Be creative to solve NPDES issues in a timely manner. It is only our brain that gets in the way of logic, creativity, and common sense.

"It is in the plan" is no excuse to waste money.

Minnesota County Engineers Conference
Stormwater Management Compliance Panel Discussion
January 22, 2026
Cragun's Resort, Brainerd

Dwayne Stenlund, MSc., CPESC, CESSWI
MnDOT Retired

University of Minnesota Program Instructor

Program Instructor (stenl002@umn.edu)

- Let me know if there are
  - issues,
  - topics,
  - corrections,
  - wishes,
  - etc.
- that could be addressed at NPDES permit training certification
- 651-415-9934

Example NPDES Permit **Problems**

- Failure to amend the SWPPP to reflect actual field and contractor operations
- Perimeter control installed at high sides of slopes
- Nothing (downgradient perimeters) around stockpiles
- Failure to perpetuate storm drainage around the work area
- Only one type of inlet protection is utilized, regardless of the work or flood risk
- Temporary sediment controls are installed on permanently stabilized materials like mulch, blanket or sod
  - *Sediment control logs as conveyance checks, perimeter control*
  - *Sediment control completely around culvert ends*
  - *Weird field inlet protection*
- Waste materials placed (stored) in conveyances, or at water edges
- Unrealistic and meaningless inspection reports
- Contractor training documents not added to SWPPP file.

Undoing certain beliefs, myths, and misunderstandings

- Access
- Culvert ends
  - Sediment traps
- Ditch Checks
- Exits
- Inlets
- Flotation Containment Boom
- Management and Maintenance
- Perimeter control
  - Stockpiles
  - Urban
- Sediment Traps & Ponds (not basins)

All SWPPP's and BMPs will fail, sometimes

- But implementation of best management practice must work for a 2 yr/24 hour type storms
  - Intensity, duration, and frequency data is necessary
- There will remain cataclysmic events that will destroy your compliance. Call the SDO when an upset occurs.
- Recommend automated datalogging tipping rain bucket

Example solutions

- Obtain contractor means and methods, might be daily.
  - Note the BEST BMP is one that is suggested by the operators of equipment that fit work in the critical location.
- Request a real inspection form. Note this is a punch list quality assurance program. Ensure the SWPPP is updated with a knowledgeable and trained named person.
- Speed as a BMP
- Amend the plan where water leaves, or can be directed around
  - Yes, really, you are authorized to amend the plan on everything except the location and type of permanent stormwater quality treatment systems (this requires a PE).

Reuse, not left to become a problem

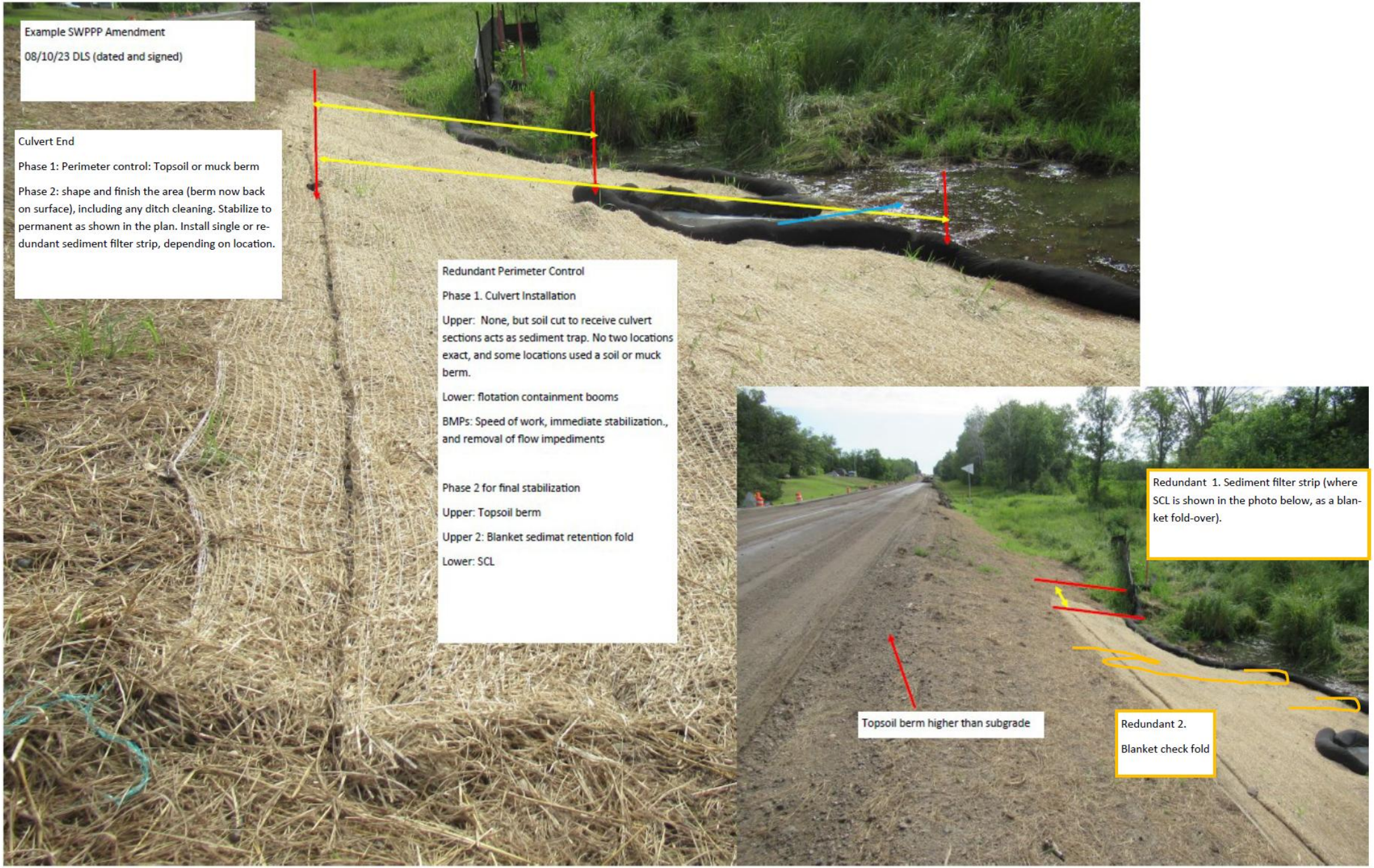
Log as placed prevented vegetation establishment.

Alternative: Sediment Filter Strip

Note: nothing is maintenance free. The contractor still must continue inspections (weekly+) and fix within ~24 hours of discovery.

I do have a formula for slope length and steepness to determine width of SFS.

Where do you see the best plant growth?


Example SWPPP Amendment
08/10/23 DLS (dated and signed)
Culvert End
Phase 1: Perimeter control: Topsoil or muck berm
Phase 2: shape and finish the area (berm now back on surface), including any ditch cleaning. Stabilize to permanent as shown in the plan. Install single or redundant sediment filter strip, depending on location.
Redundant Perimeter Control
Phase 1. Culvert Installation
Upper: None, but soil cut to receive culvert sections acts as sediment trap. No two locations exact, and some locations used a soil or muck berm.
Lower: flotation containment booms
BMPs: Speed of work, immediate stabilization., and removal of flow impediments
Phase 2 for final stabilization
Upper: Topsoil berm
Upper 2: Blanket sedimat retention fold
Lower: SCL
Redundant 1. Sediment filter strip (where SCL is shown in the photo below, as a blanket fold-over).
Topsoil berm higher than subgrade
Redundant 2.
Blanket check fold

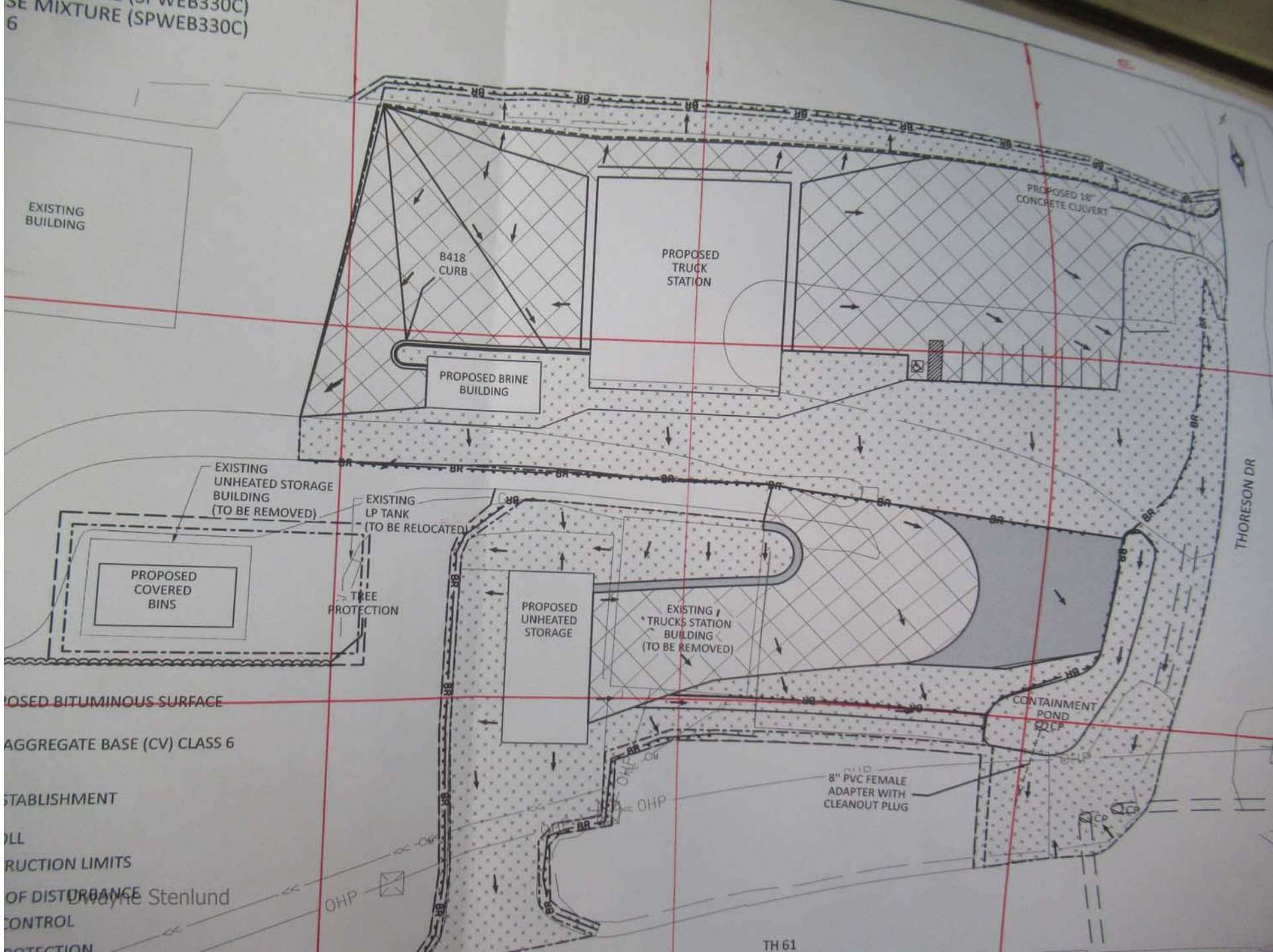
Amend the plan to utilize site conditions

Sod- Placeholder until conditions are again favorable (like Spring)

Note contractor followed detail sheet for sod placement and provided a 1-inch curb back cut. Acts as perimeter control. The SWPPP was amended to reflect field conditions.

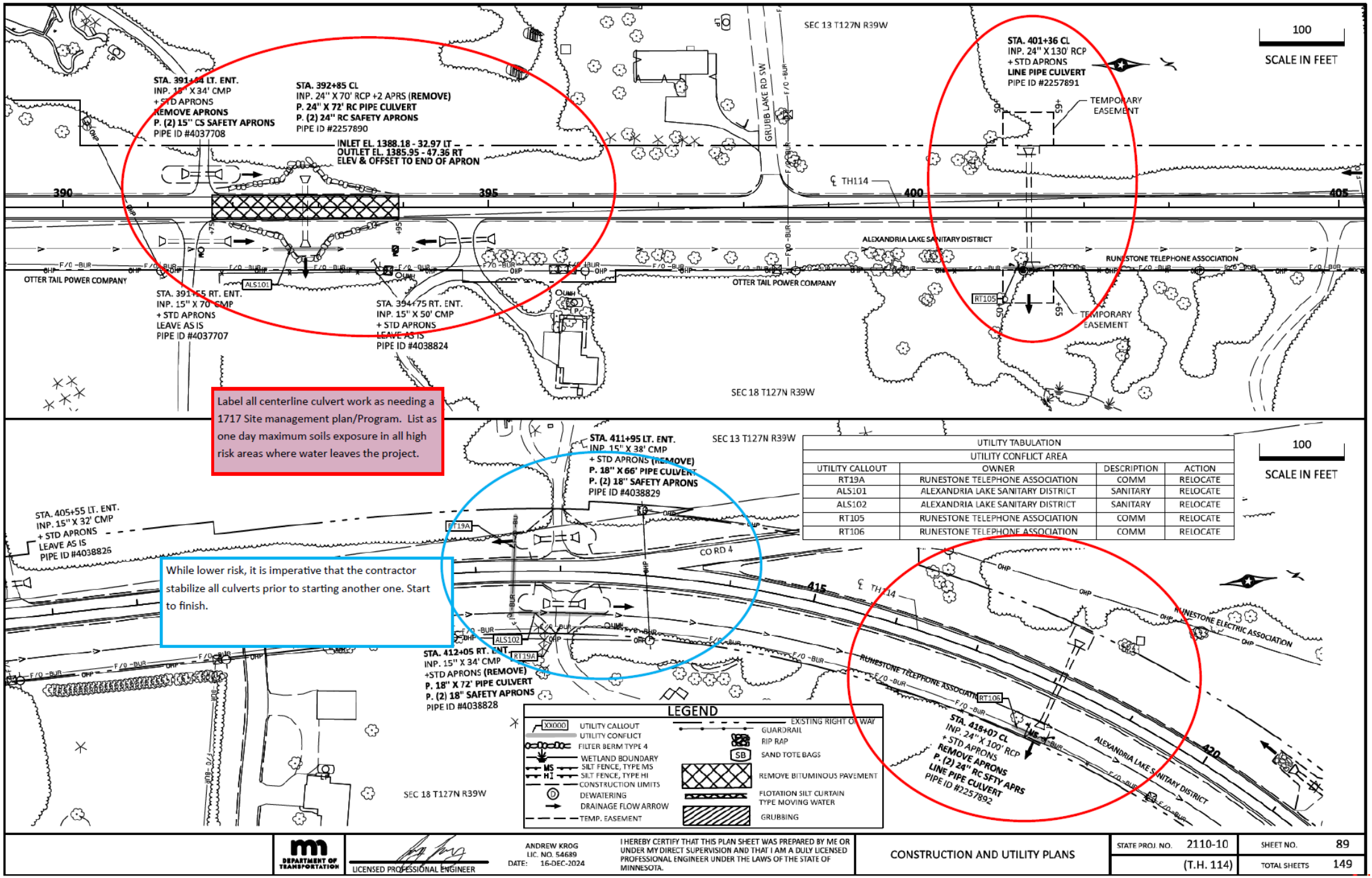

ONE
WAY

Everything shown on the SWPPP plan is amendable (*includes detail sheets). *Exception: Permanent SWQ treatment systems.*



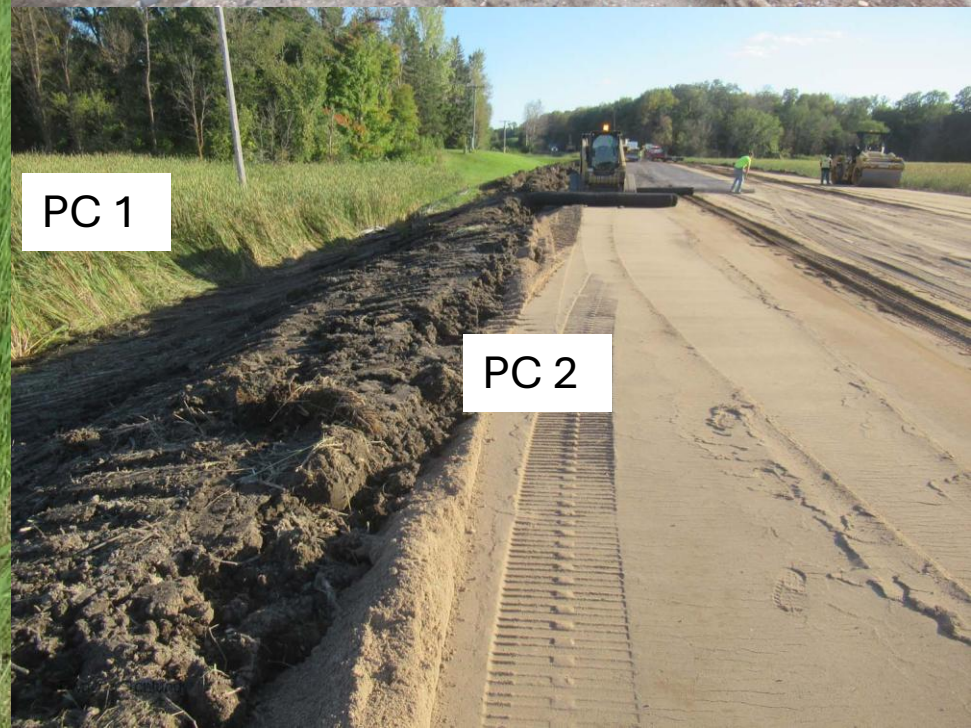
Risk

- Low
- Medium
- High
- Very High



Ask contractor equipment operator first (not business owner) for what is possible to perform the work, and not be a waste or in the way.

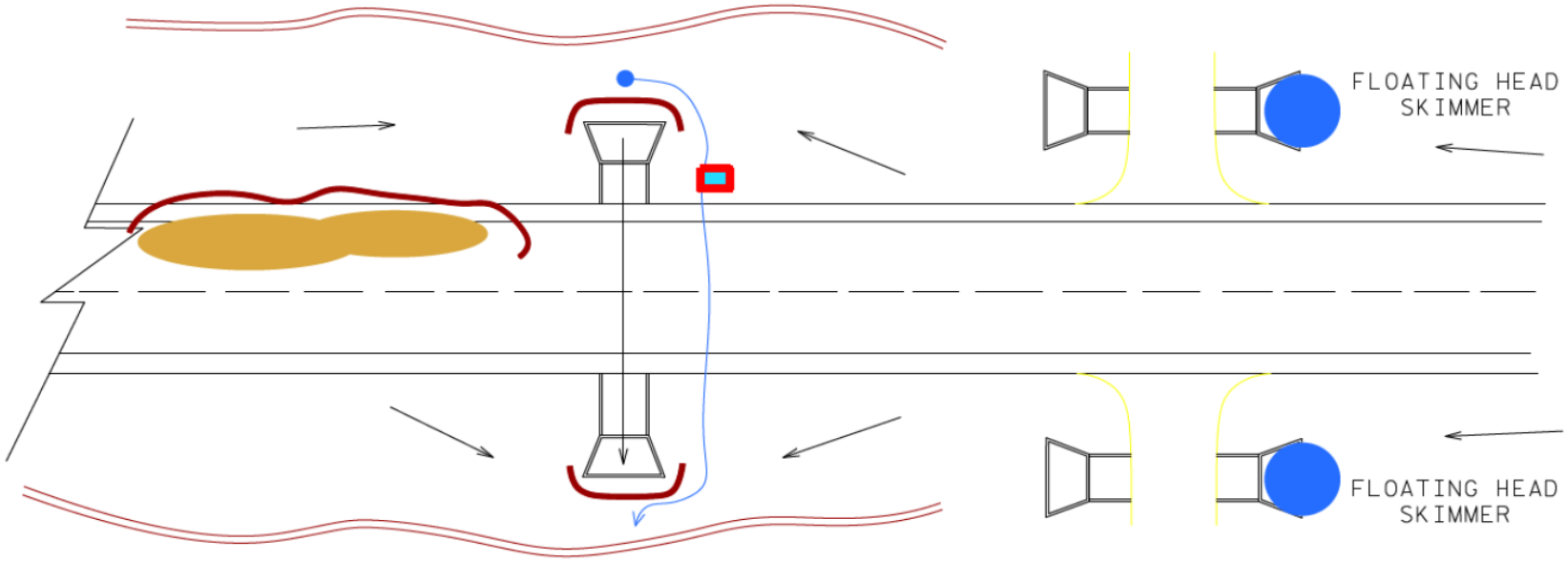
How can speed and contractor creativity be utilized to save money?

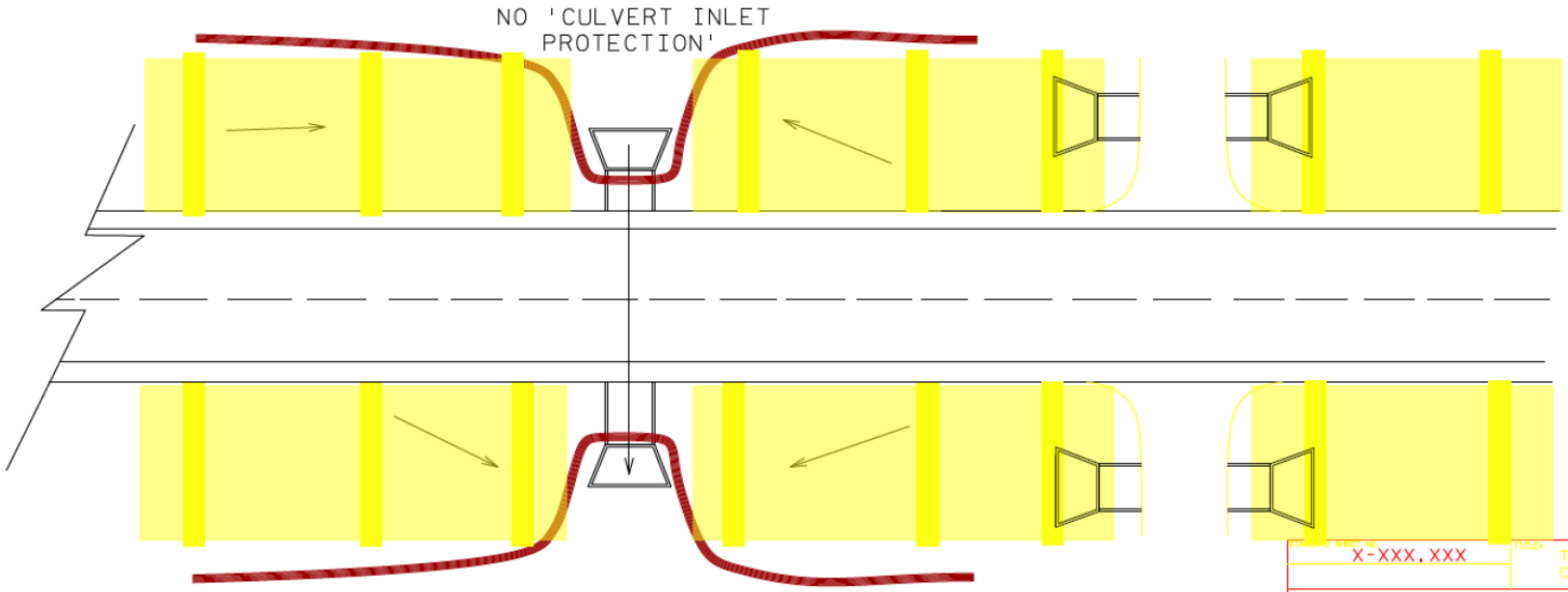

PC 1
PC 2

SFS Fold over or under


Dwayne Stenlund

Serious controls, from start to finish





STAGE 1: REDUNDANT PERIMETER CONTROL INSTALLED
STAGE 2: REQUIRE SITE MANAGEMENT PLAN
STAGE 3: INSTALL TEMPORARY SEDIMENT DITCH TRAP
STAGE 4: DEWATER WORK AREA TO TEMP DITCH TRAP
STAGE 5: INSTALL CULVERT END 'COFFER' TO ISOLATE FLOW FROM WORK
STAGE 6: INSTALL FLOW BYPASS SYSTEM

COMPLETE WORK SHOWN IN PLAN, STABILIZE BOTH ENDS OF CULVERT(S)

STAGE 7: RECONFIGURE PERIMETER CONTROL TO ALLOW WATER MOVEMENT, REMOVE TEMP SEDIMENT DITCH TRAP
STAGE 8: STABILIZE WETTED PERIMETER. USE BLANKET CHECK SYSTEM (NOT SCL TYPES)

X-XXX.XXX

Title: Temporary Erosion Centerline Culvert Controls

STATE PROJ. NO. ____-___ SHEET NO. OF SHEETS

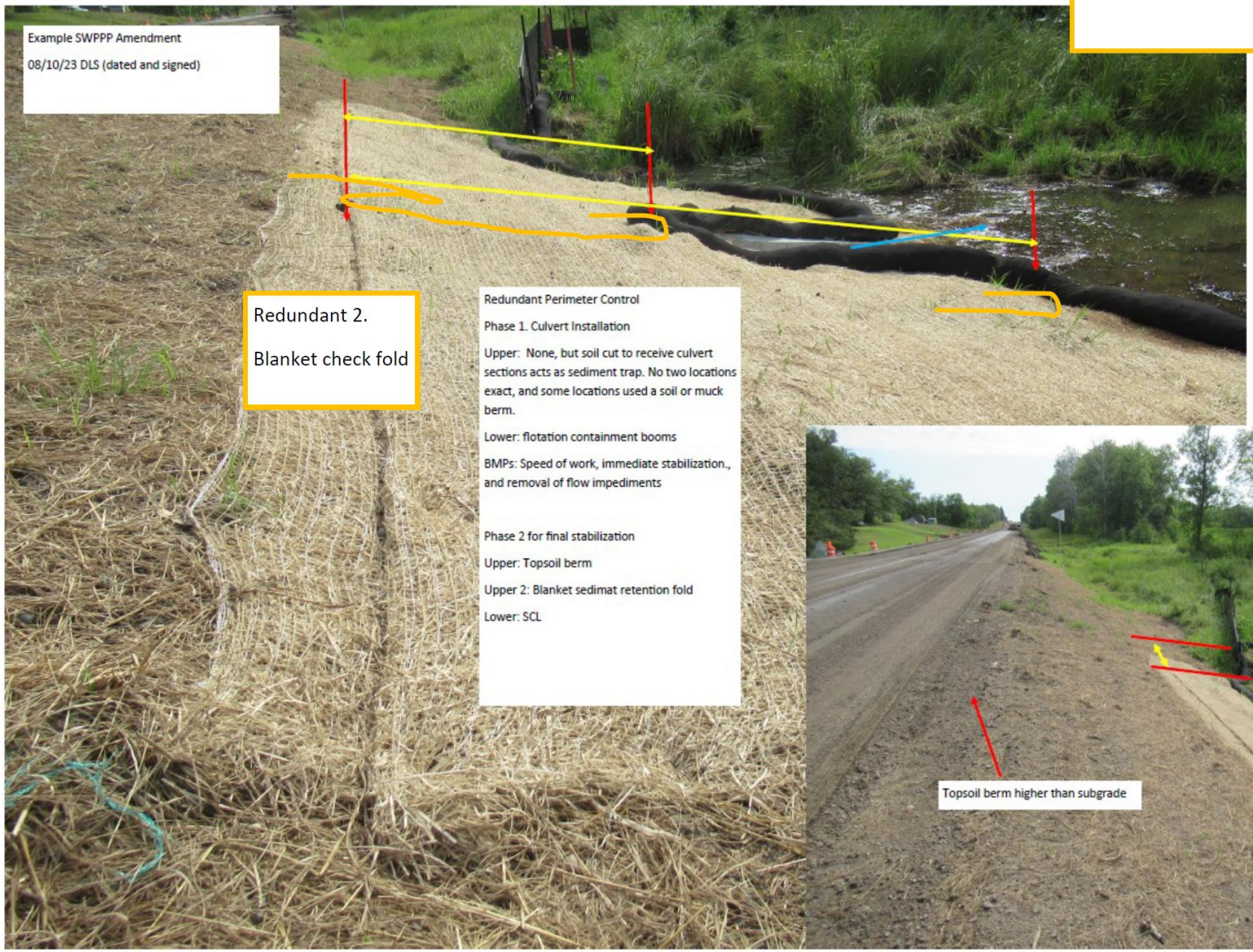
Provide Redundant controls above and along the sides.
Add nothing to block flow in the culvert apron ends

Culvert End

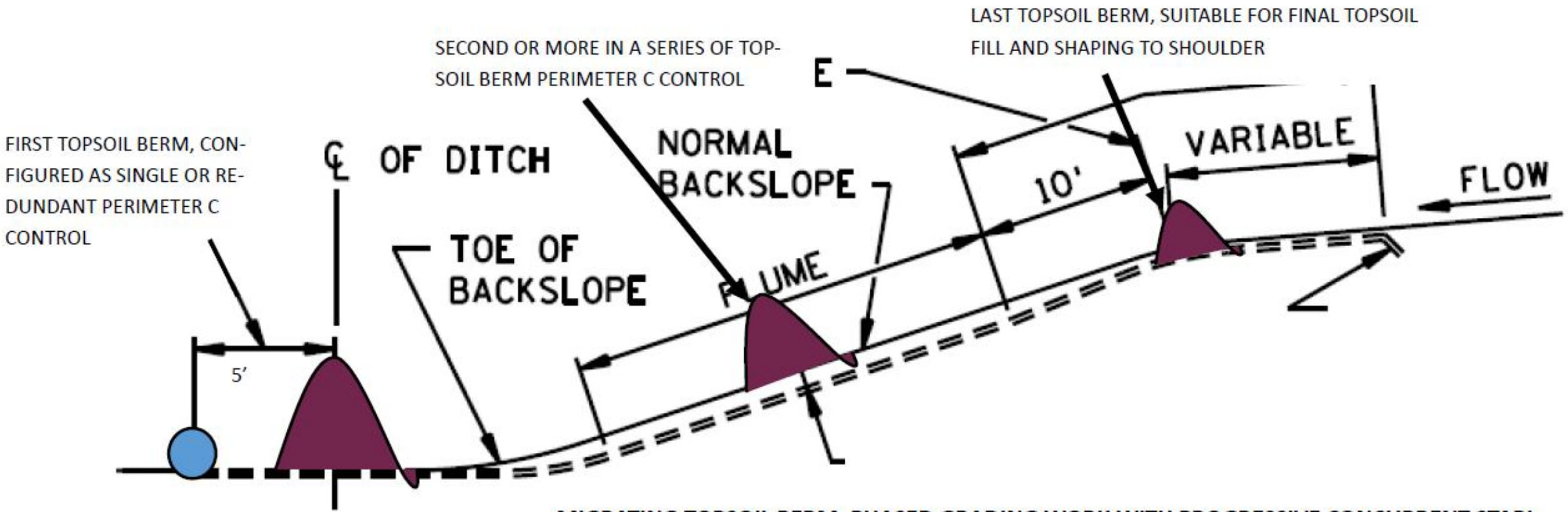
Phase 1: Perimeter control: Topsoil or muck berm

Phase 2: shape and finish the area (berm now back on surface), including any ditch cleaning. Stabilize to permanent as shown in the plan. Install single or redundant sediment filter strip, depending on location.

Redundant 1. Sediment filter strip (where SCL is shown in the photo below, as a blanket fold-over).



Utilization of topsoil berm perimeter control over the life of the contract



MIGRATING TOPSOIL BERM, PHASED GRADING WORK WITH PROGRESSIVE CONCURRENT STABILIZATION.


FRESHWATER

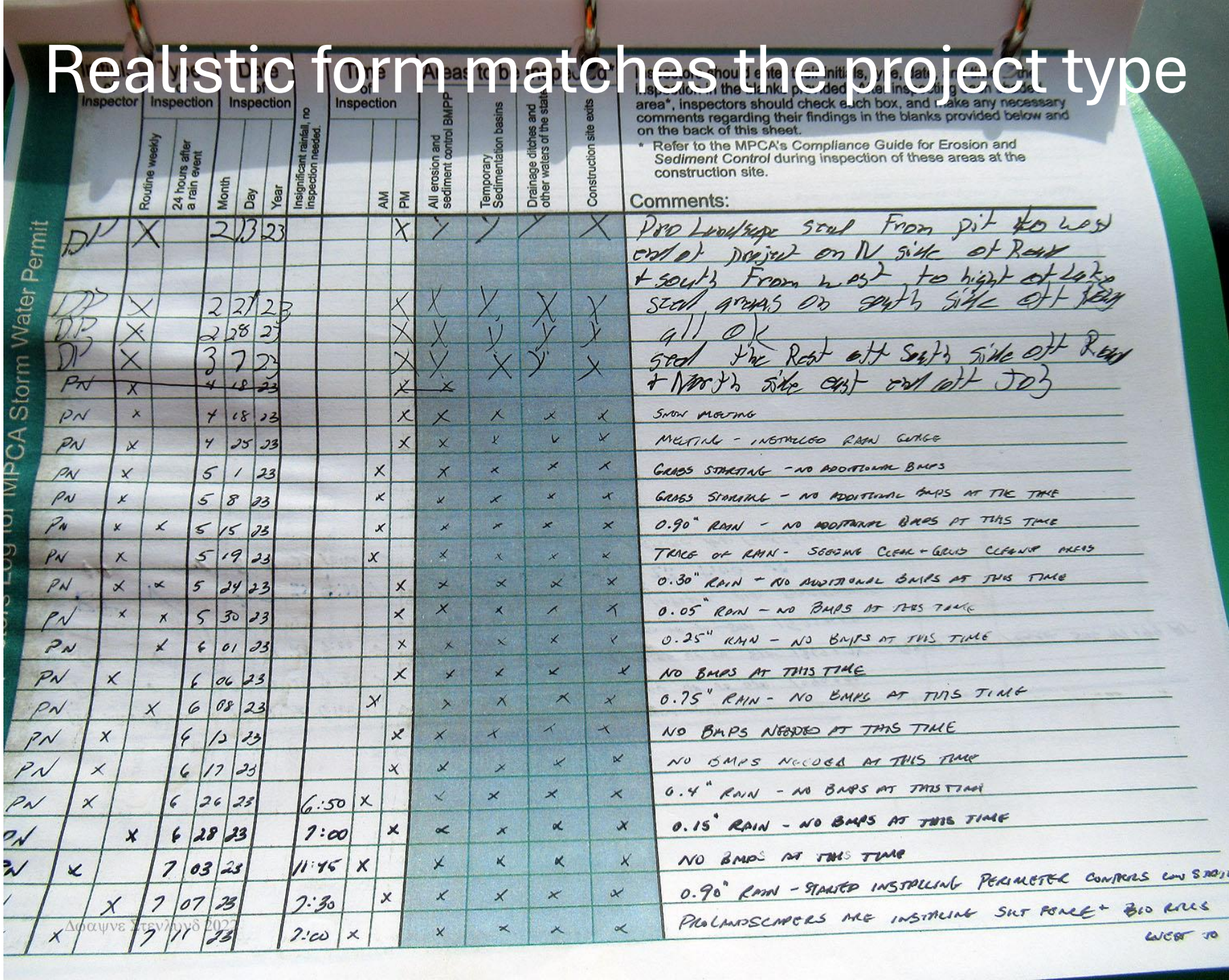

Dwayne Stenlund


Dwayne Stenlund


Dwayne Stenlund

Realistic form matches the project type

- MPCA form designed for individual home construction, or simple small sites



Form 1 Routine

1. Routine/Rain
2. Corrective actions were completed
3. Basin drawdown performance
4. Dewatering

NPDES Routine/Rain Site Inspection Report

dls2019

Inspection Date		Project Site Location			Project Identifier		
Routine Inspection	Y/N	*Emergency Event Inspection*	Y/N		*Rain Event Inspection*	Y/N	Amt (in)
Time of Inspection		Weather Condition at time of inspection					
Inspected by (Name and Title):							
Signature:		*Reminder: Add more pages as necessary. Amend SWPPP.*					

Report Summary:

Specific Location or ID#	Installed or Missing BMP (may need more than one line)	Functional Condition of BMP or Problem Issue	Recommendations & Needed Corrective Action	Date Needed by	Comments/ Photo Doc. ID

Form 2 Corrections

NPDES **Corrective Action** Verification and Inspection Report

dls2023

Re-Inspection Date:		Project Site Location	
Project (SP) Identifier			
Party that completed the work (may be more than one person or group)			
Date of Previous Inspection			
Time of Inspection		Weather Condition at time of re-inspection	
Corrections Inspected by (Name and Title):			
Signature:		*Reminder: Add more pages as necessary. Verify any required SWPPP amendments.*	

Corrective Action Report Summary:

Specific Location of Corrective Action	Project Specific Identifier From Previous Inspection Report (if different)	What Was Corrected (does it match what was suggested in prior documentation?)	If something was installed that is less rigorous, was the reason for the change documented?	Is this the third or more time where corrective actions were needed?	Was a Photo Taken?
e.g. Sta 153 R50	*# 1132*	*Type 1 mulch was re-applied at 90% coverage*	*Same*	*No*	*Yes*

Culvert End Controls?

- There is no such thing as culvert end conty
- There are details to isolate flows

CULVERT OUTFALL END ENERGY DISSIPATION STABILIZATION GUIDANCE

All culvert end outfalls require appropriate selected and installed energy dissipation stabilization (EDS) measure within 24 hours of the potential to discharge. Regardless of the proper measure, permit compliance and contract work is best performed by the pipe installation crew. Note too that many measures require placement underneath the apron end section to ensure both low and high storm flow function and integrity.

Energy dissipation stabilization type is a function of pipe size and drainage area. In all cases, shape and blend the energy dissipation stabilization measure to match apron end section and grade into the proposed slope and/or ditch gradient (should allow a smooth transition by maintenance operators).

The following are common types of energy dissipation and erosion prevention:

1. Scour control plywood, metal plates (Temporary)
2. Sod
3. Blanket, Category 25, Seed to fit the site
4. Blanket, Category 35, Seed to fit the site
5. Crushed Aggregate (Temporary)
6. Turf reinforcement mat, Category 50, 55, seed to fit the site
7. TRM Category 60, seed to fit the site
8. REPP Category 80A, seed to fit the site
9. Riprap, various classes
10. Cable Concrete

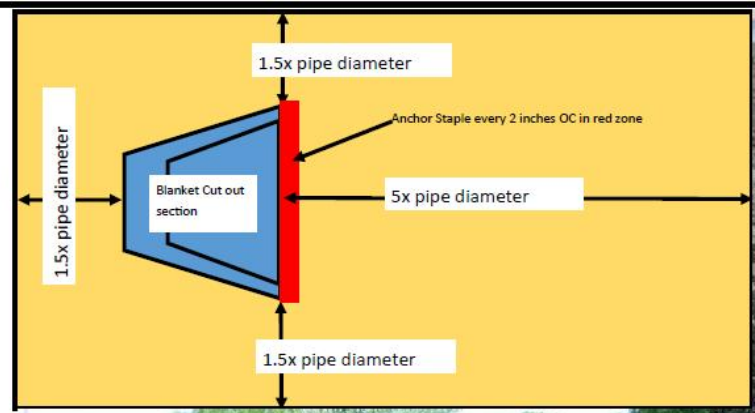
Edge Drain aprons (2502). All must be stabilized
Safety Aprons (6:1). Critical side edge stabilization, haunch compaction
Flared Aprons. Plastic or metal types with anti-frost heaving plates.

Common Energy Dissipation Stabilization Dimensions, but may vary based on site conditions and constraints:

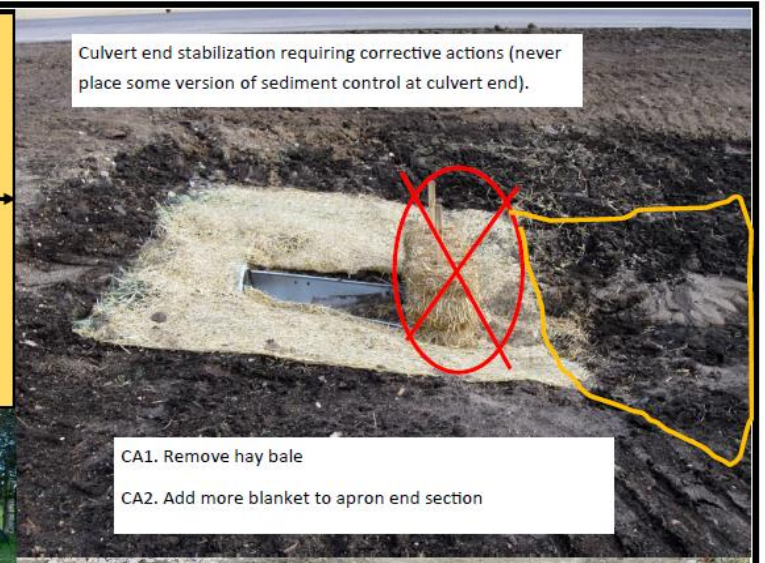
A. Culvert end best management practice, 5 times the diameter of the pipe.
B. Culvert end sides (assume a condition to flow full) BMP, 1.5 times the diameter of the pipe
C. Culvert end top, 1.5 times the diameter of the pipe
D. Depth of Riprap placement, 1.5 times D50

Table 1 Pipe Size and End Stabilization Treatment Options

Apron end sections with Pipe sizes (inches)	BMP trench, keyway, Under, or bedding	Option 1	Option 2
Edge Drains	None	Category 25	Sod
12 to 18	Trench	Category 25	Sod
21 to 27	Trench or keyway	Category 35	Category 50/55
30 to 36	Keyway or Under	Category 60	Class 1 Riprap
42 to 48	Bedding or Under	Class 3 riprap, poorly graded	Category 80A
54 to 72	Under	As per plan	Riprap
>72 inch	Under, Head Wall	As per plan	As per plan



Good Examples of Culvert end stabilization with Category 25 blanket, following the pictorial drawing above.



Culvert end stabilization requiring corrective actions (never place some version of sediment control at culvert end).

CA1. Remove hay bale

CA2. Add more blanket to apron end section

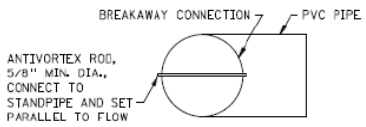
CA3. Add blanket above apron end section.

REVISION: VERSION 1, 12/18/19
DEVELOPED BY: Dwayne Stenlund
Office of Environmental Stewardship

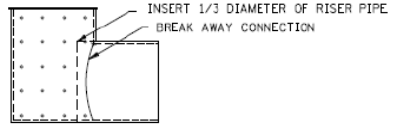
ADDITIONAL INFORMATION
DWAYNE STENLUND 612-810-9409

CULVERT END ENERGY DISSIPATION STABILIZATION

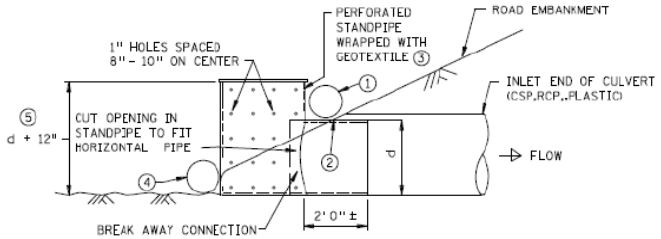
ENERGY CONTROL BMP | CULVERT SERIES



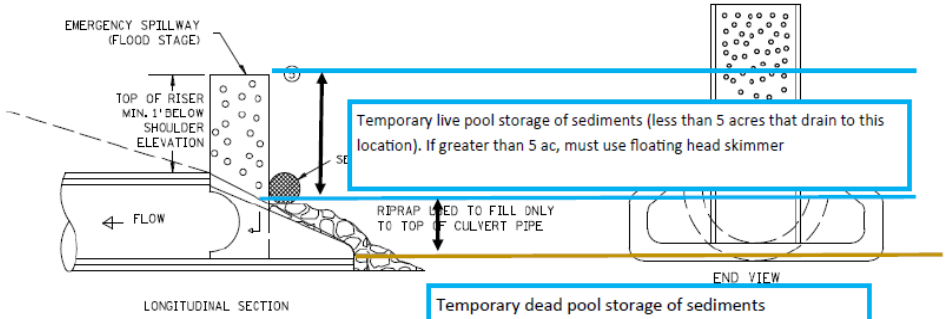
PLAN VIEW



CULVERT STANDPIPE



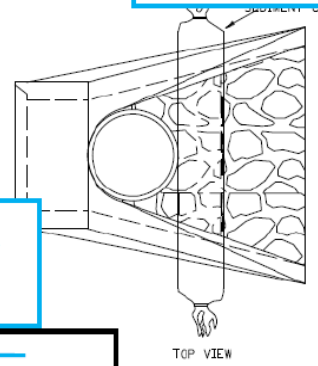
ELEVATION VIEW OF CULVERT INSTALLATION



LONGITUDINAL SECTION

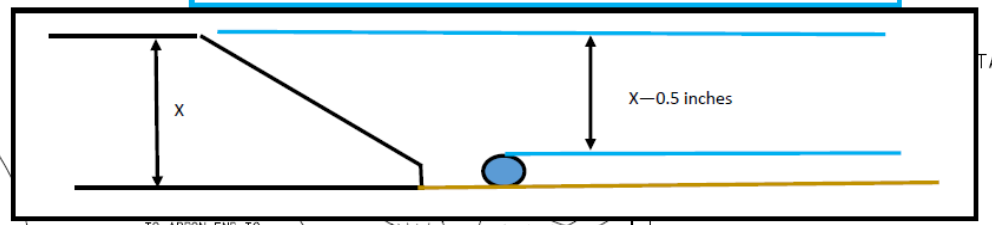
Temporary live pool storage of sediments (less than 5 acres that drain to this location). If greater than 5 ac, must use floating head skimmer

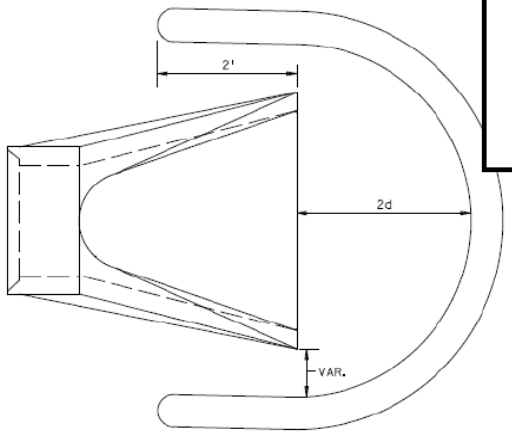
Temporary dead pool storage of sediments



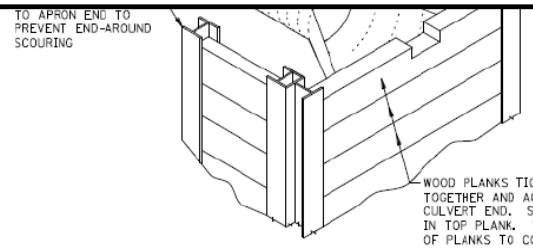
CULVERT STANDPIPE INSERT (D-RISER)
d= CULVERT SIZE: 12" - 36"

In reality, these two elevations are nearly the same and provide little capacity for dead pool storage of sediments (and are not necessary once the conveyance is permanently stabilized). The SCL typically overtop and cause gullies to form, or flow under to cause scour.





SEDIMENT CONTROL LOG WEIR (COMPOST, WOOD CHIP, OR ROCK)
d = CULVERT SIZE: 12"-36"



WOOD PLANK WEIR

NOTES:

SEE SPECS. 2573, 3891 & 3893.

FOR USE WHEN TEMPORARY PONDING IS NEEDED IN DITCH SECTIONS FOR SEDIMENT CONTROL.

MANUFACTURED ALTERNATIVES LISTED ON MnDOT'S APPROVED PRODUCTS LIST MAY BE SUBSTITUTED AT NO ADDITIONAL COST.

① ROCK LOG OR SANDBAG TO HOLD STANDPIPE AND ACT AS A SEAL BETWEEN RISER PIPE AND CULVERT.

② PLACE CULVERT APRON AND SLIDE TEMPORARY STANDPIPE INTO CSP OR RCP CULVERT.

③ ALL GEOTEXTILE USED FOR CULVERT PROTECTION SHALL BE MONOFILAMENT IN BOTH DIRECTIONS, MEETING SPEC. 3886 FOR MACHINE SLICED.

④ ROCK LOG OR RIP RAP TO HOLD STANDPIPE AND ACT AS A FILTER BETWEEN RISER PIPE AND CULVERT.

⑤ HEIGHT OVERFLOW NOT TO CAUSE FLOODING OF ROAD OR ADJACENT PROPERTIES.

REVISION:
APPROVED: 2-28-2017
CHIEF ENVIRONMENTAL OFFICER

MINNESOTA DEPARTMENT OF TRANSPORTATION
STATE DESIGN ENGINEER

STANDARD PLAN 5-297.405 | 8 OF 8
APPROVED: 2-28-2017
REVISED:

TEMPORARY SEDIMENT CONTROL
CULVERT END CONTROLS

STATE PROJ. NO. (T.H.) SHEET NO. OF SHEETS


Should have a 5 ft gap (min)

Proper placement of SCL are intended to allow sedimentation in a ditch during construction when final stabilization measures are not feasible to finish (note last 200 was stabilized).

Phase 1 Initial Inlet BMP: tree clearing, limited grading, equipment mobilization, exit development, limited soil disturbance. Also for low erosive soils or low gradient drainage areas.

Simple low height BMPs comprising above grate devices like rock logs and other SCL, and Phase 3 devices.





Phase 2 Major grading, soil stockpiling, underground excavation. Pavement typically missing.

Robust BMPs. Must include a large volume of storage, detention and sedimentation capacity around inlet due to high potential sediment loads. Most expensive phase of inlet maintenance and protection.

Depending on location, will consist of one of four types (although some devices may have incorporated combinations of the first 2 types):

1. High flow. Where ponding for turbid settlement creates a safety problem
2. High retention. Maximizes sediment capture by ponding, but need storage area around. Examples include concrete slurry controls.
3. Off-line. Remove all inlet openings as feasible and manage a few at the low point of drainage.
4. Open, but upgradient drainage is bypassed around exposed soil work area

The devices are much higher above grate or opening of Phase 1 to detain and settle sediment loads.








Phase 3 Partial stabilization of at least 70% of the area or drainage area to the inlet is not connected, or drains to the device

Simple BMPs comprising above grate devices that filter stormwater

Filtration pads

Textile grate wraps

3-dimension textile filters




Phase 4 Post Construction, minor work

Below grate inlet bags. Limited storage capacity, but safe for public use where sediment loads are low.

High flow types.

Primary function is to remove trash, reduce roadway flooding, easy to replace, remove, and monitor until upgradient contributing are is fully vegetated.



REVISION: VERSION 1, 02/12/25

DEVELOPED BY: Dwayne Stenlund

Office of Environmental Stewardship

DEPARTMENT OF TRANSPORTATION

ADDITIONAL INFORMATION
DWAYNE STENLUND 612-810-9409

EXPOSED SOIL MANAGEMENT TOOLBOX

INLET PHASING DURING CONSTRUCTION

INLET SERIES


Old/Original
How many functional protection types required?
New

Can Some Inlets Be Taken Off-line?
Are there some inlets that must be kept functional?

4. Managing Storm Water first, BMPs second

Focus on where water leaves

- We are not just learning, designing and constructing for today’s rain, we are learning, designing and constructing for tomorrow’s climate.
  - It will not be nicer.
  - It will not be cheaper.
  - We will not have more money.
  - We will not have more people.
  - But we can be more creative with what we have.