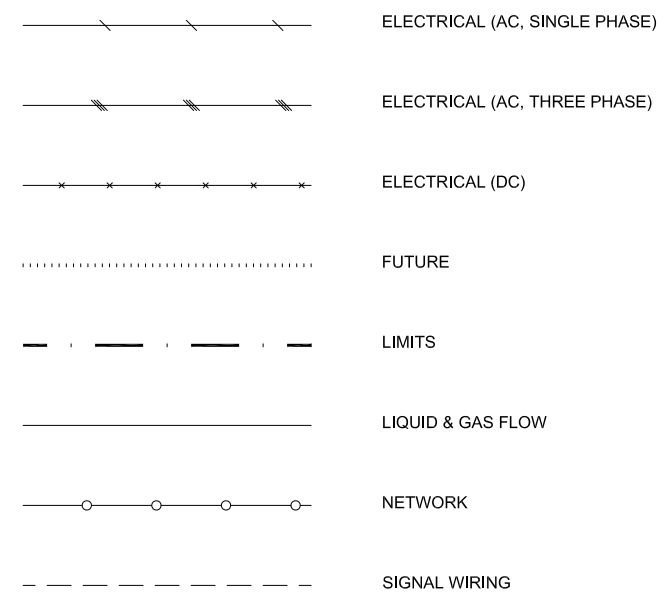
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STANDARD DRAWING

SUBJECT: MICROCLOR
MC-300
PIPING & INSTRUMENTATION DIAGRAM

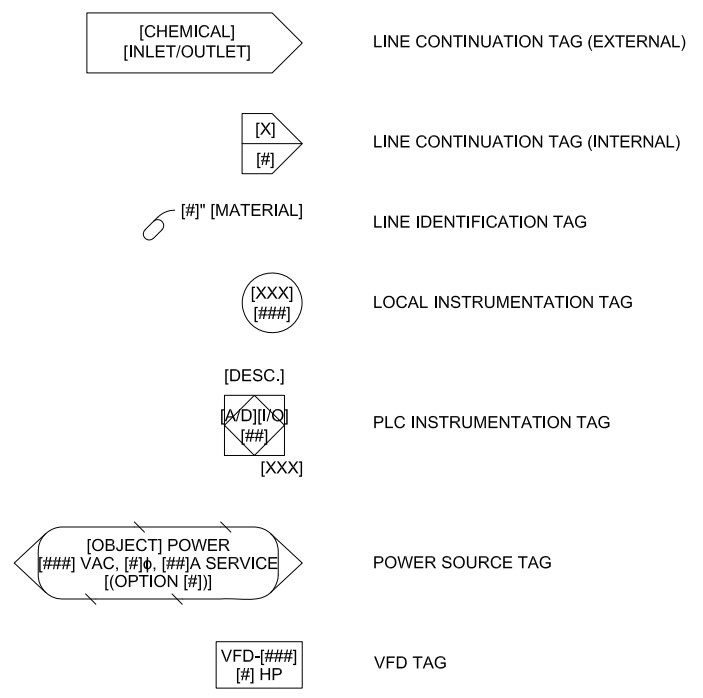
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DRAWN BY:	M. KUSHMAN	DATE:	09/13/2017
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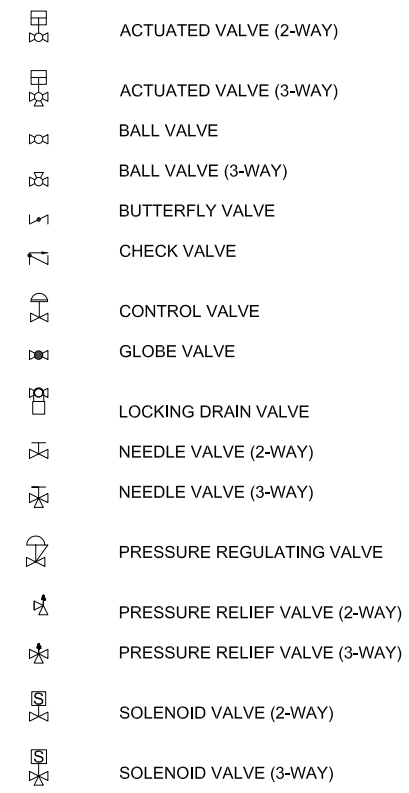
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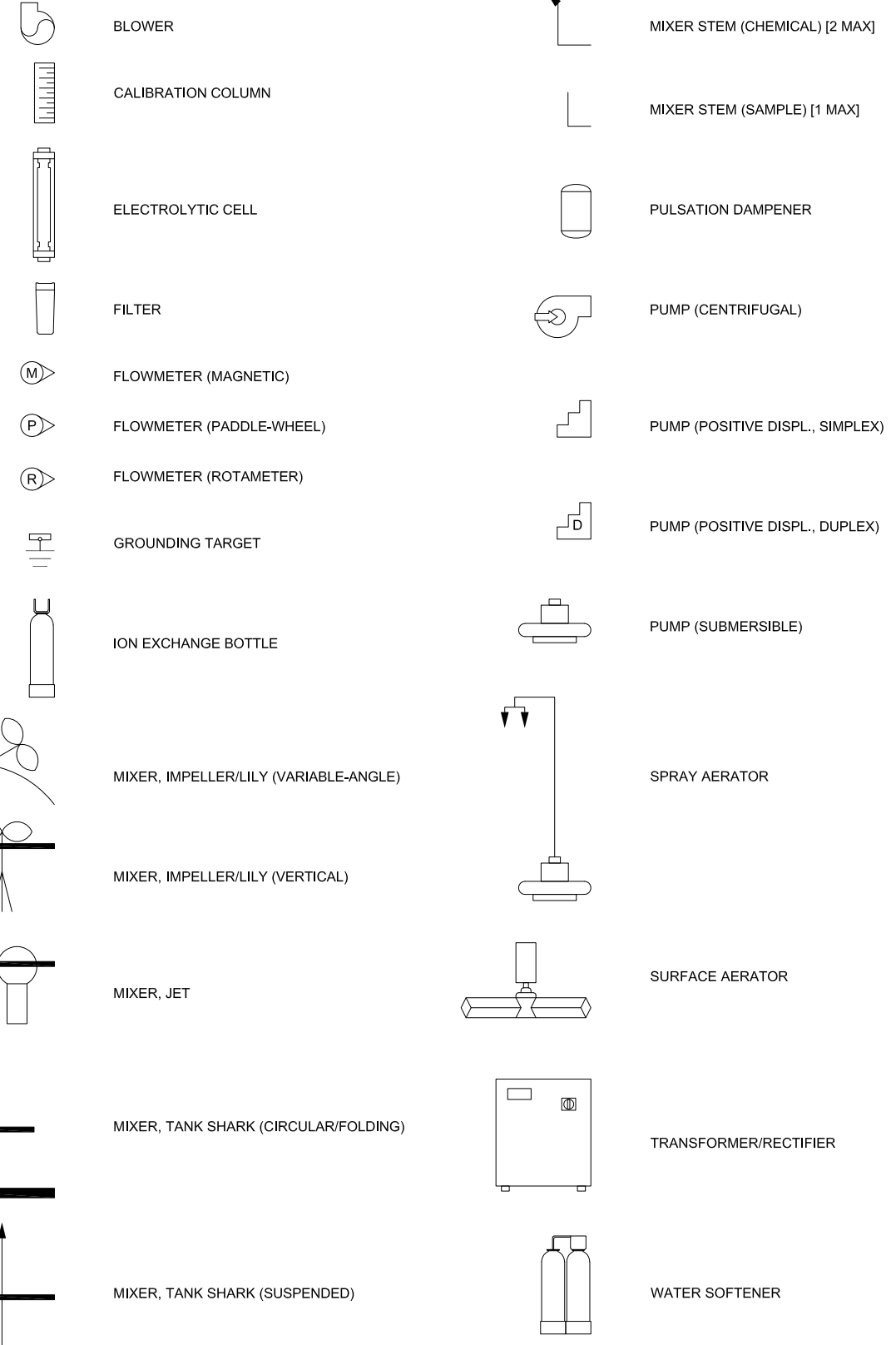
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VALVES



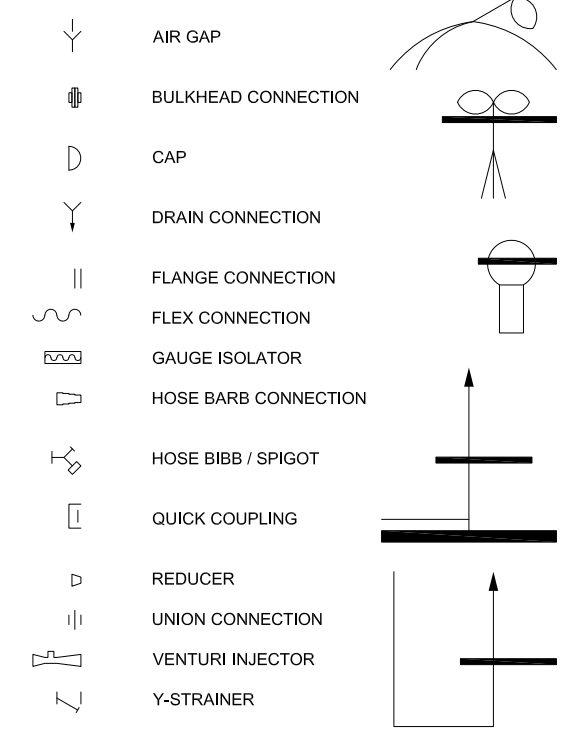
EQUIPMENT



ISA INSTRUMENT LETTER ID

LETTER	PROCESS VARIABLE	MODIFIER	READOUT/OUTPUT FUNCTION	MODIFIER
A	ANALYZER		ALARM	
B	BURNER		USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE	CONTROL	CONTROL	CLOSE
D	USER'S CHOICE	DIFFERENTIAL		
E	VOLTAGE		PRIMARY ELEMENT	
F	FLOW	RATIO		
G	USER'S CHOICE		GLASS	
H	HAND			HIGH
I	CURRENT		INDICATE	
J	POWER	SCAN		
K	TIME		CONTROL SITUATION	
L	LEVEL		LIGHT	LOW
M	USER'S CHOICE	MOMENTARY		INTERMEDIATE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE	OPEN
P	PRESSURE		POINT (TEST CONNECTION)	
Q	QUANTITY	INTEGRATE, TOTALIZE		
R	RADIATION	RELIEF	RECORD	
S	SPEED	SAFETY	SWITCH	
T	TEMPERATURE		TRANSMIT	
U	MULTI-VARIABLE		MULTI-FUNCTION	MULTI-FUNCTION
V	VIBRATION		VALVE, DAMPER	
W	WEIGHT, FORCE		WELL	
X	UNCLASSIFIED	X-AXIS	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE	Y-AXIS	RELAY, COMPUTE	
Z	POSITION	Z-AXIS	DRIVER, ACTUATOR, UNCL. F.C.E.	

FITTINGS



This drawing represents an investment by PSI WATER TECHNOLOGIES, INC. of substantial sums, including our engineering skills and experience. It is, therefore, loaned without consideration other than the agreement and condition that it is not to be used in whole or in part to assist in making or to furnish any information to others for the making of drawings, print apparatus, or parts thereof. The acceptance of this drawing will be construed as an acceptance of the foregoing conditions and as an admission of the exclusive ownership in and to the drawings of PSI WATER TECHNOLOGIES, INC.

PSI Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: M. KUSHMAN DATE: 09/13/2017
 CHECKED BY: DATE:
 SCALE: N/A SIZE:


PROJECT:	PSI WATER TECHNOLOGIES, INC. STANDARD DRAWING
SUBJECT:	MICROCLOR MC-300 PIPING & INSTRUMENTATION DIAGRAM
B DWG #:	000000-MC0300-PI SHEET 2 OF 6 REV. M

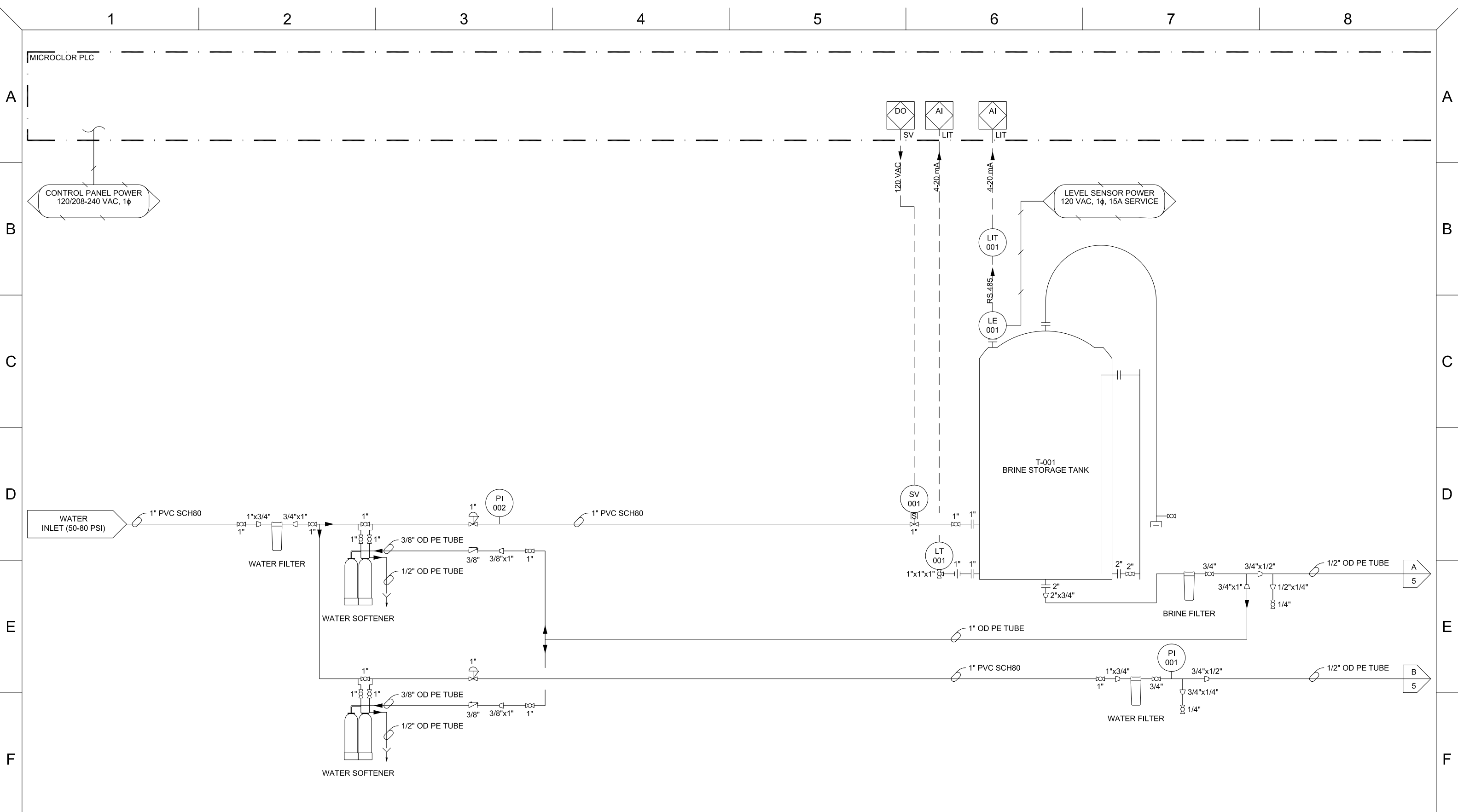
KEYED NOTES

- A** **1** SHT # 5 48" MINIMUM VERTICAL SEPARATION BETWEEN VENT HEADER (MEASURED AT LOW POINT) AND HYPOCHLORITE OUTLET (MEASURED AT HIGH POINT). MORE SEPARATION MAY BE NECESSARY IF HYPOCHLORITE OUTLET IS RAISED ABOVE TOP OF SKID, OR SKID IS RAISED ABOVE GROUND LEVEL.
- 2** SHT # 5 HYPOCHLORITE OUTLET PIPING SHALL HAVE MINIMUM DOWNWARD SLOPE TOWARD THE HYPOCHLORITE STORAGE TANK OF APPROXIMATELY 1/8" PER LINEAR FOOT FOR A STANDARD MICROCLOR ONLY. FOR SYSTEMS WITH A HEAT EXCHANGER OR APPLICATIONS WITH ELEVATION CHANGES CONSULT WITH PSI ENGINEERING.
- 3** SHT # 5 VENT PIPING SHALL HAVE MINIMUM UPWARD SLOPE TOWARD THE VENT OUTLET OF APPROXIMATELY 1/8" PER LINEAR FOOT.
- B** **4** SHT # 5 HYDROGEN DETECTOR MUST BE INSTALLED AT A HIGH POINT IN THE BUILDING NO MORE THAN ONE (1) FOOT BELOW THE CEILING.
- 5** SHT # 6 VENT TO ATMOSPHERE OUTDOORS. VENT STACK OUTLETS MUST BE AT LEAST TWO (2) FEET ABOVE THE ROOF LINE FOR AT LEAST FIFTEEN (15) FEET IN ALL DIRECTIONS. VENT OUTLET MUST NOT TERMINATE ANYWHERE PEOPLE CAN PASS BY OR CONGREGATE AND THERE MUST BE NO AIR INLETS, HEATERS, WINDOWS, AIR CONDITIONERS, OR OTHER SOURCES OF IGNITION WITHIN 15 FEET OF THE OUTLET. A SCREENED VENT CAP MUST BE USED TO TERMINATE THE HYDROGEN VENT STACKS TO THE ATMOSPHERE.
- C** **6** SHT # 6 REQUIRES OVERFLOW VENT TO ATMOSPHERE TO PREVENT SIPHONING OF TANK CONTENTS. REQUIRES DOWNCOMER TO PREVENT BACKFLOW OF HYDROGEN GAS THROUGH HYPOCHLORITE LINE.
- 7** SHT # 6 BLOWER MOUNTED 24" MAXIMUM ABOVE BASE OF GENERATOR SKID OR HYPOCHLORITE STORAGE TANK (DEPENDING ON WHICH ITS ROUTED THROUGH). IF BLOWER IS ROUTED THROUGH BOTH, DEFINE THIS LIMIT BY WHICHEVER IS LOWER IN ELEVATION.
- 8** SHT # 6 BLOWER DESIGN POINT: 406 CFM, 3.4" H₂O STATIC PRESSURE (50 FT. 6" PVC SCH. 40 PIPE RUN, 6 ELBOWS, 1 TANK ENTRANCE/EXIT).
- D** **9** SHT # 6 BLOWER REQUIRES 32" OF STRAIGHT PIPE ON OUTLET BEFORE ANY ELBOWS OR VALVES.


E

F

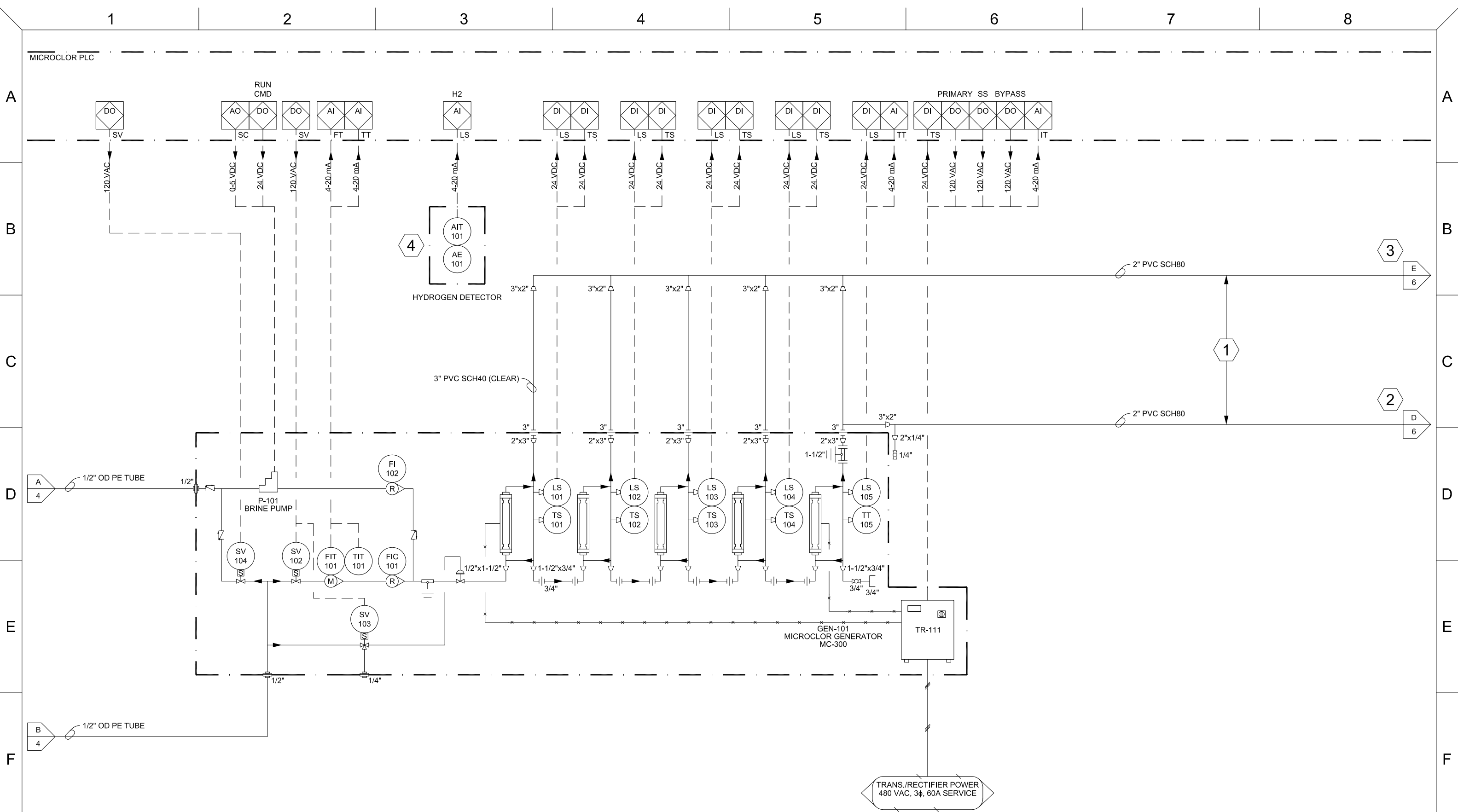
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	DRAWN BY: M. KUSHMAN	DATE: 09/13/2017	SUBJECT: MICROCLOR MC-300 PIPING & INSTRUMENTATION DIAGRAM
	CHECKED BY:	DATE:	
	SCALE: N/A	SIZE:	DWG #: 000000-MC0300-PI SHEET 3 OF 6 REV. M



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 PSI Water Technologies A UGSI SOLUTIONS COMPANY	
DRAWN BY:	DATE:
M. KUSHMAN	09/13/2017
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	N/A

PROJECT:	PSI WATER TECHNOLOGIES, INC. STANDARD DRAWING	
SUBJECT:	MICROCLOR MC-300 PIPING & INSTRUMENTATION DIAGRAM	
B DWG #:	000000-MC0300-PI	SHEET 4 OF 6 REV. M

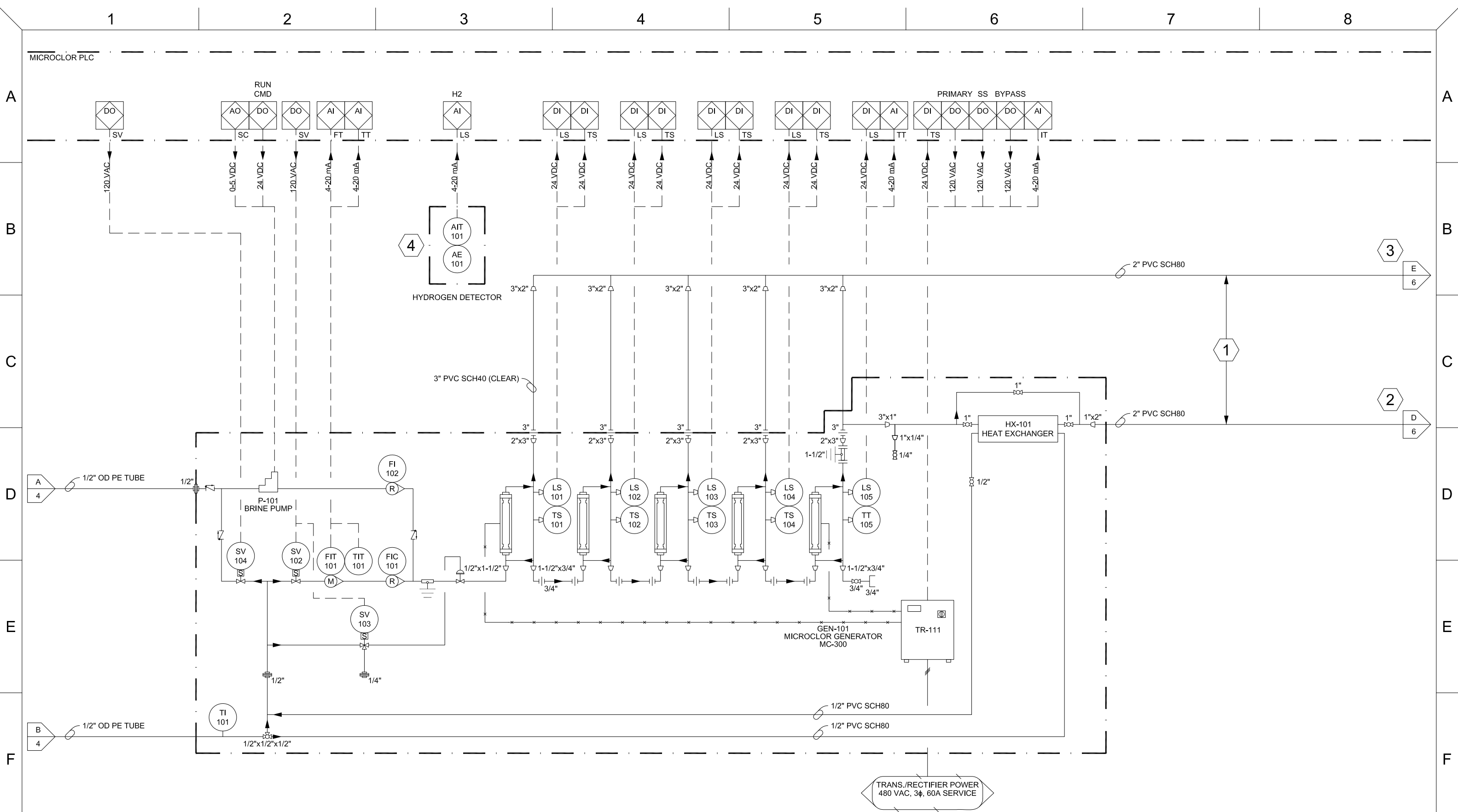


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PSI Water Technologies
A UGSI SOLUTIONS COMPANY

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DWG #:	000000-MC0300-PI	SHEET 5 OF 6	REV. M

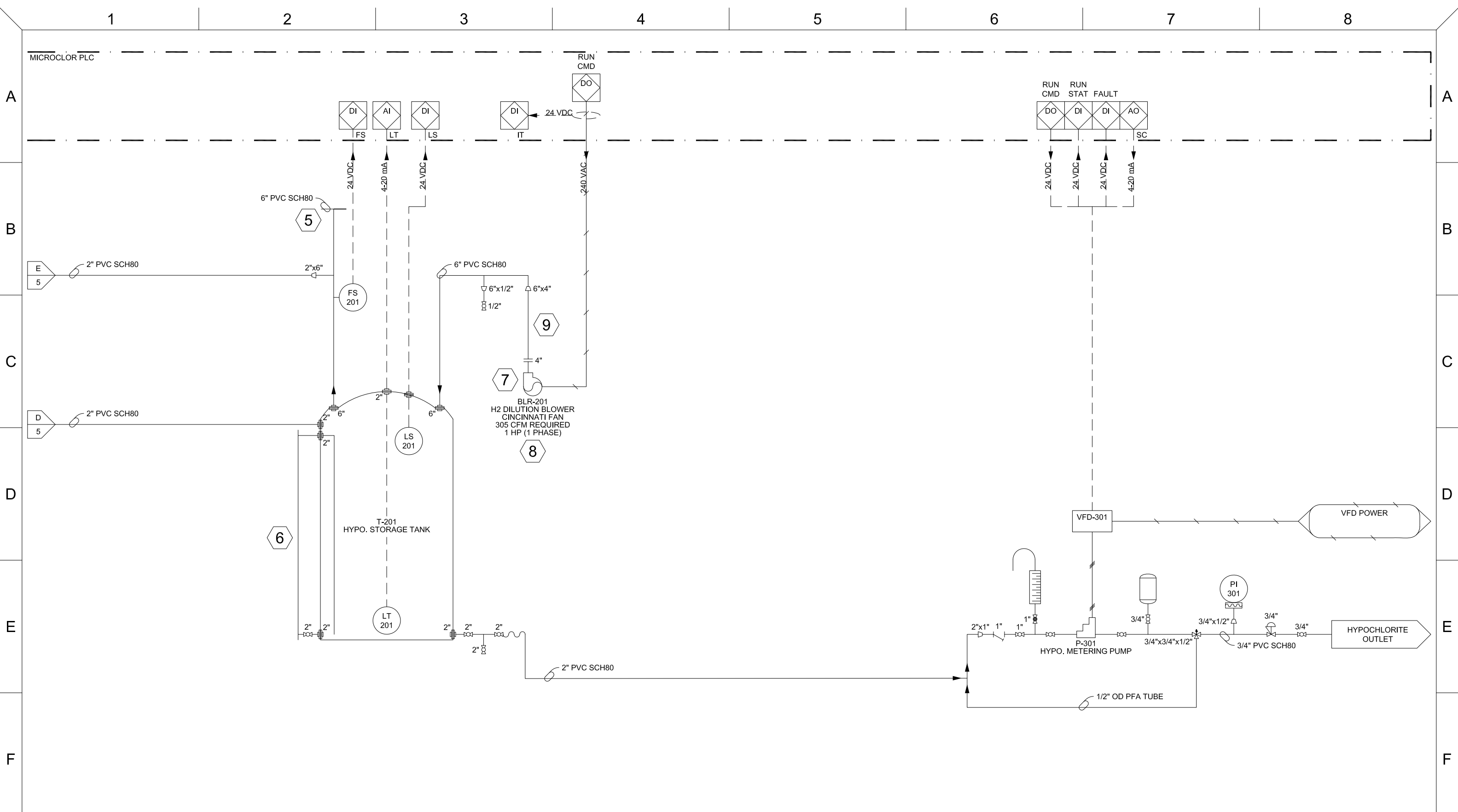



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	CHECKED BY:	DATE:	DWG #: 000000-MC0300-PI	
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SECTION 3

QUALIFICATIONS AND EXPERIENCE

Microclor® On-Site Hypochlorite Generation System

A. Company Background

Attachments

Reference List



A. COMPANY BACKGROUND

PSI Water Technologies, Inc.'s Microclor[®] system is recognized as the leading technology in on-site hypochlorite generation (OSHG) systems for virtually all water, wastewater, and reuse applications for municipal and industrial users. A reputation for long lasting, high quality products has been established over several years of excellent performance, reliable customer service, and competitive value.

The Microclor[®] line of OSHG systems was launched by PSI Water Technologies, Inc. founders Brent Simmons and Gunnar Thordarson in 2003. Their experience with OSHG systems, however, goes back much farther as pioneers in the North American OSHG system market.

Mr. Simmons' work with commercial pool salt chlorinators inspired him to consider the utilization of on-site generation of bleach for potable water applications. Chemical Services Company (CSC) was founded in 1988 with business partner Mr. Thordarson, for the sole purpose of developing large scale chlorine generation systems. A quickly growing and profitable business, CSC developed and manufactured the ClorTec[®] chlorine generator in various sizes. After building a strong reputation as the early leading technology provider with more than 3,000 global installations, this first-generation OSHG system was acquired by Severn Trent Services in 1999. Even after supporting the ClorTec[®] line for several years, they were not finished contributing to the OSHG market.

Mr. Simmons and Mr. Thordarson satisfied several voids in the OSHG market with their formation of PSI Water Technologies, Inc.'s Microclor[®] system, the next-generation on-site hypochlorite generator. With the trust and service-focused character the founders were known for, the Microclor[®] system quickly jumped to become the industry-leading technology platform. Industry consultants and customer alike looked to PSI Water Technologies, Inc., the clear leader with 80% of the market and rapid growth internationally, to set the gold standard for safety, service, and warranty.

Shortly after defining the new generation of OSHG, the Tank Shark[®] tank mixing system was developed to effectively mix and properly dose hypochlorite into water storage vessels. After the initial Tank Shark[®] mixing model in 2007, the simple mixer has evolved capabilities into a full-blown disinfectant residual management system - the Monoclor[™] chloramine management system.

In an agreement that retained all personnel, including both founders, UGSI, Inc. acquired PSI Water Technologies, Inc. in June 2014. Seeing a great potential for growth of market volume, UGSI, Inc. management quickly invested in company resources through the addition of key general and operations management positions and the remodel of PSI Water Technologies,

PSI WATER TECHNOLOGIES

A cleanwater1 Company

Inc.'s Campbell, California, headquarters and manufacturing facility. Integration with the existing UGSI sales force offers nine full-time individuals who jointly possess over 300 years combined experience selling, designing, manufacturing, installing, and servicing on-site hypochlorite generation equipment.

As a customer-focused company, PSI Water Technologies, Inc. is dedicated the following three attributes:

- a. The availability and quick shipment of on-site hypochlorite generation and tank mixing systems, and equipment replacement parts taken from its deep stock of inventory
- b. The thorough design and manufacture of innovative, pre-assembled, on-site hypochlorite generation systems that conform to the requirements of each customer and/or installation
- c. The appointing of experienced staff devoted to continuous quality improvement through further product development

PSI Water Technologies, Inc.'s parent company, UGSI Solutions, Inc. (UGSI), a private company, is a leading provider of cutting edge infrastructure technologies and PSI Water Technologies to a wide range of commercial, industrial, and governmental water and wastewater customers. UGSI meets its customers' needs through technological innovation, dedication to customer service, and an unyielding commitment to quality.

In addition to PSI Water Technologies, Inc., the UGSI portfolio consists of the following products and services:

- UGSI Chemical Feed, Inc.: PolyBlend® polymer feed systems, Encore® chemical metering pumps, dry chemical feed equipment, and the Varea-Meter® variable area flow meters
- Mobile Pipe Lining & Coating: expert applicator of corrosion inhibiting coatings and linings for steel or ductile iron pipe and fittings

Headquartered in San Diego County, California, and led by a management team with industry-leading experience and expertise, UGSI Solutions, Inc. intends to remain in the top tier of water and wastewater infrastructure and solution companies. UGSI continues to pursue complementary products and services to expand our ability to support our customers.

End User	State	Equipment	Quantity	System Replaced	Contact Name	Phone Number	E-Mail
Daphne, City of	AL	MC-100	1	Chlorine Gas	Larry English	251-621-3198	larrye@daphneutilities.com
Orange Beach Water Authority	AL	MC-400	1	New Plant	Steve Ickes	251-967-3774	steve.ickes@gmail.com
Trussville Utilities Board, City of	AL	MC-200	1	Chlorine Gas	Alan Long	205-655-3211	along@trussville.com
Olivenhain Municipal Water District	CA	MC-2400	1	Clortec	Dave Smith	760-753-6466	dsmith@olivenhain.com
Rancho California Water District	CA	Various	>35	Chlorine Gas	Jake Wiley	951-296-6981	mcmahonh@ranchowater.com
Margate, City of	FL	MC-1200	1	Clortec	Wendel Wheeler	954-972-0828	wwheeler@margatefl.com
Columbus Water Works	GA	MC-500	1	New Plant	Carl Corley	706-992-6324	ccorley@cwvga.org
Indiana American Water	IN	MC-200	1	New Plant	Christopher Harrison	574-267-6232	christopher.harrison@amwater.com
Indiana American Water	IN	MC-160	1	OSEC	Brandon France	765-743-7973	Brandon.France@amwater.com
Baxter, City of	MN	MC-800	1	Miox	Kevin Cassidy	218-454-5116	kevin.cassidy@ci.baxter.mn.us
Burnsville, City of	MN	MC-600	2	Chlorine Gas	Linda Mullen	952-895-4552	linda.mullen@ci.burnsville.mn.us
Fairmont, City of	MN	MC-400	1	New Plant	Doug Rainforth	507-236-5840	drainforth@fairmont.org
Springfield, City Utilities of	MO	MC-1500	3	Chlorine Gas	Craig Kern	417-831-8668	Craig.Kern@cityutilities.net
Trenton, City of	MO	MC-400	1	New Plant	Steve Reid	660-359-3211	sreid@trentonmo.com
Spartanburg Water Systems	SC	MC-1000	2	New Plant	Jim Tester	864-598-7257	jttester@spartanburgwater.org
Portland, City of	TN	MC-300	1	Miox	Tim Suddarth	615-325-3915	portwtp@cityofportlandtn.gov
Midlothian, City of	TX	MC-1200	1	New Plant	Tim Walker	972-775-6663	tim.walker@midlothian.tx.us
Upper Trinity River Authority	TX	MC-2000	3	Pepcon	Tim Brazile	940-453-5579	Not available
Salt Lake City Public Utilities	UT	MC-600	2	12% Hypochlorite	Bill Myer	720-238-3963	Not available
Washington County Conservancy District	UT	MC-600	2	12% Hypochlorite	Brie Thompson	435-673-3617	briethompson@wcwcd.utah.gov
Clark Public Utilities	WA	MC-300	1	Clortec	Steve Prather	503-285-9141	dcharlson@clarkpud.com
Cheyenne, City of	WY	MC-100	1	Tablet Feeder	Lynn Gaer	307-632-9893	lgaer@cheyennebopu.org

SECTION 4

CASE STUDIES

Microclor® On-Site Hypochlorite Generation System

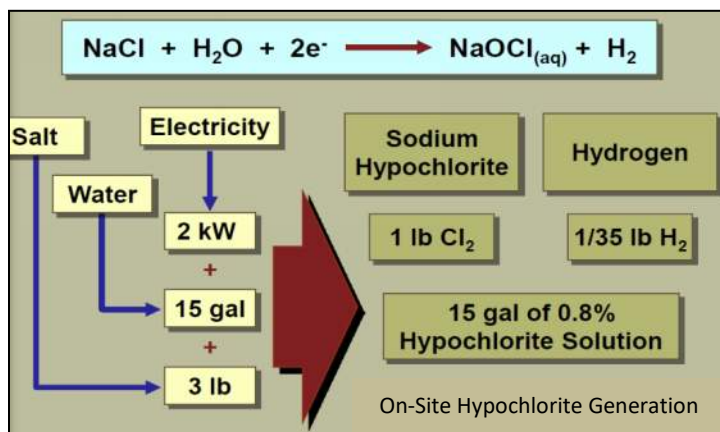


The City of Santa Ana, California Achieves Greater Resiliency, System Safety and Improved Economics by Generating Water Disinfectant On-Site



The City of Santa Ana Public Works Department is responsible for providing drinking water to the eleventh largest city in California with over 325,000 residents. Like many water providers in southern California, the City has a variety of water sources including wholesale water from Metropolitan Water District, their own network of groundwater wells and even recycled water. With an average potable water demand of about 43 million-gallons-per-day across over 45,000 service connections and about 480 miles of distribution lines, the City remains vigilant to improve system efficiency, resiliency and safety for the operations staff that manage the complex system.

Since the late 1990's the City had adopted on-site hypochlorite generation (OSHG) to produce water disinfectant (sodium hypochlorite) at the City's 14 well sites. As an early adopter of the first-generation technology, the City benefited from OSHG which uses electricity and table salt to produce a non-hazardous concentration (<0.8%) of sodium hypochlorite (bleach) for the purposes of disinfecting the well water. OSHG is much safer than other alternatives such as chlorine gas or highly concentrated sodium hypochlorite that would have to be transported through city streets and neighborhoods.



As the first-generation systems from the 1990's came to the end of their useful life, the City staff began to evaluate designs for the replacement OSHG systems. Importantly, the Public Works staff were experienced operators and were able to carefully examine the alternatives to the earlier designs they had in place as well as slightly upgraded systems in their fleet already. The latest generation Microclor® OSHG designs from PSI Water Technologies utilized a new vertical electrolyzer cell

configuration (versus the older horizontal cell design) that promised easier cleaning, observation and better hydrogen by-product evacuation. Once the City observed the new Microclor® OSHG in operation, they found that the clear vertical cells not only met the City's performance requirements but were indeed easier to inspect and facilitate planning for the periodic maintenance (primarily cleaning of calcium scale that decreases product yield over time) on the systems.

www.4psi.net

The City decided to purchase all 14 replacement wellfield OSHG systems during 2016 with control panels that provided connectivity and control with the City's SCADA system. The systems were a combination of 40, 60 and 100 pound-per-day systems which were all installed by PSI Water Technologies.



City of Santa Ana Walnut Well OSHG Installation

“The Microclor® OSHG systems are a safer, cost-effective and easier to maintain alternative to our previous OSHG systems. OSHG continues to be an excellent technology for our multiple and dispersed well-sites.”

Juan Ramirez, Water Services Production Supervisor, City of Santa Ana, California

SECTION 5

BROCHURES

Microclor® On-Site Hypochlorite Generation System





PSI Water Technologies
A UGSI SOLUTIONS COMPANY

MAKING BLEACH MADE EASY

MICROCLOR[®]

On-Site Sodium Hypochlorite Generation

Making Bleach Makes Sense

Microclor® OSHG On-Site Hypochlorite Generation (OSHG) is the safe, sound, clean & green disinfection option.



Microclor® MC-40, 40 Pounds Per Day

As concerns mount and regulations change regarding the safety and security of using chlorine gas for water disinfection, many utilities are choosing sodium hypochlorite (bleach) as a safer disinfection alternative. Once the decision to convert to a safer alternative has been made the question remains whether to purchase or produce sodium hypochlorite. Microclor® OSHG is the right choice to meet your disinfection requirements. The items listed below are the most significant of the many benefits realized by upgrading to Microclor® OSHG. We encourage you to contact the many utilities currently using Microclor® OSHG for further evidence supporting the decision to purchase a Microclor® OSHG.

Safety

Microclor's® OSHG dilute (0.8%) hypochlorite solution is below most hazardous material concentration thresholds of 1%. This reduces operator HazMat exposure and eliminates the need for diluting commercial hypochlorite to compensate for degradation which results in inconsistent solution strength.

Fewer Deliveries

The only raw materials required for the OSHG process are salt and water. This will reduce vendor deliveries by about 66% compared to commercial bulk hypochlorite. Less truck traffic through the community and at the facility will reduce the potential for accidents and eliminate the associated carbon footprint. This furthers efforts towards Green Facility Management and improves the water security profile.

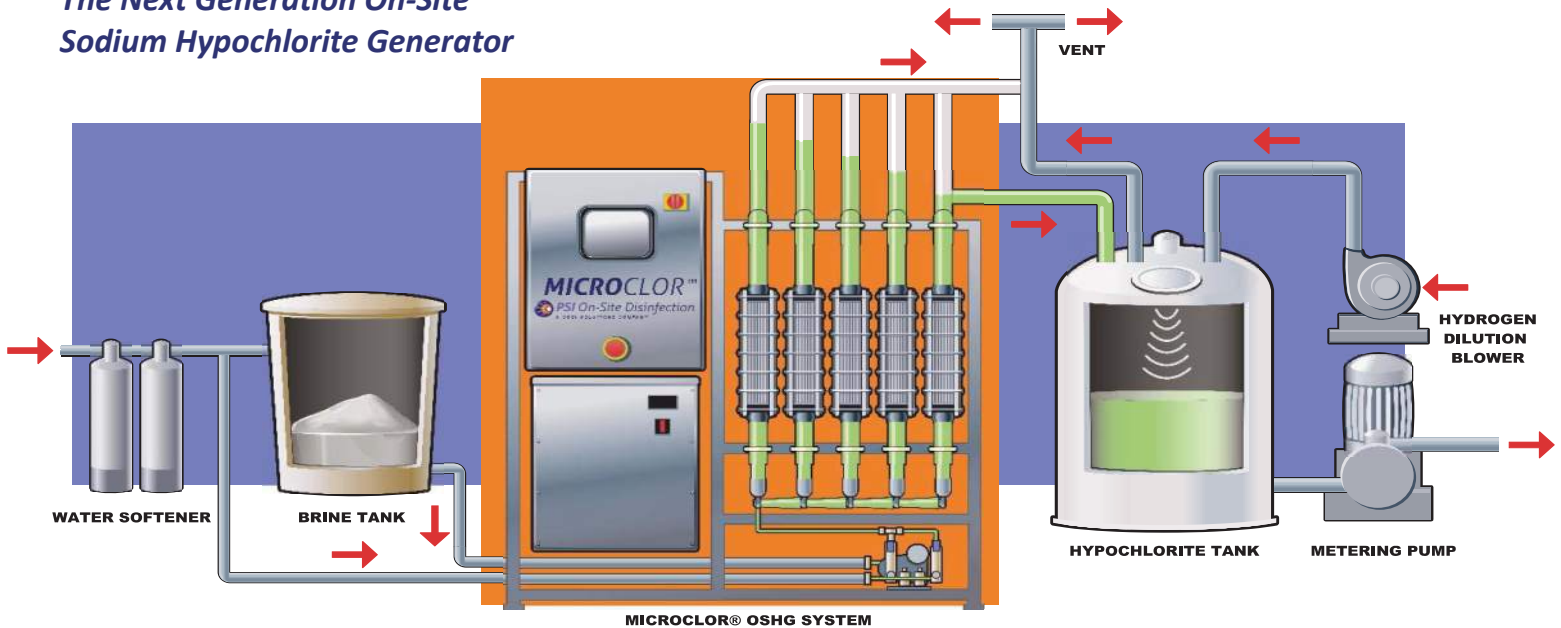
Continuity of Operations

Microclor® OSHG will enable storage of larger quantities of raw materials (salt) necessary for your disinfection process. This will result in a more sustainable and robust treatment facility better able to withstand the demands imposed by a natural disaster or health emergency.

Reduced Operational Costs

Since all chlorine compounds are derived from salt, electrolytic conversion on-site will result in significant savings to the owner. Typically, it costs 50-70% less to produce sodium hypochlorite as compared to buying it.

The Next Generation On-Site Sodium Hypochlorite Generator



Microclor[®] OSHG is modular in design and utilizes standard components which are easily customized to meet a wide range of requirements.

A typical Microclor[®] OSHG system includes:

- Stainless Steel Skid Assembly
- Water Softener
- Brine Tank
- Brine Pump
- Electrolytic Cells
- Skid-mounted PLC Control Panel
- D.C. Rectifier
- Hypochlorite Storage Tank
- Hypochlorite Metering Pump
- Hydrogen Dilution Blower

Capacities: 20-2400 pounds per day chlorine equivalent

Control: Automatic, regulated by storage tank level

Percentage Sodium Hypochlorite: 0.8% +/- 0.05%*

Consumables per Pound of Chlorine Produced: ~ 2.5-3.5 lbs salt, 1.8-2.4 kWh(AC), 14.0-17.0 gallons water

Water Input: Potable water, 50-80 PSI, 55°F-78°F (13°C-25°C)

Salt: 99.7% pure dry weight Morton White Crystal or equivalent

Power: 208V/240V, 1 Ph: 20-60 ppd; 208V, 3 Ph: 40-80 ppd; 480V, 3 Ph: 20-2400 ppd

Control Cabinet: 304 stainless steel NEMA 4X

Operator Interface: 6" color touchscreen

Programmable Logic Controller: Allen Bradley[®] MicroLogix[™] 1400

* Actual performance may differ in systems with less than five cells with operating conditions outside the norm

Microclor[®] OSHG Product Parameters

	Capacity				Total Flow		Brine Flow		Water Flow		Incoming Power Ratings (FLA)					
	PPD	KgPD	FORMAT	CELL	GPM	LPM	GPM	LPM	GPM	LPM	208V/1Φ	240V/1Φ	208V/3Φ	380V/3Φ	480V/3Φ	600V/3Φ
MC-20	20	9	1X20	2X12	0.2	0.8	0.02	0.1	0.18	0.7	13	11	7	4	3	2
MC-40	40	18	2X20	2X12	0.4	1.5	0.04	0.2	0.36	1.4	26	22	14	8	6	5
MC-60	60	27	3X20	2X12	0.6	2.3	0.06	0.2	0.54	2.0	39	33	21	12	9	7
MC-80	80	36	4X20	2X12	0.8	3.0	0.08	0.3	0.72	2.7			28	15	12	10
MC-100	100	45	5X20	2X12	1	3.8	0.10	0.4	0.90	3.4				19	15	12
MC-160	160	73	4X40	4X12	1.6	6.1	0.16	0.6	1.44	5.5				31	24	19
MC-200	200	91	5X40	4X12	2	7.6	0.20	0.8	1.80	6.8				38	30	24
MC-300	300	136	5X60	6X12	3	11.4	0.30	1.1	2.70	10.2				58	46	37
MC-400	400	182	5X80	8X12	4	15.1	0.40	1.5	3.60	13.6				77	61	49
MC-500	500	227	5X100	10X12	5	18.9	0.50	1.9	4.50	17.0				96	76	61
MC-600	600	273	5X120	12X12	6	22.7	0.60	2.3	5.40	20.4				115	91	73
MC-800	800	364	5X160	12X16	8	30.3	0.80	3.0	7.20	27.3				154	122	97
MC-1000	1000	455	5X200	12X20	10	37.9	1.00	3.8	9.00	34.1				192	152	122
MC-1200	1200	545	5X240	12X24	12	45.4	1.20	4.5	10.80	40.9				231	183	146
MC-1600	1600	727	10X160	12X16	16	60.6	1.60	6.1	14.40	54.5				307	243	195
MC-2000	2000	909	10X200	12X20	20	75.7	2.00	7.6	18.00	68.1				384	304	243
MC-2400	2400	1091	10X240	12X24	24	90.8	2.40	9.1	21.60	81.8				461	365	292

Making Bleach Made Easy

The safety and cost effectiveness of On-Site Hypochlorite Generation makes it the best option for disinfecting water.

Since 1988 On-Site Hypochlorite Generation has been recognized as an effective method for disinfection of water. Process Solutions, Inc. has dramatically improved the technology into the robust and reliable design of the patented (www.psipatents.com) Microclor® OSHG system.

The patented Microclor® OSHG design is the result of over twenty-five years of experience in the manufacturing, installation and servicing of hypochlorite generation equipment. Advancements in system safety and ease of operation make Microclor® OSHG the overwhelming choice for water treatment professionals.

The combined benefits of the following unique features make Microclor® OSHG the most resilient and durable system available today:

- Vertical Cell Arrangement
- Multiple Cell Configuration
- Direct Hydrogen Management
- Continuous Process Control
- Full-Wave DC Power
- Compact Cell Design
- High-Velocity Electrolyte Circulation

VERTICAL/MULTI CELL CONFIGURATION

The Microclor® OSHG vertical cell arrangement is the most significant of the many features that distinguish it from the earlier generations of equipment.

DIRECT HYDROGEN MANAGEMENT

The electrolytic cells are configured in a vertical array and vented directly to atmosphere. This prevents the chance of overpressurization by releasing all hydrogen directly from each cell. Other systems use the storage tanks as hydrogen separators which can contribute to excessive cell pressure and vibration in the discharge piping.

CONTINUOUS PROCESS CONTROL

Microclor's® OSHG integral brine pump is controlled by the PLC to optimize salt conversion efficiency and hypochlorite production. Automating precise brine control reduces operator intervention and improves system effectiveness.

FULL-WAVE DC POWER

Automated brine control allows full-wave rectification which greatly reduces excess heat and the number of components necessary in the rectifier. This reduces facility HVAC loads and improves system reliability.

COMPACT CELL DESIGN

The cell's vertical orientation not only allows better hydrogen separation but is also more compact, resulting in a more space-efficient footprint. The clear acrylic cell body supports the electrode array and eliminates the need for internal baffles and fasteners, reducing maintenance and repair costs over the life of the system.

HIGH-VELOCITY ELECTROLYTE CIRCULATION

The hydraulic lift created by the hydrogen separation circulates electrolyte through the cell loop at 3 fps. This reduces the requirement for cell cleaning and minimizes heat accumulation in the cell.



Microclor® MC-1000, 1,000 Pounds Per Day

Making Bleach Made Easy

“ The simplicity of the Microclor® OSHG system never ceases to impress me. Based on my prior experience with on-site hypochlorite generation, I never knew a system could be so easy to operate and maintain. Love it. ”

*Leo Williams, Mountain Regional Water SSD
Operations Superintendent*



Advantages:

- Safest OSHG Design
- Low-Cost, Stable Hypochlorite
- Vertical Cell Design
- Multi-Cell Configuration
- Immediate/Continuous Hydrogen Removal
- No Hydrogen Containment
- Small Footprint
- Low-Maintenance
- 24-Hour Service

Service and Support

Process Solutions provides world class service and technical support for its line of Microclor® OSHG products. Spare parts, peripheral components, troubleshooting advice and field service are all elements of a robust customer orientation that Process Solutions possesses to ensure that our customers are “making water”.



LEARN MORE ABOUT Microclor® OSHG
www.4psi.net



Microclor® LC-40S, 40 Pounds Per Day



Process Solutions, Inc.
1077 Dell Avenue, Suite A | Campbell, CA 95008
Toll Free: (888) 774-4536 (PSI HELP)
Tel: (408) 370-6540 | Fax: (408) 866-4660
Email: mail@4psi.net | www.4psi.net
Rev. 2 07/2017



APPENDIX C7: CP CROWLEY CHEMICAL PUMPS AND HORIZONTAL END SUCTION PUMPS

From: alex.quach@cpcrowley.com
To: [Nguyen, Hoai \(Kati\)](#)
Subject: RE: CDM Smith - Pulsafeeder Pumps
Date: Thursday, June 22, 2023 2:57:14 PM
Attachments: [image006.png](#)
[image009.png](#)
[image010.png](#)
[image011.png](#)
[image012.png](#)
[image013.png](#)
[image015.png](#)
[AQ23-06-22 01.pdf](#)

Hi Kati,

Horizontal end suction centrifugal pumps with VFD

- 620 gpm at 280 TDH (2 pumps total) - Goulds 3196 3x4-10, Budget Price \$36k each pump + \$9.5k each VFD
- 150 gpm at 280 TDH (2 pumps total) – Goulds 3196 1.5x3-10, Budget Price \$25k each pump + \$5.5k each VFD
- 730 gpm with 81 TDH (2 duty, 1 standby) – Goulds 3196 4x6-10H, Budget Price \$34k each pump + \$5.5k each VFD

Please see attached for the horizontal end suction pump and PumpSmart VFD selections.

In regards to the chemical pumps, I'd still budget \$25k for each chemical feed skid as a safe number, except \$28k for the 3-gph orthophosphate skid:

Chemical pumps

Bisulfite

- 170 gal tank – Double Wall Poly Tank, Budget \$1,500
- Two 1.5-gph pumps (1 duty, 1 standby) - Pulsatron Pump, Model LPH4MA-VTC1-XXX

Orthophosphate

- 150 gal tank – Double Wall Poly Tank, Budget \$1,500
- Two 1.5-gph pumps (1 duty, 1 standby) - Pulsatron Pump, Model LPH4MA-VTC1-XXX

Orthophosphate

- 400 gal tank – Double Wall Poly Tank, Budget \$2,000
- Two 3-gph pumps (1 duty, 1 standby) - Pulsatron Pump, Model LPH5MA-VTC3-XXX

If you have any questions, please don't hesitate to reach out.

Thank You,

Alex Quach

Operations Manager



CHARLES P. CROWLEY COMPANY

15861 Business Center Drive, Irwindale, CA USA 91706

Phone: (626) 856-5656 x130, Direct: (626) 214-3724, Fax: (626) 856-5658, Mobile: (626) 827-0070

From: alex.quach@cpcrowley.com
To: [Nguyen, Hoai \(Kati\)](#)
Subject: RE: CDM Smith - Pulsafeeder Pumps
Date: Friday, June 30, 2023 11:28:42 AM
Attachments: [image001.png](#)
[image002.png](#)
[image003.png](#)
[image004.png](#)
[image005.png](#)
[image006.png](#)
[image008.png](#)
[AQ23-06-22 01 \(2\).pdf](#)

Hi Kati,

See attached for selections.

Horizontal End Suction Pumps with VFDs

- 730 gpm at 130' TDH - Goulds 3196 4x6-13, Budget Price \$34k each pump + \$7.5k each VFD
- 350 gpm at 290' TDH - Goulds 3196 2x3-10, Budget Price \$30k each pump + \$9k each VFD

For a 220gal double wall tank, you can use \$3,500 as a budget price.

Thank You,

Alex Quach
Operations Manager



CHARLES P. CROWLEY COMPANY

15861 Business Center Drive, Irwindale, CA USA 91706

Phone: (626) 856-5656 x130, Direct: (626) 214-3724, Fax: (626) 856-5658, Mobile: (626) 827-0070

email: alex.quach@cpcrowley.com, website: www.cpcrowley.com

From: alex.quach@cpcrowley.com <alex.quach@cpcrowley.com>

Sent: Friday, June 30, 2023 10:46 AM

To: 'Nguyen, Hoai (Kati)' <nguyenh@cdmsmith.com>

Subject: RE: CDM Smith - Pulsafeeder Pumps

Hi Kati,

I will have it for you shortly.

Thank You,

Alex Quach
Operations Manager



CHARLES P CROWLEY CO INC

Date: June 30, 2023

CHARLES P CROWLEY CO INC
15861 BUSINESS CENTER DR.
IRWINDALE, CALIFORNIA 91706

Attention: Kati Nguyen

Subject: Inquiry No:
Proposal No: AQ23-06-22 01

Alex Quach
Charles P. Crowley
15861 Business Center
Drive
Irwindale, CA 91706
Office: 626-856-5656 x
130
Fax: 626-856-5658
Email:
alex.quach@cpcrowley.co
m

Dear, We thank you very much for the above mentioned inquiry. Our proposal is attached for your review and consideration. All technical details with data sheets, pump performance curves, drawings, and brochures can be found in the attached package. Terms & Conditions: Standard ITT/Goulds Pumps: apply. Our delivery schedule and location for each item is noted on the individual datasheets. All prices are Our offer is valid for 15 business days from the date of our quotation. We trust the above is per your requirements. Should you have any questions, please do not hesitate to contact us. Sincerely, ITT/Goulds Pumps



CHARLES P CROWLEY CO INC

Alex Quach
 Charles P. Crowley
 15861 Business Center
 Drive
 June 30, 2023
 Irwindale, CA 91706
 Office: 626-856-5656 x
 130
 Fax: 626-856-5658
 Email:
 alex.quach@cpcrowley.co
 m

PROFORMA INVOICE

Customer: CHARLES P CROWLEY CO INC
 Proposal No: AQ23-06-22 01

Main Offer

ITEM NO	QTY	MODEL	SIZE	CONSTRUCTION	DRIVER RATING/FRAME	RPM	UNIT TOTAL	GRAND TOTAL
ITEM 006	1	3196	4x6-13 MTi	Ductile iron with 316SS impeller	50.0 hp/326T	1800	34,048	34,048
ITEM 007	1	3196	2x3-10 MTi	Ductile iron with 316SS impeller	60.0 hp/326TS	3600	30,159	30,159
TOTAL 2 units (Main offer) in USD-United States Dollars								64,207

CHARLES P CROWLEY CO INC

Proposal No: AQ23-06-22 01
Item No: ITEM 006 (Base Offer)
Attn: Kati Nguyen

Alex Quach
Charles P. Crowley
15861 Business Center
Drive
Irwindale, CA 91706
Office: 626-856-5656 x
130
Fax: 626-856-5658
Email:
alex.quach@cpcrowley.co
m

June 30, 2023

MODEL: 3196 MTi SIZE: 4x6-13/6V QTY: 1

Operating Conditions

SERVICE

LIQUID Water , Rated Temp. 70.0 deg F, SP.GR 1.000, Viscosity
1.000 cp, Rated/Max. suction pressure 0.0 / 0.0 psi g
CAPACITY Rated 730.0 gpm
HEAD 130.0 (ft)
AMBIENT TEMP Min//Max Temp. 5.0/104.0 deg F

i-FRAME™



Performance at 1780 RPM per HI 14.6 1B basis power

PUBLISHED EFFY 74.5% (CDS)
RATED EFFY 74.0% with contract seal
RATED POWER 32.5 hp (incl. Mech. seal drag 0.22). (Run out 40.6 hp)
NPSHR 7.7 ft
DISCH PRESSURE (R) 56.8 psi g (61.5 psi g @ Shut off) based on 0.0 psi g rated
suction pressure
PERF. CURVE 1786-8 (Rotation CW viewed from coupling end)
SHUT OFF HEAD 142.1 ft
MIN. FLOW Continuous Stable: 321.5 gpm Hydraulic: 321.5 gpm
Thermal: N/A

Materials

CONSTRUCTION Ductile iron with 316SS impeller
CASING Ductile iron (max.casing pressure @ rated temperature 250.0 psi g)
ST.BOX COVER Ductile iron
IMPELLER 316SS - Open (11.3750 in rated, max=13.0000 in, min=9.0000 in)
CASING GASKETS Aramid Fiber with EPDM and Silicate Filler
IMPELLER O-RING Teflon
SHAFT MATERIAL SAE 4140
SHAFT SLEEVE 316SS
LUBRICATION Flood oil
SEAL CHAMBER Taper bore plus with axial ribs
GLAND 316SS Flush vent and drain with carbon restricting bushing
BEARINGS 6309 (Inboard) / 3309 (Outboard)
COUPLING Rexnord - Omega Rex Elastomer- ES-20 (standard orange element)-S.F. 1.00
COUPLING GUARD Carbon steel
BASEPLATE Cast iron camber top D00058A

Sealing Method

MECHANICAL SEAL Goulds SealPlus SP1CS (Carbon vs Silicon Carbide) - (Cartridge - Single)

Flanges

150# flat face

Frame Connections

Bearing frame drain
 Frame cooler access
 Oil fill connection

Frame Features

Ductile iron frame adapter
 Inpro VBXX-D Hybrid Bearing Isolators
 Iron bearing frame
 Premium Severe Duty Thrust Bearings

Assembly and Testing

Casing & Cover - Standard hydro test
 Impeller balanced to ISO G6.3

Painting

Goulds Blue standard painting

Warranty

5 Year Extended Warranty (All the components, manufactured by ITT Goulds pumps, in the liquid end and power end are covered).

Noise Level Data

Maximum predicted sound pressures level pump only in Decibels (db) Re 0.0002 microbars measured 3ft horizontally and 5ft from the floor per QCP 580

Noise Level	31.5	63	125	250	500	1k	2k	4k	8k	A
Pump	70.0	73.0	75.0	77.0	76.0	75.0	75.0	74.0	74.0	82.0

Driver : Electric motor Manufacturer : Pump Mfg's Choice

FURNISHED BY	Pump Mfg	MOUNTED BY	Pump Mfg
RATING	50.0 hp (37.3 KW)	ENCLOSURE	TEFC - Premium Efficiency
PHASE/FREQ/VOLTS	3/60 Hz/460	SPEED	1800 RPM
INSULATION/SF	F/1.15	FRAME	326T

Driver Features

Suitable for Variable frequency drive (VFD)

Weights and Measurements

TOTAL NET UNIT WEIGHT / VOLUME	1,228.0 lb / 18.1 ft³
TOTAL GROSS UNIT WEIGHT / GROSS VOLUME	1,449.0 lb / 44.1 ft³

Program Version 1.76.0.0

Drawing Revision Limit

Drawings returned with status approved as noted or revise and re-submit will be corrected and resubmitted only once. Thereafter, additional comments or revisions to these drawings will incur a charge of \$250 per drawing.

This proposal reflects the intended scope from the customer specifications supplied at the time of quotation. Additional specifications, requirements and scope presented at time of award or during order execution outside the original bid scope request, is subject to a change order with a potential cost and lead-time impact. ITT reserves the right to present engineering charges for more than two revision cycles on submittal drawings, provided these two revision cycles cover the intent of the specifications. ITT requires customer to provide all drawing comments applicable to the specification within the first submission return.

Our offer does not include specific review and incorporation of any Statutory or Regulatory Requirements and the offer is limited to the requirements of the design specifications. Should any Statutory or Regulatory requirements need to be reviewed and incorporated then the Customer is responsible to identify those and provide copies for review and revision of our offer.

Our quotation is offered in accordance with our comments and exceptions identified in our proposal. The pricing quoted herein will remain valid for 15 business days from the time of quotation. In the event that this validity should expire, please contact your ITT sales representative to confirm pricing validity prior to order placement.

ITT Inc. ('ITT') submits this proposal as the coronavirus (COVID-19) pandemic ('COVID-19') is impacting organizations and its supply chains around the world. ITT is carefully monitoring our supply chain and production facilities as it relates to this proposal but, given the fluid nature of this pandemic, shall not be liable for impacts arising from COVID-19 and accordingly shall be entitled to any adjustments as it relates to time or cost impacts which directly or indirectly resulting out of or arise in connection with COVID-19. Notwithstanding anything contained in this proposal to the contrary, ITT Inc. further reserves the right to modify or amend any statement made within this proposal due to any impacts arising from COVID-19.

[Click here](#) to download the pump Bulletin

[Click here](#) to learn more about the new *i-FRAME™*

CHARLES P CROWLEY CO INC

Proposal No: AQ23-06-22 01
Item No: ITEM 007 (Base Offer)

Attn: Kati Nguyen

Alex Quach
Charles P. Crowley
15861 Business Center
Drive
Irwindale, CA 91706
Office: 626-856-5656 x
130
Fax: 626-856-5658
Email:
alex.quach@cpcrowley.co
m

June 30, 2023

MODEL: 3196 MTi SIZE: 2x3-10/5V QTY: 1

Operating Conditions

SERVICE

LIQUID Water , Rated Temp. 70.0 deg F, SP.GR 1.000, Viscosity 1.000 cp, Rated/Max. suction pressure 0.0 / 0.0 psi g
CAPACITY Rated 350.0 gpm
HEAD 290.0 (ft)
AMBIENT TEMP Min//Max Temp. 5.0/104.0 deg F

i-FRAME™



Performance at 3560 RPM per HI 14.6 1B basis power

PUBLISHED EFFY 64.5% (CDS)
RATED EFFY 63.5% with contract seal
RATED POWER 40.4 hp (incl. Mech. seal drag 0.44). (Run out 52.2 hp)
NPSHR 14.3 ft
DISCH PRESSURE (R) 126.3 psi g (147.5 psi g @ Shut off) based on 0.0 psi g rated suction pressure
PERF. CURVE 5024-3 (Rotation CW viewed from coupling end)
SHUT OFF HEAD 340.7 ft
MIN. FLOW Continuous Stable: 101.5 gpm Hydraulic: 101.5 gpm Thermal: N/A

Materials

CONSTRUCTION Ductile iron with 316SS impeller
CASING Ductile iron (max.casing pressure @ rated temperature 250.0 psi g)
ST.BOX COVER Ductile iron
IMPELLER 316SS - Open (8.6875 in rated, max=10.0000 in, min=6.0000 in)
CASING GASKETS Aramid Fiber with EPDM and Silicate Filler
IMPELLER O-RING Teflon
SHAFT MATERIAL SAE 4140
SHAFT SLEEVE 316SS
LUBRICATION Flood oil
SEAL CHAMBER Taper bore plus with axial ribs
GLAND 316SS Flush vent and drain with carbon restricting bushing
BEARINGS 6309 (Inboard) / 3309 (Outboard)
COUPLING Rexnord - Omega Rex Elastomer- ES-10 (standard orange element)-S.F. 1.00
COUPLING GUARD Carbon steel
BASEPLATE Cast iron camber top B00051A

Sealing Method

MECHANICAL SEAL Goulds SealPlus SP1CS (Carbon vs Silicon Carbide) - (Cartridge - Single)

Flanges

150# flat face

Frame Connections

Bearing frame drain
 Frame cooler access
 Oil fill connection

Frame Features

Ductile iron frame adapter
 Inpro VBXX-D Hybrid Bearing Isolators
 Iron bearing frame
 Premium Severe Duty Thrust Bearings

Assembly and Testing

Casing & Cover - Standard hydro test
 Impeller balanced to ISO G6.3

Painting

Goulds Blue standard painting

Warranty

5 Year Extended Warranty (All the components, manufactured by ITT Goulds pumps, in the liquid end and power end are covered).

Noise Level Data

Maximum predicted sound pressures level pump only in Decibels (db) Re 0.0002 microbars measured 3ft horizontally and 5ft from the floor per QCP 580

Noise Level	31.5	63	125	250	500	1k	2k	4k	8k	A
Pump	77.0	80.0	81.0	79.0	73.5	78.0	76.0	73.0	74.0	82.0

Driver : Electric motor Manufacturer : Pump Mfg's Choice

FURNISHED BY	Pump Mfg	MOUNTED BY	Pump Mfg
RATING	60.0 hp (44.7 KW)	ENCLOSURE	TEFC - Premium Efficiency
PHASE/FREQ/VOLTS	3/60 Hz/460	SPEED	3600 RPM
INSULATION/SF	F/1.15	FRAME	326TS

Driver Features

Suitable for Variable frequency drive (VFD)

Weights and Measurements

TOTAL NET UNIT WEIGHT / VOLUME	1,026.0 lb / 13.9 ft³
TOTAL GROSS UNIT WEIGHT / GROSS VOLUME	1,209.0 lb / 36.5 ft³

Program Version 1.76.0.0

Drawing Revision Limit

Drawings returned with status approved as noted or revise and re-submit will be corrected and resubmitted only once. Thereafter, additional comments or revisions to these drawings will incur a charge of \$250 per drawing.

This proposal reflects the intended scope from the customer specifications supplied at the time of quotation. Additional specifications, requirements and scope presented at time of award or during order execution outside the original bid scope request, is subject to a change order with a potential cost and lead-time impact. ITT reserves the right to present engineering charges for more than two revision cycles on submittal drawings, provided these two revision cycles cover the intent of the specifications. ITT requires customer to provide all drawing comments applicable to the specification within the first submission return.

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[Click here](#) to download the pump Bulletin

[Click here](#) to learn more about the new *i-FRAME™*



PumpSmart® PS220

Intelligent Control and Protection



Customer: CHARLES P CROWLEY CO INC
Project: Beltz Treatment Plant
Date: June 30, 2023
Quote No: AQ23-06-22 01
Revision: 0
Prepared By: Alex Quach
Phone No.: 626-856-5656
Email: alex.quach@cpcrowley.com



ITT



PumpSmart®

ITT Goulds Pumps, Inc.

240 Fall Street
Seneca Falls
NY 13148
USA

PUMPSMART® PS220 Variable Speed Drive

PRICING SUMMARY

Item Number	Qty	Base Unit Description	Catalog Number	Unit Price (USD)	Item Total (USD)
ITEM 006	1	PS220 (Low Voltage) – Advanced PumpSmart Functions, NEMA 1 / IP21, 50.0 hp, 65 Amps, 440 VAC - 500 VAC	K03552A10	7,369	7,369
ITEM 007	1	PS220 (Low Voltage) – Advanced PumpSmart Functions, NEMA 1 / IP21, 60.0 hp, 77 Amps, 440 VAC - 500 VAC	K03552A11	8,622	8,622
	2				15,991

Pricing does not include Export or shipping related costs.

ITT is proud to offer this innovative program that protects against pump failure that commonly results from inadvertent dry-running or operation against a closed discharge valve. If your Goulds pump fails while a PumpSmart Control product is on the job; we will provide the pump and seal repair parts free-of-charge, up to 3 years for a new Goulds pump or 18 months for an existing installed Goulds pump. See your Goulds Pumps representative to see what pumps are currently covered under this program.

*3-Year Reliability Challenge terms and conditions apply.



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- 1.4 CLARIFICATIONS AND EXCEPTIONS TO SPECIFICATIONS**
- 1.5 SCOPE OF SUPPLY**
 - 1.5.1 Specification Table
- 1.6 PS220 SPECIFICATIONS**
 - 1.6.1 Input Connection
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 - 1.11.3 Terms of Sale
- 1.12 SERVICE RATES**

TERMS & CONDITIONS OF SALE

1.1 DESCRIPTION

ITT Monitoring and Control is pleased to present the ITT PumpSmart PS220 variable speed drive. The PS220 is the powerful combination of a standard variable speed drive and over 150 years of pump hydraulic design and pump process knowledge. By leveraging commonly available information through the variable speed drive such as speed, power and torque PumpSmart provides key pump performance indicators which maximizes control and reduces energy consumption over a standard variable speed drive. Key Features included with PumpSmart are:

SmartFlow*

Using speed and torque data from the motor and by modeling the pump performance curve PumpSmart is able to calculate the flow of the pump without any external instrumentation. SmartFlow requires no sensors for pump specific speeds of 3000 or less, and only a differential pressure transmitter for specific speeds above 3000.

Pump Protection – Because PumpSmart knows where the pump is operating on the pump performance curve at any speed, PumpSmart can alert an operator or fault the pump in the event of a process upset condition such as dry-run, dead-head, minimum-flow or run-out.

Multi-Pump Operation

A properly controlled variable speed multi-pump system is one of the most efficient and flexible means to meet highly variable systems. However coordinating the control of the system is highly variable and considerations such as optimally staging and de-staging pumps, balancing flow between pumps, distributing pump wear, and providing fault back-up detection must be factored into the control scheme. PumpSmart takes all these factors into account and provides the most efficient multi-pump control logic, all without and external PLC. Up to six pumps may be connected in a single Multipump arrangement. Staging and de-staging may be user defined or may be left to the PS220 to stage based on best efficiency.

Cavitation Protection

By monitoring a suction pressure transmitter PumpSmart provides an active condition monitoring function to protect the pump from the onset of cavitation. This unique feature is not just a general alarm. PumpSmart will intelligently reduce the speed on the pump which in turns reduces the NPSH requirements of the pump. This allows the pump to operate within the acceptable suction pressure conditions and still produce the maximum flow the pump system will allow. Once suction pressure conditions are restored to safe levels the pump will resume normal operating conditions.

Platform

The PS220 drive series is a microprocessor based Direct Torque Controlled (DTC) adjustable speed AC drive based on the ABB ACS880 drive platform. The PS220 drive takes advantage of sophisticated microprocessor control and advanced IGBT power switching technology to deliver high-performance control of AC motors for a wide range of applications.

*SmartFlow requires the pump's specific speed to be under 3000 and viscosity must not be dynamically changing.

[Click here to download the pumpsmart Bulletin](#)

1.2 APPLICABLE SPECIFICATIONS

Any specifications not explicitly included as part of this proposal are excluded from this offering.

The following specifications apply:

No applicable Low Voltage Variable Speed/Frequency Drive specifications were provided.

1.3 SPECIFIC TECHNICAL COMMENTS/EXCEPTIONS

Drive Features

- Wall mounting
- UL Type 1/IP21 protection class
- Compact design
- 3% Harmonic filtering AC choke inside
- Input rectifier protection
- Bottom entry and exit for cables
- Conformal coated PC boards
- Simple to use Wizard programming
- Safe Torque Off

1.4 CLARIFICATIONS AND EXCEPTIONS TO SPECIFICATIONS

General

We propose to supply the PumpSmart PS220 drive design on the ABB ACS880 platform with features indicated in this proposal.

This quotation is ITT's best interpretation of the information given us for the purpose of quotation. It is the responsibility of the customer to verify that this proposal meets the specifications for this project. No other equipment or material is expressed or implied.

ITT is acting as an equipment supplier only, not as a contractor, or sub-contractor. The listed specifications, (see Applicable Specifications) are applicable only to the extent of the ITT "Equipment Provider" scope of supply as described.

Specifically not included in this proposal is: Special crating, offloading at job-site, storage, installation and testing equipment, foundations, anchor bolts, templates, external wiring, field testing, independent analysis, seismic calculations and video taping of seminars. These items are the sole responsibility of the purchaser.

1.5 SCOPE OF SUPPLY

1.5.1 Specification Table

Drive Only

Item / Tag	Qty	Catalog Number	
ITEM 006	1	K03552A10	
Item Description			
Input Voltage:	440 VAC - 500 VAC		
Rated Output Current:	65		
Construction:	Wall Mount		
Enclosure:	NEMA 1 / IP21		
Nominal Horsepower:	50.0 hp		
Frame Size:	R5		
Input Disconnecting Means:	By Others		
Bypass:	No		
Input Impedance:	3%		
Communication Protocols:	None		
Other Options:			
Drive Input Fuse Ratings			
Amps (600 V)	Supplied By	Bussmann Type (or equal)	
65	No, by others	690V, 125A, Bussmann# 170M1568, Type DIN 43620: 000 / 600V, 90A, Bussmann# JJS-90, Type T	
Dimensions and Weights			
Height x Width x Depth (in / mm)	Weight lbs / kg	Dimension Drawing	
28.7"H x 8.0"W x 10.8"D / 730mm H x 203mm W x 274mm D	50.0 / 23.0	FS5_N1_IP21	
Heat Dissipation & Airflow Requirements			
Power Losses		Airflow	
Watts	BTU/Hr	CFM	CM/Hr
1117.0	3811.0	165.0	280.0

Note: Table details are not for construction and are subject to change.

1.5 SCOPE OF SUPPLY

1.5.1 Specification Table

Drive Only

Item / Tag	Qty	Catalog Number
ITEM 007	1	K03552A11

Item Description	
Input Voltage:	440 VAC - 500 VAC
Rated Output Current:	77
Construction:	Wall Mount
Enclosure:	NEMA 1 / IP21
Nominal Horsepower:	60.0 hp
Frame Size:	R5
Input Disconnecting Means:	By Others
Bypass:	No
Input Impedance:	3%
Communication Protocols:	None
Other Options:	

Drive Input Fuse Ratings		
Amps (600 V)	Supplied By	Bussmann Type (or equal)
77	No, by others	690V, 160A, Bussmann# 170M1569, Type DIN 43620: 000 / 600V, 110A, Bussmann# JJS-110, Type T

Dimensions and Weights		
Height x Width x Depth (in / mm)	Weight lbs / kg	Dimension Drawing
28.7"H x 8.0"W x 10.8"D / 730mm H x 203mm W x 274mm D	50.0 / 23.0	FS5_N1_IP21

Heat Dissipation & Airflow Requirements			
Power Losses		Airflow	
Watts	BTU/Hr	CFM	CM/Hr
1120.0	3822.0	165.0	280.0

Note: Table details are not for construction and are subject to change.

PUMPSMART® PS220 Variable Speed Drive

1.6 PS220 SPECIFICATIONS

1.6.1 Input Connection

Input Voltage	380/400/415/440/460/480/500Vac 3-phase +10%/-15%
Frequency	50/60 Hz ±5%
Line Limitations	Max +/-3% of nominal phase to phase input voltage
Fundamental Power Factor	0.98
Connection	U1, V1, W1
Nominal Impedance	Reactor with ~3% impedance - DC (R1 through R9 Frame)

1.6.2 Output (Motor) Connection

Output Voltage	0 to U1, 3-phase symmetrical, Umax at the field weakening Point
Output Frequency	0-500Hz
Frequency Resolution	0.01 Hz
Continuous Output Current	1.0 * I2Ld (light duty use), 1.0* I2hd (heavy-duty use)
Short Term Overload Capacity	I2Ldmax = 1.1 * I2Ld (1 min / 5 minutes @ 40°C), typical Ihdmax = 1.5 * I2hd (at least 1 min / 5 min @ 40°C)
Peak Overload Capacity	IMath.max (400 Vac and 500 Vac) (at least 10 seconds at start)
Field Weakening Point	8 to 500 Hz
Switching Frequency	2.7 kHz (average), DTC dynamically varies from 1 to 12kHz
Acceleration & Deceleration Time	Adjustable 0 to 1800 Sec
Efficiency	98% at nominal power level
Short circuit withstand rating	100,000 AIC (UL) R1-R9 when protected by fuses given in the hardware manual
Connection	U2, V2, W2

1.6.3 Enclosure

Style	NEMA 1 / IP21
-------	---------------

1.6.4 Agency Approval

Listing and Compliance	UL and CSA
------------------------	------------

1.6.5 Ambient Conditions, Operation

Air Temperature	0° to 40°C (104°F), above 40°C the maximum output. Current is de-rated 1% for every additional 1°C (up to 55°C) (131°F) maximum for -01 drives. Relative Humidity: 5 to 95%, no condensation allowed, maximum relative humidity is 60% in the presence of corrosive gasses
-----------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Contamination Levels

IEC	60721-3-1, 60721-3-2 and 60721-3-3
Chemical Gasses	Class 3C2
Solid Particles	Class 3S2
Installation Site Altitude	0 to 1000m (3281ft) above sea level. At sites over 1000m (3281ft) above sea level, the maximum power is de-rated 1% for every additional 100m (330ft). Maximum altitude 4000m (13123 ft) above sea level.
Vibration Max	1mm (0.04") 5 to 13.2 Hz, Max 7 m/s2 (23 ft/s2) 13.2 to 100 Hz Sinusoidal

1.6.6 Ambient Conditions, Storage, Transportation (in Protective Shipping Package)

Air Temperature	0° to 40°C (104°F), above 40°C the maximum output. Current is de-rated 1% for every additional 1°C (up to 55°C) (131°F) maximum for -01 drives
Relative Humidity	5 to 95%, no condensation allowed, maximum relative humidity is 60% in the presence of corrosive gasses

PUMPSMART® PS220 Variable Speed Drive

Atmospheric Pressure	5 to 95%, no condensation allowed, maximum relative humidity is 60% in the presence of corrosive gasses
Vibration Max	1mm (0.04") 5 to 13.2 Hz, Max 7 m/s ² (23 ft/s ²) 13.2 to 100 Hz
Shock (IEC 60068-2-29)	Max 100 m/s ² (330 ft/s ²) 11 ms
Free Fall	100mm (4 in.) for weight greater than 100Kg (220lbs)

Specifications are subject to change without notice. Please consult the factory when specifications are critical.

1.6.7 Auxiliary Power Supply (XD 24:2 and XD 24:4)

Voltage	24 Vdc, +/- 10%
Maximum Current	200 mA – minus load taken by DIO1 and DIO2
Protection	Short Circuit Protection

1.6.8 Control Terminal Blocks

Size	Size 0.5 ... 2.5 mm ² (24...12 AWG) - All control terminal blocks
Torque	Tightening torques: 0.5 N•m (5 lbf•in) for both stranded and solid wiring

1.6.9 Analog Inputs

Two (2) Programmable Differential Inputs

Two (2) Current or Voltage Signals	0 (4) to 20 mA, Input Resistance RI => 100 ohms or -10Vdc / 0(2) to +10Vdc, Input Resistance RI => 200 k-ohms
Common Mode Voltage	+/-15 Vdc, max.
Common Mode Rejection Ratio	> 60 dB at 50 Hz
Resolution	0.025% (12 bit) (11 bit + Sign bit)
Accuracy	+/-0.5% of Full Scale Range
Input Updating Time	1 ms (Primary Control Program)
Optional Isolation	Available through optional external module

1.6.10 Reference Power Supply

Voltage	+10Vdc, 0, -10Vdc +/- 0.5% at 25° C (77° F)
Maximum Load	10 mA
Applicable Potentiometer	1 k-ohm to 10 k-ohm

1.6.11 Analog Outputs

Two (2) Programmable Current Outputs

Signal Level	0 (4) to 20 mA
Resolution	0.025% (12 bit) (11bit +Sign Bit)
Accuracy	+/-1% Full Scale Range
Maximum Load Impedance	500 ohms
Output Updating Time	1 ms (Primary Control Program)
Frequency Range	0-300Hz

1.6.12 Digital Inputs

Six (6) Programmable Digital Inputs (Common Ground), plus One (1) Start Interlock

Isolation	Isolated
Isolation Test Voltage	500 VAC, 1 minute
Input Type	NPN/PNP (DI1...DI5), NPN (DI6)
Signal Level	24Vdc
Rin	2.0 kOhms
Logical switch thresholds	< 5Vdc at '0', >15Vdc at '1'
Input Current	15 mA, Digital Input 1 to Digital Input 5, 5 mA Digital Input 6

PUMPSMART® PS220 Variable Speed Drive

Filtering Time Constant	Hardware Filter .04 ms
Input Updating Time	Digital Filtering up to 8 ms (Primary Control Program)

Internal 24 Vdc Supply for Digital Inputs

Voltage	24Vdc
Maximum Current	200 mA
Connector	XD24:2 and XD24:4
Protection	Short Circuit Proof

An external 24 Vdc supply may be used instead of the internal supply

1.6.13 Digital Inputs/Output

Two (2) Programmable Digital Inputs/Outputs

Isolation	Isolated
Input Configuration	DIO1 frequency input (0 ... 16KHz with 4 microsecond hardware filtering)
Output Configuration	DIO2 frequency output (0 ... 16KHz with 4 microsecond hardware filtering)
Signal Level	24Vdc
Rin	2.0 kOhms
Logical input switch thresholds	< 5Vdc at '0', >15Vdc at '1'
Filtering Time Constant	0.25 ms
As output	Total output current from +24VD is limited to 200 ma

1.6.14 Relay Outputs

Three Programmable Relay Outputs

Switching Capacity	2 A at 30Vdc or 250Vac
Maximum Continuous Current	IC = 2 Amps RMS
Protection	Varistors (250 V)
Output Updating Time	1 ms (Primary Control Program)

1.6.15 Safe Torque Off Connection

Input Voltage Range	-3 ... 30 V DC
Logical input switch thresholds	< 5Vdc at '0', >17Vdc at '1' Both input connection must be closed for the drive to start
Current Consumption	55 mA (continuous)
EMC Immunity	according to IEC 61326-3-1

1.6.16 Protections

Single Phase	Protected (input & output)
Over Voltage Trip Limit	$1.3 * U_{1max}$
Under Voltage Trip Limit	$0.65 * U_{1min}$
Over Temperature	Protected
Motor Stall Protection	Protected
Motor Over Temperature	Protected (I2t)
Cross Cable Connection	Protected

COMMERCIAL TERMS

1.7 DOCUMENTATION REQUIREMENTS

Submittal Documentation

All documentation is submitted electronically only

Data Table

General Arrangement Drawing

General Specifications

NOTE: ITT reserves the right to charge the customer for additional documentation requests outside the Scope of Supply.

1.8 WARRANTY

Warranty is one year from date of startup, not to exceed 18 months after date of shipment, and covers defects in workmanship and materials only. This warranty is provided when factory start up is done by a PumpSmart Certified technician. Warranty is limited to the value of the ITT supplied equipment. The standard ITT terms and conditions of sale will apply to any purchase order resulting from this proposal unless other terms and conditions are specifically negotiated in written form and signed as acceptable.

IN NO EVENT WILL CONSEQUENTIAL AND/OR LIQUIDATED DAMAGES BE ACCEPTED.

1.9 SHIPPING

Freight for Drives is quoted FOB SFO

Submittal Documents 2 weeks ARO

6-8 weeks for frame sizes R1-R7 Wall Mount Drives 380-500Vac (from ARAD) typical*

*Delivery quoted is based on shop loading at time of quote and may change based on shop loading at time of order release.

Please contact M&C for expedite requests.

1.10 TERMS OF PAYMENT

All pricing shown is firm for order entry within 90 days.

Terms of payment Net 30

Prices do not include export boxing or taxes

1.10.1 Commissioning

PumpSmart commissioning services are performed by a factory Certified PumpSmart Technician and can increase the drive warranty to 3 years from date of shipment from the factory. This Commissioning Service line option is an estimate based on the pump and drive being ready for startup when the Technician arrives and all necessary resources being available at time of startup. If additional time becomes necessary it will be billed at rates identified in the following Service Rates document. Service includes one day onsite plus travel time and expenses. See section 1.12 for a copy of commissioning and service rates.

1.11 MISCELLANEOUS TERMS OF PAYMENT

1.11.1 Storage

Provisions must be made by the receiving party for storage in a clean, dry, temperature controlled facility immediately after conducting a thorough receiving inspection. In the event purchaser is unable to accept shipment upon notification of ITT readiness to ship, goods shall be placed in suitable storage by ITT. Storage charges, escalation charges (if applicable) and any charges for re-inspection by Q.A., will be accrued to the account of purchaser. Storage for longer than one year may require the PumpSmart drive capacitors to be restored at additional cost.

1.11.2 Intellectual Properties

Right to all intellectual properties, developed by ITT, remains the property of ITT.

1.11.3 Terms of Sale

The standard ITT terms and conditions of sale will apply in accordance to the IP500 document to any purchase order resulting from this quotation unless other terms and conditions are specifically negotiated in written form and signed as acceptable by ITT. Freight prices, if quoted, are based on means of transportation selected by ITT. Special means of transport directed by customer purchase order will incur additional freight charges. A copy of the IP500 document is available upon request.

1.12 SERVICE RATES

Includes PumpSmart®, ProSmart®, iAlert® products, training, service, commissioning or startup related services as needed for successful implementation of any of the Monitoring and Control products globally where applicable. Additional charges/expense may apply in certain regions and areas of the global coverage of ITT. Hazardous regions, regions under conflict, war or countries on embargoed list may not be available for service(s) performed by ITT and is subject to current corporate laws, restrictions as outlined by ITT or governments. It is required that ITT personnel verify subject country, state; region is approved for authorized product startup, commissioning, service or training.

SUPERVISION OF INSPECTION, START -UP, FIELD TESTING AND/OR PROGRAMMING SERVICE FOR DOMESTIC ORDERS

(a) The equipment shall be installed and put into operation by and at the expense of the Purchaser. Upon request of the Purchaser, the ITT Monitoring & Control group will furnish the services of a Field Service Engineer or qualified Technician to advise and assist the Purchaser/owner/operator in the inspection and/or startup of the machinery. The Purchaser shall furnish safe and proper working conditions and safe storage of any special tools. The Purchaser shall furnish all necessary labor, cranes, cribbing; oil, supplies, station operating force, steam, electricity, extensions, water, and other material and supplies required to install and operate the equipment to desired load and shall furnish free available crane and switching service and the service of operators and other employees that may be deemed necessary for full load pump testing and operation.

(b) ITT Monitoring & Controls shall not be responsible for material furnished by the Purchaser or for acts, or failures to act, site delays out of control of M&C, personnel furnished by Purchaser nor shall Goulds Pumps be responsible for the construction of foundations or for the soil conditions upon which they are built. Goulds Pumps provides no warranties, either expressed or implied, in construction with this service.

(c) Additional outside of scope technical support by site shall be (if necessary) by owner and site responsibility. Outside of scope changes or additions shall be billed according to charges below by ITT M&C and/or with outside contracted ITT companies as necessary and proposed in writing.

(d) Unless otherwise stipulated or agree upon in writing, the Purchaser shall pay for:

1. At the rate of 1840 USD per day for each standard (8) eight-hour day worked or spent in travel to and from the job site, plus all travel and living expenses of the Field Service Engineer/Technician from the time of leaving base location until return and all shipping charges and rentals for any special tools and materials as may be required.

2. Hours worked in excess of the standard eight-hour (8) days, Monday through Friday, and hours worked on Saturday, Sunday and holidays, will be billed in accordance with the following schedule:

Monday through Friday over eight hours	345 USD per hour*
Saturday all hours	345 USD per hour*
Sundays and holidays all hours	460 USD per hour*

*Other countries and regions may have different weekly schedules and can be adjusted based on in country work week and specified weekend.

3. Overtime rates will be charged for time spent in travel as such if requested by Purchaser.

4. The rates specified in Items 1. and 2. above are not subject to change provided the Engineer/Technician begins to perform these services within one year from the date of proposal.

5. Minimum billing for less than four hours worked or spent in travel will be 50 percent of the daily rate.

6. The minimum billing for more than four hours but less than eight hours worked or spent intravel will be the full daily rate.

7. The time when the Engineer/Technician is ready, willing and able to work at the job site Monday through Friday shall be considered to be time worked for the purpose of this paragraph, even if services are not utilized or site is not ready.

8. All travel and living expenses will be billed at actual cost-plus a 15% handling charge. Domestic air travel will be via tourist, coach or economy class when available. Travel via company car will be billed at \$0.82 per mile.

PUMPSMART® PS220 Variable Speed Drive

- (e) When a per diem rate is stipulated in lieu of the rate shown in Paragraph (d)1, it will include local travel and living expenses at the jobsite only. Travel expenses between base location and jobsite, and shipping charges and rentals for any special tools and materials will be billed to Purchaser. Overtime charges will be in accordance with Paragraphs (d)2 and (d)3.
- (f) Invoices rendered to the Purchaser are payable upon receipt of the invoice. Sales or other applicable taxes shall be charged to the Purchaser.
- (g) The Buyer shall be required to contact Primary Sales Person (John Crowley, Phone #:) two (2) weeks prior to initial start-up of pumps in order to schedule Field Engineer/Technician to the jobsite. If time sheets are required by the customer, they shall be provided by the customer and signed after services are performed by both the customer and Field Engineer/Technician.
- (h) Before initial startup of the equipment a preliminary check of the pump and installation will be conducted by the field Engineer / Technician. Follow the guide lines established in the Attached "Field Service Installation and Startup Checklist".
- (i) After startup has been successfully completed the field Engineer / Technician will follow-up with a field report of observations / conclusions and recommendations.
- (j) Official owner signoff shall be performed after successful operation of equipment as stated releasing ITT M&C of site requirements. Future returns to the site (including warranty calls) will be billed at same rates as section (d)

CHARLES P CROWLEY CO INC

Proposal No: AQ23-06-22 01

Item No: ITEM 006 (Base Offer)

Attn: Kati Nguyen

Alex Quach
Charles P. Crowley
15861 Business Center
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Irwindale, CA 91706
Office: 626-856-5656 x
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Fax: 626-856-5658
Email:
alex.quach@cpcrowley.co
m

June 30, 2023

**PUMPSMART VARIABLE SPEED DRIVE SYSTEMS: PS220 (Low Voltage) –
Advanced PumpSmart Functions QTY: 1**

Operating Site Conditions

OPERATING TEMP. 5.0 deg F minimum, 104.0 deg F maximum (no de-rate required)
ELEVATION 3,281.0 ft ASL maximum (no de-rate required)
MAX MOTOR CABLE 984.00 ft

Controller Ratings

CONTROLLER PART NO. K03552A10
POWER 50.0 hp (based on NEMA ratings for typical 4-pole motor, check motor
current for compatibility)
MAXIMUM CURRENT 65A Continuous
SUPPLY VOLTAGE 440 VAC - 500 VAC
RECOMMENDED FUSE SIZE 600V, 90A, Bussmann# JJS-90, Type T

Controller Platform

DRIVE PLATFORM ABB ACS880-01
DRIVE FRAME SIZE R5
WEIGHT 50.0 lb
ENCLOSURE RATING NEMA 1 / IP21

The PS220 is an integrated pump controller that can increase the Flow Economy and Reliability of your pump and system. Use the PS220 to replace a traditional motor starter to take advantage of the adjustable soft starter and add the flexibility to dial in the pump speed to match the process demand. The PS220 protects the pump from upset conditions with patented pump protection algorithms and the motor from overload conditions. The PS220 is the complete pump controller package and can be applied to any centrifugal or positive displacement pump.

Pump Insight - With features such as SMARTFLOW Sensorless Flow and the Flow Economy Calculator the PS220 provides the information you need to help run you process smoothly and efficiently.

Advanced Pump Protection - Use the patented Sensorless Pump Protection to protect the pump from upset conditions such as dry-run, low-flow, dead-head and run-out at any operating speed.

Flow Economy - By righting sizing the pump to the process demand the Flow Economy of your pump is optimized which will reduce energy consumption and overall total operating cost.

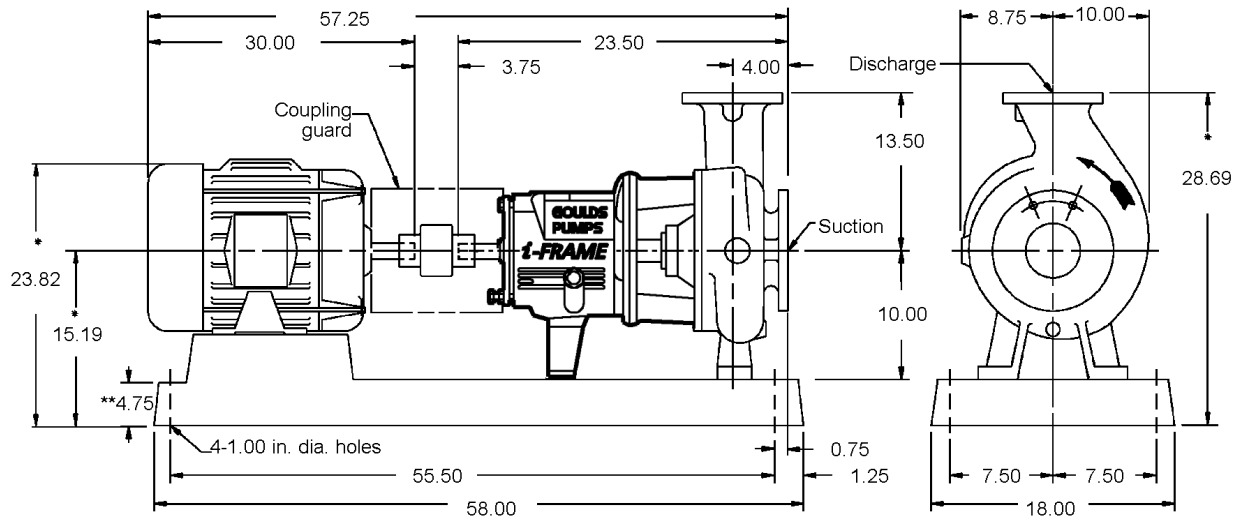
Process Control - As standard PumpSmart systems come equipped with advanced process control features that help optimize your pumping system for maximum uptime, reliability and energy savings.

Pump Knowledge - With over 150 years of pump expertise be confident your pump has been optimally selected and is properly protected by the people who know pumps. If you have a pump that can benefit from any of these features let the pump experts evaluate your system and recommend the best PumpSmart solution.



Our offer does not include specific review and incorporation of any Statutory or Regulatory Requirements and the offer is limited to the requirements of the design specifications. Should any Statutory or Regulatory requirements need to be reviewed and incorporated then the Customer is responsible to identify those and provide copies for review and revision of our offer.

****** Our quotation is offered in accordance with our comments and exceptions identified in our proposal.**



Pump Specification

SUCT.FLANGE SIZE	6"	DRILLING	ANSI 150#	FACING	FF	FINISH	SERRATED
DISCH.FLANGE SIZE	4"	DRILLING	ANSI 150#	FACING	FF	FINISH	SERRATED
PUMP ROTATION (LOOKING AT PUMP FROM MOTOR)				CW			
TYPE OF LUBRICATION	FLOOD OIL			COOLED	NO		
TYPE OF STUFFING BOX	TAPER BORE PLUS WITH AXIAL RIBS			COOLED	NO		
TYPE OF SEALING	MECHANICAL SEAL						

Weights and Measurements

PUMP/PUMPSMART	425.0/50.0 lb
MOTOR/CPLG	580.0/18.0 lb
BASEPLATE	205.0 lb
TOTAL	1,228.0 lb
GR.VOLUME w/BOX	44.1 ft ³
GR.WEIGHT w/BOX	1,449.0 lb

Motor Specification

MOTOR BY	PUMP MFG	MOUNT BY	PUMP MFG	MFG.	PUMP MFG'S CHOICE OR EQUAL
FRAME	326T	POWER	50.0 hp	RPM	1800
PHASE	3	FREQUENCY	60 HZ	VOLTS	460
INSULATION	F	S.F.	1.15		
ENCLOSURE	TEFC - PREMIUM EFFICIENCY				

Notes and References

- MTR DIMENSIONS ARE APPROXIMATE
 - INSTALL FOUNDATION BOLTS IN PIPE SLEEVES
 - ALLOW FROM 0.75 to 1.50in. FOR
 - THE BASEPLATE IS DESIGNED FOR GROUT INSTALLATION UNLESS OTHERWISE NOTED. REFER TO THE INSTALLATION MANUAL INSTRUCTIONS.
 - * Tolerance is -0.38 +0.38
 - SUCTION FLANGE HAS 8-3/4-10 UNC TAPPED HOLES
 - ** Foundation bolt grip thickness
- FOR PUMP TAPPED OPENINGS REFER TO DWG.:
TAQ23-06-22 01 / ITEM 006

Auxiliary Specification

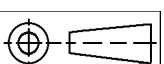
COUPLING BY	PUMP MFG	CPLG TYPE	REXNORD OMEGA REX ELASTOMER- ES-20 (STANDARD ORANGE)
CPL GUARD BY	PUMP MFG	CPLG GUARD MATL	CARBON STEEL
BASEPLATE	CAST IRON CAMBER TOP D00058A		
MECH.SEAL	GOULDS SEALPLUS SP1CS (CARBON VS SILICON CARBIDE)		

DRAWING IS FOR REFERENCE ONLY.
NOT CERTIFIED FOR CONSTRUCTION UNLESS SIGNED.

Customer: CHARLES P CROWLEY CO INC
Serial No:
Customer P.O. No:
Item No: ITEM 006 (Base Offer)
Project No: Beltz Treatment Plant
End User: Santa Cruz

DRAWING NO AQ23-06-22 01/ITEM 006

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ITT Corp



All dimensions are in inches.
Drawing is not to scale
Weights (lbs) are approximate

Job/Inq.No. :

Purchaser : CHARLES P CROWLEY CO INC

End User: Santa Cruz

Issued by : Alex Quach

Item/Equip.No. : ITEM 006 (Base Offer)

Quotation No. : AQ23-06-22 01

Date : 06/30/2023

Service :

Order No. :

Certified By :

Rev. : 0

Operating Conditions

Liquid: Water
 Temp.: 70.0 deg F
 S.G./Visc.: 1.000/1.000 cp
 Flow: 730.0 gpm
 TDH: 130.0 ft
 NPSHa:
 Solid size:
 % Susp. Solids
 (by wtg):

Pump Performance

Published Efficiency: 74.5 %
 Rated Pump Efficiency: 74.0 %
 Rated Total Power: 32.5 hp
 Non-Overloading Power: 40.6 hp
 Imp. Dia. First 1 Stg(s): 11.3750 in
 NPSHr: 7.7 ft
 Shut off Head: 142.1 ft
 Vapor Press:
 Suction Specific Speed: 10,910 gpm(US) ft
 Min. Hydraulic Flow: 321.5 gpm
 Min. Thermal Flow: N/A
 Max. Solids Size: 1.0000 in

- Notes:**
1. Power and efficiency losses are not reflected on the curve below.
 2. Curve shown is at ambient temperature conditions.

Job/Inq.No. :
Purchaser : CHARLES P CROWLEY CO INC
End User : Santa Cruz
Item/Equip.No. : ITEM 006 (Base Offer)
Service :
Order No. :
Issued by : Alex Quach
Quotation No. : AQ23-06-22 01
Rev. : 0
Date : 06/30/2023
Certified By :

Operating Conditions

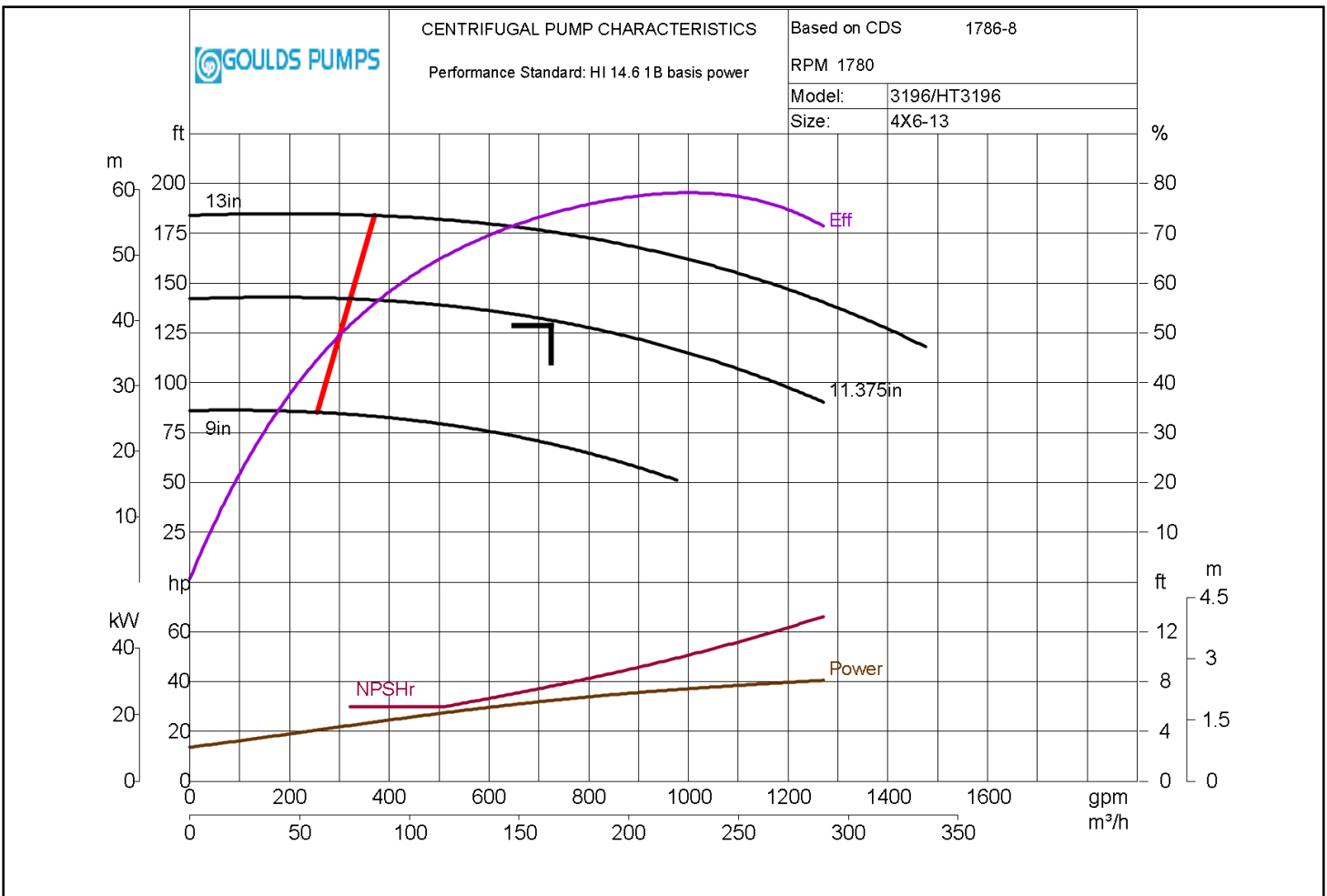
Liquid: Water
Temp.: 70.0 deg F
S.G./Visc.: 1.000/1.000 cp
Flow: 730.0 gpm
TDH: 130.0 ft
NPSHa:
Solid size:

Pump Performance

Published Efficiency: 74.5 %
Rated Pump Efficiency: 74.0 %
Rated Total Power: 32.5 hp
Non-Overloading Power: 40.6 hp
Imp. Dia. First 1 Stg(s): 11.3750 in
NPSHr: 7.7 ft
Max. Solids Size: 1.0000 in
Suction Specific Speed: 10,910 gpm(US) ft
Min. Hydraulic Flow: 321.5 gpm
Min. Thermal Flow: N/A
Shut off Head: 142.1 ft
% Susp. Solids (by wtg):

Vapor Press:

Notes: 1. Curve shown is at ambient temperature conditions.



Viscosity corrections have been performed in accordance with HI 9.6.7-2015

CHARLES P CROWLEY CO INC

Proposal No: AQ23-06-22 01

Item No: ITEM 007 (Base Offer)

Attn: Kati Nguyen

Alex Quach
Charles P. Crowley
15861 Business Center
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Irwindale, CA 91706
Office: 626-856-5656 x
130
Fax: 626-856-5658
Email:
alex.quach@cpcrowley.co
m

June 30, 2023

**PUMPSMART VARIABLE SPEED DRIVE SYSTEMS: PS220 (Low Voltage) –
Advanced PumpSmart Functions QTY: 1**

Operating Site Conditions

OPERATING TEMP. 5.0 deg F minimum, 104.0 deg F maximum (no de-rate required)
ELEVATION 3,281.0 ft ASL maximum (no de-rate required)
MAX MOTOR CABLE 984.00 ft

Controller Ratings

CONTROLLER PART NO. K03552A11
POWER 60.0 hp (based on NEMA ratings for typical 4-pole motor, check motor
current for compatibility)
MAXIMUM CURRENT 77A Continuous
SUPPLY VOLTAGE 440 VAC - 500 VAC
RECOMMENDED FUSE SIZE 600V, 110A, Bussmann# JJS-110, Type T

Controller Platform

DRIVE PLATFORM ABB ACS880-01
DRIVE FRAME SIZE R5
WEIGHT 50.0 lb
ENCLOSURE RATING NEMA 1 / IP21

The PS220 is an integrated pump controller that can increase the Flow Economy and Reliability of your pump and system. Use the PS220 to replace a traditional motor starter to take advantage of the adjustable soft starter and add the flexibility to dial in the pump speed to match the process demand. The PS220 protects the pump from upset conditions with patented pump protection algorithms and the motor from overload conditions. The PS220 is the complete pump controller package and can be applied to any centrifugal or positive displacement pump.

Pump Insight - With features such as SMARTFLOW Sensorless Flow and the Flow Economy Calculator the PS220 provides the information you need to help run you process smoothly and efficiently.

Advanced Pump Protection - Use the patented Sensorless Pump Protection to protect the pump from upset conditions such as dry-run, low-flow, dead-head and run-out at any operating speed.

Flow Economy - By righting sizing the pump to the process demand the Flow Economy of your pump is optimized which will reduce energy consumption and overall total operating cost.

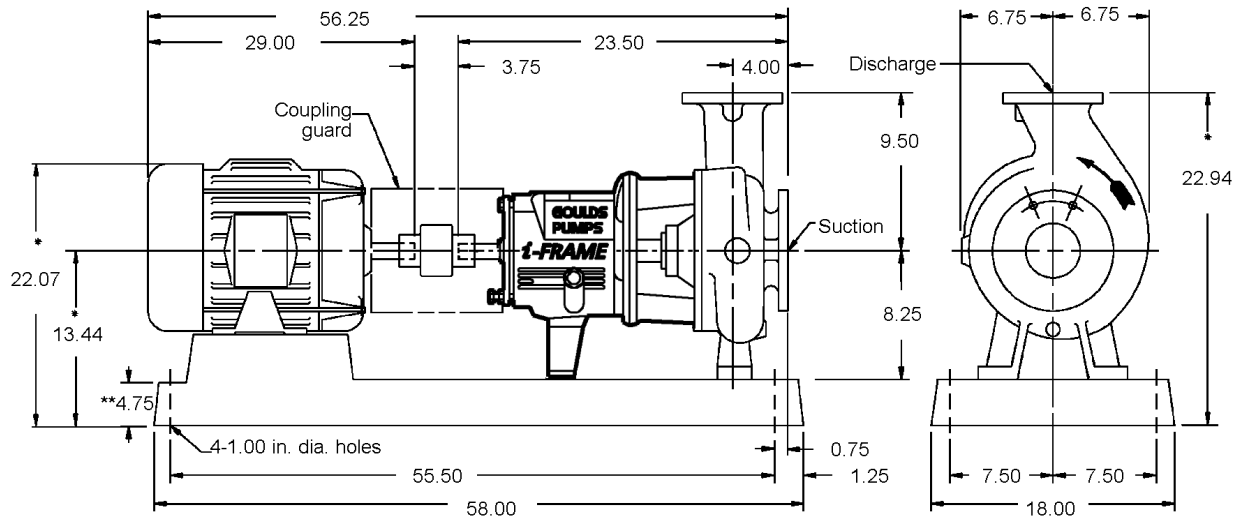
Process Control - As standard PumpSmart systems come equipped with advanced process control features that help optimize your pumping system for maximum uptime, reliability and energy savings.

Pump Knowledge - With over 150 years of pump expertise be confident your pump has been optimally selected and is properly protected by the people who know pumps. If you have a pump that can benefit from any of these features let the pump experts evaluate your system and recommend the best PumpSmart solution.



Our offer does not include specific review and incorporation of any Statutory or Regulatory Requirements and the offer is limited to the requirements of the design specifications. Should any Statutory or Regulatory requirements need to be reviewed and incorporated then the Customer is responsible to identify those and provide copies for review and revision of our offer.

****** Our quotation is offered in accordance with our comments and exceptions identified in our proposal.**



Pump Specification

SUCT.FLANGE SIZE	3"	DRILLING	ANSI 150#	FACING	FF	FINISH	SERRATED
DISCH.FLANGE SIZE	2"	DRILLING	ANSI 150#	FACING	FF	FINISH	SERRATED
PUMP ROTATION (LOOKING AT PUMP FROM MOTOR)				CW			
TYPE OF LUBRICATION	FLOOD OIL			COOLED	NO		
TYPE OF STUFFING BOX	TAPER BORE PLUS WITH AXIAL RIBS			COOLED	NO		
TYPE OF SEALING	MECHANICAL SEAL						

Weights and Measurements

PUMP/PUMPSMART	250.0/50.0 lb
MOTOR/CPLG	560.0/11.0 lb
BASEPLATE	205.0 lb
TOTAL	1,026.0 lb
GR.VOLUME w/BOX	36.5 ft ³
GR.WEIGHT w/BOX	1,209.0 lb

Motor Specification

MOTOR BY	PUMP MFG	MOUNT BY	PUMP MFG	MFG.	PUMP MFG'S CHOICE OR EQUAL
FRAME	326TS	POWER	60.0 hp	RPM	3600
PHASE	3	FREQUENCY	60 HZ	VOLTS	460
INSULATION	F	S.F.	1.15		
ENCLOSURE	TEFC - PREMIUM EFFICIENCY				

Notes and References

- MTR DIMENSIONS ARE APPROXIMATE
 - INSTALL FOUNDATION BOLTS IN PIPE SLEEVES
 - ALLOW FROM 0.75 to 1.50in. FOR
 - THE BASEPLATE IS DESIGNED FOR GROUT INSTALLATION UNLESS OTHERWISE NOTED. REFER TO THE INSTALLATION MANUAL INSTRUCTIONS.
 - * Tolerance is -0.38 +0.38
 - ** Foundation bolt grip thickness
- FOR PUMP TAPPED OPENINGS REFER TO DWG.:
TAQ23-06-22 01 / ITEM 007

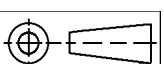
Auxiliary Specification

COUPLING BY	PUMP MFG	CPLG TYPE	REXNORD OMEGA REX ELASTOMER- ES-10 (STANDARD ORANGE)
CPL GUARD BY	PUMP MFG	CPLG GUARD MATL.	CARBON STEEL
BASEPLATE	CAST IRON CAMBER TOP B00051A		
MECH.SEAL	GOULDS SEALPLUS SP1CS (CARBON VS SILICON CARBIDE)		

DRAWING IS FOR REFERENCE ONLY.
NOT CERTIFIED FOR CONSTRUCTION UNLESS SIGNED.

Customer: CHARLES P CROWLEY CO INC
Serial No:
Customer P.O. No:
Item No: ITEM 007 (Base Offer)
Project No: Beltz Treatment Plant
End User: Santa Cruz

DRAWING NO AQ23-06-22 01/ITEM 007



All dimensions are in inches.
Drawing is not to scale
Weights (lbs) are approximate

Copyright 2023
ITT Corp

Job/Inq.No. :

Purchaser : CHARLES P CROWLEY CO INC

End User: Santa Cruz

Issued by : Alex Quach

Item/Equip.No. : ITEM 007 (Base Offer)

Quotation No. : AQ23-06-22 01

Date : 06/30/2023

Service :

Order No. :

Certified By :

Rev. : 0

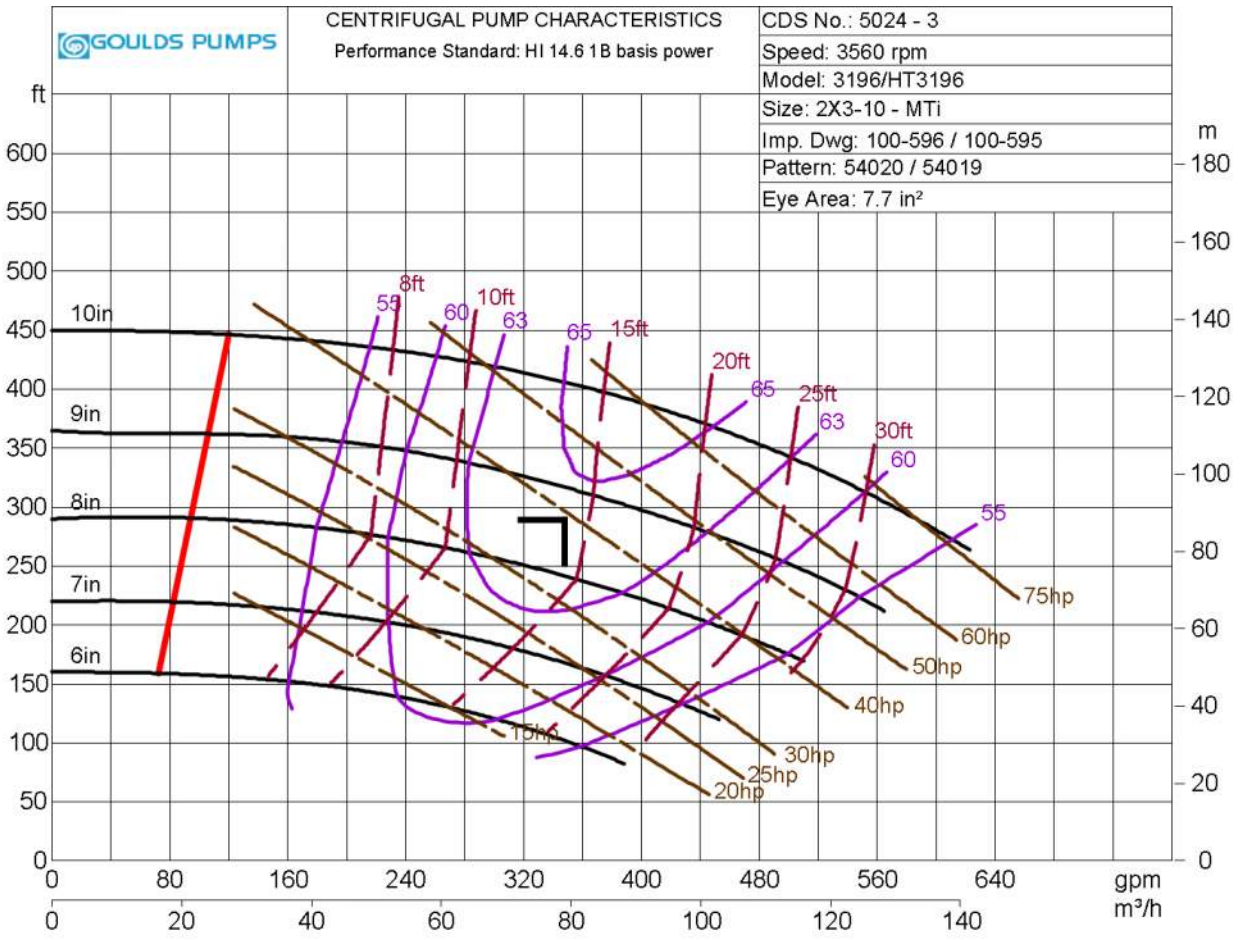
Operating Conditions

Liquid: Water
 Temp.: 70.0 deg F
 S.G./Visc.: 1.000/1.000 cp
 Flow: 350.0 gpm
 TDH: 290.0 ft
 NPSHa:
 Solid size:
 % Susp. Solids (by wtg):

Pump Performance

Published Efficiency: 64.5 %
 Rated Pump Efficiency: 63.5 %
 Rated Total Power: 40.4 hp
 Non-Overloading Power: 52.2 hp
 Imp. Dia. First 1 Stg(s): 8.6875 in
 NPSHr: 14.3 ft
 Shut off Head: 340.7 ft
 Vapor Press:
 Suction Specific Speed: 8,673 gpm(US) ft
 Min. Hydraulic Flow: 101.5 gpm
 Min. Thermal Flow: N/A
 Max. Solids Size: 0.3750 in

- Notes:**
1. Power and efficiency losses are not reflected on the curve below.
 2. Curve shown is at ambient temperature conditions.



Job/Inq.No. :

Purchaser : CHARLES P CROWLEY CO INC

End User : Santa Cruz

Issued by : Alex Quach

Rev. : 0

Item/Equip.No. : ITEM 007 (Base Offer)

Quotation No. : AQ23-06-22 01

Date : 06/30/2023

Service :

Order No. :

Certified By :

Operating Conditions

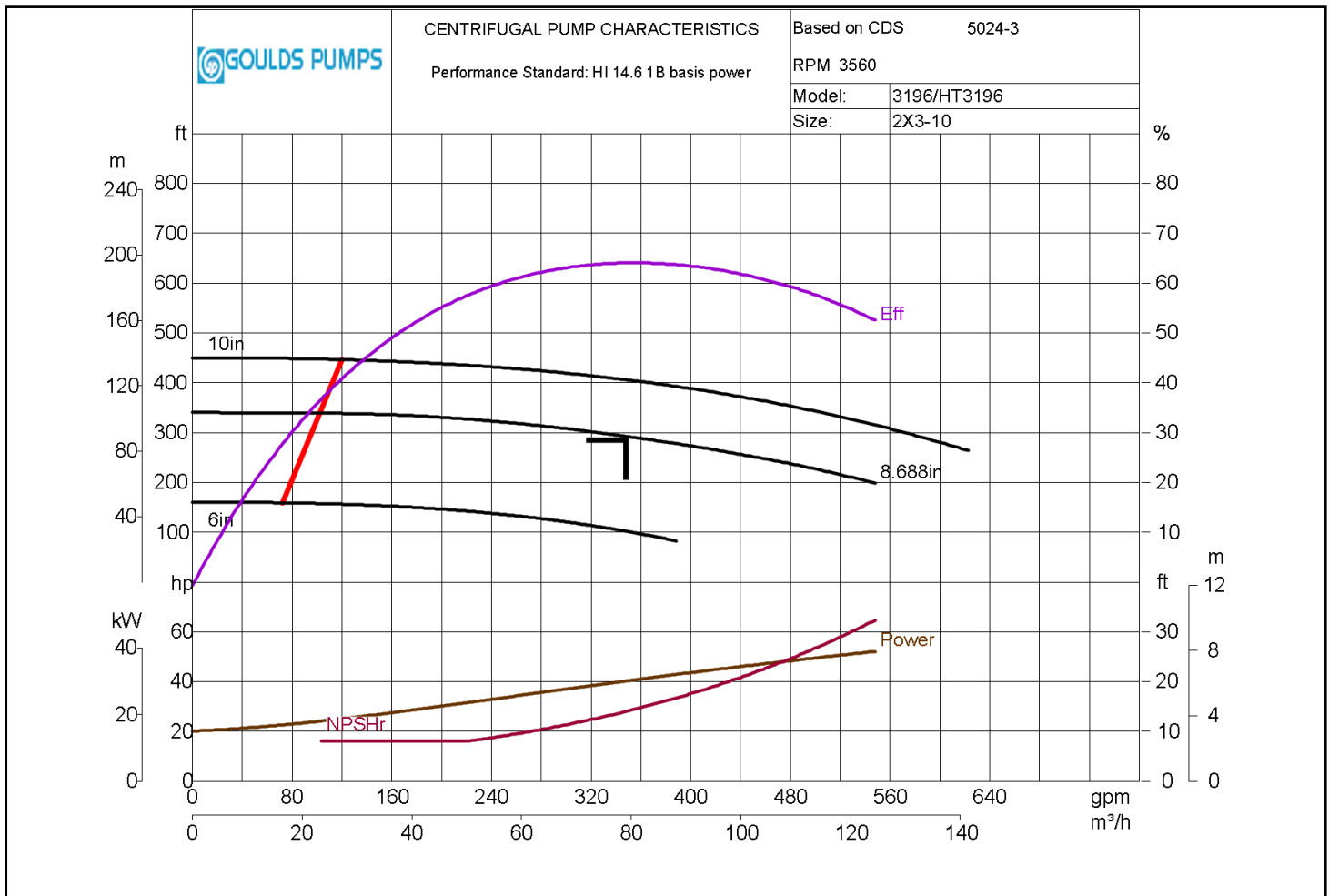
Liquid: Water
 Temp.: 70.0 deg F
 S.G./Visc.: 1.000/1.000 cp
 Flow: 350.0 gpm
 TDH: 290.0 ft
 NPSHa:
 Solid size:

Pump Performance

Published Efficiency: 64.5 %
 Rated Pump Efficiency: 63.5 %
 Rated Total Power: 40.4 hp
 Non-Overloading Power: 52.2 hp
 Imp. Dia. First 1 Stg(s): 8.6875 in
 NPSHr: 14.3 ft
 Max. Solids Size: 0.3750 in
 Suction Specific Speed: 8,673 gpm(US) ft
 Min. Hydraulic Flow: 101.5 gpm
 Min. Thermal Flow: N/A
 Shut off Head: 340.7 ft
 % Susp. Solids (by wtg):

Vapor Press:

Notes: 1. Curve shown is at ambient temperature conditions.



Viscosity corrections have been performed in accordance with HI 9.6.7-2015



From: alex.quach@cpcrowley.com <alex.quach@cpcrowley.com>

Sent: Tuesday, June 27, 2023 1:20 PM

To: Nguyen, Hoai (Kati) <nguyenh@cdmsmith.com>

Subject: RE: CDM Smith - Pulsafeeder Pumps

Hi Kati,

I was out of the office on Friday and Monday.

Please see attached for the new pump selections.

Horizontal End Suction Pumps with VFD

- 219 gpm at 290 ft TDH - Goulds 3196 1.5x3-10, Budget Price \$26k each pump + \$6k each VFD
- 480 gpm at 290 ft TDH - Goulds 3196 3x4-10, Budget Price \$38k each pump + \$9.5k each VFD

Best Regards,

Alex Quach
Operations Manager



CHARLES P. CROWLEY COMPANY

15861 Business Center Drive, Irwindale, CA USA 91706

Phone: (626) 856-5656 x130, Direct: (626) 214-3724, Fax: (626) 856-5658, Mobile: (626) 827-0070

email: alex.quach@cpcrowley.com, website: www.cpcrowley.com

From: Nguyen, Hoai (Kati) <nguyenh@cdmsmith.com>

Sent: Monday, June 26, 2023 8:33 AM

To: alex.quach@cpcrowley.com

Subject: RE: CDM Smith - Pulsafeeder Pumps

Thank you so much Alex! This is great information and I really appreciate it.

Might I also ask for quotes for the following as well?

Horizontal End Suction Pumps with VFD

- 219 gpm at 290 ft TDH
- 480 gpm at 290 ft TDH



CHARLES P CROWLEY CO INC

Date: June 27, 2023

**CHARLES P CROWLEY CO INC
15861 BUSINESS CENTER DR.
IRWINDALE, CALIFORNIA 91706**

Attention: Kati Nguyen

**Subject: Inquiry No:
Proposal No: AQ23-06-22 01**

Alex Quach
Charles P. Crowley
15861 Business Center
Drive
Irwindale, CA 91706
Office: 626-856-5656 x
130
Fax: 626-856-5658
Email:
alex.quach@cpcrowley.co
m

Dear, We thank you very much for the above mentioned inquiry. Our proposal is attached for your review and consideration. All technical details with data sheets, pump performance curves, drawings, and brochures can be found in the attached package. Terms & Conditions: Standard ITT/Goulds Pumps: apply. Our delivery schedule and location for each item is noted on the individual datasheets. All prices are Our offer is valid for 15 business days from the date of our quotation. We trust the above is per your requirements. Should you have any questions, please do not hesitate to contact us. Sincerely, ITT/Goulds Pumps



CHARLES P CROWLEY CO INC

Alex Quach
 Charles P. Crowley
 15861 Business Center
 Drive
 June 27, 2023
 Irwindale, CA 91706
 Office: 626-856-5656 x
 130
 Fax: 626-856-5658
 Email:
 alex.quach@cpcrowley.co
 m

PROFORMA INVOICE

Customer: CHARLES P CROWLEY CO INC
Proposal No: AQ23-06-22 01

Main Offer

ITEM NO	QTY	MODEL	SIZE	CONSTRUCTION	DRIVER RATING/FRAME	RPM	UNIT TOTAL	GRAND TOTAL
ITEM 004	1	3196	1.5x3-10 MTi	Carbon Steel with 316SS impeller	40.0 hp/324TS	3600	26,000	26,000
ITEM 005	1	3196	3x4-10 MTi	Ductile iron with 316SS impeller	75.0 hp/365TS	3600	37,823	37,823

TOTAL 2 units (Main offer) in USD-United States Dollars **63,823**

CHARLES P CROWLEY CO INC

Proposal No: AQ23-06-22 01
Item No: ITEM 004 (Base Offer)
Attn: Kati Nguyen

Alex Quach
Charles P. Crowley
15861 Business Center
Drive
Irwindale, CA 91706
Office: 626-856-5656 x
130
Fax: 626-856-5658
Email:
alex.quach@cpcrowley.co
m

June 27, 2023

MODEL: 3196 MTi SIZE: 1.5x3-10/5V QTY: 1

Operating Conditions

SERVICE

LIQUID Water , Rated Temp. 70.0 deg F, SP.GR 1.000, Viscosity
1.000 cp, Rated/Max. suction pressure 0.0 / 0.0 psi g
CAPACITY Rated 219.0 gpm
HEAD 290.0 (ft)
AMBIENT TEMP Min//Max Temp. 5.0/104.0 deg F

i-FRAME™



Performance at 3560 RPM per HI 14.6 1B basis power

PUBLISHED EFFY 61.0% (CDS)
RATED EFFY 60.0% with contract seal
RATED POWER 27.0 hp (incl. Mech. seal drag 0.44). (Run out 36.1 hp)
NPSHR 8.4 ft
DISCH PRESSURE (R) 127.4 psi g (144.7 psi g @ Shut off) based on 0.0 psi g rated
suction pressure
PERF. CURVE 5020-2 (Rotation CW viewed from coupling end)
SHUT OFF HEAD 334.3 ft
MIN. FLOW Continuous Stable: 68.1 gpm Hydraulic: 68.1 gpm Thermal:
N/A

Materials

CONSTRUCTION Carbon Steel with 316SS impeller
CASING Carbon Steel (max.casing pressure @ rated temperature 250.0 psi g)
ST.BOX COVER Carbon Steel
IMPELLER 316SS - Open (8.6875 in rated, max=10.0000 in, min=6.0000 in)
CASING GASKETS Aramid Fiber with EPDM and Silicate Filler
IMPELLER O-RING Teflon
SHAFT MATERIAL SAE 4140
SHAFT SLEEVE 316SS
LUBRICATION Flood oil
SEAL CHAMBER Taper bore plus with VPE
GLAND 316SS Flush vent and drain with carbon restricting bushing
BEARINGS 6309 (Inboard) / 3309 (Outboard)
COUPLING Rexnord - Omega Rex Elastomer- ES-5 (standard orange element)-S.F. 1.00
COUPLING GUARD Carbon steel
BASEPLATE Cast iron camber top B00051A

Sealing Method

MECHANICAL SEAL Goulds SealPlus SP1CS (Carbon vs Silicon Carbide) - (Cartridge - Single)

Flanges

150# raised face

Frame Connections

Bearing frame drain
 Frame cooler access
 Oil fill connection

Frame Features

Ductile iron frame adapter
 Inpro VBXX-D Hybrid Bearing Isolators
 Iron bearing frame
 Premium Severe Duty Thrust Bearings

Assembly and Testing

Casing & Cover - Standard hydro test
 Impeller balanced to ISO G6.3

Painting

Goulds Blue standard painting

Warranty

5 Year Extended Warranty (All the components, manufactured by ITT Goulds pumps, in the liquid end and power end are covered).

Noise Level Data

Maximum predicted sound pressures level pump only in Decibels (db) Re 0.0002 microbars measured 3ft horizontally and 5ft from the floor per QCP 580

Noise Level	31.5	63	125	250	500	1k	2k	4k	8k	A
Pump	67.0	75.0	77.0	76.0	70.0	72.0	71.0	66.0	67.0	76.0

Driver : Electric motor Manufacturer : Pump Mfg's Choice

FURNISHED BY	Pump Mfg	MOUNTED BY	Pump Mfg
RATING	40.0 hp (29.8 KW)	ENCLOSURE	TEFC - Premium Efficiency
PHASE/FREQ/VOLTS	3/60 Hz/460	SPEED	3600 RPM
INSULATION/SF	F/1.15	FRAME	324TS

Driver Features

Suitable for Variable frequency drive (VFD)

Weights and Measurements

TOTAL NET UNIT WEIGHT / VOLUME	1,013.2 lb / 13.3 ft³
TOTAL GROSS UNIT WEIGHT / GROSS VOLUME	1,191.2 lb / 35.5 ft³

Program Version 1.76.0.0

Drawing Revision Limit

Drawings returned with status approved as noted or revise and re-submit will be corrected and resubmitted only once. Thereafter, additional comments or revisions to these drawings will incur a charge of \$250 per drawing.

This proposal reflects the intended scope from the customer specifications supplied at the time of quotation. Additional specifications, requirements and scope presented at time of award or during order execution outside the original bid scope request, is subject to a change order with a potential cost and lead-time impact. ITT reserves the right to present engineering charges for more than two revision cycles on submittal drawings, provided these two revision cycles cover the intent of the specifications. ITT requires customer to provide all drawing comments applicable to the specification within the first submission return.

Our offer does not include specific review and incorporation of any Statutory or Regulatory Requirements and the offer is limited to the requirements of the design specifications. Should any Statutory or Regulatory requirements need to be reviewed and incorporated then the Customer is responsible to identify those and provide copies for review and revision of our offer.

Our quotation is offered in accordance with our comments and exceptions identified in our proposal. The pricing quoted herein will remain valid for 15 business days from the time of quotation. In the event that this validity should expire, please contact your ITT sales representative to confirm pricing validity prior to order placement.

ITT Inc. ('ITT') submits this proposal as the coronavirus (COVID-19) pandemic ('COVID-19') is impacting organizations and its supply chains around the world. ITT is carefully monitoring our supply chain and production facilities as it relates to this proposal but, given the fluid nature of this pandemic, shall not be liable for impacts arising from COVID-19 and accordingly shall be entitled to any adjustments as it relates to time or cost impacts which directly or indirectly resulting out of or arise in connection with COVID-19. Notwithstanding anything contained in this proposal to the contrary, ITT Inc. further reserves the right to modify or amend any statement made within this proposal due to any impacts arising from COVID-19.

[Click here](#) to download the pump Bulletin

[Click here](#) to learn more about the new *i-FRAME™*

CHARLES P CROWLEY CO INC

Proposal No: AQ23-06-22 01
Item No: ITEM 005 (Base Offer)

Attn: Kati Nguyen

Alex Quach
Charles P. Crowley
15861 Business Center
Drive
Irwindale, CA 91706
Office: 626-856-5656 x
130
Fax: 626-856-5658
Email:
alex.quach@cpcrowley.co
m

June 27, 2023

MODEL: 3196 MTi SIZE: 3x4-10/5V QTY: 1

Operating Conditions

SERVICE

LIQUID Water , Rated Temp. 70.0 deg F, SP.GR 1.000, Viscosity 1.000 cp, Rated/Max. suction pressure 0.0 / 0.0 psi g

CAPACITY Rated 480.0 gpm

HEAD 290.0 (ft)

AMBIENT TEMP Min//Max Temp. 5.0/104.0 deg F

Performance at 3560 RPM per HI 14.6 1B basis power

PUBLISHED EFFY 69.5% (CDS)

RATED EFFY 69.0% with contract seal

RATED POWER 51.6 hp (incl. Mech. seal drag 0.44). (Run out 64.6 hp)

NPSHR 13.2 ft

DISCH PRESSURE (R) 127.7 psi g (146.3 psi g @ Shut off) based on 0.0 psi g rated suction pressure

PERF. CURVE 1616-10 (Rotation CW viewed from coupling end)

SHUT OFF HEAD 338.0 ft

MIN. FLOW Continuous Stable: 167.6 gpm Hydraulic: 167.6 gpm Thermal: N/A

i-FRAME™



Materials

CONSTRUCTION Ductile iron with 316SS impeller

CASING Ductile iron (max.casing pressure @ rated temperature 250.0 psi g)

ST.BOX COVER Ductile iron

IMPELLER 316SS - Open (8.6250 in rated, max=10.0000 in, min=6.0000 in)

CASING GASKETS Aramid Fiber with EPDM and Silicate Filler

IMPELLER O-RING Teflon

SHAFT MATERIAL SAE 4140

SHAFT SLEEVE 316SS

LUBRICATION Flood oil

SEAL CHAMBER Taper bore plus with axial ribs

GLAND 316SS Flush vent and drain with carbon restricting bushing

BEARINGS 6309 (Inboard) / 3309 (Outboard)

COUPLING Rexnord - Omega Rex Elastomer- ES-10 (standard orange element)-S.F. 1.00

COUPLING GUARD Carbon steel

BASEPLATE Cast iron camber top B00051A

Sealing Method

MECHANICAL SEAL Goulds SealPlus SP1CS (Carbon vs Silicon Carbide) - (Cartridge - Single)

Flanges

150# flat face

Frame Connections

Bearing frame drain
 Frame cooler access
 Oil fill connection

Frame Features

Ductile iron frame adapter
 Inpro VBXX-D Hybrid Bearing Isolators
 Iron bearing frame
 Premium Severe Duty Thrust Bearings

Assembly and Testing

Casing & Cover - Standard hydro test
 Impeller balanced to ISO G6.3

Painting

Goulds Blue standard painting

Warranty

5 Year Extended Warranty (All the components, manufactured by ITT Goulds pumps, in the liquid end and power end are covered).

Noise Level Data

Maximum predicted sound pressures level pump only in Decibels (db) Re 0.0002 microbars measured 3ft horizontally and 5ft from the floor per QCP 580

Noise Level	31.5	63	125	250	500	1k	2k	4k	8k	A
Pump	84.0	85.0	81.0	80.0	79.0	78.0	78.0	75.0	74.0	84.0

Driver : Electric motor Manufacturer : Pump Mfg's Choice

FURNISHED BY	Pump Mfg	MOUNTED BY	Pump Mfg
RATING	75.0 hp (55.9 KW)	ENCLOSURE	TEFC - Premium Efficiency
PHASE/FREQ/VOLTS	3/60 Hz/460	SPEED	3600 RPM
INSULATION/SF	F/1.15	FRAME	365TS

Driver Features

Suitable for Variable frequency drive (VFD)

Weights and Measurements

TOTAL NET UNIT WEIGHT / VOLUME	1,321.0 lb / 15.7 ft³
TOTAL GROSS UNIT WEIGHT / GROSS VOLUME	1,521.0 lb / 40.0 ft³

Program Version 1.76.0.0

Drawing Revision Limit

Drawings returned with status approved as noted or revise and re-submit will be corrected and resubmitted only once. Thereafter, additional comments or revisions to these drawings will incur a charge of \$250 per drawing.

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ITT Inc. ('ITT') submits this proposal as the coronavirus (COVID-19) pandemic ('COVID-19') is impacting organizations and its supply chains around the world. ITT is carefully monitoring our supply chain and production facilities as it relates to this proposal but, given the fluid nature of this pandemic, shall not be liable for impacts arising from COVID-19 and accordingly shall be entitled to any adjustments as it relates to time or cost impacts which directly or indirectly resulting out of or arise in connection with COVID-19. Notwithstanding anything contained in this proposal to the contrary, ITT Inc. further reserves the right to modify or amend any statement made within this proposal due to any impacts arising from COVID-19.

[Click here](#) to download the pump Bulletin

[Click here](#) to learn more about the new *i-FRAME™*



PumpSmart® PS220

Intelligent Control and Protection



Customer: CHARLES P CROWLEY CO INC
Project: Beltz Treatment Plant
Date: June 27, 2023
Quote No: AQ23-06-22 01
Revision: 0
Prepared By: Alex Quach
Phone No.: 626-856-5656
Email: alex.quach@cpcrowley.com



ITT



PumpSmart®

ITT Goulds Pumps, Inc.

240 Fall Street
Seneca Falls
NY 13148
USA

PUMPSMART® PS220 Variable Speed Drive

PRICING SUMMARY

Item Number	Qty	Base Unit Description	Catalog Number	Unit Price (USD)	Item Total (USD)
ITEM 004	1	PS220 (Low Voltage) – Advanced PumpSmart Functions, NEMA 1 / IP21, 40.0 hp, 52 Amps, 440 VAC - 500 VAC	K03552A09	6,185	6,185
ITEM 005	1	PS220 (Low Voltage) – Advanced PumpSmart Functions, NEMA 1 / IP21, 75.0 hp, 96 Amps, 440 VAC - 500 VAC	K03552A12	9,226	9,226
	2				15,411

Pricing does not include Export or shipping related costs.

ITT is proud to offer this innovative program that protects against pump failure that commonly results from inadvertent dry-running or operation against a closed discharge valve. If your Goulds pump fails while a PumpSmart Control product is on the job; we will provide the pump and seal repair parts free-of-charge, up to 3 years for a new Goulds pump or 18 months for an existing installed Goulds pump. See your Goulds Pumps representative to see what pumps are currently covered under this program.

*3-Year Reliability Challenge terms and conditions apply.



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- 1.2 APPLICABLE SPECIFICATIONS**
- 1.3 SPECIFIC TECHNICAL COMMENTS/EXCEPTIONS**
- 1.4 CLARIFICATIONS AND EXCEPTIONS TO SPECIFICATIONS**
- 1.5 SCOPE OF SUPPLY**
 - 1.5.1 Specification Table
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- 1.8 WARRANTY**
- 1.9 SHIPPING**
- 1.10 TERMS OF PAYMENT**
 - 1.10.1 Commissioning
- 1.11 MISCELLANEOUS TERMS OF PAYMENT**
 - 1.11.1 Storage
 - 1.11.2 Intellectual Properties
 - 1.11.3 Terms of Sale
- 1.12 SERVICE RATES**

TERMS & CONDITIONS OF SALE

1.1 DESCRIPTION

ITT Monitoring and Control is pleased to present the ITT PumpSmart PS220 variable speed drive. The PS220 is the powerful combination of a standard variable speed drive and over 150 years of pump hydraulic design and pump process knowledge. By leveraging commonly available information through the variable speed drive such as speed, power and torque PumpSmart provides key pump performance indicators which maximizes control and reduces energy consumption over a standard variable speed drive. Key Features included with PumpSmart are:

SmartFlow*

Using speed and torque data from the motor and by modeling the pump performance curve PumpSmart is able to calculate the flow of the pump without any external instrumentation. SmartFlow requires no sensors for pump specific speeds of 3000 or less, and only a differential pressure transmitter for specific speeds above 3000.

Pump Protection – Because PumpSmart knows where the pump is operating on the pump performance curve at any speed, PumpSmart can alert an operator or fault the pump in the event of a process upset condition such as dry-run, dead-head, minimum-flow or run-out.

Multi-Pump Operation

A properly controlled variable speed multi-pump system is one of the most efficient and flexible means to meet highly variable systems. However coordinating the control of the system is highly variable and considerations such as optimally staging and de-staging pumps, balancing flow between pumps, distributing pump wear, and providing fault back-up detection must be factored into the control scheme. PumpSmart takes all these factors into account and provides the most efficient multi-pump control logic, all without and external PLC. Up to six pumps may be connected in a single Multipump arrangement. Staging and de-staging may be user defined or may be left to the PS220 to stage based on best efficiency.

Cavitation Protection

By monitoring a suction pressure transmitter PumpSmart provides an active condition monitoring function to protect the pump from the onset of cavitation. This unique feature is not just a general alarm. PumpSmart will intelligently reduce the speed on the pump which in turns reduces the NPSH requirements of the pump. This allows the pump to operate within the acceptable suction pressure conditions and still produce the maximum flow the pump system will allow. Once suction pressure conditions are restored to safe levels the pump will resume normal operating conditions.

Platform

The PS220 drive series is a microprocessor based Direct Torque Controlled (DTC) adjustable speed AC drive based on the ABB ACS880 drive platform. The PS220 drive takes advantage of sophisticated microprocessor control and advanced IGBT power switching technology to deliver high-performance control of AC motors for a wide range of applications.

*SmartFlow requires the pump's specific speed to be under 3000 and viscosity must not be dynamically changing.

[Click here to download the pumpsmart Bulletin](#)

1.2 APPLICABLE SPECIFICATIONS

Any specifications not explicitly included as part of this proposal are excluded from this offering.

The following specifications apply:

No applicable Low Voltage Variable Speed/Frequency Drive specifications were provided.

1.3 SPECIFIC TECHNICAL COMMENTS/EXCEPTIONS

Drive Features

- Wall mounting
- UL Type 1/IP21 protection class
- Compact design
- 3% Harmonic filtering AC choke inside
- Input rectifier protection
- Bottom entry and exit for cables
- Conformal coated PC boards
- Simple to use Wizard programming
- Safe Torque Off

1.4 CLARIFICATIONS AND EXCEPTIONS TO SPECIFICATIONS

General

We propose to supply the PumpSmart PS220 drive design on the ABB ACS880 platform with features indicated in this proposal.

This quotation is ITT's best interpretation of the information given us for the purpose of quotation. It is the responsibility of the customer to verify that this proposal meets the specifications for this project. No other equipment or material is expressed or implied.

ITT is acting as an equipment supplier only, not as a contractor, or sub-contractor. The listed specifications, (see Applicable Specifications) are applicable only to the extent of the ITT "Equipment Provider" scope of supply as described.

Specifically not included in this proposal is: Special crating, offloading at job-site, storage, installation and testing equipment, foundations, anchor bolts, templates, external wiring, field testing, independent analysis, seismic calculations and video taping of seminars. These items are the sole responsibility of the purchaser.

1.5 SCOPE OF SUPPLY

1.5.1 Specification Table

Drive Only

Item / Tag	Qty	Catalog Number
ITEM 004	1	K03552A09

Item Description	
Input Voltage:	440 VAC - 500 VAC
Rated Output Current:	52
Construction:	Wall Mount
Enclosure:	NEMA 1 / IP21
Nominal Horsepower:	40.0 hp
Frame Size:	R4
Input Disconnecting Means:	By Others
Bypass:	No
Input Impedance:	3%
Communication Protocols:	None
Other Options:	

Drive Input Fuse Ratings		
Amps (600 V)	Supplied By	Bussmann Type (or equal)
52	No, by others	690V, 100A, Bussmann# 170M1567, Type DIN 43620: 000 / 600V, 80A, Bussmann# JJS-80, Type T

Dimensions and Weights		
Height x Width x Depth (in / mm)	Weight lbs / kg	Dimension Drawing
22.7"H x 8.0"W x 10.8"D / 580mm H x 203mm W x 274mm D	41.0 / 19.0	FS4_N1_IP21

Heat Dissipation & Airflow Requirements			
Power Losses		Airflow	
Watts	BTU/Hr	CFM	CM/Hr
907.0	3095.0	165.0	280.0

Note: Table details are not for construction and are subject to change.

1.5 SCOPE OF SUPPLY

1.5.1 Specification Table

Drive Only

Item / Tag	Qty	Catalog Number
ITEM 005	1	K03552A12

Item Description	
Input Voltage:	440 VAC - 500 VAC
Rated Output Current:	96
Construction:	Wall Mount
Enclosure:	NEMA 1 / IP21
Nominal Horsepower:	75.0 hp
Frame Size:	R6
Input Disconnecting Means:	By Others
Bypass:	No
Input Impedance:	3%
Communication Protocols:	None
Other Options:	

Drive Input Fuse Ratings		
Amps (600 V)	Supplied By	Bussmann Type (or equal)
96	No, by others	690V, 200A, Bussmann# 170M3815, Type DIN 43620: 1 / 600V, 150A, Bussmann# JJS-150, Type T

Dimensions and Weights		
Height x Width x Depth (in / mm)	Weight lbs / kg	Dimension Drawing
28.6"H x 9.9"W x 14.1"D / 726mm H x 251mm W x 357mm D	93.0 / 42.0	FS6_N1_IP21

Heat Dissipation & Airflow Requirements			
Power Losses		Airflow	
Watts	BTU/Hr	CFM	CM/Hr
1295.0	4419.0	256.0	435.0

Note: Table details are not for construction and are subject to change.

PUMPSMART® PS220 Variable Speed Drive

1.6 PS220 SPECIFICATIONS

1.6.1 Input Connection

Input Voltage	380/400/415/440/460/480/500Vac 3-phase +10%/-15%
Frequency	50/60 Hz ±5%
Line Limitations	Max +/-3% of nominal phase to phase input voltage
Fundamental Power Factor	0.98
Connection	U1, V1, W1
Nominal Impedance	Reactor with ~3% impedance - DC (R1 through R9 Frame)

1.6.2 Output (Motor) Connection

Output Voltage	0 to U1, 3-phase symmetrical, Umax at the field weakening Point
Output Frequency	0-500Hz
Frequency Resolution	0.01 Hz
Continuous Output Current	1.0 * I2Ld (light duty use), 1.0* I2hd (heavy-duty use)
Short Term Overload Capacity	I2Ldmax = 1.1 * I2Ld (1 min / 5 minutes @ 40°C), typical Ihdmax = 1.5 * I2hd (at least 1 min / 5 min @ 40°C)
Peak Overload Capacity	IMath.max (400 Vac and 500 Vac) (at least 10 seconds at start)
Field Weakening Point	8 to 500 Hz
Switching Frequency	2.7 kHz (average), DTC dynamically varies from 1 to 12kHz
Acceleration & Deceleration Time	Adjustable 0 to 1800 Sec
Efficiency	98% at nominal power level
Short circuit withstand rating	100,000 AIC (UL) R1-R9 when protected by fuses given in the hardware manual
Connection	U2, V2, W2

1.6.3 Enclosure

Style	NEMA 1 / IP21
-------	---------------

1.6.4 Agency Approval

Listing and Compliance	UL and CSA
------------------------	------------

1.6.5 Ambient Conditions, Operation

Air Temperature	0° to 40°C (104°F), above 40°C the maximum output. Current is de-rated 1% for every additional 1°C (up to 55°C) (131°F) maximum for -01 drives. Relative Humidity: 5 to 95%, no condensation allowed, maximum relative humidity is 60% in the presence of corrosive gasses
-----------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Contamination Levels

IEC	60721-3-1, 60721-3-2 and 60721-3-3
Chemical Gasses	Class 3C2
Solid Particles	Class 3S2
Installation Site Altitude	0 to 1000m (3281ft) above sea level. At sites over 1000m (3281ft) above sea level, the maximum power is de-rated 1% for every additional 100m (330ft). Maximum altitude 4000m (13123 ft) above sea level.
Vibration Max	1mm (0.04") 5 to 13.2 Hz, Max 7 m/s2 (23 ft/s2) 13.2 to 100 Hz Sinusoidal

1.6.6 Ambient Conditions, Storage, Transportation (in Protective Shipping Package)

Air Temperature	0° to 40°C (104°F), above 40°C the maximum output. Current is de-rated 1% for every additional 1°C (up to 55°C) (131°F) maximum for -01 drives
Relative Humidity	5 to 95%, no condensation allowed, maximum relative humidity is 60% in the presence of corrosive gasses

PUMPSMART® PS220 Variable Speed Drive

Atmospheric Pressure	5 to 95%, no condensation allowed, maximum relative humidity is 60% in the presence of corrosive gasses
Vibration Max	1mm (0.04") 5 to 13.2 Hz, Max 7 m/s ² (23 ft/s ²) 13.2 to 100 Hz
Shock (IEC 60068-2-29)	Max 100 m/s ² (330 ft/s ²) 11 ms
Free Fall	100mm (4 in.) for weight greater than 100Kg (220lbs)

Specifications are subject to change without notice. Please consult the factory when specifications are critical.

1.6.7 Auxiliary Power Supply (XD 24:2 and XD 24:4)

Voltage	24 Vdc, +/- 10%
Maximum Current	200 mA – minus load taken by DIO1 and DIO2
Protection	Short Circuit Protection

1.6.8 Control Terminal Blocks

Size	Size 0.5 ... 2.5 mm ² (24...12 AWG) - All control terminal blocks
Torque	Tightening torques: 0.5 N•m (5 lbf•in) for both stranded and solid wiring

1.6.9 Analog Inputs

Two (2) Programmable Differential Inputs

Two (2) Current or Voltage Signals	0 (4) to 20 mA, Input Resistance RI => 100 ohms or -10Vdc / 0(2) to +10Vdc, Input Resistance RI => 200 k-ohms
Common Mode Voltage	+/-15 Vdc, max.
Common Mode Rejection Ratio	> 60 dB at 50 Hz
Resolution	0.025% (12 bit) (11 bit + Sign bit)
Accuracy	+/-0.5% of Full Scale Range
Input Updating Time	1 ms (Primary Control Program)
Optional Isolation	Available through optional external module

1.6.10 Reference Power Supply

Voltage	+10Vdc, 0, -10Vdc +/- 0.5% at 25° C (77° F)
Maximum Load	10 mA
Applicable Potentiometer	1 k-ohm to 10 k-ohm

1.6.11 Analog Outputs

Two (2) Programmable Current Outputs

Signal Level	0 (4) to 20 mA
Resolution	0.025% (12 bit) (11bit +Sign Bit)
Accuracy	+/-1% Full Scale Range
Maximum Load Impedance	500 ohms
Output Updating Time	1 ms (Primary Control Program)
Frequency Range	0-300Hz

1.6.12 Digital Inputs

Six (6) Programmable Digital Inputs (Common Ground), plus One (1) Start Interlock

Isolation	Isolated
Isolation Test Voltage	500 VAC, 1 minute
Input Type	NPN/PNP (DI1...DI5), NPN (DI6)
Signal Level	24Vdc
Rin	2.0 kOhms
Logical switch thresholds	< 5Vdc at '0', >15Vdc at '1'
Input Current	15 mA, Digital Input 1 to Digital Input 5, 5 mA Digital Input 6

PUMPSMART® PS220 Variable Speed Drive

Filtering Time Constant	Hardware Filter .04 ms
Input Updating Time	Digital Filtering up to 8 ms (Primary Control Program)

Internal 24 Vdc Supply for Digital Inputs

Voltage	24Vdc
Maximum Current	200 mA
Connector	XD24:2 and XD24:4
Protection	Short Circuit Proof

An external 24 Vdc supply may be used instead of the internal supply

1.6.13 Digital Inputs/Output

Two (2) Programmable Digital Inputs/Outputs

Isolation	Isolated
Input Configuration	DIO1 frequency input (0 ... 16KHz with 4 microsecond hardware filtering)
Output Configuration	DIO2 frequency output (0 ... 16KHz with 4 microsecond hardware filtering)
Signal Level	24Vdc
Rin	2.0 kOhms
Logical input switch thresholds	< 5Vdc at '0', >15Vdc at '1'
Filtering Time Constant	0.25 ms
As output	Total output current from +24VD is limited to 200 ma

1.6.14 Relay Outputs

Three Programmable Relay Outputs

Switching Capacity	2 A at 30Vdc or 250Vac
Maximum Continuous Current	IC = 2 Amps RMS
Protection	Varistors (250 V)
Output Updating Time	1 ms (Primary Control Program)

1.6.15 Safe Torque Off Connection

Input Voltage Range	-3 ... 30 V DC
Logical input switch thresholds	< 5Vdc at '0', >17Vdc at '1' Both input connection must be closed for the drive to start
Current Consumption	55 mA (continuous)
EMC Immunity	according to IEC 61326-3-1

1.6.16 Protections

Single Phase	Protected (input & output)
Over Voltage Trip Limit	$1.3 * U_{1max}$
Under Voltage Trip Limit	$0.65 * U_{1min}$
Over Temperature	Protected
Motor Stall Protection	Protected
Motor Over Temperature	Protected (I2t)
Cross Cable Connection	Protected

COMMERCIAL TERMS

1.7 DOCUMENTATION REQUIREMENTS

Submittal Documentation

All documentation is submitted electronically only

Data Table

General Arrangement Drawing

General Specifications

NOTE: ITT reserves the right to charge the customer for additional documentation requests outside the Scope of Supply.

1.8 WARRANTY

Warranty is one year from date of startup, not to exceed 18 months after date of shipment, and covers defects in workmanship and materials only. This warranty is provided when factory start up is done by a PumpSmart Certified technician. Warranty is limited to the value of the ITT supplied equipment. The standard ITT terms and conditions of sale will apply to any purchase order resulting from this proposal unless other terms and conditions are specifically negotiated in written form and signed as acceptable.

IN NO EVENT WILL CONSEQUENTIAL AND/OR LIQUIDATED DAMAGES BE ACCEPTED.

1.9 SHIPPING

Freight for Drives is quoted FOB SFO

Submittal Documents 2 weeks ARO

6-8 weeks for frame sizes R1-R7 Wall Mount Drives 380-500Vac (from ARAD) typical*

*Delivery quoted is based on shop loading at time of quote and may change based on shop loading at time of order release.

Please contact M&C for expedite requests.

1.10 TERMS OF PAYMENT

All pricing shown is firm for order entry within 90 days.

Terms of payment Net 30

Prices do not include export boxing or taxes

1.10.1 Commissioning

PumpSmart commissioning services are performed by a factory Certified PumpSmart Technician and can increase the drive warranty to 3 years from date of shipment from the factory. This Commissioning Service line option is an estimate based on the pump and drive being ready for startup when the Technician arrives and all necessary resources being available at time of startup. If additional time becomes necessary it will be billed at rates identified in the following Service Rates document. Service includes one day onsite plus travel time and expenses. See section 1.12 for a copy of commissioning and service rates.

1.11 MISCELLANEOUS TERMS OF PAYMENT

1.11.1 Storage

Provisions must be made by the receiving party for storage in a clean, dry, temperature controlled facility immediately after conducting a thorough receiving inspection. In the event purchaser is unable to accept shipment upon notification of ITT readiness to ship, goods shall be placed in suitable storage by ITT. Storage charges, escalation charges (if applicable) and any charges for re-inspection by Q.A., will be accrued to the account of purchaser. Storage for longer than one year may require the PumpSmart drive capacitors to be restored at additional cost.

1.11.2 Intellectual Properties

Right to all intellectual properties, developed by ITT, remains the property of ITT.

1.11.3 Terms of Sale

The standard ITT terms and conditions of sale will apply in accordance to the IP500 document to any purchase order resulting from this quotation unless other terms and conditions are specifically negotiated in written form and signed as acceptable by ITT. Freight prices, if quoted, are based on means of transportation selected by ITT. Special means of transport directed by customer purchase order will incur additional freight charges. A copy of the IP500 document is available upon request.

1.12 SERVICE RATES

Includes PumpSmart®, ProSmart®, iAlert® products, training, service, commissioning or startup related services as needed for successful implementation of any of the Monitoring and Control products globally where applicable. Additional charges/expense may apply in certain regions and areas of the global coverage of ITT. Hazardous regions, regions under conflict, war or countries on embargoed list may not be available for service(s) performed by ITT and is subject to current corporate laws, restrictions as outlined by ITT or governments. It is required that ITT personnel verify subject country, state; region is approved for authorized product startup, commissioning, service or training.

SUPERVISION OF INSPECTION, START -UP, FIELD TESTING AND/OR PROGRAMMING SERVICE FOR DOMESTIC ORDERS

(a) The equipment shall be installed and put into operation by and at the expense of the Purchaser. Upon request of the Purchaser, the ITT Monitoring & Control group will furnish the services of a Field Service Engineer or qualified Technician to advise and assist the Purchaser/owner/operator in the inspection and/or startup of the machinery. The Purchaser shall furnish safe and proper working conditions and safe storage of any special tools. The Purchaser shall furnish all necessary labor, cranes, cribbing; oil, supplies, station operating force, steam, electricity, extensions, water, and other material and supplies required to install and operate the equipment to desired load and shall furnish free available crane and switching service and the service of operators and other employees that may be deemed necessary for full load pump testing and operation.

(b) ITT Monitoring & Controls shall not be responsible for material furnished by the Purchaser or for acts, or failures to act, site delays out of control of M&C, personnel furnished by Purchaser nor shall Goulds Pumps be responsible for the construction of foundations or for the soil conditions upon which they are built. Goulds Pumps provides no warranties, either expressed or implied, in construction with this service.

(c) Additional outside of scope technical support by site shall be (if necessary) by owner and site responsibility. Outside of scope changes or additions shall be billed according to charges below by ITT M&C and/or with outside contracted ITT companies as necessary and proposed in writing.

(d) Unless otherwise stipulated or agree upon in writing, the Purchaser shall pay for:

1. At the rate of 1840 USD per day for each standard (8) eight-hour day worked or spent in travel to and from the job site, plus all travel and living expenses of the Field Service Engineer/Technician from the time of leaving base location until return and all shipping charges and rentals for any special tools and materials as may be required.

2. Hours worked in excess of the standard eight-hour (8) days, Monday through Friday, and hours worked on Saturday, Sunday and holidays, will be billed in accordance with the following schedule:

Monday through Friday over eight hours	345 USD per hour*
Saturday all hours	345 USD per hour*
Sundays and holidays all hours	460 USD per hour*

*Other countries and regions may have different weekly schedules and can be adjusted based on in country work week and specified weekend.

3. Overtime rates will be charged for time spent in travel as such if requested by Purchaser.

4. The rates specified in Items 1. and 2. above are not subject to change provided the Engineer/Technician begins to perform these services within one year from the date of proposal.

5. Minimum billing for less than four hours worked or spent in travel will be 50 percent of the daily rate.

6. The minimum billing for more than four hours but less than eight hours worked or spent intravel will be the full daily rate.

7. The time when the Engineer/Technician is ready, willing and able to work at the job site Monday through Friday shall be considered to be time worked for the purpose of this paragraph, even if services are not utilized or site is not ready.

8. All travel and living expenses will be billed at actual cost-plus a 15% handling charge. Domestic air travel will be via tourist, coach or economy class when available. Travel via company car will be billed at \$0.82 per mile.

PUMPSMART® PS220 Variable Speed Drive

- (e) When a per diem rate is stipulated in lieu of the rate shown in Paragraph (d)1, it will include local travel and living expenses at the jobsite only. Travel expenses between base location and jobsite, and shipping charges and rentals for any special tools and materials will be billed to Purchaser. Overtime charges will be in accordance with Paragraphs (d)2 and (d)3.
- (f) Invoices rendered to the Purchaser are payable upon receipt of the invoice. Sales or other applicable taxes shall be charged to the Purchaser.
- (g) The Buyer shall be required to contact Primary Sales Person (John Crowley, Phone #:) two (2) weeks prior to initial start-up of pumps in order to schedule Field Engineer/Technician to the jobsite. If time sheets are required by the customer, they shall be provided by the customer and signed after services are performed by both the customer and Field Engineer/Technician.
- (h) Before initial startup of the equipment a preliminary check of the pump and installation will be conducted by the field Engineer / Technician. Follow the guide lines established in the Attached "Field Service Installation and Startup Checklist".
- (i) After startup has been successfully completed the field Engineer / Technician will follow-up with a field report of observations / conclusions and recommendations.
- (j) Official owner signoff shall be performed after successful operation of equipment as stated releasing ITT M&C of site requirements. Future returns to the site (including warranty calls) will be billed at same rates as section (d)

CHARLES P CROWLEY CO INC

Proposal No: AQ23-06-22 01

Item No: ITEM 004 (Base Offer)

Attn: Kati Nguyen

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Charles P. Crowley
15861 Business Center
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Irwindale, CA 91706
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Fax: 626-856-5658
Email:
alex.quach@cpcrowley.co
m

June 27, 2023

**PUMPSMART VARIABLE SPEED DRIVE SYSTEMS: PS220 (Low Voltage) –
Advanced PumpSmart Functions QTY: 1**

Operating Site Conditions

OPERATING TEMP. 5.0 deg F minimum, 104.0 deg F maximum (no de-rate required)
ELEVATION 3,281.0 ft ASL maximum (no de-rate required)
MAX MOTOR CABLE 984.00 ft

Controller Ratings

CONTROLLER PART NO. K03552A09
POWER 40.0 hp (based on NEMA ratings for typical 4-pole motor, check motor
current for compatibility)
MAXIMUM CURRENT 52A Continuous
SUPPLY VOLTAGE 440 VAC - 500 VAC
RECOMMENDED FUSE SIZE 600V, 80A, Bussmann# JJS-80, Type T

Controller Platform

DRIVE PLATFORM ABB ACS880-01
DRIVE FRAME SIZE R4
WEIGHT 41.0 lb
ENCLOSURE RATING NEMA 1 / IP21

The PS220 is an integrated pump controller that can increase the Flow Economy and Reliability of your pump and system. Use the PS220 to replace a traditional motor starter to take advantage of the adjustable soft starter and add the flexibility to dial in the pump speed to match the process demand. The PS220 protects the pump from upset conditions with patented pump protection algorithms and the motor from overload conditions. The PS220 is the complete pump controller package and can be applied to any centrifugal or positive displacement pump.

Pump Insight - With features such as SMARTFLOW Sensorless Flow and the Flow Economy Calculator the PS220 provides the information you need to help run you process smoothly and efficiently.

Advanced Pump Protection - Use the patented Sensorless Pump Protection to protect the pump from upset conditions such as dry-run, low-flow, dead-head and run-out at any operating speed.

Flow Economy - By righting sizing the pump to the process demand the Flow Economy of your pump is optimized which will reduce energy consumption and overall total operating cost.

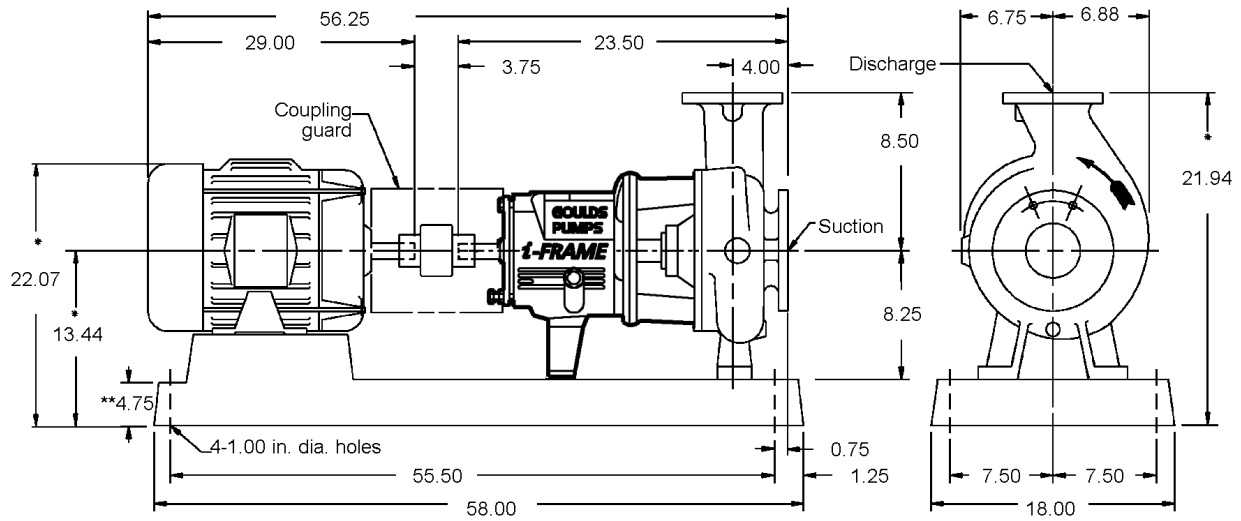
Process Control - As standard PumpSmart systems come equipped with advanced process control features that help optimize your pumping system for maximum uptime, reliability and energy savings.

Pump Knowledge - With over 150 years of pump expertise be confident your pump has been optimally selected and is properly protected by the people who know pumps. If you have a pump that can benefit from any of these features let the pump experts evaluate your system and recommend the best PumpSmart solution.



Our offer does not include specific review and incorporation of any Statutory or Regulatory Requirements and the offer is limited to the requirements of the design specifications. Should any Statutory or Regulatory requirements need to be reviewed and incorporated then the Customer is responsible to identify those and provide copies for review and revision of our offer.

****** Our quotation is offered in accordance with our comments and exceptions identified in our proposal.**



Pump Specification

SUCT.FLANGE SIZE	3"	DRILLING	ANSI 150#	FACING	RF	FINISH	SERRATED
DISCH.FLANGE SIZE	1.5"	DRILLING	ANSI 150#	FACING	RF	FINISH	SERRATED
PUMP ROTATION (LOOKING AT PUMP FROM MOTOR)			CW				
TYPE OF LUBRICATION	FLOOD OIL		COOLED		NO		
TYPE OF STUFFING BOX	TAPER BORE PLUS WITH VPE		COOLED		NO		
TYPE OF SEALING	MECHANICAL SEAL						

Weights and Measurements

PUMP/PUMPSMART	240.0/41.0 lb
MOTOR/CPLG	560.0/8.2 lb
BASEPLATE	205.0 lb
TOTAL	1,013.2 lb
GR.VOLUME w/BOX	35.5 ft ³
GR.WEIGHT w/BOX	1,191.2 lb

Motor Specification

MOTOR BY	PUMP MFG	MOUNT BY	PUMP MFG	MFG.	PUMP MFG'S CHOICE OR EQUAL
FRAME	324TS	POWER	40.0 hp	RPM	3600
PHASE	3	FREQUENCY	60 HZ	VOLTS	460
INSULATION	F	S.F.	1.15		
ENCLOSURE	TEFC - PREMIUM EFFICIENCY				

Notes and References

- MTR DIMENSIONS ARE APPROXIMATE
 - INSTALL FOUNDATION BOLTS IN PIPE SLEEVES
 - ALLOW FROM 0.75 to 1.50in. FOR
 - THE BASEPLATE IS DESIGNED FOR GROUT INSTALLATION UNLESS OTHERWISE NOTED. REFER TO THE INSTALLATION MANUAL INSTRUCTIONS.
 - * Tolerance is -0.38 +0.38
 - ** Foundation bolt grip thickness
- FOR PUMP TAPPED OPENINGS REFER TO DWG.:
TAQ23-06-22 01 / ITEM 004

Auxiliary Specification

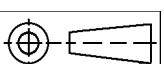
COUPLING BY	PUMP MFG	CPLG TYPE	REXNORD OMEGA REX ELASTOMER- ES-5 (STANDARD ORANGE)
CPL GUARD BY	PUMP MFG	CPLG GUARD MATL.	CARBON STEEL
BASEPLATE	CAST IRON CAMBER TOP B00051A		
MECH.SEAL	GOULDS SEALPLUS SP1CS (CARBON VS SILICON CARBIDE)		

DRAWING IS FOR REFERENCE ONLY.
NOT CERTIFIED FOR CONSTRUCTION UNLESS SIGNED.

Customer: CHARLES P CROWLEY CO INC
Serial No:
Customer P.O. No:
Item No: ITEM 004 (Base Offer)
Project No: Beltz Treatment Plant
End User: Santa Cruz

DRAWING NO AQ23-06-22 01/ITEM 004

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ITT Corp



All dimensions are in inches.
Drawing is not to scale
Weights (lbs) are approximate

Job/Inq.No. :

Purchaser : CHARLES P CROWLEY CO INC

End User: Santa Cruz

Issued by : Alex Quach

Item/Equip.No. : ITEM 004 (Base Offer)

Quotation No. : AQ23-06-22 01

Date : 06/27/2023

Service :

Order No. :

Certified By :

Rev. : 0

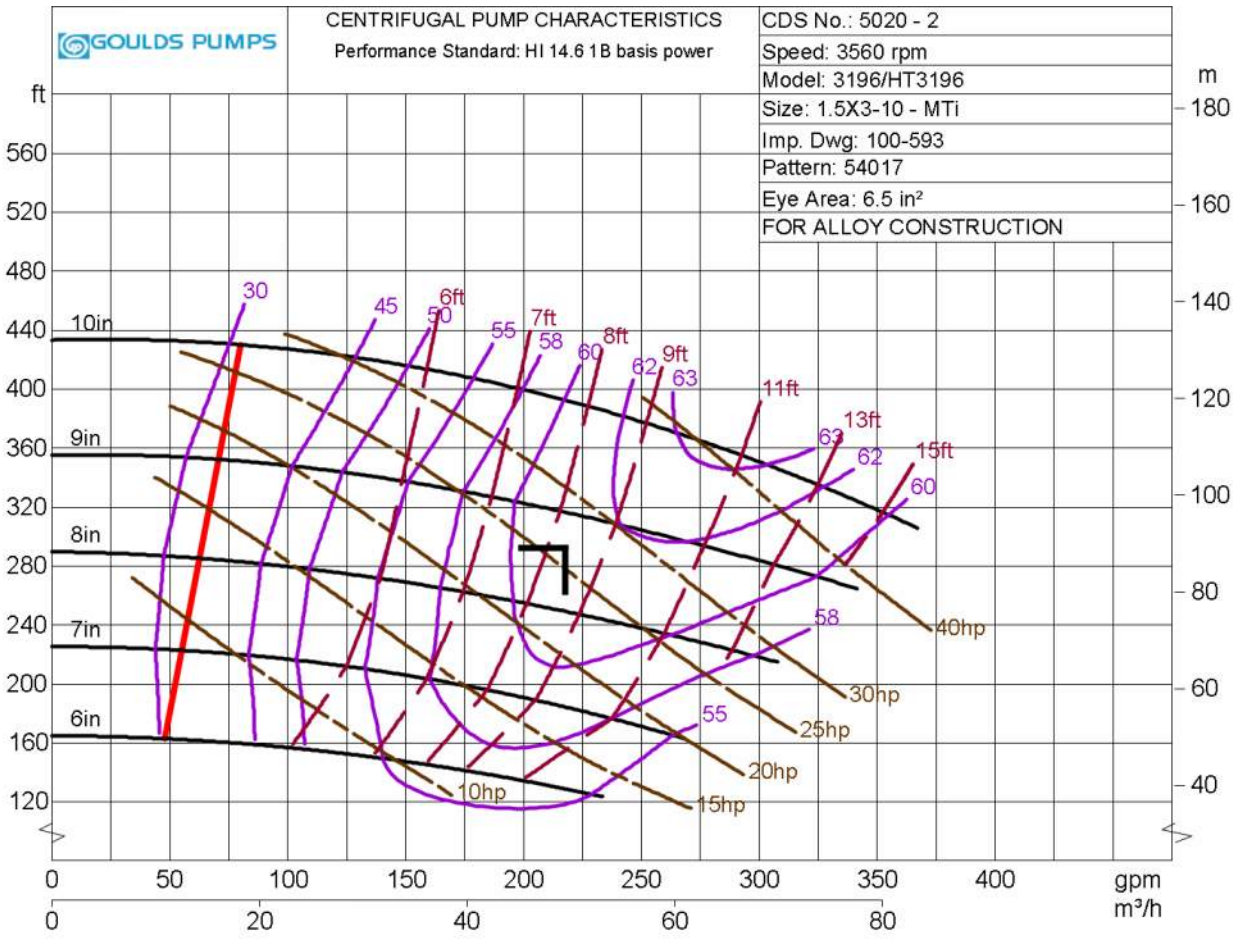
Operating Conditions

Liquid: Water
 Temp.: 70.0 deg F
 S.G./Visc.: 1.000/1.000 cp
 Flow: 219.0 gpm
 TDH: 290.0 ft
 NPSHa:
 Solid size:
 % Susp. Solids (by wtg):

Pump Performance

Published Efficiency: 61.0 %
 Rated Pump Efficiency: 60.0 %
 Rated Total Power: 27.0 hp
 Non-Overloading Power: 36.1 hp
 Imp. Dia. First 1 Stg(s): 8.6875 in
 NPSHr: 8.4 ft
 Shut off Head: 334.3 ft
 Vapor Press:
 Suction Specific Speed: 10,432 gpm(US) ft
 Min. Hydraulic Flow: 68.1 gpm
 Min. Thermal Flow: N/A
 Max. Solids Size: 0.2190 in

- Notes:**
1. Power and efficiency losses are not reflected on the curve below.
 2. Curve shown is at ambient temperature conditions.



Job/Inq.No. :

Purchaser : CHARLES P CROWLEY CO INC

End User : Santa Cruz

Issued by : Alex Quach

Rev. : 0

Item/Equip.No. : ITEM 004 (Base Offer)

Quotation No. : AQ23-06-22 01

Date : 06/27/2023

Service :

Order No. :

Certified By :

Operating Conditions

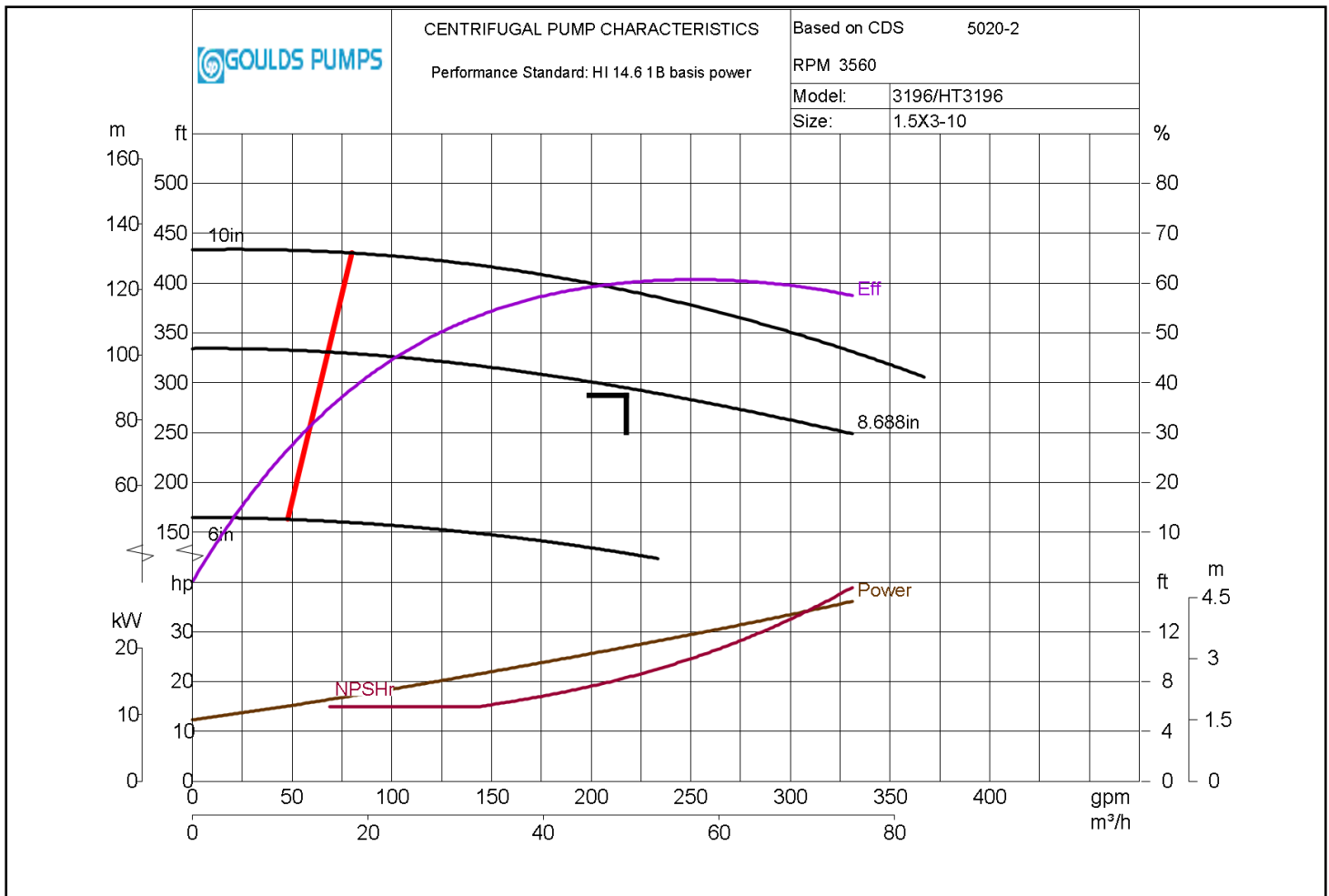
Liquid: Water
 Temp.: 70.0 deg F
 S.G./Visc.: 1.000/1.000 cp
 Flow: 219.0 gpm
 TDH: 290.0 ft
 NPSHa:
 Solid size:

Pump Performance

Published Efficiency: 61.0 %
 Rated Pump Efficiency: 60.0 %
 Rated Total Power: 27.0 hp
 Non-Overloading Power: 36.1 hp
 Imp. Dia. First 1 Stg(s): 8.6875 in
 NPSHr: 8.4 ft
 Max. Solids Size: 0.2190 in
 Suction Specific Speed: 10,432 gpm(US) ft
 Min. Hydraulic Flow: 68.1 gpm
 Min. Thermal Flow: N/A
 Shut off Head: 334.3 ft
 % Susp. Solids (by wtg):

Vapor Press:

Notes: 1. Curve shown is at ambient temperature conditions.



Viscosity corrections have been performed in accordance with HI 9.6.7-2015

CHARLES P CROWLEY CO INC

Proposal No: AQ23-06-22 01

Item No: ITEM 005 (Base Offer)

Attn: Kati Nguyen

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m

June 27, 2023

**PUMPSMART VARIABLE SPEED DRIVE SYSTEMS: PS220 (Low Voltage) –
Advanced PumpSmart Functions QTY: 1**

Operating Site Conditions

OPERATING TEMP. 5.0 deg F minimum, 104.0 deg F maximum (no de-rate required)
ELEVATION 3,281.0 ft ASL maximum (no de-rate required)
MAX MOTOR CABLE 984.00 ft

Controller Ratings

CONTROLLER PART NO. K03552A12
POWER 75.0 hp (based on NEMA ratings for typical 4-pole motor, check motor
current for compatibility)
MAXIMUM CURRENT 96A Continuous
SUPPLY VOLTAGE 440 VAC - 500 VAC
RECOMMENDED FUSE SIZE 600V, 150A, Bussmann# JJS-150, Type T

Controller Platform

DRIVE PLATFORM ABB ACS880-01
DRIVE FRAME SIZE R6
WEIGHT 93.0 lb
ENCLOSURE RATING NEMA 1 / IP21

The PS220 is an integrated pump controller that can increase the Flow Economy and Reliability of your pump and system. Use the PS220 to replace a traditional motor starter to take advantage of the adjustable soft starter and add the flexibility to dial in the pump speed to match the process demand. The PS220 protects the pump from upset conditions with patented pump protection algorithms and the motor from overload conditions. The PS220 is the complete pump controller package and can be applied to any centrifugal or positive displacement pump.

Pump Insight - With features such as SMARTFLOW Sensorless Flow and the Flow Economy Calculator the PS220 provides the information you need to help run you process smoothly and efficiently.

Advanced Pump Protection - Use the patented Sensorless Pump Protection to protect the pump from upset conditions such as dry-run, low-flow, dead-head and run-out at any operating speed.

Flow Economy - By righting sizing the pump to the process demand the Flow Economy of your pump is optimized which will reduce energy consumption and overall total operating cost.

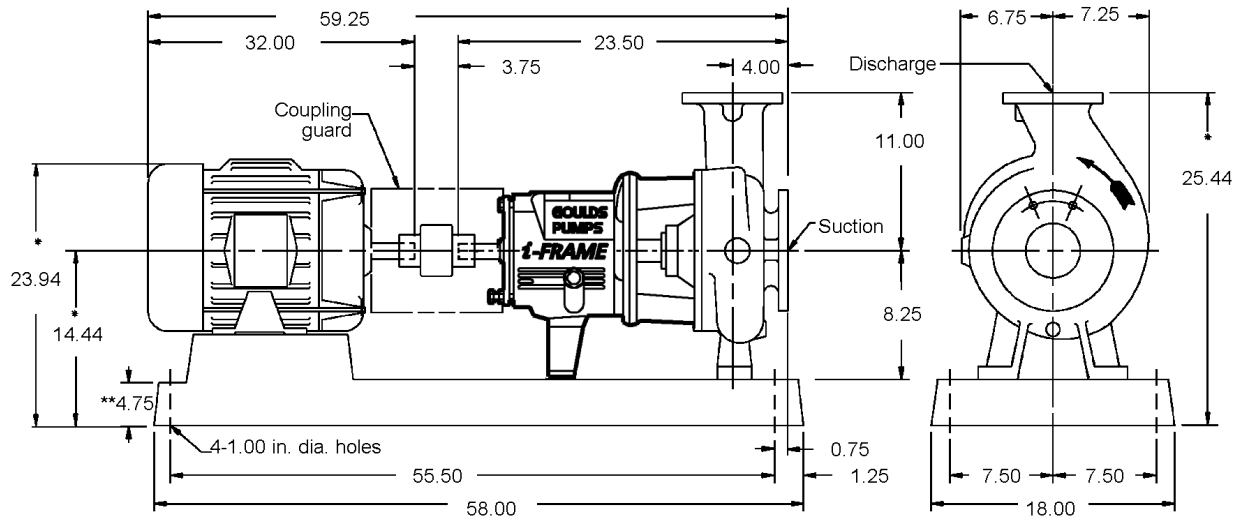
Process Control - As standard PumpSmart systems come equipped with advanced process control features that help optimize your pumping system for maximum uptime, reliability and energy savings.

Pump Knowledge - With over 150 years of pump expertise be confident your pump has been optimally selected and is properly protected by the people who know pumps. If you have a pump that can benefit from any of these features let the pump experts evaluate your system and recommend the best PumpSmart solution.



Our offer does not include specific review and incorporation of any Statutory or Regulatory Requirements and the offer is limited to the requirements of the design specifications. Should any Statutory or Regulatory requirements need to be reviewed and incorporated then the Customer is responsible to identify those and provide copies for review and revision of our offer.

****** Our quotation is offered in accordance with our comments and exceptions identified in our proposal.**



Pump Specification

SUCT.FLANGE SIZE	4"	DRILLING	ANSI 150#	FACING	FF	FINISH	SERRATED
DISCH.FLANGE SIZE	3"	DRILLING	ANSI 150#	FACING	FF	FINISH	SERRATED
PUMP ROTATION (LOOKING AT PUMP FROM MOTOR)				CW			
TYPE OF LUBRICATION	FLOOD OIL			COOLED	NO		
TYPE OF STUFFING BOX	TAPER BORE PLUS WITH AXIAL RIBS			COOLED	NO		
TYPE OF SEALING	MECHANICAL SEAL						

Weights and Measurements

PUMP/PUMPSMART	285.0/93.0 lb
MOTOR/CPLG	820.0/11.0 lb
BASEPLATE	205.0 lb
TOTAL	1,321.0 lb
GR.VOLUME w/BOX	40.0 ft ³
GR.WEIGHT w/BOX	1,521.0 lb

Motor Specification

MOTOR BY	PUMP MFG	MOUNT BY	PUMP MFG	MFG.	PUMP MFG'S CHOICE OR EQUAL
FRAME	365TS	POWER	75.0 hp	RPM	3600
PHASE	3	FREQUENCY	60 HZ	VOLTS	460
INSULATION	F	S.F.	1.15		
ENCLOSURE	TEFC - PREMIUM EFFICIENCY				

Notes and References

- MTR DIMENSIONS ARE APPROXIMATE
 - INSTALL FOUNDATION BOLTS IN PIPE SLEEVES
 - ALLOW FROM 0.75 to 1.50in. FOR
 - THE BASEPLATE IS DESIGNED FOR GROUT INSTALLATION UNLESS OTHERWISE NOTED. REFER TO THE INSTALLATION MANUAL INSTRUCTIONS.
 - * Tolerance is -0.38 +0.38
 - ** Foundation bolt grip thickness
- FOR PUMP TAPPED OPENINGS REFER TO DWG.:
TAQ23-06-22 01 / ITEM 005

Auxiliary Specification

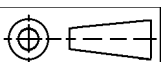
COUPLING BY	PUMP MFG	CPLG TYPE	REXNORD OMEGA REX ELASTOMER- ES-10 (STANDARD ORANGE)
CPL GUARD BY	PUMP MFG	CPLG GUARD MATL.	CARBON STEEL
BASEPLATE	CAST IRON CAMBER TOP B00051A		
MECH.SEAL	GOULDS SEALPLUS SP1CS (CARBON VS SILICON CARBIDE)		

DRAWING IS FOR REFERENCE ONLY.
NOT CERTIFIED FOR CONSTRUCTION UNLESS SIGNED.

Customer: CHARLES P CROWLEY CO INC
Serial No:
Customer P.O. No:
Item No: ITEM 005 (Base Offer)
Project No: Beltz Treatment Plant
End User: Santa Cruz

Copyright 2023
ITT Corp

DRAWING NO AQ23-06-22 01/ITEM 005



All dimensions are in inches.
Drawing is not to scale
Weights (lbs) are approximate

Job/Inq.No. :

Purchaser : CHARLES P CROWLEY CO INC

End User: Santa Cruz

Issued by : Alex Quach

Item/Equip.No. : ITEM 005 (Base Offer)

Quotation No. : AQ23-06-22 01

Date : 06/27/2023

Service :

Order No. :

Certified By :

Rev. : 0

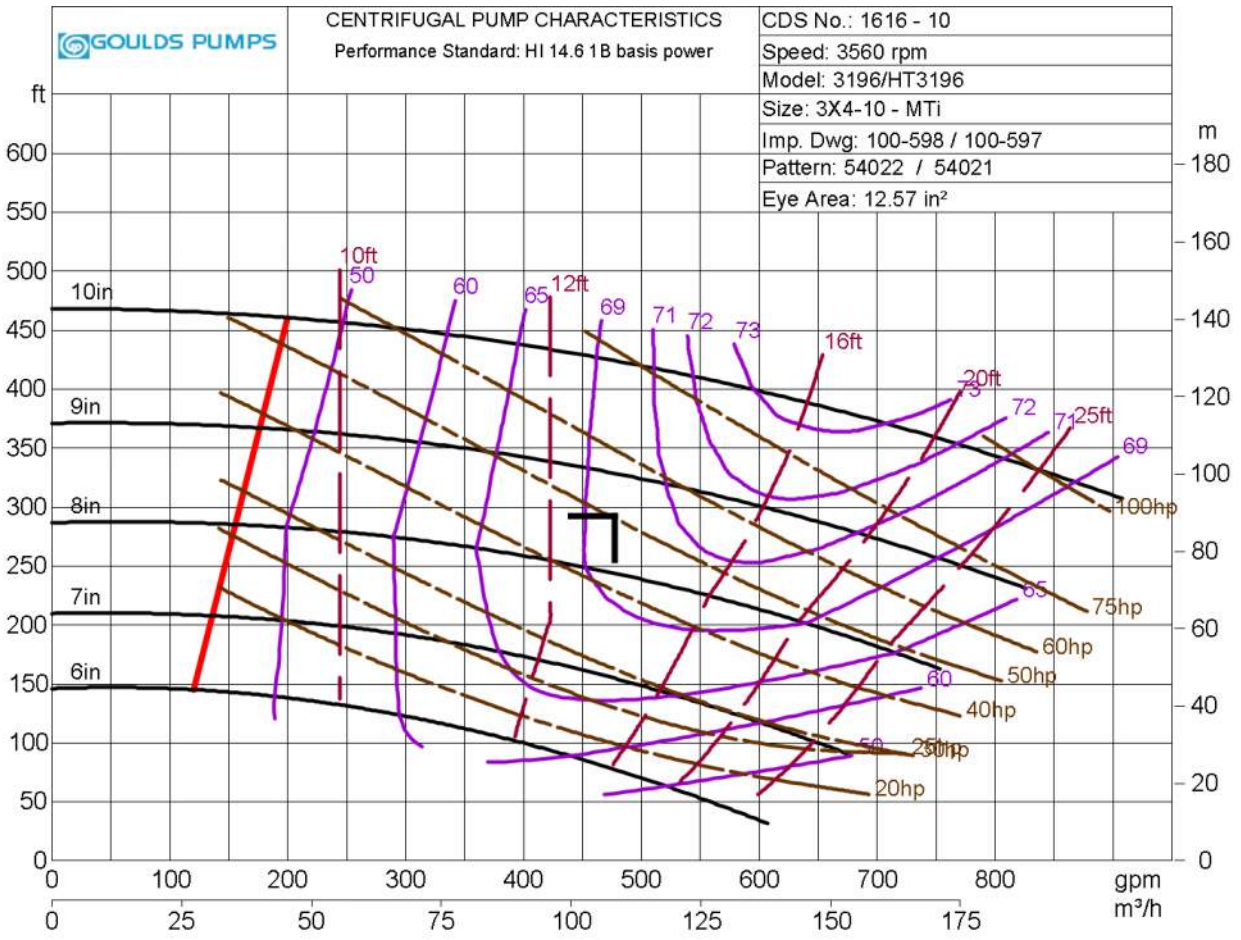
Operating Conditions

Liquid: Water
 Temp.: 70.0 deg F
 S.G./Visc.: 1.000/1.000 cp
 Flow: 480.0 gpm
 TDH: 290.0 ft
 NPSHa:
 Solid size:
 % Susp. Solids (by wtg):

Pump Performance

Published Efficiency: 69.5 %
 Rated Pump Efficiency: 69.0 %
 Rated Total Power: 51.6 hp
 Non-Overloading Power: 64.6 hp
 Imp. Dia. First 1 Stg(s): 8.6250 in
 NPSHr: 13.2 ft
 Shut off Head: 338.0 ft
 Vapor Press:
 Suction Specific Speed: 10,841 gpm(US) ft
 Min. Hydraulic Flow: 167.6 gpm
 Min. Thermal Flow: N/A
 Max. Solids Size: 0.6250 in

- Notes:**
1. Power and efficiency losses are not reflected on the curve below.
 2. Curve shown is at ambient temperature conditions.



Job/Inq.No. :

Purchaser : CHARLES P CROWLEY CO INC

End User : Santa Cruz

Issued by : Alex Quach

Rev. : 0

Item/Equip.No. : ITEM 005 (Base Offer)

Quotation No. : AQ23-06-22 01

Date : 06/27/2023

Service :

Order No. :

Certified By :

Operating Conditions

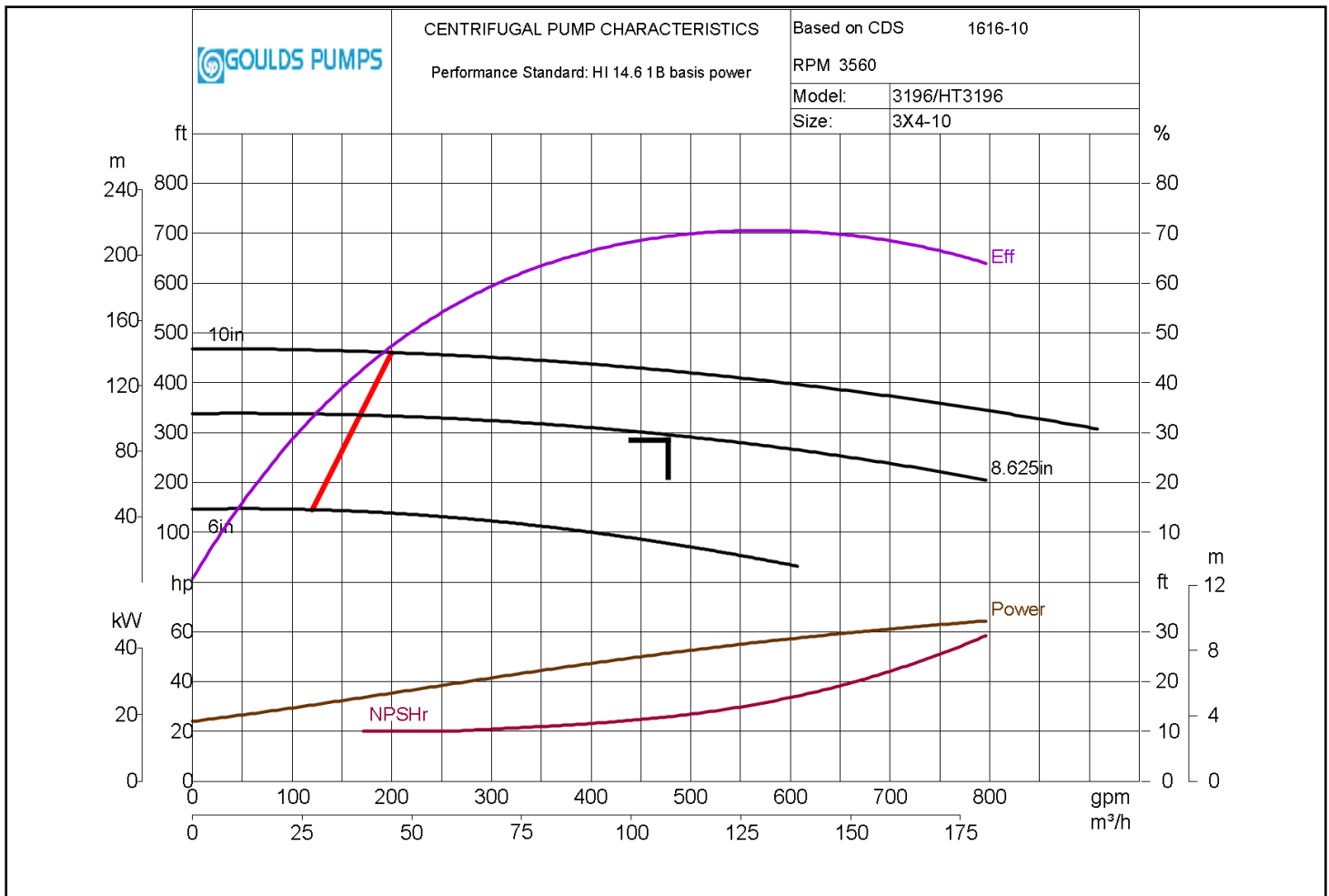
Liquid: Water
 Temp.: 70.0 deg F
 S.G./Visc.: 1.000/1.000 cp
 Flow: 480.0 gpm
 TDH: 290.0 ft
 NPSHa:
 Solid size:

Pump Performance

Published Efficiency: 69.5 %
 Rated Pump Efficiency: 69.0 %
 Rated Total Power: 51.6 hp
 Non-Overloading Power: 64.6 hp
 Imp. Dia. First 1 Stg(s): 8.6250 in
 NPSHr: 13.2 ft
 Max. Solids Size: 0.6250 in
 Suction Specific Speed: 10,841 gpm(US) ft
 Min. Hydraulic Flow: 167.6 gpm
 Min. Thermal Flow: N/A
 Shut off Head: 338.0 ft
 % Susp. Solids (by wtg):

Vapor Press:

Notes: 1. Curve shown is at ambient temperature conditions.



Viscosity corrections have been performed in accordance with HI 9.6.7-2015

APPENDIX C8: EVOQUA ION EXCHANGE

From: [Tinnerino, Patricia A](#)
To: [Nguyen, Hoai \(Kati\)](#)
Cc: [Ussery, Robert R](#)
Subject: RE: Santa Cruz Beltz Groundwater Treatment Plant
Date: Tuesday, June 13, 2023 11:58:02 AM
Attachments: [image001.png](#)
[image002.png](#)
[image003.png](#)
[image004.png](#)
[image005.png](#)
[image006.png](#)
[image007.png](#)
[image008.jpg](#)
[image009.png](#)

Kati

That would be important too! Haha

1. Budgetary cost for PFAS removal with IX – 2190 gpm
 - a. (2) HP1220CIX system with PSR2 Plus resin – estimated cost for system with initial media fill \$1,800,000 (installation and offloading by others)

Best Regards,
Patricia Tinnerino
Account Manager- Municipal Services

Evoqua Water Technologies LLC
14250 Gannet Street
La Mirada, CA 90638

T: 714-262-1560
F: 714-464-2230
E: patricia.tinnerino@evoqua.com

www.evoqua.com

To Schedule Resin Service: Raymond Farthing @ 213-798-2322



From: Nguyen, Hoai (Kati) <nguyenh@cdmsmith.com>
Sent: Tuesday, June 13, 2023 11:52 AM
To: Tinnerino, Patricia A <patricia.tinnerino@evoqua.com>
Cc: Ussery, Robert R <robert.ussery@evoqua.com>
Subject: RE: Santa Cruz Beltz Groundwater Treatment Plant

[This message came from an external mail server outside of the company.]

Thank you Patricia. What about for PFAS removal?

Kati Nguyen, EIT
Civil Engineer
46 Discovery #250, Irvine, CA 92618
T: 213.457.2157 | nguyenh@cdmsmith.com



From: Tinnerino, Patricia A <patricia.tinnerino@evoqua.com>

Sent: Tuesday, June 13, 2023 11:37 AM

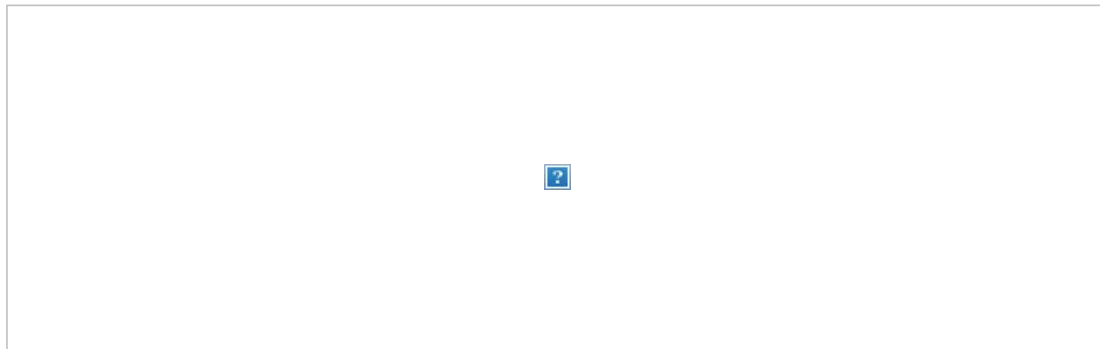
To: Nguyen, Hoai (Kati) <nguyenh@cdmsmith.com>

Cc: Ussery, Robert R <robert.ussery@evoqua.com>

Subject: RE: Santa Cruz Beltz Groundwater Treatment Plant

Kati

We could switch the high flow design and do a triplex 120x96. The budgetary price would be similar to the quote before since it is 3 larger tanks versus 4 smaller tanks



1. Budgetary cost for some pressure filters to remove oxidized iron and manganese with Green Sand Plus media: designing for a max flow of 2190 gpm and 3 gpm/sf – I recommend the high flow PTI system (with PLC to automate backwash based on dP set point) –
 - a. triplex PTI 120x96 – estimated cost for system with initial media fill \$2,500,000 (installation and offloading by others)

Best Regards,
Patricia Tinnerino
Account Manager- Municipal Services

Evoqua Water Technologies LLC
14250 Gannet Street
La Mirada, CA 90638

T: 714-262-1560
F: 714-464-2230
E: patricia.tinnerino@evoqua.com

www.evoqua.com

To Schedule Resin Service: Raymond Farthing @ 213-798-2322

APPENDIX C9: POWER DESIGN INC SOUND ENCLOSURES



Quote No. **A080223-1R1**
 Revision No. _____

QUOTE

Customer

Company: CDM Smith
 Name: Kati Nguyen
 Address: 46 Discovery #250
 City: Irvine State CA ZIP 92618
 Phone: 213-457-2157
 Fax: _____
 Cell: _____
 Email: nguyenh@cdmsmith.com

Misc

Date: 10/24/2023
 Rep: Artwel
 Distributor: CONSOLIDATED PARTS
 End User: CD SMITH
 RFQ No: SANTA CRUZ
 GROUNDWATER
 Drawing: SIMILAR

Qty	Product	Unit Price	TOTAL
1	PS4-74-0-L1-LG PADMOUNT ENCLUSURE LIGHT GRAY COLOR, PE4-74-0 FIBERGLASS ENCLOSURE WITH (2) HINGED DOUBLE DOORS, R-11 SPRAY FOAM INSULATION GELCOATED WHITE, 10 db NOISE REDUCTION, SS VENTILATION LOUVER WITH PLUG ON ENDS, TWO LOW, TWO HIGH, OPPOSITE EACH OTHER, 3-POINT LATCH, PADLOCKING PROVISIONS, AND SS HARDWARE.	\$ 10,700.00	
1	ME2-48-144-L1-LG MODULAR ENCLOSURE 4'W X 12'L X 8'H, LIGHT GRAY IN COLOR, 3" NOMINAL INTERNAL FLANGE, (1) DOUBLE FIBERGLASS DOOR, 72"W X 84"H, 14 GA SS JAMB, 3-POINT LATCH AND PADLOCKABLE, SS RAIN GUARD, AND SS HARDWARE	\$ 11,440.00	
1	ME2-86-144-L1-LG MODULAR ENCLOSURE 8'W X 12'L X 9'H, LIGHT GRAY IN COLOR, 3" NOMINAL INTERNAL FLANGE, (1) DOUBLE FIBERGLASS DOOR, 72"W X 84"H, 14 GA SS JAMB, 3-POINT LATCH AND PADLOCKABLE, SS RAIN GUARD, AND SS HARDWARE	\$ 14,630.00	
1	ME2-144-192-L1-LG MODULAR ENCLOSURE 12'W X 16'L X 10'10"H, LIGHT GRAY IN COLOR, 3" NOMINAL INTERNAL FLANGE, (1) DOUBLE FIBERGLASS DOOR, 72"W X 84"H, 14 GA SS JAMB, 3-POINT LATCH AND PADLOCKABLE, SS RAIN GUARD, AND SS HARDWARE	\$ 24,665.00	
	OPTIONS		
1	LED LIGHT 40W, 120V, 4000LM	\$ 1,125.00	
1	EMERGENCY EXIT SIGN WITH BATTERY BACKUP	\$ 220.00	
1	EXTERIOR LED LIGHT W/MOTION SENSOR	\$ 1,000.00	
1	GFI RECEPTACLE, 20A-120V	\$ 95.00	
1	AC BREAKER PANEL, 120/240V, 125A MLO, NEMA1, SURFACE MOUNTED W/BREAKERS	\$ 1,125.00	
1	PUMP HOUSE STYLE HEATER, 500W, 240V, WITH THERMOSTATE	\$ 970.00	
1	EXHAUST SYSTEM, 10", 652CFM, 120V, EXHAUST FAN & FIBERGLASS HOOD, INTAKE LOUVER 18" X 18" ADJUSTABLE BLADE, ALUM. W/LOUVER MOTOR & THERMOSTAT	\$ 3,565.00	
	PROPOSAL DETAILS		
	SHIPPING LEAD-TIME: SHIPMENT CAN BE MADE IN APPROXIMATELY 48 TO 52 WEEKS AFTER RECEIPT OF YOUR FORMAL PURCHASE ORDER OR RELEASE OF AN ORDER THAT IS ON HOLD, BASED ON STANDARD LEAD TIME. ALL SHIPPING ESTIMATES ARE SUBJECT TO PRIOR SALE OF MATERIAL AND/OR MANUFACTURING CAPACITY.		
	TERMS AND CONDITIONS OF SALE: ANY ORDER OR ORDERS BASED ON THIS QUOTATION (1) ARE SUBJECT TO ACCEPTANCE BY POWER DESIGN INC ONLY AT ITS OFFICE IN HOOD RIVER, OREGON (2) ARE SUBJECT TO POWER DESIGN'S GENERAL CONDITIONS OF SALE STATED BELOW; AND (3) SHOULD BE MADE OUT TO POWER DESIGN IN CARE OF: POWER DESIGN INC C/O MILLIE BACK - MILLIE@POWERDESIGNINC.COM PO BOX 147 ODELL OR 97044		
	SubTotal	\$ -	
	Tax Rate(s)	0.00%	\$ -
	TOTAL	\$ -	

TERMS

Freight: **FREIGHT PREPAID & ADD OR THIRD PARTY**
 FOB: FACTORY HOOD RIVER OREGON
 Comments: _____

GENERAL TERMS & CONDITIONS - POWER DESIGN INC TERMS & CONDITIONS APPLY TO ALL PRODUCTS AND SERVICES SOLD AND/OR QUOTED. POWER DESIGN INC TERMS ARE AVAILABLE AT www.powerdesigninc.com/general-terms-condition/

PRICE: This quotation may be withdrawn by Power Design Inc, if not accepted in 30 days of the date of this quote. The quoted prices and explicit terms of sale contained in PDI quotation will become active only after proper notification of award by customer. **Pricing subject to possible Escalation/De-Escalation due to raw material, freight, or component costs, notice of any price adjustments to be given 4-6 weeks prior to shipment.**

MINIMUM ORDER: \$375.00 net on all orders.

FREIGHT: F.O.B. Factory with freight per freight terms noted in the terms above on single releases to a single destination within the western states U.S.A., or nearest West Coast U.S.A Dock for Export Markets. Shipments are to be to the nearest common carrier delivery point. Method of transportation and routing will be at the Sellers discretion with the Buyer to pay any additional expenses resulting from other requests. For orders and releases shipped freight prepaid & add, actual transportation charges will be prepaid and then added to the invoice.

LEAD-TIME: The above estimated ship date might vary depending availability of other shipments to consolidate this quote with and delivery of buyouts from other vendors. Shipping dates are approximate and Seller will take all reasonable action to maintain those dates.

TERMS: Net 30 Days on approved credit, or pre-payment.

TAXES: All prices quoted are exclusive of any federal, state, or municipal sales, excise, or other taxes which the Seller may be required to collect by law. Such taxes will be added to the invoice.

CANCELLATIONS: All orders accepted are considered to be firm commitments on the part of the Buyer. Cancellation of an order or individual item of non-stocked material will be allowed only when the Buyer pays cancellation charges based on all reasonable charges incurred by the Seller at the time of request for cancellation.

RETURNED GOODS: Return of material authorization must be obtained in writing from Seller. Only material regularly stocked and in saleable condition will be accepted for credit. Out-bound freight, return freight, and a 20% minimum restocking charge will be deducted from the credit.

LIMITED ONE YEAR WARRANTY: Seller warrants that all products sold by it will be free of defects in material and workmanship under normal use and service for a period of one (1) year after the date of shipment by Seller. In addition, Seller warrants the fiberglass laminate against degradation of strength under normal use and service for a period of twenty five (25) years after the date of shipment by Seller. Seller's obligation under this warranty is limited to repair or replacing, at its option, any goods, which upon inspection by Seller shall disclose to Seller's satisfaction to have been defective in material or workmanship, excluding, however, expenses associated with removal or reinstallation of the products, such as transportation, labor, and the like.

APPENDIX C10: FIL-TREK CARTRIDGE FILTERS

Customer Name Kati Nguyen
Company CDM Smith
Phone Number 213-457-2157
Email nguyenh@cdmsmith.com

Quoted By Kevin Vekariya
Phone Number (519) 623-7448 ext 103
Email KVekariya@fil-trek.com

Quote Number RF-231027-03
Quote Date 2023-11-06
Revision Number
Customer Tag #

Customer Project #

Item	Model Number	Description	P/N	Qty	Price Ea	Total Price
1	S4GLH46-205-4-14F-150	GLH Series - Cartridge Housing	TBD	2	\$52,450.00	\$104,900.00
2	KG-PO-5-40-PO-E1	Klaris Gold Cartridge [15/box]	TBD	420	\$8.35	\$3,507.00
3	NSF Price	NSF Cost Adder	TBD	2	\$500.00	\$1,000.00
4						
5	*Spare*					
6	Closure O-Ring	EPDM NSF O-Ring	TBD	5	\$415.00	\$2,075.00
7						
8						
9						
10						
11						
12						
13						
14						
15						
					Total	\$111,482.00
					Currency	USD
16	Freight <u>Estimate</u>	Freight to		1	\$0.00	\$0.00
					Total without freight	\$111,482.00

NOTES -NSF Certified

Lead Time 12-14 weeks ARAD

Approval Required* Yes

If approval is not required the housing will be manufactured in accordance with the drawing supplied with this quote.

No approval drawings will be submitted after receipt of Purchase Order.

Additional Costs Not Included in Pricing Above

-Certified Shipping Documents from the Chamber of Commerce are not included. Add \$300 if required (typically overseas).

Payment via Credit Card 2.4% of total value

Payment via Wire Transfer \$50.00 per transfer

[Click here to review all terms and conditions](#)

IncoTerms ExWorks our factory, Cambridge,

Payment Terms: 100% Net 30 subject to approved credit check

Quote Outline	
Pg	Description
1	Pricing and Commercial
2	Process Information
3	Vessel and Mechanical Information
4	Inspection & Test Plan
5	Technical and Commercial Clarification worksheet

Quote Number


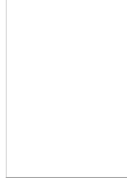
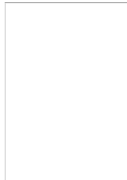
RF-231027-03

Quote Date

2023-11-06

Revision Number

0

Rev	GENERAL INFORMATION				VESSEL DESIGN		Rev
1	Tag Number(s)						
2	Project Number						
3	MODEL NUMBER	S4GLH46-205-4-14F-150		Number of Filters/vessel	205		42
4	# Vessels	2		Description of Filters	2 1/2"OD x 40" long filter cartridge (DOE)		43
5	Drawing Number	TBD					44
6	Family	001002		Filter Supports	SS316 Bottom cups W/ v-posts & top spring		45
7	OPERATING CONDITIONS			PROCESS INFORMATION			46
8	Fluid/Gas Description #1	Ion Exchange Pre-Treatment		Clean DP through Housing		psi	47
9	Fluid/Gas Description #2			Clean DP through Filters		psi	48
10	State (gas, liquid, solid)			Total Pressure Drop	0.00	psi	49
11	Contaminant #1			"Dirty" change out	15	psi	50
12	Contaminant #2			Flux Rate		gpm/ft2	51
13	Operating Pressure		psi	Flow Rate per		cartridge	52
14	Operating Temperature		°F	Filter Surface Area		ft2	53
15	Minimum Operating Temperature		°F	Basket Surface Area		ft2	54
16	Density of Fluid		lb/ft3	Basket Open Area		ft2	55
17	Viscosity		cP	Flow Direction	Outside / In		56
18	Specific Gravity			Filter Efficiency			57
19	Flow Rate		gpm	Velocity thru Vessel		ft/s	58
20	Desired Clean Pressure Loss		psi	Vessel Head Loss		ft	59
21	Required Micron Rating			Est. Filter Change Interval		days	60
22	Removal Efficiency			Calculated Gas Flow		ACFM	61
23	Particulate Volume		ppm				62
24	Gas Molecular Weight						63
25	FILTER INFORMATION						64
26		Option 1		Option 2		Option 3	65
27	Filter Part Number	KG-PO-5-40-PO-E1					66
28	Filter Type	Klaris Gold					67
29	Media	Polypro					68
30	Micron Rating	5					69
31	Outside Diameter	2.5					70
32	Length	40					71
33	Core Material						72
34	End Cap Material						73
35	O-Ring/Gasket						74
36	Flange Material						75
37							76
38	Image						77
39							78
40							79
41							80

Quote Number

RF-231027-03

Quote Date

2023-11-06

Revision Number

0

Rev	GENERAL INFORMATION									Rev	
1	Tag Number(s)										
2	Project Number							VESSEL DESIGN			
3	MODEL NUMBER S4GLH46-205-4-14F-150			Number of Filters/vessel		205			42		
4	# Vessels 2			Description of Filters		2 1/2"OD x 40" long filter cartridge (DOE)			43		
5	Drawing Number TBD								44		
6	Family 001002			Filter Supports	SS316 Bottom cups W/ v-posts & top spring				45		
7	DESIGN CONDITIONS									46	
8	Design Pressure		150	psi	Shell		SA240 304/L		47		
9	Design Temperature		250	°F	Heads		SA240 304		48		
10	MDMT		-20	°F	Flanges		SA182 F304		49		
11	Corrosion Allowance			in	Flange Gaskets		-		50		
12	Design Specification		ASME Section VIII Div. 1 - U		Pipe		SA312 TP304		51		
13					Couplings/Fittings		SA182 F316 B16.11		52		
14	VESSEL DIMENSIONS							Internal Supports		SS304	53
15	Shell OD		46.75	in	Fasteners		SA193 B7 YZP		54		
16	Shell ID		46.125	in	External Attachments		SS304		55		
17	Shell Seam to Seam		53	in	Davit Type		MECHANICAL DAVIT		56		
18	Volume		77	ft3	Davit Material		SS304		57		
19	Empty Weight		2606	lb	Closure Type		SWING BOLTS W/ HEX		58		
20	Operational Weight		7375	lb	Closure Seal Material		EPDM NSF		59		
21	Overall Elevation		72.0625	in	Closure Seal Type		O ring		60		
22	Orientation		Horizontal		Material Restrictions		N/A		61		
24	CONNECTIONS							TESTING AND INSPECTION		63	
25	Mark	Service	Qty	Size	Rating	Type	Hydro Test Pressure	195		64	
26	N1	Inlet	1	14	150	RFSO	Hydro Test Duration			65	
27	N2	Outlet	1	14	150	RFSO	Radiography	N/A		66	
28	N3	Gauge Port	2	0.5	3000	NPT	PT Testing	N/A		67	
29	N4	Vent	2	0.5	3000	NPT	UT Testing	N/A		68	
30	N5	Clean Drain	1	2	3000	NPT	MP Testing	N/A		69	
31	N6	Dirty Drain	1	2	3000	NPT	PWHT	N/A		70	
32	N7						Impact Testing	N/A		71	
33	N8						Hardness Testing	N/A		72	
34	N9						PMI	N/A		73	
35	N10						Visual	N/A		74	
36	PAINTING/COATING									75	
	Internal			External							
37	Step 1	Bead blast sspc-sp6 using glass beads (no paint)				Bead blast sspc-sp6 using glass beads (no paint)				76	
38	Step 2	None				None				77	
39										78	
40	Step 3	None				None				79	
41										80	

Note: Nozzles attached to the vessel shall not be used to support pipe spools or other pipeline equipment. When required, Fil-Trek will provide the maximum allowable nozzle loadings after the vessel design is completed. This RFQ will take exception to nozzle loading specifications exceeding the maximum allowable nozzle loadings as defined above, it is the clients responsibility to properly support inline piping.

- R Review only
- H Mandatory witness
- W Optional witness. Notification required.
- M Monitor. Observe at any time.

Quote Number RF-231027-03

Quote Date 2023-11-06

Revision Number 0

	SUBMITTAL	WEEKS		FIL-TREK QC	A.I.	CLIENT	R	H	W	M
		2	ARO							
DESIGN	General Arrangement Drawing	2	ARO		Y					
	ITP & Traveler		ARO		Y					
	Weld Procedure(s)		ARO		Y					
	Weld Map		ARO		Y					
	Calculations		ARO		Y					
	NDE Procedures and NDE Map		ARO		if applicable					
PRIOR TO MANUFACTURING	Pre-Inspection Meeting		ARAD							
	Uncontrolled QA Manual		ARAD							
	Material Test Certificates (MTRs)		ARAD		Y					
	Welder's Qualification		ARAD		Y					
	NDT Personnel Qualifications		ARAD		if applicable					
	PMI Procedure		ARAD							
	Painting/Coating Procedure		ARAD							
	Hydrotest Procedure		ARAD		Y					
DURING MANUFACTURING	Fit-Up Inspection		ARAD		if applicable					
	Welding in accordance with WPS		ARAD		if applicable					
	Production test coupons		ARAD		if applicable					
	Internal Inspection		ARAD		if applicable					
	Post Weld Heat Treatment		ARAD		if applicable					
	Radiographic Examinations		ARAD		if applicable					
	Other NDE (UT, MT, DP, LP)		ARAD		if applicable					
	Non-Conformance Reports		ARAD		if applicable					
	In-Process Dimensional Inspection		ARAD							
FINAL TESTING & INSPECTION	Dimensional Inspection		ARAD							
	Visual Inspection		ARAD		Y					
	Repad Test		ARAD		if applicable					
	Hydrotest		ARAD		Y					
	Surface Preparation Inspection		ARAD							
	Painting/Coating Inspection		ARAD							
	Marking and Preservation Inspection		ARAD							
AFTER SHIPMENT	Manufacturer Data Book				Y					
	Shipping Release Note									

Quote Number

RF-231027-03

Quote Date

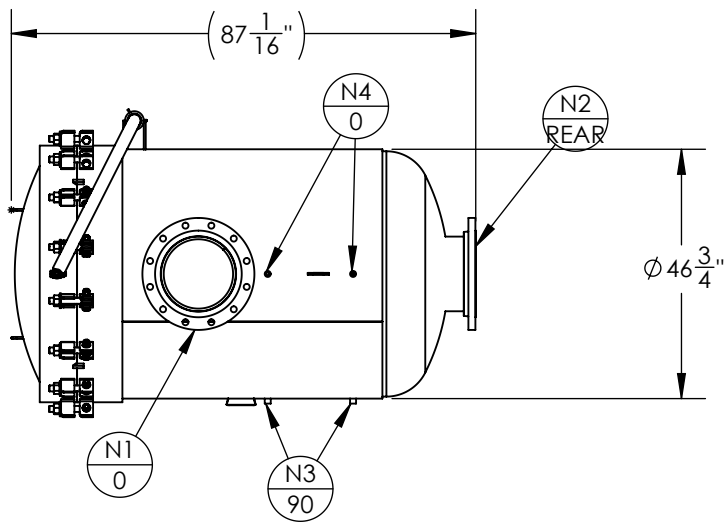
2023-11-06

Revision Number

0

Technical and Commercial Clarification worksheet

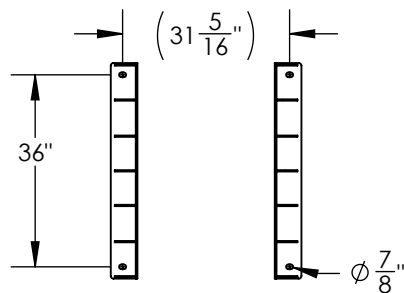
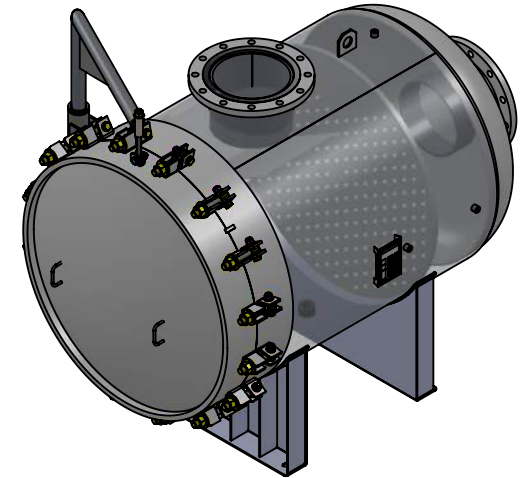
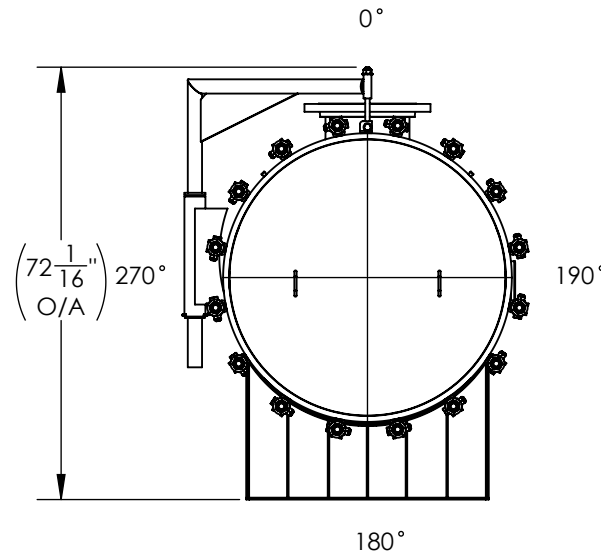
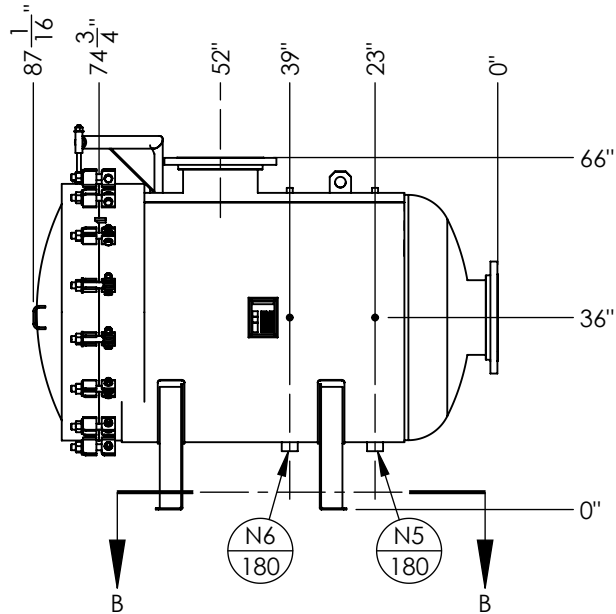
Item No.	Bidder Clarification / Exception	Client Response	Open/Closed
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			



- NOTES:
- VESSEL WILL HOUSE (QTY=205)
 - 2.5" OD x 40" LG DOE
 - DRY WEIGHT: 2606.39 LBS
 - FLOODED WEIGHT: 7375 LBS
 - SHIPPING WEIGHT: 2800 LBS
 - VESSEL VOLUME: 77.0 C.F.

NOZZLE SCHEDULE			
MARK	QTY	SIZE / RATING	DESCRIPTION
N1	1	14" 150# RFSO	INLET
N2	1	14" 150# RFSO	OUTLET
N3	2	1/2" 3000# NPT	PRESSURE GAUGE
N4	2	1/2" 3000# NPT	VENT
N5	1	2" 3000# NPT	CLEAN DRAIN
N6	1	2" 3000# NPT	DIRTY DRAIN

VESSEL DESIGN CONDITIONS			
CODE: ASME SECTION VIII DIV. 1, 2017 EDITION			
M.A.W.P.:	150 PSI @ 250°F	M.D.M.T.:	-20° F @ 150 PSI
M.A.E.P.:	FV PSI @ 250°F		
CORROSION ALLOWANCE:	NONE	HYDROTEST PRESS:	195 PSI
STAMP:	U	SERVICE:	NON LETHAL
PWHT:	N/A	RADIOGRAPHY:	N/A
MATERIAL:	SS304	GASKET:	EPDM NSF



SECTION B-B

APPROVED WITH MARK-UPS <input type="checkbox"/>		APPROVED <input type="checkbox"/>	
<p>THIRD ANGLE PROJECTION</p> <p>TOLERANCES-UNLESS OTHERWISE NOTED</p> <p>DECIMAL .X = ±.1" .XX = ±.02" .XXX = ±.005"</p> <p>FRACTIONAL = ±1/8"</p> <p>ANGULAR = ± 1°</p> <p>MAX. MACHINED SURFACE FINISH 125 √</p>	<p>FIL-TREK CORPORATION</p> <p>55 Stafford Court Cambridge, Ontario N1T 1B3 Canada</p> <p>Phone: (519) 623-7448 Fax: (519) 623-8807 Email: info@fil-trek.com Website: www.fil-trek.com</p>		
	<p>THIS DRAWING IS THE PROPERTY OF 'FIL-TREK CORPORATION' AND MUST NOT BE COPIED OR USED IN ANY WAY DETRIMENTAL TO THE CORPORATION</p> <p>EQUIPMENT: CARTRIDGE FILTER VESSEL (GLH SERIES)</p> <p>MODEL NO: S4GLH46-205-4-14F-150</p> <p>CUSTOMER:</p>		
PARENT: NEW DESIGN	DRAWN: KV	DATE: 11/6/2023	Part. No.
CHK'D:	SCALE: NTS	SERIAL No.	REV. No. 0

Appendix D

Alternative 1: Chlorination + Aeration + GreensandPlus

Present Value Calculation Sheet

Assumptions			
Discount Rate	3.0%	per year	
Total Life Span	30	years	
Initial Equipment Costs			
Aeration System	\$ 724,660	Equip Only	Based on QED Quote
Wetwell			
Booster Pumps	\$ 240,000	Equip Only	Based on Peerless quote
GreensandPlus Filtration System	\$ 1,254,000	Equip Only	Based on H&T quote
Washwater Tanks	\$ 217,972	Equip Only	Based on Superior quote
Sodium Hypochlorite Generation System	\$ 346,300	Equip Only	Based on MicroClor quote
Orthophosphate System	\$ 27,000	Equip Only	Based on CP Crowley quote
Reclaimed Washwater Pumps	\$ 64,000	Equip Only	Based on CP Crowley quote
ASR Backflush Tank	\$ 75,000	Equip Only	Based on PolyProcessing quote
Sound Enclosures	\$ 14,630	Equip Only	Based on Power Design Inc quote
Total	\$ 2,963,562		
Equipment Replacement Costs			
Discount Rate	3.0%	per year	Rate
Item 1:			<i>Note: "Pmt" should be blank for future capital cost</i>
Number of Years from start	15	years	Nper
Pumps and Chemical Systems	\$ 677,300		[fv]
Present Value of Item 1 Replacement	\$ 434,733		
Item 2:			
Number of Years from start	20	years	Nper
Aeration System, Vessels and Tanks	\$ 2,286,262		[fv]
Present Value of Item 2 Replacement	\$ 1,265,848		
Equipment Replacement Total PV	\$ 1,700,581		
Annual O&M Costs			
Power - Aeration Blower	\$ 64,541	per year	
Power - Booster Pumps	\$ 121,014	per year	
Power - Filter Airwash Blower	\$ 807	per year	
Power - Filter Air Compressor	\$ 54	per year	
Power - Filter Motorized Valve	\$ 215	per year	
Power - Sodium Hypochlorite Geration System	\$ 5,273	per year	
Power - Hydrogen Dilution Blower	\$ 538	per year	
Power - Sodium Hypochlorite Influent Dosing	\$ 269	per year	
Power - Sodium Hypochlorite Effluent Dosing	\$ 269	per year	
Power - Orthophosphate Dosing	\$ 269	per year	
Power - Washwater Mixing Pump	\$ 215	per year	
Power - Reclaimed Washwater Pump	\$ 21,514	per year	
Power - ASR Mixing Pump	\$ 108	per year	
Chemical - Salt	\$ 12,057	per year	
Chemical - Orthophosphate		per year	
		per year	
Total	\$ 227,141	per year	
Present Value of O&M:			<i>Symbol in Excel</i>
Discount Rate	3.0%	per year	Rate
Number of Years	30	years	Nper
Annual O&M (from above)	\$ 227,141	per year	Pmt
Present Value of O&M	\$ 4,452,058		See "Directions" tab
Total Present Value:			
Initial Equipment Costs (from above)	\$ 2,963,562		
Equipment Replacement Costs	\$ 1,700,581		
Present Value of O&M	\$ 4,452,058		
Total Present Value	\$ 9,116,201		

Alternative 2: Chlorination + Aeration + GreensandPlus + PFAS Treatment

Present Value Calculation Sheet

Assumptions			
Discount Rate	3.0%	per year	
Total Life Span	30	years	
Initial Equipment Costs			
Aeration System	\$ 724,660	Equip Only	Based on QED Quote
Wetwell			
Booster Pumps	\$ 280,000	Equip Only	Based on Peerless quote
GreensandPlus Filtration System	\$ 1,254,000	Equip Only	Based on H&T quote
Dechlorination System	\$ 27,000	Equip Only	Based on CP Crowley quote
Cartridge Filters	\$ 95,206	Equip Only	Based on Fil-Trek quote
Ion Exchange System	\$ 1,800,000	Equip Only	Based on Evoqua quote
Washwater Tanks	\$ 217,972	Equip Only	Based on Superior quote
Sodium Hypochlorite Generation System	\$ 371,300	Equip Only	Based on MicroClor quote
Orthophosphate System	\$ 27,000	Equip Only	Based on CP Crowley quote
Reclaimed Washwater Pumps	\$ 64,000	Equip Only	Based on CP Crowley quote
ASR Backflush Tank	\$ 75,000	Equip Only	Based on PolyProcessing quote
Sound Enclosures	\$ 14,630	Equip Only	Based on Power Design Inc quote
Total	\$ 4,950,768		
Equipment Replacement Costs			
Discount Rate	3.0%	per year	<i>Rate</i>
Item 1:			<i>Note: "Pmt" should be blank for future capital cost</i>
Number of Years from start	15	years	<i>Nper</i>
Pumps and Chemical Systems	\$ 769,300		<i>[fv]</i>
Present Value of Item 1 Replacement	\$ 493,784		
Item 2:			
Number of Years from start	20	years	<i>Nper</i>
Aeration System, Vessels and Tanks	\$ 4,181,468		<i>[fv]</i>
Present Value of Item 2 Replacement	\$ 2,315,177		
Equipment Replacement Total PV	\$ 2,808,962		
Annual O&M Costs			
Power - Aeration Blower	\$ 64,541	per year	
Power - Booster Pumps	\$ 201,690	per year	
Power - Filter Airwash Blower	\$ 807	per year	
Power - Filter Air Compressor	\$ 54	per year	
Power - Filter Motorized Valve	\$ 215	per year	
Power - Sodium Hypochlorite Geration System	\$ 6,895	per year	
Power - Hydrogen Dilution Blower	\$ 538	per year	
Power - Sodium Hypochlorite Influent Dosing	\$ 269	per year	
Power - Sodium Hypochlorite Effluent Dosing	\$ 269	per year	
Power - Sodium Bisulfite Dosing	\$ 269	per year	
Power - Orthophosphate Dosing	\$ 269	per year	
Power - Washwater Mixing Pump	\$ 215	per year	
Power - Reclaimed Washwater Pump	\$ 21,514	per year	
Power - ASR Mixing Pump	\$ 108	per year	
Chemical - Salt	\$ 15,766	per year	
Chemical - Sodium Bisulfite	\$ 1,139	per year	
Chemical - Orthophosphate		per year	
IX Resin Replacement	\$ 20,400	per year	
Total	\$ 334,956	per year	
Present Value of O&M:			<i>Symbol in Excel</i>
Discount Rate	3.0%	per year	<i>Rate</i>
Number of Years	30	years	<i>Nper</i>
Annual O&M (from above)	\$ 334,956	per year	<i>Pmt</i>
Present Value of O&M	\$ 6,565,290		<i>See "Directions" tab</i>
Total Present Value:			
Initial Equipment Costs (from above)	\$ 4,950,768		
Equipment Replacement Costs	\$ 2,808,962		
Present Value of O&M	\$ 6,565,290		
Total Present Value	\$ 14,325,020		

Alternative 3: Chlorination + GreensandPlus + PFAS Treatment

Present Value Calculation Sheet

Assumptions			
Discount Rate	3.0%	per year	
Total Life Span	30	years	
Initial Equipment Costs			
Booster Pumps	\$ 320,000	Equip Only	Based on Peerless quote
GreensandPlus Filtration System	\$ 1,789,000	Equip Only	Based on H&T quote
Dechlorination System	\$ 30,000	Equip Only	Based on CP Crowley quote
Cartridge Filters	\$ 111,482	Equip Only	Based on Fil-Trek quote
Ion Exchange System	\$ 1,800,000	Equip Only	Based on Evoqua quote
Washwater Tanks	\$ 236,000	Equip Only	Based on Superior quote
Sodium Hypochlorite Generation System	\$ 407,800	Equip Only	Based on MicroClor quote
Orthophosphate System	\$ 27,000	Equip Only	Based on CP Crowley quote
Reclaimed Washwater Pumps	\$ 78,000	Equip Only	Based on CP Crowley quote
ASR Backflush Tank	\$ 75,000	Equip Only	Based on PolyProcessing quote
Sound Enclosures	\$ 14,630	Equip Only	Based on Power Design Inc quote
Total	\$ 4,888,912		
Equipment Replacement Costs			
Discount Rate	3.0%	per year	Rate
			<i>Note: "Pmt" should be blank for future capital cost</i>
Item 1:			
Number of Years from start	15	years	Nper
Pumps and Chemical Systems	\$ 862,800		[fv]
Present Value of Item 1 Replacement	\$ 553,798		
Item 2:			
Number of Years from start	20	years	Nper
Vessels and Tanks	\$ 4,026,112		[fv]
Present Value of Item 2 Replacement	\$ 2,229,161		
Equipment Replacement Total PV	\$ 2,782,959		
Annual O&M Costs			
Power - Filter Booster Pumps	\$ 201,690	per year	
Power - Filter Airwash Blower	\$ 807	per year	
Power - Filter Air Compressor	\$ 54	per year	
Power - Filter Motorized Valve	\$ 269	per year	
Power - Sodium Hypochlorite Geration System	\$ 8,734	per year	
Power - Hydrogen Dilution Blower	\$ 538	per year	
Power - Sodium Hypochlorite Influent Dosing	\$ 269	per year	
Power - Sodium Hypochlorite Effluent Dosing	\$ 269	per year	
Power - Orthophosphate Dosing	\$ 269	per year	
Power - Washwater Mixing Pump	\$ 215	per year	
Power - Reclaimed Washwater Pump	\$ 32,270	per year	
Power - ASR Mixing Pump	\$ 108	per year	
Chemical - Salt	\$ 19,971	per year	
Chemical - Orthophosphate	#DIV/0!	per year	
Total	\$ 265,462	per year	
Present Value of O&M:			<i>Symbol in Excel</i>
Discount Rate	3.0%	per year	Rate
Number of Years	30	years	Nper
Annual O&M (from above)	\$ 265,462	per year	Pmt
Present Value of O&M	\$ 5,203,165		See "Directions" tab
Total Present Value:			
Initial Equipment Costs (from above)	\$ 4,888,912		
Equipment Replacement Costs	\$ 2,782,959		
Present Value of O&M	\$ 5,203,165		
Total Present Value	#####		