Printed on 03/31/2008

Company Name Pengrove Coal Co.
Project 61820105-29W (Chemical)
Site Name Martin

AMD TREAT

Costs AMD TREAT MAIN COST FORM

Passive Treatment	A	S	
Vertical Flow Pond			$0
Anoxic Limestone Drain			$0
Anaerobic Wetlands			$0
Aerobic Wetlands			$0
Manganese Removal Bed			$0
Oxic Limestone Channel			$0
Limestone Bed			$0
BIO Reactor			$0
Passive Subtotal:			**$0**
Active Treatment			
Caustic Soda	1	0	$2,387
Hydrated Lime			$0
Pebble Quick Lime			$0
Ammonia			$0
Oxidants			$0
Soda Ash			$0
Active Subtotal:			**$0**
Ancillary Cost			
Ponds	2	0	$10,000
Roads	1	0	$24,004
Land Access			$0
Ditching			$0
Engineering Cost	1	0	$7,278
Ancillary Subtotal:			**$41,282**
Other Cost (Capital Cost)			$0
Total Capital Cost:			**$43,669**
Annual Costs			
Sampling	1	0	$1,298
Labor	1	0	$21,840
Maintenance	1	0	$1,274
Pumping			$0
Chemical Cost	1	0	$14,311
Oxidant Chem Cost			$0
Sludge Removal	1	0	$2,492
Other Cost (Annual Cost)			$0
Land Access (Annual Cost)			$0
Total Annual Cost:			**$41,215**
Other Cost			

Water Quality

Calculated Acidity	289.00	mg/L
Alkalinity	0.00	mg/L

Calculate Net Acidity (Acid-Alkalinity)
Enter Net Acidity manually

Net Acidity (Hot Acidity)	289.00	mg/L
Design Flow	57.10	gpm
Typical Flow	42.00	gpm
Total Iron	22.60	mg/L
Aluminum	11.20	mg/L
Manganese	59.00	mg/L
pH	3.10	su
Ferric Iron	0.00	mg/L
Ferrous Iron	0.00	mg/L
Sulfate	814.80	mg/L
Filtered Fe	0.00	mg/L
Filtered Al	0.00	mg/L
Filtered Mn	0.00	mg/L
Specific Conductivity	0.00	uS/cm
Total Dissolved Solids	0.00	mg/L
Dissolved Oxygen	0.00	mg/L
Typical Acid Loading	26.6	tons/yr

Total Annual Cost: per 1000 Gal of H2O Treated $1.865

Company Name Pengrove Coal Co.

Project 61820105-29W (Chemical)

Site Name Martin

COMMENTS:

Printed on 03/31/2008

Company Name Pengrove Coal Co.

Project 61820105-29W (Chemical)

Site Name Martin

AMD TREAT

CAUSTIC SODA

AMDTREAT

☑ **Opening Screen Water Parameters**

Caustic Soda Name

Influent Water Parameters that Affect Caustic Soda

Calculated Acidity: 289.00 mg/L

Alkalinity: 0.00 mg/L

○ Calculate Net Acidity (Acid-Alkalinity)

○ Enter Net Acidity manually

Net Acidity (Hot Acidity): 289.00 mg/L

Design Flow: 57.10 gpm

Typical Flow: 42.00 gpm

Total Iron: 22.60 mg/L

Aluminum: 11.20 mg/L

Manganese: 59.00 mg/L

1. Gallons of Caustic per Year	23,851.10	gal/yr
2. Gallons of Caustic per Month	1,987.59	gal/mo
3. Gallons of Caustic per Day	65.34	gal/day
☐ 4. Titration?		
5. Caustic Titration Volume		gal caustic/gal water treated
6. Purity of Caustic Solution	99.00	purity of 20% caustic solution
7. Mixing Efficiency of Caustic Solution	90.00	%
8. Tank Cost	2000	$
9. Tank Volume	2500	gal
10. Delivery Frequency	12	times/yr
11. Valve Unit Cost	50.00	$
12. Number of Valves	2	nbr
13. Feeder Line Length	20	ft
14. Feeder Line Unit Cost	0.35	$/ft
15. Installation of System Unit Cost	35.00	$/hr
16. Installation Hours	8	hours

☐ 17. Automatic System?		
18. PID pH Proportional Control		$
19. pH Probe		$
20. Chemical Metering Pump		$
☐ 21. Water Wheel Dispenser		
22. Dispenser Cost		$

Caustic Sub-Totals

23. Number of Tanks Required	1	nbr
24. Tank Cost	2,000	$
25. Automatic System or Wheel Dispenser Cost	0	$
26. Cost of Valves	100	$
27. Feeder Line Cost	7	$
28. Labor Cost	280	$
29. Total Capital Cost	2,387	$

Record Number 1 of 1

Company Name Pengrove Coal Co.

Project 61820105-29W (Chemical)

Site Name Martin

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AMD TREAT

PONDS

AMDTREAT

Pond Name

Pond Design Based On:

- (•) Retention Time
  - 1. Desired Retention Time: 24.0 hours
  - [ ] 2. Include Sludge Removal?
  - 3. Sludge Removal Frequency: times/year
  - [ ] 4. Titration?
    - 5. Sludge Rate: gal sludge/ gal H2O
    - 6. Percent Solids: %
    - 7. Sludge Density: lbs./gal
- ( ) Pond Size
  - 8. Pond Length at Top of Freeboard: ft
  - 9. Pond Width at Top of Freeboard: ft

	Run		Rise	
10. Slope Ratio of Pond Sides	2.0	:	1	
11. Freeboard Depth	2.0			ft
12. Water Depth	4.0			ft
13. Excavation Unit Cost	5.50			$/yd3
14. Total Length of Effluent / Influent Pipe	0.00			ft
15. Unit Cost of Pipe	0.00			$/ft

Liner Cost

- (•) No Liner
- ( ) Clay Liner
  - 16. Clay Liner Unit Cost: $/yd3
  - 17. Thickness of Clay Liner: ft
- ( ) Synthetic Liner
  - 18. Synthetic Liner Unit Cost: $/yd2

[ ] 19. Clearing and Grubbing?

- ( ) 20. Land Multiplier: ratio
- ( ) 21. Clear/Grub Acres: acres
- 22. Clear and Grub Unit Cost: $/acre

23. Revegetation Cost: 1500.00 $/acre

24. Cost of Baffles: 0 $

Calculated Pond Dimensions per Pond

25. Length at Top of Freeboard	93	ft
26. Width at Top of Freeboard	50	ft
27. Freeboard Volume	720	yd3
28. Water Volume	407	yd3
29. Estimated Annual Sludge	0	yd3/yr
30. Volume of Sludge per Removal	0	yd3/ removal
31. Excavation Volume	0.25	acre ft
32. Excavation Volume	407	yd3
33. Clear and Grub Area	0.16	acres
34. Liner Area	0	yd2
35. Calculated Retention Time	24	hours

Ponds Sub-Totals per Pond

36. Excavation Cost	2,239	$
37. Pipe Cost	0	$
38. Liner Cost	0	$
39. Clearing and Grubbing Cost	0	$
40. Revegetation Cost	82	$
41. Baffle Cost	0	$

[x] 42. Estimated Cost: 2,322 $

[x] 43. Accept Minimum Pond Cost?

The Recommended Minimum Construction Cost of Building a Pond is $ 5,000

44. Recommended Minimum Cost: 5,000 $

45. Total Cost: 5,000 $

[x] **Opening Screen Water Parameters**

Influent Water Parameters that Affect Ponds

Calculated Acidity: 289.00 mg/L

Alkalinity: 0.00 mg/L

- (•) Calculate Net Acidity (Acid-Alkalinity)
- ( ) Enter Net Acidity manually

Net Acidity (Hot Acidity): 289.00 mg/L

Design Flow: 57.10 gpm

Typical Flow: 42.00 gpm

Total Iron: 22.60 mg/L

Aluminum: 11.20 mg/L

Manganese: 59.00 mg/L

Record Number 1 of 2

Company Name Pengrove Coal Co.

Project 61820105-29W (Chemical)

Site Name Martin

Printed on 03/31/2008

AMD TREAT

PONDS

AMDTREAT

Pond Name

Pond Design Based On:

- (•) Retention Time
  - 1. Desired Retention Time: 24.0 hours
  - [ ] 2. Include Sludge Removal?
  - 3. Sludge Removal Frequency: times/year
  - [ ] 4. Titration?
    - 5. Sludge Rate: gal sludge/ gal H2O
    - 6. Percent Solids: %
    - 7. Sludge Density: lbs./gal
- ( ) Pond Size
  - 8. Pond Length at Top of Freeboard: ft
  - 9. Pond Width at Top of Freeboard: ft

	Run		Rise
10. Slope Ratio of Pond Sides	2.0	:	1

- 11. Freeboard Depth: 2.0 ft
- 12. Water Depth: 4.0 ft
- 13. Excavation Unit Cost: 5.50 $/yd3
- 14. Total Length of Effluent / Influent Pipe: 0.00 ft
- 15. Unit Cost of Pipe: 0.00 $/ft

Liner Cost

- (•) No Liner
- ( ) Clay Liner
  - 16. Clay Liner Unit Cost: $/yd3
  - 17. Thickness of Clay Liner: ft
- ( ) Synthetic Liner
  - 18. Synthetic Liner Unit Cost: $/yd2

[ ] 19. Clearing and Grubbing?

- ( ) 20. Land Multiplier: ratio
- ( ) 21. Clear/Grub Acres: acres
- 22. Clear and Grub Unit Cost: $/acre

- 23. Revegetation Cost: 1500.00 $/acre
- 24. Cost of Baffles: 0 $

Calculated Pond Dimensions per Pond

25. Length at Top of Freeboard	93	ft
26. Width at Top of Freeboard	50	ft
27. Freeboard Volume	720	yd3
28. Water Volume	407	yd3
29. Estimated Annual Sludge	0	yd3/yr
30. Volume of Sludge per Removal	0	yd3/ removal
31. Excavation Volume	0.25	acre ft
32. Excavation Volume	407	yd3
33. Clear and Grub Area	0.16	acres
34. Liner Area	0	yd2
35. Calculated Retention Time	24	hours

Ponds Sub-Totals per Pond

36. Excavation Cost	2,239	$
37. Pipe Cost	0	$
38. Liner Cost	0	$
39. Clearing and Grubbing Cost	0	$
40. Revegetation Cost	82	$
41. Baffle Cost	0	$
[x] 42. Estimated Cost	2,322	$

[x] 43. Accept Minimum Pond Cost?

The Recommended Minimum Construction Cost of Building a Pond is $ 5,000

44. Recommended Minimum Cost: 5,000 $

45. Total Cost: 5,000 $

[x] **Opening Screen Water Parameters**

Influent Water Parameters that Affect Ponds

Calculated Acidity: 289.00 mg/L

Alkalinity: 0.00 mg/L

- (•) Calculate Net Acidity (Acid-Alkalinity)
- ( ) Enter Net Acidity manually

Net Acidity (Hot Acidity): 289.00 mg/L

Design Flow: 57.10 gpm

Typical Flow: 42.00 gpm

Total Iron: 22.60 mg/L

Aluminum: 11.20 mg/L

Manganese: 59.00 mg/L

Record Number 2 of 2

Company Name Pengrove Coal Co.

Project 61820105-29W (Chemical)

Site Name Martin

Printed on 03/31/2008

AMD TREAT

ROADS

AMDTREAT

Road Name

1. Road Length	2000	ft
2. Road Width	15	ft
3. Road Depth	1.00	ft
4. Aggregate Unit Cost	20.00	$/yd3
5. GeoTextile Length	0	ft
6. GeoTextile Unit Cost	0.50	$/yd2
7. Length of Silt Fence	0	ft
8. Unit Cost of Silt Fence	1.00	$/ft
☑ 9. Surveying?		
10. Survey Rate	1.0	acres/day
11. Survey Unit Cost	650	$/day
☑ 12. Clearing and Grubbing?		
13. Clear and Grub Cost	1256	$/acre
14. Reveg Unit Cost	1500.00	$/acre
15. Culvert Unit Cost	30.00	$/ft
16. Culvert Length	0	ft

Roads Sub-Totals

17. Road Surface Cost	22,222	$
18. GeoTextile Cost	0	$
19. Silt Fence Cost	0	$
20. Culvert Cost	0	$
21. Revegetation Cost	207	$
22. Survey Cost	537	$
23. Clear and Grub Cost	1,038	$
24. Total Cost	24,004	$

Record Number 1 of 1

Company Name Pengrove Coal Co.

Project 61820105-29W (Chemical)

Site Name Martin

Printed on 03/31/2008

AMD TREAT

ENGINEERING COST

1. Capital Cost *	36,391	$
(•) 2. Per Cent of Capital Cost	20.00	%
( ) 3. Actual Engineering Cost		$
4. Total Engineering Cost	7,278	$

*** Total Capital Cost minus Engineering and Land Access Capital Cost**

Company Name Pengrove Coal Co.

Project 61820105-29W (Chemical)

Site Name Martin

Printed on 03/31/2008

AMD TREAT

SAMPLING

AMDTREAT

Sampling Name

Estimate Sampling Cost

1. Unit Labor Cost		$/hr
2. Collection Time per Sample		hours/sample
3. Travel Time		hr
4. Sample Frequency		samples/mo
5. Lab Cost Per Sample		$/sample
6. Number of Sample Points		points

Enter Established Annual Sampling Cost

7. Actual Annual Sampling Cost	1,298	$

Sampling Sub-Totals

8. Yearly Sample Analysis Cost	0	$
9. Yearly Travel Cost	0	$
10. Yearly Collection Cost	0	$

11. Sampling Cost	1,298	$

Record Number 1 of 1

Company Name Pengrove Coal Co.

Project 61820105-29W (Chemical)

Site Name Martin

Printed on 03/31/2008

AMD TREAT

LABOR

Labor Name

Estimate Labor Cost

1. Site Visits per Week	3.00	
2. Site Labor Time per Visit	2.00	hours
3. Travel Time per Visit	2.00	hours
4. Unit Labor Cost	35.00	$/hour

Enter Established Annual Labor Cost

5. Actual Annual Labor Cost		$

6. Total Cost	21,840	$

Record Number 1 of 1

Printed on 03/31/2008

Company Name Pengrove Coal Co.

Project 61820105-29W (Chemical)

Site Name Martin

AMD TREAT

MAINTANENCE

Estimate Maintenance Cost

1. Percent of Active Cost	3.50	%
2. Percent of Passive Cost	3.50	%
3. Percent of Ancillary Cost *	3.50	%
4. Percent of Other Capital Cost	3.50	%

Enter Established Annual Maintenance Cost

5. Annual Maintenance Cost		$

Maintenance Sub-Totals

6 Total Maintenance Active Cost	84	$
7. Total Maintenance Passive Cost	0	$
8. Total Maintenance Ancillary Cost	1,190	$
9. Total Maintenance Other Capital Cost	0	$
10. Total Maintenance Cost	1,274	$

* Ancillary Cost does int include Cost for Land Access and Engineering Cost

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Company Name Pengrove Coal Co.

Project 61820105-29W (Chemical)

Site Name Martin

AMD TREAT
CHEMICAL COST

AMDTREAT

Chemical Cost Name:

☑ **Opening Screen Water Parameters**

Influent Water Parameters that Affect Chemical Cost

Calculated Acidity: 289.00 mg/L

Alkalinity: 0.00 mg/L

- ◉ Calculate Net Acidity (Acid-Alkalinity)
- ○ Enter Net Acidity manually

Net Acidity (Hot Acidity): 289.00 mg/L

Design Flow: 57.10 gpm

Typical Flow: 42.00 gpm

Total Iron: 22.60 mg/L

Aluminum: 11.20 mg/L

Manganese: 59.00 mg/L

Record Number 1 of 1

○ A. Hydrated Lime ?

☐ 1 Titration?

2. Hydrated Lime Titration Amount ____ lbs of hydrated lime / gal of H2O

3. Hydrated Lime Purity ____ %

4. Mixing Efficiency of Hydrated Lime ____ %

5. Hydrated Lime Unit Cost ____ $/lb

○ B. Pebble Quick Lime ?

☐ 6. Titration?

7. Pebble Lime Titration Amount ____ lbs of Pebble Lime / gal of H2O

8. Pebble Lime Purity ____ %

9. Mixing Efficiency of Pebble Lime ____ %

○ Delivered in Bags

10. Pebble Lime Bag Unit Cost ____ $/lb

○ Bulk Delivery

11. Pebble Lime Bulk Unit Cost ____ $/lb

◉ C. Caustic Soda ?

☐ 12. Titration?

13. Caustic Titration Amount ____ gal ofcaustic / gal H2O

14. Caustic Purity ____ purity of 20% caustic solution

15. Mixing Efficiency of Caustic ____ %

○ Non-Bulk Delivery

16. Caustic Non-Bulk Unit Cost ____ $/gal

◉ Bulk Delivery

17. Caustic Bulk Unit Cost 0.60 $/gal

☐ 18. Flocculents?

19. Flocculent Consumption ____ gal/hr

20. Flocculent UnitCost ____ $/gal

○ E. Anhydrous Ammonia ?

☐ 21. Titration?

22. AmmoniaTitration Amount ____ lbs of ammonia / gal H2O

23. Ammonia Purity ____ %

24. Mixing Efficiency of Ammonia ____ %

○ Non-Bulk Delivery

25. Ammonia Non-Bulk Unit Cost ____ $/lb

○ Bulk Delivery

26. Ammonia Bulk Unit Cost ____ $/lb

○ F. Soda Ash ?

☐ 27. Titration?

28 Soda Ash Titration Amount ____ lbs of soda ash / gal of H2O

29. Soda Ash Purity ____ %

30. Mixing Efficiency of Soda Ash ____ %

31 Soda Ash Unit Cost ____ $/lb

○ G. Known Chemical Cost ?

32. Known Annual Chemical Cost ____ $

Chemical Cost Sub-Totals / **Annual Amount of Chemicals Consumed**

33. Total Hydrated Lime Cost	0	$	0	lbs
34. Total Pebble Lime Cost	3,165	$	63,301	lbs
35. Total Caustic Soda Cost	14,311	$	23,851	gals
36. Total Anhydrous Ammonia Cost	0	$	0	lbs
37. Total Soda Ash Cost	0	$	0	lbs
38. Total Known Chemical Cost	0	$		
39. Total Flocculent Cost	0	$	0	gals

40. Selected Chemical: **CAUSTIC SODA**

Annual Chemical Cost 14,311 $

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Company Name Pengrove Coal Co.

Project 61820105-29W (Chemical)

Site Name Martin

AMD TREAT

SLUDGE REMOVAL

AMDTREAT

☑ **Opening Screen Water Parameters**

Influent Water Parameters that Affect Sludge Removal

Calculated Acidity: 289.00 mg/L

Alkalinity: 0.00 mg/L

- ◉ Calculate Net Acidity (Acid-Alkalinity)
- ○ Enter Net Acidity manually

Net Acidity (Hot Acidity): 289.00 mg/L

Design Flow: 57.10 gpm

Typical Flow: 42.00 gpm

Total Iron: 23 mg/L

Aluminum: 11 mg/L

Manganese: 59 mg/L

Sludge Removal Name

1. Select One — Selection for Method of Removing Sludge

- ◉ Sludge Removal by $ per Gallon
  - 2. Sludge Removal Unit Cost: 0.06 $/gal
- ○ Sludge Removal by Vacuum Truck
  - 3. Vacuum Truck Unit Cost: $/hr
  - 4. Mobilization Cost: $
  - 5. Hours to be Used: hr
- ○ Sludge Removal by Mechanical Excavation
  - 6. Mechanical Excavation Unit Rate: $/hr
  - 7. Mobilization Cost: $
  - 8. Hours to be Used: hr
- ○ Sludge Removal by Lagoon Cleaner
  - 9. Lagoon Cleaning Unit Rate: $/hr
  - 10. Mobilization Cost: $
  - 11. Hours to be Used: hr
- ○ Actual Sludge Removal Cost
  - 12. Actual Sludge Removal Cost: $

13. Off Site Disposal Cost: 0.00 $

Record Number 1 of 1

Concentrations from Main Water Quality Screen

14. Iron Concentration	22.60	mg/L
15. Manganese Concentration	59.00	mg/L
16. Aluminum Concentration	11.20	mg/L
17. Total Miscellaneous Concentration	0	mg/L
18. Percent Solids	5.00	%
19. Sludge Density	8.33	lbs/gal
☐ 20. Titration?		
21. Gal. of Sludge per Gal of Water Treated		gal
22. Estimated Sludge Volume	205	yd3/yr

Cost for Sludge Removal Types

23. Removal by $ per Gallon	2,492	$
24. Removal by Vacuum Truck	0	$
25. Removal by Mechanical Excavation	0	$
26. Removal by Lagoon Cleaner	0	$
27. Actual Sludge Removal Cost	0	$

Sludge Removal Sub-Totals

28. Currently Selected Removal Cost Plus Off Site Disposal Cost: 2,492 $

Printed on 03/31/2008

Company Name Pengrove Coal Co.

Project 61820105-29W (Chemical)

Site Name Martin

AMD TREAT
RECAPITIZALITION COST

AMDTREAT

Calculation Period 75 yrs Inflation Rate 3.10 % Net Return Rate 6.00 %

Recapitizalition Name

A.	B	C	D	E	F	G
Description of Item	Unit Cost Per Item	Quantity	Total Item Cost	Life Cycle	Number of Periods	Total PV
1. Caustic System	2,387	1	2,387	20	3	2,609
2. Ponds	10,000	1	10,000	20	3	10,932
3. Road	24,004	1	24,004	20	3	26,241
4.	0	0	0	0	0	0
5.	0	0	0	0	0	0
6.	0	0	0	0	0	0
7.	0	0	0	0	0	0
8.	0	0	0	0	0	0
9.	0	0	0	0	0	0
10.	0	0	0	0	0	0
11.	0	0	0	0	0	0
12.	0	0	0	0	0	0
13.	0	0	0	0	0	0
14.	0	0	0	0	0	0
15.	0	0	0	0	0	0
16.	0	0	0	0	0	0
17.	0	0	0	0	0	0
18.	0	0	0	0	0	0
19.	0	0	0	0	0	0
20.	0	0	0	0	0	0

Total Capital Cost 36,391 $ PV Grand Total 39,782 $