## Layout - Snyderville Basin Silver Creek



Summary Equipment Database Hydromantis 2014,(USA Avg)

### Layout Summary

	Value	Units
Unit process construction cost	\$24 300 000	\$
Other direct construction costs	\$5 320 000	\$
Other indirect construction cos	\$22,000,000	\$
Total construction costs	\$51,600,000	ŝ
ANNUAL COSTS		•
LABOR COSTS		
Administration labor cost	\$53,200	\$/yr
Laboratory labor cost	\$156,000	\$/yr
Unit process operation labor co	\$1,060,000	\$/yr
Unit process maintenance labo	\$426,000	\$/yr
Total labor costs	\$1,690,000	\$/yr
MATERIAL COSTS		
Total material cost	\$497,000	\$/yr
CHEMICAL COSTS		
Total chomical cost	\$71.400	¢hur
Total chemical cost	ψ/ 1, <del>-</del> 00	ψ/yi
ENERGY COSTS		
Total energy cost	\$550,000	\$/yr
Total operation and maintanen	\$2,810,000	\$/yr
CONSTRUCTION COST AMO	<b>A</b> 4 000 000	<b>A</b> /
Amortization cost for total cons	\$4,880,000	\$/yr
Total annual project cost	\$7.690.000	\$/vr
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PROJECT SUMMARY		
Present worth	\$92,000,000	\$
Total project cost	\$51,600,000	\$
Total operation labor cost	\$1,260,000	\$/yr
Total maintenance labor cost	\$426,000	\$/yr
Total material cost	\$497,000	\$/yr
Total chemical cost	\$71,400	\$/yr
Total energy cost	\$550,000	\$/yr
Total amortization cost	\$4,880,000	\$/yr

### Process Summary

Process	Construction (\$)	Operation (\$/yr)	Maintenance (\$/yr)	Material (\$/yr)	Chemical (\$/yr)	Energy (\$/yr)	Amortization (\$/yr)
Influent Pump Station	3310000	36300	26000	23200	0	47000	283000
Preliminary Treatment	671000	52900	23900	16800	0	3050	56300
Ultra-Violet Disinfection	877000	0	9620	8770	3050	21900	74300
Centrifugation	4360000	264000	14800	109000	16800	5360	426000
Microscreening	1300000	33200	18100	129000	0	39500	142000
Post Aeration	58000	32900	10600	1440	0	3330	5270
Drying Beds	385000	83400	35300	3470	0	0	33500
BNR - 3/5 Stage with MBR	3990000	226000	120000	75800	0	258000	371000
Effluent	0	0	0	0	0	0	0
Hauling and Land Filling	298000	2910	0	53600	0	0	62500
Membrane Bioreactor	7800000	324000	167000	76700	51600	172000	1060000
Blower System	1200000	0	0	0	0	0	101000
Other Costs	27400000	209000	0	0	0	0	2270000

Summary of Other Costs for Description Other Costs	Layout Value		Units
Quantities			
Required land		15	acre
Administration labor hours		1030	hr/yr
Laboratory labor hours Costs		3020	hr/yr
DIRECT COSTS			
Mobilization	4	78000	\$
Site preparation	7	09000	\$
Site electrical	13	30000	ŝ
Yard piping	8	92000	\$
Instrumentation and control	6	65000	ŝ
Lab and administration building	12	50000	ŝ
Total direct construction costs	53	20000	\$
INDIRECT COSTS			
Cost of land	3	00000	\$
Miscellaneous cost	17	00000	\$
Legal cost	6	80000	\$
Engineering design fee	51	00000	\$
Inspection cost	6	80000	\$
Contingency	34	00000	\$
Technical	6	80000	\$
Interest during construction	50	60000	\$
Profit	44	40000	\$
Total indirect construction cost	220	00000	\$
Total of other construction cos	274	00000	\$
LABOR COSTS			
Administration labor cost		53200	\$/yr
Laboratory labor cost	1	56000	\$/yr
Summary of Air Supply Syst Description Blower System for Entire Plant	em Value		Units
Design Information			
Minimum air flow capacity Safety factor		15900	scfm
Requested air flow capacity		23800	scfm
Total capacity of blowers		23800	scfm
Number of blowers in use		4	
Total number of blowers		5	
Capacity of individual blowers		5950	scfm
Estimated cost of an installed t	1	79000	\$
Blower building area		1690	sqft
Construction and equipment or	12	00000	\$
Installed Blower Cost	8	96000	ŝ
Building Cost	1	86000	ŝ
Misc Costs	1	19000	\$
Operational labor cost	'	0000 n	\$/vr
Maintenance labor cost		0	\$/vr
Material and supply cost		0	\$/vr
Chemical cost		0	\$/vr
Energy cost		0	¢,y: \$/\/r
Amortization cost	1	01000	\$/vr
Notes	1	01000	φ, μ

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

# Influent Wastewater

initiaent i unip otation		
Design Output Data		
Description	Value	Units
Pump Station		
Design Information		
Volume of wet well	53200	cuft
Width of wet well	410	ft
Depth of the pumping station	28.3	ft
Length of the pumping station	21.2	ft
Width of the pumping station	441	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	74.5	ft
Quantities		
Operation labor required	705	pers-hrs/yr
Maintenance labor required	595	pers-hrs/yr
Electrical energy required	470000	kWh/yr
Volume of earthwork required	1110000	cuft
Volume of slab concrete requir	89400	cuft
Volume of wall concrete requir	34800	cuft
Capacity per pump	9410	gpm(US)
Number of constant speed pur	2	
Number of variable speed pur	0	
Diameter of discharge header	21.9	in
Total dynamic head	90	ft
Size of selected pump	20	in
Specific speed of pump	3980	

Duran astation and ad		4000	
Pump rotating speed		1200	rpm up
Niotor size required		249	HP
Size of selected motor		250	HP A
viain of pump system		4.0	11 A
Length of pump system		21.0	11. #
Width of the dry well		21.2	11. #
Costo		50.0	n
Construction and equipment of		3310000	¢
Earthwork Cost		330000	¢
Wall Concrete Cost		830000	¢
Slab Concrete Cost		1160000	¢
Building Cost		75000	¢
Installed Pump Equipment C		407000	¢
Miec Coste		506000	¢
Operational labor cost		36300	\$/vr
Maintenance labor cost		26000	\$/vr
Material and supply cost		23200	\$/vr
Chemical cost		20200	\$/vr
Energy cost		47000	\$/vr
Amortization cost		283000	\$/vr
Preliminary Treatment			
Design Output Data			
Description	Value		Units
Preliminary Treatment			
Design Information			
Mechanically Cleaned Bar Scr	een		
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		2.48	ft
Average channel depth		1	ft
Horizontal Flow Grit Chamber			
Maximum flow		15.4	cuft/s
Average flow		6.21	cuft/s
Minimum flow		3.13	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		7.72	cuft/s
Width of channel		1.29	ft
Depth of channel		4	ft
Length of channel		144	ft
Settling velocity of particle		0.0707	ft/s
Slope of channel bottom		0.00136	
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 co		671000	\$
Operational labor cost		52900	\$/yr
Maintenance labor cost		23900	\$/yr
Material and supply cost		16800	\$/yr
Chemical cost		0	\$/yr
Amertization cost		3050	\$/yr
Amonization cost		30300	φ/yi
Ultra-Violet Disinfection			
Design Output Data			
Design Output Data	Value		Unite
Ultra Violat Disinfaction	value		Units
Design Information			
Design based on a model calc		2 12	aal/LIS)/(min.\//)
Total number of lamps needed		2.12	gai(00)/(min w)
Number of spare channels		243	
Total number of lamps used in		294	
Number of excess lamps		45	
Number of lamps/modules		2	
Number of modules/bank		3	
Number of banks/channel		7	
Number of channels		7	
Calculated headloss		158	in
Costs		.50	
Construction and equipment of		877000	\$
Cost of installation		526000	\$
Total cost of UV lamps		351000	\$
Operational labor cost		0	\$/yr
Maintenance labor cost		9620	\$/yr
Material and supply cost		8770	\$/yr
Chemical cost		3050	\$/yr
Energy cost		21900	\$/yr
Amortization cost		74300	\$/yr

Centrifugation			
Design Output Data	Value		Unite
Centrifugation	value		onits
Design Information			
Total power required		123	HP
Power required per unit		61.5	HP
Excess capacity factor		1.25	
Number of units		2	
Chemical dose		1	% dry wt
Sludge flow		0.2	apm(LIS)
Initial solid conc		1.2	%
Operational hours per day		8	hr
Operational days per week		5	d
Quantities			
Number of centrifuges		2	
Power required per unit		61.5	HP
Dry solids produced		422	squ ton(short)/d
Operation labor required		1970	pers-hrs/vr
Maintenance labor required		340	pers-hrs/yr
Electrical energy required		53600	kWh/yr
Costs			
Construction and equipment	CC	4250000	\$
Operational labor cost Maintenance labor cost		102000	\$/yr \$/yr
Material and supply cost		106000	\$/yr
Chemical cost		00000	\$/yr
Energy cost		5360	\$/yr
Amortization cost		426000	\$/yr
Polymer Feed System			
Quantities		10.0	16.74
Folymer dosage		49.0	and(LIS)
O&M labor required		2330	pers-hrs/vr
Dry material handling and mi	xiı	833	pers-hrs/yr
Total operation labor require	d	3160	pers-hrs/yr
Costs			
Construction and equipment	CC	115000	\$
Operational labor cost Maintonance labor cost		163000	\$/yr \$/yr
Material and supply cost		2300	\$/yr
Chemical cost		16800	\$/vr
Energy cost		0	\$/yr
		0	Cher
Amortization cost		0	ф/ yi
Amortization cost		0	φ/yi
Amortization cost Microscreening Design Output Data		U	φ/yi
Amortization cost Microscreening Design Output Data Description	Value	U	Units
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Amortization cost Microscreening Design Output Data Description Microscreening Design Information	Value	0	Units
Amortization cost Microscreening Design Output Data Description Microscreening Design Information Microscreen loading rate	Value	7	units gal(US)/(sqft·min)
Amortization cost Microscreening Design Output Data Description Microscreening Design Information Microscreen loading rate Quantity of wash water requi	Value	7	units gal(US)/(sqft·min) %-
Amortization cost Microscreening Description Microscreening Design Information Microscreen loading rate Quantity of wash water required Overstiffiction	<b>Value</b> re	7 4 995	units gal(US)/(sqft·min) % sqft
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Amortization cost Microscreening Design Output Data Design Output Data Design Information Microscreen loading rate Quantity of wash water required Quantities Number of batteries Number of batteries Number of units/battery Drum diameter	Value re ed	0 7 4 995 1 4 10	gal(US)/(sqft·min) % sqft
Amortization cost Microscreening Description Microscreening Design Information Microscreen loading rate Quantity of wash water requi Area of microscreens require Quantities Number of batteries Number of units/battery Drum diameter Drum width	Value re ed	7 4 995 1 4 10 10	yyi Units gal(US)/(sqft⋅min) % sqft ft
Amortization cost Microscreening Description Microscreening Design Information Microscreen loading rate Quantity of wash water requi Area of microscreens require Quantities Number of batteries Number of units/battery Drum diameter Drum width Area of selected unit	Value re ed	7 4 995 1 4 10 10 315	yyı Units gal(US)/(sqft⋅min) % sqft ft ft sqft
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Amortization cost Microscreening Design Output Data Description Microscreening Design Information Microscreen loading rate Quantity of wash water requi Area of microscreens required Quantities Number of batteries Number of units/battery Drum width Area of selected unit Area of wall concrete required Volume of earthwork require Costs Construction and equipment Earthwork Cost Slab Concrete Cost Building Cost Installed Equipment Cost Misc Costs Operational labor cost Maintenance labor cost Maintenance labor cost Maintenance labor cost Maintenance labor cost Material and supply cost Chemical cost Energy cost Amortization cost Post Aeration Design Output Data Description Post Averation by Diffused Ae Design Information Dissolved oxygen in influent Desired dissolved oxygen in	Value re ed tim d cc <b>Value</b> ration ef	7 4 995 1 4 4 00 10 315 660 645 415 395000 7900 26100 1300000 7750 190000 857000 130000 857000 18100 129000 33200 18100 129000 39500 142000	syyi Units gal(US)/(sqft·min) % sqft ft ft sqft pers-hrs/yr pers-hrs/yr pers-hrs/yr cuft cuft s \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
Amortization cost Microscreening Design Output Data Description Microscreening Design Information Microscreen loading rate Quantity of wash water requi Area of microscreens required Quantity of wash water requi Area of building Number of batteries Number of batteries Number of batteries Number of batteries Number of batteries Number of loatteries Number of loatter of loatteries Number of loatterie	Value re ed value ration	7 4 995 1 4 10 10 315 660 7900 26100 130000 7750 190000 72600 857000 169000 33200 18100 129000 0 339500 142000	syyi Units gal(US)/(sqft·min) % sqft ft ft sqft sqft sqft sqft sqft sqf
Amortization cost Microscreening Design Output Data Description Microscreening Design Information Microscreen loading rate Quantity of wash water requi Area of microscreens required Quantity of wash water requi Area of building Operation labor required Maintenance labor required Volume of wall concrete requ Volume of earthwork required Construction and equipment Earthwork Cost Slab Concrete Cost Building Cost Installed Equipment Cost Maintenace labor cost Maintenace labor cost Building Cost Installed Equipment Cost Maintenial and supply cost Chemical cost Energy cost Amortization cost Post Aeration Post Aeration pb Diffused Ae Design Information Dissolved oxygen in influent Desired dissolved oxygen in	Value re ed Value ration ef e	7 4 995 1 4 10 10 315 660 645 415 335500 7900 26100 130000 7750 130000 7750 130000 857000 857000 18100 129000 18100 0 33200 142000 142000	syyi Units gal(US)/(sqft·min) % sqft ft ft sqft sqft sqft sqft sqft sqf
Amortization cost Microscreening Design Output Data Description Microscreening Design Information Microscreen loading rate Quantity of wash water requi Area of microscreens required Quantities Number of batteries Number of batteries Number of units/battery Drum diameter Drum width Area of selected unit Area of selected unit Area of selected unit Area of building Operation labor required Maintenance labor required Electrical energy required Volume of earthwork required Construction and equipment Earthwork Cost Slab Concrete Cost Building Cost Installed Equipment Cost Material and supply cost Chemical cost Energy cost Amortization cost Post Aeration Design Output Data Design Output Data Design Information Dissolved oxygen in influent Design dissolved oxygen in Correction factor for pressur Minimum dissolved oxygen in Oxygen saturation at summer	Value re ed Value ration ef e n t r	7 4 995 1 4 4 0 10 315 660 645 415 395000 7900 26100 1300000 7750 190000 72600 857000 1300000 132000 18100 0 33200 142000 142000	syyi Units gal(US)/(sqft·min) % sqft ft ft sqft sqft sqft sqft sqft sqf

Operating transfer efficiency	2.9	5 lbO2/(HP·h)
Total volume of aerobic reacto	2770	0 gal(US)
Air flow rate required to meet a	13	4 scfm
Juanulies	1	c #
ength of basin	82	3 IL 4 ft
Nidth of basin	3	0 ft
Number of diffusers	1	2
Number of swing arm diffuser I		1
/olume of wall concrete require	86	0 cuft
/olume of slab concrete requir	18	5 cuft
Electrical energy required	3330	0 kWh/yr
Operation labor required	64	0 pers-hrs/yr
Maintenance labor required	24	3 pers-hrs/yr
Josts	5000	0.0
Well Construction and equipment co	5800	U \$ 0 ¢
Slab Concrete Cost	2070	0 \$ 0 ¢
Installed Equipment Cost	2040	οφ Λ¢
Misc Costs	575	0 \$ 0 \$
Operational labor cost	3290	0 \$/vr
Maintenance labor cost	1060	0 \$/vr
Material and supply cost	144	0 \$/yr
Chemical cost		0 \$/yr
Energy cost	333	0 \$/yr
Amortization cost	527	0 \$/yr
Drying Beds		
Design Output Data		
Description	Value	Units
Sludge Drying Beds		
Design Information		
Fotal surface area required	2690	0 sqft
nitial depth of sludge	1.	2 in
-Inal solids	5	0% cd
	49.	σu
Juanuues Total drving bed surface area	2600	0 saft
Number bede	2030	0 341
Surface area of each individua	299	o O saft
ength of each bed	14	9 ft
/olume of earthwork required	13200	0 cuft
/olume concrete for dividing w	937	0 cuft
/olume of R.C. in-place for true	201	0 cuft
/olume of sand	2010	0 cuft
/olume of gravel	2690	0 cuft
Clay pipe diameter		6 in
Fotal length clay pipe	269	0 in
Sludge solids produced	1.5	2 ton(short)/d
Operational labor required	162	0 pers-hrs/yr
Maintenance labor required	80	9 pers-hrs/yr
	20500	0.0
Earthwork Cost	38500	0 \$ 0 ¢
Wall Concrete Cost	15900	0 ¢ 0 ¢
Slab Concrete Cost	15000	0\$
Drving Bed Media Cost	7500	0\$
Drain Pine System Cost	5910	0\$
Misc Costs	3820	0\$
Operational labor cost	8340	0 \$/yr
Maintenance labor cost	3530	0 \$/yr
Material and supply cost	347	0 \$/yr
Chemical cost		0 \$/yr
Energy cost		0 \$/yr
Amortization cost	3350	0 \$/yr
ND 2/5 Store with MPD		
Design Output Data		
Description	Value	Units
BNR System for BIO-P and N F	Removal	Onits
Design Information	tomovar	
5-Stage Biological Phosphorus		
Design aerobic SRT for nitrifica	1	5 d
Total reactor SRT	3	0 d
Design SS	900	0 mg/L
Calculated VSS	643	0 mg/L
Calculated VSS:TSS ratio	0.71	5 mg VSS/mg SS
Total volume of anaerobic reac	78	9 m3
Fotal volume of anoxic reactor:	184	0 m3
Total volume of aerobic reacto	263	0 m3
Fotal volume of all reactors	526	0 m3
Nidth of parallel train	1	0 m
sidewater depth		5 m
NUMBER OF DATTERIES		1
Number of parallel trains per b		4 2
Number of anoxic cells within (		∠ 2
Anaeropic bydraulic retention t	10	∠ 4. hr
Anoxic hydraulic retention time	1.2	9 hr
Aerobic hydraulic retention time	4 1	4 hr
Amount of sludge generated	158	0 kg/d
Sludge recycle ratio	30	0 %

Sludge recycle rate	45800	m3/d
Nitrogen required for biomass	12.7	mg/L
Phosphorus required for bioma	2.54	mg/L
Oxygen required to meet avera	3310	kg/d
Air flow required to meet avera	5490	N m3/hr
Design air flow	34.8	N m3/min/1000 m3
Quantities		
Operation labor required	2800	pers-hrs/yr
Maintenance labor required	1420	pers-hrs/yr
Electrical energy required	1370000	kWh/yr
Volume of earthwork required	111000	cuft
Volume of slab concrete requir	51100	cuft
Volume of wall concrete require	25200	cuft
Handrail length	928	ft
Number of diffusers per train	431	
Fine bubble diffuser floor cove	12.6	%
Number of swing arm headers	4	
Required mixing power	36.4	kW
Total number of mixers	24	
Design mixing power per mixer	2.24	kW
Mixing power for each unaerat	3.03	kW
Costs		
Construction and equipment co	2700000	\$
Earthwork Cost	33000	\$
Wall Concrete Cost	606000	\$
Slab Concrete Cost	663000	\$
Handrail Cost	69600	\$
Installed Aerator Equipment	432000	\$
Air Piping Cost	257000	\$
Installed Mixer Equipment Co	369000	\$
Misc Costs	267000	\$
Operational labor cost	144000	\$/yr
Maintenance labor cost	62000	\$/yr
Material and supply cost	66700	\$/yr
Chemical cost	0	\$/yr
Energy cost	137000	\$/yr
Amortization cost	249000	\$/yr
Internal Recycle Pumping		
Design Information		
Average daily pumping rate	4.03	MGD(US)
Total pumping capacity	4.03	MGD(US)
Design capacity per pump	1400	gpm(US)
Number of pumps	12	
Number of batteries	1	
Firm pumping capacity	4.03	MGD(US)
Quantities		
Operation labor required	526	pers-hrs/yr
Maintenance labor required	442	pers-hrs/yr
Electrical energy required	538000	kWh/yr
Volume of earthwork required	2240	cuft
Area of pump building	279	sqft
Costs		•
Construction and equipment co	576000	\$
Earthwork Cost	2650	\$
Pump Building Cost	123000	\$
Installed Pump Cost	362000	\$
Misc Costs	87800	\$
Operational labor cost	27100	\$/yr
Maintenance labor cost	19300	\$/yr
Material and supply cost	4030	\$/yr
Chemical cost	0	\$/yr
Energy cost	53800	\$/yr
Amortization cost	54400	\$/yr
Internal Recycle Pumping		
Design Information	4.00	
Average daily pumping rate	4.03	MGD(US)
I otal pumping capacity	4.03	MGD(US)
Design capacity per pump	1400	gpm(US)
Number of pumps	12	
	1 02	
Firm pumping capacity	4.03	MGD(US)
Quantities	506	noro bro/ur
Meintenenee leher required	320	pers-hrs/yr
Electrical operaty required	529000	kW/b/m
Liectrical energy required	536000	KVVII/yi
Area of nume building	2240	cuit
Costs	215	squ
Construction and equipment or	576000	\$
Farthwork Cost	2650	ŝ
Pump Building Cost	122000	\$
Installed Pump Cost	123000	\$
Mise Costs	302000	φ ¢
Mise COSIS	0/000	φ ¢/wr
Maintenance Johor cost	2/ 100	ψιyi \$/vr
Material and supply cost	19200	ψι yi \$/vr
Material and supply COSL	4030	φ/yl ¢/yr
Energy cost	E2000	φ/yr ¢/yr
Energy Cost	53800	φ/yr ¢/yr
Minoritzation cost Sludgo Booydo Dumnin -	54400	φiyi
Siluage Recycle Pumping		
Average deily pumping anto	4.00	
rverage daily pumping rate	4.03	1000(00)

I otal pumping capacity			1.000 (1.10)	
		4.03	MGD(US)	
Design capacity per pump	1	1400	gpm(US)	
Number of pumps		3		
Number of batteries		1		
Firm pumping capacity		4.03	MGD(US)	
Quantities				
Operation labor required		526	pere-bre/vr	
Maintananaa lahar raguirad		440	pero bro/yr	
Maintenance labor required	101	442	pers-ms/yr	
Electrical energy required	135	5000	KVVn/yr	
Volume of earthwork required		2240	cuft	
Area of pump building		279	sqft	
Costs				
Construction and equipment c	. 144	1000	\$	
Earthwork Cost		662	\$	
Pump Building Cost	30	0700	\$	
Installed Pump Cost	90	500	\$	
Mice Costs	21	1000	¢	
Operational Johan aget	21	7100	φ ¢hæ	
Operational labor cost	21	100	\$/yi	
Maintenance labor cost	19	3300	\$/yr	
Material and supply cost	1	1010	\$/yr	
Chemical cost		0	\$/yr	
Energy cost	13	3500	\$/yr	
Amortization cost	13	3600	\$/yr	
Effluent				
Design Output Data				
Description	Valuo		Unite	
Cente	value		onits	
Cosis		~	•	
Construction and equipment c	t i i i i i i i i i i i i i i i i i i i	0	\$	
Operational labor cost		0	\$/yr	
Maintenance labor cost		0	\$/yr	
Material and supply cost		0	\$/yr	
Chemical cost		0	\$/vr	
Energy cost		ō	\$/vr	
Amortization cost		0	¢, yi	
Amonization cost		0	ψiği	
Hauling and Land Filling				
Hadning and Land Finning				
Design Output Data	M.1 .		11.94	
Description	Value		Units	
Sludge Hauling and Land Fillin	g			
Design Information				
Volume of sludge hauled		3.61	cuyd/d	
Truck capacity		19	cuvd	
Round trip time to disposal site		1	hr	
Truck loading time		0 75	hr	
Operational bours per day		0.70	hr	
Number of trucks required		1	111	
Number of trucks required		10		
Distance to disposal site		10	mies	
Quantities				
Total sludge volume hauled	:	3.61	cuyd/d	
Total sludge volume hauled Maximum anticipated landfill d	:	3.61 30	cuyd/d d	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei	: (	3.61 30 8	cuyd/d d ft	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area	C 1	3.61 30 8 365	cuyd/d d ft sqft	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed	! !	3.61 30 8 365 13.5	cuyd/d d ft sqft ft	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Length of sludge storage shed	( ! !	3.61 30 8 365 13.5 27	cuyd/d d ft sqft ft ft	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Length of sludge storage shed	( ! !	3.61 30 365 13.5 27	cuyd/d d ft sqft ft ft cuff	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Length of sludge storage shed Volume of earthwork required	( ! !	3.61 30 8 365 13.5 27 1190	cuyd/d d ft sqft ft cuft cuft	
Total sludge volume hauled Maximum anticipated landfild Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Length of sludge storage shed Volume of earthwork required Volume of slab concrete requi	( ! ! 1	3.61 30 8 365 13.5 27 1190 551	cuyd/d d ft sqft ft cuft cuft cuft	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Length of sludge storage shed Volume of earthwork required Volume of slab concrete requi		3.61 30 365 13.5 27 1190 551 365	cuyd/d d ft sqft ft cuft cuft sqft	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Volume of earthwork required Volume of slab concrete requi Surface area of canopy roof Round trip haul distance	4 9 1 1 1	3.61 30 8 365 13.5 27 1190 551 365 20	cuyd/d d ft sqft ft cuft cuft sqft miles	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Length of sludge storage shed Volume of earthwork required Volume of slab concrete requi Surface area of canopy roof Round trip haul distance Round trips per day per truck	4 1 1 1 1 1 1 1	3.61 30 8 365 13.5 27 1190 551 365 20 1	cuyd/d d ft sqft ft cuft cuft sqft miles	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Length of sludge storage shed Volume of earthwork required Volume of slab concrete requi Surface area of canopy roof Round trip haul distance Round trip per day per truck Distance traveled per year per		3.61 30 8 365 13.5 27 1190 551 365 20 1 5000	cuyd/d d ft sqft ft cuft cuft cuft sqft miles miles	
Total sludge volume hauled Maximum anticipated landfil d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Volume of earthwork required Volume of slab concrete requi Surface area of canopy roqui Surface area of canopy roqui Surface area of canopy roqui Surface area of panopy roqui Surface area of pa	( ! !	3.61 30 8 365 13.5 27 1190 551 365 20 1 5000 3.19	cuyd/d d ft sqft ft cuft cuft sqft miles miles ton(short)/d	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Length of sludge storage shed Volume of earthwork required Volume of slab concrete requi Surface area of canopy roof Round trip haul distance Round trips per day per truck Distance traveled per year per Sludge hauled Operation labor required	4 4 1 1 1 1	3.61 30 8 365 13.5 27 1190 551 365 20 1 5000 3.19 56.4	cuyd/d d ft sqft ft cuft cuft cuft sqft miles miles ton(short)/d pers-hrs/yr	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Length of sludge storage shed Volume of slab concrete requi Surface area of canopy roof Round trip haul distance Round trips per day per truck Distance traveled per year per Sludge hauled Operation labor required LandFilling cost	4 4 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	3.61 30 8 365 13.5 27 1190 551 365 20 1 5000 3.19 56.4 5200	cuyd/d d ft sqft ft cuft cuft cuft cuft sqft miles miles miles ton(short)/d pers-hrs/yr	
Total sludge volume hauled Maximum anticipated landfil d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Volume of slab concrete required Volume of slab concrete required Surface area of canopy roqui Surface area of canopy roqui Surface area of canopy roqui Surface area of canopy roqui Sludge hauled per year per Sludge hauled Operation labor required LandFilling cost Costs	6 6 7 8 8 8 8	3.61 30 8 365 13.5 27 1190 551 365 20 1 5000 3.19 56.4 5200	cuyd/d d ft sqft ft cuft cuft sqft miles miles ton(short)/d pers-hrs/yr \$/yr	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Length of sludge storage shed Volume of earthwork required Volume of slab concrete requi Sludge and trip haul distance Round trips per day per truck Distance traveled per year per Sludge hauled Operation labor required LandFilling cost Construction and equipment c	4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	3.61 30 8 365 13.5 27 1190 551 365 20 1 5000 3.19 56.4 5200	cuyd/d d ft sqft ft cuft cuft cuft sqft miles ton(short)/d pers-hrs/yr \$/yr \$	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Volume of earthwork required Volume of earthwork required Volume of slab concrete requir Surface area of canopy roof Round trip haul distance Round trip haul distance Round trip haul distance Round trip haul distance Sludge hauled Operation labor required LandFilling cost Costs Construction and equipment c Earthwork Cost	4 5 7 7 8 8 8 8 8 8 8 8 8	3.61 30 8 365 13.5 27 1190 551 365 20 1 5000 3.19 56.4 5200 3.20 8000 3.22	cuyd/d d ft sqft ft cuft cuft cuft cuft sqft miles miles miles ton(short)/d pers-hrs/yr \$/yr	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Volume of earthwork required Volume of slab concrete requi Surface area of canopy roof Round trip haul distance Round trips per day per truck Distance traveled per year per Sludge hauled Operation labor required LandFilling cost Costs Construction and equipment c Earthwork Cost	4 4 5 6 7 8 7 8 7 8 7 96	3.61 30 8 365 13.5 27 1190 551 365 20 1 5000 3.19 56.4 5200 8000 352	cuyd/d d ft sqft ft cuft cuft cuft sqft miles miles ton(short)/d pers-hrs/yr \$/yr \$	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Length of sludge storage shed Volume of earthwork required Volume of earthwork required Volume of slab concrete requi Surface area of canopy roof Round trip haul distance Round trips per day per truck Distance traveled per year per Sludge hauled Operation labor required LandFilling cost Construction and equipment c Earthwork Cost Slab Concrete Cost	1 38 38 296	3.61 30 8 365 13.5 27 1190 551 365 20 1 5000 3.19 56.4 5200 8000 352 7140	cuyd/d d ft sqft ft cuft cuft cuft sqft miles miles ton(short)/d pers-hrs/yr \$/yr \$	
Total sludge volume hauled Maximum anticipated landfil d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Volume of slab concrete required Volume of slab concrete required Surface area of canopy roof Round trip haul distance Round trip haul distance Round trip haul distance Sludge hauled Operation labor required LandFilling cost Costs Construction and equipment c Earthwork Cost Slab Concrete Cost Canopy Roof Cost	4 4 38 38 7 7 7 7	3.61 30 8 365 13.5 27 1190 551 365 20 1 5500 3.19 56.4 5200 3.09 56.4 5200 3.59 56.4 5200 3.59 55.1 3.65 20 1 3.65 20 1 3.65 20 3.19 55.1 3.55 20 3.19 55.2 3.55 20 3.19 55.2 3.55 20 3.19 55.2 3.55 20 3.19 55.2 3.55 20 3.19 55.2 3.55 20 3.19 55.2 3.55 20 3.19 55.2 3.55 20 3.19 55.2 3.55 20 3.19 55.2 3.55 3.55 20 3.19 55.2 3.00 3.52 3.19 3.55	cuyd/d d ft sqft ft cuft cuft cuft sqft miles miles ton(short)/d pers-hrs/yr \$/yr \$ \$	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Length of sludge storage shed Volume of slab concrete required Volume of slab concrete required Volume of slab concrete required Nound trip haul distance Round trips per day per truck Distance traveled per year per Sludge hauled Operation labor required LandFilling cost Costs Construction and equipment c Earthwork Cost Slab Concrete Cost Canopy Roof Cost Vehicle Cost	4 4 5 6 7 7 7 7 7 7 7 7 7 7 7 7 285	3.61 30 8 365 13.5 27 1190 551 365 20 1 5500 3.19 56.4 5200 352 7140 7310 8000	cuyd/d d ft sqft ft cuft cuft cuft sqft miles miles ton(short)/d pers-hrs/yr \$/yr \$	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Volume of earthwork required Volume of earthwork required Volume of slab concrete requir Surface area of canopy roof Round trip haul distance Round trip haul distance Sludge hauled Operation labor required LandFilling cost Costs Construction and equipment c Earthwork Cost Slab Concrete Cost Canopy Roof Cost Vehicle Cost Operational labor cost	38 38 296 7 288 2	3.61 30 8 365 113.5 551 365 20 1190 551 365 20 1551 365 20 3.19 56.4 5200 3.19 56.4 5200 3.19 56.4 5200 3.19 56.4 5200 3.19 55.1 3000 3.52 7140 3000 2910	cuyd/d d ft sqft ft cuft cuft cuft cuft sqft miles miles miles ton(short)/d pers-hrs/yr \$/yr \$ y/yr \$	
Total sludge volume hauled Maximum anticipated landfil d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Volume of slab concrete requi Surface area of canopy root Round trip haul distance Round trips per day per truck Distance traveled per year per Sludge hauled Operation labor required LandFilling cost Costs Construction and equipment c Earthwork Cost Slab Concrete Cost Canopy Roof Cost Vehicle Cost Operational labor cost Maintenance labor cost	4 4 35 35 36 7 7 7 283 283 2	3.61 30 8 365 13.5 27 1190 551 365 20 1 5500 3.19 56.4 5200 3.19 56.4 5200 3.19 56.4 7310 3000 2910 0	cuyd/d d ft sqft ff cuft cuft cuft sqft miles miles ton(short)/d pers-hrs/yr \$/yr \$/yr \$ \$ \$ \$ \$	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Length of sludge storage shed Volume of slab concrete required Volume of slab concrete required Volume of slab concrete required Nound trips per day per truck Distance traveled per year per Sludge hauled Operation labor required LandFilling cost Construction and equipment c Earthwork Cost Slab Concrete Cost Canopy Roof Cost Vehicle Cost Operational labor cost Maintenance labor cost Material and supply cost	4 4 36 296 7 283 2 2 5 5	3.61 30 8 365 13.5 27 1190 551 365 20 1 5500 3.19 56.4 5200 3.19 56.4 5200 3.32 7140 7310 3000 2910 0 3600	cuyd/d d ft sqft ft t cuft cuft cuft cuft cuft sqft miles ton(short)/d pers-hrs/yr \$/yr \$/yr \$ \$ \$ \$ \$ \$ \$ \$ \$	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Volume of earthwork required Volume of earthwork required Volume of slab concrete requir Surface area of canopy roof Round trip haul distance Round trip haul distance Conton traveled per year per Sludge hauled Operation labor required LandFilling cost Costs Construction and equipment c Earthwork Cost Slab Concrete Cost Canopy Roof Cost Vehicle Cost Operational labor cost Material and supply cost Chemical cost	38 38 296 7 7 288 2 2 8 2 8 2 8 2 8 2 8 2 8 2 8 2	3.61 30 8 365 13.5 27 1190 551 365 20 1 5000 3.19 56.4 5200 3.19 56.4 5200 3.22 7140 7310 000 000 000 000 000 000 000	cuyd/d d ft sqft ft cuft cuft cuft sqft miles miles miles s s s \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	
Total sludge volume hauled Maximum anticipated landfill d Anticipated sludge storage hei Sludge storage shed area Width of sludge storage shed Volume of slab concrete requi Surface area of canopy roof Round trip haul distance Round trips per day per truck Distance traveled per year per Sludge hauled Operation labor required LandFilling cost Costs Construction and equipment c Earthwork Cost Slab Concrete Cost Canopy Roof Cost Vehicle Cost Operational labor cost Maintenance labor cost Maintenance labor cost Maintenance labor cost Chemical cost	4 4 36 36 296 7 7 288 2 2 50	3.61 30 8 365 13.5 27 1190 551 365 20 10 551 3.19 56.4 5200 3.19 56.4 5200 3.19 56.4 5200 3.19 0 3.000 2910 0 0 0 0 0 0 0 0 0 0 0 0 0	cuyd/d d ft sqft ft cuft cuft cuft cuft sqft miles miles ton(short)/d pers-hrs/yr \$/yr \$/yr \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	
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Maintenance labor required	3060	pers-hrs/yr
Electrical energy required	42100	kvvn/yr cuff
Volume of slab concrete require	27100	cuft
Volume of wall concrete require	13000	cuft
Handrail length Number of diffusors per train	738	π
Number of swing arm headers	259	
Costs		
Construction and equipment co	7350000	\$
Earthwork Cost Wall Concrete Cost	12500	\$ \$
Slab Concrete Cost	351000	\$
Handrail Cost	55300	\$
Membrane Cost	6070000	\$
Air Piping Cost	200000	\$ \$
Misc Cost	149000	\$
Operational labor cost	275000	\$/yr
Maintenance labor cost	134000	\$/yr
Chemical cost	51600	s,∕yı \$/vr
Energy cost	160000	\$/yr
Amortization cost	1020000	\$/yr
Permeate Pumping		
Average daily pumping rate	1.34	MGD(US)
Total pumping capacity	3.34	MGD(US)
Design capacity per pump	1290	gpm(US)
Number of pumps	9	
Firm pumping capacity	11.1	MGD(US)
Quantities		
Operation labor required	660	pers-hrs/yr
Maintenance labor required	558 121000	pers-hrs/yr
Volume of earthwork required	2190	cuft
Area of pump building	273	sqft
Costs	110000	۴
Earthwork Cost	418000	ֆ Տ
Pump Building Cost	90200	\$
Installed Pump Cost	262000	\$
Misc Costs	63700	\$ ¢hæ
Maintenance labor cost	24400	\$/vr
Material and supply cost	2930	\$/yr
Chemical cost	0	\$/yr
Energy cost Amortization cost	12100	\$/yr \$/yr
Waste Sludge Pumping	33300	ψ/yi
Design Information		
Average daily pumping rate	0.0337	MGD(US)
Total pumping capacity	0.0337	mGD(US)
Number of pumps	3	gpm(00)
Number of batteries	1	
Firm pumping capacity	0.0337	MGD(US)
Operation labor required	285	pers-hrs/vr
Maintenance labor required	218	pers-hrs/yr
Electrical energy required	1140	kWh/yr
Volume of earthwork required	1610 201	cuπ saft
Costs	201	Sqit
Construction and equipment co	39600	\$
Earthwork Cost	476	\$
Installed Pump Cost	22100	ծ Տ
Misc Costs	6040	\$
Operational labor cost	14700	\$/yr
Maintenance labor cost	9520	\$/yr \$/yr
Chemical cost	2//	\$/vr
Energy cost	114	\$/yr
Amortization cost	3750	\$/yr