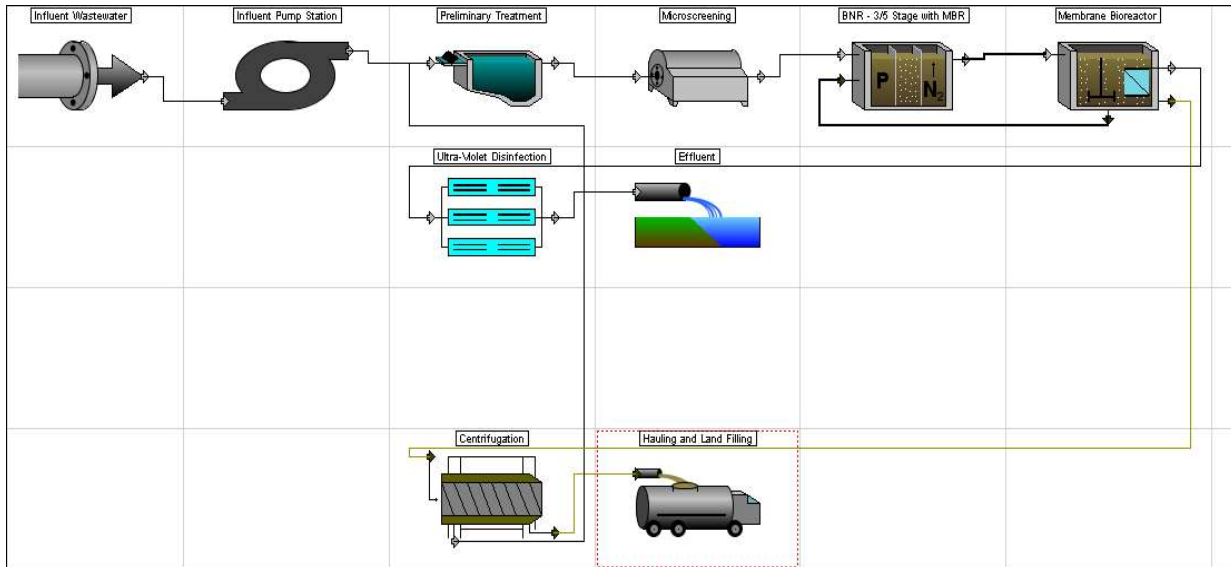


Layout - Jordan Basin WRF



Summary

Equipment Database

Hydromantis 2014,(USA Avg)

Layout Summary

Description	Value	Units
CONSTRUCTION COSTS		
Unit process construction cost:	\$53,000,000	\$
Other direct construction costs	\$13,000,000	\$
Other indirect construction costs	\$49,000,000	\$
Total construction costs	\$115,000,000	\$

ANNUAL COSTS

LABOR COSTS		
Administration labor cost	\$150,000	\$/yr
Laboratory labor cost	\$190,000	\$/yr
Unit process operation labor cost	\$1,750,000	\$/yr
Unit process maintenance labor cost	\$684,000	\$/yr
Total labor costs	\$2,770,000	\$/yr

MATERIAL COSTS		
Total material cost	\$1,240,000	\$/yr

CHEMICAL COSTS		
Total chemical cost	\$226,000	\$/yr

ENERGY COSTS		
Total energy cost	\$1,390,000	\$/yr

Total operation and maintenance	\$5,630,000	\$/yr
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CONSTRUCTION COST AMC		
Amortization cost for total construction	\$11,000,000	\$/yr

Total annual project cost	\$16,600,000	\$/yr
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PROJECT SUMMARY		
Present worth	\$198,000,000	\$
Total project cost	\$115,000,000	\$
Total operation labor cost	\$2,090,000	\$/yr
Total maintenance labor cost	\$684,000	\$/yr
Total material cost	\$1,240,000	\$/yr
Total chemical cost	\$226,000	\$/yr
Total energy cost	\$1,390,000	\$/yr
Total amortization cost	\$11,000,000	\$/yr

Process Summary

Process	Construction (\$)	Operation (\$/yr)	Maintenance (\$/yr)	Material (\$/yr)	Chemical (\$/yr)	Energy (\$/yr)	Amortization (\$/yr)
Influent Pump Station	9960000	56500	45400	69700	0	64200	848000
Preliminary Treatment	1250000	142000	59100	31200	0	5630	105000
Ultra-Violet Disinfection	1740000	0	19000	17400	8720	62500	171000
Centrifugation	6740000	542000	32100	219000	77200	22000	634000

Microscreening	4360000	125000	70600	482000	0	93400	489000
Effluent	0	0	0	0	0	0	0
Hauling and Land Filling	893000	74300	0	146000	0	0	150000
BNR - 3/5 Stage with MBR	6870000	304000	173000	95100	0	711000	647000
Membrane Bioreactor	18100000	506000	285000	178000	140000	435000	2500000
Blower System	3100000	0	0	0	0	0	260000
Other Costs	62000000	340000	0	0	0	0	5160000

Summary of Other Costs for Layout

Description	Value	Units
Other Costs		
Quantities		
Required land	24	acre
Administration labor hours	2910	hr/yr
Laboratory labor hours	3690	hr/yr
Costs		
DIRECT COSTS		
Mobilization	1190000	\$
Site preparation	1510000	\$
Site electrical	3490000	\$
Yard piping	2280000	\$
Instrumentation and control	1860000	\$
Lab and administration building	2690000	\$
Total direct construction costs	13000000	\$
INDIRECT COSTS		
Cost of land	480000	\$
Miscellaneous cost	3800000	\$
Legal cost	1520000	\$
Engineering design fee	11400000	\$
Inspection cost	1520000	\$
Contingency	7600000	\$
Technical	1520000	\$
Interest during construction	11300000	\$
Profit	9910000	\$
Total indirect construction cost	49000000	\$
Total of other construction costs	62000000	\$
LABOR COSTS		
Administration labor cost	150000	\$/yr
Laboratory labor cost	190000	\$/yr

Summary of Air Supply System

Description	Value	Units
Blower System for Entire Plant		
Design Information		
Minimum air flow capacity	40300	scfm
Safety factor	1.5	
Requested air flow capacity	60500	scfm
Total capacity of blowers	60500	scfm
Number of blowers in use	4	
Total number of blowers	5	
Capacity of individual blowers	15100	scfm
Estimated cost of an installed blower	512000	\$
Blower building area	2140	sqft
Costs		
Construction and equipment cost	3100000	\$
Installed Blower Cost	2560000	\$
Building Cost	236000	\$
Misc Costs	307000	\$
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	260000	\$/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	168000	cuft
Width of wet well	949	ft
Depth of the pumping station	32.7	ft
Length of the pumping station	27.6	ft
Width of the pumping station	988	ft
Minimum depth of water in wet well	11.7	ft

Area of pump building	1110 sqft
Peak capacity of pumps	45.1 MGD(US)
Firm pumping capacity	45.1 MGD(US)
Total dynamic head - average	43.9 ft
Quantities	
Operation labor required	1100 pers-hrs/yr
Maintenance labor required	1000 pers-hrs/yr
Electrical energy required	642000 kWh/yr
Volume of earthwork required	3370000 cuft
Volume of slab concrete requir	317000 cuft
Volume of wall concrete requir	90400 cuft
Capacity per pump	31300 gpm(US)
Number of constant speed pur	2
Number of variable speed pur	0
Diameter of discharge header	40 in
Total dynamic head	52.9 ft
Size of selected pump	36 in
Specific speed of pump	5410
Pump rotating speed	444 rpm
Motor size required	302 HP
Size of selected motor	350 HP
Width of pump system	7.8 ft
Length of pump system	29.4 ft
Length of the dry well	27.6 ft
Width of the dry well	38.4 ft
Costs	
Construction and equipment co	9960000 \$
Earthwork Cost	998000 \$
Wall Concrete Cost	2180000 \$
Slab Concrete Cost	4110000 \$
Building Cost	123000 \$
Installed Pump Equipment C	1030000 \$
Misc Costs	1520000 \$
Operational labor cost	56500 \$/yr
Maintenance labor cost	45400 \$/yr
Material and supply cost	69700 \$/yr
Chemical cost	0 \$/yr
Energy cost	64200 \$/yr
Amortization cost	848000 \$/yr

Preliminary Treatment

Design Output Data

Description	Value	Units
Preliminary Treatment		
Design Information		
Mechanically Cleaned Bar Screen		
Bar size	0.25	in
Bar spacing	1.5	in
Slope of bars from horizontal	30	degrees
Head loss through screen	0.0206	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	9.32	ft
Average channel depth	1	ft
Horizontal Flow Grit Chamber		
Maximum flow	41.8	cuft/s
Average flow	23.3	cuft/s
Minimum flow	14.1	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	20.9	cuft/s
Width of channel	3.48	ft
Depth of channel	4	ft
Length of channel	144	ft
Settling velocity of particle	0.0707	ft/s
Slope of channel bottom	0.00046	
Allowance for currents	1.7	
Manning coefficient	0.035	
Hydraulic retention time	1.6	min
Volume of grit	60.5	cuft/d
Costs		
Construction and equipment co	1250000	\$
Operational labor cost	142000	\$/yr
Maintenance labor cost	59100	\$/yr
Material and supply cost	31200	\$/yr
Chemical cost	0	\$/yr
Energy cost	5630	\$/yr

Amortization cost 105000 \$/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	674	
Number of spare channels	1	
Total number of lamps used in	840	
Number of excess lamps	166	
Number of lamps/modules	4	
Number of modules/bank	5	
Number of banks/channel	7	
Number of channels	6	
Calculated headloss	149	in
Costs		
Construction and equipment cc	1740000	\$
Cost of installation	1050000	\$
Total cost of UV lamps	697000	\$
Operational labor cost	0	\$/yr
Maintenance labor cost	19000	\$/yr
Material and supply cost	17400	\$/yr
Chemical cost	8720	\$/yr
Energy cost	62500	\$/yr
Amortization cost	171000	\$/yr

Centrifugation

Design Output Data

Description	Value	Units
Centrifugation		
Design Information		
Total power required	566	HP
Power required per unit	189	HP
Excess capacity factor	1.25	
Number of units	3	
Chemical dose	1	% dry wt
Chemicals required	28.6	lb/hr
Sludge flow	453	gpm(US)
Initial solid conc	1.2	%
Operational hours per day	8	hr
Operational days per week	5	d
Quantities		
Number of centrifuges	3	
Power required per unit	189	HP
Area of building	960	sqft
Dry solids produced	7.77	ton(short)/d
Operation labor required	4230	pers-hrs/yr
Maintenance labor required	708	pers-hrs/yr
Electrical energy required	220000	kWh/yr
Costs		
Construction and equipment cc	6320000	\$
Operational labor cost	218000	\$/yr
Maintenance labor cost	32100	\$/yr
Material and supply cost	210000	\$/yr
Chemical cost	0	\$/yr
Energy cost	22000	\$/yr
Amortization cost	634000	\$/yr
Polymer Feed System		
Quantities		
Polymer dosage	228	lb/d
Liquid chemical solution fed	11000	gpd(US)
O&M labor required	5010	pers-hrs/yr
Dry material handling and mixi	1280	pers-hrs/yr
Total operation labor required	6300	pers-hrs/yr
Costs		
Construction and equipment cc	425000	\$
Operational labor cost	324000	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	8490	\$/yr
Chemical cost	77200	\$/yr
Energy cost	0	\$/yr
Amortization cost	0	\$/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	2690 sqft
Quantities	
Number of batteries	1
Number of units/battery	15
Drum diameter	10 ft
Drum width	10 ft
Area of selected unit	315 sqft
Area of building	1620 sqft
Operation labor required	2420 pers-hrs/yr
Maintenance labor required	1560 pers-hrs/yr
Electrical energy required	934000 kWh/yr
Volume of wall concrete required	15700 cuft
Volume of earthwork required	65900 cuft
Costs	
Construction and equipment cost	4360000 \$
Earthwork Cost	19500 \$
Slab Concrete Cost	378000 \$
Building Cost	178000 \$
Installed Equipment Cost	3220000 \$
Misc Costs	569000 \$
Operational labor cost	125000 \$/yr
Maintenance labor cost	70600 \$/yr
Material and supply cost	482000 \$/yr
Chemical cost	0 \$/yr
Energy cost	93400 \$/yr
Amortization cost	489000 \$/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	92.3	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	2	
Distance to disposal site	10	miles
Quantities		
Total sludge volume hauled	92.3	cuyd/d
Maximum anticipated landfill duration	30	d
Anticipated sludge storage height	8	ft
Sludge storage shed area	9340	sqft
Width of sludge storage shed	68.3	ft
Length of sludge storage shed	137	ft
Volume of earthwork required	24700	cuft
Volume of slab concrete required	10300	cuft
Surface area of canopy roof	9340	sqft
Round trip haul distance	20	miles
Round trips per day per truck	3	
Distance traveled per year per truck	15000	miles
Sludge hauled	81.6	ton(short)/d
Operation labor required	1440	pers-hrs/yr
LandFilling cost	35200	\$/yr
Costs		
Construction and equipment cost	893000	\$
Earthwork Cost	7300	\$
Slab Concrete Cost	133000	\$
Canopy Roof Cost	187000	\$
Vehicle Cost	566000	\$
Operational labor cost	74300	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	146000	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	150000	\$/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		
Max. specific growth of nitrifier:	0.374	1/d
Death rate of nitrifiers at winter	0.0601	1/d
Minimum aerobic SRT for nitrif	4.67	d
Design aerobic SRT for nitrific:	6.54	d
Total reactor SRT	10.5	d
Design SS	9000	mg/L
Calculated VSS	6560	mg/L
Calculated VSS:TSS ratio	0.729	mg VSS/mg SS
Total volume of anaerobic reac	1270	m ³
Total volume of anoxic reactor:	1930	m ³
Total volume of aerobic reacto	5270	m ³
Total volume of all reactors	8470	m ³
Width of parallel train	10	m
Sidewater depth	5	m
Number of batteries	1	
Number of parallel trains per b	6	
Number of anoxic cells within c	1	
Number of aerobic cells within	1	
Anaerobic hydraulic retention ti	0.532	hr
Anoxic hydraulic retention time	0.806	hr
Aerobic hydraulic retention tim	2.21	hr
Amount of sludge generated	7260	kg/d
Sludge recycle ratio	300	%
Sludge recycle rate	172000	m ³ /d
Nitrogen required for biomass	12.7	mg/L
Phosphorus required for bioma	2.53	mg/L
Oxygen required to meet aver	10100	kg/d
Air flow required to meet aver	16700	N m ³ /hr
Design air flow	52.8	N m ³ /min/1000 m ³
Quantities		
Operation labor required	3960	pers-hrs/yr
Maintenance labor required	2180	pers-hrs/yr
Electrical energy required	3080000	kWh/yr
Volume of earthwork required	173000	cuft
Volume of slab concrete requir	75100	cuft
Volume of wall concrete requir	37600	cuft
Handrail length	1260	ft
Number of diffusers per train	840	
Fine bubble diffuser floor cover	19.2	%
Number of swing arm headers	4	
Required mixing power	46.8	kW
Total number of mixers	24	
Design mixing power per mixer	2.24	kW
Mixing power for each unaerat	3.9	kW
Costs		
Construction and equipment co	4210000	\$
Earthwork Cost	51300	\$
Wall Concrete Cost	904000	\$
Slab Concrete Cost	974000	\$
Handrail Cost	94500	\$
Installed Aerator Equipment	810000	\$
Air Piping Cost	586000	\$
Installed Mixer Equipment Co	369000	\$
Misc Costs	417000	\$
Operational labor cost	204000	\$/yr
Maintenance labor cost	98500	\$/yr
Material and supply cost	76500	\$/yr
Chemical cost	0	\$/yr
Energy cost	308000	\$/yr
Amortization cost	395000	\$/yr
Internal Recycle Pumping		
Design Information		
Average daily pumping rate	7.57	MGD(US)
Total pumping capacity	7.57	MGD(US)
Design capacity per pump	2630	gpm(US)
Number of pumps	18	
Number of batteries	1	
Firm pumping capacity	7.57	MGD(US)
Quantities		
Operation labor required	580	pers-hrs/yr
Maintenance labor required	492	pers-hrs/yr
Electrical energy required	1510000	kWh/yr
Volume of earthwork required	2790	cuft
Area of pump building	349	sqft
Costs		
Construction and equipment co	1120000	\$
Earthwork Cost	4970	\$
Pump Building Cost	231000	\$

Installed Pump Cost	717000 \$
Misc Costs	171000 \$
Operational labor cost	29900 \$/yr
Maintenance labor cost	22300 \$/yr
Material and supply cost	7870 \$/yr
Chemical cost	0 \$/yr
Energy cost	151000 \$/yr
Amortization cost	106000 \$/yr
Internal Recycle Pumping	
Design Information	
Average daily pumping rate	10.1 MGD(US)
Total pumping capacity	10.1 MGD(US)
Design capacity per pump	3500 gpm(US)
Number of pumps	18
Number of batteries	1
Firm pumping capacity	10.1 MGD(US)
Quantities	
Operation labor required	639 pers-hrs/yr
Maintenance labor required	541 pers-hrs/yr
Electrical energy required	2020000 kWh/yr
Volume of earthwork required	3190 cuft
Area of pump building	399 sqft
Costs	
Construction and equipment cost	1280000 \$
Earthwork Cost	5670 \$
Pump Building Cost	263000 \$
Installed Pump Cost	814000 \$
Misc Costs	195000 \$
Operational labor cost	32900 \$/yr
Maintenance labor cost	24500 \$/yr
Material and supply cost	8940 \$/yr
Chemical cost	0 \$/yr
Energy cost	202000 \$/yr
Amortization cost	121000 \$/yr
Sludge Recycle Pumping	
Design Information	
Average daily pumping rate	15.1 MGD(US)
Total pumping capacity	15.1 MGD(US)
Design capacity per pump	5260 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	15.1 MGD(US)
Quantities	
Operation labor required	732 pers-hrs/yr
Maintenance labor required	617 pers-hrs/yr
Electrical energy required	504000 kWh/yr
Volume of earthwork required	3990 cuft
Area of pump building	499 sqft
Costs	
Construction and equipment cost	265000 \$
Earthwork Cost	1180 \$
Pump Building Cost	54800 \$
Installed Pump Cost	169000 \$
Misc Costs	40400 \$
Operational labor cost	37700 \$/yr
Maintenance labor cost	27900 \$/yr
Material and supply cost	1850 \$/yr
Chemical cost	0 \$/yr
Energy cost	50400 \$/yr
Amortization cost	25100 \$/yr

Membrane Bioreactor

Design Output Data

Description	Value	Units
Membrane Bioreactor		
Design Information		
Total volume of reactors	134000	cuft
Length of parallel train	52.3	ft
Width of parallel train	26.1	ft
Sidewater depth	16.4	ft
Number of batteries	1	
Number of parallel trains per battery	6	
Total Membrane Area	171000	m2
Total Scour Air Requirement	42800	N m3/hr
Quantities		
Operation labor required	8700	pers-hrs/yr
Maintenance labor required	5250	pers-hrs/yr
Electrical energy required	3890000	kWh/yr
Volume of earthwork required	87900	cuft
Volume of slab concrete required	48600	cuft
Volume of wall concrete required	22400	cuft
Handrail length	1250	ft

Number of diffusers per train	420
Number of swing arm headers	3
Costs	
Construction and equipment cc	17200000 \$
Earthwork Cost	26100 \$
Wall Concrete Cost	539000 \$
Slab Concrete Cost	629000 \$
Handrail Cost	93800 \$
Membrane Cost	14800000 \$
Installed Aerator Equipment	459000 \$
Air Piping Cost	449000 \$
Misc Cost	292000 \$
Operational labor cost	448000 \$/yr
Maintenance labor cost	238000 \$/yr
Material and supply cost	172000 \$/yr
Chemical cost	140000 \$/yr
Energy cost	389000 \$/yr
Amortization cost	2420000 \$/yr
Permeate Pumping	
Design Information	
Average daily pumping rate	3.03 MGD(US)
Total pumping capacity	5.43 MGD(US)
Design capacity per pump	2090 gpm(US)
Number of pumps	15
Number of batteries	1
Firm pumping capacity	30.2 MGD(US)
Quantities	
Operation labor required	774 pers-hrs/yr
Maintenance labor required	773 pers-hrs/yr
Electrical energy required	455000 kWh/yr
Volume of earthwork required	2550 cuft
Area of pump building	319 sqft
Costs	
Construction and equipment cc	849000 \$
Earthwork Cost	3780 \$
Pump Building Cost	175000 \$
Installed Pump Cost	541000 \$
Misc Costs	130000 \$
Operational labor cost	39900 \$/yr
Maintenance labor cost	35000 \$/yr
Material and supply cost	5950 \$/yr
Chemical cost	0 \$/yr
Energy cost	45500 \$/yr
Amortization cost	80300 \$/yr
Waste Sludge Pumping	
Design Information	
Average daily pumping rate	0.155 MGD(US)
Total pumping capacity	0.155 MGD(US)
Design capacity per pump	53.9 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	0.155 MGD(US)
Quantities	
Operation labor required	346 pers-hrs/yr
Maintenance labor required	273 pers-hrs/yr
Electrical energy required	5220 kWh/yr
Volume of earthwork required	1620 cuft
Area of pump building	203 sqft
Costs	
Construction and equipment cc	52400 \$
Earthwork Cost	481 \$
Pump Building Cost	22300 \$
Installed Pump Cost	21600 \$
Misc Costs	7990 \$
Operational labor cost	17800 \$/yr
Maintenance labor cost	12400 \$/yr
Material and supply cost	367 \$/yr
Chemical cost	0 \$/yr
Energy cost	522 \$/yr
Amortization cost	4950 \$/yr