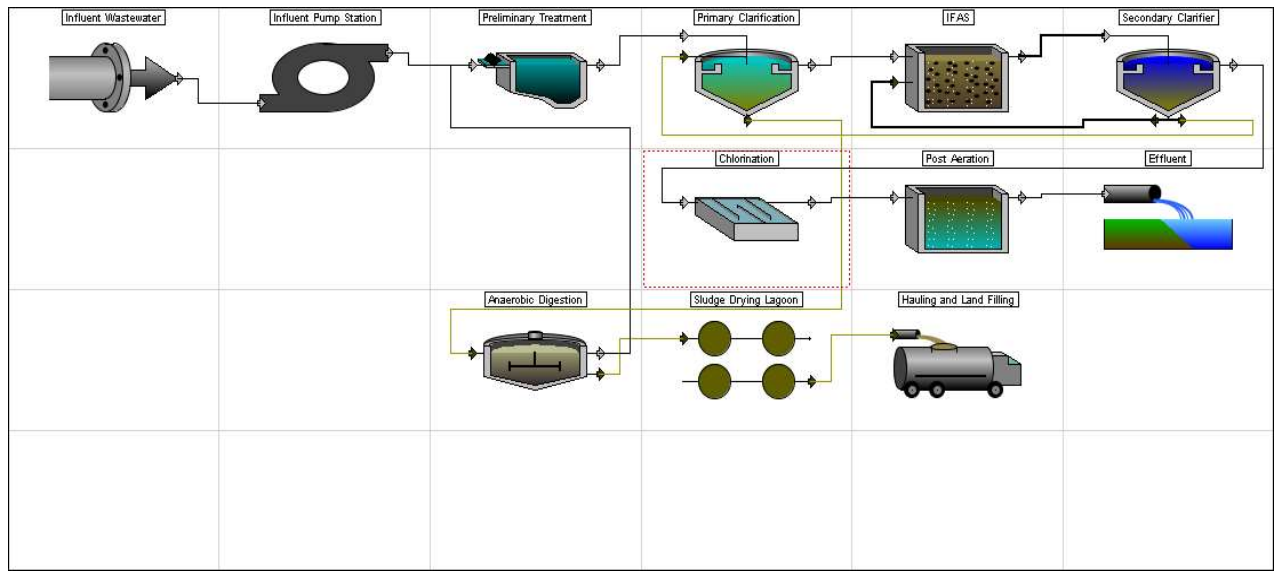


Layout - Price River



Summary

Equipment Database

Hydromantis 2014,(USA Avg)

Layout Summary

Description	Value	Units
CONSTRUCTION COSTS		
Unit process construction cost:	\$13,500,000	\$
Other direct construction costs	\$5,320,000	\$
Other indirect construction costs	\$14,800,000	\$
Total construction costs	\$33,600,000	\$

ANNUAL COSTS

LABOR COSTS

Administration labor cost	\$53,200	\$/yr
Laboratory labor cost	\$156,000	\$/yr
Unit process operation labor cost	\$576,000	\$/yr
Unit process maintenance labor cost	\$268,000	\$/yr
Total labor costs	\$1,050,000	\$/yr

MATERIAL COSTS

Total material cost	\$224,000	\$/yr
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CHEMICAL COSTS

Total chemical cost	\$78,900	\$/yr
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ENERGY COSTS

Total energy cost	\$476,000	\$/yr
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Total operation and maintenance	\$1,830,000	\$/yr
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CONSTRUCTION COST AMC

Amortization cost for total construction	\$2,930,000	\$/yr
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Total annual project cost	\$4,770,000	\$/yr
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PROJECT SUMMARY

Present worth	\$57,600,000	\$
Total project cost	\$33,600,000	\$
Total operation labor cost	\$785,000	\$/yr
Total maintenance labor cost	\$268,000	\$/yr
Total material cost	\$224,000	\$/yr
Total chemical cost	\$78,900	\$/yr
Total energy cost	\$476,000	\$/yr
Total amortization cost	\$2,930,000	\$/yr

Process Summary

Process	Construction (\$)	Operation (\$/yr)	Maintenance (\$/yr)	Material (\$/yr)	Chemical (\$/yr)	Energy (\$/yr)	Amortization (\$/yr)
Influent Pump Station	2070000	36300	25000	14500	0	28000	179000
Preliminary Treatment	671000	52800	23000	16800	0	3040	56200
Anaerobic Digestion	3440000	73100	38700	27900	0	11600	325000
Primary Clarification	474000	49400	24600	4630	0	993	44100

Chlorination	571000	45700	6270	22100	78900	11800	58600
Sludge Drying Lagoon	98000	4390	2310	0	0	0	8210
IFAS	3910000	203000	104000	76300	0	416000	415000
Post Aeration	58000	32900	10200	1440	0	3320	5270
Hauling and Land Filling	325000	8990	0	53600	0	0	64800
Secondary Clarifier	693000	69800	34500	6790	0	1300	63900
Effluent	0	0	0	0	0	0	0
Blower System	1210000	0	0	0	0	0	101000
Other Costs	2010000	209000	0	0	0	0	1610000

Summary of Other Costs for Layout

Description	Value	Units
Other Costs		
Quantities		
Required land	43	acre
Administration labor hours	1030	hr/yr
Laboratory labor hours	3020	hr/yr
Costs		
DIRECT COSTS		
Mobilization	478000	\$
Site preparation	709000	\$
Site electrical	1330000	\$
Yard piping	892000	\$
Instrumentation and control	665000	\$
Lab and administration building	1250000	\$
Total direct construction costs	5320000	\$
INDIRECT COSTS		
Cost of land	860000	\$
Miscellaneous cost	1080000	\$
Legal cost	433000	\$
Engineering design fee	3250000	\$
Inspection cost	433000	\$
Contingency	2170000	\$
Technical	433000	\$
Interest during construction	3300000	\$
Profit	2820000	\$
Total indirect construction cost	14800000	\$
Total of other construction costs	20100000	\$
LABOR COSTS		
Administration labor cost	53200	\$/yr
Laboratory labor cost	156000	\$/yr

Summary of Air Supply System

Description	Value	Units
Blower System for Entire Plant		
Design Information		
Minimum air flow capacity	16000	scfm
Safety factor	1.5	
Requested air flow capacity	23900	scfm
Total capacity of blowers	23900	scfm
Number of blowers in use	4	
Total number of blowers	5	
Capacity of individual blowers	5990	scfm
Estimated cost of an installed blower	180000	\$
Blower building area	1690	sqft
Costs		
Construction and equipment costs	1210000	\$
Installed Blower Cost	900000	\$
Building Cost	186000	\$
Misc Costs	119000	\$
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	101000	\$/yr

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

Influent Wastewater

Influent Pump Station

Design Output Data

Description	Value	Units
Pump Station		
Design Information		
Volume of wet well	26600	cuf
Width of wet well	205	ft
Depth of the pumping station	28.3	ft
Length of the pumping station	21.2	ft

Width of the pumping station	236 ft
Minimum depth of water in wet	7.31 ft
Area of pump building	682 sqft
Peak capacity of pumps	13.6 MGD(US)
Firm pumping capacity	13.6 MGD(US)
Total dynamic head - average	44.5 ft
Quantities	
Operation labor required	705 pers-hrs/yr
Maintenance labor required	595 pers-hrs/yr
Electrical energy required	280000 kWh/yr
Volume of earthwork required	626000 cuft
Volume of slab concrete requir	47000 cuft
Volume of wall concrete requir	19800 cuft
Capacity per pump	9410 gpm(US)
Number of constant speed purr	2
Number of variable speed purr	0
Diameter of discharge header	21.9 in
Total dynamic head	60 ft
Size of selected pump	20 in
Specific speed of pump	4050
Pump rotating speed	889 rpm
Motor size required	166 HP
Size of selected motor	200 HP
Width of pump system	4.6 ft
Length of pump system	21.6 ft
Length of the dry well	21.2 ft
Width of the dry well	30.6 ft
Costs	
Construction and equipment cc	2070000 \$
Earthwork Cost	186000 \$
Wall Concrete Cost	477000 \$
Slab Concrete Cost	609000 \$
Building Cost	75000 \$
Installed Pump Equipment C	410000 \$
Misc Costs	316000 \$
Operational labor cost	36300 \$/yr
Maintenance labor cost	25000 \$/yr
Material and supply cost	14500 \$/yr
Chemical cost	0 \$/yr
Energy cost	28000 \$/yr
Amortization cost	179000 \$/yr

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	2.47	ft
Average channel depth	1	ft
Horizontal Flow Grit Chamber		
Maximum flow	15.4	cuft/s
Average flow	6.18	cuft/s
Minimum flow	2.79	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	7.71	cuft/s
Width of channel	1.28	ft
Depth of channel	4	ft
Length of channel	144	ft
Settling velocity of particle	0.0707	ft/s
Slope of channel bottom	0.00137	
Allowance for currents	1.7	
Manning coefficient	0.035	
Hydraulic retention time	1.6	min
Volume of grit	16.1	cuft/d
Costs		
Construction and equipment cc	671000	\$
Operational labor cost	52800	\$/yr
Maintenance labor cost	23000	\$/yr
Material and supply cost	16800	\$/yr

Chemical cost	0 \$/yr
Energy cost	3040 \$/yr
Amortization cost	56200 \$/yr

Anaerobic Digestion

Design Output Data

Description	Value	Units
Anaerobic Digestion		
Design Information		
Percent VSS destroyed	50	%
Solids concentration in digeste	5	%
Detention time	25	d
Digester depth	27.1	ft
Digester diameter	65	ft
Effective digester volume	198000	cuft
Number of digesters per batter	2	
Number of primary digesters p	1	
Number of secondary digester:	1	
Number of batteries	1	
Gas produced	34.6	cuft/min
Heat required	719000	BTU/hr
Digester gas required	27.7	cuft/min
Total natural gas required	0	cuft/yr
Quantities		
Operation labor required	1420	pers-hrs/yr
Maintenance labor required	920	pers-hrs/yr
Electrical energy required	116000	kWh/yr
Volume of earthwork required	197000	cuft
Slab thickness	10.8	in
Volume of slab concrete requir	6560	cuft
Wall thickness	21	in
Volume of wall concrete requir	23700	cuft
Sidewater depth	27.1	ft
Surface area/floor of 2-story cc	1240	sqft
Piping size	8	in
Length of total piping system	624	ft
Number of 90 degree elbows	26	
Number of tees	51	
Number of plug valves	37	
Total dry solids treated	4.62	ton(short)/d
Costs		
Construction and equipment cc	3440000	\$
Earthwork Cost	58400	\$
Wall Concrete Cost	572000	\$
Slab Concrete Cost	85000	\$
Building Cost	137000	\$
Piping System Cost	381000	\$
Floating Cover Cost	1220000	\$
Gas Recirculation Units Cost	267000	\$
Heating Units Cost	182000	\$
Gas Safety Equipment Cost	120000	\$
Installed Pumps Cost	74800	\$
Operational labor cost	73100	\$/yr
Maintenance labor cost	38700	\$/yr
Material and supply cost	27900	\$/yr
Chemical cost	0	\$/yr
Energy cost	11600	\$/yr
Amortization cost	325000	\$/yr

Primary Clarification

Design Output Data

Description	Value	Units
Primary Clarification		
Design Information		
Surface area	5120	sqft
Surface area per circular clarifi	2560	sqft
Diameter of each circular clarif	58	ft
Number of clarifiers per batter	2	
Number of batteries	1	
Solids loading rate	2.95	lb/(sqft-d)
Hydraulic retention time	2.02	hr
Weir length	673	ft
Volume of sludge generated	26400	gpd(US)
Quantities		
Operation labor required	684	pers-hrs/yr
Maintenance labor required	375	pers-hrs/yr
Electrical energy required	9040	kWh/yr
Volume of earthwork required	64500	cuft
Slab thickness	10.2	in
Volume of slab concrete requir	5360	cuft
Wall thickness	11.5	in
Volume of wall concrete requir	3880	cuft

Costs	
Construction and equipment cost	436000 \$
Earthwork Cost	19100 \$
Wall Concrete Cost	93500 \$
Slab Concrete Cost	69500 \$
Installed Equipment Cost	187000 \$
Misc Costs	66500 \$
Operational labor cost	35200 \$/yr
Maintenance labor cost	15800 \$/yr
Material and supply cost	4360 \$/yr
Chemical cost	0 \$/yr
Energy cost	904 \$/yr
Amortization cost	40500 \$/yr
Waste Sludge Pumping	
Design Information	
Average daily pumping rate	0.0264 MGD(US)
Total pumping capacity	0.0264 MGD(US)
Design capacity per pump	9.17 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	0.0264 MGD(US)
Quantities	
Operation labor required	276 pers-hrs/yr
Maintenance labor required	210 pers-hrs/yr
Electrical energy required	892 kWh/yr
Volume of earthwork required	1600 cuft
Area of pump building	201 sqft
Costs	
Construction and equipment cost	38300 \$
Earthwork Cost	475 \$
Pump Building Cost	22100 \$
Installed Pump Cost	9890 \$
Misc Costs	5840 \$
Operational labor cost	14200 \$/yr
Maintenance labor cost	8850 \$/yr
Material and supply cost	268 \$/yr
Chemical cost	0 \$/yr
Energy cost	89 \$/yr
Amortization cost	3620 \$/yr

Chlorination

Design Output Data

Description	Value	Units
Chlorination		
Design Information		
Volume of tank	208000	gal(US)
Average chlorine required	332	lb/d
Peak chlorine required	833	lb/d
Influent coliform count	10000000	/100ml
Effluent coliform count	29.2	/100ml
Quantities		
Operational labor required	887	pers-hrs/yr
Maintenance labor required	149	pers-hrs/yr
Electrical energy required	118000	kWh/yr
Volume of earthwork required	11900	cuft
Volume of slab concrete required	2790	cuft
Volume of wall concrete required	4980	cuft
Number of chlorinators and equipment	1	
Chlorination building area	220	sqft
Number of chlorine cylinders	5	
Area of chlorine storage building	700	sqft
Costs		
Construction and equipment cost	571000	\$
Earthwork Cost	3520	\$
Wall Concrete Cost	120000	\$
Slab Concrete Cost	36100	\$
Installed Equipment Cost	320000	\$
Building Cost	24200	\$
Storage Building Cost	38500	\$
Misc Costs	28700	\$
Operational labor cost	45700	\$/yr
Maintenance labor cost	6270	\$/yr
Material and supply cost	22100	\$/yr
Chemical cost	78900	\$/yr
Energy cost	11800	\$/yr
Amortization cost	58600	\$/yr

Sludge Drying Lagoon

Design Output Data

Description	Value	Units
Sludge Drying Lagoon		
Design Information		

Sludge flow	13500 gpd(US)
Initial solids content in sludge	5 %
Sludge depth in lagoon	1 ft
Dry solids produced	2060000 lb/yr
Lagoon volume	896000 cuft
Total lagoon surface area	896000 sqft
Number of lagoons required	2
Quantities	
Operation labor required	85.2 pers-hrs/yr
Maintenance labor required	55 pers-hrs/yr
Volume of earthwork required	258000 cuft
Volume of wall concrete requir	80 cuft
Surface area per lagoon	448000 sqft
Length of lagoon at top of leve	681 ft
Depth of cut	0.24 ft
Depth of fill	2.76 ft
Costs	
Construction and equipment cc	98000 \$
Earthwork Cost	76400 \$
Wall Concrete Cost	1930 \$
Misc Costs	19600 \$
Operational labor cost	4390 \$/yr
Maintenance labor cost	2310 \$/yr
Material and supply cost	0 \$/yr
Chemical cost	0 \$/yr
Energy cost	0 \$/yr
Amortization cost	8210 \$/yr

IFAS

Design Output Data

Description	Value	Units
IFAS		
Design Information		
Carbon & Nitrification Design		
Max. specific growth of nitrifier:	0.2	1/d
Death rate of nitrifiers at winter	0.0301	1/d
Minimum SRT for design at wi	5.89	d
Design SRT for design at wint	8.83	d
Design SS	2500	mg/L
Calculated VSS	1710	mg/L
Calculated VSS:TSS ratio	0.686	mg VSS/mg SS
Total volume of reactors	7060	m ³
Length of parallel train	36	m
Width of parallel train	10	m
Sidewater depth	5	m
Number of batteries	1	
Number of parallel trains per b	4	
Number of cells within one trai	2	
Total number of dividing walls	4	
Hydraulic retention time	11	hr
F/M ratio	0.127	kg BOD/kg MLSS/d
Volumetric BOD loading	0.362	kg BOD/m ³ /d
Observed yield (VSS basis)	0.999	g VSS/g BOD
Observed yield (TSS basis)	0.972	g TSS/g BOD
Amount of alkalinity required	268	gCaCO ₃ /m ³
Amount of sludge generated	3320	kg/d
Sludge recycle rate	5140	m ³ /d
Nitrogen requirement for biom:	8.71	mg/L
Phosphorus requirement for bi	1.74	mg/L
Oxygen requirement to meet a	5720	kg/d
Air flow required to meet avera	26600	N m ³ /hr
Design air flow	62.8	N m ³ /min/1000 m ³
Quantities		
Operation labor required	3480	pers-hrs/yr
Maintenance labor required	2090	pers-hrs/yr
Electrical energy required	4110000	kWh/yr
Volume of earthwork required	137000	cuft
Volume of slab concrete requir	57800	cuft
Volume of wall concrete requir	30200	cuft
Handrail length	1140	ft
Number of diffusers per train	333	
Number of swing arm headers	5	
Volume of Media required	3530	m ³
Sieve Area required	38.1	m ²
Costs		
Construction and equipment cc	3780000	\$
Earthwork Cost	40600	\$
Wall Concrete Cost	727000	\$
Slab Concrete Cost	749000	\$
Handrail Cost	85400	\$
Installed Aerator Equipment	451000	\$
Air Piping Cost	268000	\$

Misc Costs	255000 \$
Media Cost	1160000 \$
Screen Cost	41900 \$
Operational labor cost	179000 \$/yr
Maintenance labor cost	87700 \$/yr
Material and supply cost	75500 \$/yr
Chemical cost	0 \$/yr
Energy cost	411000 \$/yr
Amortization cost	403000 \$/yr
Sludge Recycle Pumping	
Design Information	
Average daily pumping rate	1.36 MGD(US)
Total pumping capacity	2.71 MGD(US)
Design capacity per pump	943 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	1.36 MGD(US)
Quantities	
Operation labor required	458 pers-hrs/yr
Maintenance labor required	377 pers-hrs/yr
Electrical energy required	45400 kWh/yr
Volume of earthwork required	2030 cuft
Area of pump building	254 sqft
Costs	
Construction and equipment cost	123000 \$
Earthwork Cost	601 \$
Pump Building Cost	27900 \$
Installed Pump Cost	76100 \$
Misc Costs	18800 \$
Operational labor cost	23600 \$/yr
Maintenance labor cost	15800 \$/yr
Material and supply cost	864 \$/yr
Chemical cost	0 \$/yr
Energy cost	4540 \$/yr
Amortization cost	11700 \$/yr

Post Aeration

Design Output Data

Description	Value	Units
Post Aeration by Diffused Aeration		
Design Information		
Dissolved oxygen in influent	2	mg/L
Desired dissolved oxygen in effluent	5	mg/L
Correction factor for pressure	1	
Minimum dissolved oxygen in tank	2	mg/L
Oxygen saturation at summer temperature	8.5	mg/L
Oxygen required	99.7	lb/d
Operating transfer efficiency	2.95	lbO ₂ /(HP·h)
Total volume of aerobic reactor	27700	gal(US)
Air flow rate required to meet oxygen demand	133	scfm
Quantities		
Basin depth	15	ft
Length of basin	8.22	ft
Width of basin	30	ft
Number of diffusers	12	
Number of swing arm diffuser lines	1	
Volume of wall concrete required	860	cuft
Volume of slab concrete required	185	cuft
Electrical energy required	33200	kWh/yr
Operation labor required	640	pers-hrs/yr
Maintenance labor required	243	pers-hrs/yr
Costs		
Construction and equipment cost	58000	\$
Wall Concrete Cost	20700	\$
Slab Concrete Cost	11100	\$
Installed Equipment Cost	20400	\$
Misc Costs	5740	\$
Operational labor cost	32900	\$/yr
Maintenance labor cost	10200	\$/yr
Material and supply cost	1440	\$/yr
Chemical cost	0	\$/yr
Energy cost	3320	\$/yr
Amortization cost	5270	\$/yr

Hauling and Land Filling

Design Output Data

Description	Value	Units
Sludge Hauling and Land Filling		
Design Information		
Volume of sludge hauled	11.2	cuyd/d
Truck capacity	19	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	11.2 cuyd/d
Maximum anticipated landfill depth	30 d
Anticipated sludge storage height	8 ft
Sludge storage shed area	1130 sqft
Width of sludge storage shed	23.8 ft
Length of sludge storage shed	47.6 ft
Volume of earthwork required	3290 cuft
Volume of slab concrete required	1460 cuft
Surface area of canopy roof	1130 sqft
Round trip haul distance	20 miles
Round trips per day per truck	1
Distance traveled per year per truck	5000 miles
Sludge hauled	9.88 ton(short)/d
Operation labor required	175 pers-hrs/yr
Landfilling cost	35200 \$/yr
Costs	
Construction and equipment cost	325000 \$
Earthwork Cost	975 \$
Slab Concrete Cost	18900 \$
Canopy Roof Cost	22600 \$
Vehicle Cost	283000 \$
Operational labor cost	8990 \$/yr
Maintenance labor cost	0 \$/yr
Material and supply cost	53600 \$/yr
Chemical cost	0 \$/yr
Energy cost	0 \$/yr
Amortization cost	64800 \$/yr

Secondary Clarifier

Design Output Data

Description	Value	Units
Secondary Clarification		
Design Information		
Surface area	10200	sqft
Surface area per circular clarifier	5090	sqft
Diameter of each circular clarifier	81	ft
Number of clarifiers per battery	2	
Number of batteries	1	
Solids loading rate	11.1	lb/(sqft-d)
Hydraulic retention time	4.04	hr
Designed surface overflow rate	400	gal(US)/(sqft-d)
Weir length	671	ft
Volume of wasted sludge	85200	gpd(US)
Quantities		
Operation labor required	1030	pers-hrs/yr
Maintenance labor required	570	pers-hrs/yr
Electrical energy required	10100	kWh/yr
Volume of earthwork required	132000	cuft
Slab thickness	10.2	in
Volume of slab concrete required	10100	cuft
Wall thickness	11.5	in
Volume of wall concrete required	5340	cuft
Costs		
Construction and equipment cost	647000	\$
Earthwork Cost	39000	\$
Wall Concrete Cost	128000	\$
Slab Concrete Cost	131000	\$
Installed Equipment Cost	250000	\$
Misc Costs	98700	\$
Operational labor cost	53300	\$/yr
Maintenance labor cost	24000	\$/yr
Material and supply cost	6470	\$/yr
Chemical cost	0	\$/yr
Energy cost	1010	\$/yr
Amortization cost	59500	\$/yr
Waste Sludge Pumping		
Design Information		
Average daily pumping rate	0.0852	MGD(US)
Total pumping capacity	0.0852	MGD(US)
Design capacity per pump	29.6	gpm(US)
Number of pumps	3	
Number of batteries	1	
Firm pumping capacity	0.0852	MGD(US)
Quantities		
Operation labor required	321	pers-hrs/yr
Maintenance labor required	250	pers-hrs/yr
Electrical energy required	2870	kWh/yr

Volume of earthwork required	1610 cuft
Area of pump building	202 sqft
Costs	
Construction and equipment cc	46300 \$
Earthwork Cost	478 \$
Pump Building Cost	22200 \$
Installed Pump Cost	16600 \$
Misc Costs	7060 \$
Operational labor cost	16500 \$/yr
Maintenance labor cost	10500 \$/yr
Material and supply cost	324 \$/yr
Chemical cost	0 \$/yr
Energy cost	287 \$/yr
Amortization cost	4380 \$/yr

Effluent

Design Output Data

Description	Value	Units
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