Appendix E: Navigability Determination Email

From: Maria Scholze [mailto:maria@wiwetlandspecialists.com]
Sent: Friday, November 21, 2014 12:56 PM
To: 'Anna Breland'
Cc: 'Kirsten Pauly'
Subject: RE: DRT Sands Concurrence

Anna,

[redacted]

Oh, a piece of good news, sort of. I received a "desktop determination" on the un-named stream's navigability designation. At this time, it would not be designated as "navigable" by WDNR. BUT, they will not make it a final determination until they can see the site without the snow. So, if it melts this winter, they will take a look at it, or it will have to wait until the spring. They based the desktop determination on the photos in the wetland delineation report, other aerial photos, USGS, and other criteria like size of drainage area. I thought this might be helpful in your planning process.

Maria Scholze
Wisconsin Wetland Specialists
715-383-2122
www.wiwetlandspecialists.com or

Appendix F: Well Construction Reports

Well Construction Report For
WISCONSIN UNIQUE WELL NUMBER QV347

State of WI - Private Water Systems - DG/2
Department of Natural Resources, Box 7921
Madison, WI 53707
Please type or Print using a black Pen
Please Use Decimals Instead of Fractions.

Form 3300-77A
(R 8/00)

Property Owner: **SCHUMACHER, JIM**
Telephone Number: **715-859-6588**
Mailing Address: **PO BOX 161**
City: **BLOOMER** State: **WI** Zip Code: **54724**
County of Well Location: **Chippewa**
County Well Permit No.: **W 21334**
Well Completion Date: **07/26/2002**

1. Well Location: [X] Town [ ] City [ ] Village of **AUBURN**
Fire # (if available): **21278**
Grid or Street Address or Road Name and Number: **27TH ST**
Subdivision Name Lot # Block #

Well Constructor (Business Name): **AQUA-SERVICE INC**
License #: **6083**
Facility ID Number (Public Wells)
Address: **1386 24 1/2 ST**
Public Well Plan Approval # W--
City: **CAMERON** State: **WI** Zip Code: **54822**
Date of Approval (mm/dd/yyyy)
Hicap Permanent well #
Common Well #
Specific Capacity **1.4** gpm/ft

Gov't Lot # or **SE** 1/4 of **SE** 1/4 of
Section **20** T **31** N; R **10** [ ] E [X] W
Latitude Deg. Min.
Longitude Deg Min.

2. Well Type: [X] New [ ] Replacement [ ] Reconstruction
Lat/Long Method: **GPS008**
of previous unique well # constructed in
Reason for replaced or Reconstructed Well?

3. Well serves **1** # of homes and or
(e.g. barn, restaurant, church, school, industry, etc.)
High capacity Well? [ ] Yes [X] No
Property? [ ] Yes [X] No

[X] Drilled [ ] Driven Point [ ] Jetted [ ] Other:

4. Is the well located upslope or sideslope and not downslope from any contamination source, including those on neighboring properties? [X] Yes [ ] No
Well located within 1,200 feet of a quarry? [ ] Yes [ ] No If yes, distance in feet from quarry:
Well located in floodplain? [ ] Yes [X] No
Distance in Feet from Well to Nearest:

1. Landfill
25 2. Building Overhang
65 3. Septic [X] Holding Tank [ ]
90 4. Sewage Absorption Unit
5. Nonconforming Pit
6. Buried Home Heating Oil Tank
7. Buried Petroleum Tank
8. Shoreline [ ] Swimming Pool [ ]
9. Downspout/Yard Hydrant
10. Privy
11. Foundation Drain to Clearwater
12. Foundation Drain to Sewer
13. Building Drain [ ] Cast Iron or Plastic [ ] Other
14. Building Sewer [ ] Gravity [ ] Pressure [ ] Cast Iron or Plastic [ ] Other
15. Collector or Street Sewer: [ ] Sanitary units in. diam. [ ] Storm [ ] =< 6 [ ] > 6
16. Clearwater Sump
17. Wastewater Sump
18. Paved Animal Barn Pen
19. Animal Yard or Shelter
20. Silo
21. Barn Gutter
22. Manure Pipe [ ] Gravity [ ] Pressure [ ] Cast Iron or Plastic [ ] Other
23. Other Manure Storage
24. Ditch
25. Other NR 812 Waste Storage

5. Drillhole Dimensions and Construction Method

Dia (in.)	From (ft.)	To (ft.)
10	**0**	**55**
6	**55**	**160**

Upper Enlarged Drillhole / Lower Open Bedrock
[ ] ---1. Rotary - Mud Circulation---
[X] ---2. Rotary - Air---
[X] ---3. Rotary - Air and Foam---
[ ] ---4.Drill-Through Casing Hammer
[ ] ---5. Reverse Rotary
[ ] ---6. Cable-tool Bit in. dia---
[ ] 7. Dual Rotary
[X] 8. Temp. Outer Casing **10** in. dia. **12** depth (ft)
Removed? [X] Yes [ ] No
If no, why not?

8. Geology

Type, Caving/Noncaving, Color, Hardness, etc	From (ft.)	To (ft.)
YVS- YELLOW NONCAVING SAND	**0**	**12**
YVN- YELLOW NONCAVING SANDSTONE	**12**	**160**

6. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification	From (ft.)	To (ft.)
6	**NEW STEEL PIPE PE 19#/FT SAWHILL**	**0**	**57**
6	**OPEN SANDSTONE**	**57**	**160**

Dia. (in.)	Screen type, material & slot size		

9. Static Water Level
ft. above ground surface
102 ft. below ground surface

10. Pump Test
Pumping Level **113** ft. below surface
Pumping at **15** GPM for **2** hours

11. Well is: [X] Above Grade [ ] Below Grade
14 in.
Developed? [X] Yes [ ] No
Disinfected? [X] Yes [ ] No
Capped? [X] Yes [ ] No

7. Grout or Other Sealing Material. Method
Method: **PRESS TREMIE PUMPED**

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
NEAT CEMENT GROUT	**0**	**55**	**16**

12. Did you notify the owner of the need to permanently abandon and fill all unused wells on this property?
[ ] Yes [ ] No If no, explain:

13. Signature of the Well Constructor or Supervisory Driller: **JW** Date signed: **07/26/2002**
Signature of Drill Rig Operator (Mandatory unless same as above): **JJH** Date signed: **07/26/2002**

Make additional comments on reverse side about geology, additional screens, water quality, etc.
Variance issued [ ] Yes [X] No

Well Construction Report For
WISCONSIN UNIQUE WELL NUMBER CQ144

State of WI - Private Water Systems - DG/2
Department of Natural Resources, Box 7921
Madison, WI 53707
Please type or Print using a black Pen
Please Use Decimals Instead of Fractions.

Form 3300-77A
(R 8/00)

Property Owner: **WILLIAM E WALDBUESSER**
Telephone Number: **715-526-3488**
Mailing Address: **RR 2 BOX 228-A**
City: **BLOOMER** State: **WI** Zip Code: **54724**
County of Well Location: **Chippewa**
County Well Permit No.: **W W00526**
Well Completion Date: **08/08/1990**

1. Well Location: [X] Town [ ] City [ ] Village of **AUBURN**
Fire # (if available):
Grid or Street Address or Road Name and Number: **AUBURN VIEW RD**
Subdivision Name: Lot #: Block #:

Well Constructor (Business Name): **VERN PEAK**
License #: **14**
Facility ID Number (Public Wells):
Address: **RT 3 BOX 215**
Public Well Plan Approval #: W--
City: **CADOTT** State: **WI** Zip Code: **54727-9114**
Date of Approval (mm/dd/yyyy):
Hicap Permanent well #:
Common Well #:
Specific Capacity: **1.1** gpm/ft

Gov't Lot # or **SW** 1/4 of **SW** 1/4 of
Section **21** T **31** N; R **10** [ ] E [X] W
Latitude Deg. Min.
Longitude Deg Min.

2. Well Type: [X] New [ ] Replacement [ ] Reconstruction
Lat/Long Method: **GPS008**
of previous unique well # constructed in
Reason for replaced or Reconstructed Well?
NEW BUILDING SITE

[X] Drilled [ ] Driven Point [ ] Jetted [ ] Other:

3. Well serves **1** # of homes and or
(e.g. barn, restaurant, church, school, industry, etc.)
High capacity Well? [ ] Yes [X] No
Property? [ ] Yes [X] No

4. Is the well located upslope or sideslope and not downslope from any contamination source, including those on neighboring properties? [X] Yes [ ] No
Well located within 1,200 feet of a quarry? [ ] Yes [ ] No If yes, distance in feet from quarry:
Well located in floodplain? [ ] Yes [X] No
Distance in Feet from Well to Nearest:

1. Landfill
2. Building Overhang
3. Septic [ ] Holding Tank [ ]
4. Sewage Absorption Unit
5. Nonconforming Pit
6. Buried Home Heating Oil Tank
7. Buried Petroleum Tank
8. Shoreline [ ] Swimming Pool [ ]
9. Downspout/Yard Hydrant
10. Privy
11. Foundation Drain to Clearwater
12. Foundation Drain to Sewer
13. Building Drain [ ] Cast Iron or Plastic [ ] Other
14. Building Sewer [ ] Gravity [ ] Pressure [ ] Cast Iron or Plastic [ ] Other
15. Collector or Street Sewer: [ ] Sanitary units in. diam. [ ] Storm [ ] =< 6 [ ] > 6
16. Clearwater Sump
17. Wastewater Sump
18. Paved Animal Barn Pen
19. Animal Yard or Shelter
20. Silo **140**
21. Barn Gutter
22. Manure Pipe [ ] Gravity [ ] Pressure [ ] Cast Iron or Plastic [ ] Other
23. Other Manure Storage
24. Ditch
25. Other NR 812 Waste Storage

5. Drillhole Dimensions and Construction Method

Dia (in.)	From (ft.)	To (ft.)
6	0	159

Upper Enlarged Drillhole / Lower Open Bedrock
[ ] ---1. Rotary - Mud Circulation---------- [ ]
[ ] ---2. Rotary - Air---------- [ ]
[ ] ---3. Rotary - Air and Foam---------- [ ]
[ ] ---4.Drill-Through Casing Hammer
[ ] ---5. Reverse Rotary
[ ] ---6. Cable-tool Bit in. dia------ [ ]
[ ] 7. Dual Rotary [ ]
[ ] 8. Temp. Outer Casing in. dia. depth (ft)
Removed? [ ] Yes [ ] No
If no, why not?

8. Geology

Type, Caving/Noncaving, Color, Hardness, etc		From (ft.)	To (ft.)
--S-	SAND	0	13
--SG	SAND @ BOULDERS @ GRAVELS	13	24
--N-	SAND	24	44
--N-	SANDROCK	44	159

6. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification	From (ft.)	To (ft.)
6	STEEL- 18.97- A53B U.S.-(SAWHILL) P.E. - WELDED	0	44

Dia. (in.)	Screen type, material & slot size		

9. Static Water Level
ft. above ground surface
95 ft. below ground surface

10. Pump Test
Pumping Level **104** ft. below surface
Pumping at **10** GPM for **2** hours

11. Well is: [X] Above Grade [ ] Below Grade
72 in.
Developed? [X] Yes [ ] No
Disinfected? [X] Yes [ ] No
Capped? [X] Yes [ ] No

7. Grout or Other Sealing Material. Method
Method:

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement

12. Did you notify the owner of the need to permanently abandon and fill all unused wells on this property?
[ ] Yes [ ] No If no, explain: **OWNER WILL COMPLY**

13. Signature of the Well Constructor or Supervisory Driller: **VP** Date signed: **08/08/1990**
Signature of Drill Rig Operator (Mandatory unless same as above): **VP** Date signed: **08/08/1990**

Make additional comments on reverse side about geology, additional screens, water quality, etc.
Variance issued [ ] Yes [X] No

State of Wisconsin
Department of Natural Resources
Private Water Supply
Box 7921
Madison, Wisconsin 53707

NOTE:
White Copy – Division's Copy
Green Copy – Driller's Copy
Yellow Copy – Owner's Copy

WELL CONSTRUCTOR'S REPORT
Form 3300–15 Rev. 2-79

DEC 8 1982

1. COUNTY: Chippewa
CHECK (✓) ONE: ☑ Town ☐ Village ☐ City Name: Anderson

2. LOCATION: ¼ Section or Gov't. Lot: SW/NW; Section: 28; Township: 31N; Range: 10W
OR – Grid or Street No.: Street or Road Name:
AND – If available subdivision name, lot & block No.:

3. NAME ☐ OWNER ☐ AGENT AT TIME OF DRILLING CHECK (✓) ONE: Jack Clark
ADDRESS: Rt 2
POST OFFICE: Bloomer, Wis ZIP CODE: 54724

4. Distance in feet from well to nearest: (Record answer in appropriate block)

Building	Sanitary Bldg. Drain C.I.	Sanitary Bldg. Drain Other	Sanitary Bldg. Sewer C.I.	Sanitary Bldg. Sewer Other	Floor Drain Connected To: C.I. Sewer	Floor Drain Connected To: Other Sewer	Storm Bldg. Drain C.I.	Storm Bldg. Drain Other	Storm Bldg. Sewer C.I.	Storm Bldg. Sewer Other
35										

Street Sewer San.	Street Sewer Storm	Other Sewers C.I.	Other Sewers Other	Foundation Drain Connected to: Sewer	Sewage Sump	Clearwater Dr.	Clearwater Sump	Sewage Sump C.I.	Sewage Sump Other	Clearwater Sump	Septic Tank	Holding Tank	Sewage Absorption Unit: Seepage Pit / Seepage Bed / Seepage Trench	Manure Hopper or Retention or Pnuematic Tank
											85		115	

Privy	Pet Waste Pit	Pit: Nonconforming Existing	Subsurface Pumproom Nonconforming Existing	Barn Gutter	Animal Barn Pen	Animal Yard	Silo With Pit	Glass Lined Storage Facility	Silo w/o Pit	Earthen Silage Storage Trench Or Pit	Earthen Manure Basin
		Well / Pump / Tank							130		

Temporary Manure Stack or Platform	Watertight Liquid Manure Tank or Basin	Manure Pressure Pipe	Subsurface Gasoline or Oil Tank	Waste Pond or Land Disposal Unit (Specify Type)	Manure Storage Basin / Concrete Floor Only / Concrete Floor and Partial Concrete Walls	Other (Describe)

5. Well is intended to supply water for: farm & home

6. DRILLHOLE

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
10	Surface	40			
6	40	120			

7. CASING, LINER, CURBING AND SCREEN

Dia. (in.)	Material, Weight, Specification Mfg. & Method of Assembly	From (ft.)	To (ft.)
6"	ASTM-A53 P.E. new steel pipe 19 lb/ft	Surface	85
6"	open bore	85	120

8. GROUT OR OTHER SEALING MATERIAL

Kind	From (ft.)	To (ft.)
drill cuttings	Surface	40

9. FORMATIONS

Kind	From (ft.)	To (ft.)
top soil	Surface	1
Clay	1	4
sand & gravel	4	30
sand & clay	30	50
soft sandstone	50	84
hard sandstone	84	120

10. TYPE OF DRILLING MACHINE USED
☐ Cable Tool ☑ Rotary-hammer w/drilling mud & air ☐ Jetting with ☐ Air ☐ Water
☐ Rotary-air w/drilling mud ☐ Rotary-hammer & air
☐ Rotary-w/drilling mud ☐ Reverse Rotary

Well construction completed on 9/22 1982

11. MISCELLANEOUS DATA
Yield Test: 2 Hrs. at 20 GPM
Well is terminated 12 inches ☑ above ☐ below final grade
Depth from surface to normal water level 62 Ft.
Well disinfected upon completion ☑ Yes ☐ No
Depth of water level when pumping 64 Ft. Stabilized ☑ Yes ☐ No
Well sealed watertight upon completion ☑ Yes ☐ No

Water sample sent to Madison laboratory on 9/27 1982

Your opinion concerning other pollution hazards, information concerning difficulties encountered, and data relating to nearby wells, screens, seals, method of finishing the well, amount of cement used in grouting, blasting, etc., should be given on reverse side.

Signature: Jerome Wojtkiewicz
Registered Well Driller
Business Name and Complete Mailing Address: Jerome Wojtkiewicz plt
Route 1 - Box 159B
Cameron, Wisconsin 54822
Kramer Well Drlg. Inc.

1393

Well Construction Report For
WISCONSIN UNIQUE WELL NUMBER MD861

State of WI - Private Water Systems - DG/2
Department of Natural Resources, Box 7921
Madison, WI 53707
Please type or Print using a black Pen
Please Use Decimals Instead of Fractions.

Form 3300-77A
(R 8/00)

Property Owner: **TOWN OF AUBURN**
Telephone Number: **715-568-3970**
Mailing Address: **3826 STATE HWY 64**
City: **BLOOMER** State: **WI** Zip Code: **54724**
County of Well Location: **Chippewa**
County Well Permit No.: **W W14793**
Well Completion Date: **11/05/1997**

1. Well Location: [X] Town [ ] City [ ] Village of **AUBURN**
Fire # (if available)
Grid or Street Address or Road Name and Number
Subdivision Name Lot # Block #

Well Constructor (Business Name): **KRAMER WELL DRILLING INC**
License #: **45**
Facility ID Number (Public Wells)
Address: **N3055 COUNTY W**
Public Well Plan Approval # W--
City: **WEYERHAEUSER** State: **WI** Zip Code: **54895-9734**
Date of Approval (mm/dd/yyyy)
Hicap Permanent well #
Common Well #
Specific Capacity: **.8** gpm/ft

Gov't Lot # or **SE** 1/4 of **NE** 1/4 of
Section **28** T **31** N; R **10** [ ] E [X] W
Latitude Deg. Min.
Longitude Deg Min.

2. Well Type: [ ] New [X] Replacement [ ] Reconstruction
Lat/Long Method: **GPS008**
of previous unique well # constructed in
Reason for replaced or Reconstructed Well?
LOW VOLUME OLD WELL
[X] Drilled [ ] Driven Point [ ] Jetted [ ] Other:

3. Well serves **TOWN HALL** # of homes and or
(e.g. barn, restaurant, church, school, industry, etc.)
High capacity Well? [ ] Yes [X] No
Property? [ ] Yes [X] No

4. Is the well located upslope or sideslope and not downslope from any contamination source, including those on neighboring properties? [X] Yes [ ] No
Well located within 1,200 feet of a quarry? [ ] Yes [ ] No If yes, distance in feet from quarry:
Well located in floodplain? [ ] Yes [X] No
Distance in Feet from Well to Nearest:

1. Landfill
12 2. Building Overhang
55 3. Septic [ ] Holding Tank [ ]
4. Sewage Absorption Unit
5. Nonconforming Pit
6. Buried Home Heating Oil Tank
7. Buried Petroleum Tank
8. Shoreline [ ] Swimming Pool [ ]
9. Downspout/Yard Hydrant
10. Privy
11. Foundation Drain to Clearwater
12. Foundation Drain to Sewer
13. Building Drain [ ] Cast Iron or Plastic [ ] Other
47 14. Building Sewer [X] Gravity [ ] Pressure [X] Cast Iron or Plastic [ ] Other
15. Collector or Street Sewer: [ ] Sanitary units in. diam. [ ] Storm [ ] =< 6 [ ] > 6
16. Clearwater Sump
17. Wastewater Sump
18. Paved Animal Barn Pen
19. Animal Yard or Shelter
20. Silo
21. Barn Gutter
22. Manure Pipe [ ] Gravity [ ] Pressure [ ] Cast Iron or Plastic [ ] Other
23. Other Manure Storage
24. Ditch
25. Other NR 812 Waste Storage

5. Drillhole Dimensions and Construction Method

Dia (in.)	From (ft.)	To (ft.)
10	**0**	**57**
6	**57**	**90**

Upper Enlarged Drillhole / Lower Open Bedrock
[ ] ---1. Rotary - Mud Circulation---------- [ ]
[X] ---2. Rotary - Air---------- [ ]
[X] ---3. Rotary - Air and Foam---------- [ ]
[ ] ---4.Drill-Through Casing Hammer
[ ] ---5. Reverse Rotary
[ ] ---6. Cable-tool Bit in. dia------ [ ]
[ ] 7. Dual Rotary [ ]
[ ] 8. Temp. Outer Casing in. dia. depth (ft)
Removed? [ ] Yes [ ] No
If no, why not?

8. Geology

Type, Caving/Noncaving, Color, Hardness, etc		From (ft.)	To (ft.)
--I-	**TOPSOIL**	**0**	**1**
-VC-	**NON CAVING BR CLAY**	**1**	**4**
Y-N-	**NON CAVING YELLOW SANDSTONE**	**4**	**90**

6. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification	From (ft.)	To (ft.)
6	**PE SAWHILL STEEL 19 LBS FT ASTM A53**	**0**	**59**

Dia. (in.)	Screen type, material & slot size		

9. Static Water Level
ft. above ground surface
42 ft. below ground surface

10. Pump Test
Pumping Level **62** ft. below surface
Pumping at **15** GPM for **1** hours

11. Well is: [X] Above Grade [ ] Below Grade
18 in.
Developed? [X] Yes [ ] No
Disinfected? [X] Yes [ ] No
Capped? [X] Yes [ ] No

7. Grout or Other Sealing Material. Method
Method: **TRIMIE PRSSURE**

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
NEAT CEMENT	**0**	**57**	**15**

12. Did you notify the owner of the need to permanently abandon and fill all unused wells on this property?
[X] Yes [ ] No If no, explain:

13. Signature of the Well Constructor or Supervisory Driller: **GJ** Date signed: **11/10/1997**
Signature of Drill Rig Operator (Mandatory unless same as above) Date signed

Make additional comments on reverse side about geology, additional screens, water quality, etc.
Variance issued [ ] Yes [X] No

Well Construction Report For
WISCONSIN UNIQUE WELL NUMBER OI413

State of WI - Private Water Systems - DG/2
Department of Natural Resources, Box 7921
Madison, WI 53707
Please type or Print using a black Pen
Please Use Decimals Instead of Fractions.

Form 3300-77A
(R 8/00)

Property Owner: **RIHN, CLAUDE**
Telephone Number: **715-568-5409**
Mailing Address: **20839 CTY HWY DD**
City: **BLOOMER** State: **WI** Zip Code: **54724**
County of Well Location: **Chippewa**
County Well Permit No.: **W 18742**
Well Completion Date: **09/05/2000**

1. Well Location: [X] Town [ ] City [ ] Village of **AUBURN**
Fire # (if available)
Grid or Street Address or Road Name and Number
Subdivision Name Lot # Block #

Well Constructor (Business Name): **KRAMER WELL DRILLING INC**
License #: **45**
Facility ID Number (Public Wells)
Address: **N3055 COUNTY W**
Public Well Plan Approval #: W--
City: **WEYERHAEUSER** State: **WI** Zip Code: **54895-9734**
Date of Approval (mm/dd/yyyy)
Hicap Permanent well #
Common Well #
Specific Capacity: **1.9** gpm/ft

Gov't Lot # or **NW** 1/4 of **NW** 1/4 of
Section **27** T **31** N; R **10** [ ] E [X] W
Latitude Deg. Min.
Longitude Deg Min.

2. Well Type: [X] Replacement [ ] New [ ] Reconstruction
Lat/Long Method: **GPS008**
of previous unique well # constructed in
Reason for replaced or Reconstructed Well?
OLD WELL HIGH NITRATE
[X] Drilled [ ] Driven Point [ ] Jetted [ ] Other:

3. Well serves **1** # of homes and or **BARN**
(e.g. barn, restaurant, church, school, industry, etc.)
High capacity Well? [ ] Yes [X] No
Property? [ ] Yes [X] No

4. Is the well located upslope or sideslope and not downslope from any contamination source, including those on neighboring properties? [X] Yes [ ] No
Well located within 1,200 feet of a quarry? [ ] Yes [ ] No If yes, distance in feet from quarry:
Well located in floodplain? [ ] Yes [X] No
Distance in Feet from Well to Nearest:

- 1. Landfill
- **20** 2. Building Overhang
- **71** 3. Septic [ ] Holding Tank [ ]
- **88** 4. Sewage Absorption Unit
- 5. Nonconforming Pit
- 6. Buried Home Heating Oil Tank
- 7. Buried Petroleum Tank
- 8. Shoreline [ ] Swimming Pool [ ]
- 9. Downspout/Yard Hydrant
- 10. Privy
- 11. Foundation Drain to Clearwater
- 12. Foundation Drain to Sewer
- 13. Building Drain [ ] Cast Iron or Plastic [ ] Other
- **52** 14. Building Sewer [X] Gravity [ ] Pressure [X] Cast Iron or Plastic [ ] Other
- 15. Collector or Street Sewer: [ ] Sanitary units in. diam. [ ] Storm [ ] =< 6 [ ] > 6
- 16. Clearwater Sump
- 17. Wastewater Sump
- **>150** 18. Paved Animal Barn Pen
- **>150** 19. Animal Yard or Shelter
- 20. Silo
- 21. Barn Gutter
- 22. Manure Pipe [ ] Gravity [ ] Pressure [ ] Cast Iron or Plastic [ ] Other
- 23. Other Manure Storage
- 24. Ditch
- 25. Other NR 812 Waste Storage

5. Drillhole Dimensions and Construction Method

Dia (in.)	From (ft.)	To (ft.)
9	0	110
6	110	130

Upper Enlarged Drillhole / Lower Open Bedrock
- [ ] ---1. Rotary - Mud Circulation---------- [ ]
- [X] ---2. Rotary - Air---------- [ ]
- [X] ---3. Rotary - Air and Foam---------- [ ]
- [ ] ---4.Drill-Through Casing Hammer
- [ ] ---5. Reverse Rotary
- [ ] ---6. Cable-tool Bit in. dia------ [ ]
- [ ] 7. Dual Rotary [ ]
- [X] 8. Temp. Outer Casing **10** in. dia. depth (ft)
  Removed? [X] Yes [ ] No
  If no, why not?

8. Geology

Type, Caving/Noncaving, Color, Hardness, etc		From (ft.)	To (ft.)
--I-	TOP SOIL	0	1
-QS-	CAVING BR SAND	1	9
-VN-	NON CAVING YELLOW SANDSTONE	9	130

6. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification	From (ft.)	To (ft.)
6	P.E. IPSCO STEEL 19#/FT ASTM A-53	0	111

Dia. (in.)	Screen type, material & slot size		

9. Static Water Level
ft. above ground surface
70 ft. below ground surface

10. Pump Test
Pumping Level **78** ft. below surface
Pumping at **15** GPM for **2** hours

11. Well is: [X] Above Grade [ ] Below Grade
25 in.
Developed? [X] Yes [ ] No
Disinfected? [X] Yes [ ] No
Capped? [X] Yes [ ] No

7. Grout or Other Sealing Material. Method
Method: **TRIMIE PRESSURE**

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
NEAT CEMENT	0	110	30

12. Did you notify the owner of the need to permanently abandon and fill all unused wells on this property?
[X] Yes [ ] No If no, explain:

13. Signature of the Well Constructor or Supervisory Driller: **GJ** Date signed: **09/11/2000**
Signature of Drill Rig Operator (Mandatory unless same as above) Date signed

Make additional comments on reverse side about geology, additional screens, water quality, etc.
Variance issued [ ] Yes [X] No

Well Construction Report For
WISCONSIN UNIQUE WELL NUMBER RS196

State of WI - Private Water Systems - DG/2
Department of Natural Resources, Box 7921
Madison, WI 53707
Please type or Print using a black Pen
Please Use Decimals Instead of Fractions.

Form 3300-77A
(R 8/00)

Property Owner: **SCHATTNER, CHRIS & PATTI**
Telephone Number: **715-568-5403**
Mailing Address: **20839 CO HWY DD**
City: **BLOOMER** State: **WI** Zip Code: **54724**
County of Well Location: **Chippewa**
County Well Permit No.: **W 22393**
Well Completion Date: **12/20/2003**

1. Well Location: [X] Town [ ] City [ ] Village of **AUBURN**
Fire # (if available): **21004**
Grid or Street Address or Road Name and Number: **CO HWY DD**
Subdivision Name Lot # Block #

Well Constructor (Business Name): **KRAMER WELL DRILLING INC**
License #: **45**
Facility ID Number (Public Wells)
Address: **N3055 COUNTY W**
Public Well Plan Approval #: W--
City: **WEYERHAEUSER** State: **WI** Zip Code: **54895-9734**
Date of Approval (mm/dd/yyyy)
Hicap Permanent well #
Common Well #
Specific Capacity: **.1** gpm/ft

Gov't Lot # or **SW** 1/4 of **SW** 1/4 of
Section **22** T **31** N; R **10** [ ] E [X] W
Latitude Deg. Min.
Longitude Deg Min.

2. Well Type: [X] New [ ] Replacement [ ] Reconstruction
Lat/Long Method: **GPS008**
of previous unique well # constructed in
Reason for replaced or Reconstructed Well?

[X] Drilled [ ] Driven Point [ ] Jetted [ ] Other:

3. Well serves **1** # of homes and or
(e.g. barn, restaurant, church, school, industry, etc.)
High capacity Well? [ ] Yes [X] No
Property? [ ] Yes [X] No

4. Is the well located upslope or sideslope and not downslope from any contamination source, including those on neighboring properties? [X] Yes [ ] No
Well located within 1,200 feet of a quarry? [ ] Yes [ ] No If yes, distance in feet from quarry:
Well located in floodplain? [ ] Yes [X] No
Distance in Feet from Well to Nearest:

1. Landfill
28 2. Building Overhang
60 3. Septic [X] Holding Tank [ ]
78 4. Sewage Absorption Unit
5. Nonconforming Pit
6. Buried Home Heating Oil Tank
7. Buried Petroleum Tank
8. Shoreline [ ] Swimming Pool [ ]
9. Downspout/Yard Hydrant
10. Privy
11. Foundation Drain to Clearwater
12. Foundation Drain to Sewer
13. Building Drain [ ] Cast Iron or Plastic [ ] Other
56 14. Building Sewer [X] Gravity [ ] Pressure [X] Cast Iron or Plastic [ ] Other
15. Collector or Street Sewer: [ ] Sanitary units in. diam. [ ] Storm [ ] =< 6 [ ] > 6
16. Clearwater Sump
17. Wastewater Sump
18. Paved Animal Barn Pen
19. Animal Yard or Shelter
20. Silo
21. Barn Gutter
22. Manure Pipe [ ] Gravity [ ] Pressure [ ] Cast Iron or Plastic [ ] Other
23. Other Manure Storage
24. Ditch
25. Other NR 812 Waste Storage

5. Drillhole Dimensions and Construction Method

Dia (in.)	From (ft.)	To (ft.)
9	**0**	**47**
6	**47**	**160**

Upper Enlarged Drillhole / Lower Open Bedrock
[ ] ---1. Rotary - Mud Circulation---------- [ ]
[X] ---2. Rotary - Air---------- [X]
[X] ---3. Rotary - Air and Foam---------- [ ]
[ ] ---4.Drill-Through Casing Hammer
[ ] ---5. Reverse Rotary
[ ] ---6. Cable-tool Bit in. dia------ [ ]
[ ] 7. Dual Rotary [ ]
[ ] 8. Temp. Outer Casing in. dia. depth (ft)
Removed? [ ] Yes [ ] No
If no, why not?

8. Geology

Type, Caving/Noncaving, Color, Hardness, etc	From (ft.)	To (ft.)
--I- TOPSOIL	0	1
YVN- NONCAVING YELLOW SANDSTONE	1	160

6. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification	From (ft.)	To (ft.)
6	PLAIN END SAWHILL STEEL 19#/FT ASTMA53	0	47

Dia. (in.)	Screen type, material & slot size		

9. Static Water Level
ft. above ground surface
10 ft. below ground surface

10. Pump Test
Pumping Level **120** ft. below surface
Pumping at **15** GPM for **1** hours

11. Well is: [X] Above Grade [ ] Below Grade
21 in.
Developed? [X] Yes [ ] No
Disinfected? [X] Yes [ ] No
Capped? [X] Yes [ ] No

7. Grout or Other Sealing Material. Method
Method: **TREMIE PRESSURE**

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
NEAT CEMENT	0	47	9

12. Did you notify the owner of the need to permanently abandon and fill all unused wells on this property?
[X] Yes [ ] No If no, explain:

13. Signature of the Well Constructor or Supervisory Driller: **GJ** Date signed: **12/08/2003**
Signature of Drill Rig Operator (Mandatory unless same as above) Date signed

Make additional comments on reverse side about geology, additional screens, water quality, etc.
Variance issued [ ] Yes [X] No

Appendix G: Groundwater Monitoring Plan

JANUARY 2015

PROPOSED
GROUNDWATER MONITORING PLAN

DRT SANDS, INC.

PROPOSED MINING OPERATION
TOWN OF AUBURN
CHIPPEWA COUNTY, WISCONSIN

DRAFT

SUNDE ENGINEERING, PLLC.
10830 Nesbitt Avenue South
Bloomington, MN 55437-3100

DRT SANDS
GROUNDWATER AND
SURFACE WATER MONITORING AND MITIGATION PLAN

1. INTRODUCTION

This Groundwater and Surface Water Monitoring and Mitigation Plan (Plan) has been developed for the DRT Sand's proposed sandstone mining facility in Chippewa County (Site). The goals of this plan are to demonstrate compliance with NR 135.08[1] and ensure that groundwater is protected during and reclamation activities. This monitoring plan addresses monitoring for both groundwater quantity and quality.

2. POTENTIAL IMPACTS:

Water quantity has the potential to be impacted by the mining operation as a result of water use associated with the operation of the wet processing plant. While recycling of process water will minimize the volume of groundwater withdrawal, a high capacity well permit will still be required to supply make up water to the fresh water supply pond. The high capacity well will be cased into the Mt Simon aquifer in order to minimize the potential for impacts to surface waters and wetlands.

Mining has the potential to increase the risk of impacts to groundwater quality. Surface soils are removed and the excavation reduces the depth of soils and their associated attenuation and filtering capacity. Fuels and flocculants are used at the mine site and processing area. Best Management Practices, (BMPs), Spill Prevention and Response Plans and progressive site reclamation help to minimize the risk of groundwater quality impacts.

3. EXISITNG WATER TABLE DATA

The elevation of the groundwater beneath the Site is estimated to range between approximately 1050-1085 feet above mean sea level based on the Generalized Water-Table Map for Chippewa County[2]. Well constructor's reports for on-site and adjacent water wells indicate a range in water table elevation from approximately 1048-1058 feet above mean sea level. The direction of groundwater flow is generally from the north to the south with the closest residential water wells located just over 1,000 feet from the approximate location of the future production well. Other residential wells are

---

[1] NR 135.08 Groundwater protection.
(1) GROUNDWATER QUANTITY. A nonmetallic mining site shall be reclaimed in a manner that does not cause a permanent lowering of the water table that results in adverse effects on surface waters or a significant reduction in the quantity of groundwater reasonably available for future users of groundwater.
(2) GROUNDWATER QUALITY. Nonmetallic mining reclamation shall be conducted in a manner which does not cause groundwater quality standards in ch. NR 140 to be exceeded at a point of standards application.

[2] Lippelt. Miscellaneous Map Series Generalized Water-Table Elevation of Chippewa County. Wisconsin Geological and Natural History Survey Map 88-1. 1988

located around the perimeter of the mining area as illustrated on Figure 1, Proposed Monitoring Well Network.

4. GROUNDWATER MONITORING PLAN:

The groundwater monitoring plan has been developed to monitor impacts to water quantity and water quality as a result of the proposed mining operations. A groundwater monitoring network consisting of three monitoring wells and the production well will be installed at the Site. The monitoring wells will be 2" wells with a ten foot screen installed to a target depth of ten to fifteen feet into the water table. The proposed locations of the monitoring wells are indicated on Figure 1. The locations of the wells were chosen to allow evaluation of water table data across the entire site and to further define the direction and gradient of groundwater flow across the site.

The wells will be surveyed in to establish location and elevation information. Water level data will be collected from the three monitoring wells prior to the start-up of operations to establish a base line condition. A water table map will be generated from the data and submitted to Chippewa County. Water level data from the production well will also be collected and used to generate the initial water table map. Water level data will be collected at least annually thereafter with results included in the annual report to the County. It should be noted that water levels naturally fluctuate on a seasonal basis and in response to larger climatic trends, therefore monitoring is expected to reflect these normal changes in water levels over time.

Water samples will be collected from the monitoring wells to establish a baseline of water quality. W1 will be located adjacent to and down gradient of the wet plant site and a proposed process water pond. Water quality samples will continue to be sampled and analyzed from this well on an annual basis. Results will be submitted to Chippewa County as part of the annual report.

Water quality analysis will be performed for pH, specific conductance, total coliform bacteria, nitrates, chloride, acrylamide and diesel range organics (DRO). Sampling and analysis will be performed by a qualified analytical laboratory. Table 1 lists the monitoring wells, frequency and parameter list for the monitoring well network.

The frequency of monitoring and the parameters may be modified based on results of the water quality monitoring program. The project is not anticipated to cause impacts to water supply in surrounding wells. However, if adjacent wells within the area experience well interference or water supply issues, they will be investigated promptly. DRT Sands will work with a local well driller in determining the nature of the probable and if attributed to the mine site, will reestablish a suitable water supply to the effective well. This may mean lowering a pump in an existing well or drilling a deeper well.

DRAFT

Table 1 Monitoring Parameters/Frequency

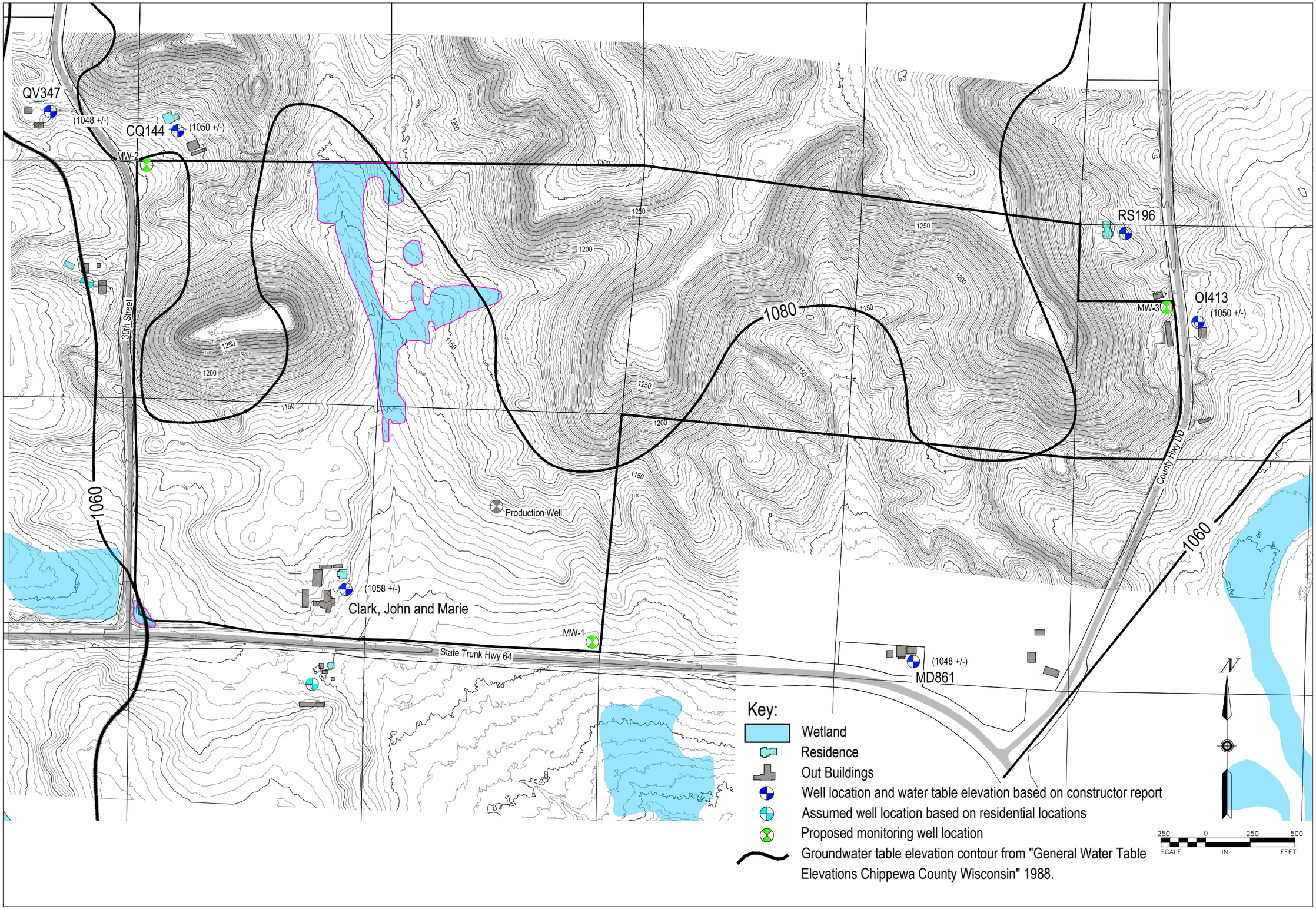
ID	Parameter	Frequency	Parameter	Frequency
MW-1	chloride, pH, specific conductance, total coliform bacteria, nitrates, acrylamide and diesel range organics (DRO).	Annually (Spring Quarter)	Water Level	Quarterly
MW-2	NA		Water Level	Quarterly
MW-3	NA		Water Level	Quarterly

Chloride, pH, specific conductance, and total coliform bacteria results will be used to evaluate general groundwater quality. These are indicator parameters. These data will be compared to results of previous events. If there is a documented increasing trend in the data (or decreasing trend in pH) and verified by resampling then the data will be statistically evaluated to determine if the concentrations are related to naturally occurring background. If DRO is detected above 2.0 mg/l, the well will be resampled. Depending upon resampling results, either increased frequency of monitoring, monitoring of an expanded list of parameters (BETX, PAHs), or continued monitoring of trends will be adopted based upon discussion with Chippewa County LCFM.

5. REPORTING

Water quality data and water level data will be summarized and submitted to Chippewa County in an annual report.

DRAFT



Sunde Engineering, PLLC.

CONSULTING CIVIL ENGINEER
10830 NESBITT AVENUE SOUTH
BLOOMINGTON, MINNESOTA 55437
(952) 881-3344 TELEPHONE
(952) 881-1913 FAX
www.sundecivil.com

DRT Sands Inc

Industrial Sand Mining Permit

Town of Auburn
Chippewa County

DATE	REVISION

NAME
DATE: 10-10-14

INFORMATION:

PROJECT NO.: 14-534
DRAWN BY:
CHECKED BY:
APPROVED BY:
SCALE:
DATE: 1-27-2015

DESCRIPTION:

Proposed Groundwate
Monitoring Network

SHEET NO:

Figure 1

XOFX

#PROJECT T.TWP . R.RG . S.SEC DRAWN DRAWING: G:\DWGS\DRT Sands\Chippewa County\Groundwater Monitoring Plan\Proposed Groundwater Monintoring Network.dwg LAYOUT: Layout1

Appendix H: Reclamation and Construction Inspection Plan

RECLAMATION & CONSTRUCTION INSPECTION PLAN

The purpose of this plan is to assure the reclamation plan is followed throughout the mining and reclamation process.

It is the operator's responsibility to notify the Land Conservation Department 2 work days in advance of when these work items will be occurring.

- Clearing & grubbing
- Topsoil stripping
- Berm / stockpile construction (A horizon, B horizon, overburden soils only)
- Storm water pond construction [PE]
- Storm water diversion construction [PE]
- A & B horizon soils reapplication
- Installation of other BMPs (erosion mat, silt fence…)
- Importing material (Any material brought into the mine to be used as fill or as soil amendments)
- Temporary storm water infiltration basin construction
- Removal of berm / stockpile

It is the operator's responsibility to notify the Land Conservation Department immediately in the event of any of the following.

- Failure of any storm water facility (pond, infiltration basin, diversion…) [PE]
- Spills covered in the SPCC plan

[PE] These items require the assistance of a private sector professional engineer.

Appendix I: Alternative Settling Pond Liner Specification

Alternative Settling Pond Liner Specification

Chippewa County
Department of Land Conservation & Forest Management

1. SCOPE

The work shall consist of placing soil liner material for the purposes of creating a settling pond liner with limited potential for leaching of process water and associated chemical constituents.

2. MATERIALS

All soil liner material shall be free of organic material. No frozen soil shall be used in the liner.

Soil liner material shall be classified as ML or CL under the Unified Soil Classification System and contain greater than 50% material by weight passing the No. 200 sieve.

Fill materials shall have a moisture content sufficient to ensure the required compaction. When kneaded in the hand, the soil will form a ball which does not readily separate and will not extrude out of the hand when squeezed tightly.

3. FOUNDATION

The foundation area shall be cleared of trees, stumps, roots, brush, rubbish, and stones greater than 6 inches in diameter. Foundations shall be stripped to remove vegetation and other unsuitable materials. Topsoil shall be stripped from the foundation area.

4. PLACEMENT & COMPACTION

Soil liner material shall be placed in 6 inch lifts. Each lift shall be compacted with using one of the following methods.

- 1 pass of a sheepsfoot roller (minimum of 10,000 lb. operating weight)
- 1 pass of a fully loaded rubber-tired scraper.
- 2 passes Track-type crawler (minimum of 30,000 lb.)

Passes shall be wheel track to wheel track to meet soil liner compaction requirements.

The thickness of the soil liner shall be no less than 1 foot.

5. OTHER

Alternative methods of compaction will be allowed with onsite testing to confirm soil liner compaction to a minimum of 95% standard proctor test (ASTM D-698).

09/2011

Appendix J: Stormwater Management Plan

Stormwater Management,
Erosion and Sedimentation Control Plan:

1.0 Purpose and Intent:

The purpose of the Stormwater Management Plan (Stormwater Plan) for the DRT Sands Mine Site is to protect and improve the quality of surface waters and groundwaters by reducing the amount of pollutants potentially contained in the stormwater runoff. This primary goal is accomplished by:

1.1 Identification of sources of stormwater contamination;
1.2 Development of appropriate source area pollution prevention best management practices designed to prevent or minimize stormwater contamination;
1.3 Development of stormwater treatment best management practices to reduce stormwater contaminants prior to discharge; and
1.4 Development of schedules, as necessary, to ensure that the stormwater management actions developed within the SWPPP are implemented and evaluated on a regular basis.

This Stormwater Plan outlines source area pollution prevention and sediment treatment best management practices that shall be utilized to minimize sediment discharge to the maximum extent practicable. Other stormwater pollutants, such as salt, petroleum products, or other materials potentially hazardous to surface waters or groundwaters will be controlled to the maximum extent practicable by the use of source area pollution prevention best management practices and treatment best management practices.

The Stormwater Plan includes this narrative. Plan sheets will be developed in accordance with the stormwater pollution prevention plans described below that will include the following Plan Sheets: Sheet C1, Existing Conditions Drainage Area Map; Sheet C2, Phase 1 Stormwater Management, Sedimentation and Erosion Control Plan; C3, Sedimentation and Erosion Control Details; Sheet C4, Sedimentation and Erosion Control Notes, and all Appendixes.

It is recognized that prior to beginning construction activity at the mione site, construction WPDES coverage must be obtained. In addition, prior to mining activiites, the DRT Sands Mine Site must apply for and obtain a WPDES permit that regulates discharges of pollutants as provided in chapter 283, Wis. Statutes. The DRT Sands Mine Site is eligible for coverage under the Wisconsin Pollutant Discharge Elimination System (WPDES) Permit No. WI-0046515-05 (NMM GP). In accordance with the requirements in Section 3.3 of NMM GP, a Stormwater Pollution Prevention Plan (SWPPP) must be developed for nonmetallic mineral mining operations that have stormwater contact with overburden, raw material, intermediate product, finished product, or waste material and that stormwater is discharged off the mining site to a surface water (excluding mine water treatment ponds) or to a wetland not exempted under s. NR 103.06, Wis. Adm. Code. The development of a SWPPP for the Site will take into consideration stormwater management, erosion and sedimentation controls presented here, but will modified and further defined to reflect further site design and mine planning.

2.0 Activity Description:

Nonmetallic mining activities include clearing and grubbing, removal and stockpiling of A and B horizon topsoil, removal and stockpiling of overburden, extraction of sandstone using a variety of earth moving equipment, blasting as needed, on-site processing including crushing, screening, washing and wet sizing, stockpiling, and

transporting stockpiled material to an off-site dry plant for final processing, sizing and loading for transport to market.

Initial construction activities will involve the wet processing and stockpile area and site access. Activities associated with construction of the wet plant include clearing and grubbing, removal and stockpiling of A and B horizon topsoils, construction of site access, perimeter berm construction, site grading, construction of stormwater management features (diversion, ditches, swales and ponds), and stripping and stockpiling overburden.

3.0 Site Drainage:

3.1 Existing Drainage Patterns and Receiving Waters:

Existing drainage patterns are shown on Sheet C-3, *Existing Conditions* of the Reclamation Plan. There is one unnamed intermittent stream or drainageway located on-site that runs from north to south through the western portion of the property, then heads east along the north side of Hwy 64, then through two 32" CMP Culverts beneath Hwy 64 and eventually enters Trout Creek, just over 1.5 mile downstream of the Site. Trout Creek flows southwesterly, eventually entering the Red Cedar River to the west approximately 10 miles downstream. The very western most portion of the Site drains to the east and through a 32" CMP culvert under 30th Street and eventually into Beaver Creek, approximately 1 mile west of the Site. Beaver Creek flows westerly and also ultimately enters the Red Cedar River. There are no impaired waters or outstanding/exceptional resource waters within 1 mile of the Site.

3.2 Wetlands:

A wetland complex is located in the northern portion of the on-site drainageway and a small wetland basin is located in the very southwestern corner of the Site. A wetland delineation was conducted in the fall of 2014. Field verification by the WDNR and County is planned for the spring 2015 growing season. A desktop determination of "non-navigable" has been made for the wetlands on the Site, however, this will need to be verified in the spring as well. Surrounding wetland basins are identified as emergent wet meadow, forested, and scrub/shrub communities on the WDNR surface water mapper.

Mining plans have been developed to ensure that direct impacts to wetlands are avoided and that any work performed adjacent to wetland areas is performed in accordance with federal, state and local wetland, floodplain and/or shoreland regulations. Updated wetland information will be incorporated into an amendment of the Stormwater Plan or into the SWPPP to be developed for the Site.

3.3 Existing Site Soils:

Soil Information:

There are several soil types on the proposed Site. The Plainbo Loamy sand (PdD) 12%-20% slopes and the Boone Fine Sand (BoE) 20-45% slopes are the most prominent soil types within the proposed mining area. Most of the soil types have formed over sandstone parent material on bedrock controlled uplands and outwash plains with just over 50% of the soils in Hydrologic Soil Group A. Table 3, *Site Soils,* in the Reclamation Plan lists the soil types found on the Mine Site and includes information on the depth of topsoil (A horizon soils) and subsoil (B horizon soils) and the volumes of A and B horizon soils based on an

average thickness associated with each soil type. Sheet C5, *Soils Map*, illustrates the aerial distribution of the Site soils. Additional information detailing the handling storage and reuse of topsoil and subsoil is included in Section 4.2.

Topsoil and subsoil will be used to construct temporary berms along the operational boundary of the Mine Site. A horizon soils will be kept separate from B horizon soils. Topsoil will not be stockpiled with general overburden materials.

3.4 Proposed Site Drainage:

The goal of the stormwater management plan will be to contain on site as much of the stormwater as possible. Drainage through the intermittent drainageway will continue uninterrupted through the Site.

A main stormwater pond will be located on the wet plant site to collect stormwater from the plant site. Stormwater collecting in this pond will be used to fill a water truck for dust control and the remainder will be pumped to the thickening tank/clarifier in the water treatment portion of the wet plant where it will be treated and then used in the wet plant.

Although the stormwater pond in the plant area will not routinely discharge stormwater, it is possible during periods when the plant is not operating, for example during spring snowmelt, that there may be a discharge from the pond. The pond will be drained down in the fall prior to shutting down the wet plant for the season and will have the capacity to store a minimum of a 10 year- 24 hour rainstorm event. There will be a manual outlet control device on the pond so that water can be tested and treated prior to discharge if necessary.

The plant site will also have two or more process water ponds. These ponds will receive water draining off of the wet processed sand piles as well as treated water from the clarifier. Stormwater will be routed away from the process water ponds. The process water ponds will be constructed with a liner either meeting the requirements of NR 213 or an alternative specification with approval of Chippewa County such as the alternative Settling Pond Liner Specification included as Appendix H in the Reclamation Plan. Process water will be pumped back to the plant for reuse and will not be discharged off site.

Site drainage will be modified throughout the durations of active mining operation. As much of the Site drainage will be managed internally as practical. As the mine floor is lowered below the surrounding elevations much of the active mine area will drain internally. Stormwater management ponds will be constructed at various locations throughout the perimeter of the Site where there are areas for potential discharge of stormwater during active mining and reclamation activities. Final design of these basins will be developed in conjunction with the SWPPP for the Mine Site. In general the ponds will be equipped with an outlet that enables manual control of discharge from the ponds. If it is not practical to utilize collected stormwater as dust control, discharge will be allowed once sufficient treatment has occurred using traditional settlement or if needed the application of flocculants. There will be sufficient storage in each stormwater pond to retain at least a 10-year 24 hour rainstorm event. Controlled release of treated water will restore the storage capacity of the pond. These ponds will be designed in accordance with DNR Conservation Practice 1064 using Class 3 soils for the purpose of defining settling velocities.

Under the final reclamation condition, changes in slopes, soil structure and vegetative cover will result in than overall increase in rates of runoff. During final reclamation of an area, the ponds will be converted to serve as rate control ponds with the outlet and manual valve system modified or removed to control the post mining discharge to pre-mining rates of runoff for the 2, 10, 25 and 100 year- 24 hour rainstorm events.

4.0 Potential Source Areas of Stormwater Contamination

4.1 Access Roads: Unpaved site access and internal mining haul roads may generate dust. Necessary moisture will be applied to the construction area and haul roads in order to prevent the spread of dust. Approved dust control products may be used as necessary.

4.2 Land Disturbing Activities: Typical land disturbing activities at the Site will include constructing roads, overburden removal, clearing and grubbing, topsoil and overburden removal, excavating sandstone, perimeter berming, reclamation grading, and other related activities. BMPs that minimize erosion and sedimentation will be most effective if installed as close as possible to the source. A list of best management practices (BMPs) used to control land disturbing activities is presented in Section 5.0.

4.2 Storage Areas for Raw Products: Product storage areas, including topsoil, overburden, raw sand and wet processed sand stockpiles are potential areas for stormwater contamination. During normal mining operations, wet processed sand ready for delivery to the dry plant will be stockpiled on site. Stormwater contacting the winter feed pile is a potential source of stormwater contamination. The base of the stockpile area will be graded to drain to a process water pond. Water from the process water pond will be recirculated back to the wet processing plant for reuse and will not be discharged off-site.

4.3 Areas of Significant Erosion: These include areas stripped in preparation of mining, stockpiles, internal access roads, transfer/staging areas, unreclaimed mining areas, and runoff from off-site areas. A list of best management practices (BMPs) used to control areas of significant erosion is presented in Section 5.0.

4.4 Vehicle Maintenance Areas: Stormwater contacting areas where vehicle maintenance or washing occurs has the potential to pick up contaminants. All vehicle maintenance will take place in an area with spill prevention measures in place.

4.5 Washing Areas for Equipment and Vehicles: Any external washing of trucks and other construction vehicles will be limited to a defined area of the site. Vehicles will be washed only on an area stabilized with stone that drains to an approved sediment trapping device. Runoff from the washing area will be contained and waste properly disposed of. No engine degreasing is allowed on site.

5.0 Best Management Practices:

The primary objective of BMPs to be implemented at the Site is to:

- Minimize disturbed areas;
- Stabilize inactive disturbed areas;
- Minimize stormwater runoff from the active mining areas of the mining operation;
- Collect and retain sediment from active areas of the mining operation;
- Minimize velocities from access roads that drain out of the Site; and
- Collect sediment from access roads and vehicles that operate in the mine.

Permanent and temporary best management practices to be incorporated into the construction of the site as well as during mining, reclamation and processing activities:

5.1 Silt Fence
5.2 Rock Construction Entrance
5.3 Diversion Berms
5.4 Conveyance Swales
5.5 Erosion Control Matting
5.6 Ditch Checks
5.7 Sedimentation Basins with valves to control the release of treated stormwater
5.8 Water Applied Polymer (flocculants and coagulants)
5.9 Seeding and Mulching
5.10 Temporary Infiltration Areas within recessed portion of the mine floor

6.0 General Operations:

6.1 Temporary and permanent erosion prevention and sediment controls will be used during construction activities to provide soil stabilization for disturbed areas and structural controls to divert runoff and remove sediment. Controls are also identified to address other potential stormwater pollutant sources such as construction materials, waste disposal, control of vehicle traffic, and sanitary waste disposal.

6.2 BMPs identified on the above referenced plans and in the SWPPP to be prepared for the Site in accordance with the WPDES Nonmetallic Mining General Permit WI-0046515-5 shall be selected, installed, and maintained in an appropriate and functional manner that is in accordance with relevant manufacturer specifications and accepted engineering practices.

6.3 Sediment control practices shall be established on all down gradient perimeters before any up gradient land disturbing activities begin. These practices shall remain in place until final stabilization has been established.

7.0 Erosion Prevention Practices

7.1 The location of areas not to be disturbed shall be delineated (e.g. with flags, stakes, signs, silt fence, etc.) on the Site before work begins.

7.2 The removal of trees and surface vegetation shall be avoided wherever possible. Mining activity shall be phased in order to expose the smallest practical area of soil at any given time. Appropriate phasing, vegetative buffer strips, horizontal slope grading, and other construction practices that minimize erosion shall be implemented.

7.3 Following initial soil disturbance or redisturbance, permanent or temporary stabilization against erosion due to rain, wind, and running water shall be completed as soon as possible, but in no case later than 14 calendar days, on all disturbed or graded areas including stormwater management pond sideslopes. This requirement does not apply to those areas that are currently being used for material storage or for those areas on which mining, grading, site building, or other activities are actively underway.

7.4 Vegetation shall be established on all topsoil stockpiles and diversion berms and swales.

7.5 Any areas to be paved shall be stabilized using early application of gravel base.

7.6 The normal wetted perimeter of any temporary or permanent drainage ditch or swale that conveys water from any portion of the processing area or active unstabilized mining and reclamation fill areas, or diverts water around the site, within 200 lineal feet from the property edge, or within 200 feet from the point of discharge to any surface water shall be stabilized within 24 hours of connecting to a surface water.

7.7 The remaining portions of any temporary or permanent drainage ditches or swales shall be stabilized within 14 calendar days after connecting to a surface water and construction in that portion of the ditch has temporarily or permanently ceased.

7.8 Pipe outlets shall be provided with temporary or permanent energy dissipation within 24 hours of connection to a surface water. An 18 inch thick layer of WiDOT 606 medium riprap shall be placed onto a 9 inch thick layer of granular filter material at locations indicated on the plan in accordance with WiDOT 606. Two layers of WiDOT 645.3.7 Type HR Geotextile fabric shall be installed beneath the granular filter material. The installation at pipe outfalls shall be configured as shown on Sheet C3 Sedimentation and Erosion Control Details, for the size of pipe indicated and the geotextile fabric shall extend under the culvert apron a minimum of 3 feet. For pipe sizes smaller than 12 inch diameter, the minimum quantity of riprap and filter blanket shall be no less than that required for 12 inch diameter pipes.

7.9 Necessary moisture or approved dust control shall be applied to the mine area and haul roads in order to prevent the spread of dust.

8.0 Soil Stabilization

8.1 Water and maintain seeded areas on a timely day-to-day basis. In the event of a seeding failure, reseed and remulch the areas where the original seed has failed to grow and perform additional watering as necessary.

8.2 In areas to be temporarily seeded, use introduced seed mixture in accordance with WiDOT Seed Mix No. 20. Apply seed mixture in accordance with WiDOT Standard Spec. 630 and WDNR Conservation Practice Standard 1059.

8.3 In areas to be permanently seeded, establish and maintain native seed mixtures in accordance with Revegetation Plan, Section 4.5 of the Reclamation Plan.

8.4 Reinforce pond overflow swales with Landlok TRM 450 turf reinforcement mat, or approved equal. Install the mat in accordance with the manufacturer's recommendations.

8.5 For stabilization of slopes and channels, refer to the Channel Erosion Control Matrix and the Slope Erosion Control Matrix included as Figure 1 and Figure 2 to determine appropriate erosion control practices are appropriate under various conditions. Apply mulch uniformly over the soil surface by hand or machine within 24 hours after seeding in accordance with WiDOT Standard Specifications for Highway and Structure Construction. Immediately after placement, anchor all mulch material into the soil by crimping (straight

disking) in a direction perpendicular to that of the overland stormwater flow. Punch the mulch into the soil to a depth of 2 to 3 inches with a disk spacing of 8" or less.

8.6 In seeded areas with slopes steeper than 4:1, install biodegradable erosion control blankets uniformly over the soil surface by hand within 24 hours after seeding in accordance with manufacturers recommendations. Use WiDOT Standard Spec. 628.2 ECRM Class I Type B mat.

8.7 In seeded ditches, install ECRM or TRM erosion control mats uniformly over the soil surface by hand within 24 hours after seeding in accordance with manufacturers recommendations. Use WiDOT Standard Spec. 628.2 ECRM Class I Type B mat or TRM Class III Type C mat.

8.8 Erosion Control Blanket Installation: Lay the blanket parallel to the direction of water flow with the netting on the top. Spread the blankets evenly without stretching so that fibers are in direct contact with the soil. Overlap adjacent strip edges 2 - 4 inches. Overlap strip ends a minimum of 10 inches with the upgrade strip on top. Bury the upstream end of each blanket at least 6 inches in a vertical trench with the soil pressed firmly against the embedded mat. Install additional check trenches at 50' intervals. Staple strip ends and end overlaps with not more than 12 inches between staples. Staple all other joints and edges at 2 ft. intervals. Place additional staples down the center of each blanket in a diamond pattern at a maximum of 2 foot intervals. Insert all staples flush with the ground surface. Staples shall be 11 gauge or heavier "U"-shaped with a 1 - 2 inch crown. Staple length shall be 10 inches.

8.9 Winter Mulching: Snow mulching consists of mulch material spread over frozen ground. Mulch materials that do not require disc-anchoring into the soil may be placed without modification. Mulch materials that require disc-anchoring may be anchored with hydraulic soil stabilizers or may be frozen to the soil by applying water at a rate of 2000 gallons per acre over the mulch as a substitution for disc-anchoring.

9.0 Sediment Control Practices

9.1 Sediment control practices shall be implemented in order to minimize sediment from entering surface waters.

9.2 Temporary or permanent sediment control measures including silt fence at perimeter of construction, rock construction entrances, sediment filters, silt sacks, and sedimentation basins shall be installed prior to beginning site clearing, grading, or other land-disturbing activity.

9.3 Sediment control practices shall be established on all down gradient perimeters before any up gradient land disturbing activities begin. These practices shall remain in place until final stabilization has been established.

9.4 The timing of the installation of sediment control practices may be adjusted in order to accommodate short-term activities, but sediment control practices shall be installed before the next precipitation event even if the short-term activity is not complete.

9.5 If the down gradient treatment system becomes overloaded, additional up gradient sediment control practices or redundant BMPs shall be installed in order to eliminate the overloading.

9.6 Check dams, diversion swales, or other grade control practices shall be installed in order to ensure sheet

flow and prevent rills (for slope lengths greater than 75 feet with a grade of 3:1 or steeper).

9.7 Before beginning construction, a temporary rock construction entrance shall be installed at each point where vehicles exit the construction site. Place the rock aggregate in a layer at least 6 inches thick across the entire width of the entrance. Extend the rock entrance at least 50 feet into the construction zone. Use a geotextile fabric beneath the aggregate in order to prevent migration of soil into the rock from below. The entrance shall be maintained in a condition that will prevent tracking or flowing of sediment onto paved roadways. Periodic top dressing with additional stone shall be provided as required. Entrances not protected by temporary rock construction entrances shall be closed to all construction traffic.

9.8 If necessary, the wheels of construction vehicles shall be cleaned in order to remove soils before the vehicles leave the construction site. Vehicles shall be washed only on an area stabilized with stone that drains into an approved sediment trapping device.

9.9 All soils and sediments tracked or otherwise deposited onto adjacent property shall be removed on a daily basis throughout the duration of the project.

9.10 Silt fence or other effective sediment controls shall be installed around all temporary soil stockpiles. Soil or dirt stockpiles shall be located such that the downslope drainage length is no less than 25 feet from the toe of the pile to a surface water, including stormwater conveyances such as swales, pipes and ditches unless there is a bypass in place for the stormwater.

9.11 Silt Fence: WiDOT Standard Specification 628.2.6 silt fence. Silt fence shall be installed along the contour (on a level horizontal plane) with the ends turned up (J-hooks) in order to help pond water behind the fence. The silt fence shall be installed on the uphill side of the support posts. A post spacing of 4 feet or less shall be provided. Posts shall be driven at least 2 feet into the ground. The silt fence fabric shall be anchored in a trench at least 6 inches deep and 6 inches wide dug on the upslope side of the support posts. The fabric shall be laid in the trench and then backfilled and compacted with a vibratory plate compactor. Any splices in the fabric shall be made at a fence post. At splices, the fabric shall be overlapped at least 6 inches, folded over, and securely fastened to the fence post. A silt fence backed by snow fence, wire mesh, or stiff plastic mesh reinforcement shall be installed and maintained directly downstream of all storm sewer outfalls.

9.12 Erosion control facilities in areas where concentrated flows occur (such as swales, ditches, and areas in front of culverts and catchbasins) shall be reinforced by backing them with snow fence, wire mesh, or stiff plastic mesh reinforcement until paving and turf establishment operations have been completed. Posts for the reinforcing fence shall be 4 inch diameter wood posts, or standard steel fence posts weighing not less than 1.3 lbs per lineal foot, with a minimum length of 30 inches plus burial depth. Posts for the reinforcing fence shall be spaced at intervals of 10 feet or less. Posts for the reinforcing fence shall be driven at least 2 feet into the ground.

9.13 All temporary erosion and sediment control devices shall be maintained in place until the contributing drainage area has been stabilized. Any rilling, gully formation, or washouts shall be repaired. After final establishment of permanent stabilization, all temporary synthetic, structural, and non-biodegradable erosion and sediment control devices and any accumulated sediments shall be removed and disposed of off-site. Permanent sedimentation basins shall be restored to their design condition immediately following stabilization of the site.

10.0 Permanent Stormwater Management System

10.1 Stormwater contaminated with sediment shall, to the maximum extent practicable, be captured on the nonmetallic mining site and then allowed to evaporate or infiltrate into the earth so the sediment is removed prior to discharge to groundwater. The tracking of sediment onto local roads shall be minimized by the use of BMPs such as, an asphalt or concrete approach to the road or use of a temporary rock construction entrance. There shall be no direct injection, through wells, of stormwater into the groundwater.

10.2 Stormwater discharges off the mining site to wetlands or to surface waters from areas with exposed earthen materials (including aggregate materials stockpiled for reuse) shall be treated with solids separation BMPs to reduce the amount of sediment discharged to the maximum extent practicable. These treatment practices may include settling, sedimentation, water applied polymers, and filtration.

10.3 Wet Sedimentation Basin: Stormwater runoff from disturbed surfaces that cannot be infiltrated will be treated by on-site wet sedimentation basins. The basins will be designed to meet the WDNR Conservation Practice Standard 1064 using Class 3 soils for the purpose of defining particle settling velocity.

10.4 Treatment Surface Area: The treatment surface area provided for the site is designed so that the peak discharge from Pond 1 for the 1-year, 24-hour design storm does not exceed the allowable using Equation 1 of the WDNR Conservation Practice Standard 1064.

CHANNEL EROSION CONTROL MATRIX

(Concentrated Flow Application)

TYPE OF EROSION CONTROL DEVICE	PERMISSIBLE SHEAR LB/S.F.	DITCH GRADE < 2% Max. Length (ft.) 300	< 2% 600	< 2% 1200	2% - 4% Max. Length (ft.) 300	2% - 4% 600	2% - 4% 1200	4% - 6% Max. Length (ft.) 300	4% - 6% 600	4% - 6% 1200	6% - 9% * Max. Length (ft.) 300	6% - 9% * 600	6% - 9% * 1200	9% - 12% * Max. Length (ft.) 300	9% - 12% * 600	9% - 12% * 1200	REMARKS
Seed with properly anchored mulch	0.6																Anchor mulch per specifications.
Sod ditch checks with seed and mulch	N/A					C											Install one ditch check for every 1 foot of drop. Sod stakes required.
Temporary ditch checks (hay bales or approved manufactured alternatives lisited in the WisDOT PAL)	N/A																Install one ditch check for every 2 feet of drop. Maximum 200' spacing. Not recommended for slopes less than 1%.
Sod ditch liner	1.0																Upstream end must be buried. Additional sod stakes required.
Double netted light duty (WisDOT Class I Type B) erosion mat	1.5																Only mat type products allowed.
Sod reinforced with a double netted jute (WisDOT Class II Type A) erosion mat	1.5																Upstream end must be buried. Additional sod stakes required. Two bid items needed.
Stone or rock ditch checks, or Rock-Filled Filter Bags	N/A																Use No. 2 coarse aggregate, railroad ballast, or breaker run. Install one ditch check for every 2 feet of drop. Use in conjunction with a channel lining.
Medium duty coconut erosion mat (WisDOT Class II Type B or C)	2.0																
Heavy duty synthetic (WisDOT Class III Type A) erosion mat or turf reinforcement mat (WisDOT Class III Type B)	2.0																Germination may be a problem with Class III Type A mats. An ECRM is required for initial erosion protection for Class III Type B mats.
Heavy duty synthetic turf reinforcement (WisDOT Class III Type C) mat	3.5																An ECRM is required for initial erosion protection. Contact manufacturer if higher shears are needed.
Riprap ditch checks	N/A																Place top of downstream ditch check level with bottom of upstream ditch check. Use in conjunction with a channel lining.
Heavy duty synthetic turf reinforcement (Class III Type D) mat	5																An ECRM is required for initial erosion protection. Contact manufacturer if higher shears are needed.
Light riprap	4																Outfalling, overtopping and scour need to be addressed. Use 2' minimum ditch depth.
Medium riprap	5																
Heavy riprap	8																

Riprap measures apply to all ditch types. Use of these measure requires engineering judgement and design.

CHANNEL EROSION CONTROL MATRIX

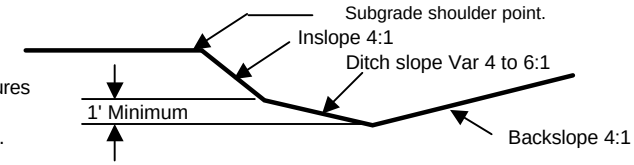
(Concentrated Flow Application)

TYPE OF EROSION CONTROL DEVICE	PERMISSIBLE SHEAR LB/S.F.	DITCH GRADE < 2% Max. Length (ft.) 300	600	1200	2% - 4% Max. Length (ft.) 300	600	1200	4% - 6% Max. Length (ft.) 300	600	1200	6% - 9% * Max. Length (ft.) 300	600	1200	9% - 12% * Max. Length (ft.) 300	600	1200	REMARKS
Grouted rip rap	N/A	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	Address outfalling, overtopping and scour. Line with Grotextile fabric Type "HR", (see Chap. 10, Const. Detail and special provision). Use 2' minimum ditch depth.
Articulated Concrete Block Type A	5	●	●	●	●	●	●	●	●	●	●						ACBs apply to all ditch types. Use of these measures requires engineering judgement and design.
Articulated Concrete Block Type B	10	●	●	●	●	●	●	●	●	●	●	●	●	●			
Articulated Concrete Block Type C	15	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Articulated Concrete Block Type D	20	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Articulated Concrete Block Type E	30	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	

Standard Ditch Section

●

Erosion control for ditches not conforming to the typical at right, that complies with FDM procedures 11-15-1 Figures 6 & 7, should be designed according to FDM Chapter 13.



KEY

Effective range of device for Sandy or Clayey Soil: ●

Device applicable, may not be cost effective: ●

" C " effective for clayey soil only

Not applicable. Use in conjunction with other BMPs: (X)

ECRM - Erosion control revegetation mat. All Class I and II mats are ECRMs.
TRM - Turf reinforcement mat.
FDM - WisDOT Facilities Development Manual
BMP - Best Management Practice
PAL - See Note 6

* For ditch grades over 9% special design considerations may be required.
** Soils that are not sandy should be treated as clay soils.

NOTES

1) Ditch flow rates used to develop bar chart are based on a 60 ft. right of way from pavement centerline and a 2-Yr. rainfall event for temporary liners or a 25-Yr. rainfall event for permanent (Class III mat or riprap) liners. If the drainage area extends outside the 60 foot right of way or unusual flows are expected, use the shear stress column values to determine the suitablity of a liner. See FDM procedures in Chapter 10 and in Section 13-30-10.
2) Erosion mats shall extend upslope 1.0 ft. min. vertically from the ditch bottom or 6" higher than the design flow depth. There shall be no joints within 18" of the low point.
3) Cost shall be a consideration in the selection of these devices.
4) Add sediment traps at the bottom of channel slopes.
5) Refer to FDM Chapter 10 for any channels exceeding the limits shown.
6) Approved materials for erosion products are referenced from the Wisconsin Department of Transportation Erosion Control Product Acceptability Lists (PAL), found at the web site: http://www.dot.wisconsin.gov/business/engrserv/pal.htm
7) On long or steep channels that require a higher class mat, use the appropriate lower class mat for the first 300 ft to 600 ft of the channel.
8) Effective erosion control involves minimizing the amount of time soil is exposed and the selection of a combination of practices, and not reliance on just one practice.

SLOPE EROSION CONTROL MATRIX

TYPE OF EROSION CONTROL	SLOPE																		REMARKS
	6:1 or flatter (7)			4:1			3:1			2.5:1			2:1			1:1			
	SLOPE LENGTH			SLOPE LENGTH			SLOPE LENGTH			SLOPE LENGTH			SLOPE LENGTH			SLOPE LENGTH			
	0 - 30'	30 - 60'	60 - 120	0 - 30'	30 - 60'	60 - 120	0 - 30'	30 - 60'	60 - 120	0 - 30'	30 - 60'	60 - 120	0 - 30'	30 - 60'	60 - 120	0 - 30'	30 - 60'	60 - 120	
Seed with properly anchored mulch	●	●	●	●	●	●	●	●											
Single netted light duty (WisDOT Class I Type A) erosion mat	▬	▬	▬	▬	▬	▬	●	●	●	●	●								
Light duty single netted 100% biodegradeable (WisDOT Urban Type A) erosion mat	▬	▬	▬	▬	▬	▬													Use only 100% biodegradeable anchors for urban mats.
Light duty double netted 100% biodegradeable (WisDOT Urban Type B) erosion mat	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬									Use only 100% biodegradeable anchors for urban mats.
Bonded Mulch (WisDOT Type A Soil Stabilizer)	▬	▬	▬	▬	▬	▬	▬	▬											May be applied over Class III Type B, C, or D mats in place of erosion control revegetation mats.
Polymer (WisDOT Type B Soil Stabilizer)	Used in conjunction with other BMPs effective up to a 2:1 slope. Not effective in sand. When used alone effective up to a 3:1 slope. Stand alone use appropriate for earthen stock piles, temporary, and late season applications																		
Double netted light duty (WisDOT Class I Type B) erosion mat	▬	▬	▬	▬	▬	▬	●	●	●	●	●	⊗	▬	▬					
Sod	▬	▬	▬	▬	▬	▬	●	●	●	●	●	⊗	▬	▬					
Medium duty coconut erosion mat (WisDOT Class II Type B or C)	▬	▬	▬	▬	▬	▬	▬	▬	●	●	●	●	●	●					
Sod reinforced with a double netted jute (WisDOT Class II Type A) erosion mat	▬	▬	▬	▬	▬	▬	▬	▬	●	●	●	⊗	▬	▬					Sod stakes required. Two bid items needed.
Heavy duty synthetic erosion control revegetation mat (WisDOT Class III Type A)	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	●	●	●				Germination may be a problem with Class III Type A mats
Riprap	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	●	●	●				Angle of repose must be considered, see FDM Chapter 13.
Heavy duty synthetic turf reinforcement (WisDOT Class III Type B or C) mat	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	●	●	●	●			A soil stabilizer or ECRM will be required for initial erosion protection.
Heavy duty synthetic turf reinforcement (WisDOT Class III Type D) mat	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	●	●	●	●	●	●	A soil stabilizer or ECRM will be required for initial erosion protection.
Slope paving or grouted riprap	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	Consider clear zone requirements. Only use in limited circumstances such as overflow areas near bridges.

SLOPE EROSION CONTROL MATRIX

Benches	Consider benches when cuts exceed 20', bench at approximately 15' vertical intervals to collect and drain water. Treat benches as channels (ditches). Adjust elevations to provide drainage. Consider flumes at transitions.
Intercepting embankments	Used to intercept runoff from abutting lands. Flumes may be necessary to direct runoff.
Silt fence	Used at toe of slopes to intercept and detain small amounts of sediment. Use only WisDOT approved silt fence as listed in the PAL.
Temporary ditch checks or Erosion bales	Used at toe of slopes to intercept and detain small amounts of sediment.
Slope drains/flumes	May be necessary on slopes (see channel matrix for design guidance).
Sediment traps	Used to trap sediment laden runoff. Could be used at the inlet or outlet end of slope drain.

KEY:

Not applicable. Use in conjunction with other BMPs: ⊗

Effective range of device for Sandy or Clayey Soil: ●●●●●●●

Device applicable, may not be cost effective: ●●●●●●●

* Soils that are not sandy should be treated as clay soils.

ECRM - Erosion control revegetation mat. All Class I and II mats are ECRMs.
TRM - Turf reinforcement mat.
FDM - WisDOT Facilities Development Manual
PAL - See Note 5

NOTES

1) Cost shall be a consideration in the selection of these devices.
2) Designers should review FDM Chapter 10 prior to selection of erosion mats.
3) Install intercepting ditches to limit slope lengths to 15' vertical intervals. (See FDM Chapter 10)
4) Refer to FDM Chapter 10 for any slopes exceeding the limits shown.
5) Approved materials for erosion products are referenced from the Wisconsin Department of Transportation Erosion Control Product Acceptability Lists (PAL), found at the web site: http://www.dot.wisconsin.gov/business/engrserv/pal.htm
6) On steeper slopes that require a higher class mat, use the appropriate lower class mat or seed and mulch for the first 30 ft to 60 ft of the slope.
7) Unless project conditions require otherwise, seed and mulch all slopes that are flatter than a 5% grade, regardless of length. If practicable, bench the slopes.
8) Effective erosion control involves minimizing the amount of time soil is exposed and the selection of a combination of practices, and not reliance on just one practice.