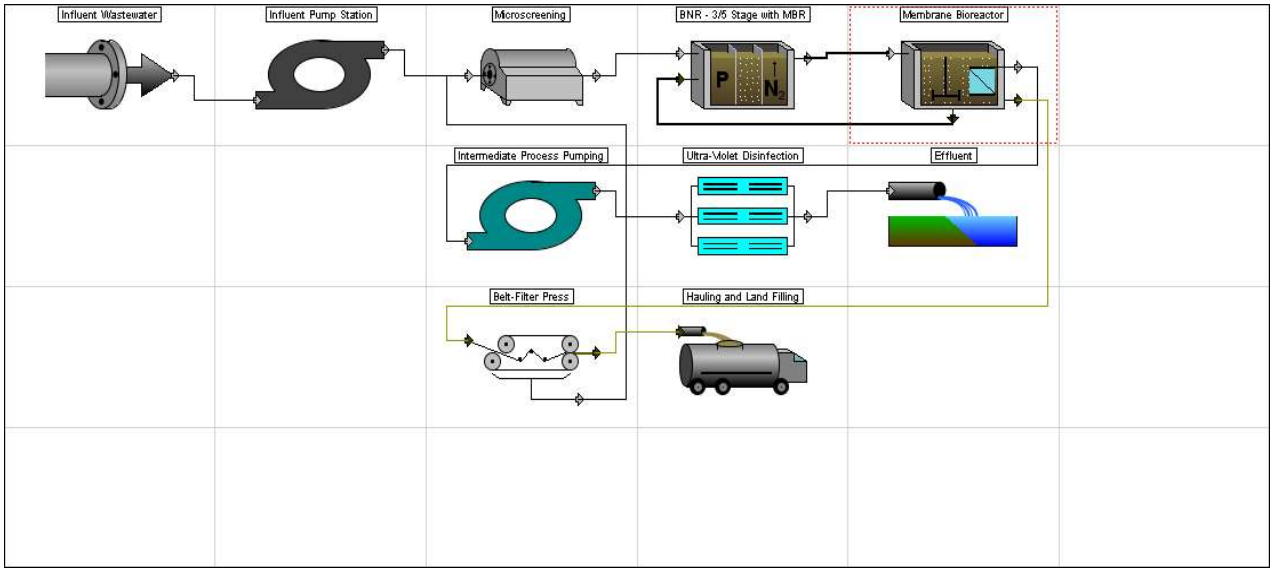
Layout - Mona City



Summary

Equipment Database

Hydromantis 2014,(USA Avg)

Layout Summary

Description	Value	Units
CONSTRUCTION COSTS		
Unit process construction cost	$5,300,000	$
Other direct construction costs	$1,330,000	$
Other indirect construction cos	$5,090,000	$
Total construction costs	$11,700,000	$
ANNUAL COSTS		
LABOR COSTS		
Administration labor cost	$10,400	$/yr
Laboratory labor cost	$114,000	$/yr
Unit process operation labor c	$336,000	$/yr
Unit process maintenance labc	$171,000	$/yr
Total labor costs	$631,000	$/yr
MATERIAL COSTS		
Total material cost	$123,000	$/yr
CHEMICAL COSTS		
Total chemical cost	$13,500	$/yr
ENERGY COSTS		
Total energy cost	$87,900	$/yr
Total operation and maintanen	$855,000	$/yr
CONSTRUCTION COST AMC		
Amortization cost for total cons	$1,120,000	$/yr
Total annual project cost	$1,970,000	$/yr
PROJECT SUMMARY		
Present worth	$23,700,000	$
Total project cost	$11,700,000	$
Total operation labor cost	$460,000	$/yr
Total maintenance labor cost	$171,000	$/yr
Total material cost	$123,000	$/yr
Total chemical cost	$13,500	$/yr
Total energy cost	$87,900	$/yr
Total amortization cost	$1,120,000	$/yr

Process Summary

Process	Construction ($)	Operation ($/yr)	Maintenance ($/yr)	Material ($/yr)	Chemical ($/yr)	Energy ($/yr)	Amortization ($/yr)
Influent Pump Station	448000	24800	16300	3130	0	4690	39000
Microscreening	307000	4150	2110	27800	0	9780	32900
Intermediate Process Pumping	110000	20700	13200	771	0	1670	10400
Belt-Filter Press	812000	733	145	0	2420	528	74300

BNR - 3/5 Stage with MBR	744000	125000	63800	16900	0	28300	69700
Ultra-Violet Disinfection	215000	0	2190	2150	747	5360	18200
Hauling and Land Filling	289000	1070	0	53600	0	0	61800
Membrane Bioreactor	1890000	159000	73700	18300	10300	37500	251000
Effluent	0	0	0	0	0	0	0
Blower System	486000	0	0	0	0	0	40800
Other Costs	6420000	124000	0	0	0	0	522000

Summary of Other Costs for Layout

Description	Value	Units
Other Costs		
Quantities		
Required land	10	acre
Administration labor hours	203	hr/yr
Laboratory labor hours	2210	hr/yr
Costs		
DIRECT COSTS		
Mobilization	114000	$
Site preparation	217000	$
Site electrical	292000	$
Yard piping	204000	$
Instrumentation and control	131000	$
Lab and administration building	374000	$
Total direct construction costs	1330000	$
INDIRECT COSTS		
Cost of land	200000	$
Miscellaneous cost	381000	$
Legal cost	153000	$
Engineering design fee	1140000	$
Inspection cost	153000	$
Contingency	763000	$
Technical	153000	$
Interest during construction	1150000	$
Profit	995000	$
Total indirect construction cost	5090000	$
Total of other construction cos	6420000	$
LABOR COSTS		
Administration labor cost	10400	$/yr
Laboratory labor cost	114000	$/yr

Summary of Air Supply System

Description	Value	Units
Blower System for Entire Plant		
Design Information		
Minimum air flow capacity	3210	scfm
Safety factor	1.5	
Requested air flow capacity	4820	scfm
Total capacity of blowers	4820	scfm
Number of blowers in use	1	
Total number of blowers	2	
Capacity of individual blowers	4820	scfm
Estimated cost of an installed l	157000	$
Blower building area	1120	sqft
Costs		
Construction and equipment cc	486000	$
Installed Blower Cost	315000	$
Building Cost	123000	$
Misc Costs	48200	$
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	40800	$/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	2150	cuft
Width of wet well	21.6	ft
Depth of the pumping station	25.1	ft
Length of the pumping station	16.4	ft
Width of the pumping station	47.2	ft
Minimum depth of water in wet	4.08	ft

Area of pump building	440	sqft
Peak capacity of pumps	2.04	MGD(US)
Firm pumping capacity	2.04	MGD(US)
Total dynamic head - average	46.1	ft
Quantities		
Operation labor required	482	pers-hrs/yr
Maintenance labor required	400	pers-hrs/yr
Electrical energy required	46900	kWh/yr
Volume of earthwork required	131000	cuft
Volume of slab concrete requir	5110	cuft
Volume of wall concrete requir	4700	cuft
Capacity per pump	1420	gpm(US)
Number of constant speed pur	2	
Number of variable speed pur	0	
Diameter of discharge header	8.51	in
Total dynamic head	88.1	ft
Size of selected pump	8	in
Specific speed of pump	2360	
Pump rotating speed	3050	rpm
Motor size required	47.6	HP
Size of selected motor	50	HP
Width of pump system	2.2	ft
Length of pump system	16.6	ft
Length of the dry well	16.4	ft
Width of the dry well	25.6	ft
Costs		
Construction and equipment co	448000	$
Earthwork Cost	38700	$
Wall Concrete Cost	113000	$
Slab Concrete Cost	66300	$
Building Cost	48400	$
Installed Pump Equipment C	113000	$
Misc Costs	68300	$
Operational labor cost	24800	$/yr
Maintenance labor cost	16300	$/yr
Material and supply cost	3130	$/yr
Chemical cost	0	$/yr
Energy cost	4690	$/yr
Amortization cost	39000	$/yr

Microscreening

Design Output Data

Description	Value	Units
Microscreening		
Design Information		
Microscreen loading rate	7	gal(US)/(sqft·min)
Quantity of wash water require	4	%
Area of microscreens required	199	sqft
Quantities		
Number of batteries	1	
Number of units/battery	2	
Drum diameter	6	ft
Drum width	6	ft
Area of selected unit	108	sqft
Area of building	155	sqft
Operation labor required	80.6	pers-hrs/yr
Maintenance labor required	51.9	pers-hrs/yr
Electrical energy required	97800	kWh/yr
Volume of wall concrete requir	2600	cuft
Volume of earthwork required	5860	cuft
Costs		
Construction and equipment co	307000	$
Earthwork Cost	1740	$
Slab Concrete Cost	62600	$
Building Cost	17000	$
Installed Equipment Cost	186000	$
Misc Costs	40000	$
Operational labor cost	4150	$/yr
Maintenance labor cost	2110	$/yr
Material and supply cost	27800	$/yr
Chemical cost	0	$/yr
Energy cost	9780	$/yr
Amortization cost	32900	$/yr

Intermediate Process Pumping

Design Output Data

Description	Value	Units
Intermediate Pumping		
Design Information		
Average daily pumping rate	0.5	MGD(US)
Total pumping capacity	2	MGD(US)
Design capacity per pump	694	gpm(US)

Number of pumps	3	
Number of batteries	1	
Firm pumping capacity	0.5	MGD(US)
Quantities		
Operation labor required	402	pers-hrs/yr
Maintenance labor required	325	pers-hrs/yr
Electrical energy required	16700	kWh/yr
Volume of earthwork required	1920	cuft
Area of pump building	239	sqft
Costs		
Construction and equipment cc	110000	$
Earthwork Cost	568	$
Pump Building Cost	26300	$
Installed Pump Cost	66500	$
Misc Costs	16800	$
Operational labor cost	20700	$/yr
Maintenance labor cost	13200	$/yr
Material and supply cost	771	$/yr
Chemical cost	0	$/yr
Energy cost	1670	$/yr
Amortization cost	10400	$/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	12.5	gpm(US)
Final solids content	19	%
Solids capture fraction	0.992	
Quantities		
Operation labor required	14.2	pers-hrs/yr
Maintenance labor required	3.56	pers-hrs/yr
Power	5280	kWh/yr
Polymer required	1860	lb/yr
Dry solids produced	510	lb/d
Belt filter(s)	275000	$
Building	279000	$
Installation	68800	$
Polymer system	82500	$
Feed pumps	30300	$
Conveyor system	77000	$
Costs		
Construction and equipment cc	812000	$
Building Cost	279000	$
Polymer System Cost	82500	$
Feed Pumps Cost	30300	$
Conveyor System Cost	77000	$
Installed Belt Filter	344000	$
Operational labor cost	733	$/yr
Maintenance labor cost	145	$/yr
Material and supply cost	0	$/yr
Chemical cost	2420	$/yr
Energy cost	528	$/yr
Amortization cost	74300	$/yr

BNR - 3/5 Stage with MBR

Design Output Data

Description	Value	Units
BNR System for BIO-P and N Removal		
Design Information		
3-Stage Biological Phosphorus		
Design aerobic SRT for nitrifica	12.5	d
Total reactor SRT	25	d
Design SS	9000	mg/L
Calculated VSS	6490	mg/L
Calculated VSS:TSS ratio	0.721	mg VSS/mg SS
Total volume of anaerobic reac	83.2	m3
Total volume of anoxic reactors	194	m3
Total volume of aerobic reacto	277	m3
Total volume of all reactors	554	m3
Width of parallel train	10	m
Sidewater depth	5	m
Number of batteries	1	
Number of parallel trains per b	2	
Number of anoxic cells within c	1	
Number of aerobic cells within	1	
Anaerobic hydraulic retention ti	1.05	hr
Anoxic hydraulic retention time	2.44	hr

Aerobic hydraulic retention tim	3.49	hr
Amount of sludge generated	200	kg/d
Sludge recycle ratio	300	%
Sludge recycle rate	5720	m3/d
Nitrogen required for biomass	12.8	mg/L
Phosphorus required for bioma	2.56	mg/L
Oxygen required to meet avera	397	kg/d
Air flow required to meet avera	659	N m3/hr
Design air flow	39.6	N m3/min/1000 m3
Quantities		
Operation labor required	1160	pers-hrs/yr
Maintenance labor required	540	pers-hrs/yr
Electrical energy required	148000	kWh/yr
Volume of earthwork required	22600	cuft
Volume of slab concrete requir	4630	cuft
Volume of wall concrete requir	4280	cuft
Handrail length	119	ft
Number of diffusers per train	105	
Fine bubble diffuser floor cove	14.4	%
Number of swing arm headers	1	
Required mixing power	3.9	kW
Total number of mixers	4	
Design mixing power per mixe	1.12	kW
Mixing power for each unaerat	0.975	kW
Costs		
Construction and equipment co	340000	$
Earthwork Cost	6680	$
Wall Concrete Cost	103000	$
Slab Concrete Cost	60000	$
Handrail Cost	8960	$
Installed Aerator Equipment	53700	$
Air Piping Cost	17600	$
Installed Mixer Equipment Co	56200	$
Misc Costs	33700	$
Operational labor cost	59700	$/yr
Maintenance labor cost	21900	$/yr
Material and supply cost	14100	$/yr
Chemical cost	0	$/yr
Energy cost	14800	$/yr
Amortization cost	31500	$/yr
Internal Recycle Pumping		
Design Information		
Average daily pumping rate	0.756	MGD(US)
Total pumping capacity	0.756	MGD(US)
Design capacity per pump	263	gpm(US)
Number of pumps	6	
Number of batteries	1	
Firm pumping capacity	0.756	MGD(US)
Quantities		
Operation labor required	424	pers-hrs/yr
Maintenance labor required	345	pers-hrs/yr
Electrical energy required	50700	kWh/yr
Volume of earthwork required	1720	cuft
Area of pump building	215	sqft
Costs		
Construction and equipment co	159000	$
Earthwork Cost	1020	$
Pump Building Cost	47300	$
Installed Pump Cost	86700	$
Misc Costs	24300	$
Operational labor cost	21900	$/yr
Maintenance labor cost	14000	$/yr
Material and supply cost	1110	$/yr
Chemical cost	0	$/yr
Energy cost	5070	$/yr
Amortization cost	15100	$/yr
Internal Recycle Pumping		
Design Information		
Average daily pumping rate	1.01	MGD(US)
Total pumping capacity	1.01	MGD(US)
Design capacity per pump	350	gpm(US)
Number of pumps	6	
Number of batteries	1	
Firm pumping capacity	1.01	MGD(US)
Quantities		
Operation labor required	440	pers-hrs/yr
Maintenance labor required	360	pers-hrs/yr
Electrical energy required	67500	kWh/yr
Volume of earthwork required	1760	cuft
Area of pump building	220	sqft
Costs		
Construction and equipment co	174000	$

Earthwork Cost	1040	$
Pump Building Cost	48400	$
Installed Pump Cost	98400	$
Misc Costs	26600	$
Operational labor cost	22700	$/yr
Maintenance labor cost	14600	$/yr
Material and supply cost	1220	$/yr
Chemical cost	0	$/yr
Energy cost	6750	$/yr
Amortization cost	16500	$/yr
Sludge Recycle Pumping		
Design Information		
Average daily pumping rate	0.504	MGD(US)
Total pumping capacity	0.504	MGD(US)
Design capacity per pump	175	gpm(US)
Number of pumps	3	
Number of batteries	1	
Firm pumping capacity	0.504	MGD(US)
Quantities		
Operation labor required	403	pers-hrs/yr
Maintenance labor required	325	pers-hrs/yr
Electrical energy required	16900	kWh/yr
Volume of earthwork required	1680	cuft
Area of pump building	210	sqft
Costs		
Construction and equipment cc	70600	$
Earthwork Cost	498	$
Pump Building Cost	23100	$
Installed Pump Cost	36200	$
Misc Costs	10800	$
Operational labor cost	20800	$/yr
Maintenance labor cost	13200	$/yr
Material and supply cost	494	$/yr
Chemical cost	0	$/yr
Energy cost	1690	$/yr
Amortization cost	6680	$/yr

Ultra-Violet Disinfection

Design Output Data

Description	Value	Units
Ultra-Violet Disinfection		
Design Information		
Design based on a model calc	2.12	gal(US)/(min·W)
Total number of lamps needed	50	
Number of spare channels	1	
Total number of lamps used in	72	
Number of excess lamps	22	
Number of lamps/modules	2	
Number of modules/bank	3	
Number of banks/channel	3	
Number of channels	4	
Calculated headloss	10.8	in
Costs		
Construction and equipment cc	215000	$
Cost of installation	129000	$
Total cost of UV lamps	85900	$
Operational labor cost	0	$/yr
Maintenance labor cost	2190	$/yr
Material and supply cost	2150	$/yr
Chemical cost	747	$/yr
Energy cost	5360	$/yr
Amortization cost	18200	$/yr

Hauling and Land Filling

Design Output Data

Description	Value	Units
Sludge Hauling and Land Filling		
Design Information		
Volume of sludge hauled	1.32	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	1.32	cuyd/d
Maximum anticipated landfill dc	30	d
Anticipated sludge storage hei	8	ft
Sludge storage shed area	134	sqft
Width of sludge storage shed s	8.19	ft
Length of sludge storage shed	16.4	ft

Volume of earthwork required	509	cuft
Volume of slab concrete requir	247	cuft
Surface area of canopy roof	134	sqft
Round trip haul distance	20	miles
Round trips per day per truck	1	
Distance traveled per year per	5000	miles
Sludge hauled	1.17	ton(short)/d
Operation labor required	20.7	pers-hrs/yr
LandFilling cost	35200	$/yr
Costs		
Construction and equipment cc	289000	$
Earthwork Cost	151	$
Slab Concrete Cost	3200	$
Canopy Roof Cost	2680	$
Vehicle Cost	283000	$
Operational labor cost	1070	$/yr
Maintenance labor cost	0	$/yr
Material and supply cost	53600	$/yr
Chemical cost	0	$/yr
Energy cost	0	$/yr
Amortization cost	61800	$/yr

Membrane Bioreactor

Design Output Data

Description	Value	Units
Membrane Bioreactor		
Design Information		
Total volume of reactors	12400	cuft
Length of parallel train	22.5	ft
Width of parallel train	11.2	ft
Sidewater depth	16.4	ft
Number of batteries	1	
Number of parallel trains per b	3	
Total Membrane Area	15800	m2
Total Scour Air Requirement	3160	N m3/hr
Quantities		
Operation labor required	2390	pers-hrs/yr
Maintenance labor required	1250	pers-hrs/yr
Electrical energy required	359000	kWh/yr
Volume of earthwork required	15800	cuft
Volume of slab concrete requir	3180	cuft
Volume of wall concrete requir	4400	cuft
Handrail length	253	ft
Number of diffusers per train	78	
Number of swing arm headers	1	
Costs		
Construction and equipment cc	1680000	$
Earthwork Cost	4680	$
Wall Concrete Cost	106000	$
Slab Concrete Cost	41200	$
Handrail Cost	19000	$
Membrane Cost	1360000	$
Installed Aerator Equipment	69000	$
Air Piping Cost	43100	$
Misc Cost	38700	$
Operational labor cost	123000	$/yr
Maintenance labor cost	50700	$/yr
Material and supply cost	16800	$/yr
Chemical cost	10300	$/yr
Energy cost	35900	$/yr
Amortization cost	231000	$/yr
Permeate Pumping		
Design Information		
Average daily pumping rate	0.252	MGD(US)
Total pumping capacity	1	MGD(US)
Design capacity per pump	387	gpm(US)
Number of pumps	6	
Number of batteries	1	
Firm pumping capacity	2.23	MGD(US)
Quantities		
Operation labor required	488	pers-hrs/yr
Maintenance labor required	405	pers-hrs/yr
Electrical energy required	15200	kWh/yr
Volume of earthwork required	1780	cuft
Area of pump building	222	sqft
Costs		
Construction and equipment cc	180000	$
Earthwork Cost	1050	$
Pump Building Cost	48800	$
Installed Pump Cost	103000	$
Misc Costs	27500	$
Operational labor cost	25100	$/yr

Maintenance labor cost	16500	$/yr
Material and supply cost	1260	$/yr
Chemical cost	0	$/yr
Energy cost	1520	$/yr
Amortization cost	17000	$/yr
Waste Sludge Pumping		
Design Information		
Average daily pumping rate	0.00427	MGD(US)
Total pumping capacity	0.00427	MGD(US)
Design capacity per pump	1.48	gpm(US)
Number of pumps	3	
Number of batteries	1	
Firm pumping capacity	0.00427	MGD(US)
Quantities		
Operation labor required	218	pers-hrs/yr
Maintenance labor required	161	pers-hrs/yr
Electrical energy required	145	kWh/yr
Volume of earthwork required	1600	cuft
Area of pump building	200	sqft
Costs		
Construction and equipment cc	31800	$
Earthwork Cost	474	$
Pump Building Cost	22000	$
Installed Pump Cost	4430	$
Misc Costs	4840	$
Operational labor cost	11200	$/yr
Maintenance labor cost	6530	$/yr
Material and supply cost	222	$/yr
Chemical cost	0	$/yr
Energy cost	14	$/yr
Amortization cost	3000	$/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