UBWPAD Facility Improvements – Phase III

Design Criteria: Liquid A (CDM: April 2010)

DESIGN YEAR FLOWS AND LOADINGS

DESIGN INFLUENT FLOWS (mgd)	2010	2020
AVERAGE ANNUAL (AAF)	42	45
MAXIMUM MONTH	70	75
MAXIMUM DAY	106	111
PEAK HOUR	154	160
DESIGN FLOWS TO ADVANCED TREATMENT (mgd)		
AVERAGE ANNUAL (AAF)	43.6	46.6
MAXIMUM MONTH	70	75
MAXIMUM DAY	80	80
PEAK HOUR		120
ADVANCED TREATMENT BYPASS CAPACITY (mgd)	80	80

2010 DESIGN INFLUENT LOADINGS (lbs/day) (INCLUDING SEPTAGE)

	AVERAGE ANNUAL	MAXIMUM DAY	MAXIMUM MONTH
BOD	65,700	101,000	75,300
TSS	67,500	135,000	83,900
TKN	7,790	10,500	10,300
P	1,400	2,330	1,570

2010 DESIGN LOADINGS TO ADVANCED TREATMENT (lbs/day) (INCLUDING SIDESTREAM)

BOD	47,200	76,200	52,700
TSS	30,700	61,200	34,200
TKN	8,790	12,500	9,900
P	1,750	3,030	2,000

2020 DESIGN INFLUENT LOADINGS (lbs/day) (INCLUDING SEPTAGE)

	AVERAGE ANNUAL	MAXIMUM DAY	MAXIMUM MONTH
BOD	71,600	110,000	82,100
TSS	73,400	146,000	91,200
TKN	8,860	11,900	11,700
P	1,620	2,700	1,820

2020 DESIGN LOADINGS TO ADVANCED TREATMENT (lbs/day) (INCLUDING SIDESTREAM)

	AVERAGE ANNUAL	MAXIMUM DAY	MAXIMUM MONTH
BOD	50,600	81,500	56,700
TSS	32,800	65,400	36,600
TKN	9,860	13,900	11,200
P	1,970	3,400	2,300

PRELIMINARY TREATMENT

INFLUENT SCREENING

TYPE	catenary
NUMBER OF UNITS	4
UNIT CAPACITY	40 mgd
CLEAR SPACING OF BARS	5/8 inch
CHANNEL WIDTH	4.5 ft
CHANNEL DEPTH	
EAST	11 ft
WEST	10 ft
AERATED GRIT	
NUMBER OF TANKS	4
DETENTION TIME @ PEAK FLOW	(2020)
EAST	3.5 min
WEST	6.0 min
UNIT DIMENSIONS	
LENGTH	60 ft
WIDTH	
EAST	15 ft
WEST	25 ft
SIDEWATER DEPTH	15 ft
AIR SUPPLY	
NUMBER OF BLOWERS	3
TYPE OF BLOWER	positive displacement
BLOWER CAPACITY	600 scfm @ 7.3 psi

PRIMARY TREATMENT

PRIMARY SETTLING TANKS	
NUMBER OF UNITS	7
UNIT DIMENSIONS	
LENGTH	200 ft
WIDTH	40 ft
SIDEWATER DEPTH	10 ft
TOTAL SURFACE AREA	56,000 sq ft
OVERFLOW RATE (based on 7 tanks in service)	
AVERAGE ANNUAL	750 gpd/sq ft (804 gpd/sq ft)
PEAK HOUR	2,750 gpd/sq ft (2,857 gpd/sq ft)

SECONDARY TREATMENT

A^2O SYSTEM	
ANAEROBIC ZONE	
NUMBER OF TRAINS	4
STAGES PER TRAIN	3
STAGE DIMENSIONS	
A (LENGTH x WIDTH x SIDE WATER DEPTH)	36 ft x 41 ft x 15.9 ft
B	36 ft x 41 ft x 15.9 ft
C	47 ft x 84 ft x 15.9 ft
VOLUME	
PER TRAIN	0.82 MG
TOTAL	3.3 MG
F/M (lb BOD/ lb MLSS) (SEE NOTE 4)	
A	2.4
B	1.2
C	0.51
HYDRAULIC RETENTION TIME	(FORWARD FLOW ONLY)
AVERAGE ANNUAL	1.7 hr
PEAK HOUR	0.66 hr
ANOXIC ZONE	
NUMBER OF TRAINS	4
STAGES PER TRAIN	2
STAGE DIMENSIONS	
D (LENGTH x WIDTH x SIDE WATER DEPTH)	36 ft x 84 ft x 15.3 ft
E (LENGTH x WIDTH x SIDE WATER DEPTH)	37 ft x 84 ft x 14.8 ft
VOLUME	
PER TRAIN	0.69 MG
TOTAL	2.8 MG
HYDRAULIC RETENTION TIME	(forward flow only)
AVERAGE ANNUAL	1.5 hr
PEAK HOUR	2.5 hr
AEROBIC ZONE	
NUMBER OF TRAINS	4
UNIT DIMENSIONS	
LENGTH	345 ft
WIDTH	84 ft
SIDEWATER DEPTH	14.3 ft
VOLUME	
PER TRAIN	3.1 MG
TOTAL	12.4 MG
SRT A/O AND MLE	10 DAY
A2/O	8 DAY
MLSS / MLVSS	4,100 mg/l / 3,280 mg/l
HYDRAULIC RETENTION TIME	(forward flow only)
AVERAGE ANNUAL	6.6 hr
PEAK HOUR	2.5 hr
INTERNAL RECYCLE PUMPS	
NUMBER OF UNITS	8
TYPE	submersible propeller
CAPACITY	12,500 gpm @ 4.8 ft
MOTOR HORSEPOWER	40 hp
AVERAGE INTERNAL RECYCLE RATE SUMMER	320% AAF
AVERAGE INTERNAL RECYCLE RATE WINTER	130% AAF
BLOWERS	
NUMBER OF UNITS	4
TYPE	single stage centrifugal
CAPACITY	17,900 acfm
MOTOR HORSEPOWER	800 hp

Design Criteria: Liquid B (CDM: April 2010)

SECONDARY TREATMENT (CONT'D)

FINAL SETTLING TANKS	
NUMBER OF UNITS	8
TYPE	circular w/rapid sludge uptake
DIMENSIONS	
DIAMETER	140 feet
SIDEWATER DEPTH	14.6 feet
UNIT SURFACE AREA	15,400 sqft
TOTAL SURFACE AREA	123,150 sq ft
UNIT VOLUME	224,800 cu ft
TOTAL VOLUME	1,798,700 cu ft
OVERFLOW RATE	
AVERAGE ANNUAL	378 gpd/sq ft
PEAK HOUR	974 gpd/sq ft
SOLIDS LOADING	
AVERAGE ANNUAL	21 lbs/d/sq ft
PEAK HOUR	49 lbs/d/sq ft
DETENTION TIME	
AVERAGE ANNUAL ANNUAL	7.1 hr
PEAK HOUR	2.7hr

RETURN ACTIVATED SLUDGE PUMPS	
NUMBER OF UNITS	10 [8 operating, 2 standby]
TYPE	vertical non clog centrifugal
CAPACITY (125% AAF)	4,900 gpm @36 FT
MOTOR HORSEPOWER	60 hp
AVERAGE RAS RATE	69 % AAF

WASTE ACTIVATED SLUDGE PUMPS	
NUMBER OF UNITS	6 [4 operating, 2 standby]
TYPE	horizontal non clog centrifugal
CAPACITY (10 DAY SRT)	350 gpm @60 FT
MOTOR HORSEPOWER	10hp

SCUM PUMPS	
NUMBER OF UNITS	2
TYPE	hose pumps
CAPACITY	125 gpm
MOTOR HORSEPOWER	25hp

DRAIN PUMPS	
NUMBER OF UNITS	2
TYPE	Vertical non clog centrifugal
CAPACITY	1800 gpm @26ft
MOTOR HORSEPOWER	20hp

DISINFECTION / DECHLORINATION

DISINFECTION	
NUMBER OF CONTACT TANKS	2
TOTAL VOLUME	0.76 MG
DETENTION TIME (2020)	
AVERAGE ANNUAL	24.3
PEAK HOUR	9.1
DISINFECTANT	SODIUM HYPOCHLORITE
PEAK DOSAGE	
@ AVERAGE FLOW	20 mg/l
@ PEAK FLOW	8 mg/l
@ PEAK BYPASS FLOW	12 mg/l

DECHLORINATION	
CHEMICAL	SODIUM BISULFITE
DOSAGE	1.6 mg/l per mg/l residual

ODOR CONTROL

BIOFILTER	
SOURCE	screenings, grit, primary influent and effluent channels
PROCESS AIR FLOW	18,000 cfm
STATIC PRESSURE	10 in WG.
DIMENSIONS	
WIDTH	20 ft
LENGTH	67 ft
MEDIA DEPTH	7 ft 6 in
AIR HEATER	200,000 BTU

ACTIVATED CARBON	
SOURCE	sludge holding and receiving tanks
NUMBER OF CARBON CANISTERS	2
UNIT DIMENSIONS	
DIAMETER	6 ft
BED DEPTH	3 ft
AIR FLOW (each)	2,000 cfm
PRESSURE DROP	12 in water column across each bed

FLOW MEASUREMENT

INFLUENT – PARSHALL FLUME	
WIDTH	12 ft
RATED CAPACITY	336 mgd

ADVANCED TREATMENT BYPASS – PALMER – BOWLUS – FLUME	
PALMER–BOWLUS FLUME	
WIDTH	72 in
RATED CAPACITY	120 mgd

NOTES:

1. VALUES SHOWN REFLECT DESIGN CRITERIA UNDER 2020 FLOWS AND LOADS.
2. SIDEWATER DEPTH BASED ON AVERAGE HYDRAULIC PROFILE.
3. F/M VALUES BASED ON MAXIMUM MONTH 2020 LOAD.
4. PUMP UNITS ARE EQUALLY DIVIDED BETWEEN NORTH AND SOUTH PUMP STATION.
5. SOLIDS HANDLING PROCESSES NOT SHOWN ON THIS SHEET

Design Criteria: Solids A (CDM: April 2010)

DESIGN YEAR SLUDGE QUANTITIES

PRIMARY SLUDGE	2010	2020
AVERAGE (lb/day)	41,900	45,600
MAXIMUM WEEK (lb/day)	60,300	65,600
PRIMARY SLUDGE CONCENTRATION	4–5%	4–5%
(SEE NOTE 3)		
SECONDARY SLUDGE		
AVERAGE (lb/day)	41,400	44,400
MAXIMUM WEEK (lb/day)	50,900	54,600
SECONDARY SLUDGE CONCENTRATION	0.4–1%	0.4–1%
OUTSIDE SLUDGE	(CURRENT)	
AVERAGE (lb/day)	14,200	14,200
MAXIMUM WEEK (lb/day)	22,600	22,600
PRIMARY SLUDGE CONCENTRATION	4–4.5%	4–4.5%

SECONDARY SLUDGE THICKENING

DISSOLVED AIR FLOTATION (DAF) THICKENERS	
SLUDGE TYPE	Secondary/WAS
NUMBER OF UNITS	2
UNIT DIMENSIONS	
LENGTH	70 ft
WIDTH	16 ft
SIDEWATER DEPTH	8.75 ft
TOTAL SURFACE AREA	22,240 sq ft
SOLIDS LOADING RATE	
AVERAGE	0.83 lb/hr/sq ft
MAXIMUM WEEK	1.02 lb/hr/sq ft
HYDRAULIC LOADING RATE	
AVERAGE @ 0.4% SOILDS	0.41 gpm/sq ft
MAXIMUM WEEK @ 0.4% SOLIDS	0.51 gpm/sq ft
OPERATING SCHEDULE	24 hours a day
FEED CONCENTRATION	0.4–1%
THICKENED SLUDGE CONCENTRATION	4–5%

SLUDGE PUMPING

PRIMARY SLUDGE PUMP (PSP 1701–1707)	
PUMP TYPE	Duplex Plunger
NUMBER OF UNITS	7
CAPACITY	200 gpm @ 60 ft
MOTOR HORSEPOWER	6 @ 7.5 and 1 @ 10
THICKENED SLUDGE PUMPS	
PUMP TYPE	Hose Pump
NUMBER OF UNITS	2
CAPACITY @ CONTINUOUS DUTY	60–160 gpm @ 72.5 psi
MOTOR HORSEPOWER	25

SLUDGE PUMPING CONT.

DAF DRAIN PUMP	
PUMP TYPE	Duplex Plunger
NUMBER OF UNITS	1
CAPACITY @ CONTINUOUS DUTY	140 gpm @ 60 ft
MOTOR HORSEPOWER	10

SLUDGE TRANSFER PUMPS	
PUMP TYPE	Triplex Plunger
NUMBER OF UNITS	3
CAPACITY @ CONTINUOUS DUTY	350 gpm @ 100 ft
MOTOR HORSEPOWER	20

DEWATERING FEED PUMPS	
PUMP TYPE	Hose Pump
NUMBER OF UNITS	4
CAPACITY @ CONTINUOUS DUTY	60–160 gpm @ 72.5 psi
MOTOR HORSEPOWER	25

SLUDGE STORAGE

SLUDGE HOLDING TANK NO. 1 (PRIMARY SLUDGE)	
DIAMETER	55 ft
SIDEWATER DEPTH	25 ft
TOTAL VOLUME	445,000 gal
AVERAGE STORAGE @ 4% SOLIDS	3.3 days
MAXIMUM WEEK STORAGE @ 4% SOLIDS	2.3 days
MIXER	
TYPE	Axial Flow
NUMBER OF UNITS	1
CAPACITY	18,000 gpm
MOTOR HORSEPOWER	20
SLUDGE HOLDING TANK NO. 2 (THICKENED WAS AND OUTSIDE SLUDGE)	
DIAMETER	55 ft
SIDEWATER DEPTH	25 ft
TOTAL VOLUME	445,000 gal
AVERAGE STORAGE @ 4.5% SOLIDS	3.8 days
MAXIMUM WEEK STORAGE @ 4.5% SOLIDS	3.1 days
MIXER	
TYPE	Axial Flow
NUMBER OF UNITS	1
CAPACITY	18,000 gpm
MOTOR HORSEPOWER	20
SLUDGE MIX TANKS	
NUMBER OF UNITS	2
DIAMETER	12 ft
SIDE WATER DEPTH	27 ft
TOTAL VOLUME	45,700 gal
MIXER	
TYPE	Vertical Shaft–Hydrfoil
NUMBER OF UNITS	1
MOTOR HORSEPOWER	5

Design Criteria: Solids B (CDM: April 2010)

SLUDGE DEWATERING

BELT FILTER PRESSES	
NUMBER OF UNITS	4 (3 duty, 1 standby)
SIZE OF UNITS	2 m (Effective Width)
SOLIDS LOADING RATE	
AVERAGE	940 lb/hr/m (3 duty)
MAXIMUM WEEK	993 lb/hr/m (3 duty)
HYDRAULIC LOADING RATE	
AVERAGE	54 gpm/m (3 duty)
MAXIMUM WEEK	57 gpm/m (3 duty)
OPERATING SCHEDULE	24 hours a day
FEED CONCENTRATION	3–5%
DEWATERED CAKE SOLIDS CONCENTRATION	20–26%
MOTOR HORSEPOWER – BELT DRIVES	3 (x 3 Motors)
MOTOR HORSEPOWER – HYDRAULIC DRIVE	2 (x 1 Motors)

DEWATERED CAKE PUMPS	
PUMP TYPE	Hydraulically Driven Piston Pump
NUMBER OF UNITS	4 (3 duty, 1 standby)
CAPACITY	15–50 gpm @
MOTOR HORSEPOWER	75

MULTIPLE–HEARTH FURNACE/AIR POLLUTION CONTROL

MULTIPLE–HEARTH FURNACE (with flue gas recirculation)	
NUMBER OF INCINERATORS	2
CAPACITY (each incinerator)	
MAXIMUM THROUGHPUT	3.0 dry tons/hour
FLUE GAS RECIRCULATION (FGR) FANS WITH VFD'S	
NUMBER OF FANS	2
MOTOR HORSEPOWER	125 hp
DESIGN AIR FLOW RATE	50,000 acfm @ 1000 deg F
DESIGN STATIC PRESSURE	5 in water column

AIR POLLUTION CONTROL – WET ELECTROSTATIC PRECIPITATORS (WESP)	
NUMBER	2
UNIT DIMENSIONS	
DIAMETER	10.5 ft
HEIGHT	45 ft
SPECIFIC COLLECTION AREA (SCA)	130 sq ft/1000 acfm
OUTLET PARTICULATE	0.008 Grains/dscf
CONCENTRATION	Corrected to 7% O_2

SIDESTREAM PUMPING

SIDESTREAM PUMP	
PUMP TYPE	Vertical Turbine Solids Handling
NUMBER OF UNITS	3
CAPACITY	1750 gpm @ 20 ft
MOTOR HORSEPOWER	15

NOTES:

1. ALL SLUDGE CALCULATIONS BASED ON EXISTING NPDES PERMIT.
2. VALUES SHOWN REFLECT DESIGN CRITERIA UNDER 2020 FLOWS AND LOADS.
3. PRIMARY SLUDGE IS PUMPED OUT OF THE PRIMARY SETTLING TANKS AT 1–2% SOLIDS. PRIMARY SLUDGE THICKENS TO 4–5% SOILDS IN THE SLUDGE HOLDING TANK.