ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

and

DOMINION ENERGY TRANSMISSION, INC.
SUPPLY HEADER PROJECT

Supplemental Filing
October 27, 2017

APPENDIX B

Update to the Construction, Operation, and Maintenance Plan

Dominion Resources Services, Inc.
5000 Dominion Boulevard,
Glen Allen, VA 23060

October 20, 2017

Clyde Thompson
Forest Supervisor
U.S. Forest Service
Monongahela National Forest
200 Sycamore Street
Elkins, WV 26241

Mr. Joby Timm
Forest Supervisor
U.S. Forest Service
George Washington and Jefferson National Forests
5162 Valleypointe Parkway
Roanoke, VA 24019

Re: Atlantic Coast Pipeline, LLC, Atlantic Coast Pipeline Project Construction, Operation, and Maintenance Plan

Dear Mr. Thompson and Mr. Timm,

The enclosed DVD contains a Construction, Operation, and Maintenance (COM) Plan, including referenced attachments, prepared in support of Atlantic Coast Pipeline, LLC's (Atlantic's) proposed Atlantic Coast Pipeline (ACP) Project. This COM Plan is submitted pursuant to Atlantic's amended Application for Transportation and Utility Systems and Facilities on Federal Lands dated April 21, 2017. Atlantic seeks a special use permit to construct and operate an underground natural gas pipeline on National Forest System lands in the Monongahela National Forest (MNF) and George Washington National Forests (GWNF) in connection with the ACP.

The COM Plan addresses issues specific to proposed pipeline crossings of National Forest System lands in the MNF and GWNF, including issues identified by Forest Service staff in scoping comments on the ACP; in comments on draft Resource Reports previously submitted by Atlantic to the Federal Energy Regulatory Commission; in various letters to and meetings with Atlantic; and in Forest Service comments on the previous versions of the COM Plan. The COM Plan additionally incorporates the results of biological and cultural resource surveys and other studies completed on National Forest System lands.

Atlantic looks forward to continued opportunities to work with Forest Service staff on the ACP.

Please contact Mr. Spencer Trichell at (804) 273-3472 or spencer.trichell@dom.com if you have questions regarding the COM Plan. Please direct written responses to:

> Richard Gangle
> Energy Infrastructure Environmental Services
> Dominion Resources Services, Inc.
> 5000 Dominion Boulevard
> Glen Allen, Virginia 23060

Sincerely,

Richard B. Gangle
Environmental Manager, Atlantic Coast Pipeline

Cc (w/enclosures):

> Kent Karriker, Ecosystems Group Leader, Monongahela National Forest
> Todd Hess, Realty Specialist/Special Use Manager, Monongahela National Forest
> Alex Fraught, Lands Program Manager, George Washington National Forest
> Jennifer Adams, Special Projects Coordinator, U.S. Forest Service
> Spencer Trichell, Dominion

Enclosure:

> DVD containing the COM Plan and associated attachments

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE
Docket Nos. CP15-554-000
CP15-554-001

Construction, Operations, and Maintenance Plan

Prepared by

ERM

Updated Rev 3
October 2017

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LIST OF ACRONYMS AND ABBREVIATIONS

ACP	Atlantic Coast Pipeline
ACRES	Assessment, Cleanup, and Redevelopment Exchange System
ANST	Appalachian National Scenic Trail
AO	Authorized Officer
APE	Area of Potential Effect
Atlantic	Atlantic Coast Pipeline, LLC
ATWS	Additional Temporary Workspace
BA	biological assessment
BFM	bonded fiber matrix
BIC	Best in Class
Blocking Plan	OHV Blocking Plan
BMP	best management practice
BRP	Blue Ridge Parkway
BSRF	Belted Silt Retention Fence
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CM	Compliance Monitors
COM	Construction, Operation, and Maintenance
CP	cathodic protection
CPCN	Certificate of Public Convenience and Necessity
DEQ	Department of Environmental Quality
Dominion	Dominion Energy, Inc.
Dominion Energy	Dominion Energy Transmission, Inc.
DTI	Dominion Energy Services, Inc.
Duke Energy	Duke Energy Corporation
E&S	Erosion and Sediment Control
ECC	Environmental Construction Coordinator
EI	Environmental Inspector
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ERP	Emergency Response Plan
ESCP	Erosion and Sedimentation Control Plan
FERC PM	FERC Environmental Project Manager
FERC	Federal Energy Regulatory Commission
FS	Forest Service
FT	Forest Trail
Ft. /sec.	feet per second
FWS	U.S. Fish and Wildlife Service
GAI	GAI Consultants, Inc.
GPS	global positioning system
GWNF	George Washington National Forest1
HDD	horizontal directional drill
HDPE	High-density polyethylene
LOD	Limits of Disturbance

[1] George Washington National Forest refers to the northern portion of the George Washington & Jefferson National Forests throughout this document. Originally two separate national forests, the George Washington & Jefferson National Forests were administratively combined in 1995 and are administered as a single national forest unit.

LRMP	Land and Resource Management Plans
LUST	Leaking Underground Storage Tank
MNF	Monongahela National Forest
MP	Milepost
NFS	National Forest System
NNIS	Non-Native Invasive Species
NPS	National Park Service
NTP	Notice to Proceed
NTU	Nephelometric Turbidity Units
OHV	Off-Highway Vehicle[2]
OPS	Office of Pipeline Safety
Piedmont	Piedmont Natural Gas Co., Inc.
Plan	Upland Erosion Control, Revegetation, and Maintenance Plan
PPV	peak particle velocity
Procedures	Wetland and Waterbody Construction and Mitigation Procedures
Projects	Atlantic Coast Pipeline and Supply Header Project
RQ	reportable quantities
SPCC	Spill Prevention, Control, and Countermeasure
SUP	Special Use Permit
Survey	Soil Survey
SWP	small whorled pogonia
SWPPP	Storm Water Pollution Prevention Plan
TES	threatened and endangered species
TMDL	Total Maximum Daily Load
Transportation Plan	Traffic and Transportation Plan
TSCO	Timber Sale Contracting Officer
UDP	Unanticipated Discoveries Plan for Cultural Resources and Human Remains Policy
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USDA	United States Department of Agriculture
USDOT	U.S. Department of Transportation
UTV	Utility Task Vehicle
VAC	Virginia Code
VDEQ	Virginia Department of Environmental Quality
VDOT	Virginia Department of Transportation
VESCH	Virginia Erosion and Sediment Control Handbook
WVDOT	West Virginia Department of Transportation

[2] Off-Highway Vehicle (OHV) in this document refers generally to all types of motorized off-highway vehicles, including both street-legal and non-street-legal full-sized vehicles, motorcycles, all-terrain vehicles Utility Task Vehicles (UTV), etc.

1.0 INTRODUCTION

1.1 BACKGROUND

Atlantic Coast Pipeline, LLC (Atlantic) is a company formed by four major U.S. energy companies – Dominion Energy, Inc. (Dominion; NYSE: D), Duke Energy Corporation (Duke Energy; NYSE: DUK), Piedmont Natural Gas Co., Inc. (Piedmont; NYSE: PNY), and Southern Company Gas (NYSE: GAS). [3] The company was created to develop, own, and operate the proposed Atlantic Coast Pipeline (ACP), an approximately 600-mile-long, interstate natural gas transmission pipeline system designed to meet growing energy needs in Virginia and North Carolina. Atlantic has contracted with Dominion Energy Transmission, Inc. (Dominion Energy), a subsidiary of Dominion, to permit, build, and operate the ACP on behalf of Atlantic.

The ACP will serve the growing energy needs of multiple public utilities and local distribution companies in Virginia and North Carolina. Based on current customer commitments, approximately 79.2 percent of the natural gas transported by the ACP will be used as a fuel to generate electricity for industrial, commercial, and residential uses. The remainder of the natural gas will be used directly for residential (9.1 percent), industrial (8.9 percent), and commercial and other uses such as vehicle fuel (2.8 percent). By providing access to low-cost natural gas supplies, the ACP will increase the reliability and security of natural gas supplies in Virginia and North Carolina.

An environmental impact statement (EIS) has been prepared for the Project by the Federal Energy Regulatory Commission (FERC), which has jurisdiction over the project under Section 7 of the Natural Gas Act. The FERC was responsible for the preparation of the Project's EIS in compliance with the Council on Environmental Quality regulations for implementing the National Environmental Policy Act (40 Code of Federal Regulations [CFR] Parts 1500-1508), and FERC's National Environmental Policy Act implementing regulations (18 CFR Part 380). The FERC will use the EIS to aid in deciding whether to issue the ACP a Certificate of Public Convenience and Necessity (CPCN). The U.S. Department of Agriculture's Forest Service (FS), along with several other federal agencies, cooperated with the FERC in preparing the EIS for the Project, and will use the EIS to aid in its own decision-making process, as discussed below. A complete list of federal, state/commonwealth, and local permits is included as Attachment N.

FERC, in consultation with the State Historic Preservation Officers, is also responsible for compliance with Section 106 of the National Historic Preservation Act (16 U.S. Code [USC] § 470f) and its implementing regulations (36 CFR Part 800) promulgated by the Advisory Council on Historic Preservation.

FERC, in consultation with the U.S. Fish and Wildlife Service (FWS), is also the lead federal agency responsible for compliance with Sections 7(a)(2) and 7(c) of the Endangered Species Act (16 USC §§ 1536(a)(2), 1536(c)). FERC will prepare a biological assessment (BA) consistent with the requirements of 50 CFR § 402.12(f). The BA will identify conservation measures to avoid or minimize any adverse effects the Project may have on federally listed species and their critical habitat.

Portions of the Project would cross National Forest System (NFS) lands administered by the Monongahela National Forest (MNF) and George Washington National Forest (GWNF)[4] (see

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[3] On August 24, 2015, Southern Company and AGL Resources announced that the boards of directors of both companies approved a definitive merger agreement. Pursuant to the agreement, AGL Resources will become a new wholly owned subsidiary of Southern Company. The companies announced completion of this transaction on July 1, 2016.

[4] Since 1995, the GWNF in central western Virginia and the Jefferson National Forest in southwestern Virginia have been administratively combined as the single George Washington & Jefferson National Forests, managed by a single Forest Supervisor.

Figure 1.1-1). Accordingly, Atlantic submitted an Application for Transportation and Utility Systems and Facilities on Federal Lands (Form SF-299) on November 12, 2015. Atlantic amended its application to incorporate various route changes on July 29, 2016, and amended its application again on April 21, 2017 to reduce the proposed permanent right-of-way width to 50 feet.[5]

The ACP's proposed route does not lie within a GWNF-designated utility corridor. The GWNF will determine whether to amend the Land and Resource Management Plans (LRMP) to exempt the ACP right-of-way from being designated as a utility corridor. Several other project-specific amendments to LRMPs for both the MNF and the GWNF are being considered; these are noted in the relevant Construction, Operation, and Maintenance (COM) Plan section. The FS must also decide whether to authorize granting a Special Use Permit (SUP) to construct and operate the pipeline facilities on NFS lands. The COM Plan specifies the terms under which the SUP would be granted. The COM Plan is intended to be appended to the SUP.

The COM plan is intended to satisfy the Mineral Leasing Act of 1920's requirement that "the Secretary or agency head, prior to granting a right-of-way or permit pursuant to this section for a new project which may have a significant impact on the environment, will require the applicant to submit a plan of construction, operation, and rehabilitation for such right-of-way or permit which will comply with this section. The Secretary or agency head will issue regulations or impose stipulations which will include, but will not be limited to: (A) requirements for restoration, revegetation, and curtailment of erosion of the surface of the land; (B) requirements to insure that activities in connection with the right-of-way or permit will not violate applicable air and water quality standards nor related facility siting standards established by or pursuant to law; (C) requirements designed to control or prevent (i) damage to the environment (including damage to fish and wildlife habitat), (ii) damage to public or private property, and (iii) hazards to public health and safety; and (D) requirements to protect the interests of individuals living in the general area of the right-of-way or permit who rely on the fish, wildlife, and biotic resources of the area for subsistence purposes. Such regulations will be applicable to every right-of-way or permit granted pursuant to this section, and may be made applicable by the Secretary or agency head to existing rights-of-way or permits, or rights-of-way or permits to be renewed pursuant to this section,"(30 USC 185(h)(2). The COM Plan would be attached to and made part of an SUP to construct, operate, maintain, and terminate the ACP project on NFS lands.

This COM Plan provides detailed information on requirements and standards only for the ~19.9 miles of the ACP that is on NFS lands. It does not apply on non-NFS lands. The COM Plan is also the repository and reference for new and amended permits, approvals, clearances, and plans that may be issued during the planning, construction and operation of the portion of the Project on NFS lands. During the planning and building of the ACP, changes to the COM Plan may be warranted. In consultation with the Authorized Officer (AO; see Section 3.6.2), the COM plan will be updated throughout the term of such authorization(s) as needed to reflect any necessary changes or adjustments to the plan.

5 Atlantic submitted a separate application to the National Park Service (NPS) for a right-of-way across NPS-administered Blue Ridge Parkway lands.

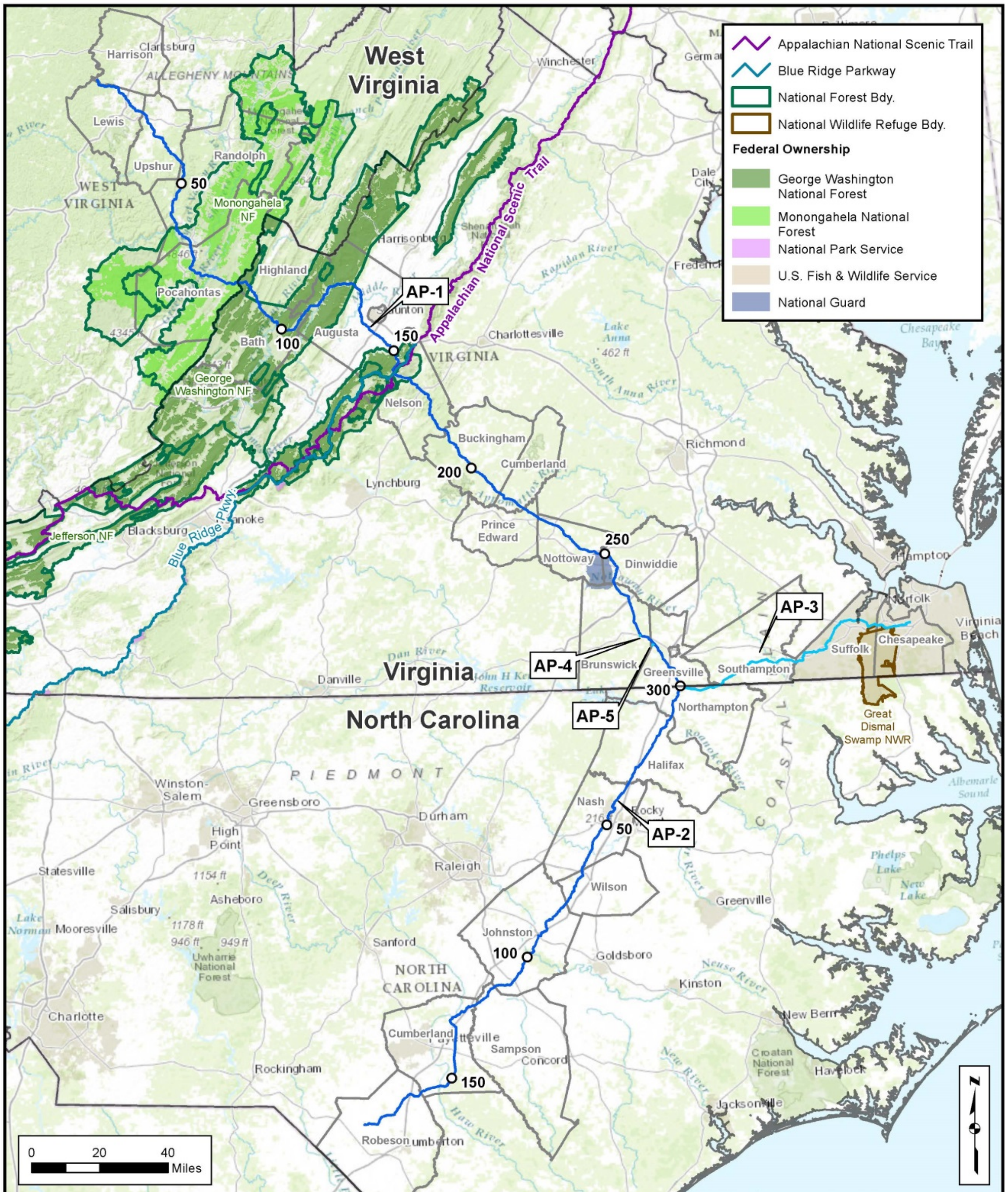

Figure 1.1-1
Atlantic Coast Pipeline
Project Location

FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\National_Forests\COM\COM_Figures_acp_com_general_location.mxd, REVISED: 01/23/2017, SCALE: 1:2,500,000 DRAWN BY: NRG GIS

2.0 PROJECT DESCRIPTION

The following ACP project description encompasses the entire project (i.e. portions of the Project that lie on both NFS and non-NFS lands):

Mainline Pipeline Facilities:

- AP-1: approximately 333 miles of underground 42-inch outside diameter natural gas transmission pipeline in Harrison, Lewis, Upshur, Randolph, and Pocahontas Counties, West Virginia; Highland, Bath, Augusta, Nelson, Buckingham, Cumberland, Prince Edward, Nottoway, Dinwiddie, Brunswick, and Greensville Counties, Virginia; and Northampton County, North Carolina. All of the mainline pipeline facilities that are on NFS lands are AP-1.
- AP-2: approximately 186 miles of underground 36-inch outside diameter natural gas transmission pipeline in Northampton, Halifax, Nash, Wilson, Johnston, Sampson, Cumberland, and Robeson Counties, North Carolina.

Lateral Pipeline Facilities:

- AP-3: approximately 83 miles of underground 20-inch outside diameter natural gas lateral pipeline in Northampton County, North Carolina; and Greensville and Southampton Counties and the Cities of Suffolk and Chesapeake, Virginia.
- AP-4: approximately 0.4 mile of underground 16-inch outside diameter natural gas lateral pipeline in Brunswick County, Virginia.
- AP-5: approximately 1 mile of underground 16-inch outside diameter natural gas lateral pipeline in Greensville County, Virginia.

Compressor Station Facilities:

- Compressor Station 1 (Marts Compressor Station): a new, natural gas-fired compressor station at approximately Milepost [6] (MP) 7.5 of the AP-1 mainline in Lewis County, West Virginia.
- Compressor Station 2 (Buckingham Compressor Station): a new, natural gas-fired compressor station at approximately MP 191.5 of the AP-1 mainline in Buckingham County, Virginia.
- Compressor Station 3 (Northampton Compressor Station): a new natural gas-fired compressor station at approximately MP 300.1 of the AP-1 mainline and MP 0.0 of the AP-2 mainline and 0.0 of the AP-3 lateral in Northampton County, North Carolina.

[6] The mileposts used in the initial FERC Application, which was filed on September 18, 2015 (FERC Accession Number 20150918-5212), were based on three-dimensional changes in topography along the proposed pipeline routes. In areas where a pipeline route has changed due to the adoption of an alternative, the mileposts in the affected area have been scaled to account for the resulting difference in the length of the route. For these reasons, the straight-line distance between consecutive mileposts as indicated or depicted in tables and figures in this updated Resource Report may be greater than or less than 5,280 feet. The mileposts should be considered as reference points only.

Other Aboveground Facilities:

- Nine new metering and regulating stations at receipt and/or delivery points along the new pipelines (including one at Compressor Station 1 and one at Compressor Station 2).

- Forty-one valve sites at select points along the new pipelines at intervals specified by U.S. Department of Transportation (USDOT) regulations at Title 49 CFR Part 192.

- Eleven sets of pig launcher and/or receiver sites at 11 sites along the new pipelines (including launcher/receiver sites at Compressor Stations 2 and 3).

2.1 FACILITIES ON NATIONAL FOREST SYSTEM LANDS

This COM Plan applies only to NFS lands crossed by the ACP. On NFS lands, the ACP consists of approximately 19.9 miles of 42-inch, buried steel pipe across portions of the MNF and GWNF. The pipeline route crosses the MNF for a total of 5.2 miles, all within the Marlinton Ranger District. It crosses the GWNF for a total of 14.7 miles in the Warm Springs, North River, and Glenwood & Pedlar Ranger Districts, in Virginia. No compressor stations, meter and regulating stations, pig launcher/receivers, mainline valves or other major above-ground facilities are proposed on NFS lands. Minor appurtenant facilities on NFS lands include pipeline markers and cathodic protection (CP) test stations.

Pipeline markers will be installed at road and rail and trail crossings, and at other areas as deemed necessary to alert the public to the line’s presence. Outside of NFS lands, larger aerial markers will be installed in the permanent right-of-way at periodic intervals to facilitate aerial surveillance during operation of the pipeline system. No aerial markers will be installed on NFS lands.

Installation of a CP system is necessary to protect the pipe from corrosion, and is required by USDOT pipeline safety regulations. The CP system for the ACP utilizes a number of anode beds installed perpendicular to the right-of-way; none of these will be located on NFS lands. The CP system also requires the installation of CP test stations, which consist of small-diameter plastic stand-pipes holding wires attached to the pipes, at periodic intervals, usually at road crossings next to the pipeline marker. Some CP test stations will be installed on NFS lands. Atlantic will coordinate with the FS regarding the locations of CP test stations prior to installation.

Construction of the ACP requires the use of existing FS roads for access to the right-of-way. Some of these roads will require improvements, ranging from light grading and graveling of existing road prisms, to widening at certain locations to accommodate pipe and log trucks. A number of new roads will also be required. Once the pipeline is installed, these same roads will be used to access the right-of-way for operations and maintenance purposes. Roads to be used for ACP purposes, including new and existing roads, and existing roads that will require improvements, are shown in Table 2.1.1-2.

2.1.1 Land Requirements

On NFS lands, Atlantic proposes to utilize a nominal 125-foot-wide construction right-of-way for installation of the 42-inch pipeline, with a 40-foot-wide spoil side and an 85-foot-wide working side. For most pipeline construction activities, this right-of-way width would accommodate large equipment, pipe stringing and set up, welding, the trench, and the temporary storage of topsoil and trench spoil.

Additional temporary workspace (ATWS) is proposed on NFS lands at certain locations, such as road crossings, and where additional spoil or topsoil storage, log landings or equipment staging is needed.

Accordingly, the total width of the construction right-of-way will exceed the nominal 125 foot width in these areas. Conversely, the nominal 125-foot construction right-of-way width is proposed to be reduced to 75 feet in wetlands and certain other ecologically sensitive areas. At certain areas where topsoil is segregated (see Section 2.1.4) an additional 25 feet of ATWS is required for topsoil stockpiling.

Typical right-of-way configurations are provided in Attachment A. The alignment sheets (provided in Attachment B) give the exact dimensions of the proposed construction right-of-way, including ATWS, on NFS lands.

On NFS lands, Atlantic proposes a 50-foot-wide permanent right-of-way for operating purposes. A 10-foot strip centered over the pipeline will be maintained in an herbaceous state. No permanent access road will be established on or along the right-of-way. All construction work areas and the permanent right-of-way will be restored in accordance with the Restoration and Rehabilitation Plan (Section 11) and the Visual Resources Plan (Section 21).

The ACP will mostly use existing FS roads to access the pipeline right-of-way. A number of new roads would be required. Several existing, unnumbered roads that will be used are not part of the FS road system, and so are considered new roads in this COM Plan. Section 2.1.3 provides more details about access roads proposed to construct and operate the pipeline.

Most of the existing FS roads to be utilized for construction purposes will require minor grading and graveling and/or widening to accommodate construction vehicles. Most roads utilized for construction would also be used to access the permanent right-of-way for operation and maintenance purposes. Table 2.1.1-1 below shows the acreage directly affected on the MNF and GWNF for the construction right-of-way, the permanent right-of-way, and access roads.

TABLE 2.1.1-1

Summary of National Forest System Lands Directly Affected by the Atlantic Coast Pipeline (acres)

National Forest	Permanent right-of-way (50' width)	Temporary Workspace, including Additional Temporary Workspace	Total Construction ROW	Access Roads (as is or with improvements)[7]	Access Roads (new)
Monongahela National Forest	30.9	51.0	81.9	29.0	1.8
George Washington National Forest	98.3	147.7	246.0	53.7	5.4
Total	**129.2**	**198.7**	**327.9**	**82.7**	**7.2**

[7] Includes existing roadway, assumes 30' width

TABLE 2.1.1-2

Atlantic Coast Pipeline Access Roads on NFS Lands[8]

Forest Road No.	Project Access Road Name	Mile-post	County	State	New/ Existing	Improve - ments	National Forest	Area Affected by Construction and Operations (acres)	Length (miles)	Needed for O&M	Width of Road ROW (ft)[9]	Cultural/Bio Survey status[10]
New road connecting MNF road 1026 and right-of-way	05-001-C009.AR2	71.7	Pocahontas	WV	New	N/A	MNF	0.2	0.1	Yes	15	Complete
MNF Road 1026 (Buzzard Ridge Road)	05-001-C009.AR1	71.7	Pocahontas	WV	Exist	Yes	MNF	13.9	3.8	Yes	30	Complete
MNF Road 1012 (Sugar Camp Road)	05-001-E064.AR1	81.8	Pocahontas	WV	Exist	Yes	MNF	4.8	1.3	Yes	30	Complete
New road connecting MNF Road 1012 (Sugar Camp Road) and right-of-way	05-001-E064.AR1	81.8	Pocahontas	WV	New	N/A	MNF	1.5	0.4	Yes	30	Complete
MNF Road 1017 (Upper Shock Run Road)	05-001-E064.AR3	83.3	Pocahontas	WV	Exist	Yes	MNF	0.1	0.0	Yes	30	Complete
MNF Road 55 (Allegheny Road)	05-001-E064-AR2	83.3 to 83.8	Pocahontas	WV	Exist	Yes	MNF	10.2	2.8	Yes	30	Complete
New road along an existing un-numbered road between Highway 84 and right-of-way	06-001-B001.AR3	85.0	Highland	VA	New	N/A	GWNF	0.6	0.2	Yes	30	Complete
New Road	06-001-B001-AR7	85.3	Highland	VA	New	N/A	GWNF	1.8	0.5	Yes	30	Complete
New road along an existing un-numbered road between Highway 84 and right-of-way	06-001-B001.AR4	85.4	Highland	VA	New	N/A	GWNF	0.4	0.1	Yes	30	Complete
New Road	06-001-B001-AR5	86.4	Highland	VA	New	Yes	GWNF	0.2	<0.1	Yes	30	Complete
GWNF Road 124	36-014.AR2	93.6	Bath	VA	New/Exist	Yes	GWNF	19.1	5.3	Yes	30	Complete
GWNF Road 281 (Campbell Hollow Road)	36-016.AR1	96.3	Bath	VA	Exist	Yes	GWNF	10.1	2.8	Yes	30	Complete
GWNF Road 309	36-016.AR2	99.6	Bath	VA	Exist	Yes	GWNF	2.0	0.6	Yes	30	Complete
GWNF Road 348.1	07-001.A009-AR1	116.5	Augusta	VA	Exist	Yes	GWNF[11]	<0.1	<0.1			

8 Note that an access road that had been designated as #36-014.AR3, along Laurel Run, is no longer on the table; it is no longer proposed for Project use.

9 Estimated. Final width subject to as-built surveys.

10 Fall botanical surveys may be required for some access roads.

TABLE 2.1.1-2

Atlantic Coast Pipeline Access Roads on NFS Lands[8]

Forest Road No.	Project Access Road Name	Mile-post	County	State	New/ Existing	Improve - ments	Nation al Forest	Area Affected by Construction and Operations (acres)	Length (miles)	Needed for O&M	Width of Road ROW (ft)[9]	Cultural/Bio Survey status[10]
GWNF Roads 449/449A	07-001.AR1-AR3	116.8	Augusta	VA	Exist	Yes	GWNF	2.4/7.2	0.7/2.0	Yes	30	Complete
New Road connecting GWNF Road 449 and right-of-way.	07-001.AR1-AR 4	117.2	Augusta	VA	New	Yes	GWNF	0.1	<0.1	Yes	30	Complete
New road along an existing un-numbered road between GWNF Road 449A and right-of-way	07-001.AR1-AR 6	118.0	Augusta	VA	New	N/A	GWNF	0.9	0.3	Yes	30	Complete
GWNF Road 466A	07-001.AR1-AR 8	120.2	Augusta	VA	Exist	Yes	GWNF	1.1	0.3	No	30	Complete
GWNF Road 466	07-001.AR1-AR 9	120.4	Augusta	VA	Exist	Yes	GWNF	2.0	0.6	Yes	30	Complete
GWNF Road 1755	07-001.AR1-AR 7	121.1	Augusta	VA	New	Yes	GWNF	1.4	0.4	Yes	30	Complete
GWNF Road 1755	07-001.AR1.AR1	121.2	Augusta	VA	Existing	Yes	GWNF	9.6	2.6	Yes	30	Complete
GWNF Road 1757	07-001 AR1-AR2	122.9	Augusta	VA	Existing	Yes	GWNF	0.2	0.1	Yes	30	Complete

[11] Access Road 07-001.A009-AR1 may lie entirely outside GWNF. Intersection of access road and right-of-way lies at property boundary.

2.1.2 Construction Schedule

Subject to receipt of the required permits and regulatory approvals, initial construction activities (e.g., timber removal, preparation of contractor yards and access roads) are expected to begin in November 2017. The ACP pipeline will be built along 17 spreads, five of which lie on NFS lands. It is anticipated that all facilities will be placed in service by the fourth quarter of 2019. Key milestone dates for the construction schedule are summarized in Table 2.1.1-3.

Construction on the MNF will span two spreads. Spread 3 crosses the MNF for about 0.8 mile, north of Cloverlick Mountain. Initial site preparation on Spread 3 is scheduled to begin in September 2018. Timber removal[12] is scheduled to begin in November 2018, with pipeline construction to commence in April 2019.

Spread 3A crosses the MNF for about 4.4 miles between Michael Mountain and the Virginia border. Timber removal on Spread 3A is scheduled for November 2017. Pipeline construction is scheduled to commence in April 2018.

Construction on the GWNF will span four spreads. Spread 3A, which also lies on the MNF, crosses the GWNF for about 4 miles just east of the West Virginia-Virginia border, where the GWNF abuts the MNF. As indicated above, timber removal on this spread is scheduled for November 2017 and pipeline construction is scheduled to commence in April 2018.

Spread 4 crosses the GWNF for about 3.8 miles in Highland and Bath counties, Virginia. Initial site preparation on Spread 4 is scheduled to begin in September 2018. Timber removal is scheduled to begin in November 2018, with pipeline construction to commence in April 2019.

Spread 4A crosses the GWNF for about 6.9 miles in Augusta County. Timber removal is scheduled to begin in November, 2017. Pipeline construction is scheduled to start in April 2018.

Spread 5 crosses the GWNF for about 1.3 miles in the vicinity of the Mt. Torrey Furnace and the Appalachian National Scenic Trail in Augusta County. The horizontal directional drill crossing of the Appalachian National Scenic Trail and Blue Ridge Parkway, which lies within Spread 5, is scheduled to be constructed from March to September 2018. Timber may be cleared from the horizontal directional drilling (HDD) entry and exit sites in late 2017. For the rest of Spread 5, initial site preparation is scheduled to begin in September 2018, with timber removal beginning in November 2018, and pipeline construction commencing in February 2019.

In both National Forests, vegetation pre-clearing (timber felling and mowing) is planned to be completed prior to the beginning on the migratory bird nesting season (April 1 in West Virginia, and March 15 in Virginia). Figure 2.1-1 shows the locations and scheduled start dates of construction spreads in and near the MNF and GWNF.

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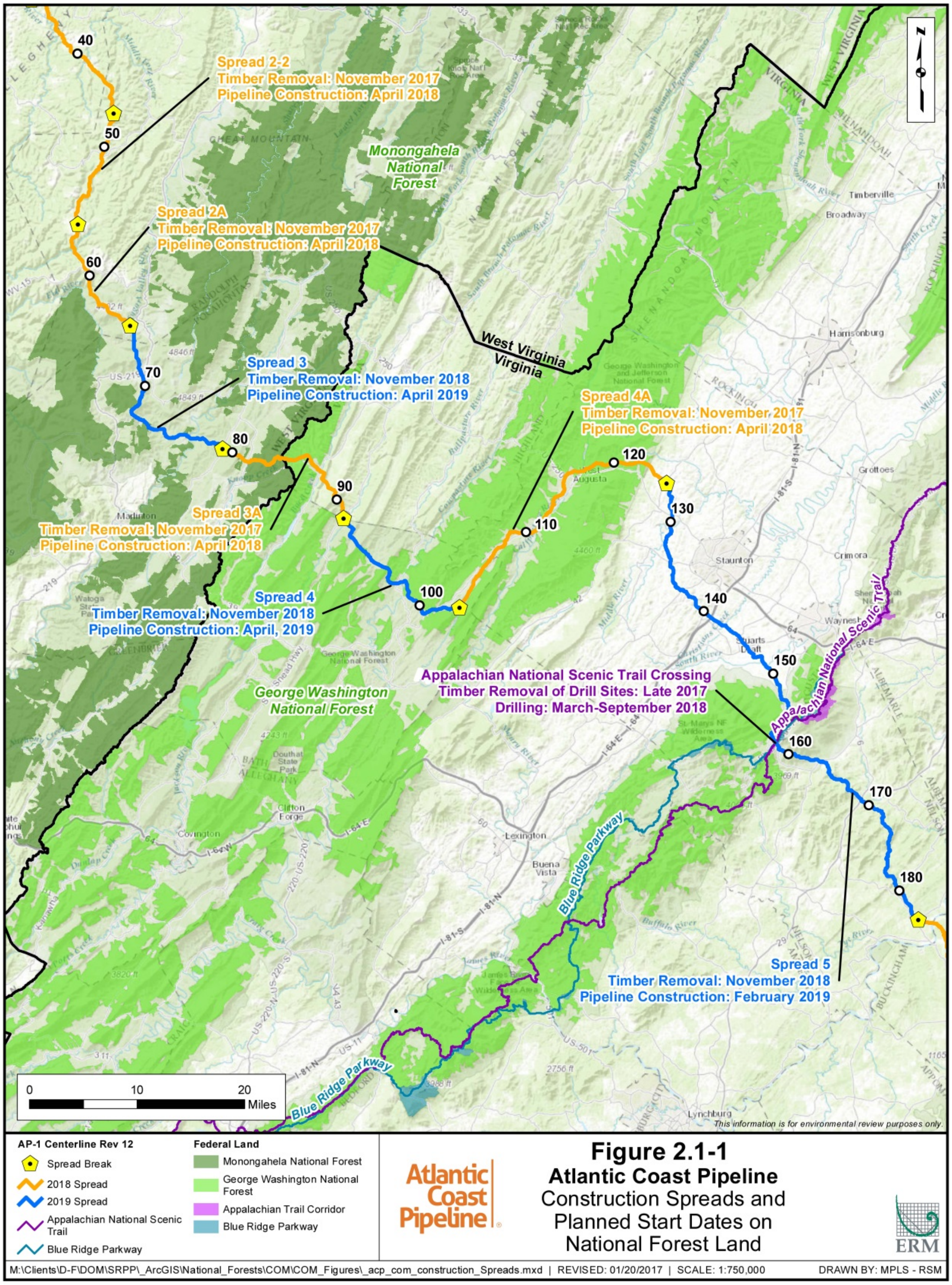
[12] Throughout the COM Plan “timber removal” is used to describe the entire merchantable timber logging process, from felling to removal of the logs from the right-of-way.


Spread 2-2
Timber Removal: November 2017
Pipeline Construction: April 2018
Spread 2A
Timber Removal: November 2017
Pipeline Construction: April 2018
Spread 3
Timber Removal: November 2018
Pipeline Construction: April 2019
Spread 3A
Timber Removal: November 2017
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Monongahela National Forest
George Washington National Forest
West Virginia
Virginia
Blue Ridge Parkway
Appalachian National Scenic Trail
Staunton
Harrisonburg
Lexington
Buena Vista
Lynchburg
Covington
This information is for environmental review purposes only.
0 10 20 Miles
AP-1 Centerline Rev 12
Spread Break
2018 Spread
2019 Spread
Appalachian National Scenic Trail
Blue Ridge Parkway
Federal Land
Monongahela National Forest
George Washington National Forest
Appalachian Trail Corridor
Blue Ridge Parkway
Atlantic Coast Pipeline
Figure 2.1-1
Atlantic Coast Pipeline
Construction Spreads and Planned Start Dates on National Forest Land
ERM
M:\Clients\D-F\DOM\SRPP_ArcGIS\National_Forests\COM\COM_Figures_acp_com_construction_Spreads.mxd | REVISED: 01/20/2017 | SCALE: 1:750,000
DRAWN BY: MPLS - RSM

TABLE 2.1.1-3

Construction Schedule by Spread for the Atlantic Coast Pipeline and Supply Header Project [a]

Spread	Approximate Mileposts	Counties/Cities and States/Commonwealths	Begin Construction	Finish Construction [d]
ATLANTIC COAST PIPELINE				
Initial Construction Activities				
Initial Site Preparation (2018 spreads)	By spread	See below	November 2017	1Q 2018
Tree Clearing (2018 spreads) [b, c]	By spread	See below	November 2017	1Q 2018
Initial Site Preparation (2019 spreads)	By spread	See below	September 2018	1Q 2019
Tree Clearing (2019 spreads) [b, c]	By spread	See below	November 2018	1Q 2019
Construction of Pipeline				
Spread 1-1 (AP-1)	0.0–17.2	Harrison, and Lewis Counties, WV	April 2019	4Q 2019
Spread 1-2 (AP-1)	17.2–31.6	Lewis and Upshur Counties, WV	April 2019	4Q 2019
Spread 2-1 (AP-1) [f]	31.6–47.3	Upshur and Randolph Counties, WV	April 2018	4Q 2018
Spread 2-2 (AP-1) [f]	47.3–56.1	Randolph County, WV	April 2018	4Q 2018
Spread 2A (AP-1) [f]	56.1–65.4	Randolph County, WV	April 2018	4Q 2018
Spread 3 (AP-1)	65.4–79.2	Randolph and Pocahontas Counties, WV	April 2019	4Q 2019
Spread 3A (AP-1) [f]	79.2–91.3	Pocahontas County, WV and Highland County, VA	April 2018	4Q 2018
Spread 4 (AP-1)	91.3–103.1	Highland and Bath Counties, VA	April 2019	4Q 2019
Spread 4A (AP-1) [f]	103.1–125.9	Bath and Augusta Counties, VA	April 2018	4Q 2018
Spread 5 (AP-1) [g]	125.9–183.3	Augusta and Nelson Counties, VA	February 2019	4Q 2019
Spread 6 (AP-1) [g]	183.3–239.6	Nelson, Buckingham, Cumberland, Prince Edward, and Nottoway Counties, VA	February 2018	4Q 2018
Spread 7 (AP-1)	239.6–300	Nottoway, Dinwiddie, Brunswick, and Greensville Counties, VA, and Northampton County, NC	February 2019	4Q 2019
Spread 8 (AP-2)	0.0–61.6	Northampton, Halifax, and Nash Counties, NC	February 2018	4Q 2018
Spread 9 (AP-2)	61.6–125.0	Nash, Wilson, Johnston, Sampson, and Cumberland Counties, NC	February 2019	4Q 2019
Spread 10 (AP-2)	125.0–183.0	Cumberland and Robeson Counties, NC	February 2018	4Q 2018
Spread 11 (AP-3)	0.0–83.0	Northampton County, NC, Greensville and Southampton Counties, VA, and the Cities of Suffolk and Chesapeake, VA	February 2018	4Q 2018
Spread 12 (AP-4; AP-5) [e]	0.0–0.4; 0.0–1.1	Brunswick County, VA; Greensville County, VA	February 2018	4Q 2018
Construction of Compressor Stations				
Compressor Station 1	7.6	Lewis County, WV	November 2017	4Q 2019
Compressor Station 2	191.5	Buckingham County, VA	November 2017	4Q 2019
Compressor Station 3	300.1	Northampton County, NC	November 2017	4Q 2019
Construction of Metering and Regulating Stations				
Kincheloe	7.6	Lewis County, WV	November 2017	4Q 2019
Long Run	47.2	Randolph County, WV	April 2018	4Q 2019
Woods Corner	191.5	Buckingham County, VA	November 2017	4Q 2019
Smithfield	92.7	Johnston County, NC	November 2017	3Q 2019
Fayetteville	132.9	Johnston County, NC	February 2018	3Q 2019

TABLE 2.1.1-3

Construction Schedule by Spread for the Atlantic Coast Pipeline and Supply Header Project [a]

Spread	Approximate Mileposts	Counties/Cities and States/Commonwealths	Begin Construction	Finish Construction [d]
Pembroke	183.0	Robeson County, NC	March 2018	3Q 2019
Elizabeth River	83.0	City of Chesapeake, VA	April 2018	3Q 2019
Brunswick	0.4	Brunswick County, VA	January 2018	3Q 2019
Greensville	1.1	Greensville County, VA	February 2018	3Q 2019
SUPPLY HEADER PROJECT				
Initial Construction Activities				
Initial Site Preparation (Spread 13)	By spread	See below	November 2017	1Q 2018
Tree Clearing (Spread 13) [b, c]	By spread	See below	November 2017	1Q 2018
Initial Site Preparation (Spread 14)	By spread	See below	November 2018	1Q 2019
Tree Clearing (Spread 14) [b, c]	By spread	See below	November 2018	1Q 2019
Construction of Pipeline Spreads				
Spread 13 (TL-635)	0.0–33.6	Wetzel, Doddridge, Tyler, and Harrison Counties, WV	April 2018	4Q 2019
Spread 14 (TL-636)	0.0–3.9	Westmoreland County, PA	January 2019	4Q 2019
Construction of Compressor Station Modifications				
JB Tonkin	0.0	Westmoreland County, PA	February 2018	3Q 2019
Crayne	NA	Greene County, PA	February 2018	3Q 2019
Burch Ridge	NA	Marshall County, WV	April 2019	4Q 2019
Mockingbird Hill	0.0	Wetzel County, WV	February 2018	3Q 2019
M&R Stations				
CNX	NA	Lewis County, WV	January 2019	4Q 2019
Abandonment of Gathering Compressor Units				
Hastings	NA	Wetzel County, WV	January 2019	4Q 2019

[a] The number and timing of the construction spreads are subject to change dependent upon construction and permit requirements.
[b] The start of tree removal is dependent upon the results of the environmental surveys and agency consultations.
[c] Including tree removal for aboveground facilities, access roads, and contractor yards. Tree clearing for construction spreads 1-1, 1-2, 3, 4, Blue Ridge Parkway HDD, and James River HDD will take place in 2018.
[d] The finish construction date refers to the end of mechanical construction; additional restoration and post construction activity is expected to occur in the Project area beyond the timeframe reflected here. 1Q = first quarter; 2Q = second quarter; 3Q = third quarter; 4Q = fourth quarter.
[e] Spread 12 will be completed with spread 11 and is counted as one spread.
[f] Hydrostatic test and remaining cleanup will be completed by the 3Q of 2019.
[g] Blue Ridge Parkway and James River HDDs will be constructed in 2018.

TABLE 2.1.1-4

Construction Schedule on NFS Lands for the Atlantic Coast Pipeline Project

Spread No.	National Forest	Approximate Length On Forest (miles)	Begin Initial Site Preparation	Begin Timber Removal	Begin Pipeline Construction	Finish Pipeline Construction
3	MNF	0.8	Sept. 2018	Nov. 2018	April 2019	4Q 2019
3A	MNF	4.4	Nov. 2017	Nov. 2017	April 2018	4Q 2018
3A	GWNF	4.0	Nov. 2017	Nov. 2017	April 2018	4Q 2018
4	GWNF	3.8	Sept. 2018	Nov. 2018	April 2019	4Q 2019
4A	GWNF	6.9	Nov. 2017	Nov. 2017	April 2018	4Q 2018
5	GWNF	1.2	Sept. 2018	Nov. 2018	Feb. 2019	4Q 2019
5 (ANST Crossing)	GWNF	0.1	Late 2017	Late 2017	March 2018	Sept. 2018

Seasonal Restrictions

Timber Removal/Clearing

Vegetation pre-clearing (tree felling and mowing) on the MNF is scheduled to take place between November 16 and March 31 during the first construction season and November 16 and March 31 and September 1 and March 31 of the second construction season, which will avoid bat roosting and West Virginia's migratory bird nesting seasons, respectively. For any areas of the right-of-way within 5 miles of known Indiana bat hibernacula, no timber removal will occur before November 16. Removal of felled commercial timber from the construction right-of-way will take place after April 1, but could commence earlier if ground conditions permit.

Vegetation pre-clearing (tree felling and mowing) on the GWNF is scheduled to take place between November 16 and March 15 of the first construction season and November 16 and March 31 and September 1 and March 15 of the second construction season, which will avoid bat roosting and Virginia's migratory bird nesting seasons, respectively. For any areas of the right-of-way within 5 miles of known Indiana bat hibernacula, no timber removal will occur before November 16. Removal of felled commercial timber from the construction right-of-way will take place after April 1, but could commence earlier if ground conditions permit.

Surveys for eagles were completed in 2016 via helicopter and no eagle nests were identified on NFS lands. Bald eagles are known to occur year round in areas with suitable habitat along the ACP route; bald eagles nest in late winter into the summer and roost in the winter. Golden eagles are not known to nest in this area, although they do winter roost. If additional bald eagle nests or occupied bald or golden eagle winter roosting habitat are identified ahead of or during construction, Atlantic will follow the National Bald Eagle Management Guidelines for work within 660 feet of bald eagle nests on the GWNF, and within 1500 feet of nesting sites that have been active within the last three nesting seasons on the MNF, as required by MNF Standard W25. Blasting activities during construction will not occur within ½ mile (1 mile in open areas) of any active nest or roosting area, unless an eagle disturbance permit has been received from the FWS. Blasting activities during construction will not occur within ½ mile (1 mile in open areas) of any active nest or roosting area, unless an eagle disturbance permit has been received from the FWS. For tree clearing that occurs during the winter roosting or nesting season, a qualified biological monitor will accompany the clearing crews and search for roosting golden eagles and nesting bald eagles.

Stream and Wetland Crossings

At streams containing sensitive fisheries and other sensitive aquatic organisms, crossings utilizing dry crossing methods will be scheduled to occur during the least sensitive periods, determined in consultation with federal and state/commonwealth agencies, including the FS. Streams on NFS lands where timing restrictions have been adopted are shown in Tables 2.1.1-5 and 2.1.1-6.

TABLE 2.1.1-5

Waterbodies Crossed and Crossing Methods for the Atlantic Coast Pipeline in the Monongahela National Forest

Milepost	Feature ID	Waterbody Name	Flow Regime	Approximate Crossing Width (feet)	Construction Method[a]	State Water Quality Classification[a]	Fishery [b] Type	Timing Restriction[c]
81.5	spoa402	Unnamed trib. to Sugar Camp Run	Intermittent	4	Dam and Pump or Flume	Unnamed trib. to B1	Coldwater; some segments designated as trout streams	September 15 to March 31
82.0	spoa400	Unnamed trib.to Shock Run	Perennial	12	Dam and Pump or Flume	Unclassified	Coldwater	September 15 to March 31

[a] Abbreviations for West Virginia State Water Quality Classifications are listed below:

West Virginia Stream Water Use Categories:

Category A - Public Water; Category B - Propagation and Maintenance of Fish and Other Aquatic Life; Category B1 - Warm Water Fishery; Category B2 - Trout Waters; Category B4 – Wetlands; Category C - Water Contact Recreation (Category C); Category D - Agricultural and Wildlife Uses; Category D1 –Irrigation; Category D2 - Livestock; Category D3 - Wildlife; Category E - Water Supply Industrial, Water Transport, Cooling and Power ; Category E1 - Water Transport; Category E2 - Cooling Water; Category E3 - Power Production; Category E4 - Industrial (West Virginia CSR, 2014).

State Water Quality Classifications were determined using West Virginia Code of State Regulations, Title 47, Series 2, and communication with West Virginia Department of Environmental Protection (WVDEP) staff (Peterson, 2015). WVDEP considers all waters of the state Category A, B, and C waters. Waterbodies are assumed to be capable of supporting public water use. Those waterbodies listed in the table as Category A waters are waterbodies listed in appendices to West Virginia CSR, Title 47.

High Quality Streams (HQS) are based on the Sixth Edition of the West Virginia High Quality Streams prepared by the Wildlife Resources Section of the West Virginia Division of Natural Resources.

State regulations require the classification to extend into adjacent tributaries, indicated by Unnamed Trib (unnamed tributary) to [Stream Class] to indicate connected tributaries to classified waters.

[b] Fisheries type is based on readily available data from agency consultation letters or online data. Additional consultation with state and federal agencies will be on-going to further refine these waterbody designations.

[c] Timing restrictions are based on readily available data from agency consultation letters or online data. Additional consultations with state and federal agencies, as well as field survey data for protected species will be necessary to further refine timing restrictions.

TABLE 2.1.1-6

Waterbodies Crossed and Crossing Methods for the Atlantic Coast Pipeline in the George Washington National Forest

Milepost	Feature ID[a]	Waterbody Name	Flow Regime	Approximate Crossing Width (feet)[b]	FERC Classification[c]	Construction Method [d]	State Water Quality Classification[e]	Fishery Type[f]	Timing Restriction
85.0	shia407	Unnamed trib. to Townsend Draft	Perennial	45	Intermediate	Dam and Pump or Flume	Unclassified	Unclassified	September 15 to March 31
85.1	shia410	Unnamed trib. to Townsend Draft	Perennial	10	Intermediate	Dam and Pump or Flume	Unclassified	Unclassified	October 1 to March 31
85.4	shia409	Unnamed trib. to Lick Draft	Perennial	10	Intermediate	Dam and Pump or Flume	Unclassified	Unclassified	October 1 to March 31
85.5	shia408	Lick Draft	Perennial	8	Minor	Dam and Pump or Flume	Unclassified	Unclassified	October 1 to March 31
94.1	sbaa004	Laurel Run	Perennial	7	Minor	Dam and Pump or Flume	Aquatic Life, I-IV	Wild Brook Trout	October 1 to March 31
98.3	sbaa005	Unnamed trib. to Cowpasture River	Perennial	16	Intermediate	Dam and Pump or Flume	Unnamed trib. to Aquatic Life	Unclassified	May 15 to July 31
115.8	saua436	Barn Lick Branch	Perennial	9	Minor	Dam and Pump or Flume	Unclassified	Unclassified	N/A
117.1	saua416	Dowell's Draft	Perennial	10	Intermediate	Dam and Pump or Flume	Unclassified	Unclassified	October 1 to March 31
117.2	saua418	Unnamed trib. to Dowell's Draft	Perennial	9	Minor	Dam and Pump or Flume	Unclassified	Unclassified	N/A
117.7	saua419	Unnamed trib. to Dowell's Draft	Intermittent	7	Minor	Dam and Pump or Flume	Unclassified	Unclassified	N/A
120.2	saua427e	Buckhorn Creek	Ephemeral	2	Minor	Dam and Pump or Flume	Unnamed trib. to Aquatic Life, I-IV	Unnamed trib. to Wild Brook Trout	October 1 to March 31
120.2	saua427p	Buckhorn Creek	Perennial	25	Intermediate	Dam and Pump or Flume	Aquatic Life, I-IV	Wild Brook Trout	N/A
120.4	saua428	Unnamed trib. to Buckhorn Creek	Perennial	29	Intermediate	Dam and Pump or Flume	Aquatic Life, I-IV	Wild Brook Trout	N/A
120.6	saua429	Unnamed trib. to Stoutameyer Branch	Intermittent	3	Minor	Dam and Pump or Flume	Unnamed trib. to Aquatic Life, I-IV	Unnamed trib. to Wild Brook Trout	N/A
121.1	saua438	Stoutameyer Branch	Perennial	6	Minor	Dam and Pump or Flume	Unclassified	Coldwater	N/A
122.5	saua421	Unnamed trib. to Jennings Branch	Intermittent	3	Minor	Dam and Pump or Flume	Unnamed trib. to Aquatic Life, I-IV	Unnamed trib. to Wild Brook Trout	October 1 to March 31
122.8	saua422	Unnamed trib. to Jennings Branch	Intermittent	6	Minor	Dam and Pump or Flume	Unnamed trib. to Aquatic Life, I-IV	Unnamed trib. to Wild Brook Trout	October 1 to March 31
123.0	saua423	Unnamed trib. to Jennings Branch	Ephemeral	3	Minor	Dam and Pump or Flume	Unnamed trib.to Aquatic Life, I-IV	Unnamed trib. to Wild Brook Trout	October 1 to March 31
154.2	saua072	Unnamed trib. to Back Creek	Intermittent	5	Minor	Dam and Pump or Flume	Unnamed trib. to Aquatic Life, V-VIII	Unnamed trib. to Stockable Trout Stream	N/A

TABLE 2.1.1-6

Waterbodies Crossed and Crossing Methods for the Atlantic Coast Pipeline in the George Washington National Forest

Milepost	Feature ID[a]	Waterbody Name	Flow Regime	Approximate Crossing Width (feet)[b]	FERC Classification[c]	Construction Method [d]	State Water Quality Classification[e]	Fishery Type[f]	Timing Restriction
154.4	saua434	Unnamed trib. to Back Creek	Intermittent	8	Minor	Dam and Pump or Flume	Unnamed trib. to Aquatic Life, V-VIII	Unnamed trib.to Stockable Trout Stream	N/A
154.5	saua071	Unnamed trib. to Back Creek	Intermittent	4	Minor	Dam and Pump or Flume	Unnamed trib. to Aquatic Life, V-VIII	Unnamed trib. to Stockable Trout Stream	N/A
154.8	saua433	Unnamed trib. to Back Creek	Intermittent	10	Intermediate	Dam and Pump or Flume	Unnamed trib. to Aquatic Life, V-VIII	Unnamed trib. to Stockable Trout Stream	N/A
154.9	saua432	Unnamed trib. to Back Creek	Ephemeral	6.	Minor	Dam and Pump or Flume	Unnamed trib. to Aquatic Life, V-VIII	Unnamed trib. to Stockable Trout Stream	N/A
155.0	saua431	Unnamed trib. to Back Creek	Intermittent	2	Minor	Dam and Pump or Flume	Unnamed trib. to Aquatic Life, V-VIII	Unnamed trib. to Stockable Trout Stream	N/A
155.1	saua430	Unnamed trib. to Back Creek	Ephemeral	11	Intermediate	Dam and Pump or Flume	Unnamed trib. To Aquatic Life, V-VIII	Unnamed trib. to Stockable Trout Stream	N/A

[A] Atlantic utilized a project-specific nomenclature system that assigned a unique identifier (ID) to each waterbody encountered during field surveys. The breakdown of the unique waterbody ID includes the following abbreviations and descriptors, using shia407 as an example: s = stream, hi = Highland County (two letters used for each county), a = crew A collected the feature, and 407 is the unique number from 000 – 999 used to uniquely identify the waterbody. Where access to property was not available to field crews, National Hydrography Dataset (NHD) data were used to supplement field survey data. Unique IDs beginning with "NHD" represent waterbodies for which ground truth data have not yet been collected. This unique ID is consistently used for each waterbody to correlate to the geospatial data (GIS data), field data collected on datasheets, and waterbody impact tables used during project permitting.

[b] Waterbodies with a Feature ID starting with NHD represent waterbodies that are based on desktop data from the National Hydrography Dataset, and widths have been assumed as 10 feet wide for perennial and 5 feet wide for intermittent waterbodies in this dataset.

[c] Minor = <10 feet wide at time of crossing. Intermediate = 10 – 100 feet wide at time of crossing.

[d] Construction methods are provided for features that intersect the centerline. [e] Abbreviations for Virginia Water Quality Classifications are listed below:

Virginia Trout Waters Classes:

Classes I, II, III, IV are wild natural trout streams ranking from highest to lowest quality

Classes V, VI, VII, VIII are stockable trout streams ranking from highest to lowest quality

Water Quality Classifications were determined using Virginia Department of Environmental Quality GIS dataset, 2012 Integrated WQ Report Rivers, January 27, 2014 available for download from the Virginia Environmental Geographic Information System (VEGIS) website at: http://www.deq.virginia.gov/ConnectWithDEQ/VEGIS/VEGISDatasets.aspx. State regulations require the classification to extend into adjacent tributaries, indicated by Unnamed trib.) to [Stream Class] to indicate connected tributaries to classified waters.

Unclassified – waters that do not have an assigned classification, or are not unnamed tributaries to classified waters.

[f] Fisheries type is based on readily available data from agency consultation letters or online data. Additional consultation with state and federal agencies will be on-going to further refine these waterbody designations.

[g] Timing restrictions are based on readily available data from agency consultation letters or online data. Additional consultations with state and federal agencies, as well as field survey data for protected species will be necessary to further refine timing restrictions.

2.1.3 Access

The ACP will mostly use existing FS roads to access the pipeline right-of-way. A number of new roads will be required. Several existing, unnumbered roads that will be used are not part of the FS road system, and so are considered new roads in this COM Plan (see Table 2.1.1-2). Maps showing locations of access road improvements on NFS lands are provided in Attachment F.[13]

New Access Road 05-001-C009.AR2 would consist of about 400 feet of new road on the MNF between Forest Road 1026 (Buzzard Ridge Road) and the pipeline right-of-way near MP 71.7. The pipeline right-of-way itself does not lie on NFS lands at this location. Use of Forest Road 1026 is subject to several conditions as detailed in the Biological Evaluation (incorporated by reference into the COM Plan). A biological monitor will be on site during road improvement activities to ensure Allegheny woodrat habitat at Forest Road 1026 is avoided and undisturbed. In road segments adjacent to Allegheny woodrat habitat, road usage will be minimized to avoid dawn and dusk high woodrat activity periods and minimize potential injury or mortality from vehicle collisions. Similarly, in road segments adjacent to potential eastern spotted skunk rocky outcrop habitat, road usage will be minimized to avoid dawn and dusk high skunk activity periods and minimize potential injury or mortality from vehicle collisions.

New Access Road 05-001-E064.AR1 would consist of about 0.4 mile of new road on the MNF between Forest Road1012 (Sugar Camp Road) and the right-of-way, at approximately MP 81.8.

New Access Road 06-001-B001.AR3 would consist of about 0.2 mile of new road on the GWNF, following the alignment of an unnamed road between Highway 84 and the right-of-way, at approximately MP 85.0.

New Access Road 06-001-B001.AR7 would consist of about 0.5 mile of new road on the GWNF, at approximately MP 85.3.

New Access Road 06-001-B001.AR4 would consist of about 0.1 mile of new road on the GWNF, following the alignment of an unnamed road between Highway 84 and the right-of-way, at approximately MP 85.4.

New Access Road 07-001.AR1-AR4 is a short (approximately 200 feet) new road at approximately MP 117.2, connecting GWNF Forest Road 449 with the right-of-way.

New Access Road 07-001-AR1-AR-6 would consist of about 0.8 mile of new road on the GWNF, following the alignment of an unnamed road between Forest Road 449A and the right-of-way, at approximately MP 118.0.

New Access Road 07-001.AR1-AR 7 would follow GWNF Forest Road 1755 for about 0.4 mile between Stover Shop Road and the pipeline right-of-way at about MP 121.1. Forest Road 1755 would require substantial improvements along its entire length to accommodate construction equipment, and so has been considered a new road for purposes of the COM Plan. This segment of Forest Road 1755 would be closed to the public during road construction.

Among the existing roads that would be utilized is GWNF Forest Road 281 (Project Access Road No. 36-016.AR1). A portion of this existing road lies within GWNF Management Prescription Area 2C3 (Eligible Recreation River Corridor). The GWNF LRMP includes a standard relevant to road

[13] A previously planned 1.2 mile access road along Laurel Run is no longer planned for Project use.

construction or reconstruction within this Management Prescription, which GWNF is considering as potentially requiring a project-specific LRMP amendment:

> *Allow road construction or reconstruction to improve recreational access, improve soil and water, to salvage timber, or to protect property or public safety.* **(GWNF LRMP 2C3-015)**

ACP's plans for this access road include a widening of the entrance way, where GWNF Road 281 intersects Indian Draft Road, and graveling of the surface. Atlantic is not proposing construction or reconstruction of Forest Road 281. The GWNF is considering whether the proposed road improvements would require a project-specific amendment to the LRMP.

Most of the existing FS roads to be used for pipeline construction will require minor grading and graveling and/or widening to accommodate construction vehicles. Improvements to existing roads, as well as new road construction, will be done according to FS specifications. New and existing improved roads will meet FS requirements for all seasons, based on engineering standards that use information such as American Association of State Highway Transportation Officials and UNIFIED values for soils to be used as base material as well as the anticipated level of use (intensity, duration, and type/weight of vehicles).

Prior to construction, Atlantic will provide engineering details of planned new roads and improvements to existing roads, as have been requested by the FS, for FS review. The roads and associated drainage structures will be designed and constructed in accordance with FS requirements. Methods and locations for disposal of any excess fill created by road construction will also be identified.

All roads utilized for construction would also be used to access the permanent right-of-way for operation and maintenance purposes. Use of FS access roads not identified in the COM Plan, or the undertaking of improvements to existing FS roads not identified in the COM Plan, will not occur unless approved in writing by the FS AO and FERC.

2.1.4 General Pipeline Construction Procedures

Construction of the ACP will follow industry-standard practices and procedures as described below. In a typical scenario, construction involves a series of discrete activities conducted in a linear sequence. These include survey and staking; clearing and grading; trenching; pipe stringing, bending, and welding; lowering-in and backfilling; hydrostatic testing; final tie-in; commissioning; and right-of-way cleanup and restoration. Figure 2.1-2 illustrates each of the steps in a typical construction sequence. A description of each step in the process is provided below.

2.1.4.1 Survey and Staking

Atlantic's surveyors will stake the pipeline centerlines and limits of the construction right-of-way and ATWS areas. Using global positioning system (GPS) coordinate information collected during field surveys, wetland boundaries and other environmentally sensitive areas will also be marked at this time.

Atlantic's surveyors will record existing NFS property corner monuments and their accessories, including any property boundary markers and survey markers that may be disturbed during construction, so they may be re-established after construction, in accordance with the FS Land Surveying Guide.

As discussed further in Section 12 (Non-Native Invasive Plant Species Management Plan), prior to beginning ground-disturbing activities, existing populations of non-native invasive plant species will be treated to prevent spreading them via project activities.

2.1.4.2 Clearing

Prior to beginning ground-disturbing activities, Atlantic's construction contractors will coordinate with the One-Call systems in West Virginia and Virginia to have existing underground utilities (e.g., cables, conduits, and pipelines) identified and flagged. Merchantable timber will be felled and managed in accordance with the Timber Removal Plan.

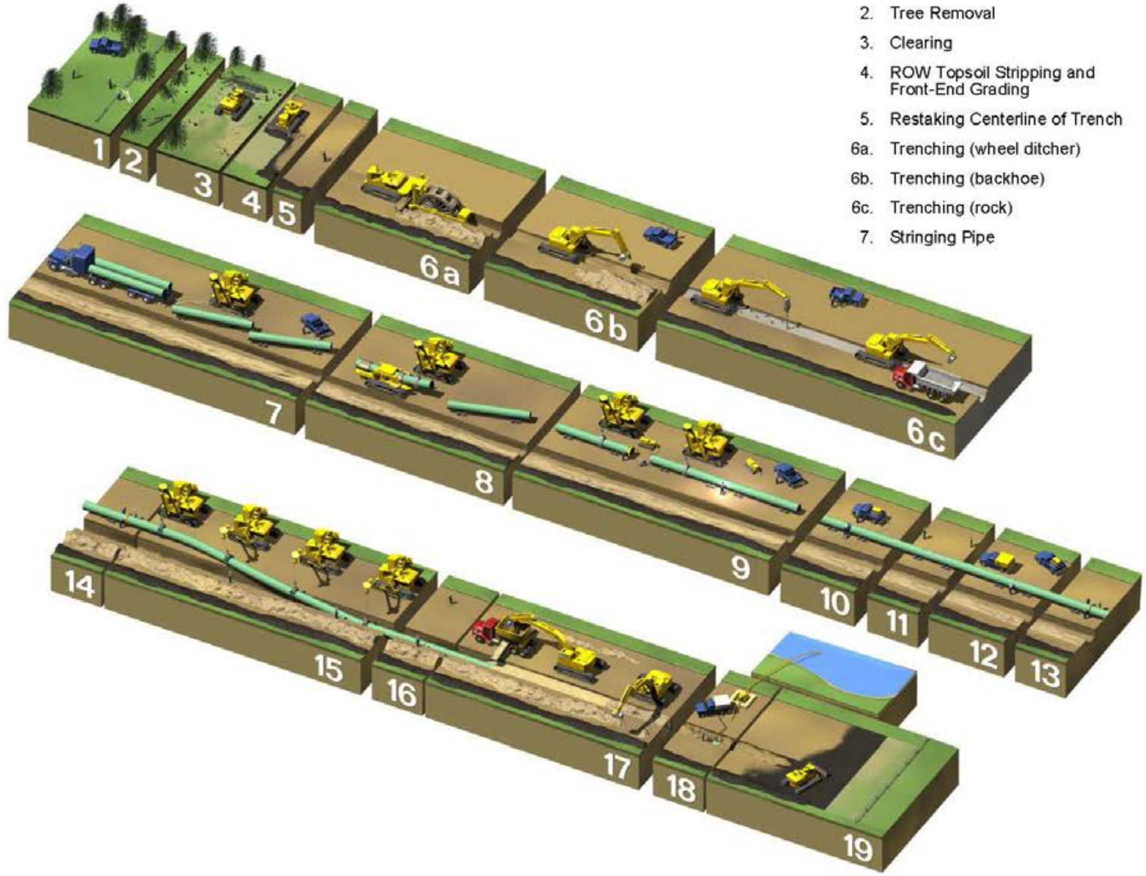
After merchantable timber has been felled, pre-clearing crews will mobilize to the construction areas. The pre-clearing crew, using only hand tools, will cut non-merchantable trees and other woody and non-woody vegetation. Felled trees that are to be removed from the right-of-way will be left on the ground until April, unless ground conditions allow for earlier removal.

Fences along the right-of-way will be cut and braced, and temporary gates and fences will be installed to contain livestock, if present. Clearing crews will then clear the work area of vegetation and other obstacles, including trees, stumps that lie within the trenchline, logs, brush, and rocks. All equipment will be cleaned of foreign material that may contain weed propagules before entering NFS lands, as discussed in Section 12 (Non-Native Invasive Plant Species Management Plan). Clearing equipment consists of the following:

- Grapple Hoe
- Bucket Hoe
- Forwarder
- Tracked Chipper
- Winch Tractor
- Stump Grinder
- Brush Mower
- Fuel Buggy
- Utility Task Vehicle (UTV)
- Pickup Truck
- Mat Truck
- Fuel Truck
- Low Boy

Cleared vegetation and stumps will either be chipped (except in wetlands), burned (if permitted), or hauled offsite to a commercial disposal facility or for beneficial reuse, as directed by the AO. No chips, mulch, or mechanically cut woody debris will be stockpiled in wetlands, and no upland woody debris will be disposed of in wetlands.

Burning of slash, stumps, or non-merchantable wood is not currently anticipated. If burning is deemed necessary, it will be done only after Atlantic has acquired all applicable permits and approvals, including specific authorization from the AO or Timber Sale Contracting Officers (TSCO). In West Virginia, such burning would require an Approval to Conduct Open Burning for Land Clearing Debris from the West Virginia Department of Environmental Protection. In Virginia, burning on federal lands would not be subject to the Virginia Department of Forestry's Burn Law. Virginia counties may enact bans on outdoor burning, but such ordinances do not apply to federal lands. Any burning on NFS lands will be done in accordance with standards contained in FS' Management Direction for Fire Management, and with the Fire Prevention and Suppression Plan (Section 5). This would entail preparation of a project-specific Burn Plan for FS approval.



1. Survey and Staking
2. Tree Removal
3. Clearing
4. ROW Topsoil Stripping and Front-End Grading
5. Restaking Centerline of Trench
6a. Trenching (wheel ditcher)
6b. Trenching (backhoe)
6c. Trenching (rock)
7. Stringing Pipe
8. Field Bending Pipe
9. Line-Up, Initial Weld
10. Fill & Cap, Final Weld
11. As-Built Footage
12. X-Ray Inspection, Weld Repair
13. Coating Field Welds
14. Inspection & Repair of Coating
15. Lowering Pipe into Trench
16. As-Built Survey
17. Pad, Backfill, Rough Grade
18. Hydrostatic Testing, Final Tie-in
19. Replace Topsoil, Final Clean-Up, Full Restoration

For environmental review purposes only

Atlantic Coast Pipeline

Figure 2.1-2
Atlantic Coast Pipeline
Typical Pipeline Construction Sequence

ERM

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DRAWN BY: McGregor

2.1.4.3 Topsoil Segregation

Atlantic will segregate topsoil over an approximately 20-foot wide strip roughly centered on the pipeline centerline from which stumps have been removed, at the following locations:

- MPs 73.4 to 73.6
- MPs 80.4 to 80.6
- MPs 82.6 to 83.0
- MPs 83.2 to 83.4
- MPs 83.6 to 83.9
- MPs 121.4 to 122.4
- MPs 122.7 to 122.8

In these areas, after stumps have been removed Atlantic will segregate the top six inches of soil.

In areas where topsoil segregation is conducted, subsoil from trench excavations will be placed adjacent to the topsoil in a separate pile to allow for proper restoration of the soil during backfilling and restoration. Gaps will be left between the topsoil and subsoil piles to prevent stormwater runoff from backing up or flooding. Mixing of topsoil and subsoil piles will be prevented by separating them physically or with a mulch or silt fence barrier, where necessary and dictated by site conditions, to accommodate reduced workspace. Topsoil piles will be stabilized to minimize erosion loss, using sediment barriers, mulch, temporary seeding, or functional equivalents.

In areas where topsoil segregation is not performed, during the clean-up and restoration phase Atlantic will apply soil conditioning amendments such as ProGanics or other similar biotic soil media, at two times the minimum application rate (or at the optimal rate to enhance revegetation success, as determined in consultation with the FS), and will install a hydraulically-applied growth media system such as flexterra or a similar product. Exposed bedrock areas will be treated with Earthguard Fiber Matrix Erosion Control System, which is a hydraulically applied system for slope stabilization and revegetation.

Atlantic has also agreed to fund an off-site mitigation program aimed at achieving long-term improvement of soil productivity on NFS lands.

2.1.4.4 Grading

Following clearing and topsoil segregation at the locations listed above, the construction work areas will be graded where necessary to provide a level work surface to allow safe passage of construction equipment and emergency vehicles. More extensive grading will be required in steep side slope or vertical areas and where necessary to prevent excessive bending of the pipelines. Topsoil will be segregated in accordance with the Erosion and Sedimentation Control Plan (Section 9).

Grading spoils and/or trench spoils will be will be spread over the travel lane portion of the construction right-of-way. Compaction of the underlying soils due to the relatively heavier use of this area by equipment and vehicles will thereby be minimized.

In areas disturbed by grading, and as specified in the Erosion and Sedimentation Control Plan and other relevant sections of the COM Plan, temporary erosion and sediment controls will be installed immediately after initial grading within the right-of-way to minimize erosion. All materials used for erosion and sediment control will be weed free. The erosion and sediment control structures will be inspected and maintained throughout the construction and restoration phases of the Project.

2.1.4.5 Trenching

Pipe trench will be excavated by rotary trenching machines, track-mounted backhoes, or other similar equipment. Trench spoil will be deposited adjacent to the trench within the construction right-of-way. The trench for each pipeline will be excavated to a depth that provides sufficient cover over the pipeline after backfilling. The typical dimensions of each pipeline trench will vary depending on a number of factors, such as the substrate in the vicinity of the trench (see Table 2.1.4-1). The bottom width of the trench will accommodate the diameter of the pipeline and sufficient pad material around it (typically approximately one foot on either side of the pipeline). The top width will vary to allow the sides of the trench to be adapted to local soil conditions at the time of construction. If trench dewatering is required, it will be conducted in accordance with the Erosion and Sedimentation Control Plan and applicable permits in a manner that will not cause erosion or result in silt-laden water flowing into a wetland or waterbody.

When rock or rocky formations are encountered, hydraulic hammers, tractor-mounted mechanical rippers or rock trenchers will be used for breaking up the rock prior to excavation. In areas where mechanical equipment or other means cannot be used to break up or loosen boulders or shallow bedrock, blasting will be required. Locations where blasting may be required on NFS lands are identified in the Blasting Plan.

Areas of open trench will be inspected daily by Environmental Inspectors (EI) for any wildlife that may have fallen into the trench. EIs will consult with biological monitors as necessary to remove the animal safely.

TABLE 2.1.4-1

Typical Trench Dimensions for the Atlantic Coast Pipeline

Pipeline	Outside Diameter	Cover	Top Width (feet)	Depth (feet)	Typical Depth of Cover (feet)
ATLANTIC COAST PIPELINE					
AP-1	42-inch	Non-agricultural upland	10–15	7.5	3
		Agricultural	10–15	8.5	4
		Wetland	15–20	7.5	3
		Road, railroad, and waterbody crossings	15–20	9.5	5

2.1.4.6 Pipe Stringing, Bending, and Welding

Individual joints of pipe (up to approximately 80 feet long) will be transported to the construction right-of-way and strung along the trenchline in a single, continuous line. Individual sections of pipe will be bent, where necessary, to allow for a uniform fit with the contours at the bottom of the trench and horizontal points of inflection. Typically, a track-mounted, hydraulic pipe-bending machine will tailor the shape of the pipe to conform to the contours of the trench. After the pipe sections are bent, they will be welded together into long sections and placed on temporary supports along the trench.

Welding is a crucial phase of pipeline construction because the integrity of the pipeline depends on this process. Each weld must exhibit the same structural integrity with respect to strength and ductility. Welding will be conducted in compliance with 49 CFR 192 and API Standard 1104, Welding of Pipelines and Related Facilities. Completed welds will be visually and radiographically inspected. Welds that do not meet established specifications will be repaired or removed. Following welding and after inspection, pipe weld joints will be coated with an epoxy coating in accordance with required specifications. If the coating is sprayed on, it will be contained within semi-automatic application rings that ensure little or no overspray of coating into the environment. The coating will be inspected for defects, and repaired, if necessary, prior to lowering the pipe into the trench.

2.1.4.7 Lowering-in and Backfilling

Prior to lowering-in, the trench will be inspected for rocks and other debris that could damage the pipe or its protective coating, and where necessary, the pipe will be protected with rock-shield, a thick, plastic-based protective mesh wrapped around the pipe to protect it from rock damage. Dewatering may be necessary to inspect the bottom of the trench in areas where water has accumulated. If dewatering is required, it will be conducted in accordance with the Erosion and Sedimentation Control Plan and applicable permits in a manner that will not cause erosion or result in silt-laden water flowing into a wetland or waterbody.

The pipe will be lifted from the temporary supports and lowered into the trench using side-boom tractors. Sand bags or sifted spoil (not topsoil) will be placed in the bottom of the ditch to support the pipe. As necessary, trench breakers (stacked sand bags, bags of bentonite or ready mix concrete, or foam) will be installed in the trench around the pipe where necessary to prevent movement of subsurface water along the pipeline, at intervals based on soil type and slope.

Where foam materials are used for trench breakers, the following mitigation will be incorporated to maintain their functionality over the life of the project:

- Trench Breaker Drainage - Foam trench breakers will include drainage devices to allow seepage and/or shallow sub-surface water to move slowly through the trench backfill and down the trenchline, and to mitigate the potential that seepage water will be retained behind any individual breaker. These devices may include, but are not limited to: the placement of sandbags one to two layers deep across the bottom of the trench prior to foam installation (i.e. allows seepage beneath the installed foam materials), and/or drain pipes (using high-density polyethylene [HDPE] materials) wrapped with filter fabric and passing through the breaker and extending just beyond on either side of the breaker. Example trench breaker drainage configurations with various drainage mitigation options are shown in Attachment C-2, and described as follows: refer to Detail 4A (REVG) for a typical trench breaker(s) with drainage mitigation as a pipe/sand bags through the breaker; refer to Detail 1B (REVF) for breaker(s) with enhanced drainage mitigation that would be used at targeted and/or in challenging slope conditions; refer to Detail 4C (REVF) for sack-crete breaker(s) with drainage mitigation; and refer to Detail 4F (REVF) for a typical breaker at a targeted location with drainage mitigation.

- Trench Breaker Keys - Foam breakers will be keyed into the trench bottom and side walls to limit seepage around the breakers and improve stability; refer to Detail 4A (REVG) for example.

- Trench Backfill Loading on Pipe - During installation, geotextile fabric will be wrapped around the pipe prior to foam application, which prevents the foam from adhering tightly to the pipe and allows the pipe to move relative to the breaker (i.e. it can slide longitudinal to the pipe), which mitigates for potential transfer of backfill loading (and corresponding stresses) to the pipe; refer to Detail 4D (REVF) for example.

- Slope Breakers with Trench Breakers - Slope breaker(s) will be installed immediately downslope of the installed trench breaker position, to intercept any surface water accumulation and divert it off the right-of-way; refer to Detail 4A (REVF) for example.

Lifespan of the foam breakers and associated drainage mitigation is expected to match that of the pipeline itself, within typical operation and maintenance expectations, given the durability of the materials used (e.g. polyurethane foam, and HDPE drain pipe materials).

After lowering-in, the pipe will be padded and the trench will be backfilled with previously excavated materials using bladed equipment or backhoes. If the material excavated from the trench is rocky, the pipeline will be protected with a rock shield or covered with other suitable fill (i.e., crushed limestone rock or screened sand). Additionally, excavated rock may be buried within the limits of the construction right-of-way, crushed with a rock pulverizer and incorporated into fill, or used as gravel to upgrade access roads. Excavated material not required for backfill will be removed and disposed of at approved upland disposal sites. Atlantic will not remove excess soil or rock material from NFS lands without authorization from the AO. If requested by the FS, rock material of appropriate size will be stacked in specific configurations to provide potential habitat for rare, threatened, or endangered species (e.g., timber rattlesnake, small-footed bats, rock voles, etc.).

If soil moisture is unsuitable for replacement, topsoil or spoil material may be mechanically mixed, or FS-approved materials may be physically mixed in to allow evaporation to achieve acceptable moisture levels. If compaction comparison measurements of adjacent soil and restored soil reveal discrepancies Atlantic will either decompact or rework the soils to establish appropriate compaction. Compaction measurement results will be provided to the Forest Service staff on a weekly basis.

If soils containing hazardous materials are encountered during excavation, Atlantic will implement the procedures identified in the Contaminated Media Plan (Section 14) to isolate and contain the suspected soil contamination, collect and test samples of the soil to identify the contaminants, and develop a response plan for crossing or avoiding the site. With the exception of soils classified as hazardous material, all native soils can be used as backfill without affecting the pipe, regardless of soil chemistry or texture.

2.1.4.8 Hydrostatic Testing

After backfilling and all other construction activities that could affect the pipeline are complete, each pipeline will be hydrostatically tested in sections to verify that each system is free from leaks and will provide the required margin of safety at operating pressures. Individual sections of pipeline to be tested will be determined by water availability, terrain conditions, and class location. No water will be withdrawn from sources on either the MNF or the GWNF. As practicable, water will be transferred from one test section to another to reduce the amount of water that is required for testing. No hydrostatic discharge locations are proposed on either the MNF or the GWNF.

During hydrostatic testing, internal pressures and durations will be in accordance with 49 CFR 192 and applicable permit conditions. If leaks are found during testing, the leaks will be repaired and the section of pipe retested until the required specifications are met.

No water impoundment structures are proposed to be located on NFS lands.

2.1.4.9 Final Tie-in and Commissioning

After hydrostatic testing, the pipeline will first be cleaned and dried utilizing compressed air and dry foam pig(s). The pig(s) will be continuously run through the pipeline, at designated controlled launching and receiving points located within the construction limits of disturbance, until desired moisture content is achieved. After the pipeline has been dried and verified through Atlantic's inspection, in-line inspection tools (telemetry pigs) will be utilized to detect anomalies within the pipe that may have been introduced during construction. In the event that any anomalies are identified, they will first be located and excavated for field verification, and then cut out and replaced with pre-tested pipe, in accordance with all project environmental permits and guidelines. Once all anomaly repairs (if any are identified) have been completed, then final-tie(s) will be completed and commissioning of the line will begin. During the commissioning of the line, operational equipment associated with the pipeline (e.g. mainline valves) will be inspected and verified for proper installation and functionally working controls, including communication systems, and the initial start-up of compressor facilities will begin. The line and associated facilities will be purged slowly and loaded with natural gas until brought into actual operation.

2.1.4.10 Clean-Up and Restoration

Final cleanup will begin after backfilling and as soon as weather and site conditions permit. Final cleanup (including final grading and installation of permanent erosion control devices) will be completed within timeframes specified in the Erosion and Sedimentation Control Plan (Section 9), the Restoration and Rehabilitation Plan (Section 11), and the Visual Resources Plan (Section 21). Construction debris will be collected and taken to an approved disposal facility. Preconstruction contours will be restored as closely as practicable. Segregated topsoil will be replaced (with the exception of Non-Native Invasive Species (NNIS)-infested topsoil – see the Non-Native Invasive Plant Species Management Plan, Section 12), and permanent erosion controls will be installed. In areas where topsoil segregation was not performed, Atlantic will apply soil conditioning amendments such as ProGanics or other similar biotic soil media, at two times the minimum application rate, and will install a hydraulically-applied growth media system such as flexterra or a similar product.

Revegetation measures will be implemented with the goal of maintaining ACP's ability to monitor and protect the integrity of the pipeline, including the ability to conduct visual patrolling, in accordance with the Restoration and Rehabilitation Plan (Section 11), the Non-Native Invasive Plant Species Management Plan (Section 12), and the Visual Resources Plan (Section 21). Work areas will be stabilized and seeded as soon as possible after final grading, weather and soil conditions permitting, subject to the recommended seeding dates for the seed mixes used to revegetate different areas along the pipelines. Seeding will stabilize the soil, improve the appearance of the area disturbed by construction, and restore native flora. Planting of nursery stock woody vegetation on all temporary construction areas will be done in accordance with the Restoration and Rehabilitation Plan (Section 11.3.1.12) and the Visual Resources Plan (Section 21.2).

If seasonality or timing prevents the use of vegetative erosion control measures, physical measures such as silt fences, soil conditioners or hydraulic mulches will be used in the short term and inspected and maintained regularly to ensure proper functioning until seeding occurs and revegetation becomes effective. Silt fence shall not be used at locations of concentrated overland flow, whether the flow is natural or constructed. Compost filter socks or other controls designed to filter or chemically remove sediment from water shall be used in those locations.

As-built drawings of the pipeline segments crossing NFS lands will be provided to the FS following construction. Upon completion of construction, Atlantic will re-establish all disturbed NFS property corner monuments and their accessories, including any property boundary markers, in conformance with the FS' Land Surveying Guide.

Federal regulations require markers be placed at public road and railroad crossings, and wherever necessary to identify the location of the pipeline to reduce the possibility of damage or interference (49 CFR 192.707). Two types of pipeline markers showing the location of the pipeline will be installed after construction: line-of-sight markers and crossing markers. The markers will convey emergency information in accordance with applicable government regulations, including USDOT safety requirements.

Line-of-sight markers will be installed intermittently along the pipeline right-of-way according to ACP specifications. These line-of-sight markers will be flat fiberglass stakes with markings on both sides of the marker. Crossing markers will be installed on both sides of all road, rail, and trail crossings, and at fence lines. These crossing markers will be round posts (3 inches in diameter and 5 feet in height) with wording on at least one side facing the roadway, railway, trail, or fence line. The markers will contain markings required by law, including the following:

- the marker must state the word “Warning”;
- the marker must identify what product is being carried in the pipeline;
- the marker must identify the pipeline operator;
- the marker must include a telephone number that can be reached 24 hours per day, 365 days per year in case of an emergency; and
- the marker must include “call before you dig” labeling and the telephone of the state/commonwealth One-Call system.

No aerial markers will be installed on NFS lands.

2.1.5 Specialized Pipeline Construction Procedures

In addition to standard pipeline construction methods, Atlantic will use special construction techniques where warranted by site-specific conditions, e.g., when constructing across waterbodies, wetlands, roads and trails, highways, railroads, steep terrain, karst areas, agricultural areas, and residential areas; when blasting through rock; or when working in winter conditions. Each of these specialized measures is described below. Illustrations of select crossing methods are provided in Attachment A.

2.1.5.1 Waterbody Crossings

Atlantic will cross all waterbodies on NFS lands using open cut construction methods. Specifically, Atlantic will employ the “dry” open cut methods discussed below. Other stream crossing methods, including the open cut wet crossing method, coffer dam method, conventional bore method, or HDD method, are therefore not discussed. It should be noted that while HDD will not be employed to cross waterbodies on the NFS lands, a single HDD will be utilized to cross both the Appalachian National Scenic Trail, which lies on the GWNF, and Blue Ridge Parkway (BRP), which lies on NPS land (see Section 2.1.5.9 and Attachment O).

Atlantic will adhere to the measures specified in the Stream and Wetland Crossing Procedures described in Section 10, and any additional requirements contained in federal or state/commonwealth waterbody crossing permits, including applicable permits and approvals from the U.S. Army Corps of Engineers (USACE) and various state/commonwealth agencies. Complete lists of the waterbodies crossed on NFS lands and the construction method proposed for each crossing are provided in Tables 2.1.1-6 and 2.1.1-6.

During the clearing and grading phase of construction, temporary bridges will be installed across waterbodies on NFS lands in accordance with the Procedures to allow construction equipment and personnel to cross. The bridges may include clean rock fill over culverts, timber mats supported by flumes, railcar flatbeds, flexi-float apparatuses, or other types of spans. Construction equipment will be required to use the bridges, except that the clearing and bridge installation crews will be allowed one pass through waterbodies before bridges are installed (this one-time pass through to install temporary bridges will be included in any applicable state/commonwealth permit applications pertaining to stream crossing construction). The temporary bridges will be removed when construction and restoration activities are complete.

ATWS will be required on both sides of waterbody crossings to stage construction equipment, fabricate the pipeline, and store construction materials. Except as authorized by the FS, ATWS will be located at least 100 feet from the water's edge at each waterbody on NFS lands (on the GWNF, the buffer increases on slopes greater than 10 percent)[14]. ATWS locations are shown on the construction alignment sheets provided in Attachment B. These locations are subject to the same environmental field surveys and analyses as any project construction work area.

Clearing adjacent to waterbodies will involve the removal of trees and brush from the construction right-of-way and ATWS areas. Woody vegetation within the construction right-of-way will be cleared to the edge of each waterbody. Sediment barriers will be installed at the top of the bank if no herbaceous strip exists. Initial grading of the herbaceous strip will be limited to the extent needed to create a safe approach to the waterbody and to install temporary bridges.

Following clearing, sediment barriers will be installed and maintained across the right-of-way adjacent to waterbodies and within ATWS to minimize the potential for sediment runoff. Silt fence, coir logs, and/or weed-free straw bales[15] located across the working side of the right-of-way will be removed during periods of active construction when vehicle traffic is present, and will be replaced each night. Alternatively, drivable berms may be installed and maintained across the right-of-way in lieu of silt fences and/or weed-free straw bales.

Vehicle and equipment refueling and lubricating at waterbodies will take place in upland areas that are 100 feet or more from the edge of the waterbody and adjacent wetlands (the buffer distance is greater where slopes exceed 10 percent). Stationary equipment such as water pumps for use during stream crossing construction may need to be operated continuously on the banks of waterbodies and may require refueling in place. All such stationary equipment will be enclosed within impermeable secondary containment structures. The Spill Prevention, Control and Countermeasure (SPCC) Plan Section 13) addresses the handling of fuel and other materials associated with the Projects. The SPCC Plan will be available on each construction spread.

After the pipeline is installed across a waterbody using one of the methods described below, the trench will be backfilled with native material excavated from the trench. If present and moved prior to construction, larger rocks or boulders will be replaced in the stream channel within the construction area following backfill of the trench. The streambed profile will be restored to pre-existing contours and grade conditions to prevent scouring. The stream banks will then be restored as near as practicable to pre-existing conditions and stabilized. Typical stabilization measures include seeding, plantings, and installation of erosion control blankets. Jute thatching or bonded fiber blankets will be installed on banks of waterbodies or road crossings to stabilize seeded areas. Temporary erosion controls will be installed immediately following bank restoration. Rip-rap is proposed to be utilized at one stream crossing

[14] The Forest Service may adjust LRMP stream buffer widths to facilitate compliance with State requirements for stream crossings. Decisions to adjust stream buffers will be based on an interdisciplinary review and site-specific field investigation by the Forest Service. The buffers shall, at a minimum, encompass the riparian area defined on the basis of soils, vegetation and hydrology and the ecological functions and values associated with the riparian area.

[15] Atlantic will not use straw bales on the MNF for primary erosion control, but may use weed-free straw bales in dewatering structures.

location, an unnamed perennial tributary to Townsends Draft located at approximately MP 85.0 on the GWNF. A site-specific drawing of the slope stabilization design at this location is provided in Attachment C-3.

Waterbody crossings will be inspected and maintained until restoration of vegetation is complete.

Flume Method Dry Crossing

The flume crossing method consists of isolating and temporarily diverting the flow of water across the trenching area through one or more large-diameter, smooth steel flume pipes placed in the waterbody. This method allows for trenching activities to occur within a relatively dry stream or riverbed (i.e., beneath the flume pipes containing the water flow) thereby avoiding sedimentation and turbidity in the waterbody. The flume method is typically used to cross small to intermediate flowing waterbodies that support coldwater or other significant fisheries.

For each waterbody where the flume method is implemented, a sufficient number of adequately sized flume pipes will be installed in the waterbody to accommodate the highest anticipated flows during construction. Atlantic will use stream gauge data from the U.S. Geological Survey to determine the highest anticipated flows during the time the flume crossing is in effect. As noted above, the duration of in-stream construction activities (excluding blasting, if required) will be limited to as short a duration as possible. In the absence of stream gauge data, Atlantic's engineers and EIs will estimate the highest anticipated flows based on the width of the waterbody at the ordinary high water mark, the depth of the waterbody, existing flows at the time of the crossing, and the weather forecast at the time of the crossing. As a contingency, Atlantic will stage additional flume pipes at the crossing in the event that the volume of flow increases due to a precipitation event.

Prior to installation, EIs will visually verify the flume pipes are free of dirt, grease, oil, or other pollutants. After placing the pipes in the waterbody, sand- or pea gravel-filled bags, water bladders, or metal wing deflectors will be placed in the waterbody around the flume pipes upstream and downstream of the proposed trench. These devices will serve to dam the stream and divert the water flow through the flume pipes thereby isolating the water flow from the construction work area between the dams.

After installation of the flume pipes, the remaining standing water between the dams will be pumped out. Pump intakes will be appropriately screened to prevent entrainment of aquatic species. Additionally, any visible fish or other aquatic species trapped in the dewatered area will be removed and returned to the flowing waterbody. Leakage from the dams or subsurface flow from below the waterbody bed may cause water to accumulate in the trench once trenching has begun. If water accumulates in this area, it may be periodically pumped through piping into energy dissipation/sediment filtration devices as required by the Procedures. Such devices include geotextile filter bags or straw bale (weed-free) structures.

Backhoe-type excavators located on the banks of the waterbody will be used to excavate a trench under the flume pipe across the dewatered streambed. Spoil excavated from the waterbody trench will be placed and stored on the bank above the high water mark and a minimum of 10 feet from the edge of the waterbody in a manner compliant with state timing restrictions and as appropriate for specific site conditions. Temporary erosion control devices such as silt fences will be installed around the perimeter of the spoil piles. Once the trench is excavated, a prefabricated segment of pipe will be installed beneath the flume pipes. The trench will then be backfilled with the native material excavated from the trench across the waterbody bed. The banks will be protected with temporary erosion control devices before removing the dams and flume pipes and returning flow to the waterbody channel.

The flume method has proven to be an effective technique for constructing pipelines across sensitive waterbodies. The potential for the introduction of turbidity or suspended sediments is limited because sediment generated during trench excavation and backfilling operations is isolated to the dewatered area between dams. When flumes are installed properly, the operation of the flume is generally stable and can be left in place for periods prior to and following the installation of the waterbody pipeline crossing. The flume method also provides for continued fish passage through the construction work area via the flume pipes during the crossing.

Dam-and-Pump Dry Crossing Method

The dam-and-pump method may be used as an alternative to the flume method. It generally is preferred for waterbodies where hard bedrock occurs and in-stream blasting is required. The dam-and-pump method is similar to the flume method except that pumps and hoses are used instead of flume pipes to isolate and transport the stream flow around the construction work area. Similar to the flume method, the objective of the dam-and-pump method is to create a relatively dry work area to avoid or minimize the transportation of sediment and turbidity downstream of the crossing during in-stream work.

As the first step in implementing the dam-and-pump method, one or more pumps and hoses of sufficient size to transport anticipated flows around the construction work area will be installed in the waterbody. Additional back-up pumps will be on site at all times in case of pump failure. Once the pumps are operational, the waterbody upstream and downstream of the construction area will be dammed with sandbags and/or steel plates. Prior to dewatering the streambed, any visible fish or other aquatic species trapped in the dewatered area will be removed and returned to the flowing waterbody. As the dams are installed, the pumps will be started to maintain continuous flow in the waterbody.

Following the installation of the dams, the pumps will be run continuously until the pipeline is installed across the waterbody and the streambed and banks are restored. Pump intakes above the upstream dam will be appropriately screened to prevent entrainment of aquatic species. Energy-dissipation devices will be used to prevent scouring of the streambed at the discharge location. Water flow will be maintained through all but a short reach of the waterbody at the actual crossing location.

Backhoe-type excavators located on the banks of the waterbody will be used to excavate a trench across the waterbody. Spoil removed from the trench will be placed and stored on the bank above the high water mark at a minimum of 10 feet from the edge of the waterbody in a manner compliant with state timing restrictions and as appropriate for specific site conditions. Trench plugs will be maintained between the upland trench and the waterbody crossing. After backfilling, the dams will be removed and the banks restored and stabilized as described above.

2.1.5.2 Wetland Crossings

Six wetlands are crossed by the by the construction right-of-way; one on the MNF and five on the GWNF. The estimated temporary impacts to wetlands on both Forests is approximately 0.15 acre. With respect to permanent impacts (i.e. the long term vegetative conversion of palustrine forested wetlands on the permanently maintained right-of-way), the total impact is estimated at approximately 0.04 acre. Construction across wetlands will be conducted in accordance with the Stream and Wetland Crossing Procedures (Section 10), the FERC Procedures and additional requirements identified in federal or state/commonwealth wetland crossing permits. Typical methods for construction across wetlands are described below.

In accordance with the FERC Procedures, the width of the construction right-of-way will be limited to 75 feet through wetlands, with ATWS on both sides of wetland crossings to stage construction equipment and materials, fabricate the pipeline, and store materials and excavated spoil. Except as authorized by the FS, ATWS will be located at least 100 feet from the wetland boundary at each wetland crossed on NFS lands (on the GWNF, the buffer increases on slopes greater than 10 percent).

Wetland boundaries will be clearly marked in the field prior to the start of construction with signs and flagging. Construction equipment working in wetlands will be limited to what is essential for right-of-way clearing, excavating the trench, fabricating and installing the pipeline, backfilling the trench, and restoring the right-of-way. The wetlands crossed by the pipeline route on NFS lands do not span the entire width of the construction right-of-way; therefore travel from one side of the wetland to the other should be able to avoid the wetlands. If areas are identified where there is no reasonable access to or along the right-of-way except through wetlands, non-essential equipment will be allowed to travel through wetlands once, unless the ground is firm enough or has been stabilized to avoid rutting.

Clearing of vegetation in wetlands will be limited to trees and shrubs, which will be cut flush with the surface of the ground and removed from the wetland. To avoid excessive disruption of wetland soils and the native seed and rootstock within the topsoil, stump removal, grading, topsoil segregation, and excavation will be limited to the area immediately over the trenchline, except a limited amount of stump removal and grading may be conducted in other areas if required by safety-related issues. Topsoil segregation over the trenchline will only occur if the wetland soils are not saturated at the time of construction.

Following clearing, sediment barriers, such as silt fences, straw bales (weed-free), or other approved sediment barriers, will be installed and maintained adjacent to wetlands and within ATWS areas as necessary to minimize the potential for sediment runoff. Sediment barriers will be installed across the full width of the construction right-of-way at the base of slopes adjacent to wetland boundaries. Silt fences, coir logs and/or weed-free straw bales installed across the working side of the right-of-way will be removed during active construction when vehicle traffic is present, and will be replaced each night. Alternatively, drivable berms may be installed and maintained across the right-of-way in lieu of silt fences or weed-free straw bales. Sediment barriers will also be installed adjacent to or within wetlands along the edge of the right-of-way, where necessary, to minimize the potential for sediment to run off the construction right-of-way and into wetlands outside the work area. If trench dewatering is necessary, the water will be pumped through piping into energy dissipation/sediment filtration devices as required by the FERC Procedures. Such devices include geotextile filter bags or weed-free straw bale structures.

The method of pipeline construction used in wetlands will depend on site-specific weather conditions, soil saturation, and soil stability at the time of construction. If wetland soils are not excessively saturated at the time of construction and can support construction equipment on equipment mats, they will be crossed using conventional open-trench construction. This will occur in a manner similar to conventional upland cross-country construction techniques. In unsaturated wetlands, topsoil from the trenchline will be stripped and stored separately from subsoil.

Because little or no grading will occur in wetlands, restoration of contours will be accomplished during backfilling. Prior to backfilling, trench breakers will be installed, where necessary, to prevent subsurface drainage of water from wetlands. Where topsoil is segregated, the subsoil will be backfilled first followed by the topsoil. Topsoil will be replaced to the original ground level leaving no crown over the trenchline. In areas where wetlands overlie rocky soils, the pipe will be padded with rock-free soil or sand before backfilling with native bedrock and soil. Equipment mats, gravel fill, and/or geotextile fabric will be removed from wetlands following backfilling.

Where wetlands are located at the base of slopes, permanent slope breakers will be constructed across the right-of-way in upland areas adjacent to the wetland boundary. Temporary sediment barriers will be installed where necessary until revegetation of adjacent upland areas is successful. Once revegetation is successful, sediment barriers will be removed from the right-of-way and disposed of at an approved disposal facility.

2.1.5.3 Road and Trail Crossings

Section 7 (Traffic and Transportation Plan) identifies FS roads crossed by the ACP on NFS lands, with crossing methods[16]. Table 2.1.5-1 identifies trails crossed by the ACP on NFS lands.

All roads and trails crossed by the ACP on the MNF and GWNF, with the exception of the Appalachian National Scenic Trail (ANST), will be crossed using the open-cut method and then restored to preconstruction conditions. This method could require temporary closure of the road or trail to traffic and establishment of detours. If no reasonable detour is feasible, at least one lane of the road or trail being crossed will be kept open to traffic, except during brief periods when it is essential to close the road to install the pipeline in the trench. Perpendicular road and trail crossings will be completed in a few days using the same type of sub-bed and surface material as the original construction. Where the road or trail lies parallel to and within the pipeline construction right-of-way, the road, or trail will require closure during the duration of construction (see Attachment S; Road and Trail Open Cut Crossing Plans).

Atlantic will take measures such as posting signs and implementing necessary traffic control measures at open-cut road crossings for safety and to minimize traffic disruptions (see Attachment T; Flagging, Fencing and Signage Plan). Measures associated with road or trail closures, detours to avoid active construction areas, and measures for maintaining access across the road, are addressed in Section 7 and Attachment S. Debris from road construction (e.g., remnants of concrete) will be recycled or disposed of at an approved disposal facility. Section 2.1.5.9 and Appendix O address the crossing of the ANST.

TABLE 2.1.5-1

Forest Service Trails Crossed by the Atlantic Coast Pipeline Project

Trail Name/Number	National Forest	Approximate Milepost	Crossing Method
Shenandoah/447	GWNF	98.7	Open Cut
Brushy Ridge/718	GWNF	105.9	Open Cut
Dowell's Draft/650	GWNF	117.1	Open Cut
White Oak/486	GWNF	120.4	Open Cut
Appalachian National Scenic Trail/1	GWNF	158.1	HDD

2.1.5.4 Steep Terrain

Steep slope hazards are one of numerous geologic hazards and processes that could adversely affect environmental resources; or affect the routing, design, construction, and operation or the integrity of the Project. In accordance with Atlantic's commitment to safety and the environment, Atlantic developed and implemented for all new construction projects, the Slope Stability Policy and Procedure (updated in September 2016) to avoid, minimize, and mitigate potential landslide issues in slip prone areas prior to, during, and after construction (see Attachment C-1). The Slope Stability Policy and Procedure applies to both West Virginia and Virginia. It includes considerations for slips associated with pipeline construction during routing, engineering design, preconstruction planning, construction, and post-construction. It exceeds FERC or other regulatory requirements regarding slope stability design.

[16] The ACP Project does not cross any state highways or railroads on FS lands.

In addition, Atlantic is committed to identifying mitigation measures beyond standard practices targeted to prevent slips on steep slopes through a Best In Class (BIC) Program. The focus of the BIC Program is to proactively address steep slopes (defined as slopes greater than 30 percent and 100 feet in length) and landslide hazards related to pipeline construction, compressor station, and metering and regulation facilities that could potentially affect environmental resources, in particular streams, wetlands, and waterbodies. The BIC program is intended to incorporate the permit requirements from West Virginia and Virginia, and then go above and beyond all these regulatory standards, in order to mitigate for potential erosion and sediment discharges related to steep slope, landslide, and erosion hazards.

The ultimate goal of the BIC Program is to develop project-specific engineering mitigation recommendations and thereby support preparation of steep slope control measures and site-specific Erosion and Sedimentation Control Plan (ESCP) for the ACP. The BIC Program achieves this by pulling together a team of internal Dominion stakeholders along with supporting external subject matter experts to develop project specific mitigation recommendations; by using a process based approach that includes: hazard identification and assessment (i.e. find and then understand the hazard), engineering mitigation design (i.e. targeted design measures that mitigate the hazard), monitoring (i.e. track performance to know if additional mitigation is needed), and operational measures (i.e. monitor and maintain and operate the system, as needed).

The BIC Program Team convened in a series of design workshops to examine the identified hazards and supporting information along the pipeline alignment. The hazards were initially identified by studies such as the Geohazards Assessment or the karst study, and/or from other targeted studies such as the Order 1 Soil Survey. These studies identify and assess or support the review of the hazard, and provide a basis to select the most applicable and robust BIC mitigation response to minimize or eliminate the hazard, and then monitor the hazard through ongoing operations. Drawings associated with steep slope design are included in Attachment C-3. Additional drawings associated with steep slope design as have been requested by the FS will be provided at least 30 days prior to the start of construction at the location covered by the drawing.

To the extent that steep slope designs include installation of bleeder drains, and where sufficient flow exists from these drains, FS may require water quality monitoring at these locations. Discharge will be tested for hydrocarbons, trace metals, or other constituents that may occur in or on material used in pipeline construction. Water quality monitoring at these locations will be discontinued upon test results demonstrating compliance with State water quality standards.

2.1.5.5 Karst Areas

Based on review of maps from the U.S. Geological Survey, West Virginia Department of Environmental Protection, and Virginia Department of Mines, Minerals, and Energy, portions of the AP-1 mainline route across NFS lands have the potential to contain karst features (Dicken et al., 2005; Hubbard, 1983; Nicholson et al., 2005; West Virginia Department of Environmental Protection, 1998). A detailed desktop assessment and field survey was conducted by a geotechnical expert to identify sinkholes and other karst features (e.g., cave entrances, closed depressions, and sinking streams) along the proposed pipeline route in these areas. The Karst Monitoring and Mitigation Plan (Attachment H) identifies construction and restoration practices in karst areas. In accordance with this plan, erosion and sediment controls will be installed prior to construction along the edge of the right-of-way and in other work areas upslope of known sinkholes or other karst features with a direct connection to the phreatic zone of the karst (i.e., groundwater). Refueling activities and the handling of fuel and other materials in the vicinity of these features will be conducted in accordance with the SPCC Plan (Section 13). Additionally, Atlantic will monitor clearing, grading, and trenching activities to identify potential karst features that may have been unidentifiable on the surface during the preconstruction survey. If features are uncovered, they will be evaluated by a geotechnical contractor, in conjunction with the construction/environmental team members, to determine the need for mitigation measures, such as stabilization. Additionally, Atlantic will monitor karst features as described in the Karst Monitoring and Mitigation Plan.

2.1.5.6 Blasting

It is anticipated that blasting will be required in areas where hard shallow bedrock or boulders are encountered that cannot be removed by conventional excavation with a backhoe trencher, by ripping with a bulldozer followed by backhoe excavation, or by hammering with a backhoe-attached device followed by backhoe excavation. The Blasting Plan identifies areas on NFS lands where hard shallow bedrock is anticipated and blasting could be necessary. The Blasting Plan also provides blasting procedures, including safety, use, storage, and transportation of explosives, consistent with safety requirements as defined by federal and state/commonwealth regulations.

2.1.5.7 Winter Construction/Snow Removal

Atlantic does not expect that pipeline construction will occur in frozen ground conditions, although such a scenario is possible depending on weather conditions, particularly if construction extends into the late 4th Quarter of the year. It is also quite possible that construction could occur during times of snowfall in West Virginia and Virginia, particularly at higher elevations. Atlantic filed a Winter Construction Plan with the FERC (Attachment D), which identifies Best Management Practices (BMP) for winter construction activities that apply project-wide; additional requirements specific to NFS lands are included herein. As necessary, snow will be removed from construction work areas to expose soils for grading and excavation. Snow removal will be limited to active construction areas and areas needed to maintain access to the construction right-of-way. Snow will be bladed or pushed to the edges of the right-of-way with a motor-grader, snowplow, or bulldozer fitted with a “shoe” to minimize impacts on underlying soils and vegetation, and stockpiled within the right-of-way or in approved ATWS areas. Snow will not be bladed off the right-of-way. Alternatively, in the event of extreme snow events or significant snowdrifts, snow may be blown off the right-of-way using industrial blowers mounted to construction vehicles. Snow that is blown off the construction right-of-way will be directed away from existing roads and driveways, parking areas, residences, and other structures. Regardless of the method used, snow removal equipment will access the ACP Project area from approved access roads, and will operate from within the construction right-of-way or approved ATWS areas.

Snow will be removed from both the working and spoil sides of the construction right-of-way prior to topsoil segregation and grading to prevent mixing of snow with excavated spoil. Snow which accumulates on the right-of-way during construction will be removed and stockpiled along the edges of the construction right-of-way or in approved ATWS areas, or blown off the right-of-way, as described above. Large accumulations of snow on excavated spoil piles will be removed as practicable prior to backfilling. Snow will not be mixed with spoil during backfilling to the extent practicable.

Snow also will be removed, as necessary, from approved access roads by plowing to the edges of the road or blowing off the road to allow safe access to the construction right-of-way. Access roads on NFS lands will have a minimum of 2 inches of snow left to protect the road base. If conditions require blading down to the surface Atlantic will repair and replace lost material per FS standards. Snow removal will be conducted in a manner that protects roads, ensures safe and efficient transportation of materials, and prevents erosion damage to roads, streams, and adjacent lands. In addition, on NFS lands Atlantic will:

- Remove snow from the entire width of the road surface, including turnouts.

- Remove snow slides, earth slides, fallen timber, and boulders that obstruct the road surface.
- Remove snow, ice, and debris from ditches and culverts so that the drainage system will function efficiently at all times.
- Deposit all debris, except snow and ice, removed from the road surface and ditches at locations approved by the responsible official and away from stream channels.
- Equip snowplow blades with skid shoes to prevent loss of surfacing and damage to the road. A minimum of two inches of snow will be left to protect the road.
- Restore any damage resulting from snow removal in a timely manner.
- Ensure that snow plowing is conducted in accordance with Section 7 (Traffic and Transportation Plan).

Atlantic will not:

- Undercut constructed slopes or remove gravel or other surfacing material from the road surface.
- Leave snow berms on the road surface. Berms on the shoulder of the road will be removed or drainage holes will be opened and maintained. Drainage holes will be spaced as necessary to obtain satisfactory surface drainage without discharge on erodible fills.
- Use equipment with cleats or other tracks to plow snow without prior written approval of the AO.
- Use any agents, chemical or physical, to aid in the removal of snow.

The access roads will be maintained in accordance with applicable permit requirements and landowner agreements.

Gaps will be left in stockpiled snow piles based on an assessment of drainage patterns to allow water to drain off of the right-of-way during thaw. Gaps will also be left in stockpiled snow at drainage crossings. Atlantic's EIs will assess potential volumes and velocities of snow melt, considering temperature variations and rain amounts, and will work with the construction contractors to determine how best to stockpile snow, and where to create gaps in the event of a significant snow melt, to avoid situations where large accumulations of melting snow could flow away from the right-of-way causing erosion. Erosion control devices and diversion berms will be installed in these areas, as appropriate, in accordance with the Erosion and Sedimentation Control Plan. ACP will use temporary erosion controls, such as compost filter socks, in between stockpiled topsoil and spoil material and stockpiled snow to prevent erosion or mixing on NFS lands.

During winter or spring thaw conditions, Atlantic will determine when construction activities may be required, and will ensure they are implemented in accordance with the Winter Construction Plan. These construction activities could include any or all of the following:

- Surveying and staking the access roads, right of way, temporary work space and additional temporary work space

- Opening, upgrading, preparing and maintaining access roads
- Loading and offloading of construction equipment
- Felling, hauling and removing of timber
- Clearing vegetation
- Installing and maintaining erosion and sediment control materials and devices
- Chipping, grinding and burning (if permitted) of timber, slash and stumps
- Stripping, salvaging and stabilizing topsoil
- Topsoiling, grading of the right of way, temporary work space and additional temporary work space
- Hammering, drilling, blasting, excavating, storing, hauling and removing rock
- Hauling, stringing and bending of the pipe
- Excavating the ditch
- Welding the pipe and non-destructive examination of the welds
- Sandblasting and coating the welds
- Hauling and stockpiling padding material and installing it in the ditch
- Lowering the pipe into the ditch and backfilling
- Boring under roads, railroads and other infrastructure
- Horizontal directional drilling and associated support activities
- Installing, filling, maintaining, emptying and removing water impoundment structures
- Hauling and trucking of water
- Filling, testing, dewatering, drying, cleaning and internally inspecting the pipeline
- Removing, hauling and disposing of construction debris, trash and waste
- Maintaining and refueling equipment
- Monitoring, maintaining, stabilizing and securing the right of way, temporary work space, additional temporary work space and access roads
- Restoring areas disturbed by construction

In the transitional period between non-frozen and frozen soil conditions, Atlantic will implement appropriate measures as described in the Erosion and Sedimentation Control Plan (Section 9), Restoration and Rehabilitation Plan (Section 11) and Winter Construction Plan (Attachment D), based on site-specific conditions (e.g., soil stability) as determined by Atlantic's EIs, craft inspectors, construction site supervisor, and the AO or his/her designee.

Although excavation during frozen soil conditions is not anticipated during construction on NFS lands, if it becomes necessary to excavate across wetlands in such conditions, based on comments from the FS Atlantic will not leave a thin layer of topsoil over the trench line during the removal of topsoil, as will be done on non-NFS lands.

Similarly, in the unlikely event that, during restoration, mulch cannot be crimped due to frozen soil, hydraulic mulch or tackifier will be employed to stabilize mulch; water will not be used.

2.1.5.8 Concrete Coating

As noted above, concrete coating or bag weights will be used to provide negative buoyancy for the pipelines where they are installed across wetlands and waterbodies. Concrete coating, where required, will be applied to pipe joints at the contractor yards or on the construction right-of-way. The pipe will either be coated at contractor yards, in the construction right-of-way or in approved ATWS areas. All applications of concrete coating will be conducted in accordance with the SPCC Plan (Section 13) and other applicable environmental requirements. Concrete coating activities will not be conducted within 100 feet of wetlands, waterbodies, or springs, or within 300 feet of karst features, unless the location is an existing industrial site designated for such use.

2.1.5.9 Appalachian National Scenic Trail/Blue Ridge Parkway Crossing

Atlantic proposes to cross beneath the ANST and BRP with a single HDD. This method will avoid direct impacts to these features and surrounding federal lands, and will significantly mitigate visual impacts of the pipeline right-of-way from both features. Plan and profile drawings for the proposed HDD are included as Attachment O.

At the proposed pipeline crossing location, the ANST lies on GWNF land, while the nearby BRP lies on NPS lands. The GWNF is considering a project-specific LRMP amendment that would allow the ACP to cross the ANST at this location. **GWNF LRMP Standard 4A-025** states:

> *Locate new public utilities and rights-of-way in areas of [the ANST Management Prescription Area] where major impacts already exist. Limit linear utilities and rights-of-way to a single crossing of the [ANST Management Prescription Area] per project.*

The HDD method is a process that allows for trenchless construction by drilling a hole beneath a surface feature, such as in this case the BRP and the ANST, and installing a prefabricated segment of pipeline through the hole. Use of this method will completely avoid disturbance to the surface of the right-of-way between the entry and exit points of the drill. The entry site lies in Nelson County; the exit site lies to the northwest of the entry site, in Augusta County. Neither of these sites lies on NFS land. The length of the HDD from entry to exit point is approximately 4,600 feet. When installed, the pipe will lie more than 600 feet below the ANST and the BRP.

Tree clearing and site preparation associated with the HDD to cross the ANST and BRP is anticipated to begin in fall of 2017 at the HDD entry and exit sites. This work will be limited to tree clearing and site grading at the entry and exit workspaces. Drilling operations would begin in early spring of 2018. Drilling and installation of the pull section, and cleanup and regrading of the construction site, as needed, is conservatively estimated to continue for seven months.

To complete the HDD, a drill rig will be placed on the entry side of the crossing and a small-diameter pilot hole (i.e., about 4 inches) will be drilled along a predetermined path within the right-of-way underneath the BRP, other federal lands and the ANST using a powered drill bit. As drilling progresses, additional segments of drill pipe will be inserted into the pilot hole to extend the length of the drill under the mountain. The drill bit will be steered and monitored throughout the process to maintain the designated path of the pilot hole. Once the pilot hole is complete, the pilot hole will be enlarged through a process of back-reaming using progressively larger reaming tools until the bore hole is wide enough to accept the permanent pipeline. Several passes will be required to enlarge the hole to a sufficient diameter to accommodate the pipeline. The final hole will be approximately 12 inches larger than the 42-inch-diameter pipeline to be installed, or approximately 54 inches.

Throughout the drilling process, a fluid mixture consisting of water and bentonite clay (a naturally occurring mineral) will be pumped into the drill hole to lubricate the bit, transport rock cuttings to the surface, and maintain the integrity of the hole. Small pits will be dug at or near the entry and exit points for the HDD and will be located completely within the limits of the construction right-of-way. These pits will be used to temporarily store and manage the drilling fluid and cuttings. The fluid and cuttings will be pumped from the pits to an on-site recycling unit where the fluid will be processed (rock cuttings removed) and cleaned for reuse. Water for the drilling operation and hydrostatic testing of the HDD pipe section will be trucked to the site from the James River. The drilling operation will conform to all relevant sections of this COM Plan.

Noise from the HDD process is not expected to have a significant impact on users of the ANST, due to distance as well as intervening terrain and vegetation barriers. If during the HDD process noise levels at the ANST exceed 75 decibels, a sound barrier will be erected at the drill site in a manner to reduce noise levels to less than 75 decibels.

The pipeline segment (also called a pull section) to be installed beneath the surface feature will be fabricated on the right-of-way or in the approved additional temporary workspace on the exit side of the crossing while the drill hole is reamed to size. The pull section will be inspected and hydrostatically tested prior to installation. A steel bullhead will be welded onto the front end of the pull section to aid in pulling the pipe through the drill hole. After the hole is completed, the pull section will be attached to the drill string on the exit side of the hole and pulled back through the hole toward the drill rig. As the pipeline is being installed, excess drilling fluid that is displaced from the hole by the pipeline will be collected and disposed of at an appropriate and approved off-site facility.

Temporary storage of material removed from either the proposed or contingency drill path will occur on the workspace associated with the entry or exit locations, which are not located on NFS land. Cuttings will be hauled away and deposited at approved landfills and will not result in any significant temporary accumulation. Any temporary storage of cuttings will be in accordance with project requirements (e.g., erosion and sedimentation controls, setbacks from water bodies, site clean-up).

Once installation of the HDD pipeline is completed, the pulled segment will be welded into the cross country sections of pipeline on either side of the HDD and the construction site will be cleaned up, regraded as necessary, and reseeded/replanted. Trees will be allowed to regrow in all temporary workspace outside of the permanent right-of-way.

ACP has developed a contingency plan for the HDD crossing of the ANST and BRP. It includes an initial contingency plan of utilizing an alternative HDD path or paths, and an alternative contingency plan using direct pipe trenchless technology. The ANST crossing contingency plan is described in Attachment P.

2.1.6 Construction Safety & Security

Day-to-day security of the work sites (contractor yards, material yards, work sites, etc.) will be the responsibility of the respective contractors assigned to the site. Contractors will likely use private security contractors and/or local off-duty police officers to maintain security. Contractors' security personnel will coordinate with Atlantic corporate security and will provide briefings on known or potential security risks as necessary. Atlantic will coordinate all security and safety activities at work sites on NFS lands with the designated FS staff.

Each contractor will have a full-time safety representative assigned to each active construction site. This representative will work closely with Atlantic safety personnel, both field and managerial, to maintain and enforce project safety guidelines. Each contractor will develop site-specific safety plans that will address the safety concerns associated with each work site (steep terrain, urban work areas, etc.).

The contractors' safety plans will be submitted to Atlantic for approval and will address a broad range of project safety guidelines and procedures, including but not limited to:

- Accident investigation
- Substance abuse policy
- Emergency action plans (fire reporting, site evacuation procedures, etc.)
- Local emergency contacts (police, fire, hospitals, etc.)
- Safety training requirements and procedures
- Safe operation of equipment
- Traffic control procedures

General security and safety plans will be reviewed daily, during morning meetings with all construction personnel, prior to leaving the yard. Once on the right-of-way or associated job site, specific safety and security risks associated with the day's work will be addressed with job hazard analysis conducted by crew foremen. The job hazard analysis will be narrower in scope and will address specific hazards associated with the work to be completed that day.

Atlantic will, in close coordination with the FS, post signs at various strategic locations informing the public about the pipeline construction, any road or trail closures or detours, restricted areas, etc. Along portions of the construction right-of-way between road and trail crossings, ACP will post signs at or near the edge of the work area at spacings of about 200 feet or as dictated by terrain and visibility, warning the public that the construction right of way is closed to public entry. Measures to ensure the safety of the public are discussed in more detail in Section 18, Public Access Plan.

2.2 OPERATIONS AND MAINTENANCE

2.2.1 Routine Maintenance

Dominion Energy Services, Inc. (DTI) will operate and maintain the ACP facilities in accordance with all applicable federal and state/commonwealth requirements, including the minimum federal safety standards identified in Transportation of Natural and Other Gas by Pipeline, 49 CFR 192. Operations and maintenance of the ACP facilities will be performed by or at the direction of DTI in its capacity as operator of the ACP pursuant to a Construction, Operations, and Maintenance Agreement with Atlantic.

The USDOT's Pipeline and Hazardous Materials Safety Administration regulates the operations and maintenance of natural gas pipeline facilities. The regulations found at 49 CFR 192.613, 192.703, 192.705, and 192.709 address aerial and ground patrols of pipeline facilities. DTI will conduct regular aerial and ground patrols of the pipeline facilities in accordance with these regulations. The frequency of patrols is determined by class location unit (i.e., population density) and the location of the pipeline. DTI has Standard Operating Procedures for its facilities that define patrol frequency and methods and identify reporting requirements for abnormal or unusual conditions. All patrols are documented in an Inspection Monitoring System Compliance Database.

The pipeline facilities will be inspected by qualified personnel from the air (currently performed monthly) and on foot (yearly) in accordance with the applicable regulations. This will allow for adequate viewing of the right-of-way and the use of technology and equipment for leak detection. Aerial patrols are performed at altitudes that do not disturb nesting birds or other wildlife. Foot patrols are conducted by staff trained to identify potential issues such as erosion, slips, and leaks. These surveillance activities will provide information on possible encroachments and nearby construction activities, exposed pipe, and other potential concerns that may affect the safety and operation of the pipelines. Field personnel will advise the appropriate operations personnel of new construction along or near the pipeline system. Line patrol of highway and railroad crossings will be completed as required by the USDOT.

FS staff will be notified of any planned foot patrols and will be provided with any resulting reports or photographs concerning the condition of the right-of-way, including evidence of unauthorized Off-Highway Vehicle (OHV) use, or integrity of the pipeline system.

Pipeline markers and signs will be inspected to assure that pipeline locations are clearly identified. The condition of pipeline markers will be noted during line patrols as well as during road crossing, One-Call, and other inspections. Damaged or missing line markers will be noted and repaired or replaced as necessary.

In order to maintain accessibility of the right-of-way and accommodate pipeline integrity surveys, vegetation along the right-of-way will be cleared or trimmed periodically, and as necessary, in accordance with the Erosion and Sedimentation Control Plan (Section 9), Non-Native Invasive Plant Species Management Plan (Section 12), Stream and Wetland Crossing Procedures (Section 10), and Visual Resources Plan (Section 21). No vegetation maintenance will be required in the ANST area crossed by HDD. Clearing equipment will be pre-approved by the FS. Clearing will occur between September 1 and April 1 on the MNF and between September 1 and March 15 on the GWNF.

As part of routine maintenance of the pipeline system, DTI will occasionally trim woody vegetation and herbaceous vegetation over the pipe as necessary to maintain a visible corridor, centered on the pipeline, to allow for adequate aerial inspection.

On steep slopes (>40 percent) depending on bank stability the clearing would be completed via motorized equipment and/or hand clearing. No herbicides will be utilized for normal vegetation maintenance.

DTI will monitor the right-of-way and other areas affected by project construction for infestations of non-native invasive species that may have been created or exacerbated by its construction activities, and will utilize FS-approved herbicides to treat such infestations, in accordance with Section 12, the Non-Native Invasive Plant Species Management Plan. DTI and ACP will treat infestations both before and after construction, as specified in Section 12.

Operations and maintenance procedures, including record keeping, will be performed in accordance with USDOT requirements.

Pipeline integrity surveys and vegetation maintenance may identify areas along the right-of-way where permanent erosion control devices need to be repaired or additional erosion control devices may be needed. If problem areas are evident, erosion control devices will be repaired or installed, as necessary, and the right-of-way will be stabilized to prevent future degradation. FS staff will be advised of planned erosion control repairs, re-installations, or additions.

2.2.2 Major Maintenance Work

During the operating life of the pipeline, it may be necessary on occasion to excavate the pipe for inspection, repair, or replacement purposes. Atlantic will notify the appropriate Forest in advance of such work to review the work plan, to ensure the work is carried out in compliance with the terms of the SUP, and to address any other issues regarding the work. In many cases the work would be able to be performed within the permanent right-of-way boundaries. However, in some instances additional workspace may be needed outside the permanent right-of-way, depending on terrain, the extent of the excavation or repairs, etc., in which case Atlantic will seek appropriate temporary authorization from the FS. In such instances, Atlantic anticipates that the work would be able to be carried out within the ACP construction footprint.

2.2.3 Emergency Repairs

49 CFR Part 192 describes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Under Section 192.615, each pipeline operator must establish an emergency plan that provides written procedures to minimize the hazards from a gas pipeline emergency. Key elements of the plan include procedures for:

- receiving, identifying, and classifying emergency events, such as gas leaks, fires, explosions, and natural disasters;
- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- making personnel, equipment, tools, and materials available at the scene of an emergency;
- protecting people first and then property, and making safe from actual or potential hazards; and
- emergency shutdown of systems and safe restoration of service.

DTI has an Emergency Response Plan (ERP) for its existing pipeline system in accordance with the USDOT regulations. DTI will update the ERP to incorporate the proposed Project based on feedback from local emergency service providers (e.g., police, fire, medical, and emergency response). The updates to the ERP will identify the appropriate contacts for emergency service providers (including names and telephone numbers) in the event of an emergency during operation of the Project. The updated ERP will be available prior to construction.

The USDOT requires that pipeline operators establish and maintain liaisons with local fire, police, and other emergency responders to plan for and coordinate emergency response efforts in the event of an incident during construction or operation of the proposed facilities. Additionally, each operator must establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a natural gas pipeline emergency and report it to the appropriate public officials. Accordingly, DTI will establish and maintain liaisons with local public officials and emergency responders, and provide appropriate training to responders before the proposed ACP is placed in service.

Regular meetings[17] will be held with emergency response agencies (including FS wildland fire and law enforcement personnel and local fire departments) where the role of the agencies with regard to pipeline fires will be discussed, along with issues related to potential compressor station incidents. The information exchanged between DTI and the emergency response agencies that participate in these meetings will familiarize each organization with the resources, including personnel and equipment that can be utilized in the unlikely event that an incident occurs. Police and fire departments will also receive emergency telephone numbers that can be used to contact DTI 24 hours a day.

In the unlikely event of an incident, DTI will work with emergency response agencies to maintain access to and from residences and businesses during potential emergency situations. DTI will implement its ERP to bring the incident under control, and work with local responders to maintain access to residences and businesses via existing roads. If a road is damaged by an incident, or access to residences and business is otherwise restricted, DTI responders will cut a new road for access or make an old road passable, to reach the affected residences and businesses. Additionally, in an emergency situation, DTI could use air lift services to reach affected residences and businesses. After the emergency is remedied and safe operations have resumed, work areas will be restored to the conditions originally agreed upon with the FS.

2.2.4 Pipeline Operations/Safety and Security

The USDOT is the federal agency responsible for pipeline safety under Title 49, United States Code Chapter 601. Within the USDOT, the Pipeline and Hazardous Materials Safety Administration's Office of Pipeline Safety (OPS) administers a national regulatory program to facilitate the safe transportation of natural gas and other hazardous materials by pipeline. The OPS has developed safety regulations and other approaches to risk management that promote safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards that set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve the required safety standards.

The pipeline facilities associated with the ACP will be designed, constructed, operated, and maintained to meet or exceed the USDOT Minimum Federal Safety Standards in Title 49 CFR Part 192. These regulations, which are intended to protect the public and to prevent natural gas facility accidents and failures, include specifications for material selection and qualification; minimum design requirements; and protection of the pipeline from internal, external, and atmospheric corrosion.

2.2.5 Integrity Management Plan

The Gas Transmission Integrity Management Rule (49 CFR Part 192, Subpart O) specifies how pipeline operators must identify, prioritize, assess, evaluate, repair, and validate the integrity of gas

[17] Pipeline and Hazardous Materials Safety Administration Code requires ACP to hold annual meetings with emergency response agencies. This will be facilitated via regional and/or individual municipality meetings.

transmission pipelines that could, in the event of a leak or failure, affect High Consequence Areas. This rule requires that operators develop a written integrity management plan that includes:

- identification of all covered segments;
- development of a Baseline Assessment Plan to assure the integrity of all covered segments;
- a framework that contains all required elements of the Integrity Management Program;
- a process to assure continual improvement to the program;
- provisions to implement industry standards invoked by reference; and
- a process to document changes to the program (and notify OPS as required).

DTI has implemented a comprehensive Integrity Management Program that meets or exceeds these regulations. DTI's Integrity Management Program addresses the following:

- High Consequence Areas[18]
- Threat Identification/Risk Assessment – DTI has adopted a threat-based methodology for managing pipeline risk.
- Baseline/Continuous Assessment Plans – Risk assessment provides a rational and consistent method to assess the integrity of a pipeline segment. This method allows for prioritization, which more effectively uses resources in identifying and mitigating threats.
- Remediation/Prevention – Remediation is defined as action taken by the operator to mitigate the danger of a potential integrity concern. Remediation includes pressure reduction and/or timely repair and preventive measures that halt a potential integrity problem so it does not proceed to failure.
- Record-Keeping Provisions – DTI maintains a complete history of all major integrity components within integrated databases.
- Performance and Quality Assurance – DTI's Integrity Management Program is evaluated to confirm that the program effectively assesses integrity and protects High Consequence Areas. A Quality Assurance Plan provides documented proof that the operator meets all requirements of its Integrity Management Plan.
- Management of Change – Management of change procedures identify changes to pipeline systems and consider the impact of those changes on the integrity of the pipeline system.
- Communications – DTI has developed and implemented a communications plan to inform company personnel, jurisdictional authorities, and the public about its integrity management efforts and the results of its integrity management activities.

[18] No High Consequence Areas are located along the pipeline route on either National Forest.

2.2.6 Facilities Security

DTI maintains a Critical Gas Facilities Security Plan that addresses the assessment of risks to DTI facilities. DTI will update this plan to incorporate the proposed Project. The risk assessment process includes sabotage, terrorism, theft and diversion, cyber threats, security breaches, and security incidents. DTI Corporate Security, working with DTI Management, conducts ongoing risk assessment of DTI facilities utilizing the continual risk management methodology. This methodology assesses historical and projected risks.

The security plan implements a strategy that includes the development of close working relationships with the local, state/commonwealth, and federal law enforcement agencies that are responsible for DTI sites throughout the DTI footprint. These relationships include the sharing of risk/threat information pertaining to DTI facilities. The security strategy also includes an ongoing training program for DTI personnel on the security topics of the signs of terrorism, sabotage, and suspicious incidents, to include the reporting of such incidents to DTI Management, DTI Corporate Security, law enforcement, and the appropriate state/commonwealth and federal regulatory agencies.

2.2.7 Abandonment

While Atlantic has no plans for abandonment of its pipeline facilities, if abandonment is necessary, Atlantic will either remove its pipeline facilities from NFS lands or abandon them in place as authorized or directed by the AO, and restore the right-of-way and associated work areas, in consultation with the FS.

2.3 KEY CONTACTS

Forest Service

Project Managers/Points of Contact

Jennifer P. Adams, Special Projects Coordinator
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District Rangers

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Lauren Stull, District Ranger
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George Washington National Forest

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Federal Energy Regulatory Commission (FERC)

FERC Environmental Project Manager

Third-Party Monitors

Dominion Energy Transmission, Inc. (Permit Holder)

Project Managers

Ron Baker

Britanny Moody

Environmental Construction Coordinator

Robert "Shane" Prescott

Construction Site Supervisors

Spread 3
Stanley Wilt
304-613-9583

Spread 3A
Joe Pena
304-657-6832

Spread 4
Steve Stuter
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Spread 4A & 5
Jerred Pierson
804-239-2511

Environmental Construction Coordinator

Manager of Security

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2.4 OPERATING PLAN REQUIREMENTS

From Forest Service Manual 2716.72:

The provisions enumerated in paragraphs 1 through three below will be included in all operating plans for special use authorizations.

1. Incident Notification. Require the holder to contact the authorized officer as soon as practicable after the following incidents occur on NFS lands covered by a special use authorization.

   a. An incident resulting in death, permanent disability, or personal injuries that are life-threatening or that are likely to cause permanent disability;

   b. A structural, mechanical, or electrical malfunction or failure of a component of a facility designed for passenger transport or any operational actions that impair the function or operation of such a facility in a way that could affect public safety;

   c. A search and rescue operation to locate a person; or

   d. Any incident that has high potential for serious personal injury or death or significant property, environmental, or other natural resource damage, including avalanches, landslides, flooding, fire, structural failures, and release of hazardous materials.

2. Method of Notification. Specify the method of incident notification. The authorized officer will determine how incident notification must be made. The means of incident notification may be tailored to the characteristics of the authorized use or occupancy, as needed.

3. Contents of Notification. Require the holder to specify when, where, and how the incident occurred and who was present or affected by the incident.

Regarding Paragraph 2 above (Method of Notification), Atlantic will notify the AO (or his or her delegated agent) by phone as soon as possible. Atlantic will follow-up within 48 hours of notifying the AO by phone with a written incident report that meets the requirements of Paragraph 3 above.

3.0 ENVIRONMENTAL COMPLIANCE

3.1 PURPOSE

The purpose of this Environmental Compliance Plan is to identify processes to ensure compliance with conditions attached to ACP authorizations, for the portion of the Project that lies on NFS lands only. However, it is designed to be consistent with, and will be referenced in, the broader *Implementation Plan*, which is required by the FERC to address environmental compliance across the entire Project. The Environmental Compliance Plan establishes processes and procedures for environmental training, environmental inspection and monitoring, and reporting on NFS lands. It also identifies the roles and responsibilities of Project and agency staff or their representatives, in assuring environmental compliance. This Environmental Compliance Plan extends to all subject areas covered by the COM Plan, for purposes of training, compliance and reporting.

3.2 FERC IMPLEMENTATION PLAN

Among the standard conditions included by the FERC in any issuance of a CPCN, is that the certificate holder submit an *Implementation Plan*. The *Implementation Plan* will describe how Atlantic will comply with the construction procedures and mitigation measures described in their application, supplemental filings (including responses to staff data requests), the final EIS, and conditions required by the CPCN. The *Implementation Plan* will demonstrate to the FERC, regulatory agencies, and federal/state land management agencies that Atlantic has considered all environmental requirements related to the project, and has a plan to ensure they are implemented during construction. The *Implementation Plan* will include, among other items, the following:

- updated alignment sheets;
- any changes, route realignments, facility relocations and staging area changes or additions shown on alignment sheets along with a written description of the change, existing land use/cover type, documentation of landowner or land management agency approval, and a statement of any cultural or federally listed threatened or endangered species that will be affected;
- a statement that Atlantic will inform contractor personnel of the EIs authority and commitment to provide environmental training to contractor personnel;
- a description of how Atlantic will implement the construction procedures and mitigation measures described in its application, supplemental filings (including responses to staff data requests), the final EIS, and required by the CPCN; and how Atlantic will incorporate these requirements into the contract bid documents, construction contracts and construction drawings so that the mitigation required at each site is clear to onsite construction and inspection personnel;
- a schedule or Gantt Chart that includes dates for the completion of all required surveys and reports; the environmental training of construction personnel; the start of construction; and the start and completion of restoration;
- the number of EIs assigned per construction spread, and how Atlantic will ensure that sufficient personnel are available to implement the environmental mitigation measures; company personnel, including EIs and contractors; who will receive copies of the appropriate material; the location and dates of the environmental compliance training; the

procedures (including use of contract penalties) Atlantic will follow if noncompliance occurs;

- a discussion of the EI's roles and responsibilities;
- a commitment by Atlantic to file weekly or biweekly construction status reports;
- a description of Atlantics environmental complaint resolution procedure that provides landowners with clear and simple directions for identifying and resolving their environmental mitigation problems/concerns during construction and restoration of the ACP Project.

Atlantic's *Implementation Plan* will need to be filed with the FERC within 60 days of acceptance of the CPCN.

3.3 CONTRACTOR BID DOCUMENTS

Atlantic will include copies of all approved environmental construction and mitigation plans and permits for incorporation into the construction contracts. The construction contracts will include penalties for noncompliance with the Project's environmental requirements.

3.4 PREPARATION OF REQUEST FOR PROPOSAL FOR THIRD-PARTY COMPLIANCE CONTRACTOR

Following receipt of the CPCN from the FERC, Atlantic will prepare a request for proposal to provide third-party compliance oversight on behalf of the FERC and other agencies, including, pending their concurrence, the MNF and GWNF. The request for proposal will be sent to multiple environmental firms with a demonstrated track record of providing these services to the FERC. The environmental contractor assisting FERC with the Environmental Impact Statement is typically included on the list assuming they are qualified to provide these services. Atlantic will choose its preferred proposals (typically three) and submit them to FERC. The FERC will choose its preferred provider from the proposals submitted by Atlantic.

3.5 NOTICES TO PROCEED

Atlantic will not commence construction anywhere on the Project until the FERC has issued the Project a Notice to Proceed (NTP). FERC's NTP is typically issued once the certificate holder has satisfactorily demonstrated compliance with pre-construction conditions contained in the CPCN. Similarly, Atlantic will not commence construction (including timber removal) on NFS lands unless and until the AO has issued the Project an NTP.

3.6 ENVIRONMENTAL COMPLIANCE ROLES AND RESPONSIBILITIES

3.6.1 Forest Service (FS)

The FS has authority over all activities that occur on NFS lands.

3.6.2 FS Authorized Officer

The FS AO will have environmental compliance oversight over the portion of the project on NFS lands, and is responsible for determining overall environmental compliance with the COM Plan, Record of Decision, and terms of the SUP. The AO has stop work authority for all project-related activities on NFS lands. The AO manages the Field Compliance/Monitoring Officers. The AO is responsible for issuing NTPs on NFS lands and for approving requested project changes on NFS lands using the variance request process described in Section 3.9 below.

3.6.3 Field Compliance/Monitoring Officers

The Field Compliance/Monitoring Officers will conduct compliance oversight inspections on all NFS lands. The Field Compliance/Monitoring Officers will be responsible to the AO to verify and document Atlantic's compliance with the COM Plan, the Record of Decision, and terms of the SUP. The Field Compliance/Monitoring Officers will not interact directly with the contractor but will coordinate and communicate with Atlantic's EIs. The Field Compliance/Monitoring Officers will conduct field review of potential project changes and report findings to the AO to support approval or denial of variance requests. The Field Compliance/Monitoring Officers will have stop work authority for discrete activities on NFS lands that pose an immediate threat to a sensitive environmental resource. The Field Compliance/Monitoring Officers will also have the authority to affirm that specific goals or objectives have been met.

3.6.4 Federal Energy Regulatory Commission

3.6.5 FERC Environmental Project Manager

The FERC Environmental Project Manager (FERC PM) will have environmental compliance oversight over the entire Project. The FERC PM will direct the activities of the Third-Party Compliance Monitoring Team. The FERC PM will have stop work authority for all project-related activities.

3.6.6 Third-Party Compliance Monitoring Team

The FERC Third-Party Compliance Monitoring Team will consist of an office-based Compliance Manager and multiple field-based Compliance Monitors (CM). The Third-Party Compliance Manager will manage the Third-Party Compliance Monitoring Program and be responsible for directing the day to day activities of the Third-Party CMs, reporting compliance results to FERC, and managing the FERC variance approval process. The Third-Party Compliance Manager will be responsible to ensure that corrective actions are documented in relation to all noncompliance activities. The Third-Party Compliance Manager will be responsible, on the FERC's behalf, to approve or deny Level 2 variance requests. Any such approval would be issued only after the designated FS AO has approved the variance. The Third Party Compliance Manager will document all variance requests and approvals, and will coordinate with Atlantic, the AO, and the FERC PM to ensure compliance.

The CMs will conduct daily inspections of all construction activities and document their observations and levels of compliance in daily reports. The CM will assist in the review of variance requests and be responsible to approve or deny Level 1 variance requests after the FS has approved the variance. Level 1 variance requests may be verbally approved by the FS. The CMs' primary responsibilities will be monitoring environmental compliance on all non-NFS lands; however, because the FERC has responsibility for environmental compliance over the entire Project, the CMs will conduct limited monitoring on NFS lands and will coordinate with the Field Compliance/Monitoring Officers. The CMs will not interact directly with the contractor but will coordinate and communicate with Atlantic's EIs and the FS' Field Compliance/Monitoring Officers. The CMs will have stop work authority for discrete activities that pose an immediate threat to a sensitive environmental resource.

3.6.7 Project Manager

Atlantic's Project Manager will be responsible to Atlantic and is responsible for overall management of construction activities.

3.6.8 Construction Site Supervisor

The Construction Site Supervisor will have direct oversight of all personnel that prepare, construct, maintain, and rehabilitate the Project. The Supervisor also has control over site-specific construction plans, including the ability to make modifications to those plans, pending any necessary FS approvals. In addition to FS requirements, this person must ensure that construction complies with the FERC CPCN, the COM Plan, and other Project mitigation plans and permits. The Construction Site Supervisor is authorized to direct workers at a site to carry out activities in accordance with these and other permit conditions. The Construction Site Supervisor will ensure compliance with all applicable safety requirements.

3.6.9 Environmental Construction Coordinator

The Environmental Construction Coordinator (ECC) will serve as part of the environmental team relative to environmental compliance within Atlantic. The ECC has the responsibility of ensuring full compliance with applicable laws, environmental rules, regulations, permits, and company policies that pertain to their Project. The ECC's roles and responsibilities may include:

- Ensure compliance with applicable federal, state, and local environmental regulations, permits, company standards, and procedures, and facility procedures at the Project;
- Promote environmental stewardship;
- Coordinate with EI's and contractors to ensure site environmental compliance;
- Serve as primary site coordinator with Dominion Energy Environmental Services, internal departments, and external agencies regarding environmental issues;
- Serve as contact with community or local public to resolve environmental emergencies, complaints, or problems;
- Maintain environmental permits, plans, and various compliance records; and
- Assist with environmental emergency response activities.

3.6.10 Environmental Inspector

EIs will have the authority to stop activities that violate the environmental conditions of the FERC CPCN, the COM Plan, stipulations of other environmental permits or approvals, or landowner easement agreements, as well as order appropriate corrective action.

The EI will have peer status with all other activity inspectors and will report directly to the ECC who has overall authority on the construction spread or Project.

The number and experience of EIs assigned to each construction spread will be appropriate for the length of the construction spread and the number/significance of resources affected. The person designated as the EI will typically be a dedicated role for each construction spread.

At a minimum, the EI will be responsible for:

- Inspecting construction activities for compliance with the requirements of this COM Plan, the environmental conditions of the FERC CPCN, proposed mitigation measures, other federal or state and local environmental permits and approvals, and environmental requirements in landowner easement agreements;

- Identifying, documenting, and overseeing corrective actions, as necessary to bring an activity back into compliance;

- Verifying that the limits of authorized construction work areas and locations of access roads are visibly marked before clearing, and maintained throughout construction;

- Verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, including waterbodies and wetlands, or areas with special requirements along the construction work area;

- Identifying erosion/sediment control and soil stabilization needs in all areas;

- Ensuring that the design of slope breakers will not cause erosion or direct water into sensitive resource areas, including cultural resource sites, wetlands, waterbodies and sensitive species habitats;

- Verifying that dewatering activities are properly monitored and do not result in the deposition of sand, silt, and/or sediment into sensitive resource areas, including wetlands, waterbodies, cultural resource sites, and sensitive species habitat; stopping dewatering activities if such deposition is occurring and ensuring the design of the discharge is changed to prevent reoccurrence; and verifying that dewatering structures are removed after completion of dewatering activities;

- Ensuring that subsoil and topsoil are tested on NFS lands to measure compaction and determine the need for corrective action;

- Advising the Construction Site Supervisor when environmental conditions (such as wet weather, severe storm events or frozen soils) make it advisable to restrict or delay construction activities to avoid topsoil mixing or excessive compaction;

- Ensuring restoration of contours and topsoil;

- Verifying that any imported soils are free of noxious weeds and soil pests, unless otherwise approved by the landowner, and is considered clean and free of hazardous materials;

- Ensuring that the appropriate erosion/sediment control and stabilization needs are implemented in all areas, including ensuring that erosion and sediment controls are properly installed and maintained daily to prevent sediment flow into sensitive resource areas (e.g., wetlands, waterbodies, cultural resource sites, and sensitive species habitats) and onto roads, and determining the need for additional erosion control devices;

- Inspecting and ensuring the maintenance of temporary erosion and sediment control measures at least:
    - On a daily basis in areas of active construction or equipment operation;
    - On a twice-weekly basis in areas with no construction or equipment operation;
    - Within 24 hours of each stormwater event (runoff from precipitation, snowmelt, surface runoff and drainage, including rainfall events resulting in 0.5 inch or more);
- Ensuring the repair of all ineffective temporary erosion and sediment control measures within 24 hours of identification, or as soon as conditions allow if compliance with this time frame would result in greater environmental impacts;
- Identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase;
- Ensuring proper seed mixes, rates, planting specifications and related restoration measures are employed, and obtaining documentation thereof;
- Ensuring that the Contractor implements and complies with Atlantic's internal environmental standards and related operating procedures;
- Verifying that locations for any disposal of excess construction materials for beneficial reuse comply with this COM Plan and any applicable permits/authorizations; and;
- Keeping records of compliance with the environmental conditions of the FERC CPCN, the COM Plan, and other federal or state environmental permits during active construction and restoration. Records should include photo documentation.

3.6.11 Environmental Monitors

In addition to EIs, Environmental Monitors will be deployed as required. Environmental Monitors are resource specialists and include for example cultural and biological resource monitors. Depending on the Project requirements, the biological monitors may be general biological monitors, avian or fisheries monitors, or other species-specific monitors with certifications for handling sensitive species. These monitors will be provided on an as-needed basis in compliance with construction monitoring plans and permit conditions. For example, certain monitors may only be required when construction activities are in the vicinity of a specific site (e.g., a known cultural resource site or habitat for a threatened endangered species). Depending on the timing of construction, avian monitors may be required during tree clearing operations.

3.7 ENVIRONMENTAL TRAINING

Environmental training will be given to both Atlantic personnel and contractor personnel whose activities have the potential to affect the environment during pipeline construction. All construction personnel from the ECCs, EIs, craft inspectors, and contractor job superintendent, to loggers, welders, equipment operators, and laborers will be given some form of environmental training. The level of training will be commensurate with the type of duties of the personnel. At the discretion of Atlantic, environmental training for personnel may also be required on the Project where it is not required by FERC.

Training will be given prior to the start of construction and throughout the construction process, as needed, and will cover the following issues:

- COM Plan and FERC CPCN requirements, and related mitigation plans;
- General environmental regulatory permit requirements;
- Job- or activity-specific permit requirements;
- Atlantic policies and commitments;
- Cultural resource procedures and restrictions;
- Threatened and endangered and other sensitive species procedures and restrictions;
- Procedures in the event of unanticipated paleontological discoveries (see Attachment R); and
- Any other pertinent information related to the job.

In addition to the EI, all other construction personnel are expected to play an important role in maintaining strict compliance with all permit conditions, and to promptly report any conditions that are perceived as having the potential to threaten environmental protection to the appropriate inspector during construction.

3.8 REPORTING

All EIs and Environmental Monitors will document their daily inspection activities in a daily report using an electronic reporting system. All information for the daily inspection reports will be entered into an electronic daily report template that transfers the information to a Project-specific database. The daily report will have required reporting fields such as date, location information, and compliance level and will be capable of handling photographic documentation. The electronic reporting system will be used to generate information for the Atlantic's weekly report to be submitted to FERC.

Turbidity monitoring and reporting associated with stream crossing construction is addressed in the Water Quality Monitoring Plan (Section 20.4).

Post-construction reporting is discussed in the ESCP (Section 9.10), the Stream and Wetland Crossing Procedures (Section 10.4.3), the Restoration and Rehabilitation Plan (Section 11.4.1.4), the Non-Native Invasive Plan Species Management Plan (Section 12.4.1.4), and the OHV Blocking Plan (Section 19.5).

3.9 VARIANCE PROCEDURES

Project changes will require approval through the variance request process. A dedicated Variance Coordinator may be required to coordinate variance requests from the contractor, ensure approvals are received from Atlantic, ensure any necessary landowner approvals are in place, appropriate documentation is provided (e.g., photos, maps, biological/ cultural survey), and other agency approval as necessary. Levels of variance approvals are as follows:

- Level 1 variance requests include the approval of like-use roads (assuming the Project has received blanket concurrences from the FWS and State Historic Preservation Officer for like-use roads); shifting extra workspace along the construction right-of-way for a short distance within the previously surveyed corridor (without increasing land use disturbance in type or acreage or impacting cultural or environmental resources); and performance-based changes to mitigation measures. On NFS lands, Level 1 variances will be site-specific must be approved in writing by the FS Field Compliance/ Monitoring Officer. Any such approvals will be documented by the FERC Compliance Monitor.

- Level 2 variance requests typically include additional workspace within the area surveyed for cultural and biological resources. On NFS lands, Level 2 variance requests will be site-specific and must be approved in writing by the FS Field Compliance/Monitoring Officer. Any such approvals will be documented by the FERC Compliance Monitor.

- Level 3 variance requests typically include additional workspace for which cultural and biological survey and associated agency consultation is required. They may include changes to permanent facility locations or Project-wide changes. On NFS lands, Level 3 variance requests may or may not be site-specific and must be approved in writing by the AO. Level 3 variance requests must also be formally filed with the FERC for review and approval by the FERC PM.

4.0 TIMBER REMOVAL PLAN

4.1 PURPOSE

The purpose of this plan is to describe how timber removal activities will be conducted on NFS lands, and identify measures for reducing impacts and stabilizing areas where timber is removed. For purposes of this plan, timber removal is defined as the felling and removal of merchantable timber logs, disposal of non-merchantable timber, and the decking/removal of logs at the edge of the right-of-way or landings. This plan augments the other construction, restoration, and mitigation plans prepared for the Projects. All applicable provisions of other plans apply to timber removal activities (e.g., the equipment refueling procedures described in the SPCC Plan).

The MNF and GWNF each have standards and guidelines applicable to timber removal practices within the National Forests. This Timber Removal Plan has been written to conform to the standards and guidelines contained within the LRMPs of both National Forests. Where a particular project activity may not be able to conform with particular standards and guidelines, for example logging on steep slopes, a project-specific Forest Plan Amendment may be required before that activity can be authorized.

The ACP will cross under the ANST on NFS lands administered by the GWNF. Atlantic is planning to cross the ANST, as well as the nearby Blue Ridge Parkway corridor on NPS land, with a single HDD, eliminating the need to clear trees at these sensitive crossing locations.

4.2 TRAINING

Prior to the start of timber removal, Atlantic will conduct environmental and safety training for Atlantic and Contractor personnel. The training program will focus on this *Timber Removal Plan*, the FERC Plan and Procedures, and other applicable elements of the COM Plan and permit conditions. In addition, Atlantic will provide large-group training sessions before each work crew commences construction with periodic follow-up training for groups of newly assigned personnel.

4.3 COMPENSATION

Timber located on NFS lands will be paid for and disposed of through the use of the 2400-6T or 2400-4 Forest Service Timber Sale Contract forms. The appropriate contract form will be determined at the discretion of the TSCO. The volume of merchantable timber to be removed for pipeline construction will be determined by a timber cruise complying with a cruise plan provided by the FS. The cruise will evaluate forests within the Project's footprint and provide a volume estimate for merchantable timber. The FS will perform a timber appraisal based upon this cruise to determine the value of the merchantable timber to be removed and will provide Atlantic with a Forest Service Timber Contract (2400-6T or 2400-4) for review and execution. Atlantic will reimburse the federal government based on that valuation by executing the proffered FS timber contract and paying for merchantable timber, prior to any cutting taking place.

4.4 TIMBER CRUISE AND EXTRACTION PLANS

Timber cruises have been conducted to determine timber volumes, values, and species composition, in accordance with Cruise Plans provided by the MNF and GWNF (see Attachment Q). For areas containing merchantable timber, the Atlantic will prepare Timber Extraction Plans (a.k.a. Logging Plans) in consultation with the MNF and GWNF after timber cruises are complete. These plans will identify:

- the timber volume to be cleared;
- tree sizes;
- log grades;
- the removal method(s) to be used;
- yarding methods and any landing locations and decks;
- the volume of timber that will be yarded at each landing; and
- the locations of any landings and decks.

4.5 TIMBER REMOVAL METHODS

No mechanical harvesting methods will be employed on NFS lands. All felling will be done by hand. The Project is considering two timber removal methods for the Project: mechanical removal or placing along the edge of the right-of-way.

4.5.1 Mechanical Removal

Where possible, mechanical removal will be employed. Felled trees will be piled, allowing them to be transported (yarded) to larger collection areas (landings) by “skidders” or “forwarders,” which are specialized machines for moving trees. Skidders drag logs, while forwarders carry logs clear of the ground. Log cranes and logging shovels will load trucks, feed grinders, handle stumps, place environmental mats, build bridges, and aid in the overall safe handling of materials and rigging on the landing and in the woods.

Skidders will be limited to slopes of 35 percent or less. Forwarders, skyline, or other advanced harvesting systems may be utilized on slopes from 35-50 percent as approved by the FS on a case-by-case basis. Sections 4.7.2.1 and 4.7.2.2 list applicable LRMP standards for the MNF and GWNF, respectively.

4.5.2 Other Timber Management

In consultation with the FS, Atlantic may harvest and permanently place felled timber along the edge of the project right-of-way. This will be considered in areas where safe removal of timber is not reasonable. This may include areas such as those without adequate access, steep slope terrain, or other areas that may present a significant safety risk. Additional considerations would include areas where removal of timber would result in significantly more environmental impact than leaving along the edge of the right-of-way.

4.6 PLANNED TIMBER REMOVAL OPERATIONS

4.6.1 General Requirements

The schedule for timber removal is provided in Section 2.1.1.3. Vegetation pre-clearing (tree felling and mowing) on the MNF is scheduled to take place between November 16 and March 31 during the first construction season and November 16 and March 31 and September 1 and March 31 of the second construction season, which will avoid bat roosting and West Virginia’s migratory bird nesting seasons, respectively. For any areas of the right-of-way within 5 miles of known Indiana bat hibernacula on the MNF, no timber removal will occur before November 16. Vegetation pre-clearing (tree felling and mowing) on the GWNF is scheduled to take place between November 16 and March 15 of the first construction season and November 16 and March 31 and September 1 and March 15 of the second construction season, which will avoid bat roosting and Virginia’s migratory bird nesting seasons, respectively.

Surveys for eagles were completed in 2016 via helicopter and no eagle nests were identified on NFS lands. Bald eagles are known to occur year round in areas with suitable habitat along the ACP route; bald eagles nest in late winter into the summer and roost in the winter. Golden eagles are not known to nest in this area, although they do winter roost.

If additional bald eagle nests or occupied bald or golden eagle winter roosting habitat are identified ahead of or during construction, Atlantic will follow the National Bald Eagle Management Guidelines for work within 660 feet of bald eagle nests, and within 1500 feet of nesting sites that have been active within the last three nesting seasons on the MNF, as required by MNF Standard W25. Blasting activities during construction will not occur within ½ mile (1 mile in open areas) of any active nest or roosting area, unless an eagle disturbance permit has been received from the FWS. For tree clearing that occurs during the winter roosting or nesting season, a qualified biological monitor will accompany the clearing crews for work conducted in areas where golden and bald eagles are believed to be present on NFS lands. The National Bald Eagle Management Guidelines and Forest standards will be followed for active bald eagle nests identified. If the recommended buffers in the Guidelines cannot be implemented, a qualified biologist will communicate with the FWS and the FS to determine an appropriate buffer based on the work activity, visibility to nest, and stage of nesting. The GWNF, MNF, and appropriate FWS office will be contacted to discuss appropriate measures to protect the nesting eagles if the standards in the Bald Eagle Management Guidelines cannot be followed.

For tree felling activities occurring between January 1 and March 31, EIs will inspect the construction right-of-way prior to clearing for raptor stick nests, and will call a qualified biologist to confirm nest activity if a nest is found, since many raptors begin nesting during this period. If any active raptor nests are identified, a 100-foot no-activity buffer will be implemented until the nest is no longer active.

After receipt of a Notice to Proceed with construction on NFS lands and before initiating timber removal activities, Atlantic will conduct any necessary pre-treatment of the construction right-of-way for NNIS, in accordance with Section 12 (Non-Native Invasive Plant Species Management Plan).

Before initiating timber removal activities, Atlantic will conduct environmental training for company and contractor personnel. The training program will focus on the COM Plan, the FERC *Plan and Procedures* and other Project requirements and permit conditions. In addition, Atlantic will provide large-group training sessions before each crew commences construction, with periodic follow-up training for groups of newly assigned personnel.

A detailed civil survey will be conducted before timber removal activities begin to delineate the limits of approved work areas (i.e., the construction right-of-way, temporary and ATWS, aboveground facility sites and associated workspace, staging areas, and contractor yards). The locations of approved access roads will be flagged and marked with signs.

Riparian and wetland areas will be clearly labeled in the field. Other areas/sensitive features will be flagged prior to clearing (e.g., existing snags or large diameter trees on the edge of the construction right-of-way to be saved/protected as green recruitment or habitat/shade trees). Applicable erosion and sediment control measures will be installed in accordance with the Erosion and Sedimentation Control Procedures (Section 9) to prevent unnecessary disturbance associated with initial clearing. Additionally, temporary bridges will be installed at waterbody crossings along the right-of-way.

Prior to felling, the boundaries of the construction areas will be painted with paint furnished by the FS. Tree felling consists of manual cutting only and leaving the trees on the ground. Merchantable timber will be left at the edge of the right-of-way or skidded or carried to locations for loading onto trucks and hauling off site. In areas where timber will be removed from the right-of-way, tree removal will commence in April but could commence earlier if ground conditions permit. Timber will be burned (if permitted), chipped, stacked along the edge of the right-of-way, hauled off-site, or salvaged for use during restoration activities (e.g., habitat construction, OHV blocking). After it is cut, timber that will be salvaged for restoration will be flagged, quantified, labeled, and placed along the edge of the construction right-of-way or at the nearest staging area.

Slash will not be windrowed or left in a manner that creates an obstruction. If approved by the TSCO, slash may be burned. Stumps will be cut as close to the ground as possible and left in place, except over the trench line, or where grading is necessary to create a safe and level work surface. The top of the stumps will be ground flush to or below grade within the majority of the right-of-way. All stumps excavated from the trench line that cannot be ground to mulch onsite will be placed along the edge of the construction right-of-way or in temporary extra workspaces. Stumps will be hauled from the extra workspaces to a pulp mill, a permitted disposal facility, used on the right-of-way for restoration purposes, or burned (if permitted), based on the results of further consultation with the FS.

During construction, Atlantic will monitor compliance with the environmental requirements and permit conditions for the Project. The EIs will be responsible for monitoring contractor compliance with this Timber Removal Plan.

4.6.2 Access Roads and Storage Areas

Approved access roads and storage areas for timber removal activities will be depicted on Project alignment sheets and flagged or otherwise marked in the field. LRMP standards and guidelines applicable to pipeline construction access roads also apply to timber haul roads; these are listed in Section 7 (Traffic and Transportation Plan).

4.7 MITIGATION MEASURES

4.7.1 General Mitigation Measures

Atlantic will implement several additional measures to reduce or minimize impacts associated with timber removal activities, including the following:

- During timber removal, temporary erosion control devices will be installed, inspected, and maintained in accordance with the Plan and Procedures. Erosion control and all other timber removal activities taking place during the winter season will be conducted in accordance with the Winter Construction Plan.

- Any debris entering a waterbody as a result of felling and yarding of timber will be removed as soon as practical and will be placed outside the 100-year floodplain where feasible.

- Logs and slash will not be yarded across perennial streams unless fully suspended.

- During logging/clearing operations, the direction of log or slash movement will be conducted to minimize the potential for sediment reaching waterbodies.

- Logs firmly embedded in the bed or bank of waterbodies that are in place prior to felling and yarding of timber will not be disturbed unless they prevent trenching or fluming operations or operation of equipment.

- Any existing logs that are removed from waterbodies to construct the pipeline crossing will be returned to the waterbody after the pipeline has been installed, backfilling is complete, and while stream banks are being restored.

- Landings for clearing operations will not be located in wetlands or riparian areas, and, where feasible, logs yarded out of wetlands or riparian areas will be skidded with at least one end suspended from the ground to minimize soil disturbance.

- Any timber cleared from the pipeline right-of-way or other work areas that will be used for in-stream or upland wildlife habitat diversity structures will be stored at the edge of the right-of-way or in approved temporary workspace areas for use during restoration.

- Prior to clearing operations, EIs will flag existing snags on the edges of the construction right-of-way or ATWS, where feasible, to save from clearing. These snags will be saved as mitigation to benefit primary and secondary cavity nesting birds, mammals, reptiles, and amphibians.

- Selected large diameter trees on the edge of the construction right-of-way and ATWS areas will be flagged by EIs to save/protect as green recruitment or habitat/shade trees, where feasible.

- The Visual Resources Plan (Section 21), and Restoration and Rehabilitation Plan (Section 11) will be implemented, which will reduce visual impacts by employing "feathering" of the right-of-way edge in certain locations, and replanting woody vegetation in the construction right-of-way.

Where ground skidding is used, the following measures will be implemented to minimize soil disturbance:

- Low ground weight (pressure) vehicles will be used, where feasible.

- The removal of soil duff layers will be avoided to maintain a cushion between the soil, logs, and logging equipment. Proper supportive surfacing material will be operated on during timber removal. Soil quality standards will be maintained and detrimental soil disturbance will be avoided. Proper skid roads will be constructed if needed to ensure safe operations and protection of resources on site. Use of skid roads will not cause soil movement resulting in erosion and sedimentation. Since skid roads will lie within the limits of the pipeline construction work area, such areas will be restored as part of the pipeline construction restoration effort.

- Designed skid trails will be used to restrict detrimental soil disturbance (e.g., compaction and displacement) to a smaller area of the right-of-way over the pipeline trenching area. Detrimental soil disturbance will be defined by FSH 2550. Class 2 and Class 3 disturbances will be mitigated to return proper function to the soil resource. All skid trails will be identified in the logging plan to be submitted for the review and approval of the FS, and must be in compliance with the respective Forest's LRMP.

4.7.2 Additional Mitigation Measures for NFS Lands

On NFS lands, additional measures will be implemented, in conformance with LRMP standards and guidelines. If a general mitigation measure is more stringent than its counterpart Forest mitigation measure below, the more stringent measure will be applied.

4.7.2.1 Monongahela National Forest

- Whole trees will not be yarded without approval from the TSCO **(MNF LRMP TR05).**

- Slash will be removed from permanent roads and recreation trails. Slash may be retained in wildlife openings in brush piles if approved by the TSCO (**MNF LRMP TR08**). Slash will not be windrowed or left in a manner that creates an obstruction. Slash may be chipped and blown off the right-of-way outside wetlands or stream channels.

- FS roads will not be used for skidding (**MNF LRMP TR09).**

- FS roads will not be used as log landings unless approved by the TSCO. Any wildlife openings used as log landings will be restored similarly to all pipeline construction work areas upon completion of construction **(MNF LRMP TR10).**

- Log landings and other concentrated timber removal activities will be located outside channel buffers **(MNF LRMP TR11).**

- Skid trails will be kept to the minimum necessary to yard the logs **(MNF LRMP TR13).**

- Right-of-way edges will be "feathered" in irregular patterns to blend in with the landscape in the immediate foreground, foreground, or midground of visually sensitive areas **(MNF LRMP TR20).**

- On slopes greater than 40 percent, use of tracked or tired vehicles will be analyzed on a case-by-case basis to determine the best method of operation while maintaining soil stability and productivity standards. **(MNF LRMP SW07).** Mechanized logging equipment will not operate on slopes greater than 40 percent or on wet soils without interdisciplinary FS review and AO approval of mitigation measures that are capable of maintaining soil slope stability. Note: the MNF is considering a project-specific LRMP amendment pursuant to this standard.

- Winter logging will meet Forest-wide soil and water quality standards **(MNF LRMP SW09).**

- Tree removal within channel buffers will be necessary to construct the pipeline. Appropriate setbacks of ATWS from streams and riparian areas have been determined in consultation with Forest staff, consistent with **MNF LRMP SW37.**

- Skid trails and landings will not be constructed within 100 feet of perennial, intermittent, and ephemeral channels except at crossings or when locations outside the 100-foot zone pose a greater risk to aquatic or riparian resources. The 100-foot filter strip may be modified based on site-specific conditions such as soil type, slope, and stability **(MNF LRMP SW40).**

- Access roads identified for pipeline access will be used for timber removal activities as well (see Table 2.1.1-2). To the extent possible, any necessary landings will be sited at locations where extra workspace for pipeline construction is needed, to avoid disturbing more area than is necessary.

- No timber removal activities will take place outside work areas authorized by the FS; this will avoid impacts to any threatened and endangered plant populations outside the workspace.

- Logs will not be skidded through seeps, vernal pools, bogs, fens, and other wetlands, and slash and logs will be kept out of them **(MNF LRMP SW51).**

- Cable yarding that crosses channel buffers will avoid or mitigate adverse effects to the stream channel. Crossing will be at as near a right angle as possible, with full suspension if feasible. Trees cut within channel buffers to provide cable corridors may be left on site for woody debris recruitment and erosion control **(MNF LRMP SW52).**

4.7.2.2 George Washington National Forest

- Atlantic will inventory any stands proposed for timber harvest for existing old growth conditions using the criteria in Appendix B of "Guidance for Conserving and Restoring Old Growth Forest Communities on National Forests in the Southern Region (Forestry Report R8-FR62, June, 1997". Any stands in Old Growth Forests Type 1 (Northern Hardwood), 2a (Hemlock-Northern Hardwood), 2b (White Pine-Northern Hardwood), 2c (Spruce-Northern Hardwood), 5 (Mixed Mesophytic), 10 (Hardwood Wetland Forests), 22 (Dry and Xeric Oak Forest), 24 (Xeric Pine and Pine-Oak Forest and Woodland), or 28 (Eastern Riverfront) that meet the age criteria for old growth will be unsuitable for timber production, regardless of whether they meet the other criteria for existing old growth. Stands in Old Growth Forest Types 21 (Dry Mesic Oak), or 25 (Dry and Dry-Mesic Oak Pine) may be suitable for timber harvest. Decisions to harvest these stands would be made after consideration of the contribution of identified patches to the distribution and abundance of the old growth community type and to the desired condition of the appropriate prescription during project analysis. **(GWNF LRMP FW-85).** GWNF has identified this standard as potentially requiring a project-specific LRMP amendment, pending completion an of old growth forest inventory.

- Advanced harvesting methods (such as cable or helicopter) will be used on sustained slopes greater than 35 percent (**GWNF LRMP FW-125).**

- Log landings will be located outside of riparian corridors. **(GWNF LRMP FW-139).**

- All equipment used for harvesting and hauling operations will be serviced outside of riparian corridors **(GWNF LRMP FW-140).**

- Unless otherwise authorized by the TSCO, log landings will be ripped to a depth of 6-8 inches to break up compaction, and to ensure soil productivity and the successful reestablishment of vegetation. **(GWNF LRMP FW-141).**

- Skid trails will cross riparian corridors only at Forest-designated crossings. If crossing a perennial or intermittent stream is unavoidable, temporary bridges will be used. All streams will be crossed as close to a right angle as possible. Stabilization of skid trails will occur as soon as possible after use, to minimize soil movement downslope. **(GWNF LRMP FW-142).**

- Skidding of trees will be directed in a manner that prevents creation of channels or gullies that concentrate water flow to adjacent streams. **(GWNF LRMP FW-143).**

- Temporary stream crossings associated with timber harvest operations will be removed and rehabilitated. **(GWNF LRMP FW-144).**

- Dips or waterbars or other dispersal methods will be constructed and maintained to direct stormwater off skid trails and reduce potential sediment flow to streams. **(GWNF LRMP FW-145).**

- Designated trails will not be used as skid trails. Crossing of designated trails will occur at right angles to the extent feasible. Designated trail treads and profiles will be restored upon completion of pipeline construction. **(GWNF LRMP FW-146).**

- Right-of-way edges will be shaped or "feathered" in irregular patterns to blend in with the existing landscape in High and Moderate Scenic Integrity Objective areas. At the direction of the TSCO, some edges may not need feathering to meet the Scenic Integrity Objectives. Geometric shapes will not be utilized. **(GWNF LRMP FW-184).**

- If visible within a 100-foot zone of concern from Level 1 & 2 travelways and use areas, slash will be removed, burned (if permitted), chipped, or lopped. These treatments result in an average slash height of 2 feet off the ground. **(GWNF LRMP FW-186).** Slash will not be windrowed or left in a manner that creates an obstruction.

- To the extent practical, log landings, access roads and bladed skid trails will be located out of view to avoid bare mineral soil observation from Concern Level 1 travel routes and viewing platforms. **(GWNF LRMP FW-190).**

- Access roads identified for pipeline access (see Table 2.1.1-2) will be used for timber removal activities as well. To the extent possible, any necessary landings will be sited at locations where extra workspace for pipeline construction is needed, to avoid disturbing more area than is necessary.

- No timber machinery will cross the ANST nor operate between the HDD entry and exit points or, if the contingency direct drill approach is employed, between the direct drill entry and exit points.

- All woody material will be moved, lopped, and/or scattered so as not to be visible from the ANST or its associated features.

5.0 FIRE PREVENTION AND SUPPRESSION PLAN

Section 5.0 will be provided at a later date.

6.0 BLASTING PLAN

6.1 PURPOSE

Based on an analysis of the Natural Resource Conservation Service's Soil Survey Geographic Database, approximately 5.0 miles of the proposed ACP pipeline route on the MNF and 12.8 miles on the GWNF will cross areas with bedrock at depths of less than 60 inches. Some of this bedrock is considered paralithic (soft) and may not require blasting during construction. About 3.6 miles on the MNF and 7.9 miles on the GWNF cross soils with a lithic contact (hard bedrock) within 60 inches of the surface that may require blasting or other special construction techniques during installation of the proposed pipelines.

This Blasting Plan is based on the blasting plan prepared in connection with Atlantic's application to the FERC for the entire ACP. The plan outlines the procedures and safety measures that Atlantic will adhere to while conducting blasting activities required for the construction of the ACP. Before blasting, a site-specific Blasting Specification Plan, which is consistent with the provisions in this Blasting Plan, will be submitted by the Contractor to Atlantic for approval. Approval of a site-specific Blasting Specification Plan does not relieve the Contractor from responsibility or liability.

TABLE 6.1-1

Estimated Length of Ditch Potentially Requiring Blasting on NFS Lands for the Atlantic Coast Pipeline Project

National Forest	Miles of Ditch	Bedrock <60"	Hard Bedrock <60"
MNF	5.2	5.0	3.6
GWNF	14.7	12.8	7.9
Total	19.9	17.8	11.5

6.2 TRAINING

Prior to the start of construction, Atlantic will conduct environmental and safety training for Company and Contractor personnel. The training program will focus on the FERC Plan and Procedures, the COM Plan, including this Blasting Plan; and applicable permit conditions. In addition, Atlantic will provide large-group training sessions before each work crew commences construction with periodic follow-up training for groups of newly assigned personnel.

6.3 GENERAL REQUIREMENTS

Blasting for grade or trench excavation will be used where deemed necessary by the Contractor, and approved by an Atlantic representative, after examination of the site. Areas where blasting is known to be needed will be provided to the FS prior to construction. Blasting operations will be conducted by or under the direct and constant supervision of personnel legally licensed and certified to perform such activity in the jurisdiction where blasting occurs. Prior to any blasting activities, the Contractor will provide Atlantic with appropriate information documenting the experience, licenses, and permits associated with blasting personnel. Atlantic will provide such information to the FS.

Blasting-related operations will comply with applicable federal and/or state/commonwealth, and local regulations, permit conditions, and the construction contract. These operations include:

- obtaining, transporting, storing, handling, loading, detonating, and disposing of blasting material;

- drilling; and
- ground-motion monitoring.

6.4 PRE-BLASTING REQUIREMENTS

Prior to the initiation of blasting operations, the Contractor will comply with the following:

- The Contractor will obtain all required federal, state/commonwealth, and local permits relating to the transportation, storage, handling, loading, and detonation of explosives.
- The Contractor will be responsible for the protection of existing underground facilities.
- Before performing any work on, or accessing the construction right-of-way within either Forest, the Contractor will verify with an Atlantic representative that the FS, specifically the MNF and/or the GWNF have been notified of the upcoming construction activities. The Contractor will notify all such parties at least 48 hours prior to blasting.
- Atlantic will submit the Contractor's site-specific Blasting Specification Plan to the FS prior to the execution of blasting.

6.5 SITE-SPECIFIC BLASTING PLANS

For each area determined to require blasting, a site-specific Blasting Specification Plan will be prepared by the Contractor. This plan will include, at a minimum, the following information:

- blaster's name, company, copy of license, and statement of qualifications;
- seismograph company, names, equipment and sensor location;
- site location (milepost and stationing), applicable alignment sheet numbers, and associated rock type and geological structure (solid, layered, or fractured);
- copies of all required federal, state/commonwealth, and local permits;
- methods and materials, including explosive type, product name and size, weight per unit, and density; stemming material; tamping method; blasting sequence; use of non-electrical initiation systems for all blasting operations; and magazine type and locations for storage of explosives and detonating caps;
- site dimensions, including explosive depth, distribution, and maximum charge and weight per delay; and hole depth, diameter, pattern, and number of holes per delay;
- GPS coordinates of blasting location(s), distance and orientation to nearest aboveground and underground structures, and dates and hours blasting will be conducted;
- blasting procedures for:
    - storing, handling, transporting, loading, and firing explosives;

- prevention of misfires, fly-rock, fire prevention, noise, and stray current accidental-detonation;
- signs, flagmen, and warning signals prior to each blast;
- locations where the pipeline route:
  - parallels or crosses an electrical transmission corridor, cable, or pipeline;
  - parallels or crosses a highway or road;
  - approaches within 500 feet of a water well or within 150 feet of an oil and gas well; or
  - approaches within 1,000 feet of any residence, building, or occupied structure;
- local notification;
- inspections after each blast;
- disposal of waste blasting material; and
- blasting considerations on steep slopes.

6.6 MONITORING

During blasting operations, the Contractor will be required to monitor operations in the following manner:

- The Contractor will provide seismographic equipment to measure the peak particle velocity (PPV) of all blasts in the vertical, horizontal, and longitudinal directions.
- The Contractor will measure the PPV at any existing pipelines, domestic structures, water supply wells, oil and gas wells, electrical transmission tower footings, and other utilities within 150 feet of the blasting. If none of these structures/facilities are present, the Contractor will measure the PPV at the edge of the construction right-of-way.
- The Contractor will complete a Blasting Log Record immediately after each blast and submit a copy to an Atlantic representative upon completion of blasting activities at each blasting site.

6.7 SAFETY

6.7.1 Protection of Aboveground and Underground Structures

Where blasting is determined to be required, Atlantic will identify any municipal water mains proposed for crossing, and will consult the local water authority. Reports of identified crossings will include location by milepost, owner, and status and results of contacts with the water authority.

The Contractor will exercise control to prevent damage to aboveground and underground structures including pipelines, domestic structures, water supply wells, oil and gas wells, electrical transmission tower footings, and other utilities. The Contractor will implement the following procedures:

- If blasting occurs within 500 feet of an identified water well, water flow performance and water quality testing will be conducted before blasting. If the water well is damaged as a result of ACP blasting, and upon confirmation through a damage claim investigation, the well will be repaired or otherwise restored or the well owner will be compensated for damages. Atlantic will provide an alternative potable water supply to the landowner until repairs occur.

- If blasting occurs within 150 feet of aboveground structures, the Contractor and an Atlantic representative will inspect and photograph the structures before blasting. In the event that blasting damage to the aboveground structure is confirmed, the owner will be compensated.

- Blasting will not be allowed within 15 feet of an existing pipeline, unless specifically authorized by an Atlantic representative.

- Holes that have contained explosive material will not be re-drilled. Holes will not be drilled where danger exists of intersecting another hole containing explosive material.

- Blasting mats or padding will be used on all shots where necessary to prevent scattering of loose rock onto adjacent property and to prevent damage to nearby structures and overhead utilities.

- Blasting will not begin until occupants of nearby buildings, stores, residences, places of business, places of public gathering, and farmers have been notified by the Contractor in advance to protect personnel, property, and livestock. The Contractor will notify all such parties at least 48 hours prior to blasting.

- Blasting in or near environmentally sensitive areas, such as streams and wildlife areas, may include additional restrictions. Blasting in streams will only take place after any surface flow has been diverted around the work area. When blasting in streams, the following protocol will be used. These protocols may include fish alert tactics, such as:

    - Prior to the initiation of the designed blast and following audible warning signals, a single cap will be initiated in the stream to alert fish to move away from the blasting area.

    - Any visible fish or other aquatic species trapped in the blasting area will be removed and relocated downstream (will only be used in smaller streams).

    - In larger streams a boat can be used both up and down stream to alert fish to move away from the blasting area. This tactic can be used only if the operators of the boat can retreat a safe distance from the blast zone as determined by the Blaster in Charge.

- When blasting on steep slopes the following measures will be taken to minimize blasting impacts:

- A safety berm may be created at the base of each shot to minimize the shot material movement down the slope after initiation if practical.
- A catch berm may be created at the base of the hill to stop material from leaving the right-of-way, if practical.
- Berms may be constructed on the right-of-way to direct any rolling material away for the offside boundaries.
- Shots will be initiated from the lowest elevation of the trench.
- The blaster will conduct test blasts on areas without slope with a reduction of powder factor that will fracture the material while keeping it in place. Tight digging and higher vibrations may be associated with this adjustment.
- Decking the holes may be considered to lower the pounds per delay.
- Where multiple trench shots are to be initiated, the shot material will stay in place and remain muck bound. This will hold the following shots in place.

- All blasting will be subject to the following limitations:
  - Maximum PPV of 12.0 inches per second, or the maximum PPV in accordance with state/commonwealth or local regulations, in any of three mutually perpendicular axes measured at the lesser distance of the nearest facility or the edge of the permanent easement.
  - Maximum drill size will be 2.5 inches unless otherwise approved by an Atlantic representative.
  - Maximum quantity of explosive per delay will be governed by the recorded measurements as influenced by the test blast program or a scaled distance formula.
  - Explosive agents and ignition methods will be approved by an Atlantic representative. Ammonium nitrate/fuel oil and other free flowing explosives and blasting agents are not acceptable and will not be used.
  - Drill holes will not be left loaded overnight.
  - Approved stemming material will be used in all holes.
- The drilling pattern will be set in a manner to achieve smaller rock fragmentation (maximum 1 foot in diameter) to use as much as possible of the blasted rock as backfill material after the pipe has been padded in accordance with the specifications. The Contractor will submit the proposed drilling pattern to an Atlantic representative for approval.
- Under pipeline crossings and all other areas where drilling and blasting is required within 15 feet of existing facilities:

- o Drill holes will be reduced to a maximum of 2 inches or less in diameter.
- o The number of holes shot at one time will be limited to three unless otherwise approved by an Atlantic representative.
- o Appropriate delay between charges will be used to attain desired fragmentation.

6.7.2 Protection of Personnel

The Contractor will include in its procedures all federal, state/commonwealth, and local safety requirements for blasting. The Contractor's procedures will address, at a minimum, the following requirements:

- Blasting will be performed during daylight hours only.
- Only authorized, qualified, and experienced personnel will handle explosives.
- No explosive materials will be located where they may be exposed to flame, excessive heat, sparks, or impact. Smoking, firearms, matches, open flames, and heat- and spark-producing devices will be prohibited in or near explosive magazines or while explosives are being handled, transported, or used.
- A code of blasting signals will be established, posted in conspicuous places, and utilized during blasting operations. Employee training will be conducted on the use and implementation of the code.
- The Contractor will use every reasonable precaution including, but not limited to, visual and audible warning signals, warning signs, flag persons, and barricades to ensure personnel safety.
- Warning signs, with lettering a minimum of 4 inches in height on a contrasting background, will be erected and maintained at all approaches to the blast area.
- Flaggers will be stationed on all roadways and trails passing within 1,000 feet of the blast area to stop all traffic during blasting operations.
- Both workers involved in the detonation and personnel not involved in the detonation will stand back at a distances determined by the person in charge from the time the blast signal is given until the "ALL CLEAR" is sounded.
- No loaded holes will be left unattended or unprotected. No explosives or blasting agent will be abandoned.
- In the case of a misfire, the blaster will provide proper safeguards for personnel until the misfire has been re-blasted or safely removed.
- The exposed areas of the blast will be matted wherever practicable. In cases where such a procedure is not deemed to be feasible, the Contractor will submit an alternative procedure for review by an Atlantic representative and the site in question will be visited and examined by the consultant before any approval is granted.

- Atlantic may employ two-way radios for communication between vehicles and office facilities. The Contractor will advise Atlantic and other Contractors of any need to cease use of such equipment during blasting activities.

- All loading and blasting activity will cease and personnel in and around the blast area will retreat to a position of safety during the approach and progress of an electrical storm irrespective of the type of explosives or initiation system used. This is a major safety precaution and will always be observed. All explosive materials, all electrical initiation systems, and all non-electric initiation systems are susceptible to premature initiation by lightning.

- Previous blast areas must be inspected to verify the absence of misfires. No drilling may commence until such inspection occurs. If a misfire occurs adjacent to a hole to be drilled, the misfire will be cleared by the blaster using reasonable techniques required for the situation prior to commencement of drilling. If a misfire occurs at some distance from the drilling area, drilling may be stopped while clearing preparations are underway. When the misfire is to be cleared by re-shooting, drilling will be shut down and personnel evacuated to a place of safety prior to detonation.

- All transportation of explosives will be in accordance with applicable federal, state/commonwealth, and local laws and regulations. Vehicles used to transport explosives will be in good working condition and equipped with tight wooden or non-sparking metal floor and sides. If explosives are carried in an open-bodied truck, they will be covered with a waterproof and flame-resistant tarp. Wiring will be fully insulated to prevent short-circuiting and at least two fire extinguishers will be carried. The vehicle will be plainly marked to identify its cargo so that the public may be adequately warned. Metal, flammable, or corrosive substances will not be transported in the same vehicle with explosives. There will be no smoking, and unauthorized or unnecessary personnel will not be allowed in the vehicle. Competent, qualified personnel will load and unload explosives into or from the vehicle.

- No sparking metal tools will be used to open kegs or wooden cases of explosives. Metallic slitters will be used to open fiberboard cases, provided the metallic slitter does not come in contact with the metallic fasteners of the case. There will be no smoking, no matches, no open lights, or other fire or flame nearby while handling or using explosives. Explosives will not be placed where they are subject to flame, excessive heat, sparks, or impact. Partial cases or packages of explosives will be re-closed after use. No explosives will be carried in the pockets or clothing of personnel. The wires of an electric blasting cap will not be tampered with in any way. Wires will not be uncoiled. The use of electric blasting caps will not be permitted during dust storms or near any other source of large charges of static electricity. Uncoiling of the wires or use of electric caps will not be permitted near radio-frequency transmitters. The firing circuit will be completely insulated from the ground or other conductors.

- No blast will be fired without a positive signal from the person in charge. This person will have made certain that all surplus explosives are in a safe place; all persons, vehicles, and/or boats are at a safe distance; and adequate warning has been given. Adequate warning of a blast will consist of, but not be limited to, the following:

    - notifying nearby homeowners and local agencies, if necessary;

  - stopping vehicular and/or pedestrian traffic near the blast site; and
  - signaling with an air horn, whistle, or similar device using standard warning signals.

- Only authorized and necessary personnel will be present where explosives are being handled or used.

- The condition of the hole will be checked with a wooden tamping pole prior to loading. Surplus explosives will not be stacked near working areas during loading. Detonating fans will be cut from spool before loading the balance of charge into the hole. No explosives will be forced into a bore hole past an obstruction. Loading will be done by a blaster holding a valid license or by personnel under his direct supervision.

- Fly-rock leaving the right-of-way will be collected immediately and disposed of at disposal sites approved by Atlantic. This work will not be left to the cleanup crew.

- If any blasting is necessary within 2,000 feet of the Appalachian National Scenic Trail, flaggers will be stationed on the Trail to stop traffic during the blasting operations. Hikers could be delayed a maximum of 15 minutes.

6.7.3 Lightning Hazard

A risk of accidental detonation caused by lightning strikes exists at any time the workplace is experiencing an electrical storm and there are loaded holes on site. If this hazard is judged to exist by an Atlantic representative, work will discontinue at all operations and workers will be moved to secure positions away from the loaded holes. Furthermore, workers will not return to the work site until the storm has passed and an Atlantic representative has indicated it is clear to return.

The Contractor will have on site an approved lightning instrument capable of measuring the degree of electrical activity as a storm approaches, and the distance to the storm front from the instrument on the right-of-way.

6.8 KARST

In accordance with Atlantic's Karst Terrain Assessment, Construction, Monitoring and Mitigation Plan (Attachment H), and in addition to the measures described above, the following procedures will be implemented in areas of karst terrain:

- Blasting will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of known or presumed habitat for federally listed threatened and endangered species in the subterranean karst environment (e.g. Madison cave isopod). Blasting will not occur within areas in close proximity to known threatened, endangered, sensitive, or locally rare species habitat unless approved by the FWS and the FS.

- Excavations will be inspected for voids, openings or other tell-tale signs of solution (karst) activity.

- If rock removal intercepts an open void, channel, or cave, construction activities will cease in the vicinity of the void, channel, or cave until a remedial assessment is performed by a qualified geologist or engineer with experience in karst terrain. The opening and associated biotic environment will also be investigated by a qualified, FS-approved biologist to determine if bats or other species are present in the structure, if the feature is suitable for bats (large enough, suitable microclimate), and how remediation will affect the microclimate upon which bats and other species depend.

- If an opening to a cave forms during construction activities, coordination will be immediately initiated with the FS, FWS, and either West Virginia Department of Conservation or the Virginia Department of Conservation and Recreation-Natural Heritage Program Karst Program.

- Use of explosives will be limited to low-force charges designed to transfer the explosive force only to the rock which is designated for removal (e.g., maximum charge of 2 inches per second ground acceleration).

- If the track drill used to prepare drill holes for explosive charges encounters a subsurface void during drilling operations with a vertical drop of greater than 6 inches within the first 10 feet of bedrock, or a group of voids totaling more than 6 inches within the first 10 feet of bedrock, then explosives will not be used until a subsurface exploration is conducted to determine if the voids have connectivity to a deeper karst structure. The subsurface exploration will be carried out with track drill probes, coring drill, electrical resistivity, or other techniques capable of resolving open voids in the underlying bedrock. If a track drill or coring rig is used, then all open holes will be grouted shut after the completion of the investigation. The opening and associated biotic environment will also be investigated by a qualified biologist to determine if bats or other species are present in the structure, if the feature is suitable for bats (large enough, suitable microclimate), and how remediation will affect the microclimate upon which bats and other species depend.

- It is not expected that the limestone found within NFS lands along the pipeline route will fracture in such a way as to cause ground displacement. Following each blast, the area will be examined for signs of ground cracking. Any indication of “overbreak” (i.e. cracks greater than half the distance to the edge of the construction right-of-way) will be brought to the attention of the blaster and noted on the blast report. The shot pattern and/or loading will be adjusted to minimize or eliminate overbreak. Signature hole analysis will be performed to determine optimum timing for the specific geology. The signature hole data will be interpreted by the blasting company engineers who will specify timing to the blasters for in-field detonator programming. Ongoing signature hole analysis will be necessary to adapt to the changing geology. How often this is completed will depend on site specific conditions.

- Site specific erosion and sediment control plans will be submitted to the FS prior to any drilling activities in karst topography.

6.9 BLASTING ON STEEP SLOPES

Blasting on steep slopes and landslide-prone slopes will be accomplished using conventional trench blasting methods. Blasting may also be required during the right-of-way grading operation.

A drill will be lowered down the slope using conventional winching techniques. The drilling program will be based on 2 or 3 rows of 2-1/2 to 3 1/2 inch diameter holes drilled with a grid spacing of approximately 4-5 feet by 4-5 feet along the ditch line. The drill pattern will be established using a powder factor of about 3.0-4.0 pounds per cubic yard to achieve the desired explosive energy ratio needed to break the rock and pull the ditch. This shot pattern may be adjusted on a site-specific basis to compensate for different geology, nearby structures, utilities or other sensitive areas. A signature hole analysis will be performed to determine optimum timing for the specific geology. The signature hole data will be interpreted by the blasting company engineers who will specify timing to the blasters for in field detonator programming. Ongoing signature hole analysis will be necessary to adapt to the changing geology. How often this is completed will depend on the site specific conditions. The amount of cartridge type explosives per borehole will be limited by the proximity of existing structures and utilities.

All shots will be carefully designed by the licensed blaster to control flyrock. All hole loading activity will be supervised by the licensed blaster. The licensed blaster will communicate with the drillers to obtain geological information for each shot. Matting and or padding may be utilized at the discretion of the licensed blaster.

Several methods will be taken to minimize blasting impacts on these slopes.

1. Trench

    a. Decking the holes may be considered to lower the pounds per delay.

    b. The blaster will calculate the average powder factor currently used on the project. By increasing the stemming height the blast may achieve a reduction of 5 percent to 25 percent in powder which will minimize vertical and horizontal movement.

    c. Where multiple trench shots are to be initiated, the shot material will stay in place and remain muck bound. This will hold the following shots in place.

2. Right-of-way

    a. Decking the holes may be considered to lower the pounds per delay.

    b. The blaster will calculate the average powder factor currently used on the project. By increasing the stemming height the blast may achieve a reduction of 5 to 30 percent in explosives which will minimize vertical and horizontal movement.

    c. Where multiple right-of-way shots are to be initiated, the area will remain muck bound. This will hold the following shots in place.

        i. A safety berm may be created at the base of each shot to minimize the shot material movement down the slope after initiation if practical.

        ii. A catch berm may be created at the base of the hill to stop material from leaving the right-of way, if practical.

        iii. Berms may be constructed on the right-of-way to direct any rolling material away for the offside boundaries.

        iv. Shots will be initiated from the lowest elevation of the trench.

        v. The blaster will conduct test blasts on areas without slope with a reduction of powder factor that will fracture the material while keeping it in place. Tight digging and higher vibrations may be associated with this adjustment.

vi. Decking the holes may be considered to lower the pounds per delay.

vii. Where multiple trench shots are to be initiated, the shot material will stay in place and remain muck bound. This will hold the following shots in place.

6.10 STORAGE REQUIREMENTS

All explosives, blasting agents, and initiation devices will be stored in locked magazines that have been located, constructed, approved, and licensed in accordance with federal, state/commonwealth, and local regulations. Magazines will be dry, well ventilated, reasonably cool (painting of the exterior with a reflective color), bullet and fire resistant, and kept clean and in good condition.

Initiation devices will not be stored in the same box, container, or magazine with other explosives. Explosives, blasting agents, or initiation devices will not be stored in wet or damp areas; near oil, gasoline, or cleaning solvents; or near sources of heat radiators, steam pipes, stoves, etc. No metal or metal tools will be stored in the magazine. There will be no smoking, matches, open lights, or other fire or flame inside or within 50 feet of storage magazines or explosive materials.

Magazines will be constructed and located in accordance with federal, state/commonwealth, and local regulations. Magazines will be marked in minimum 3-inch-high letters with the words “DANGER – EXPLOSIVES” prominently displayed on all sides and roof, and be kept locked at all times unless explosives are being delivered or removed by authorized personnel. Admittance will be restricted to the magazine keeper, blasting supervisor, or licensed blaster.

Accurate and current records will be kept of the explosive material inventory to ensure that oldest stocks are utilized first, satisfy regulatory requirements, and for immediate notification of any loss or theft. Magazine records will reflect the quantity of explosions removed, the amount returned, and the net quantity used at the blasting site.

When explosive materials are taken from the storage magazine, they will be kept in the original containers until used. Small quantities of explosive materials may be placed in day boxes, powder chests, or detonator boxes. Any explosive material not used at the blast site will be returned to the storage magazine and replaced in the original container as soon as possible.

6.11 SPECIFIC FS GUIDELINES

The MNF’s LRMP includes several standards regarding the use of explosives in the Forest. In addition to aforementioned blasting procedures citied in this document, Atlantic will also adhere to the following standards:

- Explosives will not be used within 200 feet of hibernacula, maternity colonies, or bachelor colonies unless analysis can demonstrate that this activity will not have an adverse effect on bat populations or habitat. Explosives outside of this area will not be used when such use has potential to damage the cave or disturb the bat. **(MNF LRMP TE20).**

- Explosives may be allowed within the primary range if it can be demonstrated that this activity will not have an adverse effect on bat populations or habitat. **(MNF LRMP TE39).**

- Explosives will not be used within 200 feet of hibernacula, within key areas, or within 2.5 miles of active maternity sites, unless analysis can demonstrate that this activity will not have an adverse effect on bat populations or habitat. Explosives outside of these areas will not be used when such use has potential to damage the cave or disturb the bat. **(MNF LRMP TE50).**

The GWNF's LRMP does not offer specific standards, goals, or guidelines that addressed blasting or the use of explosives.

7.0 TRAFFIC AND TRANSPORTATION MANAGEMENT PLAN

7.1 PURPOSE

The purpose of the Transportation Plan is to identify BMPs that Atlantic will implement during construction of the Project to minimize impacts on roadways and traffic. This plan is based on the Transportation Plan prepared in connection with Atlantic's application to the FERC for the entire ACP. This Transportation Plan incorporates elements that are applicable to construction across roads and highways, commuting of the construction workforce, maintenance of traffic, movement of construction vehicles and delivery of equipment and materials within both National Forests crossed by the ACP.

Operation and maintenance of the proposed facilities will not affect traffic flow on roads and highways on NFS lands. Periodic maintenance and inspection procedures along the pipeline will involve a low frequency of light vehicle movement on and off roadways. Therefore, no impacts on roads or traffic are expected during operation of the Project.

7.2 TRAINING

Prior to the start of construction, Atlantic will conduct environmental and safety training for Atlantic and Contractor personnel. The training program will focus on the FERC Plan and Procedures, the COM Plan, including this Traffic and Transportation Management Plan; and applicable permit conditions. In addition, Atlantic will provide large-group training sessions before each work crew commences construction with periodic follow-up training for groups of newly assigned personnel.

In developing the project environmental and safety training programs, Atlantic will review all traffic and transportation requirements relevant to the work of the Contractors or Atlantic personnel, and determine content and delivery strategies aimed at ensuring all project staff and Contractors understand how the requirements intersect with their functions. FS staff's input will be invited in preparing the training programs, and FS staff participation in the actual training sessions is encouraged. With respect to traffic and transportation issues, it is likely that special emphasis will be given to the following:

1. The importance of using only approved and posted project access roads.
2. Avoiding driving or parking outside the limits of approved access roads.
3. Obeying posted speed limits.
4. Use of flaggers where construction traffic is likely to encounter public traffic.
5. Other road safety-related requirements.

Atlantic conducts company-wide driver safety programs for its field operations personnel. When the project has been put into service and is ready to be turned over to Operations, requirements relevant to operating the pipeline system on NFS lands, such as this COM Plan, will be transitioned to DTI Operational staff. The hand-off to Operations will entail meetings and training sessions to ensure Operations staff understands all relevant requirements.

7.2.1 General Requirements

Prior to construction, Atlantic will obtain applicable federal, state/commonwealth, and local road use and crossing permits. ACP personnel will comply with all permit requirements and conditions to provide for public safety and minimize impacts on public roads. West Virginia or Virginia guidelines will be utilized on FS properties where there are no specific federal guidelines regarding maintenance of traffic, flagging protocol and signage. Copies of this Traffic and Transportation Management Plan as well as applicable state/commonwealth guideline documents will be provided to the appropriate personnel and maintained at each Contractor's field office.

Atlantic will consult with the MNF and GWNF, the West Virginia Department of Transportation (WVDOT) and the Virginia Department of Transportation (VDOT) regarding detour routes, speed/load limits, and other use limitations, conditions, or restrictions on the roads that will be utilized during construction. Before the start of construction, Atlantic will refer to the WVDOT's Manual on Temporary Traffic Control for Streets and Highways, the Virginia Work Area Protection Manual, the MNF and GWNF LRMPs and the United States Department of Agriculture (USDA) Guidelines for Road Maintenance Levels to develop maintenance of traffic plans that are acceptable to the FS.

As discussed further in the following sections, Atlantic will place and maintain traffic control measures, such as flag persons, warning signs, lights, and/or barriers, as appropriate, to safeguard construction workers and the public and to minimize traffic congestion. The aforementioned measures will be in accordance with the WVDOT's Manual on Temporary Traffic Control for Streets and Highways, the Virginia Work Area Protection Manual, and specific temporary traffic control measures adopted by the MNF or the GWNF.

Atlantic will maintain traffic flow and emergency vehicle access on roadways and the Appalachian National Scenic Trail and will work with local law enforcement, fire departments, and emergency medical services to coordinate access for effective emergency response during construction.

The USDA Guidelines for Road Maintenance Levels, prepared for the FS, provides guidelines for road types, and maintenance within NFS property. Atlantic will provide protective measures to avoid damage to Forest road surfaces crossed by construction equipment. Atlantic will comply with weight limitations for and restrictions pursuant to prescription guidelines on designated FS roads.

All Forest roads crossed by the pipeline are unpaved, and will be crossed with open cut construction methods (see Section 7.4). Once construction is complete, Atlantic will repair road damage that occurs as a result of construction, and roadways will be restored to their preconstruction condition. Sediment barriers will be installed at the base of slopes adjacent to roads to prevent sediment from the construction right-of-way from being washed onto roads during rain events.

7.3 ACCESS TO THE RIGHT-OF-WAY

Atlantic has endeavored to utilize existing roads to the extent practicable to provide access to the construction right-of-way on NFS lands. Construction traffic will be limited to access roads approved by the FERC and the FS. Prior to and throughout construction, signs will be posted to identify approved access roads for construction traffic. If additional roads are identified as necessary for construction, they will not be used without authorization of both the FERC and the FS. A table listing the access roads planned on NFS lands is included in Table 2.1.1-2 of this COM Plan.

Some of the existing FS roads identified for access to the pipeline right-of-way require improvement (such as grading, widening, the addition of gravel, or removal of obstructions) to provide for proper drainage or to safely accommodate construction equipment and vehicles. Roads requiring improvements are identified in Table 2.1.1-2 of this COM Plan. Such improvements will be consistent with the USDA Guidelines for Road Maintenance Levels as well as the LRMP for the applicable National Forest. Prior to construction, Atlantic will provide engineering details of planned new roads and improvements to existing roads, as have been requested by the FS, for FS review.

The erosion control and restoration measures approved by the FS, the West Virginia Division of Environmental Protection and the Virginia Department of Environmental Quality (DEQ), will be utilized for improving, using, and restoring access roads or when constructing new access roads. If culverts are required to improve an access road at stream crossings, the culverts will be adequately sized to accommodate stormwater runoff as required by federal, state, or local permits, and will be of sufficient strength to support construction and maintenance equipment.

Atlantic will perform maintenance activities during construction, including blading or filling activities, to ensure the safety and proper functioning of all access roads. Dust emissions along unpaved access roads will be controlled by applying water, as needed, and by restricting vehicle speeds. If excessive rutting takes place on access roads, Atlantic will perform maintenance activities on the road prior to continued use. Road maintenance will conform to the USDA Guidelines of Road Maintenance Levels, as well as to any standard contained in the LRMP of the MNF or the GWNF, as applicable.

Atlantic's construction contractors will be responsible for removing obstructions affecting access roads, if present, within the boundaries of the roadway (up to a width of approximately 30 feet centered on the road centerline). Such obstructions will be cleared using the following methods, as appropriate.

- The removal of trees, limbs, brush, and other obstructions will be limited to those obstructing the driver's sight distance or within 15 feet of vertical clearance above the roadway.
- Limbing will be accomplished by the use of pruning saws, power saws, nippers, bow saws, or crosscuts. Limbs will be pruned flush with the trunk of the tree, except for portions of overhanging limbs. Use of axes for limbing will be prohibited.
- Material removed will be disposed of in approved areas or at the direction of the FS.

During winter, snow will be removed, as necessary, from approved access roads to allow safe access to the construction right-of-way. Plowing of access roads will continue as necessary through the end of active construction. Blades used to remove snow shall be equipped with skid shoes to prevent loss of surfacing and damage to the road. A minimum of 2 inches of snow will be left to protect the road. Section 2.1.5.7 provides additional information regarding snow removal.

If existing Forest roads are damaged during construction, Atlantic will restore the roads to their maintenance prescription guideline as described in the USDA Guidelines for Road Maintenance Levels. All construction access roads will also be used for pipeline operation and maintenance purposes. Further information regarding planned improvements to access roads is included in Attachment F.

7.4 ROAD CROSSINGS

Construction across state maintained roads will be conducted in accordance with permits received from the WVDOT and the VDOT. Temporary traffic measures, such as flagging and maintenance of traffic flow, will be conducted in a manner consistent with the WVDOT Manual on Temporary Traffic Control for Streets and Highways and the Virginia Work Area Protection Manual. Construction planned across Forest roads will adhere to FS standards. Table 7.4-1 lists Forest roads crossed by the ACP[19]. Some roads, such as MNF Road 55, must be crossed more than once, due to terrain conditions where the road lies; avoidance of road crossings at these locations would typically require sidehill cuts and correspondingly greater ground disturbance.

[19] Table 2.1.9.5-1 identifies trails crossed by the ACP on NFS lands.

As shown in Table 7.4-1, Forest roads will be crossed by open cut methods, and will require temporary closure of the road to traffic. Roads crossed at a perpendicular angle will be completed in approximately 3-4 days, whereas roads that lie parallel to and within the construction right-of-way will require closure for the duration of construction in that particular section of right-of way, and establishment of detours as necessary (see Attachment S (Road and Trail Open Cut Crossing Plans). Roads that lie parallel to and within the construction right-of-way include GWNF Roads 449B, 1755, and 1757.

Pre-construction conditions of the road will be photo-documented as an aid to restoration. The same type of sub-bed and surface material as the original construction, or flowable fill material, will be used to backfill the pipe and restore the road surface. Additional gravel will be brought in if necessary to ensure a safe, firm surface for passage. Atlantic will follow the appropriate signage protocol and maintenance of traffic planning in conformance with FS protocols for single-lane operation at open-cut road crossings for safety and to minimize traffic disruptions. If the FS does not have specific protocols for one-lane operation, Atlantic will utilize the applicable state standards.

Atlantic will notify the GWNF at least four weeks in advance of commencing construction activities that will require a long-term trail or road closure and/or detour. Atlantic will work with the FS to ensure users are informed of any closures, detours, etc. as discussed in Section 18 (Public Access Plan) and Attachment T (Flagging, Fencing and Signage Plan).

TABLE 7.4-1

Forest Service Roads Crossed by the Atlantic Coast Pipeline

Forest Road No.	Approximate Milepost	Road Crossing Method
MNF Road 1014 (Shock Run)	83.2	Open Cut
MNF Road 1017 (Upper Shock Run)	83.3	Open Cut
MNF Road 55 (Allegheny Road)	83.7	Open Cut
MNF Road 55 (Allegheny Road)	83.8	Open Cut
MNF Road 55 (Allegheny Road)	83.8	Open Cut
GWNF Road 281C	96.3	Open Cut
GWNF Road 281 (Campbell Hollow Road)	96.3	Open Cut
GWNF Road 1748	97.0	Open Cut
GWNF Road 348.1 [a]	116.5	Open Cut
GWNF Road 449	117.1	Open Cut
GWNF Road 449	117.1	Open Cut
GWNF Road 449A	118.7	Open Cut
GWNF Road 449B	118.7-119.8	Open Cut
GWNF Road 466A	120.2	Open Cut
GWNF Road 466	120.4	Open Cut
GWNF Road 1755	121.2-121.8	Open Cut
GWNF Road 1757	121.8-122.4	Open Cut

[a] Crossing location appears to lie outside GWNF boundary,

Where construction crosses roads necessary for access to private residences or businesses and no alternative entrance exists, Atlantic will implement measures (e.g., plating over the open portion of the trench or a temporary bridge) to maintain passage for landowners and emergency vehicles. Atlantic will place and maintain traffic control measures during construction, and use flaggers, warning signs, lights, and barriers, as appropriate, for safety and to minimize traffic congestion.

On NFS lands, Atlantic will adhere to applicable federal traffic control standards, however, in the absence of specific federal standards, Atlantic will defer to the applicable sections of the WVDOT's Manual on Temporary Traffic Control for Streets and Highways or the Virginia Work Area Protection Manual for flagging, signage, road closures, and maintenance of traffic.

Once construction is complete, Atlantic will repair road damage that occurs as a result of construction, and roadways will be restored to their preconstruction condition.

7.5 MOVEMENT OF PERSONNEL, EQUIPMENT, AND MATERIALS

The movement of construction equipment, materials, and personnel will cause a temporary increase in traffic volumes along FS-maintained roadways. Impacts are expected to be minor and short term because construction spreads and personnel will be geographically dispersed and personnel will commute to and from work areas in early mornings and late evenings during non-peak traffic hours.

Contractor yards will be used to stage construction, store materials, and park equipment when not on-site. Construction equipment will be moved from the contractor yard and delivered to the construction right-of-way. Once on the right-of-way, construction equipment will move in a linear manner along the right-of-way as work progresses, minimizing traffic on local roads. The amount of equipment moved by hauling from site to site will be reduced due to the accessibility created by the construction right-of-way. Traffic control measures consistent with the WVDOT/VDOT and the FS will be implemented to further minimize impacts to traffic on roadways and park service roads, to assist with transportation of construction equipment and materials, and to provide for public safety. The construction contractors will post caution signs on roads, where appropriate, to alert motorists of pipeline construction and warn them of slow traffic caused by construction across roadways. Flaggers, signs, barricades, guardrails, safety fence, and/or signals will be placed and maintained at road crossings as required by federal, state, or local permits. Flaggers will be equipped with high visibility green/yellow safety vests and stop/slow signs pursuant to WVDOT or VDOT standards will be used on each side of the road when equipment is working on or crossing over the road. Posted speed limits will be observed on all roads or as specified by the FS.

7.6 FEDERAL GUIDELINES PERTAINING TO PROJECT ACCESS ROADS

The ACP will cross roads and utilize access roads on NFS lands in the MNF in West Virginia and the GWNF in Virginia. Traffic and transportation management and maintenance activities on these lands will conform to the standards and guidelines contained within the USDA Guidelines for Road Maintenance Levels and the LRMPs of the MNF and GWNF for road use, maintenance, and construction as well as WVDOT and VDOT standards where applicable. Potentially applicable federal standards and guidelines are listed below.

7.6.1 Monongahela National Forest Land and Resource Management Plan

- Roads will be constructed to the standard appropriate to their intended use, considering safety and other resource concerns. **(MNF LRMP RF04).**

- Cooperators or permittees may be allowed to locate, design, and build special purpose roads on NFS lands. The FS will review all such locations and designs, and approve them where appropriate. Location and standards will be coordinated with the needs for management and for protection of other resources. **(MNF LRMP RF05).**

- New road construction will avoid wetlands where feasible. If a wetland cannot be avoided, road construction may be allowed as long as the subsurface drainage patterns can be preserved and maintained. Any road that would cross a wetland will cross in a way that minimizes disturbance to the wetland. **(MNF LRMP RF06).**

- Where new roads cross streams or high-risk areas, disturbed soils will be stabilized and designed drainage structures will be installed as soon as practical. High-risk areas include landslide prone areas, steep slopes, and highly erosive soils (**MNF LRMP RF07).**

- The process to determine road maintenance levels should evaluate the purpose of the road, the type of vehicles expected, the duration and frequency of use, and necessary environmental protection measures. **(MNF LRMP RF11).**

- Temporary roads may be constructed and used to provide for short-term management access needs. **(MNF LRMP RF14).**

- Temporary roads will be rehabilitated and returned to productivity following their use. (**MNF LRMP RF15).**

- Vehicle use on closed roads by permittees, contractors, or other cooperators may be authorized to conduct official business or to perform resource management activities. **(MNF LRMP RF20).**

- Per the NNIS Plan (Section 12), take measures to prevent new infestations of NNIS, with emphasis on areas where species have a high probability for establishment and spread. (**MNF LRMP VE19a).**

- Per the NNIS Plan (Section 12), take measures to control NNIS on rights-of-way and other use areas. (**MNF LRMP VE19b**).

- Per the NNIS Plan (Section 12), take measures to reduce the potential for spread and establishment of noxious weed infestations. (**MNF LRMP VE22**).

7.6.2 George Washington National Forest

- Roads will be designed and constructed to the standard necessary to provide access and manage resources according to management prescription desired conditions and public safety. **(GWNF LRMP FW-230).**

- All new and reconstructed roads will blend into the landscape to the extent practical. **(GWNF LRMP FW-232).**

- Apply the level of maintenance needed to protect the investment, facilitate resource management, and provide for user safety. **(GWNF LRMP FW-234).**

- Closed system roads are planted with native or desirable non-native wildflowers, forbs, shrubs, and/or grasses. **(GWNF LRMP FW-235).**

- Specify management requirements for permittee access roads in the designated use permit, where roads are included in the authorization. **(GWNF LRMP FW-248).**

7.6.3 United States Department of Agriculture Guidelines for Road Maintenance Levels

- Maintenance prescription guidelines for roads level 1 through level 5
- Road Management Strategies

8.0 SLOPE STABILITY PLAN

8.1 STEEP TERRAIN

Atlantic recognizes the increased risk of instability associated with pipeline construction while traversing steep slopes. As a baseline, Atlantic developed a program for use on projects within steep terrain. The program outlines the following engineering design methods which will apply to slip prevention and correction during construction:

- drainage improvement, which may include providing subsurface drainage at seep locations through granular fill and outlet pipes, incorporating drainage devices into trench breakers, and/or intercepting groundwater seeps and diverting them from the right-of-way;
- buttressing slopes with trench breakers;
- benching and re-grading with controlled backfill;
- using alternative backfill, as approved by the FS;
- chemical stabilization of backfill, as approved by the FS;
- Geogrid reinforced slope, which consists of benching existing slope, installing subsurface drains, and incorporating Geogrid reinforcement into compacted backfill; and/or
- retaining structures.

Selection of the most appropriate engineered prevention measure or combination is dependent on the individual site conditions and constraints during the time of construction.

For the ACP Project, Atlantic is also committed to identifying mitigation measures beyond standard practices through the BIC Program. The focus of the BIC Program is to proactively evaluate steep slopes (defined as slopes with an inclination greater than 30 percent and greater than 100 feet in length) and landslide hazards related to construction of the pipeline, compressor station, and metering and regulation facilities that could potentially impact environmental resources, in particular streams, wetlands, and waterbodies. The BIC program is intended to incorporate the permit requirements from West Virginia and Virginia, and then exceed these regulatory standards, where appropriate, in order to mitigate for potential erosion and sediment discharges related to steep slope and landslide hazards.

The ultimate goal of the BIC Program is to develop project-specific engineering mitigation recommendations and thereby support preparation of steep slope control measures and site-specific ESCP for the ACP. The BIC Program has achieved this by assembling a team of internal Dominion stakeholders along with supporting external subject matter experts to develop project- specific mitigation recommendations and in the field determinations, by using a process-based approach that includes: hazard identification and assessment (i.e. find and then understand the hazard), engineering mitigation design (i.e. targeted design measures that mitigate the hazard), monitoring (i.e. track performance to understand if additional mitigation is needed), and operational measures (i.e. monitor and maintain and operate the system, as needed).

The BIC Program Team convened in a series of design workshops to examine the identified hazards and supporting information along the pipeline alignment. The hazards were initially identified by studies such as the Geohazards Assessment or the karst study, and/or from other targeted studies such as the Order 1 Soil Survey. These studies identified and assessed or supported the review of the hazard, and provided a basis to select the most applicable and robust BIC mitigation response to minimize the hazard, and then monitor the hazard through ongoing operations.

The conceptual work-flow process of the BIC Program (see Figures A-1/2 through A-4) is organized around four general steps, briefly described as follows:

- Hazard Identification - Geologic hazards are systematically identified during the Geohazards Analysis Program through desktop analysis and field reconnaissance as well as by supporting evaluations (e.g. karst studies and soil surveys).

- Hazard Characterization, Assessment, and Threat Classification - As part of the Geohazards Analysis Program, the nature of the geohazards and their potential impacts on the pipeline and environmental resources are assessed. A semi-quantitative ranking of hazard threat level to the proposed pipeline from various geohazards is used to identify areas for further investigation to determine where appropriate mitigation and monitoring measures may need to be designed and implemented during construction.

- Hazard Mitigation - Areas for mitigation are selected based upon potential risk to the pipeline, environment, and operations and maintenance. Overall hazard reduction techniques may include BIC construction practices and/or best management practices.

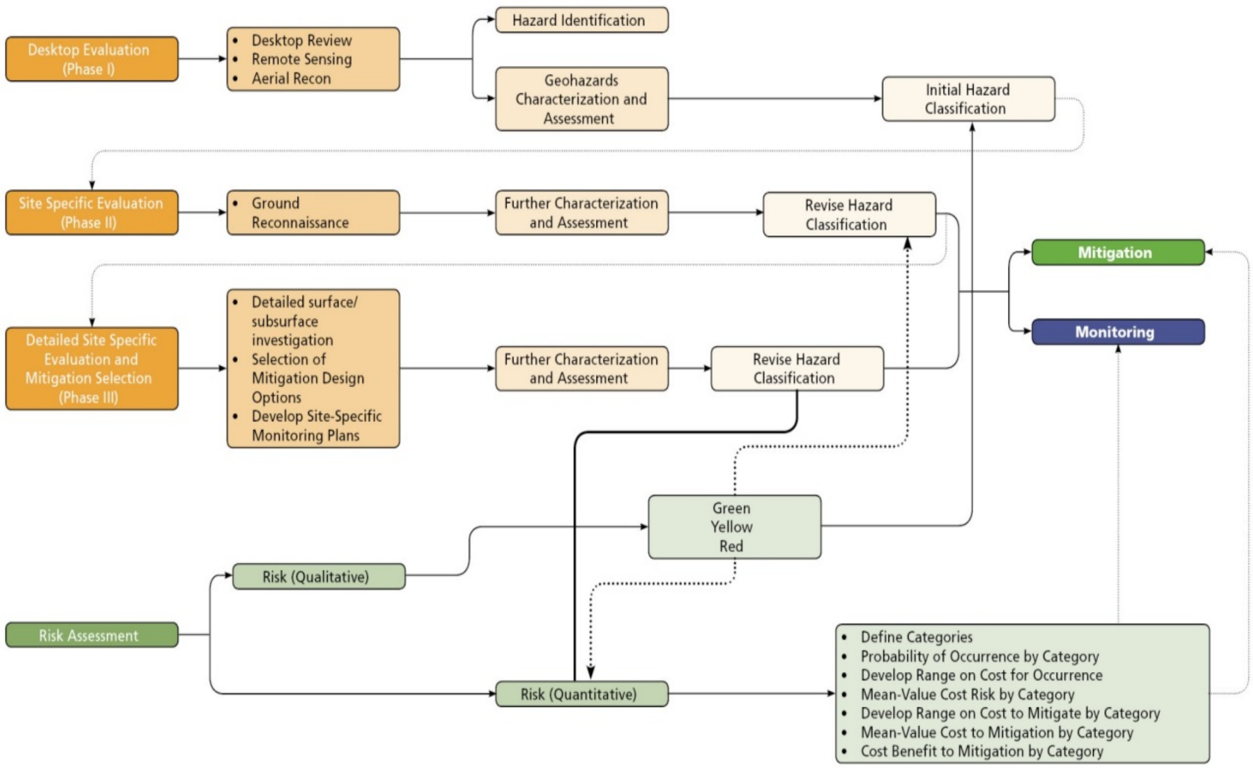
    - Site and hazard specific plans have been developed based on the recommendations of the Geohazards Analysis Program and mitigation techniques selected by a BIC team of experts. The site and hazard specific plans will address the specific geologic hazard (e.g., slip, stream scour, ground displacement) with detailed mitigation measures, as applicable, for construction and/or operation of the Project.

- Hazard Monitoring - Atlantic will monitor mitigation techniques to assess their effectiveness and the need for further mitigation, if appropriate.

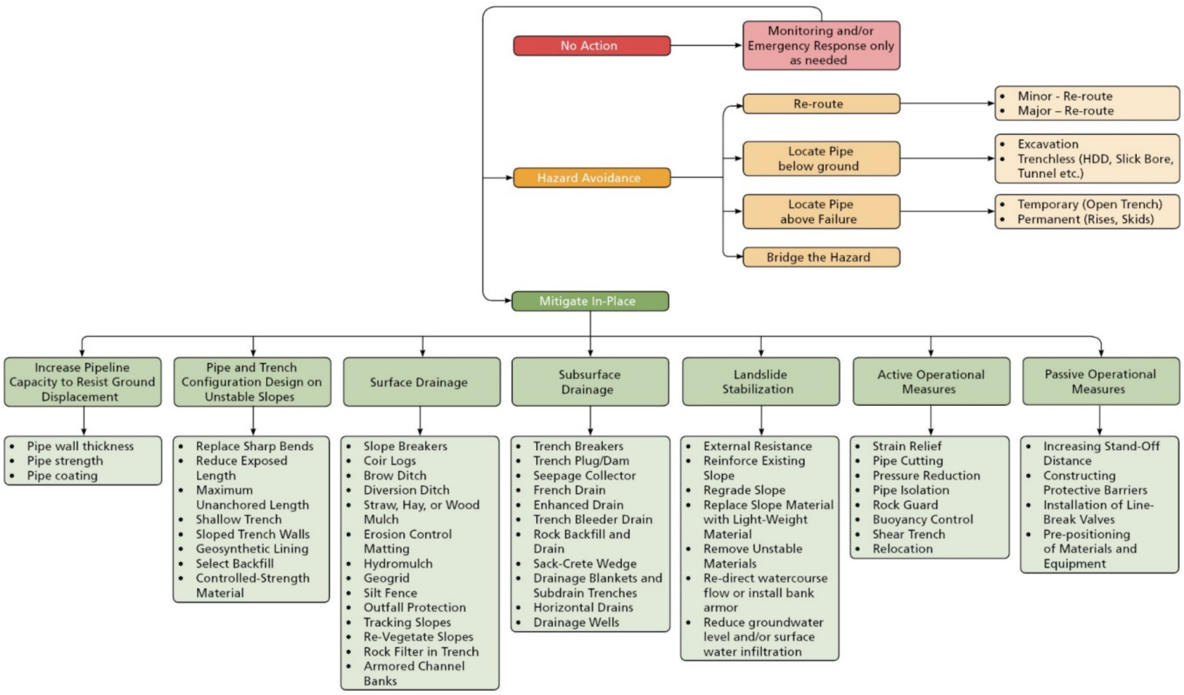
The ultimate goal of the BIC Program is to develop project-specific engineering mitigation recommendations and thereby support preparation of steep slope control measures and site-specific ESCP for the ACP. Drawings associated with the BIC Program, including site-specific drawings of two locations on NFS lands, are provided in Attachments C-1 and C-2. The following site-specific design drawings will be provided to the FS for review and approval at least 30 days in advance of starting construction at each respective site:

Site	MPs	Drawing
MNF#2	72-73	Site Specific (#4)
MNF#1	73-74	Site Specific (#5)
GWNF#2	84.9-85	Site Specific (#7)
GWNF#4	120.1	Site Specific (#11)
GWNF#5	120.3	Site Specific (#12)

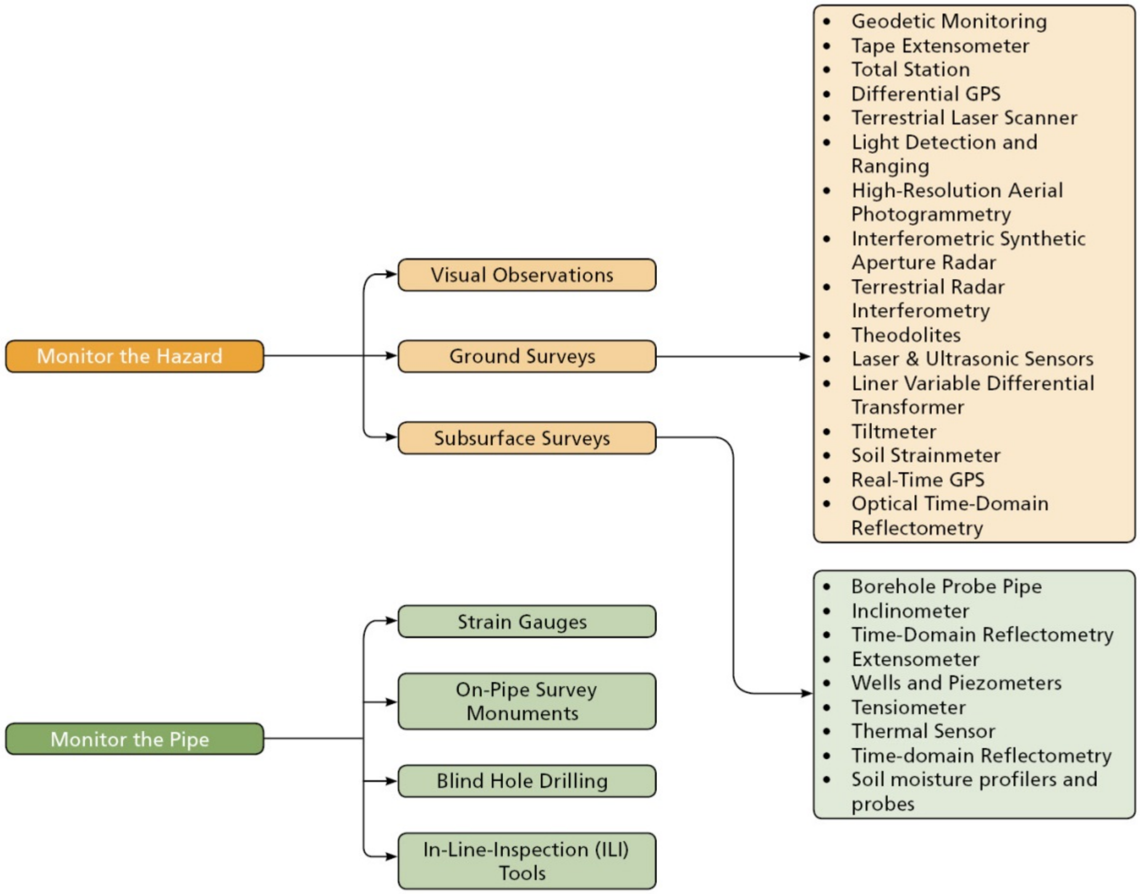
A-1/2: Hazard Identification and Assessment



A-3: Hazard Mitigation



A-4: Hazard Monitoring



Atlantic will provide specific employee training which will be developed from the BIC program. Atlantic personnel with responsibility for pipeline routing, construction, or operation must be trained in this procedure on an annual basis. The training may be completed by an online learning management system module or may be conducted by Energy Infrastructure Environmental Services personnel, or Atlantic Engineering Management. At a minimum, the following personnel will be trained;

- Engineering Directors and Managers;
- Design and construction engineers;
- Operations Directors, Managers and Supervisors;
- Construction supervisors; and
- Construction and operations ECC.

The training must include the following;

- Types and causes of slope failures;
- Routing avoidance and desktop methods;
- Field reconnaissance;
- Risk prioritization;
- Pipeline design and engineering to prevent slope failures;
- Addressing slope failures during construction;
- Addressing slope failures post construction; and
- Reporting requirements.

9.0 EROSION AND SEDIMENTATION CONTROL PLAN

9.1 PURPOSE

This ESCP has been prepared for use by Atlantic and its contractors as a guidance manual for minimizing erosion of disturbed soils and transportation of sediments off the construction right-of-way and into sensitive resource areas during natural gas pipeline construction. The procedures developed in this plan, which represent Atlantic's BMPs, are designed to accommodate varying field conditions while achieving compliance with regulatory requirements and protecting environmentally sensitive areas.

This ESCP is designed to provide guidelines, BMPs, and typical techniques for the installation and implementation of soil erosion and sediment control measures while permitting adequate flexibility to use the most appropriate BMP measures based on site-specific conditions. The intent of the ESCP is to provide general information on the pipeline construction process and sequence, and to describe specific measures that will be employed during and following construction to minimize impacts to the environment.

The goal of the ESCP is to preserve the integrity of the construction area and environmentally sensitive areas and to maintain existing water quality by:

- Minimizing the extent and duration of disturbance;
- Diverting runoff to stabilized areas;
- Installing temporary and permanent erosion control measures; and
- Establishing an effective inspection and maintenance program.

All land-disturbing activities will conform, at a minimum, to the FERC Plan and Procedures. Atlantic will also comply with Storm Water Pollution Prevention Plans (SWPPP) that meet each state's requirements. Atlantic has also prepared Construction Alignment Sheets depicting the locations of erosion and sediment controls in construction work areas, consistent with the FERC Plan and Procedures, as well as the West Virginia Department of Environmental Protection, Division of Water and Waste Management, *Erosion and Sediment Control Best Management Practice Manual*[20] (2006), the Virginia Department of Environmental Quality's *Virginia Erosion and Sediment Control Handbook* (VESCH) [21] (1992), Virginia's *Forestry Best Management Practices for Water Quality Technical Manual*, DTI's 2016 *Annual Standards and Specifications for Erosion and Sediment Control and Stormwater Management for Construction and Maintenance of Linear Gas Transmission Pipeline* (Standards and Specifications), and Dominion Energy's Slope Stability Policy and Procedure (Attachment C-1).

In addition, the MNF and GWNF are managed under LRMPs issued in 2011 and 2014, respectively. The LRMPs are comprehensive planning documents designed to guide land management decisions within the National Forest boundaries. The LRMPs describe desired conditions and outline Management Prescriptions to be pursued to achieve those conditions.

The Virginia Department of Forestry's *Virginia's Forestry Best Management Practices for Water Quality, Technical Manual*, 2011 was also consulted during selection of erosion and sediment control measures.

Atlantic selected the more stringent or protective of the erosion and sediment control requirements set forth by FERC, West Virginia, Virginia, and the FS to include in this ESCP. Consultation with FS staff regarding specific control and restoration measures to be used in the MNF and GWNF is ongoing.

9.2 SOILS

An Order 1 Soil Survey (Survey) was performed between May 9 and June 22, 2016 on NFS lands between MP 47 and MP 115.

The soil survey was conducted in accordance with the requirements outlined in special use permit #GBR205003for surveys in the MNF, and special use permit #GWP433201T for surveys in the GWNF.

9.2.1 Soil Survey

The survey was conducted in four phases: (1) Desktop Study, (2) Preliminary Field Reconnaissance, (3) Team Training, and (4) Field Investigation. Background information was obtained during the desktop study to help identify the prevalent soil-landscape relationships across the proposed pipeline route within the Project area. The background information was also used by the soil scientist team to identify preliminary test pit locations and develop strategies for conducting the survey. Preliminary GIS-generated maps were prepared for planning and field use. This section outlines the objectives and accomplishments of each phase. The survey report is included as Attachment G.

9.3 CONSTRUCTION WORK AREAS

Construction work areas include the construction right-of way, additional temporary work space, access roads, temporary pipe storage and contractor yards, and aboveground facilities.

[20] An online copy is available on the West Virginia Department of Environmental Protection website at: https://apps.dep.wv.gov/dwwm/stormwater/BMP/index.html

[21] Hardcopy 1992 editions identify this as a Virginia Department of Conservation and Recreation document; the online version identifies this as a Virginia Department of Environmental Quality document.

9.3.1 Pipeline Right-of Way

The construction corridor on NFS lands will measure 125 feet in width, with a 40-foot-wide spoil side and an 85-foot-wide working side. In areas where topsoil will be segregated from over the ditchline (see Section 2.1.4), an additional 25 feet of temporary construction workspace will be needed on the working side of the corridor to provide sufficient space to store topsoil. In wetlands, the width of the construction right-of-way will be reduced to 75 feet, with 25 feet on the spoil side and 50 feet on the working side. Following construction, a 50-foot-wide permanent right-of-way will be maintained for operation of the pipeline.

During construction of the pipeline, the top width of the excavated pipe trench in most areas will typically range from 10 to 20 feet. This assumes that construction personnel will not be required to work in the trench, which is typical for most installations. In areas with steep terrain, construction personnel will be required to work in the trench to weld the pipeline. In these areas, the top of the trench will typically be 30 feet wide to provide sufficient space for construction personnel to work in the trench safely. The additional spoil from excavation of a wider trench will be stockpiled in the temporary construction right-of-way and ATWS.

9.3.2 Additional Temporary Workspace

In addition to the construction right-of-way, ATWS will be required to stage construction activities and store equipment, materials, and excavated material at wetland, waterbody, and road crossings. ATWS will also be required in areas with steep side slopes, where topsoil will be segregated from over the ditchline, or where special construction techniques are implemented as well as at tie-ins with existing pipeline facilities, utility crossings, truck turnaround areas, and spread mobilization/de-mobilization areas.

ATWS measuring 50 by 150 feet will typically be required on both sides of the corridor and both sides of the crossing at wetlands, waterbodies measuring greater than 10 feet in width, two lane roads, and railroads. ATWS measuring 25 by 100 feet will typically be required on both sides of the corridor and both sides of the crossing at waterbodies measuring less than 10 feet in width and single lane roads. Except as authorized by the FS, ATWS will be located at least 100 feet from the water's edge at each waterbody on NFS lands (on the GWNF, the buffer increases on slopes greater than 10 percent)[22]. Locations of ATWS are shown on the construction alignment sheets (Attachment B).

9.3.3 Access Roads

Atlantic has identified roads to be used to provide access to the right-of-way during construction and operation of the Project. Atlantic will mostly utilize existing roads, but several new roads are proposed to be constructed on NFS lands (see Section 2.1.3). Some existing roads will require improvement (such as grading, gravelling, replacing or installing culverts, minor widening, and/or clearing of overhead vegetation) to safely accommodate construction equipment and vehicles.

9.4 CRITICAL AREAS

Atlantic developed and implemented the Slope Stability Policy and Procedure (Attachment C-1) to avoid, minimize, and mitigate potential landslide issues in slip prone areas prior to, during, and after

[22] The FS may adjust LRMP stream buffer widths to facilitate compliance with State requirements for stream crossings. Decisions to adjust stream buffers will be based on an interdisciplinary review and site-specific field investigation by the Forest Service. The buffers shall, at a minimum, encompass the riparian area defined on the basis of soils, vegetation and hydrology and the ecological functions and values associated with the riparian area.

construction. The Slope Stability Policy and Procedure was updated in September, 2016 and applies to both Virginia and West Virginia. It includes considerations for slips associated with pipeline construction during routing, engineering design, preconstruction planning, construction, and post construction.

9.4.1 Steep Terrain

Atlantic recognizes the increased risk in slips associated with pipeline construction while traversing steep slopes. Special construction procedures and erosion and sediment control measures will be used in steep terrain areas. Additionally, Atlantic has developed and implemented a BIC Program to proactively manage construction and operation in steep slope areas. Section 8 (Slope Stability Plan) describes these measures and procedures.

Atlantic will:

- ensure that the erosion and sediment control measures in West Virginia are in compliance with an approved SWPPP or the West Virginia Erosion and Sediment Control Best Management Practice Manual;
- ensure that the erosion and sediment control measures in the Commonwealth of Virginia are in compliance with an approved SWPPP or the following regulations:
    - Virginia Erosion and Sediment Control Regulations, (9 Virginia Code [VAC] VAC 25-840 et seq., as amended);
    - Virginia Erosion and Sediment Control Certification Regulations (9 VAC25-850 et seq. as amended);
    - Virginia Department of Environmental Quality (VDEQ), VESCH, Third Ed., 1992, as amended;
    - VDEQ, Virginia Stormwater BMP Clearinghouse Stormwater Design Specifications, 2013, as amended;
    - Virginia Stormwater Management Program Regulations (9 VAC 25-870 et seq., as amended);
    - VDEQ, Virginia Stormwater Management Handbook, First Edition, 1999, as amended;
- conduct monthly inspections to assess potential concerns and document and remediate identified slope failures;
- complete a geotechnical analysis to evaluate the causes of past slope failures along its pipeline right-of-way;
- identify procedures and measures to identify, prevent, contain, and remediate slope failures; and
- develop and implement policy and procedures to address slip prone areas.

9.4.2 Karst Geological Formations

A Karst Monitoring and Mitigation Plan was developed for the proposed Project and is included as Attachment H.

9.4.3 Waterbodies and Wetlands

Section 10 (Stream and Wetland Crossing Procedures) identifies measures to minimize the extent and duration of Project-related disturbance on wetlands and waterbodies in the MNF and GWNF.

9.4.3.1 Virginia Requirements

The Environmental Protection Agency (EPA) issued the Chesapeake Bay Total Maximum Daily Load (TMDL) on December 29, 2010. The Chesapeake Bay TMDL addresses all segments of the Bay and its tidal tributaries and establishes waste load allocation to reduce nitrogen, phosphorus and sediment discharges into the Bay. The portion of the ACP Project within the GWNF lies within the Chesapeake Bay TMDL Watershed and may be subject to additional Chesapeake Bay TMDL watershed measures during construction, in addition to erosion and sedimentation control measures outlined in this Section.

9.5 EROSION AND SEDIMENT CONTROL MEASURES

Cross-country pipeline construction typically proceeds in assembly line fashion, with multiple stages of construction occurring simultaneously at different locations to minimize the time needed to complete the Project. The stages of construction include survey and flagging, clearing, topsoil segregation, grading, trenching, pipe assembly (including stringing, bending, welding, testing, coating, and lowering-in), backfilling, hydrostatic testing, final grading, and restoration. The erosion and sediment control measures to be installed for each of these stages are described below. Typical drawings of general erosion and sediment control measures are provided in Attachments I-1 and I-2. Site-specific erosion and sedimentation controls are shown on the Construction Alignment Sheets (Attachment B).

9.5.1 Site Preparation

- Survey and flag the construction right-of-way and mark environmentally sensitive areas;
- Install rock access pads during grading;
- Conduct initial clearing, limited to that necessary to install temporary sediment barriers;
- Install perimeter erosion and sediment controls prior to any bulk earth-moving activity (road grading, road use, log skidding, etc.).
- Install all perimeter BMPs immediately after any bulk earth-moving activity;
- Conduct progressive clearing and stump removal with installation of temporary sediment barriers and temporary equipment bridges keeping pace with clearing;
- Modify access roads by grading and installing stone where needed;
- Segregate topsoil over the ditchline at specified locations (see Section 2.1.4.3), and grade the right-of-way, and

- Install temporary slope breakers, also referred to as interceptor dikes, temporary right-of-way diversions or water bars, as needed to reduce runoff velocity and divert water off the construction right-of-way.

9.5.2 Pipe Installation

- Excavate new trench to accommodate new/replacement pipeline segment;
- String pipe, bend the pipe joints;
- Weld the pipe, inspect welds;
- Lower the pipe into the trench;
- Install permanent trench plugs;
- Backfill the trench;
- Install trench dewatering structures;
- Bring the pipeline into service;
- Final grade right-of-way and temporary workspaces to original contours to the extent practicable; conduct soil testing and decompact as necessary.
- Install permanent interceptor dikes; and
- Replace segregated topsoil.

9.5.3 Restoration

- Conduct right-of-way finish grading and cleanup. As soon as slopes, channels, ditches, and other disturbed areas reach final grade, they must be stabilized;
- Where topsoil has not been segregated, apply soil conditioning amendments such as ProGanics or other similar biotic soil media, at two times the minimum application rate; install a hydraulically-applied growth media system such as flexterra or similar product.
- Restore temporary access roads or any paved surfaces to original condition; and
- Remove temporary sediment barriers from an area when replaced by permanent erosion control measures or when the area has been successfully restored to uniform 70 percent cover of perennial vegetation. Temporary erosion control BMPs will not be removed until inspection by the EI to confirm site stabilization.
- Reseed/replant work areas with native and pollinator species as provided in the Restoration and Rehabilitation Plan (Section 11).

9.5.4 Survey and Flagging

- The limits of the approved work areas, boundaries of environmentally sensitive areas, and the location of the facilities will be marked in the field prior to the start of mechanized activities. Environmentally sensitive areas are those that are more susceptible to serious erosion problems and thus may require enhanced erosion and sediment control measures. Examples of such areas may include steep slopes and sinkholes down-gradient of Project activities. Examples of specialized controls that may be used in these areas include specialized pipeline construction methods that combine several construction stages, thereby reducing earth disturbance.

- The limits of approved work areas, including the construction right-of-way, ATWS and staging areas) will be established and visibly marked before clearing. The locations of approved access roads will be flagged and marked with signs.

- Signs and highly visible flagging will also be used to mark the boundaries of sensitive resource areas, including waterbodies and wetlands, any areas adjacent to or upslope from occurrences of threatened and endangered species (TES) plants (without identifying TES plants on the sign), any areas downslope from known NNIS populations, and/or areas with special requirements along the construction work area, in accordance with the Construction Alignment Sheets. Orange safety fencing or flagging will be used to ensure that equipment operators stay out of critical areas. Safety fencing will be installed as needed during grading at public access points or around open unattended excavations to warn pedestrians of possible hazards. In addition, lights, signs and other warnings are required at road entrances and road crossings (see West Virginia or VDOT permits and regulations).

- Safety fencing may also be used to identify sensitive areas to be protected during construction or to highlight hazards along the right-of-way (e.g., a single-strand electric fence). Safety fencing will not be substituted for wire fencing in active pastures.

- Flagging or marking will be maintained throughout construction.

- Other large diameter trees on the edge of the construction right-of-way and ATWS areas will be flagged by EIs to save/protect as green recruitment or habitat/shade trees, where feasible.

9.5.4.1 Virginia Requirements

Refer to Virginia Erosion and Sediment Control (E&S) Handbook for further details on the following requirement:

- Per VESCH Std. & Spec. 3.01 (Safety Fence), safety fencing will be installed as needed during grading at public access points or around open unattended excavations to warn pedestrians of possible hazards. In addition, lights, signs and other warnings are required at road entrances and road crossings (see VDOT permits and regulations).

- Per Virginia Standard & Spec 3.38 (Tree Preservation and Protection), at a minimum the limits of clearing will be located outside the drip line of any tree to be retained within the limits of disturbance (LOD). In addition, heavy equipment, vehicular traffic, or stockpiles will not be permitted within the drip line of any tree to be retained within the LOD.

9.5.5 Construction Entrance

A construction entrance will be constructed at any point where construction equipment leaves the right-of-way and enters a paved public road or other paved surface. Typically, a construction entrance consists of filter fabric overlain by 6 inches of coarse aggregate extending a minimum of 70 feet from the edge of the pavement. It will extend the full width of the vehicular ingress and egress area and have a minimum width of 12 feet. Conveyance of surface water through culverts under the entrance will be provided, as necessary.

The construction entrance will function to remove mud from vehicles and equipment leaving the right-of-way. As mud accumulates on the entrance, clean stone will be added or the tire mats lifted and shaken to remove mud. Any mud that is carried onto the pavement will be thoroughly removed by the end of the day by shoveling or sweeping. The mud will be returned to the right-of-way. The use of water to remove sediment tracked onto roadways is not permitted. Additionally, vehicles will be washed in accordance with the NNIS Plan (Section 12), which addresses washing of vehicles to prevent spread of NNIS on NFS lands.

If the majority of the mud is not removed by the passage of the vehicles over the stone, then the tires of the vehicles will be washed before entering the public road. A wash rack may be used to make washing more convenient and effective. Wash water be carried away from the entrance to a settling area to remove sediment before discharge.

Maintenance of the construction entrance may require periodic top dressing with additional stone and cleanout of any structures used to trap sediment. If any inadvertent sediment tracking occurs on the public roadway, the road will be cleaned thoroughly by the end of each day.

9.5.5.1 Virginia Requirements

Refer to Virginia E&S Handbook for further details on the following requirement:

- In accordance with VESCH Std. & Spec 3.02 (Stone Construction Entrance), a construction entrance will be constructed at any point where construction equipment leaves the right-of-way and enters a paved public road or other paved surface. Typically, a construction entrance is comprised of filter fabric overlain by 6 inches of coarse aggregate (VDOT #1) extending a minimum of 70 feet from the edge of the pavement. The area of the entrance must be excavated 3 inches prior to laying the filter fabric underliner. The entrance must extend the full width of the vehicular ingress and egress area and have a minimum 12-foot width. Conveyance of surface water through culverts under the entrance will be provided, as necessary. If such as conveyance is impossible, the construction of a “mountable” berm with 5:1 slopes will be permitted.

9.5.6 Clearing

Clearing operations include the removal of vegetation within the construction right-of-way. The Timber Removal Plan (Section 4) provides additional information regarding timber removal.

- Clearing will be confined to within the construction right-of-way shown on the Construction Alignment Sheets (Attachment B);

- Trees will be felled into the construction right-of-way to minimize damage to trees and structures adjacent to the right-of-way. Trees that inadvertently fall beyond the edge of the right-of-way will be immediately moved onto the right-of-way and disturbed areas will be immediately stabilized, per FS approval;

- Slash will be ground up and used as mulch, hauled to an approved disposal site, or burned (if permitted).

- Stumps excavated from the trench line that are not ground to mulch onsite will be placed along the edge of the construction right-of-way or in temporary extra workspaces. Stumps will be hauled from the extra workspaces to an approved disposal site, used on the right-of-way for restoration purposes, burned (if permitted), or disposed of according to FS requirements.

- Felled merchantable timber will be managed in accordance with Section 4 (Timber Removal Plan).

- Existing surface drainage patterns will not be altered by the placement of timber or brush piles at the edge of the construction right-of-way.

- Where ground skidding is used, the following measures will be implemented to minimize soil disturbance:

  - Low ground weight (pressure) vehicles will be used, where feasible.

  - The removal of soil duff layers will be avoided to maintain a cushion between the soil, logs, and logging equipment.

  - Designed skid trails will be used to restrict detrimental soil disturbance (e.g., compaction and displacement) to a smaller area of the right-of-way over the pipeline trenching area.

- Erosion and sediment control measures will be installed immediately following mechanized clearing of trees, brush and vegetation.

9.5.6.1 Virginia Requirements

- According to VESCH Std. & Spec. 3.38, fires will not be permitted within 100 feet from the drip line of any trees to be retained within the LOD. Fires will be limited in size to prevent adverse effects on trees, and kept under surveillance.

9.5.7 Wind Erosion Control

Consistent with VESCH **Std. & Spec. 3.39 (Wind Erosion Contro**l), the following temporary sediment controls will be used, as applicable, to minimize the surface and air movement of dust during land disturbing and construction activities:

- In areas with little or no construction traffic, a vegetatively stabilized surface will reduce dust emissions.

- Mulch will be used in areas without heavy traffic pathways.

- Tillage will be used only in an emergency situation before wind erosion begins. Plowing will be done on the windward side of the site with chisel-type plows spaced approximately 12 inches apart.

- The contractors will have one or more water trucks available per spread that will load water from approved permitted sources to spray areas for dust control.

- Use of spray-on adhesives may be used on mineral soils only.

- Crushed stone or course gravel will be used to stabilize roads and other areas during construction.

- A board fence, wind fence, or sediment fence may be used to control air currents and blowing soil. Barriers will be placed perpendicular to prevailing air currents at intervals of about 15 times the barrier height.

- Calcium chloride may be applied by a mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage.

Finally, after land disturbing activities are complete, permanent vegetation and site stabilization will provide long-term protection against wind erosion.

9.5.8 Install Temporary Sediment Barriers and Diversions

Sediment barriers, which are temporary sediment controls intended to minimize the flow and deposition of sediment beyond approved workspaces or into sensitive resource areas, will be installed following vegetative clearing operations. The primary sediment barrier methods to be used on the ACP Project will include silt fencing, temporary diversion dikes, and sediment traps. Sediment traps, perimeter dikes, sediment barriers and other measures intended to trap sediment will be constructed as a first step in any land-disturbing activity and will be made functional before upslope land disturbance takes place. General requirements are as follows:

- Temporary sediment barriers will be installed at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a road crossing, waterbody and/or wetland, or closer if needed, until revegetation is complete. If needed, multiple barriers will be used to contain sediment. Adequate room will be left between the base of the slope and the sediment barrier to accommodate ponding of water and sediment deposition. For silt fencing, an effort will be made to locate the fencing at least 5 feet to 10 feet beyond the toe of the slope.

- Silt fence will not be used at locations of concentrated overland flow, whether the flow is natural or constructed. Compost filter socks or other approved controls to filter sediment will be used at these locations.

- Where wetlands or waterbodies are adjacent to and downslope of construction work areas, sediment barriers will be installed along the edge of these areas, as shown on the construction alignment sheets.

- Temporary sediment barriers will be inspected daily in areas of active construction to ensure proper functioning and maintenance. In other areas with no construction or equipment operation, sediment barriers will be inspected and maintained on a weekly basis throughout construction and within 24 hours of each 0.5 inch of rainfall event.

- Sediment removed from erosion controls will be disposed by adding to existing onsite soil stockpiles and stabilizing, or will be reused onsite within the construction right-of-way and outside of any wetlands, streams or riparian areas.

- All temporary sediment barriers will be maintained in place until permanent revegetation measures are successful or the upland areas adjacent to wetlands, waterbodies, or roads are stabilized.

- Temporary sediment barriers will be removed from an area when replaced by permanent erosion or sediment control measures or when the area has been successfully restored to perennial vegetation.

- Erosion barriers will be constructed of synthetic materials, clean straw bales, or other Forest Service-approved material free of seeds or viable parts of invasive plants.

- TES plant populations will be protected from erosion and overland sediment flow. Temporary sediment barriers will be installed at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from any TES plant populations, or closer if needed, until revegetation is complete.

- Areas downslope from NNIS plant populations will be protected from erosion and overland sediment flow. Temporary sediment barriers will be installed at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from any NNIS plant populations, or closer if needed, until revegetation is complete.

9.5.8.1 West Virginia Requirement

Refer to West Virginia BMP Manual for further details for the following requirement:

- Remove temporary sediment barriers from an area when replaced by permanent erosion or sediment control measures or when the area has been successfully restored to uniform 70 percent perennial vegetation.

Refer to West Virginia General Water Pollution Control Permit (G.4.e.2.A.ii.k) for the following requirement:

- No hay or straw bales will be used in West Virginia, except that weed-free straw bales may be used in dewatering structures.

9.5.8.2 Virginia Requirement

Refer to Virginia E&S Handbook for further details for the following requirements:

- Per Virginia Minimum Standard 2, during construction of the project, soil stock piles and borrow areas will be stabilized or protected with sediment trapping measures. Atlantic is responsible for the temporary protection and permanent stabilization of soil stockpiles on site as well as borrow areas and soil intentionally transported from the project site.

- Per Virginia Minimum Standard 3, permanent vegetation will not be considered established until a ground cover is achieved that is uniform, mature enough to survive and will inhibit erosion. Remove temporary sediment barriers from an area when replaced by permanent erosion or sediment control measures or when the area has been successfully restored to perennial vegetation. Permanent vegetation will not be considered established until a ground cover is achieved that is uniform, mature enough to survive and will inhibit erosion.

9.5.9 Silt Fencing

- The following specifications can be found in the DEQ Virginia Erosion & Sediment Control Field Manual and are consistent with the FERC Plan and Procedures. Silt fencing constructed of synthetic filter fabric stretched across and attached to supporting posts, and in some cases a wire support fence, will be placed across or at the toe of a slope or in a minor drainage way to intercept and detain sediment and decrease flow velocities from drainage areas of limited size. Silt fencing is applicable where sheet and rill erosion or small concentrated flows may be a problem. However, silt fence will not be used at locations of concentrated overland flow, whether the flow is natural or constructed. Compost filter socks or other approved controls to filter sediment will be used at these locations.

- Silt fencing will be used where the size of the drainage area is not more than one quarter acre per 100 feet of silt fence length; the maximum slope length behind the barrier is 100 feet; and the maximum gradient behind the barrier is 50 percent (2:1).

- Compost filter socks or other approved controls can be used in minor swales or ditches where the maximum contributing drainage area is no greater than 1 acre and flow is no greater than 1 cubic feet per second. In ditches or swales where higher velocity flow is expected, rock check dams will be used.

- Silt fencing will not be used in areas where rock or some other hard surface prevents the full and uniform depth anchoring of the barrier.

- If steel posts are utilized, they must have a minimum weight of 1.33 pounds per linear foot and have a minimum length of 5 feet. Posts will be placed a maximum of 6 feet apart.

- The height of the fence will be a minimum of 16 inches above grade and will not exceed 34 inches above ground elevation.

- Filter cloth will be spliced together only at support posts with a minimum 6-inch overlap.

- A trench will be excavated approximately 4-inches wide and 4-inches deep on the upslope side of the proposed location of the measure.

- When wire support is not used, extra-strength filter fabric will be fastened to the upslope side of the posts using one inch long (minimum) heavy-duty wire staples or tie wires and the fabric will be extended into the trench. The posts will be placed a maximum of 6 feet apart.

- When wire support is used, the wire mesh fence must be fastened securely to the upslope side of the posts using heavy duty wire staples at least one inch long, tire wires or hog rings. The wire will extend into the trench a minimum of two inches and will not extend more than 34 inches above the ground surface. The standard-strength fabric will be stapled or wired to the wire fence, and 8 inches of the fabric will be extended into the trench. The posts will be placed a maximum of 10 feet apart.

- If silt fence is to be constructed across a ditch line or swale, the measure must be of sufficient length to eliminate end flow and the configuration will resemble an arc with the ends oriented upslope. Extra-strength filter fabric must be used for ditch lines or swales with a maximum 3-foot spacing of posts.

- The 4-inch by 4-inch trench will be backfilled and the soil compacted over the filter fabric.

- Remove accumulated sediments when sediment reaches half the above-ground height of the fence.

- On NFS lands, all silt fences will be removed and discarded properly after project completion. Soils will be stabilized and seeded as per the Restoration and Rehabilitation Plan (Section 11). Permanent erosion control protective measures will be utilized if seeding alone will not stabilize the site and provide soil stability.

9.5.9.1 Belted Silt Retention Fence

The primary silt fence product planned for use on the ACP Project is a patented Belted Silt Retention Fence (BSRF) product which is available in two designs used to address different site conditions, as follows:

- BSRF Priority 1 (green band) is a heavy-duty silt fence constructed with a 36-inch, non-woven, spun-bond fabric with an internal scrim incorporated into the fabric for additional strength and durability. The system utilizes wood stakes spaced at 4-feet intervals and a specific method of attachment. The system is functionally equivalent to wire back and metal steel post silt fence and is designed for the protection of high priority areas, including wetlands and waterbodies.

- BSRF Priority 2 (black band) is a medium-duty silt fence constructed with a 36-inch, non-woven, spun-bond fabric that is calendared on one side. The system utilizes wood stakes spaced at 6-feet intervals and a specific method of attachment.

An estimated 125,000 feet of silt fence is anticipated to be needed on NFS lands.

9.5.10 Temporary Diversion Dike

A temporary ridge of segregated subsoil, which will be compacted during construction at the top of a sloping disturbed area, will be used to divert stormwater runoff from upslope drainage areas away from the unprotected slope. Temporary diversion dikes can also be constructed at the base of a slope to protect adjacent and downstream areas by diverting sediment-laden runoff from a disturbed area to a sediment-trapping control measure. A temporary diversion dike is a good choice when the control limits of a silt fence are exceeded. The temporary diversion dike must be installed as a first step in the land-disturbing activity at locations shown on the Construction Alignment Sheets and must be functional prior to upslope land disturbance.

- The maximum allowable drainage area is 5 acres.
- The minimum height measured on the upslope side of the dike is 18 inches.
- The dike will be compacted to prevent failure and have side slopes 1.5:1 or flatter with a minimum base width of 4.5 feet.
- The channel behind the dike will have a parabolic or trapezoidal cross-section shape to avoid high velocity flow which could arise in a v-shaped ditch. The channel will have a positive grade to a stabilized outlet.
- The diversion dike and channel will be stabilized immediately following installation with temporary or permanent vegetation. Where channel slope is greater than two percent, hydraulic mulches and soil conditioners, upon approval of the FS, will be used to stabilize soil until vegetation is established. Rolled Erosion Control Product will not be used on NFS lands.
- The temporary diversion dike will be inspected and repairs made to the dike, flow channel, outlet or sediment trapping area, as necessary. Once every day in active construction areas, whether a storm event has occurred or not, the measure will be inspected and repairs made if needed. Damages caused by construction traffic or other activity must be repaired before the end of each working day.
- Segregated topsoil will not be used to create temporary diversion dikes.

9.5.10.1 West Virginia Requirements

Refer to West Virginia BMP Manual for detailed specifics on the following requirements.

- Temporary (less than 6 months) diversions must be designed to handle peak discharge from a 2-year/24-hour storm.
- The side slopes will be no steeper than 2:1
- The design will include a 10 percent settlement factor.

9.5.10.2 Virginia Requirements

In accordance with VESCH Std. & Spec 3.09 (Temporary Diversion Dike), refer to Virginia E&S Handbook for detailed specifics on the following requirements.

- The minimum height measured on the upslope side of the dike is 18 inches.
- The dike will be compacted to prevent failure and have side slopes 1.5:1 or flatter with a minimum base width of 4.5 feet.

9.5.11 Temporary Sediment Trap

A temporary ponding area formed by constructing an earthen embankment with a stone outlet may be used to detain sediment-laden runoff from small disturbed areas (where total drainage area is less than three acres) to allow sediment to settle out prior to discharge. The sediment trap may be constructed either independently or in conjunction with a temporary diversion dike as a suitable option for outlet control. The temporary sediment trap must be installed as a first step in the land-disturbing activity at locations shown on the Construction Alignment Sheets and must be functional prior to upslope land disturbance.

- The maximum useful life of a temporary sediment trap is 18 months. Traps will be replaced should the construction period exceed 18-months. Sediment traps may need to be replaced sooner than 18 months (on an as-needed basis) if at any time they cease to be effective. This will be determined based on the regularly scheduled inspections of these traps. Erosional control inspection and maintenance will continue on all parts of the project until the landscape is deemed stable. Permanent features will replace temporary features if the erosional feature does not become stable in the short term (less than 18 months.

- Topsoil will not be used for constructing sediment barriers of any kind.

- The total contributing drainage area to a sediment trap is less than 3 acres

- The sediment trap must be designed to have an initial storage volume of 134 cubic yards per acre of drainage area with a minimum 2:1 length to width ratio, if possible.

- Side slopes of the excavated area will be no steeper than 1:1 and the maximum depth of excavation within the wet storage area should be 4 feet.

- Outlet requirements include a combined coarse aggregate/riprap stone section of the embankment. Filter cloth will be placed at the stone-soil interface. The length of the stone outlet will be designed at 6 feet times the total drainage area in acres. The crest of the stone outlet will be at least 1.0 foot below the top of the embankment.

- The maximum height of the embankment will be 5 feet measured to the base of the stone outlet. Side slopes of the embankment will be 2:1 or flatter.

- Fill material will be selected from material that is free of roots or other woody vegetation, large stones, or organic matter, and will be compacted in 6-inch lifts.

- The temporary sediment trap will be stabilized immediately following installation with temporary or permanent vegetation that is free of weeds, invasive species and other contaminants.

- Accumulated sediments will be removed when sediment reaches half the design storage volume. Sediment removed will be deposited in a disturbed area, onto spoil piles within the right-of-way, in a manner that will not erode and cause sedimentation problems.

- Stone will be replaced if it becomes choked with sediment.

- Subsoil used to create these features will be de-compacted prior to replacing it in the pipeline trench, within the right-of-way, or within an approved ATWS.

9.5.11.1 West Virginia Requirements

Refer to West Virginia BMP Manual for further details for the following requirement:

- The sediment trap should have a storage volume of 3600 cubic feet per acre of drainage area. (WV BMP 3.29).

9.5.11.2 Virginia Requirements

Refer to Virginia E&S Handbook for further details for the following requirement:

- Per VESCH Std. & Spec 3.13 (Temporary Sediment Trap), outlet requirements include a combined coarse aggregate/riprap stone section of the embankment (VDOT #3, #357 or #5 Coarse Aggregate and Class I riprap). The typical length of the stone outlet is shown in the Typical Erosion and Sedimentation Control Details for Virginia (Attachment I-2).

9.5.12 Grading

The construction right-of-way will be graded as needed to provide a level workspace for safe operation of heavy equipment used in pipeline construction.

9.5.13 Topsoil Segregation

Atlantic will segregate topsoil over an approximately 20-foot wide strip roughly centered on the pipeline centerline from which stumps have been removed, at the following locations:

- MPs 73.4 to 73.6
- MPs 80.4 to 80.6
- MPs 82.6 to 83.0
- MPs 83.2 to 83.4
- MPs 83.6 to 83.9
- MPs 121.4 to 122.4
- MPs 122.7 to 122.8

In these areas, after stumps have been removed Atlantic will segregate the top six inches of soil.

In areas where topsoil segregation is conducted, subsoil from trench excavations will be placed adjacent to the topsoil in a separate pile to allow for proper restoration of the soil during backfilling and restoration. Gaps will be left between the topsoil and subsoil piles to prevent stormwater runoff from backing up or flooding. Mixing of topsoil and subsoil piles will be prevented by separating them physically or with a mulch or silt fence barrier, where necessary and dictated by site conditions, to accommodate reduced workspace. Topsoil piles will be stabilized to minimize erosion loss, using sediment barriers, mulch, temporary seeding, or functional equivalents.

In areas where topsoil segregation is not performed, during the clean-up and restoration phase Atlantic will apply soil conditioning amendments such as ProGanics or other similar biotic soil media, at two times the minimum application rate, and will install a hydraulically-applied growth media system such as flexterra or a similar product.

Atlantic will also do the following:

- Maintain separation of salvaged topsoil and subsoil throughout all construction activities.
- Leave gaps in the topsoil piles and spoil piles for the installation of temporary slope breakers to allow water to be diverted off the construction right-of-way.
- Topsoil will not be used for constructing sediment barriers of any kind. In addition, topsoil will never be used for padding the pipe, improving or maintaining roads, or as fill material.
- Stabilize topsoil piles and minimize loss due to wind and water erosion with use of sediment barriers, mulch, temporary seeding, or functional equivalents.
- Topsoil operations (stripping and replacement) will not be performed when the soil is excessively wet or frozen.
- All perimeter dikes, berms, sediment basins, and other sediment controls will be in place prior to stripping. These practices must be maintained during topsoiling.
- Side slopes of the stockpile will not exceed 2:1.
- Perimeter controls must be placed around the stockpile immediately.
- Prior to dumping and spreading topsoil, decompaction of subsoil will be performed in any areas requiring such treatment.
- Topsoil will be uniformly distributed over the trenchline from which it was stripped. On steep slopes areas compaction will be avoided to allow for infiltration and soil permeability, which will enhance revegetation and slope stabilization.
- Topsoil containing NNIS will be left undisturbed to the degree possible. Cleared vegetation and segregated topsoil from areas of invasive plant infestations will be maintained adjacent to the areas from which they were removed to eliminate the transport of soil-borne propagules to other areas along the right-of-way. The stockpiles will be identified as invasive plant species stockpiles with signs. During reclamation, the materials will be returned to the areas from which they were obtained.

9.5.13.1 West Virginia Requirements

Refer to West Virginia BMP's Handbook for detailed information for the following requirements which are applicable to West Virginia and more stringent than FERC or the FS requirements:

- Seeding of stockpiles will be completed within 7 days of the formation of the stockpile if it is to remain dormant for longer than 21 days in accordance with West Virginia Std & spec 3.10 (Temporary Seeding). Stabilization of stockpiles with a temporary cover (i.e. mulch) in accordance with West Virginia Std & spec 3.12 (Mulching) is also acceptable.
- In areas which are not going to be mowed, the surface will be left rough by not fine grading in accordance with West Virginia Std &Spec 3.08 (Surface Roughening).

9.5.13.2 Virginia Requirements

Refer to Virginia E&S Handbook for detailed information for the following requirements which are applicable to Virginia and more stringent than FERC or the FS requirements:

- Per VESCH Std & Spec 3.31 (Temporary Seeding) and Virginia Minimum Standard #1 and #2, seeding seeding of stockpile will be completed within 7 days of the formation of the stockpile if it is to remain dormant for longer than 14 days in accordance with Virginia Std & Spec 3.31 (Temporary Seeding) and Minimum Standard #1 and #2. Stabilization of stockpiles with a temporary cover (i.e. mulch) in accordance with Virginia Std & Spec 3.35 (Mulching) is also acceptable.

- If during routine inspections it is observed that temporary seed is not successfully establishing on temporary stockpiles within 14 days, the appropriate soil amendments (lime and fertilizer) will be considered, and if needed will be incorporated in accordance with ESC Technical Bulletin #4. Temporary and permanent stabilization will be applied strictly in accordance with MS-1.

- In areas which are not going to be mowed, the surface will be left rough by not fine grading in accordance with Virginia Std &Spec 3.29 (Surface Roughening).

9.5.14 Tree Stump Removal and Disposal

- Stumps in the area over the ditchline will be removed. Stumps within the rest of the construction right-of-way will be flush cut or ground below the surface in accordance with Atlantic construction specifications to allow the safe passage of equipment, as determined by the Construction Site Supervisor or EI.

- Stumps will be disposed of by one of the following methods with the approval of the FS:

  - Burned on construction right-of-way, if permitted;

  - Chipped, spread across the construction right-of-way in upland areas, and plowed in;

  - Used as erosion control or OHV blocking material;

  - Hauled off-site for disposal at an appropriately-licensed disposal facility.

- Timber that can be salvaged for restoration will be flagged, quantified, labeled, and placed along the edge of the construction right-of-way or at the nearest staging area.

9.5.15 Rock Management

Rock, including blast rock, will be disposed of in one of the following ways:

- Rock excavated from the trench may be used to backfill the trench only to the top of the existing bedrock profile. (Rock that is not returned to the trench will be considered construction material or waste, unless approved for use as mulch or for some other use on the construction work areas by the FS);

- Windrowed on the edge of the right-of-way per AO approval;
- Used to create wildlife habitat as directed by the AO;
- Burying of large rock within the construction right-of-way;
- Removed and disposed of at an authorized disposal site;
- Used as rip-rap for streambank stabilization if permitted by FS and other regulatory agencies such as the USACE, and provided the rock is uncontaminated and free of soil and other debris. Rip-rap is proposed to be utilized at one stream crossing location, an unnamed perennial tributary to Townsends Draft located at approximately MP 85.0 on the GWNF. A site-specific drawing of the slope stabilization design at this location is provided in Attachment C-3.

9.5.15.1 Virginia Requirements:

- Per VESCH Std. & Spec. 3.19 (Riprap), stone for riprap will consist of field stone or rough unhewn quarry stone of approximately rectangular shape. The stone will be hard and angular and of such quality that it will not disintegrate on exposure to water or weathering and it will be suitable in all respects for the purpose intended. The specific gravity of the individual stones will be at least 2.5. Rubble concrete may be used provided it has a density of at least 150 lbs. per cubic foot, and otherwise meets the requirement of the VESCH standard and specification.

9.5.16 Temporary Slope Breakers

Temporary slope breakers, also called temporary right-of-way diversions and water bars, are temporary erosion control measures intended to reduce runoff velocity and divert water off the construction right-of-way. Temporary slope breakers may be constructed of materials such as compacted soil, silt fence, or sand bags. Segregated topsoil may not be used for constructing temporary slope breakers.

- Install temporary slope breakers on all disturbed areas as necessary following topsoil removal and grading operations to avoid excessive erosion. Unless otherwise specified by permit conditions, temporary slope breakers must be installed on slopes at the recommended spacing interval indicated below.
- The temporary diversion will be constructed across the disturbed portion of the right-of-way;
- Positive grade with less than two percent slope will be provided to a stabilized outlet; steeper grading may be utilized as necessary to promote positive drainage.
- Direct the outfall of each slope breaker to a stable, well vegetated area or construct an energy-dissipating device (staked weed-free straw bales [Virginia only], biodegradable erosion control fabric, compost filter sock) at the end of the slope breaker.
- Position the outfall of each temporary slope breaker to prevent sediment discharge into wetlands, waterbodies, or other sensitive resource areas.

- Each diversion will exit onto stabilized ground. It will never exit onto the right-of-way where it can run down to the next diversion. These stabilized areas will be reinforced if necessary, and routinely inspected and maintained to prevent erosion off the right-of-way.

- Install temporary slope breakers on slopes greater than 5 percent where the base of the slope is less than 50 feet from waterbody, wetland, and road crossings.

- Minimum allowable height of the diversion is 18 inches, installed by machine or hand-compacted in 8-inch lifts.

- Side slopes will be 2:1 or flatter to allow the passage of construction traffic, along with a minimum base width of 6 feet.

- Inspect temporary slope breakers daily in areas of active construction to insure proper functioning and maintenance. In other areas, the slope breakers will be inspected and maintained on a weekly basis throughout construction, and following every rainfall.

- Slope breakers which will not be subject to construction traffic will be stabilized with temporary seeding.

9.5.16.1 West Virginia Requirements

Refer to West Virginia BMP Manual for detailed specifics on the following requirements.

- Closer spacing may be used if determined necessary by the EI. The WV BMP Manual spacing requirements are recommended since they are more stringent than FERC Plan requirements (see Table 9.5.16-1):

TABLE 9.5.16-1

Recommended Spacing and Materials for Permanent Slope Breakers [a]
(WV BMP Manual Std & spec 3.18)

Trench Slope	Distance (feet)
Less than 5%	300
10%	175
15%	125
20%	100
Greater than 25%	75

[a] Slope breaker spacing in areas of steep terrain may be decreased as a result of the steep slopes BIC Program described in Section 8.1. Accordingly, this table may be revised to reflect more stringent spacing requirements.

9.5.16.2 Virginia Requirements

Refer to Virginia E&S Handbook for detailed information for the following requirements:

- Closer spacing may be used if determined necessary by the EI. The VESCH spacing requirements are recommended since they are more stringent than FERC Plan requirements (see Table 9.5.16-2):

TABLE 9.5.16-2

Recommended Spacing and Materials for Temporary Slope Breakers [a]
(VESCH Std & Spec 3.11)

Trench Slope	Distance (feet)
Less than 7%	100
7–25%	75
25–40%	50
Over 40%	25

[a] Slope breaker spacing in areas of steep terrain may be decreased as a result of the steep slopes BIC Program described in Section 8.1. Accordingly, this table may be revised to reflect more stringent spacing requirements.

9.5.17 Timber Mat Stabilization

Atlantic utilizes construction timber mats to provide access through areas such as wetlands and waterbodies, some agricultural fields, and other areas as determined by the Construction Supervisor. This practice reduces soil compaction and provides a stable travel lane for contractors along the Project right-of-way, thus minimizing land disturbance. This practice may be incorporated in addition to the WV BMP and VESCH practices and requirements.

The use of construction timber mats generally does not constitute soil disturbance or a change in hydrology. Therefore, the installation of timber mat access roads and work pads is not considered a regulated land-disturbing activity and these areas are generally not included in land disturbance area calculations.

9.5.18 Temporary Stabilization

9.5.18.1 West Virginia Requirements

When acceptable final grade cannot be achieved (e.g. during winter or early spring construction), when permanent seeding cannot be applied due to adverse soil and weather conditions, or any time an area will remain idle for more than 21 days, temporary stabilization (temporary seed, mulch, additional sediment barriers as directed by the EI) must be applied within seven (7) days to that area. Erosion and sedimentation control measures will be monitored and maintained until conditions improve and final restoration can be completed.

9.5.18.2 Virginia Requirements

When acceptable final grade cannot be achieved (e.g. during winter or early spring construction), when permanent seeding cannot be applied due to adverse soil and weather conditions, or any time an area will remain idle for more than 14 days, temporary stabilization (temporary seed, mulch, additional sediment barriers as directed by the EI) must be applied within seven (7) days to that area. Erosion and sedimentation control measures will be monitored and maintained until conditions improve and final restoration can be completed.

9.5.18.3 Trenching

The trench centerline will be staked after the construction right-of-way has been prepared. In general, a trench will be excavated to a depth that will permit burial of the pipe with a minimum of 3 feet of cover.

The following procedures will be standard practice during ditching:

- Flag drainage tiles damaged during ditching activities for repair;

- Place spoil in additional extra work areas or at least 10 feet away from the waterbody's edge in the construction right-of-way, in a manner compliant with state timing restrictions and as appropriate for specific site conditions. Spoil will be contained with erosion and sediment control devices to prevent spoil materials or sediment-laden water from transferring into waterbodies and wetlands or off of the right-of-way;

- If temporary erosion or sediment controls are damaged or removed during trenching, they will be repaired and/or replaced before the end of the work day;

- Excavated material will be placed on the uphill side of trenches.

9.5.18.4 Trench Breakers

Permanent sacks of sand, polyurethane foam, bentonite clay, or possibly cement bags (in areas of steep terrain) installed around the pipe will remain in the trench to prevent subsurface channeling of water along the trench. Topsoil will not be used in trench breakers. Trench breakers are not employed in trenchless pipeline construction such as HDD or for non-linear facilities (e.g. compressor stations, metering and regulating stations).

Where foam trench breakers are employed, the following considerations will be incorporated to ensure their functionality over the life of the project:

- Drainage devices will be installed with each foam breaker to facilitate groundwater movement down the trenchline. These devices may include the placement of sandbags one to two layers deep across the bottom of the trench prior to foam installation, and/or pvc drain pipes screened with filter fabric extending to either side of the foam breaker. Typical trench breaker drainage configurations are shown in Attachment C-2.

- Foam breakers will be keyed into the trench side walls to provide added stability, counteracting any temporary differential loading on the upslope side of the breaker.

- During installation, geotextile fabric will be wrapped around the pipe prior to foam application, which prevents the foam from adhering to the pipe and ensures any movement of the trench breaker will not transfer stress to the pipe.

- Although trench breaker drains are designed to minimize concentration of water at the surface, for each foam trench breaker a surface slope breaker will be installed immediately downslope of the trench breaker position, to ensure that any surface water accumulation is directed off the right-of-way.

Trench breakers will be installed at the same spacing as and upslope of permanent slope breakers unless determined otherwise by the certifying Professional Engineer. Placement of trench breakers is shown on the Construction Alignment Sheets (Attachment B).

Permanent trench breakers will be installed at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a waterbody or wetland and where needed to avoid draining a waterbody or wetland.

Trench breakers must be installed at wetland boundaries or the trench bottom must be sealed, as specified in the Procedures. Trench breakers will not be installed within a wetland.

Any foam trench breakers that are installed will include drainage devices to allow seepage and/or shallow sub-surface water to move slowly through the trench backfill and down the trenchline, and to mitigate the potential that seepage water will be retained behind any individual breaker. Section 2.1.4.7 provides additional details on foam trench breaker design.

9.5.18.5 Trench & Site Dewatering

Dewatering may be periodically conducted to remove accumulated groundwater or precipitation from the construction right-of-way, including from within the trenchline. The need for erosion controls as well as the type of control used will vary depending on the type and amount of sediment within the water, and volume and rate of discharge. The Karst Plan (Attachment H) outlines the requirements of site dewatering within karst areas. Karst features will not be utilized for the disposal of water.

9.5.18.6 Dewatering Filter Bag

No discharge of hydrostatic test water is planned on NFS lands. However, trench dewatering on NFS lands may be necessary at locations along the pipeline, for example, if a high water table is encountered. Atlantic utilizes filter bags for dewatering and velocity reduction on a majority of pipeline construction projects in accordance with the dewatering practices illustrated in the WV BMP Manual (Std. & Spec. 3.22 Dewatering) and VESCH (Std. & Spec. 3.26 Dewatering Structure). Design criteria and specifications vary by dewatering bag manufacturer. A variety of filtering dewatering bag products are available on the market. All manufacturers' guidance on the use, design, sizing, maintenance and application of the geotextile dewatering bag will be followed.

- Dewatering (on or off the construction right-of-way) will be conducted in a manner that does not cause erosion and does not result in heavily silt-laden water flowing into any waterbody, wetland, or off-site property.

- Hose intakes will be elevated and screened to minimize pumping of deposited sediments.

- Dewatering structures will be removed as soon as practicable after the completion of dewatering activities. If sediment build-up prevents the bag from functioning properly, or the bag becomes half full of sediment, the bag will be discarded and replaced.

9.5.18.7 Virginia Requirements

Refer to Virginia E&S Handbook for detailed information for the following requirements:

- If discharging to a well-vegetated area, then per VESCH Std. & Spec 3.26, a minimum filtering length of 75 feet must be available in order for such a method to be feasible. A de-watering bag may not be needed if there is a well-stabilized, vegetated area on-site to which water can be discharged. The area must be stabilized so that it can filter sediment and at the same time withstand the velocity of the discharged water without eroding.

- As warranted by site conditions, a standard dewatering structure may be used per the construction and maintenance specifications in VESCH Std. & Spec 3.26 (Dewatering Structure), including the use of a portable sediment tank, filter box, or straw bale/silt fence pit. The dewatering structure must be sized (and operated) to allow pumped water to flow through the filtering device without overtopping the structure. The filtering devices must be inspected frequently and repaired or replaced once the sediment build-up prevents the structure from functioning as designed. The accumulated sediment removed from a dewatering device must be spread on-site and stabilized or disposed of at an approved disposal site.

9.5.18.8 Pipe Installation

During all phases of the pipe installation process, all roadway crossings and access points will be safe and accessible. Damaged temporary erosion controls will be repaired by the end of the work day. If portions of slope breakers are removed from the travel lane to facilitate safe work conditions, they will be restored prior to the end of the work day. Pipe installation will commence according to Atlantic construction and implementation plans and generally consists of stages such as stringing and bending, welding, and lowering-in and tie-ins.

9.5.18.9 Backfilling

Backfilling consists of covering the pipe with the earth removed from the trench or with other fill material hauled to the site when the existing trench spoil is not adequate for backfill. Backfilling will follow lowering-in of the pipeline as close as is practical.

In areas where the trench bottom is irregularly shaped due to consolidated rock or where the excavated spoil materials are unacceptable for backfilling around the pipe, padding material may be required to prevent damage to the pipe. This padding material will generally consist of sand, crushed limestone, or screened spoil materials from trench excavation. Material used for backfilling trenches will be properly compacted in order to minimize erosion and promote stabilization.

9.5.18.10 Hydrostatic Testing

While hydrostatic testing will occur on all pipeline sections of the Project, including those of NFS lands, there will be no hydrostatic test water appropriations or test water discharges on NFS lands.

9.5.18.11 Restoration and Final Cleanup

Restoration of the right-of-way will begin after pipeline construction activities have been completed. Restoration measures include the re-establishment of final grades and drainage patterns as well as the installation of permanent erosion and sediment control devices to minimize post-construction erosion. Property will be restored as close to its preconstruction condition as practical unless otherwise specified by the FS. All temporary erosion and sedimentation control measures will be removed within 30 days after final site stabilization or after the temporary measures are no longer needed. Trapped sediment will be removed or stabilized onsite. Disturbed soil resulting from removal of the BMPs or vegetation will be permanently stabilized. Per Virginia Minimum Standard 3, permanent stabilization is achieved when vegetation is established that is uniform, mature enough to survive, and will inhibit erosion.

- ACP will make every reasonable effort to complete final cleanup of an area (including final grading, topsoil replacement and installation of permanent erosion control structures) within 20 days after backfilling the trench in that area (within 10 days in residential areas). If seasonal or other weather conditions prevent compliance with these timeframes, continue to inspect and maintain temporary erosion and sediment controls (i.e. temporary slope breakers, sediment barriers, and mulch) until conditions allow completion of cleanup. Temporary soil stabilization (temporary seed, mulch, additional sediment barriers as directed by the EI) will be applied within 7 days to denuded areas that may not be at final grade but will remain dormant for longer than 14 days.

- As soon as slopes, channels, ditches, and other disturbed areas reach final grade, they will be stabilized. The disturbed right-of-way will be seeded as soon as possible and within no more than 7 days of final grading, weather and soil conditions permitting.

- The right-of-way will be graded to pre-construction contours, with the exception of the installation of any permanent measures required herein.

- Grading practices such as stair-stepping or grooving slopes or leaving slopes in a roughened condition by not fine-grading will be used on all slopes steeper than 3:1 in accordance with West Virginia Standard & Specification 3.08 (Surface roughening) and Virginia Standard and Specification 3.29 (Surface roughening) on all slopes steeper than 3:1 or that have received final grading but will not be stabilized immediately.

- Segregated topsoil will be spread back across the graded portion of the right-of-way to its original profile.

- The size, density, and distribution of rock on the construction right-of-way will be similar to adjacent areas not disturbed by construction, or as approved by the AO.

- A travel lane may be left open temporarily to allow access by construction traffic if the temporary erosion and sediment control structures are installed, regularly inspected and maintained. When access is no longer required, the travel lane will be removed and the right-of-way restored.

- All construction debris (used filter bags, skids, trash, etc.) will be removed from all construction work areas unless the FS approves leaving material onsite for beneficial reuse, stabilization, or habitat restoration. The right-of-way will be graded and left in the proper condition for planting.

- For construction activities occurring in winter, conditions such as frozen soils or snow cover could delay successful soil compaction mitigation or seeding activities. In these conditions, Atlantic will follow its Winter Construction Plan (Attachment D) and resume clean-up and restoration efforts the following spring. Atlantic will monitor and maintain temporary erosion controls (e.g., temporary slope breakers, sediment barriers, or mulch) until conditions allow for completion of cleanup and installation of permanent erosion control structures.

- NNIS measures will be implemented, as described in Section 12.

9.5.18.12 West Virginia Requirements

Refer to West Virginia BMP Manual for detailed information for the following requirements:

- Final site stabilization means that all soil-disturbing activities are completed, and that either a permanent vegetative cover with a density of 70 percent or greater has been established or that the surface has been stabilized by hard cover such as pavement or buildings. It should be noted that the 70 percent requirement refers to the total area vegetated and not just a percent of the site.

9.5.18.13 Virginia Requirements

Refer to Virginia E&S Handbook for detailed information for the following requirement.

- Permanent vegetation will not be considered established until a ground cover is achieved that is uniform, mature enough to survive and will inhibit erosion.

9.5.18.14 Permanent Slope Breakers

Permanent slope breakers will be installed during final grading, where required, to slow runoff velocity and direct water off the right-of-way and prevent sediment deposition into sensitive resources. Permanent slope breakers may be constructed of materials such as soil, stone, or some functional equivalent.

- Construct and maintain permanent slope breakers as shown on erosion control drawings.

- Spacing for permanent slope breakers will be as described in Table 9.5.18-1:

TABLE 9.5.18-1

Recommended Spacing for Permanent Slope Breakers (FERC V.B.2)

Trench Slope	Distance (feet)
5-15	300
>15-30	200
>30	100

NOTE: Slope breaker spacing in areas of steep terrain may be decreased as a result of the steep slopes BIC Program described in Section 8.0 Accordingly, this table may be revised to reflect more stringent spacing requirements.

- Permanent slope breakers will be constructed with a minimum of a two to eight percent outslope to divert surface flow to a stable vegetative area without causing water to pool or erode behind the slope breaker; steeper grading may be utilized as necessary to promote positive drainage. In the absence of a stable vegetative area, energy-dissipating devices will be installed at the end of the breaker.

- Per the FERC Plan, slope breakers may extend slightly (about 4 feet) beyond the edge of the construction right-of-way to effectively drain water off the disturbed area. Where permanent breakers extend beyond the edge of the construction right-of-way, they are subject to compliance with all applicable survey and permit requirements. Analysis has been performed to confirm that the flow leaving the permanent waterbars is sheet flow and therefore can be discharged to a well-vegetated area.

- Where drainage is insufficient in upland areas, a rock-lined drainage swale may be installed, as approved by the EI. The drainage swale is generally 8 feet wide and a maximum of 18-24 inches deep.

9.5.18.15 Soil Stabilization Mulching and Binders

Soil stabilization mulching and binders are addressed in Section 11.3.1.10 of the COM Plan. Seeding is addressed in Section 11.3.1.11 of the COM Plan.

9.5.18.16 Soil Compaction

Soil compaction is addressed in Section 11.3.1.3 of the COM Plan.

9.5.18.17 Revegetation

Revegetation is addressed in Section 11.3.1 of the COM Plan.

9.5.19 Vegetative Streambank Stabilization

Streambanks are always vulnerable to new damage and repairs are periodically required. During construction, banks will be checked after every high-water event. Gaps in the vegetative cover will be fixed at once, and mulched if necessary. Fresh cuttings from other plants on the bank may be used to fill gaps, or they may be taken from mother-stock plantings if available.

9.5.19.1 Virginia Requirement:

Vegetative streambank stabilization will be used to protect streambanks from the erosive forces of flowing waters. Vegetative streambank stabilization will be implemented along banks in creeks, streams and rivers subject to erosion from excess runoff. This practice is generally applicable where bankfull flow velocity does not exceed five feet per second, and soils are erosion resistant. Above 5 feet per second, structural measures are generally required. In accordance with VESCH Std. & Spec 3.22 (Vegetative Streambank Stabilization), Atlantic will adhere to the following design criteria:

- Ensure that channel bottoms are stable before stabilizing channel banks.
- Keep velocities at bankfull flow non-erosive for the site conditions.
- Provide mechanical protection such as rip-rap, or additional materials required by the FS such as logs, root wads, or boulders, on the outside of channel bends if bankful stream velocities approach the maximum allowable for site conditions.
- Be sure that requirements of other Commonwealth or federal agencies are met in the design in the case that other approvals or permits are necessary.

9.5.20 Structural Streambank Stabilization

Structural streambank stabilization is applicable to streambank sections which are subject to excessive erosion due to increased flows or disturbance during construction. This practice is generally applicable where flow velocities exceed 5 ft. /sec. or where vegetative streambank protection is inappropriate. Although structural streambank stabilization is not anticipated to be necessary to stabilize streambanks; in the event that it is deemed appropriate, Atlantic will consult with the FS and seek the AO’s approval and other permits as necessary.

9.5.20.1 Virginia Requirement:

In accordance with VESCH Std. & Spec 3.23 (Structural Streambank Stabilization), Atlantic will adhere to the following general construction and maintenance specifications, where appropriate:

Streambank Protection Measures:

- Riprap - heavy angular stone placed or dumped onto the streambank to provide armor protection against erosion. Installation should be in accordance with Std. & Spec. 3.19 (Riprap)

- Gabions - Rectangular, rock-filled wire baskets are pervious, semi-flexible building blocks which can be used to armor the bed and/or banks of channels or to divert flow away from eroding channel sections. At a minimum, they should be constructed of a hexagonal triple twist mesh of heavily galvanized steel wire. The design water velocity for channels utilizing gabions should not exceed that given below in Table 9.5.20-1:

TABLE 9.5.20-1

Recommended Gabion Thickness

Gabion Thickness (feet)	Maximum Velocity (feet per second)
1/2	6
3/4	11
1	14

- Deflectors (groins or jetties) - Structural barriers which project into the stream to divert flow away from eroding streambank sections.

- Reinforced Concrete - may be used to armor eroding sections of the streambank by constructing retaining walls or bulk heads. Positive drainage behind these structures must be provided.

- Log Cribbing - a retaining structure built of logs to protect streambanks from erosion. Log cribbing is normally built on the outside of stream bends to protect the streambank from the impinging flow of the stream.

- Grid Pavers - modular concrete units with interspersed void areas which can be used to armor the streambank while maintaining porosity and allowing the establishment of vegetation. These structures may be obtained in pre-cast blocks or mats, or they may be formed and poured in place.

All structures should be maintained in an "as built" condition. Structural damage caused by storm events should be repaired as soon as possible to prevent further damage to the structure or erosion of the streambank.

9.6 ACCESS ROAD CONSTRUCTION

Atlantic has identified roads which will be used to provide access to the proposed ACP pipeline right-of-way and other facilities during construction and operation of the Project. Atlantic will primarily utilize existing roads. Section 2.1.1.4 provides information regarding new access roads proposed to be constructed on NFS lands.

The following conditions apply to the use of all access roads:

- Access road upgrades requiring grading of earth, cleaning of roadside channels, widening or similar earth disturbance will have appropriate erosion and sediment controls installed. Existing access roads requiring only the resurfacing with gravel are not required to be included within the limits of disturbance.
- Construction entrances will have stone access entrance and exit drives and parking areas to reduce the tracking of sediment onto public or private roads.
- During construction and restoration activities, access to the right-of-way is limited to the use of new or existing access roads identified on the construction drawings.
- The only access roads that can be used in wetlands, other than the construction right-of-way, are those existing roads requiring no modification or improvements, other than routine repair, and posing no impact on the wetland.
- The construction right-of-way may be used for access across wetlands when the wetland soil is firm enough to avoid rutting or the construction right-of-way has been appropriately stabilized to avoid rutting (e.g., timber matting). However, access is not allowed through wetlands that would not otherwise be impacted by the Project.
- In wetlands that cannot be appropriately stabilized, all construction equipment other than that needed to install the wetland crossing will use access roads located in upland areas. Where access roads in upland areas do not provide reasonable access, all other construction equipment will be limited to one pass through the wetland using the construction right-of-way.
- Safe and accessible conditions will be maintained at all road crossings and access points during construction and restoration. Access road maintenance through the construction sequence may include grading and the addition of gravel or stone when necessary.
- Access roads will be maintained in a stable manner to prevent off- right-of-way impacts, including impacts to adjacent and/or nearby sensitive resource areas, and all appropriate erosion and sediment control measures will be implemented for construction/ improvement of access roads.
- Use of tracked equipment on public roadways will be limited and in accordance with requirements of the managing agency.
- Soil or gravel spilled or tracked onto roadways will be removed daily or more frequently as necessary to maintain safe road conditions.
- Damages to roadway surfaces, shoulders, and bar ditches will be repaired.
- For access through a saturated wetland, timber mats or an equivalent will be used, unless otherwise authorized by agency permits.
- Construction equipment operating in wetland will be limited to areas needed to clear the right-of-way, dig the trench, fabricate and install the pipeline, backfill the trench, and

restore the construction right-of-way. All other construction equipment will use access roads located in upland areas to the maximum extent practical.

- In some cases, existing roads will require improvement (such as grading, gravelling, replacing or installing culverts, minor widening, and/or clearing of overhead vegetation) to safely accommodate construction equipment and vehicles.

- Traffic will be restricted on access roads during unfavorable conditions, such as saturated soil. Gravel, wooden mats or a combination of geotextile and gravel may be used to help facilitate operations during wet periods.

- Roads will be surfaced with gravel or another suitable material to provide a non-erodible running surface.

- Cut-banks and fill-slopes will be stabilized as soon as feasible to a non-erodible condition using vegetation, rock, geotextile material or other suitable material.

- Silt fence or rip rap outlet protection will be constructed at outlets of drainage structures.

- Fill material will not be side-cast if there is a chance that it will enter a stream, or if side slope exceeds 60 percent. Full bench construction with end hauling material to a suitable location is recommended when side slopes exceed 60 percent.

- When access roads intersect public highways, the contractor will use a combination of geotextile and gravel (temporary stone construction entrance) to help keep mud off highway entrances.

- Roads will be maintained so that water can flow freely from the road surface.

- Sediment Barriers will be provided on the downgradient side of the access roads where there is a waterbody within 200 feet of the LOD.

9.6.1.1 Virginia Requirements:

In accordance with VESCH Std. & Spec. 3.02 (Stone Construction Entrance,

- a construction entrance will be constructed at any point where construction equipment leaves the right-of-way and enters a paved public road or other paved surface.

In accordance with VESCH Std. & Spec 3.03 (Road Stabilization),

- Temporary access roads should be at least 14 feet wide for one-way traffic and 20 feet wide for two-way traffic.

- All cuts and fills will be 2:1 or flatter to the extent possible. A 6-inch course of VDOT #1 Course Aggregate will be applied immediately after grading.

- Temporary access roads will follow the contour as much as possible with grades between 2-10 percent. Steep gradients that exceed these grades may be necessary when boundary lines or buffer areas require such a deviation. In these instances of steep terrain, additional BMPs will be necessary to mitigate the disturbance. Road grades will vary frequently to help reduce road surface erosion.

- In accordance with VESCH Std. & Spec 3.20 (Rock Check Dam), Atlantic will adhere to the following construction and maintenance specifications:
- Use VDOT #1 coarse aggregate alone when the drainage area of the ditch or swale is less than 2 acres. Use a combination of Class I riprap and VDOT #1 coarse aggregate when the drainage area is between 2 and 10 acres.
- Maximum height of the check dam will be 3 feet.
- The center of the check dam must be at least 6 inches lower than the outer edges to create a weir effect.
- Key the check dam into the soil approximately 6 inches for added stability
- Filter cloth may be used under the stone to provide a stable foundation and to facilitate the removal of the stone.
- 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.
- Sediment should be removed from behind the check dams when it has accumulated ½ of the original height of the dam. Erosion caused by high flows around the edges of the dam should be corrected immediately.
- Unless incorporated into a permanent stormwater management control, check dams are to be removed when their useful life has been completed. In temporary ditches and swales, check dams should be removed and the ditch filled in when they are no longer needed. In permanent ditches and swales, check dams should be removed when the grass has matured sufficiently to protect the ditch or swale. The area beneath the check dam should be seeded and mulched immediately after removal.
- Per VESCH Std & Spec 3.17 (Stormwater Conveyance Channel), Atlantic will apply the following general specifications to the construction and maintenance of roadside ditches:
- Trees, stumps, roots and obstructions will be removed and disposed properly;
- The channel will be excavated and graded to the proper grade and cross section;
- Fill will be well compacted;
- Excess soil will be removed and disposed of properly;
- The method used to establish grass in the ditch or channel will depend upon the severity of the conditions encountered. Methods available for grass establishment are set forth in VESCH Std & Spec 3.32 (Permanent Seeding);
- During the initial establishment, grass-lined channels should be repaired immediately and grass re-established if necessary. After grass has become established, the channel should

be checked periodically to determine if the grass is withstanding flow velocities without damage. If the channel is to be mowed, it should be done in a manner that will not damage the grass; and

- For riprap-lined channels: riprap will be installed in accordance with VESCH Std. & Spec. 3.19 (Riprap). Riprap-lined channels should be inspected periodically to ensure that scour is not occurring beneath the fabric underlining of the riprap layer. The channel should also be checked to determine that the stones are not dislodged by large flows.

9.7 SPECIAL CONSTRUCTION PROCEDURES

Sensitive areas (e.g. wetland/water body crossings or residential developments) or areas requiring specialized construction measures (e.g. boring or directional drilling) will be treated as separate construction entities. Sensitive areas require additional erosion and sediment control procedures. Specialized construction often combines several construction stages into one and reduces earth disturbance, reducing the amount of erosion and sediment control measures.

9.7.1 Winter Construction

A Winter Construction Plan is included as Attachment D.

The plan addresses:

- Winter construction procedures (e.g., snow handling and removal, access road construction and maintenance, soil handling under saturated or frozen conditions, topsoil stripping);

- Stabilization and monitoring procedures if ground conditions will delay restoration until the following spring (e.g., mulching and erosion controls, inspection and reporting, stormwater control during spring thaw conditions); and

- Final restoration procedures (e.g., subsidence and compaction repair, topsoil replacement, seeding).

9.7.2 Seeps

In the event that subsurface flow is encountered, an under drain will be utilized, as necessary, to divert water away from the right-of-way. If encountered, seeps can be mitigated by using seep collectors placed down-slope of areas showing seepage. Armored fill placed at the toe of the slope may be used in areas of steep slopes in addition to a perforated drain pipe to divert subsurface water away from the cut slope. These structures may be kept in place or re-installed after construction in a manner that avoids seepage concentrations from the right-of-way while minimizing overall changes to subsurface flow. On steep slopes these seeps, as identified during construction, would go through an incremental layer of field review, per the BIC Program, to determine if additional erosion controls would be required.

9.7.3 Road Crossings

Section 7.4 of the Traffic and Transportation Plan addresses road crossings on NFS lands.

9.8 INSPECTION FREQUENCY

Inspection of temporary erosion and sediment control measures with occur at least:

- On a daily basis in areas of active construction or equipment operation;
- On a twice-weekly basis in areas with no construction or equipment operation; and
- Within 24 hours of each stormwater event (runoff from precipitation, snowmelt, surface runoff and drainage, including rainfall events resulting in 0.5 inches or more).

9.8.1 Virginia Requirements

The Commonwealth of Virginia inspection frequency depends on whether the area of land disturbance discharges to exceptional waters or waters impaired for sediment, sediment-related parameter, or nutrients. Atlantic has elected to apply the most stringent inspection frequency to the entire ACP Project, regardless of location within an exceptional or impaired waterbody watershed. Therefore, SWPPP inspections will be conducted at a frequency of at least once every 4 business days.

Therefore, in accordance with Virginia Stormwater Management Act, the Virginia Erosion and Sediment Control Law and associated regulations, where applicable, the following will be implemented:

- Permanent or temporary soil stabilization will be applied to denuded areas within 7 days after final grade is reached on any portion of the site.

- Nutrients will be applied in accordance with manufacturer's recommendations or an approved nutrient management plan and will not be applied during rainfall events.

- Inspection requirements are as follows:

    - Inspections will be conducted at a frequency of at least once every four business days; and

    - Representative inspections used by linear construction projects will include all outfalls discharging to surface waters identified as impaired or for which a TMDL wasteload allocation has been established. Representative inspections occur once temporary or permanent soil stabilization has been installed and vehicle access may compromise the temporary or permanent soil stabilization and potentially cause additional land disturbance increasing the potential for erosion. Runoff from the temporary or permanently stabilized pipeline right-of-way will generally occur as sheet flow and will not be discharged through discrete outfalls. In the event that an outfall is present along the pipeline right-of-way, representative inspections will include those discrete outfalls. Proposed access roads will be covered under the general inspections requirements, due to accessibility to the roadway.

9.9 CORRECTIVE ACTION

DTI and/or their contractors will take corrective action to any of the inspected areas that have reported deficiencies to the control measures in place. Repairs will be made within 24 hours of identification, or as soon as conditions allow if compliance with this time frame would result in greater environmental impacts.

9.10 REPORTING

Section 3.8 of the COM Plan discusses general inspection reporting requirements. Additional reporting requirements specific to this Erosion and Sedimentation Control Plan are as follows:

- Atlantic will maintain records that identify by milepost:
  - method of application, application rate, and type of fertilizer, pH modifying agent, seed, and mulch used;
  - acreage treated;
  - dates of backfilling and seeding;
  - names of landowners requesting special seeding treatment and a description of the follow-up actions;
  - the location of any subsurface drainage repairs or improvements made during restoration; and
  - any problem areas and how they were addressed.
- Atlantic will submit quarterly reports to the FS documenting the results of follow-up inspections; any problem areas; and corrective actions taken for at least 2 years following construction.

9.11 POST-CONSTRUCTION ACTIVITIES AND MAINTANANCE

9.11.1 Monitoring Program

Atlantic and/or their contractors will follow numerous post-construction monitoring and maintenance requirements.

- Restoration success criteria are provided in Section 11.4.1.1 (Restoration and Rehabilitation Plan).
- Atlantic will conduct post-construction revegetation monitoring in accordance with Section 11 (Restoration and Rehabilitation Plan).
- Post-construction NNIS monitoring/treatment will be done in accordance with Section 12 (Non-Native Invasive Plant Species Management Plan).
- Revegetation efforts will continue until revegetation is successful, in accordance with Section 11.4.1 (Restoration and Rehabilitation Plan).
- Slopes that are found to be eroding excessively within one year of permanent stabilization will be provided with additional slope stabilizing measures until the problem is corrected.
- Monitor and record the success of wetland revegetation annually until wetland revegetation is successful, as described in Section 10.4.3.

9.11.2 Maintenance

- As part of routine maintenance of the pipeline system, DTI will occasionally trim woody vegetation and herbaceous vegetation over the pipe as necessary to maintain a visible corridor, centered on the pipeline, to allow for adequate aerial inspection.

- On steep slopes (>40 percent) depending on bank stability the clearing would be completed via motorized equipment and/or hand clearing. No herbicides will be utilized for normal vegetation maintenance. Clearing will occur between September 1 and April 1 on the MNF and between September 1 and March 15 on the GWNF.

- Atlantic will not use herbicides in or within 100 feet of a stream or wetland, except as allowed by the appropriate federal or state agency.

- Within three years after construction, Atlantic will file a report with the FS and FERC identifying the status of the wetland revegetation efforts and documenting success. For any wetland where revegetation is not successful at the end of three years after construction, Atlantic will develop and implement (in consultation with a professional wetland ecologist) a remedial revegetation plan to actively revegetate wetlands. Atlantic will continue revegetation efforts and file a report annually documenting progress in these wetlands until wetland revegetation is successful.

- Atlantic will make efforts to control all types of OHV use, as described in the Blocking Plan (Section 19).

9.12 STORMWATER MANAGEMENT

Where pre-development land cover conditions are changed significantly triggering post-construction stormwater quality and quantity requirements, post-construction BMPs may be required to comply with water quality and water quantity criteria and Virginia MS-19 of the Erosion and Sediment Control Regulations.

Successful management of post-construction runoff from the right-of-way will include the following non-structural BMPs: proper grading to minimize concentrated flow and restore pre-construction flow patterns; mitigation of soil compaction to improve infiltration and decrease runoff volume; and establishment of permanent vegetation. Annual maintenance and inspection programs for the right-of-way will be implemented to provide long-term vegetation management and runoff control. Through the implementation of these non-structural BMPs, post-construction runoff characteristics of the land surface after the completion of construction and final stabilization will be equivalent to pre-construction conditions. Additional details for each of the non-structural BMPs are presented in Section 9.12.2.

9.12.1 West Virginia and Virginia Requirements

The West Virginia Department of Environmental Protection and VDEQ recognize that construction of aboveground and underground linear utilities may not result in changes to the pre-development hydrologic characteristics of the land surface. The installation of the ACP pipeline is an example of such a Project where the areas disturbed will be returned to their pre-development condition, with the exception of a 10-foot strip centered over the pipeline through forested areas, which will be maintained in a herbaceous state for pipeline maintenance purposes.

Access roads surfaced with gravel and designated to remain post-construction represent impervious surface. To assess the potential for increases in nutrient loading, runoff volume and peak flow rate within Virginia a stormwater quality and quantity evaluation was completed and is included in the Virginia SWPPP prepared for ACP. The purpose of this evaluation is to demonstrate compliance with Virginia's water quality and quantity criteria as set forth in 9 VAC 25-870-63 and 9 VAC 25-870-66, respectively, and related VDEQ guidance.

Where pre-development land cover conditions are changed significantly, triggering post-construction stormwater quality and quantity requirements, post-construction BMPs may be required to comply with water quality and quantity criteria and Virginia Minimum Standard MS-19 of the Virginia Erosion and Sediment Control Regulations.

9.12.2 Non-Structural Stormwater BMPs

Restoration of the right-of-way will begin after pipeline construction activities have been completed. Restoration measures include the re-establishment of final grades and drainage patterns as well as the installation of permanent erosion and sediment control measures to minimize post-construction erosion and to control post-construction stormwater runoff. Grading will be conducted prior to construction where necessary to provide a reasonably level work surface. Upon completion of construction, Dominion will:

- restore the ground surface as closely as practicable to original contours to restore natural overland water flow patterns, aquifer recharge, and drainage patterns;
- re-contour disturbed areas in a fashion designed to stabilize slopes, remove ruts and scars, and support successful revegetation; and
- restore, to original or better condition, drainage ditches and culverts that are diverted or damaged during construction.

Additionally, in areas with slope inclinations equivalent to or greater than 30 percent and a slope length greater than 100 feet, restoration of steep terrain may include:

- grading to the natural conditions;
- installation of permanent erosion control devices (i.e., slope breakers) designed to reduce runoff velocity, divert water from the surface of the right-of-way, and encourage retention of soils;
- the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil; and
- the use of grading practices such as stair-stepping or grooving slopes or leaving slopes in a roughened condition by not fine-grading in accordance with VESCH **Std & Spec 3.29 (Surface Roughening)** on slopes with an inclination exceeding 3 horizontal to 1 vertical (3:1) or that have received final grading but will not be stabilized immediately.

In addition to these general measures, Dominion will develop and implement other additional site-specific measures, where warranted, to address land movement, surface erosion, backfill erosion, general soil stability when backfilling the trench, and restoring of the right-of-way in steep slope areas. Specifically, Dominion is committed to employing BIC measures to protect the environment in steep slope areas. BIC is defined as the most efficient and/or protective design or configuration with the least environmental impact while providing reliable construction and operations.

The following special design and construction mitigation measures will be implemented during construction in steep slope areas:

- targeted management and diversion of surface water around landslide sites, including the use of ditches, berms, slope breakers, and/or grading;
- mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;
- targeted management of water sources along the trench, including the use of trench breakers and/or added drainage piping in the trench;
- targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
- engineering of the backfill around or within steep slope areas to dry the backfill, facilitate compaction, improve backfill soil strength, and reduce saturation;
- installation of targeted structures to stabilize backfill using engineered fill, retaining walls, sack-crete placements, key trenches, and/or shear trenches; and
- reduction in surcharge on steep slope areas by reducing excess or saturated backfill.

9.12.2.1 Soil Compaction Mitigation

Soil compaction resulting from construction activities may reduce the potential for successful revegetation as well as decrease infiltration capability thereby increasing runoff potential. Fine-textured soils with poor internal drainage that are moist or saturated during construction are the most susceptible to compaction and rutting. Dominion will minimize impacts by implementing the mitigation measures for compaction and rutting as described in FERC’s Plan and summarized below.

If moisture levels are found to be unsuitable for replacement, topsoil or spoil material may be mechanically mixed, or FS-approved materials may be physically mixed in to allow evaporation to achieve allowable moisture levels. If compaction comparison measurements of adjacent soil and restored soil reveal discrepancies, Atlantic will either decompact or rework the soils to establish appropriate compaction. Compaction measurement results will be provided to the Forest Service staff on a weekly basis.

9.12.2.2 Revegetation

A Restoration and Rehabilitation Plan (Section 11.0) was prepared for the ACP to address post-construction restoration and rehabilitation activities. The Restoration and Rehabilitation Plan describes seedbed preparation, seed mix selection, seeding methods, lime and fertilizer application, mulching, and supplemental planting.

Virginia Requirements:

In accordance with Virginia Minimum Standards (MS-1), permanent or temporary soil stabilization will be applied to denuded areas within seven (7) days after final grade is reached on any portion of the site. Temporary soil stabilization will be applied within seven (7) days to denuded areas that may not be at final grade but will remain dormant for longer than 14 days. Permanent stabilization will be applied to areas that are to be left dormant for more than one (1) year. A permanent vegetative cover will be established on denuded areas not otherwise permanently stabilized. Per Virginia Minimum Standards (MS-3), permanent stabilization is achieved when vegetation is established that is uniform, mature enough to survive and will inhibit erosion.

Restoration Inspection and Reporting

The Restoration and Rehabilitation Plan (Section 11.4) addresses post-construction restoration inspection and reporting on NFS lands.

9.12.3 Permanent Slope Breakers

In addition to non-structural BMPs, Dominion will construct permanent slope breakers during the construction phase of the Project. The slope breakers, installed primarily as an erosion control measure, also provide incremental benefit to stormwater management in the near-term post-construction period.

Permanent slope breakers will be installed during final grading, except in cultivated areas and lawns (unless requested by the landowner), using spacing as shown on the construction alignment sheets. Spacing for permanent slope breakers will be consistent with the FERC Plan requirements and are outlined below:

TABLE 9.12.3-1

Recommended Spacing for Permanent Slope Breakers (FERC V.B.2)

Trench Slope	Distance (feet)
5-15	300
>15-30	200
>30	100

NOTE: Slope breaker spacing in areas of steep terrain may be decreased as a result of the steep slopes BIC Program. Accordingly, this table may be revised to reflect more stringent spacing requirements.

The use of permanent slope breakers will shorten the drainage path, reduce runoff velocity, and direct water off the right-of-way to a stable well-vegetated area as sheet flow. In the absence of a stable well-vegetated area, an energy dissipating device, such as riprap outlet protection, will be installed at the end of the slope breaker.

9.13 VARIANCE TO OPEN TRENCH LENGTH

The Virginia Erosion and Sediment Control Law Minimum Standard 16a requires that no more than 500 feet of trench remain open at one time. However, this requirement would significantly slow construction and increase the amount of time the work area remains disturbed. In accordance with 9 VAC 25-870-50, Atlantic will request that VDEQ approve open trench work greater than 500 feet where necessary to facilitate efficient and effective construction in compliance with Virginia Erosion and Sediment Control Law. Proposed maximum open trench lengths on the GWNF are shown in Table 9.13-1.

TABLE 9.13-1

Proposed Open Trench Lengths on the George Washington National Forest

Spread	**Length (feet)**
Spread 3A	1370
Spread 4	2423
Spread 4A	4699
Spread 5	4597

Any other variances to this plan or the State Minimum Standards must be approved prior to implementation. The EI will monitor any variance-related activities.

9.14 ADDITIONAL MITIGATION MEASURES FOR NFS LANDS

On NFS lands, additional measures will be implemented in conformance with the applicable standards and guidelines identified in the MNF and GWNF LRMPs. If a general mitigation measure as described above is more stringent than an applicable standard or guideline, the more stringent measure will be applied.

9.14.1 Monongahela National Forest

- Maintain, restore, or improve soil quality, productivity, and function. Manage soil disturbances from management activities such that they do not result in long-term loss of inherent soil quality and function. (**MNF LRMP SW01**).

- Disturbed soils dedicated to growing vegetation shall be rehabilitated by fertilizing, liming, seeding, mulching, or constructing structural measures as soon as possible, but generally within 2 weeks after Project completion, or prior to periods of inactivity, or as specified in contracts. Rip compacted sites when needed for vegetative re-establishment and recovery of soil productivity and hydrologic function. The intent is to minimize the time that soil is exposed on disturbed sites or retained in an impaired condition. (**MNF LRMP SW03**). Note: the MNF is considering a project-specific LRMP amendment to this standard.

- Erosion prevention and control measures shall be used in program and Project plans for activities that may reduce soil productivity or cause erosion. (**MNF LRMP SW04**).

- Severe rutting resulting from management activities shall be confined to less than 5 percent of an activity area. (**MNF LRMP SW06**). Note: the MNF is considering a project-specific LRMP amendment to this standard.

- Use of wheeled and/or tracked motorized equipment may be limited on soil types that include the following soil/site area conditions:

  - Steep Slopes (40 to 50 percent) – Operation on these slopes shall be analyzed on a case-by- case basis to determine the best method of operation while maintaining soil stability and productivity.

  - Very Steep Slopes (more than 50 percent) – Use is prohibited without recommendations from interdisciplinary team review and line officer approval.

  - Susceptible to Landslides – Use on slopes greater than 15 percent with soils susceptible to downslope movement when loaded, excavated, or wet is allowed only with mitigation measures during periods of freeze-thaw and for one to multiple days following significant rainfall events. If the risk of landslides during these periods cannot be mitigated, then use is prohibited.

- Soils Commonly Wet At Or Near The Surface During A Considerable Part Of The Year, Or Soils Highly Susceptible To Compaction. Equipment use shall normally be prohibited or mitigated when soils are saturated or when freeze-thaw cycles occur. (**MNF LRMP SW07**). Note: the MNF is considering a project-specific LRMP amendment to this standard,

  - Management actions that have the potential to contribute to soil nutrient depletion will be evaluated for the potential effects of depletion in relation to on-site acid deposition conditions. (**MNF LRMP SW08**).

- Inventory the soil resource to the appropriate intensity level as needed for Project planning and/or design considerations. (**MNF LRMP SW10**). Note: See Section 9.2.1.

- Soil stabilization procedures should take place as soon as practical after earth-disturbing activities are completed or prior to extended periods of inactivity. Special revegetation measures may be required. (**MNF LRMP SW11**).

- Use Forest-wide soils map(s) and county soil survey report interpretations to help determine soil characteristics and protection needs. (**MNF LRMP SW12**).

- Topsoil should be retained to improve the soil medium for plant growth on areas to be disturbed by construction. Topsoil should be salvaged from an area during construction and stockpiled for use during subsequent reclamation, or obtained from an alternate site. On some areas, soil material may have to be added to obtain vigorous plant growth. Soil to be used for this purpose should have chemical tests made to determine its desirability for use. (**SW15**).

- Where the removal of vegetative material, topsoil, or other materials may result in erosion, the size of the area may be limited from which these materials are removed at any one time. (**MNF LRMP SW16**).

- Management activities that may result in accelerated erosion and loss of organic matter should have one or more of the following practices applied to mitigate potential effects:

  - Limiting mineral soil exposure,

  - Appropriately dispersing excess water,

  - Ensuring sufficient effective groundcover,

  - Stabilizing disturbed soils through revegetation, mulching, or other appropriate means,

  - Preventing or minimizing excessive compaction, displacement, puddling, erosion, or burning of soils, and

  - Preventing or minimizing the initiation or acceleration of mass soil movement (e.g., slumps, debris flows, or landslides). (**MNF LRMP SW19**)

- Where new roads and skid roads cross stream channels, channel and bank stability shall be maintained. (**MNF LRMP SW35**).

- When stream crossing structures are removed, stream channels shall be restored to their near natural morphology (width, depth, and gradient associations for streambeds, streambanks, floodplains, and terraces). Disturbed soil shall be stabilized. (**MNF LRMP SW36**).

- New structures (culverts, bridges, etc.) shall be designed to accommodate storm flows expected to occur while the structures are in place. Use scientifically accepted methods for calculating expected storm flows. (**MNF LRMP SW46**).

- Ground disturbance should be avoided within seeps, vernal pools, bogs, fens, and other wetlands during Project implementation. These areas should be managed to protect wet soils and rare plants and provide wildlife watering sources using the following protection:

  - No new system roads or skid roads should be located within these areas except at essential crossings. Such crossings should be designed to minimize disturbance to the extent practical.

  - Logs should not be skidded through these areas. Keep slash and logs out of them.

- For protection of cold water fisheries, apply the following to the channel buffers of perennial trout streams (stocked and native) during the period of October 1 to June 1:

  - Potential sediment-producing ground disturbance exceeding two consecutive days shall only be initiated after consultation with a Forest fisheries biologist.

  - Sediment-producing ground disturbance during this period shall use additional erosion control measures and seeding or mulching, applied concurrently with the activity. (**MNF LRMP WF14**).

- Work with USDA, state, and private forestry and county extension agents to identify or develop sources for weed-free straw and mulch. (**MNF LRMP VE20**).

9.14.2 George Washington National Forest

- On all soils dedicated to growing vegetation, the organic layers, topsoil and root mat will be left in place over at least 85 percent of the activity area and revegetation is accomplished within 5 years. (The activity area is the area of potential soil disturbance expected to produce vegetation in the future, for example: timber harvest units, prescribed burn area, grazing allotment, etc.). **(GWNF LRMP FW-5)**. Note: the GWNF is considering a project-specific LRMP amendment to this standard,

- Locate and design management activities to avoid, minimize, or mitigate potential erosion. **(GWNF LRMP FW-6)**

- Use ditchlines and culverts when new permanent road construction grades are more than 6 percent and the road will be managed as open for public use. **(GWNF LRMP FW-7)**

- Water saturated in areas expected to produce biomass should not receive vehicle traffic or livestock trampling to prevent excess soil compaction. **(GWNF LRMP FW-8)** Note: the GWNF is considering a project-specific LRMP amendment to this standard.

- Where soils are disturbed by management activities, appropriate revegetation measures should be implemented. When outside the normal seeding seasons, initial treatments may be of a temporary nature, until permanent seeding can be applied. Revegetation should be accomplished within 5 years. For erosion control, annual plants should make up >50 percent of seed mix when seeding outside the normal seeding season and the area should be reseeded with perennials within 1½ years. **(GWNF LRMP FW-9)**

- Clearcutting is not allowed where high risk soils (as described in Chapter 3-Management Approach for Soils and in the Glossary) are identified. **(GWNF LRMP FW-12)**

- Motorized vehicles are restricted in the channeled ephemeral zone to designated crossings. Motorized vehicles may only be allowed on a case-by-case basis, after site-specific analysis, in the channeled ephemeral zone outside of designated crossings. **(GWNF LRMP FW-15)** Note: the GWNF is considering a project-specific LRMP amendment to this standard,

- Management activities expose no more than 10 percent mineral soil in the channeled ephemeral zone. **(GWNF LRMP FW-16)** Note: the GWNF is considering a project-specific LRMP amendment to this standard.

- Favor use of native grasses and wildflowers beneficial as wildlife foods when seeding temporary roads, skid roads, log landings and other temporary openings when slopes are less than 5 percent. On slopes greater than five percent, favor use of vegetation that best controls erosion. **(GWNF LRMP FW-93)**

- A contractor’s sources of fill, soil, shale, and related materials will be pre-approved. Contractors will submit a description of the source. The Project inspector or a qualified designee will inspect the supply source. Use of the source will be prohibited if contaminated by transferable agents of invasive species. **(GWNF LRMP FW-95)**

- The soils of riparian corridors have an organic layer (including litter, duff, and/or humus) of sufficient depth and composition to maintain the natural infiltration capacity, moisture regime, and productivity of the soil (recognizing that floods may periodically sweep some areas within the floodplain of soil and vegetation). **(GWNF LRMP DC 11-03)**

- Exposed mineral soil and soil compaction from human activity may be present but are dispersed and do not impair the productivity and fertility of the soil. Any human-caused disturbances or modifications that cause environmental degradation through concentrated runoff, soil erosion, or sediment transport to the channel or waterbody are promptly rehabilitated or mitigated to reduce or eliminate impacts. **(GWNF LRMP FW 11-04)**

- Management activities expose no more than 10 percent mineral soil within the Project area riparian corridor. **(GWNF LRMP FW 11-003).** Note: the GWNF is considering a project-specific LRMP amendment to this standard.

- To minimize the length of streamside disturbance, ensure that approach sections are aligned with the stream channel at as near a right angle as possible. Locate riparian corridor crossings to minimize the amount of fill material needed and minimize channel impacts. Generally, permanent structures or temporary bridges on permanent abutments are provided when developing new crossings on perennial streams. Permanent structures, temporary bridges or hardened fords are used when crossing intermittent streams. **(GWNF LRMP DC 11-050)**

- If culverts are removed, stream banks and channels must be restored to a natural size and shape. All disturbed soil must be stabilized. **(GWNF LRMP FW 11-054)**

- For activities not already covered in the above standards, ground disturbing activities are allowed within the corridor if the activity will cause more resource damage if it were located outside the corridor, on a case-by-case basis following site-specific analysis. Any activity allowed under these conditions is minimized and effective sediment trapping structures such as silt fences, brush barriers, straw bale barriers, gravelling, etc., are required. Sediment control, prior to, or simultaneous with, the ground disturbing activities, is provided. **(GWNF LRMP FW 11-058)**

10.0 STREAM AND WETLAND CROSSING PROCEDURES

10.1.1 PURPOSE

The intent of these Procedures is to identify measures to minimize the extent and duration of Project-related disturbance on wetlands and waterbodies in the MNF and GWNF. The Stream and Wetland Crossing Procedures are based on Project-wide wetland and waterbody measures developed by the FERC, modified to take into account standards and guidelines from both Forests' LRMPs. Tables 2.1.1-5 and 2.1.1-6 show waterbodies crossed on MNF and GWNF lands, respectively. Six wetlands are crossed by the by the construction right-of-way; one on the MNF and five on the GWNF. Wetlands are discussed in Section 10.4. If, prior to Project construction, Atlantic identifies individual measures in the FERC's standard wetland and waterbody procedures considered unnecessary, technically infeasible, or unsuitable due to local conditions, it may request variations to the FERC procedures (and to this COM Plan). Any such request will fully describe alternative measures, and explain how those alternative measures would achieve a comparable level of mitigation.

10.1.2 DEFINITIONS

- "Waterbody" includes any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes:
  - "minor waterbody" includes all waterbodies less than or equal to 10 feet wide at the water's edge at the time of crossing;
  - "intermediate waterbody" includes all waterbodies greater than 10 feet wide but less than or equal to 100 feet wide at the water's edge at the time of crossing; and
  - "major waterbody" includes all waterbodies greater than 100 feet wide at the water's edge at the time of crossing.
- "Wetland" includes areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

10.2 ENVIRONMENTAL IN SPECTORS

At least one EI having knowledge of the wetland and waterbody conditions in the Project area is required for each construction spread. The number and experience of EIs assigned to each construction spread will be appropriate for the length of the construction spread and the number/significance of resources affected. The responsibilities of the EI are outlined in Section 3.6.10 of the COM Plan.

10.3 WATERBODY CROSSINGS

10.3.1 NOTIFICATION PROCEDURES AND PERMITS

Atlantic will do the following:

- Apply to the USACE, or its delegated agency, for the appropriate jurisdictional wetland and waterbody crossing permits.

- Provide written notification to authorities responsible for potable surface water supply intakes located within 3 miles downstream of the crossing at least 1 week before beginning work in the waterbody, or as otherwise specified by that authority.

- Apply for state-issued waterbody crossing permits and obtain individual or generic section 401 water quality certification or waiver.

- Notify appropriate federal and state authorities, including the FS, at least 48 hours before beginning trenching or blasting within the waterbody, or as specified in applicable permits.

10.3.2 INSTALLATION

10.3.2.1 Time Window for Construction

Unless expressly permitted or further restricted by the FS and other appropriate federal or state agency in writing on a site-specific basis, instream work, except that required to install or remove equipment bridges, will occur during the time windows shown in Tables 2.1.1-5 and 2.1.1-6.

The MNF specifies that stream crossing construction on temporary and permanent roads should be completed as soon as practical, with mitigation as needed to minimize the potential for sedimentation **(MNF LRMP SW-62).** The GWNF specifies that construction of crossings is completed on all channeled ephemerals as soon as possible after work has started on the crossing. Permanent and temporary roads on either side of crossings within the channeled ephemeral zone are to be graveled **(GWNF LRMP SW-24).**

The Project will comply with **GWNF LRMP 11-048**, which stipulates that for any road construction within riparian corridors, in-stream use of heavy equipment or other in-stream disturbance activities is limited to the amount of time necessary for completion of the project, that construction of crossings is completed on all streams as soon as possible after work has started on the crossing, and that permanent and temporary roads on either side of stream crossings within the riparian corridor are graveled. The Project will comply with **GWNF LRMP 11-049**, which stipulates that when constructing roads within the riparian corridor, each road segment will be stabilized prior to starting another segment, and that stream crossings will be stabilized before road construction proceeds beyond the crossing.

10.3.2.2 Extra Work Areas

Atlantic will do the following:

- Except as authorized by the FS, ATWS will be located at least 100 feet from the water’s edge at each waterbody on NFS lands (on the GWNF, the buffer increases on slopes greater than 10 percent).

- Limit the size of extra work areas to the minimum needed to construct the waterbody crossing.

10.3.2.3 Crossing Procedures

Atlantic will do the following on all NFS lands:

- Comply with the USACE, or its delegated agency, permit terms and conditions.

- Construct crossings as close to perpendicular to the axis of the waterbody channel as engineering and routing conditions permit.

- Where pipelines parallel a waterbody, maintain buffers of undisturbed vegetation between the waterbody (and any adjacent wetland) and the construction right-of-way, except where maintaining this offset will result in greater environmental impact. On the MNF, minimum buffer widths are 100 feet for perennial streams, and large intermittent streams (i.e. >50 acre drainage areas), 50 feet for small intermittent streams (i.e. <50 acre drainage area) and 25 feet for ephemeral streams. On the GWNF, minimum buffer widths increase with slope. These buffer widths may be adjusted based on site-specific conditions, upon review and approval of the FS.

- Where waterbodies meander or have multiple channels, route the pipeline to minimize the number of waterbody crossings.

- Maintain adequate waterbody flow rates to protect aquatic life, and prevent the interruption of existing downstream uses.

- Waterbody buffers (e.g., extra work area setbacks, refueling restrictions) will be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

- Crossing of waterbodies when they are dry or frozen and not flowing may proceed using standard upland construction techniques in accordance with the Plan, provided that the EI verifies that water is unlikely to flow between initial disturbance and final stabilization of the feature. In the event of perceptible flow, Atlantic will comply with all applicable Procedure requirements for "waterbodies."

The following standards apply to MNF lands:

- Design crossings so stream flow does not pond above the structure during normal flows to reduce sediment deposition and safely pass high flows **(MNF LRMP SW60).**

- Provide passage for fish and other aquatic organisms at all new or reconstructed stream crossings of existing or potential fish-bearing streams. Exceptions may be allowed to prevent the upstream migration of undesired species **(MNF LRMP WF21).**

- Allow pipelines within channel buffers but limit them to essential crossings **(MNF LRMP MG41).** Although tree removal within channel buffers will be necessary, appropriate setbacks of ATWS from streams and riparian areas have been determined in consultation with FS staff, consistent with **MNF LRMP SW37**.

- Avoid construction of pipelines running parallel to streams **(MNF LRMP MG40).**

- Restore steam channels when stream crossing structures are removed to their near-natural morphology (width, depth, and gradient associations for streambeds, streambanks, floodplains, and terraces). Stabilize disturbed soil **(MNF LRMP SW36).**

The following standards apply to GWNF lands:

- Improve connectivity of stream systems through replacement of standard culverts with crossing structures that allow for full passage of all aquatic organisms **(GWNF LRMP Strategy).**

- In the channeled ephemeral zones, up to 50 percent of the basal area may be removed down to a minimum basal area of 50 square feet per acre. Removal of additional basal area is allowed on a case-by-case basis when needed to benefit riparian-dependent resources. **(GWNF LRMP FW-17)** Note: the GWNF is considering a project-specific LRMP amendment to this standard.

- Tree removals from the core of the riparian corridor may only take place if needed to: enhance the recovery of the diversity and complexity of vegetation native to the site; rehabilitate both natural and human-caused disturbances; provide habitat improvements for aquatic or riparian species; or threatened, endangered, sensitive, and locally rare species; reduce fuel build-up; provide for public safety; for approved facility construction/renovation; or as allowed in standards 11-015 or 11-024. **(GWNF LRMP 11-019).** Note: the GWNF is considering a project-specific LRMP amendment to this standard,

- Use culverts, temporary bridges, hardened fords, or corduroy where needed to protect channel or bank stability when crossing channeled ephemeral streams **(GWNF LRMP FW-23).**

10.3.2.4 Spoil Pile Placement and Control

All spoil from minor and intermediate waterbody crossings, and upland spoil from major waterbody crossings will be placed in the construction right-of-way at least 10 feet from the water's edge or in additional extra work areas in a manner compliant with state timing restrictions and as appropriate for specific site conditions. Atlantic will use sediment barriers to prevent the flow of spoil or silt-laden water into any waterbody.

10.3.2.5 Equipment Bridges

Only clearing equipment and equipment necessary for installation of equipment bridges will cross waterbodies prior to bridge installation. Atlantic will limit the number of such crossings of each waterbody to one per piece of clearing equipment. Atlantic will construct and maintain equipment bridges to allow unrestricted flow and to prevent soil from entering the waterbody. Examples of such bridges include:

- equipment pads and culvert(s);
- equipment pads or railroad car bridges without culverts;
- clean rock fill and culvert(s); and
- flexi-float or portable bridges.

Additional options for equipment bridges may be utilized by Atlantic that achieves the performance objectives noted above. Atlantic will not use soil to construct or stabilize equipment bridges.

Atlantic will design and maintain each equipment bridge to withstand and pass the highest flow expected to occur while the bridge is in place and align culverts to prevent bank erosion or streambed scour. If necessary, install energy dissipating devices downstream of the culverts.

Atlantic will design and maintain equipment bridges to prevent soil from entering the waterbody and remove temporary equipment bridges as soon as practicable after permanent seeding. If there will be more than one month between final cleanup and the beginning of permanent seeding and reasonable alternative access to the right-of-way is available, Atlantic will remove temporary equipment bridges as soon as practicable after final cleanup.

Culverts and bridges will be designed to accommodate storm flows expected to occur while the structures are in place and use scientifically accepted methods for calculating expected storm flows (MNF SW46). Atlantic will construct stream crossings and bridges to withstand major storm and runoff events (GWNF Climate Change Strategy).

10.3.2.6 Roads and Skid Trails

During watershed or Project-level analysis, Atlantic will assess existing or proposed road stream crossings for effects to stream channel form and function, including channel stability, passage of storm flows and associated debris, and passage of aquatic organisms. It will prioritize crossings to address or correct identified concerns **(GWNF LRMP SW32).**

Where new roads cross stream channels, channel and bank stability will be maintained **(MNF LRMP SW35).** Where new roads cross streams or high-risk areas, disturbed soils will be stabilized and designed drainage structures will be installed as soon as the soil is disturbed, in concert with the beginning of the work. High-risk areas include landslide prone areas, steep slopes, and highly erosive soils **(MNF LRMP RF07).**

Skid trails used for logging may cross riparian corridors at designated crossings. If crossing a perennial or intermittent stream is unavoidable, Atlantic will use a temporary bridge or other approved method within the state BMP. Stabilization of skid trails will occur as soon as possible to minimize soil movement downslope **(GWNF FW-142)**. Skidding of trees should be directed in a manner that prevents creation of channels or gullies that concentrate water flow to adjacent streams **(GWNF LRMP FW143).**

10.3.2.7 Dry-Ditch Crossing Methods

Unless approved otherwise by the appropriate federal or state agency, Atlantic will install the pipeline using one of the dry-ditch methods outlined below for crossings of waterbodies on NFS lands.

Dam and Pump

The dam-and-pump method may be used without prior approval for crossings of waterbodies where pumps can adequately transfer streamflow volumes around the work area, and there are no concerns about sensitive species passage. Implementation of the dam-and-pump crossing method will meet the following performance criteria:

- use sufficient pumps, including on-site backup pumps, to maintain downstream flows;
- construct dams with materials that prevent sediment and other pollutants from entering the waterbody (e.g., sandbags or clean gravel with plastic liner);

- screen pump intakes to minimize entrainment of fish;
- prevent streambed scour at pump discharge; and
- continuously monitor the dam and pumps to ensure proper operation throughout the waterbody crossing.

Flume Crossing

The flume crossing method requires implementation of the following steps:

- install flume pipe after blasting (if necessary), but before any trenching;
- use sand bag or sand bag and plastic sheeting diversion structure or equivalent to develop an effective seal and to divert stream flow through the flume pipe (some modifications to the stream bottom may be required to achieve an effective seal);
- properly align flume pipe(s) to prevent bank erosion and streambed scour;
- do not remove flume pipe during trenching, pipelaying, or backfilling activities, or initial streambed restoration efforts; and
- remove all flume pipes and dams that are not also part of the equipment bridge as soon as final cleanup of the stream bed and bank is complete.

10.3.2.8 Temporary Erosion and Sediment Control

Atlantic will install sediment barriers immediately after initial disturbance of the waterbody or adjacent upland. Sediment barriers will be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Plan; however, the following specific measures will be implemented at stream crossings:

- install sediment barriers across the entire construction right-of-way at all waterbody crossings, where necessary to prevent the flow of sediments into the waterbody. Removable sediment barriers (or driveable berms) must be installed across the travel lane. These removable sediment barriers can be removed during the construction day, but must be re-installed after construction has stopped for the day and/or when heavy precipitation is imminent;
- where waterbodies are adjacent to the construction right-of-way and the right-of-way slopes toward the waterbody, install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the waterbody; and
- use temporary trench plugs at all waterbody crossings, as necessary, to prevent diversion of water into upland portions of the pipeline trench and to keep any accumulated trench water out of the waterbody.

10.3.2.9 Trench Dewatering

Atlantic will dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any waterbody. Atlantic will remove the dewatering structures as soon as practicable after the completion of dewatering activities.

10.3.3 RESTORATION

Atlantic will do the following:

1. Use clean gravel or native cobbles for the upper one foot of trench backfill in all waterbodies that contain coldwater fisheries.

2. For open-cut crossings, stabilize waterbody banks and install temporary sediment barriers within 24 hours of completing instream construction activities. For dry-ditch crossings, it will complete streambed and bank stabilization before returning flow to the waterbody channel.

3. Return all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the EI.

4. Install erosion control fabric or a functional equivalent on waterbody banks at the time of final bank recontouring. Atlantic will not use synthetic monofilament mesh/netted erosion control materials on NFS lands. Erosion control fabric used on NFS lands will be made of biodegradable material (e.g., jute) and will have characteristics that do not pose an entrapment hazard (e.g., moveable/expandable joints, large openings). Anchor erosion control fabric with staples or other appropriate devices.

5. Comply with the USACE or its delegated agency permit terms and conditions in the application of riprap for bank stabilization.

6. Unless otherwise specified by state permit, limit the use of riprap to areas where flow conditions preclude effective vegetative stabilization techniques such as seeding and erosion control fabric.

7. Revegetate disturbed riparian areas with native species of conservation grasses, pollinator-friendly species, legumes, and woody species, similar in density to adjacent undisturbed lands.

8. Install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent that are less than 50 feet from the waterbody, or as needed to prevent sediment transport into the waterbody. In addition, install sediment barriers as outlined in the Plan. In some areas, with the approval of the EI, an earthen berm may be suitable as a sediment barrier adjacent to the waterbody.

Numbers 3 through 7 above also apply to those perennial or intermittent streams not flowing at the time of construction.

Atlantic will maintain, enhance, or restore vegetation conditions that provide (**MNF LRMP SW31):**

- Ecological functions of riparian, wetland, and aquatic ecosystems.
- Canopy conditions that regulate riparian and stream temperature regimes for native and desired non-native fauna and flora.
- Natural recruitment potential for large woody debris and other sources of nutrient inputs to aquatic ecosystems.
- Bank and channel stability and structural integrity.
- Habitat and habitat connectivity for aquatic and riparian-dependent species and upland species that use riparian corridors.
- Buffers to filter sediment.

If culverts are removed, banks and channel will be restored to a natural size and shape. All disturbed soil will be stabilized **(GWNF LRMP FW-25).** Temporary stream crossings will be removed and rehabilitated **(GWNF LRMP FW-144).**

10.3.4 POST-CONSTRUCTION MAINTENANCE

As part of routine maintenance of the pipeline system, DTI will occasionally trim woody vegetation and herbaceous vegetation over the pipe as necessary to maintain a visible corridor, centered on the pipeline, to allow for adequate aerial inspection.

On steep slopes (>40 percent) depending on bank stability the clearing would be completed via motorized equipment and/or hand clearing. No herbicides will be utilized for normal vegetation maintenance. Clearing will occur between September 1 and April 1 on the MNF and between September 1 and March 15 on the GWNF.

Atlantic will not use herbicides in or within 100 feet of a waterbody except as allowed by the FS. Time of year restrictions specified in Section 2.2.1 for maintenance-related vegetative clearing apply to riparian areas.

10.4 WETLAND CROSSINGS

One wetland is crossed by the ACP pipeline route on the GWNF, at MP 85.4. The construction right-of-way would affect one wetland on the MNF, at approximate MP 82.7, and four wetlands on the GWNF, at MPs 85.4 (about 350 feet west of the wetland that is crossed at the same MP), 117.1, 120.4, and 154.6.

Wetland crossings will minimize disturbance to the wetland **(MNF LRMP MG33**). Atlantic has routed the pipeline accordingly.

New road construction will avoid wetlands where feasible. If a wetland cannot be avoided, road construction may be allowed as long as the subsurface drainage patterns can be preserved and maintained. Any road that would cross a wetland will cross in a way that minimizes disturbance to the wetland **(MNF LRMP RF06**).

Atlantic will limit the width of the construction right-of-way to 75 feet or less. Prior written approval of the AO will be sought where topographic conditions or soil limitations require that the construction right-of-way width within the boundaries of a federally delineated wetland be expanded beyond 75 feet. Such requests must also be approved in writing by the FERC.

Wetland boundaries and buffers will be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

Ground disturbance will be avoided to the extent practicable within seeps, vernal pools, bogs, fens, and other wetlands during Project implementation. These areas will be managed to protect wet soils and rare plants and provide wildlife watering sources using the following protection (**MNF LRMP SW51):**

- No new road will be located within these areas except at essential crossings. Such crossings should be designed to minimize disturbance to the extent practical.
- Logs will not be skidded through these areas and slash and logs will be kept out of them.
- Where available, a canopy of 60-100 percent crown closure will be maintained within and adjacent to these areas, unless a more open canopy is needed for Threatened, Endangered, and Protected species or Regional Forest Sensitive Species management.
- Mast trees or shrubs may be planted in seeps if mast plants are currently lacking.

10.4.1 INSTALLATION

10.4.1.1 Extra Work Areas and Access Roads

Except as authorized by the FS, ATWS will be located at least 100 feet from the water's edge at each waterbody on NFS lands (on the GWNF, the buffer increases on slopes greater than 10 percent).

The construction right-of-way may be used for access when the wetland soil is firm enough to avoid rutting or the construction right- of-way has been appropriately stabilized to avoid rutting (e.g., with timber riprap, prefabricated equipment mats, or terra mats). Severe rutting resulting from management activities will be confined to less than 5 percent of an activity area **(MNF LRMP SW06).** Note: the MNF is considering a project-specific LRMP amendment to this standard.

In wetlands that cannot be appropriately stabilized, all construction equipment other than that needed to install the wetland crossing will use access roads located in upland areas. Where access roads in upland areas do not provide reasonable access, Atlantic will limit all other construction equipment to one pass through the wetland using the construction right-of-way.

The only access roads, other than the construction right-of-way, that can be used in wetlands are those existing roads that can be used with no modifications or improvements, other than routine repair, and no impact on the wetland.

10.4.1.2 Crossing Procedures

Atlantic will comply with USACE permit terms and conditions. It will assemble the pipeline in an upland area unless the wetland is dry enough to adequately support skids and pipe. Atlantic will use "push-pull" or "float" techniques to place the pipe in the trench where water and other site conditions allow. Atlantic will minimize the length of time that topsoil is segregated and the trench is open. The trench will not be excavated through the wetland until the pipeline is assembled and ready for lowering in.

Atlantic will limit construction equipment operating in wetland areas to that needed to clear the construction right-of-way, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the construction right-of-way.

Atlantic will cut vegetation just above ground level, leaving existing root systems in place, and remove it from the wetland for disposal.

Atlantic will limit pulling of tree stumps and grading activities to directly over the trenchline. It will not grade or remove stumps or root systems from the rest of the construction right-of-way in wetlands unless the Construction Site Supervisor and EI determine that safety-related construction constraints require grading or the removal of tree stumps from under the working side of the construction right-of-way.

Atlantic will segregate the top 1 foot of topsoil from over the trenchline within wetland areas, except in areas where standing water is present or soils are saturated. Immediately after backfilling is complete, Atlantic will restore the segregated topsoil to its original location.

Atlantic will not use rock, soil imported from outside the wetland, tree stumps, or brush riprap to support equipment on the construction right-of-way.

If standing water or saturated soils are present or if construction equipment causes ruts or mixing of the topsoil and subsoil in wetlands, Atlantic will use low-ground-weight construction equipment, or operate normal equipment on timber riprap, prefabricated equipment mats, or terra mats.

Atlantic will remove all Project-related material used to support equipment on the construction right-of-way upon completion of construction.

10.4.1.3 Temporary Sediment Control

Atlantic will install sediment barriers immediately after initial disturbance of the wetland or adjacent upland. Sediment barriers must be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench). Except as noted below in this Section, Atlantic will maintain sediment barriers until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Erosion and Sedimentation Control Plan (Section 9).

Atlantic will install sediment barriers across the entire construction right-of-way immediately upslope of the wetland boundary at all wetland crossings where necessary to prevent sediment flow into the wetland.

Where wetlands are adjacent to the construction right-of-way and the right-of-way slopes toward the wetland, Atlantic will install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the wetland.

Atlantic will install sediment barriers along the edge of the construction right-of- way as necessary to contain spoil and sediment within the construction right-of-way through wetlands. Sediment barriers will be removed during right-of-way cleanup.

If soils are commonly wet at or near the surface during a considerable part of the year, or if soils are highly susceptible to compaction, equipment use will normally be avoided or mitigated by Atlantic when soils are saturated or when freeze-thaw cycles occur **(MNF LRMP SW07d).**

10.4.1.4 Trench Dewatering

Atlantic will dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any wetland. Atlantic will remove the dewatering structures as soon as practicable after the completion of dewatering activities.

10.4.2 RESTORATION

Where the pipeline trench may drain a wetland, Atlantic will construct trench breakers at the wetland boundaries and/or seal the trench bottom as necessary to maintain the original wetland hydrology. Atlantic will restore pre-construction wetland contours to maintain the original wetland hydrology.

For each wetland crossed, Atlantic will install a trench breaker at the base of slopes near the boundary between the wetland and adjacent upland areas. It will install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from the wetland, or as needed to prevent sediment transport into the wetland. In addition, Atlantic will install sediment barriers as outlined in the Erosion and Sedimentation Control Plan (Section 9). In some areas, with the approval of the EI, an earthen berm may be suitable as a sediment barrier adjacent to the wetland.

Atlantic will not use fertilizer, lime, or mulch unless required in writing by the appropriate federal or state agency.

Atlantic will ensure that all disturbed areas successfully revegetate with wetland herbaceous and/or woody plant species. The Restoration and Rehabilitation Plan (Section 11) identifies seed mixes and planting prescriptions applicable to wetlands.

Atlantic will remove temporary sediment barriers located at the boundary between wetland and adjacent upland areas after revegetation and stabilization of adjacent upland areas are judged to be successful as specified in section VII.A.4 of the Plan.

10.4.3 POST-CONSTRUCTION MAINTENANCE AND REPORTING

As part of routine maintenance of the pipeline system, DTI will occasionally trim woody vegetation and herbaceous vegetation over the pipe as necessary to maintain a visible corridor, centered on the pipeline, to allow for adequate aerial inspection.

Atlantic will not use herbicides in or within 100 feet of a wetland, except as allowed by the FS. Time of year restrictions specified in Section 2.2.1 for maintenance-related vegetative clearing apply to routine mowing and clearing of wetland areas.

Atlantic will monitor and record the success of wetland revegetation annually until wetland revegetation is successful.

Wetland revegetation will be considered successful if all of the following criteria are satisfied:

- the affected wetland satisfies the current federal definition for a wetland (i.e., soils, hydrology, and vegetation);
- vegetation is at least 80 percent of either the cover documented for the wetland prior to construction, or at least 80 percent of the cover in adjacent wetland areas that were not disturbed by construction;
- if natural rather than active revegetation was used, the plant species composition is consistent with early successional wetland plant communities in the affected ecoregion; and
- non-native invasive species and noxious weeds are absent, unless they are abundant in adjacent areas that were not disturbed by construction.

For any wetland where revegetation is not successful at the end of 3 years after construction, Atlantic will develop and implement (in consultation with a professional wetland ecologist) a remedial revegetation plan to actively revegetate wetlands. Atlantic will continue revegetation efforts and file a report annually documenting progress in these wetlands until wetland revegetation is successful.

10.5 HYDROSTATIC TESTING

No hydrotest water withdrawals or discharges are planned on NFS lands.

11.0 RESTORATION AND REHABILITATION PLAN

11.1 PURPOSE

This Restoration and Rehabilitation Plan was prepared for the ACP to address post-construction restoration and rehabilitation activities on NFS lands and describes the processes and measures that will be implemented to mitigate the impacts to habitats and scenery. NFS lands are managed in accordance with various management directives, including standards and guidelines for restoration and revegetation activities. This Restoration and Rehabilitation Plan has been developed in consultation with the MNF and GWNF and is consistent with the MNF and GWNF LRMPs. It has also been written to conform to FERC requirements and industry-accepted practices and standards. Furthermore, the Restoration and Rehabilitation Plan will be implemented in conjunction with the 2013 versions of the FERC Plan and Procedures as well as other relevant sections of this COM Plan.

11.2 TRAINING

Prior to the start of construction, Atlantic will conduct environmental and safety training for Company and Contractor personnel. The training program will focus on the FERC's Plan and Procedures; other construction, restoration, and mitigation plans, including this *Restoration and Rehabilitation Plan*; and applicable permit conditions. In addition, Atlantic will provide large-group training sessions before each work crew commences construction with periodic follow-up training for groups of newly assigned personnel.

Training for environmental inspectors will also include:

- emergency contacts and numbers;
- pipeline right-of-way rehabilitation and restoration techniques specific for the NFS lands;
- seeding techniques on steep slope sites; and
- erosion minimization and control measures.

11.3 RESTORATION AND REHABILITATION

This section provides a description of restoration and rehabilitation measures and BMPs that would be used to restore temporary construction areas and the pipeline right-of way on NFS lands. These measures and BMPs are based on FERC requirements and industry-accepted practices, in addition to site-specific requirements and recommendations for restoration developed in conjunction with FS staff.

11.3.1 Restoration and Rehabilitation Measures and Best Management Practices

11.3.1.1 Erosion Control

Construction of the pipeline will be followed by restoration of the right-of-way, stabilization of the soil, seeding, and planting. Atlantic will complete final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting. For construction activities occurring in winter, conditions such as frozen soils or snow cover could delay successful soil compaction mitigation or seeding activities. In these conditions, Atlantic will resume clean-up and restoration efforts the following spring. Atlantic will monitor and maintain temporary erosion controls (e.g., temporary slope breakers, sediment barriers, or mulch) until conditions allow for completion of cleanup and installation of permanent erosion control structures.

Temporary erosion control measures and permanent erosion control devices to be employed during and after construction are described in the Erosion and Sedimentation Control Plan (Section 9).

During construction, the effectiveness of temporary erosion control devices will be monitored by Atlantic's EI. The FS will also employ its own compliance monitors. Monitoring reports will identify follow-up actions; subsequent inspection/reporting will ensure the follow-up action has been completed, and that erosion control devices continue to function. Where appropriate for local resource priorities, the role of the EI may be filled by agricultural or horticultural monitors. After construction, the effectiveness of revegetation and permanent erosion control devices will be monitored by Atlantic.

11.3.1.2 Soil Restoration

Successful revegetation is dependent on appropriate soil conditions and can be influenced by several factors, including soil texture, soil compaction (density), soil microbial health, drainage class, salinity, and acidity. Unless otherwise approved by the FS, soil restoration will include:

- removal of excavated rock as described in Section 2.1.4.7 – Lowering-in and Backfilling;
- distribution of rock on the work area as described in Section 2.1.4.7 – Lowering-in and Backfilling;
- re-grading of the right-of-way to restore preconstruction contours to the extent practicable;
- topsoil segregation and replacement as described in Section 11.3.1.4; and
- preparation of the soil for revegetation as described in Section 11.3.1.8 and 11.3.1.9.

11.3.1.3 Soil Compaction

Soil compaction resulting from construction activities may reduce the potential for successful revegetation. Fine-textured soils with poor internal drainage that are moist or saturated during construction are the most susceptible to compaction.

The area of the construction right-of-way most susceptible to compaction is the travel lane, where the bulk of equipment and vehicle use occurs. Atlantic will minimize compaction in this area by spreading grading and/or trench spoils over the travel lane, thereby reducing compaction on the underlying soil. In addition, small tie-in crews will be utilized for pipeline installation on steep slopes, which will reduce soil compaction in these areas.

Prior to finish grading, Atlantic will test for soil compaction:

- in undisturbed areas adjacent to the construction workspace with the same soil type under similar moisture conditions, to approximate preconstruction conditions as a baseline to help determine where compaction mitigation within the work area is necessary
- in areas requested by the FS; and
- in areas identified by the EIs, who will be responsible for conducting subsoil and topsoil compaction testing and determining the need for corrective measures.

Compaction will be mitigated through the use of tillage equipment such as a paraplow or similar implement. In areas where topsoil segregation occurs, soil compaction will be remediated as necessary prior to re-spreading of salvaged topsoil. In rocky or heavily rooted soils, a representative compaction measurement may be difficult to obtain. If compaction testing is impeded by rock or roots, Atlantic will investigate the use of other methods to measure compaction (e.g., use of pocket penetrometer) or may, in consultation with the FS, conclude that there is a suitable amount of large material in the soil to rectify potential compaction.

11.3.1.4 Topsoil Segregation and Replacement

The potential mixing of topsoil or surface soil with the subsoil from construction activities could result in a loss of soil fertility. To prevent mixing of the soil horizons or incorporation of additional rock into the topsoil, Atlantic will segregate topsoil over an approximately 20-foot wide strip roughly centered on the pipeline centerline from which stumps have been removed, at the following locations:

- MPs 73.4 to 73.6
- MPs 80.4 to 80.6
- MPs 82.6 to 83.0
- MPs 83.2 to 83.4
- MPs 83.6 to 83.9
- MPs 121.4 to 122.4
- MPs 122.7 to 122.8

In these areas, after stumps have been removed, Atlantic will segregate the top six inches of soil.

In areas where topsoil segregation is conducted, subsoil from trench excavations will be placed adjacent to the topsoil in a separate pile to allow for proper restoration of the soil during backfilling and restoration. Gaps will be left between the topsoil and subsoil piles to prevent stormwater runoff from backing up or flooding. Mixing of topsoil and subsoil piles will be prevented by separating them physically or with a mulch or silt fence barrier, where necessary and dictated by site conditions, to accommodate reduced workspace. Topsoil piles will be stabilized to minimize erosion loss, using sediment barriers, mulch, temporary seeding, or functional equivalents.

In areas where topsoil segregation is not performed, during the clean-up and restoration phase, Atlantic will apply soil conditioning amendments such as ProGanics or other similar biotic soil media, at two times the minimum application rate (or at the optimal rate to enhance revegetation success, as determined in consultation with the FS), and will install a hydraulically-applied growth media system such as flexterra or a similar product.

Atlantic has also agreed to fund an off-site mitigation program aimed at achieving long-term improvement of soil productivity on NFS lands.

Measures to prevent the spread of non-native invasive plant species are provided in Section 12 (Non-Native Invasive Plant Species Management Plan).

11.3.1.5 Re-Contouring

Grading will be conducted where necessary to provide a reasonably level work surface. Upon completion of construction, Atlantic will:

- restore the ground surface as closely as practicable to original contours to restore natural overland water flow patterns, aquifer recharge, and drainage patterns;
- re-contour disturbed areas in a fashion designed to stabilize slopes, remove ruts and scars, and support successful revegetation; and
- restore drainage ditches and culverts that are diverted or damaged during construction to their original or better condition.

11.3.1.6 Steep Slope Areas

Segments of the right of way with steep slopes (i.e., slopes >30 percent and longer than 100 feet in any direction) may present restoration difficulties associated with increased potential for erosion. Sections 8 (Slope Stability Plan) and 9 (Erosion and Sedimentation Control Plan), and Section 2.1.5.4 discuss measures aimed at maintaining stability and minimizing erosion on steep slopes crossed by the pipeline, thereby facilitating revegetation efforts. At the same time, seeding of steep slopes with the appropriate erosion control and permanent seed mixes, application of soil conditioners and flexterra (or similar material), re-planting the temporary construction work areas, and post-construction monitoring of these areas, as discussed in this section, will facilitate long-term stabilization of steeper segments of the right-of-way.

Slopes greater than 35 percent will be restored to natural contours to the extent practicable, or in accordance with specific requests from the FS. Restoration of steep terrain may include:

- grading to the natural conditions;
- installation of permanent erosion control devices (i.e., slope breakers) designed to reduce runoff velocity, divert water from the surface of the right-of-way, and encourage retention of soils; and
- the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil.

In addition to these general measures, Atlantic will develop and implement other additional site-specific measures, where warranted, to address land movement, surface erosion, backfill erosion, general soil stability when backfilling the trench, and stabilizing the right-of-way in steep slope areas (see Section 9.4.1 for details). As addressed in Section 8 (Slope Stability Plan), Atlantic is committed to employing BIC measures to protect the environment in steep slope areas. Best in Class is defined as the most efficient and/or protective design or configuration with the least environmental impact providing reliable construction and operations.

Atlantic will implement the Slope Stability Policy and Procedure and has conducted geotechnical studies along the proposed pipeline routes in West Virginia and western Virginia in steep terrain areas to assess the potential for landslides and landslips to occur during construction and operation of the Project.

The following lists some of the special design and construction mitigation measures that will be implemented if a problem is encountered during construction in steep slope areas:

- targeted management and diversion of surface water around landslide sites, including the use of ditches, berms, slope breakers, and/or grading;
- mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking
- targeted management of water sources along the trench, including the use of trench breakers and/or added drainage piping in the trench;
- targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
- engineering of the backfill around or within steep slope areas to dry the backfill, add compaction, improve backfill soil strength, and reduce saturation;
- installation of targeted structures to stabilize backfill within the trench using engineered fill, retaining walls, bagged concrete mix, key trenches, and/or shear trenches; and
- reduction in surcharge on steep slope areas by reducing excess or saturated backfill.

11.3.1.7 Site Preparation and Seeding

Atlantic will complete final grading and permanent erosion control measures within 20 days after backfilling of the trench, seasonal or other weather conditions permitting. In the event that this timeframe cannot be met or construction or restoration activities are interrupted for an extended period, mulch will be spread prior to seeding. In these cases, slopes within 100 feet of wetlands or waterbodies will be mulched at a rate of 3 tons per acre (FERC, 2013a). In accordance with the FS requirements, the mulch material will not include the use of hay. Instead, materials may include clean straw, wood or paper fiber, coconut fiber, or other FS-approved material that is not likely to contain seeds or viable parts of invasive plants.

11.3.1.8 Seedbed Preparation

Proper preparation of the soil surface and seedbed is essential for rapid and healthy revegetation (Virginia DEQ, 1992). Successful germination of seed is enhanced by a well-prepared seedbed, the suitability of which decreases rapidly after rainfall.

Seedbed preparation starts immediately after soil has been replaced on the right-of-way and final grading, contouring, and de-compaction activities are complete. Seedbed preparation will be conducted immediately prior to seeding to prepare a firm seedbed conducive to proper seed placement. Seedbed preparation will also be performed to break up surface crusts and to reduce weeds that develop between the initial ground clearing and final seeding. Additionally, the seedbed will be left with a rough surface to promote the capturing or lodging of seed, and reduce runoff and erosion potential. The rough seedbed surface will also retain soil moisture for seedling germination and promote faster establishment of vegetation.

In compacted areas, additional measures such as chisel plowing or disking may be necessary to improve water infiltration and soil aeration necessary to prepare an adequate seedbed. When hydroseeding, Atlantic will scarify the soil surface prior to seeding to enhance seed-soil contact and promote germination.

Other measures to be implemented as appropriate on the MNF and GWNF include:

- where soils are saturated, employ timber mats or trench spoil to protect underlying soil where possible;
- use a mini-crew on steep slopes to limit the use of heavy equipment;
- use a cone penetrometer to measure compaction on the construction right-of-way prior to and following completion of construction activities;
- post-construction compaction that exceeds pre-construction compaction will indicate the need for compaction remediation;
- on right-of-way slopes <20 percent where compaction remediation is needed, use de-compaction techniques such as a ripper, harrow disk, backhoe bucket teeth, chisel plow, or other FS-approved techniques to de-compact areas that have become compacted through construction.; and
- on ≥20 percent slopes where compaction remediation is needed and can be accomplished safely and effectively without causing further resource damage, use backhoe bucket teeth, or another safe, FS-approved method, to break up compacted soils.

11.3.1.9 Lime and Fertilizer Application

In general, and in accordance with the Plan and Procedures, upland areas will have a fertilizer and pH supplement (i.e., lime) mixed into the upper two inches of topsoil. No lime or fertilizer will be used within 100 feet of wetlands or waterbodies or within 300 feet of karst features. In upland areas without specific fertilization requirements, Atlantic will:

- provide soil nutrient additions where suggested by soil chemistry or soil fertility data. However, in absence of this data, the FS recommends the application of 600 – 800 pounds per acre of 10-20-10 (Nitrogen, Phosphorous, and Potassium), 400 pounds per acre of 15-30-15, or 800 -1,000 pounds per acre of 10-10-10 fertilizer. Lime will be applied at the rate of 1,500 - 4,000 pounds per acre (pelletized or dust) or 4,000 pounds per acre as hydro Lime (*Suggested Seeding Techniques for Pipeline Rights-of-Ways and Associated Disturbances on the Monongahela and George Washington – Jefferson National Forest, 2016*).
- avoid fertilizer drift through restricted application times that exclude periods of high winds or heavy rains;
- store and mix all fertilizers in upland areas and away from karst features, where contamination of wetlands, waterbodies, or karst features will be avoided; and
- in disturbed areas where topsoil has not been segregated, Atlantic will apply soil conditioning amendments such as ProGanics or Flexterra for seed application and erosion control.

11.3.1.10 Mulching and Binders

In areas where topsoil has been segregated and replaced, Atlantic will apply mulch to slopes immediately after seeding to prevent erosion or as specified by the FS. Mulch materials will be anchored to the soil with stakes or liquid mulch tackifiers. No tackifiers will be used within 100 feet of wetlands and waterbodies or within 300 feet of karst features.

Possible mulch materials and application techniques are described below.

- salvaged wood materials, including slash and non-merchantable timber, will be retained in forested areas and placed on the right-of-way after final grading, re-contouring, and seeding is complete. Woody debris is expected to support revegetation while preventing erosion and providing micro-habitat for various species.

- native wood chip materials will be used in forested systems and will be generated from cleared materials that are chipped and stockpiled on the edge of the right-of-way. Native wood chips are expected to aid in the successful revegetation of disturbed areas.

- wood fiber hydromulch may be used in shrubby areas to augment biomass salvaged during clearing. Hydromulch is evenly distributed and absorbs water quickly, which enhances seed survival rates and discourages erosion during regeneration of shrubby species.

- Bonded fiber matrix (BFM), a type of hydromulch designed to control erosion on steep slopes, may also be used where appropriate. BFM slurry contains thermally processed wood fibers (approximately 80 percent), water (approximately 10 percent), and tackifiers and polymer-based binding agents that are quick to dry upon application. BFM is hydraulically applied, which allows for controlled application on steep slopes where access may be difficult. BFM will only be applied to stable slopes where final grading has been completed and water runoff has been diverted from the slope face. Once BFM has had 24 to 48 hours to cure, an erosion-resistant blanket is formed that is flexible, absorbent, and biodegradable, and that will accelerate plant growth. BFM may be used in conjunction with slope breakers and other erosion control devices on slopes longer than 70 feet. BFM application rates will depend on manufacturers specifications, based upon the slope of the disturbed areas (Terra Novo, 2016).

- weed-free straw will be used to preserve the soil base in areas where native salvaged material is not available. In areas that are seeded by drill, Atlantic will apply one bale of clean straw per 1,000 square feet. Where broadcast seeding is used, Atlantic will apply two bales of clean straw per 1,000 square feet, or in accordance with requirements specified by the FS. Where straw is utilized, Atlantic will apply whole straw on top of chopped straw to provide protection against erosion from overland flow and raindrop impact protection.

- in areas where topsoil has not been segregated (see Section 2.1.4.3), Atlantic will apply soil conditioning amendments such as ProGanics or other similar biotic soil media, at two times the minimum application rate, and will install a hydraulically-applied growth media system such as flexterra or a similar product. Exposed bedrock areas will be treated with Earthguard Fiber Matrix Erosion Control System, which is a hydraulically applied system for slope stabilization and revegetation.

Additional guidelines and specifications recommended by FS to be implemented in the MNF and GWNF are described below:

- materials will be weed free and accompanied by vendor’s test results for noxious weed content.
- seeded areas will either be mulched with weed free straw at a rate of 2,000 – 4,000 pounds per acre hand spread, or blown fiber mulch hydroseeded at 1500 – 2000 pounds per acre, or other appropriate material.
- natural biodegradable products are preferred. Materials will be free of invasive species, including but not limited to plants, pests, and pathogens.
- hydraulic erosion control products will be suitable for wildlife.
- if the use of stabilization netting is required/permitted, wildlife friendly geotextiles will be used. These products will either not contain netting, or netting will be made of 100 percent 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, will not be used. Any netting used will also have a loose-weave design with movable joints between horizontal and vertical twines to reduce the chance for wildlife entanglement, injury, or death.
- silt fence reinforced with metal or plastic mesh will not be used.
- when no longer required, (after soils are stable and the vegetative cover is established), temporary erosion control and sediment control products will be promptly removed.
- any products that require mixing with water need to have a FS-approved water source. The source of water will not be contaminated with non-native invasive organisms that could spread into streams.
- to the maximum extent practicable, and consistent with overall schedule objectives, Atlantic will endeavor to complete construction in areas identified as susceptible to slope instability or erosion (e.g., steep slopes) at a time in the construction cycle that maximizes the available growing season length for revegetation, while complying with other timing commitments related to threatened and endangered species.
- temporary erosion control for work stoppages during the winter will be installed where soil disturbance has occurred but pipeline construction or reclamation has not been completed.
- temporary erosion control will include treatment of soil materials and the soil surface to reduce the potential for soil movement, as well as installation of erosion control treatments to further ensure sediment transport is controlled.
- rough surfacing will be used to increase the potential for water infiltration and reduce the potential for sheet erosion.
- soil protection will be provided to rough surfaced areas to enhance temporary erosion control during the dormant season. Protection will be in the form of soil conditioners or

hydraulic mulches (e.g., polyacrylamides, polysaccharides, etc.) or weed free mulch or similar soil cover determined to be suitable by the FS. Weed free mulch or similar soil cover may be used as a substitute for, or augmentation to, soil conditioners or hydraulic mulches. These forms of soil protection may be applied with or without seed application.

- the soil conditioners or hydraulic mulches that are used will be identified by Atlantic and be suitable for the soil chemical conditions.

- the FS must approve the selected conditioner(s) prior to application. Different soil conditioners or hydraulic mulches may be needed at different locations along the pipeline route because soil chemistry varies along the route. The expected life of the soil conditioner or hydraulic mulch will be a consideration in the selection; if the expected effective life of the soil conditioner or hydraulic mulch is less than the time until work resumes, additional applications of the soil conditioner or hydraulic mulch will be required. For mulches, at a minimum, the type of mulch and application method will be capable of preventing erosion by raindrop impact and inter-rill and rill flow. The type, application rate, and application method must be approved by the FS prior to application.

- tackifiers that are used for retention of mulch on the site must be approved by the FS. Use of asphalt emulsion tackifiers is not permitted on NFS lands.

- additional sediment control treatments, such as barriers, will be used in addition to other winter-work stoppage temporary erosion controls in case the other erosion controls (e.g., soil conditioners or hydraulic mulches, mulch, etc.) are not fully effective.

- wood-fiber hydraulic mulches are generally short-lived and require a 24-hour period to dry before rainfall occurs.

- wood fiber naturally has tackifying properties, but fiber alone may not be sufficient on steep slopes. In those cases the addition of a tackifier will help keep the seeds in contact with the soil.

- as wood chips, shredded woody materials, and other high-carbon materials decompose, they remove plant nutrients such as nitrogen from the soil. This can reduce soil fertility and make it difficult for grasses to grow. This should be taken into account when planning restoration seeding.

11.3.1.11 Seeding

The goal of the revegetation effort is to address the stabilization of the right-of-way post-construction by using appropriate seed mixes. Initially, the primary goal of seeding is to establish a vegetative cover to minimize surface erosion and sedimentation resulting from precipitation and surface flow. The secondary goal is the establishment of an assortment of native species beneficial for wildlife and pollinators.

Atlantic has consulted with the FS and other agencies to identify appropriate seed mixes and horticultural practices for use during restoration. Based on discussions with the MNF and GWNF to-date, a variety of seed mixes are provided, including native and pollinator-friendly species, and seeding techniques appropriate to the various conditions expected to be found along the pipeline route.

Atlantic will perform seeding of permanent vegetation during the fall or spring of the year in which construction is completed, within the recommended seeding dates, and within six working days of final grading, weather and soil conditions permitting. Atlantic will prioritize seeding and other restoration work in high-elevation areas, in an attempt to avoid restoration delays due to winter-related weather and field conditions. If seeding cannot be done within optimal time frames, appropriate temporary erosion control measures will be installed and temporary grass cover will be seeded. If temporary grass cover is used, seeding of permanent vegetation will occur at the beginning of the next recommended seeding season.

In the MNF and GWNF appropriate seasons for seeding can vary dramatically depending on elevation. Spring seeding can be conducted from March 15th – June 1st, and fall seeding can be done from August 15th – October 15th, but neither timeframe is appropriate in its entirety at all elevations. Atlantic will consult with the FS for the most appropriate timeframes for specific elevations and for seeding or treatments outside normal or appropriate seasons.

Seed Mix Recommendations

The recommended FS guidance and application techniques, and seed mixes tailored for the MNF and GWNF for temporary and permanent erosion control and special site conditions and habitats, are provided below.

- seed will be Virginia- or West Virginia- certified seed (bag tags attached; seed certification will meet each state’s standards for their certified seed classification), or alternative seed sourced from approved distributors.

- all leguminous seed will be either be pre-inoculated from a supplier, or mixed with inoculant specified for use on that particular seed according to manufacturer’s directions. Inoculants will be manually applied at double the manufacturer’s rate. Inoculant will be mixed with legume seed prior to mixing with other seeds. For hydroseeding a minimum of five times the dry seeding rate of inoculant will be used.

- when using native seed, local ecotypes will be used as available, in the following order of preference: from within state; from mountain regions of an adjoining state; or from within 100 miles, as long as it is within the Appalachian mountain ecosystem.

- a minimum of 100 pounds per acre of seed will be applied when seeding for permanent erosion control, unless otherwise specified by the seed mix provider.

- all seeding will occur promptly after construction halts, either temporarily or permanently. Erosion control seed mixes will be sufficient to stabilize sites for varying lengths of time, and seed mixes may need to vary depending on that timeframe.

- areas to be planted with species beneficial for wildlife after pipeline installation will be treated with temporary erosion control mix during a normal seeding season.

- areas not to be treated with wildlife seed species will be treated with permanent erosion control seeding during a normal seeding season.

- seeding rates will be doubled when hydroseeding.

Temporary Erosion Control Seed Mixes

Table 11.3.1-1 provides a summary seed mixtures and application rates by slope class recommended to be used in disturbed areas on NFS lands for temporary erosion control under the following conditions:

- where erosion control is needed outside of normal seeding seasons;
- concurrent with permanent mechanical erosion control; and
- prior to permanent seeding, where such follow-up is appropriate.

TABLE 11.3.1-1

Seed Mix FS01: Recommended Seed Mixes for Temporary Erosion Control by Slope Class

Seed Mix/Slope Class	Common Species Name [a]	Scientific Name	Number of Seeds (seeds/feet^2) [b]	Seeding Application Rate (lbs/acre/PLS) [c]
0 to 30 Percent Slope				
1	Annual Rye Grass	*Lolium multiflorum*	34.87	7.00
	Cereal Rye	*Secale cereale*	18.60	45.00
	Brown Top Millet	*Panicum ramosum*	13.77	8.00
Total				60.00
31 to 50 Percent Slope				
2	Annual Rye Grass	*Lolium multiflorum*	52.31	10.50
	Cereal Rye	*Secale cereale*	27.89	67.50
	Brown Top Millet	*Panicum ramosum*	20.66	12.00
Total				90.00
50 to ≥ 70 Percent Slope				
3	Annual Rye Grass	*Lolium multiflorum*	78.46	15.75
	Cereal Rye	*Secale cereale*	41.84	101.25
	Brown Top Millet	*Panicum ramosum*	30.99	18.00
Total				135.00

Source: FS, 2016; Roundstone, 2017.

[a] Temporary erosion control species. The FS also recommended German/Foxtail Millet (*Seteria italic*) as a temporary species.

[b] Seeds per square feet.

[c] lbs/acre/PLS = pounds per acre of pure live seed.

Permanent Erosion Control Seed Mix

Table 11.3.1-2 provides a summary of seed mixtures and application rates that are recommended to be used in disturbed areas on NFS lands for permanent erosion control under the following conditions:

- only during normal seeding season in Spring and Fall;
- on slopes too steep or inaccessible for planting equipment, i.e., in slopes 50 percent or greater; or
- on areas planned to be left not in final grade for more than 1 year.

TABLE 11.3.1-2

Seed Mix FS02: Recommended Seed Mix for Permanent Erosion Control

Type	Common Species Name	Scientific Name	Number of Seeds (seeds/feet^2) [a]	Seeding Application Rate (lbs/acre/PLS) [b]
Non-native	Creeping Red Fescue	*Festuca rubra*	10.33	1.000
Grasses	Indian Grass	*Sorghastrum nutans*	32.14	8.000
	Purple Top	*Tridens flavus*	53.37	5.000
	Upland Bentgrass	*Agrostis perennans*	22.96	0.125
	Canada Wild Rye	*Elymus canadensis*	10.47	4.000
	Deer Tongue Grass	*Panicum clandestinum*	32.14	4.000
	Virginia Wild Rye	*Elymus virginicum*	9.18	4.000
	Switchgrass	*Panicum virgatum*	11.89	2.000
Forbs	Spiked Blazing Star	*Liatris spicata*	2.18	0.500
	New England Aster	*Aster novae-angliae*	6.89	0.250
	False Sunflower	*Heliopsis helianthoides*	3.62	1.500
	Showy Ticktrefoil	*Desmodium canadense*	2.48	1.500
	Slender Lespedeza	*Lespedeza virginica*	2.01	0.500
	Slender Mountain Mint	*Pycnanthemum tenuifolium*	17.22	0.125
	Bergamot	*Monarda fistulosa*	14.35	0.500
	American Senna	*Senna hebecarpa*	0.76	1.500
	Partridge Pea	*Cassia fasciculata*	1.72	1.000
	Blackeyed Susan	*Rudbeckia hirta*	18.37	0.500

Source: FS, 2016; Roundstone, 2017.

[a] Seeds per square feet.

[b] lbs/acre/PLS = pounds per acre of pure live seed.

Special Site Conditions Seed Mixes (Native Species for Wildlife and Pollinators)

Seed mixes FS03 – for Dry Uplands or Highlands (Table 11.3.1-3), FS04 – for Riparian Habitat Areas (Table 11.3.1-4), FS05 – for Wetland Habitat Areas (Table 11.3.1-5), and FS06 for Dry Low pH Habitat Areas (Table 11.3.1-6) are provided below, and are to be applied as permanent vegetation in areas where drill-seeding is feasible (e.g., in areas where slopes are less than 40 percent).

TABLE 11.3.1-3

Seed Mix FS03: Recommended Seed Mix for Dry Uplands or High Elevation Habitat Areas [a]

Type	Common Species Name	*Scientific Name*	Number of Seeds (seeds/feet^2) [b]	Seeding Application Rate (lbs/acre/PLS) [c]
Grasses	Indian Grass	*Sorghastrum nutans*	16.07	4.000
	Switchgrass	*Panicum virgatum*	11.89	2.000
	Virginia Wild Rye	*Elymus virginicus*	13.77	6.000
Forbs	Blackeyed Susan	*Rudbeckia hirta*	9.18	0.250
	Common Milkweed	*Asclepias syriaca*	0.28	0.250
	False Sunflower	*Heliopsis helianthoides*	1.81	0.750
	Panicled Leaf Ticktrefoil	*Desmodium paniculatum*	0.83	0.500
	Partridge Pea	*Cassia fasciculata*	0.86	0.500
	Showy Ticktrefoil	*Desmodium canadense*	0.83	0.500
	Slender Mountain Mint	*Pycnanthemum tenuifolium*	17.22	0.125
	Bergamot	*Monarda fistulosa*	7.17	0.250

Source: FS, 2016; Roundstone, 2017.

[a] Reduce planting application rate by 5 percent for each slope class (i.e., 0 - 8, 8 -15, or 15 – 30 percent) below slope class 30 – 50 percent. "High Elevation" areas are habitat sites with elevations higher than 3,000 feet above mean sea level.

[b] Seeds per square feet.

[c] lbs/acre/PLS = pounds per acre of pure live seed.

TABLE 11.3.1-4

Seed Mix FS04: Recommended Seed Mix for Riparian Habitat Areas [a]

Type	Common Species Name	Scientific Name	Number of Seeds (seeds/feet^2) [b]	Seeding Application Rate (lbs/acre/PLS) [c]
Grasses	Upland Bentgrass	*Agrostis perennans*	11.48	0.063
	Big Bluestem	*Andropogon gerardii*	16.53	5.000
	Virginia Wild Rye	*Elymus virginicus*	11.48	5.000
Forbs	Boneset	*Eupatorium perfoliatum*	11.48	0.250
	Sneezeweed	*Helenium autumnale*	11.48	0.250
	Joe-Pye Weed	*Eupatorium fistulosum*	17.22	0.375
	Wild Senna	*Senna marilandica*	0.30	0.500
	New York Ironweed	*Vernonia noveboracensis*	0.86	0.125
	Partridge Pea	*Cassia fasciculata*	0.86	0.500
	Spotted Joe-Pye Weed	*Eupatorium maculatum*	4.02	0.125
	Swamp Milkweed	*Asclepias incarnata*	0.40	0.250

Source: FS, 2016; Roundstone, 2017.

[a] Reduce planting application rate by 5 percent for each slope class (i.e., 0 - 8, 8 -15, or 15 – 30 percent) below slope class 30 – 50 percent.

[b] Seeds per square feet.

[c] lbs/acre/PLS = pounds per acre of pure live seed.

TABLE 11.3.1-5

Seed Mix FS05: Recommended Seed Mix for Wetland Habitat Areas [a]

Type	Common Species Name	Scientific Name	Number of Seeds (seeds/feet^2) [b]	Seeding Application Rate (lbs/acre/PLS) [c]
Non-native	Oats [d]	*Avena sativa*	14.25	32.000
Grasses	Bottlebrush Grass	*Elymus hystrix*	0.86	0.500
	Nodding Sedge	*Carex crinita*	4.13	0.250
	Path Rush	*Juncus tenuis*	25.83	0.250
	Red Top Panicum	*Panicum rigidulum*	27.38	1.500
	Soft Rush	*Juncus effusus*	51.65	0.5000
	Squarrose Sedge	*Carex squarrosa*	2.30	0.250
	Switchgrass	*Panicum virgatum*	4.46	0.750
	Tussock Sedge	*Carex stricta*	10.33	0.250
	Wool Grass	*Scirpus cyperinus*	51.65	0.250
Forbs	Blue False Indigo	*Baptisia australis*	0.30	0.500
	Canada Anemone	*Anemone canadensis*	0.18	0.063
	Canadian Burnet	*Sanguisorba canadensis*	0.29	0.063
	Great Blue Lobelia	*Lobelia siphilitica*	11.48	0.063
	New York Ironweed	*Vernonia noveboracensis*	1.72	0.250
	Spotted Joe-Pye Weed	*Eupatorium maculatum*	8.03	0.250
	Swamp Milkweed	*Asclepias incarnata*	0.40	0.250
	American Senna	*Senna hebecarpa*	0.38	0.750

Source: FS, 2016; Roundstone, 2017.

[a] Reduce planting application rate by 5 percent for each slope class (i.e., 0 - 8, 8 -15, or 15 – 30 percent) below slope class 30 – 50 percent.

[b] Seeds per square feet.

[c] lbs/acre/PLS = pounds per acre of pure live seed.

[d] Use Spring Oats instead of Cereal Rye as a nurse crop because it is less competitive with natives.

TABLE 11.3.1-6

Seed Mix FS06: Recommended Seed Mix for Dry Acidic Habitat Areas [a]

Type	Common Species Name	Scientific Name	Number of Seeds (seeds/feet^2) [b]	Seeding Application Rate (lbs/acre/PLS) [c]
Non-native	Purple Top	*Tridens flavus*	53.37	5.000
Grasses	Splitbeard Bluestem	*Andropogon ternarius*	9.92	2.000
	Wood Oats	*Chasmanthium sessiliflorum*	1.95	1.000
Forbs	Virginia Spiderwort	*Tradescantia virginiana*	1.04	0.313
	Common Blackberry	*Rubus allegheniensis*	1.13	0.188
	Tall Goldenrod	*Solidago canadensis*	6.03	0.375
	Indian Hemp	*Apocynum cannabinum*	5.02	0.438
	White Avens	*Geum canadense*	4.59	0.500

Source: FS, 2016; Roundstone 2017.

[a] Reduce planting application rate by 5 percent for each slope class (i.e., 0 - 8, 8 -15, or 15 – 30 percent) below slope class 30 – 50 percent.

[b] Seeds per square feet.

[c] lbs/acre/PLS = pounds per acre of pure live seed.

Seeding Methods

To enhance germination, the seed mixes for special site conditions will be drill-seeded. On slopes exceeding 40 per cent, drill seeding is not feasible, nor are such seed mixes intended to function as erosion control. On slopes exceeding 40 per cent, erosion control seed mixes will be applied by hydroseeding or broadcast seeding at double the recommended seeding rate.

Erosion control seeding may be conducted with the use of a seed drill, a mechanical broadcast seeder, or by hydroseeding. The standard application method will be seeding with a seed drill equipped with a cultipacker in areas with slopes less than 40 percent. In rocky soils or where site conditions may limit the effectiveness of this equipment, other alternatives may be appropriate (e.g., use of a chain drag) to lightly cover seed after application, as approved by an EI. Broadcasting or hydroseeding at double the recommended seeding rates will be used in lieu of drilling in areas with slopes greater than 40 percent. Atlantic will consult with FS staff regarding seeding methods in problematic areas such as extremely rocky areas or slopes exceeding 40 percent.

Broadcast seeding may also be used for areas with minimal to moderate slopes and will be performed by dry dispersal or wet broadcast seeding. Wet broadcast seeding is an effective treatment for temporary erosion control and may be used when hydroseeding late in the season or on certain site conditions where hydroseeding is not practical. To support successful seed germination, seed will be broadcast once soil compaction has been rectified and soil composition includes proper aeration and water percolation to support plant development. Where seed is broadcast, the seedbed will be restructured with a cultipacker or imprinter after seeding. Once seed is broadcast, Atlantic will rake the area lightly to encourage plant establishment and minimize the seed that migrates from the site. Some seed, for example that of pollinator species which should not be seeded too deeply, may be broadcast on top of flexterra (or similar material), based on recommendations from seed suppliers.

Hydroseeding involves the mixing of slurry (i.e., seed, water, fertilizer, tackifier, or mulch) in a truck-mounted mixing tank and ground application via a pressurized pump. Hydroseeding is the preferred method of seed dispersal on slopes greater than 50 percent or in areas inaccessible to drill or planting equipment, where site conditions require seed adherence to the soil. Prior to hydroseeding, Atlantic will scarify the seedbed to facilitate lodging and germination of seed. Tackifiers will be applied where necessary so that seed adheres to soil. Polymer binders, if selected, will be used in accordance with manufacturer's specifications to ensure proper compatibility with fertilizers and to avoid foaming that might otherwise result from excessive agitation. All chemical components will be mixed and administered in accordance with manufacturer guidelines. In addition, hydroseeding near wetlands or waterbodies will only be conducted in accordance with the FERC Plan and Procedures and other applicable FS requirements.

11.3.1.12 Tree and Shrub Planting

The goals of planting trees and shrubs in construction work areas are to more rapidly soften visual impacts, and to establish beneficial habitat for a variety of wildlife, including birds, mammals, and pollinators. For small mammals and game birds, placement and spacing of shrubs on the landscape are important. Shrubs placed close enough together that the crowns touch or grow together to form a large clump or thicket provide excellent cover, refuge, and brood-rearing habitat that is vital in open spaces.

Recommended Tree and Shrub Species by Habitat

Tables 11.3.1-7 (FSTS01) and 10.3.1-8 (FSTS02) provide summaries of the tree and shrub plant species by habitat type recommended to be used on NFS lands. The recommended plant species for dry uplands and riparian/seep areas have a variety of pH preferences so that the appropriate plant species can be chosen depending on habitat and soil types, and elevation ranges. The maximum heights of the species are also provided in the tables. Depending on spacing, a feathered edge can be created by planting small trees on the forest/disturbance edge with shorter trees and shrubs on the other side toward the center of the right-of-way.

In addition, the plant species are also divided into deer-resistant and non- or less deer-resistant plants. To reduce the cost and effort of planting, monitoring, and replacement, deer-resistant plants may be given preference. However, the non-resistant apple, plum, hazelnut, and persimmon species are of high value to wildlife and also preferred for inclusion, and these particular species will be protected by fencing cages to prevent deer browse. Non-resistant plants without fencing may also be used but may receive damage, possibly leading to the need for replacement.

TABLE 11.3.1-7

Tree and Shrub Species FSTS01: Recommended Tree and Shrub Species for Dry Uplands Areas

Common Species Name	Scientific Name	Height (Inches)	pH Range	Wetland Indicator Status [a]	Planting Instructions (Feet apart)
Deer Resistant					
Common Serviceberry	*Amelanchier arborea*	36	4.8-7.5	FAC	20
Canadian Serviceberry	*Amelanchier canadensis*	23	5.5-7.5	FAC	15
Allegheny Serviceberry	*Amelanchier laevis*	25	<6.8		15
Devil's Walking Stick	*Aralia spinose*	20	Varies	FAC	8 apart in clumps or offset rows
Pawpaw	*Asimina triloba*	30	4.7-7.2	FAC	15
Washington Hawthorne	*Crataegus phaenopyrum*	30	6.8-7.2	FAC	15
Bigfruit Hawthorne	*Crataegus macrosperma*	20	Varies		15
Black Huckleberry	*Gaylussacia baccata*	6	Acidic	FACU	6 apart in clumps or offset rows
Gray Inkberry [b]	*Ilex glabra*	8	4.5-7.0	FAC	6 apart in clumps or offset rows
Mountain Holly [b]	*Ilex montana*	30	Acidic	FACU	20
Mountain Laurel	*Kalmia latifolia*	15	Acidic	FACU	8 apart in clumps or offset rows
Common Spicebush [b]	*Lindera benzoin*	9	5.0-8.9	FAC	8 apart in clumps or offset rows
Red Mulberry [b]	*Morus rubra*	70	5.0-7.0	FACU	20
Red Spruce	*Picea rubens*	110	4.0-5.8	FACU	20
Appalachian Gooseberry	*Ribes rotundifolium*	5	6.1-8.5		4apart in clumps or offset rows
American Black Elderberry	*Sambucus canadensis*	12	5.0-8.9	FAC	6 apart in clumps or offset rows
Southern Arrowwood	*Viburnum dentatum*	9	<6.8	FAC	7 apart in clumps or offset rows
Blackhaw	*Viburnum prunifolium*	15	6.8-7.2	FACU	8 apart in clumps or offset rows
Not/Less Deer Resistant					
Chinquapin	*Castanea pumila*	20	4.5-6.6		10
New Jersey Tea	*Ceanothus americanus*	3	4.3-6.5		4 apart in clumps or offset rows
Common Hackberry	*Celtis occidentalis*	60	6.0-7.8	FACU	50
Flowering Dogwood	*Cornus florida*	30	4.8-7.7	FACU	30
Gray Dogwood)	*Cornus racemose*	6	4.8-7.4	FAC	3 apart in clumps or offset rows
American Hazelnut	*Corylus Americana*	10	5.0-7.0	FACU	10 apart in clumps or offset rows
Beaked Hazelnut	*Corylus cornuta*	8	4.8-7.5	FACU	8 apart in clumps or offset rows
Cockspur Hawthorn	*Crataegus crus-galli*	30	4.5-7.2	FACU	25

TABLE 11.3.1-7

Tree and Shrub Species FSTS01: Recommended Tree and Shrub Species for Dry Uplands Areas

Common Species Name	Scientific Name	Height (Inches)	pH Range	Wetland Indicator Status [a]	Planting Instructions (Feet apart)
American Persimmon [b]	*Diospyros virginiana*	55	4.7-7.5	FAC	35
American Witchhazel	*Hamamelis virginiana*	20	4.5-6.2	FACU	15
American/Sweet Crabapple	*Malus coronaria*	30	7.0-basic		30
Sourwood	*Oxydendrum arboretum*	35	4.0-6.5	UPL	20
Allegheny Plum	*Prunus alleghaniensis*	20	5.0-7.5		20
American Plum	*Prunus Americana*	25	5.0-7.0	FACU	20
Chickasaw Plum	*Prunus angustifolia*	25	5.0-7.5		20
Staghorn Sumac [b]	*Rhus typhina*	30	6.8-7.2		15 apart in clumps or offset rows
American Mountain Ash	*Sorbus Americana*	20	Acidic	FACU	15
Lowbush Blueberry	*Vaccinium angustifolium*	2	<6.8	FACU	2 apart in clumps or offset rows

Source: FS, 2017.

[a] FAC = facultative (occurs in wetlands and non-wetlands); FACU = facultative upland (usually occurs in non-wetlands, but may occur in wetlands); UPL = upland (almost never occur in wetlands).

[b] Dioecious (male and female flowers occur on separate plants).

TABLE 11.3.1-8

Tree and Shrub Species FSTS02: Recommended Tree and Shrub Species for Riparian/Seep Areas

Common Species Name	Scientific Name	Height (Inches)	pH	Wetland Indicator Status [a]	Planting Instructions (Feet apart)
Deer Resistant					
False Indigo Bush	*Amorpha fruticose*	10	5.0-8.5	FACW	7 apart in clumps or offset rows
Red Chokeberry	*Aronia arbutifolia*	12	<6.8	FACW	4 apart in clumps or offset rows
River Birch	*Betula nigra*	70	3.0-6.5	FACW	50
Common Buttonbush	*Cephalanthus occidentalis*	12	4.7-8.6	OBL	4 apart in clumps or offset rows
Silky Dogwood	*Cornus amomum*	10	5.0-7.0	FACW	6 apart in clumps or offset rows
Redosier Dogwood	*Cornus sericea*	20	<7.0	FACW	6 apart in clumps or offset rows
Green Hawthorne	*Crataegus viridis*	30	4.3-7.3	FACW	25
Bushy St. John’s Wort	*Hypericum densiflorum*	5	5.5-7.0	FACW	3 apart in clumps or offset rows
Winterberry Holly [b]	*Ilex verticillata*	10	4.5-7.5	FACW	6 apart in clumps or offset rows
Common Ninebark	*Physocarpus opulifolius*	10	4.5-6.5	FACW	5 apart in clumps or offset rows
Swamp Rose	*Rosa palustris*	8	4.0-7.0	OBL	5 apart in clumps or offset rows
Pussy Willow [b]	*Salix discolor*	20	6.8-7.2	FACW	8 apart in clumps or offset rows
Steelebush	*Spiraea tomentosa*	4	Acidic	FACW	4 apart in clumps or offset rows
Not/Less Deer Resistant					

TABLE 11.3.1-8

Tree and Shrub Species FSTS02: Recommended Tree and Shrub Species for Riparian/Seep Areas

Common Species Name	Scientific Name	Height (Inches)	pH	Wetland Indicator Status [a]	Planting Instructions (Feet apart)
Hazel Alder	*Alnus serrulata*	15	5.0-7.0	OBL	7 apart in clumps or offset rows
Highbush Blueberry	*Vaccinium corymbosum*	12	4.7-7.5	FACW	5 apart in clumps or offset rows
Possumhaw	*Viburnum nudum*	16	<6.8	OBL	7 apart in clumps or offset rows

Source: FS, 2017.

[a] FACW = facultative wetland (usually occurs in wetlands, but may occur in non-wetlands); OBL – obligate wetland (almost always occurs in wetlands).

[b] Dioecious (male and female flowers occur on separate plants).

Native Plant Sources

In accordance with the FS recommendations, all species planted will be native to the area. The seed source or ecotype for the saplings will emphasize local sources, with first preference for within-state, then mountainous regions of an adjacent state, followed by within the Appalachian Mountain region. The seed source or ecotype will be verified with the vendor.

Care of Saplings, and Planting Procedures

Trees and shrubs will be planted as at least two-year old saplings. They will be planted while still dormant, in early spring, if possible. Some species may be planted in late fall/early winter when dormant. The saplings will not be allowed to dry out during the planting process. To avoid saplings drying out and to ensure proper tree planting, the following instructions will be followed:

<u>Care of Handling</u>

- **Protection from Sun, Wind, and Adverse Temperature.** Saplings will be handled, stored, and transported in a manner to protect them from sun and wind. Only one bag/bundle of saplings will be opened at a time. Partially used bags will be kept closed to prevent exposure of sapling roots to air. Any bag that is torn, separated, or otherwise opened inadvertently will be quickly patched or otherwise resealed. Partially used bundles will be kept rolled and tied to prevent exposure of sapling roots to air.

- **Keeping Sapling Roots Moist**. Sapling roots will be kept moist at all times prior to and during planting. Roots of saplings in opened bags or bundles will be watered if the roots begin to dry. Saplings not being planted will be kept under a tarp in a protected and shaded area.

- **Protection from Contamination and Damage**. Saplings will be protected from contamination by materials such as gasoline, diesel fuel, oils, or chemicals. Saplings will not be damaged by hitting the root or striking the roots across an object to remove excess soil. Roots will not be cut or pruned.

Planting Procedures

- saplings will not be separated prior to placement in planting bags. One bag will be opened at a time. Another bag will not be opened until the previously opened bag is empty. Planting bags will be free of tears and holes.

- only one sapling at a time will be removed from the planting bag. This will be done after the planting hole has been made in the ground with a dibble bar, auger, or other suitable planting tool.

- each sapling will be planted in a vertical position in a debris-free hole.

- each sapling will be planted to a depth where groundline is at approximate root collar level.

- soil will be firmly packed around each planted sapling. The planting hole will be closed first at the bottom and then at the top. Soil will be firmly packed around each sapling and free from air pockets.

- saplings will be planted in a manner to prevent "U" roots, "J" roots, "L" roots, and twisted or balled roots.

- saplings will not be planted in frozen ground or during freezing weather.

- trees or shrubs will not be planted in standing water.

- if a large rock is encountered and removed while digging planting holes, it will be placed far enough off to the side or into the forest to protect maintenance equipment when mowing.

- to avoid possible root damage, planting tools will not be used to maneuver roots of saplings into holes.

Planting Configuration and Select Fencing

Planting Configuration

- those species that form low, bushy, dense cover will be planted in a clump or offset rows, as indicated in the tables. At least ten individuals will be planted at the specified spacing distances in order to form the cover or thicket.

- those species that are more of a tree form will be planted at the specified spacing distances with at least five individuals together for those that are monoecious in reproductive morphology (having male and female flowers on the same plant). For those trees and shrubs that are dioecious (having male and female flowers on different plants), as indicated in the tables, at least ten individuals will be planted together at the specified distances if the sexes of the plants are unknown. If the sexes of the saplings are known, then five plants may be planted instead of ten with one male to four females.

- more than the above-mentioned minimums may be planted for each species in a given location, but a variety of species will be planted in each area.

Select Fencing

Apple, plum, hazelnut, and persimmon trees will be individually fenced immediately after planting to protect from deer browse. Five- to six-foot tall, 12- to 14-gauge welded wire fence with 2 inches by 4 inches openings between wires, or its functional equivalent, will be installed. The fence/cage around each of the above- mentioned saplings will be four feet in circumference to allow for crown spread within the fence. Each fence will be staked using two metal t-posts or other strong support and secured to the fence using metal clips, wire, or zip ties.

11.3.2 Additional Restoration Mitigation Measures for NFS Lands

On NFS lands, additional measures will be implemented, in conformance with LRMP standards and guidelines, and recommendations from FS staff. If a mitigation measure or BMP is more stringent than its counterpart FS mitigation measure below, the more stringent measure will be applied.

11.3.2.1 Monongahela National Forest

- use of wheeled and/or tracked motorized equipment may be limited on soil types that include the following soil/site area conditions: d) soils commonly wet at or near the surface during a considerable part of the year, or soils highly susceptible to compaction. Equipment use will normally be prohibited or mitigated when soils are saturated or when freeze-thaw cycles occur (**MNF LRMP SW07**). The MNF is considering a project-specific LRMP amendment to this standard.

- management actions that have the potential to contribute to soil nutrient depletion will be evaluated for the potential effects of depletion in relation to on-site acid deposition conditions (**MNF LRMP SW08**).

- inventory the soil resource to the appropriate intensity level as needed for Project planning and/or design considerations (**MNF LRMP SW10**). Liming soils with a surface pH of less than 5.5 will be considered except where there is an objective to maintain acidic ecosystems (**MNF LRMP SW13).**

- mulch will be applied to all disturbed soils in the MNF.

- on NFS lands where topsoil will be segregated, O and A horizons and transition soil horizons AB and BA are considered topsoil.

11.3.2.2 George Washington National Forest

- where soils are disturbed by management activities, appropriate revegetation measures will be implemented. When outside the normal seeding seasons, initial treatments may be of a temporary nature, until permanent seeding can be applied. Revegetation should be accomplished within 5 years. For erosion control, annual plants should make up >50 percent of seed mix when seeding outside the normal seeding season and the area should be reseeded with perennials within 1½ years (**GWNF LRMP FW-9).**

- clearcutting is not allowed where high risk soils (soils very susceptible to nutrient depletion and acidification) are identified (**GWNF LRMP FW-12).**

- on NFS lands where topsoil will be segregated, O and A horizons and transition soil horizons AB and BA are considered topsoil.

11.3.3 Riparian Restoration

Following initial stream bank stabilization, Atlantic will restore the banks of waterbodies and floodplains to preconstruction contours to the extent practicable. In steep-slope areas, re-grading may be required to reestablish stable contours capable of supporting preconstruction drainage patterns. Riparian areas will be revegetated with native species across the entire width of the construction corridor. Restoration of riparian areas will be designed to:

- restore stream bank integrity as well as floodplain and riparian functioning, including both shore crossings up to the ordinary high water mark and the area outwards from the streambank a minimum of 100 feet, and in accordance with LRMP standards and guidelines;

- withstand periods of high flow without increasing erosion and downstream sedimentation; and

- include temporary erosion control fencing, which will remain in place until stream bank and riparian restoration is complete.

Permanent bank stabilization and erosion control devices (e.g., natural structures, rock riprap, and/or large woody debris) will be installed as necessary on steep banks in accordance with permit requirements and any recommendations from the geohazard analysis to permanently stabilize the banks and minimize sediment deposition into waterbodies.

11.3.3.1 Forested Riparian Areas

Restoration of forested riparian areas will include seeding as discussed above, and will include supplemental plantings of tree seedlings and shrubs in temporary work areas. Clearing of riparian trees in forested areas will reduce shade near streams, and may allow for an increase in local water temperature. Large woody debris, where available and appropriate habitat conditions exist, will be placed adjacent to waterbody crossings to add shade and fish habitat. Fast growing native trees and shrubs will be placed closest to the bank top to provide canopy recovery as quickly as possible to shade and overhang the waterbodies.

11.3.4 Wetland Restoration

Restoration of wetland areas will include seeding with mixes listed in Table 11.3.1.5. Atlantic will employ clearing and construction techniques designed to support regeneration of existing wetland vegetation, including the following:

- clearing vegetation at ground level in all non-forested wetland areas outside of the trench line to leave existing root systems intact to help stabilize soils, preserve existing ground elevations, and promote revegetation through sprouting and from existing seed stocks;

- using equipment mats to prevent soil compaction and allow intact root systems to regrow;

- replacing the topsoil segregated from the trenchline in unsaturated wetlands to promote reestablishment of existing wetland species and preserving the vegetative propagules (i.e., seeds, tubers, rhizomes, and bulbs) within the soil, which will have the potential to germinate or sprout when the topsoil is replaced; and

- limiting the removal of stumps to the trench area in forested wetlands, except where safety considerations necessitate additional stump removal, as retained stumps will facilitate reestablishment of woody species by enabling re-sprouting from existing root structures.

In accordance with the FERC Procedures, Section 10 of this COM Plan (Stream and Wetland Crossing Procedures) and any relevant USACE permit requirements, sediment barriers will be installed immediately following clearing activities occurring within wetlands or adjacent upland areas along the pipeline right-of-way. Where necessary, sediment barriers will be installed across the construction right-of-way immediately upslope of the wetland boundary to prevent sediment flow into wetlands. Sediment barriers will be properly maintained throughout construction, reinstalled as necessary, and removed after restoration is complete and revegetation has stabilized the disturbed areas.

Any woody vegetation within wetlands will not be allowed to fully reestablish within portions of the permanent right-of-way centered over the pipeline trench line. Atlantic will periodically remove woody species from wetlands to facilitate post-construction inspections of the permanently maintained right-of-way. Where the pipeline crosses wetlands, Atlantic will clear or trim woody vegetation that impedes aerial visibility of a 30-foot wide corridor centered over the pipeline.

11.3.5 Exposed Bedrock

Exposed bedrock areas will be treated with the Earthguard Fiber Matrix Erosion Control System, which is a hydraulically applied system for slope stabilization and revegetation.

11.4 RESTORATION MONITORING AND MAINTENANCE

11.4.1 Restoration Monitoring

The purpose of the monitoring program is to evaluate the long-term status and effectiveness of restoration efforts and to determine locations where remedial seeding or planting may be required. Progress toward meeting success criteria for both the seeding and planting efforts will be assessed. Assessments of vegetative progress will be made with respect to how well those efforts are performing to reduce visual impacts as well.

Post-construction monitoring for vegetative cover will be conducted annually a minimum of 2 years following initial restoration. Similar monitoring will be done for activities such as erosion control repair or operations-related activities that require re-seeding.

Trees and shrubs will be monitored for survival and fencing conditions. Monitoring will occur one year and three years after planting and will be performed anytime from bud break in the spring to leaf drop in the fall. If survival in any clump of planted species is less than 50 percent, dead plants will be replaced. If survival of a particular species continues to be low in any given area, fencing may be required, or a different species will be substituted. Fencing that is damaged enough to impede the growth of the plants they protect will be repaired or replaced. After the third-year monitoring effort, Atlantic will consult with the FS to determine whether additional monitoring of woody plants is warranted.

Maintenance clearing of the pipeline right-of-way is discussed in Section 2.2.1. NNIS post-construction monitoring and treatment is discussed Section 11. Care will be taken during any herbicide use to avoid inadvertent application on native plantings, including suckers emanating from them.

11.4.1.1 Revegetation Performance Criteria/Standard

The long-term goal of restoration is to restore structure and function on disturbed areas that will eventually lead to the establishment of self-sustaining native or introduced plant communities. To determine whether disturbed areas are progressing toward this goal, the following performance criteria will be used to assess restoration success along restored sites on NFS lands. After revegetation is determined successful by the FS, the FS will provide guidance on the monitoring frequency to assure that the remainder of the right-of-way is properly maintained.

- revegetation will be considered successful if upon visual survey the density and cover of non-nuisance vegetation are similar in density and cover to adjacent undisturbed lands.

11.4.1.2 Qualitative Monitoring

Qualitative monitoring will be conducted for a minimum of 2 years following initial restoration at all restored areas on NFS lands. The goal of the qualitative monitoring is to document and evaluate the need for remediation to ensure the restored areas are progressing toward the performance success standard.

During monitoring, the extent of plant ground cover will be estimated at each restored site. Other site characteristics that will be monitored in addition to ground cover include soil erosion, natural recruitment of native plant species, reproduction, non-native invasive plant species abundance, wildlife use, and pattern of established vegetation (i.e., pattern of large interspaces)[23]. Lack of erosion at a site is one indicator of soil stability. Natural recruitment and/or reproduction indicate that important functional processes are in place that facilitate regeneration, such as pollination and seed dispersion. Non-native invasive plant species potentially compete with the seeded species and relatively high abundance can have negative effects on site conditions. Evidence of wildlife use is an indicator that habitat conditions are being restored.

Based on monitoring observations, the restored site will be given a success rating and determinations will be made regarding any necessary remedial activities, which may include reseeding the site, spot seeding, or supplemental erosion control. Recommendations may also include waiting another year or two prior to any remediation to allow for favorable re-establishment conditions, based on the judgement of the restoration specialists and the severity of the situation. Photography will be used to help document the status of the recovery of all sites. Photography will also be used to document the success of revegetation as it pertains to reducing impacts to scenery (e.g. vegetative plantings, right-of-way feathering, screening).

11.4.1.3 Quantitative Monitoring

Performance of the revegetation success will be measured on restored areas to supplement the qualitative monitoring described in Section 11.4.1.2. Sample locations within the restored areas will be randomly selected. Sample size adequacy will be calculated to ensure sufficient samples are taken to estimate the mean success parameters with an appropriate level of confidence.

[23] Although soil erosion and NNIS observations will be noted during the revegetation surveys, both erosion and NNIS surveys are principally conducted under separate monitoring efforts, as discussed in COM Plan Sections 9 and 12, respectively.

Revegetation success will be monitored by using a 1 x 1 meter quadrant sampling method to assess plant cover in the monitoring plots. Quadrants will be randomly placed in each of the monitoring plots in each of the six revegetation seed mix areas (see seed mix tables in Section 11.3.1.11) to measure plant ground cover. The location and number of monitoring plots will be determined in consultation with the FS.

11.4.1.4 Reporting

At the end of the growing season Atlantic will include with one of the quarterly monitoring reports required by the FERC Plan a preliminary report summarizing the results of the revegetation monitoring effort and identifying where remedial seeding or planting is recommended. Areas that need remedial action will be identified by milepost, accompanied by photos, and include a description of recommended remedial measures, such as supplemental seeding or planting. Upon FS approval, remedial seeding or other remedial measures will be implemented within the same field season.

An annual summary report, including a summary of corrective actions taken and photographs of representative areas, problem areas, etc., will be submitted during the first quarter of the following year. This annual report may be combined with reporting on monitoring/remediation efforts for erosion control and NNIS management.

12.0 NON-NATIVE INVASIVE PLANT SPECIES MANAGEMENT PLAN

12.1 PURPOSE

The areas crossed by the ACP contain widespread populations of many noxious weeds and other non-native invasive plant species. The purpose of this Non-Native Invasive Plant Species Management Plan is to describe methods to prevent and control the introduction or spread of non-native invasive plant species during and following construction of the Project on NFS lands. Atlantic and its Contractors[24] will be responsible for implementing the procedures described in this plan.

12.1.1 Training

Prior to the start of construction, Atlantic will conduct environmental training for Company and Contractor personnel. The training program will focus on the FERC's Plan and Procedures, the COM Plan, including this Non-Native Invasive Plant Species Management Plan, and applicable permit conditions. In addition, Atlantic will provide large-group training sessions before each work crew commences construction with periodic follow-up training for groups of newly assigned personnel.

12.2 JURISDICTION

Noxious weeds are plant species designated by federal, state/commonwealth, or county/city governments as injurious to public health, agriculture, recreation, wildlife, or property (Sheley et al., 1999). The more general term "non-native invasive species" is used for species that are non-native to an ecosystem and whose introduction causes or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112). Non-native invasive plants include not only noxious weeds, but other plants that are not native to an area. Both noxious weeds and non-native invasive plants are considered opportunistic species that flourish in disturbed areas and prevent native plants from establishing successive communities.

Under Executive Order 13112, a federal agency shall not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of non-native invasive species in the United States or elsewhere unless it has been determined that the benefits of such actions outweigh the potential harm caused by non-native invasive species, and that all feasible and prudent measures to minimize the risk of harm will be implemented.

The non-native invasive species found on the MNF and GWNF are monitored by the FS as outlined in the respective Forests' LRMPs. The results of the non-native invasive species surveys along the proposed route on NFS lands are included in Attachment J.

12.3 NON-NATIVE INVASIVE PLANT SPECIES SURVEYS

Atlantic conducted field surveys for FS-listed non-native invasive plant species within a 300-foot-wide corridor along the proposed ACP pipeline route. A list of the non-native invasive plant species identified through July 2016 in the ACP survey corridors is provided in Table 12.3-1. The milepost locations of non-native invasive plant species identified through July 2016 are provided in Attachment J.

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[24] Contractor refers to the company or companies retained by Atlantic or another contractor to construct the proposed facilities.

TABLE 12.3-1

Non-Native Invasive Plant Species Identified Within the Monongahela and George Washington National Forests

Latin Name	Common Name	Atlantic Coast Pipeline
Acer platanoides	Norway maple	
Ailanthus altissima	Tree of heaven	
Alliaria petiolata	Garlic mustard	X
Amaranthus hybridus	Common pigweed or green amaranth	
Ampelopsis brevipendunculata	Porcelain berry	
Anthoxanthum odoratum	Sweet vernal grass	
Arctium minus	Lesser burrdock	
Arthraxon hispidus	Jointed grass or small carpetgrass	
Barbarea vulgaris	Winter cress or yellow rocket	
Berberis thunbergii	Japanese barberry	X
Bidens aristosa	Ozark tickseed sunflower	
Bromus commutatus	Hairy chess or meadow brome	
Bromus inermis var. inermis	Smooth brome	
Bromus sterilis	Barren bromegrass or poverty brome	
Bromus tectorum var. tectorum	Downy chess or cheatgrass	
Butomus umbellatus	Flowering rush	
Carduus crispus	Curled thistle	
Carduus nutans	Musk Thistle	
Celastrus orbiculata	Oriental bittersweet	
Centaurea biebersteinii (C. maculosa)	Spotted knapweed	
Chrysanthemum leucanthemum	Ox-eye daisy	
Cichorium intybus	Chicory	
Cirsium arvese	Canada thistle	
Cirsium vulgare	Bull thistle	
Clerodendrum trichotomum	Harlequin glorybower	
Coronilla varia	Crown vetch	
Daucus carota	Queen Anne’s lace	
Dioscorea oppositifolia	Chinese yam	
Dipsacus laciniatus	Cut-leaved teasel	
Echium vulgare	Viper’s bugloss	
Elaeagnus angustifolia	Russian olive	
Elaeagnus umbellata	Autumn olive	X
Elytrigia repens	Quackgrass	
Epipactis helleborine	Broadleaf hellborine	
Festuca aruninacea	Kentucky 31 fescue	
Festuca elatior	Tall fescue	
Festuca pratensis	Meadow fescue	
Glechoma hederacea	Ground ivy or gill-over-the-ground	
Heracleum mantegazzianum	Giant hogweed	
Heracleum mantegazzianum	Giant hogweed	
Hesperis matronalis	Dame’s rocket	
Hieracium pretense	King devil or field hawkweed	
Holcus lanatus	Velvet grass	
Hydrilla verticillata	Hydrilla	
Hydrilla verticillata	Hydrilla	
Hypericum perforatum	Common St. John’s wort	
Iris pseudacorus	Yellow iris or yellow flag	
Lespedeza bicolor	Japanese bushclover	

TABLE 12.3-1

Non-Native Invasive Plant Species Identified Within the Monongahela and George Washington National Forests (cont'd)

Latin Name	Common Name	Atlantic Coast Pipeline
Lespedeza cuneata	Sericea lespedeza	
Ligustrum obtusifolium	Regal privet or border privet	
Ligustrum vulgare	European privet or common privet	
Lonicera spp.	Japanese amur, Morrow's, Tartarian, or Bell's honeysuckle	
Lysimachia nummularia	Moneywort or creeping jenny	
Lythrum salicaria	Purple loosestrife	
Melilotus alba	White sweet clover	
Melilotus officinalis	Yellow sweet clover	
Microstegium vimineum	Japanese stiltgrass	X
Muscari botryoides	Grape hyacinth	
Myriophyllum spicatum	Eurasian water-milfoil	
Orinthogalum umbellatum	Star of Bethlehem	
Orithogalum nutans	Drooping star of Bethlehem	
Paulownia tomentosa	Princess-tree	
Perilla frutescens	beefstakeplant	
Phleum pretense	Timothy	
Phragmites australis	Common reed	
Plantago major	Great plantain	
Poa compressa	Canada bluegrass	
Poa pratensis	Kentucky bluegrass	
Poa trivialis	Rough bluegrass	
Polygonum aviculare	Knotweed	
Polygonum cespitosum var. longisetum	Asiatic water pepper	
Polygonum cuspidatum	Japanese knotweed	
Polygonum sachalinense	Sachaline or giant knotweed	
Poncirus trifoliate	Hardy orange	
Potamogeton crispus	Curly pondweed	
Pueraria lobate	Kudzu	
Ranunculus ficaria	Lesser celandine or fig buttercup	
Rhamnus cathartica	Common buckthorn	
Rhodotypos scandens	Jetbead	
Rorippa sylvestris	Creeping yellow cress	
Rosa multiflora	Multiflora rose	X
Rubus phoenicolasius	Wineberry	
Rumex acetosella	Sheep sorrel	
Rumex crispus	Yellow dock or curly dock	
Sorghum halepense	Johnsongrass	
Spiraea japonica	Japanese spiraea	
Stellaria media	Common chickweed	
Tussilago farfara	Colt's-foot	X
Verbascum Thapsus	Great mullein	
Vinca minor	Periwinkle	

12.4 NON-NATIVE INVASIVE PLANT SPECIES MANAGEMENT

The non-native invasive plant species management program for the ACP is designed to:

- identify areas supporting non-native invasive plants prior to construction;
- prevent the introduction and spread of non-native invasive plants from construction equipment moving along the right-of-way, including ATWS, staging areas and construction access roads where widening or other ground disturbance will take place outside the existing road prism;
- contain non-native invasive plant propagules by preventing segregated topsoil from being spread to adjacent areas along the construction right-of-way; and
- address non-native invasive plant infestations caused by restoration and operation of the Project.

Attachment J identifies the primary and alternative treatment methods for non-native invasive species identified during survey in the ACP Project area. The primary and/or alternative treatment method will be used based on the growing stage and prevalence of the non-native invasive species. Methods may vary based on proximity to environmental features (e.g., wetlands, open water, sensitive species locations, and agricultural fields), in accordance with FS regulations, and MNF and GWNF LRMPs. Atlantic has reached out to the West Virginia Natural Heritage Program for recommendations for herbicide treatment adjacent to sensitive features, but has not yet received a response. Recommendations from the Virginia Natural Heritage Program have been incorporated into the COM Plan. Populations species listed in the “Regional Forester’s Sensitive Species and Occurrence Analysis Results” found adjacent to non-native invasive plant species and their recommended herbicide treatment/application are included in Attachment J.

As noted above, Atlantic conducted surveys for non-native invasive plant species within the ACP Project area. Additional areas supporting non-native invasive plant species may be identified during preconstruction inspections by Atlantic’s EIs[25]. Prior to construction, the EIs will mark areas of non-native invasive plant infestations by using color-coded flagging, staking, and/or signs on the construction right-of-way. Atlantic will, in consultation with the FS, determine whether soil disturbance can reasonably be avoided within infested areas, for example by not topsoiling in these areas. Identification of existing non-native invasive plant locations will alert EIs and construction personnel to implement control measures before, during, and after construction.

LRMP goals and standards relevant to the ACP Project with respect to NNIS issues include the following:

“For management actions that have been identified by the Forest as likely to cause a negative effect on RFSS populations, negative effects will be avoided or minimized to the maximum extent practical while still accomplishing the purpose of the project or action. Unavoidable negative effects will be mitigated to the extent practical and consistent with the project purpose.” **(MNF LRMP VE13)**

“Work to prevent new infestations of NNIS, with emphasis on areas where species have a high probability for establishment and spread.” **(MNF LRMP VE19)**

[25] The role and responsibilities of an EI are defined in Section 2 (Environmental Compliance).

12.4.1 Treatment Measures

12.4.1.1 Pre-Treatment

Prior to clearing (including timber removal) and grading operations, pre-treatment of non-native invasive plant infestations will be conducted if it will aid in controlling the spread of non-native invasive plant species during construction. In general, pre-treatment will be used when the plant species has not yet gone to seed for the year and has the possibility of producing seed prior to removal during construction.

Control measures to be implemented may include the application of herbicide or mechanical measures such as mowing. The control measure chosen will be the best method available for the time, place, and species, as determined through consultation with the FS.

Herbicide application is an effective means of reducing the size of non-native invasive plant species populations. Herbicide treatment methods will be based on species-specific and area-specific conditions (e.g. annual vs. perennial species; proximity to wetlands, open water, riparian areas, or agricultural areas; and time of year), and will be coordinated with the FS prior to implementation. Hand application methods (e.g. backpack spraying) will be used to treat occurrences of non-native invasive species within the right-of-way and in other work areas. Within 60 feet of any identified sensitive plant species, only hand-pulling on NNIS species will be permitted. Preconstruction treatment of infestation areas will be controlled to minimize impacts on surrounding vegetation.

Only herbicides and application methods approved by the FS will be used on NFS lands, subject to FS permission and coordination. Application of herbicides will be completed in accordance with label directions and applicable chemical contact times (as specified by the manufacturer) in advance of clearing and grading within the construction right-of-way. Treatment may be restricted in areas that are not readily accessible (e.g., difficult topography, saturated/inundated soils) or where there are documented occurrences of protected species that could be adversely impacted by herbicide applications; such instances will be evaluated on a case-by-case basis with the FS. Atlantic will continue to work with the FS to address non-native invasive plant species control options where protected species and their habitats occur along the ACP.

In accordance with 18 CFR 380.15(f)(3), herbicides will not be used as a treatment unless authorized by the FS. Atlantic will obtain permission from the FS prior to applications of herbicides within the right-of-way or other work areas. Additionally, Atlantic will use products that are approved by the EPA for use as herbicides, and applications of these products will be in accordance with applicable regulations.

In addition to complying with 18 CFR 380.15(f)(3), Atlantic will: 1) use herbicides which are registered with the EPA; 2) apply herbicides according to specifications of the *Federal Insecticide, Fungicide, and Rodenticide Act*; and 3) use only certified applicators to apply herbicides.

Mechanical control (e.g., mowing or disking) can also be an effective control measure for annual species. The efficacy of mechanical control measures is dependent upon proper timing to cut the vegetation prior to the maturation of seed and may require multiple treatments during the growing season. However, mechanical control can also stimulate germination of certain disturbance-adapted invasive species, and will be utilized only after consultation with the FS. Mechanical control will be done outside of the migratory bird nesting periods described in the Migratory Bird Plan, wherever practical. If a conflict arises between seasonal timing of treatment for a particular NNIS plant of interest and the time-of-year restriction for nesting birds, Atlantic will consult with the FS AO to determine the appropriate action.

Both the MNF and GWNF contain populations of a federally listed plant species, the small whorled pogonia, adjacent to the construction work area. In accordance with the September, 2017 Small Whorled Pogonia Conservation Plan submitted to the FS, FWS and other agencies, herbicide use will be prohibited within 60 feet of small whorled pogonia (SWP) populations, so hand-pulling will be used to control occurrences of non-native plant encroachments within this area.

12.4.1.2 Preventive Measures during Construction

The following measures will be implemented to prevent the spread of non-native invasive plant species during construction activities.

- Atlantic will direct its Contractors to clean equipment and vehicles prior to initial arrival at contractor yards and staging areas.

- All equipment (including timber mats) will be cleaned prior to arriving on the construction site. The equipment will be inspected by the Contractor and EI to verify that it is clean of soil and debris, which are capable of transporting non-native invasive plant propagules, prior to working on the Project.

- Atlantic will install wash stations for construction equipment near the entrance and exit points of each contiguous NFS tract, outside the Forest boundaries.

- Cleaning will be conducted using high pressure washing equipment, compressed air, and/or manually to remove excess soil and debris from the tracks, tires, and blades of equipment.

- Wash water will be managed on site at the wash station. The water will be filtered or contained so that it does not transport non-native invasive plant species seeds or plant parts off-site and does not contaminate soil, groundwater, or surface water. If hydro- or petro-chemicals are present in the wash water, it will not be released on NFS lands, but taken to an approved West Virginia/Virginia waste disposal site.

- The Contractor and EI will maintain logs documenting the cleaning history of each piece of equipment. The EI will use stickers or other visual marking to identify that equipment has been cleaned and an inspection has been completed.

- Cleared vegetation and segregated topsoil from areas of non-native invasive plant infestations will be maintained adjacent to the areas from which they were removed to eliminate the transport of soil-borne propagules to other areas along the right-of-way. The stockpiles will be identified as non-native invasive plant species stockpiles with signs. The Contractor will install sediment barriers (e.g. silt fence) around the stockpiles to ensure the material is not transported to adjacent areas. During reclamation, the materials will be returned to the areas from which they were obtained.

- Equipment required for initial vegetation clearing and/or topsoil segregation in areas of non-native invasive plant infestation will be cleaned prior to leaving the area. Once the topsoil has been segregated, subsequent equipment will not require cleaning as it will not come into contact with non-native invasive plant species or topsoil potentially containing propagules. Equipment required for topsoil replacement during restoration activities will also be cleaned prior to moving out of an area of infestation.

- All equipment that comes in contact with soils potentially contaminated with non-native invasive species will be cleaned prior to being transported from ACP work sites to other job sites.

- Materials used for erosion control (e.g. straw mulch) will be weed free.

12.4.1.3 Post-Construction Treatment Methods

Atlantic's objective is to comply with regulatory and Project-specific requirements to prevent the spread of non-native invasive plant species and to treat areas of the right-of-way where, in comparison to adjacent areas, non-native invasive plant species form a significant portion of the vegetation community. Atlantic will coordinate NNIS treatments with the FS so that the FS is aware of, and can respond to, NNIS infestations near to, but outside of, Atlantic's area of responsibility. Atlantic will utilize established restoration procedures to prevent the establishment of non-native invasive plant species in areas disturbed by construction.

In non-frozen soil conditions, the construction Contractor will implement restoration procedures on disturbed lands immediately following construction. In frozen soil conditions, restoration activities will be delayed until the spring or summer following construction. In either case, ongoing revegetation and monitoring efforts will ensure adequate vegetative cover to discourage the establishment of non-native invasive plant species.

Following construction, the ACP Project area will be monitored in accordance with the Plan and Procedures. In the event that non-native invasive plant species become established in the right-of-way, or construction work areas, Atlantic will implement measures (e.g. mowing or treatment with herbicides) to control non-native invasive plants within such areas and prevent the spread of non-native invasive plants to adjacent lands that do not contain non-native invasive species. In addition, Atlantic will implement control measures at the aboveground facility sites to prevent the spread of non-native invasive plant species onto adjacent properties. Weed infestations that develop during operations as a result of construction or operations activities will be treated using approved herbicides or mechanical methods (e.g. mowing) as appropriate for the species and in accordance with applicable laws and regulations. The method selected will be the best available for the time, place, and species as determined through consultation with the FS.

Post-construction herbicide applications will be conducted prior to seed maturation where possible and where necessary. Applications will be controlled to minimize impacts on surrounding vegetation. Herbicide treatment methods will be based on species-specific and area-specific conditions as described above and will be coordinated with the FS. Hand application methods (e.g. backpack spraying) will be used to treat occurrences of non-native invasive species within the right-of-way and in other work areas. Following treatment, the need for supplemental seeding will be determined in consultation with the FS. If supplemental seeding is determined to be appropriate it will be implemented in a manner consistent with the *Restoration and Rehabilitation Plan*. The timing of subsequent revegetation efforts will be based on the persistence of the herbicide.

Mechanical methods entail the use of equipment to mow or disk non-native invasive plant species populations. Mechanical treatments will be conducted prior to seed maturation where required. If such a method is used, subsequent seeding will be conducted, if necessary, to re-establish a desirable vegetative cover that will stabilize the soils and slow the potential reoccurrence of non-native invasive plant species. Mechanical control will be done outside of the migratory bird nesting periods described in the Migratory Bird Plan, wherever practical. If a conflict arises between seasonal timing of treatment for a particular

NNIS plant of interest and the time-of-year restriction for nesting birds, Atlantic will consult with the FS AO to determine the appropriate action.

Where warranted, Atlantic will consult with the FS regarding the use of biological and alternative non-native invasive plant control methods. The implementation of these measures will require approval from the FS.

Both the MNF and GWNF contain populations of a federally listed plant species, the small whorled pogonia, adjacent to the construction work area. In accordance with the September, 2017 Small Whorled Pogonia Conservation Plan submitted to the FS and FWS, the area within 100 feet of the SWP occurrences and extending towards the Project right-of-way will be searched for non-native invasive plant species during the first three years of post-construction NNIS monitoring. Herbicide use will be prohibited within 60 feet of SWP populations, so hand-pulling will be used to control occurrences of non-native invasive plant encroachments within this area.

12.4.1.4 Monitoring

Following construction, work areas on NFS lands will be monitored for NNIS. Monitoring will be done in the spring, late enough to facilitate weed species identification, but early enough to allow for treatment at the appropriate time. Supplemental monitoring visits will be conducted as necessary for NNIS species that emerge later during the year. Within fifteen days of completion of the monitoring, Atlantic will prepare a preliminary report identifying NNIS locations and recommendations for treatment, which will be sent to the Forests for approval. Upon FS approval, treatment will be carried out that same season. Attachment J identifies the primary and alternative treatment methods for NNIS. The primary and/or alternative treatment method will be used based on the growing stage and prevalence of the non-native invasive species.

NNIS control measures will be considered successful if upon visual survey the density and cover of non-NNIS are similar in density and cover to nearby non-forested, undisturbed lands, and NNIS are absent, unless they are abundant in areas that were not disturbed by construction. Atlantic will coordinate NNIS treatments with the FS so that the FS is aware of, and can respond to, NNIS infestations near to, but outside of, Atlantic’s area of responsibility.

Atlantic will submit an annual summary report of the year’s monitoring and treatment of NNIS, during the first quarter of the following year. This annual report may be combined with reporting on erosion control and revegetation monitoring/remediation. Atlantic will continue NNIS monitoring and treatment for five years following completion of construction on a given spread. Beginning with the sixth year following construction, the FS will monitor the right-of-way on NFS lands for NNIS. Atlantic will annually reimburse the FS for reasonable costs to monitor and treat NNIS within the right-of-way.

12.5 HERBICIDES

12.5.1 Herbicide Application and Handling

To comply with the MNF and GWNF LRMPs, a selective herbicide application method will be utilized. Herbicide application will be based on information gathered from field surveys and consultations with the FS. Before application, Atlantic or its Contractors will obtain required FS approval. Herbicide application will be conducted in accordance with applicable laws, regulations, and LRMP standards, by a licensed contractor. Hand application methods (e.g. backpack spraying) will be used to treat occurrences of non-native invasive species within the right-of-way and in other work areas.

Calibration checks of equipment will be conducted at the beginning of spraying and periodically to ensure proper application rates.

Herbicides will be transported to the site with the following provisions:

- on-site herbicide quantities will be limited where practical;
- concentrate will be transported in approved containers only, in a manner that will prevent tipping or spilling, and in a compartment that is isolated from food, clothing, and safety equipment;
- mixing will be conducted in an upland area and at a distance greater than 100 feet from waterbodies or wetlands; greater than 200 feet from private wells, private land, riparian corridors, open water, or other sensitive areas;
- herbicides will not be ground applied within 60 feet of any known threatened, endangered, proposed, or sensitive plant, buffers will be clearly marked, and physical barriers must be sufficient to protect the non-target vegetation from herbicide drift and flow;
- storage and handling of all herbicides and equipment will be in accordance with all applicable regulations; and
- all herbicide equipment and containers will be maintained as needed and inspected for leaks on a daily basis.

12.5.2 Herbicide Spills

Atlantic has prepared and will implement a SPCC Plan (Section 13) to avoid or minimize the potential impact of hazardous material spills during construction and operation of the Project. In accordance with this plan, herbicide contractors will be responsible for keeping spill kits in their vehicles and in herbicide storage areas to allow for quick and effective response to spills. Response to an herbicide spill will vary depending on the material spilled, and the size and location of the spill. The order of priorities after discovering a spill are to protect the safety of personnel and the public, minimize damage to the environment, and conduct cleanup and remediation activities.

All herbicide contractors will obtain and have readily available copies of the appropriate Safety Data Sheets (formerly known as Material Safety Data Sheets) and labels for the herbicides used. All herbicide spills will be reported in accordance with applicable laws and requirements. Further information regarding spill response and reporting is provided in the SPCC Plan.

12.6 OTHER CONTROL MEASURES

As outlined in the MNF and GWNF LRMPs, Atlantic will use a secondary treatment method in the event the temperature requirements have been exceeded and/or the wind speed has been exceeded on the day of application. Other control measures like hand pulling, and/or basal spot treatment may be utilized. Treatment methods would be species-specific or based on proximity to sensitive features. Stem-specific treatments should be used on rock outcrops or sinkholes. Atlantic will ensure soil-active herbicides will not be used on slopes over 45 percent or on aquifer recharge zones. These areas will be marked by buffers. Atlantic will continue to coordinate with the FS during construction to ensure these treatment measures are implemented as an alternative to the primary method of herbicide application.

12.7 TREATMENT SCHEDULE

Atlantic will provide the FS with a pre-construction treatment schedule once the Project nears the construction period. Post-construction treatment timing will be based on the specific recommendations contained within the preliminary NNIS monitoring report as described in Section 12.4.1.4, and will generally align with the time frames provided in Attachment J.

13.0 SPILL PREVENTION, CONTROL, AND COUNTERMEASURE PLAN

13.1 PURPOSE

The purpose of this SPCC Plan is to identify preventive measures, such as training, equipment inspection, and refueling procedures, to reduce the likelihood of spills; and mitigation measures, such as containment and cleanup, to minimize potential impacts should a spill occur. Atlantic's construction Contractors, [26] whose activities could result in a spill of fuel or other hazardous materials, will be required to adopt the following protocols for spill prevention, cleanup, and reporting during construction of the ACP.

Transportation and temporary storage of hazardous materials, including fuels, oils, hydraulic fluid, and blasting materials, could be required on NFS lands. The locations of temporary storage areas for these materials on NFS lands will be determined in consultation with FS staff and discussions with the construction contractor.

13.2 TRAINING

Prior to the start of construction, Atlantic will conduct environmental and safety training for Company and Contractor personnel. The training program will focus on the FERC Plan and Procedures, the COM Plan, including this SPCC Plan, and applicable permit conditions. In addition, Atlantic will provide large-group training sessions before each work crew commences construction with periodic follow-up training for groups of newly assigned personnel.

Experienced, well-trained personnel are essential for the successful implementation of the SPCC Plan. Contractors will provide spill prevention and response training to their work crews. The training program will be designed to improve awareness of safety requirements, pollution control laws, and proper operation and maintenance of equipment. Contractors will train all employees who handle fuels and other regulated substances to prevent spills and to quickly and effectively contain and cleanup spills that may occur in accordance with applicable regulations and the provisions of this plan.

13.3 ROLES AND RESPONSIBILITIES

A. **Spill Coordinator –** Each Contractor will appoint a Spill Coordinator who will be responsible for coordinating Contractor Work Crews for spill cleanup, conducting site investigations, and completing spill reports. The Spill Coordinator will report spills to an EI, who will initiate the spill reporting process (see Section 13.6). The Spill Coordinator will be responsible for completing a Spill Report Form (Attachment K) within 24 hours of the occurrence of a spill, regardless of the size of the spill.

B. **Contractor Work Crews –** Contractor Work Crews will comply with this SPCC Plan and will notify the crew foreman or Spill Coordinator immediately of a spill of fuel or other hazardous material, regardless of the volume of the spill.

C. **Environmental Inspectors –** The EIs will monitor the Contractors' compliance with the provisions of the SPCC Plan to ensure that spill resources are allocated and cleanup is accomplished in accordance with this plan and applicable regulatory requirements. The EIs will work in conjunction with Atlantic's environmental team to promptly report spills to appropriate federal, state/commonwealth, and local agencies, as required, and to

[26] Contractor or Contractors refer to the company or companies retained by Atlantic or another contractor to construct the proposed facilities.

coordinate with these agencies regarding contacting additional parties or agencies as may be required.

13.4 PREVENTIVE MEASURES

Contractors will minimize the potential for a spill during construction activities by implementing appropriate measures to prevent and contain spills. Equipment and materials will be located onsite to meet the provisions of this plan. The Contractors will comply with applicable environmental and safety laws and regulations, and the standards within the MNF and GWNF LRMPs. Contractors will ensure that a copy of this plan is available onsite to all construction crew members and Forest Service Fire Management personnel (**GWNF LRMP FW149; MNF LRMP FM01**). All cleanup and other construction-related spill activities will be completed by the appropriate Contractors.

Spill prevention measures are described below.

A. Prior to construction, the Contractors will provide site-specific descriptions and maps depicting locations of fixed and mobile hazardous material containers and the types of materials located within containers. The site-specific descriptions and maps will identify the direction, rate of flow, and total quantity of petroleum or hazardous liquid that could be discharged from containers or from major equipment failures.

B. Contractors will visually inspect aboveground storage containers for leaks and spills on a regular basis and whenever containers are refilled. Contractors will maintain inspection records for every container.

C. Contractors will construct secondary containment structures (e.g. temporary liners and seamless impermeable berms) around aboveground single wall, storage containers so that liquids will be contained and collected in specified areas isolated from waterbodies in the event of a leak or spill. Double wall containers will not require secondary containment. Storage containers will not be placed in areas subject to periodic flooding and washout.

D. Secondary containment structures must provide a containment volume equal to a minimum of 110 percent of the maximum storage volume of the storage container for single wall containers.

E. Secondary containment structures must be constructed so that no outlet is provided and a spill will be contained within the containment structure. Accumulated rainwater may be removed if authorized by the EI. Accumulated water with a visible sheen will be collected for proper storage, transport, and disposal.

F. Contractors will remove all secondary containment structures at the conclusion of the Project. Contractors also will be responsible for returning the storage impoundment area to its original contours and appearance upon completion of the Project.

G. Hazardous materials, including chemicals, fuels, and lubricating oils, will be stored only at designated staging areas and in appropriate service vehicles. Containers will be located in a manner that minimizes the possibility of contamination to water resources, including drinking water, groundwater dependent ecosystems, karst areas, and cave soils and their natural hydrology. The storage areas will be located at least 100 feet away from wetlands, waterbodies, and springs; at least 200 feet away from private water supply wells; at least 300 feet away from karst features; and at least 400 feet away from municipal water supply wells unless a larger buffer is required by regulatory agencies. Containers will not be located within 500 feet of a developed recreation area or Scenic Area. Staging areas and facility sites for hazardous materials storage, overnight parking, and refueling and servicing of machinery, etc., will not be located upslope of any TES plants where runoff or spills could possibly affect them.

H. Storage containers will display labels that identify the contents of the container and whether the contents are hazardous. Contractors will maintain and provide to Atlantic, when requested, copies of all Safety Data Sheets (formerly known as Material Safety Data Sheets). All containers used for the storage of hazardous materials, including chemicals, fuels, and lubricating oils, will be of material and construction compatible with the material stored and the conditions of storage such as pressure and temperature. All containers will be in good condition.

I. Contractors will conduct routine equipment maintenance, such as oil changes, in staging areas and will dispose of waste oil in an appropriate manner (e.g. the Contractors will collect the waste oil in labeled, sealed containers and transport the waste oil to a recycling facility).

J. Contractors will correct visible leaks in storage containers as soon as possible. Leaks outside of secondary containment, regardless of volume, will be reported to the Spill Coordinator and an EI.

K. Drain valves on temporary storage containers will be locked to prevent accidental or unauthorized discharges from the containers.

L. All fuel nozzles will be equipped with functional automatic shut-off valves.

M. The drivers of tank trucks will be responsible for spill prevention and the provision of secondary containment during tank truck unloading. Procedures for loading and unloading tank trucks will meet the minimum requirements established by applicable law and associated regulations. Drivers will observe and control the fueling operations at all times to prevent overfilling. Contractors will be responsible for training drivers of tank trucks to comply with these provisions.

N. Prior to departure of a tank truck, all outlets of the vehicle will be closely examined by the driver for leakage and tightened, adjusted, or replaced, as necessary, to prevent liquid leakage while in transit. Contractors will be responsible for training drivers of tank trucks to comply with these provisions.

O. Pumps operating within 100 feet of a waterbody or wetland boundary will utilize appropriate secondary containment systems to prevent spills

P. All machinery will arrive on the right-of-way in a clean, washed condition, maintained free of fluid leaks. All equipment will be in good working order and inspected on a regular basis.

Q. Overnight parking of equipment, as well as refueling and servicing of construction equipment, will be restricted to upland areas at least 100 feet away from waterbodies, wetlands, and springs; at least 200 feet from private water-supply wells; at least 300 feet from karst features; and at least 400 feet from municipal water-supply wells. Where this is not practicable, and where the EI finds in advance no reasonable alternative, the equipment will be fueled by designated personnel with specific training in refueling, spill containment, and cleanup, under the supervision of an EI. Prior to refueling, appropriate steps will be taken (including deployment of secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill.

R. Fuel trucks transporting fuels to construction areas will only travel on approved access roads.

S. Contractors will keep a spill kit onsite and on all equipment in case of machinery leaks or spills. If a spill kit is used, it will be replaced within 24 hours.

1. Restricted Refueling Areas will be identified in the field with flagging or signs. A site-specific plan and written approval from an EI will be required to refuel in restricted areas.

2. Approval must be received from an Atlantic representative and, where necessary, appropriate regulatory permits must be obtained, prior to refueling in Restricted Refueling Areas.

3. In large wetlands where no upland site is available for refueling, auxiliary fuel tanks may be mounted to equipment to minimize the need for refueling.

4. Trained Contractor personnel must be available for refueling, and an EI or another trained Atlantic representative must be present.

5. Equipment such as large, stationary pumps will be fitted with auxiliary tanks as appropriate. The auxiliary tanks will be placed within secondary containment which provides for a containment volume equal to a minimum of 110 percent of the volume of the auxiliary tanks.

6. Refueling within Restricted Refueling Areas will take place in areas designated by an EI. Fuel trucks with a capacity in excess of 300 gallons will not be allowed within a Restricted Refueling Area unless adequate secondary containment is provided.

7. Refueling of dewatering pumps, generators, and other small, portable equipment will be performed using approved containers with a maximum volume of 5 gallons.

T. Contractors will stock a sufficient supply of sorbent and barrier materials at construction staging areas to allow the rapid containment and recovery of a spill. Sorbent and barrier materials will also be used to contain runoff from spill areas.

U. Shovels and 55 gallon drums will be kept at each individual staging area. If small quantities of soil become contaminated within the staging area, they will be collected and placed in the drums. The drums will be labelled to indicate the contents of the drum, including the spilled/recovered material.

V. Large quantities of contaminated soil will be collected using heavy equipment and will be stored in drums or other suitable containers prior to disposal. The drums will be labelled to indicate the contents of the drum, including the spilled/recovered material.

W. The Contractors will dispose of all contaminated soil in accordance with applicable state/commonwealth and federal regulations.

X. Spill Kits

1. Each construction crew will have adequate absorbent materials and containment booms on hand to enable the rapid and complete cleanup of spills, as well as sufficient tools and materials to stop leaks.

2. Contractors must maintain spill kits containing a sufficient quantity of absorbent and barrier materials to adequately contain and recover foreseeable spills. These kits may include, but are not limited to: absorbent pads, straw bales, absorbent clay, sawdust, floor drying agents, spill containment barriers, plastic sheeting, skimmer pumps, and 55 gallon drums. The equipment will be located near fuel storage areas and other locations, as necessary, to be readily available in the event of a spill.

3. All fuel equipment, and where practicable, service trucks, will carry adequate spill response materials. Spill response materials present on trucks will consist of absorbent pads, absorbent material, plastic bags, and a shovel.

4. The Spill Coordinator will inform the EIs and all Contractor personnel of the location of spill control equipment and materials, and have them readily accessible while construction activities are occurring.

5. If a spill kit is used, it will be replaced within 24 hours.

Y. Concrete coating activities and washout activities will not be performed within 100 feet of wetlands, waterbodies, or springs, or with 300 feet of karst features unless the location is an existing industrial site designated for such use.

Z. If pumps used for trench dewatering are within 100 feet of any waterbody or wetland, secondary containment and refueling of these pumps will be addressed in site-specific procedures that will be developed regarding prevention, containment and clean-up of potential spills.

13.5 SPILL RESPONSE

A. The first priorities after discovering a spill are to protect the safety of personnel and the public and to minimize damage to the environment. Actions to be taken immediately following a spill will include the following:

1. The safety of the situation (including the surrounding public) will be assessed.

2. Sources of ignition will be removed from the area by trained personnel if safe to do so.

3. The source of the spill will be shut off by trained personnel if safe to do so.

4. Efforts to contain the spill immediately will be initiated by trained personnel if safe to do so.

5. Cleanup activities will be initiated as soon as possible after the spill is contained using properly trained and protected personnel with adequate spill cleanup materials and equipment (see Section 13.7).

6. As necessary, Dominion Energy will deploy one of several emergency response contractors it has under contract in West Virginia and Virginia to further contain and clean up the spill.

13.6 SPILL REPORTING

A. All spills will be reported immediately to Atlantic. Reports will include the following information (found on the Spill Report Form):

   1. Date, time, and location of the spill.

   2. Type of material spilled.

   3. Amount of material spilled.

   4. Extent of spill area.

   5. Whether the material has reached or has the potential to reach a wetland, waterbody, or karst feature.

   6. Status of spill containment and cleanup.

   7. Circumstances leading up to the spill.

B. Atlantic's environmental team will report all spills on NFS lands to the MNF or GWNF. Spills will be reported as well to the applicable state regulatory agencies if the spill meets or exceeds a reportable threshold. Table 13.6-1 lists the federal and state/commonwealth agencies that would be contacted if a spill meets or exceeds a reportable threshold.

C. Federal standards for reportable quantities (RQ) of hazardous materials are listed at 40 CFR 302.4, which is incorporated into this SPCC Plan by reference. Additional requirements by state/commonwealth are as follows:

   1. West Virginia:

      a. Hazardous waste spills must be reported when equal to or exceeding the federal RQs at 40 CFR 302.4 (see e.g., W. Va. CSR § 60-3-5).

      b. Oil spills must be reported when "causing a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines" (see CWA 111; 40 CFR 110.3(b); and, by analogy, W. Va. Legislative Rules § 31-1).

c. Toxic air pollutant spills must be reported when exceeding (i) 1 pound for ethylene oxide and vinyl chloride, (ii) 10 pounds for acrylonitrile and butadiene, or (iii) 50 pounds for all others (W. Va. CSR § 45-27-10.4).

TABLE 13.6-1

Agency Notification List for Spills Exceeding Reportable Threshhold[27]

Agency	Program	Contact Information	Hours of Operation	Applicable Areas Served
Federal				
Environmental Protection Agency	National Response Center	800-424-8802	24-hour hotline	All Areas
West Virginia				
Department of Environmental Protection (WVDEP)	Emergency 24-hour Hotline for Hazardous Waste Release	800-642-3074	24-hour hotline	Entire State
WVDEP	Elkview Emergency Response Unit	304-558-5938	Monday – Friday 8:00 am – 4:00 pm	Entire State
Virginia				
DEQ	Pollution Response Program- Valley Regional Office	540-574-7800	Monday – Friday 8:30 am – 4:30 pm	Augusta, Highland, and Nelson Counties
DEQ	Pollution Response Program- Blue Ridge Regional Office	540-562-6700	Monday – Friday 8:30 am – 4:30 pm	Buckingham, Cumberland, Prince Edward, and Nottoway Counties
DEQ	Pollution Response Program- Piedmont Regional Office	804-527-5020	Monday – Friday 8:30 am – 4:30 pm	Dinwiddie, Brunswick, and Greensville Counties
DEQ	Pollution Response Program- Tidewater Regional Office	757-518-2000	Monday – Friday 8:30 am – 4:30 pm	Southampton County and Cities of Suffolk and Chesapeake
DEQ	Pollution Response Program – Online Reporting System	Online form at: http://www.deq.virginia.gov/Programs/PollutionResponsePreparedness/PollutionReportingForm.aspx	24-hour online reporting option	Entire Commonwealth
Department of Emergency Management	Virginia Emergency Response Team	800-468-8892 or 804-674-2400	24-hour hotline	Entire Commonwealth

2. Virginia:

a. Oil discharges to land must be reported in amounts equal to or greater than 25 gallons (or less if certain recordkeeping and clean-up requirements are not met) (VAC § 62.1-44.34:19).

[27] All spills on NFS lands, regardless of quantity, will be reported to the MNF or GWNF.

b. An oil spill that discharges or may reasonably be expected to discharge into commonwealth waters must be reported, regardless of amount (VAC § 62.1-44.34:19).

c. Hazardous waste spills must be reported when equal to or exceeding federal RQs at 40 CFR 302.4 (see 9 VAC 25-880-70, generally describing applicable reporting quantities).

D. Contractors are responsible for assisting Atlantic and DTI with preparing follow-up written incident reports to regulatory agencies upon request.

13.7 SPILL CONTAINMENT AND CLEANUP

A. Land Spill

1. Berms will be constructed with available equipment to physically contain the spill and sorbent materials will be applied to the spill area. Traffic on contaminated soils will be prevented to the extent practicable. Some traffic on contaminated soils may be necessary to avoid impacts on adjacent or sensitive resources (e.g. wetlands).

2. Contaminated soils and vegetation will be removed and disposed of at a properly licensed waste disposal facility.

3. Waste materials from the spill will be disposed of according to applicable regulatory requirements.

4. The following information will be provided to an EI and Atlantic and DTI as available following containment and cleanup (but no later than 24 hours after transport and disposal of the contaminated waste material):

    a. The amount of the spilled material that was recovered during cleanup.

    b. Proposed reclamation of remaining contaminated areas.

    c. Storage method for the contaminated waste material before transport and disposal.

    d. Transport and disposal documentation for the contaminated waste material.

5. If necessary, an Emergency Response Contractor will be secured for large spills to further contain and clean up the spill.

B. **Wetland or Waterbody Spill**: The following measures will be implemented immediately to control a spill into a wetland or waterbody:

1. For spills in standing water, floating booms, skimmer pumps, and holding tanks will be readily available and used, as appropriate, by the Contractors to recover and contain released materials on the surface of the water.

2. Berms and/or trenches will be constructed in upland areas to contain a spill before it enters a wetland or waterbody. Deployment of booms, skimmers, and sorbent materials will be utilized if the spill reaches a waterbody. The spilled product will be retrieved and the contaminated area cleaned-up in accordance with recommendations from the Spill Coordinator and applicable regulations and guidelines.

3. If necessary, an Emergency Response Contractor will be secured for large spills in wetlands or waterbodies to further contain and clean up the spill.

4. Approvals or permits from regulatory agencies may be required to place equipment into a wetland or waterbody. Therefore, Contractors must receive written permission from Atlantic or DTI before placing equipment into a wetland or waterbody for the purpose of spill cleanup.

C. Karst: In addition to the measures described above, the following procedures will be implemented in areas of karst terrain:

1. Buffers of 300 feet around karst features (e.g., sinkholes, caves, sinking or losing streams, ponors, pinnacled bedrock, and large springs) within or adjacent to the construction right-of-way will be marked with signs and/or highly visible flagging until construction related ground disturbing activities are completed.

2. Equipment refueling will not be permitted within flagged or marked buffer areas for karst features or areas draining into karst features, except by hand-carried cans (5 gallon maximum capacity), when necessary.

3. Equipment servicing and maintenance areas will be sited outside of flagged or marked buffer areas for karst features or areas draining into karst features.

4. Erosion and sediment controls will be implemented, as appropriate, to prevent runoff resulting from construction equipment washing operations (if applicable) to directly enter a karst feature by locating these operations outside of karst buffer areas.

5. Construction equipment, vehicles, materials, hazardous materials, chemicals, fuels, lubricating oils, and petroleum products will not be parked, stored, or serviced within 300 feet of a karst feature.

6. Equipment will be checked for leaks daily by the Contractors prior to beginning work in karst areas; and damaged or defective equipment will be removed or repaired prior to use in karst areas.

7. Atlantic or DTI will notify the National Response Center and either the West Virginia Department of Environmental Protection or Virginia DEQ if a reportable spill impacts a karst feature.

13.8 CERTIFICATION BY A PROFESSIONAL ENGINEER

This SPCC Plan has been certified by a professional engineer in accordance with 40 CFR 112.7 – *General Requirements for Spill Prevention, Control, and Countermeasure Plans*.

Professional Engineer Date

13.9 CERTIFICATION BY THE CONTRACTOR

The Contractor listed below agrees to follow the requirements of Atlantic's *Spill Prevention, Control, and Countermeasure Plan* during all work activities conducted for Atlantic.

______________________________	______________________________
Contractor	Date
______________________________	______________________________
Responsible Official (Print Name)	Title
______________________________	
Responsible Official (Signature)	

14.0 CONTAMINATED MEDIA PLAN

14.1 BACKGROUND

Atlantic searched federal and state/commonwealth databases to identify contaminated sites in the vicinity of the proposed ACP facilities. The EPA's Facility Registry System map service was used to locate sites within 1 mile of the proposed facilities that are listed on the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) and the Assessment, Cleanup and Redevelopment Exchange System (ACRES) (EPA, 2014).[28] In addition, various map services and databases for known contaminated sites were reviewed for each state/commonwealth.

Review of EPA records identified no Federal Brownfield sites and three Federal Superfund sites within one mile of the proposed ACP facilities, none of which are in the MNF or GWNF. Sites identified in the state/commonwealth databases consist of landfills, solid waste sites, and Leaking Underground Storage Tanks (LUST). No landfills, solid waste sites, or LUST sites were identified in the MNF or GWNF.

The locations of the contaminated sites listed in Table 14.1-1 are based on publicly available geospatial point data. Point data alone are insufficient for identifying the boundaries and extent of contamination at each site. Atlantic has submitted information requests to the EPA and state/commonwealth agencies for additional information regarding the location and extent of contamination at the sites. If contaminated sites are found to be crossed or affected by the proposed routes, Atlantic will investigate options for avoiding these sites, including route variations. This *Contaminated Media Plan* will be updated, as appropriate, based on the results of the information requests.

[28] CERCLIS and ACRES sites are commonly known as Federal Superfund and Brownfield sites, respectively.

TABLE 14.1-1

Contaminated Sites, Landfills, and Leaking Underground Storage Tanks Near the Atlantic Coast Pipeline [a]

County/ City and State/ Commonwealth	Pipeline Segment	Nearest Milepost	Site Name	Distance and Direction from Centerline (ft)	Facility Type	Surface Drainage Direction from Project [c]	Open or Closed Status [d]
ATLANTIC COAST PIPELINE							
CERCLIS and ACRES Sites Identified within 1 mile of the Centerline and Aboveground Facilities							
Chesapeake, VA	AP-3	81.9	Money Point Creosote Site	4,109 N	Superfund Site	Down Gradient	Active
Chesapeake, VA	AP-3	81.9	Eppinger & Russel Co Inc.	4,472 N	Superfund Site	Down Gradient	Active
Chesapeake, VA	AP-3	82.4	Borden Smith Douglass	54 S	Superfund Site	Side Gradient	Active
Landfill and Solid Waste Sites Identified within 0.5 mile of the Centerline and Aboveground Facilities							
Augusta, VA	AP-1	141.5	Jolivue Landfill/Augusta Regional Landfill	915 NE	Closed MSW Landfill and Active MSW Landfill Complex	Up Gradient	Closed
Chesapeake, VA	AP-3	81.0	Dominion Chesapeake Energy Center	317 E	Closed Industrial Landfill and Active Industrial Landfill	Side Gradient	Closed
Chesapeake, VA	AP-3	82.5	Atlantic Aggregate Recyclers	884 NE	Inert Landfill	Up Gradient	Closed
Southampton, VA	AP-3	34.5	SPSA-Boykins Transfer Station	131 SW [b]	Active Waste Transfer Station	Down Gradient	Open
Southampton, VA	AP-3	34.5	SPSA-Franklin Transfer Station	137 SW [b]	Closed Waste Transfer Station	Up Gradient	Closed
Leaking Underground Petroleum Storage Tank (LUST) Sites within 1000 feet of the Centerline and Aboveground Facilities							
Highland, VA	AP-1	87.6	Bussard Residence	207 N [b]	LUST	Up Gradient	Closed
Highland, VA	AP-1	109	VDOT McDowell Area Headquarters	52 E [b]	LUST	Up Gradient	Closed
Highland, VA	AP-1	109	VDOT McDowell	173 N [b]	LUST	Up Gradient	Closed
Augusta, VA	AP-1	134.0	Deerfield Grocery	833 S	LUST	Down Gradient	Closed
Augusta, VA	AP-1	143.9	Starkey Residence	148 SW	LUST	Side Gradient	Closed
Nelson, VA	AP-1	194.5	Ridge Crest Baptist Church	980 SW	LUST	Up Gradient	Closed
Buckingham, VA	AP-1	235.2	Betty Brown Property	646 E	LUST	Up Gradient	Closed
Brunswick, VA	AP-1	301.4	Russel Residence	992 E	LUST	Side Gradient	Closed
Southampton, VA	AP-3	23.6	Cooke Residence	889 NW	LUST	Up Gradient	Closed
Suffolk, VA	AP-3	62.0	City of Suffolk Pump Station 11	244 NW	LUST	Side Gradient	Closed
Chesapeake, VA	AP-3	78.6	Deep Creek Pharmacy	160 S	LUST	Down Gradient	Closed
Chesapeake, VA	AP-3	78.8	Mid Atlantic Repair, Inc.	535 S	LUST	Down Gradient	Closed
Chesapeake, VA	AP-3	78.8	Watkins Motor Lines, Inc.	363 S	LUST	Down Gradient	Closed
Chesapeake, VA	AP-3	80.1	Deep Creek Pumping Station	725 N	LUST	Up or Side Gradient	Closed
Chesapeake, VA	AP-3	81.1	Chesapeake Energy Center	923 E	LUST	Up or Side Gradient	Closed
Chesapeake, VA	AP-3	81.2	IMTT-Chesapeake Terminal	626 NW	LUST	Up or Side Gradient	Closed
Chesapeake, VA	AP-3	81.5	Chesapeake Energy Center	698 S	LUST	Up or Side Gradient	Closed
Chesapeake, VA	AP-3	81.6	Chesapeake Energy Center	748 S	LUST	Up or Side Gradient	Open

TABLE 14.1-1

Contaminated Sites, Landfills, and Leaking Underground Storage Tanks Near the Atlantic Coast Pipeline [a] (cont'd)

County/ City and State/ Commonwealth	Pipeline Segment	Nearest Milepost	Site Name	Distance and Direction from Centerline (ft)	Facility Type	Surface Drainage Direction from Project [c]	Open or Closed Status [d]
Leaking Underground Petroleum Storage Tank (LUST) Sites within 1000 feet of the Centerline and Aboveground Facilities							
Chesapeake, VA	AP-3	81.6	Chesapeake Energy Center	730 S	LUST	Up or Side Gradient	Closed
Chesapeake, VA	AP-3	81.6	Chesapeake Energy Center	720 S	LUST	Up or Side Gradient	Closed
Chesapeake, VA	AP-3	81.7	Chesapeake Energy Center	850 S	LUST	Up or Side Gradient	Closed
Chesapeake, VA	AP-3	82.0	One Steel Recycling	899 N	LUST	Down Gradient	Closed
Chesapeake, VA	AP-3	82.4	Quest Transport LLC	305	LUST	Side Gradient	Closed
Chesapeake, VA	AP-3	82.4	Former Smith Douglass Plant	431 S	LUST	Side Gradient	Closed

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[b] Sites are nearest to aboveground facilities not the centerline. Mileposts for these sites are identified for the nearest milepost in a direct line to the centerline.

[c] USGS topographic maps were reviewed to evaluate the topographic disposition of each site in relation to the Project.

[d] Active = Superfund sites are reported as active in EPA files; however, an active status does not necessarily mean that any ongoing investigations or cleanups are taking place or are planned to take place at the site.

Closed = specific requirements for site closure varies between states/commonwealths, but generally speaking, this means that the tank has been removed, the site has been remediated, and any remaining contaminant concentrations do not pose an unacceptable risk to human health or the environment.

14.2 PURPOSE

Atlantic recognizes the potential for encountering unknown contaminated soil or groundwater during construction. This *Contaminated Media Plan* describes the steps that Atlantic and its Contractors[29] will implement in the event that suspected contaminated soil or groundwater is encountered during construction.

14.3 TRAINING

Prior to the start of construction, Atlantic will conduct environmental and safety training for Atlantic and Contractor personnel. The training program will focus on the FERC Plan and Procedures; other construction, restoration, and mitigation plans, including this *Contaminated Media Plan*; and applicable permit conditions. In addition, Atlantic will provide large-group training sessions before each work crew commences construction with periodic follow-up training for groups of newly assigned personnel.

14.4 IDENTIFICATION OF CONTAMINATED MEDIA AND INITIAL RESPONSE

Contractor personnel and Atlantic's EIs will observe work areas during construction for signs of potential contamination, including:

- discoloration of soil;
- chemical-like odors from soil or water;
- oily sheens or puddles on soil;
- oily sheens on water;
- buried drums or other waste containers;
- buried waste (e.g., garbage, debris, ash, medical waste, or clinical containers);
- discolored surface water;
- differences in vegetation growth (phytotoxicity); and/or
- evidence of waste treatment practices.

If signs of contamination are encountered on NFS lands, the Contractor will stop work in the vicinity of the suspected contamination; restrict access to the suspected contamination site; and notify the crew foreman, an EI, the Spill Coordinator (identified in the SPCC Plan), and Atlantic. The EI will immediately notify the designated FS representative.

14.5 CONTAINMENT AND CHARACTERIZATION

The Contractor will initiate measures to avoid the spread of contaminants until the type of contaminant, its concentration, potential exposure routes, and management options are evaluated. If signs of potential contamination are observed during construction, the following response actions will be implemented.

A. If potentially contaminated soil or groundwater is exposed during excavation activities, excavation will stop in the area of potential contamination and an EI and Atlantic representative will be contacted immediately.

[29] Contractor refers to the company or companies retained by Atlantic or another contractor to construct the proposed facilities.

B. If potentially contaminated soil will not be backfilled, the soil will be placed on an impervious surface or 10-mil polyethylene and covered with 10-mil polyethylene to prevent rainfall run-on and run-off. The potentially contaminated soil will not be moved from the site by the Contractor unless approved to do so by the EI and/or Atlantic representative.

C. If potentially contaminated groundwater is draining from the sides of the excavation and standing in the trench, temporary trench plugs will be installed to avoid the migration of the potentially contaminated groundwater to uncontaminated areas within the trench. Potentially contaminated groundwater will not be pumped from the trench.

D. If a trench or excavation will be left open and precipitation may occur, measures will be implemented to prevent precipitation run-off from entering the trench (e.g., by installing waterbars to divert runoff from the trench and trench plugs to prevent the flow of contaminated water in the trench).

Concurrent with the management of the contaminated media, representative soil and groundwater samples, as applicable, will be collected for chemical analysis. Appropriate tests or analyses will be conducted by a qualified laboratory. Initial testing will be based on field observations and the suspected nature of the contamination. Laboratory analyses could include: total petroleum hydrocarbons, oil and grease, pH, volatile organic compounds, semi-volatile organic compounds, polychlorinated biphenyls, and/or metals.

Depending on the nature and extent of the contamination, Atlantic will notify the MNF or GWNF, as appropriate, and the appropriate federal, state/commonwealth, and local regulatory agencies. Appropriate agencies include, but are not be limited to, the following:

A. West Virginia Department of Environmental Protection at 1-800-642-3074 (24-hours).

B. Virginia Department of Emergency Management at 1-800-468-8892 (24-hours, in-state calls only) or at 1-804-674-2400 (24-hours, out-of-state calls). Online spill reporting for non-emergency releases can be completed at http://www.deq.virginia.gov/Programs/PollutionResponsePreparedness/PollutionReportingForm.aspx.

C. National Response Center (Washington, D.C.) at 1-800-424-8802 (24 hours).

14.6 AVOIDANCE OR RESPONSE PLANS

If the contaminant identified is found to be a health or safety hazard or harmful to the pipeline or operation of its CP system, a route variation may be considered to avoid the area of contamination. Applicable permits and regulatory approvals will be obtained prior to proceeding with a route variation.

If the contaminant does not pose a health or safety concern and will not otherwise interfere with the pipeline, a written plan for completing construction within the contaminated area will be prepared. Test pits or borings may be excavated within the right-of-way to assess the extent of the contamination. Depending on the nature and extent of contaminated media, site-specific measures will be identified to complete construction across the contaminated area. These measures may include:

- storing excavated soil on an impervious surface or a sheet of 10-mil polyethylene;
- avoiding water withdrawals from the trench;
- removing and disposing of contaminated media at an approved disposal facility;

- replacing contaminated soil with clean backfill; and/or
- implementing staged withdrawal and disposal of standing trench water during backfilling to avoid overflow and runoff.

Contaminated soil will not be placed back in the trench unless approved by the appropriate regulatory agency and by Atlantic in writing. Site-specific construction plans for areas of contamination will be developed in accordance with environmental regulations, and approval of the plans by appropriate regulatory agencies will be obtained prior to implementation of the plans.

15.0 CULTURAL RESOURCES

15.1 PURPOSE

The purpose of this section is to summarize the cultural resources studies conducted to-date, remaining studies which are yet to be completed, and procedures that should be followed if an unanticipated discovery occurs.

15.2 SUMMARY OF CULTURAL RESOURCES INVESTIGATIONS ON NFS LANDS

In order to minimize the potential during construction for accidental discovery of cultural resources, Atlantic contracted GAI Consultants, Inc. (GAI) to conduct Phase I archaeological survey and historic architectural reconnaissance of the Project's defined Area of Potential Effect (APE) in the GWNF and the MNF. The studies encompass locations associated with the proposed undertaking where there will be alteration and disturbance of surface and subsurface soils that contain or have potential to contain archaeological sites, including proposed construction areas, access roads, staging areas, etc. The APE along the pipeline consists of a 91.4-meter (300-foot) corridor centered on the proposed pipeline. The APE for access roads consists of a 15.2 meter (50-foot) corridor centered on the proposed/existing roadways. An APE wider than the proposed limit of disturbance was studied for both the pipeline and access roads to allow flexibility in final design. Any project changes that would result in ground disturbance outside the current APE would be subject to supplemental field surveys.

The FS identified concerns about potential impacts to cultural resources associated with unauthorized use of the pipeline right-of-way by third parties. Section 19 (OHV Blocking Plan) identifies measures, including post-construction monitoring, that will be implemented to avoid or minimize resource damage related to this activity.

In the MNF, as of July 2017, cultural resources studies have been completed for the proposed Project and a Phase I cultural resources survey technical report as well as an addendum Phase I archaeological survey report have been reviewed and accepted by the MNF.

In the GWNF, as of July 2017, Phase I field studies are complete; however, an addendum Phase I cultural resources survey report for the area of Ft. Lewis, including a section of the proposed pipeline corridor and a few access roads, has been submitted and is in review by the GWNF. Phase I cultural resources surveys have been completed for the remainder of the proposed Project and a combined technical report has been reviewed and accepted by GWNF personnel. To date, GAI recorded six new pre-contact-period archaeological sites, three new historic-era archaeological sites, and ten pre-contact-period isolated finds. GAI also re-identified two previously recorded pre-contact-period archaeological sites, but was unable to re-identify two other previously recorded archaeological sites. Four newly identified sites (44AU0914, 44AU0915, 44AU0917, 44AU0918) and two previously recorded sites (44AU0780, 44AU0781) were determined to warrant additional study. Phase II archaeological testing was conducted at these six sites. Four of these sites extend outside the APE; therefore, the GWNF required additional Phase II testing outside the APE at those sites in order to evaluate the entire site. All six sites contain pre-contact-period lithic scatters. A few pieces of pre-contact-period ceramic were also recovered from Site 44AU0781. A small historic-period artifact scatter, as well as remains of a charcoal hearth related to iron furnace fuel production, were encountered at Site 44AU0917. A revised Phase II technical report for these six sites (incorporating the additional testing outside the APE) is in progress and is planned to be submitted to the GWNF in October 2017. One architectural resource was recorded as part of the addendum survey in the Fort Lewis area. This resource, the Duncan Knob Lookout tower, is recommended eligible for listing in the National Register of Historic Places under Criteria A and C.

Detailed "Unanticipated Discoveries Plan for Cultural Resources and Human Remains Policy" documents (UDP) have been prepared for the GWNF (Attachment L) and the MNF (Attachment M), which comply with the relevant state and federal regulations concerning the protection of cultural resources. Procedures outlined in the UDPs must be followed during construction. As per the UDP, EIs and possibly Archaeological Monitors will have the responsibility to monitor altered and disturbed areas for potential archaeological remains throughout construction. The EI and the Archaeological Monitor will be responsible for advising the construction contractor's personnel on the procedures to follow in the event that an unanticipated discovery is made. A copy of each UDP will be maintained by the EI, the Archaeological Monitor, and at the construction field office. Training will occur as part of the pre-construction on-site training program for foremen, company inspectors, and construction supervisors. The EI will advise all operators of equipment involved in grading, stripping, or trenching activities to:

- Stop work immediately if they observe any indications of the presence of cultural materials, animal bone, or possible human bone.
- Immediately contact the EI (if not available contact the Construction Site Supervisor).
- Treat human remains with dignity and respect.

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16.0 REGIONAL FORESTER'S SENSITIVE SPECIES; THREATENED AND ENDANGERED PLANTS AND ANIMALS

Information on impacts to species on the Regional Forester's Sensitive Species list is contained within the draft Biological Evaluation submitted to the FS in August, 2017. The Biological Evaluation is incorporated by reference into this COM Plan.

Federally listed threatened and endangered species are addressed in a draft Biological Assessment filed with FERC and provided to the FWS in January, 2017, in accordance with Section 7 of the Endangered Species Act. Atlantic will comply with measures adopted by the federal agencies, as may be recommended in the FWS's Biological Opinion, which is expected to be issued in the latter half of 2017.

17.0 FUGITIVE DUST CONTROL AND MITIGATION PLAN

17.1 PURPOSE

The purpose of this *Fugitive Dust Control and Mitigation Plan* is to identify potential sources of fugitive dust emissions arising from construction activities and to provide direction to Contractors [30] on measures for avoiding, minimizing, and controlling fugitive dust. This plan is based on the *Fugitive Dust Control & Mitigation Plan* prepared in connection with Atlantic's application to the FERC for the entire ACP. Fugitive dust includes total suspended particulates, particulate matter with an aerodynamic diameter less than 10 micrometers, and particulate matter with an aerodynamic diameter less than 2.5 micrometers (collectively, "fugitive dust").

Fugitive dust will result from land clearing, grading, excavation, concrete work, and vehicle traffic on paved and unpaved roads. The amount of fugitive dust generated at any given time will be a function of construction activity, soil type, soil moisture content, wind speed, precipitation, vehicle traffic, vehicle types, and roadway characteristics. Fugitive dust emissions will be greater during dry periods and in areas of fine-textured soils subject to surface activity. The ACP will employ proven BMPs to control and limit releases of fugitive dust, such as the application of water to disturbed surfaces or roads.

17.2 TRAINING

Prior to the start of construction, Atlantic will conduct environmental and safety training for Company and Contractor personnel. The training program will focus on the FERC Plan and Procedures; other construction, restoration, and mitigation plans, including this *Fugitive Dust Control and Mitigation Plan*; and applicable permit conditions. In addition, Atlantic will provide large-group training sessions before each work crew begins construction with periodic follow-up training for groups of newly assigned personnel.

EIs and/or construction supervisors will be responsible to ensure that contractor personnel are complying with all dust control measures and have authority to enforce and require compliance with this plan.

17.3 FUGITIVE DUST SOURCES

Fugitive dust is generated by the mechanical disturbance of granular material exposed to air. Dust from open sources is termed "fugitive" because it is not discharged to the atmosphere in a confined flow stream.

The following construction activities have the potential to generate fugitive dust:

- vehicle and equipment movement on paved and unpaved surfaces;
- vegetation removal;
- clearing, grading, and excavation;
- soil stabilization; and
- bulk/pile material loading, unloading, and hauling.

[30] Contractor refers to the company or companies retained by Atlantic or another contractor to construct the proposed facilities

17.4 DUST CONTROL MEASURES

17.4.1 Application of Water or Other Dust Suppressant

Atlantic will make all practicable efforts to minimize fugitive dust emissions from construction activities. Atlantic will have one or more water trucks available per spread that will load water from approved sources to spray areas for dust control. None of these sources will be located on NFS lands. Disturbed and trafficable areas will be kept sufficiently damp during working hours in dry conditions to minimize wind-blown or traffic-generated dust emissions.

Areas to be watered include, but are not limited to, the following:

- the construction corridor for each pipeline, including ATWS;
- contractor yards and staging areas;
- access roads;
- aboveground facility sites;
- active grading areas;
- un-stabilized areas;
- soil stockpiles; and
- parking areas.

The frequency at which water trucks will spray construction areas will vary based on weather and site conditions. More frequent applications will be required in dry conditions and where dust generation is likely.

17.4.2 Use of Approved Access Roads

Atlantic will install signs to direct traffic to designated access roads for construction of the ACP. Any traffic that deviates from designated access roads will be redirected to designated access roads and reported to the appropriate supervisor and an EI for corrective action. [31] All vehicles and equipment leaving a work site will implement BMPs to prevent dirt or mud from being transferred or tracked to public roads. For example, track-out onto paved public roads will be cleaned up as needed and in a timely manner using street sweeping or an equivalent method.

17.4.3 Enforcing Speed Limits

All vehicle and equipment traffic will be limited to a speed limit of 15 miles per hour on or in designated access roads, the construction right-of-way, contractor yards, and other work areas. Atlantic will post speed limit signs on designated access roads to ensure that all equipment/vehicle operators are aware of the speed limit on the road that is being travelled. Any observations of excessive speeds will be reported to the appropriate supervisor and an EI for corrective action. EIs will have the authority to adjust speed limits for individual operations based on site-specific conditions to minimize fugitive dust.

17.4.4 Best Management Practices for Open-body Haul Trucks

If excessive dust is generated from open-body haul trucks, corrective measures will be implemented to mitigate the generation of dust. Corrective measures may include: adjusting speed limits along designated haul roads during periods where conditions contribute to excessive dust; misting/wetting

[31] The role and responsibilities of an EI are defined in the Federal Energy Regulatory Commission's *Plan.*

soils or other materials prior to loading into haul trucks; or covering open-body haul trucks to prevent fugitive dust emissions.

17.4.5 Restoration of Disturbed Areas

All disturbed areas will be stabilized and restored as soon as practicable, which will minimize conditions favorable to dust generation (see Section 9, the Erosion and Sedimentation Control Plan, and Section 11, the Restoration and Rehabilitation Plan).

17.4.6 Maintenance of Spoil Stockpiles

If construction is inactive for more than 7 days, the Contractor will cover or stabilize spoil piles with a soil binder, tackifier, mulch, vegetation, or equivalent method in accordance with applicable permit requirements and regulations. If sustained winds are likely in areas susceptible to dust, temporary fencing may be installed to reduce wind speeds around spoil piles and minimize dust.

18.0 PUBLIC ACCESS PLAN

18.1 PURPOSE

The purposes of this *Public Access Plan* are to:

- Identify measures for informing casual users of the MNF and GWNF about construction of the ACP.
- Identify measures to inform specific user groups whose activities may intersect ACP construction about any closures, detours, restrictions, alternative access routes, etc. associated with ACP construction.
- Ensure the safety of recreational users of MNF and GWNF lands, while at the same time minimizing impacts to recreational use, during the period of pipeline construction.

18.2 RESPONSIBILITIES

The following individuals are responsible for developing and coordinating ACP Project information to be used to inform the public about Project construction on the National Forests.

ACP Public Affairs:
Name: ______________________________
Phone: ______________________________
E-mail: ______________________________

Monongahela National Forest Public Affairs:
Name: ______________________________
Phone: ______________________________
E-mail: ______________________________

George Washington National Forest Public Affairs:
Name: ______________________________
Phone: ______________________________
E-mail: ______________________________

18.3 PROJECT WIDE MEASURES

The ACP Project website, found at https://atlanticcoastpipeline.com/, provides general information about the Project. The website also provides a telephone hotline, allowing members of the public to speak to a Project representative. Prior to the start of construction, ACP will add contact information for FERC and FS representatives to its website as well.

A list of trails crossed by the ACP on NFS lands is provided in Table 2.1.5-1. A list of roads crossed by the ACP on NFS lands is provided in Table 7.4-1. Signage requirements are addressed in Attachment S (Flagging, Fencing and Signage Plan).

18.4 NATIONAL FOREST-SPECIFIC MEASURES

- Prior to and during construction, ACP public affairs representatives will work with public affairs specialists from both the MNF and GWNF as necessary to provide updated Project information for communication to Forest users.
- ACP public affairs representatives will work with public affairs specialists from the MNF and GWNF to plan and implement any targeted outreach to particular groups of Forest users, e.g. hiking, hunting or fishing organizations, and the general public, etc.
- Prior to ACP construction activity in any particular part of either Forest, ACP will post temporary signs on Forest roads used as construction access roads alerting road users to the presence of logging and construction vehicles on the roads.
- Prior to construction, ACP will work with both Forests to identify any specific road or trail closures or detours necessary to facilitate pipeline construction and ensure safety of the public. No detours will be routed in a way that would direct the public near TES plant populations.
- On roads and trails that cross the pipeline right-of-way, ACP will post temporary signs informing road and trail users of any closures, detours, or other restrictions associated with crossing the construction zone (see Attachment S; Flagging, Fencing and Signage Plan). Signage will be developed in consultation with the Forest public affairs specialists.
- On Forest roads remaining open during construction, ACP will employ flagmen during periods of active construction at road/pipeline right-of-way intersections, when construction equipment or vehicles may be crossing the road.
- On Forest trails that cross the pipeline right-of-way, ACP will post temporary signs at trailheads informing trail users of any closures, detours, or other restrictions associated with crossing the construction zone. All signage will be developed in consultation with the Forest public affairs specialists and trails specialists. Signs will contain no information about sensitive Forest resources.
- On Forest trails that cross the pipeline right-of-way that remain open during construction, ACP will erect exclusion fencing on either side of such trails where they cross the construction zone, with appropriate signage warning hikers to stay out of the construction area. During periods of active construction when vehicles and equipment may be crossing over the trail, ACP will employ flagmen/spotters to escort hikers safely across the construction zone. If temporary trail detours are employed, detour routes will be developed in consultation with Forest recreational specialists, and the routes will be prominently demarcated.
- At portions of the construction right-of-way between road and trail crossings, ACP will post signs at or near the edge of the work area, at approximate 200 feet spacings or as dictated by terrain and visibility, warning the public that the construction right of way is closed to public entry.
- In areas of active blasting, signage and flaggers will be posted in accordance with the Blasting Plan. This includes providing 48-hour notice to surrounding residents and businesses, posting of warning signs at approaches to the blast area, with minimum

4-inch lettering on a contrasting background, and stationing of flaggers at roads and trails at least 1,000 feet from the entrance to any areas of active blasting.

19.0 OFF HIGHWAY VEHICLE BLOCKING PLAN

19.1 PURPOSE

The purpose of this Off Highway Vehicle Blocking Plan (Blocking Plan) is the prevention of OHV travel along the proposed pipeline, proposed access roads, and onto adjacent or nearby NFS lands. OHV travel along the proposed pipeline and access roads could lead to unauthorized entrance to restricted areas, could damage sensitive biological and cultural resources, could create or exacerbate erosion, could impede right-of-way restoration, and could compromise the integrity of the right-of-way. Consequently, both Forests and the pipeline operator have an interest in preventing OHV use along the proposed pipeline and its access roads.

The Blocking Plan identifies a process for determining where OHV blocking measures are necessary, for identifying approaches appropriate at specific locations, and for follow-up monitoring to assess the effectiveness of the measures, and to adjust blocking measures accordingly. Examples of methods that may be used include boulders, stumps, berms, gates, visual marking, downed woody debris, visual screening, and rough road access.

19.2 OHV USE ON NFS LANDS

The ACP route crosses through no areas on either the MNF or the GWNF where OHV use is authorized. A 10-foot strip of the right-of-way centered over the pipeline will be maintained in an herbaceous state for pipeline surveillance and maintenance purposes. In predominantly forested areas where the right-of-way crosses Forest roads, the right-of-way can present a tempting linear path for some OHV users, despite Forest rules prohibiting such use. While such unauthorized use is difficult to stop entirely, measures to discourage OHV use of the right-of-way are appropriate.

The blocking measures must take into consideration that access is necessary to every point along the pipeline by maintenance and repair crews. Blocking measures must be designed to avoid creating unreasonable impediments to pipeline maintenance vehicles or larger equipment that must access the right-of-way in emergency events or for major maintenance work.

19.3 LOCATIONS REQUIRING BLOCKING MEASURES

Blocking measures will be considered at all Forest roads and trails crossed by the ACP, and other locations determined by the AO to be likely access points for OHVs to travel along the pipeline. These locations are provided in Table 19.3-1.

TABLE 19.3-1

Potential OHV Blocking Locations a

Forest Road No.	Approximate Milepost	Access Road No.	Crossing Method
Un-numbered road connecting with MNF Road 212	81.8	05-001-E064.AR1	N/A
MNF Road 1014 (Shock Run)	83.2	N/A	Open cut
MNF Road 1017 (Upper Shock Run)	83.3	05-001E064.AR3	Open cut
MNF Road 55 (Allegheny Road)	83.7	N/A	Open cut
MNF Road 55 (Allegheny Road)	83.8	N/A	Open cut
MNF Road 55 (Allegheny Road)	83.8	N/A	Open cut
Un-numbered road connecting with Highway 84	85.0	06-001-B001.AR3	N/A
New Road	85.3	06-001-B001-AR7	N/A
Un-numbered road connecting with Highway 84	85.4	06-001-B001.AR4	N/A
New Road	86.4	06-001-B001-AR5	N/A
GWNF Road 124	93.6	36-014-AR2	N/A
GWNF Road 281C	96.3	N/A	Open cut
GWNF Road 281	96.3	36-026.AR1	Open cut
GWNF Road 1748	97.0	N/A	Open cut
Shenandoah Trail (FT 447)	98.7	N/A	Open cut
GWNF Road 309	99.6	36-016.AR2	N/A
Brushy Ridge Trail (FT 718)	105.9	N/A	Open cut
GWNF Road 348.1 [b]	116.5	07-001-A009-AR1	Open cut
GWNF Roads 449/449A	116.8	07-001-AR1-AR3	N/A
Dowell's Draft Trail (FT 650)	117.0	N/A	Open cut
GWNF Road 449	117.0	N/A	Open cut
GWNF Road 449	117.1	N/A	Open cut
New road connecting to GWNF Road 449	117.2	07.001-AR1-AR4	N/A
Un-numbered road connecting to GWNF Road 449A	118.0	07-001.AR1-AR 6	Open cut
GWNF Road 449A	118.7	07-001-AR3	Open cut
GWNF Road 449B	118.8	N/A	Open cut
GWNF Road 466A	120.2	07-001.AR1-AR8	Open cut
White Oak Trail (FT 486)	120.4	N/A	Open cut
GWNF Road 466	120.4	07-001.AR1-AR9	Open cut
GWNF Road 1755	121.1	07-001-AR1-AR7	Open cut
GWNF Road 1755	121.2	07-001-AR1-AR1	N/A
GWNF Road 1755	121.4	N/A	Open cut
GWNF Road 1755	121.8	N/A	Open cut
GWNF Road 1757	122.9	07-001-AR1-AR2	N/A

[a] Best current estimate of blocking locations; will be updated in consultation with FS

[b] Intersection of Access Road 07-001-A009-AR1 and right-of-way may lie outside GWNF boundary.

19.4 BLOCKING MEASURES

The following blocking measures will be considered for installation at each of the locations listed in Table 19.3-1. The site-specific measures, and placement of any physical barriers, will be approved by the AO.

- Berms. Berms will be placed across the right-of-way where it intersects an existing road. Berm slopes will not exceed 30 per cent. Berms will be placed across the right-of-way as part of erosion control, strategically placed to reduce visibility and mimic local topography.

- Rock and woody material distribution. Large rocks, stumps, limbs, and related material removed and stockpiled during construction will be strategically placed, without making it appear as a challenging obstacle course. The placement will be done in a manner to present a physical barrier as well as to erase visual cues signaling the presence of the right-of-way from the access point.

- Surface preparation. At locations where the pipeline has open cut across the access point (as opposed to where the pipeline has been bored beneath paved roads), the right-of-way will be back-bladed or raked by bulldozer or by hand, to erase the traces of the intersection of the pipeline right-of-way with the access point.

- Gates. Where deemed appropriate by the AO, locking gates may be installed according to FS specifications. Gate openings will be a minimum of 16 feet wide to accommodate pipeline maintenance vehicles and equipment. For gated access intended to allow foot traffic for hunting and other dispersed recreational activities, a clear passage for wheelchair access will be incorporated, to meet federal accessibility guidelines.

- Signs. Signs warning the public that OHV use is prohibited along the pipeline right-of-way will be installed if requested by the FS. Signs may dissuade some OHV users, but they may also call attention to the right-of-way, so their effectiveness is best judged by FS recreation staff.

19.5 POST-CONSTRUCTION MONITORING

The Project EI will document the establishment of OHV blocking measures at each crossing location upon completion. The documentation will identify what measures were installed, the date of completion, and will include photographs of the sites. In conjunction with its post-construction restoration monitoring, Atlantic will monitor each site for two years following completion of construction activities on the specific spread, and will annually prepare a report documenting their effectiveness. Each OHV blocking location will be visited to photograph the site, assess whether OHV use appears to be occurring and what, if any corrective measures are recommended. Any necessary corrective measures will be determined in consultation with FS staff.

After two years, the locations will be monitored periodically for the life of the project by FS and pipeline operations staff to determine whether further corrective action is warranted. Regular aerial patrols[32] will also note changed conditions on the right-of-way, such as the appearance of vehicle tracks that may provide evidence of unauthorized OHV use along the pipeline. Any observation of changed conditions that may require corrective action will be conveyed in writing to the FS and followed up with discussions with the appropriate FS resource specialist to determine a course of action.

[32] ACP pipelines are currently scheduled for aerial surveillance on a monthly basis.

20.0 WATER QUALITY MONITORING PLAN

The purpose of this plan is to describe how water quality monitoring activities will be conducted on NFS lands where stream crossings are planned. Stream crossing methods are designed to minimize stream bank and bed erosion thus preventing the release of sediment into streams, and are short-term in duration. Streams less than 10-feet-wide will be crossed within 24 hours and streams 10-feet-wide to 100-feet-wide will be crossed in 48 hours, unless rock is encountered and requires blasting or other rock removal methods. Atlantic will install the pipeline using dry-ditch methods for crossings of waterbodies on the MNF and GWNF (dam and pump or flume crossing methods), which further limits sediment release and elevated turbidity downstream of crossing areas.

This plan augments the other construction, restoration, and mitigation plans prepared for the Project. Atlantic will install stream crossings in accordance with the FERC Procedures, which stipulate how crossings are planned, constructed, restored and monitored, and USACE permit requirements.

Water quality monitoring at bleeder drains is addressed in Section 2.1.5.4.

In July, 2017 Atlantic submitted to the GWNF a "Post-Construction Benthic Macroinvertebrate Survey Monitoring Plan," which is hereby incorporated by reference into this COM Plan. The Post-Construction Macroinvertebrate Survey Monitoring Plan proposes monitoring of benthic macroinvertebrates at 14 stream crossing sites for a year following construction. It provides field sampling methods, lab and data analysis procedures, and reporting protocols.

20.1 JURISDICTIONS

The MNF lies in West Virginia and the GWNF is located in Virginia. Only West Virginia has numeric standards applicable to turbidity. This Water Quality Monitoring Plan has been written to conform to the West Virginia numeric standards and will be applicable to both National Forests. Virginia provides narrative guidance with respect to erosion and sediment control[33], and these guidelines have also been incorporated in the procedures described in this plan.

20.2 BACKGROUND AND PURPOSE

Excess turbidity in aquatic systems can adversely affect aquatic life or other beneficial use of a waterbody. The biological effects of excess turbidity are exerted primarily as a result of reduced light penetration or as a smothering effect associated with reduced dissolved oxygen. Turbidity is a measure of the 'cloudiness' of water, which is analytically measured as the degree to which light is scattered and absorbed by suspended sediment. Turbidity is most commonly measured using a nephelometric instrument called a turbidimeter and expressed in terms of Nephelometric Turbidity Units (NTU) (Oregon DEQ, 2010). Most published criteria for turbidity in the United States and Canada are in the form of a limited increase above background.

The purpose of this Water Quality Monitoring Plan is to monitor and address chronic impacts to water quality. Corrective actions utilizing BMPs will be implemented when necessary to address sources of chronic turbidity.

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[33] http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/Publications/ESCHandbook.aspx

20.3 NUMERIC STANDARD

As articulated in West Virginia guidance, chronic turbidity should not exceed 10 NTUs over background turbidity when the background is 50 NTUs or less, or have more than a 10 percent increase in turbidity (plus 10 NTU minimum) when the background turbidity is more than 50 NTUs averaged over any four-day period. The turbidity standard does not contain an acute criterion for cold or warm waters designations. This standard will apply to all stream crossings as measured 50 feet above (background) and 50 feet below the crossing area for streams $\leq$ 30 feet in width.

Construction related to stream crossings will adhere to timing restrictions related to aquatic life according to agency guidelines or specifications contained in state water quality permits. Timing restrictions are based on readily available data from agency consultation letters or online data. Additional consultations with state and federal agencies, as well as field survey data for protected species will occur to further refine timing restrictions.

20.4 INSPECTION AND MONITORING

As articulated in Section 3 (Environmental Compliance), one or more EIs with knowledge of the wetland and stream conditions in the project area is required for each construction spread. The EIs will be responsible for the inspection of all in-stream activities (e.g. setting of flumes or dam and pump operations, and their removal) and to take all required water quality measurements.

Measurements of turbidity will occur at all stream crossings that are state-designated as either coldwater or significant coolwater or warmwater fisheries. Monitoring will be accomplished through the use of a hand held turbidity meter (e.g., YSI 6600 V2-2 data sonde, or similar), for short term continuous monitoring and grab samples. The turbidity meter will be calibrated prior to the commencement of construction and as required throughout the duration of the monitoring activities.

Monitoring will occur at a minimum rate of 4 times per day during the period when active construction is occurring, in both the background location (50 feet above activity) and downstream location (50 feet below activity). The first monitoring event will occur approximately 30 minutes prior to the commencement of construction, and the second will occur a minimum 2-4 hours after start of instream construction. Measurements of turbidity grab samples will continue during instream pipeline installation activities. Once the crossing is complete and restoration occurs, monitoring will be conducted for four days at a minimum rate of 1 time per day. Should the chronic turbidity reading (4-day average) exceed standards, remediation of the source will occur and monitoring will continue once per day until the source is addressed and readings are within water quality standards.

20.5 CONSERVATION MEASURES

Atlantic will implement the following BMPs for all stream crossings to reduce impacts:

- implement the Erosion and Sedimentation Control Plan (Section 9) and Stream and Wetland Crossing Procedures (Section 9) of this COM Plan;
- installing sediment barriers;
- appropriately site sediment filtering devices associated with trench dewatering activities;
- reducing the volume of large equipment operating in or near the waterbody; and/or

- halting work, if necessary to address issue or implement corrective actions.

20.6 REPORTING

The EI will complete the Turbidity Monitoring Data Sheet daily, and is responsible for identifying, documenting, and overseeing corrective actions, as necessary. Daily Turbidity Monitoring Data Sheets will be submitted to the ECC to be included with a final construction report and will be made available to the FS within two weeks of the crossing.

Turbidity Monitoring Data Sheet

Project Name & Permit Number: ______________________________

Site Address (Location): ______________________________

Monitor Name: ______________________________

Company: ______________________________

Phone Number: ______________________________

Date & Time of Sample: ______________________________

Weather Conditions: ______________________________

Upstream Location* / Reading (NTU)	Downstream Location* / Reading (NTU)	Turbidity Increase (Downstream - Upstream) (NTU)	Allowable Turbidity Increase (NTU)	Turbidity Increase Above Standard? (Y/N)	Contractor Notified of results? (Y/N)

Upstream Location* / Reading (NTU)	Downstream Location* / Reading (NTU)	Turbidity Increase (Downstream - Upstream) (NTU)	Allowable Turbidity Increase (NTU)	Turbidity Increase Above Standard? (Y/N)	Contractor Notified of results? (Y/N)

Upstream Location* / Reading (NTU)	Downstream Location* / Reading (NTU)	Turbidity Increase (Downstream - Upstream) (NTU)	Allowable Turbidity Increase (NTU)	Turbidity Increase Above Standard? (Y/N)	Contractor Notified of results? (Y/N)

Mitigation Measures Taken By Contractor (if turbidity increase is above standard): [continue on back]

____

____

____

* Number of feet from activity; **Source**: City of Bellevue, Department of Planning & Community Development, P.O. Box 90012 □ Bellevue, Washington □ 98009

21.0 VISUAL RESOURCES PLAN

The LRMP for the GWNF includes the following standard:

The Forest Scenic Integrity Objectives are met for all new projects (including special uses). Existing conditions may not currently meet the assigned Scenic Integrity Objective. **(GWNF LRMP FW-182).**

The GWNF is considering whether a project-specific LRMP amendment would be necessary, based on the results of visual analyses that have been submitted separately to the GWNF.

21.1 FEATHERING VEGETATION CLEARING ON THE RIGHT-OF-WAY

At the request of the FS, Atlantic will "feather" the edges of the construction right-of-way during construction on NFS lands, at certain locations. Feathering the edges of the right-of-way refers to the selective clearing of trees and vegetation at specific locations along the edges of the right-of-way such that existing vegetation, including fully grown trees, are left up to 10 feet within the boundaries of the construction right-of-way to create a visually uneven edge along both sides of the right-of-way (Figure 21-1). When viewed axially or along the length of the right-of-way at these locations, there are no parallel, straight edges and the cleared right-of-way appears more natural. Atlantic will apply this process within long straight line tangents of pipeline corridor where immediate foreground and foreground views (i.e., from trail or road crossings) and middleground and background views (i.e., from highways) of the pipeline corridor would be present from publicly accessible locations.

Vegetation that is left standing within the edges of the construction right-of-way will extend 5 to 10 feet into the right-of-way, and will occur periodically along both edges of the right-of way in the selected areas. Feathering locations are listed in Table 21.1 and shown in Figures 21.1a through 21.1e.

TABLE 21.1

Locations of Right-of-Way Feathering on National Forest System Lands

Approximate Milepost Range	Approximate Length Within Which Feathering Locations Located (feet)	Number of Feathering Locations		National Forest	Associated Trail or Road
		Working Side	Spoil side		
80.82-80.85	160	1	0	MNF	State Highway 92
81.25-81.32	700	1	1	MNF	State Highway 92
116.75-116.93	940	2	1	GWNF	Braley Pond Road
121.05-121.20	760	1	1	GWNF	Stover Shop Road
154.00- 155.10	4440	5	6	GWNF	Blue Ridge Parkway, Appalachian National Scenic Trail

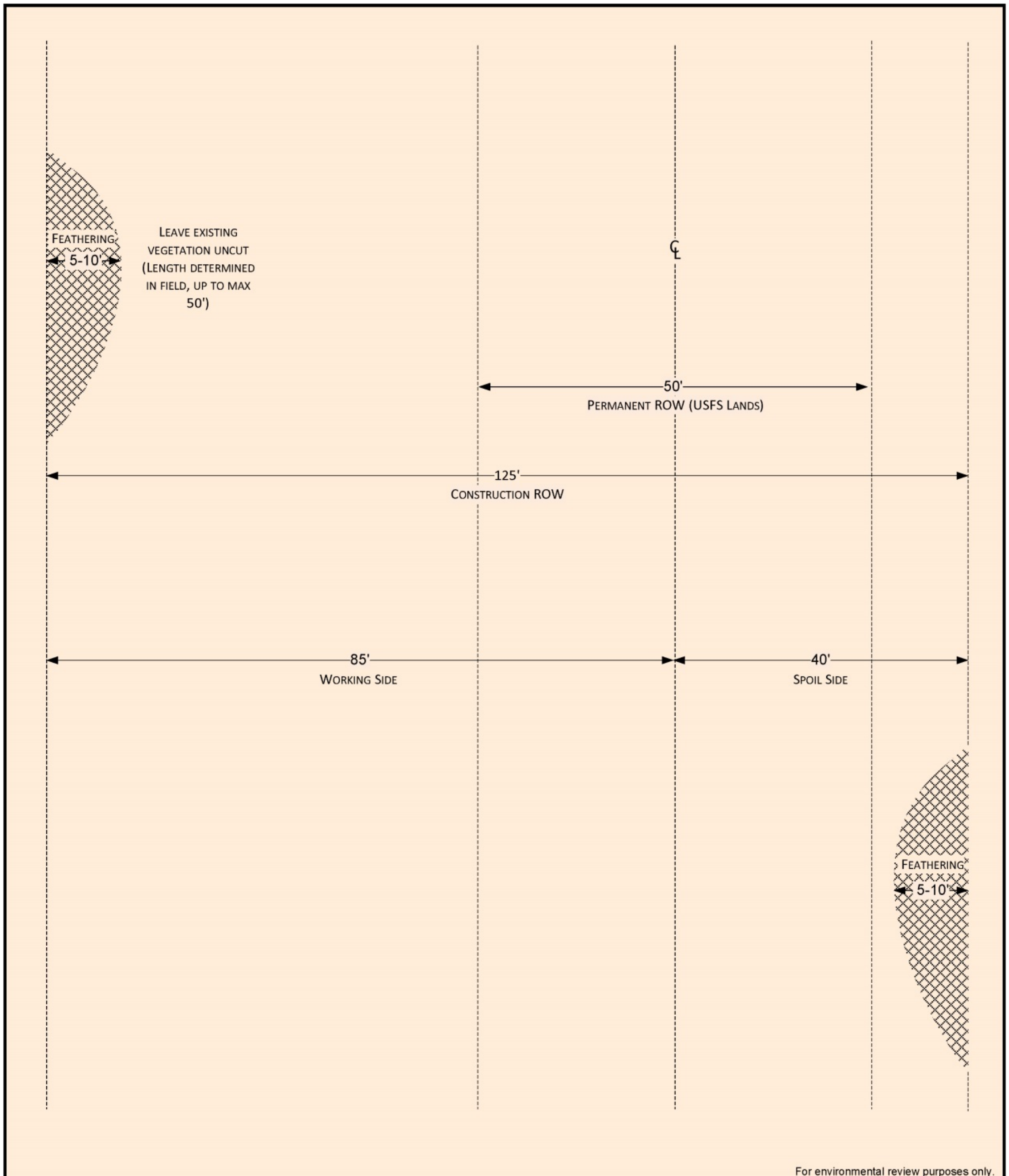
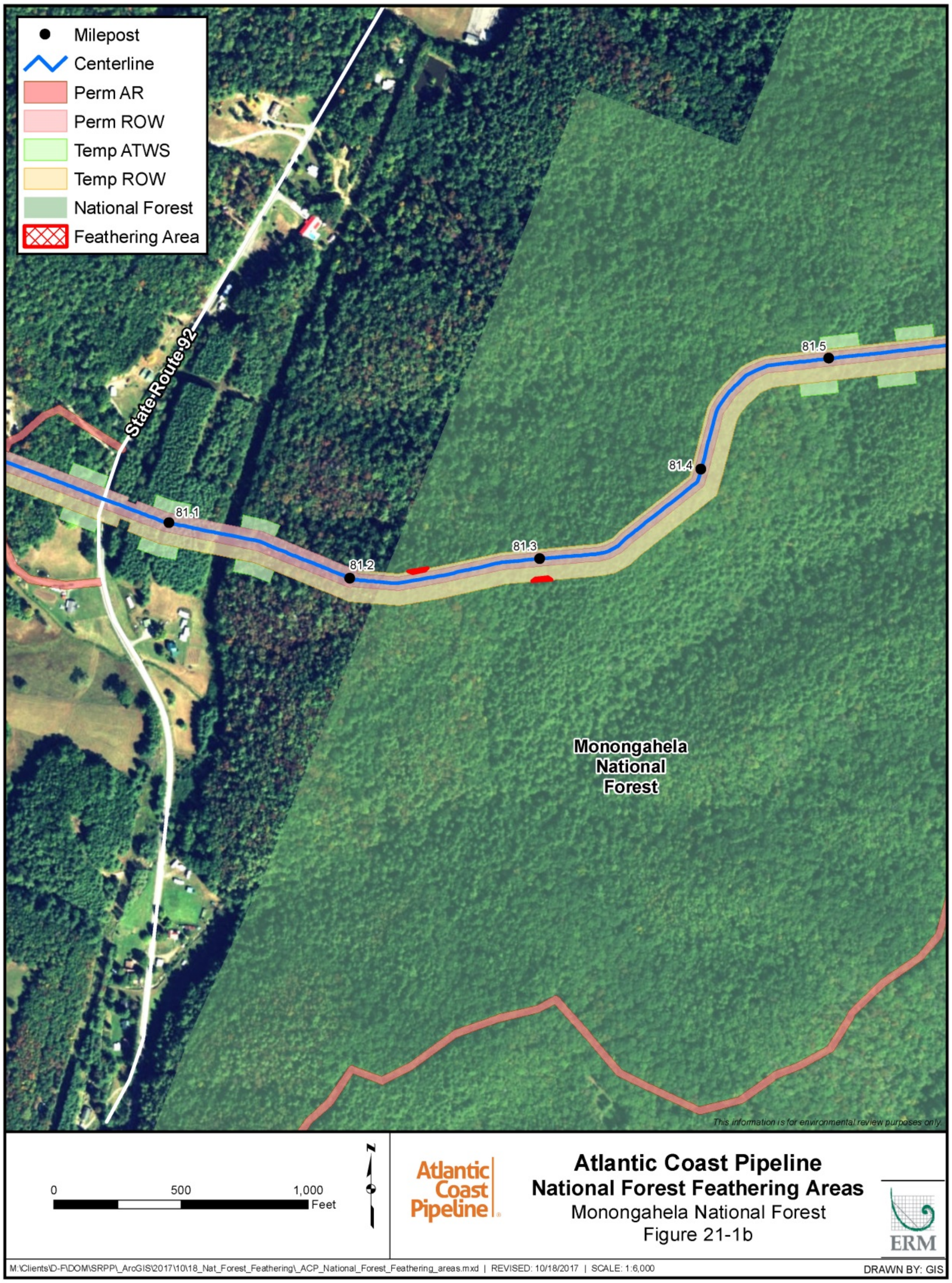


Figure 21-1
Atlantic Coast Pipeline
Plan View – Edge Feathering on Construction Right-of-Way

M:\TYPICALS_CLIENT_PROJECTS\D-F\DOM\ACP\TYPICAL_CONSTRUCTION\TYP_CON_REVEG_EDGE_FEATHERING.VSD, Date: 5/23/2007, REVISED: 10/19/2017 DRAWN BY: GIS

Atlantic Coast Pipeline
National Forest Feathering Areas
Monongahela National Forest
Figure 21-1a


Milepost
Centerline
Perm AR
Perm ROW
Temp ATWS
Temp ROW
National Forest
Feathering Area
State Route 92
81.1
81.2
81.3
81.4
81.5
Monongahela National Forest
This information is for environmental review purposes only.
0
500
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Atlantic Coast Pipeline
Atlantic Coast Pipeline
National Forest Feathering Areas
Monongahela National Forest
Figure 21-1b
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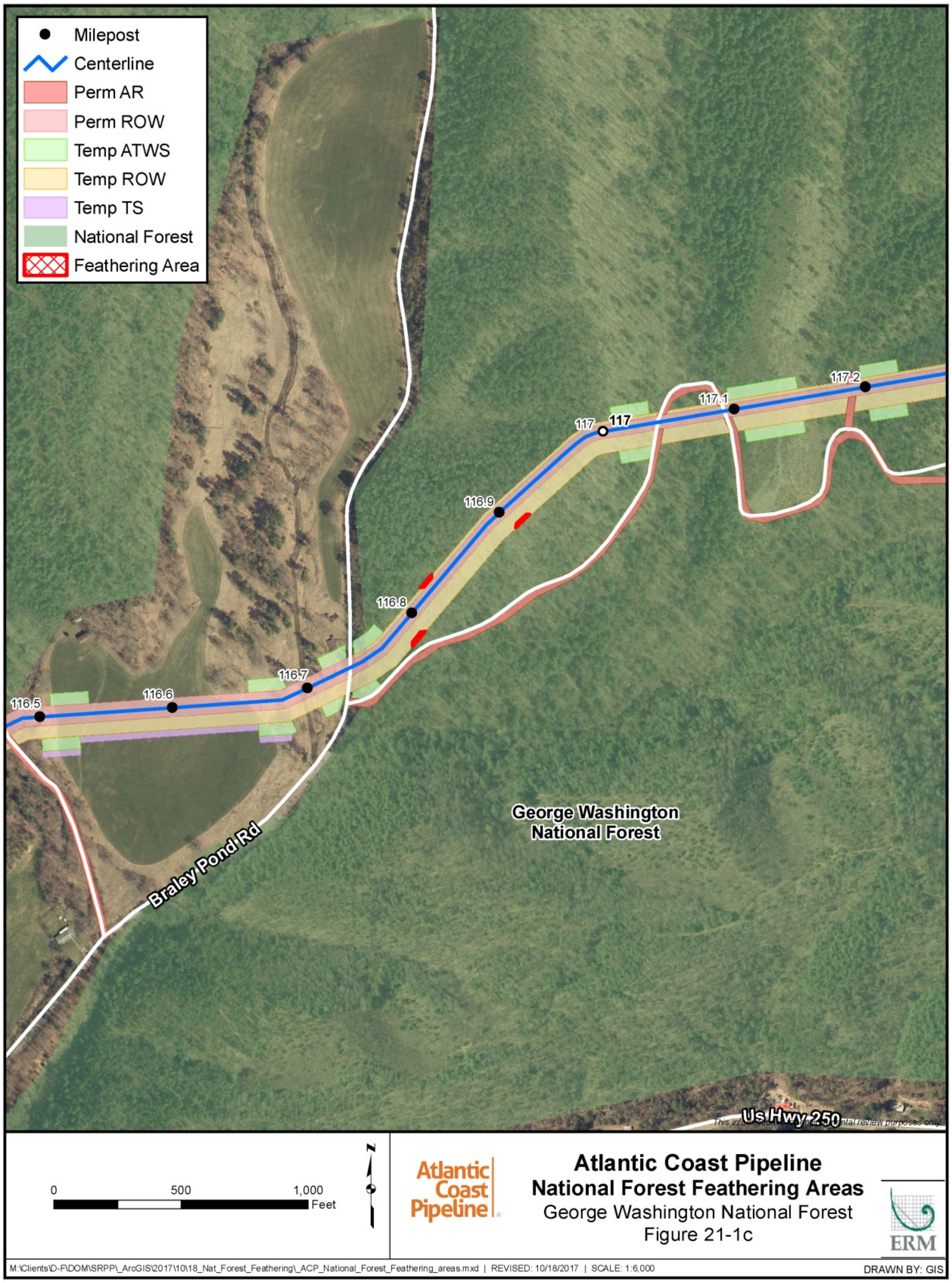
Milepost
Centerline
Perm AR
Perm ROW
Temp ATWS
Temp ROW
Temp TS
National Forest
Feathering Area
116.5
116.6
116.7
116.8
116.9
117
117
117.1
117.2
George Washington
National Forest
Braley Pond Rd
Us Hwy 250
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Feet
N
Atlantic Coast Pipeline
Atlantic Coast Pipeline
National Forest Feathering Areas
George Washington National Forest
Figure 21-1c
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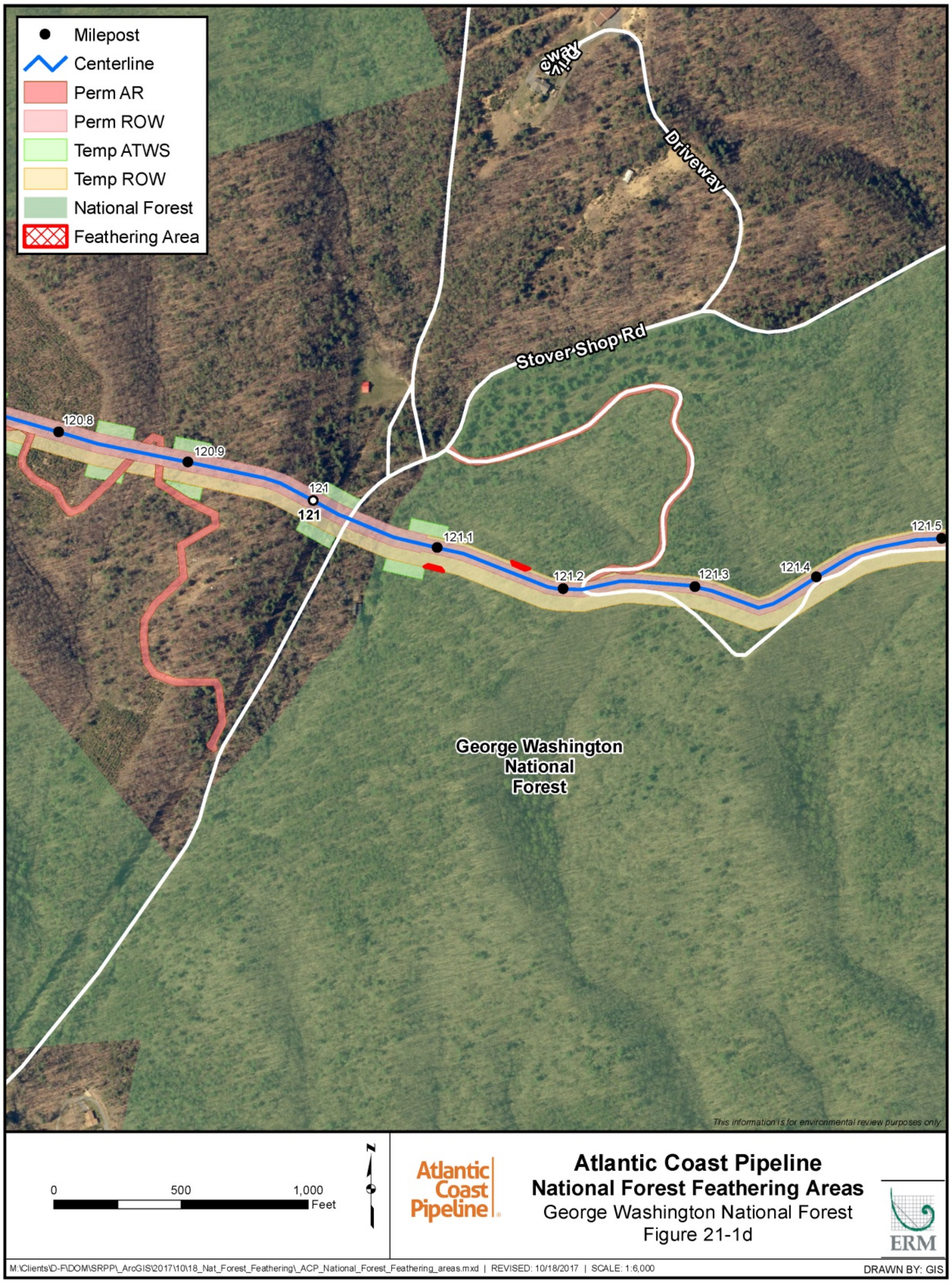
Milepost
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Driveway
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120.8
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121
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George Washington National Forest
This information is for environmental review purposes only.
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National Forest Feathering Areas
George Washington National Forest
Figure 21-1d
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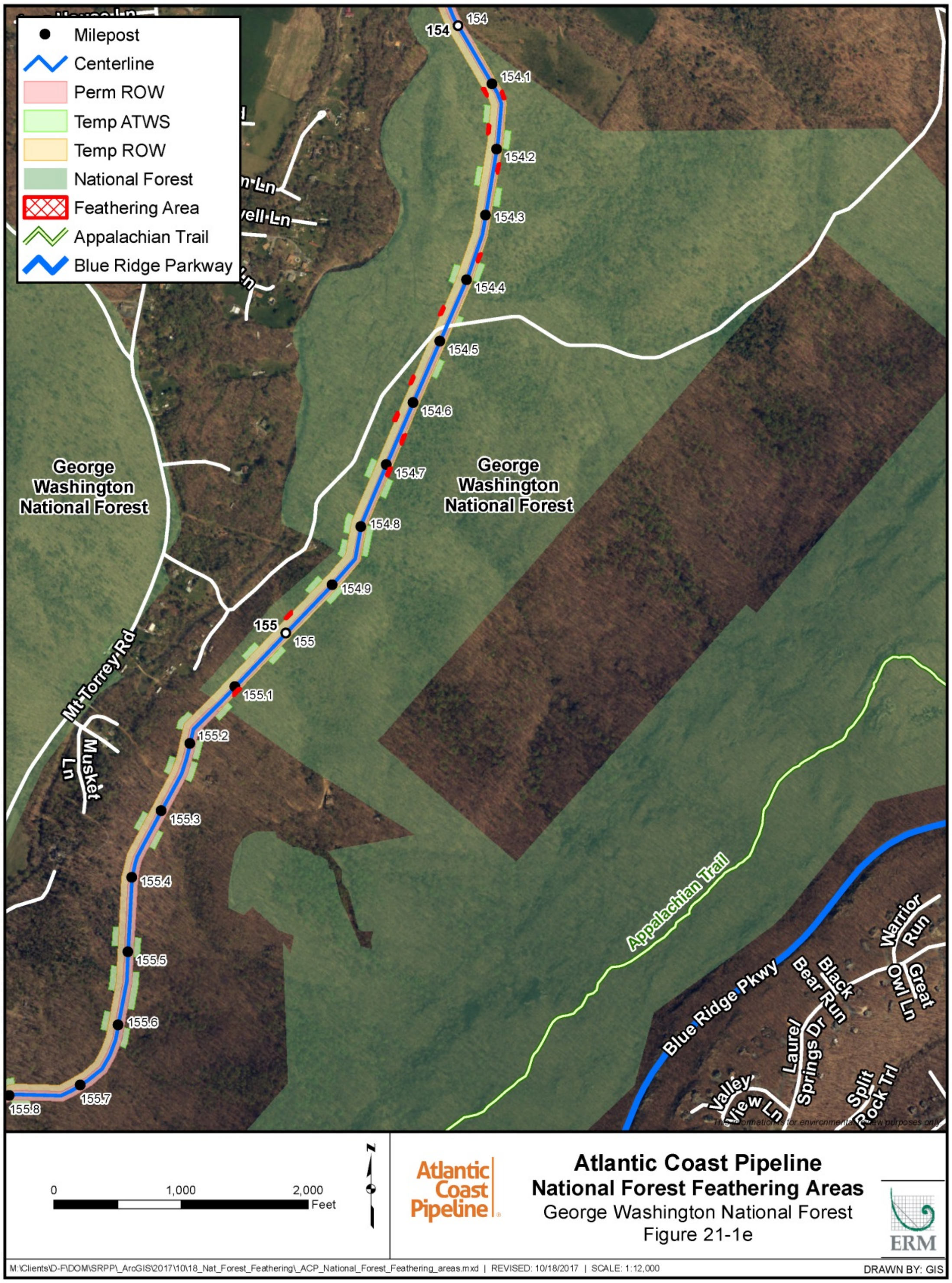
Milepost
Centerline
Perm ROW
Temp ATWS
Temp ROW
National Forest
Feathering Area
Appalachian Trail
Blue Ridge Parkway
George Washington National Forest
George Washington National Forest
Mt Torrey Rd
Musket Ln
Appalachian Trail
Blue Ridge Pkwy
Valley View Ln
Laurel Springs Dr
Bear Run
Black Bear Run
Warrior Run
Great Owl Ln
Split Rock Trl
0 1,000 2,000 Feet
Atlantic Coast Pipeline
Atlantic Coast Pipeline
National Forest Feathering Areas
George Washington National Forest
Figure 21-1e
ERM
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21.2 REPLANTING

As detailed in Section 11 (Restoration and Rehabilitation Plan), Atlantic will seed the entire construction right-of-way with seed mixes that it has selected in consultation with the FS. These seed mixes consists of a selection of warm season native grasses, some select cool season grasses in steep slope areas, and various native flowering forbs/pollinator species.

Atlantic will also replant all temporary work areas outside the 50-foot permanent right-of-way with a variety of nursery stock woody species. Plant species lists, planting configurations, and planting methods are based on guidelines provided by the FS, and are detailed in Section 11.3.1.12 of the Restoration and Rehabilitation Plan. Post-construction monitoring of plantings is addressed in Section 11.4.

In visually sensitive areas, i.e. those areas for which feathering the construction right-of-way edges is proposed, Atlantic will utilize enhanced restoration techniques to lessen the visual impact of the right-of-way. Details will be provided prior to construction.

Over time, natural revegetation from surrounding forest species and sprouting of stumps will occur and supplement the growing seedlings. Atlantic will limit stump removal to those areas requiring extensive grading and the area in the immediate trench vicinity. Stumps that have been ground to below grade will maintain their root systems, which not only helps stabilize the soil but allows many trees to regenerate from their stumps, facilitating restoration progress.

As part of routine maintenance of the pipeline system, DTI will occasionally trim woody vegetation and herbaceous vegetation over the pipe as necessary to maintain a visible corridor, centered on the pipeline, to allow for adequate aerial inspection.

Figure 20-1 Plan View- Edge Feathering on Construction Right-of-Way

22.0 REFERENCES

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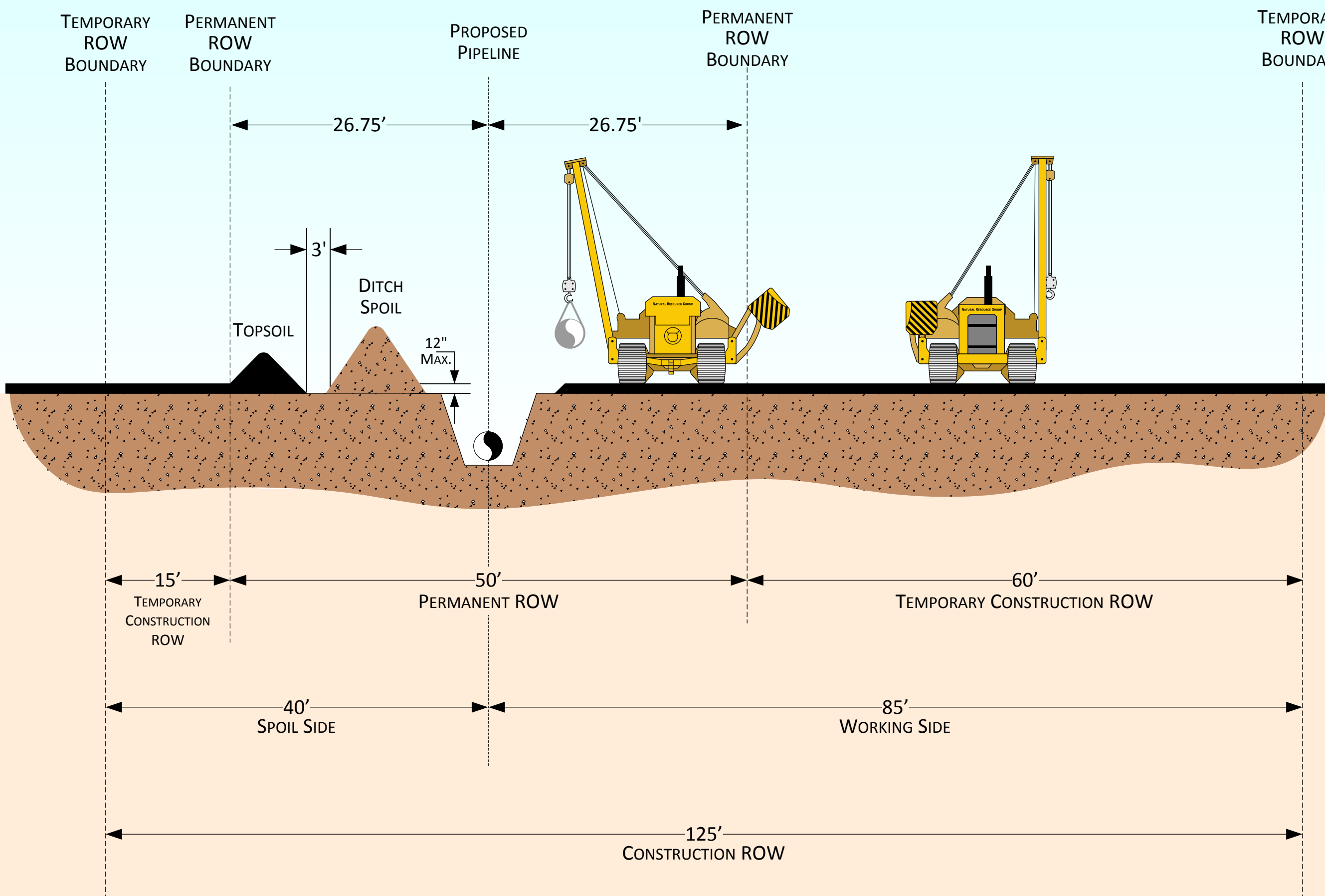
Construction, Operations, and Maintenance Plans

ATTACHMENT A

Right-of-Way Configurations



PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 125' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 75' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

For environmental review purposes only.

Atlantic Coast Pipeline SM

Atlantic Coast Pipeline
AP-1 (Federal Lands Only)
Typical Construction Right-of-Way

ERM

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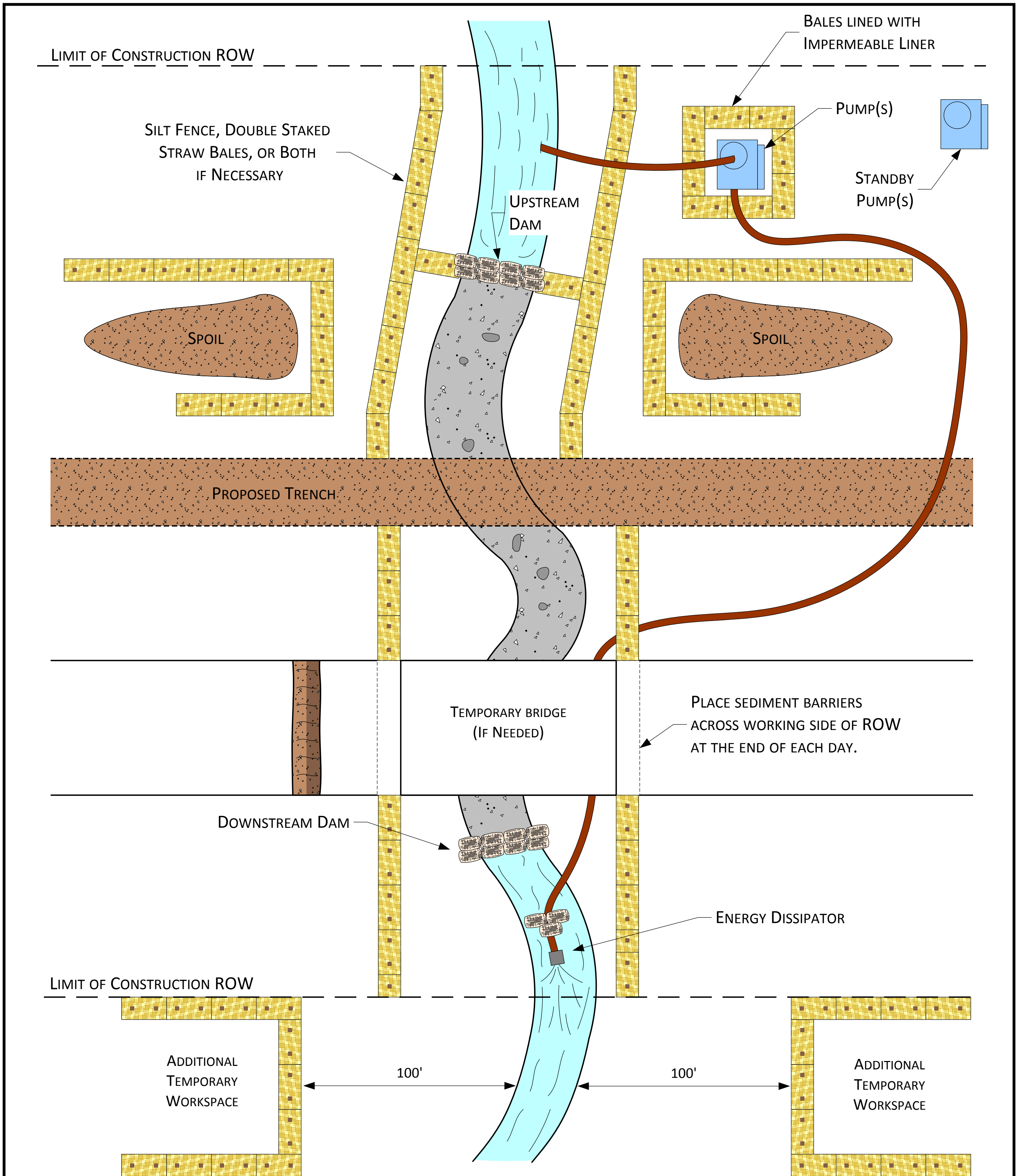

For environmental review purposes only.

Atlantic Coast Pipeline SM

Atlantic Coast Pipeline
AP-1 (42" Outside Diameter)
Typical Waterbody Crossing
Dam and Pump Method

ERM

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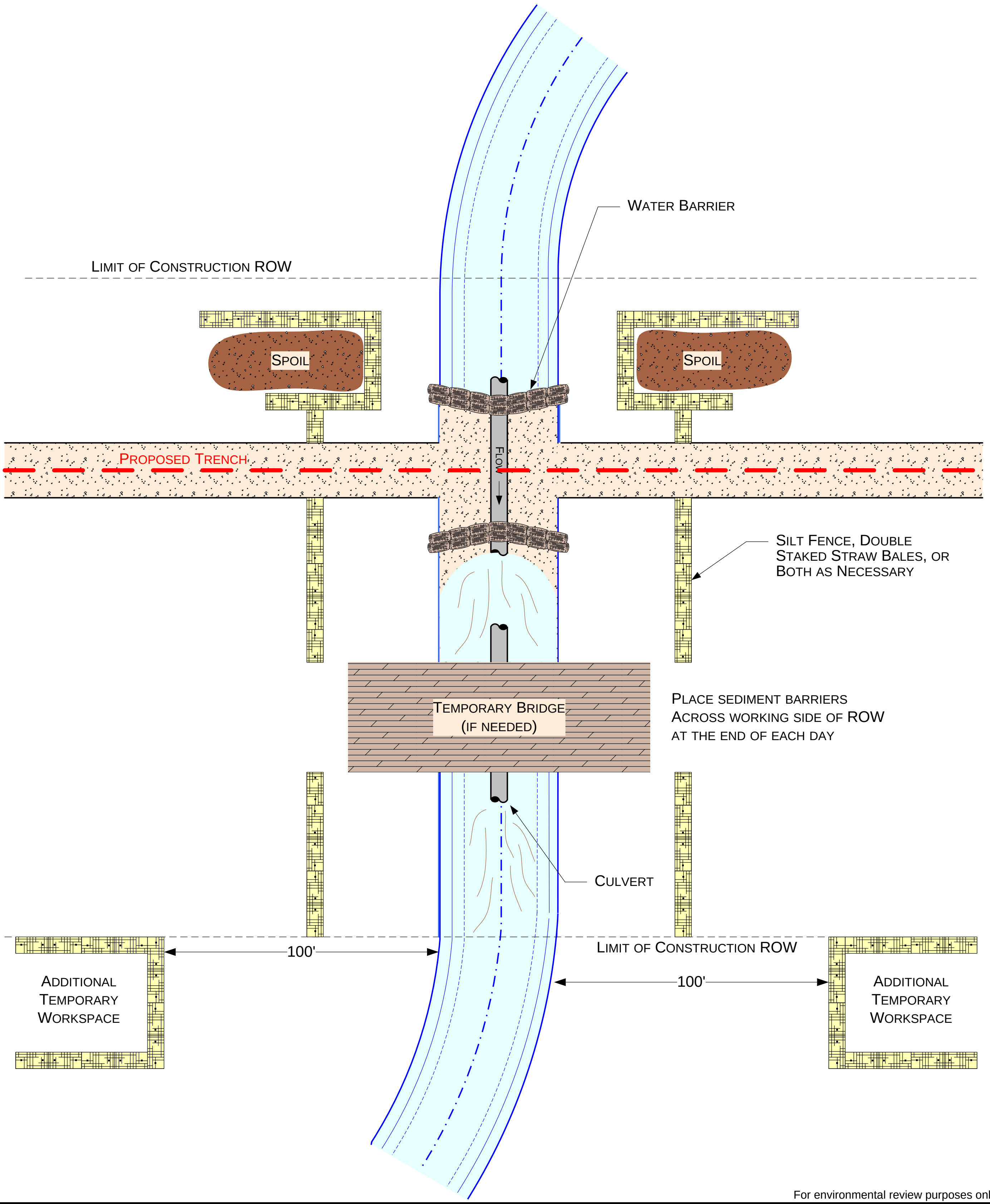
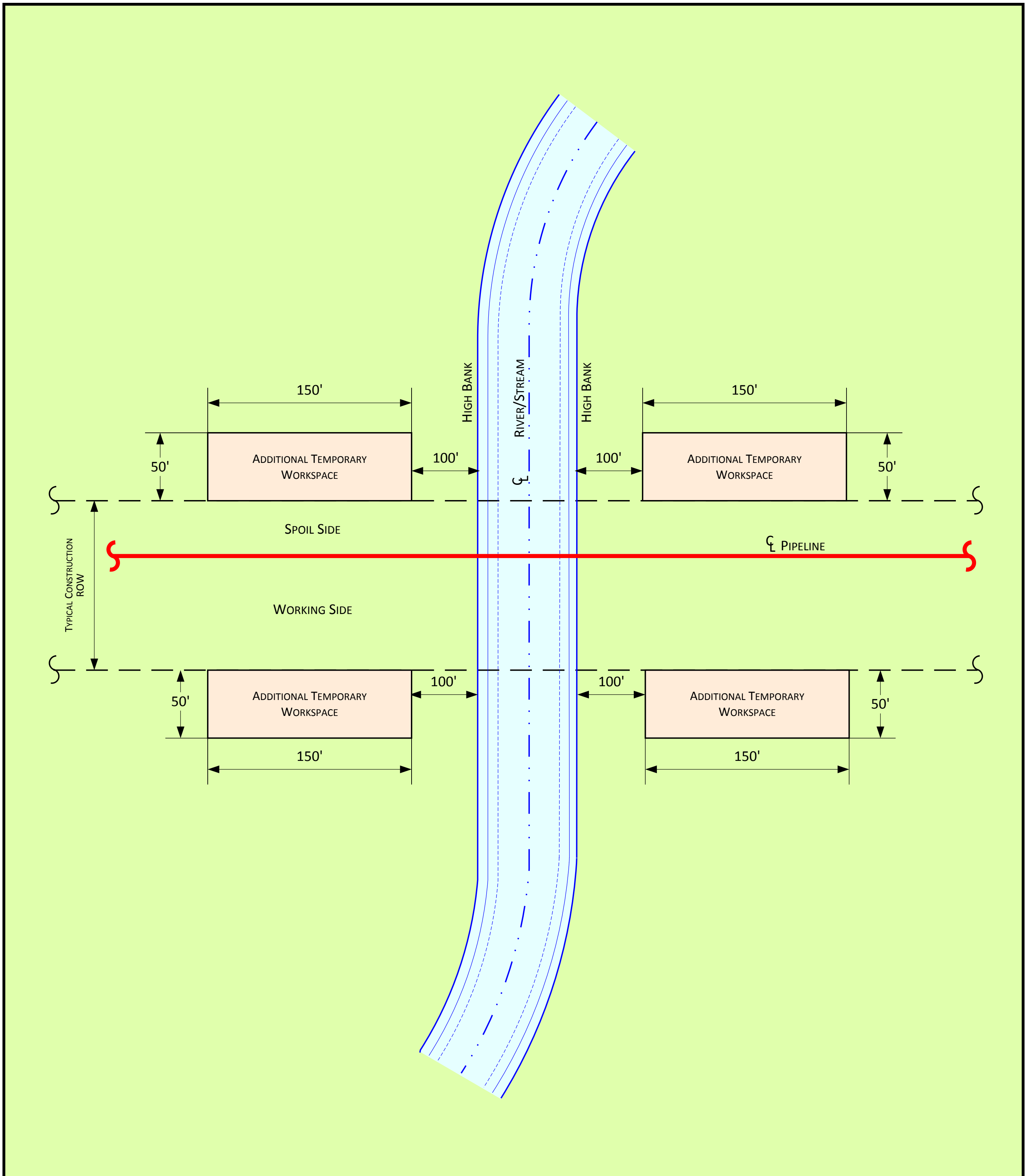


For environmental review purposes only.

Atlantic Coast Pipeline SM

Atlantic Coast Pipeline
AP-1 (42" Outside Diameter)
Typical Waterbody Crossing
Flume Method

ERM



For environmental review purposes only.

Atlantic Coast Pipeline SM

Atlantic Coast Pipeline

AP-1 (42" Outside Diameter)

Typical Additional Temporary Workspace at Waterbody Crossings Greater Than 10 Feet Wide

ERM

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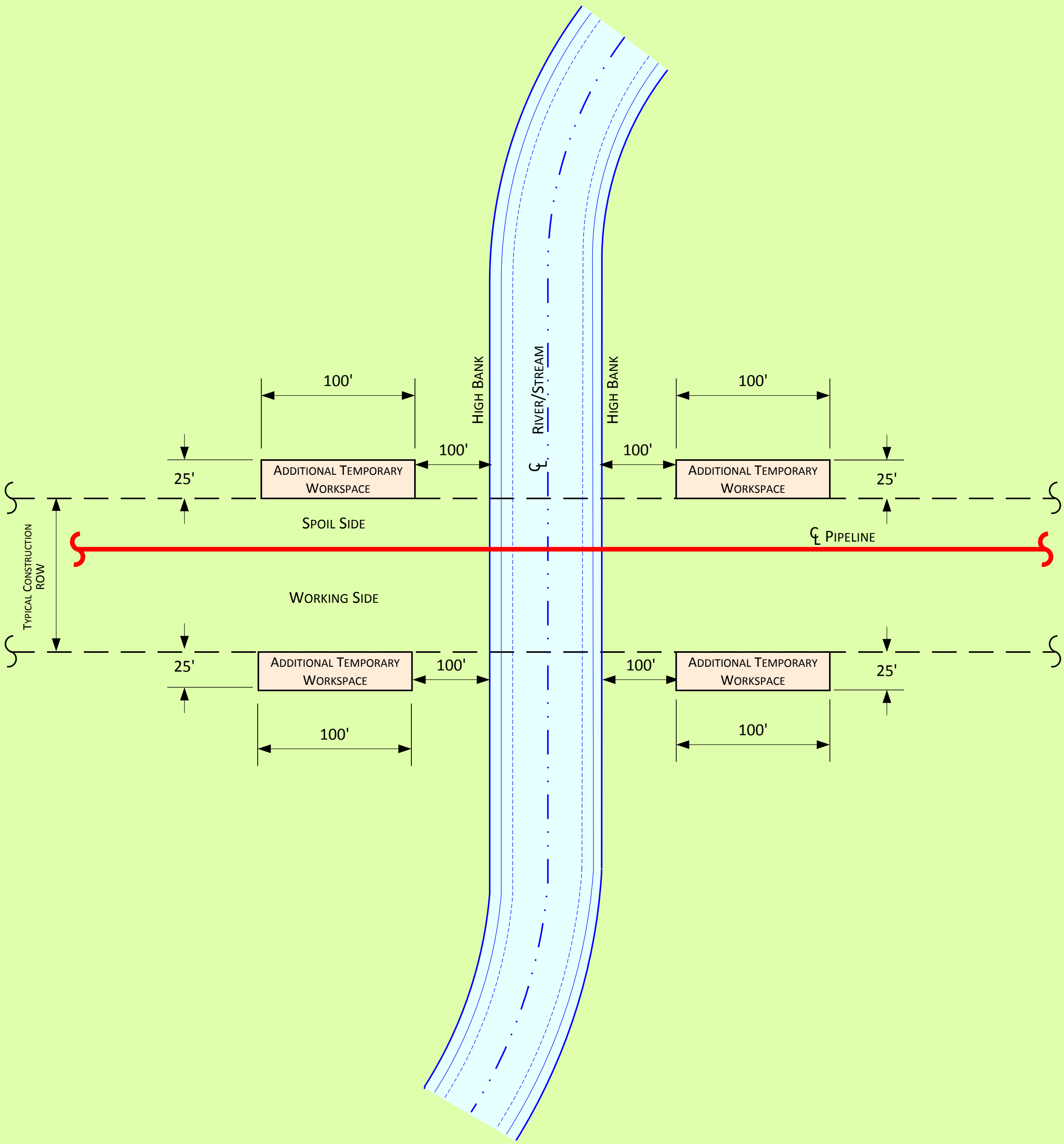

For environmental review purposes only.

Atlantic Coast Pipeline

Atlantic Coast Pipeline
AP-1 (42" Outside Diameter)
Typical Additional Workspace at Waterbodies Less Than 10 Feet Wide
Typical Additional Workspace at All Waterbodies

ERM

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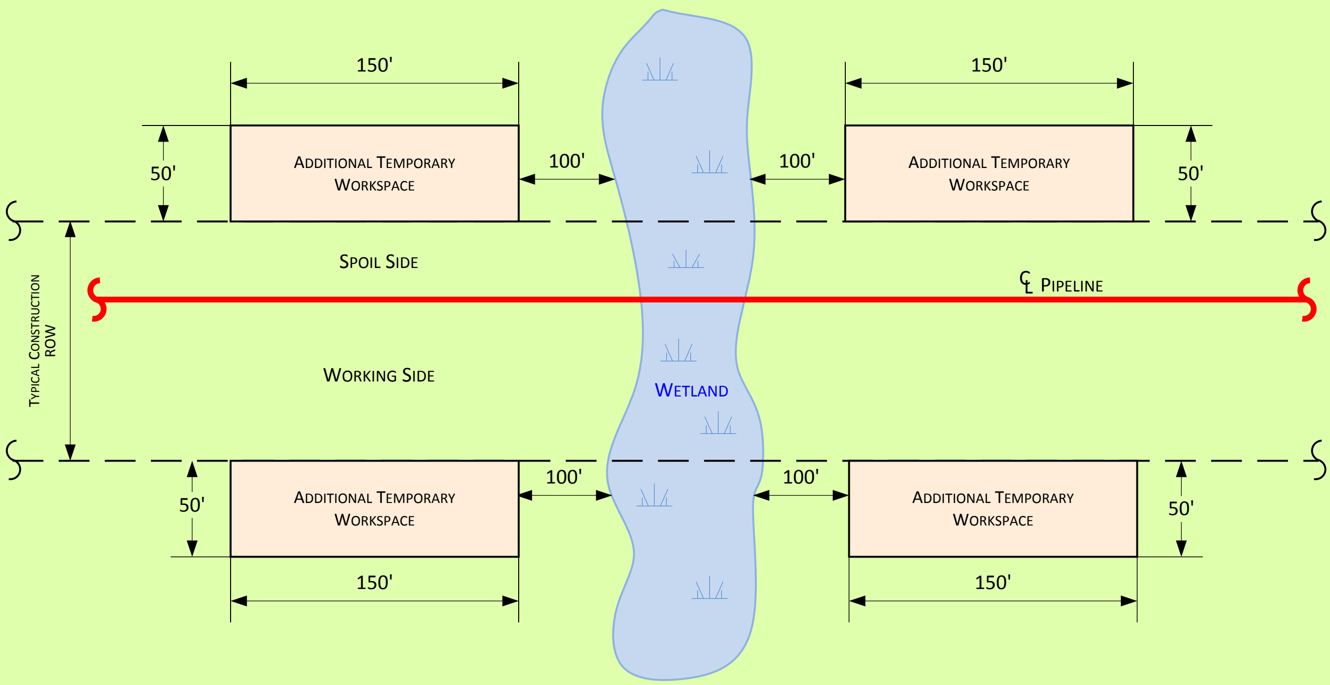

For environmental review purposes only.

Atlantic Coast Pipeline

Atlantic Coast Pipeline

AP-1 (42" Outside Diameter)

Typical Additional Temporary Workspace at Wetland Crossings

ERM

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Construction, Operations, and Maintenance Plans

ATTACHMENT C-1

Slope Stability Policy and Procedure

Slope Stability Policy and Procedure for Pipeline Design, Construction and Right of Way Maintenance

Dominion Transmission, Inc.

Engineering Services Reference Manual

9/28/2016

Slope Stability Policy and Procedure for Pipeline Design, Construction and Right of Way Maintenance

Table of Contents

Figures

Tables

ACRONYM LIST

BMP – Best management practice

CLSM – Controlled low strength material

DCNR – (Pennsylvania) Department of Conservation and Natural Resources

DTI – Dominion Transmission, Inc.

DTM – Digital terrain model

E&S – Erosion and Sediment

E&SC – Erosion and sediment control

ECC – Environmental Compliance Coordinator

EI – Environmental Inspector

EIES – Energy Infrastructure Environmental Services

FERC – Federal Energy Regulatory Commission

GIS – Geographic information system

GPS – Global positioning system

HDD – Horizontal Directional Drill

LiDAR – Light Detection and Ranging

LMS – Learning management system

LOD – Limit of disturbance

MD - Maryland

MSE – Mechanically stabilized earth

NOT – Notice of Termination

NRCS – National Cooperative Soil Survey

NRI – Natural Resource Inventory

OEPA – Ohio Environmental Protection Agency

OGRIP – Ohio Geographically Referenced Information Program

PAMAP – Pennsylvania Map

ROW – Right of way

RSS – Reinforced Soil Slope

SWPPP – Stormwater Pollution Prevention Plan

TWS – Temporary work space

USDA – United States Department of Agriculture

USGS – United States Geological Survey

VESCP – Virginia Erosion and Sediment Control Program
WSS – Web Soil Survey
WV – West Virginia
WVDEP – West Virginia Department of Environmental Protection
WVDOH – West Virginia Department of Highways
WVGES – West Virginia Geological and Economic Survey

Slope Stability Policy and Procedure for Pipeline Design, Construction and Right of Way Maintenance

POLICY:

The following slope stability procedure must be utilized as part of the development and execution of any Dominion Transmission, Inc. (DTI) pipeline project. The possibility of slope failures including landslides, will be considered during the routing, design, construction, restoration and post-construction phases of a pipeline project to avoid, reduce, or mitigate the incidence of slope failures on DTI pipeline projects. Specifically, DTI personnel and contractors engaged in pipeline projects must be trained to understand this policy and conform to the following procedure.

PROCEDURE:

1.0 Applicability

This policy and procedure will become effective on September 30, 2016. The applicability table shown below provides the details of which sections of the procedure are applicable for new pipeline projects, active pipeline projects and pipeline replacement projects.

Table 1: Applicability Sections for New Pipeline Projects, Pipeline Replacement Projects, and Existing ROW.

Applicable Sections	New pipeline projects that begin permitting after 9/30/2016	Pipeline Replacement Projects in Existing ROW	Slope Failures on Existing ROW
2.0 Introduction	X	X	
2.1 Slope Failure Susceptibility	X	X	
2.2 Types of Slope Failures	X	X	
2.3 Slope Failure Causes	X	X	
3.0 Pipeline Route Selection	X		
3.1 Preliminary Route Selection	X		
3.2 Desktop Study	X		
3.2.1 Existing Landslide Maps and Data	X		
3.2.2 Define Slopes of Greater than 30 Degrees	X	X	
3.2.3 USDA Natural Resources Conservation Service Soil Surveys	X	X	
3.2.4 Light Detection and Ranging (LiDAR)	X		

Table 1: Applicability Sections for New Pipeline Projects, Pipeline Replacement Projects, and Existing ROW, Continued.

Applicable Sections	New pipeline projects that begin permitting after 9/30/2016	Pipeline Replacement Projects in Existing ROW	Slope Failures on Existing ROW
3.2.5 Mine Study	X		
3.2.6 Desktop Study Mapping	X		
3.3 Field Reconnaissance	X	X	
3.4 Desktop Slope Failure Risk Assessment	X		
3.5 Selection of Preventative Measures for Identified High Risk Slope Failure Locations	X	X	
4.0 Pipeline Design and Engineering	X	X	
4.1 Excavation Minimization	X	X	X
4.2 Document Slope Failure Areas on Project Plans	X	X	
4.3 Temporary Work Space (TWS)	X	X	X
4.4 Include Additional Drainage	X	X	X
4.5 Engineered Details	X	X	X
4.6 Construction Stormwater Permit	X	X	
4.7 Stormwater Pollution Prevention Plan	X	X	
4.8 Documentation of Design Information	X		
5.0 Pipeline Preconstruction Planning	X	X	

Table 1: Applicability Sections for New Pipeline Projects, Pipeline Replacement Projects, and Existing ROW, Continued.

Applicable Sections	**New pipeline projects that begin permitting after 9/30/2016**	**Pipeline Replacement Projects in Existing ROW**	**Slope Failures on Existing ROW**
5.1 Slope Failure Training	X	X	X
5.1.1 Training	X	X	X
5.1.2 Environmental Permit Transition	X	X	X
5.2 Slope Failure Mitigation and Response Materials	X	X	
6.0 Addressing Slope failures during Construction	X	X	
6.1 Inspections	X	X	
6.2 Responding to Slope Failures	X	X	X
6.2.1 Evaluate Priority	X	X	X
6.2.2 Install Temporary BMPs	X	X	X
6.2.3 Gather Data	X	X	X
6.2.4 Select Slope Failure Repair Approach	X	X	X
6.2.5 Install Short Term Stabilizing Measures	X	X	X
6.2.6 Implement and Document Slope Failure Repair	X	X	X
6.2.7 Documentation of Repairs	X	X	X
7.0 Addressing Slope Failures after Construction	X	X	X
8.0 Slope Failures Caused by a Third Party	X	X	X

2.0 Introduction

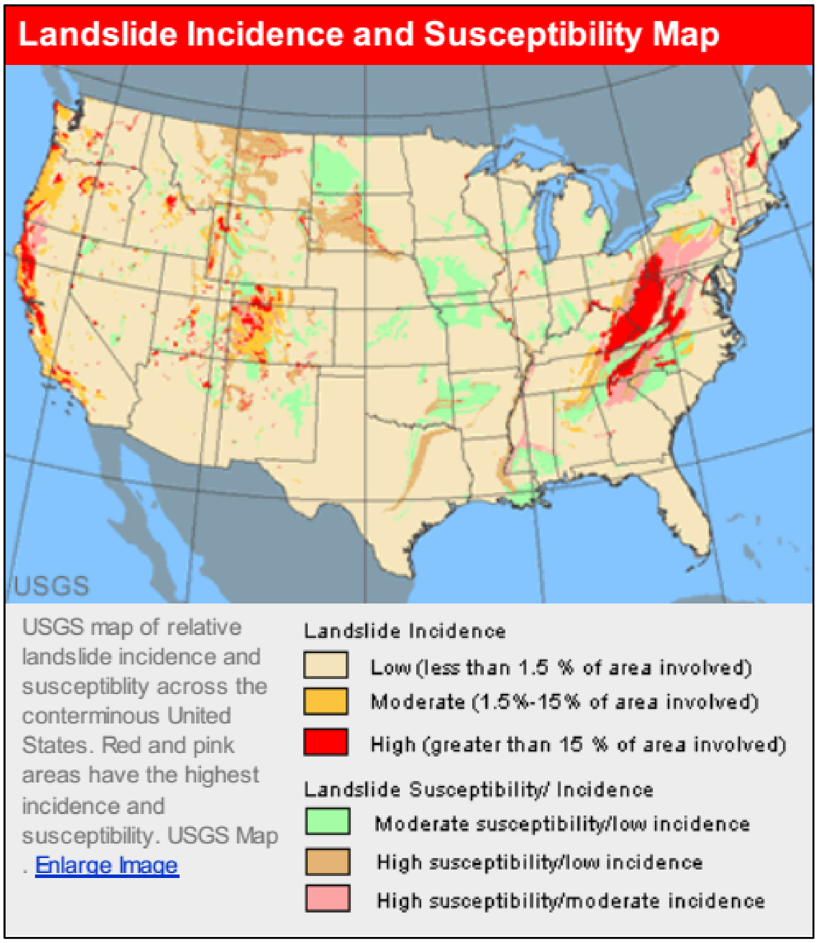
Slope failures, also referred to as landslides or slips on pipeline right-of-ways (ROW) can create adverse erosion control conditions, result in sediment deposits in adjacent waterways, cause landowner complaints, and/or damage the pipeline or other infrastructure. Additionally, slope failures can be costly to repair. Recognizing that the location of slope failures can be challenging to predict, the purpose of this procedure is to avoid and/or reduce the number and severity of slope failures that occur on new Dominion pipeline ROW, and planned expansion of existing Dominion ROW. Every pipeline project and slope failure is unique. Therefore, the specific requirements during project planning and implementation are dependent upon the site-specific conditions. The procedure provides the following;

- A method of identifying potential slope failures;
- Preventative measures;
- A method of protecting waterbodies from slope failure material runoff;
- Containment procedures for slope failure material;
- Remediation procedures; and,
- Training requirements.

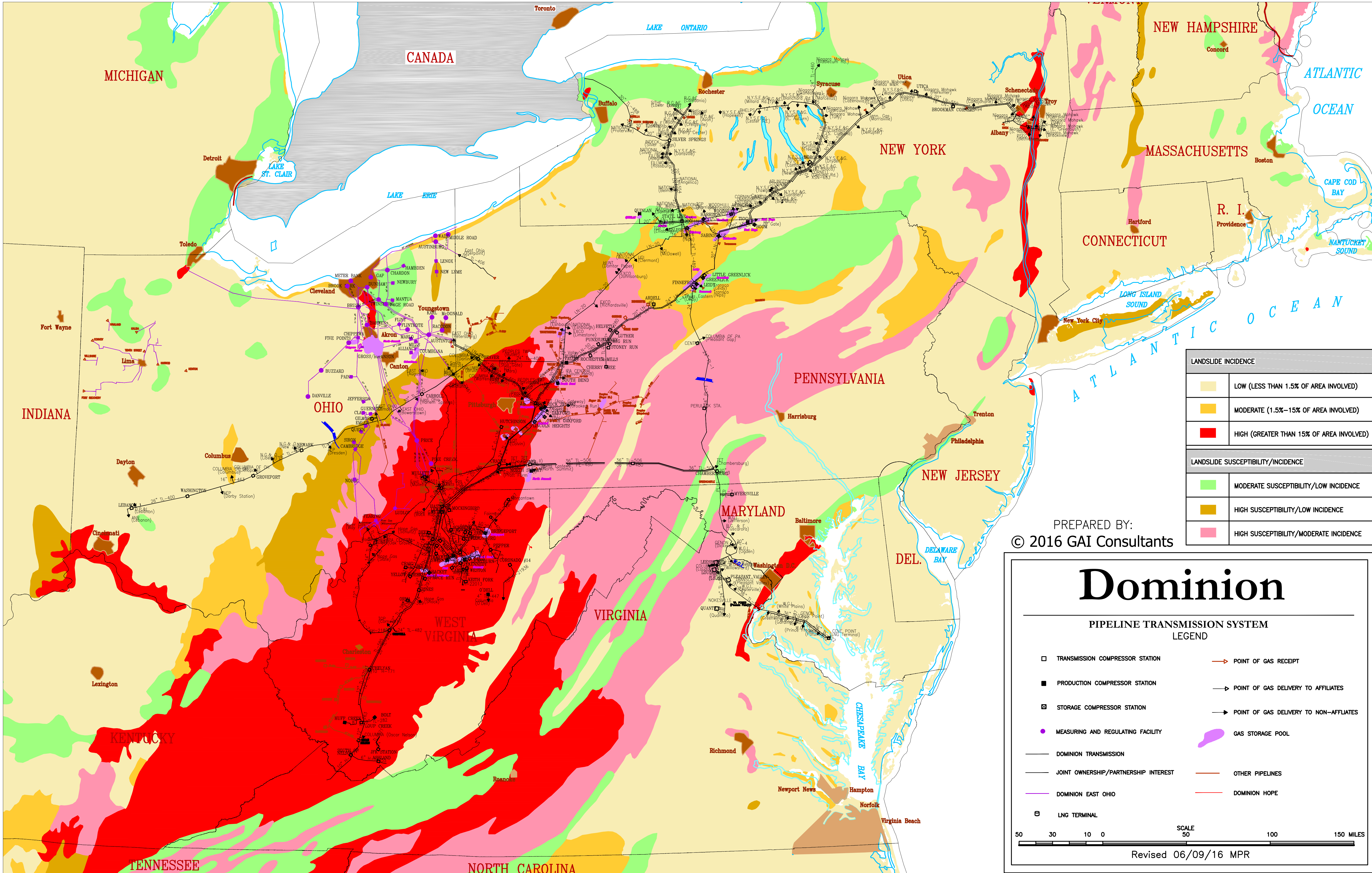
2.1 Slope Failure Susceptibility

Slope failures are plentiful and occur naturally in a large portion of the DTI operating area, and in particular the Appalachian Plateau and Valley and Ridge Provinces. Susceptibility is generally associated with cohesive soils (Silts and Clays) formed on steeper slopes that are triggered by precipitation, gravity and human activities. This region has some of the highest landslide or slope failure susceptibility in the United States, as indicated in Figure 1, which shows a USGS landslide map of the conterminous United States, and Figure 2, which shows a smaller scale map of DTI's operating area, with the locations having the highest risk of landslides shown in red.

Figure 1 – Landslide Susceptibility Map of the United States[1]



[1] USGS - Landslide Overview Map of the Conterminous United States


CANADA
Toronto
LAKE ONTARIO
MICHIGAN
Detroit
LAKE ST. CLAIR
LAKE ERIE
Toledo
Buffalo
Rochester
Syracuse
Utica
Schenectady
Troy
Albany
NEW YORK
NEW HAMPSHIRE
Concord
ATLANTIC OCEAN
MASSACHUSETTS
Boston
CAPE COD BAY
R. I.
Providence
NANTUCKET SOUND
Hartford
CONNECTICUT
LONG ISLAND SOUND
New York City
ATLANTIC OCEAN
Cleveland
Youngstown
Akron
Canton
Fort Wayne
Lima
INDIANA
OHIO
Columbus
Dayton
Cincinnati
Pittsburgh
PENNSYLVANIA
Harrisburg
Trenton
Philadelphia
NEW JERSEY
MARYLAND
Baltimore
Washington, D.C.
DEL.
DELAWARE BAY
WEST VIRGINIA
Charleston
VIRGINIA
Lexington
KENTUCKY
Richmond
Roanoke
CHESAPEAKE BAY
Newport News
Hampton
Norfolk
Virginia Beach
Elizabeth City
TENNESSEE
NORTH CAROLINA
LANDSLIDE INCIDENCE
LOW (LESS THAN 1.5% OF AREA INVOLVED)
MODERATE (1.5%–15% OF AREA INVOLVED)
HIGH (GREATER THAN 15% OF AREA INVOLVED)
LANDSLIDE SUSCEPTIBILITY/INCIDENCE
MODERATE SUSCEPTIBILITY/LOW INCIDENCE
HIGH SUSCEPTIBILITY/LOW INCIDENCE
HIGH SUSCEPTIBILITY/MODERATE INCIDENCE
PREPARED BY:
© 2016 GAI Consultants
Dominion
PIPELINE TRANSMISSION SYSTEM
LEGEND
TRANSMISSION COMPRESSOR STATION
PRODUCTION COMPRESSOR STATION
STORAGE COMPRESSOR STATION
MEASURING AND REGULATING FACILITY
DOMINION TRANSMISSION
JOINT OWNERSHIP/PARTNERSHIP INTEREST
DOMINION EAST OHIO
LNG TERMINAL
POINT OF GAS RECEIPT
POINT OF GAS DELIVERY TO AFFILIATES
POINT OF GAS DELIVERY TO NON-AFFLIATES
GAS STORAGE POOL
OTHER PIPELINES
DOMINION HOPE
SCALE
50 30 10 0 50 100 150 MILES
Revised 06/09/16 MPR

Landslides are common in the mountainous terrain of Virginia due to the presence of steep slopes and highly fractured bedrock overlain by shallow soils. The greatest landslide hazards are present in western and southwestern Virginia. Areas of low-relief such as the Piedmont and Coastal Plain also have landslides but these are generally smaller and generated by human disturbance.

Landslides have occurred throughout the majority of Pennsylvania. However, most landslides occur in southwestern Pennsylvania in areas where shallow soils are developed on steep slopes that have clay-rich bedrock. Areas such as this include the Waynesburg Hills and Pittsburgh Low Plateau sections of the Appalachian Plateaus province.

Landslides are rare or nonexistent throughout much of Ohio due to a lack of steep slopes and/or lack of geologic units prone to failure. However, there are a few areas of Ohio that experience frequent landslides. Portions of eastern and southern Ohio are characterized by steep slopes and several hundred feet of local relief. Bedrock of Mississippian, Pennsylvanian, and Permian ages, thick colluvium, and thick lake silts and outwash formed in association with Pleistocene glaciers make these areas particularly prone to slope failures. Red mudstones lose strength when they become wet and are the most slide-prone rocks in eastern Ohio. The state has experienced slope failures in areas where thick colluvium has developed, such as in Hamilton and Clermont County and the Scioto River Valley. The north-eastern half of Ohio along the Lake Erie shoreline experiences continual erosion, preventing the natural achievement of slope stability.

New York is not categorized as a state with a serious landslide threat as most of the state’s soil consists of dense glacial till comprised mostly of granular material that is not prone to landsliding. However, landslides have occurred across all of New York State, from the Adirondacks to Long Island where soft cohesive soils exist. The most common type of landslides that occur in New York are due to the combination of New York’s physiography and glacial history with most landslides occurring along major rivers and lake valleys were there were previously glacial lakes. These lakes result in glacial lake deposits (silts and clays) and are generally associated with steeper slopes.

2.1.1 Appalachian Highlands Region

The geology of the Appalachian Highlands is a primary contributor to the high incidence of slope failures. The Appalachian Plateau Province in West Virginia and Pennsylvania occurs west of the Appalachian Front, and coincides with the highest incidence of slope failures. This region contains narrow valleys and steep sided slopes with some deeper valleys. Overburden soils generally consist of colluvium overlying shallow bedrock. Colluvium is soil and debris (rock, tree material, etc.) that accumulate at the base of a slope or along the side slope by mass wasting or sheet erosion. It generally includes angular rock fragments, not sorted according to size, and could contain larger portions of bedrock. The sedimentary bedrock is mostly of the Permian-Pennsylvanian age that is relatively flat-lying and consists of cyclic sequence of sandstone, red beds, shale, limestone, and coal from the Dunkard and Monongahela Groups. Bedrock from the underlying Conemaugh Group is present in the deeper valleys. Because of the region's steep topography, abundant rainfall, low shear strength rocks, and soils with low residual strength, landslides have resulted in major infrastructure and property damage. In addition, large portions of West Virginia are extensively underlain by deep mining operations and strip mines that can also be associated with ground movements.

Southeast of the Appalachian Plateau, the flanks of the Appalachian Ridges and the Blue Ridge are covered by colluvium that is highly susceptible to sliding. Because the colluvium covers many types of bedrock, the map designations of landslide incidence and susceptibility cross formational boundaries. The designations do not correspond so closely in these areas to the units on the geologic map of the United States as they do in most areas west of the Mississippi. Most slope movements in the colluvium consist of slowly moving debris slides although many debris avalanches and debris flows can occur. Rainfall and the subsequent increase in groundwater conditions is a common trigger for landslides in this region, with the factors being the soil types and shape of the land surface, all of which relate to the underlying bedrock geology, and in many cases to slope modifications by human activity. Widespread occurrences of landslides coincide with major rainfall events, especially when the remnants of large storms track over the mountains.

In the Great Valley of Pennsylvania, Maryland, West Virginia and Virginia, east of the Appalachian Ridges, broad areas of Cambrian and Ordovician limestone contain pockets of thick residual clay that is moderately susceptible to sliding. This clay forms many small earth flows and slumps, especially along highway cuts.

2.1.2 Piedmont Region

East of the Appalachian Mountains, is the Piedmont Province of Maryland, Pennsylvania and Virginia. The province is a dissected rolling plain formed on residual soil from deeply weathered metamorphic rocks, and is bordered on the east by a dissected terraced plain on thick deposits of sand, gravel, and clay. Most of the region is free of landslides, except in the Lower Cretaceous clays of Maryland and Virginia, where the incidence of slumps and earth flows is high.

2.1.3 Atlantic Coastal Plain Region

The low dissected Atlantic Coastal plain of Maryland and Virginia is generally free of slope instability due to the moderate terrain in the majority of the area. However, there are localized areas in eastern Maryland with relatively steep slopes that have a high incidence of slope failures. In addition, a majority of Southern Maryland is highly susceptible to slope failure where the Marlboro Clay is exposed. A poorly exposed outcropping of Marlboro Clay begins in Prince Georges County and continues southwest for approximately 20 miles reaching into Charles County. Slope failures are particularly numerous in the east-central and south-western portions of Prince Georges County. Also, in the valleys of Piscataway and Mattawoman Creeks, the clay is mostly buried beneath Holocene alluvium.

2.2 Types of Slope Failures

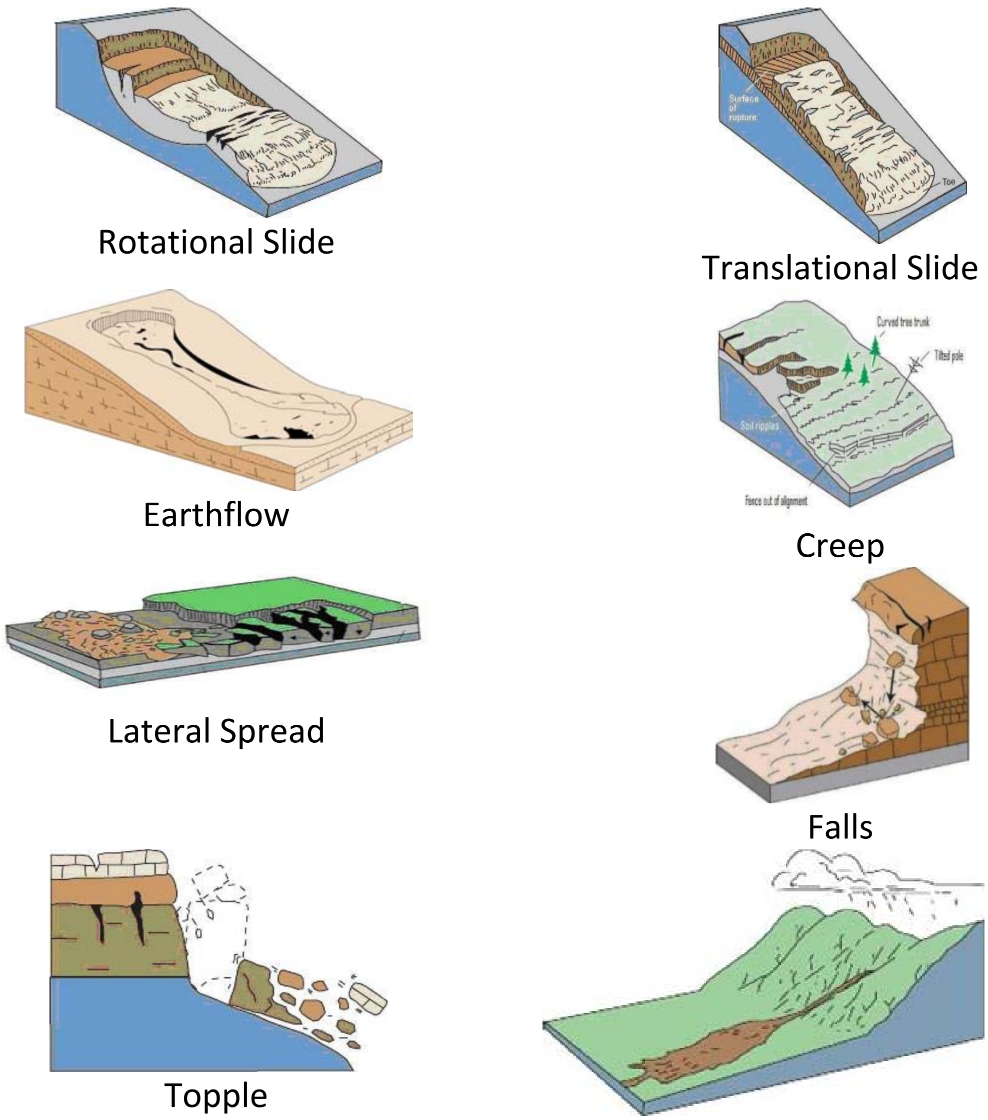
The term landslide or slip as it pertains to geologic reference can be defined as[2]: 1. the downward falling or sliding of a mass of soil, detritus, or rock, on or from a steep slope; 2. the mass itself. Other terms used to describe slips include landslides, land slips, land movements, slumps, slides, etc. The term “head scarp” refers to the tear in the ground surface located at the top of a slip. The term “toe bulge” refers to the mound of failed soil at the base of the slip.

The most common types of slips are described below[3], and a representation of some typical slips observed on pipeline ROW are presented in Figure 3.

[2] http://dictionary.reference.com/browse/landslide

[3] FEMA Landslide Loss Reduction: A Guide for State and Local Government Planning

Figure 3 – Types of Slope Failures



Source: USGS

- *Rotational Slides* – Movement of soil and debris downslope in a distinctive rotational motion. A "slump" is an example of a small rotational slide.
- *Translational Slide* – Down slope movement of soil and/or rock on a relatively planar surface and has little rotational movement or backward tilting. The mass commonly slides out on top of the original ground surface.
- *Earthflow* – Unchannelized flow of water, soil, rock, and vegetation that moves downslope.
- *Creep* – Imperceptibly slow, steady downward movement of a slope. Evidence of creep can be indicated by curved tree trunks, bent or tilted fences or retaining walls, and hummocky ground surface.
- *Lateral Spread* – Nearly horizontal movement of geologic materials; usually occurs on very gentle slopes.
- *Falls* – Abrupt movement of masses of soil or rock that becomes detached from steep slopes or cliffs. Movement generally occurs by free-fall, bouncing, and rolling. These movements are promoted by undercutting, differential weathering, excavation, or erosion.
- *Topple* – A block of rock that tilts or rotates forward on a pivot point and then separates from the main mass, falling to the slope below.
- *Debris Flow* – A moving mass of loose mud, sand, soil, rock, water and air that travels down a slope under the influence of gravity. To be considered a debris flow, the moving material must be loose and capable of "flow" and at least 50% of the material must be sand-size particles or larger.

2.3 Causes of Slope Failures

Slope Failures can be caused by nature, by man, or a combination of both. A listing of common contributing factors to slips is below.

Human Activities

- Removal of shallow bedrock on steep slopes and replacement with a weaker backfill material, such as soil fill;
- Removal of vegetation and trees;
- Changes in slope configuration, such as additional load placed on the top of the soil mass, or removal of material near the bottom of the soil mass (such as trenching for pipeline construction); and,
- Changes to the surface water or groundwater regime, such as the addition of water to a slope.

Natural Factors

- Weather;
- Erosion of toe support;
- Weathering of bedrock can produce weak, slope failure-prone materials;
- Earthquakes; and,
- Rapid lowering or rising of water level.

3.0 Pipeline Route Selection

Pipeline route selection is an important component of avoiding or minimizing the impacts of slope failures for new natural gas pipelines. The route selection process described in this document must be used for all DTI projects that include the construction of new natural gas pipelines or re-alignment of existing pipelines. DTI will avoid or mitigate the adverse effects of slope failures by following a route selection process that incorporates identification, avoidance, and/or mitigation. This process is an iterative process, and it includes preliminary route selection, desktop studies, field reconnaissance, landowner discussions and landowner considerations, temporary and permanent access road identification, and environmental factors as inputs to developing a final route. Multiple iterations of each step in the process may be necessary to develop a route that avoids or reduces the risk of slope failures.

3.1 Preliminary Route Selection

Preliminary routing includes establishing a preliminary route that serves as a starting point for the project team, and the final route will likely vary from this preliminary route. A preliminary route can be established using tools such as topographic maps, Google Earth™, available light detection and ranging (LiDAR) data, and other computer mapping software. Considerations during preliminary routing include slope failure-prone areas and construction techniques. Preliminary routing will avoid or minimize routing parallel to slopes, also known as “side hilling”, as this construction technique requires excessive excavation of material, increases the construction limits of disturbance, and results in a right-of-way that is difficult to restore and to stabilize. During preliminary route layout, care must be taken to traverse slopes perpendicular to topographic contours, and to avoid traversing slopes greater than 30 degrees (58 percent) to the maximum extent practicable. If traversing slopes of greater than 30 degrees (58 percent) cannot be avoided, it must be minimized, and these areas will be a focus of the desktop study and further evaluation during the field reconnaissance process discussed below in Section 3.3.

3.2 Desktop Study

The purpose of the desktop study is to further evaluate the preliminary route and make route adjustments prior to conducting the field reconnaissance. The DTI Project Team/field engineer, in consultation with DTI Engineering Management must decide at the beginning of a project the appropriate data to be considered during the desktop study. For small projects, the desktop study may only consist of a review of the route, and identification of steep slope areas that can be avoided. For longer projects, the desktop study should be more extensive and can include all of the items discussed below. The desktop study includes a review of existing data on slope failures and slope failure-prone areas, to allow the DTI Project Team/field engineer to make corresponding alterations in the route to avoid or minimize routing across existing slope failures and slope failure-prone areas, and to identify areas that must be crossed that will require additional review during field reconnaissance and project design.

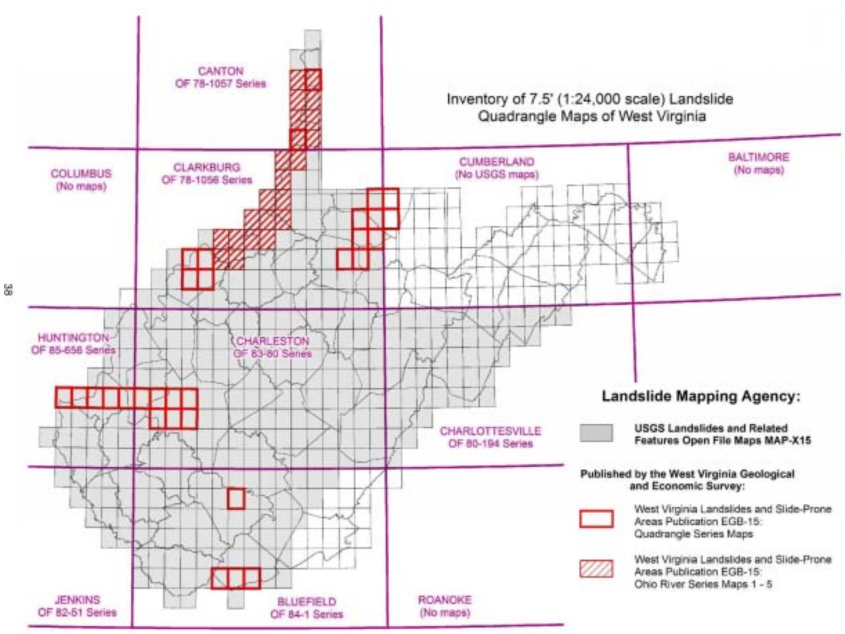
The DTI Project Team/field engineer must define the study corridor at the beginning of the study to provide ample coverage for route alterations either during the desktop study or the field reconnaissance study. Because the potential for route adjustments is greater for longer pipelines, the desktop study corridor must be wider than for shorter pipelines. The minimum width of a study corridor during the desktop review phase is 1000 feet, but may be expanded if necessary based on the project specifics. Geographic information system (GIS) is the most efficient method to conduct the desktop study. A project-specific GIS database can be developed using various information sources including, but not limited to those listed below. Additional information in the GIS includes topography, residential and commercial structures, land use, geology, streams, wetlands, cultural resource sites, cultural features such as roads, railroads, public lands and cemeteries to be used during the desktop study to refine the pipeline route prior to beginning the field reconnaissance. Potential access roads must be identified during the desktop study for further evaluation during the field reconnaissance.

3.2.1 Existing Landslide Maps and Data

The United States Geological Survey (USGS) maintains publically available GIS data for a digital compilation of landslide overview mapping of the conterminous United States at http://pubs.usgs.gov/of/1997/ofr-97-0289/ . This dataset consists of polygons enclosing areas of landslide incidence and susceptibility for the conterminous United States. The purpose of this dataset is to give the user a general indication of areas that may be susceptible to landslides, and is not suitable for local planning or site selection without further investigation on the ground.

For a portion of West Virginia, maps of old landslides and slide-prone areas were compiled in 1976 by the West Virginia Geological and Economic Survey (WVGES) in WVGES Publication EGB-15a, West Virginia Landslides and Slide-Prone Areas, P. Lessing, et. al, 1976. Landslides and slide-prone areas were mapped on USGS 7.5 minute quadrangles. Thirty-six 7.5 minute quadrangles are available as georeferenced images from the WV GIS Technical Center. The GIS data can be accessed here [WVGISTC: GIS Data Clearinghouse,] and areas covered by the data are shown in Figure 4 below. Non-georeferenced maps are available for the remaining USGS quadrangles shown in gray in Figure 4. These maps are available for download and can be georeferenced for projects that occur in areas where the georeferenced data are not directly available from the WV GIS Tech Center. State-specific information other than from USGS as discussed above are not available for Maryland, Ohio, New York, Pennsylvania or Virginia.

Figure 4 – Landslide Mapping in West Virginia



The maps must be used in the desktop study to identify areas of past slope failures, the slopes at the highest risk for slope failures, and the route adjusted to the extent practicable to avoid the highest hazard areas.

3.2.2 Define Slopes of Greater than 30 Degrees.

The desktop study must identify the degree of slope for the entire route. There are several methods to identify and define the degree of slope, either by direct measurement from topographic maps or using various computer programs. The DTI Project Team/field engineer will select an appropriate method based on the size of the project. The DTI Project Team/field engineer may select a slope angle that is shallower than 30 degrees on a project-specific bases.

3.2.3 USDA Natural Resources Conservation Service Soil Surveys

The United States Department of Agriculture (USDA) National Cooperative Soil Survey (NRCS) web-based Web Soil Survey (WSS) (http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm) provides georeferenced soil maps. The DTI Project Team/field engineer will review the soil survey information related to soil landscapes, soil formation, soil limitations for various land uses, and properties of the soils in the survey areas. In particular, information related to soil origin, slope steepness, drainage characteristics, typical soil profile with layer thickness, approximate depth to bedrock, and slope failure-prone soils can be obtained from the soil survey. Additionally, archived soil surveys are available for selected portions of West Virginia (http://www.nrcs.usda.gov/wps/portal/nrcs/surveylist/soils/survey/state/?stateId=WV), and may provide additional interpretation of soil conditions, land use applications, and soil hazards.

The objective of soil surveys is to separate major landforms that have similar land use, and not to delineate exact boundaries of soil type. Therefore, soil surveys provide a broad overview of soil conditions but are not designed for site-specific evaluations.

3.2.4 Light Detection and Ranging (LiDAR)

LiDAR is a remote sensing technology that measures distance by illuminating a target with a laser and analyzing the reflected light. LiDAR is capable of producing high resolution mapping of the earth's surface including very subtle topographic features such as headscarps, lobate features, and hummocky topography indicative of past or active slope failures.

For projects that include construction of new pipelines, the DTI Project Team/field engineer may use publicly available LiDAR data in the desk top study. If publicly available LiDAR data is not available, the project specific LiDAR data may be obtained if the DTI Project Team/field engineer and Engineering Management decides it is necessary. LiDAR data is available for purchase from select vendors for portions of the DTI system. Where LiDAR data is unavailable for purchase, it may be deemed necessary to obtain project-specific LiDAR data by flying the route. The DTI Project Team/field engineer and Engineering Management must determine if the route should be flown to obtain LiDAR data. If the DTI Project Team/field engineer determines that project specific LiDAR is not necessary, that decision must be documented in the Desktop study documentation. Typical LiDAR coverage ranges from 1000 feet to 4000 feet in width.

LiDAR data is analyzed by developing a digital terrain model (DTM) that can be imported to various computer aided drafting software suites. The DTM can be imported into the project GIS during the desktop study and used to identify past slope failures, steep slopes and other terrain features useful in routing the pipeline.

Publically available LiDAR data are available to varying degrees for each state as shown below;

Maryland: LiDAR data and other mapping data are available from the Maryland iMAP program located at http://imap.maryland.gov/Pages/lidar-topography-server.aspx

New York: LiDAR is available for portions of New York from the New York State Elevation Data site (http://gis.ny.gov/elevation/).

Ohio: LiDAR data for Ohio are available through the Ohio Geographically Referenced Information Program at http://ogrip.oit.ohio.gov/)

Pennsylvania: LiDAR data for Pennsylvania are available at the PAMAP website athttp://www.pamap.dcnr.state.pa.us/

Virginia: LiDAR is available for portions of Virginia from the Virginia LiDAR Database at http://www.virginialidar.com/index-3.html#.V3Qtw032apo

West Virginia: As of July 2015, LiDAR data is available from the WV GIS Tech Center for all or portions of Berkley, Gilmer, Jackson, Jefferson, Morgan, Webster, and Wyoming counties of West Virginia.

3.2.5 Mine Study

A mining study should occur in areas of suspected resource mining. Underground and surface coal mining is extensive throughout West Virginia, southwestern Pennsylvania, western Virginia, and southeastern Ohio. A study of state agency data bases should be checked for potential impacts to the pipeline route. Depending on the type of mining, the impacts could range from ground subsidence or ground movement from uncontrolled backfilling of strip mines or auger mining to longwall mine panel subsidence. Publically available mine mapping from state agencies are shown below:

New York
Department of Environmental Conservation - Mining & Reclamation
http://www.dec.ny.gov/cfmx/extapps/MinedLand/search/mines/
Information on the mines can be found by location, permit information or mine identification
Ohio
Division of Geological Survey - Division of Mineral Resources
https://gis.ohiodnr.gov/MapViewer/?config=OhioMines
Information for the coal seam and mine names are given
Pennsylvania
Pennsylvania Mine Map Atlas - Pennsylvania State University
http://www.minemaps.psu.edu/
Information on the Mine Map and the coal seam and mine names are given
Virginia
Virginia Department of Mines, Minerals and Energy
https://www.dmme.virginia.gov/DM/DMMappingCenter.shtml
Maps and Resource Center for mapping with mining status and coal mine outlines
West Virginia
West Virginia Geological & Economic Survey
http://ims.wvgs.wvnet.edu/index.html
All Mining Map - Information on the seam and mine names are given

3.2.6 Desktop Study Mapping

At the conclusion of the desktop study, a map will be generated that shows a composite of the desktop study results identifying the areas of high risk for slope failures including; slopes greater than 30 degrees (58 percent), past slope failures, slope failure-prone areas based on USGS mapping and/or LiDAR data, surface or near-surface mine areas that could impact stability and areas where shallow bedrock exists. The purpose of the mapping is to document and locate areas where further evaluation during the field reconnaissance is necessary. The information from the desktop study must be used in conjunction with other desktop data (streams, wetlands, residences, roads, cultural features, etc.) to revise the preliminary route to avoid as many high hazard areas as practicable. Slope failure-prone areas that cannot be avoided, must be identified for further evaluation during the field reconnaissance.

3.3 Field Reconnaissance

Field reconnaissance must be performed by individuals experienced in the identification and assessment of slope failures, other geohazards, and pipeline constructability to enhance the data obtained during the desktop study. This geohazard field reconnaissance can be performed in conjunction with identification of environmental features (i.e., streams, wetlands), but must include an emphasis on risk indicators for future slope failures. In particular, the following information are to be recorded with a hand-held GPS unit or other suitable mapping device, field notes, and photographs: existing slope failures, hummocky topography, head scarps, toe bulges, seeps and springs, tilted utility poles and fence posts, misaligned fences or guardrails, tilted trees, curved tree trunks, bedrock outcrops, sink holes, and mine spoil.

Based on the project conditions, the field reconnaissance can be limited to those areas identified during the desktop study as having increased risk of slope failures and potentially other impacts. The DTI Project Team/field engineer in consultation with DTI Engineering Management must determine if the field reconnaissance is to be performed on the entire pipeline alignment. The study corridor for field reconnaissance must be no less than the planned LOD, but may be up to 600 feet or greater in width.

3.4 Desktop Slope Failure Risk Assessment

Following data collection through the desktop study and field reconnaissance, a desktop slope failure risk assessment will be performed using the Desktop Slope Failure Risk Assessment Matrix included in Appendix A for new pipeline projects. For pipeline replacement projects, the DTI Project Team/field engineer will use the results of the field reconnaissance discussed in Section 3.3 to identify existing and previous slope failures and designate those areas as High Risk.

Using the guidance information included in Appendix A, each potential slope failure area identified in the desktop study and field reconnaissance will be assigned a numerical value for the following:

- Low, Moderate, or High probability of additional slope movement; and,

- Low, Moderate, or High probability of significant impact to pipeline, waterbodies, roadways, adjacent property, or other features.

Multiplying these two numerical values provides a risk score, as shown in the Slope Failure Risk Matrix in Figure 5 (included in Appendix A). The resulting risk score will be tabulated to prioritize the slope failures based on risk of future movement and degree of impact. This prioritization will allow for selection of 1) risks which can be avoided through a reroute or special construction design; 2) risks which are feasible to address as part of construction; 3) risks which cannot be avoided and will be handled as a future maintenance repair, if necessary.

Figure 5 – Desktop Slope Failure Risk Assessment Matrix

Probability of significant impact to pipeline, waterbodies, roadways, adjacent property, or other features	**Probability of additional slope movement**		
	High Probability (3)	**Moderate Probability (2)**	**Low Probability (1)**
High Probability (3)	High Risk (9)	High Risk (6)	Moderate Risk (3)
Moderate Probability (2)	High Risk (6)	Moderate Risk (4)	Low Risk (2)
Low Probability (1)	Moderate Risk (3)	Low Risk (2)	Low Risk (1)

<u>3.5 Selection of Preventative Measures for Identified High Risk Slope Failure Locations</u>

Following risk prioritization as outlined in Section 3.4 above, those areas along the preliminary route that have a risk score of “High” will be assigned a preventative measure. The DTI Project Team/field engineer and DTI Engineering Management must select preventative measures appropriate for each high risk location identified during the slope failure risk assessment. The DTI Project Team/field engineer also will determine if preventative measures are necessary for any of the moderate risk locations. This determination can be based on landowner concerns, highly sensitive resources in the area (trout streams, freshwater mussel streams, residential areas, transportation corridors, other utilities or other considerations. Potential preventative measures are listed below:

- Reroute around the slope failure hazard.
- Adjust the pipeline route through the slope failure hazard to minimize the consequence if slope failure were to occur. For instance, if a cross slope cannot be avoided, route the pipeline on the upslope side of the ROW and/or bury the pipe within bedrock to minimize risk to the pipeline integrity if a slope failure were to occur.
- Define locations that require engineered details, such as specialized backfill. This will include areas with slopes steeper than 30 degrees (58 percent).
- Define locations to perform a preemptive repair of an existing slope failure through which the pipeline passes.
- Adjust Temporary Work Space (TWS) limits such that soil stockpiling is not permitted along ridgelines where known slope failures are present immediately downslope of the LOD.
- In rare cases, Horizontal Directional Drill (HDD) under the hazard. However, it is not expected that HDD will be a viable options in most cases due to site constraints, such as steep terrain, that make HDD infeasible. Additionally, the increased impacts resulting from larger ground disturbance associated with HDD may increase the risk of slope failures.
- Identify and provide sufficient permanent access roads to facilitate inspection and repair in high risk slope failure locations after restoration.

4.0 Pipeline Design and Engineering

Slope failure-prone areas that were identified through the desktop study and field reconnaissance during the pipeline route selection phase must be properly engineered if avoidance is not an option. Additionally, preventative measures for high-risk slope failure areas were assigned to prioritize the work. Some of the selected preventative measures will be implemented during the engineering and design phase, as described in this section.

4.1 Excavation Minimization

Pipeline construction activities can result in conditions that can cause slope failures including removal of shallow bedrock on steep slopes and replacement with a weaker backfill material, removal of vegetation and trees, changes in slope configuration, and changes to the surface water or groundwater regime. Therefore, care must be taken to minimize excavation to that necessary to safely install the pipeline in areas prone to slope failures. The pipeline trench should be excavated to minimize the volume of material excavated and requiring subsequent restoration. The prepared pipe should be welded and or bent to match the trench profile rather than expanding the trench profile to accommodate the pipeline. Road crossings and bore pits are to be designed to minimize excavation through the use of shoring. Adequate extra work space is to be determined during project design, to prevent storing excavated material on steep slopes.

4.2 Document Slope Failure Areas on Project Plans

Slope failures and slope failure-prone areas must be included in the project plans. The following items must be included on the Stormwater Pollution Prevention Plans (SWPPP) and the Erosion and Sediment (E&S) control plans:

- Slope failure areas having high risk, as determined in Section 3.4;
- Existing slope failures; and,
- Slopes steeper than 30 degrees (58 percent).

The above items will be clearly identified on the plans using legend items, shading, or call outs such that the information is conveyed to the construction personnel and that awareness of the hazard is communicated.

4.3 Temporary Work Space (TWS)

As discussed in Section 3.5, TWS limits must be identified during the route selection phase so that soil stockpiling is not permitted along ridgelines in high risk areas, or where known slope failures are present immediately downslope of the LOD. Similarly, the limits of TWS must be adjusted to avoid placement over existing slope failures.

4.4 Include Additional Drainage

The project plans and specifications must include provisions for additional subsurface drainage on slopes greater than 30 degrees (58 percent). Include callouts and details in the E&S plans for location and type of drainage.

4.5 Engineered Details

Project-specific engineered details and specifications must be developed for those slope failure-prone areas requiring engineered preventative measures, as identified in Section 3.5. These locations will likely include areas with slopes steeper than 30 degrees (58 percent), or locations requiring pre-emptive repair of an existing slope failure in the proposed pipeline corridor.

It is important to understand that there is no one particular type of repair approach that works for all slope failures. Selection of the most cost effective preventative measure generally requires the following steps:

1. Detailed subsurface exploration to determine the condition of existing materials, depth of failure surface, depth to bedrock or stable soils, and groundwater conditions.
2. Slope stability modeling of the existing slope and the proposed preventative measure(s). This is done to verify that the repair will provide sufficient improvement in the stability of the final slope. Surface topography, laboratory strength testing, and groundwater information are necessary to perform this type of analysis.
3. Perform an Alternatives Feasibility Study to assess suitability of possible preventative and/or repair measures. Associated construction costs of each alternative can be evaluated as well.

Given difficult site access and time constraints for most pipeline projects in this region, some of these steps may not be feasible. Absent this information, conservative assumptions can be made as to the soil strength parameters, and the depth and type of failure surface for design based on good engineering principles and best professional judgment.

In general, the following engineered design methods apply to slope failure prevention and correction, and are presented in general order of increasing cost. Selection of the most appropriate engineered prevention measure or combination thereof, is dependent on individual site conditions and constraints. The DTI Project Team/field engineer and Engineering Management must also consider input from landowners, permitting agencies, and the Federal Energy Regulatory Commission (FERC) as applicable to evaluate all the factors that influence the design and construction of engineered design methods. Example typicals are shown in Appendix B. These typicals are provided as potential examples, and must be tailored to meet the site-specific requirements for each slope failure location.

- Drainage Improvement:
  - Provide subsurface drainage at seep locations through granular fill and outlet pipes.
  - Incorporate drainage into trench breakers using granular fill.
  - Intercepting groundwater seeps and diverting off ROW.
- Buttressing slopes with Sakrete trench breakers.
- Change Slope Geometry:
  - Reduce the slope by cutting at the top, or incorporating a toe buttress.

- On many overly steepened slopes the depth to bedrock is relatively shallow and slope failures often occur at the interface between the overburden soil and the bedrock. By removing the overburden soil and leaving the bedrock exposed, this could eliminate these types of slope failures. Continued erosion of the soft exposed bedrock should be anticipated.
- Modifications to E&S BMPs may be required to manage stormwater runoff between the final ROW slope configuration and existing grades beyond the ROW. One alternative approach to manage stormwater is to direct runoff to a defined channel within the ROW to carry surface water downslope. The channel must be stabilized with rip rap or by other means and be directed to an appropriately-sized stabilized outlet.

- Bench and Regrade with Controlled Backfill:
  - A common slope failure repair approach for slopes up to 30 degrees (58 percent) includes removal of the failed soil mass and reconstruction of the slope by cutting level benches into competent soil or rock beneath the failure plane, installing subsurface drainage, and placing compacted soil or other material as backfill.
- Use Alternate Backfill:
  - Removal of the existing fill soil and replacement with rock fill, such as shot rock (WVDOH Item 704.8 or equivalent) can be beneficial in slope failure repair because it improves drainage, provides a higher friction strength, and generally weighs less than a compacted soil backfill. This method is effective on slopes as steep as 38 degrees (78 percent), but should not be expected to vegetate.
  - The potential use of controlled low strength material (CLSM), such as cementitious flowable fill, as backfill within the pipeline trench could be considered as a method to reduce the pipeline trench from collecting and transporting water. The challenge is placing this material incrementally up the slope and containing it long enough for the flowable fill to harden and gain strength. **Note: Dominion policy does not allow the use of CLSM containing fly ash as filler. Therefore a flowable fill using fine aggregates or sand must be used.**
- Chemical Stabilization of Backfill:
  - Chemical modifiers, such as cement and lime, have successfully been used to dry cohesive soils that are saturated beyond the optimum moisture content, and are often used to extend the construction season. When used at higher concentrations, these modified soils can exhibit increased strength properties that can benefit slope failure stabilization projects on slopes up to 30 degrees (58 percent) or greater.

- Geogrid Reinforced Slope:
  - For slopes steeper than 30 degrees (58 percent), construction of a reinforced soil slope (RSS) may be necessary to match existing grades. A RSS consists of benching into the existing slope, installing subsurface drains, and incorporating geogrid reinforcement into compacted backfill.
- Retaining Structures:
  - Numerous types of retaining structures can be effective for slope failure prevention and repair, and are often used in combination with the repair approaches discussed previously. However, structural approaches are generally expensive since they require specialized equipment for installation on remote sites with challenging access. From the standpoint of protecting the pipeline, the most economical solution in certain cases may be to install a retaining wall and then regrade the slope below. In some cases, the slope below the retaining structure may continue to move.
  - One structural approach includes installation of soil nails with surface mesh to anchor the surficial soils to the underlying competent soil or rock. The soil nail spacing and length are designed based on the soil/rock conditions and the depth of sliding. If desired, the surface mesh can be sized to permit vegetation growth through the mesh.
  - Another alternative is the proprietary Geopier SRT system, which utilizes patented plate pile steel reinforcing elements to stabilize slopes. This system is advertised for use on slope failures less than 15 feet in depth where the soil conditions consist of an upper zone of unstable soil over stable soil or soft rock, since the pile elements must penetrate below the sliding surface into stable material. If shallow bedrock is present, predrilling of each plate pile could be required.
  - Other structural retaining wall options include gabion baskets, modular blocks, geocells, H-pile and lagging, drilled shafts, tieback walls, sheet piles, and mechanically stabilized earth (MSE).

4.6 Construction Stormwater Permit

State agency construction stormwater permits and the Federal Energy Regulatory Commission (FERC) require that restoration of the ROW be performed to match preconstruction grade. These requirements sometimes can be problematic on slopes steeper than 30 degrees (58 percent) where pipeline construction activities remove the shallow bedrock and replace it with weaker soil fill. The soil fill has lower internal shear strength than the natural rock and is unstable on these steep slopes, thus increasing the risk of slope failures. To prevent this known slope failure root cause, slopes could be reconstructed to a shallower grade than the existing slope. If the final restored slope is 30 degrees

(58 percent) or less, this approach would allow restoration of the ROW using fill materials comprised of natural soil and rock fragments without engineering design. If adjustments to the final grade are implemented, then the pipeline embedment must be increased sufficiently to maintain adequate cover depth. Additionally, modifications to stormwater Best Management Practices (BMPs) will be required since the ROW will likely be at lower elevation than the surrounding hillside, which could preclude installation of waterbars to divert water off ROW. An option to manage this stormwater effort is to direct the runoff to a defined channel within the ROW to convey surface water downslope. Any change in topography may require an individual construction stormwater permit rather than the general permit, which could add significant time to the permitting timeline and require additional review by permitting agencies along with the potential for a public comment period. This approach would require landowner approval and FERC approval if on a FERC project.

4.7 Stormwater Pollution Prevention Plan (SWPPP)

The SWPPP must include a discussion of the methods implemented to avoid slope failures and a plan of action should slope failures occur. The below paragraph provides a template that can be modified with specific measures to be used on a project.

The following paragraph will be included in each SWPPP:

> *Potential erosion problem areas, including but not limited to areas with 30^0 slopes or greater, will be protected by silt fence and permanent slope breakers. Slope breakers will be placed a minimum of 75 feet apart in areas with greater than 25^0 slopes. Care has been taken to avoid areas of steep slopes as much as practical; however, areas which could not be avoided will be addressed with (INSERT ENGINEERING MEASURES, e.g. waterbars, Rolled Erosion Control Product). In the event that subsurface flow is encountered, an under drain will be utilized, as necessary, to divert water outside of the LOD. If encountered, seeps can be mitigated by using seep collectors placed downslope of areas showing seepage. Armored fill placed at the toe of the slope may be used in areas of steep slopes in addition to a perforated drain pipe to divert subsurface water away from the cut slope. If a slope failure occurs Dominion will (INSERT CONTAINMENT MEASURES, e.g. install super silt fence, gabion baskets, jersey barriers or other portable containment devices) to keep the slope failure from impacting areas outside the LOD or waters of the state. Steep slopes have been avoided to the maximum extent practicable and are limited to (INSERT NUMBER) areas. Those areas will be restored with erosion control blanket and Dominion will implement the slope failure prevention items mentioned above as needed.*

Maryland: Slopes equal to, or greater than, 15 percent are classified as "steep slopes" and must be shown on the NRI plan. The standard symbol for steep slopes must be used on the plan and included in the legend.

New York: The New York State Standards for Erosion and Sediment Control Manual requests site plans which delineate and avoid disturbing wetlands, stream corridors and, to the extent practicable, wood lots, steep slopes and other environmentally sensitive areas. The plans should also minimize impacts by maintaining vegetative buffer strips between disturbed area and water resources. Additionally, an E&SC plan should be prepared for all land development and construction activity when uncontrolled erosion and sedimentation is anticipated and should, at a minimum, include sites on slopes that exceed 15%, sites in areas of severe erosion potential, sites within 100 feet and draining to wetland, sites within 100 feet draining to a watercourse, and/or sites with a high percentage of colloidal solids.

Ohio: Oil and gas pipeline construction activities are conditionally exempt from stormwater discharge permitting in Ohio. However, the Ohio Rainwater and Land Development Manual provides limited best practices for steep slopes. Additionally, the Ohio Environmental Protection Agency (OEPA) defines steep slopes as those that are 15 percent or greater.

Pennsylvania: According to the Erosion and Sediment Pollution Control Program Manual, critical areas should be covered with erosion control fabric. Critical areas are defined as part of a disturbed area which poses the greatest threat of sediment pollution to a receiving water. Any slope 3H:1V or steeper directly above a surface water is considered a steep slope and a critical area.

Virginia: According to the General VPDES Permit for Discharge of Stormwater from Construction Activities, a legible site plan must be submitted that identifies the limits of land disturbance including steep slopes and natural buffers around surface waters that will not be disturbed, as well as minimize(s) the disturbance of steep slopes is required as part of the permitting process.

West Virginia: WVDEP requires that the SWPPP include information on slide prone areas and the methods to be implemented to both avoid slope failures and a plan of action should slope failures occur.

4.8 Documentation of Design Information

The following documentation must be developed and filed in the DTI Engineering Documentum filing system.

- Desktop Study mapping and documentation of route adjustments to avoid slope failures and slope failure-prone areas;
- Slope failure Risk Assessment and identification of high risk areas; and
- Selected avoidance or mitigation method for each high risk slope failure location identified in the slope failure risk assessment

5.0 Pipeline Preconstruction Planning

5.1 Slope Failure Training

Training in this procedure consists of annual training on the e procedure, and project-specific review at the Environmental Permit Transition meeting.

5.1.1 Training

DTI personnel with responsibility for pipeline routing, construction, or operation must be trained in this procedure on an annual basis. The training may be completed by an online learning management system (LMS) module or may be conducted by Energy Infrastructure Environmental Services (EIES) personnel, or DTI Engineering Management. At a minimum, the following personnel will be trained;

- Engineering Directors and Managers;
- Design and construction engineers;
- Operations Directors, Managers and Supervisors;
- Construction supervisors; and
- Construction and operations Environmental Compliance Coordinators (ECC).

The training must include the following;

- types and causes of slope failures;
- routing avoidance and desktop methods;
- field reconnaissance;
- risk prioritization;
- pipeline design and engineering to prevent slope failures;

- addressing slope failures during construction;
- addressing slope failures post construction; and,
- reporting requirements.

5.1.2 Environmental Permit Transition

Prior to beginning construction, DTI and contractor personnel with responsibility for the pipeline construction must attend the Permit Transition with EIES. The EIES Permitting Lead will schedule the Permit Transition meeting to rollout the permits and clearances. The meeting will include a review of all environmental permits. At a minimum, the following personnel must attend the Environmental Permit Transition meeting;

- Permit Lead
- Project supervisor;
- Operations Supervisor/Manager (if available);
- ECC; and
- Environmental Inspector (EI) (if identified).

Recommended attendees at the Permit Transition meeting include the following;

- Construction engineer;
- Contractor supervisors, superintendents, and foreman - Policy can be reviewed with contractor at separate pre-construction meeting if cannot attend permit transition meeting;
- DTI inspectors; and

If the contractor cannot attend the environmental permit transition meeting, this policy will be reviewed with the contractor at a separate preconstruction meeting. The Environmental Permit Transition meeting will review the environmental permit conditions, training requirements, inspection requirements, and reference to this policy and procedure.

5.2 Slope Failure Mitigation and Response Materials

The DTI Construction Supervisor must identify during the preconstruction phase, the materials to be maintained onsite during construction to address a slope failure and to prevent slope failures from impacting waters of the state. These materials may include belted silt retention fence, super silt fence, jersey barriers, sakrete bags, gabion baskets, soil additives, drain pipe, stone, geotextile, or portable containment structures.

6.0 Addressing Slope Failures During Construction

6.1 Inspections

For projects with a construction stormwater permit or other E&S plan approved by a regulatory agency, inspection and maintenance of all E&S control structures shall be completed and documented. The ROW and E&S control devices will be inspected by the EI or person designated by the DTI Construction Supervisor. A record of weekly and storm event inspections will be maintained onsite for the duration of the project by the Project EI or Project Supervisor. Inspection forms will include the date(s) and names(s) of personnel making the inspection and results (including any major observations and corrective actions taken or needed). Any major observation and corrective action needed will be carried over to subsequent inspection reports until completely resolved. The inspection records must be maintained onsite during construction and retained by DTI Engineering for a minimum period of three (3) years after final stabilization. Completed inspection reports must be provided to the Construction ECC on a routine basis during construction, and the Construction ECC will conduct periodic site visits to review inspection records and to complete environmental self-assessments on select projects. Construction stormwater inspection requirements vary by state. The below table summarizes these requirements which are further detailed in the subsequent sections.

Table 2. Construction Stormwater Inspection Requirements by State.

State	Inspection Frequency	Rainfall Inspection	Inspection Records	Sign Posting
Maryland	Weekly	The following day after rainfall event resulting in runoff.	Inspection records maintained for three (3) years from the date that permit terminated.	NA
New York	< 5 acres – every 7 days > 5 acres disturbed at one time – at least 2 times every 7 calendar days separated by 2 full calendar days	NA	Inspection reports retained for 5 years following submittal of the NOT.	NA

Ohio	Every 7 calendar days	Within 24 hours of a 0.5" storm event that occurs within a 24 hour period.	Inspection reports retained for 3 years following the submittal of the NOT.	NA
Pennsylvania	Weekly	Within 24 hours after a measurable rainfall event	Inspection reports retained for 3 years from the date of the termination of coverage.	NA
Virginia	Every 5 business days or at least every 10 business days and →	Within 48 hours following any runoff producing measurable storm event.	Inspection report retained for 3 years from the expiration or termination of the permit.	Post copy of notice of coverage letter.
West Virginia	Every 7 calendar days for actively disturbed areas and Every 14 calendar days for restored areas	Within 24 hours after a storm event > 0.5" of rain in a 24 hour period.	Inspection reports retained for 2 years.	Sign posted within 24 hrs of submitting NOI.

6.1.1 FERC Requirements

For FERC projects, inspections are required in accordance with the FERC Plan. FERC inspections are required on a daily basis in areas of active construction or equipment operation, on a weekly basis in areas with no construction or equipment operation, and within 24 hours of each 0.5 inch of rainfall. All grade surfaces, walls, dams and structures, vegetation, E&SC measures and other protective devices must be maintained in good and effective condition and promptly repaired or restored, even if damaged by a third party.

6.1.2 Maryland

The December 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control can be found at the following site:

http://www.mde.state.md.us/programs/water/stormwatermanagementprogram/soilerosionandsedimentcontrol/pages/programs/waterprograms/sedimentandstormwater/erosionsedimentcontrol/esc_standards.aspx

According to the Maryland Soil Erosion and Sediment Control Manual SECTION A-3 SEDIMENT CONTROL PRINCIPLES, the owner is responsible for conducting routine inspections and required maintenance. At a minimum, the site and all controls should be inspected weekly and the next day after each rain event. However, the approval authority may require more frequent inspections, especially adjacent to sensitive areas or in impaired watersheds. A written inspection report is part of every inspection. In addition, Maryland requires a "Responsible Person" to act as an inspector. The responsible personnel involved in the construction project shall have a Certificate of Training at a Maryland Department of the Environment (MDE) approved training program for the control of erosion and sediment prior to beginning the project. Additionally, the owner or developer shall certify right of entry for periodic on-site evaluation by the appropriate enforcement authority and/or MDE.

6.1.3 New York

The following excerpts are from *Part IV. Inspection and Maintenance Requirements of the New York, Department of Environmental Conservation, SPDES General Permit for Stormwater Discharges from Construction Activity*. A copy of the entire document and appendices can be found at the following location**:**

http://www.dec.ny.gov/docs/water_pdf/gp015002.pdf

A qualified inspector must conduct site inspections. The qualified inspector qualifications are a: - licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity.

The qualified inspector shall conduct site inspections where soil disturbance activities are on-going at least once every seven (7) calendar days. In areas where disturbance is greater than five (5) acres of soil at any one time or in sensitive areas, the inspector shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days. During temporarily suspended work (e.g. winter shutdown) and when *temporary stabilization* measures have been applied to all disturbed areas, a site inspection should be completed at least once every thirty (30) calendar days.

6.1.4 Ohio

The following excerpt is from the *Ohio Environmental Protection Agency, General Permit Authorization for Stormwater Discharges Associated with Construction Activity under the National Pollutant Discharge Elimination System.* A copy of the entire document can be found at the following location**:**

http://www.epa.ohio.gov/Portals/35/permits/OHC000004_GP_Final.pdf

At a minimum, procedures in an SWPPP shall provide that all controls on the site are inspected at least once every seven calendar days and within 24 hours after any storm event greater than one-half inch of rain per 24 hour period. The inspection frequency may be reduced to at least once every month if the entire site is temporarily stabilized or runoff is unlikely due to weather conditions. The permittee shall assign "qualified inspection personnel" to conduct these inspections to ensure that the control practices are functional and to evaluate whether the SWPPP is adequate and properly implemented.

6.1.5 Pennsylvania

The following excerpt is from the *March 2012 Pennsylvania Department of Environmental Protection (PADEP) Erosion and Sediment Pollution Control Program Manual.* A copy of the entire document can be found at the following location**:**

http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-88925/363-2134-008.pdf

PADEP requires a maintenance program that provides for the operation and maintenance of BMPs and the inspection of BMPs on a weekly basis and after each stormwater event, including the repair or replacement of BMPs to ensure effective and efficient operation. The program must provide the completion of a written report documenting each inspection and all BMP repair or replacement and maintenance activities.

Pennsylvania has no certification requirement for E&SC inspectors.

6.1.6 Virginia

The following excerpt is from the *Virginia Department of Environmental Quality, General VPDES Permit for Discharges of Stormwater from Construction Activity.* A copy of the entire document can be found at the following location**:**

http://www.deq.virginia.gov/Portals/0/DEQ/Water/Regulations/9VAC25-880-VPDESConstructionSWGPRegulation.pdf

Virginia requires Inspections to be conducted at a frequency of at least once every five business days and no later than 48 hours following a measurable storm event. In the event that a measurable storm event occurs when there are more than 48 hours between business days, the inspection shall be conducted on the next business day; and representative inspections used by utility line installation, pipeline construction, or other similar linear construction activities shall inspect all outfalls discharging to surface waters identified as impaired or for which a TMDL wasteload allocation has been established and approved prior to the term of this general permit.

Virginia requires a "Certified Inspector" to complete all E&SC inspections. Certified Inspector means an employee or agent of a VESCP authority who holds a certificate of competence from the Board in the area of project inspection or is enrolled in the Board's training program for project inspection and successfully completes such program within one year after enrollment. The Virginia Regulation can be found at the following site:

http://register.dls.virginia.gov/details.aspx?id=3945

6.1.7 West Virginia

The following is summarized from *Section G. Other Requirements of the West Virginia Department of Environmental Protection, Division of Water and Waste Management, General Water Pollution Control Permit* for Stormwater Associated with Oil and Gas Related Construction Activities. A copy of the entire document can be found at the following location**:**

http://www.dep.wv.gov/WWE/Programs/stormwater/csw/Documents/OG%20stormwater%20GP%203_10_15.pdf

Inspections must be completed by individuals experienced and trained in E&S control inspections. Inspections must be completed and documented at least once every *seven (7) calendar days* for actively disturbed areas, *14 calendar days* for restored areas (restored areas includes pavement, buildings, stable waterways, a healthy, vigorous stand of perennial grass that uniformly covers at least 70 percent of the ground) and *within 24 hours* after any storm event greater than one-half (0.5) inch of rain per 24-hour period. The Project area will continue to follow the preceding schedule until a Notice of Termination (NOT) has been submitted and is approved by WVDEP. Slope failure repairs, soil conditioning, fertilization, reseeding, and mulching will be performed as required.

6.2 Responding to Slope Failures

In the event a slope failure is documented during an inspection, the following steps must be followed. Each step is discussed in detail in the following subsections and summarized in Table 2.

1. Contact the ECC immediately and they will notify EIES who will help evaluate the priority of the slope failure based on the document “Slope Failure Priority Guidance” in Appendix D. The ECC will complete any required reporting to regulatory agencies.
2. Install temporary BMPs to contain slope failure material and to prevent the slope failure from impacting waters of the state.
3. Gather data on slope failure and submit to Dominion Engineering and EIES.
4. Determine repair method and whether the repair is field-directed or engineering-directed.
5. Install short term field stabilizing measures, if applicable.
6. Implement and document slope failure repair.

Table 3. Slope failure Reporting and Repair Responsibility Matrix.

Responsible Party	Action	Time Frame
Construction Supervisor	Report Slope failures to the ECC upon discovery, who will work with EIES to evaluate slope failure using Slope Failure Priority Guidance (Appendix D)	Immediately upon discovery
Construction Supervisor	Install temporary BMPs to contain slope failure material/prevent slope failure from impacting waters of the state	As soon as practicable
ECC	Notify state environmental agency if required	Immediately
Construction Supervisor	Complete Slope Failure Information and Reporting Form (Appendix C)	Within 5 business days of discovery of slope failure
Engineering Team	Complete Slope Failure Repair Assessment Form (Appendix C) and determine if slope failure repair will be field-directed or engineering-directed.	Within 10 business days of receipt of Slope failure Evaluation Reporting Form
Engineering Team	Design repair of Engineering-directed repairs	As soon as practicable
Construction Supervisor	Install short term stabilizing measures for Priority 1 and 2 slope failures that will not be repaired within 60 days of discovery	As soon as practicable
Construction Supervisor	Implement slope failure repair	As soon as practicable
Construction Supervisor	Document slope failure repair	Upon completion of repair

6.2.1 Evaluate Priority

Upon observation of a slope failure, the ECC must be contacted to assist in the Slope Failure Priority determination using the Slope Failure Priority Guidance in Appendix D. The ECC will contact the appropriate entity for all Priority 1 and 2 Slope failures, as specified in Appendix D.

6.2.2 Install Temporary BMPs

DTI's Construction Supervisor or the EI must direct the contractor to install temporary BMPs for containment of slope failure material to protect waterbodies from slope failure material and runoff. Typical details for temporary containment measures, including silt fence, silt sock, super silt fence, and jersey barriers, are included in the SWPPP. Selection of the appropriate BMPs must be determined by the EI in consultation with the DTI Construction Supervisor so that runoff from the slope failure material is contained and waterbodies, if present, are protected. It is noted that temporary BMPs will not arrest future slope movements, and follow up actions to remediate the slope failure must be implemented as soon as practicable.

6.2.3 Gather Data

The Construction Supervisor will obtain site data of the slope failure by completing the Slope failure Information and Reporting Form provided in Appendix C, and will submit this information to DTI Engineering and EIES within five (5) business days of discovering the slope failure. The slope failure information and reporting form included in Appendix C may be used to document slope failure information. In particular, the following minimum information will be obtained and communicated:

- Name of observer;
- Date;
- Slope failure location, including latitude and longitude;
- Slope failure dimensions;
- Site photographs;
- Site sketch;
- Evidence of preexisting slope failures;
- Presence of surface water or groundwater;
- Estimate of slope steepness;
- Estimate of slope failure type (i.e., rotational, translational, earthflow, etc.); and
- Slope failure priority based on Slope Failure Priority Guidance (Appendix D).

6.2.4 Select Slope Failure Repair Approach

Within ten (10) business days of receiving the slope failure data form, DTI Engineering will evaluate whether the slope failure repair is to be field-directed or engineering-directed, and whether to engage a specialist in slope failure evaluation and repair (i.e., geotechnical engineer). The attached score sheet has been developed to assist in determining the appropriate direction of the repair and whether to engage a specialist. In general, field-directed repairs are to be limited to slope failures that are on slopes flatter than 30 degrees (58 percent), can be repaired by installation of drainage measures and earthwork, and have low consequence of future failure. Slope failures that occur on steep slopes, extend outside the ROW, pose increased consequence of future failure, or require construction techniques outside the pipeline contractor's typical construction methods are to be directed by DTI Engineering.

Selection of the most appropriate slope failure repair method is dependent on individual site conditions and constraints. Section 3.5 above provides a discussion on typical repair approaches.

- If the slope failure repair will be field-directed, then the EI and Construction Supervisor will determine the most appropriate repair approach. In general, this will involve installation of drainage, minor slope regrading, and replacement of the failed soil on benches.
- If the slope failure repair will be engineering-directed, then the Project Engineer will lead development of the slope failure repair plan.
- If a geotechnical engineer is engaged, then the Project Engineer will coordinate with the specialist to select and design the repair. This may require field exploration, stability modeling, alternatives feasibility study, and preparation of construction plans.

6.2.5 Install Short Term Stabilizing Measures

In addition to installation of temporary BMPs per Section 5.2, Priority 1 and 2 slope failures that will not be repaired within 60 days of discovery, and other slope failures that will not be repaired within 120 days of discovery will have short term stabilizing measures applied. The following is a list of possible short term stabilizing measures that can be considered:

- Remove soil at the top of the slope failure to unload the slope;
- Install a toe buttress using soil or rock fill, gabion baskets or similar devices;
- If possible, perform minor regrading of the slope with some level of compaction to smooth out the existing scarps and reduce the number of pockets in which water can collect;

- Direct drainage away from the slope failure through waterbars, diversion ditches, or temporary drains;
- Place plastic on the failed slope to protect the soils from rainfall and surface runoff; and
- Monitor the slope failure for signs of slope movement, especially after periods of heavy rain fall. If additional movement is detected or visible (i.e. cracks or scarps), notify Dominion Engineering for assistance.

Even with temporary measures, there is still a risk of additional slope movement. Therefore, long term slope failure repair measures must be implemented.

6.2.6 Implement Slope Failure Repair The slope failure repair must be completed in an efficient and timely manner, and implemented in accordance with the slope failure repair approach selected following this procedure.

6.2.7 Document Repair

The slope failure repair must be documented by the Construction Supervisor, and documentation stored in the DTI Engineering Documentum filing system. Documentation must include the following;

- Name of person completing documentation;
- Date repair was completed;
- Repair location, including latitude and longitude;
- As-built of repair showing locations of installed devices including, subsurface drainage devices, ditching, water bars, buttressing, etc.;
- Method of repair; and
- Photos of repair.

7.0 Addressing Slope Failures After Construction

In the event of a slope failure occurring after construction and prior to regulatory agency approval of a Notice of Termination (NOT) the stormwater permit, the DTI Project Team/field engineer must follow the procedures described in Section 6.0. DTI financial policies provide an out-of-cycle budget request mechanism to reopen a project budget with the proper justification to address slope failures that are a result of construction after the project budget has been closed. The out of cycle budget request can be used to address slope failures that occur in the time period between NOT submittal and regulatory agency approval of the NOT, and to ensure inspections continue until the NOT is approved.

In the event that a slope failure is discovered after approval of the NOT through routine pipeline patrols or other methods of inspection, DTI Operations must report the slope failure to the ECC who will assist EIES in the determination of the slope failure priority classification as a Priority 1 (immediate danger to environment or human health), Priority 2 (sediment laden run-off has entered a water body, Priority 3 (sediment has not reached water body, but appears imminent), or Priority 4 (poses little or no threat to the environment). In addition, DTI Operations must contact DTI Field Engineering for assistance to review the condition and develop a repair plan in accordance with this Policy and Procedure for Slope failure Avoidance, Identification, Prevention, and Remediation.

8.0 Slope Failures Caused by a Third Party

If it is determined that a slope failure is caused by the actions of a third party and not related to pipeline construction or activities by DTI, the DTI Engineering Team or Operations will contact the DTI Land, Lease, and ROW group to make notification to the third party of the slope failure.

APPENDIX A

Desktop Slope Failure Risk Assessment

Desktop Slope Failure Risk Assessment Matrix

Probability of significant impact to pipeline, waterbodies, roadways, adjacent property, or other features	Probability of additional slope movement		
	High Probability (3)	Moderate Probability (2)	Low Probability (1)
High Probability (3)	High Risk (9)	High Risk (6)	Moderate Risk (3)
Moderate Probability (2)	High Risk (6)	Moderate Risk (4)	Low Risk (2)
Low Probability (1)	Moderate Risk (3)	Low Risk (2)	Low Risk (1)

<u>Probability of additional slope movement</u>

- Low
  - Slope 22° (40%) or flatter
  - No bedrock outcrops visible
  - No evidence of previous slope movement (bent trees, fence posts, utility poles)
  - No mapped landslide is present
- Moderate
  - Slope 22° to 30° (40% to 58%)
  - Bedrock outcrops possible or limited to small portion of the slope
  - Possible evidence of previous slope movement (bent trees, fence posts, utility poles)
  - Mapped landslides present in the area, but not within the LOD
- High
  - Slope steeper than 30° (58%)
  - Bedrock outcrops prevalent or cover a sizeable portion of the slope
  - Evidence of previous slope movement (bent trees, fence posts, utility poles)
  - Mapped landslide is present within the LOD
  - Existing landslide is present based on field observations

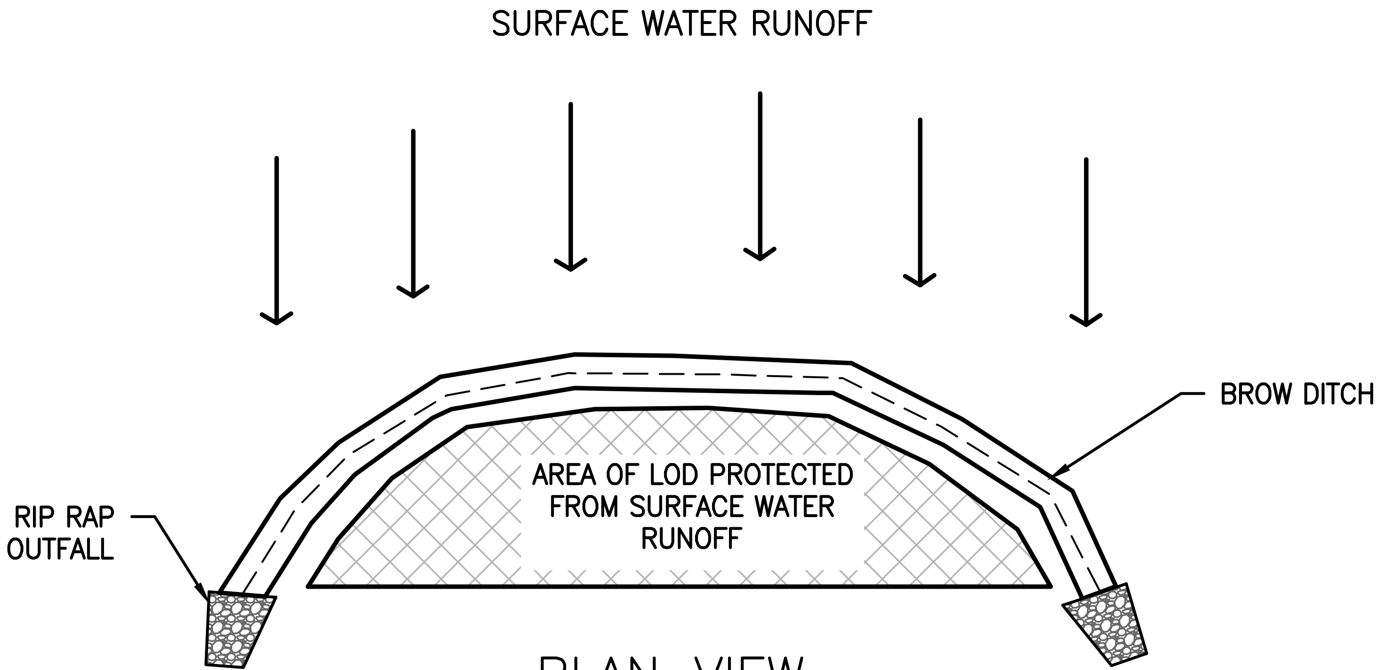
<u>Probability of significant impact to pipeline, waterbodies, roadways, adjacent property, or other features</u>

- Low
  - Pipeline traveling directly up and down the slope
  - Waterbodies or roadways are located 50 feet or more from toe of slope
- Moderate

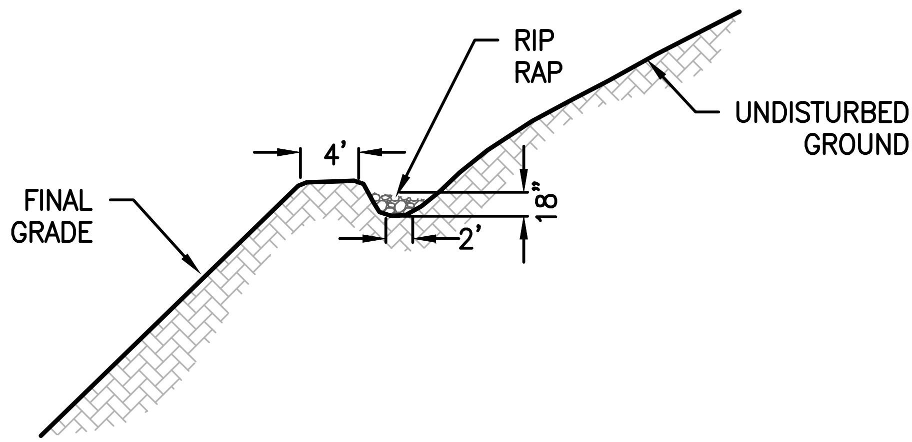
    - Pipeline traveling directly up and down the slope and slope is 30° (58%) or steeper
    - Pipeline crossing the slope (sidehilling), but will likely be installed below top of bedrock surface
    - Waterbodies or roadways are located 20 to 50 feet or more from toe of slope
- High
    - Pipeline crossing the slope (sidehilling), but will not be installed below top of bedrock surface, or top of bedrock surface is unknown
    - Waterbodies or roadways are located less than 20 feet from toe of slope

APPENDIX B

Select Typicals



PLAN VIEW
N.T.S.

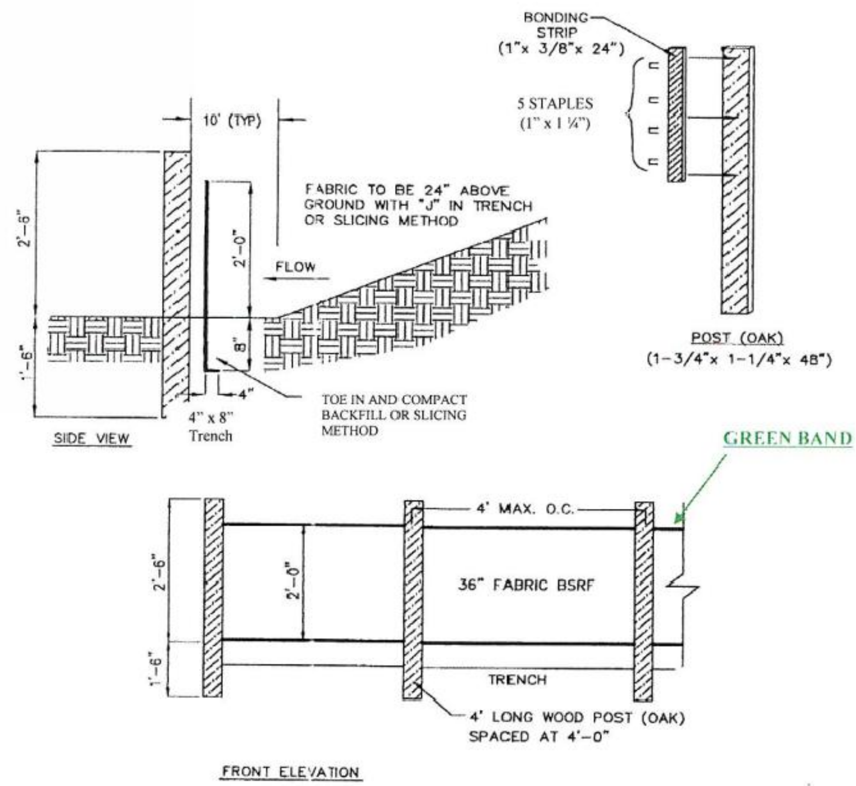


SECTION
N.T.S.

BROW DITCH DETAIL

BELTED SILT RETENTION FENCE
INSTALLATION DETAIL
PRIORITY I – GREEN BAND

SILT-SAVER, INC.

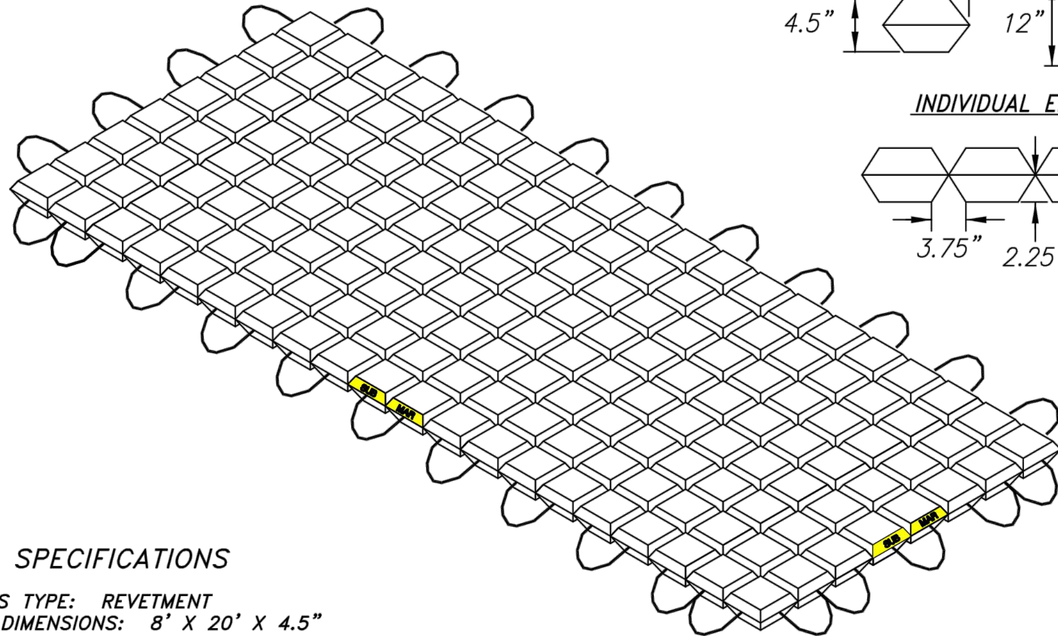


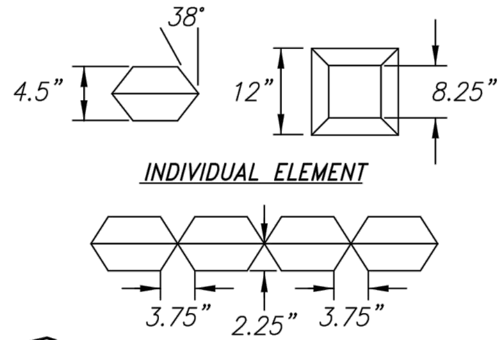
MINIMUM OVERLAP OF 18" IS TO BE PROVIDED AT ALL SPLICE JOINTS

BELTED SILT RETENTION FENCE (BSRF)

SILT-SAVER, INC.
• 1094 Culpepper Drive • Conyers, GA 30094 •
Office 770-388-7818 • Fax 770-388-7640 • Toll Free 1-888-382-SILT (7458) • Website www.siltsaver.com •

BELTED SILT RETENTION FENCE





INDIVIDUAL ELEMENT

SPECIFICATIONS

MATTRESS TYPE: REVETMENT
MATTRESS DIMENSIONS: 8' X 20' X 4.5"
MATTRESS WEIGHT: AIR 6,200 POUNDS
MATTRESS WEIGHT SUBMERGED: 3,600 POUNDS (APPROX.)
CONCRETE DENSITY: 145 LBS. PER CU. FT., 4,000 PSI
160 ELEMENTS: 5/8" ULTRA VIOLET STABILIZED COPOLYMER
EXTRUDED FIBER ROPE, MINIMUM TENSILE STRENGTH 9,500 POUNDS

805 Dunn Street
Houma, LA 70360
Ph. 985-868-0001
Fax 985-851-0108
Email: submar@submar.com
Website: www.submar.com

SUBMAR
Synergy with Nature

SUBMAR
STANDARD 8.00'x20.00'
MAT DETAIL

4.5" CONCRETE MATTRESS

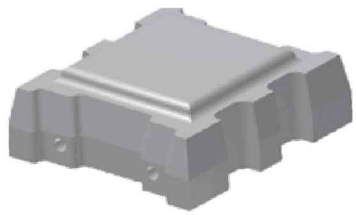
DATE:	CHECKED BY:	DRAWN BY:	SCALE:	CONTACT:	PHONE. #:
01/03/13	DWD	KPF	N.T.S.		

SUBMAR MATTRESS DETAIL

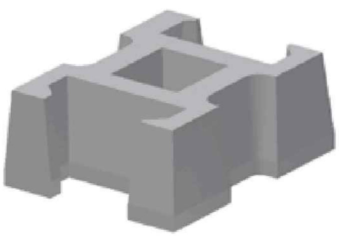
CONTECH ENGINEERED SOLUTIONS

ARMORTEC® Product Details

ArmorFlex® - Open Cell

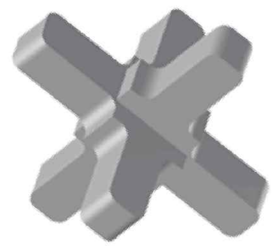


ArmorFlex® - Close Cell

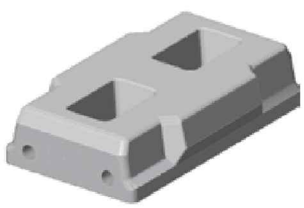


ArmorLoc®

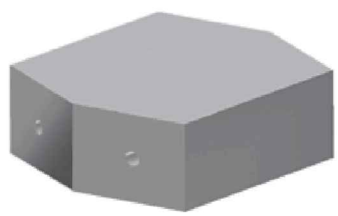
ArmorWedge®



A-Jacks®



ArmorStone®



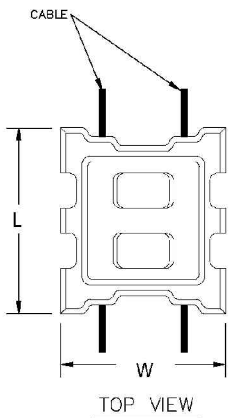
ArmorRoad®

MANUFACTURING SPECIFICATION
ASTM D6684-04

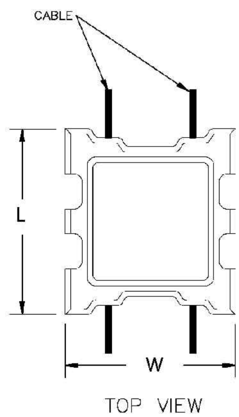
ARMORTEC® Erosion Control Solutions

ARMORTEC PRODUCT DETAILS (1 OF 4)

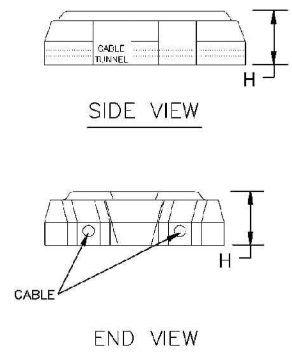
ArmorFlex® (not to scale)

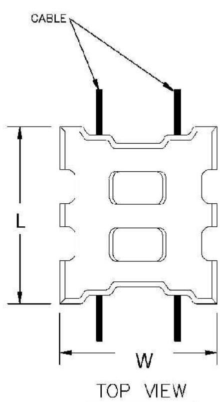


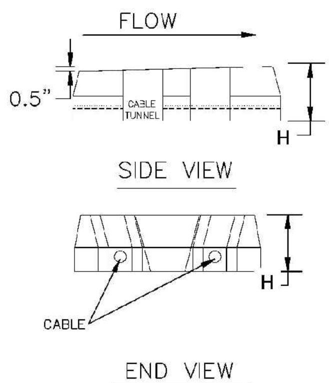
Open Cell Block



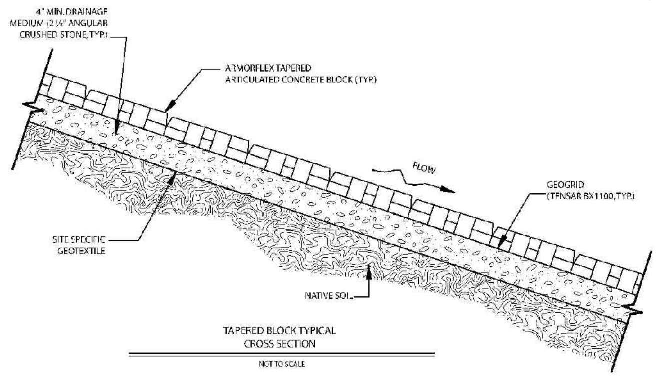
Close Cell Block



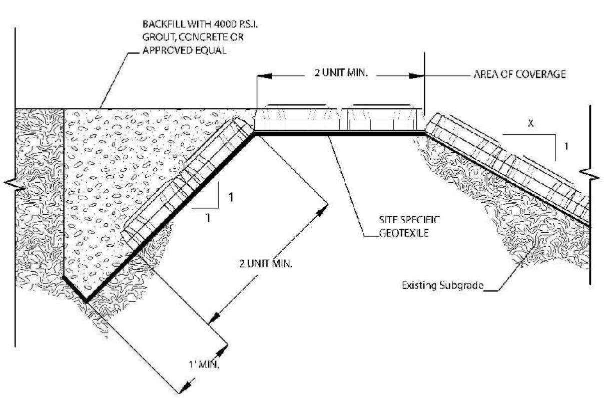




Tapered Series



Tapered Series - Cross Section



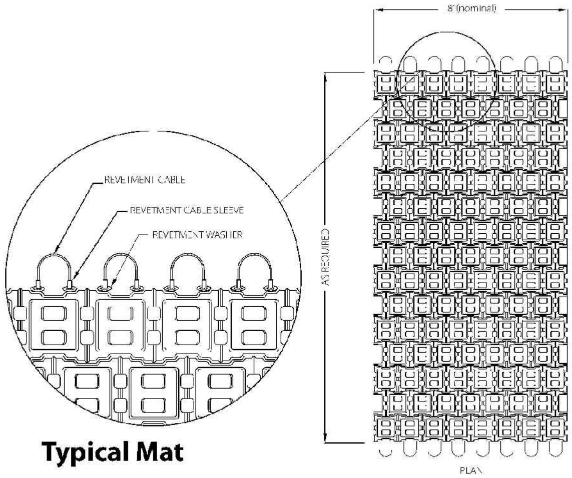
Top of Slope - Standard Detail

ArmorFlex Unit Specification

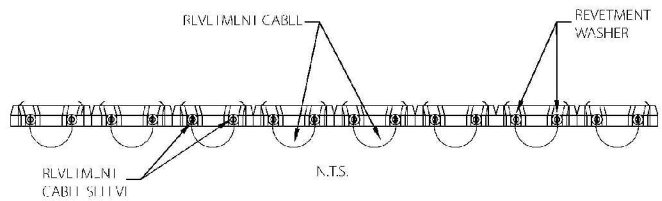
Concrete Block Class	Open/Closed Cell	Nominal Dimensions			Gross Area/ (sq. ft.)	Block Weight		Open Area %
		L	W	H		lbs	lbs/sq. ft.	
30s	Open	13.0	11.6	4.75	0.98	33-35	34-36	20
50s	Open	13.0	11.6	6.00	0.98	42-45	43-46	20
40	Open	17.4	15.5	4.75	1.77	59-64	33-36	20
50	Open	17.4	15.5	6.00	1.77	76-82	43-46	20
70	Open	17.4	15.5	8.50	1.77	108-117	61-66	20
40L	Open	17.4	23.6	4.75	2.58	97-105	38-41	20
70L	Open	17.4	23.6	8.50	2.58	174-188	68-73	20
45s	Closed	13.0	11.6	4.75	0.98	39-42	38-43	10
55s	Closed	13.0	11.6	6.00	0.98	50-54	49-55	10
45	Closed	17.4	15.5	4.75	1.77	71-77	40-43	10
55	Closed	17.4	15.5	6.00	1.77	91-98	52-56	10
85	Closed	17.4	15.5	8.50	1.77	136-146	77-83	10
45L	Closed	17.4	23.6	4.75	2.58	109-118	42-46	10
85L	Closed	17.4	23.6	8.50	2.58	207-223	80-87	10
High Velocity Application Block Classes								
40-T	Open	17.4	15.5	4.75	1.77	58-63	33-35	20
50-T	Open	17.4	15.5	6.00	1.77	75-81	43-46	20
70-T	Open	17.4	15.5	8.50	1.77	116-124	65-70	20

ARMORTEC PRODUCT DETAILS (2 OF 4)

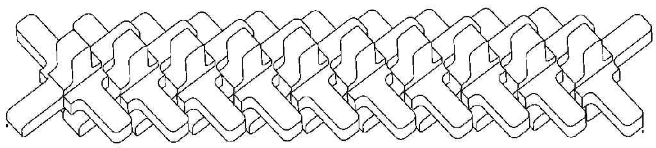
ArmorFlex® cont. (not to scale)



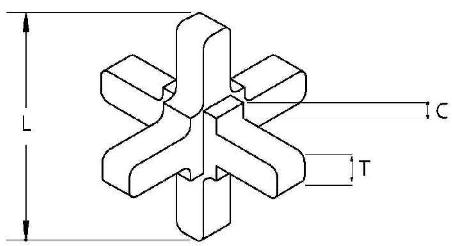
Typical Mat



A-Jacks® (not to scale)



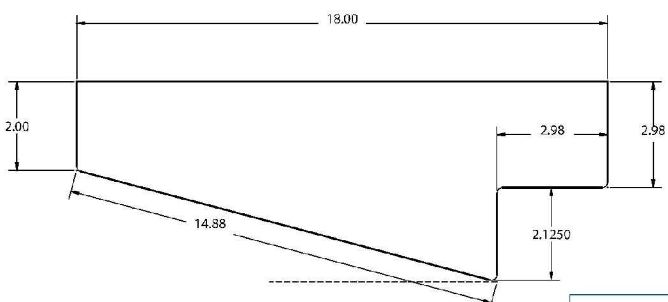
A-Jacks Placement Profile



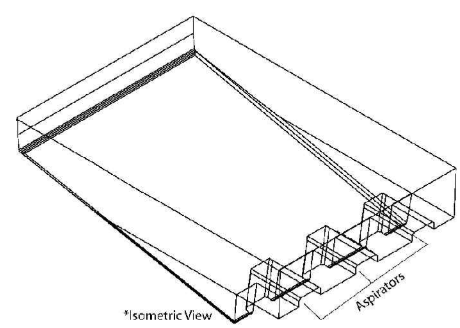
A-Jacks Unit

A-Jacks Unit Specification					
A-JACKS	L(IN)	T(IN)/H(IN)	C(IN)	VOL(FT³)	WT (LBS)
AJ-24	24	4	1.84	0.56	78
AJ-48	48	7.36	3.68	4.49	629
AJ-72	72	11.04	5.52	15.14	2.120
AJ-96	96	14.72	7.396	35.87	5.022
AJ-120	120	18.40	9.20	70.69	9.699

ArmorWedge® (not to scale)



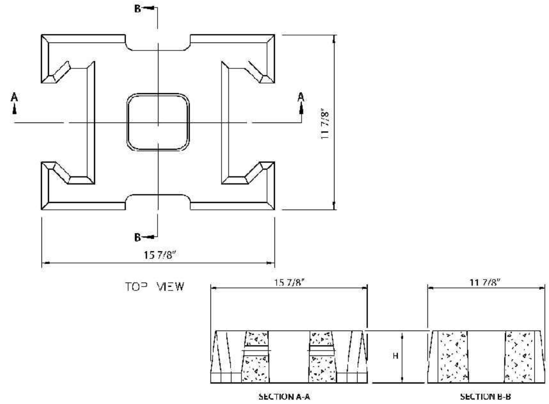
Side View - Typical Block



ArmorWedge Unit Specification					
UNIT DIMENSION	UNIT WEIGHT (LBS/ FT³)	SYSTEM WEIGHT (LBS/ FT³)	UNIT COVERAGE (SF)	COMPRESSIVE STRENGTH (PSI)	MAXIMUM ABSORPTION (LBS/FT³)
12x18	130-140	54-59	1.1875	4000	12

ARMORTEC PRODUCT DETAILS (3 OF 4)

ArmorLoc® (not to scale)

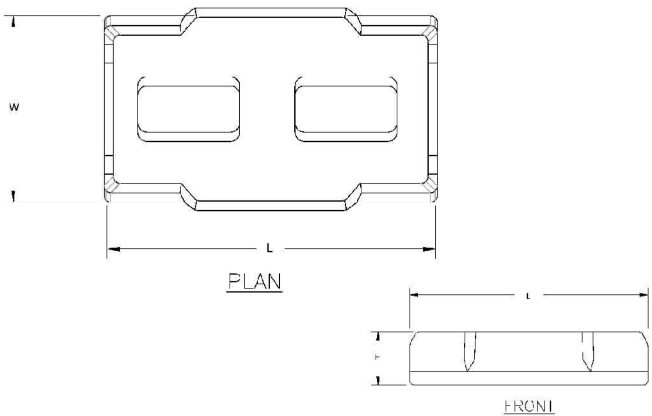


ArmorLoc Unit Specification

BLOCK	TECHNICAL DATA			DIMENSIONS AND WEIGHTS				
	Specific Weight lbs/ft³	Compressive Strength psi	Max Absorption, Avg. of 3 units 10 lbs/ft³	Thickness Inches (H)	Gross Area/ Grid ft²	Weights/ Grid lbs	Weights/ Area lbs/ft²	Open Area %
3510	130-140	4000 min	10	4	1.0	30-35	30-35	25
4511	130-140	4000 min	10	5.25	1.1	44-50	40-45	20
5011	130-140	4000 min	10	6	1.1	50-54	40-45	20

*Open-cell block shown. Closed-cell block also available.

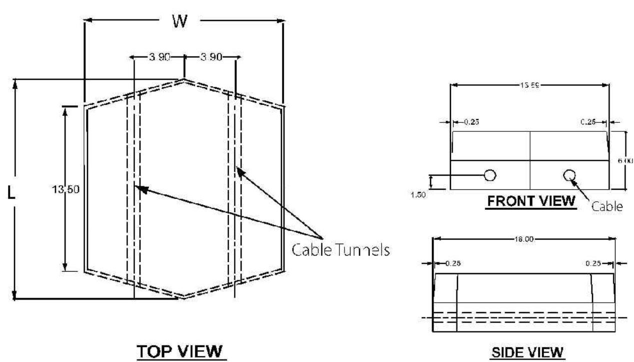
ArmorStone® (not to scale)



ArmorStone Unit Specification

CONCRETE BLOCK CLASS		NOMINAL DIMENSIONS (IN.)			UNIT COVERAGE (SF)	BLOCK		OPEN AREA %
		L	W	H		UNIT WEIGHT LBS.	SYSTEMS WEIGHTS LBS./SF	
AS 40	Open	18.00	10.00	4.50	1.25	50-54	40-44	25
AS 55	Closed	18.00	10.00	4.50	1.25	61-66	49-53	5

ArmorRoad® (not to scale)



ArmorRoad Unit Specification

BLOCK	TYPE	L	W	H	SF COVERAGE PER UNIT	WEIGHT LBS PER UNIT	SF PER TRUCK LOAD
Mat	Closed	18.00	15.60	6.00	1.74	105-109	750
Individual	Closed	18.00	15.60	6.00	1.74	100-104	750

ARMORTEC Minimum Physical Requirements per ASTM 06684-04

MIN. DENSITY (IN AIR) LBS/FT³		MIN. COMPRESSIVE STRENGTH PSI		MAX WATER ABSORPTION LBS/FT³	
Ave. of 3 Units	Individual Unit	Ave. of 3 Units	Individual Unit	Ave. of 3 Units	Individual Unit
130	125	4,000	3,500	9.1	11.7

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ARMORTEC PRODUCT DETAILS (4 OF 4)

French Drains

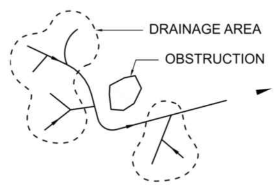
Subsurface drainage systems have been in common use for centuries. They take many forms, but are all similar in design and function to the traditional French drain. French drains are excavated trenches filled with aggregate surrounding a slotted or perforated pipe that conveys excess surface and groundwater to a discharge point away from the drainage area. **EZ***flow* drainage products can be used as a substitution for conventional aggregate in French drain systems.

PLACEMENT

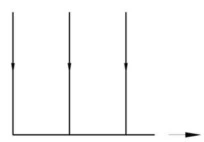
EZ*flow* drainage French drains should be laid out strategically to dewater irregular, poorly drained areas. A defined pattern such as a herring bone and gridiron should be used to drain complete areas including lawns, athletic fields, golf course greens and sand traps. These patterns include laterals that drain to collectors that discharge to an outfall. In general, laterals should not be longer than 50 feet and collectors no longer than 100 feet without increasing the pipe diameter downstream. In addition, the slope of each downgradient run should increase throughout the length of the system.

Trench depth and spacing will vary depending on soil texture of the area being drained. Trench depth can also be limited by outlet conditions in flatter areas. Lines may be spaced widely and deeply in sandy soils, and are generally placed shallower and closer together in clay soils.

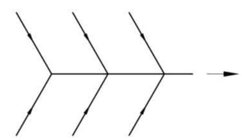
IRREGULAR



GRIDIRON



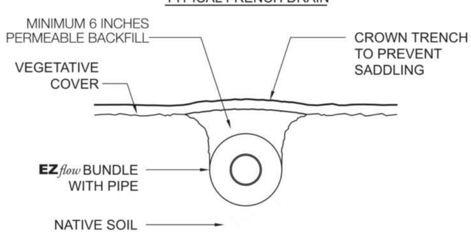
HERRING BONE



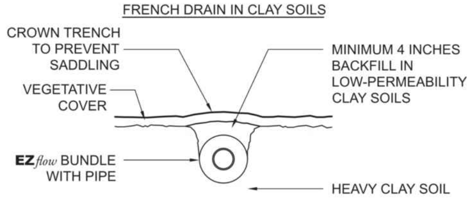
PRODUCT

The 7-inch **EZ***flow* drainage bundles with integrated 3-inch pipe are appropriate for small area residential subsurface drainage systems. 10-inch bundles with 4-inch pipe can be used to drain areas of up to two acres in poorly drained organic soils. In larger areas or if there is over 200 feet of pipe upstream, the 15-inch bundles with 6-inch pipe are recommended.

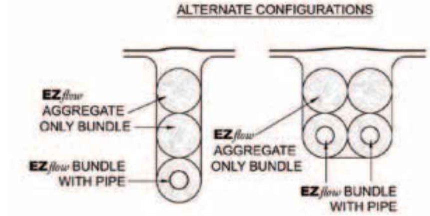
TYPICAL FRENCH DRAIN



FRENCH DRAIN IN CLAY SOILS



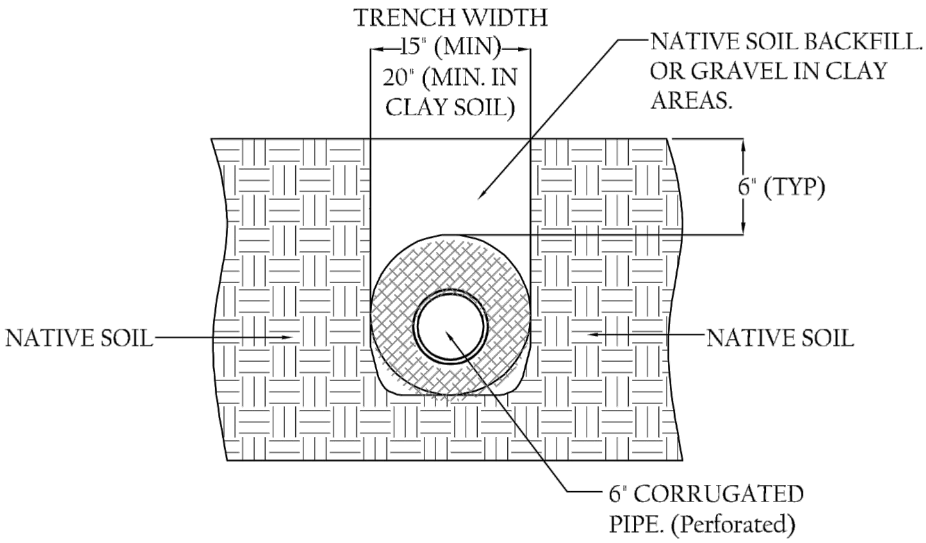
ALTERNATE CONFIGURATIONS



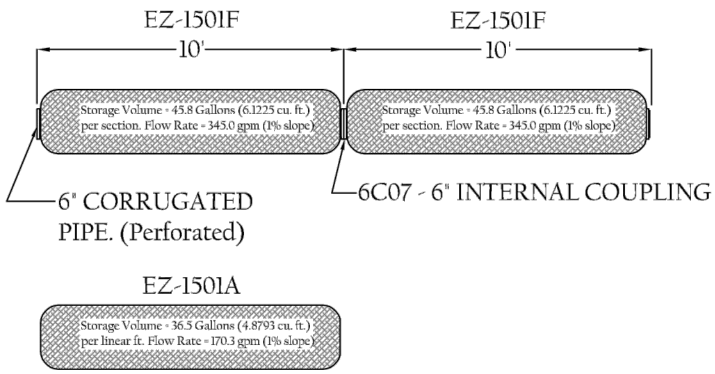
Minimum Recommended Depth of Cover*	
Condition	**Depth (in.)**
Residential area, commercial lawn mowers	6**
Athletic fields with consistent activity	8
Areas with occasional light vehicular traffic	12

* It is recommended that **EZ***flow* drainage systems be installed a minimum of 6 inches below existing or planned subsurface irrigation lines.
** In low-permeability clay soils, trenches can be placed with a minimum 4 inches of permeable backfill.

TRENCH DRAIN DETAIL



SECTION



PLAN VIEW

ADDITIONAL COVER MAY BE REQUIRED BASED ON SITE CONDITIONS. 12" COVER REQUIRED TO OBTAIN AN H-10 LOAD RATING. CONSULT WITH A LOCAL ENGINEER FOR SITE SPECIFIC REQUIREMENTS.

NDS

TECHNICAL SERVICES
1-888-825-4716
techservice@ndspro.com

EZflow™
AGGREGATE DRAINAGE SYSTEM

N. T. S.

TRENCH DRAIN DETAIL

French Drain Installation Instructions

The steps below offer typical installation practices for French drains and will vary based on site conditions. These practices are also applicable to landscape plant bed drains and for wet areas on golf courses.

1. Identify the area to be drained and mark off lateral and collector lines before digging beginning trench excavation.

2. Start excavating the trench at the discharge point or where connections to downstream piping will be made. Trench width should be equal to the diameter of the bundle being used. Trench depth will reflect existing terrain, desired drainage line slope and length, height of bundles(s) and required cover thickness. Ensure proper slopes by using a transit or builder's level and grade the trench bottom evenly for proper flow.

3. Place the **EZ***flow* drainage bundle with pipe end to end along the edge of the trench. Use an end cap at the system high point and fully insert the proper couplings at all bundle-to-bundle connections. Lay the connected bundles with pipe in trench, stacking aggregate-only bundles above these bundles as needed.

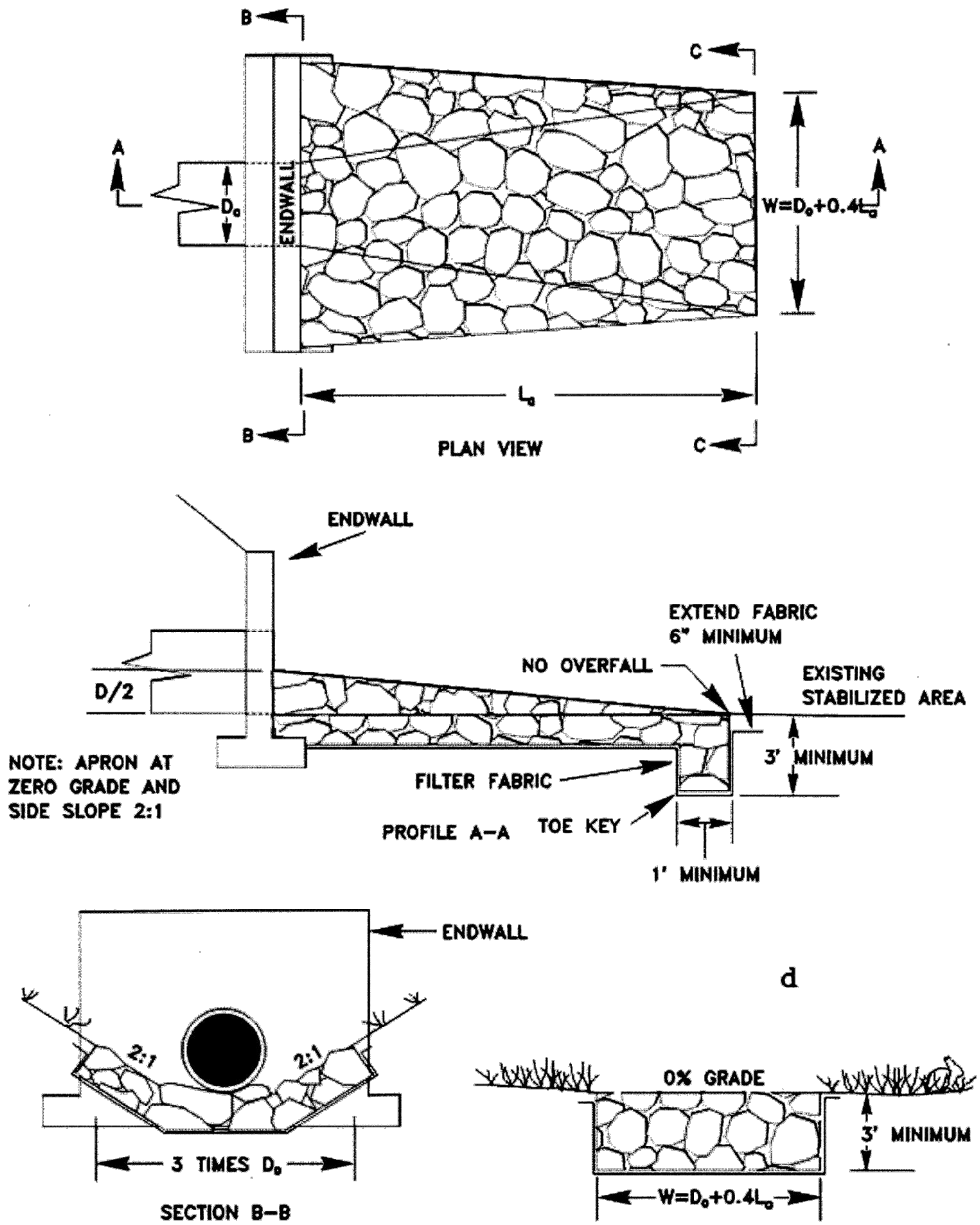
4. Place a minimum of 4-inches permeable backfill (see recommended depths of cover on page 6) over the bundles without compaction. Additional sand/backfill can be placed and compacted normally above the loose fill to prevent trench saddling. Cover trench with sod or topsoil and seed to finish installation.

TRENCH DRAIN DETAIL

FIGURE 3.17.3

OUTLET PROTECTION

DISCHARGE TO UNCONFINED SECTION
(MINIMUM TAILWATER)

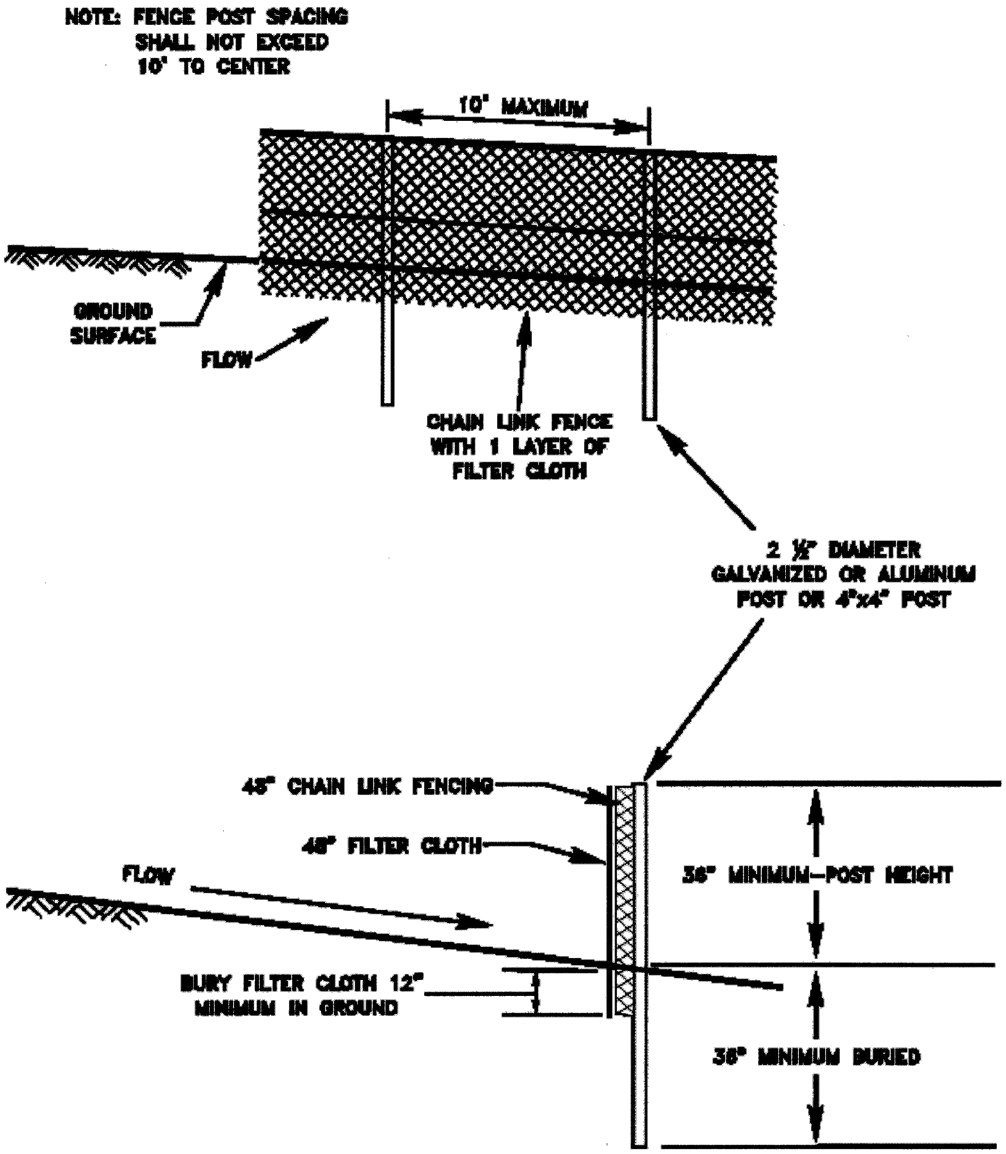


FROM NEW YORK STANDARDS AND SPECIFICATIONS
FOR EROSION AND SEDIMENT CONTROL

OUTLET PROTECTION DETAIL

FIGURE 3.28.1

SUPER SILT FENCE



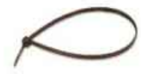
SUPER SILT FENCE DETAIL

BARRICAGE ™ FLOOD

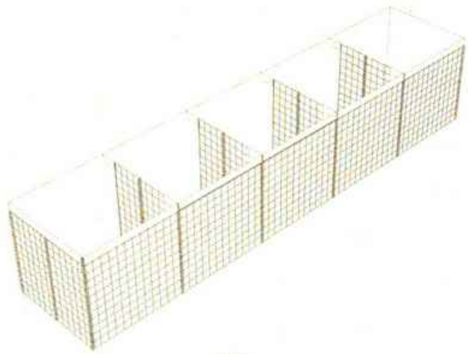
SHIELD | FLOOD | EARTH | ROCK

BarriCage™ geotextile-lined civil system for flood-defense applications. Interior grids free of geotextile fabric allow the fill to compact between cells. Easily fillable with dirt, sand, or gravel. Spiral corners join to other units with included connecting pins. Plastic ties are provided to secure geotextile lining and prevent fill from falling between system joints.

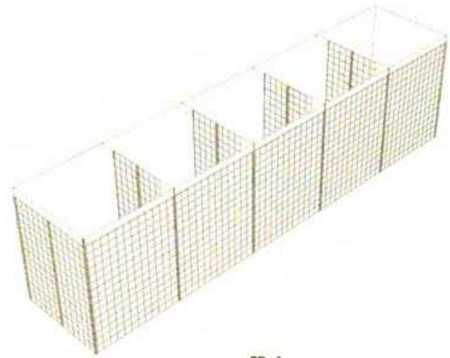
Connecting Pin



Plastic Tie



FD-3
H-3' W-3' L-15' (5 cages)



FD-4
H-4' W-3' L-15' (5 cages)

GENERAL SPECIFICATIONS:
Galvanized welded wire system to ASTM A 974-97 standards with geotextile lining. Lining is high-quality, nonwoven geotextile made of polypropylene fibers designed to form a high-strength fabric. Geotextile liner is available in tan color.

WELDED WIRE GRID CONTAINER	
Wire	
Wire Guage	8.5 American SWG, steel
Wire Diameter	0.155"/3.937mm
Wire Tensile Strength	80-110 ksi 550-760 kPa
Corrosion Protection	Zn-5AI-MM to ASTM A 856A/A 856M-03 minimum coating weight 0.8oz/Ft²/240g/m²
Grid	
Wire Spacing	3" x 3"
Tolerance on Line Wire Spacing	+/ - 1/8"
Cross Wire Straightness Across Test Panel	Limit of deviation 1/4" in 72"
Mesh Strength	70% of wire tensile strength
Panels	
Squareness	In 4' diagonals shall not vary by more than 5/8"
Flatness	In 6' not more than 2" from plane

GEOTEXTILE	STANDARD	VALUE
Mechanical Properties		
Grab Tensile Strength (Machine Direction)	ASTM D 4632	170lbs.
Grab Tensile Strength (Cross Direction)	ASTM D 4632	170lbs.
Grab Elongation (Machine Direction)	ASTM D 4632	50%
CBR Puncture	ASTM D 6241	450lbs.
Endurance Resistance		
Trapezoidal Tear (Machine Direction)	ASTM D 4533	70lbs.
Trapezoidal Tear (Cross Direction)	ASTM D 4533	70lbs.
UV Resistance (% retained after 500 hrs)	ASTM D 4355	90%
Hydraulic Properties		
Apparent Opening Size*	ASTM D 4751	70 US Std. Sieve
Permittivity*	ASTM D 4491	1.50sec⁻¹
Permeability*	ASTM D 4491	.38 cm/sec
Water Flow*	ASTM D 4491	110 gpm/ft²

*At time of manufacturing. Handling may change these properties.

a product of landmark EARTH SOLUTIONS, INC.

The given values were obtained through a series of testing performed by our suppliers and other outside testing facilities. The information included herein is subject to change at any time without notice from Landmark Earth Solutions™, Inc.

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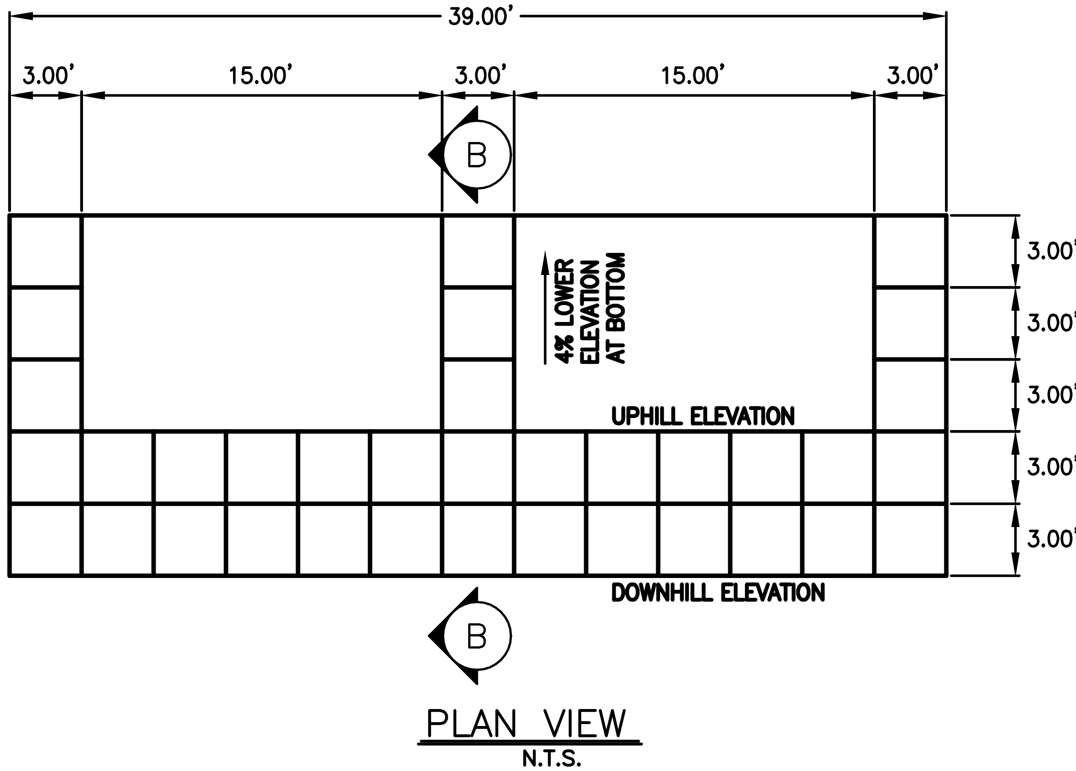
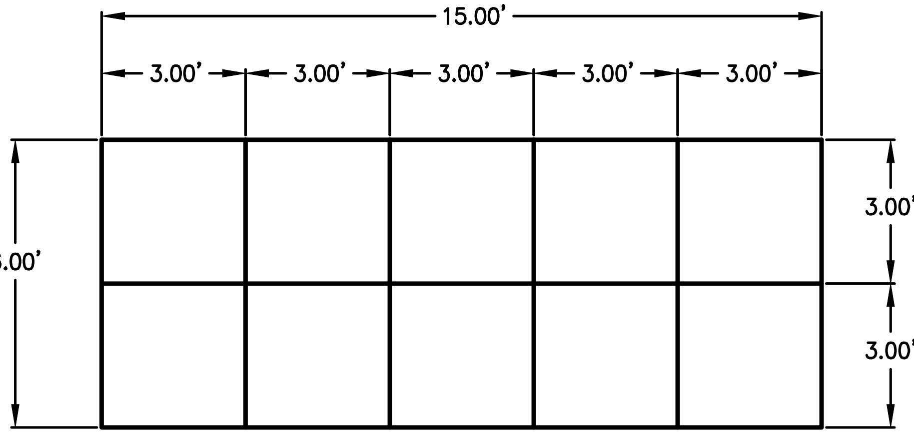
barricage

BARRICAGE CONTAINMENT DETAIL

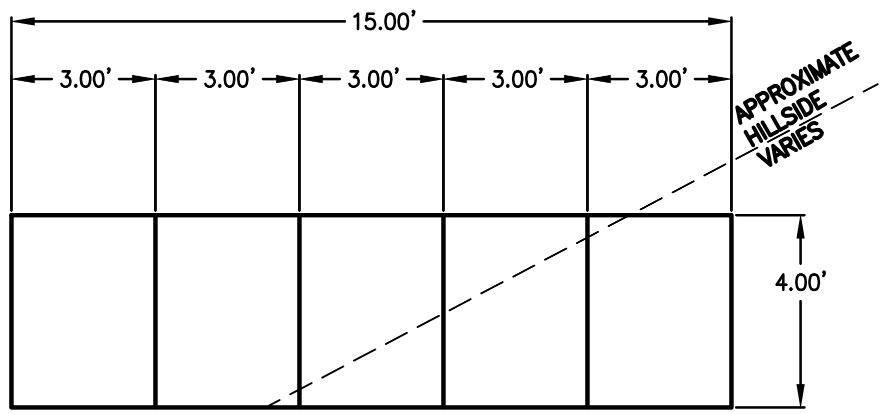


NOTE:
THIS PRODUCT FOR USE AS A TEMPORARY BUTTRESS
OR CONTAINMENT. NOT FOR PERMANENT USE.

BARRICAGE CONTAINMENT DETAIL



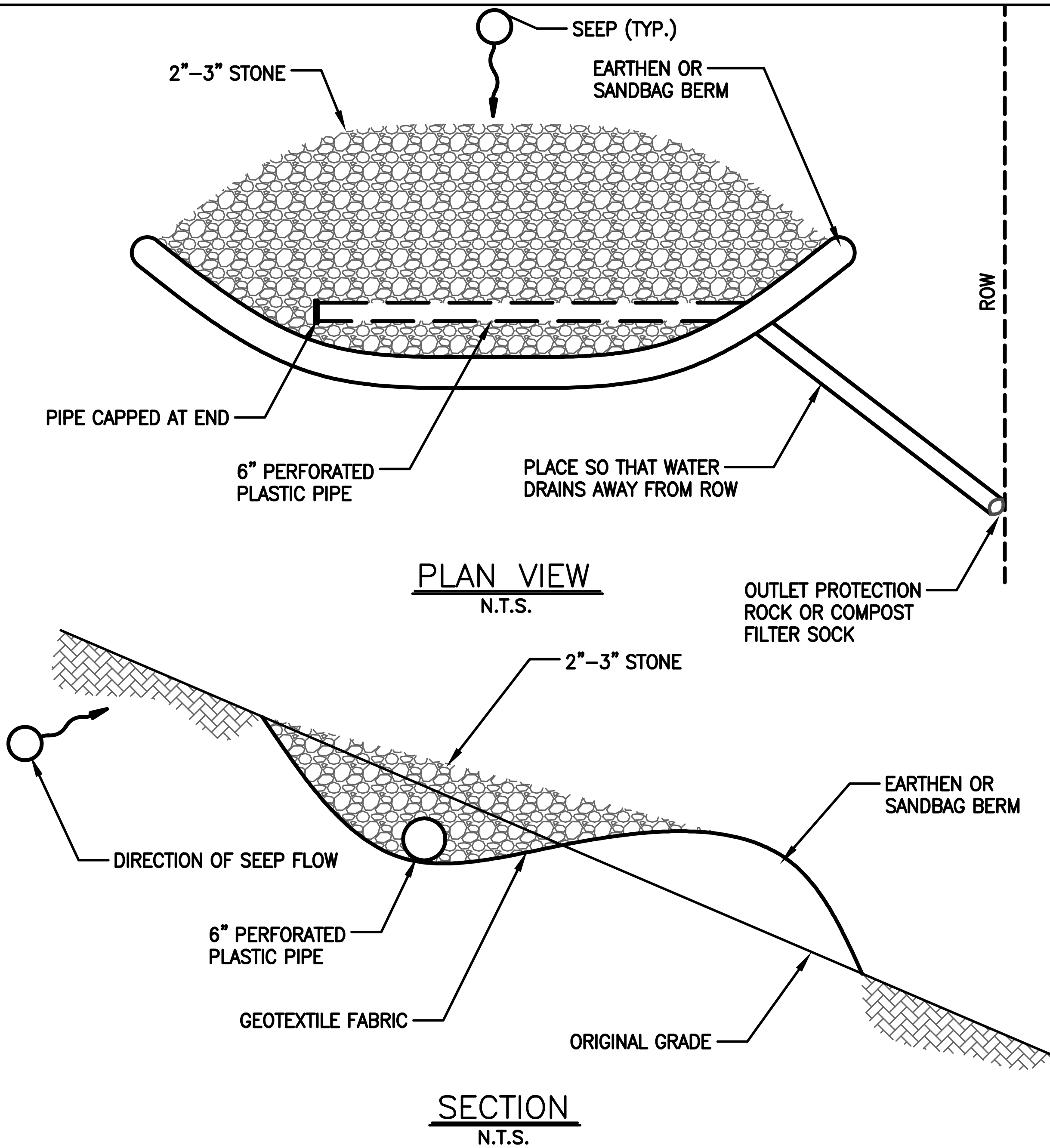
AERIAL VIEW
N.T.S.



SECTION B
N.T.S.

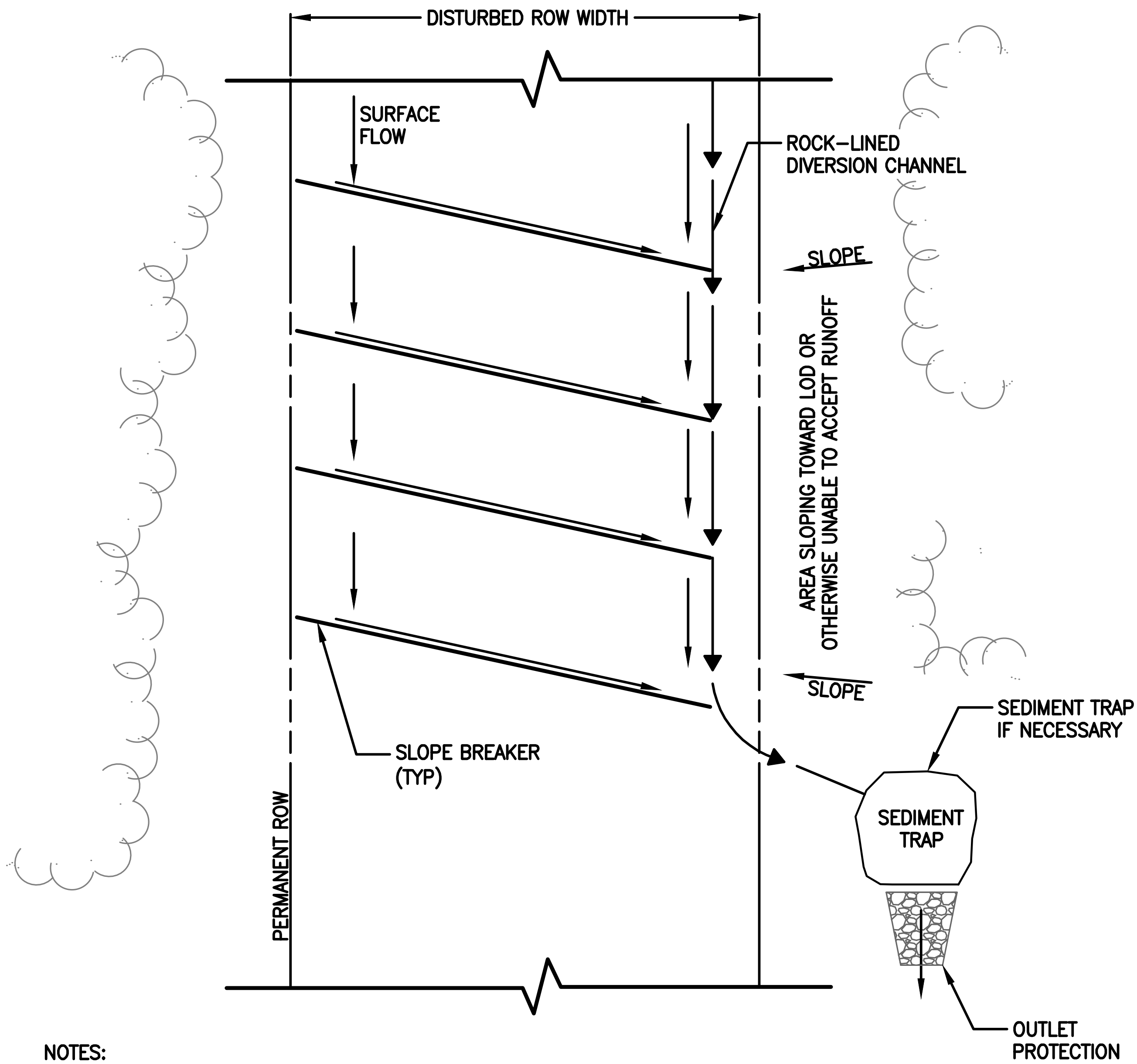
NOTE:
THIS PRODUCT FOR USE AS A TEMPORARY BUTTRESS
OR CONTAINMENT. NOT FOR PERMANENT USE.

BARRICAGE CONTAINMENT DETAIL



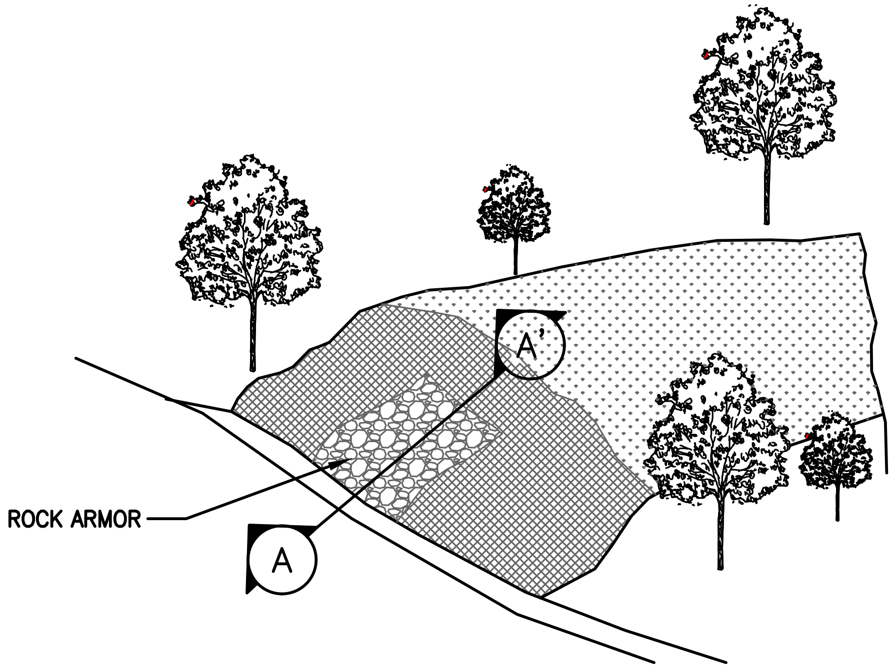
NOTE:
BERMS MAY BE CONSTRUCTED USING SANDBAGS TEMPORARILY DURING CONSTRUCTION. PERMANENT BERMS TO BE CONSTRUCTED USING COMPACTED EARTH.

SEEP COLLECTOR DETAIL

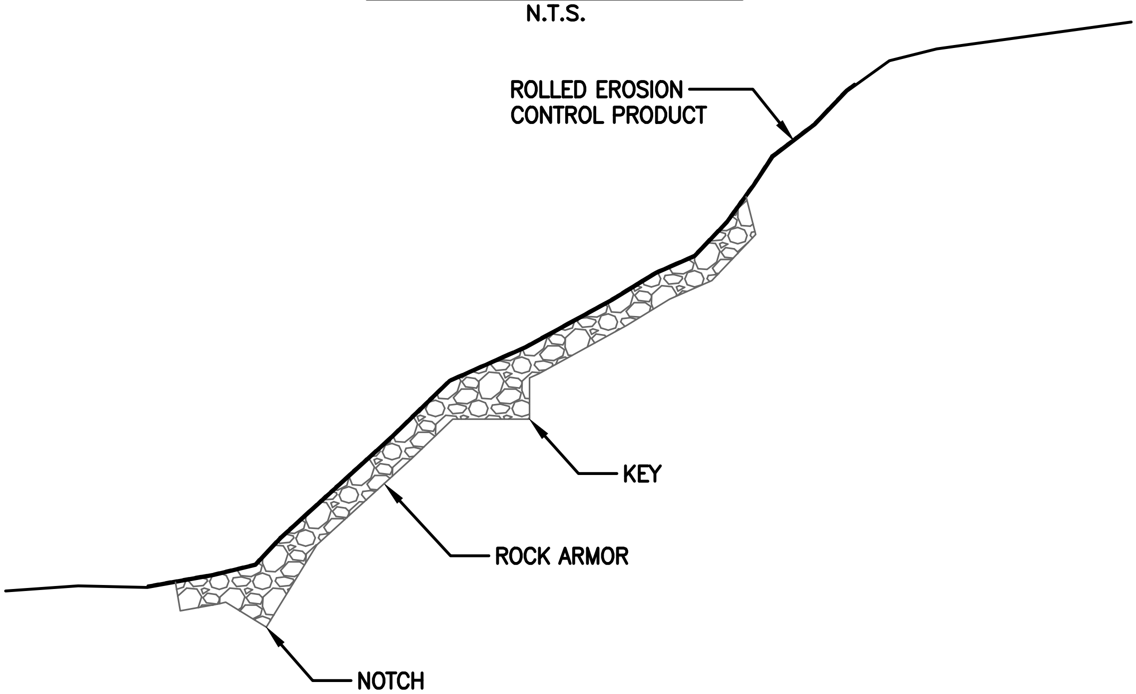


NOTES:
1. CHANNEL AND SLOPE BREAKER LAYOUT WILL NEED TO BE FIELD ADJUSTED TO CONFORM TO SITE CONDITIONS
2. CHANNEL MAY REQUIRE STONE CHECK DAMS, ROLLED EROSION CONTROL PRODUCTS AND OTHER SITE SPECIFIC EROSION AND SEDIMENT CONTROL MEASURES AS NECESSARY
3. SEDIMENT TRAP MAY BE REQUIRED WHERE SUFFICIENT VEGETATIVE COVER EXISTS DOWNSLOPE OF DIVERSION CHANNEL
4. SEDIMENT TRAP WILL REQUIRE SIZING BY AN ENGINEER

CROSS DRAIN DETAIL

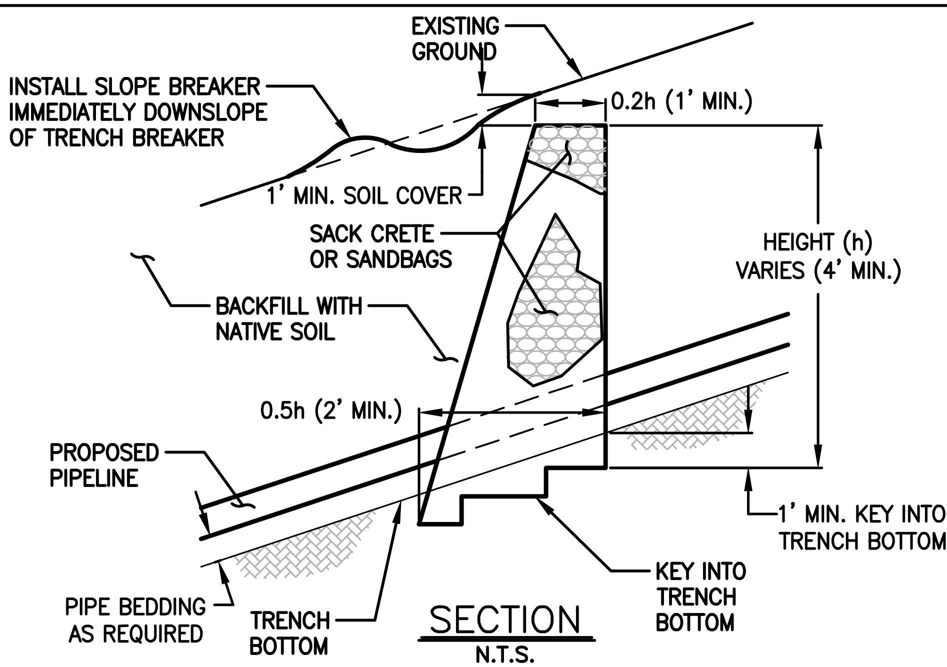


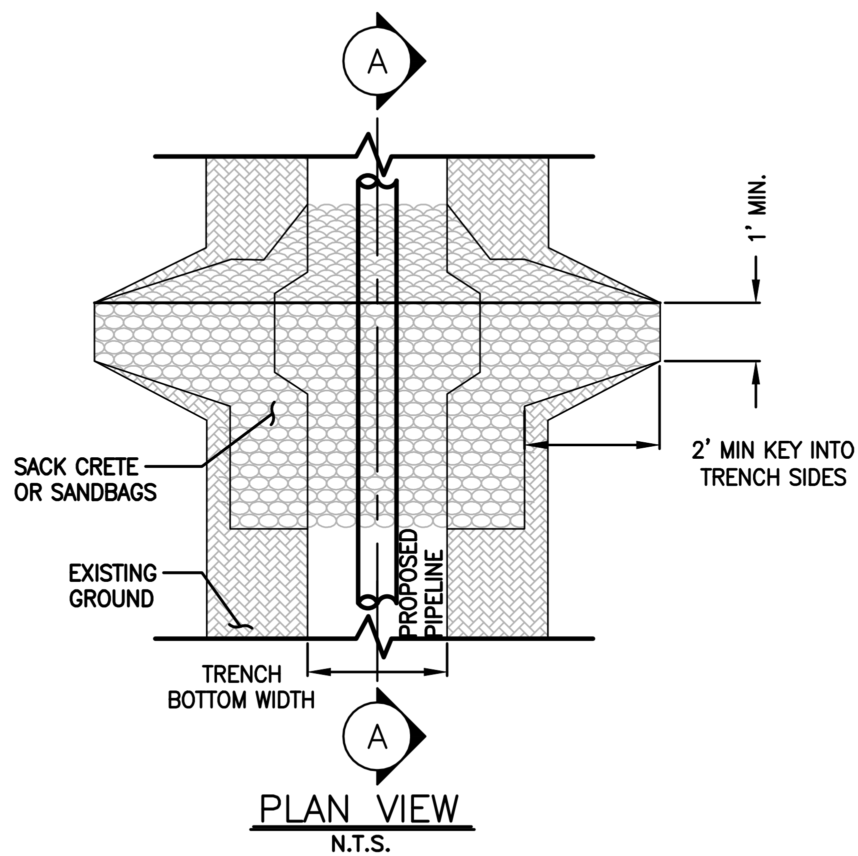
PERSPECTIVE VIEW
N.T.S.



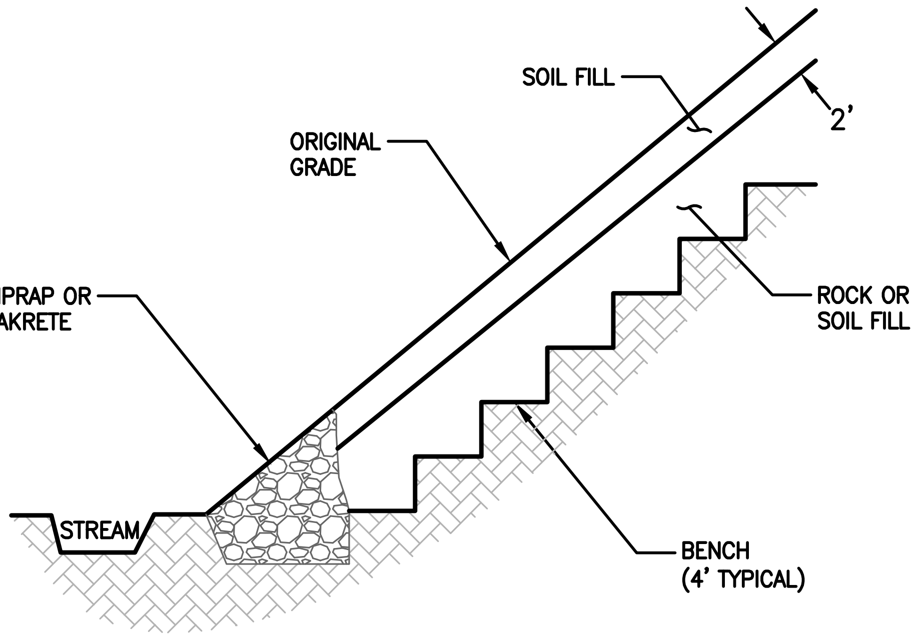
A–A' ROCK ARMOR ON STEEP SLOPE
N.T.S.

ROCK FILTER BLANKET DETAIL



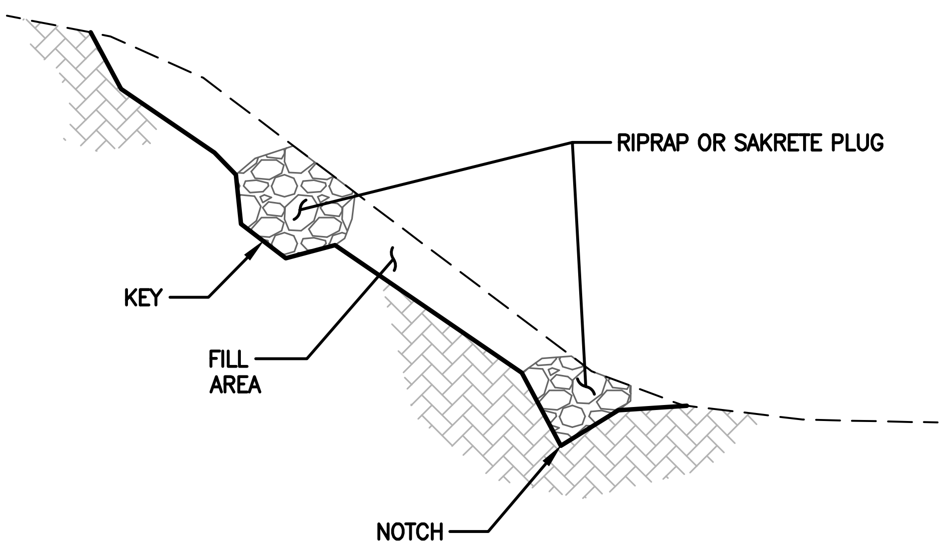


TRENCH PLUG AND WATERBAR DETAIL



BENCH AND REGRADE TYPICAL

N.T.S.



KEYING TYPICAL

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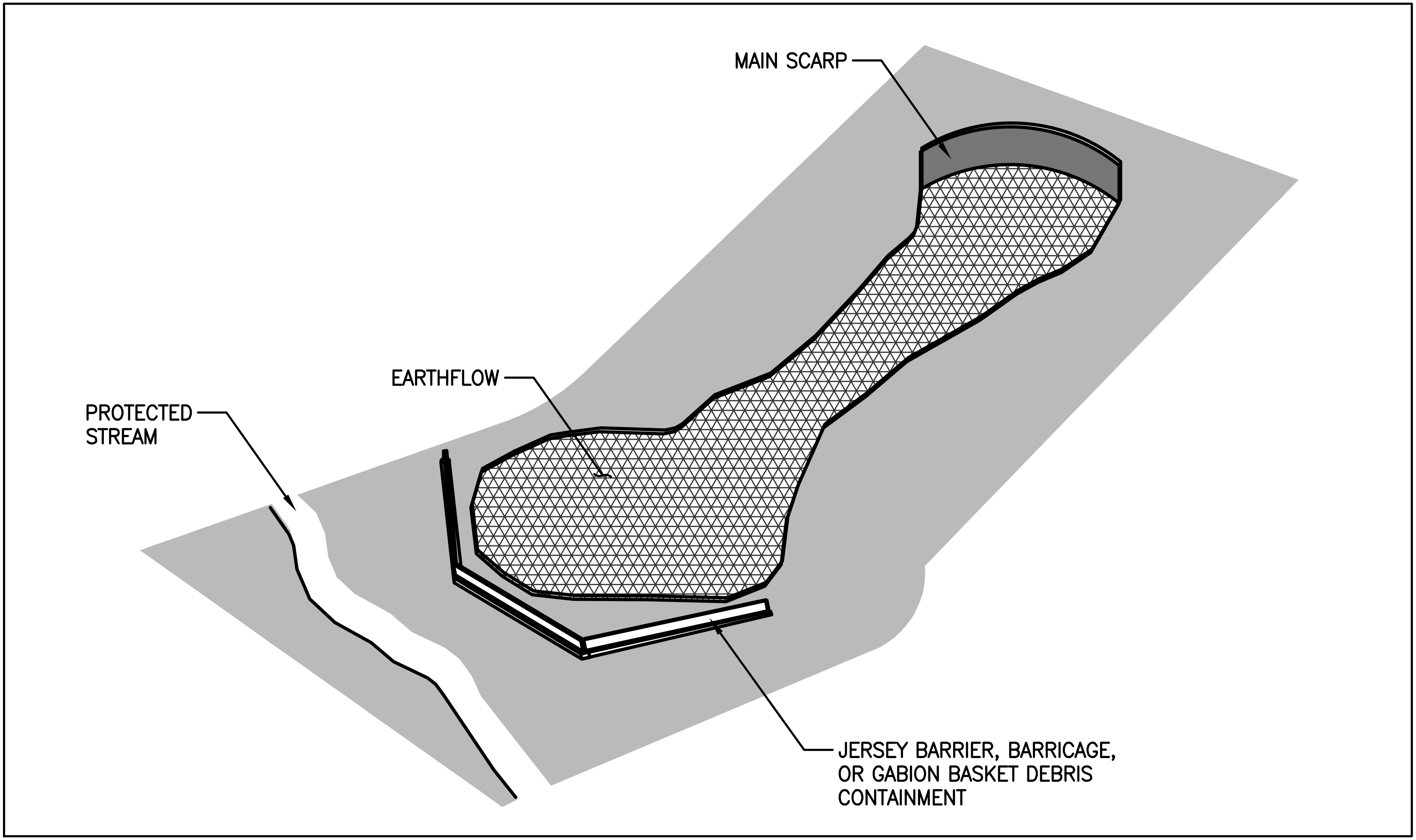
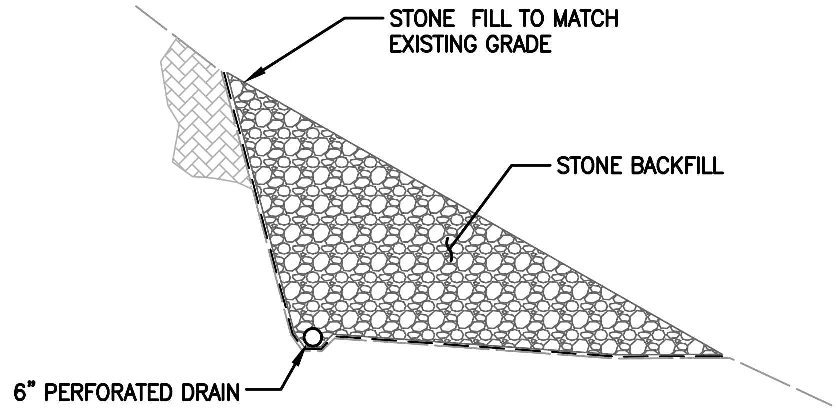
BENCH AND REGRADE WITH CONTROLLED BACKFILL DETAIL



GABION BASKET/JERSEY BARRIER CONTAINMENT DETAIL



STONE WITH DRAIN TO RESTORE FAILING SLOPE

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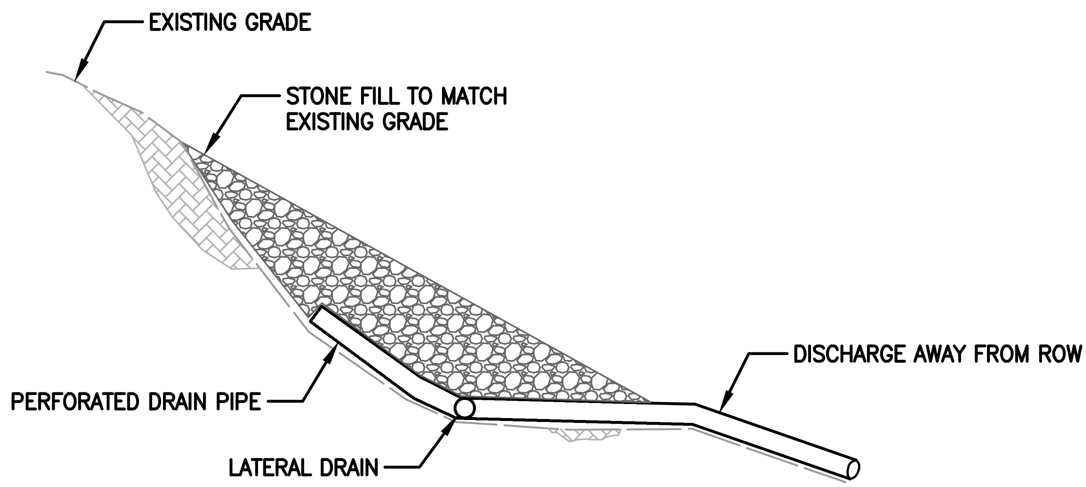
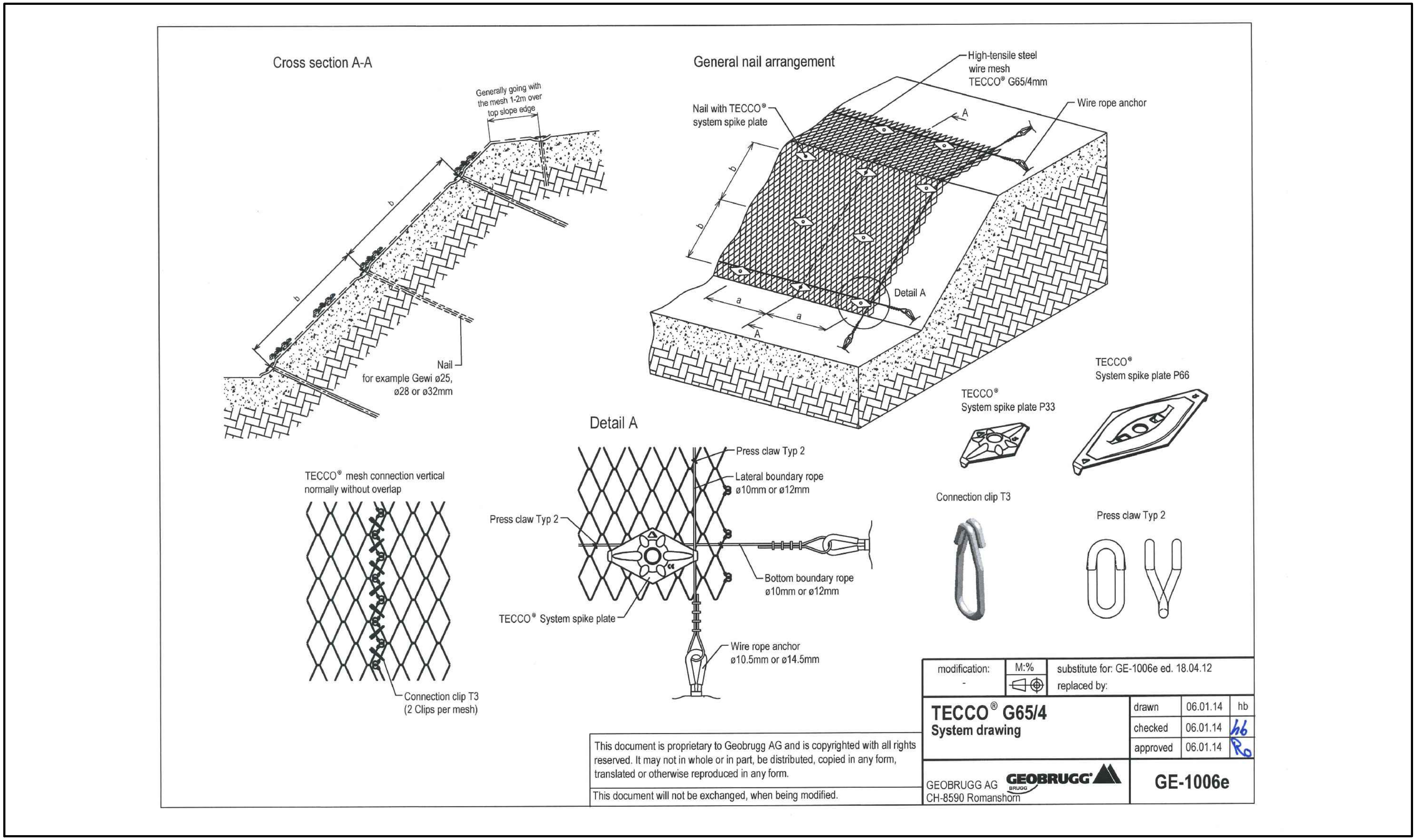


SMALL SLIP REPAIR WITH LATERAL

N.T.S.

ROCK FILL ON SLOPES BETWEEN 30–38 DEGREES DETAIL



GEOBRUGG–TECCO SYSTEM – WIRE MESH STABILIZATION

APPENDIX C

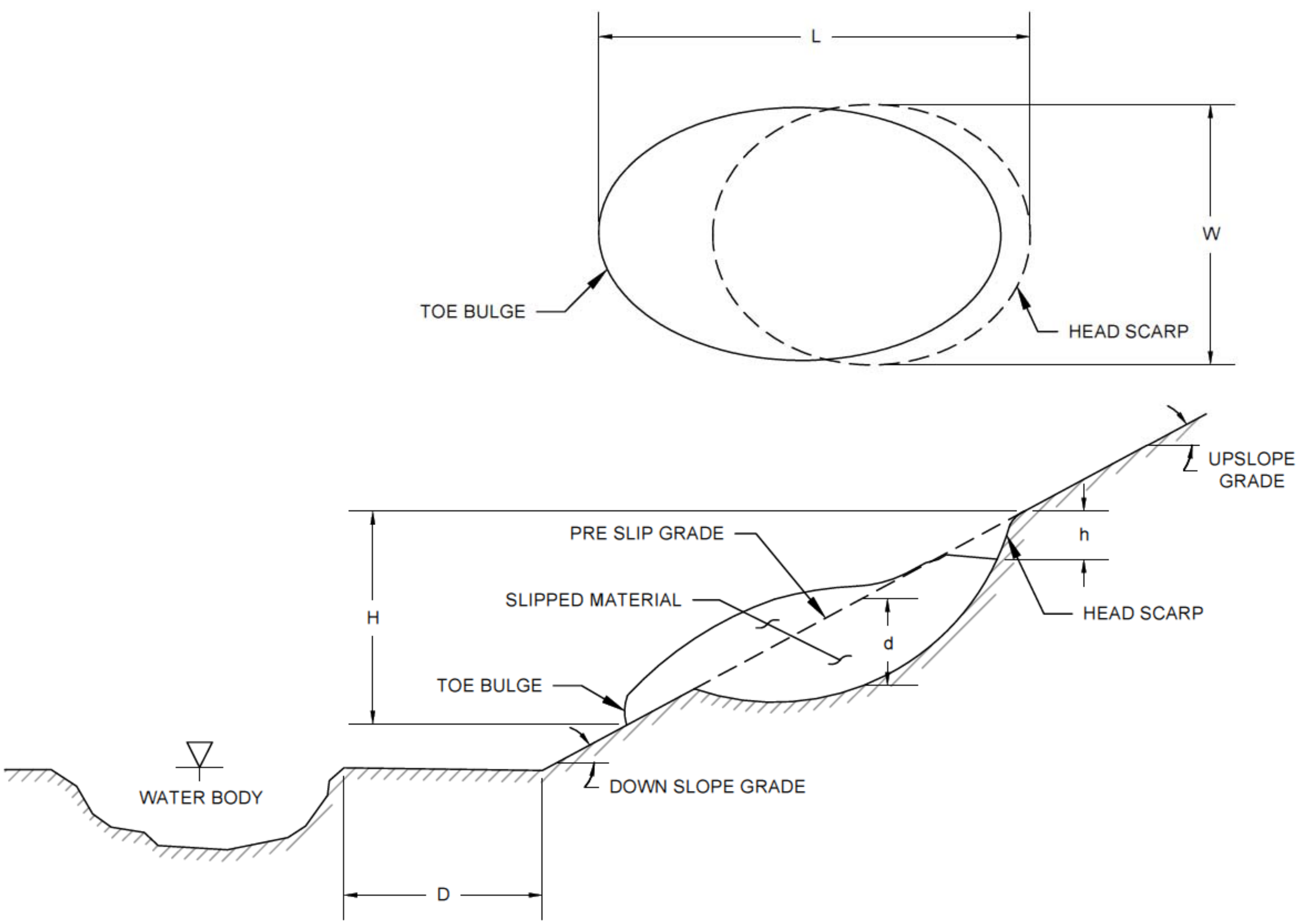
Forms

SLOPE FAILURE INFORMATION AND REPORTING FORM

Pipeline Name	
Slope Failure Station	GPS Coordinates Latitude ____________________ Longitude ____________________

Name of Observer	
Date	

Slope Failure Priority per Guidance in Appendix D Policy	○ **1**	○ **2**	○ **3**	○ **4**



Slope Characteristics

General dimensions (Rough estimate) *See above sketch for dimension key	Length, ***L*** (ft): ____________________________ Width, ***W*** (ft): ____________________________ Head Scarp Height, ***H*** (ft):____________________________ Height of total slope failure area, ***h*** (ft):____________________________ Distance from base of slope to waterbody, ***D*** (ft)____________________________ Estimated maximum depth of failure surface, ***d*** (ft)____________________________
Slope Angle	At failure ○ 20° or flatter ○ 22° to 30° ○ 30° to 38° ○ Steeper than 38°
	Upslope ○ 20° or flatter ○ 22° to 30° ○ 30° to 38° ○ Steeper than 38°
	Downslope ○ 20° or flatter ○ 22° to 30° ○ 30° to 38° ○ Steeper than 38°
Slope direction relative to pipeline	○ Pipeline is parallel to slope (up and down slope) ○ Some amount of cross slope ○ Pipeline is perpendicular to slope (cross slope, or sidehilling)
Slope type	○ Natural ○ Cut ○ Fill ○ Cut and fill
Presence of surface water	○ Yes ○ No ○ Unknown Describe: ____________________________
Presence of groundwater	○ Yes ○ No ○ Unknown Describe: ____________________________
Rock outcrops	○ Yes ○ No ○ Possible Describe location:
Rock type	☐ Shale ☐ Mudstone /Claystone ☐ Siltstone ☐ Sandstone ☐ Limestone ☐ Coal ☐ Interbedded ☐ Others ____________________________
Is there evidence of tree movement? **Look at trunks**	Perpendicular or leaning tree trunks is evidence of recent movement Describe: ____________________________
	Tree trunk bending and going vertical is evidence of previous slide movement Describe: ____________________________

Slope Failure Characteristics

Failure surface appearance	○ Circular ○ Hummocky ○ Terraced
Type of movement	○ Rotational slide ○ Translational block slide ○ Debris slide ○ Complex
Failure material(s)	○ Soil ○ Rock ○ Both Describe:
Head scarp	Describe:
Secondary scarps	Describe:
Evidence of toe bulge	○ Yes ○ No ○ Possible
Evidence of erosion	☐ Head ☐ Toe ☐ Flank ☐ Body ☐ None
Is failure within pipeline ROW	○ Permanent ○ Temporary ○ Outside LOD
Current impact to adjacent structures or properties	☐ Waterbody ☐ Pipeline/Utilities ☐ Roads ☐ Railroad ☐ Residential ☐ Buildings ☐ Bridge ☐ None ☐ Others____________________ Distance from toe of slope (ft): ____________________
Potential impact to adjacent structures or properties	☐ Waterbody ☐ Pipeline/Utilities ☐ Roads ☐ Railroad ☐ Residential ☐ Buildings ☐ Bridge ☐ None ☐ Others ____________________ Horizontal distance from toe of slope (ft): ____________________

Existing remediation	☐ Drainage ☐ Bio-stabilization ☐ Slope geometry correction ☐ Retaining structures ☐ Internal slope reinforcement ☐ Erosion control ☐ Chemical stabilization ☐ None ☐ Others ________________________________ Describe:

Other

Site access	☐ Site is accessible by permanent road, or active temporary access road ☐ Site access requires traversing steep slopes or long distance along ROW
Contractor availability	☐ Pipeline contractor still on site ☐ Pipeline contractor no longer on site, but still responsible for ROW restoration ☐ Pipeline contractor not contractually obligated for ROW restoration ☐ Specialty contractor required for anticipated repair method

Comments	

Photo Log

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SLOPE FAILURE SKETCH

Plan View and Cross-Section

Pipeline Name	Slope Failure Station

SLOPE FAILURE REPAIR ASSESSMENT FORM

Use this form to evaluate whether repair of an existing slope failure will be field-directed or engineering-directed, and whether to engage a specialist in slope failure evaluation and repair (i.e., geotechnical engineer).

PIPELINE NAME: ____________________ **SLOPE FAILURE STATION:** __________________ **DATE:** ______________

FILLED OUT BY: ____________________ **PROJECT MANAGER:** __________________

Criteria	Value	Selected Score
Slope Steepness		
Flatter than 20 degrees	1	
20 degrees to 30 degrees	5	
30 degrees to 38 degrees	10	
Steeper than 38 degrees	20	
Slope Direction Relative to Pipeline		
Pipeline is parallel to slope (i.e., up and down the slope)	1	
Some amount of cross slope	5	
Pipeline is perpendicular to slope (i.e., cross slope, or sidehilling)	10	
Evidence of Pre-existing Slope Failures		
None	1	
Mapped slope failures are present at the site, or pipeline plans indicate this location is a slope failure-prone hazard	5	
Tree trunks in the vicinity bend and go vertical	10	
Slope Failure Location		
Slope failure and material is fully within ROW	1	
Slope failure or material extends beyond ROW	10	
Consequence of Future Movement		
No Potential for Impact to pipeline, water bodies, roadways or private property	1	
Slope failure has potential to cause danger to human health and the environment (compromises other utilities, pipeline rupture, blocked public roadway(s), fish kill, release of pipeline fluids, sediment/debris in stream)	3	
Slope failure has caused an immediate danger to human health and the environment (compromises other utilities, pipeline rupture, blocked public roadway(s), fish kill, release of pipeline fluids, sediment/debris in stream)	5	
Site Access		
Site is accessible by permanent road or active temp. access road	1	
Site access requires traversing steep slopes or long distance along ROW	5	
Contractor Availability		
Pipeline contractor still on site	1	
Pipeline contractor no longer on site, but still responsible for ROW restoration	3	
Pipeline contractor not contractually obligated for ROW restoration	5	
Specialty contractor required for anticipated slope failure repair method	10	
	TOTAL	**0**

	Score
Field-directed repair	7-25
Engineering-directed repair	20-35
Engage third party specialist (i.e., geotechnical engineer)	30-70

APPENDIX D
Slope Failure Priority Guidance

Slope Failure Priority Guidance

- If you identify a slope failure on an *actively permitted construction project*, you must immediately notify the Environmental Compliance Coordinator (ECC). The ECC will coordinate with Energy Environmental Infrastructure Services (EIES) to determine the slope failure priority and the regulatory agency notification requirements. The ECC will notify the appropriate regulatory agencies as applicable.
- The ECC and EIES will work with you to identify the slope failure priority (see below).
- The ECC will provide immediate notification to the appropriate regulatory agency as required. **NOTE**: most regulatory agencies define immediate as "upon awareness and knowledge," and generally expects this to occur within 2 hours.
- If the ECC cannot be reached, contact the permitting lead in EIES. If neither the ECC nor the EIES permitting lead can be reached, please review the Slope Failure Priority Guidance below and prioritize the slope failure. For all priority 1 and 2 slope failures, immediate notification must be made to the appropriate regulatory agency. In most states this is the state emergency Spill Line, but not the National Response Center.

Slope Failure Priority Guidance

Priority 1 Slope Failure:

Definition: A slope failure which has caused an immediate danger to human health and/or the environment. This type of slope failure requires an emergency response.

Criteria: If any one of the following criteria exists, it is a Priority 1 slope failure.

- Compromises or threatens other utilities.
- Active and/or functional pipeline is broken or detached.
- A public roadway which may be used for emergency vehicles is blocked.
- A fish kill has been observed and/or reported in the general vicinity.
- Release of aqueous phase hydrocarbons (i.e. condensate). If aqueous phase hydrocarbons have been released to surface water additional notification to the National Response Center may be required.

Required Actions: Depending on the criteria met above, at least one or more of the following actions must be taken for a Priority 1 slope failure.

- Contact 811 or the appropriate one call for utilities.
- Notify the appropriate state Spill Line.
- Contact responsible party if not Dominion and potential to impact our right of way.
- Contact any other outside agencies for emergency purposes as necessary.

Priority 2 Slope Failure:

Definition: A slope failure or associated migration of sediment and/or debris, which has reached a waterway causing Conditions Not Allowable in state waters.

Criteria: If any one of the following criteria exists, it is a Priority 2 slope failure.

- Slope failure material or sediment laden runoff has entered water body.
- A pipeline is exposed but not broken.

Required Actions: At least one of the following actions must be taken for a Priority 2 slope failure.

- Contact 811 or the appropriate one call for utilities.
- Notify the appropriate state Spill Line.
- Contact responsible party if not Dominion and potential to impact our right of way.
- Contact any other outside agencies for emergency purposes as necessary.

Priority 3 Slope Failure:

Definition: A slope failure, slide or associated migration of sediment and/or debris that has not yet reached state waters.

Criteria: If any one of the following criteria exists, it is a Priority 3 slope failure.

- Impact to the water body is imminent.

Required Actions:

- Notify responsible party if not Dominion and potential to impact our right of way.

Priority 4 Slope Failure:

Definition: A slope failure that poses little or no environmental threat.

Criteria:

- No water body in the immediate area.
- Low/no probability of Conditions Not Allowable (Sediment in water body, E&S controls not maintained).
- Pipeline is not in danger of exposure, severing, detaching or rupture.

Required Action:

- Notify responsible party if not Dominion and potential to impact our right of way.

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plans

ATTACHMENT C-2

Best-in-Class Decision Tool/Work Flow Process and Typical Scenarios/Designs

Best-In-Class Decision Tool/ Work Flow Process

WORKING DRAFT
Implementing the BIC Steep Slope Hazard Mitigation Program – Decision Tree/Work Flow Process (WFP) Outline
Revised 10-04-2016_UPDATED Feb 15, 2017

Work Flow Process (WFP) for Implementation of the BIC Program – Review and Selection of Typical Scenarios and corresponding Incremental Controls.

Refer to the project document titled "Virginia Stormwater Pollution Prevention Plan (SWPPP)", Rev 5 dated February 2017 (refer to subsequent revisions to this document, as needed) for a detailed summary and definitions for the Best in Class (BIC) program. The following offers an abbreviated summary of the program.

Typical BIC mitigation designs, i.e. Typical Designs (TDs), for any given pipeline alignment location show defined "Typical Scenarios" that describe right-of-way conditions relative to steep slope areas (i.e. planar or side slope conditions, steep slopes without evidence of instability, steep slopes with potential for instability when disturbed, ridge tops, etc.). These Typical Scenarios (there are 6 scenarios, labeled A-F) characterize the kinds of steep slope and erosion related hazards at that location and thereby support development of mitigation actions. TDs provide a comprehensive and programmatic approach to address the hundreds of BIC locations along the pipeline alignment. Each TD includes a listing of applicable Incremental Controls (i.e. individual mitigation control measures shown on fly-sheets; examples include: silt fence, erosion control cloth, slope breakers, trench breakers, surface run-off controls, subsurface drains, etc.) that can be used at that site to address a range of potential conditions. TDs include mitigation measures that go above and beyond the minimum regulatory requirements.

TDs can be further developed into a Site Specific Design (SSD) for targeted locations, or to address special site conditions. Development of a SSD requires selecting the applicable Incremental Controls listed for a TD for a given site; and then defining the location, quantity, configuration, and any other site specific information needed to support construction. SSDs typically have stand-alone drawing packages showing site specific information.

The following outlines general steps for selecting site specific Incremental Controls corresponding to a TD, or for developing a SSD. The following approach is organized as a work flow process (WFP) that describes the general steps, as follows:

1. Convene team consisting (at a minimum) of BIC representatives from Dominion Engineering, Environmental, Construction, and a representative from the contractor.

2. Identify the pipeline alignment sheet corresponding to the site location; and review ESC measures (i.e. the baseline permit requirements) shown on the alignment sheet, the defined BIC Typical Steep Slope Scenario classification (A-F) for the site (also shown on the alignment sheet), the geohazards resource report assessment (typically a separate

technical reference document), and the SSURGO soils information (indicated on alignment sheets and/or as separate data).

3. Incremental Controls are organized into similar Groups that bundle corresponding mitigation measures together, to allow for practical review and selection of the best Incremental Control for the applicable site conditions, as follows:

   a. Identify and mitigate for potential sub-surface/surface drainage issues (Group 1);

   b. Identify and mitigate for temporary ROW surface or subsurface drainage (Groups 1 and 2);

   c. Identify and mitigate for disturbed ROW backfill resulting from construction, including short- and long-term mitigation/stabilization measures (Group 2);

   d. Identify and mitigate for potential erosion of surface soils (Group 3);

   e. Identify and mitigate for stabilization of trench and ROW backfill (Group 4);

   f. Identify and mitigate for potential for surface run-off on and within the ROW (Group 5);

   g. Identify and mitigate for potential surface run-off coming onto (from outside sources), across, along, and adjacent the ROW (Group 6);

   h. Identify and mitigate for temporary erosion and sediment control issues, primarily using Silt Fence (addressed under ES&C Plan) (Group 7);

   i. Identify and mitigate for oversized backfill, bedrock trench, etc.; and shallow groundwater and buoyancy issues (Groups 8 and 9);

   j. Identify and mitigate for special considerations for construction through benched topography (Group 10);

   k. Identify and mitigate for monitoring for active/future movement during construction or long-term Operation (Group 11);

   l. Identify and mitigate for active movement through stress relief excavations (during construction short-term), over the long-term (Operations), or isolate ROW in active land movement areas (shear trench) (Group 12);

   m. Identify and mitigate for ROW layout and configuration (Group 13), use these typical layouts and geometries to plan and coordinate construction and engineering mitigation measures;

   n. Identify and mitigate for special engineering conditions through development of studies, investigations, special contractors or other specialized detailed engineering, as needed (Group 14);

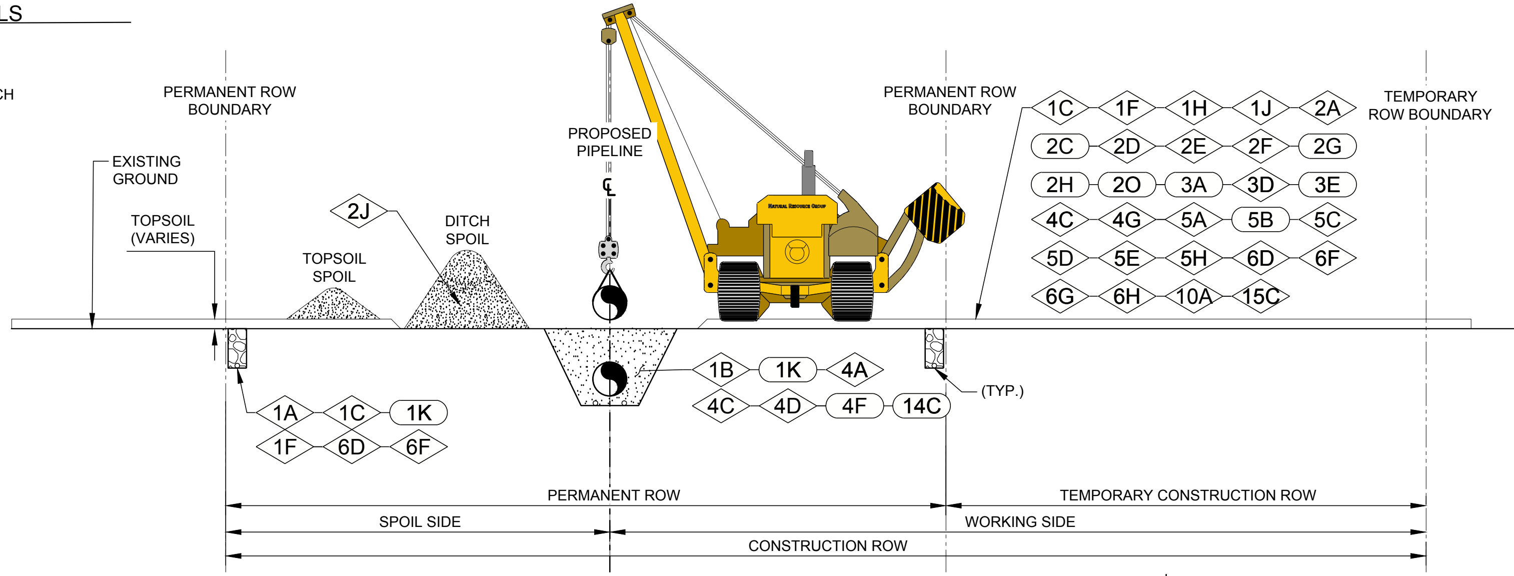
o. Identify and mitigate through avoidance by excavation, HDD, deeper trench, micro-re-route, larger re-route, etc.), or develop special access (i.e. when access is limited to the temporary constructed ROW, and other permanent access needs to be developed to provide long-term access for maintenance and operation), (Group 15);

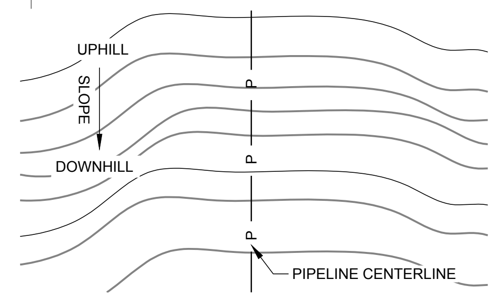
p. Identify and mitigate for karst hazards using special engineering studies and measures (Group 16).

Dominion Typical Scenarios with Typical Designs

BEST IN CLASS (BIC) INCREMENTAL CONTROLS

1A	FRENCH DRAIN (SIMPLE)
1B	ENHANCED DRAIN (GERMAN DRAIN), IN PIPELINE TRENCH
1C	TARGETED SEEP DRAINS, AT INTERSEPTED SEEPS
1F	ARMORED CHANNEL WITH DRAIN PIPE
1H	STEEP CONVEYANCE CHANNEL
1I	CHANGED SEEP CHARACTERISTICS
1K	ENERGY DISSIPATION BASIN
2A	GRADING TEMPORARY ROW SURFACE
2C	COMPACT BACKFILL
2D	DRY SOILS AND BACKFILL
2E	REMOVE UNSUITABLE EXISTING SOILS AS BACKFILL
2F	ROCK BACKFILL
2G	GRADING TO MATCH EXISTING CONTOURS
2J	SPOILS MANAGEMENT
2O	BENCH AND REGRADE WITH BACKFILL
3A	TRACK DISTURBED SLOPES
3D	ROCK ARMORING ON DISTURBED SLOPES
3E	COIR LOGS ON DISTURBED SLOPES
4A	TRENCH BREAKERS (FOAM AND SANDBAGS), MODIFIED SPACING
4C	SACK-CRETE BREAKERS (STRUCTURAL BREAKER)
4D	SLEEVE INTERFACE BETWEEN PIPELINE AND BREAKER
4F	TRENCH BREAKER WITH DRAINAGE
4G	SACK-CRETE ARMOR WITH BREAKERS
4H	FLOWABLE FILL FOR TRENCH BACKFILL
5A	SLOPE BREAKERS (TEMP AND PERMANENT), MODIFIED SPACING
5B	SLOPE BREAKER ARMORED OUTLET
5C	SLOPE BREAKERS WITH DIVERSION CHANNELS
5D	ACCESS ROADS
5E	TEMPORARY SLOPE BREAKER WITH DRAIN PIPE
5G	NO WOOD CHIPS IN ROW
5H	SURFACE WATER DIVERSIONS
6D	ARMORED CHANNEL
6F	RIPRAP GRADATIONS
6G	ARMORED V-SHAPED AND U-SHAPED CHANNELS
6H	TYP SURFACE WATER CONTROL LAYOUT
10A	BENCH RE-CONSTRUCTION THROUGH NATURAL STEPS
11F	AS-BUILT SURVEY TRENCH AND SLOPE BREAKERS
14C	BLASTING PLAN(S)
15C	ACCESS TO REMOTE ROW LOCATIONS





PLANAR SLOPE ORIENTATION (N.T.S.)

NOTES

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.
3. EXAMPLE SECTION SHOWS A TYPICAL SCENARIO. ACTUAL CUT/FILL CONDITIONS MAY VARY FOR EACH SITE.

LEGEND

XX	SCHEDULE A
XX	SCHEDULE B

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
F	2017-02-28	FINAL	DBC	THR	-	AQK

NOTES

PROJECT
BIC STEEP SLOPE
HAZARD MITIGATION PROGRAM

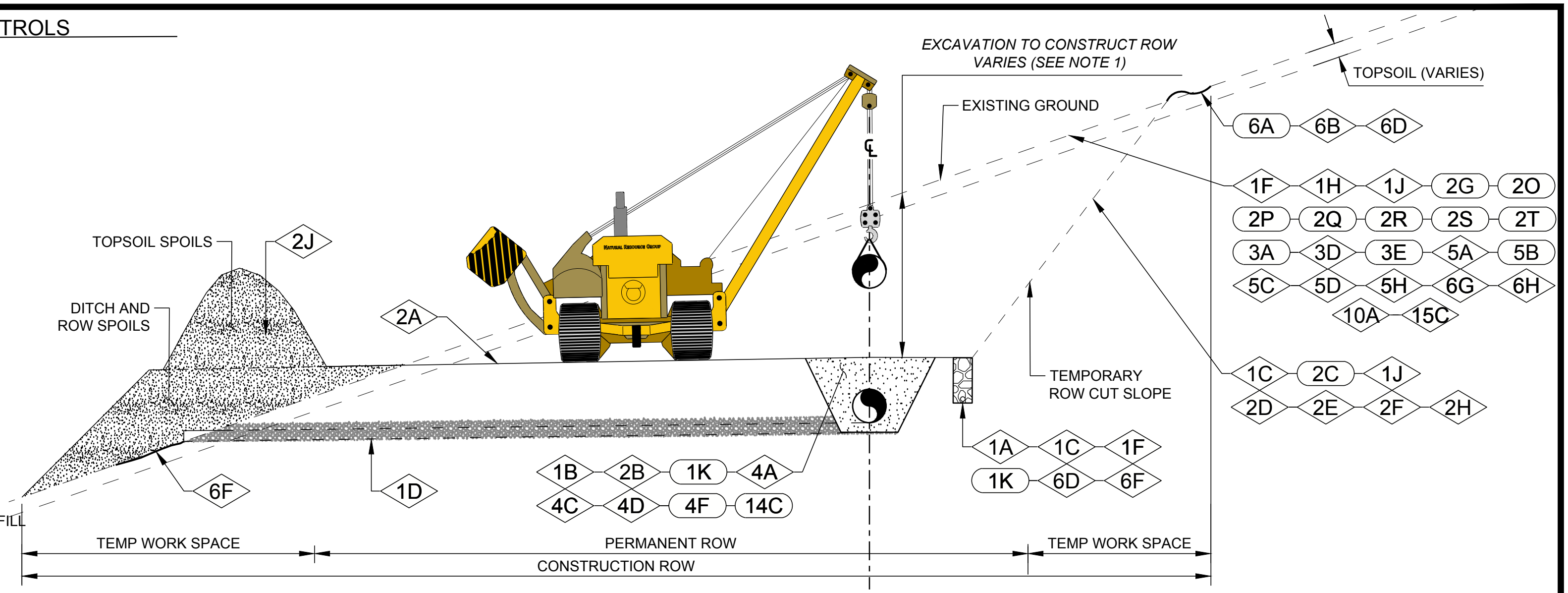
TITLE
A1 – STEEP SLOPES WITHOUT EVIDENCE OF PREVIOUS MOVEMENT (PLANAR SLOPE)

Atlantic Coast Pipeline

PROJECT No.		1535050	FILE No. TypScenarios1
DESIGN	DBC	2017-02-28	SCALE AS SHOWN
CADD	THR	2017-02-28	FIGURE
CHECK	-	2017-02-28	
REVIEW	AQK	2017-02-28	1 OF 2

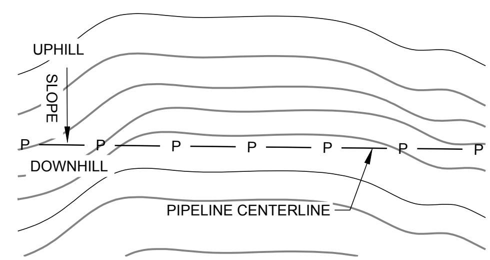
BEST IN CLASS (BIC) INCREMENTAL CONTROLS

- 1A FRENCH DRAIN (SIMPLE)
- 1B ENHANCED DRAIN (GERMAN DRAIN)
- 1C TARGETED SEEP DRAINS
- 1D BLEEDER DRAIN
- 1F ARMORED CHANNEL WITH DRAIN PIPE
- 1H STEEP CONVEYANCE CHANNEL
- 1I CHANGED SEEP CHARACTERISTICS
- 1J SINGLE TARGETED SEEP COLLECTOR
- 1K ENERGY DISSIPATION BASIN
- 2A GRADING TEMPORARY ROW SURFACE
- 2B GRADING TRENCH WITH OUTBOARD WEDGE
- 2C COMPACT BACKFILL
- 2D DRY SOILS AND BACKFILL
- 2E REMOVE UNSUITABLE EXISTING SOILS AS BACKFILL
- 2F ROCK BACKFILL
- 2G GRADING TO MATCH EXISTING CONTOURS
- 2H GRADING TO MINIMIZE BACKFILL
- 2J SPOILS MANAGEMENT
- 2O BENCH AND REGRADE WITH BACKFILL
- 2P CUT AND FILL CONSTRUCTION
- 2Q TYP SIDE HILL CUT AND FILL
- 2R TYP FILL WITH ROCK UNDER DRAIN
- 2S TYP BENCH AND REGRADE BACKFILL WITH ROCK OR SACKCRETE KEYS
- 2T TYP FILL WITH MULTIPLE ROCK CHANNELS
- 3A TRACK DISTURBED SLOPES
- 3D ROCK ARMORING ON DISTURBED SLOPES
- 3E COIR LOGS ON DISTURBED SLOPES
- 4A TRENCH BREAKERS (FOAM AND SANDBAGS), MODIFIED SPACING
- 4C SACK-CRETE BREAKERS (STRUCTURAL BREAKER)
- 4D SLEEVE INTERFACE BETWEEN PIPELINE AND BREAKER
- 4F TRENCH BREAKER WITH DRAINAGE
- 4G SACK-CRETE ARMOR WITH BREAKERS
- 4H FLOWABLE FILL FOR TRENCH BACKFILL
- 5A SLOPE BREAKERS (TEMP AND PERMANENT), MODIFIED SPACING
- 5B SLOPE BREAKER ARMORED OUTLET
- 5C SLOPE BREAKERS WITH DIVERSION CHANNELS
- 5D ACCESS ROADS
- 5E TEMPORARY SLOPE BREAKER WITH DRAIN PIPE
- 5G NO WOOD CHIPS IN ROW



BEST IN CLASS (BIC) INCREMENTAL CONTROLS

- 5H SURFACE WATER DIVERSIONS
- 6A COIR-LINED VEGETATED DIVERSION CHANNEL
- 6B BROW DITCH
- 6D ARMORED CHANNEL
- 6F RIPRAP GRADATIONS
- 6G ARMORED V-SHAPED AND U-SHAPED CHANNELS
- 6H TYP SURFACE WATER CONTROL LAYOUT
- 10A BENCH RE-CONSTRUCTION THROUGH NATURAL STEPS
- 11F AS-BUILT SURVEY TRENCH AND SLOPE BREAKERS
- 14C BLASTING PLAN(S)
- 15C ACCESS TO REMOTE ROW LOCATIONS



SIDESLOPE ORIENTATION (N.T.S.)

NOTES

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.
3. EXAMPLE SECTION SHOWS A TYPICAL SCENARIO. ACTUAL CUT/FILL CONDITIONS MAY VARY FOR EACH SITE.

LEGEND

- XX SCHEDULE A (oval)
- XX SCHEDULE B (diamond)

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
F	2017-02-28	FINAL	DBC	THR	-	AQK

NOTES

PROJECT

BIC STEEP SLOPE
HAZARD MITIGATION PROGRAM

TITLE

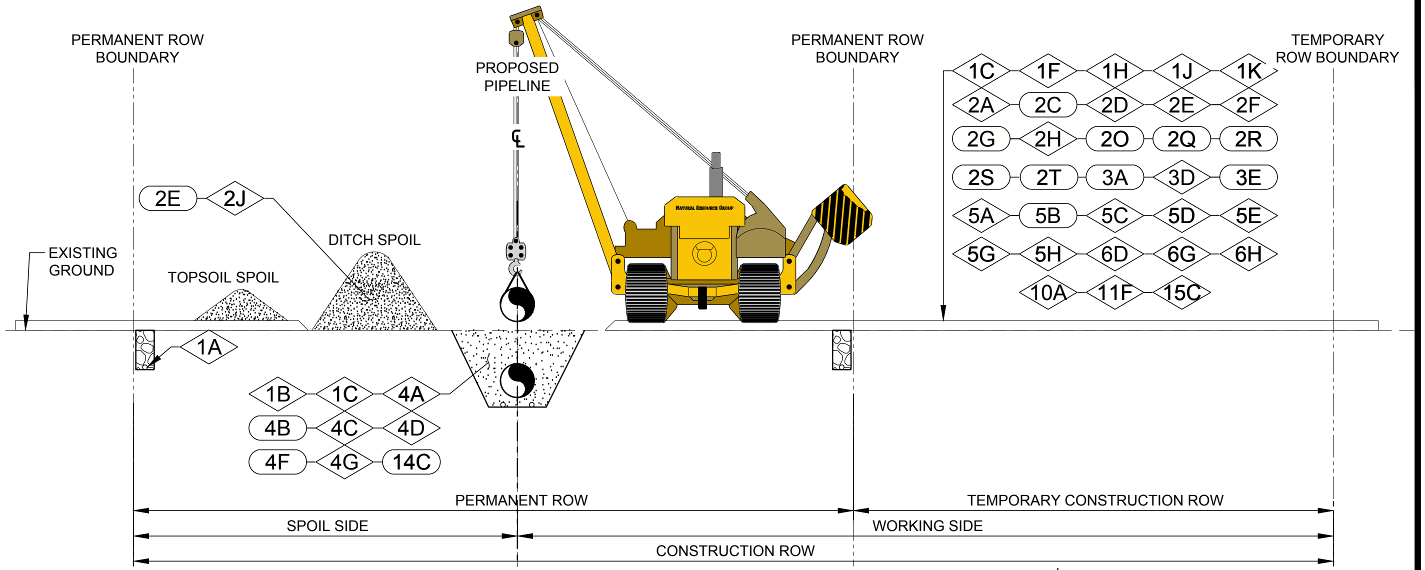
A2 - STEEP SLOPES WITHOUT EVIDENCE OF PREVIOUS MOVEMENT (SIDESLOPE)

Atlantic Coast Pipeline

PROJECT No.		1535050	FILE No.	TypScenarios1
DESIGN	DBC	2017-02-28	SCALE	AS SHOWN
CADD	THR	2017-02-28	FIGURE	
CHECK	-	2017-02-28		2 OF 2
REVIEW	AQK	2017-02-28		

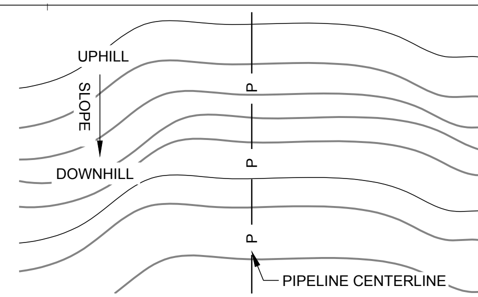
BEST IN CLASS (BIC) INCREMENTAL CONTROLS

- 1A FRENCH DRAIN (SIMPLE)
- 1B ENHANCED DRAIN (GERMAN DRAIN)
- 1C TARGETED SEEP DRAINS
- 1F ARMORED CHANNEL WITH DRAIN PIPE
- 1H STEEP CONVEYANCE CHANNEL
- 1J SINGLE TARGETED SEEP COLLECTOR
- 1K ENERGY DISSIPATION BASIN
- 2A GRADING TEMPORARY ROW SURFACE
- 2C COMPACT BACKFILL
- 2D DRY SOILS AND BACKFILL
- 2E REMOVE UNSUITABLE EXISTING SOILS AS BACKFILL
- 2F ROCK BACKFILL
- 2G GRADING TO MATCH EXISTING CONTOURS
- 2H GRADING TO MINIMIZE BACKFILL
- 2J SPOILS MANAGEMENT
- 2O BENCH AND REGRADE WITH BACKFILL
- 2Q TYP SIDE HILL CUT AND FILL
- 2R TYP FILL WITH ROCK UNDER DRAIN
- 2S TYP BENCH AND REGRADE BACKFILL WITH ROCK OR SACKCRETE KEYS
- 2T TYP FILL WITH MULTIPLE ROCK CHANNELS
- 3A TRACK DISTURBED SLOPES
- 3D ROCK ARMORING ON DISTURBED SLOPES
- 3E COIR LOGS ON DISTURBED SLOPES
- 4A TRENCH BREAKERS (FOAM AND SANDBAGS), MODIFIED SPACING
- 4B TRENCH DAMS (FOAM BAGS OR FINE GRAINED SOILS)
- 4C SACK-CRETE BREAKERS (STRUCTURAL BREAKER)
- 4D SLEEVE INTERFACE BETWEEN PIPELINE AND BREAKER
- 4F TRENCH BREAKER WITH DRAINAGE
- 4G SACK-CRETE ARMOR WITH BREAKERS
- 5A SLOPE BREAKERS (TEMP AND PERMANENT), MODIFIED SPACING
- 5B SLOPE BREAKER ARMORED OUTLET
- 5C SLOPE BREAKERS WITH DIVERSION CHANNELS
- 5D ACCESS ROADS (OLD ROADS)
- 5E TEMPORARY SLOPE BREAKER WITH DRAIN PIPE
- 5G NO WOOD CHIPS IN ROW
- 5H SURFACE WATER DIVERSIONS
- 6D ARMORED CHANNEL
- 6G ARMORED V-SHAPED AND U-SHAPED CHANNELS
- 6H TYP SURFACE WATER CONTROL LAYOUT



BEST IN CLASS (BIC) INCREMENTAL CONTROLS

- 10A BENCH RE-CONSTRUCTION THROUGH NATURAL STEPS,
- 11F AS-BUILT SURVEY TRENCH AND SLOPE BREAKERS
- 14C BLASTING PLAN(S)
- 15C ACCESS TO REMOTE ROW LOCATIONS



PLANAR SLOPE ORIENTATION (N.T.S.)

NOTES

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.
3. EXAMPLE SECTION SHOWS A TYPICAL SCENARIO. ACTUAL CUT/FILL CONDITIONS MAY VARY FOR EACH SITE.

LEGEND

- XX (oval) SCHEDULE A
- XX (diamond) SCHEDULE B

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
F	2017-02-28	FINAL	DBC	THR	-	AQK

NOTES

PROJECT
BIC STEEP SLOPE
HAZARD MITIGATION PROGRAM

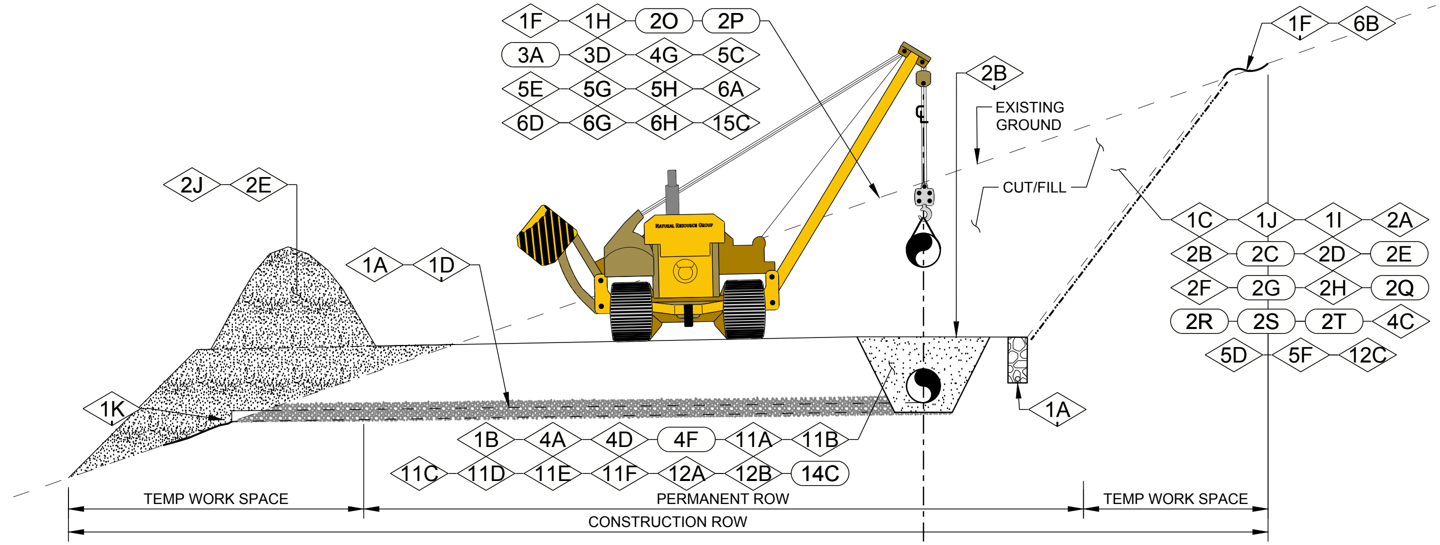
TITLE
B1 - STEEP SLOPES WITH EVIDENCE OF ACTIVE MOVEMENT (PLANAR SLOPE)

Atlantic Coast Pipeline

PROJECT No.		1535050	FILE No. TypScenarios2
DESIGN	DBC	2017-02-28	SCALE AS SHOWN
CADD	THR	2017-02-28	FIGURE
CHECK	-	2017-02-28	1 OF 2
REVIEW	AQK	2017-02-28	

BEST IN CLASS (BIC) INCREMENTAL CONTROLS

1A	FRENCH DRAIN (SIMPLE)
1B	ENHANCED DRAIN (GERMAN DRAIN)
1C	TARGETED SEEP DRAINS
1D	BLEEDER DRAIN
1F	ARMORED CHANNEL WITH DRAIN PIPE
1H	STEEP CONVEYANCE CHANNEL
1I	CHANGED SEEP CHARACTERISTICS
1J	SINGLE TARGETED SEEP COLLECTOR
1K	ENERGY DISSIPATION BASIN
2A	GRADING TEMPORARY ROW SURFACE
2B	GRADING TRENCH WITH OUTBOARD WEDGE
2C	COMPACT BACKFILL
2D	DRY SOILS AND BACKFILL
2E	REMOVE UNSUITABLE EXISTING SOILS AS BACKFILL
2F	ROCK BACKFILL
2G	GRADING TO MATCH EXISTING CONTOURS
2H	GRADING TO MINIMIZE BACKFILL
2J	SPOILS MANAGEMENT
2O	BENCH AND REGRADE WITH BACKFILL
2P	CUT AND FILL CONSTRUCTION
2Q	TYP SIDE HILL CUT AND FILL
2R	TYP FILL WITH ROCK UNDER DRAIN
2S	TYP BENCH AND REGRADE BACKFILL WITH ROCK OR SACKCRETE KEYS
2T	TYP FILL WITH MULTIPLE ROCK CHANNELS
3A	TRACK DISTURBED SLOPES
3D	ROCK ARMORING ON DISTURBED SLOPES
3E	COIR LOGS ON DISTURBED SLOPES
4A	TRENCH BREAKERS (FOAM AND SANDBAGS), MODIFIED SPACING
4B	TRENCH DAMS (FOAM BAGS OR FINE GRAINED SOILS)
4C	SACK-CRETE BREAKERS (STRUCTURAL BREAKER)
4D	SLEEVE INTERFACE BETWEEN PIPELINE AND BREAKER
4F	TRENCH BREAKER WITH DRAINAGE
4G	SACK-CRETE ARMOR WITH BREAKERS
5A	SLOPE BREAKERS (TEMP AND PERMANENT), MODIFIED SPACING
5C	SLOPE BREAKERS WITH DIVERSION CHANNELS
5D	ACCESS ROADS
5E	TEMPORARY SLOPE BREAKER WITH DRAIN PIPE
5F	SACK-CRETE WEDGE
5G	NO WOOD CHIPS IN ROW

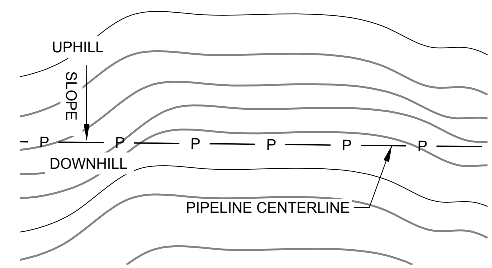


BEST IN CLASS (BIC) INCREMENTAL CONTROLS

5H	SURFACE WATER DIVERSIONS
6A	COIR-LINED VEGETATED DIVERSION CHANNEL
6B	BROW DITCH
6D	ARMORED CHANNEL
6G	ARMORED V-SHAPED AND U-SHAPED CHANNELS
6H	TYP SURFACE WATER CONTROL LAYOUT
11A	GEODETIC MONITORING
11B	STRAIN GAUGE MONITORING
11C	SLOPE INCLINOMETER MONITORING
11D	SLOPE INCLINOMETER CASING
11E	STANDPIPE PIEZOMETER MONITORING
11F	AS-BUILT SURVEY TRENCH AND SLOPE BREAKERS
12A	STRESS RELIEF EXCAVATIONS
12B	SELECT (DEFORMABLE) TRENCH BACKFILL
12C	SHEAR TRENCH
14C	BLASTING PLAN(S)
15C	ACCESS TO REMOTE ROW LOCATIONS

LEGEND

XX	SCHEDULE A
XX	SCHEDULE B



SIDESLOPE ORIENTATION (N.T.S.)

NOTES

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.
3. EXAMPLE SECTION SHOWS A TYPICAL SCENARIO. ACTUAL CUT/FILL CONDITIONS MAY VARY FOR EACH SITE.

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
F	2017-02-28	FINAL	DBC	THR	-	AQK

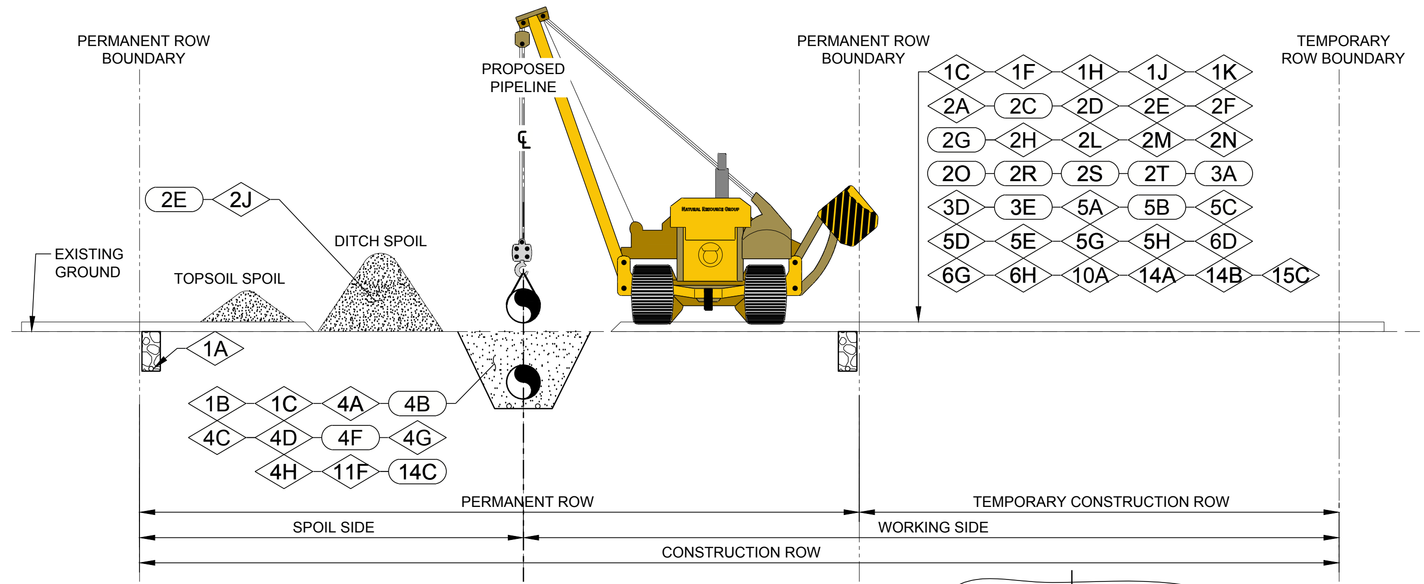
NOTES

PROJECT
BIC STEEP SLOPE
HAZARD MITIGATION PROGRAM

TITLE
B2 - STEEP SLOPES WITH EVIDENCE OF ACTIVE MOVEMENT (SIDESLOPE)

Atlantic Coast Pipeline

PROJECT No.		1535050	FILE No.	TypScenarios3
DESIGN	DBC	2017-02-28	SCALE	AS SHOWN
CADD	THR	2017-02-28	FIGURE	
CHECK	-	2017-02-28		2 OF 2
REVIEW	AQK	2017-02-28		

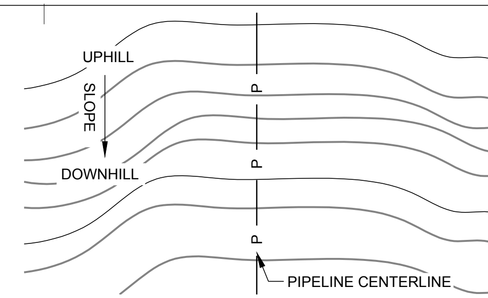


BEST IN CLASS (BIC) INCREMENTAL CONTROLS

- 1A FRENCH DRAIN (SIMPLE)
- 1B ENHANCED DRAIN (GERMAN DRAIN)
- 1C TARGETED SEEP DRAINS
- 1F ARMORED CHANNEL WITH DRAIN PIPE
- 1H STEEP CONVEYANCE CHANNEL
- 1J SINGLE TARGETED SEEP COLLECTOR
- 1K ENERGY DISSIPATION BASIN
- 2A GRADING TEMPORARY ROW SURFACE
- 2C COMPACT BACKFILL
- 2D DRY SOILS AND BACKFILL
- 2E REMOVE UNSUITABLE EXISTING SOILS AS BACKFILL
- 2F ROCK BACKFILL
- 2G GRADING TO MATCH EXISTING CONTOURS
- 2H GRADING TO MINIMIZE BACKFILL
- 2J SPOILS MANAGEMENT
- 2L SOIL-NAIL WITH TECCO MESH
- 2M EXTERNALLY STABILIZED RETAINING WALL SYSTEMS
- 2N GEOTEXTILE REINFORCED SYSTEMS
- 2O BENCH AND REGRADE WITH BACKFILL
- 2R TYP FILL WITH ROCK UNDER DRAIN
- 2S TYP BENCH AND REGRADE BACKFILL WITH ROCK OR SACKCRETE KEYS
- 2T TYP FILL WITH MULTIPLE ROCK CHANNELS
- 3A TRACK DISTURBED SLOPES
- 3D ROCK ARMORING ON DISTURBED SLOPES
- 3E COIR LOGS ON DISTURBED SLOPES
- 4A TRENCH BREAKERS (FOAM AND SANDBAGS), MODIFIED SPACING
- 4B TRENCH DAMS (FOAM BAGS OR FINE GRAINED SOILS)
- 4C SACK-CRETE BREAKERS (STRUCTURAL BREAKER)
- 4D SLEEVE INTERFACE BETWEEN PIPELINE AND BREAKER
- 4F TRENCH BREAKER WITH DRAINAGE
- 4G SACK-CRETE ARMOR WITH BREAKERS
- 4H FLOWABLE FILL FOR TRENCH BACKFILL
- 5A SLOPE BREAKERS (TEMP AND PERMANENT), MODIFIED SPACING
- 5B SLOPE BREAKER ARMORED OUTLET
- 5C SLOPE BREAKERS WITH DIVERSION CHANNELS
- 5D ACCESS ROADS (OLD ROADS)
- 5E TEMPORARY SLOPE BREAKER WITH DRAIN PIPE
- 5G NO WOOD CHIPS IN ROW
- 5H SURFACE WATER DIVERSIONS

BEST IN CLASS (BIC) INCREMENTAL CONTROLS

- 6D ARMORED CHANNEL
- 6G ARMORED V-SHAPED AND U-SHAPED CHANNELS
- 6H TYP SURFACE WATER CONTROL LAYOUT
- 10A BENCH RE-CONSTRUCTION THROUGH NATURAL STEPS
- 11F AS-BUILT SURVEY TRENCH AND SLOPE BREAKERS
- 14A SITE SPECIFIC DETAILED ENGINEERING
- 14B MESH ROCK FALL PROTECTION
- 14C BLASTING PLAN(S)
- 15C ACCESS TO REMOTE ROW LOCATIONS



PLANAR SLOPE ORIENTATION (N.T.S.)

NOTES

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.
3. EXAMPLE SECTION SHOWS A TYPICAL SCENARIO. ACTUAL CUT/FILL CONDITIONS MAY VARY FOR EACH SITE.

LEGEND

- XX SCHEDULE A
- XX SCHEDULE B

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
F	2017-02-28	FINAL	DBC	THR	-	AQK

NOTES

PROJECT

BIC STEEP SLOPE
HAZARD MITIGATION PROGRAM

TITLE

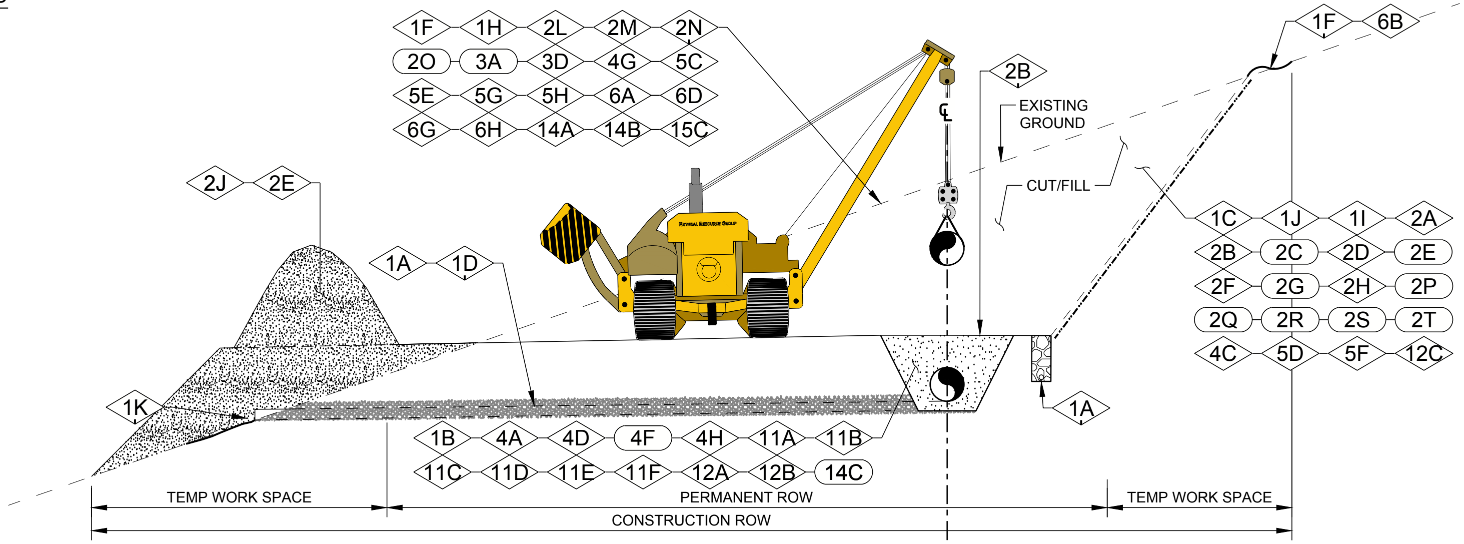
C1 – STEEP SLOPES WITH INCREASED POTENTIAL FOR INSTABILITY WHEN DISTURBED (PLANAR SLOPE)

Atlantic Coast Pipeline

PROJECT No.		1535050	FILE No.	TypScenarios2
DESIGN	DBC	2017-02-28	SCALE	AS SHOWN
CADD	THR	2017-02-28	FIGURE	
CHECK	-	2017-02-28		1 OF 2
REVIEW	AQK	2017-02-28		

BEST IN CLASS (BIC) INCREMENTAL CONTROLS

1A	FRENCH DRAIN (SIMPLE)
1B	ENHANCED DRAIN (GERMAN DRAIN)
1C	TARGETED SEEP DRAINS
1D	BLEEDER DRAIN
1F	ARMORED CHANNEL WITH DRAIN PIPE
1H	STEEP CONVEYANCE CHANNEL
1I	CHANGED SEEP CHARACTERISTICS
1J	SINGLE TARGETED SEEP COLLECTOR
1K	ENERGY DISSIPATION BASIN
2A	GRADING TEMPORARY ROW SURFACE
2B	GRADING TRENCH WITH OUTBOARD WEDGE
2C	COMPACT BACKFILL
2D	DRY SOILS AND BACKFILL
2E	REMOVE UNSUITABLE EXISTING SOILS AS BACKFILL
2F	ROCK BACKFILL
2G	GRADING TO MATCH EXISTING CONTOURS
2H	GRADING TO MINIMIZE BACKFILL
2J	SPOILS MANAGEMENT
2L	SOIL-NAIL WITH TECCO MESH
2M	EXTERNALLY STABILIZED RETAINING WALL SYSTEMS
2N	GEOTEXTILE REINFORCED SYSTEMS
2O	BENCH AND REGRADE WITH BACKFILL
2P	CUT AND FILL CONSTRUCTION
2Q	TYP SIDE HILL CUT AND FILL
2R	TYP FILL WITH ROCK UNDER DRAIN
2S	TYP BENCH AND REGRADE BACKFILL WITH ROCK OR SACKCRETE KEYS
2T	TYP FILL WITH MULTIPLE ROCK CHANNELS
3A	TRACK DISTURBED SLOPES
3D	ROCK ARMORING ON DISTURBED SLOPES
3E	COIR LOGS ON DISTURBED SLOPES
4A	TRENCH BREAKERS (FOAM AND SANDBAGS), MODIFIED SPACING
4B	TRENCH DAMS (FOAM BAGS OR FINE GRAINED SOILS)
4C	SACK-CRETE BREAKERS (STRUCTURAL BREAKER)
4D	SLEEVE INTERFACE BETWEEN PIPELINE AND BREAKER
4F	TRENCH BREAKER WITH DRAINAGE
4G	SACK-CRETE ARMOR WITH BREAKERS
4H	FLOWABLE FILL FOR TRENCH BACKFILL
5A	SLOPE BREAKERS (TEMP AND PERMANENT), MODIFIED SPACING
5C	SLOPE BREAKERS WITH DIVERSION CHANNELS



BEST IN CLASS (BIC) INCREMENTAL CONTROLS

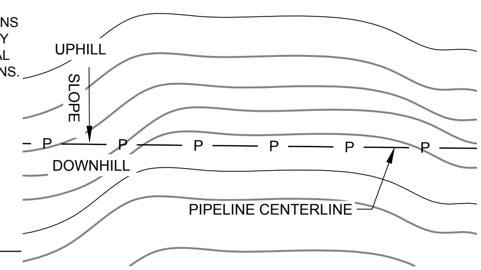
5D	ACCESS ROADS
5E	TEMPORARY SLOPE BREAKER WITH DRAIN PIPE
5F	SACK-CRETE WEDGE
5G	NO WOOD CHIPS IN ROW
5H	SURFACE WATER DIVERSIONS
6A	COIR-LINED VEGETATED DIVERSION CHANNEL
6B	BROW DITCH
6D	ARMORED CHANNEL
6G	ARMORED V-SHAPED AND U-SHAPED CHANNELS
6H	TYP SURFACE WATER CONTROL LAYOUT
11A	GEODETIC MONITORING
11B	STRAIN GAUGE MONITORING
11C	SLOPE INCLINOMETER MONITORING
11D	SLOPE INCLINOMETER CASING
11E	STANDPIPE PIEZOMETER MONITORING
11F	AS-BUILT SURVEY TRENCH AND SLOPE BREAKERS
12A	STRESS RELIEF EXCAVATIONS
12B	SELECT (DEFORMABLE) TRENCH BACKFILL
12C	SHEAR TRENCH
14A	SITE SPECIFIC DETAILED ENGINEERING
14B	MESH ROCK FALL PROTECTION
14C	BLASTING PLAN(S)
15C	ACCESS TO REMOTE ROW LOCATIONS

NOTES

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.
3. EXAMPLE SECTION SHOWS A TYPICAL SCENARIO. ACTUAL CUT/FILL CONDITIONS MAY VARY FOR EACH SITE.

LEGEND

XX (oval)	SCHEDULE A
XX (diamond)	SCHEDULE B



SIDESLOPE ORIENTATION (N.T.S.)

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
F	2017-02-28	FINAL	DBC	THR	-	AQK

NOTES

PROJECT
BIC STEEP SLOPE
HAZARD MITIGATION PROGRAM

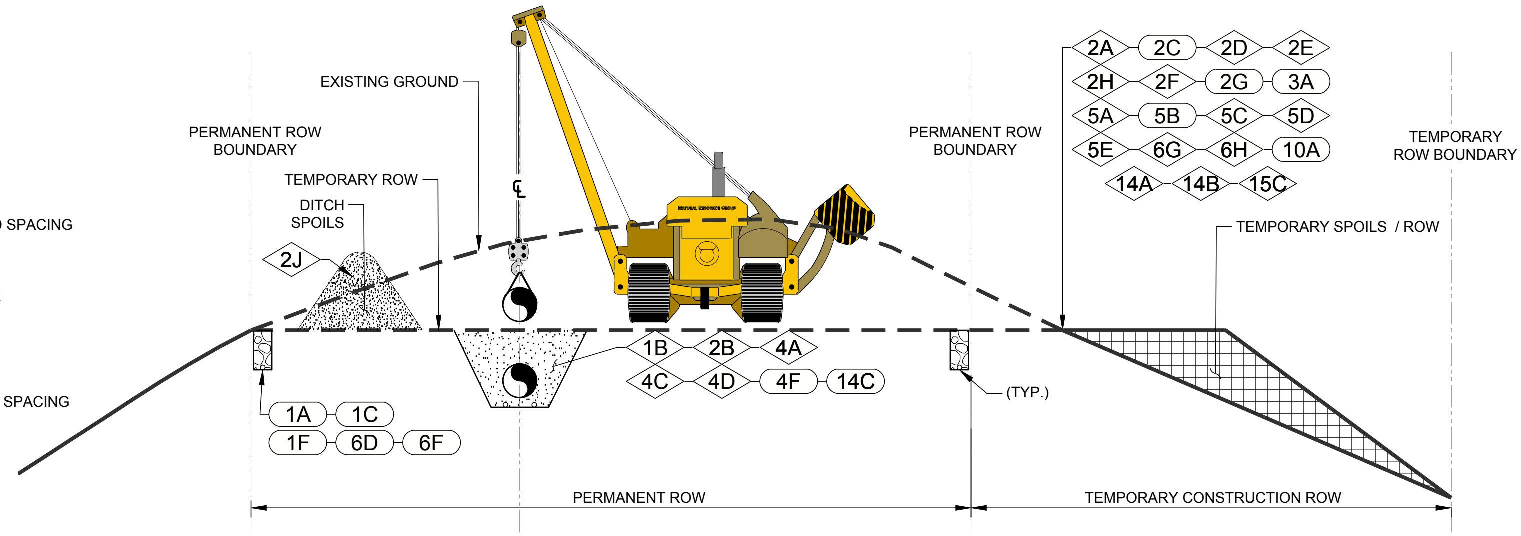
TITLE
C2 – STEEP SLOPES WITH INCREASED POTENTIAL FOR INSTABILITY WHEN DISTURBED (SIDE SLOPE)

Atlantic Coast Pipeline

PROJECT No.		1535050	FILE No.	TypScenarios3
DESIGN	DBC	2017-02-28	SCALE	AS SHOWN
CADD	THR	2017-02-28	FIGURE	
CHECK	-	2017-02-28		2 OF 2
REVIEW	AQK	2017-02-28		

BEST IN CLASS (BIC) INCREMENTAL CONTROLS

- 1B ENHANCED DRAIN (GERMAN DRAIN)
- 2A GRADING TEMPORARY ROW SURFACE
- 2B GRADING TRENCH WITH OUTBOARD WEDGE
- 2C COMPACT BACKFILL
- 2D DRY SOILS AND BACKFILL
- 2E REMOVE UNSUITABLE EXISTING SOILS AS BACKFILL
- 2F ROCK BACKFILL
- 2G GRADING TO MATCH EXISTING CONTOURS
- 2H GRADING TO MINIMIZE BACKFILL
- 2J SPOILS MANAGEMENT
- 3A TRACK DISTURBED SLOPES
- 4A TRENCH BREAKERS (FOAM AND SANDBAGS), MODIFIED SPACING
- 4C SACK-CRETE BREAKERS (STRUCTURAL BREAKER)
- 4D SLEEVE INTERFACE BETWEEN PIPELINE AND BREAKER
- 4F TRENCH BREAKER WITH DRAINAGE
- 4H FLOWABLE FILL FOR TRENCH BACKFILL
- 5A SLOPE BREAKERS (TEMP AND PERMANENT), MODIFIED SPACING
- 5B SLOPE BREAKER ARMORED OUTLET
- 5C SLOPE BREAKERS WITH DIVERSION CHANNELS
- 5D ACCESS ROADS
- 5E TEMPORARY SLOPE BREAKER WITH DRAIN PIPE
- 5G NO WOOD CHIPS IN ROW
- 6G ARMORED V-SHAPED AND U-SHAPED CHANNELS
- 6H TYP SURFACE WATER CONTROL LAYOUT
- 10A BENCH RE-CONSTRUCTION THROUGH NATURAL STEPS
- 11F AS-BUILT SURVEY TRENCH AND SLOPE BREAKERS
- 14A SITE SPECIFIC DETAILED ENGINEERING
- 14B MESH ROCK FALL PROTECTION
- 14C BLASTING PLAN(S)
- 15C ACCESS TO REMOTE ROW LOCATIONS



NOTES

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.
3. SCENARIO SHOWN WHERE RIDGE TOP IS GENERALLY CENTERED, BUT MAY VARY WITH CUT/FILL TO ONE SIDE OR THE OTHER.

LEGEND

- XX (oval) SCHEDULE A
- XX (diamond) SCHEDULE B

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
F	2017-02-28	FINAL	DBC	THR	-	AQK

NOTES

PROJECT
BIC STEEP SLOPE
HAZARD MITIGATION PROGRAM

TITLE
D - STEEP SLOPES NEAR NARROW RIDGE TOPS

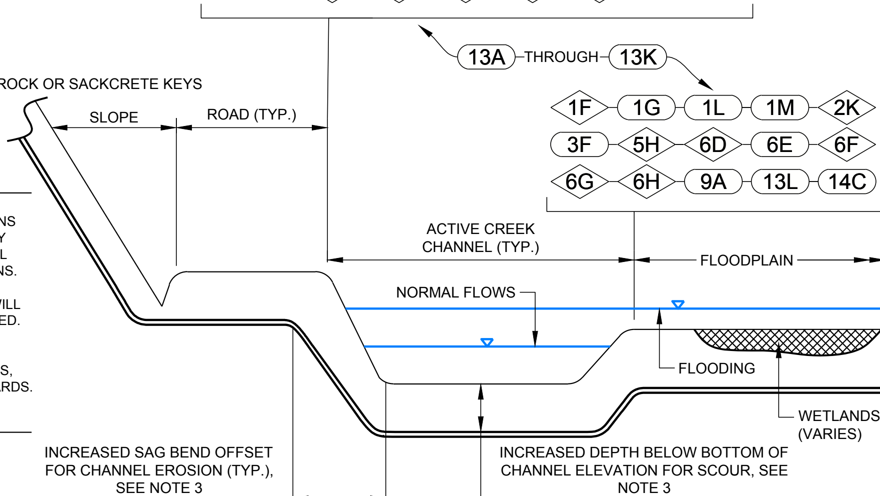
Atlantic Coast Pipeline

PROJECT No.		1535050	FILE No. TypScenarios1
DESIGN	DBC	2017-02-28	SCALE AS SHOWN
CADD	THR	2017-02-28	FIGURE
CHECK	-	2017-02-28	1 OF 1
REVIEW	AQK	2017-02-28	

BEST IN CLASS (BIC) INCREMENTAL CONTROLS

- 1A FRENCH DRAIN (SIMPLE)
- 1B ENHANCED DRAIN (GERMAN DRAIN), IN PIPELINE TRENCH
- 1C TARGETED SEEP DRAINS, AT INTERSEPTED SEEPS
- 1D BLEEDER DRAIN
- 1F ARMORED CHANNEL WITH DRAIN PIPE
- 1G DEWATERING
- 1H STEEP CONVEYANCE CHANNEL
- 1I CHANGED SEEP CHARACTERISTICS
- 1J SINGLE TARGETED SEEP COLLECTOR
- 1K ENERGY DISSIPATION BASIN
- 1L DEWATERING DISCHARGE BAG
- 1M DEWATERING DISCHARGE IN UPLAND AREA
- 2A GRADING TEMPORARY ROW SURFACE
- 2C COMPACT BACKFILL
- 2D DRY SOILS AND BACKFILL
- 2E REMOVE UNSUITABLE EXISTING SOILS AS BACKFILL
- 2F ROCK BACKFILL
- 2G GRADING TO MATCH EXISTING CONTOURS
- 2J SPOILS MANAGEMENT
- 2K GABIONS
- 2L SOIL-NAIL WITH TECCO MESH
- 2M EXTERNALLY STABILIZED RETAINING WALL SYSTEMS
- 2N GEOTEXTILE REINFORCED SYSTEMS
- 2O BENCH AND REGRADE WITH BACKFILL
- 2P CUT AND FILL CONSTRUCTION
- 2Q TYP SIDE HILL CUT AND FILL
- 2R TYP FILL WITH ROCK UNDER DRAIN
- 2S TYP BENCH AND REGRADE BACKFILL WITH ROCK OR SACKCRETE KEYS
- 2T TYP FILL WITH MULTIPLE ROCK CHANNELS
- 3A TRACK DISTURBED SLOPES
- 3D ROCK ARMORING ON DISTURBED SLOPES
- 3E COIR LOGS ON DISTURBED SLOPES
- 3F SUBMAR MATTS
- 4A TRENCH BREAKERS (FOAM AND SANDBAGS), MODIFIED SPACING
- 4B TRENCH DAMS (FOAM BAGS OR FINE GRAINED SOILS)
- 4C SACK-CRETE BREAKERS (STRUCTURAL BREAKER)
- 4D SLEEVE INTERFACE BETWEEN PIPELINE AND BREAKER
- 4F TRENCH BREAKER WITH DRAINAGE
- 4G SACK-CRETE ARMOR WITH BREAKERS
- 4H FLOWABLE FILL FOR TRENCH BACKFILL
- 5A SLOPE BREAKERS (TEMP AND PERMANENT), MODIFIED SPACING
- 5B SLOPE BREAKER ARMORED OUTLET
- 5C SLOPE BREAKERS WITH DIVERSION CHANNELS
- 5D ACCESS ROADS
- 5E TEMPORARY SLOPE BREAKER WITH DRAIN PIPE
- 5G NO WOOD CHIPS IN ROW
- 5H SURFACE WATER DIVERSIONS
- 6D ARMORED CHANNEL
- 6E TYP STREAM BANK STABILIZATION WITH VARIOUS CONCEPTUAL CONTROLS
- 6F RIPRAP GRADATIONS
- 6G ARMORED V-SHAPED AND U-SHAPED CHANNELS
- 6H TYP SURFACE WATER CONTROL LAYOUT
- 9A BUOYANCY MITIGATION
- 10A BENCH RE-CONSTRUCTION THROUGH NATURAL STEPS
- 11F AS-BUILT SURVEY TRENCH AND SLOPE BREAKERS
- 13A TYP WATERBODY OPEN CUT
- 13B TYP WATERBODY FLUME METHOD
- 13C TYP WATERBODY DAM AND PUMP
- 13D TYP WATERBODY HDD METHOD
- 13E TYP ADDITIONAL WORKSPACE AT WATERBODY ACP SHP
- 13F TYP WETLAND OPEN CUT METHOD ACP AP-1 AP-2 AP-3 AP-4 AP-5
- 13G TYP CONSTRUCTION ROW IN WETLANDS ACP SHP
- 13H TYP ADDITIONAL WORKSPACE AT WETLAND CROSSINGS ACP SHP
- 13I TYP ADDITIONAL WORKSPACE AT BORED CROSSINGS FOR TWO-LANE ROADS AND RAILROADS ACP SHP
- 13J TYP CONSTRUCTION ROW IN NON-AG AREAS ACP SHP
- 13K TYP CONSTRUCTION ROW IN AG AREAS ACP SHP
- 13L TYP COFFERDAM CROSSING
- 14A SITE SPECIFIC DETAILED ENGINEERING
- 14B MESH ROCK FALL PROTECTION
- 14C BLASTING PLAN(S)
- 15C ACCESS TO REMOTE ROW LOCATIONS

1A 1B 1C 1D 1H 1I 1J 1K
2A 2C 2D 2E 2F 2G 2J 2L
2M 2N 2O 2P 2Q 2R 2S 2T
3A 3D 3E 4A 4B 4C 4D 4F
4G 4H 5A 5B 5C 5D 5E 5G
10A 11F 14A 14B 15C



NOTES

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.
3. SEPARATE TECHNICAL STUDY MAY BE NEEDED TO DETERMINE SAGBEND SETBACKS AND BURIAL DEPTHS, BASED ON SITE SPECIFIC EROSION AND SCOUR HAZARDS.

LEGEND

- XX SCHEDULE A
- XX SCHEDULE B

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
F	2017-02-28	FINAL	DBC	THR	-	AQK

NOTES

PROJECT
BIC STEEP SLOPE
HAZARD MITIGATION PROGRAM

TITLE
E - STEEP SLOPES WITH A SENSITIVE RESOURCE AT TOE (I.E. STREAM, WETLAND, ROAD)

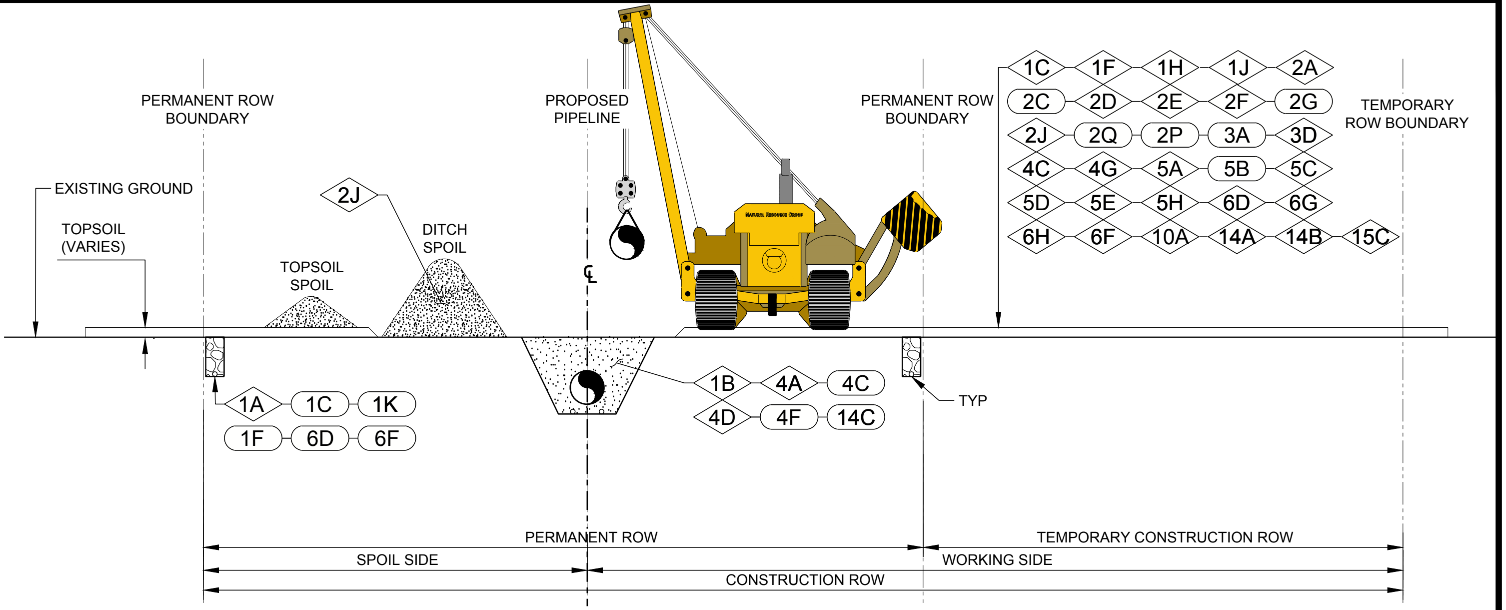
Atlantic Coast Pipeline

PROJECT No.			1535050
DESIGN	DBC	2017-02-28	
CADD	THR	2017-02-28	
CHECK	-	2017-02-28	
REVIEW	AQK	2017-02-28	

FILE No. TypScenarios1
SCALE AS SHOWN
FIGURE
1 OF 1

BEST IN CLASS (BIC) INCREMENTAL CONTROLS

- 1A FRENCH DRAIN (SIMPLE)
- 1B ENHANCED DRAIN (GERMAN DRAIN), IN PIPELINE TRENCH
- 1C TARGETED SEEP DRAINS, AT INTERSEPTED SEEPS
- 1F ARMORED CHANNEL WITH DRAIN PIPE
- 1H STEEP CONVEYANCE CHANNEL
- 1J SINGLE TARGETED SEEP COLLECTOR
- 1K ENERGY DISSIPATION BASIN
- 2A GRADING TEMPORARY ROW SURFACE
- 2C COMPACT BACKFILL
- 2D DRY SOILS AND BACKFILL
- 2E REMOVE UNSUITABLE EXISTING SOILS AS BACKFILL
- 2F ROCK BACKFILL
- 2G GRADING TO MATCH EXISTING CONTOURS
- 2J SPOILS MANAGEMENT
- 2K GABIONS
- 2L SOIL-NAIL WITH TECCO MESH
- 2M EXTERNALLY STABILIZED RETAINING WALL SYSTEMS
- 2N GEOTEXTILE REINFORCED SYSTEMS
- 2O BENCH AND REGRADE WITH BACKFILL
- 2P CUT AND FILL CONSTRUCTION
- 2Q TYP SIDE HILL CUT AND FILL
- 3A TRACK DISTURBED SLOPES
- 3D ROCK ARMORING ON DISTURBED SLOPES
- 3E COIR LOGS ON DISTURBED SLOPES
- 4A TRENCH BREAKERS (FOAM AND SANDBAGS), MODIFIED SPACING
- 4C SACK-CRETE BREAKERS (STRUCTURAL BREAKER), SEE NOTE 1 FOR UNSTABLE FILL
- 4D SLEEVE INTERFACE BETWEEN PIPELINE AND BREAKER
- 4F TRENCH BREAKER WITH DRAINAGE
- 4G SACK-CRETE ARMOR WITH BREAKERS
- 4H FLOWABLE FILL FOR TRENCH BACKFILL
- 5A SLOPE BREAKERS (TEMP AND PERMANENT), MODIFIED SPACING
- 5B SLOPE BREAKER ARMORED OUTLET
- 5C SLOPE BREAKERS WITH DIVERSION CHANNELS
- 5D ACCESS ROADS
- 5E TEMPORARY SLOPE BREAKER WITH DRAIN PIPE
- 5G NO WOOD CHIPS IN ROW
- 5H SURFACE WATER DIVERSIONS
- 6D ARMORED CHANNEL
- 6F RIPRAP GRADATIONS



BEST IN CLASS (BIC) INCREMENTAL CONTROLS

- 6G ARMORED V-SHAPED AND U-SHAPED CHANNELS
- 6H TYP SURFACE WATER CONTROL LAYOUT
- 10A BENCH RE-CONSTRUCTION THROUGH NATURAL STEPS
- 11F AS-BUILT SURVEY TRENCH AND SLOPE BREAKERS
- 14A SITE SPECIFIC DETAILED ENGINEERING
- 14B MESH ROCK FALL PROTECTION
- 14C BLASTING PLAN(S)
- 15C ACCESS TO REMOTE ROW LOCATIONS

NOTES

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.
3. EXAMPLE SECTION SHOWS A TYPICAL SCENARIO. ACTUAL CUT/FILL CONDITIONS MAY VARY FOR EACH SITE.

LEGEND

- XX SCHEDULE A
- XX SCHEDULE B

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
F	2017-02-28	FINAL	DBC	THR	-	AQK

NOTES

PROJECT

BIC STEEP SLOPE
HAZARD MITIGATION PROGRAM

TITLE

F - STEEP SLOPES PREVIOUSLY MODIFIED BY CUTTING AND FILLING

Atlantic Coast Pipeline

PROJECT No.			1535050
DESIGN	DBC	2017-02-28	
CADD	THR	2017-02-28	
CHECK	-	2017-02-28	
REVIEW	AQK	2017-02-28	

FILE No.	TypScenarios4
SCALE	AS SHOWN
FIGURE	1 OF 1

Best-In-Class Incremental Controls

DOMINION BIC PROGRAM FOR ACP/SHP
SUMMARY LISTING OF INCREMENTAL CONTROLS (SUPPORTING TYPICAL SCENARIOS)
REVISED Feb 28, 2017

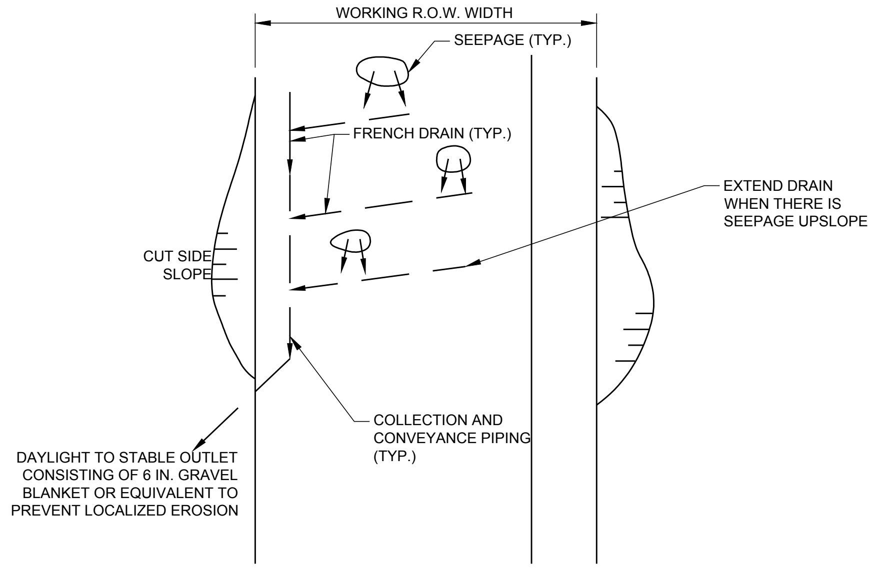
No.	GROUP	GROUP NO.	INCREMENTAL CONTROL SHEET TITLE	REV.	DATE	SHEET NO.	(C)omplete/(P)ending/(U)pdated	SOURCE DOCUMENT:
1	COVER	0	COVER SHEET	F	2/28/2017	0	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
2	SUBSURFACE DRAINAGE	1	FRENCH DRAIN (SIMPLE)	F	2/28/2017	1A	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
3			ENHANCED DRAIN (GERMAN DRAIN)	F	2/28/2017	1B	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
4			TARGETED SEEP DRAINS	F	2/28/2017	1C	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
5			BLEEDER DRAIN	F	2/28/2017	1D	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
6			DRAIN PIPE OUTFALL RIPRAP APRON	F	2/28/2017	1E	C	2017 ANNUAL STANDARDS AND SPECIFICATIONS, EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT FOR CONSTRUCTION AND MAINTENANCE OF PIPELINE PROJECTS IN VIRGINIA, DOMINION TRANSMISSION, INC. (FEBRUARY 2017)
7			ARMORED CHANNEL WITH DRAIN PIPE	F	2/28/2017	1F	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
8			DEWATERING	F	2/28/2017	1G	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
9			STEEP CONVEYANCE CHANNEL	F	2/28/2017	1H	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
10			CHANGED SEEP CHARACTERISTICS	F	2/28/2017	1I	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
11			TARGETED SEEP COLLECTOR	F	2/28/2017	1J	C	SLOPE STABILITY POLICY AND PROCEEDURE FOR PIPELINE DESIGN, CONSTRUCTION AND RIGHT OF WAY MAINTENANCE, DOMINION TRANSMISSION, INC., ENGINEERING SERVICES REFERENCE MANUAL (SEPTEMBER 28, 2016)
12			ENERGY DISSIPATION BASIN	F	2/28/2017	1K	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
13			DEWATERING DISCHARGE BAG	F	2/28/2017	1L	C	EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, WEST VIRGINIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT (2016)
14			DEWATERING DISCHARGE IN UPLAND AREA	F	2/28/2017	1M	C	EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, WEST VIRGINIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT (2016)
15	GRADING, BACKFILL, MECH STABILIZE, CUT/FILL	2	GRADING TEMPORARY ROW SURFACE	F	2/28/2017	2A	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
16			GRADING TRENCH WITH OUTBOARD WEDGE	F	2/28/2017	2B	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
17			COMPACT BACKFILL	F	2/28/2017	2C	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
18			DRY SOILS AND BACKFILL	F	2/28/2017	2D	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
19			REMOVE UNSUITABLE EXISTING SOILS AS BACKFILL	F	2/28/2017	2E	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
20			ROCK BACKFILL (WITH DRAIN)	F	2/28/2017	2F	C	SLOPE STABILITY POLICY AND PROCEEDURE FOR PIPELINE DESIGN, CONSTRUCTION AND RIGHT OF WAY MAINTENANCE, DOMINION TRANSMISSION, INC., ENGINEERING SERVICES REFERENCE MANUAL (SEPTEMBER 28, 2016)
21			GRADING TO MATCH EXISTING CONTOURS	F	2/28/2017	2G	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
22			GRADING TO MINIMIZE BACKFILL OVER LANDSLIDE	F	2/28/2017	2H	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
23			TYPICAL TRENCH DIMENSIONS IN GENERALLY FLAT TERRAIN	F	2/28/2017	2I	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
24			SPOILS MANAGEMENT	F	2/28/2017	2J	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
25			GABIONS	F	2/28/2017	2K	C	2017 ANNUAL STANDARDS AND SPECIFICATIONS, EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT FOR CONSTRUCTION AND MAINTENANCE OF PIPELINE PROJECTS IN VIRGINIA, DOMINION TRANSMISSION, INC. (FEBRUARY 2017)
26			SOIL NAIL TECCO MESH	F	2/28/2017	2L	C	SLOPE STABILITY POLICY AND PROCEEDURE FOR PIPELINE DESIGN, CONSTRUCTION AND RIGHT OF WAY MAINTENANCE, DOMINION TRANSMISSION, INC., ENGINEERING SERVICES REFERENCE MANUAL (SEPTEMBER 28, 2016)
27			EXTERNALLY STABILIZED RETAINING WALL SYSTEMS	F	2/28/2017	2M	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
28			GEOTEXTILE REINFORCED SYSTEMS	F	2/28/2017	2N	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
29			BENCH AND REGRADE WITH BACKFILL	F	2/28/2017	2O	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
30			CUT/FILL CONSTRUCTION	F	2/28/2017	2P	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
31			TYP SIDE HILL CUT AND FILL	F	2/28/2017	2Q	C	EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, WEST VIRGINIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT (2016)
32			TYP FILL WITH ROCK UNDER DRAIN	F	2/28/2017	2R	C	EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, WEST VIRGINIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT (2016)
33			TYP BENCH AND REGRADE BACKFILL WITH ROCK OR SACKCRETE KEYS	F	2/28/2017	2S	C	SLOPE STABILITY POLICY AND PROCEEDURE FOR PIPELINE DESIGN, CONSTRUCTION AND RIGHT OF WAY MAINTENANCE, DOMINION TRANSMISSION, INC., ENGINEERING SERVICES REFERENCE MANUAL (SEPTEMBER 28, 2016)
34			TYP FILL WITH MULTIPLE ROCK CHANNELS	F	2/28/2017	2T	C	EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, WEST VIRGINIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT (2016)
35	SURFACE EROSION	3	TRACK DISTURBED SLOPES	F	2/28/2017	3A	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
36			RE-VEGETATE DISTURBED SLOPES	F	2/28/2017	3B	C	EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, WEST VIRGINIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT (2016)
37			COIR CLOTH ON DISTRUBED SLOPES	F	2/28/2017	3C	C	EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, WEST VIRGINIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT (2016)
38			ROCK ARMORING ON DISTRUBED SLOPES	F	2/28/2017	3D	C	SLOPE STABILITY POLICY AND PROCEEDURE FOR PIPELINE DESIGN, CONSTRUCTION AND RIGHT OF WAY MAINTENANCE, DOMINION TRANSMISSION, INC., ENGINEERING SERVICES REFERENCE MANUAL (SEPTEMBER 28, 2016)
39			COIR LOGS ON DISTURBED SLOPES	F	2/28/2017	3E	C	EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, WEST VIRGINIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT (2016)
40			SUBMAR MATTS	F	2/28/2017	3F	C	SLOPE STABILITY POLICY AND PROCEEDURE FOR PIPELINE DESIGN, CONSTRUCTION AND RIGHT OF WAY MAINTENANCE, DOMINION TRANSMISSION, INC., ENGINEERING SERVICES REFERENCE MANUAL (SEPTEMBER 28, 2016)
41	AKERS, TRENCH VEMENTS	4	TRENCH BREAKERS (FOAM AND SANDBAGS)	F	2/28/2017	4A	C	SLOPE STABILITY POLICY AND PROCEEDURE FOR PIPELINE DESIGN, CONSTRUCTION AND RIGHT OF WAY MAINTENANCE, DOMINION TRANSMISSION, INC., ENGINEERING SERVICES REFERENCE MANUAL (SEPTEMBER 28, 2016)
42			TRENCH DAMS (FOAM, BAGS, OR FINE GRAINED SOILS)	F	2/28/2017	4B	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
43			SACK-CRETE BREAKERS (STRUCTURAL BREAKER)	F	2/28/2017	4C	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
44			SLEEVE INTERFACE BETWEEN PIPELINE AND BREAKER	F	2/28/2017	4D	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016

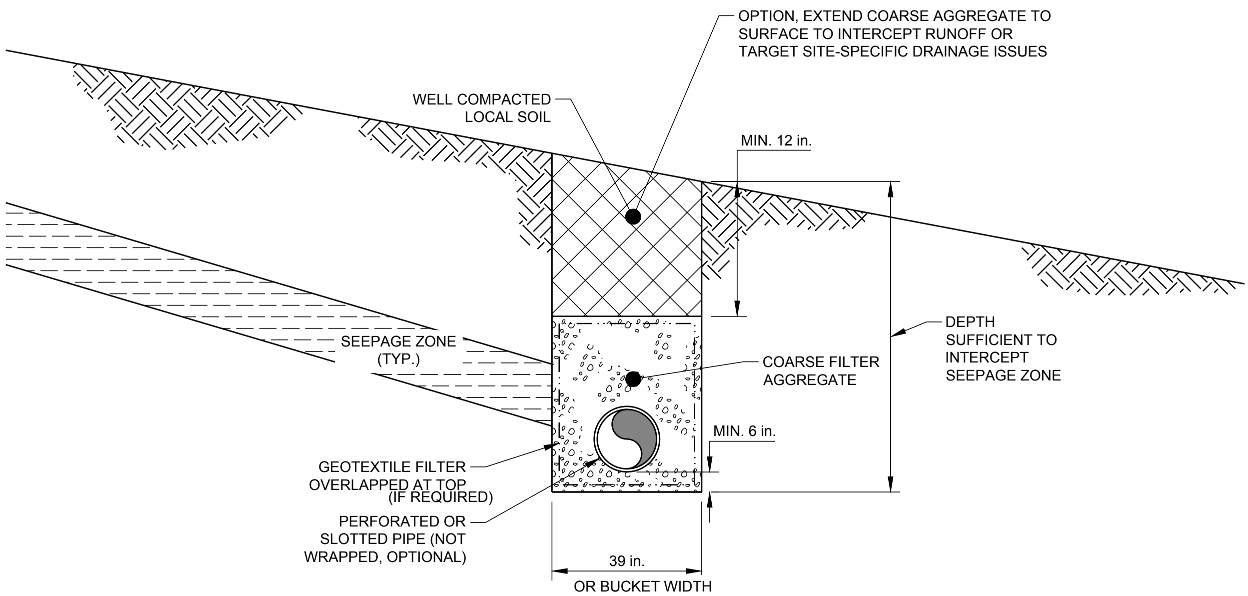
DOMINION BIC PROGRAM FOR ACP/SHP
SUMMARY LISTING OF INCREMENTAL CONTROLS (SUPPORTING TYPICAL SCENARIOS)
REVISED Feb 28, 2017

No.	GROUP	GROUP NO.	INCREMENTAL CONTROL SHEET TITLE	REV.	DATE	SHEET NO.	(C)omplete/(P)ending/(U)pdated	SOURCE DOCUMENT:
45	TRENCH BRE IMPRO		SEAL BOTTOM OF TRENCH WITH SANDBAGS	F	2/28/2017	4E	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
46			TRENCH BREAKER WITH DRAINAGE	F	2/28/2017	4F	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
47			SACK-CRETE ARMOR WITH BREAKERS	F	2/28/2017	4G	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
48			FLOWABLE FILL FOR TRENCH BACKFILL	F	2/28/2017	4H	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
49	ROW SURFACE, SLOPE BREAKERS	5	SLOPE BREAKERS (TEMP AND PERMANENT)	F	2/28/2017	5A	C	EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, WEST VIRGINIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT (2016)
50			SLOPE BREAKER ARMORED OUTLET	F	2/28/2017	5B	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
51			SLOPE BREAKERS WITH DIVERSION CHANNELS	F	2/28/2017	5C	C	SLOPE STABILITY POLICY AND PROCEEDURE FOR PIPELINE DESIGN, CONSTRUCTION AND RIGHT OF WAY MAINTENANCE, DOMINION TRANSMISSION, INC., ENGINEERING SERVICES REFERENCE MANUAL (SEPTEMBER 28, 2016)
52			ACCESS ROADS	F	2/28/2017	5D	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
53			TEMPORARY SLOPE BREAKER WITH DRAIN PIPE	F	2/28/2017	5E	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
54			SACK-CRETE WEDGE	F	2/28/2017	5F	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
55			NO WOOD CHIPS IN ROW	F	2/28/2017	5G	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
56			SURFACE WATER DIVERSIONS	F	2/28/2017	5H	C	EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, WEST VIRGINIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT (2016)
57	ROW DIVERSIONS	6	COIR-LINED VEGETATED DIVERSION CHANNEL	F	2/28/2017	6A	C	EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, WEST VIRGINIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT (2016)
58			BROW DITCH	F	2/28/2017	6B	C	SLOPE STABILITY POLICY AND PROCEEDURE FOR PIPELINE DESIGN, CONSTRUCTION AND RIGHT OF WAY MAINTENANCE, DOMINION TRANSMISSION, INC., ENGINEERING SERVICES REFERENCE MANUAL (SEPTEMBER 28, 2016)
59			ROCK FILTER IN TRENCH	F	2/28/2017	6C	C	EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, WEST VIRGINIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT (2016)
60			ARMORED CHANNELS	F	2/28/2017	6D	C	EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, WEST VIRGINIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT (2016)
61			TYP BANK ARMORING	F	2/28/2017	6E	C	EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, WEST VIRGINIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT (2016)
62			RIPRAP GRADATIONS	F	2/28/2017	6F	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
63			ARMORED V-SHAPED AND U-SHAPED CHANNELS	F	2/28/2017	6G	C	2017 ANNUAL STANDARDS AND SPECIFICATIONS, EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT FOR CONSTRUCTION AND MAINTENANCE OF PIPELINE PROJECTS IN VIRGINIA, DOMINION TRANSMISSION, INC. (FEBRUARY 2017)
64			TYP SURFACE WATER CONTROL LAYOUT	F	2/28/2017	6H	C	EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, WEST VIRGINIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT (2016)
65	SILT FENCE	7	SILT FENCE	F	2/28/2017	7A	C	2017 ANNUAL STANDARDS AND SPECIFICATIONS, EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT FOR CONSTRUCTION AND MAINTENANCE OF PIPELINE PROJECTS IN VIRGINIA, DOMINION TRANSMISSION, INC. (FEBRUARY 2017)
66			SUPER SILT FENCE	F	2/28/2017	7B	C	EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, WEST VIRGINIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT (2016)
67	PL	8	ROCK GUARD ON PIPELINE	F	2/28/2017	8A	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
68	PL	9	BUOYANCY MITIGATION	F	2/28/2017	9A	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
69	BENCHES	10	TYP BENCH RE-CONSTRUCTION	F	2/28/2017	10A	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
70	MONITORING	11	GEODETIC MONITORING	F	2/28/2017	11A	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
71			STRAIN GAUGE MONITORING	F	2/28/2017	11B	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
72			SLOPE INCLINOMETER MONITORING	F	2/28/2017	11C	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
73			SLOPE INCLINOMETER CASING	F	2/28/2017	11D	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
74			STANDPIPE PIEZOMETER MONITORING	F	2/28/2017	11E	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
75			AS-BUILT SURVEY TRENCH AND SLOPE BREAKERS	F	2/28/2017	11F	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
76	STRESS RELIEF	12	STRESS RELIEF EXCAVATIONS	F	2/28/2017	12A	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
77			SELECT (DEFORMABLE) BACKFILL AROUND PIPELINE IN LANDSLIDE	F	2/28/2017	12B	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
78			SHEAR TRENCH	F	2/28/2017	12C	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
79	ONAL WORKSPACE, TYP CROSSING METHODS	13	TYP WATERBODY OPEN CUT	F	2/28/2017	13A	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
80			TYP WATERBODY FLUME METHOD	F	2/28/2017	13B	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
81			TYP WATERBODY DAM AND PUMP	F	2/28/2017	13C	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
82			TYP WATERBODY HDD METHOD	F	2/28/2017	13D	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
83			TYP ADDITIONAL WORKSPACE AT WATERBODY ACP AP-1	F	2/28/2017	13E-1	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
84			TYP ADDITIONAL WORKSPACE AT WATERBODY ACP AP-1 AP-2 AP-3 AP-4 AP-5	F	2/28/2017	13E-2	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
85			TYP ADDITIONAL WORKSPACE AT WATERBODY SHP TL-635 TL-636	F	2/28/2017	13E-3	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
86			TYP WETLAND OPEN CUT METHOD ACP AP-1 AP-2 AP-3 AP-4 AP-5	F	2/28/2017	13F	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
87			TYP CONSTRUCTION ROW IN WETLANDS ACP AP-1	F	2/28/2017	13G-1	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
88			TYP CONSTRUCTION ROW IN WETLANDS ACP AP-2	F	2/28/2017	13G-2	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
89			TYP CONSTRUCTION ROW IN WETLANDS COLLOCATED SHP TL-635 TL-636	F	2/28/2017	13G-3	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
90			TYP CONSTRUCTION ROW IN WETLANDS NOT-COLLOCATED SHP TL-635 TL-636	F	2/28/2017	13G-4	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
91			TYP ADDITIONAL WORKSPACE AT WETLAND CROSSINGS ACP AP-1	F	2/28/2017	13H-1	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
92			TYP ADDITIONAL WORKSPACE AT WETLAND CROSSINGS ACP AP-2 AP-3 AP-4 AP-5	F	2/28/2017	13H-2	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
93			TYP ADDITIONAL WORKSPACE AT WETLAND CROSSINGS SHP TL-635 TL-636	F	2/28/2017	13H-3	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)

DOMINION BIC PROGRAM FOR ACP/SHP
SUMMARY LISTING OF INCREMENTAL CONTROLS (SUPPORTING TYPICAL SCENARIOS)
REVISED Feb 28, 2017

No.	GROUP	GROUP NO.	INCREMENTAL CONTROL SHEET TITLE	REV.	DATE	SHEET NO.	(C)omplete/(P)ending/(U)pdated	SOURCE DOCUMENT:
94	TYP ROW CONFIGURATIONS, ADDITIO		TYP ADDITIONAL WORKSPACE AT BORED CROSSINGS FOR TWO-LANE ROADS AND RAILROADS ACP AP-1	F	2/28/2017	13I-1	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
95			TYP ADDITIONAL WORKSPACE AT SINGLE-LANE ROADS AND BORED ROADS ACP AP-1 AP-2 AP-3 AP-4 AP-5	F	2/28/2017	13I-2	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
96			TYP ADDITIONAL WORKSPACE AT ALL BORED ROADS SHP TL-635 TL-636	F	2/28/2017	13I-3	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
97			TYP CONSTRUCTION ROW IN NON-AG AREAS ACP AP-2	F	2/28/2017	13J-1	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
98			TYP CONSTRUCTION ROW IN NON-AG AREAS AND WETLANDS ACP AP-3 AP-4 AP-5	F	2/28/2017	13J-2	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
99			TYP CONSTRUCTION ROW IN COLLOCATED NON-AG AREAS SHP TL-635 TL-636	F	2/28/2017	13J-3	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
100			TYP CONSTRUCTION ROW NOT-COLLOCATED IN NON-AG AREAS SHP TL-635 TL-636	F	2/28/2017	13J-4	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
101			TYP CONSTRUCTION ROW IN AG AREAS ACP AP-2	F	2/28/2017	13K-1	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
102			TYP CONSTRUCTION ROW IN AG AREAS ACP AP-3 AP-4 AP-5	F	2/28/2017	13K-2	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
103			TYP CONSTRUCTION ROW COLLOCATED IN AG AREAS SHP TL-635 TL-636	F	2/28/2017	13K-3	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
104			TYP CONSTRUCTION ROW NOT-COLLOCATED IN AG AREAS SHP TL-635 TL-636	F	2/28/2017	13K-4	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
105			TYP COFFERDAM CROSSING	F	2/28/2017	13L	C	EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, WEST VIRGINIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT (2016)
106	DETAILED ENG	14	SITE SPECIFIC DETAILED ENGINEERING	F	2/28/2017	14A	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
107			MESH ROCK FALL PROTECTION	F	2/28/2017	14B	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
108			BLASTING PLANS	F	2/28/2017	14C	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1F (NOVEMBER 2016 REV 3)
109	PLANNING	15	AVOIDANCE	F	2/28/2017	15A	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
110			EXCAVATION REMOVAL OF HAZARD	F	2/28/2017	15B	C	ACP/SHP FERC RESOURCE REPORT 1, APPENDIX 1D (SEPTEMBER 2015)
111			ACCESS TO REMOTE ROW LOCATIONS	F	2/28/2017	15C	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016
112	SPECIAL HAZARD	16	KARST HAZARDS	F	2/28/2017	16A	C	GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES IN STEEPLY SLOPING TERRAIN", MARCH 2016





NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

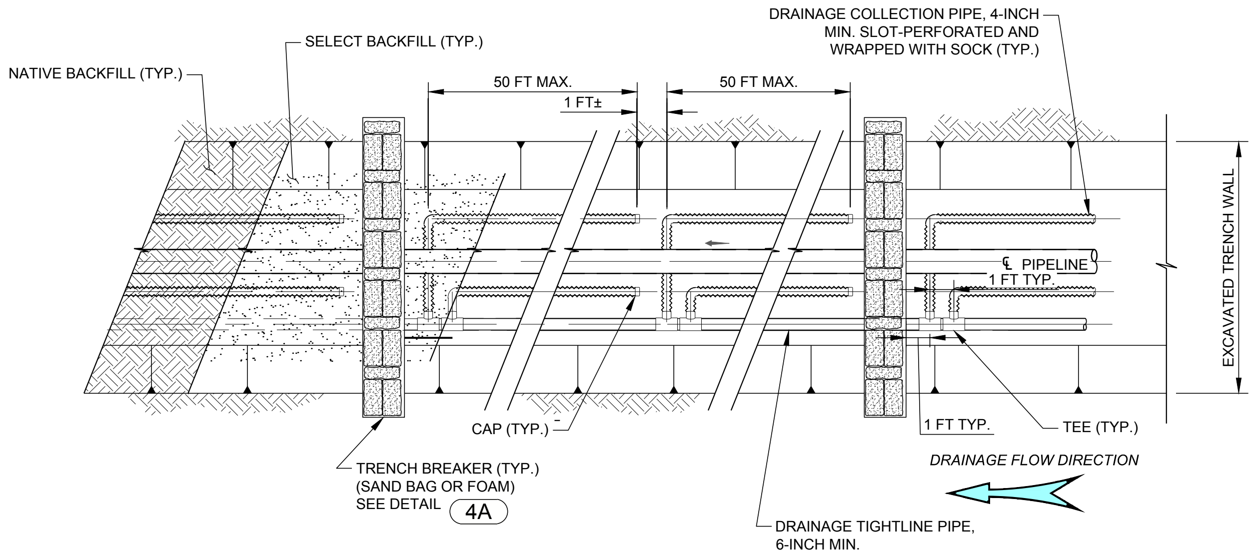
PROJECT
BIC/INCREMENTAL CONTROLS

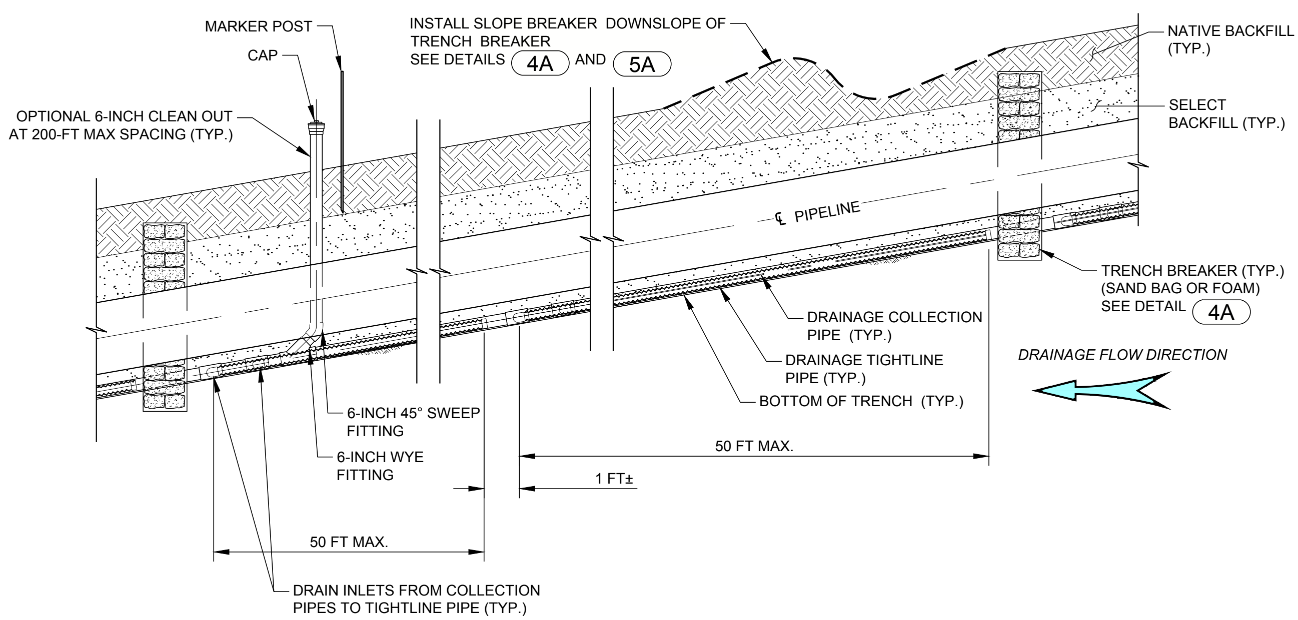
CONSULTANT

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
FRENCH DRAIN (SIMPLE)

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1A





NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. SPACING OF CLEAN-OUTS TO BE DETERMINED BASED ON SITE CONDITIONS AND OPERATION AND MAINTENANCE REQUIREMENTS.

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BIC/INCREMENTAL CONTROLS

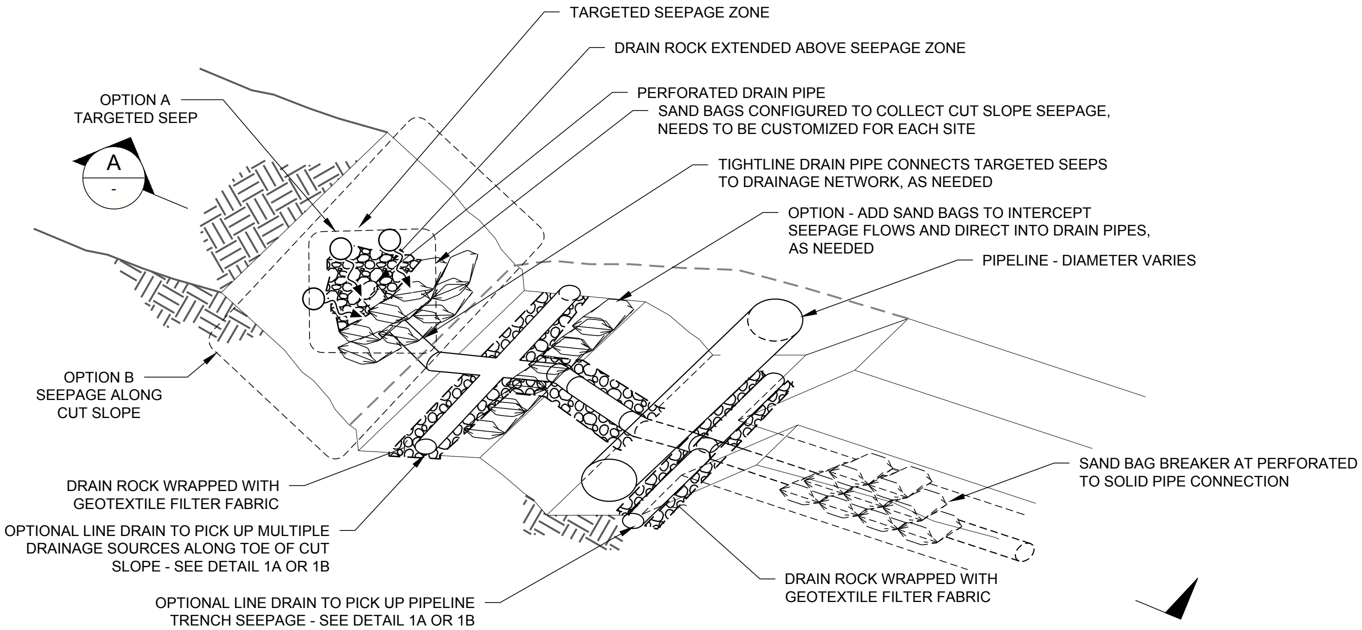
CONSULTANT

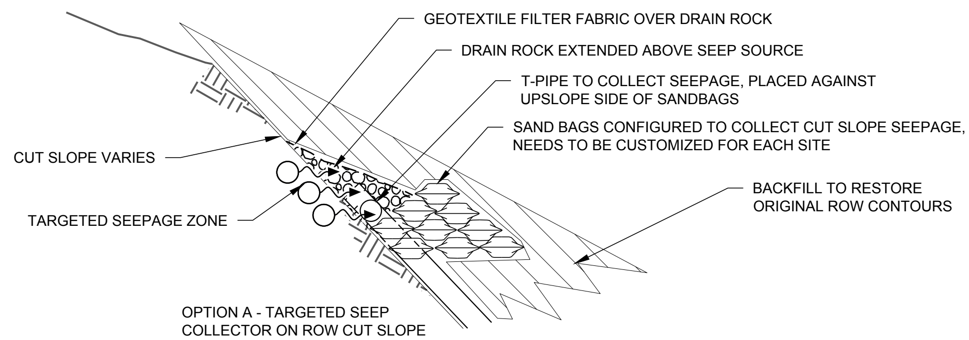
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

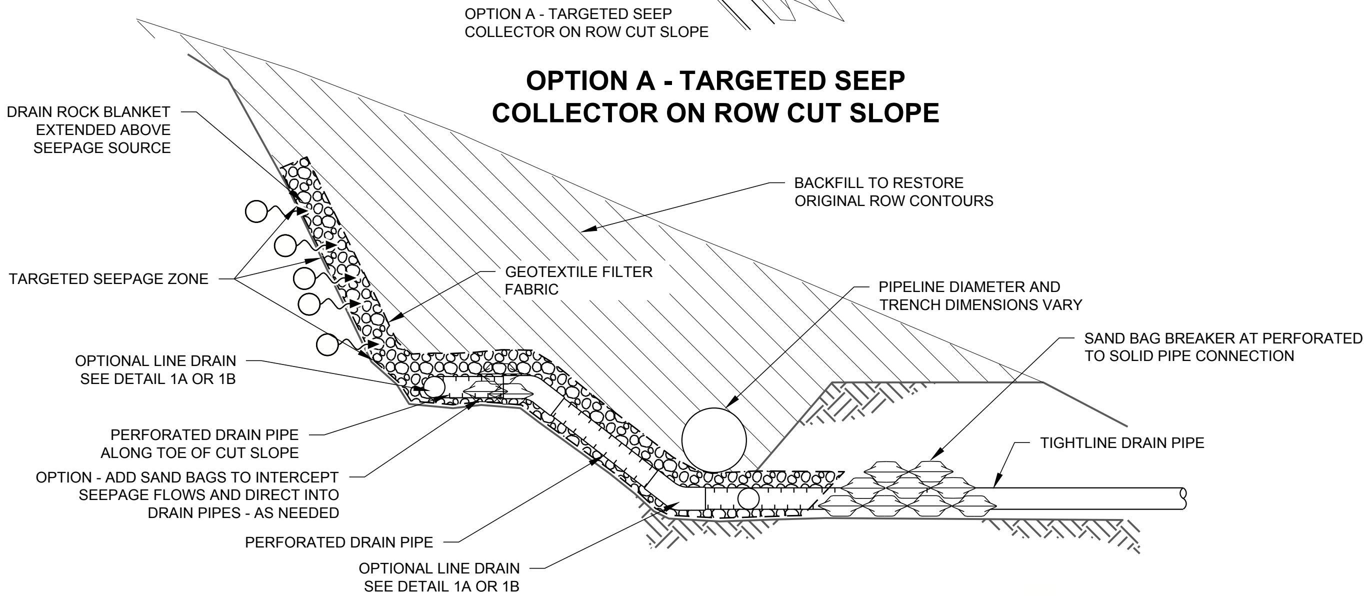
TITLE
ENHANCED DRAIN (GERMAN DRAIN)

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1B





OPTION A - TARGETED SEEP COLLECTOR ON ROW CUT SLOPE



A / - OPTION B - TARGETED SEEP COLLECTOR ON ROW CUT SLOPE

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DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

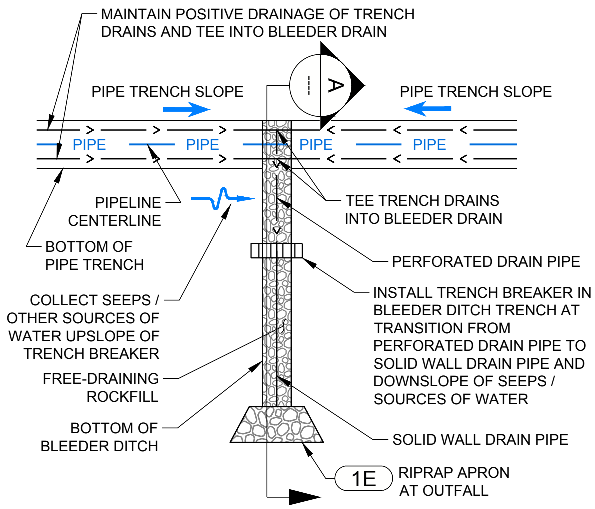
CONSULTANT

Golder Associates

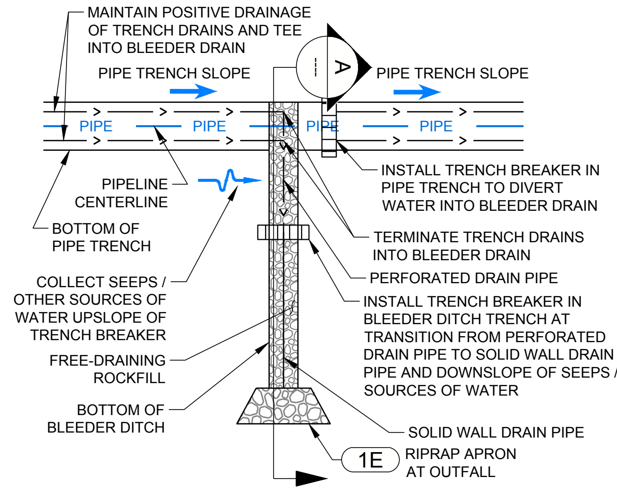
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TARGETED SEEP DRAINS

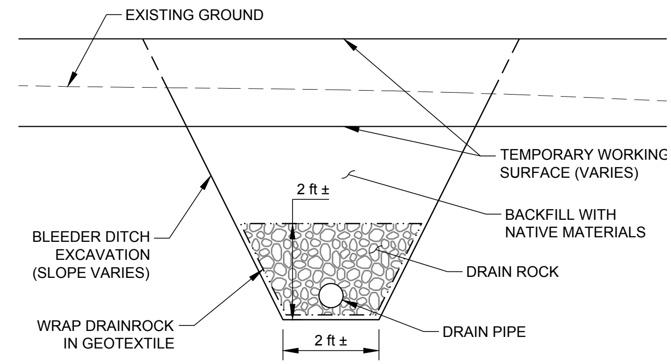
PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1C



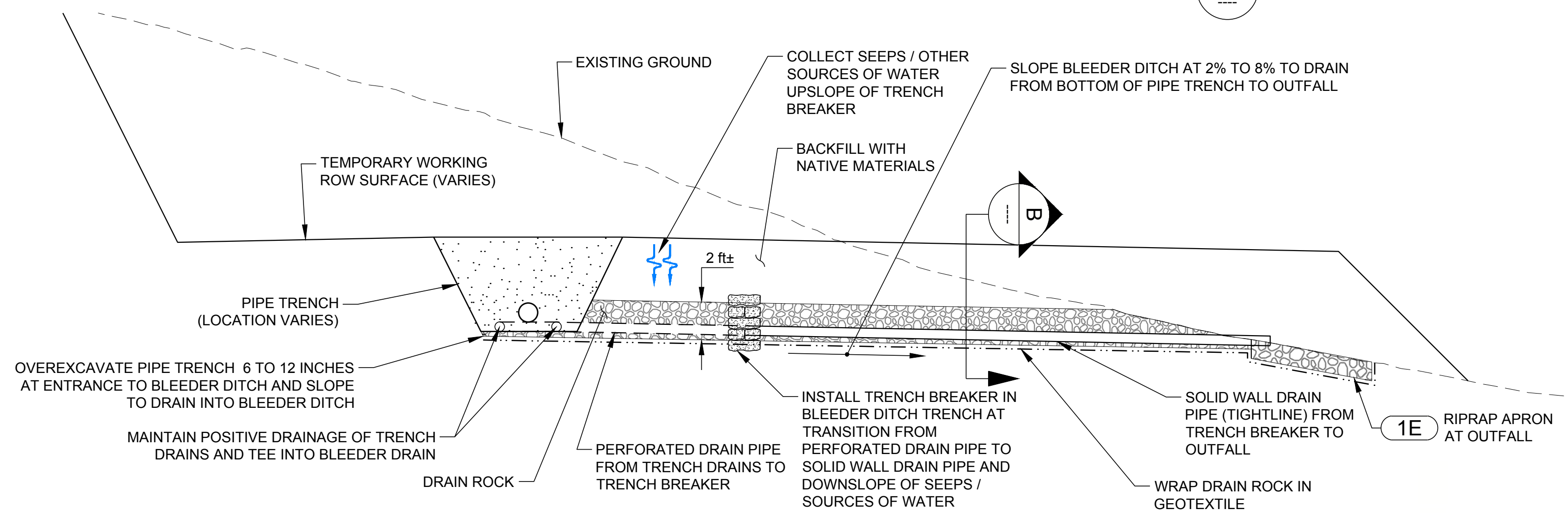
BLEEDER DRAIN WITH FLAT PIPE TRENCH



BLEEDER DRAIN WITH SLOPED PIPE TRENCH



B ---- BLEEDER DRAIN DITCH SECTION



A ---- BLEEDER DRAIN PROFILE

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. INSTALL BLEEDER DITCH IN SIDESLOPE SCENARIOS AT 100 FT INTERVALS, AT LOW POINTS IN THE PIPELINE TRENCH, OR AS NEEDED TO COLLECT SEEPS, SOURCES OF WATER, OR OTHER DRAINS.
3. NATIVE MATERIALS MAY BE USED DOWNSLOPE OF BLEEDER DITCH TRENCH BREAKER INSTEAD OF DRAINFILL PROVIDED THAT NATIVE BACKFILL MATERIALS ARE FREE-DRAINING AND NO SEEPS OR SOURCES OF WATER ARE IDENTIFIED DOWNSLOPE OF THE PIPE TRENCH.
4. LENGTH OF BLEEDER DRAIN WILL VARY AS NEEDED TO MAINTAIN POSITIVE DRAINAGE IN DITCH TO OUTFALL.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

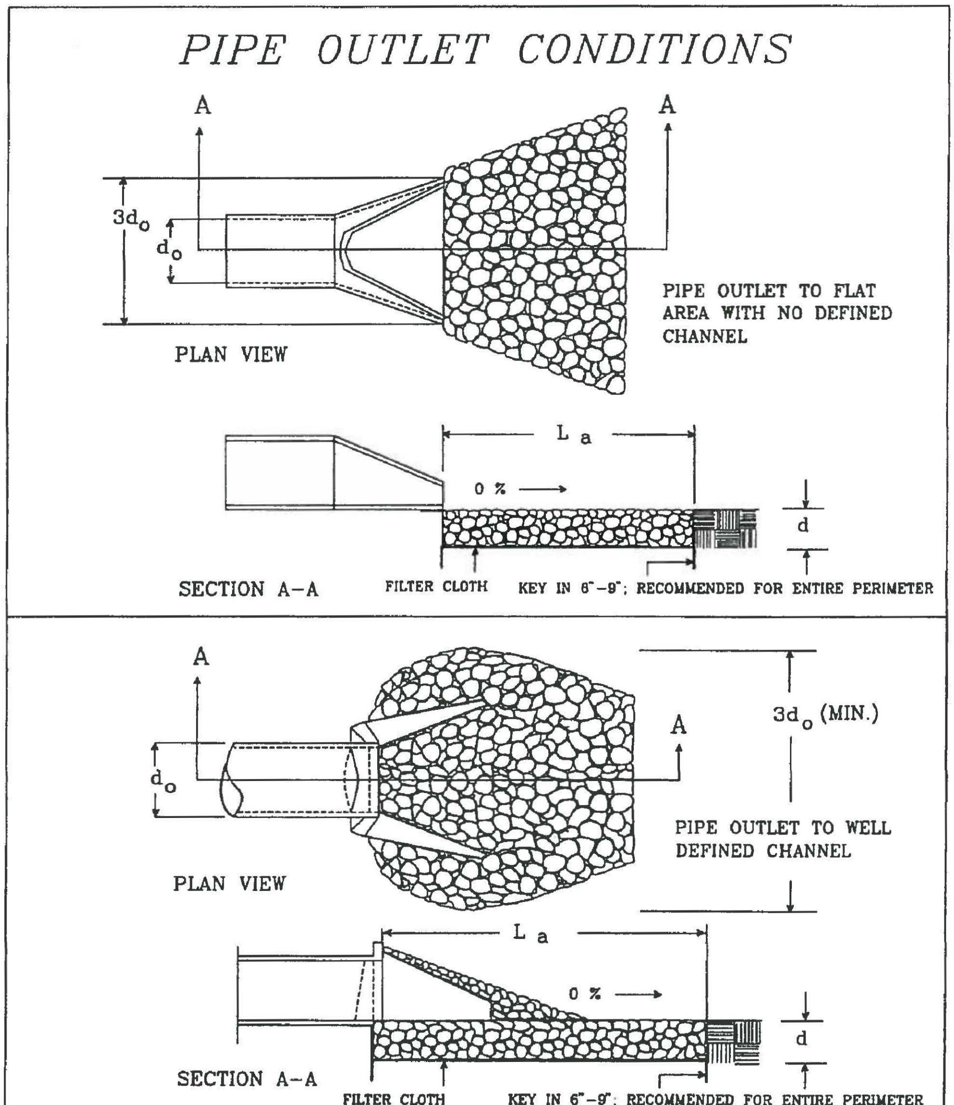
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
DESIGNED	DBC
PREPARED	REDMOND
REVIEWED	-
APPROVED	AQK

TITLE
BLEEDER DRAIN

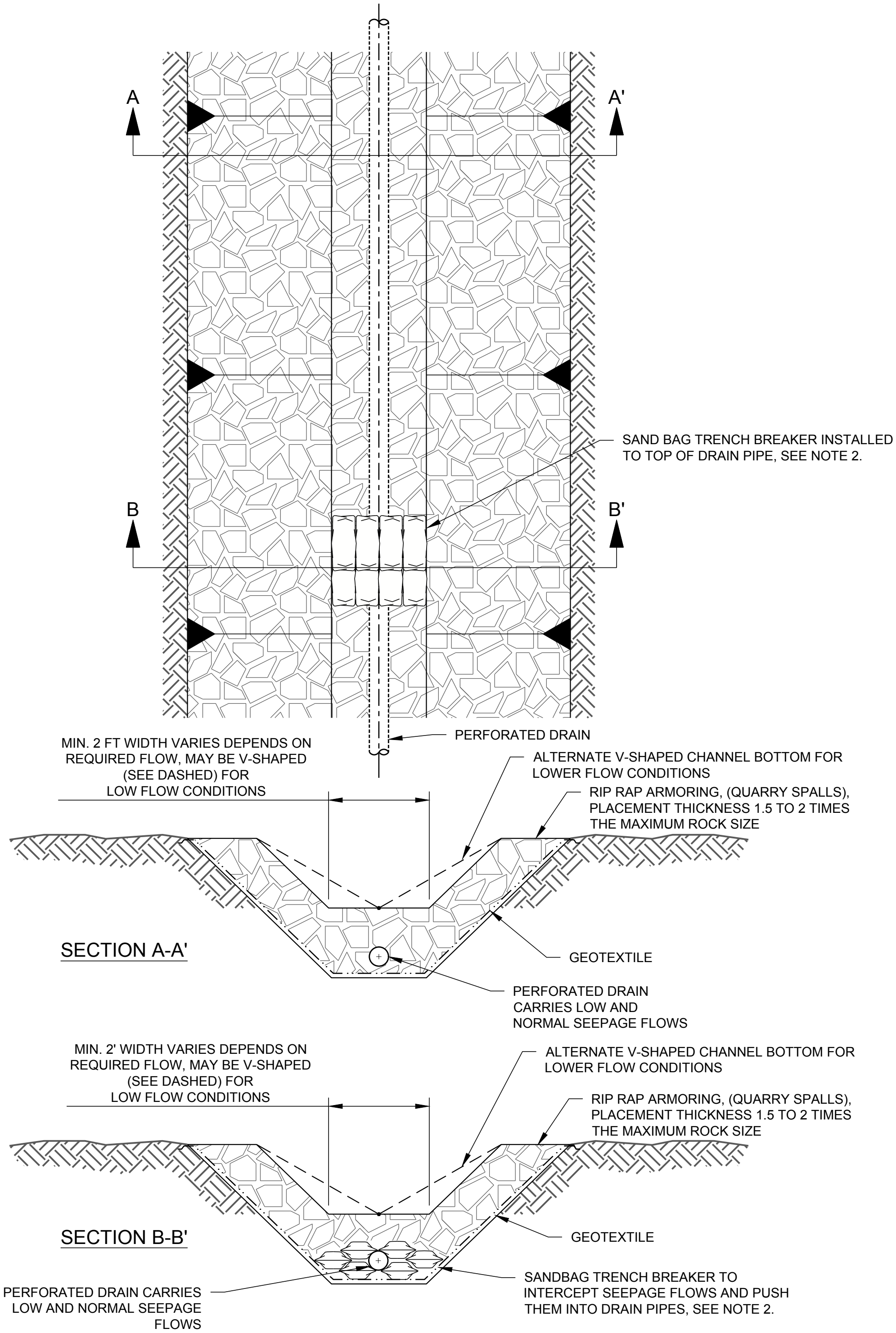
PROJECT NO.	PHASE	REV.	FIGURE
1535050	500	F	1D



NOTES:
1. APRON LINING MAY BE RIPRAP, GROUTED RIPRAP, GABION BASKET, OR CONCRETE.
2. La IS THE LENGTH OF THE RIPRAP APRON AS CALCULATED USING PLATES 3.18-3 AND 3.18-4.
3. d = 1.5 TIMES THE MAXIMUM STONE DIAMETER, BUT NOT LESS THAN 6 INCHES.

CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD: 2017-02-28 PREPARED: REDMOND DESIGN: DBC REVIEW: - APPROVED: AQK	TITLE **DRAIN PIPE OUTFALL RIPRAP APRON**	
		PROJECT No. 1535050 · PHASE 500 · Rev. F	FIGURE 1E

0 1 in



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. 100-FT MAX SPACING FOR BREAKERS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
ARMORED CHANNEL WITH DRAIN PIPE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1F

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. SPECIAL STUDIES MAY BE REQUIRED TO SUPPORT DESIGN AND IMPLEMENTATION OF SUBSURFACE DEWATERING MEASURES, WHICH MAY INCLUDE USING WELL POINTS, SUMPS, WELLS, DRAINS, DIVERSIONS, ETC.

CLIENT
DOMINION

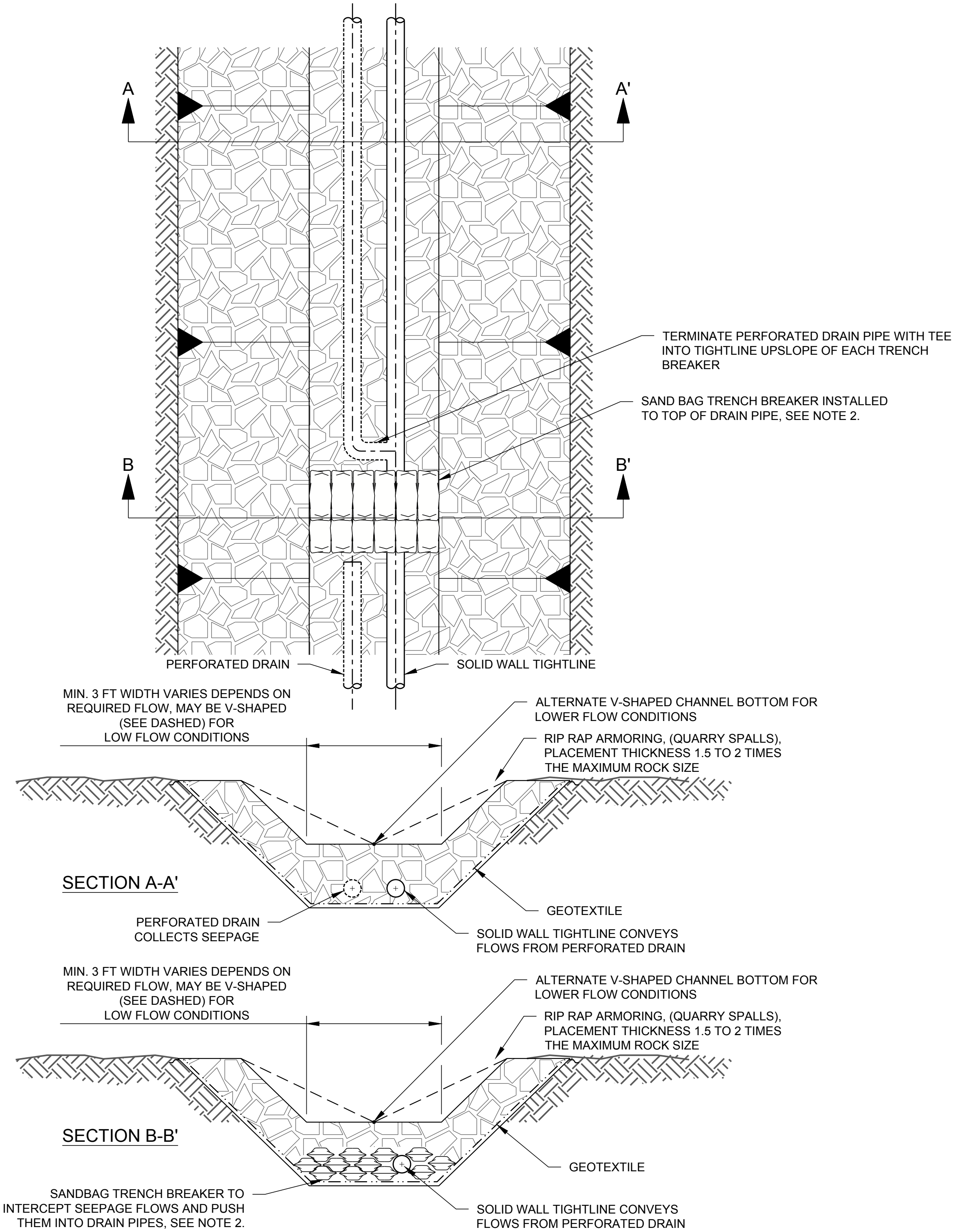
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
DEWATERING

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1G



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. 100-FT MAX SPACING FOR BREAKERS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

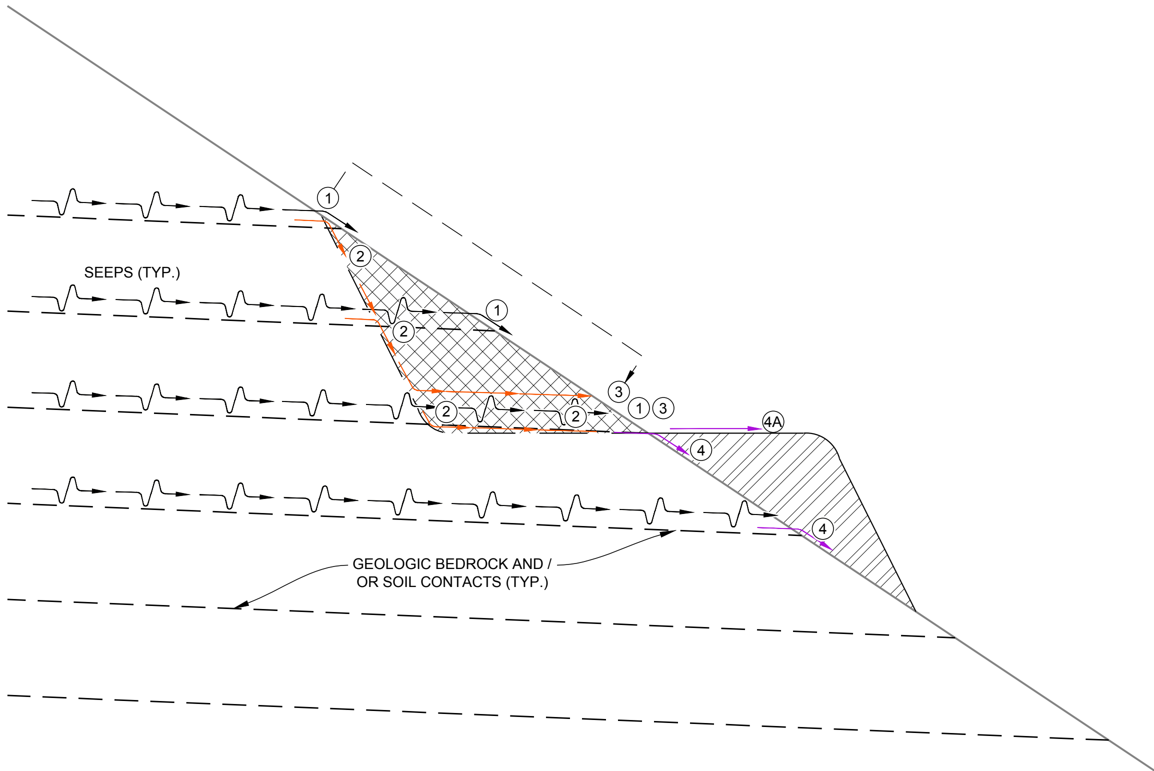
CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
STEEP CONVEYANCE CHANNEL

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1H

0 1 in



NOTE(S)

1. INSTALL PERMANENT AND / OR TEMPORARY SEEP COLLECTORS AT THE LOWEST OR DEEPEST CUT INTO NATIVE GROUND, AND AT CONTACTS AND TRANSITIONS BETWEEN BEDROCK OR SOIL UNITS (SEE 2).
2. INSTALL TEMPORARY SEEP COLLECTORS TO PROTECT AGAINST SATURATION OF SPOILS (SEE 4).
3. SEEP COLLECTORS SHOULD NOT BE LOCATED AT BACKFILL FACE AFTER RIGHT-OF-WAY RESTORATION (SEE 1), UNLESS THAT IS THE LOWEST OR DEEPEST LOCATION OF DISTRIBUTION IN THE FINAL RIGHT-OF-WAY RESTORATION (SEE 5).
4. ADDITIONAL MITIGATION MEASURES MAY BE NEEDED TO ADDRESS SATURATED BACKFILL AND / OR SPOILS, BASED ON SITE SPECIFIC CONDITIONS.

KEY

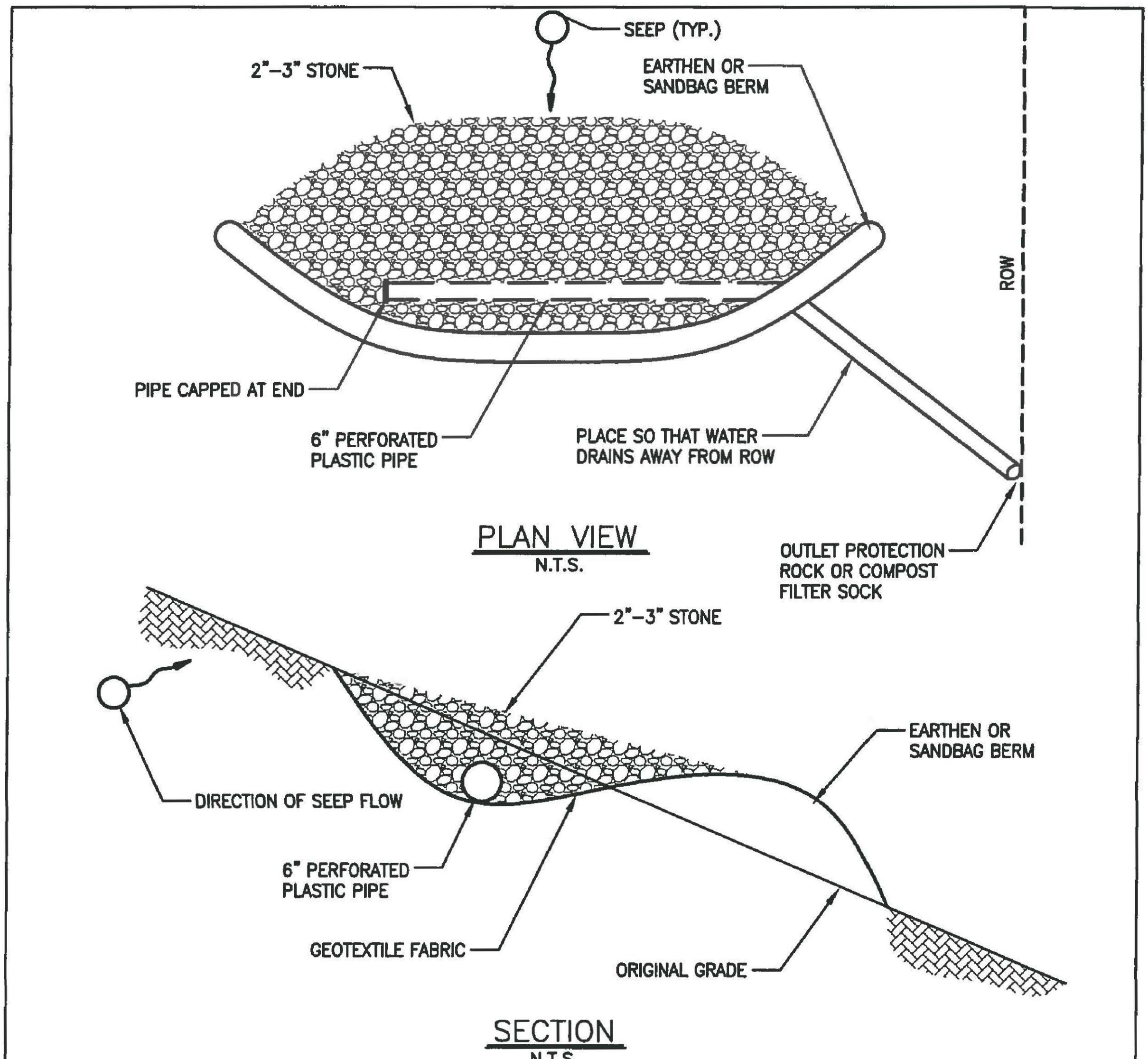
1 SEEPS EXPOSED AT SURFACE BEFORE RIGHT-OF-WAY CONSTRUCTION.

2 SEEP EXPOSED AFTER CONSTRUCTION OF THE RIGHT-OF-WAY, WITH POTENTIAL TO SATURATE BACKFILL, AND EXPRESSED IN DIFFERENT LOCATIONS AFTER CONSTRUCTION RESTORATION OF RIGHT-OF-WAY 3.

4 SATURATES TEMPORARY SPOILS DURING CONSTRUCTION OF TEMPORARY RIGHT-OF-WAY, FROM BENEATH OR FROM SURFACE FLOWS 4A.

CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT	YYYY-MM-DD: 2017-02-28	TITLE **CHANGED SEEP CHARACTERISTICS**	
Golder Associates	PREPARED: REDMOND		
	DESIGN: DBC		
	REVIEW: -	PROJECT No. 1535050	PHASE 500
	APPROVED: AQK	Rev. F	FIGURE 1I

1 in
0



NOTE:
BERMS MAY BE CONSTRUCTED USING SANDBAGS TEMPORARILY DURING CONSTRUCTION. PERMANENT BERMS TO BE CONSTRUCTED USING COMPACTED EARTH.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

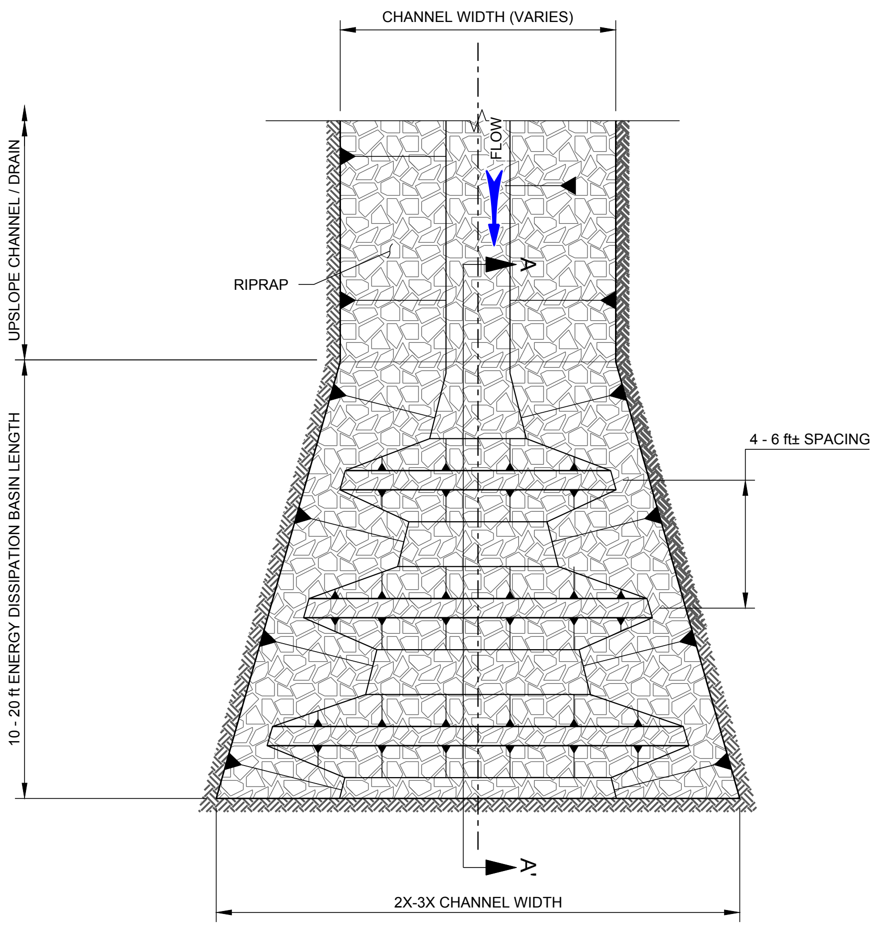
CONSULTANT
Golder Associates

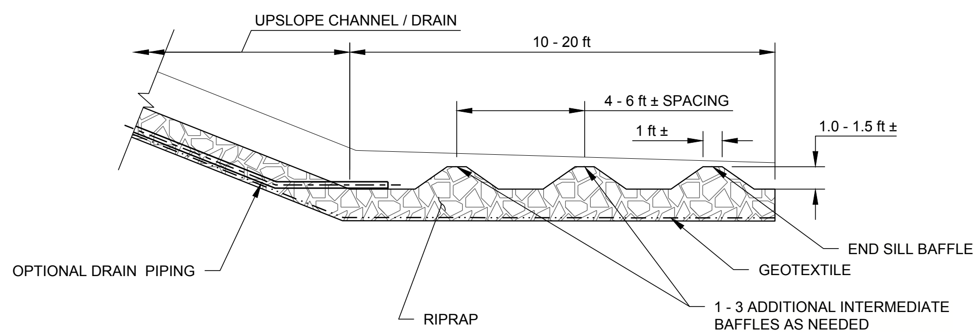
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TARGETED SEEP COLLECTOR

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1J

1 in
0





NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. ENERGY DISSIPATION BASIN SHOULD BE CONSTRUCTED AT THE DOWNSTREAM END OF CHANNELS AND DRAINS WHERE HIGH WATER VELOCITY MAY BE EXPECTED AND/OR DEBRIS MAY TRAVEL DOWN THE CHANNEL.
3. INTERMEDIATE BAFFLES SHOULD BE CONSTRUCTED AS NEEDED TO INTERCEPT DEBRIS FROM THE CHANNEL AND BELOW STEEP CHANNELS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

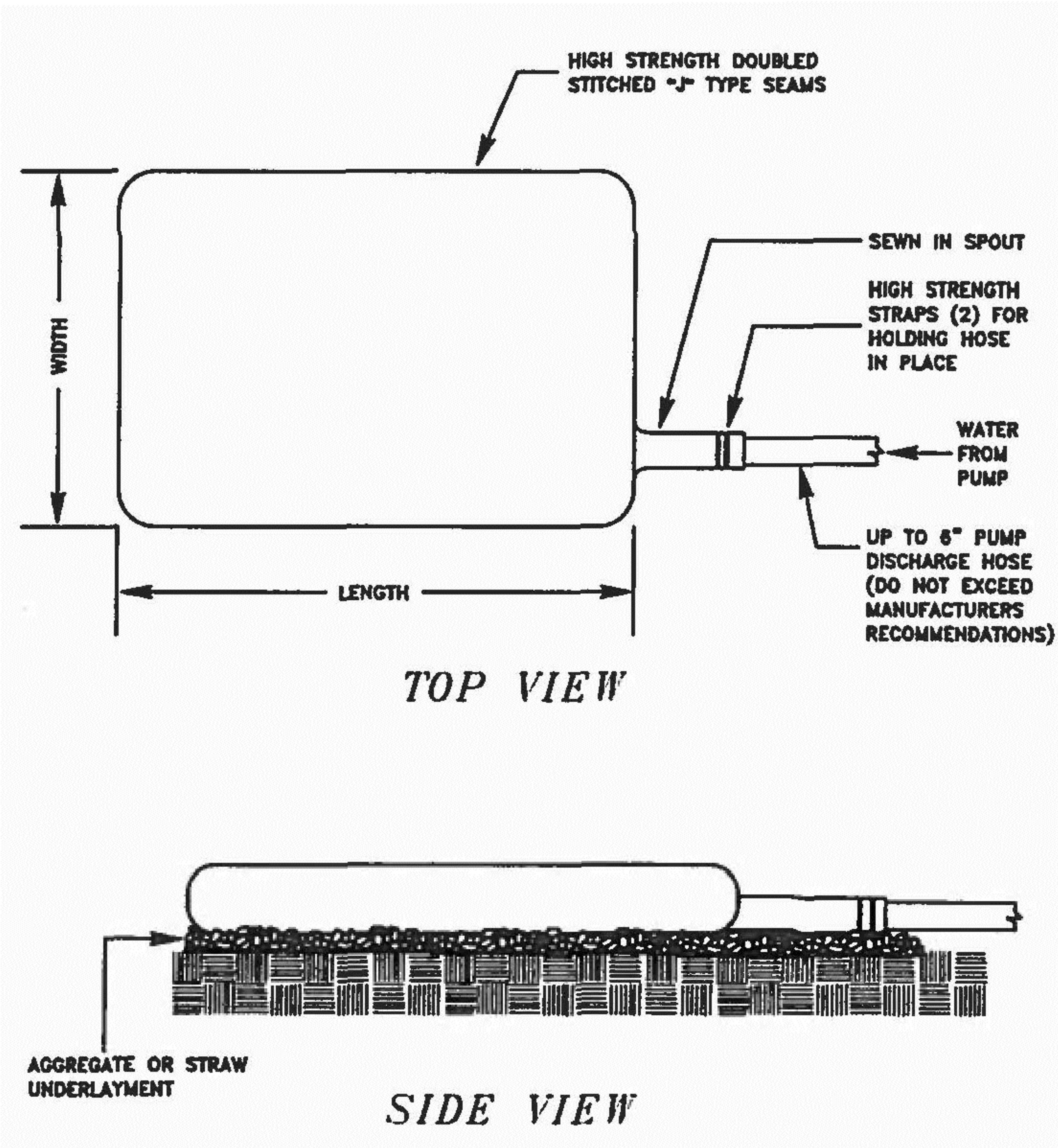
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
ENERGY DISSIPATION BASIN

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1K



CLIENT DOMINION	PROJECT BIC/INCREMENTAL CONTROLS

CONSULTANT

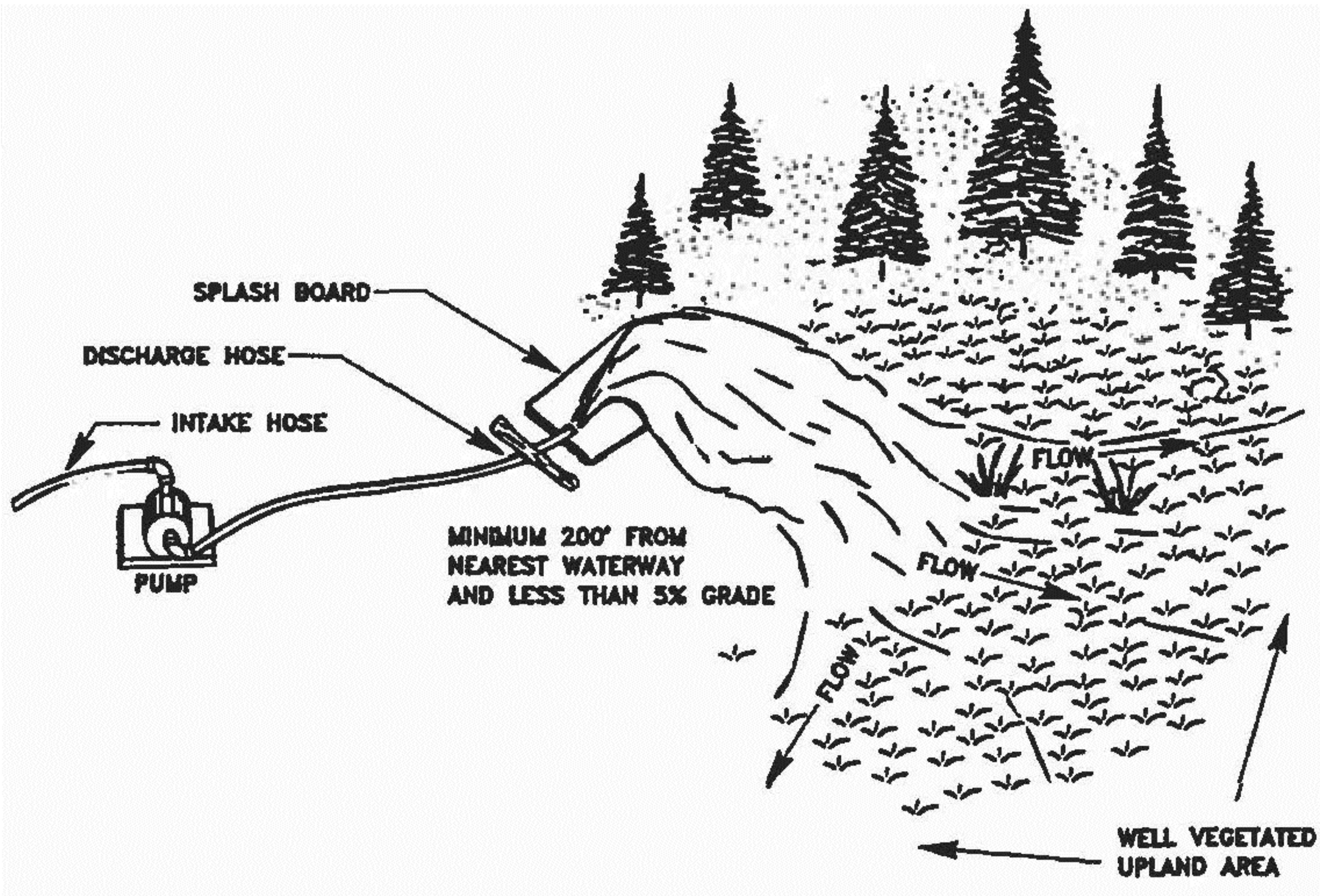
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
DEWATERING DISCHARGE BAG

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1L

0 1 in



CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

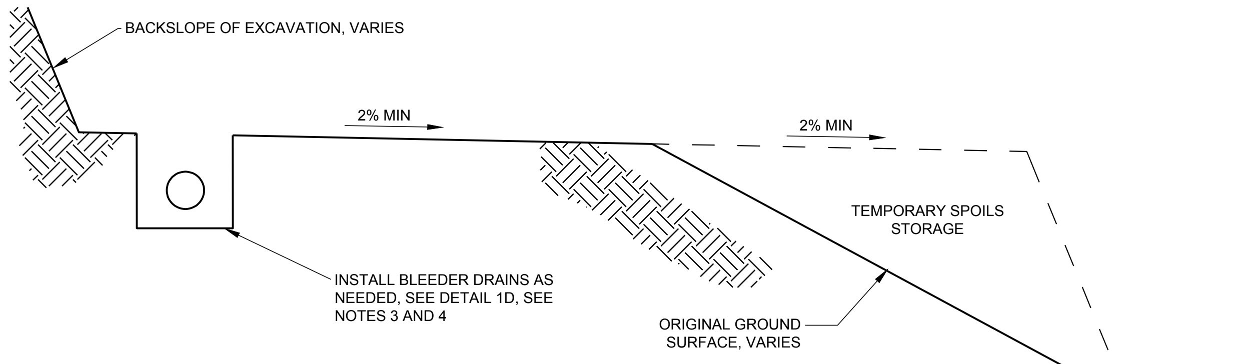
Golder Associates

TITLE
DEWATERING DISCHARGE IN UPLAND AREA

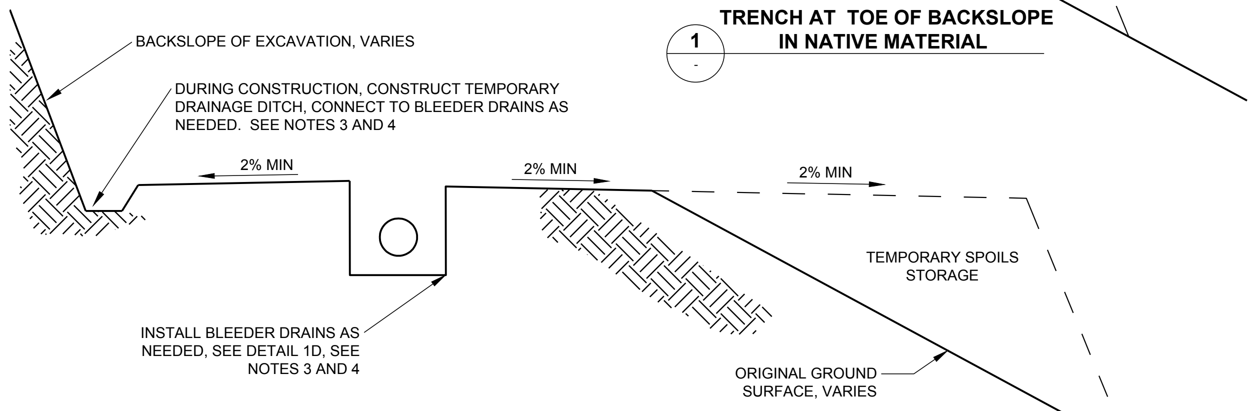
PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1M

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

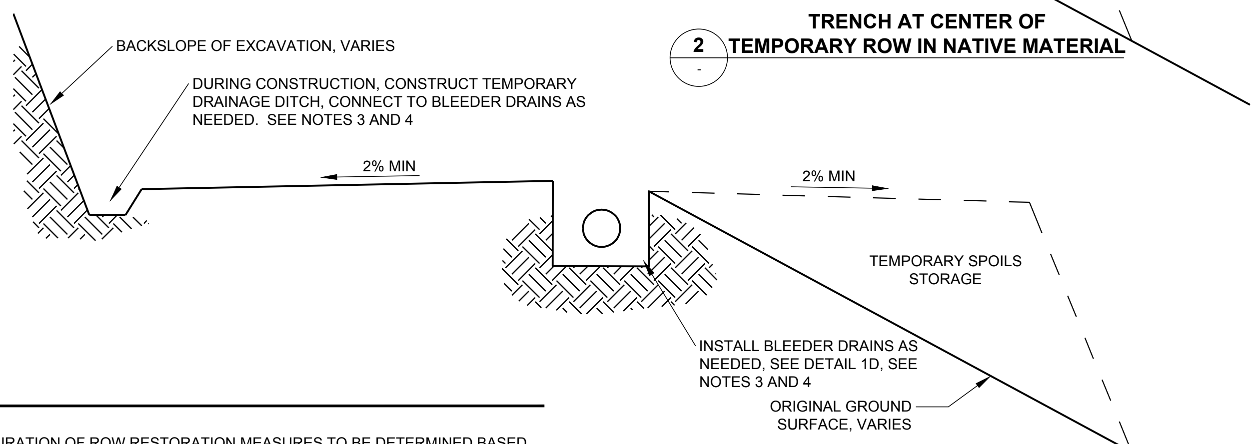
1 in
0



1 TRENCH AT TOE OF BACKSLOPE IN NATIVE MATERIAL
-



2 TRENCH AT CENTER OF TEMPORARY ROW IN NATIVE MATERIAL
-



3 TRENCH AT OUT SIDE EDGE OF TEMPORARY ROW IN NATIVE MATERIAL
-

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. THE TEMPORARY ROW SURFACE, WHEN IT IS INITIALLY CONSTRUCTED, ACTS AS A SURFACE THAT DIRECTS AND CONTROLS RUNOFF DURING CONSTRUCTION AS WELL AS CONTROLLING SEEPAGE AND SUBSURFACE FLOWS AFTER THE ROW IS RESTORED AND BACKFILLED. THEREFORE, CONSTRUCTION AND GRADING OF THE TEMPORARY ROW SURFACE SHOULD BE COMPLETED TO SO AS TO MAINTAIN POSITIVE DRAINAGE (I.E. APPROXIMATELY 2% SLOPE) AWAY FROM THE PIPELINE TRENCH, AND TO OUTBOARD SIDES OF THE ROW THAT DISCHARGE ONTO NATURAL SLOPES DIRECTED AWAY FROM THE ROW, SO THAT RUNOFF ON THE TEMPORARY ROW SURFACE DOES NOT ACCUMULATE OR POND.

3. FOR TEMPORARY CONSTRUCTION WORK PERIOD, WHERE THE TEMPORARY ROW SURFACE MUST SLOPE TO AN INSIDE AREA, WHERE ACCUMULATED RUNOFF CAN POND, THEN DRAINAGE MEASURES SHOULD BE IMPLEMENTED THAT COLLECT AND EVACUATE THE PONDED WATER DURING TEMPORARY CONSTRUCTION PERIODS AND FOR PERMANENT RESTORATION.

4. FOR PERMANENT RESTORATION, CONVERT TEMPORARY DRAINAGE DITCH TO FRENCH DRAINS AND/OR TARGETED SEEP COLLECTORS, AS NEEDED. SEE DETAILS 1A, 1C, 1D AND 1E.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

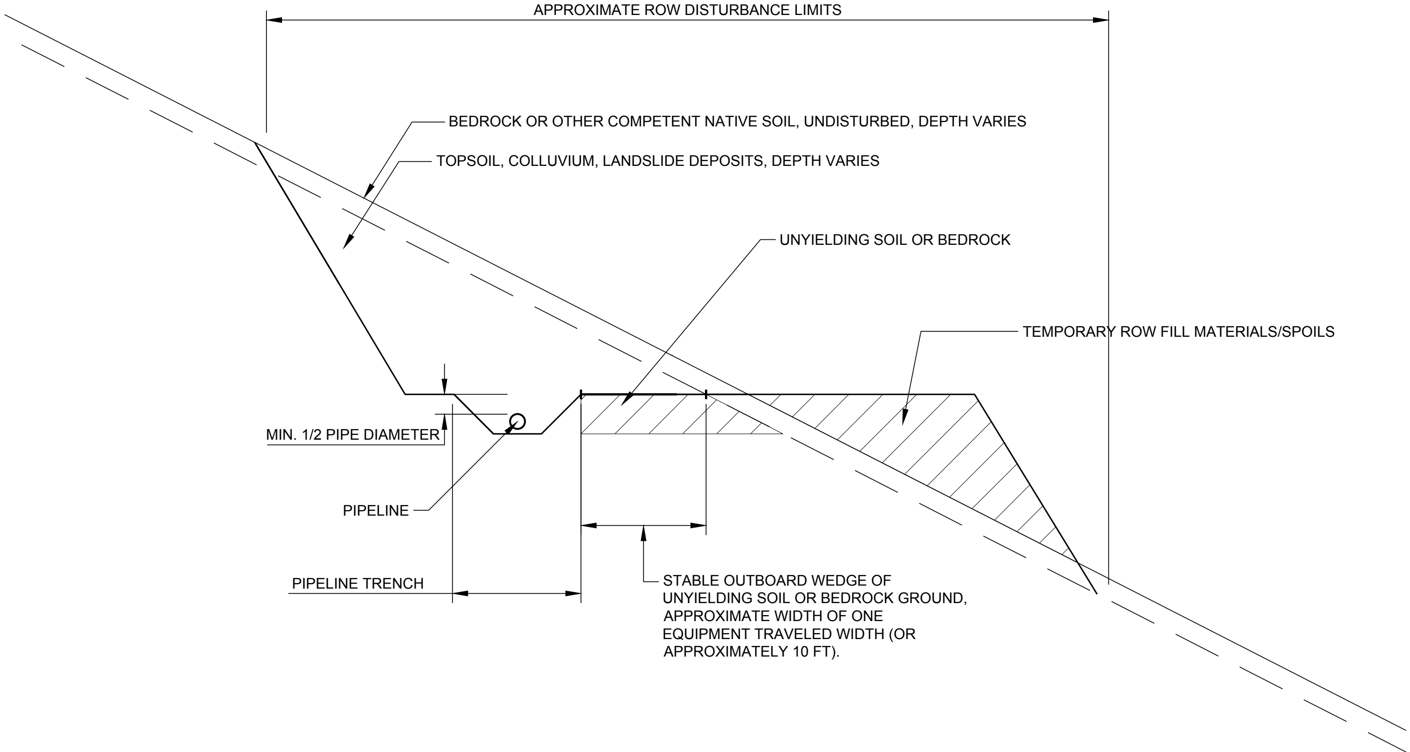
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
GRADING TEMPORARY ROW SURFACE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2A



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT	PROJECT
DOMINION	BIC/INCREMENTAL CONTROLS

CONSULTANT: Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

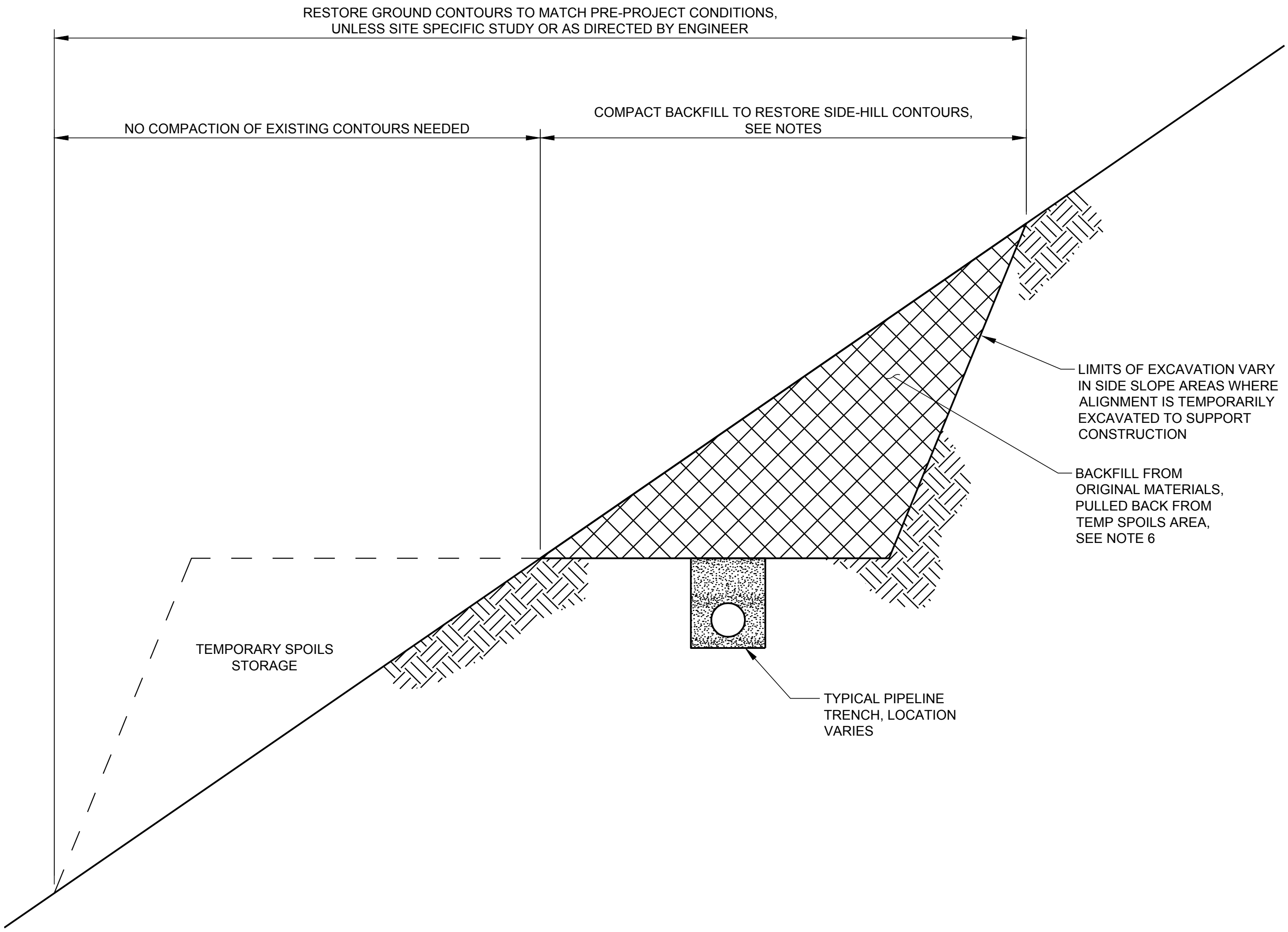
TITLE

GRADING TRENCH WITH STABLE OUTBOARD WEDGE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2B

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 1 in



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. RECOMMEND COMPACTING SIDE SLOPE AREAS USING “SHEEP’S FOOT” COMPACTION EQUIPMENT IN HORIZONTAL LAYERS.
3. BACKFILL MATERIALS SHOULD BE AT OR NEAR OPTIMUM MOISTURE CONTENT (DRYING SOILS OR ADDING WATER AS NECESSARY), VISUALLY DETERMINED BY A COMPETENT ON-SITE REPRESENTATIVE. SEE TYPICAL DETAIL 2D FOR DRYING BACKFILL.
4. SOILS COMPACTION SHOULD BE COMPLETED IN LIFTS SUCH THAT BACKFILL MATERIALS ARE STABLE, SHED WATER AND DO NOT EASILY BECOME SATURATED, AND ARE AT APPROXIMATELY THE MAXIMUM DRY DENSITY, VISUALLY DETERMINED BY A COMPETENT ON-SITE REPRESENTATIVE.
5. ADDITIONAL COMPACTION REQUIREMENTS MAY APPLY AT ROAD CROSSINGS, AREAS IDENTIFIED BY THE ENGINEER, OR AT OTHER LOCATIONS AS MAY BE REQUIRED BY LAWS AND REGULATIONS. SEE TYPICAL DETAIL 2I FOR COMPACTION REQUIREMENTS ACROSS ROADS.
6. BACKFILL CONFIGURATION MAY VARY TO FIT SITE CONDITIONS, AND MAY BE USED IN OTHER ROW CROSS-SECTION BACKFILL GEOMETRIES, AS DIRECTED BY ENGINEER.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
COMPACT BACKFILL

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2C

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. SATURATED ON-SITE SOILS MAY NEED TO BE DRIED BEFORE RE-USE AND PLACEMENT AS BACKFILL. DRYING MAY INCLUDE WIND-ROWING AND TURNING OVER IN FURROWS TO ALLOW FOR AIR EXCHANGE AND EVAPORATION TO DRY THE MATERIALS, OR ADDITION OF ADD-MIXTURES TO DRY THE SOILS.

3. THE USE OF ADD-MIXTURES TO SATURATED SOILS SHOULD BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO USE.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
DRY SOILS AND BACKFILL

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2D

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. WHERE THE PLACEMENT OF SPOILS ON THE SITE MAY INITIATE OR EXACERBATE LANDSLIDES OR RESULT IN SLOPE INSTABILITY, THE MATERIALS SHOULD BE REMOVED FROM THE SITE AND SPOILED AT A SAFE AND OFF-SITE LOCATION.

CLIENT
DOMINION

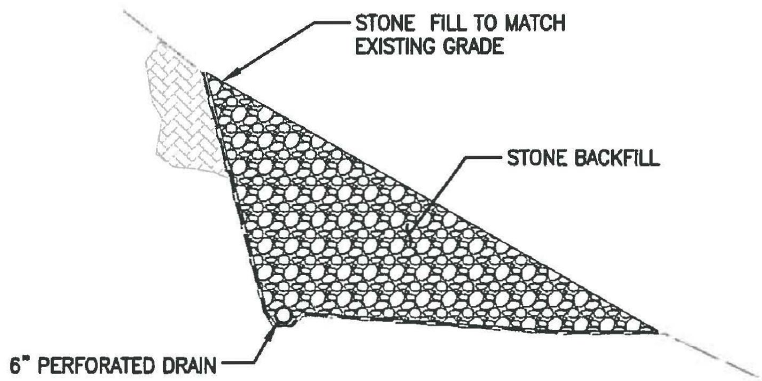
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

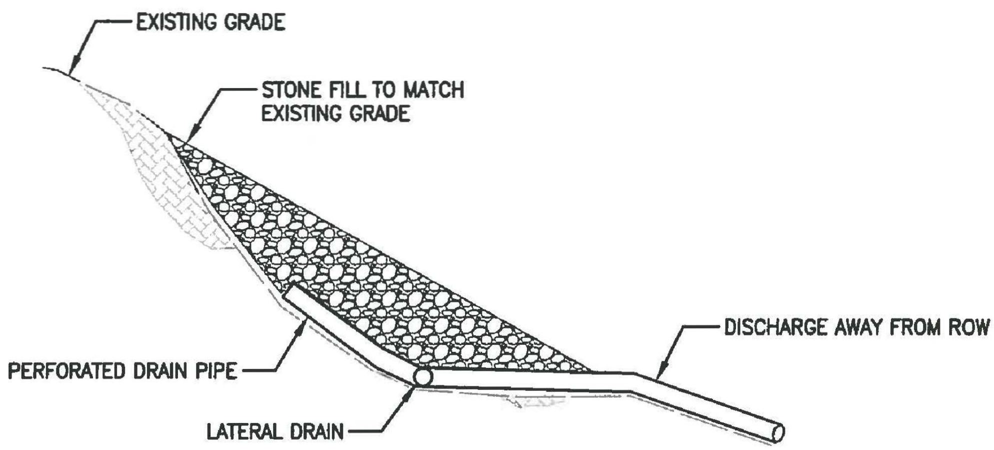
TITLE
REMOVE UNSUITABLE EXISTING SOILS AS BACKFILL

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2E



STONE WITH DRAIN TO RESTORE FAILING SLOPE

N.T.S.



SMALL SLIP REPAIR WITH LATERAL

N.T.S.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
ROCK BACKFILL (WITH DRAIN)

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2F

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. RESTORATION OF ROW SURFACES SHOULD GENERALLY RE-CONSTRUCT THE GROUND SURFACE TO MATCH THE PRE-PROJECT CONTOURS.
3. CHANGES IN THE FINAL GRADING MAY BE NEEDED TO ADDRESS SPECIFIC TARGETED GEOTECHNICAL OR HYDROTECHNICAL OR GEOLOGIC ENGINEERING ISSUES (I.E. CORRECT DRAINAGE PROBLEMS, MINIMIZE DELIVERY OF WATER TO LANDSLIDE SITES, ETC.).
4. FINAL GRADING TO BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO COMPLETION.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
GRADING TO MATCH EXISTING CONTOURS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2G

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. MINIMIZE THE PLACEMENT OF BACKFILL MATERIALS WHEN RESTORING AND RE-CONSTRUCTING LANDSLIDE SITES, IN ORDER TO REDUCE THE IMPOSED LOAD ON LANDSLIDE SITES.

3. MINIMIZE THE PLACEMENT OF SPOILS FROM GRADING WORK IN OTHER AREAS ALONG THE ROW THAT MAY OVERLAP OTHER LANDSLIDES, IN ORDER TO REDUCE THE POTENTIAL FOR INITIATING NEW LANDSLIDES.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

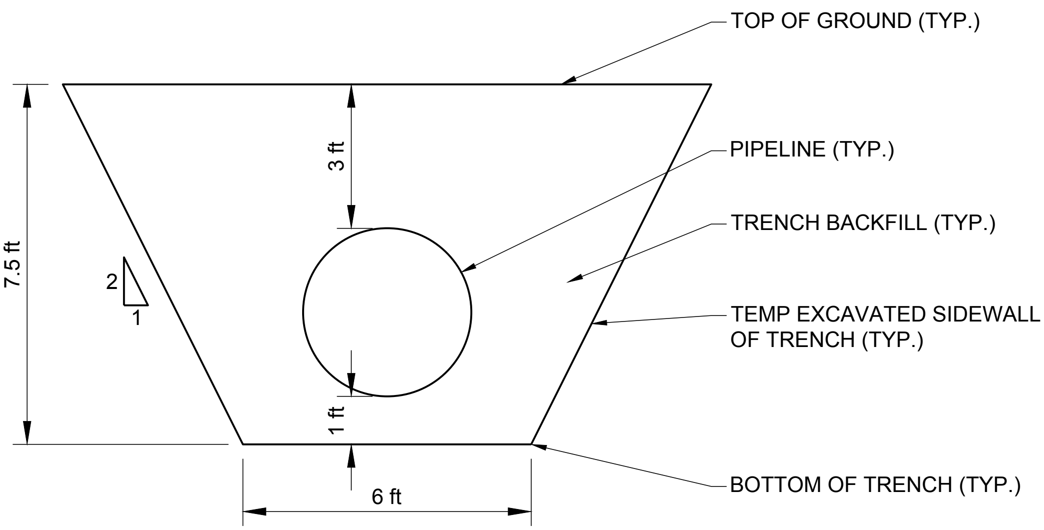
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
GRADING TO MINIMIZE BACKFILL OVER LANDSLIDE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2H



NOT TO SCALE

NOTE(S)

1. REFER TO CONTRACT SPECIFIC REQUIREMENTS, FOR TYPICAL GRADING, BACKFILL, AND TRENCHING.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYPICAL TRENCH DIMENSION IN GENERALLY FLAT TERRAIN

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2I

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
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NOTE(S)

1. DEVELOP SPOILS MANAGEMENT PLAN THAT FITS THE SITE SPECIFIC CONDITIONS, AND MEETS THE PURPOSE OF THE DESIGN AND CONSTRUCTION PLANS FOR THE TARGETED SITE. THE FOLLOWING ARE INTENDED ONLY AS GENERAL GUIDELINES, TO BE CONSISTENT WITH THE SITE SPECIFIC PLAN. ADDITIONAL MEASURES ARE ANTICIPATED.

2. MINIMIZE THE PLACEMENT OF SPOILS FROM GRADING WORK IN OTHER AREAS ALONG THE ROW THAT MAY OVERLAP OTHER POTENTIAL UNSTABLE GROUND, IN ORDER TO REDUCE THE POTENTIAL FOR INITIATING NEW SLOPE INSTABILITIES.

3. MINIMIZE THE PLACEMENT OF SPOILS MATERIALS WHEN RESTORING AND RE-CONSTRUCTING THE ROW, IN ORDER TO REDUCE THE IMPOSED LOAD ON POTENTIALLY UNSTABLE GROUND SITES.

4. EXAMPLE SPOILS MANAGEMENT MEASURES MAY INCLUDE, BUT ARE NOT LIMITED TO: STACKING SPOILS ALONG THE ROW EDGE IN DRY CONDITIONS AND WITHIN ROW OR TEWA BOUNDARIES; USE TEMPORARY PILES AND MATS TO CREATE CRIBS .TO RETAIN SPOILS; USE LOCAL LARGE BOULDERS TO BUILD TEMPORARY CRIBS TO RETAIN SPOILS; BUILD TEMPORARY PIONEER ROADS OR EXCAVATED BERMS TO RETAIN SPOILS; SHORT-HAUL OR END-HAUL SPOILS TO OFF-SITE LOCATIONS FOR TEMPORARY STORAGE OR SPOILS; STACK SPOILS IN TRAVELED WAY TO TEMPORARILY STORE; COVER SPOILS WITH PLASTIC AND/OR GEOSYNTHETIC MATERIALS; ENCASE SPOILS IN GEOSYNTHETIC MATERIALS TO IMPROVE STABILITY OF SPOILS FOR TEMPORARY STORAGE.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

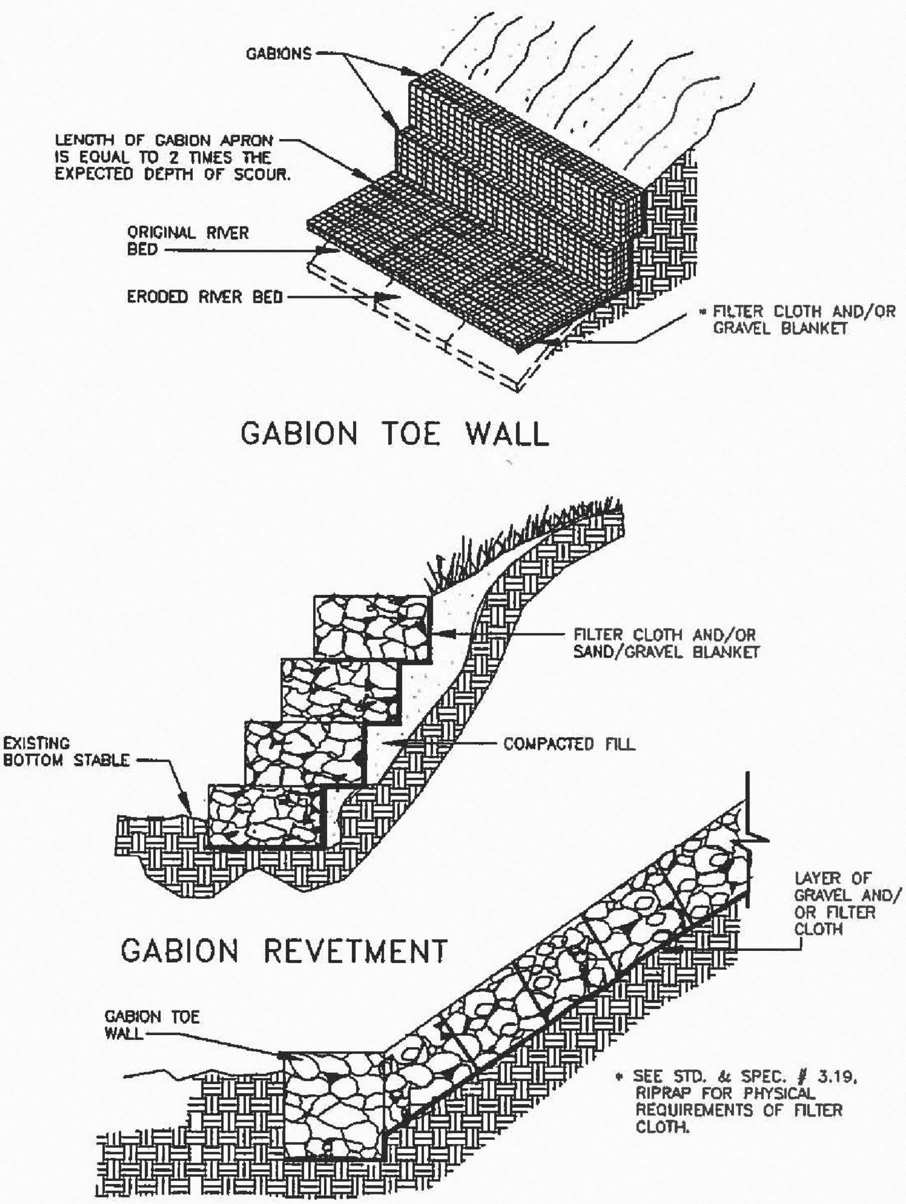
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SPOILS MANAGEMENT

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2J

GABIONS



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATIONS MEASURES TO BE DETERMINED BASED ON CONDITION ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

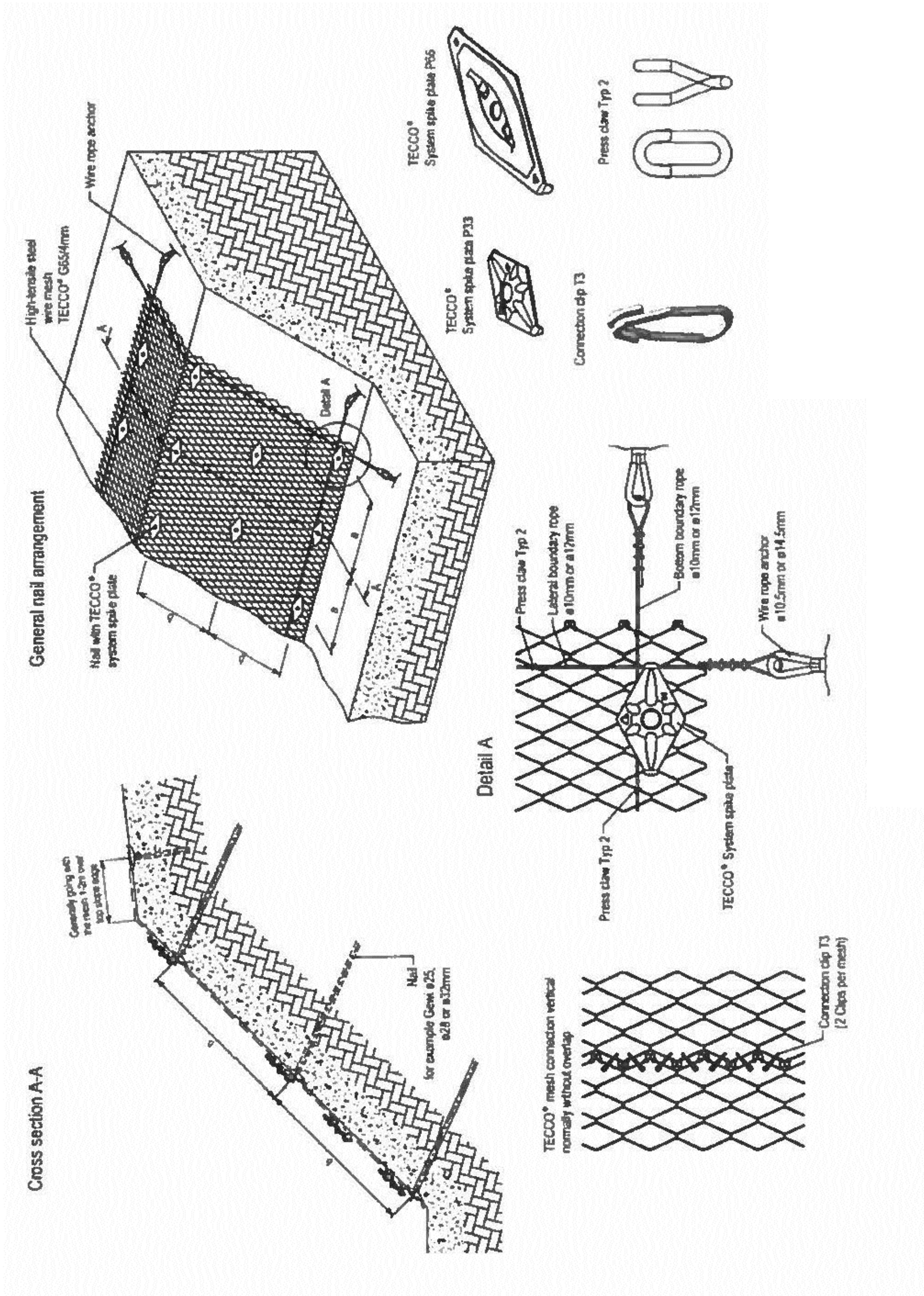
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
GABIONS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2K



NOTE(S)

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CLIENT DOMINION	PROJECT BIC/INCREMENTAL CONTROLS

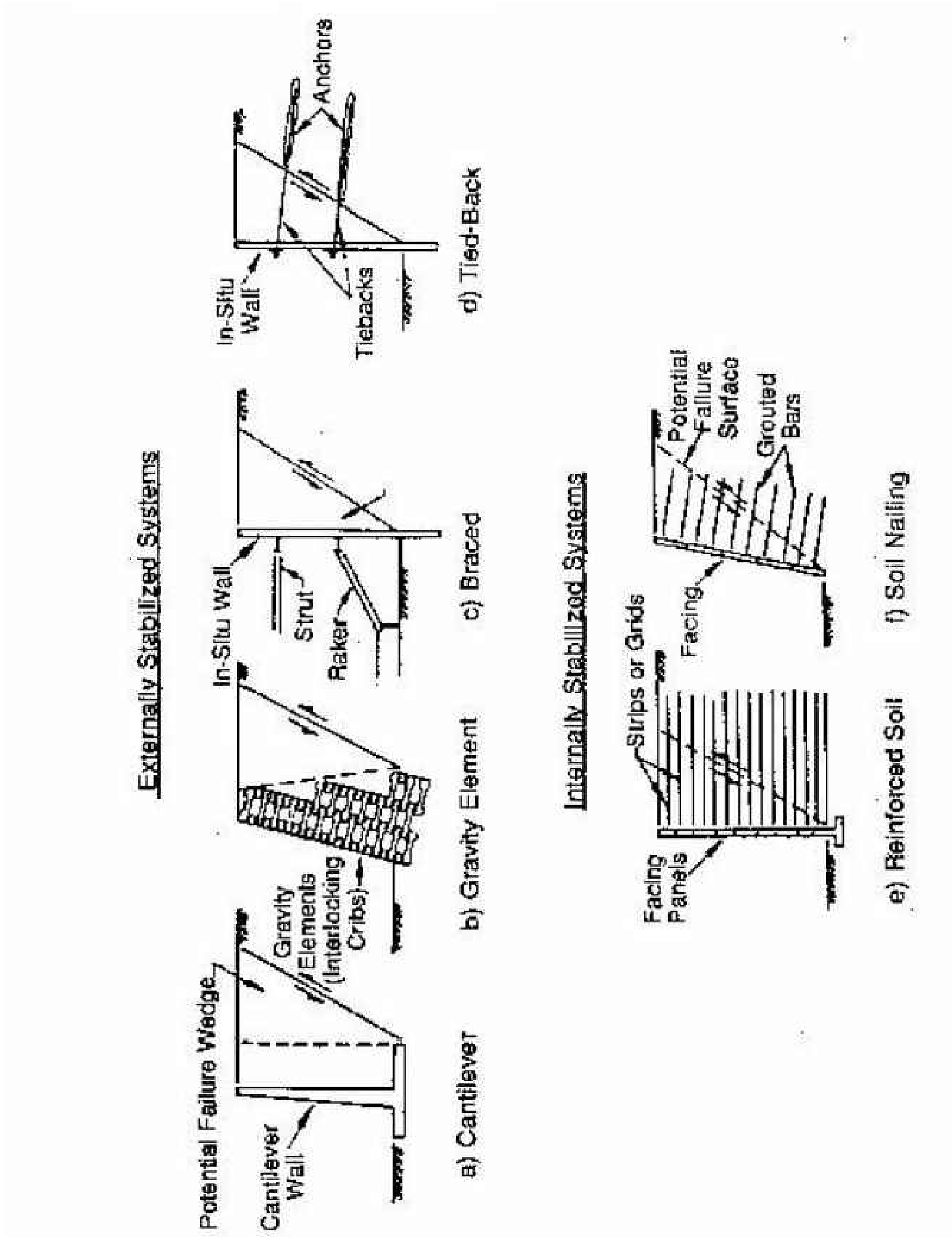
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SOIL-NAIL WITH TECCO MESH

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2L



CLIENT DOMINION	PROJECT BIC/INCREMENTAL CONTROLS

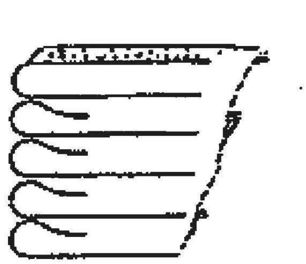
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

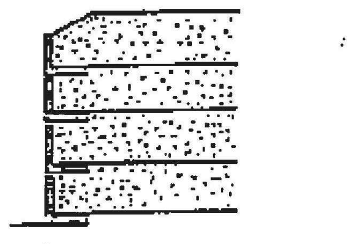
TITLE
EXTERNALLY STABILIZED RETAINING WALL SYSTEMS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2M



A) VERTICAL GEOTEXTILE FACING

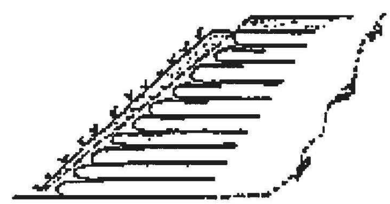
E) SLOPING GEOTEXTILE FACING



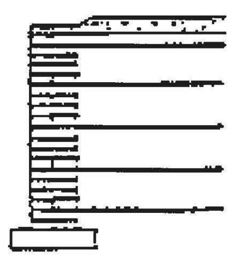
B) VERTICAL PRECAST CONCRETE ELEMENT FACING

F) SLOPING GUNITE OR STRUCTURAL FACING

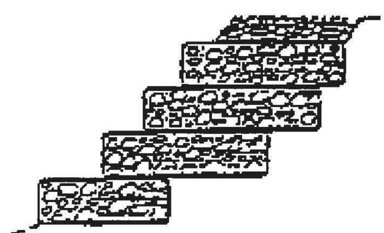
C) VERTICAL CAST IN-PLACE CONCRETE/MASONRY FACING



G) SLOPING SOIL AND VEGETATION FACING



D) VERTICAL MASONRY FACING



H) GEOTEXTILE GABION

CLIENT	PROJECT
DOMINION	BIC/INCREMENTAL CONTROLS

CONSULTANT

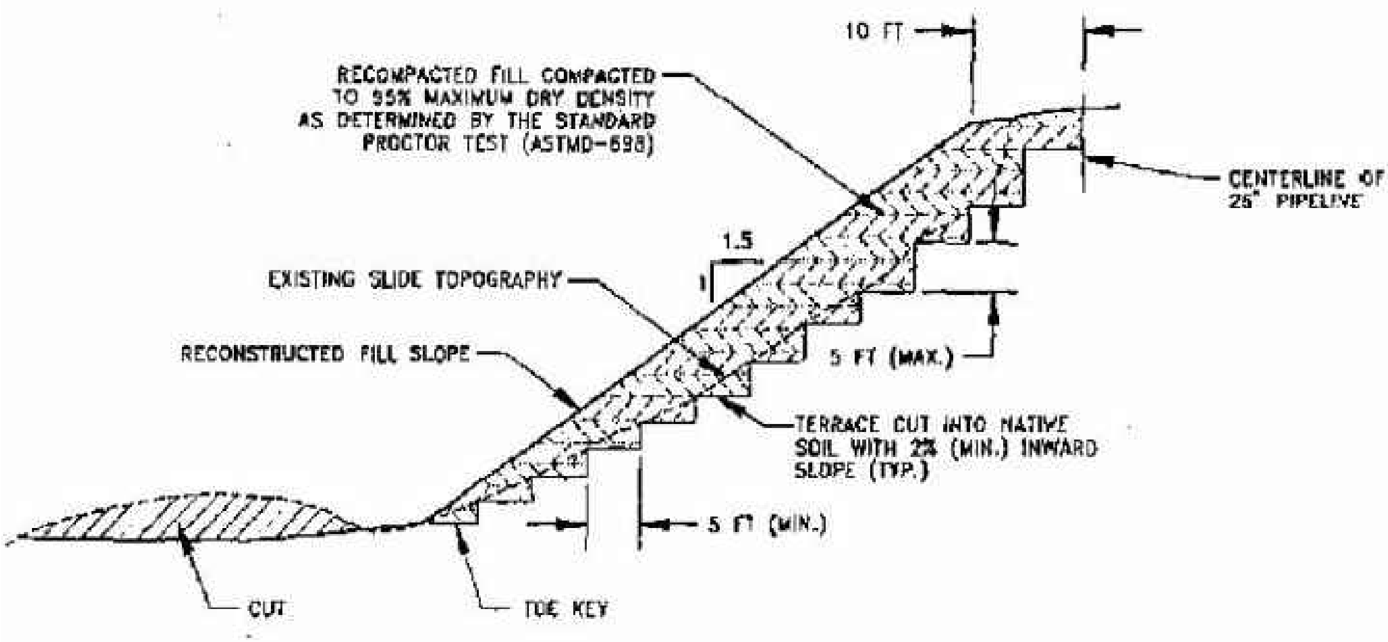
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE

GEOTEXTILE REINFORCED SYSTEMS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2N



NOTE(S)

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CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

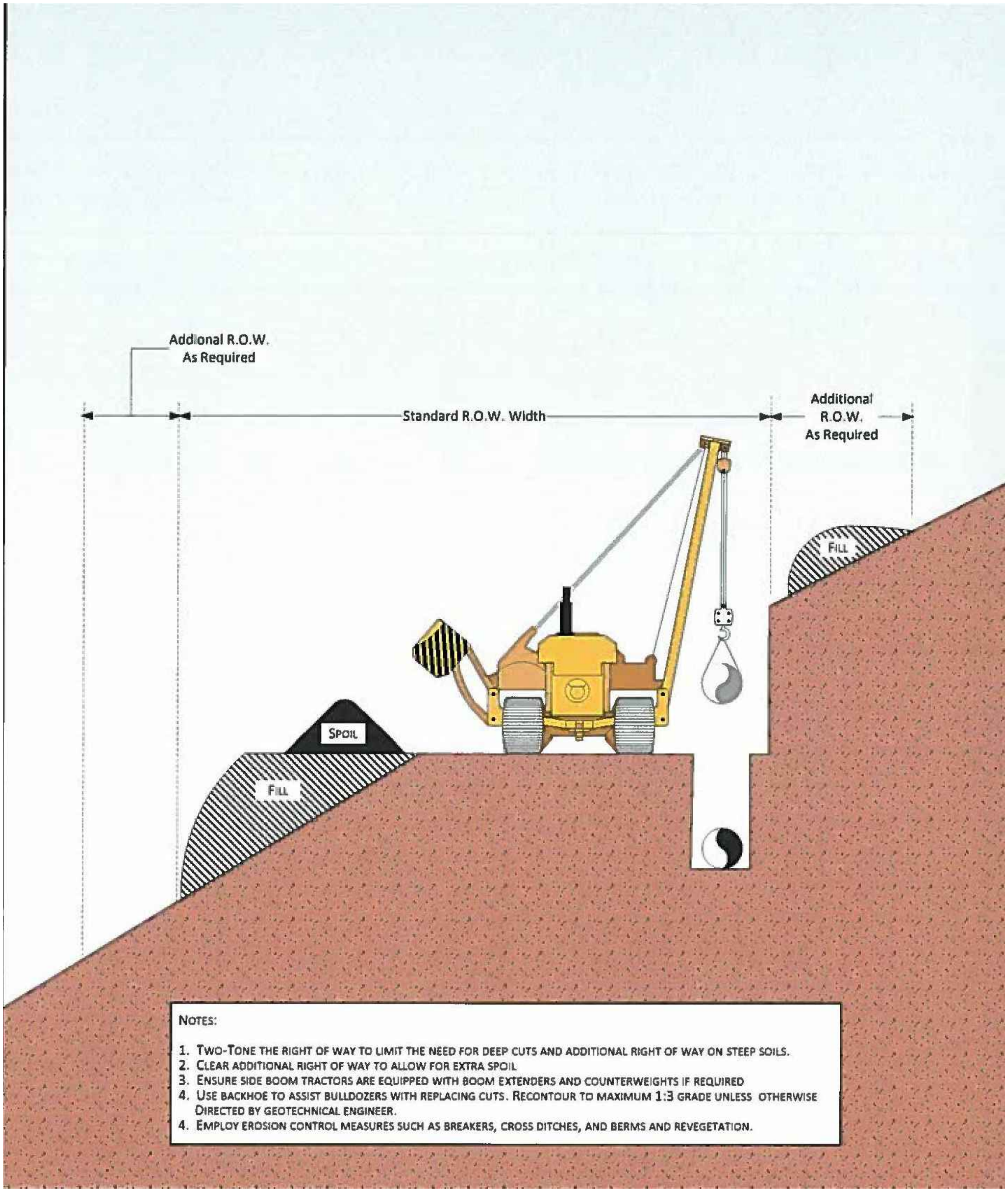
CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
BENCH AND REGRADE WITH BACKFILL

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2O

0 1 in



NOTE(S)

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CLIENT
DOMINION

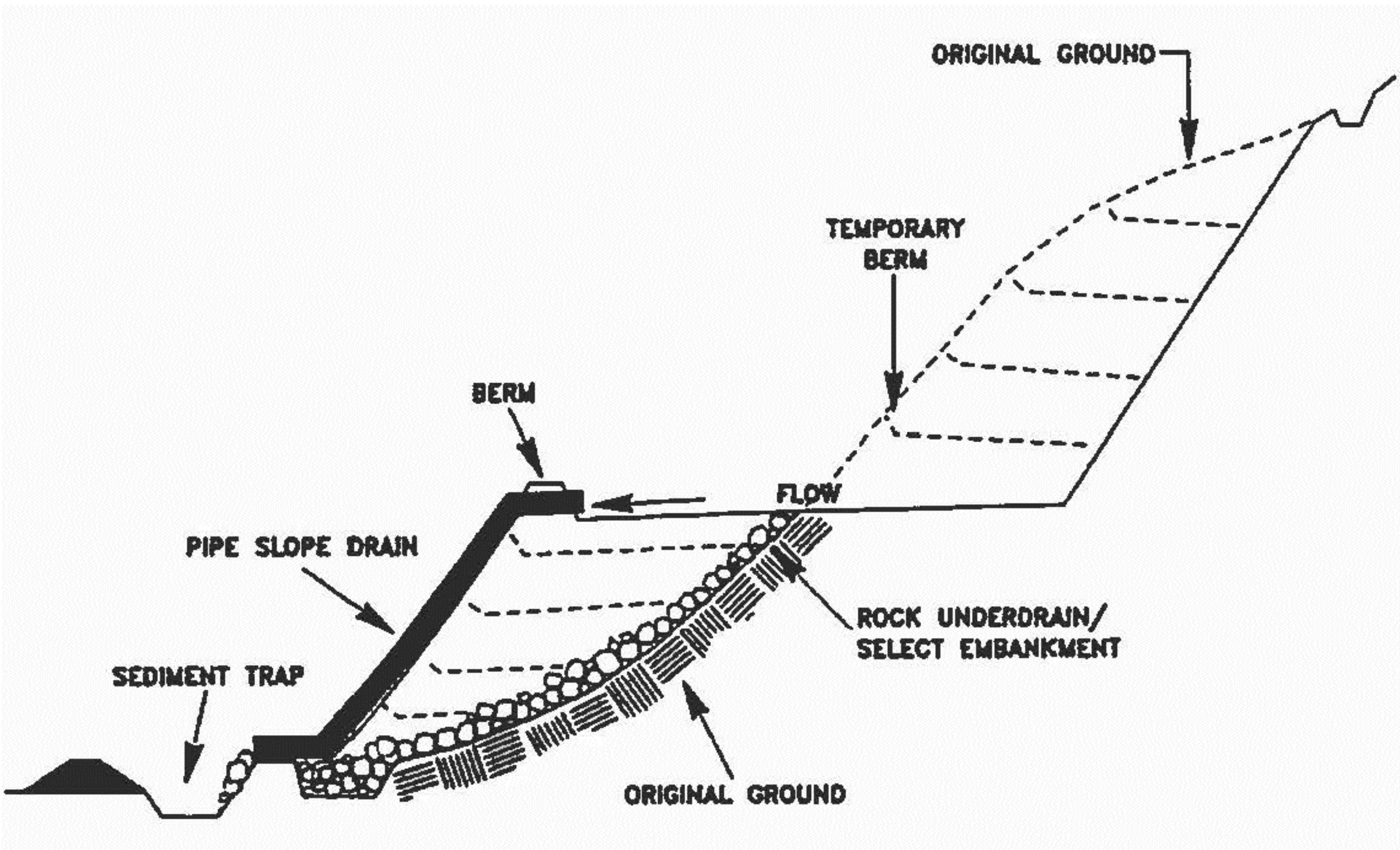
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
CUT AND FILL CONSTRUCTION

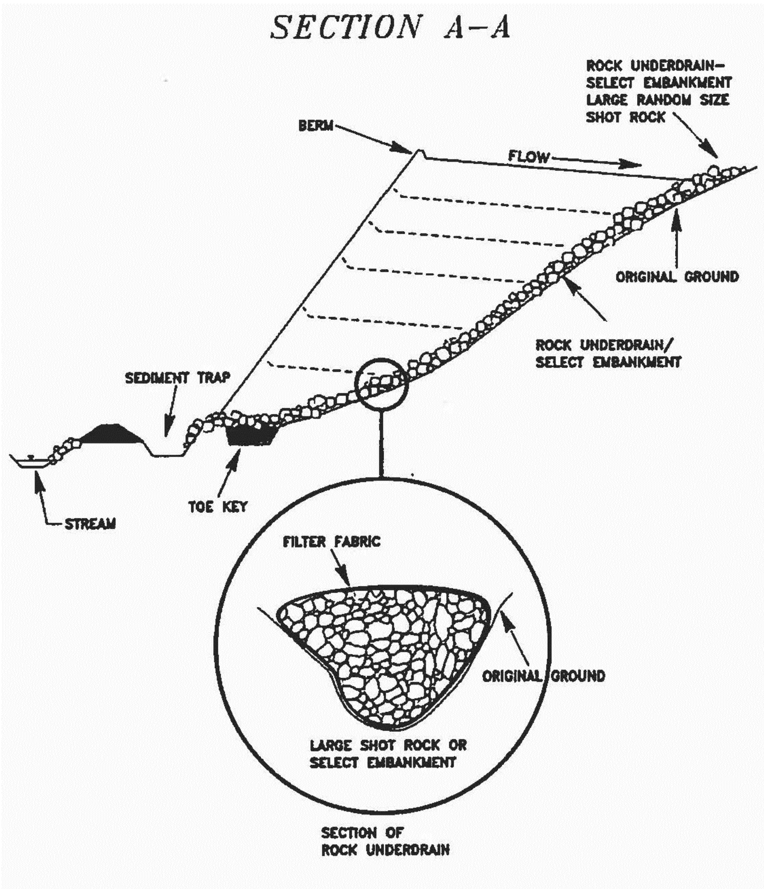
PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2P

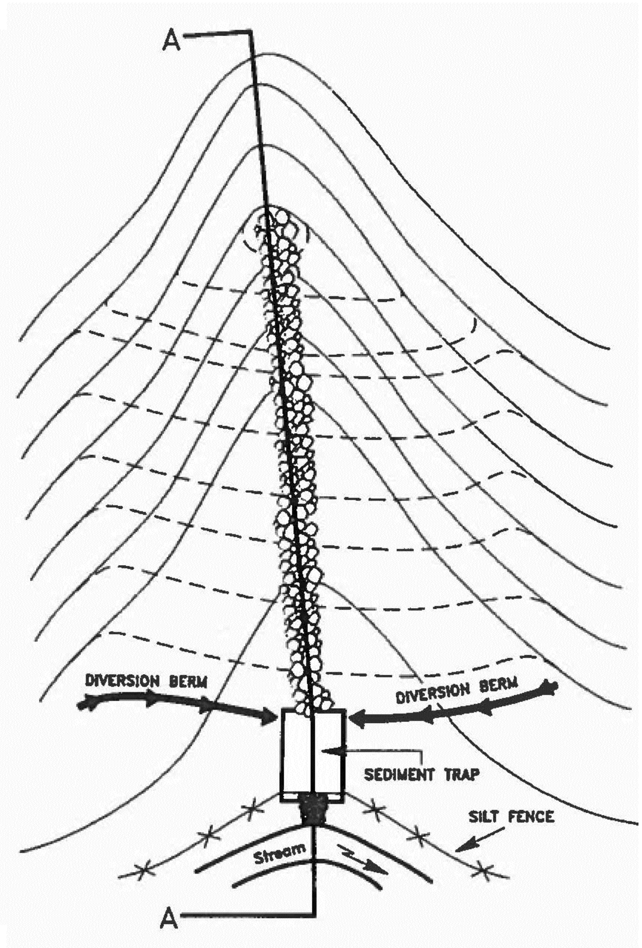


CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD	2017-02-28	TITLE **TYP SIDE HILL CUT AND FILL**
	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	
	APPROVED	AQK	

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2Q

0 1 in

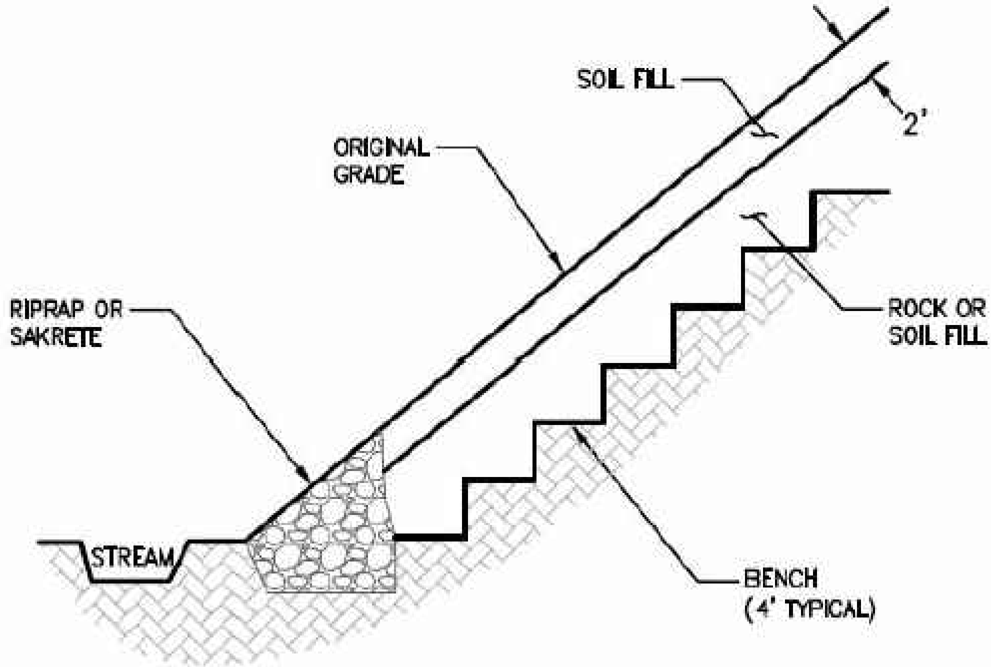




CLIENT DOMINION	PROJECT BIC/INCREMENTAL CONTROLS

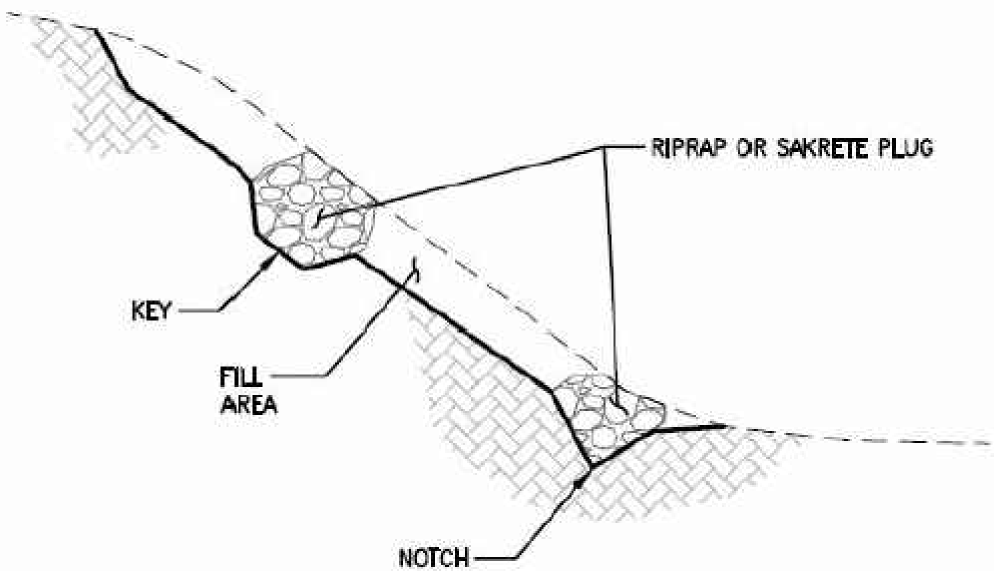
CONSULTANT			TITLE
Golder Associates	YYYY-MM-DD	2017-02-28	TYP FILL WITH ROCK UNDER DRAIN
	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	
	APPROVED	AQK	

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2R



BENCH AND REGRADE TYPICAL

N.T.S.



KEYING TYPICAL

N.T.S.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

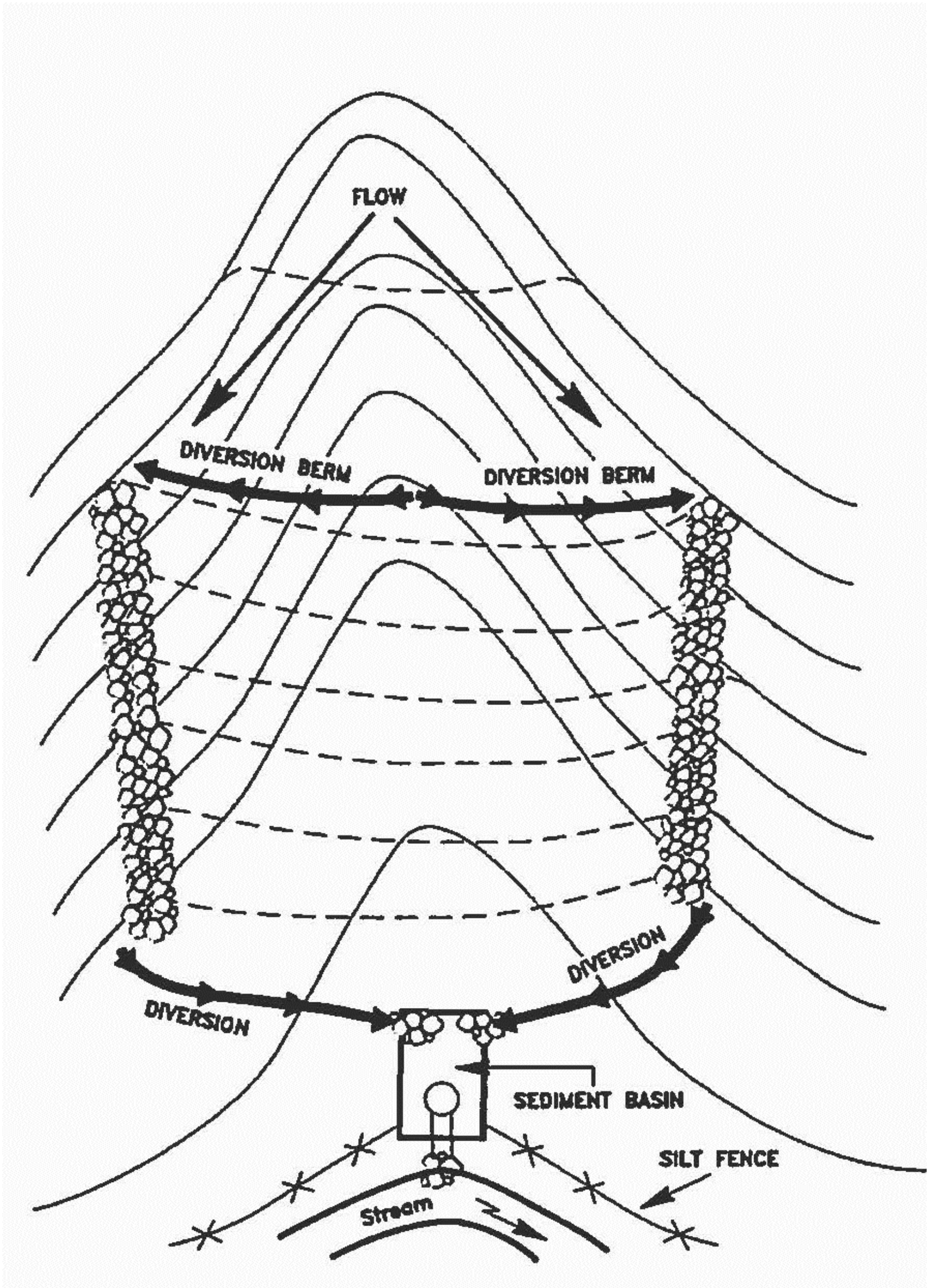
CONSULTANT

Golder Associates

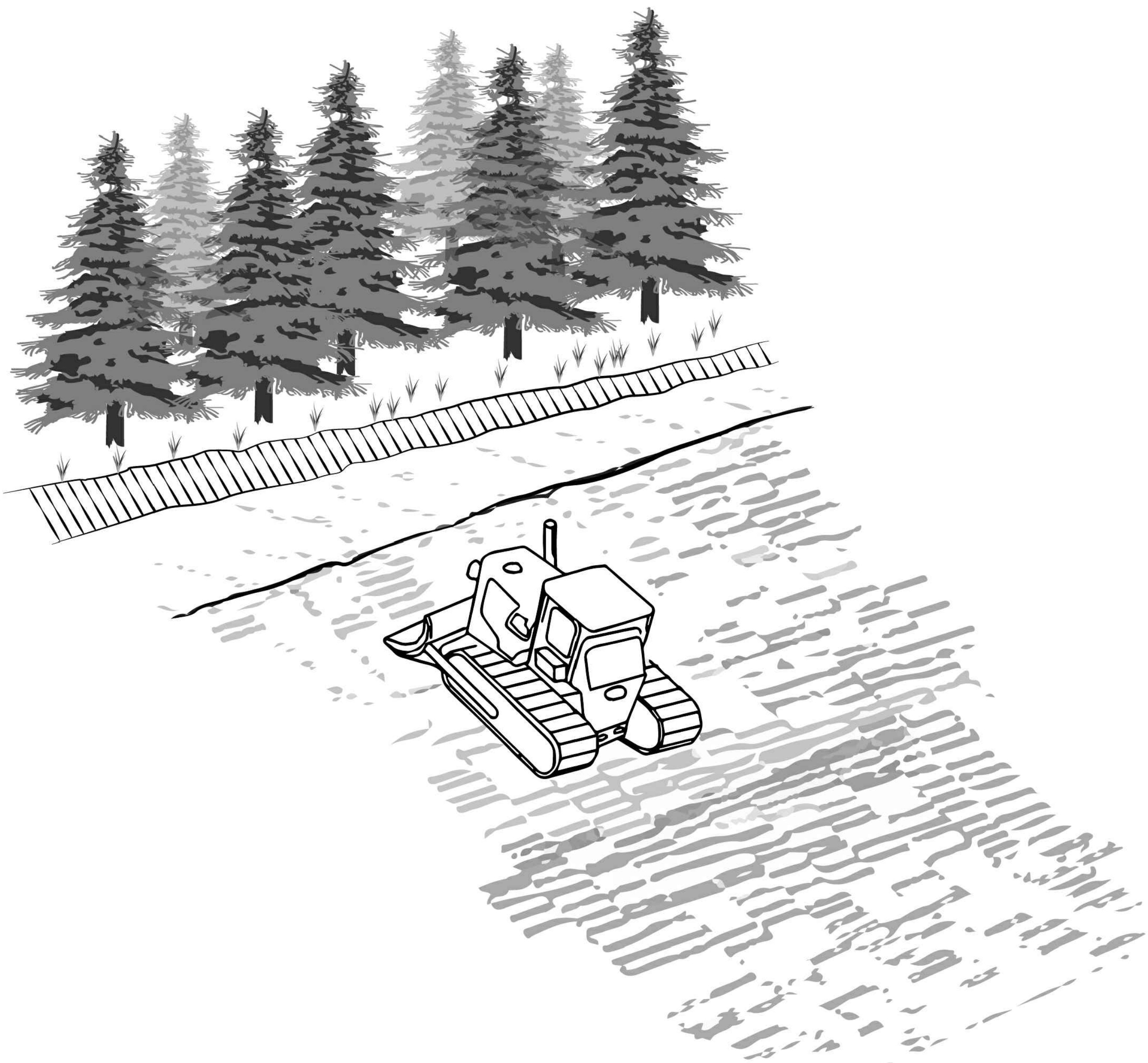
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP BENCH AND REGRADE BACKFILL WITH ROCK OR SACKCRETE KEYS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2S



CLIENT DOMINION			PROJECT BIC/INCREMENTAL CONTROLS		
CONSULTANT	YYYY-MM-DD	2017-02-28	TITLE **TYP FILL WITH MULTIPLE ROCK CHANNELS**		
Golder Associates	PREPARED	REDMOND			
	DESIGN	DBC			
	REVIEW	-	PROJECT No. 1535050	PHASE 500	Rev. F
	APPROVED	AQK	FIGURE 2T		



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. TRACKING SLOPES IS DONE BY RUNNING TRACKED MACHINERY UP AND DOWN THE SLOPE, LEAVING TREAD MARKS PERPENDICULAR TO THE SLOPE.

3. IF A BULLDOZER IS USED, THE BLADE MUST BE UP.

4. CARE SHOULD BE EXERCISED ON SOILS HAVING HIGH CLAY CONTENT TO AVOID OVER COMPACTION.

NOT TO SCALE

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TRACK DISTURBED SLOPES

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	3A

0 1 in

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. RE-VEGETATE DISTURBED SLOPES WITH NATIVE GRASS SEED MIX PER REGULATORY AND PERMIT REQUIREMENTS.
3. FINAL SEED MIX TO BE REVIEWED AND APPROVED BY ENGINEER PRIOR TO INSTALLATION.
4. GENERAL APPROACH CONSISTS OF, MAY INCLUDE, BUT IS NOT LIMITED TO, TEMPORARY SEEDING FOLLOWED BY PERMANENT SEEDING.
5. TEMPORARY SEEDING CONSISTS OF SEEDING AND MULCHING, OR MATTING USED TO PRODUCE A QUICK GROUND COVER TO REDUCE EROSION ON EXPOSED AND/OR DISTURBED SOIL THAT MAY BE REDISTURBED OR PERMANENTLY STABILIZED AT A LATER DATE. SELECT PLANTS APPROPRIATE TO THE SEASON AND SITE CONDITIONS, PER DOMINION SPECIFICATIONS AND CONTRACT REQUIREMENTS.
6. PERMANENT SEEDING ESTABLISHES PERENNIAL VEGETATION COVER ON EXPOSED AND/OR DISTURBED SOILS TO REDUCE EROSION AND DECREASE SEDIMENT YIELD FROM DISTURBED AREAS. SELECT PLANTS APPROPRIATE TO THE SEASON AND SITE CONDITIONS, PER DOMINION SPECIFICATIONS AND CONTRACT REQUIREMENTS.

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

0

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

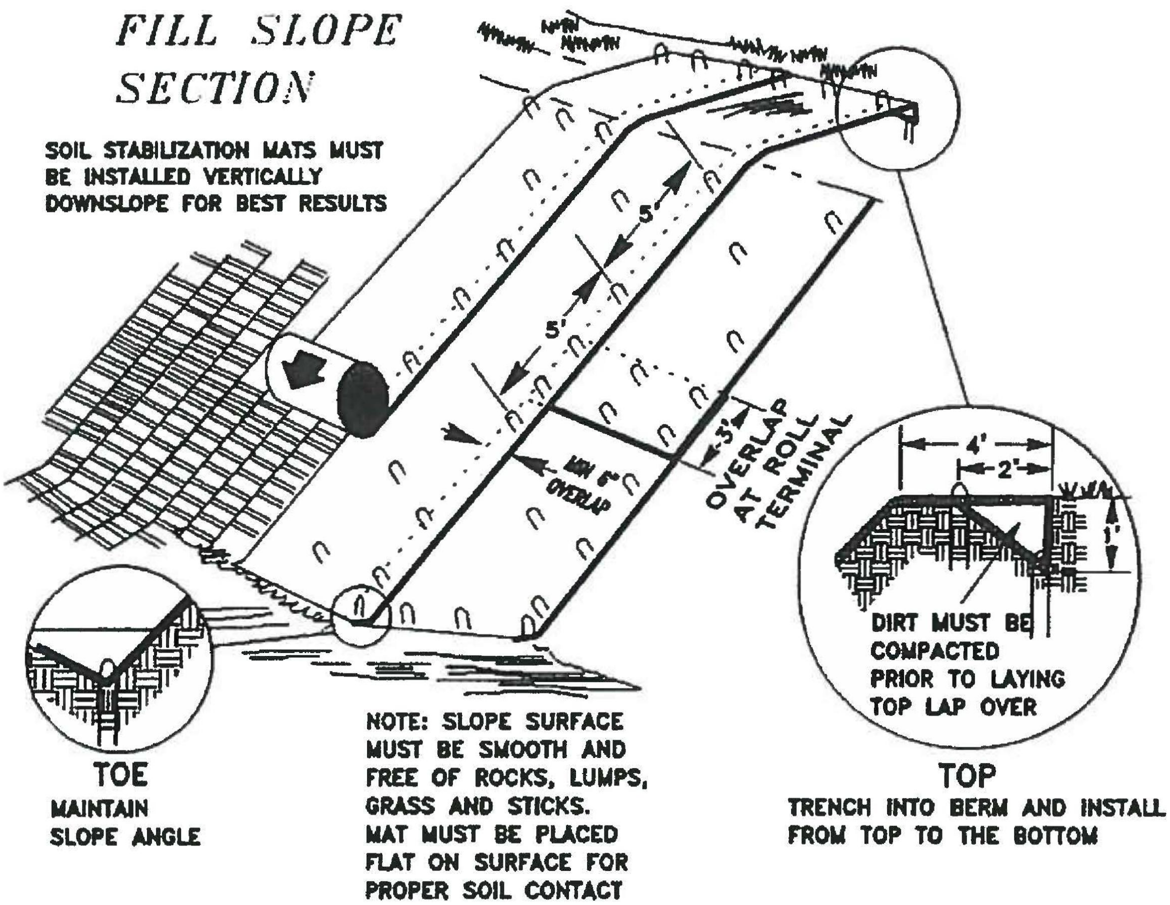
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

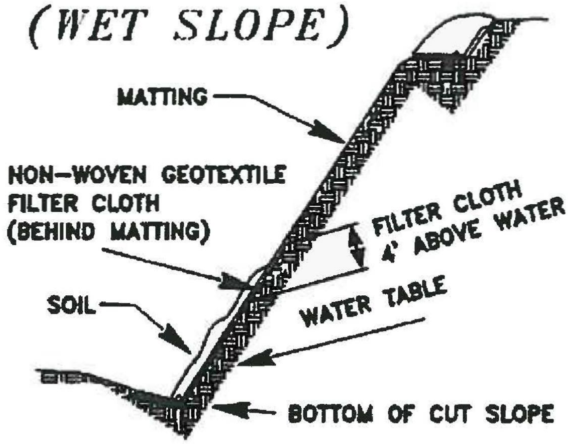
TITLE
RE-VEGETATE DISTURBED SLOPES

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	3B

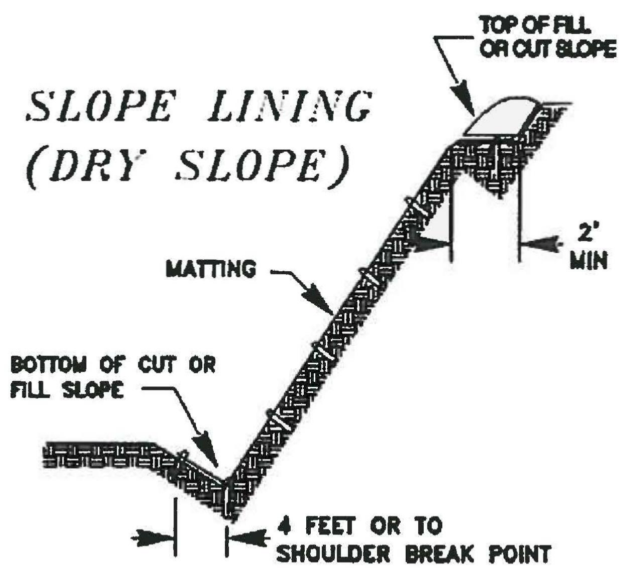
FILL SLOPE SECTION



SLOPE LINING (WET SLOPE)



SLOPE LINING (DRY SLOPE)



SOURCE: VDOT STANDARDS AND VIRGINIA DCR-DSWC

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

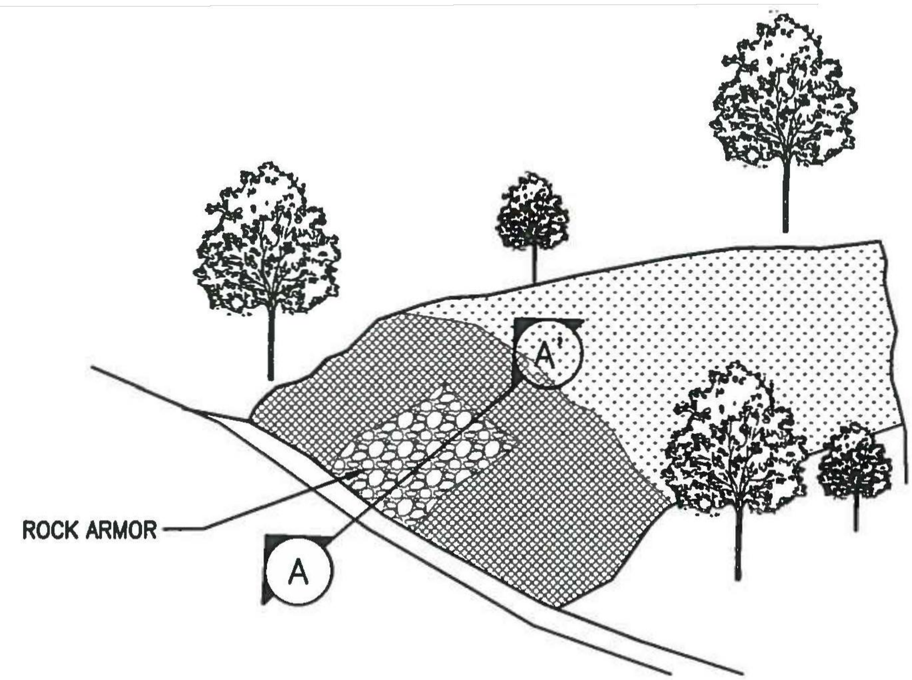
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

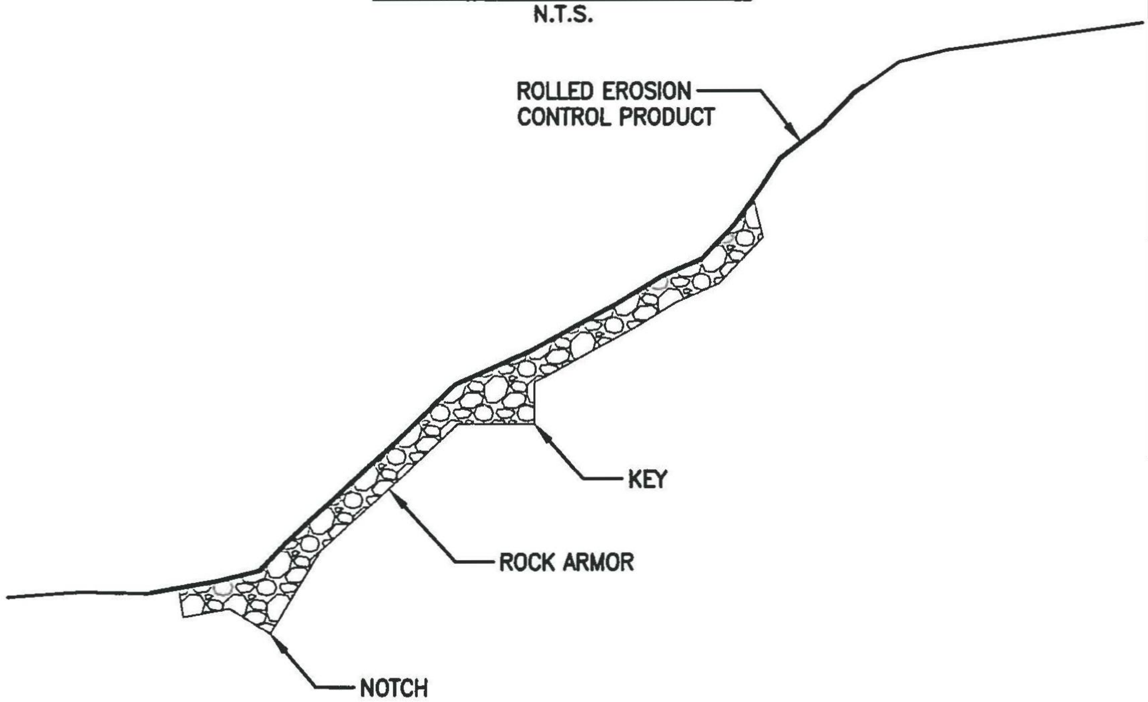
TITLE
COIR CLOTH ON DISTRUBED SLOPES

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	3C

0 1 in



PERSPECTIVE VIEW
N.T.S.

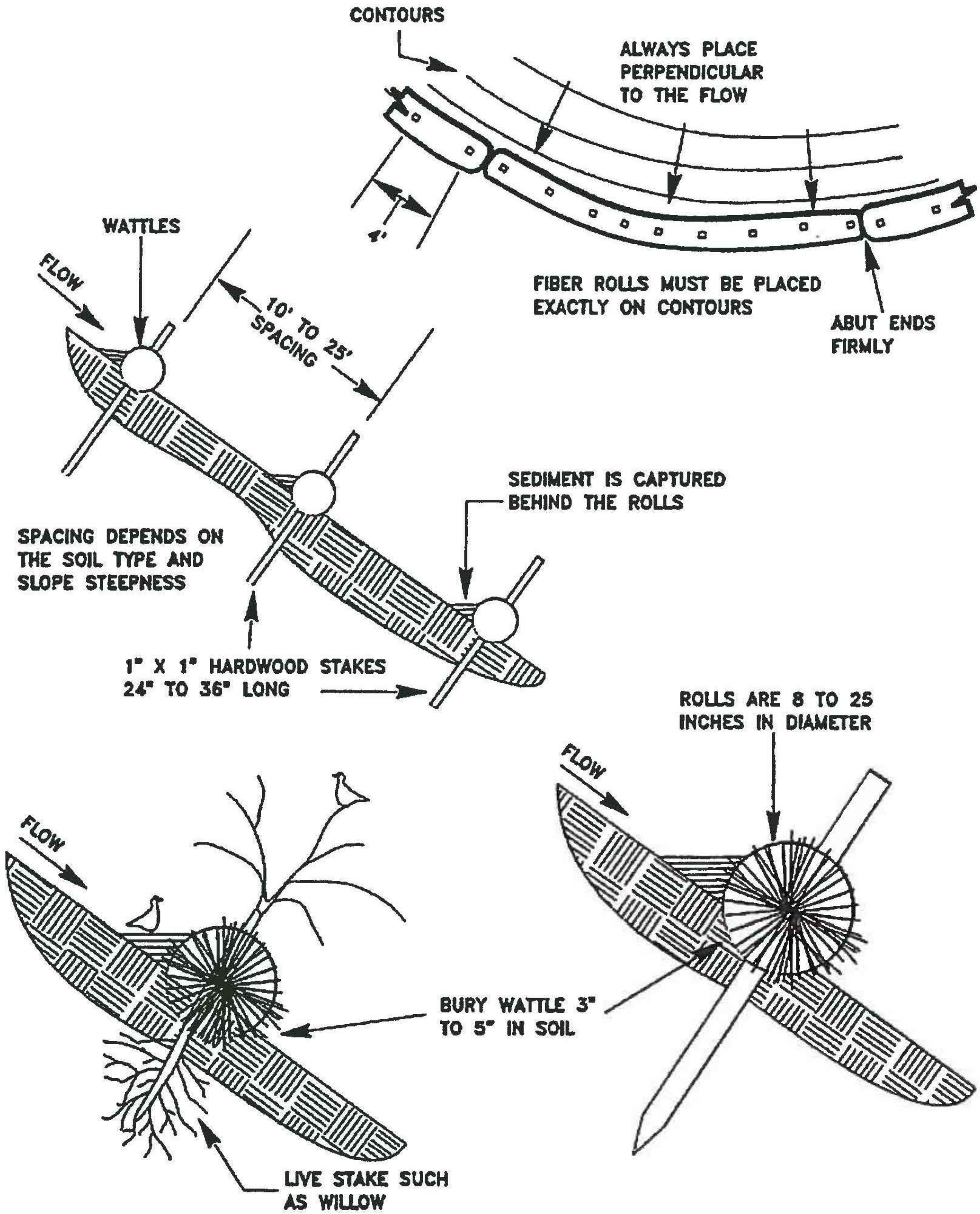


A–A' ROCK ARMOR ON STEEP SLOPE
N.T.S.

CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD	2017-02-28	TITLE ROCK ARMORING ON DISTRUBED SLOPES
	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	
	APPROVED	AQK	

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	3D

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
0 1 in



CLIENT	PROJECT
DOMINION	BIC/INCREMENTAL CONTROLS

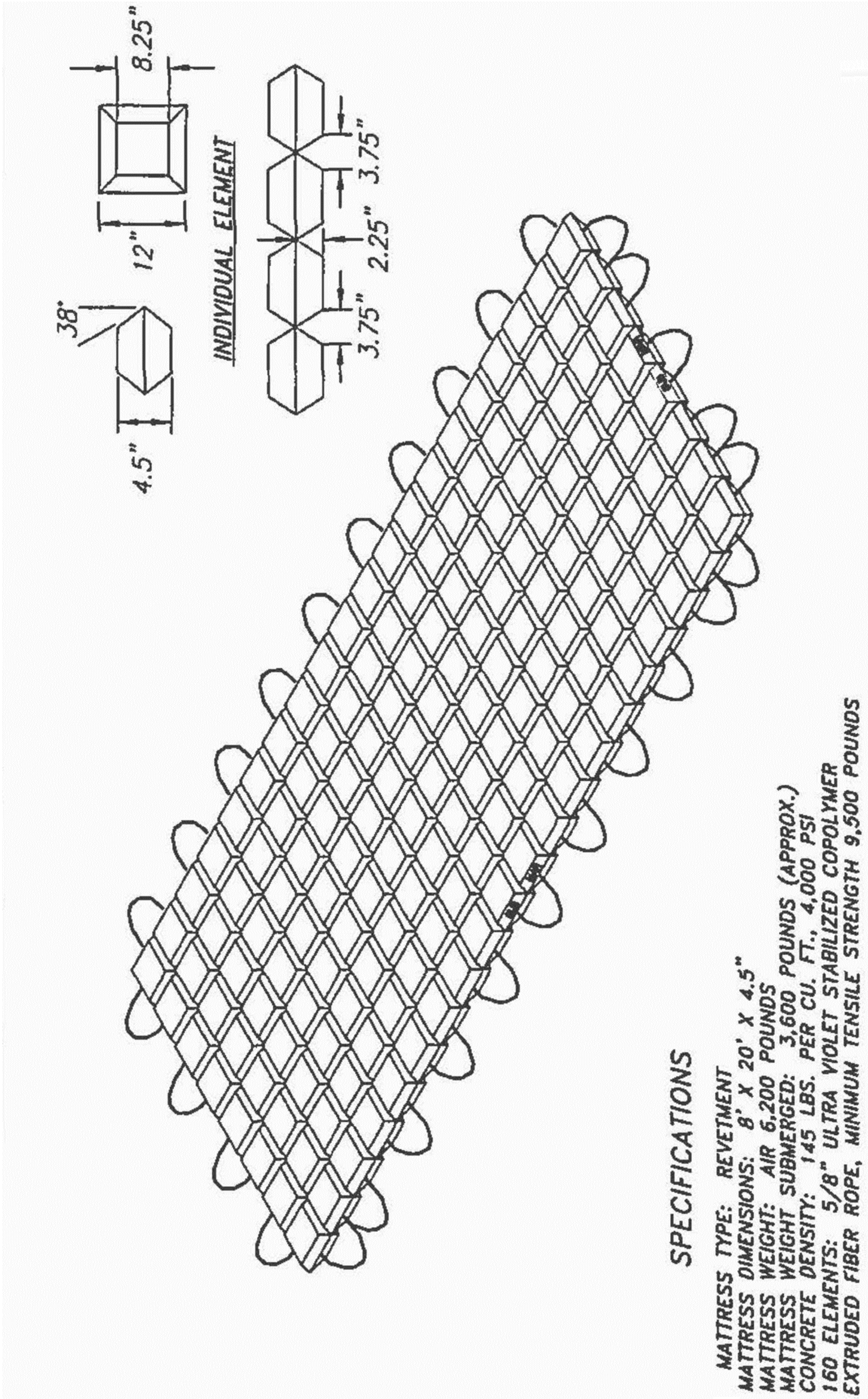
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
COIR LOGS ON DISTURBED SLOPES

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	3E



CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

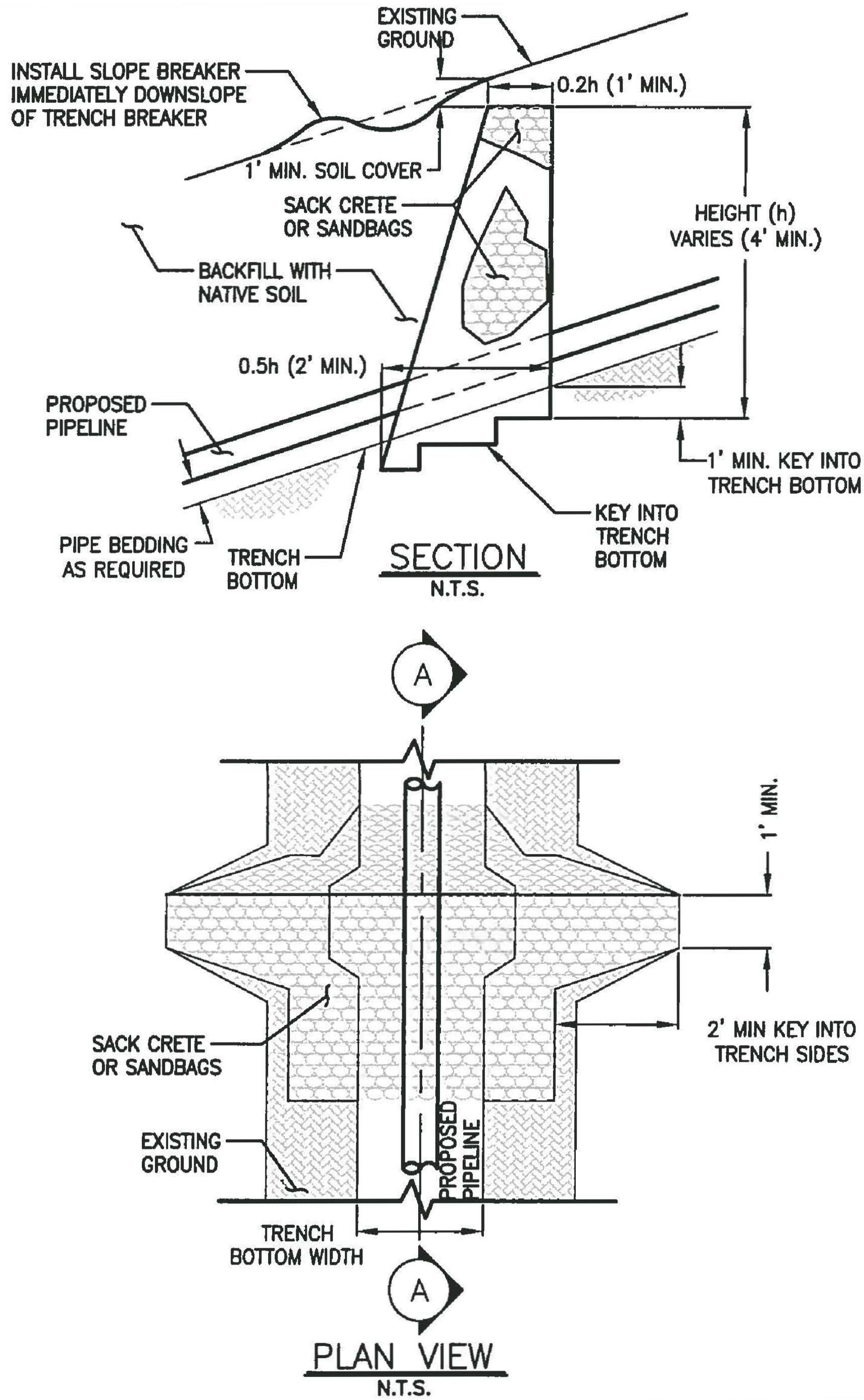
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

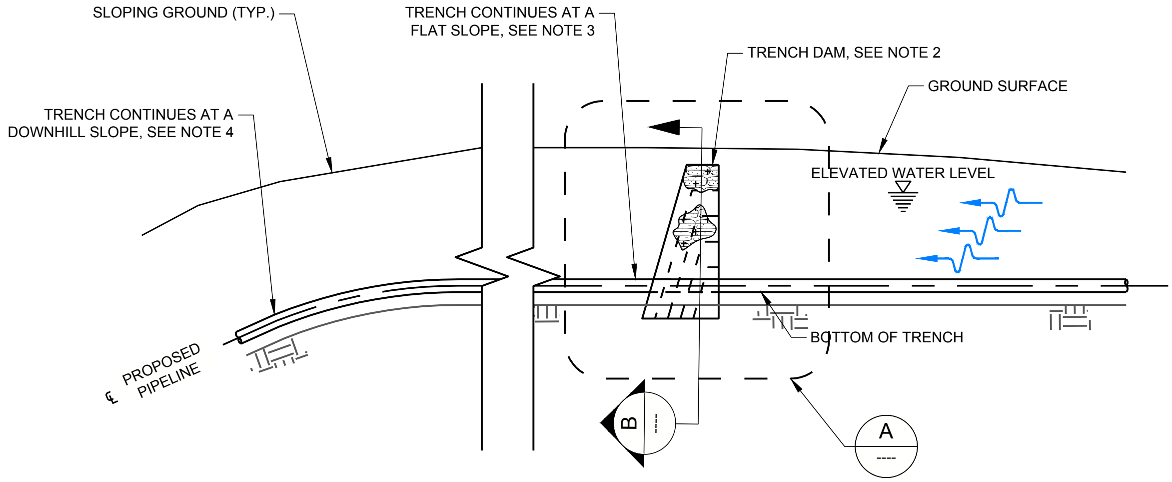
TITLE
SUBMAR MATTS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	3F

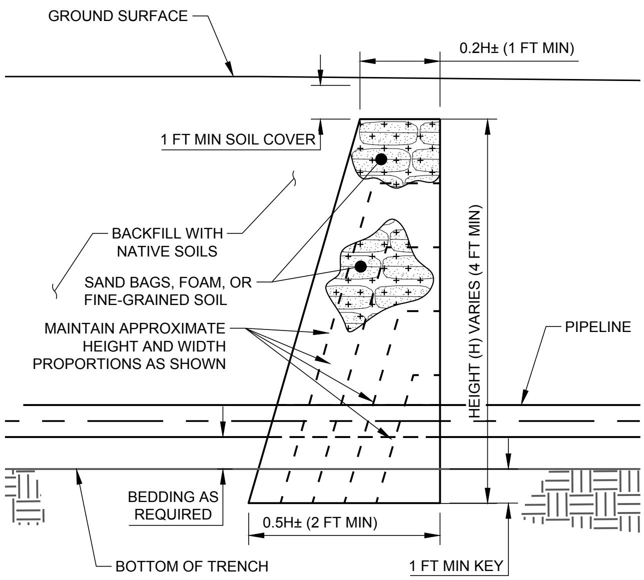


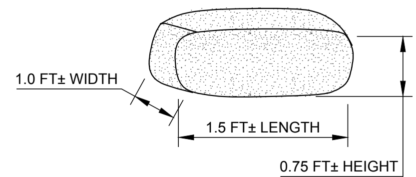
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD	2017-02-28	TITLE TRENCH BREAKERS (FOAM AND SANDBAGS)
	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	PROJECT No. 1535050 · PHASE 500 · Rev. F · FIGURE 4A
	APPROVED	AQK	

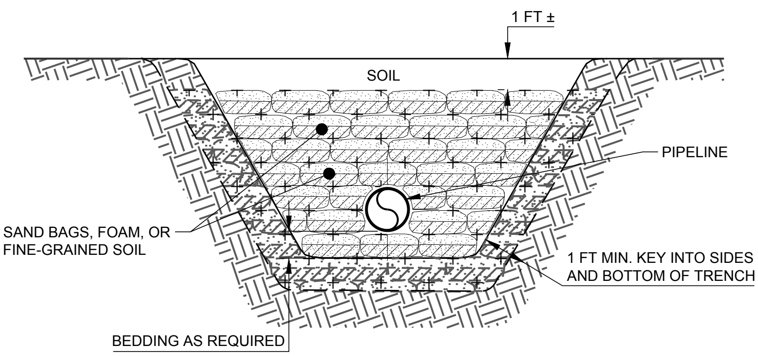


TRENCH DAM CONFIGURATION
N.T.S.





SAND BAG DETAIL
N.T.S.



N.T.S A ---- TRENCH DAM DETAIL

N.T.S B --- SECTION

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. THE PURPOSE AND INTENT OF TRENCH DAMS IS TO STOP THE FLOW OF WATER IN THE TRENCH WHERE ELEVATED WATER SURFACES MAY EXIST (SUCH AS STREAM CROSSINGS OR PONDED AREAS).
3. INSTALL TRENCH DAM IN LOW / FLAT TERRAIN AREAS THAT MAY HAVE ELEVATED WATER LEVELS. THE PURPOSE OF THE TRENCH DAM IS TO STOP FLOW OF WATER FROM RUNNING DOWN THE FLAT TRENCH.
4. INSTALL TRENCH DAM AT THE TOP OF SLOPES AT AREAS THAT MAY HAVE ELEVATED WATER LEVELS. THE PURPOSE OF THE TRENCH DAM IS TO STOP FLOW OF WATER FROM RUNNING DOWN THE TRENCH ON THE HILL SLOPE.
5. AT LOCATIONS WHERE DAMS ARE SPECIFIED ON DETAILS, PLANS OR AS DIRECTED BY COMPANY REPRESENTATIVE, SOFT PLUGS (UNEXCAVATED SECTIONS ALONG TRENCH-LINE) MAY BE LEFT IN PLACE TO PERFORM FUNCTION OF PERMANENT DAMS PRIOR TO PIPE PLACEMENT.
6. THE TRENCH SHALL BE DEWATERED THROUGH A SEDIMENT TRAP, FILTER BAG, OR DEWATERING STRUCTURE.
7. PERMANENT TRENCH DAMS SHALL BE INSTALLED BEFORE THE TRENCH IS BACKFILLED.
8. TRENCH PLUGS SHALL BE INSTALLED AT THE BANKS OF ALL PERENNIAL STREAM CROSSINGS IMMEDIATELY AFTER TRENCH EXCAVATION. THE PLUGS MAY BE TEMPORARILY REMOVED DURING PIPE PLACEMENT, BUT THEN REPLACED.
9. THE TRENCH SHALL BE DEWATERED THROUGH A SEDIMENT TRAP, FILTER BAG, OR DEWATERING STRUCTURE REFER TO TRENCH DEWATERING DETAIL (TWD).
10. PERMANENT TRENCH DAMS SHALL BE INSTALLED BEFORE THE TRENCH IS BACKFILLED.

CLIENT
DOMINION

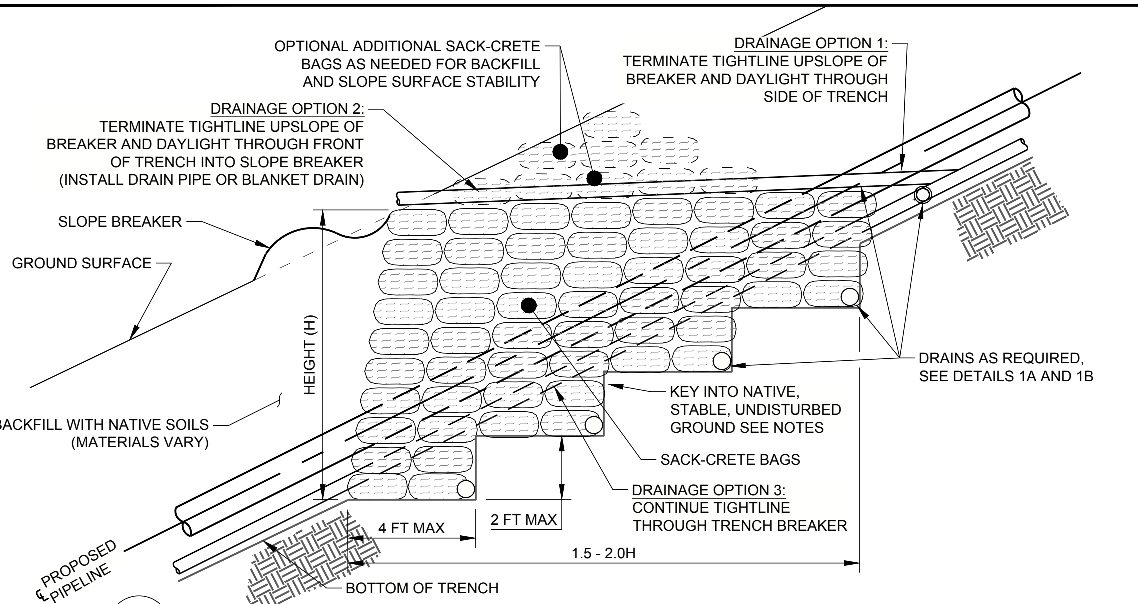
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

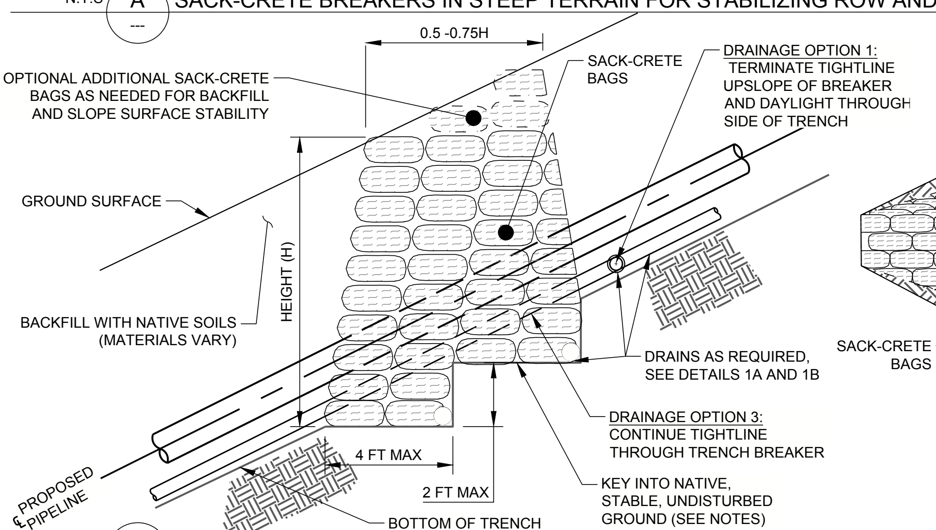
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TRENCH DAMS (FOAM, BAGS, OR FINE GRAINED SOILS)

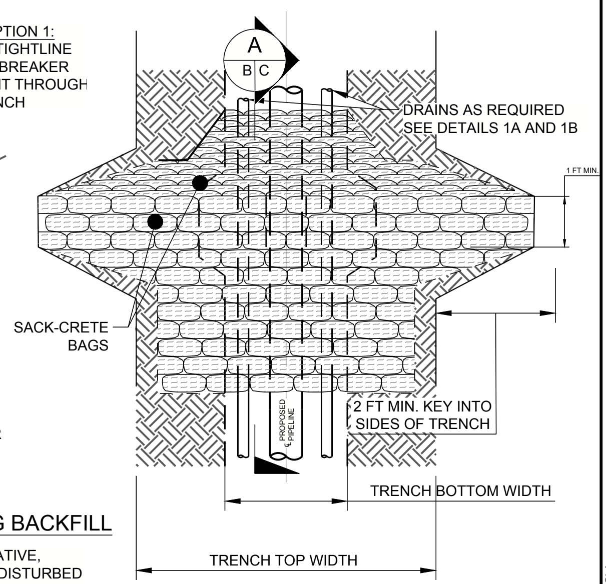
PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	4B



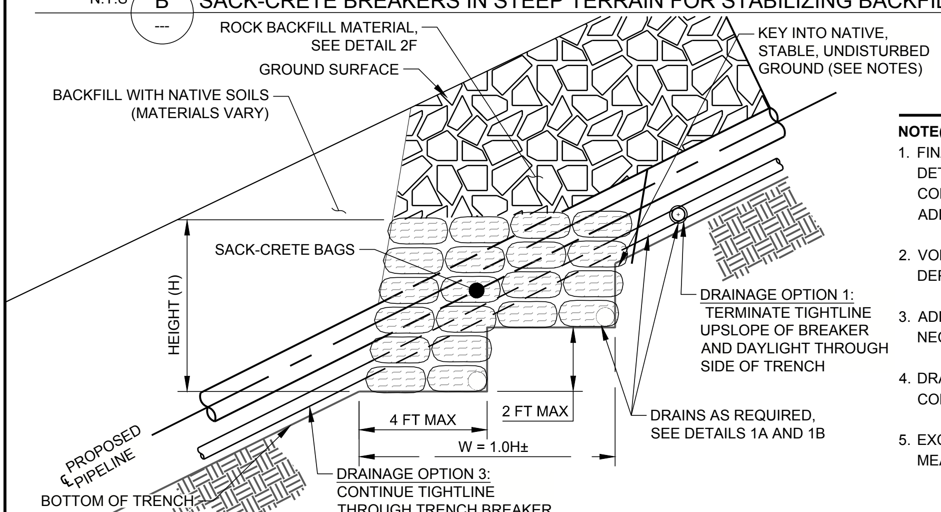
N.T.S A --- SACK-CRETE BREAKERS IN STEEP TERRAIN FOR STABILIZING ROW AND TRENCH BACKFILL



N.T.S B --- SACK-CRETE BREAKERS IN STEEP TERRAIN FOR STABILIZING BACKFILL



PLAN VIEW
N.T.S.



N.T.S C --- SACK-CRETE KEYWAY FOR ROCK BACKFILL IN STEEP TERRAIN

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.
3. ADD OR EXTEND KEYS OR PLACE ADDITIONAL SACK-CRETE BAGS AS NECESSARY TO MAINTAIN STABILITY.
4. DRAINAGE OPTION TO BE SELECTED AT THE TIME OF CONSTRUCTION BASED ON CONDITIONS ENCOUNTERED.
5. EXCAVATE KEY WITH OUTBOARD SLOPE, AND INCLUDE DRAINAGE MEASURES THAT EVACUATE ACCUMULATED SEEPAGE.

CLIENT
DOMINION

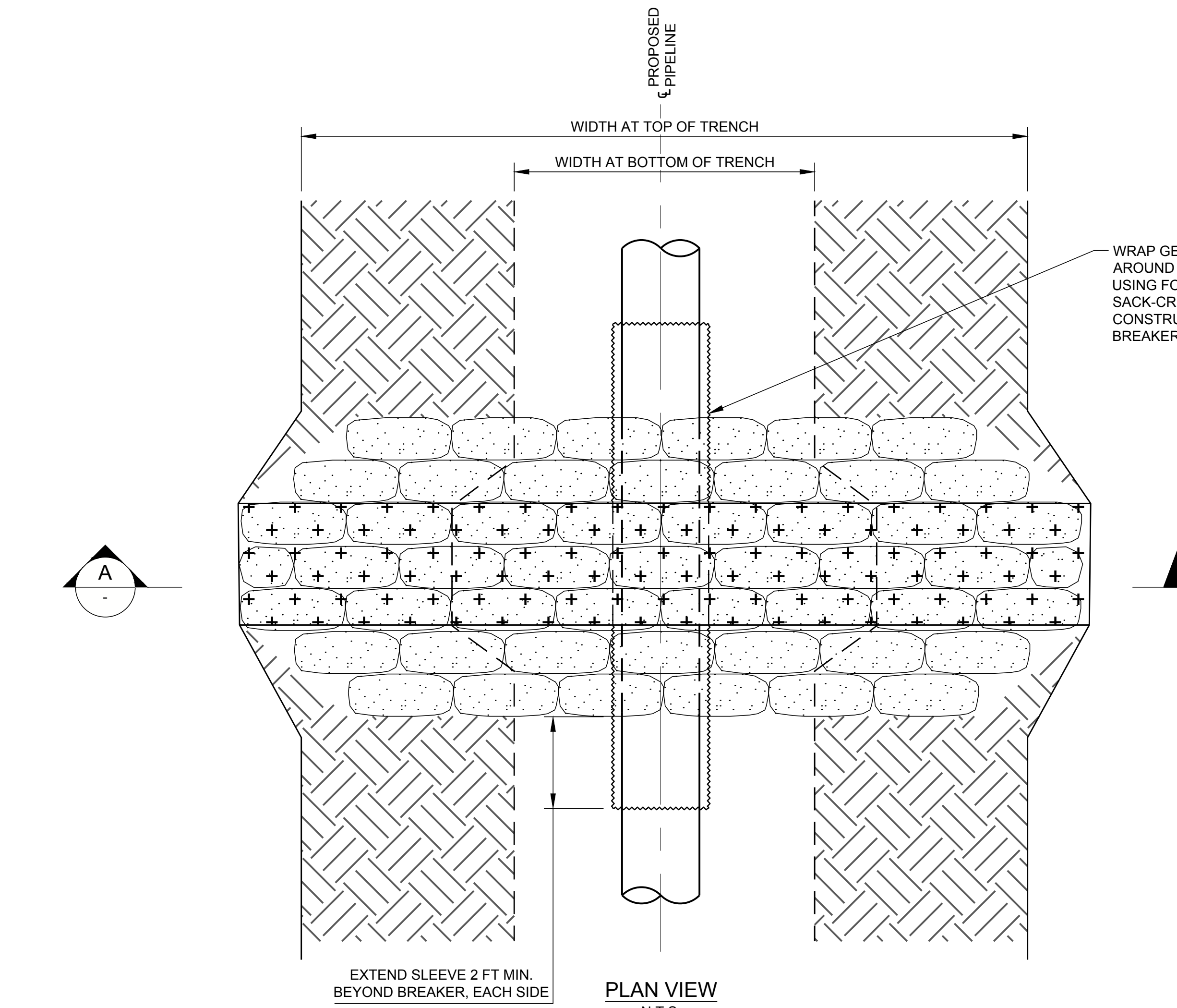
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

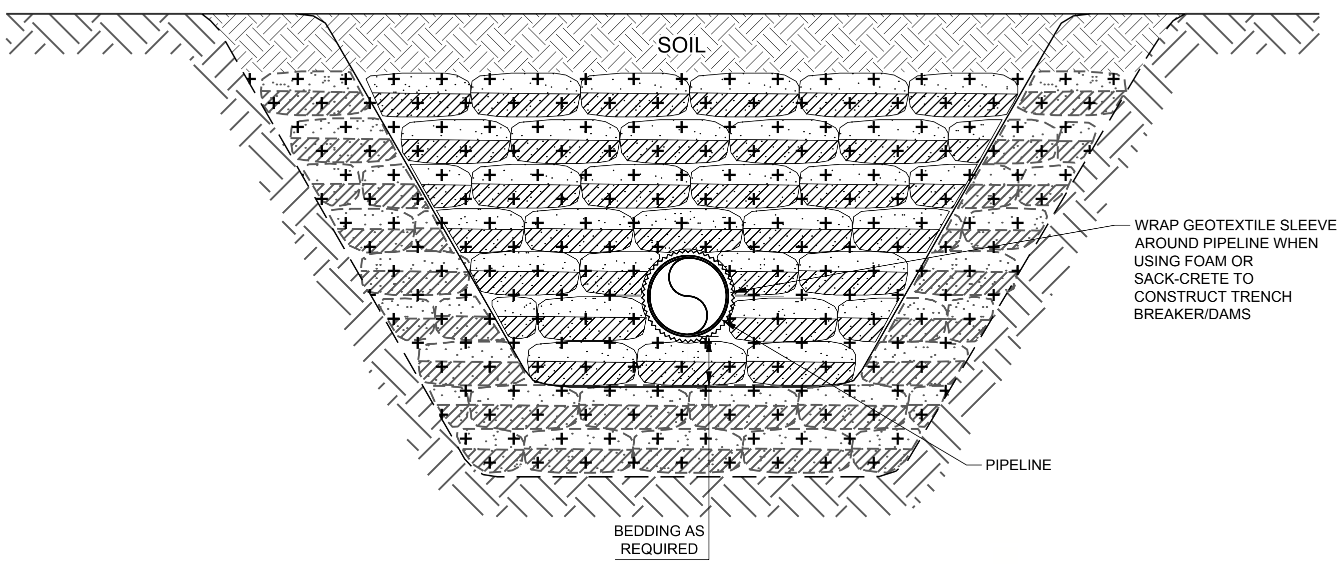
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SACK-CRETE BREAKERS (STRUCTURAL BREAKER)

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	4C



PLAN VIEW
N.T.S.



N.T.S A ELEVATION

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

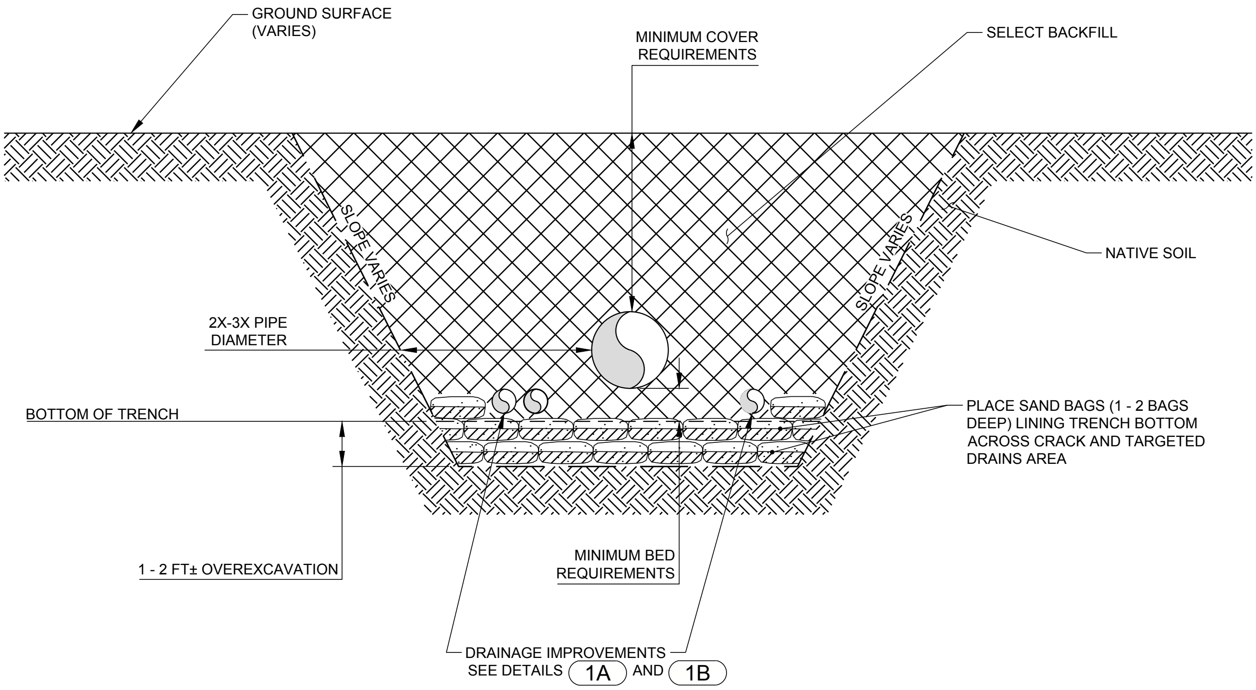
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SLEEVE INTERFACE BETWEEN PIPELINE AND BREAKER

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	4D



TYPICAL TRENCH SECTION WITH SEALED BOTTOM

SCALE: N.T.S.

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. MAINTAIN POSITIVE DRAINAGE IN TRENCH ACROSS AREAS SEALED WITH SANDBAGS, DRAINS SHOULD BE PLACED OVER THE SEAL. WATER SHOULD NOT POND BEHIND SEAL.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

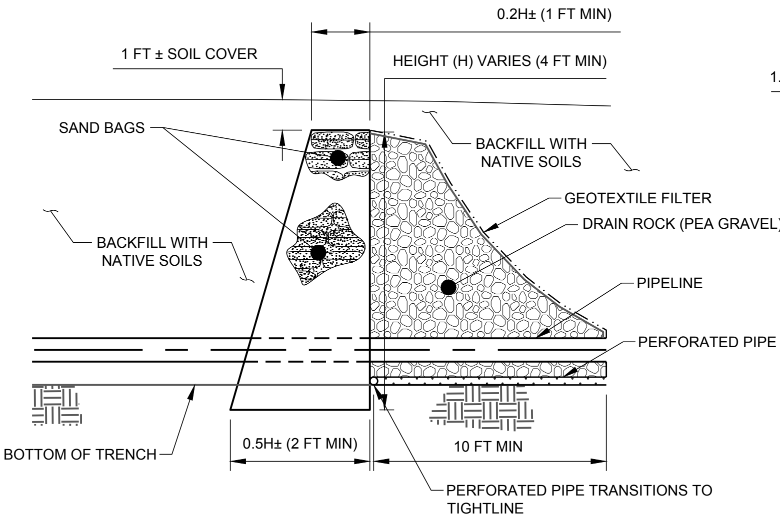
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

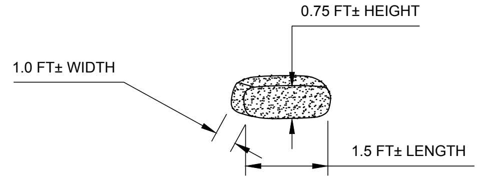
TITLE
SEAL BOTTOM OF TRENCH WITH SANDBAGS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	4E



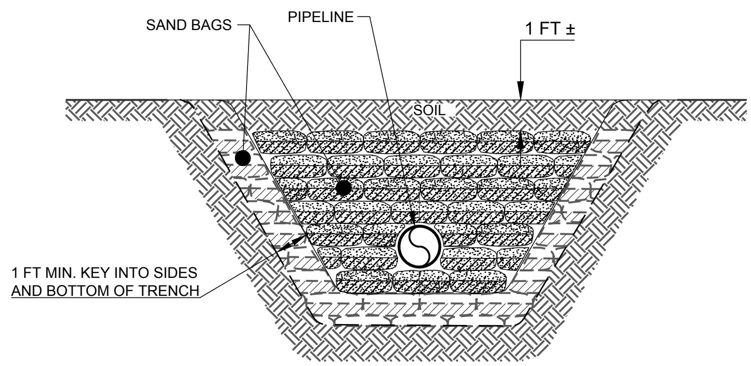
TRENCH BREAKER PROFILE VIEW

SCALE: N.T.S.



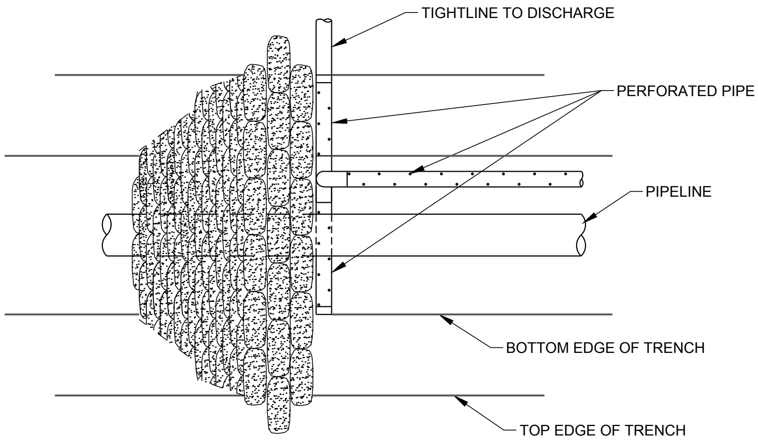
SAND BAG DETAIL

SCALE: N.T.S.



TRENCH BREAKER SECTION VIEW

SCALE: N.T.S.



TRENCH BREAKER PLAN VIEW

SCALE: N.T.S.

NOTE(S)

1. FINAL CONFIGURATION OF REPAIR TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.

CLIENT
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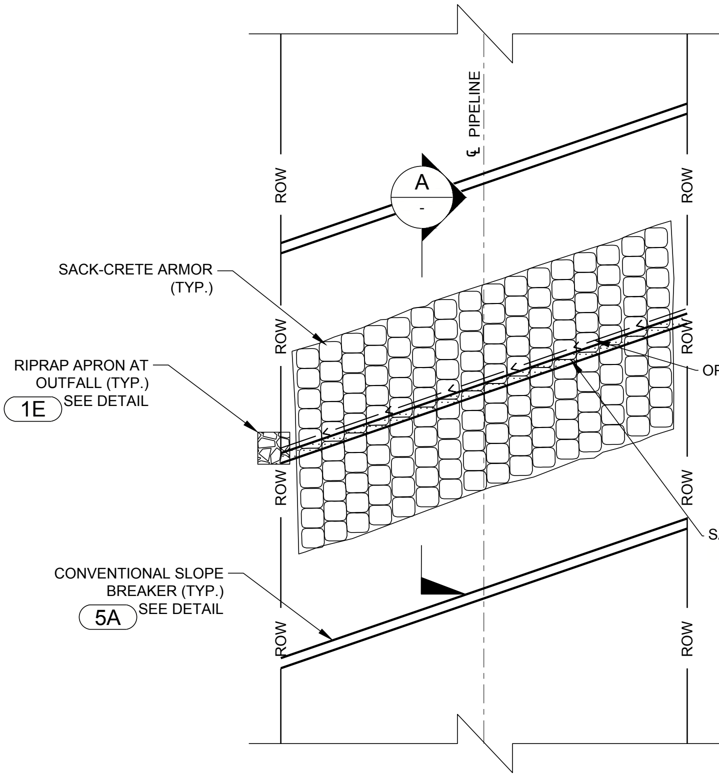
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

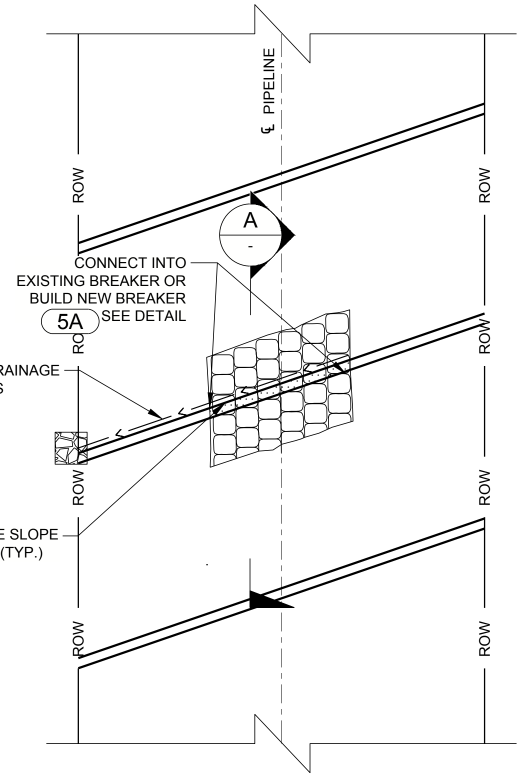
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TRENCH BREAKER WITH DRAINAGE

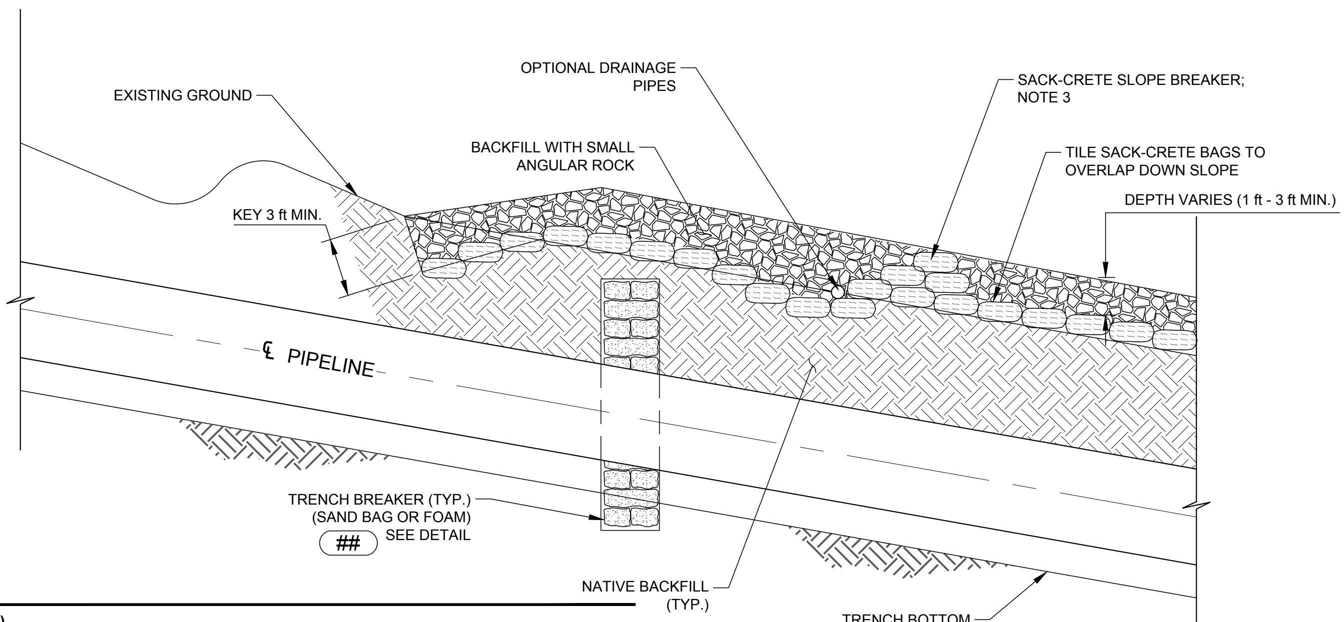
PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	4F



OPTION A - EXTEND FULL WIDTH OF ROW



OPTION B - TARGETED REPAIR AREA



A -- SECTION

NOTE(S)

1. FINAL CONFIGURATION OF REPAIR TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.

3. CONSTRUCT SLOPE BREAKER USING SACK-CRETE BAGS (1-4 HIGH) AND SLOPE ALONG ROW TO CONNECT TO EXISTING BREAKERS OR BUILD NEW BREAKERS TO INTERCEPT AND/OR DIVERT SURFACE RUNOFF TO TARGETED LOCATIONS.

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DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SACK-CRETE ARMOR WITH BREAKERS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	4G

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. FLOWABLE FILL IS A SELF-COMPACTING LOW STRENGTH MATERIAL WITH FLOWABLE CONSISTENCY THAT IS USED AS AN FILL OR BACKFILL MATERIAL AS AN ALTERNATIVE TO COMPACTED GRANULAR FILL (ACI 229R, AMERICAN CONCRETE INSTITUTE). FLOWABLE FILL IS NOT INTENDED AS A CONCRETE MATERIAL, HENCE THE LOW STRENGTH PARAMETERS.

3. REFER TO MANUFACTURER SPECIFICATIONS FOR DESIGN AND PLACEMENT, EXAMPLE TECHNICAL REFERENCES INCLUDE, BUT ARE NOT LIMITED TO: "RECOMMENDED GUIDE SPECIFICATION FOR CLSM (FLOWABLE FILL)", NRMCA 2PFFGS, NATIONAL READY MIXED CONCRETE ASSOCIATION; ASTM BOOK OF STANDARDS, VOLUMES 04.09 AND 04.02, AMERICAN SOCIETY FOR TESTING AND MATERIALS; "CONTROLLED LOW STRENGTH MATERIALS", ACP SP-150, "THE DESIGN AND APPLICATION OF CONTROLLED LOW STRENGTH MATERIALS (FLOWABLE FILL)", ASTM STP 1331, "CONTROLLED LOW-STRENGTH MATERIALS", AMERICAN CONCRETE INSTITUTE.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
FLOWABLE FILL FOR TRENCH BACKFILL

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	4H

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

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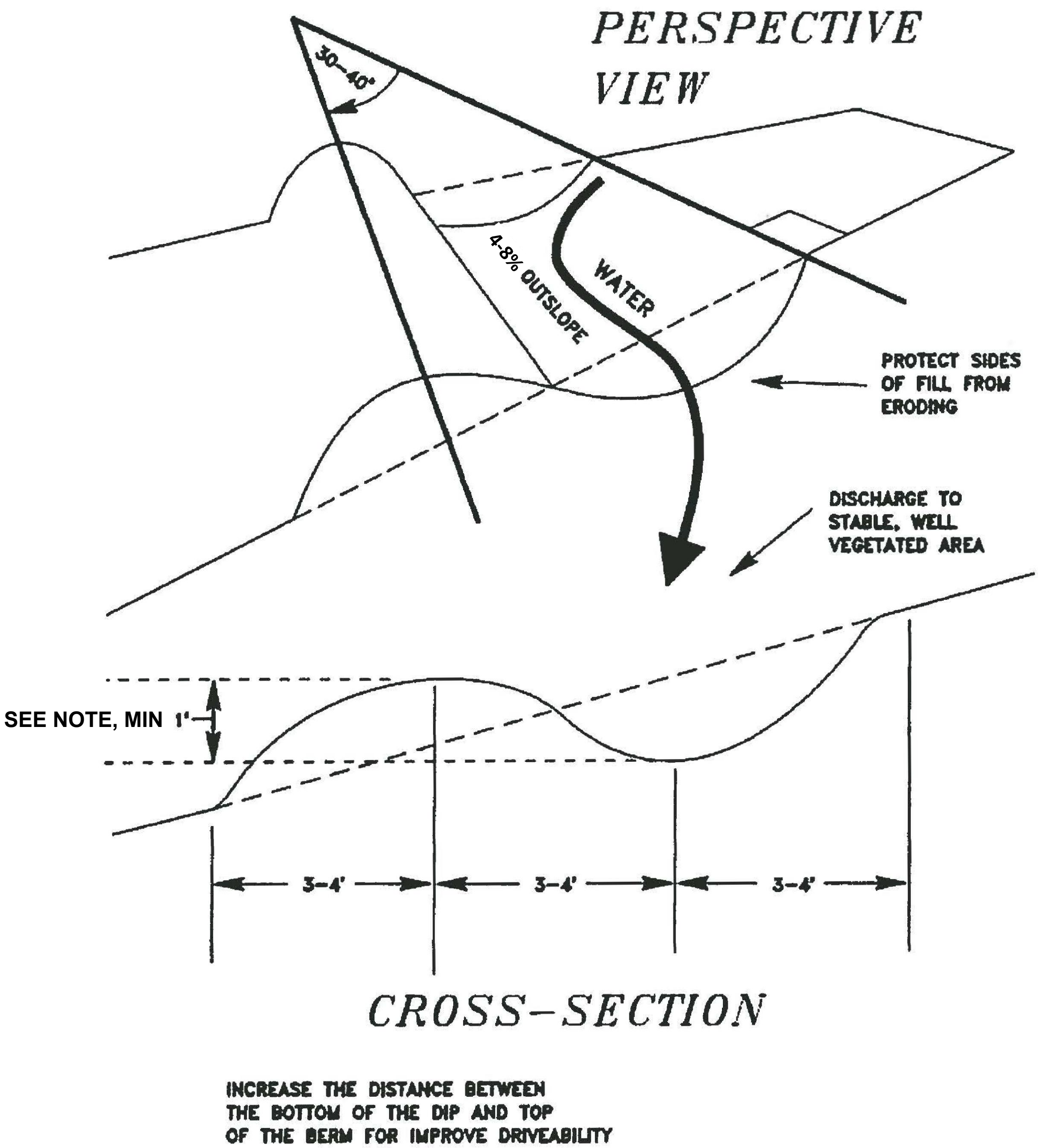
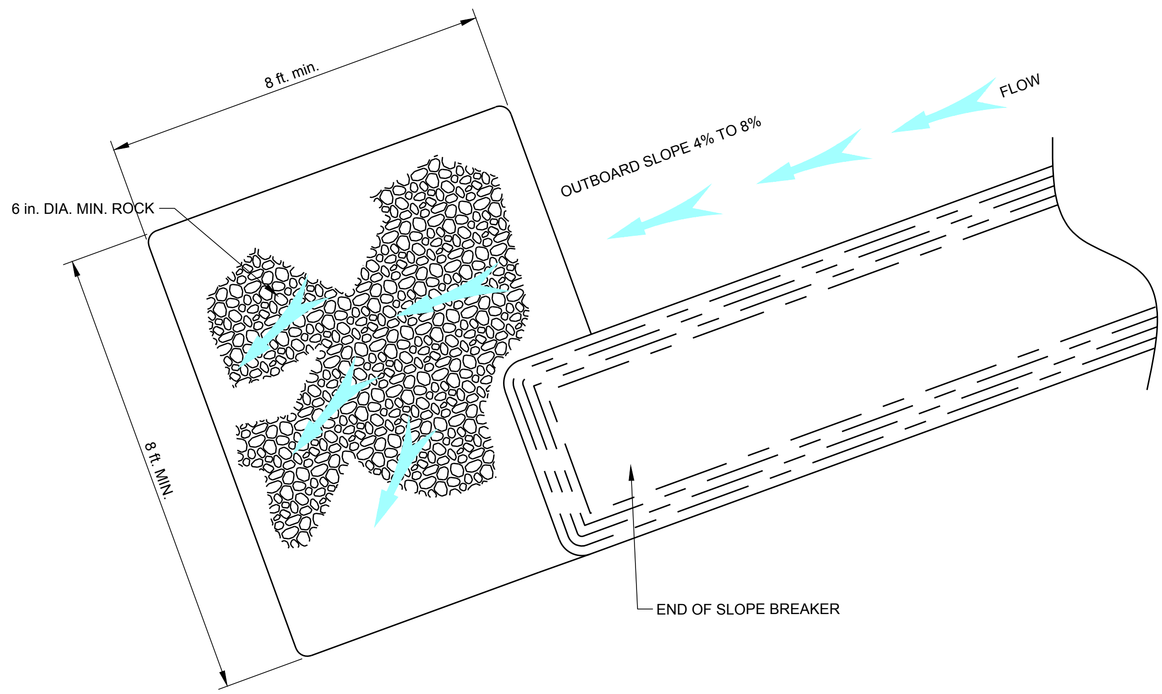


NOTE(S)

1. FINAL CONFIGURATION OF REPAIR TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION

2. DEPTH BETWEEN BOTTOM OF DIP AND TOP OF BERM MAY INCREASE, AS DIRECTED BY DOMINION.

CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT	YYYY-MM-DD: 2017-02-28	TITLE **SLOPE BREAKERS (TEMP AND PERMANENT)**	
	PREPARED: REDMOND		
Golder Associates	DESIGN: DBC		
	REVIEW: -	PROJECT No. 1535050	PHASE 500
	APPROVED: AQK	Rev. F	FIGURE 5A



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

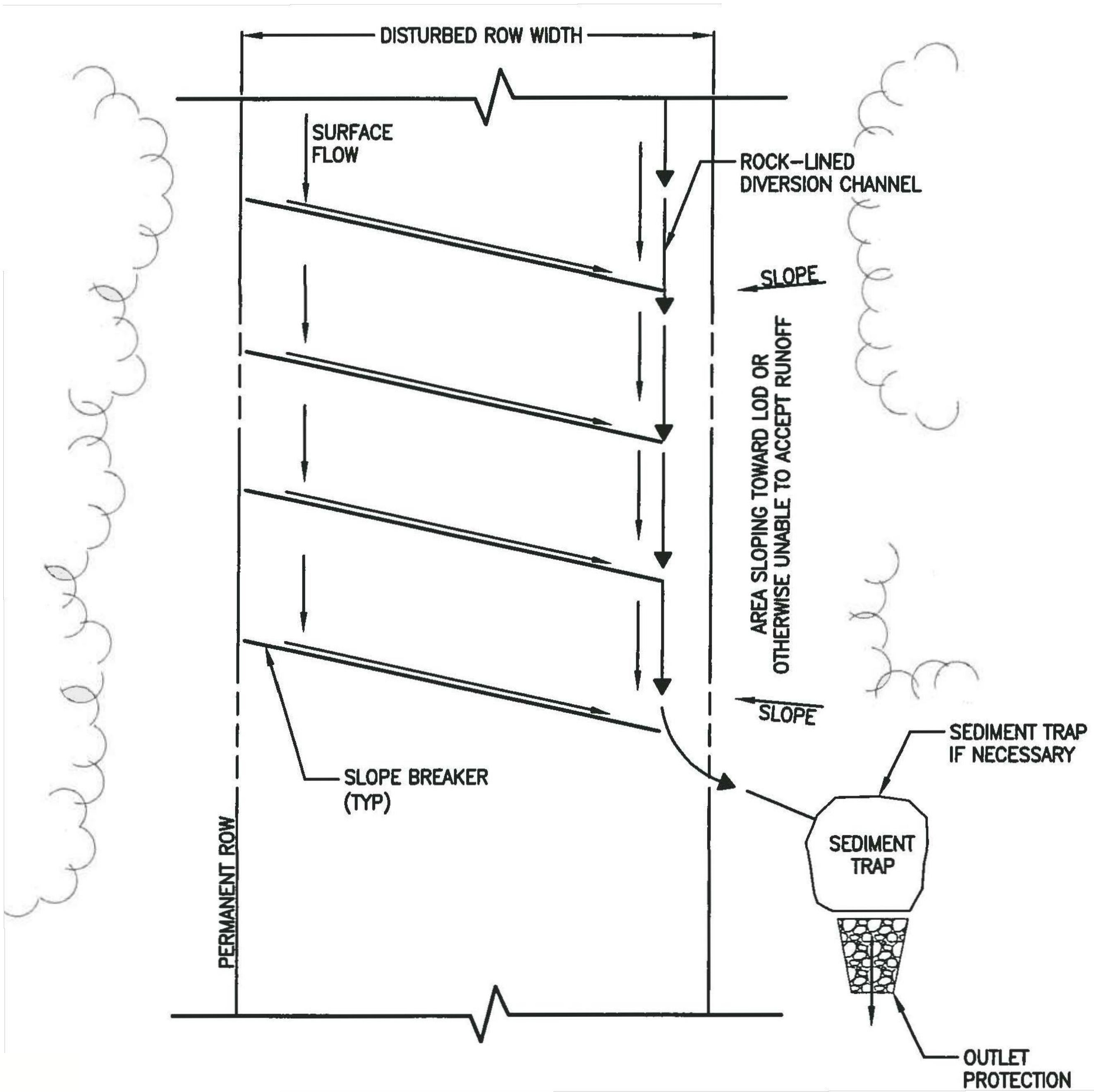
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SLOPE BREAKER ARMORED OUTLET

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	5B

0 1 in



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. CHANNEL(S) MAY REQUIRE STONE CHECK DAMS, EROSION CONTROL CLOTH, OR OTHER SITE SPECIFIC MITIGATION MEASURES, TO FIT SITE CONDITIONS.
3. SEDIMENT TRAP AND OUTLET PROTECTION REQUIRES SIZING.
4. DRAINS MAY BE ADDED TO THE UPSLOPE SIDE OF SLOPE BREAKERS (SEE BIC 1A) TO IMPROVE COLLECTION/CONVEYANCE OF FLOWS.
5. DIVERSION CHANNEL MAY BE ROCK LINED, EROSION CONTROL CLOTH LINED, OR VEGETATED TO FIT SITE CONDITIONS, AND MAY INCLUDE DRAINAGE PIPES TO IMPROVE COLLECTION/CONVEYANCE OF FLOWS (SEE BIC 1F OR 1H).

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SLOPE BREAKERS WITH DIVERSION CHANNELS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	5C

0 1 in

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. SPECIAL CARE AND CONSIDERATION IS REQUIRED TO CONSTRUCT DRAINAGE MEASURES FOR EXISTING, PERMANENT, AND TEMPORARY ACCESS ROADS ON A SITE-SPECIFIC BASIS. ACCESS ROADS MAY COLLECT RUNOFF FROM UPSLOPE AREAS AND DELIVER WATER TO THE ROW, PIPE TRENCH, OR TO OTHER GEOTECHNICAL, GEOLOGIC, OR HYDROTECHNICAL AREAS OF CONCERN. RECOMMENDED DRAINAGE MEASURES FOR ACCESS ROADS INCLUDE THE FOLLOWING:

A. DRAINAGE MEASURE MAY REQUIRE SITE SPECIFIC DESIGN WITH REGARD FOR SLOPE, DRAINAGE AREA, EROSION PROTECTION , DISCHARGE ARMORED PAD, CHECK DAMS, ETC.
B. INSTALL WATER BARS (I.E. SLOPE BREAKERS) EVERY 100-200 FEET ALONG THE ACCESS ROAD, PROVIDED THAT WATER IS NOT DISCHARGED ONTO OR ABOVE GEOTECHNICALLY SENSITIVE AREAS (LANDSLIDES, AREAS OF FILL, POTENTIALLY UNSTABLE SLOPES, ETC.) OR THE ROW.
C. INSTALL INBOARD SLOPES WITH BAR DITCH (LINED OR ARMORED AS NECESSARY) UPSLOPE OF GEOTECHNICALLY SENSITIVE AREAS AND/OR THE ROW TO CONVEY WATER TO A STABLE DISCHARGE POINT.
D. INSTALL FRENCH DRAINS AS NEEDED TO COLLECT WATER IN AREAS WHERE WATER BARS AND BAR DITCHES CAN NOT BE USED OR WOULD RESULT IN DIRECTING WATER INTO THE ROW OR PIPE TRENCH. FRENCH DRAINS SHOULD CONVEY COLLECTED WATER IN A TIGHTLINE (SOLID WALL PIPE) TO A STABLE DISCHARGE POINT.
E. INSTALL EROSION PROTECTION FOR CONCENTRATED FLOWS AND DISCHARGE POINTS/OUTLETS AS NECESSARY (I.E. CHANNEL LINING, RIPRAP APRON, ETC.).
F. DO NOT ALLOW WATER DELIVERED FROM ACCESS ROADS TO CROSS OR ENTER THE PIPE TRENCH.
G. SPECIAL STUDY MAY BE REQUIRED FOR COMPLEX SITES OR AREAS OF CONCERN.

3. CHANGES IN THE FINAL GRADING MAY BE NEEDED TO ADDRESS SPECIFIC TARGETED GEOTECHNICAL OR HYDROTECHNICAL OR GEOLOGIC ENGINEERING ISSUES (I.E. CORRECT DRAINAGE PROBLEMS, MINIMIZE DELIVERY OF WATER TO LANDSLIDE SITES, ETC.)

4. FINAL GRADING TO BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO COMPLETION.

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

0

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

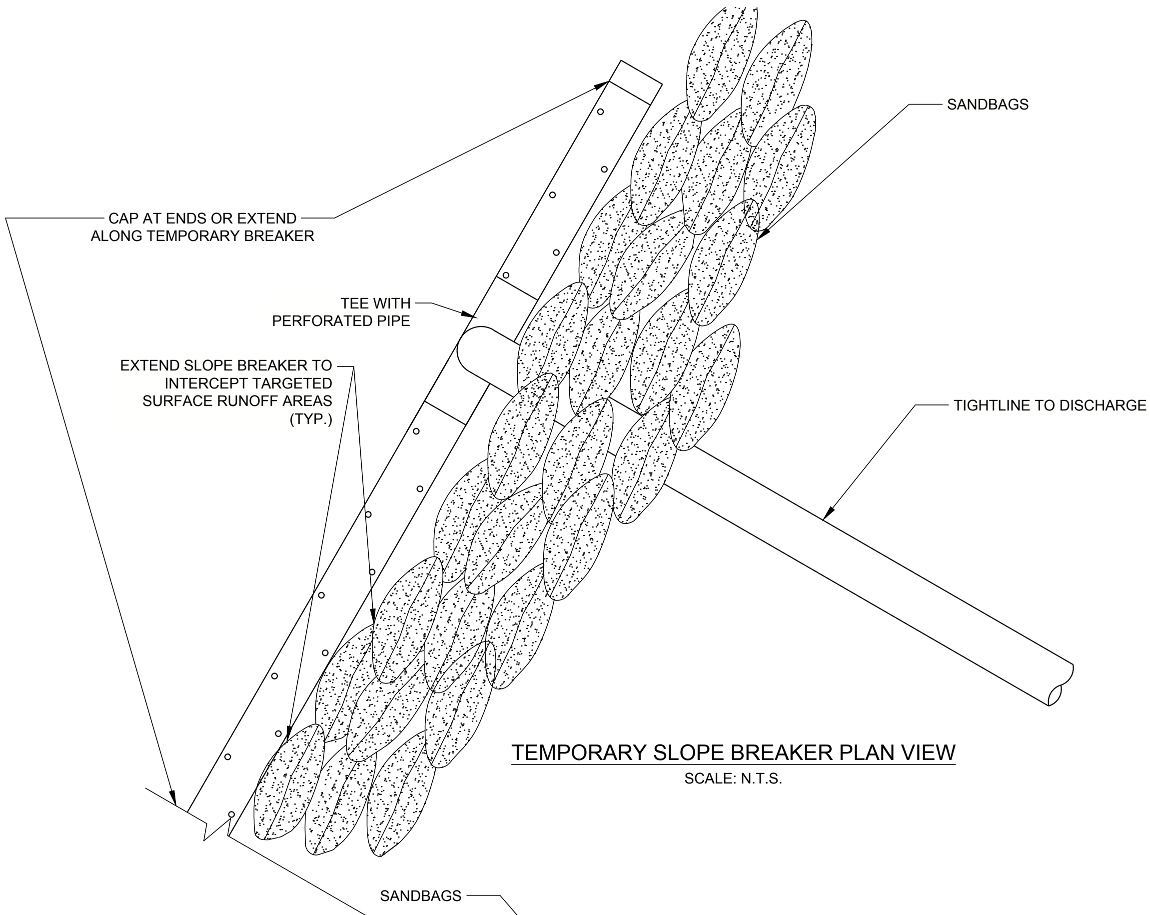
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

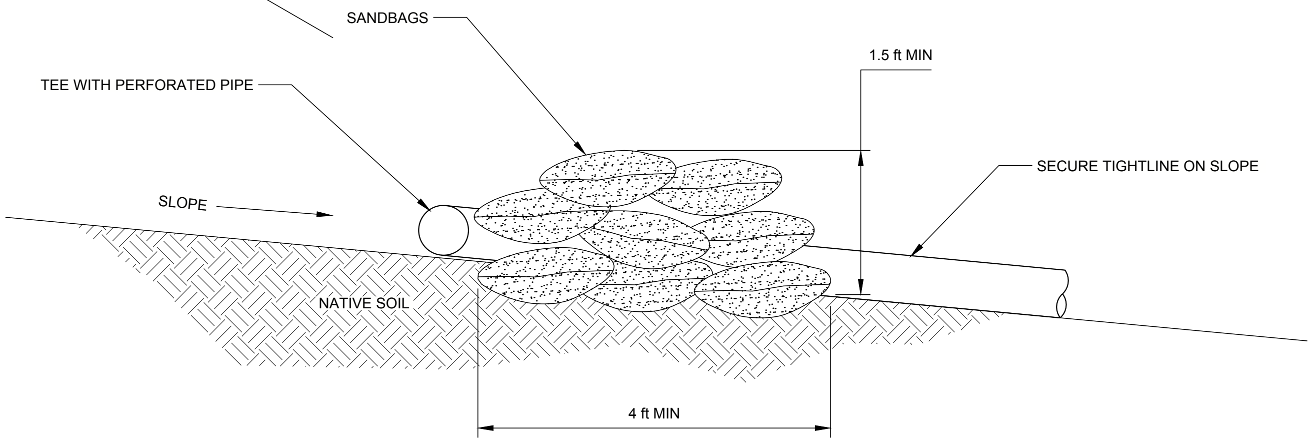
TITLE
ACCESS ROADS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	5D



TEMPORARY SLOPE BREAKER PLAN VIEW

SCALE: N.T.S.



TEMPORARY SLOPE BREAKER PROFILE VIEW

SCALE: N.T.S.

NOTE(S)

1. FINAL CONFIGURATION OF REPAIR TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

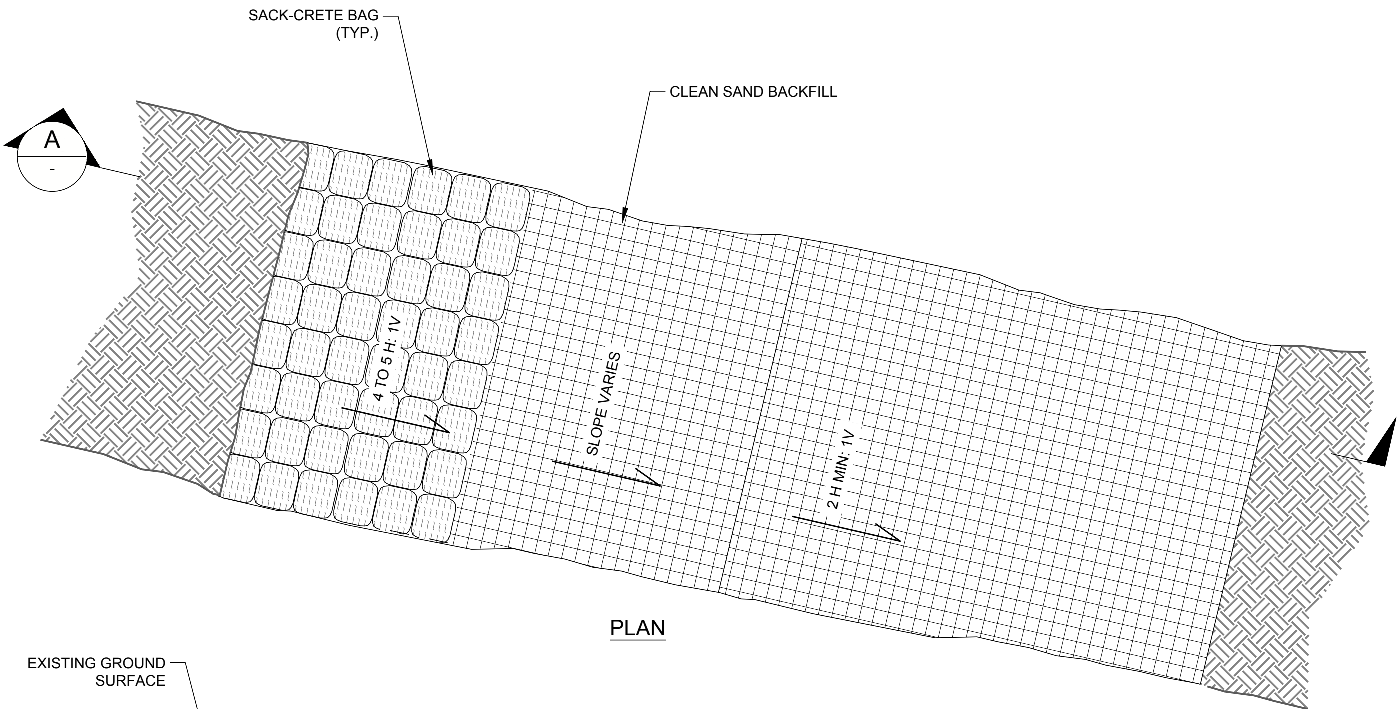
CONSULTANT

Golder Associates

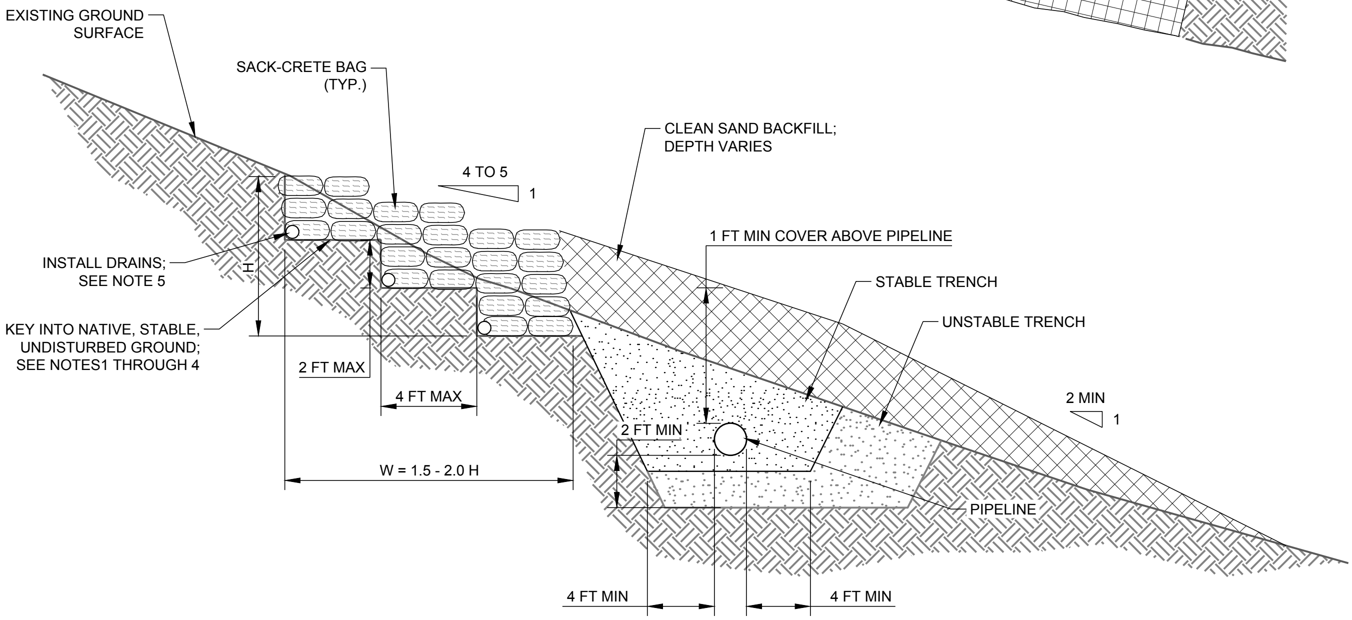
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TEMPORARY SLOPE BREAKER WITH DRAIN PIPE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	5E



PLAN



NOTE(S)

1. FINAL CONFIGURATION OF REPAIR TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.

3. ADD OR EXTEND KEYS OR PLACE ADDITIONAL SACK-CRETE BAGS AS NECESSARY TO MAINTAIN STABILITY.

4. EXCAVATE KEY WITH OUTBOARD SLOPE, AND INCLUDE DRAINAGE MEASURES THAT EVACUATE ACCUMULATED SEEPAGE.

5. DRAINAGE OPTION AND CONFIGURATION TO BE SELECTED AT THE TIME OF CONSTRUCTION BASED ON CONDITIONS ENCOUNTERED. CONSTRUCT DISCHARGE OUTFALL AT A LOCATION THAT DOES NOT IMPACT SITE CONDITIONS (LOCATION WITH POSITIVE DRAINAGE FROM THE ROW AND LANDSLIDE / POTENTIALLY UNSTABLE AREAS).

A
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SECTION

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SACK-CRETE WEDGE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	5F

NOTE(S)

1. FINAL CONFIGURATION OF REPAIR TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. NO WOOD CHIPS OR GROUND-UP WOODY/ORGANIC DEBRIS, OR SIMILAR IS ALLOWED TO BE PLACED OR SPREAD ON THE ROW, UNLESS DIRECTED BY DOMINION.

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

0

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

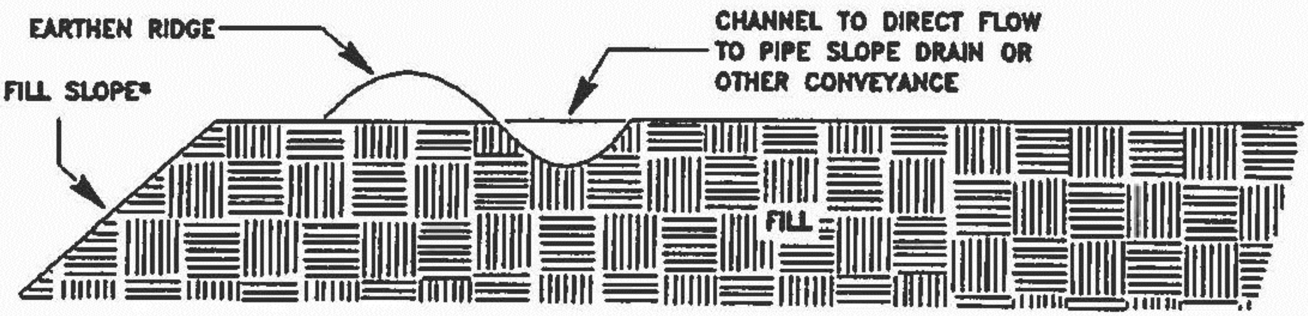
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

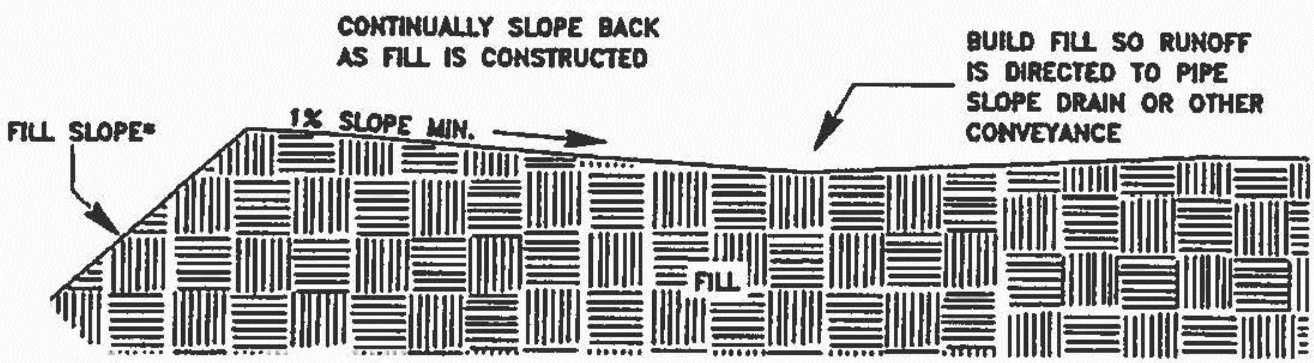
TITLE
NO WOOD CHIPS IN ROW

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	5G



TEMPORARY BERM

*SEED AND MULCH FILL SLOPE EVERY 10 FEET OF FILL OR EVERY 7 DAYS, WHICHEVER COMES FIRST



GRADING

CLIENT	DOMINION
PROJECT	BIC/INCREMENTAL CONTROLS
CONSULTANT	Golder Associates
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK
TITLE	SURFACE WATER DIVERSIONS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	5H

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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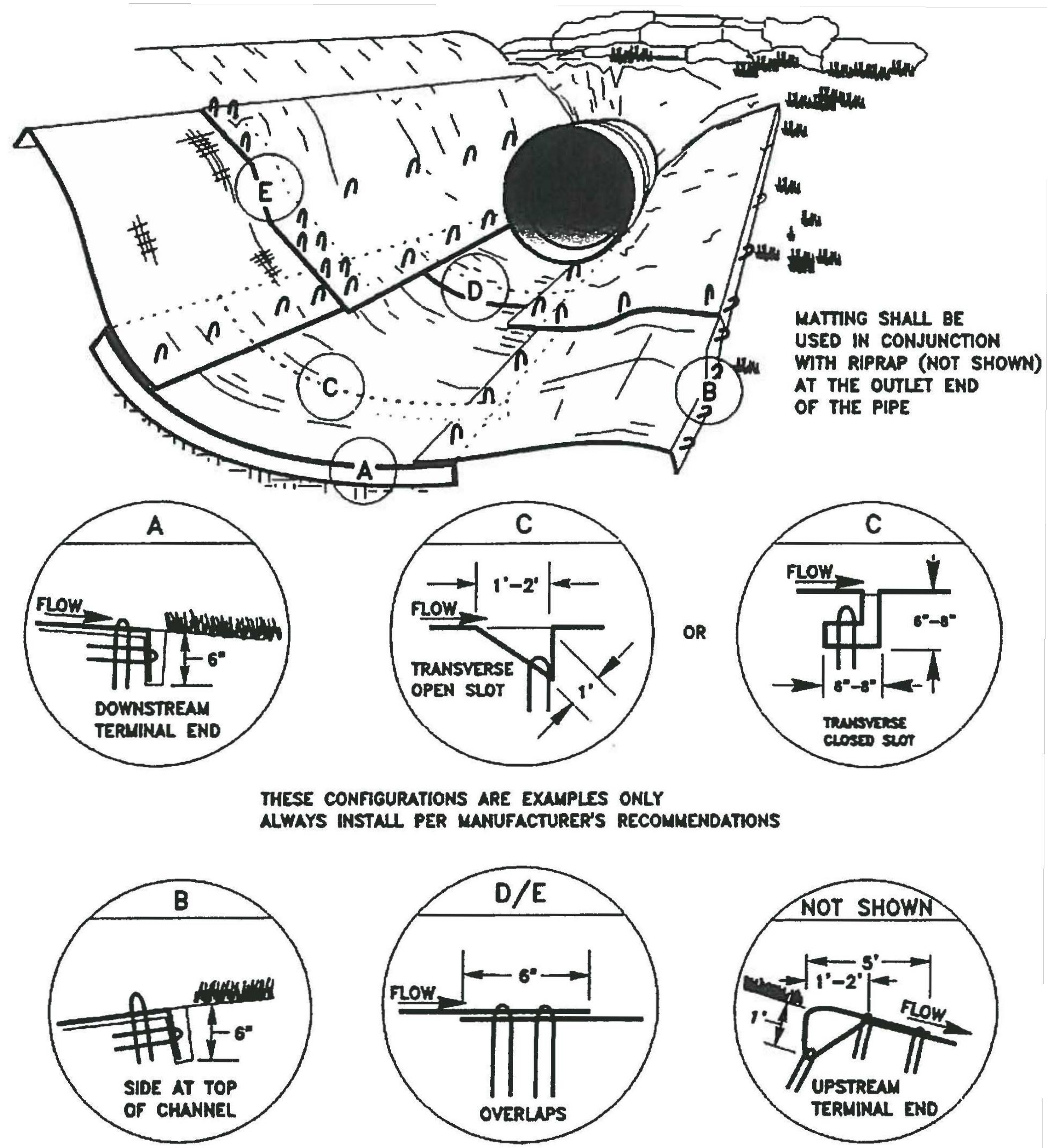
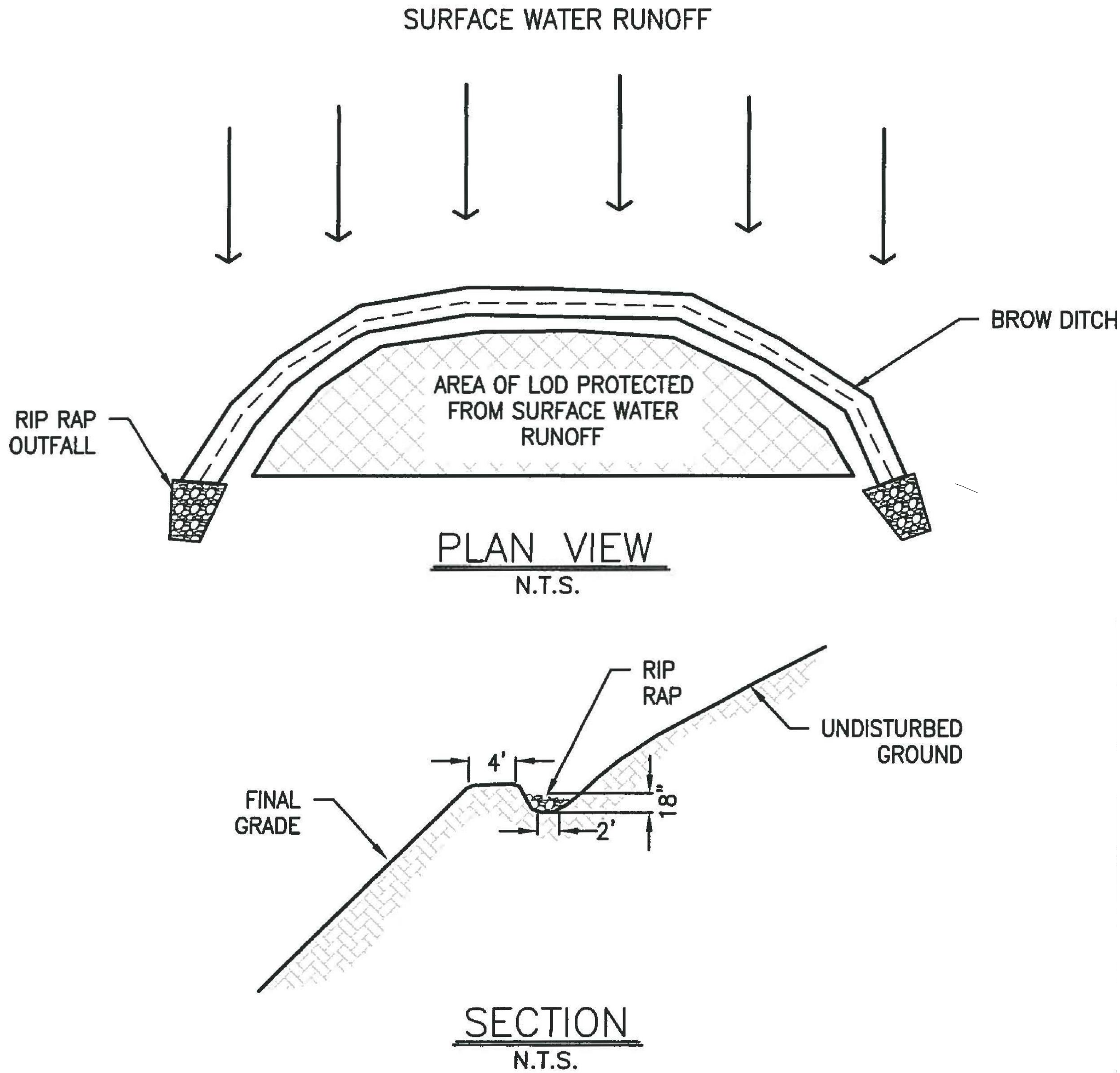


CLIENT DOMINION	PROJECT BIC/INCREMENTAL CONTROLS

CONSULTANT			TITLE
Golder Associates	YYYY-MM-DD	2017-02-28	COIR-LINED VEGETATED DIVERSION CHANNEL
	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	
	APPROVED	AQK	

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	6A



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

CLIENT DOMINION	PROJECT BIC/INCREMENTAL CONTROLS

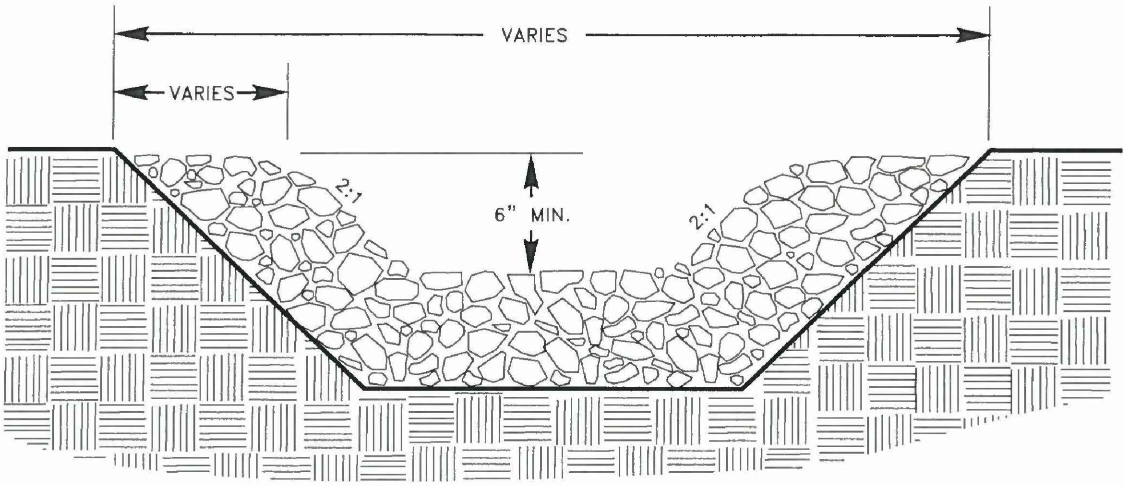
CONSULTANT

Golder Associates

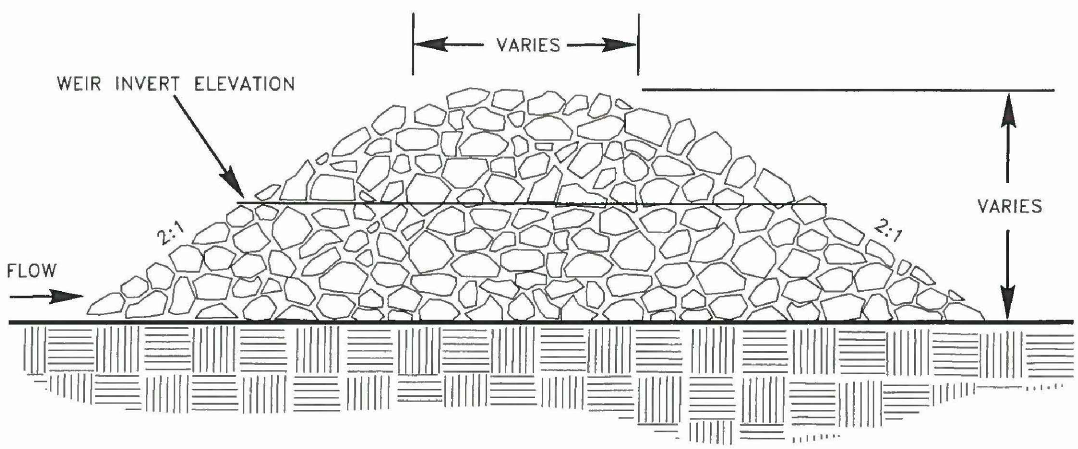
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
BROW DITCH

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	6B



ELEVATION



CROSS SECTION

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

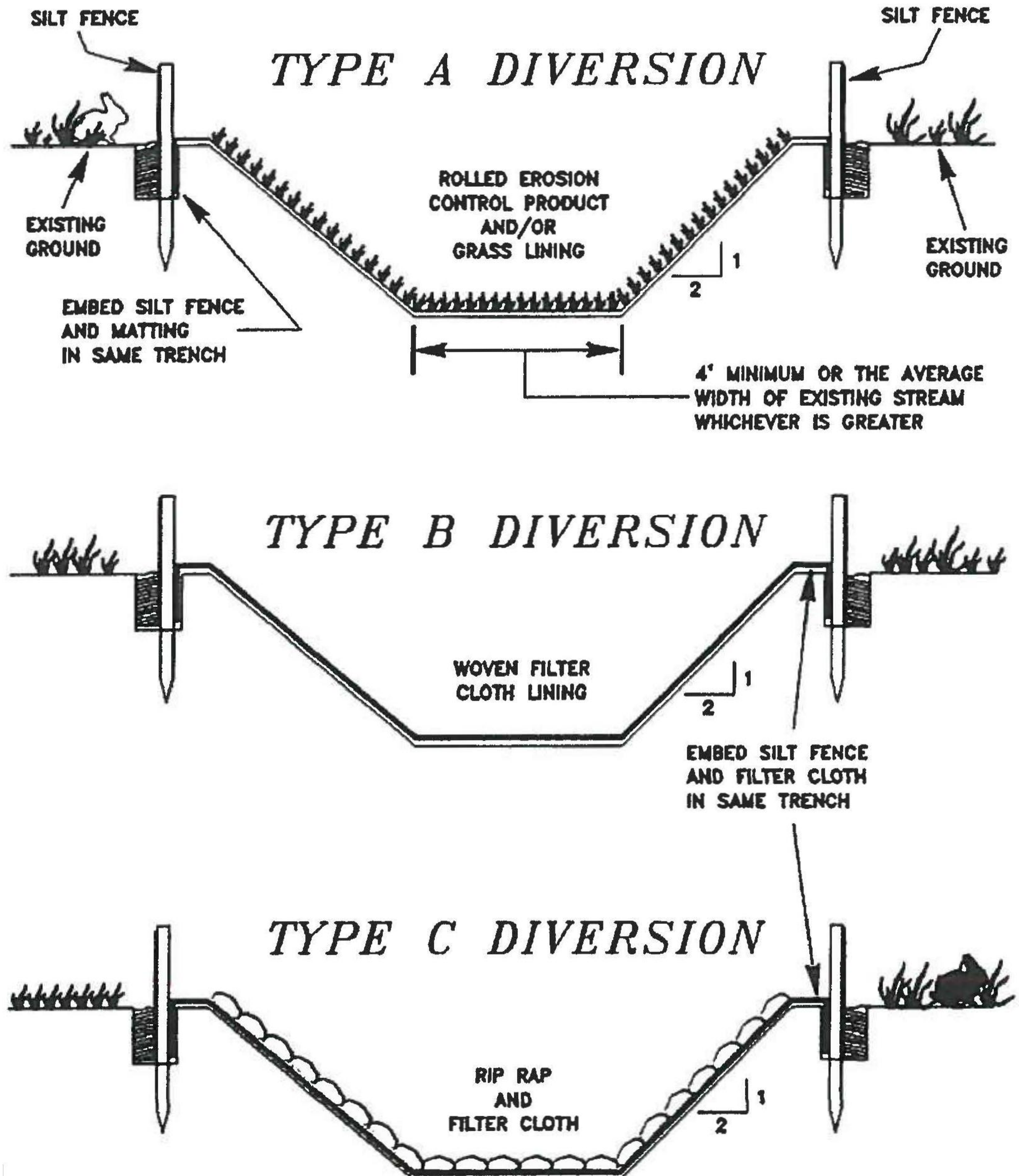
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
ROCK FILTER IN TRENCH

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	6C



CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD	2017-02-28	TITLE ARMORED CHANNEL
	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	
	APPROVED	AQK	

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	6D

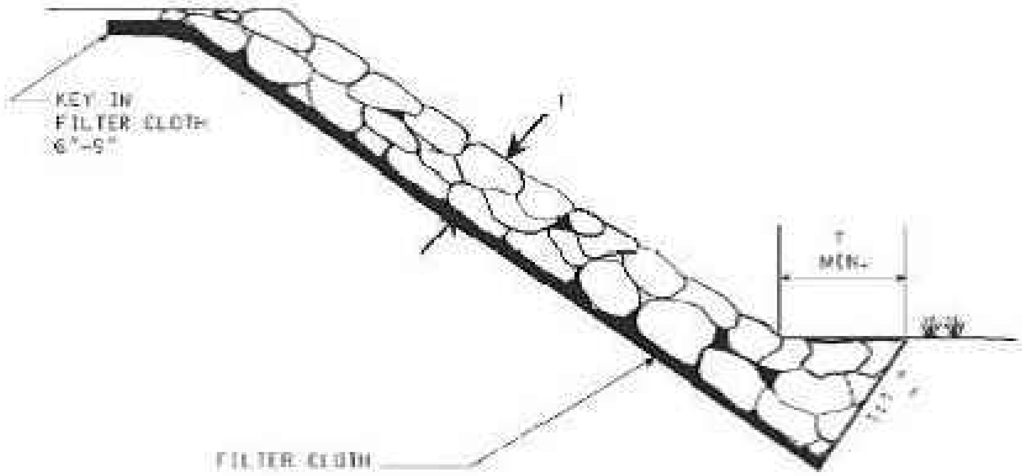
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

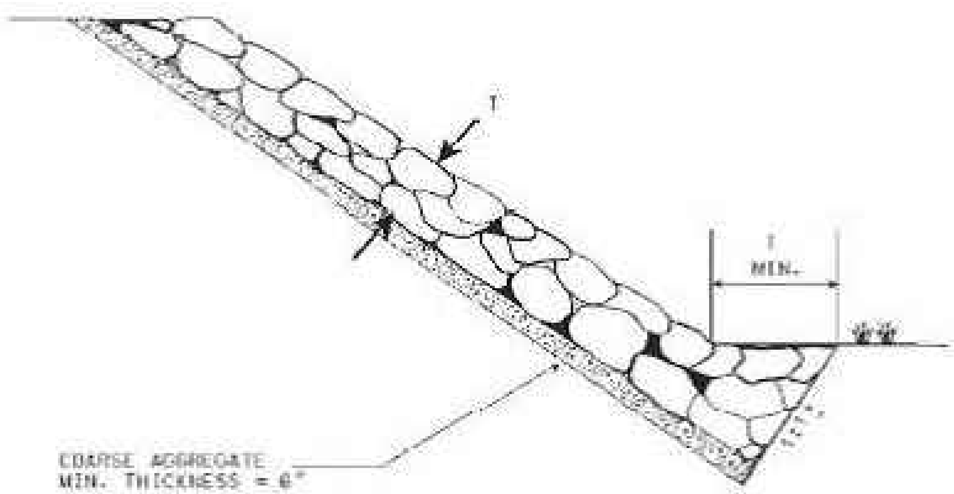
0

FILTER CLOTH UNDERLINER

(PREFERRED)



GRANULAR FILTER



CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT	YYYY-MM-DD	2017-02-28	TITLE **TYP BANK ARMORING**
	PREPARED	REDMOND	
	DESIGN	DBC	
Golder Associates	REVIEW	-	PROJECT No. 1535050 · PHASE 500 · Rev. F · FIGURE 6E
	APPROVED	AQK	

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. REFER TO THE FOLLOWING FOR EXAMPLE RIPRAP SPECIFICATIONS:

NSA No.	GRADING ROCK SIZE (INCHES)			FILTER BLANKET REQUIEMENTS		VMAX (ft./SEC.)
	MAX.	d_{50}	MIN.	SIZE NSA NO.	PLACEMENT THICKNESS	
R-1	1.5	0.75	NO.8	FS-1	N/A	2.5
R-2	3	1.5	NO.1	FS-1	N/A	4.5
R-3	6	3	NO.2	FS-1	3	6.5
R-4	12	6	NO.3	FS-2	4	9
R-5	18	9	NO.5	FS-2	6	11.5
R-6	24	12	NO.7	FS-3	8	13
R-7	30	15	NO.12	FS-3	10	14.5

3. FINAL RIPRAP SPECIFICATIONS AS DIRECTED BY DOMINION.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

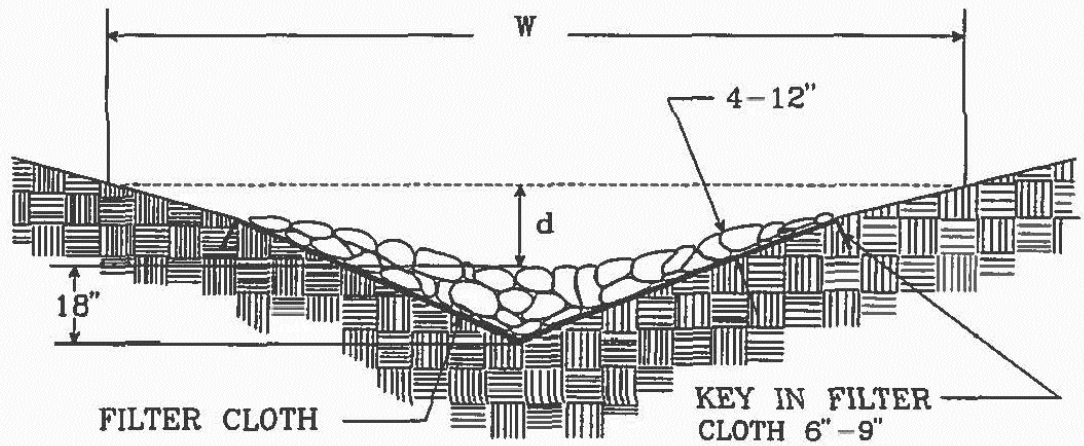
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

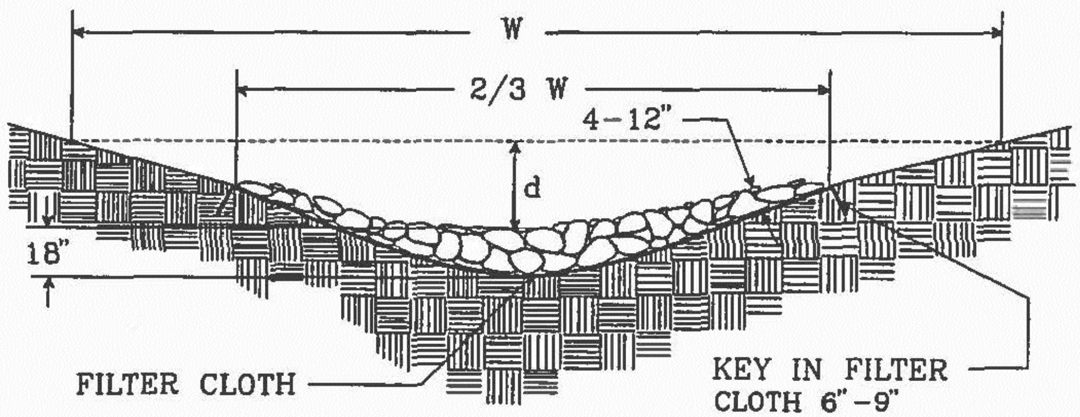
TITLE
RIPRAP GRADATIONS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	6F



V-SHAPED WATERWAY WITH STONE CENTER DRAIN

NOTE: A GRANULAR FILTER MAY BE SUBSTITUTED FOR FILTER CLOTH.



PARABOLIC WATERWAY WITH STONE CENTER DRAIN

NOTE: A GRANULAR FILTER MAY BE SUBSTITUTED FOR FILTER CLOTH.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

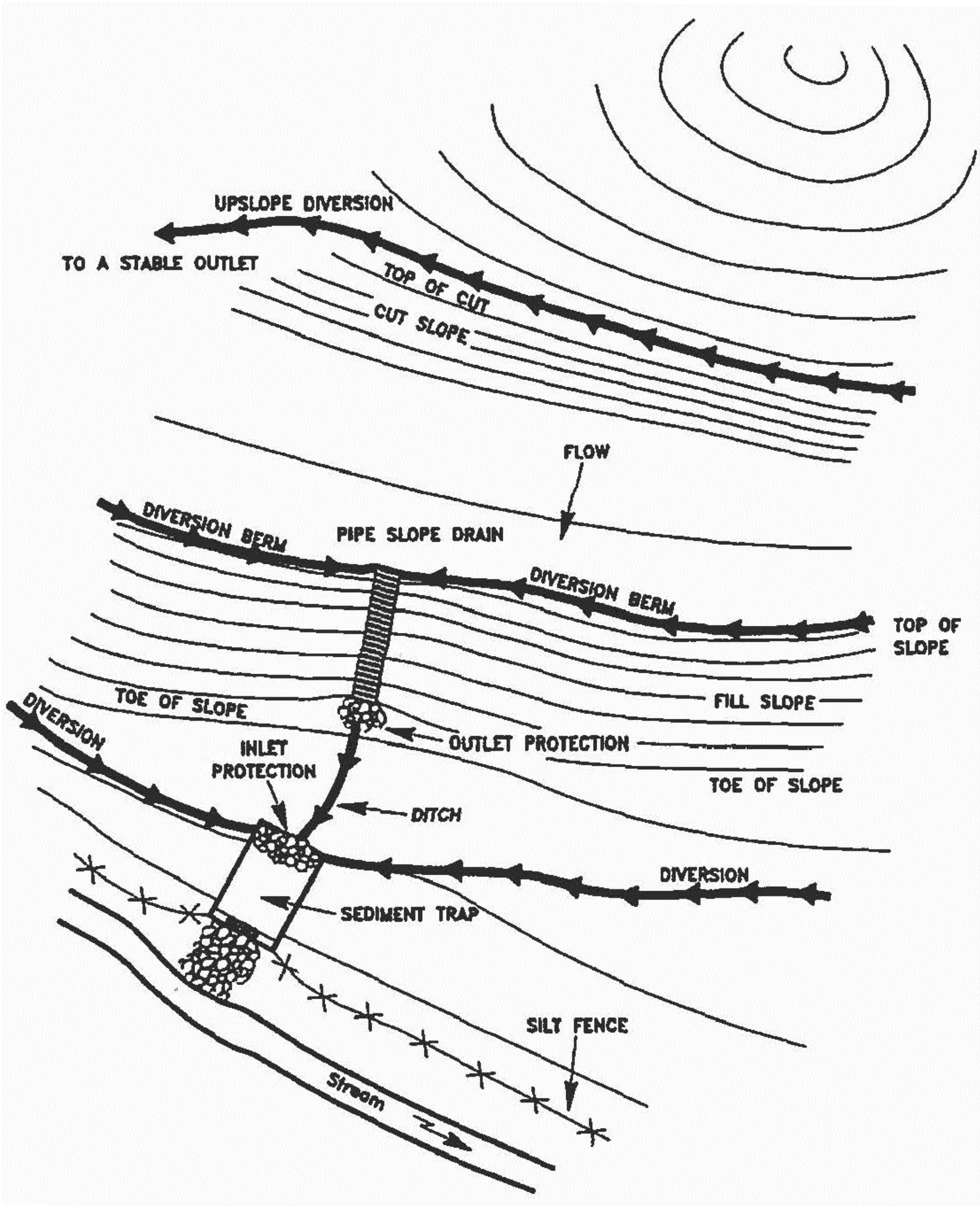
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
ARMORED V-SHAPED AND U-SHAPED CHANNELS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	6G



CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

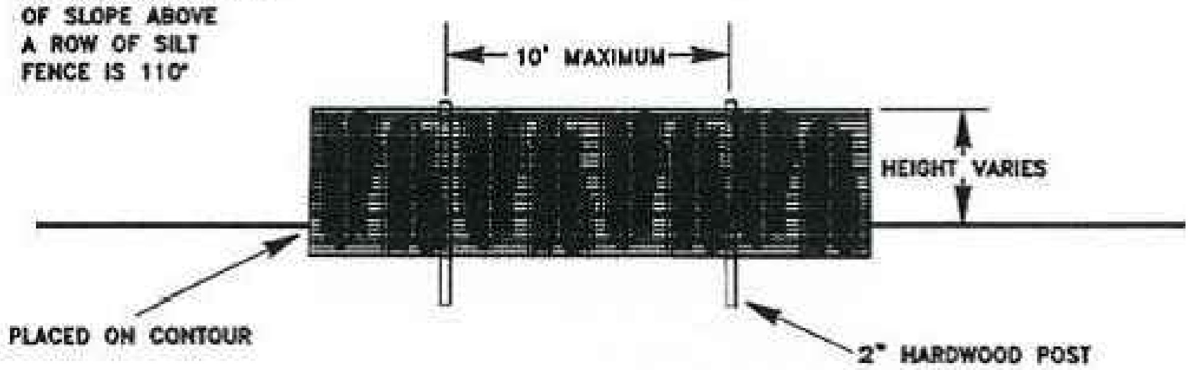
CONSULTANT

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

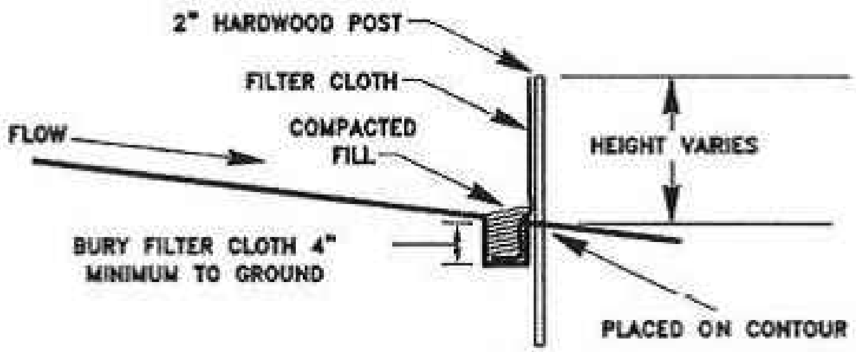
TITLE
TYP SURFACE WATER CONTROL LAYOUT

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	6H

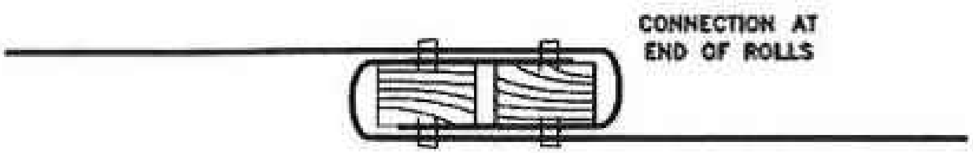
NOTE:
THE MAXIMUM LENGTH
OF SLOPE ABOVE
A ROW OF SILT
FENCE IS 110'



FRONT ELEVATION

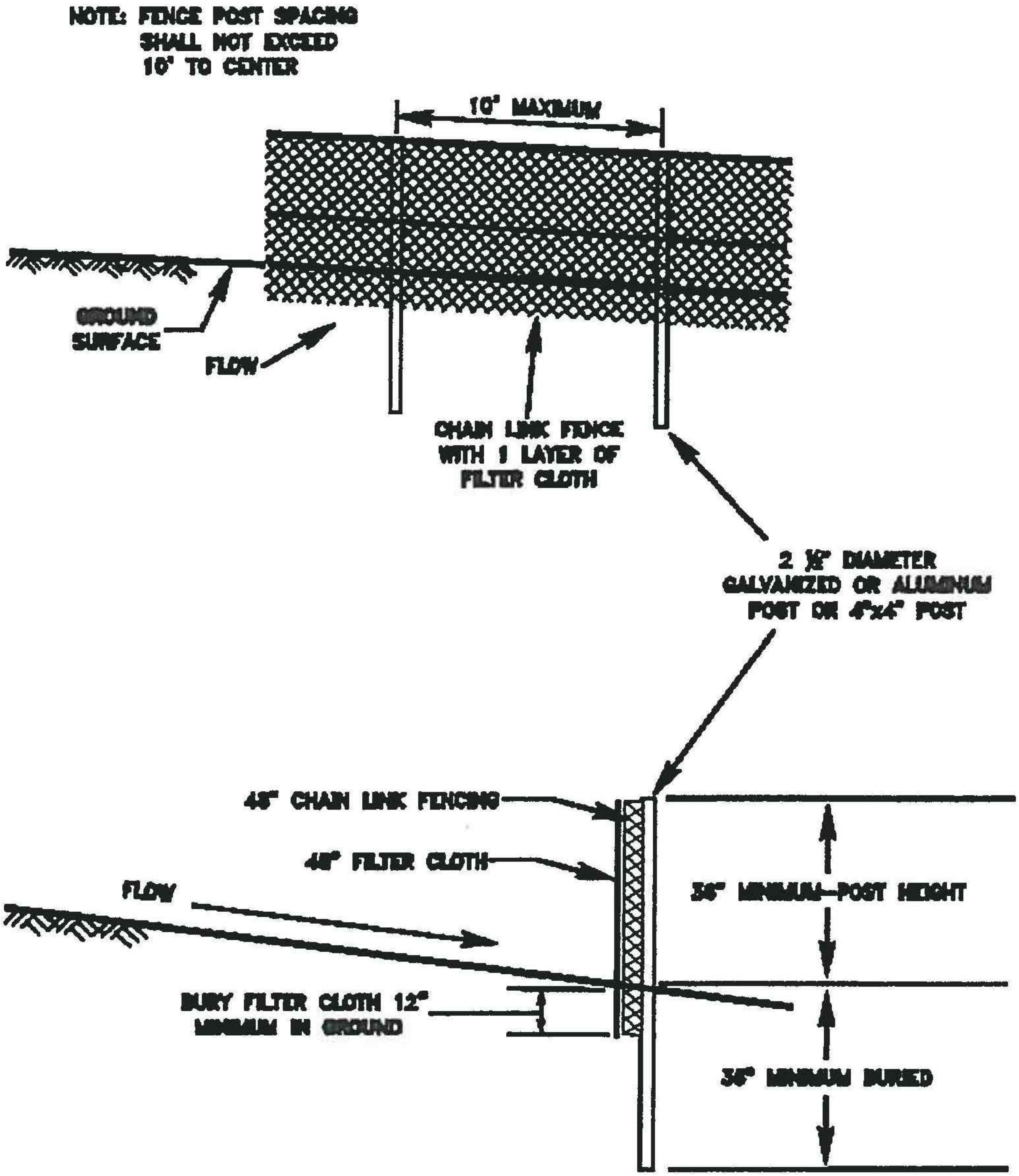


SIDE ELEVATION



TOP VIEW

CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD	2017-02-28	TITLE **SILT FENCE**
	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	PROJECT No. 1535050 · PHASE 500 · Rev. F · FIGURE 7A
	APPROVED	AQK	



CLIENT DOMINION	PROJECT BIC/INCREMENTAL CONTROLS

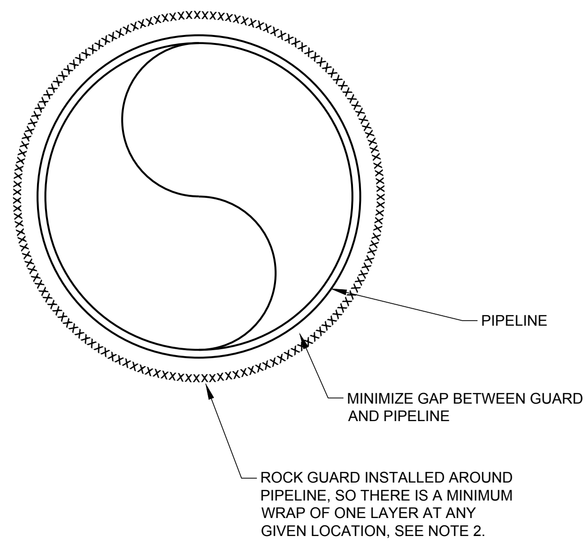
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SUPER SILT FENCE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	7B



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. SECURE ROCK GUARD PER MANUFACTURER SPECIFICATIONS , OR AS DIRECTED BY THE ENGINEER.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
ROCK GUARD ON PIPELINE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	8A

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. OPTIONS FOR BUOYANCY CONTROL INCLUDE THE USE OF CONCRETE COATING, SET-ON CONCRETE WEIGHTS, SET-ON BAGS FILLED ROCK MATERIALS, ANCHORS WITH BANDING OVER THE PIPELINE, OR DEEP BURIAL.

3. FINAL SELECTION OF BUOYANCY CONTROL SHALL BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO IMPLEMENTATION.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

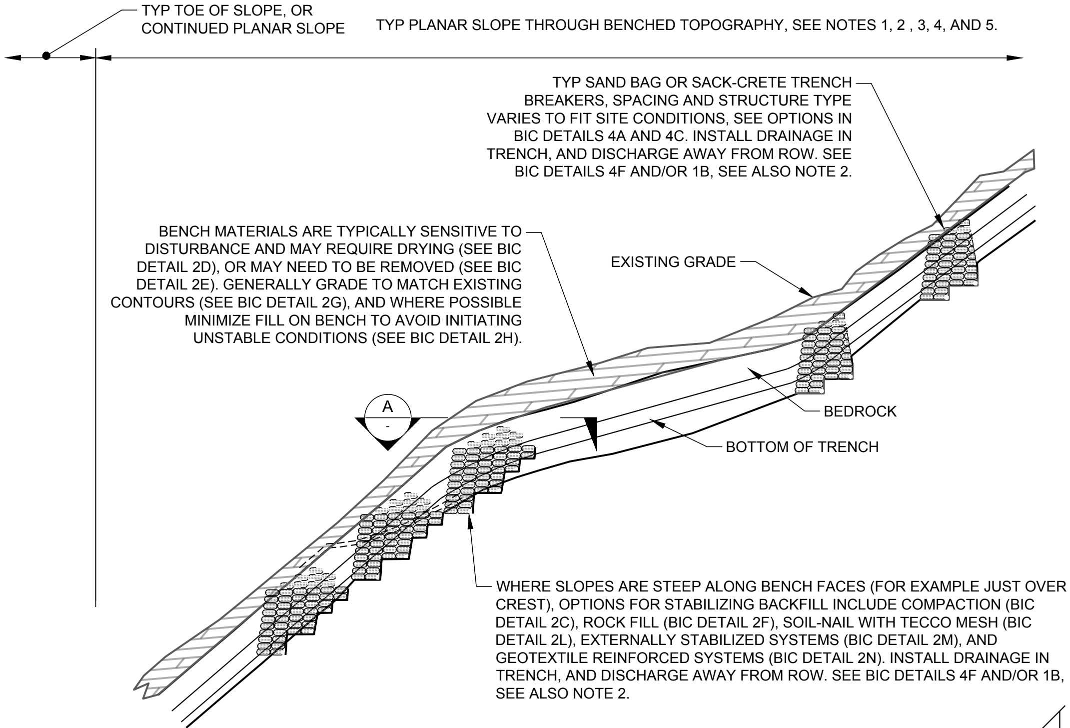
CONSULTANT

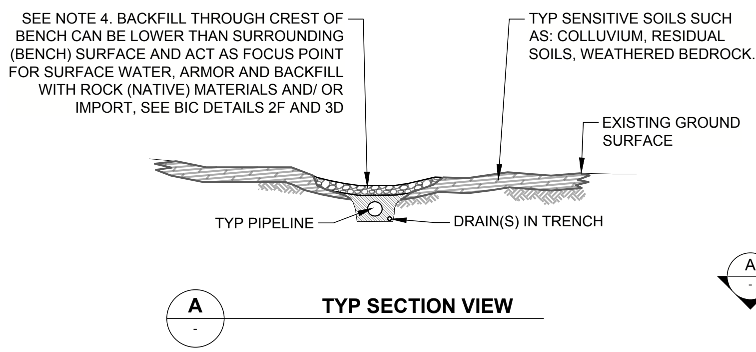
Golder Associates

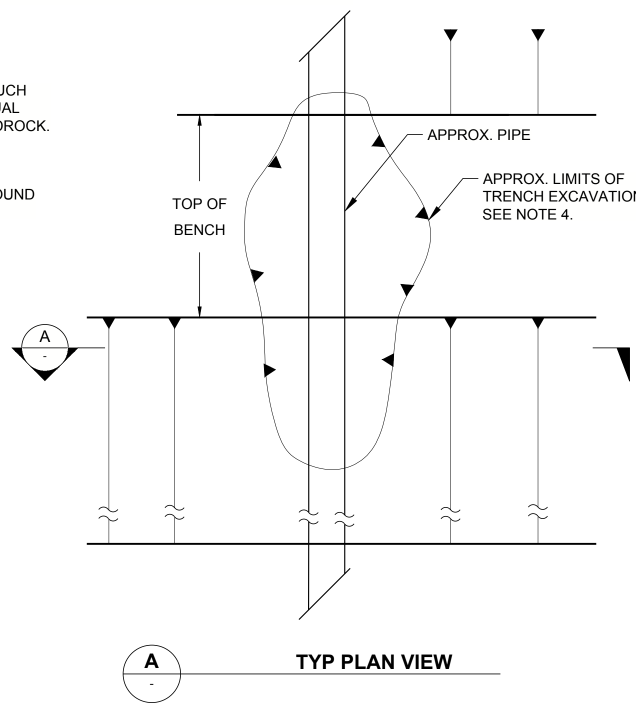
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
BUOYANCY MITIGATION

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	9A







NOTE(S)

1. TRENCH EXCAVATIONS INTO SHALLOW BEDROCK IN AREAS MAY RESULT IN INSUFFICIENT AMOUNTS OF BACKFILL AND PADDING/BEDDING DUE TO LARGER, ANGULAR SPOIL MATERIAL. ROCK GUARD MATERIALS MAY BE NEEDED TO PROTECT THE PIPELINE, SEE BIC DETAIL 8A.
2. TRENCH EXCAVATIONS INTO BEDROCK IN STEEPLY SLOPED TERRAIN (PLANAR SLOPES & INCLINED RIDGES) MAY REQUIRE TRENCH BREAKERS WITH SUFFICIENT MASS AND GEOTECHNICAL PERFORMANCE TO RETAIN BACKFILL SOILS AND/OR ROCK MATERIALS. USE OF FOAM BREAKERS IN THESE CONDITIONS IS NOT RECOMMENDED.
3. ALTERNATING LAYERS OF WEAKER BEDROCK AND STRONGER BEDROCK MATERIALS OFTEN CREATES A "BENCHED" OR "STAIR-STEPPED" APPEARANCE TO EXISTING HILL SLOPES. MAINTAIN POSITIVE DRAINAGE ACROSS BENCHES WHEN RESTORING OR MODIFYING ROW CONTOURS TO ALLOW POSITIVE DRAINAGE AND TO AVOID ACCUMULATION OF WATER ON BENCH SURFACES (WHICH CAN INFILTRATE AND SATURATE LOCAL SOILS).
4. EXCAVATIONS THROUGH BENCH CREST CREATES WIDER CUT WHERE TRENCH DEPTH INCREASES, REQUIRES RESTORATION OF INCREASED DEPTH EXCAVATIONS; MAY REQUIRE SACK-CRETE BREAKERS TO BUILD AND STABILIZE BACKFILL.
5. SHALLOW BEDROCK MAY REQUIRE BLASTING, HAMMERING, AND/OR CHIPPING TO EXCAVATE ROW AND TRENCH.

CLIENT
DOMINION

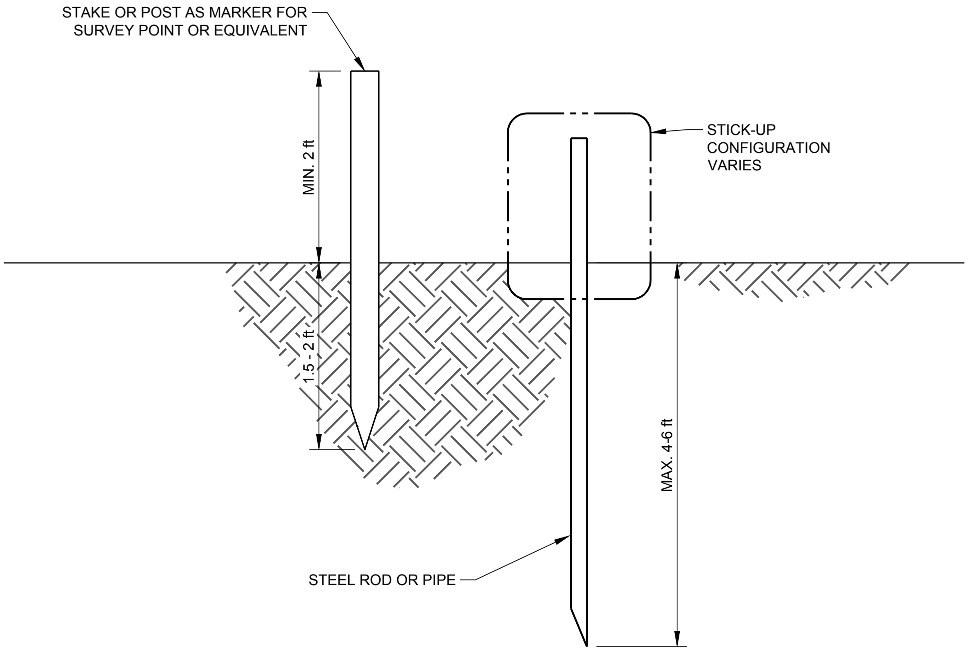
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP BENCH RE-CONSTRUCTION

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	10A



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

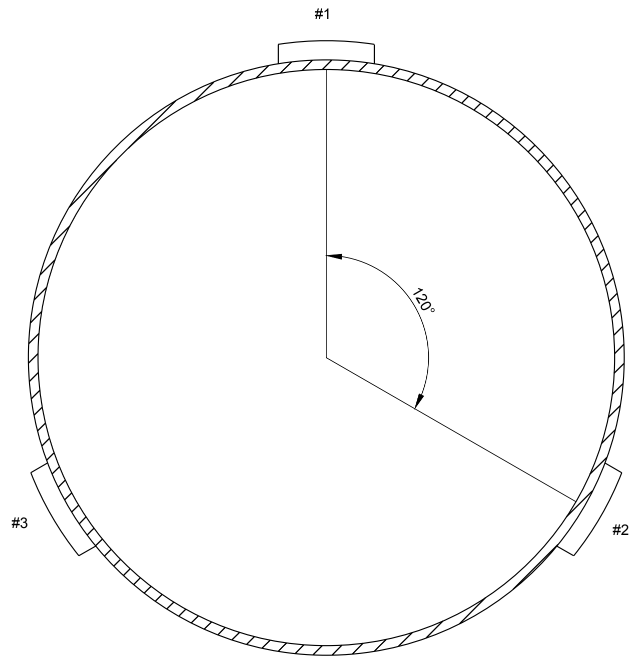
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
GEODETIC MONITORING

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	11A



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

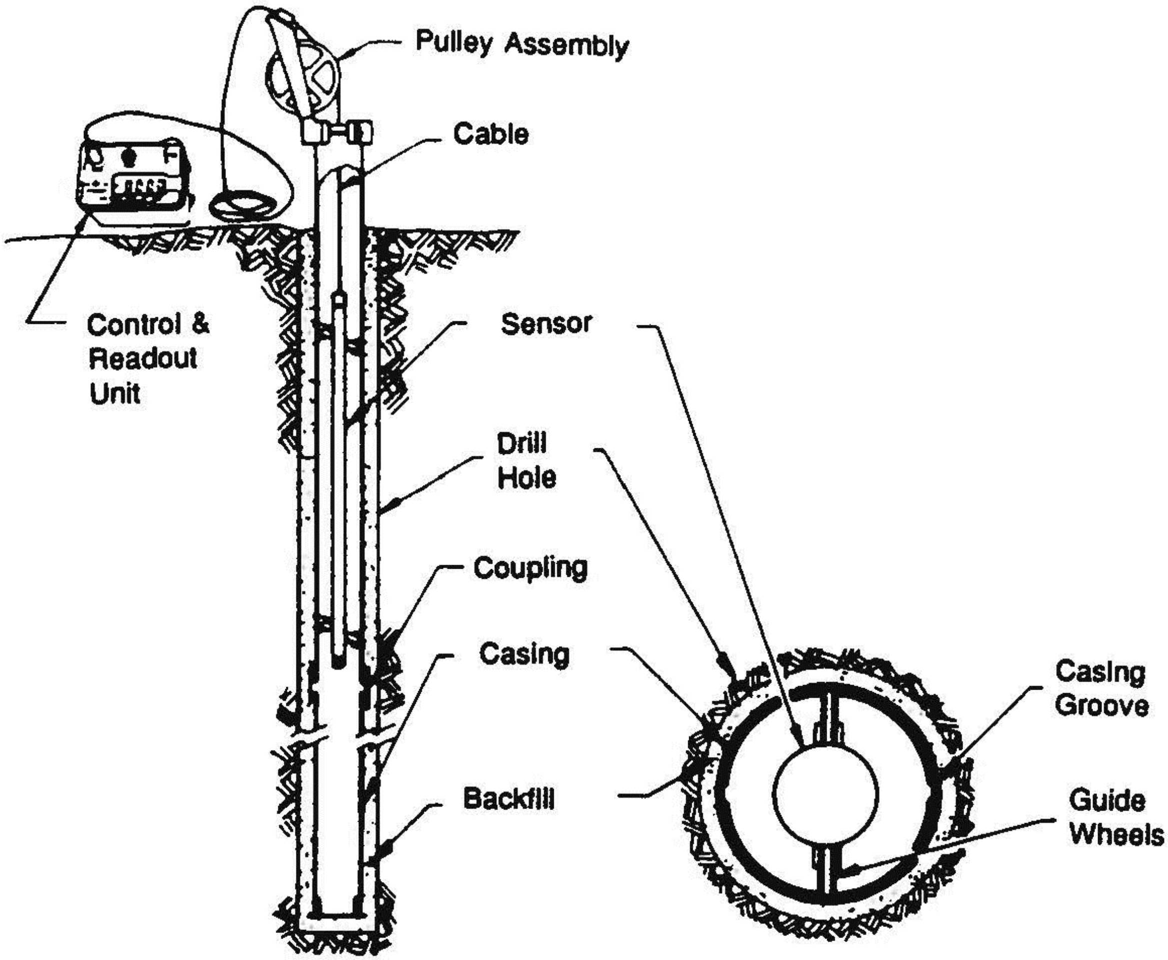
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
STRAIN GAUGE MONITORING

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	11B



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

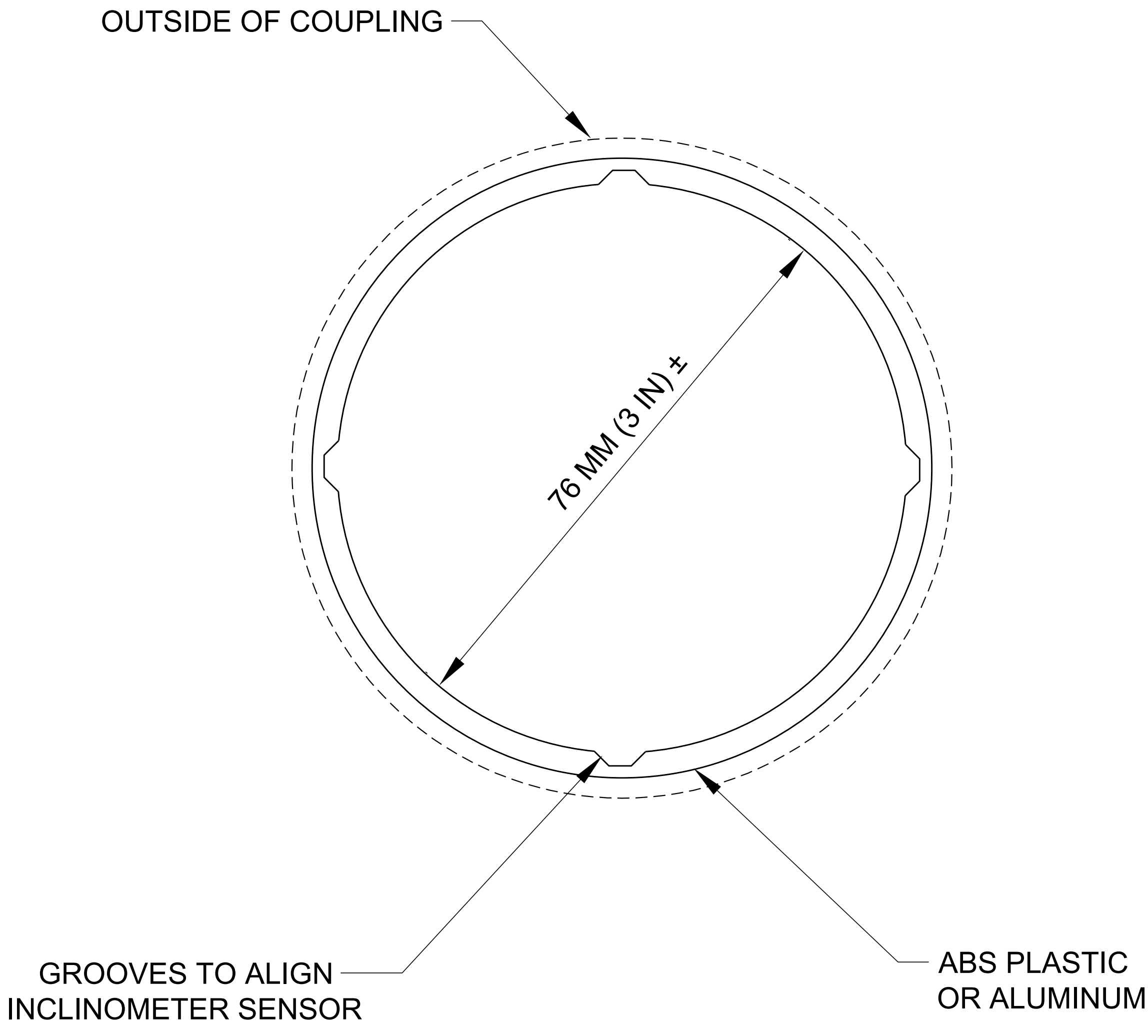
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SLOPE INCLINOMETER MONITORING

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	11C

0 1 in



NOTE(S)

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CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

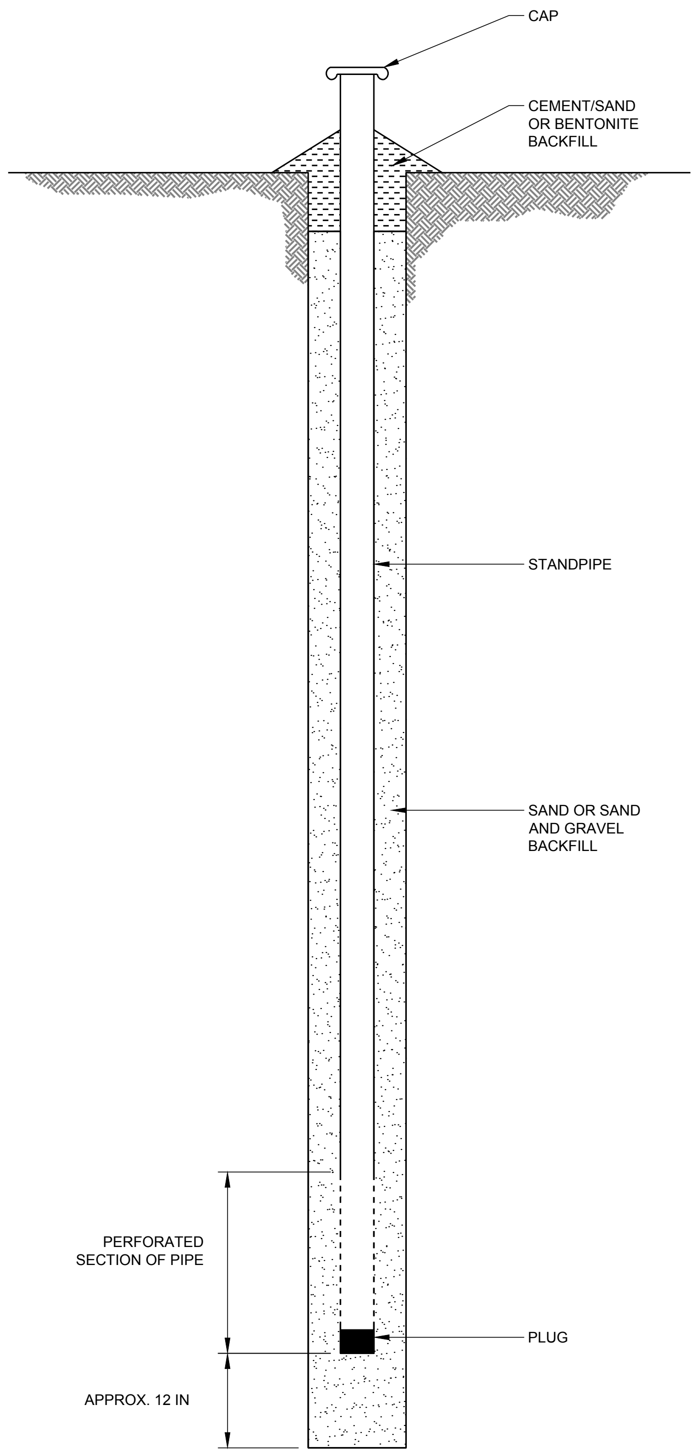
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SLOPE INCLINOMETER CASING

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	11D



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
STANDPIPE PIEZOMETER MONITORING

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	11E

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. COMPLETE AS-BUILT SURVEY OF INSTALLED TRENCH BREAKERS LOCATIONS, SO THAT SLOPE BREAKERS (WHICH ARE CONSTRUCTED LATER DURING ROW RESTORATION) CAN BE LOCATED TO CORRESPOND TO INSTALLED TRENCH BREAKERS. SLOPE BREAKERS TYPICALLY ARE LOCATED CLOSE TO AND JUST DOWNSLOPE OF TRENCH BREAKERS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
AS-BUILT SURVEY TRENCH AND SLOPE BREAKERS

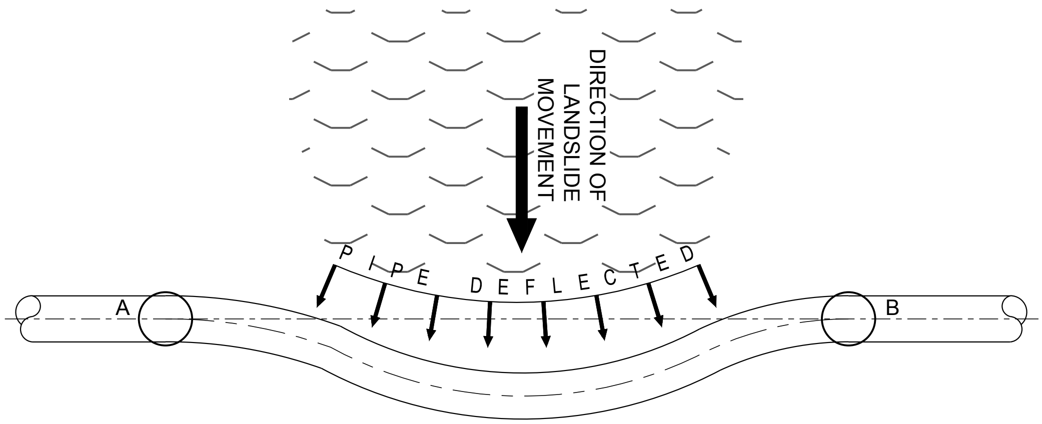
PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	11F

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

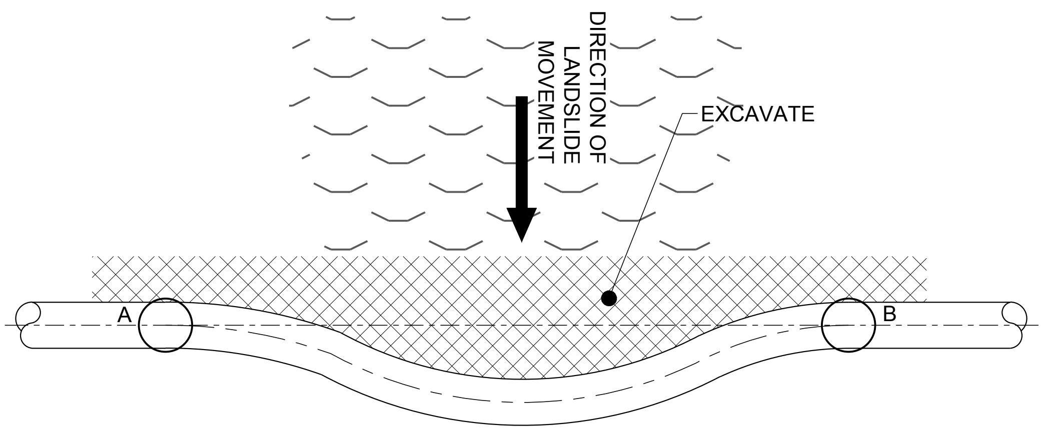
1 in

0

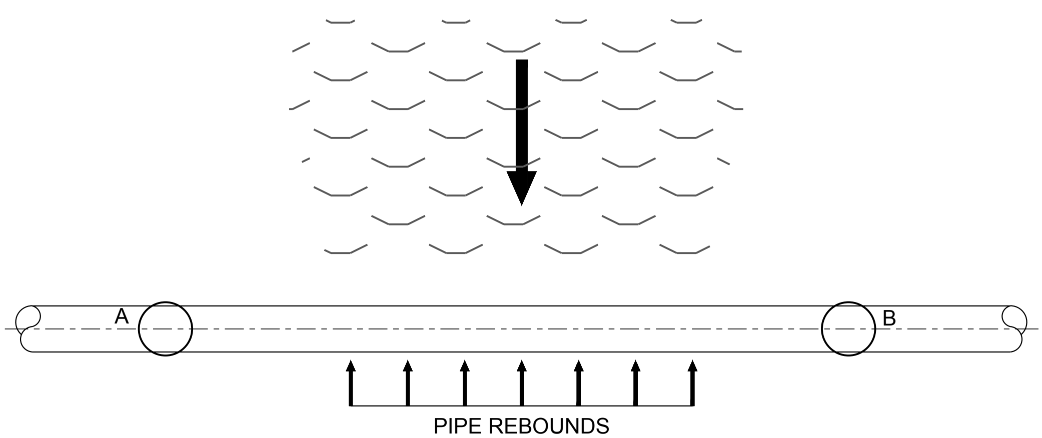
BEFORE STRAIN RELIEF EXCAVATION



DURING STRAIN RELIEF EXCAVATION



AFTER STRAIN RELIEF EXCAVATION



NOTE(S)

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CLIENT
DOMINION

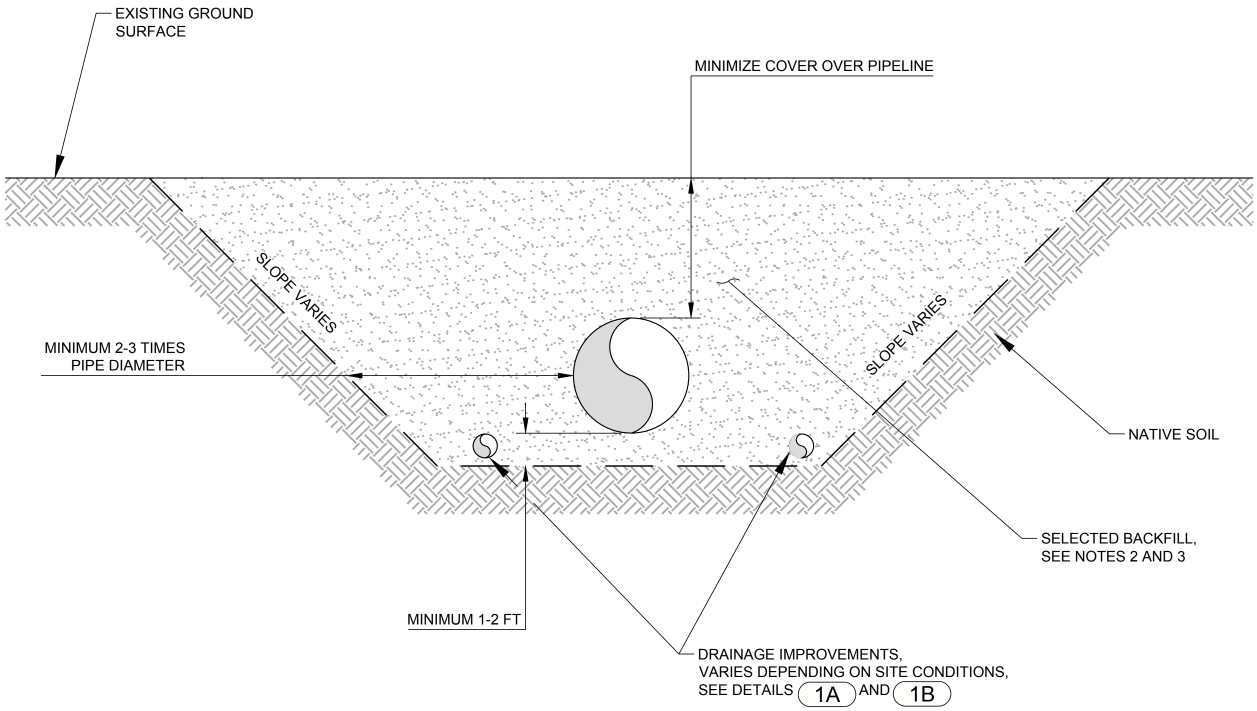
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
STRESS RELIEF EXCAVATIONS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	12A



GRAIN SIZE TABLE

PERCENT PASSING	MINIMUM
$\frac{3}{8}$ INCH	100
U.S. NO. 4	96
8	78
16	60
30	34
50	14
100	2
200	0

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. SELECT BACKFILL SHALL CONSIST OF SANDY. INVERT GRANULAR MATERIAL, EITHER NATURALLY OCCURRING OR PROCESSED. IT SHALL BE FREE FROM ORGANICS, SILT CLAY, SWELLING SOILS, GARBAGE, WOOD, OR OTHER EXTRANEOUS OR OBJECTIONABLE MATERIAL.

3. SAND SHALL BE WELL GRADED FROM COARSE TO FINE. THE GRAIN SIZE DISTRIBUTION SHALL CONFORM TO THE FOLLOWING.

CLIENT
DOMINION

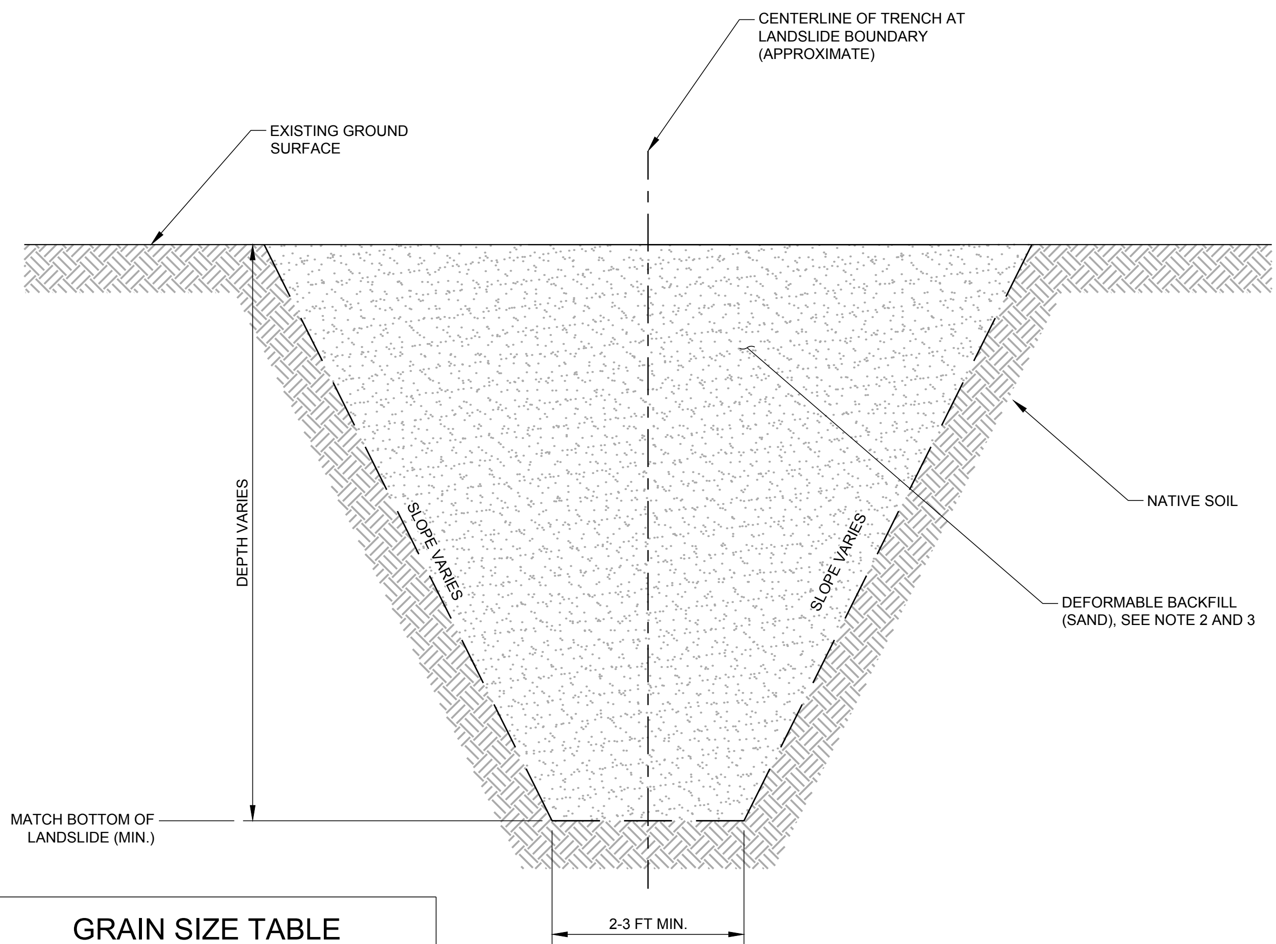
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SELECT (DEFORMABLE) BACKFILL AROUND PIPELINE IN LANDSLIDE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	12B



GRAIN SIZE TABLE

PERCENT PASSING	MINIMUM
$\frac{3}{8}$ INCH	100
U.S. NO. 4	96
8	78
16	60
30	34
50	14
100	2
200	0

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

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3. SAND SHALL BE WELL GRADED FROM COARSE TO FINE. THE GRAIN SIZE DISTRIBUTION SHALL CONFORM TO THE FOLLOWING.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SHEAR TRENCH

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	12C