

SOLIDS HANDLING MEMORANDUM

Project: SRWTP and EAFWTP Capacity Optimization, Remaining Life, and Reliability Improvement Study
Client: City of Sacramento Department of Utilities **Issue Date:** June 4, 2008
Subject: Solids Handling Improvements
File: 7670A00 City Project Number ZL61

Solids are produced at the EAFWTP from two major sources, sludge collection from the sedimentation basins and filter backwash water. Solids from backwashing are allowed to settle out in the filter wash water lagoons (FWWs) and the supernatant is recycled back to the head of the plant. Solids are solar dried and removed from the lagoons. Solids removed from the sedimentation basins are allowed to dry in the sludge lagoons through solar drying. The dried solids are then removed for disposal. The EAFWTP sludge and FWW lagoons have been difficult to manage due to the amount of solids produced and the long drying times required.

During the Capital Improvement Plan development a solids handling project was identified for implementation at EAFWTP. The project includes the installation of a solids capture device for the FWW lagoons and a solids thickening and dewatering process for the sludge lagoons.

The following cost estimate was developed for a gravity thickening and dewatering process located in the existing Sludge Lagoon 3. The process is designed for 150 dry tons per month, which is the maximum sludge production during build out water production in July (200 mgd) based on information developed by the City. The process consists of:

- Two 47-foot gravity thickeners, both in service at 3 lbs/ft³/day. This should produce a centrifuge feed concentration of 1.5 to 3.0 percent total solids. Most months one of these units can be removed from service for maintenance.
- Two centrifuges rated at 225 gpm at 1670 lbs/hr. Only one centrifuge is required to operate 6 hours per day during maximum month.
- Two conveyors and a cross over conveyor, so that either centrifuge can feed either sludge hopper.
- Two 12x12x15 feet side depth cake hoppers each designed to hold two days of cake production during maximum month. Hoppers are tall enough for cake hauling trucks to drive under them.
- CMU building 40x50x30 feet tall to house the centrifuge, MCC and other appurtenances.
- FWW sludge removal system that will pump to the gravity thickener.

- Site improvements including yard piping and a second access ramp to make the sludge lagoon a drive through.
- One round of contract dewatering to accommodate diminished capacity during construction.

It should be noted that there is adequate room in the lagoon for sodium hypochlorite storage if there is ever a need to switch the disinfection chemical feed system. This was excluded from the cost estimate.

During a water quality event similar to winter 2006 (near worst-case solids handling scenario), at build out water production rates of 80 mgd, with all equipment running this facility should be able to thicken and dewater all sludge produced by using both centrifuges for an extended run time.

During a water quality event similar to winter 1997 (worst-case solids handling scenario), at build out water production rates of 80 mgd, with all equipment running 24/7 for a month, this facility should be able to thicken and dewater all sludge produced by using both centrifuges. Additional sludge could also be put into Sludge Lagoon 1 and 2, as is current practice. In both of these scenarios the gravity thickener process performance will decline due to process overloading.

The design presented here is "full featured". A design without redundancy and unable to accommodate the worst winter loadings would be significantly less expensive.



PROJECT : City of Sacramento Fairbairn WTP
 JOB # : 7670A.00
 LOCATION : Sacramento, CA
 ELEMENT : Solids Handling

DATE : March 18, 2008
 BY : CMF
 REVIEWED BY : DSJ

SPEC. NO.	DESCRIPTION	QUAN	UNIT	UNIT COST	SUBTOTAL	TOTAL
DIVISION 2 SITEWORK						
02220	Concrete Demolition					
	CUT EXTERIOR CONCRETE SLAB ON GRADE	16,347	inFT	\$0.46	\$7,552	
	6" EXTERIOR FLOOR SLAB REMOVAL, MESH REINF CONCRETE	13,722	SF	\$6.91	\$94,753	
	DEMO CONCRETE WALLS, HEAVY REBAR, 12"	160	SF	\$26.06	\$4,169	
02300	Earthwork					
	Excavation	1,273	CY	\$12.39	\$15,770	
	Offhall	1,500	CY	\$9.23	\$13,839	
	Backfill (near building)	23	CY	\$58.32	\$1,370	
	Backfill (trench)	232	CY	\$13.80	\$3,202	
	Bed and Zone backfill	132	CY	\$58.32	\$7,699	
	Aggregate Base Course	506	CY	\$58.30	\$29,502	
	Contract Dewatering	1	LS	\$150,000.00	\$150,000	
02700	Paving and Liners					
	4" AC Paving on 8" ABC	2,250	SF	\$15.24	\$34,279	
	6" Sidewalk	2,670	SF	\$3.25	\$8,663	
	SUBTOTAL SITEWORK					\$370,798
DIVISION 3 CONCRETE						
	48" Slab on grade	67	CY	\$289.00	\$19,267	
	48" Slab on grade forms	120	LF	\$39.56	\$4,748	
	24" Slab on grade	593	CY	\$304.67	\$180,641	
	24" Slab on grade forms	537	LF	\$23.86	\$12,805	
	24" Circular Slab on grade	434	CY	\$305.67	\$132,797	
	24" Walls	68	CY	\$877.53	\$59,806	
	18" Walls	237	CY	\$1,038.65	\$246,177	
	12" Walls	26	CY	\$1,487.76	\$38,687	
	SUBTOTAL CONCRETE					\$694,928
DIVISION 4 MASONRY						
	Masonry Building	2,000	SF	\$275.00	\$550,000	
	SUBTOTAL MASONRY					\$550,000
DIVISION 5 METALS						
	Aluminum Grating	1,000	SF	\$30.91	\$30,912	
	Aluminum handrail	800	LF	\$81.02	\$64,812	
	Aluminum Stairs	60	RSR	\$554.31	\$33,259	
	Steel Hopper	2	EA	\$948,312.62	\$1,896,625	
	Circular Stairs	160	RSR	\$554.31	\$88,690	
	SUBTOTAL METALS					\$2,114,298
DIVISION 8 DOORS AND WINDOWS						
	12'x14' Metal Roll-up door	2	EA	\$3,245.00	\$6,490	
	SUBTOTAL WOODS AND PLASTICS					\$6,490
DIVISION 9 FINISHES						
	Hopper coating (Elastomeric polyurethane)	941	SF	\$16.50	\$15,531	
	SUBTOTAL FINISHES					\$15,531
DIVISION 11 EQUIPMENT						
	Polymer Blending Unit	3	EA	\$56,880.00	\$170,640	
	Fiberglass sludge mix/storage tank	2	EA	\$64,000.00	\$128,000	
	Sludge tank mixing pump	2	EA	\$32,400.00	\$64,800	
	Centrifuge	2	EA	\$430,000.00	\$860,000	
	Diverter (for Centrifuge)	2	EA	\$15,000.00	\$30,000	
	Gravity Thickener Drive Mechanism	2	EA	\$252,359.00	\$504,718	
	Progressive Cavity Pump (250 gpm 1 stage)	4	EA	\$27,653.00	\$110,612	
	FWW SYSTEM					
	Installation	1	LS	\$420,000.00	\$420,000	



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SPEC. NO.	DESCRIPTION	QUAN	UNIT	UNIT COST	SUBTOTAL	TOTAL
	Solids Capturing Device (four 22 ft wide passes)	4	EA	\$213,000.00	\$852,000	
	SUBTOTAL EQUIPMENT					\$3,140,770
DIVISION 14	CONVEYING SYSTEMS					
	Screw Conveyor	200	LF	\$3,300.00	\$660,000	
	Screw Conveyor Gate	2	EA	\$5,500.00	\$11,000	
	Sludge Gate (for hopper)	2	EA	\$33,000.00	\$66,000	
	Bridge Crane	1	EA	\$257,182.67	\$257,183	
	Live Bottom Floor	16	LF	\$5,500.00	\$88,000	
	SUBTOTAL MECHANICAL					\$1,082,183
DIVISION 15	MECHANICAL					
	6" GLDI Pipe	1,000	LF	\$49.93	\$49,927	
	6" CISP Pipe	500	LF	\$38.39	\$19,194	
	6" SCH 80 PVC Pipe	1,000	LF	\$25.87	\$25,873	
	2" SCH 80 PVC Pipe	2,000	LF	\$7.50	\$14,993	
	Pipe supports	300	EA	\$55.00	\$16,500	
	Valves and fittings	1	LS	30%	\$32,996	
	HVAC	1	LS	5%	\$37,172	
	SUBTOTAL MECHANICAL					\$196,655
DIVISION 16	Electrical, Instrumentation and Control	30%			\$2,451,495	
	SUBTOTAL EI&C					\$2,451,495
	TOTAL GRAVITY THICKENER					\$10,623,147
	CONTINGENCY				30.0%	\$3,186,944
	SUBTOTAL					\$13,810,091
	GENERAL CONTRACTOR OVERHEAD, PROFIT & RISK				18.0%	\$2,485,816
	SUBTOTAL					\$16,295,907
	ESCALATION TO MID-POINT				0.0%	\$0
	SUBTOTAL					\$16,295,907
	SALES TAX (Based on CA)				7.25%	\$590,727
	SUBTOTAL					\$16,886,634
	BID MARKET ALLOWANCE				10.0%	\$1,688,663
	TOTAL ESTIMATED CONSTRUCTION COST					\$18,575,297
	ENGINEERING, LEGAL & ADMIN. FEES				20.0%	\$3,715,059
	OWNER'S RESERVE FOR CHANGE ORDERS				5.0%	\$928,765
	TOTAL ESTIMATED PROJECT COST					\$23,219,122