

Company Name

Project DARMAC SILVERROCK

Site Name DARMAC MAIN DICSCARGE



**AMDTREAT**

**AMD TREAT**

**Costs**

**AMD TREAT MAIN COST FORM**

<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	\$76,059
Manganese Removal Bed	1	0	\$19,201
Oxic Limestone Channel			\$0
Limestone Bed			\$0
BIO Reactor			\$0
<b>Passive Subtotal:</b>			<b>\$95,260</b>
<u>Active Treatment</u>			
Caustic Soda			\$0
Hydrated Lime			\$0
Pebble Quick Lime			\$0
Ammonia			\$0
Oxidants			\$0
Soda Ash			\$0
<b>Active Subtotal:</b>			<b>\$0</b>
<u>Ancillary Cost</u>			
Ponds	1	0	\$5,000
Roads			\$0
Land Access			\$0
Ditching	1	0	\$3,621
Engineering Cost	1	0	\$16,578
<b>Ancillary Subtotal:</b>			<b>\$25,199</b>
<b>Other Cost (Capital Cost)</b>			<b>\$6,638</b>
<b>Total Capital Cost:</b>			<b>\$127,097</b>
<u>Annual Costs</u>			
Sampling	1	0	\$718
Labor	1	0	\$1,820
Maintenance	1	0	\$3,868
Pumping			\$0
Chemical Cost			\$0
Oxidant Chem Cost			\$0
Sludge Removal	1	0	\$622
<b>Other Cost (Annual Cost)</b>			<b>\$100</b>
<b>Land Access (Annual Cost)</b>			<b>\$0</b>
<b>Total Annual Cost:</b>			<b>\$7,128</b>
<b>Other Cost</b>	1	0	

**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 \$0.451**

Company Name

Project DARMAC SILVERROCK [REDACTED]

Site Name DARMAC MAIN DISCHARGE

COMMENTS: MAIN DISCHARGE WITH BURIED PIPE COLLECTION SYSTEM LISTED IN "OTHER COSTS". PLEASE NOTE THE LIFE OF THE PIPE SYSTEM IS EXPECTED TO BE > 100YEARS.

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Project DARMAC SILVERROCK

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### AMD TREAT

### AEROBIC WETLANDS

AMDTREAT

Aerobic Wetlands Name

Opening Screen Water Parameters

#### 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

#### 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

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	<input type="text" value="371.79"/>	ft
26. Width at Top of Freeboard	<input type="text" value="188.89"/>	ft
27. Freeboard Volume	<input type="text" value="3,808"/>	yd3
28. Water Surface Area	<input type="text" value="66,902"/>	ft2
29. Water Volume	<input type="text" value="1,228"/>	yd3
30. Organic Matter Volume	<input type="text" value="2,397"/>	yd3
31. Excavation Volume	<input type="text" value="3,626"/>	yd3
32. Clear and Grub Area	<input type="text" value="0.0"/>	acres
33. Liner Area	<input type="text" value="0"/>	ft2
34. Retention Time	<input type="text" value="96"/>	hrs

#### Aerobic Cost Summaries

35. Organic Matter Cost	<input type="text" value="53,938"/>	\$
36. Excavation Cost	<input type="text" value="16,317"/>	\$
37. Liner Cost	<input type="text" value="0"/>	\$
38. Clear and Grub Cost	<input type="text" value="0"/>	\$
39. Wetland Planting Cost	<input type="text" value="5,804"/>	\$

40. Total Cost  \$

Record Number 1 of 1

Company Name

Project DARMAC SILVERROCK

Site Name DARMAC MAIN DICSCHARGE



AMDTREAT

## AMD TREAT MANGANESE REMOVAL BED

MN Removal Bed Name

SIZING METHODS <b>Select One</b>			
Tons of Limestone Needed	1,271.54	<input checked="" type="radio"/> Based on Retention Time	1. Retention Time <input style="width: 50px; text-align: center;" type="text" value="1.00"/> days
Tons of Limestone Needed	200.00	<input type="radio"/> Based on Tons of Limestone	2. Limestone Needed <input style="width: 50px;" type="text"/> tons
Tons of Limestone Needed	919.45	<input type="radio"/> Based on Dimensions	3. Length at Top of Freeboard <input style="width: 50px;" type="text"/> ft
Tons of Limestone Needed	0.00	<input type="radio"/> Based on Kinetics	4. Width at Top of Freeboard <input style="width: 50px;" type="text"/> ft
			5. Rate Constant (k) <input style="width: 50px;" type="text"/> hr/ft

**Opening Screen Water Parameters**

**Influent Water Parameters that Affect MN Removal Bed**

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

6. Stone Diameter  inches

7. Effluent Mn Concentration  mg/l

8. % Void Space of Limestone Bed  %

9 Density of Loose Limestone  lbs/ft3

10. Limestone Unit Cost  \$/ton

11. Limestone Placement Unit Cost  \$/yd3

12. Freeboard Depth  ft

13. Limestone Depth  ft

14. Excavation Unit Cost  \$/yd3

15. Slope of Pond Sides  Run :  Rise

**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

**Manganese Removal Bed Sizing Summaries**

23. Top Length at Freeboard  ft

23. Top Width at Freeboard  ft

25. Freeboard Volume  yd3

26. Limestone Surface Area  ft2

27. Limestone Volume  yd3

28. Tons of Limestone  tons

29. Excavation Volume  yd3

30. Clear and Grub Area  acres

31. Liner Area  ft2

32. Theoretical Retention Time  days

**Manganese Removal Bed Sub-Totals**

33. Limestone Cost  \$

34. Limestone Placement Cost  \$

35. Excavation Cost  \$

36. Liner Cost  \$

37. Clear and Grub Cost  \$

38. Total Cost  \$

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# AMD TREAT PONDS

AMDTREAT

Pond Name

### 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 H<sub>2</sub>O

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  :

11. Freeboard Depth  ft

12. Water Depth  ft

13. Excavation Unit Cost  \$/yd<sup>3</sup>

14. Total Length of Effluent / Inlet Pipe  ft

15. Unit Cost of Pipe  \$/ft

Liner Cost

No Liner

Clay Liner

16. Clay Liner Unit Cost  \$/yd<sup>3</sup>

17. Thickness of Clay Liner  ft

Synthetic Liner

18. Synthetic Liner Unit Cost  \$/yd<sup>2</sup>

19. Clearing and Grubbing?

20. Land Multiplier  ratio

21. Clear/Grub Acres  acres

22. Clear and Grub Unit Cost  \$/acre

23. Revegetation Cost  \$/acre

24. Cost of Baffles  \$

### Calculated Pond Dimensions per Pond

25. Length at Top of Freeboard  ft

26. Width at Top of Freeboard  ft

27. Freeboard Volume  yd<sup>3</sup>

28. Water Volume  yd<sup>3</sup>

29. Estimated Annual Sludge  yd<sup>3</sup>/yr

30. Volume of Sludge per Removal  yd<sup>3</sup>/removal

31. Excavation Volume  acre ft

32. Excavation Volume  yd<sup>3</sup>

33. Clear and Grub Area  acres

34. Liner Area  yd<sup>2</sup>

35. Calculated Retention Time  hours

### Ponds Sub-Totals per Pond

36. Excavation Cost  \$

37. Pipe Cost  \$

38. Liner Cost  \$

39. Clearing and Grubbing Cost  \$

40. Revegetation Cost  \$

41. Baffle Cost  \$

42. Estimated Cost  \$

43. Accept Minimum Pond Cost?

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

44. Recommended Minimum Cost  \$

45. Total Cost  \$

Opening Screen Water Parameters

### Influent Water Parameters that Affect Ponds

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

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Project DARMAC SILVERROCK

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**AMDTREAT**

**AMD TREAT  
ENGINEERING COST**

1. Capital Cost \*  \$

2. Per Cent of Capital Cost  %

3. Actual Engineering Cost  \$

4. Total Engineering Cost  \$

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

Project DARMAC SILVERROCK with ditch

Site Name DARMAC MAIN DICSCARGE

## AMD TREAT DITCHING



**AMDTREAT**

Ditching Name MAIN DISCHARGE DARMAC SILVER ROCK

- 1. Ditch Length Rock 0 ft
- 2. Ditch Length Grass 400 ft
- 3. Bottom Width of Ditch 4.0 ft
- 4. Ditch Depth 3.00 ft
- 5. Geo Textile Unit Cost 0.50 \$/yd2
- 6. Length of Geo Textile 400 ft
- 7. Slope Ratio of Ditch Sides 

Run	:	Rise
2.00		1.00
- 8. Surveying?
- 9. Survey Rate 1.0 acres/day
- 10. Survey Unit Cost 650.00 \$/day
- 11. Clearing and Grubbing?
- 12. Clear and Grub Cost 1256.00 \$/acre

- 13. Ditch Depth of Rock 1.50 ft
- 14. Cost of Ditch Surface Rock 18.00 \$/yd3
- 15. Cost to Place Rock 12.00 \$/yd3
- 16. Excavation Unit Cost 4.50 \$/yd3
- 17. Length of Silt Fence 400.00 ft
- 18. Unit Cost of Silt Fence 1.00 \$/ft
- 19. Revegetation Unit Cost 1500.00 \$/acre

### Ditching Sub-Totals

- 20. Excavation Cost 2,000 \$
- 21. Survey Cost 325 \$
- 22. Clear and Grub Cost 221 \$
- 23. Aggregate Cost 0 \$
- 24. Filter Fabric Cost 387 \$
- 25. Silt Fence Cost 400 \$
- 26. Revegetation Cost 288 \$

Record Number 1 of 1

27. Total Cost 3,621 \$

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Project DARMAC SILVERROCK

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## 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  \$

Record Number 1 of 1



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Project DARMAC SILVERROCK

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## AMD TREAT

### LABOR

AMDTREAT

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

Company Name

Project DARMAC SILVERROCK

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AMD TREAT

### 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

Company Name

Project DARMAC SILVERROCK

Site Name DARMAC MAIN DICSCHARGE



## AMD TREAT SLUDGE REMOVAL

**AMDTREAT**

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

Company Name

Project DARMAC SILVERROCK with BURIED

Site Name DARMAC MAIN DICSCHARGE



**AMD TREAT  
RECAPITIALIZATION COST**

**AMDTREAT**

Calculation Period  yrs Inflation Rate  % Net Return Rate  %

Recapitilization 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. aerobic wetlands	76,059	1	76,059	20	3	83,147
2. Mn removal bed	19,201	1	19,201	15	5	32,563
3. pond	5,000	1	5,000	25	3	4,373
4. PIPE COLLECTION SYSTEM	6,638	1	6,638	75	1	829
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  \$