Peace River / Manasota Regional Water Supply Authority
Facility Capacity Optimization Study

Prepared for:

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Regional Water Supply Authority

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Section 1 Introduction

The Peace River Facility (PRF) is a surface water treatment plant owned and operated by the Peace River Manasota Regional Water Supply Authority (Authority). The facility is a conventional treatment plant involving coagulation /flocculation, sedimentation, filtration, and disinfection, with a rated capacity of 51 million gallons per day (MGD). The PRF consists of four treatment plants on site, namely Plant 1, Plant 2, Plant 3, and Plant 4.

Plant 1 is the oldest treatment train at around 40 years old. It was originally rated for 12 MGD and rehabilitated in 2015 and rerated to 15 MGD. Plant 2 has a capacity of 12 MGD. Plants 3 and 4 are the newest treatment trains and have capacities of 12 MGD each.

The Integrated Regional Water Supply Master Plan 2020 Update identified water supply needs for the next 20 years. As part of the planning efforts for implementation of the Master Plan's recommendations, the Authority tasked Ardurra Group, Inc. (Ardurra) with performing a Capacity Optimization Study to assess potential opportunities to gain additional capacity in the existing PRF.

The objectives of the study include:

- Identifying potential alternatives for gaining additional capacity.
- Determining additional capacity that can be gained.
- Evaluating and ranking each of the potential alternatives.

Section 2 Description of Existing Facility

The PRF consists of four existing plants. Plants 1, 3, and 4 utilize solids contact units (SCU) as their primary treatment, while Plant 2 uses conventional rapid mix, flocculation, and sedimentation. All four Plants share the common chemical feed systems which include:

- Alum – Primary coagulant
- Polymer – Flocculation aid
- Sodium hypochlorite – Disinfection
- Ammonium hydroxide – Disinfection
- Powdered activated carbon (PAC) – taste and odor issues
- Caustic – pH adjustment

Plants 1 and 2 share a common set of PAC contactors and Plants 3 and 4 share a common set of PAC contactors. A description of each existing plant is provided as follows:

2.1 Plant 1

Plant 1 was initially constructed in the late 1970s with a rated treatment capacity of 12 MGD. In 2015, Plant 1 was rehabilitated and rerated to 15 MGD. The plant consists of two (2) PAC contact tanks in series, a flow distribution box, two (2) SCUs, two (2) chlorine contact chambers, and 6 dual-media filters.

2.2 Plant 2

Plant 2 was constructed in 2001 and is rated for 12 MGD. Plant 2 utilizes two (2) PAC contact tanks, two (2) rapid mix basins, sixteen (16) flocculation basins, four (4) sedimentation basins, two (2) chlorine contact chambers, and six (6) dual-media filters.

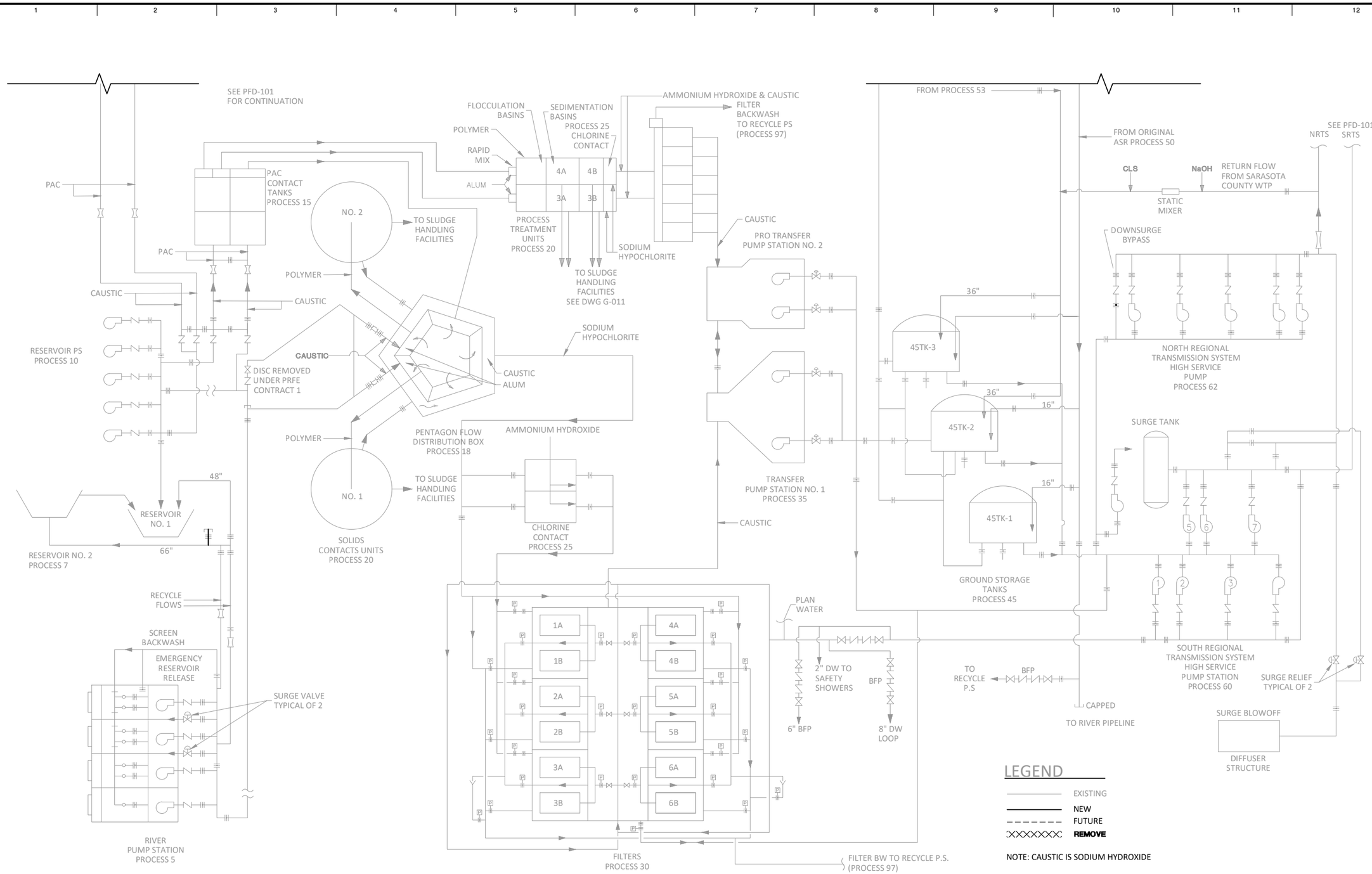
Figure 2-1 provides a process flow diagram of Plants 1 and 2.

2.3 Plant 3

Plant 3 was constructed in 2009 and is rated for 12 MGD. It was constructed with a common wall with Plant 4. Plant 3 consists of three (3) PAC contact tanks in series, a rapid mix chamber, two (2) SCUs, a chlorine contact chamber, seven (7) dual media filters and a transfer pump station.

2.4 Plant 4

Plant 4 was constructed along with and is identical to Plant 3. **Figure 2-2** provides a process flow diagram of Plants 3 and 4. Process unit dimensions for each plant are summarized in **Table 2-1**.



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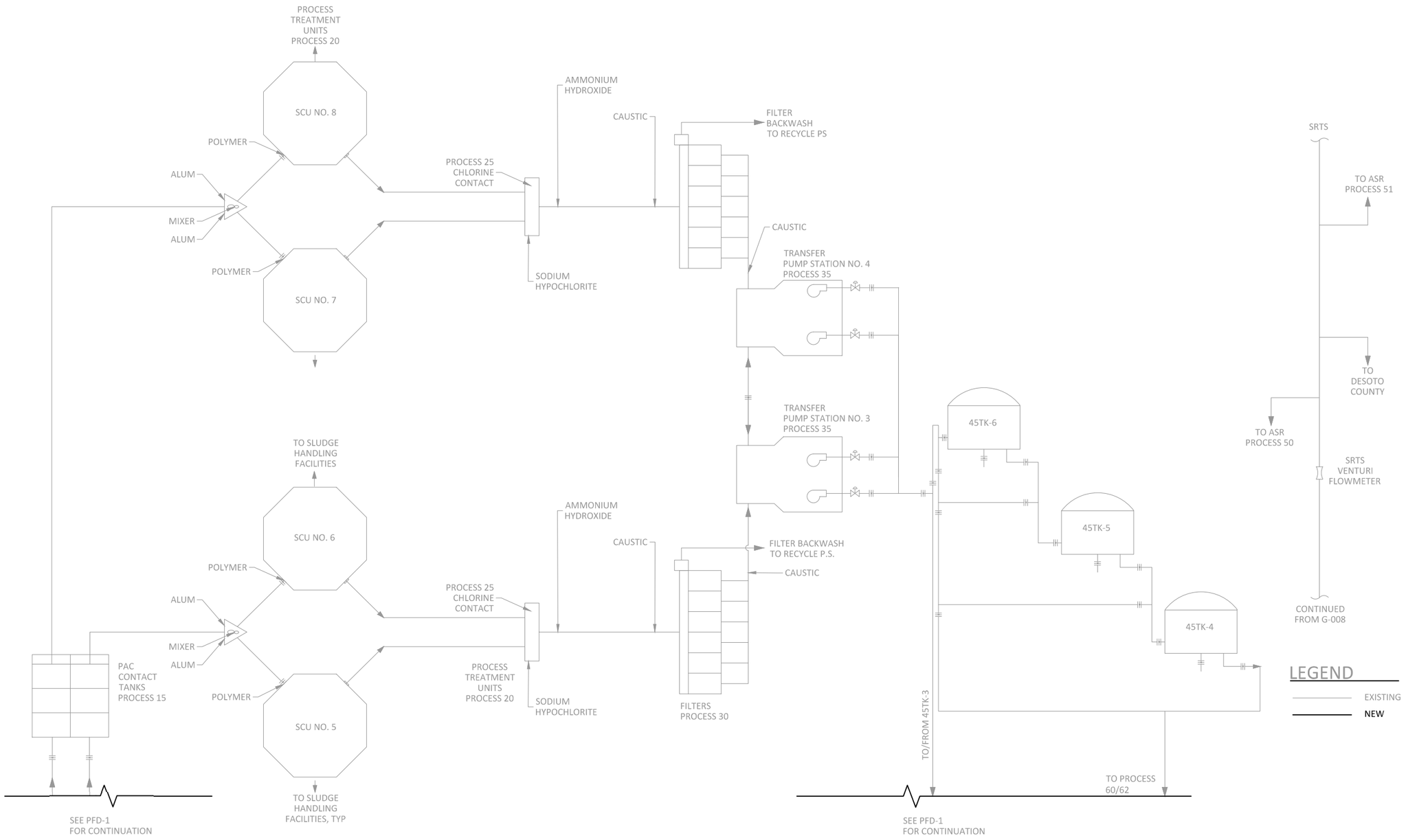
PEACE RIVER FACILITY CAPACITY OPTIMIZATION STUDY

PROCESS FLOW DIAGRAM NO. 1

JOB NO: 0367-0009-2021-0725-00

FIGURE 2-1

TM-1
AUGUST 2021



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PROCESS FLOW DIAGRAM NO. 2

JOB NO: 0367-0009-2021-0725-00

FIGURE 2-2

TM-1
AUGUST 2021

Table 2-1
Process Treatment Unit Dimensions

Plant No. 1	No. of Units	Length (ft)	Width (ft)	Depth (ft)	Unit Area (ft^2)	Total Area (ft^2)	Unit Volume (ft^3)	Total Volume (ft^3)
SCU Clarifier (DIA)	2	85	-	14.17	5675	11349	80408	160815
Flocculation Cone (DIA)	2	42	-		1385	2771	-	-
Launder Length	32	27	-	-	-	-	-	-
Filter Basins	6	20	34		680	4080		

Plant No. 2	No. of Units	Length (ft)	Width (ft)	Depth (ft)	Unit Area (ft^2)	Total Area (ft^2)	Unit Volume (ft^3)	Total Volume (ft^3)
Rapid Mix Basin No. 1	1	5	5	13.62	25	25	341	341
Rapid Mix Basin No. 2	1	5	5	13.62	25	25	341	341
Flocculation Basin No. 1 Stage 1	4	15.5	15.5	13.62	211	844	3,272	13089
Flocculation Basin No. 1 Stage 2	4	15.5	15.5	13.62	211	844	3,272	13089
Flocculation Basin No. 2 Stage 1	4	15.5	15.5	13.62	211	844	3,272	13089
Flocculation Basin No. 2 Stage 2	4	15.5	15.5	13.62	211	844	3,272	13089
Sedimentation Basin	2	131	65	17.12	8515	17030	145,777	291554
Filter Basins	6	23	15	20	345	2070	6,900	41400

Plant Nos. 3 and 4	No. of Units	Length (ft)	Width (ft)	Depth (ft)	Unit Area (ft^2)	Total Area (ft^2)	Unit Volume (ft^3)	Total Volume (ft^3)
SCU Clarifier (DIA)	4	85	-	16.14	5675	22698	91586	366346
Octogonal Basin Side Length	4	35	-	16.14	5915	23659	95465	381861
Flocculation Cone (DIA)	4	38.5	-		1164	4657		
Launder Length	64	29.5	-	-	-	-	-	-
Filter Basins	14	15	25	25	375	5250	9375	131250

Chemical Storage Tanks	No. of Units	Tag Name	Unit Volume (gal)	Total Volume (gal)
Alum Sulfate	3	100-TK-7 to 100-TK-9	20000	60000
Alum	6	100-TK-1 to 100-TK-6	15000	90000
Caustic	3	130-TK-5 to 130-TK-7	20000	60000
Sodium Hypochlorite	3	145-TK-1 to 145-TK-3	20000	60000
Ammonium Hydroxide	2	155-TK-1 to 155-TK-2	7500	15000
PAC (Plants 1 & 2)	2		25813.5	51627
PAC (Plants 3 & 4)	4		52838	211352

Section 3 Data Review and Desktop Analysis

Historical operational and performance data was reviewed and analyzed to benchmark existing treatment process operation and performance characteristics for use in the capacity optimization evaluation. Preliminary findings from the data review and analysis are presented in this section to summarize potential hydraulic and process deficiencies and bottlenecks identified in the existing system, and to develop a list of alternatives that will be evaluated and pertinent design considerations for the subsequent assessment.

3.1 Data Collection

The first task associated with the Study involved obtaining pertinent PRF information, including record drawings, previous studies, and three years of process monitoring and monthly operating report data.

Existing information provided by the Authority includes:

Record Drawings

- Plant 1 Record Drawings
- Peace River 1991 Facility Rebuild Project
- Peace River Option Contract 3 Peace River Facility/ASR Expansion
- Regional Expansion Program PRF Expansion Contract 2 WTP Expansion

Previous Studies

- Basis of Design Report – Regional Expansion Program
- Phase II Report Plant 3 & 4
- Peace River Plant 3 & 4 Cost Opinion

Process Data

- Monthly Operating Reports
- Monthly Process Workbooks
- Individual Filter Turbidity Spreadsheets
- Sludge Handling Information

3.2 Basis of Design Comparison

The PRF utilizes conventional surface water treatment processes to produce potable drinking water for its member governments and customers. These processes include chemical addition, rapid mixing, flocculation, sedimentation, filtration, and residuals handling.

The following paragraphs summarize information regarding the existing treatment processes and **Table 3-1** provides a comparison of each unit process sizing versus regulatory (10 States Standards) guidelines and standard engineering practice. Highlighted values represent values outside of typical regulatory or design guidelines.

Table 3-1

Design Basis Comparison

Process Description	Design Requirement	Reference	Plant 1 Design Flow = 15 MGD	Plant 2 Design Flow = 12 MGD	Plant 3 Design Flow = 12 MGD	Plant 4 Design Flow = 12 MGD
Rapid Mix						
Max Detention Time - sec	30	10 States Standards		37		
Min Mixing G Value - sec^{-1}	750	10 States Standards		822		
Flocculation				**		
Min Detention Time - min	30	10 States Standards		30		
Min Mixing G Value - sec-1	60	AWWA WTP Design		106		
Conventional Sedimentation				**		
Min Settling Time - hrs	4	10 States Standards		4.4		
Max Flow Through Velocity - fpm	0.5	10 States Standards		0.5		
Max Weir Loading Rate - gpd/ft	20,000	10 States Standards		12500		
Solids Contact Units - Rapid Mixing						
Detention Time - sec	N/A	10 States Standards	67		104	104
Mixing G Value - sec^{-1}	N/A	10 States Standards	582		520	520
Solids Contact Unit - Flocculation			**		**	**
Min Detention Time - min	30	10 States Standards	23.8		28.6	28.6
Mixing G Value - sec^{-1}	N/A	10 States Standards	582		520	520
Solids Contact Unit - Settling			**			
Settling Time - hrs	2 - 4	10 States Standards	1.9		2.9	2.9
Max Weir Loading Rates - gpm/ft	10	10 States Standards	6.0		4.0	4.0
Upflow Rates - gpm/ft^2	1	10 States Standards	1.06		0.77	0.77
Filters				**	**	**
Filtration Rate - gpm/ft^2 (w/1 filter out of service)	2 - 4	10 States Standards	3.1	4.8	3.7	3.7
Minimum Depth of Filter Box - ft	8.5	10 States Standards	20.0	20	20	20
Max Backwash Trough Max Spacing - ft	6.0	10 States Standards	5.0	5.3	5.3	5.3
Maximum Media Depth - in	30	10 States Standards	28	36	36	36
Min Backwash Delivery Rate - gpm/ft^2	15	10 States Standards	15***	22	20	20
Bed Expansion - %	50	10 States Standards	47	56	56	56
Minimum Filter Wash Time - min	15	10 States Standards	10	10	12	12

Rapid Mixing

The purpose of rapid mixing is to provide mixing energy necessary to rapidly and completely mix the coagulant and pH adjustment chemicals with the raw water. Mixing is accomplished by the input of energy into the water. This magnitude of mixing energy is referred to as a G value. The G value is defined by the following equation:

$$G = (\frac{P}{\mu V})^{1/2}$$

Where G = the root mean square velocity gradient, ft/s/ft
P = power input, ft·lb/s
μ = dynamic viscosity, lb·s/ft^2
V = volume, ft^3

Typical design values for rapid mixing in a water treatment are as follows:

- Hydraulic detention time: < 30 second
- G value: 750 second^{-1}

Flocculation

The purpose of the flocculation basins is to maximize the contact of destabilized particles so that the particles will grow larger and can be removed in the sedimentation processes. Typical design values for flocculation in water treatment are as follows:

- G value: 20 to 70 second-1
- Hydraulic detention time: 30 minutes
- Flow through velocities: 0.5 < v < 1.5 feet per minute (fpm)

Sedimentation

Sedimentation is a solid-liquid separation process that reduces the settable solids from the water prior to filtration. Reducing the solids loading allows the filters to operate more efficiently, which increases filter run times and decreases the amount of filter backwash water required. Typical settled water turbidities should be 1 mg/L or less. As solids settle, they accumulate in the bottom of the sedimentation basins. The PRF utilizes circular clarifier mechanisms for alum sludge removal in all four plants. Information obtained from PRF staff indicate typical sludge blow-down rates are on the order of 1,000 gal/min.

The sedimentation process is designed using the surface overflow rate, flow through velocity, hydraulic detention time, and weir loading. The following summarizes typical design values for these parameters:

- Surface Overflow Rate: 800 – 1,200 gpd/ft^2
- Flow Through Velocity: 0.5 fpm
- Detention Time: 4.0 hours
- Weir Loading: 20,000 gpd/lf
- SCU Upflow rate: 1.0 gpm/ft^2
- SCU weir loading rate: 10 gpm/ft

Filtration

Settled water from the sedimentation basins is further treated by filtering through dual media gravity filters. The purpose of the filters is to remove solids that pass through the sedimentation process. The filters provide a barrier against the transmission of waterborne diseases by removing a substantial amount of the remaining suspended particles from the water. In addition, the removal of particles reduces the demand on the disinfection process, which makes it more efficient. Regulations require that filtered water turbidity be less than 1 mg/L in 95% of the samples taken each month and in no instances be greater than 5.0 NTU. The filters are comprised of an underdrain, gravel support bed, and sand and anthracite filtration media.

The PRF has twenty-six dual media filters. Backwashing of the filters is accomplished using the filtered water. Plant 1 utilizes surface wash mechanisms to aid in cleaning the filters during the backwash process, while Plants 2, 3, and 4 utilize air scour to aid in cleaning the filters during the backwash process. The number of filters and filter dimensions for each Plant are summarized in **Table 2-1.** Filters are typically sized based on the following criteria:

- Maximum filtration rate: 4 gpm/ft^2
- Minimum backwash rate: 15 gpm/ft^2
- Backwash trough spacing: < 6 ft edge to edge
- Air flow rate: 5 scfm/ft^2

A comparison of each Plant's process unit design basis with the regulatory and design guidelines yields the following:

<u>Plant 1</u>

- Less than the minimum recommended flocculation detention time.
- Less than the minimum recommended settling time requirements.
- Greater than the recommended maximum upflow rate.
- Less than the minimum recommended filter expansion during a backwash, and backwash wash time.

Plant 2

- Greater than the recommended maximum rapid mix detention time.
- Greater than the recommended maximum filtration rate with one filter out of service. Treatment capacity with one filter out of service and a maximum filtration rate of 4 gpm/ft^2 is 9.9 MGD.
- Greater than the recommended maximum media depth.
- Average filter backwash time is less than the minimum recommended.

Plant 3

- Less than the minimum recommended flocculation detention time.
- Greater than the recommended maximum media depth.
- Average filter backwash time is less than the minimum recommended.

Plant 4

- Less than the minimum recommended flocculation detention time.
- Greater than the recommended maximum media depth.
- Average filter backwash time is less than the minimum recommended.

Based on our evaluation the following summarizes the treatment processes that have additional capacity in the existing Plants:

Plant 1

- Filters are capable of treating 19.58 MGD with one filter out of service and a maximum filtration rate of 4 gpm/ft^2.

Plant 2

- No additional capacity.

Plant 3

- Filters are capable of treating 12.96 MGD with one filter out of service and a maximum filtration rate of 4 gpm/ft^2.

Plant 4

- Filters are capable of treating 12.96 MGD with one filter out of service and a maximum filtration rate of 4 gpm/ft^2.

3.3 Review of Plant Operational Data

Plant historical operational data were reviewed. This review primarily focused on the water quality parameters and treatment performance indices.

The objectives of this review were:

1. Evaluate current production rate at individual plants;
2. Evaluate current operation parameters and treatment performance;
3. Identify opportunities for obtaining additional capacity without major expansion capital improvements; and
4. Benchmark treatment performance from current plants.

The data review includes the following:

1. Process raw water flow and finished water flows for individual plants;
2. Process backwash flows for individual plants;
3. Turbidity data in raw water, settled and finished water;
4. Filter loading rates;
5. Filter run times; and
6. Filter turbidity.

The results and observations from the data review and analysis are summarized below.

Current Plant Flows

Table 3-2 presents minimum, 5th percentile, average, 95th percentile, and maximum flows based on reported plant flow from June 2019 through May 2021. **Figure 3-1** plots the average and 95th percentile value of these flows.

Table 3-2 Historical Flow Data for PRF (June 2019 through May 2021)

Plant No.	Min. (mgd)	5th Percentile (mgd)	Average (mgd)	95th Percentile (mgd)	Max. (mgd)
Plant 1	0.00	2.27	6.01	10.82	12.64
Plant 2	0.00	1.89	5.39	9.84	11.95
Plant 3	0.00	9.43	10.48	11.60	19.58
Plant 4	7.32	9.52	10.73	11.65	19.74

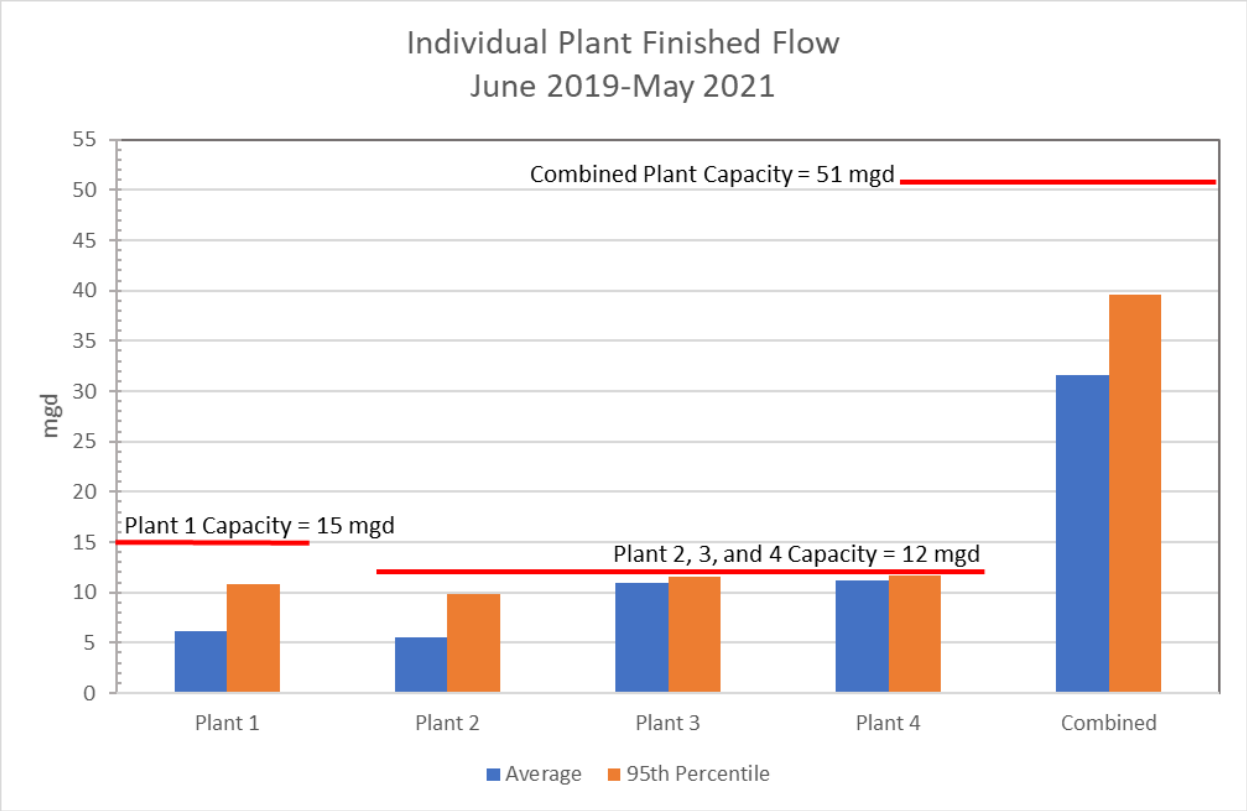


Figure 3-1 Historical Average and 95th Percentile Flow for PRF (June 2019 through May 2021)

As shown in the table and figure:

- Plant 1 currently produces 41.2% of its rated flow on average;
- Plant 2 currently produces 44.9% of its rated flow on average;
- Plant 3 currently produces 91.0% of its rated flow; and
- Plant 4 produces 92.9% of its rated flow.

In discussions with plant staff, it is understood that presently each plant operates within its designated flow band. The designated flow band for each plant is listed below:

- Plant 1: 10-15 mgd
- Plant 2: 8-12 mgd
- Plant 3: 10-12 mgd
- Plant 4: 10-12 mgd

Filter Backwash Flows

In reviewing the backwash water usage, the backwash water consumption at the four plants varies from 2.9% to 4.0%, as shown in Table 3-3, which is a reasonable range within the industrial practice (typical 3%-5%).

Table 3-3 Historical Backwash Flow Data for PRF (June 2019 through May 2021)

Plant No.	Average Backwash Flow, MGD	Average Flow/Rated Capacity
Plant 1	0.18	2.9%
Plant 2	0.17	3.0%
Plant 3	0.44	4.0%
Plant 4	0.42	3.7%

Plant Turbidity Data

Table 3-4 summarizes the results from plant turbidity data review, including raw water turbidity, settled water turbidity, and combined filter turbidity. Trending of water turbidities from historical data is shown in **Figure 3-2**.

Table 3-4 Historical Turbidity Data for PRF (June 2019 through May 2021)

Turbidity	Min. (NTU)	5th Percentile (NTU)	Average (NTU)	95th Percentile (NTU)	Max. (NTU)
Raw Water Turbidity	1.05	1.71	3.30	5.01	12.20
Combined Settled Water Turbidity	0.33	0.49	0.73	1.25	2.06
Combined Filter Water Turbidity	0.06	0.07	0.09	0.12	0.74

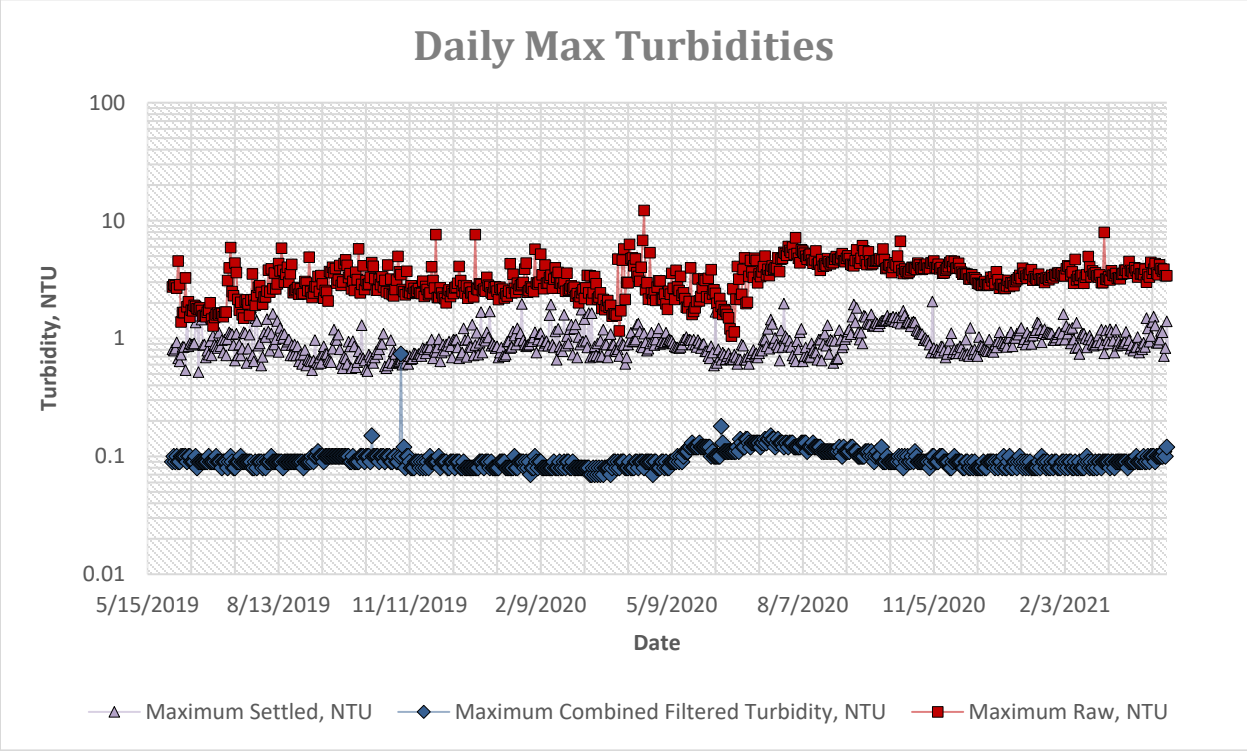


Figure 3-2 Historical Turbidity Data for PRF (June 2019 through May 2021)

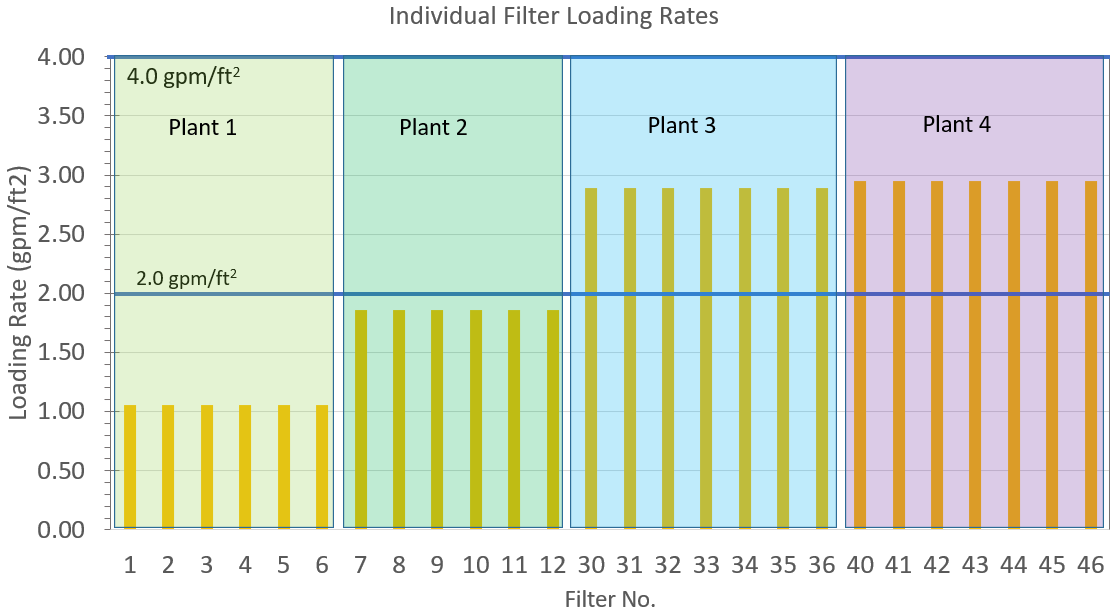
As seen, the plant produces a settled water turbidity of 0.73 NTU on average and a 95th percentile value of 1.25 NTU. The average combined filter water turbidity is 0.09 NTU with the 95th percentile valve is 0.12 NTU.

Filter Loading Rate

Filter loading rates for individual filters are presented in **Table 3-5** and illustrated in **Figure 3-3**. Note that the filter loading rates are limited by each plant's designated flow band as discussed previously.

Table 3-5 Historical Filter Loading Rates for PRF (June 2019 through May 2021)

NTU	Number of filters	Average Treated Flow	L (Ft.)	W (Ft.)	Area (Sq. Ft.)	Total Area (Sq. Ft.)	Average filter loading gpm/ft2
Plant No. 1	6	6.19	20	34	680	4,080	1.05
Plant No. 2	6	5.55	23	15	345	2,070	1.86
Plant No. 3	7	10.92	25	15	375	2,625	2.89
Plant No. 4	7	11.14	25	15	375	2,625	2.95



Note: 4.0 gpm/ft^2 and 2.0 gpm/ft^2 are 10SS design values for filter loading rates based on the biggest unit being out of service. Filter loading rates in the chart are based on historical flows with all units in service.

Figure 3-3 Historical Filter Loading Rates for PRF (June 2019 through May 2021)

- The Plant 1 filters operate at a filtration rate of 1.05 gpm/ ft2.
- The Plant 2 filters operate at 1.86 gpm/ft2.
- The Plant 3 filters operate at 2.89 gpm/ft2.

- The Plant 4 filters operate at 2.95 gpm/ft2

Filter Run Time

Filter run time for individual filters are presented in **Table 3-6** and illustrated in **Figure 3-4**. In general, the Plant 4 filters have an average of 37-38 hours, and the Plant 3 filters have 36-37 hours on average. The Plant 2 filters have 33-34 hours, and the Plant 1 filters have an average run time of 35-36 hours.

Table 3-6 Historical Individual Filter Runtimes for PRF (June 2019 through 2021)

	Filters	Min. (hrs)	Average (hrs)	Max. (hrs)		Filters	Min. (hrs)	Average (hrs)	Max. (hrs)
Plant 1	1	7.25	35.66	56.00	Plant 2	7	13.75	32.88	57.50
	2	2.25	35.71	53.50		8	2.00	32.90	57.75
	3	11.75	35.64	65.25		9	14.00	32.83	55.75
	4	2.75	35.54	60.50		10	4.50	32.88	58.75
	5	6.00	35.63	52.75		11	18.00	33.11	57.50
	6	8.75	35.63	50.50		12	7.75	32.82	56.50
Plant 3	30	13.00	36.62	49.00	Plant 4	40	24.25	37.47	64.75
	31	25.00	36.69	50.75		41	24.00	37.50	52.08
	32	13.50	38.49	88.50		42	24.75	37.51	48.75
	33	4.00	36.45	60.50		43	14.75	37.48	50.75
	34	4.00	36.55	53.75		44	19.25	37.61	54.50
	35	23.00	36.68	64.25		45	24.25	37.50	52.25
	36	21.00	36.64	58.67		46	29.50	37.72	51.50

Figure 3-4 Historical Filter Runtimes for PRF (June 2019 through 2021)

Given the existing filter media configuration, it is typical that a minimum run time of 60-70 hours should be anticipated. Typically filter run is terminated based on filtered water turbidity, headloss, or system-based run time. In further discussion with the Authority, currently filter termination is based on scheduled backwashes, operator shift changes, and plant standard operating procedures (SOP).

Individual Filter Turbidity

In conjunction with the filter run times, individual filtered water turbidity data were also reviewed and processed, as summarized in **Table 3-7**, and shown in **Figure 3-5**. The Plant 1 filters have an average filtered water turbidity of 0.106 NTU, the Plant 2 filters have an average filtered water turbidity of 0.111 NTU, the Plant 3 filters have an average filtered water turbidity of 0.160 NTU and the Plant 4 filters have an average filtered water turbidity of 0.144 NTU.

Table 3-7 Historical Individual Filter Turbidity for PRF (June 2019 through May 2021)

	Plant 1						
Filters	1	2	3	4	5	6	
5th	0.07	0.08	0.08	0.08	0.08	0.08	
Average	0.10	0.11	0.11	0.10	0.10	0.11	
95th	0.15	0.16	0.16	0.15	0.15	0.17	
	Plant 2						
	7	8	9	10	11	12	
5th	0.10	0.10	0.08	0.09	0.08	0.09	
Average	0.12	0.13	0.10	0.10	0.10	0.11	
95th	0.15	0.16	0.14	0.13	0.14	0.14	
	Plant 3						
	30	31	32	33	34	35	36
5th	0.14	0.13	0.13	0.13	0.13	0.11	0.11
Average	0.17	0.16	0.20	0.16	0.16	0.14	0.15
95th	0.21	0.20	0.38	0.21	0.21	0.19	0.20
	Plant 4						
	40	41	42	43	44	45	46
5th	0.11	0.11	0.13	0.10	0.10	0.12	0.11
Average	0.14	0.14	0.16	0.14	0.14	0.15	0.15
95th	0.18	0.19	0.20	0.19	0.18	0.20	0.20

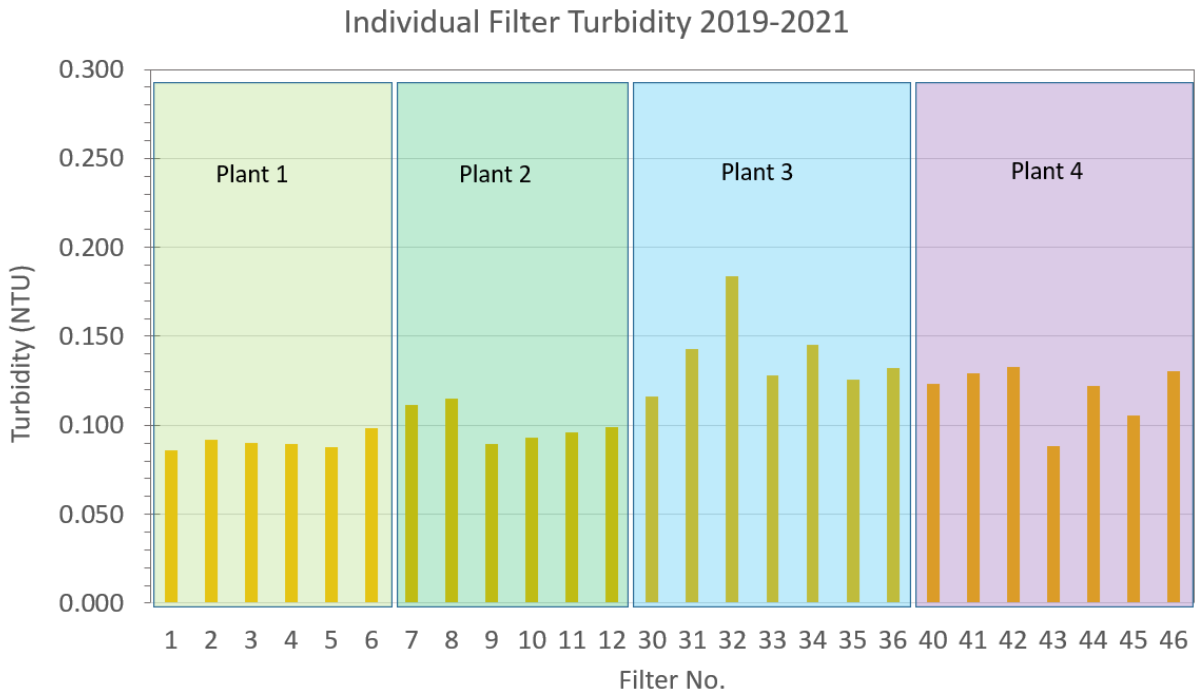


Figure 3-5 Historical Individual Filter Turbidity for PRF (June 2019 through May 2021)

Section 4 Treatment Process Alternatives Evaluation

4.1 Treatment Process Alternatives

Table 4-1 presents a list of preliminary treatment process alternatives that were collectively identified by the Authority and Ardurra for evaluation to determine opportunities for increasing plant capacity.

Table 4-1 Treatment Process Alternatives

Alternative	Plant	Alternative Description	Note
1	Plant 1	Add a 3rd up-flow clarifier to Plant 1 to increase clarification capacity	This alternative takes advantage of existing excess Plant 1 filter capacity
2A and 2B	Plant 2	Rerate Plant 2 sedimentation basins by installing plate or tube settlers and add new filters	Option A designates plate setters and Option B designates tube settlers
3A and 3B	Plant 1/Plant 2	Add plate or tube settlers to Plant 2 sedimentation basins and interconnect Plants 1 and 2 settled water flows	This alternative takes advantage of existing Plant 1 excess filter capacity; Option A designates plate setters and Option B designates tube settlers
4A and 4B	Plant 1/Plant 2	Add plate or tube settlers to Plant 2 sedimentation basins; Add membrane filtration downstream of Plants 1 and 2	This alternative takes advantage of additional sedimentation basin capacity; Option A designates plate setters and Option B designates tube settlers
5	Plants 1, 2, 3, 4	Interconnect the settled water flow from all 4 plants and, if necessary, expand one (or more) of the existing filter banks to accommodate the increased capacity	
6	Plants 1, 2, 3, 4	Interconnect the settled water flow from all 4 plants and, if necessary, construct a new dual media or membrane filter complex that can accommodate the increased capacity	
7	Plants 3 and 4	Re-rate Plants 3 and 4 from 12 to 14 MGD.	Includes reviewing findings of previously completed study

Alternative	Plant	Alternative Description	Note
8		Construct a new conventional treatment train identical to Plant 3 and Plant 4 (24 MGD)	
9		Construct a new conventional treatment train that employs high-rate plate or tube settler sedimentation with dual media filters	
10		Construct a new treatment train that employs high-rate plate or tube settler sedimentation with membrane filtration	

4.2 Treatment Process Alternative Evaluation Discussion

4.2.1 Alternative 1

Alternative 1 consists of adding a third solids contact unit to increase Plant 1 preliminary treatment capacity by 7.5 MGD to 22.5 MGD. However, Plant 1 filter capacity, with one filter out of service, is 19.58 MGD. Because of this, the Alternative 1 increased capacity is limited to 4.58 MGD. The major process equipment required to achieve this additional capacity is listed in **Table 4-2**. Site impacts from new SCU include possible relocation of raw water piping and fiber optic duct bank. The new SCU location may also impact existing ASR Wells. From a regulatory standpoint the new SCU will require coordination and permitting with FDEP.

Table 4-2 Major Process Equipment Required for Alternative 1

Equipment Description	Voltage/Phase	Horsepower/Criteria
PAC Mixer No. 1	460V/3 ph	15 hp
PAC Mixer No. 2	460V/3 ph	15 hp
HRC Reactor Clarifier Rake Drive	460V/3 ph	0.5 hp
HRC Reactor Clarifier Turbine Drive	460V/3 ph	5 hp

4.2.2 Alternatives 2A and 2B

Alternatives 2A and 2B consisted of high rating Plant 2 sedimentation basins by adding plate settlers (2A) or by adding tube settlers (2B). In addition to high rating the sedimentation basins,

additional rapid mixing, flocculation and filtration capacity will be required. To accommodate the plate settlers or tube settlers, the existing circular sludge collectors will need to be removed and hoseless type sludge collection units installed. By utilizing plate settlers, Plant 2 capacity can be increased by 16 MGD to 28 MGD. By utilizing tube settlers, Plant 2 capacity can be increased by 12 MGD to 24 MGD. The major process equipment required to achieve this additional capacity is listed in **Table 4-3**. Site impacts include construction of a new two stage rapid mix chamber, and possible relocation of site piping. From a regulatory standpoint, construction of the new rapid mix chamber, process modifications to Plant 2, and construction of new filters will require coordination and permitting with FDEP.

Table 4-3 Major Process Equipment Required for Alternative 2A and 2B

Equipment Description	Voltage/Phase	Horsepower/Criteria
PAC Slurry Mixer No. 1	460V/3 ph	10 hp
PAC Slurry Mixer No. 2	460V/3 ph	10 hp
PAC Slurry Mixer No. 3	460V/3 ph	10 hp
PAC Slurry Mixer No. 4	460V/3 ph	10 hp
PAC Recirc Pump No. 1	460V/3 ph	5 hp
PAC Recirc Pump No. 2	460V/3 ph	5 hp
PAC Recirc Pump No. 3	460V/3 ph	5 hp
PAC Recirc Pump No. 4	460V/3 ph	5 hp
PAC Metering Pump No. 1	120V	1 hp
PAC Metering Pump No. 2	120V	1 hp
PAC Metering Pump No. 3	120V	1 hp
Alum Metering Pump Skid No. 1	120V	1 hp
Alum Metering Pump Skid No. 2	120V	1 hp
Polymer Aging Mixer No. 1	460V/3 ph	1 hp
Polymer Aging Mixer No. 2	460V/3 ph	1 hp
Polymer Metering Pump Skid No. 1	120V	1 hp
Polymer Metering Pump Skid No. 2	120V	1 hp
Caustic Metering Pump Skid No. 1	120V	1 hp
Caustic Metering Pump Skid No. 2	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 1	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 2	120V	1 hp
Ammonium Hydroxide Metering Pump Skid No. 1	120V	1 hp
Ammonium Hydroxide Metering Pump Skid No. 2	120V	1 hp

Equipment Description	Voltage/Phase	Horsepower/Criteria
PAC Mixer No. 1	460V/3 ph	15 hp
PAC Mixer No. 2	460V/3 ph	15 hp
PAC Mixer No. 3	460V/3 ph	15 hp
PAC Mixer No. 4	460V/3 ph	15 hp
Rapid Mixer No. 1	460V/3 ph	25 hp
Rapid Mixer No. 2	460V/3 ph	25 hp
Rapid Mixer No. 3	460V/3 ph	25 hp
Rapid Mixer No. 4	460V/3 ph	25 hp
Flocculator No. 1A	460V/3 ph	5 hp
Flocculator No. 2A	460V/3 ph	3 hp
Flocculator No. 3A	460V/3 ph	2 hp
Flocculator No. 1B	460V/3 ph	5 hp
Flocculator No. 2B	460V/3 ph	3 hp
Flocculator No. 3B	460V/3 ph	2 hp
Plate Pack No.1 – Plate Rack No. 14 (Alt 2A)	N/A	N/A
Tube Settlers (Alt. 2B)	N/A	N/A
Sludge Collector No. 1A	460V/3 ph	0.5 hp
Sludge Collector No. 1B	460V/3 ph	0.5 hp
Sludge Collector No. 2A	460V/3 ph	0.5 hp
Sludge Collector No. 2B	460V/3 ph	0.5 hp
Dual Media Filter No. 1 – Dual Media Filter No. 14	N/A	N/A
Air Backwash Blower No. 1	460/3 ph	40 hp
Air Backwash Blower No. 2	460/3 ph	40 hp
Transfer Pump No. 1	460V/3 ph	150 hp
Transfer Pump No. 2	460V/3 ph	150 hp

4.2.3 Alternatives 3A and 3B

Alternatives 3A and 3B consists of high rating the Plant 2 sedimentation basins by adding plate settlers (3A) or by adding tube settlers (3B) and interconnecting settled water flows from Plants 1 and 2. In addition to high rating the sedimentation basin, additional rapid mixing, flocculation and filtration capacity will be required. To accommodate the plate settlers or tube settlers the existing circular sludge collectors will need to be removed and hoseless type sludge collection units installed. By utilizing plate settlers, Plant 2 settling capacity can be increased by 16 MGD to 28 MGD. By utilizing tube settlers, Plant 2 settling capacity can be increased by 12 MGD to 24 MGD. However, between Plant 1 and 2 there is only 4.58 MGD of additional filter capacity so the Plant capacity increase will be limited to 4.58 MGD. The major process equipment required to achieve this additional capacity is listed in **Table 4-4**. Site impacts include construction of a new two stage rapid mix chamber, installation of interconnecting settled water piping and possible relocation of site piping. From a regulatory standpoint the process modifications to Plant 2 will require coordination and permitting with FDEP.

Table 4-4 Major Process Equipment Required for Alternative 3A and 3B

Equipment Description	Voltage/Phase	Horsepower/Criteria
PAC Slurry Mixer No. 1	460V/3 ph	10 hp
PAC Slurry Mixer No. 2	460V/3 ph	10 hp
PAC Slurry Mixer No. 3	460V/3 ph	10 hp
PAC Slurry Mixer No. 4	460V/3 ph	10 hp
PAC Recirc Pump No. 1	460V/3 ph	5 hp
PAC Recirc Pump No. 2	460V/3 ph	5 hp
PAC Recirc Pump No. 3	460V/3 ph	5 hp
PAC Recirc Pump No. 4	460V/3 ph	5 hp
PAC Metering Pump No. 1	120V	1 hp
PAC Metering Pump No. 2	120V	1 hp
PAC Metering Pump No. 3	120V	1 hp
Alum Metering Pump Skid No. 1	120V	1 hp
Alum Metering Pump Skid No. 2	120V	1 hp
Polymer Aging Mixer No. 1	460V/3 ph	1 hp
Polymer Aging Mixer No. 2	460V/3 ph	1 hp
Polymer Metering Pump Skid No. 1	120V	1 hp
Polymer Metering Pump Skid No. 2	120V	1 hp
Caustic Metering Pump Skid No. 1	120V	1 hp

Equipment Description	Voltage/Phase	Horsepower/Criteria
Caustic Metering Pump Skid No. 2	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 1	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 2	120V	1 hp
Ammonium Hydroxide Metering Pump Skid No. 1	120V	1 hp
Ammonium Hydroxide Metering Pump Skid No. 2	120V	1 hp
PAC Mixer No. 1	460V/3 ph	15 hp
PAC Mixer No. 2	460V/3 ph	15 hp
PAC Mixer No. 3	460V/3 ph	15 hp
PAC Mixer No. 4	460V/3 ph	15 hp
Rapid Mixer No. 1	460V/3 ph	25 hp
Rapid Mixer No. 2	460V/3 ph	25 hp
Rapid Mixer No. 3	460V/3 ph	25 hp
Rapid Mixer No. 4	460V/3 ph	25 hp
Flocculator No. 1A	460V/3 ph	5 hp
Flocculator No. 2A	460V/3 ph	3 hp
Flocculator No. 3A	460V/3 ph	2 hp
Flocculator No. 1B	460V/3 ph	5 hp
Flocculator No. 2B	460V/3 ph	3 hp
Flocculator No. 3B	460V/3 ph	2 hp
Plate Pack No.1– Plate Rack No. 14 (Alt. 3A)	N/A	N/A
Tube Settlers (Alt. 3B)	N/A	N/A
Sludge Collector No. 1A	460V/3 ph	0.5 hp
Sludge Collector No. 1B	460V/3 ph	0.5 hp
Sludge Collector No. 2A	460V/3 ph	0.5 hp
Sludge Collector No. 2B	460V/3 ph	0.5 hp
Transfer Pump No. 1	460V/3 ph	150 hp
Transfer Pump No.2	460V/3 ph	150 hp

4.2.4 Alternatives 4A and 4B

Alternatives 4A and 4B consist of high rating Plant 2 sedimentation basins by adding plate settlers (4A) or by adding tube settlers (4B), converting Plant 2 dual media filters to membrane filters and interconnecting settled water flows from Plant 1 and Plant 2. In addition to high rating the sedimentation basins, additional rapid mixing and flocculation capacity will be required. To accommodate the plate settlers or tube settlers, the existing circular sludge collectors will need to be removed and hoseless type sludge collection units installed. By utilizing plate settlers, Plant 2 capacity can be increased by 16 MGD to 28 MGD. By utilizing tube settlers, Plant 2 capacity can be increased by 12 MGD to 24 MGD. The major process equipment required to achieve this additional capacity is listed in Table 4-5. Site impacts include construction of a new two stage rapid mix chamber, installation of interconnecting settled water piping and possible relocation of site piping. From a regulatory standpoint the process modifications to Plant 2 and the conversion of the dual media filters to membrane filters will require coordination and permitting with FDEP.

Table 4-5 Major Process Equipment Required for Alternative 4A and 4B

Equipment Description	Voltage/Phase	Horsepower/Criteria
PAC Slurry Mixer No. 1	460V/3 ph	10 hp
PAC Slurry Mixer No. 2	460V/3 ph	10 hp
PAC Slurry Mixer No. 3	460V/3 ph	10 hp
PAC Slurry Mixer No. 4	460V/3 ph	10 hp
PAC Recirc Pump No. 1	460V/3 ph	5 hp
PAC Recirc Pump No. 2	460V/3 ph	5 hp
PAC Recirc Pump No. 3	460V/3 ph	5 hp
PAC Recirc Pump No. 4	460V/3 ph	5 hp
PAC Metering Pump No. 1	120V	1 hp
PAC Metering Pump No. 2	120V	1 hp
PAC Metering Pump No. 3	120V	1 hp
Alum Metering Pump Skid No. 1	120V	1 hp
Alum Metering Pump Skid No. 2	120V	1 hp
Polymer Aging Mixer No. 1	460V/3 ph	1 hp
Polymer Aging Mixer No. 2	460V/3 ph	1 hp
Polymer Metering Pump Skid No. 1	120V	1 hp
Polymer Metering Pump Skid No. 2	120V	1 hp
Caustic Metering Pump Skid No. 1	120V	1 hp

Equipment Description	Voltage/Phase	Horsepower/Criteria
Caustic Metering Pump Skid No. 2	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 1	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 2	120V	1 hp
Ammonium Hydroxide Metering Pump Skid No. 1	120V	1 hp
Ammonium Hydroxide Metering Pump Skid No. 2	120V	1 hp
PAC Mixer No. 1	460V/3 ph	15 hp
PAC Mixer No. 2	460V/3 ph	15 hp
PAC Mixer No. 3	460V/3 ph	15 hp
PAC Mixer No. 4	460V/3 ph	15 hp
Rapid Mixer No. 1	460V/3 ph	25 hp
Rapid Mixer No. 2	460V/3 ph	25 hp
Rapid Mixer No. 3	460V/3 ph	25 hp
Rapid Mixer No. 4	460V/3 ph	25 hp
Flocculator No. 1A	460V/3 ph	5 hp
Flocculator No. 2A	460V/3 ph	3 hp
Flocculator No. 3A	460V/3 ph	2 hp
Flocculator No. 1B	460V/3 ph	5 hp
Flocculator No. 2B	460V/3 ph	3 hp
Flocculator No. 3B	460V/3 ph	2 hp
Plate Pack No.1 - Plate Pack No.14 (Alt. 4A)	N/A	N/A
Tube Settlers (Alt. 4B)	N/A	N/A
Sludge Collector No. 1A	460V/3 ph	0.5 hp
Sludge Collector No. 1B	460V/3 ph	0.5 hp
Sludge Collector No. 2A	460V/3 ph	0.5 hp
Sludge Collector No. 2B	460V/3 ph	0.5 hp
Fine Screen No. 1	460V/3 ph	1.0 hp
Fine Screen No. 2	460V/3 ph	1.0 hp
Membrane Filter No.1 - Membrane Filter No.6	N/A	N/A
Air Scour Blower No. 1	460V/3 ph	40 hp
Air Scour Blower No. 2	460V/3 ph	40hp
Permeate Pump No. 1	460V/3 ph	75 HP
Permeate Pump No. 2	460V/3 ph	75 HP
Permeate Pump No. 3	460V/3 ph	75 HP
Permeate Pump No. 4	460V/3 ph	75 HP
Permeate Pump No. 5	460V/3 ph	75 HP

Equipment Description	Voltage/Phase	Horsepower/Criteria
Permeate Pump No. 6	460V/3 ph	75 HP
Backpulse Pump No. 1	460V/3 ph	75 HP
Backpulse Pump No. 2	460V/3 ph	75 HP
Instrument Air Compressor No. 1	460V/3 ph	7.5 HP
Instrument Air Compressor No. 2	460V/3 ph	7.5 HP
CIP Pump No. 1	460V/3 ph	15 HP
CIP Pump No. 2	460V/3 ph	15 HP
CIP Heater	460V/3 ph	115 KW
Transfer Pump No. 1	460V/3 ph	150 hp
Transfer Pump No. 2	460V/3 ph	150 hp

4.2.5 Alternative 5

Alternative 5 consists of interconnecting settled water flow from each of the four Plants and taking advantage of the existing extra filtration capacity available in each Plant. However, after evaluating the hydraulics of all four Plants it was determined that the Plants have different hydraulic grade lines, and it is not feasible to interconnect the settled water between the Plants.

4.2.6 Alternative 6

Alternative 6 consists of interconnecting settled water flow from each of the four Plants and constructing additional filtration capacity if necessary. However, after evaluating the hydraulics of all four Plants it was determined that the Plants have different hydraulic grade lines, and it is not feasible to interconnect the settled water between the Plants.

4.2.7 Alternative 7

Alternative 7 consists of rerating Plants 3 and 4 from 12 MGD each to 14 MGD each as stated in the previous Peace River Capacity Expansion Phase II Study prepared by TKW Consulting Engineers. This takes advantage of the 4 MGD of excess filter capacity in Plants 3 and 4. No process improvements are required to gain this additional capacity. From a regulatory standpoint the increase in rated capacity will require coordination and permitting with FDEP.

4.2.8 Alternative 8

Alternative 8 consists of constructing a new 24 MGD treatment train identical to Plants 3 and 4 and new dual media filters. The major process equipment required to obtain this additional capacity is listed in **Table 4-6**. From a regulatory standpoint the new treatment train will require coordination and permitting with FDEP.

Table 4-6 Major Process Equipment Required for Alternative 8

Equipment Description	Voltage/Phase	Horsepower/Criteria
PAC Slurry Mixer No. 1	460V/3 ph	10 hp
PAC Slurry Mixer No. 2	460V/3 ph	10 hp
PAC Slurry Mixer No. 3	460V/3 ph	10 hp
PAC Slurry Mixer No. 4	460V/3 ph	10 hp
PAC Recirc Pump No. 1	460V/3 ph	5 hp
PAC Recirc Pump No. 2	460V/3 ph	5 hp
PAC Recirc Pump No. 3	460V/3 ph	5 hp
PAC Recirc Pump No. 4	460V/3 ph	5 hp
PAC Metering Pump No. 1	120V	1 hp
PAC Metering Pump No. 2	120V	1 hp
PAC Metering Pump No. 3	120V	1 hp
Alum Metering Pump Skid No. 1	120V	1 hp
Alum Metering Pump Skid No. 2	120V	1 hp
Polymer Aging Mixer No. 1	460V/3 ph	1 hp
Polymer Aging Mixer No. 2	460V/3 ph	1 hp
Polymer Metering Pump Skid No. 1	120V	1 hp
Polymer Metering Pump Skid No. 2	120V	1 hp
Caustic Metering Pump Skid No. 1	120V	1 hp
Caustic Metering Pump Skid No. 2	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 1	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 2	120V	1 hp
Ammonium Hydroxide Metering Pump Skid No. 1	120V	1 hp
Ammonium Hydroxide Metering Pump Skid No. 2	120V	1 hp
PAC System Mixer No. 1	460V/3 ph	15 hp
PAC System Mixer No. 2	460V/3 ph	15 hp
PAC System Mixer No. 3	460V/3 ph	20 hp
PAC System Mixer No. 4	460V/3 ph	15 hp

Equipment Description	Voltage/Phase	Horsepower/Criteria
PAC System Mixer No. 5	460V/3 ph	15 hp
PAC System Mixer No. 6	460V/3 ph	20 hp
Rapid Mixer No. 1	460V/3 ph	15 hp
Rapid Mixer No. 2	460V/3 ph	15 hp
HRC Reactor Clarifier Rake Drive No. 1	460V/3 ph	0.5 hp
HRC Reactor Clarifier Turbine Drive No. 1	460V/3 ph	5 hp
HRC Reactor Clarifier Rake Drive No. 2	460V/3 ph	0.5 hp
HRC Reactor Clarifier Turbine Drive No. 2	460V/3 ph	5 hp
HRC Reactor Clarifier Rake Drive No. 3	460V/3 ph	0.5 hp
HRC Reactor Clarifier Turbine Drive No. 3	460V/3 ph	5 hp
HRC Reactor Clarifier Rake Drive No. 4	460V/3 ph	0.5 hp
HRC Reactor Clarifier Turbine Drive No. 4	460V/3 ph	5 hp
Dual Media Filter No. 1 - Dual Media Filter No. 14	N/A	N/A
Air Backwash Blower No. 1	460/3 ph	40 hp
Air Backwash Blower No. 2	460/3 ph	40 hp
Transfer Pump No. 1	460V/3 ph	150 hp
Transfer Pump No. 2	460V/3 ph	150 hp
Transfer Pump No. 3	460V/3 ph	150 hp

4.2.9 Alternative 9

Alternative 9 consists of constructing a new 24 MGD conventional treatment train that employs high-rate plate or tube settlers and new dual media filters. The major process equipment required to obtain this additional capacity is listed in **Table 4-7**. From a regulatory standpoint the new treatment train will require coordination and permitting with FDEP.

Table 4-7 Major Process Equipment Required for Alternative 9

Equipment Description	Voltage/Phase	Horsepower/Criteria
PAC Slurry Mixer No. 1	460V/3 ph	10 hp
PAC Slurry Mixer No. 2	460V/3 ph	10 hp
PAC Slurry Mixer No. 3	460V/3 ph	10 hp
PAC Slurry Mixer No. 4	460V/3 ph	10 hp
PAC Recirc Pump No. 1	460V/3 ph	5 hp
PAC Recirc Pump No. 2	460V/3 ph	5 hp

Equipment Description	Voltage/Phase	Horsepower/Criteria
PAC Recirc Pump No. 3	460V/3 ph	5 hp
PAC Recirc Pump No. 4	460V/3 ph	5 hp
PAC Metering Pump No. 1	120V	1 hp
PAC Metering Pump No. 2	120V	1 hp
PAC Metering Pump No. 3	120V	1 hp
Alum Metering Pump Skid No. 1	120V	1 hp
Alum Metering Pump Skid No. 2	120V	1 hp
Polymer Aging Mixer No. 1	460V/3 ph	1 hp
Polymer Aging Mixer No. 2	460V/3 ph	1 hp
Polymer Metering Pump Skid No. 1	120V	1 hp
Polymer Metering Pump Skid No. 2	120V	1 hp
Caustic Metering Pump Skid No. 1	120V	1 hp
Caustic Metering Pump Skid No. 2	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 1	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 2	120V	1 hp
Ammonium Hydroxide Metering Pump Skid No. 1	120V	1 hp
Ammonium Hydroxide Metering Pump Skid No. 2	120V	1 hp
PAC Mixer No. 1	460V/3 ph	15 hp
PAC Mixer No. 2	460V/3 ph	15 hp
PAC Mixer No. 3	460V/3 ph	15 hp
PAC Mixer No. 4	460V/3 ph	15 hp
Rapid Mixer No. 1	460V/3 ph	25 hp
Rapid Mixer No. 2	460V/3 ph	25 hp
Rapid Mixer No. 3	460V/3 ph	25 hp
Rapid Mixer No. 4	460V/3 ph	25 hp
Flocculator No. 1A	460V/3 ph	5 hp
Flocculator No. 2A	460V/3 ph	3 hp
Flocculator No. 3A	460V/3 ph	2 hp
Flocculator No. 1B	460V/3 ph	5 hp
Flocculator No. 2B	460V/3 ph	3 hp
Flocculator No. 3B	460V/3 ph	2 hp
Plate Pack No. 1 - Plate Pack No. 14	N/A	N/A
Sludge Collector No. 1A	460V/3 ph	0.5 hp
Sludge Collector No. 1B	460V/3 ph	0.5 hp
Sludge Collector No. 2A	460V/3 ph	0.5 hp

Equipment Description	Voltage/Phase	Horsepower/Criteria
Sludge Collector No. 2B	460V/3 ph	0.5 hp
Dual Media Filter No. 1 - Dual Media Filter No. 14	N/A	N/A
Air Backwash Blower No. 1	460/3 ph	40 hp
Air Backwash Blower No. 2	460/3 ph	40 hp
Transfer Pump No. 1	460V/3 ph	150 hp
Transfer Pump No. 2	460V/3 ph	150 hp

4.2.10 Alternative 10

Alternative 10 consists of constructing a new 24 MGD conventional treatment train that employs high-rate plate or tube settlers and membrane filtration. The major process equipment required to obtain this additional capacity is listed in **Table 4-8**. From a regulatory standpoint the new treatment train will require coordination and permitting with FDEP.

Table 4-8 Major Process Equipment Required for Alternative 10

Equipment Description	Voltage/Phase	Horsepower/Criteria
PAC Slurry Mixer No. 1	460V/3 ph	10 hp
PAC Slurry Mixer No. 2	460V/3 ph	10 hp
PAC Slurry Mixer No. 3	460V/3 ph	10 hp
PAC Slurry Mixer No. 4	460V/3 ph	10 hp
PAC Recirc Pump No. 1	460V/3 ph	5 hp
PAC Recirc Pump No. 2	460V/3 ph	5 hp
PAC Recirc Pump No. 3	460V/3 ph	5 hp
PAC Recirc Pump No. 4	460V/3 ph	5 hp
PAC Metering Pump No. 1	120V	1 hp
PAC Metering Pump No. 2	120V	1 hp
PAC Metering Pump No. 3	120V	1 hp
Alum Metering Pump Skid No. 1	120V	1 hp
Alum Metering Pump Skid No. 2	120V	1 hp
Polymer Aging Mixer No. 1	460V/3 ph	1 hp
Polymer Aging Mixer No. 2	460V/3 ph	1 hp
Polymer Metering Pump Skid No. 1	120V	1 hp
Polymer Metering Pump Skid No. 2	120V	1 hp
Caustic Metering Pump Skid No. 1	120V	1 hp

Equipment Description	Voltage/Phase	Horsepower/Criteria
Caustic Metering Pump Skid No. 2	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 1	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 2	120V	1 hp
Ammonium Hydroxide Metering Pump Skid No. 1	120V	1 hp
Ammonium Hydroxide Metering Pump Skid No. 2	120V	1 hp
PAC Mixer No. 1	460V/3 ph	15 hp
PAC Mixer No. 2	460V/3 ph	15 hp
PAC Mixer No. 3	460V/3 ph	15 hp
PAC Mixer No. 4	460V/3 ph	15 hp
Rapid Mixer No. 1	460V/3 ph	25 hp
Rapid Mixer No. 2	460V/3 ph	25 hp
Rapid Mixer No. 3	460V/3 ph	25 hp
Rapid Mixer No. 4	460V/3 ph	25 hp
Flocculator No. 1A	460V/3 ph	5 hp
Flocculator No. 2A	460V/3 ph	3 hp
Flocculator No. 3A	460V/3 ph	2 hp
Flocculator No. 1B	460V/3 ph	5 hp
Flocculator No. 2B	460V/3 ph	3 hp
Flocculator No. 3B	460V/3 ph	2 hp
Plate Pack No. 1 - Plate Pack No. 12	N/A	N/A
Sludge Collector No. 1A	460V/3 ph	0.5 hp
Sludge Collector No. 1B	460V/3 ph	0.5 hp
Sludge Collector No. 2A	460V/3 ph	0.5 hp
Sludge Collector No. 2B	460V/3 ph	0.5 hp
Fine Screen No. 1	460V/3 ph	1.0 hp
Fine Screen No. 2	460V/3 ph	1.0 hp
Membrane Filter No.1 - Membrane Filter No.6	N/A	N/A
Air Scour Blower No. 1	460V/3 ph	40 hp
Air Scour Blower No. 2	460V/3 ph	40hp
Permeate Pump No. 1	460V/3 ph	75 HP
Permeate Pump No. 2	460V/3 ph	75 HP
Permeate Pump No. 3	460V/3 ph	75 HP
Permeate Pump No. 4	460V/3 ph	75 HP
Permeate Pump No. 5	460V/3 ph	75 HP
Permeate Pump No. 6	460V/3 ph	75 HP

Equipment Description	Voltage/Phase	Horsepower/Criteria
Backpulse Pump No. 1	460V/3 ph	75 HP
Backpulse Pump No. 2	460V/3 ph	75 HP
Instrument Air Compressor No. 1	460V/3 ph	7.5 HP
Instrument Air Compressor No. 2	460V/3 ph	7.5 HP
CIP Pump No. 1	460V/3 ph	15 HP
CIP Pump No. 2	460V/3 ph	15 HP
CIP Heater	460V/3 ph	115 KW
Transfer Pump No. 1	460V/3 ph	150 hp
Transfer Pump No. 2	460V/3 ph	150 hp

4.3 Treatment Process Alternative Cost Evaluation

4.3.1 Preliminary Opinion of Probably Construction Costs

A Preliminary Opinion of Probable Construction Cost (OPCC) was developed for each treatment process alternative. These costs are considered comparative costs in that they do not include improvements common to all of the alternatives (increased chemical feed capacity, solids handling capacity, onsite finished storage capacity, and high service pumping capacity, etc.). In developing these comparative OPCCs, the following assumptions were made:

- Major equipment costs were obtained from equipment manufacturers or recent bids from similar projects.
- Building cost was based on $250/sf.
- Electrical work allowance was assumed at 20% of the total estimated cost.
- Instrumentation, control, and SCADA integration work allowance was assumed at 10% of the total estimated cost.

The OPCCs are summarized in **Table 4-9**. This planning/conceptual design level OPCC includes 30% contingency, 5% mobilization/demobilization, 6% bond/insurance, and 12% contractor overhead and profit. Please note this represents cost in year 2022 dollars and an escalation to mid-point of construction should be considered once the construction schedule is determined.

The OPCCs provided in this report should be considered an order-of-magnitude planning level estimate based on the criteria set forth by the Association for the Advancement of Cost Engineering (AACE) International. These estimates are provided with accuracy within 50% below or 30% above the actual construction cost.

In addition, an engineering services fee estimated at 15 percent of the construction cost was included, which represents the costs associated with engineering design, project bid, and construction contract administration.

Table 4-9 Preliminary OPCC for Proposed Treatment Process Alternatives (in 2022 dollars)

Alternative	Plant	Alternative Description	[1]Preliminary Opinion of Construction Cost
1	Plant 1	Add a 3rd up-flow clarifier to Plant 1 to increase clarification capacity	$6,000,000
2A	Plant 2	Rerate Plant 2 sedimentation basins by installing plate settlers and add new filters	$22,400,000
2B	Plant 2	Rerate Plant 2 sedimentation basins by installing tube settlers and add new filters	$17,700,000
3A	Plant 1/Plant 2	Add plate settlers to Plant 2 sedimentation basins and interconnect Plants 1 and 2 settled water flows	$9,600,000
3B	Plant 1/Plant 2	Add tube settlers to Plant 2 sedimentation basins and interconnect Plants 1 and 2 settled water flows	$6,900,000
4A	Plant 1/Plant 2	Add plate settlers to Plant 2 sedimentation basins; Add membrane filtration downstream of Plants 1 and 2	$25,700,000
4B	Plant 1/Plant 2	Add tube settlers to Plant 2 sedimentation basins; Add membrane filtration downstream of Plants 1 and 2	$21,300,000
5	Plants 1, 2, 3, 4	Interconnect the settled water flow from all 4 plants and, if necessary, expand one (or more) of the existing filter banks to accommodate the increased capacity	$1,200,000
6	Plants 1, 2, 3, 4	Interconnect the settled water flow from all 4 plants and, if necessary, construct a new dual media or membrane filter complex that can accommodate the increased capacity	$1,200,000

Alternative	Plant	Alternative Description	[1]Preliminary Opinion of Construction Cost
7	Plants 3 and 4	Re-rate Plants 3 and 4 from 12 to 14 MGD.	N/A
8		Construct a new conventional treatment train identical to Plant 3 and Plant 4 (24 MGD)	$47,800,000
9		Construct a new conventional treatment train that employs high-rate plate or tube settler sedimentation with dual media filters	$36,400,000
10		Construct a new treatment train that employs high-rate plate or tube settler sedimentation with membrane filtration	$32,300,000

Notes:

1. Costs for treatment process equipment only. Ancillary system costs are discussed in Section 5.

4.3.2 Preliminary Operation and Maintenance Costs

Estimated operation and maintenance (O&M) costs were developed for each alternative, including electrical power, chemical usage, sludge disposal, and plant maintenance. For alternatives that involve membrane filtration, the O&M cost also includes membrane replacement costs.

Key assumptions used in developing the treatment process O&M costs include:

- Major processes include coagulation/flocculation/sedimentation/filtration.
- All costs represent year 2022 dollars.
- Electrical is $0.06/kWh based on plant data.
- The chemical (PAC, alum, caustic, ammonia, polymer, hypo) unit cost was obtained from the plant.
- Sludge will be hauled offsite and sludge hauling cost provided by the plant is $7.75/ton based on plant data and estimated sludge production from increased flow
- The annual cost for maintenance was estimated to be 1.5 percent of the equipment capital cost.

- The annual cost for labor was not included in this analysis.

The estimated annual O&M costs are presented in **Table 4-10.**

Table 4-10 Preliminary Estimated O&M Costs for Proposed Treatment Process Alternatives (in 2022 dollars)

Alternative	Plant	Alternative Description	[1]Estimated Annual O&M Cost
1	Plant 1	Add a 3rd up-flow clarifier to Plant 1 to increase clarification capacity	$326,800
2A	Plant 2	Rerate Plant 2 sedimentation basins by installing plate settlers and add new filters	$1,248,000
2B	Plant 2	Rerate Plant 2 sedimentation basins by installing tube settlers and add new filters	$951,000
3A	Plant 1/ Plant 2	Add plate MGS settlers to Plant 2 sedimentation basins and interconnect Plants 1 and 2 settled water flows	$386,500
3B	Plant 1/ Plant 2	Add tube settlers to Plant 2 sedimentation basins and interconnect Plants 1 and 2 settled water flows	$344,500
4A	Plant 1/ Plant 2	Add plate settlers to Plant 2 sedimentation basins; Add membrane filtration downstream of Plants 1 and 2	$1,367,000
4B	Plant 1/ Plant 2	Add tube settlers to Plant 2 sedimentation basins; Add membrane filtration downstream of Plants 1 and 2	$1,046,400
5	Plant 1,2,3,4	Interconnect the settled water flow from all 4 plants and, if necessary, expand one (or more) of the existing filter banks to accommodate the increased capacity	N/A, see note 2
6	Plant 1,2,3,4	Interconnect the settled water flow from all 4 plants and, if necessary, construct a new dual media or membrane filter complex that can accommodate the increased capacity	N/A, see note 2
7	Plant 1,2,3,4	Re-rate Plants 3 and 4 from 12 to 14 MGD.	$473,000
8		Construct a new conventional treatment train identical to Plant 3 and Plant 4 (24 MGD)	$2,101,900
9		Construct a new conventional treatment train that employs high-rate plate or tube settler sedimentation with dual media filters	$1,936,700

Alternative	Plant	Alternative Description	[1]Estimated Annual O&M Cost
10		Construct a new treatment train that employs high-rate plate or tube settler sedimentation with membrane filtration	$2,161,100

Notes:

1. Costs for treatment process equipment only. The cost represents O&M from the new process/equipment that is in addition to current plant O&M.
2. Alternatives to enhance operation flexibility.

4.3.3 Life Cycle Cost Analysis

A 20-year present worth analysis was performed to compare the life-cycle costs of the treatment process alternatives. The present worth costs were developed through the use of appropriate inflation and interest rates, to allow for a comparison of the impacts of each alternative over a 20-year planning period. The present worth analysis was conducted based on a 3% annual interest rate and a 4% annual inflation. For alternatives that involve membrane filtration, the present worth analysis also includes membrane replacement every 7 years.

Table 4-11 summarizes the results of the present worth analysis for all the alternatives being evaluated.

Table 4-11 Preliminary Present Worth for Proposed Treatment Process Alternatives

Alternative	Plant	Alternative Description	20-Year Net Present Worth (NPW)
1	Plant 1	Add a 3rd up-flow clarifier to Plant 1 to increase clarification capacity	$12,848,000
2A	Plant 2	Rerate Plant 2 sedimentation basins by installing plate settlers and add new filters	$48,563,000
2B	Plant 2	Rerate Plant 2 sedimentation basins by installing tube settlers and add new filters	$43,720,000
3A	Plant 1/Plant 2	Add plate MGS settlers to Plant 2 sedimentation basins and interconnect Plants 1 and 2 settled water flows	$17,625,000
3B	Plant 1/Plant 2	Add tube settlers to Plant 2 sedimentation basins and interconnect Plants 1 and 2 settled water flows	$14,102,000
4A	Plant 1/Plant 2	Add plate settlers to Plant 2 sedimentation basins; Add membrane filtration downstream of Plants 1 and 2	$55,276,000

Alternative	Plant	Alternative Description	20-Year Net Present Worth (NPW)
4B	Plant 1/Plant 2	Add tube settlers to Plant 2 sedimentation basins; Add membrane filtration downstream of Plants 1 and 2	$43,877,000
5	Plant 1,2,3,4	Interconnect the settled water flow from all 4 plants and, if necessary, expand one (or more) of the existing filter banks to accommodate the increased capacity	N/A, see note 2
6	Plant 1,2,3,4	Interconnect the settled water flow from all 4 plants and, if necessary, construct a new dual media or membrane filter complex that can accommodate the increased capacity	N/A, see note 2
7	Plant 1,2,3,4	Re-rate Plants 3 and 4 from 12 to 14 MGD.	$10,164,000
8		Construct a new conventional treatment train identical to Plant 3 and Plant 4 (24 MGD)	$91,571,000
9		Construct a new conventional treatment train that employs high-rate plate or tube settler sedimentation with dual media filters	$77,533,000
10		Construct a new treatment train that employs high-rate plate or tube settler sedimentation with membrane filtration	$79,221,000

Notes:
1. NPW Costs for treatment process equipment only.
2. Alternatives to enhance operation flexibility.

4.4 Matrix Evaluation of Treatment Process Alternaives

4.4.1 Evaluation Criteria

Cost and several non-cost ranking criteria were developed to assist in the evaluation of proposed alternatives. These criteria include:

Operational Flexibility and Complexity

Operational flexibility refers to the proposed alternative's ability to respond to variations in flow and raw water quality, and its resistance to process upsets such as loss of coagulant feed, etc.

Operational complexity refers to operator experience with the proposed equipment, level of required operator attention, and level of skill and training required by staff to operate and maintain equipment.

Maintenance Requirements

Maintenance of equipment covers the amount of major process equipment to be maintained, new or unfamiliar equipment, additional manpower required (in-house or vendor support), and type of maintenance.

Site Impacts and Expandability

This refers to the required footprint of each alternative, amount of space utilized on site, and land availability to expand the plant in the future by optimizing the use of the current plant site.

Ease of Implementation and Constructability

This refers to the impacts on plant operation and potential process interruption and shutdown that may be needed during construction, construction complexity, and construction schedule.

Regulatory Impacts and/or Benefits and Compatibility with Future Regulatory

This refers to each process's perceived ability to comply with more stringent drinking water regulations that may be developed in the future, and flexibility to make additions/changes.

Impacts on Water Quality

This refers to the ability of proposed alternative to meet plant treatment goals including particulate, microbial parameters, disinfection byproduct parameters, aesthetic water quality parameters, and recycle stream parameters etc.

Additional Treatment Capacity Achieved

This covers additional production capacity that can be gained by implementing of the proposed alternative.

Each criteria is given an evaluation weight, as some criteria have greater importance to the Authority than others. **Table 4-12** includes proposed evaluation weights based on discussion and inputs from the Authority.

After preliminary design criteria, number and size of proposed equipment, and conceptual layout were developed, each alternative was scored under each evaluation criteria. In the end, a total weighted score was obtained for each alternative. In this manner, an evaluation matrix was established to compare the proposed alternatives based on the evaluation criteria discussed above.

Table 4-12 Treatment Process Alternative Evaluation Criteria and Ranking Weight

	Evaluation Criteria	Weight
Cost	Cost Per Unit Capacity Gained	25%
Non-Cost	Operational Flexibility and Complexity	25%
	Maintenance Requirements	5%
	Site Impacts & Expandability	2%
	Ease of Implementation and Constructability	3%
	Regulatory Impacts and/or Benefits and Compatibility with Future Regulatory	10%
	Impacts on Water Quality	10%
	Additional Treatment Capacity Achieved	20%
Total Weight		100%

4.4.2 Alternative Ranking

Based on cost and non-cost evaluation criteria developed above, an evaluation matrix was developed and the results are provided in **Table 4-13**. A numerical ranking score was assigned to each alternative, from 1 to 5 based on the score determination defined in the table, which resulted in a total weighted score.

Table 4-13 Alternative Ranking Matrix

					1			2A			2B			3A			3B		
					Add a 3rd up-flow clarifier to Plant 1 to increase clarification capacity			Rerate Plant 2 sedimentation basins by installing plate settlers and add new filters			Rerate Plant 2 sedimentation basins by installing tube settlers and add new filters			Add plate settlers to Plant 2 sedimentation basins and interconnect Plants 1 and 2 settled water flows			Add tube settlers to Plant 2 sedimentation basins and interconnect Plants 1 and 2 settled water flows		
	Evaluation Criteria		Weight	Score Determination	Comments	Raw Score	Weighted Score	Comments	Raw Score	Weighted Score	Comments	Raw Score	Weighted Score	Comments	Raw Score	Weighted Score	Comments	Raw Score	Weighted Score
Cost	Life Cycle Cost per Gal Gained		25%	5 = Lowest 4 = >=5% - <20% above the Lowest 3 = >=20% - <35% above the Lowest 2 = >=35% - <50% above the Lowest 1 = >=50% above the Lowest	10% higher than the lowest	4	1	19% higher than the lowest	4	1	43% higher than the lowest	2	0.5	51% higher than the lowest	1	0.25	21% higher than the lowest	3	0.75
Non-Cost	Operational Flexibility and Complexity	Ease of operation, automation and control	25%	5 = Exceeds Expectations 4 = Above Expectations 3 = Meets Expectations 2 = Does not quite Meet Expectations 1 = Does not meet Expectations	Same process equipment as existing plant	4	1	New 3rd stage flocculators, plate settlers and sludge collection equipment, but easy to operate	2	0.5	New 3rd stage flocculators, tube settlers and sludge collection equipment, but easy to operate	4	1	New 3rd stage flocculators, plate settlers and sludge collection equipment, but easy to operate	4	1	New 3rd stage flocculators, tube settlers and sludge collection equipment, but easy to operate	4	1
	Maintenance Requirements	Ease of maintenance	5%		Same process equipment as existing plant	4	0.2	New 3rd stage flocculators, plate settlers, and sludge collection equipment, but easy to maintain; plates will require periodic cleaning	3	0.15	New 3rd stage flocculators, tube settlers and sludge collection equipment; tubes will require periodic cleaning; tube settlers not as easy to clean as plates	2.5	0.125	New 3rd stage flocculators, plate settlers, and sludge collection equipment but easy to maintain; plates will require periodic cleaning	3	0.15	New 3rd stage flocculators, tube settlers and sludge collection equipment; tubes will require periodic cleaning; tube settlers not as easy to clean as plates	2.5	0.125
	Site Impacts & Expandability	Site utilization, ability to expand in future	2%		Site impact from new SCU; raw water piping may need to be relocated; may impact fiber optic duct bank; may impact ASR Wells; Existing site has space for the 3rd clarifier at Plant 1	3	0.06	Site impact from new rapid mix and dual media filters; may require some piping relocation	3	0.06	Site impact from new rapid mix and dual media filters; may require some piping relocation	3	0.06	Site impact from new rapid mix and filter interconnect piping	4	0.08	Site impact from new rapid mix and filter interconnect piping	4	0.08
	Ease of Implementation and Constructability	Constructability & maintenance of plant operation, construction schedule	3%		Provision made for future SCU tie-in at Pentagon: will require relocation of raw water piping, fiber optic duct bank and sidewalk; will require shutdown of Plant 1 to make piping tie-ins; May impact ASR Well.	2	0.06	Would require construction staging and phasing plan to manage impacts on Plant 2 operation; Temporary provisions to maintain half of Plant 2 in operation will be required; Temporary shut-down of Plant 2 may be required.	2	0.06	Would require construction staging and phasing plan to manage impacts on Plant 2 operation; Temporary provisions to maintain half of Plant 2 in operation will be required; Temporary shut-down of Plant 2 may be required.	3	0.09	Would require construction staging and phasing plan to manage impacts on Plant 1 and Plant 2 operation; Temporary provisions to maintain half of Plant 2 in operation will be required; Temporary shut-down of Plant 1 and 2 may be required.	3	0.09	Would require construction staging and phasing plan to manage impacts on Plant 1 and Plant 2 operation; Temporary provisions to maintain half of Plant 2 in operation will be required; Temporary shut-down of Plant 1 and 2 may be required.	3	0.09
	Regulatory Impacts and/or Benefits and Compatibility with Future Regulatory	Regulatory and permitting coordination needs	10%		Would require coordination and permitting with FDEP, but don't anticipate any issues	3	0.3	Would require coordination and permitting with FDEP, but don't anticipate any issues	3	0.3	Would require coordination and permitting with FDEP, but don't anticipate any issues	3	0.3	Would require coordination and permitting with FDEP, but don't anticipate any issues	3	0.3	Would require coordination and permitting with FDEP, but don't anticipate any issues	3	0.3
	Impacts on Water Quality	Compliance with water quality standards	10%		Same process as existing and don't anticipate any issues	3	0.3	Plate settlers would provide steady settled water quality and better performance when raw water quality fluctuates	4	0.4	Tube settlers would provide steady settled water quality and better performance when raw water quality fluctuates	4	0.4	Plate settlers would provide steady settled water quality and better performance when raw water quality fluctuates	4	0.4	Tube settlers would provide steady settled water quality and better performance when raw water quality fluctuates	4	0.4
	Additional Treatment Capacity Gained		20%	5 = Highest 4 = <25% below the Highest 3 = >=25% - <50% below the Highest 2 = >=50% - <75% Below the Highest 1 = >=75% Below the Highest	81% below the Highest	1	0.2	33% below the Highest	3	0.6	50% below the Highest	2	0.4	81% below the Highest	1	0.2	81% below the Highest	1	0.2
	Total Score on a 1-5 Scale		100%				**3.120**			**3.070**			**2.875**			**2.470**			**2.945**
	Total Score on a 100-Point Scale						**62.4**			**61.4**			**57.5**			**49.4**			**58.9**
	Preliminary Ranking						**4**			**5**			**10**			**11**			**9**

Table 4-13 Alternative Ranking Matrix

					1			2A			2B			3A			3B		
					Add a 3rd up-flow clarifier to Plant 1 to increase clarification capacity			Rerate Plant 2 sedimentation basins by installing plate settlers and add new filters			Rerate Plant 2 sedimentation basins by installing tube settlers and add new filters			Add plate settlers to Plant 2 sedimentation basins and interconnect Plants 1 and 2 settled water flows			Add tube settlers to Plant 2 sedimentation basins and interconnect Plants 1 and 2 settled water flows		
	Evaluation Criteria		Weight	Score Determination	Comments	Raw Score	Weighted Score	Comments	Raw Score	Weighted Score	Comments	Raw Score	Weighted Score	Comments	Raw Score	Weighted Score	Comments	Raw Score	Weighted Score
Cost	Life Cycle Cost per Gal Gained		25%	5 = Lowest 4 = >=5% - <20% above the Lowest 3 = >=20% - <35% above the Lowest 2 = >=35% - <50% above the Lowest 1 = >=50% above the Lowest	10% higher than the lowest	4	1	19% higher than the lowest	4	1	43% higher than the lowest	2	0.5	51% higher than the lowest	1	0.25	21% higher than the lowest	3	0.75
Non-Cost	Operational Flexibility and Complexity	Ease of operation, automation and control	25%	5 = Exceeds Expectations 4 = Above Expectations 3 = Meets Expectations 2 = Does not quite Meet Expectations 1 = Does not meet Expectations	Same process equipment as existing plant	4	1	New 3rd stage flocculators, plate settlers and sludge collection equipment, but easy to operate	2	0.5	New 3rd stage flocculators, tube settlers and sludge collection equipment, but easy to operate	4	1	New 3rd stage flocculators, plate settlers and sludge collection equipment, but easy to operate	4	1	New 3rd stage flocculators, tube settlers and sludge collection equipment, but easy to operate	4	1
	Maintenance Requirements	Ease of maintenance	5%		Same process equipment as existing plant	4	0.2	New 3rd stage flocculators, plate settlers, and sludge collection equipment, but easy to maintain; plates will require periodic cleaning	3	0.15	New 3rd stage flocculators, tube settlers and sludge collection equipment; tubes will require periodic cleaning; tube settlers not as easy to clean as plates	2.5	0.125	New 3rd stage flocculators, plate settlers, and sludge collection equipment but easy to maintain; plates will require periodic cleaning	3	0.15	New 3rd stage flocculators, tube settlers and sludge collection equipment; tubes will require periodic cleaning; tube settlers not as easy to clean as plates	2.5	0.125
	Site Impacts & Expandability	Site utilization, ability to expand in future	2%		Site impact from new SCU; raw water piping may need to be relocated; may impact fiber optic duct bank; may impact ASR Wells; Existing site has space for the 3rd clarifier at Plant 1	3	0.06	Site impact from new rapid mix and dual media filters; may require some piping relocation	3	0.06	Site impact from new rapid mix and dual media filters; may require some piping relocation	3	0.06	Site impact from new rapid mix and filter interconnect piping	4	0.08	Site impact from new rapid mix and filter interconnect piping	4	0.08
	Ease of Implementation and Constructability	Constructability & maintenance of plant operation, construction schedule	3%		Provision made for future SCU tie-in at Pentagon: will require relocation of raw water piping, fiber optic duct bank and sidewalk; will require shutdown of Plant 1 to make piping tie-ins; May impact ASR Well.	2	0.06	Would require construction staging and phasing plan to manage impacts on Plant 2 operation; Temporary provisions to maintain half of Plant 2 in operation will be required; Temporary shut-down of Plant 2 may be required.	2	0.06	Would require construction staging and phasing plan to manage impacts on Plant 2 operation; Temporary provisions to maintain half of Plant 2 in operation will be required; Temporary shut-down of Plant 2 may be required.	3	0.09	Would require construction staging and phasing plan to manage impacts on Plant 1 and Plant 2 operation; Temporary provisions to maintain half of Plant 2 in operation will be required; Temporary shut-down of Plant 1 and 2 may be required.	3	0.09	Would require construction staging and phasing plan to manage impacts on Plant 1 and Plant 2 operation; Temporary provisions to maintain half of Plant 2 in operation will be required; Temporary shut-down of Plant 1 and 2 may be required.	3	0.09
	Regulatory Impacts and/or Benefits and Compatibility with Future Regulatory	Regulatory and permitting coordination needs	10%		Would require coordination and permitting with FDEP, but don't anticipate any issues	3	0.3	Would require coordination and permitting with FDEP, but don't anticipate any issues	3	0.3	Would require coordination and permitting with FDEP, but don't anticipate any issues	3	0.3	Would require coordination and permitting with FDEP, but don't anticipate any issues	3	0.3	Would require coordination and permitting with FDEP, but don't anticipate any issues	3	0.3
	Impacts on Water Quality	Compliance with water quality standards	10%		Same process as existing and don't anticipate any issues	3	0.3	Plate settlers would provide steady settled water quality and better performance when raw water quality fluctuates	4	0.4	Tube settlers would provide steady settled water quality and better performance when raw water quality fluctuates	4	0.4	Plate settlers would provide steady settled water quality and better performance when raw water quality fluctuates	4	0.4	Tube settlers would provide steady settled water quality and better performance when raw water quality fluctuates	4	0.4
	Additional Treatment Capacity Gained		20%	5 = Highest 4 = <25% below the Highest 3 = >=25% - <50% below the Highest 2 = >=50% - <75% Below the Highest 1 = >=75% Below the Highest	81% below the Highest	1	0.2	33% below the Highest	3	0.6	50% below the Highest	2	0.4	81% below the Highest	1	0.2	81% below the Highest	1	0.2
	Total Score on a 1-5 Scale		100%				**3.120**			**3.070**			**2.875**			**2.470**			**2.945**
	Total Score on a 100-Point Scale						**62.4**			**61.4**			**57.5**			**49.4**			**58.9**
	Preliminary Ranking						**4**			**5**			**10**			**11**			**9**

The final score and ranking of the top 7 alternatives are summarized in **Table 4-14.**

Table 4-14 Final Score and Ranking

Rank	Alternative	Alternative Description	Score	Additional Capacity
1	10	Construct a new treatment train that employs high-rate plate sedimentation with membrane filtration	83.2	24 MGD
2	9	Construct a new conventional treatment train that employs high-rate plate sedimentation with dual media filters	76.0	24 MGD
3	4A	Add plate settlers to Plant 2 sedimentation basins; Add membrane filtration downstream of Plants 1 and 2	69.2	16 MGD
4	1	Add a 3rd up-flow clarifier to Plant 1 to increase clarification capacity	62.4	4.6 MGD
5	2A	Rerate Plant 2 sedimentation basins by installing plate settlers and add new filters	61.4	16 MGD
6	7	Re-rate Plants 3 and 4 from 12 to 14 MGD.	61.1	4 MGD
7	8	Construct a new conventional treatment train identical to Plant 3 and Plant 4 (24 MGD)	59.8	24 MGD

These top tanked alternatives offer the following benefits:

- "Green field" construction minimizes impacts to existing operations and allows the existing plants to remain in service without process interruption.
- Membrane filtration addresses potential future regulatory requirements.
- Using high-rate plate settlers provides a smaller footprint than conventional pretreatment process.
- New process infrastructure can be designed with a better turn-down ratio that provides operational flexibility to the plant.
- New process infrastructure can be implemented with modular design and provisions for future expansion for additional capacity.

Section 5 – Ancillary System Evaluation

5.1 Existing Ancillary System

In addition to the major process equipment described above, the following ancillary facilities were assessed to identify needs for expansion/improvements to accommodate new improvements:

- Chemical storage and feed facilities
- Solids handling facilities
- Ground storage tanks
- High service pump station

The existing condition of each ancillary system is discussed briefly as follows.

5.1.1 Storage and Feed Facilities

The existing chemical storage and feed facilities consist of following:

- Aluminum Sulfate
- Polymer
- Caustic Soda
- Sodium Hypochlorite
- Ammonium Hydroxide
- Powdered Activated Carbon

Alum and polymer are stored and fed from the Alum Feed Building, Process Building 100, which is located northwest of Plants 3 and 4. Alum is stored in three (3) 20,000 gallon and six (6) 15,000 gallon bulk tanks for a total storage capacity of 150,000 gallons. The alum feed system consists of four metering pump skids with three pumps each. Each metering pump skid is dedicated to one of the Plants.

The polymer feed system consists of four (4) neat polymer makeup systems and four polymer metering pump skids. Each skid is dedicated to one of the Plants.

Hypochlorite, Caustic and Ammonium Hydroxide are stored and fed from the Hypochlorite Building, Process Building 145, which is located southeast of the Plants 3 and 4. Hypochlorite is stored in three (3) 20,000 gallon bulk storage tanks for a total storage capacity of 60,000 gallons. The hypochlorite feed system consists of two metering pump skids. Skid No. 1 feeds Plants 3 & 4 and consists of 5 metering pumps. Skid No. 2 feeds Plants 1 and 2 and consists of four metering pumps.

Caustic is stored in three (3) 20,000 gallon bulk storage tanks for a total storage capacity of 60,000 gallons. The caustic feed system consists of five metering pump skids. Skid No. 1 consists of five metering pumps and feeds raw water and pre-filter feeds for Plants 3 and 4. Skid No. 2 consists of three metering pumps and feeds post filter for Plants 3 and 4. Skid No. 3 consists of consists of four metering pumps and feeds pre-filter feed for Plants 1 and 2. Skid No. 4 consists of three metering pumps and feeds transfer feed for Plants 1 and 2.

Ammonium Hydroxide is stored in two (2) 7,500 gallon storage tanks for a total capacity of 15,000 gallons. The ammonium hydroxide feed system consists of two metering pump skids. Skid 1 consists of five metering pumps and feeds chlorine contact for Plants 3 and 4. Skid No. 2 consists of four metering pumps and feeds chlorine contact for Plants 1 and 2.

Powdered activated carbon is stored in the PAC slurry tank. The PAC slurry tank has a capacity of 16,000 cubic feet. The PAC feed system consists of two separate feed pump setups. One feed pump setup feeds Plant 1 and 2 and one feeds Plants 3 and 4. Each feed pump setup consists of two pumps operating with the third pump acting as a standby.

5.1.2 Solids Handling Facilities

Currently, the PRF has two 50-foot diameter gravity sludge thickeners. Sludge produced by the clarifiers/ sedimentation basins is fed to the thickeners by gravity blowdown. The supernatant is recycled to the head of the plant by the Recycle Pumping Station. The thickened sludge is drawn by thickened sludge pumps to the Belt Filter Press (BFP) dewatering building.

5.1.3 Ground Storage Tanks

There are currently six (6) 2-MG ground storage tanks on site, with a total storage capacity of 12 million gallons.

5.1.4 High Service Pump Station

As stated in the *Peace River Facility Capacity Expansion Phase II Engineering Report, Peace River Regional Water Treatment Plant (PWS No. 6142734)* dated January 21, 2015, the existing high service pump system has two separate pump stations. The Southern Regional High Service Pump Station consists of eight pumps with a firm capacity of 44.20 MGD and a total capacity of 52.12 MGD. The Northern Regional High Service Pump Station has five pumps in total. The pump station firm capacity is 28.63 MGD, and the total capacity is 36.26 MGD.

5.2 Ancillary System Evaluation for Selected Alternatives

From the ten alternatives being evaluated in Section 4, the following five alternatives were selected by the Authority and an evaluation was performed for each alternative to determine expansion and improvements needs of the ancillary facilities:

- Alternative 1 – New Third Upflow Clarifier to Plant 1
- Alternative 4A – New Membrane Filtration to Plant 2
- Alternative 8 – New Treatment Train Identical to Plant 3 and Plant 4
- Alternative 9 – New Treatment Train with Plate Settlers and Dual-Media Filters
- Alternative 10 – New Treatment Train with Plate Settlers and Membrane Filters

Following assumptions and design philosophy were used in the evaluation of the ancillary system:

Chemical Storage and Feed Facilities

A desktop analysis of the Monthly Workbook data provided by the Authority's Operations Staff was performed to determine average and maximum chemical usage at the Facility. This data was used to size chemical storage and feed systems for each of the alternatives. Feed pump capacities were sized based on providing maximum feed rates under maximum day demand conditions. Bulk storage quantities were calculated based on providing a minimum of 30 days of storage under average feed conditions. **Table 5-1** summarizes the feed rates used to size the feed pumps and storage tanks.

An analysis of the WTP operating data was performed to determine the average, minimum and maximum chemical dosages for each of the chemical feed systems. The dosages are summarized in **Table 5-1**.

Table 5-1 Historical Chemical Feed Dosages

Dosage (mg/l)			
Chemical	Max	Min	Avg
Aluminum Sulfate	167.00	123.67	148.34
Caustic	25.43	18.26	23.34
Ammonium Hydroxide	1.68	1.11	1.42
Hypochlorite	9.50	7.04	8.02
Polymer	0.48	0.39	0.44
Powdered Activated Carbon	37.83	5.31	18.91

These historical dosage rates were used to chemical storage and feed systems for each of the selected alternatives. Bulk storage facilities were sized to provide 30 days of storage at average day demand. Metering pumps were sized to feed maximum feed rates at maximum day demand.

Solids Handling Facilities

A desktop analysis was performed to estimate sludge generation for each selected alternative to establish a design basis for solids handling system improvements. Sludge is estimated based on historical raw water turbidity, coagulant dosage, and the dosage of other chemicals such as polymer and powder activated carbon (PAC) used for process control. The estimated sludge hydraulic and solids loadings were used to determine improvements required. Evaluation of dewatering equipment was made based on maintaining the current belt press operating schedule which is five (5) days a week for approximately ten (10) hours per day.

Ground Storage Tanks

Typically, a range of 10%-15% of onsite storage capacity is provided at water treatment plants. This will be applied to evaluate additional GSTs requirement.

High Service Pump Station

For the purpose of this study, a peak hour flow factor of 1.275, an empirical value that is commonly seen from other water treatment plants, was applied to estimate the total firm capacity of the high service pump stations and needs for additional pumps.

5.2.1 Alternative 1 – New Third Upflow Clarifier to Plant 1

Chemical Storage and Feed Facilities

To provide the chemical feed rates outlined in **Table 5-1** it was assumed that existing chemical feed pumps for Plant 1 would need to be replaced. The existing chemical feed skids and piping would be retained, and the metering pumps serving Plant 1 will be replaced with higher capacity units. Additional bulk storage capacity was not included in this alternative. The chemical feed system design criteria for Alternative 1 are summarized in **Table 5-2.**

Table 5-2 Chemical Storage and Feed Facilities Preliminary Design Criteria

Alum Feed Rate (gph)	Average	180
	Maximum	203
Alum Feed Pumps		3 @ 250 gal/hr
Sodium Hydroxide Feed Rate (gph)	Average	25
	Maximum	27
Sodium Hydroxide Feed Pumps		10 @ 60 gal/hr
Ammonium Hydroxide Feed Rate (gph)	Average	7
	Maximum	8
Ammonium Hydroxide Feed Pumps		5 @ 60 gal/hr
Sodium Hypochlorite Feed Rate (gph)	Average	45
	Maximum	52
Sodium Hypochlorite Feed Pumps		4 @ 100 gal/hr
Polymer Feed Rate (gph)	Average	90
	Maximum	100
Polymer Feed Pumps		3 @ 150 gal/hr
PAC Feed Rate (gph)	Average	160
	Maximum	325
PAC Feed Pumps		3 @ 350 gal/hr

Proposed Chemical feed equipment is listed in **Table 5-3**.

Table 5-3 Chemical Feed Equipment List

Chemical Feed Equipment Description	Voltage/Phase	Horsepower
PAC Metering Pump No. 1	120V	1 hp
PAC Metering Pump No. 2	120V	1 hp
PAC Metering Pump No. 3	120V	1 hp
Alum Metering Pump No. 1	120V	1 hp
Alum Metering Pump No. 2	120V	1 hp
Alum Metering Pump No. 3	120V	1 hp
Polymer Metering Pump No. 1	120V	1 hp
Polymer Metering Pump No. 2	120V	1 hp
Polymer Metering Pump No. 3	120V	1 hp
Caustic Metering Pump No. 1	120V	1 hp
Caustic Metering Pump No. 2	120V	1 hp
Caustic Metering Pump No. 3	120V	1 hp
Caustic Metering Pump No. 4	120V	1 hp
Caustic Metering Pump No. 5	120V	1 hp
Caustic Metering Pump No. 6	120V	1 hp
Caustic Metering Pump No. 7	120V	1 hp
Caustic Metering Pump No. 8	120V	1 hp
Caustic Metering Pump No. 9	120V	1 hp
Caustic Metering Pump No. 10	120V	1 hp
Sodium Hypochlorite Metering Pump No. 1	120V	1 hp
Sodium Hypochlorite Metering Pump No. 2	120V	1 hp
Sodium Hypochlorite Metering Pump No. 3	120V	1 hp
Sodium Hypochlorite Metering Pump No. 4	120V	1 hp
Ammonium Hydroxide Metering Pump No. 1	120V	1 hp
Ammonium Hydroxide Metering Pump No. 2	120V	1 hp
Ammonium Hydroxide Metering Pump No. 3	120V	1 hp
Ammonium Hydroxide Metering Pump No. 4	120V	1 hp
Ammonium Hydroxide Metering Pump No. 5	120V	1 hp

Solids Handling Facilities

Table 5-4 presents estimated sludge production and solids loadings.

Table 5-4 Total Sludge Production and Solids Loading Estimate for Alternative 1

Raw Sludge Solids Loading (ppd)	Average	16,533
	Maximum	50,765
Raw Sludge Hydraulic Loading (MGD)	Average	0.40
	Maximum	1.21
Thickened Sludge Solids Loading (ppd)	Average	14,880
	Maximum	45,688
Thickened Sludge Hydraulic Loading (MGD)	Average	0.058
	Maximum	0.18
Dewatered Sludge Solids Loading (ppd)	Average	12,648
	Maximum	38,835
Dewatered Sludge Hydraulic Loading (GPD)	Average	6,719
	Maximum	20,630
Recycle Flow Solids Loading (ppd)	Average	1,653
	Maximum	5,077
Recycle Flow Hydraulic Loading (MGD)	Average	0.34
	Maximum	1.03

Notes:

1. Average sludge production was based on average turbidity of 3.3 NTU, average alum sulfate dosage of 151.5 mg/L, average polymer dosage of 0.27 mg/L and PAC dosage of 32.1 mg/L as delivered at plant average flow of 35.7 MGD.
2. Maximum sludge production was based on maximum turbidity of 12.2 NTU, 95th percentile alum sulfate dosage of 151.9 mg/L, 95th percentile polymer dosage of 0.28 mg/L and 95th percentile PAC dosage of 43.8 mg/L as delivered at plant maximum flow rate of 55.6 MGD.

Raw Sludge Thickener

It is recommended that the maximum hydraulic loading rate for a gravity thickener used for alum-coagulated sludge not exceed 150 to 200 gallons/day/square foot (gpd/sf). With the additional sludge produced from the third clarifier, the two existing 50-foot diameter gravity sludge thickeners will be overloaded with a hydraulic loading rate of 309.1 gpd/sf at the maximum sludge production rate. Therefore, one new 55-foot diameter gravity sludge thickener is proposed to be added to operate with the two existing thickeners to handle current sludge and

additional sludge produced from the third clarifier. A raw sludge splitter box is also included in this cost estimating with a purpose for splitting raw sludge to three gravity thickeners.

Supernatant from the new sludge thickener will be sent to the existing recycle pump station which pumps the residual liquid flow to the head of the plant. The existing recycle pump station is adequate to handle additional recycle flow, no new pumps will be required.

Thickened Sludge Pump Station

To handle the maximum sludge production, a third thickened sludge pump will be required to pump thickened sludge to the existing dewatering building. The new thickened sludge pumps can be either progressive cavity pumps or double disc pumps.

From an operation standpoint, at the average sludge production rate, two existing pumps are adequate to transfer sludge produced to the dewatering system.

Further review of plant data from June 2019 to May 2021 indicated that 99th percentile of the raw water turbidity was 6.2 NTU, which could result in a sludge production of 3,912.24 ppd at the increased flow. At this sludge rate, two existing thickened sludge pumps are adequate. The new pump will serve as a standby unit.

Belt Filter Press and Dewatered Cake Transfer Pump

The belt press equipment and dewatered cake transfer pumps are also evaluated for both maximum and average sludge production scenarios.

A third belt press will be needed to handle increased flow at maximum sludge production rate, with each operating for approximately 8 hours/day and 5 days/week. The existing dewatering building has space for adding a third belt press and associated polymer system. Therefore, no new building is proposed for the expansion.

At the average sludge production scenario, two existing belt presses are adequate to handle the increased flow with both units operating for approximately 11 hours/day at 5 days/week schedule; alternatively, the plant can run both belt presses for approximately 10 hours/day for 6 days/week.

Preliminary sizing criteria proposed for the solids handling system is summarized in **Table 5-5**.

Table 5-5 Solids Handling System Preliminary Design Criteria for Alternative 1

Parameter		Description
Gravity Sludge Thickener		
Number of Units		1
Thickener Diameter, ft		55
Sludge Flow per Thickener (MGD)	at Max Solids Loading	0.40
	at Avg Solids Loading	0.10
Solids Loading per Thickener (ppd)	at Max Solids Loading	16,922
	at Avg Solids Loading	8,588
Surface Overflow Rate (gpd/ft^2)	at Max Solids Loading	191.50
	at Avg Solids Loading	48.74
Solids Loading Rate (ppd/ft^2)	at Max Solids Loading	8.01
	at Avg Solids Loading	4.09
Thickened Sludge Pumps		
Number of Thickened Sludge Pumps		3, two duty and one standby
Pump Type		Progressive Cavity or Double Disc with VFD
Capacity		130 gpm
Pump TDH		76 ft (estimated)
Thickened Sludge Pipe, inch		6
Belt Filter Press		
Number of Belt Filter Press		3, including two existing plus one new
Hydraulic Loading Rate		130 gpm
Feed Sludge Solids		1,033-1,972 Lbs/hr
Solids Capture		85%-90%
Sludge Cake Transfer Pump		
Number of Sludge Cake Transfer Pump		3, including two existing plus one new
Number of Pumps		1
Pump Capacity		15 gpm
Pump TDH		50 ft (estimated)

Ground Storage

The existing 12 million gallon onsite storage capacity equates to a 22% onsite storage capacity for the 55.6-MGD production. Therefore, additional ground storage is not needed for this alternative.

High Service Pump Station

The 55.6 MGD rated average capacity will require a total firm capacity of 70.89 MGD. Since the combined total firm capacity of the existing high service pump stations is approximately 72.83 MGD, no additional pumps will be required.

5.2.2 Alternative 4A – New Membrane Filtration to Plant 2

Chemical Storage and Feed Facilities

To accommodate a Plant 2 capacity of 28 MGD the cost of a new chemical feed and storage facility was included. New chemical feed systems included Alum, Polymer, Caustic, Hypochlorite, Ammonium Hydroxide and PAC. Bulk storage to provide 30 days of capacity would be provided for Alum, Caustic, Hypochlorite and Ammonium Hydroxide. All existing chemical feed systems associated with Plant 2 would be decommissioned. Bulk chemical56hemicale associated with Plant 2 would be reallocated to Plants 1, 3 and 4, increasing the days of storage available. New PAC slurry tanks and PAC contactors would also be constructed. The chemical feed system design criteria for Alternative 4A are summarized in **Table 5-6.**

Table 5-6 Chemical Storage and Feed Facilities Preliminary Design Criteria

Alum Feed Rate (gph)	Average	260
	Maximum	290
Alum Feed Pumps		3 @ 150 gal/hr
Alum Storage (gal)		180,000
Alum Storage Tanks		9 @ 20,000 gal
Sodium Hydroxide Feed Rate (gph)	Average	35
	Maximum	38
Sodium Hydroxide Feed Pumps		8 @ 60 gal/hr
Sodium Hydroxide Storage (gal)		30,000
Sodium Hydroxide Storage Tanks		2 @ 15,000 gal
	Average	10

Ammonium Hydroxide Feed Rate (gph)	Maximum	11
Ammonium Hydroxide Feed Pumps		3 @ 20 gal/hr
Ammonium Hydroxide Storage (gal)		7,500
Ammonium Hydroxide Storage Tank		1 @ 7,500 gal
Sodium Hypochlorite Feed Rate (gph)	Average	62
	Maximum	73
Sodium Hypochlorite Feed Pumps		6 @ 100 gal/hr
Sodium Hypochlorite Storage (gal)		45,000
Sodium Hypochlorite Storage Tanks		3 @ 15,000 gal
Polymer Feed Rate (gph)	Average	111
	Maximum	121
Polymer Feed Pumps		3 @ 100 gal/hr
PAC Feed Rate (gph)	Average	230
	Maximum	460
PAC Feed Pumps		3 @ 250 gal/hr

Proposed Chemical feed equipment is listed in **Table 5-7.**

Table 5-7 Chemical Feed Equipment List

Chemical Feed Equipment Description	Voltage/Phase	Horsepower
PAC Metering Pump No. 1	120V	1 hp
PAC Metering Pump No. 2	120V	1 hp
PAC Metering Pump No. 3	120V	1 hp
Alum Metering Pump Skid No. 1	120V	1 hp
Polymer Aging Mixer No. 1	460V/3 ph	1 hp
Polymer Metering Pump Skid No. 1	120V	1 hp
Caustic Metering Pump Skid No. 1	120V	1 hp
Caustic Metering Pump Skid No. 2	120V	1 hp
Caustic Metering Pump Skid No. 3	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 1	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 2	120V	1 hp
Ammonium Hydroxide Metering Pump Skid No. 1	120V	1 hp

Solids Handling Facilities

Table 5-8 presents estimated sludge production and solids loadings.

Table 5-8 Total Sludge Production and Solids Loading Estimate for Alternative 4A

Raw Sludge Solids Loading (ppd)	Average	29,571
	Maximum	61,173
Raw Sludge Hydraulic Loading (MGD)	Average	0.71
	Maximum	1.46
Thickened Sludge Solids Loading (ppd)	Average	26,614
	Maximum	55,056
Thickened Sludge Hydraulic Loading (MGD)	Average	0.10
	Maximum	0.22
Dewatered Sludge Solids Loading (ppd)	Average	22,622
	Maximum	46,798
Dewatered Sludge Hydraulic Loading (GPD)	Average	12,017
	Maximum	24,860
Recycle Flow Solids Loading (ppd)	Average	2,957
	Maximum	6,117
Recycle Flow Hydraulic Loading (MGD)	Average	0.60
	Maximum	1.25

Notes:

1. Average sludge production was based on average turbidity of 3.3 NTU, average alum sulfate dosage of 151.5 mg/L, average polymer dosage of 0.27 mg/L and PAC dosage of 32.1 mg/L as delivered at plant average flow of 40.97 MGD.
2. Maximum sludge production was based on maximum turbidity of 12.20 NTU, 95th percentile alum sulfate dosage of 151.9 mg/L, 95th percentile polymer dosage of 0.28 mg/L and 95th percentile PAC dosage of 43.8 mg/L as delivered at plant maximum flow rate of 67 MGD.

Raw Sludge Thickener

One new 60-foot diameter gravity sludge thickener is proposed to handle additional sludge produced. A raw sludge splitter box is also included in this cost estimating with a purpose for splitting raw sludge to three gravity thickeners.

Supernatant from the sludge thickener will be sent to a new recycle pump station which will pump the residual liquid flow to the head of the plant. The recycle pump station will be similar to the existing system consisting of a wet well pump station with two submersible centrifugal pumps.

Thickened Sludge Pump Station

Thickened sludge will be pumped via new thickened sludge pumps to the existing dewatering building. The new thickened sludge pumps can be either progressive cavity pumps or double disc pumps. Two thickened sludge pumps are proposed, served as one duty one standby.

Belt Filter Press and Dewatered Cake Transfer Pump

Based on the estimated sludge loadings, a third belt press will be needed to handle increased flow to maintain the current operating schedule. The existing dewatering building has a space provision for adding a third belt press and associated polymer system. Therefore, no new building is proposed for the expansion.

A new dewatered cake transfer pump will be added to handle the increased flow.

Preliminary sizing criteria proposed for the solids handling system is summarized in **Table 5-9**.

Table 5-9 Solids Handling System Preliminary Design Criteria for Alternative 4A

Parameter		Description
Gravity Sludge Thickener		
Number of Units		1
Thickener Diameter, ft		60
Sludge Flow per Thickener (MGD)	at Max Solids Loading	0.49
	at Avg Solids Loading	0.24
Solids Loading per Thickener (ppd)	at Max Solids Loading	20,391
	at Avg Solids Loading	9,857
Surface Overflow Rate (gpd/ft^2)	at Max Solids Loading	172.5
	at Avg Solids Loading	83.4

Parameter		Description
Solids Loading Rate (ppd/ft^2)	at Max Solids Loading	7.2
	at Avg Solids Loading	3.5
Thickened Sludge Pumps		
Number of Thickened Sludge Pumps		2, one duty and one standby
Pump Type		Progressive Cavity or Double Disc with VFD
Capacity		130 gpm
Pump TDH		76 ft (estimated)
Thickened Sludge Pipe, inch		6
Belt Filter Press		
Number of Units		3, including two existing plus one new
Hydraulic Loading Rate		130 gpm
Feed Sludge Solids		1,033-1,972 Lbs/hr
Solids Capture		85%-90%
Sludge Cake Transfer Pump		
Pump Type		Progressive Cavity Pump
Number of Pumps		1
Pump Capacity		15 gpm
Pump TDH		50 ft (estimated)
Recycle Pump Station		
Wet Well Dimension		6 ft Dia x 19 ft Depth
Pump Type		Submersible Centrifugal
Number of Pumps		2, one duty and one standby
Pump Capacity		206 gpm
Pump TDH, ft		50 ft (estimated)

Ground Storage

The existing available storage of 12 million gallons is equal to a 18% onsite storage capacity for the 67-MGD production. Therefore, additional ground storage is not proposed in this cost estimating.

High Service Pump Station

The 67 MGD rated capacity will require a total firm capacity of 85.43 MGD. Since the combined total firm capacity from the existing high service pump stations is approximately 72.83 MGD,

three new pumps at 7.60 MGD each are proposed, with two duty and one standby. A new high service pump station is proposed to house the new pumps and other equipment.

5.2.3 Alternative 8 – New Treatment Train Identical to Plant 3 and Plant 4

Chemical Storage and Feed Facilities

To accommodate a new treatment train with a capacity of 24 MGD the cost of a new chemical feed and storage area was included. New chemical feed systems included Alum, Polymer, Caustic, Hypochlorite, Ammonium Hydroxide and PAC. Feed systems were sized to provide maximum feed rates under maximum day demand conditions. Bulk storage was sized to provide 30 days of capacity for Alum, Caustic, Hypochlorite and Ammonium Hydroxide. New PAC slurry tanks and PAC contactors are also included. The chemical feed system design criteria for Alternative 8 are summarized in **Table 5-10**.

Table 5-10 Chemical Storage and Feed Facilities Preliminary Design Criteria

Alum Feed Rate (gph)	Average	221
	Maximum	249
Alum Feed Pumps		6 @ 150 gal/hr
Alum Storage (gal)		160,000
Alum Storage Tanks		8 @ 20,000 gal
Sodium Hydroxide Feed Rate (gph)	Average	30
	Maximum	33
Sodium Hydroxide Feed Pumps		8 @ 60 gal/hr
Sodium Hydroxide Storage (gal)		30,000
Sodium Hydroxide Storage Tanks		2 @ 15,000 gal
Ammonium Hydroxide Feed Rate (gph)	Average	8
	Maximum	10
Ammonium Hydroxide Feed Pumps		3 @ 20 gal/hr
Ammonium Hydroxide Storage (gal)		7,500
Ammonium Hydroxide Storage Tank		1 @ 7,500 gal
Sodium Hypochlorite Feed Rate (gph)	Average	53
	Maximum	63
Sodium Hypochlorite Feed Pumps		6 @ 100 gal/hr
Sodium Hypochlorite Storage (gal)		40,000
Sodium Hypochlorite Storage Tanks		2 @ 20,000 gal
Polymer Feed Rate (gph)	Average	111

	Maximum	121
Polymer Feed Pumps		6 @ 60 gal/hr
PAC Feed Rate (gph)	Average	200
	Maximum	400
PAC Feed Pumps		3 @ 200 gal/hr
PAC Storage Tank		115,000 gal

Proposed Chemical feed equipment is listed in **Table 5-11.**

Table 5-11 Chemical Feed Equipment List

Chemical Feed Equipment Description	Voltage/Phase	Horsepower
PAC Metering Pump No. 1	120V	1 hp
PAC Metering Pump No. 2	120V	1 hp
PAC Metering Pump No. 3	120V	1 hp
Alum Metering Pump Skid No. 1	120V	1 hp
Alum Metering Pump Skid No. 2	120V	1 hp
Polymer Aging Mixer No. 1	460V/3 ph	1 hp
Polymer Aging Mixer No. 2	460V/3 ph	1 hp
Polymer Metering Pump Skid No. 1	120V	1 hp
Polymer Metering Pump Skid No. 2	120V	1 hp
Caustic Metering Pump Skid No. 1	120V	1 hp
Caustic Metering Pump Skid No. 2	120V	1 hp
Caustic Metering Pump Skid No. 3	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 1	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 1	120V	1 hp
Ammonium Hydroxide Metering Pump Skid No. 1	120V	1 hp

Solids Handling Facilities

Table 5-12 presents estimated sludge production and solids loadings.

Table 5-12 Sludge Production and Solids Loading Estimate for Alternative 8

Raw Sludge Solids Loading (ppd)	Average	11,481
	Maximum	21,913
Raw Sludge Hydraulic Loading (MGD)	Average	0.27
	Maximum	0.52
Thickened Sludge Solids Loading (ppd)	Average	10,332
	Maximum	19,722
Thickened Sludge Hydraulic Loading (MGD)	Average	0.04
	Maximum	0.08
Dewatered Sludge Solids Loading (ppd)	Average	8,783
	Maximum	16763
Dewatered Sludge Hydraulic Loading (GPD)	Average	4,665
	Maximum	8,905
Recycle Flow Solids Loading (ppd)	Average	1,148
	Maximum	2,191
Recycle Flow Hydraulic Loading (MGD)	Average	0.23
	Maximum	0.45

Notes:

1. Average sludge production was based on average turbidity of 3.3 NTU, average alum sulfate dosage of 151.5 mg/L, average polymer dosage of 0.27 mg/L and PAC dosage of 32.1 mg/L as delivered at plant average flow of 15.9 MGD.
2. Maximum sludge production was based on maximum turbidity of 12.2 NTU, 95th percentile alum sulfate dosage of 151.9 mg/L, 95th percentile polymer dosage of 0.28 mg/L and 95th percentile PAC dosage of 43.8 mg/L as delivered at plant maximum flow rate of 24 MGD.

Raw Sludge Thickener

One new 60-foot diameter gravity sludge thickener is proposed to handle additional sludge produced from the new treatment train. A raw sludge splitter box is also included in this cost estimating with a provision for splitting raw sludge to a future sludge thickener should it be needed in subsequent expansion.

Supernatant from the sludge thickener will be sent to a new recycle pump station which will pump the residual liquid flow to the head of the plant. The recycle pump station will be similar to the existing system consisting of a wet well pump station with two submersible centrifugal pumps.

Thickened Sludge Pump Station

Thickened sludge will be pumped via new thickened sludge pumps to the existing dewatering building. The new thickened sludge pumps can be either progressive cavity pumps or double disc pumps. Two thickened sludge pumps are proposed.

Belt Filter Press and Dewatered Cake Transfer Pump

Based on the estimated sludge loadings, a third belt press will be needed to handle increased flow to maintain the current operating schedule. The existing dewatering building has space for adding a third belt press and associated polymer system. Therefore, no new building is proposed for the expansion.

A new dewatered cake transfer pump will be added to handle the increased flow.

Preliminary sizing criteria proposed for the solids handling system is summarized in **Table 5-13**.

Table 5-13 Solids Handling System Preliminary Design Criteria for Alternative 8

Parameter		Description
Gravity Sludge Thickener		
Number of Units		1
Thickener Diameter, ft		60
Sludge Flow per Thickener (MGD)	at Max Solids Loading	0.52
	at Avg Solids Loading	0.27
Solids Loading per Thickener (ppd)	at Max Solids Loading	21,913
	at Avg Solids Loading	11,581
Surface Overflow Rate (gpd/ft^2)	at Max Solids Loading	185.3
	at Avg Solids Loading	97.1
Solids Loading Rate (ppd/ft^2)	at Max Solids Loading	7.8
	at Avg Solids Loading	4.1
Thickened Sludge Pumps		
Number of Thickened Sludge Pumps		2, one duty and one standby
Pump Type		Progressive Cavity or Double Disc with VFD

Parameter	Description
Capacity	130 gpm
Pump TDH	76 ft (estimated)
Thickened Sludge Pipe, inch	6
Belt Filter Press	
Number of Units	3, including two existing plus one new
Hydraulic Loading Rate	130 gpm
Feed Sludge Solids	1,033-1,972 Lbs/hr
Solids Capture	85%-90%
Sludge Cake Transfer Pump	
Pump Type	Progressive Cavity Pump
Number of Pumps	1
Pump Capacity	15 gpm
Pump TDH	50 ft (estimated)
Recycle Pump Station	
Wet Well Dimension	7 ft Dia x 19 ft Depth
Pump Type	Submersible Centrifugal
Number of Pumps	2, one duty and one standby
Pump Capacity	311 gpm
Pump TDH, ft	50 ft (estimated)

Ground Storage

The existing storage volume of 12 million gallons is equal to a 16% onsite storage capacity for the 75-MGD production. Therefore, additional ground storage is not proposed for this alternative.

High Service Pump Station

The 75 MGD rated capacity will require a total firm capacity of 95.625 MGD. Since the combined total firm capacity from the existing high service pump stations is approximately 72.83 MGD, four new pumps at 7.60 MGD each are proposed, with three duty and one standby. A new high service pump station is proposed to house the new pumps and other equipment.

5.2.4 Alternative 9 – New Treatment Train with Plate Settlers and Dual-Media Filters

Chemical Storage and Feed Facilities

To accommodate a new treatment train with a capacity of 24 MGD the cost of a new chemical feed and storage area was included. New chemical feed systems included Alum, Polymer, Caustic, Hypochlorite, Ammonium Hydroxide and PAC. Feed systems were sized to provide maximum feed rates under maximum day demand conditions. Bulk storage was sized to provide 30 days of capacity for Alum, Caustic, Hypochlorite and Ammonium Hydroxide. New PAC slurry tanks and PAC contactors are also included. The chemical feed system design criteria for Alternative 9 are summarized in **Table 5-14**.

Table 5-14 Chemical Storage and Feed Facilities Preliminary Design Criteria

Alum Feed Rate (gph)	Average	221
	Maximum	249
Alum Feed Pumps		3 @ 150 gal/hr
Alum Storage (gal)		160,000
Alum Storage Tanks		8 @ 20,000 gal
Sodium Hydroxide Feed Rate (gph)	Average	30
	Maximum	33
Sodium Hydroxide Feed Pumps		8 @ 60 gal/hr
Sodium Hydroxide Storage (gal)		30,000
Sodium Hydroxide Storage Tanks		2 @ 15,000 gal
Ammonium Hydroxide Feed Rate (gph)	Average	8
	Maximum	10
Ammonium Hydroxide Feed Pumps		3 @ 20 gal/hr
Ammonium Hydroxide Storage (gal)		7,500
Ammonium Hydroxide Storage Tank		1 @ 7,500 gal
Sodium Hypochlorite Feed Rate (gph)	Average	53
	Maximum	63
Sodium Hypochlorite Feed Pumps		6 @ 100 gal/hr
Sodium Hypochlorite Storage (gal)		40,000
Sodium Hypochlorite Storage Tanks		2 @ 20,000 gal
Polymer Feed Rate (gph)	Average	111
	Maximum	121
Polymer Feed Pumps		3 @ 200 gal/hr
PAC Feed Rate (gph)	Average	200

	Maximum	400
PAC Feed Pumps		3 @ 200 gal/hr
PAC Storage Tank		115,000 gal

Proposed Chemical feed equipment is listed in **Table 5-15** below

Table 5-15 Chemical Feed Equipment List

Chemical Feed Equipment Description	Voltage/Phase	Horsepower
PAC Metering Pump No. 1	120V	1 hp
PAC Metering Pump No. 2	120V	1 hp
PAC Metering Pump No. 3	120V	1 hp
Alum Metering Pump Skid No. 1	120V	1 hp
Polymer Aging Mixer No. 1	460V/3 ph	1 hp
Polymer Metering Pump Skid No. 1	120V	1 hp
Caustic Metering Pump Skid No. 1	120V	1 hp
Caustic Metering Pump Skid No. 2	120V	1 hp
Caustic Metering Pump Skid No. 3	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 1	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 2	120V	1 hp
Ammonium Hydroxide Metering Pump Skid No. 1	120V	1 hp

Solids Handling Facilities

As the additional flow capacity is the same as Alternative 8, the total sludge production and solids loading estimate will be the same as Alternative 8. Please reference to Alternative 8 for detailed discussion about the solids handling facilities.

Preliminary sizing criteria proposed for the solids handling system is summarized in **Table 5-16**.

Table 5-16 Solids Handling System Preliminary Design Criteria for Alternative 9

Parameter		Description
Gravity Sludge Thickener		
Number of Units		1
Thickener Diameter, ft		60
Sludge Flow per Thickener (MGD)	at Max Solids Loading	0.52
	at Avg Solids Loading	0.27
Solids Loading per Thickener (ppd)	at Max Solids Loading	21,913
	at Avg Solids Loading	11,581
Surface Overflow Rate (gpd/ft^2)	at Max Solids Loading	185.3
	at Avg Solids Loading	97.1
Solids Loading Rate (ppd/ft^2)	at Max Solids Loading	7.8
	at Avg Solids Loading	4.1
Thickened Sludge Pumps		
Number of Thickened Sludge Pumps		2, one duty and one standby
Pump Type		Progressive Cavity or Double Disc with VFD
Capacity		130 gpm
Pump TDH		76 ft (estimated)
Thickened Sludge Pipe, inch		6
Belt Filter Press		
Number of Units		3, including two existing plus one new
Hydraulic Loading Rate		130 gpm
Feed Sludge Solids		1,033-1,972 Lbs/hr
Solids Capture		85%-90%
Sludge Cake Transfer Pump		
Pump Type		Progressive Cavity Pump
Number of Pumps		1
Pump Capacity		15 gpm
Pump TDH		50 ft (estimated)
Recycle Pump Station		
Wet Well Dimension		7 ft Dia x 19 ft Depth

Parameter	Description
Pump Type	Submersible Centrifugal
Number of Pumps	2, one duty and one standby
Pump Capacity	311 gpm
Pump TDH, ft	50 ft (estimated)

Ground Storage

The ground storage analysis is the same as Alternative 8 due to the same total storage capacity and plant design flow. No additional storage is needed for this alternative.

High Service Pump Station

As with Alternative 8, four new pumps at 7.60 MGD each are proposed, with three duty and one standby, to increase the total firm capacity of HSPS to 95.625 MGD. A new high service pump station is proposed to house the new pumps and other equipment.

5.2.5 Alternative 10 – New Treatment Train with Plate Settlers and Membrane Filters

Chemical Facilities

To accommodate a new treatment train with a capacity of 24 MGD the cost of a new chemical feed and storage area was included. New chemical feed systems included Alum, Polymer, Caustic, Hypochlorite, Ammonium Hydroxide and PAC. Feed systems were sized to provide maximum feed rates under maximum day demand conditions. Bulk storage was sized to provide 30 days of capacity for Alum, Caustic, Hypochlorite and Ammonium Hydroxide. New PAC slurry tanks and PAC contactors are also included. The chemical feed system design criteria for Alternative 4A are summarized in **Table 5-17**.

Table 5-17 Chemical Storage and Feed Facilities Preliminary Design Criteria

Alum Feed Rate (gph)	Average	221
	Maximum	249
Alum Feed Pumps		3 @ 150 gal/hr
Alum Storage (gal)		160,000
Alum Storage Tanks		8 @ 20,000 gal
Sodium Hydroxide Feed Rate (gph)	Average	30
	Maximum	33
Sodium Hydroxide Feed Pumps		8 @ 60 gal/hr
Sodium Hydroxide Storage (gal)		30,000
Sodium Hydroxide Storage Tanks		2 @ 15,000 gal
Ammonium Hydroxide Feed Rate (gph)	Average	8
	Maximum	10
Ammonium Hydroxide Feed Pumps		3 @ 20 gal/hr
Ammonium Hydroxide Storage (gal)		7,500
Ammonium Hydroxide Storage Tank		1 @ 7,500 gal
Sodium Hypochlorite Feed Rate (gph)	Average	53
	Maximum	63
Sodium Hypochlorite Feed Pumps		6 @ 100 gal/hr
Sodium Hypochlorite Storage (gal)		40,000
Sodium Hypochlorite Storage Tanks		2 @ 20,000 gal
Polymer Feed Rate (gph)	Average	111
	Maximum	121
Polymer Feed Pumps		3 @ 200 gal/hr
PAC Feed Rate (gph)	Average	200
	Maximum	400
PAC Feed Pumps		3 @ 200 gal/hr
PAC Storage Tank		115,000 gal

Proposed Chemical feed equipment is listed in **Table 5-18.**

Table 5-18 Chemical Feed Equipment List

Chemical Feed Equipment Description	Voltage/Phase	Horsepower
PAC Metering Pump No. 1	120V	1 hp
PAC Metering Pump No. 2	120V	1 hp
PAC Metering Pump No. 3	120V	1 hp
Alum Metering Pump Skid No. 1	120V	1 hp
Polymer Aging Mixer No. 1	460V/3 ph	1 hp
Polymer Metering Pump Skid No. 1	120V	1 hp
Caustic Metering Pump Skid No. 1	120V	1 hp
Caustic Metering Pump Skid No. 2	120V	1 hp
Caustic Metering Pump Skid No. 3	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 1	120V	1 hp
Sodium Hypochlorite Metering Pump Skid No. 2	120V	1 hp
Ammonium Hydroxide Metering Pump Skid No. 1	120V	1 hp

Solids Handling Facilities

As the additional flow capacity for Alternative 10 is the same as Alternative 8, the total sludge production and solids loading estimate will be the same as Alternative 8.

Preliminary sizing criteria proposed for the solids handling system is summarized in **Table 5-19**.

Table 5-19 Solids Handling System Preliminary Design Criteria for Alternative 10

Parameter		Description
Gravity Sludge Thickener		
Number of Units		1
Thickener Diameter, ft		60
Sludge Flow per Thickener (MGD)	at Max Solids Loading	0.52
	at Avg Solids Loading	0.27
Solids Loading per Thickener (ppd)	at Max Solids Loading	21,913
	at Avg Solids Loading	11,581

Parameter		Description
Surface Overflow Rate (gpd/ft^2)	at Max Solids Loading	185.3
	at Avg Solids Loading	97.1
Solids Loading Rate (ppd/ft^2)	at Max Solids Loading	7.8
	at Avg Solids Loading	4.1
Thickened Sludge Pumps		
Number of Thickened Sludge Pumps		2, one duty and one standby
Pump Type		Progressive Cavity or Double Disc with VFD
Capacity		130 gpm
Pump TDH		76 ft (estimated)
Thickened Sludge Pipe, inch		6
Belt Filter Press		
Number of Units		3, including two existing plus one new
Hydraulic Loading Rate		130 gpm
Feed Sludge Solids		1,033-1,972 Lbs/hr
Solids Capture		85%-90%
Sludge Cake Transfer Pump		
Pump Type		Progressive Cavity Pump
Number of Pumps		1
Pump Capacity		15 gpm
Pump TDH		50 ft (estimated)
Recycle Pump Station		
Wet Well Dimension		7 ft Dia x 19 ft Depth
Pump Type		Submersible Centrifugal
Number of Pumps		2, one duty and one standby
Pump Capacity		311 gpm
Pump TDH, ft		50 ft (estimated)

Ground Storage

The ground storage analysis is the same as Alternative 8 due to the same total storage capacity and plant design flow. No additional storage is needed for this alternative.

High Service Pump Station

As with Alternative 8, four (4) new pumps at 7.60 MGD each are proposed, with three duty and one standby, to increase the total firm capacity of HSPS to 95.625 MGD. A new high service pump station is proposed to house the new pumps and other equipment.

Section 6 - Preliminary Opinions of Probable Construction Cost

A Preliminary Opinion of Probable Construction Cost (OPCC) was developed for each of the five alternatives evaluated in Section 5. The following assumptions were made:

- Additional raw water pumping is covered in the Reservoir project and not included in this cost estimating.
- Major equipment costs were obtained from equipment manufacturers or recent bids from similar projects.
- Building cost was based on $350/sf.
- Electrical work allowance was assumed at 20% of the total estimated cost.
- Instrumentation, control, and SCADA integration work allowance was assumed at 10% of the total estimated cost.

The OPCCs for all five alternatives are summarized in **Table 6-1**. This planning/conceptual design level OPCC includes 30% contingency, 5% mobilization/demobilization, 6% bond/insurance, and 12% contractor overhead and profit. Please note this represents cost in year 2022 dollars and an escalation to mid-point of construction should be considered once the construction schedule is determined.

The OPCCs provided in this report should be considered order-of-magnitude planning level estimates based on the criteria set forth by the Association for the Advancement of Cost Engineering (AACE) International. These estimates are provided with accuracy within 50% below or 30% above the actual construction cost.

In addition, an engineering services fee estimated at 15 percent of the construction cost was included, which represents the costs associated with engineering design, project bid, and construction contract administration. Detailed cost breakdowns are included in **Appendix A**.

Table 6-1 Estimated Project Cost Costs (in 2022 dollars)

Item	Alternative 1 New Third Upflow Clarifier to Plant 1	Alternative 4A New Membrane Filtration to Plant 2	Alternative 8 New Treatment Train Identical to Plant 3 and Plant 4	Alternative 9 New Train with Plat Settlers and Dual-Media Filters	Alternative 10 New Treatment Train with Plate Settler and Membrane Filters
Additional Capacity Gained, MGD	4.58	16	24	24	24
Subtotal (Raw Cost)	$9,132,000	$46,157,000	$68,018,000	$58,935,000	$55,368,000
Contingency (30%)	$2,740,000	$13,848,000	$20,406,000	$17,681,000	$16,611,000
Subtotal	$11,872,000	$60,005,000	$88,424,000	$76,616,000	$71,979,000
MOB (5%)	$594,000	$3,001,000	$4,422,000	$3,831,000	$3,599,000
Bond/Insurance (6%)	$713,000	$3,601,000	$5,306,000	$4,597,000	$4,319,000
Subtotal	$13,179,000	$66,607,000	$98,152,000	$85,044,000	$79,897,000
Contractor OH&P (12%)	$1,582,000	$7,993,000	$11,779,000	$10,206,000	$9,588,000
TOTAL CONSTRUCTION COST	$14,761,000	$74,600,000	$109,931,000	$95,250,000	$89,485,000
Engineer's Services (15%)	$2,215,000	$11,190,000	$16,490,000	$14,288,000	$13,423,000
PROJECT TOTAL	$16,976,000	$85,790,000	$126,421,000	$109,538,000	$102,908,000
Cost per gallon Gained	$3.71	$5.36	$5.27	$4.56	$4.29

Notes:

1. Two 1,250 kW diesel emergency generators are included with Alternatives 8, 9 & 10.

Appendix A

Opinion of Probable Construction Cost

Detailed Breakdown

PEACE RIVER MANASOTA REGIONAL WATER FACILITY
Alternative 1 - Add a 3rd Up-Flow Clarifier to Plant 1
Opinion of Probable Construction Cost - Preliminary

ARDURRA

DESCRIPTION	QTY.	UNIT	Base Unit Cost	Installation Factor	UNIT PRICE	AMOUNT
DIVISION 2 - SITE CONSTRUCTION						
Demolition						
Sidewalk	1	LS	$ 2,500	1.0	$ 2,500	$ 2,500
Site work						
Temporary Erosion/Sedimentation Control	1	LS	$ 10,000	1.0	$ 10,000	$ 10,000
Excavation	500	CYD	$ 8	1.0	$ 8	$ 4,000
Sidewalk	100	LF	$ 25	1.0	$ 25	$ 2,500
Yard Piping & Appurtenances						
24-inch Piping - Pentagon to SCU	100	LF	$ 375	2.0	$ 750	$ 75,000
24-inch Piping - SCU to Pentagon	50	LF	$ 375	2.0	$ 750	$ 37,500
24-inch Piping - PAC to Pentagon	100	LF	$ 375	2.0	$ 750	$ 75,000
Pipe Supports	2	EA	$ 10,000	1.5	$ 15,000	$ 30,000
Raw Sludge Thickener						
Earthwork	1	LS	$ 9,600	1.3	$ 12,480	$ 12,500
Below Slab Piping	1	LS	$ 37,000	1.3	$ 48,100	$ 48,100
					SUBTOTAL	**$ 297,100**
DIVISION 3 - CONCRETE						
New PAC Contact Basins						
Bottom Slab	165	CYD	$ 600	1.0	$ 600	$ 99,000
Walls	250	CYD	$ 1,100	1.0	$ 1,100	$ 275,000
Elevated Slab	20	CYD	$ 1,500	1.0	$ 1,500	$ 30,000
Solids Contact Unit						
Bottom Slab	325	CYD	$ 600	1.0	$ 600	$ 195,000
Walls	280	CYD	$ 1,100	1.0	$ 1,100	$ 308,000
Grout	40	CYD	$ 1,500	1.0	$ 1,500	$ 60,000
SCU Sludge Valve Platform						
Bottom Slab	8	CYD	$ 600	1.0	$ 600	$ 4,800
Walls	3	CYD	$ 1,100	1.0	$ 1,100	$ 3,600
Raw Sludge Thickener						
Gravity Thickener Slab on Grade	180	CYD	$ 600	1.4	$ 840	$ 151,200
Gravity Thickener Walls	140	CYD	$ 1,100	1.4	$ 1,540	$ 215,600
Gravity Thickener Elevated Slabs	30	CYD	$ 1,500	1.4	$ 2,100	$ 63,000
Gravity Thickener Grout Topping	4	CYD	$ 600	1.5	$ 900	$ 3,600
Raw Sludge Splitter Box						
Raw Sludge Splitter Box	1	LS	$ 160,000	1.0	$ 160,000	$ 160,000
					SUBTOTAL	**$ 1,568,800**
DIVISION 4 - MASONRY						
High Service Pump Station Building	3417	SF	350	1.0	$ 350	$ 1,196,000
					SUBTOTAL	**$ 1,196,000**
DIVISION 5 - MISCELLANEOUS METALS						
PAC Contact Tank						
Railing	300	LF	$ 55	1.5	$ 83	$ 24,800
Stairs	1	LS	$ 10,000	1.5	$ 15,000	$ 15,000
Solids Contact Unit Number 3						
Walkway Bridge Access	1140	SF	$ 50	1.5	$ 75	$ 85,500
Exterior access walkway						
Stainless Steel Sample Sink	1	EA	$ 2,500	1.5	$ 3,750	$ 3,800
Raw Sludge Thickener						
Access Stairs	1	LS	$ 26,000	1.3	$ 33,800	$ 33,800
					SUBTOTAL	**$ 162,900**
DIVISION 11 - EQUIPMENT						
PAC Contact Tank						
PAC Mixers	2	EA	$ 42,000	1.5	$ 63,000	$ 126,000
Solids Contact Unit Number 3						
OVIVO 85 ft Diameter Type HRC Reactor Clarifier	1	EA	$ 1,650,000	1.5	$ 2,475,000	$ 2,475,000
Finish Painting	1	LS	$ 50,000	1.0	$ 50,000	$ 50,000
Chemical Feed Pumps						
Replace Chemical Feed Pumps	1	LS	$ 300,000	1.3	$ 390,000	$ 390,000
Raw Sludge Thickener						
Raw Sludge Thickener Equipment	1	EA	$ 325,000	1.0	$ 325,000	$ 325,000
Weirs	1	LS	$ 36,000	1.3	$ 46,800	$ 46,800
					SUBTOTAL	**$ 3,412,800**
DIVISION 13 - SPECIAL CONSTRUCTION						
Instrumentation, Control, and SCADA Integration work Allowance (10%)	1	LS	$ 703,000	1.0	$ 703,000	$ 703,000
					SUBTOTAL	**$ 703,000**
DIVISION 15 - MECHANICAL						
Small Diameter Process Piping						
Chemical Feed Piping	1000	LF	$ 20	1.5	$ 30	$ 30,000
2" Waterline + Spray Wash	1	LS	$ 5,000	1.5	$ 7,500	$ 7,500
Sample Piping	500	LF	$ 50	1.5	$ 75	$ 37,500
SCU Desludging System						
12" Piping	270	LF	$ 600	1.4	$ 840	$ 226,800
12" Plug Valves with Pneumatic Actuator	4	EA	$ 8,200	1.5	$ 12,300	$ 49,200
12" Cut In	2	EA	$ 5,000	1.0	$ 5,000	$ 10,000
Misc. Process Piping	1	LS	$ 25,000	1.0	$ 25,000	$ 25,000
					SUBTOTAL	**$ 386,000**
DIVISION 16 - ELECTRICAL						
Electrical Work Allowance (20%)	1	LS	$ 1,405,000	1.0	$ 1,405,000	$ 1,405,000
					SUBTOTAL	**$ 1,405,000**

SUBTOTAL	**$**	**9,132,000**
CONTINGENCY (30%)	$	2,740,000
SUBTOTAL	**$**	**11,872,000**
MOBILIZATION/DEMOBILIZATION (5%)	$	594,000
CONTRACT DOCUMENTS/INSURANCE/INDEMNIFICATION (6%)	$	713,000
SUBTOTAL	**$**	**13,179,000**
CONTRACTOR'S OH&P (12%)	$	1,582,000
TOTAL ESTIMATED CONSTRUCTION COST	**$**	**14,761,000**
ENGINEER'S SERVICES (15%)	**$**	**2,215,000**
PROJECT TOTAL	**$**	**16,976,000**

PEACE RIVER MANASOTA REGIONAL WATER FACILITY
Alternative 4A - Add Plate Settlers to Plant 2 Sedimentation Basins and Add Membrane Filters
Opinion of Probable Construction Cost - Preliminary

ARDURRA

DESCRIPTION	QTY.	UNIT	Base Unit Cost	Installation Factor	UNIT PRICE	AMOUNT
DIVISION 2 - SITE CONSTRUCTION						
Demolition						
Sidewalk	1	LS	$ 2,500	1.0	$ 2,500	$ 2,500
Remove Existing Sed Basin Overflow Troughs	1	LS	$ 10,000	1.0	$ 10,000	$ 10,000
Remove Existing Clarifier Mechanisms	4	EA	$ 10,000	1.5	$ 15,000	$ 60,000
Remove Existing Dual Media Filter Materials	1	LS	$ 50,000	1.5	$ 75,000	$ 75,000
Site work						
Temporary Erosion/Sedimentation Control	1	LS	$ 10,000	1.0	$ 10,000	$ 10,000
Excavation	500	CYD	$ 8	1.0	$ 8	$ 4,000
Sidewalk	100	LF	$ 25	1.0	$ 25	$ 2,500
Yard Piping & Appurtenances						
30" PAC Piping	100	LF	$ 620	1.8	$ 1,116	$ 111,600
30" Inlet Piping and Fittings	100	LF	$ 620	1.8	$ 1,116	$ 111,600
30" Outlet Piping and Fittings	100	LF	$ 620	1.8	$ 1,116	$ 111,600
30" Butterfly Valves	4	EA	$ 10,000	1.5	$ 15,000	$ 60,000
36" Settled Water Interconnect Piping	540	LF	$ 860	1.8	$ 1,548	$ 836,000
36" Butterfly Valves	3	EA	$ 12,000	1.5	$ 18,000	$ 54,000
Raw Sludge Thickener						
Earthwork	1	LS	$ 9,600	1.3	$ 12,480	$ 12,500
Below Slab Piping	1	LS	$ 37,000	1.3	$ 48,100	$ 48,100
					SUBTOTAL	**$ 1,509,400**
DIVISION 3 - CONCRETE						
New PAC Slurry Tanks						
Bottom Slab	145	CYD	$ 600	1.0	$ 600	$ 87,000
Walls	245	CYD	$ 1,100	1.0	$ 1,100	$ 269,500
Elevated Slab	56	CYD	$ 1,500	1.0	$ 1,500	$ 84,000
New PAC Contact Basin						
Bottom Slab	165	CYD	$ 600	1.0	$ 600	$ 99,000
Walls	250	CYD	$ 1,100	1.0	$ 1,100	$ 275,000
Elevated Slab	20	CYD	$ 1,500	1.0	$ 1,500	$ 30,000
New 2 Stage Rapid Mix						
Bottom Slab	46	CYD	$ 600	1.0	$ 600	$ 27,600
Walls	125	CYD	$ 1,100	1.0	$ 1,100	$ 137,500
Elevated Slab	40	CYD	$ 1,500	1.0	$ 1,500	$ 60,000
Sedimentation Basin Bottom Fill						
New Slab	290	CYD	$ 600	1.0	$ 600	$ 174,000
New 3rd Stage Flocculation						
Walls	130	CYD	$ 650	1.3	$ 845	$ 109,900
Support Piers	5	CYD	$ 1,100	1.3	$ 1,430	$ 7,200
Plate Settlers						
Trough Connections	16	EA	$ 1,500	1.3	$ 1,950	$ 31,200
New Settled Water Splitter Box						
Bottom Slab	40	CYD	$ 600	1.0	$ 600	$ 24,000
Walls	65	CYD	$ 1,100	1.0	$ 1,100	$ 71,500
Chemical Feed Building						
Slab on Grade	1400	CYD	$ 600	1.0	$ 600	$ 840,000
PAC Feed Building						
Slab on Grade	18	CYD	$ 600	1.0	$ 600	$ 10,500
Raw Sludge Thickener						
Gravity Thickener Slab on Grade	180	CYD	$ 600	1.4	$ 840	$ 151,200
Gravity Thickener Walls	140	CYD	$ 1,100	1.4	$ 1,540	$ 215,600
Gravity Thickener Elevated Slabs	30	CYD	$ 1,500	1.4	$ 2,100	$ 63,000
Gravity Thickener Grout Topping	4	CYD	$ 600	1.5	$ 900	$ 3,600
Raw Sludge Splitter Box						
Raw Sludge Splitter Box	1	LS	$ 160,000	1.0	$ 160,000	$ 160,000
Thickened Sludge Pump Station						
Thickened Sludge Pump Station Concrete Slab	28	CY	$ 621	1.0	$ 621	$ 17,400
Recycle Pump Station						
Recycle Pump Station Wet Well	1	LS	$ 505,700	1.0	$ 505,700	$ 505,700
Membrane Support Building						
Slab on Grade	85	CY	$ 600	1.0	$ 600	$ 51,000
High Service Pump Station Building						
Slab on Grade	250	CY	$ 600	1.0	$ 600	$ 150,000
					SUBTOTAL	**$ 3,655,400**
DIVISION 4 - MASONRY						
Chemical Feed Building	17346	SF	$ 350	1	$ 350	$ 6,071,100
PAC Feed Building	820	SF	$ 350	1	$ 350	$ 287,000
30'x50' Membrane Support Building	1500	SF	$ 275	1.2	$ 330	$ 495,000
High Service Pump Station Building	3417	SF	$ 350	1	$ 350	$ 1,196,000
					SUBTOTAL	**$ 8,049,100**
DIVISION 5 - MISCELLANEOUS METALS						
PAC Contact Tank						
Railing	300	LF	$ 55	1.5	$ 83	$ 24,800
Stairs	1	LS	$ 10,000	1.5	$ 15,000	$ 15,000
Rapid Mix						
Grating	310	SF	$ 50	1.5	$ 75	$ 23,300
Stairs	1	LS	$ 10,000	1.5	$ 15,000	$ 15,000
Railing	60	LF	$ 55	1.5	$ 83	$ 5,000
Raw Sludge Thickener						
Access Stairs	1	LS	$ 26,000	1.3	$ 33,800	$ 33,800
					SUBTOTAL	**$ 116,900**
DIVISION 11 - EQUIPMENT						
PAC Slurry Tank						
PAC Mixers	4	EA	$ 60,000	1.5	$ 90,000	$ 360,000
PAC Recirculation Pumps	4	EA	$ 25,000	1.5	$ 37,500	$ 150,000
PAC Contact Tank						
PAC Mixers	2	EA	$ 42,000	1.5	$ 63,000	$ 126,000
Rapid Mixers						
1st Stage Rapid Mixers	2	EA	$ 30,000	1.5	$ 45,000	$ 90,000
2nd Stage Rapid Mixers	2	EA	$ 30,000	1.5	$ 45,000	$ 90,000

PEACE RIVER MANASOTA REGIONAL WATER FACILITY
Alternative 4A - Add Plate Settlers to Plant 2 Sedimentation Basins and Add Membrane Filters
Opinion of Probable Construction Cost - Preliminary

DESCRIPTION	QTY.	UNIT	Base Unit Cost	Installation Factor	UNIT PRICE	AMOUNT
Flocculators						
3rd Stage Flocculator	2	EA	$ 98,000	1.5	$ 147,000	$ 294,000
Plate Settlers						
7 Plate Packs Per Basin	2	EA	$ 800,000	1.5	$ 1,200,000	$ 2,400,000
Hoseless Sludge Removal System						
Mega Vac Units	4	EA	$ 62,500	1.5	$ 93,750	$ 375,000
Membrane Filtration						
ZeeWeed Filtration System	1	LS	$ 5,000,000	1.5	$ 7,500,000	$ 7,500,000
Fine Screen	2	EA	$ 200,000	1.5	$ 300,000	$ 600,000
Splitter Box						
Weir Gates	3	EA	$ 25,000	1.5	$ 37,500	$ 112,500
Transfer Pumps						
Transfer Pumps	3	EA	$ 100,000	1.5	$ 150,000	$ 450,000
Alum Feed System						
Alum Feed Skid #1 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Polymer Feed System						
Polymer Feed Pump Skid #1	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Caustic Feed System						
Caustic Feed Skid #1 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 90,000	1.3	$ 117,000	$ 117,000
Caustic Feed Skid #2 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 90,000	1.3	$ 117,000	$ 117,000
Caustic Feed Skid #3 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 90,000	1.3	$ 117,000	$ 117,000
PAC Feed System						
PAC Feed Pumps	3	EA	$ 31,000	1.3	$ 40,300	$ 120,900
Ammonium Hydroxide Feed System						
Ammonium Hydroxide Feed Pump Skid #1	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Sodium Hypochlorite Feed System						
Sodium Hypochlorite Skid #1 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Sodium Hypochlorite Skid #2 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Raw Sludge Thickener						
Raw Sludge Thickener Equipment	1	EA	$ 325,000	1.0	$ 325,000	$ 325,000
Weirs	1	LS	$ 36,000	1.3	$ 46,800	$ 46,800
Thickened Sludge Pump Station						
Thickened Sludge Pumps	2	EA	$ 13,478	1.0	$ 13,478	$ 27,000
Belt Filter Press						
Belt Filter Press	1	EA	$ 333,000	1.0	$ 333,000	$ 333,000
Belt Filter Press Booster Pumps	1	EA	$ 20,000	1.0	$ 20,000	$ 20,000
Sludge Cake Discharge Pumps	1	EA	$ 41,000	1.0	$ 41,000	$ 41,000
Polymer System						
Polymer Feed System	1	EA	$ 155,000	1.0	$ 155,000	$ 155,000
High Service Pump Station						
High Service Pumps	3	EA	$ 350,000	1.0	$ 350,000	$ 1,050,000
Recycle Pump Station						
Recycle Pumps	2	EA	$ 33,165	1.0	$ 33,165	$ 66,400
					SUBTOTAL	**$ 15,733,600**
DIVISION 13 - SPECIAL CONSTRUCTION						
Alum Storage Tanks @ 20,000 gal	9	EA	$ 40,000	1.5	$ 60,000	$ 540,000
Caustic Storage Tanks @ 15,000 gal	2	EA	$ 50,000	1.0	$ 50,000	$ 100,000
Hypochlorite Storage Tanks @ 15,000 gal	3	EA	$ 40,000	1.5	$ 60,000	$ 180,000
Ammonium Hydroxide Storage Tank @ 7,500 gal	1	EA	$ 45,000	1.0	$ 45,000	$ 45,000
Instrumentation, Control, and SCADA Integration work Allowance (10%)	2	LS	$ 3,246,000	1.0	$ 3,246,000	$ 6,492,000
					SUBTOTAL	**$ 7,357,000**
DIVISION 15 - MECHANICAL						
Small Diameter Process Piping						
Chemical Feed Piping	1	LS	$ 235,000	1.5	$ 352,500	$ 352,500
Compressed Air Piping	300	LF	$ 75	1.5	$ 113	$ 33,800
Desludging System						
6" Sludge Piping	300	LF	$ 300	1.4	$ 420	$ 126,000
6" Plug Valves with Electric Actuators	2	EA	$ 6,500	1.5	$ 9,750	$ 19,500
12" Piping	800	LF	$ 600	1.4	$ 840	$ 672,000
12" Plug Valves with Electric Actuators	4	EA	$ 8,200	1.5	$ 12,300	$ 49,200
Membrane Piping						
12" Air Piping	250	LF	$ 80	1.5	$ 120	$ 30,000
18" Permeate Piping	150	LF	$ 100	1.5	$ 150	$ 22,500
30" Permeate Piping	100	LF	$ 300	1.5	$ 450	$ 45,000
Misc. Process Piping	1	LS	$ 1,180,020.00	1.0	$ 1,180,020	$ 1,180,100
					SUBTOTAL	**$ 2,530,600**
DIVISION 16 - ELECTRICAL						
Emergency Generators	1	EA	$ 475,000	1.5	$ 712,500	$ 712,500
Electrical Work Allowance (20%)	1	LS	$ 6,492,000	1.0	$ 6,492,000	$ 6,492,000
					SUBTOTAL	**$ 7,204,500**

	SUBTOTAL	**$ 46,157,000**
CONTINGENCY (30%)	$	13,848,000
	SUBTOTAL	**$ 60,005,000**
MOBILIZATION/DEMOBILIZATION (5%)	$	3,001,000
CONTRACT DOCUMENTS/INSURANCE/INDEMNIFICATION (6%)	$	3,601,000
	SUBTOTAL	**$ 66,607,000**
CONTRACTOR'S OH&P (12%)	$	7,993,000
TOTAL ESTIMATED CONSTRUCTION COST	**$**	**74,600,000**
ENGINEER'S SERVICES (15%)	**$**	**11,190,000**
PROJECT TOTAL	**$**	**85,790,000**

PEACE RIVER MANASOTA REGIONAL WATER FACILITY
Alternative 8 - New Conventional Plant Identical to Plants 3 and 4
Opinion of Probable Construction Cost - Preliminary

ARDURRA

DESCRIPTION	QTY.	UNIT	Base Unit Cost	Installation Factor	UNIT PRICE	AMOUNT
DIVISION 2 - SITE CONSTRUCTION						
Site work						
Temporary Erosion/Sedimentation Control	1	LS	$ 50,000	1.0	$ 50,000	$ 50,000
Excavation	8,500	CYD	$ 8	1.0	$ 8	$ 68,000
Sidewalk	1,500	LF	$ 25	1.0	$ 25	$ 37,500
Pavement	1,900	SY	$ 40	1.0	$ 40	$ 76,000
Yard Piping & Appurtenances						
8" DIP Sludge Piping	1,280	LF	$ 110	2.2	$ 242	$ 309,800
30" DIP Raw Water Piping	1,600	LF	$ 620	1.8	$ 1,116	$ 1,785,600
36" DIP Process Piping	680	LF	$ 860	1.7	$ 1,462	$ 994,200
42" DIP Filtered Water Piping	2,050	LF	$ 1,240	1.6	$ 1,984	$ 4,067,200
48" DIP Backwash Piping	500	LF	$ 1,610	1.5	$ 2,415	$ 1,207,500
Raw Sludge Thickener						
Earthwork	1	LS	$ 9,600	1.3	$ 12,480	$ 12,500
Below Slab Piping	1	LS	$ 37,000	1.3	$ 48,100	$ 48,100
					SUBTOTAL	**$ 8,656,400**
DIVISION 3 - CONCRETE						
New PAC Slurry Tanks						
Bottom Slab	122	CYD	$ 600	1.0	$ 600	$ 73,200
Walls	210	CYD	$ 1,100	1.0	$ 1,100	$ 231,000
Elevated Slab	48	CYD	$ 1,500	1.0	$ 1,500	$ 72,000
Solids Contact Units						
Slab on Grade	2000	CYD	$ 600	1.0	$ 600	$ 1,200,000
Walls	1900	CYD	$ 1,100	1.0	$ 1,100	$ 2,090,000
Elevated Slabs	310	CYD	$ 1,500	1.0	$ 1,500	$ 465,000
New Filter Structure						
Slab on Grade	1755	CYD	$ 600	1.0	$ 600	$ 1,053,000
Walls	1830	CYD	$ 1,100	1.0	$ 1,100	$ 2,013,000
Elevated Slabs	415	CYD	$ 1,500	1.0	$ 1,500	$ 622,500
Chemical Feed Building						
Slab on Grade	1200	CYD	$ 600	1.0	$ 600	$ 720,000
PAC Feed Building						
Slab on Grade	15	CYD	$ 600	1.0	$ 600	$ 9,000
Raw Sludge Thickener						
Gravity Thickener Slab on Grade	180	CYD	$ 600	1.4	$ 840	$ 151,200
Gravity Thickener Walls	140	CYD	$ 1,100	1.4	$ 1,540	$ 215,600
Gravity Thickener Elevated Slabs	30	CYD	$ 1,500	1.4	$ 2,100	$ 63,000
Gravity Thickener Grout Topping	4	CYD	$ 600	1.5	$ 900	$ 3,600
Raw Sludge Splitter Box						
Raw Sludge Splitter Box	1	LS	$ 160,000	1.0	$ 160,000	$ 160,000
Thickened Sludge Pump Station						
Thickened Sludge Pump Station Concrete Slab	28	CY	$ 621	1.0	$ 621	$ 17,400
Recycle Pump Station						
Recycle Pump Station Wet Well	1	LS	$ 505,700	1.0	$ 505,700	$ 505,700
					SUBTOTAL	**$ 9,665,200**
DIVISION 4 - MASONRY						
Chemical Feed Building	14868	SF	350	1.0	$ 350	$ 5,203,800
PAC Feed Building	700	SF	350	1.0	$ 350	$ 245,000
High Service Pump Station Building	3913	SF	350	1.0	$ 350	$ 1,369,600
					SUBTOTAL	**$ 6,818,400**
DIVISION 5 - MISCELLANEOUS METALS						
PAC Slurry Tank						
Railing	174	LF	$ 55	1.5	$ 83	$ 14,400
Stairs	1	LS	$ 25,000	1.5	$ 37,500	$ 37,500
PAC Contact Tank						
Railing	460	LF	$ 55	1.5	$ 83	$ 38,000
Solids Contact Units						
Grating	800	SF	$ 50	1.5	$ 75	$ 60,000
Stairs	2	EA	$ 10,000	1.5	$ 15,000	$ 30,000
Railing	2000	LF	$ 55	1.5	$ 83	$ 165,000
Filter Structure						
Stairs and Grating	1	LS	$ 50,000	1.5	$ 75,000	$ 75,000
Railing	2690	LF	$ 55	1.5	$ 83	$ 222,000
Hatches	6	EA	$ 750	1.5	$ 1,125	$ 6,800
Filter Enclosure	11946	SF	$ 185	1.1	$ 204	$ 2,431,100
Raw Sludge Thickener						
Access Stairs	1	LS	$ 26,000	1.3	$ 33,800	$ 33,800
					SUBTOTAL	**$ 3,113,600**

PEACE RIVER MANASOTA REGIONAL WATER FACILITY
Alternative 8 - New Conventional Plant Identical to Plants 3 and 4
Opinion of Probable Construction Cost - Preliminary

ARDURRA

DESCRIPTION	QTY.	UNIT	Base Unit Cost	Installation Factor	UNIT PRICE	AMOUNT
DIVISION 11 - EQUIPMENT						
PAC Slurry Tank						
PAC Mixers	4	EA	$ 60,000	1.5	$ 90,000	$ 360,000
PAC Recirculation Pumps	4	EA	$ 25,000	1.5	$ 37,500	$ 150,000
PAC Contact Tank						
15 hp Mixers	4	EA	$ 42,000	1.5	$ 63,000	$ 252,000
20 hp Mixers	2	EA	$ 42,000	1.5	$ 63,000	$ 126,000
Rapid Mixers						
15 hp Mixers	2	EA	$ 42,000	1.5	$ 63,000	$ 126,000
Solids Contact Units						
OVIVO 85 ft Diameter Type RCM Reactor Clarifier	4	EA	$ 1,500,000	1.3	$ 1,950,000	$ 7,800,000
Slide Gates	8	EA	$ 5,000	1.5	$ 7,500	$ 60,000
Finish Painting	1	LS	$ 50,000	1.1	$ 55,000	$ 55,000
Dual Media Filters						
Underdrains, Media and Air Scour Piping	14	EA	$ 232,000	1.5	$ 348,000	$ 4,872,000
Air Scour Blowers	2	EA	$ 100,000	1.5	$ 150,000	$ 300,000
Transfer Pumps						
Transfer Pumps	3	EA	$ 100,000	1.5	$ 150,000	$ 450,000
Alum Feed System						
Alum Feed Skid #1 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Alum Feed Skid #2 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Polymer Feed System						
Polymer Feed Skid #1	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Polymer Feed Skid #2	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Caustic Feed System						
Caustic Feed Skid #1 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 90,000	1.3	$ 117,000	$ 117,000
Caustic Feed Skid #2 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 90,000	1.3	$ 117,000	$ 117,000
Caustic Feed Skid #3 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 90,000	1.3	$ 117,000	$ 117,000
PAC Feed System						
PAC Feed Pumps	3	EA	$ 31,000	1.3	$ 40,300	$ 120,900
Ammonium Hydroxide Feed System						
Ammonium Hydroxide Feed Skid #1	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Sodium Hypochlorite Feed System						
Sodium Hypochlorite Skid #1 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Sodium Hypochlorite Skid #2 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Raw Sludge Thickener						
Raw Sludge Thickener Equipment	1	EA	$ 325,000	1.0	$ 325,000	$ 325,000
Weirs	1	LS	$ 36,000	1.3	$ 46,800	$ 46,800
Thickened Sludge Pump Station						
Thickened Sludge Pumps	2	EA	$ 13,478	1.0	$ 13,478	$ 27,000
Belt Filter Press						
Belt Filter Press	1	EA	$ 333,000	1.0	$ 333,000	$ 333,000
Belt Filter Press Booster Pumps	1	EA	$ 20,000	1.0	$ 20,000	$ 20,000
Sludge Cake Discharge Pumps	1	EA	$ 41,000	1.0	$ 41,000	$ 41,000
Polymer System						
Polymer Feed System	1	EA	$ 155,000	1.0	$ 155,000	$ 155,000
High Service Pump Station						
High Service Pumps	4	EA	$ 350,000	1.0	$ 350,000	$ 1,400,000
Recycle Pump Station						
Recycle Pumps	2	EA	$ 33,165	1.0	$ 33,165	$ 66,400
					SUBTOTAL	**$ 18,347,100**
DIVISION 13 - SPECIAL CONSTRUCTION						
Alum Storage Tanks @ 20,000 gal	8	EA	$ 40,000	1.5	$ 60,000	$ 480,000
Caustic Storage Tanks @ 15,000 gal	2	EA	$ 50,000	1.0	$ 50,000	$ 100,000
Hypochlorite Storage Tanks @ 20,000 gal	2	EA	$ 40,000	1.5	$ 60,000	$ 120,000
Ammonium Hydroxide Storage Tank @ 7,500 gal	1	EA	$ 45,000	1.0	$ 45,000	$ 45,000
Instrumentation, Control, and SCADA Integration work Allowance (10%)	1	LS	$ 5,123,000	1.0	$ 5,123,000	$ 5,123,000
					SUBTOTAL	**$ 5,868,000**
DIVISION 15 - MECHANICAL						
Small Diameter Process Piping						
Chemical Feed Piping	1	LS	$ 200,000	1.5	$ 300,000	$ 300,000
2" Waterline + Spray Wash	750	LS	$ 55	1.5	$ 83	$ 61,900
Desludging System						
6" Sludge Piping	300	LF	$ 300	1.4	$ 420	$ 126,000
6" Plug Valves with Electric Actuators	2	EA	$ 6,500	1.5	$ 9,750	$ 19,500
12" Piping	800	LF	$ 600	1.4	$ 840	$ 672,000
12" Plug Valves with Electric Actuators	4	EA	$ 8,200	1.5	$ 12,300	$ 49,200
Dual Media Filters						
Filter Piping and Valves	14	EA	$ 70,000	1.3	$ 91,000	$ 1,274,000
Misc. Process Piping	1	LS	$ 1,376,033	1.0	$ 1,376,033	$ 1,376,100
					SUBTOTAL	**$ 3,878,700**
DIVISION 16 - ELECTRICAL						
Emergency Generators	2	EA	$ 475,000	1.5	$ 712,500	$ 1,425,000
Electrical Work Allowance (20%)	1	LS	$ 10,245,000	1.0	$ 10,245,000	$ 10,245,000
					SUBTOTAL	**$ 11,670,000**

	SUBTOTAL	**$ 68,018,000**
CONTINGENCY (30%)	$	20,406,000
	SUBTOTAL	**$ 88,424,000**
MOBILIZATION/DEMOBILIZATION (5%)	$	4,422,000
CONTRACT DOCUMENTS/INSURANCE/INDEMNIFICATION (6%)	$	5,306,000
	SUBTOTAL	**$ 98,152,000**
CONTRACTOR'S OH&P (12%)	$	11,779,000
TOTAL ESTIMATED CONSTRUCTION COST	**$**	**109,931,000**
ENGINEER'S SERVICES (15%)	**$**	**16,490,000**
PROJECT TOTAL	**$**	**126,421,000**

PEACE RIVER MANASOTA REGIONAL WATER FACILITY
Alternative 9 - New Conventional Plant with Plate Settlers and Dual Media Filters
Opinion of Probable Construction Cost - Preliminary

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DESCRIPTION	QTY.	UNIT	Base Unit Cost	Installation Factor	UNIT PRICE	AMOUNT
DIVISION 2 - SITE CONSTRUCTION						
Site work						
Temporary Erosion/Sedimentation Control	1	LS	$ 50,000	1.0	$ 50,000	$ 50,000
Excavation	8,500	CYD	$ 8	1.0	$ 8	$ 68,000
Sidewalk	1,500	LF	$ 25	1.0	$ 25	$ 37,500
Pavement	1,900	SY	$ 40	1.0	$ 40	$ 76,000
Yard Piping & Appurtenances						
8" DIP Sludge Piping	1,280	LF	$ 110	2.2	$ 242	$ 309,800
30" DIP Raw Water Piping	1,600	LF	$ 620	1.8	$ 1,116	$ 1,785,600
36" DIP Process Piping	680	LF	$ 860	1.7	$ 1,462	$ 994,200
42" DIP Filtered Water Piping	2,050	LF	$ 1,240	1.6	$ 1,984	$ 4,067,200
48" DIP Backwash Piping	500	LF	$ 1,610	1.5	$ 2,415	$ 1,207,500
Raw Sludge Thickener						
Earthwork	1	LS	$ 9,600	1.3	$ 12,480	$ 12,500
Below Slab Piping	1	LS	$ 37,000	1.3	$ 48,100	$ 48,100
					SUBTOTAL	**$ 8,656,400**
DIVISION 3 - CONCRETE						
New PAC Slurry Tanks						
Bottom Slab	122	CYD	$ 600	1.0	$ 600	$ 73,200
Walls	210	CYD	$ 1,100	1.0	$ 1,100	$ 231,000
Elevated Slab	48	CYD	$ 1,500	1.0	$ 1,500	$ 72,000
New PAC Contact Basin						
Bottom Slab	245	CYD	$ 600	1.0	$ 600	$ 147,000
Walls	430	CYD	$ 1,100	1.0	$ 1,100	$ 473,000
Elevated Slab	30	CYD	$ 1,500	1.0	$ 1,500	$ 45,000
New 2 Stage Rapid Mix						
Bottom Slab	46	CYD	$ 600	1.0	$ 600	$ 27,600
Walls	120	CYD	$ 1,100	1.0	$ 1,100	$ 132,000
Elevated Slab	40	CYD	$ 1,500	1.0	$ 1,500	$ 60,000
Flocculation						
Walls	80	CYD	$ 1,100	1.3	$ 1,430	$ 114,400
Support Piers	12	CYD	$ 1,100	1.3	$ 1,430	$ 17,200
New Sedimentation Basin						
Bottom Slab	750	CYD	$ 600	1.0	$ 600	$ 450,000
Walls	550	CYD	$ 1,100	1.0	$ 1,100	$ 605,000
Elevated Slab	60	CYD	$ 1,500	1.0	$ 1,500	$ 90,000
New Filter Structure						
Slab on Grade	1755	CYD	$ 600	1.0	$ 600	$ 1,053,000
Walls	1830	CYD	$ 1,100	1.0	$ 1,100	$ 2,013,000
Elevated Slabs	415	CYD	$ 1,500	1.0	$ 1,500	$ 622,500
Chemical Feed Building						
Slab on Grade	1200	CYD	$ 600	1.0	$ 600	$ 720,000
PAC Feed Building						
Slab on Grade	15	CYD	$ 600	1.0	$ 600	$ 9,000
Raw Sludge Thickener						
Gravity Thickener Slab on Grade	180	CYD	$ 600	1.4	$ 840	$ 151,200
Gravity Thickener Walls	140	CYD	$ 1,100	1.4	$ 1,540	$ 215,600
Gravity Thickener Elevated Slabs	30	CYD	$ 1,500	1.4	$ 2,100	$ 63,000
Gravity Thickener Grout Topping	4	CYD	$ 600	1.5	$ 900	$ 3,600
Raw Sludge Splitter Box						
Raw Sludge Splitter Box	1	LS	$ 160,000	1.0	$ 160,000	$ 160,000
Thickened Sludge Pump Station						
Thickened Sludge Pump Station Concrete Slab	28	CY	$ 621	1.0	$ 621	$ 17,400
Recycle Pump Station						
Recycle Pump Station Wet Well	1	LS	$ 505,700	1.0	$ 505,700	$ 505,700
High Service Pump Station Building						
Slab on Grade	250	CY	$ 600	1.0	$ 600	$ 150,000
					SUBTOTAL	**$ 8,221,400**
DIVISION 4 - MASONRY						
Chemical Feed Building	14868	SF	350	1.0	$ 350	$ 5,203,800
PAC Feed Building	700	SF	350	1.0	$ 350	$ 245,000
High Service Pump Station Building	3913	SF	350	1.0	$ 350	$ 1,369,600
					SUBTOTAL	**$ 6,818,400**
DIVISION 5 - MISCELLANEOUS METALS						
PAC Slurry Tank						
Railing	174	LF	$ 55	1.5	$ 83	$ 14,400
Stairs	1	LS	$ 25,000	1.5	$ 37,500	$ 37,500
PAC Contact Tank						
Railing	460	LF	$ 55	1.5	$ 83	$ 38,000
Sedimentation Basin						
Railing	1100	LF	$ 55	1.5	$ 83	$ 90,800
Stairs	1	LS	$ 25,000	1.5	$ 37,500	$ 37,500
Filter Structure						
Stairs and Grating	1	LS	$ 50,000	1.5	$ 75,000	$ 75,000
Railing	2690	LF	$ 55	1.5	$ 83	$ 222,000
Hatches	6	EA	$ 750	1.5	$ 1,125	$ 6,800
Filter Enclosure	11946	SF	$ 185	1.1	$ 204	$ 2,431,100
Raw Sludge Thickener						
Access Stairs	1	LS	$ 26,000	1.3	$ 32,500	$ 32,500
					SUBTOTAL	**$ 2,985,600**

PEACE RIVER MANASOTA REGIONAL WATER FACILITY
Alternative 9 - New Conventional Plant with Plate Settlers and Dual Media Filters
Opinion of Probable Construction Cost - Preliminary

ARDURRA

DESCRIPTION	QTY.	UNIT	Base Unit Cost	Installation Factor	UNIT PRICE	AMOUNT
DIVISION 11 - EQUIPMENT						
PAC Slurry Tank						
PAC Mixers	4	EA	$ 60,000	1.5	$ 90,000	$ 360,000
PAC Recirculation Pumps	4	EA	$ 25,000	1.5	$ 37,500	$ 150,000
PAC Contact Tank						
PAC Mixers	4	EA	$ 42,000	1.5	$ 63,000	$ 252,000
Rapid Mixers						
1st Stage Rapid Mixers	2	EA	$ 30,000	1.5	$ 45,000	$ 90,000
2nd Stage Rapid Mixers	2	EA	$ 30,000	1.5	$ 45,000	$ 90,000
Flocculators						
1st stage Flocculator	2	EA	$ 88,000	1.5	$ 132,000	$ 264,000
2nd stage Flocculator	2	EA	$ 88,000	1.5	$ 132,000	$ 264,000
3rd Stage Flocculator	2	EA	$ 88,000	1.5	$ 132,000	$ 264,000
Plate Settlers						
6 Plate Packs Per Basin	2	EA	$ 700,000	1.5	$ 1,050,000	$ 2,100,000
Hoseless Sludge Removal System						
Mega Vac Units	4	EA	$ 62,500	1.5	$ 93,750	$ 375,000
Dual Media Filters						
Underdrains, Media and Air Scour Piping	14	EA	$ 232,000	1.5	$ 348,000	$ 4,872,000
Air Scour Blowers	2	EA	$ 100,000	1.5	$ 150,000	$ 300,000
Transfer Pumps						
Transfer Pumps	3	EA	$ 100,000	1.5	$ 150,000	$ 450,000
Alum Feed System						
Alum Feed Skid #1 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Polymer Feed System						
Polymer Feed Skid #1	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Caustic Feed System						
Caustic Feed Skid #1 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 90,000	1.3	$ 117,000	$ 117,000
Caustic Feed Skid #2 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 90,000	1.3	$ 117,000	$ 117,000
Caustic Feed Skid #3 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 90,000	1.3	$ 117,000	$ 117,000
PAC Feed System						
PAC Feed Pumps	3	EA	$ 31,000	1.3	$ 40,300	$ 120,900
Ammonium Hydroxide Feed System						
Ammonium Hydroxide Feed Skid #1	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Sodium Hypochlorite Feed System						
Sodium Hypochlorite Skid #1 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Sodium Hypochlorite Skid #2 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Raw Sludge Thickener						
Raw Sludge Thickener Equipment	1	EA	$ 325,000	1.0	$ 325,000	$ 325,000
Weirs	1	LS	$ 36,000	1.3	$ 46,800	$ 46,800
Thickened Sludge Pump Station						
Thickened Sludge Pumps	2	EA	$ 13,478	1.0	$ 13,478	$ 27,000
Belt Filter Press						
Belt Filter Press	1	EA	$ 333,000	1.0	$ 333,000	$ 333,000
Belt Filter Press Booster Pumps	1	EA	$ 20,000	1.0	$ 20,000	$ 20,000
Sludge Cake Discharge Pumps	1	EA	$ 41,000	1.0	$ 41,000	$ 41,000
Polymer System						
Polymer Feed System	1	EA	$ 155,000	1.0	$ 155,000	$ 155,000
High Service Pump Station						
High Service Pumps	4	EA	$ 350,000	1.0	$ 350,000	$ 1,400,000
Recycle Pump Station						
Recycle Pumps	2	EA	$ 33,165	1.0	$ 33,165	$ 66,400
					SUBTOTAL	**$ 13,367,100**
DIVISION 13 - SPECIAL CONSTRUCTION						
Alum Storage Tanks @ 20,000 gal	8	EA	$ 40,000	1.5	$ 60,000	$ 480,000
Caustic Storage Tanks @ 15,000 gal	2	EA	$ 50,000	1.0	$ 50,000	$ 100,000
Hypochlorite Storage Tanks @ 20,000 gal	2	EA	$ 40,000	1.5	$ 60,000	$ 120,000
Ammonium Hydroxide Storage Tank @ 7,500 gal	1	EA	$ 45,000	1.0	$ 45,000	$ 45,000
Instrumentation, Control, and SCADA Integration work Allowance (10%)	1	LS	$ 4,424,000	1.0	$ 4,424,000	$ 4,424,000
					SUBTOTAL	**$ 5,169,000**
DIVISION 15 - MECHANICAL						
Small Diameter Process Piping						
Chemical Feed Piping	1	LS	$ 200,000	1.5	$ 300,000	$ 300,000
Desludging System						
6" Sludge Piping	300	LF	$ 300	1.4	$ 420	$ 126,000
6" Plug Valves with Electric Actuators	2	EA	$ 6,500	1.5	$ 9,750	$ 19,500
12" Piping	800	LF	$ 600	1.4	$ 840	$ 672,000
12" Plug Valves with Electric Actuators	4	EA	$ 8,200	1.5	$ 12,300	$ 49,200
Dual Media Filters						
Filter Piping and Valves	14	EA	$ 70,000	1.3	$ 91,000	$ 1,274,000
Misc. Process Piping	1	LS	$ 1,002,533	1.0	$ 1,002,533	$ 1,002,600
					SUBTOTAL	**$ 3,443,300**
DIVISION 16 - ELECTRICAL						
Emergency Generators	2	EA	$ 475,000	1.5	$ 712,500	$ 1,425,000
Electrical Work Allowance (20%)	1	LS	$ 8,848,000	1.0	$ 8,848,000	$ 8,848,000
					SUBTOTAL	**$ 10,273,000**

SUBTOTAL	**$**	**58,935,000**
CONTINGENCY (30%)	$	17,681,000
SUBTOTAL	**$**	**76,616,000**
MOBILIZATION/DEMOBILIZATION (5%)	$	3,831,000
CONTRACT DOCUMENTS/INSURANCE/INDEMNIFICATION (6%)	$	4,597,000
SUBTOTAL	**$**	**85,044,000**
CONTRACTOR'S OH&P (12%)	$	10,206,000
TOTAL ESTIMATED CONSTRUCTION COST	**$**	**95,250,000**
ENGINEER'S SERVICES (15%)	**$**	**14,288,000**
PROJECT TOTAL	**$**	**109,538,000**

PEACE RIVER MANASOTA REGIONAL WATER FACILITY
Alternative 10 - New Conventional Plant with Plate Settlers and Membrane Filters
Opinion of Probable Construction Cost - Preliminary

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DESCRIPTION	QTY.	UNIT	Base Unit Cost	Installation Factor	UNIT PRICE	AMOUNT
DIVISION 2 - SITE CONSTRUCTION						
Site work						
Temporary Erosion/Sedimentation Control	1	LS	$ 50,000	1.0	$ 50,000	$ 50,000
Excavation	8,500	CYD	$ 8	1.0	$ 8	$ 68,000
Sidewalk	1,500	LF	$ 25	1.0	$ 25	$ 37,500
Pavement	1,900	SY	$ 40	1.0	$ 40	$ 76,000
Yard Piping & Appurtenances						
8" DIP Sludge Piping	1,280	LF	$ 110	2.2	$ 242	$ 309,800
30" DIP Raw Water Piping	1,600	LF	$ 620	1.8	$ 1,116	$ 1,785,600
36" DIP Process Piping	680	LF	$ 860	1.7	$ 1,462	$ 994,200
42" DIP Filtered Water Piping	2,050	LF	$ 1,240	1.6	$ 1,984	$ 4,067,200
48" DIP Backwash Piping	500	LF	$ 1,610	1.5	$ 2,415	$ 1,207,500
Raw Sludge Thickener						
Earthwork	1	LS	$ 9,600	1.3	$ 12,480	$ 12,500
Below Slab Piping	1	LS	$ 37,000	1.3	$ 48,100	$ 48,100
					SUBTOTAL	**$ 8,656,400**
DIVISION 3 - CONCRETE						
New PAC Slurry Tanks						
Bottom Slab	122	CYD	$ 600	1.0	$ 600	$ 73,200
Walls	210	CYD	$ 1,100	1.0	$ 1,100	$ 231,000
Elevated Slab	48	CYD	$ 1,500	1.0	$ 1,500	$ 72,000
New PAC Contact Basin						
Bottom Slab	245	CYD	$ 600	1.0	$ 600	$ 147,000
Walls	430	CYD	$ 1,100	1.0	$ 1,100	$ 473,000
Elevated Slab	30	CYD	$ 1,500	1.0	$ 1,500	$ 45,000
New 2 Stage Rapid Mix						
Bottom Slab	46	CYD	$ 600	1.0	$ 600	$ 27,600
Walls	120	CYD	$ 1,100	1.0	$ 1,100	$ 132,000
Elevated Slab	40	CYD	$ 1,500	1.0	$ 1,500	$ 60,000
Flocculation						
Walls	80	CYD	$ 1,100	1.3	$ 1,430	$ 114,400
Support Piers	12	CYD	$ 1,100	1.3	$ 1,430	$ 17,200
New Sedimentation Basin						
Bottom Slab	750	CYD	$ 600	1.0	$ 600	$ 450,000
Walls	550	CYD	$ 1,100	1.0	$ 1,100	$ 605,000
Elevated Slab	60	CYD	$ 1,500	1.0	$ 1,500	$ 90,000
New Filter Structure						
Slab on Grade	600	CYD	$ 600	1.0	$ 600	$ 360,000
Walls	610	CYD	$ 1,100	1.0	$ 1,100	$ 671,000
Elevated Slabs	140	CYD	$ 1,500	1.0	$ 1,500	$ 210,000
Chemical Feed Building						
Slab on Grade	1200	CYD	$ 600	1.0	$ 600	$ 720,000
PAC Feed Building						
Slab on Grade	15	CYD	$ 600	1.0	$ 600	$ 9,000
Raw Sludge Thickener						
Gravity Thickener Slab on Grade	180	CYD	$ 600	1.4	$ 840	$ 151,200
Gravity Thickener Walls	140	CYD	$ 1,100	1.4	$ 1,540	$ 215,600
Gravity Thickener Elevated Slabs	30	CYD	$ 1,500	1.4	$ 2,100	$ 63,000
Gravity Thickener Grout Topping	4	CYD	$ 600	1.5	$ 900	$ 3,600
Raw Sludge Splitter Box						
Raw Sludge Splitter Box	1	LS	$ 160,000	1.0	$ 160,000	$ 160,000
Thickened Sludge Pump Station						
Thickened Sludge Pump Station Concrete Slab	28	CY	$ 621	1.0	$ 621	$ 17,400
Recycle Pump Station						
Recycle Pump Station Wet Well	1	LS	$ 505,700	1.0	$ 505,700	$ 505,700
					SUBTOTAL	**$ 5,623,900**
DIVISION 4 - MASONRY						
Chemical Feed Building	14868	SF	$ 350	1	$ 350	$ 5,203,800
PAC Feed Building	700	SF	$ 350	1	$ 350	$ 245,000
30'x50' Membrane Support Building	1500	SF	$ 275	1.2	$ 330	$ 495,000
High Service Pump Station Building	3913	SF	$ 350	1	$ 350	$ 1,369,600
					SUBTOTAL	**$ 7,313,400**
DIVISION 5 - MISCELLANEOUS METALS						
PAC Slurry Tank						
Railing	174	LF	$ 55	1.5	$ 83	$ 14,400
Stairs	1	LS	$ 25,000	1.5	$ 37,500	$ 37,500
PAC Contact Tank						
Railing	460	LF	$ 55	1.5	$ 83	$ 38,000
Sedimentation Basin						
Railing	1100	LF	$ 55	1.5	$ 83	$ 90,800
Stairs	1	LS	$ 25,000	1.5	$ 37,500	$ 37,500
Filter Structure						
Stairs and Grating	1	LS	$ 50,000	1.5	$ 75,000	$ 75,000
Railing	1350	LF	$ 55	1.5	$ 83	$ 111,400
Hatches	3	EA	$ 750	1.5	$ 1,125	$ 3,400
Filter Enclosure	3015	SF	$ 185	1.1	$ 204	$ 613,600
Raw Sludge Thickener						
Access Stairs	1	LS	$ 26,000	1.3	$ 33,800	$ 33,800
					SUBTOTAL	**$ 1,055,400**
DIVISION 11 - EQUIPMENT						
PAC Slurry Tank						
PAC Mixers	4	EA	$ 60,000	1.5	$ 90,000	$ 360,000
PAC Recirculation Pumps	4	EA	$ 25,000	1.5	$ 37,500	$ 150,000
PAC Contact Tank						
PAC Mixers	4	EA	$ 42,000	1.5	$ 63,000	$ 252,000
Rapid Mixers						
1st Stage Rapid Mixers	2	EA	$ 30,000	1.5	$ 45,000	$ 90,000
2nd Stage Rapid Mixers	2	EA	$ 30,000	1.5	$ 45,000	$ 90,000

PEACE RIVER MANASOTA REGIONAL WATER FACILITY
Alternative 10 - New Conventional Plant with Plate Settlers and Membrane Filters
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DESCRIPTION	QTY.	UNIT	Base Unit Cost	Installation Factor	UNIT PRICE	AMOUNT
Flocculators						
1st stage Flocculator	2	EA	$ 88,000	1.5	$ 132,000	$ 264,000
2nd stage Flocculator	2	EA	$ 88,000	1.5	$ 132,000	$ 264,000
3rd Stage Flocculator	2	EA	$ 88,000	1.5	$ 132,000	$ 264,000
Plate Settlers						
6 Plate Packs Per Basin	2	EA	$ 700,000	1.5	$ 1,050,000	$ 2,100,000
Hoseless Sludge Removal System						
Mega Vac Units	4	EA	$ 62,500	1.5	$ 93,750	$ 375,000
Membrane Filtration						
ZeeWeed Filtration System	1	LS	$ 4,350,000	1.5	$ 6,525,000	$ 6,525,000
Fine Screen	2	EA	$ 200,000	1.5	$ 300,000	$ 600,000
Transfer Pumps						
Transfer Pumps	3	EA	$ 100,000	1.5	$ 150,000	$ 450,000
Alum Feed System						
Alum Feed Skid #1 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Polymer Feed System						
Polymer Feed Skid #1	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Caustic Feed System						
Caustic Feed Skid #1 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 90,000	1.3	$ 117,000	$ 117,000
Caustic Feed Skid #2 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 90,000	1.3	$ 117,000	$ 117,000
Caustic Feed Skid #3 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 90,000	1.3	$ 117,000	$ 117,000
PAC Feed System						
PAC Feed Pumps	3	EA	$ 31,000	1.3	$ 40,300	$ 120,900
Ammonium Hydroxide Feed System						
Ammonium Hydroxide Feed Skid #1	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Sodium Hypochlorite Feed System						
Sodium Hypochlorite Skid #1 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Sodium Hypochlorite Skid #2 - Pumps, Piping, Flow Meters, Valves	1	EA	$ 100,000	1.3	$ 130,000	$ 130,000
Raw Sludge Thickener						
Raw Sludge Thickener Equipment	1	EA	$ 325,000	1.0	$ 325,000	$ 325,000
Weirs	1	LS	$ 36,000	1.3	$ 46,800	$ 46,800
Thickened Sludge Pump Station						
Thickened Sludge Pumps	2	EA	$ 13,478	1.0	$ 13,478	$ 27,000
Belt Filter Press						
Belt Filter Press	1	EA	$ 333,000	1.0	$ 333,000	$ 333,000
Belt Filter Press Booster Pumps	1	EA	$ 20,000	1.0	$ 20,000	$ 20,000
Sludge Cake Discharge Pumps	1	EA	$ 41,000	1.0	$ 41,000	$ 41,000
Polymer System						
Polymer Feed System	1	EA	$ 155,000	1.0	$ 155,000	$ 155,000
High Service Pump Station						
High Service Pumps	4	EA	$ 350,000	1.0	$ 350,000	$ 1,400,000
Recycle Pump Station						
Recycle Pumps	2	EA	$ 33,165	1.0	$ 33,165	$ 66,400
					SUBTOTAL	**$ 15,320,100**
DIVISION 13 - SPECIAL CONSTRUCTION						
Alum Storage Tanks @ 20,000 gal	8	EA	$ 40,000	1.5	$ 60,000	$ 480,000
Caustic Storage Tanks @ 15,000 gal	2	EA	$ 50,000	1.0	$ 50,000	$ 100,000
Hypochlorite Storage Tanks @ 20,000 gal	2	EA	$ 40,000	1.5	$ 60,000	$ 120,000
Ammonium Hydroxide Storage Tank @ 7,500 gal	1	EA	$ 45,000	1.0	$ 45,000	$ 45,000
Instrumentation, Control, and SCADA Integration work Allowance (10%)	1	LS	$ 4,150,000	1.0	$ 4,150,000	$ 4,150,000
					SUBTOTAL	**$ 4,895,000**
DIVISION 15 - MECHANICAL						
Small Diameter Process Piping						
Chemical Feed Piping	1	LS	$ 200,000	1.5	$ 300,000	$ 300,000
Desludging System						
6" Sludge Piping	300	LF	$ 300	1.4	$ 420	$ 126,000
6" Plug Valves with Electric Actuators	2	EA	$ 6,500	1.5	$ 9,750	$ 19,500
12" Piping	800	LF	$ 600	1.4	$ 840	$ 672,000
12" Plug Valves with Electric Actuators	4	EA	$ 8,200	1.5	$ 12,300	$ 49,200
Membrane Piping						
12" Air Piping	250	LF	$ 350	1.5	$ 525	$ 131,300
18" Permeate Piping	150	LF	$ 520	1.5	$ 780	$ 117,000
30" Permeate Piping	100	LF	$ 1,435	1.5	$ 2,153	$ 215,300
Misc. Process Piping	1	LS	$ 1,149,008	1.0	$ 1,149,008	$ 1,149,100
					SUBTOTAL	**$ 2,779,400**
DIVISION 16 - ELECTRICAL						
Emergency Generators	2	EA	$ 475,000	1.5	$ 712,500	$ 1,425,000
Electrical Work Allowance (20%)	1	LS	$ 8,299,000	1.0	$ 8,299,000	$ 8,299,000
					SUBTOTAL	**$ 9,724,000**

SUBTOTAL	**$**	**55,368,000**
CONTINGENCY (30%)	$	16,611,000
SUBTOTAL	**$**	**71,979,000**
MOBILIZATION/DEMOBILIZATION (5%)	$	3,599,000
CONTRACT DOCUMENTS/INSURANCE/INDEMNIFICATION (6%)	$	4,319,000
SUBTOTAL	**$**	**79,897,000**
CONTRACTOR'S OH&P (12%)	$	9,588,000
TOTAL ESTIMATED CONSTRUCTION COST	**$**	**89,485,000**
ENGINEER'S SERVICES (15%)	**$**	**13,423,000**
PROJECT TOTAL	**$**	**102,908,000**