APPENDIX A

Operational Data

Table A-1
NEWMARK RD
Actual Operational Data
Waterman Facility

	SOUTH TOWER			NORTH TOWER		
Date	Air Flow (scfm)	GW Flow (gpm)	A:W ratio _:1	Air Flow (scfm)	GW Flow (gpm)	A:W ratio _:1
01/07/93		2,900				
01/14/93		2,900				
01/21/93						
01/28/93		3,000				
02/04/93						
02/11/93						
02/18/93	20,000	4,600	33	32,700	4,000	61
02/25/93	21,100	3,000	53			
03/04/93	21,400	3,000	53			
03/11/93	20,900	4,000	39			
03/18/93						
03/25/93						
04/01/93	21,200	5,400	29	36,250	4,900	55
04/08/93	20,400	3,800	40	34,600	3,600	72
04/15/93	20,700	3,000	52			
04/22/93	25,600	4,800	40			
04/29/93	25,400	2,668	71			
05/06/93	25,300	5,500	34	34,200	4,800	53
05/13/93	25,300	5,600	34	34,200	4,800	53
05/20/93	30,500	5,500	41	29,100	4,800	45
05/27/93	25,600	5,500	35			
06/03/93		3,000				
06/10/93	29,400	3,000	73			
06/17/93	29,800	3,000	74			
06/24/93	28,900	5,600	39			
07/01/93	28,300	5,400	39	27,300	4,800	43
07/08/93	29,400	5,400	41	27,800	4,800	43
07/15/93	30,000	4,500	50	28,900	4,000	54
07/22/93	29,800	3,000	74			
07/29/93	29,400	3,000	73			
08/05/93	27,200	5,600	36			
08/12/93	28,300	2,800	76			
08/19/93	29,100	2,900	75			
08/26/93		3,000				
09/02/93	29,800	2,950	76			
09/09/93	28,500	2,950	72			
09/16/93						
09/23/93	28,700	5,300	41	27,600	4,700	44
09/30/93	28,900	5,600	39			
10/07/93						
10/14/93						
10/21/93	29,800	2,800	80			
10/28/93	31,000	2,800	83			
11/04/93	30,200	2,900	78			
11/11/93	32,000	2,900	83			
11/18/93						
11/25/93						
12/02/93	29,200	5,600	39			
12/09/93						
12/16/93						
12/23/93						
12/30/93	30,200	5,800	39			

Table A-1
NEWMARK RD
Actual Operational Data
Waterman Facility

	SOUTH TOWER			NORTH TOWER		
Date	Air Flow (scfm)	GW Flow (gpm)	A:W ratio _:1	Air Flow (scfm)	GW Flow (gpm)	A:W ratio _:1
01/06/94						
01/13/94						
01/20/94	32,400	3,000				
01/27/94						
02/03/94	30,500	5,900				
02/10/94						
02/17/94	31,800	3,000				
02/24/94	31,600	3,000				
03/01/94	31,800	3,000				
03/08/94						
03/15/94						
03/22/94	31,600	3,000				
03/29/94						
04/07/94						
04/14/94						
04/21/94	30,700	3,000				
04/28/94						
05/03/94						
05/10/94						
05/17/94						
05/24/94						
05/31/94						
06/07/94	29,400	2,700				
06/14/94						
06/21/94	30,500	2,800				
06/28/94	27,800	4,400		28,000	4,300	
07/05/94	28,700	5,800				
07/12/94						
07/19/94		2,800				
07/26/94	29,400	2,800				
08/02/94	29,100	2,700				
08/09/94	27,600	2,700				
08/16/94	27,800	2,700				
08/23/94						
08/30/94	27,200	5,700				
09/06/94	27,800	5,800				
09/13/94	29,100	5,800				
09/20/94	29,600	2,700				
09/27/94	28,000	2,600				
10/04/94	29,800	2,524				
10/11/94	28,300	4,080		29,100	3,740	
10/18/94	29,200	4,488				
10/25/94						

MINIMUM:	20,000	2,524	29	27,300	3,600	43
MEAN:	16,853	2,547	19	3,892	560	6
MAXIMUM:	32,400	5,900	83	36,250	4,900	72

Figure A-1
Waterman South Tower Data

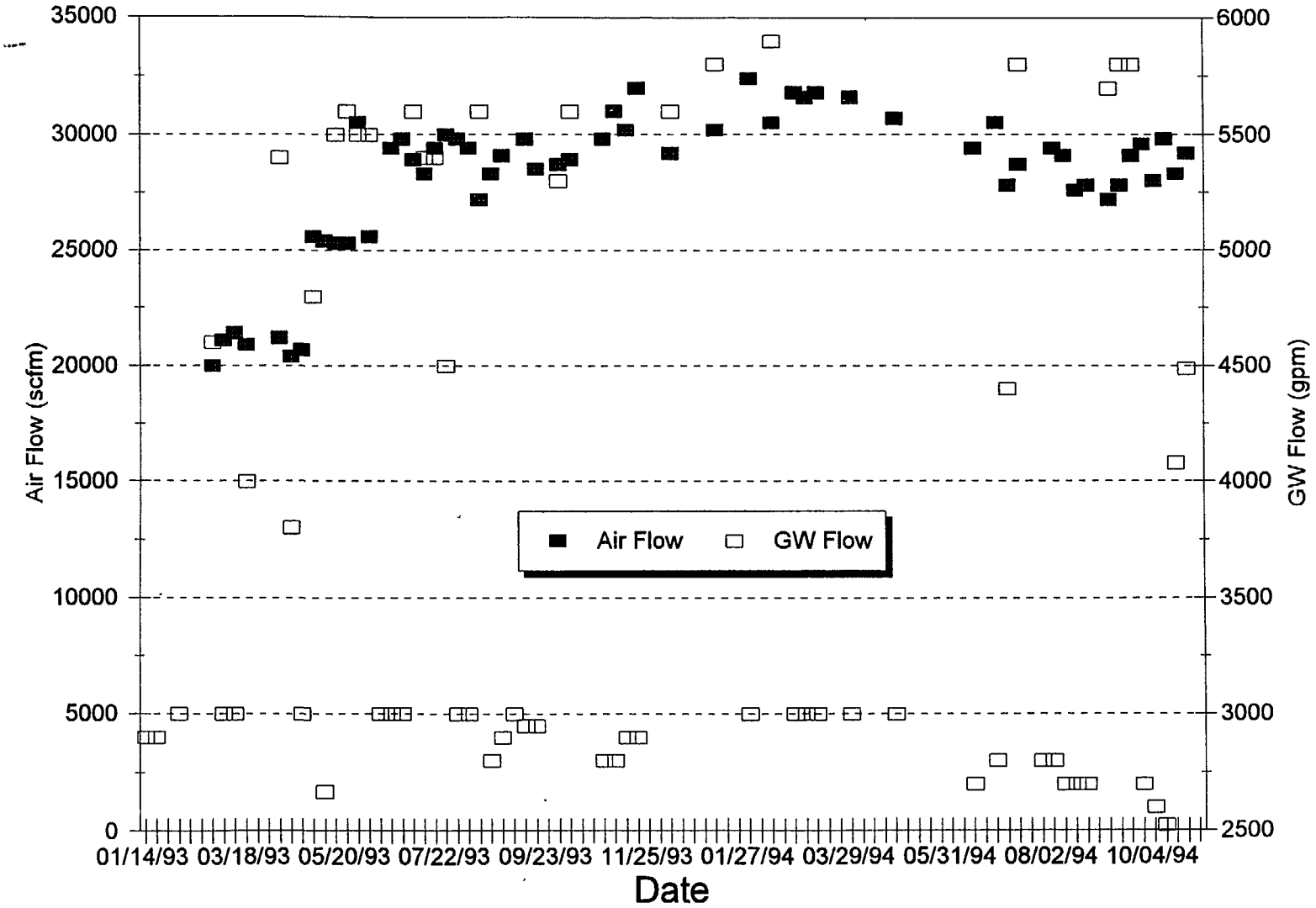
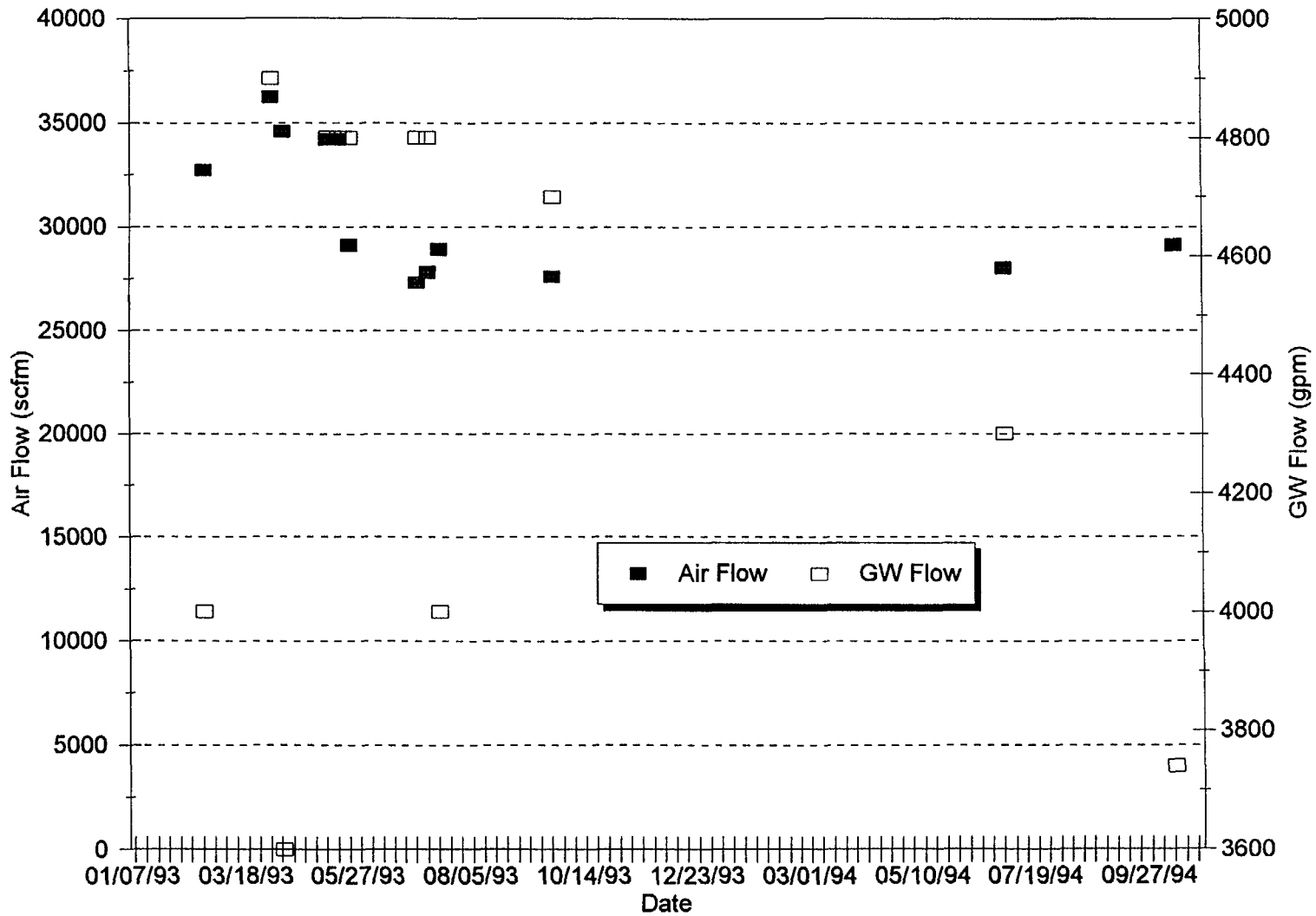


Figure A-2
Waterman North Tower Data



WATERMAN 14.4 M.G.
WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER OG SHEET

MONTH:___JAN 1993

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	CL2 LBS A/B	LBS/DAY	OPR
7.	7:30	NA	0	0	2900	3598200	NA	55:1	.4	150/37	18	LP
14.	7:25	NA	7048300	986000	2900	3968100	NA	55:1	.4	150/67	18	LP
21.	11:05	NA	0	0	0	2700500	NA	0	0	150/114	0	LP
28.	7:25	NA	6505500	241500	3000	2582100	NA	55:1	.4	150/30	19	LP

NORTH STRIPPING TOWER OG SHEET

DAY	TIME	S.T.HRS.	LEROY WATERMAN	31ST	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	CL2 LBS A/B	LBS/DAY	OPR
7.	7:35	NA	0	0	0	3598200	NA	0:0	0	37/150	0	LP
14.	7:25	NA	293500	0	0	3968100	NA	0:0	0	67/150	0	LP
21.	11:05	NA	0	0	0	2700500	NA	0:0	0	114/150	0	LP
28.	7:25	NA	0	0	0	2582100	NA	0:0	0	30/150	0	LP

TO: STATE HEALTH

CHEMICAL READS ON TOWERS

MONTH: JAN 1993

	SOUTH							NORTH						
		RESULTS				LBS REMOVED			RESULTS				LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
7.	26.91	2.7	16.4	ND	ND	.606	3.681	26.91	2.7	16.4	ND	ND	.606	3.681
14.	29.68	2.7	16.4	.5	1.8	.668	4.060	29.68	2.7	16.4	.6	2.1	.668	4.060
21.	20.20	2.7	16.4	ND	ND	.455	2.763	20.20	2.7	16.4	ND	ND	.455	2.763
28.	19.31	2.7	16.4	ND	ND	.435	2.641	19.31	2.7	16.4	ND	ND	.435	2.641
	96.10					2.164	13.145	96.10					2.164	13.145
						YTD TOTAL							YTD TOTAL	

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK
N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK
PPB X 1000 = PPM

WATERMAN 14.4 M.G.
WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER OG SHEET

MONTH:___FEB 1993

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	CL2 LBS A/B	LBS/DAY	OPR
4.	1:40	21214	0	0	0	2971200	0	0:0	.3	82/150	0	FD
11.	12:45	21341	3534900	627600	0	2704400	0	0:0	.35	0/130	0	FD
18.	11:30	21409	0	0	4600	1404200	20000	32:1	.5	150/70	38	LP
25.	11:20	21479	4138900	28600	3000	1412300	21100	56:1	.45	150/15	5	LM

NORTH STRIPPING TOWER OG SHEET

			LEROY	31ST								
4.	1:40	9199.2	0	0	0	200	0	0:0	0	150/85	0	FD
11.	12:45	9200.3	16900	5500	0	16700	0	0:0	.3	130/0	0	FD
18.	11:25	9201.7	0	0	4000	17000	32700	61:1	.6	70/150	34	LP
25.	11:30	9202.5	30600	11400	0	24200	0	0:0	.2	15/150	5	LM

TO: STATE HEALTH

CHEMICAL READS/TOWERS

MONTH: FEB 1993

	SOUTH							NORTH						
		RESULTS				LBS REMOVED				RESULTS			LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
4.	22.22	2.9	14.4	<.5	<.5	.537	2.669	0	2.9	14.4				
11.	20.23	2.9	14.4	ND	<.5	.489	2.430	.12	2.9	14.4	ND	<.5	.003	.014
18.	10.50	2.9	14.4	<.5	<.5	.254	1.261	.13	2.9	14.4	ND	<.5	.003	.016
28.	10.56	2.9	14.4	<.5	0.7	.255	1.268	.18	2.9	14.4	ND	ND	.004	.022
	63.51					1.535	7.628	.43					.010	.052
						YTD TOTAL	3.699	20.773					YTD TOTAL	2.174 13.197

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK
N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK
PPB X 1000 = PPM

WATERMAN 14.4 M.G.
WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER OG SHEET

MONTH:___MAR 1993

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	CL2 LBS A/B	LBS/DAY	OPR
4.	10:20	21557.7	0	0	3000	1637500	21400	53:1	.6	110/0	24	LP
11.	10:45	21662.2	4418700	1210900	4000	3009700	20900	54:1	.5	10/126	27	SS
18.	8:30	21797.8	0	0	0	3789700	0	0:0	.5	150/66	18	SS
25.	10:25	21934.3	5707900	3313200	0	4406200	0	0:0	.4	5/145	50	LP

NORTH STRIPPING TOWER OG SHEET

DAY	TIME	S.T.HRS.	LEROY WATERMAN	31ST 30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	CL2 LBS A/B	LBS/DAY	OPR
4.	10:20	9204.2	0	0	0	11400	0	0:0	1.1	0/110	0	LP
11.	10:40	9204.8	289100	13600	0	9200	0	0:0	.5	126/10	0	SS
18.	8:30	9205.3	0	0	0	2600	0	0:0	.4	66/150	0	SS
25.	10:20	9236.2	551500	3200	0	878500	0	0:0	.4	145/5	0	LP

TO: STATE HEALTH

CHEMICAL READS/TOWERS

MONTH: MAR 1993

	SOUTH							NORTH						
		RESULTS				LBS REMOVED			RESULTS				LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
4.	12.25	5.3	23.1	ND	<.5	.541	2.360	.09	5.3	23.1	ND	<.5	.004	.017
11.	22.51	5.3	23.1	ND	ND	.995	4.337	.07	5.3	23.1	ND	ND	.003	.013
18.	28.35	5.3	23.1	ND	ND	1.253	5.462	.02	5.3	23.1	ND	ND	.001	.004
28.	32.96	5.3	23.1	ND	ND	1.457	6.350	6.57	5.3	23.1	ND	ND	.290	1.266
	96.07					4.246	18.509	6.75					.298	1.300
						YTD TOTAL7.945	39.282						YTD TOTAL 2.472	14.497

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK
N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK
PPB X 1000 = PPM

WATERMAN 14.4 M.G.
WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER OG SHEET

MONTH:___APRL 1993

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	CL2 LBS A/B	LBS/DAY	OPR
1.	11:30	22028	0	0	5400	2606500	21200	29:1	.3	150/62	1	BL
8.	8:15	22155.2	0	0	3800	3680900	20400	40:1	.45	84/150	38	LP
15.	9:15	22298	4973500	2991000	3000	4545800	20700	51:1	.3	52/150	36	BL
22.	11:20	22448.3	0	0	4800	4900000	25600	39:1	.3	0/120	48	LP
29.	12:00	22613.7	6335700	6237600	2668	5756100	25400	71:1	.7	21/150	53	LP

NORTH STRIPPING TOWER OG SHEET

			LEROY	31ST								
1.	11:30	9237	0	0	4900	19100	36250	55:1	.5	150/62	1	BL
8.	8:10	9244.4	0	0	3600	203900	34600	71:1	.6	84/150	38	LP
15.	9:15	9278	1002000	77000	0	1153300	0	OFF	.3	52/150	36	BL
22.	11:15	9327.7	0	0	0	1777100	0	OFF	.25	0/120	48	LP
29.	12:00	9413.2	3777800	211000	0	2855100	0	OFF	.3	21/150	53	LP

TO: STATE HEALTH

CHEMICAL READS/TOWERS

MONTH: APRL 1993

SOUTH								NORTH						
		RESULTS			LBS REMOVED				RESULTS			LBS REMOVED		
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
1.	19.50	3.9	22.6	<.5	<.5	..634	3.67	0.14	3.9	22.6	<.5	<.5	.005	.026
8.	27.53	3.9	22.6	<.5	<.5	.895	5.189	1.52	3.9	22.6	<.5	<.5	.049	.286
15.	34.00	3.9	22.6	ND	ND	1.106	6.408	8.63	3.9	22.6	ND	ND	.281	1.627
22.	36.65	3.9	22.6	<.5	<.5	1.192	6.908	13.29	3.9	22.6	ND	ND	.432	2.505
29.	43.05	3.9	22.6	ND	<.5	1.400	8.114	21.36	3.9	22.6	ND	<.5	.695	4.026
	160.73					5.227	30.294	44.94					1.462	8.47
						YTD TOTAL	13.172	69.576				YTD TOTAL	6.176	22.967

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK
N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK
PPB X 1000 = PPM

WATERMAN 14.4 M.G.
WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER OG SHEET

MONTH:___MAY 1993

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	CL2 LBS A/B	LBS/DAY	OPR
6.	10:00	22780	0	0	5500	6283200	25300	34:1	.3	35/150	61	NP
13.	9:30	22923	5659700	6981600	5600	5584600	25300	34:1	.5	28/150	40	NP
20.	10:40	23114.6	0	0	5500	6250400	30500	41:1	.35	100/0	41	GS
27.	9:00	23231.2	5413600	5154900	5500	3038000	25600	0:1	.5	150/62	40	NP

NORTH STRIPPING TOWER OG SHEET

DAY	TIME	S.T.HRS.	LEROY WATERMAN	31ST	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	CL2 LBS A/B	LBS/DAY	OPR
6.	10:00	9430	0	0	4800	3432600	34200	53:1	.35	150/35	61	TF
13.	9:30	9558	3979300	571200	4800	4358400	34200	53:1	.35	150/28	40	NP
20.	10:40	9668.9	0	0	4800	1183900	29100	45:1	.35	0/100	41	GS
27.	9:00	9698.7	2662700	443200	0	954700	0	0:1	.3	62/150	40	NP

TO: STATE HEALTH

CHEMICAL READS/TOWERS

MONTH: MAY 1993

	SOUTH							NORTH						
		RESULTS			LBS REMOVED				RESULTS			LBS REMOVED		
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
6.	47.00	4.2	22.1	<.5	<.5	1.646	8.663	25.67	4.2	22.1	<.5	<.5	.899	4.731
13.	41.77	4.2	22.1	<.5	<.5	1.463	7.699	32.60	4.2	22.1	ND	<.5	1.142	6.009
20.	46.75	4.2	22.1	<.5	<.5	1.638	8.617	8.85	4.2	22.1	ND	<.5	.310	1.631
27.	22.72	4.2	22.1	<.5	<.5	.796	4.188	7.14	4.2	22.1	ND	<.5	.250	1.316
	158.24					5.543	29.167	74.26					2.601	13.687
						YTD TOTAL	18.715	98.743					YTD TOTAL	8.777 36.654

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK
N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK
PPB X 1000 = PPM

WATERMAN 14.4 M.G.
WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER OG SHEET

MONTH:___JUNE 1993

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	CL2 LBS A/B	LBS/DAY	OPR
3.	10:00		0	0	3000	4589300			.5			
10.	9:45	23487	4180500	1508600	3000	2813900	29400	79:1	.5	150/40	22	LM
17.	10:00	23634	0	0	3000	3962200	29800	74:1	.4	24/150	20	MG
24.	7:40	23789	6152300	5684100	5600	4666300	28900	39:1	.2	150/12	24	GS

NORTH STRIPPING TOWER OG SHEET

			LEROY	31ST								
3.	10:00		0	0		920400		0:1				
10.	9:45	9727	220300	53200	0	46500	0	0:1	.3	40/150	22	LM
17.	10:00	9739	0	0	0	490000	400	0:1		150/24	20	MG
24.	7:40	9782	2989600	341700	0	1662100	0	0:1	.1	12/150	22	GS

TO: STATE HEALTH

CHEMICAL READS/TOWERS

MONTH: JUNE 1993

	SOUTH							NORTH						
		RESULTS				LBS REMOVED			RESULTS				LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
3.	34.33	5.4	24.8	<.5	<.5	1.546	7.101	6.88	5.4	24.8	<.5	<.5	.310	1.423
10.	21.05	5.4	24.8	<.5	<.5	.948	4.354	.35	5.4	24.8	<.5	<.5	.016	.072
17.	29.64	5.4	24.8	<.5	<.5	1.335	6.131	3.66	5.4	24.8	<.5	<.5	.165	.757
24.	34.90	5.4	24.8	ND	ND	1.572	7.218	12.43	5.4	24.8	<.5	<.5	.560	2.571
	119.92					5.401	24.804	23.32					1.051	4.823
						YTD TOTAL	24.116	123.547					YTD TOTAL	9.828 41.477

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK
N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK
PPB X 1000 = PPM

WATERMAN 14.4 M.G.
WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER OG SHEET

MONTH: JULY 1993

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	CL2 LBS A/B	LBS/DAY	OPR
1.	10:45	23955.1	0	0	5400	5891300	28300	39:1	.4	150/67	25	SS
8.	8:30	24120.6	0	0	5400	6291800	29400	40:1	.4	90/12	30	SS
15.	8:00	24287.4	3804100	6891200	4500	5827100	30000	49:1	.5	150/70	25	SS
22.	7:30	24455.2	0	0	3000	5934400	29800	74:1	.5	24/99	24	SS
29.	7:40	24624	2428000	6068000	3000	5083600	29400	73:1	.5	83/86	11	BL

NORTH STRIPPING TOWER OG SHEET

			LEROY	31ST								
1.	10:45	9854.3	0	0	4800	2297700	27300	42:1	.4	67/150	24	SS
8.	8:30	9978.9	0	0	4800	4569400	27800	43:1	.4	12/90	25	SS
15.	8:00	10101.4	5858700	1855300	4000	4107600	28900	54:1	.5	70/150	24	SS
22.	7:30	10146.9	0	0	0	1455200	0	0:1	.2	99/24	0	SS
29.	7:40	10175	1831500	14800	0	858500	0	0:1	.1	86/83	0	BL

TO: STATE HEALTH *CHEMICAL READS/TOWERS*

MONTH: JULY 1993

	SOUTH							NORTH						
		RESULTS				LBS REMOVED			RESULTS				LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
1.	44.07	2.0	11.3	<.5	<.5	.735	4.153	17.19	2.0	11.3	ND	<.5	.287	1.620
8.	47.06	2.0	11.3	<.5	<.5	.785	4.435	34.18	2.0	11.3	ND	<.5	.570	3.221
15.	43.59	2.0	11.3	ND	<.5	.727	4.108	30.72	2.0	11.3	ND	<.5	.512	2.895
22.	44.39	2.0	11.3	ND	<.5	.740	4.183	10.88	2.0	11.3	ND	<.5	.181	1.025
29.	38.03	2.0	11.3	<.5	<.5	.634	3.584	6.42	2.0	11.3	ND	<.5	.107	.605
	217.14					3.621	20.463	99.39					1.657	9.366
						YTD TOTAL27.737	144.010						YTD TOTAL11.485	50.843

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK
N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK
PPB X 1000 = PPM

WATERMAN 14.4 M.G.
WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER OG SHEET

MONTH:___AUG 1993

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	CL2 LBS A/B	LBS/DAY	OPR
5.	10:00	24794	0	0	5600	5944400	27200	36:1	.4	150/32	53	BL
12.	9:25	24963	1514000	4130600	2800	5324100	28300	79:1	.5	0/75	42	BL
19.	8:45	25117	0	0	2900	4099800	29100	75:1	.4	79/150	22	BL
26.	7:50	NA	1230000	1693000	3000	4169200	NA	NA	NA	NA	NA	ME

NORTH STRIPPING TOWER OG SHEET

DAY	TIME	S.T.HRS.	LEROY WATERMAN	31ST	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	CL2 LBS A/B	LBS/DAY	OPR
5.	10:00	10198	0	0	0	705900	0	OFF	0	32/150	0	BL
12.	9:25	10237	1205600	244200	0	1240000	0	OFF	0	75/0	0	BL
19.	8:45	10237	0	0	0	48600	0	OFF	0	150/79	0	BL
26.	7:50	10237	1729500	333000	0	1245000	0	OFF	0		0	ME

TO: STATE HEALTH

CHEMICAL READS/TOWERS

MONTH: AUG 1993

	SOUTH							NORTH						
		RESULTS				LBS REMOVED			RESULTS				LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
5.	44.46	1.6	7.5	<.5	<.5	.593	2.781	5.28	1.6	7.5	<.5	<.5	.070	.330
12.	39.82	1.6	7.5	ND	<.5	.531	2.491	9.28	1.6	7.5	ND	<.5	.124	.580
19.	30.66	1.6	7.5	<.5	ND	.409	1.918	.36	1.6	7.5	<.5	<.5	.005	.023
26.	31.19	1.6	7.5	ND	<.5	.416	1.915	9.31	1.6	7.5	ND	<.5	.124	.582
	146.13					1.949	9.141	24.23					.323	1.515
						YTD TOTAL	29.686	153.151					YTD TOTAL	11.808 52.358

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK
N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK
PPB X 1000 = PPM

WATERMAN 14.4 M.G.
WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER OG SHEET

MONTH:___SEPT 1993

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	CL2 LBS A/B	LBS/DAY	OPR
2.	9:20	25448	0	0	2950	3584100	29800	75:1	.45	0/120	27	ME
9.	11:30	25618	0	0	2950	3506100	28500	73:1	.5	114/0	14	LM
16.	10:30	25782	0	0	0	3363000	0	0	0	150/70	14	LM
23.	11:30	25945	0	0	5300	3580400	28700	40:1	.4	97/20	47	LP
30.	9:00	26107	8000	2142800	5600	4526100	28900	38:1	.5	150/14	47	LP

NORTH STRIPPING TOWER OG SHEET

			LEROY	31ST								
2.	9:20	10311	0	0	0	588300	0	0	0	120/0	0	ME
9.	11:30	10337	0	0	0	575400	0	0	0	0/114	0	LM
16.	10:30	10372	1431400	138000	0	782400	0	0	0	70/150	17	LM
23.	11:30	10374	0	0	4700	38100	27600	43:1	.4	20/97	25	LP
30.	9:00	10402	695100	360000	0	866400	0	0	0	14/150	0	LP

TO: STATE HEALTH

CHEMICAL READS/TOWERS

MONTH: SEPT 1993

	SOUTH							NORTH						
		RESULTS				LBS REMOVED			RESULTS				LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
2.	26.81	3.0	15.8	ND	<.5	.671	3.533	4.40	3.0	15.8	ND	<.5	.110	.580
9.	26.22	3.0	15.8	ND	<.5	.656	3.455	4.30	3.0	15.8	ND	<.5	.108	.567
16.	25.15	3.0	15.8	ND	<.5	.629	3.314	5.85	3.0	15.8	ND	ND	.146	.771
23.	26.78	3.0	15.8	<.5	<.5	.670	3.529	.28	3.0	15.8	ND	<.5	.007	.037
30.	33.85	3.0	15.8	ND	<.5	.847	4.257	6.48	3.0	15.8	<.5	<.5	.162	.815
	138.81					3.473	18.088	21.31					.533	2.770
						YTD TOTAL33.159	171.239						YTD TOTAL12.341	55.128

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK
N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK
PPB X 1000 = PPM

WATERMAN 14.4 M.G.
WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER OG SHEET

MONTH:___OCT 1993

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	CL2 LBS A/B	LBS/DAY	OPR
7.	12:06	26236	0	0	0	4191200	0	0:1	0	150/116	0	ME
14.	1:56	26355	8005900	3616100	0	3810600	0	0:1	0	120/29	0	ME
21.	10:53	26531	0	0	2800	4608700	29800	80:1	.45	150/46	22	ME
28.	8:30	26650	8005900	2222000	2800	3632800	31000	82:1	.5	70/20	25	SS

NORTH STRIPPING TOWER OG SHEET

			LEROY	31ST								
7.	12:06	10405	0	0	0	63200	0	0:1	0	116/150	0	ME
14.	1:56	^10410	131900	822000	0	149200	0	0:1	0	29/150	0	ME
21.	10:53	10413	0	0	0	80600	0	0:1	0	46/150	0	ME
28.	8:30	10413	63800	377000	0	0	0	0:1	0	20/70	0	SS

TO: STATE HEALTH

CHEMICAL READS/TOWERS

MONTH: OCT 1993

	SOUTH							NORTH						
		RESULTS				LBS REMOVED			RESULTS				LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
7.	31.35	4.2	22.4	<.5	<.5	1.098	5.857	.47	4.2	22.4	<.5	<.5	.016	.088
14.	28.50	4.2	22.4	ND	<.5	.998	5.324	1.12	4.2	22.4	ND	<.5	.039	.209
21.	34.47	4.2	22.4	<.5	<.5	1.207	6.440	.60	4.2	22.4	<.5	<.5	.021	.112
28.	27.17	4.2	22.4	<.5	<.5	.952	5.076	0	4.2	22.4	ND	<.5		
	121.49					4.255	22.697	2.19					.076	.409
						YTD TOTAL37.414	193.936					YTD TOTAL12.417	55.537	

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK
N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK
PPB X 1000 = PPM

WATERMAN 14.4 M.G.
WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER OG SHEET

MONTH: NOV 1993

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	CL2 LBS A/B	LBS/DAY	OPR
4.	9:00	26806	0	0	2900	4275400	30200	78:1	.45	150/20	20	SS
11.	2:30	26945	7747700	2698800	2900	4263400	32000	82:1	.55	150/11	20	FO
18.	11:50	27065	0	0	0	3457600	0	0:1	.5	150/0	0	BL
25.	8:58	27204	7747700	3312600	0	4054900	0	0:1	.5	0/113	0	FO

NORTH STRIPPING TOWER OG SHEET

			LEROY	31ST								
4.	9:00	10413	0	0	0	16400	0	0:1	0	20/150	0	SS
11.	2:30	10415	22500	113000	0	36900	0	0:1	0	11/150	0	FO
18.	11:50	10418	0	0	0	76400	0	0:1	0	0/150	0	BL
25.	8:58	10418	43100	278000	0	0	0	0:1	0	113/0	0	FO

TO: STATE HEALTH

CHEMICAL READS/TOWERS

MONTH: NOV 1993

	SOUTH							NORTH						
		RESULTS				LBS REMOVED			RESULTS				LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
4.	31.98	3.9	19.6	ND	<.5	1.040	5.228	.12	3.9	19.6	ND	<.5	.004	.020
11.	31.89	3.9	19.6	ND	<.5	1.037	5.213	.28	3.9	19.6	ND	<.5	.009	.046
18.	25.86	3.9	19.6	ND	<.5	.841	4.227	.57	3.9	19.6	ND	<.5	.019	.093
25.	30.33	3.9	19.6	ND	ND	.987	4.958	0						
	120.06					3.905	19.626	.97					.032	.159
						YTD TOTAL	41.319	213.562					YTD TOTAL	12.449 55.696

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK
N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK
PPB X 1000 = PPM

WATERMAN 14.4 M.G.
WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER OG SHEET

MONTH: DEC 1993

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	CL2 LBS A/B	LBS/DAY	OPR
2.	3:10	27331	0	0	5600	3716100	29200	39:1	.6	125/0	12	BL
9.	9:00	27450	0	0	0	3538500	0	OFF	OFF	34/84	0	BL
16.	12:00	27555	0	1894900	0	2909000	0	OFF	OFF	150/121	19	SS
23.	9:15	27634	0	0	0	2108900	0	OFF	OFF	150/36	21	GS
30.	6:25	27719	6967100	4749800	5800	2772100	30200	38:1	.6	84/150	6	LP

NORTH STRIPPING TOWER OG SHEET

			LEROY	31ST								
2.	3:10	10418	0	0	0	0	0	OFF	0	0/125	0	BL
9.	9:00	10418	0	0	0	0	0	OFF	0	94/34	0	BL
16.	12:00	10418	30600	0	0	0	0	OFF	0	121/150	0	SS
23.	9:15	10418	0	0	0	0	0	OFF	0	36/150	0	GS
30.	6:25	10418	0	0	0	0	0	OFF	0	150/84	0	LP

TO: STATE HEALTH

CHEMICAL READS/TOWERS

MONTH: DEC 1993

	SOUTH							NORTH						
		RESULTS				LBS REMOVED			RESULTS				LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
2.	27.80	2.8	18.5	ND	ND	.649	4.289	OFF						
9.	26.47	2.8	18.5	ND	<.5	.618	4.084	OFF						
16.	21.76	2.8	18.5	ND	ND	.508	3.357	OFF						
23.	15.77	2.8	18.5	ND	ND	.368	2.433	OFF						
30.	20.73					.484	3.198							
	112.53					2.627	17.361							
					YTD TOTAL	43.846	230.923					YTD TOTAL	12.449	55.696

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK
N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK
PPB X 1000 = PPM

WATERMAN 14.4 M.G.
WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER OG SHEET

MONTH: JAN 1994

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	CL2 LBS A/B	LBS/DAY	OPR
6.	3:10	27857	0	0	0	4267500	0	0	.35	86/150	23	GS
13.	9:00	27943	2292000	4874500	0	2439200	0	0	.45	0/100	12	LP
20.	12:00	28084	0	0	3000	4037400	32400	72:1	.5	80/150	18	LM
27.	9:15	28176	931800	5619900	0	1879800	0	0	0	51/150	1	LM

NORTH STRIPPING TOWER OG SHEET

			LEROY	31ST								
6.	10:00	10418	0	0	0	0	0	OFF	0	150/86	0	GS
13.	10:25	10418	0	0	0	0	0	OFF	0	100/0	0	LP
20.	7:30	10418	0	0	0	0	0	OFF	0	150/80	0	LM
27.	8:30	10418	0	0	0	0	0	OFF	0	150/51	0	LM

TO: STATE HEALTH

CHEMICAL READS/TOWERS

MONTH: JAN 1994

	SOUTH								NORTH					
		RESULTS				LBS REMOVED				RESULTS			LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
6.	31.92	3.1	16.5	ND	<.5	.825	4.393	OFF						
13.	18.24	3.1	16.5	ND	<.5	.472	2.510	OFF						
20.	30.20	3.1	16.5	ND	<.5	.781	4.156	OFF						
27.	14.06	3.1	16.5	ND	ND	.364	1.935	OFF						
	94.42					2.442	12.994							
					YTD TOTAL	2.442	12.994					YTD TOTAL		

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK
N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK
PPB X 1000 = PPM

WATERMAN 14.4 M.G.

WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER OG SHEET

MONTH: FEB 1994

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CP.	AIR SCFM	RATIO A/W	CL2 RESID.	LBS/DAY	OPR
3.	8:50	28286	0	0	5900	2579100	30500	39:1	.6	22	LM
10.	9:30	28405	2659100	0	0	2755300	0	0	.5	16	LM
17.	9:40	28540	0	0	3000	2836200	31800	79:1	.55	18	LM
24.	7:45	28622	4398300	3718500	3000	1730600	31600	78:1	.5	15	SS

NORTH STRIPPING TOWER OG SHEET

			LEROY	31ST							
3.	8:50	10418	0	0	0	0	0	OFF	0	0	LM
10.	9:30	10418	0	0	0	0	0	OFF	0	0	LM
17.	9:45	10418	0	0	0	0	0	OFF	0	0	LM
24.	7:45	10418	0	0	0	0	0	OFF	0	0	SS

TO: STATE HEALTH

CHEMICAL READS/TOWERS

MONTH: FEB 1994

	SOUTH							NORTH						
		RESULTS				LBS REMOVED				RESULTS			LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
3.	31.92	3.4	13.6	ND	<.5	.547	2.188	OFF						
10.	18.24	3.4	13.6	ND	ND	.584	2.338	OFF						
17.	30.20	3.4	13.6	ND	ND	.601	2.406	OFF						
24.	14.06	3.4	13.6	ND	ND	.367	1.468	OFF						
	74.05					2.099	8.400							
					YTD TOTAL	4.541	21.394					YTD TOTAL		

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK

N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK

WATERMAN 14.4 M.G.

WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER OG SHEET

MONTH: MAR 94

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	LBS/DAY	OPR
1.	7:30	28751	0	0	3000	2747700	31800	79:1	.45	23	DH
8.	8:45	28823	0	0	0	1486800	0	0	0	6	LM
15.	8:30	28906	1245900	3029400	0	2323900	0	0	0	12	LM
22.	8:25	28972	0	0	3000	1758100	31600	78:1	.5	10	LM
29.	12:52	29042	1778100	3869000	0	1917800	0	0	0	35	MG

NORTH STRIPPING TOWER OG SHEET

			LEROY	31ST							
1.	7:30	10418	0	0	0	0	0	OFF	0	0	DH
8.	8:45	10418	0	0	0	0	0	OFF	0	0	LM
15.	8:30	10418	0	0	0	0	0	OFF	0	0	LM
22.	8:25	10418	0	0	0	0	0	OFF	0	0	LM
29.	12:52	10418	0	0	0	0	0	OFF	0	0	MG

TO: STATE HEALTH

CHEMICAL READS/TOWERS

MONTH: MAR 1994

	SOUTH								NORTH						
		RESULTS				LBS REMOVED				RESULTS				LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
1.	20.55	1.2	9.5	ND	<.5	.206	1.628	OFF						
8.	11.12	1.2	9.5	ND	<.5	.111	.881	OFF						
15.	17.38	1.2	9.5	ND	ND	.174	1.377	OFF						
22.	13.15	1.2	9.5	ND	ND	.132	1.042	OFF						
29.	14.34	1.2	9.5	ND	ND	.144	1.136	OFF						
	76.54					.767	6.064							
					YTD TOTAL	5.308	27.458						YTD TOTAL	

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK

N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK

PPB X 1000 = PPM

WATERMAN 14.4 M.G.

WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER OG SHEET

MONTH: APRIL 94

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	LBS/DAY	OPR
7.	7:00	29151	0	0	0	3289600	0	0:1	0	41	DH
14.	10:30	29235	1920900	4452100	0	2425600	0	0:1	0	15	SS
21.	8:30	29368	0	0	3000	4258400	30700	76:1	0	22	SS
28.	11:50	29520	4182200	7635400	0	4552400	0	0:1	0	OFF	SS

NORTH STRIPPING TOWER OG SHEET

			LEROY	31ST							
7.	7:00	10418	0	0	0	0	0	OFF	0	0	DH
14.	10:30	10418	0	0	0	0	0	OFF	0	0	SS
21.	8:30	10418	0	0	0	0	0	OFF	0	0	SS
28.	111:50	10479	0	0	0	0	0	OFF	0	0	SS

TO: STATE HEALTH

CHEMICAL READS/TOWERS

MONTH: APRIL 94

	SOUTH							NORTH						
		RESULTS				LBS REMOVED			RESULTS				LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
7.	24.61	0.8	7.5	ND	ND	.164	1.539	OFF						
14.	18.14	0.8	7.5	ND	ND	.121	1.135	OFF						
21.	31.85	0.8	7.5	ND	ND	.213	1.992	OFF						
28.	34.05	0.8	7.5	ND	ND	.227	2.130	OFF						
	108.65					.725	6.796							
					YTD TOTAL	6.033	34.254						YTD TOTAL	

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK

N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK

WATERMAN 14.4 M.G.

WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER LOG SHEET

MONTH: MAY 94

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	LBS/DAY	OPR
3.	11:00	29636	0	0	0	1456800	29800	79:1	.5	22	SS
10.	11:00	29762	0	0	0	3571200	0	0:1	0	NA	GS
17.	11:00	29874	2664900	4982000	3000	2564900	0	0:1	0	NA	GS
24.	11:00	30021	0	0	0	3746000	30100	40:1	.55	30	DH
31.	11:00	30155	3738000	7767000		3788100	0	0:1	0	NA	LM

NORTH STRIPPING TOWER LOG SHEET

			LEROY	31ST							
3.	11:00	10512	0	0	0	1032400	29700	82:1	.5	20	SS
10.	11:00	10567	0	0	0	1735400	0	0:1	NA	NA	GS
17.	11:00	10601	2358900	0	0	798600	0	0:1	NA	NA	GS
24.	11:00	10601	0	0	0	7900	0	0:1	NA	0	DH
31.	11:00	10685	979900	0		92000	0	0:1	NA	NA	LM

TO: STATE HEALTH

CHEMICAL READS/TOWERS

MONTH: MAY 94

	SOUTH							NORTH						
		RESULTS				LBS REMOVED				RESULTS			LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
3.	10.90	3.0	14.8	ND	ND	.273	1.345	7.72	3.0	14.8	ND	ND	.193	.953
10.	26.71	3.0	14.8	ND	ND	.668	3.297	12.98	3.0	14.8	ND	ND	.325	1.602
17.	19.18	3.0	14.8	ND	ND	.480	2.367	5.97	3.0	14.8	ND	ND	.149	.737
24.	28.02	3.0	14.8	ND	<.5	.701	3.459	.06	3.0	14.8	ND	ND	.002	.007
31.	28.33	3.0	14.8	ND	ND	.709	3.497	.69	3.0	14.8	ND	ND	.017	.085
	113.14					2.831	13.965	27.42					.686	3.384
						YTD TOTAL	8.864	48.219				YTD TOTAL	.686	3.384

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK

N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK

PPB X 1000 = PPM

WATERMAN 14.4 M.G.

WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER LOG SHEET

MONTH: JUNE 94

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	LBS/DAY	OPR
7.	11:00	30300	0	0	2700	3880600	29400	81:1	.5	24	FD
14.	11:00	30445	2936800	6362100	OFF	4144500	OFF	OFF	OFF	OFF	SS
21.	11:00	30559	0	0	2800	4279000	30500	81:1	.6	30	SS
28.	11:00	30723	6174800	7348600	4400	5586200	27800	47:1	.7	45	FD

NORTH STRIPPING TOWER LOG SHEET

			LEROY	31ST							
7.	11:00	10620	0	0	OFF	468900	OFF	OFF	.4	OFF	FD
14.	11:00	10675	732700	0	OFF	1597100	OFF	OFF	OFF	OFF	SS
21.	11:00	10681	0	0	OFF	154300	OFF	OFF	OFF	OFF	SS
28.	11:00	10744	2208800	0	4300	2026600	28000	49:1	.4	27	FD

TO: STATE HEALTH

MONTH: JUNE 94

CHEMICAL READS/TOWERS

	SOUTH							NORTH						
		RESULTS				LBS REMOVED			RESULTS				LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
7.	29.03	2.8	14.8	ND	ND	.678	3.583	3.51	2.8	14.8	ND	ND	.082	.433
14.	31.00	2.8	14.8	ND	ND	.724	3.826	11.95	2.8	14.8	ND	ND	.279	1.475
21.	32.01	2.8	14.8	ND	ND	.747	3.951	1.15	2.8	14.8	ND	ND	.027	.142
28.	41.78	2.8	14.8	ND	<.5	.976	5.157	15.16	2.8	14.8	ND	ND	.354	1.871
	133.82					3.125	16.517	31.77					.742	3.921
						YTD TOTAL	11.989	64.736					YTD TOTAL 1.428	7.305

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK

-- TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK

WATERMAN 14.4 M.G.

WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER LOG SHEET

MONTH: JULY 94

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	LBS/DAY	OPR
5.	11:00	30861	0	0	5800	5076800	28700	37:1	.6	56	SS
12.	11:00	30975	4566300	5364500	OFF	4021500	OFF	OFF	OFF	OFF	FD
19.	11:00	31113	0	0	2800	4803400	NA	NA	.6	NA	LM
26.	11:00	31254	4809700	7081800	2800	4328900	29400	78:1	.55	23	DH

NORTH STRIPPING TOWER LOG SHEET

			LEROY	31ST							
5.	11:00	10781	0	0	OFF	1183800	OFF	OFF	OFF	OFF	SS
12.	11:00	10803	1112000	0	OFF	665000	OFF	OFF	OFF	OFF	FD
19.	11:00	10838	0	0	OFF	1051800	OFF	OFF	OFF	OFF	LM
26.	11:00	10866	1002400	0	4300	886600	OFF	OFF	OFF	OFF	DH

TO: STATE HEALTH

CHEMICAL READS/TOWERS

MONTH: JULY 94

	SOUTH							NORTH						
		RESULTS				LBS REMOVED			RESULTS				LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
5.	37.97	2.9	11.2	ND	<.5	.918	3.547	8.85	2.9	11.2	ND	<.5	.214	.827
12.	30.08	2.9	11.2	ND	ND	.728	2.810	4.97	2.9	11.2	ND	ND	.120	.464
19.	35.93	2.9	11.2	ND	ND	.869	3.356	7.87	2.9	11.2	ND	ND	.190	.735
26.	32.38	2.9	11.2	ND	ND	.783	3.025	6.63	2.9	11.2	ND	ND	.160	.619
	136.36					3.298	12.738	28.32					.684	2.645
						YTD TOTAL15.287	77.474						YTD TOTAL 2.112	9.950

NOTE.<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK

N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK

WATERMAN 14.4 M.G.

WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER LOG SHEET

MONTH: AUG 94

DAY	TIME	S.T.HRS.	WELL CU.FT WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	LBS/DAY	OPR
2.	11:00	31391	0	0	2700	4361100	29100	81:1	.55	23	DH
9.	11:00	31544	0	0	2700	4675700	27600	76:1	.5	35	SS
16.	11:00	31707	4204200	6887800	2700	5442200	27800	77:1	.5	24	BL
23.	11:00	31854	0	0	OFF	5008600	OFF	OFF	OFF	25	LM
30.	11:00	32018	6603800	8431100	5700	6121700	27200	33:1	.55	80	LM

NORTH STRIPPING TOWER LOG SHEET

			LEROY	31ST							
2.	11:00	10876	0	0	OFF	241400	OFF	OFF	OFF	OFF	DH
9.	11:00	10885	0	0	OFF	276900	OFF	OFF	OFF	OFF	SS
16.	11:00	10903	608700	0	OFF	575100	OFF	OFF	OFF	OFF	BL
23.	11:00	10903	0	0	OFF	0	OFF	OFF	OFF	OFF	LM
30.	11:00	10916	276400		OFF	359900	OFF	OFF	OFF	OFF	LM

TO: STATE HEALTH

CHEMICAL READS/TOWERS

MONTH: AUG 1994

	SOUTH							NORTH						
		RESULTS				LBS REMOVED			RESULTS				LBS REMOVED	
	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
2.	32.62	4.4	16.8	ND	ND	1.197	4.570	1.81	4.4	16.8	ND	ND	.066	.254
9.	34.97	4.4	16.8	ND	<.5	1.283	4.900	2.07	4.4	16.8	ND	ND	.076	.290
16.	40.71	4.4	16.8	ND	ND	1.494	5.704	4.30	4.4	16.8	ND	ND	.158	.602
23.	37.46	4.4	16.8	ND	<.5	1.375	5.249	0	OFF	OFF	OFF	OFF		
30.	45.79	4.4	16.8	ND	ND	1.680	6.416	2.69	4.4	16.8	ND	ND	.099	.377
	191.55					7.029	26.839	10.87					.399	1.523
						YTD TOTAL	22.316	104.313					YTD TOTAL	2.511 11.473

NOTE:<.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK

N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK

PPB X 1000 = PPM

WATERMAN 14.4 M.G.
WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER LOG SHEET

MONTH: SEPT 94

DAY	TIME	S.T.HRS.	WELL C.F. WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	LBS/DAY	OPR
6.	11:00	32169	0	0	5800	4025100	27800	35:1	.60	40	LM
13.	11:00	32337	5797900	7008600	5800	6379200	29100	34:1	.55	29	LM
20.	11:00	32493	0		2700	4450700	29600	82:1	.5	21	TF
27.	11:00	32640	4099200	7648500	2600	4751200	28000	80:1	.45	22	ME

NORTH STRIPPING TOWER LOG SHEET

			LEROY	31ST							
6.	11:00	10925	0	0	OFF	207800	OFF	OFF	OFF	OFF	LM
13.	11:00	10941	481100	0	OFF	450900	OFF	OFF	OFF	OFF	LM
20.	11:00	10941	0	0	OFF	0	OFF	OFF	OFF	OFF	TF
27.	11:00	109442	7100	0	OFF	24900	OFF	OFF	OFF	OFF	ME

CHEMICAL READS / TOWERS

	SOUTH							NORTH						
		RESULTS				LBS REMOVED				RESULTS			LBS REMOVED	
DATE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
6.	30.11	2.1	11.9	<.5	<.5	.527	2.988	1.55	2.1	11.9	ND	ND	.027	.154
13.	47.72	2.1	11.9	ND	ND	.836	4.736	3.37	2.1	11.9	ND	ND	.059	.334
20.	33.29	2.1	11.9	ND	ND	.583	3.304	0	2.1	11.9	ND	<.5	.000	.000
27.	35.54	2.1	11.9	ND	ND	.622	3.527	.19	2.1	11.9	ND	ND	.003	.019
	146.66					2.568	14.555	5.11					.089	.507
					YTD TOTAL	24.884	118.868					YTD TOTAL	2.600	11.980

NOTE: <.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK
N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK
PPB X 1000 = PPM

WATERMAN 14.4 M.G.
WELL HEAD TREATMENT PLANT

SOUTH STRIPPING TOWER LOG SHEET

ONTH: OCT 94

DAY	TIME	S.T.HRS.	WELL C.F. WATERMAN	30TH	S.T. GPM	S.T. CF.	AIR SCFM	RATIO A/W	CL2 RESID.	LBS/DAY	OPR
4.	11:00	32804	0	0	2524	4811600	29800	68:1	.5	23	LP
11.	11:00	32916	2487300	5899300	4080	3321500	28300	52:1	.55	42	TF
18.	11:00	33032	0		4488	3351400	29200	48:1	.45	22	MG
25.	11:00	33162	3111100	5101100	OFF	4275600	OFF	OFF	OFF	OFF	SS

NORTH STRIPPING TOWER LOG SHEET

			LEROY	31ST							
4.	11:00	10943	0	0	OFF	8000	OFF	OFF	OFF	OFF	LP
11.	11:00	10948	243900	0	3740	135200	29100	58:1	.45	31	TF
18.	11:00	10957	0	0	OFF	195700	900	OFF	OFF	OFF	MG
25.	11:00	10958	200000	0	OFF	68600	OFF	OFF	OFF	OFF	SS

CHEMICAL READS / TOWERS

	SOUTH								NORTH							
			RESULTS			LBS REMOVE					RESULTS			LBS REMOVE	
DATE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE	M.G.	TCE IN	PCE IN	TCE OUT	PCE OUT	TCE	PCE
4.	35.99	2.4	13.9	ND	<.5	.720	4.172	.06	2.4	13.9	ND	ND	.001	.007
11.	24.84	2.4	13.9	ND	ND	.497	2.880	1.01	2.4	13.9	ND	ND	.020	.117
18.	25.07	2.4	13.9	ND	ND	.502	2.906	1.46	2.4	13.9	ND	ND	.029	.169
25.	31.98	2.4	13.9	ND	ND	.640	3.707	.51	2.4	13.9	ND	ND	.010	.059
	117.88					2.359	13.665	3.04					.060	.352
				YTD TOTAL		27.243	132.533				YTD TOTAL		2.660	12.33

NOTE: <.5PPB IS TAKEN AS (0.0 MG/L) *SAMPLING RESULTS USED TO CALCULATE DATE FOR ONE WEEK
N.D. = <0.5 PPB **TCE/PCE TEST WAS NOT TAKEN USED RESULTS FROM PREVIOUS WEEK
PPB X 1000 = PPM

APPENDIX B

Summary of Groundwater Analyses Results

Table B-1
Groundwater Concentrations at Various City Water Plant Inlets
San Bernardino, California

Waterman Facility

Date	PCE	TCE	Freon 12	Freon 11
	Concentrations (ug/L)			
01/01/93	16.4	2.7	NA	NA
02/01/93	14.4	2.9	NA	NA
03/04/93	23.1	5.3	17.4	0
04/01/93	22.6	3.9	NA	NA
05/06/93	22.1	4.2	NA	NA
06/03/93	24.8	5.4	0	0
07/01/93	11.3	2	NA	NA
08/05/93	7.5	1.6	NA	NA
09/02/93	15.8	3	1.4	1.5
10/07/93	22.4	4.2	NA	NA
11/04/93	19.6	3.9	NA	NA
12/02/93	18.5	2.8	11.3	2.7
01/01/94	16.5	3.1	NA	NA
02/01/94	13.6	3.4	NA	NA
03/01/94	9.5	1.2	5.3	1.8
04/12/94	7.5	0.8	NA	NA
05/03/94	14.8	3	NA	NA
05/31/94	14.8	2.8	0	3.1
07/12/94	11.2	2.9	NA	NA
08/03/94	16.8	4.4	NA	NA
09/06/94	11.9	2.1	7.7	2
10/04/94	13.9	2.4	NA	NA

17th Street Facility

Date	PCE	TCE	Freon 12	Freon 11
	Concentrations (ug/L)			
01/01/93	3.2	1.6	NA	NA
02/01/93	3	1.4	NA	NA
03/04/93	3	1.8	3.3	0
04/19/93	2.7	1.3	NA	NA
05/06/93	2.9	1.3	NA	NA
06/03/93	3.6	2.1	0	0
07/01/93	2.1	0.9	NA	NA

Table B-1
Groundwater Concentrations at Various City Water Plant Inlets
San Bernardino, California

continued

08/05/93	1.2	0.6	NA	NA
09/02/93	3.5	1.4	3.2	1.2
09/16/93	1.9	0.9	0	0
10/07/93	3.9	1.6	NA	NA
11/04/93	2.1	0.8	NA	NA
12/02/93	4.8	1.5	2.9	1.1
02/01/94	1.2	0.5	NA	NA
03/01/94	0	0	0	0
04/12/94	0	0	NA	NA
05/03/94	2.8	1.1	NA	NA
05/31/94	2.5	1	0	0.6
07/12/94	5.7	1.9	NA	NA
08/03/94	5.5	1.7	NA	NA
09/01/94	2.5	1	NA	NA
09/06/94	2.9	0.9	1.5	0.7
10/04/94	2.7	1.5	NA	NA

19th Street Facility

Date	PCE	TCE	Freon 12	Freon 11
	Concentrations (ug/L)			
02/09/93	2.9	0	0	0
08/19/93	4.6	0	0	0
09/02/93	2.9	0	0	0
10/07/93	5	0	0	0
11/04/93	1.8	0	0	0
12/02/93	2.9	0	0.8	0
01/06/94	7	0	NA	NA
02/02/94	2.5	0	NA	NA
03/01/94	7.4	0.6	7.5	0.5
04/12/94	7.2	0.6	NA	NA
05/03/94	5.2	2	NA	NA
06/01/94	6.6	0.7	NA	NA
07/12/94	5	0	NA	NA
08/03/94	5	0	NA	NA
09/06/94	2.9	0.9	NA	NA
10/04/94	9.5	0.9	NA	NA

\NEWMARK\PLANTSIN.WK1/gp

Table B-2
Loading Rates for LPGAC System
Newmark RD South
San Bernardino, California

Constituent	MW	McLaren Hart Data 1)		URS GW Monitoring Data 4)			Air Stripper Inlet Data 7)	Newmark FS Data 8)	Average Concentration	MCL Fed/CA
		Stipper Air Data 2) (ppb)	PURUS Test Data 3) (ppb)	Max. Results (ppb)	Avg. A-layer 5) (ppb)	Avg. B-layer 6) (ppb)	(ppb)	(ppb)	(ppb)	(ppb)
PCE	165.8	3.6	100	35	2.9	14.8	19.5	75	36	5/5
TCE	131.4	0.7	50	7	0.6	2.4	4.2	10	11	5/5
cis-1,2-DCE	97	0.0	10	3	0.4	1.1			3	70/6
Chloroform	119.4	0.7	5	0.2	0.0	0.1			1	100/100
Chloroethane	64.5	1.5	5	0.4	0.0	0.0			1	NE/NE
Methylene Chloride	84.9	4.1	10	0.2	0.1	0.1			3	5/NE
Toluene	92.1	2.4	5	2	0.2	0.3			2	1000/NE
Freon 11	137.4	1.2	50	7	0.5	2.8			12	NE/150
Freon 12	120.9	11.7	50	51	0.9	22.6			27	NE/NE
TOTALS		26	285	106	6	44	24	85	96	
lbs VOC/day:			27.38							

Assumptions:

8000 gpm total groundwater flow

1) McLaren Hart Emission Control Pilot Study at PURUS, March 1994
2) Analytical data (average of both Wellfield towers) from air stripper off-gas samples analyzed by Truesdail Laboratories in March 1993.
   Assumed air flow rate = 28350 cfm 41 :1 Air : Water Ratio
   Assumed GW flow rate = 5135 gpm
3) Used during pilot study at PURUS
4) Data from URS' groundwater monitoring in 04/05-1993 of monitoring wells in the Newmark study area.
5) Data from A-layer of wells in the vicinity of the Newmark study area (MW-2 through 8).
6) Data from B-layer of wells in the vicinity of the Newmark study area (MW-2 through 8).
7) Quarterly Wellfield air stripper groundwater influent test data collected by City of San Bernardino during 1993 and 1994, highest values.
8) Data used in Newmark FS was based on monitoring well data from municipal wells in the Newmark study area during the priod of 1988 to present.

NE = no MCL yet established

Figure B-1
Waterman Plant Influent Concentrations

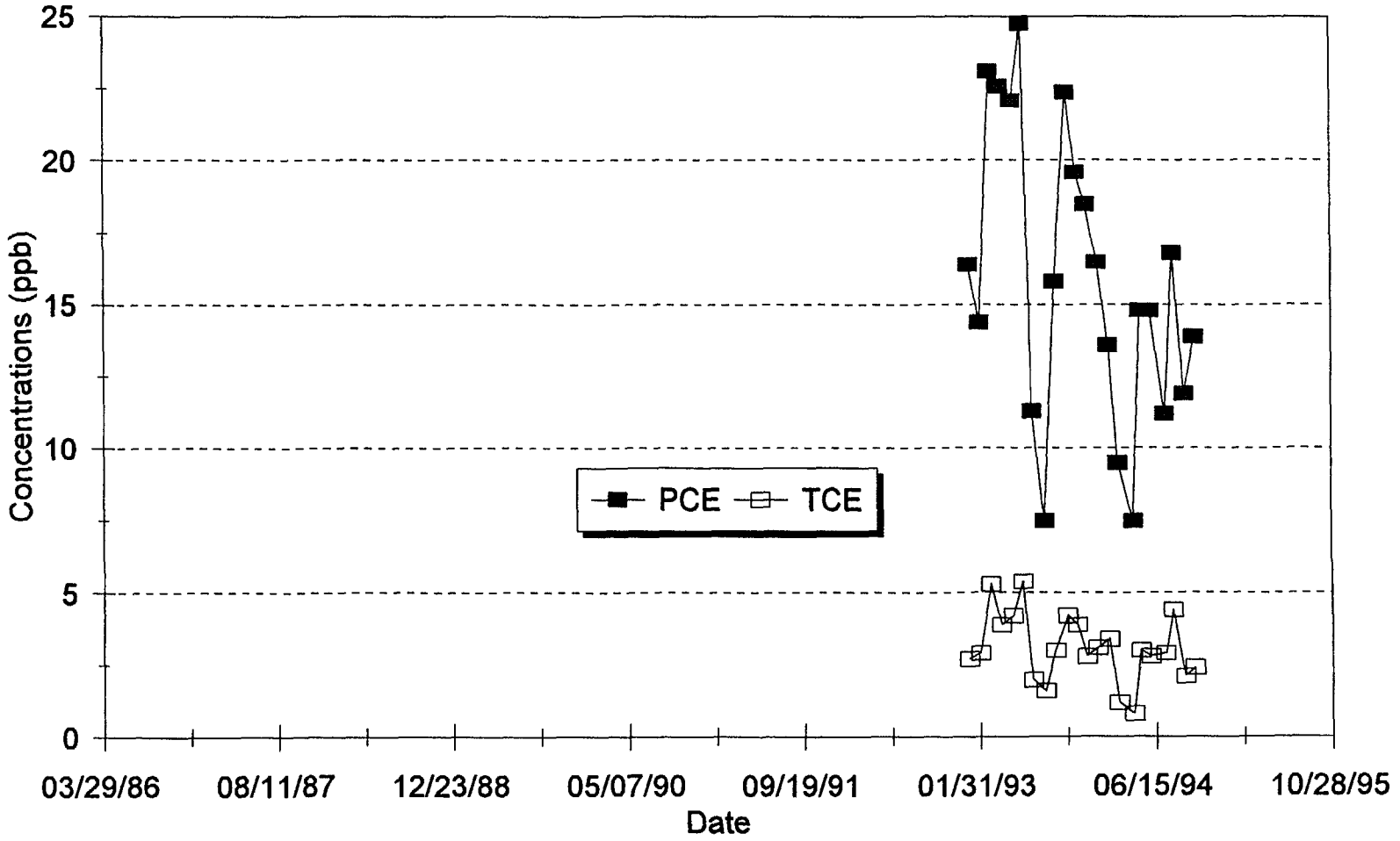


Figure B-2
17th St. Plant Influent Concentrations

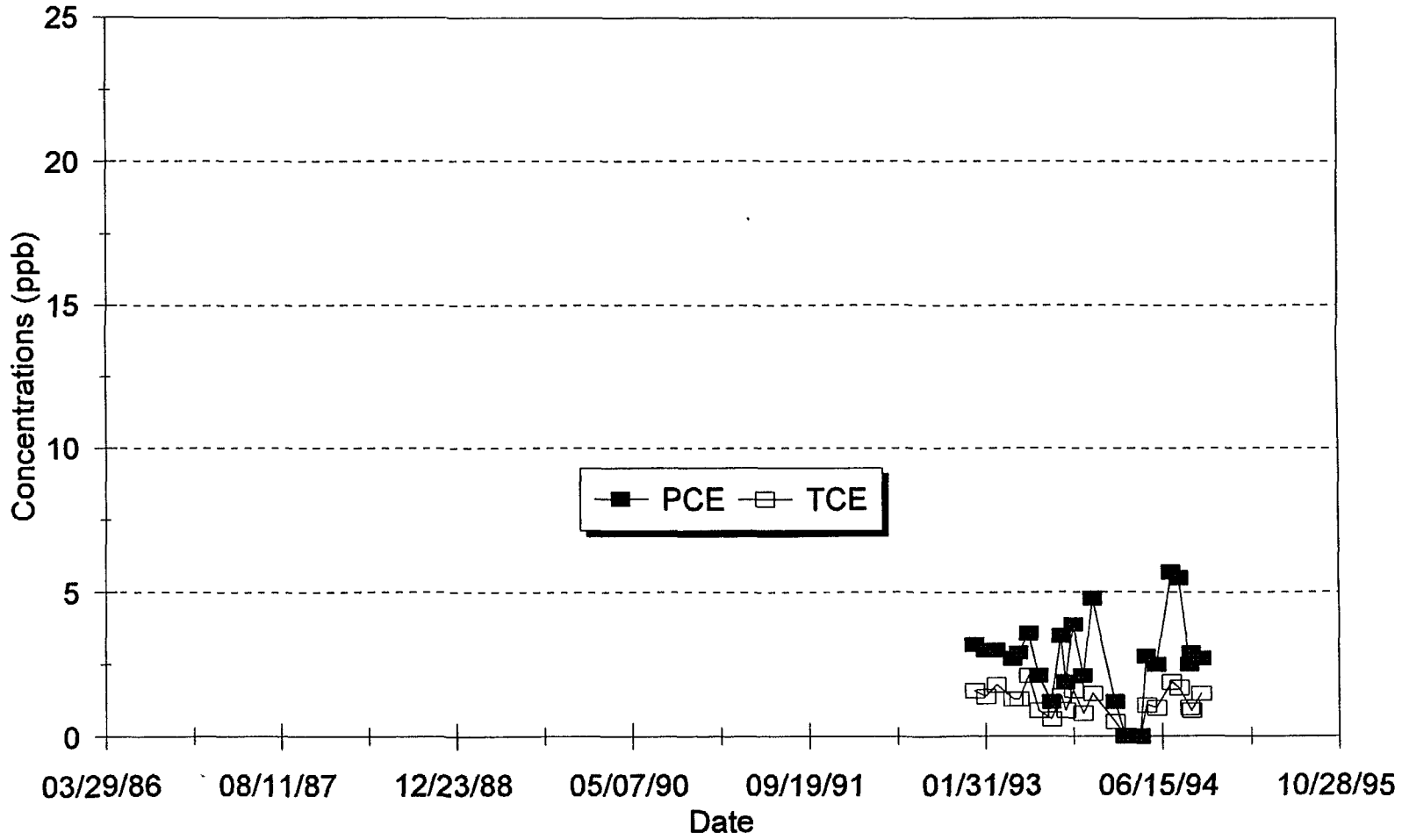


Figure B-3
19th St. Plant Influent Concentrations

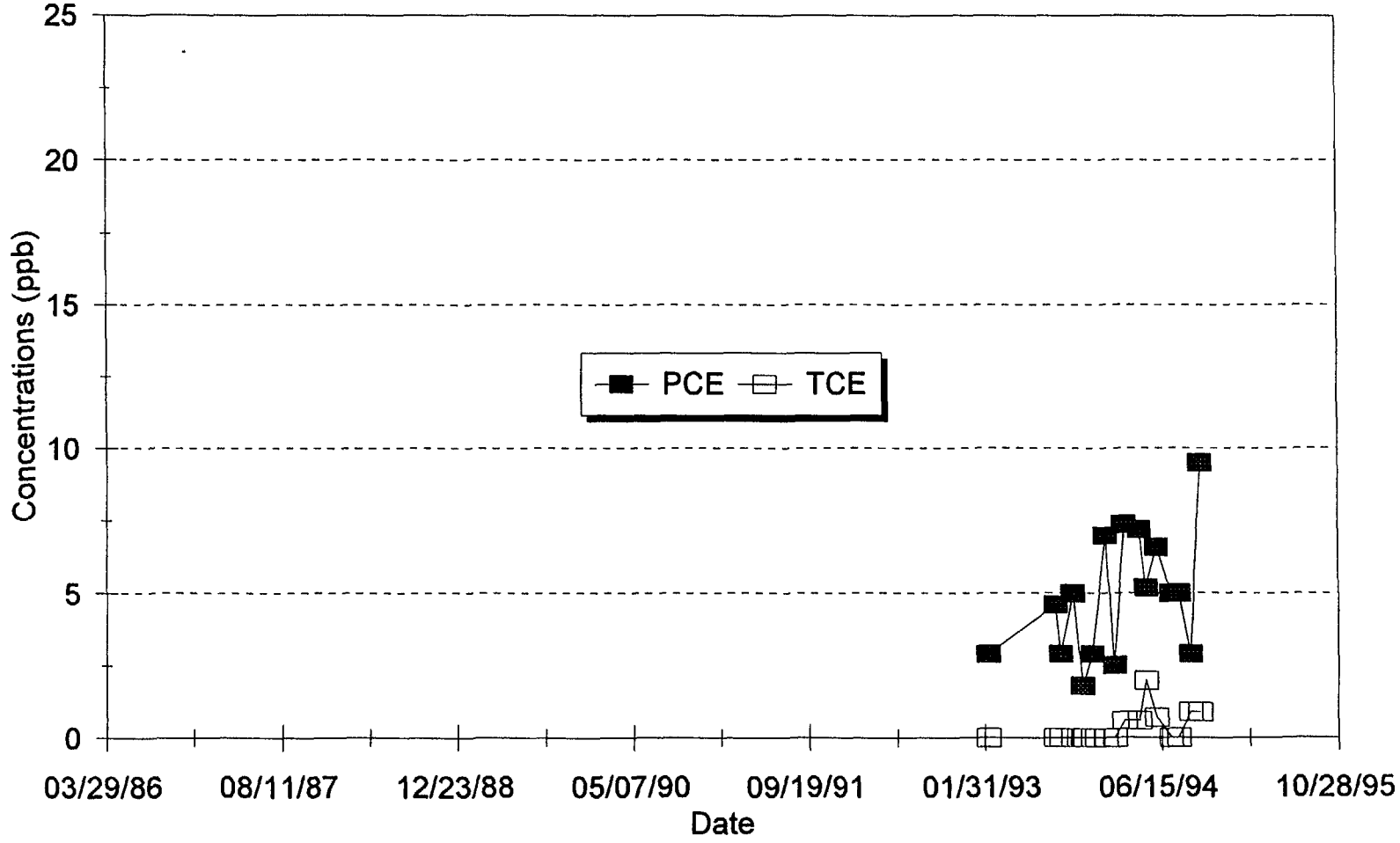
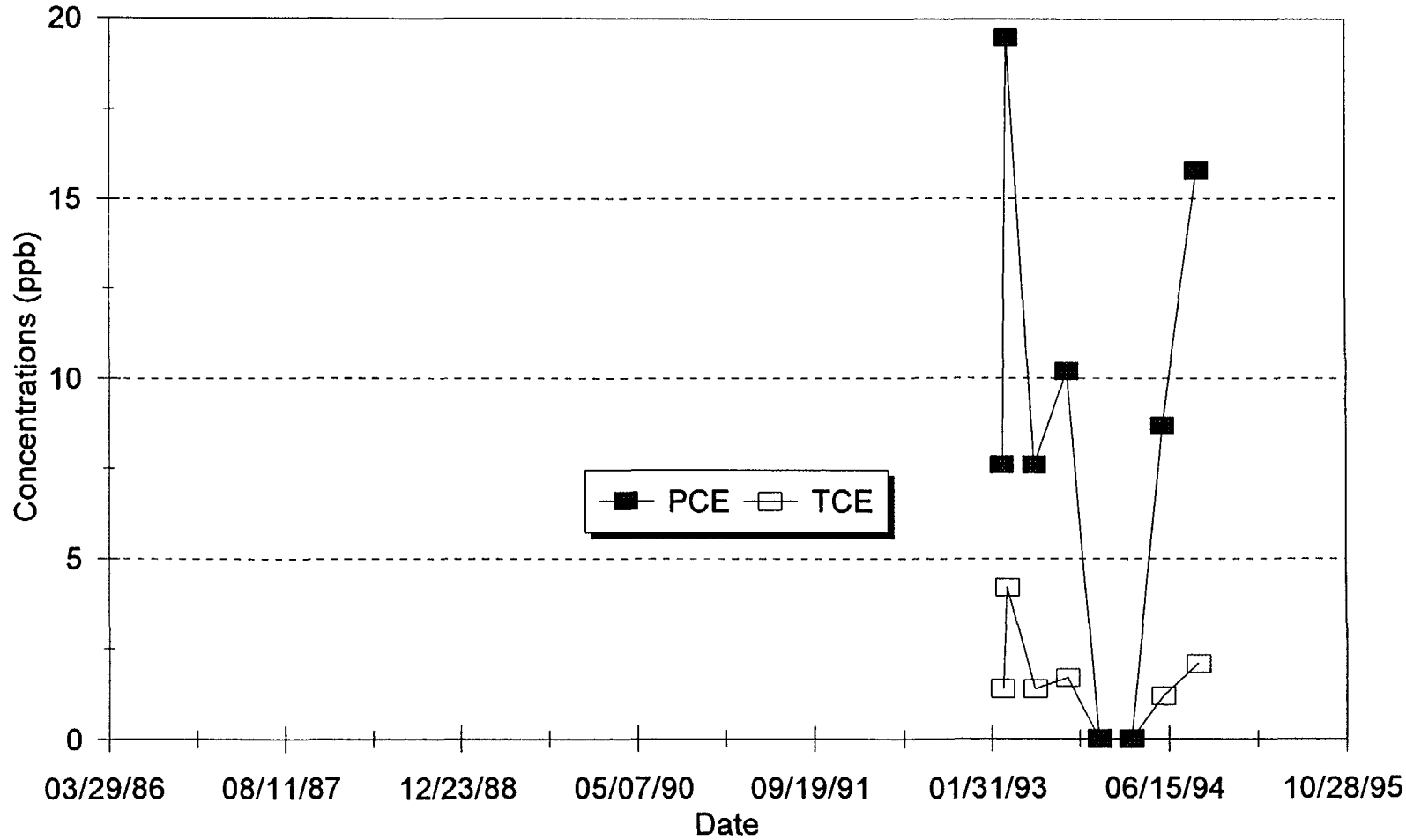


Figure B-4
North Plant Influent Concentrations



APPENDIX C

Design Calculations/Graphs

Table C-1
Loading Rates for GW Treatment System
Newmark RD
San Bernardino, California

Constituent	MW	Max. Results (ppb)	MCL Fed/CA
PCE	165.8	35	5/5
TCE	131.4	7	5/5
cis-1,2-DCE	97	3	70/6
Chloroform	119.4	0.2	100/100
Chloroethane	64.5	0.4	NE/NE
Methylene Chloride	84.9	0.2	5/NE
Toluene	92.1	2	1000/NE
Freon 11	137.4	7	NE/150
Freon 12	120.9	51	NE/NE
	Totals:	106	

\NEWMARK\DSGNBAS1.WB1/gp

Table C-2
Newmark RD South
Contact Time versus Flow Rate

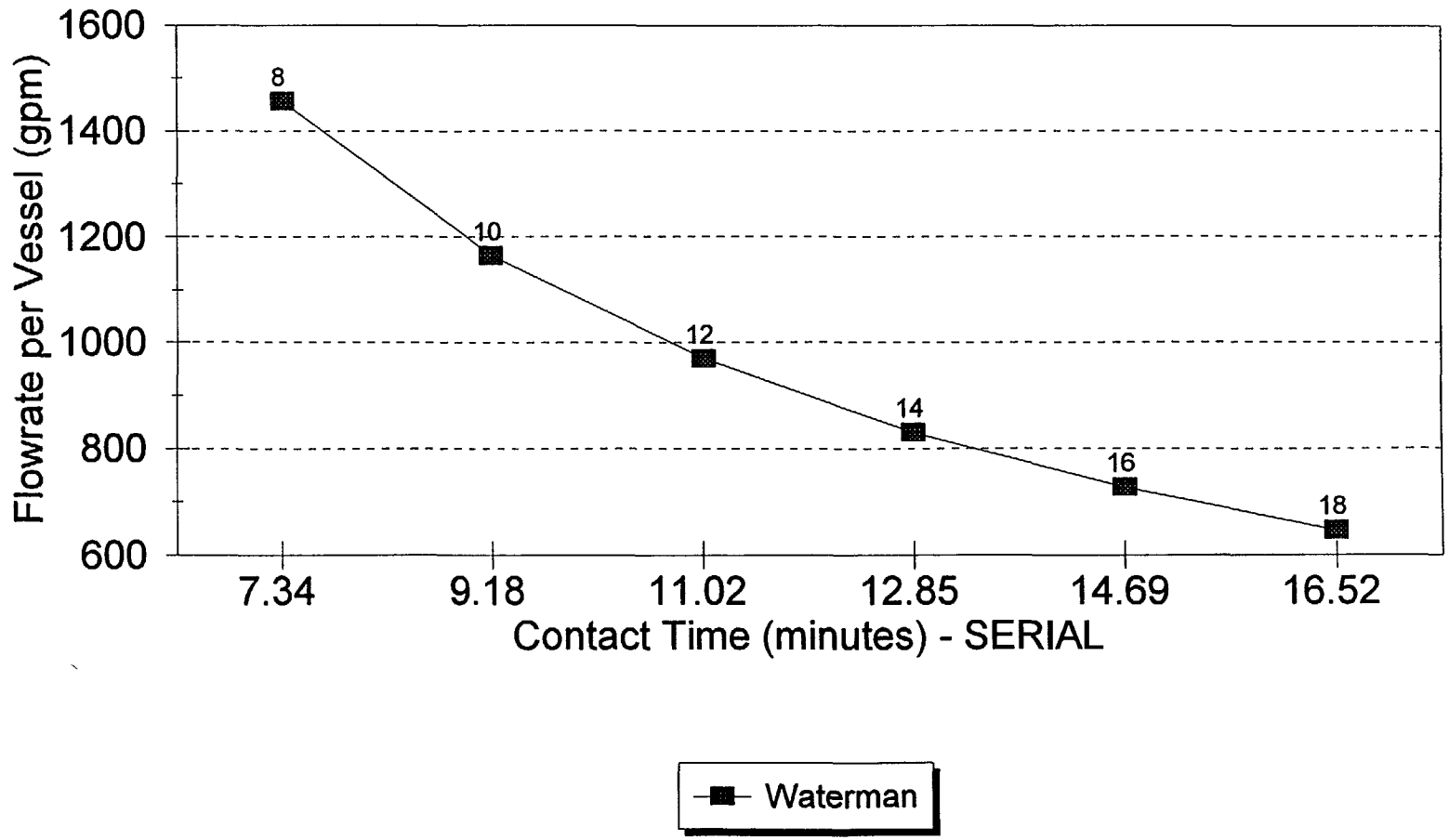
Assumptions:

Vessel size =	20,000	lbs
Carbon unit weight =	28.00	lbs/cuft
Carbon volume =	5,343	gallons
Total design flow =	8,000	gpm
	5,820	gpm @ Waterman
	2,180	gpm @ 17th Street

Serial Configuration					
	Waterman		17th Street		
No. of Vessels required	Tot.Ret.Time (min)	Flow per Vessel (gpm)	No. of Vessels required	Tot.Ret.Time (min)	Flow per Vessel (gpm)
8	7.34	1455.00	4	9.80	1090.00
10	9.18	1164.00	**6**	**14.71**	**726.67**
12	11.02	970.00	8	19.61	545.00
14	12.85	831.43	10	24.51	436.00
16	**14.69**	**727.50**			
18	16.52	646.67			

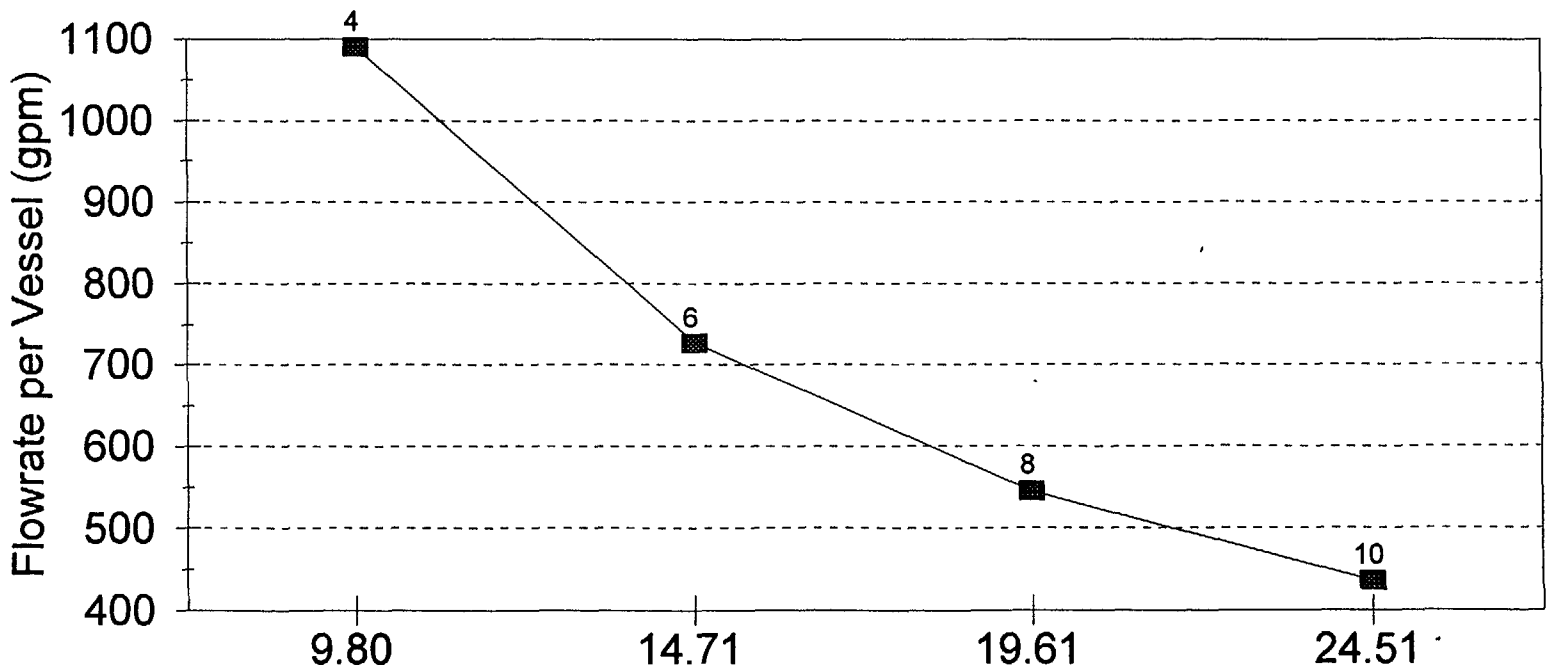
Parallel Configuration					
	Waterman		17th Street		
No. of Vessels required	Tot.Ret.Time (min)	Flow per Vessel (gpm)	No. of Vessels required	Tot.Ret.Time (min)	Flow per Vessel (gpm)
8	7.34	727.50	4	9.80	545.00
9	8.26	646.67	**6**	**14.71**	**363.33**
10	9.18	582.00	8	19.61	272.50
11	10.10	529.09	10	24.51	218.00
12	11.02	485.00			666.67
13	11.93	447.69			615.38
14	12.85	415.71			571.43
15	13.77	388.00			533.33
16	**14.69**	**363.75**			500.00
17	15.61	342.35			470.59
18	16.52	323.33			444.44

Figure C-1
Flowrate versus Total Contact Time



GP\NMK\QUATTRO\CARBON1 WB1

Figure C-2
Flowrate versus Total Contact Time



GP\NMK\QUATTRO\CARBON1 WB1

Figure C-3
Flowrate versus Total Contact Time

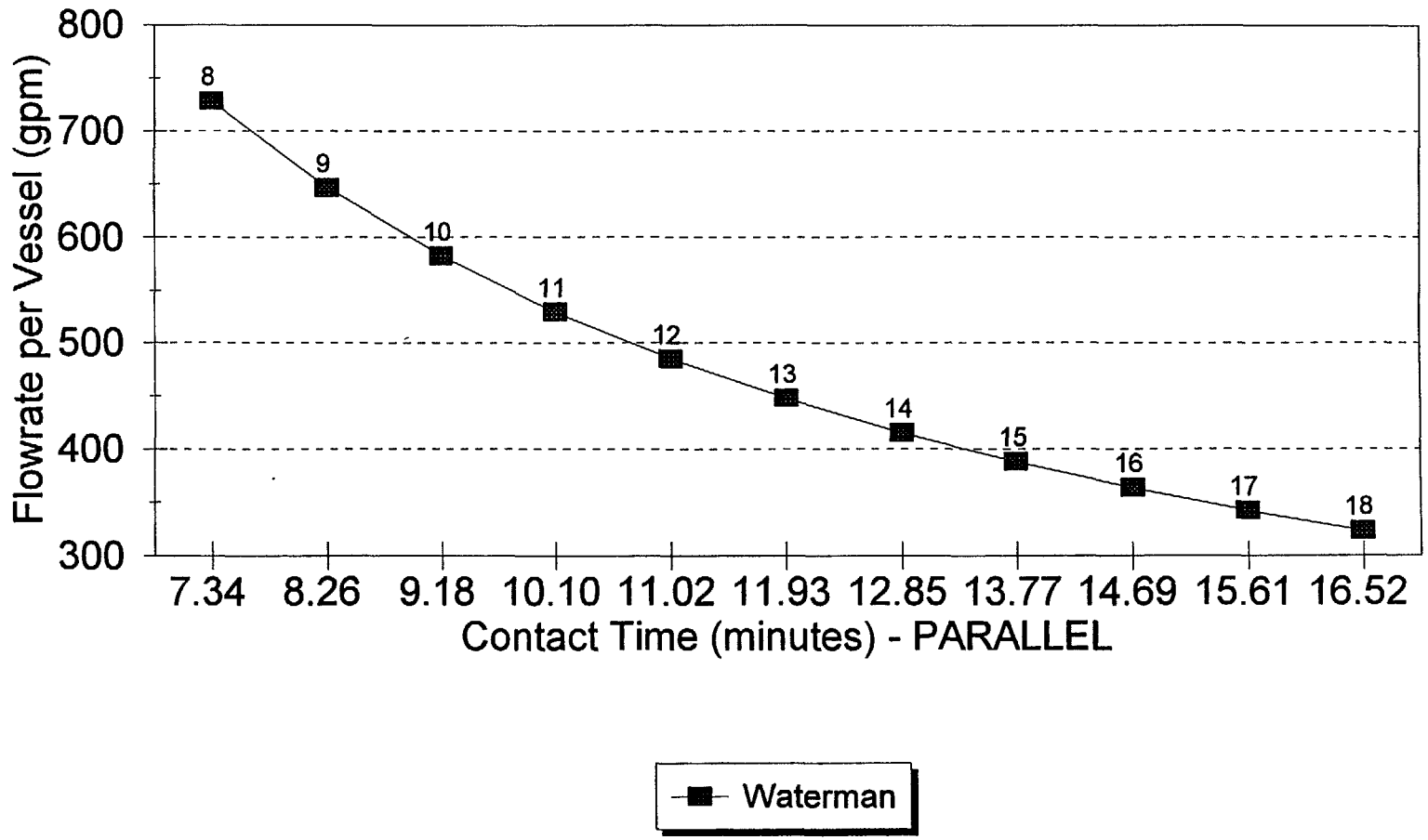
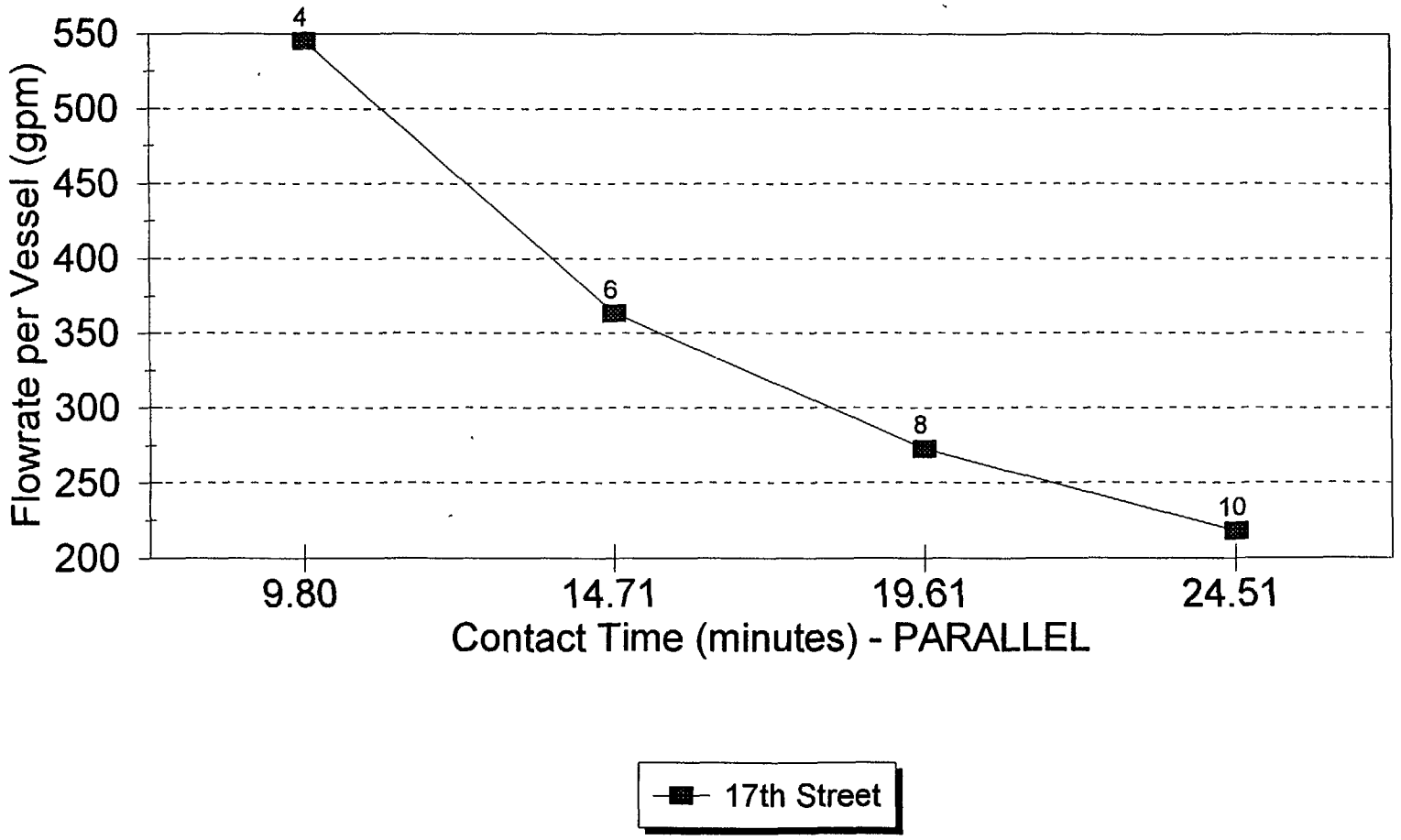


Figure C-4
Flowrate versus Total Contact Time



GP\NMK\QUATTRO\CARBON1 WB1

LPGAC - usage calcs

Assumptions

Flow = 4,875 gpm

*) Concentrations / Contaminants as described in Appendix C

20,000 lbs carbon per vessel

Serial (double-pass) configuration, 15 minutes retention time, or ~700 gpm per pair of vessels.

⇒ Required # of vessels = $\frac{4,875}{700}$ = 6.96, say 7 pairs = 14 vessels

⇒ Total Mass of carbon = 14 * 20,000 = 280,000 lbs

Average carbon consumption rate (based on vendor modeling) =

= 0.055 lbs GAC / 1000 gallons water treated.

Daily GAC consumption = $\frac{4,875 * 1440}{1,000}$ * 0.055 = 386 lbs/day

Estimated Carbon Life:

Serial Configuration: $\frac{280,000 \text{ lbs GAC}}{2} * \frac{1}{386 \text{ lbs/d}}$ = 362.60 days ≅ 0.99 years

*) Only PCE & TCE are above MCL and need to be controlled.

URS	PROJECT Newmark RD North	JOB NO. 62370 50.40
URS CONSULTANTS — A PROFESSIONAL SERVICES ORGANIZATION	SUBJECT LPGAC Usage Estimates	DATE 4-4-95
	BY SP CHECKED NN	SHEET NO. 1

Contact Time versus Flow Rate - Relationship

Assumptions:

Vessel size = 20,000 lbs GAC, each

Carbon unit weight = 28.00 lbs/ft^3

Resulting Carbon Volume = $\frac{20{,}000 \text{ lbs}}{28 \text{ lbs/ft}^3}$ = 714.3 ft^3 = 5,343 gallons

Total Design Flow = 8,000 gpm < 5,820 gpm @ Waterman; 2,180 gpm @ 17th Street

Serial Configuration

Waterman: Assume 16 vessels ⇒

⇒ Flow per pair (serial) = $\frac{5{,}820 \text{ gpm}}{8 \text{ pairs}}$ = 727.5 gpm/pair

⇒ Total Contact Time (serial) = Empty Bed Contact Time (EBCT) =

= $\frac{\text{Volume of Carbon in 2 vessels}}{\text{Flow per pair}}$ = $\frac{5{,}343 \text{ gallons} * 2}{727.5 \text{ gpm}}$ = 14.69 min

17th Street: Assume 6 vessels (existing) ⇒

⇒ Flow per pair (serial) = $\frac{2{,}180 \text{ gpm}}{3 \text{ pairs}}$ = 726.7 gpm/pair

⇒ Total Contact Time (serial) = Empty Bed Contact Time (EBCT) =

= $\frac{\text{Volume of Carbon in 2 vessels}}{\text{Flow per pair}}$ = $\frac{5{,}343 \text{ gallons} * 2}{726.7 \text{ gpm}}$ = 14.71 min

LPGAC usage calcs at Waterman Plant

Assumptions:

Flow = 8000 gpm total → Waterman: 5,820 gpm; 17th Street 2,180 gpm (existing)

Concentrations/Contaminants as described in Appendix C.

Only PCE & TCE are above MCL and need to be controlled.

20,000 lbs carbon (GAC) per vessel

Serial (double-pass) configuration, 15 minutes retention time, or ~700 gpm per pair of vessels.

⇒ Required # of vessels = $\frac{5,820}{700}$ = 8.31, say 8 pairs = **16 vessels**

⇒ Total Mass of GAC = 16 * 20,000 = 320,000 lbs

Average GAC consumption rate (based on vendor modeling) =
= 0.055 lbs GAC / 1000 gallons of water treated.

⇒ Daily GAC consumption = $\frac{5,820 * 1.440}{1,000}$ * 0.055 = **461 lbs/day**

⇒ Estimated Carbon Life (serial configuration) = $\frac{320,000 \text{ lbs}}{2 * 461 \text{ lbs/d}}$ = **347 days per vessel**

= 0.95 years

URS	PROJECT Nemmock RD South	JOB NO. 62370.6030
URS CONSULTANTS — A PROFESSIONAL SERVICES ORGANIZATION	SUBJECT LPGAC Usage Calcs	DATE 4-4-95
	BY GJ CHECKED	SHEET NO. 2 of 4

LPGAC - usage calcs at 17th Street Plant:

Design Flow = 2,180 gpm through existing plant in serial configuratio

⇒ check if the 6 existing vessels are adequate (flow ~ 700 gpm, ~ 15 min contact time):

$$\frac{2{,}180 \text{ gpm}}{700 \text{ gpm}} = 3.11, \text{ say 3 pairs} = \underline{6 \text{ vessels}} \checkmark \text{ ok}$$

Total Mass of GAC = 6 * 20,000 lbs = 120,000 lbs

Average GAC consumption rate (based on vendor modeling) =
= 0.055 lbs GAC / 1,000 gallons of water treated.

$$\Rightarrow \text{Daily GAC consumption} = \frac{2{,}180 \text{ gpm} * 1{,}440 \frac{\text{min}}{\text{day}}}{1{,}000 \text{ gallons}} * 0.055 \frac{\text{lbs GAC}}{1000 \text{ gal.}} =$$

$$= 173 \text{ lbs GAC/day}$$

⇒ Estimated Carbon Life (in serial configuration, i.e., changeout carbon when first stage is spent) =

$$= \frac{120{,}000 \text{ lbs}}{2} * \frac{1}{173 \text{ lbs GAC/d}} = 348 \text{ days} = 0.95 \text{ years (per vessel)}$$

URS CONSULTANTS — A PROFESSIONAL SERVICES ORGANIZATION	PROJECT Newmark RD South	JOB NO. 62370.60.30
	SUBJECT LPGAC Usage Calcs	DATE 4-14-95
	BY JP CHECKED	SHEET NO. 3 of 4

Backwash Cycle = 15 min @ 1,500 gpm = 22,500 gal ÷ 7.48 gal/ft³ =

≅ 3,000 ft³

Size of Backwash Sumps:

assume one sump along each GAC train (= 2 sumps)

each sump is 120' long
4' wide

the sumps are connected with 24"Ø pipe ~ 20' long

⇒ Required average depth of sump w/ 12" free board:

$$D = \frac{\overbrace{3000}^{ft^3} - \left(\frac{24}{24}\right)^2 \pi * 20'}{2*(120')*4'} + 1' = \underline{\underline{4\ ft}}$$

Connect sumps to existing drain line.
Install sluice valve @ sump where drain line exits sump.

Size grating for 1-ton forklift loading.

URS	PROJECT Newmark RD South	JOB NO. 62370.60.30
URS CONSULTANTS A PROFESSIONAL SERVICES ORGANIZATION	SUBJECT Backwash Calcs	DATE 1-4-95
	BY GP CHECKED	SHEET NO. 4 of 4

Pipeline Headloss Calcs.

Friction loss in pipe by Hazen-Williams:

$$\boxed{H_L = \frac{f * L\,(ft)}{100}}$$

HEADLOSS IN PIPE
(ref: ASAHI/AMERICA, Inc.)

$$f = 0.2083\left(\frac{100}{C}\right)^{1.852} * \frac{Q^{1.852}}{D^{4.8655}}$$

f = friction head in ft of liquid per 100 ft of pipe
L = pipe length (ft)
C = constant for pipe surface roughness (-)
Q = flow in gpm
D = inside diameter of pipe (in)

$$\boxed{H_f = k_f \frac{v^2}{2g}}$$

HEADLOSS IN FITTINGS
(ref The Gorman-Rupp Co.)

k_f = friction factor of fitting (-)
v = velocity of liquid in pipe (fps)
g = acceleration due to gravity $\left(\frac{ft}{s^2}\right)$

H_s = Static Head = Hydraulic Grade Line difference between the source of supply (groundwater table w/ drawdown) and the point of free discharge.

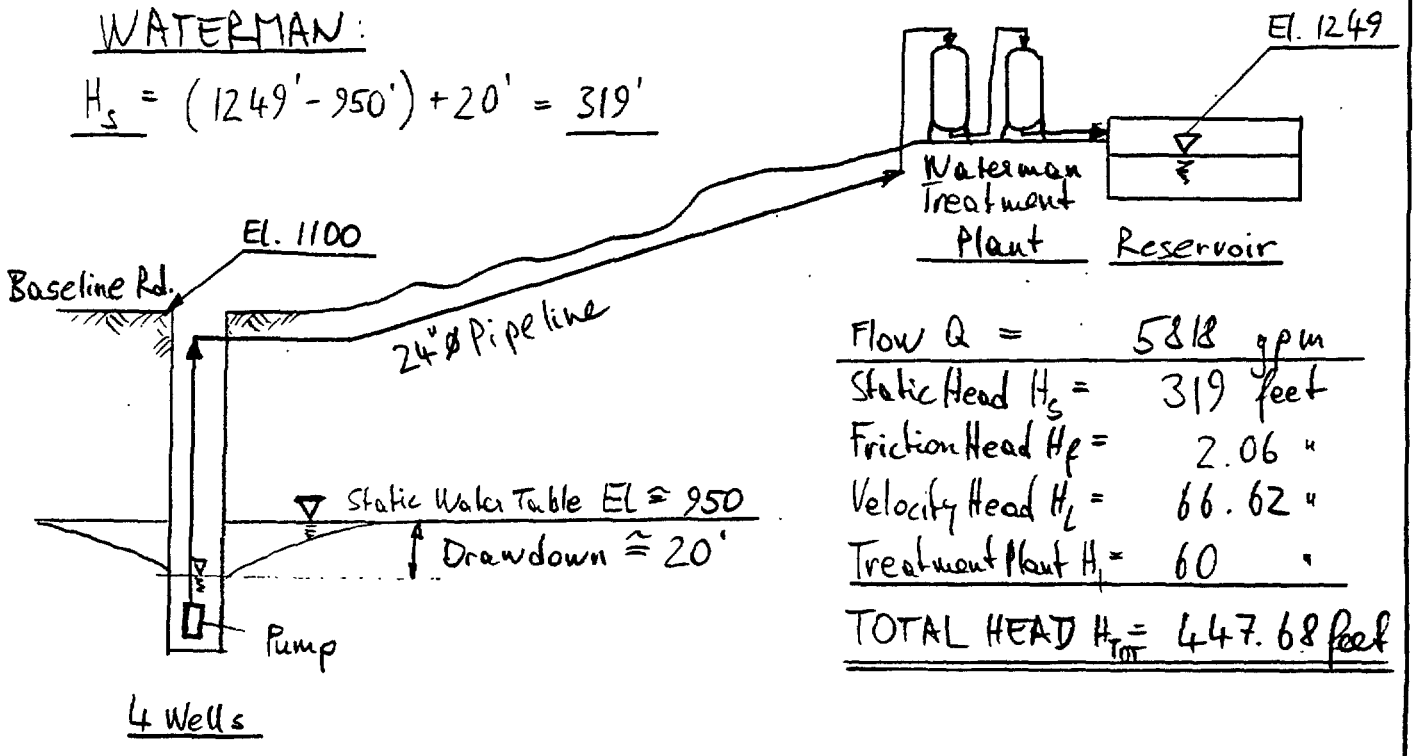
This calculation focused on transporting water through pipelines and treatment system into the reservoir. It does not account for any residual pressure required by the City.

URS	PROJECT Newmark OU RD	JOB NO. 62370.60.30
URS CONSULTANTS A PROFESSIONAL SERVICES ORGANIZATION	SUBJECT Pipeline Headloss Formulas	DATE 6/29/95
	BY fp CHECKED NPI	SHEET NO. 1 of 3

Pipeline Headloss Calcs

WATERMAN:

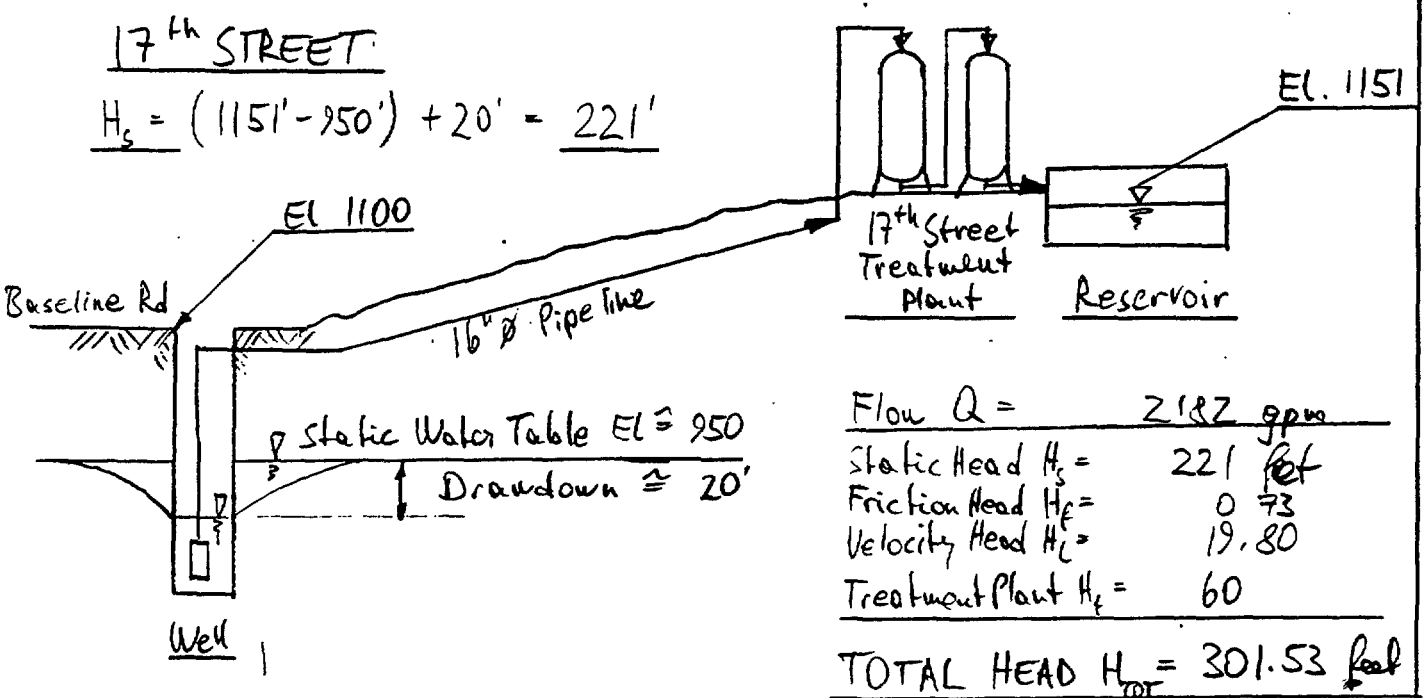
$H_s = (1249' - 950') + 20' = 319'$



Flow Q =	5818 gpm
Static Head H_s =	319 feet
Friction Head H_f =	2.06 "
Velocity Head H_l =	66.62 "
Treatment Plant H_t =	60 "
TOTAL HEAD H_{TOT} =	447.68 feet

17th STREET

$H_s = (1151' - 950') + 20' = 221'$



Flow Q =	2182 gpm
Static Head H_s =	221 feet
Friction Head H_f =	0.73
Velocity Head H_l =	19.80
Treatment Plant H_t =	60
TOTAL HEAD H_{TOT} =	301.53 feet

URS / URS CONSULTANTS — A PROFESSIONAL SERVICES ORGANIZATION	PROJECT Newmark OU RD	JOB NO. 62370.60.30	
	SUBJECT Headloss Calcs	DATE 8/4/95	
	BY JP	CHECKED JN	SHEET NO. 2 of 3

Theoretical Water Hosepower and Energy Consumption Estimates:

$$\text{Theoretical Water Horse power (Hp)} = \frac{Q\,(gpm) * H_{TOT}\,(ft) * \text{Spec Gravity}}{3960}$$

(ref: The Gorman-Rupp Co.)

$$Hp_{waterman} = \frac{5818\,(447.68)\,(1)}{3960} = 658\ Hp = 490\ kW$$

Energy Consumption (@ \$0.10/kWh):

per year: 490 kW (24 hrs) (365 days) (\$0.10/kWh) =

= \$429650/yr

$$Hp_{(17th\,St)} = \frac{2182\,(301.53)\,(1)}{3960} = 166\ Hp = 124\ kW$$

Energy Consumption (@ \$0.10/kWh).

per year: 124 kW (24 hrs) (365 days) (\$0.10/kWh) =

= \$108532/yr

Total Energy Consumption = \$538182/yr

URS	PROJECT Newmark OU RD	JOB NO. 62370 60.30
URS CONSULTANTS A PROFESSIONAL SERVICES ORGANIZATION	SUBJECT Energy Consumption	DATE 8/4/95
	BY JP CHECKED NNJ	SHEET NO. 3 of 3

LPGAC Usage Calculation — Waterman Plant

Total design Flow Rate = 7810 gpm → 5,610 gpm to Waterman Plant
→ 2,200 gpm to 17th Street Plant (existing)

Assumptions: same as shown on calculation sheet page 2 of 4 dated 4-4-95

8 pairs LPGAC vessels at Waterman Plant

LPGAC capacity of each vessel = 20,000 lb

⇒ Total Mass of LPGAC = (8×2) × 20,000 = 320,000 lb

Average LPGAC consumption rate (Based on Vendor Modeling)
= 0.055 lb LPGAC / 1,000 gallon of contaminated water

Daily LPGAC Consumption $= \frac{5,610 \times (60 \times 24)}{1,000} \times 0.055$
$\simeq$ 445 lb

Estimated Carbon life (serial configuration) $= \frac{320,000}{2 \times 445} \simeq$ 360 days (per vessel)

URS — URS CONSULTANTS — A PROFESSIONAL SERVICES ORGANIZATION	PROJECT Newmark RD South	JOB NO 41-62370	
	SUBJECT LPGAC Usage Estimate	DATE 9-18-97	
	BY NN	CHECKED	SHEET NO. 1/4

LPGAC Usage Calculation – 17th Street Plant

Design Flow Rate = 2,200 gpm

assumptions: same as shown on Calculation sheet page 2 of 4 dated 4-4-95.

3 Pairs of LPGAC vessels at 17th Street Plant.

LPGAC capacity of each vessel = 20,000 lb

⇒ Total Mass of LPGAC = (3x2) x 20,000 = 120,000 lb

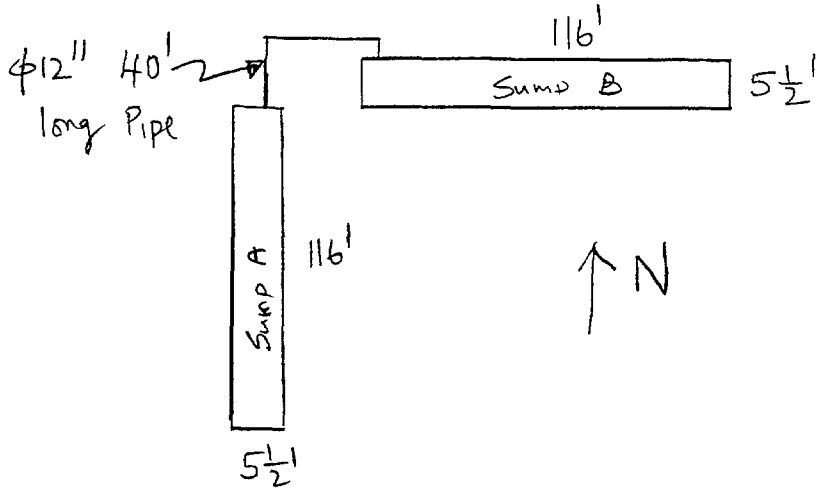
Average LPGAC consumption rate (based on Vendor Modeling)
= 0.055 lb LPGAC/1,000 gallon of contaminated water

$$\text{Daily LPGAC Consumption} = \frac{2{,}200 \times (60 \times 24)}{1{,}000} \times 0.055$$

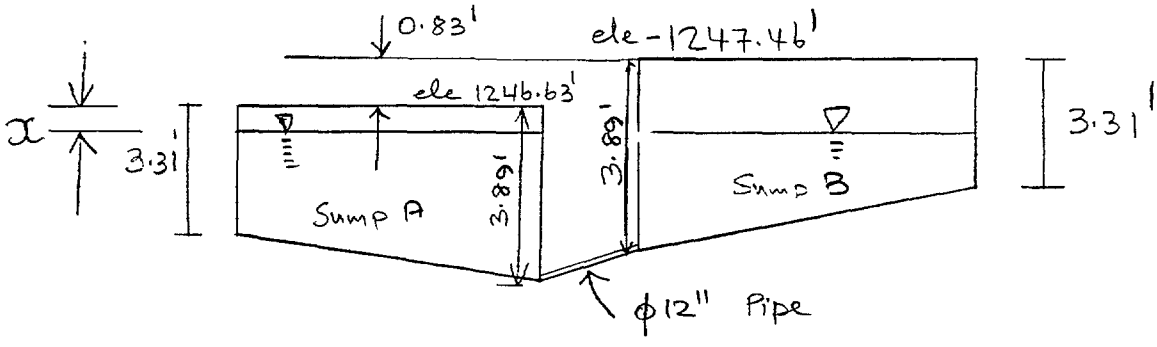
$$= 174 \text{ lb}$$

$$\text{Estimated Carbon life (serial configuration)} = \frac{120{,}000}{2 \times 174} \simeq 344 \text{ days (per vessel)}$$

URS CONSULTANTS — A PROFESSIONAL SERVICES ORGANIZATION	PROJECT Neilmark RD South	JOB NO 41-0277	
	SUBJECT LPGAC Usage Estimate	DATE 9-18-97	
	BY NN	CHECKED	SHEET NO 2/4



Backwash Sump Layout – Waterman Plant



Backwash Sump Elevation – Waterman Plant

Backwash Cycle per Vessel = 15 min @ 1,500 gpm = 22,500 gallon
= 3,000 ft³

Volume of ϕ12" 40' long pipe $= \frac{\pi}{4} \times \left(\frac{12}{12}\right)^2 \times 40' = 31.42\ ft^3$

Required Volume of Sumps A & B = 3000 − 31.42 = 2968.58 ft³

URS CONSULTANTS — A PROFESSIONAL SERVICES ORGANIZATION	PROJECT Newmark RD South	JOB NO 41-6237	
	SUBJECT Backwash Sump Capacity	DATE 9-18-97	
	BY NN	CHECKED	SHEET NO 3/4

let x' is the Freeboard in Sump A.

Volume of water in Sump A $= 116 \times 5\frac{1}{2}\left[\frac{3.31+3.89}{2} - x\right] ft^3$

Volume of water in Sump B $= 116 \times 5\frac{1}{2}\left[\frac{3.31+3.89}{2} - x - 0.83\right] ft^3$

Vol. of Water in Sumps A & B $= 2968.58\ ft^3$

$$116 \times 5\tfrac{1}{2} \times \left[\frac{3.31+3.89}{2} - x\right] + 116 \times 5\tfrac{1}{2} \times \left[\frac{3.31+3.89}{2} - x - 0.83\right]$$

$$= 2968.58$$

$$\Rightarrow x = 0.86'$$

$\therefore$ Free board in Sump A $= 0.86'$

Sump B $= 1.69'$

URS	PROJECT Nemenhah R.D South		JOB NO. 41-02370
	SUBJECT Backwash Sump Capacity		DATE 9-18-97
URS CONSULTANTS A PROFESSIONAL SERVICES ORGANIZATION	BY NN	CHECKED	SHEET NO. 4/4