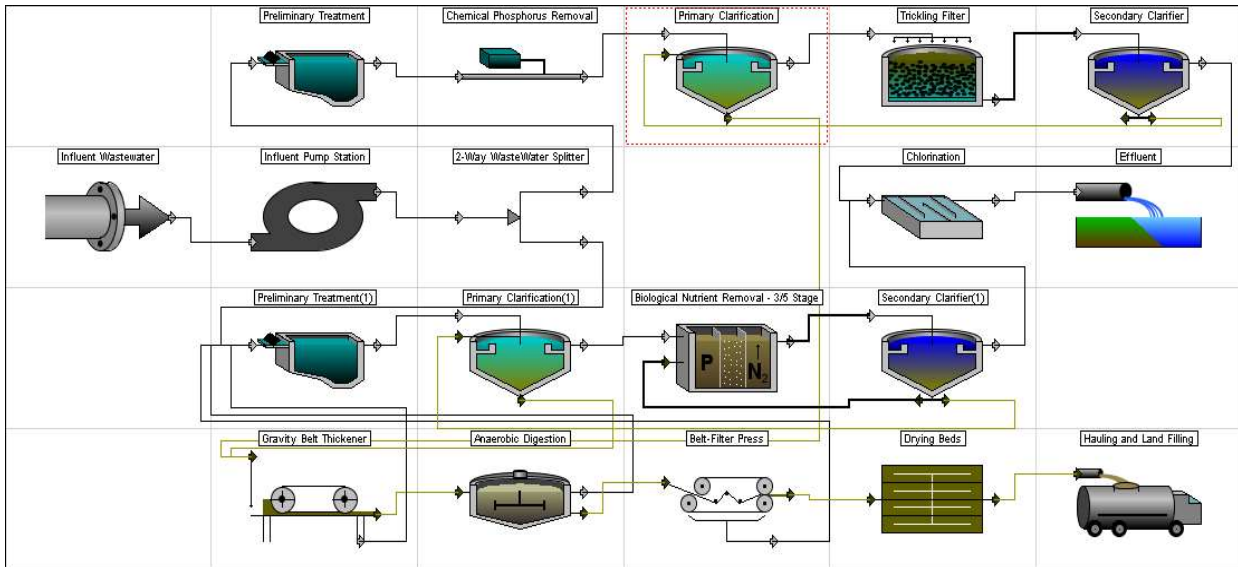


**Layout - Central Weber SID**



**Summary**

**Equipment Database**

Hydromantis 2014,(USA Avg)

**Layout Summary**

Description	Value	Units
<b>CONSTRUCTION COSTS</b>		
Unit process construction cost:	\$121,000,000	\$
Other direct construction costs	\$30,900,000	\$
Other indirect construction costs	\$113,000,000	\$
<b>Total construction costs</b>	<b>\$265,000,000</b>	<b>\$</b>

**ANNUAL COSTS**

**LABOR COSTS**

Administration labor cost	\$402,000	\$/yr
Laboratory labor cost	\$317,000	\$/yr
Unit process operation labor cost	\$4,700,000	\$/yr
Unit process maintenance labor cost	\$2,330,000	\$/yr
<b>Total labor costs</b>	<b>\$7,750,000</b>	<b>\$/yr</b>

**MATERIAL COSTS**

Total material cost	\$1,260,000	\$/yr
---------------------	-------------	-------

**CHEMICAL COSTS**

Total chemical cost	\$3,370,000	\$/yr
---------------------	-------------	-------

**ENERGY COSTS**

Total energy cost	\$2,150,000	\$/yr
-------------------	-------------	-------

Total operation and maintenance	\$14,500,000	\$/yr
---------------------------------	--------------	-------

**CONSTRUCTION COST AMC**

Amortization cost for total construction	\$22,900,000	\$/yr
--	--------------	-------

<b>Total annual project cost</b>	<b>\$37,400,000</b>	<b>\$/yr</b>
----------------------------------	---------------------	--------------

**PROJECT SUMMARY**

Present worth	\$447,000,000	\$
Total project cost	\$265,000,000	\$
Total operation labor cost	\$5,420,000	\$/yr
Total maintenance labor cost	\$2,330,000	\$/yr
Total material cost	\$1,260,000	\$/yr
Total chemical cost	\$3,370,000	\$/yr
Total energy cost	\$2,150,000	\$/yr
Total amortization cost	\$22,900,000	\$/yr

**Process Summary**

Process	Construction (\$)	Operation (\$/yr)	Maintenance (\$/yr)	Material (\$/yr)	Chemical (\$/yr)	Energy (\$/yr)	Amortization (\$/yr)
Preliminary Treatment	2050000	231000	99200	51200	0	7300	172000
Influent Pump Station	28700000	166000	120000	201000	0	103000	2440000
Preliminary Treatment(1)	2050000	233000	99900	51300	0	7330	172000
Gravity Belt Thickener	2810000	172000	41600	0	198000	61500	263000

Chemical Phosphorus Removal	0	0	0	0	1750000	0	0
2-Way WasteWater Splitter	0	0	0	0	0	0	0
Primary Clarification(1)	2380000	128000	73000	23600	0	2200	219000
Anaerobic Digestion	16000000	402000	241000	135000	0	73000	1520000
Primary Clarification	2340000	127000	72100	23200	0	2120	216000
Biological Nutrient Removal - 2	28100000	462000	299000	395000	0	1610000	2600000
Belt-Filter Press	28100000	111000	26900	0	368000	54800	263000
Trickling Filter	12600000	137000	101000	72800	0	202000	1080000
Chlorination	3300000	181000	90900	70000	1050000	18300	313000
Secondary Clarifier(1)	36300000	187000	106000	36100	0	4160	332000
Drying Beds	7730000	1770000	857000	69500	0	0	673000
Secondary Clarifier	3570000	184000	104000	35600	0	3360	327000
Effluent	0	0	0	0	0	0	0
Hauling and Land Filling	632000	61700	0	90100	0	0	101000
Blower System	2310000	0	0	0	0	0	194000
Alum Feed System	429000	141000	0	8580	0	0	36000
Other Costs	144000000	719000	0	0	0	0	12000000

### Summary of Other Costs for Layout

Description	Value	Units
Other Costs		
Quantities		
Required land	48.2	acre
Administration labor hours	7810	hr/yr
Laboratory labor hours	6160	hr/yr
Costs		
DIRECT COSTS		
Mobilization	2840000	\$
Site preparation	3090000	\$
Site electrical	8780000	\$
Yard piping	5580000	\$
Instrumentation and control	4990000	\$
Lab and administration building	5590000	\$
Total direct construction costs	30900000	\$
INDIRECT COSTS		
Cost of land	965000	\$
Miscellaneous cost	8760000	\$
Legal cost	3500000	\$
Engineering design fee	26300000	\$
Inspection cost	3500000	\$
Contingency	17500000	\$
Technical	3500000	\$
Interest during construction	26000000	\$
Profit	22800000	\$
Total indirect construction cost	113000000	\$
Total of other construction costs	144000000	\$
LABOR COSTS		
Administration labor cost	402000	\$/yr
Laboratory labor cost	317000	\$/yr

### Summary of Air Supply System

Description	Value	Units
Blower System for Entire Plant		
Design Information		
Minimum air flow capacity	26100	scfm
Safety factor	1.5	
Requested air flow capacity	39100	scfm
Total capacity of blowers	39100	scfm
Number of blowers in use	3	
Total number of blowers	4	
Capacity of individual blowers	13000	scfm
Estimated cost of an installed blower	469000	\$
Blower building area	1920	sqft
Costs		
Construction and equipment costs	2310000	\$
Installed Blower Cost	1870000	\$
Building Cost	211000	\$
Misc Costs	229000	\$
Operational labor cost	0	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	0	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	194000	\$/yr
Notes		

Energy costs are shown at the individual unit processes that require air

### Summary of Chemical Feed System for Alum

Description	Value	Units
-------------	-------	-------

Alum Solution Feed System	
Design Information	
Alum dosage rate as Al <sub>2</sub> (SO <sub>4</sub> )	17800 lb/d
Alum dosage rate as equivalent	1620 lb/d
Liquid chemical solution fed	3320 gpd(US)
Operation labor required	2740 pers-hrs/yr
Costs	
Construction and equipment cost	429000 \$
Operational labor cost	141000 \$/yr
Maintenance labor cost	0 \$/yr
Material and supply cost	8580 \$/yr
Chemical cost	0 \$/yr
Energy cost	0 \$/yr
Amortization cost	36000 \$/yr

### Influent Wastewater

#### Preliminary Treatment

##### Design Output Data

Description	Value	Units
Preliminary Treatment		
Design Information		
Mechanically Cleaned Bar Screen		
Bar size	0.25	in
Bar spacing	0.5	in
Slope of bars from horizontal	30	degrees
Head loss through screen	0.176	ft
Approach velocity	2.5	ft/s
Average flow through velocity (	2.5	ft/s
Maximum flow through velocity	3	ft/s
Screen channel width	16.3	ft
Average channel depth	1	ft
Horizontal Flow Grit Chamber		
Maximum flow	92.4	cuft/s
Average flow	40.8	cuft/s
Minimum flow	24.6	cuft/s
Temperature	10	deg C
Maximum flow through velocity	1.5	ft/s
Average flow through velocity (	1	ft/s
Size of smallest particle 100%	0.2	mm
Specific gravity of particle	2.65	
Number of units	2	
Maximum flow/unit	46.2	cuft/s
Width of channel	7.7	ft
Depth of channel	4	ft
Length of channel	144	ft
Settling velocity of particle	0.0707	ft/s
Slope of channel bottom	0.000302	
Allowance for currents	1.7	
Manning coefficient	0.035	
Hydraulic retention time	1.6	min
Volume of grit	106	cuft/d
Costs		
Construction and equipment cost	2050000	\$
Operational labor cost	231000	\$/yr
Maintenance labor cost	99200	\$/yr
Material and supply cost	51200	\$/yr
Chemical cost	0	\$/yr
Energy cost	7300	\$/yr
Amortization cost	172000	\$/yr

### Influent Pump Station

#### Design Output Data

Description	Value	Units
Pump Station		
Design Information		
Volume of wet well	497000	cuft
Width of wet well	1610	ft
Depth of the pumping station	40.1	ft
Length of the pumping station	42	ft
Width of the pumping station	1670	ft
Minimum depth of water in wet	19.1	ft
Area of pump building	2670	sqft
Peak capacity of pumps	142	MGD(US)
Firm pumping capacity	142	MGD(US)
Total dynamic head - average	43.6	ft
Quantities		
Operation labor required	3220	pers-hrs/yr
Maintenance labor required	2410	pers-hrs/yr
Electrical energy required	1030000	kWh/yr
Volume of earthwork required	9430000	cuft
Volume of slab concrete required	1060000	cuft
Volume of wall concrete required	198000	cuft

Capacity per pump	98800 gpm(US)
Number of constant speed pur	2
Number of variable speed purr	0
Diameter of discharge header	71 in
Total dynamic head	49.6 ft
Size of selected pump	72 in
Specific speed of pump	10100
Pump rotating speed	238 rpm
Motor size required	409 HP
Size of selected motor	450 HP
Width of pump system	15 ft
Length of pump system	51.4 ft
Length of the dry well	42 ft
Width of the dry well	60.4 ft
Costs	
Construction and equipment cc	28700000 \$
Earthwork Cost	2790000 \$
Wall Concrete Cost	4760000 \$
Slab Concrete Cost	13700000 \$
Building Cost	293000 \$
Installed Pump Equipment C	2750000 \$
Misc Costs	4370000 \$
Operational labor cost	166000 \$/yr
Maintenance labor cost	120000 \$/yr
Material and supply cost	201000 \$/yr
Chemical cost	0 \$/yr
Energy cost	103000 \$/yr
Amortization cost	2440000 \$/yr

### Preliminary Treatment(1)

#### Design Output Data

Description	Value	Units
Preliminary Treatment		
Design Information		
Mechanically Cleaned Bar Screen		
Bar size	0.25	in
Bar spacing	0.5	in
Slope of bars from horizontal	30	degrees
Head loss through screen	0.176	ft
Approach velocity	2.5	ft/s
Average flow through velocity (	2.5	ft/s
Maximum flow through velocity	3	ft/s
Screen channel width	16.5	ft
Average channel depth	1	ft
Horizontal Flow Grit Chamber		
Maximum flow	92.8	cuft/s
Average flow	41.2	cuft/s
Minimum flow	25	cuft/s
Temperature	10	deg C
Maximum flow through velocity	1.5	ft/s
Average flow through velocity (	1	ft/s
Size of smallest particle 100%	0.2	mm
Specific gravity of particle	2.65	
Number of units	2	
Maximum flow/unit	46.4	cuft/s
Width of channel	7.73	ft
Depth of channel	4	ft
Length of channel	144	ft
Settling velocity of particle	0.0707	ft/s
Slope of channel bottom	0.0003	
Allowance for currents	1.7	
Manning coefficient	0.035	
Hydraulic retention time	1.6	min
Volume of grit	107	cuft/d
Costs		
Construction and equipment cc	2050000	\$
Operational labor cost	233000	\$/yr
Maintenance labor cost	99900	\$/yr
Material and supply cost	51300	\$/yr
Chemical cost	0	\$/yr
Energy cost	7330	\$/yr
Amortization cost	172000	\$/yr

### Gravity Belt Thickener

#### Design Output Data

Description	Value	Units
Gravity Belt Thickener		
Design Information		
Belt filter width	2	m
Number of units	4	
Hydraulic loading per unit per r	125	gpm(US)
Hydraulic loading required per	875	gpm(US)

Final solids content	7 %
Solids capture fraction	0.998
Quantities	
Operation labor required	3340 pers-hrs/yr
Maintenance labor required	834 pers-hrs/yr
Power	615000 kWh/yr
Polymer required	152000 lb/yr
Dry solids produced	104000 lb/d
Costs	
Construction and equipment cc	2810000 \$
Building Cost	429000 \$
Polymer System Cost	445000 \$
Feed Pump Cost	132000 \$
Conveyor System Cost	301000 \$
Installed Belt Filter System C	1510000 \$
Operational labor cost	172000 \$/yr
Maintenance labor cost	41600 \$/yr
Material and supply cost	0 \$/yr
Chemical cost	198000 \$/yr
Energy cost	61500 \$/yr
Amortization cost	263000 \$/yr

### Chemical Phosphorus Removal

#### Design Output Data

Description	Value	Units
Chemical Phosphorus Removal		
Design Information		
Chemical used	Equivalent Aluminum	
Chemical dosage	7.32	g/m3
Mass of chemical per year	268000	kg/yr
Chemical sludge production	38.1	g/m3
Organic sludge production	4.02	g/m3
Costs		
Construction and equipment cc	0	\$
Operational labor cost	0	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	0	\$/yr
Chemical cost	1750000	\$/yr
Energy cost	0	\$/yr
Amortization cost	0	\$/yr

### 2-Way Wastewater Splitter

#### Design Output Data

Description	Value	Units
2-Way Wastewater Flow Splitter		
Design Information		
Flow to first split (average)	26.5	MGD(US)
Flow to first split (peak)	60	MGD(US)
Flow to first split (minimum)	16	MGD(US)
Flow to second split (average)	26.5	MGD(US)
Flow to second split (peak)	60	MGD(US)
Flow to second split (minimum)	16	MGD(US)
Costs		
Construction and equipment cc	0	\$
Operational labor cost	0	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	0	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	0	\$/yr

### Primary Clarification(1)

#### Design Output Data

Description	Value	Units
Primary Clarification		
Design Information		
Surface area	34100	sqft
Surface area per circular clarifi	4260	sqft
Diameter of each circular clarif	74	ft
Number of clarifiers per batter	8	
Number of batteries	1	
Solids loading rate	2.68	lb/(sqft-d)
Hydraulic retention time	2.02	hr
Weir length	6080	ft
Volume of sludge generated	160000	gpd(US)
Quantities		
Operation labor required	2140	pers-hrs/yr
Maintenance labor required	1190	pers-hrs/yr
Electrical energy required	16600	kWh/yr
Volume of earthwork required	432000	cuft
Slab thickness	10.2	in
Volume of slab concrete requir	34000	cuft

Wall thickness	11.5 in
Volume of wall concrete require	19800 cuft
Costs	
Construction and equipment cost	2320000 \$
Earthwork Cost	128000 \$
Wall Concrete Cost	476000 \$
Slab Concrete Cost	440000 \$
Installed Equipment Cost	924000 \$
Misc Costs	354000 \$
Operational labor cost	110000 \$/yr
Maintenance labor cost	59300 \$/yr
Material and supply cost	23200 \$/yr
Chemical cost	0 \$/yr
Energy cost	1660 \$/yr
Amortization cost	214000 \$/yr
Waste Sludge Pumping	
Design Information	
Average daily pumping rate	0.16 MGD(US)
Total pumping capacity	0.16 MGD(US)
Design capacity per pump	55.4 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	0.16 MGD(US)
Quantities	
Operation labor required	348 pers-hrs/yr
Maintenance labor required	274 pers-hrs/yr
Electrical energy required	5370 kWh/yr
Volume of earthwork required	1630 cuft
Area of pump building	203 sqft
Costs	
Construction and equipment cost	52700 \$
Earthwork Cost	482 \$
Pump Building Cost	22300 \$
Installed Pump Cost	21800 \$
Misc Costs	8040 \$
Operational labor cost	17900 \$/yr
Maintenance labor cost	13700 \$/yr
Material and supply cost	369 \$/yr
Chemical cost	0 \$/yr
Energy cost	537 \$/yr
Amortization cost	4980 \$/yr

### Anaerobic Digestion

#### Design Output Data

Description	Value	Units
Anaerobic Digestion		
Design Information		
Percent VSS destroyed	50	%
Solids concentration in digester	5	%
Detention time	25	d
Digester depth	27.1	ft
Digester diameter	65	ft
Effective digester volume	889000	cuft
Number of digesters per battery	9	
Number of primary digesters per battery	6	
Number of secondary digesters per battery	3	
Number of batteries	1	
Gas produced	386	cuft/min
Heat required	4480000	BTU/hr
Digester gas required	173	cuft/min
Total natural gas required	0	cuft/yr
Quantities		
Operation labor required	7810	pers-hrs/yr
Maintenance labor required	4830	pers-hrs/yr
Electrical energy required	730000	kWh/yr
Volume of earthwork required	886000	cuft
Slab thickness	10.8	in
Volume of slab concrete required	29500	cuft
Wall thickness	21	in
Volume of wall concrete required	107000	cuft
Sidewater depth	27.1	ft
Surface area/floor of 2-story building	4610	sqft
Piping size	8	in
Length of total piping system	2810	ft
Number of 90 degree elbows	117	
Number of tees	230	
Number of plug valves	167	
Total dry solids treated	52.5	ton(short)/d
Costs		
Construction and equipment cost	16000000	\$
Earthwork Cost	263000	\$
Wall Concrete Cost	2570000	\$

Slab Concrete Cost	382000	\$
Building Cost	507000	\$
Piping System Cost	1720000	\$
Floating Cover Cost	5480000	\$
Gas Recirculation Units Cost	1600000	\$
Heating Units Cost	950000	\$
Gas Safety Equipment Cost	600000	\$
Installed Pumps Cost	349000	\$
Operational labor cost	402000	\$/yr
Maintenance labor cost	241000	\$/yr
Material and supply cost	135000	\$/yr
Chemical cost	0	\$/yr
Energy cost	73000	\$/yr
Amortization cost	1520000	\$/yr

### Primary Clarification

#### Design Output Data

Description	Value	Units
Primary Clarification		
Design Information		
Surface area	33500	sqft
Surface area per circular clarifi	4180	sqft
Diameter of each circular clarif	73	ft
Number of clarifiers per batter	8	
Number of batteries	1	
Solids loading rate	2.4	lb/(sqft·d)
Hydraulic retention time	2.02	hr
Weir length	60300	ft
Volume of sludge generated	140000	gpd(US)
Quantities		
Operation labor required	2120	pers-hrs/yr
Maintenance labor required	1180	pers-hrs/yr
Electrical energy required	16500	kWh/yr
Volume of earthwork required	419000	cuft
Slab thickness	10.2	in
Volume of slab concrete requir	33100	cuft
Wall thickness	11.5	in
Volume of wall concrete requir	19500	cuft
Costs		
Construction and equipment cc	2280000	\$
Earthwork Cost	124000	\$
Wall Concrete Cost	469000	\$
Slab Concrete Cost	429000	\$
Installed Equipment Cost	914000	\$
Misc Costs	349000	\$
Operational labor cost	109000	\$/yr
Maintenance labor cost	58700	\$/yr
Material and supply cost	22800	\$/yr
Chemical cost	0	\$/yr
Energy cost	1650	\$/yr
Amortization cost	211000	\$/yr
Waste Sludge Pumping		
Design Information		
Average daily pumping rate	0.14	MGD(US)
Total pumping capacity	0.14	MGD(US)
Design capacity per pump	48.7	gpm(US)
Number of pumps	3	
Number of batteries	1	
Firm pumping capacity	0.14	MGD(US)
Quantities		
Operation labor required	342	pers-hrs/yr
Maintenance labor required	269	pers-hrs/yr
Electrical energy required	4720	kWh/yr
Volume of earthwork required	1620	cuft
Area of pump building	203	sqft
Costs		
Construction and equipment cc	51200	\$
Earthwork Cost	481	\$
Pump Building Cost	22300	\$
Installed Pump Cost	20600	\$
Misc Costs	7820	\$
Operational labor cost	17600	\$/yr
Maintenance labor cost	13400	\$/yr
Material and supply cost	359	\$/yr
Chemical cost	0	\$/yr
Energy cost	472	\$/yr
Amortization cost	4850	\$/yr

### Biological Nutrient Removal - 3/5 Stage

#### Design Output Data

Description	Value	Units
BNR System for BIO-P and N Removal		

Design Information

Influent BOD/TP ratio too small	
3-Stage Biological Phosphorus	
Design aerobic SRT for nitrification	7.62 d
Total reactor SRT	15 d
Design SS	3000 mg/L
Calculated VSS	2080 mg/L
Calculated VSS:TSS ratio	0.693 mg VSS/mg SS
Total volume of anaerobic reactor	0 m <sup>3</sup>
Total volume of anoxic reactor	48000 m <sup>3</sup>
Total volume of aerobic reactor	49600 m <sup>3</sup>
Total volume of all reactors	97600 m <sup>3</sup>
Width of parallel train	10 m
Sidewater depth	5 m
Number of batteries	1
Number of parallel trains per battery	8
Number of anoxic cells within each battery	3
Number of aerobic cells within each battery	3
Anaerobic hydraulic retention time	0 hr
Anoxic hydraulic retention time	11.2 hr
Aerobic hydraulic retention time	11.6 hr
Amount of sludge generated	19500 kg/d
Sludge recycle ratio	42.9 %
Sludge recycle rate	44000 m <sup>3</sup> /d
Nitrogen required for biomass	15.8 mg/L
Phosphorus required for biomass	3.15 mg/L
Oxygen required to meet average demand	26600 kg/d
Air flow required to meet average demand	44300 N m <sup>3</sup> /hr
Design air flow	14.9 N m <sup>3</sup> /min/1000 m <sup>3</sup>
Quantities	
Operation labor required	6740 pers-hrs/yr
Maintenance labor required	4130 pers-hrs/yr
Electrical energy required	8860000 kWh/yr
Volume of earthwork required	1520000 cuft
Volume of slab concrete required	420000 cuft
Volume of wall concrete required	270000 cuft
Handrail length	9970 ft
Number of diffusers per train	1630
Fine bubble diffuser floor coverage	5.39 %
Number of swing arm headers	33
Required mixing power	624 kW
Total number of mixers	64
Required mixing power per mixer	9.76 kW
Design mixing power per mixer	3.73 kW
Mixing power for each un-aerated tank	19.5 kW
Costs	
Construction and equipment cost	24000000 \$
Earthwork Cost	449000 \$
Wall Concrete Cost	6510000 \$
Slab Concrete Cost	5440000 \$
Handrail Cost	747000 \$
Installed Aerator Equipment	6110000 \$
Air Piping Cost	1260000 \$
Installed Mixer Equipment Cost	1100000 \$
Misc Costs	2380000 \$
Operational labor cost	347000 \$/yr
Maintenance labor cost	206000 \$/yr
Material and supply cost	366000 \$/yr
Chemical cost	0 \$/yr
Energy cost	886000 \$/yr
Amortization cost	2200000 \$/yr
Internal Recycle Pumping	
Design Information	
Average daily pumping rate	10.2 MGD(US)
Total pumping capacity	10.2 MGD(US)
Design capacity per pump	3530 gpm(US)
Number of pumps	24
Number of batteries	1
Firm pumping capacity	10.2 MGD(US)
Quantities	
Operation labor required	640 pers-hrs/yr
Maintenance labor required	542 pers-hrs/yr
Electrical energy required	2710000 kWh/yr
Volume of earthwork required	3200 cuft
Area of pump building	400 sqft
Costs	
Construction and equipment cost	1710000 \$
Earthwork Cost	7590 \$
Pump Building Cost	352000 \$
Installed Pump Cost	1090000 \$
Misc Costs	261000 \$
Operational labor cost	33000 \$/yr



Maintenance labor cost	27000 \$/yr
Material and supply cost	12000 \$/yr
Chemical cost	0 \$/yr
Energy cost	271000 \$/yr
Amortization cost	162000 \$/yr
Internal Recycle Pumping	
Design Information	
Average daily pumping rate	13.6 MGD(US)
Total pumping capacity	13.6 MGD(US)
Design capacity per pump	4700 gpm(US)
Number of pumps	24
Number of batteries	1
Firm pumping capacity	13.6 MGD(US)
Quantities	
Operation labor required	705 pers-hrs/yr
Maintenance labor required	595 pers-hrs/yr
Electrical energy required	3610000 kWh/yr
Volume of earthwork required	3740 cuft
Area of pump building	467 sqft
Costs	
Construction and equipment cost	1950000 \$
Earthwork Cost	8860 \$
Pump Building Cost	411000 \$
Installed Pump Cost	1240000 \$
Misc Costs	298000 \$
Operational labor cost	36300 \$/yr
Maintenance labor cost	29600 \$/yr
Material and supply cost	13700 \$/yr
Chemical cost	0 \$/yr
Energy cost	361000 \$/yr
Amortization cost	185000 \$/yr
Sludge Recycle Pumping	
Design Information	
Average daily pumping rate	27.1 MGD(US)
Total pumping capacity	27.1 MGD(US)
Design capacity per pump	9410 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	27.1 MGD(US)
Quantities	
Operation labor required	889 pers-hrs/yr
Maintenance labor required	745 pers-hrs/yr
Electrical energy required	901000 kWh/yr
Volume of earthwork required	5880 cuft
Area of pump building	734 sqft
Costs	
Construction and equipment cost	488000 \$
Earthwork Cost	1740 \$
Pump Building Cost	80800 \$
Installed Pump Cost	331000 \$
Misc Costs	74500 \$
Operational labor cost	45800 \$/yr
Maintenance labor cost	37100 \$/yr
Material and supply cost	3420 \$/yr
Chemical cost	0 \$/yr
Energy cost	90100 \$/yr
Amortization cost	46200 \$/yr

### Belt-Filter Press

#### Design Output Data

Description	Value	Units
Belt-Filter Press		
Design Information		
Belt filter width	2	m
Number of units	4	
Hydraulic loading per unit per r	70	gpm(US)
Hydraulic loading required per	452	gpm(US)
Final solids content	19	%
Solids capture fraction	0.998	
Quantities		
Operation labor required	2150	pers-hrs/yr
Maintenance labor required	539	pers-hrs/yr
Power	548000	kWh/yr
Polymer required	283000	lb/yr
Dry solids produced	77600	lb/d
Belt filter(s)	1200000	\$
Building	429000	\$
Installation	301000	\$
Polymer system	445000	\$
Feed pumps	132000	\$
Conveyor system	301000	\$
Costs		

Construction and equipment cost	2810000 \$
Building Cost	429000 \$
Polymer System Cost	445000 \$
Feed Pumps Cost	132000 \$
Conveyor System Cost	301000 \$
Installed Belt Filter	1510000 \$
Operational labor cost	111000 \$/yr
Maintenance labor cost	26900 \$/yr
Material and supply cost	0 \$/yr
Chemical cost	368000 \$/yr
Energy cost	54800 \$/yr
Amortization cost	263000 \$/yr

### Trickling Filter

#### Design Output Data

Description	Value	Units
Trickling Filtration		
Design Information		
Reaction rate constant	0.00156	
Hydraulic loading rate	0.75	gal(US)/(sqft·min)
Total hydraulic loading rate	0.781	gal(US)/(sqft·min)
Recirculation ratio	0.0419	
Number of towers per stage	2	
Number of stages	2	
Depth of filter tower	21.4	ft
Diameter of filter tower	125	ft
Surface area per filter tower	6160	sqft
Total surface area	24700	sqft
Volume per filter tower	264000	cuft
Total volume	1060000	cuft
Quantities		
Operation labor required	1250	pers-hr/yr
Maintenance labor required	813	pers-hr/yr
Volume of earthwork required	715000	cuft
Volume of slab concrete required	32900	cuft
Volume of wall concrete required	40300	cuft
Number of posts per tower	848	
Total length of precast beams	27100	ft
Costs		
Construction and equipment cost	11600000	\$
Earthwork Cost	212000	\$
Wall Concrete Cost	969000	\$
Slab Concrete Cost	426000	\$
Concrete Beam Cost	1090000	\$
Media Cost	6030000	\$
Installed Distributor Arm Cost	555000	\$
Misc Costs	2320000	\$
Operational labor cost	64200	\$/yr
Maintenance labor cost	40500	\$/yr
Material and supply cost	65800	\$/yr
Chemical cost	0	\$/yr
Energy cost	2060	\$/yr
Amortization cost	985000	\$/yr
Internal Recycle Pumping		
Design Information		
Average daily pumping rate	60.1	MGD(US)
Total pumping capacity	60.1	MGD(US)
Design capacity per pump	13900	gpm(US)
Number of pumps	4	
Number of batteries	1	
Firm pumping capacity	60.1	MGD(US)
Quantities		
Operation labor required	1410	pers-hrs/yr
Maintenance labor required	1210	pers-hrs/yr
Electrical energy required	1990000	kWh/yr
Volume of earthwork required	11100	cuft
Area of pump building	1390	sqft
Costs		
Construction and equipment cost	1000000	\$
Earthwork Cost	3290	\$
Pump Building Cost	152000	\$
Installed Pump Cost	695000	\$
Misc Costs	153000	\$
Operational labor cost	72500	\$/yr
Maintenance labor cost	60100	\$/yr
Material and supply cost	7030	\$/yr
Chemical cost	0	\$/yr
Energy cost	199000	\$/yr
Amortization cost	95000	\$/yr

### Chlorination

#### Design Output Data

Description	Value	Units
Chlorination		
Design Information		
Volume of tank	2500000	gal(US)
Average chlorine required	4420	lb/d
Peak chlorine required	10000	lb/d
Influent coliform count	10000000	/100ml
Effluent coliform count	29.2	/100ml
Quantities		
Operational labor required	3510	pers-hrs/yr
Maintenance labor required	1820	pers-hrs/yr
Electrical energy required	183000	kWh/yr
Volume of earthwork required	139000	cuft
Volume of slab concrete requir	33500	cuft
Volume of wall concrete requir	38400	cuft
Number of chlorinators and ev:	1	
Chlorination building area	360	sqft
Number of chlorine cylinders	67	
Area of chlorine storage buildir	9380	sqft
Costs		
Construction and equipment cc	3300000	\$
Earthwork Cost	41200	\$
Wall Concrete Cost	925000	\$
Slab Concrete Cost	434000	\$
Installed Equipment Cost	1090000	\$
Building Cost	39600	\$
Storage Building Cost	516000	\$
Misc Costs	252000	\$
Operational labor cost	181000	\$/yr
Maintenance labor cost	90900	\$/yr
Material and supply cost	70000	\$/yr
Chemical cost	1050000	\$/yr
Energy cost	18300	\$/yr
Amortization cost	313000	\$/yr

### Secondary Clarifier(1)

#### Design Output Data

Description	Value	Units
Secondary Clarification		
Design Information		
Surface area	67800	sqft
Surface area per circular clarifi	8470	sqft
Diameter of each circular clarif	104	ft
Number of clarifiers per batter)	8	
Number of batteries	1	
Solids loading rate	14.3	lb/(sqft-d)
Hydraulic retention time	4.04	hr
Designed surface overflow rate	400	gal(US)/(sqft-d)
Weir length	6060	ft
Volume of wasted sludge	501000	gpd(US)
Quantities		
Operation labor required	3240	pers-hrs/yr
Maintenance labor required	1810	pers-hrs/yr
Electrical energy required	24800	kWh/yr
Volume of earthwork required	925000	cuft
Slab thickness	10.2	in
Volume of slab concrete requir	65100	cuft
Wall thickness	11.5	in
Volume of wall concrete requir	27300	cuft
Costs		
Construction and equipment cc	3560000	\$
Earthwork Cost	274000	\$
Wall Concrete Cost	658000	\$
Slab Concrete Cost	844000	\$
Installed Equipment Cost	1240000	\$
Misc Costs	543000	\$
Operational labor cost	167000	\$/yr
Maintenance labor cost	90200	\$/yr
Material and supply cost	35600	\$/yr
Chemical cost	0	\$/yr
Energy cost	2480	\$/yr
Amortization cost	325000	\$/yr
Waste Sludge Pumping		
Design Information		
Average daily pumping rate	0.501	MGD(US)
Total pumping capacity	0.501	MGD(US)
Design capacity per pump	174	gpm(US)
Number of pumps	3	
Number of batteries	1	
Firm pumping capacity	0.501	MGD(US)
Quantities		
Operation labor required	403	pers-hrs/yr

Maintenance labor required	325 pers-hrs/yr
Electrical energy required	16800 kWh/yr
Volume of earthwork required	1680 cuft
Area of pump building	210 sqft
Costs	
Construction and equipment cost	70500 \$
Earthwork Cost	497 \$
Pump Building Cost	23100 \$
Installed Pump Cost	36100 \$
Misc Costs	10800 \$
Operational labor cost	20700 \$/yr
Maintenance labor cost	16200 \$/yr
Material and supply cost	493 \$/yr
Chemical cost	0 \$/yr
Energy cost	1680 \$/yr
Amortization cost	6660 \$/yr

### Drying Beds

#### Design Output Data

Description	Value	Units
Sludge Drying Beds		
Design Information		
Total surface area required	559000	sqft
Initial depth of sludge	12	in
Final solids	50	%
Bed holding time	103	d
Quantities		
Total drying bed surface area	559000	sqft
Number beds	187	
Surface area of each individual	2990	sqft
Length of each bed	149	ft
Volume of earthwork required	2750000	cuft
Volume concrete for dividing w	180000	cuft
Volume of R.C. in-place for tru	41900	cuft
Volume of sand	419000	cuft
Volume of gravel	559000	cuft
Clay pipe diameter	6	in
Total length clay pipe	55900	in
Sludge solids produced	32.3	ton(short)/d
Operational labor required	34400	pers-hrs/yr
Maintenance labor required	17200	pers-hrs/yr
Costs		
Construction and equipment cost	7730000	\$
Earthwork Cost	814000	\$
Wall Concrete Cost	3030000	\$
Slab Concrete Cost	326000	\$
Drying Bed Media Cost	1560000	\$
Drain Pipe System Cost	1230000	\$
Misc Costs	766000	\$
Operational labor cost	1770000	\$/yr
Maintenance labor cost	857000	\$/yr
Material and supply cost	69500	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	673000	\$/yr

### Secondary Clarifier

#### Design Output Data

Description	Value	Units
Secondary Clarification		
Design Information		
Surface area	66600	sqft
Surface area per circular clarifi	8320	sqft
Diameter of each circular clarif	103	ft
Number of clarifiers per batter	8	
Number of batteries	1	
Solids loading rate	0.348	lb/(sqft-d)
Hydraulic retention time	4.04	hr
Designed surface overflow rate	400	gal(US)/(sqft-d)
Weir length	6010	ft
Volume of wasted sludge	270000	gpd(US)
Quantities		
Operation labor required	3200	pers-hrs/yr
Maintenance labor required	1790	pers-hrs/yr
Electrical energy required	24600	kWh/yr
Volume of earthwork required	904000	cuft
Slab thickness	10.2	in
Volume of slab concrete requir	63900	cuft
Wall thickness	11.5	in
Volume of wall concrete requir	27100	cuft
Costs		
Construction and equipment cost	3510000	\$

Earthwork Cost	268000 \$
Wall Concrete Cost	652000 \$
Slab Concrete Cost	829000 \$
Installed Equipment Cost	1230000 \$
Misc Costs	536000 \$
Operational labor cost	165000 \$/yr
Maintenance labor cost	89200 \$/yr
Material and supply cost	35100 \$/yr
Chemical cost	0 \$/yr
Energy cost	2460 \$/yr
Amortization cost	321000 \$/yr
Waste Sludge Pumping	
Design Information	
Average daily pumping rate	0.27 MGD(US)
Total pumping capacity	0.27 MGD(US)
Design capacity per pump	93.6 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	0.27 MGD(US)
Quantities	
Operation labor required	372 pers-hrs/yr
Maintenance labor required	297 pers-hrs/yr
Electrical energy required	9060 kWh/yr
Volume of earthwork required	1640 cuft
Area of pump building	205 sqft
Costs	
Construction and equipment cost	59700 \$
Earthwork Cost	487 \$
Pump Building Cost	22600 \$
Installed Pump Cost	27500 \$
Misc Costs	9110 \$
Operational labor cost	19100 \$/yr
Maintenance labor cost	14800 \$/yr
Material and supply cost	418 \$/yr
Chemical cost	0 \$/yr
Energy cost	906 \$/yr
Amortization cost	5640 \$/yr

#### Effluent

##### Design Output Data

Description	Value	Units
Costs		
Construction and equipment cost	0 \$	
Operational labor cost	0 \$/yr	
Maintenance labor cost	0 \$/yr	
Material and supply cost	0 \$/yr	
Chemical cost	0 \$/yr	
Energy cost	0 \$/yr	
Amortization cost	0 \$/yr	

#### Hauling and Land Filling

##### Design Output Data

Description	Value	Units
Sludge Hauling and Land Filling		
Design Information		
Volume of sludge hauled	76.6	cuyd/d
Truck capacity	30	cuyd
Round trip time to disposal site	1	hr
Truck loading time	0.75	hr
Operational hours per day	8	hr
Number of trucks required	1	
Distance to disposal site	10	miles
Quantities		
Total sludge volume hauled	76.6	cuyd/d
Maximum anticipated landfill depth	30	d
Anticipated sludge storage height	8	ft
Sludge storage shed area	7760	sqft
Width of sludge storage shed	62.3	ft
Length of sludge storage shed	125	ft
Volume of earthwork required	20600	cuft
Volume of slab concrete required	8620	cuft
Surface area of canopy roof	7760	sqft
Round trip haul distance	20	miles
Round trips per day per truck	3	
Distance traveled per year per truck	15000	miles
Sludge hauled	67.8	ton(short)/d
Operation labor required	1200	pers-hrs/yr
LandFilling cost	35200	\$/yr
Costs		
Construction and equipment cost	632000	\$
Earthwork Cost	6100	\$
Slab Concrete Cost	112000	\$

Canopy Roof Cost	155000 \$
Vehicle Cost	359000 \$
Operational labor cost	61700 \$/yr
Maintenance labor cost	0 \$/yr
Material and supply cost	90100 \$/yr
Chemical cost	0 \$/yr
Energy cost	0 \$/yr
Amortization cost	101000 \$/yr