Option 2 & Option 6 **PRELIMINARY**

KIF Dry Ash in Pond & Gypsum on Peninsula (Wet ash in Dredge Cell/Ph1, and Phase 2. Phase 3 not constructed. Gypsum on Peninsula)

ITEM	DESCRIPTION	UNITS	QUANTITY	T-1 Spec	Comments/Assumptions
1.000	**Erosion Controls/ Sediment Pond**				
1.010	Erect silt fence	lf	1000	571	Place at NE Corner of Dredge Cell
1.020					
1.030	Geotextile Erosion Protection Channel	sy	4300		Non woven
1.040	D50 9" Riprap	ton	5215		18" Riprap Layer Stage A & B
1.050	3" stone, 1' thick to prevent erosion (assume 105 pcf)	ton	2004		Erosion protection channel for Gypsum
1.060	Stage 1-6 CMP Metal Spillway	ea	4		2 Gypsum ponds @ 2 per pond
1.070	Cut	bcy	43		Excavation for placement of 48" half-pipe
1.080	Fill with 1032 crushed stone	ton	93		Compacted until a stable base is achieved.
1.090	1/2 of 48" riser stand pipe	lf	512		Fully bituminous coated & 14 gage thickness
1.100	30" dia CMP	lf	1000		Fully bituminous coated & 14 gage thickness
1.110	Bedding for 30" CMP	ton	135		6" Thick up to half pipe dia.
1.120	30" dia CMP stand pipe	lf	720		4 pipes at 6 stages with 30' per stage
1.130	D50 9" riprap outlet for metal spillway	ton	53		Minimum
1.140					
1.150	Galvanized corrugated metal anti-seep collar	ea	16		Min. 2 per dike
2.000	**Seed/Mulch**				
2.001	Seed/Mulch disturbed areas	ac	26		5600 ft x 200 ft (wide swale between toe of new earthen
3.000	**South Access Road (gravel)**				assume existing road upgrade
3.010	1032 crushed stone base 6" depth	ton	3520	305	Assume 1.5 miles of roadway (8000 lf); road is 16 ft
4.000	**Perimeter Road**				
4.010	1032 crushed stone	ton	6885		Add 6" crushed stone base & compact
4.020	Roller compact	sy	22667		
5.000	**Install Drains for Swan Pond Road**				**(Omit for Option 2 and Option 6)**
6.000	**Dredge Cell/Phase 1 Operational Cost**				
6.001	**El. 810 to El. 866**				
6.002	Dry Ash Stack Quantities	cy	5476070		El. 810 to El. 866 in Dredge Cell
6.003	Wet Dip and Stack Bottom Ash Only	cy	678848		El. 810 to El. 866 in Dredge Cell
6.004	Disposal Life (Assume dike & dredge ash)	yr	12.9		Ash Production rate 475600 cy per year
6.005	Haul Distance	mi	0.5		Round trip from the preceptors

6.006					
7.00	**Gypsum Stack Peninsula (7.00 through 16.02)**				
7.01	**Clear and Grub**				
7.02	Clear and grub	ac	90		
7.03	Strip 1 ft vegetation and topsoil - spoil at stockpile	bcy	129,000		
8.00	**Erosion Controls**				
8.01	Erect silt fence	lf	4,900		6 ft post spacing, trench bottom of fence, 10% hay bales
8.02	cut for stormwater runoff pond	bcy	2000		2 ponds, assume 2.5 ac ft and 4.5 ac-ft; 0.5 ac and 0.9
8.03	fill for stormwater runoff pond	bcy	12,000		
8.04	riprap for stormwater runoff pond	ton	4,300		Combined - 1 ft deep
8.05	72 in dia cmp for outlet structure	lf	6		
8.06	48 in dia cmp for riser for outlet structure	lf	7		
8.07	cut holes in riser	ea	3		
8.08	48 in dia cmp outlet pipe (principle spillway)	lf	150		
8.09	Concrete for riser base (assume 7ft x 7 ft x 2 ft)	cy	4		
8.10	Anti-seep collars (assume concrete)	ea	7		
8.11	pipe bedding	ton	20		
8.12	clean out stormwater runoff pond	bcy	2,300		Assume 1 ft deep @ 1.4 ac
9.00	**Roads**				
9.01	South Access Road (gravel)				Assume 1.5 miles of roadway (8000 lf); road is 16 ft
9.02	Bottom Ash	bcy	2400		Assume 6 in bottom ash
9.03	crushed stone base	ton	2,900		Assume 4 inch stone (1032)
9.04					
9.05	Permanent Parking Lot (paved stone)				
9.06					
9.07	crushed stone base	ton	340		Assume 100 x 100 ft w/ 6 in crushed stone
9.08					
10.00	**Fencing**				
10.01	New fencing (including grounding)	lf	200		Assume fence to block road only - no perimeter fence
10.02	Gates, swinging	ea	1		personnel
10.03	Gates, sliding, w/ motorized operator	ea	1		20 ft wide
10.04					
11.00	**Seed/Mulch**				

11.01	Seed/Mulch disturbed areas	ac	25		Areas outside dike
12.00	**Borrow area development**				
12.01	Add some costs for future borrow area development				By estimator
12.02					
13.00	**Gypsum Disposal Facility**				
13.01	**Disposal facility construction**				
13.01	Earthwork cut	bcy	310,553		
13.02	Earthwork fill	bcy	189,719		
13.03	Spoil select cut for future 1 ft clay layer in final cover	bcy	112,933		Spoil at nearby location - assume clearing and grubbing,
13.04	Additional spoil material	bcy	7,900		Spoil separately at 1 ac site
13.05	Ditch riprap	ton	23,500		assume 2 ft deep riprap, 7300 lf ditch
13.06	geotextile (if riprap is used)	sy	19,500		assume ditch has 24 ft top width
13.07	Perimeter road surfacing - bottom ash	cy	2,400		
13.08	Perimeter road surfacing - crushed stone	ton	2,900		6 in bottom ash topped w/ 4 in stone - 1.5 mi of roadway 16 ft wide
13.09	**Compacted clay liner**	**bcy**	**339,000**		**Omit in option 2 and include in option 6 (Built in 6 lifts)**
13.10	Drainage layer (1 ft thick) for liner (No 57 stone)	ton	168,000		Unit wt = 110 pcf
13.11	Geotextile for underdrain	sy	5,700		Wrapped around pipe
13.12	Perimeter underdrain pipe	lf	6,400		8 in dia HDPE, SDR = 17, perforated
13.13	Fittings for underdrain piping	ea	50		
13.14	Concrete anchors for underdrain piping	ea	85		Assume 75 ft spacing
13.15	Proofroll subgrade	ac	70		
14.00	**Gyp on Peninsula Disposal Cost**				
14.01	**Fill for Underdrain system**	**cy**	**4,407**		
14.02	**6" dia perforated HDPE underdrains**	**lf**	**59,491**		**Elevations 770 to 850**
14.03	**Fill for Underdrain system**	**cy**	**3,525**		
14.04	**6" depth 1081 crushed stone (110 pcf)**	**ton**	**3,272**		
14.05	**Cut for Lateral outlet pipes**	**cy**	**551**		
14.06	**6" dia non-perforated HDPE Lateral outlet pipes**	**lf**	**7,436**		**Lateral pipe located every 200' on center**
14.07	**Fill for Lateral outlet pipes**	**cy**	**441**		
14.08	**6" depth 1081 crushed stone (110 pcf)**	**ton**	**409**		
14.09	**Gypsum Disposal Stack (wet sluice)**	**cy**	**5535853**		**Option 1A 3:1 slope w/ 15 ft bench**
14.10	**Wet cast Gyp Dike**	**cy**	**1011347**		**Elevations 770 to 850**
14.11	**Cut Rim ditches**	**cy**	**114575**		**Elevations 770 to 850**

14.12	**Life of Gypsum Disposal Stack**	**cy**	**20.0**		**Assume 327360 cubic yards per year (@ 84 pcf)**
14.13	**Allowance for karst geologic features**	**ls**	**240,000**		**Based on % of Gypsum Disp cost**
14.14	**Addition geotechnical investigation**	**ls**	**100000**		**Groundwater elevations, monitoring wells, &**
14.15					
15.00	**Construction parking**				
15.01	silt fence	lf	1,000		
15.02	Earthwork cut	bcy	1,000		
15.03	Earthwork fill	bcy	500		
15.04	Crushed stone base	ton	1,400		assume 100 x 100 ft x 6 in thick crushed stone base
16.00	**Engineering**				Use a 10 percentage of const costs
16.01	**Engineering**				
16.02					
17.000	**Phase 2 Base Construction (Phase 2 only)**				
17.001	**Base Layers**				
17.002	Cut for dredge cell	bcy	0		Pond not Req. for dry stacking ash
17.003	Compacted Fly Ash base (Fill)	cy	573650		Added 2' for consolidation
17.004	Proofroll subgrade	sy	177100		Fill from stock pile soil for final cover
17.005	2.5' Thick Bottom Ash Layer	cy	152717		El. 767
17.006	0.5' Thick Fly Ash Filter Layer	cy	30543		El. 767
17.007	18" dia Coarse Bottom Ash Drain Columns (Haul 2 mi, 1100 bcy)	lf	16920		564 columns (3 rows) average of drilled depth to clay layer of 30'. $20 per lf installed. (SUBCONTRACTED)
17.008	Roto till Fly Ash Layer	sy	177100		
17.009	Bottom Ash Dike Fill	cy	0		
17.010	**1' Layer of Bottom Ash**	**cy**	**61087**		**Omit for option 4 but include in option 8**
17.011	**Geosynthetic Clay Liner**	**sy**	**183260**		**Omit for option 4 but include in option 8**
17.012	4" dia. Perforated PVC Pipe (underdrains) SDR 17.5	lf	26082		
17.013	Trenching for the drain system (4"dia. underdrains)	bcy	966		
17.014	Strip existing 1' soil cover (Phase 1 expansion)	bcy	19133		Cut will be used as Fill
17.015	Anchor Trench Cut	cy	1306		El. 795, 810, & 845
17.016	Anchor Trench Fill & Compact	cy	1242		95% Standard Proctor Density
17.017					
17.018	2' Thick Bottom Ash Blanket Drain	cy	24640		
17.019	1' Thick Filter Drain Ash Layer	cy	12320		
17.020	Geomembrane	sy	36960		
17.021	Perforated Pipe ADS Drain Tube 6" Dia	lf	4946		
17.022	Geotextile for underdrain	sy	4121		

17.023	#57 Stone for underdrain pipe bedding (135 pcf)	ton	1001		
17.024	Solid Outlet Pipe ADS Drain 6" Dia	lf	1236		
17.025	#57 Stone for outlet pipe bedding (135 pcf)	ton	250		
17.026	6" dia Non-Perforated HDPE Corrugated Tubing Lateral outlet pipes @ 200' O.C. (EL. 760)	lf	302		10W425-29
17.027	1081 crushed stone, bedding 6" depth	ton	10		
17.028	6" dia Perforated HDPE Drain (El. 760)	lf	1512		10W425-68
17.029	1081 crushed stone	ton	286		
17.030	Geotextile woven monofilament	sy	1176		Trench
17.031	Cut for underdrain system	cy	224		
17.032	Back Fill for underdrain system	cy	168		
17.012	Certification	ls	31500		
17.013	QA/QC for construction of disposal facility	ls	457884		2 F.T.E. during construction at $40,000 per year & 5 week each years of operation, 4 weeks a year for engineering, & 10000 per year for testing
18.000	**Temporary slope protection (5' wide)**				
18.001	Cut for ditch	bcy	5815		
18.002	9" D50 Riprap	ton	4239		
18.003	Seed ditch	sy	6978	581	
18.004	Jute Matting	sy	6978		North American Green S150 or Synethic Industries Land
19.000	**Riprap Stilling Basin**				
19.001	Riprap D50 size 9"	ton	2344		
19.002	Cut for basin	bcy	3582		3' average depth of cut
20.000	**Phase 2 Initial Construction**				
20.001	**Dry Stack Ash Quantities**	**cy**	**614909**		**Phase 2 only (prorated based on volumes)**
20.002	**Initial Cons. Disposal Life**	**yr**	**1.3**		**475600 cy ash annual rate; Haul distance .5 mi**
20.003	Perforated Pipe ADS Drain Tube 6" Dia	lf	0		Elevations 770, 780
20.004	Geotextile for underdrain	sy	0		Woven Monofilament (Mirafi HP 370)
20.005	#57 Stone for underdrain pipe bedding (135 pcf)	ton	0		
20.006	Solid Outlet Pipe ADS Drain 6" Dia	lf	0		
20.007	#57 Stone for outlet pipe bedding (135 pcf)	ton	0		
21.000	**Rim Ditches**				
21.001	Cut	bcy	0	130	No Rim Ditching for option 2 and option 6 in Ph2/Ph3
22.000	**Phase 2 Operational Cost**				
22.001	**Stage 1 (3 to 1 side slopes)**				
22.002	**Dry Stack Ash Quantities**	**cy**	**1589685**		**Phase 2 only**
22.003	**Stage 1 Disposal Life (Assume dry stack)**	**yr**	**3.3**		**475600 cy ash annual rate; Haul distance .5 mi**

22.004	Perforated Pipe ADS Drain Tube 6" Dia	lf	0		Elevations 790, 800, 810 (not needed for dry stack)
22.005	Geotextile for underdrain	sy	0		Woven Monofilament
22.006	#57 Stone for underdrain pipe bedding (135 pcf)	ton	0		
22.007	Solid Outlet Pipe ADS Drain 6" Dia	lf	0		
22.008	#57 Stone for outlet pipe bedding (135 pcf)	ton	0		
23.000	**Phase 2 Operational Cost**				
23.001	**Stage 2 (3 to 1 side slopes)**				
23.002	**Dry Stack Ash Quantities**	cy	1773076		
23.003	**Stage 2 Disposal Life (Assume dry stack)**	yr	3.7		**475600 cy ash annual rate; Haul distance .5 mi**
23.004	Perforated Pipe ADS Drain Tube 6" Dia	lf	0		Elevations 820, 830, 840 (not needed for dry stack)
23.005	Geotextile for underdrain	sy	0		Woven Monofilament
23.006	#57 Stone for underdrain pipe bedding (135 pcf)	ton	0		
23.007	Solid Outlet Pipe ADS Drain 6" Dia	lf	0		
23.008	#57 Stone for outlet pipe bedding (135 pcf)	ton	0		
24.000	**Phase 2 Operational Cost**				
24.001	**Stage 3 (3 to 1 side slopes)**				
24.002	**Dry Stack Ash Quantities**	cy	1572022		
24.003	**Stage 3 Disposal Life (Assume dry stack)**	yr	3.3		**475600 cy ash annual rate; Haul distance .5 mi**
24.004	Perforated Pipe ADS Drain Tube 6" Dia	lf	0		Elevations 850, 860, 870 (not needed for dry stack)
24.005	Geotextile for underdrain	sy	0		Woven Monofilament
24.006	#57 Stone for underdrain pipe bedding (135 pcf)	ton	0		
24.007	Solid Outlet Pipe ADS Drain 6" Dia	lf	0		
24.008	#57 Stone for outlet pipe bedding (135 pcf)	ton	0		
25.000	**Phase 3 Initial Construction**				
25.001	**Dry Stack Ash Quantities**	cy	677412		Phase 3 only (prorated based on volumes)
25.002	**Initial Cons. Disposal Life (Assume dike & Dry Ash)**	yr	2.1		**327360 cy gypsum annual rate**
25.003	Perforated Pipe ADS Drain Tube 6" Dia	lf	4320		Elevations 710, 780
25.004	Geotextile for underdrain	sy	5742		Woven Monofilament (Mirafi HF 370)
25.004	#57 Stone for underdrain pipe bedding (135 pcf)	ton	905		
25.005	Solid Outlet Pipe ADS Drain 6" Dia	lf	1010		
25.006	#57 Stone for outlet pipe bedding (135 pcf)	ton	205		
26.000	**Phase 3 Operational Cost**				
26.001	**Stage 1 (3 to 1 side slopes)**				
26.002	**Dry Stack Ash Quantities**	cy	1349190		Phase 3 only
26.003	**Stage 1 Disposal Life (Assume dike & dry stack ash)**	yr	2.8		**475600 cy ash annual rate**
26.004	Haul distance	mi	10.5		For Dry Stacking Ash Only (Round Trip)
26.005	Perforated Pipe ADS Drain Tube 6" Dia	lf	0		Elevations 790, 800, 810

26.006	Geotextile for underdrain	sy	0	Woven Monofilament
26.007	#57 Stone for underdrain pipe bedding (135 pcf)	ton	0	
26.008	Solid Outlet Pipe ADS Drain 6" Dia	lft	0	
26.009	#57 Stone for outlet pipe bedding (135 pcf)	ton	0	
27.000	**Phase 3 Operational Cost**			
27.001	**Stage 2 (3 to 1 side slopes)**			
27.002	**Dry Stack Ash Quantities**	cy	1504825	**Phase 3 only**
27.003	**Stage 2 Disposal Life (Assume dike & Dry Stack Ash)**	yr	3.2	**475600 cy ash annual rate**
27.004	Haul distance	mi	0.5	For Dry Stacking Ash Only (Round Trip)
27.005	Perforated Pipe ADS Drain Tube 6" Dia	lft	0	Elevations 820, 830, 840
27.006	Geotextile for underdrain	sy	0	Woven Monofilament
27.007	#57 Stone for underdrain pipe bedding (135 pcf)	ton	0	
27.008	Solid Outlet Pipe ADS Drain 6" Dia	lft	0	
27.009	#57 Stone for outlet pipe bedding (135 pcf)	ton	0	
28.000	**Phase 3 Operational Cost**			
28.001	**Stage 3 (3 to 1 side slopes)**			
28.002	**Dry Stack Ash Quantities**	cy	1334189	Phase 3 only
28.003	**Stage 2 Disposal Life (Assume dike & sluice ash & gyp)**	yr	2.8	**475600 cy ash annual rate**
28.004	Haul distance	mi	0.5	For Dry Stacking Ash Only (Round Trip)
28.005	Perforated Pipe ADS Drain Tube 6" Dia	lft	0	Elevations 850, 860, 870
28.006	Geotextile for underdrain	sy	0	Woven Monofilament
28.007	#57 Stone for underdrain pipe bedding (135 pcf)	ton	0	
28.008	Solid Outlet Pipe ADS Drain 6" Dia	lft	0	
28.009	#57 Stone for outlet pipe bedding (135 pcf)	ton	0	
29.000	**Phase 2 Operational Cost**			
29.001	**Stage 4 (3 to 1 side slopes)**			
29.002	Dry Stack Ash Quantities	cy	871485	
29.003	Stage 4 Disposal Life (Assume dry stack)	yr	1.8	475600 cy ash annual rate, Haul distance .5mi
29.004	Perforated Pipe ADS Drain Tube 6" Dia	lft	0	Elevations 880, 890, 900
29.005	Geotextile for underdrain	sy	0	Woven Monofilament
29.006	#57 Stone for underdrain pipe bedding (135 pcf)	ton	0	
29.007	Solid Outlet Pipe ADS Drain 6" Dia	lft	0	
29.008	#57 Stone for outlet pipe bedding (135 pcf)	ton	0	
30.000	**Phase 3 Operational Cost**			
30.001	**Stage 4 (3 to 1 side slopes)**			

30.002	Dry Stack Ash Quantities	cy	1159225	
30.003	Stage 4 Disposal Life (Assume dike & dry stack ash)	yr	3.4	475600 cy ash
30.004	Perforated Pipe ADS Drain Tube 6" Dia	lf	0	Elevations 880, 890, 900
30.005	Geotextile for underdrain	sy	0	Woven Monofilament
30.006	#57 Stone for underdrain pipe bedding (135 pcf)	ton	0	
30.007	Solid Outlet Pipe ADS Drain 6" Dia	lf	0	
30.008	#57 Stone for outlet pipe bedding (135 pcf)	ton	0	
30.000	**Phase 2 Operational Cost**			
30.001	**Stage 5 (3 to 1 side slopes)**			
30.002	Dry Stack Ash Quantities	cy	400537	
30.003	Stage 4 Disposal Life (Assume dry stack)	yr	[illegible]	475600 cy ash annual rate, Haul distance 5 mi
30.004	Perforated Pipe ADS Drain Tube 6" Dia	lf	0	Elevations 910, 920, 930
30.005	Geotextile for underdrain	sy	0	Woven Monofilament
30.006	#57 Stone for underdrain pipe bedding (135 pcf)	ton	0	
30.007	Solid Outlet Pipe ADS Drain 6" Dia	lf	0	
30.008	#57 Stone for outlet pipe bedding (135 pcf)	ton	0	
31.000	**Phase 3 Operational Cost**			
31.001	**Stage 5 (3 to 1 side slopes)**			
31.002	**Dry Stack Ash Quantities**	cy	662310	
31.003	**Stage 5 Disposal Life (Assume dike & dredge ash)**	yr	1.4	**475600 cy ash annual rate**
31.004	Perforated Pipe ADS Drain Tube 6" Dia	lf	7715	Elevations 910, 920, 930
31.005	Geotextile for underdrain	sy	6429	Woven Monofilament
31.006	#57 Stone for underdrain pipe bedding (135 pcf)	ton	1562	
31.007	Solid Outlet Pipe ADS Drain 6" Dia	lf	[illegible]	
31.008	#57 Stone for outlet pipe bedding (135 pcf)	ton	352	
32.000	**Phase 2 & Phase 3 Operational Cost**			
32.001	**Stage 6 (3 to 1 side slopes)**			
32.002	Filter layer & bottom ash drainage layer 2' thick	cy	40231	El 930
32.003	Dry Stack Quantities	cy	564157	475600 cy ash annual rate
32.004	Stage 6 Disposal Life (Assume dike & dredge ash)	yr	[illegible]	

Assumptions

(1) All earthwork quantities are in bank cubic yards (bcy) - no shrink or swell factors applied
(2) Closure costs not included.
(3) Liner is not required for option 2, but is required for option 6.
(4) Bottom ash columns are subject to change with final design.
(5) Engineering (Inc. TVA over sight, subcontracts, and additional geotechnical investigation) - Assume 10% of construction costs.

(6) Assuming a disposal rate of 475,600 cy annually (inclucing bottom and fly ash) & Gypsum/Ash Generation 327360 cy annually.
(7) Sirgle Phase power is assumed for pump installed for Dredge Cell seepage retrofit. 3-phase power is assumed to not be required.