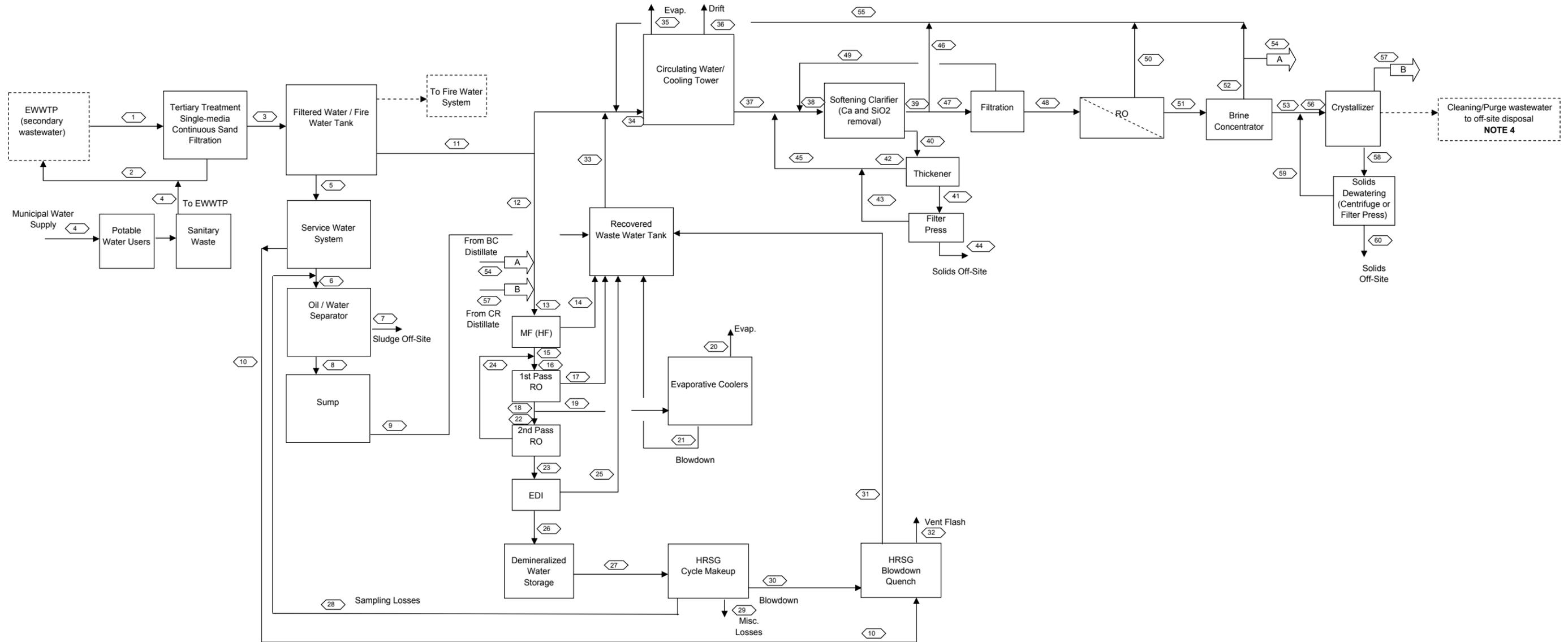


APPENDIX 2B

Water Balance Diagrams



- NOTE 1 - Recover brine concentrator and crystallizer distillates as partial makeup to MDS. However, MDS design currently based on using Filtered Water makeup exclusively
- NOTE 2 - Feed to MDS must be cooled to less than 100 oF
- NOTE 3 - PM10 limits may determine maximum TDS in the circulating water
- NOTE 4 - Will require collection and off-site disposal
- NOTE 5 - Phosphate removal included with Tertiary Treatment System

FIGURE 2B-1
WATER BALANCE SCHEMATIC DIAGRAM
 CPV VACA STATION
 VACAVILLE, CA

22-May-08	REV 3								
PROCESS FLOWS, GPM (Daily Average Flow Rate Each Case)									
Vacaville - CPV, 100% Reclaimed Wastewater (Based on Siemens Design)					(1% HRSG Blowdown Case)				
	CASES	Annual Average	Summer Typ	Summer Max	Winter Typical	Winter Min	Summer Max		Comments
	Duct Firing	OFF	OFF	OFF	OFF	OFF	ON		
	Evaporative Cooler	ON	ON	ON	OFF	OFF	ON		
	DBT, deg F	75.6	94.9	105.6	34.4	26.2	105.6		
	REL. Humidity, %	64.0	22.0	11.0	80.6	55.6	24.5		
	WBT, deg F	66.9	66.9	66.9	29.3	24.5	66.9		
	Number of CTG's	2	2	2	2	2	2		
Stream Numbers									
1	EWWTW Water Supply	2254.5	3129.4	3604.6	1613.1	1383.9	4363.3		
2	Filter Backwash (tertiary treatment) & Sanitary Wastewater	230.4	317.9	365.5	166.3	143.4	441.3	Assume 90% filter recovery	0.9
3	Filtered Effluent	2029.0	2816.5	3244.1	1451.8	1245.5	3927.0		
4	Municipal Water Supply / Sanitary Wastewater	5.0	5.0	5.0	5.0	5.0	5.0	Assume 5 gpm	5.0
5	Service Water System Feed	49.5	50.1	50.0	51.9	52.3	73.3	Assume 5 gpm & balance of flow to HRSG quench	5.0
6	Service Water System Effluent & Sampling Losses	10.0	10.0	10.0	10.0	10.0	10.0		
7	OWS Wastewater (in sludge)	0.0	0.0	0.0	0.0	0.0	0.0	Assume average is negligible	0.0
8	OWS Recovered Wastewater	10.0	10.0	10.0	10.0	10.0	10.0		
9	Recovered Wastewater from OWS Sump	10.0	10.0	10.0	10.0	10.0	10.0		
10	HRSG Blowdown Quench Water (Service Water)	44.5	45.1	45.0	46.9	47.3	68.3	Estimate 2 times HRSG Blowdown (from WP work)	2.0
11	Filtered Water Makeup To Cooling Tower & Makeup DM System	1979.5	2766.4	3194.1	1399.9	1193.2	3853.7		
12	Filtered Water Makeup to Makeup DM System	18.5	45.6	61.2	11.7	17.9	61.1		
13	Feed to MF System	71.8	121.4	147.6	50.8	51.1	165.2		
14	MF System Backwash Wastewater	3.6	6.1	7.4	2.5	2.6	8.3		
15	MF System Product Water	68.2	115.3	140.2	48.3	48.5	157.0		
16	1st Pass RO Feedwater	72.0	119.1	144.0	52.2	52.5	162.1	Assume MF recovery is 95%	0.95
17	1st Pass RO Reject	18.0	29.8	36.0	13.0	13.1	40.5		
18	1st Pass RO Product	54.0	89.3	108.0	39.1	39.3	121.6	Assume 75% recovery	0.75
19	Feed to Evaporative Coolers (1st Pass RO Product)	16.25	51.25	70.00	0.00	0.00	70.00		
20	Evaporative Cooler Evaporation	13.0	41.0	56.0	0.0	0.0	56.0	From WP Water Balances (REV D)	
21	Evaporative Cooler Blowdown	3.25	10.25	14.00	0.00	0.00	14.00	Assume 5 COC	5
22	2nd Pass RO Feed	37.7	38.1	38.0	39.1	39.3	51.6		
23	2nd Pass RO Product	34.0	34.3	34.2	35.2	35.4	46.4	Assume 90% recovery	0.90
24	2nd Pass RO Reject	3.8	3.8	3.8	3.9	3.9	5.2		
25	EDI Concentrate Wastewater	1.7	1.7	1.7	1.8	1.8	2.3		
26	EDI Product Water (feed to Demineralized Water Storage Tank)	32.3	32.6	32.5	33.5	33.6	44.1	Assume 95% recovery	0.95
27	Feed to HRSG Cycle Makeup	32.3	32.6	32.5	33.5	33.6	44.1		
28	Sampling Losses	5.0	5.0	5.0	5.0	5.0	5.0	Assume 5 gpm	5.0
29	Miscellaneous DM Water Losses	5.0	5.0	5.0	5.0	5.0	5.0	Assume 5 gpm	5.0
30	HRSG Blowdown	22.3	22.6	22.5	23.5	23.6	34.1	From WP Heat Balances, using Point 19 (assume 1% blowdown)	0.01
31	Quench Tank Blowdown	55.7	56.4	56.3	58.6	59.1	85.3		
32	HRSG Blowdown Quench Flash	11.1	11.3	11.3	11.7	11.8	17.1	Estimate 50% of HRSG Blowdown (from WP work)	0.50
33	Recovered Wastewater	92.2	114.2	125.4	86.0	86.5	160.4		
34	Cooling Tower Makeup	2536.7	3504.7	4026.7	1822.7	1556.7	4882.7		
35	Cooling Tower Evaporation	1995.0	2753.0	3165.0	1431.0	1225.0	3841.0	From WP Water Balances (REV D)	
36	Cooling Tower Drift	1.7	1.7	1.7	1.7	1.7	1.7	From WP Heat Balances, using Point 23 (assume 0.001% drift)	0.00001
37	Cooling Tower Blowdown	540.0	750.0	860.0	390.0	330.0	1040.0	Separate calculation estimate (circulating water chemistry silica limited)	
38	Softening Clarifier Feed	560.0	778.2	892.2	404.6	342.3	1078.9	Chemical Feed Flows not included	
39	Softening Clarifier Effluent	551.6	766.5	878.8	398.5	337.2	1062.7		
40	Softening Clarifier Blowdown	8.4	11.7	13.4	6.1	5.1	16.2	Assume 1.5% Blowdown	0.015
41	Gravity Thickener Effluent (Filter Press Feed)	1.4	1.9	2.2	1.0	0.9	2.7	Assume 1% solids to 6% solids	0.167
42	Gravity Thickener Decant	7.0	9.7	11.1	5.1	4.3	13.5		
43	Filter Press Filtrate	1.2	1.6	1.9	0.8	0.7	2.2		
44	Filter Press Solids	0.2	0.3	0.4	0.2	0.1	0.5	Assume 6% to 35% solids	0.171
45	Dewatering Wastewater Recovery	8.2	11.3	13.0	5.9	5.0	15.7		
46	Clarifier Effluent Return to Cooling Tower	315.0	430.0	495.0	225.0	190.0	600.0	Separate calculation estimate (circulating water chemistry silica limited)	
47	Filter Feed	236.6	336.5	383.8	173.5	147.2	462.7		
48	Filter Effluent	224.8	319.7	364.6	164.8	139.9	439.5	Assume 95% recovery	0.95
49	Filter Backwash	11.8	16.8	19.2	8.7	7.4	23.1		
50	RO Product Water (recovered to cooling tower)	168.6	239.8	273.5	123.6	104.9	329.7	Assume 75% recovery	0.75
51	RO Reject	56.2	79.9	91.2	41.2	35.0	109.9		
52	Brine Concentrator Distillate	45.0	63.9	72.9	33.0	28.0	87.9	Estimate RO Reject = 30,000 mg/L; BC bottoms = 150,000 mg/L	0.20
53	Brine Concentrator Waste	11.2	16.0	18.2	8.2	7.0	22.0		
54	Brine Concentrator Distillate to MDS Feed	45.0	63.9	72.9	33.0	28.0	87.9		
55	Combined ZLD System Recovery to Cooling Tower	483.6	669.8	768.5	348.6	294.9	929.7		
56	Crystallizer Feed	16.6	23.6	26.9	12.2	10.3	32.5		
57	Crystallizer Distillate (to MDS)	8.31	11.81	13.47	6.09	5.17	16.24	BC Bottoms = 15% dry solids; CR Bottoms = 30% dry solids	0.50
58	Dewatering System Feed	8.31	11.81	13.47	6.09	5.17	16.24		
59	Dewatering System Recovery	5.37	7.64	8.72	3.94	3.34	10.51		
60	Dewatered Crystallizer Solids	2.93	4.17	4.76	2.15	1.82	5.73	Assume 85% dry solids	0.353