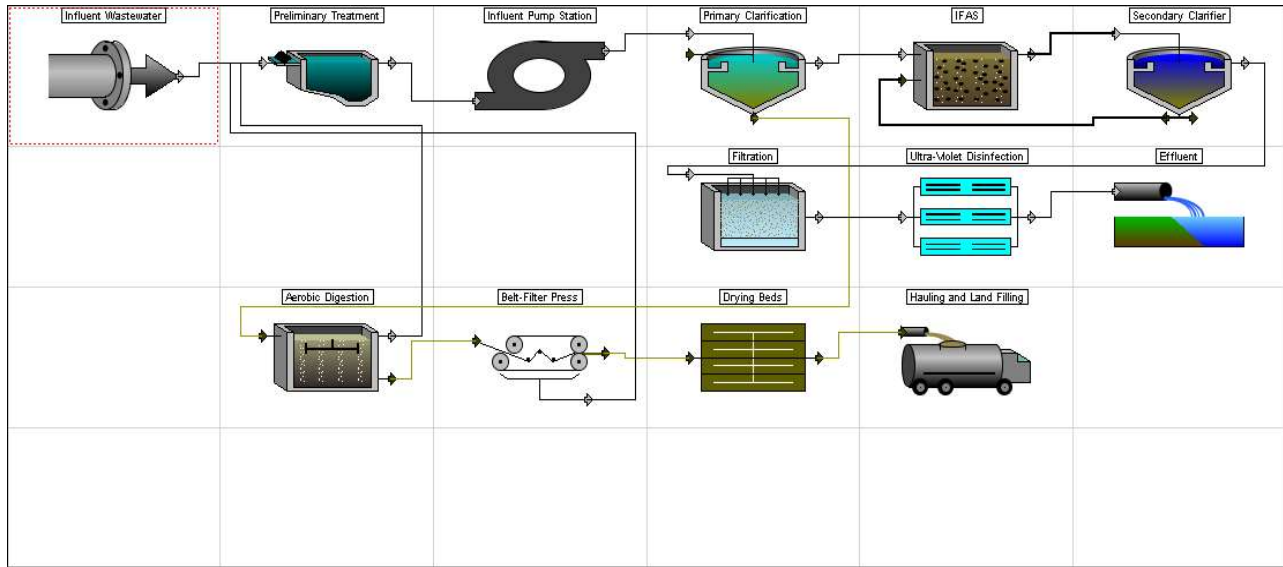


Layout - Tremonton City



Summary

Equipment Database

Hydromantis 2014,(USA Avg)

Layout Summary

Description	Value	Units
CONSTRUCTION COSTS		
Unit process construction cost:	\$8,570,000	\$
Other direct construction costs	\$3,340,000	\$
Other indirect construction costs	\$9,010,000	\$
Total construction costs	\$20,900,000	\$

ANNUAL COSTS

LABOR COSTS

Administration labor cost	\$30,900	\$/yr
Laboratory labor cost	\$140,000	\$/yr
Unit process operation labor cost	\$409,000	\$/yr
Unit process maintenance labor cost	\$195,000	\$/yr
Total labor costs	\$775,000	\$/yr

MATERIAL COSTS

Total material cost	\$200,000	\$/yr
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CHEMICAL COSTS

Total chemical cost	\$8,670	\$/yr
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ENERGY COSTS

Total energy cost	\$275,000	\$/yr
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Total operation and maintenance	\$1,260,000	\$/yr
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CONSTRUCTION COST AMC

Amortization cost for total construction	\$1,860,000	\$/yr
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Total annual project cost	\$3,120,000	\$/yr
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PROJECT SUMMARY

Present worth	\$37,400,000	\$
Total project cost	\$20,900,000	\$
Total operation labor cost	\$580,000	\$/yr
Total maintenance labor cost	\$195,000	\$/yr
Total material cost	\$200,000	\$/yr
Total chemical cost	\$8,670	\$/yr
Total energy cost	\$275,000	\$/yr
Total amortization cost	\$1,860,000	\$/yr

Process Summary

Process	Construction (\$)	Operation (\$/yr)	Maintenance (\$/yr)	Material (\$/yr)	Chemical (\$/yr)	Energy (\$/yr)	Amortization (\$/yr)
Preliminary Treatment	435000	39100	17100	10900	0	2210	36500
Aerobic Digestion	273000	67900	27100	36200	0	55900	23800
Influent Pump Station	1230000	29400	19900	8610	0	16200	106000
Belt-Filter Press	812000	1940	387	0	6430	1300	74300

Primary Clarification	323000	36100	17600	3130	0	824	30300
Filtration	1200000	6120	3300	34000	0	1600	116000
Drying Beds	149000	39300	14000	1340	0	0	12900
IFAS	1930000	139000	65900	40800	0	180000	213000
Ultra-Violet Disinfection	644000	0	6650	6440	2240	16100	54600
Hauling and Land Filling	289000	1080	0	53600	0	0	61800
Secondary Clarifier	464000	48400	23400	4530	0	967	43200
Effluent	0	0	0	0	0	0	0
Blower System	826000	0	0	0	0	0	69200
Other Costs	12400000	171000	0	0	0	0	1020000

Summary of Other Costs for Layout

Description	Value	Units
Other Costs		
Quantities		
Required land	12	acre
Administration labor hours	600	hr/yr
Laboratory labor hours	2720	hr/yr
Costs		
DIRECT COSTS		
Mobilization	296000	\$
Site preparation	477000	\$
Site electrical	802000	\$
Yard piping	545000	\$
Instrumentation and control	387000	\$
Lab and administration building	836000	\$
Total direct construction costs	3340000	\$
INDIRECT COSTS		
Cost of land	240000	\$
Miscellaneous cost	685000	\$
Legal cost	274000	\$
Engineering design fee	2060000	\$
Inspection cost	274000	\$
Contingency	1370000	\$
Technical	274000	\$
Interest during construction	2050000	\$
Profit	1790000	\$
Total indirect construction cost	9010000	\$
Total of other construction costs	12400000	\$
LABOR COSTS		
Administration labor cost	30900	\$/yr
Laboratory labor cost	140000	\$/yr

Summary of Air Supply System

Description	Value	Units
Blower System for Entire Plant		
Design Information		
Minimum air flow capacity	9040	scfm
Safety factor	1.5	
Requested air flow capacity	13600	scfm
Total capacity of blowers	13600	scfm
Number of blowers in use	2	
Total number of blowers	3	
Capacity of individual blowers	6780	scfm
Estimated cost of an installed blower	194000	\$
Blower building area	1460	sqft
Costs		
Construction and equipment cost	826000	\$
Installed Blower Cost	583000	\$
Building Cost	161000	\$
Misc Costs	81800	\$
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	69200	\$/yr
Notes		

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

Influent Wastewater

Preliminary Treatment

Design Output Data

Description	Value	Units
Preliminary Treatment		
Design Information		
Mechanically Cleaned Bar Screen		
Bar size	0.1	in
Bar spacing	0.25	in

Slope of bars from horizontal	30 degrees
Head loss through screen	0.103 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	1.24 ft
Average channel depth	1 ft
Horizontal Flow Grit Chamber	
Maximum flow	7.71 cuft/s
Average flow	3.09 cuft/s
Minimum flow	2.32 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	3.85 cuft/s
Width of channel	0.642 ft
Depth of channel	4 ft
Length of channel	144 ft
Settling velocity of particle	0.0707 ft/s
Slope of channel bottom	0.00297
Allowance for currents	1.7
Manning coefficient	0.035
Hydraulic retention time	1.6 min
Volume of grit	8.02 cuft/d
Costs	
Construction and equipment co	435000 \$
Operational labor cost	39100 \$/yr
Maintenance labor cost	17100 \$/yr
Material and supply cost	10900 \$/yr
Chemical cost	0 \$/yr
Energy cost	2210 \$/yr
Amortization cost	36500 \$/yr

Aerobic Digestion

Design Output Data

Description	Value	Units
Aerobic Digestion		
Design Information		
Solids retention time	9.79	d
Design SS	12000	mg/L
Calculated VSS	7700	mg/L
Calculated VSS:TSS ratio	0.642	mg VSS/mg SS
Total volume of reactors	440	m ³
Length of parallel train	5	m
Width of parallel train	10	m
Sidewater depth	5	m
Number of batteries	1	
Number of parallel trains per b	2	
Oxygen requirement to meet a	585	kg/d
Air flow required to meet avera	3240	N m ³ /hr
Design air flow	123	N m ³ /min/1000 m ³
Volatile solids loading	0.109	lb/(cuft-d)
Solids accumulated	1190	lb/d
Digester capacity	11600	lb
Volume of wasted sludge	53100	gal(US)
Quantities		
Operation labor required	1320	pers-hrs/yr
Maintenance labor required	660	pers-hrs/yr
Electrical energy required	559000	kWh/yr
Volume of earthwork required	20700	cuft
Volume of slab concrete requir	4210	cuft
Volume of wall concrete requir	4040	cuft
Handrail length	113	ft
Number of diffusers per train	91	
Number of swing arm headers	1	
Costs		
Construction and equipment co	273000	\$
Earthwork Cost	6150	\$
Wall Concrete Cost	97200	\$
Slab Concrete Cost	54600	\$
Handrail Cost	8470	\$
Installed Aerator Equipment	47000	\$
Air Piping Cost	32400	\$
Misc Costs	27000	\$
Operational labor cost	67900	\$/yr
Maintenance labor cost	27100	\$/yr
Material and supply cost	36200	\$/yr
Chemical cost	0	\$/yr
Energy cost	55900	\$/yr

Amortization cost 23800 \$/yr

Influent Pump Station

Design Output Data

Description	Value	Units
Pump Station		
Design Information		
Volume of wet well	14600	cuft
Width of wet well	128	ft
Depth of the pumping station	26.9	ft
Length of the pumping station	18.8	ft
Width of the pumping station	156	ft
Minimum depth of water in wet	5.89	ft
Area of pump building	553	sqft
Peak capacity of pumps	7.23	MGD(US)
Firm pumping capacity	7.23	MGD(US)
Total dynamic head - average	44.9	ft
Quantities		
Operation labor required	571	pers-hrs/yr
Maintenance labor required	485	pers-hrs/yr
Electrical energy required	162000	kWh/yr
Volume of earthwork required	382000	cuft
Volume of slab concrete requir	25000	cuft
Volume of wall concrete requir	12800	cuft
Capacity per pump	5020	gpm(US)
Number of constant speed pur	2	
Number of variable speed pur	0	
Diameter of discharge header	16	in
Total dynamic head	66.2	ft
Size of selected pump	14	in
Specific speed of pump	3670	
Pump rotating speed	1310	rpm
Motor size required	112	HP
Size of selected motor	125	HP
Width of pump system	3.4	ft
Length of pump system	19	ft
Length of the dry well	18.8	ft
Width of the dry well	28	ft
Costs		
Construction and equipment co	1230000	\$
Earthwork Cost	113000	\$
Wall Concrete Cost	309000	\$
Slab Concrete Cost	324000	\$
Building Cost	60800	\$
Installed Pump Equipment C	236000	\$
Misc Costs	188000	\$
Operational labor cost	29400	\$/yr
Maintenance labor cost	19900	\$/yr
Material and supply cost	8610	\$/yr
Chemical cost	0	\$/yr
Energy cost	16200	\$/yr
Amortization cost	106000	\$/yr

Belt-Filter Press

Design Output Data

Description	Value	Units
Belt-Filter Press		
Design Information		
Belt filter width	1	m
Number of units	1	
Hydraulic loading per unit per r	70	gpm(US)
Hydraulic loading required per	15.8	gpm(US)
Final solids content	19	%
Solids capture fraction	0.996	
Quantities		
Operation labor required	37.7	pers-hrs/yr
Maintenance labor required	9.42	pers-hrs/yr
Power	13000	kWh/yr
Polymer required	4940	lb/yr
Dry solids produced	1350	lb/d
Belt filter(s)	275000	\$
Building	279000	\$
Installation	68800	\$
Polymer system	82500	\$
Feed pumps	30300	\$
Conveyor system	77000	\$
Costs		
Construction and equipment co	812000	\$
Building Cost	279000	\$
Polymer System Cost	82500	\$
Feed Pumps Cost	30300	\$
Conveyor System Cost	77000	\$

Installed Belt Filter	344000 \$
Operational labor cost	1940 \$/yr
Maintenance labor cost	387 \$/yr
Material and supply cost	0 \$/yr
Chemical cost	6430 \$/yr
Energy cost	1300 \$/yr
Amortization cost	74300 \$/yr

Primary Clarification

Design Output Data

Description	Value	Units
Primary Clarification		
Design Information		
Surface area	2510	sqft
Surface area per circular clarifi	1250	sqft
Diameter of each circular clarifi	40	ft
Number of clarifiers per batter	2	
Number of batteries	1	
Solids loading rate	1.48	lb/(sqft·d)
Hydraulic retention time	2.02	hr
Weir length	501	ft
Volume of sludge generated	6450	gpd(US)
Quantities		
Operation labor required	471	pers-hrs/yr
Maintenance labor required	257	pers-hrs/yr
Electrical energy required	8020	kWh/yr
Volume of earthwork required	31000	cuft
Slab thickness	10.2	in
Volume of slab concrete requir	2700	cuft
Wall thickness	11.5	in
Volume of wall concrete requir	2750	cuft
Costs		
Construction and equipment co	290000	\$
Earthwork Cost	9190	\$
Wall Concrete Cost	66100	\$
Slab Concrete Cost	35000	\$
Installed Equipment Cost	136000	\$
Misc Costs	44300	\$
Operational labor cost	24300	\$/yr
Maintenance labor cost	10600	\$/yr
Material and supply cost	2900	\$/yr
Chemical cost	0	\$/yr
Energy cost	802	\$/yr
Amortization cost	27200	\$/yr
Waste Sludge Pumping		
Design Information		
Average daily pumping rate	0.00645	MGD(US)
Total pumping capacity	0.00645	MGD(US)
Design capacity per pump	2.24	gpm(US)
Number of pumps	3	
Number of batteries	1	
Firm pumping capacity	0.00645	MGD(US)
Quantities		
Operation labor required	230	pers-hrs/yr
Maintenance labor required	171	pers-hrs/yr
Electrical energy required	219	kWh/yr
Volume of earthwork required	1600	cuft
Area of pump building	200	sqft
Costs		
Construction and equipment co	32800	\$
Earthwork Cost	474	\$
Pump Building Cost	22000	\$
Installed Pump Cost	5320	\$
Misc Costs	5000	\$
Operational labor cost	11900	\$/yr
Maintenance labor cost	7010	\$/yr
Material and supply cost	230	\$/yr
Chemical cost	0	\$/yr
Energy cost	22	\$/yr
Amortization cost	3100	\$/yr

Filtration

Design Output Data

Description	Value	Units
Filtration		
Design Information		
Surface area	922	sqft
Depth	9	ft
Terminal headloss through bec	192000	ft
Maximum head for backwashir	19.6	ft
Backwash rate	20	gal(US)/(sqft·min)
Washwater gutter depth	0.444	ft

Washwater needed	92200 gal(US)
Quantities	
Operation labor required	119 pers-hrs/yr
Maintenance labor required	80.5 pers-hrs/yr
Electrical energy required	16000 kWh
Surface area per filter unit	922 sqft
Number of cells per filter unit	4
Number of filter units per batte	1
Number of batteries	1
Volume of earthwork for filter	13500 cuft
Volume of concrete for filter	6910 cuft
Volume of surge tank	12300 cuft
Width of surge tank	29.7 ft
Length of surge tank	59.3 ft
Volume of earthwork for surge	29500 cuft
Volume of concrete for surge t	4110 cuft
Costs	
Construction and equipment cc	1200000 \$
Earthwork Cost for Filter	4000 \$
Earthwork Cost for Surge Ta	8730 \$
Concrete Cost for Filter	166000 \$
Concrete Cost for Surge Tar	99000 \$
Installed Equipment Cost	680000 \$
Misc Costs	239000 \$
Operational labor cost	6120 \$/yr
Maintenance labor cost	3300 \$/yr
Material and supply cost	34000 \$/yr
Chemical cost	0 \$/yr
Energy cost	1600 \$/yr
Amortization cost	116000 \$/yr

Drying Beds

Design Output Data

Description	Value	Units
Sludge Drying Beds		
Design Information		
Total surface area required	9750	sqft
Initial depth of sludge	12	in
Final solids	50	%
Bed holding time	103	d
Quantities		
Total drying bed surface area	9750	sqft
Number beds	4	
Surface area of each individual	2440	sqft
Length of each bed	122	ft
Volume of earthwork required	48300	cuft
Volume concrete for dividing w	3890	cuft
Volume of R.C. in-place for tru	731	cuft
Volume of sand	7310	cuft
Volume of gravel	9750	cuft
Clay pipe diameter	6	in
Total length clay pipe	975	in
Sludge solids produced	0.563	ton(short)/d
Operational labor required	762	pers-hrs/yr
Maintenance labor required	342	pers-hrs/yr
Costs		
Construction and equipment cc	149000	\$
Earthwork Cost	14300	\$
Wall Concrete Cost	65600	\$
Slab Concrete Cost	5690	\$
Drying Bed Media Cost	27200	\$
Drain Pipe System Cost	21500	\$
Misc Costs	14800	\$
Operational labor cost	39300	\$/yr
Maintenance labor cost	14000	\$/yr
Material and supply cost	1340	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	12900	\$/yr

IFAS

Design Output Data

Description	Value	Units
IFAS		
Design Information		
Carbon & Nitrification Design		
Design SRT for design at winte	25	d
Design SS	3000	mg/L
Calculated VSS	2090	mg/L
Calculated VSS:TSS ratio	0.695	mg VSS/mg SS
Total volume of reactors	4170	m3
Length of parallel train	42	m

Width of parallel train	10 m
Sidewater depth	5 m
Number of batteries	1
Number of parallel trains per b	2
Number of cells within one train	3
Total number of dividing walls	4
Hydraulic retention time	13.2 hr
F/M ratio	0.0846 kg BOD/kg MLSS/d
Volumetric BOD loading	0.271 kg BOD/m3/d
Observed yield (VSS basis)	0.617 g VSS/g BOD
Observed yield (TSS basis)	0.592 g TSS/g BOD
Amount of alkalinity required	219 gCaCO3/m3
Amount of sludge generated	768 kg/d
Sludge recycle rate	3240 m3/d
Nitrogen requirement for biom:	4.3 mg/L
Phosphorus requirement for bi	0.86 mg/L
Oxygen requirement to meet a	2490 kg/d
Air flow required to meet avera	11600 N m3/hr
Design air flow	46.3 N m3/min/1000 m3
Quantities	
Operation labor required	2280 pers-hrs/yr
Maintenance labor required	1250 pers-hrs/yr
Electrical energy required	1770000 kWh/yr
Volume of earthwork required	87800 cuft
Volume of slab concrete requir	19500 cuft
Volume of wall concrete requir	13200 cuft
Handrail length	356 ft
Number of diffusers per train	287
Number of swing arm headers	6
Volume of Media required	2090 m3
Sieve Area required	18.9 m2
Costs	
Construction and equipment cc	1820000 \$
Earthwork Cost	26000 \$
Wall Concrete Cost	317000 \$
Slab Concrete Cost	253000 \$
Handrail Cost	26700 \$
Installed Aerator Equipment	262000 \$
Air Piping Cost	120000 \$
Misc Costs	110000 \$
Media Cost	688000 \$
Screen Cost	20800 \$
Operational labor cost	117000 \$/yr
Maintenance labor cost	51400 \$/yr
Material and supply cost	40100 \$/yr
Chemical cost	0 \$/yr
Energy cost	177000 \$/yr
Amortization cost	203000 \$/yr
Sludge Recycle Pumping	
Design Information	
Average daily pumping rate	0.857 MGD(US)
Total pumping capacity	1.71 MGD(US)
Design capacity per pump	595 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	0.857 MGD(US)
Quantities	
Operation labor required	431 pers-hrs/yr
Maintenance labor required	352 pers-hrs/yr
Electrical energy required	28700 kWh/yr
Volume of earthwork required	1870 cuft
Area of pump building	234 sqft
Costs	
Construction and equipment cc	104000 \$
Earthwork Cost	554 \$
Pump Building Cost	25700 \$
Installed Pump Cost	62100 \$
Misc Costs	15900 \$
Operational labor cost	22200 \$/yr
Maintenance labor cost	14400 \$/yr
Material and supply cost	730 \$/yr
Chemical cost	0 \$/yr
Energy cost	2870 \$/yr
Amortization cost	9860 \$/yr

Ultra-Violet Disinfection

Design Output Data

Description	Value	Units
Ultra-Violet Disinfection		
Design Information		
Design based on a model calcul	1.34	gal(US)/(min·W)
Total number of lamps needed	197	

Number of spare channels	1
Total number of lamps used in	216
Number of excess lamps	19
Number of lamps/modules	2
Number of modules/bank	3
Number of banks/channel	3
Number of channels	12
Calculated headloss	4.99 in
Costs	
Construction and equipment co	644000 \$
Cost of installation	387000 \$
Total cost of UV lamps	258000 \$
Operational labor cost	0 \$/yr
Maintenance labor cost	6650 \$/yr
Material and supply cost	6440 \$/yr
Chemical cost	2240 \$/yr
Energy cost	16100 \$/yr
Amortization cost	54600 \$/yr

Hauling and Land Filling

Design Output Data

Description	Value	Units
Sludge Hauling and Land Filling		
Design Information		
Volume of sludge hauled	1.34	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	1.34	cuyd/d
Maximum anticipated landfill d	30	d
Anticipated sludge storage hei	8	ft
Sludge storage shed area	135	sqft
Width of sludge storage shed	8.23	ft
Length of sludge storage shed	16.5	ft
Volume of earthwork required	513	cuft
Volume of slab concrete requir	249	cuft
Surface area of canopy roof	135	sqft
Round trip haul distance	20	miles
Round trips per day per truck	1	
Distance traveled per year per	5000	miles
Sludge hauled	1.18	ton(short)/d
Operation labor required	20.9	pers-hrs/yr
LandFilling cost	35200	\$/yr
Costs		
Construction and equipment co	289000	\$
Earthwork Cost	152	\$
Slab Concrete Cost	3220	\$
Canopy Roof Cost	2710	\$
Vehicle Cost	283000	\$
Operational labor cost	1080	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	53600	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	61800	\$/yr

Secondary Clarifier

Design Output Data

Description	Value	Units
Secondary Clarification		
Design Information		
Surface area	5000	sqft
Surface area per circular clarifi	2500	sqft
Diameter of each circular clarif	57	ft
Number of clarifiers per batter	2	
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	500	ft
Volume of wasted sludge	19700	gpd(US)
Quantities		
Operation labor required	674	pers-hrs/yr
Maintenance labor required	369	pers-hrs/yr
Electrical energy required	9000	kWh/yr
Volume of earthwork required	62300	cuft
Slab thickness	10.2	in
Volume of slab concrete requir	5190	cuft

Wall thickness	11.5 in
Volume of wall concrete requir	3820 cuft
Costs	
Construction and equipment cc	427000 \$
Earthwork Cost	18500 \$
Wall Concrete Cost	92000 \$
Slab Concrete Cost	67300 \$
Installed Equipment Cost	184000 \$
Misc Costs	65200 \$
Operational labor cost	34700 \$/yr
Maintenance labor cost	15200 \$/yr
Material and supply cost	4270 \$/yr
Chemical cost	0 \$/yr
Energy cost	900 \$/yr
Amortization cost	39800 \$/yr
Waste Sludge Pumping	
Design Information	
Average daily pumping rate	0.0197 MGD(US)
Total pumping capacity	0.0197 MGD(US)
Design capacity per pump	6.85 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	0.0197 MGD(US)
Quantities	
Operation labor required	266 pers-hrs/yr
Maintenance labor required	202 pers-hrs/yr
Electrical energy required	667 kWh/yr
Volume of earthwork required	1600 cuft
Area of pump building	200 sqft
Costs	
Construction and equipment cc	36800 \$
Earthwork Cost	475 \$
Pump Building Cost	22000 \$
Installed Pump Cost	8700 \$
Misc Costs	5620 \$
Operational labor cost	13700 \$/yr
Maintenance labor cost	8270 \$/yr
Material and supply cost	258 \$/yr
Chemical cost	0 \$/yr
Energy cost	67 \$/yr
Amortization cost	3480 \$/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	