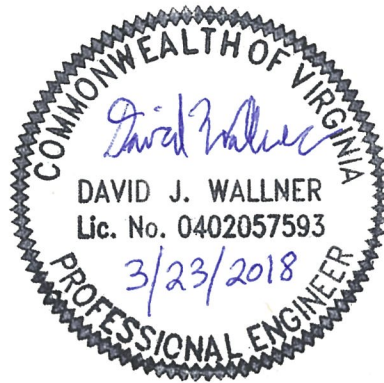


By virtue of this seal and signature, all supporting documents included in this package are accurate and support the design presented herein.





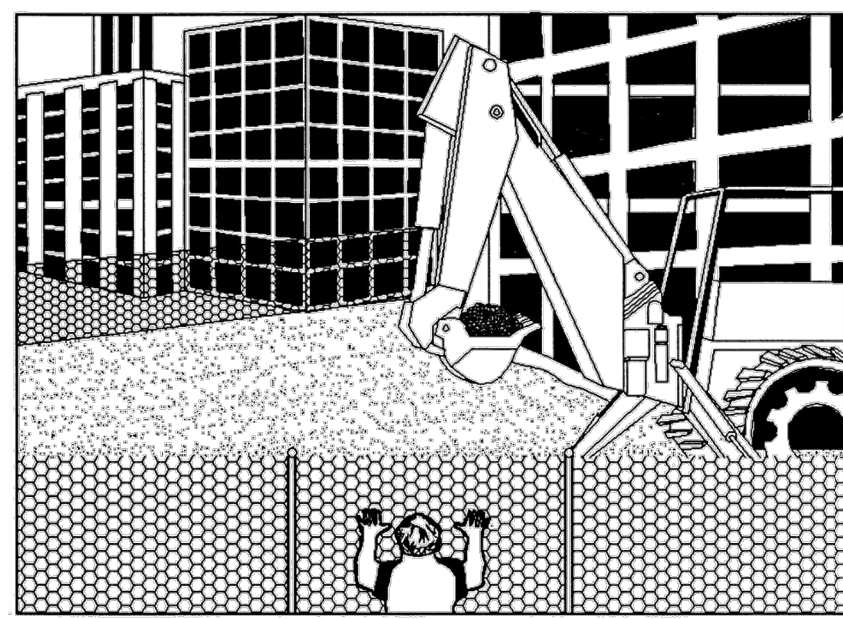




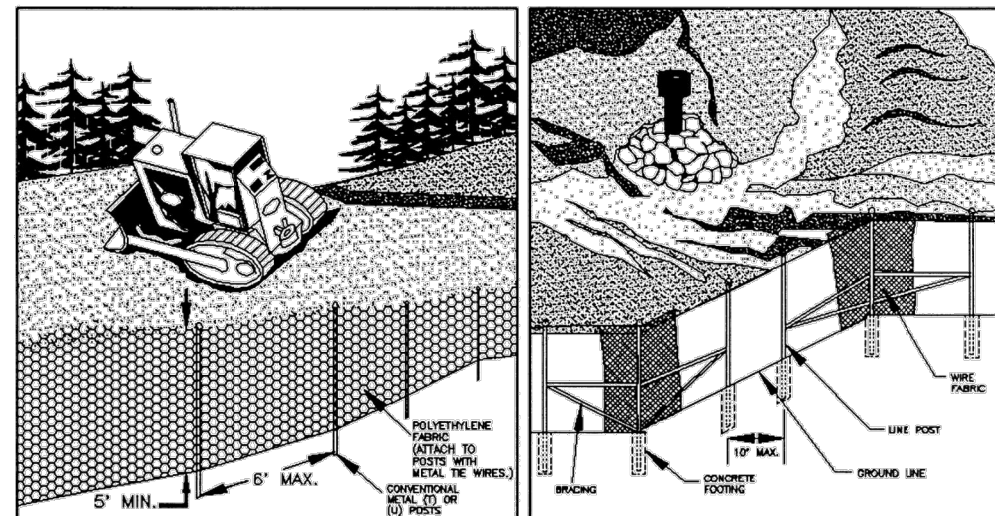
1992

3.01

### SAFETY FENCE



PERSPECTIVE VIEW



PERSPECTIVE VIEW  
PLASTIC FENCE

PERSPECTIVE VIEW  
METAL FENCE

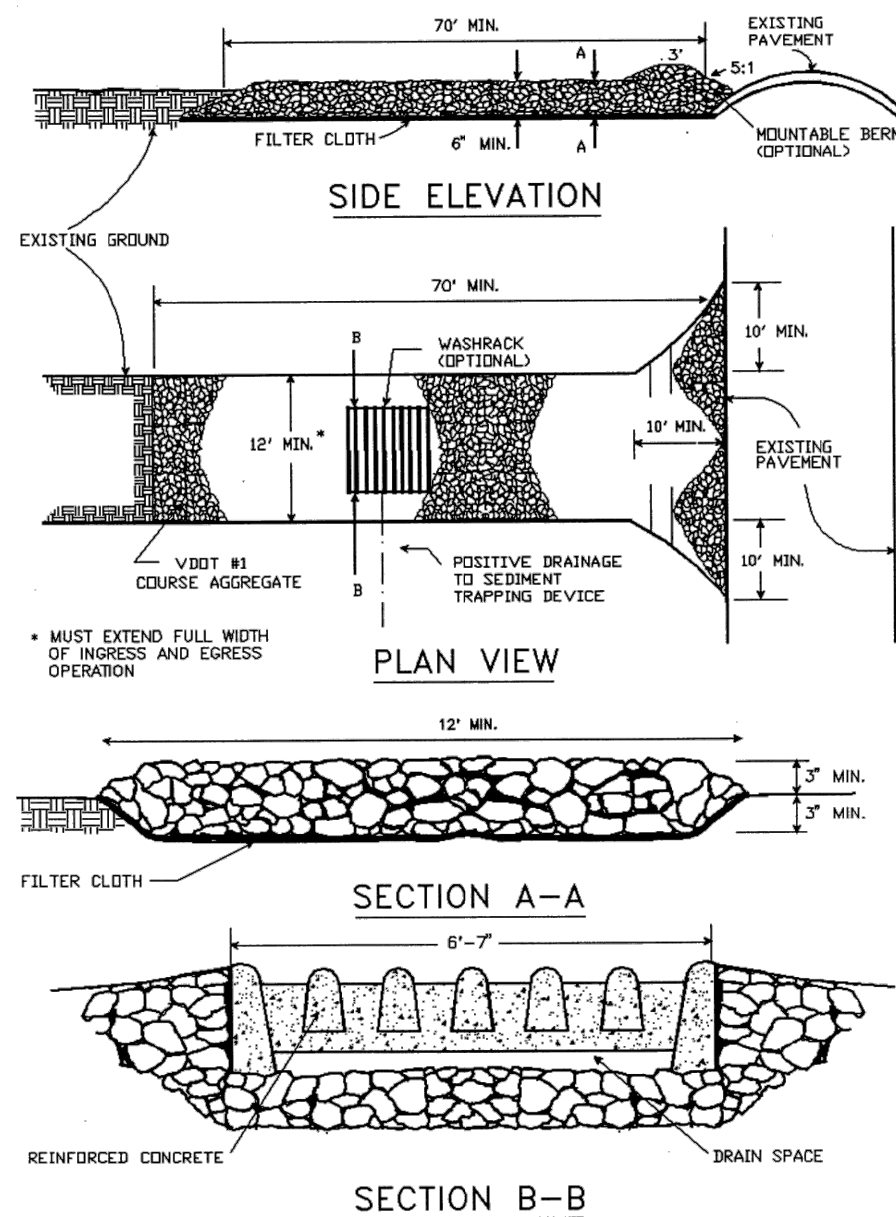
Source: Adapted from Conwed Plastics and  
VDOT Road and Bridge Standards Plate 3.01-1

SAFETY FENCE  
TAKEN FROM VADEQ 1992 MANUAL

1992

3.02

### STONE CONSTRUCTION ENTRANCE



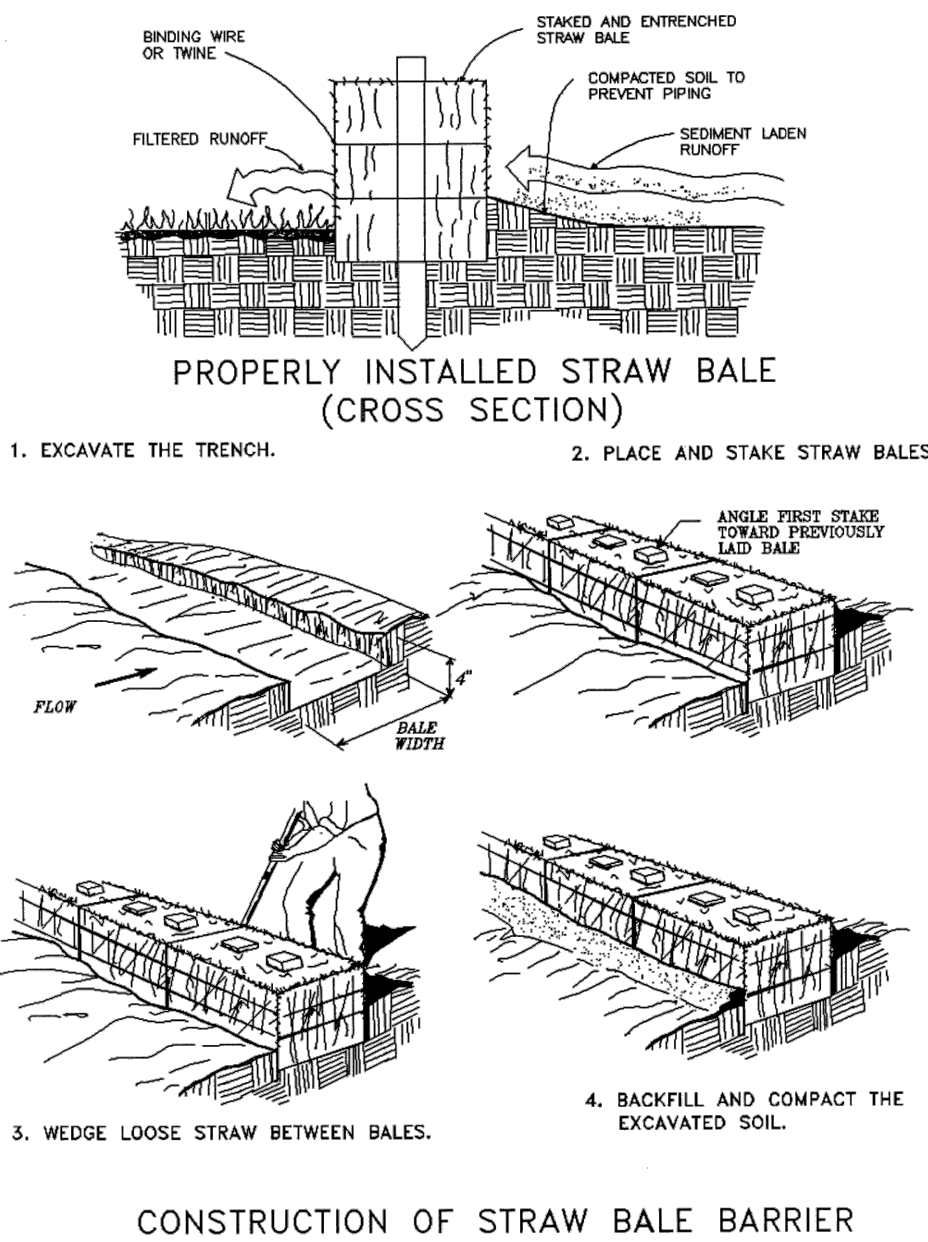
Source: Adapted from 1983 Maryland Standards for Soil  
Erosion and Sediment Control, and Va. DSWC Plate 3.02-1

STONE CONSTRUCTION ENTRANCE  
TAKEN FROM VADEQ 1992 MANUAL

1992

3.04

### STRAW BALE BARRIER



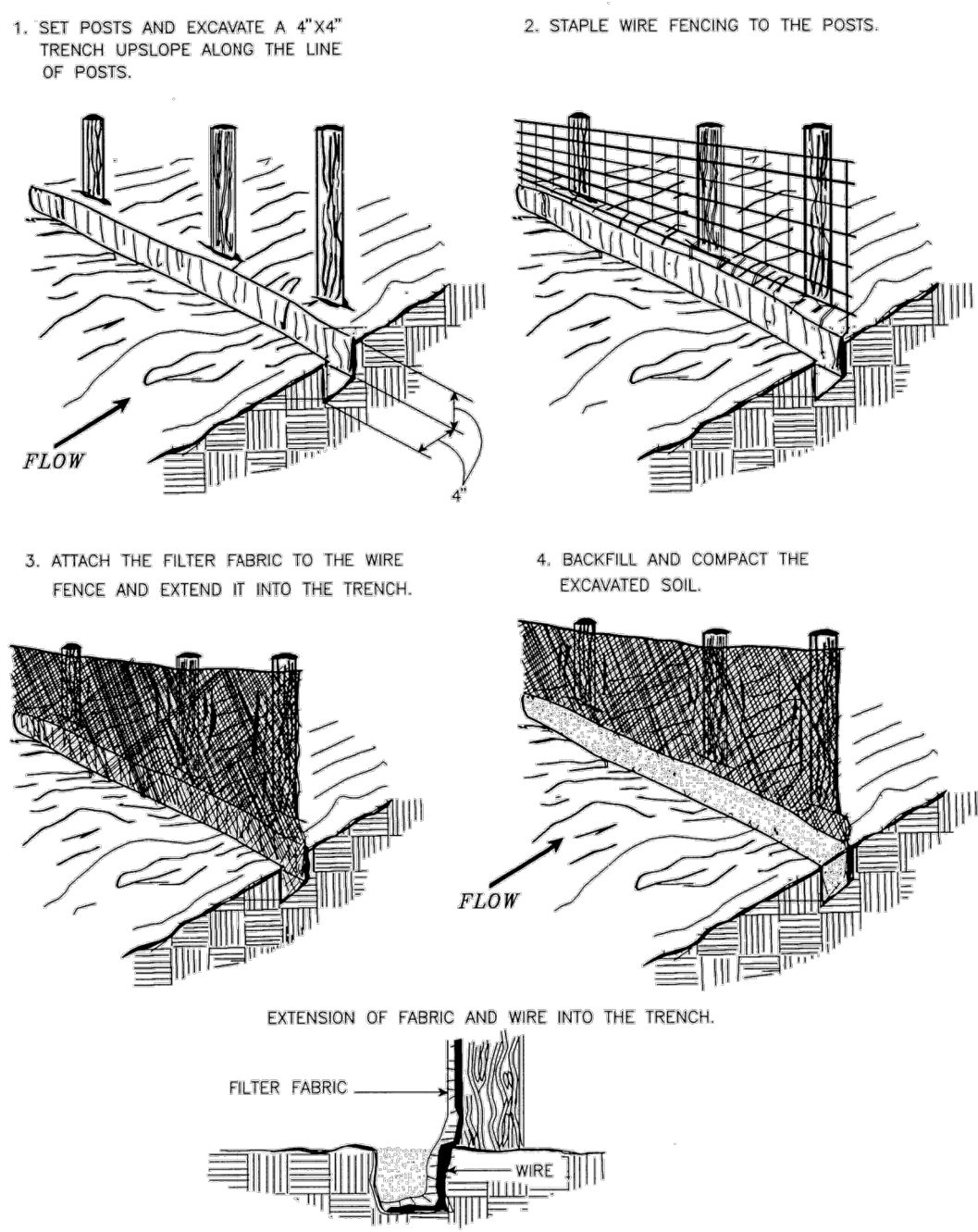
Source: Va. DSWC Plate 3.04-1

STRAW BALE BARRIER  
TAKEN FROM VADEQ 1992 MANUAL

1992

3.05

### CONSTRUCTION OF A SILT FENCE (WITH WIRE SUPPORT)



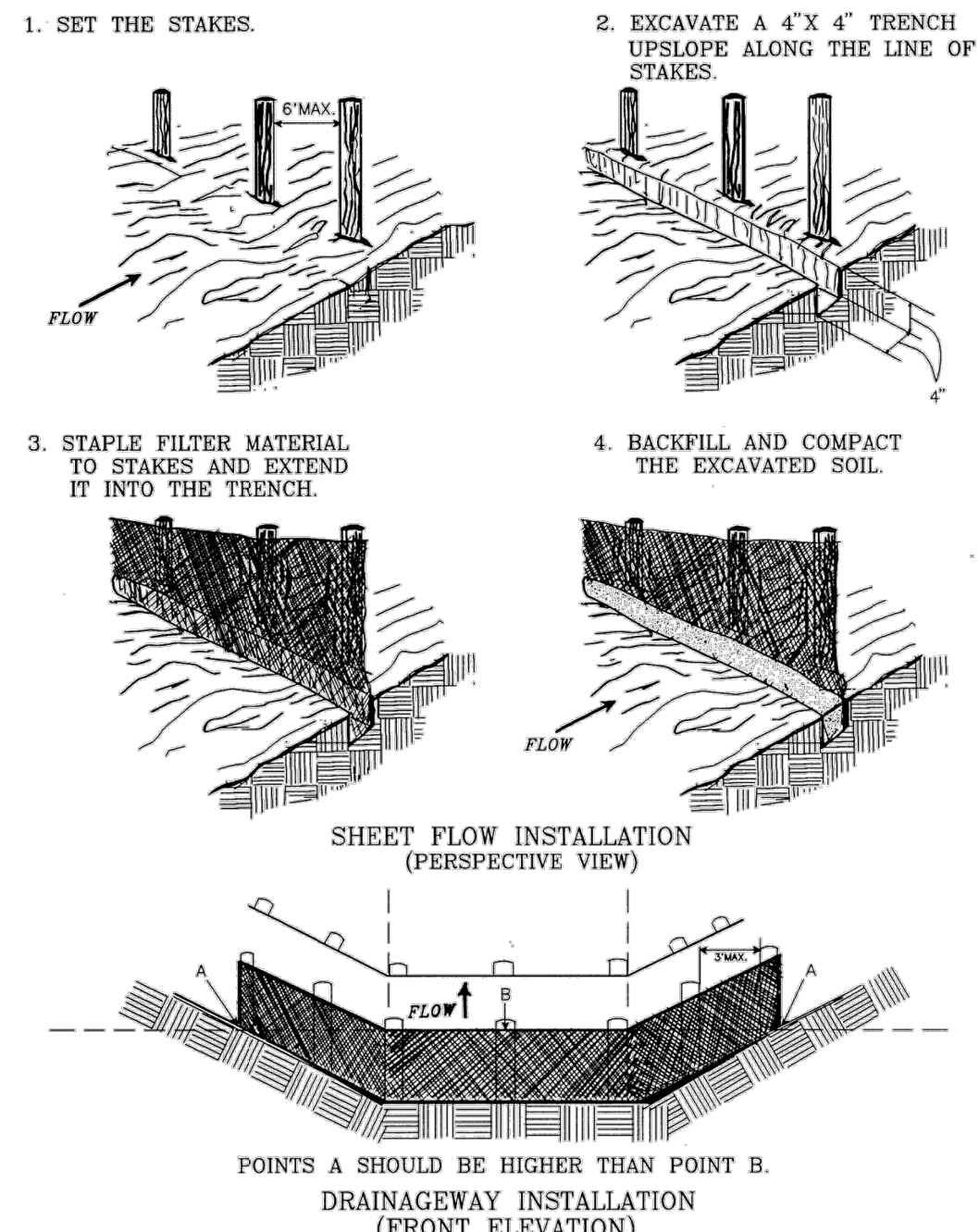
Source: Adapted from Installation of Straw and Fabric Filter  
Barriers for Sediment Control, Sherwood and Wyant Plate 3.05-1

CONSTRUCTION OF SILT FENCE  
(WITH WIRE SUPPORT)  
TAKEN FROM VADEQ 1992 MANUAL

1992

3.05

### CONSTRUCTION OF A SILT FENCE (WITHOUT WIRE SUPPORT)



Source: Adapted from Installation of Straw and Fabric Filter  
Barriers for Sediment Control, Sherwood and Wyant Plate 3.05-2

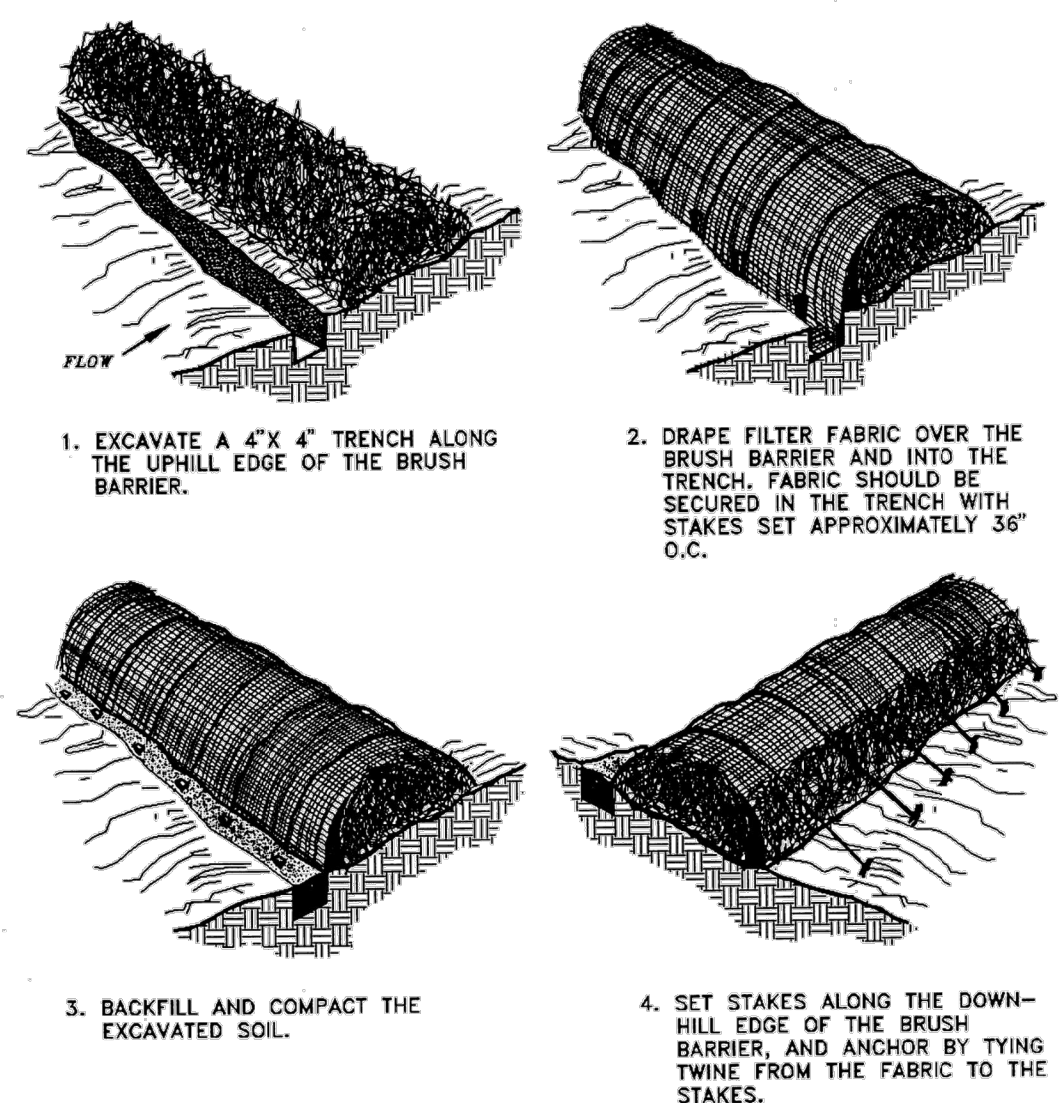
CONSTRUCTION OF SILT FENCE  
(WITHOUT WIRE SUPPORT)  
TAKEN FROM VADEQ 1992 MANUAL

1992

3.06

### CONSTRUCTION OF A BRUSH BARRIER COVERED BY FILTER FABRIC

(TREE/RESIDUAL MATERIAL  
WITH DIAMETER > 6")



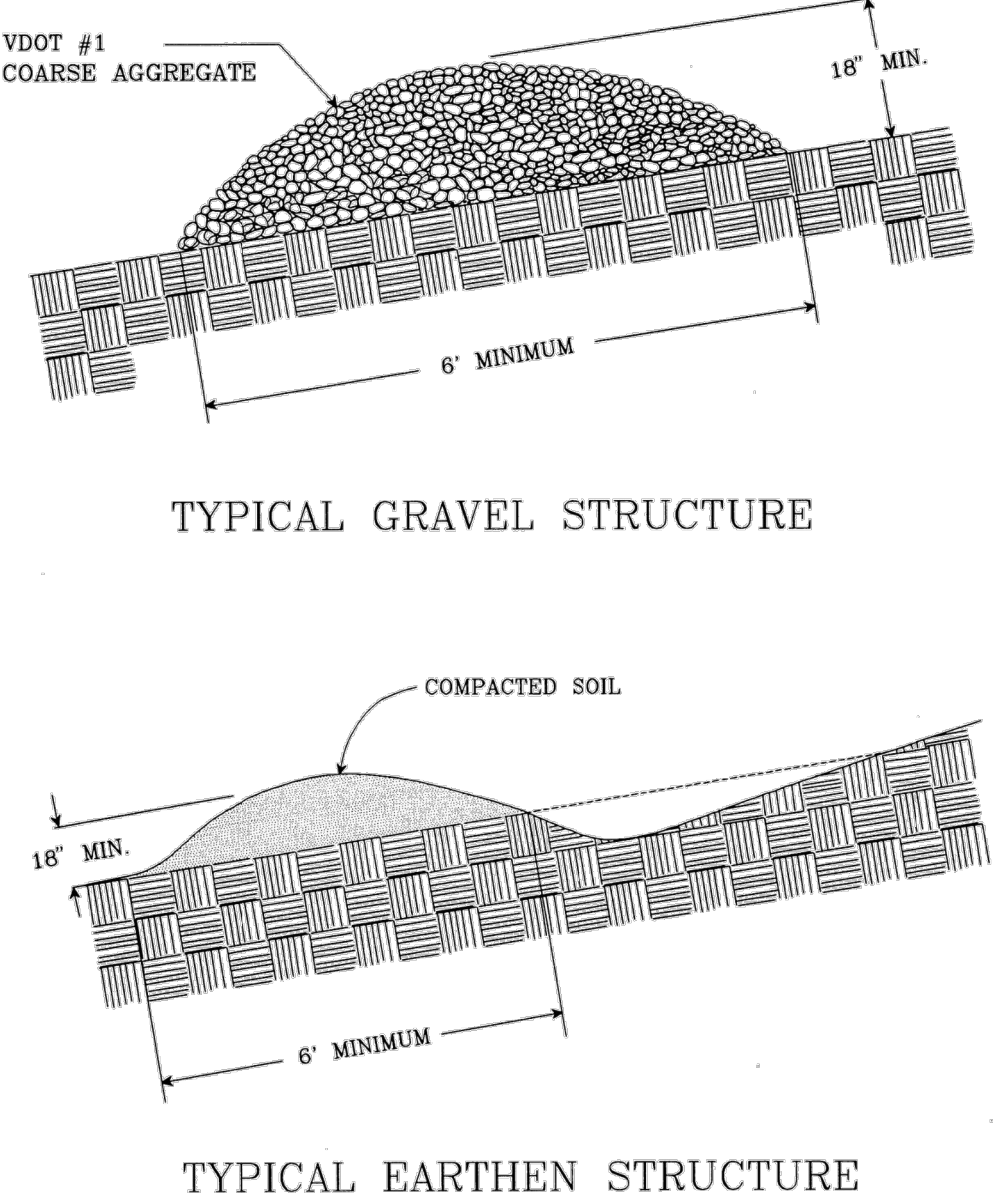
Source: Va. DSWC Plate 3.06-1

CONSTRUCTION OF A BRUSH BARRIER  
TAKEN FROM VADEQ 1992 MANUAL

1992

3.11

### TEMPORARY RIGHT-OF-WAY DIVERSIONS

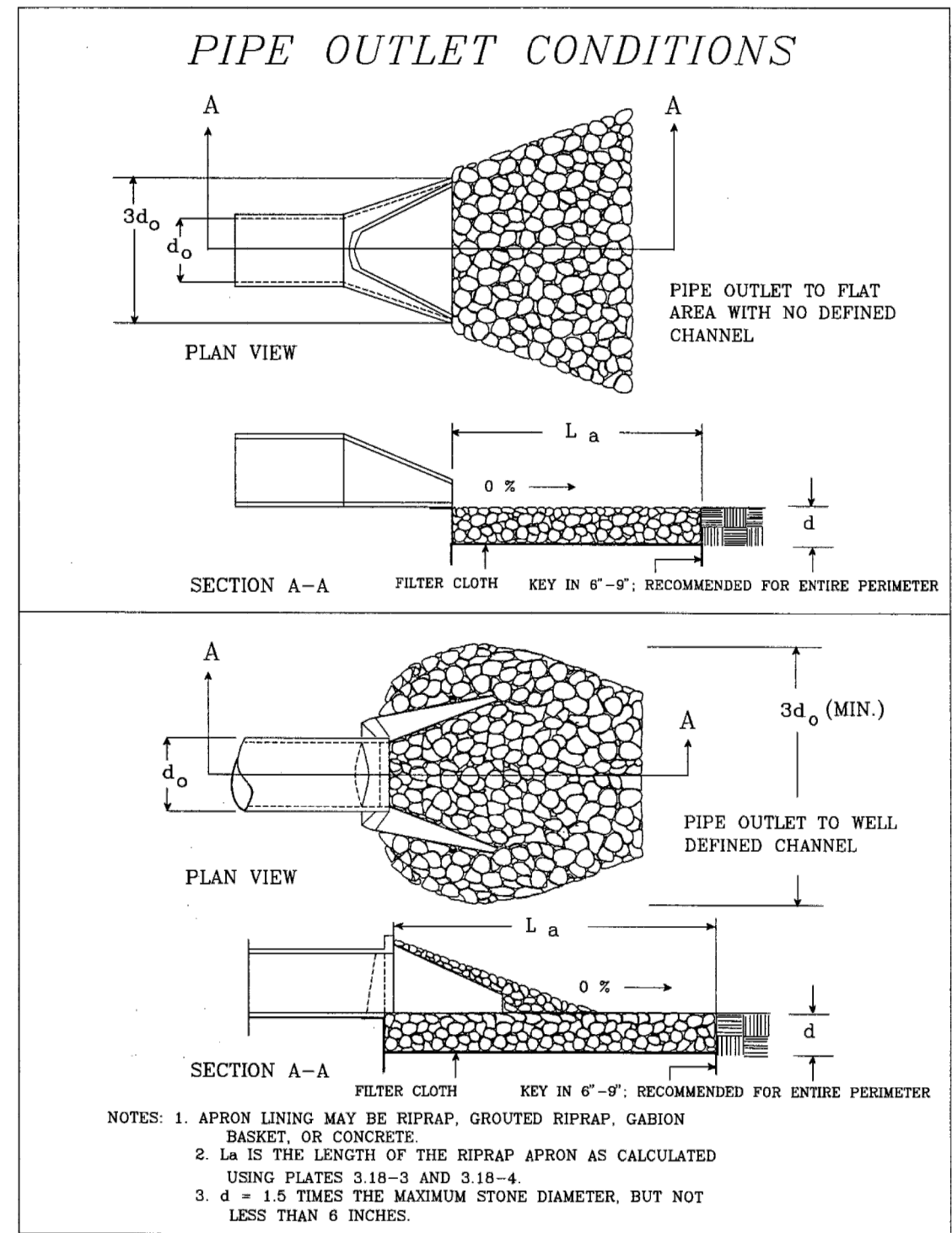


Source: Va. DSWC Plate 3.11-1

TEMPORARY RIGHT-OF-WAY DIVERSION  
DEVELOPED FROM VADEQ 1992 MANUAL

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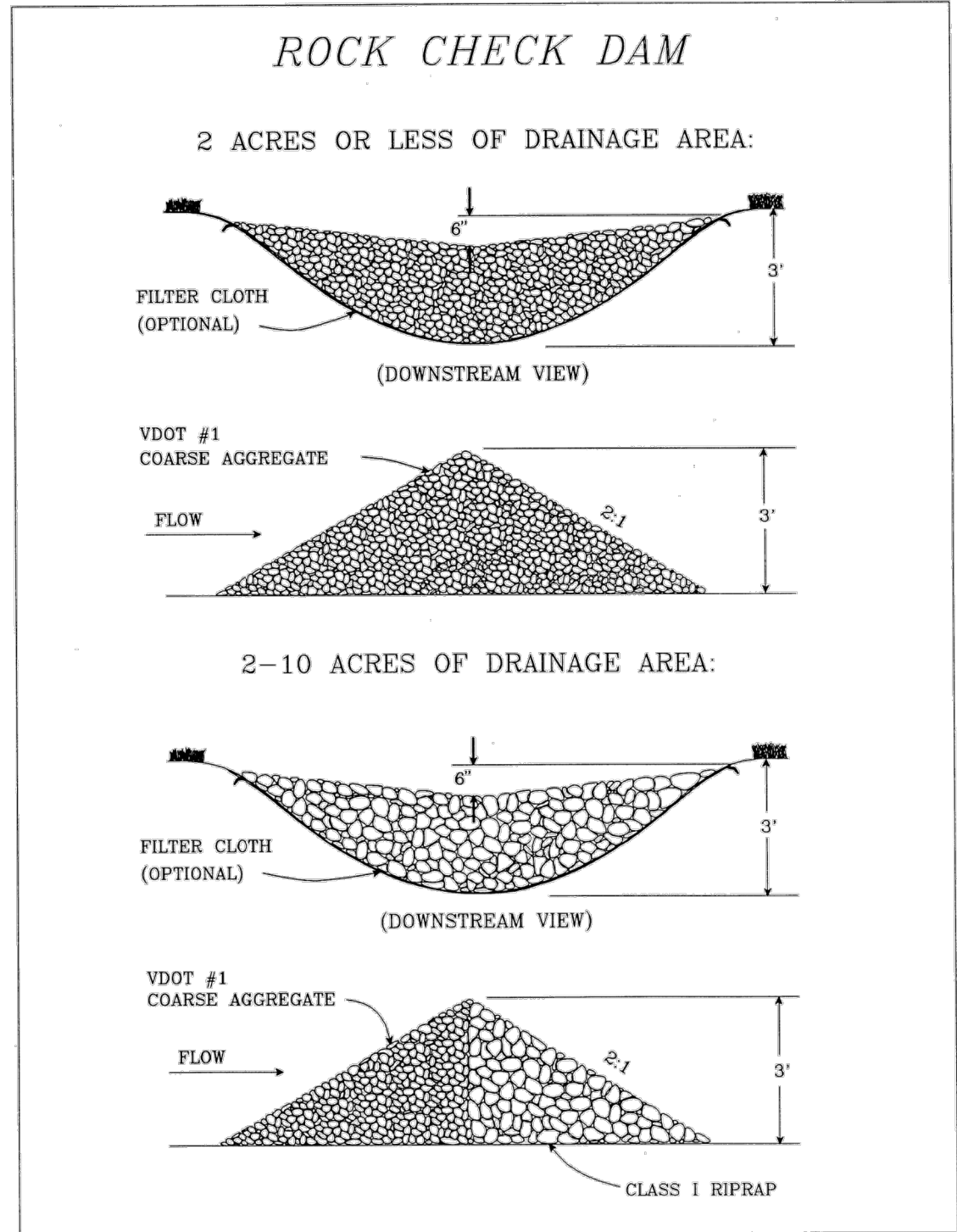




Source: Va. DSWC

Plate 3.18-1

PIPE OUTLET CONDITIONS  
TAKEN FROM VADEQ 1992 MANUAL



Source: Va. DSWC

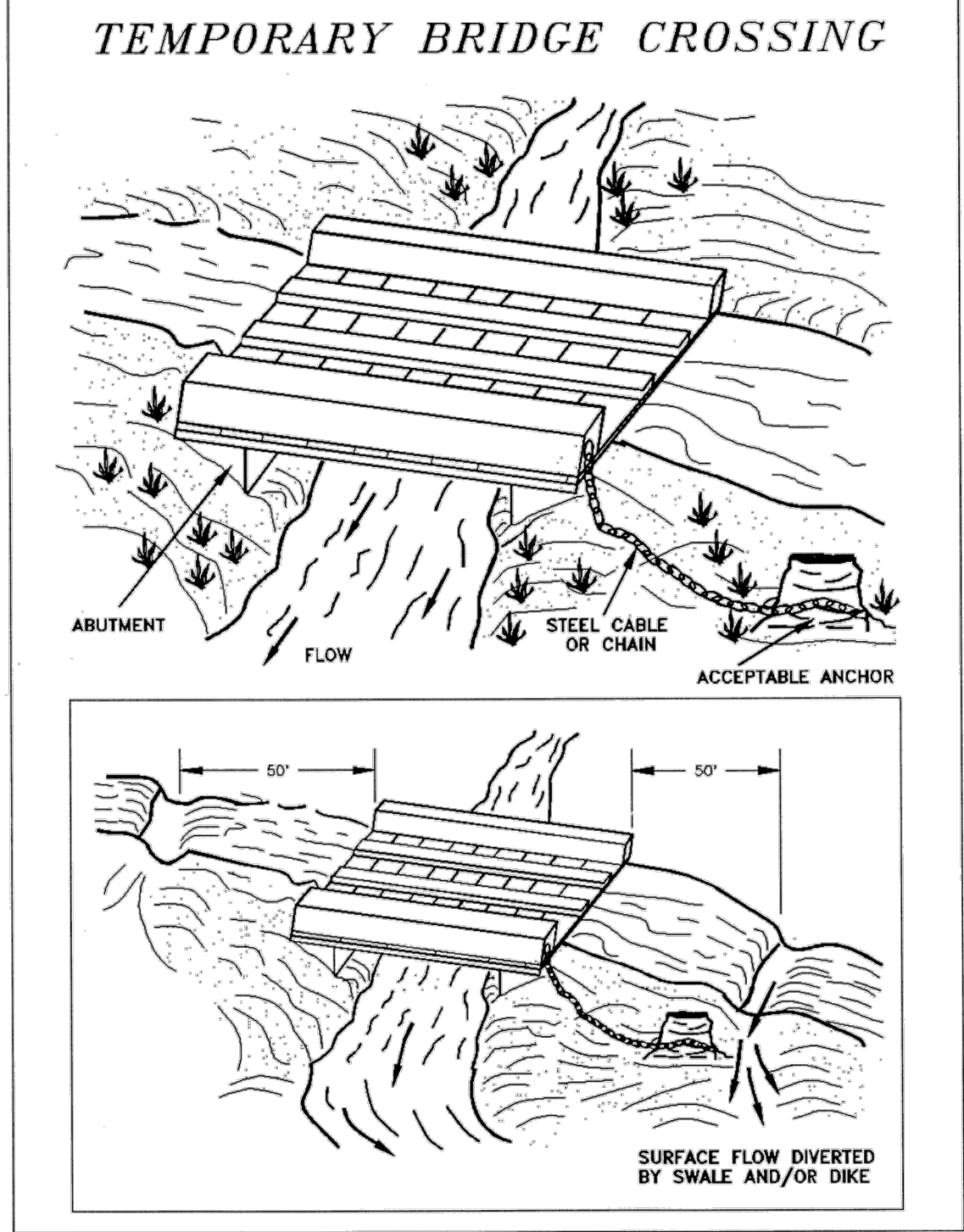
Plate 3.20-1

ROCK CHECK DAM  
DEVELOPED FROM VADEQ 1992 MANUAL

NOTES:

NO FORMAL DESIGN IS REQUIRED FOR A CHECK DAM, HOWEVER THE FOLLOWING CRITERIA SHOULD BE ADHERED TO WHEN SPECIFYING CHECK DAMS:

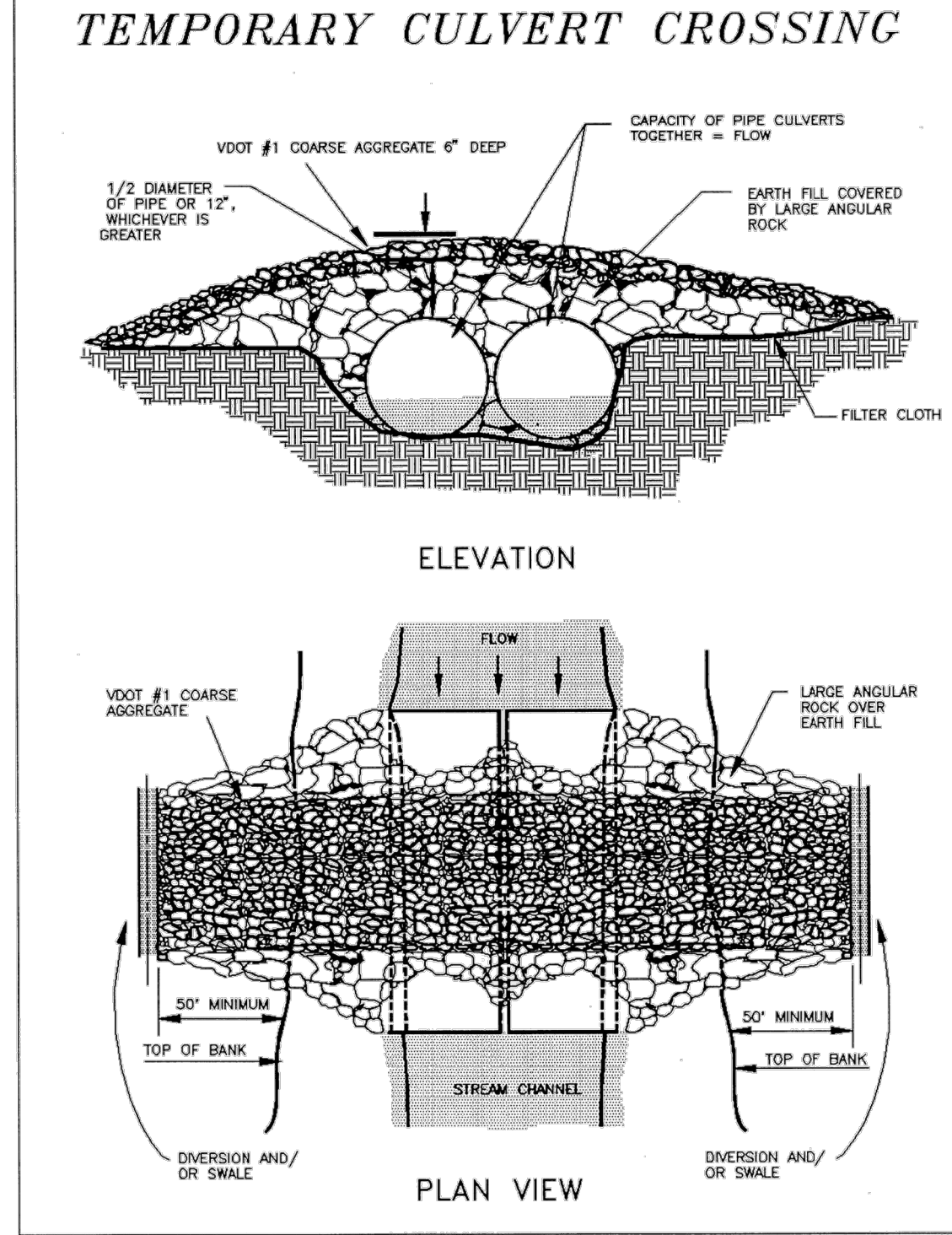
1. THE DRAINAGE AREA OF THE DITCH OR SWALE BEING PROTECTED SHALL NOT EXCEED 2 ACRES WHEN VDOT #1 COARSE AGGREGATE IS USED ALONE AND SHALL NOT EXCEED 10 ACRES WHEN A COMBINATION OF CLASS 1 RIPRAP (ADDED FOR STABILITY) AND VDOT #1 COARSE AGGREGATE IS USED.
2. THE MAXIMUM HEIGHT OF THE DAM SHALL BE 3.0 FEET.
3. THE CENTER OF THE CHECK DAM MUST BE AT LEAST 6 INCHES LOWER THAN THE OUTER EDGES. FIELD EXPERIENCE HAS SHOWN THAT MANY DAMS ARE NOT CONSTRUCTED TO PROMOTE THIS "WEIR" EFFECT. STORMWATER FLOWS ARE THEN FORCED TO THE STONE-SOIL INTERFACE, THEREBY PROMOTING SCOUR AT THE POINT AND SUBSEQUENT FAILURE OF THE STRUCTURE TO PERFORM ITS INTENDED FUNCTION.
4. FOR ADDED STABILITY, THE BASE OF THE CHECK DAM CAN BE KEYED INTO THE SOIL APPROXIMATELY 6 INCHES.
5. THE MAXIMUM SPACING BETWEEN THE DAMS SHOULD BE SUCH THAT THE TOE OF THE UPSTREAM DAM IS AT THE SAME ELEVATION AS THE TOP OF THE DOWNSTREAM DAM.
6. HAND OR MECHANICAL PLACEMENT WILL BE NECESSARY TO ACHIEVE COMPLETE COVERAGE OF THE DITCH OR SWALE AND TO INSURE THAT THE CENTER OF THE DAM IS LOWER THAN THE EDGES.
7. FILTER CLOTH MAY BE USED UNDER THE STONE TO PROVIDE A STABLE FOUNDATION AND TO FACILITATE THE REMOVAL OF THE STONE.



Source: 1983 Maryland Standards and Specifications for Soil Erosion and Sediment Control

Plate 3.24-1

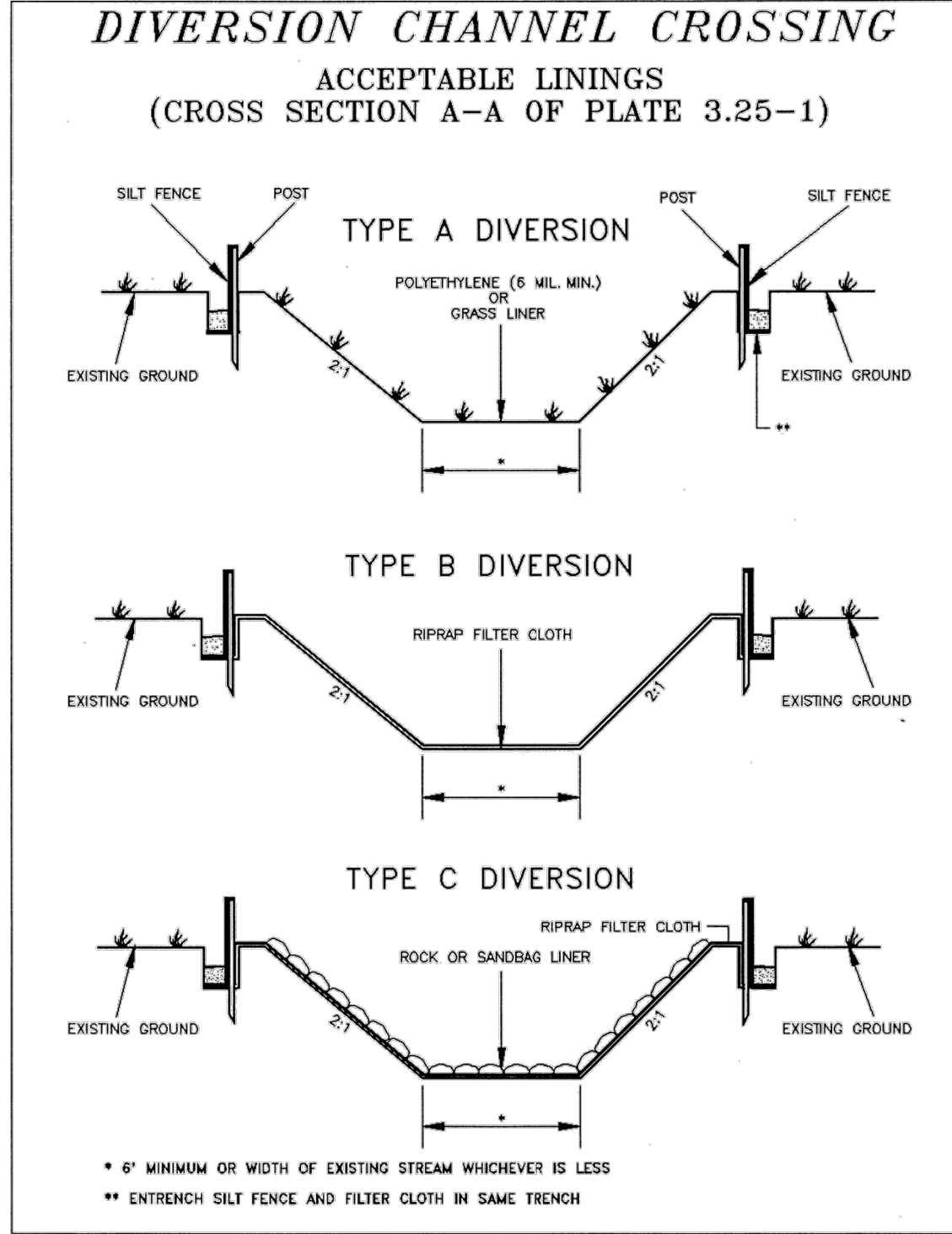
TEMPORARY BRIDGE CROSSING  
DEVELOPED FROM VADEQ 1992 MANUAL



Source: Va. DSWC

Plate 3.24-2

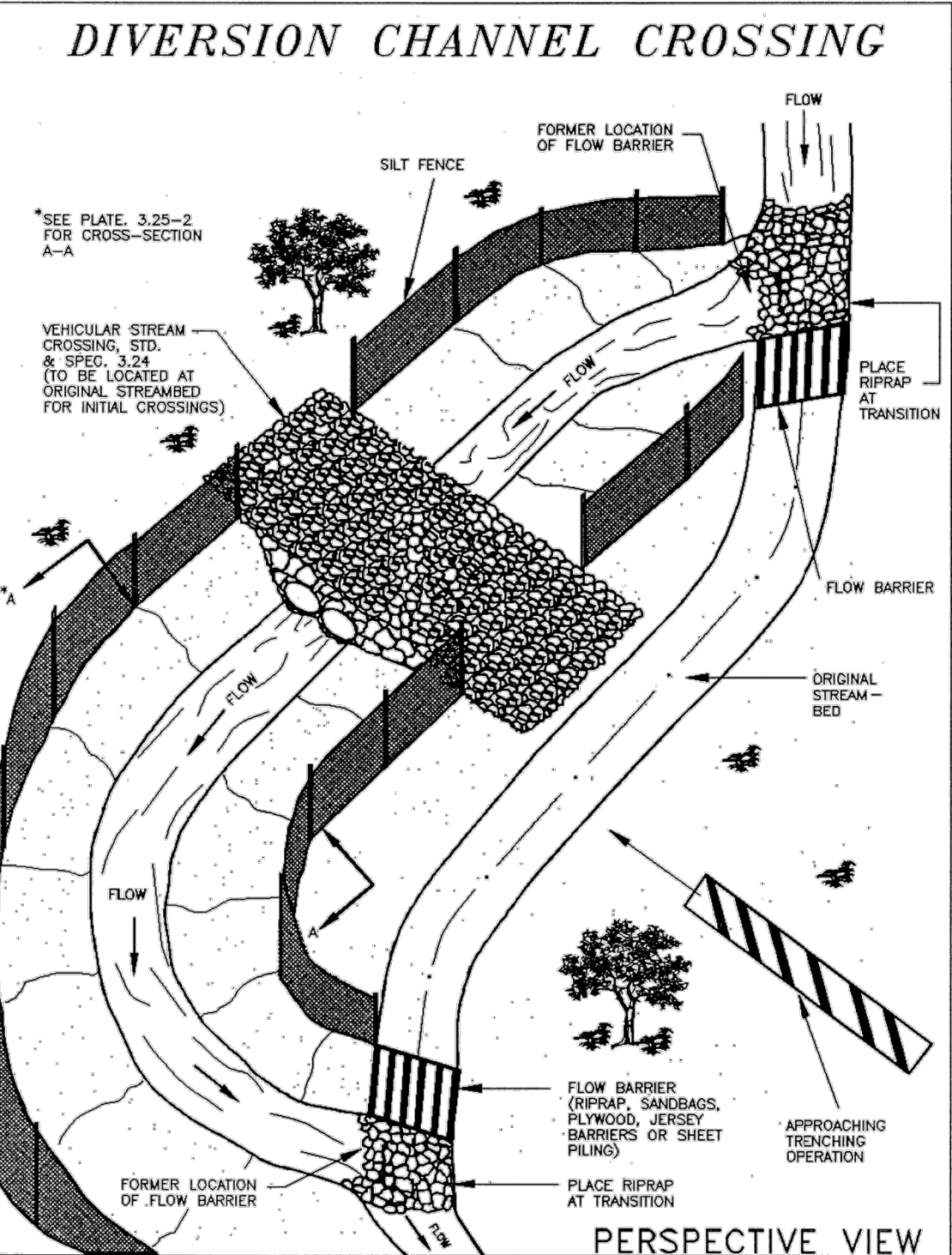
TEMPORARY CULVERT CROSSING  
TAKEN FROM VADEQ 1992 MANUAL



Source: Adapted from VDOT Standard Sheets

Plate 3.25-2

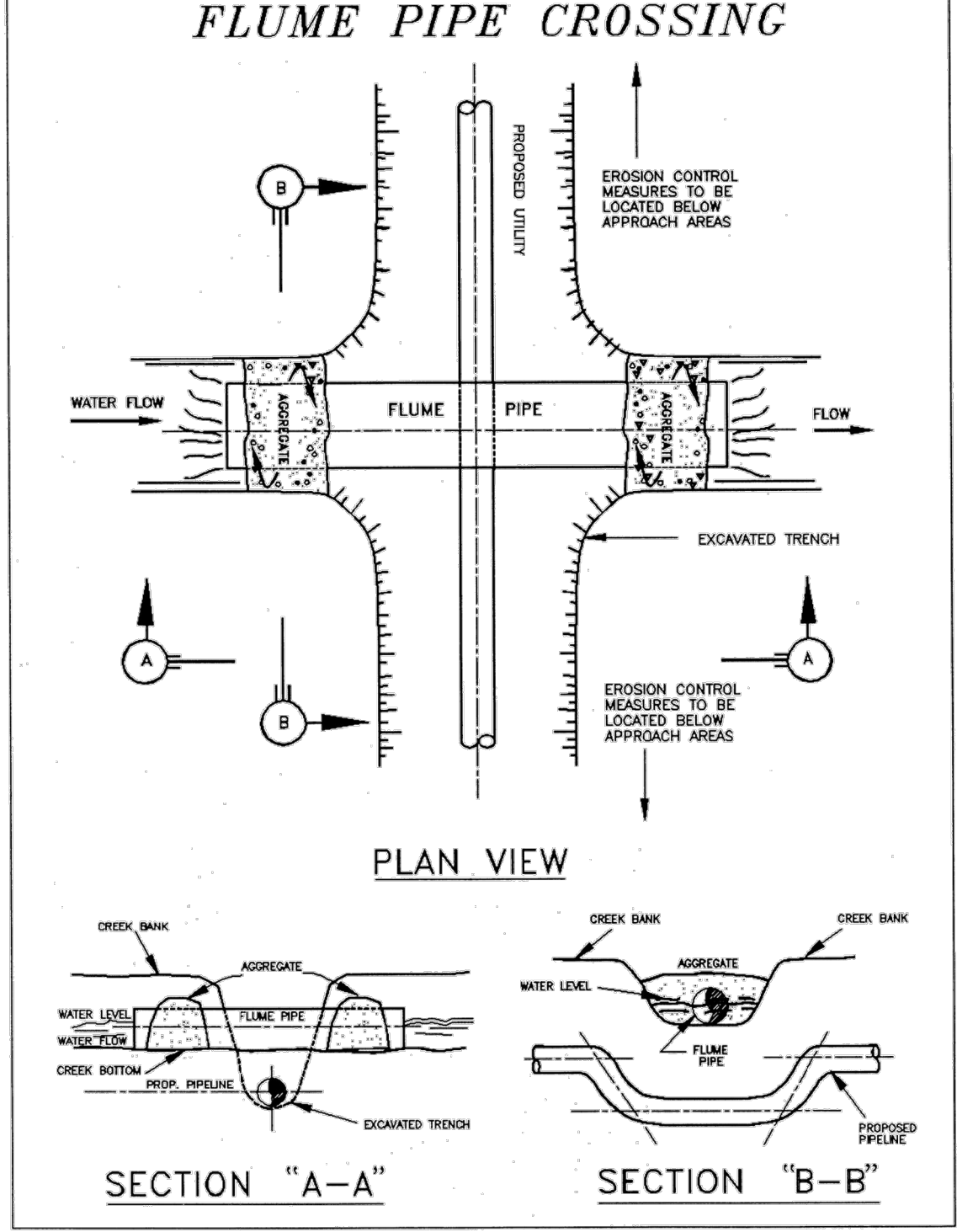
DIVERSION CHANNEL CROSSING  
DEVELOPED FROM VADEQ 1992 MANUAL



Source: Va. DSWC

Plate 3.25-1

DIVERSION CHANNEL CROSSING  
DEVELOPED FROM VADEQ 1992 MANUAL

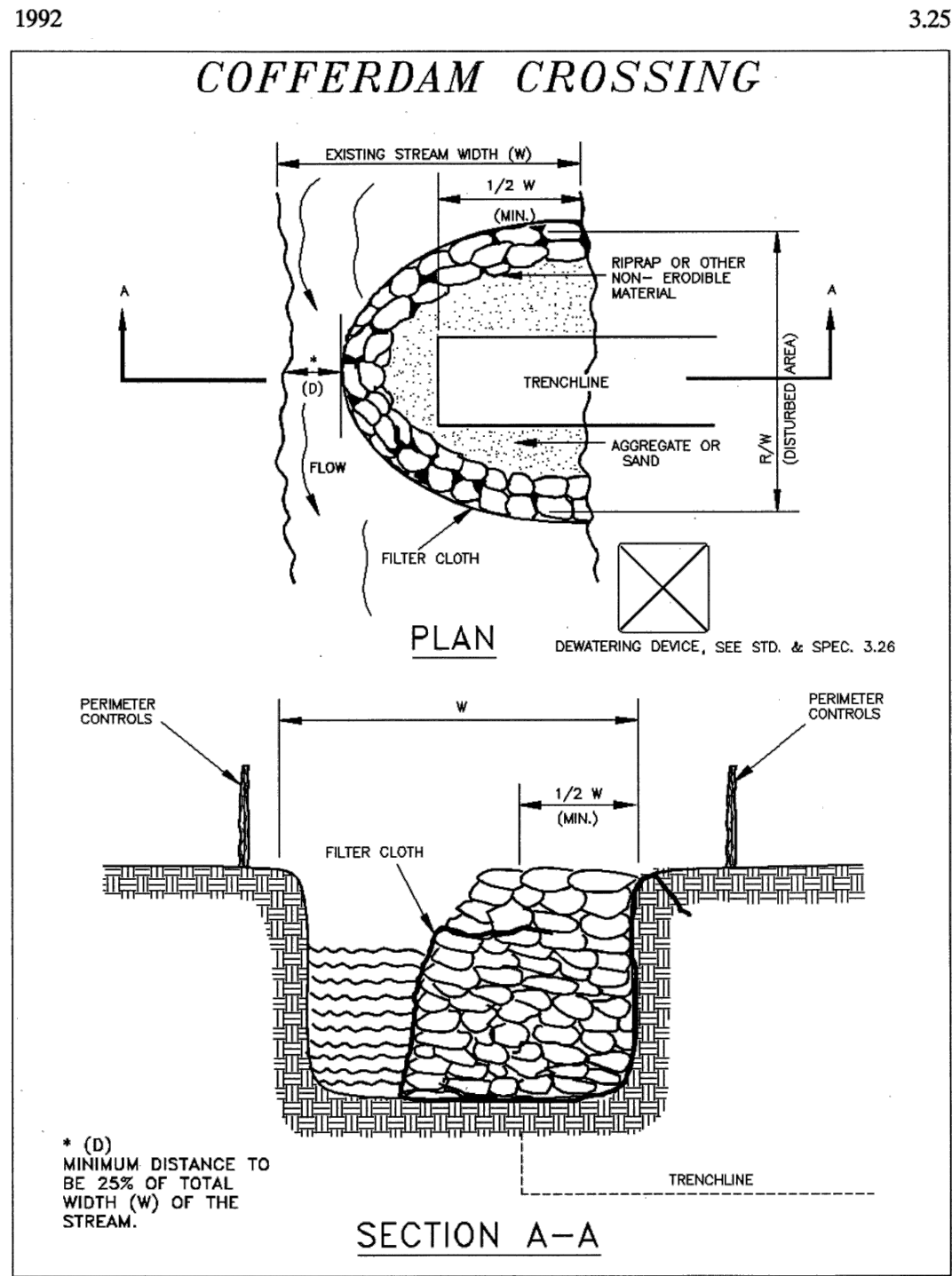


Source: Va. DSWC

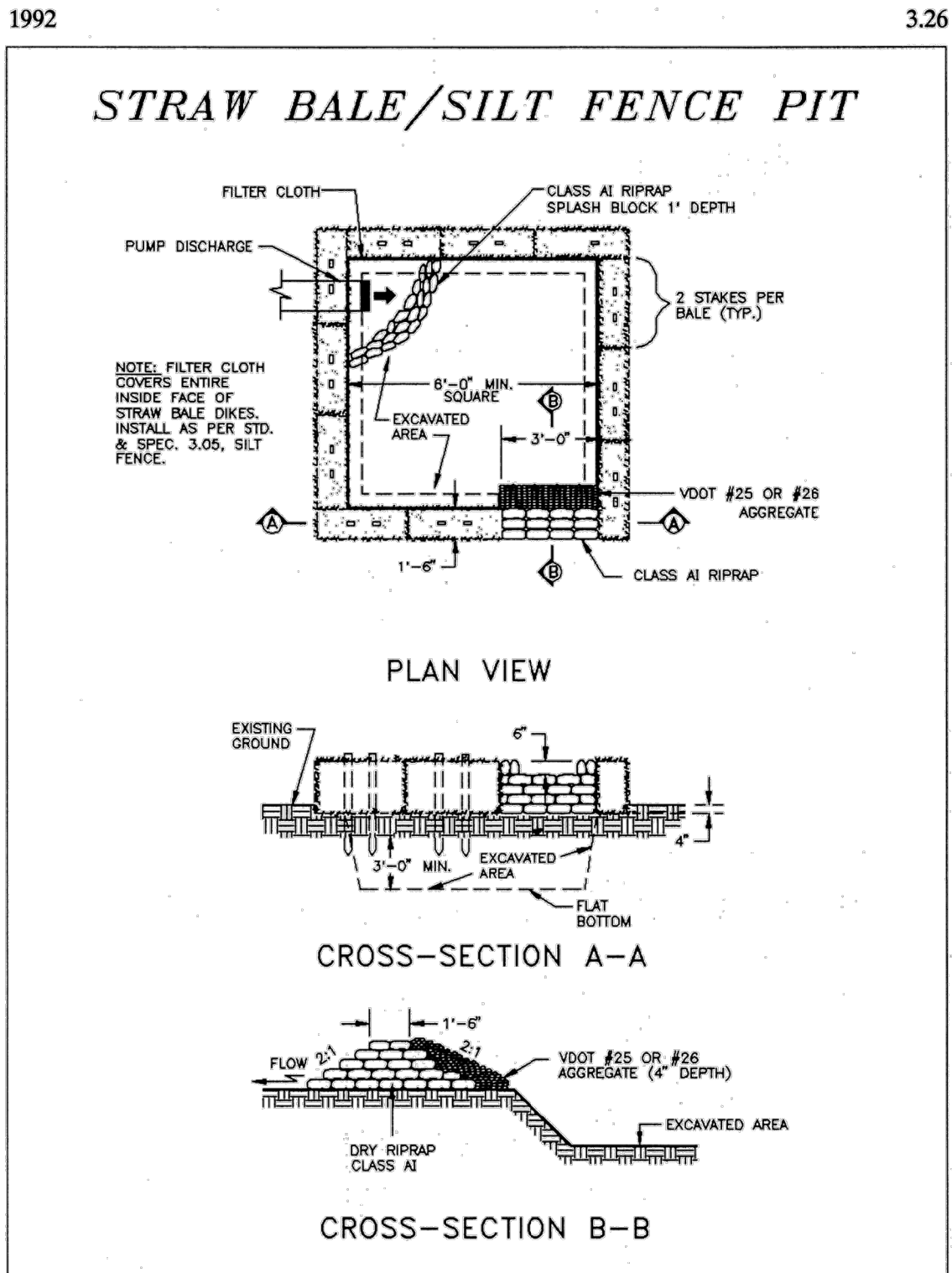
Plate 3.25-3

FLUME PIPE CROSSING  
DEVELOPED FROM VADEQ 1992 MANUAL

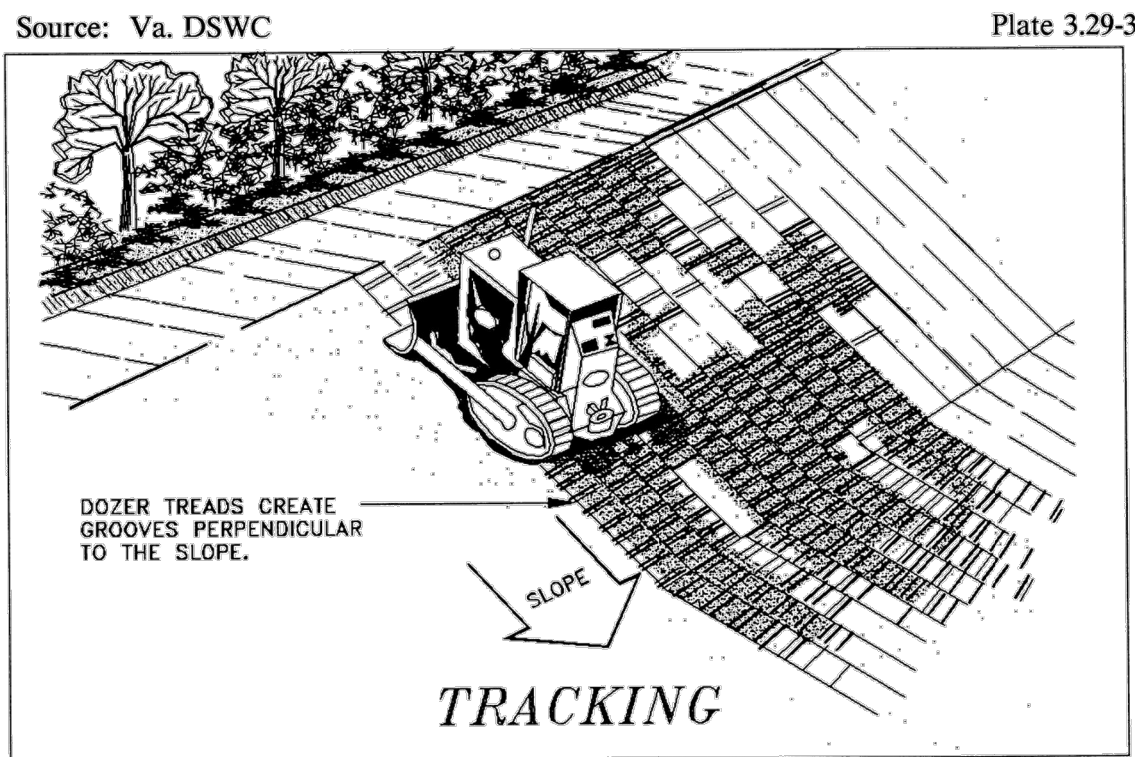
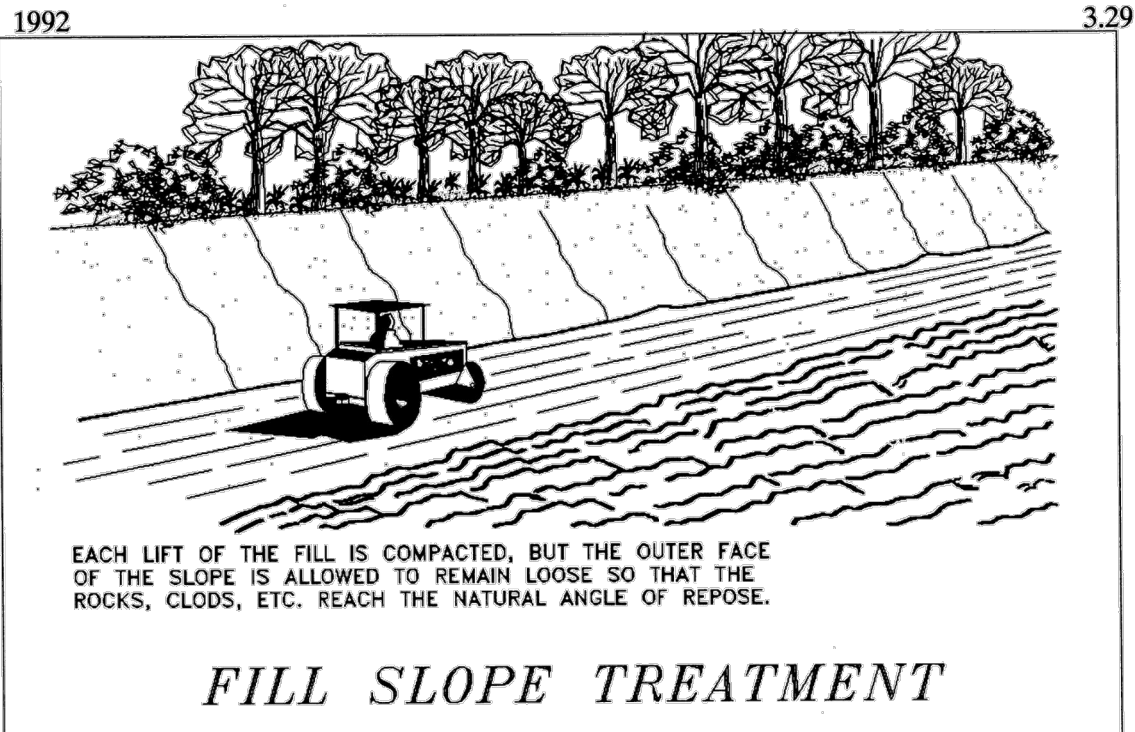




**COFFERDAM STREAM CROSSING**  
TAKEN FROM VADEQ 1992 MANUAL



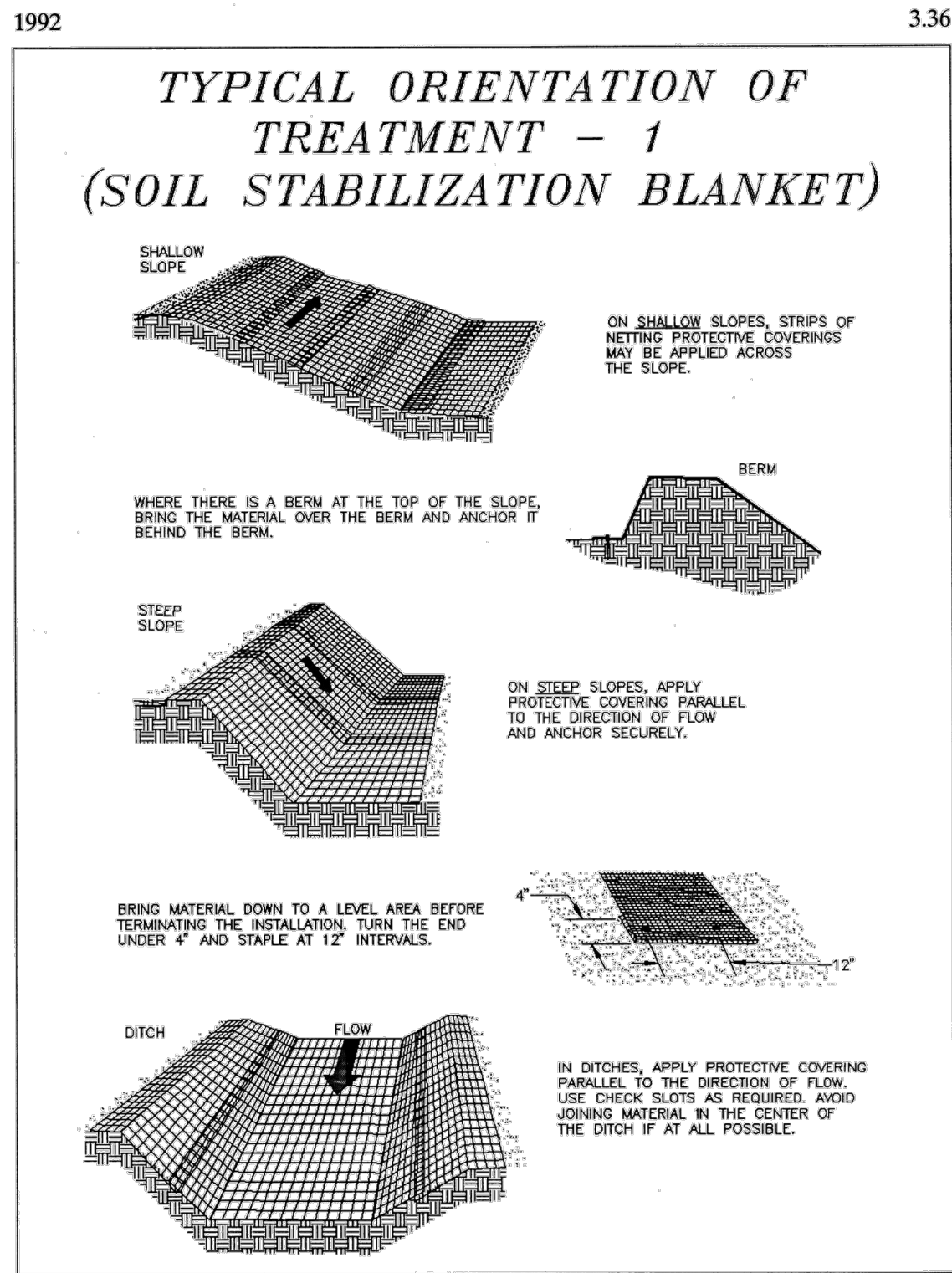
**STRAW BALE/SILT FENCE PIT**  
DEVELOPED FROM VADEQ 1992 MANUAL



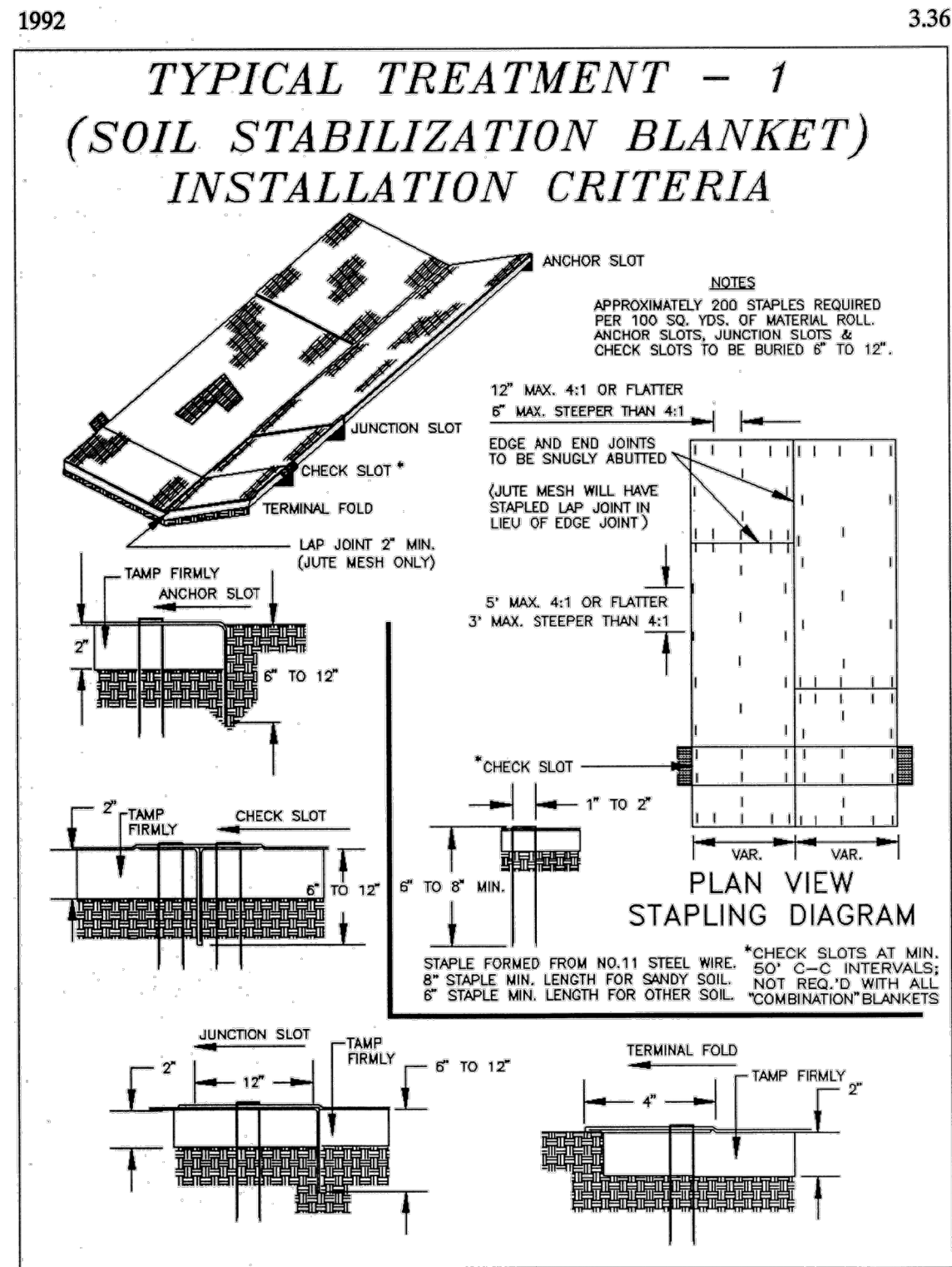
Source: Michigan Soil Erosion and Sedimentation Guide

Plate 3.29-4

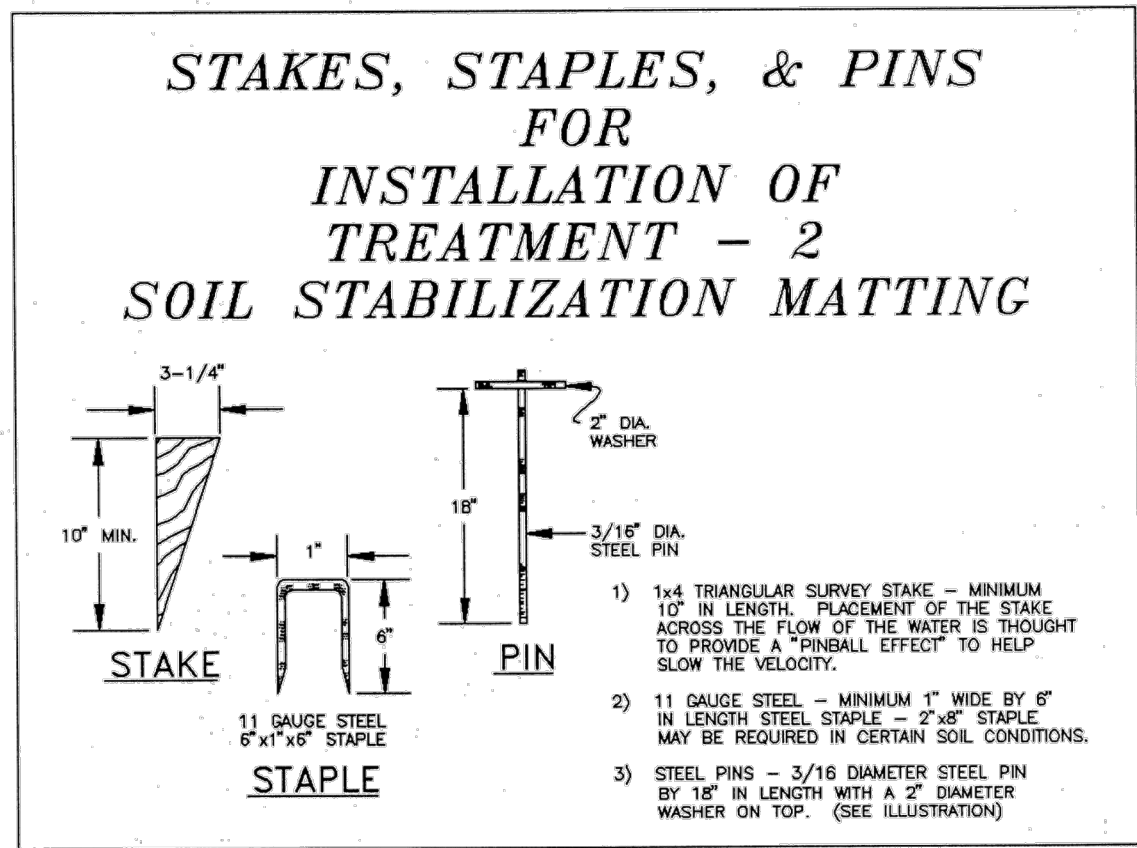
**FILL SLOPE TREATMENT & TRACKING**  
TAKEN FROM VADEQ 1992 MANUAL



**TYPICAL ORIENTATION OF TREATMENT**  
**SOIL STABILIZATION BLANKET**  
DEVELOPED FROM VADEQ 1992 MANUAL



**SOIL STABILIZATION BLANKET**  
**INSTALLATION CRITERIA**  
DEVELOPED FROM VADEQ 1992 MANUAL



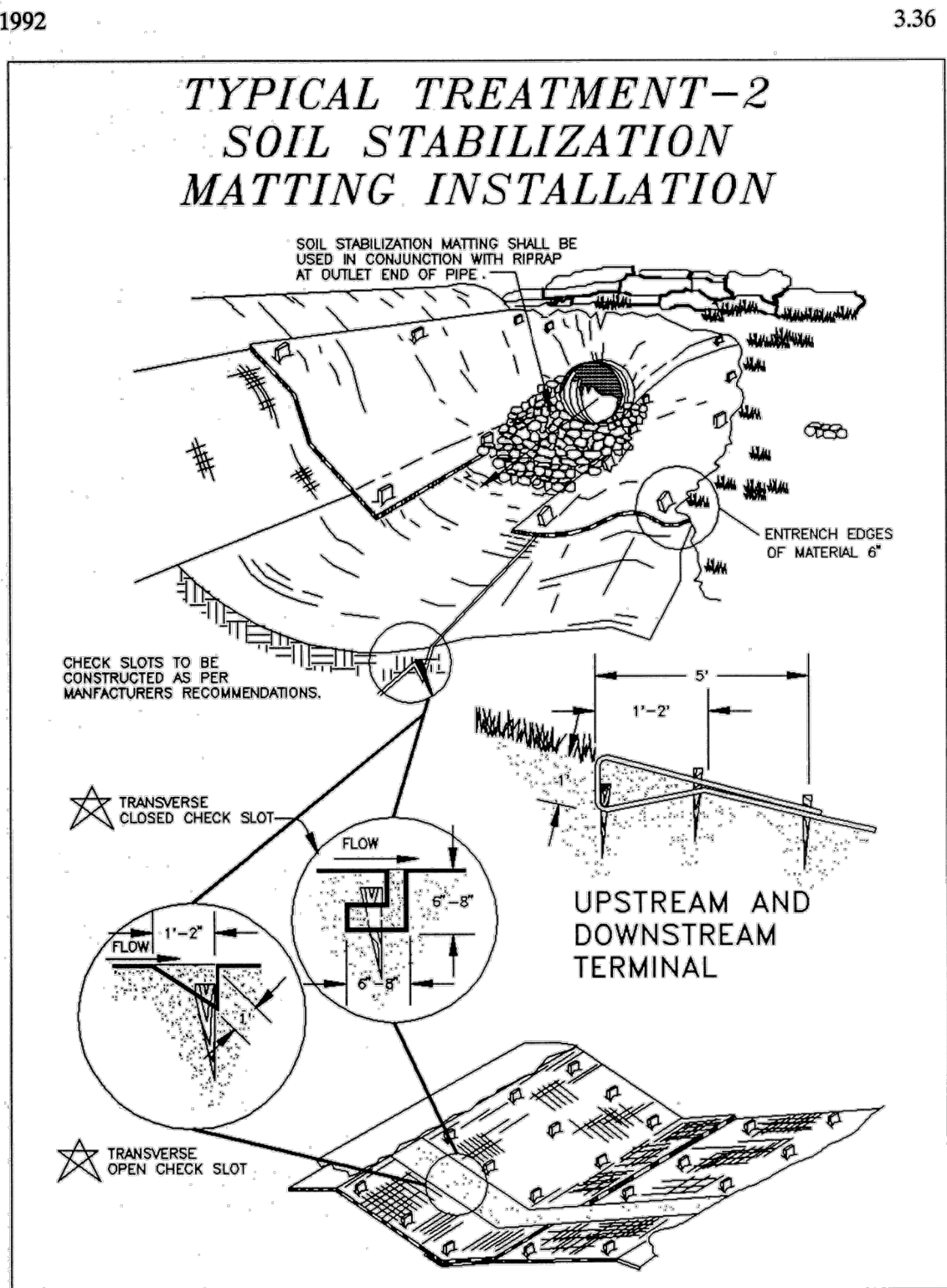
Source: Product literature from Greenstreak, Inc.

Plate 3.36-3

**Installation Requirements**

**Site Preparation** - After site has been shaped and graded to approved design, prepare a friable seedbed relatively free from clods and rocks more than 1 inch in diameter, and any foreign material that will prevent contact of the soil stabilization mat with the soil surface. If necessary, redirect any runoff away from the ditch or slope during installation.

**STAKES, STAPLES, & PINS FOR INSTALLATION**  
**OF SOIL STABILIZATION MATTING**  
DEVELOPED FROM VADEQ 1992 MANUAL



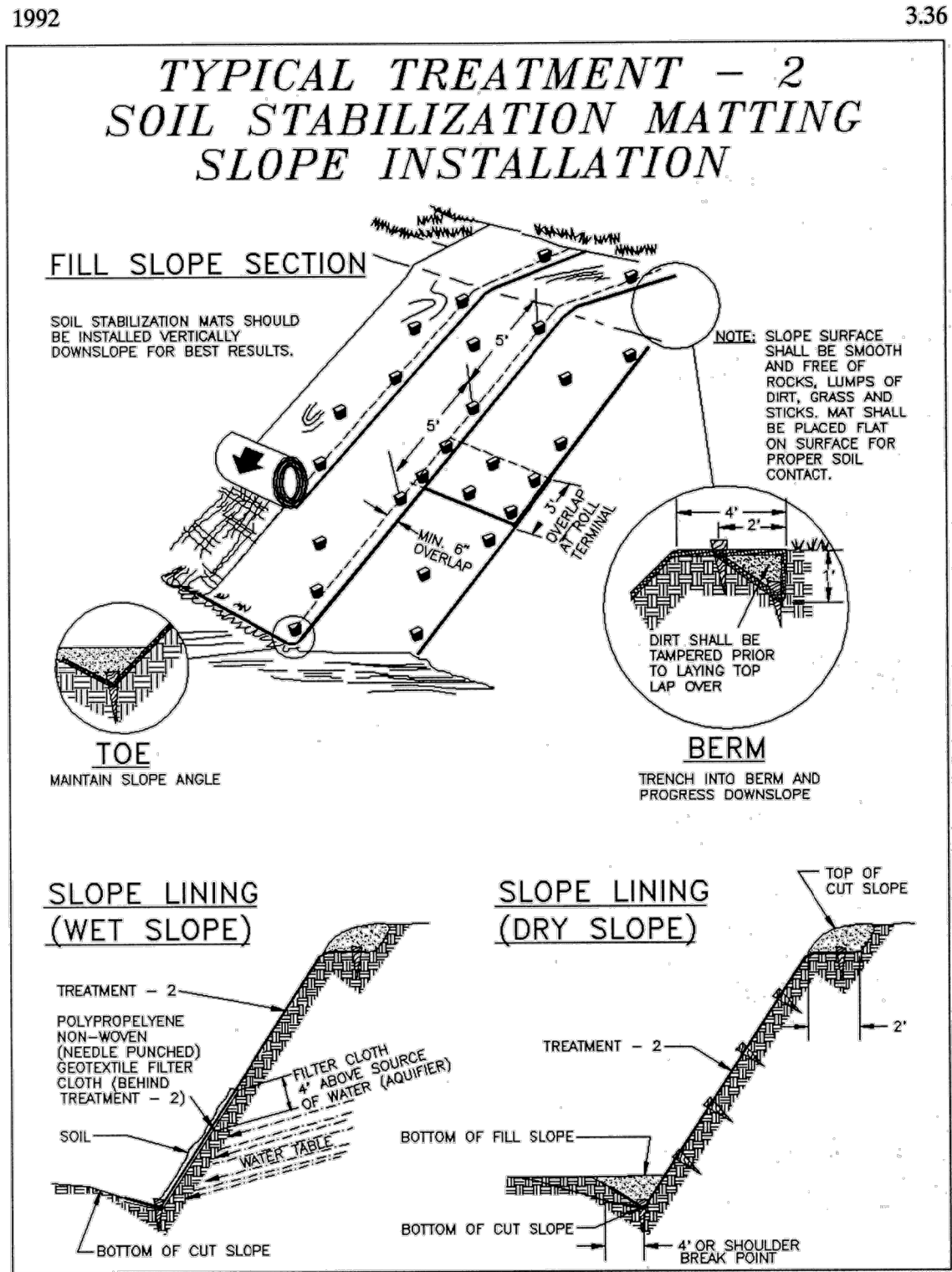
Source: VDOT Road and Bridge Standards

Plate 3.36-4

**TYPICAL TREATMENT**  
**SOIL STABILIZATION MATTING INSTALLATION**  
DEVELOPED FROM VADEQ 1992 MANUAL

ADDED DETAILS FOR ROADS AND PADS										REVISIONS:									
DW		RE		KAL		KAL		KAL		NO.		DATE		CHD.		APPD.		DESCRIPTION	
7	01/31/18																		
6	01/26/18																		
5	01/08/18																		
4	11/28/17																		
3	11/01/17																		
2	08/18/17																		
MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE										MOUNTAIN VALLEY PIPELINE, LLC 555 SOUTHPOINTE BOULEVARD, SUITE 200 CANONSBURG, PA 15317									
EROSION AND SEDIMENT CONTROL PLANS																			
MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE																			
TETRA TECH										661 ANDERSEN DRIVE FOSTER PLAZA 7 PITTSBURGH, PA 15220									
complex world   CLEAR SOLUTIONS™																			
GENERAL DETAILS SET																			
COMMONWEALTH OF PENNSYLVANIA DAVID J. WALLNER Lic. No. 0402057593 Professional Engineer																			
DRAWN BY:										KAL									
CHECKED BY:										HT									
APPROVED BY:										RE									
DATE:										11/28/2017									
SCALE:										AS SHOWN									
SHT. NO.										0.03 OF 0.23									





Source: VDOT Road and Bridge Standards

Plate 3.36-5

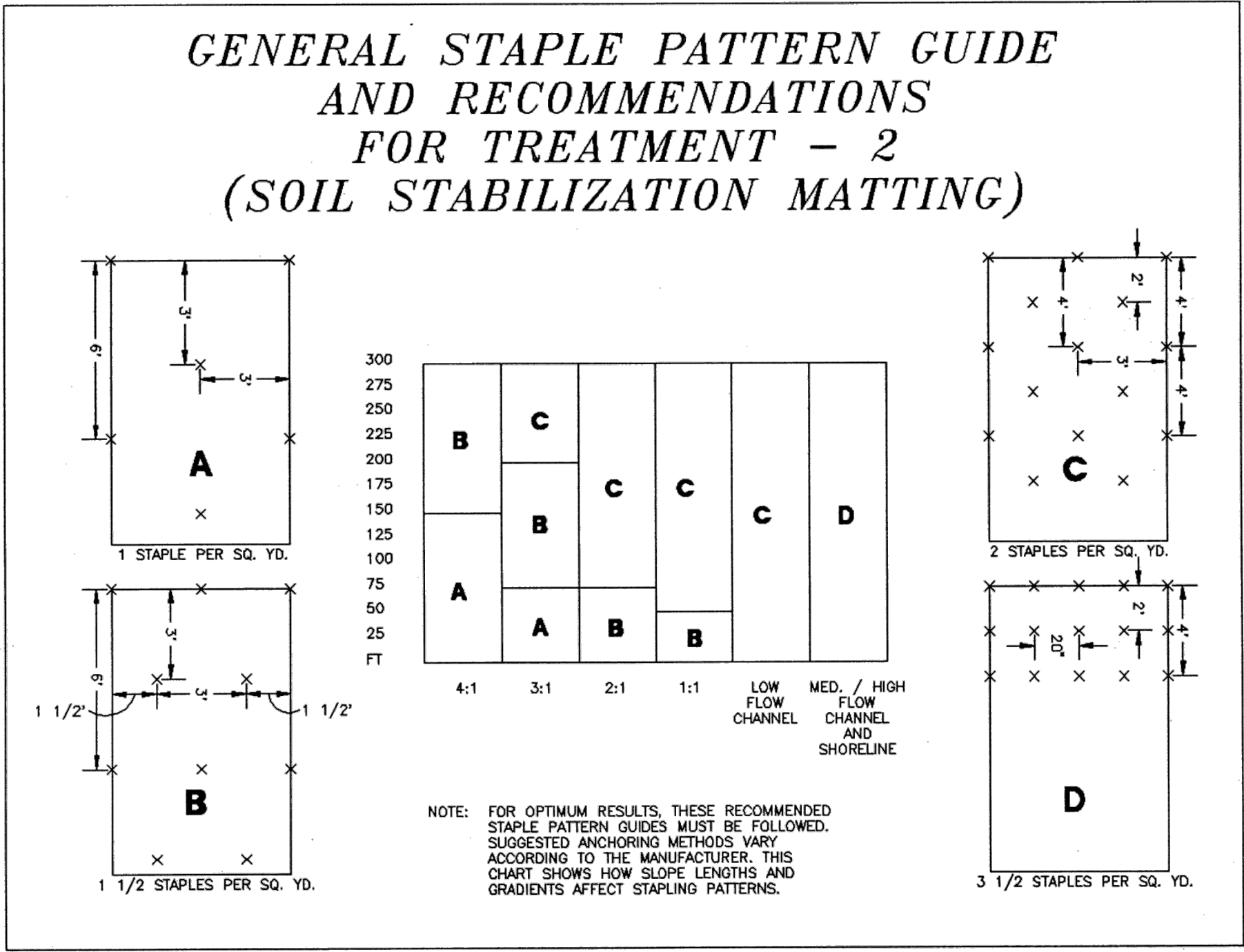
**SOIL STABILIZATION MATTING SLOPE**

NOTE:  
FOR LANDS ON THE JEFFERSON NATIONAL FOREST, IF THE USE OF STABILIZATION NETTING IS REQUIRED/PERMITTED, WILDLIFE FRIENDLY GEOTEXTILES MUST BE USED. THESE PRODUCTS MUST EITHER NOT CONTAIN NETTING, OR NETTING MUST BE MADE OF 100% BIODEGRADABLE NON-PLASTIC MATERIALS SUCH AS JUTE, SISAL, OR COIR FIBER. PLASTIC NETTING (SUCH AS POLYPROPYLENE, NYLON, POLYETHYLENE, AND POLYESTER), EVEN IF ADVERTISED AS BIODEGRADABLE, IS NOT ACCEPTED ALTERNATIVE. ANY NETTING USED MUST ALSO HAVE A LOOSE-WEAVE DESIGN WITH MOVABLE JOINTS BETWEEN HORIZONTAL AND VERTICAL TWINES TO REDUCE THE CHANCE FOR WILDLIFE ENTANGLEMENT, INJURY, OR DEATH. (CA COASTAL COMMISSION, 2012)

III - 368


Source: Product literature from North American Green

Plate 3.36-6




**GENERAL STAPLE PATTERN GUIDE  
& RECOMMENDATIONS FOR TREATMENT  
DEVELOPED FROM VADEQ 1992 MANUAL**

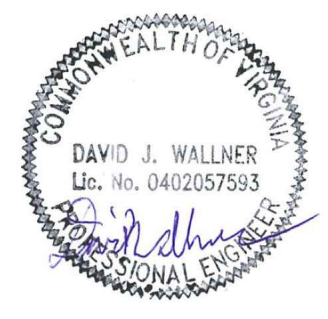
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ADDRESS VADEQ COMMENTS		DW	RE	KAL	11/28/17	4
ADDRESS VADEQ COMMENTS		DW	RE	KAL	11/01/17	3
ADDRESS VADEQ COMMENTS		DW	RE	KAL	08/18/17	2
DESCRIPTION		CHGD.	APPD.	DWN.	DATE	NO.
REVISIONS:						

**Mountain Valley Pipeline**  
EROSION AND SEDIMENT CONTROL PLANS  
MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE


MOUNTAIN VALLEY PIPELINE, LLC  
555 SOUTHPOINTE BOULEVARD, SUITE 200  
CANONSBURG, PA 15317

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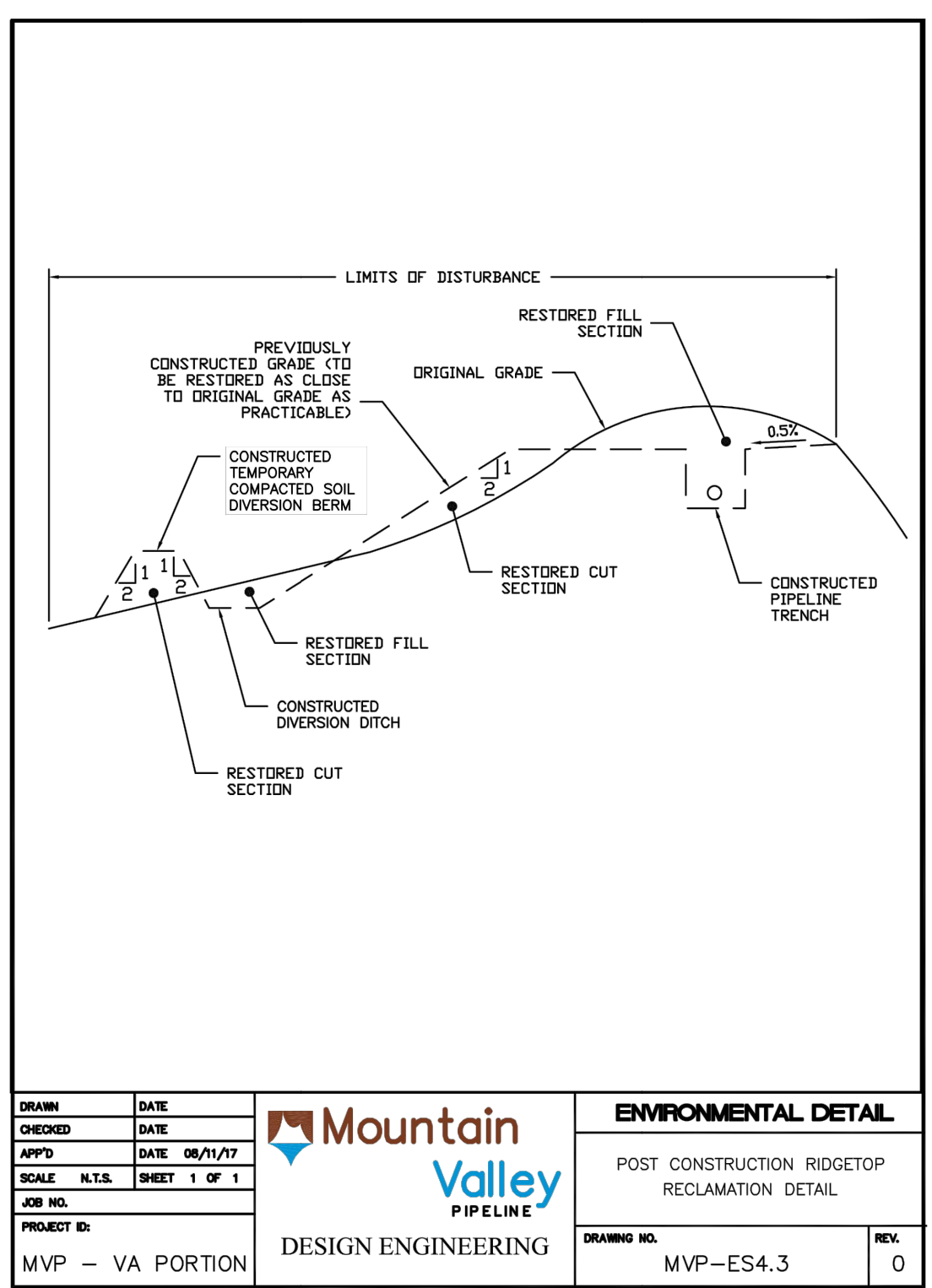
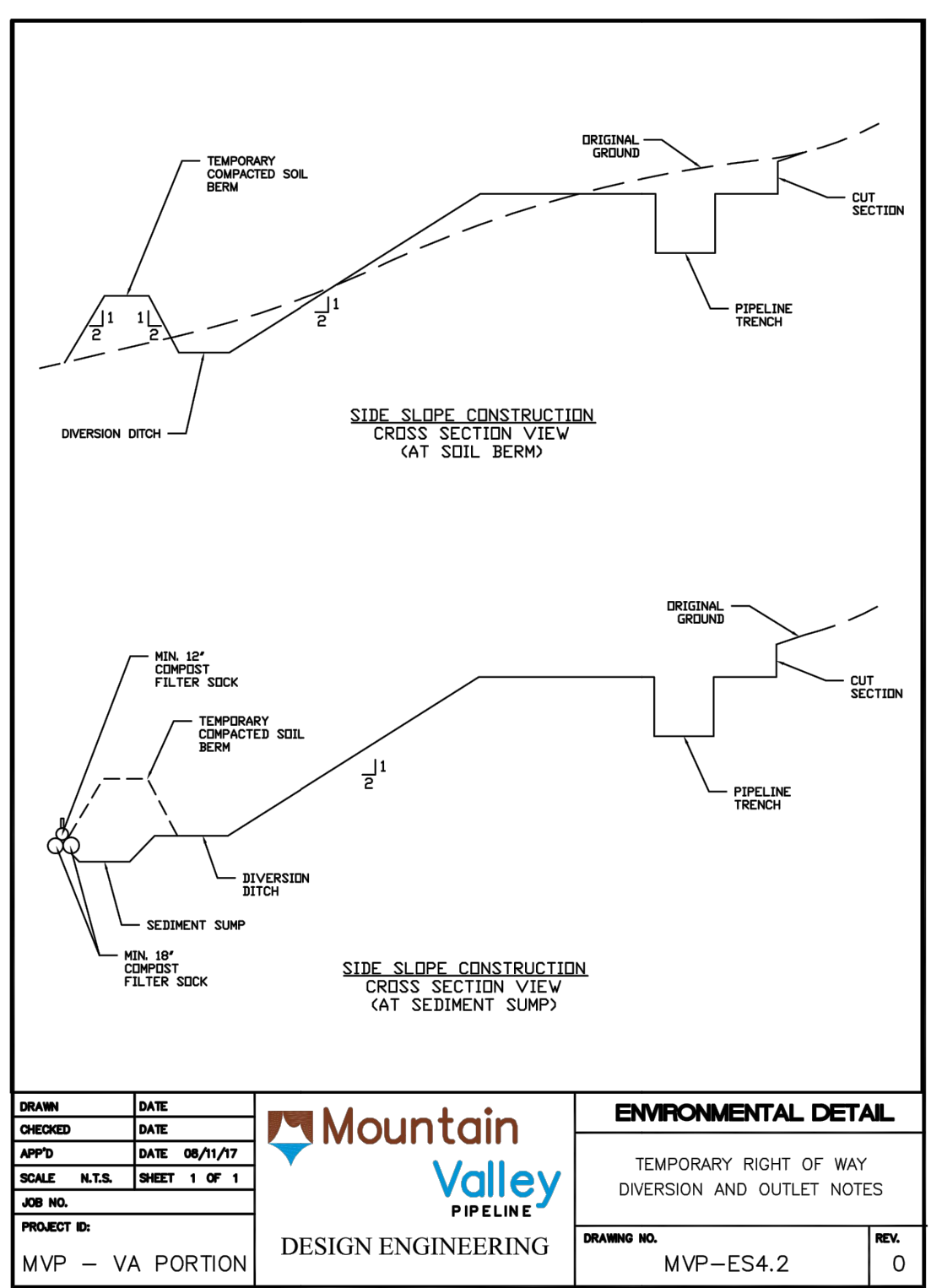
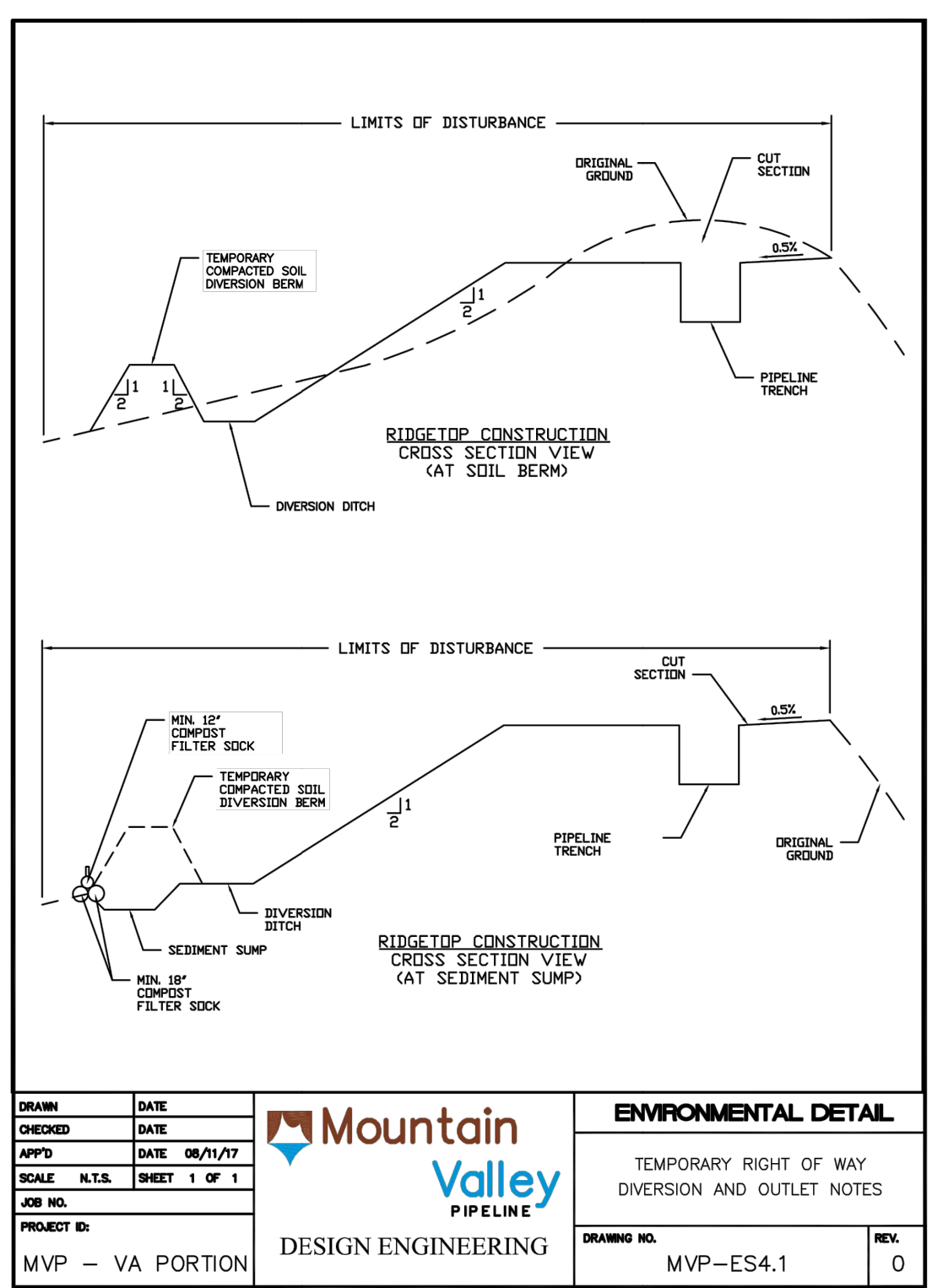
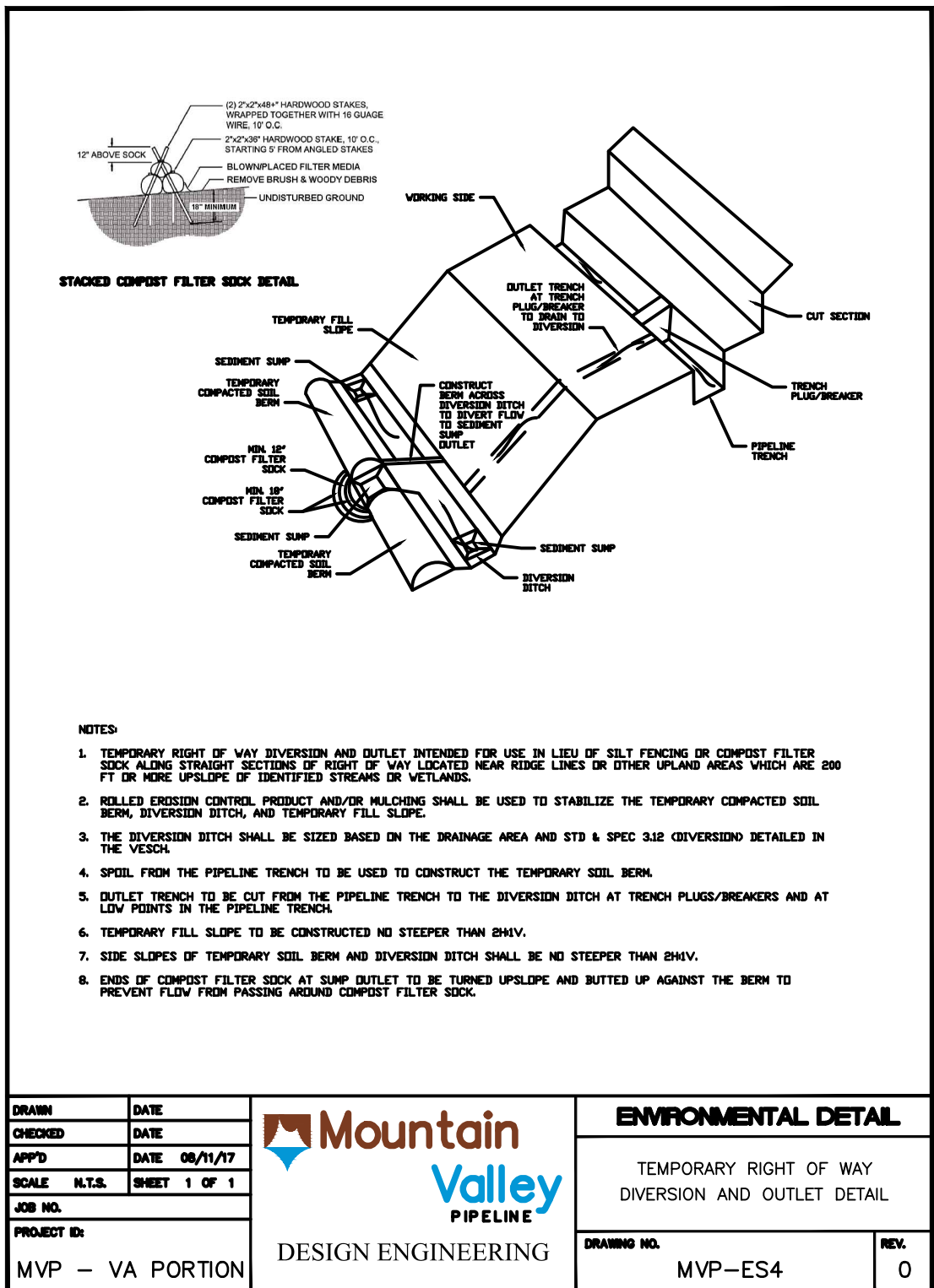
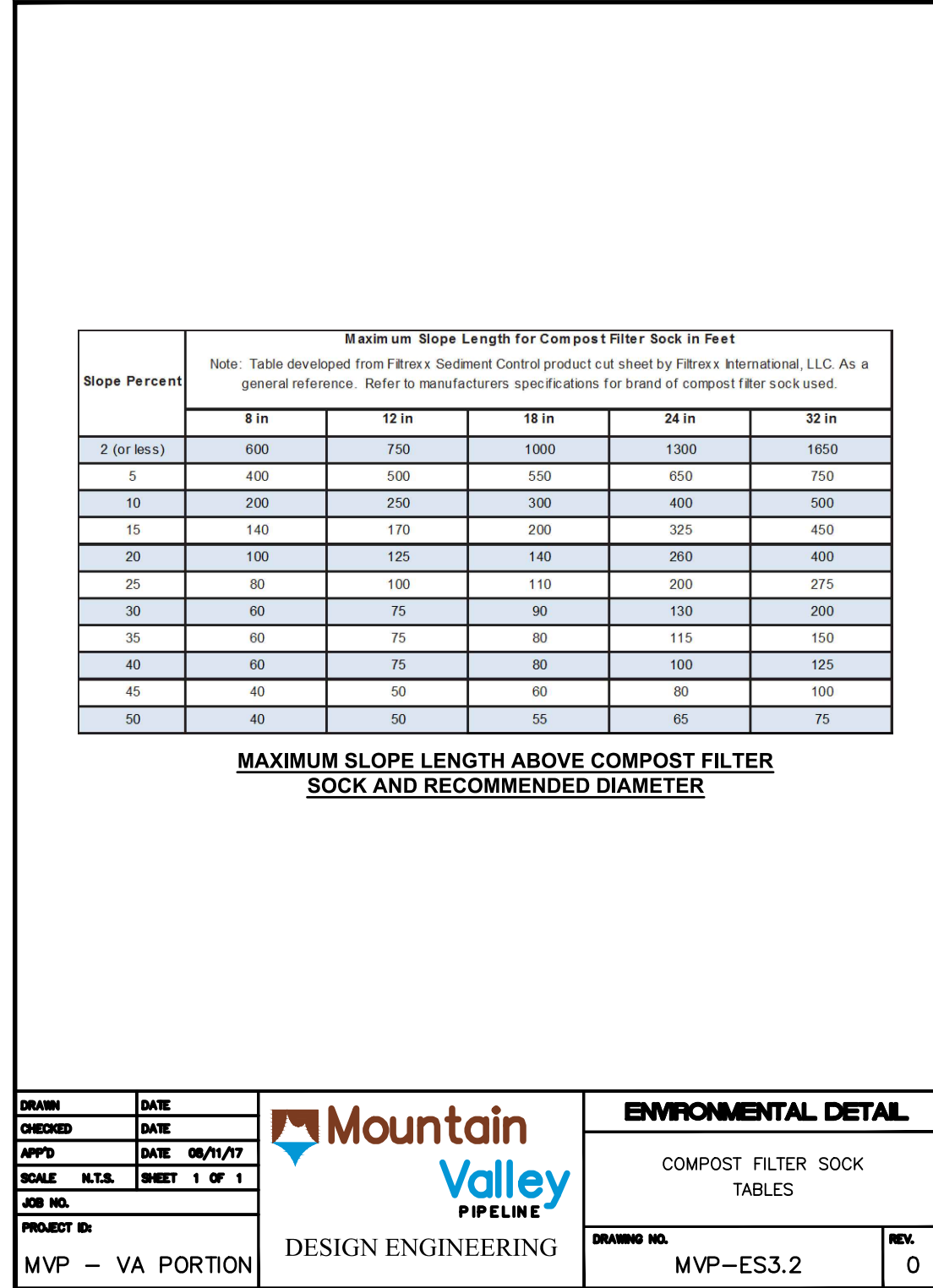
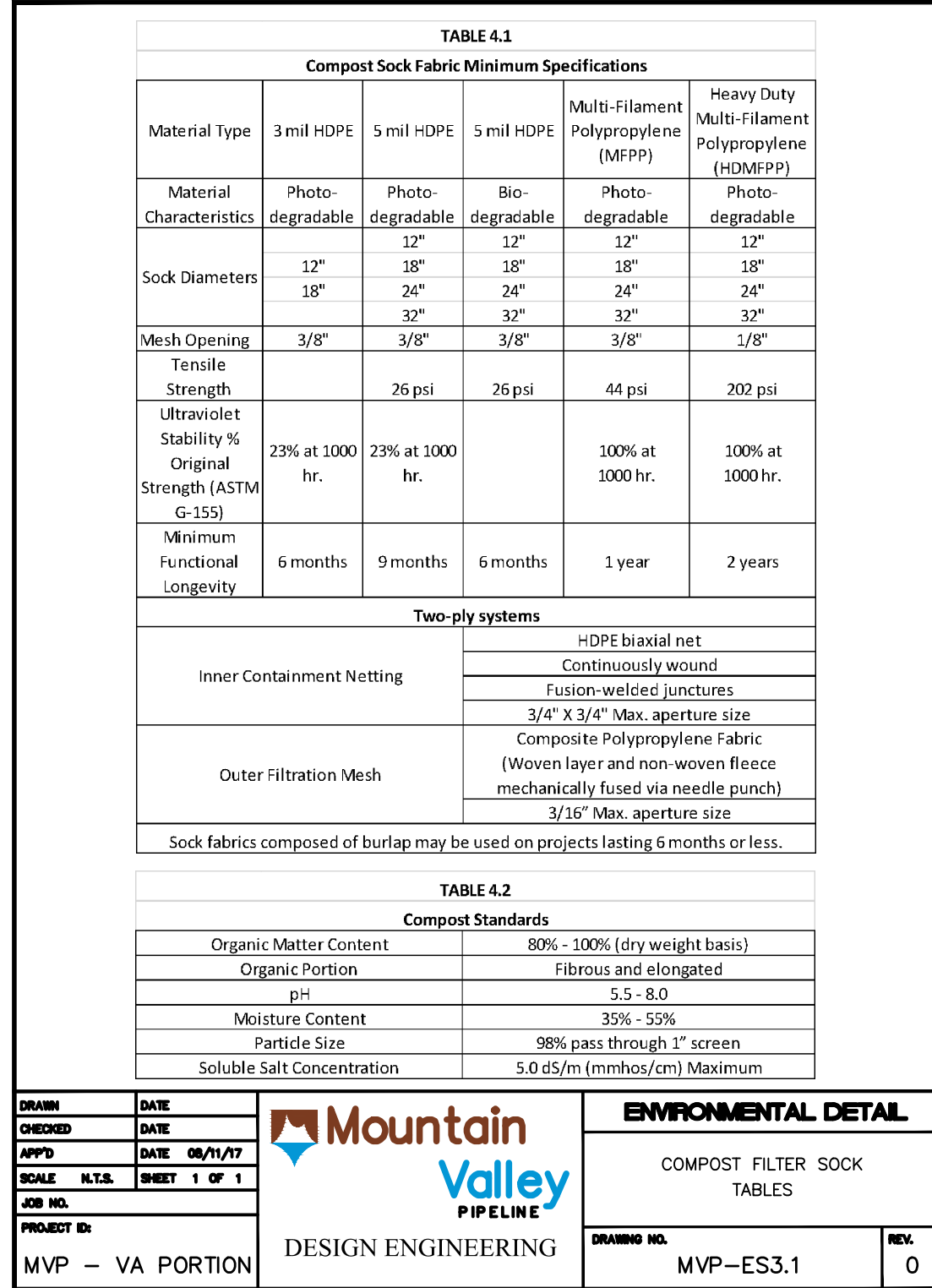
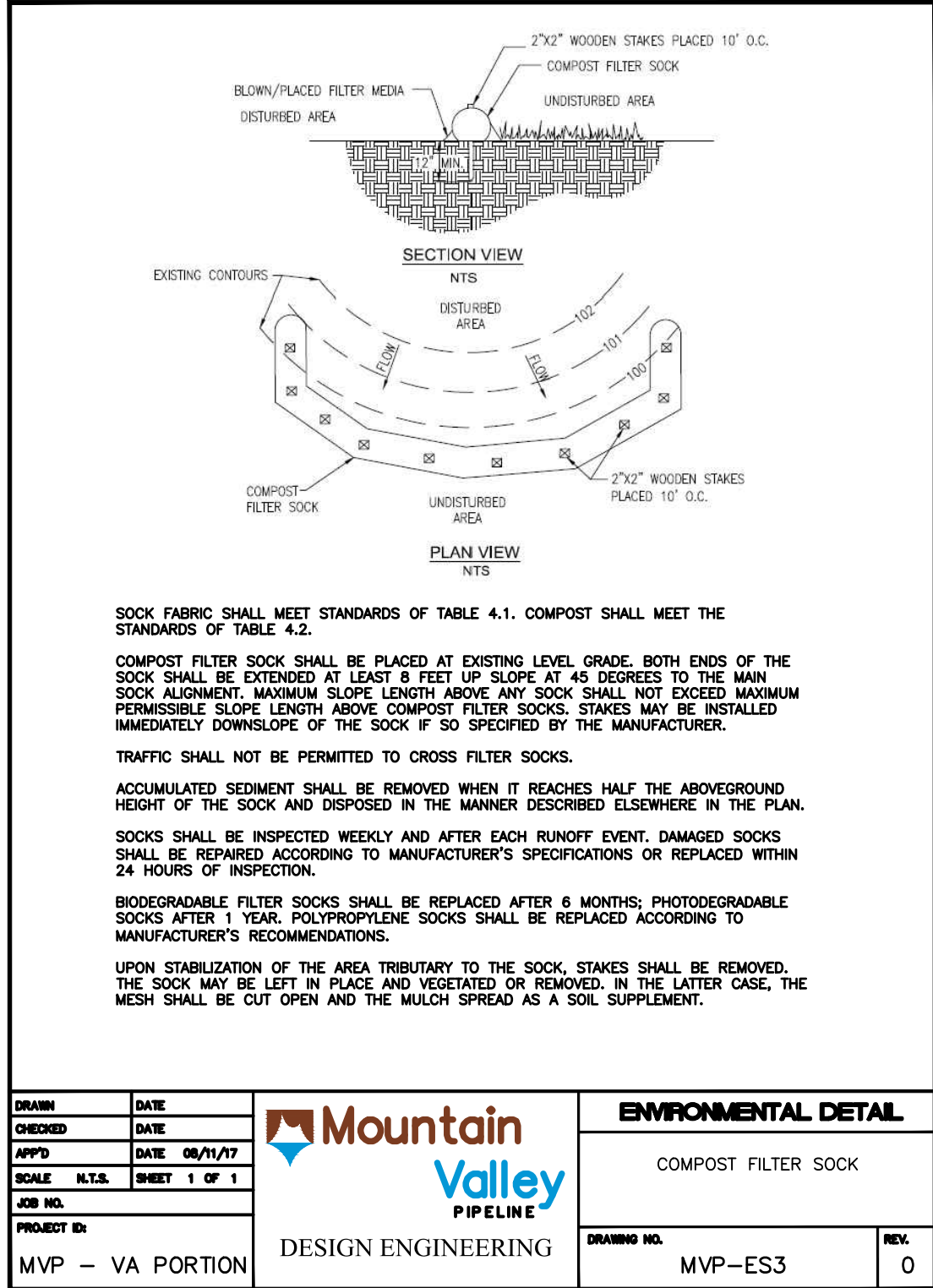
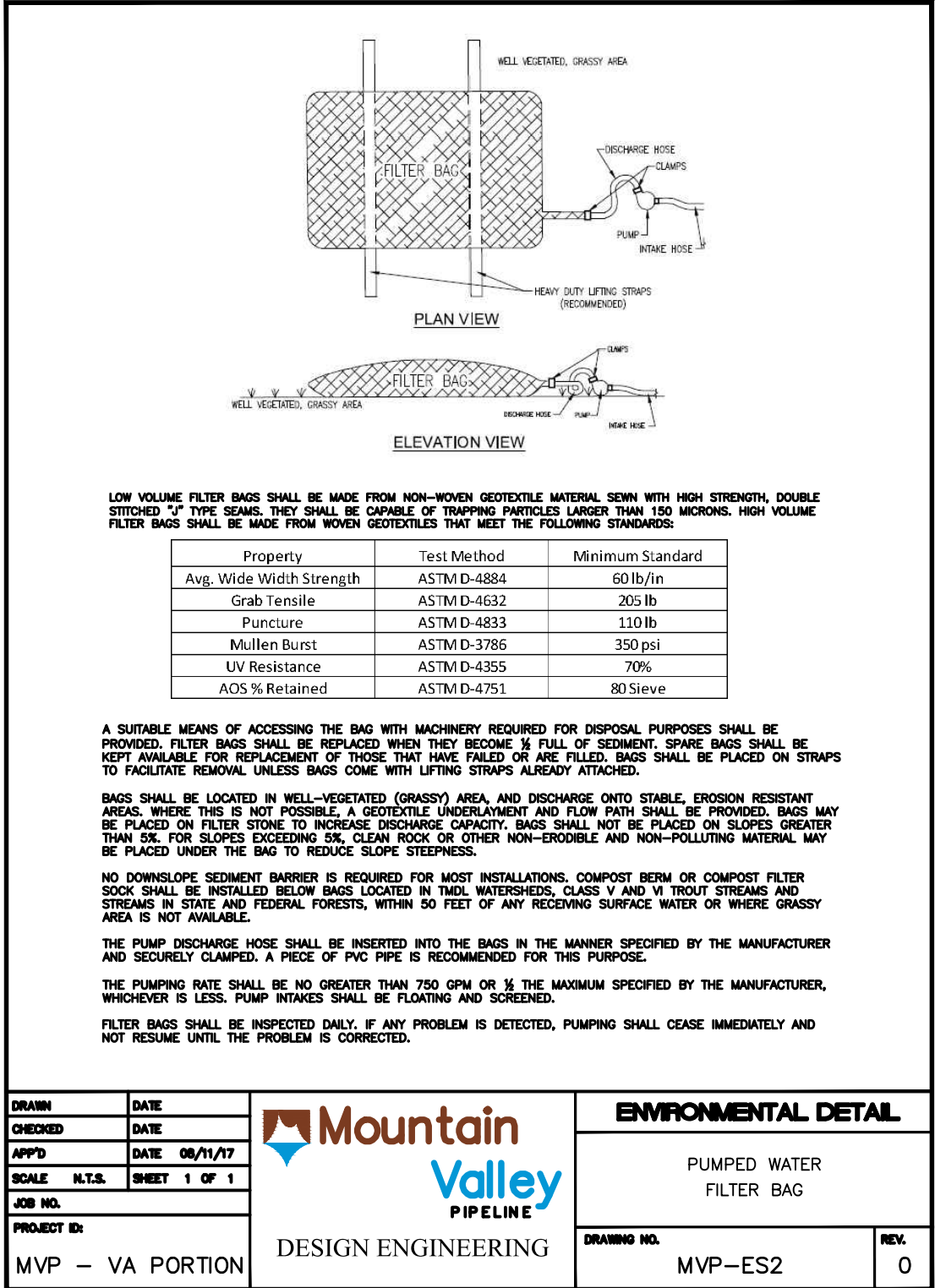
GENERAL DETAILS SET



DAVID J. WALLNER  
Lic. No. 0402057593  
PROFESSIONAL ENGINEER

DRAWN BY:		KAL
CHECKED BY:		HT
APPROVED BY:		RE
DATE:	11/28/2017	
SCALE:	AS SHOWN	
SHT. NO.	0.04	OF 0.23





ADDED DETAILS FOR ROADS AND PADS

ADDRESS VADO COMMENTS

ADDRESS VADO COMMENTS

ADDRESS VADO COMMENTS

ADDRESS VADO COMMENTS

ADDRESS VADO COMMENTS

ADDRESS VADO COMMENTS

NO.:

DATE:

CHD.:

APPD.:

DESCRIPTION:

REVISIONS:

7 01/31/18 KAL RE DW

6 01/26/18 KAL RE DW

5 01/08/18 KAL RE DW

4 11/28/17 KAL RE DW

3 11/01/17 KAL RE DW

2 08/18/17 KAL RE DW

1 01/31/18 KAL RE DW

Mountain Valley PIPELINE

EROSION AND SEDIMENT CONTROL PLANS

MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE

MOUNTAIN VALLEY PIPELINE, LLC

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FOSTER PLAZA 7

PITTSBURGH, PA 15220

GENERAL DETAILS SET

COMMONWEALTH OF PENNSYLVANIA

DAVID J. WALLNER

Lic. No. 0402057593

Professional Engineer

DESIGN ENGINEER

DRAWN BY: KAL

CHECKED BY: HT

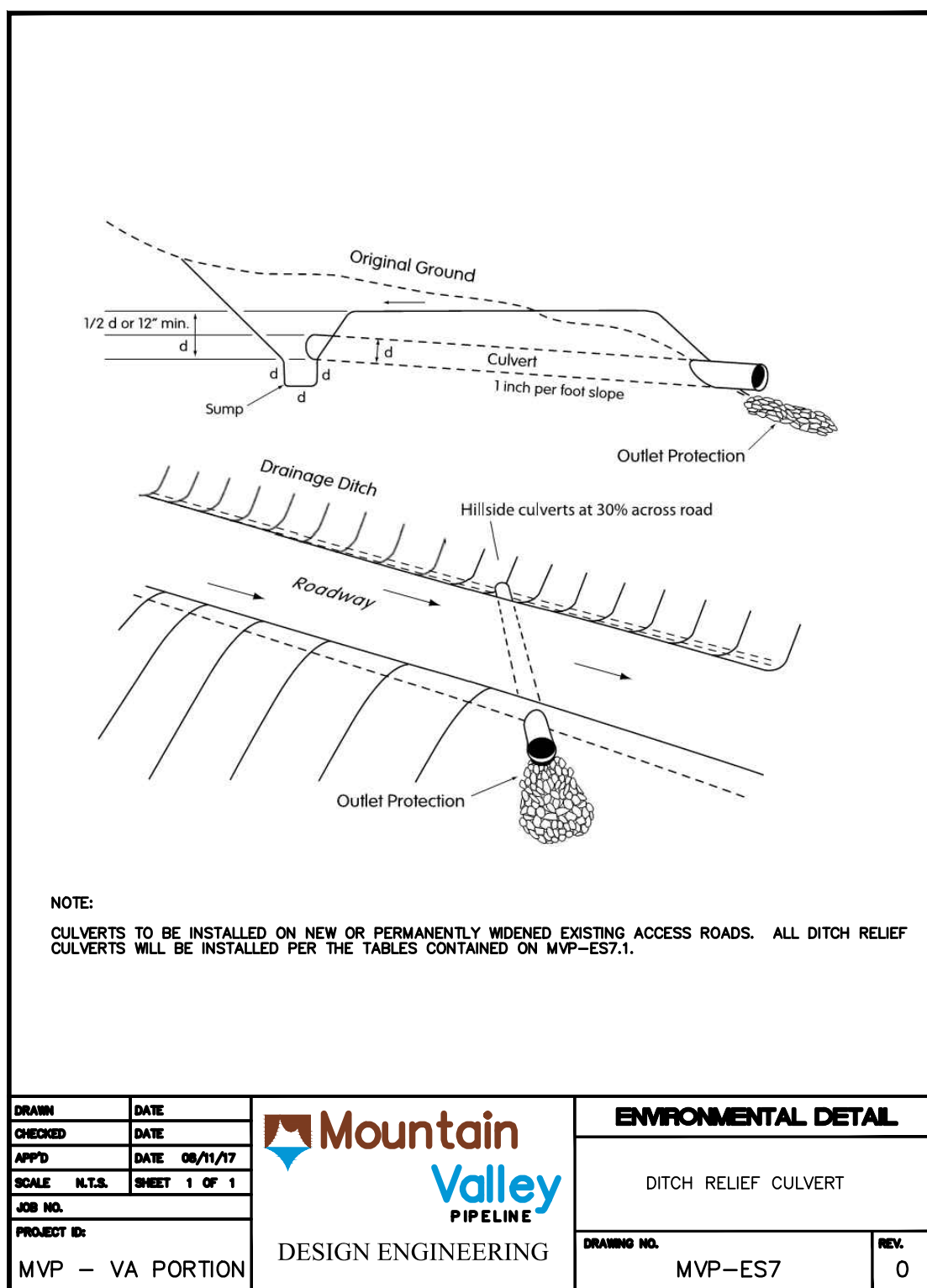
APPROVED BY: RE

DATE: 11/28/2017

SCALE: AS SHOWN

SHT. NO. 0.05 OF 0.23



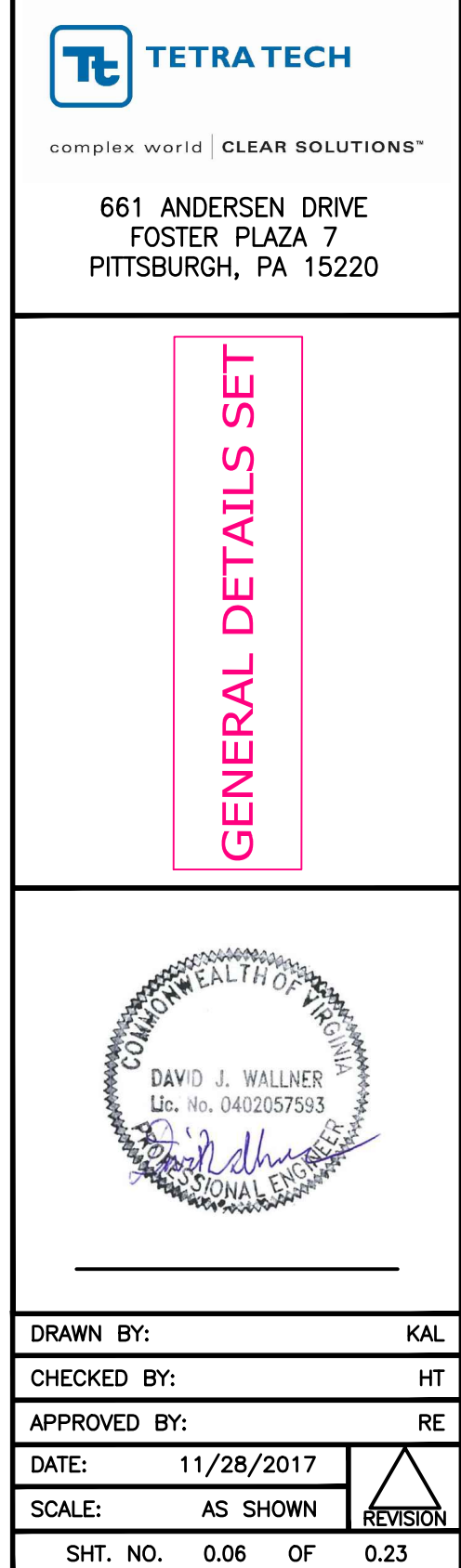
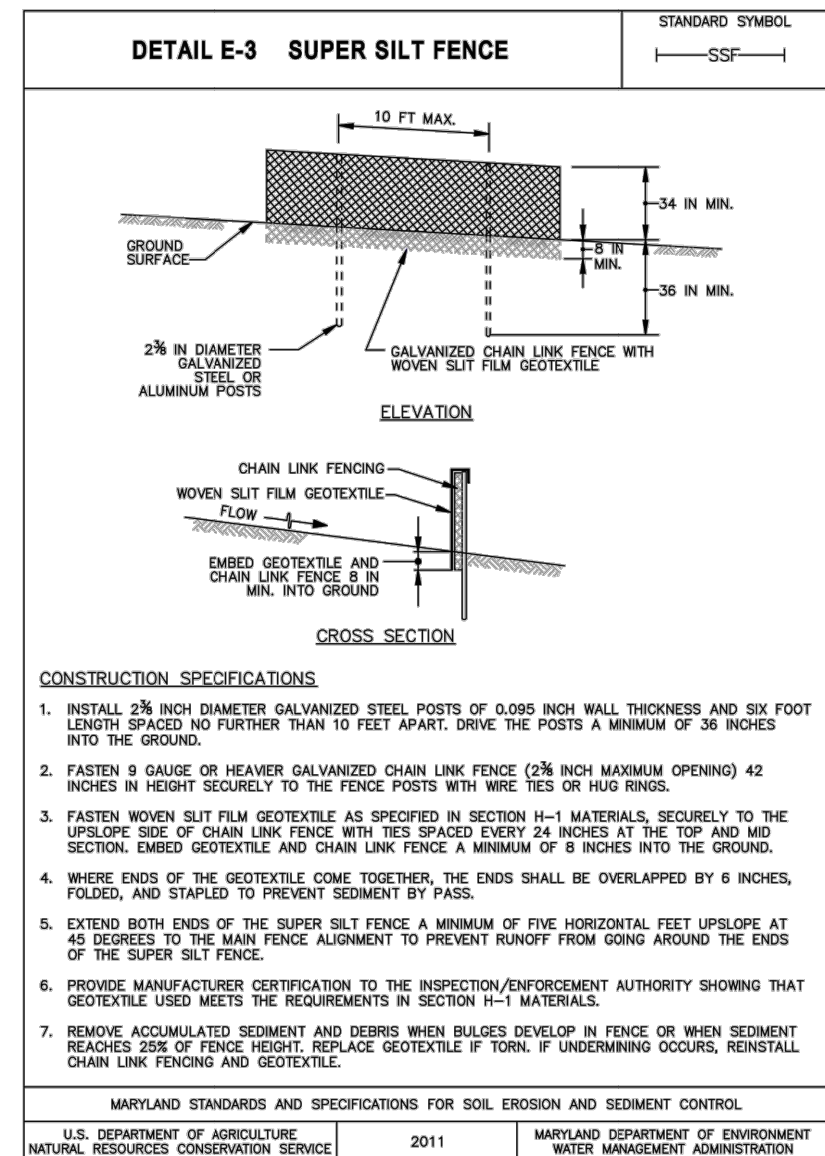
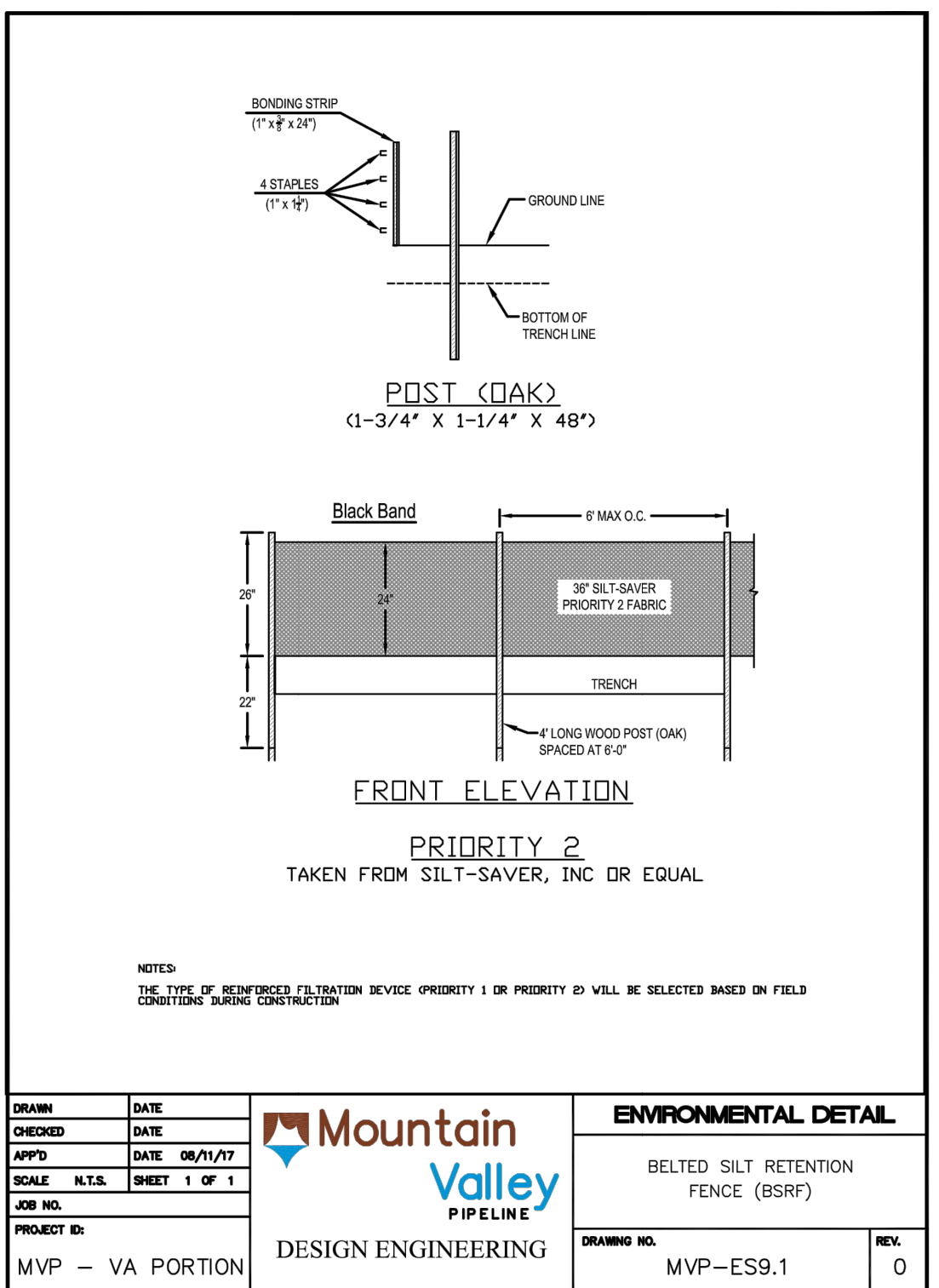
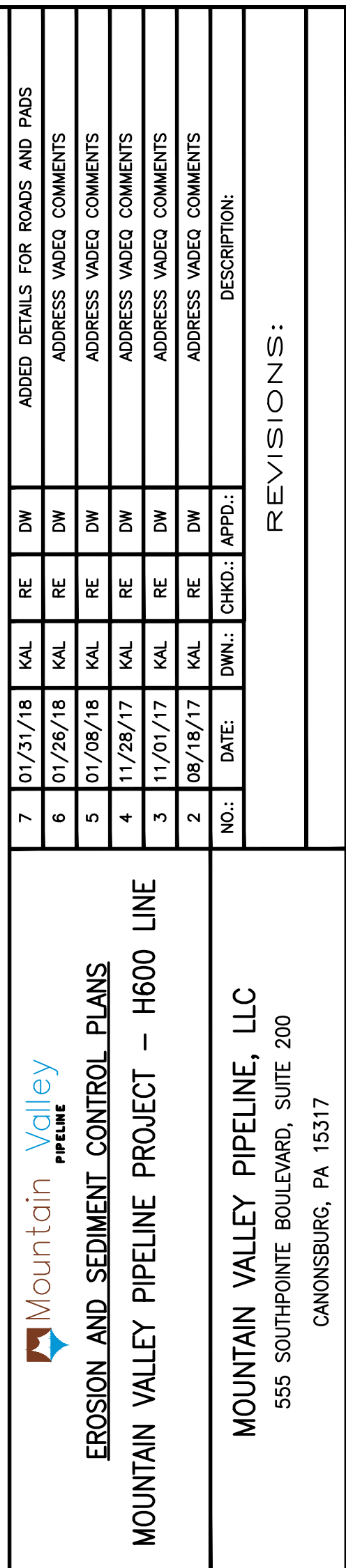


Road Grade (%)	Culvert Spacing* (ft)	Length of Upslope Drainage (ft)				
		<300	300-400	400-500	500-600	>600
		Minimum Culvert Size (in)				
2	300	12	15	15	15	18
3	235	12	15	15	15	18
4	200	12	15	15	15	18
5	180	12	12	15	15	15
6	165	12	12	12	15	15
7	155	12	12	12	12	15
8	150	12	12	12	12	15
9	145	12	12	12	12	15
10	140	12	12	12	12	15
12	135	12	12	12	12	15

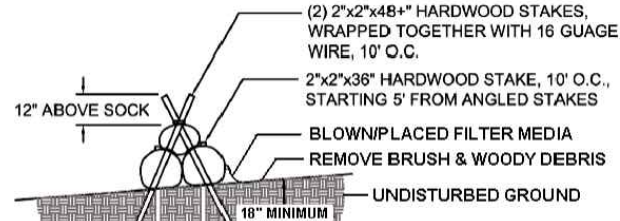
\*Culvert spacing may be adjusted slightly to take advantage of natural drainage courses

Road Grade Percent	Soil Type in Ditch				
	Gravel, Sandy Gravels, Aggregate Surfacing	Silty Gravels, Clay Gravels	Plastic and Nonplastic Inorganic Clays	Inorganic Silt, or Clayey Sands	Sands, Silty Sands, and Gravelly Sands
	Culvert Spacing Feet*				
2	990	315	245	170	95
4	335	275	210	145	85
6	285	230	180	125	75
8	240	195	150	105	65
10	200	160	125	90	55
12	160	130	105	75	45
14	135	110	85	60	35


\*Culvert spacing may be adjusted slightly to take advantage of natural drainage courses







NOTES:  
THE TYPE OF REINFORCED FILTRATION DEVICE PRIORITY 1 OR PRIORITY 2 WILL BE SELECTED BASED ON FIELD  
CONDITIONS, PORE CONSTRUCTION.

DRAWN	DATE		ENVIRONMENTAL DETAIL	
CHECKED	DATE			
APP'D	DATE 06/11/17			
SCALE N.T.S.	SHEET 1 OF 1			
JOB NO.		DESIGN ENGINEERING	DRAWING NO. MVP-ES9.3	REV. 0
PROJECT ID:				
MVP - VA PORTION				

#### Forest Regeneration Woody Seed Mix and Application Rates.

Species	Common Name	Seeding Rate (lbs/acre)
<b>Oak-Hickory Forest a</b>		
<i>Fagus grandifolia</i>	American Beech	0.3
<i>Liriodendron tulipifera</i>	Tulip Poplar	0.3
<i>Pinus strobus</i>	White Pine	0.3
<i>Pinus virginiana</i>	Virginia Pine	0.3
<i>Prunus serotina</i>	Black Cherry	0.3
<i>Amelanchier canadensis</i>	Canadian Serviceberry	0.3
<i>Cercis canadensis</i>	Eastern Redbud	0.3
<i>Cornus florida</i>	Flowering Dogwood	0.3
<i>Diostyris virginiana</i>	Periwinkle	0.3
<i>Ilex opaca</i>	American Holly	0.3
<i>Nyssa sylvatica</i>	Black Gum	0.3
<i>Sassafras albidum</i>	Sassafras	0.3
<i>Hamamelis virginiana</i>	Wild Hazel	0.3
<i>Lindera benzoin</i>	Spicebush	0.3
<i>Vaccinium angustifolium</i>	Lowbush Blueberry	0.3
<i>Viburnum acerifolium</i>	Mapleleaf Viburnum	0.3
<i>Vitis aestivalis</i>	Grape	0.3

a) Oak and hickory species to be planted as bare root seedlings in addition to this mix. Refer to Section 5.9 Bare Root Seedling Planting for more information. At minimum, 3 of the 5 overstory, 4 of the 7 understorey, and 2 of the 4 shrub species will comprise the woody seed mix for Oak-Hickory Forests.

NOTE:  
WOODY SEED MIX TO BE USED IN COMBINATION WITH MVP-ES11.2 UPLAND MEADOW SEED MIX.

DRAWN	DATE		ENVIRONMENTAL DETAIL	
CHECKED	DATE			
APP'D	DATE 06/11/17			
SCALE N.T.S.	SHEET 1 OF 1			
JOB NO.		DESIGN ENGINEERING	DRAWING NO. MVP-ES11.1	REV. 0
PROJECT ID:				
MVP - VA PORTION				

#### Upland Meadow Seed Mix and Application Rates in Virginia.

Species	Common Name	Seeding Rate (lbs/acre)	pH	Bloom Period (if applicable)
<i>Elymus virginicus</i>	Virginia Wildrye	4.00	5.0 - 7.4	June to October
<i>Schizanthus scoparium</i>	Little Bluestem	11.68	6.0 - 8.4	July to October
<i>Sorghastrum nutans</i>	Indiangrass	1.00	5.0 - 7.8	August to October
<i>Asclepias syriaca</i>	Common Milkweed	0.10		June to August
<i>Asclepias tuberosa</i>	Butterfly Milkweed	0.10	4.8 - 6.8	June to August
<i>Chamaecrista fasciculata</i>	Partridge Pea	0.80	5.5 - 7.5	July to September
<i>Sensitiva partridgea</i>	Sensitive Partridge Pea	0.06		June to October
<i>Coneopsis lanceolata</i>	Lanceleaf Coneopsis	0.44	6.0 - 7.0	April to July
<i>Eupatorium coelestinum</i>	Mistflower	0.04	5.5 - 7.5	July to October
<i>Helopsis helianthoides</i>	Oxeye Sunflower	0.40		July to August
<i>Lespedeza virginica</i>	Slender Bushclover	0.10		July to September
<i>Liatris graminifolia</i>	Grassleaf Slicing Star	0.10	5.8 - 6.8	August to October
<i>Monarda fistulosa</i>	Wild Bergamot	0.10	6.0 - 8.0	June to September
<i>Penstemon laevigatus</i>	Appalachian Beardtongue	0.10		late May to late August
<i>Pycnanthemum incanum</i>	Hoary Mountainmint	0.20		May to June
<i>Rudbeckia fulgida</i> var. <i>fulgida</i>	Orange Coneflower	0.02	< 6.8	summer
<i>Rudbeckia hirta</i>	Blackeyed Susan	0.04		July to October


Species	Common Name	Seeding Rate (lbs/acre)	pH	Bloom Period (if applicable)
<i>Senna hebecarpa</i>	Wild Senna	0.00	6.0 - 7.0	May to July
<i>Solidago juncea</i>	Early Goldenrod	0.10		July to August
<i>Solidago nemoralis</i>	Gray Goldenrod	0.04		June to July
<i>Tradescantia ohrensis</i>	Ohio Spiderwort	0.04	6.5 - 7.5	August to September
<i>Tradescantia virginiana</i>	Virginia Spiderwort	0.10		late April to mid-July

TEMPORARY SEED MIX:  
9/1 - 2/15: 50/50 MIX ANNUAL RYEGRASS (LOLIUM MULTI-FLORUM) AND WINTER RYE (SECALE CEREALE) (50-100 LBS/AC)  
2/16 - 4/30: ANNUAL RYEGRASS (LOLIUM MULTI-FLORUM) (60-100 LBS/AC)  
5/1 - 8/31: GERMAN MILLET (SETARIA ITALICA) (50 LBS/AC)

DRAWN	DATE		ENVIRONMENTAL DETAIL	
CHECKED	DATE			
APP'D	DATE 06/11/17			
SCALE N.T.S.	SHEET 1 OF 1			
JOB NO.		DESIGN ENGINEERING	DRAWING NO. MVP-ES11.2	REV. 0
PROJECT ID:				
MVP - VA PORTION				

#### Upland Steep Slope Seed Mix and Application Rates in Virginia.

Species	Common Name	Seeding Rate (lbs/acre)	pH	Bloom Period (if applicable)
<i>Agrostis perennans</i>	Autumn Bentgrass	3.15	5.5 - 7.5	Midsummer
<i>Elymus virginicus</i>	Virginia Wildrye	9.05	5.0 - 7.4	June to October
<i>Panicum clandestinum</i>	Dactyloctenium	4.50	4.0 - 7.5	May to September
<i>Schizanthus scoparium</i>	Little Bluestem	11.26	5.0 - 7.4	July to October
<i>Sorghastrum nutans</i>	Indiangrass	14.40	5.0 - 7.8	August to October
<i>Asclepias syriaca</i>	Common Milkweed	0.09		June to August
<i>Aster pilosus</i>	Heath Aster	0.05	5.4 - 7.0	After fall frost
<i>Chamaecrista fasciculata</i>	Partridge Pea	0.45	5.5 - 7.5	July to September
<i>Coneopsis lanceolata</i>	Lanceleaf Coneopsis	0.45	6.0 - 7.0	April to July
<i>Eupatorium coelestinum</i>	Mistflower	0.05	5.5 - 7.5	July to October
<i>Helopsis helianthoides</i>	Oxeye Sunflower	0.45		July to August
<i>Liatris graminifolia</i>	Grassleaf Blazing Star	0.09	5.8 - 6.8	August to October
<i>Monarda fistulosa</i>	Wild Bergamot	0.23	6.0 - 8.0	June to September
<i>Pycnanthemum incanum</i>	Hoary Mountainmint	0.05	< 6.8	summer
<i>Rudbeckia hirta</i>	Blackeyed Susan	0.45	6.0 - 7.0	May to July
<i>Senna hebecarpa</i>	Wild Senna	0.23		July to August
<i>Solidago nemoralis</i>	Gray Goldenrod	0.05	6.5 - 7.5	August to September
<i>Tradescantia ohrensis</i>	Ohio Spiderwort	0.05		late April to mid-July

DRAWN	DATE		ENVIRONMENTAL DETAIL	
CHECKED	DATE			
APP'D	DATE 06/11/17			
SCALE N.T.S.	SHEET 1 OF 1			
JOB NO.		DESIGN ENGINEERING	DRAWING NO. MVP-ES11.3	REV. 0
PROJECT ID:				
MVP - VA PORTION				

ADDED DETAILS FOR ROADS AND PADS	DW	RE	KAL
ADDRESS VADO COMMENTS	DW	RE	KAL
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NO.:	DATE:	DWN.:	NO.:
REVISIONS:			

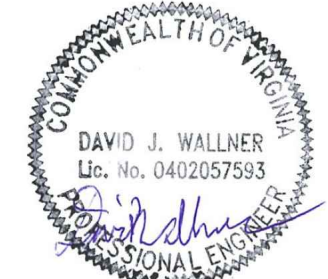
EROSION AND SEDIMENT CONTROL PLANS  
MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE

MOUNTAIN VALLEY PIPELINE, LLC  
555 SOUTHPOINTE BOULEVARD, SUITE 200  
CANONSBURG, PA 15317

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DATE:	11/28/2017
SCALE:	AS SHOWN
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Stream crossings proposed for bare-root seedling plantings.

Waterbody Name	MP	County	State	Valuable Resource
Kinballton Branch	199.1, 199.4	Giles	VA	headwaters of wild trout stream, coldwater stream
Story Creek	200.4	Giles	VA	candy darter, green floater, coldwater stream, wild trout stream
Little Story Creek	204.4	Giles	VA	coldwater stream, wild trout stream
Sinking Creek	211.2	Giles	VA	candy darter, green floater, coldwater stream, wild trout stream, non-listed mussels
UNT Craig Creek	219.2	Montgomery	VA	Headwaters of James spiny mussel occurrences, USFS lands area
UNT Craig Creek	219.3	Montgomery	VA	Headwaters of James spiny mussel occurrences, USFS lands area
Craig Creek	219.7	Montgomery	VA	Headwaters of James spiny mussel occurrences, USFS lands area
Craig Creek	219.7	Montgomery	VA	Headwaters of James spiny mussel occurrences, USFS lands area
UNT Craig Creek	219.8	Montgomery	VA	Headwaters of James spiny mussel occurrences, USFS lands area
UNT Craig Creek	220.0	Montgomery	VA	Headwaters of James spiny mussel occurrences, USFS lands area
Mill Creek	222.2	Montgomery	VA	upstream of Roanoke logperch suitable habitat, orangefin madtom, coldwater stream, wild trout
North Fork/Roanoke River	227.2	Montgomery	VA	Roanoke logperch present, non-listed mussels present, orangefin madtom, coldwater stream, wild trout
North Fork Roanoke River	227.4	Montgomery	VA	Roanoke logperch present, non-listed mussels present, orangefin madtom, coldwater stream, wild trout
Bradshaw Creek	230.7	Montgomery	VA	Roanoke logperch suitable habitat, orangefin madtom, coldwater stream, wild trout
Bradshaw Creek	231.5	Montgomery	VA	Roanoke logperch suitable habitat, orangefin madtom, coldwater stream, wild trout
Roanoke River	235.4	Montgomery	VA	Roanoke logperch present, orangefin madtom, non-listed mussels present
Bottom Creek	241.1	Roanoke	VA	upstream of Bottom Creek Gorge, orangefin madtom, coldwater stream, wild trout
Bottom Creek	242.5	Roanoke	VA	upstream of Bottom Creek Gorge, orangefin madtom, coldwater stream, wild trout

DRAWN

CHECKED

APP'D

SCALE

JOB NO.

PROJECT ID:

DATE

DATE

DATE

N.T.S.

1 OF 1

Mountain Valley PIPELINE

DESIGN ENGINEERING

ENVIRONMENTAL DETAIL

STREAM CROSSINGS PROPOSED FOR BARE ROOT SEEDLING PLANTINGS

DRAWING NO. MVP-ES11.8

REV. 0

Waterbody Name	MP	County	State	Valuable Resource
Teels Creek	258.2	Franklin	VA	upstream of Roanoke logperch suitable habitat, one of numerous project crossings of Teels Creek
Teels Creek	260.3	Franklin	VA	upstream of Roanoke logperch suitable habitat, one of numerous project crossings of Teels Creek
Teels Creek	261.0	Franklin	VA	upstream of Roanoke logperch suitable habitat, one of numerous project crossings of Teels Creek
Teels Creek	261.8	Franklin	VA	upstream of Roanoke logperch suitable habitat, one of numerous project crossings of Teels Creek
Teels Creek	262.3	Franklin	VA	Roanoke logperch suitable habitat, one of numerous project crossings of Teels Creek contributing sediment impacts
Little Creek	262.6	Franklin	VA	Roanoke logperch suitable habitat, numerous crossings upstream contributing sediment impacts
Little Creek	263.3	Franklin	VA	Roanoke logperch suitable habitat, non-listed mussels present, numerous crossings upstream contributing sediment impacts
Maggoles Creek	269.4	Franklin	VA	Roanoke logperch suitable habitat
Blackwater River	269.7	Franklin	VA	Roanoke logperch present, non-listed mussels present
UNT to Jacks Creek	278.8	Franklin	VA	orangefin madtom
Turkey Creek	280.5	Franklin	VA	orangefin madtom
Strawfield Creek	282.3	Franklin	VA	orangefin madtom
Parrot Branch	282.9	Franklin	VA	orangefin madtom
Jornikn Creek	284.4	Pittsylvania	VA	orangefin madtom
UNT to Rocky Creek	287.1	Pittsylvania	VA	Roanoke logperch present, orangefin madtom, mussels present including yellow lampmussel (VA threatened)
Pigg River	289.1	Pittsylvania	VA	Roanoke logperch suitable habitat, orangefin madtom
Harper Creek	289.9	Pittsylvania	VA	Roanoke logperch suitable habitat, orangefin madtom
Harper Creek	292.0	Pittsylvania	VA	orangefin madtom

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Mountain Valley PIPELINE

DESIGN ENGINEERING

ENVIRONMENTAL DETAIL

STREAM CROSSINGS PROPOSED FOR BARE ROOT SEEDLING PLANTINGS

DRAWING NO. MVP-ES11.9

REV. 0

Upland Area Seed Mixes within the Jefferson National Forest

Scientific Name	Common Name	Growth Habit	pH Preference
Upland Areas - Non-native Species for Erosion Control			
<i>Lolium perenne</i> subsp. <i>multiflorum</i>	Italian ryegrass; Annual ryegrass	Graminoid	5.0 - 7.9
<i>Urochloa ramosa</i> ( <i>Panicum ramosum</i> )	Browntop millet	Graminoid	5.5 - 6.9
<i>Secale cereale</i>	Cereal rye	Graminoid	5.2 - 8.0
<i>Setaria italica</i>	Foxtail millet	Graminoid	5.3 - 6.9
Upland Areas - Native Species			
<i>Chasmanthium laxum</i> *	Slender woodoats	Graminoid	4.5 - 7.0
<i>Eragrostis spectabilis</i> *	Purple lovegrass	Graminoid	4.0 - 7.5
<i>Panicum virgatum</i>	Switchgrass	Graminoid	4.5 - 8.0
<i>Sorghastrum nutans</i>	Indiangrass	Graminoid	5.0 - 7.8
<i>Tridens flavus</i> *	Purpletop	Graminoid	4.5 - 6.5
<i>Apocynum cannabinum</i> *	Indian hemp	Forb	4.5 - 7.0
<i>Chamaecrista fasciculata</i>	Partridge pea	Forb	5.5 - 7.5
<i>Desmodium canadense</i>	Showy ticklefoil	Forb	wide tolerance
<i>Desmodium paniculatum</i>	Panicledleaf ticklefoil	Forb	6.0 - 7.0
<i>Elymus virginicus</i> *	Virginia wildrye	Graminoid	5.0 - 7.4
<i>Geum canadense</i> *	White avens	Forb	4.5 - 7.5
<i>Helopsis helianthoides</i>	Oxeye sunflower; Smooth oxeye	Forb	unknown
<i>Monarda fistulosa</i> *	Wild bergamot	Forb	6.0 - 8.0
<i>Pycnanthemum</i> spp. <sup>1</sup>	Mountain mint	Forb	unknown
<i>Rubus allegheniensis</i> *	Common blackberry; Allegheny blackberry	Forb/ Subshrub	4.6 - 7.5
<i>Rudbeckia hirta</i>	Blackeyed Susan	Forb	6.0 - 7.0
<i>Solidago canadensis</i> *	Canada goldenrod	Forb	4.8 - 7.5
<i>Tradescantia virginiana</i> *	Virginia spiderwort	Forb	4.0 - 8.0

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Mountain Valley PIPELINE

DESIGN ENGINEERING

ENVIRONMENTAL DETAIL

US FOREST SERVICE (NATIONAL FOREST) LANDS UPLAND AREA SEED MIX

DRAWING NO. MVP-ES12.1

REV. 0

Riparian Seed Mixes within Jefferson National Forest

Scientific Name	Common Name	Habit	pH Preference
Non-native Species for Erosion Control			
<i>Lolium perenne</i> subsp. <i>multiflorum</i>	Italian ryegrass; Annual ryegrass	Graminoid	5.0 - 7.9
<i>Urochloa ramosa</i> ( <i>Panicum ramosum</i> )	Browntop millet	Graminoid	5.5 - 6.9
<i>Secale cereale</i>	Cereal rye	Graminoid	5.2 - 8.0
<i>Setaria italica</i>	Foxtail millet	Graminoid	5.3 - 6.9
Native Species			
<i>Agrostis perennans</i>	Autumn bentgrass; upland bentgrass	Graminoid	5.5 - 7.5
<i>Elymus virginicus</i>	Virginia Wildrye	Graminoid	5.0 - 7.4
<i>Sorghastrum nutans</i>	Indiangrass	Graminoid	5.0 - 7.8
<i>Asclepias incarnata</i>	Swamp milkweed	Forb	5.0 - 8.0
<i>Chamaecrista fasciculata</i>	Partridge pea	Forb	5.5 - 7.5
<i>Eutrochium fistulosum</i> ( <i>Eupatorium fistulosum</i> )	Joe pye weed	Forb	4.5 - 7.0
<i>Eupatorium maculatum</i>	Spotted joe pye weed	Forb	5.5 - 7.0
<i>Eupatorium perfoliatum</i>	Boneset	Forb	unknown
<i>Helianthus autumnale</i>	Common sneezeweed	Forb	4.0 - 7.5
<i>Senna hebecarpa</i>	Wild senna; American senna	Forb	unknown
<i>Senna marilandica</i>	Maryland senna	Forb / Subshrub	4.0 - 7.0
<i>Vernonia noveboracensis</i>	New York ironweed	Forb	4.5 - 8.0

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1 OF 1

Mountain Valley PIPELINE

DESIGN ENGINEERING

ENVIRONMENTAL DETAIL

US FOREST SERVICE (NATIONAL FOREST) LANDS RIPARIAN SEED MIX

DRAWING NO. MVP-ES12.2

REV. 0

Species for hydroseed mixes within the Jefferson National Forest.

Scientific Name	Common Name	Growth Habit	pH Preference
Non-native Species for Temporary Erosion Control			
<i>Lolium perenne</i> subsp. <i>multiflorum</i>	Italian ryegrass; Annual ryegrass	Graminoid	5.0 - 7.9
<i>Urochloa ramosa</i> ( <i>Panicum ramosum</i> )	Browntop millet	Graminoid	5.5 - 6.9
<i>Secale cereale</i>	Cereal rye	Graminoid	5.2 - 8.0
<i>Setaria italica</i>	Foxtail millet	Graminoid	5.3 - 6.9
Native - Highly Preferred			
<i>Sorghastrum nutans</i>	Indiangrass	Graminoid	5.0 - 7.8
<i>Tridens flavus</i>	Purpletop	Graminoid	4.5 - 6.5
Native - Preferred			
<i>Agrostis perennans</i>	Autumn bentgrass; Upland bentgrass	Graminoid	5.5 - 7.5
<i>Dichanthelium clandestinum</i>	Deertongue	Graminoid	4.0 - 7.5
<i>Elymus canadensis</i>	Canada wildrye	Graminoid	5.0 - 7.9
<i>Desmodium canadense</i>	Showy ticklefoil	Forb	wide tolerance
<i>Helopsis helianthoides</i>	Oxeye sunflower; Smooth oxeye	Forb	unknown
<i>Lespedeza virginica</i>	Slender bushclover; Slender lespedeza	Forb	acid tolerant
<i>Liatris spicata</i>	Dense blazing star; Spiked gayfeather	Forb	5.6 - 7.5
<i>Senna hebecarpa</i>	Wild senna; American senna	Forb	unknown
Native - Moderately Preferred			
<i>Panicum virgatum</i>	Switchgrass	Graminoid	4.5 - 8.0
<i>Chamaecrista fasciculata</i>	Partridge pea	Forb	5.5 - 7.5
<i>Rudbeckia hirta</i>	Blackeyed Susan	Forb	6.0 - 7.0

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Mountain Valley PIPELINE

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ENVIRONMENTAL DETAIL

US FOREST SERVICE (NATIONAL FOREST) LANDS HYDROSEED MIX

DRAWING NO. MVP-ES12.3

REV. 0

Name	Ph preference	Wetland Indicator Status
Annual Ryegrass ( <i>Lolium Multiflorum</i> (L. perenne var. <i>italicum</i> ))	5.0-7.9	N/moderate
German/Foxtail Millet ( <i>Setaria italica</i> )	5.3-6.9	FACU
Cereal Rye ( <i>Secale cereale</i> )	5.2-8.0	N/damp
Browntop Millet ( <i>Panicum ramosum</i> ) (Introduced in VA & south; possibly ok for WV?)	5.5-6.9	FACU

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Mountain Valley PIPELINE

DESIGN ENGINEERING

ENVIRONMENTAL DETAIL

US FOREST SERVICE (NATIONAL FOREST) LANDS TEMPORARY EROSION CONTROL SPECIES

DRAWING NO. MVP-ES12.4

REV. 0

MVP-ES13 Cofferdam Stream Crossing Method

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JOB NO.

PROJECT ID:

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Mountain Valley PIPELINE

DESIGN ENGINEERING

ENVIRONMENTAL DETAIL

COFFERDAM STREAM CROSSING METHOD

DRAWING NO. MVP-ES13.1

REV. P

Jersey Barrier Cofferdam - End View

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Mountain Valley PIPELINE

DESIGN ENGINEERING

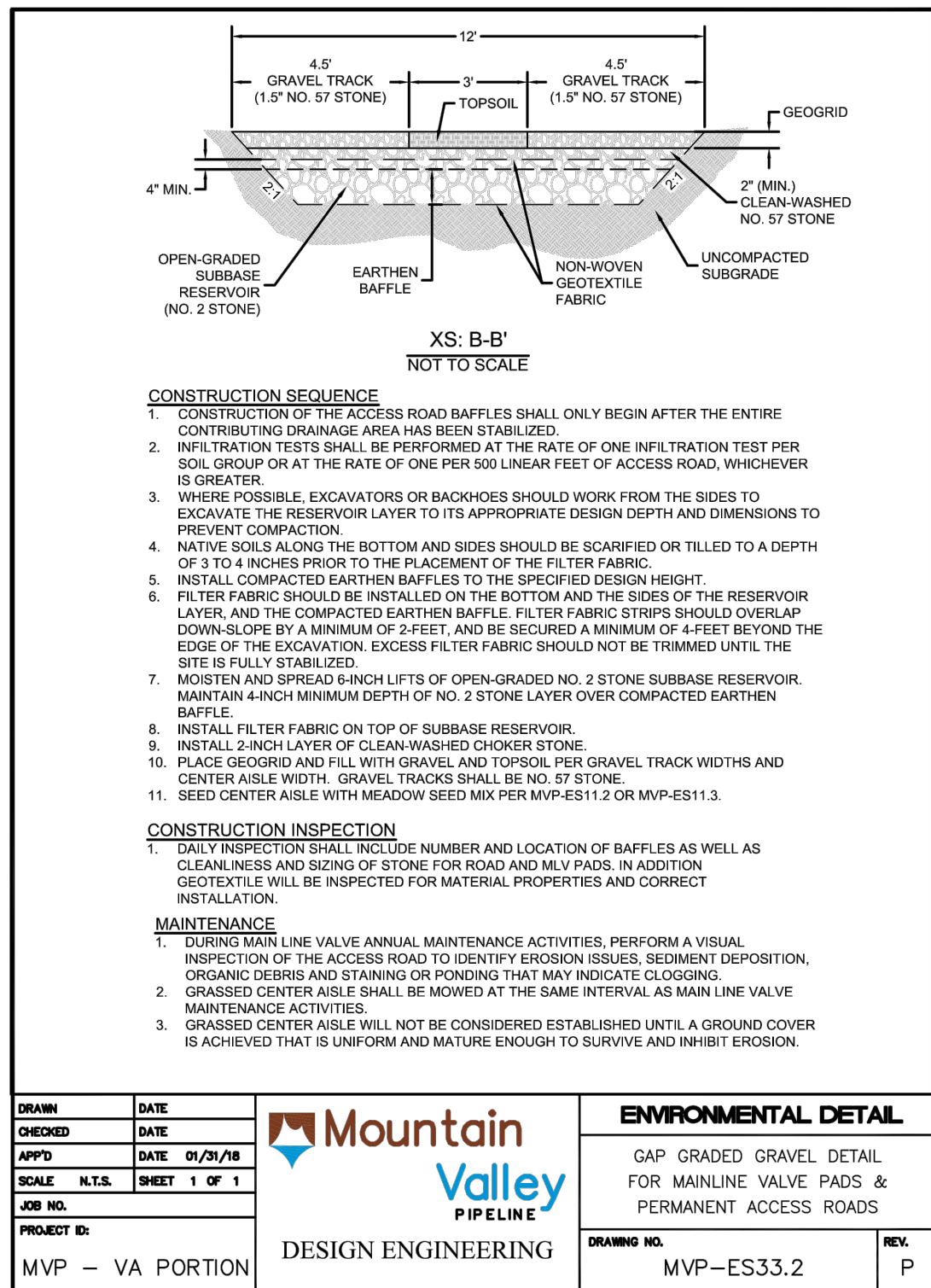
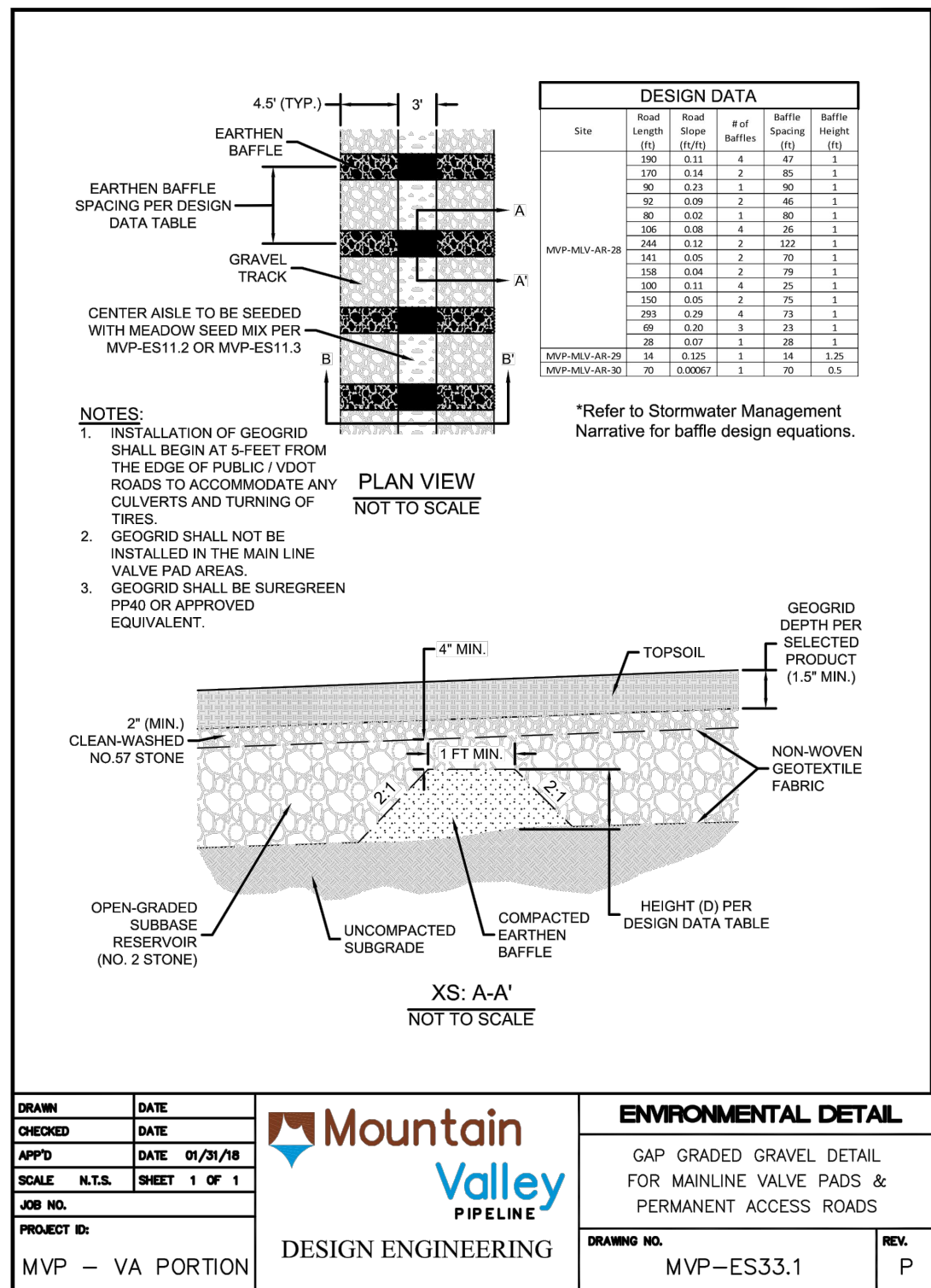
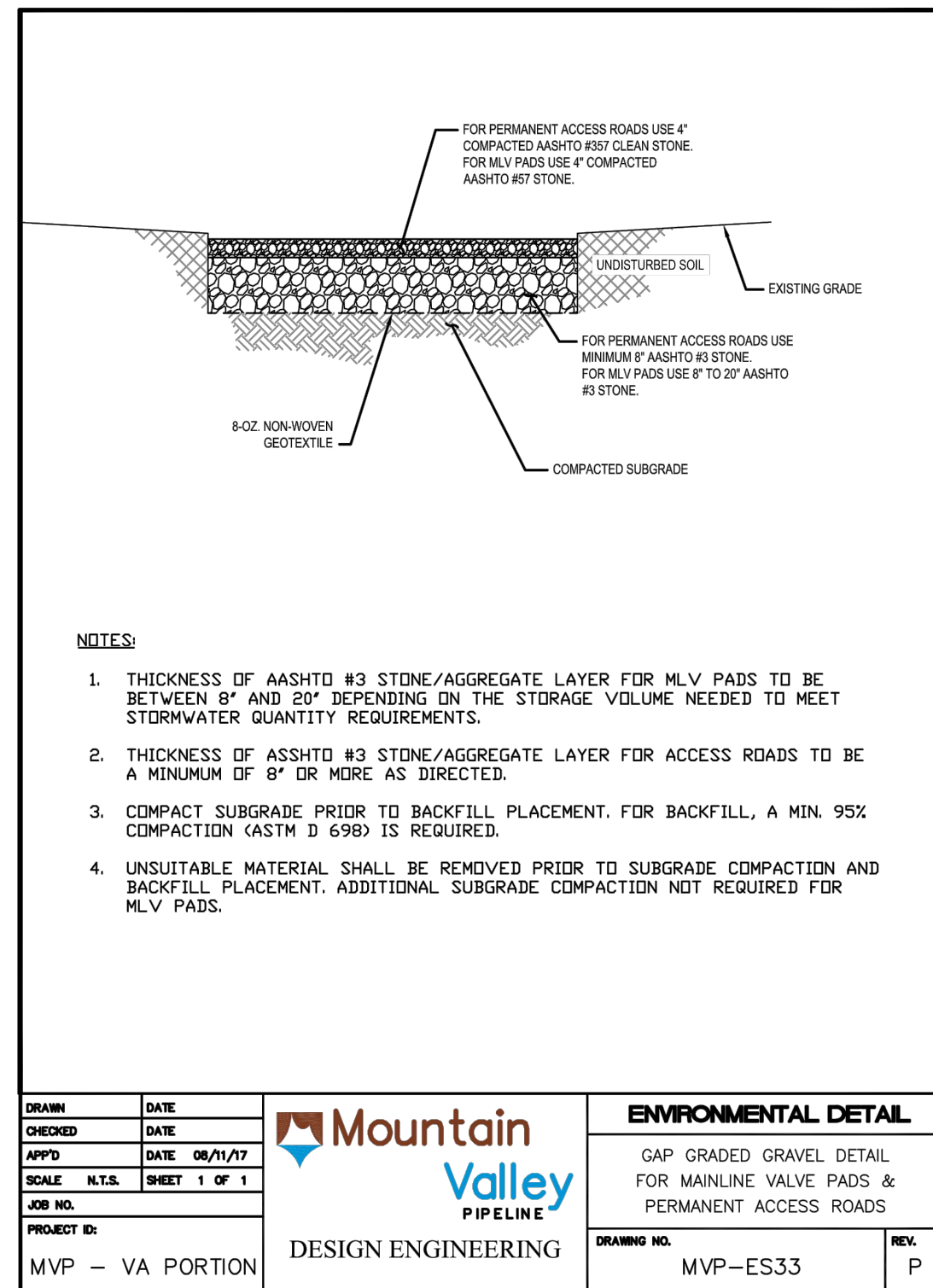
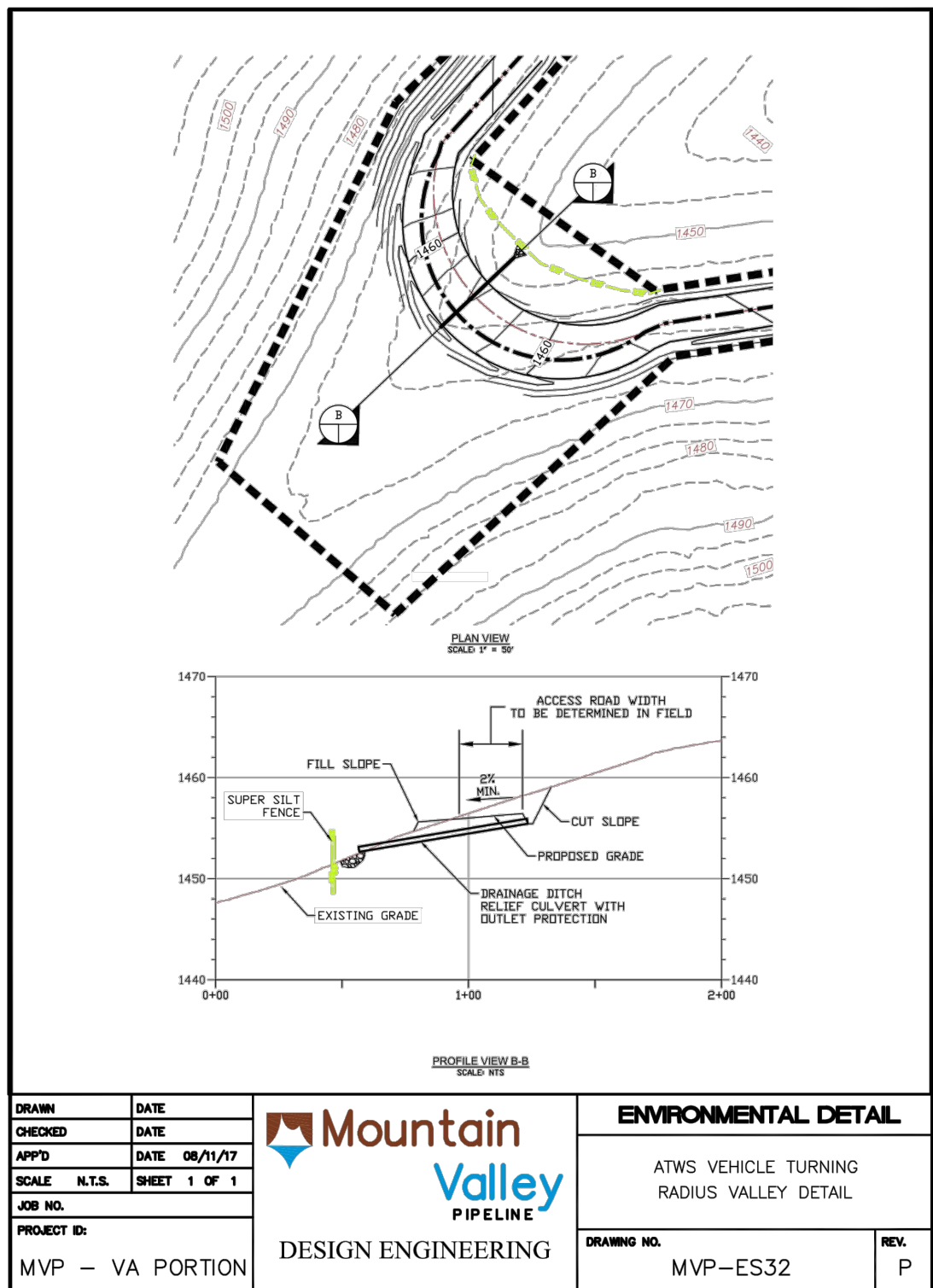
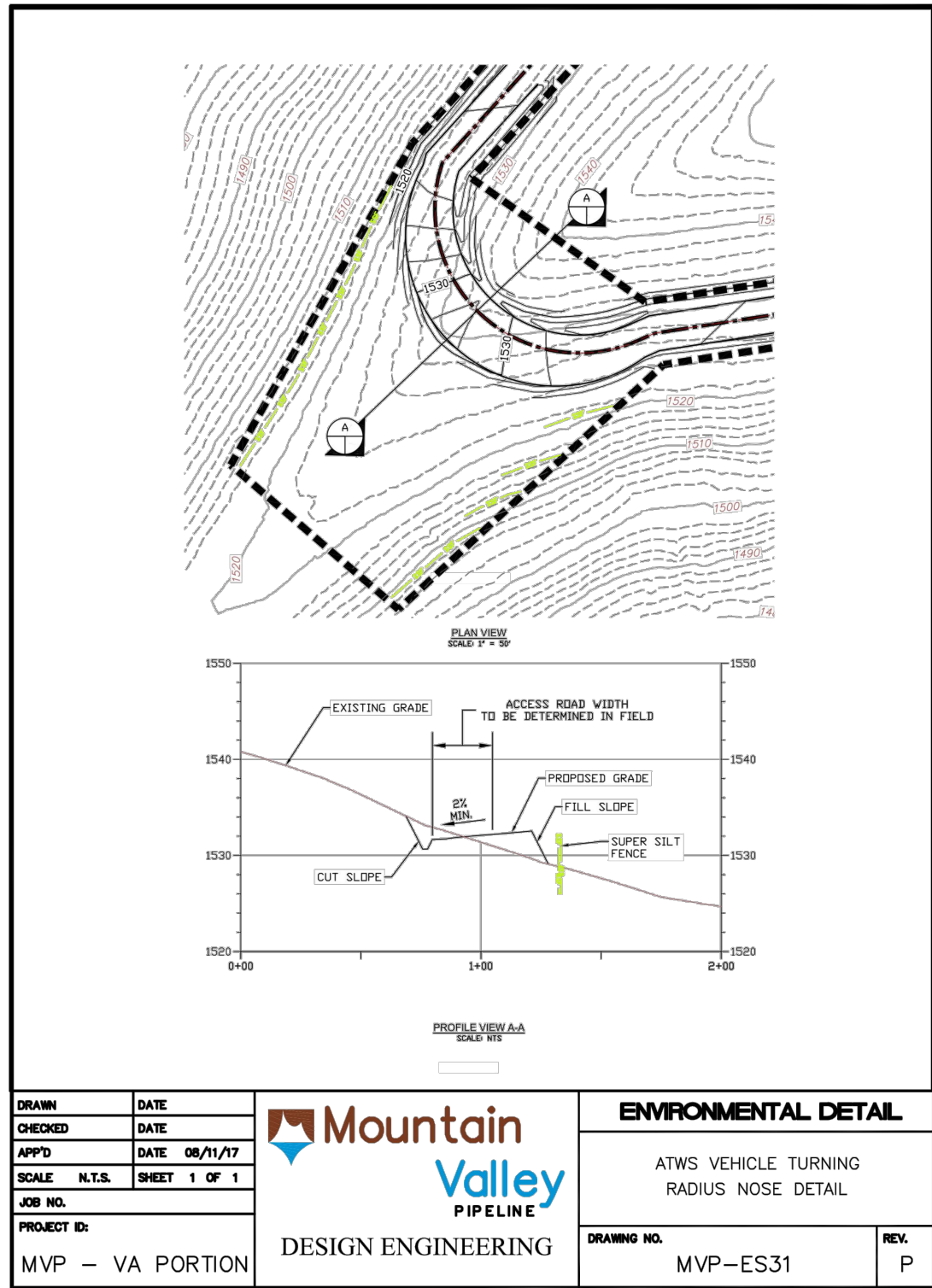
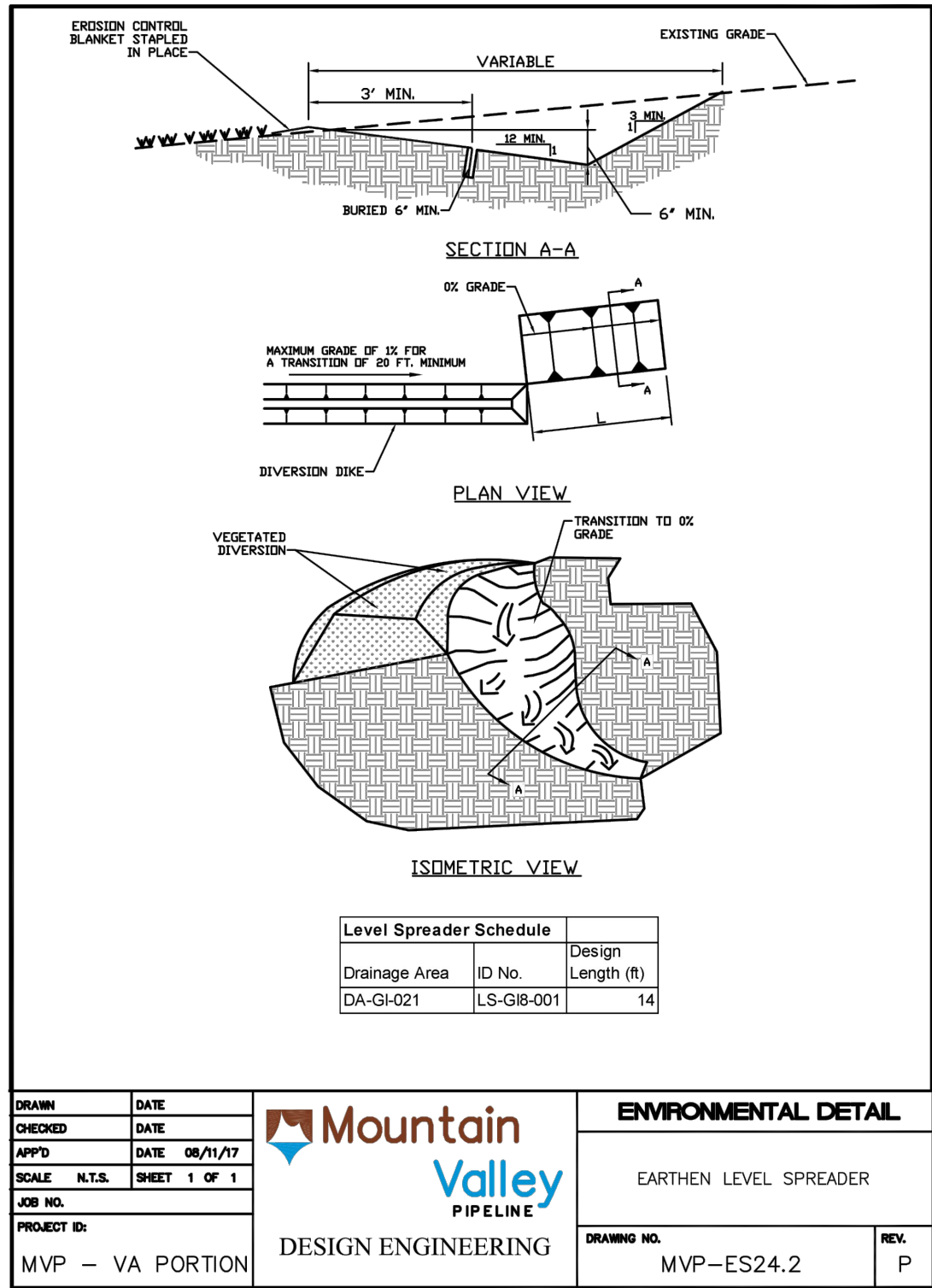
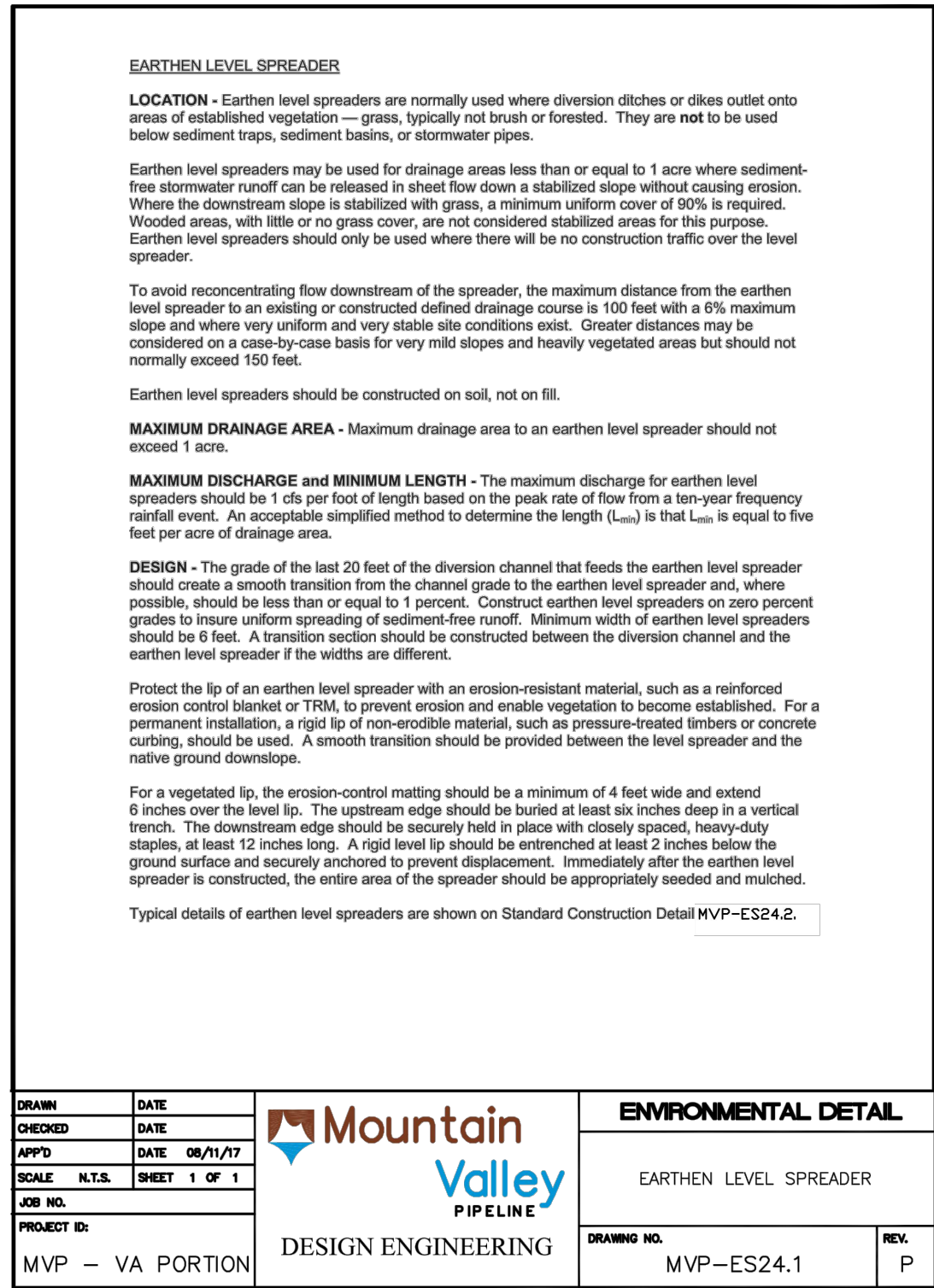
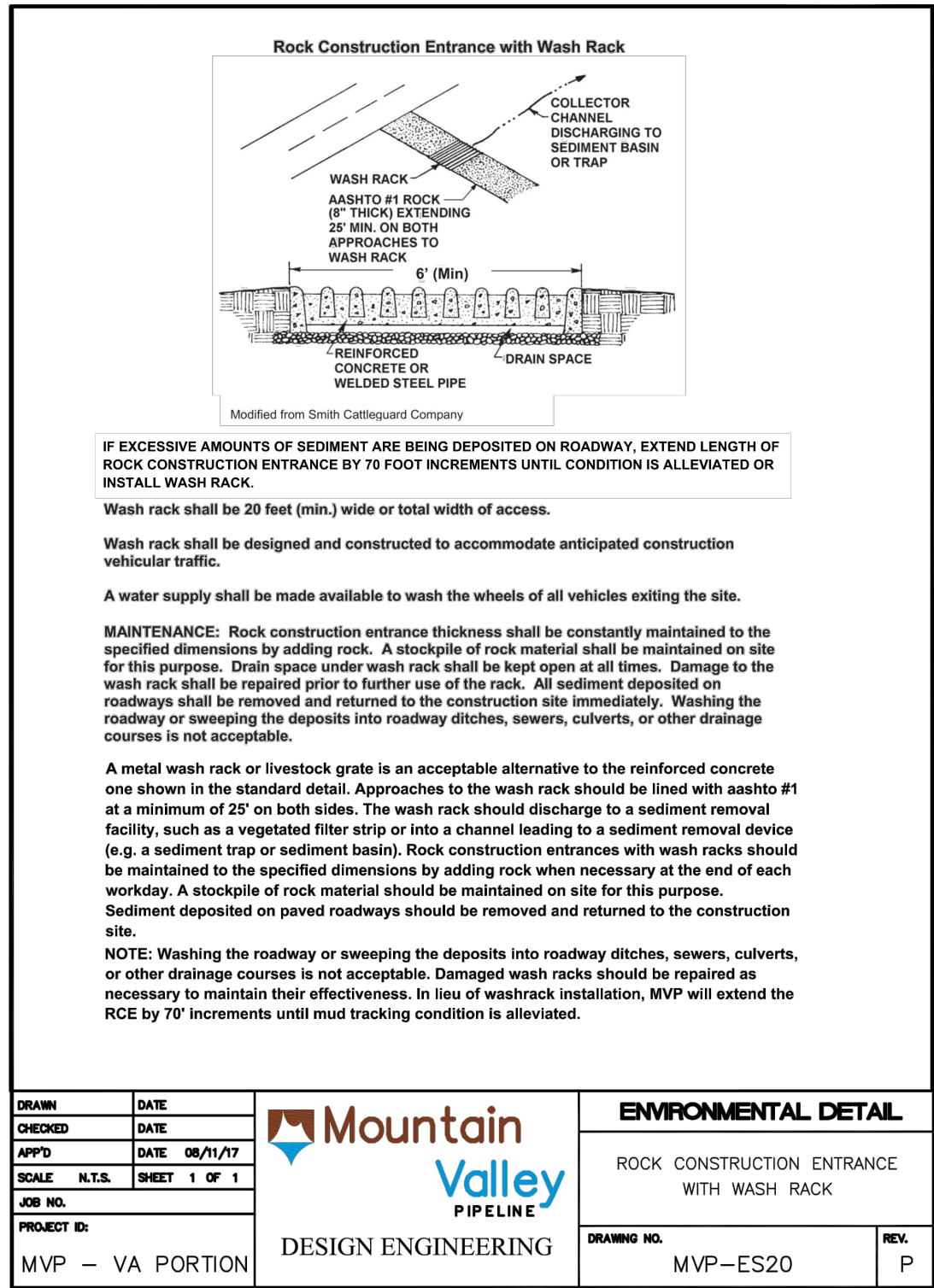
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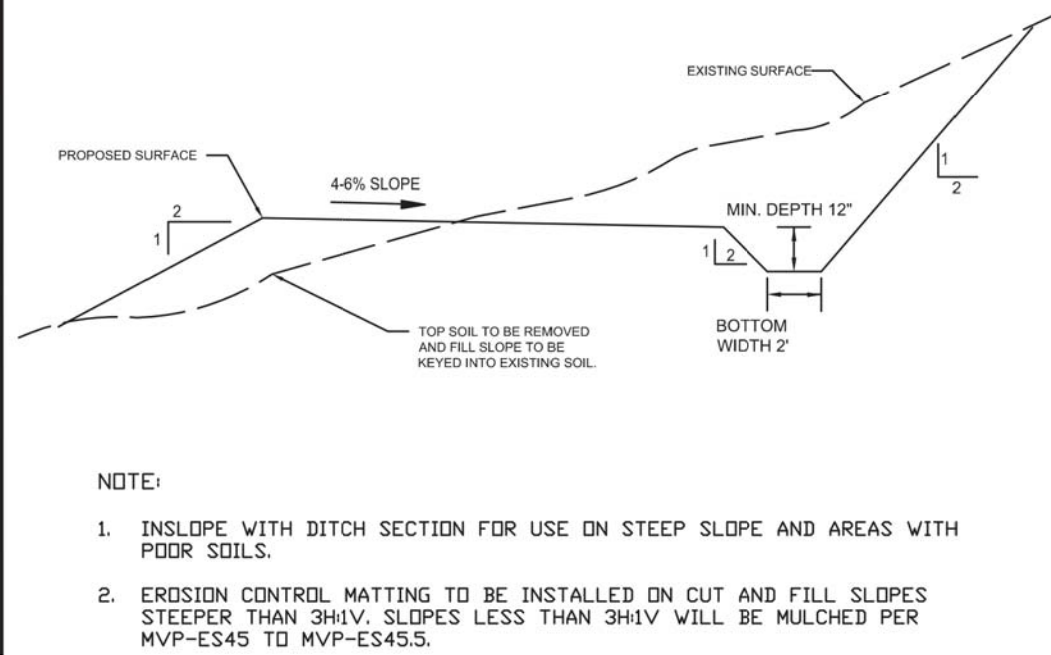


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3	11/01/17	2	08/18/17	NO:	DATE:	DWN:	APPD:
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REVISIONS:							
MOUNTAIN VALLEY PIPELINE, LLC							
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CANONSBURG, PA 15317							
TETRA TECH							
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661 ANDERSEN DRIVE FOSTER PLAZA 7 PITTSBURGH, PA 15220							
GENERAL DETAILS SET							
COMMONWEALTH OF PENNSYLVANIA DAVID J. WALLNER Lic. No. 0402057593 Professional Engineer							
DRAWN BY: KAL							
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APPROVED BY: RE							
DATE: 11/28/2017							
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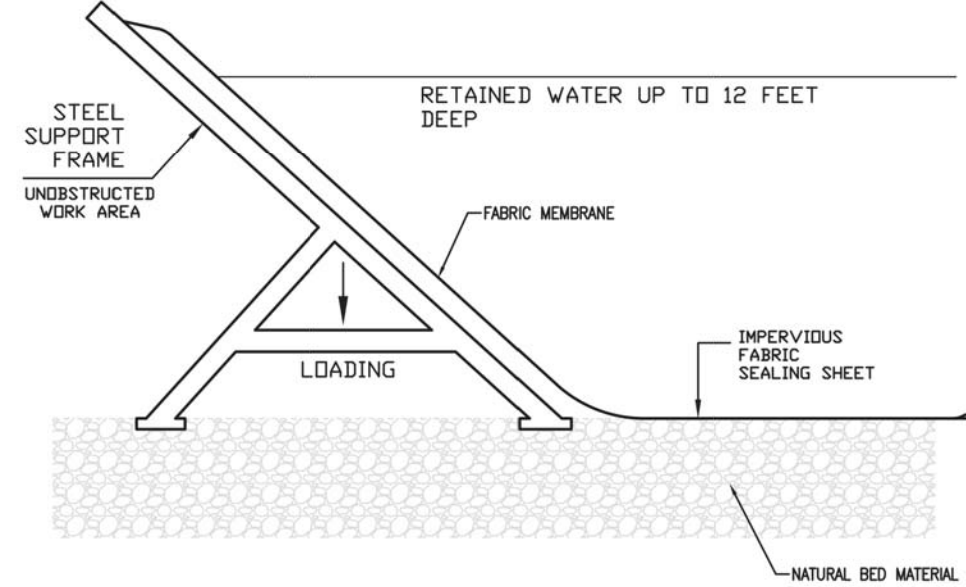


MLV ACCESS ROADS SITE SPECIFIC  
DETAILS TO BE DEVELOPED WITH  
STORMWATER MANAGEMENT PLANS

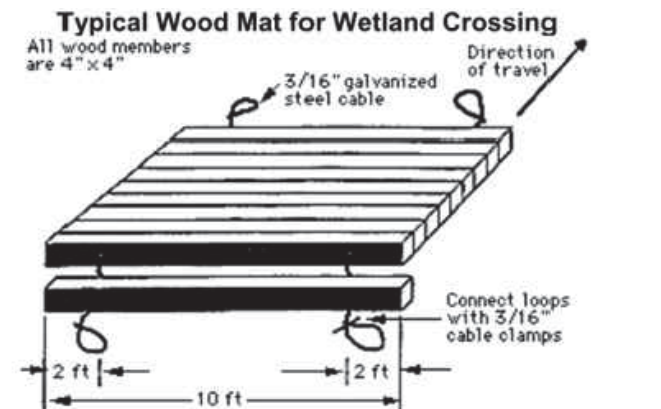
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JOB NO.		DESIGN ENGINEERING	DRAWING NO. MVP-ES33.3
PROJECT ID:			
MVP - VA PORTION			REV. P




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APPD	DATE 06/11/17		
SCALE N.T.S.	SHEET 1 OF 1		
JOB NO.		DESIGN ENGINEERING	DRAWING NO. MVP-ES34
PROJECT ID:			
MVP - VA PORTION			REV. P

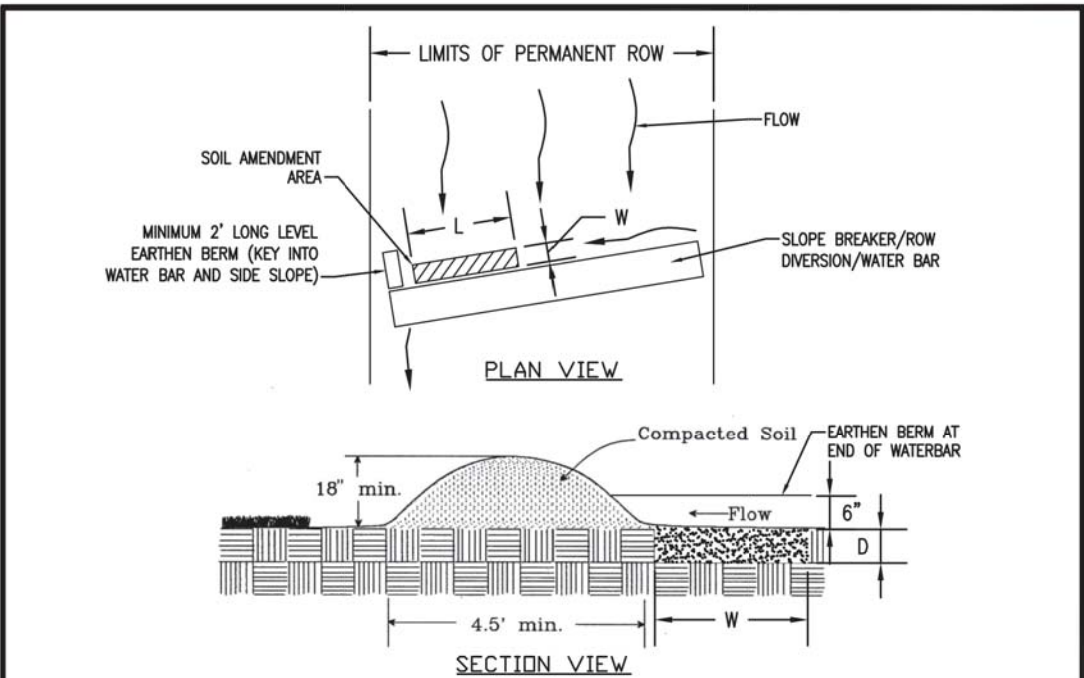


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SCALE N.T.S.	SHEET 1 OF 1		
JOB NO.		DESIGN ENGINEERING	DRAWING NO. MVP-ES36
PROJECT ID:			
MVP - VA PORTION			REV. P



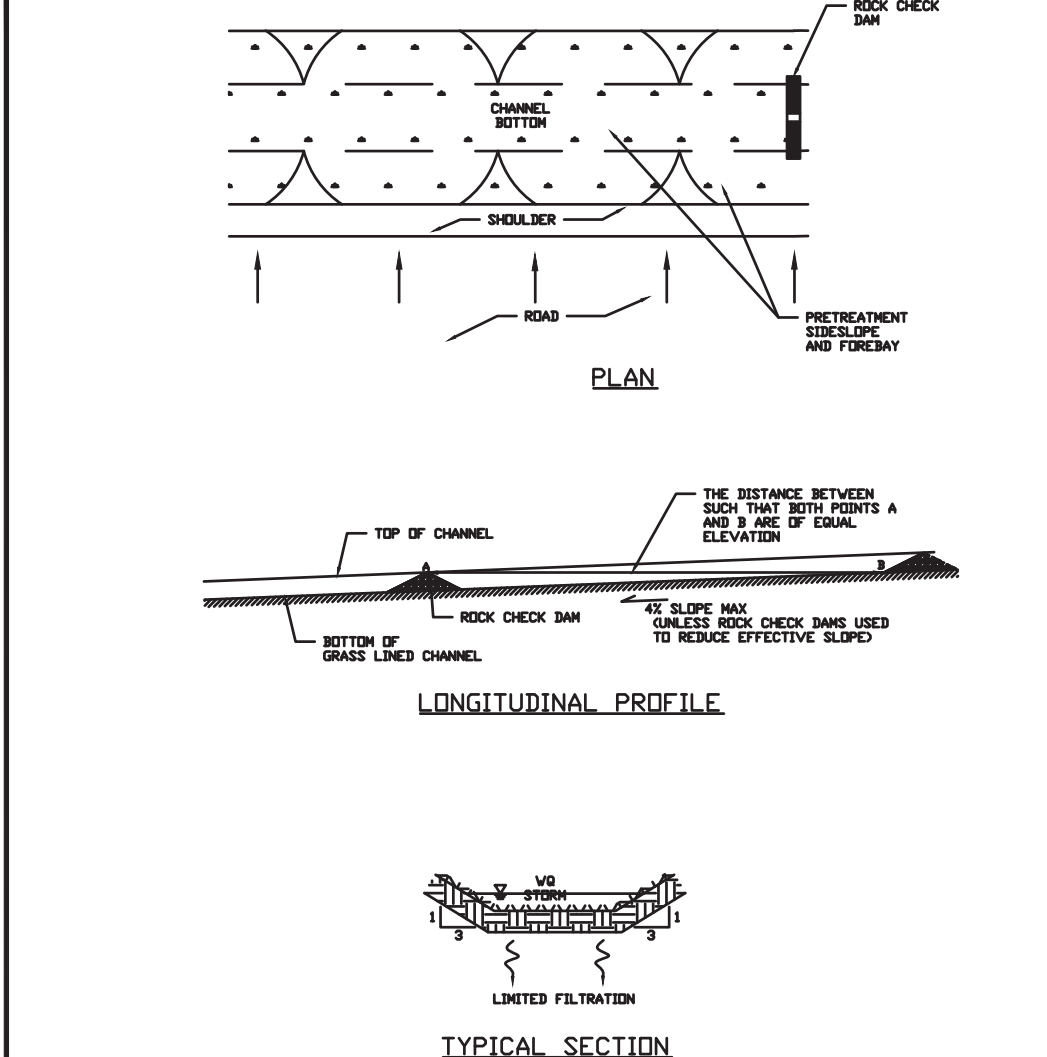
University of Minnesota FS 07009  
**A geotextile underlayment shall be used under the wood mat.**  
Source: Pa&EP, ESS Pollution Control Manual, March 2012

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APPD	DATE 06/11/17		
SCALE N.T.S.	SHEET 1 OF 1		
JOB NO.		DESIGN ENGINEERING	DRAWING NO. MVP-ES37
PROJECT ID:			
MVP - VA PORTION			REV. P




- NOTES
1. WIDTH "W" OF SOIL AMENDMENT PER PERMANENT DIVERSION DIKE/WATERBAR WITH SOIL AMENDMENT SCHEDULE.
  2. THE INCORPORATION DEPTH "D" IS ASSUMED TO BE 1 FT PER TABLE 4.3 IN VA DEP STORMWATER DESIGN SPEC #4. AN INCORPORATION DEPTH OF 2 FT IS USED IN CASES WHERE ADDITIONAL STORAGE CAPACITY IS NEEDED IN ORDER TO MEET WATER QUANTITY REQUIREMENTS.
  3. DEVELOPED FROM VA DSWC PLATE 309-1.
  4. SEE SHEET 0.7, TEMPORARY RIGHT OF WAY DIVERSION/WATERBAR ADDITIONAL DETAILS FOR PLAN VIEW.

DRAWN	DATE		ENVIRONMENTAL DETAIL
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APPD	DATE 06/11/17		
SCALE N.T.S.	SHEET 1 OF 1		
JOB NO.		DESIGN ENGINEERING	DRAWING NO. MVP-ES38
PROJECT ID:			
MVP - VA PORTION			REV. P



- NOTES
1. GRASS LINED CHANNEL TO BE SIZED PER VIRGINIA BMP CLEARINGHOUSE SPECIFICATION NO. 3.

DRAWN	DATE		ENVIRONMENTAL DETAIL
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APPD	DATE 06/11/17		
SCALE N.T.S.	SHEET 1 OF 1		
JOB NO.		DESIGN ENGINEERING	DRAWING NO. MVP-ES39
PROJECT ID:			
MVP - VA PORTION			REV. P



NOTES:

A BONDED FIBER MATRIX (BFM) IS AN EFFECTIVE METHOD OF STABILIZING STEEP SLOPES WHEN USED PROPERLY. BFM'S MAKE USE OF A CROSS-LINKED HYDROCOLLOID TACKIFIER TO BOND THERMALLY PROCESSED WOOD FIBERS. APPLICATION RATES VARY ACCORDING TO SITE CONDITIONS. FOR SLOPES UP TO 3H:1V THE BFM SHOULD BE APPLIED AT A RATE OF 3,000 LBS/ACRE. STEEPER SLOPES MAY NEED AS MUCH AS 4,000 LBS/ACRE.

BFM'S SHOULD ONLY BE USED WHEN NO RAIN IS FORECASTED FOR AT LEAST 48 HOURS FOLLOWING HE APPLICATION. THIS IS TO ALLOW THE TACKIFIER SUFFICIENT TIME TO CURE PROPERLY. ONCE PROPERLY APPLIED, A BFM IS TYPICALLY 90% EFFECTIVE IN PREVENTING ACCELERATED EROSION. BFM'S SHOULD NOT BE APPLIED BETWEEN SEPTEMBER 30 AND APRIL 1.

A POLYMER STABILIZED FIBER MATRIX (PSFM) CAN ALSO BE AN EFFECTIVE METHOD OF STABILIZING STEEP SLOPES WHEN USED PROPERLY. PSFM'S MAKE USE OF A LINEAR SOIL STABILIZING TACKIFIER THAT WORKS DIRECTLY ON SOIL TO MAINTAIN SOIL STRUCTURE, MAINTAIN PORE SPACE CAPACITY AND FLOCCULATE DISLODGED SEDIMENT THAT WILL SIGNIFICANTLY REDUCE RUNOFF TURBIDITY. PROPERLY APPLIED, A PSFM MAY BE AS MUCH AS 99% EFFECTIVE.

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APPD	DATE 06/11/17		
SCALE N.T.S.	SHEET 1 OF 1		
JOB NO.		DESIGN ENGINEERING	DRAWING NO. MVP-ES40
PROJECT ID:			
MVP - VA PORTION			REV. P

Typical Polymer Stabilized Fiber Matrix Application Rates									
Maximum Rainfall of < 20"									
SLOPE	6:1	5:1	4:1	3:1	2:1	1.5:1	1:1		
Soil Stabilizer (gals/acre)	4	5	6	7	8	9	10		
Fiber (lbs/acre)	1,500	1,500	1,500	1,800	2,000	2,500	3,000		
Maximum Rainfall of > 20" and for Site Winterization									
SLOPE	5:1	4:1	23:1						
Soil Stabilizer (gals/acre)	6	8	10						
Fiber (lbs/acre)	2,000	2,500	3,000						

NOTES:

UNLIKE ROLLED BLANKETS, THERE IS NO NEED TO SMOOTH THE SLOPE PRIOR TO APPLICATION OF HYDRAULICALLY APPLIED BLANKETS. IN FACT SOME ROUGHENING OF THE SURFACE, EITHER NATURAL OR MECHANICALLY INDUCED, IS PREFERABLE. HOWEVER, LARGE ROCKS, THOSE > 9 INCHES, AND EXISTING HILLS SHOULD BE REMOVED PRIOR TO APPLICATION. TRACKING OR GROOVING OF SLOPES SHOULD BE CONSIDERED TO SLOW WATER FLOWS DURING A STORM EVENT. SLOPE INTERRUPTION DEVICES SUCH AS STAIR STEP GRADING OR BENCHING SHOULD BE APPLIED PRIOR TO THE APPLICATION, MIXING AND APPLICATION RATES SHOULD FOLLOW MANUFACTURER'S RECOMMENDATIONS.

HYDRAULICALLY APPLIED BLANKETS ARE TYPICALLY APPLIED IN TWO STAGES, UNLESS SPECIFICALLY RECOMMENDED TO BE APPLIED IN ONE APPLICATION BY THE MANUFACTURER. THE SEED MIXTURE AND SOIL AMENDMENTS SHOULD BE APPLIED FIRST. IF THE SEED IS APPLIED AT THE SAME TIME AS THE HYDRAULICALLY APPLIED BLANKET, THE BONDED FIBERS MAY KEEP THE SEED FROM MAKING SUFFICIENT CONTACT WITH THE SOIL TO GERMINATE. AFTER THE SEED MIXTURE IS APPLIED, THE BFM, FGM, OR PSFM SHOULD BE SPRAYED OVER THE AREA AT THE REQUIRED APPLICATION RATE. (SEE ABOVE TABLES)

HYDRAULIC EROSION CONTROL PRODUCTS (HEPC USED ON JNF LANDS MUST BE SUITABLE FOR WILDLIFE

DRAWN	DATE		ENVIRONMENTAL DETAIL
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APPD	DATE 06/11/17		
SCALE N.T.S.	SHEET 1 OF 1		
JOB NO.		DESIGN ENGINEERING	DRAWING NO. MVP-ES40.1
PROJECT ID:			
MVP - VA PORTION			REV. P

ADDED DETAILS FOR ROADS AND PADS		DW	RE	KAL	7
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REVISIONS:					

EROSION AND SEDIMENT CONTROL PLANS  
MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE

MOUNTAIN VALLEY PIPELINE, LLC  
555 SOUTHPOINTE BOULEVARD, SUITE 200  
CANONSBURG, PA 15317

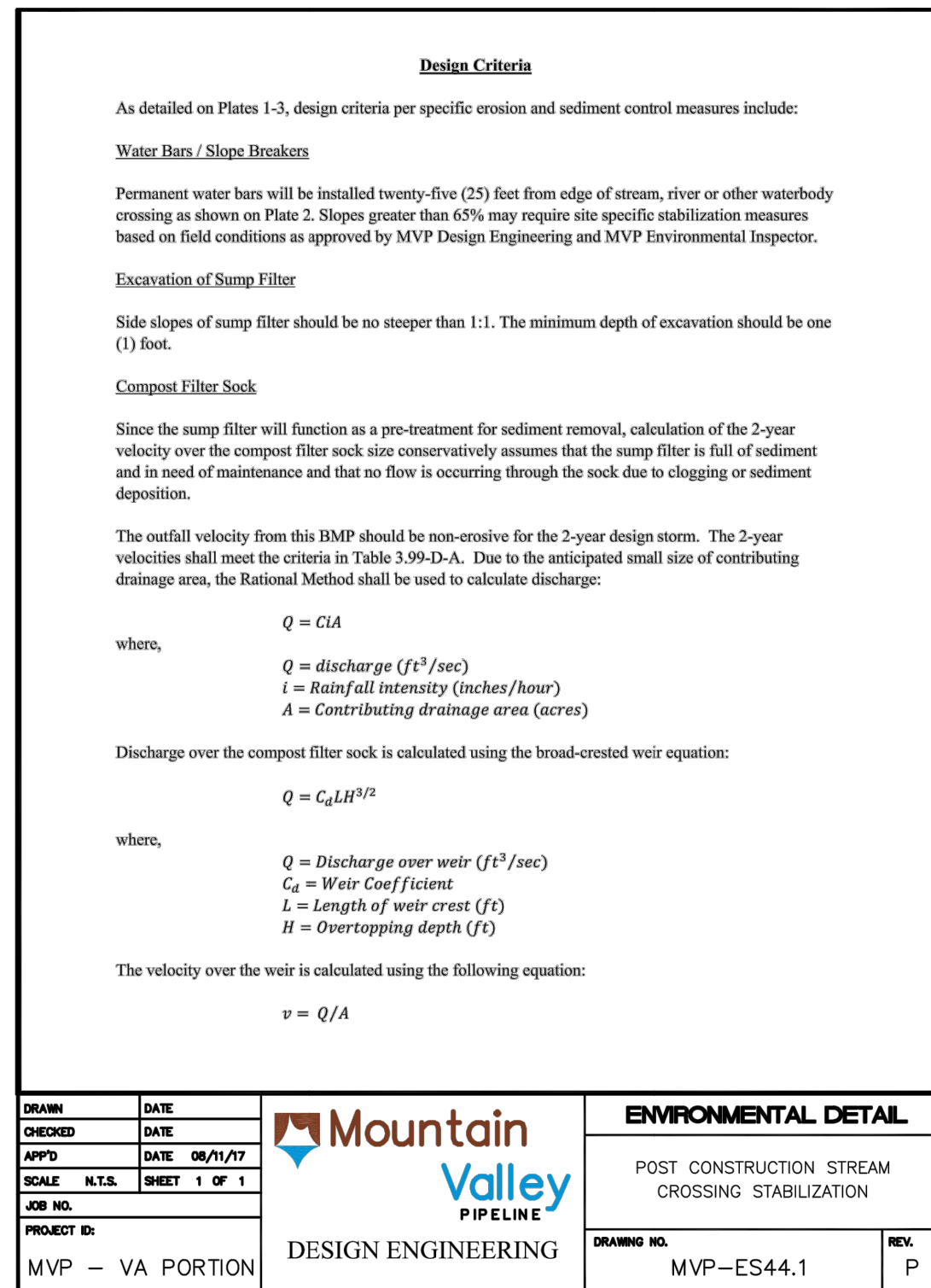
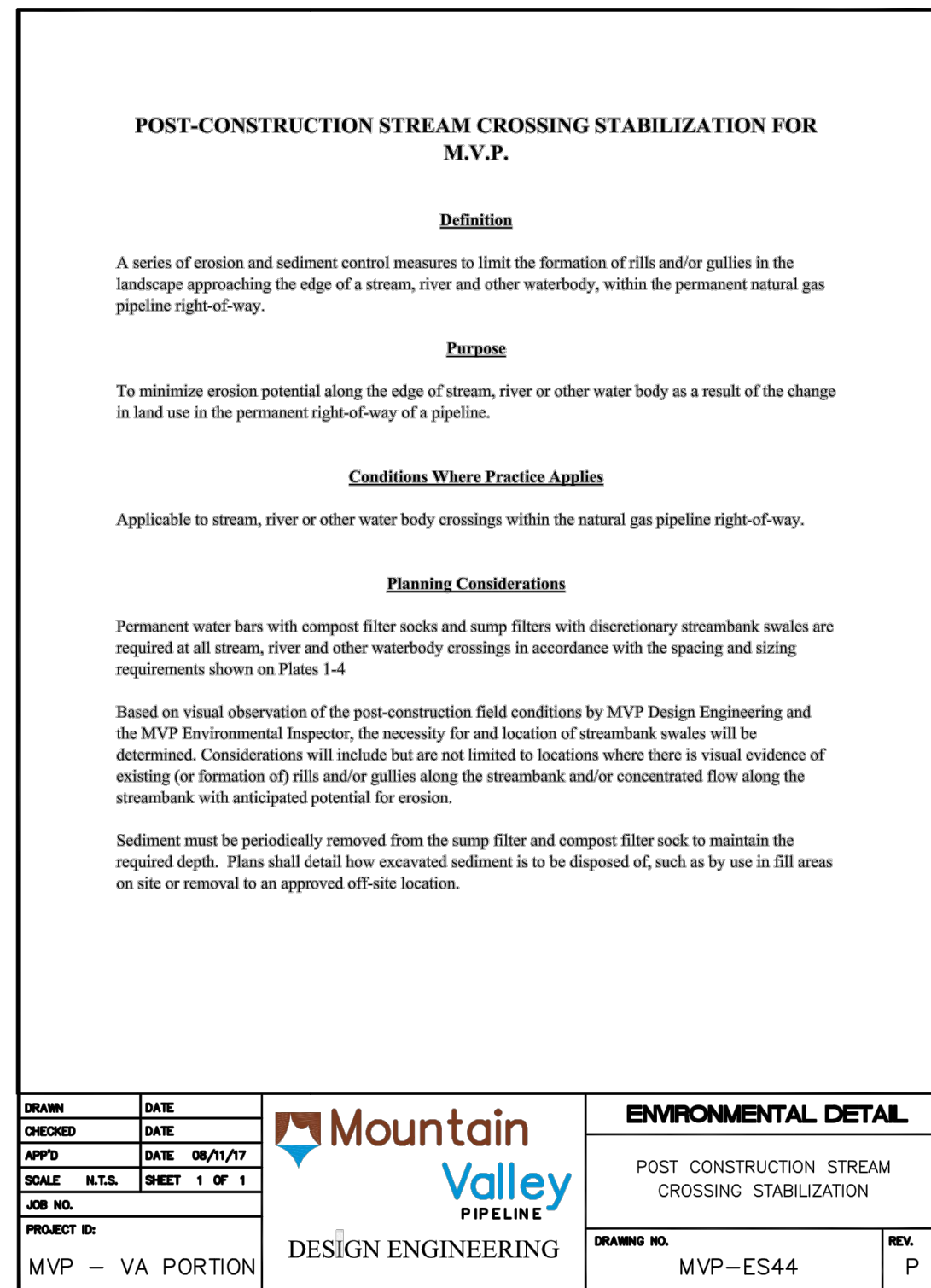
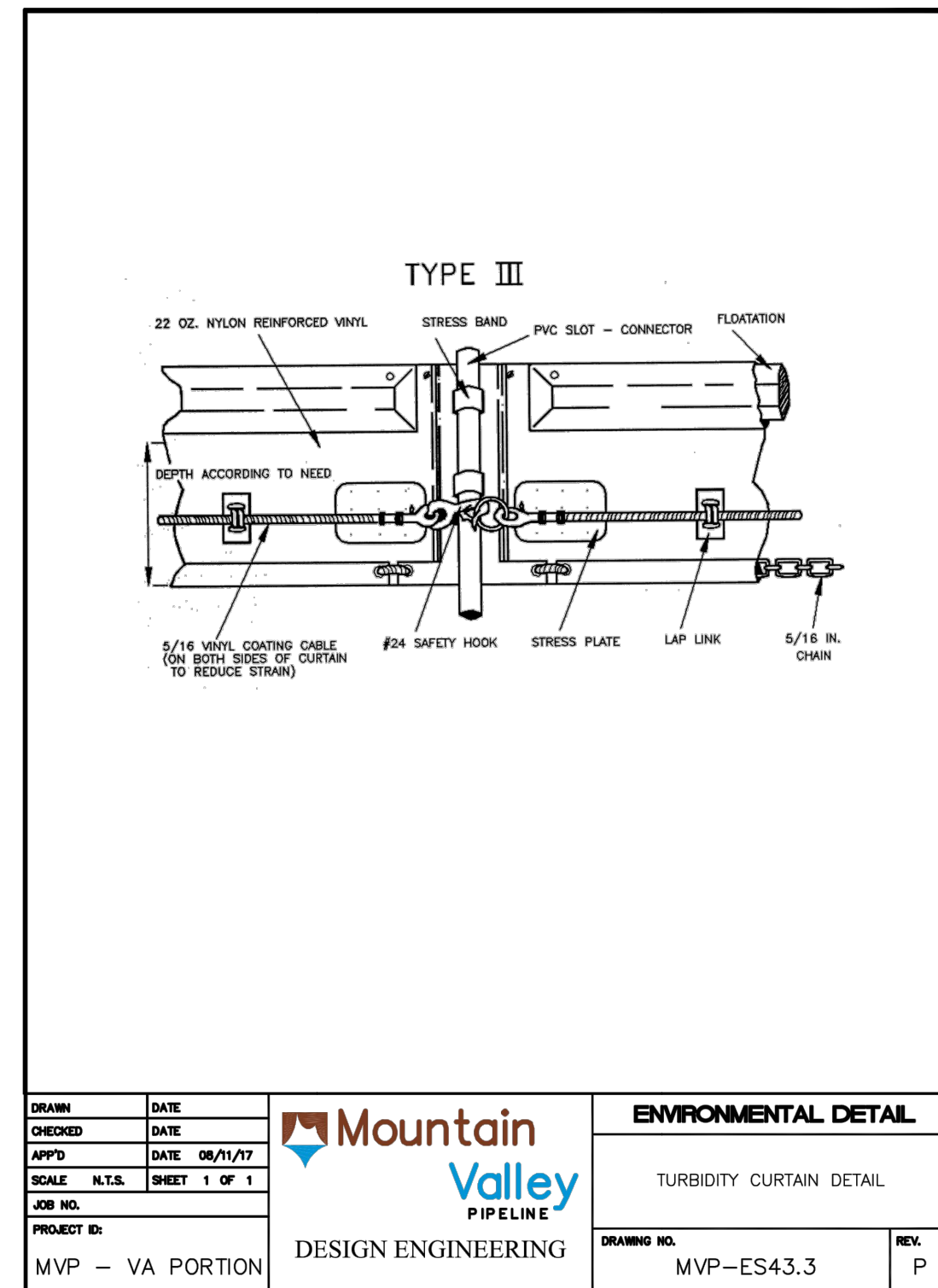
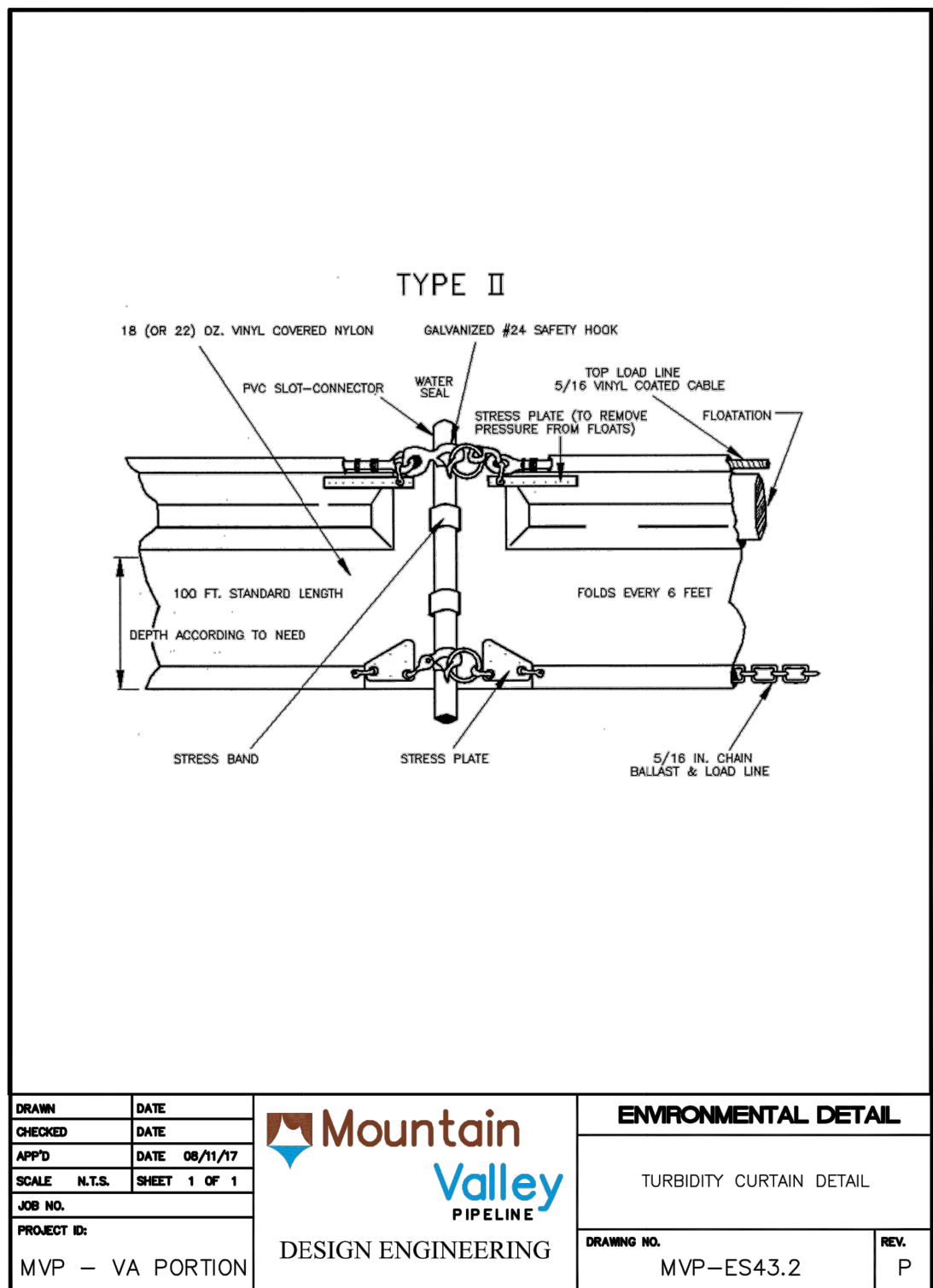
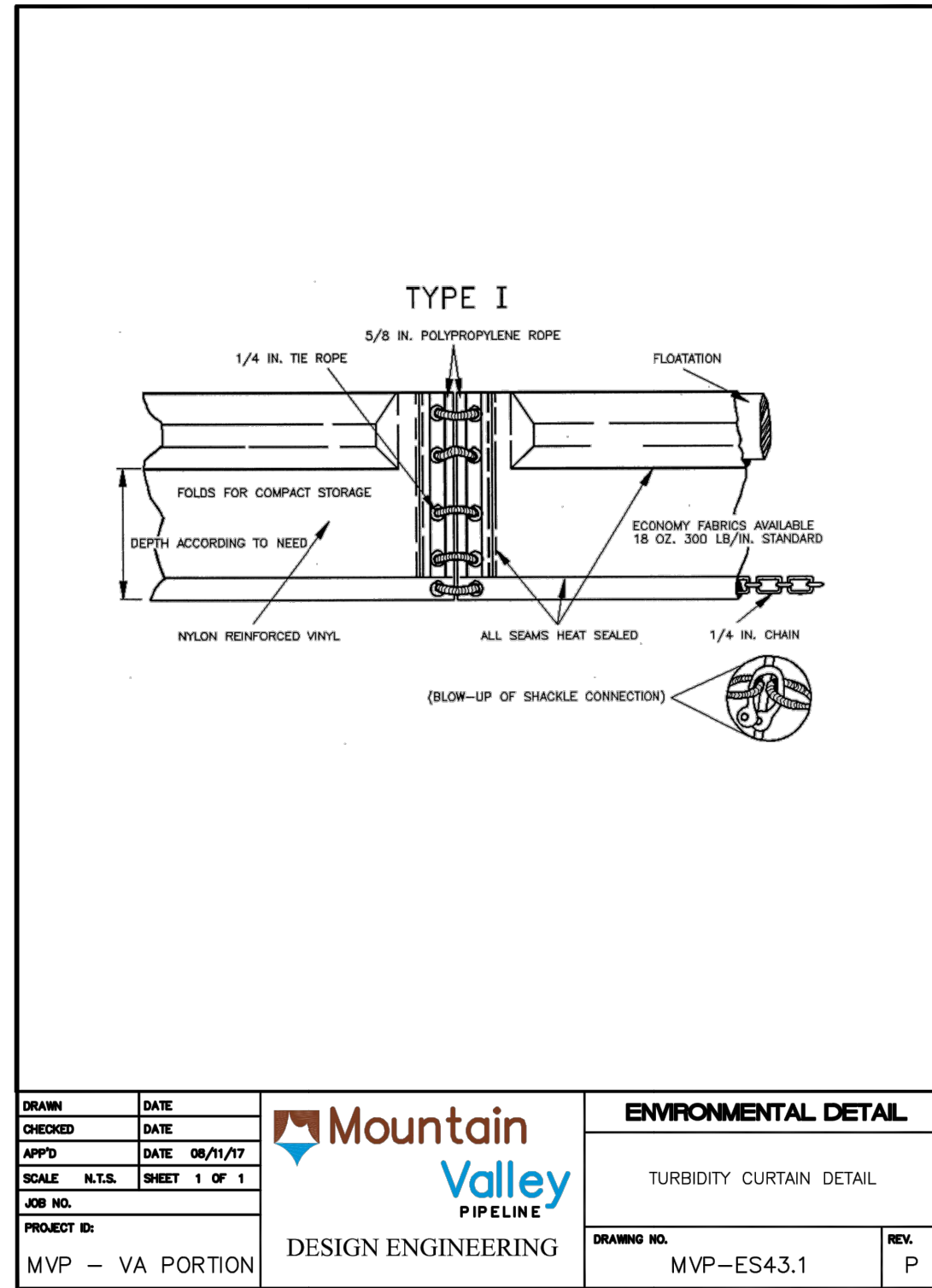
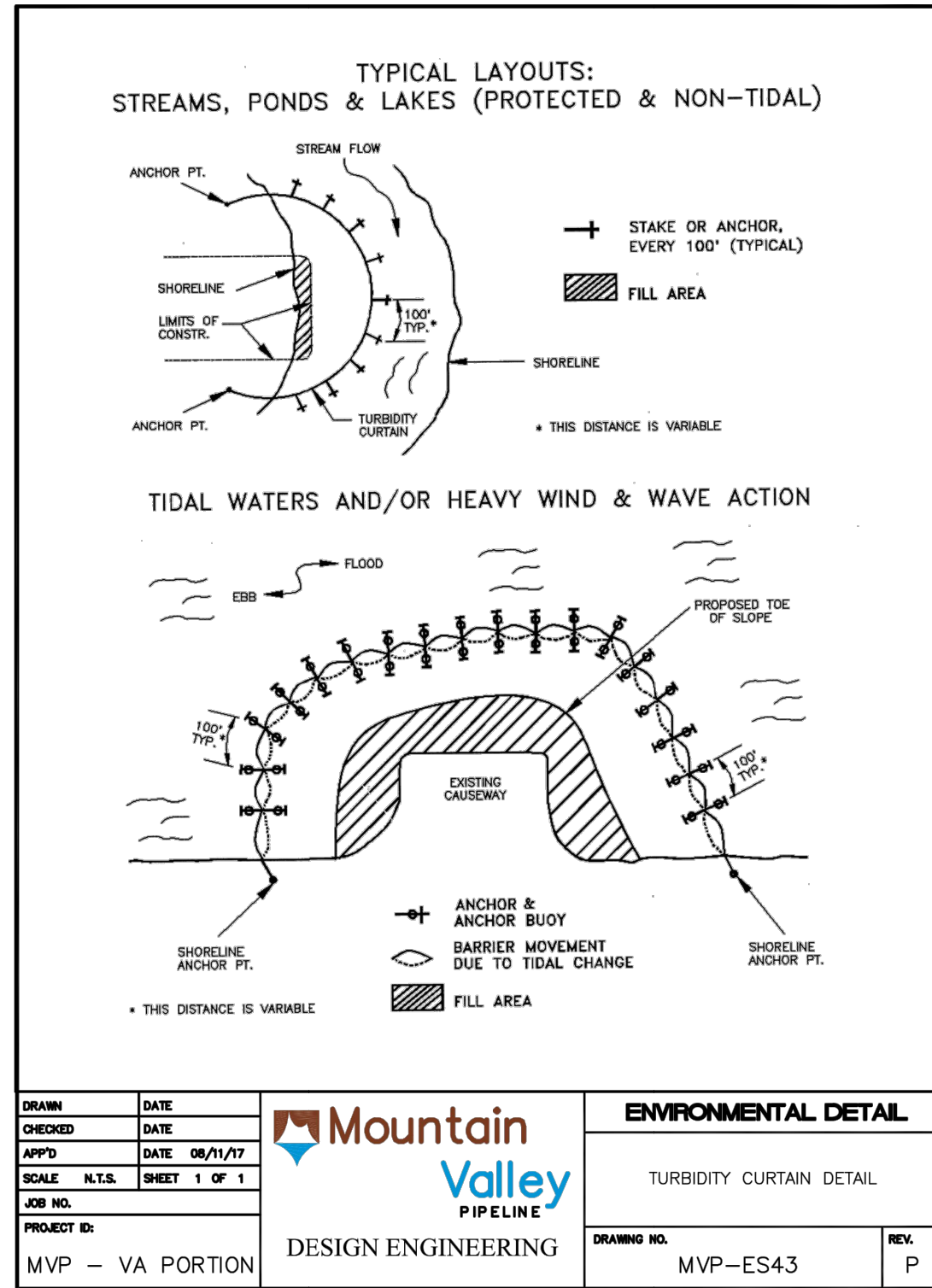
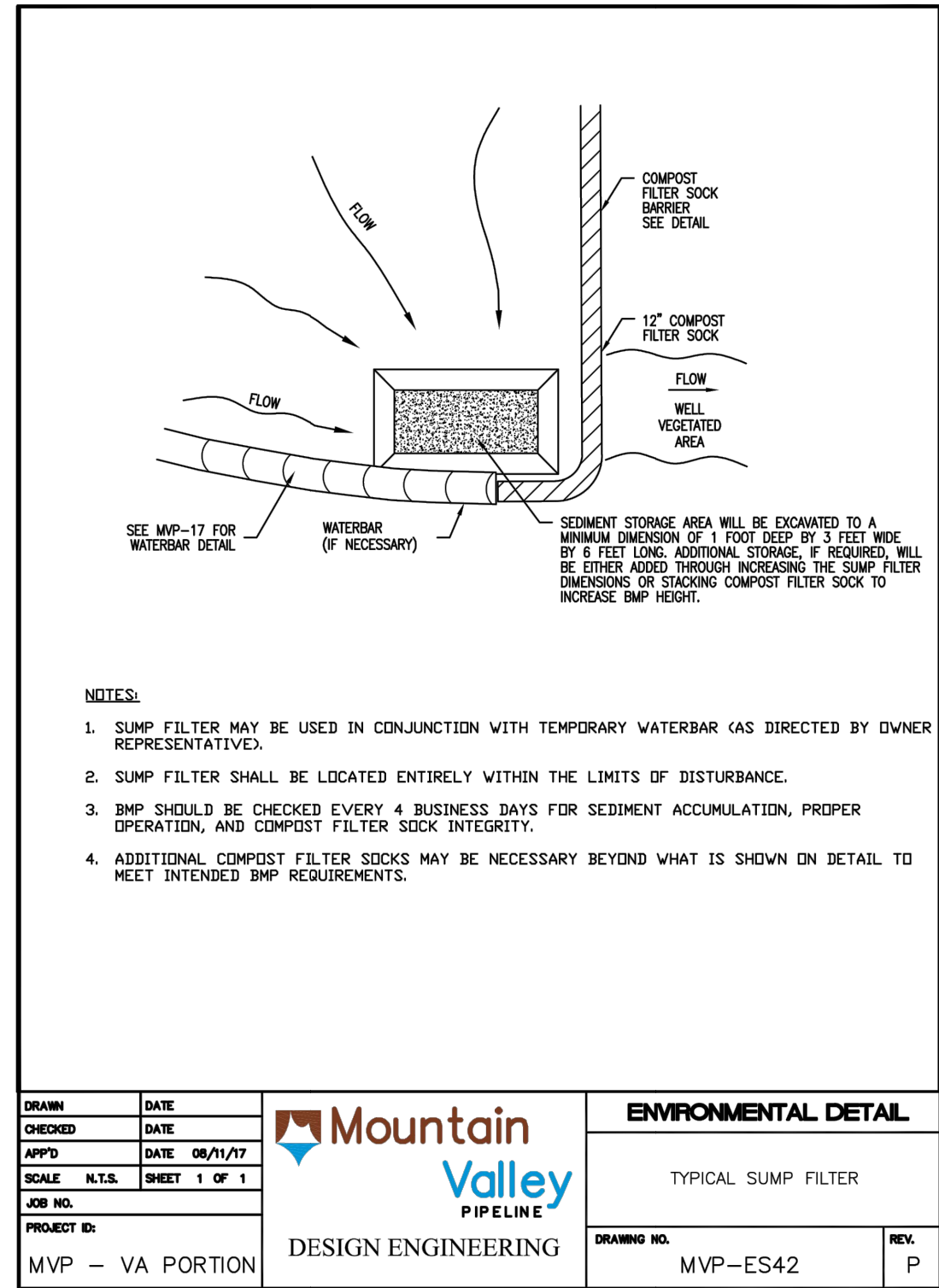
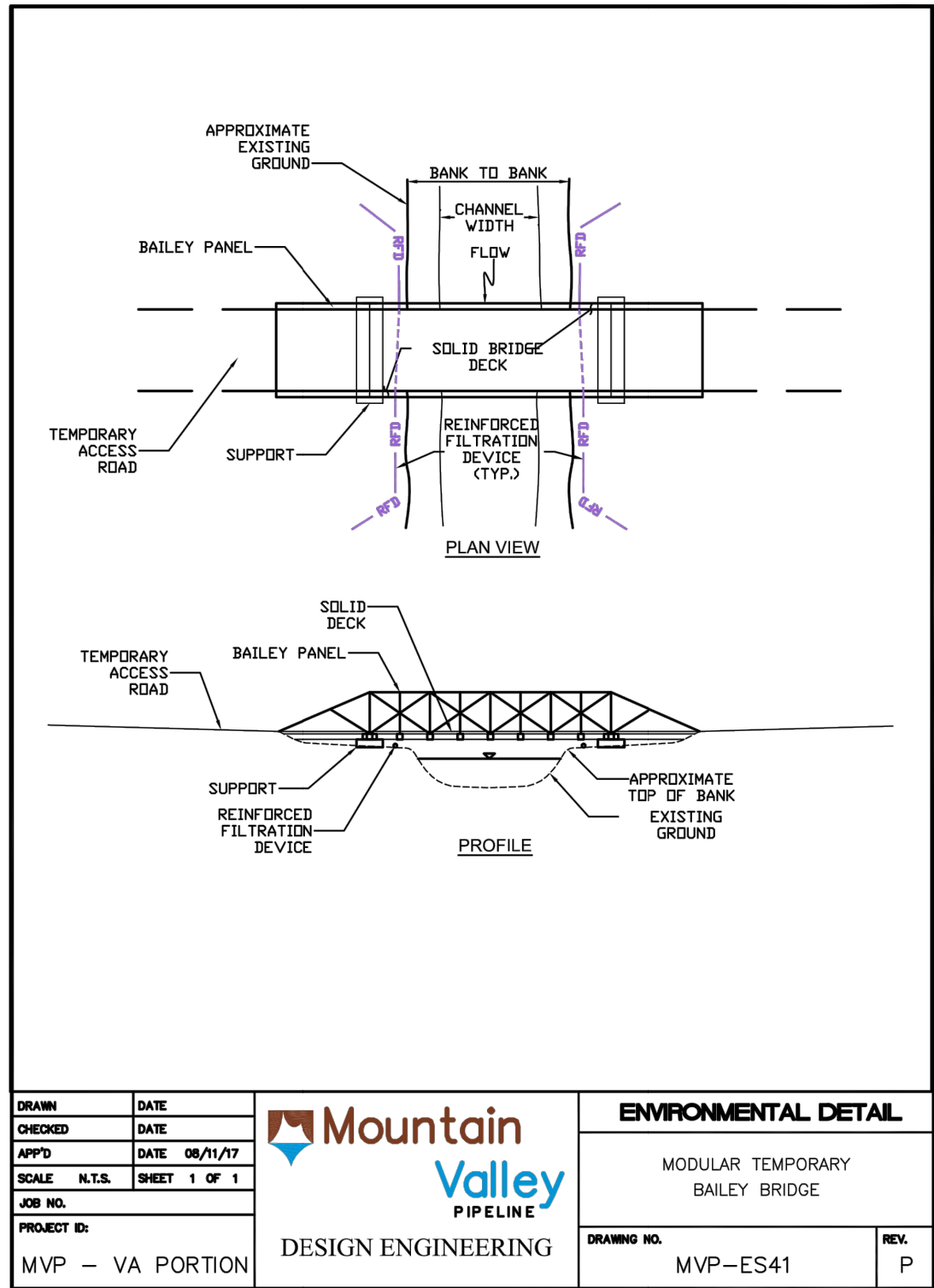
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FOSTER PLAZA 7  
PITTSBURGH, PA 15220

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DATE:	11/28/2017
SCALE:	AS SHOWN
SHT. NO.	0.10 OF 0.23





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DESCRIPTION:		CHD:	APPD:	DWN:	NO:
REVISIONS:		DATE:			
MOUNTAIN VALLEY PIPELINE, LLC 555 SOUTHPOINTE BOULEVARD, SUITE 200 CANONSBURG, PA 15317					

Mountain Valley PIPELINE  
EROSION AND SEDIMENT CONTROL PLANS  
MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE

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661 ANDERSEN DRIVE  
FOSTER PLAZA 7  
PITTSBURGH, PA 15220

GENERAL DETAILS SET

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DRAWN BY:	KAL
CHECKED BY:	HT
APPROVED BY:	RE
DATE:	11/28/2017
SCALE:	AS SHOWN
SHT. NO.	0.11 OF 0.23



where,

$v = \text{Velocity (ft/sec)}$   
 $Q = \text{Discharge over weir (ft}^3\text{/sec)}$   
 $A = \text{Flow area over weir (ft}^2\text{)}$

Soil Types	Corrected Permissible Velocities (ft/sec.)
Fine Sand (noncolloidal)	2.0
Sandy Loam (noncolloidal)	2.0
Silt Loam (noncolloidal)	2.4
Ordinary Firm Loam	2.8
Fine Gravel	4.0
Stiff Clay (very colloidal)	4.0
Graded, Loam to Cobbles (noncolloidal)	4.0
Graded, Silt to Cobbles (colloidal)	4.4
Alluvial Silts (noncolloidal)	4.4
Alluvial Silts (colloidal)	4.0
Coarse Gravel (noncolloidal)	4.8
Cobbles and Shingles	4.4
Shales and Hard Pans	4.8

**NOTE:** Correction factor value = 0.8 for flow depths less than one foot has been applied to original table.  
Source: Chapter 5, Engineering Calculations: Table 5-22 and Plate 5-39, *Virginia Erosion and Sediment Control Handbook*, 3rd Ed., 1992.

Example

Given: A one-acre drainage area in Giles County, an 18-inch diameter compost filter sock with an effective level weir length of 8 feet, in a Sandy Loam soil installed per details in Plate 2.

Solution:

- Calculate the discharge:  
 $Q = C/A = 0.9 \times 4.07 \text{ inches/hour} \times 1 \text{ acre} = 3.66 \text{ ft}^3/\text{sec}$
- Rearranging the weir equation to solve for overtopping depth:  
 $H = (Q/(C_p \times L))^{2/3} = (3.66 \text{ ft}^3/\text{sec} / (2.99 \times 8 \text{ ft}))^{2/3} = 0.29 \text{ ft}$
- Calculate the velocity over the compost filter sock:

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$v = Q/A = 3.66 \text{ ft}^3/\text{sec} / (0.29 \text{ ft} \times 8 \text{ ft}) = 1.60 \text{ ft/sec}$

4. Verify that the velocity is non-erosive in Table 3.99-D-A for Sandy Loam soil.  
 $1.60 \text{ ft/sec} < 2.0 \text{ ft/sec}$

**Streambank Swale**

Minimum thickness (T, as shown on Streambank Swale Typical Cross Section on Plate 3) shall be two (2) times the D<sub>50</sub>. For drainage areas one (1) acre or less, rock shall have a minimum D<sub>50</sub> = 6" and T = 12 inches for stream banks with a slope of 1:1 or flatter (i.e. S<sub>w</sub> = 1.0 ft/ft). If the contributing drainage area is greater than one (1) acre or if the swale is steeper than 1:1 (1.0 ft/ft), the plans shall provide calculations to determine an appropriate size stone and minimum thickness. Rock may be salvaged on-site materials and may contain topsoil, fines, sand, gravel in a mix with at least 60% rock with a D<sub>50</sub> of at least 6".

Calculations (from VDOT Drainage Manual Appendix 7B-5)

Given: A one-acre drainage area in Giles County from previous example.

Solution:

CHANNEL DATA

$Q = 3.66 \text{ (cfs)}$   $P = 3.02 \text{ (ft)}$   $n = 0.069$

$S_w = 1.00 \text{ (ft/ft)}$   $R = 0.18 \text{ (ft)}$

$d_s = 0.37 \text{ (ft)}$   $V_s = 6.81 \text{ (fps)}$

$A = 0.54 \text{ (ft}^2\text{)}$  Side Slope = 4:1

ASSUMED ROCK SIZE - D50 = 0.5 ft

VERIFY ASSUMED ROCK SIZE

$\phi = 41.2^\circ$  (Appendix 7B-1)

Side Slope = 4:1  $\phi = 14^\circ$

$K_1 = [1 - (\sin^2 \theta / \sin^2 \phi)]^{1/3}$

$K_1 = [1 - (\sin^2 14^\circ / \sin^2 41.5^\circ)]^{1/3} = 0.93$

For Specific Gravity = 2.65 and Stability Factor = 1.2

$D50 = 0.001 \times V_s^2 / (d_m^{1/3} \times K_1^{1/3})$

$D50 = 0.001 \times 6.81^2 / (0.5^{1/3} \times 0.93^{1/3}) = 0.45 \text{ ft}$

D50 Computed (0.45) < D50 Assumed (0.5)

Therefore, assumed D50 is appropriate.

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**Construction Specifications**

**General**

- All trees, brush, stumps, roots, obstructions and other unsuitable material shall be removed and disposed of properly.
- Disturbed areas will be returned to pre-construction contours. Topsoil shall be replaced in accordance with the Mountain Valley Pipeline Project Specific Standards and Specifications.
- Existing suitable stream substrate shall be salvaged and replaced to streambed at pre-construction contours.
- The swale shall be excavated or shaped to the proper grade and cross-section.
- Any excess soil shall be removed and disposed of properly.

**Water Bars / Slope Breakers**

- Water bars / slope breakers shall be installed in accordance with WATER BAR, TYPICAL SLOPE BREAKER (SB), Std. & Spec. MVP-17 and MVP-18.
- Permanent water bars are required at all stream, river and other waterbody crossings, as well as upslope from roadway and roadbed cut slopes.
- Construct permanent water bars with compost filter sock after completion of grading in accordance with the water bar spacing and sizing requirements shown on plan and in table on Plate 3.
- Water bar closest to stream top of bank shall be located twenty-five (25) feet maximum upslope from top of bank.
- Water bars shall have a slope of one to four percent.
- Water bars on retired roadways, skidtrails, and right-of-ways shall be left in place after permanent stabilization has been achieved.

**Compost Filter Socks**

- Compost filter socks shall be installed in accordance with COMPOST FILTER SOCK, Std. & Spec. MVP ES-3.
- Compost filter socks shall extend at least ten feet upslope from the uppermost limit of the sump filter.

**Sump Filters**

- Sump filters to be installed at end of water bars. Refer to sump filter detail on Plate 2.
- Sump filter shall be located entirely within the permanent right-of-way.
- Sediment storage area shall be excavated to a minimum dimension of one-foot-deep by three-feet-wide by six-feet-long. Additional storage, if required due to a larger contributing drainage area, will either be added through increasing the sump filter dimension or stacking compost filter sock to increase BMP height.

**Streambank Swales**

Streambank swales shall be installed at locations determined by MVP Design Engineering and the MVP Environmental Inspector based on their visual observation of the post-construction field conditions.

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Locations shall include but are not limited to locations where there is visual evidence of formation of rills and/or gullies along the streambank and/or evidence of concentrated flow along the streambank with anticipated potential for erosion.

- On-site salvaged rock and/or riprap, if on-site rock is not salvageable, shall be installed in accordance with RIPRAP, Std. & Spec. 3.19.
- Erosion control fabric shall be installed along the edges of the riprap-lined channel as shown on Plate 3 in accordance with SOIL STABILIZATION BLANKETS AND MATTING, Std. & Spec. 3.36.

**Inspections and Maintenance**

- Inspections shall be conducted at a frequency of (i) at least once every four business days or (ii) at least once every five business days and no later than 48-hours following a measurable storm event.
- Damaged or eroded water bars shall be restored to original dimensions within 24-hours of inspection.
- Compost filter sock shall be inspected for sediment accumulation, integrity, and maintained as necessary. Accumulated sediment shall be removed when it reaches no more than half the aboveground height of the sock and disposed in the manner described elsewhere in the plan. Damaged socks shall be repaired according to manufacturer's specifications or replaced within 24 hours of inspection.
- Sump filter shall be inspected for sediment accumulation and proper operation. Sediment shall be removed and the sump filter restored to original dimensions when sediment has accumulated to half the design depth. Sediment removal from the sump shall be deposited in a suitable area and in such a manner that it will not erode and cause sedimentation problems.
- Streambank swales shall be inspected for integrity and proper operation. Damaged or eroded streambank swales shall be restored to original dimension within 24-hours of inspection.
- If during inspection, additional rills and/or gullies are observed, streambank swales shall be installed in accordance with the construction specifications herein at these locations within 24-hours of inspection.
- Maintenance of water bars, compost filter socks and sump filters shall be provided until roadway, skidtrail, or right-of-way has achieved permanent stabilization.

**Post Stabilization**

Once permanent stabilization has been achieved, sediment storage should be seeded with permanent seed mix in accordance with the Mountain Valley Pipeline Project Specific Standards and Specifications. Compost filter socks shall remain to decompose in place and streambank swales shall remain in place.

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PLAN VIEW  
NOT TO SCALE

POST-CONSTRUCTION STREAM CROSSING STABILIZATION DETAIL

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SUMP FILTER DETAIL  
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POST-CONSTRUCTION STREAM CROSSING STABILIZATION DETAIL

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PERMANENT WATER BAR DETAIL  
NOT TO SCALE

MINIMUM SPACING FOR PERMANENT WATER BARS

PIPELINE GRADE	DISTANCE (FEET)
<2%	25'
2-5%	400'
6-15%	200'
16-30%	100'
>31%	50'

NOTES:

- REFER TO MVP-17 AND MVP-18 DETAILS (WATER BAR, TYPICAL SLOPE BREAKERS).
- PERMANENT WATER BARS WILL BE INSTALLED AS NEEDED BASED ON FIELD CONDITIONS.
- PERMANENT WATER BARS WILL BE INSTALLED 25 FEET FROM EACH WATERBODY BOUNDARY REGARDLESS OF SLOPE CONDITIONS.
- SLOPES GREATER THAN 60% MAY REQUIRE SITE SPECIFIC STABILIZATION MEASURES BASED ON FIELD CONDITIONS AS APPROVED BY MVP DESIGN ENGINEERING AND MVP ENVIRONMENTAL INSPECTOR.

STREAMBANK SWALE TYPICAL CROSS SECTION  
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PERSPECTIVE VIEW  
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POST-CONSTRUCTION STREAM CROSSING STABILIZATION DETAIL

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MULCHING

Definition

Application of plant residues or other suitable materials to the soil surface.

Purposes

1. To prevent erosion by protecting the soil surface from raindrop impact and reducing the velocity of overland flow.

2. To foster the growth of vegetation by increasing available moisture and providing insulation against extreme heat and cold.

Conditions Where Practice Applies

1. Areas which have been permanently seeded (see Appendix B – Typical Construction Details MVP-ES11.1 through ES12.3) should be mulched immediately following seeding.

2. Areas which cannot be seeded because of the season should be mulched to provide some protection to the soil surface. An organic mulch should be used, and the area then seeded as soon weather or seasonal conditions permit. It is not recommended that fiber mulch be used alone for this practice; at normal application rates it just simply does not provide the protection that is achieved using other types of mulch.

3. Mulch may be used together with plantings of trees, shrubs, or certain ground covers which do not provide adequate soil stabilization by themselves.

4. Mulch shall be used in conjunction with temporary seeding operations as specified in TEMPORARY SEEDING, Std. & Spec. 3.31

Planning Considerations

Mulches are applied to the soil surface to conserve a desirable soil property or to promote plant growth. A surface mulch is one of the most effective means of controlling runoff and erosion on disturbed land.

Mulches can increase the infiltration rate of the soil, reduce soil moisture loss by evaporation, prevent crusting and sealing of the soil surface, modify soil temperatures, and provide a suitable microclimate for seed germination.

Organic mulch materials, such as straw, wood chips, bark, and fiber mulch have been found to be the most effective.

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Chemical soil stabilizers or soil binders should not be used alone for mulch. These materials are useful to bind organic mulches together to prevent displacement.

A variety of manufactured SOIL STABILIZATION BLANKETS AND MATTING (see Std. & Spec. 3.36) have been developed for erosion control in recent years. Some of these products can be used as mulches, particularly in critical areas such as waterways. They also may be used to hold other mulch to the soil surface.

The choice of materials for mulching will be based on the type of soil to be protected, site conditions, season and economics. It is especially important to mulch liberally in mid-summer and prior to winter, and on cut slopes and southern slope exposures.

Organic Mulches

Straw - The mulch most commonly used in conjunction with seeding. The straw should come from wheat or oats (free of troublesome weed seeds) and may be spread by hand or machine. Straw can be windblown and must be anchored down by an acceptable method.

Hay – Hay shall not be used as mulch for Project activities.

Corn Stalks - These should be shredded into 4- to 6-inch lengths. Stalks decompose slowly and are resistant to displacement.

Wood Chips - Suitable for areas that will not be closely mowed, and around ornamental plantings. Chips decompose slowly and do not require tacking. They must be treated with 12 pounds of nitrogen per ton to prevent nutrient deficiency in plants; however, can be a very inexpensive mulch if chips are obtained from trees cleared on the site.

Bark Chips, Shredded Bark - These are by-products of timber processing which are used in landscaped plantings. Bark is also a suitable mulch for areas planted to grasses and not closely mowed. It may be applied by hand or mechanically and is not usually toxic to grasses or legumes; additional nitrogen fertilizer is not required.

Fiber Mulch - Used in hydros seeding operations and applied as part of the slurry. It creates the best seed-soil contact when applied over top of (as a separate operation) newly seeded areas. These fibers do not require tacking, although tacking agents or binders are sometimes used in conjunction with the application of fiber mulch. This form of mulch does not provide sufficient protection to highly erodible soils. Additionally, fiber mulch will not be considered adequate mulch when used during the dry summer months or when used for late fall mulch cover. Use straw mulch during these periods. Fiber mulch may be used to tack (anchor) straw mulch. This treatment is well suited for steep slopes, critical areas, and areas susceptible to displacement.

There are other organic materials which make excellent mulches but are only available locally or seasonally. Creative use of these materials can reduce costs.

Chemical Mulches and Soil Binders

A wide range of synthetic, spray-on materials are marketed to stabilize and protect the soil surface. These are emulsions or dispersions of vinyl compounds, rubber or other substances which are mixed with water and applied to the soil. They may be used alone in some cases as temporary stabilizers, or in conjunction with fiber mulches or straw.

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When used alone, chemical mulches do not have the capability to insulate the soil or retain soil moisture that organic mulches have. This soil protection is also easily damaged by traffic. Application of these mulches is usually more expensive than organic mulching, and the mulches decompose in 60-90 days.

Blankets and Matting

Field experience has shown that plastic netting, when used alone, does not retain soil moisture or modify soil temperature. In some cases it may stabilize the soil surface while grasses are being established, but is primarily used in grassed waterways and on slopes to hold straw or similar mulch in place.

Jute mesh and other soil stabilization blankets are good choices for mulching on difficult slopes and in minor drainage swales. Most of the soil stabilization mattings (used to create a permanent matrix for root growth within the soil) must receive mulching in order to properly stabilize an area. Notably, some manufacturers have recently developed permanent mattings which include self-contained, temporary mulching materials; however, these measures will have to meet the requirements noted in Std. & Spec. 3.36, SOIL STABILIZATION BLANKETS AND MATTING, before they can be recommended for use on steep slopes and in channel flow situations.

The most critical aspect of installing blankets and mats is obtaining firm, continuous contact between the material and the soil. Without such contact, the material may fail and thereby allow erosion to occur. It is important to use an adequate number of staples and make sure the material is installed properly in order to maximize soil protection. These products are discussed in more detail in Std. & Spec. 3.36, SOIL STABILIZATION BLANKETS & MATTING.

MVP will utilize hydraulically applied soil stabilization blankets and matting (i.e. Earthguard, Flexterra, or equivalent) as an alternate to the rolled ESC blanket material identified under STD & SPEC 3.36. Information regarding the hydraulically applied blankets is provided under Appendix B MVP-ES40 and MVP-ES40.1.

Specifications

Organic Mulches

Organic mulches may be used in any area where mulch is required, subject to the restrictions noted in Table 3.35-A.

Materials: Select mulch material based on site requirements, availability of materials, and availability of labor and equipment. Table 3.35-A lists the most commonly used organic mulches. Other materials, such as peanut hulls and cotton burs, may be used with the permission of the local Plan-Approving Authority.

Prior to mulching: Complete the required grading and install needed sediment control practices.

Lime and fertilizer should be incorporated and surface roughening accomplished as needed. Seed should be applied prior to mulching except in the following cases:

a. Where seed is to be applied as part of a hydroseeder slurry containing fiber mulch.

b. Where seed is to be applied following a straw mulch spread during winter months.

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TABLE 3.35-A

ORGANIC MULCH MATERIALS AND APPLICATION RATES

MULCHES:	RATES:		NOTES:
	Per Acre	Per 1000 sq. ft.	
Straw	1 ½ - 2 tons (Minimum 2 tons for winter cover)	70 – 90 lbs.	Free from weeds and coarse matter. Must be anchored. Spread with mulch blower or by hand.
Fiber Mulch or 1500 lbs.	Minimum 35 lbs.		Do not use as mulch for winter cover or during hot, dry periods. * Apply as slurry.
Corn Stalks	4 – 6 tons	185 – 275 lbs.	Cut or shredded in 4-6" lengths. Air-dried. Do not use in fine turf areas. Apply with mulch blower or by hand.
Wood Chips	4 – 6 tons	185 – 275 lbs.	Free of coarse matter. Air-dried. Treat with 12 lbs nitrogen per ton. Do not use in fine turf areas. Apply with mulch blower, chip handler, or by hand.
Bark Chips or Shredded Bark	50 – 70 cu. yds.	1-2 cu. yds.	Free of coarse matter. Air-dried. Do not use in fine turf areas. Apply with mulch blower, chip handler, or by hand.

\*When fiber mulch is the only available mulch during periods when straw should be used, apply at a minimum rate of 2000 lbs./ac. Or 45 lbs./1000 sq. ft.

Source: Va. DSWC

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Application: Mulch materials shall be spread uniformly, by hand or machine.

When spreading straw mulch by hand, divide the area to be mulched into approximately 1,000 sq. ft. sections and place 70-90 lbs. (a to 2 bales) of straw in each section to facilitate uniform distribution.

Mulch Anchoring: Straw mulch must be anchored immediately after spreading to prevent displacement. Other organic mulches listed in Table 3.35-A do not require anchoring. The following methods of anchoring straw may be used:

1. Mulch anchoring tool (often referred to as a Krimper or Krimper Tool)-This is a tractor-drawn implement designed to punch mulch into the soil surface. This method provides good erosion control with straw. It is limited to use on slopes no steeper than 3:1, where equipment can operate safely. Machinery shall be operated on the contour.

2. Fiber Mulch: A very common practice with widespread use today. Apply fiber mulch by means of a hydroseeder at a rate of 500-750 lbs/acre over top of straw mulch. It has an added benefit of providing additional mulch to the newly seeded area.

3. Liquid mulch binders: Application of liquid mulch binders and tackifiers should be heaviest at edges of areas and at crests of ridges and banks, to prevent displacement. The remainder of the area should have binder applied uniformly. Binders may be applied after mulch is spread or may be sprayed into the mulch as it is being blown onto the soil.

The following types of binders may be used:

a. Synthetic binders - Formulated binders or organically formulated products may be used as recommended by the manufacturer to anchor mulch.

b. \*Asphalt - Any type of asphalt thin enough to be blown from spray equipment is satisfactory. Recommended for use are rapid curing (RC-70, RC-250, RC-800), medium curing (MC-250, MC-800) and emulsified asphalt (SS-1, CSS-1, CMS-2, MS-2, RS-1, RS-2, CRS-1, and CRS-2).

Apply asphalt at 0.10 gallon per square yard (10 gal./1000 sq. ft. or 430 gal./acre). Do not use heavier applications as it may cause the straw to "poach" over rills. All asphalt designations are from the Asphalt Institute Specifications.

\*Note: This particular method is not used as commonly today as it once was in the past. The development of hydraulic seeding equipment promoted the industry to turn to synthetic or organically based binders and tackifiers. When this method is used, environmental concerns should be addressed to ensure that petroleum-based products do not enter valuable water supplies. Avoid applications into waterways or channels.

4. Mulch nettings: Lightweight plastic, cotton, or paper nets may be stapled over the mulch according to manufacturer's recommendations.

5. Peg and twine: Because it is labor-intensive, this method is feasible only in small areas where other methods cannot be used. Drive 8- to 10-inch wooden pegs to within 3 inches of the soil surface, every 4 feet in all directions. Stakes may be driven before or after straw is spread. Secure mulch by stretching twine between pegs in a criss-cross-within-a square pattern. Turn twine 2 or more times around each peg.

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Chemical Mulches

Chemical mulches\* may be used alone only in the following situations:

a. Where no other mulching material is available.

b. In conjunction with temporary seeding during the times when mulch is not required for that practice.

c. From March 15 to May 1 and August 15 to September 30, provided that they are used on areas with slopes no steeper than 4:1, which have been roughened in accordance with SURFACE ROUGHENING, Std. & Spec. 3.29. If rill erosion occurs, another mulch material shall be applied immediately.

\*Note: Chemical mulches may be used to bind other mulches or with fiber mulch in a hydroseeded slurry at any time. Manufacturer's recommendations for application of chemical mulches shall be followed.

Maintenance

All mulches and soil coverings should be inspected periodically (particularly after rainstorms) to check for erosion. Where erosion is observed in mulched areas, additional mulch should be applied. Nets and mats should be inspected after rainstorms for dislocation or failure. If washouts or breakage occur, re-install netting or matting as necessary after repairing damage to the slope or ditch. Inspections should take place up until grasses are firmly established. Where mulch is used in conjunction with ornamental plantings, inspect periodically throughout the year to determine if mulch is maintaining coverage of the soil surface; repair as needed.

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TOPSOILING & SOIL HANDLING FOR M.V.P.

Definition

Methods of preserving and using the surface layer of undisturbed soil, often enriched in organic matter, in order to obtain a more desirable planting and growth medium.

Specifications

To provide a suitable growth medium for final site stabilization with vegetation and promote successful reforestation.

Conditions Where Practice Applies

1. Where the preservation or importation of topsoil is determined to be the most effective method of providing a suitable growth medium.

2. Where the subsoil or existing soil presents the following problems:

a. The texture, pH, or nutrient balance of the available soil cannot be modified by reasonable means to provide an adequate growth medium.

b. The soil material is too shallow to provide an adequate root zone and to supply necessary moisture and nutrients for plant growth.

c. The soil contains substances potentially toxic to plant growth.

3. Only on slopes that are 2:1 or flatter unless other measures are taken to prevent erosion and sloughing.

Planning Considerations

Topsoil is the surface layer of the soil profile, generally characterized as being darker than the subsoil due to the presence of organic matter. It is the major zone of root development, carrying much of the nutrients available to plants, and supplying a large share of the water used by plants.

Although topsoil provides an excellent growth medium, there are disadvantages to its use. Stripping, stockpiling, and supplying topsoil, or importing topsoil, may not always be cost-effective. Topsoiling can delay seeding or sodding operations, increasing the exposure time of denuded areas. Most topsoil contains weed seeds, and weeds may compete with desirable species.

Advantages of topsoil include its high organic matter content and friable consistence, water-holding capacity, and nutrient content.

In site planting, the option of topsoiling should be compared with that of preparing a seedbed in subsoil. The clay content of subsoils does provide high moisture availability and deter leaching of nutrients and, when properly limed and fertilized, subsoils may provide a good growth medium which is generally free

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SHEET 1 OF 1

PXXXX

Mountain  
Valley  
PIPELINE

DESIGN ENGINEERING

ENVIRONMENTAL DETAIL

TOPSOILING & SOIL HANDLING

DRAWING NO.  
MVP-ES46

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of weed seeds. In many cases topsoiling may not be required for the establishment of less demanding, lower maintenance plant material. Topsoiling is strongly recommended where ornamental plants or high-maintenance turf will be grown. Topsoiling is a required procedure when establishing vegetation on shallow soils, soils containing potentially toxic materials, and soils of critically low pH (high acid) levels.

If topsoiling is to be done, the following items should be considered:

1. Whether an adequate volume of topsoil exists on the site. Topsoil will be spread at a compacted depth of 2 to 4 inches (depths closer to 4 inches are preferred).

2. Location of the topsoil stockpile so that it meets specifications and does not interfere with work on the site.

3. Allow sufficient time in scheduling for topsoil to be spread and bonded prior to seeding or planting.

4. Care must be taken not to apply topsoil to subsoil if the two soils have contrasting textures. Clayey topsoil over sandy subsoil is a particularly poor combination, as water may creep along the junction between the soil layers, causing the topsoil to slough. Sandy topsoil over a clay subsoil is equally as likely to fail.

5. If topsoil and subsoil are not properly bonded, water will not infiltrate the soil profile evenly and it will be difficult to establish vegetation. Topsoiling of steep slopes should be discouraged unless good bonding of soils can be achieved.

Specifications

Materials

Field exploration of the site shall be made to determine if there is sufficient surface soil of good quality to justify stripping. Topsoil shall be friable and loamy (loam, sandy loam, silt loam, sandy clay loam, clay loam). It shall be free of debris, trash, stumps, rocks, roots, and noxious weeds, and shall give evidence of being able to support healthy vegetation. It shall contain no substance that is potentially toxic to plant growth.

In areas where revegetation is of concern based on existing soil conditions and determined by the MVP Environmental Inspector (EI), topsoil samples shall be taken for analysis. Samples will be collected by the MVP EI and sent to a recognized laboratory for analysis of the following criteria:

Organic matter content shall be not less than 1.5% by weight.

pH range shall be from 6.0-7.5. If pH is less than 6.0, lime shall be added in accordance with soil test results or in accordance with the recommendations of the vegetative establishment practice being used.

Soluble salts shall not exceed 500 ppm.

Soil samples collected and sent for analysis will be identified by the MVP Construction Spread # and pipeline station from which the sample was obtained. Areas that fail to revegetate following restoration will be sampled and analyzed based on the above parameters.

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MVP – VA PORTION

Mountain  
Valley  
PIPELINE

DESIGN ENGINEERING

ENVIRONMENTAL DETAIL

TOPSOILING & SOIL HANDLING

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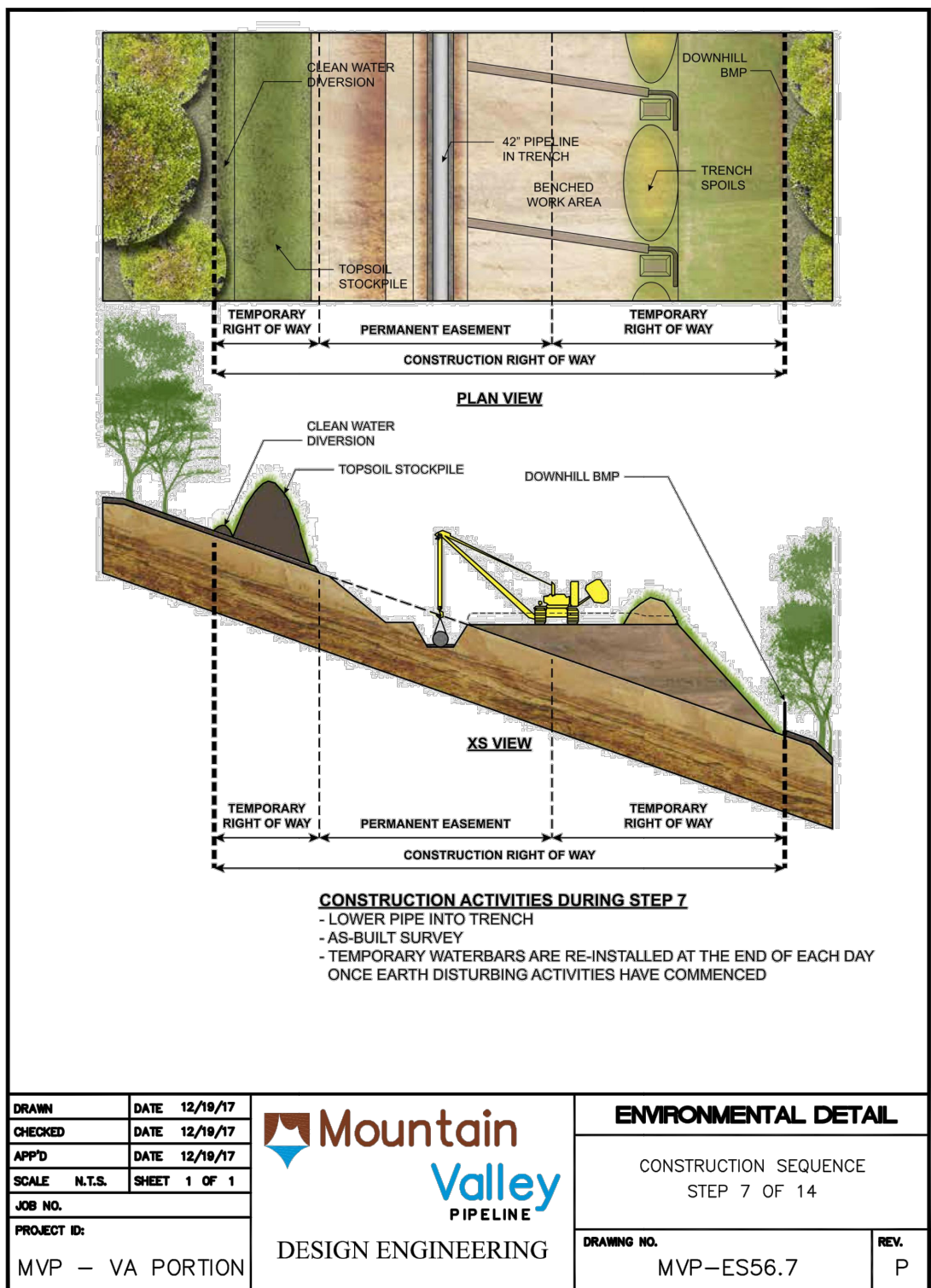
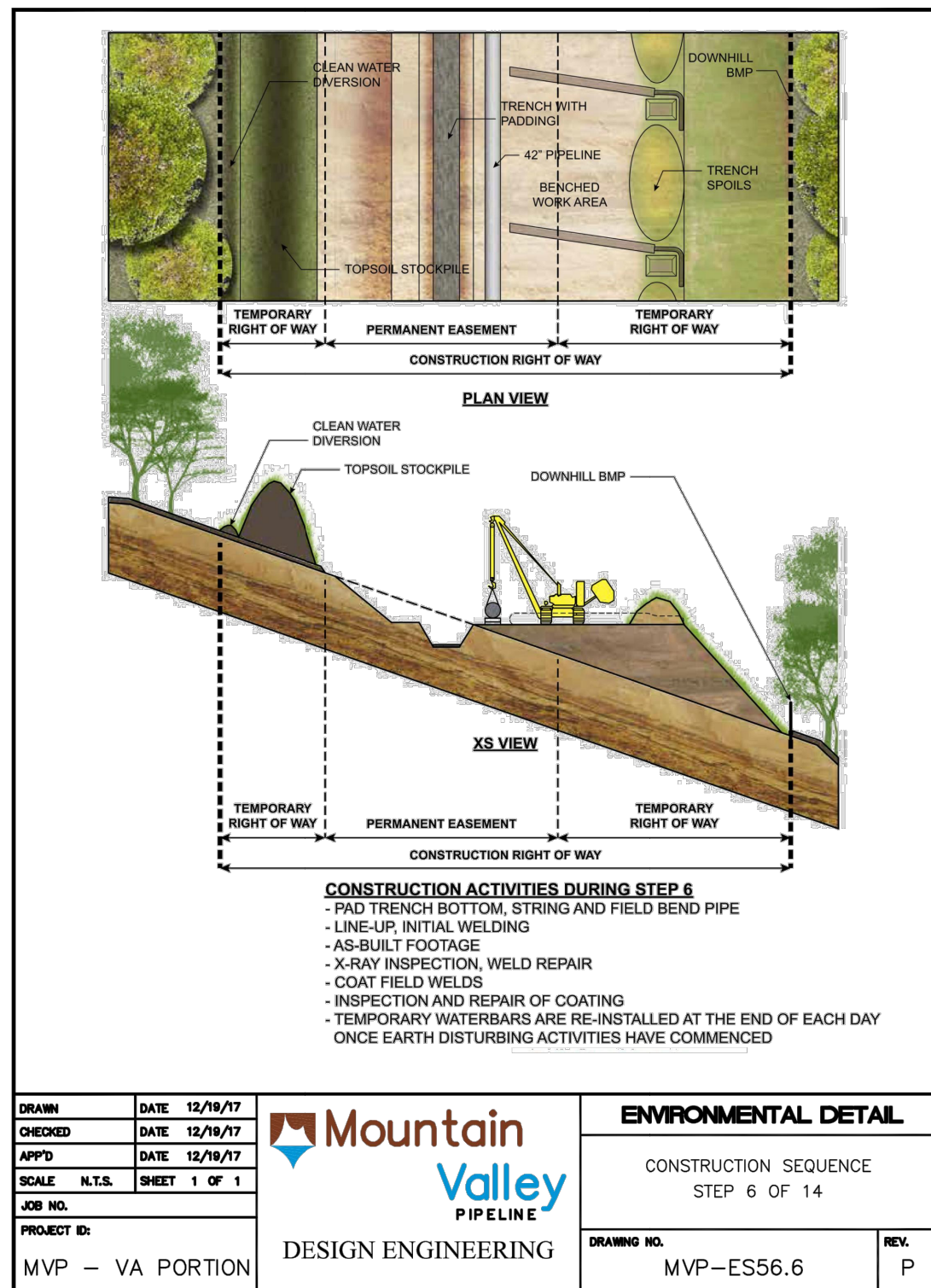
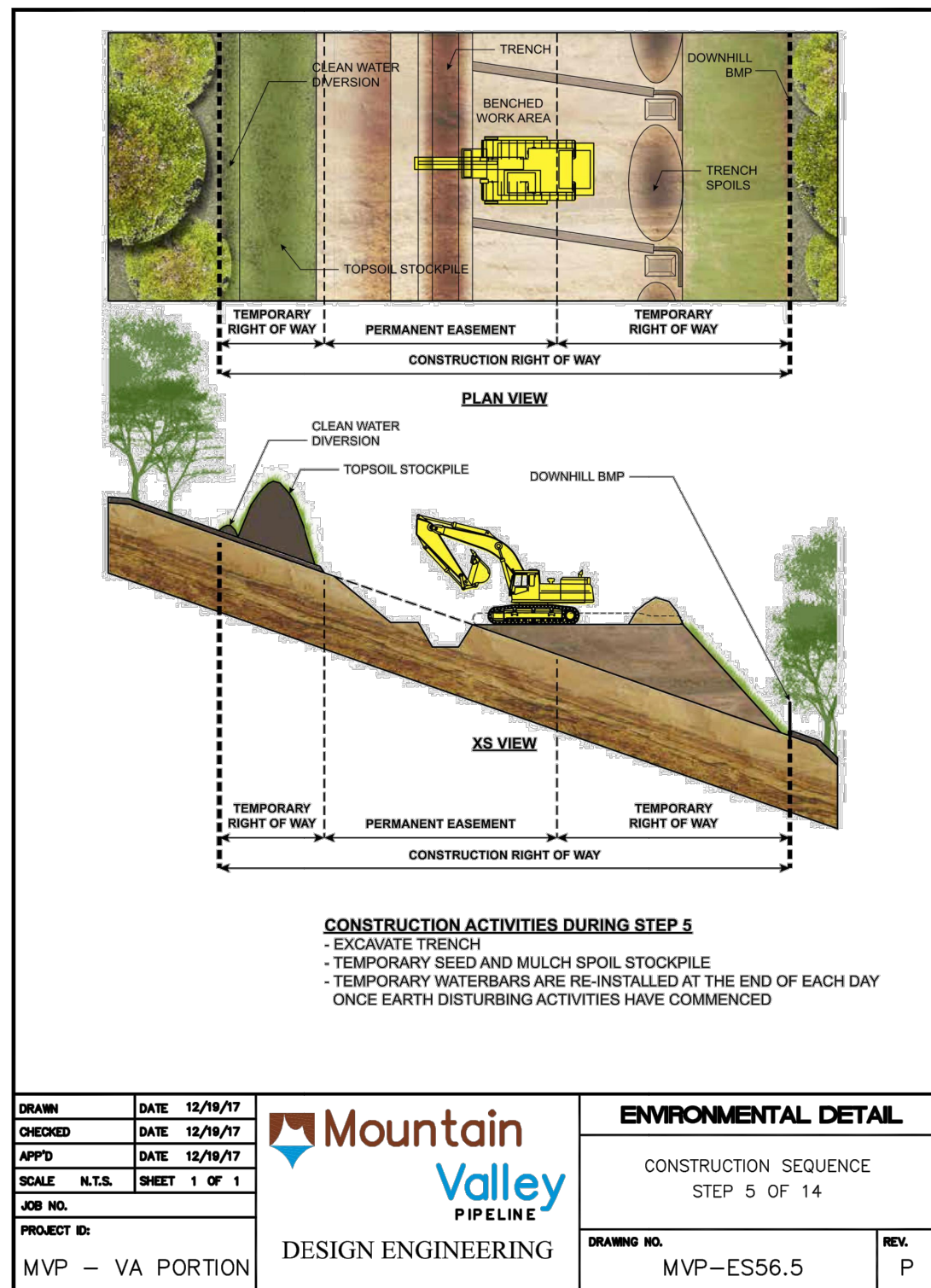
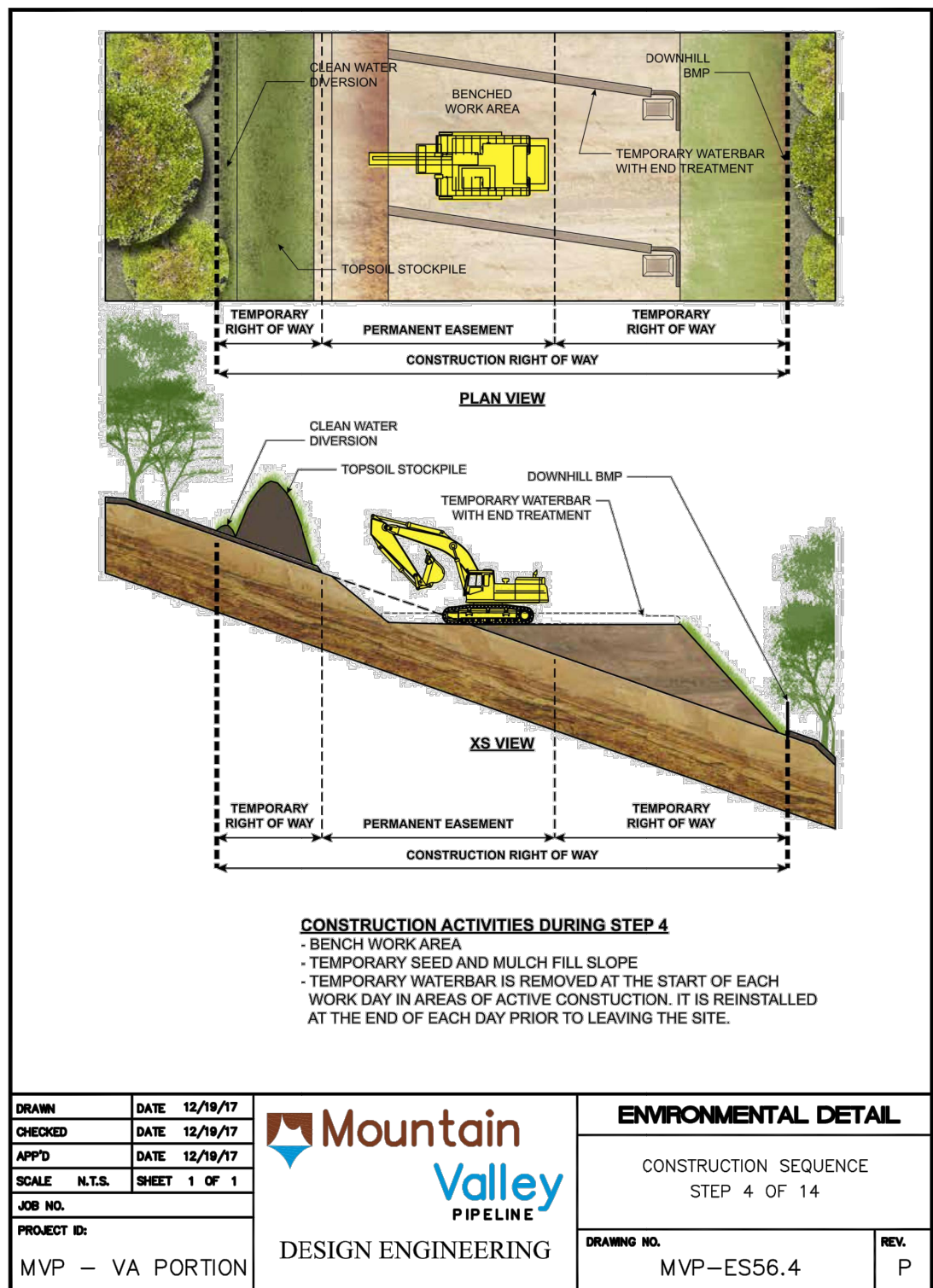
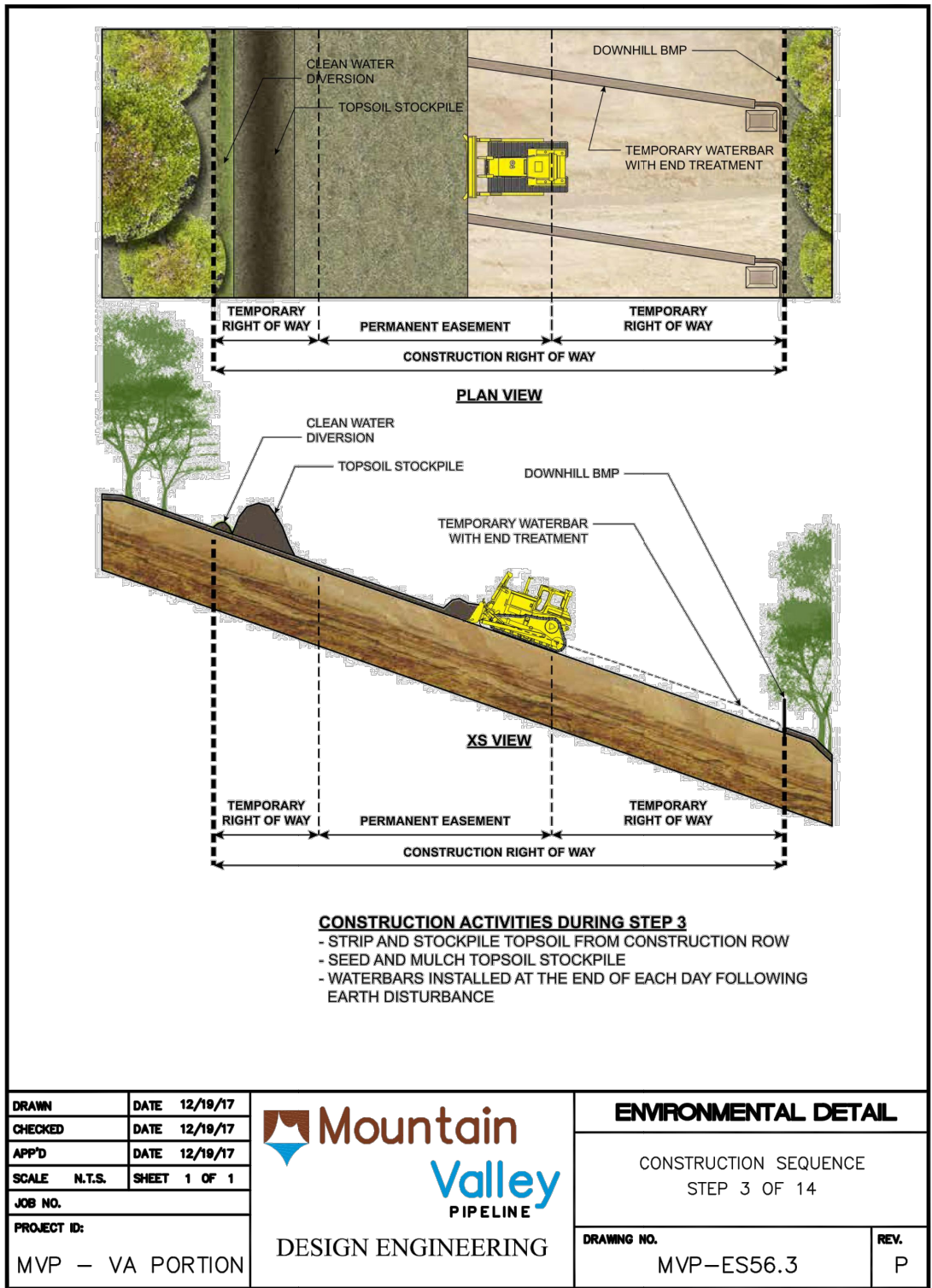
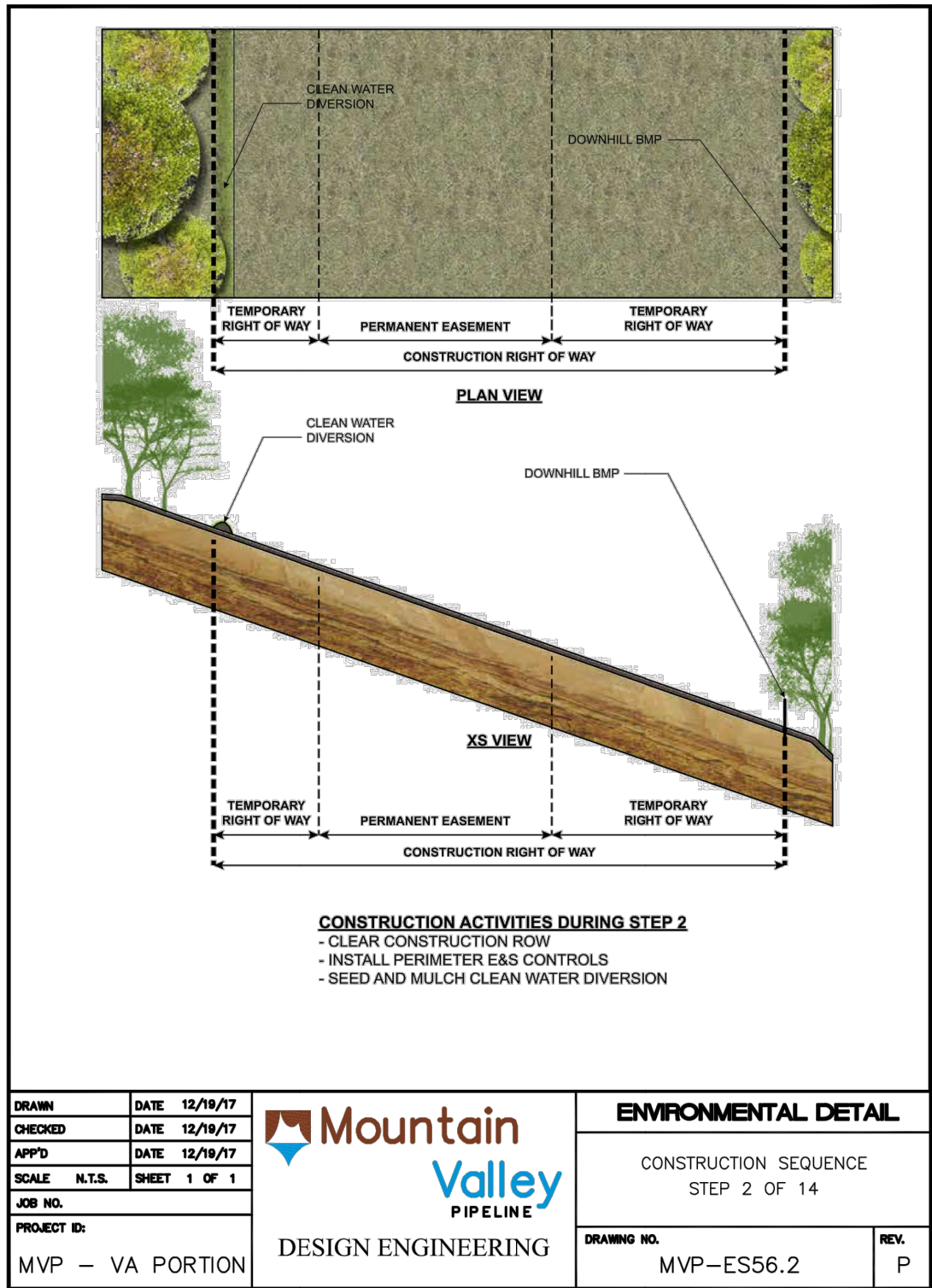
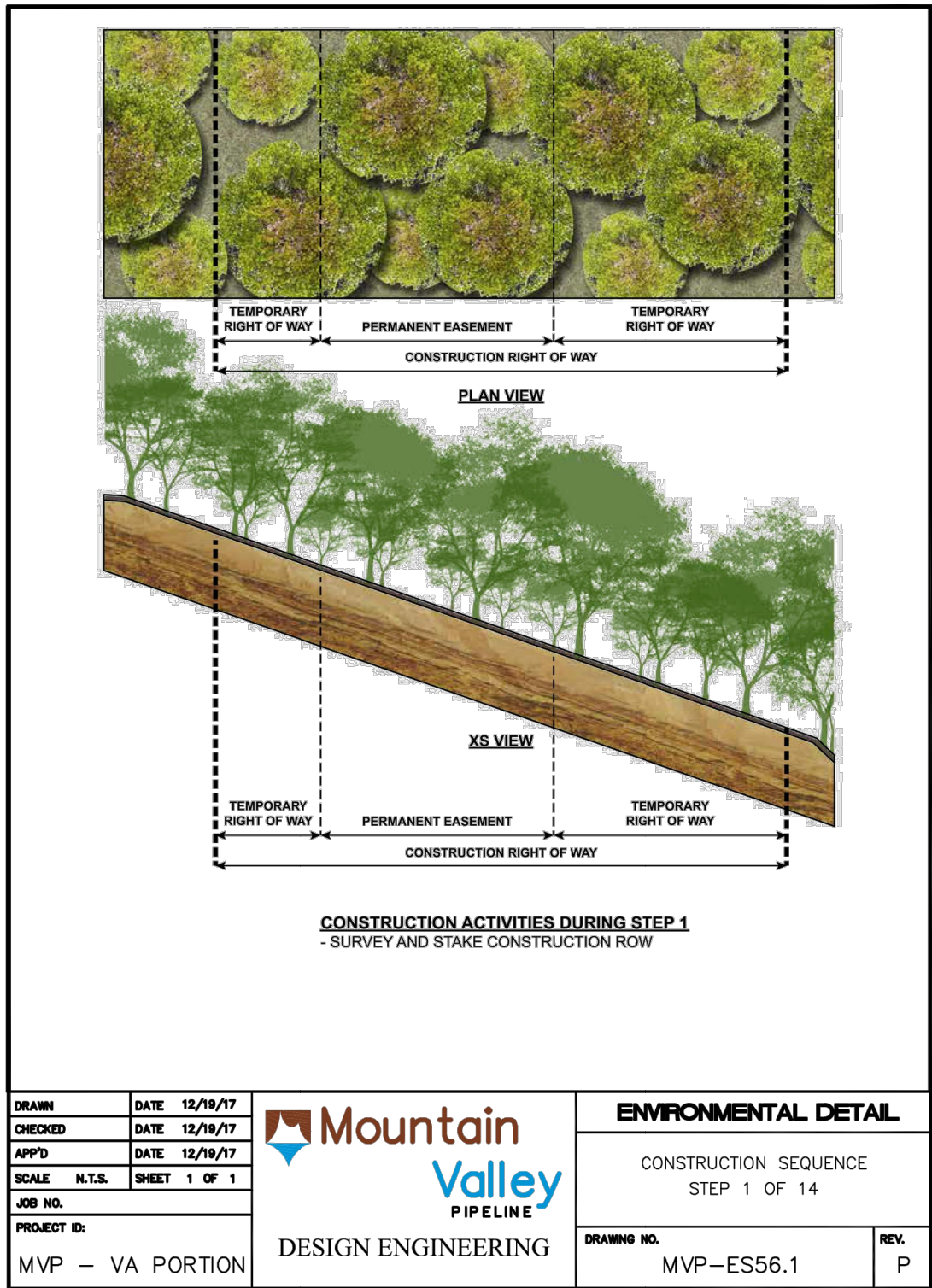
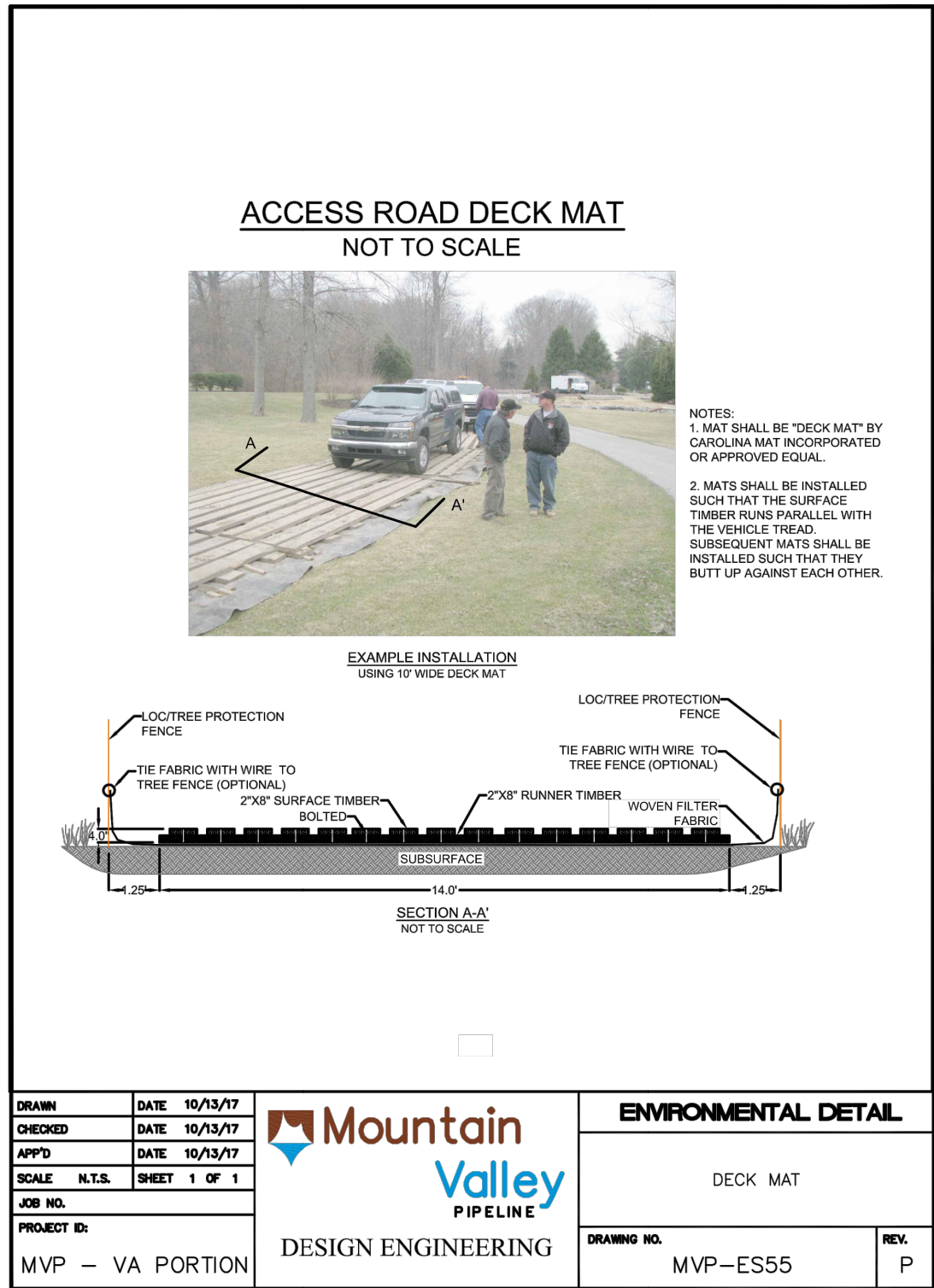
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Mountain Valley Pipeline		EROSION AND SEDIMENT CONTROL PLANS		MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE		MOUNTAIN VALLEY PIPELINE, LLC	
555 SOUTHPOINTE BOULEVARD, SUITE 200						CANONSBURG, PA 15317	

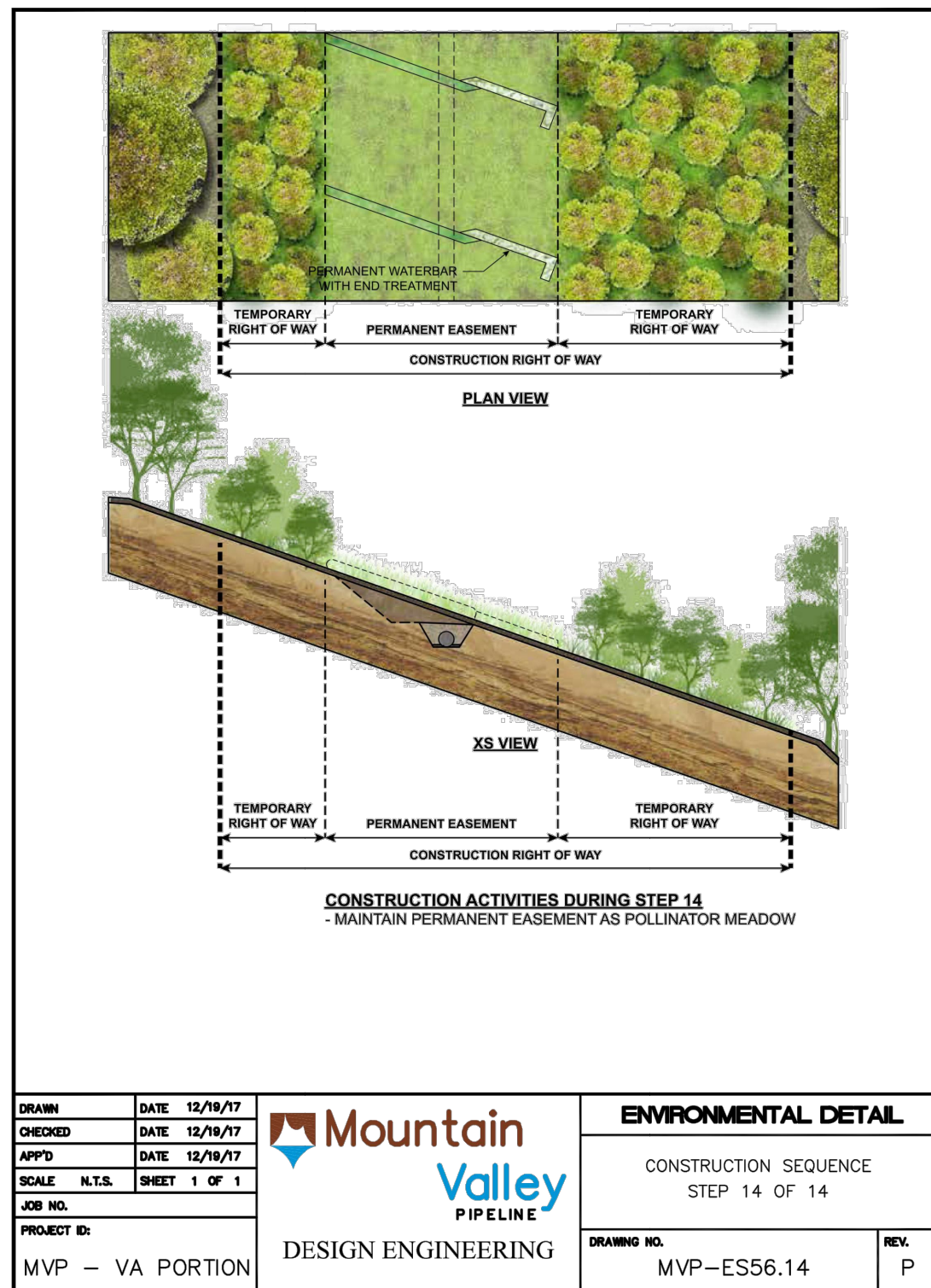
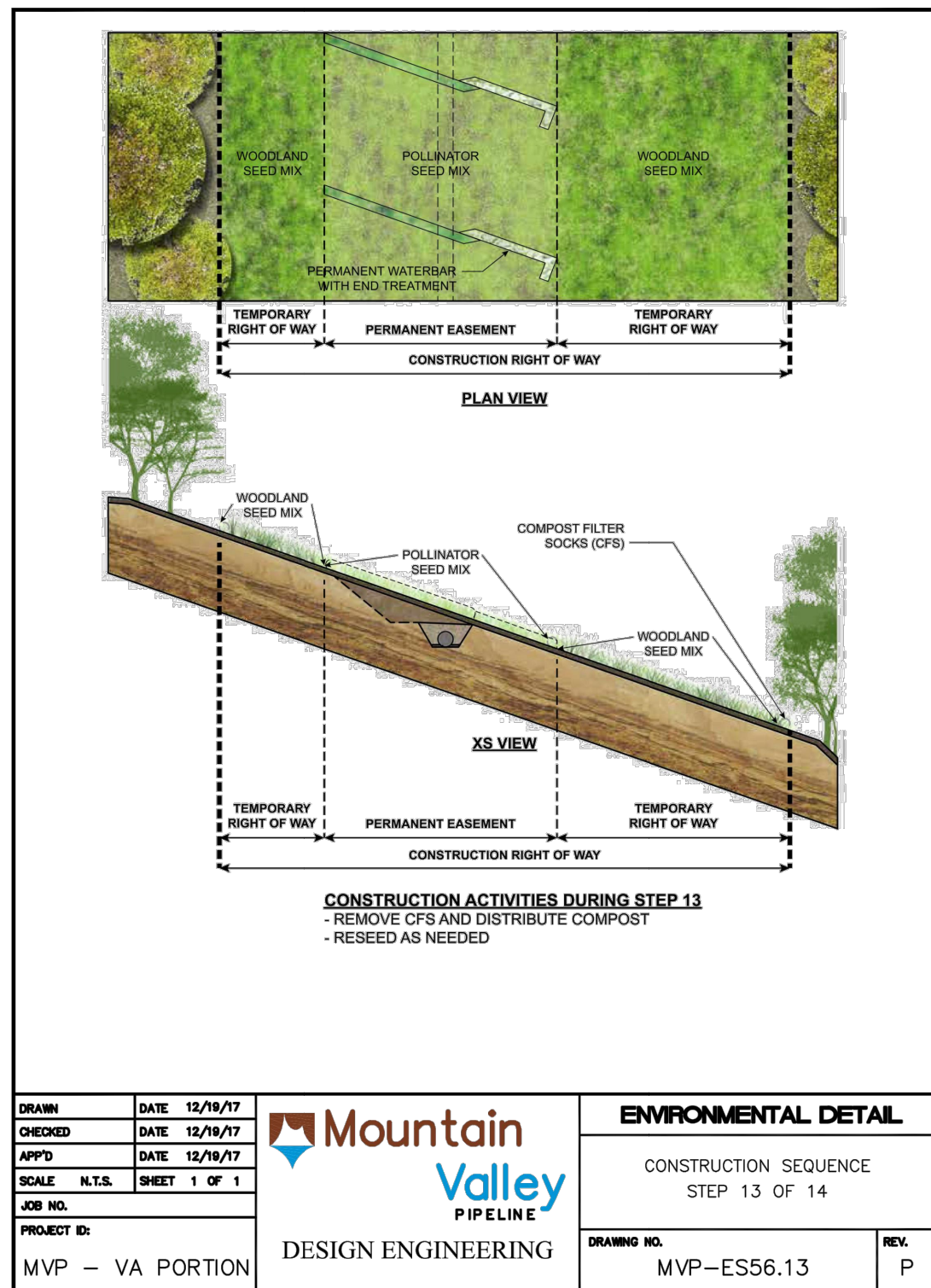
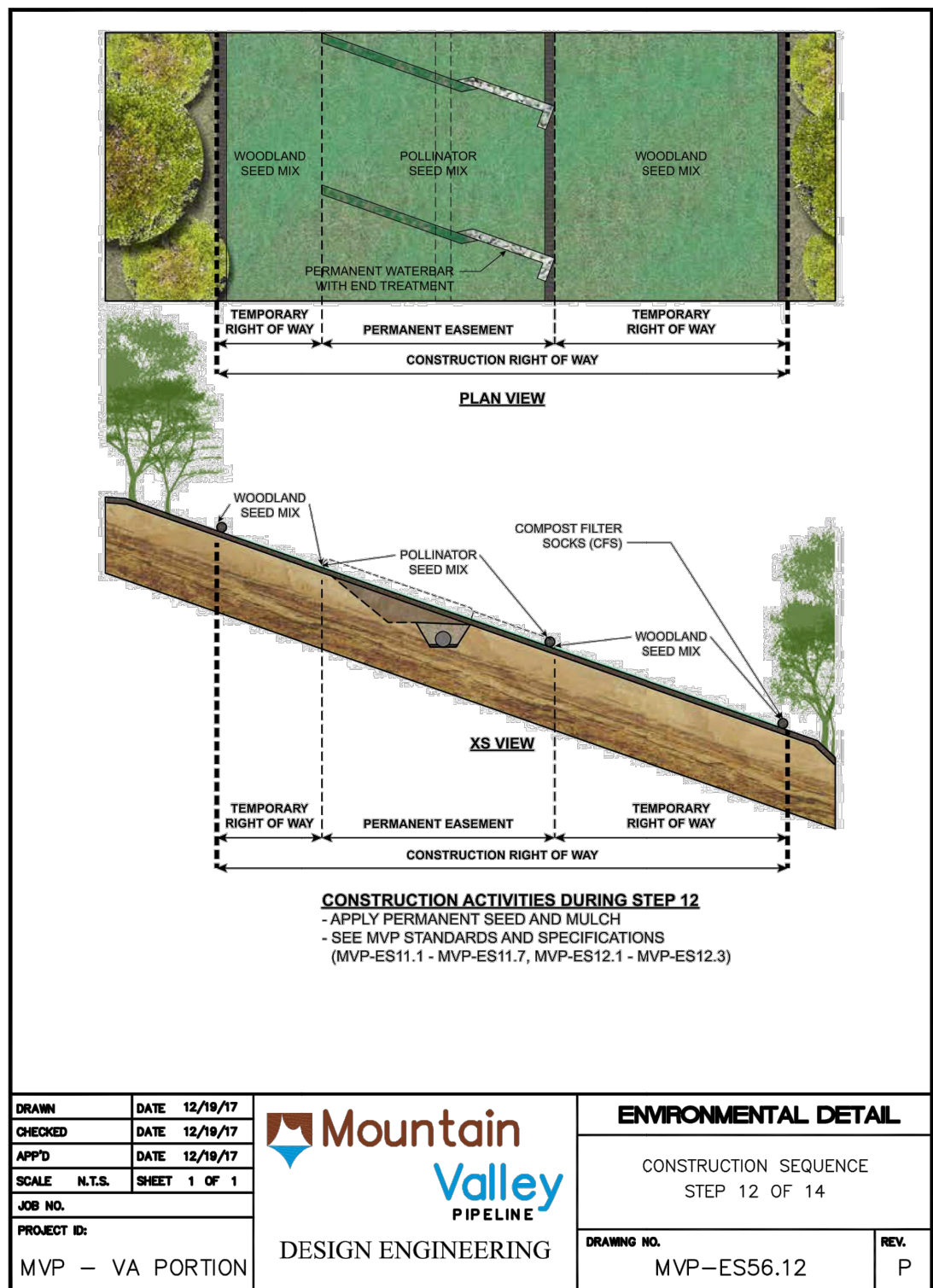
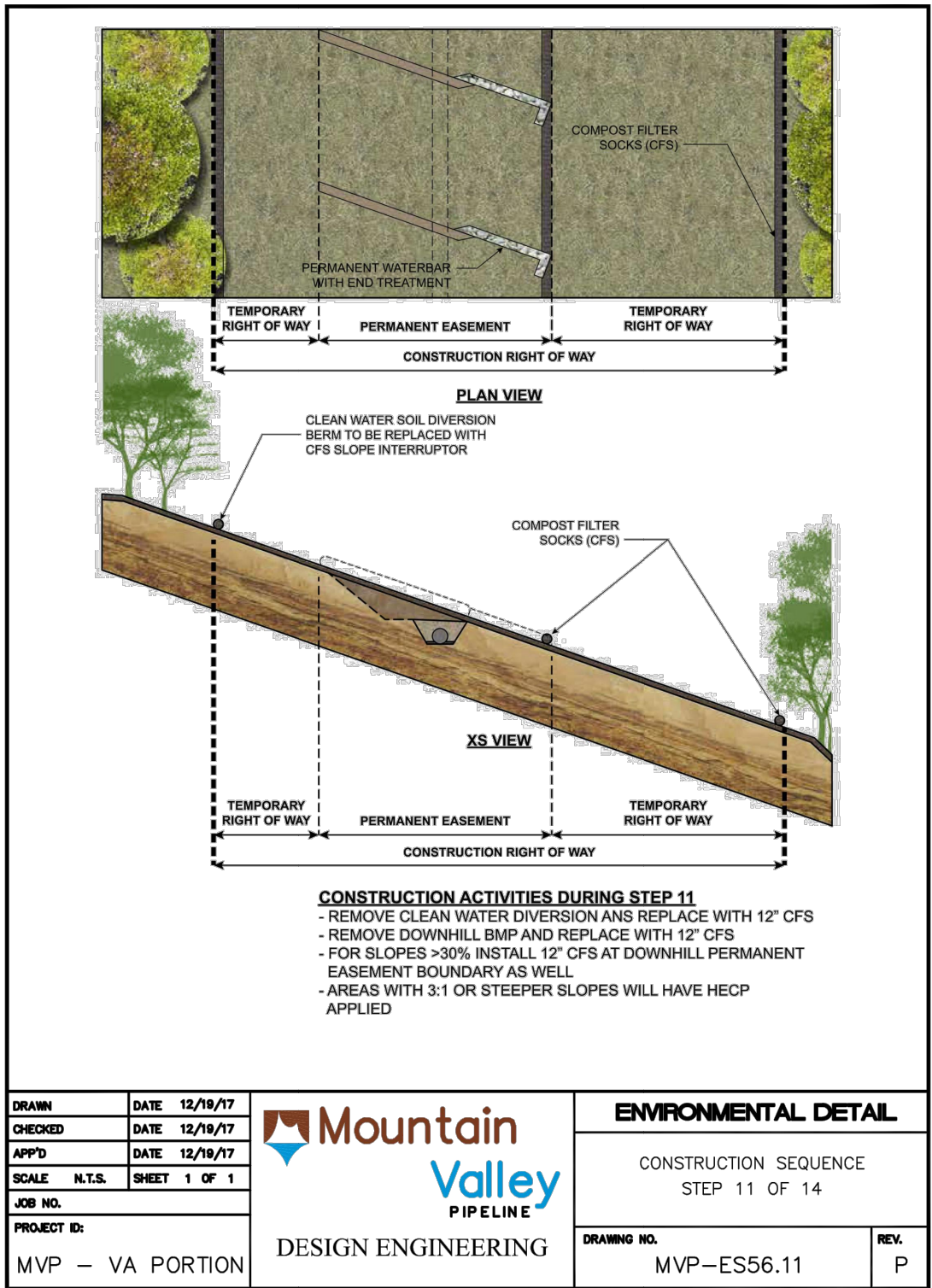
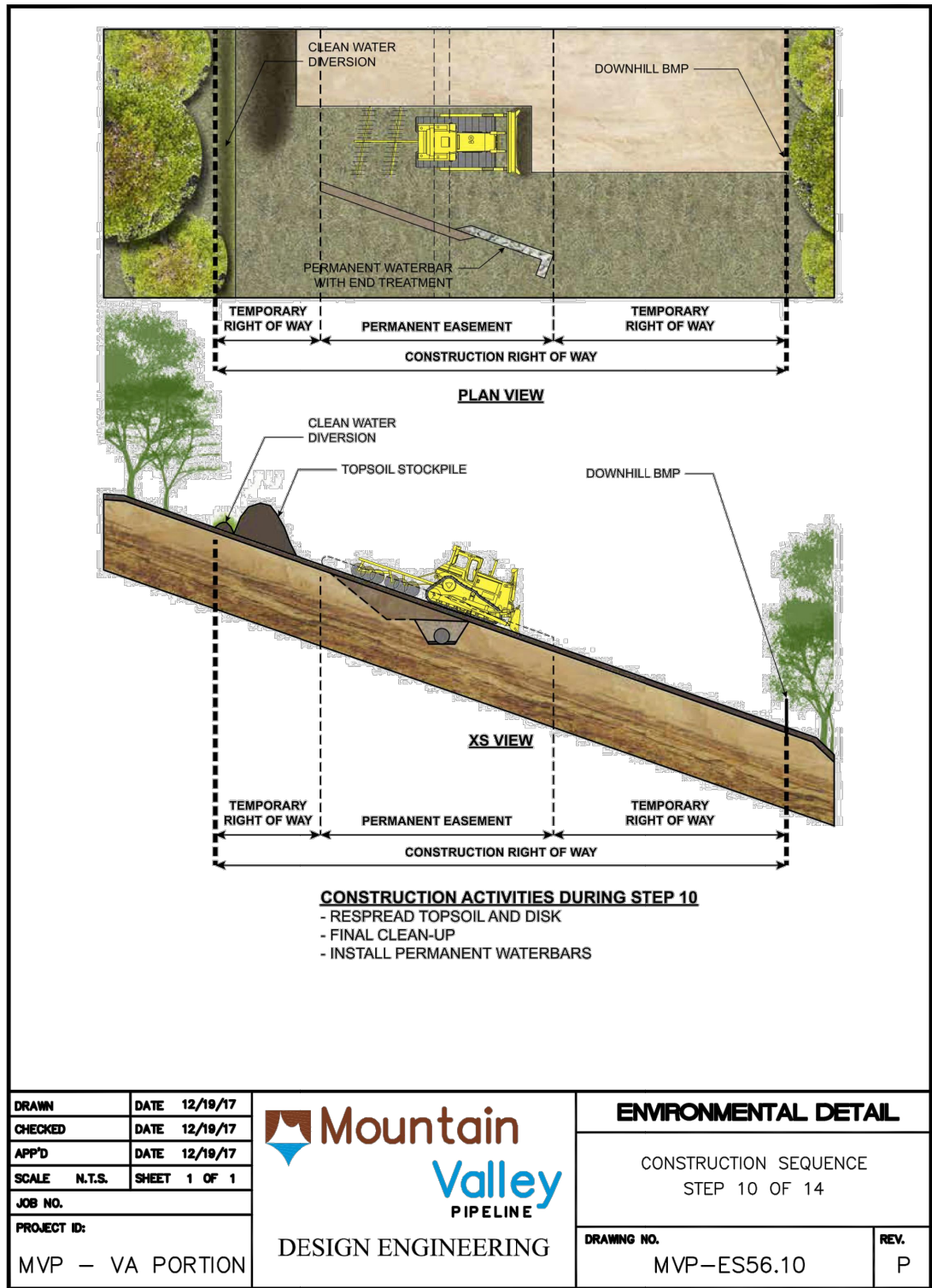
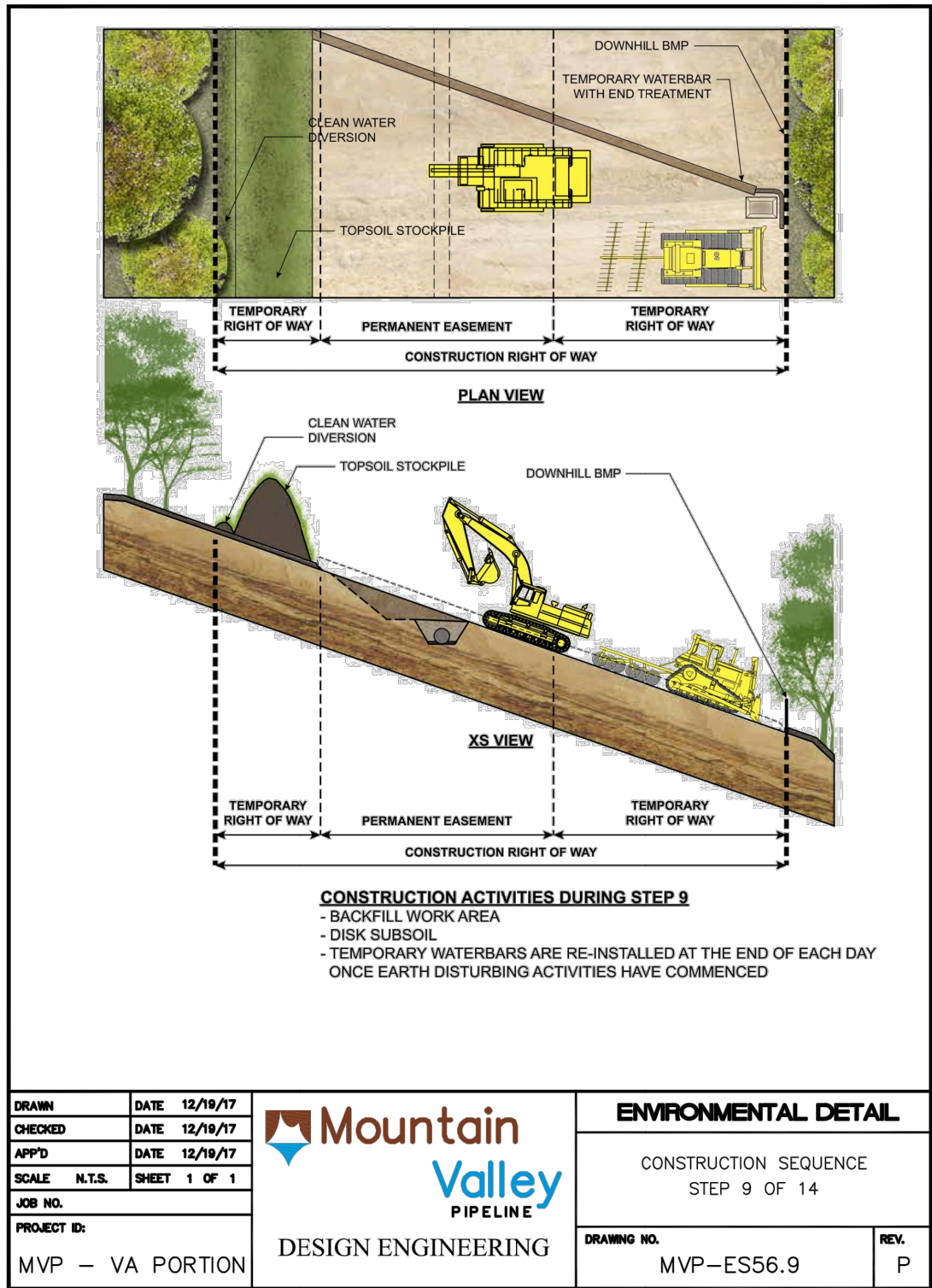
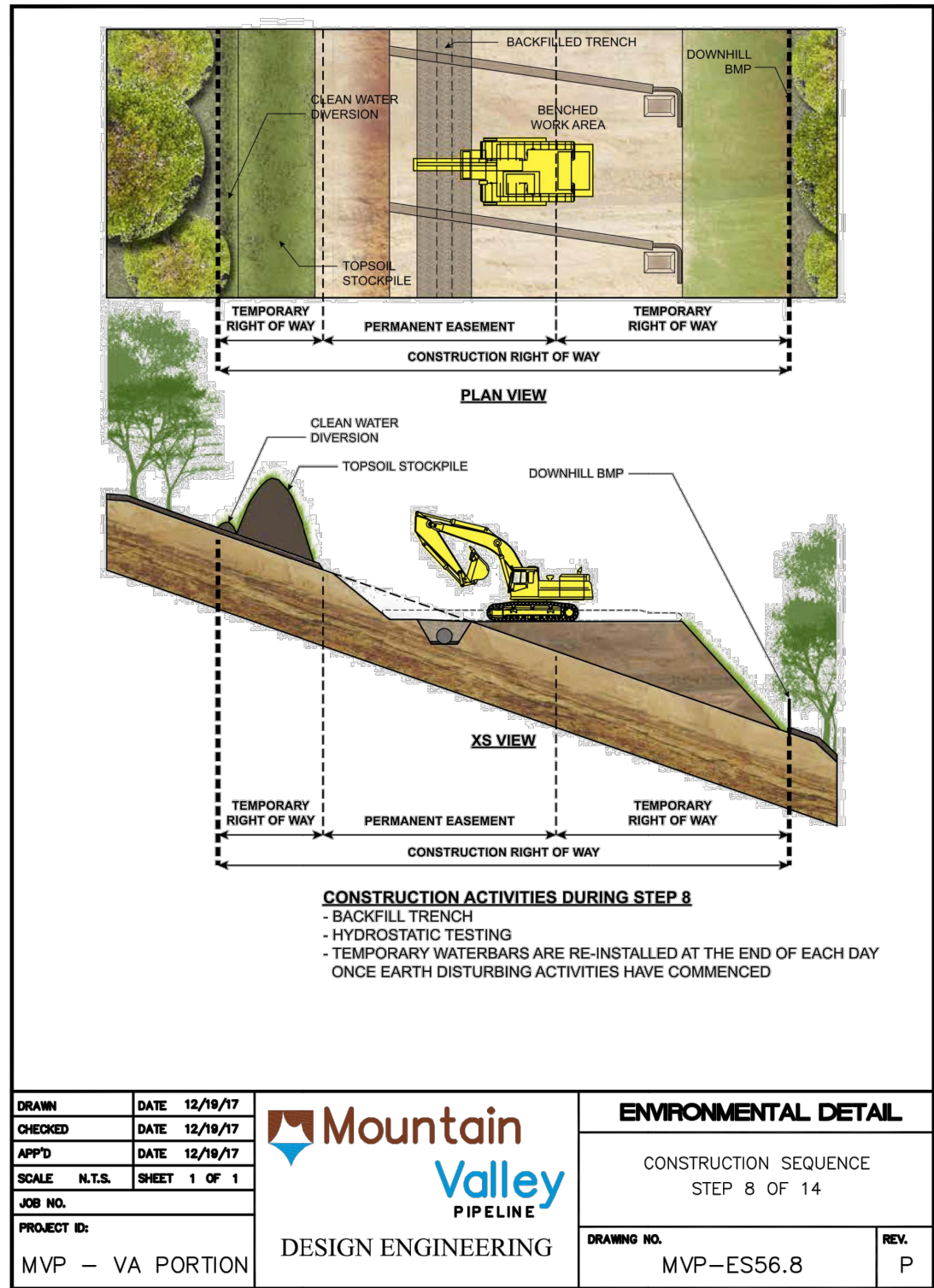
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				FOSTER PLAZA 7	
				PITTSBURGH, PA 15220	

GENERAL DETAILS SET	
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DAVID J. WALLNER Lic. No. 0402057593 Professional Engineer	
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CHECKED BY:		HT
APPROVED BY:		RE
DATE:		11/28/2017
SCALE:		AS SHOWN
SHT. NO.		0.15 OF 0.23





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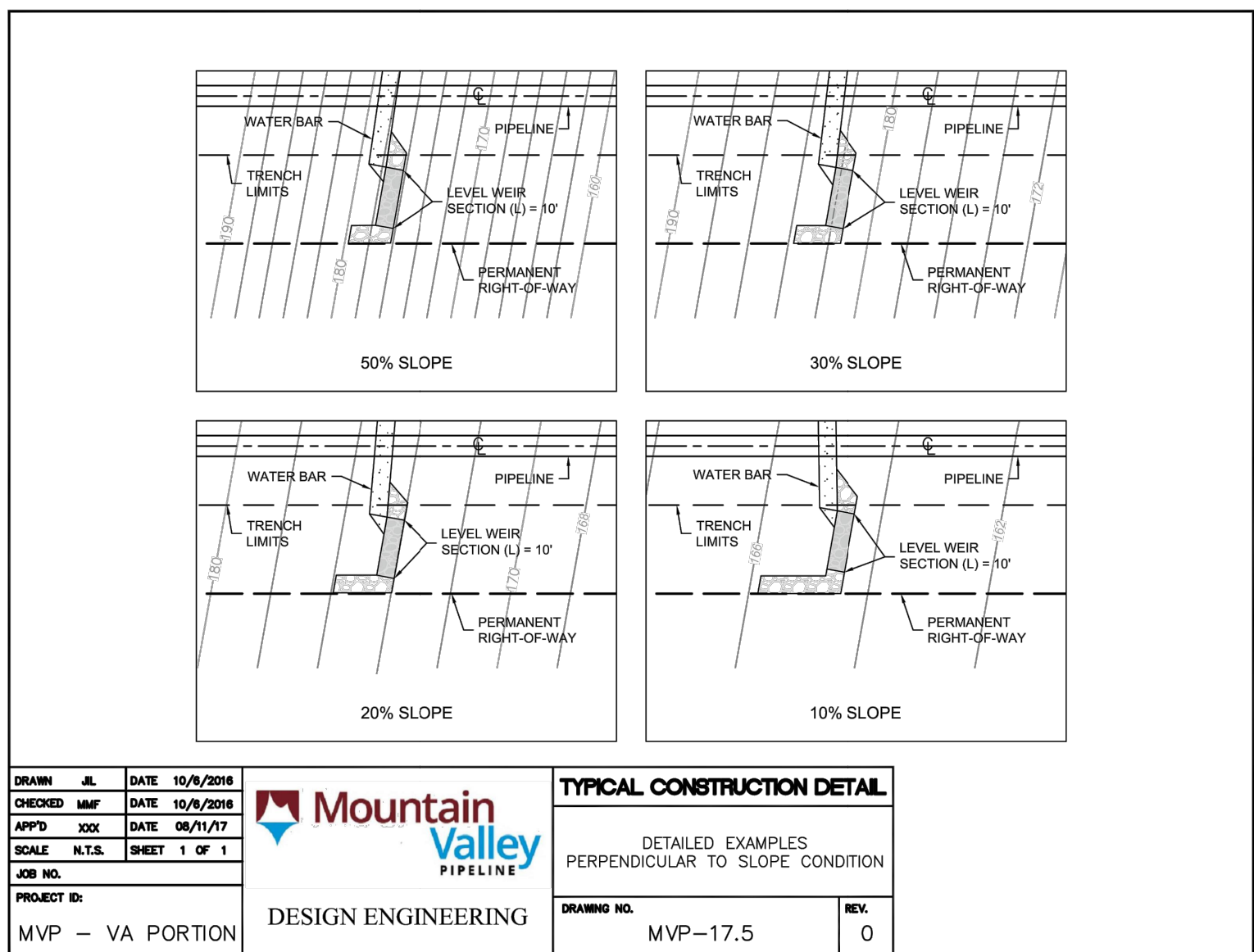
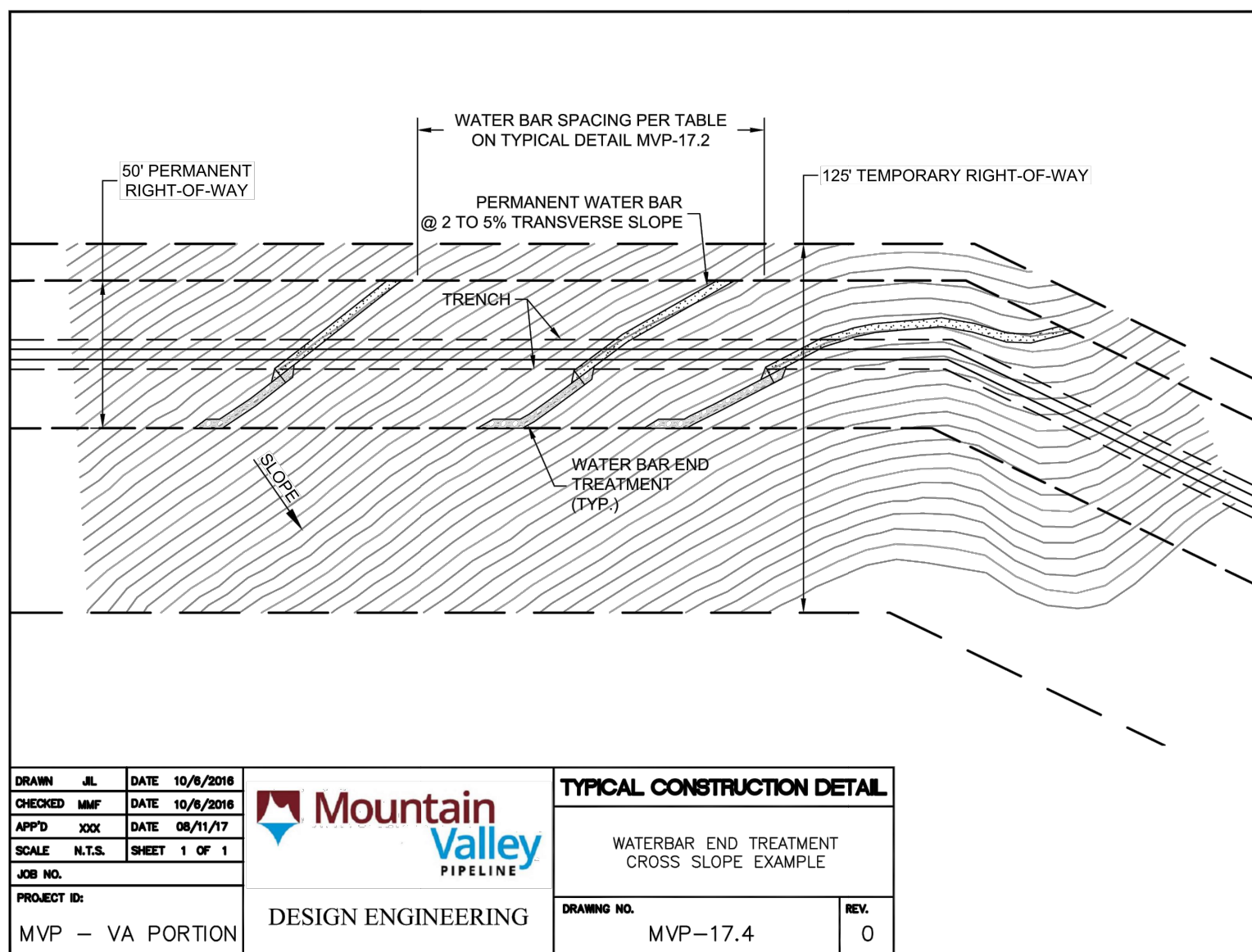
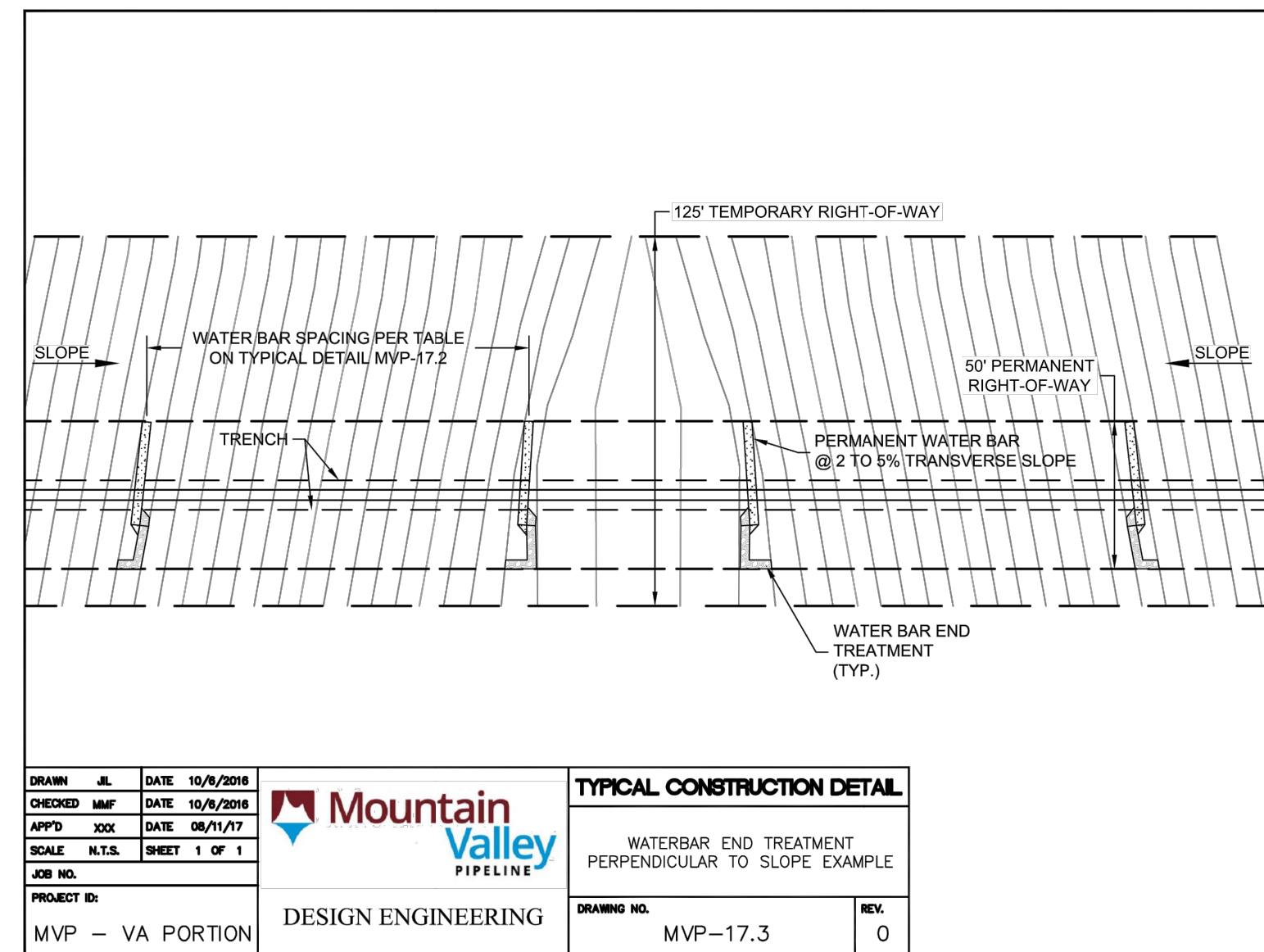
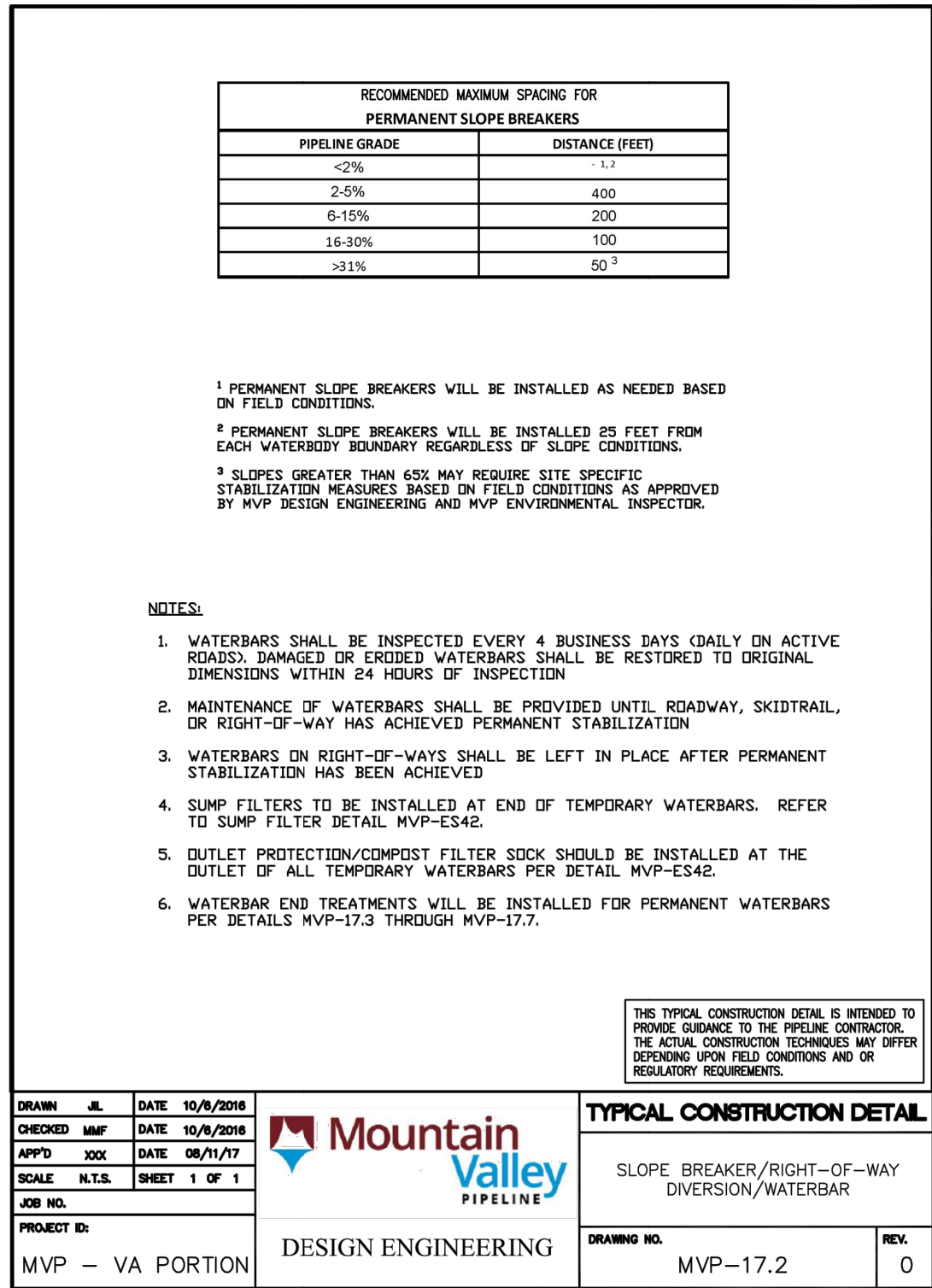
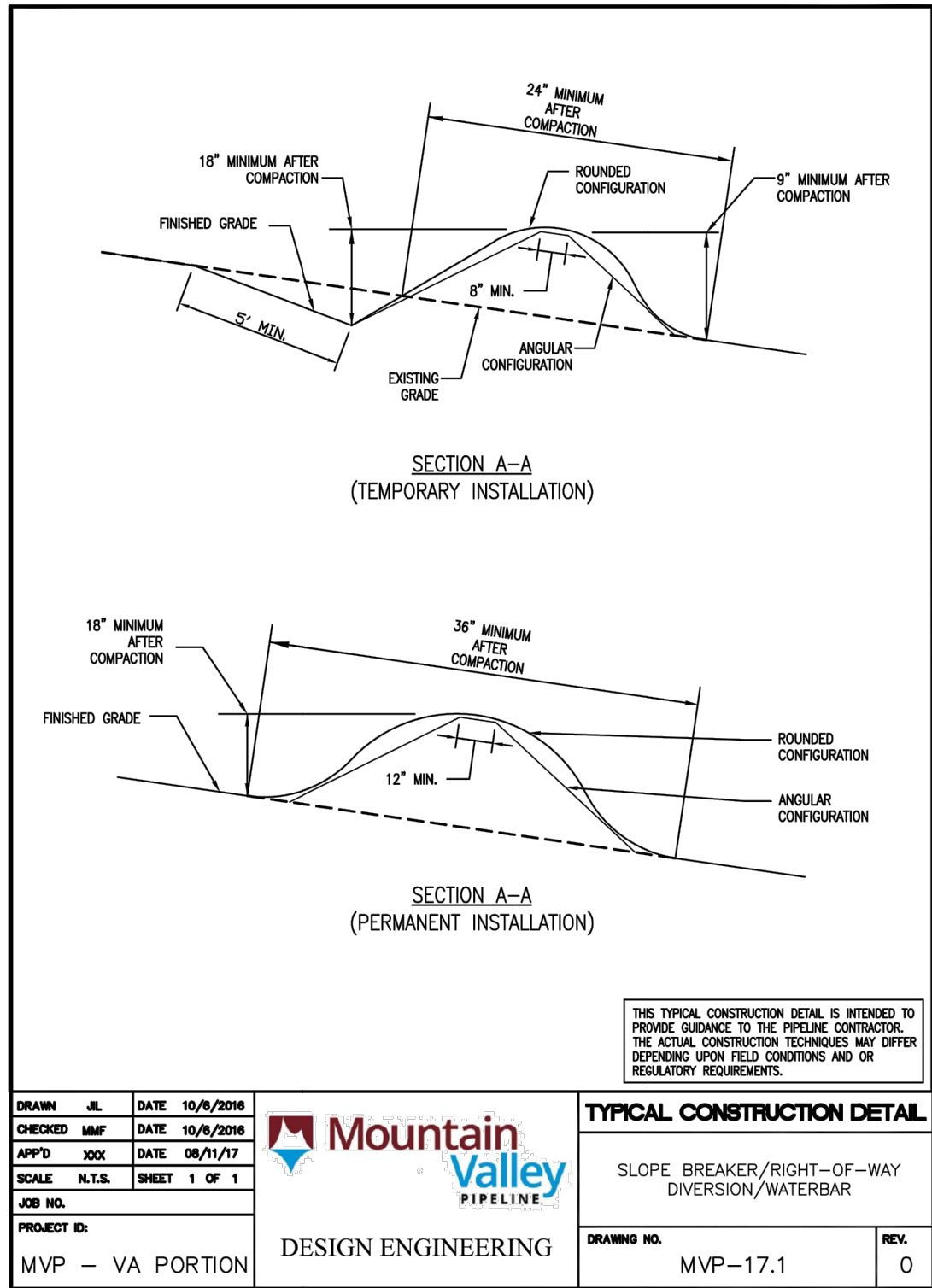
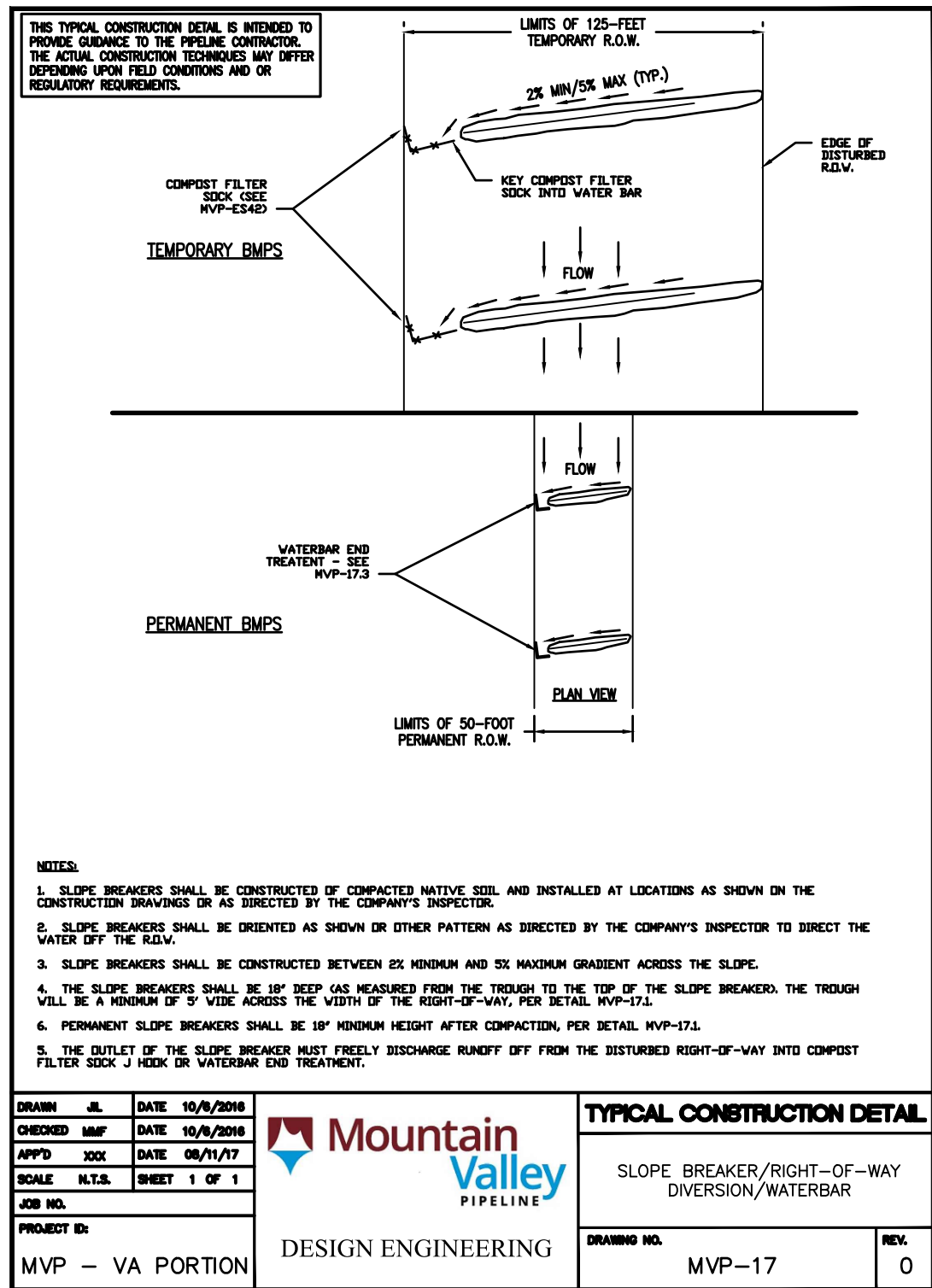
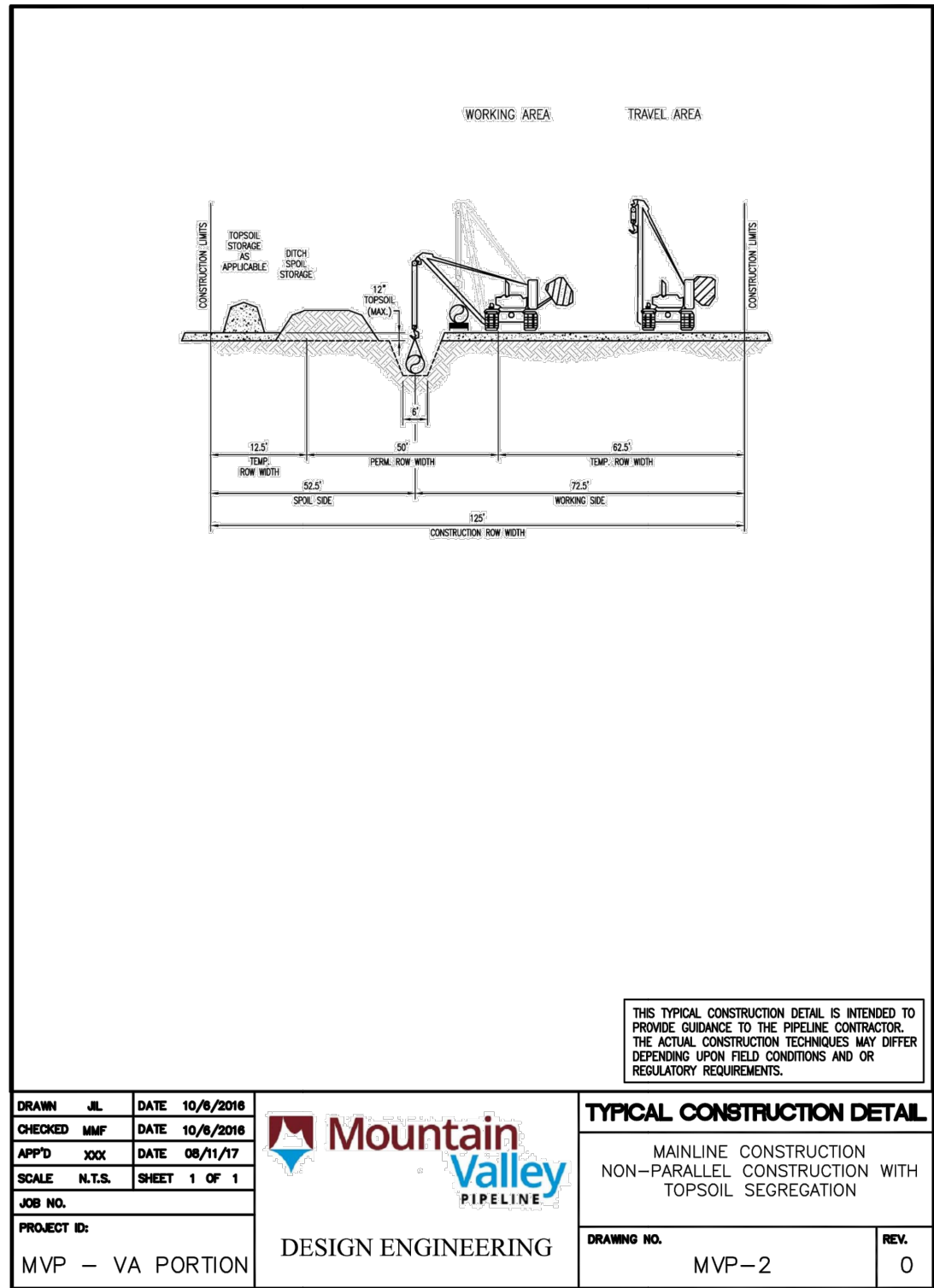
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MOUNTAIN VALLEY PIPELINE, LLC		555 SOUTHPOINTE BOULEVARD, SUITE 200	
CANONSBURG, PA 15317			

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PITTSBURGH, PA 15220			

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DAVID J. WALLNER Lic. No. 0402057593 Professional Engineer	
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DATE: 11/28/2017	
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Mountain Valley Pipeline  
EROSION AND SEDIMENT CONTROL PLANS  
MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE

MOUNTAIN VALLEY PIPELINE, LLC  
555 SOUTHPOINTE BOULEVARD, SUITE 200  
CANONSBURG, PA 15317

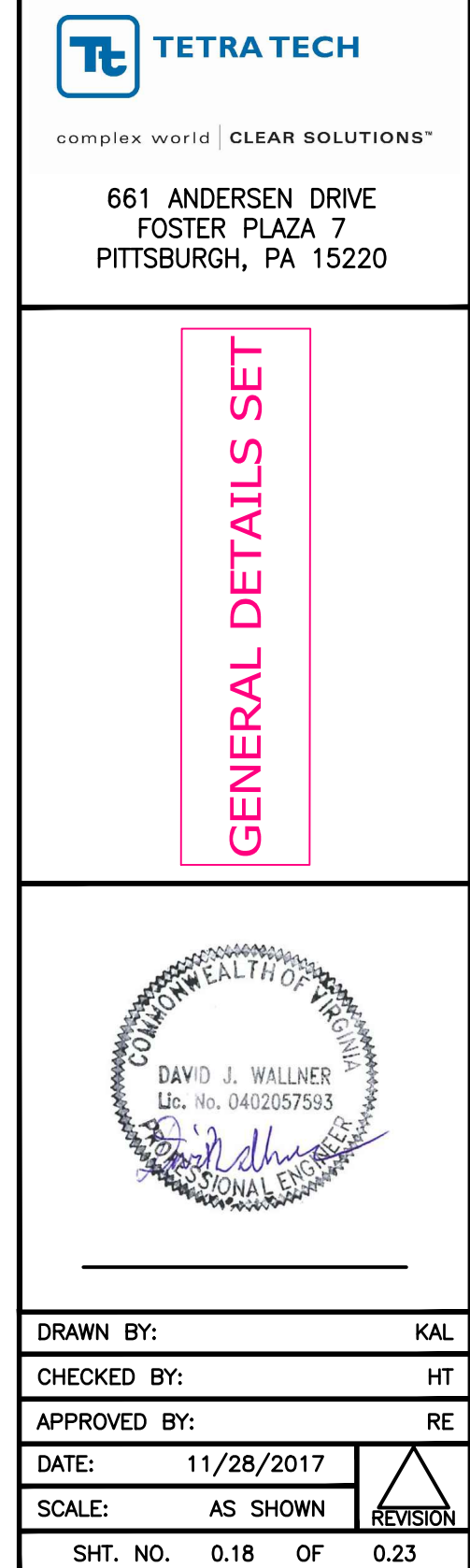
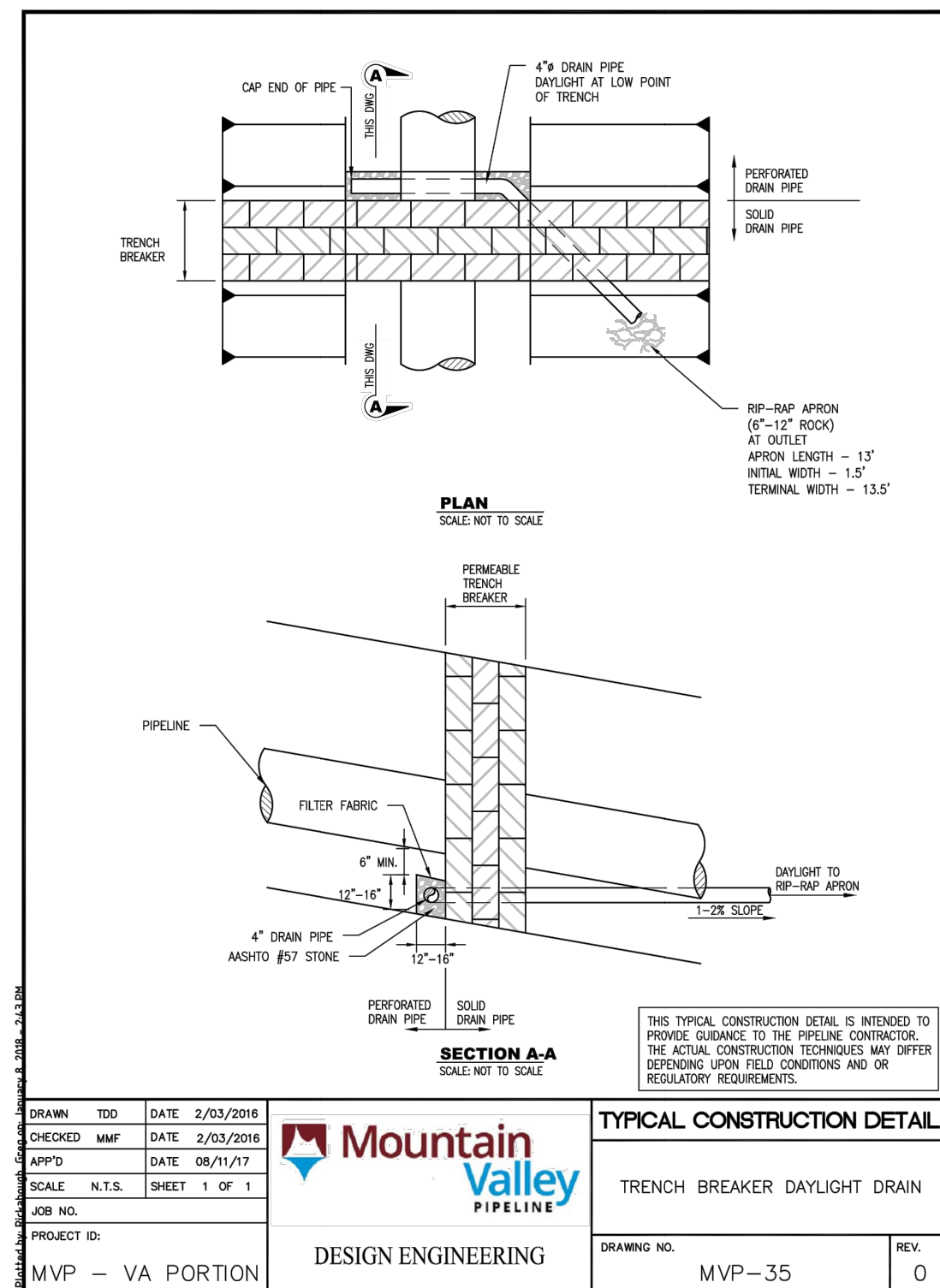
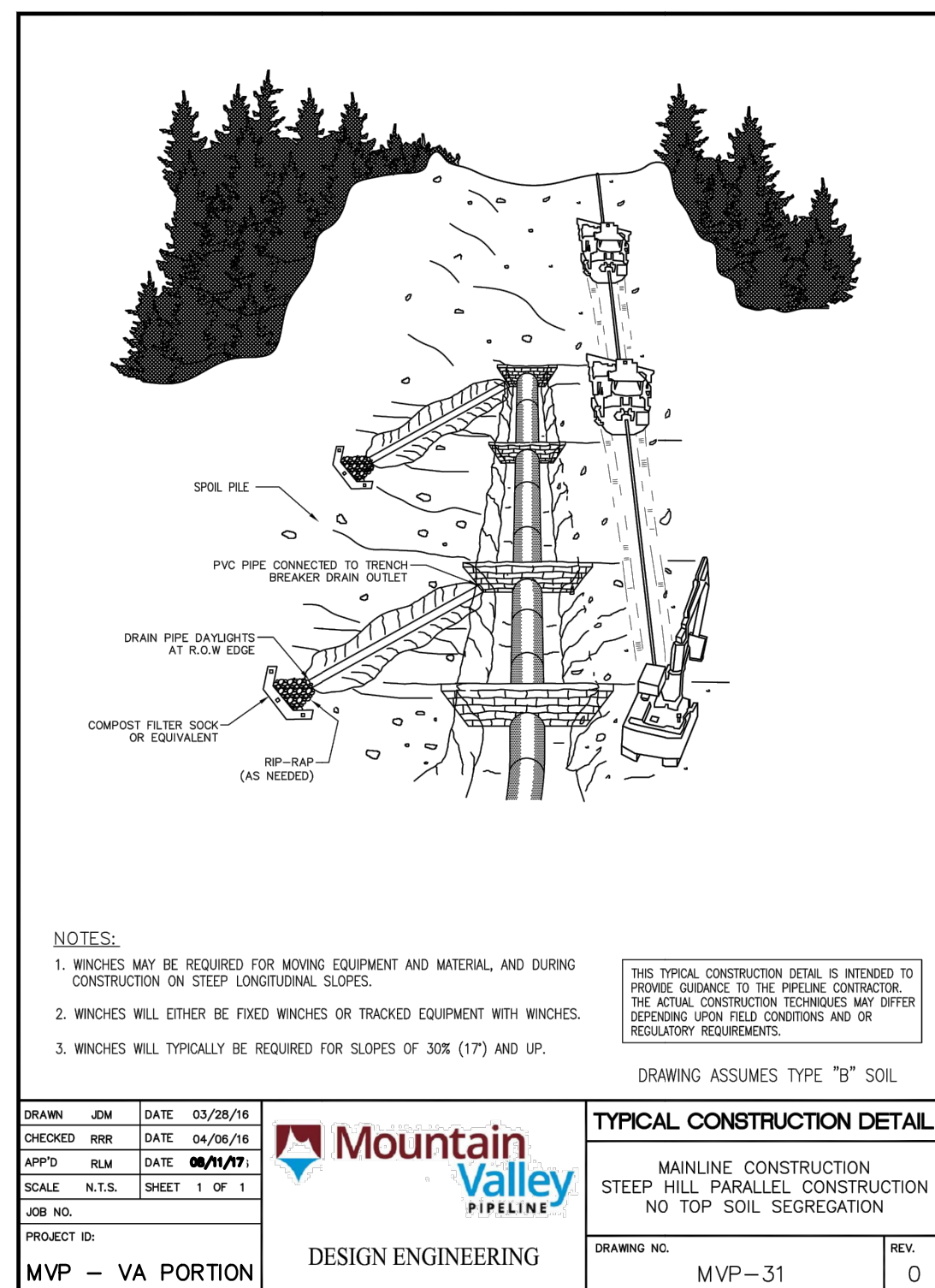
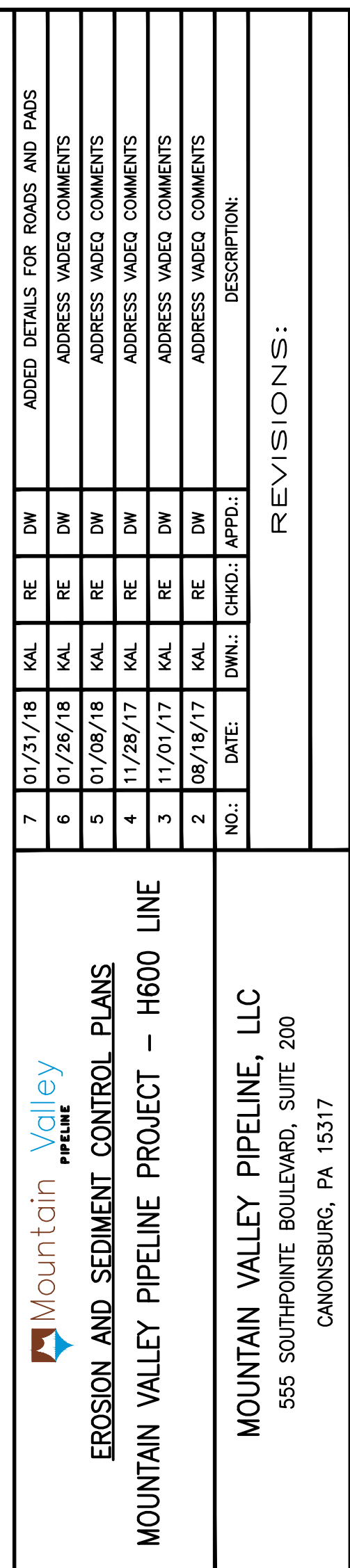
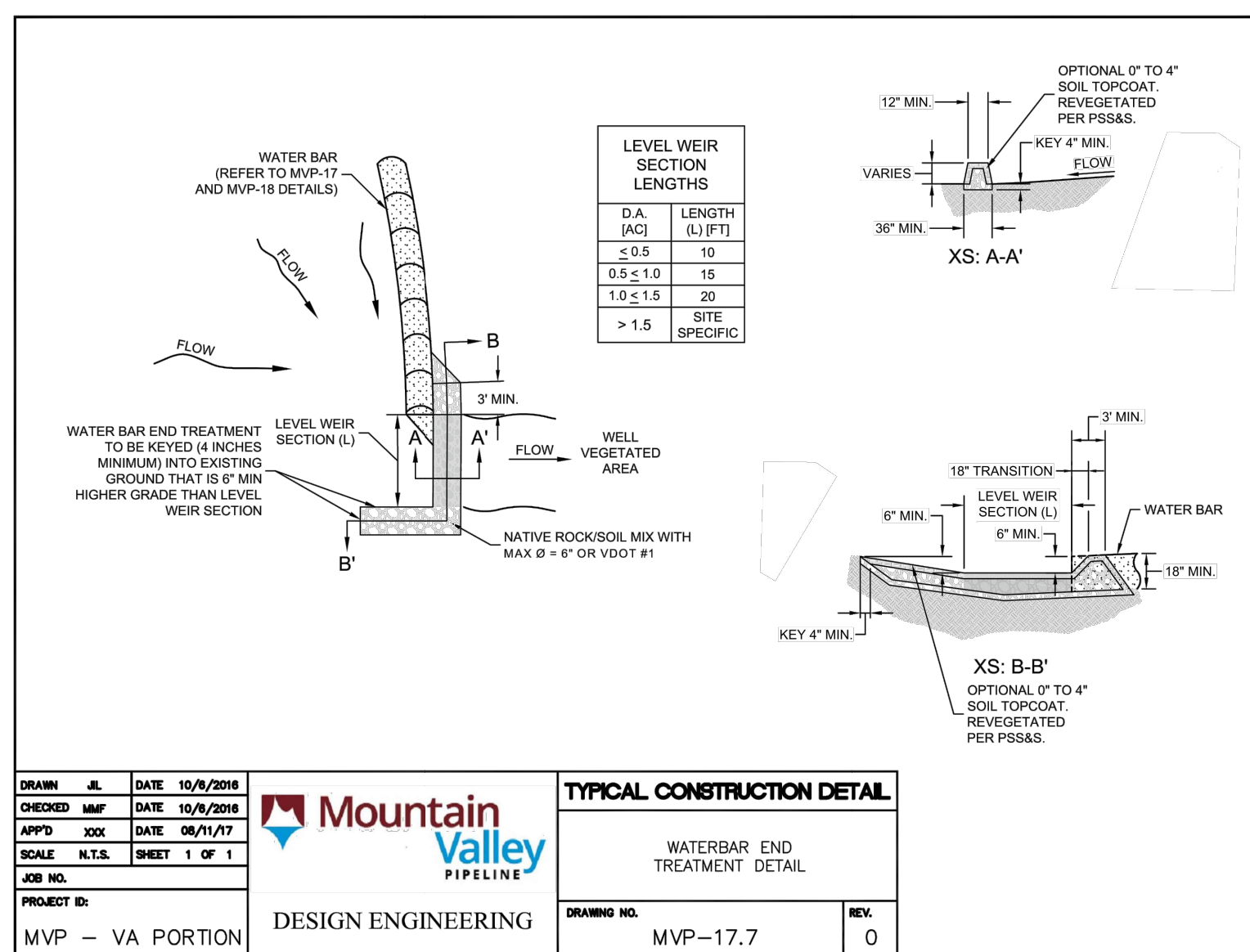
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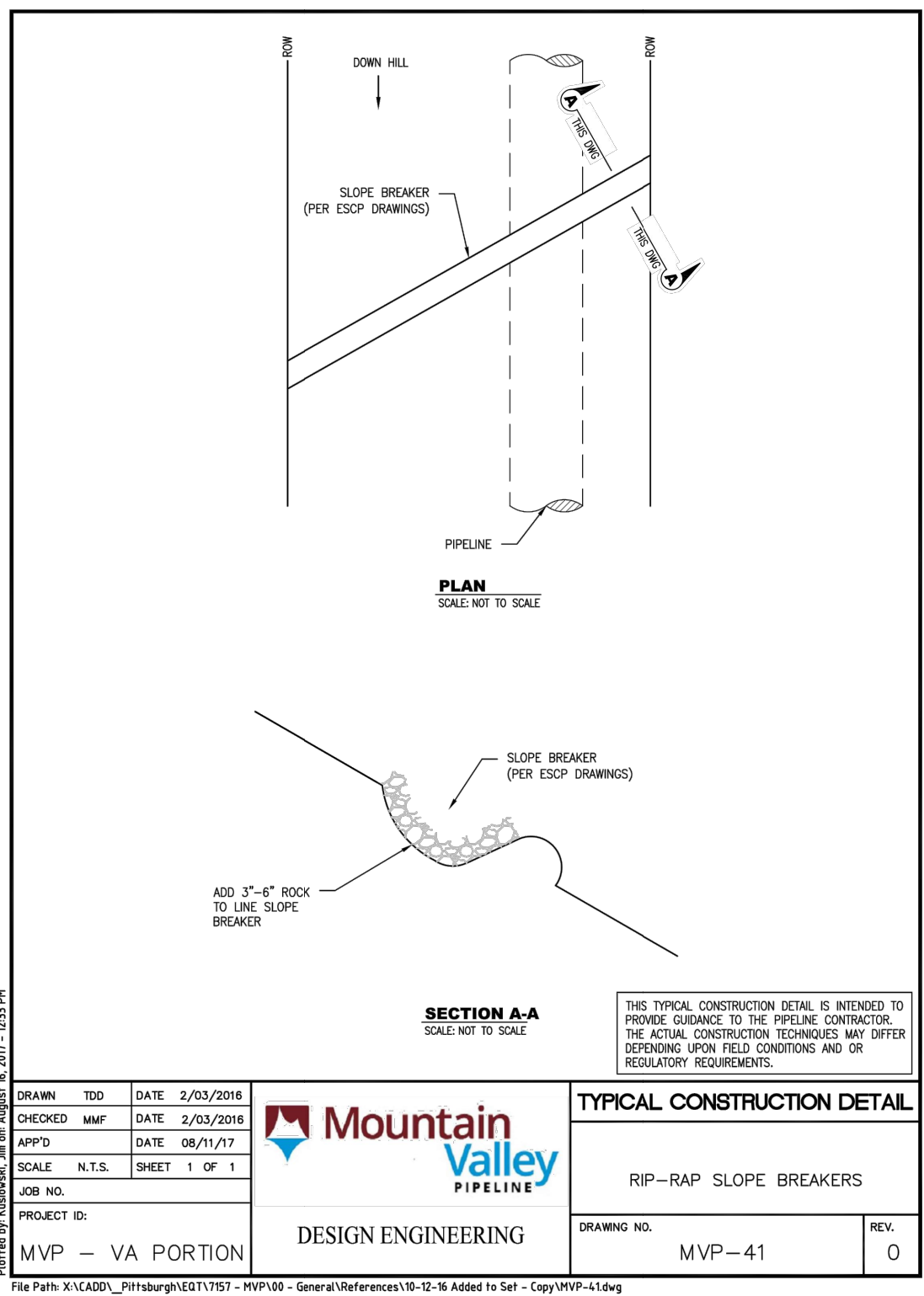
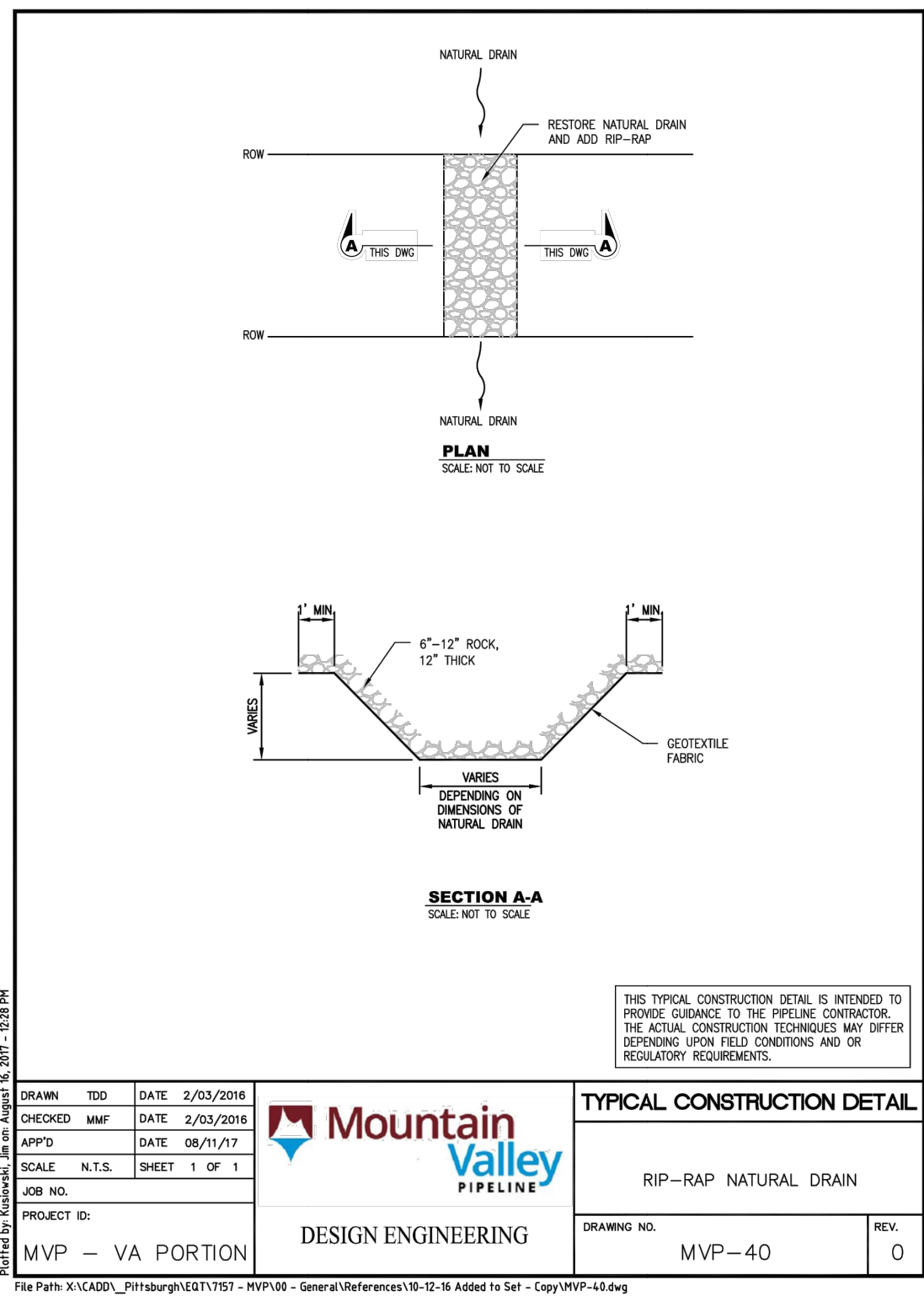
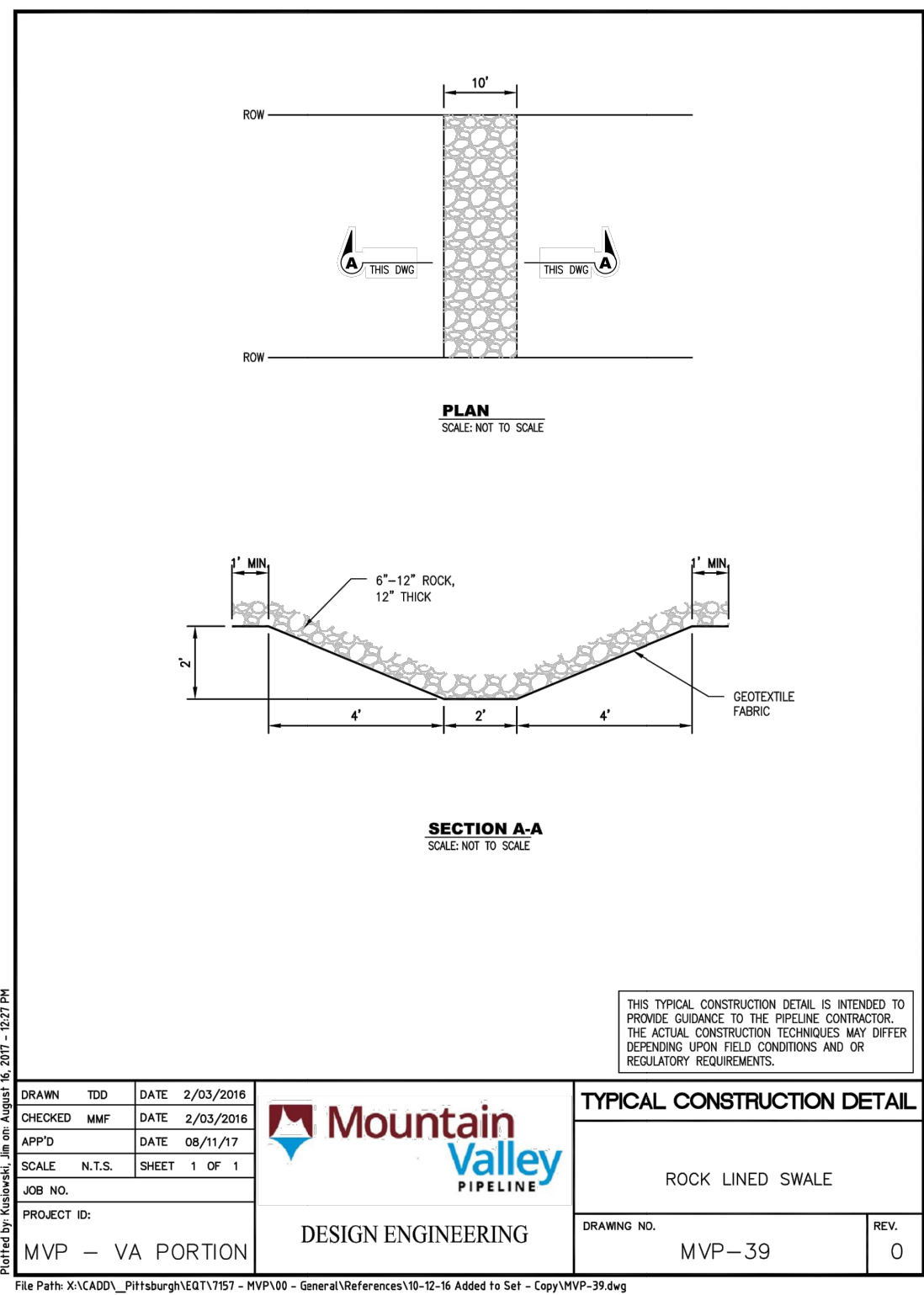
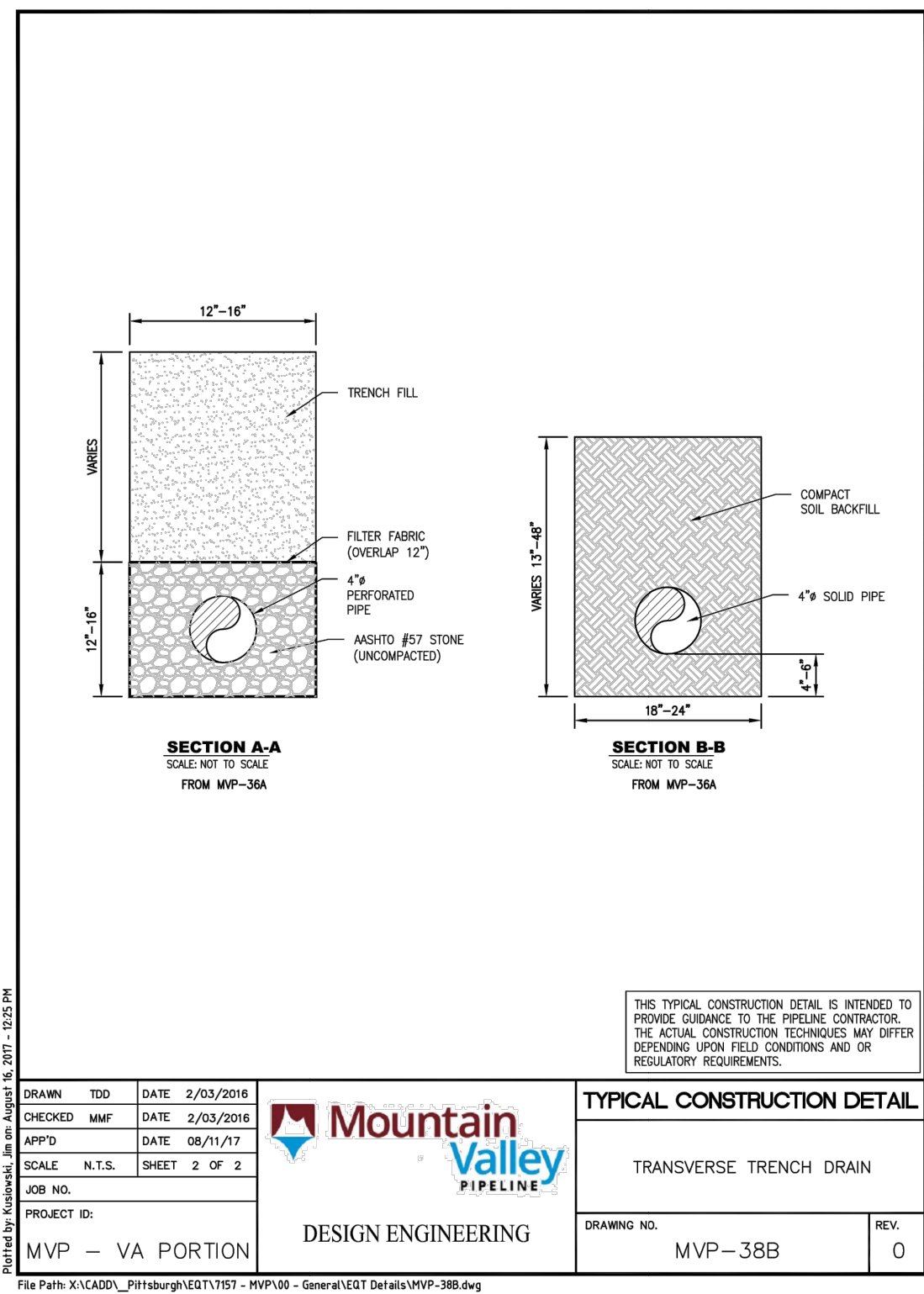
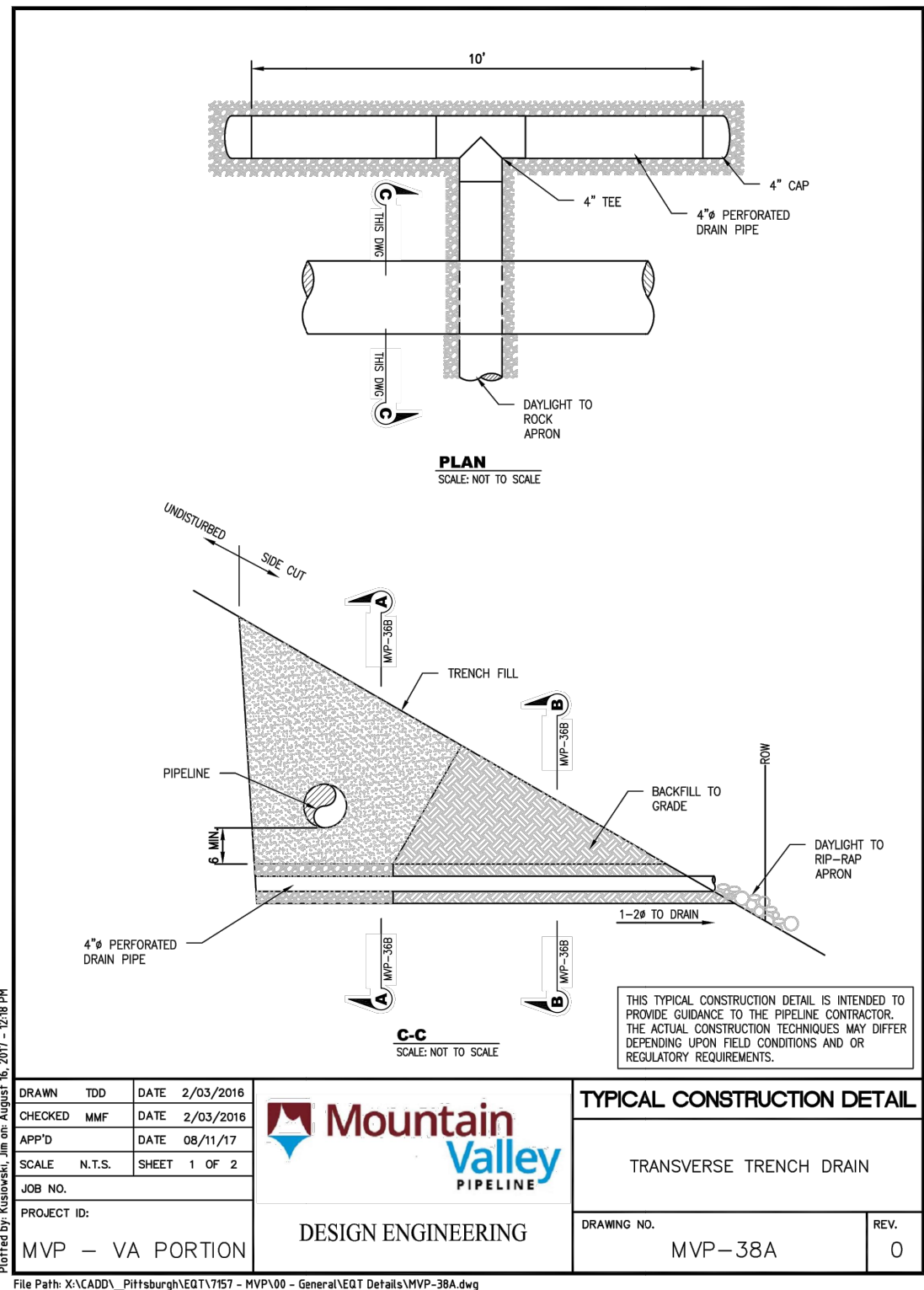
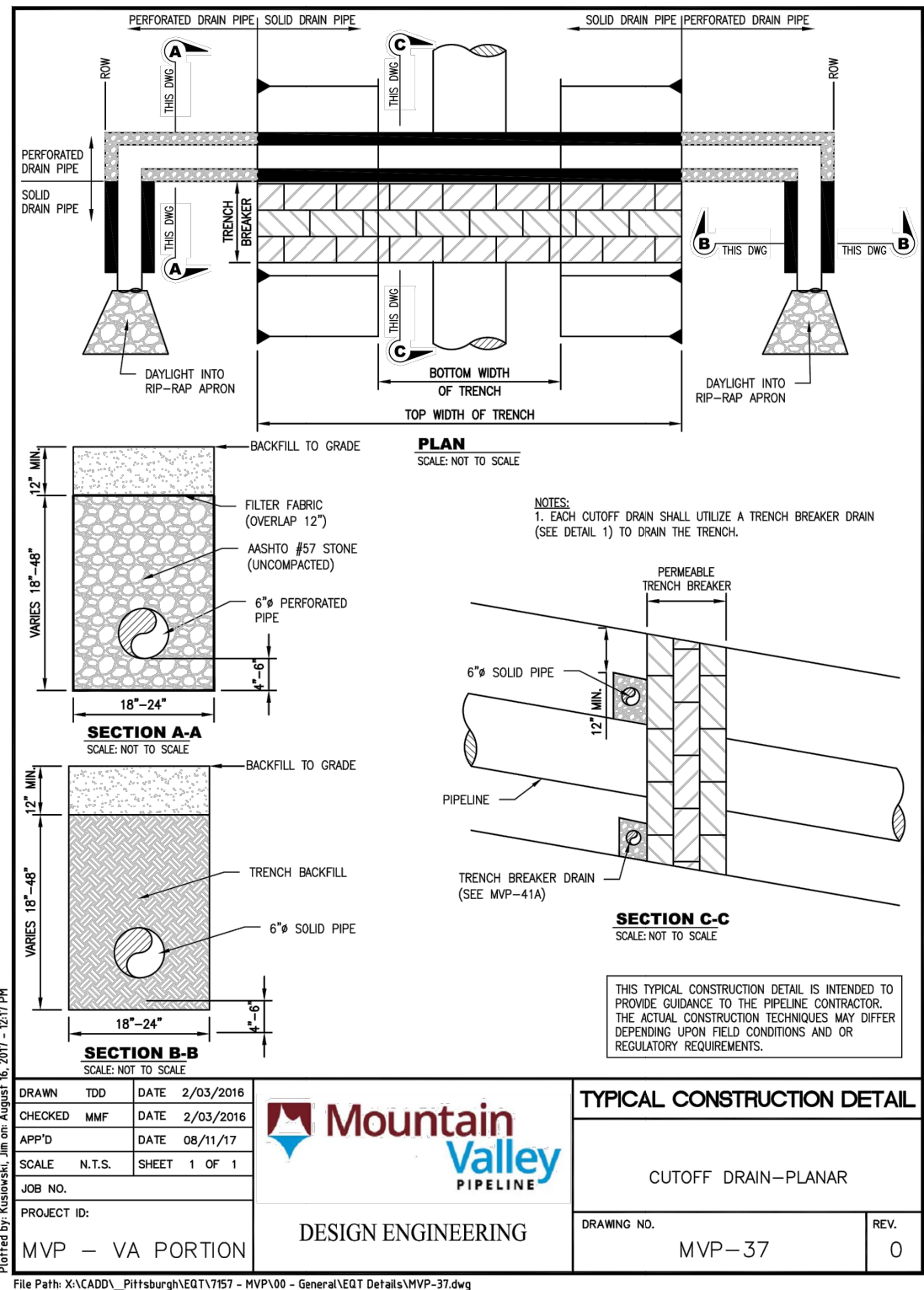
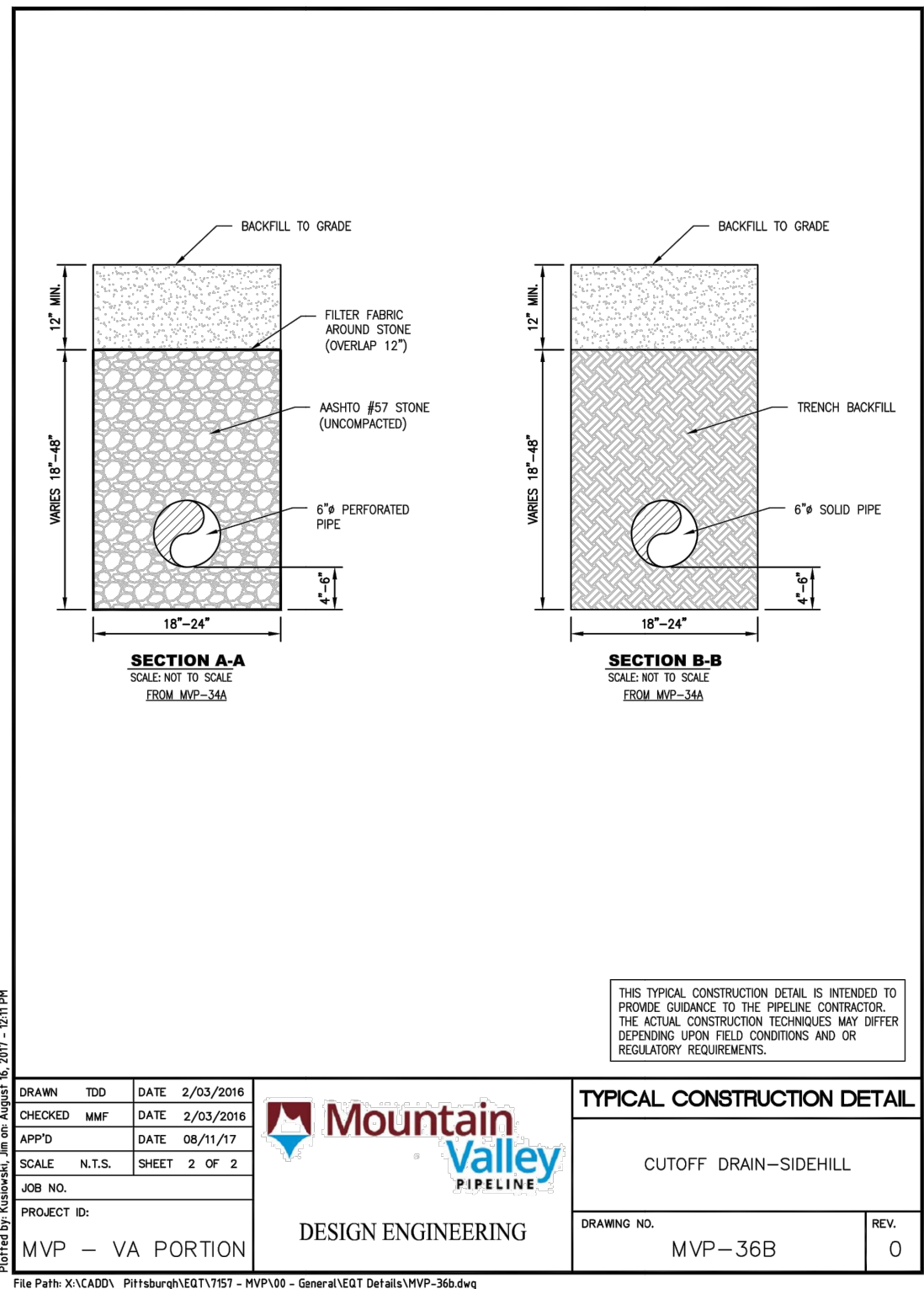
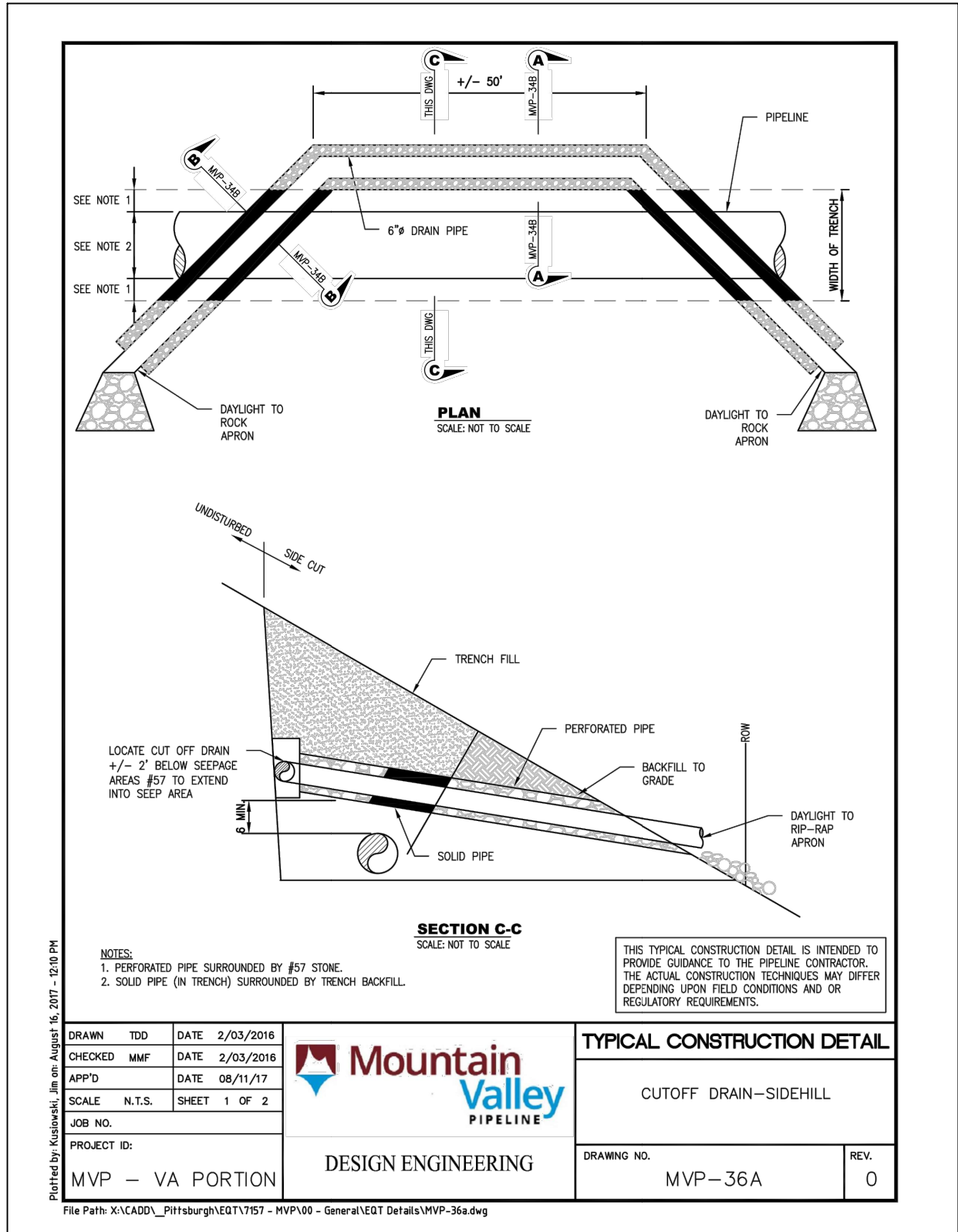
DAVID J. WALLNER  
Lic. No. 0402057593  
Professional Engineer

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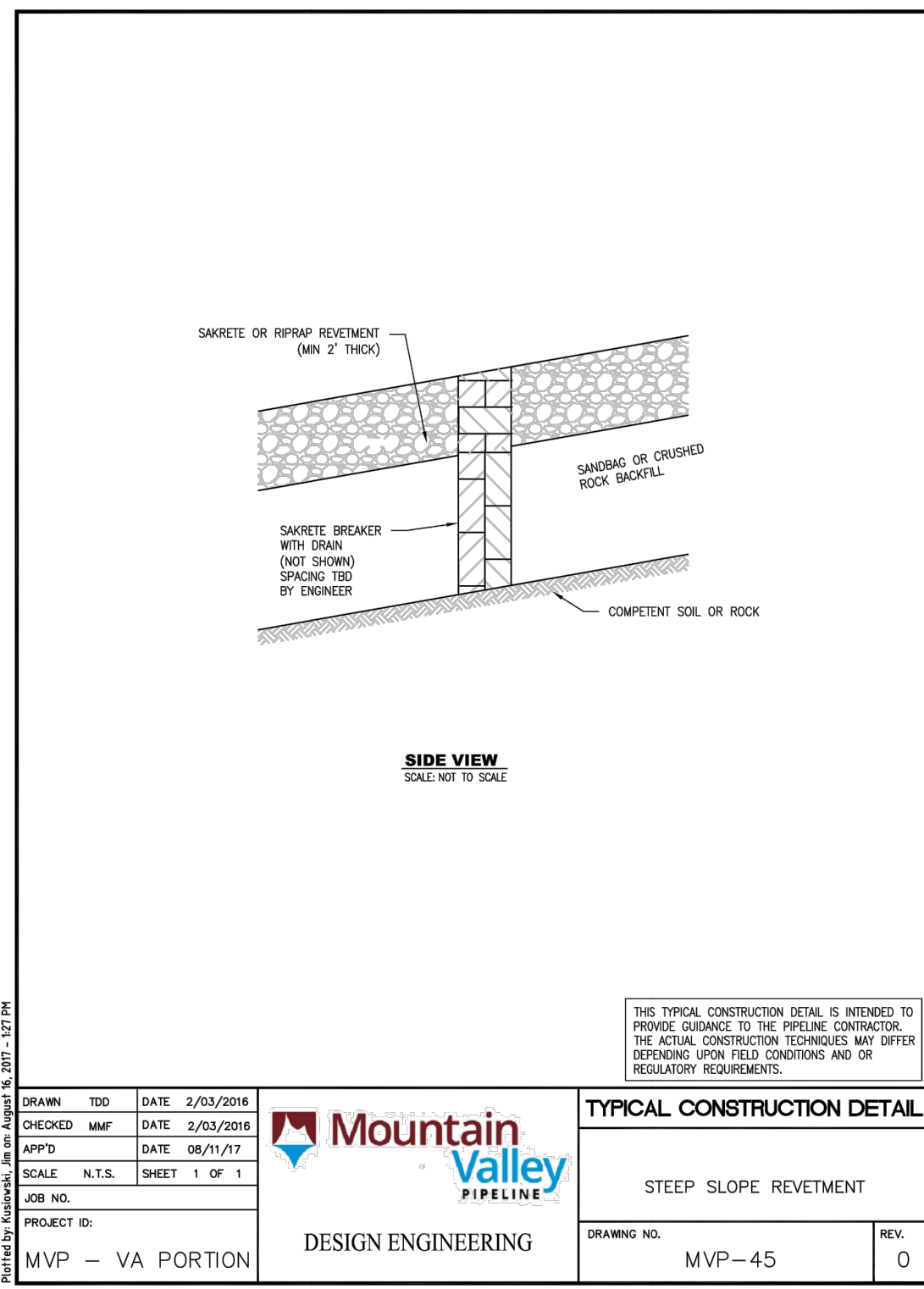
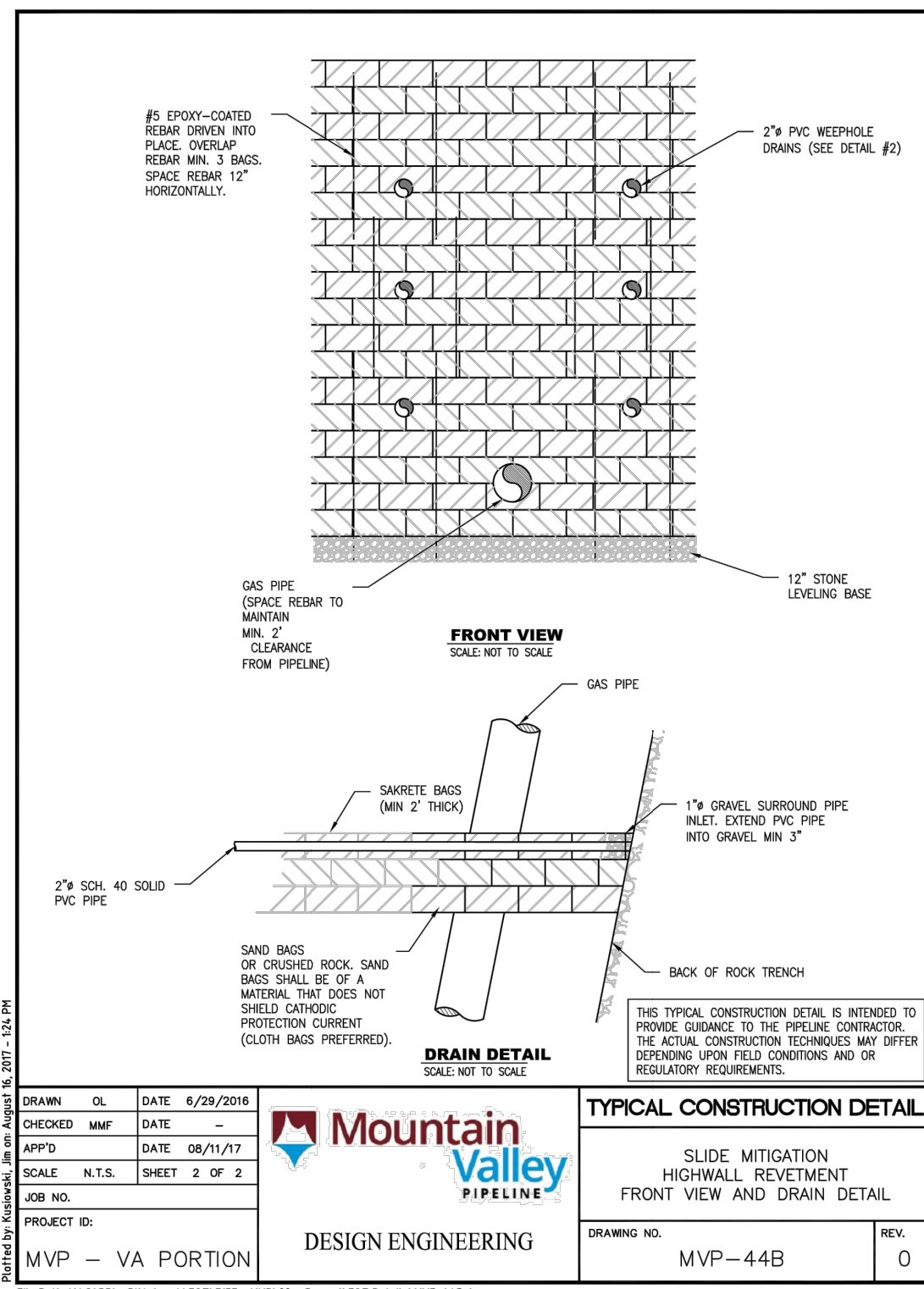
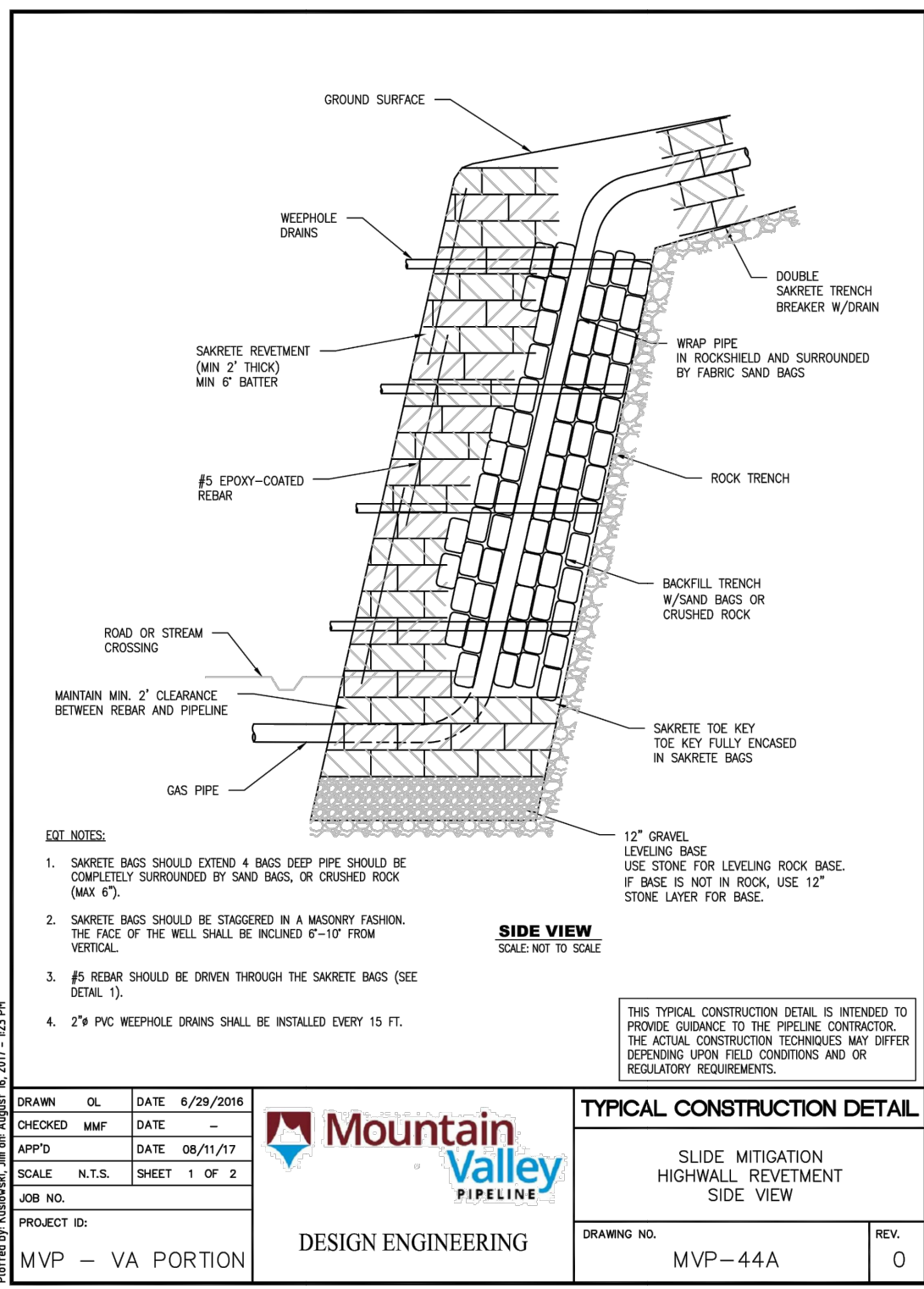
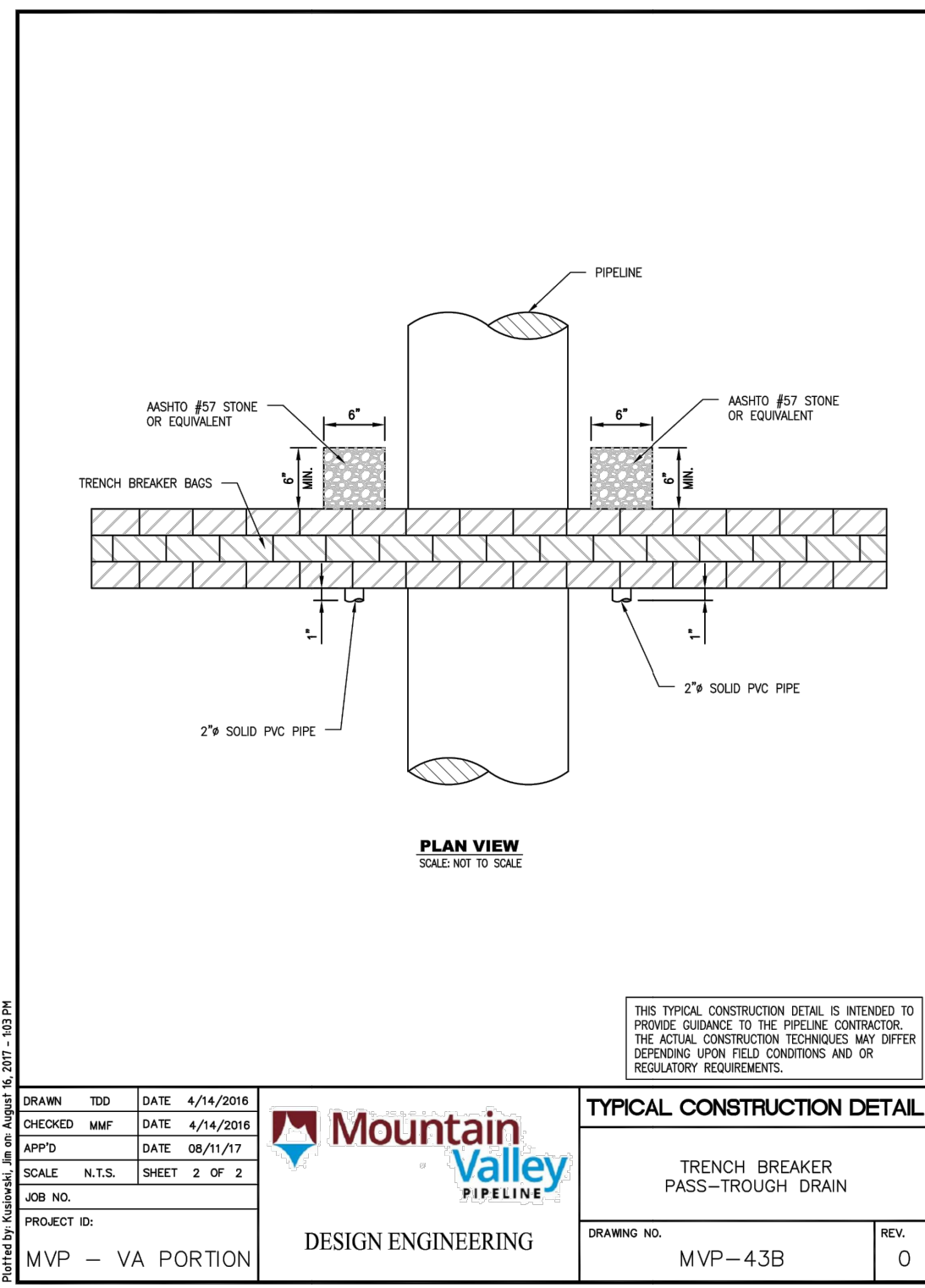
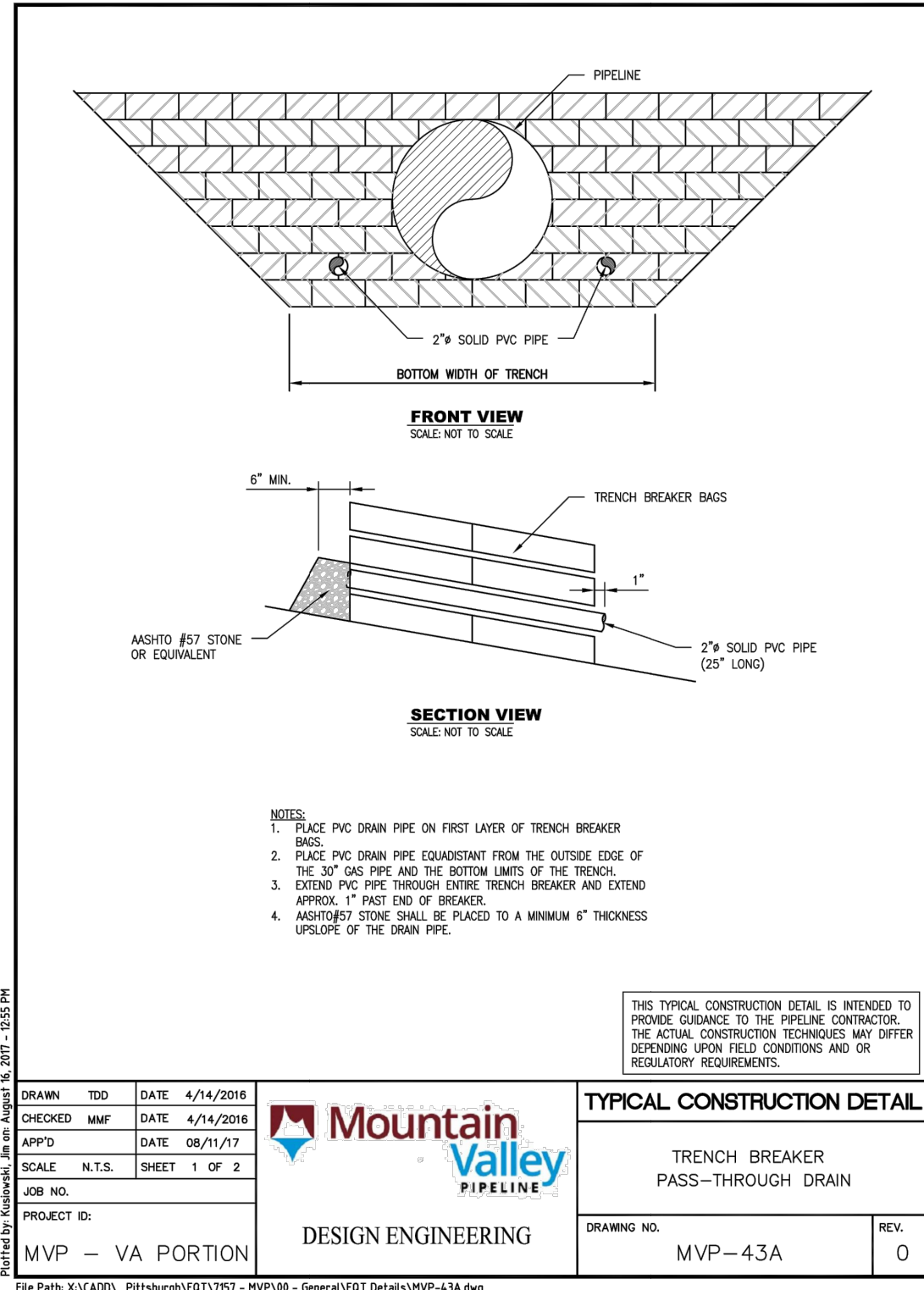
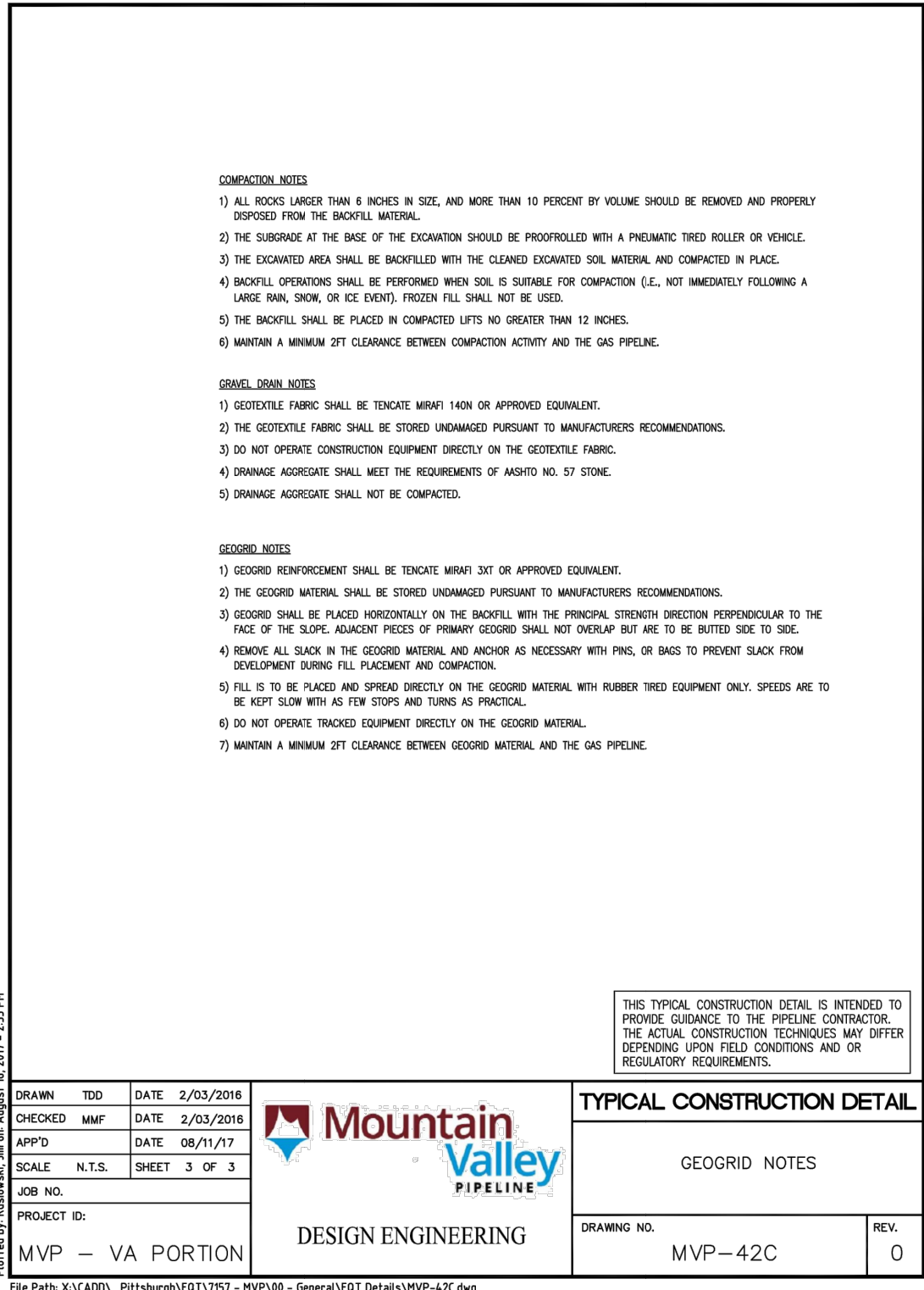
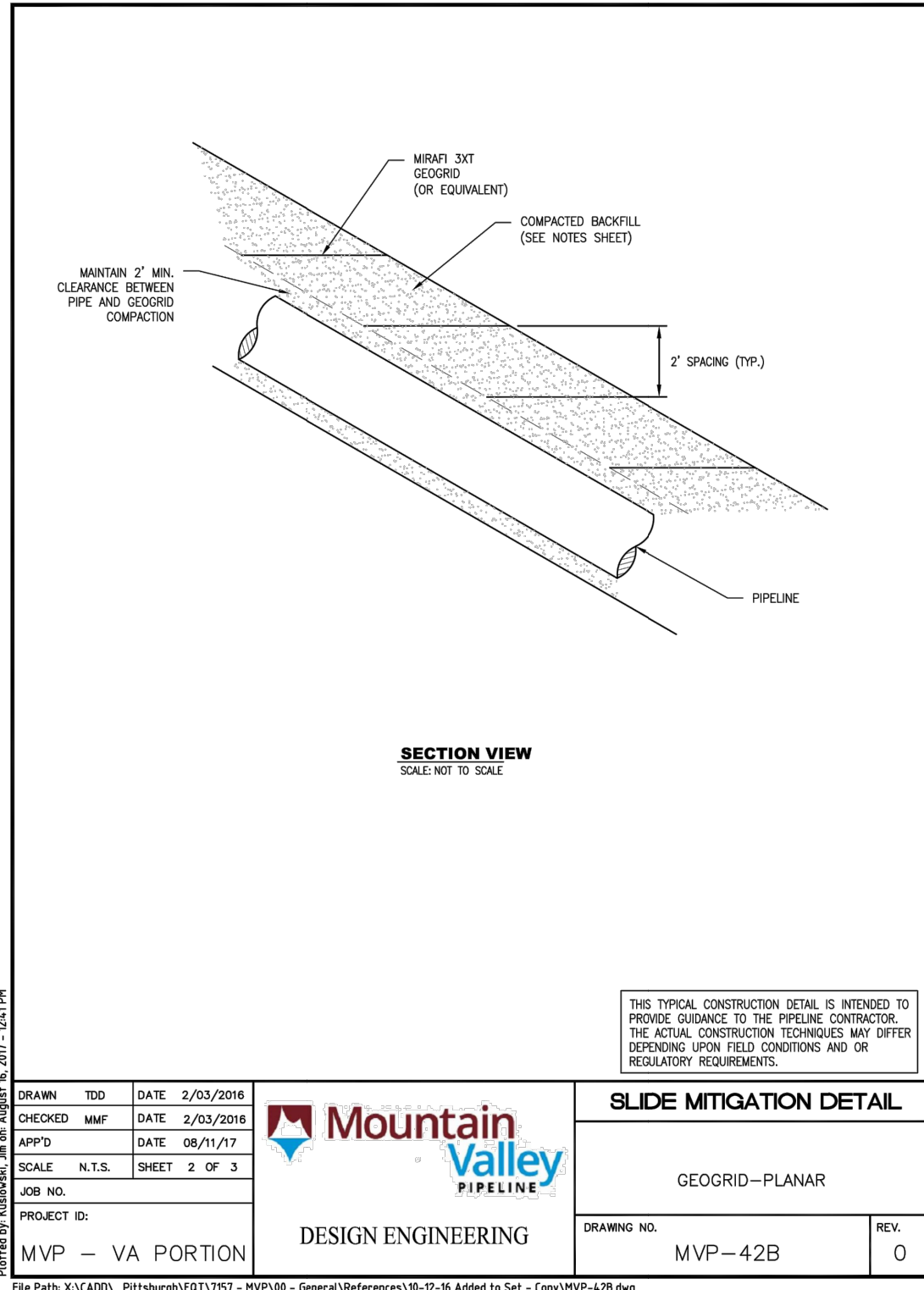
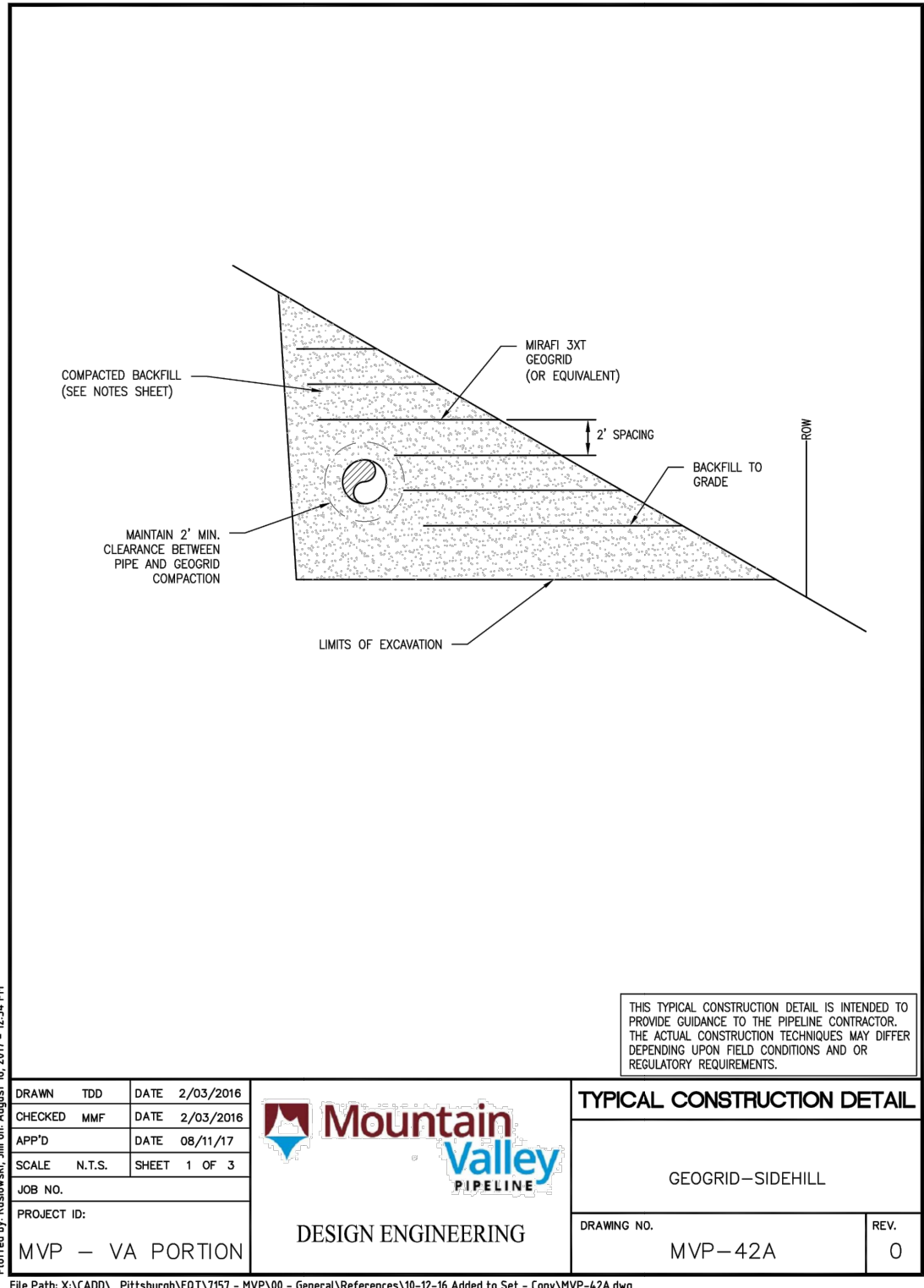






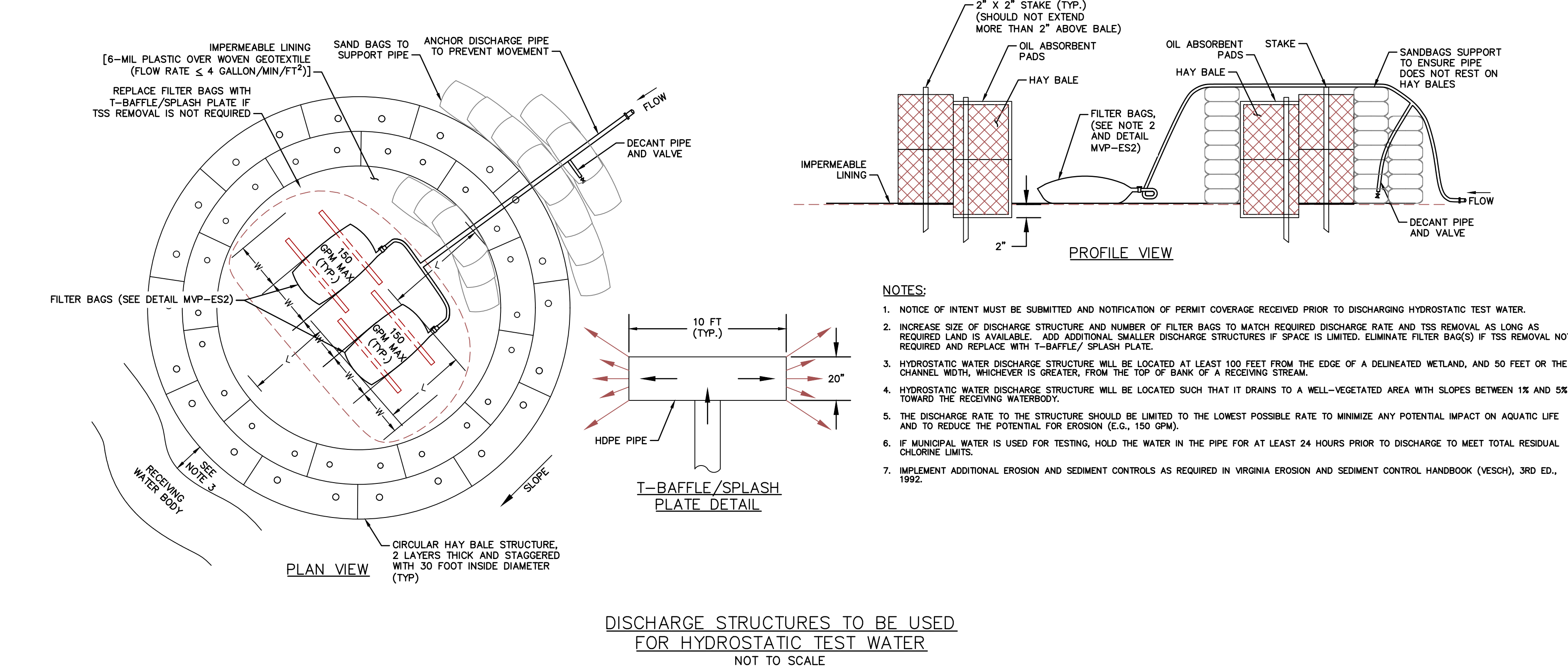
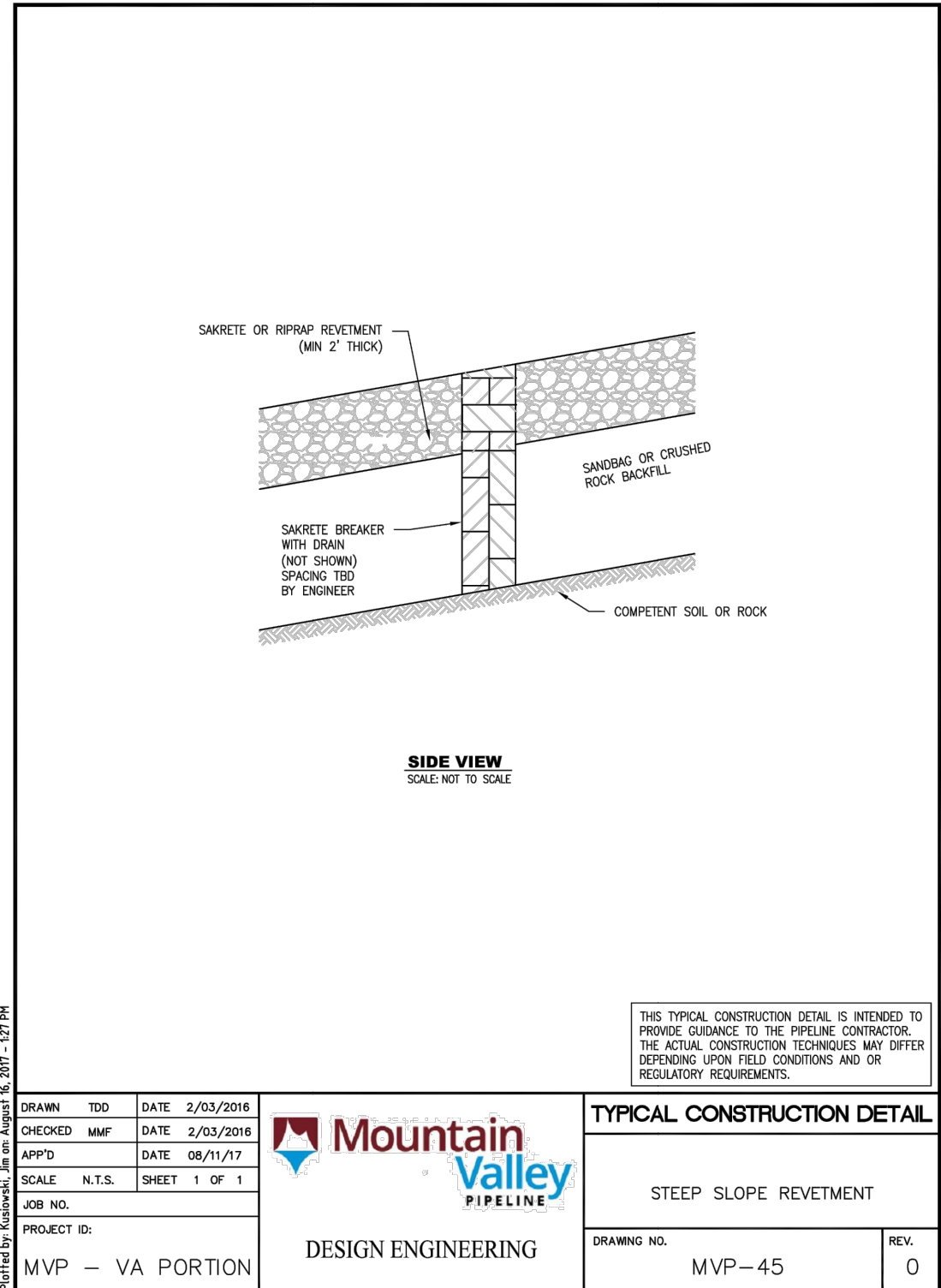
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EROSION AND SEDIMENT CONTROL PLANS										TETRA TECH complex world   CLEAR SOLUTIONS™ 661 ANDERSEN DRIVE FOSTER PLAZA 7 PITTSBURGH, PA 15220									
GENERAL DETAILS SET										DAVID J. WALLNER Lic. No. 0402057593 Professional Engineer PITTSBURGH, PA									
DRAWN BY: KAL										CHECKED BY: HT									
APPROVED BY: RE										DATE: 11/28/2017									
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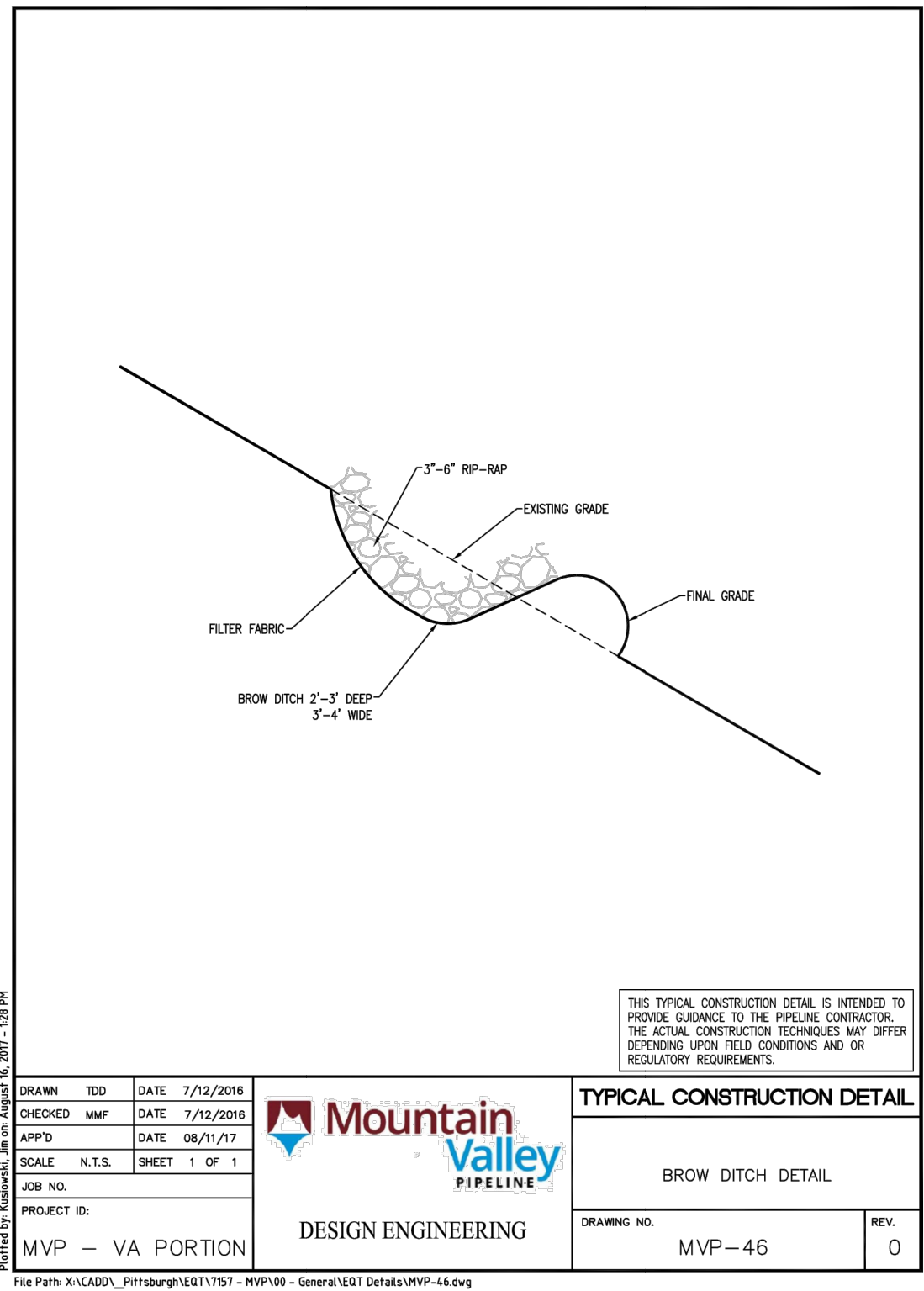


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Test Break Name	Test Break Coordinates		Proposed Outfall Coordinates		Anticipated Discharge Volume (gal)	Recommended Discharge Range (GPM)	Time to Release (days)	# of Hay Bale Structures	Receiving Water Name
	Latitude	Longitude	Latitude	Longitude					
10A	37° 07' 49.48"	-80° 08' 12.79"	37° 07' 47.890"	-80° 08' 11.280"	3,545,000	600 to 1200	4 to 2	2 to 4	S-B23/UNT to Mill Creek
10B	37° 05' 21.13"	-79° 57' 39.55"	37° 05' 22.848"	-79° 57' 40.823"	970,000	300 to 600	2 to 1	1 to 2	S-GH5
10C	37° 02' 52.583"	-79° 53' 43.515"	37° 02' 54.509"	-79° 53' 46.055"	2,150,000	600 to 1200	3 to 1	2 to 4	UNT to Blackwater River



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**Mountain Valley PIPELINE**

EROSION AND SEDIMENT CONTROL PLANS

MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE

MOUNTAIN VALLEY PIPELINE, LLC

555 SOUTHPOINTE BOULEVARD, SUITE 200

CANONSBURG, PA 15317

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661 ANDERSEN DRIVE  
FOSTER PLAZA 7  
PITTSBURGH, PA 15220

**GENERAL DETAILS SET**

DAVID J. WALLNER  
Lic. No. 0402057593  
Professional Engineer

DRAWN BY: KAL

CHECKED BY: HT

APPROVED BY: RE

DATE: 11/28/2017

SCALE: AS SHOWN

SHT. NO. 0.21 OF 0.23



GENERAL CONSTRUCTION SEQUENCE

THE FOLLOWING IS A GENERAL SEQUENCE FOR EARTHMOVING ACTIVITIES ASSOCIATED WITH CONSTRUCTION OF THE PIPELINE:

1.

INSTALL TEMPORARY EROSION AND SEDIMENT CONTROLS PRIOR TO EARTH DISTURBANCE. REFER TO BEST MANAGEMENT PRACTICES (BMP) INSTALLATION AND REMOVAL NOTES. APPROPRIATE BMPS SHOULD BE PLACED AROUND SENSITIVE AREAS PRIOR TO EARTH DISTURBANCE. STONE CONSTRUCTION ENTRANCES (SCE) ARE TO BE PROVIDED AT ALL LOCATIONS WHERE ACCESS ROADS AND PIPELINES WILL BE ACCESSING OR CROSSING A PUBLIC ROADWAY. NOTE THAT SILT FENCE, COMPOST FILTER SOCK AND SUPER SILT FENCE IS BEING INSTALLED AS PART OF A "SYSTEM" OF EROSION CONTROL BMPS INCLUDING CLEAN WATER DIVERSIONS, WATERBARS AND BONDED FIBER MATRIX. THIS BMP SYSTEM APPROACH ALLOWS MVP TO MANAGE SLOPE LENGTH LIMITATIONS OF SUPER SILT BY INTRODUCING SLOPE BREAKS AND ADDITIONAL SURFACE EROSION PROTECTION.
2.

INSTALL TEMPORARY E&S CONTROLS FOR STREAM CROSSINGS AT LOCATIONS SHOWN ON THE E&S PLAN SHEETS. NO EARTH DISTURBANCE ACTIVITIES WITHIN 50 FEET OF STREAM CHANNELS WILL BE PERFORMED UNTIL MATERIALS NEEDED TO COMPLETE THE CROSSING ARE AT THE NEAREST AVAILABLE LOCATION.
3.

GENERAL CLEARING AND GRUBBING OF THE TREES AND BRUSH ALONG THE RIGHT-OF-WAY (ROW) FOR PIPELINE TRENCHING MAY COMMENCE TO THE WIDTH SPECIFIED IN THE ROW AGREEMENTS OR CONSTRUCTION ALIGNMENT SHEETS, WHICHEVER IS LESS. SMALLER DEBRIS, SUCH AS SHRUBS OR LIMBS, ARE TO BE CHIPPED AND UTILIZED ON-SITE AS PART OF THE SOIL STABILIZATION. WHERE CHIPPED MATERIAL IS USED AS MULCH, SPREAD AT A RATE NOT TO EXCEED 1 TON/ACRE. UNLESS OTHERWISE DIRECTED BY THE LANDOWNER, LOGS WILL EITHER BE HAULED OFF-SITE OR GIVEN TO THE LANDOWNER UPON THEIR REQUEST; STUMPS AND/OR LOGS WILL BE GROUND, CHIPPED, WINDROWED, OR HAULED OFF-SITE.
4.

INSTALL CLEAN WATER DIVERSIONS AND CLEAN WATER DIVERSION PIPES IN ACCORDANCE WITH VESCH STD & SPEC 3.09 AND MVP-ES50 AND MCP-ESS0.1. IN ADDITION, INSTALL OUTLET STRUCTURES FOR CLEAN WATER PIPES IN ACCORDANCE WITH MVP-ES51 AND MVP-ESS1.1. FOLLOWING INSTALLATION OF CLEAN WATER DIVERSION BERMS STABILIZE THE UPHILL SIDE OF THE BERM USING TEMPORARY SEED, EROSION CONTROL MATTING OR BONDED FIBER MATRIX. FINALLY INSTALL ROCK CHECK DAMS IN ACCORDANCE WITH VESCH STD & SPEC 3.20 EXCEPT THAT COMPOST FILTER SOCK OR NATIVE ROCK (SIZED APPROPRIATELY PER VESCH STD & SPEC 3.20) EXCAVATED DURING GRADING WILL BE USED FOR CONSTRUCTION.
5.

INSTALL TEMPORARY AND PERMANENT RIGHT-OF-WAY DIVERSIONS/WATERBARS IMMEDIATELY AFTER INITIAL DISTURBANCE OF THE SOIL IN ACCORDANCE WITH THE WATERBAR SPACING AND SIZING REQUIREMENTS SHOWN ON THE PLAN AND DETAIL SHEETS (SEE DETAILS VADEQ STD & SPEC 3.11 AND MVP-17). RIGHT-OF-WAY DIVERSIONS/WATERBARS WILL BE CONSTRUCTED OF SOIL, AND USED TO REDUCE RUNOFF VELOCITY AND DIVERT WATER OFF THE PIPELINE ROW. WATERBARS WILL BE INSTALLED WITH SUMP FILTERS (DETAIL MVP-ES42) AT THE DISCHARGE END.
6.

EXCAVATE PIPELINE TRENCH AND BEGIN GRADING OF PROPOSED METER AND RECTIFIER ANODE BED SITES. THE PROPOSED CONSTRUCTION ROW AND EXTRA WORKSPACES ARE TO BE USED AS A WORK AREA FOR TRENCH EXCAVATION, EQUIPMENT MOVEMENT AND THE TEMPORARY STORAGE OF SOIL STOCKPILES, AS NEEDED. EQUIPMENT, SOIL STOCKPILES, AND OTHER MATERIALS ARE TO REMAIN UPSLOPE OF BMPS DURING CONSTRUCTION ACTIVITIES. REFER TO BMP INSTALLATION AND REMOVAL SEQUENCE FOR THE BMPS TO BE USED FOR PROTECTION DURING TRENCH EXCAVATION AND AROUND TEMPORARY SOIL STOCKPILES. STOCKPILES AND NON-WORK AREA SLOPES WILL BE STABILIZED THROUGH AN APPLICATION OF EITHER MULCH (ORGANIC, EROSION CONTROL BLANKET OR BONDED FIBER MATRIX) OR TEMPORARY SEED. SEGREGATION OF TOPSOIL AND SUBSOIL WILL BE PERFORMED WHERE TRENCH EXCAVATION TAKES PLACE IN AN AGRICULTURAL, WETLAND, OR RESIDENTIAL AREA.
7.

PIPELINE SECTIONS WILL BE TRANSPORTED TO THE WORK AREA AND STRUNG ALONG THE WORKING SIDE OF THE ROW PARALLEL TO THE TRENCH LINE. WELDING CAN OCCUR IN OR OUT OF THE TRENCH. THE PIPELINE WILL BE BENT TO CONFORM TO THE TRENCH CONTOUR, ALIGNED WELDED AND PLACED ON TEMPORARY SUPPORTS ALONGSIDE THE TRENCH. WELDS WILL BE VISUALLY AND RADIO-GRAPHICALLY INSPECTED AND REPAIRED AS NECESSARY. THE PIPE SECTION WILL BE LOWERED INTO THE TRENCH AND PLACED ON PADDING PER MVP CONSTRUCTION STANDARDS. ANY WETNESS ENCOUNTERED DURING CONSTRUCTION WORK WILL BE DEWATERED BY USING PUMPS, HOSES, AND PUMPED BAGS (DETAIL MVP-ES2), AND WILL BE DISCHARGED TO A WELL VEGETATED, UPLAND AREA.
8.

STREAM PIPELINE CROSSING CONSTRUCTION METHODS WILL BE INSTALLED AT LOCATIONS SHOWN ON THE E&S PLAN SHEETS AND AS SPECIFIED ON DETAIL SHEET. STREAM BANK STABILIZATION WILL BE INSTALLED IMMEDIATELY FOLLOWING COMPLETION OF PIPELINE INSTALLATION AS SHOWN ON THE DETAIL SHEET.
9.

INSTALL TRENCH BREAKERS AT LOCATIONS SHOWN ON THE DRAWINGS OR AS DIRECTED BY MVP AND AS SPECIFIED ON THE DETAIL SHEET (DETAIL MVP-20).
10.

THE TRENCH WILL SUBSEQUENTLY BE BACKFILLED WITH SUITABLE EXCAVATED MATERIAL. THE BACKFILL MATERIAL WILL BE SLIGHTLY CROWNED IN UPLAND AREAS TO ALLOW FOR SETTLEMENT THAT MAY OCCUR. CROWNING THE SOIL SLIGHTLY OVER THE PIPELINE WILL HELP PREVENT FUTURE STORM WATER-RELATED PROBLEMS FROM SETTLING OF THE BACKFILLED AREA. NO CROWNING OF SOILS WILL TAKE PLACE IN WETLANDS, STREAMS, OR FLOOD PLAINS. IN AREAS WHERE TOPSOIL HAS BEEN SEGREGATED, THE SUBSOIL WILL BE REPLACED FIRST, AND THEN THE TOPSOIL WILL BE SPREAD OVER THE AREA FROM WHICH IT WAS REMOVED. DISTURBED AREAS WILL BE RESTORED TO THEIR APPROXIMATE ORIGINAL TOPOGRAPHIC CONTOURS.
11.

STABILIZE EXPOSED AND UNWORKED SOILS BY APPLICATION OF EFFECTIVE BMPS THAT PROTECT THE SOIL FROM THE EROSIIVE FORCES OF RAINDROPS, FLOWING WATER, AND WIND. PERMANENT OR TEMPORARY SOIL STABILIZATION SHALL BE APPLIED TO DENUDED AREAS WITHIN SEVEN DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE SITE. WHERE A DENUDED AREA WILL REMAIN IDLE FOR MORE THAN 7 CALENDAR DAYS, TEMPORARY SEEDING (VA STD & SPEC 3.31, TABLE 3.31-B) WILL BE APPLIED TO THE ROUGH GRADED AREA. PERMANENT STABILIZATION SHALL BE APPLIED TO AREAS THAT ARE TO BE LEFT DORMANT FOR MORE THAN ONE YEAR.
12.

IN THE UNLIKELY EVENT THAT THERE ARE EXCESS EXCAVATED MATERIALS REMAINING AFTER THE TRENCH HAS BEEN BACKFILLED, THE MATERIAL IS TO BE DISPOSED OF WITHIN THE EXISTING ROW IN AN UPLAND AREA OUTSIDE OF THE 100-YEAR FLOOD PLAIN. MATERIAL WILL BE SPREAD IN A THIN LAYER AND TIED INTO EXISTING CONTOURS TO CREATE POSITIVE DRAINAGE FOR STORMWATER RUNOFF.
13.

CONSTRUCT PERMANENT RIGHT-OF-WAY DIVERSION/WATERBARS AFTER COMPLETION OF GRADING IN ACCORDANCE WITH THE WATERBAR SPACING AND SIZING REQUIREMENTS SHOWN ON PLAN AND DETAIL SHEETS (DETAIL MVP-17).
14.

PRIOR TO SEEDING MVP WILL DISC AREAS TO A DEPTH OF 4-6" TO FACILITATE REVEGETATION. DISCING WILL BE PERFORMED ON SUBSOILS TO A DEPTH OF 4-6" AND AGAIN FOLLOWING TOPSOILING.
15.

REVEGETATE DISTURBED AREA PER THE TABLES ON DETAILS MVP-ES11.1 TO 11.9 AND MVP-12.1 TO 12.4 OR PER LANDOWNER REQUEST. FOR 3:1 OR STEEPER SLOPES THE DISTURBED AREA WILL HAVE EROSION CONTROL FABRIC (BLANKETING, HYDROSEEDING, FLEX TERRA, OR APPROVED EQUAL) INSTALLED AS SHOWN ON DETAIL SHEET (DETAILS VA STD & SPEC 3.36, MVP-ES40 AND MVP ES-40.1).
16.

RE-ESTABLISH APPROPRIATE DRAINAGE IN EXISTING ROAD CHANNELS PRIOR TO SEEDING AND MULCHING.
17.

CONDUCTING INSPECTIONS OF TEMPORARY ESC CONTROLS AND SWM BMPS ON AT LEAST THE FOLLOWING FREQUENCIES:

A.

IN NON-TMDL WATERSHEDS
  - AT LEAST ONCE EVERY FIVE BUSINESS DAYS, OR
  - AT LEAST ONCE EVERY 10 BUSINESS DAYS AND NO LATER THAN 48 HOURS FOLLOWING A MEASURABLE STORM EVENT (OR ON THE NEXT BUSINESS DAY IF THE STORM EVENT OCCURS WHEN THERE ARE MORE THAN 48 HOURS BETWEEN BUSINESS DAYS.

B.

TMDL WATERSHEDS:
  - AT LEAST ONCE EVERY FOUR BUSINESS DAYS, OR
  - AT LEAST ONCE EVERY 5 BUSINESS DAYS AND NO LATER THAN 48 HOURS FOLLOWING A MEASURABLE STORM EVENT (OR ON THE NEXT BUSINESS DAY IF THE STORM EVENT OCCURS WHEN THERE ARE MORE THAN 48 HOURS BETWEEN BUSINESS DAYS.

TEMPORARY BMP'S WILL BE REMOVED UPON ACHIEVING VEGETATIVE STABILIZATION, WHICH IS DEFINED AS "A GROUND COVER IS ACHIEVED THAT IS UNIFORM, MATURE ENOUGH TO SURVIVE AND WILL INHIBIT EROSION". DISTURBED AREAS NOT ATTAINING AN ACCEPTABLE VEGETATIVE COVER SHALL BE RESEEDD AS NEEDED UNTIL THE ENDPOINT IS ACHIEVED.

18.

ALL POLLUTANTS, INCLUDING WASTE MATERIALS AND DEMOLITION DEBRIS THAT OCCUR ON SITE DURING CONSTRUCTION SHALL BE HANDLED AND LEGALLY DISPOSED OF IN A MANNER THAT DOES NOT CAUSE CONTAMINATION OF SURFACE WATERS. WOODY DEBRIS MAY BE CHIPPED AND SPREAD ON-SITE.
- FOR STREAM CROSSINGS, REFER TO THE FOLLOWING STEPS:
1.

INSTALL TEMPORARY EQUIPMENT BRIDGE, BYPASS HOSE, FLUME, PUMP, OR COFFERDAM AS DESCRIBED IN STREAM CROSSING DETAILS AROUND THE WORK AREA.

2.

DEWATER WORK AREA UTILIZING PUMP WATER FILTER BAGS. WHERE POSSIBLE, EXCAVATION WILL BE FROM THE TOP OF THE STREAM BANK.

3.

INSTALL TRENCH PLUGS, PIPE, AND BACKFILL.

4.

STABILIZE CHANNEL EXCAVATION AND STREAM BANKS PRIOR TO REDIRECTING STREAM FLOW.

5.

REMOVE BYPASS HOSE, FLUME, PUMP, AND TEMPORARY DAM AS NEEDED.
- IF WORKING WITHIN A WETLAND AREA, FOLLOW THE GENERALIZED CONSTRUCTION SEQUENCE BELOW:
1.

INSTALL EITHER SUPER SILT FENCE, ORANGE CONSTRUCTION FENCE, OR COMPOST FILTER SOCKS ALONG THE PERIMETERS OF THE SITE AS SHOWN ON THE CONSTRUCTION DRAWINGS.

2.

MATS, PADS, OR SIMILAR DEVICES WILL BE USED DURING THE CROSSINGS OF WETLANDS. ORIGINAL GRADES THROUGH WETLANDS MUST BE RESTORED AFTER TRENCHING AND BACKFILLING. ANY EXCESS FILL MATERIALS MUST BE REMOVED FROM THE WETLAND AND NOT SPREAD WITHIN WETLANDS.

3.

SOIL EXCAVATED FROM WETLAND AREAS WILL BE CAREFULLY REMOVED WITH THE ROOTS INTACT. THIS SOIL WILL BE PLACED IN A SEPARATE STOCKPILE TO BE REUSED DURING THE WETLAND SURFACE RESTITUTION.

4.

DEWATER WORK AREA UTILIZING PUMPED WATER FILTER BAGS.

5.

INSTALL PIPE.

6.

INSTALL TRENCH PLUGS IN WETLAND AREAS TO PREVENT THE TRENCH FROM DRAINING THE WETLAND OR CHANGING ITS HYDROLOGY.

7.

BACKFILL PIPE TRENCH. BACKFILL THE TOP 12-INCHES OF THE EXCAVATED TRENCH WITH THE STOCKPILED WETLAND SOIL TO MATCH ORIGINAL SURFACE GRADES.

8.

COMPACT BACKFILL AND GRADE THE SURFACE OF THE TRENCH AREA TO ALLOW FOR POSITIVE DRAINAGE TO SOIL E&SCS AND TO PREPARE DISTURBED AREAS FOR PERMANENT TRENCH RESTORATION.

9.

MAINTAIN ALL E&SCS DEVICES UNTIL SITE WORK IS COMPLETE AND A GROUND COVER IS ACHIEVED THAT IS UNIFORM AND MATURE ENOUGH TO SURVIVE AND INHIBIT EROSION.

10.

REMOVE ALL SOIL AND E&SC MEASURES UPON ESTABLISHMENT OF A GROUND COVER THAT IS UNIFORM AND MATURE ENOUGH TO SURVIVE AND INHIBIT EROSION. RE-GRADE AND REVEGETATE AREAS DISTURBED DURING THE REMOVAL OF THE SOIL E&SCS.
- BMP MAINTENANCE
- TEMPORARY AND PERMANENT EROSION AND SEDIMENT CONTROL BMPS SHALL BE MAINTAINED AND REPAIRED AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. MAINTENANCE AND REPAIR SHALL BE CONDUCTED IN ACCORDANCE WITH THE APPROVED STANDARDS AND SPECIFICATIONS.

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IN NON-AGRICULTURAL AREAS THE VISUAL SURVEY SHALL BE COMPARED TO THE DENSITY AND COVER OF ADJACENT UNDISTURBED LANDS. IN AGRICULTURAL AREAS, THE VISUAL SURVEY SHALL BE COMPARED TO THE ADJACENT UNDISTURBED PORTIONS OF THE SAME FIELD, UNLESS THE EASEMENT AGREEMENT SPECIFIES OTHERWISE.

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WETLANDS ALONG THE PROPOSED PIPELINE ARE EXPECTED TO EXHIBIT VARYING DEGREES OF SATURATION AND WATER ELEVATION, REQUIRING A VARIETY OF PLANT SPECIES TO BE RE-ESTABLISHED. IN UNSATURATED WETLANDS, MOST VEGETATION WILL BE REPLACED BY SEEDING. SATURATED WETLANDS WILL TYPICALLY BE ALLOWED TO RE-VEGETATE NATURALLY. WETLAND REVEGETATION WILL BE CONSIDERED SUCCESSFUL WHEN THE COVER OF HERBACEOUS AND/OR WOODY SPECIES IS AT LEAST 80 PERCENT OF THE TYPE, DENSITY, AND DISTRIBUTION OF THE VEGETATION IN ADJACENT WETLAND AREAS THAT WERE NOT DISTURBED BY CONSTRUCTION. REVEGETATION EFFORTS WILL CONTINUE UNTIL WETLAND REVEGETATION IS SUCCESSFUL.

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CONDUCTING INSPECTIONS OF TEMPORARY ESC CONTROLS AND SWM BMPS AT LEAST ONCE EVERY FOUR BUSINESS DAYS.

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TEMPORARY EROSION AND SEDIMENT CONTROL BMPS SHOULD BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION IS ACHIEVED OR AFTER THE TEMPORARY BMPS ARE NO LONGER NEEDED. TRAPPED SEDIMENT SHALL BE REMOVED OR STABILIZED ON SITE. DISTURBED SOIL RESULTING FROM REMOVAL OF BMPS OR VEGETATION SHALL BE PERMANENTLY STABILIZED.
- RESTORATION BMP PHASING
- THE FOLLOWING IS THE SEQUENCE OF EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE REMOVAL AND INSTALLATION RELATED TO RESTORATION ACTIVITIES. THIS WORK WILL OCCUR BETWEEN RESTORATION OF PIPELINE LIMIT OF DISTURBANCE TO PRE-CONSTRUCTION GRADES AND FINAL CLOSURE OF THE PROJECT DEFINED AS "ACHIEVING VEGETATIVE STABILIZATION". THE SEQUENCE IS:
- 1)

REMOVE AND GRADE OUT THE CLEAN WATER DIVERSION DIKE.

2)

REMOVE DOWNSLOPE BMPS UTILIZED DURING CONSTRUCTION AND IMMEDIATELY REPLACE WITH 12-IN COMPOST FILTER SOCK. ON SLOPES GREATER THAN 30%, AN ADDITIONAL INTERMEDIATE 12-IN COMPOST FILTER SOCKS WILL BE PLACED PER THE SLOPE SPACING (MVP-ES3.2) TO ATTENUATE THE VELOCITY OF RUNOFF IN THE RECLAIMED AREA.

3)

APPLY SPECIALTY SEEDS AS REQUIRED THAT WILL NOT BE INCLUDED IN THE MULCH PHASE (STEP 4), SEED THE AREA USING THE SEED MIXES AND RATES SPECIFIED IN MVP-ES11.1 TO MVP-ES11.9 AND MVP-ES12.1 TO MVP-ES12.4.

4)

APPLY MULCH IN THE FORM OF ORGANIC MULCH (PER MVP-ES45), SOIL STABILIZATION MATTING (PER VADEQ STD & SPEC 3.36), OR HYDRAULIC EROSION CONTROL PRODUCT (PER MVP-ES40).

5)

FOLLOWING A DETERMINATION THAT THE SITE HAS ACHIEVED VEGETATIVE STABILIZATION, THE COMPOST FILTER SOCK WILL BE "OPENED" AND THE MULCH CONTAINED WITHIN WILL BE SPREAD WITHIN THE LIMITS OF DISTURBANCE.
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BEST MANAGEMENT PRACTICES (BMP) INSTALLATION & REMOVAL NOTES

TEMPORARY AND PERMANENT BMPs WILL BE USED DURING CONSTRUCTION ACTIVITIES TO AVOID AND/OR MINIMIZE ADVERSE ENVIRONMENTAL EFFECTS OF CONSTRUCTION ACTIVITIES.

THE FOLLOWING ARE GENERAL BMP INSTALLATION NOTES FOR PIPELINE CONSTRUCTION ACTIVITIES.

- A STONE CONSTRUCTION ENTRANCE, PER VESCH STD & SPEC 3.02 AND MVP-ES20, SHALL BE PROVIDED AT ALL LOCATIONS WHERE CONSTRUCTION TRAFFIC WILL BE ACCESSING A PAVED ROAD DIRECTLY FROM A DISTURBED AREA.
- TEMPORARY SEDIMENT BARRIERS, INCLUDING APPROPRIATELY SIZED COMPOST FILTER SOCK, SILT FENCE OR SILT FENCE WILL BE PLACED AROUND SOIL STOCKPILES, AS NEEDED.
- COMPOST FILTER SOCK WILL BE PLACED AROUND WETLANDS AND WATERBODIES IN AND ADJACENT TO THE WORK AREA PRIOR TO ANY TRENCHING ACTIVITIES. COMPOST FILTER SOCK HAS BEEN SIZED PER MVP-ES3 AND THE SIZE IS SPECIFIED ON THE PLAN SETS UTILIZING THE LINE TYPES CONTAINED IN THE LEGEND ON EACH SHEET.
- STOCKPILE SLOPES WILL BE 2:1 OR FLATTER, AND STOCKPILES WILL NOT EXCEED 35 FEET IN HEIGHT.
- TEMPORARY STREAM CROSSINGS SHALL BE INSTALLED AS INDICATED ON THE E&S PLAN SHEETS AND AS PER THE E&S DETAIL SHEETS.
- WATERBARS WILL BE INSTALLED IMMEDIATELY AFTER INITIAL DISTURBANCE OF THE SOIL IN ACCORDANCE WITH THE SPACING AND SIZING REQUIREMENTS SHOWN ON PLAN AND DETAIL SHEET. WATERBARS WILL BE CONSTRUCTED OF SOIL TO REDUCE RUNOFF VELOCITY AND DIVERT WATER OFF THE PIPELINE ROW.
- EXCAVATED TRENCH SPOIL MATERIAL WILL BE USED FOR TEMPORARY RIGHT OF WAY DIVERSIONS AS SHOWN IN THE DETAIL AT THE LOCATIONS INDICATED ON THE PLAN SHEETS.
- TRENCH DEWATERING, IF NEEDED, WILL BE CONDUCTED USING A PUMP AND HOSE. WATER WILL BE RELEASED INTO A FILTER BAG THAT WILL BE LOCATED IN A WELL-VEGETATED UPLAND AREA.
- TRENCH BREAKERS WILL BE INSTALLED ON SLOPES ADJACENT TO STREAMS, WETLANDS, AND ROAD CROSSINGS TO PREVENT SUBSURFACE EROSION. TRENCH BREAKERS WILL BE INSTALLED AS SHOWN ON THE DETAILS.
- THE WORK AREA WILL BE BACKFILLED FOLLOWING PIPELINE INSTALLATION OR OTHER EXCAVATION WORK. IN AREAS WHERE TOPSOIL HAS BEEN SEGREGATED, THE SUBSOIL WILL BE REPLACED FIRST, AND THEN THE TOPSOIL WILL BE SPREAD OVER THE AREA FROM WHICH IT WAS REMOVED. DISTURBED AREAS WILL BE RESTORED TO THEIR ORIGINAL TOPOGRAPHIC CONTOURS.
- PERMANENT WATERBARS, WILL BE CONSTRUCTED WITH A TWO PERCENT (TYPICAL) OUTSLOPE TO DIVERT SURFACE FLOW TO A WELL VEGETATED STABLE AREA.
- IMMEDIATELY FOLLOWING BACKFILLING ALL DISTURBED AREAS WILL BE GRADED IN PREPARATION FOR SEEDING AND MULCHING. PRIOR TO SEEDING MVP WILL DISC AREAS TO A DEPTH OF 4-6" TO FACILITATE REVEGETATION. DISCING WILL BE PERFORMED ON SUBSOILS TO A DEPTH OF 4-6" AND AGAIN FOLLOWING TOPSOILING. THE CONSTRUCTION SITE SHOULD BE STABILIZED AS SOON AS POSSIBLE AFTER COMPLETION. ESTABLISHMENT OF FINAL COVER MUST BE INITIATED NO LATER THAN 7 DAYS AFTER REACHING FINAL GRADE. REFER TO TABLES ON THIS SHEET FOR TEMPORARY AND PERMANENT SEEDING SPECIFICATIONS.
- FOR 3:1 OR STEEPER SLOPES THE DISTURBED AREA WILL HAVE EROSION CONTROL BLANKETING INSTALLED AS INDICATED ON DETAIL SHEET.
- TEMPORARY SEDIMENT BARRIERS WILL BE MAINTAINED UNTIL VEGETATION HAS BECOME ESTABLISHED WITH A GROUND COVER THAT IS UNIFORM, MATURE ENOUGH TO SURVIVE AND WILL INHIBIT EROSION. ONCE THIS COVERAGE HAS BEEN OBTAINED, APPROPRIATE CONTROLS WILL BE REMOVED FROM THE WORK AREA. AREAS DISTURBED DURING THE REMOVAL OF THE EROSION CONTROLS WILL BE STABILIZED IMMEDIATELY.
- ALL WASTE MATERIAL WILL BE TRANSPORTED OFFSITE FOR RECYCLING AND/OR DISPOSAL AT A FACILITY APPROVED TO RECEIVE THE MATERIAL.
- IN NON-AGRICULTURAL AREAS THE VISUAL SURVEY SHALL BE COMPARED TO THE DENSITY AND COVER OF ADJACENT UNDISTURBED LANDS. IN AGRICULTURAL AREAS, THE VISUAL SURVEY SHALL BE COMPARED TO THE ADJACENT UNDISTURBED PORTIONS OF THE SAME FIELD, UNLESS THE EASEMENT AGREEMENT SPECIFIES OTHERWISE.
- WETLANDS ALONG THE PROPOSED PIPELINE ARE EXPECTED TO EXHIBIT VARYING DEGREES OF SATURATION AND WATER ELEVATION, REQUIRING A VARIETY OF PLANT SPECIES TO BE RE-ESTABLISHED. IN UNSATURATED WETLANDS, MOST VEGETATION WILL BE REPLACED BY SEEDING. SATURATED WETLANDS WILL TYPICALLY BE ALLOWED TO RE-VEGETATE NATURALLY. WETLAND REVEGETATION WILL BE CONSIDERED SUCCESSFUL WHEN THE COVER OF HERBACEOUS AND/OR WOODY SPECIES IS AT LEAST 80 PERCENT OF THE TYPE, DENSITY, AND DISTRIBUTION OF THE VEGETATION IN ADJACENT WETLAND AREAS THAT WERE NOT DISTURBED BY CONSTRUCTION. REVEGETATION EFFORTS WILL CONTINUE UNTIL WETLAND REVEGETATION IS SUCCESSFUL.

STREAM CROSSING PROCEDURES

GENERAL: PROCEDURES THAT WILL BE FOLLOWED AT STREAM CROSSING LOCATIONS INCLUDE THE FOLLOWING:

- MINIMIZE CLEARING AND GRUBBING OF VEGETATION UP TO STREAMS, AS POSSIBLE, UNTIL THE TIME OF THE PIPELINE INSTALLATION;
- ONLY THAT AREA WHICH IS REQUIRED FOR PIPELINE INSTALLATION SHALL BE DISTURBED WITHIN THE PROPOSED LIMIT OF DISTURBANCE OR RIGHT-OF-WAY AT STREAM CROSSINGS; LOCATING STAGING AREAS 50 FEET AWAY FROM THE STREAM, WHERE POSSIBLE;
- STORING CHEMICALS, STORING EQUIPMENT, WASHING EQUIPMENT, OR REFUELING EQUIPMENT MUST BE DONE IN AREAS THAT ARE GREATER THAN 100 FEET AWAY FROM THE STREAM;
- SPOIL PILE PLACEMENT AND BMPs WILL BE MONITORED AT ALL TIMES DURING STREAM CROSSING PROCEDURES; ONCE WORK WITHIN A STREAM AREA IS STARTED, IT WILL BE CONDUCTED CONTINUOUSLY TO COMPLETION; EMPHASIS WILL BE PLACED ON MINIMIZING TIME OF DISTURBANCE;
- SPOILS FROM STREAM CROSSINGS MUST BE PLACED AT LEAST 10 FEET FROM THE WATER'S EDGE; AND
- CONSTRUCTION EQUIPMENT WILL NOT BE ALLOWED IN THE STREAM CHANNEL WHEN EXCAVATION CAN BE DONE FROM EITHER SIDE OR A TEMPORARY CROSSING WHILE WORKING AT THE STREAM CROSSING.
- ESC BMPs WILL BE MONITORED/MAINTAINED AT ALL TIMES FOLLOWING INITIAL EARTH DISTURBANCE AND WILL CONTINUE UNTIL RESTORATION IS DEEMED COMPLETE.

THE FOLLOWING SECTIONS DESCRIBE STREAM CROSSING TECHNIQUES THAT MAY BE USED DURING PIPELINE RELOCATION/INSTALLATION ACTIVITIES. REFER TO THE DETAIL SHEETS AND APPROVED STANDARDS AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.

DRY CROSSING TECHNIQUES: THESE TECHNIQUES WILL BE USED TO PERFORM PIPELINE WORK IN A RELATIVELY DRY WORKING CONDITION OR AROUND THE OPEN EXCAVATION. THESE TECHNIQUES INCLUDE PUMP AROUND AND FLUME PIPE CROSSING METHODS. THE LIMITING FACTORS FOR THESE TECHNIQUES ARE USUALLY STREAM SIZE, FLOW, AND WATER DEPTH.

DIRECTIONAL BORING IS ALSO A TECHNIQUE THAT CAN BE UTILIZED AS IT WILL LESSEN THE IMPACTS ON THE WATERBODIES.

E&S CONTROL MEASURES WILL BE INSTALLED PRIOR TO ANY EARTH DISTURBANCE AND MONITORED/MAINTAINED UNTIL CONSTRUCTION AND RESTORATION THROUGH THE WATER-BODY IS COMPLETE.

FLUME PIPE METHOD: PLEASE SEE DETAIL SHEETS AND SWPPP FOR MORE INFORMATION ON THE FLUME PIPE METHOD. THIS PROCEDURE INVOLVES CONSTRUCTING TWO BULKHEADS, EITHER SANDBAGS OR PLASTIC DAMS, TO DIRECT THE STREAM FLOW THROUGH A FLUME PIPE PLACED OVER THE TRENCH PRIOR TO EXCAVATION. THE FLUME SHALL BE ALIGNED AS TO PREVENT BANK EROSION AND BED SCOUR. THE FLUME WILL NOT BE REMOVED DURING TRENCHING, PIPE LAYING OR BACKFILLING.

PUMP AROUND METHOD: PLEASE SEE THE DETAIL SHEETS AND APPROVED STANDARDS AND SPECIFICATIONS FOR MORE INFORMATION ON THE PUMP AROUND METHOD. THIS PROCEDURE INVOLVES CONSTRUCTING TWO BULKHEADS, EITHER SANDBAGS OR PLASTIC DAMS. THE UPSTREAM DAM WILL CAUSE THE WATER TO POND WHERE IT CAN BE PUMPED AROUND THE WORK AREA AND BE DISCHARGED BEHIND THE DOWNSTREAM BULKHEAD. PUMPS OF SUFFICIENT SIZE TO TRANSMIT THE FLOW DOWNSTREAM WILL BE USED. BACKUP PUMPS MUST BE ON-SITE. PUMP INTAKES MUST BE SCREENED. PUMP DISCHARGES MUST NOT CAUSE SCOUR.

TEMPORARY ROAD CROSSINGS: TEMPORARY ROAD CROSSINGS, CONSISTING OF BRIDGES OF TIMBER MATS OR CLEAN ROCK FILL AND FLUME(S), WILL BE INSTALLED TO CROSS MINOR OR INTERMEDIATE STREAMS. TIMBER MATS SHALL BE USED TO CROSS SMALLER STREAMS WHERE THE SPAN OF THE MAT WILL STRETCH FROM BANK TO BANK. CLEAN ROCK FILL AND FLUMED CROSSINGS WILL BE UTILIZED WHERE IT IS NOT FEASIBLE TO UTILIZE TIMBER MATS. AS AN ALTERNATIVE, PORTABLE BRIDGES MAY BE USED INSTEAD FOR SMALL CROSSINGS. EQUIPMENT WILL NOT BE ALLOWED TO FORD FLOWING STREAMS DURING CONSTRUCTION ACTIVITIES. TEMPORARY ROAD CROSSINGS OF STREAMS MUST MAINTAIN FOR ADEQUATE FLOW DOWNSTREAM.

STREAM BANK STABILIZATION: PERMANENT STABILIZATION SHALL OCCUR IMMEDIATELY UPON INSTALLATION, BACKFILLING, AND GRADING AT EACH STREAM CROSSING.

LEGEND

- CLEAN WATER DIVERSION DIKE (SEE DETAIL MVP-ES50 AND MVP-ES51)
- STREAM
- US FOREST SERVICE (NATIONAL FOREST) LANDS
- APPALACHIAN NATIONAL SCENIC TRAIL
- EXISTING ROAD/TRAIL
- EXISTING PROPERTY LINE
- EXISTING STATE LINE
- EXISTING COUNTY LINE
- POND
- WETLAND
- ACID FORMING MATERIAL
- AGRICULTURAL LAND USE BOUNDARY
- PROPOSED LIMIT OF DISTURBANCE
- PROPOSED ACCESS ROAD CENTERLINE
- PROPOSED PIPELINE
- PROPOSED SILT FENCE
- PROPOSED SUPER SILT FENCE (SEE DETAIL MVP-ES9.2)
- PROPOSED REINFORCED FILTRATION DEVICE (SEE DETAILS MVP-ES9, 9.1, 9.2, 9.3)
- ORANGE CONSTRUCTION SAFETY FENCE
- PROPOSED 12" COMPOST FILTER SOCK (SEE DETAILS MVP-ES3, 3.1, 3.2)
- PROPOSED 18" COMPOST FILTER SOCK (SEE DETAILS MVP-ES3, 3.1, 3.2)
- PROPOSED 24" COMPOST FILTER SOCK (SEE DETAILS MVP-ES3, 3.1, 3.2)
- GRASS-LINED CHANNEL (SEE DETAIL MVP-ES39)
- CLEAN WATER DIVERSION PIPE
- TIMBER MAT (SEE DETAIL MVP-ES37)
- STEEP SLOPE EROSION CONTROL (SEE NOTE 2)
- STEEP SLOPE AREAS (SEE NOTE 4)
- PROPOSED ROCK CONSTRUCTION ENTRANCE
- PROPOSED TRENCH BREAKER (SEE DETAIL MVP-20)
- TEMPORARY ROW DIVERSION/WATER BAR (VADEQ STD & SPEC 3.11)
- PERMANENT SLOPE BREAKER/ROW DIVERSION/WATER BAR (SEE DETAILS MVP-17, ES38, AND SCHEDULE)

NOTES:

- TOPSOIL SEGREGATION WILL BE PERFORMED IN ALL-CONSTRUCTION AREAS OF THE PROJECT IN ACCORDANCE WITH DETAIL MVP-ES46.1 THROUGH MVP-ES46.3.
- FLEX TERRA, EARTHGUARD OR EQUIVALENT MAY BE USED AS A SUBSTITUTE TO EROSION CONTROL BLANKET AS DIRECTED BY MVP.
- CONTRACTOR IS RESPONSIBLE TO IDENTIFY ALL UTILITIES. THE UTILITY LINES SHOWN ON THE PLAN ARE FOR INFORMATIONAL PURPOSES ONLY AND DO NOT REPRESENT SURVEYED LINE INFORMATION.
- SLOPES OF 30' OR GREATER EXIST. CONSTRUCTION FOR STEEP SLOPES TO BE PERFORMED USING STEEP SLOPE TECHNIQUES IDENTIFIED IN THE DETAIL SHEETS. ALSO REFER TO THE SITE-SPECIFIC DESIGN OF STABILIZATION MEASURES IN SELECTED HIGH-HAZARD PORTIONS OF THE ROUTE OF THE PROPOSED MOUNTAIN VALLEY PIPELINE PROJECT.
- WHERE CONSTRUCTION CONDITIONS PRECLUDE THE USE OF DIVERSION DITCHES DUE TO SITE CONDITIONS THE CONTRACTOR WILL INSTALL SILT FENCE AT THE DIRECTION OF MVP.
- IMPROVEMENTS TO PERMANENT AND TEMPORARY ACCESS ROADS WILL BE PERFORMED PER THE SITE SPECIFIC ACCESS ROAD DETAILS.
- TEMPORARY ACCESS ROAD CROSSING OF STREAMS AND WETLANDS WILL UTILIZE TIMBERMATS. ANY PERMANENT ROAD CROSSINGS WILL BE CONDUCTED VIA CULVERTS.
- ALL NON VMRC STREAM CROSSINGS WILL BE PERFORMED AS DESCRIBED IN THE STREAM CROSSING TABLE INCLUDED IN THIS PACKAGE.

ADDED DETAILS FOR ROADS AND PADS		DW	RE	KAL	7
ADDRESS VADEQ COMMENTS		DW	RE	KAL	6
ADDRESS VADEQ COMMENTS		DW	RE	KAL	5
ADDRESS VADEQ COMMENTS		DW	RE	KAL	4
ADDRESS VADEQ COMMENTS		DW	RE	KAL	3
ADDRESS VADEQ COMMENTS		DW	RE	KAL	2
DESCRIPTION:		CHD:	APPD:	DWN:	NO:
DATE:					
REVISIONS:					
MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE					
MOUNTAIN VALLEY PIPELINE, LLC 555 SOUTHPOINTE BOULEVARD, SUITE 200 CANONSBURG, PA 15317					
TETRA TECH complex world   CLEAR SOLUTIONS™ 661 ANDERSEN DRIVE FOSTER PLAZA 7 PITTSBURGH, PA 15220					
GENERAL DETAILS SET					
COMMONWEALTH OF PENNSYLVANIA DAVID J. WALLNER Lic. No. 0402057595 Professional Engineer					
DRAWN BY: KAL					
CHECKED BY: HT					
APPROVED BY: RE					
DATE: 11/28/2017					
SCALE: AS SHOWN					
SHT. NO. 0.23 OF 0.23					