Large Scale Site Inspections (LSSI)

Department of Environmental Quality
Office of Training Services

1

Your Instructor

Nick Shrewsbury, DEQ OTS
Nicholaus.shrewsbury@deq.virginia.gov

Questions: certification@deq.virginia.gov

2

Ground Rules

- Silence your cell phones
- Ask questions, engage with groups
- Groups of five people, please
- Speak and share your thoughts
- Be supportive of all participants
  - ***Let's do a quick intro roundtable!***

3

Continuing Education Courses
https://www.deq.virginia.gov/our-programs/training-certification/continuing-education

Large Scale Construction Site Inspections (Full - Fredericksburg)	04/07/2025 8:30 AM - 4:30 PM
Refresher for Inspectors (Full - Fairfax)	05/28/2025 8:30 AM - 4:30 PM
Regulatory SWPPP Inspections (Fairfax)	05/29/2025 8:30 AM - 4:30 PM
Large Scale Construction Site Inspections (Wytheville)	06/18/2025 8:30 AM - 4:30 PM
Using the Virginia Stormwater Management Handbook (Hampton)	07/09/2025 8:30 AM - 4:30 PM
Using the Virginia Stormwater Management Handbook (Richmond)	08/13/2025 8:30 AM - 4:30 PM
Large Scale Construction Site Inspections (Chesapeake)	09/09/2025 8:30 AM - 4:30 PM

4

The purpose of this class

Six contact hours are given for completing this course. Hours earned may be applied to ESC/SWM/Dual Inspector recertification. No partial credit is given

5

Course Sections

1. Inspection Preparation
2. SWPPP Overview Part I
3. Critical Plan Reading Skills for Large Sites
   - Plan Reading Activity
4. SWPPP Overview Part II
5. Documenting "Site Walk" Observations
   - Site Walk Activity

6

Agenda

- **Morning: Intro and Preparing for Inspections**
- *Break: 10am*
- **Mid-morning: Comparing "typical" inspections to LSSI**
- *Lunch: 12pm*
- **After lunch: Reviewing frequently changing SWPPP documentation and plans for LSSI**
- *Break: 2:30pm*
- **Afternoon: Site walk and field observations**

7

Learning Objectives

- Being prepared for LSSI before leaving the office
- Understanding how SWPPPs differ on large sites
- Familiarizing yourself with large ESC/SWM plans and tactics for directing field inspections
- Determine priority inspection areas through all phases of construction
- Understanding the process from ESC measures to SWM control installations

8

Large Scale Site Inspection – Section 1

Inspection Preparation

9

What is a Large Scale Construction Site?

- **100+ acres sites**
  - Solar Farms
  - Data Centers
  - Distribution Centers
  - Large Subdivisions
  - Other examples?

10

What's the difference?

1 acre= 43,560 sq. feet

250 acres= 10,890,000 sq. feet

11

What's the difference?

1 acre= 43,560 sq. feet

12

What's the difference?

- So, what do you guys think?

13

What's the difference?

- So, what do you guys think?

LARGER vs "TRADITIONAL" SITES

- Rising Complexity
- Increased Risk/Hazards
- More SWPPP Documentation
- Longer Timeframes
- Requires Detailed Sequencing/Phasing
- Inspectors MUST be organized

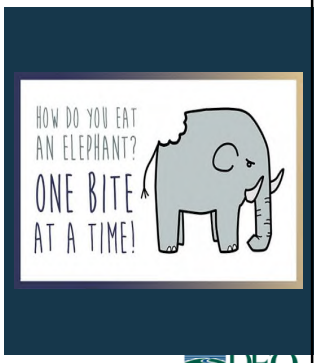
14

Preparing for the Inspection

Larger sites take longer to inspect

Preparation is ***critical!***

- *Try not to get overwhelmed*



15

Preparing for the Inspection

The ***Who***, ***What***, ***Where***, ***Why***, and ***How***???

16

Preparing for the Inspection

- ***Who***:
  - Is the Operator/permittee?
  - Are the Duly Authorized Representatives?
  - Are the Qualified Personnel inspecting the site?
  - Is your site contact person?
  - Will be part of the inspection?

17

Preparing for the Inspection

- ***What***:
  - Is the size/nature of the project?
  - Are the entry/safety protocols?
  - Equipment is needed?
  - Are previous or ongoing issues?
  - Can reasonably be accomplished (*ultimate goal*)?

18

Preparing for the Inspection

- ***Where***:
  - Are the site points of ingress/egress?
  - Is the meeting area (if applicable)?
  - Emergency information?
  - Is site documentation?
  - Are sensitive areas?
  - Are all stormwater discharge points?

19

Preparing for the Inspection

- ***Why***:
  - Is there a need for team effort?
  - Would some areas be prioritized?
  - Is documentation *MORE* critical on LSSIs?
  - Is communication between parties is essential?
  - Do we need to keep practical LSSI in perspective?

20

Preparing for the Inspection

- ***How***:
  - To manage inspection time efficiently?
  - To determine inspection priorities?
  - Will issues be documented and addressed?
  - Can dialog between parties be facilitated?
  - Will compliance best achieved?

21

Final Preparation

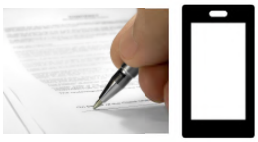
Do you have the proper PPE?

- Hard Hat
- Safety Glasses
- Hi-Vis Vest
- Gloves
- "These boots were made for walking"…but are they?
- Insect Repellant, Sunscreen
- Site/Company specific reqs. (steel vs composite-toe boots, FR material, safety debriefs)

22

But Wait There's More

- Notebook, Pens, Pencils
- Camera/Phone Fully Charged and Staying Charged
- Weather Considerations (hot, cold, rain, etc.)?
  - Phone Overheating (Summer)
  - Layered Clothing (Winter)
  - Waterproof Equipment (Rain)
- Travel Time to/from Project
- Hydrate, Hydrate, Hydrate



23

Wait…..WHERE AGAIN?

- ***Where***:
  - ***PLAN*** YOUR INSPECTION!!
    - What's the route?
    - ESC measures
    - Sensitive areas
    - Discharge points
    - Disturbed areas
    - Others? Meeting points, SWPPP, etc.
  - Take the TIME to prep!

24

Questions?

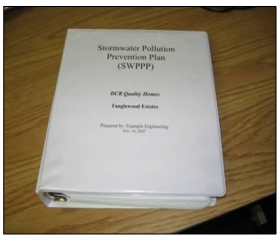
25

Large Scale Site Inspection – Section 2

SWPPP Overview

26

SWPPP Overview Part I



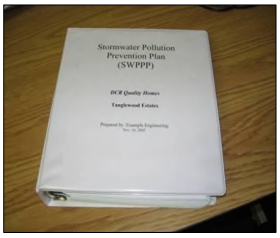
27

SWPPP Documentation

1. General information	2. Approved ESC plan	3. Approved SWM plan
4. P2 plan	5. Impaired waters, or sediment/nutrient TMDL, + Exceptional	6. PCB impaired waters and TMDL requirements
7. Turbidity Monitoring Requirements	8. Qualified personnel	9. Duly Authorized Representative
10. SWPPP signature	11. SWPPP inspection records	12. Amendments, Modifications, & Updates

28

SWPPP Overview



29

SWPPP Documentation - *Static*

1. General information	2. Approved ESC plan	3. Approved SWM plan
4. P2 plan	5. Impaired waters, or sediment/nutrient TMDL, + Exceptional	6. PCB impaired waters and TMDL requirements
7. Turbidity Monitoring Requirements	8. Qualified personnel	9. Duly Authorized Representative
10. SWPPP signature	11. SWPPP inspection records	12. Amendments, Modifications, & Updates

30

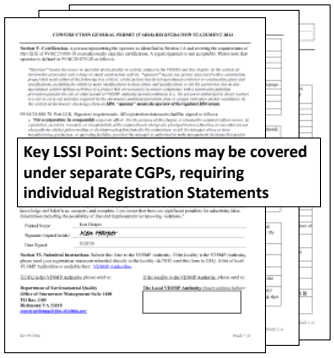
SWPPP Documentation - *Static*

- 1. General information
- 1a. Registration Statement
- 1b. Copy of Notice of Coverage
- 1c. Copy of the Construction General Permit
- 1d. Project Narrative
- 1e. Legible Site Plan

31

SWPPP Documentation - *Static*

- 1. General information
- 1a. Registration Statement

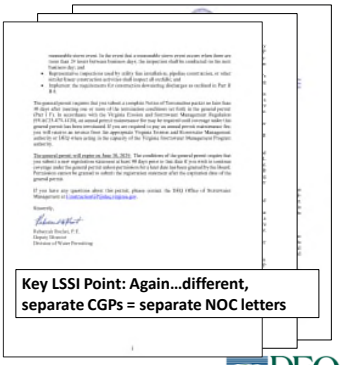


Key LSSI Point: Sections may be covered under separate CGPs, requiring individual Registration Statements

32

SWPPP Documentation - *Static*

- 1. General information
- 1b. Copy of Notice of Coverage



Key LSSI Point: Again…different, separate CGPs = separate NOC letters

33

SWPPP Documentation - *Static*

- 1. General information
- 1c. Copy of the Construction General Permit

34

SWPPP Documentation - *Static*

- 1. General information
- 1d. Project Narrative

1 Project Description

T & L Commercial Development is proposing to develop a 6.7 acre vacant lot. The lot is located in Small County at 1111 Landry Lane. The project includes the construction of one 20,000 SF office building. Two travel lanes connect two separate parking lots, one on either side of the office building to Landry Lane. An employee picnic area is located at the rear of the office building and connected to the western parking lot. The McGuffeson Pedestrian plaza and outdoor walkways connect various entrances to the building and parking lots. The parking lots provide a total of 70 parking spaces. The total traffic average daily trips to the site is estimated to be 100.

The office park is intended to meet the needs of a functioning business while also offering places for employees to enjoy the outdoors. Providing the patio area adjacent to an open turf area and meadow allow for a more aesthetically open and natural place for employees to escape the office if only for a few minutes. The site is zoned B-2 and the development is a by-right development with no special provisions or waivers. The adjacent properties to the east, north, and west are all vacant and forested.

35

SWPPP Documentation - *Static*

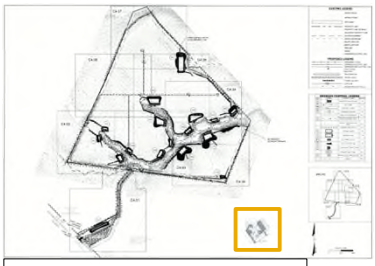
- 1. General information
- 1e. Legible Site Plan

36

SWPPP Documentation - *Static*

1. General information

1e. Legible Site Plan



Key LSSI Point: Clearly, a LOT more updates to handle when keeping a site plan "legible"

37

SWPPP Documentation - *Static*

1. General information

1e. Legible Site Plan

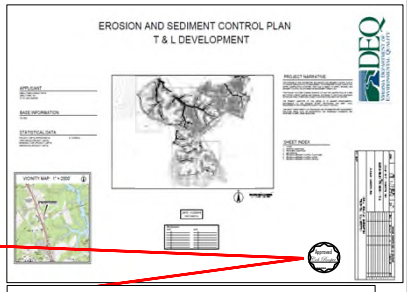
Key LSSI Point: Size increases = EVEN MORE! updates to handle when keeping a site plan "legible"

38

SWPPP Documentation - *Static*

2. Approved ESC plan

Approved

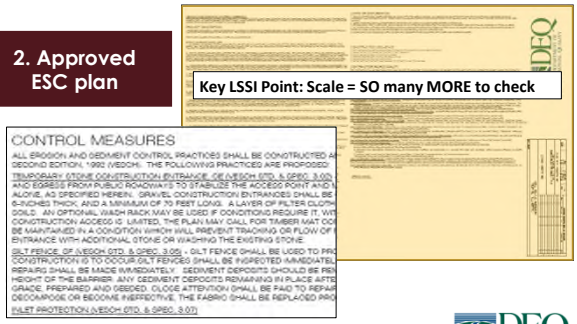


Key LSSI Point: Are there modifications to the approved plan? Potentially many, all over the site

39

SWPPP Documentation - *Static*

2. Approved ESC plan

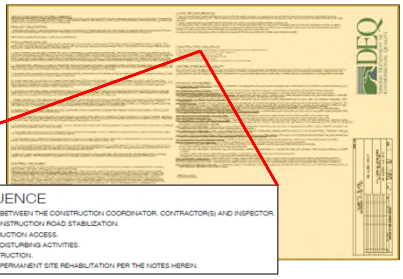


Key LSSI Point: Scale = SO many MORE to check

40

SWPPP Documentation - *Static*

2. Approved ESC plan

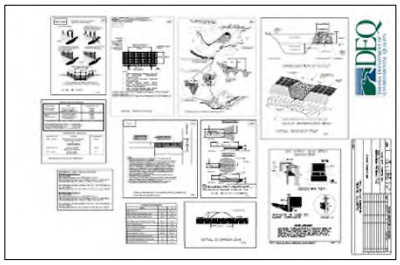


Key LSSI Point: What is the proper *phasing* for a large site?

42

SWPPP Documentation - *Static*

2. Approved ESC plan



Key Point: What temporary ESC measures are going to be installed? How to install them?

- LSSI: And where??

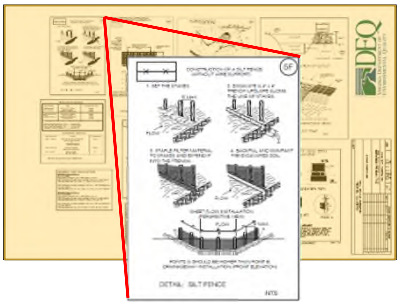
43

SWPPP Documentation - *Static*

2. Approved ESC plan

****Example –**
Silt Fence

- **LSSI: Is *every* ESC measure detailed here?**



LSSI | Section 2: SWPPP Overview Part 1

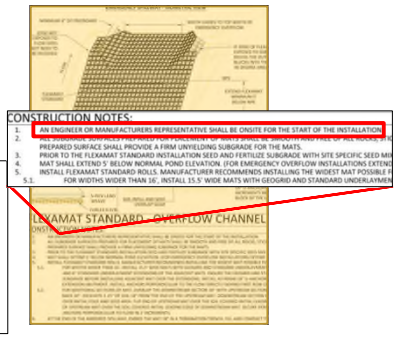
44

SWPPP Documentation - *Static*

2. Approved ESC plan

****Example –**
Silt Fence
Proprietary Measure

- **LSSI: Is *every* ESC measure detailed here?**
- **Any non-standard practices?**



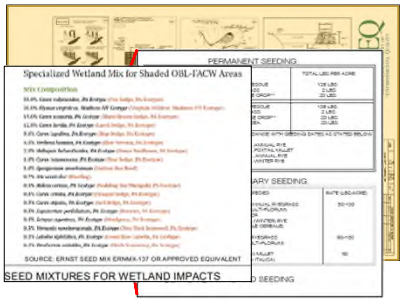
LSSI | Section 2: SWPPP Overview Part 1

45

SWPPP Documentation - *Static*

2. Approved ESC plan

LSSI Key Point: Very likely there are sensitive area impacts or adjacent to LDA?



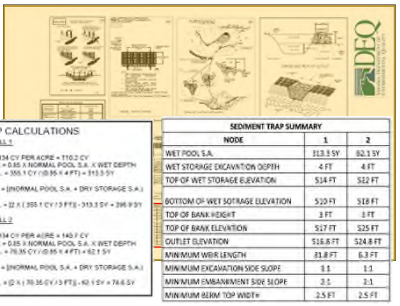
LSSI | Section 2: SWPPP Overview Part 1

46

SWPPP Documentation - *Static*

2. Approved ESC plan

LSSI Key Point: *MANY* more sediment traps/basins than smaller sites



LSSI | Section 2: SWPPP Overview Part 1

47

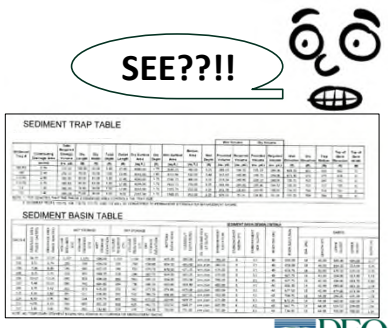
SWPPP Documentation - *Static*

2. Approved ESC plan

LSSI Key Point: *MANY* more sediment traps/basins than smaller sites

120 acres

- ***6 Traps***
- ***11 Basins***



LSSI | Section 2: SWPPP Overview Part 1

48

SWPPP Docu - *Static*

2. Approved ESC plan

LSSI Key Point: *MANY* more sediment traps/basins than smaller sites

440 acres

- ***88!! Sediment Basins***

SEE?? !!!!!!!

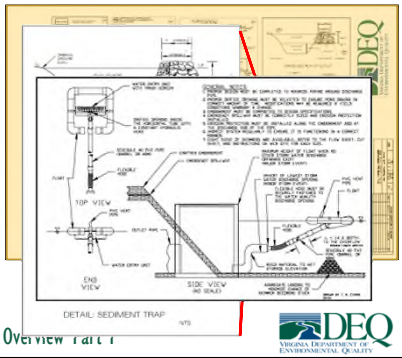
LSSI | Section 2: SWPPP Overvi

49

SWPPP Documentation - *Static*

2. Approved ESC plan

LSSI Key Point:
All **outfalls/outlet protections should be designed and sized specific to each control measure discharge (ST/SB/pipe/swale)**



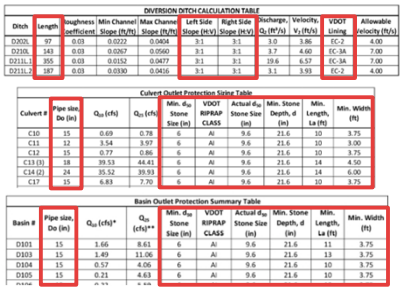
50

SWPPP Documentation - *Static*

***Info for inspectors**

2. Approved ESC plan

LSSI Key Point:
All **outfalls/outlet protections should be designed and sized specific to each control measure discharge (ST/SB/pipe/swale)**



DIVERSION DITCH CALCULATION TABLE

Ditch	Length	Roughness Coefficient	Min Channel Slope (ft/ft)	Max Channel Slope (ft/ft)	Left Side Slope (H:V)	Right Side Slope (H:V)	Discharge, Q_d (ft³/s)	Velocity, V_d (ft/s)	VDOT Lining	Allowable Velocity (ft/s)
D202L	97	0.03	0.0222	0.0404	3:1	3:1	3.0	3.86	EC-2	4.00
D210L	143	0.03	0.0267	0.0560	3:1	3:1	3.7	4.60	EC-3A	7.00
D211L.1	355	0.03	0.0152	0.0477	3:1	3:1	19.6	6.57	EC-3A	7.00
D211L.2	187	0.03	0.0330	0.0416	3:1	3:1	3.1	3.93	EC-2	4.00

Culvert Outlet Protection Sizing Table

Culvert #	Pipe size, Do (in)	Q_{do} (cfs)	Q_{D1} (cfs)	Min. d_{50} Stone Size (in)	VDOT RIPRAP CLASS	Actual d_{50} Stone Size (in)	Min. Stone Depth, d (in)	Min. Length, La (ft)	Min. Width (ft)
C10	15	0.69	0.78	6	AI	9.6	21.6	10	3.75
C11	12	3.54	3.97	6	AI	9.6	21.6	10	3.00
C12	15	0.77	0.86	6	AI	9.6	21.6	10	3.75
C13 (3)	18	39.53	44.41	6	AI	9.6	21.6	14	4.50
C14 (2)	24	35.52	39.93	6	AI	9.6	21.6	14	6.00
C17	15	6.83	7.70	6	AI	9.6	21.6	10	3.75

Basin Outlet Protection Summary Table

Basin #	Pipe size, Do (in)	Q_{do} (cfs)*	Q_{D1} (cfs)**	Min. d_{50} Stone Size (in)	VDOT RIPRAP CLASS	Actual d_{50} Stone Size (in)	Min. Stone Depth, d (in)	Min. Length, La (ft)	Min. Width (ft)
D101	15	1.66	8.61	6	AI	9.6	21.6	11	3.75
D103	15	1.49	11.06	6	AI	9.6	21.6	13	3.75
D104	15	0.57	4.06	6	AI	9.6	21.6	10	3.75
D105	15	0.21	4.63	6	AI	9.6	21.6	10	3.75

51

SWPPP Documentation - *Static*

2. Approved ESC plan

Once you understand;
- ***What*** **ESC measures are being used and;**
- ***How*** **they need to be installed…..**

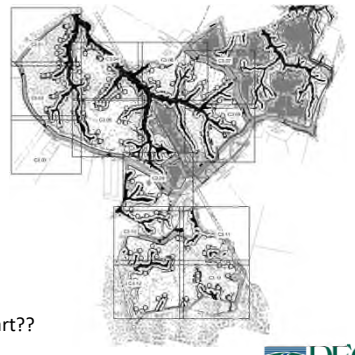
52

SWPPP Documentation - *Static*

2. Approved ESC plan

WHERE ARE THEY?!

…and ***Where*** to start??

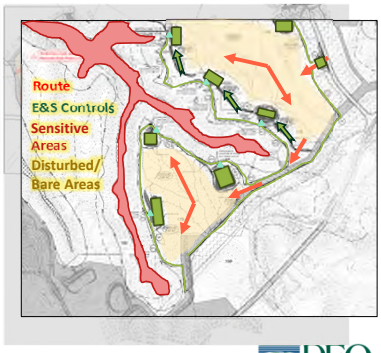


53

SWPPP Documentation - *Static*

2. Approved ESC plan

Preparation and Planning:
- Must understand the overall layout
- But…we have to dig deeper for section information

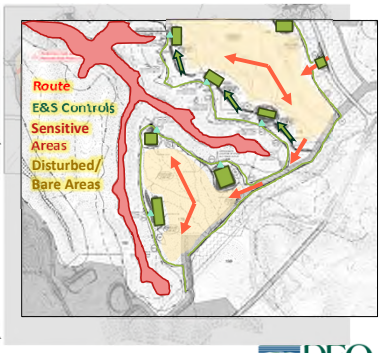


54

SWPPP Documentation - *Static*

2. Approved ESC plan

LSSI Key Point:
- **What ESC measures have(not) been installed?**
- **Co-located/Conversion to SWM facilities**
- **Hotspots – add. controls**
- **ESC no longer needed**
- **Disturbed or Active Work Areas across the project**

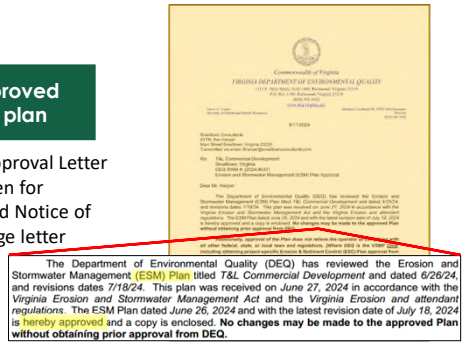


55

SWPPP Documentation - *Static*

3. Approved SWM plan

- Plan Approval Letter
- Mistaken for required Notice of Coverage letter



The Department of Environmental Quality (DEQ) has reviewed the Erosion and Stormwater Management (ESM) Plan titled *T&L Commercial Development* and dated *6/26/24*, and revisions dates *7/18/24*. This plan was received on *June 27, 2024* in accordance with the *Virginia Erosion and Stormwater Management Act* and the *Virginia Erosion and attendant regulations*. The ESM Plan dated *June 26, 2024* and with the latest revision date of *July 18, 2024* is hereby approved and a copy is enclosed. **No changes may be made to the approved Plan without obtaining prior approval from DEQ.**

56

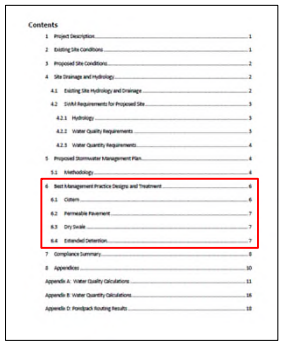
SWPPP Documentation - *Static*

3. Approved SWM plan

- Table of Contents

Key Point: Where are the permanent stormwater BMPs?

- **LSSI: Again….MANY more**



Contents

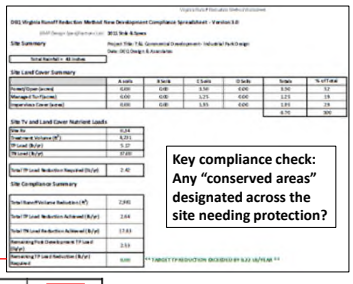
1 Project Description 1
2 Existing Site Conditions 1
3 Proposed Site Conditions 2
4 Site Drainage and Hydrology 2
4.1 Existing Site Hydrology and Drainage 2
4.2 SWM Requirements for Proposed Site 3
4.2.1 Hydrology 3
4.2.2 Water Quality Requirements 3
4.2.3 Water Quantity Requirements 4
5 Proposed Stormwater Management Plan 4
5.1 Methodology 4
6 Best Management Practice Designs and Treatment 6
6.1 Cistern 6
6.2 Permeable Pavement 7
6.3 Dry Swale 7
6.4 Extended Detention 7
7 Compliance Summary 8
8 Appendices 10
Appendix A: Water Quality Calculations 11
Appendix B: Water Quantity Calculations 16
Appendix D: Pondpack Routing Results 18

57

SWPPP Documentation - *Static*

3. Approved SWM plan

- Water Quality Compliance
  - VRRM



Key compliance check: Any "conserved areas" designated across the site needing protection?

Remaining TP Load Reduction (lb/yr) Required	0.00

** TARGET TP REDUCTION EXCEEDED BY 0.22 LB/YEAR **

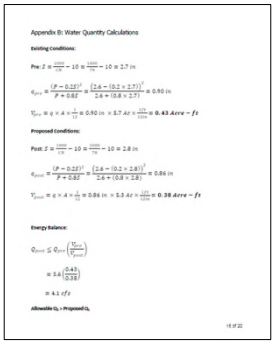
58

SWPPP Documentation - *Static*

3. Approved SWM plan

- Water Quantity Compliance
  - Calculations

Key compliance check:
- **Channel Protection**
- **Flood Protection**
- **Sheet Flow**



Appendix B: Water Quantity Calculations

Existing Conditions:

Pre: $I = \frac{1000}{CN} - 10 = \frac{1000}{74} - 10 = 2.7$ in

$Q_{pre} = \frac{(P - 0.2I)^2}{P + 0.8I} = \frac{(2.6 - (0.2 \times 2.7))^2}{2.6 + (0.8 \times 2.7)} = 0.90$ in

$V_{pre} = Q \times A \times \frac{1}{12} = 0.90\ in \times 5.7\ Ac \times \frac{1}{12} = 0.43\ Acre-ft$

Proposed Conditions:

Post: $I = \frac{1000}{CN} - 10 = \frac{1000}{74} - 10 = 2.8$ in

$Q_{post} = \frac{(P - 0.2I)^2}{P + 0.8I} = \frac{(2.6 - (0.2 \times 2.8))^2}{2.6 + (0.8 \times 2.8)} = 0.86$ in

$V_{post} = Q \times A \times \frac{1}{12} = 0.86\ in \times 5.7\ Ac \times \frac{1}{12} = 0.38\ Acre-ft$

Energy Balance:

$Q_{allow} \leq Q_{pre}\left(\frac{V_{pre}}{V_{post}}\right)$

$= 5.6\left(\frac{0.43}{0.38}\right)$

$= 4.1\ cfs$

Allowable Q_2 = Proposed Q_2

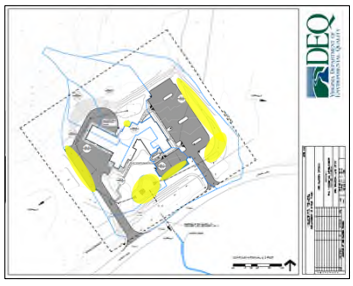
59

SWPPP Documentation - *Static*

3. Approved SWM plan

- Stormwater BMP Locations

6 Best Management Practice Designs and Treatment
6.1 Cistern
6.2 Permeable Pavement
6.3 Dry Swale
6.4 Extended Detention



60

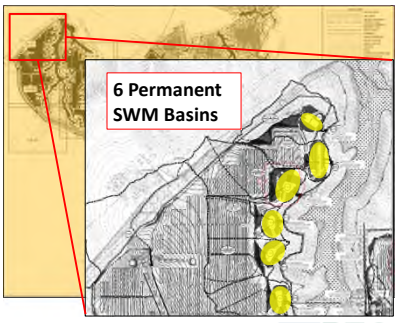
SWPPP Documentation - *Static*

3. Approved SWM plan

- Stormwater BMP Locations

How are ***Large Sites*** any different?

> 400 acres



61

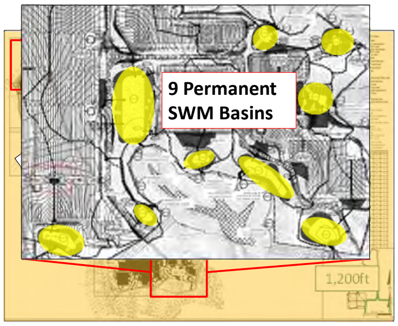
SWPPP Documentation - *Static*

3. Approved SWM plan

- Stormwater BMP Locations

How are ***Large Sites*** any different?

> 400 acres



LSSI | Section 2: SWPPP Overview Part I

62

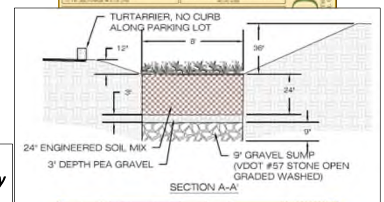
SWPPP Documentation - *Static*

3. Approved SWM plan

- Stormwater BMP Details

Key inspection check: How is this thing going to *actually be built*?

- **LSSI: Ensure *EVERY* BMP is following the plan or changes are documented**



LSSI | Section 2: SWPPP Overview Part I

63

SWPPP Documentation - *Static*

3. Approved SWM plan

- Stormwater BMP Details

- **ESC to SWM BMP conversion notes**
- **Permanent P-BMP information**

SEDIMENT BASIN TO PERMANENT DETENTION BASIN SEQUENCE

1. DEWATER BASINS AND MUCK OUT SILT. DEWATERING OF THE BASINS SHALL BE DONE IN A NON-ERODIBLE MANNER WITH THE USE OF A DIRT BAG (OR EQUIVALENT).
2. BRING BOTTOM OF BASIN TO PERMANENT GRADE (IF NECESSARY).
3. CORE THE PERMANENT ORIFICES AND INSTALL ORIFICE TRASH RACKS.
4. REMOVE THE TEMPORARY DEWATERING DEVICES FROM THE RISERS AND PLUG UP THE ORIFICES.
5. REMOVE TEMPORARY ANTI-VORTEX DEVICES AND INSTALL PERMANENT TRASH RACKS.
6. APPLY PERMANENT SEEDING TO ALL DISTURBED AND/OR PREVIOUSLY INUNDATED AREAS.
7. BASIN CONVERSIONS SHALL BE CERTIFIED BY A PROFESSIONAL ENGINEER BEFORE THE GENERAL CONSTRUCTION PERMIT IS TERMINATED.

SEDIMENT TRAP TO PERMANENT DETENTION BASIN SEQUENCE

1. DEWATER BASINS AND MUCK OUT SILT. DEWATERING OF THE BASINS SHALL BE DONE IN A NON-ERODIBLE MANNER WITH THE USE OF A DIRT BAG (OR EQUIVALENT).
2. BRING BOTTOM OF BASIN TO PERMANENT GRADE (IF NECESSARY).
3. REMOVE TEMPORARY PLATE ON PIPE AND INSTALL PERMANENT RISER.
4. REMOVE STONE OUTLET AND INSTALL PERMANENT EMERGENCY SPILLWAY.
5. APPLY PERMANENT SEEDING TO ALL DISTURBED AND/OR PREVIOUSLY INUNDATED AREAS.
6. BASIN CONVERSIONS SHALL BE CERTIFIED BY A PROFESSIONAL ENGINEER BEFORE THE GENERAL CONSTRUCTION PERMIT IS TERMINATED.

PERMANENT BASIN/RISER DESIGN TABLE

PERMANENT BASIN DESIGN DATA

SWM BASIN #	TYPE	Northing	Easting	BOTTOM ELEV.	ORIFICE DIAMETER (IN.)	RISER TOP ELEV.	EMERGENCY SPILLWAY ELEV.	EMERGENCY SPILLWAY WIDTH (FT.)	TOP OF EMBANKMENT ELEV	1-YR WSE	10-YR WSE	100-YR WSE
101	DETENTION BASIN	3644121.75	11405776.31	695.00	2	698.00	699.00	10	701.00	696.07	698.07	699.56
102	DETENTION BASIN	3643379.56	11406589.52	654.50	2	658.00	659.25	10	660.50	655.36	658.01	658.48
103	DETENTION BASIN	3643260.15	11406326.34	656.00	2	N/A	659.25	10	662.00	656.84	659.30	659.86

LSSI | Section 2: SWPPP Overview Part I

64

SWPPP Documentation - *Static*

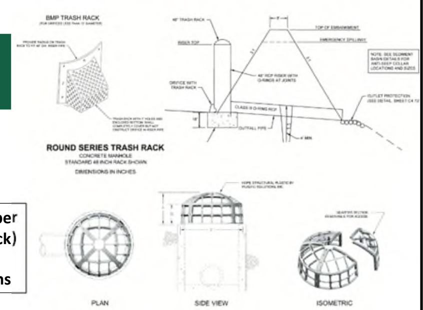
PERMANENT BASIN/RISER TYPICAL DETAIL

3. Approved SWM plan

- Stormwater BMP Details

All BMPs are converted per the SWM Plan (field check)

- **Proper materials**
- **Watertight connections**



LSSI | Section 2: SWPPP Overview Part I

65

SWPPP Documentation - *Static*

3. Approved SWM plan

- Stormwater BMP Details

Additional Considerations:

- **Other storm pipe installation**

STORM PIPE TABLE

PIPE #	DIA	FROM - TO	UPSTREAM INVERT	DOWNSTREAM INVERT	SLOPE	LENGTH	DESCRIPTION
D101C-2	24"	D101C-1 - D101C-3	122.20	120.50	2.00%	85.00 LF	24 inch RCP
D103A-2	18"	D103A-1 - D103A-3	109.59	108.51	2.00%	54.00 LF	18" RCP
D104A-2	12"	D104A-1 - D104A-3	113.77	112.99	2.00%	39.00 LF	12" RCP
D105A-2	12"	D105A-1 - D105A-3	119.57	118.75	2.00%	41.00 LF	12" RCP

LSSI | Section 2: SWPPP Overview Part I

66

SWPPP Documentation - *Static*

3. Approved SWM plan

- Stormwater BMP Details

Additional Considerations:

- **Other storm pipe installation**

STORM PIPE TABLE

PIPE #	DIA	FROM - TO	UPSTREAM INVERT	DOWNSTREAM INVERT	SLOPE	LENGTH	DESCRIPTION
D101C-2	24"	D101C-1 - D101C-3	122.20	120.50	2.00%	85.00 LF	24 inch RCP
D103A-2	18"	D103A-1 - D103A-3	109.59	108.51	2.00%	54.00 LF	18" RCP
D104A-2	12"	D104A-1 - D104A-3	113.77	112.99	2.00%	39.00 LF	12" RCP
D105A-2	12"	D105A-1 - D105A-3	119.57	118.75	2.00%	41.00 LF	12" RCP

Got pipes.....what else do we NEED to see??

Basin Outlet Protection Summary Table

Basin #	Pipe size, Do (in)	Q_{10} (cfs)*	Q_{10} (cfs)**	Min. d_{50} Stone Size (in)	VDOT RIPRAP CLASS	Actual d_{50} Stone Size (in)	Min. Stone Depth, d (in)	Min. Length, La (ft)	Min. Width (ft)
D101	15	1.66	8.61	6	AI	9.6	21.6	11	3.75
D103	15	1.49	11.06	6	AI	9.6	21.6	13	3.75
D104	15	0.57	4.06	6	AI	9.6	21.6	10	3.75
D105	15	0.21	4.63	6	AI	9.6	21.6	10	3.75

LSSI | Section 2: SWPPP Overview Part I

67

SWPPP Documentation - *Static*

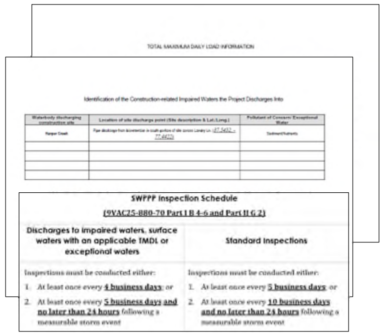
5. Impaired waters, TMDL + exceptional waters requirements

+

6. PCB impaired waters and TMDL requirements

LSSI key point: Could be discharging into multiple downstream systems

- **Are ANY waterways are identified in this section?**



LSSI | Section 2: SWPPP Overview Part I

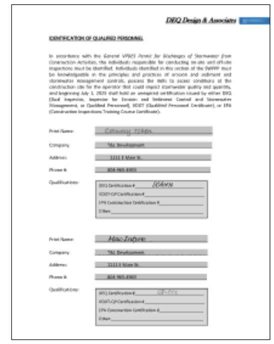
68

SWPPP Documentation - *Static*

8. Qualified personnel

Key inspection check: Who are the people doing SWPPP Inspections for the Operator?

- **LSSI: Could be MANY different people**



LSSI | Section 2: SWPPP Overview Part I

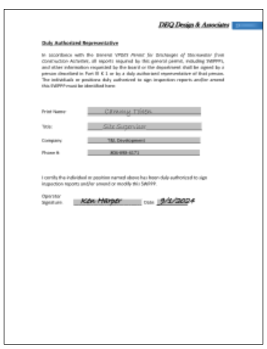
69

SWPPP Documentation - *Static*

9. Duly Authorized Representative

Key inspection check: Who can sign reports or update the SWPPP for the Operator?

- **LSSI: Again…could be MANY different people**



LSSI | Section 2: SWPPP Overview Part I

70

SWPPP Documentation - *Static*

10. SWPPP signature

Key inspection check: Is this the signed, official copy of the SWPPP?

- **LSSI: Many SWPPP copies could be floating around**

LSSI | Section 2: SWPPP Overview Part I

71

SWPPP Documentation - *Static*

1. General information

2. Approved ESC plan

3. Approved SWM plan

5. Impaired waters, or sediment/nutrient TMDL, + Exceptional

6. PCB impaired waters and TMDL requirements

8. Qualified personnel

9. Duly Authorized Representative

10. SWPPP signature

Questions???

LSSI | Section 2: SWPPP Overview Part I

72

ESC and SWM Plans

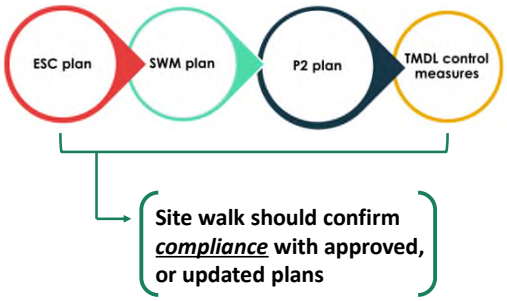
Section 3: What's the Plan??

Hands-on Activity –

Digging into an Erosion Control and Stormwater Management Plan

73

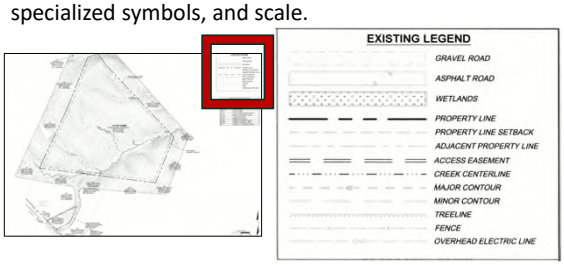
Overview



74

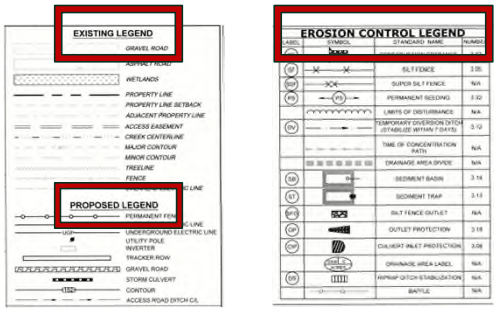
Plan Legend or Key

A small chart on the plan showing definitive line usage, specialized symbols, and scale.



75

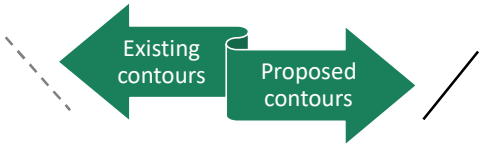
Existing, Proposed, Legend or Key



76

Reading Contour Lines

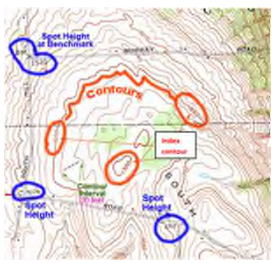
- Existing contours are usually shown as lighter gray or dashed lines
- Proposed contours are usually shown as solid black lines



77

Reading Contour Lines

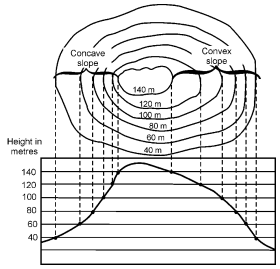
- Contour lines indicate the steepness of the terrain
- The closer the lines are together = steeper terrain
- Further apart means less steep



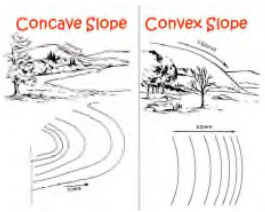
78

Slopes and Slope Calculations

Contour profiles



Concave vs. Convex



79

Calculating Slope Steepness

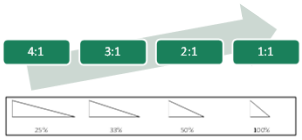
- Choose two points of interest
- Find the elevation change (rise)
  - Subtract the two points of interest
- Measure the slope length (run)
- Divide rise/run
- Multiply by 100

$$\frac{(125-110)}{40} \times 100 = 37.5\% \text{ slope}$$

80

Slopes and Angles

- Slope percentage divides the vertical distance by the horizontal distance, then multiplies by 100.
  - $\frac{1}{3} \times 100 = 33.3\%$ slope



81

Questions??

Plan Reading Basics

82

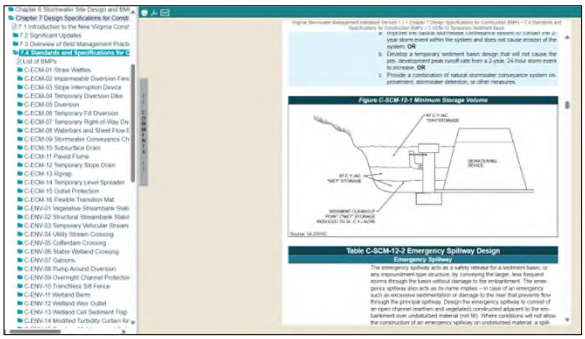
ESC Plan

Construction BMPs – VSMH Ch.7

- Structural practices
  - **C-ECM** – Erosion Control Measures
  - **C-ENV** – Environmentally Sensitive Area Protection
  - **C-PCM** – Perimeter Control Measures
  - **C-SCM** – Sediment Control Measures
    - For sediment control; *second* line of defense
- Vegetative practices
  - **C-SSM** – Surface Stabilization Measures
    - For erosion control, *first* line of defense

83

Construction BMPs – VSMH Ch.7



84

ESC Plan

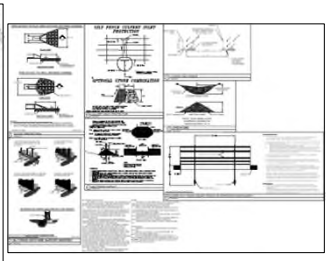
- What phase are they in?
  - Construction Sequence is critical!
- What measures are on the plan?
  - Proprietary Measures
- Where to start, and how to get where you need to go (*timing and route planning*)?
  - Entrances/roads, discharge points, sensitive areas
- Details, details, details

85

ESC Plan

Illustrative Construction Site Plan

ESC Notes and Details



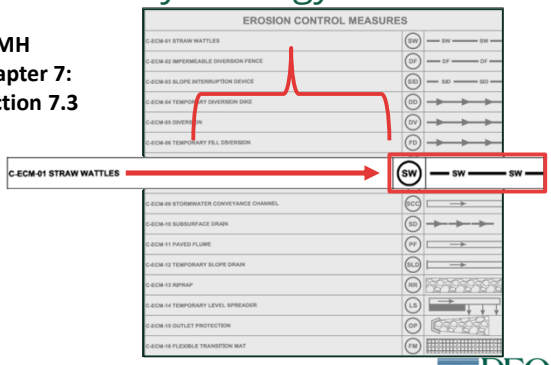
86

Common ESC measures - LSSI

87

ESC Plan Symbology – *C-ECMs*

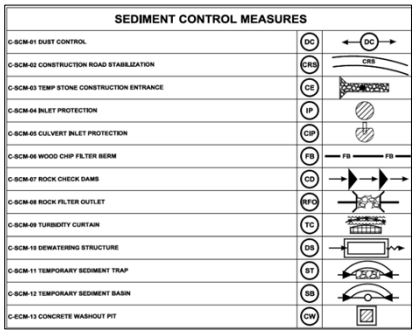
VSMH Chapter 7: Section 7.3



88

ESC Plan Symbology – *C-SCMs*

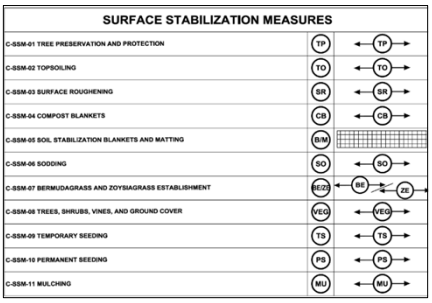
VSMH Chapter 7: Section 7.3



89

ESC Plan Symbology – *C-SSMs*

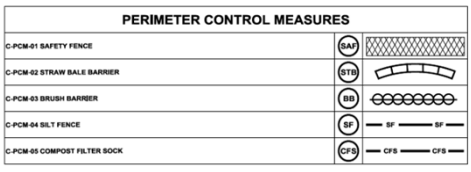
VSMH Chapter 7: Section 7.3



90

ESC Plan Symbology – *C-PCMs*

VSMH Chapter 7: Section 7.3



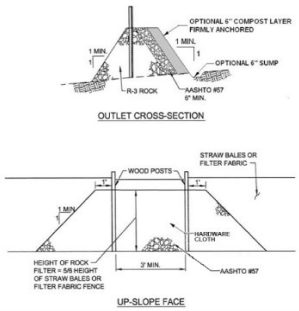
91

ESC Plan Symbology – *C-ENVs*

VSMH Chapter 7: Section 7.3

92

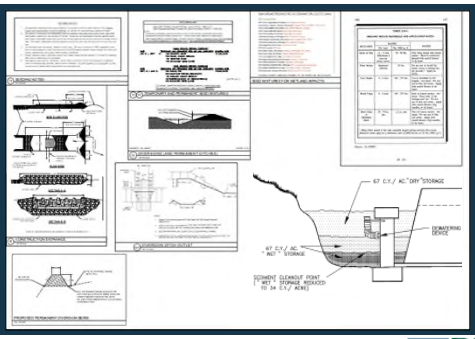
ESC Plan Considerations - Details



- Is there a detail for EVERY ESC measure?
- Is there sizing/dimensions, where required?
- Are there proprietary, or non-familiar practices?
- Does the field reflect the plan?

93

ESC Plan Considerations - Details



94

SWM Plan

Post Construction BMPs – VSMH Ch.8

- 17 Non-proprietary **P-BMPs**
  - **P-BAS – Basins**: Four (4) Measures
  - **P-CNV – Conveyances**: Four (4) Measures
  - **P-FIL – Filtration/Infiltration**: Nine (9) Measures
- Support Components
  - **P-SUP:** Six (6) Components
    - General information used across multiple P-BMPs

95

Post Construction BMPs – VSMH Ch.8

96

SWM Plan

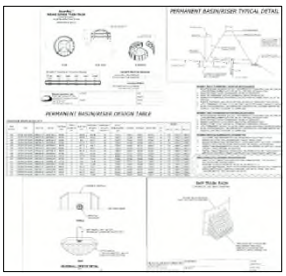
- Locations of post-construction BMPs
  - Co-located BMPs
- Phased section and BMP installation timing?
  - What sections are older, newer, closed, etc.?
- How are the permanent measures labeled?
  - Are P-BMPs being protected during construction/installation?
- Are there critical areas/hotspots on site?
  - P-BMPs near fueling areas, soil stockpiles, heavy-traffic
- Plan details for materials, sequencing, storage capacity, final stabilization

97

SWM Plan

Post Construction Site Plan

SWM Notes and Details



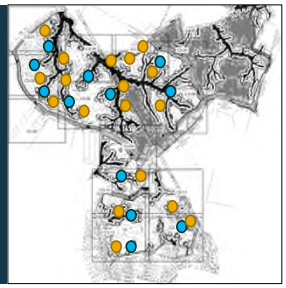
98

Common SWM P-BMPs - LSSI

99

Common SWM P-BMPs - LSSI

- Where are the P-BMPs that are getting converted?
  - What does conversion look like for EVERY P-BMP?
- Where are the sediment basins needing removal?



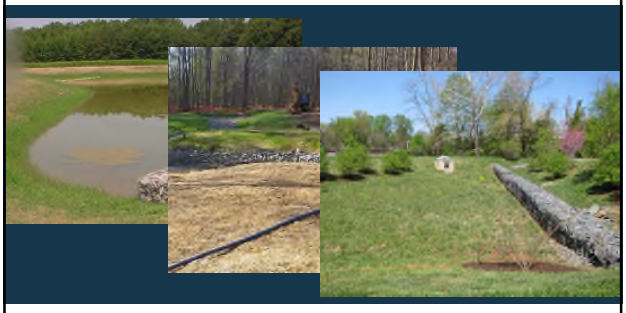
100

Questions for Conversion

- Does conversion need to happen now?
- Does CONVERSION need to happen NOW?
- DOES CONVERSION NEED TO HAPPEN NOW?
- What does conversion look like?
  - Following sequence, final grading, outlet protection design, additional materials, As-builts, etc.
- Who is responsible for maintenance on <u>installed SWM facilities</u> *during* and *after* construction?

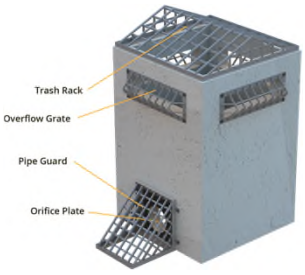
101

Converting ESC to SWM



102

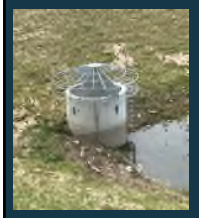
Converting ESC to SWM



103

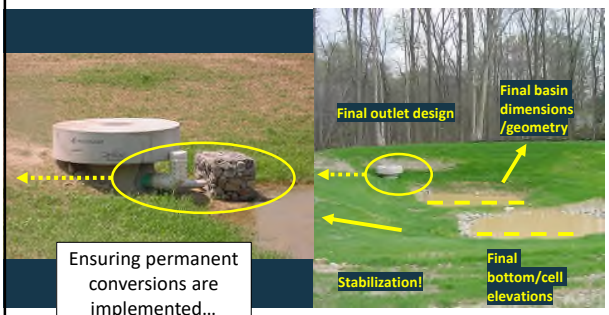
VSMH: 5.0 Design Criteria

- 3 types of spillways you may see detailed (*there are others*):

Drop Inlet Spillways (5.1)	Headwall/Conduit Spillways (5.2)	Weir Spillways (5.3)
		

104

Converting ESC to SWM



Ensuring permanent conversions are implemented…

105

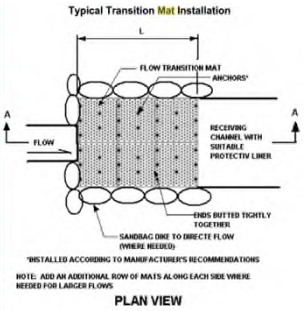
More Questions for Conversion

- Are co-located practices shown in the construction sequence?
- Check both ESC/SWM plans for conversion sequence or notes
- Do the construction sequence and conversion timing align?

106

SWM Plan Considerations – Details/Final As-builts

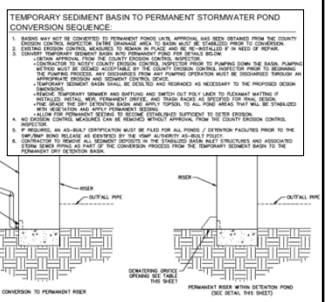
- Is there a detail/final As-built for EVERY SWM measure?
- Is there sizing/dimensions for permanent facility installations?
- Are there proprietary, or non-familiar practices?
  - Manufacturer's specifications/inspections
- Geotechnical information
- Documentation may be separate from SWM Plans



107

SWM Plan Considerations – Details/Final As-builts

Conversion Information:
Temporary to Permanent Stormwater Measures

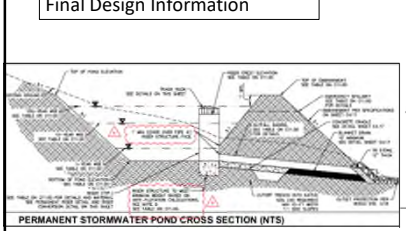


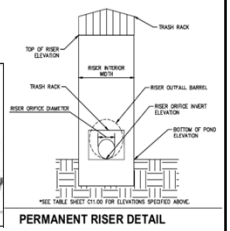
RISER CONVERSION FROM TEMP. SEDIMENT BASIN TO PERMANENT POND

108

SWM Plan Considerations – Details/Final As-builts

Permanent SWM Facilities:
Final Design Information


PERMANENT STORMWATER POND CROSS SECTION (NTS)

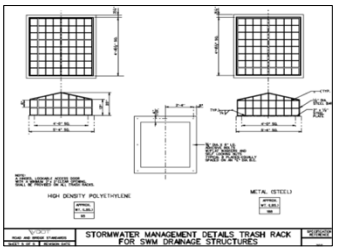


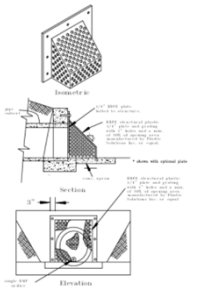
PERMANENT RISER DETAIL

109

SWM Plan Considerations – Details/Final As-builts

Permanent SWM Facilities:
Dimensions and Materials

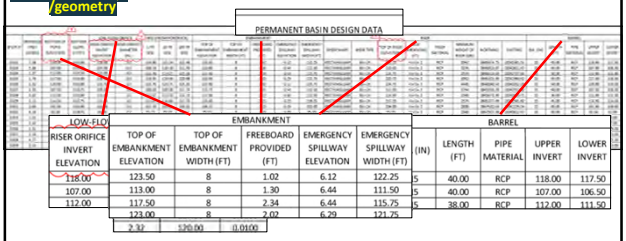




110

SWM Plan Considerations – Details/Final As-builts

Final basin dimensions/ geometry



111

SWM Plan Considerations – Details/Final As-builts

- Are long-term maintenance considerations/language included?
- Are conserved open space/maintenance easements/protected areas shown on the plan?
- Does the field reflect the plan? (Not a cut/paste maintenance page)

112

Site Plan Review Exercise

- Groups look for a set of information
- Document observations or issues
- What do you think the plan/site needs?
- Are there critical areas on site?
- About 15 minutes per plan review
- Some LSSI considerations?
- Things we've already discussed…

**All (C-) and (P-) BMPs shown that are not included in the VSMH are not endorsed for use by DEQ. Material is for training purposes ONLY.

113

ESC Plan	SWM Plan
• Construction sequence • What ESC measures? – Proprietary • ID route and inspection points – CEs, discharge points, sensitive areas, etc. • Check Notes and Details	• Locations of P-BMPs – Co-located practices? • Phasing of sections? • P-BMPs labeled? – Locations, ESC protection, pre-treatment? • Any hotspots near P-BMPs? • SWM Plan details – Dimensions, materials, plantings/vegetation – Maintenance language

114

Site Plan Review Exercise

15 minute timer!

- Inspection Routing
- ESC Measures – Adequate?
- Sensitive Areas
- Discharge Points
- ESC/SWM Plan Notes/Issues
- General Notes (Whatever!!)
  - Maintenance, Phasing, Hotspots, etc.

115

Site Plan Review Exercise

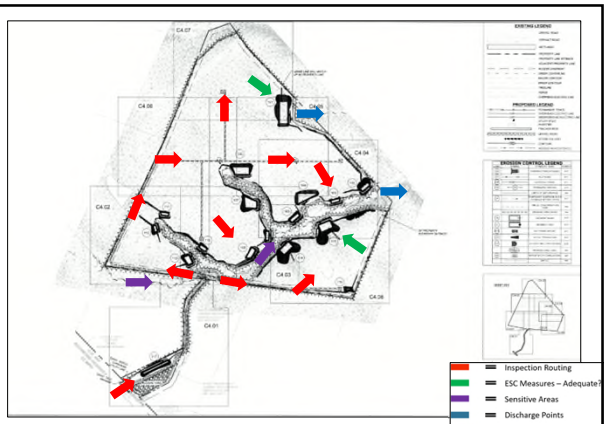
- Time to discuss what the group found!!



LSSI | ESM Plan Reading

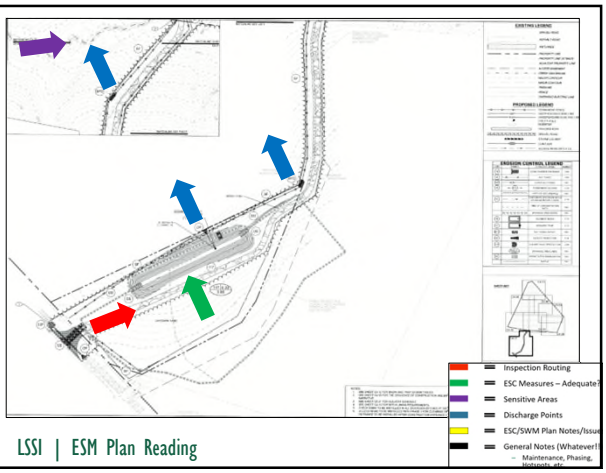
DEQ Virginia Department of Environmental Quality

116



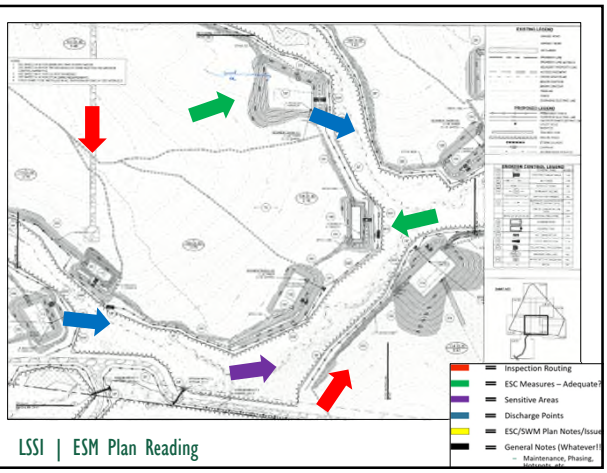
LSSI | ESM Plan Reading

117



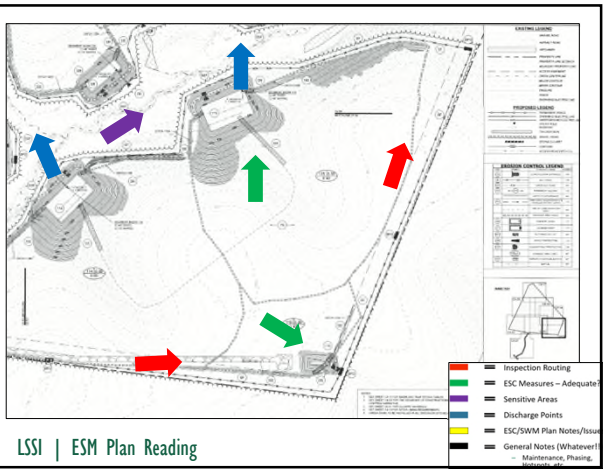
LSSI | ESM Plan Reading

118



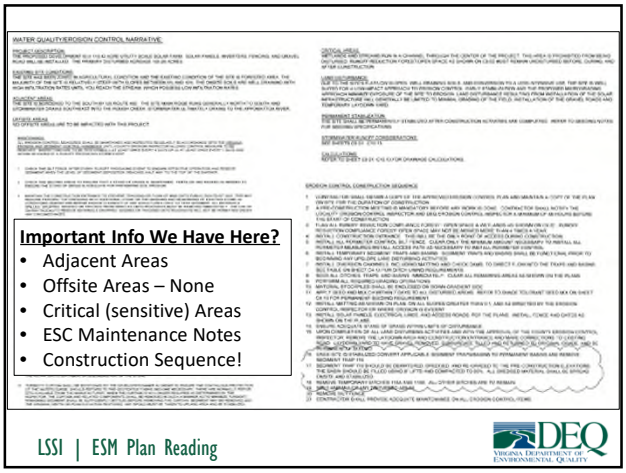
LSSI | ESM Plan Reading

119



LSSI | ESM Plan Reading

120



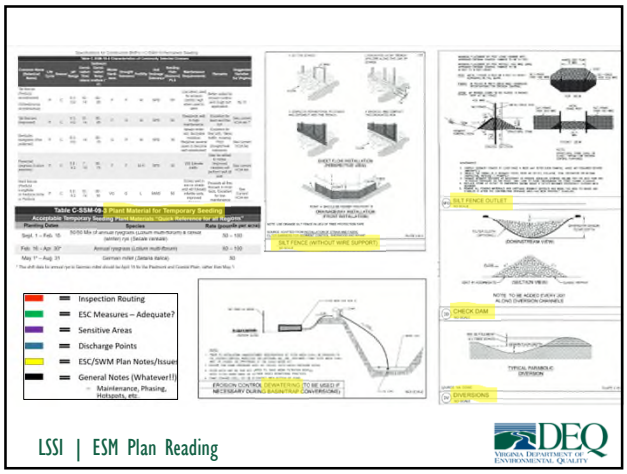
Important Info We Have Here?

- Adjacent Areas
- Offsite Areas – None
- Critical (sensitive) Areas
- ESC Maintenance Notes
- Construction Sequence!

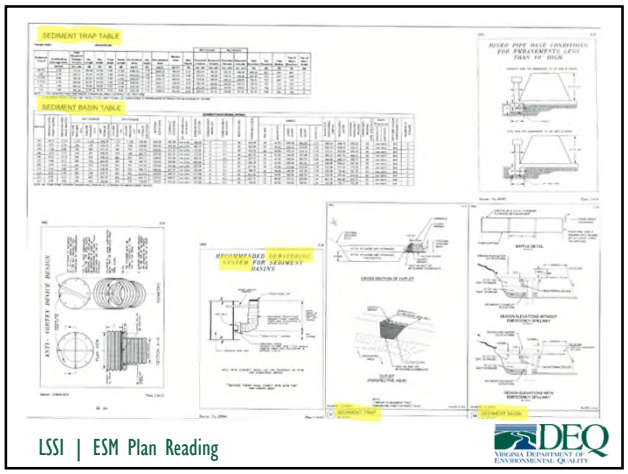
LSSI | ESM Plan Reading

DEQ Virginia Department of Environmental Quality

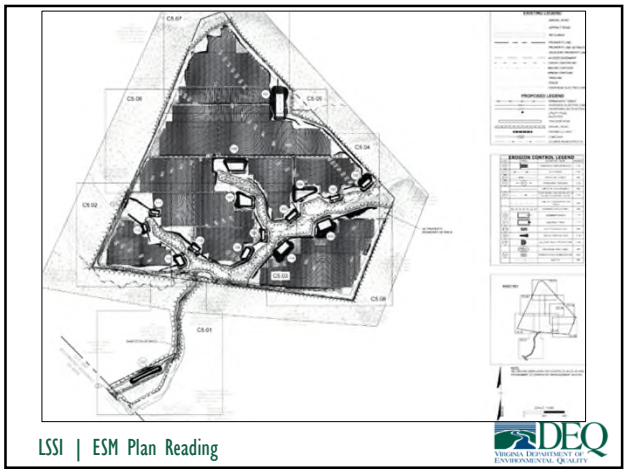
121



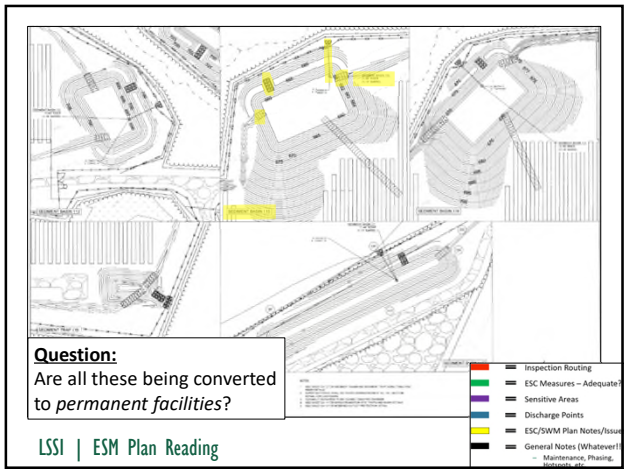
122



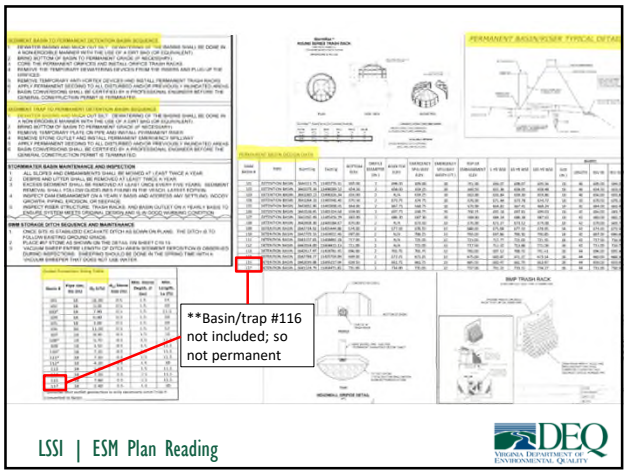
123



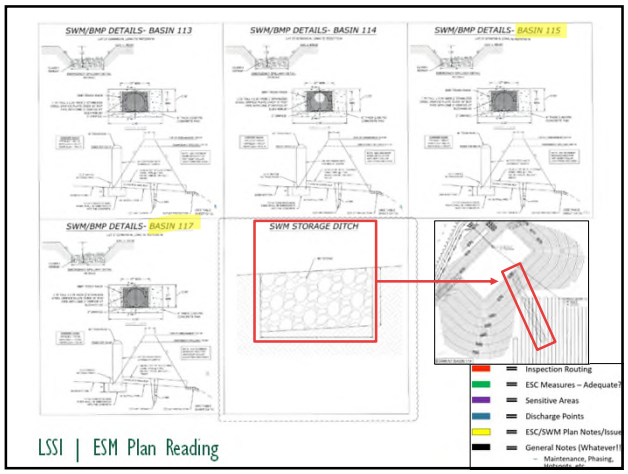
124



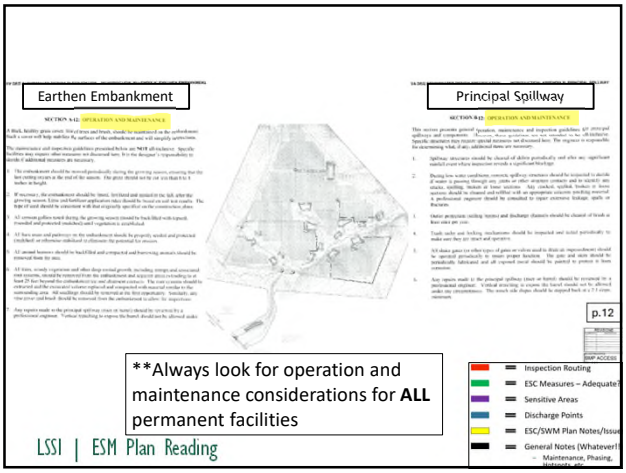
125



126



127

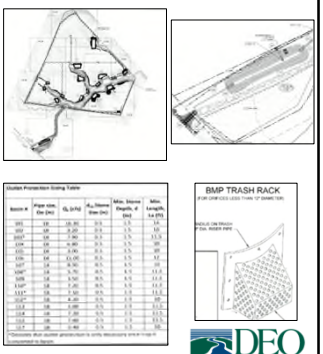


128

Site Plan Review Exercise

Takeaways (LSSI):

- Know what you're getting into before you get there
- Plan a "best" route
- *How* many ESC measures? And *Where*…
- Discharge points!!!!
- What NEEDS to be removed?
- Permanent measure info is **critical** to check!
- O&M considerations for *ongoing* inspections?



LSSI | ESM Plan Reading

129

SWPPP Review Activity – Part II
Active SWPPP Sections

LSSI | Section 4: SWPPP Overview Part II

130

SWPPP Documentation - ***Active***

1. General information	2. Approved ESC plan	3. Approved SWM plan
4. P2 plan	5. Impaired waters, or sediment/nutrient TMDL, + Exceptional	6. PCB impaired waters and TMDL requirements
7. Turbidity Monitoring Requirements	8. Qualified personnel	9. Duly Authorized Representative
10. SWPPP signature	11. SWPPP inspection records	12. Amendments, Modifications, & Updates

LSSI | Section 4: SWPPP Overview Part II

131

Quick Review: SWPPP *must* be updated

Question 1: How many days does the Qualified Personnel have to *include an inspection report* in the SWPPP once completed?

Question 2: How many days does the Operator (or Rep) have to *update* the SWPPP once a portion has changed or been modified?

Question 3: How many days does the Operator (or Rep) have to *complete* corrective actions or routine maintenance identified by a QP inspection?

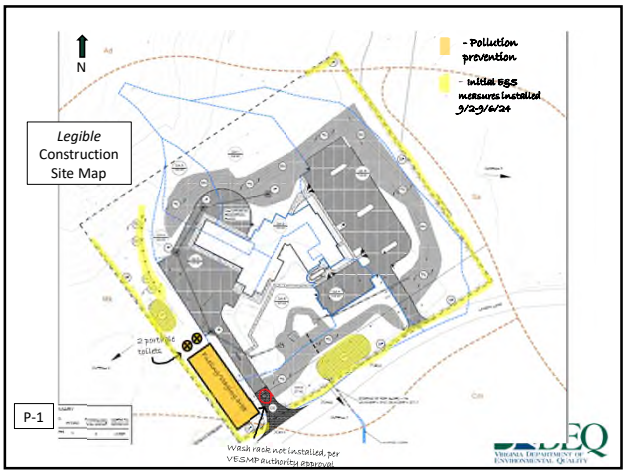
Timeframe Requirement

- A1: 4 business days
- A2: 5 business days*
- A3: 5 business days*

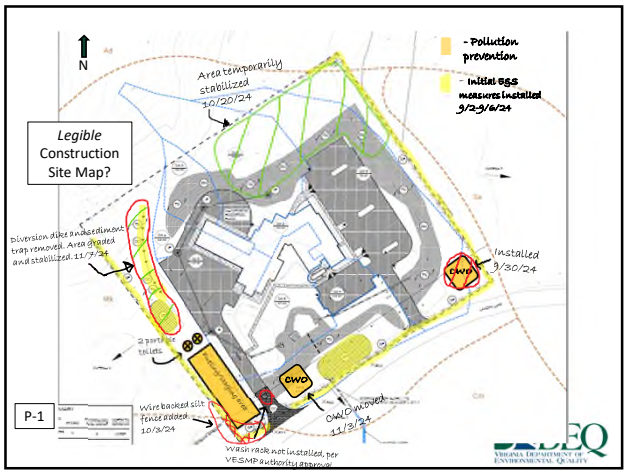
**Longer period if approved by VESMP Authority

LSSI | Section 4: SWPPP Overview Part II

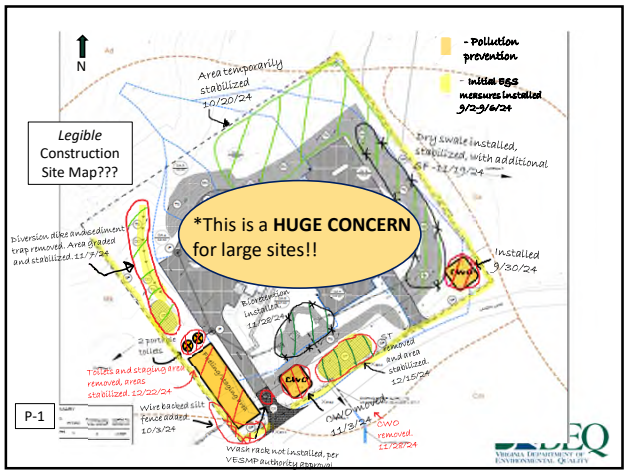
132



133



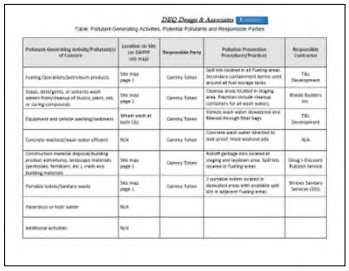
134



135

SWPPP Documentation - *Active*

Pollution Prevention Plan (P2 Plan)

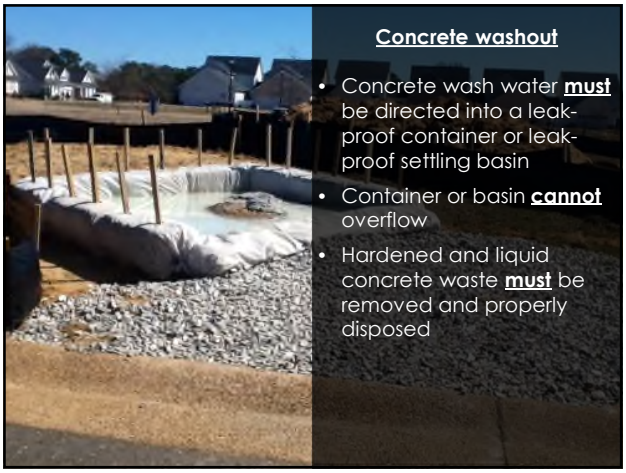


136

Pollution Prevention (P2) Practices

- Must be *site specific* within a SWPPP
- Shall be followed to prevent pollutant releases
- Denotes all relevant, specific P2 practices
- P2 plans are not usually reviewed <u>except</u> by *the inspector on-site*
- Documentation updated as conditions change (P2 *measures added, moved, or removed from the site*)
- Inspection Point:
  - What and Where onsite?
  - Site and documentation match-up?

137



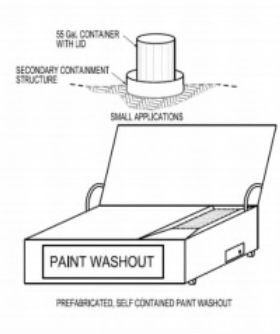
<u>Concrete washout</u>

- Concrete wash water **<u>must</u>** be directed into a leak-proof container or leak-proof settling basin
- Container or basin **<u>cannot</u>** overflow
- Hardened and liquid concrete waste **<u>must</u>** be removed and properly disposed

138

Concrete Washout Examples

139



Washout and cleanout of construction materials

Examples

- Area is **covered** (plastic sheeting or temporary roofs) to **prevent contact with stormwater**
- **Adequate containment** is provided for the **amount** of wash water used
- **Disposal** of waste solids and liquids is contract with a **hazardous waste disposal firm**

140

Paint and Other Construction Washout

LSSI | Section 4: SWPPP Overview Part II

141

Vehicle fueling and maintenance

Examples

- Secondary containment (spill berms, decks, spill containment pallets) is provided
- Cover is provided where appropriate
- Spill kits are readily available

142

Leak and spill prevention and response plan

- Procedures **must** be in place for quickly stopping, containing, and cleaning up spills, leaks, and other releases
- Procedures **must** be in place for documenting and/or reporting leaks, spills, and other releases

143

Spill Kit

- Verify Locations
  - Dedicated area?
  - Inside work truck?
  - Construction trailer?
- Check Contents
  - Adequate?
  - Restock needed?

LSSI | Section 4: SWPPP Overview Part II

144

Vehicle and equipment washing

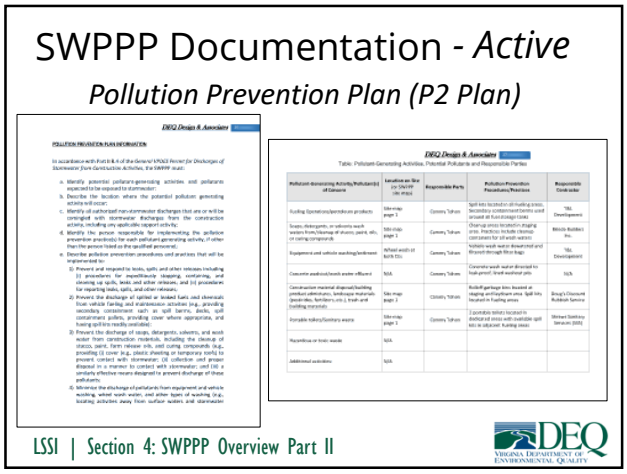
Examples

- Washing activities located away from surface waters and stormwater inlets or conveyance and directing wash waters to sediment basins or traps
- Use of filtration devices such as filter bags or sand filters, or another similarly effective control

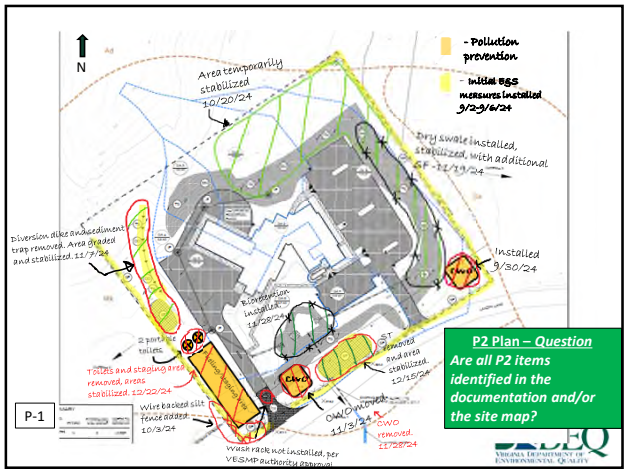
145

146

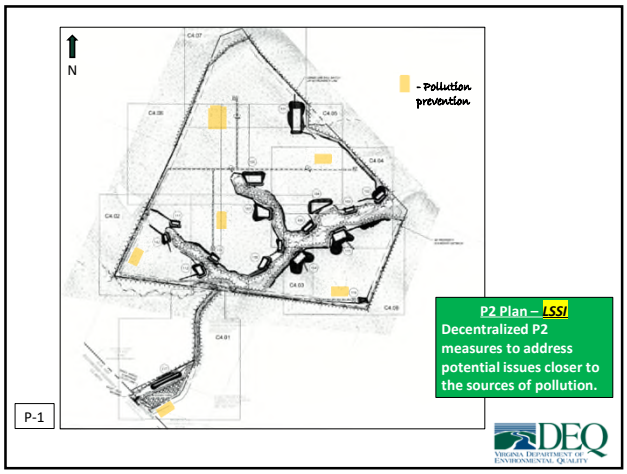
147



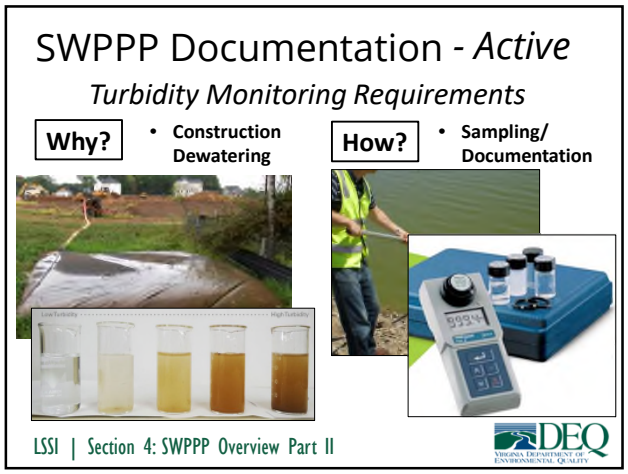
148



149



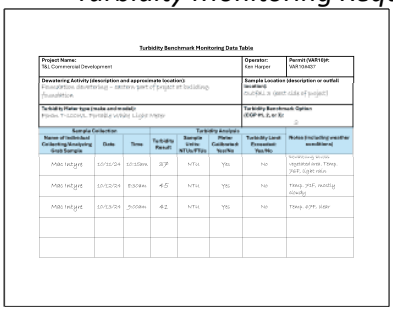
150



151

SWPPP Documentation - *Active*

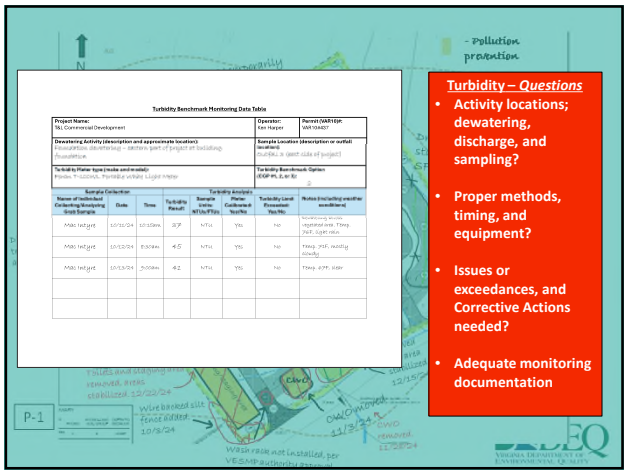
Turbidity Monitoring Requirements



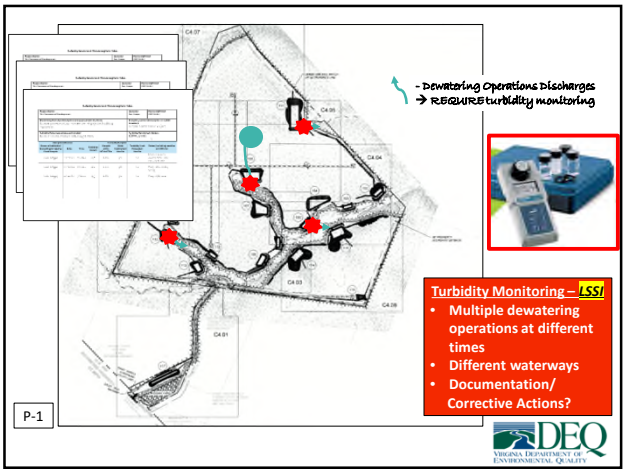
Three Benchmark Options:

1. ≤ 50 NTU/FTUs of upstream grab sample
2. ≤ 150 NTU/FTUs
3. ≤ 50 NTU/FTUs of a weekly turbidity average
4. Alternative, DEQ-approved method

152



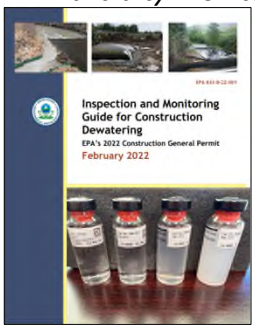
153



154

SWPPP Documentation - *Active*

Turbidity Monitoring Requirements

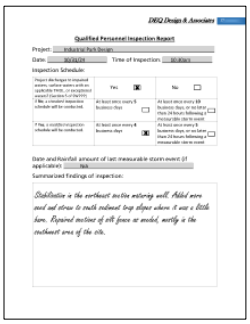


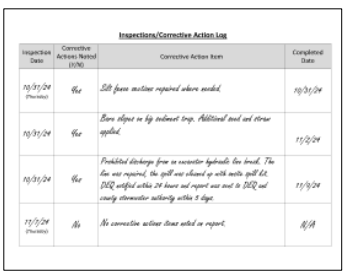
- EPA Guide for Construction Dewatering
  - https://www.epa.gov/system/files/documents/2022-01/cgp-inspection-and-monitoring-guide-for-dewatering.pdf -
- EPA Turbidity Monitoring under the Federal Construction General Permit:
  - https://www.epa.gov/npdes/turbidity-benchmark-monitoring-dewatering-under-construction-general-permit -

155

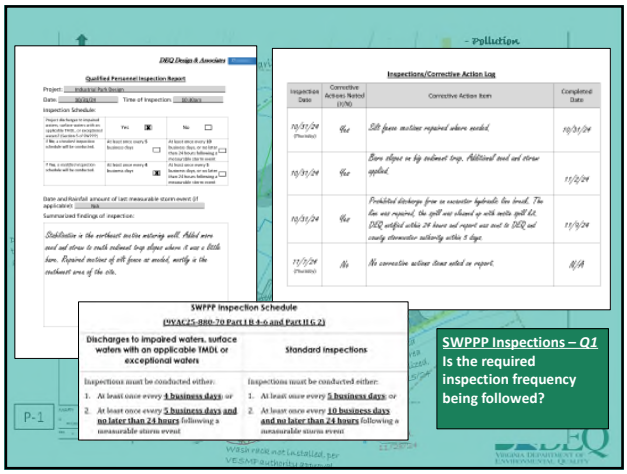
SWPPP Documentation - *Active*

Inspection Reports; Inspection/CA Log

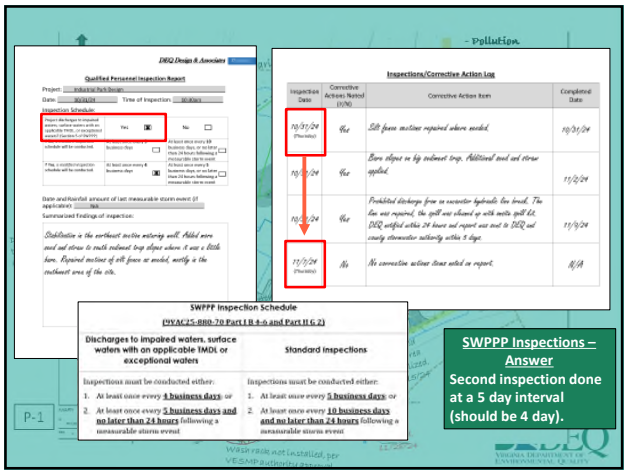




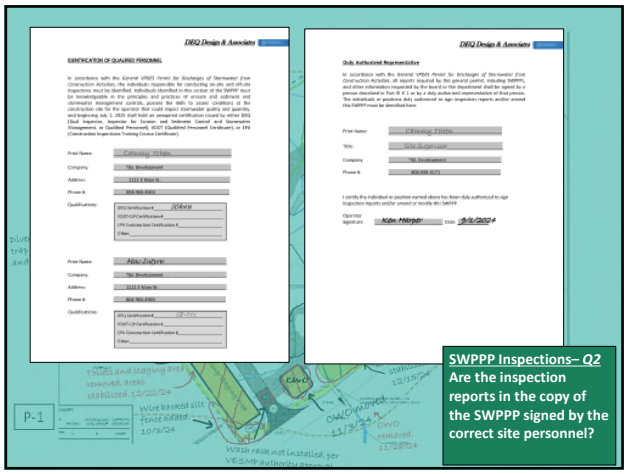
156



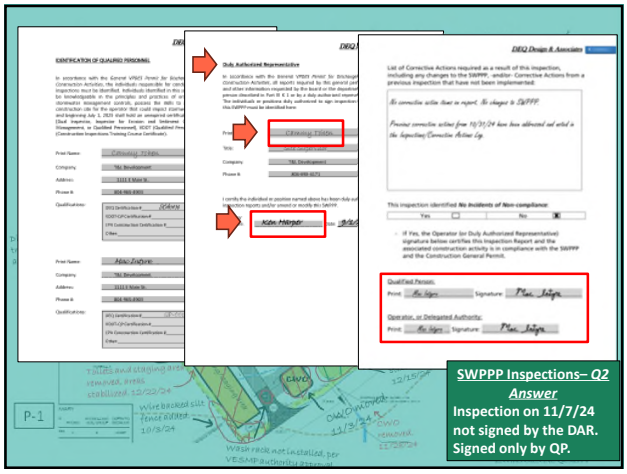
157



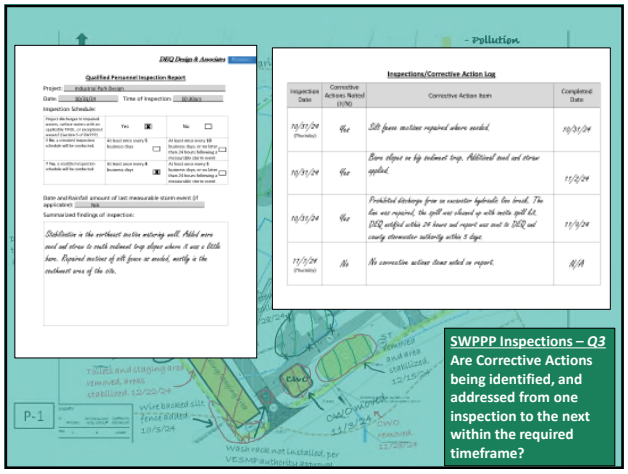
158



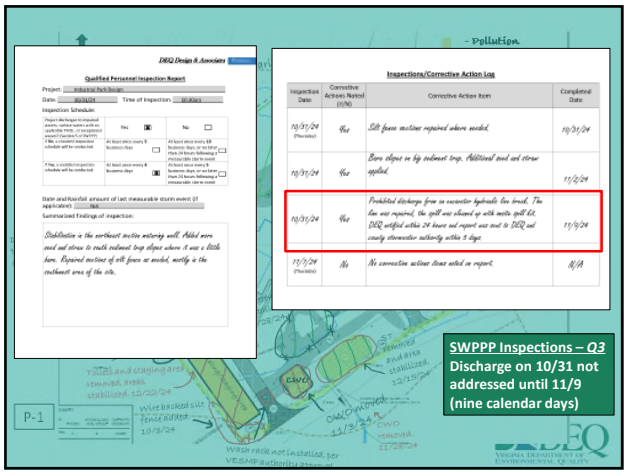
159



160



161



162

What's Going On?

Inspection Report – Corrective Actions

- Reviewing CA Log or individual Inspection Reports?
- What's been done within the 5 bus-day timeframe, and what HASN'T?
- Items passed 5 bus-day;
  - Been addressed?
  - Yes, but not signed off on
  - Or, NOT been addressed (VESMP approval?)

SWPPP Overlap (IR +):

- Prohibited Discharges
  - AMUs
- Additional P2/ESC Controls
  - P2 plan and/or AMUs
- Turbidity Exceedances
  - Turbidity Monitoring Section, AMUs
- Required stabilization of denuded areas
  - AMUs

163

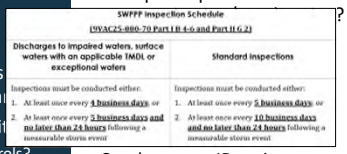
What's Going On?

Every site

- Who has been inspecting for the Operator (QPs)?
- Reports signed appropriately?
- What/Where were the issues?
- Following inspection frequency?
- Are there previous issues addressed within timefra
- Reports reflect site condi
  - Additional/modified controls?

LSSI Considerations

- How have QPs been inspecting?
  - One full day or multi-day (more, separate reports)
- Multiple inspectors
- Cumbersome IR review


SWPPP Inspection Schedule
(9VAC25-880-70 Part I B 4-6 and Part II G 2)

Discharges to impaired waters, surface waters with an applicable TMDL or exceptional waters	Standard inspections
Inspections must be conducted either: 1. At least once every 4 business days, or 2. At least once every 5 business days and no later than 24 hours following a measurable storm event	Inspections must be conducted either: 1. At least once every 5 business days, or 2. At least once every 10 business days and no later than 24 hours following a measurable storm event

164

What's Going On?

QP Inspection Report Review – Inspection *4/15*

QP report observation/ Date observed		Corrective Action/Due Date		Date Completed/Operator Signature	
SF down in SW corner, behind SB-1	4/7	Repair/replace SF as needed, per approved ESC plan	4/14	4/14	Operator
Erosion on east slope of ST-3	4/11	Repair/regrade erosion area, apply stabilization	4/18	*Item to check on next inspection*	

165

What's Going On?

QP Inspection Report Review – Inspection *6/10*

QP report observation/ Date observed		Corrective Action/Due Date		Date Completed/Operator Signature	
SF down in SW corner, behind SB-1	4/7	Repair/replace SF as needed, per approved ESC plan	4/14	4/14	Operator
Erosion on slope of		ade a, apply	4/18	4/17	Operator
OP for S installed plan		ed ESC plan	5/13	???	
SF undermined behind ST-1, SE corner	5/15	Repair and backfill undermined SF sections	5/22	5/20	Operator

Check CA Log, and/or previous reports back to 5/5

166

What's Going On? → *LSSI Example*

QP Inspection Report Review – Inspection *4/15*

QP report observation/ Date observed		Corrective Action/Due Date		Date Completed/Operator Signature	
SF down in SW corner, behind SB-1	4/7	Repair/replace SF as needed, per approved ESC plan	4/14	4/14	Operator
Erosion on east slope of ST-3	4/11	Repair/regrade erosion area, apply stabilization	4/18	*Item to check on next inspection*	

How are Large Sites any different?

167

What's Going On? → *LSSI Example*

QP Inspection Report Review – Inspection *6/10*

QP report observation/ Date observed		QP report observation/ Date observed		QP report observation/ Date observed	
SF down in SW corner of section G, behind SB-13		ST-6 not stabilized immediately once installed		SF torn/down along SE perimeter of	
Erosion on east slope of SB-6		Er sl se		ong ope of SB-16	4/17
OP for SB-3 not installed per ESC plan		Culvert IP not installed at crossing of sections B and C		Fabric liner not installed in outfalls: ST-4, 6, 7, and 11	Upslope grading prior to ESC controls in Section H	4/17
SF undermined behind ST-1, SE corner		SB-14 riser does not have dewatering device		CWO washwater outside of container, SE area of section B	Hydraulic fuel uncontained on ground near CE-3	4/17

QP report observation/ Date observed	
Section C; RCDs in swales near ST-8 full nt	4/17

!!! Issues can pile up over time with SO MUCH activity !!!

168

What's Going On? → *LSSI Example*

QP Inspection Report Review – Inspection *4/15-6/10*

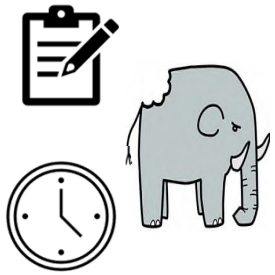
Observations		Corrective Actions		Date Completed/Op. Sign		
Issue 1	4/17	CA-1	4/24	1	4/24	Operator
Issue 2	4/17	CA-2	4/24	2	4/22	Operator
Issue 3	4/23	CA-3	4/30	3	4/25	
Issue 4	4/29	CA-4	5/6	4	4/30	Operator
Issue 5	4/29			5	5/5	Operator
Issue 6	5/5			6		
Issue 7	5/9			7	5/13	Operator
Issue 8	5/9			8	5/13	Operator
Issue 9	5/15	CA-9	5/22	9	5/22	Operator
Issue 10	5/15	CA-10	5/22	10	5/19	Operator
Issue 11	5/21	CA-11	5/28	11	5/27	
Issue 12	5/27	CA-12	6/3	12	6/1	Operator
Issue 13	5/27	CA-13	6/3	13	6/1	Operator
Issue 14	6/2	CA-14	6/9	14		

What could be happening….

169

What's Going On? → *LSSI Example*

QP Inspection Report Review – Inspection 4/15-6/10



- **Best Practices????**
  - Note dates of missing info and CA date →
  - Cross-reference CA log and/or individual reports
  - Take pictures of SWPPP pages for later reference

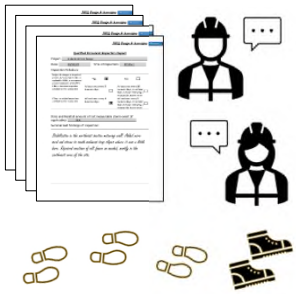
170

What's Going On? → *LSSI Example*

QP Inspection Report Review – Inspection 4/15-6/10

- **Next Steps?**
  - Check old IRs for repeat CAs (>5 days)
  - Inquire with Operator, Reps, and/or QPs
  - Ground Truth!
  - ALWAYS, ALWAYS…

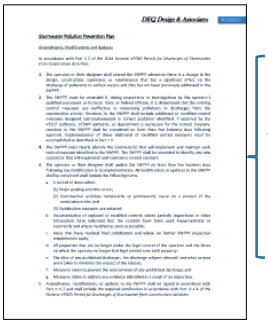
WALK THE SITE!!



171

SWPPP Documentation - *Active*

Amendments, Modifications, & Updates

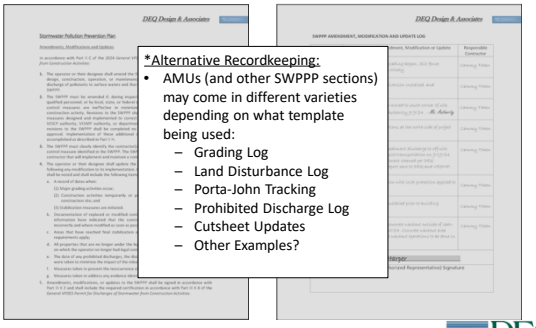


1. SWPPP change potentially effecting pollutant discharge
2. Additional/modified P2/ESC measures to address ineffective controls
3. Identify Responsible Contractors
4. SWPPP Updates:
   - *Major grading*
   - *LDA ceases on a portion of the site*
   - *Stabilization measures applied*
   - *Final stabilized areas (no inspections required)*
   - *Areas no longer under Operator control*
   - *Prohibited discharge information*

172

SWPPP Documentation - *Active*

Amendments, Modifications, & Updates



*Alternative Recordkeeping:

- AMUs (and other SWPPP sections) may come in different varieties depending on what template being used:
  - Grading Log
  - Land Disturbance Log
  - Porta-John Tracking
  - Prohibited Discharge Log
  - Cutsheet Updates
  - Other Examples?

173

SWPPP Documentation - *Active*

Amendments, Modifications, & Updates

LSSI Key Points:

- **What ESC measures have(not) been installed?**
- **Co-located/ Conversion to SWM facilities**
- **Hotspots – added controls**
- **ESC no longer needed (removed)**
- **DENUDED AREAS**
  - Grading
  - Stabilization

174

What's Going On?

Every site	LSSI Considerations
SWPPP Overlap (IR +):	
• Prohibited Discharges – AMUs	• Cumbersome document review • Even MORE documentation overlap
• Additional P2/ESC Controls – P2 plan and/or AMUs	• New sections opened? – Increases inspection area(time)
• Turbidity Exceedances – Turbidity Monitoring Section, AMUs	• Stabilized sections closed? – Older sections may not need inspecting once fully stabilized – ESC→SWM considerations
• Required stabilization of denuded areas – AMUs	

175

SWPPP Overview: Key Points and Considerations

- Is Everything There? (*take your time*)
- Who's WHO?? (QP, Duly Authorized Rep, Operator, subcontractors, 3rd party, localities)
- Corrective Actions? …Perfect Inspections?!

- Alternative Recordkeeping: *Grading Log, Cutsheet updates, Multiple SWPPP binders,etc*.
- Documentation: More is Better…Sort of

182

SWPPP Overview: Key Points and Considerations

- Summary of best management practices
  - Take enough time to understand documentation
  - Take notes and pictures of documents, especially missing info
  - Organize notes and pictures to easily reference later without confusion
  - Cross-reference missing information with other sections of the SWPPP (Ex: IRs and AMUs)
  - Talk with interested parties (QPs, Operator, etc.) to ensure a compliance strategy can be accomplished

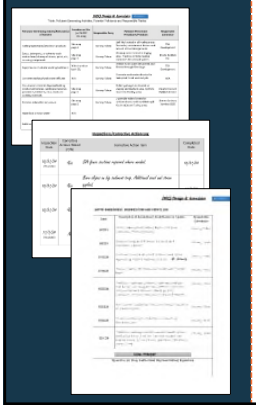
183

Large Scale Site Inspection – Section 5

Boots on the Ground

184

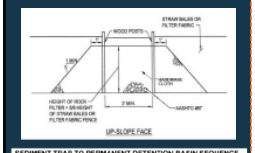
Document

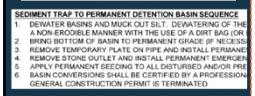


Application

185

Document





Application

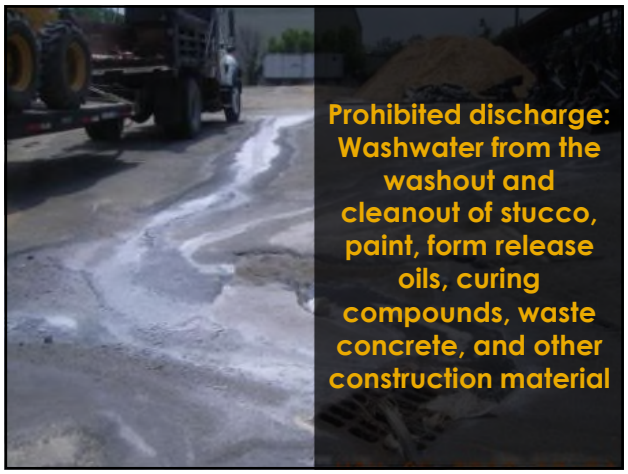
186

Prohibition of Non-stormwater Discharges

- Look out for the following prohibited discharges!
- If you see any, take pictures and note them on your inspection report
- Larger sites have ***more*** potential pollution issues

187

188



189

190

191

192

Construction BMPs – VSWHB Ch.7

- Structural practices
  - **C-ECM** – Erosion Control Measures
  - **C-ENV** – Environmentally Sensitive Area Protection
  - **C-PCM** – Perimeter Control Measures
  - **C-SCM** – Sediment Control Measures
  - For sediment control; *second* line of defense
- Vegetative practices
  - **C-SSM** – Surface Stabilization Measures
  - For erosion control, *first* line of defense

193

Erosion Control Measures (ECM)

- Prevent sheet, rill and gully erosion
- Reduce the overland flow velocities
- Shorten the length of flow
- Divert and convey runoff safely through a site

194

Erosion Control Measures (ECM)

Diversions/Diversion Dikes

Slope Interruption Devices

195

Erosion Control Measures (ECM)

Outlet Protection

Slope Drains

196

Environmentally Sensitive Area Protection (ENV)

- Used in environmentally sensitive areas (stream corridors, wetlands, floodplains)
- Applied where disturbance in an environmentally sensitive area is necessary

197

Environmentally Sensitive Area Protection (ENV)

Stream Crossings

Pump Around Diversions

198

Perimeter Control Measures (PCM)

- Intercept sheet flow from slopes
- Remove sediment and other contaminants through:
  - Ponding
  - Settling
  - Physical filtration
- Prevent contaminants from leaving the site

199

Perimeter Control Measures (PCM)

Silt Fence/Super Silt Fence

Filter Socks/Logs

200

Sediment Control Measures (SCM)

- Prevent sediment from leaving the site
- Capture or filter sediment particles

201

Sediment Control Measures (SCM)

Rock Check Dams

Dust Control

202

Sediment Control Measures (SCM)

Rock Filter Outlet

Dewatering/Filtering Operations

203

Sediment Control Measures (SCM)

Sediment Traps

Sediment Basins

204

Sediment Control Measures (SCM)

Sediment Basin - Alternative

Concrete Washout

https://stormwater.pca.state.mn.us/index.php?title=Construction_stormwater_treatment_-_dewatering,_including_chemical_treatment_and_sediment_filtration

205

Surface Stabilization Measures (SSM)

- Protect disturbed soil from surface runoff
- Both temporary covering and permanent vegetative cover
- Often part of the final landscape

206

Surface Stabilization Measures (SSM)

Erosion Matting

Surface Roughening

207

Surface Stabilization Measures (SSM)

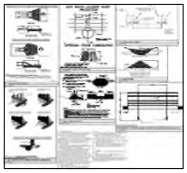
Temporary Stabilization

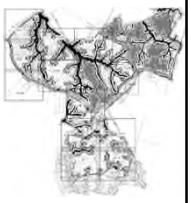
Permanent Stabilization

208

Construction BMPs – *ESC Issues*

- Document Observations:
  - Which measure?
  - Detail issues; knocked down/ damaged/doesn't work
  - Following plan?
  - WHERE IS IT?!





209

Questions?

210

Post-Construction BMP Overview

Basins – P-BAS	Conveyance – P-CNV
Constructed Wetlands	Grass Channels
Wet Pond	Dry Swales
Extended Detention Pond	Wet Swales
Rainwater Harvesting	Regenerative Stormwater Conveyance

211

Post-Construction BMPs Categories

Filtration and Infiltration – P-FIL	Support Components – P-SUP
Rooftop/Impervious Surface Disconnection	Earthen Embankment
Vegetated Roof	Principal Spillway
Permeable Pavement	Vegetated Emergency Spillway
Infiltration Practice	Pretreatment
Bioretention	Quantity-Only Approach to BMPs
Filtering Practices	
Sheet Flow to Vegetated Filter Strip/Conserved Open Space	
Soil Compost Amendment	
Tree Planting	

212

Post-Construction MTD Categories

Hydrodynamic Devices – MTD-H	Filtering Devices – MTD-F	Biofilter Devices – MTD-B
15 devices currently approved	13 devices currently approved	11 devices currently approved

213

Basins (P-BAS)

- Designed to detain or impound runoff
- Typically provide little to no infiltration
- Provide treatment through settling, runoff reduction and biologic uptake

214

Basins (P-BAS) – LSSI common

Wet Pond

ED Pond

215

Conveyance (P-CNV) 8.3.2

- Designed to receive a sustained concentrated flow of runoff or cross significant changes in grade
- Typically provide filtration, infiltration and settling within the conveyance system.

216

Conveyance (P-CNV) – LSSI common

Grass Channels/Dry Swales

Wet Swales

217

Filtration and Infiltration (P-FIL) 8.3.3

- P-FIL practices are designed to filter runoff through a natural or engineered media, returning any remaining runoff to a drainage system or infiltrating into native soils

218

Filtration and Infiltration (P-FIL) – LSSI common

Bioretention

Sheet Flow to COS

219

Support Components (P-SUP)

- Provide more generalized information that can be used across multiple different P-BMPs
- To be used in combination with other P-BMPs described in this Handbook

220

Support Components (P-SUP)

221

P-SUP-06 Pre-Treatment

1.0 Definition

- Practices that support the operation and maintenance of stormwater assets
  - Prolong the lifespan
  - Slow the velocity of flow

222

P-SUP-06 - 3.0 Planning and Considerations

- Site conditions determine which pre-treatment practices are best-suited to different situations:

Table P-SUP-06-1 Pretreatment Selection Matrix

BMP	Roof Stormwater Isolation	Limit Hydraulic Loading	Treatment Train	Sediment Forebays	Grass Channels & Filter Strips	Reverse Slope Bench	Inlet Sump	Manufactured Devices	Sumped Inlet with Traps or Filters
Grass Channel	-				+				
Infiltration Practices	+	+	+	+	+	+	+	+	+
Bioretention	+	+	+	+	+		+		+
Dry Swales	+	+	+	+	+		+		+
Wet Swales	+	+	+	+	+				
Filtering Practices		+	+	+	+		+	+	+
Wet Ponds			+	+		+		+	
Extended Detention Ponds			+			+		+	
Regenerative Swale Conveyance			+	-					
Constructed Wetlands		+	+	+		+		+	
Rainwater Harvesting	-	+						+	+

- Construction and maintenance information is based on selected measure

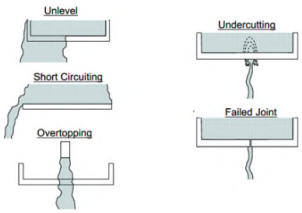
223

P-SUP-08 Permanent Level Spreader

- Flow control measure that receives concentrated flow and converts to sheet flow condition
- Common measure for large sites
- Construction/maintenance is critical
- Typically FINAL measure before stormwater discharges site

224

Section 7.0 Operations and Maintenance Considerations



- Maintain the level spreader lip at zero grade
- Inspect for low points, sags, cracks, breaks, etc. that would result in concentrated flow
- Remove debris accumulation when it reaches 20%

225

Planting Guidance – Appendix G

Plant Type – Divided into the following categories:

- Canopy Trees
- Understory Trees
- Shrubs
- Flowering Perennials
- Grasses and Groundcovers
- Green Roof Plants

Canopy Trees

226

Questions?

227

Group Activity

Site walk:

Documenting observations at inspection stations

228

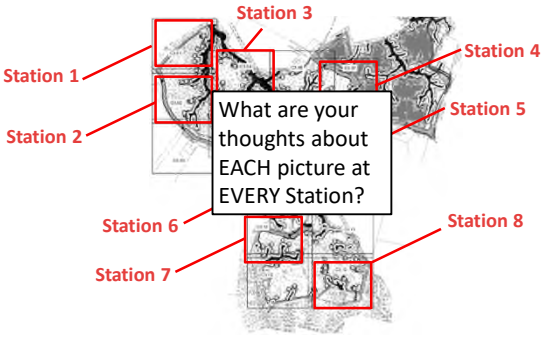
Site Walk Exercise

- Let's INSPECT!!
- ***8 Stations*** across the "site"
- Each group has ***5 minutes*** per station to document observations (40 min. tot.)

Station 1	
Picture 1	Observations, etc…
Picture 2	Observations, etc…
Picture 3	Observations, etc…

229

Site Walk - Setup



230

Site Walk Review

231

Station 1: Summary

1. No vegetation management in BMP
2. Clogged BMP orifice, no grate
3. Erosion around bad OP installation
4. Good stabilization over large area
5. Good CE, P2 measure, postings
6. Suspect fuel container- check closely
7. Decent stabilization, poor OP
8. Great overall stabilization, appare erosion in the middle of channel
9. Bare soil around P-BMP
10. Great stabilization application

232

Station 2: Summary

1. Good stabilization coverage
2. Looks full of sediment, concerned with erosion underneath
3. Good spillway installation and stabilization
4. CWO; NOT leak-proof, replace
5. Gully erosion NEEDS repair
6. Decent BMP installation/stabilization
7. No stabilization or OP; possible wet storage problem
8. No perimeter controls!!
9. Decent install – OP looking good

233

Station 3: Summary

1. OP; bend in design, garbage/erosion issues
2. Containment full
3. Serious gully erosion - repair
4. Uncontained garbage – P2 issue
5. Well-graded and stabilized
6. Old/rusted spillway – possible dewatering issues
7. CWO maintenance needed
8. Stabilization??
9. OP and stabilization needed

234

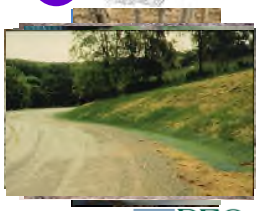
Station 4: Summary

1. Decent perimeter stabilization
2. Channel needs stabilization
3. Sediment trap?
4. OP and stabilization needed
5. P2 issues
6. Perimeter control issues
7. No OP at all
8. SF down along perimeter

235

Station 5: Summary

1. P2 concerns
2. No inlet protection
3. Potential pollutant release
4. Erosion/IP issues
5. SF installation problem
6. Sediment deposition in channel
7. Decent stabilization
8. SB failure
9. SB failure cont…thoughts??



236

Station 6: Summary

1. CWO…bad
2. Silt fence down – repair
3. Good P2 implementation
4. Decent TS around stockpile
5. Mix of good and bad
6. OP needed
7. Erosion….
8. Also erosion – concentrated in channels, off-site or on-site
9. SB; wet storage? Other issues??

237

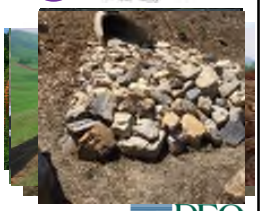
Station 7: Summary

1. Mud-tracking out of CE
2. Stabilization issues on ST
3. What could be wrong here????
4. IP is not adequate
5. Possible stabilization issues?
6. Is this an ESC measure…or a hole?
7. P2 measures look pretty solid
8. Inlet protection pretty decent

238

Station 8: Summary

1. SB needs stabilization
2. Rock filter outlet looks decent
3. Perimeter control installation
4. SB installation ongoing – OK?
5. P2 containment successful
6. IP; weird design – check plan
7. Perimeter access ongoing – thoughts??
8. Stabilization above pipe



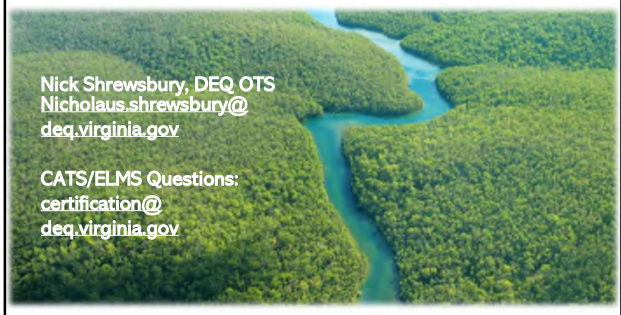
239

Site Walk Review

- LSSI Takeaways:
  - So many issues to find
    - How many??
  - A LOT to "ground truth" from SWPPP
  - Route/site walk planning and timing critical
  - Typically, a lot to follow-up with on subsequent inpsections

240

THANK YOU ALL!



241