

Company Name C & K Coal Company

Project 61783001-1C

Site Name Racic



AMD TREAT

AMD TREAT MAIN COST FORM

AMDTREAT

Costs

<u>Passive Treatment</u>	<u>A</u>	<u>S</u>	
Vertical Flow Pond			\$0
Anoxic Limestone Drain			\$0
Anaerobic Wetlands			\$0
Aerobic Wetlands	1	0	\$28,150
Manganese Removal Bed			\$0
Oxic Limestone Channel			\$0
Limestone Bed			\$0
BIO Reactor			\$0
Passive Subtotal:			\$28,150
<u>Active Treatment</u>			
Caustic Soda	1	0	\$2,387
Hydrated Lime			\$0
Pebble Quick Lime			\$0
Ammonia			\$0
Oxidants			\$0
Soda Ash			\$0
Active Subtotal:			\$0
<u>Ancillary Cost</u>			
Ponds	3	0	\$48,960
Roads			\$0
Land Access			\$0
Ditching			\$0
Engineering Cost			\$0
Ancillary Subtotal:			\$48,960
Other Cost (Capital Cost)			\$0
Total Capital Cost:			\$79,497
<u>Annual Costs</u>			
Sampling	1	0	\$1,298
Labor	1	0	\$16,380
Maintenance	1	0	\$2,079
Pumping			\$0
Chemical Cost	1	0	\$12,876
Oxidant Chem Cost			\$0
Sludge Removal	1	0	\$2,422
Other Cost (Annual Cost)			\$0
Land Access (Annual Cost)			\$0
Total Annual Cost:			\$35,055
Other Cost			

Water Quality

Calculated Acidity mg/L

Alkalinity mg/L

Calculate Net Acidity (Acid-Alkalinity)

Enter Net Acidity manually

Net Acidity (Hot Acidity) mg/L

Design Flow gpm

Typical Flow gpm

Total Iron mg/L

Aluminum mg/L

Manganese mg/L

pH su

Ferric Iron mg/L

Ferrous Iron mg/L

Sulfate mg/L

Filtered Fe mg/L

Filtered Al mg/L

Filtered Mn mg/L

Specific Conductivity uS/cm

Total Dissolved Solids mg/L

Dissolved Oxygen mg/L

Typical Acid Loading tons/yr

**Total Annual Cost: per
1000 Gal of H2O Treated \$2.613**

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COMMENTS:

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AMD TREAT AEROBIC WETLANDS

AMDTREAT

Aerobic Wetlands Name

**Opening Screen
Water Parameters**

**Influent Water
Parameters
that Affect
Aerobic Wetlands**

Calculated Acidity
 mg/L
Alkalinity
 mg/L

Calculate Net
Acidity
(Acid-Alkalinity)
 Enter Net Acidity
manually
Net Acidity
(Hot Acidity)
 mg/L

Design Flow
 gpm
Typical Flow
 gpm
Total Iron
 mg/L
Aluminum
 mg/L
Manganese
 mg/L
pH
 su

SIZING METHODS Select One

- Aerobic Wetland Based on Metal Removal Rates 1. Iron Removal Rate g/m2/day 2. Mn Removal Rate g/m2/day
- Aerobic Wetland Based on Dimensions 3. Top Length at Freeboard ft 4. Top Width at Freeboard ft
- Aerobic Wetland Based on Iron Oxidation Kinetics 5. Rate Constant moles/sec 6. Effluent Fe Concentration mg/l
7. Dissolved Oxygen mg/l 8. H2O Temperature °C

9. Length to Width Ratio Length : Width
10. Slope of Wetland Sides Run of Slope : Rise of Slope
11. Freeboard Depth ft
12. Free Standing Water Depth ft
13. Organic Matter Depth ft
14. Organic Matter Unit Cost \$/yd3
15. Organic Matter Spreading Unit Cost \$/yd3
16. Excavation Unit Cost \$/yd3
17. Wetland Planting Unit Cost \$/acre

Liner Cost

- No Liner
- Clay Liner
18. Clay Liner Unit Cost \$/yd3
19. Thickness of Clay Liner ft
- Synthetic Liner
20. Synthetic Liner Unit Cost \$/yd2

21. Clearing and Grubbing?

22. Land Multiplier ratio
23. Clear/Grub Acres acres
24. Clear and Grub Unit Cost \$/acre

Aerobic Wetland Sizing Summaries

25. Length at Top of Freeboard	2,000.00	ft
26. Width at Top of Freeboard	20.00	ft
27. Freeboard Volume	1,886	yd3
28. Water Surface Area	27,916	ft2
29. Water Volume	479	yd3
30. Organic Matter Volume	737	yd3
31. Excavation Volume	1,216	yd3
32. Clear and Grub Area	0.0	acres
33. Liner Area	0	ft2
34. Retention Time	49	hrs

Aerobic Cost Summaries

35. Organic Matter Cost	18,059	\$
36. Excavation Cost	6,693	\$
37. Liner Cost	0	\$
38. Clear and Grub Cost	0	\$
39. Wetland Planting Cost	3,398	\$

40. Total Cost \$

Record Number 1 of 1

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AMD TREAT CAUSTIC SODA

AMDTREAT

Caustic Soda Name

**Opening Screen
Water Parameters**

**Influent Water
Parameters
that Affect
Caustic Soda**

Calculated Acidity
 mg/L
Alkalinity
 mg/L

Calculate Net
Acidity
(Acid-Alkalinity)
 Enter Net Acidity
manually
Net Acidity
(Hot Acidity)
 mg/L

Design Flow
 gpm
Typical Flow
 gpm
Total Iron
 mg/L
Aluminum
 mg/L
Manganese
 mg/L

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

24. Tank Cost \$

25. Automatic System or Wheel Dispenser Cost \$

26. Cost of Valves \$

27. Feeder Line Cost \$

28. Labor Cost \$

29. Total Capital Cost \$

Record Number 1 of 1



AMD TREAT PONDS

AMDTREAT

Pond Name Pond 1

Pond Design Based On:

Retention Time

1. Desired Retention Time hours

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 200.000 ft

9. Pond Width at Top of Freeboard 75.000 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 / Inlet 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 200 ft

26. Width at Top of Freeboard 75 ft

27. Freeboard Volume 2,642 yd3

28. Water Volume 1,611 yd3

29. Estimated Annual Sludge 0 yd3/yr

30. Volume of Sludge per Removal 0 yd3/removal

31. Excavation Volume 0.99 acre ft

32. Excavation Volume 1,611 yd3

33. Clear and Grub Area 0.51 acres

34. Liner Area 0 yd2

35. Calculated Retention Time 167 hours

Ponds Sub-Totals per Pond

36. Excavation Cost 8,863 \$

37. Pipe Cost 0 \$

38. Liner Cost 0 \$

39. Clearing and Grubbing Cost 0 \$

40. Revegetation Cost 258 \$

41. Baffle Cost 0 \$

42. Estimated Cost 9,121 \$

Opening Screen Water Parameters

Influent Water Parameters that Affect Ponds

Calculated Acidity 471.10 mg/L

Alkalinity 0.00 mg/L

Calculate Net Acidity (Acid-Alkalinity)

Enter Net Acidity manually

Net Acidity (Hot Acidity) 471.10 mg/L

Design Flow 32.40 gpm

Typical Flow 25.50 gpm

Total Iron 88.26 mg/L

Aluminum 35.43 mg/L

Manganese 22.53 mg/L

Record Number
1 of 3



AMD TREAT PONDS

AMDTREAT

Pond Name Pond 2

Pond Design Based On:

Retention Time

1. Desired Retention Time hours

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 300.000 ft

9. Pond Width at Top of Freeboard 100.000 ft

	Run	Rise
10. Slope Ratio of Pond Sides	<input type="text"/> 2.0	: <input type="text"/> 1
11. Freeboard Depth	<input type="text"/> 2.0 ft	
12. Water Depth	<input type="text"/> 8.0 ft	
13. Excavation Unit Cost	<input type="text"/> 5.50 \$/yd3	
14. Total Length of Effluent / Influent Pipe	<input type="text"/> 0.00 ft	
15. Unit Cost of Pipe	<input type="text"/> 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 300 ft

26. Width at Top of Freeboard 100 ft

27. Freeboard Volume 8,345 yd3

28. Water Volume 6,240 yd3

29. Estimated Annual Sludge 0 yd3/yr

30. Volume of Sludge per Removal 0 yd3/removal

31. Excavation Volume 3.86 acre ft

32. Excavation Volume 6,240 yd3

33. Clear and Grub Area 1.03 acres

34. Liner Area 0 yd2

35. Calculated Retention Time 648 hours

Ponds Sub-Totals per Pond

36. Excavation Cost 34,322 \$

37. Pipe Cost 0 \$

38. Liner Cost 0 \$

39. Clearing and Grubbing Cost 0 \$

40. Revegetation Cost 516 \$

41. Baffle Cost 0 \$

42. Estimated Cost 34,839 \$

Opening Screen Water Parameters

Influent Water Parameters that Affect Ponds

Calculated Acidity 471.10 mg/L

Alkalinity 0.00 mg/L

Calculate Net Acidity (Acid-Alkalinity)

Enter Net Acidity manually

Net Acidity (Hot Acidity) 471.10 mg/L

Design Flow 32.40 gpm

Typical Flow 25.50 gpm

Total Iron 88.26 mg/L

Aluminum 35.43 mg/L

Manganese 22.53 mg/L

Record Number
2 of 3

Company Name C & K Coal Company

Printed on 03/31/2008

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AMD TREAT PONDS

AMDTREAT

Pond Name Sludge Pond

Pond Design Based On:

Retention Time

1. Desired Retention Time 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 150.000 ft

9. Pond Width at Top of Freeboard 50.000 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 4.50 \$/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 150 ft

26. Width at Top of Freeboard 50 ft

27. Freeboard Volume 1,176 yd³

28. Water Volume 678 yd³

29. Estimated Annual Sludge 0 yd³/yr

30. Volume of Sludge per Removal 0 yd³/removal

31. Excavation Volume 0.42 acre ft

32. Excavation Volume 678 yd³

33. Clear and Grub Area 0.25 acres

34. Liner Area 0 yd²

35. Calculated Retention Time 70 hours

Ponds Sub-Totals per Pond

36. Excavation Cost 3,051 \$

37. Pipe Cost 0 \$

38. Liner Cost 0 \$

39. Clearing and Grubbing Cost 0 \$

40. Revegetation Cost 129 \$

41. Baffle Cost 0 \$

42. Estimated Cost 3,181 \$

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 \$

Opening Screen Water Parameters

Influent Water Parameters that Affect Ponds

Calculated Acidity

471.10 mg/L

Alkalinity

0.00 mg/L

Calculate Net Acidity (Acid-Alkalinity)

Enter Net Acidity manually

Net Acidity (Hot Acidity)

471.10 mg/L

Design Flow

32.40 gpm

Typical Flow

25.50 gpm

Total Iron

88.26 mg/L

Aluminum

35.43 mg/L

Manganese

22.53 mg/L

Record Number
3 of 3

Company Name C & K Coal Company

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AMDTREAT

AMD TREAT SAMPLING

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 \$

Sampling Sub-Totals

8. Yearly Sample Analysis Cost \$

9. Yearly Travel Cost \$

10. Yearly Collection Cost \$

11. Sampling Cost \$

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AMD TREAT

AMD TREAT

LABOR

Labor Name

Estimate Labor Cost

1. Site Visits per Week

2. Site Labor Time per Visit hours

3. Travel Time per Visit hours

4. Unit Labor Cost \$/hour

Enter Established Annual Labor Cost

5. Actual Annual Labor Cost \$

6. Total Cost \$

Record Number 1 of 1

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AMDTREAT

AMD TREAT

MAINTANENCE

Estimate Maintenance Cost

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

Enter Established Annual Maintenance Cost

5. Annual Maintenance Cost \$

Maintenance Sub-Totals

- 6 Total Maintenance Active Cost \$
- 7. Total Maintenance Passive Cost \$
- 8. Total Maintenance Ancillary Cost \$
- 9. Total Maintenance Other Capital Cost \$

10. Total Maintenance Cost \$

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



AMD TREAT CHEMICAL COST

AMDTREAT

Chemical Cost Name:

**Opening Screen
Water Parameters**

**Influent Water
Parameters
that Affect
Chemical Cost**

Calculated Acidity
 mg/L
Alkalinity
 mg/L

Calculate Net
Acidity
(Acid-Alkalinity)

Enter Net Acidity
manually

Net Acidity
(Hot Acidity)
 mg/L

Design Flow
 gpm

Typical Flow
 gpm

Total Iron
 mg/L

Aluminum
 mg/L

Manganese
 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 of caustic
/ 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 \$/gal

18. Flocculents?

19. Flocculent Consumption gal/hr

20. Flocculent Unit Cost \$/gal

E. Anhydrous Ammonia ?

21. Titration?

22. Ammonia Titration 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

Chemical Cost Sub-Totals		Annual Amount of Chemicals Consumed	
33. Total Hydrated Lime Cost	<input type="text" value="0"/> \$	<input type="text" value="0"/> lbs	
34. Total Pebble Lime Cost	<input type="text" value="0"/> \$	<input type="text" value="0"/> lbs	
35. Total Caustic Soda Cost	<input type="text" value="12,876"/> \$	<input type="text" value="21,459"/> gals	
36. Total Anhydrous Ammonia Cost	<input type="text" value="0"/> \$	<input type="text" value="0"/> lbs	
37. Total Soda Ash Cost	<input type="text" value="0"/> \$	<input type="text" value="0"/> lbs	
38. Total Known Chemical Cost	<input type="text" value="0"/> \$		
39. Total Flocculent Cost	<input type="text" value="0"/> \$	<input type="text" value="0"/> gals	

40. Selected Chemical: **CAUSTIC SODA**

Annual Chemical Cost \$

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AMDTREAT

**AMD TREAT
SLUDGE REMOVAL**

Opening Screen Water Parameters

Sludge Removal Name

Influent Water Parameters that Affect Sludge Removal

Calculated Acidity

mg/L

Alkalinity

mg/L

Calculate Net Acidity (Acid-Alkalinity)

Enter Net Acidity manually

Net Acidity (Hot Acidity)

mg/L

Design Flow

gpm

Typical Flow

gpm

Total Iron

mg/L

Aluminum

mg/L

Manganese

mg/L

1. Select One

Selection for Method of Removing Sludge

Sludge Removal by \$ per Gallon

2. Sludge Removal Unit Cost \$/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 \$

Concentrations from Main Water Quality Screen

14. Iron Concentration mg/L

15. Manganese Concentration mg/L

16. Aluminum Concentration mg/L

17. Total Miscellaneous Concentration mg/L

18. Percent Solids %

19. Sludge Density lbs/gal

20. Titration?

21. Gal. of Sludge per Gal of Water Treated gal

22. Estimated Sludge Volume yd3/yr

Cost for Sludge Removal Types

23. Removal by \$ per Gallon \$

24. Removal by Vacuum Truck \$

25. Removal by Mechanical Excavation \$

26. Removal by Lagoon Cleaner \$

27. Actual Sludge Removal Cost \$

Sludge Removal Sub-Totals

28. Currently Selected Removal Cost Plus Off Site Disposal Cost \$

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AMD TREAT RECAPITALIZATION COST

AMDTREAT

Calculation Period yrs Inflation Rate % Net Return Rate %

Recapitalization Name

A. Description of Item	B. Unit Cost Per Item	C. Quantity	D. Total Item Cost	E. Life Cycle	F. Number of Periods	G. Total PV
1. Wetland	28,150	1	28,150	20	3	15,388
2. Caustic system	2,387	1	2,387	20	3	1,305
3. Ponds	48,960	1	48,960	20	3	26,764
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 \$ PV Grand Total \$