



Design and Implementing Temporary Erosion Prevention BMPs

2015 Annual MECA Conference

Duluth Convention Center

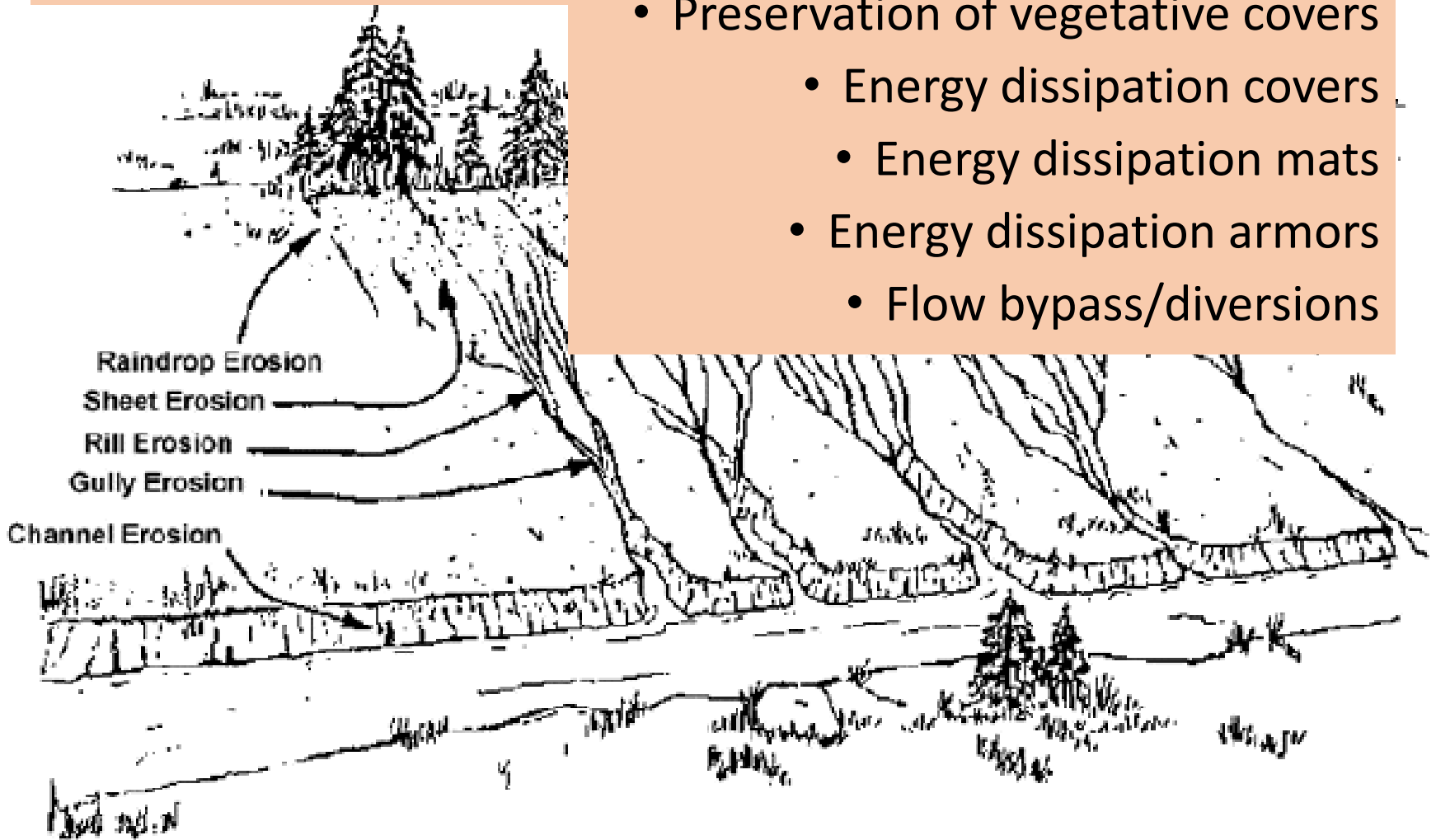
March 11, 2015

Dwayne Stenlund, MSc, CPESC

MNDOT/OES

Planning for the Erosion Process

- Preservation of vegetative covers
 - Energy dissipation covers
 - Energy dissipation mats
 - Energy dissipation armors
 - Flow bypass/diversions





Planning means preparing for rain

What is Normal?

Climate Minneapolis - Minnesota

°C | °F

	Jan	Feb	Mar	Apr	May	Jun
Average high in °F:	24	29	41	58	69	79
Average low in °F:	8	13	24	37	49	59
Av. precipitation in inch:	0.91	0.79	1.89	2.68	3.35	4.25
Days with precipitation:	8	7	11	9	11	13
Hours of sunshine:	140	166	200	231	272	302
Average snowfall in inch:	12	8	10	3	0	0

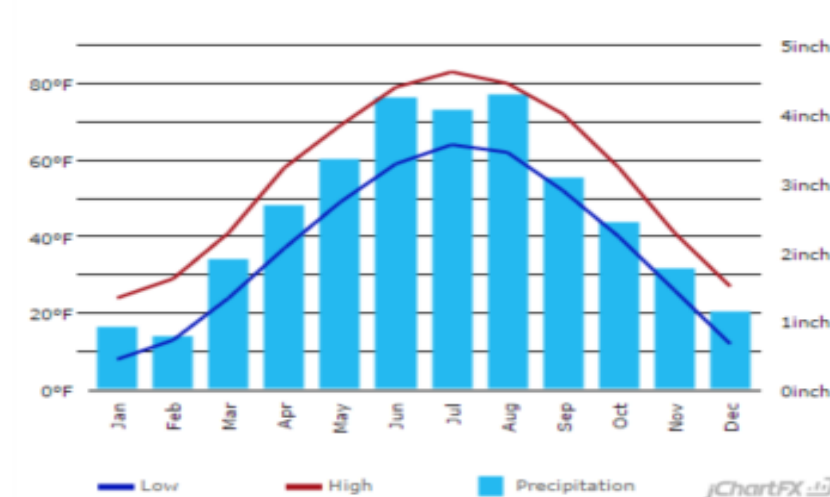
	Jul	Aug	Sep	Oct	Nov	Dec
Average high in °F:	83	80	72	58	41	27
Average low in °F:	64	62	52	40	26	12
Av. precipitation in inch:	4.06	4.29	3.07	2.44	1.77	1.14
Days with precipitation:	10	10	9	8	8	8
Hours of sunshine:	343	296	237	193	115	112
Average snowfall in inch:	0	0	0	1	9	12

Minneapolis weather averages

Annual high temperature:	55.1°F
Annual low temperature:	37.2°F
Average temperature:	46.15°F
Average annual precipitation - rainfall:	30.64 inch
Days per year with precipitation - rainfall:	112 days
Annual hours of sunshine:	2607 hours
Av. annual snowfall:	55 inch



Minneapolis Climate Graph - Minnesota Climate Chart



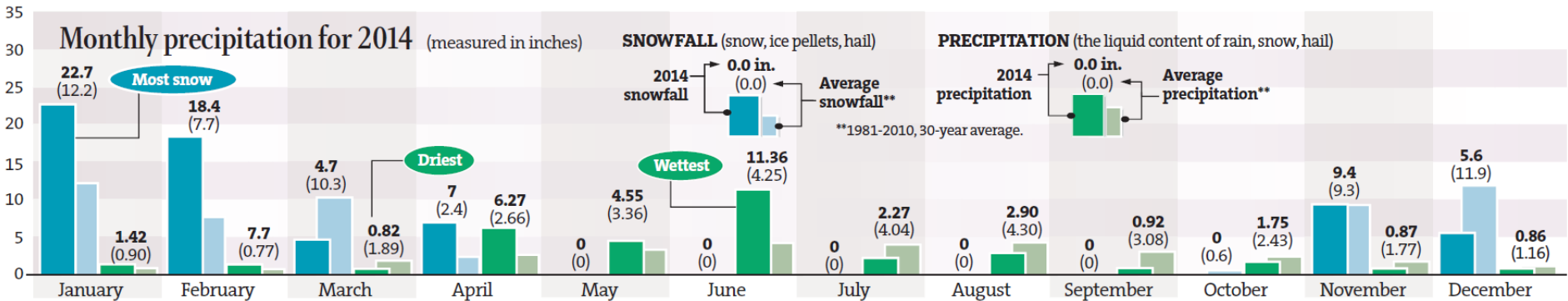
Climate data for minneapolis intl ap, Longitude: -93.2289, Latitude: 44.8831
Average weather Minneapolis, MN - 55401 - 1981-2010 normals

Jan: January, Feb: February, Mar: March, Apr: April, May: May, Jun: June, Jul: July, Aug: August, Sep: September, Oct: October, Nov: November, Dec: December

[Climograph of Minneapolis on your website](#)

The year in weather

2014



Sources: National Weather Service, State Climatology Office, DNR Division of Ecological and Water Resources

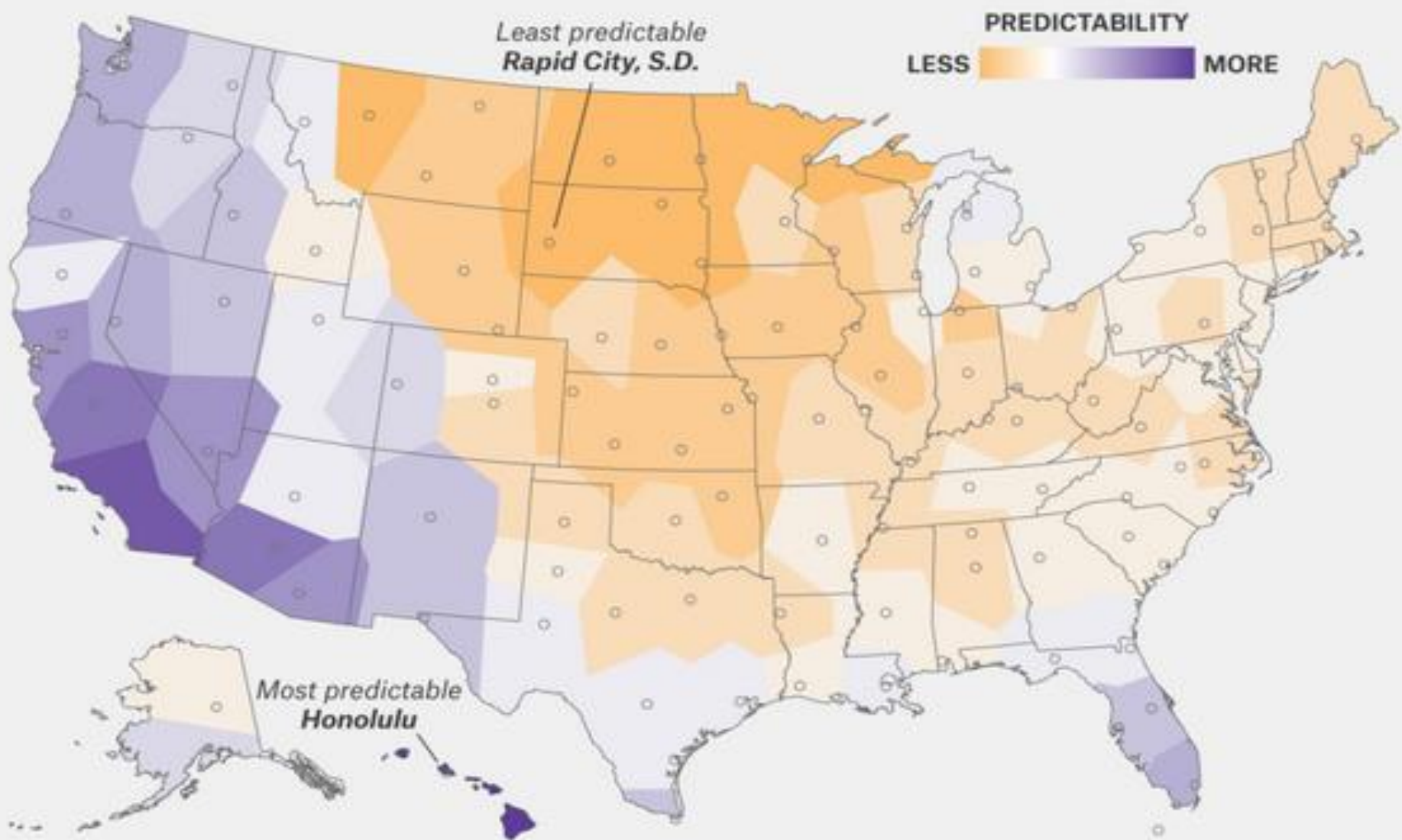
RAY GRUMNEY • Star Tribune

	Avg. high temp.	Avg. low temp.	Avg. temp.	Diff. from normal	Precip. (inches)	Diff. from normal	Snow* (inches)	Diff. from normal
Jan.	18.4	-2.5	8.0	-7.6	1.42	0.52	22.7	10.5
Feb.	17.5	-0.2	8.6	-12.3	1.41	0.64	18.4	10.7
Mar.	33.9	17.1	25.5	-7.3	0.82	-1.07	4.7	-5.6
April	51.4	34	42.7	-4.8	6.27	3.61	7	4.6
May	67.8	49.3	58.6	-0.5	4.55	1.19	0	0.0
June	78	61	69.5	0.7	11.36	7.11	0	0
July	80.6	62.5	71.5	-2.3	2.27	-1.77	0	0.0
Aug.	81.8	64.8	73.3	2.1	2.90	-1.40	0	0.0
Sept.	72.2	53.2	62.7	0.7	0.92	-2.16	0	0.0
Oct.	58.4	40	49.2	0.3	1.75	-0.68	0	-0.6
Nov.	32.4	18.5	25.4	-8.3	0.87	-0.9	9.4	0.1
Dec.	29.6	18.9	24.3	5.1	0.86	-0.27	5.6	-6.3
2014	51.8	34.7	43.3	-2.8	35.4	4.81	67.8	14.1

Source: Western Regional Climate Center *Snow, ice pellets or hail; T=trace amount (Research assistance from InYoung Choi MNDNR Climatology Volunteer)

How Predictable Is U.S. Weather?

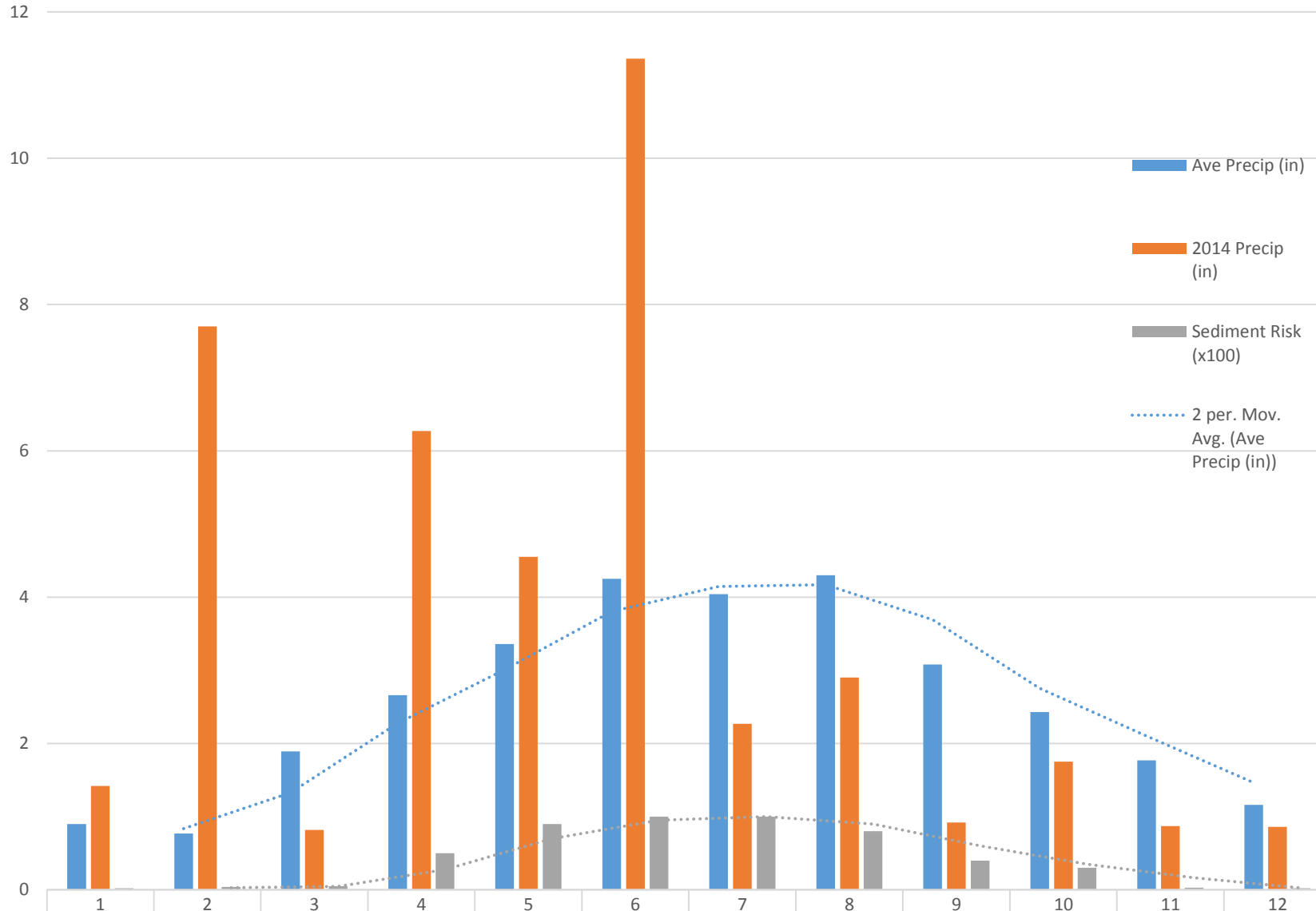
Based on data from 120 NWS weather stations, 1994-2013



What is Rain?

- 2 year, 2 to 3 inches in 24 hours?
- 1.5 inches in 10 minutes?
- 1 inch rain each day, for the next five days?
- Frozen, or saturated soils, next day greater than 2 inches?
- [Totals, *and* intensity, duration, frequency?]

Precip & Operations

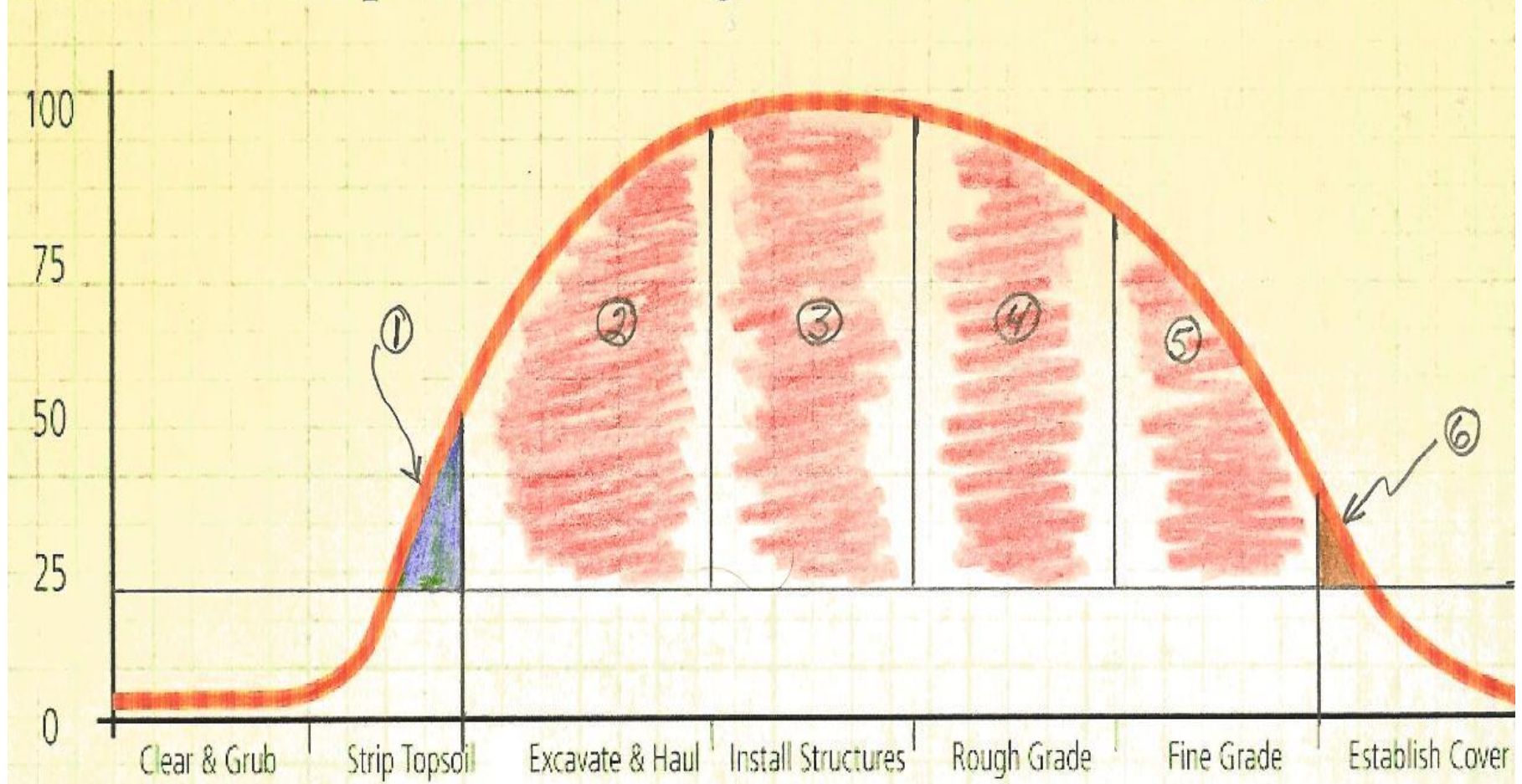


■ Ave Precip (in)	0.9	0.77	1.89	2.66	3.36	4.25	4.04	4.3	3.08	2.43	1.77	1.16
■ 2014 Precip (in)	1.42	7.7	0.82	6.27	4.55	11.36	2.27	2.9	0.92	1.75	0.87	0.86
■ Sediment Risk (x100)	0.02	0.04	0.05	0.5	0.9	1	1	0.8	0.4	0.3	0.03	0.02

January Minor February Minor March Clear & Grub April Strip Topsoil May Excavate and Haul June Install Structures July Install Structures August Rough Grade September Fine Grade Oct Est Cover Nov Minor Dec Minor

What is Sediment Discharge Risk?

Erosion potential changes with contractors operations

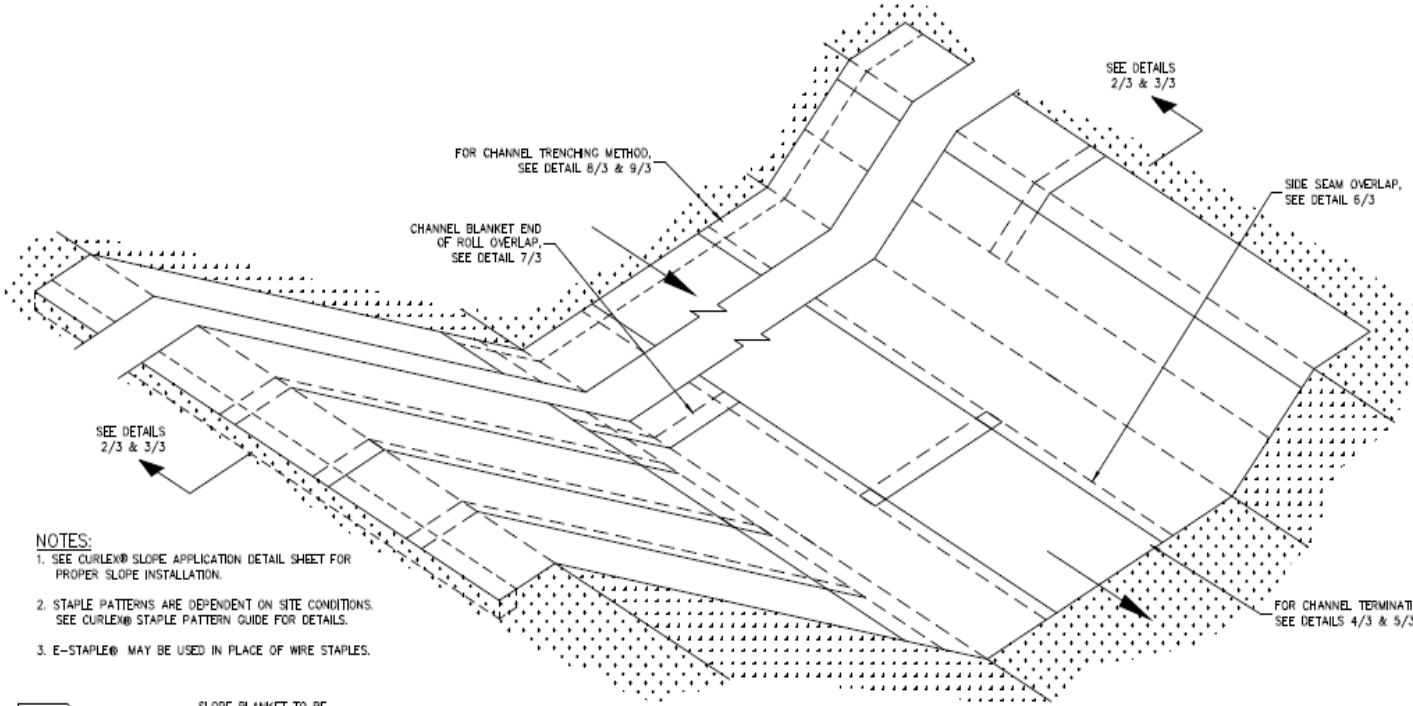


What is a SWPPP?

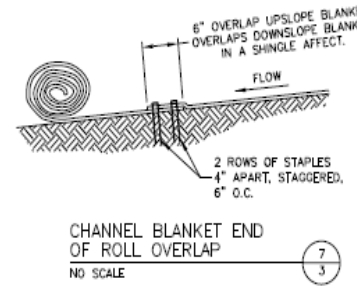
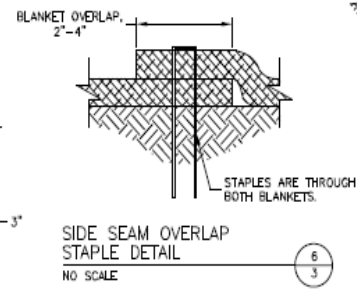
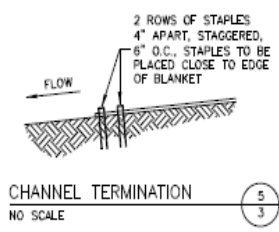
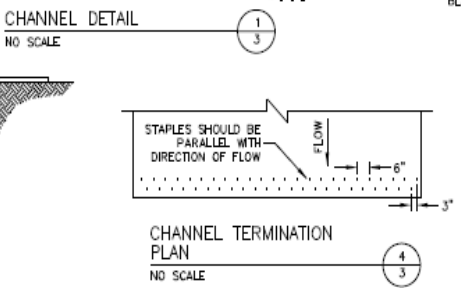
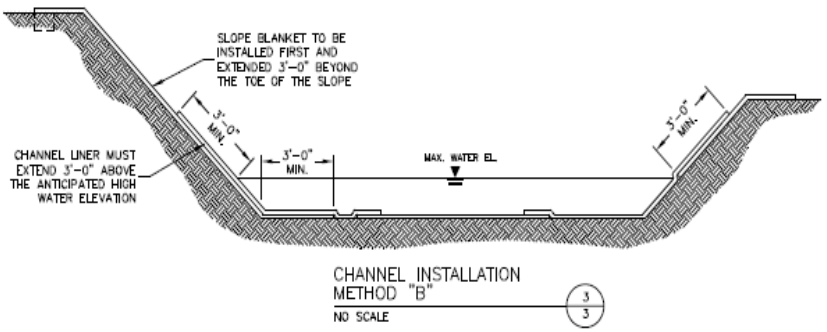
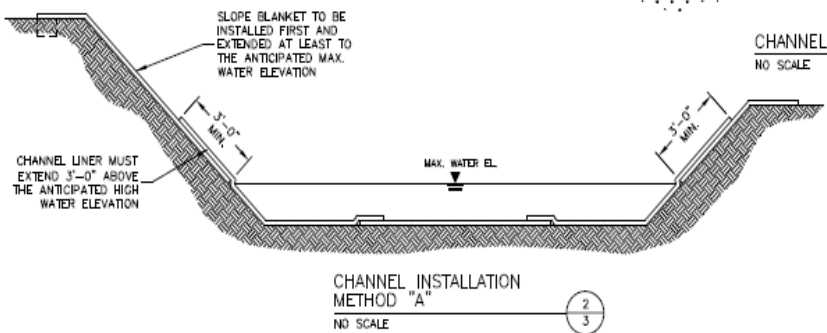
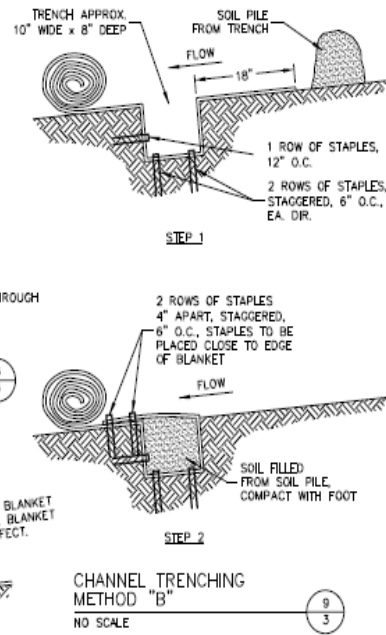
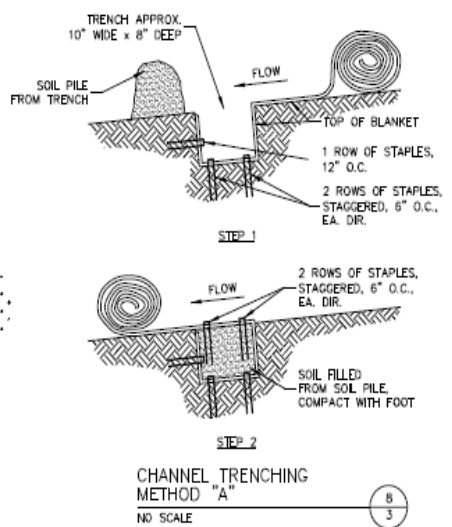
- Communication tool
 - Developed by owner
 - Phasing, estimated & tabulated quantities, plan locations, application details, estimated costs, overall responsibilities
 - Implemented by contractor
 - Avoidance, minimizing, restoration, quality control, scheduling, site management, amending, monitoring rain, corrective actions, documentation

5 Required Permit Items for Erosion Prevention

1. Non-structural practices things like planned phasing, leaving green space alone until actually needed, areas properly marked off, minimize need or planned phasing to be on slopes 3:1 and greater
2. Structural practice items of cat-walking, water bypass diversions, rapid covers, rapid repairs
3. **All** exposed (note the word all) soil areas must be stabilized (defined as immediately) includes stockpiles with significant clay, silt or organic matter;
 - a) within 7 days (special/impaired),
 - b) 24 hours MNDNR Promulgated work restrictions;
 - c) otherwise 14 days
4. Wetted perimeter of ditches from a 2-year return interval type storm, last 200 ft. to a surface water or where the water leaves the project
5. Pipe outlets with appropriate energy dissipation within 24 hours of the potential of discharge

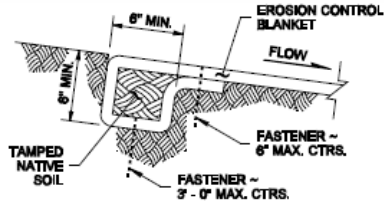


- NOTES:**
1. SEE CURLEX® SLOPE APPLICATION DETAIL SHEET FOR PROPER SLOPE INSTALLATION.
 2. STAPLE PATTERNS ARE DEPENDENT ON SITE CONDITIONS. SEE CURLEX® STAPLE PATTERN GUIDE FOR DETAILS.
 3. E-STAPLE® MAY BE USED IN PLACE OF WIRE STAPLES.

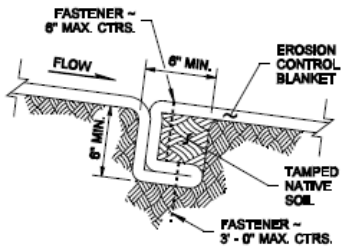


PROJECT MANAGER				AMERICAN EXCELSIOR COMPANY				SHEET DESCRIPTION				DATE 1/7/03		DRAWN BY	
CHECKED BY:				ARLINGTON, TEXAS				CURLEX® CHANNEL APPLICATION DETAIL				SCALE		PROJECT NO.	
APPROVED BY:												NONE		3	
NO.	BY	DATE	REVISIONS												

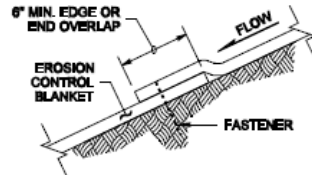
Layout Detail Sheet



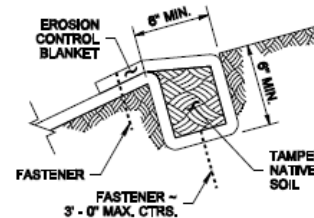
INITIAL ANCHOR - SECTION A



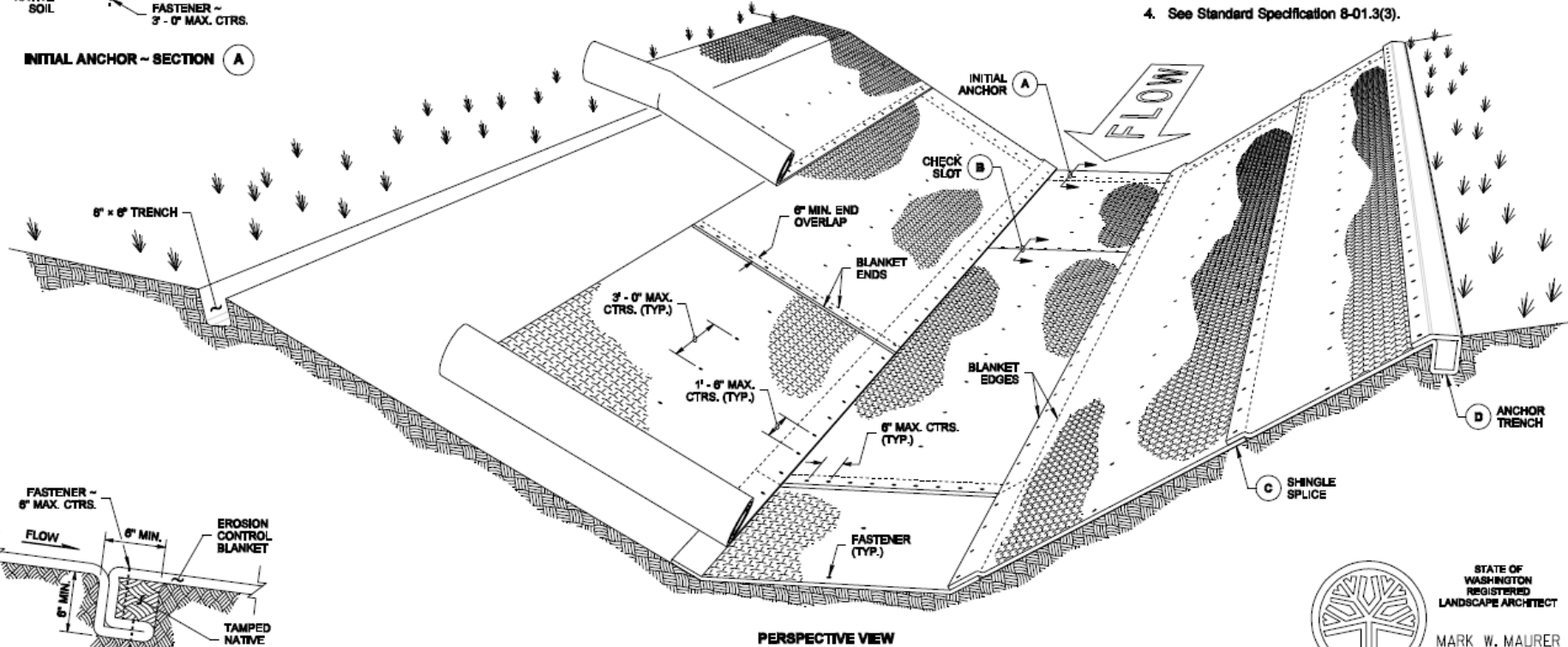
CHECK SLOT - SECTION B



SHINGLE SPLICE - SECTION C



ANCHOR TRENCH - SECTION D



PERSPECTIVE VIEW

NOTES

1. More than the minimum of one fastener per square yard may be required due to conditions such as blanket composition, soil type, surface uniformity, and flow velocity.
2. Provide Check Slots per manufacturer's recommendations.
3. Roll ends may be spliced in a check slot.
4. See Standard Specification 8-01.3(3).



STATE OF
WASHINGTON
REGISTERED
LANDSCAPE ARCHITECT

MARK W. MAURER
CERTIFICATE NO. 000598

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT. IT MUST BE APPROVED BY THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.

**EROSION CONTROL
BLANKET PLACEMENT
IN CHANNEL**
STANDARD PLAN I-60.20-00

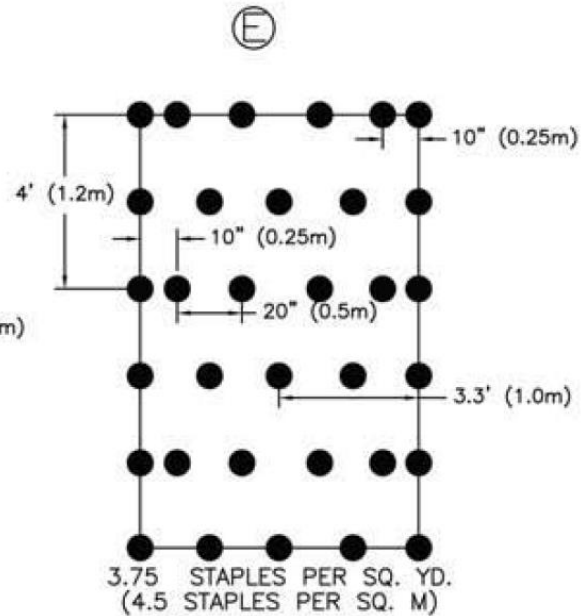
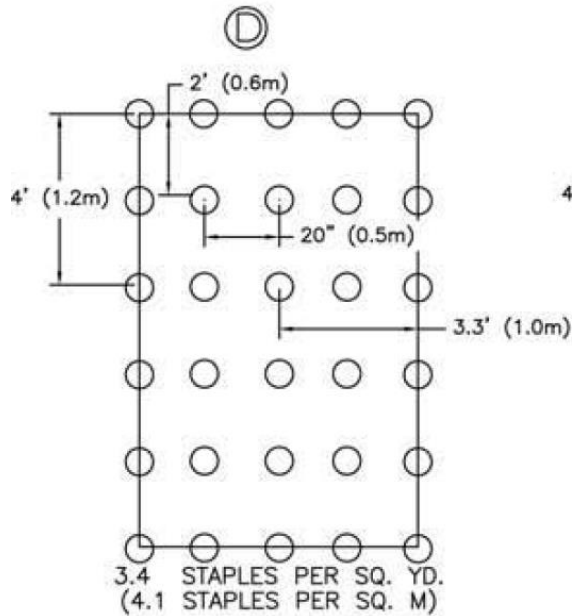
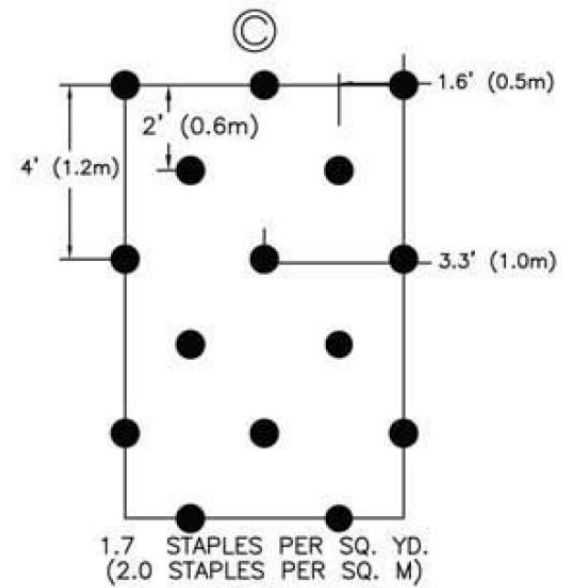
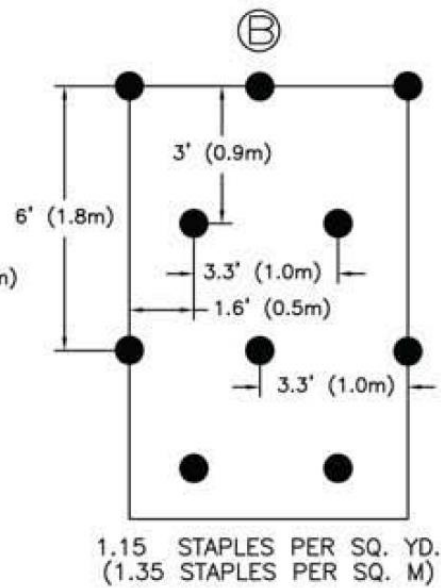
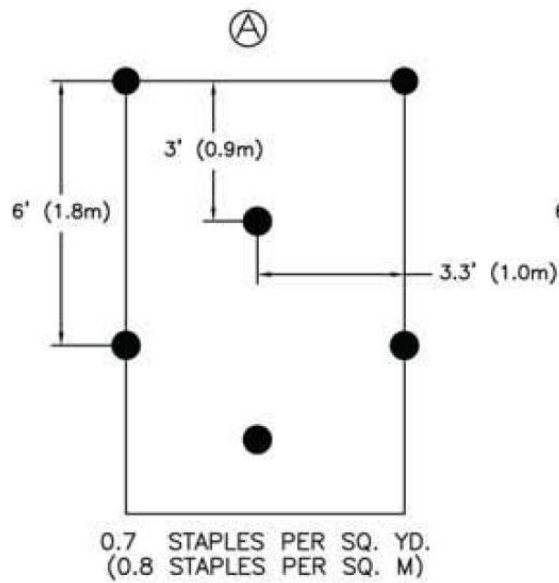
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

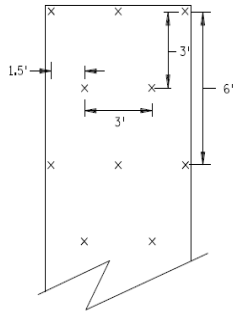
Pasco Bakotich III 08-31-07

STATE DESIGN ENGINEER DATE

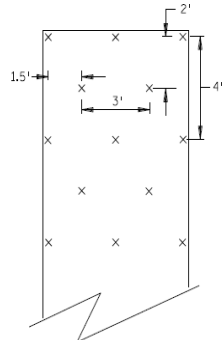
Washington State Department of Transportation



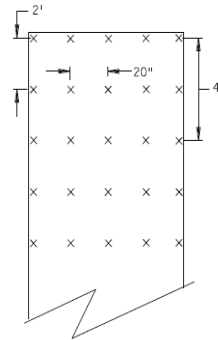
Recommended Staples per Roll on 6.67 ft. (2.03 m) Wide x 108 ft. (32.92 m) Long Rolls (80 sq. yd. / 66.89 sq. m)	
PATTERN	QUANTITY
A	56
B	92
C	136
D	272
E	300



SLOPES FLATTER THAN 1:2
(120 STAPLES PER 100 SQ YD)

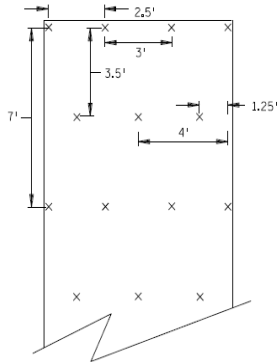


SLOPES 1:2 TO 1:1
(170 STAPLES PER 100 SQ YD)

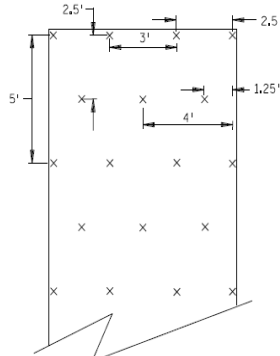


CHANNEL AND DITCH APPLICATIONS
(350 STAPLES PER 100 SQ YD)

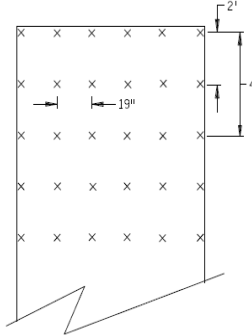
STANDARD 6.5 FT BLANKET STAPLE PATTERN



SLOPES FLATTER THAN 1:2
(120 STAPLES PER 100 SQ YD)



SLOPES 1:2 TO 1:1
(170 STAPLES PER 100 SQ YD)



CHANNEL AND DITCH APPLICATIONS
(350 STAPLES PER 100 SQ YD)

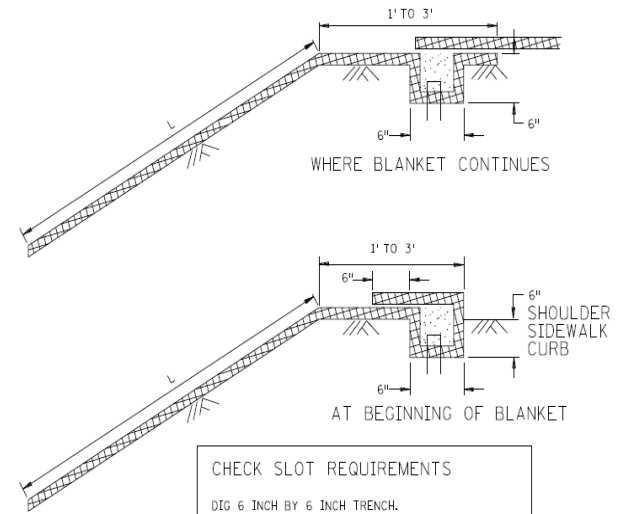
STANDARD 8 FT BLANKET STAPLE PATTERN

Slope Length 100, less than 1:3

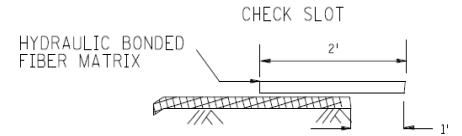
Slope length 300 less than 1:1

grade less than 1%

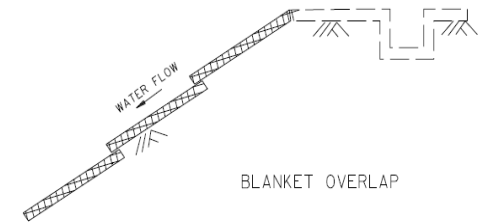
REFERENCE DATE



CHECK SLOT REQUIREMENTS
 DIG 6 INCH BY 6 INCH TRENCH.
 BACKFILL TRENCH WITH SOIL AND COMPACT.
 INSERT BLANKET INTO ENTIRE TRENCH PERIMETER.
 STAPLE BLANKET EVERY 2 FOOT ALONG THE BOTTOM OF THE TRENCH.



CHECK SLOT ALTERNATIVE



GENERAL BLANKET INSTALLATION REQUIREMENTS
 BLANKETS SHOULD BE LAID PARALLEL OR PERPENDICULAR TO THE DIRECTION OF WATER FLOW.
 OVERLAP ADJACENT STRIP EDGES A MINIMUM OF 4 INCHES.
 OVERLAP BLANKET 7 INCHES (MIN.) AT EACH END. OVERLAP BOTTOM END OF UPPER BLANKET OVER TOP END OF LOWER BLANKET. STAPLE ALONG OVERLAP EVERY 1.5 FEET.
 THE UPPERMOST BLANKET OF ALL SLOPE APPLICATIONS MUST START IN A CHECK SLOT. IF SLOPE LENGTH (L) IS 100 FT OR GREATER, INSERT BLANKET INTO A CHECK SLOT 1/3 FROM THE BOTTOM OF THE SLOPE.

STANDARD SHEET NO.	TITLE
STANDARD APPROVED:	PERMANENT EROSION CONTROL BLANKET STAPLE PATTERN FOR SLOPES
STATE PROJ. NO. ____ (TH ____) SHEET NO. __ OF ____ SHEETS	

Presentation Players

- Dr. PI Costs (*Probable Installation Costs*), *nickname PIC*
- Mr. IM Low (Incredible Method Low)
- Mr. IM High (Incredible Method High)

TEP Agenda

- MPCA NPDES/SDS Permit requirements
- MNDOT Standard Specification requirements
- TEP Plan setup
- Estimating costs
- Temporary erosion control practices, best practices, best management practices
- Non-structural TEP

Temporary EC Permit Requirements*

- Appropriate EC for every stage of construction
- Estimated quantities for the life of the contract
- Knowledge of works not shown on the plans
- Plan locations for the EC
- Unforeseen conditions
- Stockpiles
- Fish spawning
- Pipe outfalls
- Timing of EC installation
- Soil steepness
- Slope lengths
- Soil type (erodibility)
- Landform flows
- Issues of precipitation
- All Season (winter)

**Estimating costs & pay items implied, but not required*

Initiate Immediate Stabilization

12. **“Initiated immediately”** means taking an action to commence **stabilization** as soon as practicable, but no later than the end of the work day, following the day when the earth-disturbing activities have temporarily or permanently ceased, if the **Permittee(s)** know that construction work on that portion of the site will be temporarily ceased for 14 or more additional calendar days or 7 calendar days where Appendix A.C.1.a applies. The following activities can be taken to initiate **stabilization**:
 1. prepping the soil for vegetative or non-vegetative **stabilization**
 2. applying mulch or other non-vegetative product to the exposed soil area
 3. seeding or planting the exposed area
 4. starting any of the activities in # 1 – 3 on a portion of the area to be **stabilized**, but not on the entire area and
 5. finalizing arrangements to have **stabilization** product fully installed in compliance with the applicable deadline for completing **stabilization**



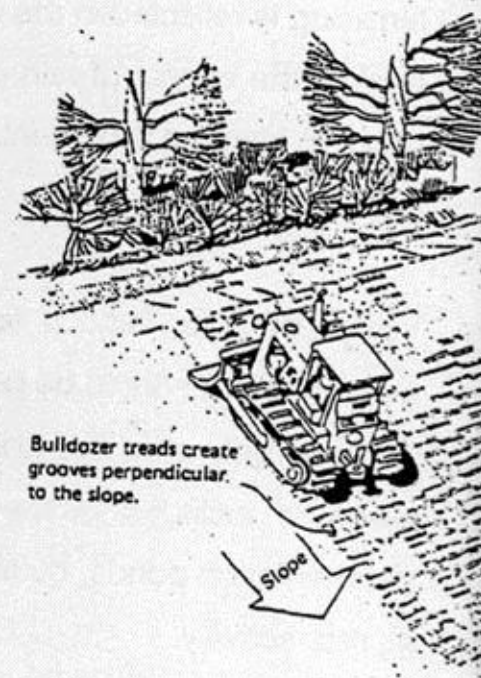
SI1: Scheduling *and*, prepping the soil





Table V.7 Values of P for Construction Sites^a

Erosion Control Practice	P
<i>Surface Condition with No Cover</i>	
Compact, smooth, scraped with bulldozer or scraper across the slope (track imprint up & down)	1.20
Same as above, except raked with bulldozer and root raked across the slope	.90
Loose as a disked plow layer	1.00
Rough irregular surface, equipment tracks in all directions	.90
Loose with rough surface > 0.3 meters depth	.80
Loose with smooth surface < 0.3 meter depth	.90
Compact with bulldozer track imprints perpendicular to the slope	.80
<i>Structures</i>	
Small sediment basins	
0.09 ha basin/ha	0.50
0.13 ha basin/ha	0.30
Downstream sediment basin	
With chemical flocculants	0.10
Without chemical flocculants	0.20
Erosion control structures	
Normal rate usage	0.50
High rate usage	0.40
Strip building	0.75



Note Practice factor 0.80 (erosion reduction)





SI2: Scheduling *and*, installing soil covers (C-factor erosion reduction 80 to 97 %)



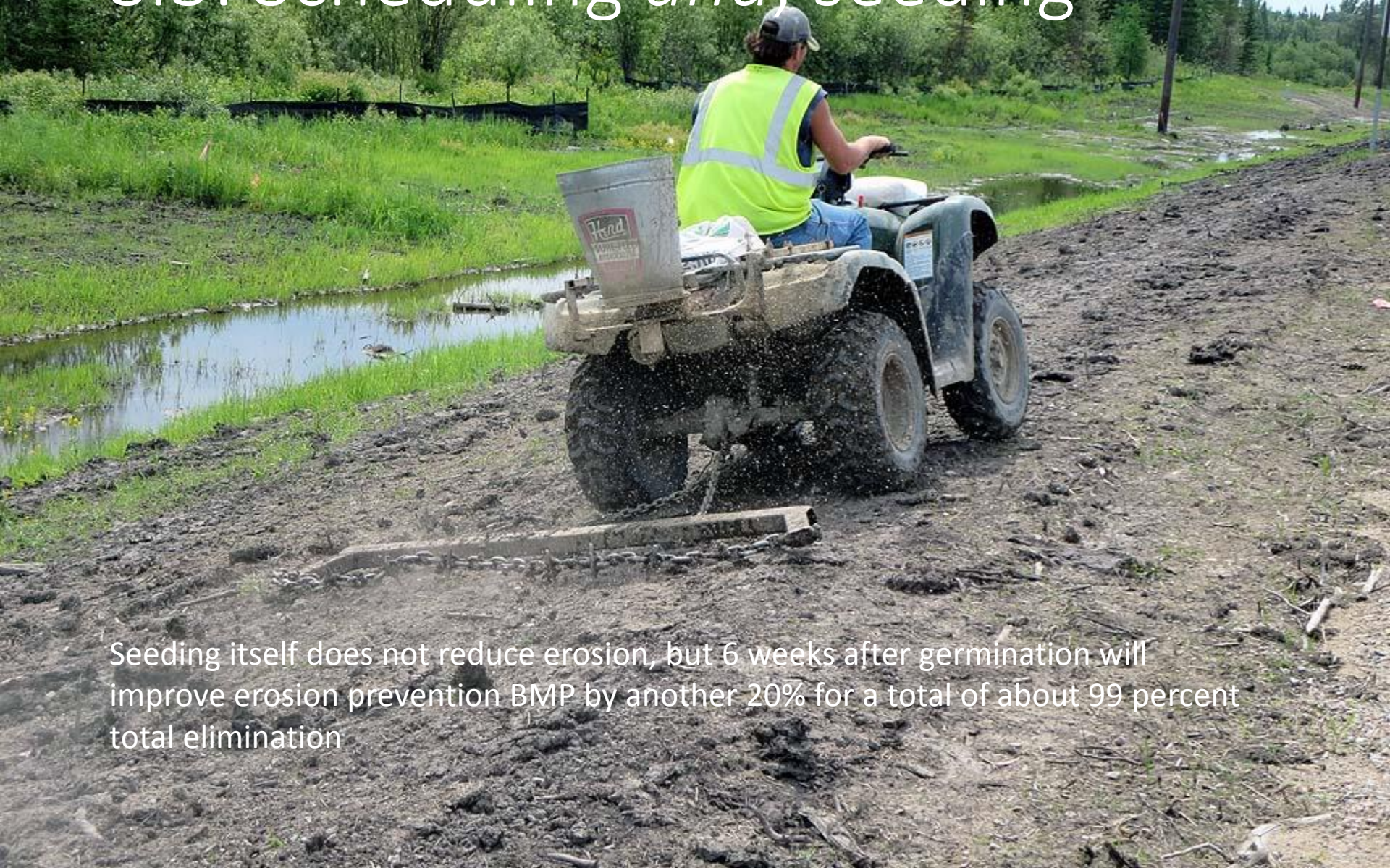
CAUTION
PULL UP
CABLE
BEFORE
OPERATING
MACHINE

**Table V.5
C Values and Slope – Length Limits (SL)
For Construction Sites***

Mulch

Type	Application in Tons/Acre	Slope Percent	C	SL
No mulch or seeding		All	1.00	
Straw or hay mulch disc anchored on slope	1.0	< 5	0.20	200
	1.0	6 – 10	0.20	100
	1.5	< 5	0.12	300
	1.5	6 – 10	0.12	150
	2.0	< 5	0.06	325
	2.0	6 – 10	0.06	200
	2.0	11 – 15	0.07	150
	2.0	16 – 20	0.11	100
	2.0	21 – 25	0.14	75
	2.0	26 – 35	0.20	75
Erosion Control Blanket	N/A	21 – 25	0.05	300
		26 – 35	0.07	200
		36 – 50	0.14	150
		51 – 67	0.20	100
Wood Chips	6.7	< 15	0.08	75
	6.7	16 – 20	0.08	50
	12.1	< 15	0.05	150
	12.1	16 – 20	0.05	75
	25.0	< 15	0.02	200
	25.0	16 – 20	0.02	150
	25.0	21 – 33	0.02	100

SI3: Scheduling *and*, seeding



Seeding itself does not reduce erosion, but 6 weeks after germination will improve erosion prevention BMP by another 20% for a total of about 99 percent total elimination

SI4: Scheduling *and*, doing soil prep, seeding, and cover



SI5: Finalizing arrangements

- Scheduling the work of SI1, SI2, SI3
 - Phone call documentation
 - Email documentation
 - Personal discussion notes



NPDES describes maximum exposures of soil; SWPPP must list project specific timeframes

STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

PROJECT DESCRIPTION/LOCATION

THE ST. CROIX RIVER CROSSING PROJECT WILL CREATE A NEW RIVER CROSSING OVER THE ST. CROIX RIVER BETWEEN STILLWATER, MINNESOTA AND HOULTON, WISCONSIN, ALONG WITH NEW ROADWAYS ON BOTH SIDES OF THE BRIDGE. THE ST. CROIX RIVER IS A NATIONAL WILD AND SCENIC RIVER WITH INVALUABLE SCENIC, RECREATIONAL, AND GEOLOGIC VALUE.

THE OVERALL PROJECT IS COMPRISED OF SEVERAL SMALLER PROJECTS, INCLUDING RECONSTRUCTION IN MINNESOTA OF TH 36 FROM THE OAKGREEN/GREELEY INTERSECTION THROUGH THE NEW INTERSECTION AT TH 95 AND CONSTRUCTION OF TH 64 IN WISCONSIN BETWEEN THE RIVER AND THE 150TH OVERPASS IN THE TOWN OF ST. JOSEPH.

THIS SWPPP ADDRESSES THE EARLY FOUNDATION CONSTRUCTION OF 5 PIERS IN THE WATER.

PROJECT SCHEDULE

ESTIMATED CONSTRUCTION START DATE: APRIL 2013

ESTIMATED CONSTRUCTION END DATE: JULY 2014

SPECIAL AND IMPAIRED WATERS

LAKE ST. CROIX IS AN IMPAIRED WATER FOR TURBIDITY. THE ENTIRE REACH OF THE ST. CROIX RIVER, A NATIONAL WILD AND SCENIC RIVER, IS CLASSIFIED AS A SPECIAL WATER IN APPENDIX A OF THE 2008 NPDES CONSTRUCTION STORMWATER PERMIT ADMINISTERED BY THE MINNESOTA POLLUTION CONTROL AGENCY (MPCA). DUE TO THE PROJECT'S PROXIMITY TO THIS SPECIAL WATER, ADDITIONAL BEST MANAGEMENT PRACTICES (BMPs) UNDER PARTS C.1, C.2 AND C.3 IN APPENDIX A OF THE PERMIT ARE REQUIRED.

ENVIRONMENTALLY SENSITIVE AREAS

IN ADDITION TO THE ST. CROIX RIVER, THE CONTRACTOR SHALL BE AWARE OF THESE ENVIRONMENTALLY SENSITIVE AREAS: WETLANDS, MUSSELS, AND OSPREY NEST. THE MUSSELS AND OSPREY NEST WILL BE RELOCATED BEFORE THE START OF CONSTRUCTION.

9. ALL EXPOSED SOIL AREAS MUST BE TEMPORARILY OR PERMANENTLY STABILIZED NO MORE THAN 7 DAYS AFTER CONSTRUCTION ACTIVITY ON THAT PORTION OF THE SITE THAT HAS TEMPORARILY OR PERMANENTLY CEASED. IN MANY INSTANCES, THIS WILL REQUIRE STABILIZATION TO OCCUR MORE THAN ONCE DURING ROUGH GRADING. RAPID STABILIZATION METHODS 1, 2, 3 OR 4 WILL BE USED TO PROVIDE TEMPORARY COVER, AS APPROPRIATE, IN THESE AREAS.
10. THE NORMAL WETTED PERIMETER OF ANY TEMPORARY OR PERMANENT DRAINAGE DITCH THAT DRAINS WATER FROM THE CONSTRUCTION SITE OR DIVERTS WATER AROUND THE CONSTRUCTION SITE MUST BE STABILIZED WITHIN 200 LINEAL FEET FROM THE PROPERTY EDGE OR POINT OF DISCHARGE TO ANY SURFACE WATER. STABILIZATION MUST OCCUR WITHIN 24 HOURS OF CONNECTION TO A SURFACE WATER, EXISTING GUTTER, STORM SEWER INLET, DRAINAGE DITCH, OR OTHER STORMWATER CONVEYANCE SYSTEM ACCORDING TO MN/DOT SPEC 1717.2A2. RAPID STABILIZATION METHOD 4 WILL BE USED TO STABILIZE THESE AREAS. THE REMAINDER OF THE DITCH MUST BE STABILIZED WITHIN 7 DAYS OF CONNECTING TO THE SURFACE WATER. PERMANENT EROSION CONTROL BLANKET OR RAPID STABILIZATION METHOD 4 WILL BE USED TO STABILIZE THESE AREAS. DISC ANCHORED MULCH AND HYDRAULIC SOIL STABILIZERS ARE NOT ALLOWED TO BE USED FOR PERMANENT DITCH STABILIZATION.
11. OUTLETS INTO SURFACE WATERS SHALL BE STABILIZED WITH ENERGY DISSIPATION WITHIN 24 HOURS OF BEING CONSTRUCTED.
12. ALL EXPOSED SOIL AREAS WILL BE STABILIZED PRIOR TO THE ONSET OF WINTER. ANY WORK STILL BEING PERFORMED WILL BE SNOW MULCHED, SEEDED, OR BLANKETED WITHIN THE TIME FRAMES IN THE NPDES CONSTRUCTION STORMWATER PERMIT.

Permanent EC, else Temporary.
Either work it, or stabilize it.

- 24 hours: Last 200 lf where water leaves the project area, 2 yr wetted perimeter flow
- 24 hours: fish, 200 ft back from waters
- 24 hours: culvert/pipe outfalls
- 7 days: special or impaired
- 14 days, not as above

Discharge conveyance stabilization BMP liners for urban projects

- Required 200 lf from point of discharge within 24 hours, over the life of the contract
 - Erosion prevention blanket
 - Wood fiber blanket, various widths of 4, 6.5, 8, and 16 feet
 - Rock aggregate liner
 - Geotextile
 - Plastic
 - Crushed bituminous liner
 - Concrete/bituminous gutter

Why TEP is important.

- Sediment controls will always fail without TEC
- TEC also fail
 - Storm event total rain, frequency, duration and intensity Exceed performance limits
 - ASHTO failure limits generally defined to mean 0.5 inch soil loss

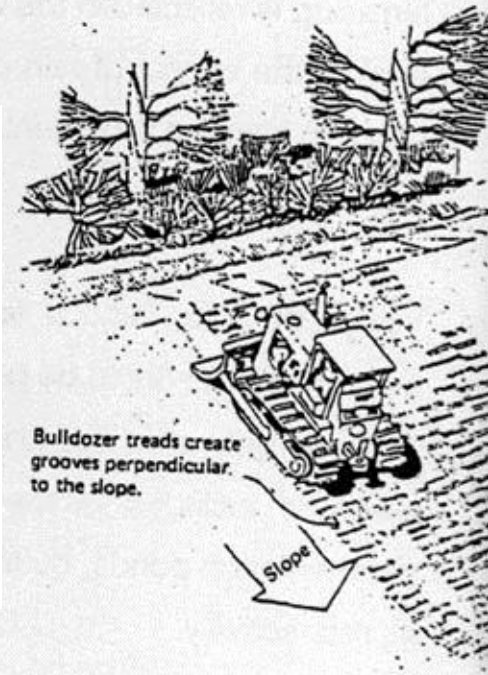
Temporary Traps

Erosion Control Practice

P

Surface Condition with No Cover

- All interim erosion prevention programs require a temporary insurance program of sediment controls for times of active works, while within permit exposed soils timeframes during active construction activities. **Schedule Traps.**



Structures

Small sediment basins	
0.09 ha basin/ha	0.50
0.13 ha basin/ha	0.30
Downstream sediment basin	
With chemical flocculants	0.10
Without chemical flocculants	0.20
Erosion control structures	
Normal rate usage	0.50
High rate usage	0.40
Strip building	0.75

Soil Dimpling (micro-trap mulch pockets)

















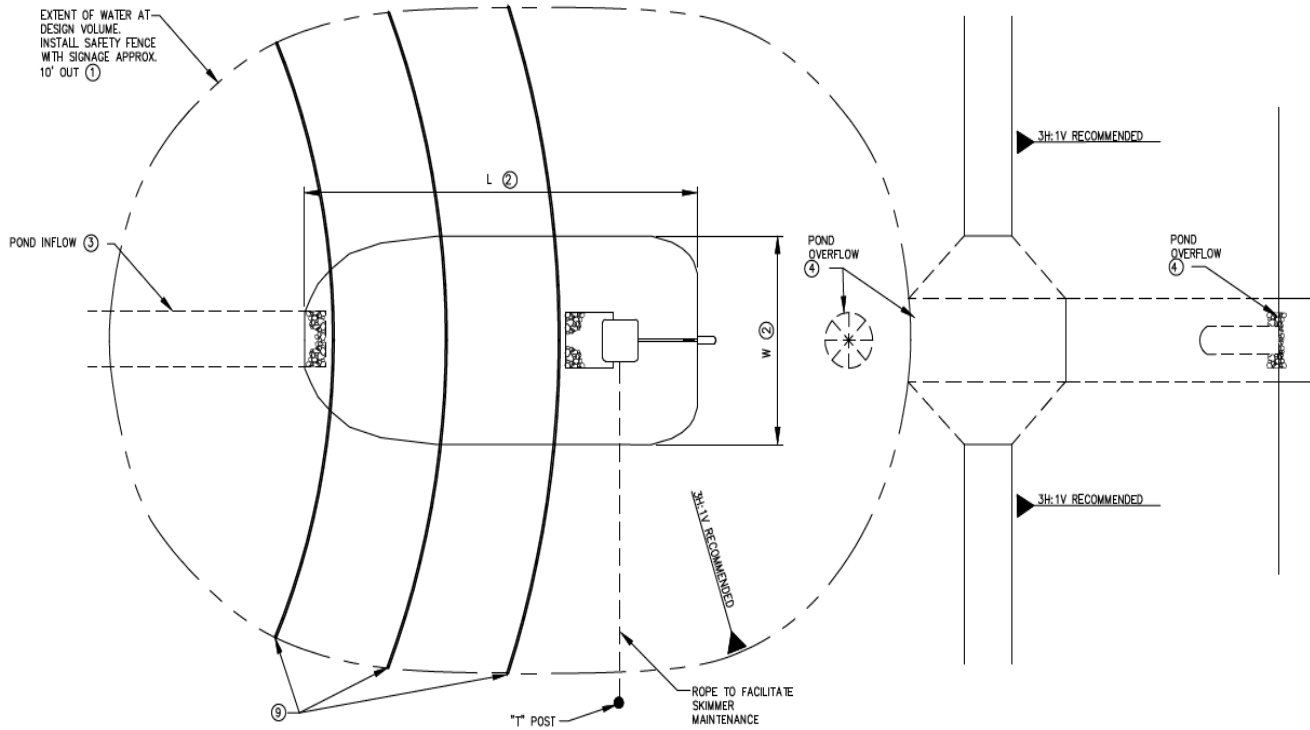


Chemical Treatment Ditch

- Wood fiber, or coir blanket/net
- Sprinkle 3.5 oz. of PAM 705 on the top, lower portion of matting section
- Re-apply after a 0.5" rain event, if needed.



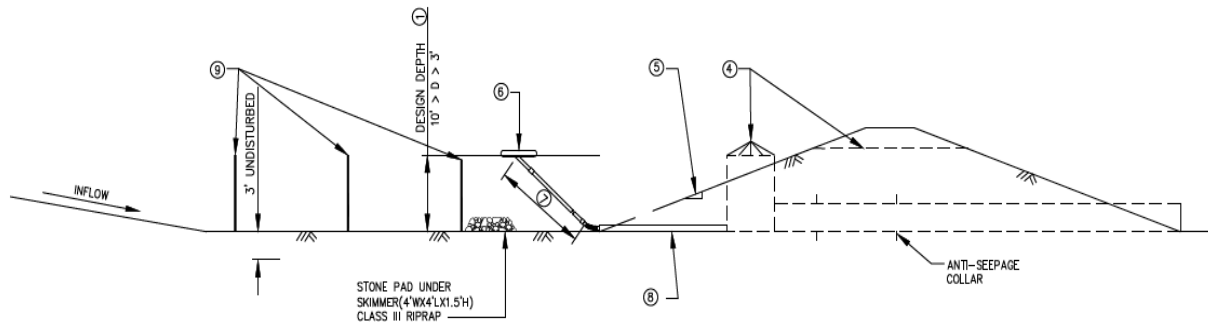




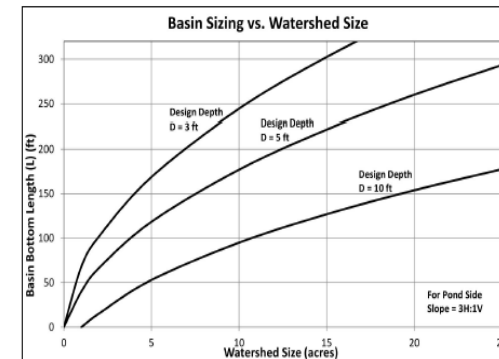
NOTES:

- ① DESIGN POND VOLUME AT THE DESIGN DEPTH (D) TO HOLD 2.5-INCHES OF WATER OVER THE INFLOW DRAINAGE AREA (SEE POND SIZING CHART BELOW). INSTALL SAFETY FENCE AROUND OUTER EXTENT AND WARNING SIGNS AT ALL FOUR SIDES STATING DROWNING HAZARD .
- ② POND WIDTH (W) SHALL BE APPROXIMATELY HALF THE LENGTH (L).
- ③ POND INFLOW MUST BE CONVEYED TO PREVENT EROSION.
- ④ POND OVERFLOW MUST BE PROPERLY DESIGNED TO CONVEY STORM WATER IN EXCESS OF THE POND VOLUME TO THE RECEIVING WATERWAY WITHOUT CAUSING EROSION. THIS MAY INCLUDE A RISER PIPE DROP STRUCTURE WITH PIPE THROUGH THE EMBANKMENT WITH SEEPAGE COLLARS AND/OR A POND OVERFLOW SPILLWAY.
- ⑤ POND SIDE SLOPES SHALL BE LINED TO PREVENT EROSION.
- ⑥ THE POND SKIMMER DEVICE SHALL BE DESIGNED TO SKIM WATER FROM WITHIN 6-INCHES OF THE POND SURFACE AND DRAIN THE DESIGN POND VOLUME OVER A PERIOD OF 72 HOURS WITH A CONSTANT FLOW RATE. SEE SPECIAL PROVISIONS FOR MATERIALS. INSTALL QL ABSORBENT BOOM AROUND EXTRE PERIMETER OF SKIMMER.
- ⑦ THE ARM PIPE TO THE SKIMMER SHALL HAVE A LENGTH OF 1.4 TIMES THE DESIGN POND DEPTH (A MINIMUM OF 6 FEET) OR AS RECOMMENDED BY MANUFACTURE.
- ⑧ THE BOTTOM OF THE ARM PIPE SHALL BE ATTACHED TO THE RISER STRUCTURE OR DIRECTLY TO A PIPE THROUGH THE EMBANKMENT TO CONVEY SKIMMER WATER DOWNSTREAM. SEE SHEET XX FOR CONNECTION EXAMPLES.
- ⑨ INSTALL THREE POND FIBER BAFFLES IN THE POND FROM THE INFLOW TO THE SKIMMER DEVICE WITH A SPACING OF ONE QUARTER THE BASIN LENGTH (L). TWO POND FIBER BAFFLES MAY BE INSTALLED IN PONDS LESS THAN 20- FEET IN LENGTH WITH A SPACING OF ONE THIRD THE BASIN LENGTH. SEE POND BAFFLE DETAIL.
- ⑩ ~~XXXXXXXXXX~~

CONSTRUCTION STORM WATER POND – PLAN



CONSTRUCTION STORM WATER POND – SECTION



POND SIZING CHART

STANDARD SHEET NO. XXX	TITLE: XXX
STANDARD APPROVED: XXX	XXX
STATE PROJ. NO.	(TH) SHEET NO. OF SHEETS





Table V.3 Magnitude of Soil Erodibility Factor, K ^a

Effects of Soil (USLE)

Technical Class	K for Organic Matter Content (%)		
	0.5	2	4
Sand	0.05	0.03	0.02
Fine sand	0.16	0.14	0.10
Very fine sand	0.42	0.36	0.28
Loamy sand	0.12	0.10	0.16
Loamy fine sand	0.24	0.28	0.18
Loamy very fine sand	0.44	0.38	0.30
Sandy loam	0.27	0.24	0.19
Fine sandy loam	0.35	0.30	0.24
Very fine sandy loam	0.47	0.41	0.35
Loam	0.38	0.34	0.29
Silt loam	0.48	0.42	0.33
Silt	0.60	0.52	0.42
Sandy clay loam	0.27	0.25	0.21
Clay loam	0.28	0.25	0.21
Silty clay loam	0.37	0.32	0.26
Sandy clay	0.14	0.13	0.12
Silty clay	0.25	0.23	0.19
Clay	0.13 - 0.2		

- Higher numbers will require higher degree of BMPs

^aAdapted from Stewart et al. (1975). The values shown are estimated average of broad ranges of specific soil values. When a texture is near the border line of two texture classes, use the average of the two K values.

#17
109.3 lb/cf
8.2%
min + 1d

Proctor #16
109.7 lb/cf
8.2%
Peabody

Proctor #15
114.8 lb/cf
12.3%
min + 1d

Proctor #13
121.2 lb/cf
11.2%
EX. T.H. 95

Proctor #12
127.9 lb/cf
11.8%
Peabody

Proctor #28
112.8 lb/cf
12.1%
3rd test
EX. T.H. 95

Proctor #27
125.2 lb/cf
12.1%
suitable
EX. T.H. 95

Proctor #20
130.5 lb/cf
7.5%
EX. T.H. 95

Proctor #25
119.2 lb/cf
13.6%
EX. T.H. 95



Stockpiles have slopes!







Genie S-85 SOUTH METRO RENTAL

K	I	M	M	E	S		
3	9	2	-	1	9	8	9

Soil Type Matters

- Wind erosion: hydrocrete, Airtrol, tackifiers, wood fibers









Why soil knowledge matters

- Soil physical properties
 - Low, medium, high cohesion
 - Straw fibers on sand
 - Wood fibers on everything else
- Length of slope matters
 - Max for straw/hay mulches: 325 ft
 - Max for blanket: 300 ft
 - Max for FRM: 300 ft
- Slope Steepness matters
 - Max for straw/hay: 1:3
 - Max for blanket: 1:1
 - Max for FRM: 1:1

SWPPP must indicate (steep) slopes 1:3 and greater!

“Steep Slopes” means slopes that are 1:3 (V:H) (33.3 percent) or steeper in grade





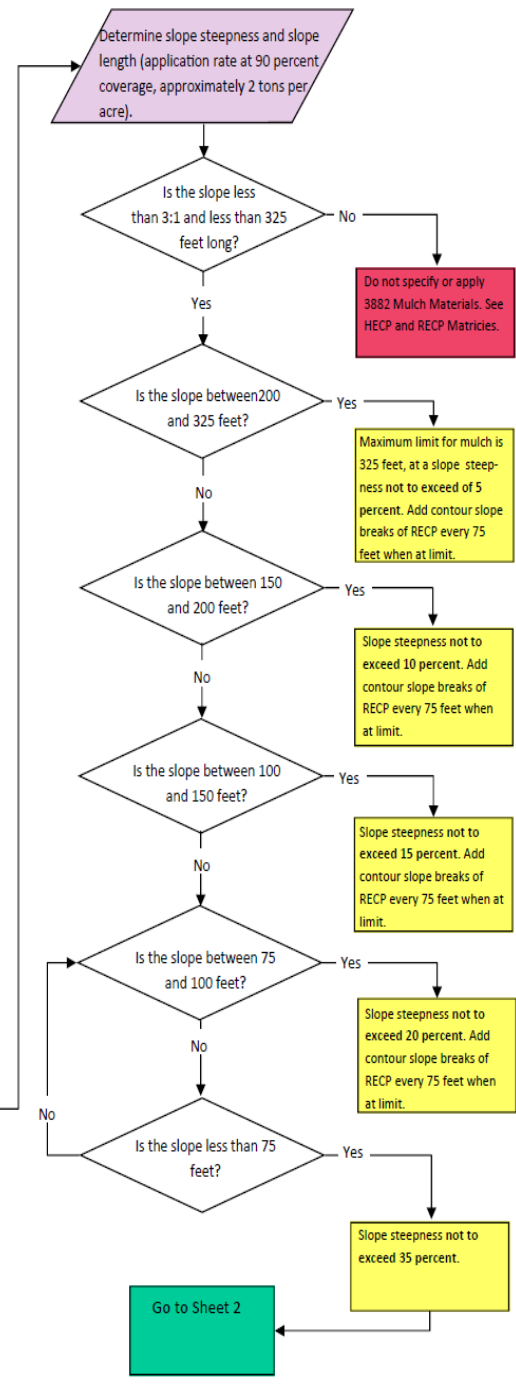
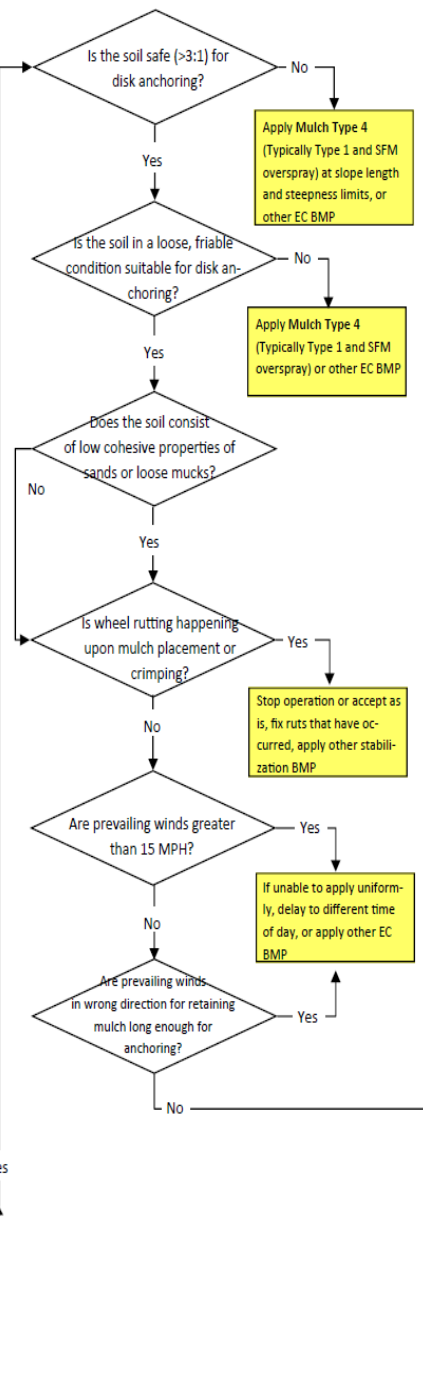
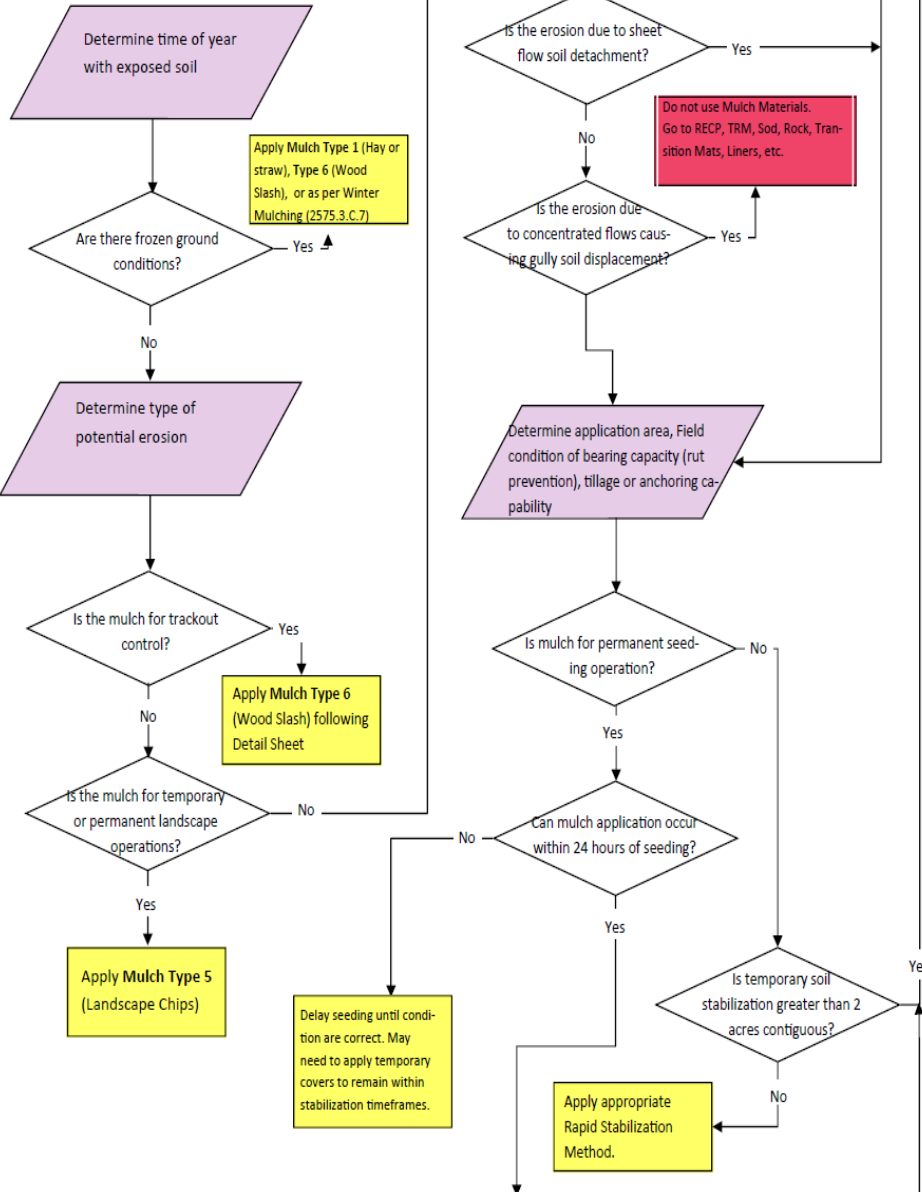
BMP Types (Tools) of TEP

Mulch Materials	Hydraulic Erosion Control Products	Rolled Erosion Control Products	Covers	Retention of Vegetation
<ul style="list-style-type: none"> • Type 1 (straw/hay) • Type 3 (Cert WF Straw)) • Type 4 (Straw + SFM) • Type 5 (wood slash) • Type 7 (prairie harvest) • Type 8 (prairie hay) 	<ul style="list-style-type: none"> • Natural tackifier • Synthetic tackifier • PAM • Compost Matrix • Hydraulic Mulch • SFM • BFM • FRM 	<ul style="list-style-type: none"> • Category 00 • Category 0 • Category 3A& B • Category 4A & B • Category 6 • TRMs 	<ul style="list-style-type: none"> • Plastic • Geotextiles • Riprap • Aggregates 	<ul style="list-style-type: none"> • Staged removals • Green space preservation • Buffers

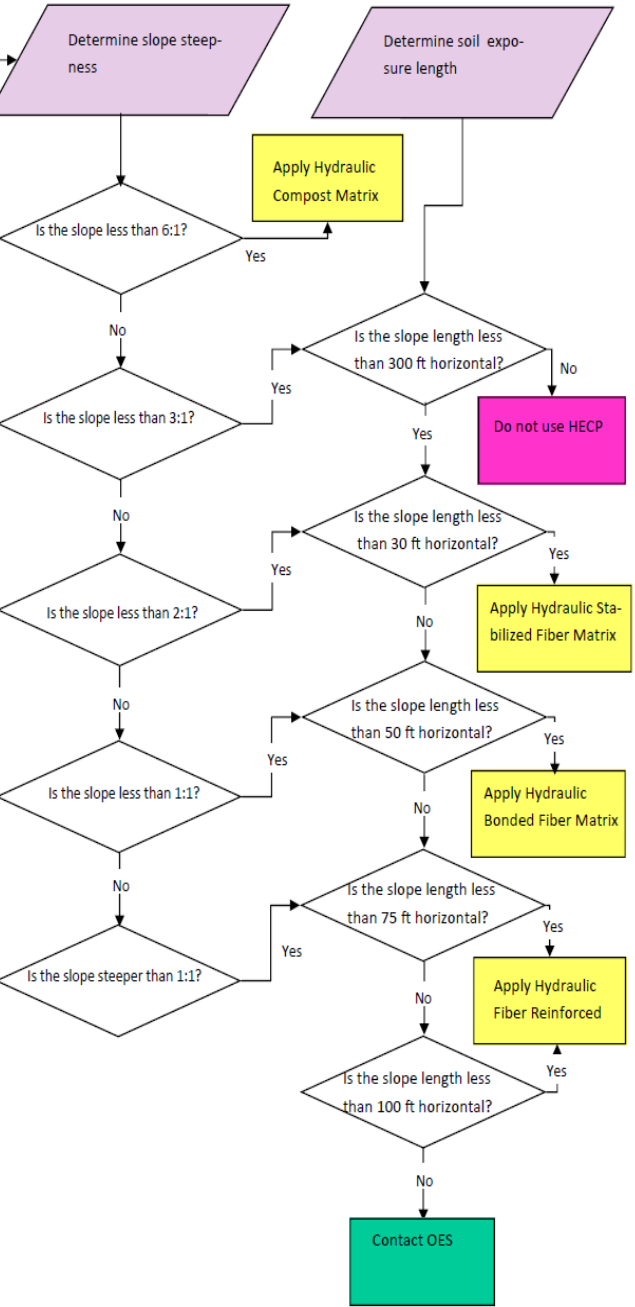
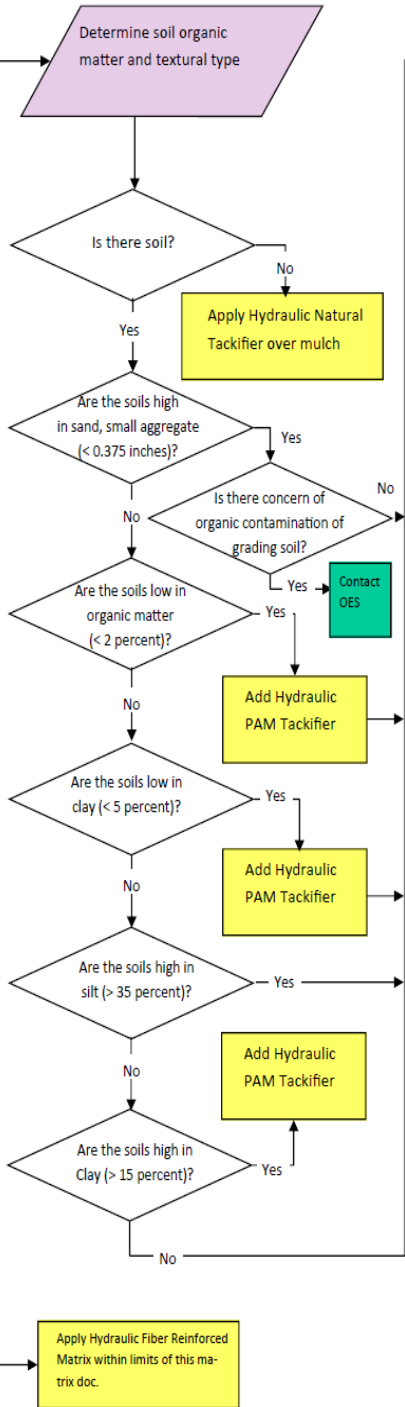
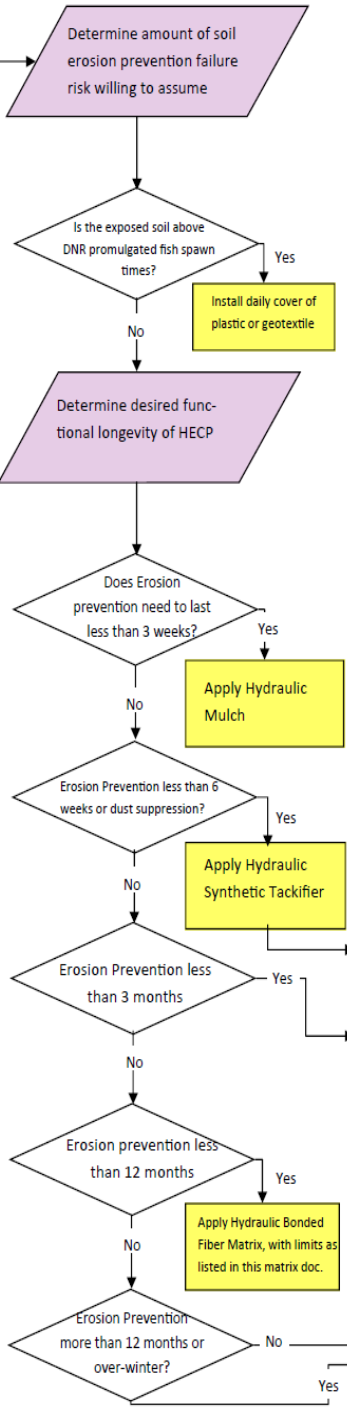
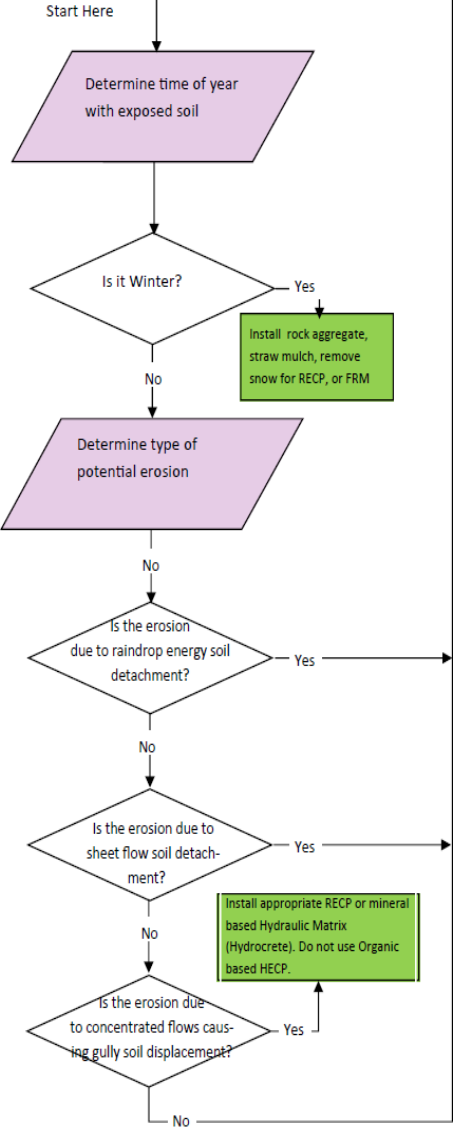
Temporary Exposed Soil Stabilization:

3882 Mulch Materials
Flow Chart Decision Matrix
Sheet 1.

2014slsV1

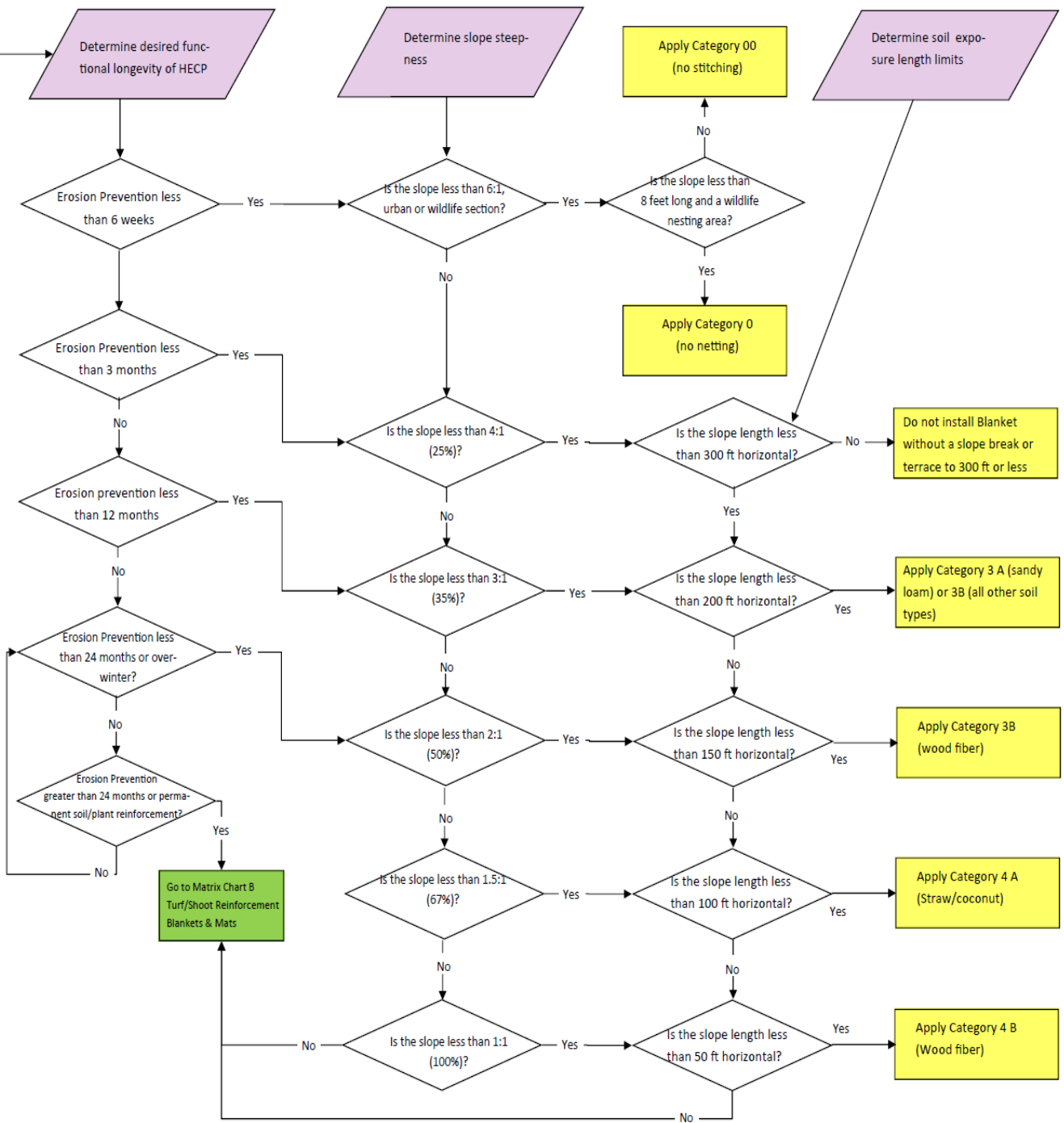
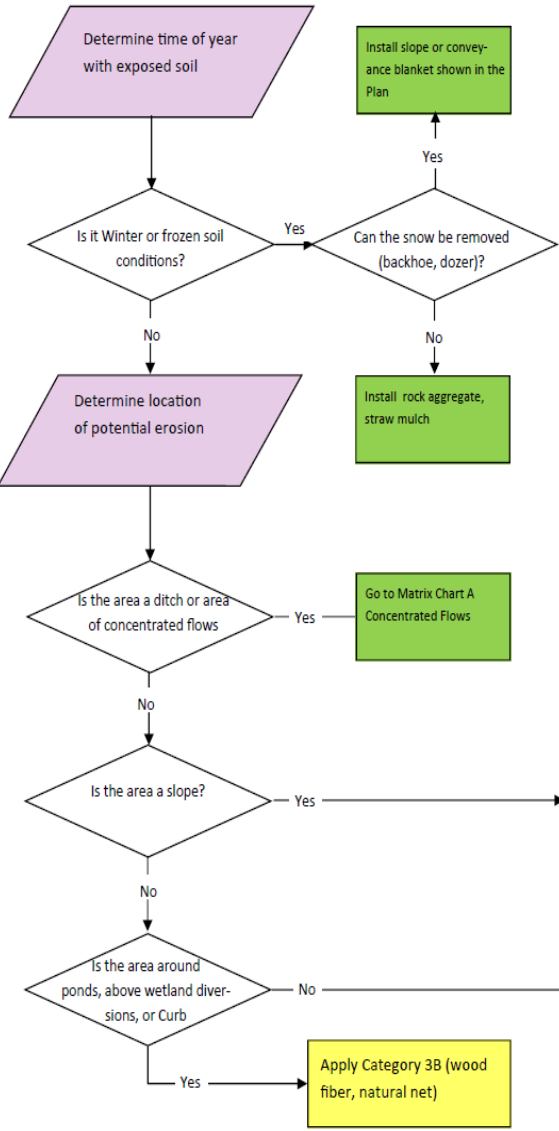


Temporary Exposed Soil Stabilization:
Hydraulic Erosion Control Products
 Flow Chart Decision Matrix



**Temporary Exposed Soil Stabilization:
Rolled Erosion Control Products**
Flow Chart Decision Matrix

Start Here 2015disV1



Three focus locations of TEP

Focus Area

- Temporary –Rapid
- Temporary – Routine
- Temporary - Permanent

Estimating Quantities

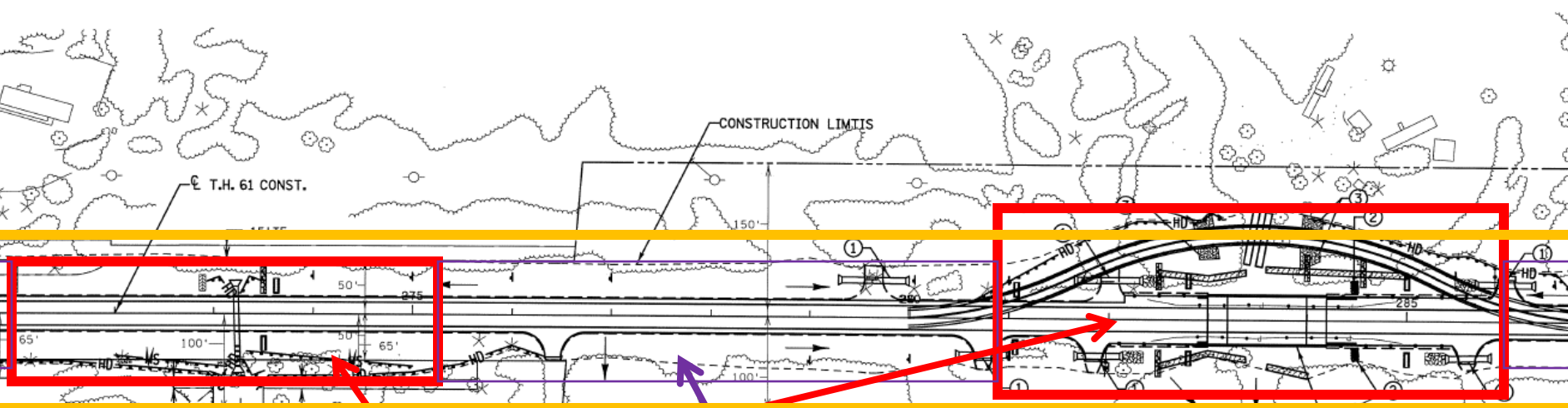
- 5 x per month/stage
 - Straw, HECP
 - RECP (Ditches, abutments, culverts, pond rings)
- 5 x per year
 - Straw, RECP, HECP
- 1x per project

Temporary Systems

- **Temporary –Rapid**: hydromulch, blanket, plastic geotextile, riprap, aggregates
- **Temporary –Routine**: straw, hydromulch, blanket
- **Temporary –Permanent**: seed, fertilizer, mulch, hydromulch, blanket, riprap

Temporary Types of Erosion control

STA. 273+23
 PL. 30" X 76' RC PIPE CULVERT DES 3006 +2 - 30" RC PIPE APRONS WITH SAFETY GRATE AT INLET
 PL. 5 TYPE 1 DISSIPATOR RINGS SPACED 5' CENTER TO CENTER FROM OUTLET APRON
 PL. RANDOM RIPRAP CLASS III ON GEOTEXTILE FILTER TYPE IV AT OUTLET



Temporary-Rapid
Temporary-Routine
Temporary-Permanent

- HD— HEAVY DUTY SILT FENCE
- PERMANENT DITCH CHECK TYPE 7 ROCK CHECK
- WS— MACHINE-SLICED SILT FENCE
- FLOW DIRECTION
- EROSION STABILIZATION MAT CLASS 2
- FILTER LOG TYPE COMPOST LOG
- ▣ DITCH BLOCK
- ENTRANCE PIPE RANDOM RIPRAP ①
- CENTERLINE PIPE CULVERT RANDOM RIPRAP
- ▭ PRECAST CONC. HEADWALL

- ① FOR ENTRANCE PIPE SIZE AND LENGTH, SEE ENTRANCE - CULVERTS CHART.
- ② PL. GROUTED RIP RAP FLUME. SEE CONSTRUCTION DETAIL FOR ADDITIONAL INFORMATION.
- ③ PLACE RANDOM RIPRAP. SEE RANDOM RIPRAP CHART FOR RIPRAP SIZE AND QUANTITIES.

I HEREBY CERTIFY THAT THIS PLAN SHEET WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.
 DATE 20-APR-2013, L.S. NO. 20407 ENGINEER



TEP part of a sediment control staging plan

1

2

3

4



Temporary-Rapid, site specific

- Straw mulch, crimp anchored
- Straw mulch hydromulch anchored
- Hydromulch, seed, fertilizer
- Blanket
- Rock mulch
- Plastic/Geotextile



Rapid installation – last 200 LF

- Material specific
 - RECP
 - TRMs, plastic, geotextiles
 - Rock
 - Concrete mats
 - Other transition mats









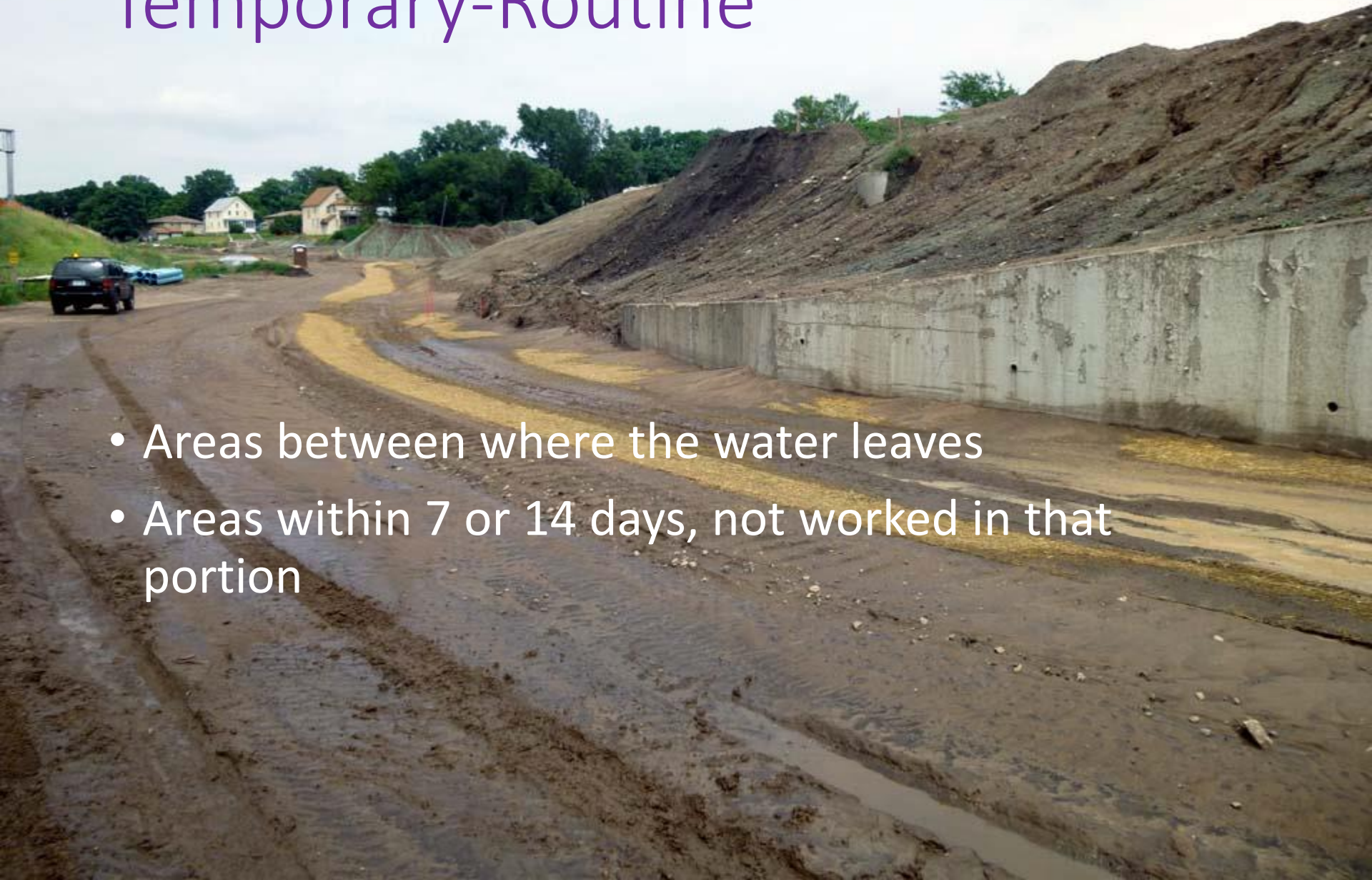






Temporary-Routine

- Areas between where the water leaves
- Areas within 7 or 14 days, not worked in that portion





TRUCK RESTRICTION
TRUCKS OVER 3600 LBS GVW
PROHIBITED BETWEEN
4 & 5

How to install
Erosion Control Matting







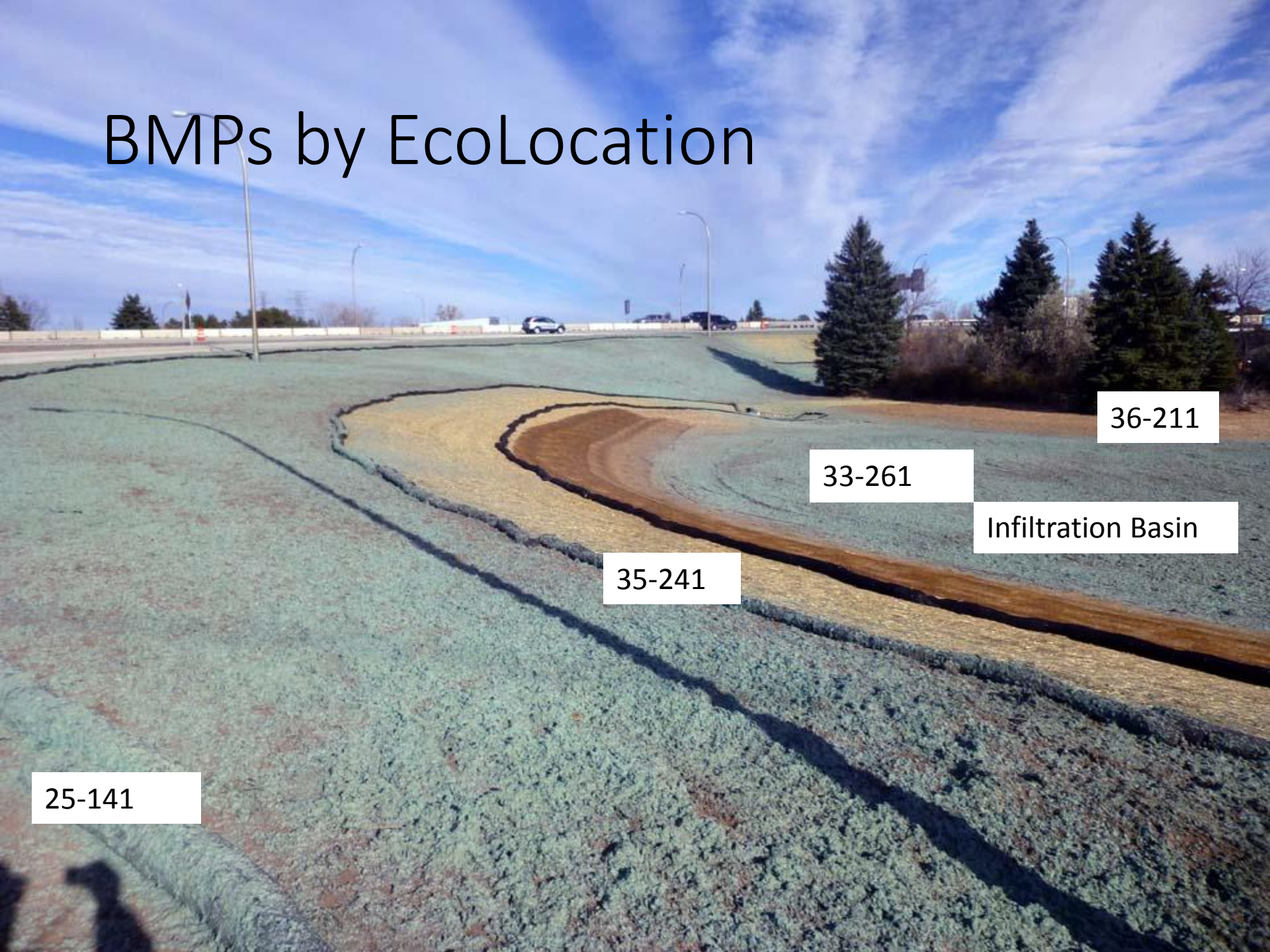
Temporary-Permanent

- No more land disturbing actions
- Final vegetative restoration





BMPs by EcoLocation



25-141

35-241

33-261

36-211

Infiltration Basin

Methods of Payment

- Wishful thinking
- Magic
- Incidental
- Lump sum
- Unit item
- Unit price absent of pay item
- Force account (time and materials)
- Supplemental agreement

Engineer's (Rough) Estimates

Per acre, installed

- RSM 1: \$800
- RSM 2: \$1,200
- RSM 3: \$3,600
- RSM 4: \$12,000
- RSM 5
- Rapid Seed Mixture: \$350
- Rapid Plastic: \$5,000
- Rapid Geotextile: \$25,000
- Rapid Topsoil: \$2,000

Per acre, installed

- Cat 3 Blanket: \$7,260
- Cat 4 RECP: \$10,890
- HM (30% Cat3): \$2,900
- BFM: (80% Cat3): \$6,500
- FRM (90% Cat3): \$9,000
- Type 1 straw: \$400
- Type 3 Cert WF: \$1,200
- Type 5 Wood Slash: \$2,500
- Compost blanket: \$11,000

ESTIMATED QUANTITIES

TAB. LETTER	ITEM NUMBER	ITEM	NOTE NO.	UNIT	TOTAL ESTIMATED QUANTITY	87% FEDERAL 13% STATE	WEST VADNAIS AREA (A)	TWIN LAKE AREA (B)	EDGERTON AREA (C)	LABORE AREA (D)
N	2573.512	TEMPORARY DITCH CHECK TYPE 3		LIN FT	13283	13283				
N	2573.513	TEMPORARY DITCH CHECK TYPE 7		CU YD	398	398				
N	2573.520	SEDIMENT REMOVAL BACKHOE		HOURL	44	44				
N	2573.530	INLET PROTECTION TYPE D	(2)	EACH	50	50				
	2573.601	EROSION CONTROL SUPERVISOR		LUMP SUM	1	1				
N	2573.602	INLET PROTECTION	(1)	EACH	406	406				
N	2573.603	ROCK LOG	(3)	LIN FT	808	808				
N	2573.604	RAPID STABILIZATION METHOD 4		SQ YD	19545	19545				
N	2573.605	RAPID STABILIZATION METHOD 1		ACRE	14	14				
N	2573.605	RAPID STABILIZATION METHOD 2		ACRE	1	1				
N	2573.609	RAPID STABILIZATION METHOD 5		TON	64	64				
N	2573.623	RAPID STABILIZATION METHOD 3		M GALLONS	3	3				
N, O	2575.501	SEEDING		ACRE	266	266				
N, O	2575.511	MULCH MATERIAL TYPE 1		TON	494	494				
N, O	2575.513	MULCH MATERIAL TYPE 9		CU YD	172	172				
N, O	2575.519	DISK ANCHORING		ACRE	248	248				
O	2575.523	EROSION CONTROL BLANKETS CATEGORY 1	(4)	SQ YD	2998	2998				
N, O	2575.523	EROSION CONTROL BLANKETS CATEGORY 3	(4)	SQ YD	38365	38365				
N, O	2575.523	EROSION CONTROL BLANKETS CATEGORY 4	(4)	SQ YD	34379	34379				
N	2575.532	COMMERCIAL FERT ANALYSIS 10-10-20		POUND	16876	16876				
O	2575.532	COMMERCIAL FERT ANALYSIS 22-5-10		POUND	62265	62265				
	2575.541	MOWING	(5)	ACRE	15	15				
	2575.545	WEED SPRAYING	(5)	ACRE	45	45				
N	2575.608	SEED MIXTURE 150		POUND	3370	3370				
O	2575.608	SEED MIXTURE 250		POUND	9940	9940				
O	2575.608	SEED MIXTURE 260		POUND	2412	2412				
O	2575.608	SEED MIXTURE 310		POUND	341	341				
O	2575.608	SEED MIXTURE 350		POUND	889	889				
O	2575.608	HYDRAULIC SOIL STABILIZER TYPE 1		POUND	4696	4696				
N	2575.608	HYDRAULIC SOIL STABILIZER TYPE 6		POUND	5575	5575				
T	2581.501	REMOVABLE PREFORMED PLASTIC MARKING		LIN FT	50939	50939				
T	2581.603	REMOVABLE PREFORMED PLASTIC MASK (BLACK)	(6)	LIN FT	2600	2600				

COST PARTICIPATION:

- (A) 100% RAMSEY COUNTY S.A.
- (B) 81.6% FEDERAL, 12.2% STATE LOCAL FUNDS.
- (C) 74.4% FEDERAL, 11.1% STATE 3.6% CITY OF LITTLE CANADA LITTLE CANADA LOCAL FUNDS
- (D) 45.8% FEDERAL, 6.9% STATE 30.8% CITY OF LITTLE CANADA LITTLE CANADA LOCAL FUNDS

INDEX

TAB. LETTER	SHEET NO.	
N	44-48	TEMPORARY
O	49	PERMANENT
T	311	TRAFFIC CONTROL

NOTES:

- (1) SEE SHEETS 1211, 1212, AND 1214 FOR DETAILS OF SUGGESTED TYPES AND SHEETS 1224 THRU 1385 FOR PLANS OF SUGGESTED TYPES. PAYMENT FOR INLET PROTECTION BY THE EACH SHALL INCLUDE ALL DEVICES NECESSARY TO PROTECT THE STRUCTURE FOR THE LIFE OF THE PROJECT. EACH STRUCTURE PROTECTED SHALL BE PAID FOR ONLY ONCE, WITH NO SEPARATE PAYMENT MADE FOR MULTIPLE INSTALLATIONS REQUIRED ON THE SAME STRUCTURE.
- (2) SEE SHEET NO. 1213 FOR DETAIL.
- (3) SEE SHEET NO. 1217 FOR DETAIL.
- (4) INCLUDES MAINTENANCE.
- (5) SEE SPECIAL PROVISIONS.
- (6) TO BE USED AS DIRECTED BY THE ENGINEER.

TEMPORARY EROSION CONTROL AND TURF ESTABLISHMENT N

PLAN SHEET STATION RANGE	RANDOM RIPRAP CL I (1)	RANDOM RIPRAP CL II (2)	CONC. MED. BARR. DES. 8337 (3)	BALE CHECK (4)	SILT FENCE TYPE MACH. SLICED (5)	FLOT. SILT CURT. STILL WATER	SED. TRAP EXCAV.	TEMP. PIPE DOWN DRAIN (6)	TEMP. DITCH CHECK TYPE 3	TEMP. DITCH CHECK TYPE 7	SED. REM. BACK HOE (7)	INLET PROT. TYPE D (10)	ROCK LOG (13)	RAPID STAB. METHOD 1	RAPID STAB. METHOD 2	RAPID STAB. METHOD 3	RAPID STAB. METHOD 4	RAPID STAB. METHOD 5	SEEDING	SEED MIX 150 (15)	MULCH MAT. TYPE 1 (16)	MULCH MAT. TYPE 9 (17)	DISK ANCHOR	EROSION CONT. BLANKET CAT. 3 (18)	EROSION CONT. BLANKET CAT. 4 (19)	COMM. FERT. ANALYSIS 10-10-20 (20)	HYD. SOIL STABIL. TYPE 6 (21)	
	CU YD	CU YD	LIN FT	EACH	LIN FT	LIN FT	CU YD	LIN FT	LIN FT	CU YD	CU YD	HOOR	EACH	EACH	LIN FT	ACRE	ACRE	M GAL	SQ YD	TON	ACRE	POUND	TON	CU YD	ACRE	SQ YD	SQ YD	POUND
STAGE 1 PHASE 1																												
SB35E STA. 861+50 TO STA. 876+50	0.8	0.9					5.3		187	6.1	0.1	6										0.9						
SB35E STA. 876+50 TO STA. 891+50					873				136	4.4	2.9	1		20	0.6	0.2										163		
SB35E STA. 891+50 TO NB35E STA. 804+50					487	42														1.0	0.4	14	0.6	0.3	202		70	
NB35E STA. 804+50 TO STA. 817+50																												
NB35E STA. 830+50 TO STA. 843+50		1.4	50		50			28	16	4.4	0.2	6	1							2.5	100	4.9		2.4	253		500	
NB35E STA. 843+50 TO STA. 856+50	2.0				552			20.1	277	9.6	1.9	8	1	36						4.9	194	8.1		4.0	2341	145	971	800
NB35E STA. 856+50 TO STA. 869+50	2.4	0.4						15.9	363	10.4	0.1	15	1	20						3.5	140	6.7	0.3	3.3	731		698	
NB35E STA. 869+50 TO STA. 882+50	1.4	29.2						21.3	140		0.1	12	3							3.0	120	5.9	7.3	3.0	226		603	
NB35E STA. 882+50 TO STA. 895+50					837				96	4.4	2.8	6	1		0.4	0.2				2.2	86	4.0	6.2	2.0	703		432	
NB35E STA. 895+50 TO STA. 908+50					710				99	283	4.4	2.4	3	1	32					2.6	105	4.6		2.3	1478		522	
NB35E STA. 908+50 TO STA. 921+50									122	176	5.2			1	16					0.9	37	1.6		0.8	549		178	
NB35E STA. 921+50 TO STA. 936+50										280					20					1.2	49	2.5		1.2			245	
NB35E STA. 936+50 TO STA. 951+50																				0.3	10	0.5		0.3			51	
NB35E STA. 951+50 TO STA. 971+50			45		45				13		0.2	2	4							0.7	28	1.1		0.6	473		133	
EB694 STA. 986+49 TO STA. 993+50																				0.2	10	0.5		0.2			49	
EB694 STA. 993+50 TO STA. 1006+50	1.4	3.1					21.3				0.2					1	95	0.6	0.6	25	1.2	2.1	0.5				123	
EB694 STA. 1006+50 TO STA. 1019+50					305															0.4	14	0.7		0.4			73	
EB694 STA. 1019+50 TO STA. 1032+50		1.4		43	791			27	200	4.4	3.1	3				0.2				2.2	86	3.8		1.9	871	201	436	276
094CON35 STA. 325+50 TO STA. 339+50	3.2	88.1	85		85		21.2		86		0.4				1.1					3.5	139	6.1	23.8	3.0	2180		897	
EB694 STA. 1099+22 TO STA. 1111+50			54		54						0.2									1								
JIGGS POND AND DRYWALL POND		10.7											1															
STAGE 1 PHASE 2																												
SB35E STA. 891+50 TO NB35E STA. 804+50						40			16	10.4		3			0.1				578									
NB35E STA. 804+50 TO STA. 817+50									78	3.9		9								2.0	0.2	8	0.4		0.2			39
NB35E STA. 817+50 TO STA. 830+50									91			12									0.3	10	0.5		0.3			51
NB35E STA. 830+50 TO STA. 843+50												2									0.7	27	1.3		0.7			135
NB35E STA. 843+50 TO STA. 856+50									48	4.4		2									2.3	91	4.6		2.3			456
NB35E STA. 856+50 TO STA. 869+50									80				1								0.6	24	1.2		0.6			118
NB35E STA. 869+50 TO STA. 882+50									220	15.6		9	2			0.3				400	0.1	5	0.3		0.1			27
NB35E STA. 882+50 TO STA. 895+50									40		0.3	4	1		1.2					973	0.1	4	0.1	11.9		320		20
NB35E STA. 895+50 TO STA. 908+50																												
NB35E STA. 908+50 TO STA. 921+50									5.3			9								112	0.1	3	0.1	1.6			14	
NB35E STA. 921+50 TO STA. 936+50									5.3			9								1412			1.5					
NB35E STA. 936+50 TO STA. 951+50	2.4	23.1	63		63		15.9		40			4	1		1.2						0.1	4	0.1	11.9		320		20
NB35E STA. 951+50 TO STA. 966+50																												
EB694 STA. 966+49 TO STA. 993+50																												
EB694 STA. 993+50 TO STA. 1006+50	0.8	2.3							5.3			9								112	0.1	3	0.1	1.6			14	
EB694 STA. 1006+50 TO STA. 1019+50	0.8	2.3							5.3			9								1412			1.5					
EB694 STA. 1019+50 TO STA. 1032+50									35	116	5.2	6		20							3.1	124	6.0		3.0	528		620
TABULATION 1 OF 5 TOTALS	15.2	188.6	297	43	4852	82	131.6	311	3122	103.2	16.6	147	24	164	4.0	0.8	3	9639	3.6	36.6	1453	67.3	59.9	33.5	11041	509	7261	1075

GENERAL NOTE:
- SEE SHEET NOS. 1224 THRU 1385 FOR TEMPORARY EROSION CONTROL AND TURF ESTABLISHMENT PLAN LOCATIONS.

- NOTES:**
- (1) TO BE USED AT THE DOWNSTREAM END OF SEDIMENT TRAPS. SEE DETAIL ON SHEET NO. 183.
 - (2) TO BE USED AT THE OUTLET FOR THE TEMPORARY PIPE DOWN DRAIN AND FOR ROCK WEEPER.
SEE DETAILS ON SHEETS 1218 AND 1219.
 - (3) TO BE USED FOR SILT FENCE TYPE SUPER DUTY. SEE DETAILS ON SHEETS 1215 AND 1216.
 - (4) SEE DETAIL ON SHEET NO. 1218.
 - (5) INCLUDES QUANTITIES FOR USE AS SILT FENCE TYPE SUPER DUTY. SEE DETAILS ON SHEETS 1215 AND 1216.
 - (6) TO BE USED AT BRIDGE ABUTMENT CORNERS. SEE DETAIL ON SHEET NO. 1218.
 - (7) SEE NOTE NO. 8 ON SHEET NO. 1222 FOR USE.
 - (8) NOT USED.
 - (9) NOT USED.
 - (10) CULVERT STANDPIPE. SEE DETAIL ON SHEET NO. 1213.
 - (11) NOT USED.
 - (12) NOT USED.
 - (13) SEE DETAILS ON SHEET NO. 1217.
 - (14) SEE SHEETS 1211, 1212, AND 1214 FOR DETAILS OF SUGGESTED TYPES AND SHEETS 1224 THRU 1385 FOR PLANS OF SUGGESTED TYPES.
 - (15) APPLIED AT A RATE OF 40 POUND/ACRE.
 - (16) APPLIED AT A RATE OF 2 TON/ACRE.
 - (17) TO BE USED FOR ROCK WEEPER. SEE DETAIL ON SHEET NO. 1219.
 - (18) STRAW BLANKET (CATEGORY 3). INCLUDES MAINTENANCE.
 - (19) STRAW COCONUT BLANKET (CATEGORY 4). INCLUDES MAINTENANCE.
 - (20) APPLIED AT A RATE OF 200 POUND/ACRE.
 - (21) APPLIED AT A RATE OF 2500 POUND/ACRE.

10 hour work day installer accomplishment goals

Under ideal conditions

- Blanket: 10,000 sq yd
- Straw/crimp: 96,800 sq yd
- BFM: 16,594 sq yd

Under lousy conditions

- RECP: 4,000 sq yd
- Straw/crimp: 24,200 sq yd
- BFM: 4,937 sq yd

Under probable conditions

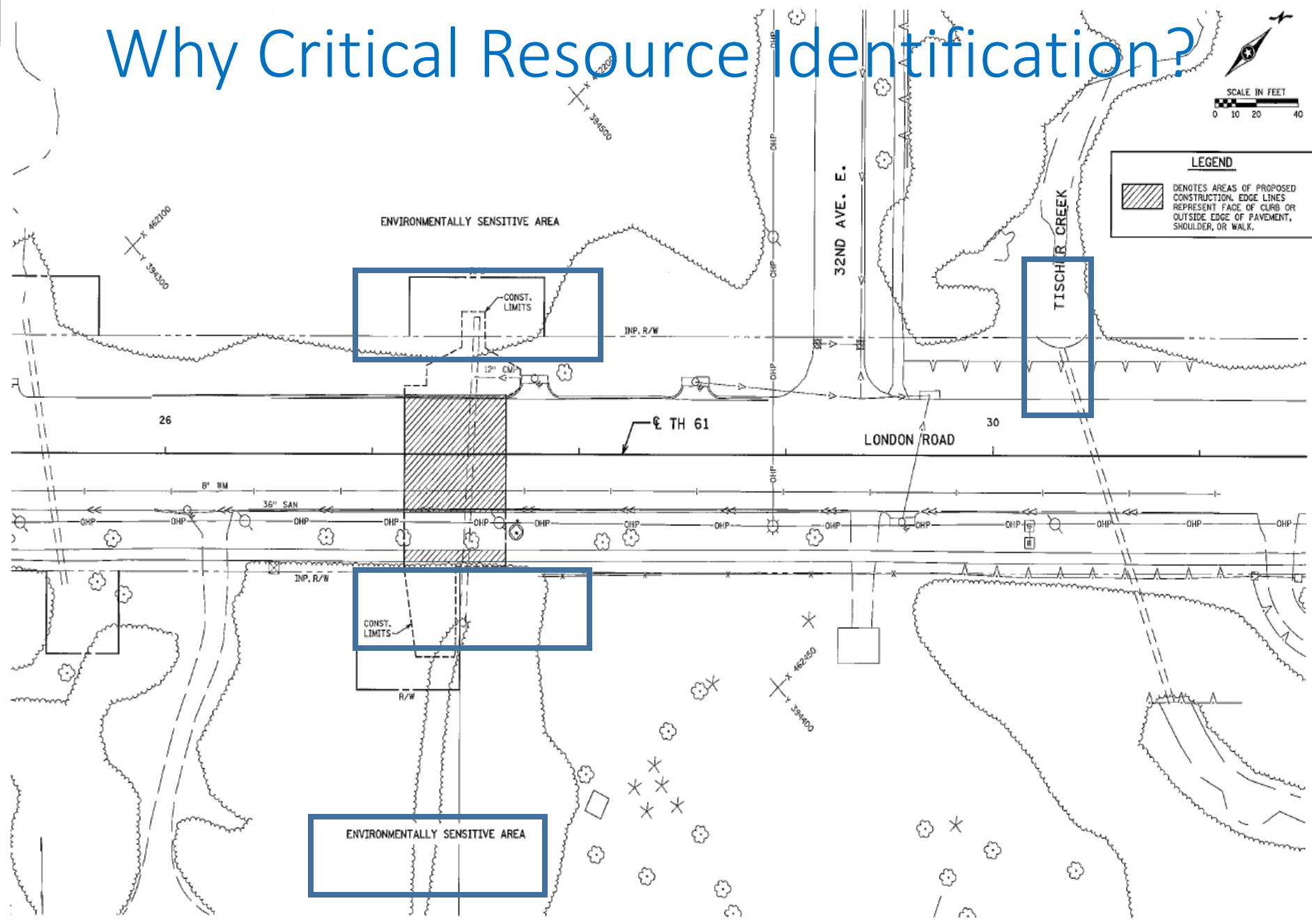
- RECP: 7,000 sq yd
- Straw/Crimp: 82,280 sq yd
- BFM: 9,874 sq yd

Blanket Cost History Comparison, 10 hour day


What is the difference between a good and bad Day?

Cost Item	Ideal conditions 10,000 sq yd	Lousy conditions 4,000 sq yd
Cat3 WF NN Material	\$ 7,500.00	\$ 3,000.00
Labor-laborer	\$ 1,500.00	\$ 1,500.00
Labor-equipment operator	\$ 750.00	\$ 750.00
Equipment	\$ 1,500.00	\$ 1,500.00
Overhead (50%)	\$ 5,625.00	\$ 3,375.00
Profit (15%)	\$ 1,687.50	\$ 1,012.50
Total Work Value	\$ 11,062.50	\$ 8,137.50
Bid Pay Item Value (\$1.25)	\$ 12,500.00	\$ 5,000.00
Difference	\$ 1,437.50	\$ (3,137.50)

Why Critical Resource Identification?



LEGEND

 DENOTES AREAS OF PROPOSED CONSTRUCTION. EDGE LINES REPRESENT FACE OF CURB OR OUTSIDE EDGE OF PAVEMENT, SHOULDER, OR WALK.

Rapid Stabilization Methods

3 Season

- Method 1 Mulch, disk anchored
- Method 2 Mulch, glued
- Method 3 HSS, seed, fertilizer
- Method 4 Blanket, Seed, Fertilizer
- Method 5 Rock
- Method SP Seed

Winter

- Snow mulching
- Frozen soil blanketing
- Rock

All Season

- Riprap
- Geotextiles

RS: Method 1

- Type 1 Mulch @ **2 tons per acre (hay or straw)**
- Disc anchored
- 0.5 to 2 acres coverage per location



RS: Method 2

- Type 1 Mulch @ **1.5 tons per acre**
- Type 5/6 Hydraulic Soil Stabilizer @ **750 pounds per acre**
 - **Wood fiber**
 - **Cellulose/wood fiber blends**
- **0.5 to 2 acres coverage per critical location**

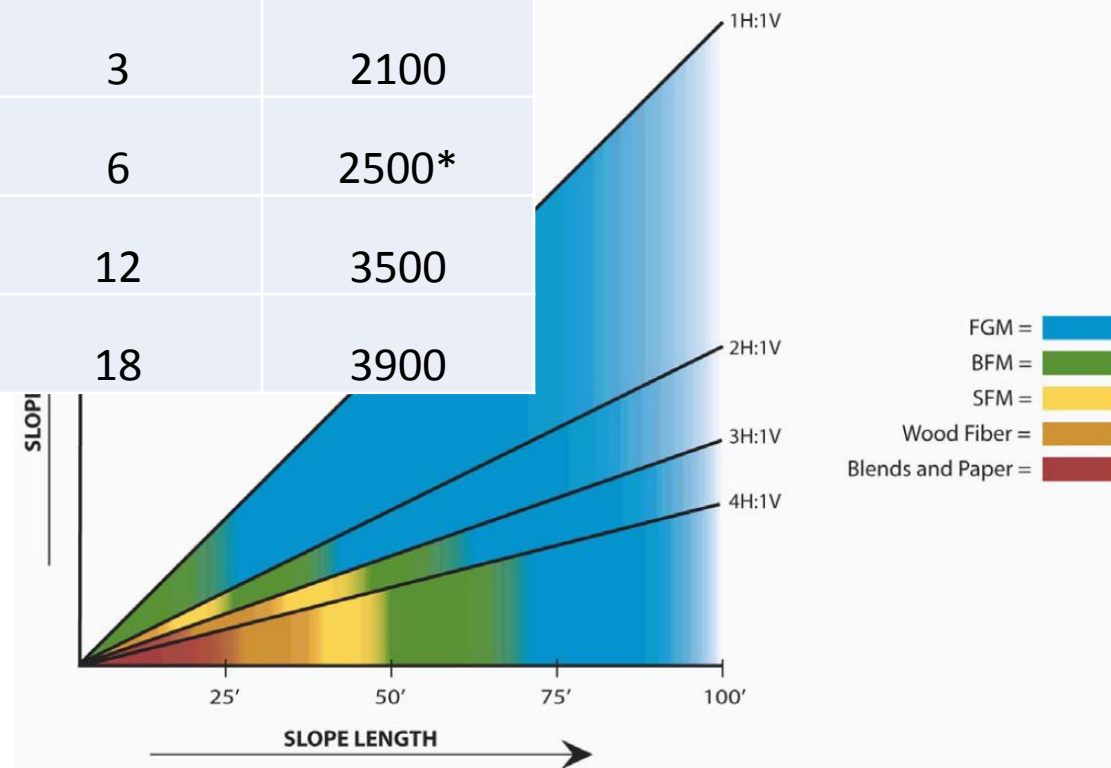


RS: Method 3

- Type 6 Hydraulic Soil Stabilizer @ **350 pounds per 1000 gallons of slurry mix**
- Seed mixture 190 @ **10 pounds per 1000 gallons of slurry mix**
- Fertilizer 10-10-20 @ **50 pounds per 1000 gallons of slurry mix**
- Water @ **875 gallons per 1000 gallons of slurry mix**
- **Note: 1000 gallons** of slurry mix will cover **1/6 acre**.
- 0.5 to 1.5 acres coverage per critical area
- (Seed Mix 190: red and alsike clovers, creeping alfalfa, hairy vetch, smooth brome grass, perennial ryegrass, and slender wheatgrass)

HFCP Design

Type	Slope	Slope Length Limits (ft)	Functional Longevity (mo)	Rate (lb/ac) Specified
Compost	3:1	300	>36	3500
Mulch	2:1	30	3	2100
Stabilized Fiber	2:1	50	6	2500*
Bonded fiber	1:1	75	12	3500
Fiber Reinforced	>1:1	100	18	3900









RS: Method 4

- Erosion Control Blanket Category 3 (Straw or wood fiber, 2S)
- Seed mixture 190 @ **2 pounds per 100 square yards**
- Fertilizer 10-10-20 @ **8 pounds per 100 square yards**
- **100 to 800 square yards coverage**





NO TRUCKS
AND WEIGHT

286

RS: Method 5

- Rip Rap Class II
- Geotextile Type III
- 10 to 20 tons per location



Combinations of RSM 3, 4 & 5

- Hydromulch in conveyance channels/ditches is not acceptable and does not meet best engineering standards and practices.



2575 Establishing Turf and Controlling Erosion

- Winter season
 - Winter seeding (can be on snow)
 - Winter mulching (can be on snow)
 - Winter blanketing (must be on soil)
 - Hydromulch (FRM, must be on soil, timing and coordination essential)
 - Winter rock
 - Plastic
 - Geotextiles















SUPERAMERICA
UNLEADED **2.63**
DIESEL
HAPPY HOLIDAYS
ENJOY AND STAY WARM

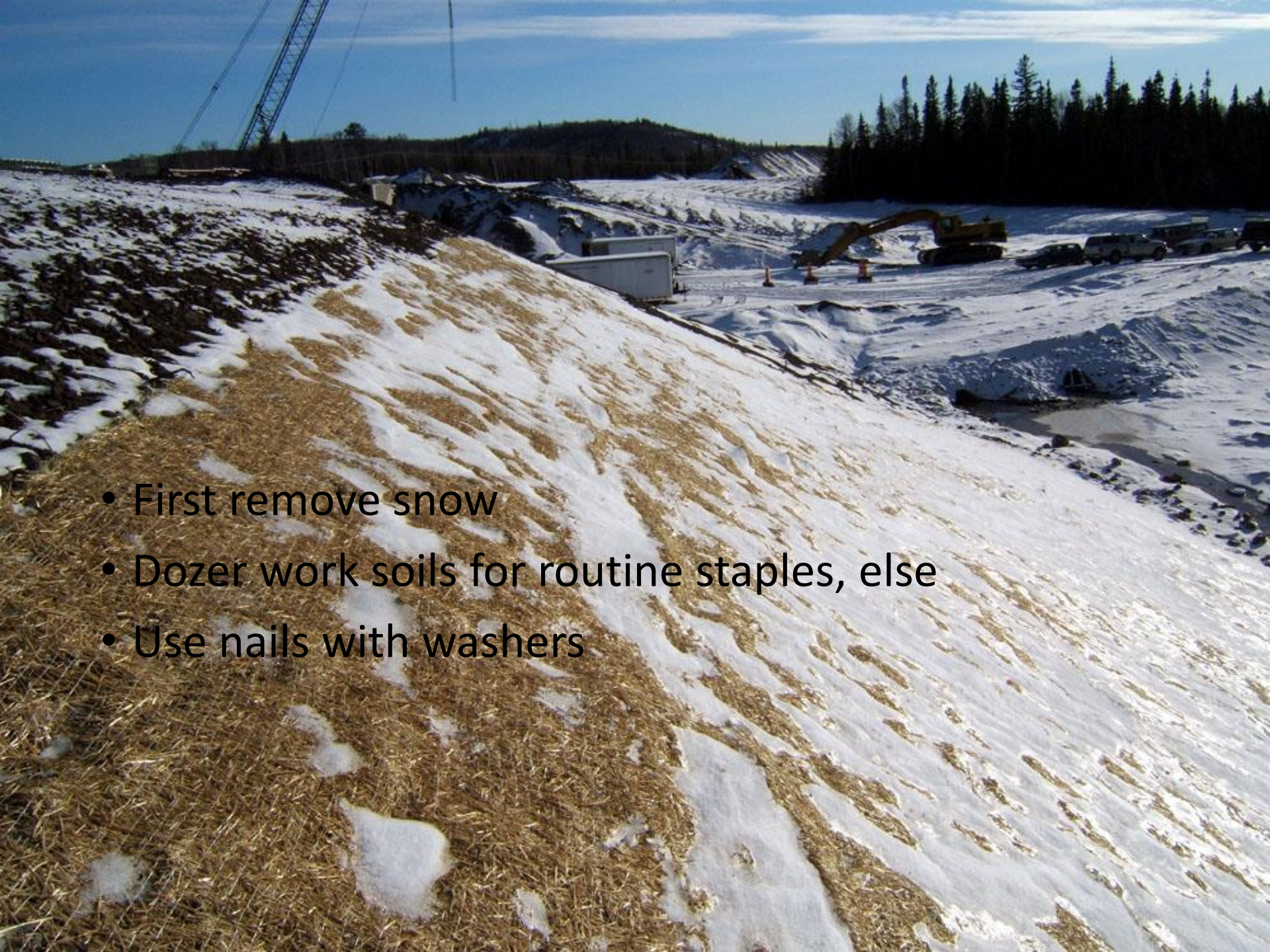
TACO BELL
Breakfast

McDonald's

STOP

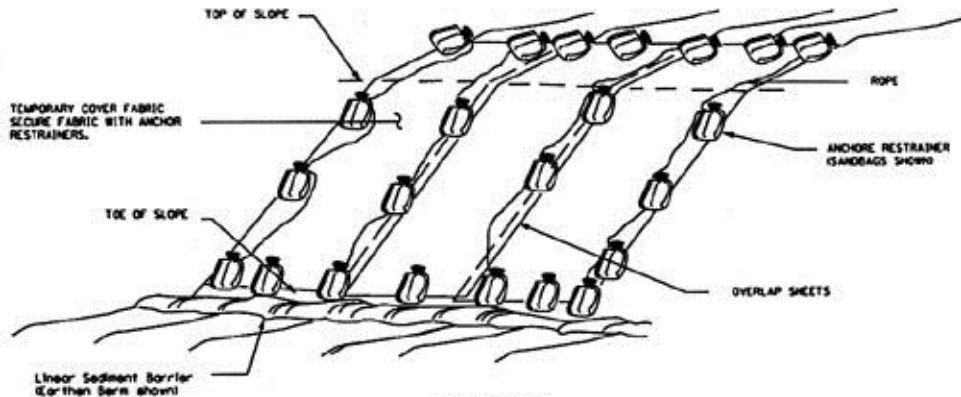
CAT



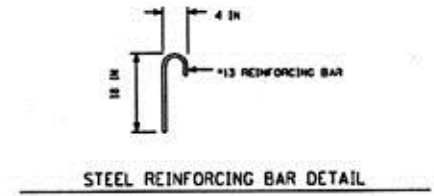


- First remove snow
- Dozer work soils for routine staples, else
- Use nails with washers

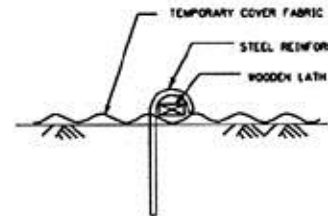
All Season Plastic/Geotextile Sheeting Soil Cover



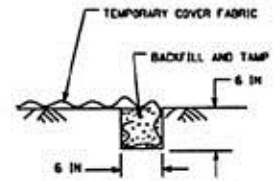
PERSPECTIVE
TEMPORARY COVER ON SLOPE



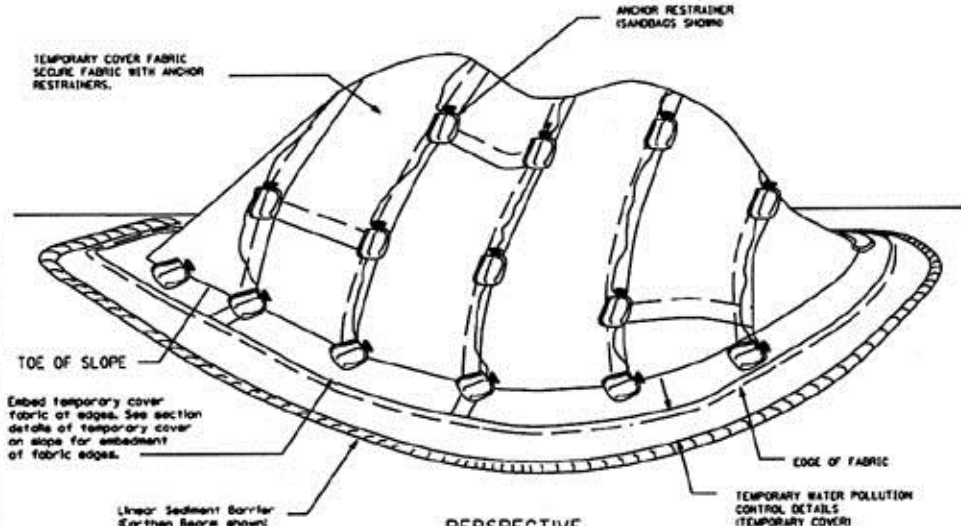
STEEL REINFORCING BAR DETAIL



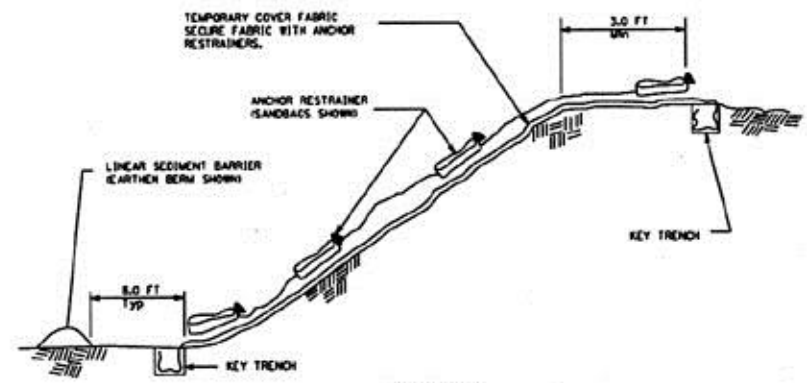
SECTION
ANCHOR RESTRAINER
(STEEL BAR AND WOODEN LATH)



SECTION
KEY TRENCH DETAIL



PERSPECTIVE
TEMPORARY COVER ON STOCKPILE



SECTION
TEMPORARY COVER ON SLOPE

I HEREBY CERTIFY THAT THIS PLAN SHEET WAS PREPARED BY ME OR UNDER MY CLOSE SUPERVISION AND THAT I AM A FULLY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.
DATE 01/10/06 REG. NO. 20300 ENGINEER *David M. [Signature]* SHEET 121 OF 121

TEMPORARY SEDIMENT CONTROL
GEOTEXTILE SHEETING 121
STATE PROJ. NO. _____ SHEET NO. _____ OF _____ SHEETS



Special Resource Control





TEP as Sediment control

- Blanket/sod buffer rings, perimeter control
- Staged, stabilized, and migrating topsoil perimeters
- Construction exits



Blanket Perimeter

Horizontal Perimeter Control Blanket





Sod (sacrificial)





Sod really does trap sediments!



Wood log and slash mulch



Slash Mulch

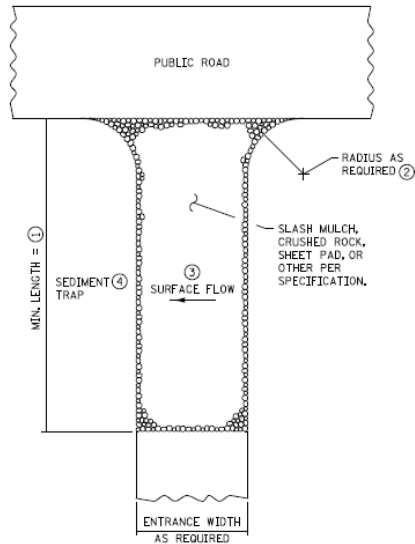


Exit Controls

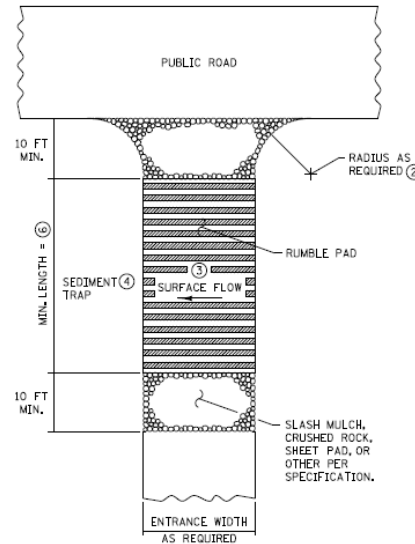
- Exit trackout control is both sediment control and erosion prevention



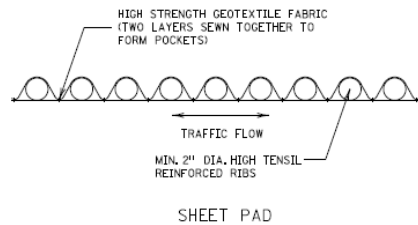
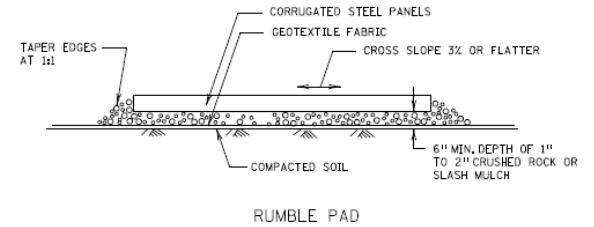
Exit Detail



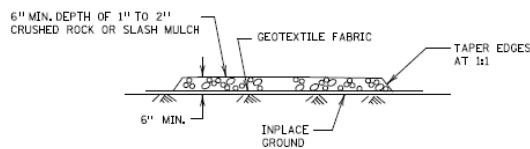
SLASH MULCH, CRUSHED ROCK, OR SHEET PAD CONSTRUCTION EXIT ③④



RUMBLE PAD CONSTRUCTION EXIT ③④



SHEET PAD



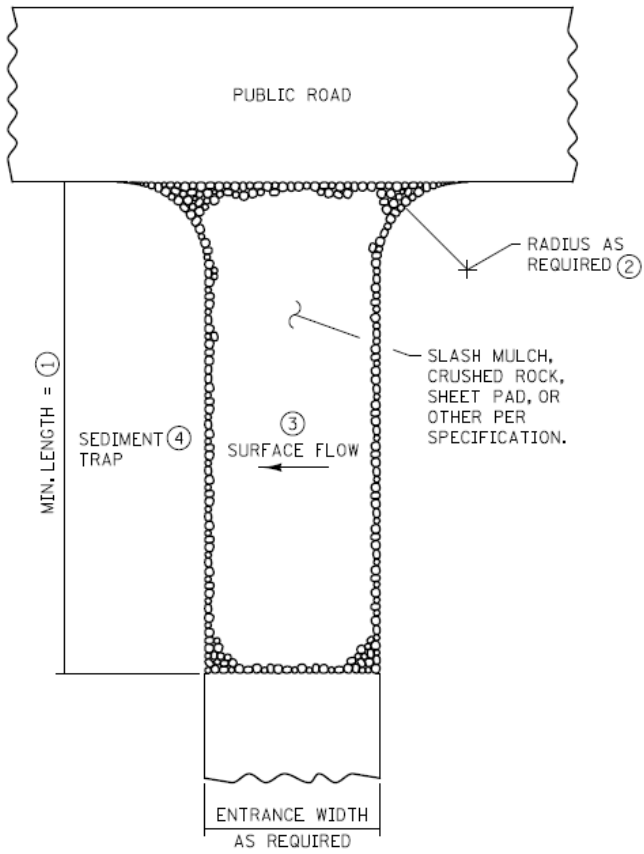
SLASH MULCH OR CRUSHED ROCK

NOTES:

- SEE SPECS. 2573 & 3882.
- ① MINIMUM LENGTH SHALL BE THE GREATER OF 50 FEET OR A LENGTH SUFFICIENT TO ALLOW A MINIMUM OF 5 TIRE ROTATIONS ON THE PROVIDED PAD, MINIMUM LENGTH SHALL BE CALCULATED USING THE LARGEST TIRE WHICH WILL BE USED IN TYPICAL OPERATIONS.
 - ② PROVIDE RADIUS OR WIDEN PAD SUFFICIENTLY TO PREVENT VEHICLE TIRES FROM TRACKING OFF OF PAD WHEN LEAVING SITE.
 - ③ IF RUNOFF FROM DISTURBED AREAS FLOWS TOWARD CONSTRUCTION EXITS, PREVENT RUNOFF FROM DRAINING DIRECTLY TO PUBLIC ROAD OVER CONSTRUCTION EXIT BY CROWNING THE EXIT OR SLOPING TO ONE SIDE, IF SURFACE GRADING IS INSUFFICIENT, PROVIDE OTHER MEANS OF INTERCEPTING RUNOFF.
 - ④ IF RUNOFF FROM CONSTRUCTION EXITS WILL DRAIN OFF OF PROJECT SITE, PROVIDE SEDIMENT TRAP WITH STABILIZED OVERFLOW.
 - ⑤ IF A TIRE WASH OFF IS REQUIRED THE CONSTRUCTION EXITS SHALL BE GRADED TO DRAIN THE WASH WATER TO A SEDIMENT TRAP.
 - ⑥ MINIMUM LENGTH OF RUMBLE PAD SHALL BE 20 FEET, OR AS REQUIRED TO REMOVE SEDIMENT FROM TIRES, IF SIGNIFICANT SEDIMENT IS TRACKED FROM THE SITE, THE RUMBLE PAD SHALL BE LENGTHENED OR THE DESIGN MODIFIED TO PROVIDE ADDITIONAL VIBRATION, WASH-OFF LENGTH SHALL BE AS REQUIRED TO EFFECTIVELY REMOVE CONSTRUCTION SEDIMENT FROM VEHICLE TIRES.
 - ⑦ MAINTENANCE OF CONSTRUCTION EXITS SHALL OCCUR WHEN THE EFFECTIVENESS OF SEDIMENT REMOVAL HAS BEEN REDUCED, MAINTENANCE SHALL CONSIST OF REMOVING SEDIMENT AND CLEANING THE MATERIALS OR PLACING ADDITIONAL MATERIAL (SLASH MULCH OR CRUSHED ROCK) OVER SEDIMENT FILLED MATERIAL TO RESTORE EFFECTIVENESS.

STANDARD SHEET NO. 5-297.405 (5 OF 7)	TITLE TEMPORARY SEDIMENT CONTROL CONSTRUCTION EXITS
STANDARD APPROVED DECEMBER 11, 2013	
STATE PROJ. NO.	(TH) SHEET NO. OF SHEETS

Construction Exit Control Type 1: Slash Mulch



SLASH MULCH, CRUSHED ROCK, OR SHEET PAD CONSTRUCTION EXIT (5)(7)



Construction Exit Control Type 2: Crushed aggregate









Natural Nets and stitchings



Measurement and Payment

- See 2575





Join the BMP Matrix

A promotional image for the BMP Matrix project. It features Keanu Reeves in a black suit and sunglasses, standing in a green-tinted environment with falling green code. He is making a hand gesture with his right hand, palm facing forward, with fingers slightly spread. The background is a dense field of green characters and symbols, reminiscent of the Matrix movie's digital rain effect.

- Dwayne Stenlund
- 612-810-9409
- Dwayne.Stenlund@state.mn.us
- [ftp://ftp2.dot.state.mn.us/pub/outbound/erosion/
BMP_Design_Matrix](ftp://ftp2.dot.state.mn.us/pub/outbound/erosion/BMP_Design_Matrix)