Appendix A: Cost Data

A cost effectiveness analysis expresses the long-run cost of an alternative on a consistent basis using common benchmarks. For this Feasibility Study, the annualized sum of the capital and operations and maintenance (O&M) costs for each alternative were compared. The following procedure was used to determine the cost effectiveness of each alternative:

- Life-cycle costs for the project's capital, reoccurring, and O&M expenditures were developed using a 20-year project life.
- The total costs for each year were discounted to present-day (2004) dollars using a discount rate of 5.625 percent.
- The net present value of each alternative was calculated based on a 20-year project life and 5.625 percent discount rate.
- This net present value was then expressed on an annual basis by amortizing the value over 20 years at the above mentioned discount rate.

The baseline capital and O&M costs for each alternative were based on general project descriptions and the technical specifications presented in the Evaluation of Technologies section of the main report. Unit costs were determined based on previous cost estimates, several of which were obtained from projects located within the vicinity of the San Joaquin River. Other unit costs were obtained from vendors and other sources.

Several assumptions were made to extend the baseline costs over the life of the project. The main assumptions are as follows:

- Construction costs were grouped into a number of categories, including Site Work, Concrete,
 Masonry, Finishes, Equipment, Special Construction, Mechanical, and Electrical and Instrumentation.
 A number of project components will require replacement during the 20-year project life. It is
 assumed that the pump motor, impeller, and diffuser lateral pipe would each need replacement once,
 at 10 years of operation. The oxygen diffusers for the Speece Cone and U-tube would need to be
 replaced every 5 years.
- The total construction costs have a lump sum contingency of 35 percent. These fees apply to years during which construction or replacement occurs.
- Other project costs including engineering, permitting and construction services are included as percentages of Total Construction Costs (10 percent, 7 percent, and 10 percent respectively).
- Annual O&M costs include Equipment Maintenance, Monitoring and Adaptive Management, Oxygen Tank Supply (i.e., rental), Oxygen Supply and Power Costs. Equipment Maintenance and Monitoring and Adaptive Management were calculated as a percentage of the total estimated capital expenses (3 to 10 percent for Equipment Maintenance and 2 to 3 percent for Monitoring and Adaptive Management). Equipment Maintenance percentages were applied to the major mechanical and equipment components. Adaptive Management percentages are applied to the total capital cost of the project. Reoccurring capital expenses, such as replacements, are presented in an individual category and not lumped into Equipment Maintenance line items. Other items are calculated based on yearly cost per unit.
- Power costs were calculated by converting the horsepower (hp) for each alternative to kilowatts (kW), and assumed the device would operate 24 hours a day for 100 days.

U-TUBE COSTS

The main difference in costs among Alternatives A through D is the cost of the vertical turbine pumps. This is due to the difference in hp requirements for either one or two U-tubes of different sizes. Different sizes of U-tubes requiring differing diameters of pipe connecting to the diffuser pipe. This diameter varies from 10 to 30 inches and thus, yields differing costs. The Mobilization/Demobilization costs for Alternative D are slightly higher compared to other alternatives due to costs associated with installation of the larger outer diameter of the connecting pipe. Replacement costs are the same for all alternatives. Power costs vary due to the differing requirements for each alternative; Alternative A is 22 hp (16.4 kW), Alternative B is 36 hp (26.8 kW), Alternative C is 45 hp (33.6 kW), and Alternative D is 100 hp. The costs of power for each alternative are summarized in Table A-1.

Table A-1. Summary of U-Tube Power Costs.

U-Tube Alternative	Power (hp)	Power (kW)	Power Usage (kW-hr)	Annual Power Cost
A	22	16.4	39,380	\$2,370
В	36	26.8	64,430	\$3,870
С	45	33.6	80,540	\$4,840
D	100	74.6	178,970	\$10,740

SPEECE CONE COSTS

The main difference in Equipment costs for Alternatives A through C is the cost for the 60 hp vertical turbine pumps associated with Alternative A, the 240 hp pump for Alternative B, and the 690 hp pump for Alternative C. Power costs are presented below in Table A-2.

Table A-2. Summary of Speece Cone Power Costs.

Speece Cone Alternative	Power (hp)	Power (kW)	Power Usage (kW-hr)	Annual Power Cost
A	60	44.7	107,380	\$6,450
В	240	179.0	429,520	\$25,780
С	690	514.5	1,234,880	\$74,100

Costs for Alternative C are much higher than costs for Alternatives A and B due to the larger required pump and fish screen requirements.

BUBBLE PLUME

The bubble plume alternatives can be divided into two categories, those using air and those using pure oxygen. Alternatives A and B which use air have power requirements, while Alternatives C and D run on pure oxygen and therefore do not require power. Alternative B requires almost twice the power as Alternative A. The additional cost is shown in Table A-3 below.

Table A-3. Summary of Bubble Plume Power Costs.

Speece Cone Alternative	Power (hp)	Power (kW)	Power Usage (kW-hr)	Annual Power Cost
A	47	35	62,640	\$4,000
В	87	65	116,330	\$6,980

The diffuser hose for Alternative A is almost twice as long as Alternative B with lengths of 11,000 and 6,000 feet respectively. The difference in length yields a much higher cost for Alternative A at \$1,034,000 and Alternative B costing \$564,000. However, for Alternatives C and D the costs are much lower (\$22,800 and \$9,600 for Alternative D) because of the shorter length requirements of 1,900 and 800 feet respectively.

The Annual Cost for each alternative was discounted to account for the "real" time value of money. The sum of the annual discounted costs over the 20-year life-cycle of the project was converted to the present value of the total cost over 20 years, including capital costs, O&M, and periodic replacements. This cost is summarized in Table A-4, followed by detailed cost sheets for each alternative.

Table A-4. San Joaquin River Aeration Engineering Feasibility Study - Cost Summary.

Туре	Alternative	Total Capital Costs	Present Value Recurring Expenses	Annual O&M Costs	Combined Annual Project Costs	Annual Cost Oxygen (per Unit)
	A	\$ 1,855,000.00	\$ 69,000.00	\$ 137,000.00	\$ 300,000.00	\$ 0.30
U-Tube	В	\$ 1,996,000.00	\$ 69,000.00	\$ 143,000.00	\$ 318,000.00	\$ 0.32
C-1 ubc	С	\$ 2,022,000.00	\$ 71,000.00	\$ 163,000.00	\$ 340,000.00	\$ 0.34
	D	\$ 2,823,000.00	\$ 133,000.00	\$ 223,000.00	\$ 473,000.00	\$ 0.47
C	A	\$ 1,875,000.00	\$ 71,000.00	\$ 152,000.00	\$ 317,000.00	\$ 0.32
Speece Cone	В	\$ 2,041,000.00	\$ 69,000.00	\$ 160,000.00	\$ 339,000.00	\$ 0.34
	С	\$ 3,349,000.00	\$ 129,000.00	\$ 270,000.00	\$ 565,000.00	\$ 0.57
	A	\$ 2,859,000.00	\$ 688,000.00	\$ 215,000.00	\$ 515,000.00	\$ 0.52
Bubble	В	\$ 1,818,000.00	\$ 379,000.00	\$ 136,000.00	\$ 322,000.00	\$ 0.32
Plume	С	\$ 948,000.00	\$ 237,000.00	\$ 218,000.00	\$ 319,000.00	\$ 0.32
	D	\$ 465,000.00	\$ 98,000.00	\$ 178,000.00	\$ 226,000.00	\$ 0.23

Notes: Discount Rate = 0.05625

U-TUBE ALTERNATIVE A - TWO 2' OUTER DIAMETER (1' OUTER RADIUS) U-TUBES X 150 FT HEIGHT

ENGINEER'S COST OPINION: PRELIMINARY DESIGN CALIFORNIA BAY DELTA AUTHORITY

onsti	SAN JOAQUI ruction Costs DATE: JULY		AERA		EERING FEASI ID: JUL 6, 200		IY STUDY
	Description	Unit		Unit Price	Quantity		Item Price
	on 1 - General Requirements	Oilit		FIICE	Quantity		FIICE
	·						
	on 2 - Site Work	201					
1 2	Cut/Fill Removable Bollards	CY EA	\$	5 300	725	\$	3,62 1,80
3	Fencing	LS	\$	6,500		\$	6,50
4	6" AB	CY	\$	36	50		1,80
5	3" AC	SF	\$	5	1600		8,00
ivisio	on 3 - Concrete					Ė	
6	O ₂ Tank Slab	CY	\$	500	18	\$	9,00
7	Building Slab	CY	\$	500	10	\$	5,00
8	Wet Well	LS	\$	6,500	1	\$	6,50
	on 4 - Masonry						
9	Split-block Masonry Building (20' x 20')	SF	\$	250	400	\$	100,00
0							
10	Coatings	LS	\$	20,000	1	\$	20,00
	on 11 - Equipment			00.000		_	50.00
11	Vertical Turbine Pumps and Appurtenances	EA	\$	26,800		\$	53,60
12	Drill & Prep 2' Diameter U-Tube Shaft	FT	\$	340 1	300		102,00
13 14	U-Tube Casing Material (Assume Welded Steel, 1")	LB FT	\$	1 50	73,800 300		73,80 15,00
14	Install U-Tube Casing Install Bottom Plug (concrete and mortar)	CY	\$	500 500		\$	3,00
16	Pump Water from Shaft and Prepare Casing	LS	\$	12,000		\$	24.00
17	Bubble Collector and Appurtenances	EA	\$	8.000		\$	16,0
18	Oxygen Diffuser	EA	\$	1,000		э \$	2,0
19	Fish Screen (Barrel)	EA	\$	240,000	1		240,0
	on 13 - Special Construction	LA	Ŷ	∠→0,000	1	φ	240,0
20	Pressure Gages/Transmitters	EA	\$	1,500	4	\$	6,0
21	Flow Meter (10" Mag)	EA	\$	13,500		\$	27,0
	on 15 - Mechanical		Ť	,		Ť	,0
22	O ₂ Supply Line Piping and Appurtenances	LF	\$	12	200	\$	2,4
23	O ₂ Control Valve and Equipment	EA	\$	3,000	2	\$	6,0
24	10" Pump Control Valve	EA	\$	9,000	2	\$	18,0
25	Isolation Valves	EA	\$	3,000	3		9,00
26	16" Ductile Iron Pipe (Header) \$/Dia-In 16		\$	144	20		2,8
27	10" Ductile Iron Pipe (Supply) \$/Dia-In 10		\$	90	20		1,8
28	16" Ductile Iron Pipe (Exhaust) \$/Dia-In 16	LF	\$	144	40	\$	5,70
29	16" Flexible Piping \$/Dia-In 16	LF	\$	144	60	\$	8,6
30	Inner Piping System (8 Inch) \$/Dia-In 8	LF	\$	72	300	\$	21,60
31	HDPE Diffuser Pipe (Assume 24" Dia) \$/Dia-In 24	LF	\$	18	800	\$	14,40
32	Pressure Regulating Station	EA	\$	8,000	4	\$	32,00
33	Diffuser Supports	EA	\$	150	80	\$	12,00
34	Lateral Installation	LF	\$	94	800	\$	75,20
	on 16 - Electrical and Instrumentation						
35	Supply	LS	\$	50,000		\$	50,00
36	Control Systems and Instrumentation	LS	\$	40,000	1	\$	40,00
37	Control Wiring	LS	\$	7,500	1		7,50
ound	ded Subtotal*					\$	1,032,0
	al Contractor Indirect Costs						
ener	Construction Management (Contractor)			2.5%	\$ 1,032,000	\$	25,8
	Mobilization/Demobilization	LS	\$	22,500	1	\$	22,5
	WODINZGROW DCMODINZGROM			inded Subtota		\$	49,0
				aoa oabiola		•	.0,0
		Total Co	nstru	ction Costs		\$	1,081,00
		Continge			35%	\$	378,3
OTAL	L CONSTRUCTION COSTS WITH CONTINGENCIES*					\$	1,460,0
Other	Project Costs						
	Engineering/SDC				10.0%		146,0
	Permitting				7.0%		102,20
	Construction Services/Inspections		_	. 1. 16 11 11	10.0%		146,00
OT 4 1	ESTIMATED CADITAL COSTS		Kou	ınded Subtota	l"	\$	395,0
UIAL	L ESTIMATED CAPITAL COSTS					\$	1,855,0
ECIII	RRING CAPITAL EXPENSES	DEDI AC	EMEN	NT INTERVAL			
	Pump Motor	10		yrs		\$	5,00
	Impeller	10		yrs		\$	5,00
	Diffuser Lateral	10		yrs		\$	101,60
	Oxygen Diffuser	5		yrs		\$	6,00
otal F	Recurring Capital Expenses		Rou	ınded Subtota	*	\$	118,0
	→ • • • • • • • • • • • • • • • • • • •				ı	_	, •
NINIT	AL OPERATIONS AND MAINTENANCE COSTS						
	Equipment Maintenance (Equipment and Mechanical)				3.0%	\$	12,6
	Monitoring and Adaptive Management				2.0%		37,1
	Worldoning and Adaptive Wanagement			750	12		9,00
	Oxygen Tank Rental	Month	\$	750	12	φ	3,0
		Month lbs	\$ \$	0.07	1,080,000		
	Oxygen Tank Rental					\$	75,60 2,37



U-TUBE ALTERNATIVE B - ONE 3.5' OUTER DIAMETER (1.75' OUTER RADIUS) U-TUBE X 220 FT HEIGHT

ENGINEER'S COST OPINION: PRELIMINARY DESIGN CALIFORNIA BAY DELTA AUTHORITY

SAN JOAQUIN RIVER AERATION ENGINEERING FEASIBILITY STUDY

	ruction Costs DATE: JULY			Unit	Outsett		Item
	Description on 1 - General Requirements	Unit		Price	Quantity		Price
DIVISIO	n i - General Requirements						
Divisio	on 2 - Site Work						
1	Cut/Fill	CY	\$	5	725	\$	3,62
2	Removable Bollards	EA	\$	300	6		1,80
3 4	Fencing 9" AB	LS CY	\$	6,500 36	1 50		6,50 1,80
5	3" AC	SF	\$	5	1600		8,00
	on 3 - Concrete	O.	Ů		1000	Ψ.	0,00
6	O ₂ Tank slab	CY	\$	500.0	18	\$	9,00
7	Building slab	CY	\$	500.0	10	\$	5,00
8	Wet Well	LS	\$	6,500.0	1	\$	6,50
	on 4 - Masonry						
9	Split-block Masonry Building (20' x 20')	SF	\$	250.0	400	\$	100,00
	on 9 - Finishes	1.0	_	20,000,0	4	•	20.00
10 Divisio	Coatings on 11 - Equipment	LS	\$	20,000.0	1	\$	20,00
11	Vertical Turbine Pumps and Appurtenances	EA	\$	61,200	1	\$	61,20
12	Drill & Prep 3.5' Diameter U-Tube Shaft	FT	\$	720	220		158,40
13	Casing Material (Assume Welded Steel, 1")	LB	\$	1	99,300		99,30
14	Install U-Tube Casing	FT	\$	50	220		11,00
15	Install Bottom Plug (concrete and mortar)	CY	\$	500	6		3,00
16	Pump Water from Shaft and Prepare Casing	LS	\$	25,000	1	\$	25,00
17	Bubble Collector and Appurtenances	EA	\$	8,000	1		8,00
18	Oxygen Diffuser	EA	\$	1,500	1	\$	1,50
19	Fish Screen (Barrel)	EA	\$	275,000	1	\$	275,00
	on 13 - Special Construction						
20	Pressure Gages/Transmitters	EA	\$	1,500	2		3,00
21	Flow Meter (18" Mag)	EA	\$	16,800	1	\$	16,80
22	on 15 - Mechanical O ₂ Supply Line Piping and Appurtenances	LF	\$	12	100	•	1,20
23	O ₂ Control Valve and Equipment	EA	\$	3,000	1	-	3,00
24	18" Pump Control Valve	EA	\$	24,000	1		24,00
25	Isolation Valves	EA	\$	6,000	2		12,00
26	18" Ductile Iron Pipe \$/Dia-In 18		\$	162	40		6,48
27	18" Flexible Piping \$/Dia-In 18		\$	162	60		9,72
28	Inner Piping System (12 Inch) \$/Dia-In 12	2 LF	\$	108	220	\$	23,76
29	HDPE Diffuser Pipe (Assume 24" Dia) \$/Dia-In 24	LF.	\$	18	800	\$	14,40
30	Pressure Regulating Station	EA	\$	5,000	4	\$	20,00
31	Diffuser Supports	EA	\$	150	80	\$	12,00
32	Lateral Installation (Within Water Column)	LF	\$	94	800	\$	75,20
	on 16 - Electrical and Instrumentation	10		50.000	4	_	50.00
33 34	Supply Control Systems and Instrumentation	LS	\$	50,000	1		50,00
35	Control Systems and Instrumentation Control Wiring	LS LS	\$	30,000 5,000	1	Ф	30,00 5,00
	led Subtotal*	LO	φ	3,000		\$	1,112,00
rtouriu	ou oubtour					Ψ	1,112,00
Genera	al Contractor Indirect Costs						
	Construction Management (Contractor)			2.5%	1,112,000	\$	27,80
	Mobilization/Demobilization	LS	\$	22,500	1	\$	22,50
			Rou	ınded Subtotal	*	\$	51,00
						_	
				ction Costs		\$	1,163,00
TOTA:	CONSTRUCTION COSTS WITH CONTINGENSIES	Continger	ncies		35%	\$	407,05
TOTAL	L CONSTRUCTION COSTS WITH CONTINGENCIES*					\$	1,571,00
Other I	Project Costs						
Other	Engineering/SDC				10.0%	\$	157,10
	Permitting				7.0%	\$	109,97
	Construction Services/Inspections				10.0%	\$	157,10
			Rou	inded Subtotal		\$	425,00
TOTAL	L ESTIMATED CAPITAL COSTS					\$	1,996,00
					_		
RECU	RRING CAPITAL EXPENSES		EMEN	IT INTERVAL		_	
	Pump Motor	10		yrs		\$	5,00
	Impeller	10		yrs		\$	5,00
	Diffusion Lateral	10		yrs		\$	101,60
	Diffuser Lateral	_		yrs		\$	4,50
Total 5	Oxygen Diffuser	5	Par	inded Subtatal	*		
Total F		5	Rou	inded Subtotal	*	\$	117,00
	Oxygen Diffuser Recurring Capital Expenses	5	Rou	inded Subtotal	*	\$	117,00
	Oxygen Diffuser	5	Rou	inded Subtotal	* 3.0%		
	Oxygen Diffuser Recurring Capital Expenses AL OPERATION AND MAINTENANCE COSTS Equipment Maintenance (Equipment and Mechanical)	5	Rou	inded Subtotal	3.0%	\$	14,78
	Oxygen Diffuser Recurring Capital Expenses AL OPERATION AND MAINTENANCE COSTS	5 Month	Rou \$	inded Subtotal	•	\$	14,78 39,92 9,00
	Oxygen Diffuser Recurring Capital Expenses AL OPERATION AND MAINTENANCE COSTS Equipment Maintenance (Equipment and Mechanical) Monitoring and Adaptive Management				3.0% 2.0%	\$ \$ \$	14,78 39,92
	Oxygen Diffuser Recurring Capital Expenses AL OPERATION AND MAINTENANCE COSTS Equipment Maintenance (Equipment and Mechanical) Monitoring and Adaptive Management Oxygen Tank Rental	Month	\$	750	3.0% 2.0% 12	\$ \$ \$	14,78 39,92 9,00



U-TUBE ALTERNATIVE C - ONE 4' OUTER DIAMETER (2' OUTER RADIUS) U-TUBE X 165 FT HEIGHT

ENGINEER'S COST OPINION: PRELIMINARY DESIGN
CALIFORNIA BAY DELTA AUTHORITY
SAN JOAQUIN RIVER AERATION ENGINEERING FEASIBILITY STUDY

Construction Costs

	uction Costs DATE: JULY			Unit	ID: JUL 6, 2004		Item
Item	Description	Unit		Price	Quantity		Price
Divisio	n 1 - General Requirements						
	1						
Divisio 1	n 2 - Site Work Cut/Fill	CY	\$	5	725	•	3,62
2	Removable Bollards	EA	\$	300		\$	1,80
3	Fencing	LS	\$	6,500		\$	6,50
4	9" AB	CY	\$	36	50		1,80
5	3" AC	SF	\$	5	1600		8,00
3			Ť			Ť	-,-
6	O ₂ Tank slab	CY	\$	500.0	18	\$	9,00
7	Building slab	CY	\$	500.0	10		5,00
8	Wet Well	LS	\$	6,500.0	1		6,50
	n 4 - Masonry		Ť	-,		Ť	-,-
9	Split-block Masonry Building (20' x 20')	SF	\$	250.0	400	\$	100,00
Divisio	n 9 - Finishes						
10	Coatings	LS	\$	20,000.0	1	\$	20,00
Divisio	n 11 - Equipment						
11	Vertical Turbine Pumps and Appurtenances	EA	\$	76,500	1	\$	76,5
12	Drill & Prep 4' Diameter U-Tube Shaft	FT	\$	510	165	\$	84,1
13	Casing Material (Assume Welded Steel, 1")	LB	\$	1	82,900	\$	82,9
14	Install U-Tube Casing	FT	\$	50	165	\$	8,2
15	Install Bottom Plug (concrete and mortar)	CY	\$	500	8	\$	4,0
16	Pump Water from Shaft and Prepare Casing	LS	\$	12,000	1	\$	12,0
17	Bubble Collector and Appurtenances	EA	\$	8,000	1	\$	8,0
18	Oxygen Diffuser	EA	\$	2,000	1	\$	2,0
19	Fish Screen (Barrel)	EA	\$	357,500	1	\$	357,5
	n 13 - Special Construction						
20	Pressure Gages/Transmitters	EA	\$	1,500		\$	3,0
21	Flow Meter (12" Mag)	EA	\$	13,500	1	\$	13,5
	n 15 - Mechanical					\$	16,5
22	O ₂ Supply Line Piping and Appurtenances	LF	\$	12	100		1,2
23	O ₂ Control Valve and Equipment	EA	\$	3,000	1		3,0
24	18" Pump Control Valve	EA	\$	24,000	1	\$	24,0
25	Isolation Valves	EA	\$	11,000	2	\$	22,0
26	18" Ductile Iron Pipe \$/Dia-In 1	8 LF	\$	162	20	\$	3,2
27		8 LF	\$	162	60	\$	9,7
28	Inner Piping System (18 Inch) \$/Dia-In 1	8 LF	\$	162	165	\$	26,7
29	HDPE Diffuser Pipe (Assume 24" Dia) \$/Dia-In 2	4 LF	\$	18	800	\$	14,4
30	Pressure Regulating Station	EA	\$	5,000	4	\$	20,0
31	Diffuser Supports	EA	\$	150	80	\$	12,0
32	Lateral Installation (Within Water Column)	LF	\$	94	800	\$	75,2
	n 16 - Electrical and Instrumentation						
33	Supply	LS	\$	50,000		\$	50,0
34	Control Systems and Instrumentation	LS	\$	30,000	1	\$	30,0
35	Control Wiring	LS	\$	5,000	1	_	5,0
kouna	ed Subtotal*					\$	1,128,0
Senera	al Contractor Indirect Costs						
	Construction Management (Contractor)			2.5%	\$ 1,128,000	\$	28,2
	Mobilization/Demobilization	LS	\$	22,500	1	\$	22,5
				unded Subtota	 *	\$	51,0
				ction Costs		\$	1,179,0
		Continge	encies		35%	\$	412,6
OTAL	CONSTRUCTION COSTS WITH CONTINGENCIES*					\$	1,592,0
Whor E	Project Costs						
Julei F	Engineering/SDC				10.0%	Ф	159.2
	Permitting				7.0%		111,4
	Construction Services/Inspections				10.0%		159,2
	Construction Services/Inspections		Roi	unded Subtota		\$	430,0
OTAL	ESTIMATED CAPITAL COSTS		1100	anded Cablola		\$	2,022,0
RECUF	RRING CAPITAL EXPENSES	REPLAC	EME	NT INTERVAL			
	Pump Motor	10		yrs		\$	5,0
	Impeller	10		yrs		\$	5,0
	Diffuser Lateral	10		yrs		\$	101,6
	Oxygen Diffuser	5		yrs		\$	6,0
otal R	Recurring Capital Expenses		Rou	unded Subtota	l*	\$	118,0
	AL OPERATION AND MAINTENANCE COORS						
	AL OPERATION AND MAINTENANCE COSTS					_	
ANNUA	Equipment Maintenance (Equipment and Mechanical)				3.0%		12,3
ANNUA					2.0%		40,4
ANNUA	Monitoring and Adaptive Management				40	•	0.0
ANNUA	Oxygen Tank Rental	Month	\$	750	12		9,0
ANNUA	Oxygen Tank Rental Oxygen Supply (13,700 lbs/day)	lbs	\$	0.07	1,370,000	\$	95,9
	Oxygen Tank Rental					\$	



U-TUBE ALTERNATIVE D - ONE 6' OUTER DIAMETER (3' OUTER RADIUS) U-TUBE X 115 FT HEIGHT

ENGINEER'S COST OPINION: PRELIMINARY DESIGN
CALIFORNIA BAY DELTA AUTHORITY
SAN JOAQUIN RIVER AERATION ENGINEERING FEASIBILITY STUDY
DATE: JULY 2, 2004 CHD: JUL 6, 2004

Construction Costs

COHSU	uction Costs DATE	JULY 2,	2004			D: JUL 6, 2004	1	
Item	Description		Unit		Unit Price	Quantity		Item Price
	n 1 - General Requirements		0			w		11.00
Di	- O Cita Manie							
Divisio 1	n 2 - Site Work Cut/Fill		CY	\$	5	725	\$	3,62
2	Removable Bollards		EA	\$	300	6		1,80
3	Fencing		LS	\$	6,500	1	\$	6,50
4	9" AB		CY	\$	36	50		1,800
5	3" AC		SF	\$	5	1600	\$	8,00
	n 3 - Concrete		C)/		500	40	•	0.00
6 7	O ₂ Tank Slab		CY	\$ \$	500	18 10		9,00
8	Building Slab Wet Well		CY LS	\$	500 6,500	10		5,000 6,500
	n 4 - Masonry		LO	Ψ	0,500	<u>'</u>	Ψ	0,50
9	Split-block Masonry Building (20' x 20')		SF	\$	250	400	\$	100,00
	n 9 - Finishes							
10	Coatings		LS	\$	20,000	1	\$	20,000
11	n 11 - Equipment Vertical Turbine Pumps and Appurtenances		EA	\$	76,500	2	s	153,00
12	Drill & Prep 6' Diameter U-Tube Shaft		FT	\$	871	115		100,16
13	Casing Material (Assume Welded Steel, 1")		LB	\$	1	87,300		87,30
14	Install U-Tube Casing		FT	\$	50	115	\$	5,750
15	Install Bottom Plug (concrete and mortar)		CY	\$	500	25		12,500
16	Pump Water from Shaft and Prepare Casing		LS	\$	35,000	1		35,00
17 18	Bubble Collector and Appurtenances Oxygen Diffusers		EA EA	\$	8,000 3,000	1 1	\$ \$	8,000 3,000
19	Fish Screen (Barrel)		EA	\$	500,000	1		500,00
	n 13 - Special Construction			ľ	,			222,000
20	Pressure Gages/Transmitters		EA	\$	1,500	2	\$	3,000
21	Flow Meter (12" Mag)		EA	\$	13,500	1	\$	13,50
Divisio 22	n 15 - Mechanical O ₂ Supply Line Piping and Appurtenances		LF	\$	12	100	\$	1,200
23	O ₂ Supply Line Piping and Appurtenances O ₂ Control Valve		EA	\$	3,000	2		6,00
24	20" Pump Control Valve		EA	\$	28,000	2		56,000
25	Isolation Valves		EA	\$	14,000	3		42,00
26	20" Ductile Iron Pipe (Header) \$/Dia-l	ln 20	LF	\$	180	40	\$	7,20
27	30" Ductile Iron Pipe (Collector/Disch) \$/Dia-l		LF	\$	270	20		5,400
28	20" Ductile Iron Pipe (Discharge) \$/Dia-l		LF	\$	180	21		3,780
29	20" Flexible Piping \$/Dia-l		LF	\$	180	120		21,600
30 31	Inner Piping System \$/Dia-I HDPE Diffuser Pipe (Assume 24" Dia) \$/Dia-I		LF LF	\$	450 15	60 1600		27,000 24,000
32	HDPE Diffuser Pipe (Assume 24" Dia) \$/Dia-l Pressure Regulating Station	111 20	EA	\$	5,000	8		40,000
33	Diffuser Supports		EA	\$	150	160		24,000
34	Lateral Installation (Within Water Column)		LF	\$	94	1600		150,400
Divisio	n 16 - Electrical and Instrumentation							
35	Supply		LS	\$	50,000	1		50,000
36 37	Control Systems and Instrumentation Contol Wiring		LS LS	\$	30,000 5,000	1	\$	30,000 5,000
	ed Subtotal*		LO	φ	3,000	<u>'</u>	\$	1,578,000
Round	ed dubiotal						Ψ	1,570,000
Genera	al Contractor Indirect Costs							
	Construction Management (Contractor)				2.5% \$	1,578,000	\$	39,450
	Mobilization/Demobilization		LS	\$	28,000	11	\$	28,000
				Rou	nded Subtotal'	•	\$	68,00
			Total Co	netruc	tion Costs		\$	1 646 000
					tion Costs	35%	\$ \$	
TOTAL	CONSTRUCTION COSTS WITH CONTINGENCIES*		Total Co Continger		tion Costs	35%	\$ \$	576,100
					tion Costs	35%	\$	576,10
	Project Costs				tion Costs		\$	576,10 2,223,00
	Project Costs Engineering/SDC				tion Costs	10.0%	\$ \$	576,100 2,223,00 222,30
	Project Costs Engineering/SDC Permitting				tion Costs	10.0% 7.0%	\$ \$ \$ \$	576,100 2,223,00 0 222,300 155,610
	Project Costs Engineering/SDC			ncies		10.0% 7.0% 10.0%	\$ \$ \$ \$ \$	222,300 155,610 222,300
Other F	Project Costs Engineering/SDC Permitting			ncies	nded Subtotal	10.0% 7.0% 10.0%	\$ \$ \$ \$	222,300 2,223,000 222,300 155,610 222,300 600,000
Other F	Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS			ncies		10.0% 7.0% 10.0%	\$ \$ \$ \$ \$	576,100 2,223,00 0 222,300 155,610 222,300 600,000
Other F	Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES		Continge	Rou	nded Subtotal [*] T INTERVAL	10.0% 7.0% 10.0%	\$ \$ \$ \$ \$ \$	576,100 2,223,000 222,300 155,610 222,300 600,000 2,823,000
Other F	Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor		REPLAC 10	Rou	nded Subtotal [*] T INTERVAL yrs	10.0% 7.0% 10.0%	\$ \$ \$ \$ \$ \$	576,100 2,223,000 222,300 155,611 222,300 600,000 2,823,000
Other F	Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller		REPLAC 10 10	Rou	nded Subtotal ^a T INTERVAL yrs yrs	10.0% 7.0% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	576,100 2,223,000 222,300 155,610 222,300 600,000 2,823,000 12,000
Other F	Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral		REPLAC 10 10 10	Rou	nded Subtotal* T INTERVAL yrs yrs yrs yrs	10.0% 7.0% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$	576,10(2,223,00(222,30(155,61(222,30(600,00(2,823,00(12,00(10,00(198,40(
TOTAL	Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral Oxygen Diffuser		REPLAC 10 10	Roui	nded Subtotal ^a T INTERVAL yrs yrs	10.0% 7.0% 10.0%	\$ \$ \$ \$ \$ \$ \$	576,10(2,223,00(222,30(155,61) 222,30(600,00(2,823,00(10,00(198,40(9,00(
TOTAL	Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral		REPLAC 10 10 10	Roui	nded Subtotal* T INTERVAL yrs yrs yrs yrs yrs yrs	10.0% 7.0% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$	576,100 2,223,000 222,300 155,611 222,300 600,000 2,823,000 12,000 10,000 198,400 9,000
TOTAL RECUF	Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral Oxygen Diffuser Recurring Capital Expenses AL OPERATION AND MAINTENANCE COSTS		REPLAC 10 10 10	Roui	nded Subtotal* T INTERVAL yrs yrs yrs yrs yrs yrs	10.0% 7.0% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	576,100 2,223,000 222,300 155,611 222,300 600,000 2,823,000 12,000 198,400 9,000 230,000
TOTAL RECUF	Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral Oxygen Diffuser Recurring Capital Expenses AL OPERATION AND MAINTENANCE COSTS Equipment Maintenance (Equipment and Mechanic		REPLAC 10 10 10	Roui	nded Subtotal* T INTERVAL yrs yrs yrs yrs yrs yrs	10.0% 7.0% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	576,100 2,223,000 222,300 155,611 222,300 600,000 2,823,000 12,000 198,400 230,000
TOTAL RECUF	Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral Oxygen Diffuser Recurring Capital Expenses AL OPERATION AND MAINTENANCE COSTS Equipment Maintenance (Equipment and Mechanic Monitoring and Adaptive Management	cal)	REPLAC 10 10 10 5	Roui EMEN	T INTERVAL yrs yrs yrs yrs yrs hded Subtotal	10.0% 7.0% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	576,10 2,223,00 222,300 155,611 222,30 600,00 2,823,00 12,000 198,400 9,000 230,000 12,066 56,466
TOTAL RECUF	Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral Oxygen Diffuser Recurring Capital Expenses AL OPERATION AND MAINTENANCE COSTS Equipment Maintenance (Equipment and Mechanic Monitoring and Adaptive Management Oxygen Tank Rental	cal)	REPLAC 10 10 10 5	Roui Roui Roui	T INTERVAL yrs yrs yrs yrs yrs onded Subtotal*	10.0% 7.0% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	576,100 2,223,000 222,300 155,610 222,300 600,000 2,823,000 12,000 198,400 9,000 230,000
TOTAL RECUF	Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral Oxygen Diffuser Recurring Capital Expenses AL OPERATION AND MAINTENANCE COSTS Equipment Maintenance (Equipment and Mechanic Monitoring and Adaptive Management Oxygen Tank Rental Oxygen Supply (19,200 lbs/day)	cal)	REPLAC 10 10 10 5	Roun EMEN Roun \$	T INTERVAL yrs yrs yrs yrs yrs nded Subtotal*	10.0% 7.0% 10.0% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,646,000 576,100 2,223,000 155,611 222,300 600,000 2,823,000 12,000 198,400 9,000 230,000 12,066 56,466 9,000 134,400
TOTAL RECUF	Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral Oxygen Diffuser Recurring Capital Expenses AL OPERATION AND MAINTENANCE COSTS Equipment Maintenance (Equipment and Mechanic Monitoring and Adaptive Management Oxygen Tank Rental	cal)	REPLAC 10 10 10 5	Roui Roui Roui	T INTERVAL yrs yrs yrs yrs yrs onded Subtotal*	10.0% 7.0% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	576,10 2,223,00 222,300 155,611 222,30 600,00 2,823,00 12,00 198,40 9,00 230,00

SPEECE CONE ALTERNATIVE A - LOW PRESSURE 2 SPEECE CONES, TOP RADIUS=0.83', BOTTOM RADIUS=4.5'

ENGINEER'S COST OPINION: PRELIMINARY DESIGN
CAL-FED Bay Delta Authority
SAN JOAQUIN RIVER AERATION ENGINEERING FEASIBILITY STUDY

				2, 2004	T	Unit	: JUNE 24, 200		Item
ltem	Description			Unit		Price	Quantity		Price
	on 1 - General Requirements			Oilit		11100	Quantity		11100
	I								
ivisio	on 2 - Site Work								
1	Removable Bollards			EA	\$	300	6	\$	1,80
2	Fencing			LS	\$	6,500	1 :		6,50
3	9" AB			CY	\$	36	20	\$	72
4	3" AC			SF	\$	5	300	\$	1,50
	on 3 - Concrete								
5	O ₂ Tank Slab			CY	\$	500	15	\$	7,50
6	Building Slab			CY	\$	500	10	\$	5,00
Divisio	on 4 - Masonry								
7	Split-block Masonry Building (20' x 20')			SF	\$	250	400	\$	100,00
Divisio	on 9 - Finishes								
8	Coatings			LS	\$	10,000	1 :	\$	10,00
Divisio	on 11 - Equipment								
9	Vertical Turbine Pump and Appurtenance	es		EA	\$	45,900	2 :	\$	91,80
10	Speece Cone -15 ft height, 0.83 ft/4.5 ft r	adius		EA	\$	35,000	2	\$	70,00
11	Movable Equipment Platform			LS	\$	220,000	1 :	\$	220,00
12	Fish Screen			EA	\$	240,000	1 :	\$	240,00
Divisio	on 15 - Special Construction								
13	Pressure Gages/Transmitters			EA	\$	1,500	4 :		6,00
14	Flow Meter (12" Mag)			EA	\$	13,500	2 :	\$	27,00
	on 15 - Mechanical								
15	O ₂ Supply Piping and appertenances			LF	\$	12	65		78
16	O ₂ Control Valve			EA	\$	2,500	2 :	\$	5,00
17	12" Ductile Iron Pipe	\$/Dia-In	12	LF	\$	108	60	\$	6,48
18	Vent	\$/Dia-In	2	LF	\$	6	30	\$	18
19	12" Flexible Connection	\$/Dia-In	12	LF	\$	108	60	\$	6,48
20	Other Miscellaneous Piping			LS	\$	4,500	1 :	\$	4,50
21	Throttling Valve			EA	\$	3,400	2 :	\$	6,80
22	12" Pump Control Valve			EA	\$	8,000	2 :	\$	16,00
23	HDPE Diffuser Pipe	\$/Dia-In	20	LF	\$	10	800	\$	8,00
24	Diffuser Supports			EA	\$	150	80	\$	12,00
25	Diffuser in Speece-Cone for oxygen			LS	\$	1,000	2 :		2,00
26	Lateral Installation			LF	\$	94	800		75,20
	on 16 - Electrical and Instrumentation				Ť			•	,
27	Supply			LS	\$	50,000	1 :	\$	50,00
28	Control Systems and Instrumentation			EA	\$	40,000	1 :		40,00
29	Control Wiring			LS	\$	12,000	2		24,00
Round	ded Subtotal*				Ť	,		\$	1,046,00
Gener	al Contractor Indirect Costs								
	Construction Management (Contractor)					2.5% \$	1,046,000	\$	26,15
	Mobilization					2.0% \$	1,046,000	\$	20,92
					Rou	nded Subtotal*		\$	47,00
				Total Co	nstruc	tion Costs	:	\$	1,093,00
						tion Costs		\$	
ΓΟΤΑΙ	L CONSTRUCTION COSTS WITH CONTING	ENCIES*		Total Co Continger		tion Costs	35%		382,55
ΓΟΤΑΙ	L CONSTRUCTION COSTS WITH CONTING	ENCIES*				tion Costs	35%	\$	382,55
	L CONSTRUCTION COSTS WITH CONTING Project Costs	ENCIES*				tion Costs	35%	\$	382,55
		ENCIES*				tion Costs	35%	\$ \$	382,55 1,476,0 0
	Project Costs	ENCIES*				tion Costs	35%	\$ \$ \$	382,55 1,476,00 147,60
	Project Costs Engineering/SDC	ENCIES*				tion Costs	10.0%	\$ \$ \$	382,55 1,476,00 147,60 103,32
	Project Costs Engineering/SDC Permitting	ENCIES*			ncies	nded Subtotal*	35% : 10.0% : 7.0% : 10.0% :	\$ \$ \$	382,55 1,476,00 147,60 103,32 147,60
Other	Project Costs Engineering/SDC Permitting	ENCIES*			ncies		10.0% : 10.0%	\$ \$ \$ \$	382,55 1,476,00 147,60 103,32 147,60 399,00
Other	Project Costs Engineering/SDC Permitting Construction Services/Inspections	ENCIES*			ncies		10.0% : 10.0%	\$ \$ \$ \$	382,55 1,476,00 147,60 103,32 147,60 399,00
Other	Project Costs Engineering/SDC Permitting Construction Services/Inspections	ENCIES*		Continger	Rou		10.0% : 10.0%	\$ \$ \$ \$	382,55 1,476,00 147,60 103,32 147,60 399,00
Other	Project Costs Engineering/SDC Permitting Construction Services/Inspections L ESTIMATED CAPITAL COSTS	ENCIES*		Continger	Rou	nded Subtotal*	10.0% : 7.0% : 10.0% :	\$ \$ \$ \$	382,55 1,476,00 147,60 103,32 147,60 399,00 1,875,00
Other	Project Costs Engineering/SDC Permitting Construction Services/Inspections L ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES	ENCIES*		Continge	Rou	nded Subtotal* T INTERVAL	10.0% : 7.0% : 10.0% :	\$ \$ \$ \$ \$	382,55 1,476,00 147,60 103,32 147,60 399,00 1,875,00
Other	Project Costs	ENCIES*		Continger REPLACI 10	Rou	nded Subtotal* T INTERVAL yrs yrs	10.0% ; 7.0% ; 10.0% ;	\$ \$ \$ \$ \$	382,55 1,476,00 147,60 103,32 147,60 399,00 1,875,00
Other	Project Costs	ENCIES*		REPLACI 10 10	Rou	nded Subtotal* T INTERVAL yrs	10.0% : 7.0% : 10.0% : .	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$	382,55 1,476,00 147,60 103,32 147,60 399,00 1,875,00
Other	Project Costs	ENCIES*		REPLACI 10 10 10	Rou	nded Subtotal* T INTERVAL yrs yrs yrs	10.0% : 7.0% : 10.0% :	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	382,55 1,476,00 147,60 103,32 147,60 399,00 1,875,00
TOTAL	Project Costs Engineering/SDC Permitting Construction Services/Inspections L ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral Diffusers in Speece (2X)	ENCIES*		REPLACI 10 10 10	Rou	nded Subtotal* T INTERVAL yrs yrs yrs yrs yrs	10.0% : 7.0% : 10.0% :	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	382,55 1,476,00 147,60 103,32 147,60 399,00 1,875,00 10,00 95,20 6,00
Other OTAL RECU	Project Costs	ENCIES*		REPLACI 10 10 10	Rou	nded Subtotal* T INTERVAL yrs yrs yrs yrs yrs	10.0% : 7.0% : 10.0% :	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	382,55 1,476,00 147,60 103,32 147,60 399,00 1,875,00 10,00 95,20 6,00
Other OTAL RECU	Project Costs	ENCIES*		REPLACI 10 10 10	Rou	nded Subtotal* T INTERVAL yrs yrs yrs yrs yrs	10.0% ; 7.0% ; 10.0% ;	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	382,55 1,476,00 147,60 103,32 147,60 399,00 1,875,00 10,00 95,20 6,00
Other OTAL RECU	Project Costs	ENCIES*		REPLACI 10 10 10	Rou	nded Subtotal* T INTERVAL yrs yrs yrs yrs yrs	10.0% : 7.0% : 10.0% :	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	382,58 1,476,00 147,60 103,32 147,60 399,00 1,875,00 10,00 95,20 6,00 122,00
TOTAL Fotal F	Project Costs	ENCIES*		REPLACI 10 10 10	Rou	nded Subtotal* T INTERVAL yrs yrs yrs yrs yrs	35% 10.0%; 7.0%; 10.0%;	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	382,58 1,476,00 147,60 147,60 147,60 147,60 399,00 1,875,00 10,00 10,00 95,20 6,00 122,00 2,33 2,68
TOTAL Fotal F	Project Costs	ENCIES*		REPLACI 10 10 10 5	Rou Rou Rou	nded Subtotal* T INTERVAL yrs yrs yrs yrs yrs onded Subtotal*	10.0% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,093,00 382,55 1,476,00 147,60 103,32 147,60 399,00 1,875,00 10,00 95,20 6,00 122,00 2,30 2,66 37,50
TOTAL Fotal F	Project Costs	ENCIES*		REPLACI 10 10 5	Rou EMEN Rou	nded Subtotal* T INTERVAL yrs yrs yrs yrs yrs nded Subtotal*	10.0% : 7.0% : 10.0% : 10.0% : 2.5% : 1.0% : 2.0% : 12.1%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	382,55 1,476,00 147,60
Other OTAL RECU	Project Costs	ENCIES*		REPLACI 10 10 10 5	Rou Rou Rou	nded Subtotal* T INTERVAL yrs yrs yrs yrs yrs onded Subtotal*	10.0% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	382,55 1,476,00 147,60 103,32 147,60 1,875,00 1,875,00 10,00 95,22 6,00 122,00 2,36 37,56



SPEECE CONE ALTERNATIVE B - PRESSURIZED 2 SPEECE CONES, TOP RADIUS=0.83', BOTTOM RADIUS=4.5'

ENGINEER'S COST OPINION: PRELIMINARY DESIGN
CAL-FED Bay Delta Authority
SAN JOAQUIN RIVER AERATION ENGINEERING FEASIBILITY STUDY

	uction Costs	DATE: JU	Ť			Unit	: JUNE 24, 20	•	Item
Item	Description			Unit		Price	Quantity		Price
Divisio	n 1 - General Requirements								
	n 2 - Site Work						_		
1	Removable Bollards			EA	\$	300	6		1,80
2	Fencing			LS	\$	6,500	1		6,50
3	9" AB			CY	\$	36	20		72
4	3" AC			SF	\$	5	300	\$	1,50
	n 3 - Concrete								
5	O ₂ Tank Slab			CY	\$	500	15		7,50
6	Building Slab			CY	\$	500	10	\$	5,00
Divisio	n 4 - Masonry								
7	Split-block Masonry Building (20' x 20')			SF	\$	250	400	\$	100,00
Divisio	n 9 - Finishes								
8	Coatings			LS	\$	10,000	1	\$	10,00
Divisio	n 11 - Equipment								
9	Vertical Turbine Pump and Appurtenances	S		EA	\$	105,000	2	\$	210,00
10	Speece Cone -15 ft height, 0.83 ft/4.5 ft ra	adius		EA	\$	35,000	2	\$	70,00
11	Movable Equipment Platform			LS	\$	220,000	1	\$	220,00
12	Fish Screen			EA	\$	240,000	1	\$	240,00
Divisio	n 13 - Special Construction								
13	Pressure Gages/Transmitters			EA	\$	1,500	4	\$	6,00
14	Flow Meter (12" Mag)			EA	\$	13,500	2		27,00
Divisio	n 15 - Mechanical								
15	O ₂ Supply Piping and Appurtanances			LF	\$	12	65		78
16	O ₂ Control Valve			EA	\$	2,500	2	\$	5,00
17		\$/Dia-In	10	LF	\$	30	40	\$	1,20
18		\$/Dia-In	2	LF	\$	6	30		18
19		\$/Dia-In	10	LF	\$	50	20		1,00
20	· · · · · · · · · · · · · · · · · · ·	\$/Dia-In	12	EA	\$	60	60		3,60
21	Other Misc Piping	ψ/Dia iii	'-	LS	\$	4.500	1		4,50
22	Throttling Valve			EA	\$	3,400	2		6,80
23	12" Pump Control Valve			EA			2		
-	·	Φ/D:- I	40		\$	8,000			16,00
24		\$/Dia-In	12	LF	\$	9	800		7,20
25	Diffuser Supports			EA	\$	150	40		6,00
26	Diffuser in Speece-Cone for oxygen			EA	\$	1,000.00	2		2,00
27	Lateral Installation			LF	\$	94	800	\$	75,20
	n 16 - Electrical and Instrumentation								
28	Supply			LS	\$	50,000		\$	50,00
29	Control Systems and Instrumentation			LS	\$	40,000	1	\$	40,00
					\$	12,000	1		12,00
30	Control Wiring			LS	Ť		- '	•	
	ed Subtotal*			LS	Ť		'	\$	
Round	ed Subtotal*			LS	Ť			\$	
Round	ed Subtotal*			LS	Ť	2.5%			1,138,00
Round	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor)			LS	Ť	2.5% \$	1,138,000	\$	1,138,00 28,45
Round	ed Subtotal*			LS		2.0% \$	1,138,000 1,138,000	\$	1,138,00 28,45 22,76
Round	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor)			LS			1,138,000 1,138,000	\$	1,138,00 28,45 22,76
Round	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor)				Rou	2.0% \$ nded Subtotal*	1,138,000 1,138,000	\$ \$	1,138,00 28,45 22,76 52,00
Round	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor)			Total Coi	Rou	2.0% \$	1,138,000	\$ \$	1,138,00 28,45 22,76 52,00 1,190,00
Round Genera	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization				Rou	2.0% \$ nded Subtotal*	1,138,000 1,138,000	\$ \$ \$	1,138,00 28,45 22,76 52,00 1,190,00 416,50
Round Genera	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor)	ENCIES*		Total Coi	Rou	2.0% \$ nded Subtotal*	1,138,000	\$ \$	1,138,00 28,45 22,76 52,00 1,190,00 416,50
Round Genera	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE	ENCIES*		Total Coi	Rou	2.0% \$ nded Subtotal*	1,138,000	\$ \$ \$	1,138,00 28,45 22,76 52,00 1,190,00 416,50
Round Genera TOTAL	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE	ENCIES*		Total Coi	Rou	2.0% \$ nded Subtotal*	1,138,000 1,138,000	\$ \$ \$ \$ \$ \$ \$ \$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00
Round Genera TOTAL	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC	ENCIES*		Total Coi	Rou	2.0% \$ nded Subtotal*	1,138,000 1,138,000 35%	\$ \$ \$ \$ \$ \$ \$ \$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00
Round Genera	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC Permitting	ENCIES*		Total Coi	Rou	2.0% \$ nded Subtotal*	1,138,000 1,138,000 35%	\$ \$ \$ \$ \$ \$ \$ \$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00
Round Genera TOTAL	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC	ENCIES*		Total Coi	Rounstruc	2.0% \$ nded Subtotal*	1,138,000 1,138,000 35% 10.0% 7.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00 160,70 112,49 160,70
Round Genera TOTAL Other F	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC Permitting Construction Services/Inspections	ENCIES*		Total Coi	Rounstruc	2.0% \$ nded Subtotal*	1,138,000 1,138,000 35% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00 160,70 112,49 160,70 434,00
Round Genera TOTAL Other F	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC Permitting	ENCIES*		Total Coi	Rounstruc	2.0% \$ nded Subtotal*	1,138,000 1,138,000 35% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00
Genera TOTAL Other F	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS	ENCIES*		Total Coi Continger	Rou	2.0% \$ nded Subtotal*	1,138,000 1,138,000 35% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00 160,70 112,49 160,70 434,00
Genera TOTAL Other F	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES	ENCIES*		Total Cor Continger	Rou	2.0% \$ nded Subtotal* ction Costs nded Subtotal*	1,138,000 1,138,000 35% 10.0%	\$\$\$ \$\$\$\$ \$\$\$\$\$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00 160,70 434,00 2,041,00
Genera TOTAL Other F	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor (2X)	ENCIES*		Total Coi Continger	Rou	2.0% \$ inded Subtotal* ction Costs inded Subtotal* IT INTERVAL yrs	1,138,000 1,138,000 35% 10.0%	\$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00 112,49 160,70 434,00 2,041,00
Genera TOTAL Other F	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor (2X) Impeller	ENCIES*		Total Continger Continger REPLAC:	Rou	2.0% \$ nded Subtotal* ction Costs nded Subtotal* IT INTERVAL yrs yrs	1,138,000 1,138,000 35% 10.0%	\$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00 160,70 434,00 2,041,00
Genera FOTAL Other F	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor (2X) Impeller Diffuser Lateral	ENCIES*		Total Cor Continger	Rou	2.0% \$ nded Subtotal* nded Subtotal* IT INTERVAL yrs yrs yrs yrs	1,138,000 1,138,000 35% 10.0%	\$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00 112,49 160,70 434,00 2,041,00
FOTAL FOTAL	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor (2X) Impeller Diffuser Lateral Diffusers in Speece (2X)	ENCIES*		Total Continger Continger REPLAC:	Rou nstruc ncies	2.0% \$ inded Subtotal inded Subtotal IT INTERVAL yrs yrs yrs yrs yrs yrs yrs yr	35% 1,138,000 1,138,000 35% 10.0% 7.0%	\$\$\$\$ \$\$\$ \$ \$\$\$\$ \$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00 160,70 434,00 2,041,00 14,00 10,00 88,40 6,00
Round Genera TOTAL Other F	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor (2X) Impeller Diffuser Lateral	ENCIES*		Total Cor Continger	Rou nstruc ncies	2.0% \$ nded Subtotal* nded Subtotal* IT INTERVAL yrs yrs yrs yrs	35% 1,138,000 1,138,000 35% 10.0% 7.0%	\$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00 160,70 434,00 2,041,00 14,00 10,00 88,40 6,00
Round Genera TOTAL Other F	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor (2X) Impeller Diffuser Lateral Diffusers in Speece (2X) Iecurring Capital Expenses			Total Cor Continger	Rou nstruc ncies	2.0% \$ inded Subtotal inded Subtotal IT INTERVAL yrs yrs yrs yrs yrs yrs yrs yr	35% 1,138,000 1,138,000 35% 10.0% 7.0%	\$\$\$\$ \$\$\$ \$ \$\$\$\$ \$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00 160,70 434,00 2,041,00 14,00 10,00 88,40 6,00
Round Genera TOTAL Other F	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor (2X) Impeller Diffuser Lateral Diffuser Sin Speece (2X) Incurring Capital Expenses AL OPERATION AND MAINTENANCE COST			Total Cor Continger	Rou nstruc ncies	2.0% \$ inded Subtotal inded Subtotal IT INTERVAL yrs yrs yrs yrs yrs yrs yrs yr	1,138,000 1,138,000 35% 10.0% 7.0%	\$\$\$ \$\$\$ \$ \$\$\$ \$ \$\$\$ \$ \$\$ \$ \$\$\$ \$ \$\$ \$ \$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00 160,70 434,00 2,041,00 14,00 88,40 6,00 119,00
Round Genera TOTAL Other F	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor (2X) Impeller Diffuser Lateral Diffuser Lateral Diffuser Lateral Diffuser Lateral Diffuser Lateral Diffuser Sin Speece (2X) Recurring Capital Expenses AL OPERATION AND MAINTENANCE COST Pumps			Total Cor Continger	Rou nstruc ncies	2.0% \$ inded Subtotal inded Subtotal IT INTERVAL yrs yrs yrs yrs yrs yrs yrs yr	1,138,000 1,138,000 35% 10.0% 7.0% 10.0%	\$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00 160,70 434,00 2,041,00 14,00 10,00 88,40 6,00 119,00
Roundid Genera TOTAL Other F	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor (2X) Impeller Diffuser Lateral Diffusers in Speece (2X) Idecurring Capital Expenses AL OPERATION AND MAINTENANCE COST Pumps Pipes			Total Cor Continger	Rou nstruc ncies	2.0% \$ inded Subtotal inded Subtotal IT INTERVAL yrs yrs yrs yrs yrs yrs yrs yr	1,138,000 1,138,000 35% 10.0% 7.0% 10.0%	\$\$\$\$ \$\$ \$ \$\$\$ \$ \$\$\$ \$ \$\$\$\$ \$ \$\$\$\$\$ \$ \$\$\$\$\$\$\$\$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00 112,49 160,70 434,00 2,041,00 14,00 10,00 88,40 6,00 119,00 5,25 3,65
Roundid Genera TOTAL Other F	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor (2X) Impeller Diffuser Lateral Diffuser Lateral Diffusers in Speece (2X) Permitting COPERATION AND MAINTENANCE COST Pumps Pipes Monitoring and Adaptive Management			Total Cor Continger REPLAC 10 10 10 5	Rou nstrucies Rou Rou	2.0% \$ nded Subtotal* ition Costs nded Subtotal* IT INTERVAL yrs yrs yrs yrs yrs nded Subtotal*	1,138,000 1,138,000 35% 10.0% 7.0% 10.0%	\$\$\$\$ \$\$ \$ \$\$\$ \$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00 160,70 434,00 2,041,00 14,00 10,00 88,40 6,00 119,00 5,25 3,65 40,82
Roundid Genera TOTAL Other F	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RING CAPITAL EXPENSES Pump Motor (2X) Impeller Diffuser Lateral Diffuser In Speece (2X) Idecurring Capital Expenses AL OPERATION AND MAINTENANCE COST Pumps Pipes Monitoring and Adaptive Management Oxygen Tank Rental			Total Cor Continger REPLAC 10 10 10 5	Rou Rou Rou S	2.0% \$ Inded Subtotal* IT INTERVAL yrs yrs yrs yrs yrs nded Subtotal* 750	1,138,000 1,138,000 35% 10.0% 7.0% 10.0%	\$\$\$\$ \$\$ \$ \$\$\$ \$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00 160,70 434,00 2,041,00 14,00 10,00 88,40 6,00 119,00 5,25 3,65 40,82 9,00
Roundid Genera TOTAL Other F	ed Subtotal* Il Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTINGE Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor (2X) Impeller Diffuser Lateral Diffuser Lateral Diffusers in Speece (2X) Permitting COPERATION AND MAINTENANCE COST Pumps Pipes Monitoring and Adaptive Management			Total Cor Continger REPLAC 10 10 10 5	Rou nstrucies Rou Rou	2.0% \$ nded Subtotal* ition Costs nded Subtotal* IT INTERVAL yrs yrs yrs yrs yrs nded Subtotal*	1,138,000 1,138,000 35% 10.0% 7.0% 10.0%	\$\$\$\$ \$	1,138,00 28,45 22,76 52,00 1,190,00 416,50 1,607,00 160,70 434,00 2,041,00 14,00 10,00 88,40 6,00 119,00 5,25 3,65 40,82

SPEECE CONE ALTERNATIVE C - PRESSURIZED 1 SPEECE CONE, TOP RADIUS=1.8', BOTTOM RADIUS=9.4'

ENGINEER'S COST OPINION: PRELIMINARY DESIGN CAL-FED Bay Delta Authority SAN JOAQUIN RIVER AERATION ENGINEERING FEASIBILITY STUDY DATE: JULY 2, 2004 CHD: JUNE 24, 2004

		DATE: JU	1			Unit	D: JUNE 24, 20	_	Item
Item	Description		Ur	nit		Price	Quantity		Price
	on 1 - General Requirements								
	on 2 - Site Work				•	200		•	4.04
	Removable Bollards		LS E	А	\$	300	6 1	\$	1,80
3	Fencing 9" AB		LS C	V	\$	6500 36	20	œ	65 7:
4	3" AC		s		\$	5	300		1,5
	on 3 - Concrete		3	1	Ψ		300	Ψ	1,0
5	O ₂ Tank Slab		С	Υ	\$	500	15	\$	7,5
6	Building Slab		С	Υ	\$	500	10		5,0
	on 4 - Masonry				Ť			Ť	-,-
7	Split-block Masonry Building (20' x 20')		S	F	\$	250	400	\$	100,0
ivisio	n 9 - Finishes								
8	Coatings		L	S	\$	10,000	1	\$	10,0
	n 11 - Equipment								
9	Vertical Turbine Pump and Appurtenance	es	E		\$	45,900		\$	137,7
10	Speece Cone (30 ft height)			A	\$	80,500		\$	161,0
11	Movable Equipment Platform		L		\$	220,000		\$	220,0
12	Fish Screen (Barrel)		E	A	\$	500,000	1	\$	500,0
	on 13 - Special Construction		-	^		1 500		•	
13	Pressure Gages/Transmitters		E		\$	1,500		\$	6,0
14	Flow Meter (12" Mag)		E	A	\$	13,500	2	\$	27,0
ivisio 15	O ₂ Supply Piping and Appurtanances		L	F	\$	12	65	S	7
16	O ₂ Supply Fibring and Appurtanances O ₂ Control Valve		E		\$	2,500		э \$	5,0
17	24" Ductile Iron Pipe (Header)	\$/Dia-In	24 L		\$	2,300	60		12,9
18	Vent	\$/Dia-in \$/Dia-In	24 L		\$	216 6	30		12,9
19	24" Ductile Iron Pipe (Discharge)	\$/Dia-in \$/Dia-In	2 L 24 L		\$	216	20		4,3
20	24" Flexible Connection	\$/Dia-III \$/Dia-In	24 E		\$	216	60		12,9
21	Other Misc Piping	φ/ Δ/α-111	Li Li		\$	4,500		\$	4,5
22	Throttling Valve		E		\$	3,400		\$	6,8
23	24" Pump Control Valve		E		\$	30,000		\$	60.0
24	HDPE Diffuser Pipe	\$/Dia-In	12 L		\$	9	1600		14,4
25	Diffuser Supports	ψ. Σ.α	E		\$	150	160		24,0
26	Diffuser in Speece-Cone for oxygen		ΙĒ		\$	1,000		\$	2,0
27	Lateral Installation		Ī		\$	94	1600		150,4
	on 16 - Electrical and Instrumentation							Ť	,
28	Supply		L	S	\$	50,000	1	\$	50,0
	Control Systems and Instrumentation			S	\$	40,000		\$	40,0
29	Control Systems and instrumentation		L L						
29 30	Control Wiring		L		\$	12,000	1	Ψ	
30						12,000		\$	12,0
30 Round	Control Wiring ed Subtotal*					12,000			12,0
30 Round	Control Wiring ed Subtotal* al Contractor Indirect Costs						1	\$	12,0 1,586,0
30 Round	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor)					2.5%	\$ 1,586,000	\$	12,0 1,586,0 39,6
30 lound	Control Wiring ed Subtotal* al Contractor Indirect Costs				\$	2.5% 2.0%	\$ 1,586,000 \$ 1,586,000	\$ \$	12,0 1,586,0 39,6 31,7
30 Round	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor)				\$	2.5%	\$ 1,586,000 \$ 1,586,000	\$	12,0 1,586,0 39,6 31,7
30 Round	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor)		L	S	\$ Roui	2.5% 2.0% nded Subtota	\$ 1,586,000 \$ 1,586,000	\$ \$	12,0 1,586,0 39,6 31,7 72,0
30 Round	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor)		Total	Con	Roui	2.5% 2.0%	\$ 1,586,000 \$ 1,586,000	\$ \$ \$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0
30 Round Genera	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization	SENCIFS*	L	Con	Roui	2.5% 2.0% nded Subtota	\$ 1,586,000 \$ 1,586,000	\$ \$ \$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3
30 Round Genera	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor)	GENCIES*	Total	Con	Roui	2.5% 2.0% nded Subtota	\$ 1,586,000 \$ 1,586,000	\$ \$ \$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3
30 Rounde Genera	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization	SENCIES*	Total	Con	Roui	2.5% 2.0% nded Subtota	\$ 1,586,000 \$ 1,586,000	\$ \$ \$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3
30 Rounde Genera	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization	GENCIES*	Total	Con	Roui	2.5% 2.0% nded Subtota	\$ 1,586,000 \$ 1,586,000	\$ \$ \$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0
30 Rounde Genera	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTING	SENCIES*	Total	Con	Roui	2.5% 2.0% nded Subtota	\$ 1,586,000 \$ 1,586,000 * 35%	\$ \$ \$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0
30 Rounde Genera	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTING Project Costs Engineering/SDC	SENCIES*	Total	Con	Roui	2.5% 2.0% nded Subtota	1,586,000 \$ 1,586,000 * 35%	\$ \$ \$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0 223,9 156,7
30 Rounde Genera	Control Wiring ed Subtotal* all Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTING Project Costs Engineering/SDC Permitting	GENCIES*	Total	Con	Roui struc	2.5% 2.0% nded Subtota	1,586,000 \$ 1,586,000 1,586,000 1,586,000 1,586,000	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0 223,9 156,7 223,9
30 Round Genera OTAL	Control Wiring ed Subtotal* all Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTING Project Costs Engineering/SDC Permitting	GENCIES*	Total	Con	Roui struc	2.5% 2.0% Inded Subtota tion Costs	1,586,000 \$ 1,586,000 1,586,000 1,586,000 1,586,000	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0 223,9 156,7 223,9 055,0 2,844,0
30 Round Genera OTAL Other F	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTING Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS	BENCIES*	Total Conti	Con	Roun struc cies	2.5% 2.0% nded Subtota tion Costs	1,586,000 \$ 1,586,000 * 35% 10.0% 7.0% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0 223,9 156,7 223,9 605,0
30 Round Genera OTAL Other F	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTING Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES	GENCIES*	Total Conti	Conngen	Roun struc cies	2.5% 2.0% anded Subtota tion Costs	1,586,000 \$ 1,586,000 * 35% 10.0% 7.0% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0 223,9 605,0 2,844,0
30 Round Genera OTAL Other F	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTING Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor	SENCIES*	Total Conti	Conngen	Roun struc cies	2.5% 2.0% Inded Subtota anded Subtota T INTERVAL	1,586,000 \$ 1,586,000 * 35% 10.0% 7.0% 10.0%	\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0 223,9 605,0 2,844,0
30 Round Genera OTAL Other F	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTING Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller	SENCIES*	Total Conti	Conngen	Roun struc cies	2.5% 2.0% anded Subtota tion Costs anded Subtota T INTERVAL yrs yrs	1,586,000 \$ 1,586,000 * 35% 10.0% 7.0% 10.0%	\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0 156,7 223,9 605,0 2,844,0
30 Round Genera OTAL Other F	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTING Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral	GENCIES*	Total Conti	Conngen	Roun struc cies	2.5% 2.0% anded Subtota tion Costs T INTERVAL yrs yrs yrs yrs	1,586,000 \$ 1,586,000 * 35% 10.0% 7.0% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0 156,7 223,9 605,0 2,844,0
30 Round Genera OTAL OTAL	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTING Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral Diffusers in Speece (2X)	SENCIES*	Total Conti	Conngen	Roun struc cies	2.5% 2.0% 2.0% Inded Subtota T INTERVAL yrs yrs yrs yrs yrs yrs	1,586,000 \$ 1,586,000 * 35% 10.0% 10.0%	\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0 156,7 223,9 605,0 2,844,0
30 Round Genera OTAL Other F	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTING Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral	GENCIES*	Total Conti	Conngen	Roun struc cies	2.5% 2.0% anded Subtota tion Costs T INTERVAL yrs yrs yrs yrs	1,586,000 \$ 1,586,000 * 35% 10.0% 10.0%	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0 156,7 223,9 605,0 2,844,0
30 Rounde Genera OTAL OTAL RECUF	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTING Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral Diffusers in Speece (2X)		Total Conti	Conngen	Roun struc cies	2.5% 2.0% 2.0% Inded Subtota T INTERVAL yrs yrs yrs yrs yrs yrs	1,586,000 \$ 1,586,000 * 35% 10.0% 10.0%	\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0 156,7 223,9 605,0 2,844,0
30 Rounde Genera OTAL OTAL RECUF	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTING Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral Diffusers in Speece (2X) Recurring Capital Expenses		Total Conti	Conngen	Roun struc cies	2.5% 2.0% 2.0% Inded Subtota T INTERVAL yrs yrs yrs yrs yrs yrs	1,586,000 \$ 1,586,000 * 35% 10.0% 10.0%	\$ \$\$\$\$ \$ \$\$ \$ \$\$\$ \$ \$\$\$ \$ \$\$\$ \$ \$\$\$ \$ \$\$\$ \$ \$\$\$ \$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0 156,7 223,9 605,0 18,0 10,0 188,8 6,0
30 Rounde Genera OTAL OTAL RECUF	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTING Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral Diffusers in Speece (2X) Recurring Capital Expenses AL OPERATION AND MAINTENANCE COSTS		Total Conti	Conngen	Roun struc cies	2.5% 2.0% 2.0% Inded Subtota T INTERVAL yrs yrs yrs yrs yrs yrs	1,586,000 \$ 1,586,000 1,586,000 1* 35%	\$ \$\$\$\$ \$\$\$ \$ \$\$\$\$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0 156,7 223,9 605,0 10,0 188,8 6,0 223,0
30 Rounde Genera OTAL OTAL RECUF	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTING Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral Diffuser in Speece (2X) Recurring Capital Expenses AL OPERATION AND MAINTENANCE COSPumps		Total Conti	Conngen	Roun struc cies	2.5% 2.0% 2.0% Inded Subtota T INTERVAL yrs yrs yrs yrs yrs yrs	1,586,000 \$ 1,586,000 * 35% 10.0% 7.0% 10.0%	\$ \$\$\$\$ \$\$\$ \$ \$\$\$\$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0 156,7 223,9 605,0 18,0 10,0 18,8 6,0,0 223,0
30 Rounde Genera OTAL OTAL RECUF	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTING Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral Diffusers in Speece (2X) Recurring Capital Expenses AL OPERATION AND MAINTENANCE COS Pumps Pipes Monitoring and Adaptive Management Oxygen Tank Rental		Total Conti	Conngend	Roui Structies Roui Roui	2.5% 2.0% 2.0% Inded Subtota T INTERVAL yrs yrs yrs yrs yrs yrs	1,586,000 \$ 1,586,000 * 35% 10.0% 10.0% *	\$ \$\$\$ \$\$\$ \$ \$\$\$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0 156,7 223,9 605,0 10,0 188,8 6,0 223,0
30 Rounde Genera OTAL OTAL RECUF	Control Wiring ed Subtotal* al Contractor Indirect Costs Construction Management (Contractor) Mobilization/Demobilization CONSTRUCTION COSTS WITH CONTING Project Costs Engineering/SDC Permitting Construction Services/Inspections ESTIMATED CAPITAL COSTS RRING CAPITAL EXPENSES Pump Motor Impeller Diffuser Lateral Diffusers in Speece (2X) Recurring Capital Expenses AL OPERATION AND MAINTENANCE COS Pumps Pipes Monitoring and Adaptive Management		Total Conti	Conngend	Rour struccies	2.5% 2.0% anded Subtota tion Costs T INTERVAL yrs yrs yrs yrs yrs hded Subtota	1,586,000 \$ 1,586,000 * 35% 10.0% 7.0% 10.0% *	\$ \$\$\$ \$\$ \$ \$\$\$ \$	12,0 1,586,0 39,6 31,7 72,0 1,658,0 580,3 2,239,0 223,9 156,7 223,9 605,0



Construction Costs

BUBBLE PLUME ALTERNATIVE A - AIR

ENGINEER'S COST OPINION: PRELIMINARY DESIGN ENGINEER'S COST OFFINION...

CAL-FED Bay Delta Authority
SAN JOAQUIN RIVER AERATION ENGINEERING FEASIBILITY STUDY
CATE: IIII Y 2, 2004 CHD: JUNE 24, 2004

Item

	Description	Unit	Unit Price	Quantity	Item Price
	on 1 - General Requirements	Ollit	Price	Quantity	Price
DIVISIO	ni i - General Requirements				
Divisio	on 2 - Site Work				
1	Removable Bollards	EA	\$ 300	6 \$	2,000
2	Fencing	LS	\$ 6,500	1 \$	6,500
3	9" AB	CY	\$ 36	45 \$	1,620
4	3" AC	SF	\$ 5	1600 \$	8,000
Divisio	on 3 - Concrete				•
5	Building Slab	CY	\$ 500	10 \$	5,000
Divisio	on 4 - Masonry				
6	Split-block Masonry Building (20' x 20')	SF	\$ 250	400 \$	100,000
Divisio	on 9 - Finishes				
7	Coatings	LS	\$ 10,000	1 \$	10,000
Divisio	on 11 - Equipment				
8	Compressor and Appurtenances	EA	\$ 26,000	1 \$	26,000
Divisio	n 15 - Mechanical				
9	Distribution Line (10" HDPE) Dia	10 LF	\$ 5	5500 \$	27,500
10	Air Bubble Diffuser	LF	\$ 12	5500 \$	66,000
11	Diffuser Supports and Anchorage	EA	\$ 150	550 \$	82,500
12	Diffuser Installation	LF	\$ 94	11000 \$	1,034,000
13	Pressure Regulating Station	EA	\$ 5,000	27 \$	135,000
Divisio	on 16 - Electrical and Instrumentation				
14	Supply	LS	\$ 50,000	1 \$	50,000
15	Control Systems and Instrumentation	EA	\$ 35,000	1 \$	35,000
16	Control Wiring	LS	5,500	1	5,500
Round	ed Subtotal*			\$	1,595,000
Genera	al Contractor Indirect Costs				
	Construction Management (Contractor)		2.5%	\$ 1,595,000 \$	39,875
	Mobilization		2.0%		31,900
			Rounded Subtotal	* \$	72,000
		Total Cor	nstruction Costs	\$	1,667,000
		Continger	ncies	35 % \$	583,450
TOTAL	CONSTRUCTION COSTS WITH CONTINGENCIES*			\$	2,251,000
Other I	Project Costs				
	Engineering/SDC			10.0% \$	225,100
	Permitting			7.0% \$	157,570
	Construction Services/Inspections			10.0% \$	225,100
			Rounded Subtotal	* \$	608,000
			Rounded Subtotal	т.	000,000
TOTAL	ESTIMATED CAPITAL COSTS		Rounded Subtotal	\$	
					2,859,000
	RRING CAPITAL EXPENSES		EMENT INTERVAL	\$	2,859,000
	RRING CAPITAL EXPENSES Air Bubble Diffuser	10		\$	2,859,000 1,182,500
RECU	RRING CAPITAL EXPENSES Air Bubble Diffuser Compressor Motor		EMENT INTERVAL yrs yrs	\$ \$ \$	2,859,000 1,182,500 5,000
RECU	RRING CAPITAL EXPENSES Air Bubble Diffuser	10	EMENT INTERVAL yrs	\$ \$ \$	2,859,000 1,182,500 5,000
RECUF	RRING CAPITAL EXPENSES Air Bubble Diffuser Compressor Motor Recurring Capital Expenses	10	EMENT INTERVAL yrs yrs	\$ \$ \$	2,859,000 1,182,500 5,000
RECUF	RRING CAPITAL EXPENSES Air Bubble Diffuser Compressor Motor Recurring Capital Expenses ANNUAL OPERATION AND MAINTENANCE COSTS	10	EMENT INTERVAL yrs yrs	\$ \$ \$	2,859,000 1,182,500 5,000 1,188,000
RECUF	RRING CAPITAL EXPENSES Air Bubble Diffuser Compressor Motor Recurring Capital Expenses	10	EMENT INTERVAL yrs yrs	\$ \$ \$ *	2,859,000 1,182,500 5,000 1,188,000
RECUF	RRING CAPITAL EXPENSES Air Bubble Diffuser Compressor Motor Recurring Capital Expenses ANNUAL OPERATION AND MAINTENANCE COSTS	10	EMENT INTERVAL yrs yrs	\$ \$ \$	
Total F	RRING CAPITAL EXPENSES Air Bubble Diffuser Compressor Motor Recurring Capital Expenses - ANNUAL OPERATION AND MAINTENANCE COSTS Equipment and Maintenance (Equipment and Mechanical)	10	EMENT INTERVAL yrs yrs	\$ \$ \$ *	2,859,000 1,182,500 5,000 1,188,000

^{*}Rounded up to the nearest \$1,000.



Construction Costs

BUBBLE PLUME ALTERNATIVE B - AIR

ENGINEER'S COST OPINION: PRELIMINARY DESIGN ENGINEER'S COST OFFINION...

CAL-FED Bay Delta Authority
SAN JOAQUIN RIVER AERATION ENGINEERING FEASIBILITY STUDY
CATE: IIII Y 2, 2004 CHD: JUNE 24, 2004

Item

^{*}Rounded up to the nearest \$1,000.



BUBBLE PLUME ALTERNATIVE C - OXYGEN

ENGINEER'S COST OPINION: PRELIMINARY DESIGN

CAL-FED Bay Delta Authority
SAN JOAQUIN RIVER AERATION ENGINEERING FEASIBILITY STUDY

Construction Costs DATE: JULY 2, 2004 CHD: JUNE 24, 2004

<u>Cons</u> tr	ruction Costs DATE:	JUL	Y 2, 2004		CHD:	JUNE 24, 20	04	
Item	Description		Unit		Unit Price	Quantity		Item Price
Divisio	n 1 - General Requirements							
	on 2 - Site Work							
1	Removable Bollards		EA	\$	300		\$	1,800
2	Fencing		LS	\$	6,500	1	\$	6,50
3	9" AB		CY	\$	36	16		576
4	3" AC		SF	\$	5	400	\$	2,000
	on 3 - Concrete		0),					
5	O ₂ Tank Slab		CY	\$	500	15	\$	7,50
	on 9 - Finishes							
6	Coatings		LS	\$	4,000	1	\$	4,000
	on 15 - Mechanical							
7	Distribution Line Dia	3	LF	\$	2	1900		2,850
8	O ₂ Supply Piping and Appurtenances		LF	\$	12	30		360
9	O ₂ Control Valve		EA	\$	2,500	1		2,500
10	Pressure Regulating Station		EA	\$	5,000	10		47,500
11	Air Bubble Diffuser		LF	\$	12	1900		22,800
12	Diffuser Supports and Anchorage		EA	\$	150	190		28,500
13	Diffuser Installation		LF	\$	94	3800	\$	357,20
	n 16 - Electrical and Instrumentation							
14	Supply		LS	\$	25,000			25,00
15	Control Systems and Instrumentation		EA	\$	15,000	1	\$	15,00
16	Control Wiring ed Subtotal*		LS		3,500	1	\$	3,500.0 528,00
	Construction Management (Contractor) Mobilization			Rou	2.5% \$ 2.0% \$ nded Subtotal*	528,000 528,000	\$ \$	13,200 10,560 24,000
			Total Con	ction Costs		\$	552,000	
			Contingen	cies		35%	\$	193,200
TOTAL	CONSTRUCTION COSTS WITH CONTINGENCIES*						\$	746,000
Other F	Project Costs							
	Engineering/SDC					10.0%		74,60
	Permitting					7.0%		52,22
	Construction Services/Inspections					10.0%	\$	74,600
				Rou	nded Subtotal*		\$	202,000
TOTAL	ESTIMATED PROJECT COSTS						\$	948,000
RECUF	RRING CAPITAL EXPENSES		REPLACE	MEN	IT INTERVAL			
	Air Bubble Diffuser		10		yrs		\$	408,500
	7 th Bassie Billacel						_	
Total R	Recurring Capital Expenses*						\$	409,00
							\$	409,00
	Recurring Capital Expenses*					10.0%		•
	Recurring Capital Expenses* AL OPERATION AND MAINTENANCE COSTS					10.0% 3.0%	\$	94,800
	Recurring Capital Expenses* AL OPERATION AND MAINTENANCE COST\$ Equipment and Maintenance (Equipment and Mechanical)		Month	\$	750.00		\$	94,800 28,440 9,000
	Recurring Capital Expenses* AL OPERATION AND MAINTENANCE COST\$ Equipment and Maintenance (Equipment and Mechanical) Monitoring and Adaptive Management		Month lbs	\$	750.00 0.07	3.0%	\$ \$	94,800 28,440

^{*}Rounded up to the nearest \$1,000.



Construction Costs

BUBBLE PLUME ALTERNATIVE D - OXYGEN

ENGINEER'S COST OPINION: PRELIMINARY DESIGN

CAL-FED Bay Delta Authority
SAN JOAQUIN RIVER AERATION ENGINEERING FEASIBILITY STUDY

DATE: MAY 17, 2004 CHD: JUNE 1, 2004

Division 9 - Finishes	001101	uction costs DATE: N	1417	17, 2007	Спр:		JUNE 1, 2004		
Name		•		Unit			Quantity		
Removable Bollards	Divisio	n 1 - General Requirements							
Removable Bollards									
Pencing									4 000
3 9"AB									
A 3" AC									
Division 3 - Concrete									
S				SF	φ	3	400	Φ	2,000
Division 9 - Finishes				CY	\$	500	15	\$	7,500
Coatings		-						•	.,
Division 15 - Mechanical				LS	\$	4.000	1	\$	4,000
8 Q₂ Supply Piping and Appurtenances LF \$ 12 30 \$ 36 9 Q₂ Control Valve EA \$ 2,500 1 \$ 2,500 10 Pressure Regulating Station EA \$ 5,000 4 \$ 20,000 11 Air Bubble Diffuser LF \$ 12 800 \$ 9,600 12 Diffuser Supports and Anchorage EA \$ 100 80 \$ 8,000 13 Diffuser Installation LF \$ 94 1600 \$ 150,400 14 Supply LS \$ 25,000 1 \$ 25,000 15 Control Systems and Instrumentation EA \$ 15,000 1 \$ 25,000 16 Control Wiring LS \$ 3,500 1 \$ 3,500 17 Control Wiring LS \$ 3,500 1 \$ 3,500 18 Control Wiring LS \$ 3,500 1 \$ 3,500 19 Construction Management (Contractor) 2,5% \$ 259,000 \$ \$ 6,47 19 Mobilization 2,0% \$ 259,000 \$ \$ 5,180 10 Total Construction Costs \$ 271,000 10 Control Wiring 10,0% \$ 36,600 10 Construction Services/Inspections 10,0% \$ 36,600 10	Divisio	<u>. </u>			Ť	,		Ė	,
9	7	Distribution Line Dia	4	LF	\$	2	800	\$	1,600
10	8			LF	\$	12	30	\$	360
11	9	=		EA	\$	2,500	1	\$	2,500
12	10	Pressure Regulating Station		EA	\$	5,000	4	\$	20,000
13		Air Bubble Diffuser		LF	\$	12	800	\$	9,600
Division 16 - Electrical and Instrumentation LS \$ 25,000 1 \$ 25,000 1 \$ 25,000 1 \$ 25,000 1 \$ 25,000 1 \$ 25,000 1 \$ 25,000 1 \$ 25,000 1 \$ 25,000 1 \$ 3,500									8,000
14			_	LF	\$	94	1600	\$	150,400
15									0-00
16		1				•			
Seminary					Ъ	,		\$	
Construction Management (Contractor) 2.5% \$ 259,000 \$ 6,475		· · · · · · · · · · · · · · · · · · ·		LS		3,500	-	Φ	
Contingencies 35% \$ 94,850		,			Rou	2.0% \$		\$	5,180 12,000
State Construction Costs with Contingencies State Stat			Т	Total Construction Costs				\$	271,000
Construction Services/Inspections		Contingencies				35%	\$	94,850	
Engineering/SDC	TOTAL	CONSTRUCTION COSTS WITH CONTINGENCIES ⁴						\$	366,000
Permitting	Other F	-							
Construction Services/Inspections 10.0% \$ 36,600									
Rounded Subtotal* \$99,000		•							
\$ 465,000 \$ 465,000 \$ 465,000 \$ 465,000 \$		Construction Services/Inspections			D	0	10.0%		
RECURRING CAPITAL EXPENSES Air Bubble Diffuser 10 yrs \$ 168,000 Total Recurring Capital Expenses ANNUAL OPERATION AND MAINTENANCE COSTS Equipment and Maintenance (Equipment and Mechanical) Monitoring and Adaptive Management Oxygen Tank Rental Oxygen Supply Month \$ 750.00 12 \$ 9,000 0xygen Supply	TOTAL	FOTIMATED DDG IFOT COOTS			Κοι	inded Subtotain		_	
Air Bubble Diffuser 10 yrs \$ 168,000 Total Recurring Capital Expenses \$ 168,000 ANNUAL OPERATION AND MAINTENANCE COSTS Equipment and Maintenance (Equipment and Mechanical) 10.0% \$ 46,500 Monitoring and Adaptive Management 3.0% \$ 13,950 Oxygen Tank Rental Month \$ 750.00 12 \$ 9,000 Oxygen Supply lbs \$ 0.07 1,538,500 \$ 107,695	IOIAL	ESTIMATED PROJECT COSTS						Þ	465,000
\$ 168,000	RECUF	RRING CAPITAL EXPENSES	F	REPLACE	MEI	NT INTERVAL			
ANNUAL OPERATION AND MAINTENANCE COSTS Equipment and Maintenance (Equipment and Mechanical) Monitoring and Adaptive Management Oxygen Tank Rental Oxygen Supply Month 750.00 12 9,000 107,699		Air Bubble Diffuser		10		yrs			168,000
Equipment and Maintenance (Equipment and Mechanical) 10.0% \$ 46,500 Monitoring and Adaptive Management 3.0% \$ 13,950 Oxygen Tank Rental Month \$ 750.00 12 \$ 9,000 Oxygen Supply Ibs \$ 0.07 1,538,500 \$ 107,698	Total R	Recurring Capital Expenses						\$	168,000
Monitoring and Adaptive Management 3.0% \$ 13,950 Oxygen Tank Rental Month \$ 750.00 12 \$ 9,000 Oxygen Supply Ibs \$ 0.07 1,538,500 \$ 107,690	ANNUA	AL OPERATION AND MAINTENANCE COSTS							
Oxygen Tank Rental Month \$ 750.00 12 \$ 9,000 Oxygen Supply lbs \$ 0.07 1,538,500 \$ 107,698									46,500
Oxygen Supply lbs \$ 0.07 1,538,500 \$ 107,698		0 1							13,950
,0 11,7		• •							9,000
		,0 11 7	lk	os	\$	0.07	1,538,500	\$ \$	107,695 178,000

^{*}Rounded up to the nearest \$1,000.