

APPENDIX F: PERFORMANCE ASSESSMENT



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Appendix F. Summary Table of Loading and Performance Data			
Parameter	Design Value	Historical Data	Date
Influent Characteristics			
Flow, mgd			
Average Dry Weather (ADW)	7.4 ¹	6.8	2002-2008
Average Annual (AA)	8.0 ¹	8.9	2002-2009
Maximum Month (ADMM)	9.3 ¹	20.6	2002-2009
Peak Day	--	53.8	2002-2009
Peak Hour	32.6 ¹	--	--
BOD₅, ppd			
Average Annual (AA)	17,800 ¹	17,191	2003-2009 ¹
Maximum Month (ADMM)	22,100 ¹	26,347	2003-2009 ¹
TSS, ppd			
Average Annual (AA)	19,200 ¹	18,760	2003-2009 ¹
Maximum Month (ADMM)	27,800 ¹	55,455	2003-2009 ¹
Recycle Stream Characteristics			
Flow, mgd			
Average Annual (AA)	1.2 ¹	--	--
Maximum Month (ADMM)	0.9 ¹	--	--
BOD₅, ppd			
Average Annual (AA)	900 ¹	--	--
Maximum Month (ADMM)	1,050 ¹	--	--
TSS, ppd			
Average Annual (AA)	1,320 ¹	--	--
Maximum Month (ADMM)	1,900 ¹	--	--
Preliminary Treatment: Grit removal			
Peak Hour Flow, mgd	20.0 ¹	17 ⁷	2002-2009
Type	aerated	--	--
Number of Units	2	--	--
Surface Area, Total, square ft	470 ¹	--	--

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Parameter	Design Value	Historical Data	Date
Overflow Rate, gpd/square ft			
Average Annual	17,000 ¹	19,024	2002-2009
Maximum Month	20,200 ¹	36,170 ⁷	2002-2009
Peak Hour	42,500 ¹	36,170 ⁷	2002-2009
Detention Time, min			
Average Annual	7 ¹	6.4	2002-2009
Maximum Month	6 ¹	3.4	2002-2009
Horizontal Velocity, fps			
Average Annual	0.04 ¹	--	--
Maximum Month	0.05 ¹	--	--
Primary Treatment			
Peak Hour Flow, mgd	20.0 ¹	17 ⁸	2002-2009
Type	circular clarifiers	--	--
Number of Units	2	--	--
Total Surface Area, square ft	10,050 ¹	--	--
Weir Length, Total, ft	475 ¹	--	--
Capacity, mgd			
Average dry weather flow (ADWF), each	4.25 ¹	--	--
Maximum month, each	10 ¹	--	--
Peak Hour, mgd	20 ¹	--	--
Average TSS Removal, %	65 ²	64	2003-2009 ¹
Average BOD ₅ Removal, %	35 ²	33	2003-2009 ¹
Overflow rates, gpd/square ft			
Average Annual	800 ¹	890	2002-2009
Maximum Month	925 ¹	1,692 ⁷	2002-2009
Peak Hour	1,990 ¹	1,692 ⁷	2002-2009
Detention Time, hr			
Average Annual	3.2 ¹	2.9	2002-2009
Maximum Month	3.7 ¹	1.5 ⁷	2002-2009

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Parameter	Design Value	Historical Data	Date
Weir Loading, gpd/ft			
Average Annual	16,800 ¹	18,823	2002-2009
Maximum Month	19,600 ¹	35,789 ⁷	2002-2009
Average Primary Sludge Flow, gpd	--	19,059	2004-2009
Primary Sludge Total Solids, %	--	5.47	2004-2009
Primary Sludge TSS, ppd	--	8,163	2004-2009
Oxidation Pond Treatment			
Pond 1 BOD₅ loading, lb/acre/day			
Summer Range (May through October)	48-100 ³	43	2003-2008
Winter Range (November through April)	19-48 ³	40	2002-2009
Reliable Pond 1 Loading Capacity, ppd			
Summer range (May through October)	5,300-11,100 ³	4,797	2003-2008
Winter range (November through April)	2,100-5,300 ³	4,458	2002-2009
Average Effluent Ammonia, mg/L-N	--	10.7	2006-2009
Average Effluent TSS, mg/L	--	87.6	2004-2009
Flocculating Clarifiers			
Type	circular	--	--
Number of Units	2	--	--
Total Surface area, square ft	10,050 ¹	--	--
Weir Length, Total, ft	975 ¹	--	--
Overflow Rate, gpd/square ft			
Average Annual	625 ¹	--	--
Maximum Month	845 ¹	--	--
Maximum Month Weir Loading, gpd/ft	8,700 ¹	--	--
Maximum Month Capacity, each, mgd	4.25 ¹	--	--
Average Effluent TSS, mg/L	--	11.8	2004-2009
Activated Sludge Treatment (General)			
Number of Trains	2	--	--
Maximum Month Design Flow, each train, mgd	4.3 ¹	4.1	2001-2009

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Parameter	Design Value	Historical Data	Date
Influent BOD₅ Concentration, mg/L			
Average Annual	150 ^{2, 4}	164	2001-2009
Maximum Month (BOD Removal Only)	189 ^{2, 4}	--	--
Influent BOD₅ Loading, each train, ppd			
Average Annual	5,400 ^{2, 4, 5}	5,411	2001-2009
Maximum month (BOD Removal Only)	6,800 ^{2, 4, 5}	8,435	2001-2009
Influent TSS Concentration, mg/L			
Average Annual	94 ^{2, 4}	92	2001-2009
Maximum Month (BOD Removal Only)	140 ^{2, 4}	--	--
Influent TSS Loading, each train, ppd			
Average Annual	3,400 ^{2, 4, 5}	3,108	2001-2009
Maximum Month (BOD Removal Only)	5,000 ^{2, 4, 5}	6,224	2001-2009
Influent NH₃-N Concentration, mg/L			
Average Annual	23 ^{2, 4}	27	2002-2009
Maximum Month (BOD Removal Only)	--	--	--
Influent NH₃-N Loading, each train, ppd			
Average Annual	830 ^{2, 4, 5}	920	2002-2009
Maximum Month (BOD Removal Only)	--	2,800 ⁸	2002-2009
Influent TKN-N Concentration, mg/L			
Average Annual	30 ^{2, 4}	--	--
Maximum Month (BOD Removal Only)	--	--	--
Influent TKN-N Loading, each train, ppd			
Average Annual	1,100 ^{2, 4, 5}	--	--
Maximum Month (BOD Removal Only)	--	--	--
Wastewater temperature, °C	18 ²	--	--
Aeration Basins			
Number of Units	2	--	--
Hydraulic Detention Time, hrs			
Average Annual	6 ¹	--	--
Maximum Month	6 ¹	--	--
SRT, days (Nitrification Mode)	6.5 ^{2, 4}	6.9	2001-2009
MLSS, mg/L (Nitrification Mode)	2,680 ^{2, 4}	2,452	2001-2009

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Parameter	Design Value	Historical Data	Date
Average Annual Oxygen Requirements per Train, ppd			
Carbonaceous demand	5,420 ^{1,4}	--	--
Nitrogenous demand	3,830 ^{1,4}	--	--
Total	9,250 ^{1,4}	--	--
Peak Diurnal Oxygen Requirements During AA Conditions Per Train, ppd			
Carbonaceous demand	7,260 ^{1,4}	--	--
Nitrogenous demand	7,660 ^{1,4}	--	--
Total	14,920 ^{1,4}	--	--
Secondary Clarifiers			
Type	circular	--	--
Number of Units	2	--	--
Total Surface Area, each, sq ft	7,850 ¹	--	--
Surface Overflow Rate, gal/sq ft/day			
Average Annual	--	522	2001-2009
Maximum Month	548 ⁵	718	2001-2009
Average RAS Flow per Clarifier, mgd	1.7 – 5.8 ¹	1.2	2001-2009
Average RAS Flow, % of influent	30-133 ¹	31	2001-2009
Average Solids Loading Rate, ppd/sq ft	--	14.0	2001-2009
MLSS SVI, mL/g			
Average Annual	--	89	2001-2009
90th Percentile	--	122	2001-2009
Secondary Effluent			
Average Effluent TSS, mg/L	--	12.0	2001-2009
Average Effluent NH3-N, mg/L	--	1.0	2002-2009
Average Effluent NO3-N, mg/L	--	22.7	2002-2009
Filtration			
Filtration Type	continuous backwash	--	--
Number of filter cells	4	--	--
Total surface area, sq ft	2,000 ⁶	--	--

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Parameter	Design Value	Historical Data	Date
Hydraulic Loading With All Cells in Service, mgd			
Average	--	--	--
Maximum	--	--	--
Oxidation Pond Water, mgd	6.3 ⁶	--	--
Secondary Effluent, mgd	9.8 ⁶	--	--
Hydraulic Loading Rate, gpm/sf			
Average	--	1.7 ⁱ	2004-2009
Maximum	--	2.7 ⁱ	2004-2009
Oxidation Pond Water	2.2 ⁶	--	--
Secondary Effluent	3.4 ⁶	--	--
Reject Rate, Percent of Influent			
Average	--	32 ⁱ	2004-2009
Maximum	--	--	--
Oxidation Pond Water	20 ⁶	--	--
Secondary Effluent	10 ⁶	--	--
Filter output, mgd			
Average	--	3.6 ⁱ	2003-2009
Maximum	--	5.6 ⁱ	2003-2009
Oxidation Pond Water	5 ⁶	--	--
Secondary Effluent	8.8 ⁶	--	--
Effluent turbidity, NTU	--	1.2	2004-2009
Discharge & Reclamation			
River discharge (basins East, West)	--	--	--
Flow, mgd	17.5 ⁷	13.5	2002-2009
Detention time, min	53 ⁷	68	2002-2009
Effluent coliform, /100mL	--	2.9	2005-2009
Reclamation water (basins East, 3)			
Flow, mgd	8.8 ⁷	3.7	2002-2008
Detention time, min	128 ⁷	302	2002-2008

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Parameter	Design Value	Historical Data	Date
WAS Thickening			
Type	dissolved air flotation	--	--
Number of Units	1	--	--
Surface area, sq ft	900 ¹	--	--
WAS Flow, mgd			
Average Annual	0.12-0.30 ¹	0.05	2001-2009
Maximum Month	--	--	--
Hydraulic loading, gpm/sq ft			
Average Annual	0.80 ¹	0.06	2001-2009
Maximum Month	0.60 ¹	0.25	2001-2009
WAS Solids, ppd			
Average Annual	6,620 ¹	4,668	2001-2009
Maximum Month	9,470 ¹	11,867	2001-2009
WAS Solids Loading, ppd/sq ft			
Average Annual	7.3 ¹	5.2	2001-2009
Maximum Month	10.5 ¹	13.2	2001-2009
Average Annual TWAS			
Solids, ppd	--	4,574	2004-2009
Flow, gpd	--	16,973	2004-2009
Average TWAS Total Solids, %	3.0 ²	3.18	2004-2009
Average Annual Capture, %	95 ²	82-105% ¹⁰	2008-2009
Anaerobic Digestion			
Type	egg shaped	--	--
Number	1	--	--
Hydraulic feed rate, gpd			
Average Annual	57,000 ¹	35,983	2004-2009
Maximum Month	83,000 ¹	55,500	2004-2009
Hydraulic Retention Time, days			
Average Annual	24.0 ¹	37.9	2004-2009
Maximum Month	16.5 ¹	24.6	2004-2009

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Parameter	Design Value	Historical Data	Date
Volatile Solids Loading, ppd/cu ft			
Average Annual	0.08 ¹	0.05	2005-2009
Maximum Month	0.12 ¹	0.08	2005-2009
Average Annual Volatile Solids Destruction, %	--	55.0	2004-2009
Average Annual Digested Sludge % Solids	--	2.1	2004-2009
Sludge Dewatering			
Type	belt filter press	--	--
Number of Units	2 + 1	--	--
TSS feed, ppd	17,100 ¹	6,965 ¹¹	2007-2009
Liquid feed, gal/day	83,000 ¹	44,387 ¹¹	2004-2009
Run Time			
Days per week	5 ¹	--	--
Hours per day	6 ¹	--	--
Liquid loading, gpm/m	80 ¹	--	--
Solids loading, maximum month, lb/hr	3,990 ¹	--	--
Cake solids, percent	16-20 ¹	17.1	2004-2009
Percent capture, percent	90 ¹	--	--

Sources of design values:

¹Phase II drawings and specifications (Carollo 1998)

²Preliminary design report (Carollo 1992)

³2008 TM 27 Evaluation of Plant in Support of Biosolids Removal Project (Brown & Caldwell 2008).

⁴Loading parameters based on allowing for nitrification during AA conditions and BOD removal only during ADMM conditions.

⁵Calculated

⁶Phase I drawings and specifications (Carollo 1994)

⁷Hydraulic restrictions limit flow through preliminary and primary processes to 17 mgd

⁸Based on only 1 sample per month.

⁹Based on operating blend of pond and activated sludge effluent.

¹⁰Data is highly variable. Capture range dependent on calculation methodology.

¹¹Calculation of average includes zero values for days when BFP not operated.

¹²2002 data excluded due to suspected influent sampling issues.

-- not available