

Appendix A: Cost Analysis Data

Cost Analysis Data

Two different concentrate volumes were examined; the year 2020 volume of 10 mgd and the year 2035 volume of 30 mgd. The cost estimates are considered “planning level.” The estimates give an order of magnitude and do not give construction costs. Tools developed during CASS Phase II were used for estimates of the RO facilities, pipelines and evaporation ponds. Other costs were found on the Web, by direct contact and other listed sources including Mike Mickley’s Report #69. All costs are in 2008 dollars.

Evaporation ponds	CASS II “Design&BuildROwithEvapPonds” Excel spread sheet*
RO & MF facilities	CASS II “Design&BuildROwithEvapPonds” Excel spread sheet*
Pipelines	CASS II “Design&BuildROwithEvapPonds” Excel spread sheet*
Wetlands	CH2MHill Technical Memorandum**
Brine Concentrator	Report No. 69, Mike Mickley***
Lime Softening	PBS&J, 1991 Water Supply Cost Estimates****
Deep Well Disposal	PBS&J, 1991 Water Supply Cost Estimates****
VSEP	Personal E-Mail, Josh Miller sales, New Logic Research, Inc.
O&M Costs:	
Pump Plant	3% of plant cost + electricity
Concentrator	6% of plant cost + electricity
Pipe line	0.5% of pipeline cost
Evap pond	0.5% of pond cost + replacement
Softening Plant	3% of plant cost + chemicals
RO/MF	CASS II “Design&BuildROwithEvapPonds” Excel spread sheet*
Electricity	\$.077 kilowatt/hr
Chemicals	
Lime Ca(OH) ₂	\$150.00 ton (www.exporters.sg)
Soda Na ₂ CO ₃	\$150.00 ton estimated
Removal & hauling	\$9.62 ton
Land Costs	CASS II “Design&BuildROwithEvapPonds” Excel spread sheet*
Interest Rate	4.875% Reclamations construction interest rate for 2008
Cost Index	Reclamation Construction Cost Trends (composite rate 1 st Qtr/2008)

* Information for spread sheet came from; “Membrane Concentrate Disposal: Practices and Regulation - Program Report No. 69”, Michael Mickley, September 2001 and “Reverse Osmosis Treatment of Central Arizona Project Water for the City of Tucson”, Reclamation, January 2004

** “Preliminary Analysis of a Conceptual Wetland System for Managing Membran Concentrate”, CH2M Hill, March 2008

*** “Membrane Concentrate Disposal: Practices and Regulation - Program Report No. 69”, Michael Mickley, September 2001

**** UEC Water Supply Plan – Support Document, Chapter 9 Water Quality and Treatment, 2004

***** Land Costs research done by Steve Augustine, Economist, Reclamation

Regional Plan 1. Pipeline to Yuma

Length of Pipe (miles)

Farm land	71
West desert	69
Canal ROW	34
Towns	4

Total	178
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10 MGD pipeline to Yuma

<u>Concentrate</u>	<u>Miles of 24"</u>	<u>Cost per mile</u>	<u>Cost</u>
10 mgd	pipeline		
congested	4	\$835,392	\$3,341,568
uncongested	174	\$694,624	\$120,864,576
Capital Costs			\$124,206,144
NEPA		10%	\$12,420,614
Engineering		20%	\$24,841,229
Mobilization		5%	\$6,210,307
Construction Management		25%	\$31,051,536
Contingencies		40%	\$49,682,458
Total Pipeline Costs			\$248,412,288

<u>Easement</u>	<u>feet</u>	<u>acres</u>	<u>cost per acre</u>	<u>total cost</u>
Farm land	373,771	429	\$24,770	\$10,626,886
West Desert	363,211	417	\$2,477	\$1,032,665
Canal ROW	179,890	206	\$24,770	\$5,114,536
Towns	21,120	24	\$38,107	\$923,806
Total easement				\$17,697,894

Total Capital Costs	\$266,110,182
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O&M	\$621,031
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Interest Rate	4.875%
Years	50
Annualized Capital	\$ (14,296,046)
Annual O&M	\$ (621,031)
Annualized Costs	\$ (14,917,077)

Regional Plan 1. Pipeline to Yuma

30 MGD pipeline to Yuma

<u>Concentrate</u> 30 mgd	<u>Miles of 42"</u> pipeline	<u>Cost per mile</u>	<u>Cost</u>
congested	4	\$1,880,691	\$7,522,766
uncongested	174	\$1,573,294	\$273,753,178
Capital Costs			\$281,275,944
NEPA		10%	\$28,127,594
Engineering		20%	\$56,255,189
Mobilization		5%	\$14,063,797
Construction Management		25%	\$70,318,986
Contingencies		40%	\$112,510,378
Total Pipeline Costs			\$562,551,888

<u>Easement</u>	<u>feet</u>	<u>acres</u>	<u>cost per acre</u>	<u>cost</u>
Farm land	373,771	429	\$24,770	\$10,626,886
West Desert	363,211	417	\$2,477	\$1,032,665
Canal ROW	179,890	206	\$24,770	\$5,114,536
Towns	21,120	24	\$38,107	\$923,806
Total easement				\$17,697,894

Total Capital Costs **\$580,249,781**

O&M **\$1,406,380**

Interest Rate	4.875%
Years	50
Annualized Capital	\$ (31,172,342)
Annual O&M	\$ (1,406,380)
Annualized Costs	\$ (32,578,722)

Regional Plan 2. Evaporation Ponds East of Gila Bend

10 MGD Evap Pond

<u>Concentrate</u> 10 mgd	<u>Miles of 24"</u> pipeline	<u>Cost per mile</u>	
uncongested	45	\$943,976	\$42,478,929

Pumping Plant	Lump Sum	\$1,100,000
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<u>Easement</u>	<u>feet</u>	<u>acres</u>	<u>cost per acre</u>	<u>total cost</u>	
Farm land	83,107	95	\$24,770	\$2,362,865	
West Desert	153,384	176	\$2,477	\$436,094	
easement				\$2,798,959	Note: easement is assumed to be 50 feet wide

Evaporation Ponds

<u>Size (miles²)</u>	<u>Total Land</u>
3.63	4.94

	<u>acre</u>	<u>liner*</u>		
Land cost	\$16,195		\$51,170,440	*Liner thickness is 120 mill
Earthwork	\$12,385		\$39,130,336	
Liner		\$0.0136	\$165,031,550	
Other**			\$25,533,233	**Monitoring wells, etc.
Sub-total Evap Ponds			\$280,865,559	

Sub-total pipe, pump & ponds		\$324,444,488
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NEPA	10%	\$32,444,449
Engineering	20%	\$64,888,898
Mobilization	5%	\$16,222,224
Construction Management	25%	\$81,111,122
Contingencies	40%	\$129,777,795
Total pipe, pump & ponds		\$648,888,976

Energy Costs

Flow (gal/d)	Head (ft)	Q (gpm)	Horse Power	Kilowatts	Cost kw-hr	Yearly cost
10,000,000	100	6944	175	131	0.077	\$88,242

Total Capital Costs	\$651,687,935
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Annualized replacement liner***	\$1,758,919	***Liner is replaced after 25 years
O&M	\$3,496,884	

Interest Rate	4.875%
Years	50
Annualized Capital	\$ (35,010,163)
Annual O&M	\$ (5,255,803)
Annualized Costs	\$ (40,265,966)

Regional Plan 2. Evaporation Ponds East of Gila Bend

30 MGD Evap Pond

Concentrate Miles of 42'
30 mgd pipeline

uncongested	45	Cost per mile	\$1,573,294	\$70,798,236
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Pumping Plant	Lump Sum		\$3,300,000
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<u>Easement</u>	<u>feet</u>	<u>acres</u>	<u>cost per acre</u>	<u>total cost</u>
Farm land	83,107	95	\$24,770	\$2,362,865
West Desert	153,384	176	\$2,477	\$436,094
<u>easement</u>				<u>\$2,798,959</u>

Note: easement is assumed to be 50 feet wide

Evaporation Ponds

<u>Size (miles²)</u>	<u>Total Land</u>
10.90	14.82

	<u>acre</u>	<u>liner*</u>	
Land cost	\$16,195		\$153,652,285
Earthwork	\$12,385		\$117,498,806
Liner		\$0.0136	\$495,549,282
Other**			\$76,670,037
<u>Sub-total Evap Ponds</u>			<u>\$843,370,411</u>

*Liner thickness is 120 mill

**Monitoring wells, etc.

<u>Sub-total pipe, pump & ponds</u>	<u>\$917,468,647</u>
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NEPA	10%	\$91,746,865
Engineering	20%	\$183,493,729
Mobilization	5%	\$45,873,432
Construction Management	25%	\$229,367,162
Contingencies	40%	\$366,987,459
<u>Total pipe, pump & ponds</u>		<u>\$1,834,937,294</u>

Energy Costs

Flow (gal/d)	Head (ft)	Q (gpm)	Horse Power	Kilowatts	Cost kw-hr	Yearly cost
30,000,000	100	20833	526	392	0.077	\$264,726

<u>Total Capital Costs</u>	<u>\$1,837,736,253</u>
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	Annualized replacement liner***	\$5,281,604	
<u>O&M</u>			<u>\$10,216,174</u>

***Liner is replaced after 25 years

Interest Rate		4.875%	
Years		50	
Annualized Capital	\$	(98,727,385)	
Annual O&M	\$	(15,497,778)	
<u>Annualized Costs</u>		<u>\$ (114,225,163)</u>	

Regional Plan 3. Brine Concentrator/Evaporation Pond

10 MGD pipeline to Brine Concentrator

Concentrate	Miles of 24" pipeline	Cost per mile	
10 mgd uncongested	28.11	\$943,976	\$26,535,171
Pipeline costs			\$26,535,171

Brine Concentrator Costs

3 mgd 2001*	3 mgd 2008	# of BC's**	10 mgd
\$20,000,000	\$27,179,487	10	\$90,598,291
Brine Concentrator Costs			\$90,598,291

* Mike Micky's Report No. 69
 **Each BC is 700 gpm or 1mgd

land	acres	cost per acre	total cost
BC Facilities	30	\$16,195	\$485,864

Evaporation Ponds

Size (acres ²)	Total Land		
140	190		
		acre	liner***
Land cost	\$16,195		\$3,083,618
Earthwork	\$12,385		\$1,733,868
Liner		\$0.0136	\$9,945,083
Other****			\$1,476,257
Sub-total Evap Ponds			\$16,238,826

***Liner thickness is 120 mill

****Monitoring wells, etc.

Easement	feet	acres	cost per acre	total cost
Farm land	108,293	124	\$38,107	\$4,736,815
West Desert	40,128	46	\$16,195	\$745,973
easement				\$5,482,788

Note: easement is assumed to be 50 feet wide

Sub-total Pipe, BC & Pond	\$133,372,288
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NEPA	10%	\$13,337,229
Engineering	20%	\$26,674,458
Mobilization	5%	\$6,668,614
Construction Management	25%	\$33,343,072
Contingencies	40%	\$53,348,915
Total Pipe, BC & Pond		\$267,230,441

Total Capital Costs	\$272,713,229
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Energy Costs		*85 kw-hr per 1000 gal of feed water	
Day (kw-hrs)	electricity (kw-hr)	Daily Cost	Yearly cost
850,000	0.077	\$65,450	\$23,889,250

O&M	Annualized replacement liner***	\$105,995
		\$5,755,762

***Liner is replaced after 25 years

Total O&M	\$29,751,007
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Interest Rate	4.875%
Years	50
Annualized Capital	\$ (14,650,777)
Annual O&M	\$ (29,751,007)
Annualized Costs	\$ (44,401,784)

Regional Plan 3. Brine Concentrator/Evaporation Pond

30 MGD pipeline to Brine Concentrator

Concentrate	Miles of 42"	Cost per mile	
10 mgd pipeline	pipeline		
uncongested	28.11	\$1,573,294	\$44,225,298
Pipeline costs			\$44,225,298

Brine Concentrator Costs

3 mgd 2001*	3 mgd 2007	# of BC's**	10 mgd
\$20,000,000	\$26,949,153	30	\$269,491,525
Brine Concentrator Costs			\$269,491,525

* Mike Micky's Report No. 69
 **Each BC is 700 gpm or 1mgd

land	acres	cost per acre	total cost
BC Facilities	50	\$16,195	\$809,774

Evaporation Ponds

Size (acres ²)	Total Land		
419	570		
		acre	liner***
Land cost	\$16,195		\$9,228,828
Earthwork	\$5,716		\$2,395,025
Liner		\$0.0136	\$29,764,213
Other****			\$4,138,807
Sub-total Evap Ponds			\$45,526,873

***Liner thickness is 120 mill

****Monitoring wells, etc.

Easement	feet	acres	cost per acre	total cost
Farm land	108,293	124	\$38,107	\$4,736,815
West Desert	40,128	46	\$16,195	\$745,973
easement				\$5,482,788

Note: easement is assumed to be 50 feet wide

Sub-total Pipe, BC & Pond	\$359,243,696
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NEPA	10%	\$35,924,370
Engineering	20%	\$71,848,739
Mobilization	5%	\$17,962,185
Construction Management	25%	\$89,810,924
Contingencies	40%	\$143,697,478
Total Pipe, BC & Pond		\$719,297,166

Total Capital Costs	\$724,779,954
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Energy Costs		*85 kw-hr per 1000 gal of feed water	
Day (kw-hrs)	electricity (kw-hr)	Daily Cost	Yearly cost
2,550,000	0.077	\$196,350	\$71,667,750

Annualized replacement liner*****	\$317,229
O&M	\$16,707,849

*****Liner is replaced after 25 years

Total O&M	\$88,692,828
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Interest Rate	4.875%
Years	50
Annualized Capital	\$ (38,936,833)
Annual O&M	\$ (88,692,828)
Annualized Costs	\$ (127,629,661)

Regional Plan 4. Softening/RO/VSEP/Evap Ponds

10 MGD pipeline to Softening/RO/VSEP/Evap Ponds

Concentrate	Miles of 24"	Cost per mile	
10 mgd	pipeline		
uncongested	28.11	\$943,976	\$26,535,171
Pipeline costs sub-total			\$26,535,171

O&M Pipeline sub-total \$132,676

Softening Facilities*	10 mgd Facility	
		\$13,000,000
Softening Facility Costs sub-total		\$13,000,000

* Lime and soda ash precipitation of hardness

Chemicals	Soda Na ₂ CO ₃	Lime Ca(OH) ₂	sludge (disp)
Tons	22	7	58
Cost (day)	\$3,300	\$1,050	\$500
Cost (annual)	\$1,204,500	\$383,250	\$182,500
Chemical & Sludge Disposal sub-total			\$1,770,250

O&M facility, chemical & sludge sub-total \$2,160,250

Secondary RO Facility (10 mgd)

65% recovery	Size (MGD)	Cost
MF Portion of Facility	10	\$16,560,000
RO Portion of Facility	10	\$12,410,000
MF/RO facility Capital Sub-total		\$28,970,000

O&M MF/RO facility sub-total \$1,760,000

VSEP Facility (3.5 mgd)

50% recovery	Cost 1mgd**	Cost 3.5 mgd	** Quote from New Logic Research, Inc.
	\$7,900,000	\$27,650,000	
VSEP facility Capital sub-total		\$27,650,000	

O&M VSEP facility sub-total \$1,659,000

Evaporation Ponds (1.75 mgd)

	Size (acres ²)	Total Land	
	407	554	
	acre	liner***	
Land cost	\$16,195		\$8,964,518
Earthwork	\$5,716		\$2,326,432
Liner	\$0.0136		\$28,911,777
Other****			\$4,020,273
Sub-total Evap Ponds			\$44,223,000

***Liner thickness is 120 mill

****Monitoring wells, etc.

O&M evap ponds sub-total \$221,115

land	acres	cost per acre	total cost
Softening, RO, VSEP facilities	20	\$16,195	\$323,909

Easement	feet	acres	cost per acre	total cost
Farm land	108,293	124	\$38,107	\$4,736,815
West Desert	40,128	46	\$16,195	\$745,973
easement				\$5,482,788

Note: easement is assumed to be 50 feet wide

Subtotal Capital Softening, RO, VSEP, Evap Ponds, Pipe \$140,378,172

NEPA	10%	\$14,037,817
Engineering	20%	\$28,075,634
Mobilization	5%	\$7,018,909
Construction Management	25%	\$35,094,543
Contingencies	40%	\$56,151,269
Total Soft, RO, VSEP, Pipe & Pond		\$280,756,343

Total Capital Costs \$286,563,041

Annual energy costs	\$661,646	
Annualized replacement liner*****	\$308,144	
Total O&M Costs		\$6,902,831

*****Liner is replaced after 25 years

Interest Rate	4.875%	
Years	50	
Annualized Capital	\$ (15,394,821)	
Annual O&M	\$ (6,902,831)	
Annualized Costs		\$ (22,297,651)

Regional Plan 4. Softening/RO/VSEP/Evap Ponds

30 MGD pipeline to Softening/RO/VSEP/Evap Ponds

Concentrate	Miles of 42" 10 mgd pipeline	Cost per mile	
uncongested	28.11	\$1,573,294	\$44,225,298
Pipeline costs sub-total			\$44,225,298

O&M Pipeline sub-total	\$221,126
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Softening Facilities*	30 mgd Facility	
	\$27,000,000	
Softening Facility Costs sub-total		\$27,000,000

* Lime and/or soda ash precipitation of hardness

Chemicals	Soda Na ₂ CO ₃	Lime Ca(OH) ₂	sludge
Tons	66	21	174
Cost (day)	\$9,900	\$3,150	\$1,500
Cost (annual)	\$3,613,500	\$1,149,750	\$547,500
Chemical & Sludge Disposal sub-total			\$5,310,750

O&M facility, chemical & sludge sub-total	\$6,120,750
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Secondary RO Facility (30 mgd)

65% Recovery	Size (MGD)	Cost
MF Portion of Facility	30	\$35,730,000
RO Portion of Facility	30	\$34,000,000
MF/RO facility Capital Sub-total		\$69,730,000

O&M MF/RO facility sub-total	\$5,150,000
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VSEP Facility (10.5 mgd)

50% Recovery	Cost 1mgd**	Cost 10.5 mgd	** Quote from New Logic Research, Inc.
	\$7,900,000	\$82,950,000	
VSEP facility Capital sub-total		\$82,950,000	

O&M VSEP facility sub-total	\$4,977,000
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Evaporation Ponds (5.25 mgd)

	Size (acres ²)	Total Land	
	1221	1661	
	acre	liner***	
Land cost	\$16,195	\$26,893,555	***Liner thickness is 120 mill
Earthwork	\$5,710	\$6,971,759	
Liner	\$0.0136	\$86,735,332	
Other****		\$12,060,065	****Monitoring wells, etc.
Sub-total Evap Ponds		\$132,660,711	

O&M evap ponds sub-total	\$663,304
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land	acres	cost per acre	total cost
Softening, RO, VSEP facilities	20	\$16,195	\$323,909

Easement	feet	acres	cost per acre	total cost
Farm land	108,293	124	\$38,107	\$4,736,815
West Desert	40,128	46	\$16,195	\$745,973
easement				\$5,482,788

Note: easement is assumed to be 50 feet wide

Subtotal Capital Softening, RO, VSEP, Evap Ponds, Pipe	\$356,566,009
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NEPA	10%	\$35,656,601
Engineering	20%	\$71,313,202
Mobilization	5%	\$17,828,300
Construction Management	25%	\$89,141,502
Contingencies	40%	\$142,626,403
Total Soft, RO, VSEP, Pipe & Pond		\$713,132,017

Total Capital Costs	\$718,938,715
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Annual energy costs	\$1,984,938	
Annualized replacement liner*****	\$924,432	*****Liner is replaced after 25 years
Total O&M Costs		\$20,041,550

Interest Rate	4.875%
Years	50
Annualized Capital	\$ (38,623,028)
Annual O&M	\$ (20,041,550)
Annualized Costs	\$ (58,664,579)

Regional Plan 5. Wetlands Treatment - Surface Discharge into Gila River

10 MGD Wetlands with pipeline to Gila River

<u>Concentrate</u>	<u>Miles of 24"</u>	<u>Cost per mile</u>	
<u>10 mgd</u>	<u>pipeline</u>		
uncongested	5	\$943,976	\$4,719,881
<u>Pipeline costs</u>			<u>\$4,719,881</u>

<u>Easement</u>	<u>feet</u>	<u>acres</u>	<u>cost per acre</u>	<u>total cost</u>
Farm land	26,400	30	\$38,107	\$1,154,757
<u>easement</u>				<u>\$1,154,757</u>

Note: easement is assumed to be 50 feet wide

<u>Wetland for .5 mgd*</u>		<u>Wetland for 10 mgd</u>	<u>*Preliminary Analysis of a Conceptual Wetland System(CH2M Hill March 7, 2008)</u>
Construction	\$2,900,000	\$58,000,000	
Startup	\$100,000	\$2,000,000	
Other**		\$6,000,000	**monitoring wells, etc.
<u>Wetland costs</u>			<u>\$66,000,000</u>

<u>Land Costs</u>	<u>acres</u>	<u>cost per acre</u>	<u>Total Cost</u>
Farm land	200	\$38,107	\$7,621,399
<u>land costs</u>			<u>\$7,621,399</u>

Subtotal wetlands & pipe \$70,719,881

NEPA	10%	\$7,071,988
Engineering	20%	\$14,143,976
Mobilization	5%	\$3,535,994
Construction Management	25%	\$17,679,970
Contingencies	40%	\$28,287,952
<u>Total wetlands & pipe</u>		<u>\$141,439,762</u>

Total Capital Costs \$150,215,919

Annual cost removal wetlands	\$176,786	1/3 wetland removed at 12, 24 & 36 years as heavy metals saturate media
Annual cost replacement wetlands	\$1,223,440	1/3 wetland replaced at 12, 24 & 36 years
O&M Pipeline & Wetlands	\$353,599	
<u>Total O&M</u>		<u>\$1,753,825</u>

Interest Rate	4.875%
Years	50
Annualized Capital	\$ (8,069,942)
Annual O&M	\$ (1,753,825)
<u>Annualized Costs</u>	
	<u>\$ (9,823,767)</u>

Regional Plan 5. Wetlands Treatment - Surface Discharge into Gila River

30 MGD Wetlands with pipeline to Gila River

<u>Concentrate</u>	<u>Miles of 42"</u>	<u>Cost per mile</u>	
<u>30 mgd</u>	<u>pipeline</u>		
uncongested	5	\$1,573,294	\$7,866,471
Pipeline costs			\$7,866,471

<u>Easement</u>	<u>feet</u>	<u>acres</u>	<u>cost per acre</u>	<u>total cost</u>
Farm land	26,400	30	\$38,107	\$1,154,757
easement				\$1,154,757

Note: easement is assumed to be 50 feet wide

<u>Wetland for .5mgd*</u>		<u>Wetland for 30 mgd</u>	<u>*Preliminary Analysis of a Conceptual Wetland System(CH2M Hill March 7, 2008)</u>
Construction	\$2,900,000	\$174,000,000	
Startup	\$100,000	\$6,000,000	
Other**		\$18,000,000	**monitoring wells, etc.
Wetland costs			\$180,000,000

<u>Land Costs</u>	<u>acres</u>	<u>cost per acre</u>	<u>Total Cost</u>
Farm land	600	\$38,107	\$22,864,198
land costs			\$22,864,198

Subtotal wetlands & pipe \$187,866,471

NEPA	10%	\$18,786,647
Engineering	20%	\$37,573,294
Mobilization	5%	\$9,393,324
Construction Management	25%	\$46,966,618
Contingencies	40%	\$75,146,588
Total wetlands & pipe		\$375,732,941

Total Capital Costs \$399,751,896

Annual cost removal wetlands	\$530,358	1/3 wetland removed at 12, 24 & 36 years as heavy metals saturate media
Annual cost replacement wetlands	\$3,670,321	1/3 wetland replaced at 12, 24 & 36 years
Normal: O&M Pipeline & Wetlands	\$939,332	
Total O&M		\$5,140,011

Interest Rate	4.875%
Years	50
Annualized Capital	\$ (21,475,584)
Annual O&M	\$ (5,140,011)
Annualized Costs	\$ (26,615,595)

Regional Plan 6. Deep well Injection Site

10 MGD Pipeline to Injection Well

Concentrate	Miles of 24" pipeline	Cost per mile	
10 mgd	50	\$943,976	\$47,198,810
Pipeline costs			\$47,198,810

Easement	feet	acres	cost per acre	total cost	
Farm land	52,800	61	\$38,107	\$2,309,515	
West Desert	211,200	242	\$16,195	\$3,926,175	
easement				\$6,235,690	Note: easement is assumed to be 50 feet wide

Injection Well

Cost per gal/day capacity	size (gal/day)	costs
\$0.69	10,000,000	\$6,875,676
Injection Well costs		\$6,875,676

Land Costs	acres	cost per acre	Total Cost
West Desert	5	\$16,195	\$80,977
land costs			\$80,977

Subtotal Capital costs injection well & pipe \$54,074,486

Energy Costs						Annual	
Flow (gal/d)	Head (ft)	Q (gpm)	Horse Power	Kilowatts	Cost kw-hr	Kilowatt-hours	Yearly cost
10,000,000			22000	16412	0.077	143,769,120	\$11,070,222

NEPA	10%	\$5,407,449
Engineering	20%	\$10,814,897
Mobilization	5%	\$2,703,724
Construction Management	25%	\$13,518,621
Contingencies	40%	\$21,629,794
Total injection well & pipe		\$108,148,972

Total Capital Costs \$114,465,639

Total O&M Costs \$11,306,216

Interest Rate	4.875%
Years	50
Annualized Capital	\$ (6,149,355)
Annual O&M	\$ (11,306,216)
Annualized Costs	\$ (17,455,572)

Regional Plan 6. Deep well Injection Site

30 MGD Pipeline to Injection Well

<u>Concentrate</u>	<u>Miles of 42"</u>	<u>Cost per mile</u>	
30 mgd	pipeline		
uncongested	50	\$1,573,294	\$78,664,706
Pipeline costs			\$78,664,706

<u>Easement</u>	<u>feet</u>	<u>acres</u>	<u>cost per acre</u>	<u>total cost</u>	
Farm land	52,800	61	\$38,107	\$2,309,515	
West Desert	211,200	242	\$16,195	\$3,926,175	
easement				\$6,235,690	Note: easement is assumed to be 50 feet wide

Injection Well

<u>Cost per gal/day capacity</u>	<u>size (gal/day)</u>	<u>costs</u>
\$0.69	30,000,000	\$20,627,027
Injection Well costs		\$20,627,027

<u>Land Costs</u>	<u>acres</u>	<u>cost per acre</u>	<u>Total Cost</u>
West Desert	10	\$16,195	\$161,955
land costs			\$161,955

Subtotal Capital costs injection well & pipe \$99,291,733

Energy Costs						Annual	
Flow (gal/d)	Head (ft)	Q (gpm)	Horse Power	Kilowatts	Cost kw-hr	Kilowatt-hours	Yearly cost
30,000,000			66000	49236	0.077	431,307,360	\$33,210,667

NEPA	10%	\$9,929,173
Engineering	20%	\$19,858,347
Mobilization	5%	\$4,964,587
Construction Management	25%	\$24,822,933
Contingencies	40%	\$39,716,693
Total injection well & pipe		\$198,583,467

Total Capital Costs \$204,981,112

Total O&M Costs \$33,603,990

Interest Rate	4.875%
Years	50
Annualized Capital	\$ (11,012,053)
Annual O&M	\$ (33,603,990)
Annualized Costs	\$ (44,616,043)