**Plant Report** 



**Full-Scale Cost Estimates** 

### Bay Area Regional Desalination Project Alternative No. 1

Capital Costs						\$168,500,000			
1. Sitework									
2. Intake and Raw Water Pump Station									
3. Brine Disposal									
4. MF/UF Facilities									
0. RO Facilities 7. Permeste Tank						\$44,100,000 \$500,000			
8. Clearwells						\$1,900,000			
9. High Service Pumping Station						\$4,400,000			
10. Neutralization Tanks						\$400,000			
11. Chemical Building A						\$1,900,000			
12. Chemical Building B						\$2,300,000			
13. Solids Handling Facilities						\$9,900,000			
14. Pile Foundations						\$3,100,000			
15. Transmission Main						\$7,800,000			
Subtotal						\$0,200,000 \$109,300,000			
Contingencies					20%	\$21,900,000			
Planning, Permitting, Engin	eerina & Admin	istrative Costs			25%	\$32,800,000			
Land Acquisition						\$3,500,000			
Concentrate Discharge Per	mit & Connectio	on Fee				\$1,000,000			
Annual Costs						\$10,450,000			
1. Power Requirements	•	-				\$5,400,000			
a. Raw Water Pumping	6,300,000	kWh/yr	_	\$/kWh	\$630,000				
c. RO High Pressure Pumps	28,100,000	kWh/yr	\$0.10	\$/kWh	\$2,810,000				
d. Finished Water Pumping	19,100,000	kvvh/yr		\$/KVVh	\$1,910,000				
e. Centriluge	79,000	KVVN/yr		\$/KVVN	\$7,900	¢1 400 000			
a Sodium Hypochlorite (12.5% solp)	450.000	gallons/vr	\$1.00	len/2	\$450,000	<del>۵۱,400,000</del>			
b Aqueous Ammonia (19%)	699,500	lbs/vear	\$300.00	\$/liquid ton	\$104 925				
c. Citric Acid (dry)	17,200	lbs/year	\$1.00	\$/lbs	\$17,200				
d. Caustic Soda (30% soln)	33,600	lbs/year	\$700.00	\$/liquid ton	\$11,760				
e. Ferric Chloride (dry)	380,500	lbs/year	\$0.40	\$/lbs	\$152,200				
f. Antiscalant (100% soln)	10,500	gallons/yr	\$10.00	\$/gal	\$105,000				
g. Sodium Bisulfite (38%)	67,000	lbs/year	\$0.58	\$/lbs	\$38,592				
h. Fluorosilicic Acid (24% soln)	197,500	lbs/year	\$760.00	\$/liquid ton	\$75,050				
I. Polymer (dry)	13,700	lbs/year	\$1.50	\$/lbs	\$20,550				
j. Lime k. Carbon Diaxida	1,500	tons/yr	\$170.00	\$/ton	\$200,000 \$80,000				
3. Equipment Replacement Cost	000	10115/91	\$100.00	φ/t0H	\$60,000	\$1 400 000			
a. Feed Water Screens	10	vears	\$138.000	\$/replacement	\$13.800	ψ1, <del>4</del> 00,000			
b. Feed Water Microscreens	10	years	\$26,000	\$/replacement	\$31,200				
c. UF Modules	7	years	\$3,600	\$/replacement	\$617,143				
d. Cartridge Filters	0.25	years	\$30	\$/replacement	\$169,920				
e. RO BW Modules	5	years	\$600	\$/replacement	\$302,400				
f. RO SW Modules	5	years	\$1,050	\$/replacement	\$264,600				
4. Statting Costs		In comt-	140 5	Φ /le n/e e r =	<b>0054 000</b>	\$900,000			
a. Operators	1.5	people	112.5	⊅/nr/person	\$351,000				
p. rechnicians c. Maintenance	1.5	people	07.0 75	φ/ni/person \$/hr/person	⇒∠13,000 \$234.000				
d Administrative	0.5	people	50	\$/hr/person	\$52,000				
5. Outside Services	0.0	pooplo	00	φ/π/ροισσπ	<i><b>QOL</b>,000</i>	\$1.350.000			
a. Hauling costs	9,900	tons (wet)	45	\$/ton	\$445,500	+ - , ,			
b. Landfill costs	9,900	tons (wet)	40	\$/ton	\$396,000				
c. Concentrate disposal costs		LS			\$500,000				
Present Worth of Annual Costs						\$204,900,000			
Annual Worth of Capital Costs						\$8,600,000			
Period	30	years							
Discount Rate	3	%	<b>\$40,450,000</b>		<b>#004000</b>				
Net Present Worth Factor         19.60         \$10,450,000         \$204,900,000           Net Applied Worth Factor         10.0540         \$204,000,000<									
	D.0510	al Costs)	φ100,000,000		Φ0,000,000	\$373 400 000			
TOTAL INCLUTIVALUE (Annual + Capital Costs) \$373,400,00									
Net Present Worth per acre-foot		00010)				\$550			
Unit Cost of Water, based on Annua	Worth (Year 1	), per acre-foot	•			\$840			
Water produced (acre-feet)		,, per dere 1901				680.000			
						,			

# **BAY AREA REGIONAL DESALINATION PLANT** (BARDP)

# PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COSTS

BASED ON CONCEPTUAL DESIGN STUDY FOR ALTERNATIVE NO. 1

owner: **EBMUD, CCWD, SCVWD, SFPUC** 

Prepared for MWH 2121 N.California Blvd., Suite 600 Walnut Creek, CA 94596 (925) 627-4500; FAX (925) 627-4501

Prepared by

M. LEE CORPORATION Construction Management & Consulting Cost Estimating & Scheduling 500 Sutter Street, Suite 923 San Francisco, CA 94102

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CTION COSTS
Page No
3-5
6
7
8-13

# BAY AREA REGIONAL DESALINATION PLANT CONTRA COSTA SITE PRELIMINARY CONSTRUCTION COST OPINION BASED ON CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 1 BASIS OF ESTIMATE

### 1.0 Outline

- 1.1 The preliminary construction cost estimate, which represents our opinion of probable construction cost, is comprised of the following integral parts:
  - a) Preamble
  - b) Estimate Summary
  - c) Estimate Details

Please see "Table of Contents" for further details.

### 1.2 The preparation of this estimate is based on the following:

- a) Draft Alternative 1 Design Criteria dated 9-17-2009 by MWH
- b) Revised Conceptual Site Plan prepared by MWH received on 10-13-2009
- c) Various supplemental preliminary information via emails from MWH's project manager/designer
- d) Clarifications with designers.

Based on a total site area of 8.2 acres, 300 ft long 54" in-take pipe and 3 miles long 30" dia transmission pipeline off site.

Note: The following buildings are no longer part of the program for the scope of this estimate: Operations Building, Maintenance Building and Microscreen Building.

### 2.0 Assumptions & Qualifications

- 2.1 The estimate specifically excludes the following items:
  - a) Land acquisition or ROW costs
  - b) Hazmat abatement, if any
  - c) Legal fees and finance costs
  - d) Permit & plan check fees
  - e) Utility connection fees
  - f) Owner's administration costs
  - g) Design services
  - h) Survey services, materials lab
  - i) Project/Construction management
  - j) Change orders during construction
  - k) Cost escalation beyond the date of this estimate.
  - 1) Design & Estimate Contingency (to be carried separately)
  - m) Construction Contingency

# Prepared for MWH Prepared by M Lee Corp

# BAY AREA REGIONAL DESALINATION PLANT CONTRA COSTA SITE PRELIMINARY CONSTRUCTION COST OPINION BASED ON CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 1 BASIS OF ESTIMATE

It is assumed that the above items, if needed, are included elsewhere in the owner's overall project budget.

2.2 The estimate is based on the following assumptions:

All work will be done during regular working hours. Assumed no overtime work is required.

Unit costs are based on prevailing rates.

The estimate is based on estimated prices, current as of September 2009, with a minimum of four responsible and responsive bids under a competitive bidding environment for a fixed price lump sum contract.

Note: Experience indicates that fewer than four bidders may result in higher bids, and conversely more than four bidders may result in more competitive bids. Therefore it is important to obtain as many bids as possible.

Allowances have been used for items which are required but are currently undefined.

Assume all buildings and tanks are on pile foundations based on experience with subsurface conditions in this region.

The unit prices used in the direct cost estimate section are composite unit prices which include : costs for material, sales tax, labor, equipment and subcontractor's/supplier's mark-ups.

Cost Escalation

No cost escalation factor is included in the estimate. For the next two years, we recommend that an 4% escalation per year to mid-point of construction be included as a separate line item in the total project cost.

2.3The following is a list of some items that may affect the cost estimate:

- a) Modifications to the scope of work or assumptions included in this estimate
- b) Unforeseen sub-surface conditions such rock and hazardous material
- c) Special phasing requirements
- d) Restrictive technical specifications or excessive contract conditions
- e) Any specified item of equipment, material, or product that cannot be obtained from at least three different sources
- f) Any other non-competitive bid situations

# BAY AREA REGIONAL DESALINATION PLANT CONTRA COSTA SITE PRELIMINARY CONSTRUCTION COST OPINION BASED ON CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 1 BASIS OF ESTIMATE

- 2.4 The estimate has been prepared using generally accepted practices and it represents our opinion of probable construction costs. It is intended to be a determination of fair market value for the project construction. It is not a prediction of low bid. Since we have no control over market conditions (such as surges in steel and cement prices) and other factors which may affect the bid prices, we cannot and do not warrant nor guarantee that bids or ultimate construction costs will not vary from the cost estimate.
- 2.5 Please note that the estimate has been prepared based on preliminary information and design assumptions which are subject to verifications and changes as the design progresses. An updated estimate should be prepared when more specific and detailed design information is available.
- 3.0 Abbreviations used in the estimate:
  - cy = cubic yard ea = each gsf = gross square foot hr = hour lb = pound lf = linear foot loc=location ls = lump sum sf = square foot
- 4.0 This is a Class 5 Conceptual Design Level Estimate according to AACE International Cost Estimate Classification.

# CONTRA COSTA SITE PRELIMINARY CONSTRUCTION COST OPINION BASED ON CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 1 BASIS OF ESTIMATE GRAND SUMMARY OF CONSTRUCTION

### ALL IN 2009 DOLLARS

Code	Item	Total Construction (Hardcost) Estimate \$
1	Sitework	4,200,000
2	Intake and Raw Water Pump Station	3,100,000
3	Brine Disposal	1,100,000
4	MF/UF Facilities	18,300,000
5	Filtrate Tanks	1,100,000
6	RO Facilities	44,100,000
7	Permeate Tank	500,000
8	Clearwells	1,900,000
9	High Service Pumping Station	4,400,000
10	Neutralization Tanks	400,000
11	Chemical Building A	1,900,000
12	Chemical Building B	2,300,000
13	Solids Handling Facilities	9,900,000
14	Pile Foundation	3,100,000
15	30" Transmission Mains	7,800,000
16	Site Electrical Systems	5,200,000

# TOTAL

109,300,000

Please read the attached "Preamble" and 'Estimate Details" for assumptions, exclusions, qualifications and scope of work

## CONTRA COSTA SITE PRELIMINARY CONSTRUCTION COST OPINION BASED ON CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 1 BASIS OF ESTIMATE ESTIMATE SUMMARY

				ALL IN 2009 DOLLARS			
		(Gen	Bonds &	G.C.'s			
	Direct Cost Estimate	Condition)	Insurance	OH&P	<b>Total Construction (Hardcost)</b>		
Code	per Attached Detail	5%	2%	5%	Estimate		
		A*10%	(A+B)*2%	(A+B+C)*	Total A to D		
				5%		Rounded-off	
	Α	В	С	D	F		
1 Sitework	3,730,348	186,517	78,337	199,760	4,194,962	4,200,000	
2 Intake and Raw Water Pump Stat	ior 2,760,782	138,039	57,976	147,840	3,104,637	3,100,000	
3 Brine Disposal	1,000,000	50,000	21,000	53,550	1,124,550	1,100,000	
4 MF/UF Facilities	16,282,000	814,100	341,922	871,901	18,309,923	18,300,000	
5 Filtrate Tanks	960,000	48,000	20,160	51,408	1,079,568	1,100,000	
6 RO Facilities	39,250,110	1,962,506	824,252	2,101,843	44,138,711	44,100,000	
7 Permeate Tank	450,000	22,500	9,450	24,098	506,048	500,000	
8 Clearwells	1,690,000	84,500	35,490	90,500	1,900,490	1,900,000	
9 High Service Pumping Station	3,945,000	197,250	82,845	211,255	4,436,350	4,400,000	
10 Neutralization Tanks	320,000	16,000	6,720	17,136	359,856	400,000	
11 Chemical Building A	1,712,000	85,600	35,952	91,678	1,925,230	1,900,000	
12 Chemical Building B	2,064,000	103,200	43,344	110,527	2,321,071	2,300,000	
13 Solids Handling Facilities	8,833,000	441,650	185,493	473,007	9,933,150	9,900,000	
14 Pile Foundation	2,729,000	136,450	57,309	146,138	3,068,897	3,100,000	
15 30" Transmission Mains	6,969,600	348,480	146,362	373,222	7,837,664	7,800,000	
16 Site Electrical Systems	4,643,565	232,178	97,515	248,663	5,221,921	5,200,000	
TOTAL	97,339,405	4,866,970	2,044,127	5,212,526	109,463,028	\$109,300,000	

Please read the attached "Preamble" and 'Estimate Details" for assumptions, exclusions, qualifications and scope of work.

		Item	<b>Description of Work</b>	Quantity	Unit	Unit Cost \$	Direct Cost	
Line #	Code					lotal	1 otal \$	Remarks/Assumptions
1		A - SITEW	ORK	7.0	Acre			assume site is 750'x405' = 330,750 SF = 7.0 acres
2	1	Site cle	arance/misc. demo	304,920	SF	0.20	60,984	
3	1	Rough	grading/fine grading	304,920	SF	0.25	76,230	
4	1	Buildin	g pad formation	84,975	SF	1.50	127,463	
5	1	Tank p	ad formation	59,912	SF	1.50	89,868	
6	1	Circula	tion paved roadway	65,893	SF	5.50	362,412	4" AC on 8" AB on 6" subbase
7	1	Other p	paved area/gravel area	146,220	SF	3.00	438,660	
8	1	Site fer	ncing	2,540	LF	20.00	50,800	
9	1	Entry c	ontrol	1	LS	100,000.00	100,000	
10	1	Site sec	curity allowance	1	LS	250,000.00	250,000	
11	1	Landsc	aping allowance	1	LS	150,000.00	150,000	
12	1	Site par	rking allowance	1	LS	100,000.00	100,000	
13								
14		Site uti	lities allowances:					
15	1	Stor	n drainage	212,113	SF	1.60	339,381	area outside buildings & tanks
16	1	Sani	tary sewer	1	LS	200,000.00	200,000	
17	1	Site Ele	ectrical					
18	16	Subs	tation	1	LS	800,000.00	800,000	
19	16	Elect	trical/telecom	1	LS	3,475,000.00	3,475,000	
20	16	Site	lighting	212,113	SF	1.25	265,141	
21	16	Cond	crete pad for substation	6,912	SF	12.00	82,944	
22	16	Fenc	ing/enclosure for substation	256	LF	80.00	20,480	
23	1	Pad for	CO2	2,400	SF	18.00	43,200	
24								
25								
26		Total b	efore Mobilization, Bonds, Insurance, Ol	H&P, Contingencie	8		7,032,563	
27								
28								
29		B1 - BUILD	INGS (EXCLUDING PILES)					CMU bldgs
30		Costs f	or foundation, structure, architecture,					
		buildin	g M&E only.					All building to be on pile
31		Piles fo	or Buildings and equipment inside building	igs				
		with a s	separate section.					

		Item	Description of Work	Quantity	Unit	Unit Cost \$	<b>Direct</b> Cost	
Line #	Code					Total	Total \$	Remarks/Assumptions
32								
33	2	Raw V	Vater Pump Station	4,500	GSF	200.00	900,000	
34	13	Solids	Building	2,400	GSF	200.00	480,000	
35		Micros	screen Building		None			
36		Mainte	enance Shop		None			
37	13	not use	ed		GSF	200.00		
38	4	MF/U	F Building	12,000	GSF	180.00	2,160,000	
39	11	Chemi	cal Building A	4,900	GSF	200.00	980,000	
40	12	Chemi	cal Building B	4,800	GSF	200.00	960,000	
41	6	RO Bı	iilding	30,625	GSF	180.00	5,512,500	
42		Operat	ion Building, 2-story		None			
43	9	High S	Service Pump Station	9,000	GSF	200.00	1,800,000	
44								
45								
46		Total l	before Mobilization, Bonds, Insurance, C	H&P, Contingencie	s		12,792,500	
47								
48								
29		B2 - BUILI	DINGS - PILES ONLY				(	CMU bldgs
32								
33	14	Raw V	Vater Pump Station	4,500	GSF	40.00	180,000	
34	14	Solids	Building	2,400	GSF	40.00	96,000	
35	14	Micros	screen Building		None			
36		None		None	None			
37	14	not use	ed		GSF	40.00		
38	14	MF/U	F Building	12,000	GSF	40.00	480,000	
39	14	Chemi	cal Building A	4,900	GSF	40.00	196,000	
40	14	Chemi	cal Building B	4,800	GSF	40.00	192,000	
41	14	RO Bı	uilding	30,625	GSF	40.00	1,225,000	
42		Operat	ion Building, 2-story		None			
43	14	High S	Service Pump Station	9,000	GSF	40.00	360,000	
44								
45								
46		Total b	before Mobilization, Bonds, Insurance, C	H&P, Contingencie	s		2,729,000	
47								

Line#	Code	Item	<b>Description of Work</b>	Quantity	Unit	Unit Cost \$ Total	Direct Cost Total \$	Remarks/Assumptions
48								L
49		C: TANKS						All tanks to be on piles
50	13	Thicke	ner, 80' dia, RC construction	2	EA	2,000,000.00	4,000,000	1
51	10	Neutra	lization tank	2	EA	160,000.00	320,000	
52	5	Filtrati	on Tank	2	EA	480,000.00	960,000	
53	8	Clearw	ell	1	EA	1,440,000.00	1,440,000	
54	7	Permea	te Tank	1	EA	450,000.00	450,000	
55	8	Concre	te vaults	1	EA	250,000.00	250,000	
56	12	CO2 pl	ant/storage	1	EA	400,000.00	400,000	
57								
58								
59		Total b	efore Mobilization, Bonds, Insurance, O	H&P, Contingencies	8		7,820,000	
60								
61								
62		D-EQUIPM	IENT					Unit cost include 10% for electrical & instrumentation
63								
64		Materia	al cost, FOB jobsite					Includes 9.25% sales tax
65	4	UF N	Membrane System	1	EA	8,805,600.00	8,805,600	per Layne Christensen Company
66	6	RO	equipment	1	EA	24,300,000.00	24,300,000	per Biwater AEWT
67	2	Wed	ge wire screen intake	1	EA	100,292.00	100,292	per Johnson Screens
68	4	Misc	croscreen equipment	4	EA	305,900.00	1,223,600	per Amiad Filtration System
69	6	Cart	ridge filters	10	EA	29,716.00	297,160	per Parker Process Advanced Filtration
70		Sales ta	ax @ 9.25%	W	ith abov	ve		
71		Installa	tion cost for the above equipment		-	<b>a</b> < 40,000,00	<b>2</b> < 10 000	
72	4	UF	Membrane System	1	EA	2,640,000.00	2,640,000	
73	6	RO	equipment	1	EA	7,290,000.00	7,290,000	
74	2	Wed	ge wire screen intake	1	EA	50,490.00	50,490	
75	4	Misc	croscreen equipment	4	EA	123,200.00	492,800	
76 77	6	Cart	ridge filters	26	EA	10,450.00	271,700	
78		Other s	ystem					
79		Solid h	andling system					
80	13	Thic	kening	2	EA	990,000.00	1,980,000	
81	13	Slud	ge pump system	2	EA	550,000.00	1,100,000	

		Item	Description of Work	Quantity	Unit	Unit Cost \$	Direct Cost	
Line #	Code		-			Total	Total \$	Remarks/Assumptions
82	13	Cent	rifuge dewatering system	2	EA	485,000.00	970,000	per Andritz
83		Chemic	cal system					
84	11	Sodi	um bisulfite	1	LS	85,000.00	85,000	
85	11	Ferri	Ferric Chloride system		LS	85,000.00	85,000	
86	11	Antis	scalant system	1	LS	85,000.00	85,000	
87	11	Poly	mer	1	LS	85,000.00	85,000	
88	12	Aqua	a Ammonia	1	LS	85,000.00	85,000	
89	12	Sodi	um Hypochlorite	1	LS	85,000.00	85,000	
90	12	Fluo	rosilicic Acid	1	LS	85,000.00	85,000	
91	12	Lime	5	1	LS	55,000.00	55,000	
92	12	Carb	oon Dioxide	1	LS	10,000.00	10,000	
93								
94		Pumps						
95	2	Raw	water pumps	3	EA	330,000.00	990,000	
96	6	Boos	ster pump	3	EA	220,000.00	660,000	located in RO Bldg
97	9	Finis	sh water pump	3	EA	165,000.00	495,000	
98	13	Slud	ge pump	3	EA	55,000.00	165,000	
99	2	VFD	o for raw water pumps	3	EA	165,000.00	495,000	
100	13	VFD	o for sludge pump	3	EA	6,000.00	18,000	
101	9	VFD	o for high service pump	3	EA	250,000.00	750,000	
102								
103		Electric	cal & instrumentation for equipment	Inc	luded abo	ve		
104								
105								
106		Total b	efore Mobilization, Bonds, Insurance, OH&P	, Contingencie	s		53,754,642	
107								
108								
109		E-INSIDE F	BUILDING PIPING					
110		Piping,	fitting & valves for equipment inside building	gs (not building	g mechani	ical or plumbing		
111	2	Raw W	Vater Pump Station	4,500	GSF	50.00	225,000	
112	13	Solids 1	Building	2,400	GSF	50.00	120,000	
113		Micros	creen Building		None			
114		Mainte	nance Shop		None			
115	13	not use	d		GSF	60.00		

		Item	Description of Work	Quantity	Unit	Unit Cost \$	Direct Cost	
Line #	Code		-			Total	Total \$	Remarks/Assumptions
116	4	MF/UI	FBuilding	12,000	GSF	80.00	960,000	
117	11	Chemi	cal Building A	4,900	GSF	80.00	392,000	
118	12	Chemi	cal Building B	4,800	GSF	80.00	384,000	
119	6	RO Bu	ilding	30,625	GSF	30.00	918,750	
120		Operat	ion Building, 2-story	1	None			
121	9	High S	ervice Pump Station	9,000	GSF	100.00	900,000	
122								
123								
124		Total b	efore Mobilization, Bonds, Insurance, OH&	3,899,750				
125								
126								
127		F-YARD P	PING					
128		Piping	, fitting & valves for equipment at Yard					Welded steel, motored lined & coated
129	1	12"		570	LF	290.00	165,300	
130	1	36"		920	LF	560.00	515,200	
131	1	42"		310	LF	660.00	204,600	
132	1	54"		260	LF	1,410.00	366,600	
133								
134		Add tr	enching					
135	1	12"		570	LF	17.00	9,690	
136	1	36"		920	LF	46.00	42,320	
137	1	42"		310	LF	56.00	17,360	
138	1	54"		260	LF	78.00	20,280	
139								
140								
141		Total b	efore Mobilization, Bonds, Insurance, OH&	&P, Contingencies	8		1,341,350	
142				-				
143								
144		G: Off-Site	Transmission Pipeline (3 miles)					Extend 3 miles $= 15840 \text{ LF}$
145		Piping	fitting & valves for equipment at Yard					
146	15	30" pij	De la	15,840	LF	350.00	5,544,000	
147	15	Trench	ing	15,840	LF	40.00	633,600	
148	15	Restor	e disturbed paving/Crossing/Misc	15,840	LF	50.00	792,000	
149								

		Item Description of Work	Quantity	Unit	Unit Cost \$	Direct Cost	
Line #	Code				Total	Total \$	Remarks/Assumptions
150							
151		Total before Mobilization, Bonds, Insura	nce, OH&P, Contingencies			6,969,600	
152							
153							
154	3	Brine Disposal	1	LS	1,000,000.00	1,000,000	

### Alternative No. 1 Power Calculations

### Non-RO Power Costs

Annual	365							
Raw Water Pumps			Finished Water Pumps			Centrifuge <sup>1</sup>		
Efficiency	Pressure	Flow	Power	Pressure	Flow	Power	motor	Power
%	psi	gpm	kWh/yr	psi	MG/yr	kWh/yr	HP	kWh/yr
68%	57	19,646	6,300,000	240	7,421	19,100,000	100	79,000

<sup>1</sup>Centrifuge runs 4 hrs per day, 22 days per month, 12 months per year

### **RO Power Costs**

January	31								
RO Feed Pumps									
	High								
Specific	RO Feed	Pressure	Permeate						
Energy <sup>1</sup>	Flow	Pump	Flow						
		Power							
kWh/kgal	gpm	kWh/mo	MG /mo						
3.54	17,288	2,800,000	617						

February	28		
	RO Fee	ed Pumps	
		High	
Specific	RO Feed	Pressure	Permeate
Energy <sup>1</sup>	Flow	Pump	Flow
		Power	
kWh/kgal	gpm	kWh/mo	MG /mo
3.024	17,288	2,200,000	572

March	31		
	RO Fee	ed Pumps	
		High	
Specific	RO Feed	Pressure	Permeate
Energy <sup>1</sup>	Flow	Pump	Flow
		Power	
kWh/kgal	gpm	kWh/mo	MG /mo
2.5872	17.288	2.000.000	633

_	April	30		
		RO Fee	ed Pumps	
			High	
	Specific	RO Feed	Pressure	Permeate
	Energy <sup>1</sup>	Flow	Pump	Flow
			Power	
	kWh/kgal	gpm	kWh/mo	MG /mo
	2.5284	17,288	1,900,000	612

May	31		
	RO Fee	ed Pumps	
		High	
Specific	RO Feed	Pressure	Permeate
Energy <sup>1</sup>	Flow	Pump	Flow
		Power	
kWh/kgal	gpm	kWh/mo	MG /mo
2.34	17,288	1,900,000	641

June	30		
	RO Fee	ed Pumps	
		High	
Specific	RO Feed	Pressure	Permeate
Energy <sup>1</sup>	Flow	Pump	Flow
		Power	
kWh/kgal	gpm	kWh/mo	MG /mo
2.44	17,288	1,900,000	620

July	31		
	RO Fee	ed Pumps	
		High	
Specific	RO Feed	Pressure	Permeate
Energy <sup>1</sup>	Flow	Pump	Flow
		Power	
kWh/kgal	gpm	kWh/mo	MG /mo
2.478	17,288	2,000,000	641

August	31

	RO Fee	ed Pumps	
		High	
Specific	RO Feed	Pressure	Permeate
Energy <sup>1</sup>	Flow	Pump	Flow
		Power	
kWh/kgal	gpm	kWh/mo	MG /mo
3.024	17,288	2,400,000	625

### **Convertion factors**

2.31 head (ft) / psi 3956 gpm\*ft / hp 0.7457 kW / hp

### 0.84 energy factor for future recovery system

September	30		
	RO Fee	ed Pumps	
		High	
Specific	RO Feed	Pressure	Permeate
Energy <sup>1</sup>	Flow	Pump	Flow
		Power	
kWh/kgal	gpm	kWh/mo	MG /mo
3.276	17,288	2,500,000	605

October	31		
	RO Fee	ed Pumps	
		High	
Specific	RO Feed	Pressure	Permeate
Energy <sup>1</sup>	Flow	Pump	Flow
		Power	
kWh/kgal	gpm	kWh/mo	MG /mo
3.2592	17,288	2,600,000	633

November	30		
	RO Fee	ed Pumps	
		High	
Specific	RO Feed	Pressure	Permeate
Energy <sup>1</sup>	Flow	Pump	Flow
		Power	
kWh/kgal	gpm	kWh/mo	MG /mo
3.696	17,288	2,800,000	605

### December 31

RO Feed Pumps				
		High		
Specific	RO Feed	Pressure	Permeate	
Energy <sup>1</sup>	Flow	Pump	Flow	
		Power		
kWh/kgal	gpm	kWh/mo	MG /mo	
3.9144	17,288	3,100,000	617	

28,100,000 kWh/year 7,421 MG/year (permeate) 20.330171 MG/day (permeate)

### Bay Area Regional Desalination Project Alternative No. 2

Capital Costs \$181,000,000									
1. Sitework						\$4,200,000			
<ol><li>Intake and Raw Water Pump Station</li></ol>						\$3,100,000			
3. Brine Disposal									
4. WF/UF Facilities									
5. Filtrate Tanks									
6. RO Facilities									
7. Permeate Tank						\$500,000			
8. Clearwells						\$1,800,000			
9. High Service Pumping Station						\$4,400,000			
10. Neutralization Tanks						\$400,000			
12. Chemical Building R						\$1,900,000			
12. Chemical Building B						\$2,300,000			
14 Pile Foundations						\$3,300,000			
15 Transmission Main						\$7,800,000			
16. Site Electrical Systems						\$5,600,000			
Subtotal						\$117,700,000			
Contingencies					20%	\$23,500,000			
Planning, Permitting, Engine	eering & Adminis	strative Costs			25%	\$35,300,000			
Land Acquisition						\$3,500,000			
Concentrate Discharge Perr	mit & Connectior	n Fee				\$1,000,000			
Annual Costs						\$13,150,000			
1. Power Requirements	-	-				\$7,900,000			
a. Raw Water Pumps	6,300,000	kWh/yr	4	\$/kWh	\$630,000				
b. RO High Pressure Pumps	53,400,000	kWh/yr	\$0.10	\$/kWh	\$5,340,000				
c. Finished Water Pumps	18,500,000	kWh/yr		\$/kWh	\$1,850,000				
d. Centrifuge	79,000	kWh/yr		\$/kWh	\$7,900	<b>*</b> 4 000 000			
	404.000	/	<b>0</b> 4.00	¢/ 1	<b>#</b> 40.4.000	\$1,300,000			
a. Sodium Hypochiorite (12.5% soin)	424,000	gallons/yr	\$1.00	\$/gai \$/liauid tan	\$424,000				
b. Aqueous Ammonia (19%)	720,000	lbs/year	\$300.00	\$/liquid ton	\$108,000				
d. Caustic Soda (20% solp)	23,600	lbs/year	\$1.00	\$/IDS \$/liquid top	\$23,600 \$11,760				
e Ferric Chloride (dry)	420,000	lbs/year	\$0.40	\$/liquid ton \$/lbs	\$168,000				
f. Antiscalant (100% soln)	10.000	gallons/yr	\$10.00	\$/gal	\$100,000				
g. Sodium Bisulfite (38%)	67.000	lbs/vear	\$0.58	\$/lbs	\$38.592				
h. Fluorosilicic Acid (24% soln)	189,300	lbs/year	\$760.00	\$/liquid ton	\$71,934				
i. Polymer (dry)	13,700	lbs/year	\$1.50	\$/lbs	\$20,550				
j. Lime	1,400	tons/yr	\$170.00	\$/ton	\$238,000				
k. Carbon Dioxide	800	tons/yr	\$100.00	\$/ton	\$80,000				
3. Equipment Replacement Cost						\$1,700,000			
a. Feed Water Screens	10	years	\$138,000	\$/replacement	\$13,800				
b. Feed Water Microscreens	10	years	\$26,303	\$/replacement	\$31,563				
c. UF Modules	7	years	\$3,600	\$/replacement	\$617,143				
d. Cartridge Filters	0.25	years	\$27	\$/replacement	\$272,160				
e. NF Modules	5	years	\$600	\$/replacement	\$288,120				
t. SW Modules	5	years	\$1,050	\$/replacement	\$432,180	<b>*</b> 000.000			
4. Staning Costs	4 6	Inconio	110 5	¢/br/porcop	¢251.000	\$900,000			
a. Operators	1.0	people	97.5	¢/ni/person	\$351,000 \$272,000				
	1.5	people	07.3 75	\$/III/person	\$273,000				
d Administrative	0.5	people	50	\$/hi/person	\$52,000				
5. Outside Services	0.0	people	50	ψ/11/person	ψ52,000	\$1 350 000			
a Hauling costs	9 900	tons (wet)	45	\$/ton	\$445,500	<i>\</i> ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
b. Landfill costs	9,900	tons (wet)	40	\$/ton	\$396.000				
c. Concentrate disposal costs	-,	LS		<b>•</b> , ••••	\$500,000				
Present Worth of Annual Costs									
Annual Worth of Capital Costs						\$9,300,000			
Period	30	years							
Discount Rate 3 %									
Net Present Worth Factor 19.60 \$13,150,000 \$257,800,000									
Net Annual Worth Factor	0.0510		\$181,000,000		\$9,300,000				
TOTAL PRESENT WORTH VALUE (Annual + Capital Costs)									
TOTAL ANNUAL WORTH VALUE (Annual + Capital Costs) \$22,450,000									
Net Present Worth, per acre-foot \$660									
Unit Cost of Water, based on Annual	Worth (Year 1)	, per acre-foot				\$1,010			
Water produced (acre-feet)						664,000			

# **BAY AREA REGIONAL DESALINATION PLANT** (BARDP)

# PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COSTS

BASED ON CONCEPTUAL DESIGN STUDY FOR ALTERNATIVE NO. 2

owner: **EBMUD, CCWD, SCVWD, SFPUC** 

Prepared for MWH 2121 N.California Blvd., Suite 600 Walnut Creek, CA 94596 (925) 627-4500; FAX (925) 627-4501

Prepared by

M. LEE CORPORATION Construction Management & Consulting Cost Estimating & Scheduling 500 Sutter Street, Suite 923 San Francisco, CA 94102

(415) 693-0236; FAX (415) 693-0237

PRELIMINARY OPINION OF PROBABLE CONSTR	UCTION COSTS
BASED ON CONCEPTUAL DESIGN STUDY FOR ALTERNATIVE NO. 2	
Table of Contents	Page No
Basis of Estimate	3-5
Grand Summary by Components/Buildings	6
Estimate Summary by Components/Buildings	7
Estimate Details by Disciplines	8-13

# BAY AREA REGIONAL DESALINATION PLANT CONTRA COSTA SITE PRELIMINARY CONSTRUCTION COST OPINION BASED ON CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 2 BASIS OF ESTIMATE

### 1.0 Outline

- 1.1 The preliminary construction cost estimate, which represents our opinion of probable construction cost, is comprised of the following integral parts:
  - a) Preamble
  - b) Estimate Summary
  - c) Estimate Details

Please see "Table of Contents" for further details.

### 1.2 The preparation of this estimate is based on the following:

- a) Draft Alternative 1 Design Criteria dated 9-17-2009 by MWH
- b) Revised Conceptual Site Plan prepared by MWH received on 10-13-2009
- c) Various supplemental preliminary information via emails from MWH's project manager/designer
- d) Clarifications with designers.

Based on a total site area of 8.2 acres, 300 ft long 54" in-take pipe and 3 miles long 30" dia transmission pipeline off site.

Note: The following buildings are no longer part of the program for the scope of this estimate: Operations Building, Maintenance Building and Microscreen Building.

### 2.0 Assumptions & Qualifications

- 2.1 The estimate specifically excludes the following items:
  - a) Land acquisition or ROW costs
  - b) Hazmat abatement, if any
  - c) Legal fees and finance costs
  - d) Permit & plan check fees
  - e) Utility connection fees
  - f) Owner's administration costs
  - g) Design services
  - h) Survey services, materials lab
  - i) Project/Construction management
  - j) Change orders during construction
  - k) Cost escalation beyond the date of this estimate.
  - 1) Design & Estimate Contingency (to be carried separately)
  - m) Construction Contingency

# Prepared for MWH Prepared by M Lee Corp

# BAY AREA REGIONAL DESALINATION PLANT CONTRA COSTA SITE PRELIMINARY CONSTRUCTION COST OPINION BASED ON CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 2 BASIS OF ESTIMATE

It is assumed that the above items, if needed, are included elsewhere in the owner's overall project budget.

2.2 The estimate is based on the following assumptions:

All work will be done during regular working hours. Assumed no overtime work is required.

Unit costs are based on prevailing rates.

The estimate is based on estimated prices, current as of September 2009, with a minimum of four responsible and responsive bids under a competitive bidding environment for a fixed price lump sum contract.

Note: Experience indicates that fewer than four bidders may result in higher bids, and conversely more than four bidders may result in more competitive bids. Therefore it is important to obtain as many bids as possible.

Allowances have been used for items which are required but are currently undefined.

Assume all buildings and tanks are on pile foundations based on experience with subsurface conditions in this region.

The unit prices used in the direct cost estimate section are composite unit prices which include : costs for material, sales tax, labor, equipment and subcontractor's/supplier's mark-ups.

Cost Escalation

No cost escalation factor is included in the estimate. For the next two years, we recommend that an 4% escalation per year to mid-point of construction be included as a separate line item in the total project cost.

2.3The following is a list of some items that may affect the cost estimate:

- a) Modifications to the scope of work or assumptions included in this estimate
- b) Unforeseen sub-surface conditions such rock and hazardous material
- c) Special phasing requirements
- d) Restrictive technical specifications or excessive contract conditions
- e) Any specified item of equipment, material, or product that cannot be obtained from at least three different sources
- f) Any other non-competitive bid situations

# BAY AREA REGIONAL DESALINATION PLANT CONTRA COSTA SITE PRELIMINARY CONSTRUCTION COST OPINION BASED ON CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 2 BASIS OF ESTIMATE

- 2.4 The estimate has been prepared using generally accepted practices and it represents our opinion of probable construction costs. It is intended to be a determination of fair market value for the project construction. It is not a prediction of low bid. Since we have no control over market conditions (such as surges in steel and cement prices) and other factors which may affect the bid prices, we cannot and do not warrant nor guarantee that bids or ultimate construction costs will not vary from the cost estimate.
- 2.5 Please note that the estimate has been prepared based on preliminary information and design assumptions which are subject to verifications and changes as the design progresses. An updated estimate should be prepared when more specific and detailed design information is available.
- 3.0 Abbreviations used in the estimate:
  - cy = cubic yard ea = each gsf = gross square foot hr = hour lb = pound lf = linear foot loc=location ls = lump sum sf = square foot
- 4.0 This is a Class 5 Conceptual Design Level Estimate according to AACE International Cost Estimate Classification.

# CONTRA COSTA SITE PRELIMINARY CONSTRUCTION COST OPINION BASED ON CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 2 BASIS OF ESTIMATE GRAND SUMMARY OF CONSTRUCTION

### ALL IN 2009 DOLLARS

		Total Construction
Code Ite	em	(Hardcost) Estimate
		\$
1 Si	tework	4,200,000
2 Int	take and Raw Water Pump Station	3,100,000
3 Br	ine Disposal	1,100,000
4 MI	F/UF Facilities	18,300,000
5 Fil	trate Tanks	1,100,000
6 RC	D Facilities	51,300,000
7 Pe	ermeate Tank	500,000
8 CI	earwells	1,800,000
9 Hi	gh Service Pumping Station	4,400,000
10 Ne	eutralization Tanks	400,000
11 <b>C</b> ł	nemical Building A	1,900,000
12 Cł	nemical Building B	2,300,000
13 Sc	olids Handling Facilities	10,600,000
14 Pi	le Foundation	3,300,000
15 30	" Transmission Mains	7,800,000
16 Si	te Electrical Systems	5,600,000

# TOTAL

117,700,000

Please read the attached "Preamble" and 'Estimate Details" for assumptions, exclusions, qualifications and scope of work

## CONTRA COSTA SITE PRELIMINARY CONSTRUCTION COST OPINION BASED ON CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 2 BASIS OF ESTIMATE ESTIMATE SUMMARY

				ALL IN 2009 DOLLARS				
		(Gen	Bonds &	G.C.'s				
	Direct Cost Estimate	Condition)	Insurance	OH&P	<b>Total Constructi</b>	on (Hardcost)		
Code	per Attached Detail	5%	2%	5%	Estimate			
		A*10%	(A+B)*2%	(A+B+C)*	Total A to D			
				5%		Rounded-off		
	Α	В	С	D	F			
1 Sitework	3,695,085	184,754	77,597	197,872	4,155,308	4,200,000		
2 Intake and Raw Water Pump Stat	tior 2,760,782	138,039	57,976	147,840	3,104,637	3,100,000		
3 Brine Disposal	1,000,000	50,000	21,000	53,550	1,124,550	1,100,000		
4 MF/UF Facilities	16,282,000	814,100	341,922	871,901	18,309,923	18,300,000		
5 Filtrate Tanks	960,000	48,000	20,160	51,408	1,079,568	1,100,000		
6 RO Facilities	45,627,610	2,281,381	958,180	2,443,359	51,310,530	51,300,000		
7 Permeate Tank	450,000	22,500	9,450	24,098	506,048	500,000		
8 Clearwells	1,600,000	80,000	33,600	85,680	1,799,280	1,800,000		
9 High Service Pumping Station	3,945,000	197,250	82,845	211,255	4,436,350	4,400,000		
10 Neutralization Tanks	320,000	16,000	6,720	17,136	359,856	400,000		
11 Chemical Building A	1,712,000	85,600	35,952	91,678	1,925,230	1,900,000		
12 Chemical Building B	2,064,000	103,200	43,344	110,527	2,321,071	2,300,000		
13 Solids Handling Facilities	9,457,000	472,850	198,597	506,422	10,634,869	10,600,000		
14 Pile Foundation	2,975,000	148,750	62,475	159,311	3,345,536	3,300,000		
15 30" Transmission Mains	6,969,600	348,480	146,362	373,222	7,837,664	7,800,000		
16 Site Electrical Systems	4,965,347	248,267	104,272	265,894	5,583,780	5,600,000		
TOTAL	104,783,424	5,239,171	2,200,452	5,611,153	117,834,200	\$117,700,000		

Please read the attached "Preamble" and 'Estimate Details" for assumptions, exclusions, qualifications and scope of work.

Line #	Code	Item	Description of Work	Quantity	Unit	Unit Cost \$ Total	Direct Cost Total \$	Remarks/Assumptions
1		A - SITEW	). PK	7.0	Acre			assume site is 750'x405' - 357 000 SE - 7.0 acres
2	1	Site cle	earance/misc. demo	304.920	SF	0.20	60.984	$\frac{1}{10000000000000000000000000000000000$
3	1	Rough	grading/fine grading	304,920	SF	0.25	76.230	
4	1	Buildir	g pad formation	96,350	SF	1.50	144,525	
5	1	Tank p	ad formation	59,912	SF	1.50	89,868	
6	1	Circula	tion paved roadway	65,893	SF	5.50	362,412	4" AC on 8" AB on 6" subbase
7	1	Other 1	baved area/gravel area	134,845	SF	3.00	404,535	
8	1	Site fer	ncing	2,540	LF	20.00	50,800	
9	1	Entry c	ontrol	1	LS	100,000.00	100,000	
10	1	Site se	curity allowance	1	LS	250,000.00	250,000	
11	1	Landsc	aping allowance	1	LS	150,000.00	150,000	
12	1	Site pa	rking allowance	1	LS	100,000.00	100,000	
13								
14		Site uti	lities allowances:					
15	1	Stor	m drainage	200,738	SF	1.60	321,181 a	area outside buildings & tanks
16	1	Sani	tary sewer	1	LS	200,000.00	200,000	
17	1	Site El	ectrical					
18	16	Subs	tation	1	LS	800,000.00	800,000	
19	16	Elec	trical/telecom	1	LS	3,811,000.00	3,811,000	
20	16	Site	lighting	200,738	SF	1.25	250,923	
21	16	Con	crete pad for substation	6,912	SF	12.00	82,944	
22	16	Fenc	ing/enclosure for substation	256	LF	80.00	20,480	
23	1	Pad for	CO2	2,400	SF	18.00	43,200	
24								
25								
26		Total b	efore Mobilization, Bonds, Insurance, Ol	H&P, Contingencies			7,319,082	
27								
28								
29	B1 - BUILDINGS (EXCLUDING PILES)							CMU bldgs
30	Costs for foundation, structure, architecture, building							A 11 1 11 / 1 11
21		M&E (	my.	~~				An ounding to be on pile
51		Piles fo	or Buildings and equipment inside buildin	gs				
	I	with a	separate section.					

Line #         Code         Total         Total         Total         Remarks/Assumptions           32         2         Raw Water Pump Station         4,500         GSF         200.00         980,000           34         13         Solids Building         2,400         GSF         200.00         480,000           35         Microscreen Building         None         None         100.00         480,000           36         Mintenance Shop         None         None         100.00         2,160,000           37         13         not tased         2,400         GSF         200.00         980,000           40         12         Chemical Building A         4,900         GSF         200.00         980,000           41         6         RO Building C-story         None         0         00         980,000           42         Operation Building, 2-story         None         13.947,500         13.947,500           44         45         Total before Mobilization, Bonds, Insurance, OH&P, Contingencies         13.947,500           43         9         High Service Pump Station         4,500         GSF         40.00         96,000           44         45         Total before Mobilization,			Item	<b>Description of Work</b>	Quantity	Unit	Unit Cost \$	Direct Cost	
2       Raw Water Pump Station       4.500       GSF       200.00       900.000         34       13       Solids Building       2,400       GSF       200.00       480,000         35       Microscreen Building       None       None       100.000       480,000         36       Microscreen Building       2,400       GSF       200.00       480,000         36       Microscreen Building       2,400       GSF       180.000       2,160,000         37       13       not used       2,400       GSF       200.00       980,000         37       1       Chemical Building A       4,900       GSF       200.00       980,000         40       12       Chemical Building A       4,900       GSF       200.00       980,000         41       6       RO Building       2.story       None       0       1,800,000         42       Operation Building, 2-story       None       13,947,500       13,947,500         43       9       High Service Pump Station       4,500       GSF       40.00       96,000         44       Raw Water Pump Station       4,500       GSF       40.00       96,000       14         51       Ha	Line #	Code					Total	Total \$	Remarks/Assumptions
33       2       Raw Water Pump Station       4,500       GSF       200.00       900.000         34       13       Solids Building       2,400       GSF       200.00       480.000         36       Microscreen Building       None       None       13       not used       2,400       GSF       200.00       480.000         38       4       MF/UF Building       12,000       GSF       200.00       980.000         40       12       Chemical Building A       4,900       GSF       200.00       980.000         40       12       Chemical Building A       4,900       GSF       200.00       980.000         41       6       RO Building -2-story       None       -       -         42       Operation Building. 2-story       None       -       -       -         43       9       High Service Pump Station       9,000       GSF       200.00       1,800.000         44       -       -       Total before Mobilization, Bonds, Insurance, OH&P, Contingencies       -       -       13,947,500         73       14       Meroscreene Ruilding       None       -       -       -         74       MaintenanceShop       None <td>32</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	32								
34       13       Solids Building       2,400       GSF       200,00       480,000         35       Mcroscreen Building       Nome       Nome         36       mot used       2,400       GSF       200,00       480,000         37       13       mot used       2,400       GSF       200,00       480,000         38       4       MF/UF Building       12,000       GSF       200,00       980,000         39       11       Chemical Building B       4,800       GSF       200,00       960,000         41       6       RO Building 2,-story       None       0       1,800,000       6,187,500         42       Operation Building 2,-story       None       1,300,000       1,300,000         44       Fortal before Mobilization, Bonds, Insurance, OH&P, Contingencies       13,947,500         45       -       -       -       13,947,500         46       Total before Mobilization, Bonds, Insurance, OH&P, Contingencies       13,947,500         47       -       -       -       -         48       Amot used       2,400       GSF       40,00       96,000         41       Mcroscreen Building       Nome       -       -	33	2	Raw Water Pump Station		4,500	GSF	200.00	900,000	
35       Microscreen Building       None         36       Maintenance Shop       None         37       13       not used       2,400       GSF       200,00       480,000         38       4       MF/UF Building       12,000       GSF       200,00       980,000         40       12       Chemical Building A       4,900       GSF       200,00       960,000         41       6       RO Building       34,375       GSF       180,00       6,187,500         20       Operation Building       2-story       None       -       -         43       9       High Service Pump Station       9,000       GSF       200,00       1,800,000         44       -       -       -       -       -       -         44       -       -       -       -       -       -         45       -       -       -       -       -       -       -         46       - <t< td=""><td>34</td><td>13</td><td>Solids Bu</td><td>uilding</td><td>2,400</td><td>GSF</td><td>200.00</td><td>480,000</td><td></td></t<>	34	13	Solids Bu	uilding	2,400	GSF	200.00	480,000	
36       Maintenance Shop       None         37       13       not used       2,400       GSF       200.00       480.000         38       4       MF/UF Building       12,000       GSF       200.00       980.000         39       11       Chemical Building A       4,900       GSF       200.00       980.000         40       12       Chemical Building B       4,800       GSF       200.00       960.000         41       6       RO Building 2-story       None       0       6,187,500         42       Operation Building, 2-story       None       13,947,500       1,800,000         44       -       -       -       13,947,500         45       -       -       -       13,947,500         46       -       -       -       -         47       -       -       -       -         48       -       -       -       -         49       High Service Pump Station       4,500       GSF       40.00       96.000         34       14       Solids Building       None       -       -       -         36       14       Microscreen Building       None </td <td>35</td> <td></td> <td>Microser</td> <td>een Building</td> <td></td> <td>None</td> <td></td> <td></td> <td></td>	35		Microser	een Building		None			
37       13       not used       2,400       GSF       200.00       480.000         38       4       MF/UF Building       12,000       GSF       180.00       2.160,000         39       11       Chemical Building A       4,900       GSF       200.00       980,000         40       12       Chemical Building       34,375       GSF       200.00       960,000         41       6       RO Building       34,375       GSF       180.00       6.187,500         42       Operation Building, 2-story       None	36		Maintena	ince Shop		None			
38       4       MF/UF Building       12,000       GSF       18,000       2,160,000         39       11       Chemical Building A       4,900       GSF       200,00       980,000         41       6       RO Building       34,375       GSF       180,00       6,187,500         42       Operation Building, 2-story       None       -       -       -         43       9       High Service Pump Station       9,000       GSF       200,00       1,800,000         44       -       -       -       -       -       -         44       -       -       -       -       -       -         45       -       -       -       -       -       -       -         46       -       -       -       -       -       -       -       -         47       -	37	13	not used		2,400	GSF	200.00	480,000	
39       11       Chemical Building A       4,900       GSF       200.00       980,000         40       12       Chemical Building B       4,800       GSF       200.00       960,000         41       6       RO Building       2-story       None       0       6,187,500         42       Operation Building, 2-story       None       0       1,800,000         44       9       High Service Pump Station       9,000       GSF       200.00       1,800,000         44       45       Total before Mobilization, Bonds, Insurance, OH&P, Contingencies       13,947,500       13,947,500         47          13,947,500       CMU bldgs         48          13,947,500       CMU bldgs         29       B2 - BUILDINGS - PILES ONLY       CMU bldgs       CMU bldgs         20        Solids Building       2,400       GSF       40.00       96,000         31       14       Raw Water Pump Station       4,500       GSF       40.00       96,000         35       14       Microscreen Building       None            36       Maintenance Shop       None        <	38	4	MF/UF B	Building	12,000	GSF	180.00	2,160,000	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	39	11	Chemica	l Building A	4,900	GSF	200.00	980,000	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	40	12	Chemica	l Building B	4,800	GSF	200.00	960,000	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	41	6	RO Build	ling	34,375	GSF	180.00	6,187,500	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	42		Operation	n Building, 2-story		None			
44 45 46 47Total before Mobilization, Bonds, Insurance, OH&P, Contingencies13,947,50048 49 $B2 - BUILDINGS - PILES ONLY$ CMU bldgs3314Raw Water Pump Station4,500GSF40.00180,0003414Solids Building2,400GSF40.0096,0003514Microscreen BuildingNone3614not used2,400GSF40.0096,0003814MF/UF Building12,000GSF40.00196,0003914Chemical Building A4,900GSF40.00196,0004114RO Building34,375GSF40.001,375,00042Operation Building, 2-storyNone1114High Service Pump Station9,000GSF40.00360,0004414High Service Pump Station9,000GSF40.001,375,00014314High Service Pump Station9,000GSF40.00360,0004414High Service Pump Station9,000GSF40.00360,0004414High Service Pump Station, Bonds, Insurance, OH&P, Contingencies2,975,000	43	9	High Ser	vice Pump Station	9,000	GSF	200.00	1,800,000	
45 46 47Total before Mobilization, Bonds, Insurance, OH&P, Contingencies13,947,50047 48B2 - BUILDINGS - PILES ONLYCMU bldgs3314 14Raw Water Pump Station $4,500$ GSF $40.00$ $180,000$ 3414 14Solids Building $2,400$ GSF $40.00$ $96,000$ 3514 Microscreen BuildingNone36Maintenance ShopNone $000$ 3714 Microscrean BuildingNone3814 MF/UF Building12,000GSF $40.00$ $96,000$ 3914 Chemical Building A $4,900$ GSF $40.00$ $196,000$ 4014 H Operation Building, 2-storyNone $000$ $1375,000$ 41 44High Service Pump Station $9,000$ GSF $40.00$ $360,000$ 42 44Total before Mobilization, Bonds, Insurance, OH&P, Contingencies $2,975,000$	44								
46Total before Mobilization, Bonds, Insurance, OH&P, Contingencies13,947,500474813,947,50049 <b>B2 - BUILDINGS - PILES ONLY</b> CMU bldgs3314Raw Water Pump Station4,500GSF40.00180,0003414Solids Building2,400GSF40.0096,0003514Microscreen BuildingNone00036Maintenance ShopNone00096,0003814Noftware00096,0003914Chemical Building A4,900GSF40.003914Chemical Building B4,800GSF40.004114RO Building LastoryNone00042Operation Building, 2-storyNone000360,0004314High Service Pump Station9,000GSF40.00360,0004445Total before Mobilization, Bonds, Insurance, OH&P, Contingencies2,975,000	45								
47       48       CMU bldgs         29       B2 - BUILDINGS - PILES ONLY       CMU bldgs         33       14       Raw Water Pump Station $4,500$ GSF $40.00$ $180,000$ 34       14       Solids Building $2,400$ GSF $40.00$ $96,000$ 35       14       Microscreen Building       None       None $80.000$ $96,000$ 36       Maintenance Shop       None       None $80.000$ $96,000$ 38       14       MF/UF Building $12,000$ GSF $40.00$ $480,000$ 39       14       Chemical Building A $4,900$ GSF $40.00$ $196,000$ 40       14       Chemical Building B $4,800$ GSF $40.00$ $192,000$ 41       14       RO Building $34,375$ GSF $40.00$ $1,375,000$ 42       Operation Building, 2-story       None       None $40.00$ $360,000$ 44       45       Total before Mobilization, Bonds, Insurance, OH&P, Contingencies $2,975,000$ $2,975,000$	46		Total bef	ore Mobilization, Bonds, Insurance, OH	I&P, Contingencies			13,947,500	
48       CMU bldgs $32$ CMU bldgs $33$ 14       Raw Water Pump Station $4,500$ GSF $40,00$ $180,000$ $34$ 14       Solids Building $2,400$ GSF $40,00$ $96,000$ $35$ 14       Microscreen Building       None       None $36$ Maintenance Shop       None       None $37$ 14       not used $2,400$ GSF $40,00$ $96,000$ $38$ 14       MF/UF Building $12,000$ GSF $40,00$ $196,000$ $39$ 14       Chemical Building A $4,900$ GSF $40,00$ $196,000$ $40$ 14       RP Building B $4,800$ GSF $40,00$ $192,000$ $41$ IA       RD Building B $34,375$ GSF $40,00$ $192,000$ $41$ IA       RD Building, 2-story       None $40,00$ $360,000$ $41$ $41$ High Service Pump Station $9,000$ GSF $40,00$ $360,000$ $44$ $45$ Total	47								
29 32B2 - BUILDINGS - PILES ONLYCMU bldgs3314Raw Water Pump Station $4,500$ GSF $40.00$ $180,000$ 3414Solids Building $2,400$ GSF $40.00$ $96,000$ 3514Microscreen BuildingNone $1000000000000000000000000000000000000$	48								
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	29		B2 - BUILDI	NGS - PILES ONLY				(	CMU bldgs
3314Raw Water Pump Station $4,500$ GSF $40.00$ $180,000$ 3414Solids Building $2,400$ GSF $40.00$ $96,000$ 3514Microscreen BuildingNone $180,000$ 36Maintenance ShopNone $180,000$ 3714not used $2,400$ GSF $40.00$ 3814MF/UF Building $12,000$ GSF $40.00$ $96,000$ 3814MF/UF Building A $4,900$ GSF $40.00$ $480,000$ 3914Chemical Building A $4,900$ GSF $40.00$ $192,000$ 4014Chemical Building B $4,800$ GSF $40.00$ $1,375,000$ 4114RO Building, 2-storyNone $433$ 14High Service Pump Station $9,000$ GSF $40.00$ $360,000$ 44Total before Mobilization, Bonds, Insurance, OH&P, Contingencies $2,975,000$ $360,000$	32								
3414Solids Building2,400GSF40.0096,000 $35$ 14Microscreen BuildingNoneNone $36$ Maintenance ShopNoneNone $37$ 14not used2,400GSF40.00 $38$ 14MF/UF Building12,000GSF40.00 $39$ 14Chemical Building A4,900GSF40.00 $40$ 14Chemical Building B4,800GSF40.00 $41$ 14RO Building34,375GSF40.00 $42$ Operation Building, 2-storyNone14 $43$ 14High Service Pump Station9,000GSF40.00 $44$ 45Total before Mobilization, Bonds, Insurance, OH&P, Contingencies2,975,000	33	14	Raw Wa	ter Pump Station	4,500	GSF	40.00	180,000	
3514Microscreen BuildingNone $36$ Maintenance ShopNoneNone $37$ 14not used2,400GSF $40.00$ $96,000$ $38$ 14MF/UF Building12,000GSF $40.00$ $480,000$ $39$ 14Chemical Building A $4,900$ GSF $40.00$ $196,000$ $40$ 14Chemical Building B $4,800$ GSF $40.00$ $192,000$ $41$ 14RO Building $34,375$ GSF $40.00$ $1,375,000$ $42$ Operation Building, 2-storyNone $43$ 14High Service Pump Station $9,000$ GSF $40.00$ $360,000$ $44$ Total before Mobilization, Bonds, Insurance, OH&P, Contingencies $2,975,000$ $2,975,000$	34	14	Solids Bu	uilding	2,400	GSF	40.00	96,000	
36       Maintenance Shop       None       None $37$ 14       not used $2,400$ GSF $40.00$ $96,000$ $38$ 14       MF/UF Building $12,000$ GSF $40.00$ $480,000$ $39$ 14       Chemical Building A $4,900$ GSF $40.00$ $196,000$ $40$ 14       Chemical Building B $4,800$ GSF $40.00$ $192,000$ $41$ 14       RO Building $34,375$ GSF $40.00$ $1,375,000$ $42$ Operation Building, 2-story       None       None $41$ High Service Pump Station $9,000$ GSF $40.00$ $360,000$ $44$ $45$ $5600$ $56000$ $4000$ $360,000$ $41000$ $360,000$ $41000$ $360,000$ $41000$ $40000$ $360,000$ $410000$ $400000$ $400000$ $4000000$ $40000000$ $40000000000$ $40000000000000000$ $4000000000000000000000000000000000000$	35	14	Microscr	een Building		None			
37       14       not used       2,400       GSF       40,00       96,000         38       14       MF/UF Building       12,000       GSF       40,00       480,000         39       14       Chemical Building A       4,900       GSF       40,00       196,000         40       14       Chemical Building B       4,800       GSF       40,00       192,000         41       14       RO Building       34,375       GSF       40,00       1,375,000         42       Operation Building, 2-story       None	36		Maintena	ince Shop	None	None			
38       14       MF/UF Building       12,000       GSF       40.00       480,000         39       14       Chemical Building A       4,900       GSF       40.00       196,000         40       14       Chemical Building B       4,800       GSF       40.00       192,000         41       14       RO Building       34,375       GSF       40.00       1,375,000         42       Operation Building, 2-story       None	37	14	not used		2,400	GSF	40.00	96,000	
39       14       Chemical Building A       4,900       GSF       40.00       196,000         40       14       Chemical Building B       4,800       GSF       40.00       192,000         41       14       RO Building       34,375       GSF       40.00       1,375,000         42       Operation Building, 2-story       None	38	14	MF/UF B	Building	12,000	GSF	40.00	480,000	
40       14       Chemical Building B       4,800       GSF       40.00       192,000         41       14       RO Building       34,375       GSF       40.00       1,375,000         42       Operation Building, 2-story       None	39	14	Chemica	l Building A	4,900	GSF	40.00	196,000	
41       14       RO Building       34,375       GSF       40.00       1,375,000         42       Operation Building, 2-story       None	40	14	Chemica	l Building B	4,800	GSF	40.00	192,000	
42       Operation Building, 2-story       None         43       14       High Service Pump Station       9,000       GSF       40.00       360,000         44       45       46       Total before Mobilization, Bonds, Insurance, OH&P, Contingencies       2,975,000         47       47       46       46       46       2,975,000	41	14	RO Build	ling	34,375	GSF	40.00	1,375,000	
43       14       High Service Pump Station       9,000       GSF       40.00       360,000         44       45       46       Total before Mobilization, Bonds, Insurance, OH&P, Contingencies       2,975,000         47       47       40.00       360,000	42		Operatio	n Building, 2-story		None			
44       45       46     Total before Mobilization, Bonds, Insurance, OH&P, Contingencies       47	43	14	High Ser	vice Pump Station	9.000	GSF	40.00	360.000	
45       46       47   Total before Mobilization, Bonds, Insurance, OH&P, Contingencies 2,975,000	44		8	1	- ,- • •				
46Total before Mobilization, Bonds, Insurance, OH&P, Contingencies2,975,00047	45								
47	46		Total bef	ore Mobilization, Bonds, Insurance. OF	I&P, Contingencies			2,975,000	
	47			·····, · ···, ·····, ·····, ·····, ·····, ·····, ·····, ·····, ······	,			, , 5 • •	

Line #	Code	Item	<b>Description of Work</b>	Quantity	Unit	Unit Cost \$ Total	Direct Cost Total \$	Remarks/Assumptions
A8	Couc	_				1 otur	10tur y	
40		C: TANKS						All tanks to be on piles
50	13	Thicken	er, 80' dia, RC construction	2	EA	2.000.000.00	4,000,000	
51	10	Neutrali	zation tank	2	EA	160.000.00	320.000	
52	5	Filtratio	n Tank	2	EA	480.000.00	960.000	
53	8	Clearwe	11	1	EA	1,350,000.00	1,350,000	
54	7	Permeat	e Tank	1	EA	450,000.00	450,000	
55	8	Concrete	e vaults	1	EA	250,000.00	250,000	
56	12	CO2 pla	nt/storage	1	EA	400,000.00	400,000	
57		-	C .					
58								
59		Total be	fore Mobilization, Bonds, Insurance, OH	&P, Contingencies			7,730,000	
60								
61								
62		D-EQUIPMI	ENT					Unit cost include 10% for electrical & instrumentation
63								
64		Material	cost, FOB jobsite					Includes 9.25% sales tax
65	4	UF M	embrane System	1	EA	8,805,600.00	8,805,600	per Layne Christensen Company
66	6	RO eo	luipment	1	EA	28,600,000.00	28,600,000	per Biwater AEWT
67	2	Wedg	e wire screen intake	1	EA	100,292.00	100,292	per Johnson Screens
68	4	Miscr	oscreen equipment	4	EA	305,900.00	1,223,600	per Amiad Filtration System
69	6	Cartri	dge filters	10	EA	29,716.00	297,160	per Parker Process Advanced Filtration
70		Sales tax	x @ 9.25%	W	ith abov	e		
71		Installati	on cost for the above equipment					
72	4	UF M	embrane System	1	EA	2,640,000.00	2,640,000	
73	6	RO eo	luipment	1	EA	8,580,000.00	8,580,000	
74	2	Wedg	e wire screen intake	1	EA	50,490.00	50,490	
75	4	Miscr	oscreen equipment	4	EA	123,200.00	492,800	
76	6	Cartri	dge filters	26	EA	10,450.00	271,700	
77								
78		Other sy	stem					
79		Solid ha	ndling system					
80	13	Thick	ening	2	EA	990,000.00	1,980,000	
81	13	Sludg	e pump system	2	EA	550,000.00	1,100,000	

		Item	Description of Work	Quantity	Unit	Unit Cost \$	Direct Cost	
Line #	Code					Total	Total \$	Remarks/Assumptions
82	13	Centr	rifuge dewatering system	2	EA	485,000.00	970,000 p	per Andritz
83		Chemic	cal system					
84	11	Sodiu	um bisulfite	1	LS	85,000.00	85,000	
85	11	Ferrie	c Chloride system	1	LS	85,000.00	85,000	
86	11	Antis	scalant system	1	LS	85,000.00	85,000	
87	11	Polyr	mer	1	LS	85,000.00	85,000	
88	12	Aqua	a Ammonia	1	LS	85,000.00	85,000	
89	12	Sodiu	um Hypochlorite	1	LS	85,000.00	85,000	
90	12	Fluor	rosilicic Acid	1	LS	85,000.00	85,000	
91	12	Lime		1	LS	55,000.00	55,000	
92	12	Carb	on Dioxide	1	LS	10,000.00	10,000	
93								
94		Pumps						
95	2	Raw	water pumps	3	EA	330,000.00	990,000	
96	6	Boos	ster pump	3	EA	220,000.00	660,000 1	ocated in RO Bldg
97	9	Finisl	h water pump	3	EA	165,000.00	495,000	
98	13	Sludg	ge pump	3	EA	55,000.00	165,000	
99	2	VFD	for raw water pumps	3	EA	165,000.00	495,000	
100	13	VFD	for sludge pump	3	EA	6,000.00	18,000	
101	9	VFD	for high service pump	3	EA	250,000.00	750,000	
102								
103		Electric	al & instrumentation for equipment	Inc	luded abov	ve		
104								
105								
106		Total be	efore Mobilization, Bonds, Insurance, OH&P	, Contingencies			59,344,642	
107								
108								
109		E-INSIDE B	BUILDING PIPING					
110		Piping,	fitting & valves for equipment inside building	gs (not building m	echanical	or plumbing)		
111	2	Raw W	ater Pump Station	4,500	GSF	50.00	225,000	
112	13	Solids	Building	2,400	GSF	50.00	120,000	
113		Microso	creen Building		None			
114		Mainter	nance Shop		None			
115	13	not use	ed	2,400	GSF	60.00	144,000	

		Item	Description of Work	Quantity	Unit	Unit Cost \$	Direct Cost	
Line #	Code		-			Total	Total \$	Remarks/Assumptions
116	4	MF/UF	Building	12,000	GSF	80.00	960,000	
117	11	Chemic	cal Building A	4,900	GSF	80.00	392,000	
118	12	Chemic	cal Building B	4,800	GSF	80.00	384,000	
119	6	RO Bu	ilding	34,375	GSF	30.00	1,031,250	
120		Operat	ion Building, 2-story	1	None			
121	9	High S	ervice Pump Station	9,000	GSF	100.00	900,000	
122								
123								
124		Total b	efore Mobilization, Bonds, Insurance, OH&P	, Contingencies			4,156,250	
125								
126								
127		F-YARD PI	PING					
128		Piping,	fitting & valves for equipment at Yard					Welded steel, motored lined & coated
129	1	12"		570	LF	290.00	165,300	
130	1	36"		920	LF	560.00	515,200	
131	1	42"		310	LF	660.00	204,600	
132	1	54"		260	LF	1,410.00	366,600	
133								
134		Add tre	enching					
135	1	12"		570	LF	17.00	9,690	
136	1	36"		920	LF	46.00	42,320	
137	1	42"		310	LF	56.00	17,360	
138	1	54"		260	LF	78.00	20,280	
139								
140								
141		Total b	efore Mobilization, Bonds, Insurance, OH&P	, Contingencies			1,341,350	
142								
143								
144		G: Off-Site	Transmission Pipeline (3 miles)					Extend 3 miles $= 15840 \text{ LF}$
145		Piping,	fitting & valves for equipment at Yard					
146	15	30" pip	e	15,840	LF	350.00	5,544,000	
147	15	Trench	ing	15,840	LF	40.00	633,600	
148	15	Restore	e disturbed paving/Crossing/Misc	15,840	LF	50.00	792,000	
149								

		Item Description of Work	Quantity	Unit	Unit Cost \$	Direct Cost	
Line #	Code				Total	Total \$	Remarks/Assumptions
150							
151		Total before Mobilization, Bonds, Inst	arance, OH&P, Contingencies			6,969,600	
152							
153							
154	3	Brine Disposal	1	LS	1,000,000.00	1,000,000	
153							

### Non-RO Power Costs Annual 365

Annual	505							
	Raw Water Pumps			Finish	ed Water I	Pumps	Centrifuge <sup>1</sup>	
Efficiency	Pressure	Flow	Power	Pressure	Flow	Power	motor	Power
%	psi	gpm	kWh/yr	psi	MG/yr	kWh/yr	HP	kWh/yr
68%	57	19,646	6,300,000	240	7,217	18,500,000	100	79,000
<sup>1</sup> Centrifuge runs 4 hrs per day, 22 days per month, 12 months per year								

Convertion factors	
2.31	head (ft) / psi
3956	gpm*ft / hp
0.7457	kW / hp

0.8 energy factor for future recovery system

# RO Power Costs

January	31						
NF Feed Pumps				SW Feed	d Pumps		
		High		Specific		High	
Specific	NF Feed	Pressure	Specific	Energy	SW Feed	Pressure	Permeate
Energy	Flow	Pump	Energy	w/energy	Flow	Pump	Flow
		Power		recovery		Power	
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month
2.6	17,292	2,100,000	9.16	7.328	7,778	3,200,000	632.71

### February 28

rebruary	20						
N	F Feed Pum	ips		SW Feed	d Pumps		
		High		Specific		High	
Specific	NF Feed	Pressure	Specific	Energy	SW Feed	Pressure	Permeate
Energy	Flow	Pump	Energy	w/energy	Flow	Pump	Flow
		Power		recovery		Power	
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month
2.06	17.292	1.500.000	7.71	6.168	7.264	2.300.000	579.88

March	31						
NF Feed Pumps				SW Feed	d Pumps		
		High		Specific		High	
Specific	NF Feed	Pressure	Specific	Energy	SW Feed	Pressure	Permeate
Energy	Flow	Pump	Energy	w/energy	Flow	Pump	Flow
		Power		recovery		Power	
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month
1.61	17,292	1,300,000	6.39	5.112	6,569	1,900,000	654.41

April	30						
N	F Feed Pum	ps		SW Feed	d Pumps		
		High		Specific		High	
Specific	NF Feed	Pressure	Specific	Energy	SW Feed	Pressure	Permeate
Energy	Flow	Pump	Energy	w/energy	Flow	Pump	Flow
		Power		recovery		Power	
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month
1.73	17,292	1,300,000	6.2	4.96	7,431	2,000,000	621.3

May	31						
N	IF Feed Pum	ps		SW Feed	d Pumps		
		High		Specific		High	
Specific	NF Feed	Pressure	Specific	Energy	SW Feed	Pressure	Permeate
Energy	Flow	Pump	Energy	w/energy	Flow	Pump	Flow
		Power		recovery		Power	
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month
1.68	17,292	1,300,000	5.67	4.536	7,785	2,000,000	636.43

June	30						
NF Feed Pumps				SW Feed	d Pumps		
		High		Specific		High	
Specific	NF Feed	Pressure	Specific	Energy	SW Feed	Pressure	Permeate
Energy	Flow	Pump	Energy	w/energy	Flow	Pump	Flow
		Power		recovery		Power	
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month
1.9	17,292	1,500,000	5.81	4.648	8,472	2,200,000	611.4

July	31						
NF Feed Pumps				SW Feed	d Pumps		
		High		Specific		High	
Specific	NF Feed	Pressure	Specific	Energy	SW Feed	Pressure	Permeate
Energy	Flow	Pump	Energy	w/energy	Flow	Pump	Flow
		Power		recovery		Power	
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month
2.04	13,833	1,300,000	5.62	4.496	10,507	2,700,000	602.95

### 31 NF Feed Pumps August SW Feed Pumps High High Specific Energy Specific NF Feed Pressure Specific SW Feed Pressure Permeate Energy Flow Pump Energy w/energy Flow Pump Flow Power kWh/mo recovery kWh/kgal kWh/kgal Power kWh/mo mg/month kWh/kgal gpm gpm 2.67 7,778 1,000,000 5.96 4.768 13,708 3,700,000 557.69

Septemb	er 30						
NF Feed Pumps				SW Fee	d Pumps		
		High		Specific		High	
Specific	NF Feed	Pressure	Specific	Energy	SW Feed	Pressure	Permeate
Energy	Flow	Pump	Energy	w/energy	Flow	Pump	Flow
		Power		recovery		Power	
kWh/kga	al gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month
2.89	8,299	1,100,000	6.56	5.248	13,708	3,900,000	539.7

### October 31 NF Feed Pumps SW Feed Pumps High Specific High Specific NF Feed Pressure Specific Energy SW Feed Pressure Permeate Energy Flow Pump Energy w/energy Flow Pump Flow Power recovery Power kWh/kgal gpm kWh/kgal kWh/kgal gpm 12,410 kWh/mo kWh/mo mg/month 10,375 5.48 2.79 1,300,000 6.85 3,800,000 572.26

November	30						
NF Feed Pumps				SW Fee	d Pumps		
		High		Specific		High	
Specific	NF Feed	Pressure	Specific	Energy	SW Feed	Pressure	Permeate
Energy	Flow	Pump	Energy	w/energy	Flow	Pump	Flow
		Power		recovery		Power	
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month
3.1	12,104	1,700,000	8.23	6.584	11,361	4,100,000	570.3

December	31						
NF Feed Pumps				SW Fee	d Pumps		
		High		Specific		High	
Specific	NF Feed	Pressure	Specific	Energy	SW Feed	Pressure	Permeate
Energy	Flow	Pump	Energy	w/energy	Flow	Pump	Flow
		Power		recovery		Power	
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month
3.1	17,292	2,400,000	10.2	8.16	8,299	3,800,000	638.29