MOUNTAIN VIEW WASTEWATER PLANT
LR05-5857

INDEX

Narrative

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The current Mountain View WWTP is permitted to discharge treated wastewater to Hugh's Creek through NPDES permit #AR0020117. The permitted flow is approximately 0.73 MGD

A new parameter was added to the permit in approximately the year 2000. The newly added parameter was nitrate and nitrite nitrogen (10 mg/d, 7-day average). The current trickling filter plant has been unable to consistently meet this limit.

The proposed project has been designed to consistently comply with the NPDES permit. The project will basically construct a new plant and abandon all existing treatment phases except the headworks & final clarifier. The final clarifer will receive new equipment.

The existing treatment scheme is as follows: headworks → primary clarifier → trickling → filter → secondary clarifier → bio-tower → final clarifier → chlorine disinfection. } existing

The proposed treatment scheme is as follows: headworks → extended aeration oxidation ditch → final clarifier → ultra violet disinfection.

A change in flow capacity is not being requested at this time, though the oxidation ditch is sized for an average flow up to 0.85 MGD. 0.73 *

- The calculated maximum possible flow through plant is ± 4MGD.
- Hydraulically, the piping systems, pumping systems, oxidation ditch and ultraviolet disinfection basin have been designed for a hydraulic capacity of at least 4MGD.

* See letter dated – July 27/2006 from Bryan Hicks

Design Basis

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Job No. ______ Sheet ______ / ______

Project ______

Prepared By BA Date: ______

Checked By ______ Date: ______

Design Basis

1. Design new oxidation ditch to be capable of treating at least the average annual flow.

- Between 2002 and June 2005, highest annual average flow = .64 MGD (2003)

- Add New Flatwoods flow of 0.0399 mgd = 0.68 MGD

- The Existing plant is permitted for 0.73 MGD.

Use the permitted flow of 0.73 mgd as the design flow; this will allow some future growth.

U.S. Census Bureau
American FactFinder

FACT SHEET

Mountain View city, Arkansas

Census 2000 Demographic Profile Highlights:

General Characteristics - show more >>	Number	Percent	U.S.		
Total population	2,876	100.0	100%	map	brief
Male	1,288	44.8	49.1%	map	brief
Female	1,588	55.2	50.9%	map	brief
Median age (years)	46.8	(X)	35.3	map	brief
Under 5 years	157	5.5	6.8%	map	
18 years and over	2,295	79.8	74.3%		
65 years and over	738	25.7	12.4%	map	brief
One race	2,826	98.3	97.6%		
White	2,789	97.0	75.1%	map	brief
Black or African American	0	0.0	12.3%	map	brief
American Indian and Alaska Native	27	0.9	0.9%	map	brief
Asian	0	0.0	3.6%	map	brief
Native Hawaiian and Other Pacific Islander	1	0.0	0.1%	map	brief
Some other race	9	0.3	5.5%	map	
Two or more races	50	1.7	2.4%	map	brief
Hispanic or Latino (of any race)	49	1.7	12.5%	map	brief
Household population	2,735	95.1	97.2%	map	brief
Group quarters population	141	4.9	2.8%	map	
Average household size	2.13	(X)	2.59	map	brief
Average family size	2.72	(X)	3.14	map	
Total housing units	1,450	100.0	100.0%	map	
Occupied housing units	1,287	88.8	91.0%		brief
Owner-occupied housing units	771	59.9	66.2%	map	
Renter-occupied housing units	516	40.1	33.8%	map	brief
Vacant housing units	163	11.2	9.0%	map	

Social Characteristics - show more >>	Number	Percent	U.S.		
Population 25 years and over	2,051	100.0			
High school graduate or higher	1,382	67.4	80.4%	map	brief
Bachelor's degree or higher	217	10.6	24.4%	map	
Civilian veterans (civilian population 18 years and over)	390	16.5	12.7%	map	brief
Disability status (population 21 to 64 years)	413	28.6	19.2%	map	brief
Foreign born	47	1.6	11.1%	map	brief
Male, Now married (population 15 years and over)	736	64.4	56.7%		brief
Female, Now married (population 15 years and over)	736	55.8	52.1%		brief
Speak a language other than English at home (population 5 years and over)	107	3.8	17.9%	map	brief

Economic Characteristics - show more >>	Number	Percent	U.S.		
In labor force (population 16 years and over)	1,160	48.0	63.9%		brief
Mean travel time to work in minutes (population 16 years and over)	15.4	(X)	25.5	map	brief
Median household income (dollars)	19,302	(X)	41,994	map	
Median family income (dollars)	27,559	(X)	50,046	map	
Per capita income (dollars)	17,375	(X)	21,587	map	
Families below poverty level	85	10.2	9.2%	map	brief
Individuals below poverty level	482	17.0	12.4%	map	

Housing Characteristics - show more >>	Number	Percent	U.S.		
Single-family owner-occupied homes	515	100.0			brief
Median value (dollars)	70,500	(X)	119,600	map	brief
Median of selected monthly owner costs	(X)	(X)			brief

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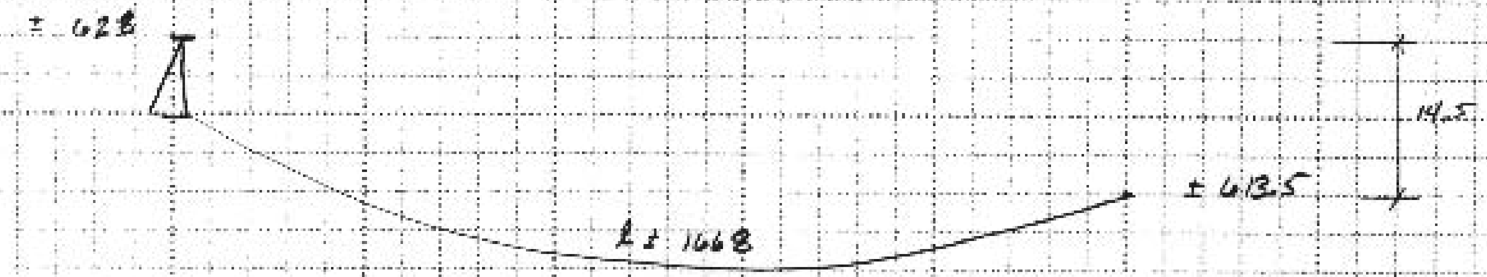
Job No. ________ Sheet ___/___
Project: Mtn View WTP
Prepared By: BH Date: 11-21-05
Checked By: ________ Date: ________

Determine approx. Volume of water that can come to plant through combination of 8" & 10" siphon & Denton P.S.

10" siphon



10" > $14.5' = \frac{10.44\,(1668)\,(Q)^{1.85}}{140^{1.85}\;\; 10.58^{4.8655}}$

$Q^{1.85} = 750{,}660.1$

$\therefore Q = \underline{\underline{1500 \text{ gpm}}}$

8" > $14.5 = \frac{10.44\,(1668)\,Q^{1.85}}{140^{1.85}\;\; 8.55^{4.8655}}$

$Q^{1.85} = 266{,}250$

$\therefore Q = \underline{857 \text{ gpm}}$

Denton p.s. capacity design = 381 gpm w/ Both pumps running

Approx total flow to plant = 2738 gpm = 3.943 MGD

Flow Data

	2002	2003	2004	2005	AVG
Jan.	0.68	0.70	0.80	0.94	**0.78**
Feb.	0.97	0.88	0.79	0.61	**0.81**
Mar.	1.27	0.75	0.58	0.71	**0.83**
Apr.	0.89	0.44	0.66	0.67	**0.66**
May	0.69	0.81	0.68	0.29	**0.62**
June	0.76	0.67	0.32	0.25	**0.50**
July	0.41	0.44	0.26	0.26	**0.34**
Aug.	0.43	0.42	0.27	0.23	**0.34**
Sept.	0.33	0.56	0.24		**0.38**
Oct.	0.32	0.38	0.55		**0.42**
Nov.	0.29	0.71	1.07		**0.69**
Dec.	0.51	0.88	0.86		**0.75**
AVG	0.63	0.64	0.59	0.49	**0.59**

7.64 / 12 = 0.636

Average = 0.59 MGD

Min flow: 0
Max flow: 0

Min flow: 0
Max flow: 0

January Date	January Flow	February Date	February Flow	March Date	March Flow
1	0.71	1	0.48		0.59
2	0.87	2	0.49		0.47
3	0.75	3	0.66		0.46
4	2.10	4	0.59		0.44
5	2.60 (max)	5	0.67		0.46
6	1.90	6	0.51		0.41
7	1.80	7	0.56		0.31
8	1.80	8	0.78		0.45
9	1.20	9	0.69		0.37
10	0.81	10	0.63		0.66
11	0.89	11	0.60		0.53
12	0.79	12	0.57		0.47
13	1.20	13	0.75		0.47
14	1.30	14	0.92 (max)		0.38
15	1.00	15	0.77		0.35
16	0.85	16	0.68		0.38
17	0.76	17	0.60		0.38
18	0.73	18	0.55		0.39
19	0.70	19	0.60		0.38
20	0.61	20	0.42 (min)		0.34
21	0.66	21	0.56		0.29 (min)
22	0.69	22	0.59		0.76
23	0.48	23	0.57		1.80
24	0.46	24	0.68		1.00
25	0.46	25	0.62		0.94
26	0.60	26	0.59		1.00
27	0.44	27	0.47		1.60
28	0.41 (min)	28	0.54		2.00 (max)
29	0.53			1	1.70
30	0.56			2	1.30
31	0.50			3	1.00
3.71"	0.94	2.10"	0.61	7.8"	0.71
Min flow:	0.41	Min flow:	0.42	Min flow:	0.29
Max flow:	2.60	Max flow:	0.92	Max flow:	2.00

Annual Average = 0.49

Number flows over 2 MGD = 4
Number flows over 1 MGD = 33

Number flows under .25 MGD = 55

April		May		June	
Date	Flow	Date	Flow	Date	Flow
1	0.86	1	0.55	1	0.22
2	0.86	2	0.36	2	0.27
3	0.67	3	0.38	3	0.27
4	**0.51**	4	0.35	4	0.26
5	**0.55**	5	0.31	5	0.31
6	0.65	6	0.30	6	0.22
7	1.00	7	0.31	7	0.26
8	1.00	8	0.31	8	0.26
9	0.84	9	0.30	9	0.26
10	0.69	10	0.27	10	0.28
11	0.60	11	0.27	11	0.30
12	1.80	12	0.28	12	0.30
13	1.10	13	0.28	13	**0.18**
14	0.83	14	0.31	14	0.26
15	0.89	15	0.27	15	0.22
16	0.73	16	**0.24**	16	0.24
17	0.72	17	**0.25**	17	0.26
18	0.81	18	**0.23**	18	0.28
19	**0.50**	19	**0.24**	19	0.25
20	**0.47**	20	**0.26**	20	**0.20**
21	**0.46**	21	**0.24**	21	0.33
22	**0.45**	22	0.25	22	0.25
23	**0.50**	23	**0.24**	23	0.22
24	**0.34**	24	0.30	24	**0.21**
25	**0.31**	25	0.26	25	0.26
26	**0.35**	26	**0.23**	26	0.29
27	**0.33**	27	0.26	27	**0.17**
28	**0.33**	28	0.28	28	0.23
29	0.61	29	0.27	29	**0.21**
30	**0.43**	30	0.26	30	**0.21**
		31	**0.23**		
3.33"	0.67	0.55"	0.29	1.55"	0.25
Min flow:	0.31	Min flow:	0.23	Min flow:	0.17
Max flow:	1.80	Max flow:	0.55	Max flow:	0.33

July	
Date	Flow
1	0.27
2	0.29
3	0.30
4	0.26
5	0.25
6	0.27
7	0.24
8	0.25
9	0.26
10	0.28
11	0.22
12	0.24
13	0.25
14	0.26
15	0.24
16	0.31 max
17	0.27
18	0.22
19	0.26
20	0.24
21	0.24
22	0.27
23	0.27
24	0.28
25	0.19 min
26	0.23
27	0.23
28	0.27
29	0.24
30	0.28
31	0.24
1.28"	0.26

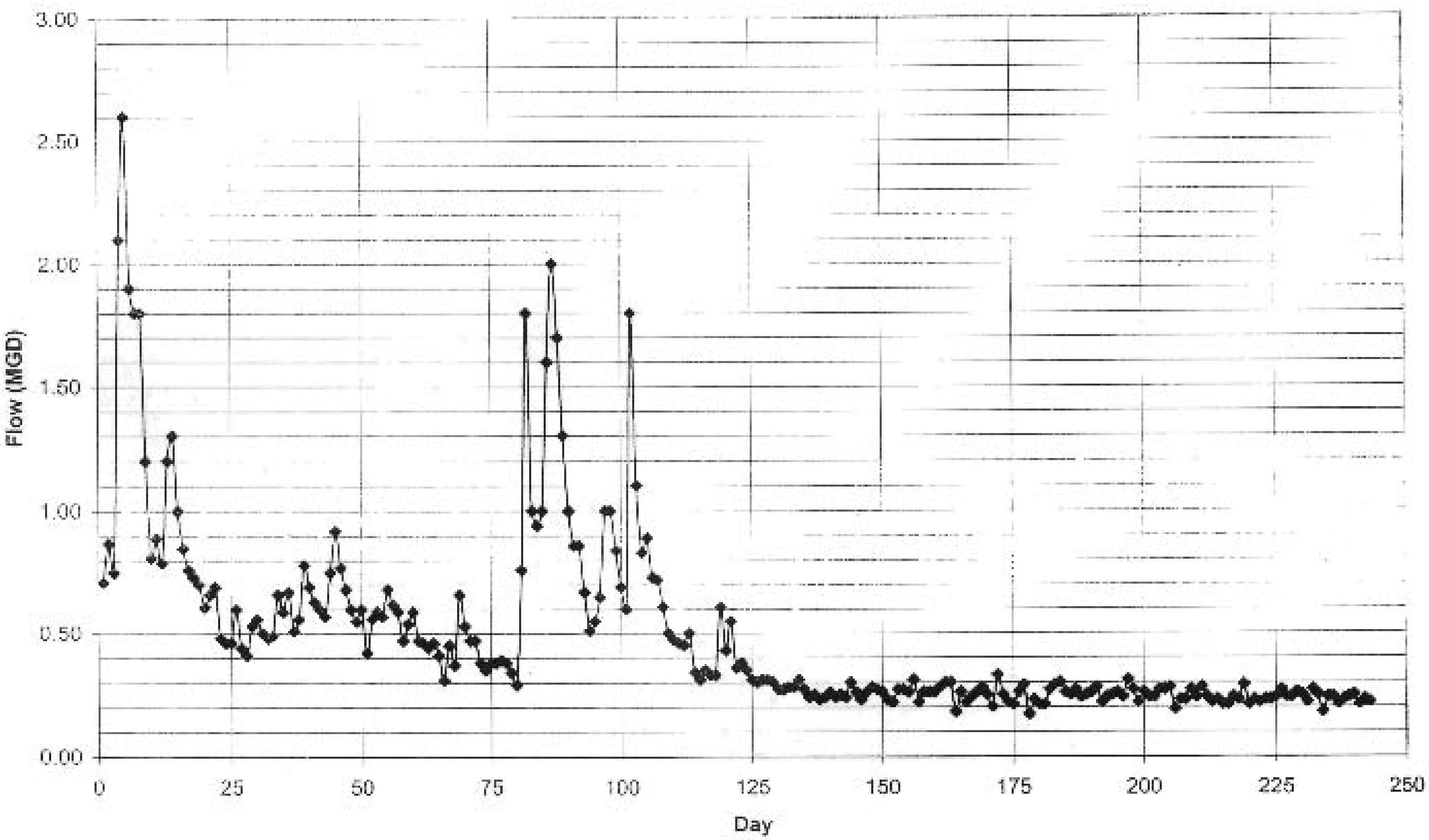
Min flow: 0.19
Max flow: 0.31

August	
Date	Flow
1	0.22
2	0.23
3	0.21
4	0.21
5	0.24
6	0.23
7	0.29 max
8	0.21
9	0.23
10	0.22
11	0.23
12	0.23
13	0.24
14	0.27
15	0.24
16	0.24
17	0.26
18	0.25
19	0.22
20	0.27
21	0.25
22	0.18 min
23	0.24
24	0.24
25	0.21
26	0.23
27	0.24
28	0.25
29	0.21
30	0.23
31	0.22
1.20"	0.23

Min flow: 0.18
Max flow: 0.29

05

2005 Flow Data



Mountain View Wastewater Treatment Plant

2004 Flow Data
+/- 15% of monthly avg.

January Date	January Flow	February Date	February Flow	March Date	March Flow	April Date	April Flow	Peak
1	1.20	1	0.66		0.43	1	0.50	.9
2	0.84	2	0.46		0.51	2	0.38	1.9
3	0.91	3	0.72		0.46	3	0.35	
4	0.92	4	0.60		0.80	4	0.42	
5	0.92	5	0.67		1.30	5	0.25	
6	1.00	6	1.90		1.40	6	0.32	
7	0.79	7	1.60		0.98	7	0.43	
8	0.72	8	1.30		0.80	8	0.32	
9	0.71	9	0.99		0.76	9	0.35	
10	0.71	10	1.40		0.67	10	0.36	
11	0.60	11	0.81		0.59	11	0.41	
12	0.50	12	0.90		0.58	12	0.37	
13	0.56	13	1.10		0.60	13	0.38	
14	0.54	14	0.86		0.71	14	0.31	
15	0.55	15	0.84		0.38	15	0.31	
16	0.49	16	0.76		0.60	16	0.34	
17	0.94	17	0.74		0.58	17	0.39	
18	1.20	18	0.74		0.51	18	0.49	
19	1.50	19	0.69		0.45	19	0.23	
20	0.87	20	0.71		0.47	20	0.35	
21	0.82	21	0.75		0.54	21	0.34	
22	0.80	22	0.58		0.27	22	0.62	
23	0.75	23	0.39		0.35	23	1.80	
24	0.71	24	0.51		0.38	24	2.10	
25	0.81	25	0.49		0.38	25	2.20	
26	0.79	26	0.46		0.41	26	1.70	
27	0.77	27	0.43		0.41	27	1.30	
28	0.77	28	0.42		0.39	28	1.00	
29	0.68	29	0.48	1	0.46	29	0.85	
30	0.68			2	0.47	30	0.76	
31	0.71			3	0.43			
2.3"	0.80	2.3"	0.79	2.6"	0.58	7.7"	0.66	
Min flow:	0.49	Min flow:	0.39	Min flow:	0.27	Min flow:	0.23	
Max flow:	1.50	Max flow:	1.90	Max flow:	1.40	Max flow:	2.20	

Annual Average = 0.59

Number flows over 2 MGD = 12
Number flows over 1 MGD = 92

Number flows under .25 MGD = 54

May		Peak June		July		August	
Date	Flow	Date	Flow	Date	Flow	Date	Flow
1	0.81	1	0.39	1	0.25	1	**0.22**
2	0.94	2	0.33	2	0.29	2	**0.19**
3	0.79	3	0.36	3	0.34	3	**0.21**
4	0.74	4	0.31	4	0.32	4	**0.22**
5	0.65	5	0.32	5	0.34	5	0.23
6	**0.55**	6	0.34	6	0.23	6	0.25
7	**0.49**	7	0.31	7	0.26	7	0.30
8	**0.48**	8	0.32	8	0.34	8	0.29
9	**0.41**	9	0.40	9	0.29	9	**0.19**
10	**0.31**	10	0.40	10	0.38	10	0.34
11	**0.34**	11	0.37	11	0.26	11	0.28
12	**0.34**	12	0.42	12	0.29	12	0.55
13	**0.54**	13	0.39	13	0.29	13	0.31
14	1.80	14	**0.24**	14	0.26	14	0.27
15	2.10	15	0.28	15	0.25	15	0.36
16	1.50	16	0.33	16	0.26	16	**0.22**
17	0.84	17	0.30	17	0.33	17	0.23
18	0.98	18	0.30	18	0.33	18	0.24
19	0.63	19	0.28	19	**0.21**	19	0.25
20	0.74	20	0.31	20	**0.22**	20	0.29
21	0.65	21	**0.21**	21	**0.21**	21	0.29
22	**0.56**	22	0.32	22	**0.21**	22	0.28
23	0.65	23	0.36	23	**0.20**	23	0.25
24	.34 0.36 .49	24	0.28	24	**0.21**	24	0.26
25	**0.45**	25	0.30	25	0.27	25	0.23
26	**0.41**	26	0.29	26	0.24	26	0.24
27	**0.42**	27	0.29	27	**0.22**	27	**0.20**
28	**0.43**	28	0.29	28	**0.19**	28	0.27
29	**0.41**	29	**0.25**	29	**0.21**	29	0.35
30	**0.41**	30	**0.27**	30	0.23	30	**0.21**
31	**0.44**			31	0.24	31	0.24
4.3"	0.68	1.9"	0.32	2.4"	0.26	3.5"	0.27
Min flow:	0.31	Min flow:	0.21	Min flow:	0.19	Min flow:	0.19
Max flow:	2.10	Max flow:	0.42	Max flow:	0.38	Max flow:	0.55

September Date	September Flow	October Date	October Flow	November Date	November Flow	December Date	December Flow
1	0.22	1	0.25	1	1.50	1	2.00
2	0.22	2	0.28	2	2.10	2	1.40
3	0.24	3	0.23	3	1.70	3	1.30
4	0.32	4	0.20	4	1.20	4	1.10
5	0.26	5	0.22	5	1.20	5	0.89
6	0.28	6	0.24	6	1.10	6	1.40
7	0.18	7	0.19	7	0.87	7	1.00
8	0.22	8	0.23	8	0.61	8	1.30
9	0.22	9	0.76	9	0.66	9	1.20
10	0.23	10	0.42	10	0.57	10	1.10
11	0.26	11	0.78	11	0.84	11	0.97
12	0.30	12	1.60	12	1.60	12	0.75
13	0.18	13	0.72	13	1.20	13	0.70
14	0.25	14	0.45	14	0.82	14	0.64
15	0.25	15	1.10	15	0.69	15	0.50
16	0.24	16	0.72	16	0.69	16	0.56
17	0.25	17	0.51	17	0.61	17	0.51
18	0.25	18	0.30	18	0.57	18	0.60
19	0.26	19	0.49	19	0.76	19	0.49
20	0.20	20	0.39	20	0.78	20	0.34
21	0.22	21	0.39	21	0.66	21	0.43
22	0.22	22	0.36	22	0.53	22	0.47
23	0.22	23	0.42	23	1.00	23	0.88
24	0.22	24	0.38	24	1.60	24	0.77
25	0.29	25	0.29	25	2.00	25	0.67
26	0.25	26	0.33	26	1.40	26	0.66
27	0.20	27	0.33	27	1.40	27	0.66
28	0.21	28	0.35	28	1.70	28	0.77
29	0.20	29	1.10	29	0.92	29	0.78
30	0.21	30	1.30	30	0.97	30	0.80
		31	1.60			31	0.92
0"	0.24	9.4"	0.55	6.5"	1.07	2.3"	0.86
Min flow:	0.18	Min flow:	0.19	Min flow:	0.53	Min flow:	0.34
Max flow:	0.32	Max flow:	1.60	Max flow:	2.10	Max flow:	2.00

Mountain View Wastewater Treatment Plant

2003 Flow Data
+/- 15% of monthly avg.

January		February		March		April	
Date	Flow	Date	Flow	Date	Flow	Date	Flow
1	2.20	1	**0.41**	1	1.10	1	0.54
2	1.70	2	**0.40**	2	0.82	2	0.51
3	1.80	3	**0.34**	3	0.84	3	0.44
4	1.40	4	**0.39**	4	0.88	4	0.44
5	1.20	5	**0.33**	5	0.77	5	**0.34**
6	0.90	6	**0.33**	6	0.67	6	0.44
7	0.94	7	**0.41**	7	0.78	7	0.58
8	0.84	8	**0.47**	8	0.65	8	0.63
9	0.78	9	**0.46**	9	0.64	9	0.55
10	0.63	10	**0.39**	10	**0.47**	10	0.47
11	0.61	11	**0.53**	11	**0.54**	11	0.42
12	**0.42**	12	**0.54**	12	**0.52**	12	0.42
13	**0.33**	13	**0.54**	13	**0.50**	13	0.38
14	**0.50**	14	0.84	14	**0.59**	14	**0.30**
15	**0.48**	15	1.26	15	**0.52**	15	0.41
16	**0.49**	16	1.91	16	**0.52**	16	0.41
17	**0.48**	17	1.71	17	**0.43**	17	0.40
18	**0.47**	18	1.10	18	**0.46**	18	0.40
19	**0.44**	19	0.92	19	0.80	19	0.42
20	**0.44**	20	1.10	20	1.10	20	0.47
21	**0.46**	21	1.00	21	1.50	21	**0.33**
22	**0.44**	22	1.50	22	1.20	22	**0.36**
23	**0.40**	23	1.90	23	0.85	23	**0.31**
24	**0.41**	24	1.50	24	**0.63**	24	0.51
25	**0.40**	25	1.20	25	0.73	25	0.59
26	**0.42**	26	1.10	26	1.00	26	0.50
27	**0.31**	27	1.00	27	0.92	27	0.41
28	**0.39**	28	1.10	28	0.82	28	**0.36**
29	**0.41**			29	0.79	29	**0.37**
30	**0.45**			30	**0.63**	30	**0.35**
31	**0.44**			31	**0.45**		
1.6"	0.70	4.3"	0.88	2.7"	0.75	2.0"	0.44
Min flow:	0.31	Min flow:	0.33	Min flow:	0.43	Min flow:	0.30
Max flow:	2.20	Max flow:	1.91	Max flow:	1.50	Max flow:	0.63

Annual Average = 0.64

Number flows over 2 MGD = 5
Number flows over 1 MGD = 94

Number flows under .25 MGD = 0

Mountain View Wastewater Treatment Plant

2003 Flow Data
+/- 15% of monthly avg.

May Date	May Flow	June Date	June Flow	July Date	July Flow	August Date	August Flow
1	0.35	1	0.55	1	0.44	1	0.40
2	0.43	2	0.55	2	0.36	2	0.37
3	0.39	3	1.80	3	0.49	3	0.48
4	0.41	4	1.10	4	0.46	4	0.77
5	0.33	5	0.91	5	0.36	5	0.67
6	0.42	6	0.81	6	0.39	6	0.66
7	0.39	7	0.75	7	0.35	7	0.50
8	0.39	8	0.73	8	0.34	8	0.45
9	0.85	9	0.57	9	0.33	9	0.38
10	0.63	10	0.55	10	0.33	10	0.42
11	0.95	11	0.55	11	0.32	11	0.35
12	0.87	12	0.70	12	0.45	12	0.37
13	0.64	13	1.10	13	0.34	13	0.33
14	0.74	14	0.77	14	0.38	14	0.38
15	1.10	15	0.84	15	0.30	15	0.36
16	0.82	16	0.65	16	0.31	16	0.38
17	1.80	17	0.64	17	0.29	17	0.28
18	2.10	18	0.58	18	0.31	18	0.24
19	1.70	19	0.58	19	0.61	19	0.33
20	1.30	20	0.58	20	0.69	20	0.33
21	1.00	21	0.81	21	0.34	21	0.31
22	0.97	22	0.48	22	0.49	22	0.34
23	0.83	23	0.46	23	0.82	23	0.30
24	0.75	24	0.42	24	0.42	24	0.35
25	0.97	25	0.38	25	0.42	25	0.27
26	0.88	26	0.55	26	0.40	26	0.29
27	0.70	27	0.64	27	0.42	27	0.24
28	0.79	28	0.46	28	0.29	28	0.32
29	0.59	29	0.48	29	0.94	29	0.29
30	0.58	30	0.37	30	0.81	30	0.43
31	0.52			31	0.48	31	1.37
8.4"	0.81	5.0"	0.67	6.8"	0.44	5.1"	0.42
Min flow:	0.33	Min flow:	0.37	Min flow:	0.29	Min flow:	0.24
Max flow:	2.10	Max flow:	1.80	Max flow:	0.94	Max flow:	1.37

Mountain View Wastewater Treatment Plant

2003 Flow Data
+/- 15% of monthly avg.

September Date	September Flow	October Date	October Flow	November Date	November Flow	December Date	December Flow
1	0.83	1	0.30	1	0.36	1	0.77
2	1.00	2	0.29	2	0.32	2	0.71
3	1.80	3	0.30	3	0.27	3	0.73
4	1.20	4	0.39	4	0.33	4	1.10
5	0.92	5	0.28	5	0.33	5	0.91
6	0.72	6	0.31	6	0.43	6	0.85
7	0.68	7	0.34	7	0.45	7	0.79
8	0.42	8	0.32	8	0.45	8	0.56
9	0.48	9	0.31	9	0.36	9	0.69
10	0.42	10	0.51	10	0.22	10	1.90
11	0.44	11	0.51	11	0.33	11	1.10
12	0.49	12	0.49	12	0.35	12	0.89
13	0.60	13	0.37	13	0.32	13	0.86
14	0.76	14	0.47	14	0.30	14	0.85
15	0.50	15	0.49	15	0.38	15	0.81
16	0.47	16	0.40	16	0.38	16	0.84
17	0.40	17	0.44	17	0.30	17	0.81
18	0.40	18	0.48	18	1.20	18	0.75
19	0.39	19	0.37	19	2.00	19	0.71
20	0.34	20	0.31	20	1.20	20	0.82
21	0.39	21	0.36	21	1.10	21	0.59
22	0.38	22	0.35	22	1.00	22	0.42
23	0.38	23	0.39	23	0.85	23	1.00
24	0.33	24	0.41	24	1.30	24	0.87
25	0.33	25	0.41	25	1.10	25	0.88
26	0.34	26	0.43	26	0.93	26	0.74
27	0.39	27	0.34	27	0.87	27	0.79
28	0.34	28	0.39	28	1.90	28	0.66
29	0.27	29	0.35	29	1.10	29	0.82
30	0.28	30	0.31	30	0.90	30	1.80
		31	0.34			31	1.30
1.4"	0.56	2.8"	0.38	10.4"	0.71	5.4"	0.88
Min flow:	0.27	Min flow:	0.28	Min flow:	0.22	Min flow:	0.42
Max flow:	1.80	Max flow:	0.51	Max flow:	2.00	Max flow:	1.90

Mountain View Wastewater Treatment Plant

2002 Flow Data
+/- 15% of monthly avg.

January Date	Time	Flow	February Date	Time	Flow	March Date	Flow	April Date	Flow
1	noon	0.61	1	AM	2.60	1	0.55	1	1.50
2	AM	0.33	2	noon	1.70	2	0.67	2	1.20
3	AM	0.50	3	AM	1.30	3	1.22	3	0.80
4	AM	0.44	4	AM	0.84	4	0.81	4	0.81
5	noon	0.49	5	AM	0.75	5	0.79	5	0.79
6	noon	0.59	6	AM	0.71	6	0.72	6	0.84
7	AM	0.63	7	AM	0.97	7	0.64	7	0.69
8	AM	0.62	8	AM	1.30	8	0.71	8	1.20
9	AM	0.56	9	noon	1.40	9	1.20	9	1.80
10	AM	0.58	10	noon	1.00	10	1.80	10	1.30
11	AM	0.50	11	AM	0.82	11	0.96	11	1.20
12	AM	0.48	12	AM	0.81	12	2.10	12	0.97
13	noon	0.57	13	AM	0.75	13	1.80	13	0.97
14	AM	0.35	14	AM	0.76	14	1.40	14	1.40
15	AM	0.43	15	AM	0.71	15	1.20	15	1.10
16	AM	0.45	16	AM	0.67	16	0.89	16	0.94
17	AM	0.40	17	AM	0.77	17	0.94	17	0.84
18	AM	0.41	18	AM	0.63	18	0.86	18	0.80
19	AM	0.56	19	AM	0.62	19	1.10	19	0.76
20	AM	0.65	20	AM	1.10	20	2.90	20	0.74
21	AM	0.56	21	AM	1.30	21	2.40	21	0.71
22	AM	0.56	22	AM	0.98	22	1.60	22	0.59
23	AM	0.84	23	AM	0.86	23	1.20	23	0.56
24	AM	1.50	24	AM	0.84	24	1.10	24	0.82
25	AM	1.80	25	AM	0.75	25	1.00	25	0.65
26	noon	1.40	26	AM	0.65	26	1.90	26	0.55
27	AM	0.83	27	AM	0.62	27	1.80	27	0.56
28	AM	0.95	28	AM	0.61	28	1.40	28	0.63
29	AM	0.86				29	1.20	29	0.42
30	AM	0.77				30	1.10	30	0.46
31	AM	0.99				31	1.40		
	4.55" RAIN	0.88		3.1" RAIN	0.97	9.4"	1.27	3.45"	0.89
	Min flow:	0.33		Min flow:	0.61	Min flow	0.55	Min flow	0.42
	Max flow:	1.80		Max flow	2.60	Max flow	2.90	Max flow	1.80

Annual Average 0.83

17 periods of low flow for 4+ consecutive days
6 periods of high flow for 4+ consecutive days

Number flows over 2 MGD = 9
Number flows over 1 MGD = 94

Number flows under .25 MGD = 7

Mountain View Wastewater Treatment Plant

2002 Flow Data
+/- 15% of monthly avg.

May Date	May Flow	June Date	June Flow	July Date	July Flow	August Date	August Flow
1	0.90	1	0.74	1	0.34	1	0.74
2	0.77	2	0.64	2	0.38	2	0.50
3	0.65	3	0.51	3	0.35	3	0.51
4	0.62	4	0.50	4	0.51	4	0.37
5	0.52	5	0.48	5	0.50	5	0.39
6	0.43	6	2.00	6	0.47	6	0.41
7	0.51	7	1.30	7	0.48	7	0.46
8	0.45	8	0.95	8	0.39	8	0.42
9	0.53	9	0.86	9	0.36	9	0.35
10	0.64	10	0.85	10	0.34	10	0.47
11	0.72	11	1.80	11	0.33	11	0.33
12	0.66	12	1.40	12	0.36	12	0.33
13	0.94	13	1.30	13	0.46	13	0.34
14	1.00	14	1.20	14	0.47	14	0.80
15	0.80	15	0.83	15	0.31	15	0.88
16	0.70	16	0.56	16	0.33	16	0.51
17	0.74	17	0.59	17	0.38	17	0.53
18	1.20	18	0.53	18	0.38	18	0.39
19	0.94	19	0.39	19	0.74	19	0.34
20	0.80	20	0.60	20	0.59	20	0.37
21	0.68	21	0.54	21	0.45	21	0.35
22	0.64	22	0.55	22	0.39	22	0.36
23	0.57	23	0.53	23	0.37	23	0.34
24	0.56	24	0.46	24	0.36	24	0.35
25	0.50	25	0.47	25	0.33	25	0.38
26	0.53	26	0.45	26	0.34	26	0.32
27	0.58	27	0.45	27	0.35	27	0.35
28	0.50	28	0.42	28	0.41	28	0.34
29	0.62	29	0.49	29	0.30	29	0.32
30	0.89	30	0.47	30	0.37	30	0.34
31	0.77			31	0.44	31.00	0.34
5.15"	0.69	6.1"	0.76	4.35"	0.41	5.9"	0.43
Min flow	0.43	Min flow:	0.39	Min flow:	0.30	Min flow:	0.32
Max flo	1.20	Max flow:	2.00	Max flow:	0.74	Max flow:	0.88

Annual Average 0.63

Mountain View Wastewater Treatment Plant

2002 Flow Data
+/- 15% of monthly avg.

September		October		November		December	
Date	Flow	Date	Flow	Date	Flow	Date	Flow
1	0.37	1	0.22	1	0.28	1	0.27
2	0.34	2	0.18	2	0.27	2	0.25
3	0.36	3	0.32	3	0.35	3	0.27
4	0.34	4	0.32	4	0.33	4	0.49
5	0.36	5	0.32	5	0.42	5	0.62
6	0.35	6	0.23	6	0.47	6	0.38
7	0.44	7	0.28	7	0.33	7	0.40
8	0.28	8	0.30	8	0.31	8	0.38
9	0.33	9	0.28	9	0.32	9	0.32
10	0.28	10	0.33	10	0.32	10	0.31
11	0.30	11	0.34	11	0.26	11	0.31
12	0.44	12	0.29	12	0.29	12	0.30
13	0.29	13	0.33	13	0.27	13	0.32
14	0.34	14	0.28	14	0.30	14	0.89
15	0.37	15	0.28	15	0.28	15	0.41
16	0.34	16	0.27	16	0.29	16	0.37
17	0.33	17	0.27	17	0.26	17	0.40
18	0.32	18	0.28	18	0.25	18	0.42
19	0.29	19	0.31	19	0.29	19	0.49
20	0.40	20	0.32	20	0.26	20	0.83
21	0.52	21	0.24	21	0.27	21	0.52
22	0.36	22	0.28	22	0.25	22	0.48
23	0.28	23	0.29	23	0.24	23	0.41
24	0.40	24	0.26	24	0.24	24	0.23
25	0.26	25	0.29	25	0.24	25	0.90
26	0.27	26	0.32	26	0.24	26	0.91
27	0.29	27	1.30	27	0.28	27	0.74
28	0.27	28	0.29	28	0.30	28	0.72
29	0.25	29	0.33	29	0.25	29	0.54
30	0.23	30	0.31	30	0.27	30	0.54
		31	0.28			31	1.70
1.8"	0.33	1.9"	0.32	1.53"	0.29	7.4"	0.51
Min flow:	0.23	Min flow:	0.18	Min flow:	0.24	Min flow:	0.23
Max flow:	0.52	Max flow:	1.30	Max flow:	0.47	Max flow:	1.70

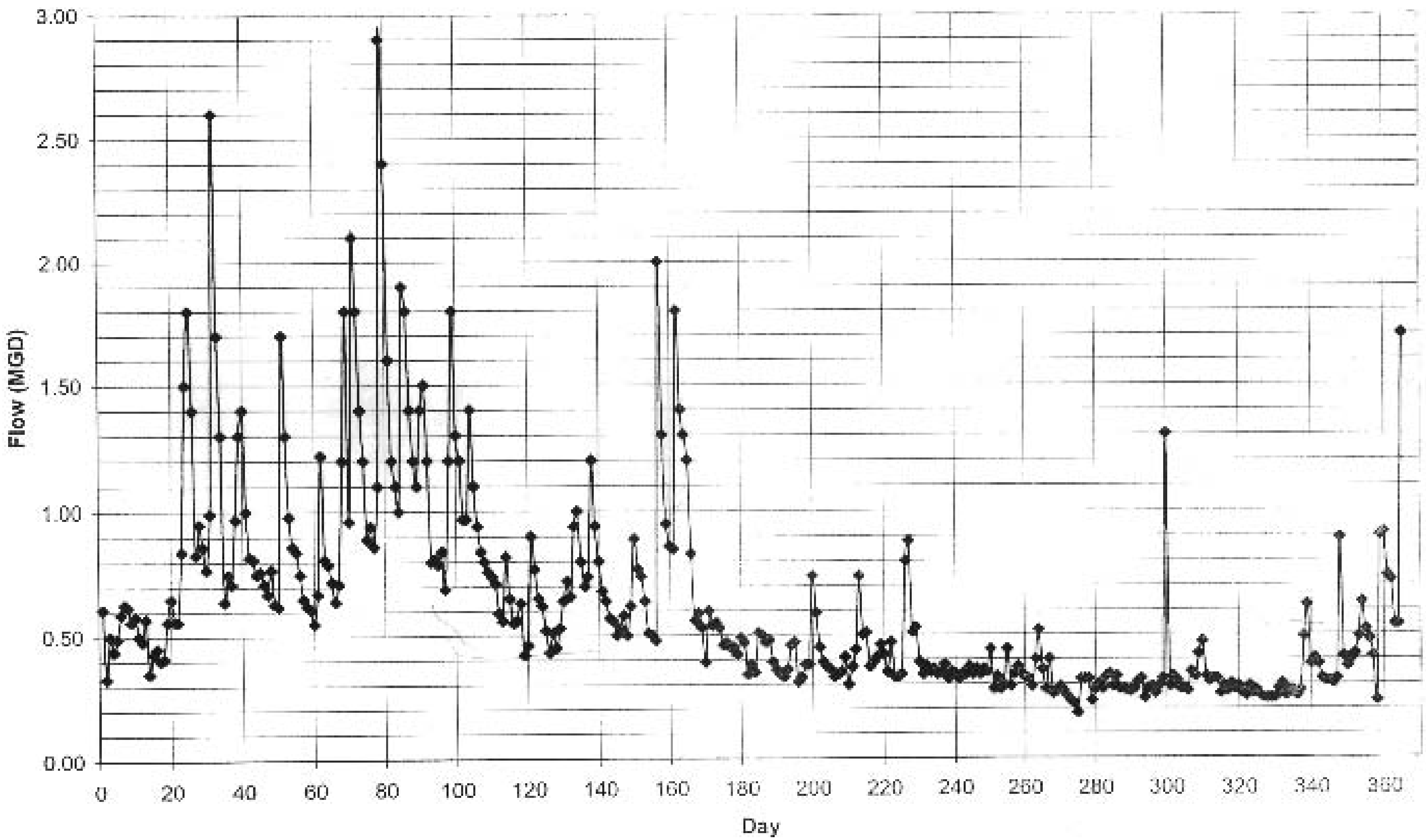
Annual Average 0.63

	2002	2003	2004	AVG
Jan.	0.68	0.70	0.80	**0.73**
Feb.	0.97	0.88	0.79	**0.88**
Mar.	1.27	0.75	0.58	**0.87**
Apr.	0.89	0.44	0.66	**0.66**
May	0.69	0.81	0.68	**0.73**
June	0.76	0.67	0.32	**0.58**
July	0.41	0.44	0.26	**0.37**
Aug.	0.43	0.42	0.27	**0.37**
Sept.	0.33	0.56	0.24	**0.38**
Oct.	0.32	0.38	0.55	**0.42**
Nov.	0.29	0.71	1.07	**0.69**
Dec.	0.51	0.88	0.86	**0.75**
AVG	0.63	0.64	0.59	**0.62**

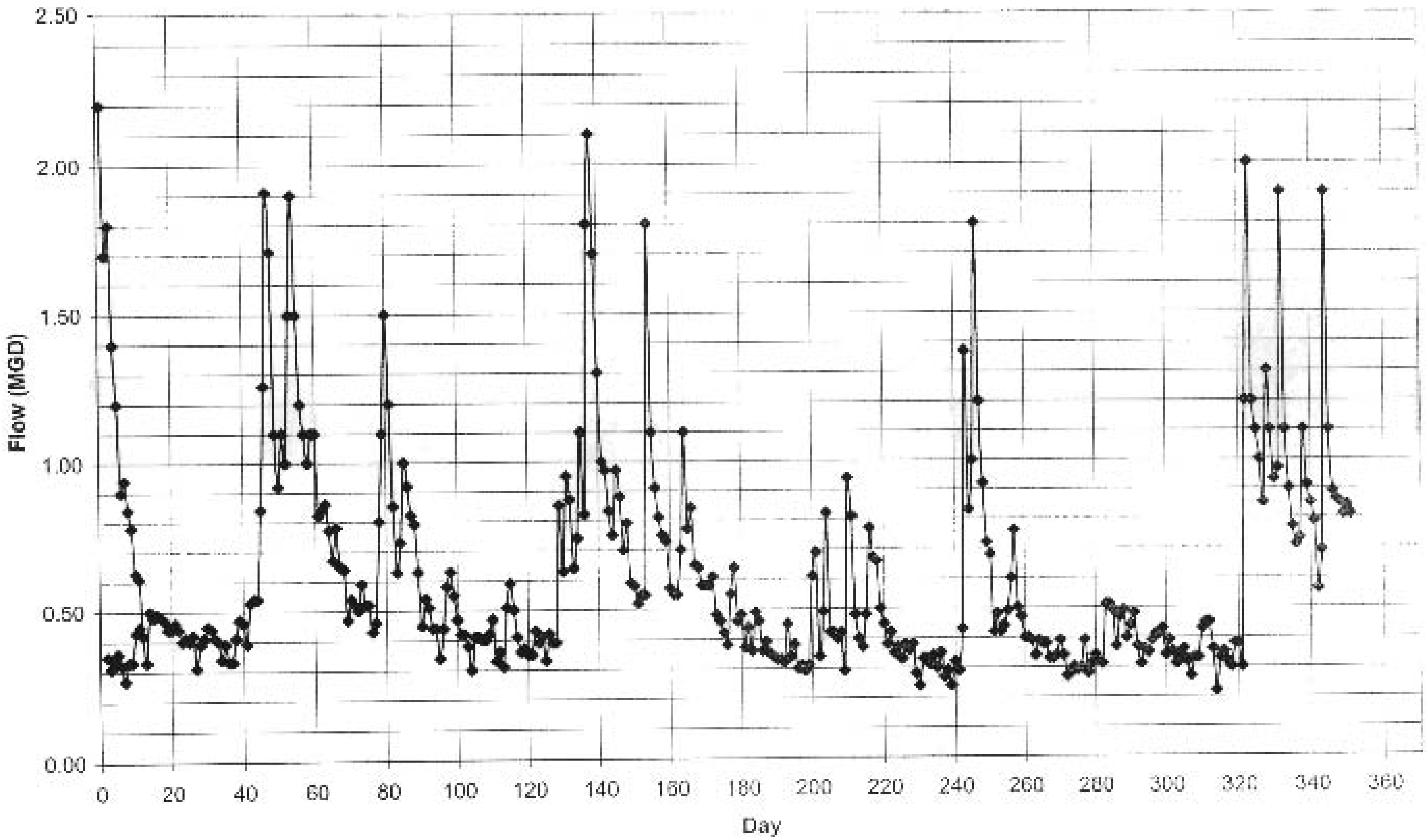
Min flow: 0
Max flow: 0

Min flow: 0
Max flow: 0

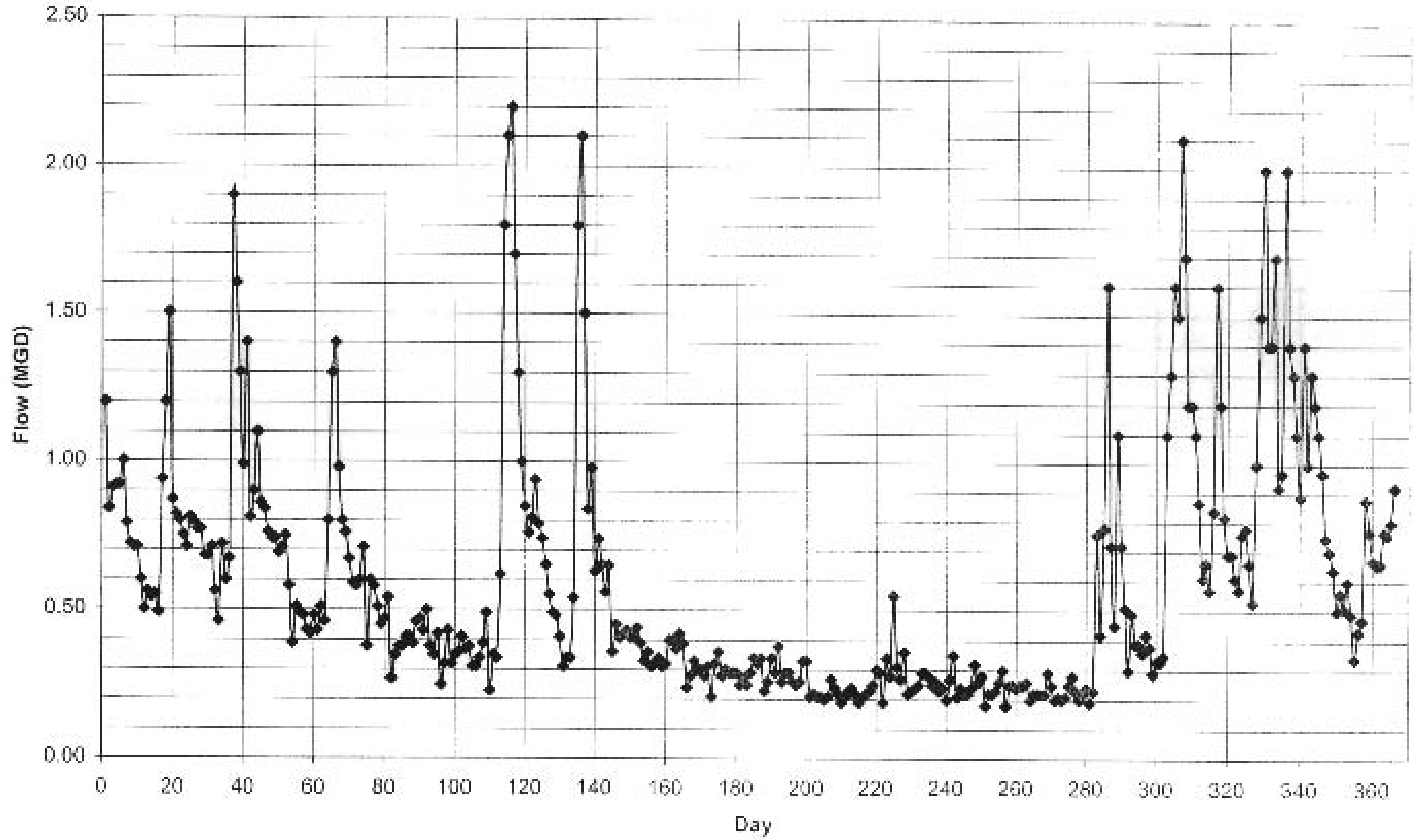
2002 Flow Data



2003 Flow Data



2004 Flow Data



Influent Characteristics

MCE McCLELLAND CONSULTING ENGINEERS, INC.
DESIGNED TO SERVE
P.O. Box 34087 • Little Rock, Arkansas 72203-4087
501-371-0272 • FAX 501-371-9932

Job No. ______ Sheet ___/___

Project Influent - Mtn View

Prepared By 8/28/05 - 9/4/05 Date: ______

Checked By ______ Date: ______

Date	BOD		TSS	NH3	NO3
Sun, 8/28	246.6		64	8	.1
Mon 8/29	201		132	18.15	.1
Tues 8/30	180.3		108	22.4	.1
Wed 8/31	450	} Joe Thatcher said to discount this	520	22.9	.1
Thurs 9/1	151.2		112	21.1	.01
Fri 9/2	114.6		212	30.9	.01
Sat 9/3	205.8		256	32	.01
Sun 9/4	214.8		176	29.9	.01
Avg (Less Wed)	187.8		151.4		

200

BOD History

Oct 03	Results after primary clarifier		estimated influent	Q
10/19-20 →	156 x 1.3 =		203	.37
10/21-22 →	123 x 1.3 =		160	.36
10/23-24 →	93.6 x 1.3 =		122	.39
10/26-27 →	120 x 1.3 =		156	.43
10/28-29 →	54 x 1.3 =		70.2	.39
10/30 → 31 →	63.6 x 1.3 =		83	.31

Nov 03			
11/2-3 →	76.5 x 1.3 =	99.5	.32
11/4-5 →	70.5 x 1.3 =	91.65	.33
11/6-7 →	56.1 x 1.3 =	73	.43
11/9-10 →	67.5 x 1.3 =	87.8	.36
11/11-12 →	70.5 x 1.3 =	91.7	.33
11/13-14 →	132.8 x 1.3 =	173	.32
11/16-17 →	45 x 1.3 =	58.5	.38
11/18-19 →	33 x 1.3 =	42.9	1.2

Ammonia Range 2 - 25 Avg 9-15
Nitrate Range .01 to 4 Avg < 1

Sun - Mon

Client:	City of Mt View	Sample Number:	25126-01
Sample	Self Monitoring	Date Reported:	9/16/2005
Sample Location:	WWTP Influent		
Permit Number:	AR0020117		
References:	40 CFR Part 136 Approved Methods, Containers, Preservation, Holding Times Standard Methods for the Examination of Water and Wastewater: EPA-600/4-79-020		
Quality Control:	Blank, duplication, known addition, quarterly analysis of external references samples		
QA Frequency:	Minimum of 10% Spikes and Duplicates		

Grab		Composite		Date/Time Received:
Date/Time	Sampler	Date/Time	Sampler	08/29/05 13:40
08/29/05 0:00	J Thatcher	08/28/05 0:00	J Thatcher	

Parameter	Reference	Test Date/Time	Initials	Result	QAQC RPD	QAQC Spike Rec.
Basic WW						
cBOD	5210 B	8/29/2005 2:00:00 PM	AP	246.6 mg/l		
TSS	2540 D	9/2/2005 12:00:00 PM	DC	64 mg/l		
Ammonia, NH3-N	4500-NH3 B,C	8/31/2005 8:00:00 AM	RJH	8.0 mg/l		
Nitrate Nitrogen						
Nitrate	4500 NO3 E	9/8/2005 10:00:00 AM	DC	0.1 mg/l		
Total Phosphorus						
Phosphorus	EPA 365.2	9/6/2005 8:30:00 AM	RJH	5.9 mg/l		

* Quality assurance performed on other samples.

Chain of custody, equipment calibration and maintenance records, and QA/QC information are on file at the laboratory.

Kim Carman, Laboratory Manager

J. McClelland, P.E., President

Mon to Tues

Client:	City of Mt View	Sample Number:	25130-01
Sample	Self Monitoring	Date Reported:	9/16/2005
Sample Location:	WWTP Influent		
Permit Number:	AR0020117		
References:	40 CFR Part 136 Approved Methods, Containers, Preservation, Holding Times Standard Methods for the Examination of Water and Wastewater; EPA-600/4-79-020		
Quality Control:	Blank, duplication, known addition, quarterly analysis of external references samples		
QA Frequency:	Minimum of 10% Spikes and Duplicates		

Grab Date/Time	Grab Sampler	Composite Date/Time	Composite Sampler	Date/Time Received:
08/30/05 0:00	J Thatcher	08/29/05 0:00		08/31/05 13:30

Parameter	Reference	Test Date/Time	Initials	Result	QAQC RPD	QAQC Spike Rec.
Basic WW						
cBOD	5210 B	9/2/2005 8:00:00 AM	DC	201 mg/l		
TSS	2540 D	9/2/2005 12:00:00 PM	DC	132 mg/l		
Ammonia, NH3-N	4500-NH3 B,C	9/9/2005 8:00:00 AM	RJH	18.15 mg/l		
Nitrate Nitrogen						
Nitrate	4500 NO3 E	9/8/2005 10:00:00 AM	DC	0.1 mg/l		
Total Phosphorus						
Phosphorus	EPA 365.2	9/6/2005 8:30:00 AM	RJH	4.1 mg/l		

* Quality assurance performed on other samples.

Chain of custody, equipment calibration and maintenance records, and QA/QC information are on file at the laboratory.

Kim Carman, Laboratory Manager

J. McClelland, P.E., President

Tues - Wed

Client:	City of Mt View		Sample Number: 25130-002
Sample	Self Monitoring		Date Reported: 9/16/2005
Sample Location:	WWTP Influent		
Permit Number:	AR0020117		
References:	40 CFR Part 136 Approved Methods, Containers, Preservation, Holding Times Standard Methods for the Examination of Water and Wastewater: EPA-600/4-79-020		
Quality Control:	Blank, duplication, known addition, quarterly analysis of external references samples		
QA Frequency:	Minimum of 10% Spikes and Duplicates		

Grab		Composite		Date/Time Received:
Date/Time	Sampler	Date/Time	Sampler	08/31/05 13:30
08/31/05 0:00	J Thatcher	08/30/05 0:00		

Parameter	Reference	Test Date/Time	Initials	Result	QAQC RPD	QAQC Spike Rec.
Basic WW						
cBOD	5210 B	9/2/2005 8:00:00 AM	DC	180.3 mg/l		
TSS	2540 D	9/2/2005 12:00:00 PM	DC	108 mg/l		
Ammonia, NH3-N	4500-NH3 B,C	9/9/2005 8:00:00 AM	RJH	22.4 mg/l		
[illegible]rate Nitrogen						
Nitrate	4500 NO3 E	9/8/2005 10:00:00 AM	DC	0.1 mg/l		
Total Phosphorus						
Phosphorus	EPA 365.2	9/6/2005 8:30:00 AM	RJH	6.5 mg/l		

* Quality assurance performed on other samples.

Chain of custody, equipment calibration and maintenance records, and QA/QC information are on file at the laboratory.

Kim Carman, Laboratory Manager

J. McClelland, P.E., President

Wed - Thurs

Client:	City of Mt View	Sample Number:	25130-003
Sample	Self Monitoring	Date Reported:	9/16/2005
Sample Location:	WWTP Influent		
Permit Number:	AR0020117		
References:	40 CFR Part 136 Approved Methods, Containers, Preservation, Holding Times Standard Methods for the Examination of Water and Wastewater: EPA-600/4-79-020		
Quality Control:	Blank, duplication, known addition, quarterly analysis of external references samples		
QA Frequency:	Minimum of 10% Spikes and Duplicates		

Grab		Composite		Date/Time Received:
Date/Time	Sampler	Date/Time	Sampler	08/31/05 13:30
09/01/50 0:00	J Thatcher	08/31/05 0:00		

Parameter	Reference	Test Date/Time	Initials	Result	QAQC RPD	QAQC Spike Rec.
Basic WW						
cBOD	5210 B	9/2/2005 8:00:00 AM	DC	450 mg/l		
TSS	2540 D	9/2/2005 12:00:00 PM	DC	520 mg/l		
Ammonia, NH3-N	4500-NH3 B,C	9/9/2005 8:00:00 AM	RJH	22.9 mg/l		
Nitrate Nitrogen						
Nitrate	4500 NO3 E	9/8/2005 10:00:00 AM	DC	0.1 mg/l		
Total Phosphorus						
Phosphorus	EPA 365.2	9/6/2005 8:30:00 AM	RJH	5.9 mg/l		

* Quality assurance performed on other samples.

Chain of custody, equipment calibration and maintenance records, and QA/QC information are on file at the laboratory.

Kim Carman, Laboratory Manager

J. McClelland, P.E., President

Thurs

Client:	City of Mt View	Sample Number:	25156-002
Sample	Self Monitoring	Date Reported:	9/16/2005
Sample Location:	WWTP Influent		
Permit Number:	AR0020117		
References:	40 CFR Part 136 Approved Methods, Containers, Preservation, Holding Times Standard Methods for the Examination of Water and Wastewater: EPA-600/4-79-020		
Quality Control:	Blank, duplication, known addition, quarterly analysis of external references samples		
QA Frequency:	Minimum of 10% Spikes and Duplicates		

Grab		Composite		Date/Time Received:
Date/Time	Sampler	Date/Time	Sampler	
		09/01/05 0:00		09/07/05 14:40

Parameter	Reference	Test Date/Time	Initials	Result	QAQC RPD	QAQC Spike Rec.
Basic WW						
cBOD	5210 B	9/7/2005 4:30:00 PM	AP	151.2 mg/l		
TSS	2540 D	9/9/2005 12:45:00 PM	DC	112 mg/l		
Ammonia, NH3-N	4500-NH3 B,C	9/9/2005 8:00:00 AM	RJH	21.1 mg/l		
Nitrate Nitrogen						
Nitrate	4500 NO3 E	9/15/2005 1:00:00 PM	DC	0.01 mg/l		
Total Phosphorus						
Phosphorus	EPA 365.2	9/6/2005 8:30:00 AM	RJH	5.9 mg/l		

* Quality assurance performed on other samples.

Chain of custody, equipment calibration and maintenance records, and QA/QC information are on file at the laboratory.

Kim Carman, Laboratory Manager

J. McClelland, P.E., President

Fri

Client:	City of Mt View	Sample Number:	25156-003
Sample	Self Monitoring	Date Reported:	9/16/2005
Sample Location:	WWTP Influent		
Permit Number:	AR0020117		
References:	40 CFR Part 136 Approved Methods, Containers, Preservation, Holding Times Standard Methods for the Examination of Water and Wastewater: EPA-600/4-79-020		
Quality Control:	Blank, duplication, known addition, quarterly analysis of external references samples		
QA Frequency:	Minimum of 10% Spikes and Duplicates		

Grab		Composite		Date/Time Received:
Date/Time	Sampler	Date/Time	Sampler	09/07/05 14:40
		09/02/05 0:00		

Parameter	Reference	Test Date/Time	Initials	Result	QAQC RPD	QAQC Spike Rec.
Basic WW						
cBOD	5210 B	9/7/2005 4:30:00 PM	AP	114.6 mg/l		
TSS	2540 D	9/9/2005 12:45:00 PM	DC	212 mg/l		
Ammonia, NH3-N	4500-NH3 B,C	9/9/2005 8:00:00 AM	RJH	30.9 mg/l		
rate Nitrogen						
Nitrate	4500 NO3 E	9/15/2005 1:00:00 PM	DC	0.01 mg/l		
Total Phosphorus						
Phosphorus	EPA 365.2	9/14/2005 8:00:00 AM	RJH	10.3 mg/l		

* Quality assurance performed on other samples.

Chain of custody, equipment calibration and maintenance records, and QA/QC information are on file at the laboratory.

Kim Carman, Laboratory Manager

J. McClelland, P.E., President

SAT

Client:	City of Mt View	Sample Number:	25156-004
Sample	Self Monitoring	Date Reported:	9/16/2005
Sample Location:	WWTP Influent		
Permit Number:	AR0020117		
References:	40 CFR Part 136 Approved Methods, Containers, Preservation, Holding Times Standard Methods for the Examination of Water and Wastewater: EPA-600/4-79-020		
Quality Control:	Blank, duplication, known addition, quarterly analysis of external references samples		
QA Frequency:	Minimum of 10% Spikes and Duplicates		

Grab Date/Time	Grab Sampler	Composite Date/Time	Composite Sampler	Date/Time Received:
		09/03/05 0:00		09/07/05 14:40

Parameter	Reference	Test Date/Time	Initials	Result	QAQC RPD	QAQC Spike Rec.
Basic WW						
cBOD	5210 B	9/7/2005 4:30:00 PM	AP	205.8 mg/l		
TSS	2540 D	9/9/2005 12:45:00 PM	DC	256 mg/l		
Ammonia, NH3-N	4500-NH3 B,C	9/9/2005 8:00:00 AM	RJH	32.0 mg/l		
[illegible]rate Nitrogen						
Nitrate	4500 NO3 E	9/15/2005 1:00:00 PM	DC	0.01 mg/l		
Total Phosphorus						
Phosphorus	EPA 365.2	9/14/2005 8:00:00 AM	RJH	10 mg/l		

* Quality assurance performed on other samples.

Chain of custody, equipment calibration and maintenance records, and QA/QC information are on file at the laboratory.

Kim Carman, Laboratory Manager

J. McClelland, P.E., President

Sun.

Client:	City of Mt View
Sample	Self Monitoring
Sample Location:	WWTP Influent
Permit Number:	AR0020117
References:	40 CFR Part 136 Approved Methods, Containers, Preservation, Holding Times Standard Methods for the Examination of Water and Wastewater: EPA-600/4-79-020
Quality Control:	Blank, duplication, known addition, quarterly analysis of external references samples
QA Frequency:	Minimum of 10% Spikes and Duplicates

Sample Number: 25156-005
Date Reported: 9/16/2005

Grab Date/Time	Grab Sampler	Composite Date/Time	Composite Sampler	Date/Time Received:
		09/04/05 0:00		09/07/05 14:40

Parameter	Reference	Test Date/Time	Initials	Result	QAQC RPD	QAQC Spike Rec.
Basic WW						
cBOD	5210 B	9/7/2005 4:30:00 PM	AP	214.8 mg/l		
TSS	2540 D	9/9/2005 12:45:00 PM	DC	176 mg/l		
Ammonia, NH3-N	4500-NH3 B,C	9/9/2005 8:00:00 AM	RJH	29.9 mg/l		
[illegible]rate Nitrogen						
Nitrate	4500 NO3 E	9/15/2005 1:00:00 PM	DC	0.01 mg/l		
Total Phosphorus						
Phosphorus	EPA 365.2	9/14/2005 8:00:00 AM	RJH	7.35 mg/l		

* Quality assurance performed on other samples.

Chain of custody, equipment calibration and maintenance records, and QA/QC information are on file at the laboratory.

Kim Carman, Laboratory Manager

J. McClelland, P.E., President

Line Size Calculations

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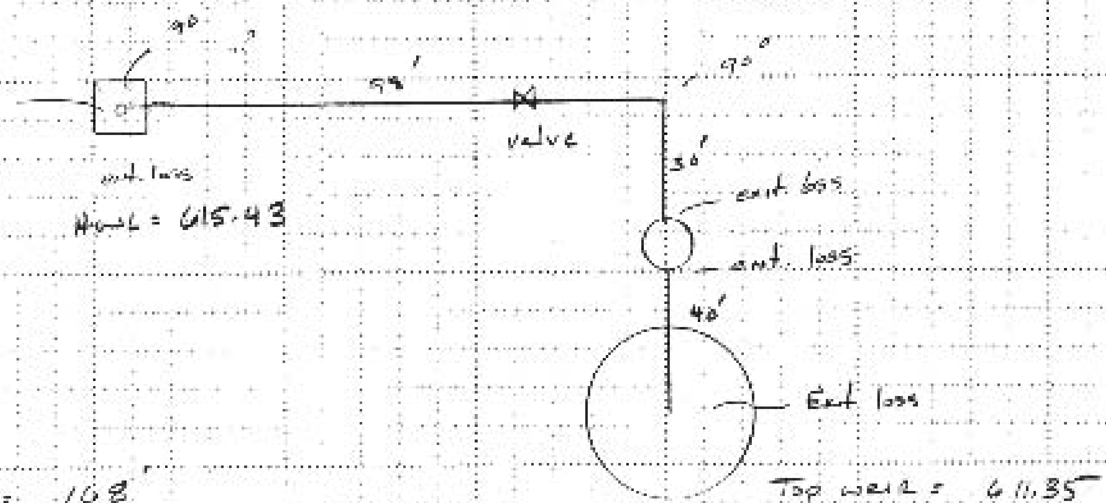
Job No. ______ Sheet ___/___
Project Mtn View
Prepared By BA Date: ______
Checked By ______ Date: ______

Size Line from Oxidation Ditch to final clarifier



L = 168'
90° Bends = 2 × 17' = 34'

Eq length = 202'

exit loss = $\frac{kV^2}{2g}$ = $\frac{1(5.86)^2}{2(32.2)}$ = .44' × 3 = 1.82' (V @ 4MGD)

Entrance loss = $\frac{.78(5.86)^2}{2(32.2)}$ = .34 × 2 = .68'

14" pipe ⇒ $h_{Lf} = \frac{10.44(202)(2778)^{1.85}}{110^{1.85}\ 14.35^{4.8655}}$ = 1.82

Total h_L = 1.82 + .68 + 1.82 = 3.82'

Available head = 4.08'

use 16" to be conservative

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Job No. ________ Sheet ____ / ____
Project ________
Prepared By ________ Date: ________
Checked By ________ Date: ________

Check Flow from Oxidation Ditch to Final Clarifier

16" Line , L_{16} = 98 + 30 + = 128'

2 - 90° BND - 19x2 = 38
1 - Valve = 3

			1 MGD	4 MGD
1 - Exit Loss	$kV^2/2g$	$1(1.108)^2/2g$ =	.02' ,	.3047'
1 - Entrance Loss		.78(.02) =	.016 ,	.24

h_{Lt} 1MGD = $\frac{10.44\,(169)\,.695^{1.85}}{110^{1.85}\,(16.675)^{4.8655}}$ = .0605 + .02 + .016 = .097 use .1'

h_{Lt} 4MGD = $\frac{10.44\,(169)\,2.778^{1.85}}{110^{1.85}\,(16.675)^{4.8655}}$ = .785 + .31 + .24 = 1.34'

14" Line , L_{14} = 40'

	1 MGD	4 MGD
1 - 90° Bnd = 17'		
1 - ent. loss	.78(.0325) = .0254	.406
1 - exit loss	.0325	.521

h_{Lt} 1MGD = $\frac{10.44\,(57)\,(.695)^{1.85}}{110^{1.85}\,(14.55)^{4.8655}}$ = .04 + .0254 + 0.0325 = .098

h_{Lt} 4MGD = $\frac{10.44\,(57)\,2.778^{1.85}}{110^{1.85}\,(14.55)^{4.8655}}$ = .514 + .406 + .521 = 1.44

Total h_L @ 1MGD = ±0.2' ok 3' available

Total h_L @ 4MGD = 2.78' ok 4' available

V_{14} = 1.447	1MGD	V_{16} = 1.108
V_{14} = 5.79	4MGD	V_{16} = 4.43

A_{14} = 1.069 ft²
A_{16} = 1.396 ft²

Q = VA

1MGD = 1.547 cfs
4MGD = 6.189 cfs

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Job No. ______ Sheet 1

Project: Mtn View

Prepared By: BA Date: 1-9-06

Checked By: ______ Date: ______

- Determine size of Ductile Iron Pipe FROM Headworks to relift pump sta.

 - Design Flow max = 4 MGD - See calcs

 For max flow through siphon: (3.943)

 (Keep in mind that Avg Daily Flow = ± .3 MGD)
 ↑ dry weather

 - Design as a pressure line

 will 14" Line be suitable?

$$hL = \frac{10.44\,(\pm 145)\,(2778)^{1.85}}{110^{1.85}\,(14)^{4.8655}} = 4.58'$$

(± 9' is Avail, OK)

check velocity: $Q = VA$

$6.19 = V\,(1.1142)$ (14.6" 2")

$V = 5.32$ ft/sec ok

Note: This will actually be a gravity line at 4 MGD

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Job No. ______ Sheet ____/____

Project ______

Prepared By ______ Date: ______

Checked By ______ Date: ______

Size RAS Line

Max Flow = ± 1.3 Q = 1.3 X .85 = 1.11 MGD = 1.72 cfs
Min Flow = ± 1 X .3 = .3 MGD = .464 cfs
Ann. avg = ± .68 X 1.0 = .68 MGD = 1.05 cfs

6" area = ± $\frac{5.97^2}{4}\pi \div 144$ = .1944 ft^2

8" area = ± $\frac{8.12^2}{4}\pi \div 144$ = .345 ft^2

Q = V A

V_6 max = 8.85 V_8 max = 4.71

V_6 min = 2.38 V_8 min = 1.27

V_6 avg = 5.4 V_8 avg = 2.27

Use 6" - it covers a larger flow area w/ higher velocity. Velocities do not appear too high, especially since it is an "open system"

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Job No. ______ Sheet ___ / ___

Project ______

Prepared By ______ Date: ______

Checked By ______ Date: ______

check elevation of water in pipe bet. splitter box & disinfection

14" pipe : L = 100'
1 - 45° = 12'
1 - 90 = 3'

eq. length = 115'

	1MGD	4MGD
entrance loss	.0254	.406
Exit loss	.0325	.521

1MGD) $\frac{10.44 (115) (695)^{1.85}}{110^{1.85} \; 14.55^{4.8655}} = .08$

4MGD) $\frac{10.44 (115)(2778)^{1.85}}{110^{1.85} \; 14.55^{4.8655}} = 1.04$

Elev of water @ 1MGD = 603.73 + .08 + .0254 + .0325 = 603.9

@ 4MGD = 603.73 + 1.04 + .406 + .521 = 605.7

TAB H

Extended Aeration Oxidation Ditch

Desing flow = 0.73 MGD

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Job No. ______ Sheet ① / ____

Project ______

Prepared By ______ Date: ______

Checked By ______ Date: ______

Size line (Forcemain) from influent p.s. to oxidation ditch

- Pump Sta. may be set up one of two ways:
  1) pump when well is full, shut off when empty
  2) maintain continuous level in wetwell

Let look at option 2:

Flow range .17 MGD / day (118 gpm, .263 cfs) to 4 MGD (2778 gpm, 6.19 cfs)

Look at velocities:

8" ID = 8.205 in, a = .3672

8" (.17) = .263/.3672 = .716 ft/sec

8" 4 = 6.19/.3672 = 16.86 ft/sec

8 (.85) = 1.31/.3672 = 3.58 ft/sec

8 1.5 = 2.32/.3672 = 6.32 ft/sec

Id = ± 10.215, a = .5691

10" (.17) = .263/.5691 = .462

10" (4) = 6.19/.5691 = 10.87

10" (.85) = 1.31/.5691 = 2.3

10" 1.5 = 2.32/.5691 = 4.07

8" .3 = .464/.3672 = 1.26

10" .3 = " = .8153

8" .6 = .928/.3672 = 2.52

10" .6 = 1.63

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Job No. ____________ Sheet 1 / ____

Project ____________

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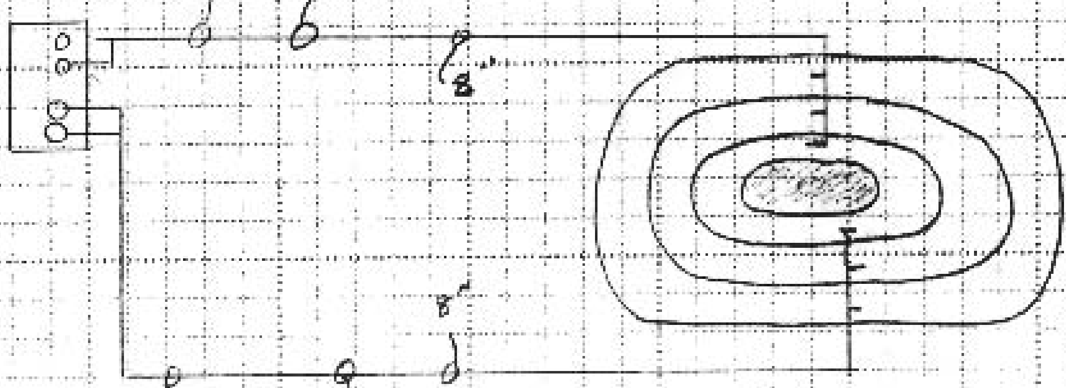
This line used for normal flow — combination of 2 pumps should be able to achieve this

Average Annual Daily Q = .68 MGD
x 3.44 peak
2.33 MGD

± Avg. dry weather =
.35
x 3.44
1.2 MGD

Q = .1 - 2 MGD



Q = 2 MGD
Variable Speed

(one pump should be able to accomplish this)

Design Q = .85 MGD
x 3.44 peak
2.924 MGD

This line will be used for I/I flow - This flow will normally be directed to the outer channel but be capable of all channels.

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Job No. ______ Sheet ② / ___

Project ______

Prepared By ______ Date: ______

Checked By ______ Date: ______

Design Pumps for Influent Pump Station

Design Q = .85 MGD

Max Flow to plant = 4 MGD

Firm capacity should exceed 4 MGD

ONE pump should be able to pump design Q

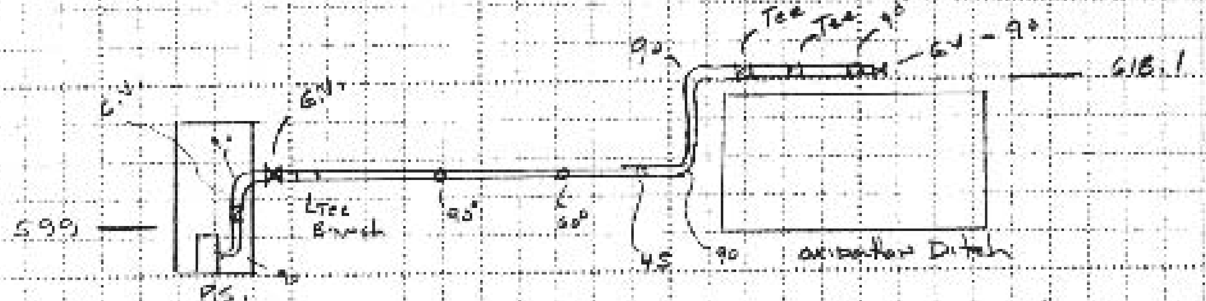
* two pumps = 2 MGD

pumps will be designed to maintain a certain level in the wetwell.

minimum recorded flowrate/day = 170,000 gal/day
= 118 gpm

Try This Scenario –

pump 1	max = .85 MGD
pump 2	max = .85 MGD
pump 3	max = 3 MGD
pump 4	max = 3 MGD (redundant)



Length = ± 260' + 20 = 280', use 300'

$V_{.85} = \frac{1.31}{.3077} = 3.58$

$V_4 = \frac{6.189}{.3491} = 17.73$

8" CV (1)	=	1 x 74 =	74
8" GV (2)	=	2 x 3 =	6
8" Tee (run) (2)	=	2 x 4 =	8
8" Tee branch (1)	=	1 x 20 =	20
90° (7)	=	7 x 10 =	70
60° (1)	=	1 x 6.5 =	6.5
45° (1)	=	1 x 6.5 =	6.5
			191

Exit loss = $\frac{KV^2}{2g} = 1\frac{(3.58)^2}{2g} = .2'$

MOUNTAIN VIEW INFLUENT PUMP STATION

SYSTEM CURVE FOR 2MGD PUMPS

Pipe size = 8"

FLOW	HL(f)	STATIC	EXIT LOSS	TDH	VELOCITY
500000	1.391456	19.1	0.06912	20.56058	2.109812
750000	2.946039	19.1	0.155519	22.20156	3.164718
1000000	5.016203	19.1	0.276479	24.39268	4.219624
1250000	7.579815	19.1	0.431998	27.11181	5.27453
1500000	10.62047	19.1	0.622077	30.34255	6.329436
1750000	14.12523	19.1	0.846716	34.07194	7.384342
2000000	18.08342	19.1	1.105915	38.28934	8.439248
2250000	22.48603	19.1	1.399673	42.9857	9.494154
2500000	27.32525	19.1	1.727992	48.15324	10.54906
2750000	32.59422	19.1	2.09087	53.78509	11.60397
3000000	38.28683	19.1	2.488308	59.87514	12.65887

use 43 to be safe

Pump specified on pump 2MGD @ 43' TDH

SYSTEM CURVE FOR NORMAL FLOW PUMPS (.15 TO 2MGD-FOR BOTH PUMPS)

Pipe size = 8"

FLOW	HL(f)	STATIC	EXIT LOSS	TDH	VELOCITY
150000	0.165898	19.1	0.006221	19.27212	0.632944
200000	0.282474	19.1	0.011059	19.39353	0.843925
300000	0.598084	19.1	0.024883	19.72295	1.265887
400000	1.018321	19.1	0.044237	20.16256	1.68785
500000	1.53875	19.1	0.06912	20.70787	2.109812
600000	2.156023	19.1	0.099532	21.35556	2.531774
700000	2.86751	19.1	0.135475	22.10298	2.953737
850000	4.106753	19.1	0.199756	23.40651	3.58668
1000000	5.547197	19.1	0.276479	24.92368	4.219624
1250000	8.382183	19.1	0.431998	27.91418	5.27453
1500000	11.74471	19.1	0.622077	31.46679	6.329436
1750000	15.62047	19.1	0.846716	35.56718	7.384342
2000000	19.99766	19.1	1.105915	40.20357	8.439248
2250000	24.86631	19.1	1.399673	45.36598	9.494154

4-4-06
note: Pumps specified on pump
2250000 gpd w/ both pumps on
@ 45.5' TDH

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Job No. ______ Sheet ③ ___/___

Project ______

Prepared By ______ Date: ______

Checked By ______ Date: ______

Total Dynamic head ✓ .85 MGD

$$h_{Lf} = \frac{10.44\,(491)\,591^{1.85}}{110^{1.85}\,(8.2)^{4.8655}} = 4.12'$$

$$TDH = \underset{h_{Lf}}{4.12} + \underset{Exit}{.2} + \underset{static}{19.1} = 23.42'$$

Create system curve;

Q	Static	Hlf	Exit Loss	TDH
.2 (139)	19.1	.28	.02	19.4
.5 (347)	19.1	1.54	.07	20.7
.85	19.1	4.12	.2	23.4
1.0 (695)	19.1	5.56	.28	24.9
1.25 (868)	19.1	8.38	.43	27.9
1.5 (1042)	19.1	11.75	.62	31.5
1.75 (1215)	19.1	15.6	.84	35.5

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Job No. ______ Sheet (4) / ______

Project ______

Prepared By ______ Date: ______

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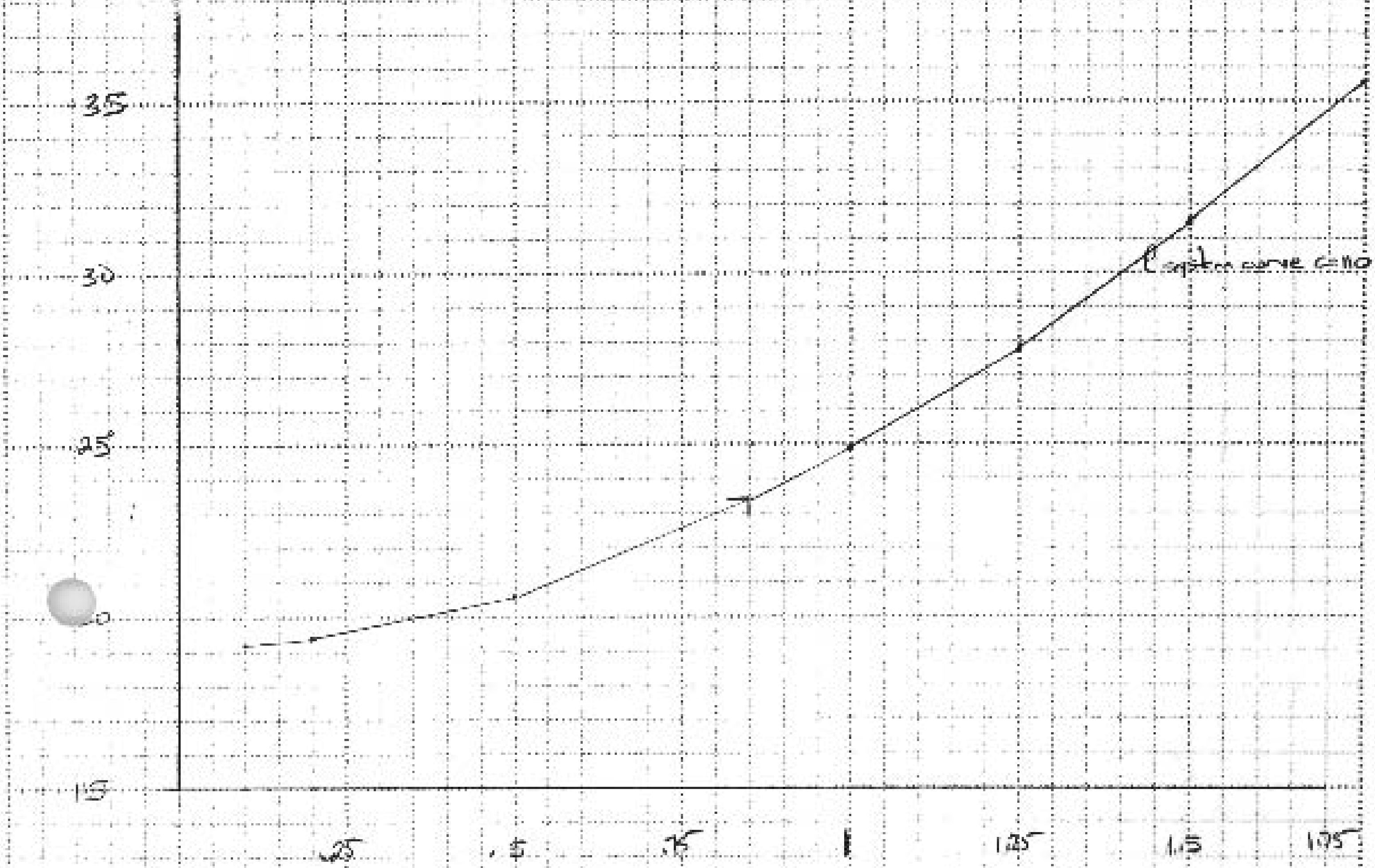

This is the curve for the smaller pumps (2 pumps - 2 MGD)

RAS Pump Station

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Job No. ______ Sheet 1 / ______

Project ______

Prepared By ______ Date: ______

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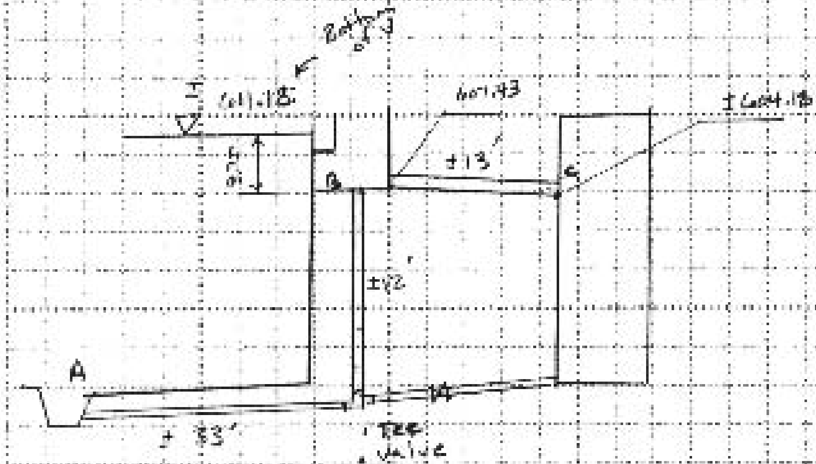
RAS DESIGN

Find level of water in Wetwell @ 884 gpm



Find Equivalent length

Pipe length AB 45'

Valve = 2.6

Tee = 15'

63'

$h_{L+} = \frac{10.44 (63)(884)^{1.85}}{140^{1.85} (5.37)^{4.8655}} = 5.58'$

Entrance loss = $.5 \frac{V^2}{2g}$ .71

Exit loss $= (1)\frac{V^2}{2g}$ = 1.42'

Total Losses to "B" = 7.71' <NO GOOD>

6" Pipe cannot be used w/ telescoping valve

If 6" is used - it must come in through lower pipe.

If 6" used -

WL in p.s. @ Flow = 1.4Q (884 gpm)

= 611.18 - 7.71 = 603.5

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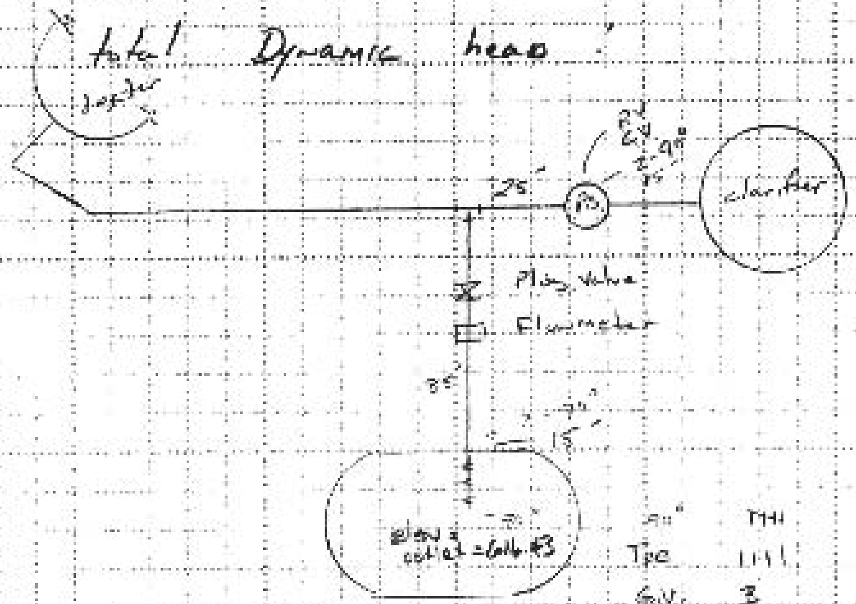
Job No. ______ Sheet 2 / ____
Project ______
Prepared By ______ Date: ______
Checked By ______ Date: ______

Design RAS Pump Station Renovations

• Design Pumps to be variable speed

Range .2 MGD to 1.2 MGD ← 1.4 x Q Des
1.5 x if range is acceptable

• Find total Dynamic head:



Q_RAS = 1.2 MGD = 834 gpm (6" PIPING) ID = 5.97"

Eq length RAS = 15 + 25 + 85 + 15 = 140'

90° bnd = 5 x 7.2 = 36
Tee = 4 x 15 = 60
GV = 3 x 2.6 = 8
CV = 1 x 52' = 52
156' ∴ 156 + 140 = 296, Say 300'

$h_f = \frac{10.44\ (300)\ 834^{1.85}}{140^{1.85}\ (5.97)^{4.8655}} = 22.3'$

Add losses ; Exit loss = $\frac{KV^2}{2g}$ = $\frac{9.55^2}{2(32.2)}$ = 1.42'

Total Losses = 22.3 + 1.42 = 23.71 say 24'

Oxidation Ditch $O.F._{max}$ = 615.43

℄ Water level in PS. = 603.5 → Say 603

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Job No ______ Sheet 3 / ____
Project ______
Prepared By ______ Date: ______
Checked By ______ Date: ______

∴ Static head = 616.43 − 603 = 13.43′ say 13.5′

TDH = 13.5 + 24 = 37.5′
Q = 834 gpm

* Now - Find head conditions @ normal flow:

Q = .68 × 1.4 + .75 MGD = say 1 MGD = 694 gpm

$h_{Lf} = \frac{10.44\,(300)\,694^{1.85}}{110^{1.85}\,(5.97)^{4.8655}} = 15.85$ say 16′

Exit Loss = $\frac{KV^2}{2g} = (1)\frac{(7.96)^2}{2(32.2)} = .98$ say 1′

Level in wetwell =

$h_{Lf} = \frac{10.44\,(65)\,(694)^{1.85}}{110^{1.85}\,(5.97)^{4.8655}} = 4.1$

Exit loss = 1

Entrance loss = .5

∴ 611.18 − 5.6 = 605.6

level = 605.6

∴ static Head = 616.43 − 605.6 = 10.83′ say 11′

∴ TDH_{Normal} = 11′ + 17′ = say 28′

Q = 694
TDH = 28

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Job No. ______ Sheet 4 / ______

Project ______

Prepared By ______ Date: ______

Checked By ______ Date: ______

* Now find head conditions @ low flow!

$Q = 200{,}000\ gpd = 139\ gpm$

$h_{Lf} = \frac{10.44\,(300)\,139^{1.85}}{110^{1.85}\,(5.97)^{4.8655}} = .81'$

Exit loss: $\frac{V^2}{2g} = \frac{1.59^2}{2g} = .04'$

- level in wetwell:

$h_{Lf} = \frac{10.44\,(65)\,(139)^{1.85}}{100^{1.85}\,(5.97)^{4.8655}} = .21'$

Exit loss = .04
Entrance loss = .02

level = 611.18 - .21 - .04 - .02 = 610.91

∴ Static Head = 616.43 - 610.91 = 5.52

∴ TDH = 5.52 + .81 + .04 = 6.37', say 6.5'

Q = 139 gpm
TDH = 6.5'

Extended Aeration
Oxidation Ditch

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ORBAL DESIGN OUTLINE

Project:	Mt View - AR Orbal	Prepared:	07/18/2006
Engineer:	McClellond consulting engineer	Designer:	Dennis Barnes

Influent Characteristics

Flow, MGD	0.73
BOD5, mg/L	200
TSS, mg/L	200
TP, mg/L	6
NH3-N, mg/L	40
TKN, mg/L	50

Effluent Requirements

BOD5, mg/L	10
TSS mg/L	15
TP, mg/L	1.5
NH3-N, mg/L	1.0
TN, mg/L	10.0

Orbal Design Parameters

Total Load, lb BOD5/day	1,216	MLSS, mg/L	3,470
Primary Clarifiers	NO	No. of Trains in Parallel	1
		Solids under Aeration, Lbs.	12,466
Organic Loading, lb/1000 cft/day	21.15	Sludge Yield	0.85
		WAS per train, lb/day	1,039
Total Hydraulic Detention Time, Hr	14.2	Sludge Age, days	12

Basin Dimensions

No. of Channels per Train	3	Wall Thickness, ft	1.00
Channel Depth, ft	12.00	Radius of Center Island, ft.	5.0
Channel Width, ft		Length of Short Axis Straight Section, ft.	0.0
Inner	10.00	Length of Long Axis Straight Section,ft.	14.0
Middle	10.00	Overall Width, ft.	76.0
Outer	10.00	Overall Length, ft.	90.0
		Volume per Train, cubic feet	57,581
		Volume per Train, gal	430,705

Pumping Requirements

RAS pumping rate at 150% of Q, (where Q is the average design flow rate)
Pump MLSS containing Nitrates from Aerobic Inner channel to Anoxic Outer channel at 400% of Q

Drives Recommendation

Location	Channels spanned	Discs per aerator	Design rpm	Max. rpm	Quantity per train	HP
Outer	1	18	29	45	(2)	10.0
Center Island	2	36	43	55	(2)	30.0
Wall Pumps for Nitrate Recycle to Anoxic Outer Channel				1		5.6

Based on max. disc immersion of	21 inches	Installed HP per Train	86 HP
Based on motor efficiency of	90%		
and design disc immersion of	14 inches	Operating electrical Hp per Train	38 HP

Additional Costs	*Concrete*		Unit Price	Orbal Basin Cubic Yards	
		Walls	$550	320	$176,000
		Floors	$500	156	$78,000
	Installation	Hourly Rate	Orbal	SmartBNR	
		$55	130 man-hrs	100 man-hrs	$13,000
				Total Additional Costs	$267,000

Influent Characteristics Ave. design flow, MGD 0.73

BOD5, mg/L	200	NH3-N, mg/L	40		
TSS, mg/L	200	TKN, mg/L	50	TP, mg/L	6

A) Determine Basin Volume

Basin volume is determined by minimum sludge age required to maintain a healthy population of nitrifying organisms at the minimum wastewater temperature. θ_{min}=1/(μ_{max}*EXP(0.098*(T_{min}-15)))*TPF*SF, where:

Minimum wastewater temperature, T_{min} =	53.6 degrees F
ΦΤ΄xΓ¨Τ ε'ὤ΄΄ΰ "Τ΄Ωε μ_{max} =	0.47 $days^{-1}$
Diurnal Peak Factor, DPF =	1.2
Monthly Peak Factor, MPF =	1.3
DPF x MPF = Total Process Peak Factor, TPF =	1.56
Safety Factor, SF =	2.5
Minimum Solids Residence Time, θ_{min} =	11.1 days
Selected Solids Residence Time, θx =	12.0 days

Use McCarty kinetic equations to calculate basin volume required:

1) **Inert solids:**

$M_{o\text{-}IS} = (M_{o\text{-}TSS})(1 - f_{VSSo})$ =

(1218 lb/day influent TSS)(100 - 80% VSS) / (100%) = 244 lb/day

2) **Nonbiodegradable VSS:**

$M_{o\text{-}NS} = (M_{o\text{-}TSS})(f_{VSSo})(f_{NB})$ =

(1218 lb/day influent TSS)(80% VSS),(40% NBVSS) / (100%) 390 lb/day

3) **Heterotropic Kinetic Parameters**

Growth Rate, $Y_{true,15}$ =	0.6 lb VSS/lb BOD5
Decay rate, b_{15} =	0.06 $days^{-1}$
BOD Half-saturation coefficient, K_{BOD} =	20 mg/l BOD
Adjusting for temperature, $b_T = b_{15}(1.04)^{(T-15)}$ =	0.073 $days^{-1}$
Maximum Growth Rate, $\mu_{MAX,h}$ =	6

Estimate Effluent BOD_5:

Soluble BOD, $S_e = [K_{BOD}(1+b_T\,\theta_x)]/[\theta_x(\mu_{MAX,h} - b_T) - 1]$ =	0.54 mg/l
Effluent VSS concentration, f =	40%
$BOD_{5,total} = S_e$ + (TSS x f) =	
0.54 + (10mg/l effluent TSS)(40% VSS) / (100%)	4.54 mg/l

Observed yield of heterotrophs: $Y_{OBS\ H} = Y_{true}/(1 + b_T\theta_x)$ = 0.32

Heterotrophic Biomass Produced: $M_H = (M_{o\text{-}BOD} - M_{e\text{-}BOD})(Y_{OBS\text{-}H})$ = 381 lb/day

4) **Autotrophic Kinetic Parameters**

Growth Rate, $Y_{true,15}$ =	0.15 lb VSS/lb NH3-N
Decay Rate, b =	0.05 $days^{-1}$
Ammonia half-saturation coefficient, K_{an} =	0.5 mg NH_3-N/L
Oxygen half-saturation coefficient, Ko =	1 mg DO/L
ΦΤ΄xΓ¨Τ ε'ὤ΄΄ΰ "Τ΄Ωε μ_{max} =	0.47 $days^{-1}$
Adjusting for temperature: $\mu_{max\,T} = \mu_{max,15}e^{0.098(T-15)}$ =	0.350 $days^{-1}$
$b_T = b_{15}(1.04)^{(T-15)}$ =	0.044 $days^{-1}$

Calculate observed yield of autotrophs: $Y_{OBS\ A} = Y_{true}/(1 + b_T\theta_x)$ = 0.098

Nitrogen assimilated by heterotrophic biomass:

Nitrogen content of biomass: N_{bm} =	12%
Nitrogen assimulated: $M_{NA\text{-}H} = (M_H)(N_{bm})$ =	46 lb/day

Nitrogen assimilated by autotrophic biomass (1st iteration):

TKN oxidized: $M_{TKN\text{-}o} = M_{o\text{-}TKN} - M_{NA\text{-}H}$ =	259 lb/day
Autotrophic Biomass Produced: $M_A = (M_{TKN\text{-}o})(Y_{OBS\,A})$ =	25 lb/day
Nitrogen assimilated by autotrophic biomass: $M_{NA\text{-}A} = (M_A)(N_{bm})$ =	3 lb/day

Nitrogen assimilated by autotrophic biomass (2nd iteration):

TKN oxidized: $M_{TKN\text{-}o} = M_{o\text{-}TKN} - M_{NA\text{-}H} - M_{NA\text{-}A}$ =	256 lb/day
Autotrophic Biomass Produced: $M_A = (M_{TKN\text{-}o})(Y_{OBS\,A})$ =	25 lb/day
Nitrogen assimilated by autotrophic biomass: $M_{NA\text{-}A} = (M_A)(N_{bm})$ =	3 lb/day
TKN oxidized: $M_{TKN\text{-}o} = M_{o\text{-}TKN} - M_{NA\text{-}H} - M_{NA\text{-}A}$ =	256 lb/day
Oxidized TKN Concentration = $(M_{TKN\text{-}o})(1000)/Q$ =	42 mg/l

5) **Total Solids Production Rate:**

$P_x = M_{o\text{-}IS} + M_{o\text{-}NS} + M_H + M_A$ =	1039 lb/day
Overall Yield: $Y_N = P_x/M_{o\text{-}BOD}$ =	0.85
MLVSS: (Mo-NS + MH + MA) / Px =	76.56%

6) **Orbal Basin Volume Calculations:**

Calculate required volume, based on MLSS concentration of	3500 mg/l
Required Volume, V = (θx)(Px)(1,000,000)/8.34/MLSS =	427048 gallons
Selected Orbal basin volume =	430705 gallons
Actual MLSS: X = (θx)(Px)(1,000,000)/V/8.34 =	3470 mg/l

7) **Waste Activated Sludge:**

WAS TSS: $X_W = (1 + F_R)(X)/(F_R)$ =	5784 mg/l
WAS Flow: QW = (Px)(1000000)/(XW)/8.34 =	21535 gal/day

B. Determine Actual Oxygen Transfer Rate (AOTR) to be satisfied in Orbal

1) **Carbonaceous O2 demand**

oxygen equivalent of cell mass, B =	1.42 lb O2/lb VSS
Influent BOD_{ULT}:BOD5 RATIO:	1.46
Effluent BOD_{ULT}:BOD5 RATIO:	1.2
Carbonaceous oxygen demand design factor, $f_{c\text{-}o2}$:	1.16

a) Mass of BOD_5 O_2 demand equivalents entering the system:
lb BOD5/d x Influent BODULT:BOD5 RATIO =
(1218 lb/day influent BOD)(1.46) = 1778 lb/day

b) Mass of BOD_5 O_2 demand equivalents leaving the system:
lb BOD5/day x Effluent BODULT:BOD5 RATIO =
(28 lb/day effluent BOD)(1.46) = 33 lb/day

c) Mass of O_2 equivalents leaving the system as biomass:
heterotrophic VSS/d + autotrophic VSS/d x lb O2/lb VSS =
(381 + 25.01)(1.42) = 576 lb/day

d) Carbonaceous O_2 demand (calc.): $f_{c\text{-}o2}(a - b - c)$ = 1356 lb/day

e) Carbonaceous O_2 demand (selected): 1356 lb/day

2) Nitrification oxygen demand:

Nitrification oxygen equivalent: 4.6
Denitrification oxygen credit: 2.9

Nitrification oxygen demand: lb O2/kg NH3-N x lb TKN oxidized/day =
(256 lb/day TKN oxidized)(4.6) = 1176 lb/day

3) Denitrification oxygen credit:

As long as that the organic loading is high enough and the O2 supply is distributed to multiple locations, the outer channel(s) of Orbal systems can be maintained in an anoxic state by limiting the percentage of the overall system AOR satisfied in each anoxic channel to a value close to the percentage of the overall system volume in that channel, resulting in simultaneous nitrification and denitrification. Ammonia oxidation will occur at a rate proportional to the percentage of AOR satisfied in each Orbal channel. With a strong oxygen deficit (DO = near zero mg/l), 100% of the ammonia oxidized will be denitrified. With a mild oxygen deficit condition (DO = near 0.5 mg/l), 65% of ammonia oxidized will be denitrified. Based on the process split listed in the table below, we can calculate the rate of denitrification for the Orbal system:

	Channel			
	1	2	3	Total
Volume Split	47.7%	33.3%	18.9%	100.0%
AOR Split	19.4%	44.2%	36.4%	100.0%
DO, mg/l	0.0	0.5	2.0	
Denite Rate	100%	65%	0%	

Nitrogen Mass Balance

Nitrogen components in clarifier return activated sludge, with RAS flow at 150% of design flow

Ammonia-N: MR-NH3 = (Ce-NH3)(Q)(RAS%)(8.34) = 3 lb/day
Nitrate-N: MR-NOx = (Ce-NOx)(Q)(RAS%)(8.34) = 32 lb/day
Total-N: MR-TN = (Ce-TN)(Q)(RAS%)(8.34) = 52 lb/day

Nitrogen components in MLSS recycle stream, with internal recycle (IR) at 400% of design flow

Ammonia-N: MIR-NH3 = (Ce-NH3)(Q)(Recycle%)(8.34) = 7 lb/day
Nitrate-N: MIR-NOx = (Ce-NOx)(Q)(Recycle%)(8.34) = 86 lb/day
Total-N: MIR-TN = (Ce-TN)(Q)(Recycle%)(8.34) = 140 lb/day

Nitrogen components in channel 1 influent:

Ammonia-N: $M_{I-NH3} = M_{o-NH3} + M_{R-NH3} + M_{IR-NH3} =$ 286 lb/day
Nitrate-N: $M_{I-NOx} = M_{o-Nox} + M_{R-Nox} + M_{IR-NOx} =$ 118 lb/day

Nitrogen Components in Reactor 1 Effluent:

Ammonia-N: $M_{1-NH3} = M_{I-NH3} - (M_{o-NH3} - M_{e-NH3})(f_{N1}) =$ 217 lb/day
Nitrate-N: $M_{1-Nox} = (M_{I-NH3} - M_{1-NH3} + M_{I-NOx})(1-f_{D1}) =$ 0 lb/day

Nitrogen Components in Reactor 2 Effluent:

Ammonia-N: M2-NH3 = M1-NH3 - (Mo-NH3 - Me-NH3)(fN2) =	104 lb/day
Nitrate-N: M2-Nox = (M1-NH3 - M2-NH3 + N1-NOx)(1-fD2) =	39 lb/day

Nitrogen Components in Reactor 3 Effluent:

Ammonia-N: M3-NH3 = M2-NH3 - (Mo-NH3 - Me-NH3)(fN3) =	5 lb/day
Nitrate-N: M3-NOx = (M2-NH3 - M3-NH3 + N2-NOx)(1-fD3) =	53 lb/day

Nitrogen Components in Clarifier Effluent:

Ammonia-N: $M_{e\text{-}NH3} = M_{4\text{-}NH3} - M_{R\text{-}NH3}$ =	2 lb/day
Nitrate-N: $M_{e\text{-}NOx} = M_{4\text{-}NOx} - M_{R\text{-}NOx}$ =	21 lb/day
Effluent NH_3-N Concentration = $(M_{e\text{-}NH3})(1000)/Q$ =	0.3 mg/l
Effluent NO_3-N Concentration = (Me-Nox)(1000)/Q =	3.5 mg/l

Denitrification oxygen credit:

(lb O2/lb NO3-N)(lb TKN oxidized/d - lb effluent NO3-N/day) =
(2.9)(256 - 21) = 680 lb/day

4) **Net oxygen demand, AOR:**

lb Carbonaceous O2/d + lb Nitrogenous O2/d - lb Denitrification Credit/day = 1852 lb/day

C) **Determine Standard Oxygen Transfer Rate (SOTR) to be satisfied in Orbal**

SOTR = AOTR / FCF

$$FCF = A \times (B \times ACF \times C_s - DO) \times TCF / 9.092$$

Alpha, A = 0.95 Beta, B = 0.98

Elevation = 770 feet Altitude Correction Factor (ACF) = 0.972

Design water temperature = 68F Temperature Correction Factor (TCF) = 1.000

Saturation Concentration of Oxygen at Design Water Temperature, Cs = 9.09 mg/l

DO = Dissolved oxygen concentration in each reactor, mg/l

	Channel 1	2	3	Total
AOR, lb/hr	15	34	28	77
DO, mg/l	0.0	0.5	2.0	
FCF	0.905	0.853	0.696	
SOR, lb/hr	17	40	40	97

1) Calculate disc quantity required per channel # of discs required = SOTR / SOTR/disc

	Channel 1	2	3	
Design disc immersion (in.)	14.0	14.0	14.0	
Design disc speed (rpm)	29	43	43	
Design SOTR/disc lb/hr/disc	0.48	1.18	1.18	Total
Disc Quantity	36	36	36	108

2) Disc aerator drive selection

(2) 10.0 Hp aerator(s) on periphery of basin, each turning 18 discs

(2) 30.0 Hp aerator(s) on periphery of basin, each turning 36 discs

3) Check for adequate oxygen reserve capacity

	Channel 1	2	3
Max. disc immersion (in.)	21.0	21.0	21.0
Max. disc speed (rpm)	45	55	55
Max. SOTR/disc lb/hr/disc	1.80	2.50	2.50

RESERVE SOTR CAPACITY

	All aerators in service	Largest aerator out
Maximum SOTR =	245 lb/hr	155 lb/hr
Reserve Over Design Load =	152%	60%

1) Calculate disc quantity required per channel # of discs required = SOTR / SOTR/disc

	Channel 1	2	3	
Design disc immersion (in.)	16.0	16.0	16.0	
Design disc speed (rpm)	29	43	43	
Design SOTR/disc lb/hr/disc	0.64	1.32	1.32	Total
Disc Quantity	36	36	36	108

2) Disc aerator drive selection

(2) 10.0 Hp aerator(s) on periphery of basin, each turning 18 discs

(2) 30.0 Hp aerator(s) on periphery of basin, each turning 36 discs

80 Hp

3) Check for adequate oxygen reserve capacity

	Channel 1	2	3
Max. disc immersion (in.)	21.0	21.0	21.0
Max. disc speed (rpm)	45	55	55
Max. SOTR/disc lb/hr/disc	1.80	2.50	2.50

1.8 × 24 = 43. lb/day
2.5 × 24 = 60. lb/hr
2.5 × 24 = 60. lb/hr

RESERVE SOTR CAPACITY

	All aerators in service	Largest aerator out
Maximum SOTR =	245 lb/hr	155 lb/hr
Reserve Over Design Load =	115%	36%

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{transfer rate = $\frac{2 \text{ lbs } O_2}{1 \text{ hp} \cdot \text{hr}}$}

$$\frac{1 \text{ hp}}{2 \text{ lbs } O_2} = \frac{x \text{ hp}}{114 \text{ lb } O_2}$$

$$x = \frac{114 \text{ lb } O_2 \times 1 \text{ hp}}{2 \text{ lbs } O_2} = 57 \text{ hp}$$

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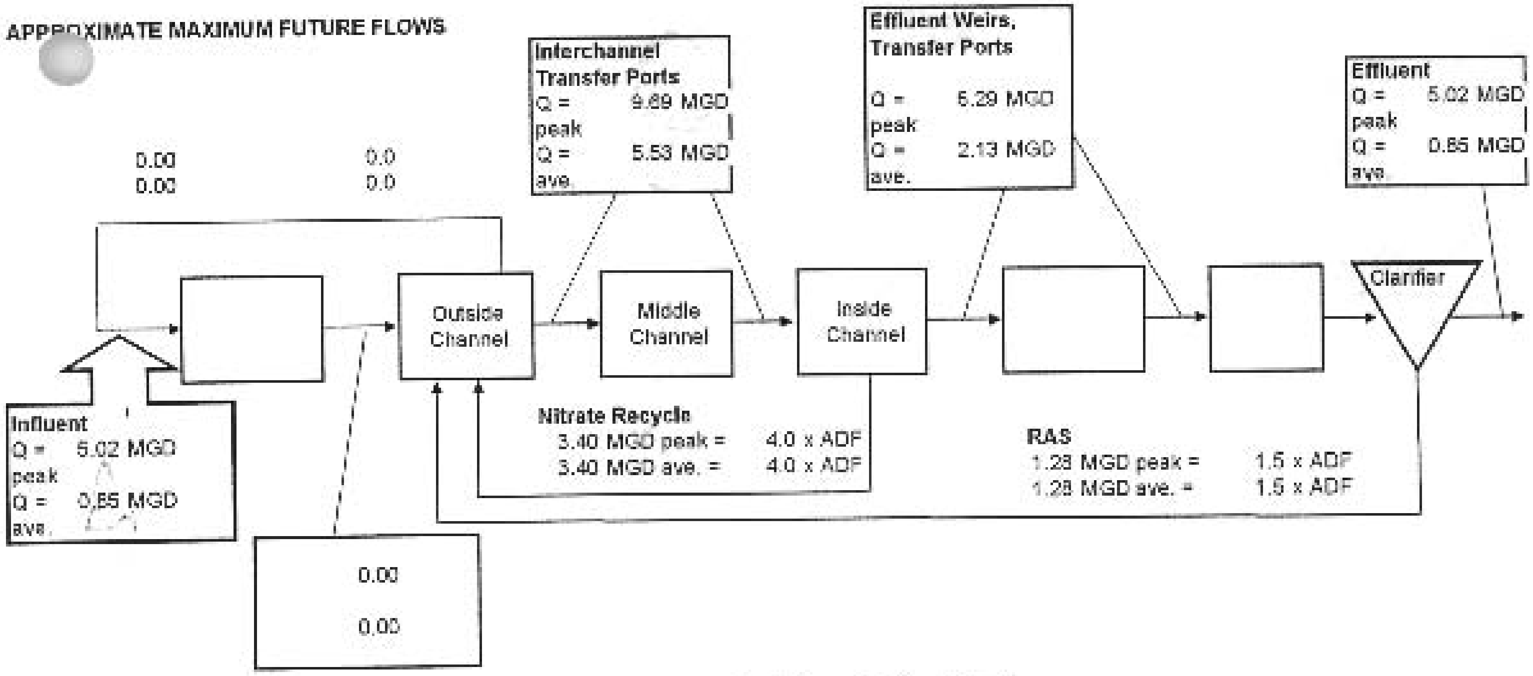
HYDRAULIC CALCULATIONS FOR ORBAL SYSTEM

Date: 11/6/2005
Project: Mt View - AR Orbal
Engineer: McClellend consulting engineer
Designer: Dennis Barnes

Number of Channels in Orbal 3

APPROXIMATE MAXIMUM FUTURE FLOWS



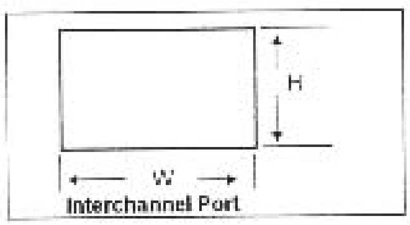
SUGGESTED SIZING FOR INTERCHANNEL TRANSFER PORTS

(ports between outer, middle, and inner channels)

Maximum flow = 9.69 MGD = 5.02 MGD peak + 1.28 MGD RAS + 3.40 MGD SIM-PRE
Limit headloss to 0.50 inches at peak flow

Headloss Calculations: $h = 1.21\ (Q/A)^2$

where, h = headloss in inches
Q = flow in MGD
A = area in sq. ft



Solving for A, we have:

$A = (1.21Q^2/h)^{1/2} =$ 15.07 sq. ft.

Recommended port opening size = 16.00 sq. ft. = 48 inch x 48 inch

Actual hl at peak, inches =	0.444	Actual hl at average, inches =	0.144
Actual hl at peak, ft =	0.037	Actual hl at average, ft =	0.012

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HYDRAULIC CALCULATIONS FOR ORBAL SYSTEM

Date: 11/8/2005

Project: Mt View - AR Orbal

Engineer: McClellend consuting engineer

Designer: Dennis Barnes

SUGGESTED SIZING FOR EFFLUENT CONTROL STRUCTURE GATE

(gate between inner channel and effluent weirs)

Maximum flow = 6.290 MGD = 5.015 MGD peak + 1.275 MGD RAS

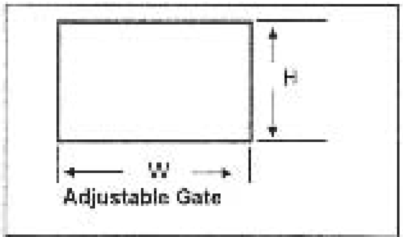
Limit headloss to 1 inches at peak flow

Headloss Calculations: h = 1.21 (Q/A)^2

Where: h = headloss in inches
Q = flow in MGD
A = area in sq. ft.

Solving for A, we have:

A = (1.21Q^2/h)^1/2 = 6.919 sq. ft.



Recommended port opening size = 7.111 sq. ft. = 32 inch x 32 inch

Actual hl at peak, inches = 0.947

Actual hl at ave., ft = 0.079

Actual hl at average, inches = 0.1081

Actual hl at average, ft = 0.009

HYDRAULIC CALCULATIONS FOR ORBAL SYSTEM

Date: 11/8/2005 Page 2 of 2

Project: Mt View - AR Orbal

Engineer: McClellend consuting engineer

Designer: Dennis Barnes

SUGGESTED SIZING FOR EFFLUENT WEIRS

Maximum flow = 6.290 MGD = 5.015 MGD peak + 1.275 MGD RAS

Limit headloss to 3 inches at peak flow with adjustable gate at 100% closed

Headloss Calculations: h = (18.96Q/L)^2/3

Where: h = headloss in inches
Q = flow in MGD
L = length of weir in feet

Solving for L, we have:

L = (18.96Q/h^3/2) = 23.0 feet

Recommended high weir length = 23 feet

Actual hl at peak, inches = 2.996

Actual hl at peak, ft = 0.250

Minimum recommended low weir length = 5.157 feet

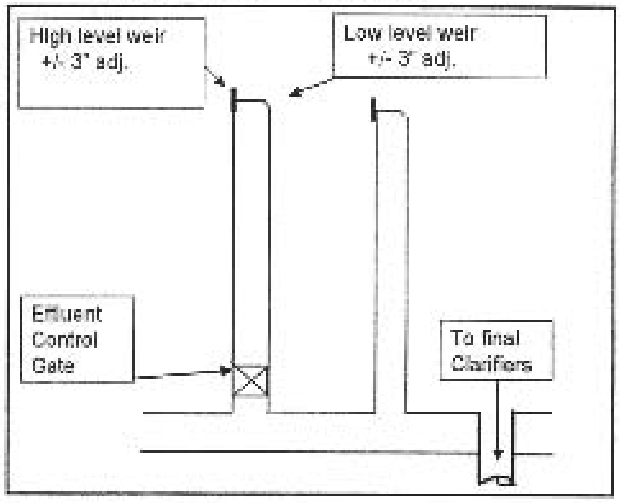
Actual low weir length, feet = 6 feet

Actual hl at peak, inches = 7.338 inches

Actual hl at peak, ft = 0.611 feet

Maximum disc immersion = 21"
Minimum disc immersion = 9"
disc radius = 27"

Section view of Center Island Weirs



- Top of high level weir plate should be placed 6" + 2.996 " (high weir hl) + 0.888 " (interchannel gate hl) = 9.88 " = 0.824 feet below the centerline of the shaft. Top of concrete weir support should be placed 3" below the high weir plate.

- Top of low level weir plate should be placed 18" below the center line of the shaft. Top of concrete weir support to be 21" below the centerline of the shaft.

With high level weir at 0.8236 feet below shaft centerline, max. disc immersion at average flow = 18.88 inches

If chamber between low weir and gate has a cross-sectional area= 2 sq. ft. average velocity = 0.656 fps

peak velocity = 3.88 fps

Dec 7

Final Clarifier

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Job No. ______ Sheet ___/___
Project: Mtn View WWTP
Prepared By: BA Date: 1-10-06
Checked By: ______ Date: ______

Check Clarifier Capacity

Avg Annual flow (2003 was max) = .64 mgd
Add for additions:
133 homes (3 people)(100) = .039,900 mgd

Total Peak hourly ∴ (.64 + .039900)(3.44) = 2.34 MGD

10 state stds:

A = surface overflow rate: 1000 gpd/ft^2

B = Peak solids loading: 35 lb/day/ft^2

A. surface overflow: $\frac{\pi d^2}{4} = \pi\frac{(55)^2}{4} = 2376\ ft^2$

2376 × 1000 = 2,375,829 gpd = 2.375 MGD

2.375 > 2.34 ok

B. Solids Loading:

MLSS = 4041 per calcs, ∴ use 4500 mg/l

4500 × ~~.85~~ 0.73 mgd × 8.34 = ~~31,900~~ lb/day 27396.9

$\frac{\text{~~31,900~~ } 27396.9}{2376}$ = ~~13.4~~ 11.53 lb/day/ft^2 < 35 ok ✓