WEST VIRGINIA GENERAL WATER POLLUTION CONTROL PERMIT FOR STORMWATER ASSOCIATED WITH OIL AND GAS CONSTRUCTION ACTIVITY (WV PERMIT NO. WV0116815)

Dominion Transmission, Inc.
Stormwater Pollution Prevention Plan (SWPPP)

SUPPLY HEADER PROJECT –
HARRISON, DODDRIDGE, TYLER, AND WETZEL COUNTIES, WEST VIRGINIA

Planned Construction Start Date: November 2017

Planned Construction Completion Date: December 2019

Construction Supervisor: ______________________________

Telephone: ______________________________

Project Manager (signature): ______________________________

Construction Contractor (signature): ______________________________

Environmental Inspector (signature): ______________________________

NOTE:
THIS PLAN MUST BE KEPT AT THE CONSTRUCTION SITE DURING WORKING HOURS

SWPPP Prepared:
March 2017

Prepared by: Environmental Resources Management, Inc.

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DOMINION TRANSMISSION, INC.
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## TABLE OF CONTENTS

*Section numbering corresponds to the online site registration application form.*
*Sections 1 through 7 are to be completed online.*

## LIST OF TABLES



## LIST OF DRAWING SETS



## LIST OF APPENDICES

## LIST OF DEFINITIONS

| | |
|---|---|
| ATWS | additional temporary workspace |
| BA | Biological Assessment |
| BIC | Best-in-Class |
| BMP | best management practices |
| BSRF | Belted Silt Retention Fence |
| CS | compressor station |
| DTI | Dominion Transmission, Inc. |
| EI | Environmental Inspector |
| EPA | U.S. Environmental Protection Agency |
| ERM | Environmental Resources Management, Inc. |
| ESC | erosion and sediment control |
| FERC | Federal Energy Regulatory Commission |
| FERC Plan | FERC Upland Erosion Control, Revegetation, and Maintenance |
| FERC Procedures | FERC Wetland and Waterbody Construction and Mitigation Procedures |
| GPP | Groundwater Protection Plan |
| hp | horsepower |
| HUC | hydrologic unit code |
| LOD | limit of disturbance |
| M&R | metering and regulating |
| MLRA | Major Land Resource Area |
| MP | milepost |
| NOAA Fisheries | National Oceanic and Atmospheric Administration, National Marine Fisheries Service |
| NOT | Notice of Termination |
| NPDES | National Pollutant Discharge Elimination System |
| NRCS | Natural Resources Conservation Service |
| Project | Supply Header Project |
| RECP | Rolled Erosion Control Product |
| ROW | right-of-way |
| SDS | Safety Data Sheet |
| SHP | Supply Header Project |
| SPCC | Spill Prevention, Control, and Countermeasures |
| SWPPP | Stormwater Pollution Prevention Plan |
| TMDL | Total Maximum Daily Load |
| TRM | Turf Reinforcement Mat |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |
| WAP | Western Allegheny Plateau |
| WMA | Wildlife Management Area |
| WV BMP Manual | West Virginia Erosion and Sediment Control Best Management Practice Manual |
| WVDCH | West Virginia Division of Culture and History |
| WVDEP | West Virginia Department of Environmental Protection |
| WVDNR | West Virginia Division of Natural Resources |

## EXECUTIVE SUMMARY

The purpose of this Stormwater Pollution Prevention Plan (SWPPP) with Site-Specific Erosion and Sediment Control Plan (ESCP) is to present procedures that will be followed during the Supply Header Project (SHP or Project) construction activities to minimize adverse impacts due to sedimentation and potential environmental pollutants resulting from stormwater runoff, and to reduce potential sediment and environmental pollutant runoff after Project completion. Dominion Transmission, Inc. (DTI) is proposing to develop, own, and operate approximately 37.5 miles of interstate natural gas transmission pipeline and associated laterals in West Virginia, and Pennsylvania as shown on Figure 1 of Appendix A. Dominion Transmission, Inc. (DTI) is seeking authorization from the Federal Energy Regulatory Commission (FERC) under Section 7(c) of the Natural Gas Act to construct, own, operate, and maintain the proposed facilities for the SHP system.[1] Land-disturbing activities will conform, at a minimum, to the following FERC regulations and guidelines, as appropriate and applicable:

- FERC, *Upland Erosion Control, Revegetation, and Maintenance Plan* (FERC Plan), 2013. Available online at https://www.ferc.gov/industries/gas/enviro/plan.pdf ;

- FERC, *Wetland and Waterbody Construction and Mitigation Procedures* (FERC Procedures), 2013. Available online at https://www.ferc.gov/industries/gas/enviro/procedures.pdf;

This plan was prepared in accordance with guidelines for the West Virginia General Water Pollution Control Permit for Stormwater Associated with Oil and Gas Related Activities (Permit No. WV0116815), the West Virginia *Erosion and Sediment Control Best Management Practice Manual* (WV BMP Manual), as amended, and the West Virginia Department of Environmental Protection's (WVDEP) construction stormwater website, accessed online at: http://www.dep.wv.gov/WWE/Programs/stormwater/csw/Pages/home.aspx. In geographic areas where multiple overlapping regulatory requirements and guidelines apply, DTI selected the more stringent or protective of the requirements and guidelines set forth by FERC, WVDEP, and where applicable, the U.S. Forest Service. In addition, incremental controls above and beyond regulatory requirements will be implemented during construction in steep slope terrain to mitigate hazards associated with potential slope instability. Appendix B provides a table indicating the FERC regulatory requirements and where more stringent or protective requirements will be used during construction.

This SWPPP, with ESCP, was prepared by Environmental Resources Management, Inc. (ERM). Personnel at all levels of responsibility will be trained regarding the components and goals associated with this SWPPP and Groundwater Protection Plan (GPP), addressing topics including spill response, good housekeeping, and routine inspection. The initial training is to be conducted at the Project kick-off meeting and refreshed quarterly for the length of the Project. Training records will be maintained on site for review by the WVDEP Director or representative.

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[1] DTI is also requesting a Blanket Certificate of Public Convenience and Necessity pursuant to Part 284, Subpart G, of FERC's regulations authorizing open-access transportation of natural gas for others with pre-granted abandonment authority, and a Blanket Certificate of Public Convenience and Necessity pursuant to Part 157, Subpart F, of FERC's regulations authorizing certain facility construction and operation, certain certificate amendments and abandonments.

Records will be kept for a minimum of two years after the Notice of Termination (NOT) has been submitted and accepted by WVDEP. Company personnel must be identified to inspect the Project as set forth under Section G.4.e.2.D of the Permit. A tracking procedure must be used to ensure that adequate corrective actions have been taken in response to deficiencies identified during an inspection. Records of inspection must be maintained on site for review by the director or the director's representative. Incidents such as spills, leaks, and improper dumping, along with other information describing the quality and quantity of stormwater discharges will be included in the records. A GPP has been prepared and is included in Appendix C of this SWPPP.

All SWPPPs and GPPs required under this permit are considered public domain reports and will be made available for review by the public within a reasonable timeframe upon request. Nothing in this SWPPP shall be construed as relieving the responsibility for compliance with all applicable federal, state, or local statutes, ordinances or regulations.

The SWPPP has a specific role in protecting the State's waters, promoting the proper management of on-site materials, and serves as a resource document for emergency response and pollution prevention, as well as a technical resource for SWPPP training. This SWPPP covers two primary areas of responsibility. These responsibilities are:

1. Compliance Responsibilities – involve the overall responsibility to implement this SWPPP and includes areas such as training, maintenance, and inspection programs mandated by the SWPPP and permit regulatory requirements. This responsibility also includes the permitting, inspection, and documentation identified in this Plan.

2. Release Response Responsibilities – involve the development of a release response organization, release response procedures, and identification of specified actions to be taken by employees in the event of a release.

The purpose of the SWPPP is to establish management and technical practices designed to avoid or minimize the contact between pollutants and surface water as a result of a release or improper waste disposal. Furthermore, the specific goals in developing the SWPPP components are:

1. to identify potential sources of pollution and source materials on site which may reasonably be expected to affect the quality of stormwater discharges associated with construction activity;

2. to describe and ensure that practices are implemented to eliminate and/or reduce pollutants from source materials in stormwater discharges associated with construction activity; and

3. to promote compliance with the terms and conditions of the General Water Pollution Control Permit for Stormwater Associated with Oil and Gas Related Construction Activities.

The SWPPP provides procedures and practices to be implemented during the construction phase of the Project. A separate SWPPP will be developed, as necessary, for post-construction operation of aboveground facilities in compliance with applicable stormwater regulatory requirements associated with industrial activities.

If at any time the WVDEP notifies DTI that minimum SWPPP requirements are not met, DTI will have 30 days to make the necessary changes and certify in writing to the WVDEP that the changes have been made. Additionally, the SWPPP must be modified as necessary to include additional or modified best management practices (BMP) designed to correct specific problems identified. These adaptive management requirements are designed to result in permit compliance and prevent or minimize stormwater discharges that could cause a violation of state water quality or groundwater protection standards. The SWPPP must also be modified whenever there is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the state. A SWPPP revision form is included as Appendix D.

A copy of this SWPPP must be available on site at all times for the review by WVDEP personnel. If requested, WVDEP personnel will be afforded access to the construction premises to review practices and operations regulated under the General Permit and review records required to be maintained by this permit.

## 8.0 RECEIVING STREAM(S)[2]

The proposed Project will cross two watersheds within West Virginia. Table 8-1 lists the watersheds crossed by the 8-digit hydrologic unit code (HUC). The location of waterbodies located within and adjacent to the Project footprint is shown on the Construction Alignment Sheets, Drawing Set #1.

TABLE 8-1

**Watersheds Crossed by the Supply Header Project in West Virginia**

| Regional Watershed/ Sub-Region | Approximate Mileposts | County and State | Hydrologic Unit Code (HUC)-8/ Subbasin Name |
|---|---|---|---|
| **Ohio Regional Watershed** | | | |
| Monongahela | 0.0–0.6 | Harrison County, WV | 05020002/West Fork |
| Upper Ohio | 0.6–33.36 | Doddridge, Tyler, and Wetzel Counties, WV | 05030201/Little Muskingum – Middle Island |

The proposed SHP facilities in West Virginia are located within the Monongahela and Upper Ohio sub-regions of the Ohio Regional Watershed. The name, milepost crossing point, flow regime, crossing width, crossing method, and stream classifications for waterbodies crossed by the SHP in West Virginia are included in Appendix E. The name, milepost, 6-digit HUC and 8-digit HUC codes for receiving streams of the SHP in West Virginia are included in Appendix F. The locations of the facilities and waterbodies are shown on maps, included on Figure 2 and Figure 3 of Appendix A, with details provided on the Construction Alignment Sheets, Drawing Set #1.

DTI reviewed the WVDEP 2012 list of 303(d) Impaired Waters for the state of West Virginia to identify crossings of waterbodies identified as impaired. If receiving waters are identified as having a U.S. Environmental Protection Agency (EPA) Total Maximum Daily Load (TMDL), additional monitoring or BMPs will be implemented as required by WVDEP. Table 8-2 summarizes the identified impaired waterbodies crossed by the Project in West Virginia. There are nine (9) identified 303(d) impaired streams crossed by the SHP in West Virginia. Figure 3 of Appendix A shows an overview map highlighting the impaired streams. DTI is evaluating the contaminants listed within these waterbodies for the probability to encounter contaminated water or sediments during construction, or to exacerbate impairments during construction. According to the information in Table 8-2 below, none of the waterbodies crossed has an identified established and approved TMDL for (i) sediment or a sediment-related parameter (i.e., total suspended solids or turbidity), or (ii) nutrients (i.e., nitrogen or phosphorus). According to the WVDEP list of Tier 3 streams, there are no Tier 3 waterbodies crossed by SHP in West Virginia.

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[2] Section numbering corresponds to the online registration application form. Sections 1 through 7 are to be completed online.

TABLE 8-2

**Impaired Waterbodies Crossed by the Supply Header Project in West Virginia**

| County and State [a] | Milepost | Waterbody Name | Proposed Crossing Method [b] | Impairment Cause |
|---|---|---|---|---|
| Wetzel County, WV | 31.7 | Upper Run | Dam-and-pump/dry ditch crossing | Fecal coliform |
| Wetzel County, WV | 30.9 | Richwood Run | Dam-and-pump/dry ditch crossing | Fecal coliform |
| Wetzel County, WV | 30.1, 29.8, 29.4 | South Fork Fishing Creek | Dam-and-pump/dry ditch crossing | Fecal Coliform, Iron, CNA (conditions not allowable), biological – aquatic life |
| Doddridge County, WV | 18.5 | McElroy Creek | Dam-and-pump/dry ditch crossing | Fecal coliform, iron |
| Doddridge County, WV | 12.9 | Flint Run | Dam-and-pump/dry ditch crossing | Fecal coliform |
| Doddridge County, WV | 10.6 | Buckeye Run | Associated with road bore | Fecal coliform, iron, CNA, biological – aquatic life |
| Doddridge County, WV | 7.8 | Buffalo Calf Fork | Dam-and-pump/dry ditch crossing | Fecal coliform |
| Doddridge County, WV | 5.5 | Buckeye Creek | Dam-and-pump/flume crossing | Fecal coliform |
| Doddridge County, WV | 2.1 | Meathouse Fork | Dam-and-pump crossing | Fecal coliform, iron, CNA, biological – aquatic life |

a West Virginia Department of Environmental Protection. 2012. Water and Waste Management – 2012 GIS Shapefiles – 303D_TMDL_Impaired streams in West Virginia. Available online at: http://www.dep.wv.gov/WWE/watershed/IR/Pages/303d_305b.aspx. Accessed February 2015.

b West Virginia Department of Environmental Protection. 2012. 2012 West Virginia Integrated Water Quality Monitoring and Assessment Report. EPA approved. Available online at: http://www.dep.wv.gov/WWE/watershed/IR/Pages/303d_305b.aspx. Accessed February 2015.

## 9.0 PROJECT DESCRIPTION

DTI is proposing to construct approximately 33.6 miles of pipeline, new metering station, and compressor stations (CS) within the state of West Virginia for transmission of natural gas to markets in Virginia and North Carolina. Descriptions of each component of the Project are provided in the following sections. The locations of the facilities are shown on Figure 2 of Appendix A, with details provided on the Construction Alignment Sheets, Drawing Set #1.

The approximate original contours of the Project site will be restored to promote the preservation of the preconstruction drainage patterns and features, and the disturbed area will be re-vegetated or otherwise stabilized with pervious material. Cut and fill totals within the proposed pipeline route are expected to balance following the restoration of the disturbed area.

## 9.1 PROPOSED FACILITIES

### 9.1.1 Pipeline Facilities

The TL-635 loop, which will consist of 33.6 miles of 30-inch outside diameter pipeline, will originate at a connection with DTI's proposed AP-1 pipeline just south of the Harrison/Doddridge County line in West Virginia. From this point, the pipeline will extend to the north/northwest for approximately 10 miles into Doddridge County. It will then head to the north for approximately 24 miles, crossing Doddridge, Tyler, and Wetzel Counties, terminating at the expanded Mockingbird Hill CS. Approximately 13 miles of the TL-635 loop will be located parallel to existing linear corridor facilities, including pipelines, electric transmission lines, and roads.

### 9.1.2 Compressor Station Modifications

The existing Burch Ridge CS currently has one natural gas-fired turbine that provides 6,130 horsepower (hp) of compression. The proposed modifications at the Burch Ridge CS will include the installation of crossover piping to allow for bi-directional compression between DTI's existing TL-590 and TL-377 pipelines. Current operations at the Burch Ridge CS allow for gas to be compressed from TL-377 into TL-590; however, the gas could not be compressed in the reverse direction from TL-590 into TL-377. The proposed crossover piping will allow the gas to be compressed in both directions and will provide the operational bi-directional flexibility required to meet existing and proposed DTI customer obligations. No additional compression will be added at this station. The Burch Ridge CS will only include upgrades to the existing site with no additional land disturbance.

The existing Mockingbird Hill CS currently has one natural gas-driven turbine that provides 7,800 hp of compression and is capable of compressing gas in multiple directions. The proposed modifications at this CS will include the addition of two new natural gas-driven turbines that will provide a combined 41,000 hp of additional compression including the existing 7,800 hp of compression already in place. The proposed modifications will also include seven new structures (compressor building, auxiliary building, utility gas building, drum storage building, electrical building, dekatherm building, and general storage buildings), with a chain-link security fence installed around the perimeter of the expanded site. New equipment at the station will include gas filter/separators, gas coolers, inlet air filters, exhaust silencers, tanks, blowdown silencers, heaters, and auxiliary generators. These changes are based on current engineering and design, and may be updated when engineering and design is finalized. The proposed compression and ancillary equipment will also be capable of compressing gas in multiple directions among the connecting pipelines at the station. A site specific plan for the Mockingbird Hill CS is provided in Drawing Set #2.

### 9.1.3 Metering and Regulating Station

DTI will construct one new metering and regulating (M&R) station (the CNX M&R Station) on the same site and within the same fenceline as CS 1 (Marts) in Lewis County, West Virginia. CS 1 (Marts) is associated with the Atlantic Coast Pipeline. The CNX M&R station will enable natural gas receipts into DTI's existing TL-360 mainline. The station will contain two dekatherm buildings, a regulation building, and a meter building. Equipment at the station will include gas filter/separators, gas meters, and regulators.

### 9.1.4 Valve Sites

Four valve sites will be installed along the proposed TL-635 loop in West Virginia and the following locations in Table 9.1.4-1.

TABLE 9.1.4-1

**Valve Site Locations Along the Supply Header Project in West Virginia**

| Valve Site Name | County | Approximate Milepost |
|---|---|---|
| Marts Junction | Harrison | 0.0 |
| Valve Site 1 | Doddridge | 12.4 |
| Valve Site 2 | Wetzel | 29.6 |
| Mockingbird Hill CS | Wetzel | 33.6 |

Valves will be installed below grade with aboveground valve operators, risers, blowdown valves, and crossover piping connected on each side of the valve. A chain-link security fence will be installed around the perimeter of each valve site. The area within the fenceline will be covered with gravel. The valves will allow DTI, as the operator, to segment the pipelines for safety, operations, and maintenance purposes. The locations of the valves along the SHP route are shown on the Construction Alignment Sheets, Drawing Set #1.

### 9.1.5 Pig Launchers

One pig launcher associated with the SHP will be built on the same site and within the same fenceline as the modifications at the Mockingbird Hill CS in Wetzel County. The pig receiving site for the SHP will be the Marts Junction Interconnection, located in Harrison County. The pig launcher/receiver system will be used to run pipeline inspection tools, called pigs, through the TL-635 pipeline system.

### 9.1.6 Abandonment of Gathering Compressor Units

DTI intends to abandon in place two existing gathering compressor units (Hastings Compressor Units 1 and 2) at its existing Hastings CS in Wetzel County. The Hastings Compressor Units 1 and 2 discharge natural gas into DTI's existing TL-413 pipeline for subsequent processing at DTI's existing Hastings Extraction Plant.

### 9.1.7 Contractor Yards

Temporary pipe storage and contractor yards will be needed to store equipment and stage construction activities for the proposed pipelines and other facilities. DTI attempted to identify and select yards that have been previously disturbed by human activities and do not have an on-going land use that precludes use of the site during construction of the Projects. Where previously disturbed sites are not available, DTI selected sites with level terrain in mostly cleared areas. This was done to minimize the amount of clearing, grading, and filling at each site. Generally, yard preparation will be limited with minimal clearing, grading, leveling, and filling in upland areas. Following construction, yards will be restored in accordance with FERC's *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) and *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures), along with other federal and state agency requirements and landowner stipulations.

Six temporary contractor yards will be used to support construction activities along the SHP. Contractor Yards 5 and 6 will be located in Wetzel County; Contractor Yards 7, 8, and 9 will be located in Doddridge County; and Contractor Yard 10 will be located in Ritchie County. The proposed pipe storage and contractor yards will be located on previously disturbed and stabilized land that will not require additional grading. ESC measures will be installed along the perimeter of each yard as needed to prevent sediment from impacting adjacent resources. The locations of the contractor yards along the SHP route are included on the Construction Alignment Sheets, Drawing Set #1.

### 9.1.8 Cathodic Protection

Cathodic protection will be provided by an impressed current system on the TL-635 pipeline. One ground bed containing arrays of sacrificial anodes to provide a path with low resistance to ground is planned along the TL-635 loop. Construction of the ground bed will occur in an area measuring approximately 500 feet in length by 25 feet in width. Following construction, DTI will retain an easement for operation of the ground bed measuring approximately 500 feet in length and 10 feet in width. The location of the ground bed is provided on the Construction Alignment Sheets, Drawing Set #1.

### 9.1.9 Water Impoundments

DTI will utilize aboveground water impoundment structures to temporarily store water needed for hydrostatic testing. Water for hydrostatic testing will be withdrawn from adjacent surface waters and/or municipal sources and will be pumped to the water impoundments gradually over a 30- to 90-day period. The water impounds will be constructed in additional temporary workspaces (ATWS) and will be circular in configuration with a diameter of approximately 190 feet and a height of approximately 15 feet. Specific BMPs will be detailed on the Construction Alignment Sheets, Drawing Set #1.

Two water impoundments will be erected to support activities along the SHP in West Virginia. One water impoundment will be located in Doddridge County and another water impoundment will be located in Wetzel County.

## 9.2 EXISTING SITE CONDITIONS

The Project site contains vegetated right-of-way (ROW), wooded, meadow, and residential areas, and is set within topography that is hilly and mountainous.

### 9.2.1 Vegetation

The SHP is located within the Western Allegheny Plateau (WAP) ecoregion. The WAP ecoregion extends across Ohio, southwestern Pennsylvania, northwestern West Virginia, and northeastern Kentucky. It is characterized by broad valleys, ridges, and rounded hills, with many lakes, marshes, and bogs throughout the region. Precipitation in the WAP is normally distributed during the year with rain being higher in spring and summer. The ecoregion is approximately 72 percent forested with a combination of mixed oak and mixed temperate forests. Wet hemlock forests are also present, but their range has declined significantly.

The TL-635 Pipeline will cross 3.5 miles of deciduous forests, 27.0 miles of mixed forests, less than 0.1 miles of deciduous savanna and glades, and 0.6 miles of floodplains and riparian vegetation. Deciduous forests typically consist of broadleaf trees, shrubs, perennial herbs, and mosses. The most common species found in the SHP area are red oak, white oak, and hickory. Mixed forests consist of oak-hickory-pine forests with hardwoods found in the understory. Deciduous savanna and glade communities are primarily found where shallow soils exist at higher elevations. Lower elevations of the savanna are typically surrounded by fragmented agriculture. Floodplains and riparian communities crossed by the SHP typically consist of silver maple, sycamore and ash, pin oak or, black willow.

The proposed TL-635 route crosses approximately 3.7 miles of West Virginia Division of Natural Resources (WVDNR) land in the Lewis Wetzel Wildlife Management Area (WMA). This area encompasses approximately 13,590 acres of steep terrain ranging in elevation from 736 to 1,560 feet above sea level. The WMA is mostly forested with oak-hickory and cove hardwood species. The SHP TL-635 crosses the WMA between MPs 23.5 and 29.4 in Wetzel County. The mixed deciduous and coniferous forests and woodlands can be further described as Appalachian Hemlock-Hardwood Forest and South-Central Interior Mesophytic Forest. The deciduous forests can be further defined as Allegheny-Cumberland Dry Oak Forest and Woodland – Hardwood and Northeastern Interior Dry-Mesic Oak Forest. The floodplain riparian forests crossed are considered Central Interior and Appalachian Floodplain Systems.

Land use types can be determined from Appendix G and the Construction Alignment Sheets, Drawing Set #1.

### 9.2.2 Soils

All of the proposed SHP facilities are located within the Central Allegheny Plateau Major Land Resource Area (MLRA) designated by the Natural Resources Conservation Service (NRCS). The physiography in this MLRA is characterized by a dissected plateau with narrow valleys and ridgetops separated by long and steep side slopes. The dominant soil orders are Alfisols, Ultisols, and Inceptisols. These shallow to very deep, skeletal to clayey soils have a mesic temperature regime, an udic moisture regime, and mixed mineralogy. Typical soil groups in these orders include Dystrudepts, Hapludults, Hapludalfs, Fragiudults, Endoaquepts, Eutrudepts, and Udorthents. These soils formed mainly in residuum on ridges and hillsides; colluvium on footslopes; alluvium along streams; and material derived from surface mining of coal. Soil classifications for the West Virginia portion of the SHP are included on the Construction Alignment Sheets, Drawing Set #1 and Appendix H.

## 9.3 ADJACENT AREAS

Adjacent areas to the Project include forested, agricultural, and residential areas. The Project is located in the Monongahela watershed for the portion of the Project located in Harrison County, and within the Upper Ohio watershed for the Doddridge, Tyler, and Wetzel Counties. Adjacent waterbodies were field delineated and are shown on the Construction Alignment Sheets, Drawing Set #1.

## 9.4 CRITICAL AND SENSITIVE AREAS AND SPECIES

DTI has been in consultation with the U.S. Fish and Wildlife Service (USFWS) and WVDNR. DTI also received data from the West Virginia Natural Heritage Program regarding potential sensitive communities and species that are crossed by the Project. No known sensitive natural heritage communities are crossed by the SHP.

### 9.4.1 Endangered Species Consultation

As required under Section 7 of the Endangered Species Act of 1973 (as amended), projects that require Federal authorization must undergo consultation with USFWS and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) to ensure that any action they authorize is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.

DTI has prepared a Biological Assessment (BA) at the request of the FERC, to initiate formal consultation with the FWS and NOAA Fisheries. As part of consultations with the FWS, species-specific field or habitat surveys have or will be completed for several species as identified by FWS West Virginia Ecological Services Field Office. Additional steps for avoidance, or mitigation will be discussed as part of the consultations with the FWS as applicable. If appropriate and applicable, specific BMPs will be used to address identified potential rare, threatened and endangered, species as part of this SWPPP and will be identified on the Construction Alignment Sheets, Drawing Set #1.

Four federally listed and protected species may occur within the SHP footprint. The Indiana bat is listed as potentially occurring in all counties of the SHP; however, based on DTI's preliminary bat surveys conducted in accordance with USFWS regulations, no Indiana bats were identified within the Project limits in Wetzel, Tyler, Doddridge, or Harrison counties. The northern long-eared bat is listed as a federally threatened species, and was identified in Wetzel and Doddridge counties through DTI's preliminary bat surveys.

There are two federally listed mussel species with the potential to occur in the SHP Project area: clubshell mussel and snuffbox mussel. At least one or both of these species have the potential to occur in four streams crossed by the proposed TL-635 pipeline loop, including Indian Creek, McElroy Creek, Meathouse Fork, and Buckeye Creek. DTI conducted occupancy surveys in the summer of 2015, and no federally listed mussels were found during field surveys of these waterbodies.

The WVDNR does not have a state threatened and endangered species program, but defers to the FWS' list of federally listed threatened and endangered species. In accordance with West Virginia Mussel Survey Plan, all native freshwater mussels are protected in the state. If appropriate and applicable, specific protection measures or BMPs required by the WVDNR will be noted on the Construction Alignments Sheets, Drawing Set #1.

### 9.4.2 Historic Preservation

Natural Resources Group reviewed the files maintained by the West Virginia Division of Culture and History (WVDCH), the West Virginia State Historic Preservation Office's Interactive Map Viewer, and the Update to the Civil War Sites Advisory Commission's Report on the Nation's Civil War Battlefields State of West Virginia. Seven previously recorded archeological sites and 24 previously recorded aboveground resources were identified along or near the proposed SHP facilities in West Virginia.

A Phase I archaeological survey was conducted for the Project. The survey study area included a 300-foot wide corridor centered on the proposed pipeline centerlines, as well as aboveground and ancillary facilities, including access roads. Two structures identified by the surveys are considered eligible for listing on the National Register of Historic Places, but surveys determined that these aboveground resources will not be affected by the SHP. Copies of the survey reports have been provided to the WVDCH for review, and filed with FERC. If applicable, avoidance measures will be addressed as part of DTI's consultations with the WVDCH.

### 9.4.3 Federally Owned Lands

The proposed WV SHP pipeline route does not cross federally owned lands.

### 9.4.4 State-Owned Lands

The proposed TL-635 route crosses approximately 3.7 miles of WVDNR land in the Lewis Wetzel WMA. The SHP crosses the WMA between mileposts (MPs) 23.7 and 27.3 and between MPs 27.6 and 27.7 in Wetzel County. The WMA is owned and managed by the

WVDNR, and is a heavily forested area dominated by oak-hickory and cove hardwoods with numerous oil and natural gas wells and pipelines scattered throughout the area. The deciduous forests of the Lewis Wetzel WMA are considered important bird habitats, as these "cove forests" found within the WMA tend to have high species richness. DTI has developed conservation measures to minimize impacts on migratory birds and is also consulting with the USFWS regarding impacts, mitigation, and measures to minimize impacts on migratory birds. DTI will continue consultations with the WVDNR regarding the proposed pipeline route and construction activities through the Lewis Wetzel WMA.

### 9.4.5 Waterbodies

Waterbodies are defined by the FERC as "any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as lakes and ponds." The FERC categorizes surface waters as major, intermediate, or minor waterbodies based on the width of the water's edge at the time of crossing. Major waterbodies are greater than 100 feet wide, intermediate waterbodies are between 10 feet and 100 feet wide, and minor waterbodies are 10 feet wide or less.

Waterbodies were avoided where possible. All waterbodies crossed and crossing methods within West Virginia are show in Appendix E. The erosion and sediment controls implemented in waterbodies can be found in Section 14.1. There were no major waterbody crossed by the SHP in West Virginia.

### 9.4.6 Wetlands

During the routing phase of the Project, Fish and Wildlife Service (FWS) National Wetland Inventory (NWI) data, was used to provide a preliminary analysis of wetland resources and to assess where wetland impacts could be avoided or minimized. NWI data was also used to estimate the number, size, and locations of wetlands along the proposed pipeline routes prior to conducting wetland delineations in the field.

DTI began conducting field surveys during the 2014 field season, on properties where survey permission was granted by the landowner, to identify and delineate wetlands within the SHP pipeline construction corridors and other work areas. The wetland delineation study area for the SHP consisted of a 300-foot-wide corridor centered on the proposed pipeline centerlines, a 50-foot-wide corridor centered over access roads, and the construction footprints at aboveground facility sites. The wetland delineation for the Project encompassed potential areas required for installation of the proposed pipelines (i.e., the construction ROW, ATWS, staging areas, and access roads) and the aboveground facilities (i.e., compressor and M&R stations and other facilities). Within West Virginia, the survey progress is 98% complete for the mainline pipeline, 100% for the M&R and pig launcher/receiver sites, 100% complete for the compressor stations, 100% complete for the Contractor Yards, and 100% complete for the Access Roads.

Wetland crossings were avoided when possible; however, the data summarizing the number of wetlands crossings are based on field surveys conducted to date. In areas where a survey has not yet been completed due to access not being granted, NWI data was used to estimate the potential impact to wetlands. The location of wetlands crossed and crossing methods along the pipeline route are shown in Appendix I and the Construction Alignment Sheets included as Drawing Set #1.

DTI will avoid permanent impacts on wetlands and minimize temporary impact to the maximum extent practicable for crossing wetlands for access and otherwise avoiding use of wetland areas within contractor yards.

### 9.4.7 Residential Areas

In residential areas, construction activities will be completed as expediently as practicable to minimize disturbance to residents. While constructing in these areas, DTI will maintain access to the residences for the duration of construction activities. Where the pipeline will cross roads necessary for access to residential properties and no alternative entrances exist, DTI will implement measures, such as plating over the open portion of the trench, to maintain passage for landowners and emergency vehicles.

In general, DTI will reduce the width of the construction ROW or adjust the pipeline centerline to avoid occupied structures. For any residences within 50 feet of a construction work area, DTI will implement the following mitigation measures during construction:

- Orange safety fence will be installed at a minimum of 15 feet from the residence, and 100 feet along the construction corridor, each direction from the residence.
- Avoid the removal of mature trees and landscaping within the construction work area, unless necessary for safe operation of equipment, or as specified in the landowner agreements.
- Restore all lawn areas and landscaping immediately following cleanup operations or as specified in landowner agreement.
- During landowner negotiations, identify location of septic system and avoid or develop a replacement plan with landowner during construction.
- For this project, the following notes will also be applied:

    a. Where the pipeline centerline is within 25 feet of a residence, the trench will not be excavated until the pipe is ready for installation.

    b. Landowner will be notified one week prior to construction on his/her property.

    c. No refueling or storage of hazardous materials will occur within 200 feet of a private well.

    d. Steel plating or other effective means will be provided to allow landowner access to his/her residence should construction or other ground disturbances occur at egress points, landowner driveways, or other private access ways.

e. On public roads, DTI will follow the traffic management plans that are filed as part of the road-use permit.

f. Construction will be limited to daylight hours.

g. DTI will:

    i. Ensure piping is welded and installed as quickly as possible to minimize the amount of time a neighborhood is affected by construction;

    ii. Complete final cleanup, grading, and installation of permanent erosion control devices within 10 days after backfilling the trench, weather permitting. If seasonal or other weather conditions prevent compliance with this time frame, maintain temporary erosion controls (sediment barriers and mulch) until conditions allow completion of restoration; and

    iii. During landowner negotiations, will work with landowner on restoration procedure. These procedures will include seeding mix, tree/shrub planting and hardscape replacement.

DTI has prepared site-specific construction plans for residences located within 50 feet of the construction work areas for the Project, see Appendix J. The plans identify the mitigation measures DTI will implement at each residence to control erosion and sedimentation and to promote safe and efficient pipeline installation with minimal impact on residents.

### 9.4.8 Winter Construction

DTI has developed and filed a project-specific winter construction plan with the FERC application. 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).

### 9.4.9 Agricultural Areas

Special construction procedures and best practices for activities within actively cultivated or rotated land used for the production of crops including but not limited to corn, grains, orchards, vineyards and hayfields may be needed in agricultural areas. These activities will be implemented according to the FERC Plan.

In actively cultivated and rotated croplands, pastures, orchards, nurseries, and residential areas, topsoil will be removed and segregated in accordance with the FERC Plan. DTI will maintain water flow in crop irrigation systems, unless shutoff is coordinated with affected parties. Typically, topsoil will be removed over the entire width of the construction ROW (with the exception of areas beneath topsoil stockpiles). Following pipeline installation, the subsoil will be returned to the ditch and the topsoil replaced in the area from which it was removed. As necessary, the working side of the ROW will be de-compacted prior to final grading and restoration.

Where livestock fences (including electric fences) need to be cut to access the construction ROW, DTI will brace and secure the fencing prior to construction and repair the fences to preconstruction condition or better during the restoration phase of the Project. Further, DTI will work with landowners to remove livestock to alternate fields during construction or maintain adequate temporary fencing in grazing areas. If cattle or other livestock are present during construction, DTI will install temporary fencing around the ROW in areas where the pipe trench is left open overnight. Additionally, DTI will confer with landowners regarding a potential grazing deferment to allow vegetation to establish within the ROW after construction of the Project is complete.

DTI will work with landowners to identify drain tile systems in advance of construction, and mark the locations of any tile broken during pipeline trenching operations. DTI will contact landowners and local soil conservation authorities to determine the locations of future drain tiles that are likely to be installed within three years of the SHP construction. DTI will implement temporary tile line repairs to maintain the functionality of tile drainage systems during construction. Prior to backfilling the trench, DTI will employ a qualified tile contractor for permanent tile repairs. DTI will probe all drainage tile systems within the area of disturbance to check for damage, and will repair damaged drain tiles to their original or better condition. DTI will not use filter-covered drain tiles unless the local soil conservation authorities and the landowner agree. Following completion of construction and restoration, DTI will work with landowners to repair or correct tile drainage problems due to construction of the Projects. DTI will engage a qualified drain tile specialist, as needed, to conduct or monitor repairs to drain tile systems affected by construction.

In agricultural lands, the pipelines will be buried at depths sufficient to provide a minimum of 4 feet of cover to avoid potential impacts associated with typical agricultural activities, such as plowing. In consultation with landowners, the pipeline may be buried deeper in certain locations to facilitate the passage of heavy equipment, such as logging equipment.

## 9.5 POTENTIAL EROSION PROBLEM AREAS

Streams will be protected by Belted Silt Retention Fence (BSRF), and Rolled Erosion Control Product (RECP). Critical slopes will be protected by BSRF, Turf Reinforcement Mat (TRM), RECP, and slope breakers. Critical slopes include areas that would be prone to slips or sloughing. Special attention will be given to those slopes that are near surface waters. The discharge of soils from failed slopes into surface waters is a serious occurrence and may result in environmental non- compliance. A Best-in-Class (BIC) Steep Slopes Program, Appendix K, was developed by DTI for the Project and is described in greater detail in Sections 15.12.

### 9.5.1 Slopes

Portions of the SHP mainline in West Virginia will be constructed in steep, mountainous terrain. Slope instability in the form of landslides, landslips, or surficial slumping can present a significant hazard to pipeline routing, design, construction, and operation in steep slope areas if proper planning and mitigation is not considered in advance. When routing the SHP, the goal was to do so perpendicularly to topographic contours and to minimize routing on steep slopes to the extent practicable, in accordance with DTI's program for steep slopes, which includes considerations for slips associated with pipeline construction during routing as well as engineering design, preconstruction planning, construction, and post construction.

Construction typical details and cross-sectional diagrams of general construction techniques are provided as Appendix L. BMP installation details along the proposed SHP are shown on the Construction Alignment Sheets, Drawing Set #1. DTI's Best-in-Class (BIC) Program was designed to proactively address slopes greater than 30 percent and greater than 100 feet in length and to identify mitigation measures beyond standard practices. Details of the BIC Program are provided in Appendix K and Section 15.12 of this SWPPP.

All of the proposed SHP facilities are located in the Kanawha Section of the Appalachian Plateau physiographic province. This section, which is also referred to as the Unglaciated Allegheny Mountains, features undulating low, broad ridges and swells parallel to the mountains to the east, reducing in amplitude as the plateau slopes to the west.

In West Virginia, the proposed TL-635 mainline will be constructed in steep, mountainous terrain. Generally, the pipeline alignment will run along ridgelines and up and down slopes (as opposed to crossing laterally on side slopes). Installation along the ridgelines may require the pipeline to be buried deeper than normal (i.e., with greater than 3 feet of cover over the pipeline, which is typical in non-agricultural uplands). This is due to the techniques needed to construct along narrow ridgelines. The surface of ridgelines may need to be temporarily lowered to create a level construction ROW. Excavation of the trench will begin from the leveled work area. Following construction, the temporary ROW will be restored to preconstruction contours to the maximum extent practical.

### 9.5.2 Seeps

In the event that subsurface flow is encountered, a subsurface drain or 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 down-slope of areas showing seepage. Armored fill (typically 4-inch to 8-inch riprap), 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. The use of subsurface drains in steep slope areas is addressed by the BIC Program and the project-specific control recommendations provided in Appendix K.

## 9.6 PROJECT ACCESS POINTS/ACCESS ROADS

DTI has identified roads which will be used to provide access to the proposed SHP ROW and other facilities during construction and operation of the Project. DTI will utilize existing roads to the extent practicable, but some new roads will need to be built in remote areas. Additionally, new roads will need to be built to provide access to aboveground facility sites (e.g., compressor and M&R stations, valves) during operations. The SHP Project proposes to utilize a total of 27.4 miles of access roads within West Virginia during construction. An estimated 2.9 miles of new roadway within West Virginia will be constructed. The Project will involve 1.5 miles of hybrid existing/new access roads within West Virginia (this includes access roads where a portion of the road is existing and a portion is new, to-be-constructed). 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. Roadwork on public lands will conform to the design standards of the land managing agency. If existing roads are damaged during construction by DTI Contractors or representatives, DTI may be required to restore these roads to preconstruction condition or better.

Access roads must have a stone construction entrance at exit drives and parking areas to reduce the tracking of sediment onto public or private roads. Except for haul roads, all unpaved roads on the site carrying more than 25 vehicles per day must be graveled. All public and private roads adjacent to a construction entrance site must be inspected and cleared of debris originating from the construction site. The locations of access roads along the SHP route are shown on the Construction Alignment Sheets, Drawing Set #1.

## 9.7 POTENTIAL POLLUTANTS

Typical material storage at pipeline construction sites includes diesel fuel, hydraulic oil, and welding gases (oxygen and acetylene). Construction for the Project will require the use of lubricating oils, aerosol spray lubricants, paint, gasoline/diesel fuels, and solvents. A mobile fueling truck will be used to transport gasoline/diesel fuels. Other oils and/or chemicals are expected to be delivered in 5-gallon steel containers or 55-gallon drums. Table 9.7-1 outlines potential pollutants and their associated BMPs. Materials will be stored on pallets, located inside one or more secondary containment areas, as needed. There are no materials known to be used, stored, or disposed of at the proposed construction sites that are considered hazardous under the Resource Conservation and Recovery Act regulations; therefore, a discharge of hazardous materials is not considered likely. If potentially hazardous materials are used, their use will be minimized to that necessary for the required task and will be managed following the guidelines outlined in Section 18.4.

TABLE 9.7-1

**Potential Pollutants and Best Management Practices**

| Pollutant Name | Source | Associated BMP(s) |
|---|---|---|
| Sediment | Erosion | Site-specific erosion and sedimentation controls; BIC steep slopes controls; FERC Plans and Procedures. |
| Oil | Hydraulic oil, lubrication oil, greases, etc. associated with equipment and vehicles | Proper application, following manufacturer recommendations. Store minimum quantities necessary in tightly sealed containers, away from concentrated stormwater were possible, or within secondary containment. Dispose of used containers and excess material in accordance with manufacturer recommendations and local, state, and federal regulations. Vehicles and equipment will be inspected routinely for leaks, and will be repaired promptly to minimize or avoid drips. |
| Gasoline and diesel fuel | Fueling areas, mobile fueling truck, equipment and vehicles | Proper fueling practices, including personnel monitoring while fueling, routine inspections of fueling equipment, and use of secondary containment. Fuels stored on site will be within secondary containment subject to routine inspection, in accordance with the SPCC Plan. Vehicles and equipment will be inspected routinely for leaks, and will be repaired promptly to minimize or avoid drips. |
| Paint | Construction and maintenance activities | Proper application, following manufacturer recommendations. Store minimum quantities necessary in tightly sealed containers, away from concentrated stormwater were possible, or within secondary containment. Dispose of used containers and excess material in accordance with manufacturer recommendations and local, state, and federal regulations. |
| Solvents | Construction, maintenance, and cleaning activities | Proper application, following manufacturer recommendations. Utilize drip pans and sorbent materials during use. Store minimum quantities necessary in tightly sealed containers, away from stormwater were possible, or within secondary containment. Dispose of used containers and excess material in accordance with manufacturer recommendations and local, state, and federal regulations. |
| Antifreeze and coolants | Equipment and vehicles | Proper application, following manufacturer and equipment specifications. Store minimum quantities necessary in tightly sealed containers, away from concentrated stormwater were possible, or within secondary containment. Dispose of used containers and excess material in accordance with manufacturer recommendations and local, state, and federal regulations. Vehicles and equipment will be inspected routinely for leaks, and will be repaired promptly to minimize or avoid drips. |
| Welding gases | Construction and maintenance activities | Proper use, following manufacturer specifications. Store minimum quantities necessary in properly marked undamaged cylinders or containers, away from concentrated stormwater were possible, or within secondary containment. Dispose of used containers and excess material in accordance with manufacturer recommendations and local, state, and federal regulations. |
| Drilling mud and fluids | Drilling and construction activities | Proper use of structures to divert and contain material, using secondary containment where applicable, in conjunction with designated storage areas and containers prior to off-site disposal in accordance with local, state, and federal regulations. |
| Bentonite | Drilling and construction activities | Proper use, following manufacturer specifications. Keep bagged material covered and dry until use. Store minimum quantities necessary in away from stormwater. Dispose of used containers and excess material in accordance with manufacturer recommendations and local, state, and federal regulations. |
| Concrete | Construction and maintenance activities | Proper use, following manufacturer specifications. Keep bagged material covered and dry until use. Store minimum quantities necessary away from stormwater. Excess “green” concrete will not be poured in or exposed to stream flow or concentrated stormwater flows. Dispose of used containers and/or excess material in accordance with manufacturer recommendations and local, state, and federal regulations. |

| TABLE 9.7-1 (cont'd) | | |
|---|---|---|
| **Potential Pollutants and Best Management Practices** | | |
| Pollutant Name | Source | Associated BMP(s) |
| Adhesives, epoxy, etc. | Construction and maintenance activities | Proper use, following manufacturer specifications. Store minimum quantities necessary in tightly sealed containers, away from stormwater were possible, or within secondary containment. Dispose of used containers and excess material in accordance with manufacturer recommendations and local, state, and federal regulations. |
| Wood preservative | Construction and maintenance | Proper use, following manufacturer specifications. Store minimum quantities necessary in tightly sealed containers, away from stormwater were possible, or within secondary containment. Dispose of used containers and excess material in accordance with manufacturer recommendations and local, state, and federal regulations. |
| Fertilizers | Erosion | Site-specific erosion and sedimentation controls; Best-In-Class Steep Slopes controls; FERC Plans and Procedures |
| Pesticides | Erosion, construction, and maintenance activities | Site-specific erosion and sedimentation controls; Best-In-Class Steep Slopes controls; FERC Plans and Procedures. Proper application, following manufacturers' specifications. Store minimum quantities necessary in tightly sealed containers, away from stormwater were possible, or within secondary containment. Dispose of used containers and excess material in accordance with manufacturer recommendations and local, state, and federal regulations. |
| Herbicides | Erosion, construction, and maintenance activities | Proper application, following manufacturer specifications. Store minimum quantities necessary in tightly sealed containers, away from stormwater were possible, or within secondary containment. Dispose of used containers and excess material in accordance with manufacturer recommendations and local, state, and federal regulations. |
| Sandblast Media | Construction | Spent blast media will be stored in closed containers and consolidated as needed into a larger dumpster or roll off container. The material will be disposed of in accordance with manufacturer recommendations and local, state, and federal regulations. |

Site-specific descriptions and maps depicting locations of fixed and mobile oil containers and type of material located within the containers will be provided by the contractors prior to construction. DTI's contractors will provide DTI with a written SPCC Plan, specific to their operation and materials, which meets or exceeds federal regulatory requirements.

A GPP has been prepared for the proposed SHP activities. The GPP includes a record of potential contaminants along with procedures designated to protect groundwater from project activities. A copy of the GPP is included as Appendix C.

As new materials are used on site, their pollution potential will be evaluated. It is the responsibility of the stormwater inspector and contractor to update and monitor the inventory list within this SWPPP, and verify that the potential pollutants listed in Table 9.7-1 have a BMP installed to minimize the potential for and/or prevent discharges.

Safety Data Sheets (SDSs) for materials anticipated for use during execution of the Project will be kept by the Contractor and provided to DTI prior to construction. SDSs will be available from the contractor on an as-required basis.

## 10.0 ESTIMATED START AND COMPLETION DATES FOR THE PROJECT

Subject to receipt of the required permits and regulatory approvals, DTI anticipates that the clearing of ROW will commence in the fall of 2017. The SHP pipeline will be built along one spread in West Virginia, with construction estimated to begin in November 2017 and finish at the end of 2019. DTI anticipates that the proposed pipeline and facilities in West Virginia will be placed in service by December 2019. Key milestone dates for the construction schedule are summarized in Table 10-1**.**

The Sequence of Construction (Section 13.2) describes the timing and manner of installation of the erosion and sediment controls (ESCs).

TABLE 10-1

**Construction Schedule by Spread for the Supply Header Project in West Virginia [a]**

| Construction Activity/ Spread or Facility | Approximate Milepost | Counties | Begin Construction | Finish Construction |
|---|---|---|---|---|
| **Initial Construction Activities** | | | | |
| Initial site preparation | 0.0–33.6 | Wetzel, Doddridge, Tyler, and Harrison Counties | November 2017 | 1Q 2018 |
| Tree clearing [b] | 0.0–33.6 | Wetzel, Doddridge, Tyler, and Harrison Counties | November 2017 [c] | 1Q 2018 |
| **Construction of Pipeline** | | | | |
| Spread 13 TL-635 | 0.0–33.6 | Wetzel, Doddridge, Tyler, and Harrison Counties | January 2018 | 4Q 2019 |
| **Construction of Compressor Station Modifications** | | | | |
| Burch Ridge | NA | Marshall County | April 2019 | 4Q 2019 |
| Mockingbird Hill | 0.0 | Wetzel County | February 2018 | 3Q 2019 |
| **M&R Stations** | | | | |
| CNX | NA | Lewis County | January 2019 | 4Q 2019 |
| **Abandonment of Gathering Compressor Units** | | | | |
| Hastings | NA | Wetzel County | January 2019 | 4Q 2019 |

[a] The number and timing of the construction spreads are subject to change dependent upon construction and permit requirements.
[b] Including tree clearing for aboveground facilities.
[c] The start of tree clearing is dependent upon the results of the environmental surveys and agency consultations.

## 10.1 APPLICABLE FEDERAL, STATE, OR LOCAL PROGRAMS

DTI is seeking authorization from FERC under Section 7(c) of the Natural Gas Act to construct, own, operate, and maintain the SHP. Additional programs, permits, and consultations applicable to DTI's proposed Project include:

- Notice of proposed construction or authorization (Federal Aviation Administration);
- Section 401 and 404 of the Clean Water Act (U.S. Army Corps of Engineers, WVDEP);

- Section 7 of the Endangered Species Act (USFWS);
- Title 40 Code of Federal Regulations Part 112 Oil Pollution Prevention;
- New Source Review air permit (or other applicable permit)(WVDEP);
- Section 403 of the Clean Water Act, National Pollutant Discharge Elimination System (NPDES) Water Pollution Control Permit for Stormwater Associated with Oil and Gas Activities (WVDEP);
- Section 403 of the Clean Water Act, NPDES Water Pollution Control Permit for Hydrostatic Testing Water (WVDEP);
- Large Quantity User Water Use registration (WVDEP);
- Section 106 of the National Historic Preservation Act (WVDCH, tribal governments);
- Natural Heritage/Protected Species and Stream Activity Permit (WVDNR, West Virginia Public Lands Corporation);
- Highway Occupancy/Encroachment Permits MM109 (West Virginia Department of Transportation, Division of Highways); and
- Regulatory Floodplain Fill Permits:
    - Doddridge County;
    - Wetzel County; and
    - Harrison County.

## 10.2 NOTICE OF TERMINATION

Within 30 days of final stabilization, DTI will file a NOT for the permit, which notifies WVDEP that the Permittee is requesting a final inspection of the site. ESCs are to be removed once stabilization is achieved. DTI will coordinate removal of ESCs with the WVDEP final inspection.

## 11.0 CUBIC YARDS OF EXCAVATION (CUT/FILL) AND WASTE/BORROW SITES

Excavation activities will consist of excavating and backfilling of the pipeline trench, construction of the CS pad, and construction of the M&R Stations and other ancillary facilities. No waste areas, borrow sites, or ditches will be installed as part of this Project. Cubic yards of cut/fill by facility are included in Table 11-1.

TABLE 11-1

**Cubic Yards of Excavation**

| Location | Cut (Cubic Yards) | Fill (Cubic Yards) |
|---|---|---|
| Pipeline | 370,000 | 370,000 |
| Mockingbird Hill CS | 118,400 | 118,600 |
| Burch Ridge CS | 0 | 0 |

Trenching will be accomplished with an excavator or a similar machine. Excavated material is typically placed adjacent to the trench. In areas where soft rock or hard pans are present, tractor-mounted ripper may be used to break and loosen consolidated material. Loosened material, not suitable as safe backfill material for placement over or around the pipeline, will be removed from the excavated substrate prior to backfilling of the trench. The loosened material will be redistributed within the limits of the permitted workspace. Upon successful installation of the pipeline segment and backfilling operations, the excavation areas will be returned to their approximate original slope and contours.

Backfilling of the trench will be performed as early as possible and should not exceed 45 days per pipeline segment. The Contractor will be required to notify DTI and the Environmental Inspector (EI) of any extenuating circumstances requiring open trenches in excess of 45 days. The backfill material that will be returned to the trench will typically consist mostly of the excavated material removed from the trench subject to particle size and quality of the materials. Following pipeline installation, disturbed areas will be returned to their approximate original slope and contours, stabilized, and seeded.

Land acreages affected by the SHP including the permanent pipeline ROW, temporary construction ROW, ATWS, aboveground facility sites, access roads, and pipe storage and contractor yards are outlined in Table 11-2. Specific areas of grading and excavation are outlined in the attached drawings, the Construction Alignment Sheets, Drawing Set #1 and Aboveground Facility Site Specific Plans, Drawing Set #2.

For the TL-635 pipeline loop, the construction corridor in non-agricultural uplands in areas that are co-located with existing ROW will measure 100 feet in width, with a 25-foot wide spoil side and a 75-foot wide working side. The construction corridor in non-agricultural uplands in areas that are not co-located with existing ROW will measure 110 feet wide, with a 35-foot wide spoil side and a 75-foot wide working side. In areas where full width topsoil segregation is required, 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 ROW 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 easement along the length of the TL-635 line will be maintained for operation of the pipeline.

Following construction of the SHP pipeline, land within the temporary construction ROW will be restored.

TABLE 11-2

**Summary of Construction Site Estimates [a]**

| Facility | Land Affected During Construction (acres) | Post-Construction Operations Area (acres) |
|---|---|---|
| **TL-635 Pipeline** | | |
| ROW | 392.6 | 197.2 |
| Additional temporary workspace[b] | 68.1 | 0.0 |
| **Access Roads[c]** | | |
| Existing | 78.0 | 78.0 |
| New (to be constructed) | 11.1 | 11.1 |
| Hybrid[d] | 25.0 | 25.0 |
| **Contractor Yards** | | |
| 5 (Wetzel County) | 1.0 | 0.0 |
| 6 (Wetzel County) | 1.2 | 0.0 |
| 7 (Doddridge County) | 0.7 | 0.0 |
| 8 (Doddridge County) | 1.7 | 0.0 |
| 9 (Doddridge County) | 2.8 | 0.0 |
| 10 (Ritchie County) | 22.5 | 0.0 |
| **Aboveground Facilities** | | |
| Burch Ridge CS[e] | 6.3 | 0.0 |
| Mockingbird Hill CS | 64.0 | 9.5 |
| CNX M&R Station[f] | 0.0 | 0.0 |
| Valves[g] | 0.0 | 0.0 |
| Pig Launcher[h] (Mockingbird Hill CS) | 0.0 | 0.0 |
| Pig Receiver[h] (Marts Junction) | 0.6 | 0.6 |
| Hastings CS[i] | 0.0 | 0.0 |

[a] The numbers in this table have been rounded for presentation purposes.
[b] This includes ATWS, topsoil segregation areas, and water impoundment structures.
[c] The land requirements for the access roads are inclusive of all states associated with the SHP (e.g., West Virginia and Pennsylvania).
[d] This includes access roads where a portion of the road is existing and a portion is new, to be constructed.
[e] No additional land will be required at the Burch Ridge CS. Work at this site will occur within the fenceline of the existing facility.
[f] No additional land will be required at the CNX M&R Station for the proposed SHP. Work at this site will occur within the fenceline of CS 1, associated with the Atlantic Coast Pipeline Project.
[g] No additional land will be affected by construction or operation of the pig launcher assembly installed on the same sites and within the fenceline of CS1 (Marts).
[h] No additional land will be affected by construction or operation of the pig launcher/receiver assemblies installed on the same sites and within the fencelines as the Mockingbird Hill CS.
[i] No additional land will be required at the Hastings CS. Work at this site will occur within the existing facility.

In addition to the construction ROW, ATWS will be required to stage construction activities and store equipment, materials, and spoil at wetland, waterbody, and road crossings. ATWS will also be required in areas with steep side slopes, where special construction techniques are implemented, at tie-ins with existing pipeline facilities, utility crossings, truck turnaround areas, and spread mobilization/de-mobilization areas. For the TL-635 loop, ATWS measuring 25 by 100 feet will typically be required on both sides of the corridor and both sides of the crossing at wetlands, waterbodies, roads, and railroads. Following construction of the pipelines, ATWS will be restored in accordance with the FERC Plan and Procedures, along with other federal and state agency requirements and landowner stipulations. Specific locations of ATWS are shown on the Construction Alignment Sheets, Drawing Set #1.

Post-construction stormwater runoff for these land disturbance areas are discussed in Section 12.0.

## 12.0 PRE-DISCHARGE AND POST-DISCHARGE CALCULATIONS

Post-construction stormwater management BMPs are outlined in Section 13.4.2 of this plan. Details on seed mixtures are provided in Section 13.3.6 and the Restoration and Rehabilitation Plan, Appendix M. Following construction, disturbed areas will be restored back to approximate preconstruction contours along with promoting uniform vegetation growth for stability. BMP's will not be removed until stabilization is achieved and vegetation of ground areas have progressed above 70% uniform coverage. Stormwater outlets shall be stabilized with non-erosive material or discharged at non-erosive velocities.

New impervious surfaces will not be created by this Project along the pipeline ROW. The majority of areas that will be affected consist of vegetated ROW. All non-impervious areas in the ROW disturbed by the Project will be restored to their approximate original conditions and their preconstruction contours. When encountered, existing impervious areas disturbed by the Project will be restored with similar construction materials and to approximate original conditions, and contours. Accordingly, post-construction runoff will remain essentially the same as preconstruction runoff. Therefore, the calculation of runoff coefficients for preconstruction versus post-construction conditions along the ROW is not warranted or applicable to the linear portion of the Project. Likewise, the temporary pipe storage and contractor yards will be restored to pre-construction conditions and will not require stormwater management measures.

Mockingbird Hill CS involves the addition of impervious area, and has had stormwater management facilities designed according to site specific parameters and requirements. Refer to site construction plans and calculations for post construction stormwater management at Mockingbird Hill CS (Drawing Set #2).

## 13.0 NARRATIVE DESCRIPTION OF EROSION AND SEDIMENT CONTROLS

The ESC outlined in this plan have been prepared for use by DTI and its contractors as a guidance manual for minimizing erosion of disturbed soils and transportation of sediments off the construction ROW and into identified water resources, sensitive areas and residential areas during construction of the Project. The procedures developed, which represent the Project's BMPs, are designed to accommodate varying field conditions while achieving compliance with regulatory requirements and being protective of the environment.

This SWPPP also includes implementation of the BIC program for addressing steep slopes, slip prone soils, and similar sensitive areas beyond typical West Virginia requirements. This BIC Program proactively addresses identified potential issues and provides a tool box for the construction team to actively address issues identified during construction.

The ESC measures outlined in the following sections are 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 ESC measures included in this plan 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 potential impacts to the environment.

ESC BMP information is referenced from the WV BMP Manual. This SWPPP, specifically the ESCs for construction activities in this plan have five goals, as required by WVDEP:

1. limiting the amount of total disturbance;
2. diverting upslope water around disturbed areas off the site;
3. limiting the exposure of disturbed areas to the shortest duration possible;
4. controlling internal water and runoff; and
5. removing sediment from stormwater before it leaves the site.

## 13.1 MINIMIZE DISTURBED AREA

### 13.1.1 Typical Right-of-Way Requirements

Pipeline construction workspace requirements are a function of pipe diameter, equipment size, topography, type and depth to rock, geological rock formations, location of construction such as at road crossings or river crossings, pipeline crossovers, methods of construction such as boring or open-cut construction, or existing soil conditions encountered during construction. As the diameter of the pipeline being installed increases, so does the depth of trench, excavated spoil material, equipment size, and ultimately the amount of construction work space that will be required to construct the Project. Workspace locations for a given project will be shown on the Construction Alignment Sheets, Drawing Set #1.

Additional, construction ROW may be required at specific locations including, but not limited to, steep side or vertical slopes, road crossings, pipeline crossovers, areas requiring supplemental topsoil segregation, and staging areas associated with wetland and waterbody crossings.

Construction activities, including staging, grading and additional spoil storage areas, are restricted to the construction ROW limits identified on the Construction Alignment Sheets, except for specific activities in limited, non-wetland and non-riparian areas that are allowed by the FERC Plan and Procedures (i.e., slope breakers, energy-dissipating devices, dewatering structures, and drain tile system repairs). Use of these limited areas is subject to landowner or land management agency approval and compliance with all applicable survey, permit, and reporting requirements; therefore, prior DTI approval is required to use these areas. In some cases, federal, state, and local permits and authorizations may require additional approvals.

Minor field realignments and workspace shifts per landowner needs and requirements are only allowed if construction activities remain within the environmental field survey area, comply with Project-specific environmental permits and landowner easements, and do not adversely affect new landowners or resource areas.

### 13.1.2 Access Roads and Access Points

To the extent practical, access to the construction ROW should utilize existing roads and access will be avoided or minimized in wetlands. However, additional access roads to the construction ROW may be required at various points along the Project where other road crossings (paved or gravel state/local roads) do not exist. Improvements to existing access roads (i.e., earth grading, replacing/installing culverts, and trimming overhanging vegetation) may be required due to the size and nature of the equipment that would utilize the road. Refer to Appendix N for Access Road Plans and details. The following conditions apply to the use of access roads:

- In West Virginia, access road upgrades requiring grading of earth, cleaning of roadside channels, widening or similar earth disturbance shall be shown within the Project LOD and have ESC measures installed. Existing access roads requiring only a resurfacing with gravel or asphalt are not required to be included within the LOD.

- Construction entrances will have stone access entrance and exit drives and parking areas to reduce the tracking of sediment onto public or private roads. Except for haul roads, all unpaved roads on the site carrying more than 25 vehicles per day will be graveled.

- During construction and restoration activities, access to the ROW is limited to the use of new or existing access roads identified on the Construction Alignment Sheets.

- The only access roads that can be used in wetlands, other than the construction ROW, are those existing roads requiring no modification or improvements, other than routine repair, and posing no impact on the wetland.

- The construction ROW may be used for access across wetlands when the wetland soil is firm enough to avoid rutting or the construction ROW 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 shall use access roads located in upland areas. Where access roads in upland areas do not provide reasonable access, limit all other construction equipment to one pass through the wetland using the construction ROW.

- Limit construction equipment operating in wetland areas to that needed to clear the ROW, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the construction ROW. Other construction equipment shall use access roads located in upland areas to the maximum extent practical.

- Maintain safe and accessible conditions 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.

- Maintain access roads in a stable manner to prevent off-ROW impacts, including impacts on adjacent and/or nearby sensitive resource areas, and implement appropriate ESC measures for construction/improvement of access roads.

- Minimize the use of tracked equipment on public roadways and in accordance with requirements of the managing agency.

- Remove soil or gravel spilled or tracked onto roadways daily or more frequently as necessary to maintain safe road conditions.

- Repair damages to roadway surfaces, shoulders, and bar ditches.

- If crushed stone/rock access pads are used in residential or agricultural areas, stone shall be placed on appropriate geotextile fabric to facilitate removal after construction.

- All access roads across a waterbody must use an equipment bridge.

- For access through a saturated wetland, use timber mats or an equivalent, unless otherwise authorized by agency permits.

### 13.1.3 Contractor Yards

Contractor yards are required for storing and staging equipment, pipe, fuel, oil, pipe fabrication, and other construction-related materials and preparations. The contractor shall perform the following measures at contractor yards:

- Strip and segregate topsoil in agricultural lands.
- Install ESC structures identified on the construction drawings, and as outlined in this SWPPP. Implement additional controls as directed by the EI. Maintain controls throughout construction and restoration activities.
- Implement required spill prevention and containment of potential contaminants and comply with the SPCC Plan, including the completion of required site-specific forms and attachments.
- Restore and revegetate all disturbed areas in accordance with the measures outlined in this SWPPP and the Restoration and Rehabilitation Plan (Appendix M), landowner agreements and/or as directed by the EI. At a minimum, the area must be returned to approximate preconstruction contours and stabilized prior to contractor demobilization.

### 13.1.4 Off-Right-of-Way Disturbance

All construction activities are restricted to the construction ROW LOD identified on the construction drawings, except for specific activities in limited, non-wetland and non-riparian areas that are allowed by the FERC Plan and Procedures. Activities allowed to occur off-ROW but within the permit boundary are limited to the installation of slope breakers, energy-dissipating devices and dewatering structures, and repairs to drain tile.

## 13.2 CONSTRUCTION SEQUENCE

This section provides an overview of the equipment and operations necessary to complete construction, describes potential impacts that may occur from each operation, and identifies the measures that will be implemented to control these potential impacts. This section discusses in detail the ESC techniques that typically apply to each construction activity including Site Preparation (flagging, clearing, grading), Pipe Installation (trenching, welding, lowering-in, backfill), and Restoration (final grading, seeding). An approximate construction schedule for the SHP is provided as Table 10-1.

Miss Utility of West Virginia (WV 8-1-1) will be contacted at least two business days prior to start of work but no sooner than 10 days before excavation begins. Prior to starting any earth disturbance activities, appropriate Project and agency personnel shall be invited to a preconstruction meeting.

**Site Preparation**

1. Survey and flag the construction ROW and mark environmentally sensitive areas.

2. Install rock construction access pads.

3. Conduct initial clearing, limited to that necessary to install temporary sediment barriers.

4. Install perimeter BMPs incrementally in advance of bulk earth-moving activity.

5. Conduct progressive clearing with installation of temporary sediment barriers and temporary equipment bridges keeping pace with clearing.

6. Modify access roads by grading and installing stone where needed.

7. Grade the ROW, and segregate topsoil where necessary.

8. Install temporary slope breakers, as needed to reduce runoff velocity and divert water off the construction ROW. If specified, install temporary ESC measures at the outlet of each slope breaker.

9. For any outlets associated with the General Permit a marker listing the name of the establishment to which the General Permit was issued, the permit number, and the outlet number will be posted on the stream bank at each outlet. The marker will be a minimum size of two feet by two feet and will be a minimum of three feet above ground level.

**Clearing and Flagging**

Clearing operations include the removal of vegetation within the construction ROW. Various clearing methods are employed depending on tree size, contour of the land, and the ability of the ground to support clearing equipment. Vegetative clearing can be accomplished either by hand or by cutting equipment. The following procedures will be standard practice during clearing:

1. Prior to beginning the removal of vegetation:

   a. the limits of clearing will be established and visibly marked before clearing;

   b. signs and highly visible flagging will also be used to mark the boundaries of sensitive resource areas, including waterbodies and wetlands, and/or areas with special requirements along the construction work area, in accordance with the Construction Alignment Sheets, Drawing Set #1;

   c. flagging or marking shall be maintained throughout construction; and

   d. trees to be protected per landowner requests or as otherwise directed will be clearly marked.

2. All construction activities and ground disturbance will be confined to within the construction ROW shown on the Construction Alignment Sheets, Drawing Set #1.

3. All brush and trees will be felled into the construction ROW to minimize damage to trees and structures adjacent to the ROW. Trees that inadvertently fall beyond the edge of the ROW will be immediately moved onto the ROW and disturbed areas will be immediately stabilized, per landowner approval.

4. Trees will be chipped and removed or cut into lengths identified by the landowner and then stacked at the edge of the ROW or removed. Trees may be burned depending on local and state restrictions, applicable permits, construction Line List stipulations, and landowner agreements.

5. Brush and limbs may be disposed of in one or more of the following ways depending on local restrictions, applicable permits, construction Line List stipulations, and landowner agreements:

   a. stockpiled along the edge of the ROW;

   b. burned – if burning of brush is elected and approved by the EI, the Contractor will first obtain a burn permit from the WVDEP Division of Air Quality and notify the local Fire Department with jurisdiction for regional requirements in West Virginia. During the forest fire season (typically March 1-May 31 and October 1- December 31) a permit must also be obtained from the West Virginia Division of Forestry. Notification of the Division of Forestry will be made outside of forest fire season. The Contractor will abide by all site-specific requirements of the permit. The EI will identify burn permit requirements that conflict with other permits or requirements of the Project;

   c. chipped, spread across the ROW in upland areas, and plowed in at the discretion of the Construction Site Supervisor or EI and in accordance with applicable project documents (excess material must be removed);

   d. used as part of erosion control mix material; or

   e. hauled off site to a DTI-approved location.

6. Existing surface drainage patterns shall not be altered by the placement of timber or brush piles at the edge of the construction ROW.

**Grading**

The construction ROW will be graded as needed to provide a level workspace for safe operation of heavy equipment used in pipeline construction. The following procedures will be standard practice during grading; topsoil segregation, tree stump removal and disposal, rock management, temporary stabilization, and temporary slope breakers as needed. These procedures are discussed in more detail in subsequent sections.

## Trenching

The trench centerline will be staked after the construction ROW 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:

1. flag drainage tiles damaged during ditching activities for repair;

2. place spoils in additional extra work areas or at least 10 feet away from the waterbody's edge in the construction ROW. Spoil will be contained with ESC devices to minimize the potential for spoil materials or sediment-laden water from transferring into waterbodies and wetlands or off of the ROW; and

3. if temporary ESC structures are damaged or removed during trenching, they shall be repaired and/or replaced before the end of the work day.

## Pipe Installation

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

1. Excavate new trench to accommodate new/replacement pipeline segment.

2. String pipe, bend the pipe joints.

3. Weld the pipe, inspect welds.

4. Lower the pipe into the trench.

5. Install permanent trench plugs and drains.

6. Backfill the trench.

7. Install hydrostatic test dewatering structures.

8. Hydrostatically test the pipe and dewater.

9. Bring the pipeline to gas service.

## 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 or screened spoil materials from trench excavation.

## Restoration and Final Cleanup

Restoration of the ROW 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 ESC devices to minimize post-construction erosion. Property shall be restored as close to its preconstruction condition as practical unless otherwise specified by the landowner.

1. The Contractor shall 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 ESC (i.e., temporary slope breakers, sediment barriers, and mulch) until conditions allow completion of cleanup.

2. As soon as slopes, channels, ditches, and other disturbed areas reach final grade, they must be stabilized. The disturbed ROW will be seeded as soon as possible and within no more than 6 working days of final grading, weather and soil conditions permitting.

3. Grade the ROW to approximate preconstruction contours, with the exception of the installation of any permanent measures required herein.

4. Spread segregated topsoil back across the graded ROW to its original profile.

5. Remove excess rock from at least the top 12 inches of soil in all cultivated or rotated cropland, managed pastures, hayfields, residential areas, as well as other areas at the landowner's request. The size, density, and distribution of rock on the construction ROW shall be similar to adjacent areas not disturbed by construction. The landowner or land managing agency may approve other provisions in writing.

6. A travel lane may be left open temporarily to allow access by construction traffic if the temporary ESC structures are installed, regularly inspected and maintained. When access is no longer required, the travel lane must be removed and the ROW restored.

7. Remove all construction debris (used filter bags, skids, trash, etc.) from all construction work areas. Remove all unused or incidental clean material unless the landowner or land managing agency approves leaving material on site for beneficial reuse, stabilization, or habitat restoration. Grade or till the ROW to leave the soil in the proper condition for planting.

8. Final grade ROW and temporary workspaces to approximate original contours to the extent practicable.

9. Replace segregated topsoil.

10. Install permanent water bars.

11. Conduct ROW restoration and cleanup. As soon as slopes, channels, ditches, and other disturbed areas reach final grade, they must be stabilized.

12. Apply soil amendments, permanent seed, mulch and/or erosion control matting.

13. Restore temporary access roads or paved surfaces to original condition.

14. 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 perennial vegetation.

## 13.3 VEGETATIVE PRACTICES

Natural vegetation will be preserved as much as possible, but especially on critical areas such as: steep slopes, areas adjacent to perennial and intermittent watercourses or swales or wetlands, and on building sites in wooded areas. Fence or clearly mark areas around plants that are to be saved. Where possible and authorized, adjust trench routing around identified special plants and trees.

Stabilization measures must be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased; but in no case more than seven days after the construction activity in that portion of the site has ceased. However, where construction activity will resume on a portion of the site within 14 days from when the activities ceased, (i.e., the total time period that construction activity is temporarily halted is less than 14 days) then stabilization measures do not have to be initiated on that portion of the site by the seventh day after construction activities have temporarily ceased.

Areas where the seed has failed to germinate adequately and establish a uniform perennial vegetative cover with a density of 70 percent, within 30 days after seeding and mulching must be reseeded immediately, or as soon as weather conditions allow. Clean water diversions must be stabilized before becoming functional. For more detail on the seed mixes and revegetation measures see Appendix M, Restoration and Rehabilitation Plan.

### 13.3.1 Tree Stump Removal and Disposal

To allow adequate clearance for safe operation of vehicles and equipment the removal of tree stumps in upland areas along the entire width of the permanent ROW will be completed. Stumps within the temporary ROW will be removed or ground below the surface to allow the safe passage of equipment, as determined by the Construction Site Supervisor or EI. In addition the following removal or disposal of tree stumps could potential occur:

- In wetlands, limit pulling of tree stumps and grading activities to directly over the trenchline. Grading or removal of stumps/root systems will not be completed from the rest of the construction ROW in wetlands unless the Chief Inspector and EI determine that safety-related construction constraints require grading or the removal of tree stumps from under the working side of the construction ROW (per FERC Procedure VI.B.2.g).

- Dispose of stumps by one of the following methods with the approval of the Construction Site Supervisor and the landowner and in accordance with regulatory requirements:

    - burned on construction ROW;
    - chipped, spread across the construction ROW in upland areas, and plowed in;
    - used as erosion control mix material; or
    - hauled off site to an approved disposal facility.

### 13.3.2 Temporary Vegetation

Temporary vegetation will be conducted as needed for graded areas, spoil piles and other disturbed land during construction. The seed used for vegetation will not include any plant species prohibited by the West Virginia Noxious Weed Act. As part of the FERC process a Restoration and Rehabilitation Plan was prepared for the SHP to address post-construction restoration and rehabilitation activities. Revegetation and seeding mixes are discussed in more detail in this plan included as Appendix M. The seed mixes were determined by the project area broken into Revegetation Units (RU) by physiographic regions.

### 13.3.3 Topsoil Segregation

During construction, topsoil and subsoil will be disturbed by grading of the ROW, trench excavation, and by heavy equipment moving along the ROW. Implementation of proper topsoil segregation is intended to mitigate these construction impacts and promote or facilitate post-construction revegetation success.

Topsoil segregation methods will be used in all residential areas (except where the topsoil is being replaced), wetlands (except areas where standing water is present or soils are saturated), cultivated or rotated croplands, managed pastures, hayfields, and other areas at the landowner's or land managing agency's request. Either the "ditch plus spoil side" or the "full ROW" segregation method will be used.

1. Prevent the mixing of topsoil with subsoil by stripping topsoil from either the full work area or from the trench and subsoil storage area ("ditch plus spoil side" method).

2. Segregate at least 12 inches of topsoil in deep soils with more than 12 inches of topsoil. In soils with less than 12 inches of topsoil, make every effort to segregate the entire topsoil layer.

3. Within wetlands, segregate the top 12 inches of topsoil within the trenchline, except in areas where standing water is present or soils are saturated.

4. In residential areas, importation of topsoil (i.e., topsoil replacement) is an acceptable alternative to topsoil segregation, if approved by the landowner and Construction Site Supervisor.

5. Maintain separation of salvaged topsoil and subsoil throughout all construction activities.

6. 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 ROW.

7. Never use topsoil for padding the pipe, constructing temporary slope breakers, trench breakers or trench plugs, improving or maintaining roads, or as a fill material.

8. Stabilize topsoil piles and minimize loss due to wind and water erosion with use of sediment barriers, mulch, temporary seeding, or functional equivalents, where necessary. The stockpiles will be laid out perpendicular to the predominant wind direction where possible and practical.

#### 13.3.4 Mulching/Erosion Control Blanket

At a minimum, a mulch application will be applied and temporary erosion control structures will be maintained until stabilization has been achieved. Mulch is intended to stabilize the soil surface and shall consist of weed-free straw, wood fiber hydromulch, erosion control fabric, or some functional equivalent as approved by the EI and Construction Site Supervisor. A Restoration and Rehabilitation Plan was prepared for the Atlantic Coast Pipeline and the associated SHP to address post-construction restoration and rehabilitation activities. Refer to the attached Restoration and Rehabilitation Plan (Appendix M) for seedbed preparation, seed mix selection, seeding methods, lime and fertilizer application, mulching, and supplemental planting.

DTI will request an exception to the time of year restriction for chemical mulches. DTI will use Earth Guard brand fiber matrix mulch (copolymer emulsion blend with fiber mulch) or similar. The material will be used in accordance with manufacturers specifications including application rates based upon time of year, slope and soil conditions. As the Project will continue for more than a year, the use of this material is expected to occur within various seasons as both a permanent and temporary stabilization.

### 13.3.5 Temporary Seeding

Use temporary seeding where exposed soil surfaces are not to be fine-graded for periods longer than 21 days. Such areas include denuded areas, soil stockpiles, dikes, dams, sides of sediment basins, temporary road banks, etc. A permanent vegetative cover must be applied to areas that will be left unworked for a period of more than six months. Annual plants that sprout rapidly and survive for only one growing season are suitable for establishing temporary vegetative cover. Temporary seeding is encouraged whenever possible to aid in controlling erosion on construction sites. To control erosion on bare soil surfaces, plants must be able to germinate and grow. Seedbed preparation is essential. If the area has been recently loosened or disturbed, no further roughening is required. When the area is compacted, crusted, or hardened, the soil surface must be loosened by disking, raking, harrowing, or other acceptable means. Seed must be evenly applied with a broadcast seeder, drill, cultipacker seeder, or hydroseeder. Small grains must be planted no more than 1.5 inches deep. Small seeds, such as annual rye, must be planted no more than one-quarter-inch deep. Other grasses and legumes must be planted no more than one-half-inch deep. Temporary seeding conducted in fall for winter cover and during hot and dry summer months must be mulched with straw or hay according to the standard for mulching. Hydromulches (fiber mulch) may not provide adequate temperature and moisture control. See Table 13.3.5-1 for timeframes when temporary seeding is required.

Table 13.3.5-1

**Temporary Seeding Timeframes**

| Areas Requiring Temporary Stabilization | Timeframe to Apply Erosion Controls |
|---|---|
| For all construction areas, disturbed areas that will be idle for more than 21 days | Within 7 days of the most recent disturbance in the area |
| Disturbed areas that will be idle over the winter | Prior to the on-set of winter weather |

### 13.3.6 Permanent Seeding

Permanent seeding is the establishment of perennial vegetative cover on disturbed areas by planting seed. Permanent seeding will permanently stabilize disturbed areas in a manner that is economical, adaptable to site conditions, and allows selection of the most appropriate plant materials. Permanent seed will be applied in disturbed areas where permanent, long-lived vegetative cover is needed to stabilize the soil, and at rough-graded areas that will not be brought to final grade for six months or more. However, in seeding for erosion control purposes, the inclusion of more than one species must be considered. Mixtures need not be excessive in poundage or seed count. The addition of a nurse crop is necessary for soil stabilization, particularly on difficult sites, those with steep slopes, poor, rocky, erosive soils, those seeded outside of the optimum seeding periods, or in any situation where the permanent cover development is likely to be slow. The nurse crop germinates and grows rapidly, holding the soil until the slower-growing perennial (permanent) seedlings become established. The seed mixture(s) to be used are described in the Restoration and Rehabilitation Plan, included as Appendix M.

If seed fails to germinate adequately (uniform perennial vegetative cover with a density of 70 percent) in any of the Project areas within 30 days after seeding and mulching, then the areas must be reseeded immediately, or as soon as weather conditions allow.

If vegetation has not been established by November 1st, use Winter Rye at 85 pounds per acre in lieu of the Perennial Ryegrass.

### 13.3.7 Wetland Vegetation Practices

As further described in Section 5.10 of the Restoration and Rehabilitation Plan (Appendix M), seeding of wetlands is not anticipated as wetlands are expected to naturally revegetate. Wetland revegetation will be considered successful when vegetation community characteristics are similar to the vegetation in adjacent wetland areas that were not disturbed by construction. Restored wetland vegetation will include at least 80 percent of the species targeted for restoration, and the density and distribution of individuals plants will be similar to areas not disturbed by construction. Fertilizer, lime, or mulch will not be used within the wetland area unless required in writing by an appropriate land management or state agency. Topsoil in wetland areas will be segregated, stockpiled, and reapplied after final grading has been reached.

### 13.3.8 Vegetative Buffers

A natural vegetative buffer must be provided adjacent to receiving streams or other waterbodies on the Project site. Vegetative buffers may be reduced at the direction of the EI for linear Projects where ROW acquisition or area is limited. Contractor shall attempt to maintain as much of the natural vegetation as possible in these instances.

No disturbance is permitted within a vegetative buffer, except for necessary infrastructure improvements (utility lines, road crossings, etc.), or unless planting is required.

The minimum vegetative buffer width must be 100 feet, unless specific design information can be provided to justify a smaller buffer width. For slopes greater than 10 percent, the minimum distance is 250 feet. Smaller buffers may be used in conjunction with other BMPs.

The width of the contributing area to the vegetative buffer will not exceed 300 feet, unless energy-dissipating devices are provided. Buffers may be used as a supplement to other BMPs for larger drainage areas. Good (minimum of 80 percent) vegetative cover must be present in the proposed buffer area.

## 13.4 STRUCTURAL CONTROLS

Activities related to the construction of the SHP will occur within the Project Area indicated on Figure 2 in Appendix A. Excavation activities for this Project will be limited to the indicated LOD. Excess soil will be spread on site, and disturbed areas will be returned to their approximate original slope and contours. Constructed fill slopes are generally limited to the construction of the ancillary facilities such as Compressor Station modifications or the M&R Station. No fill slopes are being proposed for the SHP alignment except in limited instances identified in the field where necessary to promote slope stability. The following sections detail the temporary and permanent sediment controls measures proposed to be utilized within the proposed pipeline route. The proposed disturbance within the pipeline route is temporary; therefore, no permanent stormwater detention/retention structures will be required on the pipeline.

Stormwater controls and ESCs have been designed for the ancillary facilities such as the Compressor Stations and M&R Station. These controls will be shown on the Site Specific Drawings (see Drawing Set #2). For all disturbed areas, sediment-laden water must be directed through appropriate BMPs before leaving the Project Area.

The entire ROW will be re-vegetated following completion of the installation activities. The following sections and the Construction Alignment Sheets, Drawing Set #1, illustrate the various ESCs that will be used on this Project. Typical construction details with regard to road, railroad, stream, and wetland crossings are located in Appendix L.

### 13.4.1 Temporary Structural Control Measures

#### 13.4.1.1 Temporary Sediment Barriers

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 prior to mechanized clearing of trees, brush, and vegetation. They may be constructed of materials such as silt fence, compacted earth (e.g., drivable berms across travel lanes), compost filter sock, sand bags, or other appropriate materials (see detail on Construction Alignment Sheets, Drawing Set #1).

1. Install temporary erosion controls immediately after initial disturbance of the soil. Temporary erosion controls must be properly maintained through construction (on a daily basis) and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration is complete.

2. Install temporary sediment barriers 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. Leave adequate room between the base of the slope and the sediment barrier to accommodate ponding of water and sediment deposition.

3. Where wetlands or waterbodies are adjacent to and downslope of construction work areas, install sediment barriers along the edge of these areas, as necessary to prevent sediment flow into the wetland or waterbody.

4. Sediment control logs such as coir logs or compost filter logs will be used on equipment bridges or on mats across the travel lane.

5. Inspect temporary sediment barriers 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 following runoff events (greater than 0.5 inches of rainfall in 24 hours). Remove accumulated

sediments when sediment reaches ½ the above-ground height of the fence or 1/3 the above-ground height of compost filter sock barriers. (See Maintenance Section 18.0).

6. Sediment removed from erosion controls will be disposed of by adding it to existing on-site soil stockpiles and stabilizing, or will be reused on site within the construction ROW and outside of any wetlands, streams, or riparian areas.

7. Maintain all temporary sediment barriers in place until permanent revegetation measures are successful or the upland areas adjacent to wetlands, waterbodies, or roads are stabilized.

8. Remove temporary sediment barriers from an area when replaced by permanent ESC measures or when the area has been successfully restored to a minimum of 70 percent uniform distribution of perennial vegetation.

#### 13.4.1.2 Belted Silt Retention Fence

BSRF will be used to intercept and detain sediment from disturbed areas during construction operations to minimize the potential for sediment from leaving the site. BSRF will be entrenched a minimum eight inches with four-inch "J" and placed on the contour perpendicular to the flow of the water. It will not be installed in areas of concentrated flow or in areas where the drainage area is too large. BSRF will be installed in accordance with the Manufactures recommendations in places below disturbed areas where erosion would occur in the form of sheet flow and small rill erosion. BSRF will never be installed in streams or in any area where there is a reasonable chance of concentrated flow. A trench must be excavated approximately four inches wide and eight inches deep on the upslope side of the proposed location of the measure. The fabric must not be stapled to existing trees. The most common type of BSRF has the stakes attached to the fabric at the factory. The four-inch by eight-inch trench must be backfilled and the soil compacted over the filter fabric. BSRF will be removed when it has served its useful purpose, but not before the upslope area has been permanently stabilized. The ends of a run of BSRF will be turned uphill to provide required sediment retention capacity behind the BSRF and to prevent runoff from going around the end.

BSRF will be installed where indicated on the Construction Alignment Sheets, Drawing Set #1 and as directed by the EI. BSRF will be installed following the contour and at the following locations unless otherwise directed by the EI:

- at edge of ROW if a residential area is within 50 feet of the construction ROW;
- at the entrance and exit of all wetlands; on either side of an ephemeral, intermittent, or perennial stream crossing;
- at edge of ROW if an intermittent or perennial stream is within 50 feet of the construction ROW; and
- along the edge of paved roadways if the roadway is downgradient of land disturbance.

BSRF will be installed in accordance with the detail in the Construction Alignment Sheets. Sediment will be removed when accumulations reach one-third of the ground height of the sediment barrier. Any section of a sediment control structure that has been undermined or topped will be immediately repaired.

The method of installation for the BSRF is an integral part of the system and is critical to the success of the installation. The specifically designed process includes wood (oak) stakes and wood bonding strips at four-foot intervals. Four-foot stakes are driven to a depth which allows 24 inches of fabric to be above ground. The fabric is then stretched along the inside perimeter of the stakes, pulled tightly, and held in place with bonding strips. The bonding strips (typically 1" x 3/8" x 24") are attached to the stake with 1" x 1 ¼" staples. Five staples are used to secure the fabric in place against the 1 ¼" x 1 ¾" oak posts. This installation bonds the fabric and support system (scrim) to the vertical support post. The remaining fabric is now tucked into the trench forming a "J" and when filled with dirt creates a "ground bite." With its firm attachment to each post, the load is now spread to the total linear strength of all the posts within the system. Variance from the material specifications installation requirements may alter the performance of this product.

BSRF fabric should be purchased in continuous rolls and cut to the length of the barrier to avoid joints. When joints are necessary, use an 18- to 24-inch overlap as indicated in the construction details and manufacturer recommendations.

BSRF will remain in place and maintained until the disturbed area being controlled by the BMP is permanently stabilized. BSRF function is consistent with WVDEP standards and expected to maintain and limit erosion from the proposed construction corridor.

#### 13.4.1.3 Rolled Erosion Control Products

RECP is utilized on slopes or in conditions where typical mulch application may not provide adequate protection for germination and establishment of vegetation. RECP will be used where indicated on the Construction Alignment Sheets and where directed by the EI. When using RECPs, a stable and firm soil surface typically free of rocks over 4 inches, aggregations of smaller rock or other obstructions will be prepared. Soil amendments will be applied as necessary to prepare the seedbed. Seed and fertilizer will be applied in accordance with the Permanent Seeding Specifications. Typically, RECPs are unrolled parallel to the primary direction of flow (i.e., downslope). The product must maintain intimate contact with the soil surface over the entirety of the installation. Do not stretch or allow material to bridge over surface inconsistencies. Staple/stake RECPs to soil such that each staple/stake is flush with underlying soil. Install anchor trenches, seams and terminal ends as specified in the manufacturer's instructions. Install RECPs after application of seed, fertilizer, mulches (if necessary) and other necessary soil amendments. Additional information regarding installation of RECPs may be found in Construction Alignment Sheets, Drawing Set #1.

#### 13.4.1.4 Temporary Slope Breakers

Temporary slope breakers are temporary erosion control measures intended to reduce runoff velocity and divert water off the construction ROW. 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 grading operations to avoid excessive erosion. Unless otherwise specified by permit conditions, temporary slope breakers must be installed on slopes greater than 5 percent at the recommended spacing interval indicated below (closer spacing should be used if necessary):

| Slope (%) | Spacing (feet) |
|---|---|
| < 5 | 300 |
| 10 | 175 |
| 15 | 125 |
| 20 | 100 |
| >25 | 75 |

- Direct the outfall of each slope breaker to a stable, well vegetated area or construct an energy-dissipating device (silt fence, erosion control fabric, compost filter sock, etc.) 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.

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

- 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 or after a runoff event (greater than 0.5 inches in 24 hours) throughout construction. Repairs should be made within 24 hours of identification, or as soon as practical.

#### 13.4.1.5 Trench and Site Dewatering

Dewatering may be periodically conducted to remove accumulated water or precipitation from the construction ROW, 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.

1. Conduct dewatering (on or off the construction ROW) in such a manner that does not cause erosion and does not result in silt-laden water flowing into any waterbody or wetland.

2. Elevate and screen the intake of each hose used to withdraw the water from the trench to minimize pumping of deposited sediments.

3. Water may be discharged into areas where adequate vegetation is present adjacent to the construction ROW to function as a filter medium.

4. Where vegetation is absent or in the vicinity of waterbody / wetland areas, water will be pumped into a discharge structure that accommodates the anticipated discharge volumes as well as type and amount of sediment within the water being discharged, including:

   a. a filter bag, or

   b. a structure composed of appropriate sediment barriers.

5. A structure that is more typically used for discharges of hydrostatic test water may be necessary for large volumes of water.

6. When using filter bags, secure the discharge hose to the bag. Bags will be monitored and will be changed when approximately half full to reduce the potential for bag breakage.

7. Remove dewatering structures as soon as practicable after the completion of dewatering activities.

#### 13.4.1.6 Drop Inlet Protection

Storm drain inlets are to be made operational before permanent stabilization of the corresponding disturbed drainage area. The use of drop inlets is typically limited to developed areas of the Project (i.e., compressor stations). The drainage area will be no greater than one-acre per inlet. The drainage area must have slopes of five percent or less, and the area immediately around the inlet must not exceed a slope of one percent. The inlet protection device must be constructed in a manner that will facilitate clean out and disposal of trapped sediment and minimize interference with construction activities. The inlet protection devices must be constructed in such a manner that any resultant ponding of stormwater will not cause excessive inconvenience or damage to adjacent areas or structures. For the inlet protection devices that utilize stone as the chief ponding/filtering medium, a range of stone sizes is offered. The designer must attempt to get the greatest amount of "filtering" action possible. In all designs that utilize stone with a wire-mesh support as a filtering mechanism, the stone can be completely wrapped with the wire mesh to improve stability and provide easier cleaning. Filter Fabric may be added to any of the devices that utilize stone to significantly enhance sediment removal; but, reduced flow capacity will occur. The fabric, which must meet the physical requirements noted for "extra strength," must be secured between the stone and the inlet (on wire-mesh if it is present). As a result of the significant increase in filter efficiency provided by the fabric, a larger range of stone sizes (up to gabion size) may be utilized with such a configuration. Significant ponding will occur at the inlet if filter cloth is utilized in this manner. If there is a possibility that ponding will occur, the top of the inlet protection must be at least six inches below the nearest low spot to insure sufficient freeboard. Remove any obstructions prior to excavating and grading. Excavate any sump area, grade slopes, and properly dispose of soil. The inlet grate must be secured to prevent seepage of sediment-laden water. Ensure that weep holes in the inlet structure are protected by filter fabric and gravel.

Types of Inlet Protection include Silt Fence Drop Inlet Protection, Gravel and Wire Mesh Drop Inlet Protection, Block and Gravel Drop Inlet Protection, Pipe Riser Drop Inlet Protection, Excavated Drop Inlet Sediment Trap, Gravel Curb Inlet Protection, Curb Inlet Protection with two-inch by four-inch wooden Weir Block, and Gravel Inlet Protection. Refer to the Facility Construction Plans and the WV BMP Manual.

### 13.4.2 Permanent Control Structures

#### 13.4.2.1 Permanent Trench Breakers/Trench Plugs

Trench plugs are intended to slow subsurface water flow and erosion along the trench and around the pipe in sloping terrain. An engineer or similarly qualified professional shall determine the need for and spacing of trench plugs. At a minimum, install a trench breaker 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. Install trench breakers at wetland boundaries, as specified in the Procedures. However, trench plugs will not be installed within a wetland.

Trench plugs will be constructed with sand bags, polyurethane foam, or an equivalent as identified in the permit requirements. Topsoil shall not be used to construct trench plugs. Sakrete may be used at the discretion of the Construction Site Supervisor on severe slopes greater than 30 percent.

Trench plugs, which are used in conjunction with slope breakers, shall be installed at the locations shown on the Construction Alignment Sheets (see Drawing Set #1), at the same spacing interval as and upslope of permanent water bars, or as otherwise determined by an engineer or similarly qualified professional, such as the EI. If not shown, the following spacing will be used:

| Slope (%) | Spacing (feet) |
|---|---|
| < 5 | 300 |
| 10 | 175 |
| 15 | 125 |
| 20 | 100 |
| >25 | 75 |

Impervious trench plugs shall be installed at the base of slopes adjacent to waterbodies and wetlands, and where needed to avoid draining of a resource.

#### 13.4.2.2 Permanent Water Bars

Permanent water bars (i.e., slope breakers) will be installed during final grading, where required, to slow runoff velocity and direct water off the ROW and prevent sediment deposition into sensitive resources. Permanent water bars may be constructed of materials such as soil, stone, or some functional equivalent. In accordance with the FERC Plan, DTI will adhere to the following general construction and maintenance specifications:

- Construct and maintain permanent water bars in all areas, except cultivated areas and lawns, unless requested by the landowner, using spacing shown on the Construction Alignment Sheets, Drawing Set #1.
- Spacing for permanent water bars will be the same as temporary slope breakers described in Section 13.4.1.4.
- Construct slope breakers to divert surface flow to a stable area without causing water to pool or erode behind the breaker. In the absence of a stable area, construct appropriate energy-dissipating devices at the end of the breaker.
- Water bars may extend slightly (about four feet) beyond the edge of the construction ROW to effectively drain water off the disturbed area. Where water bars extend beyond the edge of the construction ROW, they are subject to compliance with all applicable survey and permit requirements.

Construct and maintain permanent water bars of at least 12 inches in height in all areas, except cultivated areas and lawns, unless requested by the landowner, at the locations shown on the Construction Alignment Sheets, Drawing Set #1. If not shown, the following spacing will be used:

| **Slope (%)** | **Spacing (feet)** |
|---|---|
| < 5 | 300 |
| 10 | 175 |
| 15 | 125 |
| 20 | 100 |
| >25 | 75 |

Construct permanent water bars with a typical 2 to 12 percent cross slope to divert surface flow to a stable vegetative area without causing water to pool or erode behind the slope breaker. In the absence of a stable vegetative area, install an energy-dissipating device at the end of the water bar. Permanent water bars will be installed on access roads in accordance with Construction Alignment Sheets (Drawing Set #1) or as directed by the EI.

Do not install permanent water bars where the discharge will run down and into the next water bar diversion. Where sufficient ROW or landowner permission exists, water bars may extend slightly (about four feet) beyond the edge of the construction ROW to effectively drain water off the disturbed area. Where permanent water bars extend beyond the edge of the construction ROW, they are subject to compliance with all applicable survey and permit requirements.

Where drainage is insufficient in upland areas, install a rock-lined drainage swale as approved by the EI.

DTI will request an exception to utilize belted silt retention fence (BSRF) as an acceptable form of energy dissipation and sediment control at the ends of water bars during construction activities, in addition to other commonly accepted methods (i.e. filter sock, salvaged native rock, coir logs, etc.). During permanent seeding and restoration activities when temporary water bars are converted to permanent installations, the end treatment is then proposed to be changed to a filter sock, rock outlet or similar. These options will be requested as acceptable forms of energy dissipation if Right-of-Way Diversion Spacing is maintained per Table 3.18.1 of the "2006 Erosion and Sediment Control Best Management Practice Manual".

#### 13.4.2.3 Riprap

Riprap is used as a non-erodible lining for concentrated storm flows and for energy dissipation in stormwater flows. It may be used, as appropriate, at storm drain outlets, on channel banks and/or bottoms, roadside ditches, drop structures, at the toe of slopes, as transition from concrete channels to vegetated channels, etc. Riprap is classified as either graded or uniform. A sample of graded riprap would contain a mixture of stones that vary in size from small to large. A sample of uniform riprap would contain stones which are all fairly close in size. For most applications, graded riprap is preferred to uniform riprap. Graded riprap forms a flexible self-healing cover, while uniform riprap is more rigid and cannot withstand movement of the stones. Hand or mechanical placement of individual stones is limited to that necessary to achieve the proper thickness, line, and grade. To ensure that stone of substantial weight is used when constructing riprap structures, specified weight and diameter ranges for individual stones and composition requirements must be followed. Refer to Table 3.23.1: American Association of State Highway and Transportation (AASHTO) Riprap Gradation Classes in the WV BMP Manual. If stone is crushed on site, great care must be taken to produce stone sizes that mirror the requirements created by the designer and this specification. Disturbance of areas where riprap is to be placed must be undertaken only when final preparation and placement of the riprap can follow immediately behind the initial disturbance. Where riprap is used for outlet protection, the riprap must be installed before the construction of the pipe or channel is completed. The minimum thickness of the riprap layer must be two times the maximum stone diameter, but not less than six inches. A lining of engineering filter fabric (geotextile) must be placed between the riprap and the underlying soil surface to prevent soil movement into or through the riprap. Filter fabric must not be used on slopes greater than 1.5:1 as slippage may occur and must be used in conjunction with a layer of course aggregate (granular filter blanket is described below) when the riprap to be placed is Class C (top size of approximately 24 inches) or larger. Riprap must extend up the banks of the channel to a height equal to the maximum depth of flow or to a point where vegetation can be established to adequately protect the channel. When installing geotextile filter cloths, the cloth must be placed directly on the prepared slope. The edges of the sheets must overlap by at least twelve inches. Anchor pins fifteen inches long must be spaced every three feet along the overlap. Placement of riprap must follow immediately after placement of the filter. The riprap must be placed so that it produces a dense well-graded mass of stone with a minimum of voids.

#### 13.4.2.4 Rock Check Dams

This practice, utilizing a combination of stone sizes, is limited to use in small open channels that drain five acres or less. It is never used in live streams. Check dams can be useful in the following instances: temporary ditches or swales, and temporary or permanent ditches and swales which need protection during the establishment of grass linings. This practice is primarily for reduction of erosive velocities during channel disturbance and is not a substitute for major perimeter trapping measures such as a sediment trap or basin. The drainage area of the ditch or swale being protected must not exceed two acres when two-inch to four-inch aggregate is used alone; and must not exceed five acres when a combination of four-inch to eight-inch aggregate (added for stability) and the smaller aggregate is used. Refer to Figure 3.05.1 of the WV BMP Manual for orientation of stone and a cross-sectional view of the measure. An effort must be made to extend the stone to the top of channel banks. The maximum height of the dam shall not exceed three feet. The center of the check dam must be at least six inches lower than the outer edges. The maximum spacing between the dams must be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam. The maximum distance between rock check dams is 300 feet. When using a small trap in front of the check dam, ensure the minimum transition from the ditch into the trap is at least 5:1.

#### 13.4.2.5 Geotextiles

Geotextiles are usually made from a synthetic polymer such as polypropylene, polyester, polyethylenes, and polyamides. Geotextiles can be woven, knitted, or nonwoven. Geotextiles can be used either to prevent water from permeating a slope or to control the amount of infiltration that occurs during rainfall. Erosion control fabric or blankets are used during restoration, including as mulch, to slow down stormwater and stabilize soil until vegetation becomes established. Install erosion control fabric or blankets where necessary or as recommended by the EI. Anchor the erosion control fabric or blanket with staples or other appropriate devices in accordance with the manufacturer recommendations. Evaluate flow conditions to determine if erosion control fabric is suitable as an effective vegetation stabilization technique on waterbody banks. High-velocity erosion control fabric should be used on the swale side of permanent slope breakers, when utilizing geotextile on slope breakers.

#### 13.4.2.6 Turf Reinforcement Mats

Permanent RECPs or TRMs are used for reinforcing grass-lined channels and stream banks and can be useful when underlying soil boundaries that may subside or shift slightly after installation. They are composed of ultraviolet stabilized polymeric fibers, filaments, nettings, and/or wire mesh, integrating together to form a three-dimensional matrix. The types of polymer include polypropylene, polyethylene, polyamides, and polyvinyl chloride. Often TRMs are combined with organic material such as coir to aide vegetation establishment and provide the initial temporary erosion control necessary to resist the forces of running water until the vegetation can become established. Typical vegetation includes grasses that can withstand inundation. TRMs can be installed after applying seed to the prepared soil surface, or deployed first and then seeded following infilling with soil. The former method allows the roots and shoots to grow through and interlock with the geosynthetic matrix. For applications where natural vegetation alone will not sustain expected flow conditions and/or provide sufficient long-term erosion protection, a TRM will be required. The TRM must have the necessary performance properties to effectively control erosion and reinforce vegetation under the expected long-term site conditions. The TRM must conform to one of the specifications and corresponding properties found in Table 3.13.2 of the WV BMP Manual.

Prepare a stable and firm soil surface free of rocks and other obstructions. Apply soil amendments as necessary to prepare seedbed. Apply seed and fertilizer in accordance with the

Permanent Seeding Specification. For TRMs, if soil in-filling, install TRM, apply seed, and other soil amendments lightly brush or rake 0.3- to 0.7-inch of topsoil into TRM matrix to fill the product thickness. If in-filling with a hydraulically applied matrix or medium is required, install TRM, then install hydraulically applied matrix or medium at the manufacturers' suggested application rate.

#### 13.4.2.7 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 and rutting. DTI will minimize impacts by implementing the mitigation measures for compaction and rutting as described in FERC's Plan and Procedures. DTI will test for soil compaction using penetrometers or other appropriate devices:

- In residential and agricultural areas (e.g., active croplands, pastures, nurseries, and orchards) disturbed by construction activities;
- In other areas requested by the land managing agency or landowner;
- In undisturbed areas adjacent to the construction workspace with the same soil type under similar moisture conditions to approximate preconstruction conditions; 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 impacts will be mitigated through the use of tillage equipment during restoration activities such as a paraplow or similar implement. In areas where topsoil segregation occurs, plowing with a paraplow or other deep tillage implement to alleviate subsoil compaction will be conducted before replacement of the topsoil. In rocky or heavily rooted soils, compaction may be impossible to measure and rectify without additional damage. If compaction testing is impeded by rock or roots, DTI may conclude that there is a suitable amount of large material in the soil to rectify potential compaction. Soil compaction will be remediated prior to re-spreading of salvaged topsoil.

## 14.0 WATERBODY, WETLAND, AND ROAD CROSSING PROTOCOL

### 14.1 STREAM CROSSING

All necessary permits must first be acquired prior to construction activities commencing at streams. Movement across waterbodies will be limited to necessary equipment only. BMPs for vehicles crossing streams and wetlands will be utilized when practical. For each identified crossing location, dry crossing techniques are preferred. Individual stream crossings will be completed in a continuous, progressive manner and completed within 72 hours under normal or low stream flow conditions.

Stream crossings associated with the Project are listed in Appendix E.

DTI will employ a typical temporary equipment crossing at each stream location. The temporary equipment crossing will consist of timber mat bridges, (with or without culverts), or a rock-flume crossing, depending on the depth of the stream channel and channel flow at the time of construction. Details regarding these crossing methods are found the in Appendix E. All stream crossings will be restored to approximate preconstruction grades and contours, and banks will be re-vegetated and stabilized.

DTI will obtain necessary stream permits including WVDNR Office of Land and Streams for the Public Land Corporation, the Section 404 U.S. Army Corps of Engineers Permits, and WVDEP Section 401 Certification DTI will conduct stream crossing actions as authorized by applicable permits and regulations.

#### 14.1.1 Time Windows for Instream Work

Unless expressly permitted or further restricted by the appropriate federal or State agency in writing on a site-specific basis, instream work must occur during the following time windows:

- Coldwater fisheries – June 1 through September 30;
- Coolwater and Warmwater Fisheries-June 1 through November 30;

Installation or removal of equipment bridges above the top of bank is not subject to the aforementioned time windows.

#### 14.1.2 Equipment Bridge

Only clearing equipment and equipment necessary for installation of equipment bridges will cross waterbodies prior to bridge installation. DTI will limit the number of such crossings of each waterbody to one per piece of clearing equipment.

DTI 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 that achieve the performance objectives noted above. DTI will not use soil to construct or stabilize equipment bridges. Each equipment bridge will be designed and maintained to withstand and pass the highest flow expected to occur while the bridge is in place. Culverts will be aligned to prevent bank erosion or streambed scour. If necessary, install energy dissipating devices downstream of the culverts. Design and maintain equipment bridges to prevent soil from entering the waterbody. DTI will 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, DTI will remove temporary equipment bridges as soon as practicable after final cleanup.

### 14.1.3 Stream Crossing Techniques

The following techniques are a means of diverting flow over or around the open excavation: open cut, conventional bore, and dry crossing. The limiting factors for these techniques are usually stream size, flow, and water depth.

#### 14.1.3.1 Open-Cut Method

The open-cut or wet trench crossing method will involve trenching through the waterbody while water continues to flow through the trenching area. Prior to initiating construction across the waterbody, the crossing section of pipeline will be fabricated (i.e., bent, welded, and coated) in adjacent ATWS areas. Backhoe-type excavators will then be used to excavate a trench in the flowing waterbody from one or both banks of the waterbody. Where the waterbody is too wide to excavate the trench from the banks, equipment may operate from within the waterbody with approval from the appropriate regulatory agencies. Equipment operating within the waterbody will be limited to that needed to construct the crossing. During these operations, flow will be maintained at the crossing as specified in the FERC Procedures. Turbidity curtains will be installed downstream of the crossing as necessary to minimize suspended solids in the water.

Spoil excavated from the trench will be placed on the bank above the high water mark (at least 10 feet from the edge of the water) or placed adjacent to the trench in the stream (major waterbodies only, in accordance with the FERC Procedures) for use as backfill. A prefabricated segment of pipeline will then be placed into the trench using side-boom tractors. Concrete coating (installed in uplands in project workspace) or bag weights will be utilized, as necessary, to provide negative buoyancy for the pipeline. Once the trench is backfilled, the banks will be restored as near as practicable to preconstruction contours and stabilized as described above. Excavated material not required for backfill will be removed and disposed of at approved upland disposal sites.

Throughout the construction process, DTI will follow the FERC Procedures to avoid or minimize impacts on water quality. Construction activities will be scheduled so that the trench is not excavated across the waterbody until immediately prior to pipe laying activities. The duration of in-stream construction activities (excluding blasting, if required) will be limited to 24 hours across minor waterbodies (those 10 feet in width or less) and 48 hours across intermediate waterbodies (those between 10 and 100 feet in width).

#### 14.1.3.2 Conventional Bore

In some cases, waterbodies may be crossed by conventional subsurface boring beneath the waterbody. Boring involves installing pipeline through a hole bored through the substrate. Where this method is implemented, equipment operating from pits excavated on either side of the crossing will bore through the substrate beneath the waterbody. If dewatering of the pits is necessary, it will be conducted in accordance with the Plan and Procedures and applicable permits in a manner that will minimize erosion and prevent silt-laden water flowing into the waterbody or adjacent wetlands.

The pipeline will be pushed through the bore under the waterbody. The conventional bore can eliminate direct surface impacts on waterbodies, however, there are limitations to its use. This method cannot typically be used to cross waterbodies with unconsolidated soils in the substrate because it is not possible to maintain the integrity of the borehole in this condition.

Because conventional bores in general are installed straight along a horizontal plane, the bore pits must be excavated to a depth sufficient to allow installation of pipe at the appropriate depth beneath the streambed (i.e., five feet beneath the streambed) and to account for the height of the boring machinery. Where waterbodies are entrenched or adjacent slopes are steep, excavation to sufficient depths can require excessively large pits to address Occupational Safety and Health Administration (OSHA) shoring requirements, which creates the potential to sink the stream or flood the bore pits. These considerations limit the use of this crossing method for entrenched waterbodies or those with steep slopes.

#### 14.1.3.3 Dry Crossings

DTI will implement dry crossing methods of minor waterbodies where techniques will support the passage of stream flow. There are three primary crossing methods that include installation of pipeline in dry streambed conditions: the flume method, dam-and-pump, and cofferdam method. In each case, normal stream flows are maintained upstream and downstream of the work area.

##### 14.1.3.3.1 Flume Crossing

A flume pipe crossing consists of two impervious dams across a stream with one or more culverts installed to pass the stream flow across the work area. A flume pipe crossing can be used when in- stream construction will last less than 72 hours and the stream is narrow (less than 15 feet wide) or wider in low water conditions.

The flume pipe crossing must be made operational prior to the start of the instream construction. A large flume pipe(s) or culvert(s) of an adequate size to support normal water channel flow (see Table 3.21.1 of WV BMP Manual) must be installed in the streambed across the proposed pipeline trench centerline. Riprap, jersey barrier, or sandbags must be placed close to each end of the flume pipe so as to dam off the creek, thus forcing the water to flow through the flume pipe (see Drawing Set #1). Sandbags are the preferred method for diverting water into the flumes. The commercial cofferdams can be used if a tight seal can be created. The entrapped water in the work area can then be pumped into an approved dewatering device. The trench can then be dug under the flume pipe. The pipe sections will then be installed to the proper depth under the flume pipe. After the utility pipe is installed, the ditch will be backfilled and restabilization must be carried out.

Reclamation of the stream banks will occur the same day as the installation of the pipe is completed. Re-stabilization must consist of the installation of ungrouted riprap on all disturbed streambank areas (or on the area six feet on both sides of the centerline of the utility trench, whichever is greater) with slopes of 3:1 or greater. Refer to the specification for Riprap for installation requirements. For slopes of 3:1 or less, vegetative stabilization with or without RECP may be used, pending approval by the Division of Water and Waste Management. Stabilization of its streambed and banks and the approach areas must occur immediately following the attainment of final grade.

After completion of backfilling operation and restoration of stream banks and leveling of streambed, the flume pipe can then be removed. The stone can be removed or spread as stabilization of the streambed depending on permit requirements. Sediment control in approach areas must not be removed until all construction is completed in the stream crossing area and the contributing drainage area to the device is stabilized. All ground contours must be returned to their original condition.

#### 14.1.3.3.2 Dam-and-pump Method

The dam-and-pump method generally is preferred for smaller waterbodies, where mechanical pumps can dependably convey stream flows. In this approach, 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 will be installed adjacent to the waterbody. Additional back-up pumps will be on site at all times as a contingency, 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. 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 or impingement of aquatic species as described in relevant species sections. Energy-dissipation devices, such as splash blocks, filter bags, or energy dissipation sleeves, 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 water. Trench plugs will be maintained between the upland trench and the waterbody crossing. After backfilling, the banks will be restored and stabilized as described above, and the dams will be removed.

#### 14.1.3.3.3 Cofferdam

Some waterbodies will be crossed using the cofferdam method. In this method, a temporary diversion structure is installed from the bank around half the width of the crossing to isolate that section of the stream from the rest of the waterbody. Once the temporary diversion structure is installed, water is pumped from the isolated section to allow excavation of the pipe trench from the bed of the waterbody in the dry. After the pipe is installed in the trench in the isolated section of stream, the temporary diversion structure is disassembled and then reinstalled from the opposite bank of the crossing and the process is repeated. The cofferdam method allows waterbodies to be crossed in the dry in discrete sections while water flows unimpeded around the temporary diversion structure. The method is sometimes favored for wide, relatively shallow waterbodies or waterbodies containing sensitive fisheries because it allows water and fish to pass around the temporary diversion structure.

For waterbodies crossed using the cofferdam method, sections of steel frame for the temporary diversion structure will be assembled in an upland area adjacent to the crossing. Depending on size, the frame sections will be placed in the waterbody either manually or by crane. The frame sections will be positioned around a predetermined perimeter in the waterbody extending from one of the banks. The spacing of frame sections will be based on the depth of the water, but a typical spacing will be 15 to 30 inches. The frame sections may be reinforced, as necessary, with steel poles or other supports to increase stability of the structure, especially in waterbodies with soft substrate. Fabric sheets will then be attached to the top of the frame and unrolled down and out onto the bed of the waterbody on the exterior side of the frame. The fabric sheets will create a liner around the frame with a seal on the bed of the waterbody. The fabric may be covered in soft sediments or sandbags to help create the seal.

After the temporary diversion structure is installed, one or more pumps will be used to dewater the area within the temporary diversion structure. Pump intakes will be appropriately screened to prevent entrainment of aquatic species. Water will be discharged to the waterbody outside the structure through an energy-dissipating device to prevent scouring of the bed at locations of discharge. Once dewatering is complete, any fish trapped in the temporary diversion structure will be removed and returned to the flowing waterbody. Construction equipment will enter the isolated section of the waterbody from the adjacent bank. This construction equipment will be used to excavate the trench, install a pre-assembled section of pipe, backfill the trench, and restore the bed as near as practicable to preconstruction contours. The equipment is removed from the temporary diversion structure via the adjacent bank.

After the section of pipeline is installed, the enclosed area within the temporary diversion structure will be flooded. Then the fabric sheets and steel frame sections will be disassembled. The structure will be reinstalled from the opposite bank, with enough overlap of the initial excavation area so that the installed section is accessible for tie-in to the next section of pipe. The dewatering and construction process is then repeated from the opposite bank, to complete the crossing of the waterbody.

### 14.1.4 FERC Waterbody Classification

In the FERC Procedures, a “waterbody” is defined to include 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. Waterbodies have been further divided into three classifications by FERC depending on the width of the feature, which dictate construction limitations or requirements.

#### 14.1.4.1 Minor Waterbodies

FERC defines a "minor waterbody” as a waterbody less than or equal to 10 feet wide at the water’s edge at the time of crossing. Minor waterbodies will be crossed in accordance with the following requirements:

- The spoil from minor waterbody crossings must be placed in the construction ROW at least10 feet from the water’s edge or in additional extra work areas. Use sediment barriers to prevent the flow of spoil or silt-laden water into any waterbody.
- Unless approved otherwise by the appropriate federal or state agency, utilize a dry crossing construction technique to install crossings at minor waterbodies that are state-designated fisheries or federally designated as critical habitat.
- Where a dry-ditch crossing is not required, minor waterbodies may be crossed using the open-cut crossing method, with the following restrictions:
    - Except for blasting and other rock breaking measures, complete instream construction activities (including trenching, pipe installation, backfill, and restoration of the streambed contours) within 24 hours. Streambanks and unconsolidated streambeds may require additional restoration after this period; and
    - Limit use of equipment operating in the waterbody to that needed to construct the crossing.

#### 14.1.4.2 Intermediate Waterbodies

FERC defines an "intermediate waterbody” as a waterbody greater than 10 feet wide but less than or equal to 100 feet wide at the water’s edge at the time of crossing. Intermediate waterbodies will be crossed in accordance with the following requirements:

- The spoil from intermediate waterbody crossings must be placed in the construction ROW at least 10 feet from the water's edge or in additional extra work areas. Use sediment barriers to prevent the flow of spoil or silt-laden water into any waterbody.

- Unless approved otherwise by the appropriate federal or state agency, install the pipeline using a dry crossing method for crossings of waterbodies up to 30 feet wide (at the water's edge at the time of construction) that are:

  - State-designated as either coldwater or significant coolwater or warmwater fisheries, or

  - Federally-designated as critical habitat.

Where a dry-ditch crossing is not required, intermediate waterbodies may be crossed using the open-cut crossing method, with the following restrictions:

- Complete instream construction activities (not including blasting and other rock breaking measures) within 48 hours, unless site-specific conditions make completion within 48 hours infeasible;

- Limit use of equipment operating in the waterbody to that needed to construct the crossing; and

- All other construction equipment must cross on an equipment bridge as specific in Section 14.1.2.

#### 14.1.4.3 Major Waterbodies

FERC defines a "major waterbody" as all waterbodies greater than 100 feet wide at the water's edge at the time of crossing. There were no major waterbody crossed by the SHP in West Virginia.

### 14.1.5 Waterbody Restoration

Restore and stabilize the waterbody banks and channel in accordance with this section.

- Return waterbody banks to preconstruction contours or to stable angle of repose as approved by the EI.

- Use clean gravel or native cobbles for the upper 12 inches of trench backfill in waterbodies identified as coldwater fisheries, unless otherwise specified by state-specific agency recommendations or permit conditions.

- For dry crossings, complete bank stabilization before returning flow to the waterbody channel.

- Limit the use of rock riprap to areas where flow conditions preclude effective vegetation stabilization techniques such as seeding and erosion control fabric, unless otherwise specified by COE and state permits. Limit the placement of rock riprap to the slopes along the disturbed waterbody crossing. Application of riprap for bank stabilization must comply with COE, or its delegated agency, permit terms and conditions.

- Disturbed banks and riparian work areas will be seeded as soon as possible after final grading, weather and soil conditions permitting and subject to the recommended seeding dates for the area. Seeding is intended to stabilize the soil, improve the appearance of the area disturbed by construction, and restore native flora. DTI will determine appropriate seeding prescriptions based upon the vegetative community of the disturbed area.

- Install erosion control fabric or a functional equivalent on waterbody banks at the time of final bank contouring. Do not use synthetic monofilament mesh/netted erosion control materials in areas designated as sensitive wildlife habitat unless the product is specifically designed to minimize harm to wildlife.

- Revegetate disturbed riparian areas with native species of conservation grasses, legumes and woody species similar in density to adjacent undisturbed lands.

- In the event that final cleanup is deferred more than 20 days after the trench is backfilled, all slopes within 100 feet of waterbodies will be mulched with 3 tons/acre of straw.

- Remove all temporary sediment barriers when replaced by permanent erosion controls or when restoration of adjacent upland areas is successful.

- Install a permanent water bar and a trench plug at the base of slopes greater than 5% that are less than 50 feet from each waterbody crossed.

#### 14.1.6 Post-Construction Maintenance

DTI will limit routine vegetation mowing or clearing adjacent to waterbodies to allow a riparian strip at least 25 feet wide, as measured from the waterbody's mean high water mark, to permanently revegetate with native plant species across the entire construction ROW. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. Routine vegetation mowing or clearing will not be done more frequently than every 3 years.

In addition, trees that are located within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating may be cut and removed from the permanent ROW. DTI will not use herbicides or pesticides in or within 100 feet of a waterbody except as allowed by the appropriate land management or state agency.

Time of year restrictions specified in section VII.A.5 of the FERC Plan (April 15 – August 1 of any year) apply to routine mowing and clearing of riparian areas.

## 14.2 WETLAND CROSSING PROTOCOL

Construction across wetlands will be conducted in accordance with the Procedures, site-specific modifications to the Procedures requested by DTI and approved by the FERC, and any additional requirements identified in Federal or State wetland crossing permits. Typical methods for construction across wetlands are described below. A table listing the wetlands and crossing methods for wetlands crossed by the SHP within West Virgina is provided in Appendix I.

The construction ROW 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 temporary side-cast. ATWS will be located in upland areas a minimum of 50 feet from the wetland edge (with the exception of site-specific modifications as requested by DTI and approved by FERC).

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 ROW clearing, excavating the trench, fabricating and installing the pipeline, backfilling the trench, and restoring the ROW. In areas where there is no reasonable access to the ROW 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. DTI will install a timber mat over the portion of the wetlands located within the LOD. Timber mat will be removed at the completion of construction activities.

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.

Immediately following clearing, sediment barriers, such as silt fences 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 ROW at the base of slopes adjacent to wetland boundaries. ECDs installed across the working side of the ROW will be removed during the day when vehicle traffic is present, and will be replaced each night. Alternatively, drivable berms may be installed and maintained across the ROW in lieu of silt fences or straw bales. Sediment barriers will also be installed within wetlands along the edge of the ROW, where necessary, to minimize the potential for sediment to run off the construction ROW and into wetlands outside the work area. If trench dewatering is necessary, it will be conducted in accordance with the FERC Procedures and applicable permits. Silt-laden trench water will be discharged into an energy dissipation/sediment filtration device, such as a geotextile filter bag, to minimize the potential for erosion and sedimentation.

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.

Where wetland soils are saturated or in inundated lowlands areas where soils cannot support conventional pipe-laying equipment, the pipeline may be installed using the push-pull method. This method will involve stringing and welding the pipeline outside of the wetland and excavating and backfilling the trench using a backhoe supported by equipment mats. A prefabricated section of pipeline will be installed in the wetland by equipping it with buoys and pushing or pulling it across the water-filled trench. After the pipeline is floated into place, the floats will be removed and the pipeline will sink into place. In most cases, the pipeline will be coated with concrete or equipped with set-on weights to provide negative buoyancy. Once the pipeline is in place, the trench will be backfilled. The push-pull construction method minimizes the number of equipment passes, reducing wetland impacts and soil compaction in lowland areas and can be utilized in conjunction with the open trench method described above for waterbody crossings.

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 water bars will be constructed across the ROW 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 ROW and disposed of at an approved disposal facility.

### 14.3 ROAD CROSSINGS

Construction across paved roads, highways, and railroads will be conducted in accordance with the FERC Plan and requirements identified in road and railroad crossing permits or approvals. Most paved roads, highways, and railroads will be crossed by conventional subsurface boring beneath the roadbed or railroad, which will avoid surface disturbance of the roads and railroads. Boring activities will consist of the following: excavating a pit on each side of the road or railroad; placing boring equipment within the pits; boring a hole under the roadbed or railroad that is greater than or equal to the diameter of the pipe; and pulling a section of pipe through the hole. For long crossings, sections of pipe may be welded into a pipe string before being pulled through the borehole.

Typically, there is little or no disruption to traffic at road, highway, or railroad crossings during boring operations; however, brief traffic delays could occur when equipment required to complete a bore is brought onto or off of the construction rights-of-way. In these instances, DTI will use flaggers and signage to safely slow or direct traffic as appropriate.

Unpaved roads, two-tracks, trails, and driveways, as well as roads in areas with a high water table, will be crossed using the open-cut method and then restored to preconstruction condition. This method will require temporary closure of the road to traffic and establishment of detours. If no reasonable detour is feasible, at least one lane of the road being crossed will be kept open to traffic except during brief periods when it is essential to close the road to install the pipeline. Most open-cut road crossings will be completed and the road restored in a few days using the same type of sub-bed and surface material as the original construction. DTI will take measures such as posting signs at open-cut road crossings for safety and to minimize traffic disruptions.

If road closures are necessary, a road closure schedule will be arranged with the appropriate transportation authority, if applicable, prior to the closure. Landowners, land managing agencies, and local businesses that could be affected by the closure, as well as law enforcement agencies, will be notified in advance of the closure.

Where construction crosses roads necessary for access to private residences or businesses and no alternative entrance exists, DTI 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. DTI 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.

Once construction is complete, DTI's construction contractors will repair road damage that occurs as a result of construction, and roadways will be restored to their preconstruction condition. A table with the Road Crossing Methods is included in Appendix O.

## 15.0 OTHER CONTROLS

## 15.1 VEHICLE AND EQUIPMENT MAINTENANCE

Equipment will be refueled with extreme care under continual surveillance and away from wetland and associated waterbodies. A combination of fixed storage tanks and mobile fuel tanker trucks will be used to store and deliver fuel to on-site equipment. On-site bulk fuel tanks shall be located in the staging areas with secondary containment areas around the tank. Fueling will either occur at a staging area by small mobile tanks or in upland areas of the alignment. If refueling occurs within a Restricted Refueling Area, a DTI representative or EI must be present. If any fuel is spilled, the fuel impacted soil material and fuel residue shall be cleaned up and disposed of properly. Fuel dispensers shall be locked during non-construction hours.

All equipment will be maintained in good operating condition and inspected regularly for leaks. Routine scheduled maintenance and identified necessary maintenance shall only take place within the staging areas unless equipment is not able to be moved to staging areas for unplanned, emergency repairs. In the event of planned major maintenance, the vehicle should be transported off site for service. Any liquids leaked during maintenance shall be cleaned up and disposed of properly.

Repairs shall only be made outside of the staging area if equipment requires emergency repairs on site (e.g., unexpected hydraulic hose rupture or similar) and cannot be moved to the staging area. As soon as equipment can be safely moved, the equipment shall be moved to staging areas for continued maintenance. The EI shall be notified of all necessary emergency repairs prior to them occurring. Proper containers and/or disposable sorbent materials shall be placed under the equipment to collect drips and leaked liquids. Impacted soils and spilled material shall be properly cleaned up, contained, and disposed of properly.

Vehicle washing shall be performed off site. No vehicle washing will occur on site, except in the case of field maintenance. Non-native invasive species washing stations may be on the ROW to help reduce or prevent the spread of invasive species.

All equipment operating on site will have sufficient spill containment equipment on board to provide for prompt cleanup in the event of a release. All equipment will also carry tools necessary to stop leaks and, if possible, make repairs.

## 15.2 OFF-SITE VEHICLE TRACKING

Access to the ROW must be from public roadways, approved access roads, and existing ROW only. Any location where a new access point meets paved roadways, a combination of matting, culvert installation, and 70-foot-long crushed stone access pads must be used to minimize the tracking of mud onto paved roads. Stone must be placed on a geotextile to facilitate removal. Geotextile fabric used for this purpose must be durable and strong enough to allow removal of stone and fabric. All surface water flowing or diverted toward construction entrances must be piped across the entrance. If a culvert is impractical, a mountable berm with 5:1 slopes must be used. Wheels on all vehicles must be cleaned to remove sediment prior to entrance onto public ROW. If washing is required, it must be done on an area stabilized with stone and which drains into approved sediment trapping device. Detergents are not preferred for washing vehicles on location. If the Contractor elects to use a detergent, it must be approved by DTI and the EI.

Public and private roads adjacent to a construction entrance will be inspected and kept clear of debris.

## 15.3 UNAUTHORIZED VEHICLE ACCESS TO RIGHT OF WAY

DTI will offer to install and maintain measures to control unauthorized vehicle access to the ROW based on requests by the manager or owner of forested lands. These measures may include:

1. signs;
2. fences with locking gates;
3. permanent access roads;
4. slash and timber barriers, pipe barriers, or a line of boulders across the ROW; or
5. conifers or other appropriate shrubs with a mature height of 4 feet or less across the ROW.

## 15.4 TEMPORARY CONSTRUCTION ROAD, WORK AND PARKING AREA STABILIZATION

One-way traffic, 20 feet wide for two-way traffic, and 30 feet wide for haul roads. Road slopes must not exceed 15 percent. All cuts and fills must be 2:1 or flatter and 6-inch crushed aggregate must be applied immediately after grading and geotextile must be applied to the roadbed for additional stability. In heavy duty traffic situations, stone must be placed at an eight-inch to 10-inch depth. Temporary parking areas must be located on naturally flat areas to minimize grading. Grades must not exceed four percent, but must be sufficient to provide drainage for all temporary extra workspaces that will be used for parking. Stabilize disturbed areas not covered with stone immediately after installation with appropriate temporary or permanent vegetation.

## 15.5 SURFACE ROUGHENING

All slopes steeper than 3:1 require surface roughening, either stair-step grading, grooving, furrowing, or tracking, if they are to be stabilized with vegetation. Areas with grades less than 3:1 must have the soil surface lightly roughened and loose to a depth of two to four inches prior to seeding. Slopes with a stable rock face do not require roughening or stabilization. Stair-step grading may be carried out on any material soft enough to be ripped with a bulldozer. Slopes consisting of soft rock with some subsoil are particularly suited to stair-step grading. The ratio of the vertical cut distance to the horizontal distance must be less than 1:1, and the horizontal portion of the "step" must slope toward the vertical wall. Individual vertical cuts must not be more than 30 inches on soft soil materials and not more than 40 inches in rocky materials. Grooving consists of using machinery to create a series of ridges and depressions that run perpendicular to the slope (on the contour). Grooves may be made with any appropriate implement which can be safely operated on the slope and which will not cause undue compaction. These grooves must not be less than three inches deep or further than 15 inches apart. Fill slopes with a gradient steeper than 3:1 must be grooved or allowed to remain rough as they are constructed. At no time must slopes be bladed or scraped to produce a smooth, shiny, hard surface. Roughening with tracked machinery on clayey soils is not recommended unless no alternatives are available. When tracking is the chosen surface roughening technique, it must be done by operating tracked machinery up and down the slope to leave horizontal depressions in the soil. Roughened areas must be seeded and mulched as soon as possible to obtain optimum seed germination and seedling growth but at a minimum within seven days of reaching final grade, or within seven days if no additional activity is anticipated for 21 days or more.

### 15.6 BURNING

If burning of brush is elected and approved by the EI, the Contractor will first obtain a burn permit from the WVDEP Division of Air Quality and notify the local Fire Department with jurisdiction for regional requirements in West Virginia. During the forest fire season (typically March 1 to May 31 and October 1 to December 31 a permit must also be obtained from the West Virginia Division of Forestry. Notification of the Division of Forestry will be made outside of forest fire season. The Contractor will abide by all site-specific requirements of the permit. The EI will identify burn permit requirements that conflict with other permits or requirements of the Project. No burning shall occur in areas where concentrated stormwater will flow. Ash shall be dispersed and blended into the soil used for reestablishing approximate original contour.

### 15.7 FUGITIVE DUST CONTROL

Wind is capable of causing erosion, particularly in dry climates or during the dry season. Wind erosion can occur where surface soil is loose and dry. Wind erosion may also occur in areas where vegetation is sparse or absent.

This can be washed into receiving waters during the next storm event or snowmelt runoff. Additionally, the prevailing winds in the vicinity of the pipeline are from the northwest. The excavated top soil, ground cover, and overburden materials will be stockpiled for reuse once the pipeline construction is completed. The stockpiles will be laid out perpendicular to the predominant wind direction where possible and practical. Temporary sediment controls will be used where soil deposits susceptible to wind erosion are found within the Project area.

### 15.8 WIND EROSION CONTROL

For wind erosion control, 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:

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

2. Mulch will be used in areas without heavy traffic pathways. The Restoration and Rehabilitation Plan attached as Appendix M includes recommendations provided by regional NRCS offices and other Federal agencies regarding seeding mixtures and soil amendments. Some of the recommendations provided include specifications on the use of mulch and/or tackifiers to control soil erosion (i.e., wind and water soil erosion) during the construction and restoration of the pipeline. The information provided includes recommendations on the type of mulch material, application rates, soil binders, and tackifiers.

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

4. Exposed soil can be sprinkled with water until the surface is wet and repeated as needed.

5. Spray-on adhesives may be used on mineral soils only.

6. Use crushed stone or course gravel to stabilize roads and other areas during construction.

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

8. 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.

## 15.9 STAGING AREAS

Staging areas should be maintained on site throughout the construction activities. The staging areas should be used as a place to store equipment, construction materials, waste, and additional construction related material. The staging areas shall be in an area away from concentrated stormwater drainage paths. The contractor is responsible for storing and securing all tools, materials, and waste.

## 15.10 WASHOUT AREAS

A washout area for excess concrete and cleaning of concrete delivery vehicles shall be constructed near areas where concrete pours will occur. Concrete wash water or green concrete shall be managed to minimize the potential for this material to reach identified water and wetland resources.

The washout area shall be installed in an upland area away from potential wetlands and streams. It shall be above grade, with a minimum width of 10 feet. The base and sides of the washout area shall be covered with a plastic sheeting at least 10 mils thick without any holes or tears. The wash area shall be inspected for any leaks, holes, and tears in the plastic on a daily basis. If the washout area gets to 75 percent capacity, the area should be cleaned out. Once all concrete mixing activities are completed, the concrete waste area should be allowed to harden, broken up, and then disposed of properly.

## 15.11 ROCK MANAGEMENT

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

1. Rock excavated from the trench may be used to backfill the trench with approval of the DTI representative;

2. Windrowed or blended into final graded ROW. Attain written landowner permission if necessary;

3. Removed and disposed of at a DTI- approved landfill;

4. Used as riprap for streambank stabilization as allowed by applicable regulatory agency(ies) and provided the rock is durable, uncontaminated and free of soil and other debris; or

5. If removed to a DTI-approved disposal site not within the LOD, coordination with the county/disposal site operator is required.

6. Durable rock may be salvaged and used for permanent water bar outlets.

DTI has prepared a Blasting Plan for procedures and safety measures that DTI's construction contractors will adhere to while conducting blasting activities required for the construction of the SHP. A copy of the current Blasting Plan is provided in Appendix P.

## 15.12 BEST IN CLASS PROGRAM FOR SLOPES GREATER THAN 30 PERCENT

DTI recognizes the increased risk of instability associated with pipeline construction particularly while traversing steep slopes. As a baseline, DTI 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 that may include providing subsurface drainage at seep locations through granular fill and outlet pipes, incorporating drainage into trench breakers using granular fill, and/or intercepting groundwater seeps and diverting them from the ROW;

- buttressing slopes with Sakrete trench breakers;

- changing slope geometry;
- benching and re-grading with controlled backfill;
- using alternative backfill;
- chemical stabilization of backfill;
- geogrid reinforced slope that 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.

For the SHP Project, DTI is also committed to identifying mitigation measures beyond standard practices through a Best in Class (BIC) Program. The focus of the BIC Program is to proactively address steep slopes (defined as slopes with an inclination greater than 30 percent and greater than 100 feet in length) and landslide hazards related to pipeline construction, 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, Virginia, and North Carolina, and then exceed these regulatory standards, 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 ESC control measures for the SHP Project. The BIC Program has achieved this by assembling a team of internal Dominion stakeholders along with supporting external subject matter experts (SMEs) 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 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 identify and assess or support the review of the hazard, and provide a basis to select the appropriate BIC mitigation response to minimize or eliminate the hazard, and then monitor the hazard through ongoing operations.

The conceptual work-flow process of the BIC Program 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). Refer to Figure 4 of Appendix A for the conceptual work-flow process diagram describing the general approach.

- 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. Refer to Figure 4 of Appendix A for the conceptual work-flow process diagram describing the general approach.

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

  Hazard-specific control measures were developed based on the recommendations of the Geohazards Analysis Program and mitigation techniques selected by a BIC team of experts. The hazard-specific control measures address the specific geologic hazard (e.g., slip, stream scour, ground displacement) with mitigation measures, as applicable, for construction and/or operation of the Project. DTI has incorporated these mitigation measures in Appendix K of this SWPPP. Refer to Figure 5 of Appendix A for the conceptual work-flow process diagram.

- Hazard Monitoring - DTI will monitor mitigation techniques to assess their effectiveness and the need for further mitigation, if appropriate. Refer to Figure 6 of Appendix A for a conceptual work flow process diagram.

As one of the initial steps in the BIC Program, DTI implemented a comprehensive Geohazards Analysis Program to assess potential geohazards, including slope failures, along the proposed pipeline route. The study for slope failures included:

- a desktop analysis to prepare an inventory of and categorize potential slope hazards along the proposed routes;

- a field program to verify the locations and limits of slope hazards along the routes;

- a risk analysis of slope hazards along the routes; and

- recommendations for landslide and landslip mitigation, if and where warranted.

DTI has completed the desktop portion of the Geohazards Analysis Program and the field reconnaissance portion and filed a report on the results of the Program to FERC. The final report provided recommendations on geological hazards and potential risks to be mitigated during construction and operation of the proposed SHP facilities. Through desktop study and field verification, the Geohazards Analysis Program identified six recurring typical steep slope hazard scenarios which collectively encompass the majority of the steep slopes identified along the SHP alignment. Some sites may have the characteristics of more than one typical scenario type, particularly those that contain sensitive resources at the slope's toe or where previously modified by cutting and filling.

The six typical scenarios are identified by letters A through F, and each are generally described as follows:

Primary Scenarios

A. Steep slopes without evidence of previous movement;

B. Steep slopes with evidence of active movement;

C. Steep slopes with increased potential to become unstable after construction disturbance;

D. Steep slopes near narrow ridge tops;

Secondary Scenarios

E. Steep slopes with a sensitive resource at toe (e.g. streams, wetlands, roads); and

F. Steep slopes previously modified by cutting and filling.

Project-specific steep slope geohazard mitigation Typical Designs (TDs) for each of the six typical scenarios were developed as part of the BIC Program and are provided in Appendix K. Additionally, six slopes receiving Site-Specific Designs (SSDs) are currently under development for those locations with unique geohazard concerns and/or a greater potential for instability. These six SSDs will be coordinated with state and federal agencies upon full completion of the engineering design and constructability analysis.

The locations where the BIC Program Typical Designs will be implemented are identified on the Construction Alignment Sheets, Drawing Set #1. Additionally, the location of SSDs will be shown on the Construction Alignment Sheets after the final designs are completed.

Implementation of the BIC Steep Slope Hazard Mitigation Program in the field during construction will follow a detailed decision tree/work flow process provided in Appendix K. In summary, the TD packages are intended to provide a comprehensive and programmatic approach to address the hundreds of BIC locations along the pipeline alignment. TD packages include Incremental Control (IC) measures (i.e. Typical Details) that provide targeted mitigation for steep slope related hazards that are above and beyond the standard erosion and sediment controls necessary to meet regulatory requirements. The TDs list BIC ICs that are available for use at a site. The host of ICs for each typical scenario provides options to the field team to respond to site-specific field conditions. These ICs will be selected using the decision tree/work flow process provided in Appendix K will be implemented in addition to the standard ESC measures which are shown on the alignment sheets. Detailed drawings of the ICs are also provided in Appendix K.

SSD packages will be site-specific steep slope mitigation plans that address specialized steep slope or related hazards and conditions at targeted sites, and require geotechnical, hydro-technical engineering, or geologic technical support to develop the design package. SSD packages typically include detailed engineering drawing sets, showing plan and profile and section views of the intended design, supported by details and specifications, and may require specialized work plans. Incremental controls proposed for SSDs are the same as used for the TDs. There are currently ten slopes along the SHP pipeline within West Virginia, identified through the Geohazards Analysis Program, which will be addressed with a SSD. DTI will provide specific employee training which has been developed from the steep slope program. 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.

## 16.0 BMP SEQUENCING

Temporary and permanent BMPs will be used during maintenance activities to avoid and/or minimize adverse environmental effects. BMP installation guidance and engineered drawings are located on the Construction Alignment Sheets, see Drawing Set #1. For more details about BMP sequencing see Section 13.2.

## 17.0 ANTIDEGRADATION – TIER 3.0 WATERS

Construction activities discharging to Tier 3 waters must go through the Tier 3.0 antidegradation review process. Activities do not cross Tier 3 waters. For more information on Tier 3 waters see Section 8.0.

## 17.1 DISCHARGES TO WATERS WITH APPROVED TMDLS

It is DTI's understanding that projects that are permitted under West Virginia General Water Pollution Control Permit for Stormwater Associated with Oil and Gas related Activities are not subject to the caps established by the TMDL.

## 18.0 MAINTENANCE

All BMPs must be properly selected, installed, and maintained in accordance with good engineering practices and, where applicable, manufacturer specifications. If periodic inspections or other information indicates a control has been used inappropriately or incorrectly, the operator must replace or modify the control for site situations as soon as practicable. If site inspections identify control measures that are not operating effectively, maintenance must be performed as soon as practicable to maintain the continued effectiveness of stormwater controls. If site inspections identify existing control measures that need to be modified or if conditions suggest additional control measures are necessary, implementation must be completed before the next anticipated storm event. If implementation before the next anticipated storm event is impracticable, the situation must be documented in the SWPPP and alternative control measures shall be implemented as soon as practicable.

Inspectors must look for evidence of, or the potential for, pollutants such as sediments, foam, or sheen, entering a stormwater conveyance system. Control measures identified in the SWPPP must be inspected for proper installation, maintenance, and operation. Discharge locations, where accessible, must be inspected to ascertain whether control measures are effective in minimizing impacts on receiving waters. Where discharge locations are inaccessible, nearby downstream locations must be inspected to the extent that such inspections are practicable. Locations where vehicles enter or exit the site must be inspected for evidence of off-site sediment tracking. The operator must report noncompliance which may adversely affect state waters or may endanger public health.

For the duration of the construction process, the construction contractor will be responsible for inspection and maintenance of all ESC structures. Dominion will be responsible for inspection and maintenance from post-construction until final stabilization is achieved. The ROW and ESC devices will be inspected daily at the active construction site and at least once every seven calendar days for actively disturbed areas, 14 calendar days for restored areas, and within 24 hours after any storm event greater than one-half-inch per 24-hour period. After the Project area achieves 70 percent uniform perennial vegetative growth, BSRF and other temporary controls will be removed, and the NOT will be submitted. Inspections will occur once every 14 days until the NOT has been approved by WVDEP. Soil conditioning, fertilization, reseeding, and mulching will be performed as required. All grade surfaces, walls, dams and structures, vegetation, ESC measures and other protective devices shall be maintained in good and effective condition and promptly repaired or restored.

A record of weekly and storm event inspections will be maintained by the Project EI or Project Supervisor and submitted to Dominion. This record 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 weekly inspections will be recorded using the BMP inspection form included in Appendix Q, or similar. The inspection sheets will be maintained on site during construction and retained for a minimum period of two years after final soil stabilization.

## 18.1 ROLES AND RESPONSIBILITIES

EIs will have the authority to stop activities that violate the environmental conditions of FERC's Orders (if applicable), 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 Construction Site Supervisor who has overall authority on the construction spread or Project. For each construction spread, at least one EI will have knowledge of the wetland and waterbody conditions in the project area. The number and experience of EIs assigned to each construction spread shall be appropriate for the length of the construction spread and the number/significance of resources affected.

At a minimum the EI will be responsible for:

- inspecting construction activities for compliance with the requirements of this plan, the construction drawings, the environmental conditions of FERC (if applicable), proposed mitigation measures, other federal or state and local (if applicable) environmental permits and approvals, and environmental requirements in landowner easements;
- 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 ESC 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 in agricultural and residential areas to measure compaction and determine the need for corrective action;

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

- ensuring restoration of approximate original contours and replacement of topsoil;

- verifying that the soils imported for agricultural or residential use have been certified as 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 ESC and stabilization needs are implemented in all areas, including ensuring that ESC structures 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 ESC measures at least:

    - on a daily basis in areas of active construction or equipment operation;

    - on a weekly basis in areas with no construction or equipment activity; and

    - within 24 hours of each stormwater event (runoff from precipitation, snowmelt, surface runoff and drainage), including time rainfall events resulting in 0.5 inches or more;

- ensuring the repair of all ineffective temporary ESC measures immediately after 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;

- ensuring proper seed mixes, rates and restoration methods are used, and obtaining documentation;

- ensuring that the Contractor implements and complies with a SPCC Plan, DTI's Waste Management Plan, and other company environmental documents and standard operating procedures;

- verifying that locations for any disposal of excess construction materials for beneficial reuse comply with this SWPPP and any applicable permits/clearances; and

- keeping records of compliance with environmental conditions of FERC's Orders and mitigation measures proposed by DTI in the application submitted to FERC (if applicable), and other federal or state environmental permits during active construction and restoration. Records should include photo documentation.

Copies of blank SWPPP and BMP inspection forms are included as Appendix Q.

## 18.2 EMPLOYEE TRAINING

Prior to the start of construction, DTI will conduct environmental and field training for company and contractor personnel. The training program will be focused on the WV BMP Manual, the FERC Plan and Procedures, this SWPPP, applicable permit conditions, and other applicable construction, restoration, and mitigation plans as identified. DTI will provide large-group training sessions before each work crew commences construction with follow-up training for groups of newly assigned personnel. Following initial training, the training will be conducted on a quarterly basis until construction activities are completed.

Contractors will provide spill prevention and response training to their work crews as well as educate work crews on how to conduct daily inspections of ESC mechanisms. The training program will be designed to improve awareness of potential hazards, pollution control laws, and proper operation and maintenance or 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. Contractors will also train all employees the methods by which to inspect ESC structures, to properly install and repair ESC structures, and response procedures in the event an erosion and sediment structure fails. Copies of blank training records are included as Appendix R.

## 18.3 RECORD KEEPING

Blank versions of the inspection and training forms can be found in Appendices Q and R respectively. All records will be maintained for at least three years. For each spill, written documentation of the spill is required. The following information is to be included in this documentation:

1. Date and time of spill (actual/discovered)
2. Area where spill occurred
3. Type of spill (oil, lubricant, etc.)
4. Estimated volume
5. Did any spill leave the property?
    a. If so, where was it discharged?
    b. What is the ditch into which the spill has, or may, enter?
6. Suspected failure that caused the spill?
7. Assessment of imminent danger to personnel or property?

8. Damage and injuries caused by spill?

9. Actions taken to contain, stop, remove, or clean up spill?

10. Identification of any local emergency unit(s) contacted?

## 18.4 HOUSEKEEPING

The following housekeeping and materials management practices will be conducted to ensure that releases of hazardous substances or oil in the stormwater do not occur. Store, as appropriate, only enough products on site required to complete the Project. Store on-site materials in a neat, orderly manner in their original containers (unless they are not re-sealable), and with either the materials original manufacturer label or replacement label that identify the contents of each container. SDSs will be retained for the period of time that the product is being utilized on site in accordance with applicable Occupational Safety and Health Administration regulations. Follow manufacturer recommendations for proper use and disposal, and do not mix substances with one another unless recommended by the manufacturer. Use, whenever possible, all of a product before disposing of the container. If surplus product must be disposed of, follow manufacturer or local/state recommended methods for proper disposal.

Inspect materials storage areas routinely to ensure proper use and management of materials for, at a minimum, the following:

- leaks, corrosion, and integrity of containers;
- accumulated liquids on the ground;
- improper labeling and storage practices;
- opened or deteriorated containers;
- provide a temporary berm or other device for on-site containers with a 55-gallon capacity or larger that are utilized to store diesel or gasoline fuel, oil, or other hazardous substances to ensure residual material resulting from leaks/drips do not enter into the stormwater discharge;
- conduct routine maintenance, such as replacement and repair of leaking fittings, valves, hoses, or other equipment;
- remediate/clean up minor spills which pose no threat to site personnel that may have resulted from leaking containers, equipment leaks, spilled materials, or other site specific operations immediately after discovery;
- containers (e.g., dumpsters, drums) must be available for the proper collection of all waste material, including construction debris, sanitary garbage, petroleum products, and any hazardous materials to be used on site. Containers must be covered and not leaking;

- implement the measures below during unloading/loading operations of large quantities of hazardous substances or oil;

- provide temporary diversion dikes, berms, or other structures to protect adjacent drainage pathways until such operations are completed;

- assign personnel to monitor the transfer operation; and

- inspect the area beneath the truck/equipment transferring hazardous substances or oil for spills or leaks before and after the unloading/loading operations.

### 18.4.1 Procedure for Disposal of Material

Measures must be planned and implemented for housekeeping, materials management, and litter control. Construction wastes, such as building materials, sanitary wastes, etc., will be handled in such a manner so as not to adversely impact water quality of stormwater runoff. All solid waste and construction/demolition material must be disposed of in accordance with the Code of West Virginia and Legislative Rule Title 33 Series 1. Dominion and its contractor will be responsible for properly disposing of waste materials in accordance with WVDEP regulations. Wherever possible, recycling of excess materials rather than disposal is preferred.

Site non-hazardous waste shall be collected and stored in appropriate containers (e.g., dumpsters) at the staging areas. The containers shall have lids to minimize windblown trash and the accumulation of water. The containers shall be in an area that stormwater does not collect or drain to, and meet federal, state, and municipal regulations. The containers shall be emptied once they are near capacity. Containers shall not be allowed to overflow.

***Waste material shall not be buried on site.***

Hazardous wastes are not anticipated to be generated for the Project based on the anticipated construction. In the event hazardous waste is generated, it will not be stored within 100 feet of a waterbody or wetland. This applies to storage and does not apply to normal operation or use of equipment in these areas. Potentially hazardous wastes (i.e., used motor oils) will be separated from other waste through segregation of storage areas and proper labeling of containers. Hazardous waste will be removed from the site by licensed contractors in accordance with applicable regulatory requirements and disposed at an approved/licensed facility. Manifests documenting the proper transportation and disposal of the waste will be generated and maintained for the Project.

***Hazardous waste will not be buried or disposed of in the waste material dumpsters.***

## 19.0 SPILL PREVENTION AND RESPONSE PROCEDURES

The Project is generally linear in nature; therefore, potential spills may occur along the entire length of the Project area, but specifically in areas where refueling, equipment maintenance, and chemical storage is occurring. When refueling or maintaining equipment in staging areas or along the ROW, location of streams, wetlands, other water conveyance channels and wells must be observed and appropriate buffer areas maintained. The Contractor shall manage potential contaminants as presented in Section 9.7 of this document and manage drips and spills in accordance with accepted engineering and environmental practice. Additional details on spill prevention, material handling procedures and storage requirements are located in the GPP in Appendix C.

DTI will report any noncompliance to the appropriate contact in Table 19-1 which may endanger health or the environment immediately after becoming aware of the circumstances. If a spill occurs, the FWS office in West Virginia shall also be contacted along with the West Virginia Division of Wildlife Resources.

TABLE 19-1

**Spill Response Notification Contacts**

| Agency | Location | Telephone |
|---|---|---|
| U.S. Coast Guard National Response Center | National | 1-800-424-8802 |
| West Virginia Department of Environmental Protection | Charleston, WV | 1-800-642-3074 |
| West Virginia Department of Natural Resources, Office of Land and Streams | Charleston, WV | 1-304-558-3225 |
| USFWS West Virginia Field Office | Elkins, WV | 304-636-6586 |
| West Virginia Division of Wildlife Resources | South Charleston, WV | 304-558-9125 |
| **Local Fire Departments** | | |
| West Milford Volunteer Fire Department | West Milford, Harrison County | 304-745-3355 |
| McClellan District Volunteer Fire Department | Center Point, Doddridge County | 304-782-2774 |
| Shirley Volunteer Fire Department | Shirley, Tyler County | 304-758-2391 |
| Jacksonburg Volunteer Fire Department | Jacksonburg, Wetzel County | 304-889-2400 |

A written submission shall be provided to the WVDEP within five days of becoming aware of the circumstances. The written description shall contain a description of the noncompliance and its cause, the period of noncompliance (including exact dates and times), and if not corrected, the anticipated time it is expected to continue, and steps taken to reduce, eliminate, and prevent recurrence of the noncompliance.

SPCC Plans are required for contractors storing more than 1,320 gallons of any liquid that has petroleum oil except gasoline, in tanks and drums 55 gallons and larger, including portable tanks. A Tier I SPCC Plan (one that the contractor can prepare without hiring a Professional Engineer) is allowed when the contractor has:

1. a total aboveground oil storage capacity of 10,000 U.S. gallons or less;

2. no aboveground oil storage containers with a capacity greater than 5,000 U.S. gallons; and

3. in the three years prior to the date the SPCC Plan is certified, had no single discharge of oil to navigable waters or adjoining shorelines exceeding 1,000 U.S. gallons, or no two discharges of oil to navigable waters or adjoining shorelines each exceeding 42 U.S. gallons within any 12-month period.[3]

Any facility owner/operator who is subject to the SPCC Rule must comply with the reporting requirements found in 40 CFR 112.4. A discharge must be reported to the EPA Regional Administrator (RA) when there is a discharge of:

- More than 1,000 U.S. gallons of oil in a single discharge to navigable waters or adjoining shorelines.

- More than 42 U.S. gallons of oil in each of two discharges to navigable waters or adjoining shorelines occurring within any twelve-month period.

It is the Contractor's responsibility to ensure any stored materials comply with West Virginia Legislative Rule Title 47, Series 62 (47 CSR 62).

## 19.1 ALLOWABLE NON-STORMWATER DISCHARGE

Non-stormwater discharges shall not be allowed under the WV General Pollution Control Permit for Stormwater Discharges Associated with Oil and Gas Activities. DTI will seek coverage under NPDES Water Pollution Control Permit for Discharges of Hydrostatic Test Water.

## 19.2 TWELVE ELEMENTS OF AN EROSION AND SEDIMENT CONTROL PLAN

### 19.2.1 Element #1 Mark Clearing Limits

Clearly mark all ROW and LOD boundaries to show clearing and disturbance limits.

### 19.2.2 Element #2 Establish Construction Access

See Section 13.1.2 for construction access and maintenance.

### 19.2.3 Element #3 Install Sediment Controls

Install all BMPs as shown on the Construction Alignment Sheets, Drawing Set #1. BMPs must be constructed in accordance with this plan and the WV BMP Manual.

[3] Not including discharges that are the result of natural disasters, acts of war, or terrorism. When determining the applicability of this SPCC reporting requirement, the gallon amount(s) specified (either 1,000 or 42) refers to the amount of oil that actually reaches navigable waters or adjoining shorelines not the total amount of oil spilled. The EPA considers the entire volume of the discharge to be oil for the purposes of these reporting requirements.

### 19.2.4 Element #4 Stabilize Soils

See the Construction Alignment Sheets (Drawing Set #1) for soil properties and Sections 13.3 and 13.4 for Soil Stabilization BMPs.

### 19.2.5 Element #5 Protect Slopes

RECP will be installed on slopes with 3:1 or steeper slopes. See Section 9.5 and 15.12 for how to protect critical slopes.

### 19.2.6 Element #6 Protect Drain Inlets

Use drop inlet or riprap inlet protection BMPs to protect inlets from receiving sediment. See Section 13.4.1.6 for Drop Inlet BMP information.

### 19.2.7 Element #7 Convey Stormwater in a Non-Erosive Manner

Stormwater created by a permanent increase impervious area will be conveyed to stormwater BMPs. All channels and culvert outlets will be properly lined with riprap or TRM to minimize erosion.

No stormwater management controls within the AP-1 mainline are expected to be required due to the linear nature of the Project, coordination with WVDEP may be necessary to confirm. There will be negligible change in land use from pre- to post-construction conditions. Disturbed areas within the ROW will be returned to existing condition following construction. Stormwater management controls, if needed at ancillary facilities, will be shown on Drawing Set #2.

### 19.2.8 Element #8 Control Other Pollutants

All pollutants, including waste materials and demolition debris that occur on site during construction, must be handled and disposed of in a manner that does not cause contamination of surface water. See Section 19.0 for Spill Prevention and Response Procedures.

### 19.2.9 Element #9 Control Dewatering

A hose, pump, and geotextile bag must be used to remove sediment-laden water from a construction area. See Section 13.4.1.5 for a description on dewatering practices.

### 19.2.10 Element #10 Maintain BMPs

After construction is completed, all temporary BMPs will be removed and any land disturbed by removal will be permanently stabilized with 70 percent vegetative cover. See Section 18.0 for maintenance procedures.

### 19.2.11 Element #11 Manage the Project

The Contractor will call 811, West Virginia's one-call notification system, at least 48 hours prior to construction to coordinate with existing utilities. Employee training programs must inform all on- site personnel who are directly involved with construction activities at all levels of responsibility of the components and goals of the SWPPP. Company personnel must be identified to inspect as set forth under G.4.e.2.D of the Permit No. WV0116815. A tracking procedure must be used to ensure that adequate corrective actions have been taken in response to deficiencies identified during an inspection. Records of inspection must be maintained on site for review by the WVDEP director or the director's representative. Incidents such as spills, leaks and improper dumping, along with other information describing the quality and quantity of stormwater discharges must be included in the records. Inspection and maintenance records must be kept on site for review by the WVDEP director or the director's representative.

### 19.2.12 Element #12 Stabilization

Site must be temporarily stabilized within seven days after construction ceases. If construction activity will resume on a portion of the site within 21 days from when activities ceased, then stabilization measures do not have to be initiated on that portion of the site by the seventh day after construction. Areas where the seed has failed to germinate adequately within 30 days after seeding and mulching must be reseeded immediately or as soon as weather conditions allow. Stabilization is considered when 70 percent uniform perennial vegetative coverage has been achieved.

## 20.0 DETAILED SITE MAP(S) OF EROSION AND SEDIMENT CONTROLS

Figure 1 of Appendix A provides the location of the proposed SHP route. Figure 2 of Appendix A provides the West Virginia SHP route and depicts the boundary of the construction ROW and locations of aboveground facilities. Figure 3 of Appendix A illustrates impaired waterways that are crossed by the SHP. The construction ROW will be returned to original contours at the completion of construction. Dominion holds a ROW agreement for the pipeline easement through the property. No waste areas, borrow sites, or ditches will be installed as part of this Project. Structural controls to be used in the Project are depicted in the Construction Alignment Sheets, Drawing Set #1. Appendix L contains typical drawings of ESCs to be used on this Project.

## 21.0 SITE MAP OF THE FINAL CONDITIONS SHOWING THE STORMWATER MANAGEMENT FACILITIES

The proposed pipeline route will be returned to approximately original contours and re-vegetated with an appropriate seed mix. The only permanent stormwater controls to be used on this section of the Project are permanent water bars, trench plugs, and bleeder drains as shown on the Construction Alignment Sheets, Drawing Set #1. Mockingbird Hill CS will require permanent stormwater controls, which are shown in the Site Specific Drawings (see Drawing Set #2).

## 22.0 NARRATIVE DESCRIPTION OF THE FINAL STORMWATER MANAGEMENT AND POLLUTION PREVENTION PLAN

The proposed pipeline route will be returned to approximate original contours and re-vegetated with an appropriate seed mix. The only permanent stormwater controls to be used on this Project are permanent water bars, trench plugs, and bleeder drains; trench plugs are to be installed in the ditch line at all stream and wetland crossing locations. Construction Alignment Sheets, Drawing Set #1 include detail drawings of permanent water bars. They will be constructed at the WVDEP required spacing.

New impervious surfaces will not be created. The majority of areas that will be affected consist of vegetated ROW. All non-impervious areas disturbed by the Project will be restored to wooded area, and and/or vegetated ROW and their approximate preconstruction contours. If any are encountered, existing impervious areas disturbed by the Project will be restored to their preconstruction materials, conditions, and contours.

Mockingbird Hill CS involves the addition of impervious area and has stormwater management facilities designed according to site specific parameters and requirements. Site Construction plans have been developed for Mockingbird Hill CS (see Drawings Set #2).

Accordingly, post-construction runoff will remain essentially the same as preconstruction runoff within the proposed pipeline route. Therefore, the calculation of runoff coefficients for preconstruction versus post-construction conditions is not warranted or applicable to this linear Project. For Mockingbird Hill CS, post-construction runoff calculations of runoff coefficients for preconstruction versus post-construction conditions will be shown in the Site Specific Drawings (see Drawing Set #2).

## 23.0 PUBLIC NOTICE SIGN

Within 24 hours of filing a Notice of Intent (NOI) or Site Registration Application, the Project must display a sign for the duration of the construction Project near the entrance of the Project or, for linear Projects, at a location near an active part of the Project that is accessible by the public.

For Info on Water Pollution Control Permit
To comment on Pollution Control Plan:

Call: 800-654-5227

Or
DEP.Plan@wv.gov
DEP 601 57th Street SE Charleston, WV 25304

Filed with WVDEP

Application Date: [03/31/2017]

Dominion Transmission Inc. (DTI)
on Behalf of SHP

Supply Header Project

(844) 215-1819

The sign will be at least 24 inches by 24 inches with 1.6-inch and 0.8-inch letters and high contrast colors will be used. The sign must be placed at least three feet above ground level, clearly visible and legible from a public road or ROW. If it is not feasible to display a sign at or near the Project, Dominion may post a notice containing the information at a local public building, including but not limited to, a town hall or public library.

## 24.0 CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Anne E Bomar
Signature

31 March 2017
Date

Senior VP, Pipeline Services and Optimization
Title

# Drawing Set #1

Construction Alignment Sheets

Provided Separately

# Drawing Set #2

Mockingbird Hill Site Specific Plans

Provided Separately

# APPENDIX A

Figures

*FIGURE 1     PROJECT OVERVIEW MAP*

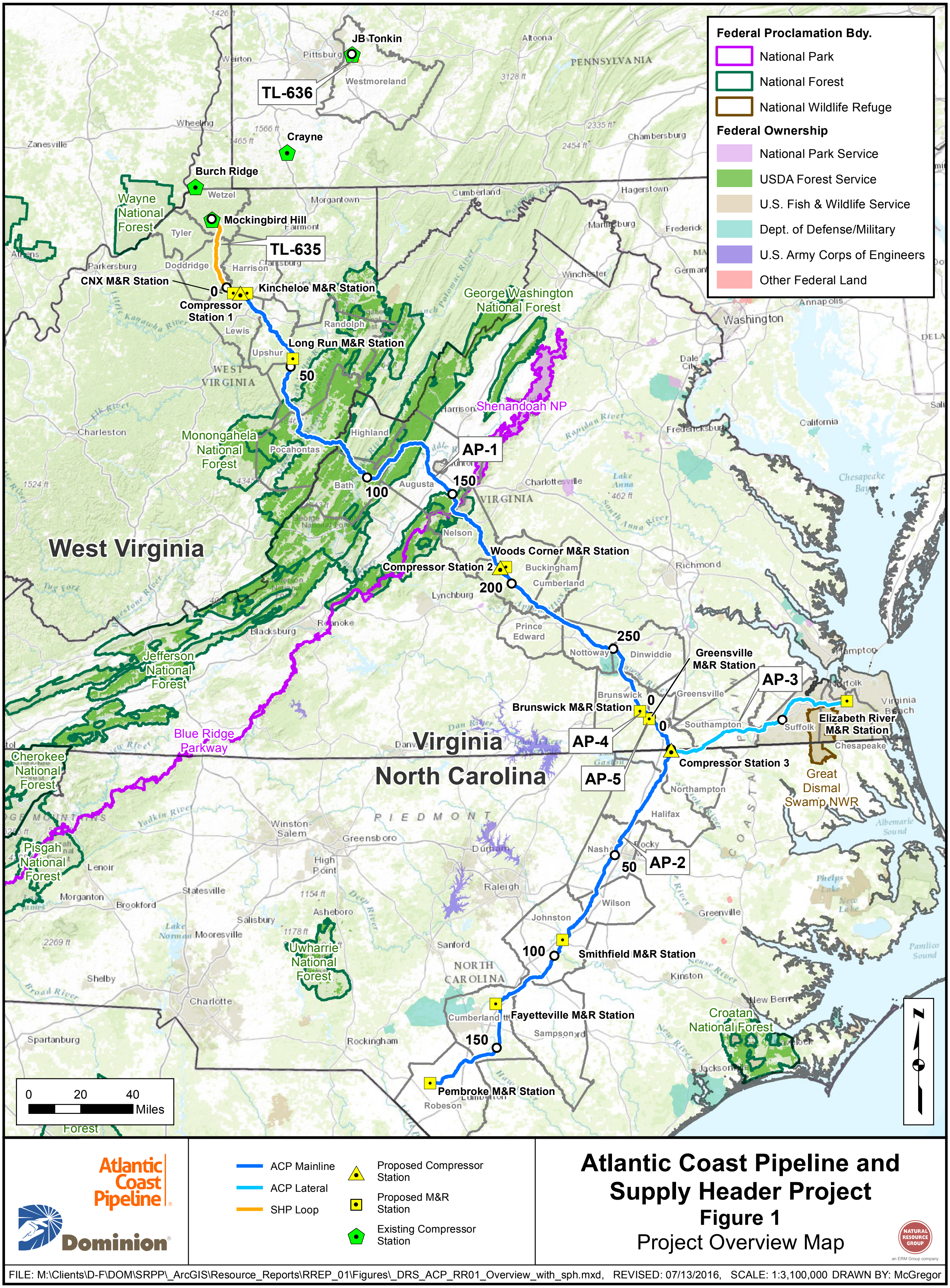
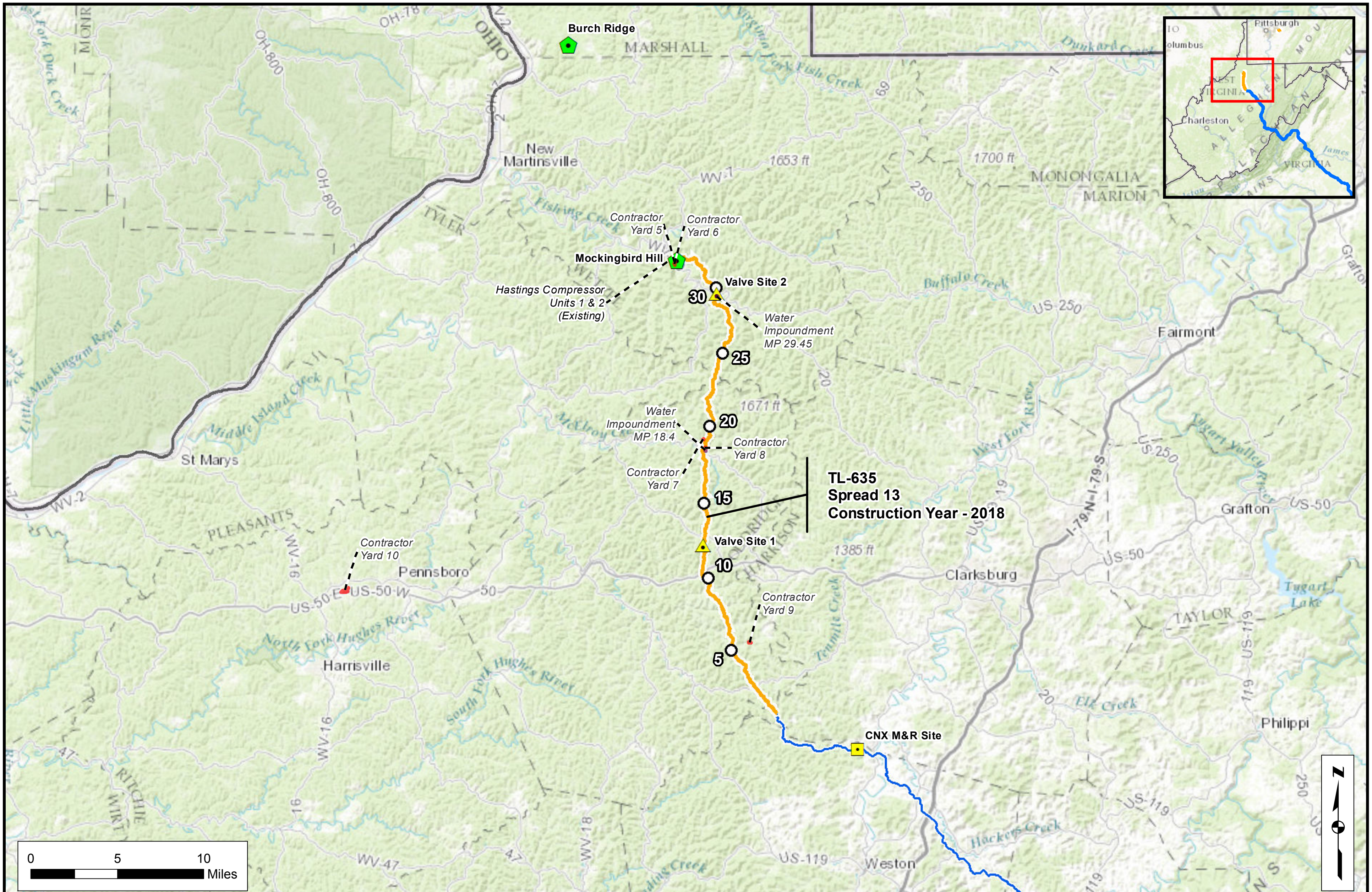


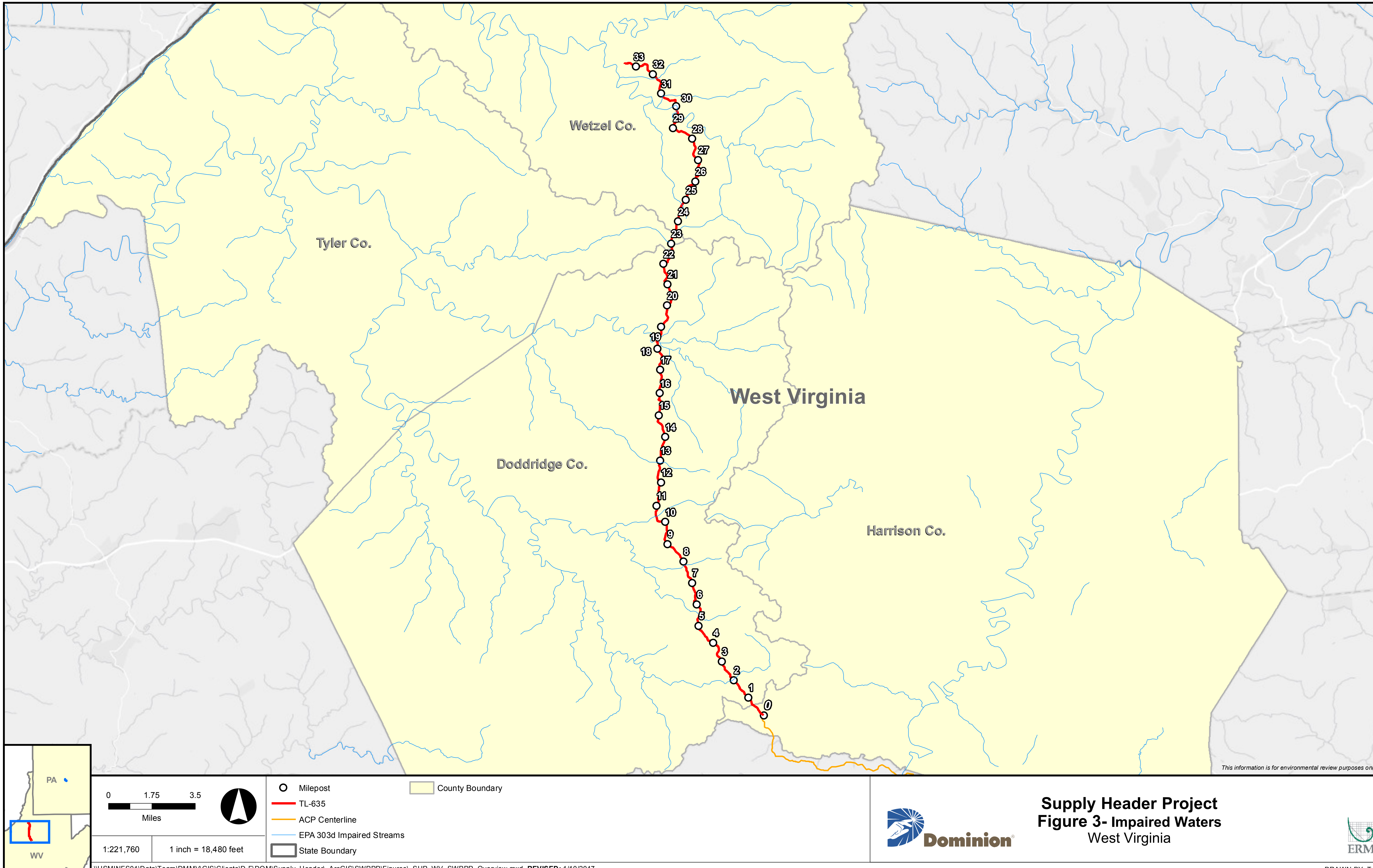
*FIGURE 2 PROPOSED WEST VIRGINIA PIPELINE ROUTE MAP*



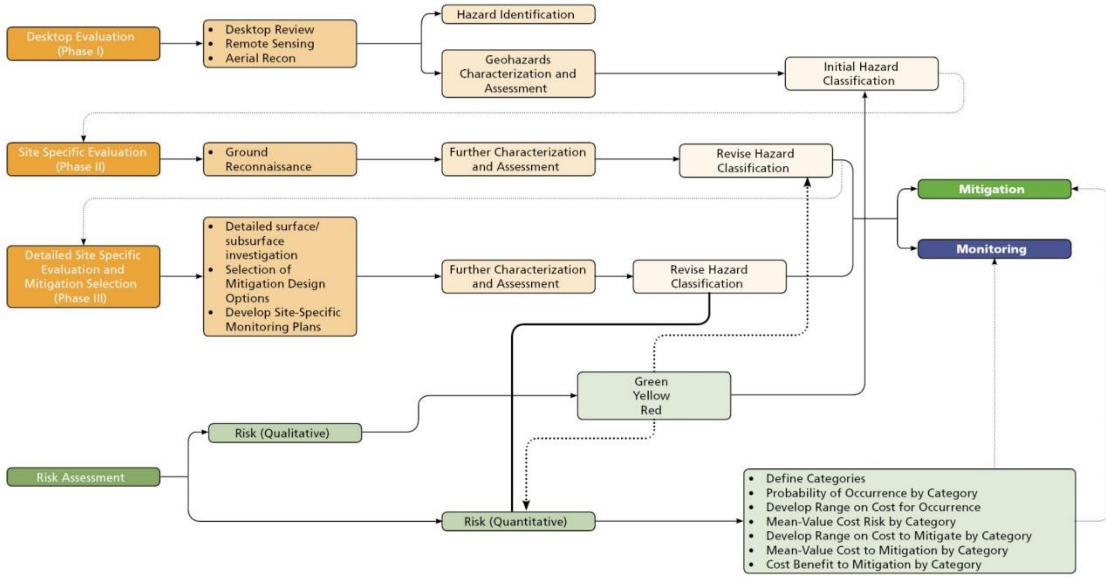

| | | |
|---|---|---|
| Dominion | Milepost<br>Proposed Centerline (TL-635 - Spread 13)<br>Atlantic Coast Pipeline<br>Compressor Station<br>CNX M&R Site<br>Valve Site | **Supply Header Project**<br>**Figure 2**<br>Proposed Route<br>West Virginia<br>ERM |

FILE: M:\Clients\D-F\DOM\Supply_Header_ArcGIS\SWPPP\Figures_SHP_Spread_Cons_Date_WV.mxd, REVISED: 03/17/2017, SCALE: 1:499,749 DRAWN BY: TAH

FIGURE 3 IMPAIRED WATERS MAP



## *FIGURE 4 HAZARD IDENTIFICATION AND ASSESSMENT*



## *FIGURE 5     HAZARD MITIGATION*

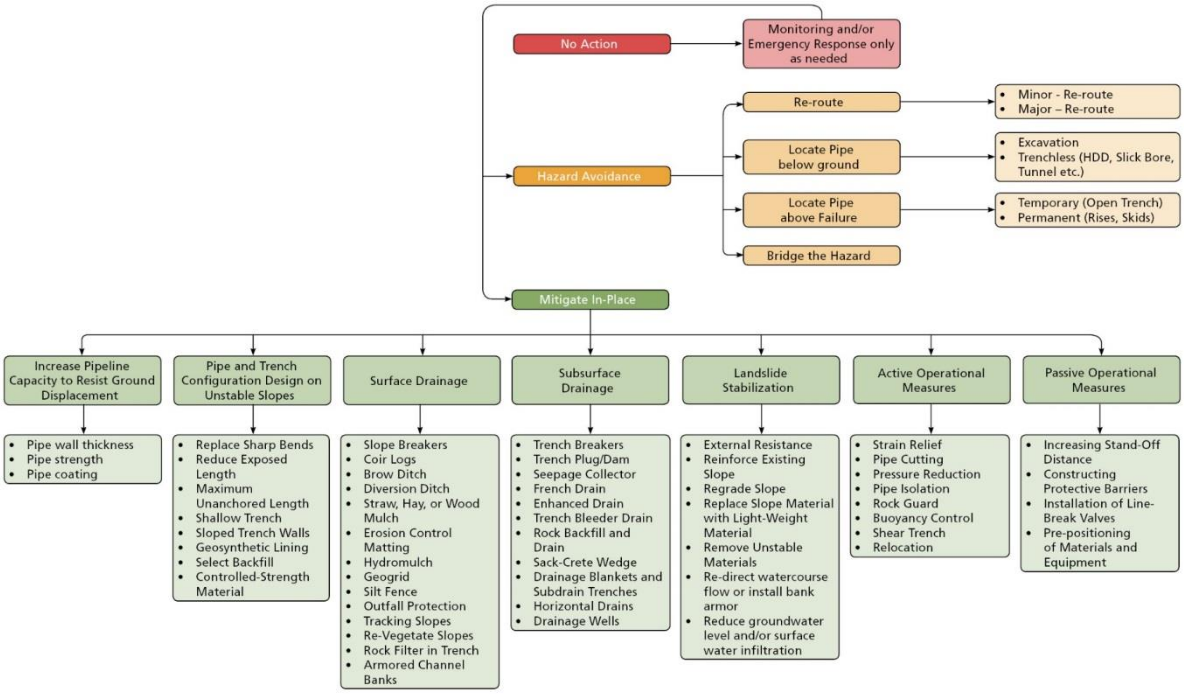
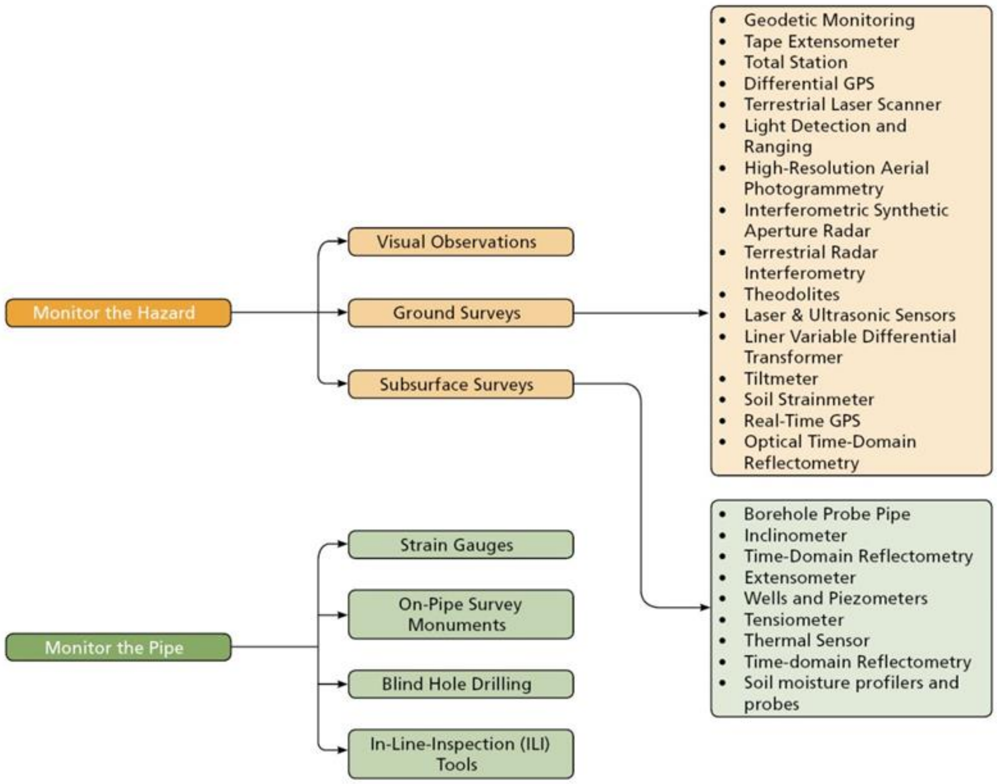


***FIGURE 6 HAZARD MONITORING***



# APPENDIX B

FERC Regulation Table

| Regulation Document | Regulation | Description | More Stringent Regulation | More Stringent Reason | Reference in Plan | Where Regulation Applies | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Steep Slopes | National Forest | Non-specific Area |
| **FERC Upland Erosion Control, Revegetation, and Maintenance Plan** | | | | | | | | |
| FERC Plan | II.A.1: Environmental Inspection | At least one Environmental Inspector is required for each construction spread during construction and restoration (as defined by section V). The number and experience of Environmental Inspectors assigned to each construction spread shall be appropriate for the length of the construction spread and the number/significance of resources affected. | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.A.2: Environmental Inspection | Environmental Inspectors shall have peer status with all other activity inspectors. | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.A.3: Environmental Inspection | Environmental Inspectors shall have the authority to stop activities that violate the environmental conditions of the FERC's Orders, stipulations of other environmental permits or approvals, or landowner easement agreements; and to order appropriate corrective action. | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.B.1: Responsibilities of Environmental Inspectors | Inspecting construction activities for compliance with the requirements of this Plan, the Procedures, the environmental conditions of the FERC's Orders, the mitigation measures proposed by the project sponsor (as approved and/or modified by the Order), other environmental permits and approvals, and environmental requirements in landowner easement agreements. | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.B.2: Responsibilities of Environmental Inspectors | Identifying, documenting, and overseeing corrective actions, as necessary to bring an activity back into compliance; | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.B.3: Responsibilities of Environmental Inspectors | Verifying that the limits of authorized construction work areas and locations of access roads are visibly marked before clearing, and maintained throughout construction; | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.B.4: Responsibilities of Environmental Inspectors | Verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, waterbodies, wetlands, or areas with special requirements along the construction work area; | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.B.5: Responsibilities of Environmental Inspectors | Identifying erosion/sediment control and soil stabilization needs in all areas | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.B.6: Responsibilities of Environmental Inspectors | Ensuring that the design of slope breakers will not cause erosion or direct water into sensitive environmental resource areas, including cultural resource sites, wetlands, waterbodies, and sensitive species habitats; | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.B.7: Responsibilities of Environmental Inspectors | Verifying that dewatering activities are properly monitored and do not result in the deposition of sand, silt, and/or sediment into sensitive environmental resource areas, including wetlands, waterbodies, cultural resource sites, and sensitive species habitats; 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; | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.B.8: Responsibilities of Environmental Inspectors | Ensuring that subsoil and topsoil are tested in agricultural and residential areas to measure compaction and determine the need for corrective action | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.B.9: Responsibilities of Environmental Inspectors | Advising the Chief Construction Inspector when environmental conditions (such as wet weather or frozen soils) make it advisable to restrict or delay construction activities to avoid topsoil mixing or excessive compaction; | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.B.10: Responsibilities of Environmental Inspectors | Ensuring restoration of contours and topsoil; | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.B.11: Responsibilities of Environmental Inspectors | Verifying that the soils imported for agricultural or residential use are certified as free of noxious weeds and soil pests, unless otherwise approved by the landowner; | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.B.12: Responsibilities of Environmental Inspectors | Ensuring that erosion control devices are properly installed to prevent sediment flow into sensitive environmental 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; | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.B.13: Responsibilities of Environmental Inspectors | Inspecting and ensuring the maintenance of temporary erosion control measures at least:<br>a. on a daily basis in areas of active construction or equipment operation;<br>b. on a weekly basis in areas with no construction or equipment operation; and<br>c. within 24 hours of each 0.5 inch of rainfall; | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.B.14: Responsibilities of Environmental Inspectors | Ensuring the repair of all ineffective temporary erosion 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; | Most Stringent | NA | Section 18.1 | | | x |

| Regulation Document | Regulation | Description | More Stringent Regulation | More Stringent Reason | Reference in Plan | Where Regulation Applies | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Steep Slopes | National Forest | Non-specific Area |
| FERC Plan | II.B.15: Responsibilities of Environmental Inspectors | Keeping records of compliance with the environmental conditions of the FERC's Orders, and the mitigation measures proposed by the project sponsor in the application submitted to the FERC, and other federal or state environmental permits during active construction and restoration; | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.B.16: Responsibilities of Environmental Inspectors | Identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase; and | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | II.B.17: Responsibilities of Environmental Inspectors | Verifying that locations for any disposal of excess construction materials for beneficial reuse comply with section III.E. | Most Stringent | NA | Section 18.1 | | | x |
| FERC Plan | III.A.1: Construction Work Areas | Identify all construction work areas (e.g., construction right-of-way, extra work space areas, pipe storage and contractor yards, borrow and disposal areas, access roads) that would be needed for safe construction. The project sponsor must ensure that appropriate cultural resources and biological surveys are conducted, as determined necessary by the appropriate federal and state agencies. | Most Stringent | NA | Sections 9.4, 9.6, 11.0, & 18.1<br>Construction Alignment Sheets | | | x |
| FERC Plan | III.A.2: Construction Work Areas | Project sponsors are encouraged to consider expanding any required cultural resources and endangered species surveys in anticipation of the need for activities outside of authorized work areas. | Most Stringent | NA | Sections 9.4, 9.6, 11.0, & 18.1<br>Construction Alignment Sheets | | | x |
| FERC Plan | III.A.3: Construction Work Areas | Plan construction sequencing to limit the amount and duration of open trench sections, as necessary, to prevent excessive erosion or sediment flow into sensitive environmental resource areas. | Most Stringent | NA | Section 13.2<br>Construction Alignment Sheets | | | x |
| FERC Plan | III.B.1: Drain Tile and Irrigation Systems | Attempt to locate existing drain tiles and irrigation systems. | Most Stringent | NA | Sections 9.4.9, 13.1.1, 13.1.4, 18.1<br>Construction Alignment Sheets | | | x |
| FERC Plan | III.B.2: Drain Tile and Irrigation Systems | Contact landowners and local soil conservation authorities to determine the locations of future drain tiles that are likely to be installed within 3 years of the authorized construction. | Most Stringent | NA | Section 9.4.9<br>Construction Alignment Sheets | | | x |
| FERC Plan | III.B.3: Drain Tile and Irrigation Systems | Develop procedures for constructing through drain-tiled areas, maintaining irrigation systems during construction, and repairing drain tiles and irrigation systems after construction. | Most Stringent | NA | Section 9.4.9<br>Construction Alignment Sheets | | | x |
| FERC Plan | III.B.4: Drain Tile and Irrigation Systems | Engage qualified drain tile specialists, as needed to conduct or monitor repairs to drain tile systems affected by construction. Use drain tile specialists from the project area, if available. | Most Stringent | NA | Section 9.4.9<br>Construction Alignment Sheets | | | x |
| FERC Plan | III.C: Grazing Deferment | Develop grazing deferment plans with willing landowners, grazing permittees, and land management agencies to minimize grazing disturbance of revegetation efforts. | Most Stringent | NA | Section 9.4.9 | | | x |
| FERC Plan | III.D: Road Crossings and Access Points | Plan for safe and accessible conditions at all roadway crossings and access points during construction and restoration. | FERC Plan IV.E | Additional specific requirements in FERC Plan IV.E | Section 9.6 | | | x |
| FERC Plan | III.E: Disposal Planning | Determine methods and locations for the regular collection, containment, and disposal of excess construction materials and debris (e.g., timber, slash, mats, garbage, drill cuttings and fluids, excess rock) throughout the construction process. Disposal of materials for beneficial reuse must not result in adverse environmental impact and is subject to compliance with all applicable survey, landowner or land management agency approval, and permit requirements. | GP G.4.e.2.C.i | Must dispose waste in accordance with W. VA Code and the Solid Waste Management Rule | Section 18.4.1 | | | x |
| FERC Plan | III.F.1: Agency Coordination | Obtain written recommendations from the local soil conservation authorities or land management agencies regarding permanent erosion control and revegetation specifications. | Most Stringent | NA | Section 9.4.9<br>Appendix M Restoration and Rehabilitation Plan | | | x |
| FERC Plan | III.F.2: Agency Coordination | Develop specific procedures in coordination with the appropriate agencies to prevent the introduction or spread of invasive species, noxious weeds, and soil pests resulting from construction and restoration activities. | Most Stringent | NA | Sections 13.3, 15.1, & 18.1<br>Appendix M Restoration and Rehabilitation Plan | | | x |
| FERC Plan | III.F.3: Agency Coordination | Develop specific procedures in coordination with the appropriate agencies and landowners, as necessary, to allow for livestock and wildlife movement and protection during construction. | Most Stringent | NA | Sections 9.4.9 & 13.1 | | | x |
| FERC Plan | III.F.4: Agency Coordination | Develop specific blasting procedures in coordination with the appropriate agencies that address pre- and post-blast inspections; advanced public notification; and mitigation measures for building foundations, groundwater wells, and springs. Use appropriate methods (e.g., blasting mats) to prevent damage to nearby structures and to prevent debris from entering sensitive environmental resource areas. | Most Stringent | NA | Section 15.11<br>Appendix P - Blasting Plan | | | x |

| Regulation Document | Regulation | Description | More Stringent Regulation | More Stringent Reason | Reference in Plan | Where Regulation Applies | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Steep Slopes | National Forest | Non-specific Area |
| FERC Plan | III.G: Spill Prevention and Response Procedures | The project sponsor shall develop project-specific Spill Prevention and Response Procedures, as specified in section IV of the staff's Procedures. A copy must be filed with the Secretary of the FERC (Secretary) prior to construction and made available in the field on each construction spread. The filing requirement does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations. | FERC Plan IV:A.2 | More specific material handling procedures and requirement to also include a GPP | Section 19.0 | | | x |
| FERC Plan | III.H: Residential Construction | For all properties with residences located within 50 feet of construction work areas, project sponsors shall: avoid removal of mature trees and landscaping within the construction work area unless necessary for safe operation of construction equipment, or as specified in landowner agreements; fence the edge of the construction work area for a distance of 100 feet on either side of the residence; and restore all lawn areas and landscaping immediately following clean up operations, or as specified in landowner agreements. If seasonal or other weather conditions prevent compliance with these time frames, maintain and monitor temporary erosion controls (sediment barriers and mulch) until conditions allow completion of restoration. | Most Stringent | NA | Section 9.4.7 | | | x |
| FERC Plan | III.I: Winter Construction Plans | If construction is planned to occur during winter weather conditions, project sponsors shall develop and file a project-specific winter construction plan with the FERC application. This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.<br>The plan shall address:<br>1. winter construction procedures (e.g., snow handling and removal, access road construction and maintenance, soil handling under saturated or frozen conditions, topsoil stripping);<br>2. 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<br>3. final restoration procedures (e.g., subsidence and compaction repair, topsoil replacement, seeding). | Most Stringent | NA | Section 9.4.8 | | | x |
| FERC Plan | IV.A.1: Approved Areas of Disturbance | Project-related ground disturbance shall be limited to the construction right-of-way, extra work space areas, pipe storage yards, borrow and disposal areas, access roads, and other areas approved in the FERC's Orders. Any project-related ground disturbing activities outside these areas will require prior Director approval. This requirement does not apply to activities needed to comply with the Plan and Procedures (i.e., slope breakers, energy-dissipating devices, dewatering structures, drain tile system repairs) or minor field realignments and workspace shifts per landowner needs and requirements that do not affect other landowners or sensitive environmental resource areas. All construction or restoration activities outside of authorized areas are subject to all applicable survey and permit requirements, and landowner easement agreements. | Most Stringent | NA | Sections 11.0 & 13.0 | | | x |
| FERC Plan | IV.A.2: Approved Areas of Disturbance | The construction right-of-way width for a project shall not exceed 75 feet or that described in the FERC application unless otherwise modified by a FERC Order. However, in limited, non-wetland areas, this construction right-of-way width may be expanded by up to 25 feet without Director approval to accommodate full construction right-of-way topsoil segregation and to ensure safe construction where topographic conditions (e.g., side-slopes) or soil limitations require it. Twenty-five feet of extra construction right-of-way width may also be used in limited, non-wetland or non-forested areas for truck turn-arounds where no reasonable alternative access exists.<br><br>Project use of these additional limited areas is subject to landowner or land management agency approval and compliance with all applicable survey and permit requirements. When additional areas are used, each one shall be identified and the need explained in the weekly or biweekly construction reports to the FERC, if required. The following material shall be included in the reports:<br>a. the location of each additional area by station number and reference to previously filed alignment sheets, or updated alignment sheets showing the additional areas;<br>b. identification of the filing at FERC containing evidence that the additional areas were previously surveyed; and<br>c. a statement that landowner approval has been obtained and is available in project files. | Most Stringent | NA | Section 11.0<br>Construction Alignment Sheets | | | x |
| FERC Plan | IV.B.1: Topsoil Segregation | Unless the landowner or land management agency specifically approves otherwise, prevent the mixing of topsoil with subsoil by stripping topsoil from either the full work area or from the trench and subsoil storage area (ditch plus spoil side method) in:<br>a. cultivated or rotated croplands, and managed pastures;<br>b. residential areas;<br>c. hayfields; and<br>d. other areas at the landowner's or land managing agency's request. | Most Stringent | NA | Section 13.3.3 | | | x |
| FERC Plan | IV.B.2: Topsoil Segregation | In residential areas, importation of topsoil is an acceptable alternative to topsoil segregation. | Most Stringent | NA | Section 13.3.3 | | | x |
| FERC Plan | IV.B.3: Topsoil Segregation | Where topsoil segregation is required, the project sponsor must:<br>a. segregate at least 12 inches of topsoil in deep soils (more than 12 inches of topsoil); and<br>b. make every effort to segregate the entire topsoil layer in soils with less than 12 inches of topsoil. | Most Stringent | NA | Section 13.3.3 | | | x |
| FERC Plan | IV.B.4: Topsoil Segregation | Maintain separation of salvaged topsoil and subsoil throughout all construction activities. | Most Stringent | NA | Section 13.3.3 | | | x |
| FERC Plan | IV.B.5: Topsoil Segregation | Segregated topsoil may not be used for padding the pipe, constructing temporary slope breakers or trench plugs, improving or maintaining roads, or as a fill material. | Most Stringent | NA | Section 13.3.3 | | | x |
| FERC Plan | IV.B.6: Topsoil Segregation | Stabilize topsoil piles and minimize loss due to wind and water erosion with use of sediment barriers, mulch, temporary seeding, tackifiers, or functional equivalents, where necessary. | Most Stringent | NA | Section 13.3.3 | | | x |
| FERC Plan | IV.C: Drain Tiles | 1. Mark locations of drain tiles damaged during construction.<br>2. Probe all drainage tile systems within the area of disturbance to check for damage.<br>3. Repair damaged drain tiles to their original or better condition. Do not use filter-covered drain tiles unless the local soil conservation authorities and the landowner agree. Use qualified specialists for testing and repairs.<br>4. For new pipelines in areas where drain tiles exist or are planned, ensure that the depth of cover over the pipeline is sufficient to avoid interference with drain tile systems. For adjacent pipeline loops in agricultural areas, install the new pipeline with at least the same depth of cover as the existing pipeline(s). | Most Stringent | NA | Sections 9.4.9, 13.1.1, & 13.1.4<br>Construction Alignment Sheets | | | x |
| FERC Plan | IV.D: Irrigation | Maintain water flow in crop irrigation systems, unless shutoff is coordinated with affected parties. | Most Stringent | NA | Section 9.4.9<br>Construction Alignment Sheets | | | x |
| FERC Plan | IV.E: Road Crossings and Access Points | 1. Maintain safe and accessible conditions at all road crossings and access points during construction.<br>2. If crushed stone access pads are used in residential or agricultural areas, place the stone on synthetic fabric to facilitate removal.<br>3. Minimize the use of tracked equipment on public roadways. Remove any soil or gravel spilled or tracked onto roadways daily or more frequent as necessary to maintain safe road conditions. Repair any damages to roadway surfaces, shoulders, and bar ditches. | Most Stringent | NA | Section 13.1.2 & 15.2 | | | x |
| FERC Plan | IV.F: Temporary Erosion Control | Install temporary erosion controls immediately after initial disturbance of the soil. Temporary erosion controls must be properly maintained throughout construction (on a daily basis) and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration is complete. | Most Stringent | N/A | Section 13.4.1 | | | x |

| Regulation Document | Regulation | Description | More Stringent Regulation | More Stringent Reason | Reference in Plan | Where Regulation Applies | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Steep Slopes | National Forest | Non-specific Area |
| FERC Plan | IV.F.1: Temporary Erosion Control | 1. Temporary Slope Breakers<br>a. Temporary slope breakers are intended to reduce runoff velocity and divert water off the construction right-of-way. Temporary slope breakers may be constructed of materials such as soil, silt fence, staked hay or straw bales, or sand bags.<br>b. Install temporary slope breakers on all disturbed areas, as necessary to avoid excessive erosion. Temporary slope breakers must be installed on slopes greater than 5 percent where the base of the slope is less than 50 feet from waterbody, wetland, and road crossings at the following spacing (closer spacing shall be used if necessary)<br>Slope (%) Spacing (feet)<br>5-15 300<br>>15-30 200<br>>30 100<br><br>c. Direct the outfall of each temporary slope breaker to a stable, well vegetated area or construct an energy-dissipating device at the end of the slope breaker and off the construction right-of-way.<br>d. Position the outfall of each temporary slope breaker to prevent sediment discharge into wetlands, waterbodies, or other sensitive environmental resource areas. | WV BMP 3.18 Right-of-Way Diversion | WV BMP Manual used for temporary and permanent slope breaker<br>Slope (%) Spacing (feet)<br>< 5 300<br>10 175<br>15 125<br>20 100<br>>25 75 | Section 13.4.1.4 | | | x |
| FERC Plan | IV.F.2: Temporary Erosion Control | Temporary Trench Plugs: Temporary trench plugs are intended to segment a continuous open trench prior to backfill.<br>a. Temporary trench plugs may consist of unexcavated portions of the trench, compacted subsoil, sandbags, or some functional equivalent.<br>b. Position temporary trench plugs, as necessary, to reduce trenchline erosion and minimize the volume and velocity of trench water flow at the base of slopes. | Most Stringent | N/A | Section 13.4.2.1 | | | x |
| FERC Plan | IV.F.3: Temporary Erosion Control | Sediment Barriers: Sediment barriers are intended to stop the flow of sediments and to prevent the deposition of sediments beyond approved workspaces or into sensitive resources.<br>a. Sediment barriers may be constructed of materials such as silt fence, staked hay or straw bales, compacted earth (e.g., driveable berms across travelways), sand bags, or other appropriate materials.<br>b. At a minimum, install and maintain temporary sediment barriers across the entire 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 a waterbody, wetland, or road crossing until revegetation is successful as defined in this Plan. Leave adequate room between the base of the slope and the sediment barrier to accommodate ponding of water and sediment deposition.<br>c. Where wetlands or waterbodies are adjacent to and downslope of construction work areas, install sediment barriers along the edge of these areas, as necessary to prevent sediment flow into the wetland or waterbody. | Most Stringent | N/A | Section 13.4.1.1 | | | x |
| FERC Plan | IV.F.4: Temporary Erosion Control | Mulch:<br>a. Apply mulch on all slopes (except in cultivated cropland) concurrent with or immediately after seeding, where necessary to stabilize the soil surface and to reduce wind and water erosion. Spread mulch uniformly over the area to cover at least 75 percent of the ground surface at a rate of 2 tons/acre of straw or its equivalent, unless the local soil conservation authority, landowner, or land managing agency approves otherwise in writing.<br>b. Mulch can consist of weed-free straw or hay, wood fiber hydromulch, erosion control fabric, or some functional equivalent.<br>c. Mulch all disturbed upland areas (except cultivated cropland) before seeding if:<br>(1) final grading and installation of permanent erosion control measures will not be completed in an area within 20 days after the trench in that area is backfilled (10 days in residential areas), as required in section V.A.1; or<br>(2) construction or restoration activity is interrupted for extended periods, such as when seeding cannot be completed due to seeding period restrictions.<br>d. If mulching before seeding, increase mulch application on all slopes within 100 feet of waterbodies and wetlands to a rate of 3 tons/acre of straw or equivalent.<br>e. If wood chips are used as mulch, do not use more than 1 ton/acre and add the equivalent of 11 lbs/acre available nitrogen (at least 50 percent of which is slow release).<br>f. Ensure that mulch is adequately anchored to minimize loss due to wind and water.<br>g. When anchoring with liquid mulch binders, use rates recommended by the manufacturer. Do not use liquid mulch binders within 100 feet of wetlands or waterbodies, except where the product is certified environmentally non-toxic by the appropriate state or federal agency or independent standards-setting organization.<br>h. Do not use synthetic monofilament mesh/netted erosion control materials in areas designated as sensitive wildlife habitat, unless the product is specifically designed to minimize harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices. | Most Stringent | N/A | Section 13.3.4<br>Appendix M - Restoration and Rehabilitation Plan | | | x |
| FERC Plan | V.A.1: Restoration Cleanup | Commence cleanup operations immediately following backfill operations. Complete final grading, topsoil replacement, and installation of permanent erosion control structures within 20 days after backfilling the trench (10 days in residential areas). If seasonal or other weather conditions prevent compliance with these time frames, maintain temporary erosion controls (i.e., temporary slope breakers, sediment barriers, and mulch) until conditions allow completion of cleanup.<br><br>If construction or restoration unexpectedly continues into the winter season when conditions could delay successful decompaction, topsoil replacement, or seeding until the following spring, file with the Secretary for the review and written approval of the Director, a winter construction plan (as specified in section III.I). This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations. | Most Stringent | N/A | Section 13.2 | | | x |
| FERC Plan | V.A.2: Restoration Cleanup | A travel lane may be left open temporarily to allow access by construction traffic if the temporary erosion control structures are installed as specified in section IV.F. and inspected and maintained as specified in sections II.B.12 through 14. When access is no longer required the travel lane must be removed and the right-of-way restored. | Most Stringent | N/A | Section 13.2 | | | x |
| FERC Plan | V.A.3: Restoration Cleanup | 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 shall be considered construction debris, unless approved for use as mulch or for some other use on the construction work areas by the landowner or land managing agency. | Most Stringent | N/A | Section 15.11 | | | x |
| FERC Plan | V.A.4: Restoration Cleanup | Remove excess rock from at least the top 12 inches of soil in all cultivated or rotated cropland, managed pastures, hayfields, and residential areas, as well as other areas at the landowner's request. The size, density, and distribution of rock on the construction work area shall be similar to adjacent areas not disturbed by construction. The landowner or land management agency may approve other provisions in writing. | Most Stringent | N/A | Section 13.2 | | | x |
| FERC Plan | V.A.5: Restoration Cleanup | Grade the construction right-of-way to restore pre-construction contours and leave the soil in the proper condition for planting. | Most Stringent | N/A | Section 13.2 | | | x |
| FERC Plan | V.A.6: Restoration Cleanup | Remove construction debris from all construction work areas unless the landowner or land managing agency approves leaving materials onsite for beneficial reuse, stabilization, or habitat restoration. | Most Stringent | N/A | Section 13.2 | | | x |
| FERC Plan | V.A.7: Restoration Cleanup | Remove temporary sediment barriers when replaced by permanent erosion control measures or when revegetation is successful. | Most Stringent | N/A | Section 13.4.1.1 | | | x |

| Regulation Document | Regulation | Description | More Stringent Regulation | More Stringent Reason | Reference in Plan | Where Regulation Applies | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Steep Slopes | National Forest | Non-specific Area |
| FERC Plan | V.B.1: Permanent Erosion Control Devices | 1. Trench Breakers<br>a. Trench breakers are intended to slow the flow of subsurface water along the trench. Trench breakers may be constructed of materials such as sand bags or polyurethane foam. Do not use topsoil in trench breakers.<br>b. An engineer or similarly qualified professional shall determine the need for and spacing of trench breakers. Otherwise, trench breakers shall be installed at the same spacing as and upslope of permanent slope breakers.<br>c. In agricultural fields and residential areas where slope breakers are not typically required, install trench breakers at the same spacing as if permanent slope breakers were required.<br>d. At a minimum, install a trench breaker 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. Install trench breakers at wetland boundaries, as specified in the Procedures. Do not install trench breakers within a wetland. | Most Stringent | N/A | Section 13.4.2.1 | | | x |
| FERC Plan | V.B.2: Permanent Erosion Control Devices | Permanent Slope Breakers<br>a. Permanent slope breakers are intended to reduce runoff velocity, divert water off the construction 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.<br>b. Construct and maintain permanent slope breakers in all areas, except cultivated areas and lawns, unless requested by the landowner, using spacing recommendations obtained from the local soil conservation authority or land managing agency.<br>In the absence of written recommendations, use the following spacing unless closer spacing is necessary to avoid excessive erosion on the construction right-of-way:<br>Slope (%) Spacing (feet)<br>5 - 15 300<br>>15 - 30 200<br>>30 100<br><br>c. Construct slope breakers to divert surface flow to a stable area without causing water to pool or erode behind the breaker. In the absence of a stable area, construct appropriate energy-dissipating devices at the end of the breaker.<br>d. 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 slope breakers extend beyond the edge of the construction right-of-way, they are subject to compliance with all applicable survey requirements. | WV BMP 3.18 Right-of-Way Diversion | WV BMP Manual used for temporary and permanent slope breaker<br>Slope (%) Spacing (feet)<br>< 5 300<br>10 175<br>15 125<br>20 100<br>>25 75 | Sections 13.4.2.2 | | | x |
| FERC Plan | V.C.1: Soil Compaction Mitigation | Test topsoil and subsoil for compaction at regular intervals in agricultural and residential areas disturbed by construction activities. Conduct tests on the same soil type under similar moisture conditions in undisturbed areas to approximate preconstruction conditions. Use penetrometers or other appropriate devices to conduct tests. | Most Stringent | N/A | Section 13.4.2.7 | | | x |
| FERC Plan | V.C.2: Soil Compaction Mitigation | Plow severely compacted agricultural areas with a paraplow or other deep tillage implement. In areas where topsoil has been segregated, plow the subsoil before replacing the segregated topsoil.<br><br>If subsequent construction and cleanup activities result in further compaction, conduct additional tilling. | Most Stringent | N/A | Section 13.4.2.7 | | | x |
| FERC Plan | V.C.3: Soil Compaction Mitigation | Perform appropriate soil compaction mitigation in severely compacted residential areas. | Most Stringent | N/A | Section 13.4.2.7 | | | x |
| FERC Plan | V.D.1: Revegetation | General:<br>a. The project sponsor is responsible for ensuring successful revegetation of soils disturbed by project-related activities, except as noted in section V.D.1.b.<br>b. Restore all turf, ornamental shrubs, and specialized landscaping in accordance with the landowner's request, or compensate the landowner. Restoration work must be performed by personnel familiar with local horticultural and turf establishment practices. | Most Stringent | N/A | Section 13.3.6<br>Appendix M - Restoration and Rehabilitation Plan | | | x |
| FERC Plan | V.D.2: Revegetation | Soil Additives:<br>Fertilize and add soil pH modifiers in accordance with written recommendations obtained from the local soil conservation authority, land management agencies, or landowner. Incorporate recommended soil pH modifier and fertilizer into the top 2 inches of soil as soon as practicable after application. | FERC Plan VI.C. | While fertilizing is allowed by V.D.2., section VI.C. prohibits the use of fertilizers in wetlands unless required in writing by a state or federal agency. | Sections 13.3 & 13.4<br>Appendix M - Restoration and Rehabilitation Plan | | | x |
| FERC Plan | V.D.3: Revegetation | Seeding Requirements:<br>a. Prepare a seedbed in disturbed areas to a depth of 3 to 4 inches using appropriate equipment to provide a firm seedbed. When hydroseeding, scarify the seedbed to facilitate lodging and germination of seed.<br>b. Seed disturbed areas in accordance with written recommendations for seed mixes, rates, and dates obtained from the local soil conservation authority or the request of the landowner or land management agency. Seeding is not required in cultivated croplands unless requested by the landowner.<br>c. Perform seeding of permanent vegetation within the recommended seeding dates. If seeding cannot be done within those dates, use appropriate temporary erosion control measures discussed in section IV.F and perform seeding of permanent vegetation at the beginning of the next recommended seeding season. Dormant seeding or temporary seeding of annual species may also be used, if necessary, to establish cover, as approved by the Environmental Inspector. Lawns may be seeded on a schedule established with the landowner.<br>d. In the absence of written recommendations from the local soil conservation authorities, seed all disturbed soils within 6 working days of final grading, weather and soil conditions permitting, subject to the specifications in section V.D.3.a through V.D.3.c.<br>e. Base seeding rates on Pure Live Seed. Use seed within 12 months of seed testing.<br>f. Treat legume seed with an inoculant specific to the species using the manufacturer's recommended rate of inoculant appropriate for the seeding method (broadcast, drill, or hydro).<br>g. In the absence of written recommendations from the local soil conservation authorities, landowner, or land managing agency to the contrary, a seed drill equipped with a cultipacker is preferred for seed application.<br>Broadcast or hydroseeding can be used in lieu of drilling at double the recommended seeding rates. Where seed is broadcast, firm the seedbed with a cultipacker or roller after seeding. 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 the Environmental Inspector. | Most Stringent | N/A | Section 13.3.5<br>Appendix M - Restoration and Rehabilitation Plan | | | x |
| FERC Plan | VI. Off-Road Vehicle Control | To each owner or manager of forested lands, offer to install and maintain measures to control unauthorized vehicle access to the right-of-way. These measures may include:<br>A. signs;<br>B. fences with locking gates;<br>C. slash and timber barriers, pipe barriers, or a line of boulders across the right-of-way; and<br>D. conifers or other appropriate trees or shrubs across the right-of-way. | Most Stringent | N/A | Section 15.3 | | | x |
| FERC Plan | VII.A.1: Post-Construction Activities and Reporting | MONITORING AND MAINTENANCE:<br>Conduct follow-up inspections of all disturbed areas, as necessary, to determine the success of revegetation and address landowner concerns. At a minimum, conduct inspections after the first and second growing seasons. | Most Stringent | N/A | Section 18.1<br>Appendix M - Restoration and Rehabilitation Plan | | | x |

| Regulation Document | Regulation | Description | More Stringent Regulation | More Stringent Reason | Reference in Plan | Where Regulation Applies | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Steep Slopes | National Forest | Non-specific Area |
| FERC Plan | VII.A.2: Post-Construction Activities and Reporting | Revegetation in non-agricultural areas shall 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. In agricultural areas, revegetation shall be considered successful when upon visual survey, crop growth and vigor are similar to adjacent undisturbed portions of the same field, unless the easement agreement specifies otherwise.<br><br>Continue revegetation efforts until revegetation is successful. | GP G.4.e.2.A.i.c for all areas and MNF LRMP SW05 for areas located in the MNF | The GP specifies that at least 70% of the disturbed areas in West Virginia must be germinated adequately within 30 days of seed planting. For disturbed areas in the MNF, 85% of the area must be planted. | Appendix M - Restoration and Rehabilitation Plan | | x | |
| FERC Plan | VII.A.3: Post-Construction Activities and Reporting | Monitor and correct problems with drainage and irrigation systems resulting from pipeline construction in agricultural areas until restoration is successful. | Most Stringent | N/A | Section 9.4.9 | | | x |
| FERC Plan | VII.A.4: Post-Construction Activities and Reporting | Restoration shall be considered successful if the right-of-way surface condition is similar to adjacent undisturbed lands, construction debris is removed (unless otherwise approved by the landowner or land managing agency per section V.A.6), revegetation is successful, and proper drainage has been restored. | Most Stringent | N/A | Section 13.3.8<br>Appendix M - Restoration and Rehabilitation Plan | | | x |
| FERC Plan | VII.A.5: Post-Construction Activities and Reporting | Routine vegetation mowing or clearing over the full width of the permanent right-of-way in uplands shall not be done more frequently than every 3 years. However, to facilitate periodic corrosion/leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In no case shall routine vegetation mowing or clearing occur during the migratory bird nesting season between April 15 and August 1 of any year unless specifically approved in writing by the responsible land management agency or the U.S. Fish and Wildlife Service. | FERC Plan VI.D | Routine mowing and clearing is not allowed over the full width of the permanent ROW in wetlands | Section 14.1.5<br>Appendix M - Restoration and Rehabilitation Plan | | | x |
| FERC Plan | VII.A.6: Post-Construction Activities and Reporting | Efforts to control unauthorized off-road vehicle use, in cooperation with the landowner, shall continue throughout the life of the project. Maintain signs, gates, and permanent access roads as necessary. | Most Stringent | N/A | Section 15.3 | | | x |
| FERC Plan | VII.B.1: Reporting | 1. The project sponsor shall maintain records that identify by milepost:<br>a. method of application, application rate, and type of fertilizer, pH modifying agent, seed, and mulch used;<br>b. acreage treated;<br>c. dates of backfilling and seeding;<br>d. names of landowners requesting special seeding treatment and a description of the follow-up actions;<br>e. the location of any subsurface drainage repairs or improvements made during restoration; and<br>f. any problem areas and how they were addressed. | Most Stringent | N/A | Appendix M - Restoration and Rehabilitation Plan | | | x |
| FERC Plan | VII.B.2: Reporting | The project sponsor shall file with the Secretary quarterly activity reports documenting the results of follow-up inspections required by section VII.A.1; any problem areas, including those identified by the landowner; and corrective actions taken for at least 2 years following construction.<br><br>The requirement to file quarterly activity reports with the Secretary does not apply to projects constructed under the automatic authorization, prior notice, or advanced notice provisions in the FERC's regulations. | Most Stringent | N/A | Appendix M - Restoration and Rehabilitation Plan | | | x |
| **FERC Wetland and Waterbody Construction and Mitigation Procedures** | | | | | | | | |
| FERC Procedures | III.A: Environmental Inspectors | At least one Environmental Inspector having knowledge of the wetland and waterbody conditions in the project area is required for each construction spread. The number and experience of Environmental Inspectors assigned to each construction spread shall be appropriate for the length of the construction spread and the number/significance of resources affected. | Most Stringent | NA | Section 18.1 | | | x |
| FERC Procedures | III.B: Environmental Inspectors | The Environmental Inspector's responsibilities are outlined in the Upland Erosion Control, Revegetation, and Maintenance Plan (Plan). | Most Stringent | NA | N/A | | | x |
| FERC Procedures | IV:A.1: Preconstruction Planning | The project sponsor shall develop project-specific Spill Prevention and Response Procedures that meet applicable requirements of state and federal agencies. A copy must be filed with the Secretary prior to construction and made available in the field on each construction spread. This filing requirement does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.<br>It shall be the responsibility of the project sponsor and its contractors to structure their operations in a manner that reduces the risk of spills or the accidental exposure of fuels or hazardous materials to waterbodies or wetlands. The project sponsor and its contractors must, at a minimum, ensure that:<br>a. all employees handling fuels and other hazardous materials are properly trained;<br>b. all equipment is in good operating order and inspected on a regular basis;<br>c. fuel trucks transporting fuel to on-site equipment travel only on approved access roads;<br>d. all equipment is parked overnight and/or fueled at least 100 feet from a waterbody or in an upland area at least 100 feet from a wetland boundary. These activities can occur closer only if the Environmental Inspector determines that there is no reasonable alternative, and the project sponsor and its contractors have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;<br>e. hazardous materials, including chemicals, fuels, and lubricating oils, are not stored within 100 feet of a wetland, waterbody, or designated municipal watershed area, unless the location is designated for such use by an appropriate governmental authority. This applies to storage of these materials and does not apply to normal operation or use of equipment in these areas;<br>f. concrete coating activities are not performed within 100 feet of a wetland or waterbody boundary, unless the location is an existing industrial site designated for such use. These activities can occur closer only if the Environmental Inspector determines that there is no reasonable alternative, and the project sponsor and its contractors have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;<br>g. pumps operating within 100 feet of a waterbody or wetland boundary utilize appropriate secondary containment systems to prevent spills; and<br>h. bulk storage of hazardous materials, including chemicals, fuels, and lubricating oils have appropriate secondary containment systems to prevent spills. | Most Stringent | NA | Section 19.0 | | | x |
| FERC Procedures | IV.A.2: Preconstruction Planning | The project sponsor and its contractors must structure their operations in a manner that provides for the prompt and effective cleanup of spills of fuel and other hazardous materials. At a minimum, the project sponsor and its contractors must:<br>a. ensure that each construction crew (including cleanup crews) has on hand sufficient supplies of absorbent and barrier materials to allow the rapid containment and recovery of spilled materials and knows the procedure for reporting spills and unanticipated discoveries of contamination;<br>b. ensure that each construction crew has on hand sufficient tools and material to stop leaks;<br>c. know the contact names and telephone numbers for all local, state, and federal agencies (including, if necessary, the U. S. Coast Guard and the National Response Center) that must be notified of a spill; and<br>d. follow the requirements of those agencies in cleaning up the spill, in excavating and disposing of soils or other materials contaminated by a spill, and in collecting and disposing of waste generated during spill cleanup. | FERC Plan IV:A.1 | More specific material handling procedures and requirement to also include a GPP | Section 19.0 | | | x |
| FERC Procedures | IV.B: Agency Coordination | The project sponsor must coordinate with the appropriate local, state, and federal agencies as outlined in these Procedures and in the FERC's Orders. | Most Stringent | NA | Sections 10.0, 11.0, & 19.0 | | | x |
| FERC Procedures | V.A: Waterbody Crossings | NOTIFICATION PROCEDURES AND PERMITS:<br>1. Apply to the U.S. Army Corps of Engineers (COE), or its delegated agency, for the appropriate wetland and waterbody crossing permits.<br>2. 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.<br>3. Apply for state-issued waterbody crossing permits and obtain individual or generic section 401 water quality certification or waiver.<br>4. Notify appropriate federal and state authorities at least 48 hours before beginning trenching or blasting within the waterbody, or as specified in applicable permits. | Most Stringent | N/A | Section 10.1 | | | x |

| Regulation Document | Regulation | Description | More Stringent Regulation | More Stringent Reason | Reference in Plan | Where Regulation Applies: Steep Slopes | Where Regulation Applies: National Forest | Where Regulation Applies: Non-specific Area |
|---|---|---|---|---|---|---|---|---|
| FERC Procedures | V.B.1:Installation | Time Window for Construction: Unless expressly permitted or further restricted by the appropriate federal or state agency in writing on a site-specific basis, instream work, except that required to install or remove equipment bridges, must occur during the following time windows:<br>a. coldwater fisheries - June 1 through September 30; and<br>b. coolwater and warmwater fisheries - June 1 through November 30. | Most Stringent | NA | Section 14.1.1 | | | x |
| FERC Procedures | V.B.2:Installation | Extra Work Areas<br>a. Locate all extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.<br>b. The project sponsor shall file with the Secretary for review and written approval by the Director, site-specific justification for each extra work area with a less than 50-foot setback from the water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. The justification must specify the conditions that will not permit a 50-foot setback and measures to ensure the waterbody is adequately protected.<br>c. Limit the size of extra work areas to the minimum needed to construct the waterbody crossing. | Most Stringent | NA | Sections 13.2 & 14.1 | | | x |
| FERC Procedures | V.B.3:Installation | General Crossing Procedures<br>a. Comply with the COE, or its delegated agency, permit terms and conditions.<br>b. Construct crossings as close to perpendicular to the axis of the waterbody channel as engineering and routing conditions permit.<br>c. Where pipelines parallel a waterbody, maintain at least 15 feet 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.<br>d. Where waterbodies meander or have multiple channels, route the pipeline to minimize the number of waterbody crossings.<br>e. Maintain adequate waterbody flow rates to protect aquatic life, and prevent the interruption of existing downstream uses.<br>f. Waterbody buffers (e.g., extra work area setbacks, refueling restrictions) must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.<br>g. 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 Environmental Inspector verifies that water is unlikely to flow between initial disturbance and final stabilization of the feature. In the event of perceptible flow, the project sponsor must comply with all applicable Procedure requirements for "waterbodies" as defined in section I.B.1. | Most Stringent | NA | Sections 13.2, 14.0, 14.1, & 14.3 | | | x |
| FERC Procedures | V.B.4:Installation | Spoil Pile Placement and Control<br>a. All spoil from minor and intermediate waterbody crossings, and upland spoil from major waterbody crossings, must be placed in the construction right-of-way at least 10 feet from the water's edge or in additional extra work areas as described in section V.B.2.<br>b. Use sediment barriers to prevent the flow of spoil or silt-laden water into any waterbody. | Most Stringent | NA | Section 14.1 | | | x |
| FERC Procedures | V.B.5:Installation | Equipment Bridges<br>a. Only clearing equipment and equipment necessary for installation of equipment bridges may cross waterbodies prior to bridge installation. Limit the number of such crossings of each waterbody to one per piece of clearing equipment.<br>b. Construct and maintain equipment bridges to allow unrestricted flow and to prevent soil from entering the waterbody. Examples of such bridges include:<br>(1) equipment pads and culvert(s);<br>(2) equipment pads or railroad car bridges without culverts;<br>(3) clean rock fill and culvert(s); and<br>(4) flexi-float or portable bridges.<br>Additional options for equipment bridges may be utilized that achieve the performance objectives noted above. Do not use soil to construct or stabilize equipment bridges.<br>c. Design and maintain each equipment bridge to withstand and pass the highest flow expected to occur while the bridge is in place. Align culverts to prevent bank erosion or streambed scour. If necessary, install energy dissipating devices downstream of the culverts.<br>d. Design and maintain equipment bridges to prevent soil from entering the waterbody.<br>e. Remove temporary equipment bridges as soon as practicable after permanent seeding.<br>f. If there will be more than 1 month between final cleanup and the beginning of permanent seeding and reasonable alternative access to the right-of-way is available, remove temporary equipment bridges as soon as practicable after final cleanup.<br>g. Obtain any necessary approval from the COE, or the appropriate state agency for permanent bridges. | Most Stringent | NA | Section 14.1.2 | | | x |
| FERC Procedures | V.B.6:Installation | a. Dry-Ditch Crossing Methods<br>a. Unless approved otherwise by the appropriate federal or state agency, install the pipeline using one of the dry-ditch methods outlined below for crossings of waterbodies up to 30 feet wide (at the water's edge at the time of construction) that are state-designated as either coldwater or significant coolwater or warmwater fisheries, or federally-designated as critical habitat.<br>b. Dam and Pump<br>(1) 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.<br>(2) Implementation of the dam-and-pump crossing method must meet the following performance criteria:<br>(i) use sufficient pumps, including on-site backup pumps, to maintain downstream flows;<br>(ii) construct dams with materials that prevent sediment and other pollutants from entering the waterbody (e.g., sandbags or clean gravel with plastic liner);<br>(iii) screen pump intakes to minimize entrainment of fish;<br>(iv) prevent streambed scour at pump discharge; and<br>(v) continuously monitor the dam and pumps to ensure proper operation throughout the waterbody crossing.<br>c. Flume Crossing: The flume crossing method requires implementation of the following steps:<br>(1) install flume pipe after blasting (if necessary), but before any trenching;<br>(2) 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);<br>(3) properly align flume pipe(s) to prevent bank erosion and streambed scour;<br>(4) do not remove flume pipe during trenching, pipelaying, or backfilling activities, or initial streambed restoration efforts; and<br>(5) 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.<br>d. Horizontal Directional Drill<br>For each waterbody or wetland that would be crossed using the HDD method, file with the Secretary for the review and written approval by the Director, a plan that includes:<br>(1) site-specific construction diagrams that show the location of mud pits, pipe assembly areas, and all areas to be disturbed or cleared for construction;<br>(2) justification that disturbed areas are limited to the minimum needed to construct the crossing;<br>(3) identification of any aboveground disturbance or clearing between the HDD entry and exit workspaces during construction;<br>(4) a description of how an inadvertent release of drilling mud would be contained and cleaned up; and<br>(5) a contingency plan for crossing the waterbody or wetland in the event the HDD is unsuccessful and how the abandoned drill hole would be sealed, if necessary.<br>The requirement to file HDD plans does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations. | Most Stringent | NA | Sections 13.1, 14.1.3, & 15.4 | | | x |
| FERC Procedures | V.B.7:Installation | Crossings of Minor Waterbodies<br>Where a dry-ditch crossing is not required, minor waterbodies may be crossed using the open-cut crossing method, with the following restrictions:<br>a. except for blasting and other rock breaking measures, complete instream construction activities (including trenching, pipe installation, backfill, and restoration of the streambed contours) within 24 hours. Streambanks and unconsolidated streambeds may require additional restoration after this period;<br>b. limit use of equipment operating in the waterbody to that needed to construct the crossing; and<br>c. equipment bridges are not required at minor waterbodies that do not have a state-designated fishery classification or protected status (e.g., agricultural or intermittent drainage ditches). However, if an equipment bridge is used it must be constructed as described in section V.B.5. | Most Stringent | NA | Sections 13.1 & 14.1.4.1 | | | x |

| Regulation Document | Regulation | Description | More Stringent Regulation | More Stringent Reason | Reference in Plan | Where Regulation Applies | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Steep Slopes | National Forest | Non-specific Area |
| FERC Procedures | V.B.8:Installation | Crossings of Intermediate Waterbodies<br>Where a dry-ditch crossing is not required, intermediate waterbodies may be crossed using the open-cut crossing method, with the following restrictions:<br>a. complete instream construction activities (not including blasting and other rock breaking measures) within 48 hours, unless site-specific conditions make completion within 48 hours infeasible;<br>b. limit use of equipment operating in the waterbody to that needed to construct the crossing; and<br>c. all other construction equipment must cross on an equipment bridge as specified in section V.B.5. | Most Stringent | NA | Sections 13.1 & 14.1.4.2 | | | x |
| FERC Procedures | V.B.9:Installation | Crossings of Major Waterbodies<br>Before construction, the project sponsor shall file with the Secretary for the review and written approval by the Director a detailed, site-specific construction plan and scaled drawings identifying all areas to be disturbed by construction for each major waterbody crossing (the scaled drawings are not required for any offshore portions of pipeline projects). This plan must be developed in consultation with the appropriate state and federal agencies and shall include extra work areas, spoil storage areas, sediment control structures, etc., as well as mitigation for navigational issues. The requirement to file major waterbody crossing plans does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.<br><br>The Environmental Inspector may adjust the final placement of the erosion and sediment control structures in the field to maximize effectiveness. | Most Stringent | NA | Sections 13.1 & 14.1.4.3 | | | x |
| FERC Procedures | V.B.10:Installation | Temporary Erosion and Sediment Control<br>Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the waterbody or adjacent upland.<br><br>Sediment barriers must 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 must be implemented at stream crossings:<br>a. 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;<br>b. 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<br>c. 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. | Most Stringent | NA | Sections 13.1, 13.3, & 13.4 | | | x |
| FERC Procedures | V.B.11:Installation | Trench Dewatering<br>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. Remove the dewatering structures as soon as practicable after the completion of dewatering activities. | GP G.4.e.2.A.ii.i | The GP G.4.e.2.A.ii.i has additional requirements for how and where to dewater. The requirement also requires a procedure to be implemented | Sections 13.1 & 13.4.1.5 | | | x |
| FERC Procedures | V.C: Restoration | 1. Use clean gravel or native cobbles for the upper 1 foot of trench backfill in all waterbodies that contain coldwater fisheries.<br>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, complete streambed and bank stabilization before returning flow to the waterbody channel.<br>3. Return all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the Environmental Inspector.<br>4. Install erosion control fabric or a functional equivalent on waterbody banks at the time of final bank recontouring. Do not use synthetic monofilament mesh/netted erosion control materials in areas designated as sensitive wildlife habitat unless the product is specifically designed to minimize harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices.<br>5. Application of riprap for bank stabilization must comply with COE, or its delegated agency, permit terms and conditions.<br>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.<br>7. Revegetate disturbed riparian areas with native species of conservation grasses, legumes, and woody species, similar in density to adjacent undisturbed lands.<br>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 Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the waterbody.<br>9. Sections V.C.3 through V.C.7 above also apply to those perennial or intermittent streams not flowing at the time of construction. | Most Stringent | N/A | Sections 13.1, 13.4.2.2, 13.4.2.3, 13.4.2.5, & 14.1.5 | | | x |
| FERC Procedures | V.D: Post-Construction Maintenance | 1. Limit routine vegetation mowing or clearing adjacent to waterbodies to allow a riparian strip at least 25 feet wide, as measured from the waterbody's mean high water mark, to permanently revegetate with native plant species across the entire construction right-of-way. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In addition, trees that are located within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating may be cut and removed from the permanent right-of-way. Do not conduct any routine vegetation mowing or clearing in riparian areas that are between HDD entry and exit points.<br><br>2. Do not use herbicides or pesticides in or within 100 feet of a waterbody except as allowed by the appropriate land management or state agency.<br><br>3. Time of year restrictions specified in section VII.A.5 of the Plan (April 15 – August 1 of any year) apply to routine mowing and clearing of riparian areas. | Most Stringent | N/A | Section 14.0 | | | x |
| FERC Procedures | VI.A.1: General | The project sponsor shall conduct a wetland delineation using the current federal methodology and file a wetland delineation report with the Secretary before construction. The requirement to file a wetland delineation report does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.<br><br>This report shall identify:<br>a. by milepost all wetlands that would be affected;<br>b. the National Wetlands Inventory (NWI) classification for each wetland;<br>c. the crossing length of each wetland in feet; and<br>d. the area of permanent and temporary disturbance that would occur in each wetland by NWI classification type.<br>The requirements outlined in this section do not apply to wetlands in actively cultivated or rotated cropland. Standard upland protective measures, including workspace and topsoiling requirements, apply to these agricultural wetlands. | Most Stringent | N/A | Sections 9.4.6 & 14.2 | | | x |
| FERC Procedures | VI.A.2: General | Route the pipeline to avoid wetland areas to the maximum extent possible. If a wetland cannot be avoided or crossed by following an existing right-of-way, route the new pipeline in a manner that minimizes disturbance to wetlands. Where looping an existing pipeline, overlap the existing pipeline right-of-way with the new construction right-of-way. In addition, locate the loop line no more than 25 feet away from the existing pipeline unless site-specific constraints would adversely affect the stability of the existing pipeline. | MNF LRMP MG33 | Pipelines are not allowed in wetlands in the MNF | Sections 9.4.6 & 14.2 | | x | |
| FERC Procedures | VI.A.3: General | Limit the width of the construction right-of-way to 75 feet or less. Prior written approval of the Director is required 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. Early in the planning process the project sponsor is encouraged to identify site-specific areas where excessively wide trenches could occur and/or where spoil piles could be difficult to maintain because existing soils lack adequate unconfined compressive strength. | Most Stringent | N/A | Sections 9.4.6 & 14.2 | | | x |
| FERC Procedures | VI.A.4: General | Wetland boundaries and buffers must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete. | Most Stringent | N/A | Sections 9.4.6 & 14.2 | | | x |

| Regulation Document | Regulation | Description | More Stringent Regulation | More Stringent Reason | Reference in Plan | Where Regulation Applies | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Steep Slopes | National Forest | Non-specific Area |
| FERC Procedures | VI.A.5: General | Implement the measures of sections V and VI in the event a waterbody crossing is located within or adjacent to a wetland crossing. If all measures of sections V and VI cannot be met, the project sponsor must file with the Secretary a site-specific crossing plan for review and written approval by the Director before construction. This crossing plan shall address at a minimum:<br>a. spoil control;<br>b. equipment bridges;<br>c. restoration of waterbody banks and wetland hydrology;<br>d. timing of the waterbody crossing;<br>e. method of crossing; and<br>f. size and location of all extra work areas. | Most Stringent | N/A | Sections 9.4.6 & 14.2 | | | x |
| FERC Procedures | VI.A.6: General | Do not locate aboveground facilities in any wetland, except where the location of such facilities outside of wetlands would prohibit compliance with U.S. Department of Transportation regulations. | Most Stringent | N/A | Sections 9.4.6 & 14.2 | | | x |
| FERC Procedures | VI.B.1: Installation | Extra Work Areas and Access Roads<br>a. Locate all extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from wetland boundaries, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.<br>b. The project sponsor shall file with the Secretary for review and written approval by the Director, site-specific justification for each extra work area with a less than 50-foot setback from wetland boundaries, except where adjacent upland consists of cultivated or rotated cropland or other disturbed land. The justification must specify the site-specific conditions that will not permit a 50-foot setback and measures to ensure the wetland is adequately protected.<br>c. 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). In wetlands that cannot be appropriately stabilized, all construction equipment other than that needed to install the wetland crossing shall use access roads located in upland areas. Where access roads in upland areas do not provide reasonable access, limit all other construction equipment to one pass through the wetland using the construction right-of-way.<br>d. 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. | Most Stringent | N/A | Sections 9.4.6 & 14.2 | | | x |
| FERC Procedures | VI.B.2: Installation | Crossing Procedures<br>a. Comply with COE, or its delegated agency, permit terms and conditions.<br>b. Assemble the pipeline in an upland area unless the wetland is dry enough to adequately support skids and pipe.<br>c. Use “push-pull” or “float” techniques to place the pipe in the trench where water and other site conditions allow.<br>d. Minimize the length of time that topsoil is segregated and the trench is open. Do not trench the wetland until the pipeline is assembled and ready for lowering in.<br>e. 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.<br>f. Cut vegetation just above ground level, leaving existing root systems in place, and remove it from the wetland for disposal. The project sponsor can burn woody debris in wetlands, if approved by the COE and in accordance with state and local regulations, ensuring that all remaining woody debris is removed for disposal.<br>g. Limit pulling of tree stumps and grading activities to directly over the trenchline. Do not grade or remove stumps or root systems from the rest of the construction right-of-way in wetlands unless the Chief Inspector and Environmental Inspector 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.<br>h. Segregate the top 1 foot of topsoil from the area disturbed by trenching, except in areas where standing water is present or soils are saturated. Immediately after backfilling is complete, restore the segregated topsoil to its original location.<br>i. Do not use rock, soil imported from outside the wetland, tree stumps, or brush riprap to support equipment on the construction right-of-way.<br>j. If standing water or saturated soils are present, or if construction equipment causes ruts or mixing of the topsoil and subsoil in wetlands, use low-ground-weight construction equipment, or operate normal equipment on timber riprap, prefabricated equipment mats, or terra mats.<br>k. Remove all project-related material used to support equipment on the construction right-of-way upon completion of construction. | Most Stringent | N/A | Section 14.2 | | | x |
| FERC Procedures | VI.B.3: Installation | Temporary Sediment Control<br>Install sediment barriers (as defined in section IV.F.3.a of the Plan) 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 section VI.B.3.c, 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 Plan.<br>a. 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.<br>b. Where wetlands are adjacent to the construction right-of-way and the right-of-way slopes toward the wetland, 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.<br>c. 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. Remove these sediment barriers during right-of-way cleanup. | Most Stringent | N/A | Sections 13.1, 13.3, & 13.4, 14.2 | | | x |
| FERC Procedures | VI.B.4: Installation | Trench Dewatering<br>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. Remove the dewatering structures as soon as practicable after the completion of dewatering activities. | GP G.4.e.2.A.ii.i | Requirements for how and where to dewater and required to have procedure in place | Sections 13.1 & 13.4.1.5 | | | x |
| FERC Procedures | VI.C: Restoration | 1. Where the pipeline trench may drain a wetland, construct trench breakers at the wetland boundaries and/or seal the trench bottom as necessary to maintain the original wetland hydrology.<br>2. Restore pre-construction wetland contours to maintain the original wetland hydrology.<br>3. For each wetland crossed, install a trench breaker at the base of slopes near the boundary between the wetland and adjacent upland areas. 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, install sediment barriers as outlined in the Plan. In some areas, with the approval of the Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the wetland.<br>4. Do not use fertilizer, lime, or mulch unless required in writing by the appropriate federal or state agency.<br>5. Consult with the appropriate federal or state agencies to develop a project-specific wetland restoration plan. The restoration plan shall include measures for re-establishing herbaceous and/or woody species, controlling the invasion and spread of invasive species and noxious weeds (e.g., purple loosestrife and phragmites), and monitoring the success of the revegetation and weed control efforts. Provide this plan to the FERC staff upon request.<br>6. Until a project-specific wetland restoration plan is developed and/or implemented, temporarily revegetate the construction right-of-way with annual ryegrass at a rate of 40 pounds/acre (unless standing water is present).<br>7. Ensure that all disturbed areas successfully revegetate with wetland herbaceous and/or woody plant species.<br>8. 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. | Most Stringent | N/A | Sections 13.1 & 13.4.2.1 | | | x |

| Regulation Document | Regulation | Description | More Stringent Regulation | More Stringent Reason | Reference in Plan | Where Regulation Applies | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Steep Slopes | National Forest | Non-specific Area |
| FERC Procedures | VI.D: Post-Construction Maintenance And Reporting | 1. Do not conduct routine vegetation mowing or clearing over the full width of the permanent right-of-way in wetlands. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In addition, trees within 15 feet of the pipeline with roots that could compromise the integrity of pipeline coating may be selectively cut and removed from the permanent right-of-way. Do not conduct any routine vegetation mowing or clearing in wetlands that are between HDD entry and exit points.<br>2. Do not use herbicides or pesticides in or within 100 feet of a wetland, except as allowed by the appropriate federal or state agency.<br>3. Time of year restrictions specified in section VII.A.5 of the Plan (April 15 – August 1 of any year) apply to routine mowing and clearing of wetland areas.<br>4. Monitor and record the success of wetland revegetation annually until wetland revegetation is successful.<br>5. Wetland revegetation shall be considered successful if all of the following criteria are satisfied:<br>a. the affected wetland satisfies the current federal definition for a wetland (i.e., soils, hydrology, and vegetation);<br>b. 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;<br>c. 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<br>d. invasive species and noxious weeds are absent, unless they are abundant in adjacent areas that were not disturbed by construction.<br>6. Within 3 years after construction, file a report with the Secretary identifying the status of the wetland revegetation efforts and documenting success as defined in section VI.D.5, above. The requirement to file wetland restoration reports with the Secretary does not apply to projects constructed under the automatic authorization, prior notice, or advance notice provisions in the FERC's regulations.<br><br>For any wetland where revegetation is not successful at the end of 3 years after construction, develop and implement (in consultation with a professional wetland ecologist) a remedial revegetation plan to actively revegetate wetlands. Continue revegetation efforts and file a report annually documenting progress in these wetlands until wetland revegetation is successful. | Most Stringent | N/A | Sections 13.3.8, 14.1.6, & 14.2<br>Appendix M - Restoration and Rehabilitation Plan | | | x |
| FERC Procedures | VII.A: Notification Procedures and Permits | 1. Apply for state-issued water withdrawal permits, as required.<br>2. Apply for National Pollutant Discharge Elimination System (NPDES) or state-issued discharge permits, as required.<br>3. Notify appropriate state agencies of intent to use specific sources at least 48 hours before testing activities unless they waive this requirement in writing. | Most Stringent | N/A | NA Separate NPDES Permit not included in SWPPP | | | x |
| FERC Procedures | VII.B: General | 1. Perform 100 percent radiographic inspection of all pipeline section welds or hydrotest the pipeline sections, before installation under waterbodies or wetlands.<br>2. If pumps used for hydrostatic testing are within 100 feet of any waterbody or wetland, address secondary containment and refueling of these pumps in the project's Spill Prevention and Response Procedures.<br>3. The project sponsor shall file with the Secretary before construction a list identifying the location of all waterbodies proposed for use as a hydrostatic test water source or discharge location. This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations. | Most Stringent | N/A | NA Separate NPDES Permit not included in SWPPP | | | x |
| FERC Procedures | VII.C: Intake Source and Rate | 1. Screen the intake hose to minimize the potential for entrainment of fish.<br>2. Do not use state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and/or local permitting agencies grant written permission.<br>3. Maintain adequate flow rates to protect aquatic life, provide for all waterbody uses, and provide for downstream withdrawals of water by existing users.<br>4. Locate hydrostatic test manifolds outside wetlands and riparian areas to the maximum extent practicable. | Most Stringent | Additional specific requirements in FERC Plan IV.E | NA Separate NPDES Permit not included in SWPPP | | | x |
| FERC Procedures | VII.D: Discharge Location, Method, and Rate | 1. Regulate discharge rate, use energy dissipation device(s), and install sediment barriers, as necessary, to prevent erosion, streambed scour, suspension of sediments, or excessive streamflow.<br>2. Do not discharge into state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and local permitting agencies grant written permission. | Most Stringent | N/A | NA Separate NPDES Permit not included in SWPPP | | | x |

# APPENDIX C

Groundwater Protection Plan (GPP)

# GROUNDWATER PROTECTION PLAN FOR CONSTRUCTION SITES

| PROJECT/SITE INFORMATION |
| --- |
| Project/Site Name: Supply Header Project |
| County (s): Harrison, Doddridge, Tyler, and Wetzel Counties |

*For additional information refer to the Project Description Section of the Stormwater Pollution Prevention Plan.

## CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personal properly gather and evaluate the information submitted. Based on my inquire of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Anne E Bomar

Signature

31 March 2017

Date

Anne E Bomar

Printed Name

Senior Vice President, Pipeline Services & Optimization

Title

*If authorization is no longer accurate because of a different individual or position has responsibility for the overall operation of the project, a new authorization must be submitted to the Director prior to, or together with any reports, information, or applications to be signed by an authorized representative.*

# 47 CSR 58.4.11.a

| INVENTORY WORKSHEET FOR POTENTIAL CONTAMINANTS | |
|---|---|
| **Potential Contaminant** | **Potential to Contaminate Soil or Ground Water** |
| Loading/Unloading Operations | Truck loading and unloading operations involve bulk liquid transfer to and from above ground storage tanks. There is a risk potential for release of fluids kept in bulk storage areas during unloading and loading activities. Liquid product delivery and waste pickups also include 55-gallon drums and smaller containers. |
| Aboveground Storage Tanks | Fuel tanks will be stored at the equipment staging areas. There is a risk of release of regulated liquids to the ground at above ground storage tank location due to overfilling tanks, improper hose connections and tank failure due to tank deterioration or overpressure. |
| Portable Containers | Equipment in the field will be fueled from tanks carried to the work area. Used oil and other materials used for vehicle maintenance are produced during construction activities. There is a risk of release of liquids to the ground at the transfer location areas due to overfilling drums, containers or equipment, improper hose connections, handling incidents and container or drum failure due to deterioration.<br><br>Small quantities of liquid fuel, solvents, and lubricants (i.e. motor oils, hydraulic fluids, paints, coatings and primers) may be stored at staging areas and in the field. From time to time, materials are stored at various other locations to facilitate construction activities and there may also be minor qualities of other liquid waste and materials stored onsite pending off-site management. Portable tanks are occasionally used at construction location to collect fluids generated by construction activities. |
| Pipeline Fluids | The presence of pipeline fluids during pipeline abandonment and removal may result in the release of pipeline fluid during removal of the pipe. Leakage of liquid from pipelines during the initial cutting activity process poses a potential for release.<br>No pipeline fluids will be present during the construction phase of the Project. |
| Concrete Coating | Concrete coating activities are required on some construction projects and involved the use on concrete materials to coat pipeline for weighted stream crossings. There is a potential risk for release of concrete or concrete wash water during coating activities. |

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| Equipment Washing | Construction equipment washing operations are utilized during construction project to minimize the transfer of materials from separate field locations and roadways. There is potential for the release of wash water during washing operations. |
| Horizontal Direction Drilling Fluids | Horizontal directional drilling (HDD) is utilized to install pipeline crossings on construction projects as a trenchless method to install pipelines with minimal disturbance to the surface or stream and wetlands. There is a risk associated with drilling fluids (also referred to as drilling mud) inadvertently escaping to the ground surface known as a "frac out". The drilling mud consists of water and a viscosifier, naturally occurring bentonite clay (sodium montmorillonite), a non-hazardous waste as defined by the USEPA. Drilling fluids are stored in steel tanks and processed through a solids control system. HDD is not an anticipated waterbody crossing method in the SHP West Virginia section. |
| Waste Storage Areas | Areas used for storage or disposal of raw materials, products, or wastes may have the ability to release contaminants into the groundwater. An example of this would be storage piles of excavated soil material that are contaminated with natural gas liquids. This material is a waste that poses potential for contaminating groundwater. |
| Construction Equipment | Construction equipment often contain potential sources of contamination such as petroleum fuel, oil, and hydraulic fluid. The operation of this equipment may result in the failure of parts of systems that could result in the release of contaminants. |

Storage locations and quantities of the potential contaminants will vary due to the nature of the work at the construction site.

# 47 CSR 58.4.11.b

| PROCEDURES DESIGNED TO PROTECT GROUND WATER AT CONSTRUCTION SITES | |
|---|---|
| **Potential Contaminant** | **Procedures to Prevent Contamination of Ground Water** |
| Loading/Unloading Operations | All truck loading/unloading operations are to be continually manned until the operation is complete. The drivers of trucks that haul into or out of each facility are required to have the proper training and must be Department of Transportation (DOT) licensed. These drivers follow proper loading and unloading procedures to assist in the prevention of spills. 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. Additionally, all major truck loading/unloading operations are equipped with secondary containment systems further reducing the risk of release. Lastly, facilities with loading/unloading operations either have spill-response equipment on site, on the vehicles or at nearby warehouse facilities. Operations will utilize the equipment and their contingency procedures, allowing rapid response to any release.<br><br>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.<br><br>For general spill cleanup, a spill kit is located on each piece of equipment and additional absorbent material on site. This spill kit contains adsorbent material, pads, and tools for the cleanup of spills. (DTI) maintains contracts with several emergency spill response companies in the event of a large spill including Ryan Environmental and McCutcheon Environmental Inc. |
| Aboveground Storage Tanks | Releases from tanks would most likely be due to overfilling. All tanks that are manually filled are checked as to available capacity through the use of a tank gauge or sticking.<br><br>Releases from tanks may also take place as the result of accidental or unauthorized opening of a drain valve. To release such events, only authorized personnel are allowed access to the storage tanks and drain valves are kept capped and secured (e.g. locked) except when in use. Some project locations are fenced and may have security lighting to prevent access to equipment or have security onsite during off hours.<br><br>Lastly, releases from tanks could also take place due to failure of the tank itself due to corrosion. All tanks covered by this Plan undergo routine visual inspections. Should any aspect of this inspection indicate a potential problem, a |

| PROCEDURES DESIGNED TO PROTECT GROUND WATER AT CONSTRUCTION SITES | |
|---|---|
| **Potential Contaminant** | **Procedures to Prevent Contamination of Ground Water** |
| | licensed Professional Engineer (PE) or by an individual certified to perform tank inspections by the American Petroleum Institute or the Steel Tank Institute will inspect the tank and determine if a formal tank integrity test is required for the tank.<br><br>All tanks are visually inspected briefly during walk-around reviews of the construction site and whenever containers are refilled. In addition, the tanks are examined more closely at least quarterly. If conditions are observed that require further inspections and/or testing of any of the tanks, the Contractor will be contacted and the appropriate personnel will respond to the issue and/or observed condition.<br><br>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. |
| Portable Containers | Hazardous materials, including chemicals, fuels, and lubricating oils, will be stored only at designated staging areas and in appropriate service vehicles. 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.<br>All motor fuel, lube oil, chemicals, and other polluting substances will be tightly sealed and clearly labeled during transportation and storage.<br><br>Secondary containment will be provided for all storage areas for fuel, solvents, and lubricants. Spill kits containing absorbent materials approved for petroleum products will be kept at all storage areas. A Safety Data Sheet (SDS) for each hazardous material will be available on site. Onsite personnel would respond immediately using absorbent materials to any spill. Some released material may enter the underlying soil and be addressed by a remediation contractor. |
| Pipeline Fluids | No pipeline fluids will be present during the construction phase of the Project. |
| Concrete Coating | Concrete coating activities will be limited to pipeyard areas and right-of-way upland areas at least 100 feet away from waterbodies, wetlands, and springs. Cleanup materials will be readily available and quick response can be made in the event of a spill to the ground.<br><br>Semi-solid concrete will be removed from the ground and properly disposed of. Concrete wash water will be contained in secondary containment structures. Concrete coating activities and washout activities will not be performed 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. |

| PROCEDURES DESIGNED TO PROTECT GROUND WATER AT CONSTRUCTION SITES | |
|---|---|
| **Potential Contaminant** | **Procedures to Prevent Contamination of Ground Water** |
| | |
| Equipment Washing | Equipment will not be washed in any waterbody or wetland, nor will runoff resulting from washing operations be permitted to directly enter any waterbody or wetland.<br><br>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. |
| Horizontal Direction Drilling Fluids | Horizontal directional drilling (HDD) is utilized to install pipeline crossings on construction projects as a trenchless method to install pipelines with minimal disturbance to the surface or stream and wetlands. There is a risk associated with drilling fluids (also referred to as drilling mud) inadvertently escaping to the ground surface known as a "frac out". The drilling mud consists of water and a viscosifier, naturally occurring bentonite clay (sodium montmorillonite), a non-hazardous waste as defined by the USEPA. Drilling fluids are stored in steel tanks and processed through a solids control system.<br><br>HDD is not an anticipated waterbody crossing method in West Virginia. |
| Waste Storage Areas | New areas used for storage or disposal of raw materials, products or wastes shall be designed, constructed, and operated to prevent release of contaminants to the groundwater, using liner systems if necessary. |
| Construction Equipment | All construction equipment vehicles are visually inspected briefly prior to equipment start-up and prior to entering a waterbody buffer area or crossing any waterbody or equipment bridge. Steps will be taken to repair leaks or remove the equipment from service, when necessary.<br>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).<br><br>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. |

*To minimize the risk of potential release, storage of fertilizers, batteries, part cleaners or other short term use materials and products will be stored at off site location until required on the construction site. Large quantities of short term use materials will not be stored on-site.

# 47 CSR 58.4.11.c

| DESIGN PROCEDURES FOR NEW EQUIPMENT/OPERATION | |
|---|---|
| **Equipment/Operation** | **Design Practice** |
| Tank Compatibility | All aboveground storage tanks will be compatible with the products stored by the tanks they protect. 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. |
| Tank Secondary Containment | Tank drain valves on each of the tanks are kept secure when not in use to prevent any unauthorized personnel from operating the valves. None of the secondary containment units are drained directly into a storm drain or open watercourse. Before any accumulated precipitation is drained, the water is visually examined to confirm that a sheen, floating layer, or other visible contamination is not present. Qualified personnel will perform all dike draining activities. A dike-draining record form is used to record all containment unit-draining events. |
| Tank Fail-Safe | Most tanks are manually filled under constant supervision and are equipped with either a sight glass or fast response gauge to protect against spills due to overfilling. Tanks that are manually filled and not equipped with such devices are gauged using a stick to determine capacity prior to filling. |

*Any planned installation of new equipment or changes in procedures will be reviewed as to potential impact on groundwater prior to installation/implementation. Upon completion of this review and assessment of risks, all appropriate measures will be taken to minimize the risk of release from such installations/operations changes.

# 47 CSR 58.4.11.d

| OTHER REGULARTORY PROGRAMS RELEVANT TO GROUND WATER PROTECTION | |
|---|---|
| **Permit Number/Rule Citation** | **Permit/Plan** |
| Spill Prevention Control and Countermeasures – 40CFR112 | The objective of spill prevention and control planning is to prevent or minimize the risk of release of oil and oil products and possible exposure of personnel and contamination of the environment. DTI and the Contractor will implement an SPCC plan for each construction site that requires one in accordance with 40 CFR 112. The SPCC Plan incorporates an inventory of potential discharge sites for petroleum products and hazardous materials, and a strategy to contain and remedy such discharges if they occur. The SPCC Plan, if required, will be maintained on site. |
| National Pollutant Discharge Elimination System (NPDES) | The Project will complete a SWPPP and a project control to comply with general requirements of the West Virginia General Construction Stormwater Associated with Oil and Gas Related Construction Activities, permit no. WV0116815, issued by the West Virginia Department of Environmental Protection (WVDEP) Division of Water and Waste Management (DWWM) as part of the NPDES permit program. |
| Transportation of Natural and Other Gas by Pipeline – 40CFR192 | These regulations require that each operator of a pipeline facility comply with at least the minimum safety standards and specifications to ensure public safety. DTI ensures that all facilities and equipment including pipe, valves, pressure vessels, and other pressure containing equipment are designed, operated, and maintained to prevent leaks and failures according to these regulations. DTI also conforms to the employee training and certification requirements covered under these regulations. |
| Resource Conservation and Recovery Act – 40CFR262 | Any generator who treats, stores, or disposes of hazardous wastes on-site must comply with regulations developed under RCRA. The majority of DTI's construction projects are not subject to these regulations as a generator of hazardous waste. Where applicable, DTI complies with generator requirements through proper accumulation, labeling, and tracking of hazardous waste shipments. It also insures that transportation, treatment, storage, and disposal of their hazardous waste are conducted only by companies with EPA identification numbers and authority to manage the waste. |
| Comprehensive Environmental Response, Compensation and Liability Act | CERCLA regulations provided broad Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health of the environment. The law authorizes two kinds of response actions:<br><br>• Short-term removals, where actions may be taken to address releases or threatened releases requiring prompt response.<br>• Long-term remedial response actions, that permanently and significantly reduce the dangers associated with releases or threats of releases of hazardous substances that are serious, but not immediately |

| | |
|---|---|
| | life threatening.<br><br>DTI's monitoring program, structural controls, and management practices minimize potential releases of hazardous substances. |
| Standard for Universal Waste Management – 40CFR273 | These regulations govern the handling and disposal of universal wastes that include fluorescent light tubes, sodium vapor lamps, batteries, pesticides, and thermostats. Wastes under this category are managed separately from other wastes generated at the sites. DTI complies with this regulation through implementation of a universal waste management program to ensure proper handling and disposal of wastes identified under this regulation. |
| Standard for the Management of Used Oil – 40CFR279 | These regulations govern the handling, storage, and disposal of used oil. Generators of used oil are subject to handling and storage requirements that include proper storage containers, maintaining tanks in good condition, proper labeling of tanks and fill pipes, and periodic inspections. Generators of used oil must also verify that transporters of off-site shipments of used oil have obtained EPA ID numbers. DTI facilities that generate or otherwise handle used oil are subject to these requirements. |
| West Virginia Code 22-30 – The Above Storage Tank Act | The West Virginia AST Act requires that all ASTs be registered and identified on a tier based system. The Act requires submittal of spill response plans and tank inspection and monitoring programs. The ACT includes design, construction, and maintenance criterion as well as registration, signage, leak detection, overflow/spill monitoring and response, secondary containment, public notification requirements included by the Above Storage Tank Act. The pipeline or station Contractor will register all applicable AST tanks with the West Virginia Department of Environmental Protection and meet all design, monitoring, inspection, and notification requirements as well as any other requirement outlined in the Act. |

# 47 CSR 58.4.11.e

| INFORMATION REASONABLY AVAILABLE REGARDING EXISTING GROUNDWATER QUALITY | |
|---|---|
| **Topic** | **Information or Location** |
| Closest surface water body | Multiple streams present in work area |
| Distance to closest surface water body | Multiple stream crossings |
| Depth to groundwater | Surface to greater than 80 inches |
| Known groundwater monitoring wells within 2000 feet | None known |
| Known public or private drinking water wells within 150 feet | 12 wells (3 wells in Harrison County, 5 wells in Doddridge County, and 4 wells in Wetzel County) |
| Closest Well Head Protection Area | • None known within project area |
| Closest Source Water Protection Area | • Pine Grove Water, Wetzel County |
| Soil Type | See Section 9.2.2 in SWPPP |
| Type of underlying geologic formations | Sedimentary, sandstone, and carbonate |
| Septic tank percolation tests by county health dept. | None known |
| Sampling results from monitoring wells, drinking wells, springs, or seeps | None known |
| Prior spills, remediation efforts, and known Contamination | No contaminated sites, landfills, and leaking underground storage tanks (LUSTs) were identified within one mile of the Project. |

# 47 CSR 58.4.11.f

No wastes will be used for deicing, ice control, structural fills, road based, or other uses unless provided for in existing regulations.

# 47 CSR 58.4.11.g

All employees will be trained on their responsibility to ensure groundwater protection. Current job procedures provide direction on how to prevent groundwater contamination through proper work practices.

Personnel, who handle, sample or come in direct contact with oils or materials that have the potential to contaminate groundwater, undergo basic training where pollution prevention is stressed. Release prevention procedures and control equipment maintenance are thoroughly explained during either annual training sessions or monthly safety meetings. Other items discussed during training sessions include:

- Preventative measures, including spill prevention and response and preventative maintenance.
- Pollution control laws and regulations.
- Features and operations of the facility that are designed to minimize discharges, particularly spill prevention procedures.
- Good housekeeping practices.
- Waste identification and management procedures.
- Proper handling of raw materials (including proper storage, transportation and disposal of unused materials).

Training records on current employees are maintained within DTI's Learning Management System (LMS) database for DTI personnel and maintained by the Contractor for construction personnel.

# 47 CSR 58.4.11.g

Every quarter during the life of the construction activity, covered by this Plan, the site will be inspected to ensure that all elements and equipment of the site's groundwater protection program are in place and properly functioning. The Quarterly Inspection Form is attached as Appendix A.

Deficiencies discovered during the visual inspections or from the results of analytical testing will be immediately reported to the Project Supervisor. The Supervisor will determine what corrective actions will be taken to mitigate adverse impacts to the environment.

Records of Quarterly GPP inspections are documented by the Project Supervisor or Contractor and provided to the Project Supervisor. Historical reports will be maintained at a reasonable accessible location to show that the Quarterly GPP inspections were performed, who performed the inspection, and detail the results of the inspection.

# Ground Water Protection Inspection Checklist

**Location:**_____________________________ **Completed By:**_______________________

**Compliance Date:**_______________________ **Complete Date:**______________________

**Instructions:** Required to be completed every quarter. All negative answers ('Yes') require an explanation.

| Item # | Question | Answer Yes/No |
|---|---|---|
| **1.** | Since the last inspection, have material handling practices changed in any way?<br>**Explain:** | ☐ ☐ |
| **2.** | Since the last inspection, has there been any new on-site construction?<br>**Explain:** | ☐ ☐ |
| **3.** | Since the last inspection, has there been any tank additions, removals or upgrades?<br>**Explain:** | ☐ ☐ |
| **4.** | Since the last inspection, is the site covered under any new environmental regulatory permits?<br>**Explain:** | ☐ ☐ |
| **5.** | Since the last inspection, have any new operations been implemented?<br>**Explain:** | ☐ ☐ |
| **6.** | Since the last inspection, have there been any spills, leaks or releases?<br>**Explain:** | ☐ ☐ |
| **7.** | Is there any indication that spills, leaks or discharges are imminent?<br>**Explain:** | ☐ ☐ |
| **8.** | Are there any new potential ground water contaminants stored at the site that are not already identified in the plan?<br>**Explain:** | ☐ ☐ |
| **9.** | Is there any indication of any on-site ground water contamination as a result of site or company operations?<br>**Explain:** | ☐ ☐ |

# APPENDIX D

SWPPP Revision Form

## SWPPP Revision Form

| Status | Date | Section Number | Page Number | Revision Description | Person Making Revision |
|---|---|---|---|---|---|
| **SWPPP/GPP Issuance:** | January 2017 | | | | |
| **Revisions:** | | | | | |
| | | | | | |
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| | | | | | |
| **Next Revision Due:** | | | | | |

# APPENDIX E

Waterbodies Crossed and Crossing Methods Table

**Waterbodies Crossed by the Supply Header Project in West Virginia**

| MP | Feature ID [a] | Waterbody Name [b] | Waterbody Regime | Approx. Crossing Width (feet) [c] | Temp. Affected Bank Length (feet) | Perm. Affected Bank Length (feet) | Construction Method | State Regulatory Class [d] | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|---|---|
| **Pipeline Facilities** | | | | | | | | | | |
| **HUC 8 - 5020002** | | | | | | | | | | |
| **Harrison County** | | | | | | | | | | |
| 0.2 | shag002 | UNT to Tanner Fork | Perennial | 2 | 192 | 0 | Dam and Pump or Flume | UNT to B1 | 39.173127 | -80.563251 |
| **HUC 8 - 5030201** | | | | | | | | | | |
| **Doddridge County** | | | | | | | | | | |
| 0.7 | sdog002 | UNT to Dry Fork | Intermittent | NA | 87 | 0 | Not Crossed by Centerline | UNT to B1 | 39.179334 | -80.569469 |
| 0.8 | sdog001 | UNT to Dry Fork | Perennial | 8 | 101 | 0 | Dam and Pump or Flume | UNT to B1 | 39.179621 | -80.569474 |
| 1.3 | sdoh004 | Dry Fork | Perennial | 11 | 85 | 0 | Dam and Pump or Flume | B1 | 39.184636 | -80.575072 |
| 1.4 | sdoh003 | UNT to Dry Fork | Perennial | 4 | 115 | 0 | Dam and Pump or Flume | UNT to B1 | 39.186893 | -80.575581 |
| 2.1 | sdog014 | Meathouse Fork | Perennial | 30 | 113 | 0 | Dam and Pump | B1, HQS | 39.192305 | -80.583228 |
| 2.9 | sdog015 | Johnson Fork | Perennial | 6 | 93 | 0 | Dam and Pump or Flume | B1 | 39.201259 | -80.591379 |
| 4.0 | sdog018 | UNT to Indian Fork | Perennial | 13 | 114 | 0 | Dam and Pump | UNT to B1 | 39.213752 | -80.598065 |
| 4.6 | sdog020 | UNT to Indian Fork | Perennial | 9 | 131 | 0 | Dam and Pump | UNT to B1 | 39.219177 | -80.605066 |
| 5.1 | sdog022 | UNT to Indian Fork | Perennial | 8 | 78 | 0 | Dam and Pump or Flume | UNT to B1 | 39.219642 | -80.604023 |
| 5.5 | nhd_wv_083 | Buckeye Creek | Perennial | 31 | 138 | 0 | Dam and Pump or Flume | B1, HQS | 39.23007 | -80.6085 |
| 5.5 | nhd_wv_084 | UNT to Buckeye Creek | Intermittent | 17 | 319 | 0 | Dam and Pump or Flume | UNT to B1, HQS | 39.23027 | -80.60841 |
| 5.9 | sdoa004 | UNT to Buckeye Creek | Ephemeral | NA | 66 | 0 | Not Crossed by Centerline | UNT to B1, HQS | 39.235205 | -80.609067 |
| 5.9 | sdoa016 | UNT to Buckeye Creek | Ephemeral | NA | 156 | 0 | Not Crossed by Centerline | UNT to B1, HQS | 39.235382 | -80.609121 |
| 5.9 | sdoa018 | UNT to Buckeye Creek | Intermittent | 6 | 150 | 0 | Dam and Pump or Flume | UNT to B1, HQS | 39.235048 | -80.608937 |
| 5.9 | sdoa019 | UNT to Buckeye Creek | Ephemeral | NA | 275 | 0 | Not Crossed by Centerline | UNT to B1, HQS | 39.234943 | -80.608894 |
| 6.7 | nhd_wv_154 | Greenbrier Creek | Perennial | 18 | 96 | 0 | Dam and Pump or Flume | B1 | 39.244438 | -80.61216 |
| 6.7 | sdoa010 | UNT to Greenbrier Creek | Ephemeral | NA | 18 | 0 | Not Crossed by Centerline | UNT to B1 | 39.24405 | -80.612054 |
| 6.7 | sdoa013 | UNT to Greenbrier Creek | Ephemeral | NA | 122 | 0 | Not Crossed by Centerline | UNT to B1 | 39.24513 | -80.612596 |
| 6.8 | sdoa012 | UNT to Greenbrier Creek | Ephemeral | 2 | 143 | 0 | Dam and Pump or Flume | UNT to B1 | 39.246552 | -80.613343 |
| 7.8 | sdog033 | Buffalo Calf Fork | Perennial | 21 | 100 | 0 | Dam and Pump | B1 | 39.259398 | -80.619254 |
| 7.9 | sdog034 | UNT to Buffalo Calf Fork | Perennial | NA | 2 | 0 | Not Crossed by Centerline | UNT to B1 | 39.259865 | -80.619115 |
| 8.9 | sdog023 | UNT to Buffalo Calf Fork | Perennial | 8 | 103 | 0 | Dam and Pump or Flume | UNT to B1 | 39.270407 | -80.630282 |

**Waterbodies Crossed by the Supply Header Project in West Virginia**

| MP | Feature ID [a] | Waterbody Name [b] | Waterbody Regime | Approx. Crossing Width (feet) [c] | Temp. Affected Bank Length (feet) | Perm. Affected Bank Length (feet) | Construction Method | State Regulatory Class [d] | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|---|---|
| 9.4 | sdog024 | Long Run | Perennial | 26 | 102 | 0 | Dam and Pump | B1 | 39.27679 | -80.633501 |
| 10.6 | sdog025 | Buckeye Run | Perennial | 17 | 101 | 0 | Bore | B1, HQS | 39.288369 | -80.640581 |
| 10.6 | sdog026 | UNT to Buckeye Run | Perennial | 10 | 254 | 0 | Bore | UNT to B1, HQS | 39.288955 | -80.640846 |
| 12.9 | sdog028 | Flint Run | Perennial | 12 | 108 | 0 | Dam and Pump | B1, HQS | 39.319805 | -80.639854 |
| 14.0 | sdog007 | UNT to Right Hand Fork East Run | Perennial | 7 | 113 | 0 | Dam and Pump | UNT to B1 | 39.335192 | -80.638112 |
| 15.1 | sdog008 | UNT to Big Battle Run | Perennial | 5 | 142 | 0 | Dam and Pump or Flume | UNT to B1 | 39.348706 | -80.638224 |
| 15.2 | sdog009 | UNT to Big Battle Run | Perennial | 3 | 146 | 0 | Dam and Pump or Flume | UNT to B1 | 39.34895 | -80.637767 |
| 15.6 | sdoh009 | UNT to Big Battle Run | Perennial | 11 | 105 | 0 | Dam and Pump | UNT to B1 | 39.355284 | -80.366928 |
| 15.8 | sdoh008 | UNT to Big Battle Run | Perennial | 6 | 112 | 0 | Dam and Pump or Flume | UNT to B1 | 39.356626 | -80.637474 |
| 17.8 | sdoh010 | Little Battle Run | Perennial | 16 | 101 | 0 | Dam and Pump | B1 | 39.383466 | -80.637766 |
| 18.6 | sdoh012 | McElroy Creek | Perennial | 74 | 101 | 0 | Dam and Pump | B1, HQS | 39.383005 | -80.638724 |
| 18.6 | sdog031 | UNT to McElroy Creek | Perennial | 41 | 169 | 0 | Dam and Pump | UNT to B1, HQS | 39.393157 | -80.637575 |
| 20.6 | sdog032 | Franks Run | Perennial | 31 | 81 | 0 | Dam and Pump | B1 | 39.419105 | -80.628983 |
| **Tyler County** | | | | | | | | | | |
| 23.1 | styg001 | UNT to Indian Creek | Intermittent | NA | 132 | 0 | Not Crossed by Centerline | UNT to B1 | 39.44808 | -80.628308 |
| 23.1 | styg002 | Indian Creek | Perennial | 16 | 101 | 0 | Dam and Pump | B1 | 39.448271 | -80.628525 |
| **Wetzel County** | | | | | | | | | | |
| 24.7 | swzg024_1 | UNT to Buffalo Run | Perennial | 19 | 75 | 0 | Dam and Pump | UNT to B1 | 39.470063 | -80.620221 |
| 24.8 | swzg024_2 | UNT to Buffalo Run | Perennial | 14 | 76 | 0 | Dam and Pump | UNT to B1 | 39.470207 | -80.620086 |
| 25.4 | swzg025 | UNT to Buffalo Run | Perennial | NA | 52 | 0 | Not Crossed by Centerline | UNT to B1 | 39.471245 | -80.621231 |
| 25.4 | swzg026 | UNT to Buffalo Run | Perennial | 13 | 101 | 0 | Dam and Pump | UNT to B1 | 39.477867 | -80.615595 |
| 26.8 | swzg028 | UNT to Carpenter Run | Perennial | NA | 47 | 0 | Not Crossed by Centerline | UNT to B1 | 39.493842 | -80.606459 |
| 26.9 | swzg027 | Carpenter Run | Perennial | 16 | 77 | 0 | Dam and Pump | B1 | 39.494337 | -80.606903 |
| 28.1 | swza002 | Ashcamp Run | Perennial | 9 | 104 | 0 | Dam and Pump or Flume | B1 | 39.509627 | -80.612822 |
| 28.1 | swza001 | UNT to Ashcamp Run | Ephemeral | NA | 152 | 0 | Not Crossed by Centerline | UNT to B1 | 39.509613 | -80.613161 |
| 29.4 | swzh028 | South Fork Fishing Creek | Perennial | 74 | 101 | 0 | Dam and Pump or Flume | B1, HQS | 39.519869 | -80.623938 |

**Waterbodies Crossed by the Supply Header Project in West Virginia**

| MP | Feature ID [a] | Waterbody Name [b] | Waterbody Regime | Approx. Crossing Width (feet) [c] | Temp. Affected Bank Length (feet) | Perm. Affected Bank Length (feet) | Construction Method | State Regulatory Class [d] | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|---|---|
| 29.4 | swzh027 | UNT to South Fork Fishing Creek | Perennial | NA | 17 | 0 | Not Crossed by Centerline | UNT to B1, HQS | 39.520234 | -80.623374 |
| 29.5 | swzg014 | UNT to South Fork Fishing Creek | Perennial | 3 | 158 | 0 | Dam and Pump or Flume | UNT to B1, HQS | 39.520918 | -80.623053 |
| 29.7 | swzg016_1 | UNT to South Fork Fishing Creek | Intermittent | NA | 125 | 0 | Not Crossed by Centerline | UNT to B1, HQS | 39.523633 | -80.622864 |
| 29.7 | swzg016_2 | UNT to South Fork Fishing Creek | Intermittent | NA | 111 | 0 | Not Crossed by Centerline | UNT to B1, HQS | 39.523275 | -80.622967 |
| 29.7 | swzg015_1 | UNT to South Fork Fishing Creek | Intermittent | 10 | 83 | 0 | Dam and Pump or Flume | UNT to B1, HQS | 39.523565 | -80.623119 |
| 29.7 | swzg015_2 | UNT to South Fork Fishing Creek | Intermittent | 7 | 56 | 0 | Dam and Pump or Flume | UNT to B1, HQS | 39.523748 | -80.623131 |
| 29.7 | swzg015_3 | UNT to South Fork Fishing Creek | Intermittent | 9 | 135 | 0 | Dam and Pump or Flume | UNT to B1, HQS | 39.523858 | -80.623137 |
| 29.7 | swzg017 | UNT to South Fork Fishing Creek | Intermittent | NA | 90 | 0 | Not Crossed by Centerline | UNT to B1, HQS | 39.524155 | -80.623014 |
| 29.7 | swzg018_1 | South Fork Fishing Creek | Perennial | 66 | 103 | 0 | Dam and Pump | B1, HQS | 39.526501 | -80.623481 |
| 30.1 | swzg018_2 | South Fork Fishing Creek | Perennial | 54 | 113 | 0 | Dam and Pump | B1, HQS | 39.533885 | -80.634354 |
| 30.9 | swzg019 | Richwood Run | Perennial | 33 | 103 | 0 | Dam and Pump | B1 | 39.53386 | -80.634564 |
| 31.1 | swzg007 | UNT to Richwood Run | Ephemeral | NA | 271 | 0 | Not Crossed by Centerline | B1 | 39.536287 | -80.63593 |
| 31.8 | swzg021 | Upper Run | Perennial | 29 | 161 | 0 | Dam and Pump | B1 | 39.544398 | -80.639333 |
| 32.2 | swzg022 | UNT to Upper Run | Perennial | 18 | 106 | 0 | Dam and Pump | UNT to B1 | 39.548464 | -80.644841 |
| 33.2 | swzg023 | Lower Run | Perennial | 27 | 100 | 0 | Dam and Pump or Flume | B1 | 39.552346 | -80.65775 |
| 33.4 | swzg009 | UNT to Lower Run | Perennial | 15 | 105 | 0 | Dam and Pump | UNT to B1 | 39.552407 | -80.661634 |
| **Access Roads** | | | | | | | | | | |
| **HUC 8 - 5030201** | | | | | | | | | | |
| **Doddridge County** | | | | | | | | | | |
| 0.9 | sdoj009 | Dry Fork | Perennial | 6 | 42 | 42 | Add stone over existing culvert | B1 | 39.181446 | -80.566341 |
| 0.9 | sdoj010 | UNT to Dry Fork | Perennial | 4 | 30 | 30 | Add stone over existing culvert | UNT to B1 | 39.181341 | -80.566965 |

**Waterbodies Crossed by the Supply Header Project in West Virginia**

| MP | Feature ID [a] | Waterbody Name [b] | Waterbody Regime | Approx. Crossing Width (feet) [c] | Temp. Affected Bank Length (feet) | Perm. Affected Bank Length (feet) | Construction Method | State Regulatory Class [d] | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|---|---|
| 2.9 | sdog016 | UNT to Johnson Fork | Perennial | 4 | 46 | 46 | No improvement needed | UNT to B1 | 39.201285 | -80.59182 |
| 4.0 | sdoa023 | UNT to Indian Fork | Perennial | 9 | 33 | 33 | No improvement needed | UNT to B1 | 39.215125 | -80.597172 |
| 5.0 | sdoj008 | Indian Fork | Perennial | 20 | 60 | 60 | No improvement needed | B1 | 39.223972 | -80.604833 |
| 5.1 | sdoj007 | Indian Fork | Perennial | 6 | 31 | 31 | Add timber mats over existing culvert | B1 | 39.226432 | -80.604239 |
| 5.4 | sdoa021 | Buckeye Creek | Perennial | 14 | 31 | 31 | Install bridge | B1, HQS | 39.230169 | -80.608291 |
| 5.4 | sdoj007 | Indian Fork | Perennial | 12 | 60 | 60 | Install bridge | B1 | 39.227102 | -80.603938 |
| 5.9 | sdoa004 | UNT to Buckeye Creek | Ephemeral | 33 | 526 | 526 | Pending additional review | UNT to B1, HQS | 39.235205 | -80.609067 |
| 5.9 | sdoa016 | UNT to Buckeye Creek | Ephemeral | NA | 276 | 276 | Pending additional review | UNT to B1, HQS | 39.235382 | -80.609121 |
| 6.0 | sdoa005 | UNT to Buckeye Creek | Ephemeral | 1 | 34 | 34 | Pending additional review | UNT to B1, HQS | 39.237711 | -80.608451 |
| 6.0 | sdoa017 | UNT to Buckeye Creek | Ephemeral | NA | 90 | 90 | Pending additional review | UNT to B1, HQS | 39.236297 | -80.609011 |
| 7.8 | sdoj005 | Buffalo Calf Fork | Perennial | 10 | 31 | 31 | No improvement needed | B1 | 39.257656 | -80.622715 |
| 7.9 | sdoj004 | UNT to Buffalo Calf Fork | Perennial | 4 | 32 | 32 | No improvement needed | UNT to B1 | 39.261515 | -80.618638 |
| 9.4 | sdoj003 | UNT to Long Run | Perennial | 25 | 88 | 88 | Extend existing culvert/add timber mats or fill | UNT to B1 | 39.277925 | -80.634562 |
| 11.7 | sdoj001 | UNT to Buckeye Run | Intermittent | 4 | 32 | 32 | Culvert maintenance required | UNT to B1, HQS | 39.302928 | -80.635056 |
| 13.5 | sdoh019 | UNT to Flint Run | Perennial | 4 | 30 | 30 | No improvement needed | UNT to B1, HQS | 39.326333 | -80.63176 |
| 14.0 | sdoa003 | UNT to Flint Run | Perennial | 1 | 25 | 25 | Add stone | UNT to B1, HQS | 39.334158 | -80.629339 |
| 14.1 | sdoh020 | UNT to Right Hand Fork | Perennial | 4 | 28 | 28 | Install culvert/add timber mats or fill | UNT to B1 | 39.334917 | -80.636587 |
| 14.1 | sdog007 | UNT to Right Hand Fork East Run | Perennial | 19 | 90 | 90 | Install culvert/add timber mats or fill | UNT to B1 | 39.335192 | -80.638112 |
| 14.2 | sdog029 | UNT to Right Hand Fork East Run | Intermittent | 3 | 31 | 31 | Install culvert/add timber mats or fill | UNT to B1 | 39.336652 | -80.63503 |
| 14.2 | sdoh021 | UNT to Big Battle Run | Perennial | 6 | 31 | 31 | No improvement needed | UNT to B1 | 39.33906 | -80.625285 |
| 15.5 | sdoh022 | Big Battle Run | Perennial | 18 | 34 | 34 | No improvement needed | B1 | 39.351876 | -80.626247 |
| 15.8 | sdoh008 | UNT to Big Battle Run | Perennial | 5 | 30 | 30 | No improvement needed | UNT to B1 | 39.356626 | -80.637474 |
| 15.8 | sdog030 | UNT to Big Battle Run | Intermittent | 3 | 33 | 33 | Install culvert/add fill | UNT to B1 | 39.357083 | -80.637542 |
| 16.3 | sdoh023 | Big Battle Run | Perennial | 31 | 35 | 35 | No improvement needed | B1 | 39.363923 | -80.622467 |

**Waterbodies Crossed by the Supply Header Project in West Virginia**

| MP | Feature ID [a] | Waterbody Name [b] | Waterbody Regime | Approx. Crossing Width (feet) [c] | Temp. Affected Bank Length (feet) | Perm. Affected Bank Length (feet) | Construction Method | State Regulatory Class [d] | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|---|---|
| 16.5 | sdoh023 | Big Battle Run | Perennial | 27 | 42 | 42 | No improvement needed | B1 | 39.363952 | -80.622311 |
| 16.5 | sdoh024 | UNT to Big Battle Run | Perennial | 5 | 134 | 134 | No improvement needed | UNT to B1 | 39.364101 | -80.6233 |
| 17.8 | sdoh017 | Little Battle Run | Perennial | 19 | 49 | 49 | Add timber mats over existing culvert | B1 | 39.381653 | -80.639107 |
| 17.8 | sdoh010 | Little Battle Run | Perennial | 6 | 31 | 31 | Add timber mats over existing culvert | B1 | 39.383466 | -80.637766 |
| 18.5 | sdoh012 | McElroy Creek | Perennial | 37 | 33 | 33 | No improvement needed | B1, HQS | 39.39256 | -80.638533 |
| 18.6 | sdoa100 | Talkington Fork | Perennial | 33 | 34 | 34 | Install bridge | B1, HQS | 39.392286 | -80.636805 |
| 19.0 | sdoh016 | Franks Run | Perennial | 10 | 30 | 30 | No improvement needed | B1 | 39.400574 | -80.638514 |
| 21.9 | sdoh013 | UNT to Broad Run | Intermittent | 5 | 39 | 39 | No improvement needed | UNT to B1 | 39.435751 | -80.640047 |
| **Wetzel County** | | | | | | | | | | |
| 24.7 | swzh024 | UNT to Buffalo Run | Perennial | 30 | 33 | 33 | Install culvert/add stone | UNT to B1 | 39.471457 | -80.621408 |
| 24.8 | swzh025 | UNT to Buffalo Run | Perennial | 17 | 32 | 32 | Add timber mats over existing culvert | UNT to B1 | 39.471245 | -80.621231 |
| 24.8 | swzh023 | UNT to Buffalo Run | Perennial | 10 | 35 | 35 | Install culvert/add timber mats or stone | UNT to B1 | 39.471575 | -80.621391 |
| 24.8 | swzh023 | UNT to Buffalo Run | Perennial | 11 | 33 | 33 | Install culvert/add timber mats or stone | UNT to B1 | 39.472583 | -80.622472 |
| 24.8 | swzh022 | UNT to Buffalo Run | Perennial | 3 | 34 | 34 | Culvert maintenance required | UNT to B1 | 39.47403 | -80.624992 |
| 24.8 | swzh023 | UNT to Buffalo Run | Perennial | 8 | 54 | 54 | Add fill over existing culvert | UNT to B1 | 39.473466 | -80.62438 |
| 25.4 | swzg025 | UNT to Buffalo Run | Perennial | 5 | 31 | 31 | Culvert maintenance required | UNT to B1 | 39.477643 | -80.615271 |
| 25.4 | swzg026 | UNT to Buffalo Run | Perennial | 24 | 76 | 76 | No improvement needed | UNT to B1 | 39.477867 | -80.615595 |
| 25.5 | swzh010 | UNT to Buffalo Run | Perennial | 10 | 35 | 35 | Culvert maintenance required | UNT to B1 | 39.478601 | -80.619084 |
| 25.5 | swzh010 | UNT to Buffalo Run | Perennial | 4 | 47 | 47 | Culvert maintenance required | UNT to B1 | 39.480228 | -80.621761 |
| 25.5 | swzh010 | UNT to Buffalo Run | Perennial | 4 | 37 | 37 | No improvement needed | UNT to B1 | 39.480818 | -80.623871 |
| 25.6 | swzh009 | UNT to Buffalo Run | Intermittent | NA | 24 | 24 | Install culvert/add fill | UNT to B1 | 39.48631 | -80.620756 |
| 25.6 | swzh008 | UNT to Buffalo Run | Intermittent | NA | 18 | 18 | No improvement needed | UNT to B1 | 39.486348 | -80.620937 |
| 25.9 | swzh016 | UNT to Arches Fork | Perennial | 8 | 91 | 91 | Install culvert/add timber mats or stone | UNT to B1 | 39.476835 | -80.602328 |

**Waterbodies Crossed by the Supply Header Project in West Virginia**

| MP | Feature ID [a] | Waterbody Name [b] | Waterbody Regime | Approx. Crossing Width (feet) [c] | Temp. Affected Bank Length (feet) | Perm. Affected Bank Length (feet) | Construction Method | State Regulatory Class [d] | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|---|---|
| 26.0 | swzh019 | UNT to Arches Fork | Perennial | 17 | 57 | 57 | Add fill over existing culvert | UNT to B1 | 39.47839 | -80.595024 |
| 26.0 | swzh021 | Arches Fork | Perennial | 27 | 32 | 32 | No improvement needed | B1 | 39.478143 | -80.591544 |
| 26.2 | swzh004 | UNT to Buffalo Run | Perennial | NA | 155 | 155 | No improvement needed | UNT to B1 | 39.486332 | -80.61524 |
| 26.2 | swzh002_1 | UNT to Buffalo Run | Perennial | 22 | 61 | 61 | Install culvert/add timber mats or stone | UNT to B1 | 39.485941 | -80.621844 |
| 26.2 | swzh002_2 | UNT to Buffalo Run | Perennial | 59 | 183 | 183 | No improvement needed | UNT to B1 | 39.486154 | -80.621219 |
| 26.2 | swzh002_3 | UNT to Buffalo Run | Perennial | 81 | 201 | 201 | Install culvert/add timber mats | UNT to B1 | 39.486507 | -80.619223 |
| 26.2 | swzh002_4 | UNT to Buffalo Run | Perennial | 9 | 85 | 85 | Install culvert/add timber mats or stone | UNT to B1 | 39.487637 | -80.613088 |
| 26.2 | swzh003 | UNT to Buffalo Run | Perennial | 54 | 131 | 131 | Extend existing culvert | UNT to B1 | 39.486342 | -80.614742 |
| 26.2 | swzh005 | UNT to Buffalo Run | Perennial | 4 | 38 | 38 | Install culvert/add timber mats | UNT to B1 | 39.486615 | -80.613797 |
| 26.2 | swzh006 | UNT to Buffalo Run | Intermittent | 3 | 32 | 32 | Install culvert/add fill | UNT to B1 | 39.488053 | -80.61274 |
| 26.2 | swzh007 | UNT to Buffalo Run | Intermittent | 2 | 31 | 31 | Install culvert/add fill | UNT to B1 | 39.488115 | -80.612646 |
| 29.5 | swzh027 | UNT to South Fork Fishing Creek | Perennial | 4 | 30 | 30 | Install culvert/add timber mats or stone | UNT to B1, HQS | 39.520234 | -80.623374 |
| 30.9 | swzg019 | Richwood Run | Perennial | 24 | 27 | 27 | Install culvert/add timber mats or stone | B1 | 39.534171 | -80.633808 |
| 30.9 | swzg019 | Richwood Run | Perennial | 24 | 28 | 28 | No improvement needed | B1 | 39.534184 | -80.633717 |
| 33.2 | swzg023 | Lower Run | Perennial | 34 | 54 | 54 | Install culvert/add timber mats or stone | B1 | 39.552346 | -80.65775 |
| 33.4 | swzg008 | Lower Run | Perennial | 14 | 30 | 30 | Install culvert/add timber mats or stone | B1 | 39.55011 | -80.661192 |
| 33.5 | swzg003 | South Fork Fishing Creek | Perennial | 87 | 36 | 36 | No improvement needed | B1, HQS | 39.55034 | -80.669777 |
| 33.5 | swzg007_1 | UNT to Lower Run | Perennial | 7 | 124 | 124 | Replace culvert/add fill | UNT to B1 | 39.551888 | -80.665388 |
| 33.5 | swzg007_2 | UNT to Lower Run | Perennial | 7 | 125 | 125 | Culvert maintenance required | UNT to B1 | 39.552363 | -80.665253 |
| **Ground Beds** | | | | | | | | | | |
| **HUC 8 - 5030201** | | | | | | | | | | |
| 17.8 | sdoh011 | UNT to Little Battle Run | Perennial | 79 | 79 | 0 | Dam and Pump or Flume | UNT to B1 | 39.383005 | -80.638724 |

**Waterbodies Crossed by the Supply Header Project in West Virginia**

| MP | Feature ID [a] | Waterbody Name [b] | Waterbody Regime | Approx. Crossing Width (feet) [c] | Temp. Affected Bank Length (feet) | Perm. Affected Bank Length (feet) | Construction Method | State Regulatory Class [d] | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|---|---|
| **Water Impoundments** | | | | | | | | | | |
| **HUC 8 - 5030201** | | | | | | | | | | |
| 29.5 | swzh027 | UNT to South Fork Fishing Creek | Perennial | 184 | 184 | 0 | Install temporary culvert | UNT to B1, HQS | 39.520234 | -80.623374 |
| **Aboveground Facilities** | | | | | | | | | | |
| **HUC 8 - 5030201** | | | | | | | | | | |
| 33.6 | swzg006_1 | UNT to Lower Run | Intermittent | 12 | 107 | 0 | Dam and Pump or Flume | UNT to B1 | 39.52265 | -80.665295 |
| 33.6 | swzg006_2 | UNT to Lower Run | Intermittent | 598 | 598 | 0 | Install culvert | UNT to B1 | 39.552131 | -80.663728 |
| | | | **Totals** | **2,757** | **12,496** | **4,241** | | | | |

[a] Waterbodies with a Feature ID starting with nhd represent waterbodies that are based on desktop data from the National Hydrography Dataset.

[b] UNT = Unnamed Tributary

[c] NA for Approximate Crossing Width indicates that the proposed pipeline or access road centerline does not cross the waterbody.

[d] 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 staff. B1—Warm Water Fishery.

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 UNT to [Stream Class] to indicate connected tributaries to classified waters.

# APPENDIX F

Receiving Waters Table

| Feature Name | County | State | HUC6 | HUC6 Name | HUC8 | HUC8 Name | Milepost |
|---|---|---|---|---|---|---|---|
| UNT to Tanner Fork | Harrison County | West Virginia | 050200 | Monongahela | 05020002 | West Fork | 0.2 |
| UNT to Dry Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 0.7 |
| UNT to Dry Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 0.8 |
| Dry Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 0.9 |
| UNT to Dry Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 0.9 |
| Dry Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 1.3 |
| UNT to Dry Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 1.4 |
| Meathouse Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 2.1 |
| Johnson Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 2.9 |
| UNT to Johnson Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 2.9 |
| UNT to Indian Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 4.0 |
| UNT to Indian Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 4.0 |
| UNT to Indian Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 4.6 |
| Indian Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 5.0 |
| UNT to Indian Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 5.1 |
| Indian Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 5.1 |
| Indian Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 5.4 |
| Buckeye Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 5.4 |
| Buckeye Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 5.5 |
| UNT to Buckeye Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 5.5 |
| UNT to Buckeye Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 5.9 |
| UNT to Buckeye Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 5.9 |
| UNT to Buckeye Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 5.9 |
| UNT to Buckeye Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 5.9 |
| UNT to Buckeye Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 5.9 |
| UNT to Buckeye Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 5.9 |
| UNT to Buckeye Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 6.0 |
| UNT to Buckeye Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 6.0 |
| UNT to Greenbrier Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 6.7 |
| Greenbrier Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 6.7 |
| UNT to Greenbrier Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 6.7 |
| UNT to Greenbrier Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 6.8 |
| Buffalo Calf Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 7.8 |
| Buffalo Calf Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 7.8 |
| UNT to Buffalo Calf Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 7.9 |
| UNT to Buffalo Calf Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 7.9 |
| UNT to Buffalo Calf Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 8.9 |
| Long Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 9.4 |
| UNT to Long Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 9.4 |
| Buckeye Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 10.6 |
| UNT to Buckeye Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 10.6 |
| UNT to Buckeye Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 11.7 |
| Flint Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 12.9 |
| UNT to Flint Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 13.5 |
| UNT to Flint Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 14.0 |
| UNT to Right Hand Fork East Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 14.0 |
| UNT to Right Hand Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 14.1 |
| UNT to Right Hand Fork East Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 14.1 |
| UNT to Big Battle Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 14.2 |
| UNT to Right Hand Fork East Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 14.2 |
| UNT to Big Battle Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 15.1 |
| UNT to Big Battle Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 15.2 |

| Feature Name | County | State | HUC6 | HUC6 Name | HUC8 | HUC8 Name | Milepost |
|---|---|---|---|---|---|---|---|
| Big Battle Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 15.5 |
| UNT to Big Battle Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 15.6 |
| UNT to Big Battle Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 15.8 |
| UNT to Big Battle Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 15.8 |
| UNT to Big Battle Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 15.8 |
| Big Battle Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 16.3 |
| Big Battle Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 16.5 |
| UNT to Big Battle Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 16.5 |
| UNT to Little Battle Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 17.8 |
| Little Battle Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 17.8 |
| Little Battle Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 17.8 |
| Little Battle Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 17.8 |
| Mcelroy Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 18.5 |
| Mcelroy Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 18.5 |
| Talkington Fork | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muckingum-Middle Island | 18.6 |
| UNT to Mcelroy Creek | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 18.6 |
| Franks Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 19.0 |
| Franks Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 20.6 |
| UNT to Broad Run | Doddridge County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 21.9 |
| UNT to Indian Creek | Tyler County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 23.1 |
| Indian Creek | Tyler County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 23.1 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 24.7 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 24.7 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 24.8 |
| UNT To Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 24.8 |
| UNT To Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 24.8 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 24.8 |
| UNT To Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 24.8 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 24.8 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 25.4 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 25.4 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 25.4 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 25.4 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 25.5 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 25.5 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 25.5 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 25.6 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 25.6 |
| UNT to Arches Fork | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 25.9 |
| UNT to Arches Fork | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 26.0 |
| Arches Fork | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 26.0 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 26.2 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 26.2 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 26.2 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 26.2 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 26.2 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 26.2 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 26.2 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 26.2 |
| UNT to Buffalo Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 26.2 |
| UNT to Carpenter Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 26.8 |
| Carpenter Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 26.9 |

| Feature Name | County | State | HUC6 | HUC6 Name | HUC8 | HUC8 Name | Milepost |
|---|---|---|---|---|---|---|---|
| Ashcamp Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 28.1 |
| UNT to Ashcamp Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 28.1 |
| South Fork Fishing Creek | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 29.4 |
| UNT to South Fork Fishing Creek | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 29.4 |
| UNT to South Fork Fishing Creek | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 29.5 |
| UNT to South Fork Fishing Creek | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 29.5 |
| UNT to South Fork Fishing Creek | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 29.5 |
| UNT to South Fork Fishing Creek | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 29.7 |
| UNT to South Fork Fishing Creek | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 29.7 |
| UNT to South Fork Fishing Creek | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 29.7 |
| UNT to South Fork Fishing Creek | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 29.7 |
| UNT to South Fork Fishing Creek | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 29.7 |
| UNT to South Fork Fishing Creek | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 29.7 |
| South Fork Fishing Creek | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 29.7 |
| South Fork Fishing Creek | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 30.1 |
| Richwood Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 30.9 |
| Richwood Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 30.9 |
| Richwood Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 30.9 |
| UNT to Richwood Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 31.1 |
| Upper Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 31.8 |
| UNT to Upper Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 32.2 |
| Lower Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 33.2 |
| Lower Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 33.2 |
| Lower Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 33.4 |
| UNT to Lower Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 33.4 |
| South Fork Fishing Creek | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 33.5 |
| UNT to Lower Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 33.5 |
| UNT to Lower Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 33.5 |
| UNT to Lower Run | Wetzel County | West Virginia | 050302 | Upper Ohio-Little Kanawha | 05030201 | Little Muskingum-Middle Island | 33.6 |
| UNT to Lower Run | Wetzel County | West Virginia | 050303 | Upper Ohio-Little Kanawha | 05030202 | Little Muskingum-Middle Island | 33.6 |

# APPENDIX G

Current Land Uses Table

Appendix G

**Land Uses Affected by Construction and Operation of the Supply Header Project (in acres)** [a, b, c]

| | | | Agriculture (Cultivated Crop) | | Agriculture (Pasture Land) | | Agriculture (Tree Plantation/Harvested Forest) | | Upland Forest/Woodland | | Developed (Open to Low Intensity) | | Developed (Medium to High Intensity) | | Open Land | | Wetlands | | Open Water | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PROJECT/Facility Type/Facility | County | State | Constr. | Oper. | Constr. | Oper. | Constr. | Oper. | Constr. | Oper. | Constr. | Oper. | Constr. | Oper. | Constr. | Oper. | Constr. | Oper. | Constr. | Oper. | Constr. | Oper. |
| **SUPPLY HEADER PIPELINE** | | | | | | | | | | | | | | | | | | | | | | |
| **Pipeline Facilities** | | | | | | | | | | | | | | | | | | | | | | |
| TL-635 | Harrison | WV | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 2.7 | 1.6 | 1.6 | 1.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.6 | 0.0 | 0.0 | 5.0 | 3.7 |
| | Doddridge | WV | 1.6 | 0.9 | 6.1 | 2.9 | 0.0 | 0.0 | 249.1 | 123.8 | 4.9 | 2.6 | 0.1 | 0.0 | 0.1 | 0.0 | 0.5 | 0.3 | 0.9 | 0.5 | 263.4 | 131.1 |
| | Tyler | WV | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0. | 8.3 | 4.1 | 0.4 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 8.8 | 4.3 |
| | Wetzel | WV | 1.7 | 1.1 | 1.9 | 1.0 | 0.0 | 0.0 | 107.2 | 54.0 | 3.3 | 1.5 | 0.0 | 0.0 | 0.2 | 0.1 | 0.3 | 0.2 | 0.9 | 0.5 | 115.4 | 58.2 |
| **TL-635 Total** | | | **3.4** | **2.1** | **8.0** | **3.8** | **0.0** | **0.0** | **367.3** | **183.5** | **10.2** | **5.7** | **0.1** | **0.0** | **0.3** | **0.1** | **1.3** | **1.0** | **1.8** | **0.9** | **392.6** | **197.2** |
| **Compressor Station Modifications** [f] | | | | | | | | | | | | | | | | | | | | | | |
| Mockingbird Hill Compressor Station | Wetzel | WV | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 49.2 | 7.9 | 14.3 | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 64.0 | 9.5 |
| Burch Ridge Compressor Station | Marshall | WV | 0.0 | 0.0 | 3.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.3 | 0.0 |
| **Compressor Station Total** | | | **0.5** | **0.0** | **3.7** | **0.0** | **0.0** | **0.0** | **49.2** | **7.9** | **14.3** | **1.6** | **2.7** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **70.3** | **9.5** |
| **Pig Receiver Sites** [e] | | | | | | | | | | | | | | | | | | | | | | |
| Martz Junction | Harrison | WV | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.4 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.6 | 0.6 |
| **Pig Receiver Total** | | | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.1** | **0.1** | **0.4** | **0.4** | **0.0** | **0.0** | **0.0** | **0.0** | **0.1** | **0.1** | **0.0** | **0.0** | **0.6** | **0.6** |
| **ABOVEGROUND FACILITIES TOTAL** | | | **0.5** | **0.0** | **3.7** | **0.0** | **0.0** | **0.0** | **49.3** | **8.0** | **14.8** | **2.0** | **2.7** | **0.0** | **0.0** | **0.0** | **0.1** | **0.1** | **0.0** | **0.0** | **70.9** | **10.1** |

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[a] The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the exact sum of the addends in all cases.

[b] Estimate based on the typical right-of-way configurations for each pipeline as described in Section 1.4.1.1.

[e] ACP launcher/receivers at sites 3, 4, 5, 6, 7, 9, and 11 and Supply Header Project launcher/receivers are located with compressor station and/or M&R Sites and, therefore, are not included in the table.

# APPENDIX H

Soil Characteristics by Milepost Table

APPENDIX H

Soil Characteristics by Milepost Segment and Soil Map Unit Along the Proposed Pipeline Routes

| Milepost | | | | | | | | | Highly Erodible | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Begin | End | Map Unit Symbol | Component Percent (%) | Component Name | Crossing Length (miles) | Prime Farmland [a] | Hydric Soils [a] | Compaction Prone [b] | Water [c] | Wind [d] | Revegetation Concerns [e] | Stony/ Rocky [f] | Shallow to Bedrock [g] |
| **SUPPLY HEADER** | | | | | | | | | | | | | |
| **TL-635** | | | | | | | | | | | | | |
| Harrison County, WV | | | | | | | | | | | | | |
| 0.00 | 0.35 | UF | 50 | Fluvaquents | 0.18 | N | Y | Y | N | N | N | Y | N |
| | | | 50 | Udifluvents | 0.18 | N | N | N | N | N | N | Y | N |
| 0.35 | 0.56 | GuE3 | 78 | Gilpin | 0.16 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 22 | Upshur | 0.04 | N | N | N | Y | N | Y | Y | Paralithic |
| 0.56 | 0.61 | GuF3 | 78 | Gilpin | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 22 | Upshur | 0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| 0.61 | 0.64 | GuE | 33 | Upshur | 0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 67 | Gilpin | 0.02 | N | N | N | Y | N | Y | Y | Paralithic |
| 0.64 | 0.67 | GsE | 41 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| 0.67 | 0.88 | GsF | 38 | Peabody | 0.08 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.13 | N | N | N | Y | N | Y | Y | Lithic |
| Doddridge County, WV | | | | | | | | | | | | | |
| 0.88 | 0.94 | GsF | 63 | Gilpin | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 38 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| 0.94 | 1.10 | GsE | 59 | Gilpin | 0.09 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | 0.07 | N | N | N | Y | N | Y | Y | Lithic |
| 1.10 | 1.29 | GsF | 38 | Peabody | 0.07 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.12 | N | N | N | Y | N | Y | Y | Lithic |
| 1.29 | 1.34 | Se | 100 | Sensabaugh | 0.05 | Prime | N | N | N | N | N | Y | N |
| 1.34 | 1.38 | SeB | 100 | Sensabaugh | 0.03 | Prime | N | N | N | N | N | Y | N |
| 1.38 | 1.40 | GsF | 63 | Gilpin | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 38 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| 1.40 | 1.43 | GsE | 59 | Gilpin | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| 1.43 | 1.52 | GsF | 38 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.06 | N | N | N | Y | N | Y | Y | Lithic |
| 1.52 | 1.87 | GsE | 59 | Gilpin | 0.20 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | 0.14 | N | N | N | Y | N | Y | Y | Lithic |
| 1.87 | 2.04 | GsF | 38 | Peabody | 0.06 | N | N | N | Y | N | Y | Y | Lithic |

APPENDIX H

Soil Characteristics by Milepost Segment and Soil Map Unit Along the Proposed Pipeline Routes

| Milepost | | Map Unit Symbol | Component Percent (%) | Component Name | Crossing Length (miles) | Prime Farmland [a] | Hydric Soils [a] | Compaction Prone [b] | Highly Erodible | | Revegetation Concerns [e] | Stony/ Rocky [f] | Shallow to Bedrock [g] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Begin | End | | | | | | | | Water [c] | Wind [d] | | | |
| | | | 63 | Gilpin | 0.10 | N | N | N | Y | N | Y | Y | Lithic |
| 2.04 | 2.09 | Ch | 100 | Chagrin | 0.05 | Prime | N | N | N | N | N | N | N |
| 2.09 | 2.31 | GsF | 38 | Peabody | 0.08 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.14 | N | N | N | Y | N | Y | Y | Lithic |
| 2.31 | 2.72 | GsE | 41 | Peabody | 0.16 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.24 | N | N | N | Y | N | Y | Y | Lithic |
| 2.72 | 2.81 | GsF | 38 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.06 | N | N | N | Y | N | Y | Y | Lithic |
| 2.81 | 2.82 | GsE | 59 | Gilpin | <0.01 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | <0.01 | N | N | N | Y | N | Y | Y | Lithic |
| 2.82 | 2.87 | GsF | 38 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| 2.87 | 2.92 | VsE | 100 | Vandalia | 0.04 | N | N | N | Y | N | Y | Y | N |
| 2.92 | 3.16 | GsF | 38 | Peabody | 0.09 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.15 | N | N | N | Y | N | Y | Y | Lithic |
| 3.16 | 3.48 | GsE | 41 | Peabody | 0.14 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.19 | N | N | N | Y | N | Y | Y | Lithic |
| 3.48 | 3.56 | GsF | 38 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.05 | N | N | N | Y | N | Y | Y | Lithic |
| 3.56 | 3.71 | GsE | 59 | Gilpin | 0.09 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | 0.06 | N | N | N | Y | N | Y | Y | Lithic |
| 3.71 | 3.87 | GsF | 38 | Peabody | 0.06 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.11 | N | N | N | Y | N | Y | Y | Lithic |
| 3.87 | 3.91 | GsE | 41 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| 3.91 | 3.97 | GsF | 63 | Gilpin | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 38 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| 3.97 | 4.01 | SeB | 100 | Sensabaugh | 0.05 | Prime | N | N | N | N | N | Y | N |
| 4.01 | 4.12 | GsF | 63 | Gilpin | 0.07 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 38 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| 4.12 | 4.28 | GsE | 59 | Gilpin | 0.09 | N | N | N | Y | N | Y | Y | Lithic |

APPENDIX H

Soil Characteristics by Milepost Segment and Soil Map Unit Along the Proposed Pipeline Routes

| Milepost | | Map Unit Symbol | Component Percent (%) | Component Name | Crossing Length (miles) | Prime Farmland [a] | Hydric Soils [a] | Compaction Prone [b] | Highly Erodible | | Revegetation Concerns [e] | Stony/ Rocky [f] | Shallow to Bedrock [g] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Begin | End | | | | | | | | Water [c] | Wind [d] | | | |
| | | | 41 | Peabody | 0.06 | N | N | N | Y | N | Y | Y | Lithic |
| 4.28 | 4.37 | GsF | 38 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.06 | N | N | N | Y | N | Y | Y | Lithic |
| 4.37 | 4.51 | GsE | 59 | Gilpin | 0.08 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | 0.05 | N | N | N | Y | N | Y | Y | Lithic |
| 4.51 | 4.55 | GsF | 38 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| 4.55 | 4.60 | Se | 100 | Sensabaugh | 0.04 | Prime | N | N | N | N | N | Y | N |
| 4.60 | 4.63 | GsF | 38 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| 4.63 | 4.86 | GsE | 41 | Peabody | 0.10 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.14 | N | N | N | Y | N | Y | Y | Lithic |
| 4.86 | 5.22 | GsF | 38 | Peabody | 0.13 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.22 | N | N | N | Y | N | Y | Y | Lithic |
| 5.22 | 5.23 | GsE | 41 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| 5.23 | 5.31 | GsF | 63 | Gilpin | 0.05 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 38 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| 5.31 | 5.41 | GsE | 41 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.06 | N | N | N | Y | N | Y | Y | Lithic |
| 5.41 | 5.45 | GsF | 38 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| 5.45 | 5.48 | SeB | 100 | Sensabaugh | 0.03 | Prime | N | N | N | N | N | Y | N |
| 5.48 | 5.54 | Ch | 100 | Chagrin | 0.06 | Prime | N | N | N | N | N | N | N |
| 5.54 | 5.60 | SeB | 100 | Sensabaugh | 0.06 | Prime | N | N | N | N | N | Y | N |
| 5.60 | 5.65 | VaD | 100 | Vandalia | 0.05 | State | N | N | Y | N | Y | Y | N |
| 5.65 | 5.69 | GsF | 38 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| 5.69 | 5.71 | GpE | 50 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 50 | Gilpin | 0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| 5.71 | 5.75 | GuD | 38 | Upshur | 0.01 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.02 | State | N | N | Y | N | Y | Y | Paralithic |
| 5.75 | 5.77 | GuC | 63 | Gilpin | 0.02 | State | N | N | Y | N | Y | Y | Paralithic |

APPENDIX H

Soil Characteristics by Milepost Segment and Soil Map Unit Along the Proposed Pipeline Routes

| Milepost | | Map Unit Symbol | Component Percent (%) | Component Name | Crossing Length (miles) | Prime Farmland [a] | Hydric Soils [a] | Compaction Prone [b] | Highly Erodible | | Revegetation Concerns [e] | Stony/ Rocky [f] | Shallow to Bedrock [g] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Begin | End | | | | | | | | Water [c] | Wind [d] | | | |
| | | | 38 | Upshur | 0.01 | State | N | N | Y | N | Y | Y | Paralithic |
| 5.77 | 5.83 | GsE | 59 | Gilpin | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| 5.83 | 5.87 | GsF | 38 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| 5.87 | 5.92 | SeB | 100 | Sensabaugh | 0.04 | Prime | N | N | N | N | N | Y | N |
| 5.92 | 5.94 | GsF | 38 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| 5.94 | 6.03 | GuD | 38 | Upshur | 0.03 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.06 | State | N | N | Y | N | Y | Y | Paralithic |
| 6.03 | 6.11 | GsE | 41 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.05 | N | N | N | Y | N | Y | Y | Lithic |
| 6.11 | 6.17 | GsF | 38 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| 6.17 | 6.20 | GsE | 59 | Gilpin | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| 6.20 | 6.24 | GsF | 63 | Gilpin | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 38 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| 6.24 | 6.43 | GsE | 59 | Gilpin | 0.11 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | 0.08 | N | N | N | Y | N | Y | Y | Lithic |
| 6.43 | 6.56 | GsF | 38 | Peabody | 0.05 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.08 | N | N | N | Y | N | Y | Y | Lithic |
| 6.56 | 6.64 | GsE | 59 | Gilpin | 0.05 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| 6.64 | 6.65 | GsF | 63 | Gilpin | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 38 | Peabody | <0.01 | N | N | N | Y | N | Y | Y | Lithic |
| 6.65 | 6.75 | Se | 100 | Sensabaugh | 0.09 | Prime | N | N | N | N | N | Y | N |
| 6.75 | 6.80 | GuD | 63 | Gilpin | 0.04 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 38 | Upshur | 0.02 | State | N | N | Y | N | Y | Y | Paralithic |
| 6.80 | 6.89 | GsE | 41 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.05 | N | N | N | Y | N | Y | Y | Lithic |
| 6.89 | 6.94 | GsF | 38 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.03 | N | N | N | Y | N | Y | Y | Lithic |

APPENDIX H

Soil Characteristics by Milepost Segment and Soil Map Unit Along the Proposed Pipeline Routes

| Milepost Begin | Milepost End | Map Unit Symbol | Component Percent (%) | Component Name | Crossing Length (miles) | Prime Farmland [a] | Hydric Soils [a] | Compaction Prone [b] | Highly Erodible Water [c] | Highly Erodible Wind [d] | Revegetation Concerns [e] | Stony/ Rocky [f] | Shallow to Bedrock [g] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.94 | 7.36 | GsE | 41 | Peabody | 0.17 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.25 | N | N | N | Y | N | Y | Y | Lithic |
| 7.36 | 7.42 | GsF | 38 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| 7.42 | 7.73 | GsE | 41 | Peabody | 0.13 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.19 | N | N | N | Y | N | Y | Y | Lithic |
| 7.73 | 7.84 | GsF | 63 | Gilpin | 0.06 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 38 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| 7.84 | 7.87 | Se | 100 | Sensabaugh | 0.04 | Prime | N | N | N | N | N | Y | N |
| 7.87 | 7.89 | SeB | 100 | Sensabaugh | 0.02 | Prime | N | N | N | N | N | Y | N |
| 7.89 | 7.94 | GsF | 63 | Gilpin | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 38 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| 7.94 | 8.10 | GsE | 59 | Gilpin | 0.09 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | 0.07 | N | N | N | Y | N | Y | Y | Lithic |
| 8.10 | 8.11 | GsF | 63 | Gilpin | <0.01 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 38 | Peabody | <0.01 | N | N | N | Y | N | Y | Y | Lithic |
| 8.11 | 8.41 | GsE | 59 | Gilpin | 0.18 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | 0.12 | N | N | N | Y | N | Y | Y | Lithic |
| 8.41 | 8.72 | GuD | 38 | Upshur | 0.12 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.20 | State | N | N | Y | N | Y | Y | Paralithic |
| 8.72 | 8.79 | GsE | 59 | Gilpin | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| 8.79 | 8.90 | GsF | 38 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.07 | N | N | N | Y | N | Y | Y | Lithic |
| 8.90 | 8.95 | GsE | 41 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| 8.95 | 8.98 | GsF | 38 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| 8.98 | 9.15 | GsE | 41 | Peabody | 0.07 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.10 | N | N | N | Y | N | Y | Y | Lithic |
| 9.15 | 9.18 | GsF | 38 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| 9.18 | 9.25 | GsE | 59 | Gilpin | 0.04 | N | N | N | Y | N | Y | Y | Lithic |

APPENDIX H

Soil Characteristics by Milepost Segment and Soil Map Unit Along the Proposed Pipeline Routes

| Milepost Begin | Milepost End | Map Unit Symbol | Component Percent (%) | Component Name | Crossing Length (miles) | Prime Farmland [a] | Hydric Soils [a] | Compaction Prone [b] | Highly Erodible Water [c] | Highly Erodible Wind [d] | Revegetation Concerns [e] | Stony/ Rocky [f] | Shallow to Bedrock [g] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 41 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| 9.25 | 9.36 | GsF | 38 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.07 | N | N | N | Y | N | Y | Y | Lithic |
| 9.36 | 9.43 | Se | 100 | Sensabaugh | 0.07 | Prime | N | N | N | N | N | Y | N |
| 9.43 | 9.54 | GsF | 38 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.07 | N | N | N | Y | N | Y | Y | Lithic |
| 9.54 | 9.91 | GuD | 38 | Upshur | 0.14 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.23 | State | N | N | Y | N | Y | Y | Paralithic |
| 9.91 | 10.11 | GsE | 41 | Peabody | 0.08 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.12 | N | N | N | Y | N | Y | Y | Lithic |
| 10.11 | 10.19 | GsF | 63 | Gilpin | 0.05 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 38 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| 10.19 | 10.24 | GsE | 41 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| 10.24 | 10.38 | GuD | 38 | Upshur | 0.05 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.09 | State | N | N | Y | N | Y | Y | Paralithic |
| 10.38 | 10.54 | GsF | 38 | Peabody | 0.06 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.10 | N | N | N | Y | N | Y | Y | Lithic |
| 10.54 | 10.62 | Ud | 100 | Udorthents | 0.08 | N | N | N | Y | N | N | N | N |
| 10.62 | 10.85 | GsF | 63 | Gilpin | 0.14 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 38 | Peabody | 0.09 | N | N | N | Y | N | Y | Y | Lithic |
| 10.85 | 12.26 | GsE | 41 | Peabody | 0.59 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.85 | N | N | N | Y | N | Y | Y | Lithic |
| 12.26 | 12.29 | GsF | 38 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| 12.29 | 12.31 | GsE | 59 | Gilpin | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| 12.31 | 12.44 | GuD | 63 | Gilpin | 0.08 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 38 | Upshur | 0.05 | State | N | N | Y | N | Y | Y | Paralithic |
| 12.44 | 12.72 | GsE | 41 | Peabody | 0.12 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.17 | N | N | N | Y | N | Y | Y | Lithic |
| 12.72 | 12.90 | GsF | 38 | Peabody | 0.07 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.11 | N | N | N | Y | N | Y | Y | Lithic |

APPENDIX H

Soil Characteristics by Milepost Segment and Soil Map Unit Along the Proposed Pipeline Routes

| Milepost | | Map Unit Symbol | Component Percent (%) | Component Name | Crossing Length (miles) | Prime Farmland [a] | Hydric Soils [a] | Compaction Prone [b] | Highly Erodible | | Revegetation Concerns [e] | Stony/ Rocky [f] | Shallow to Bedrock [g] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Begin | End | | | | | | | | Water [c] | Wind [d] | | | |
| 12.90 | 12.98 | Se | 100 | Sensabaugh | 0.08 | Prime | N | N | N | N | N | Y | N |
| 12.98 | 13.05 | GuD | 38 | Upshur | 0.03 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.04 | State | N | N | Y | N | Y | Y | Paralithic |
| 13.05 | 13.09 | GsE | 41 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| 13.09 | 13.10 | GsF | 38 | Peabody | <0.01 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | <0.01 | N | N | N | Y | N | Y | Y | Lithic |
| 13.10 | 13.10 | GsE | 41 | Peabody | <0.01 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | <0.01 | N | N | N | Y | N | Y | Y | Lithic |
| 13.10 | 13.31 | GsF | 38 | Peabody | 0.08 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.14 | N | N | N | Y | N | Y | Y | Lithic |
| 13.31 | 13.44 | GsE | 41 | Peabody | 0.05 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.08 | N | N | N | Y | N | Y | Y | Lithic |
| 13.44 | 13.52 | GuC | 38 | Upshur | 0.03 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.05 | State | N | N | Y | N | Y | Y | Paralithic |
| 13.52 | 14.01 | GuD | 38 | Upshur | 0.19 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.31 | State | N | N | Y | N | Y | Y | Paralithic |
| 14.01 | 14.17 | GsF | 38 | Peabody | 0.06 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.10 | N | N | N | Y | N | Y | Y | Lithic |
| 14.17 | 14.27 | GsE | 41 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.06 | N | N | N | Y | N | Y | Y | Lithic |
| 14.27 | 14.31 | GsF | 38 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| 14.31 | 14.40 | GuD | 38 | Upshur | 0.04 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.06 | State | N | N | Y | N | Y | Y | Paralithic |
| 14.40 | 14.57 | GuC | 63 | Gilpin | 0.10 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 38 | Upshur | 0.06 | State | N | N | Y | N | Y | Y | Paralithic |
| 14.57 | 14.63 | GuD | 38 | Upshur | 0.03 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.04 | State | N | N | Y | N | Y | Y | Paralithic |
| 14.63 | 15.03 | GsE | 41 | Peabody | 0.16 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.24 | N | N | N | Y | N | Y | Y | Lithic |
| 15.03 | 15.12 | GsF | 38 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.05 | N | N | N | Y | N | Y | Y | Lithic |

APPENDIX H

Soil Characteristics by Milepost Segment and Soil Map Unit Along the Proposed Pipeline Routes

| Milepost | | Map Unit Symbol | Component Percent (%) | Component Name | Crossing Length (miles) | Prime Farmland [a] | Hydric Soils [a] | Compaction Prone [b] | Highly Erodible | | Revegetation Concerns [e] | Stony/ Rocky [f] | Shallow to Bedrock [g] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Begin | End | | | | | | | | Water [c] | Wind [d] | | | |
| 15.12 | 15.14 | Se | 100 | Sensabaugh | 0.02 | Prime | N | N | N | N | N | Y | N |
| 15.14 | 15.19 | GsF | 38 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| 15.19 | 15.28 | GsE | 41 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.05 | N | N | N | Y | N | Y | Y | Lithic |
| 15.28 | 15.34 | GsF | 38 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| 15.34 | 15.44 | GsE | 41 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.06 | N | N | N | Y | N | Y | Y | Lithic |
| 15.44 | 15.59 | GsF | 63 | Gilpin | 0.09 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 38 | Peabody | 0.05 | N | N | N | Y | N | Y | Y | Lithic |
| 15.59 | 15.63 | Se | 100 | Sensabaugh | 0.04 | Prime | N | N | N | N | N | Y | N |
| 15.63 | 15.66 | GsF | 38 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| 15.66 | 15.73 | GsE | 59 | Gilpin | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| 15.73 | 15.99 | GsF | 38 | Peabody | 0.09 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.16 | N | N | N | Y | N | Y | Y | Lithic |
| 15.99 | 17.65 | GsE | 41 | Peabody | 0.69 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.99 | N | N | N | Y | N | Y | Y | Lithic |
| 17.65 | 17.80 | GsF | 63 | Gilpin | 0.09 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 38 | Peabody | 0.06 | N | N | N | Y | N | Y | Y | Lithic |
| 17.80 | 17.84 | SeB | 100 | Sensabaugh | 0.04 | Prime | N | N | N | N | N | Y | N |
| 17.84 | 18.00 | GsF | 38 | Peabody | 0.06 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.10 | N | N | N | Y | N | Y | Y | Lithic |
| 18.00 | 18.11 | GsE | 41 | Peabody | 0.05 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 0.07 | N | N | N | Y | N | Y | Y | Lithic |
| 18.11 | 18.21 | GsF | 63 | Gilpin | 0.06 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 38 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| 18.21 | 18.26 | GpE | 50 | Gilpin | 0.03 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 50 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Paralithic |
| 18.26 | 18.31 | VaD | 100 | Vandalia | 0.05 | State | N | N | Y | N | Y | Y | N |
| 18.31 | 18.35 | MoB | 100 | Monongahela | 0.05 | State | N | N | N | N | N | N | N |

APPENDIX H

Soil Characteristics by Milepost Segment and Soil Map Unit Along the Proposed Pipeline Routes

| Milepost Begin | Milepost End | Map Unit Symbol | Component Percent (%) | Component Name | Crossing Length (miles) | Prime Farmland [a] | Hydric Soils [a] | Compaction Prone [b] | Highly Erodible Water [c] | Highly Erodible Wind [d] | Revegetation Concerns [e] | Stony/ Rocky [f] | Shallow to Bedrock [g] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18.35 | 18.37 | GsF | 38 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.01 | N | N | N | Y | N | Y | Y | Lithic |
| 18.37 | 18.55 | Co | 100 | Cotaco | 0.19 | Prime | N | N | N | N | N | N | N |
| 18.55 | 18.56 | W | 100 | Water | 0.01 | N | N | N | N | N | N | N | N |
| 18.56 | 18.59 | Ch | 100 | Chagrin | 0.03 | Prime | N | N | N | N | N | N | N |
| 18.59 | 18.70 | GsF | 38 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.07 | N | N | N | Y | N | Y | Y | Lithic |
| 18.70 | 18.70 | GsE | 59 | Gilpin | <0.01 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | <0.01 | N | N | N | Y | N | Y | Y | Lithic |
| 18.70 | 18.83 | GsF | 38 | Peabody | 0.05 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.08 | N | N | N | Y | N | Y | Y | Lithic |
| 18.83 | 19.99 | GsE | 59 | Gilpin | 0.70 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | 0.49 | N | N | N | Y | N | Y | Y | Lithic |
| 19.99 | 20.05 | GsF | 38 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.04 | N | N | N | Y | N | Y | Y | Lithic |
| 20.05 | 20.57 | GsE | 59 | Gilpin | 0.30 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 41 | Peabody | 0.21 | N | N | N | Y | N | Y | Y | Lithic |
| 20.57 | 20.65 | GsF | 38 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.05 | N | N | N | Y | N | Y | Y | Lithic |
| 20.65 | 20.69 | Se | 100 | Sensabaugh | 0.04 | Prime | N | N | N | N | N | Y | N |
| 20.69 | 20.74 | GsF | 38 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 63 | Gilpin | 0.03 | N | N | N | Y | N | Y | Y | Lithic |
| 20.74 | 22.73 | GsE | 41 | Peabody | 0.83 | N | N | N | Y | N | Y | Y | Lithic |
| | | | 59 | Gilpin | 1.19 | N | N | N | Y | N | Y | Y | Lithic |
| 22.73 | 22.87 | GuD | 38 | Upshur | 0.05 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.09 | State | N | N | Y | N | Y | Y | Paralithic |
| 22.87 | 22.92 | GpD | 38 | Upshur | 0.02 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.04 | State | N | N | Y | N | Y | Y | Paralithic |
| 22.92 | 23.05 | GpF | 38 | Upshur | 0.05 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.08 | N | N | N | Y | N | Y | Y | Paralithic |
| 23.05 | 23.07 | Sn | 100 | Sensabaugh | 0.02 | Prime | N | N | N | N | N | Y | N |
| Tyler County, WV | | | | | | | | | | | | | |
| 23.07 | 23.11 | Sn | 100 | Sensabaugh | 0.04 | Prime | N | N | N | N | N | Y | N |

APPENDIX H

Soil Characteristics by Milepost Segment and Soil Map Unit Along the Proposed Pipeline Routes

| Milepost | | Map Unit Symbol | Component Percent (%) | Component Name | Crossing Length (miles) | Prime Farmland [a] | Hydric Soils [a] | Compaction Prone [b] | Highly Erodible | | Revegetation Concerns [e] | Stony/ Rocky [f] | Shallow to Bedrock [g] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Begin | End | | | | | | | | Water [c] | Wind [d] | | | |
| 23.11 | 23.21 | GpF | 63 | Gilpin | 0.07 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 38 | Upshur | 0.04 | N | N | N | Y | N | Y | Y | Paralithic |
| 23.21 | 23.54 | GpD | 63 | Gilpin | 0.21 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 38 | Upshur | 0.13 | State | N | N | Y | N | Y | Y | Paralithic |
| 23.54 | 23.57 | GpD | 43 | Peabody | 0.01 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 57 | Gilpin | 0.02 | State | N | N | Y | N | Y | Y | Paralithic |
| Wetzel County, WV | | | | | | | | | | | | | |
| 23.57 | 23.59 | GpD | 57 | Gilpin | 0.01 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 43 | Peabody | 0.01 | State | N | N | Y | N | Y | Y | Paralithic |
| 23.59 | 23.88 | GpF | 63 | Gilpin | 0.18 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 38 | Peabody | 0.11 | N | N | N | Y | N | Y | Y | Paralithic |
| 23.88 | 24.01 | GpE | 44 | Peabody | 0.06 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 56 | Gilpin | 0.07 | N | N | N | Y | N | Y | Y | Paralithic |
| 24.01 | 24.09 | GpF | 63 | Gilpin | 0.05 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 38 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Paralithic |
| 24.09 | 24.09 | GpE | 44 | Peabody | <0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 56 | Gilpin | <0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| 24.09 | 24.24 | GpD | 57 | Gilpin | 0.08 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 43 | Peabody | 0.06 | State | N | N | Y | N | Y | Y | Paralithic |
| 24.24 | 24.24 | GpF | 38 | Peabody | <0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | <0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| 24.24 | 24.63 | GpD | 43 | Peabody | 0.17 | State | N | N | Y | N | Y | Y | Paralithic |
| | | GpD | 57 | Gilpin | 0.22 | State | N | N | Y | N | Y | Y | Paralithic |
| 24.63 | 24.74 | GpF | 38 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpF | 63 | Gilpin | 0.07 | N | N | N | Y | N | Y | Y | Paralithic |
| 24.74 | 24.79 | Sk | 100 | Skidmore | 0.05 | State | N | N | N | N | N | Y | N |
| 24.79 | 25.10 | GpF | 38 | Peabody | 0.12 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpF | 63 | Gilpin | 0.20 | N | N | N | Y | N | Y | Y | Paralithic |
| 25.10 | 25.24 | GpD | 57 | Gilpin | 0.08 | State | N | N | Y | N | Y | Y | Paralithic |
| | | GpD | 43 | Peabody | 0.06 | State | N | N | Y | N | Y | Y | Paralithic |
| 25.24 | 25.36 | GpF | 38 | Peabody | 0.05 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpF | 63 | Gilpin | 0.08 | N | N | N | Y | N | Y | Y | Paralithic |
| 25.36 | 25.45 | Sk | 100 | Skidmore | 0.09 | State | N | N | N | N | N | Y | N |

APPENDIX H

Soil Characteristics by Milepost Segment and Soil Map Unit Along the Proposed Pipeline Routes

| Milepost Begin | Milepost End | Map Unit Symbol | Component Percent (%) | Component Name | Crossing Length (miles) | Prime Farmland [a] | Hydric Soils [a] | Compaction Prone [b] | Highly Erodible Water [c] | Highly Erodible Wind [d] | Revegetation Concerns [e] | Stony/ Rocky [f] | Shallow to Bedrock [g] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25.45 | 25.50 | GpF | 38 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpF | 63 | Gilpin | 0.03 | N | N | N | Y | N | Y | Y | Paralithic |
| 25.50 | 25.60 | GpE | 56 | Gilpin | 0.05 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpE | 44 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Paralithic |
| 25.60 | 25.68 | GpF | 63 | Gilpin | 0.05 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpF | 38 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Paralithic |
| 25.68 | 25.73 | GpE | 44 | Peabody | 0.02 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpE | 56 | Gilpin | 0.03 | N | N | N | Y | N | Y | Y | Paralithic |
| 25.73 | 25.82 | GpD | 57 | Gilpin | 0.05 | State | N | N | Y | N | Y | Y | Paralithic |
| | | GpD | 43 | Peabody | 0.04 | State | N | N | Y | N | Y | Y | Paralithic |
| 25.82 | 25.89 | GpF | 63 | Gilpin | 0.05 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpF | 38 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Paralithic |
| 25.89 | 26.13 | GpD | 43 | Peabody | 0.10 | State | N | N | Y | N | Y | Y | Paralithic |
| | | GpD | 57 | Gilpin | 0.13 | State | N | N | Y | N | Y | Y | Paralithic |
| 26.13 | 26.28 | GpF | 38 | Peabody | 0.06 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpF | 63 | Gilpin | 0.10 | N | N | N | Y | N | Y | Y | Paralithic |
| 26.28 | 26.54 | GpD | 57 | Gilpin | 0.15 | State | N | N | Y | N | Y | Y | Paralithic |
| | | GpD | 43 | Peabody | 0.11 | State | N | N | Y | N | Y | Y | Paralithic |
| 26.54 | 26.78 | GpF | 38 | Peabody | 0.09 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpF | 63 | Gilpin | 0.15 | N | N | N | Y | N | Y | Y | Paralithic |
| 26.78 | 26.87 | VaD | 100 | Vandalia | 0.09 | State | N | N | Y | N | Y | Y | N |
| 26.87 | 26.95 | GpF | 38 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpF | 63 | Gilpin | 0.04 | N | N | N | Y | N | Y | Y | Paralithic |
| 26.95 | 27.02 | GpE | 44 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpE | 56 | Gilpin | 0.04 | N | N | N | Y | N | Y | Y | Paralithic |
| 27.02 | 27.37 | GpD | 43 | Peabody | 0.15 | State | N | N | Y | N | Y | Y | Paralithic |
| | | GpD | 57 | Gilpin | 0.20 | State | N | N | Y | N | Y | Y | Paralithic |
| 27.37 | 27.38 | GpE | 56 | Gilpin | 0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpE | 44 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| 27.38 | 27.50 | GpD | 57 | Gilpin | 0.07 | State | N | N | Y | N | Y | Y | Paralithic |
| | | GpD | 43 | Peabody | 0.05 | State | N | N | Y | N | Y | Y | Paralithic |
| 27.50 | 27.58 | GpE | 44 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpE | 56 | Gilpin | 0.04 | N | N | N | Y | N | Y | Y | Paralithic |

APPENDIX H

Soil Characteristics by Milepost Segment and Soil Map Unit Along the Proposed Pipeline Routes

| Milepost | | Map Unit Symbol | Component Percent (%) | Component Name | Crossing Length (miles) | Prime Farmland [a] | Hydric Soils [a] | Compaction Prone [b] | Highly Erodible | | Revegetation Concerns [e] | Stony/ Rocky [f] | Shallow to Bedrock [g] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Begin | End | | | | | | | | Water [c] | Wind [d] | | | |
| 27.58 | 27.84 | GpD | 43 | Peabody | 0.11 | State | N | N | Y | N | Y | Y | Paralithic |
| | | GpD | 57 | Gilpin | 0.15 | State | N | N | Y | N | Y | Y | Paralithic |
| 27.84 | 28.07 | GpF | 38 | Peabody | 0.09 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpF | 63 | Gilpin | 0.15 | N | N | N | Y | N | Y | Y | Paralithic |
| 28.07 | 28.12 | Sk | 100 | Skidmore | 0.05 | State | N | N | N | N | N | Y | N |
| 28.12 | 28.20 | GpF | 38 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpF | 63 | Gilpin | 0.05 | N | N | N | Y | N | Y | Y | Paralithic |
| 28.20 | 28.22 | GpE | 44 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpE | 56 | Gilpin | 0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| 28.22 | 28.40 | GpF | 38 | Peabody | 0.07 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpF | 63 | Gilpin | 0.11 | N | N | N | Y | N | Y | Y | Paralithic |
| 28.40 | 28.47 | GpE | 44 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpE | 56 | Gilpin | 0.04 | N | N | N | Y | N | Y | Y | Paralithic |
| 28.47 | 28.62 | GpF | 38 | Peabody | 0.06 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpF | 63 | Gilpin | 0.10 | N | N | N | Y | N | Y | Y | Paralithic |
| 28.62 | 29.08 | GpE | 44 | Peabody | 0.20 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpE | 56 | Gilpin | 0.25 | N | N | N | Y | N | Y | Y | Paralithic |
| 29.08 | 29.40 | GpF | 63 | Gilpin | 0.20 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpF | 38 | Peabody | 0.12 | N | N | N | Y | N | Y | Y | Paralithic |
| 29.40 | 29.51 | No | 100 | Nolin | 0.11 | Prime | N | N | N | N | N | Y | N |
| 29.51 | 29.52 | GpE | 44 | Peabody | <0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpE | 56 | Gilpin | <0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| 29.52 | 29.60 | GpD | 57 | Gilpin | 0.04 | State | N | N | Y | N | Y | Y | Paralithic |
| | | GpD | 43 | Peabody | 0.03 | State | N | N | Y | N | Y | Y | Paralithic |
| 29.60 | 29.71 | GpE | 56 | Gilpin | 0.07 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpE | 44 | Peabody | 0.05 | N | N | N | Y | N | Y | Y | Paralithic |
| 29.71 | 29.72 | GpD | 57 | Gilpin | 0.01 | State | N | N | Y | N | Y | Y | Paralithic |
| | | GpD | 43 | Peabody | <0.01 | State | N | N | Y | N | Y | Y | Paralithic |
| 29.72 | 29.75 | EkB | 100 | Elk | 0.02 | Prime | N | N | N | N | N | N | N |
| 29.75 | 29.86 | No | 100 | Nolin | 0.11 | Prime | N | N | N | N | N | Y | N |
| 29.86 | 29.88 | GpE | 44 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| | | GpE | 56 | Gilpin | 0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| 29.88 | 29.89 | No | 100 | Nolin | 0.01 | Prime | N | N | N | N | N | Y | N |

APPENDIX H

Soil Characteristics by Milepost Segment and Soil Map Unit Along the Proposed Pipeline Routes

| Milepost | | Map Unit Symbol | Component Percent (%) | Component Name | Crossing Length (miles) | Prime Farmland [a] | Hydric Soils [a] | Compaction Prone [b] | Highly Erodible | | Revegetation Concerns [e] | Stony/ Rocky [f] | Shallow to Bedrock [g] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Begin | End | | | | | | | | Water [c] | Wind [d] | | | |
| 29.89 | 29.92 | GpE | 44 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 56 | Gilpin | 0.02 | N | N | N | Y | N | Y | Y | Paralithic |
| 29.92 | 30.13 | No | 100 | Nolin | 0.20 | Prime | N | N | N | N | N | Y | N |
| 30.13 | 30.26 | GpF | 63 | Gilpin | 0.08 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 38 | Peabody | 0.05 | N | N | N | Y | N | Y | Y | Paralithic |
| 30.26 | 30.27 | GpE | 44 | Peabody | <0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 56 | Gilpin | <0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| 30.27 | 30.27 | GpF | 63 | Gilpin | <0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 38 | Peabody | <0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| 30.27 | 30.55 | GpE | 44 | Peabody | 0.12 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 56 | Gilpin | 0.16 | N | N | N | Y | N | Y | Y | Paralithic |
| 30.55 | 30.59 | GpF | 38 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.02 | N | N | N | Y | N | Y | Y | Paralithic |
| 30.59 | 30.71 | GpD | 43 | Peabody | 0.05 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 57 | Gilpin | 0.06 | State | N | N | Y | N | Y | Y | Paralithic |
| 30.71 | 30.82 | GpF | 63 | Gilpin | 0.07 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 38 | Peabody | 0.04 | N | N | N | Y | N | Y | Y | Paralithic |
| 30.82 | 30.97 | No | 100 | Nolin | 0.15 | Prime | N | N | N | N | N | Y | N |
| 30.97 | 31.00 | GpF | 63 | Gilpin | 0.02 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 38 | Peabody | 0.01 | N | N | N | Y | N | Y | Y | Paralithic |
| 31.00 | 31.18 | GpD | 57 | Gilpin | 0.10 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 43 | Peabody | 0.08 | State | N | N | Y | N | Y | Y | Paralithic |
| 31.18 | 31.58 | GpE | 44 | Peabody | 0.18 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 56 | Gilpin | 0.23 | N | N | N | Y | N | Y | Y | Paralithic |
| 31.58 | 31.81 | GpF | 38 | Peabody | 0.09 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.15 | N | N | N | Y | N | Y | Y | Paralithic |
| 31.81 | 31.85 | Sk | 100 | Skidmore | 0.04 | State | N | N | N | N | N | Y | N |
| 31.85 | 31.92 | GpF | 38 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.04 | N | N | N | Y | N | Y | Y | Paralithic |
| 31.92 | 32.13 | GpD | 43 | Peabody | 0.09 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 57 | Gilpin | 0.12 | State | N | N | Y | N | Y | Y | Paralithic |
| 32.13 | 32.47 | GpF | 63 | Gilpin | 0.22 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 38 | Peabody | 0.13 | N | N | N | Y | N | Y | Y | Paralithic |

APPENDIX H

Soil Characteristics by Milepost Segment and Soil Map Unit Along the Proposed Pipeline Routes

| Milepost | | Map Unit Symbol | Component Percent (%) | Component Name | Crossing Length (miles) | Prime Farmland [a] | Hydric Soils [a] | Compaction Prone [b] | Highly Erodible | | Revegetation Concerns [e] | Stony/ Rocky [f] | Shallow to Bedrock [g] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Begin | End | | | | | | | | Water [c] | Wind [d] | | | |
| 32.47 | 33.11 | GpD | 43 | Peabody | 0.28 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 57 | Gilpin | 0.37 | State | N | N | Y | N | Y | Y | Paralithic |
| 33.11 | 33.21 | GpF | 38 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.06 | N | N | N | Y | N | Y | Y | Paralithic |
| 33.21 | 33.25 | Sk | 100 | Skidmore | 0.04 | State | N | N | N | N | N | Y | N |
| 33.25 | 33.32 | GpF | 38 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.05 | N | N | N | Y | N | Y | Y | Paralithic |
| 33.32 | 33.39 | GpE | 56 | Gilpin | 0.04 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 44 | Peabody | 0.03 | N | N | N | Y | N | Y | Y | Paralithic |
| 33.39 | 33.51 | GpF | 38 | Peabody | 0.05 | N | N | N | Y | N | Y | Y | Paralithic |
| | | | 63 | Gilpin | 0.08 | N | N | N | Y | N | Y | Y | Paralithic |
| 33.51 | 33.53 | GpD | 43 | Peabody | 0.01 | State | N | N | Y | N | Y | Y | Paralithic |
| | | | 57 | Gilpin | 0.01 | State | N | N | Y | N | Y | Y | Paralithic |

[a] As designated by the Natural Resources Conservation Service. Prime = Prime with not mitigation, State = soil of statewide importance

[b] Includes soils that have clay loam or finer textures in somewhat poor, poor, and very poor drainage classes.

[c] Includes land in capability subclasses 4E through 8E and soils with an average slope greater than or equal to 9 percent.

[d] Includes soils with Wind Erodibility Group classification of one or two.

[e] Includes coarse-textured soils (sandy loams and coarser) that are moderately well to excessively drained and soils with an average slope greater than or equal to 9 percent.

[f] Includes soils that have either: 1) a very gravelly, extremely gravelly, cobbley, stony, bouldery, flaggy, or channery modifier to the textural class, or 2) have greater than 5 percent (weight basis) of rock fragments larger than 3 inches in any layer within the profile.

[g] Includes soils that have bedrock within 60 inches of the soil surface. Paralithic refers to "soft" bedrock that will not likely require blasting during construction. Lithic refers to "hard" bedrock that may require blasting or other special construction techniques during installation of the proposed pipeline segments.

Note: Y = Yes; N = No

# APPENDIX I

Wetlands Crossed and Crossing Methods Table

**Wetlands Crossed by the Supply Header Project in West Virginia**

| MP | Feature ID | Wetland Type [a] | Crossing Length (feet) [b] | Temporary Impact (acres) [c] | Conversion Impacts (acres) [d] | Permanent Loss | Construction Method | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|---|
| **Pipeline Facilities** | | | | | | | | | |
| **HUC 8 - 5020002** | | | | | | | | | |
| **Harrison County** | | | | | | | | | |
| 0.1 | whag001e | PEM | NA | 0.33 | 0 | 0 | Not Crossed by Centerline | 39.172195 | -80.561942 |
| 0.4 | whag002e | PEM | NA | 0.21 | 0 | 0 | Not Crossed by Centerline | 39.175847 | -80.565526 |
| **HUC 8 - 5030201** | | | | | | | | | |
| **Doddridge County** | | | | | | | | | |
| 0.8 | wdog001e | PEM | NA | 0.05 | 0 | 0 | Not Crossed by Centerline | 39.17951 | -80.56967 |
| 1.3 | wdog005e | PEM | 94 | 0.18 | 0 | 0 | Open Cut | 39.18491 | -80.57471 |
| 1.4 | wdoh003e | PEM | NA | 0.03 | 0 | 0 | Not Crossed by Centerline | 39.18549 | -80.57534 |
| 2.9 | wdog006f | PFO | 23 | 0.04 | 0.03 | 0 | Open Cut | 39.20134 | -80.59129 |
| 5.1 | wdog008f | PFO | 37 | 0.07 | 0.04 | 0 | Open Cut | 39.22499 | -80.60875 |
| 12.2 | wdog010f | PFO | 50 | 0.06 | 0.06 | 0 | Open Cut | 39.31009 | -80.639 |
| 15.1 | wdog003e | PEM | NA | <0.01 | 0 | 0 | Not Crossed by Centerline | 39.34868 | -80.6383 |
| 20.7 | wdog012s | PSS | 65 | 0.09 | 0.07 | 0 | Open Cut | 39.41918 | -80.62924 |
| **Wetzel County** | | | | | | | | | |
| 24.8 | wwzg003f | PFO | 61 | 0.1 | 0.07 | 0 | Open Cut | 39.47013 | -80.62012 |
| 26.8 | wwzg004f | PFO | 129 | 0.19 | 0.13 | 0 | Open Cut | 39.49418 | -80.60684 |
| 31.3 | wwza001e | PEM | NA | <0.01 | 0 | 0 | Not Crossed by Centerline | 39.53872 | -80.63663 |
| **Access Roads** | | | | | | | | | |
| **HUC 8 - 5030201** | | | | | | | | | |
| **Doddridge County** | | | | | | | | | |
| 4.0 | wdoa002e | PEM | 13 | 0 | 0 | <0.01 | Add stone | 39.21419 | -80.59756 |
| 14.1 | wdoh006f | PFO | 71 | 0 | 0 | 0.04 | Replace culvert/add stone | 39.33531 | -80.63577 |
| 18.5 | wdoa100e | PEM | 39 | 0 | 0 | 0.03 | Add timber mats and stone/sand | 39.39116 | -80.63607 |
| 24.8 | wwzg003f | PFO | 95 | 0 | 0 | 0.07 | Add timber mats | 39.47013 | -80.62012 |
| 25.4 | wwzh021e | PEM | 172 | 0 | 0 | 0.1 | Add stone | 39.47706 | -80.60437 |
| 25.4 | wwzh022e | PEM | 74 | 0 | 0 | 0.05 | Add stone | 39.47611 | -80.60026 |
| 26.2 | wwzh020e | PEM | 102 | 0 | 0 | 0.06 | Add stone | 39.48671 | -80.61369 |

**Wetlands Crossed by the Supply Header Project in West Virginia**

| MP | Feature ID | Wetland Type [a] | Crossing Length (feet) [b] | Temporary Impact (acres) [c] | Conversion Impacts (acres) [d] | Permanent Loss | Construction Method | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|---|
| **Ground Beds** | | | | | | | | | |
| **HUC 8 - 5030201** | | | | | | | | | |
| 17.8 | wdoh004e | PEM | NA | 0.01 | 0 | 0 | Open Cut | 39.38304 | -80.6388 |
| **HUC 8 - 5030201** | | | | | | | | | |
| **Water Impoundments** | | | | | | | | | |
| 18.5 | wdoa100e | PEM | NA | 0.03 | 0 | 0 | Add timber mats and stone/sand | 39.39145 | -80.63613 |
| | | **Totals** | **1,025** | **1.40** | **0.40** | **0.36** | | | |

[a] Indicates Cowardin classification. PEM – palustrine emergent, PSS – palustrine scrub-shrub, and PFO – palustrine forested.
[b] NA for Approximate Crossing Width indicates that the proposed pipeline or access road centerline does not cross the waterbody.
[c] Temporary impacts include all permanent right-of-way workspace, temporary workspace, and extra temporary workspace, and temporary access roads.
[d] Conversion of PFO and PSS wetlands consists of acreage that will be maintained as herbaceous/scrub-shrub wetlands following construction to facilitate inspection and maintenance of the pipeline.

# APPENDIX J

Site Specific Plans for Residences

# SUPPLY HEADER PROJECT

FERC's Plans will be followed for Residential Construction, for all Residences located within 50 feet of the construction work area

1. Orange safety fence will be installed at a minimum 15 feet from the residence, and 100 feet along the construction corridor, each direction from residence.
2. Will avoid the removal of mature trees and landscaping within the construction work area, unless necessary for safe operation of equipment, or as specified in the landowner agreements
3. Restore all lawn areas and landscaping immediately following clean up operations or as specified in landowner agreement
4. During landowner negotiations, identify location of septic system and avoid or develop a replacement plan with landowner during construction.

For this project, the following notes will also be applied

a. Where the pipeline centerline is within 25 feet of a residence, the trench will not be excavated until the pipe is ready for installation.

b. Landowner will be notified one week prior to construction on his/her property

c. No refueling or storage of hazardous materials will occur within 200 feet of a private well.

d. Steel plating or other effective means will be provided to allow landowner access to his/her residence should construction or other ground disturbance occur. Required at egress points, landowner driveways, or other private access ways.

e. On public roads, we will follow our traffic management plans that are filed as part of the permit

f. Construction will be limited to daylight hours.

g. Applicant will:

- Ensure piping is welded and installed as quickly as possible to minimize the amount of time a neighborhood is affected by construction;
- Complete final cleanup, grading, and installation of permanent erosion control devices within 10 days after backfilling the trench, weather permitting.
- During landowner negotiations, will work with landowner on restoration procedure. These procedures will include seeding mix, tree/shrub planting and hardscape replacement.

| | | | | | |
|---|---|---|---|---|---|
| gai consultants<br>SOUTHPOINTE OFFICE<br>6000 TOWNE CENTER BLVD.<br>CANONSBURG, PA 15317<br>724-873-3545 | CONSTRUCTION TECHNIQUES<br>NEAR RESIDENTIAL STRUCTURES<br>GENERAL NOTES | DWN. JJP | CHKD. DLH | APPD. NET | DATE 9/09/2015 |
| | | SCALE: NONE | | | TASK NO. 00 |
| | DOMINION TRANSMISSION, INC.<br>445 W. MAIN STREET<br>CLARKSBURG, WEST VIRGINIA 26301 | PROJECT NO./DASH NO. 141330.01 | | | |
| | | DRAWING NO. A001 | | | REV — |

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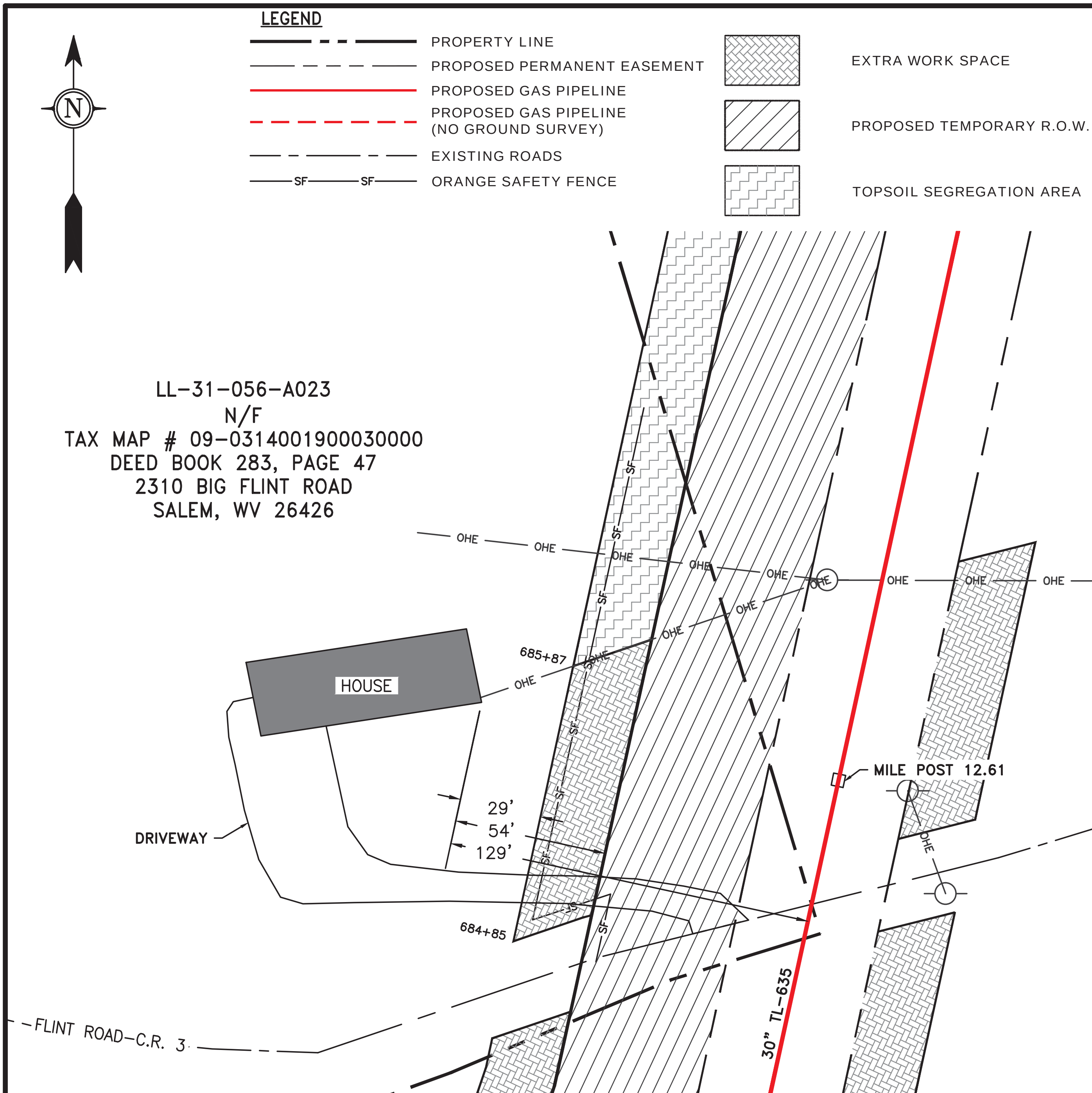


NOTES:

1. CONSTRUCTION TECHNIQUE WILL BE STOVE PIPE OR DRAG SECTION AND ROAD BORE.
2. ORANGE SAFETY FENCE WILL BE INSTALLED A MINIMUM OF FIFTEEN FEET FROM RESIDENCE. ALONG CONSTRUCTION R/W, 100' TO EITHER SIDE OF STRUCTURE.
3. VEHICLE ACCESS TO RESIDENCE WILL BE MAINTAINED AT ALL TIMES DURING THE CONSTRUCTION PERIOD.

SCALE: 1" = 50'

50' 0 50' 100'

gai consultants
SOUTHPOINTE OFFICE
6000 TOWN CENTER BLVD.
SUITE 300 EAST
CANONSBURG, PA 15317
724-873-3545

RIGHT OF WAY EXHIBIT

DODDRIDGE COUNTY, WEST VIRGINIA

DOMINION TRANSMISSION, INC.
445 W. MAIN STREET
CLARKSBURG, WEST VIRGINIA 26301

DWN. EilerAC | CHKD. HoosiDL | APPD. TysonNE | DATE 9/1/15

SCALE: AS SHOWN | TASK NO. 05

PROJECT NO./DASH NO. 141330.01

DRAWING NO. LL-31-056-A023 REV

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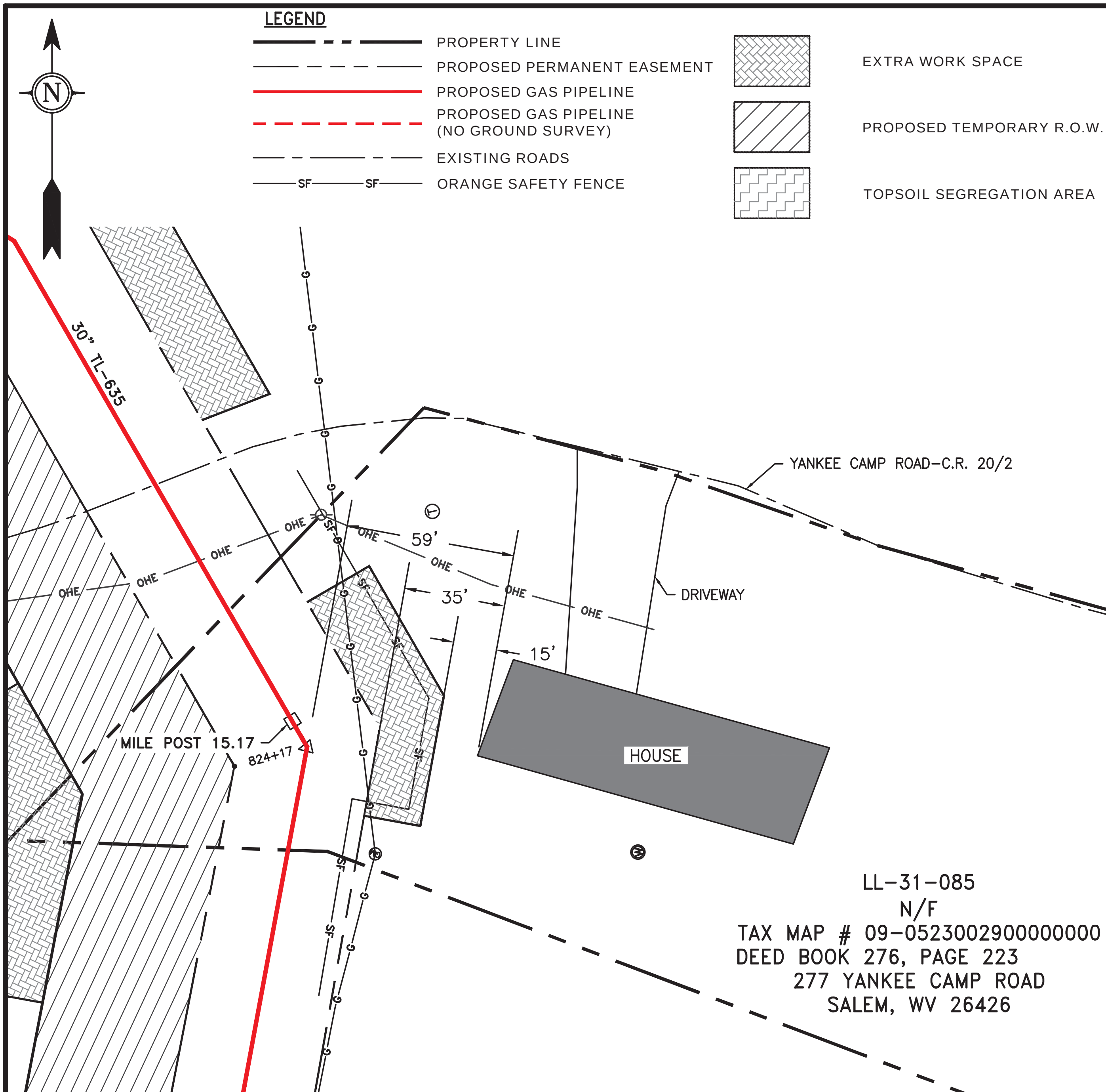


NOTES:

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2. ORANGE SAFETY FENCE WILL BE INSTALLED A MINIMUM OF FIFTEEN FEET FROM RESIDENCE. ALONG CONSTRUCTION R/W, 100' TO EITHER SIDE OF STRUCTURE.
3. VEHICLE ACCESS TO RESIDENCE WILL BE MAINTAINED AT ALL TIMES DURING THE CONSTRUCTION PERIOD.

SCALE: 1" = 50'

50' 0 50' 100'

gai consultants
SOUTHPOINTE OFFICE
6000 TOWN CENTER BLVD.
SUITE 300 EAST
CANONSBURG, PA 15317
724–873–3545

**RIGHT OF WAY EXHIBIT**

DODDRIDGE COUNTY, WEST VIRGINIA

**DOMINION TRANSMISSION, INC.**
445 W. MAIN STREET
CLARKSBURG, WEST VIRGINIA 26301

DWN. EilerAC | CHKD. HoosiDL | APPD. TysonNE | DATE 9/1/15

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PROJECT NO./DASH NO. 141330.01

DRAWING NO. LL–31–085 | REV –

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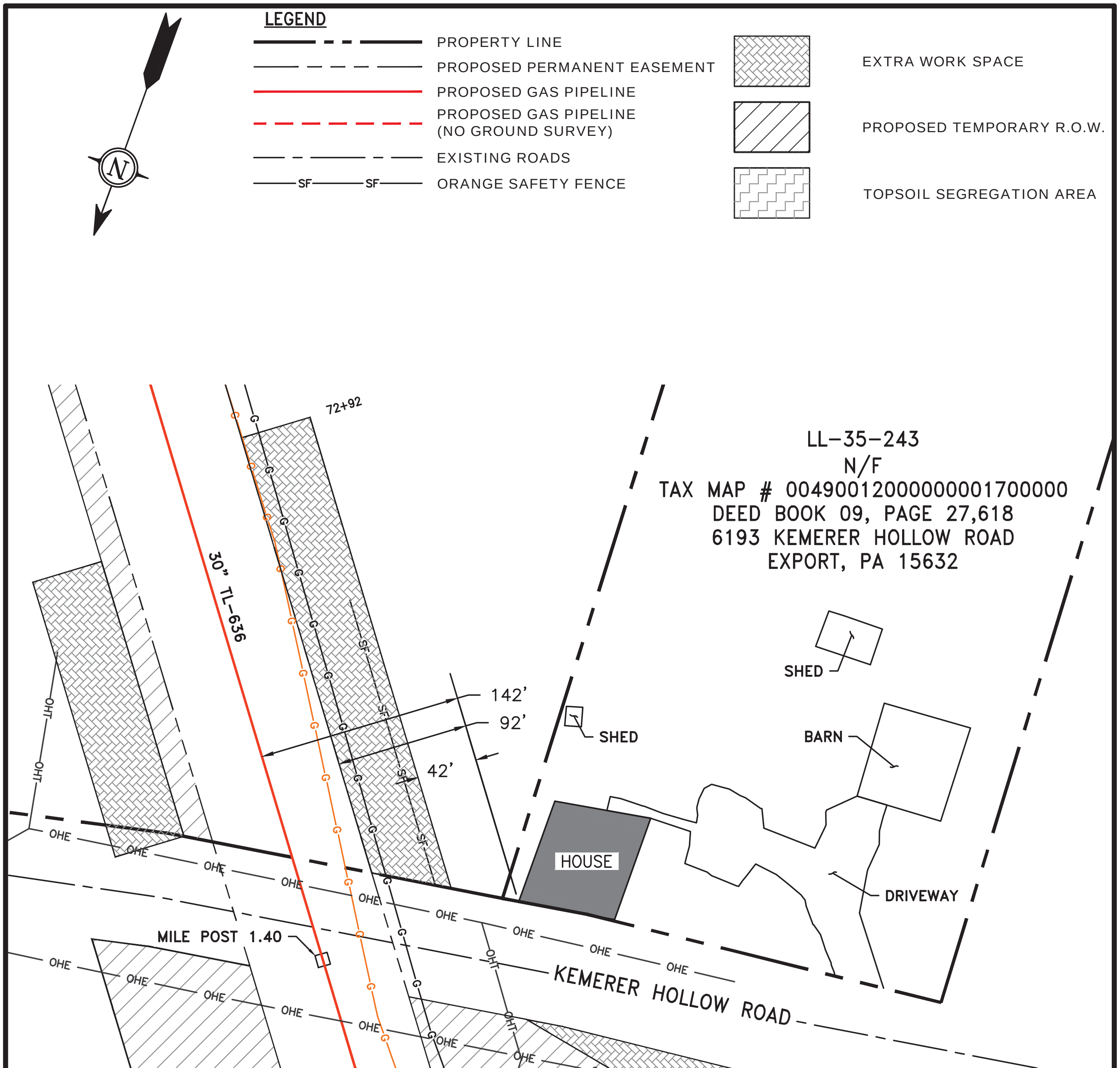


NOTES:

1. CONSTRUCTION TECHNIQUE WILL BE STOVE PIPE OR DRAG SECTION AND ROAD BORE.
2. ORANGE SAFETY FENCE WILL BE INSTALLED A MINIMUM OF FIFTEEN FEET FROM RESIDENCE. ALONG CONSTRUCTION R/W, 100' TO EITHER SIDE OF STRUCTURE.
3. VEHICLE ACCESS TO RESIDENCE WILL BE MAINTAINED AT ALL TIMES DURING THE CONSTRUCTION PERIOD.

SCALE: 1" = 50'

50' 0 50' 100'

gai consultants
SOUTHPOINTE OFFICE
6000 TOWN CENTER BLVD.
SUITE 300 EAST
CANONSBURG, PA 15317
724-873-3545

**RIGHT OF WAY EXHIBIT**

WESTMORELAND COUNTY, PENNSYLVANIA

**DOMINION TRANSMISSION, INC.**
445 W. MAIN STREET
CLARKSBURG, WEST VIRGINIA 26301

| DWN. EilerAC | CHKD. HoosiDL | APPD. TysonNE | DATE 9/1/15 |
|---|---|---|---|
| SCALE: AS SHOWN | | | TASK NO. 05 |

PROJECT NO./DASH NO. 141330.01

DRAWING NO. LL-35-243 REV —

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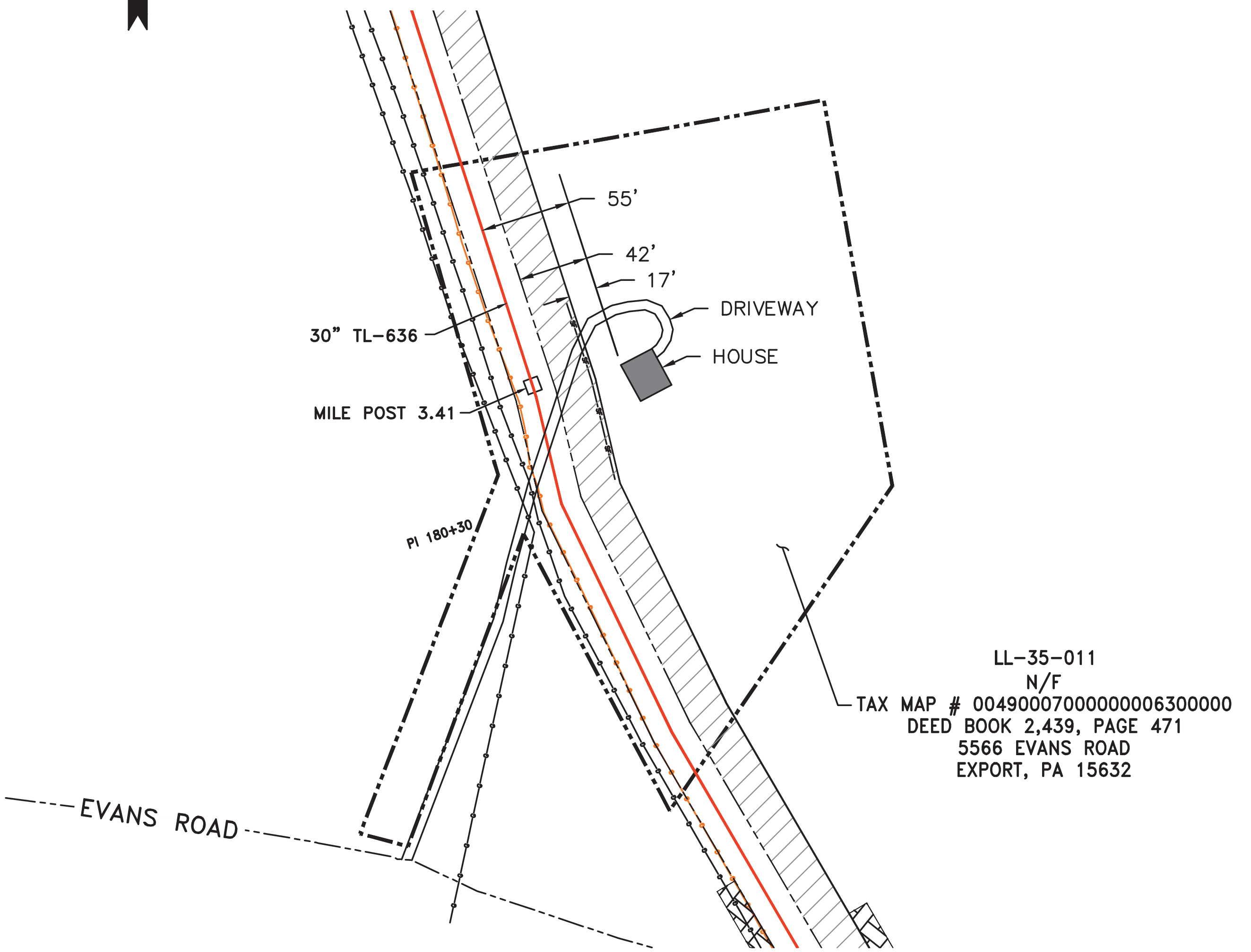
GAI CAD FILE: Z:\ENERGY\2014\C141330.01 - DTI - SUPPLY HEADER - SURV\CAD\SURV C141330.01\CONSTRUCTION_ALIGNMENT - PA\DWG\HOUSE EXHIBITS\C141330-01-000-00-017_HOUSE EXHIBIT_LL-35-243.DWG

9/1/2015 12:01 PM

LEGEND

- PROPERTY LINE
- PROPOSED PERMANENT EASEMENT
- PROPOSED GAS PIPELINE
- PROPOSED GAS PIPELINE (NO GROUND SURVEY)
- EXISTING ROADS
- ORANGE SAFETY FENCE
- EXTRA WORK SPACE
- PROPOSED TEMPORARY R.O.W.
- TOPSOIL SEGREGATION AREA




NOTES:

1. CONSTRUCTION TECHNIQUE WILL BE STOVE PIPE OR DRAG SECTION AND ROAD BORE.
2. ORANGE SAFETY FENCE WILL BE INSTALLED A MINIMUM OF FIFTEEN FEET FROM RESIDENCE. ALONG CONSTRUCTION R/W, 100' TO EITHER SIDE OF STRUCTURE.
3. VEHICLE ACCESS TO RESIDENCE WILL BE MAINTAINED AT ALL TIMES DURING THE CONSTRUCTION PERIOD.

SCALE: 1" = 200'

200' 0 200' 400'

gai consultants
SOUTHPOINTE OFFICE
6000 TOWN CENTER BLVD.
SUITE 300 EAST
CANONSBURG, PA 15317
724-873-3545

**RIGHT OF WAY EXHIBIT**
MICHAEL P. & SANDRA L. PAJAK
WESTMORELAND COUNTY, PENNSYLVANIA

**DOMINION TRANSMISSION, INC.**
445 W. MAIN STREET
CLARKSBURG, WEST VIRGINIA 26301

DWN. EilerAC | CHKD. HoosiDL | APPD. TysonNE | DATE 9/2/15

SCALE: AS SHOWN | TASK NO. 05

PROJECT NO./DASH NO. 141330.01

DRAWING NO. LL-35-011 | REV –

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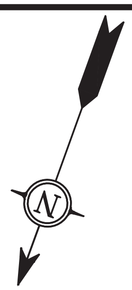
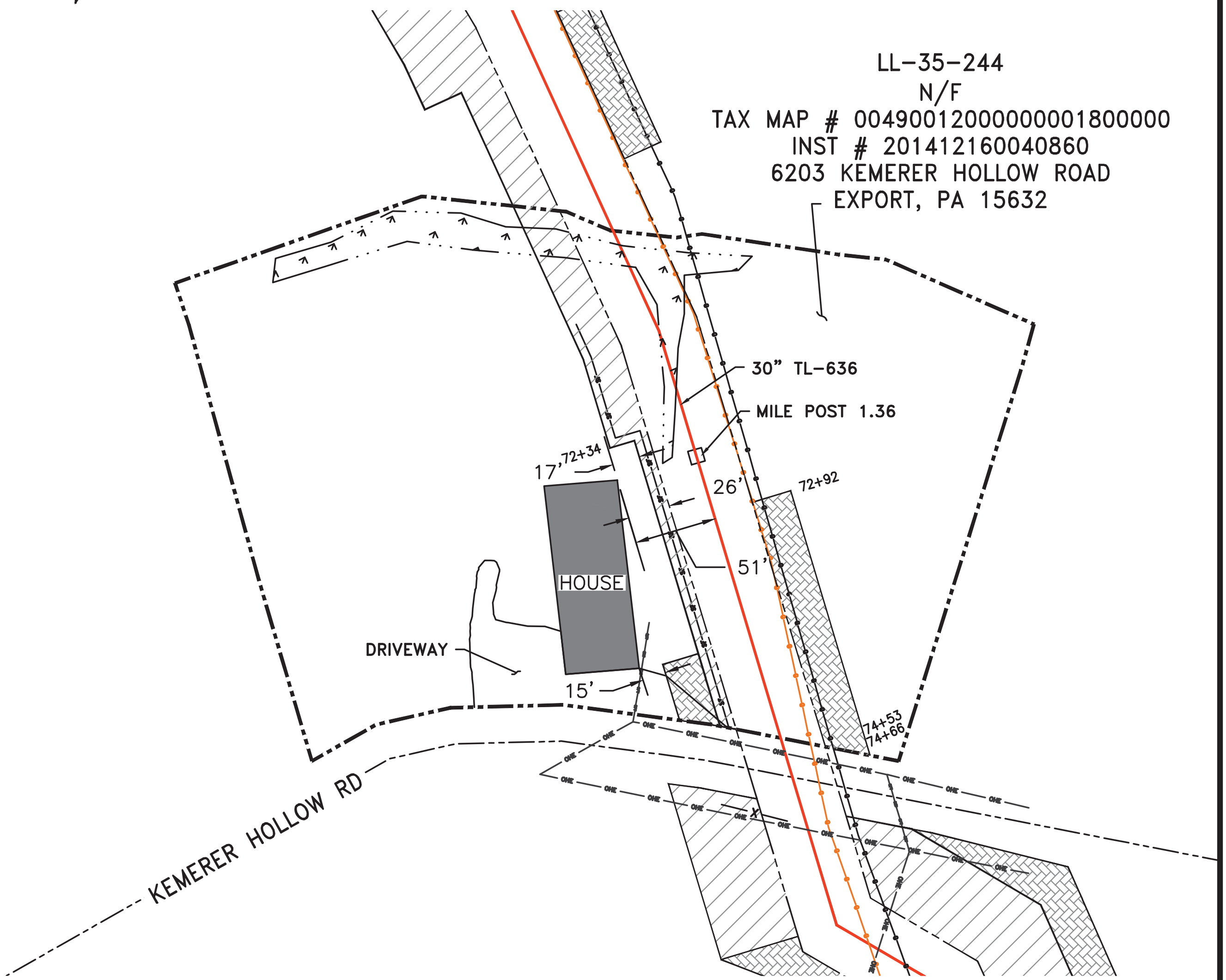
GAI CAD FILE: Z:\ENERGY\2014\C141330.01 - DTI - SUPPLY HEADER - SUR\CAD\SURV C141330.01\CONSTRUCTION_ALIGNMENT - PA\DWG\HOUSE EXHIBITS\C141330-01-000-00-A030_HOUSE EXHIBIT_LL-35-011.DWG

9/2/2015 10:36 AM



**LEGEND**

| | |
|---|---|
| PROPERTY LINE | |
| PROPOSED PERMANENT EASEMENT | EXTRA WORK SPACE |
| PROPOSED GAS PIPELINE | PROPOSED TEMPORARY R.O.W. |
| PROPOSED GAS PIPELINE (NO GROUND SURVEY) | TOPSOIL SEGREGATION AREA |
| EXISTING ROADS | |
| ORANGE SAFETY FENCE | |




**NOTES:**

1. CONSTRUCTION TECHNIQUE WILL BE STOVE PIPE OR DRAG SECTION AND ROAD BORE.
2. ORANGE SAFETY FENCE WILL BE INSTALLED A MINIMUM OF FIFTEEN FEET FROM RESIDENCE. ALONG CONSTRUCTION R/W, 100' TO EITHER SIDE OF STRUCTURE.
3. VEHICLE ACCESS TO RESIDENCE WILL BE MAINTAINED AT ALL TIMES DURING THE CONSTRUCTION PERIOD.

SCALE: 1" = 100'

100' 0 100' 200'

gai consultants
SOUTHPOINTE OFFICE
6000 TOWN CENTER BLVD.
SUITE 300 EAST
CANONSBURG, PA 15317
724-873-3545

**RIGHT OF WAY EXHIBIT**

WESTMORELAND COUNTY, PENNSYLVANIA

**DOMINION TRANSMISSION, INC.**
445 W. MAIN STREET
CLARKSBURG, WEST VIRGINIA 26301

| | | | |
|---|---|---|---|
| DWN. EilerAC | CHKD. HoosiDL | APPD. TysonNE | DATE 9/2/15 |
| SCALE: AS SHOWN | | | TASK NO. 05 |

PROJECT NO./DASH NO. 141330.01

DRAWING NO. LL-35-244

REV –

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GAI CAD FILE: Z:\ENERGY\2014\C141330.01 - DTI - SUPPLY HEADER - SURV\CAD\SURV C141330.01\CONSTRUCTION_ALIGNMENT - PA\DWG\HOUSE EXHIBITS\C141330-01-000-00-A011_HOUSE EXHIBIT_LL-35-244.DWG

9/2/2015 10:52 AM

# APPENDIX K

Best-In-Class (BIC) Steep Slope Control Measures and Site-Specific Design

# Best-In-Class Decision Tool/ Work Flow Process

**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 "West Virginia General Water Pollution Control Permit for Stormwater Associated with Oil and Gas Construction Activity, Stormwater Pollution Prevention Plan (SWPPP), Atlantic Coast Pipeline (Harrison, Lewis, Upshur, Randolph, and Pocahontas Counties, West Virginia)", Rev 5 dated March 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).

# Atlantic Coast Pipeline Project

## Best in Class (BIC) Field Implementation Form

| Spread/Project | Business Unit | Date |
|---|---|---|
| | Dominion Transmission, Inc | |

| Attendees |
|---|
| Construction/Engineering- |
| Environmental- |
| Contractor- |

| Location | |
|---|---|
| Station Begin: | 0+00 |
| Station End: | 0+00 |
| Milepost Begin: | 0.00 |
| Milepost End: | 0.00 |

| **Current Site Conditions:** (Choose from Drop Menu) | |
|---|---|
| Weather Conditions: | Partly Cloudy |
| Precipitation: | Heavy Rain |
| Wind: | Heavy Wind >20 mph |
| Temperature: | |
| ROW Conditions: | Dry |

| Typical Slope Design | |
|---|---|
| Slope Design A | ☐ |
| Slope Design B | ☐ |
| Slope Design C | ☐ |
| Slope Design D | ☐ |
| Slope Design E | ☐ |
| Slope Design F | ☐ |
| Site Specific Design | ☐ |

| **48 Hour Forcast Site Conditions:** (Choose from Drop Menu) | |
|---|---|
| Weather Conditions: | Clear |
| Precipitation: | Light Rain |
| Wind: | Light Wind <10 mph |
| Temperature: | |
| ROW Conditions: | Frozen |

**Notable Slope Characteristics during Construction**

Describe slope as it pertains to construction at that moment. Also area to put in what type of slope (eg, A1 or A2) if Typical Design A is chosen above. Include characteristics of features at toe of slopes if present, etc.

**Group Discussion and Communications**

General notes as discussed by individuals in the field making decisions on what controls to implement.

**BIC Incremental Controls Implemented on Slope as chosen by Group**

Use both the oval and diamond letters from Typical Design Sheets along with any additional notes regarding incremental controls added

**Follow-up Information if needed**

**Group Affirmation:** ☑ By checking this box, I affirm that the above observations are correct to the best of my knowledge.
This form is to be completed in accordance with the required BIC training program.

**Signature of Parties Involved in Implementation:**

Photo 1

Station #:
Direction:
Comments:

Photo 2

Station #:
Direction:
Comments:

Photo 3

Station #:
Direction:
Comments:

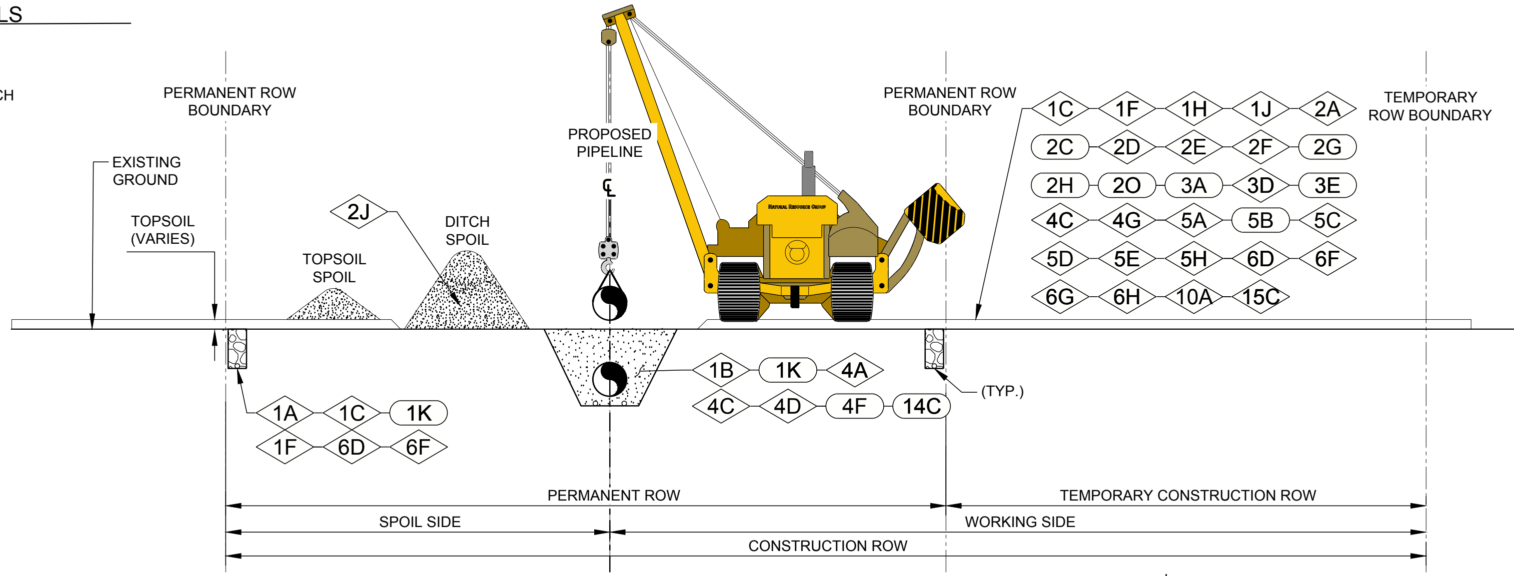
Photo 4

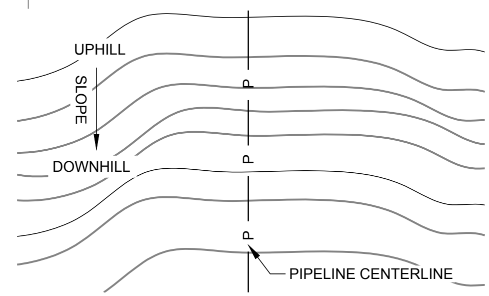
Station #:
Direction:
Comments:

# 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 (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

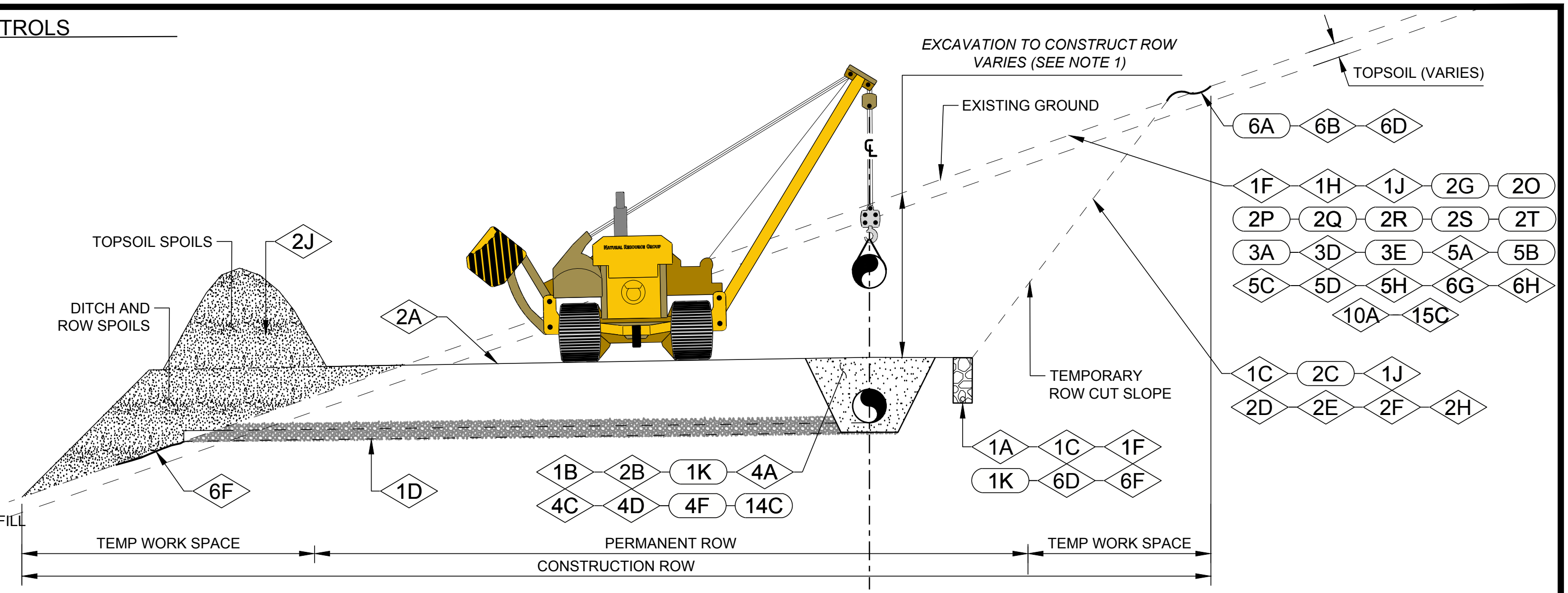
TITLE
**A1 – STEEP SLOPES WITHOUT EVIDENCE OF PREVIOUS MOVEMENT (PLANAR SLOPE)**

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 | 1 OF 2 |
| REVIEW | AQK | 2017-02-28 | |

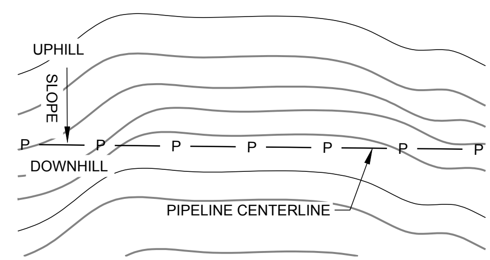
## BEST IN CLASS (BIC) INCREMENTAL CONTROLS

- 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
- 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
- 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

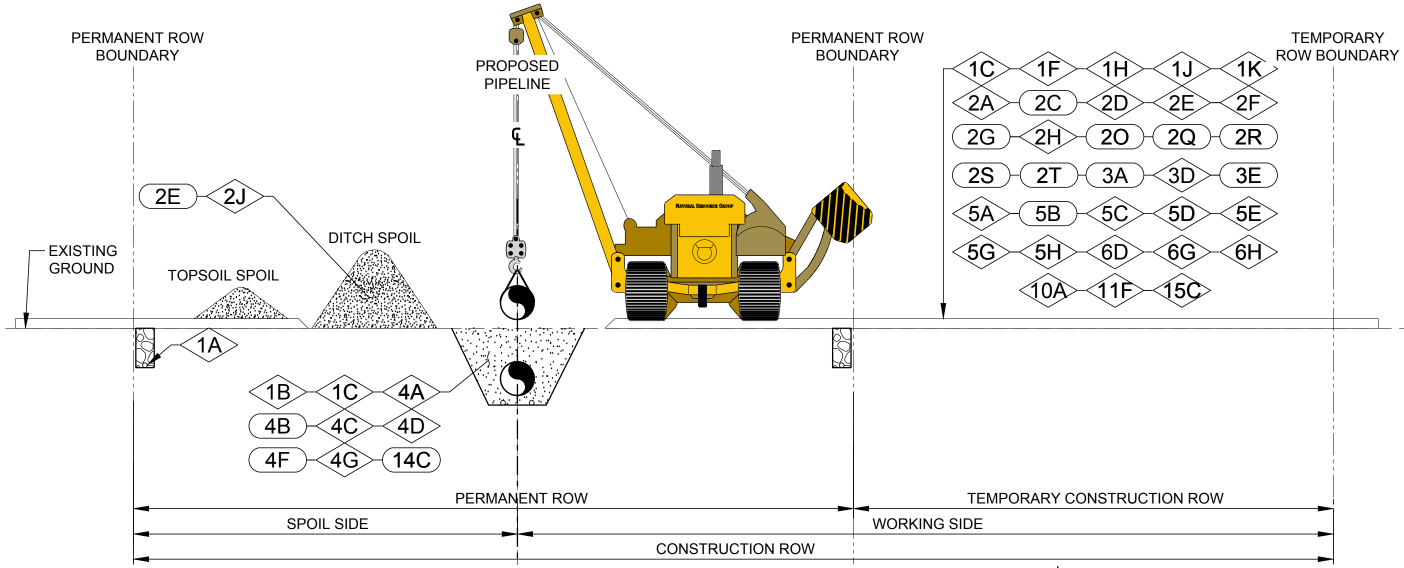
TITLE
**A2 - STEEP SLOPES WITHOUT EVIDENCE OF PREVIOUS MOVEMENT (SIDESLOPE)**

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 | |

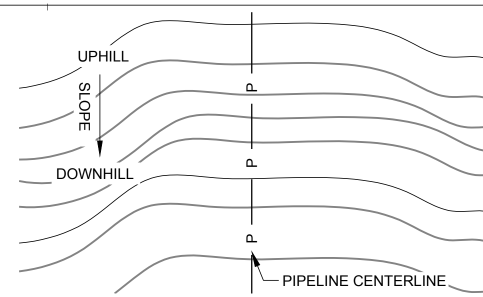
## BEST IN CLASS (BIC) INCREMENTAL CONTROLS

- 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

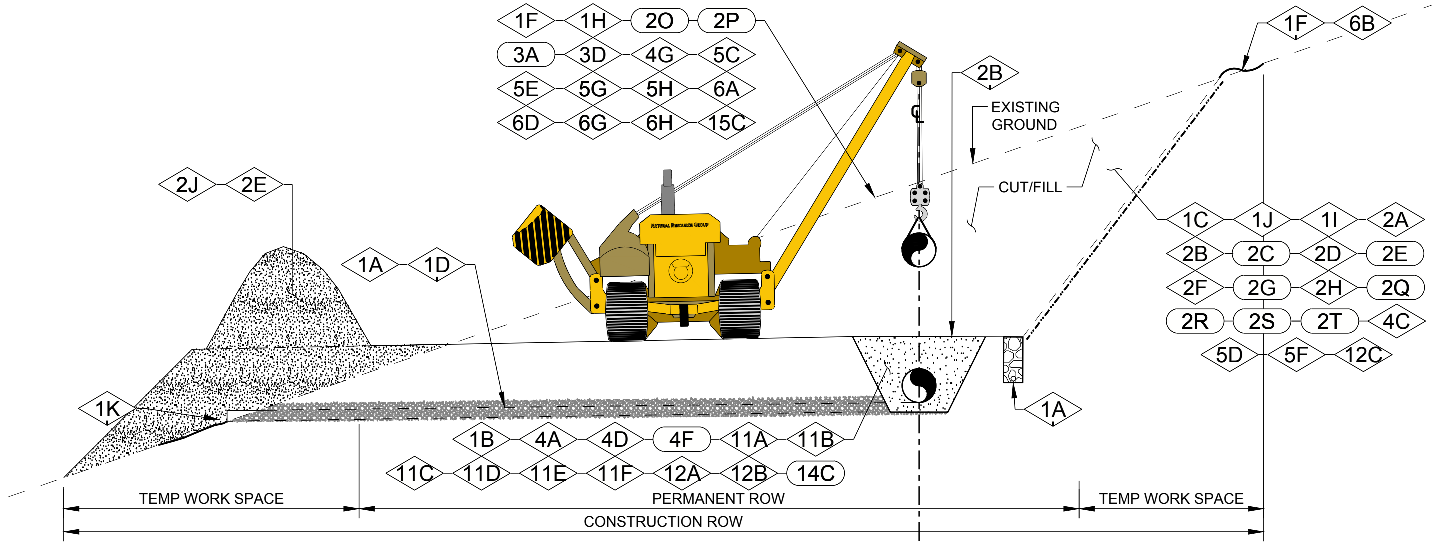
TITLE
**B1 - STEEP SLOPES WITH EVIDENCE OF ACTIVE MOVEMENT (PLANAR SLOPE)**

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 |

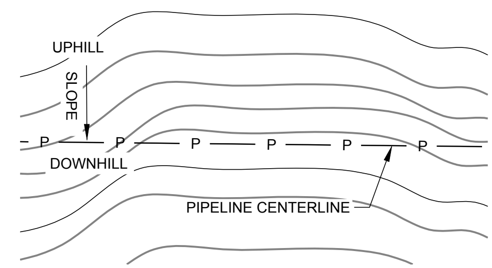



## BEST IN CLASS (BIC) INCREMENTAL CONTROLS

| | |
|---|---|
| 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)**

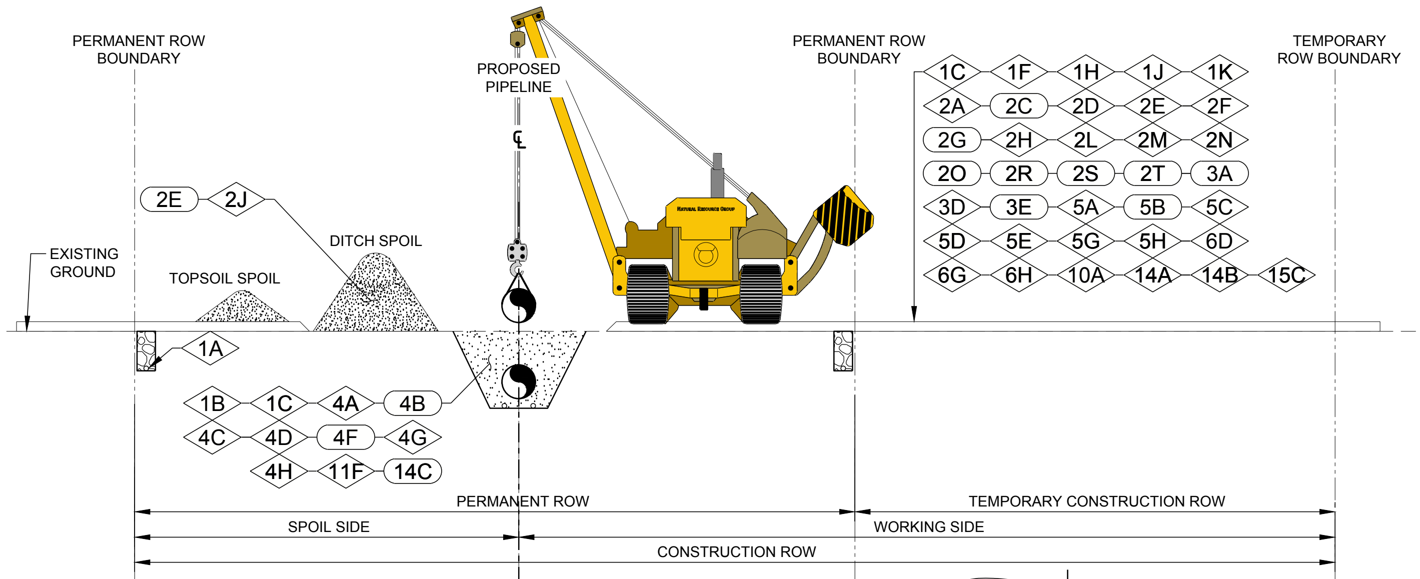
Atlantic Coast Pipeline

| | | | |
|---|---|---|---|
| PROJECT No. | | | 1535050 |
| DESIGN | DBC | 2017-02-28 | |
| CADD | THR | 2017-02-28 | |
| CHECK | - | 2017-02-28 | |
| REVIEW | AQK | 2017-02-28 | |

| | |
|---|---|
| FILE No. | TypScenarios3 |
| SCALE | AS SHOWN |
| FIGURE | 2 OF 2 |

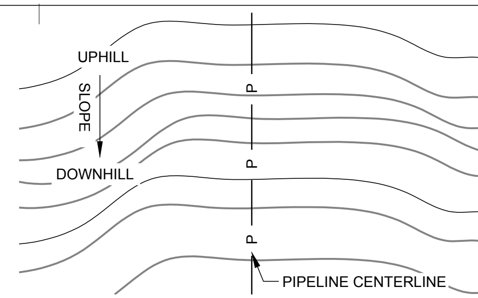
## BEST IN CLASS (BIC) INCREMENTAL CONTROLS

- 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

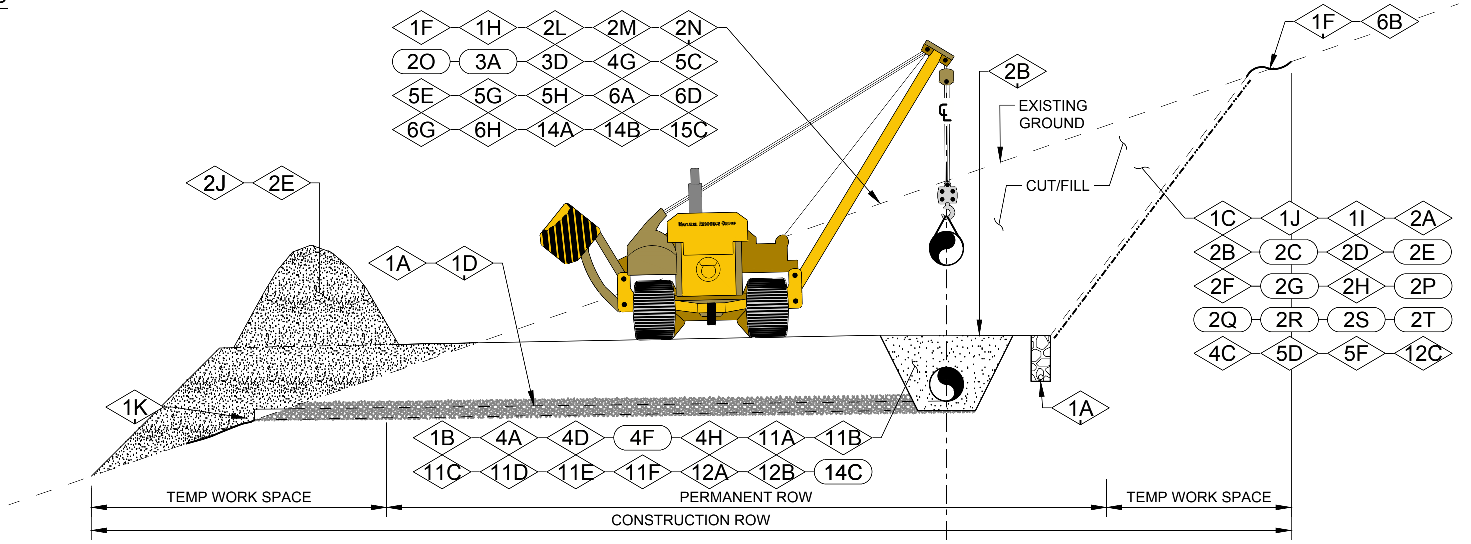
TITLE
**C1 – STEEP SLOPES WITH INCREASED POTENTIAL FOR INSTABILITY WHEN DISTURBED (PLANAR SLOPE)**

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

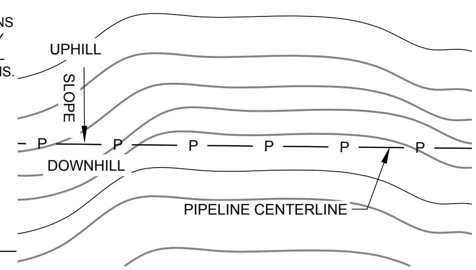
| | |
|---|---|
| 5D | ACCESS ROADS |
| 5E | TEMPORARY SLOPE BREAKER WITH DRAIN PIPE |
| 5F | SACK-CRETE WEDGE |
| 5G | NO WOOD CHIPS IN ROW |
| 5H | SURFACE WATER DIVERSIONS |
| 6A | COIR-LINED VEGETATED DIVERSION CHANNEL |
| 6B | BROW DITCH |
| 6D | ARMORED CHANNEL |
| 6G | ARMORED V-SHAPED AND U-SHAPED 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

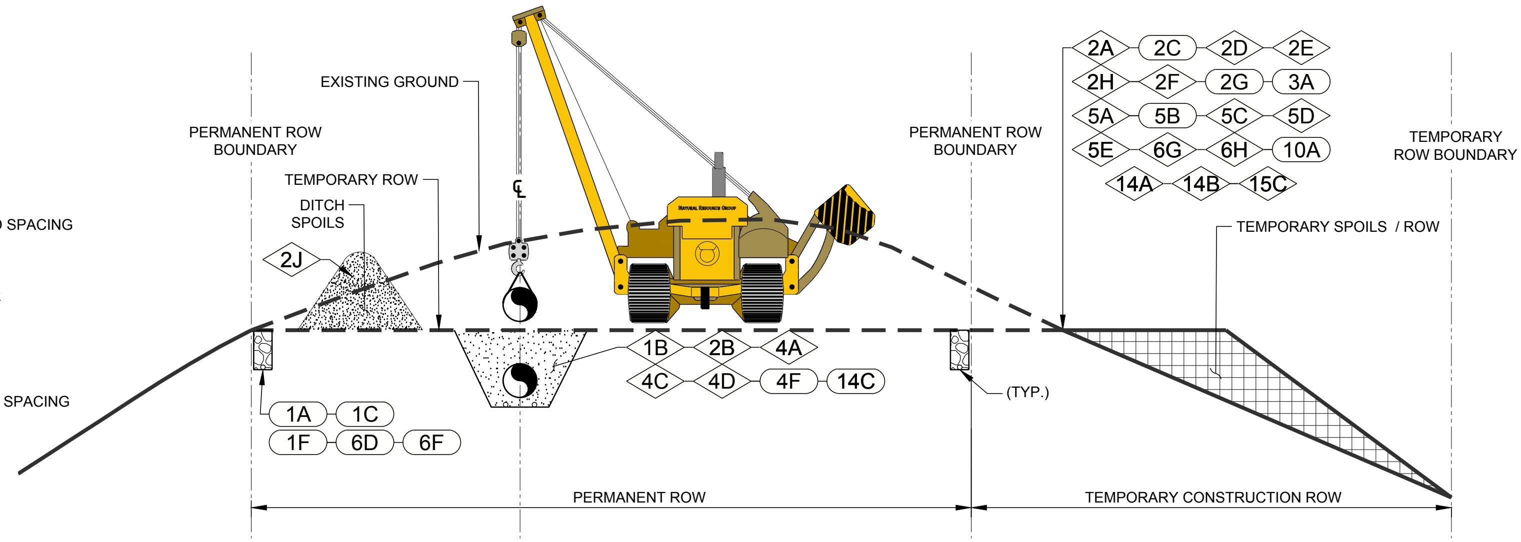
TITLE
**C2 – STEEP SLOPES WITH INCREASED POTENTIAL FOR INSTABILITY WHEN DISTURBED (SIDE SLOPE)**

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

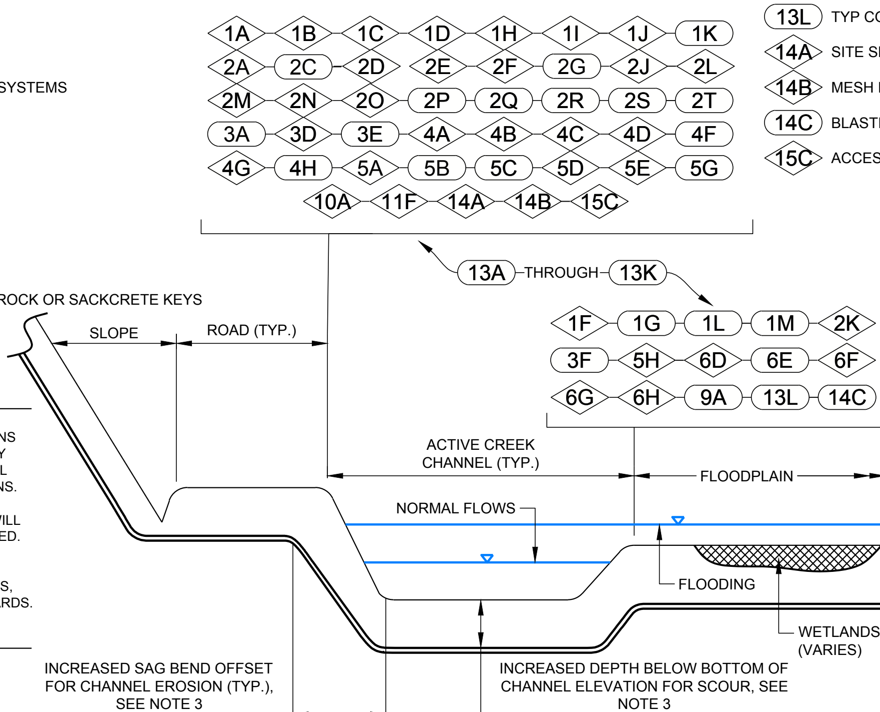
| | | | | |
|---|---|---|---|---|
| PROJECT No. | | 1535050 | FILE No. | TypScenarios1 |
| DESIGN | DBC | 2017-02-28 | SCALE | AS SHOWN |
| CADD | THR | 2017-02-28 | FIGURE | |
| CHECK | - | 2017-02-28 | | 1 OF 1 |
| REVIEW | AQK | 2017-02-28 | | |

## 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




## 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

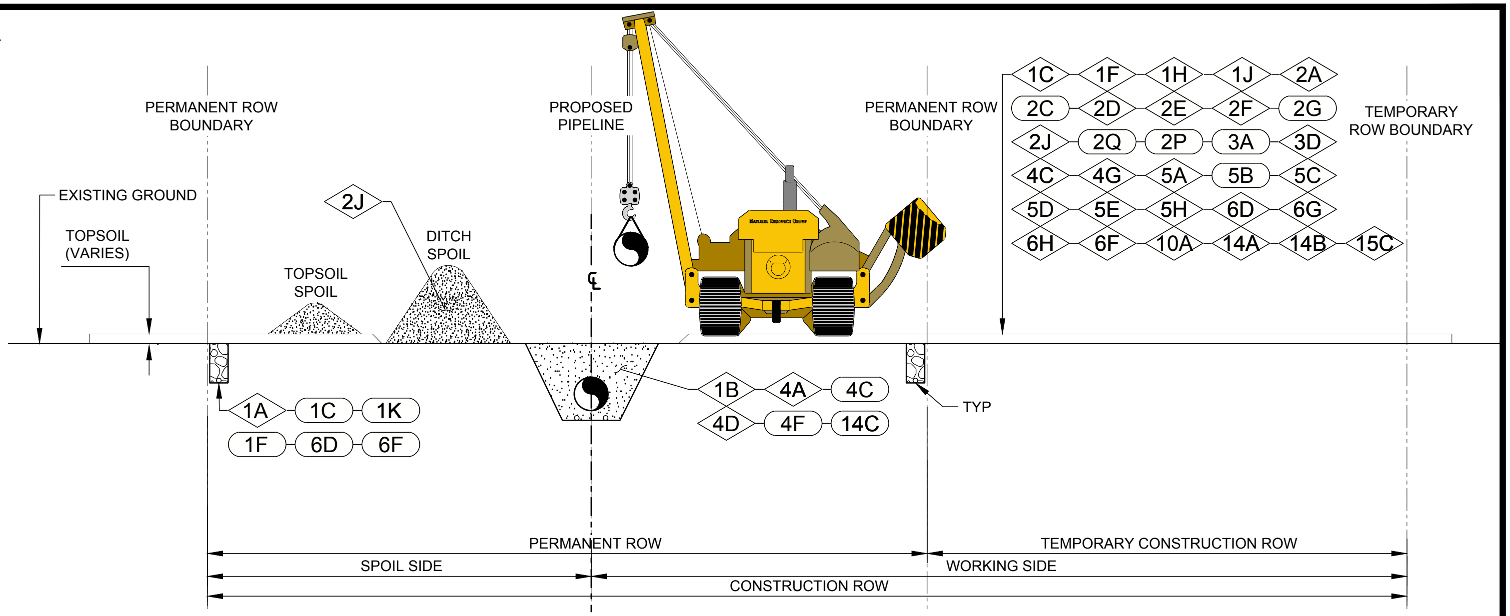
TITLE
# E - STEEP SLOPES WITH A SENSITIVE RESOURCE AT TOE (I.E. STREAM, WETLAND, ROAD)

Atlantic Coast Pipeline

| | | | | |
|---|---|---|---|---|
| PROJECT No. | | 1535050 | 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
- 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 (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

**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**

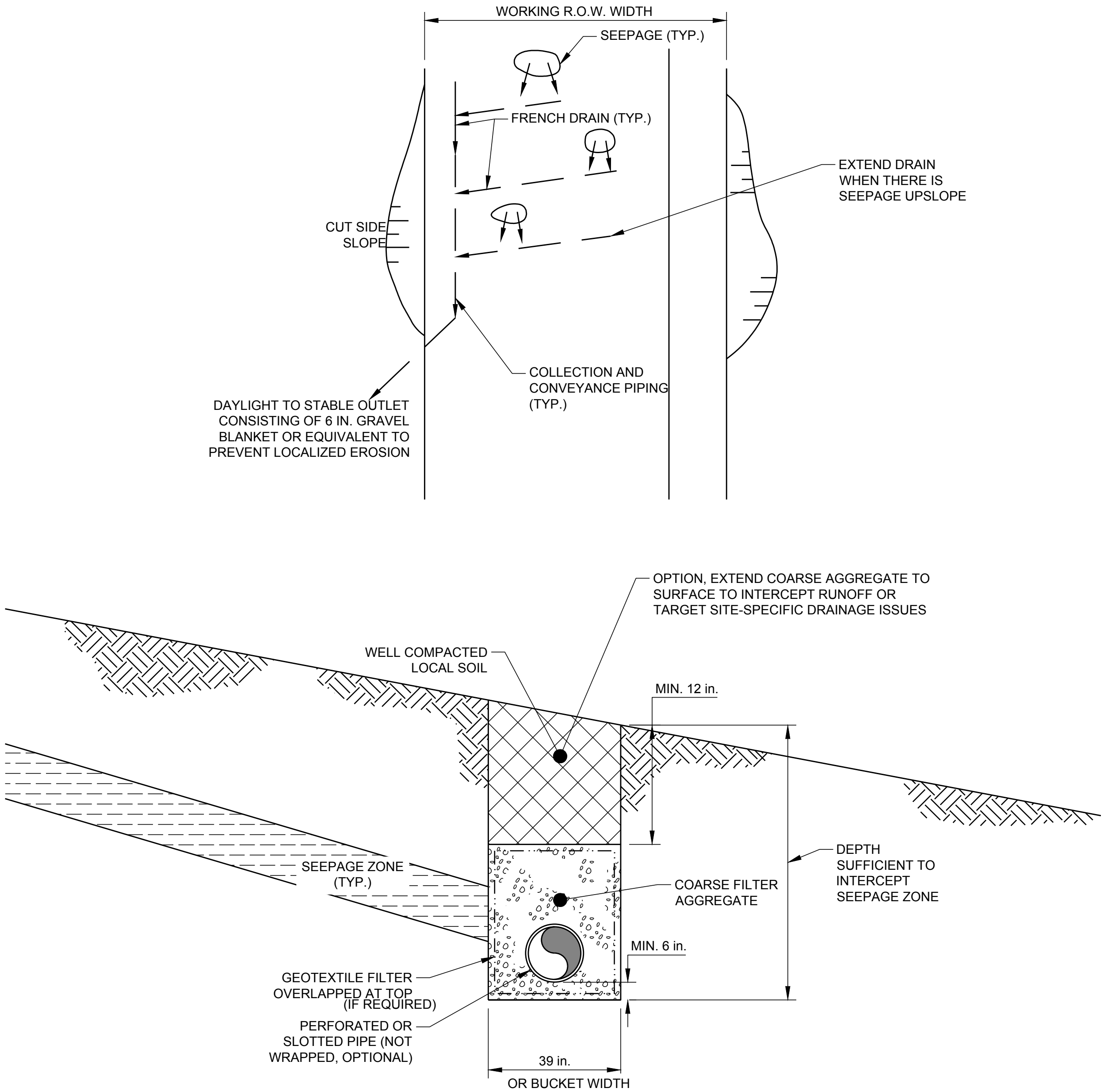
| No. | GROUP | GROUP NO. | INCREMENTAL CONTROL SHEET TITLE | REV. | DATE | SHEET NO. | (C)omplete/(P)ending/(U)pdated | SOURCE DOCUMENT: |
|---|---|---|---|---|---|---|---|---|
| 1 | COVER | 0 | COVER SHEET | F | 2/28/2017 | 0 | C | GOLDER, "GEOTECHNICAL AND GEOLOGICAL ENGINEERING SUPPORT FOR PIPELINES 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 OVEMENTS | 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
Golder Associates

| | |
|---|---|
| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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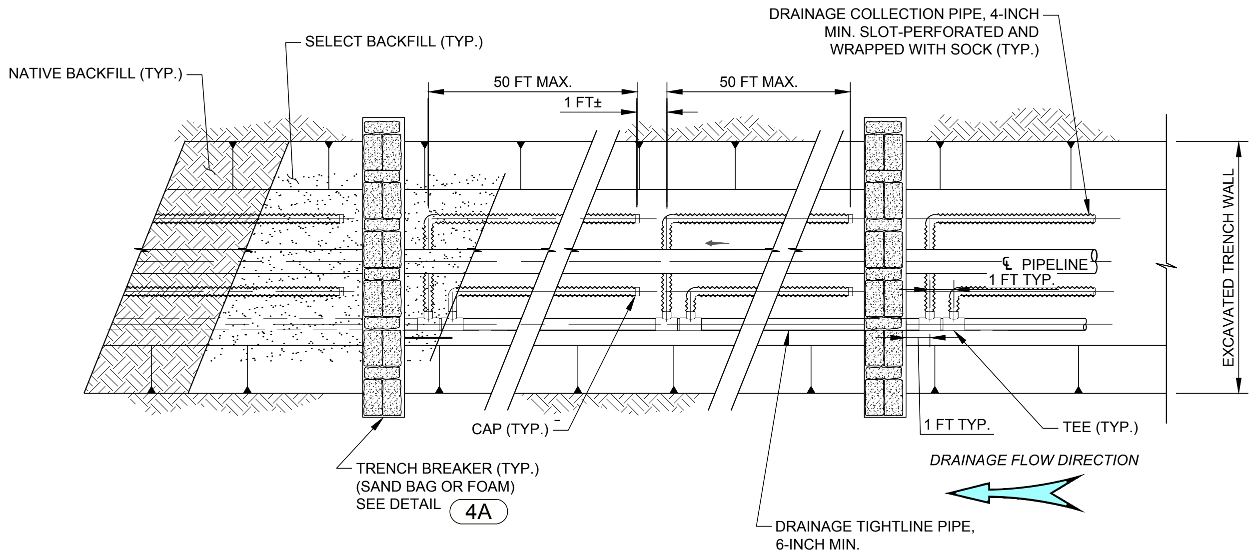


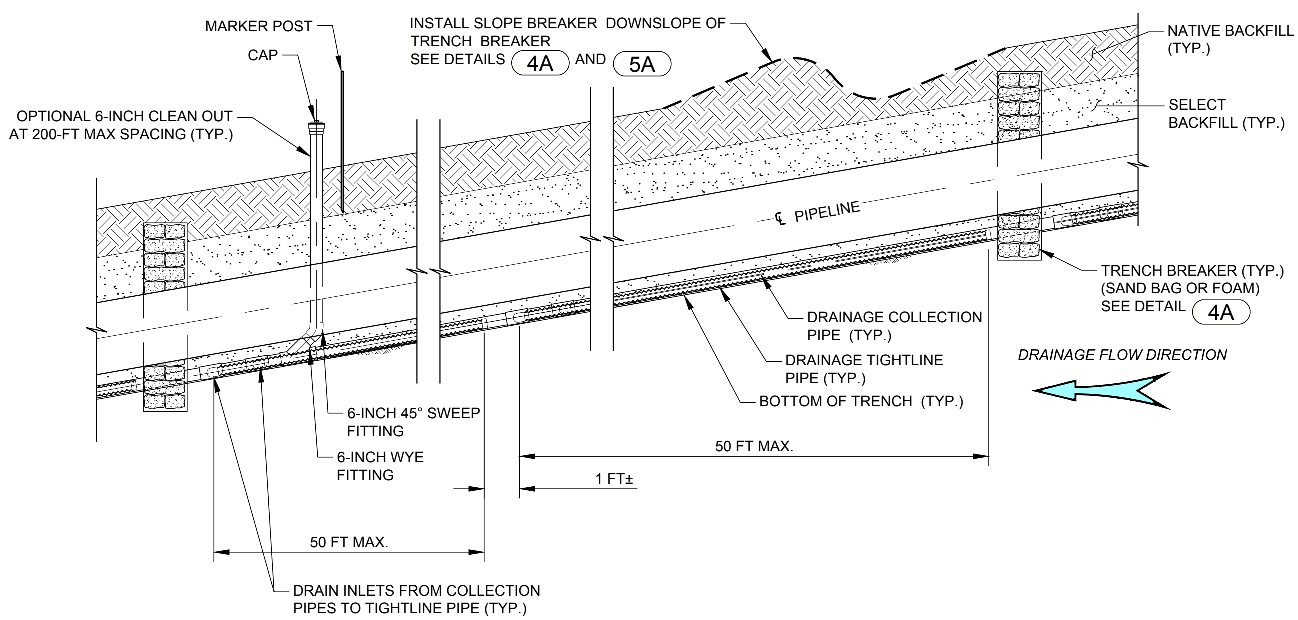


**NOTE(S)**

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. SPACING OF CLEAN-OUTS TO BE DETERMINED BASED ON SITE CONDITIONS AND OPERATION AND MAINTENANCE REQUIREMENTS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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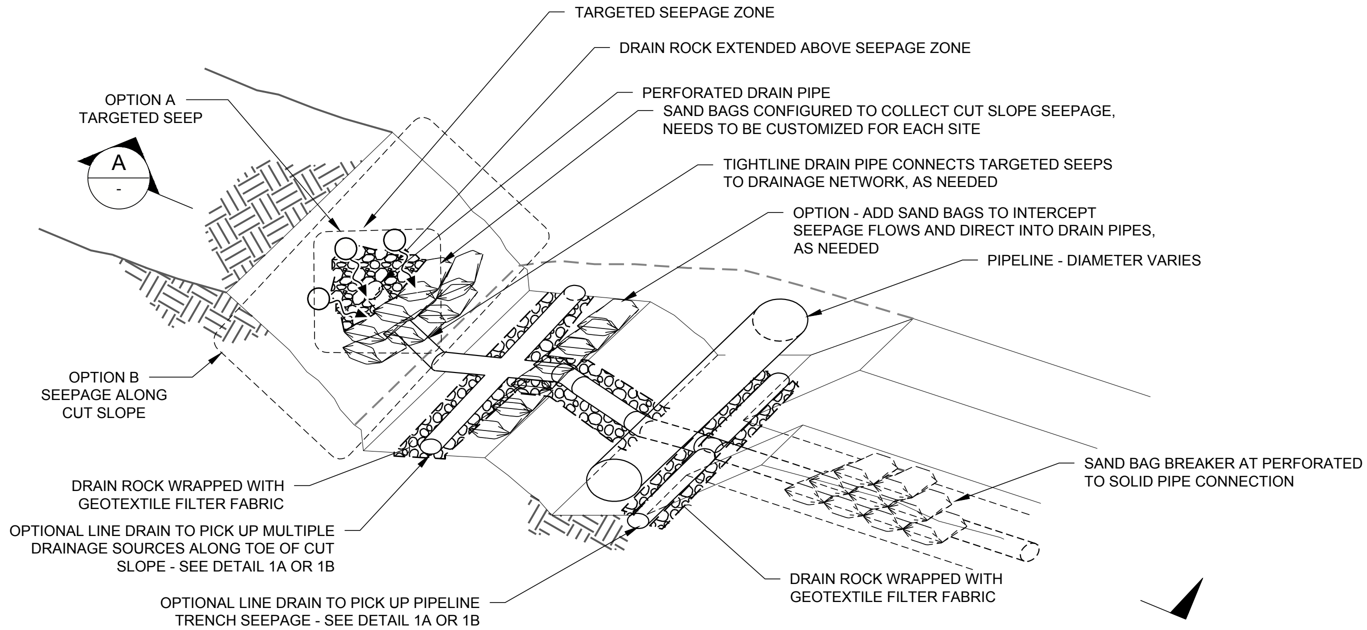
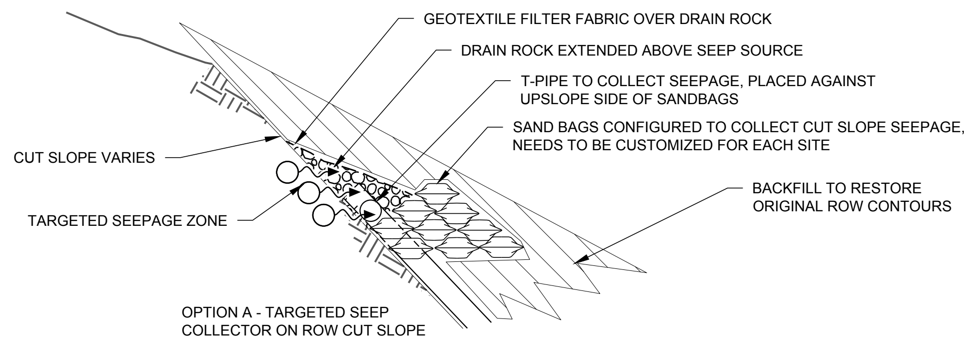
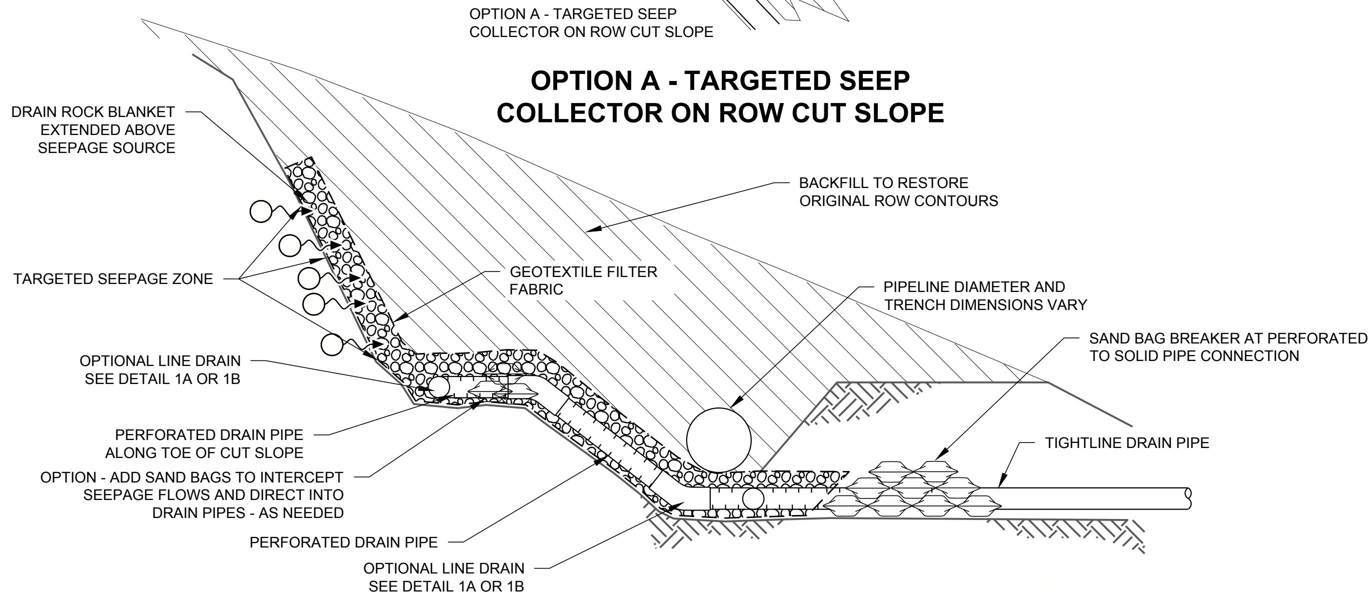



**OPTION A - TARGETED SEEP COLLECTOR ON ROW CUT SLOPE**




**OPTION B - TARGETED SEEP**
A
-
**COLLECTOR ON ROW CUT SLOPE**

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DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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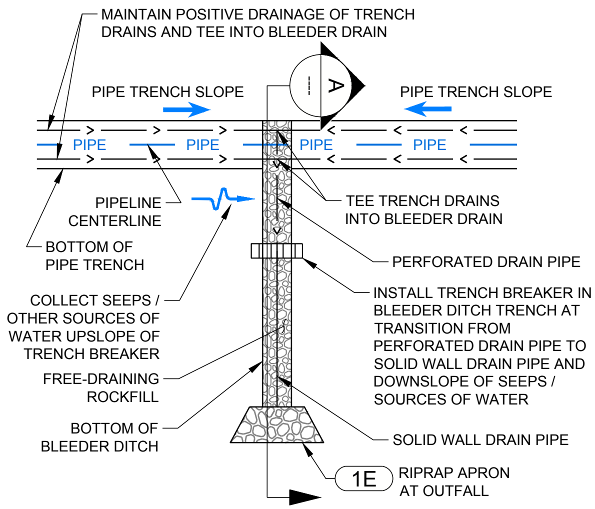
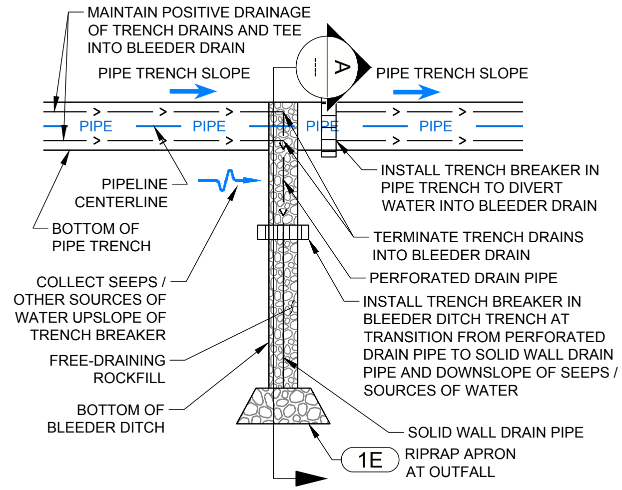
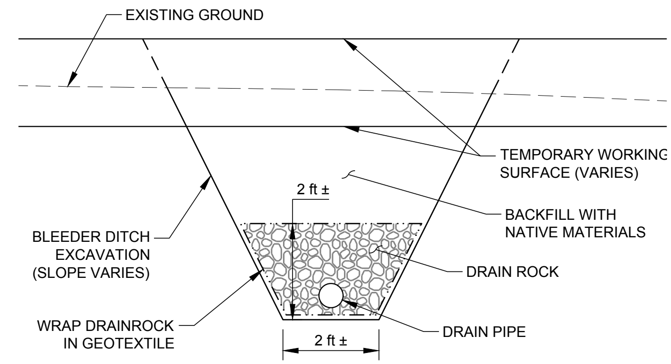


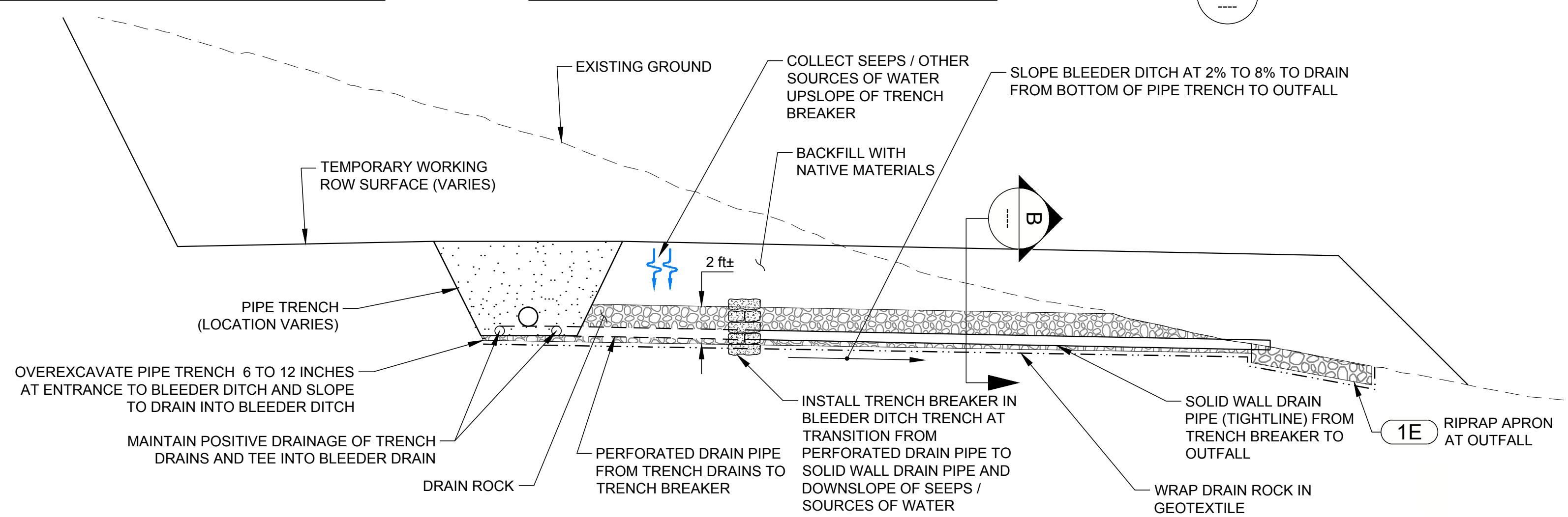

BLEEDER DRAIN WITH FLAT PIPE TRENCH




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

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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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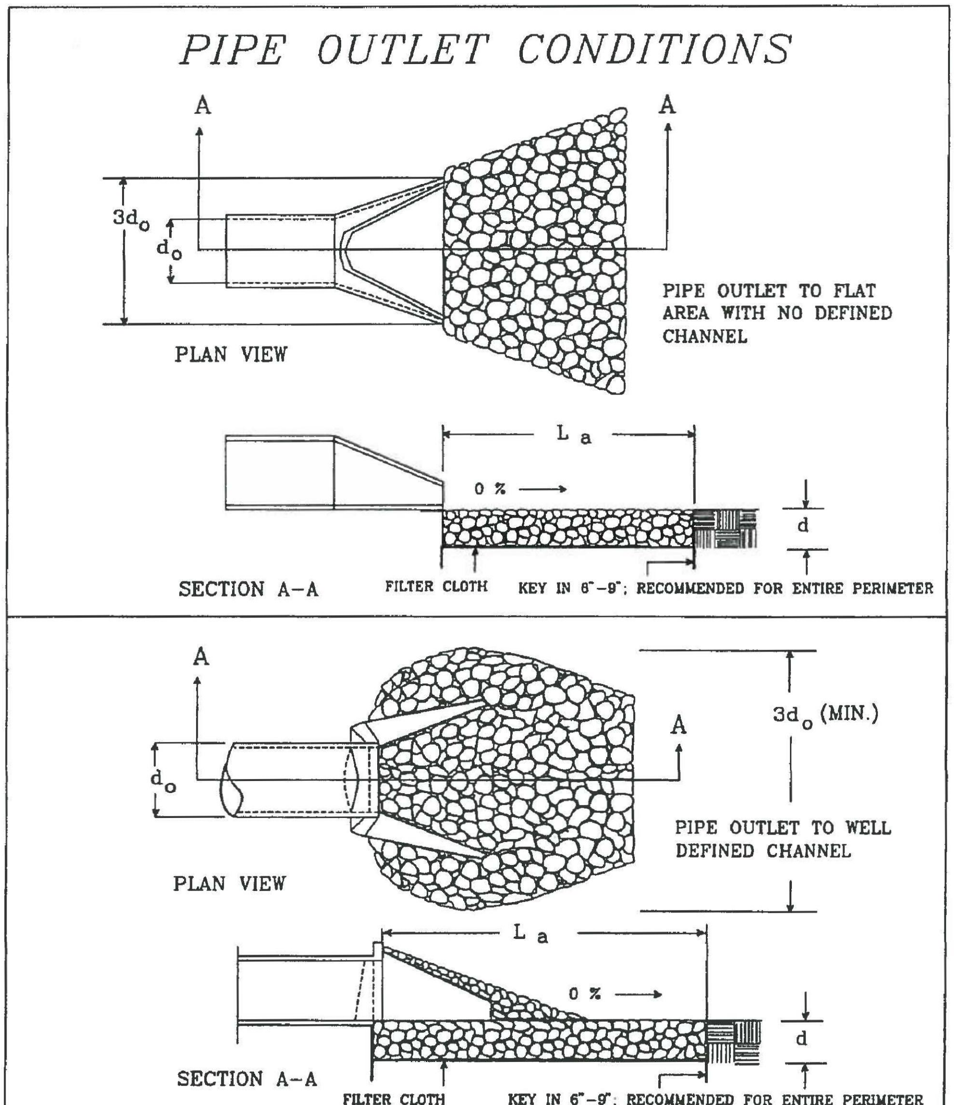


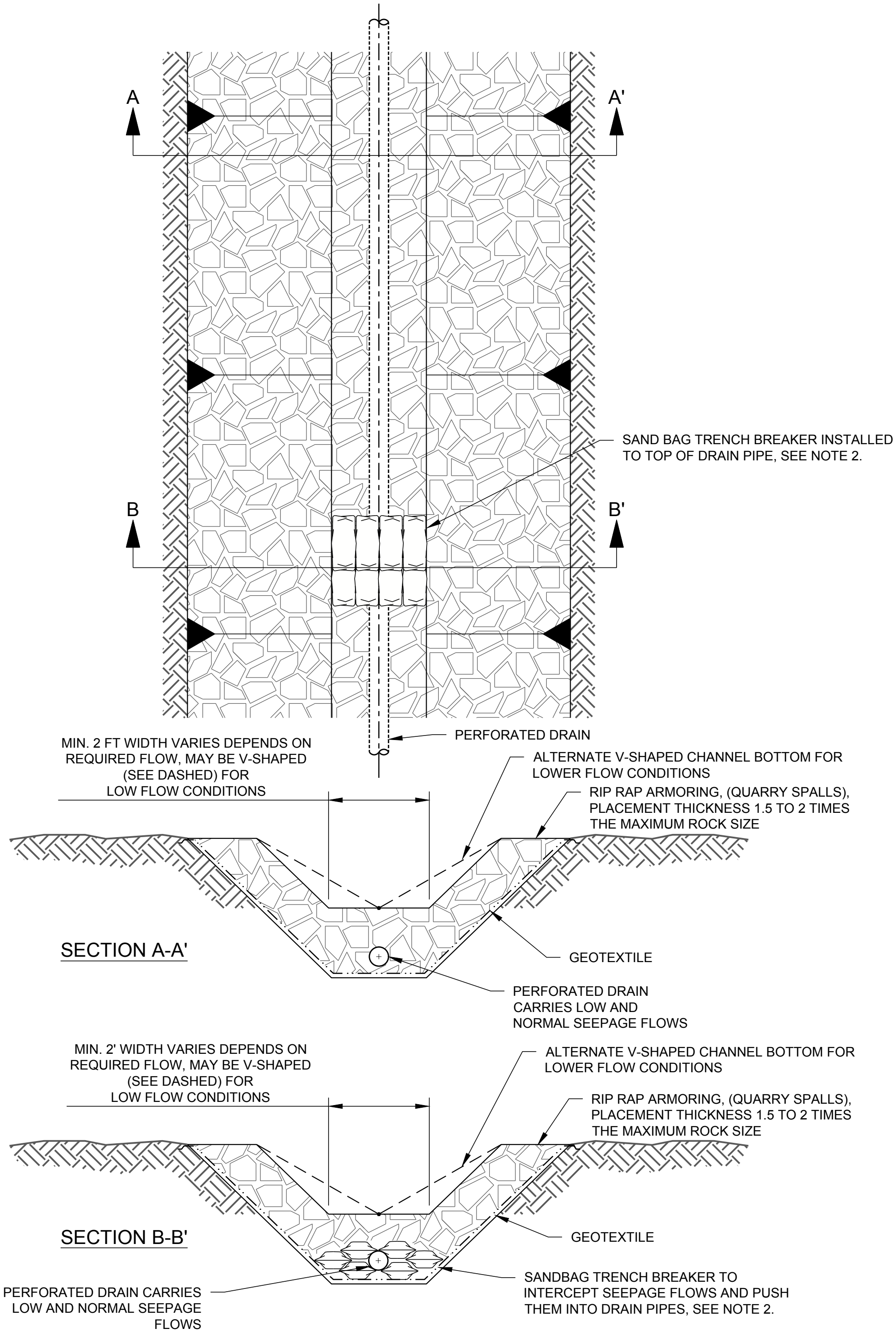

NOTES:
1. APRON LINING MAY BE RIPRAP, GROUTED RIPRAP, GABION BASKET, OR CONCRETE.
2. La IS THE LENGTH OF THE RIPRAP APRON AS CALCULATED USING PLATES 3.18-3 AND 3.18-4.
3. d = 1.5 TIMES THE MAXIMUM STONE DIAMETER, BUT NOT LESS THAN 6 INCHES.

| | | | |
|---|---|---|---|
| CLIENT | DOMINION | PROJECT | BIC/INCREMENTAL CONTROLS |
| CONSULTANT | Golder Associates | TITLE | DRAIN PIPE OUTFALL RIPRAP APRON |
| YYYY-MM-DD | 2017-02-28 | | |
| PREPARED | REDMOND | | |
| DESIGN | DBC | | |
| REVIEW | - | | |
| APPROVED | AQK | | |

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 1E |

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. 100-FT MAX SPACING FOR BREAKERS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

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| 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 |

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. 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

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|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**DEWATERING**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 1G |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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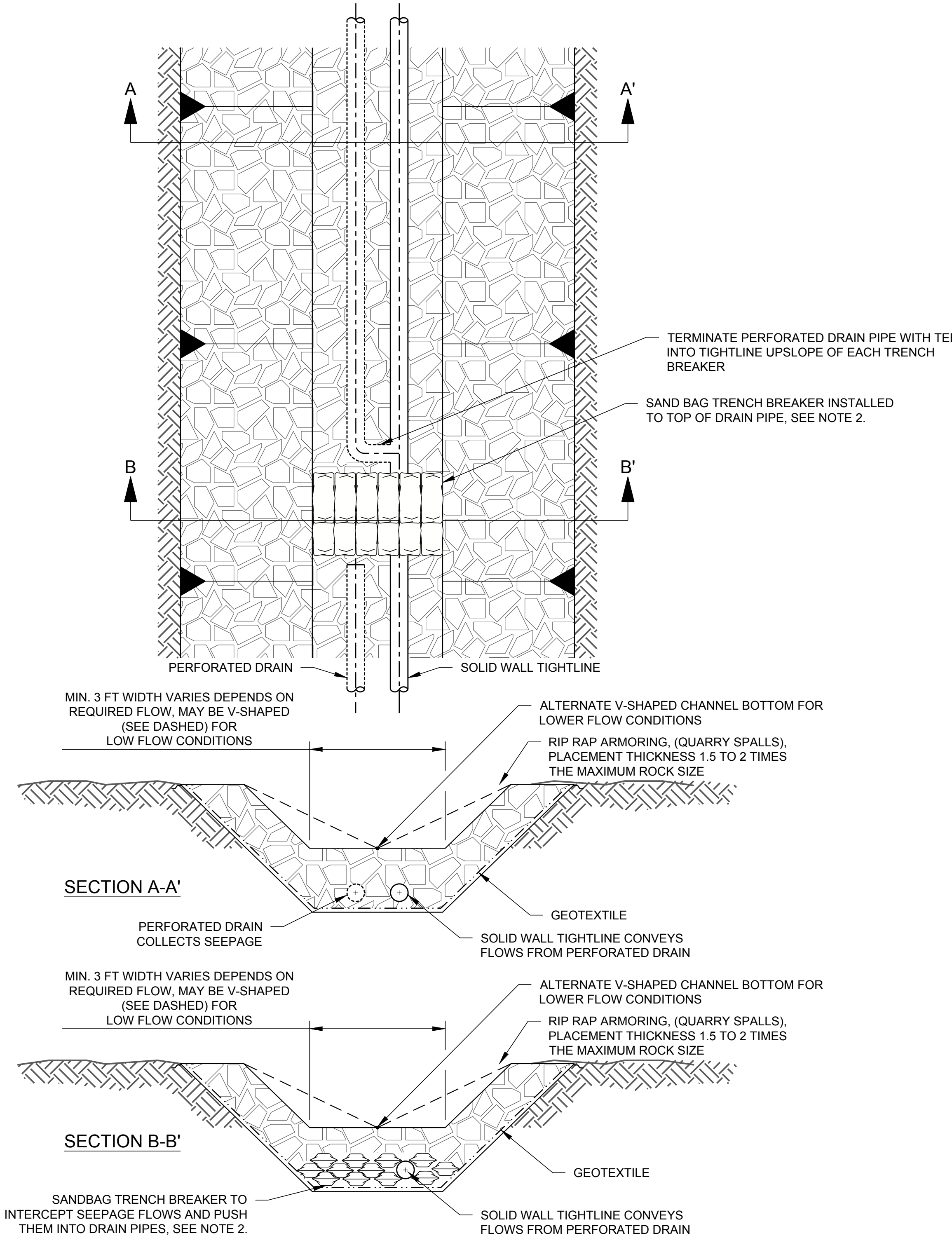


**NOTE(S)**

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. 100-FT MAX SPACING FOR BREAKERS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

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|---|---|
| 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 |

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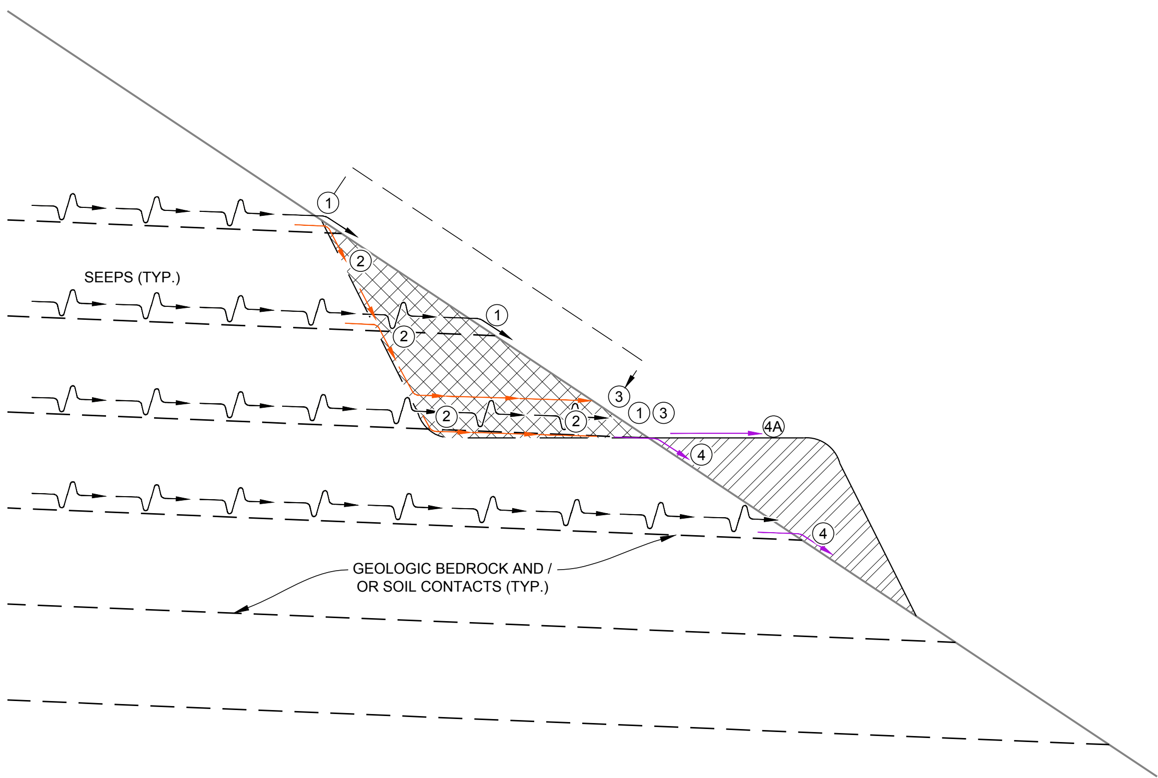
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A




**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 | PROJECT |
|---|---|
| DOMINION | BIC/INCREMENTAL CONTROLS |

CONSULTANT

Golder Associates

| | |
|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE

**CHANGED SEEP CHARACTERISTICS**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 1I |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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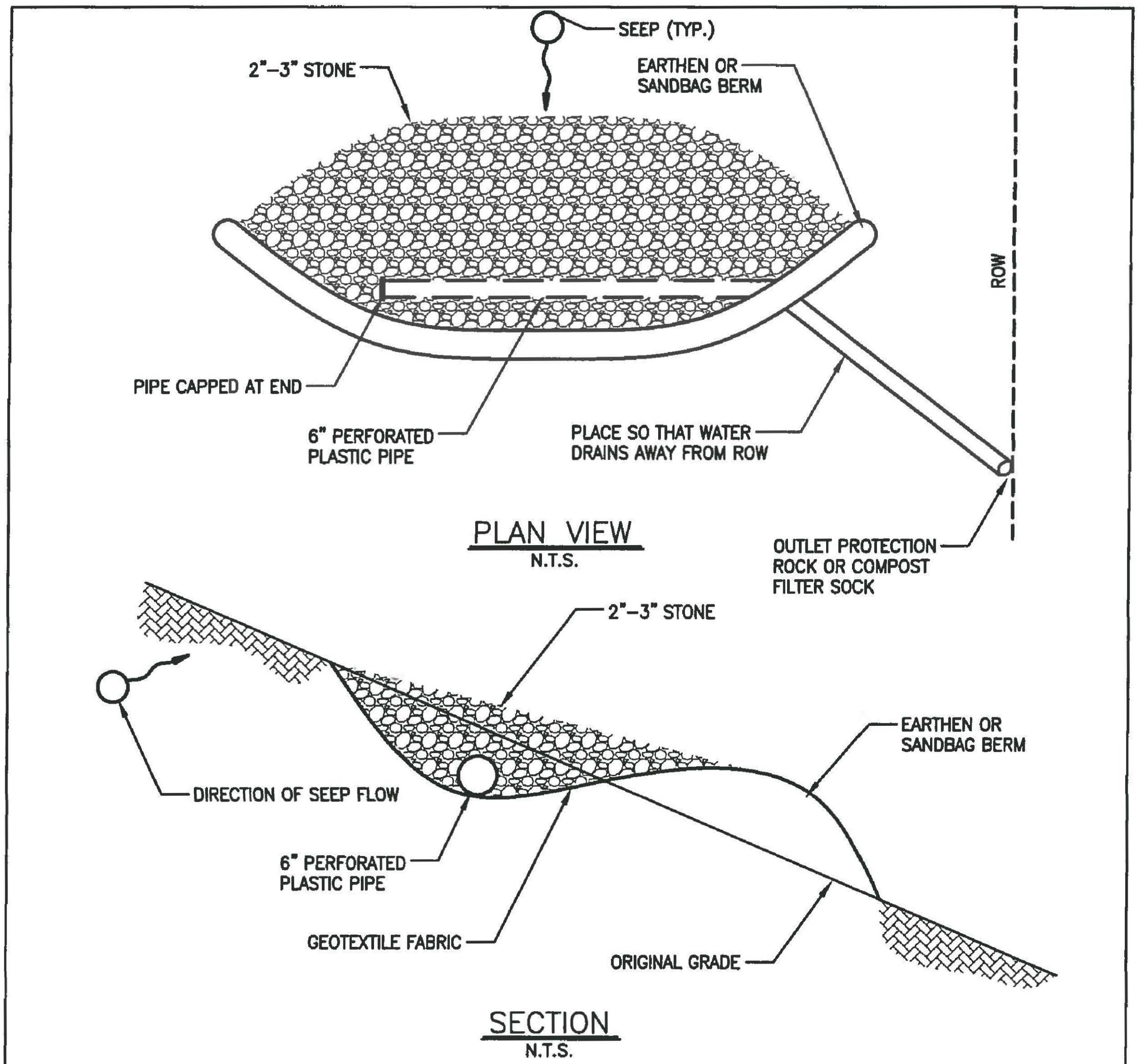


NOTE:
BERMS MAY BE CONSTRUCTED USING SANDBAGS TEMPORARILY DURING CONSTRUCTION. PERMANENT BERMS TO BE CONSTRUCTED USING COMPACTED EARTH.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

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|---|---|
| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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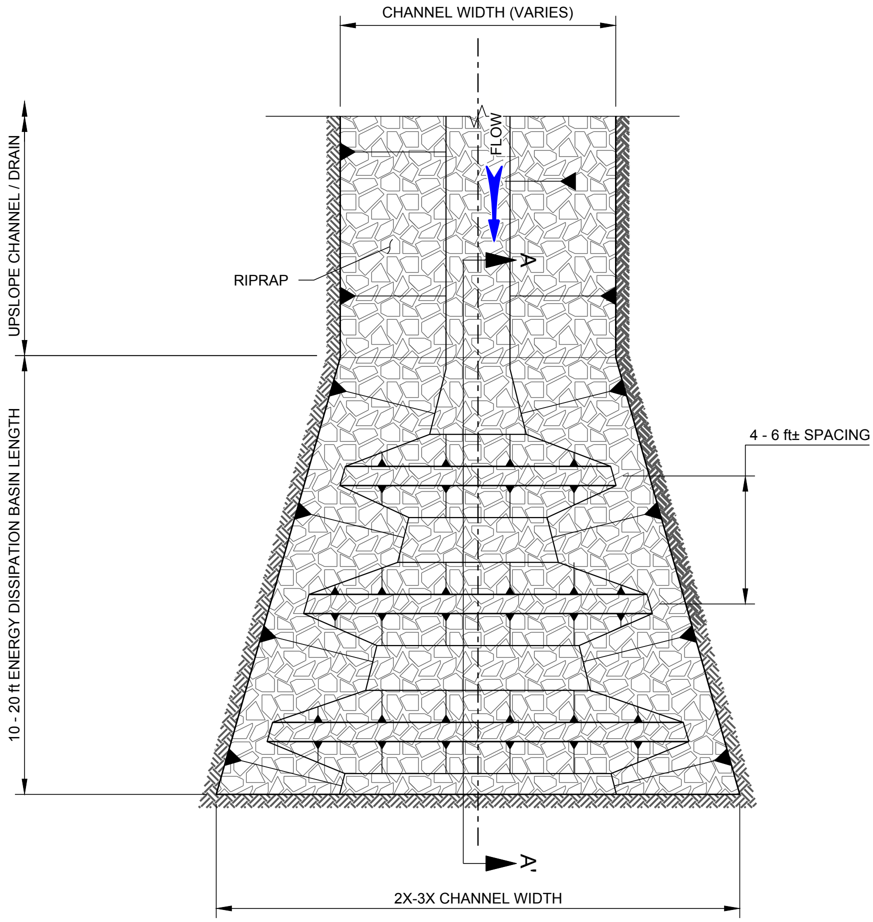


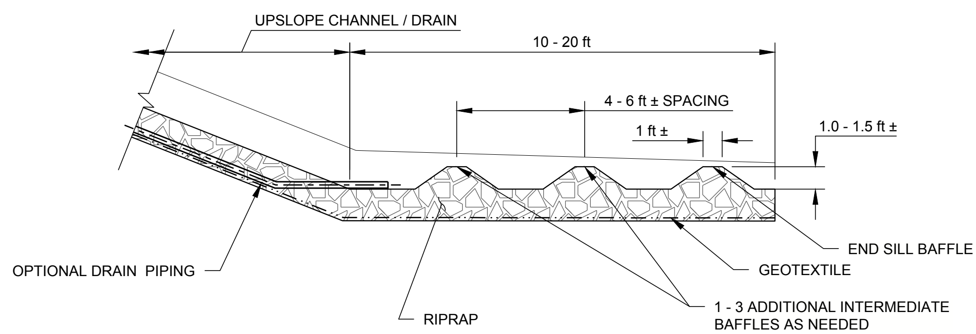


**NOTE(S)**

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. 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

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|---|---|
| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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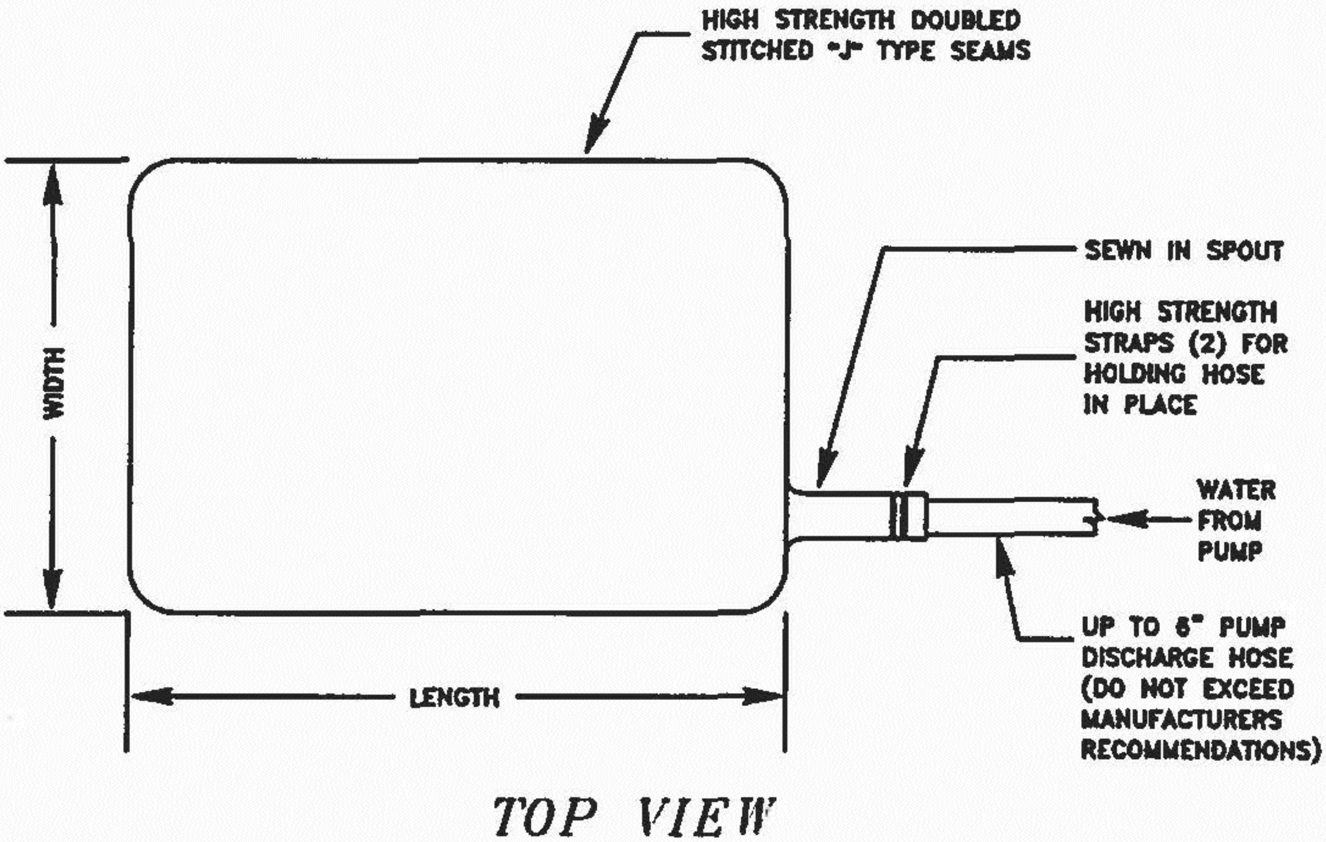


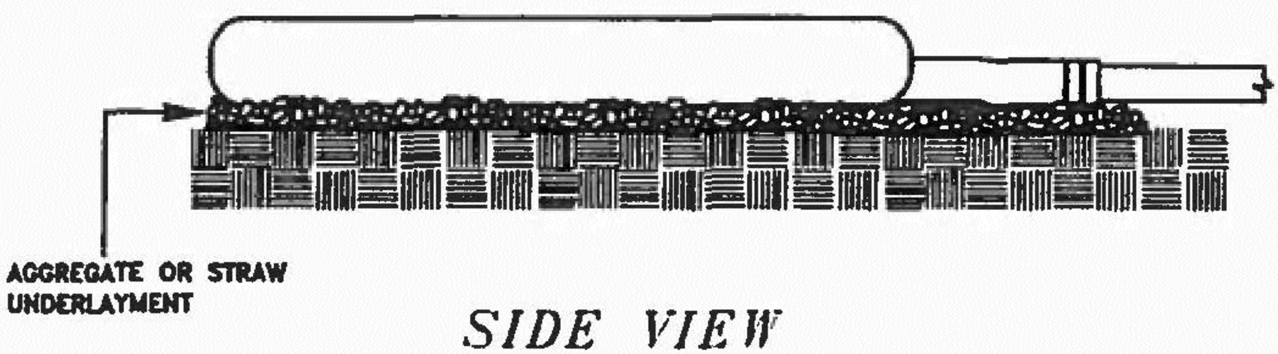


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| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT<br>Golder Associates | YYYY-MM-DD: 2017-02-28<br>PREPARED: REDMOND<br>DESIGN: DBC<br>REVIEW: -<br>APPROVED: AQK | TITLE<br>**DEWATERING DISCHARGE BAG** | |
| | | PROJECT No. 1535050 / PHASE 500 / Rev. F | FIGURE 1L |

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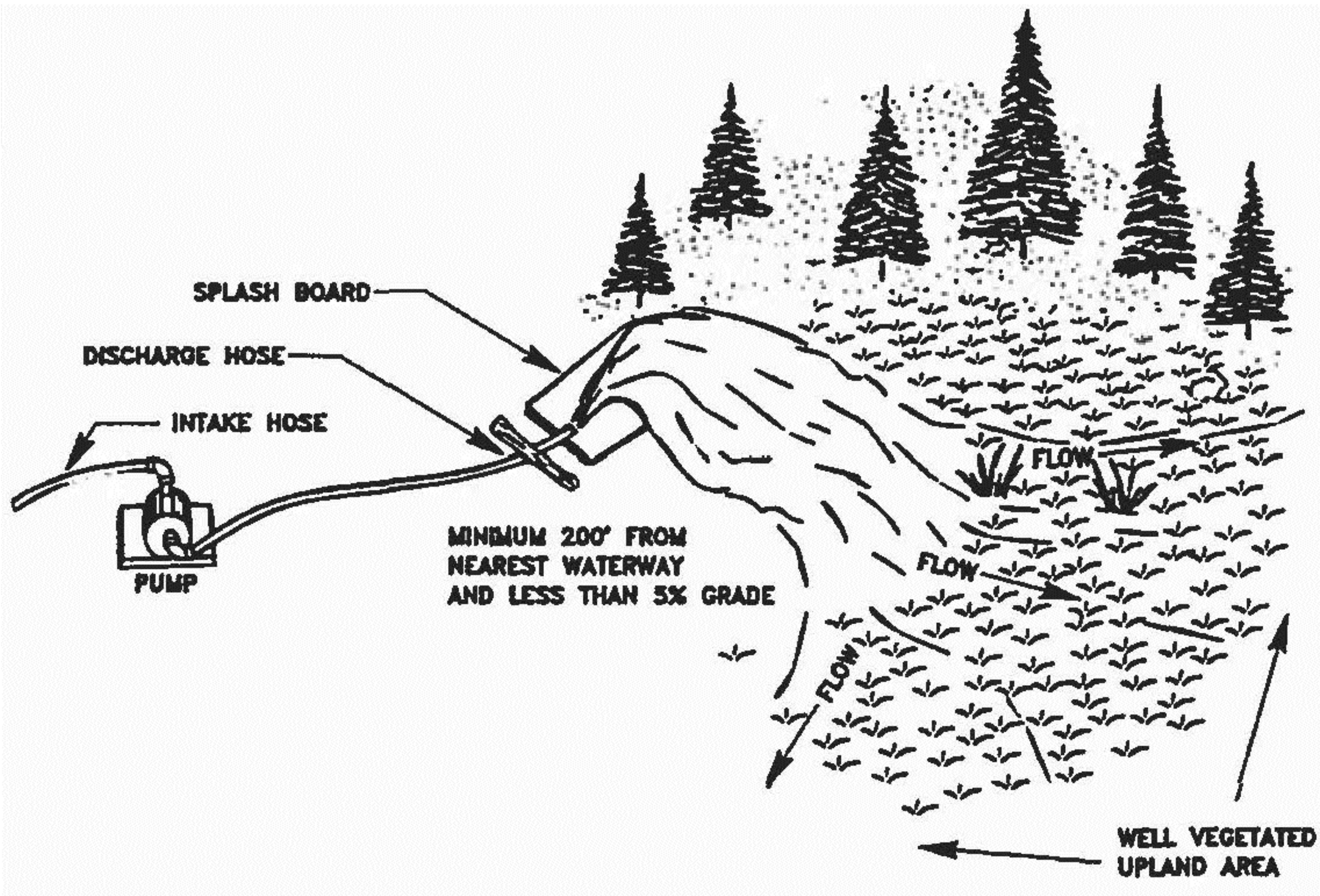


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|---|---|---|---|
| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT | YYYY-MM-DD | 2017-02-28 | TITLE<br>DEWATERING DISCHARGE IN UPLAND AREA |
| Golder Associates | PREPARED | REDMOND | |
| | DESIGN | DBC | |
| | REVIEW | - | |
| | APPROVED | AQK | |

| PROJECT No. | PHASE | Rev. | FIGURE |
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| 1535050 | 500 | F | 1M |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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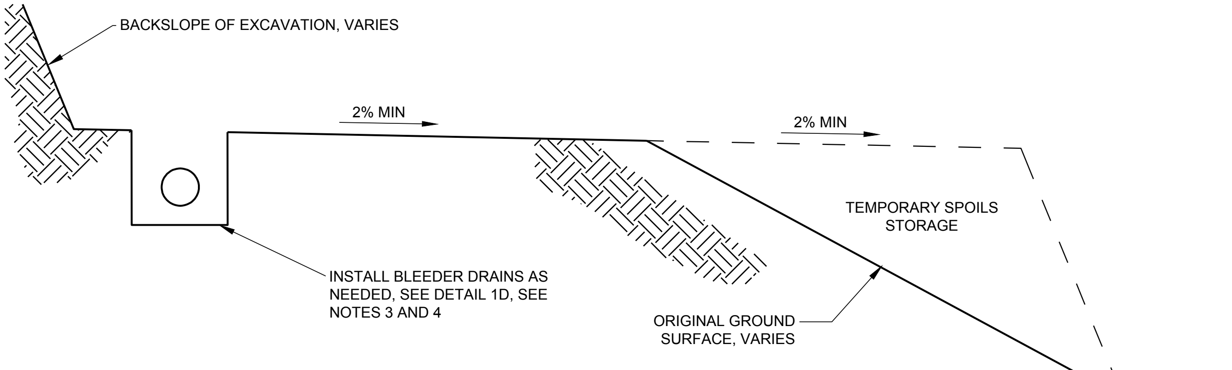
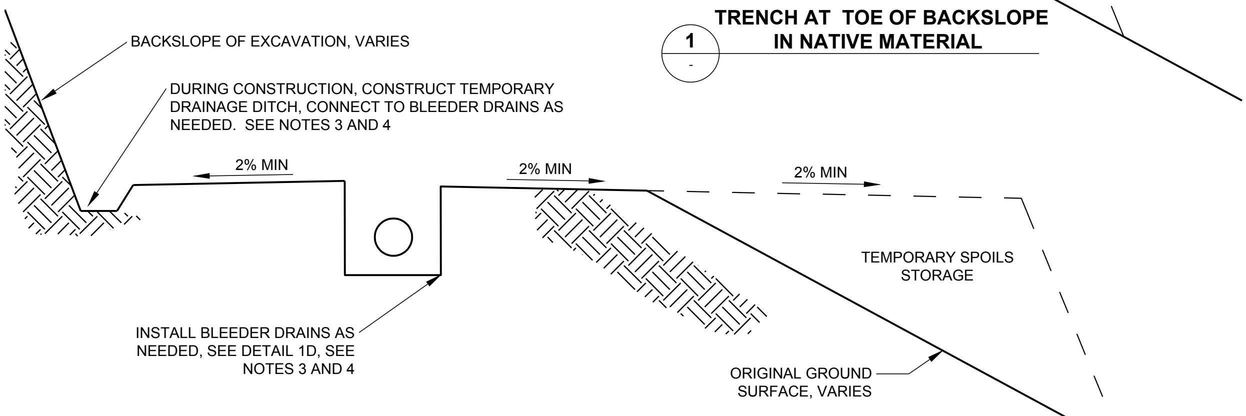
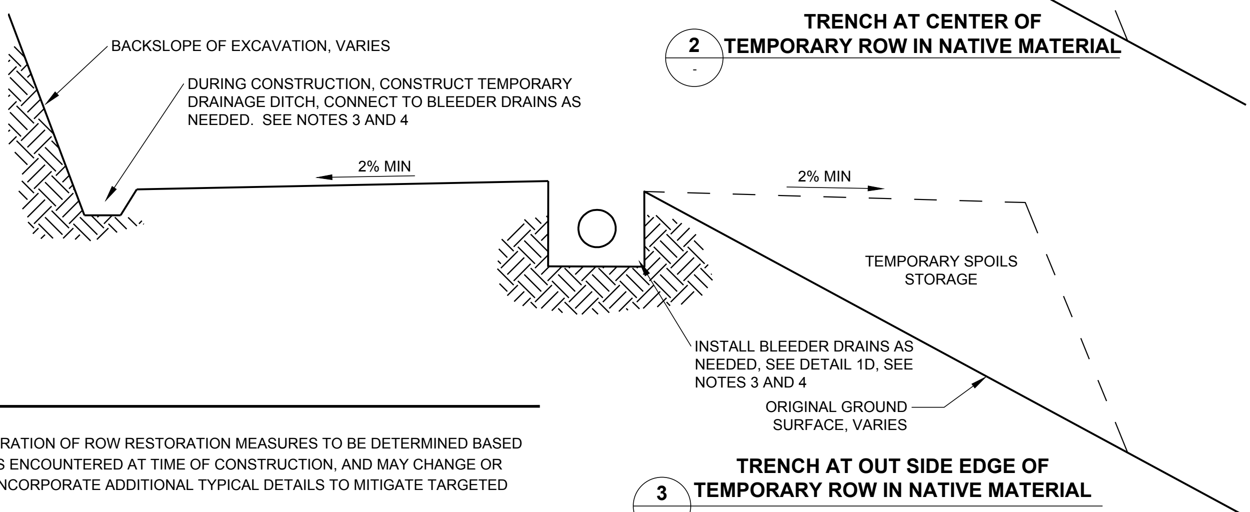



**1 / -** **TRENCH AT TOE OF BACKSLOPE IN NATIVE MATERIAL**




**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

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| 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 |

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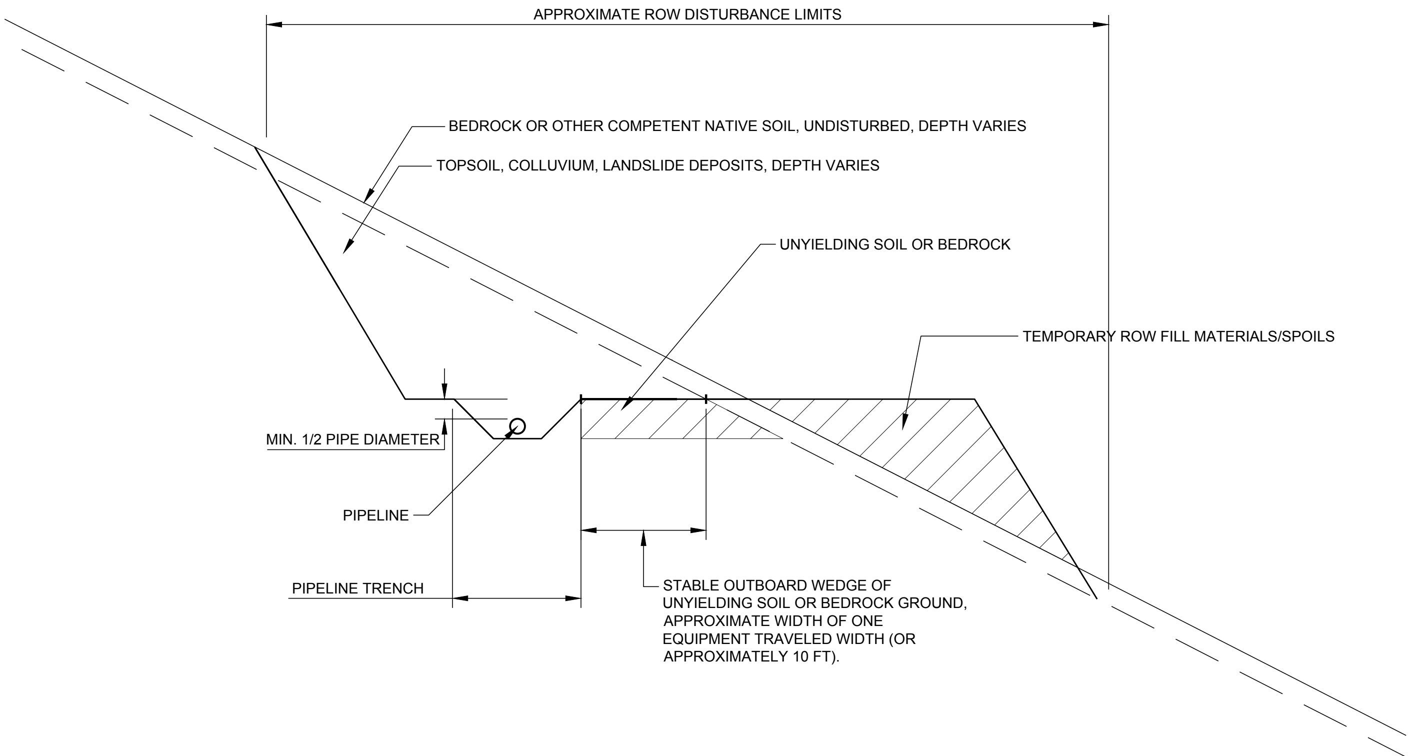


**NOTE(S)**

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.

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DOMINION

PROJECT
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CONSULTANT

Golder Associates

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| 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

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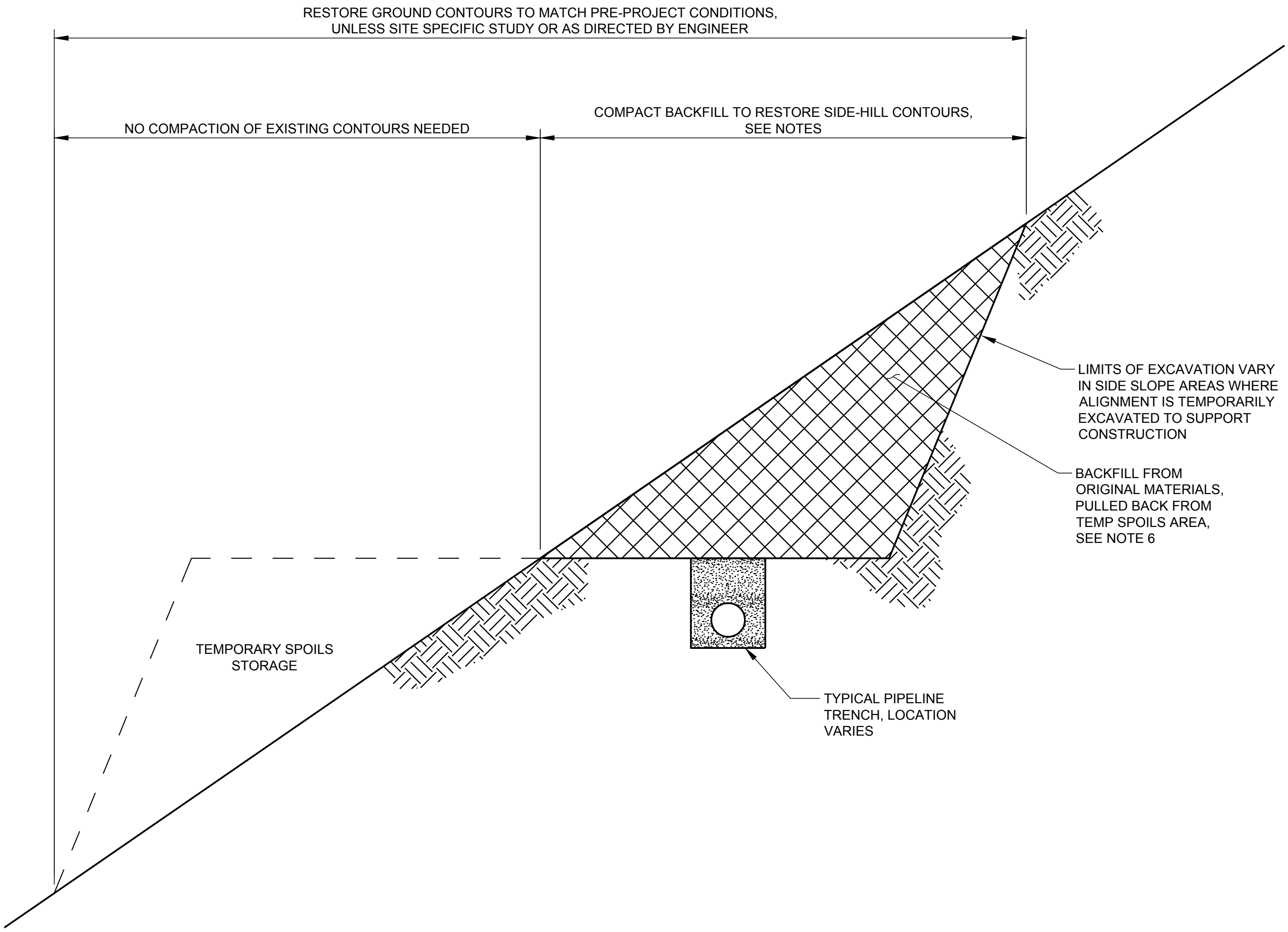


**NOTE(S)**

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. 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.

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| DESIGN | DBC |
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| APPROVED | AQK |

TITLE
**COMPACT BACKFILL**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 2C |

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. 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.

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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| 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.

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| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**REMOVE UNSUITABLE EXISTING SOILS AS BACKFILL**

| PROJECT No. | PHASE | Rev. | FIGURE |
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| 1535050 | 500 | F | 2E |

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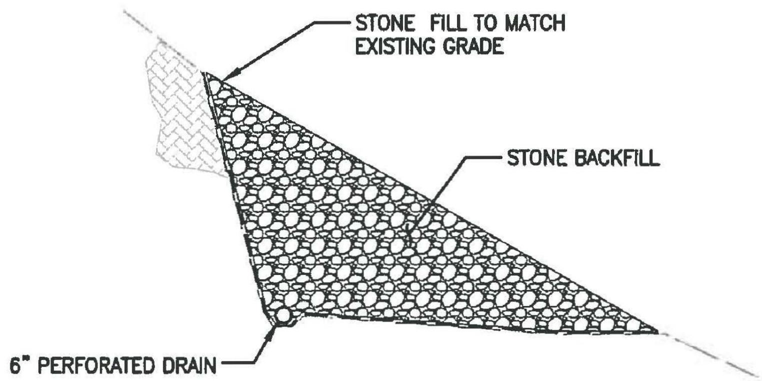
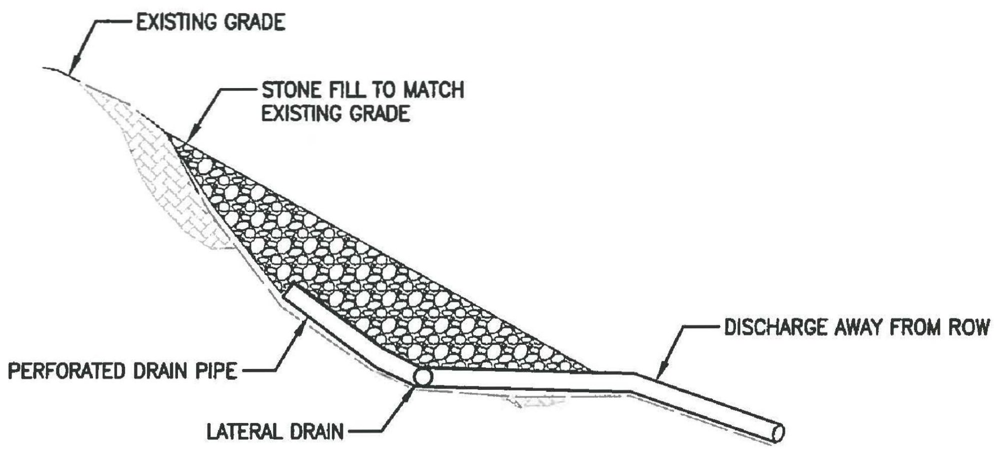



STONE WITH DRAIN TO RESTORE FAILING SLOPE
N.T.S.




SMALL SLIP REPAIR WITH LATERAL
N.T.S.

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| CONSULTANT<br>Golder Associates | YYYY-MM-DD | 2017-02-28 | TITLE<br>**ROCK BACKFILL (WITH DRAIN)** |
| | PREPARED | REDMOND | |
| | DESIGN | DBC | |
| | REVIEW | - | PROJECT No. 1535050 · PHASE 500 · Rev. F · FIGURE 2F |
| | APPROVED | AQK | |

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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.

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| APPROVED | AQK |

TITLE
**GRADING TO MATCH EXISTING CONTOURS**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 2G |

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. 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.

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| REVIEW | - |
| APPROVED | AQK |

TITLE
**GRADING TO MINIMIZE BACKFILL OVER LANDSLIDE**

| PROJECT No. | PHASE | Rev. | FIGURE |
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| 1535050 | 500 | F | 2H |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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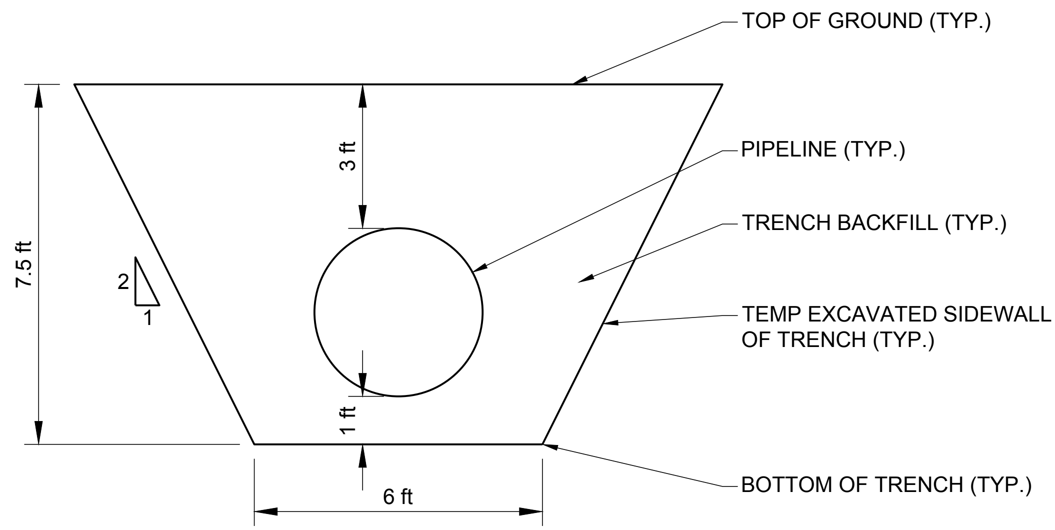


NOT TO SCALE

**NOTE(S)**

1. REFER TO CONTRACT SPECIFIC REQUIREMENTS, FOR TYPICAL GRADING, BACKFILL, AND TRENCHING.

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| 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
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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.

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| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**SPOILS MANAGEMENT**

| PROJECT No. | PHASE | Rev. | FIGURE |
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| 1535050 | 500 | F | 2J |

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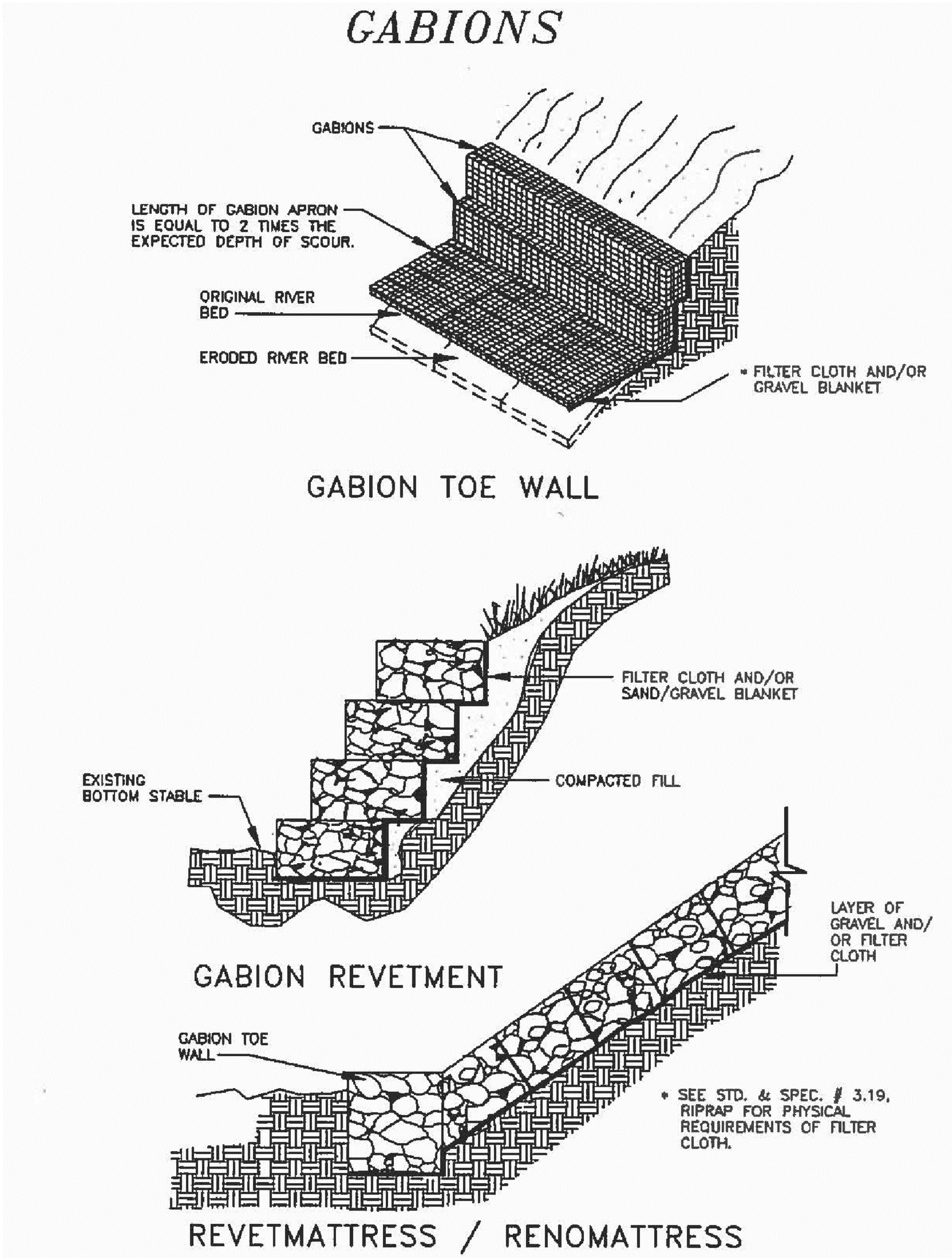


**NOTE(S)**

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TITLE
**GABIONS**

| PROJECT No. | PHASE | Rev. | FIGURE |
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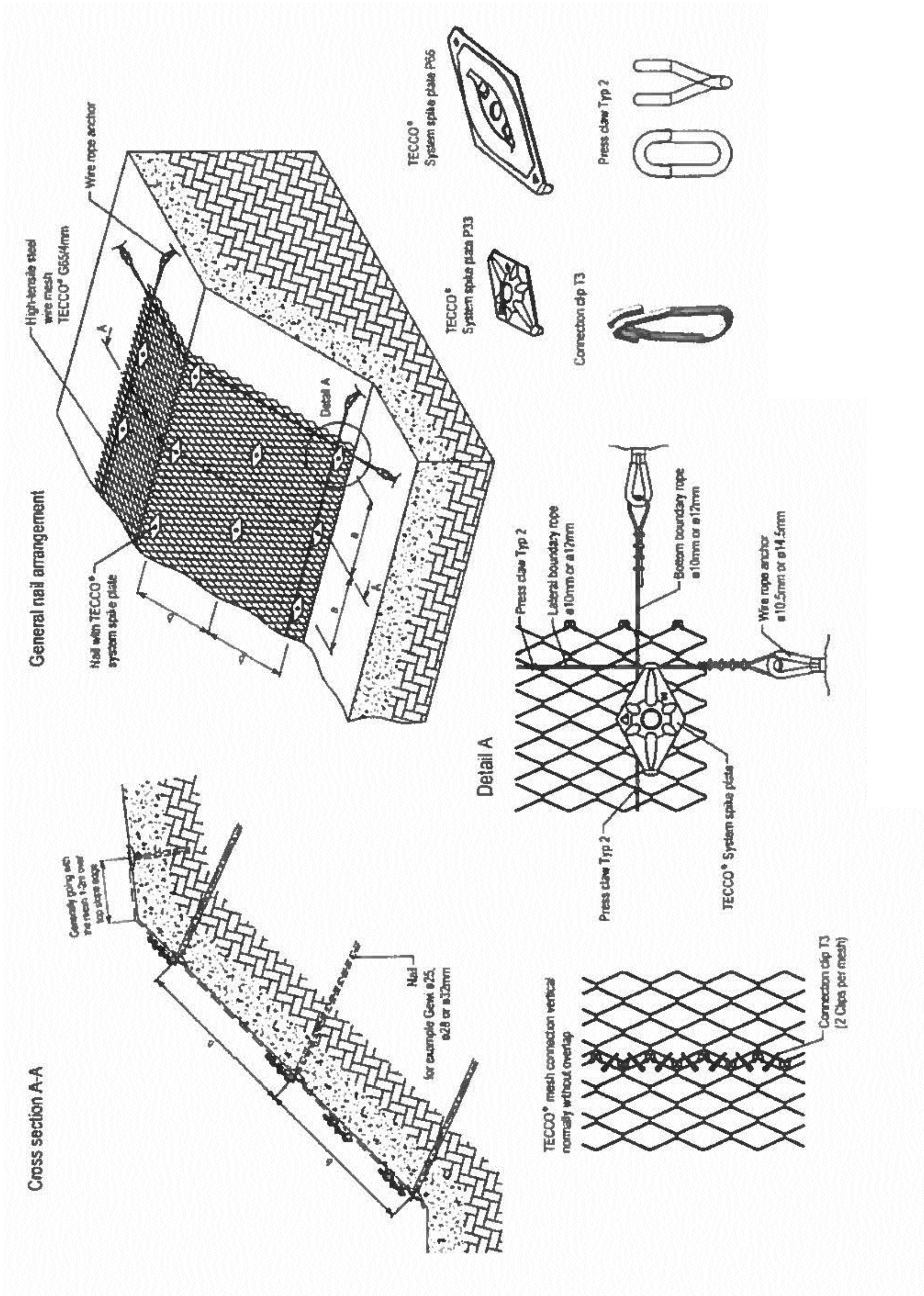
| 1535050 | 500 | F | 2K |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A




**NOTE(S)**

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| CLIENT | PROJECT |
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| DOMINION | BIC/INCREMENTAL CONTROLS |

CONSULTANT

Golder Associates

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| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**SOIL-NAIL WITH TECCO MESH**

| PROJECT No. | PHASE | Rev. | FIGURE |
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| 1535050 | 500 | F | 2L |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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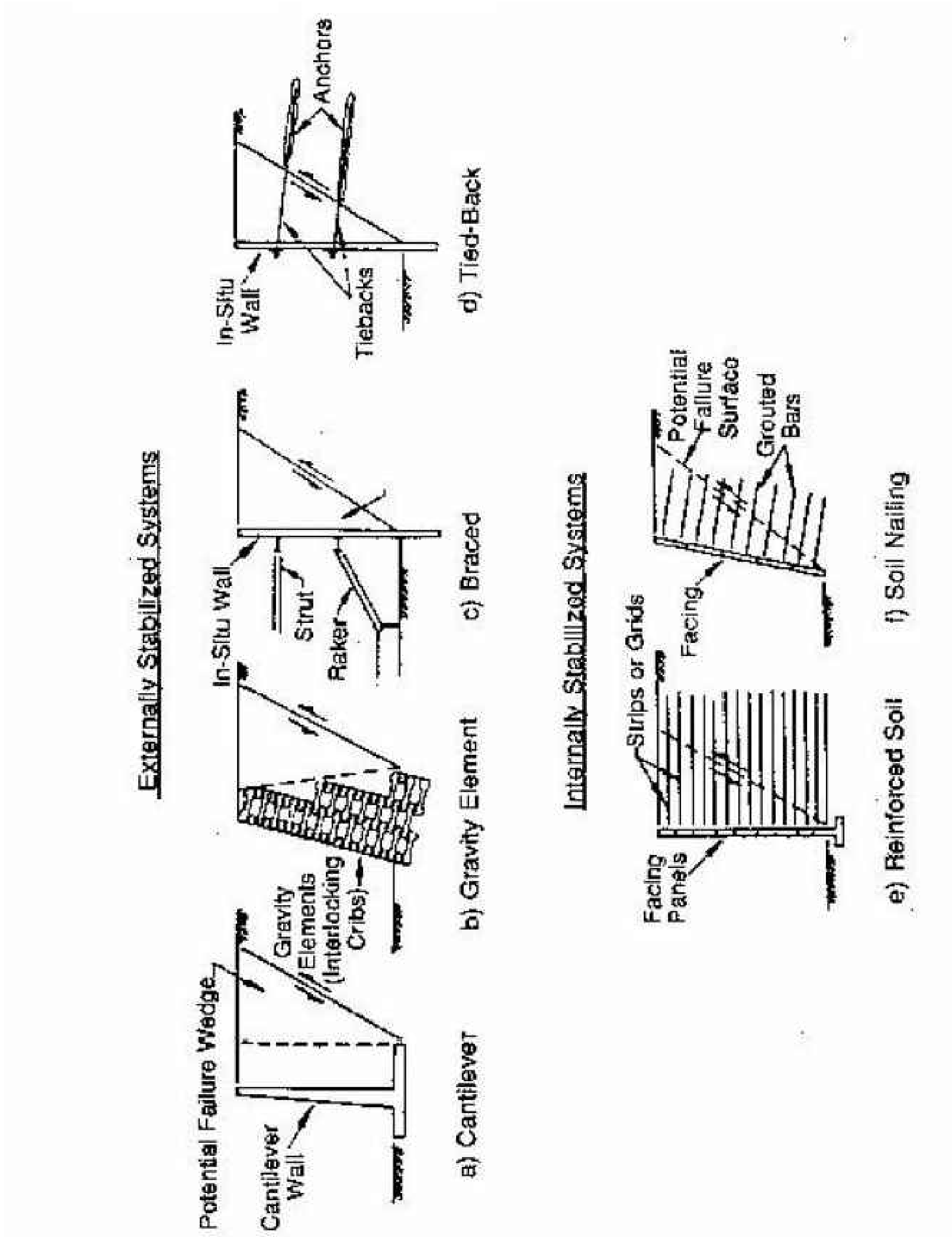


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| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**EXTERNALLY STABILIZED RETAINING WALL SYSTEMS**

| PROJECT No. | PHASE | Rev. | FIGURE |
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| 1535050 | 500 | F | 2M |

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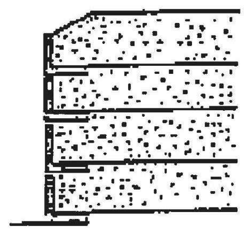
A) VERTICAL GEOTEXTILE FACING

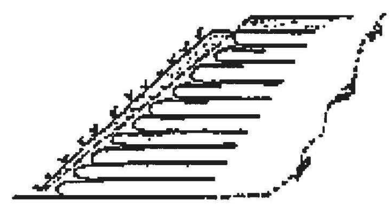
E) SLOPING GEOTEXTILE FACING



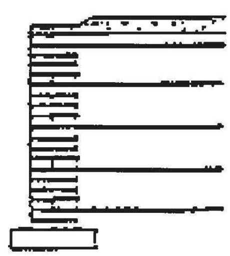
B) VERTICAL PRECAST CONCRETE ELEMENT FACING

F) SLOPING GUNITE OR STRUCTURAL FACING

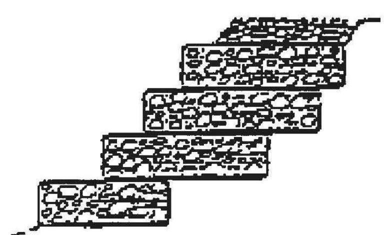
C) VERTICAL CAST IN-PLACE CONCRETE/MASONRY FACING



G) SLOPING SOIL AND VEGETATION FACING



D) VERTICAL MASONRY FACING



H) GEOTEXTILE GABION

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| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT<br>Golder Associates | YYYY-MM-DD: 2017-02-28<br>PREPARED: REDMOND<br>DESIGN: DBC<br>REVIEW: -<br>APPROVED: AQK | TITLE<br>**GEOTEXTILE REINFORCED SYSTEMS** | |

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 2N |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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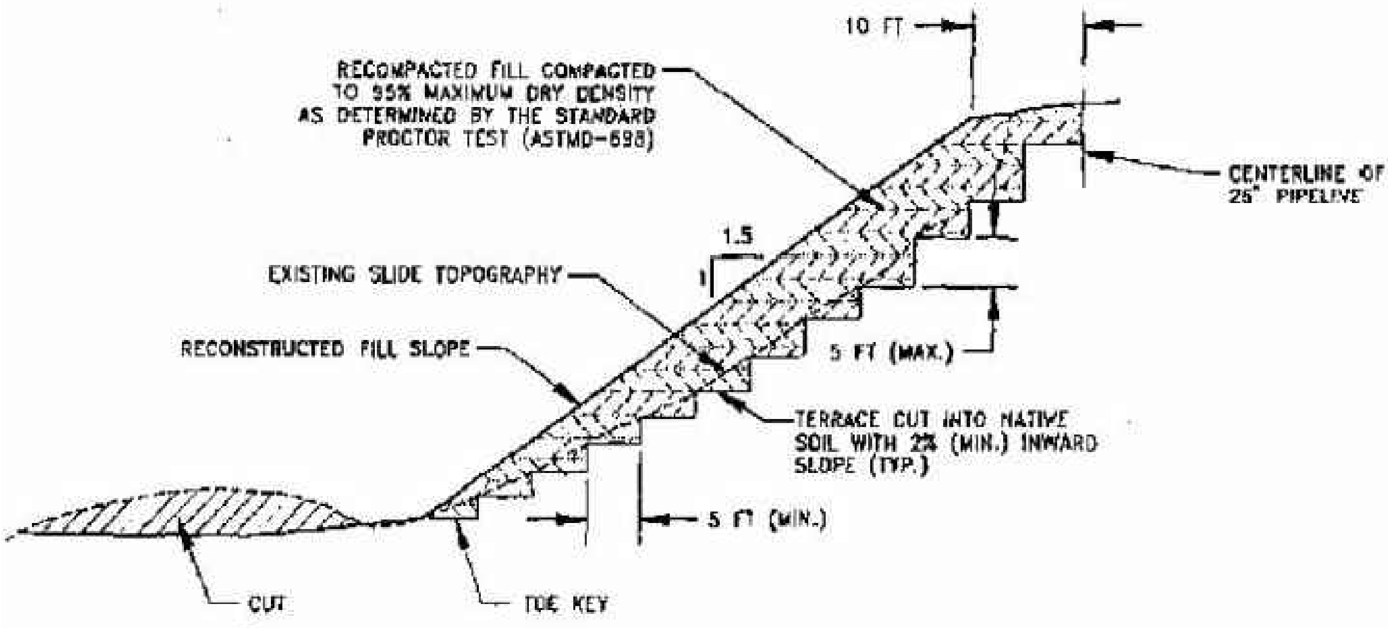


**NOTE(S)**

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.

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| CLIENT<br>DOMINION | PROJECT<br>BIC/INCREMENTAL CONTROLS |

| CONSULTANT | | | TITLE |
|---|---|---|---|
| Golder Associates | YYYY-MM-DD | 2017-02-28 | **BENCH AND REGRADE WITH BACKFILL** |
| | PREPARED | REDMOND | |
| | DESIGN | DBC | |
| | REVIEW | - | PROJECT No. 1535050 / PHASE 500 / Rev. F / FIGURE 2O |
| | APPROVED | AQK | |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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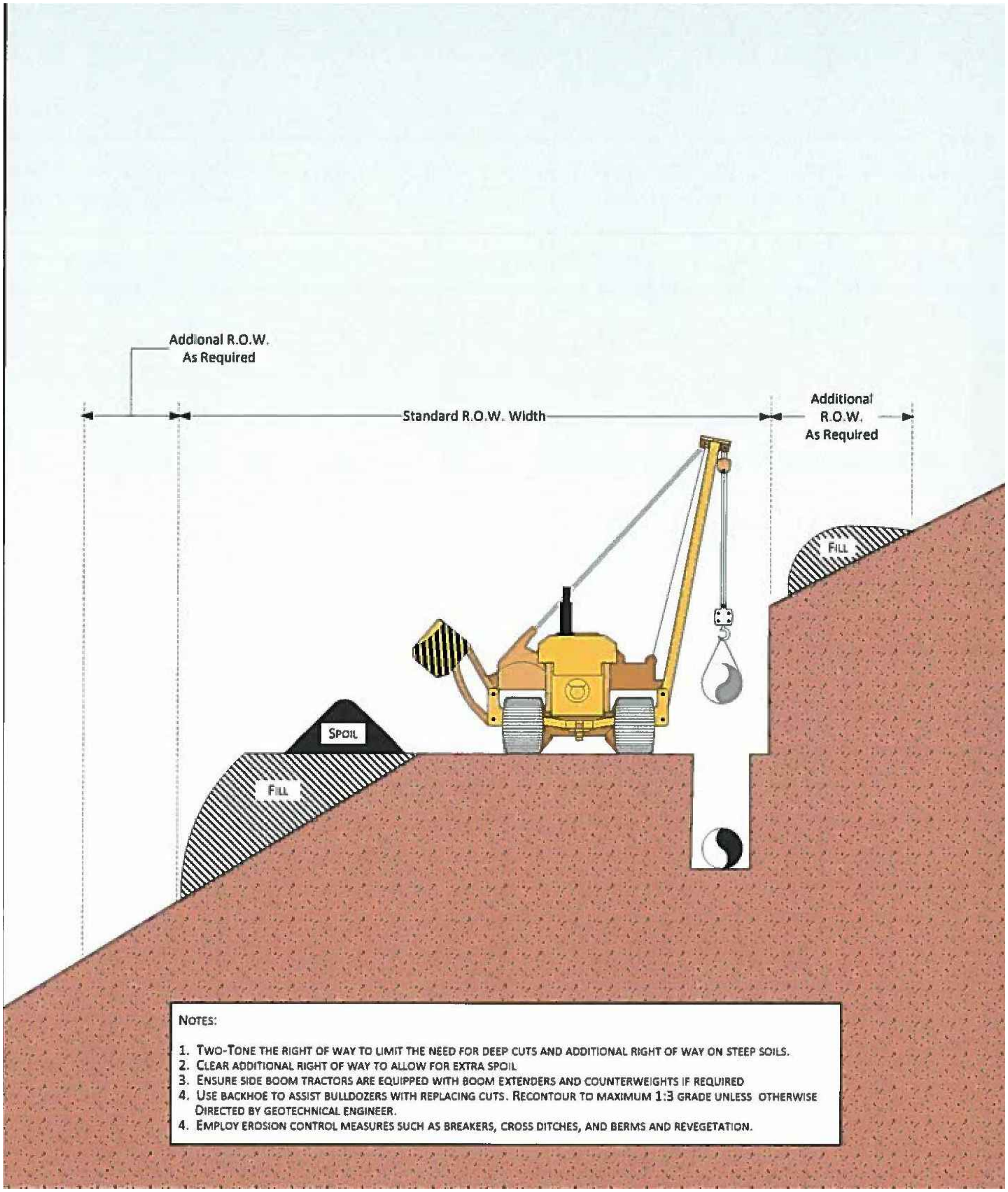


**NOTE(S)**

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.

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DOMINION

PROJECT
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CONSULTANT
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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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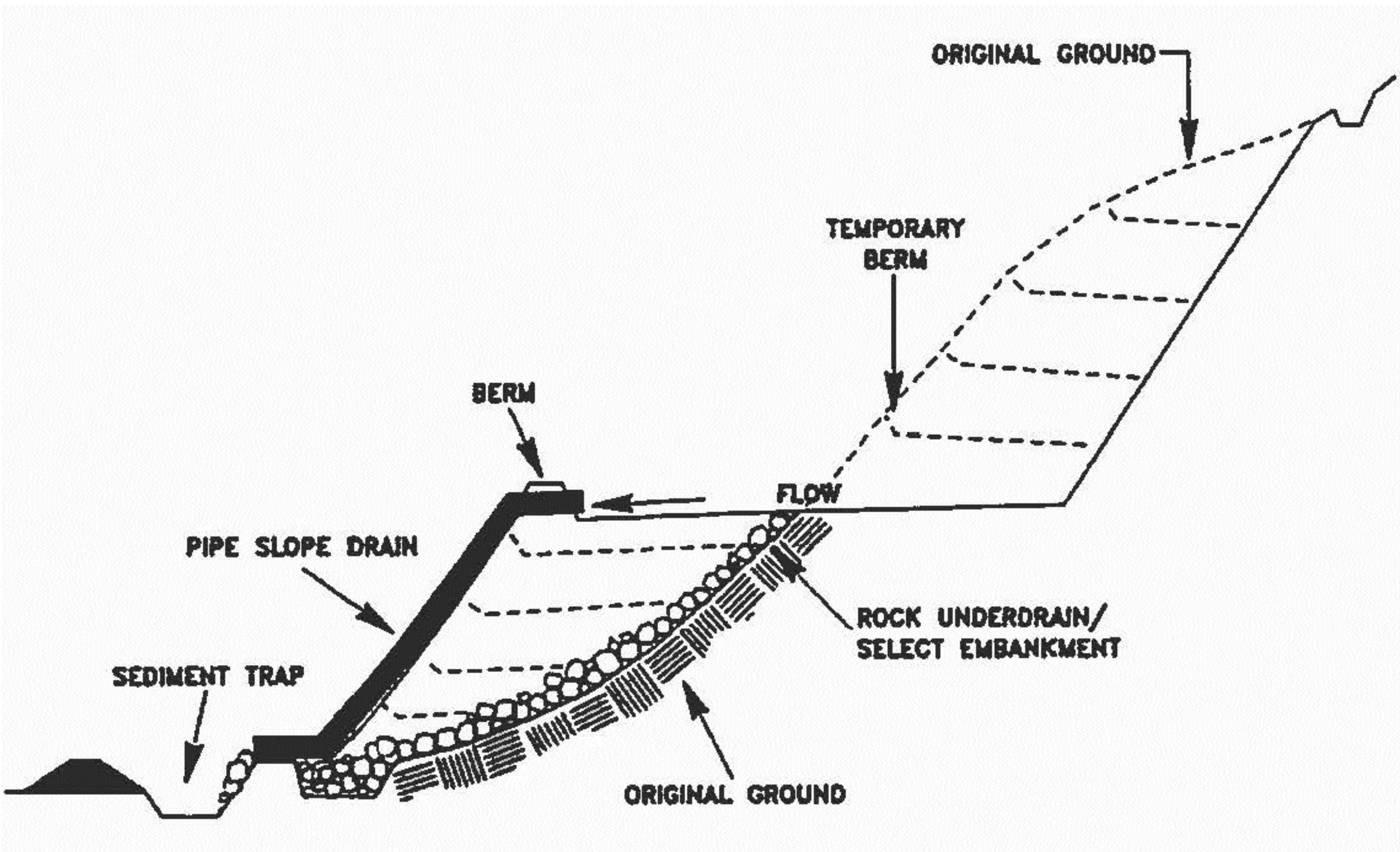


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| CLIENT | DOMINION |
| PROJECT | BIC/INCREMENTAL CONTROLS |
| CONSULTANT | Golder Associates |
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |
| TITLE | TYP SIDE HILL CUT AND FILL |
| PROJECT No. | 1535050 |
| PHASE | 500 |
| Rev. | F |
| FIGURE | 2Q |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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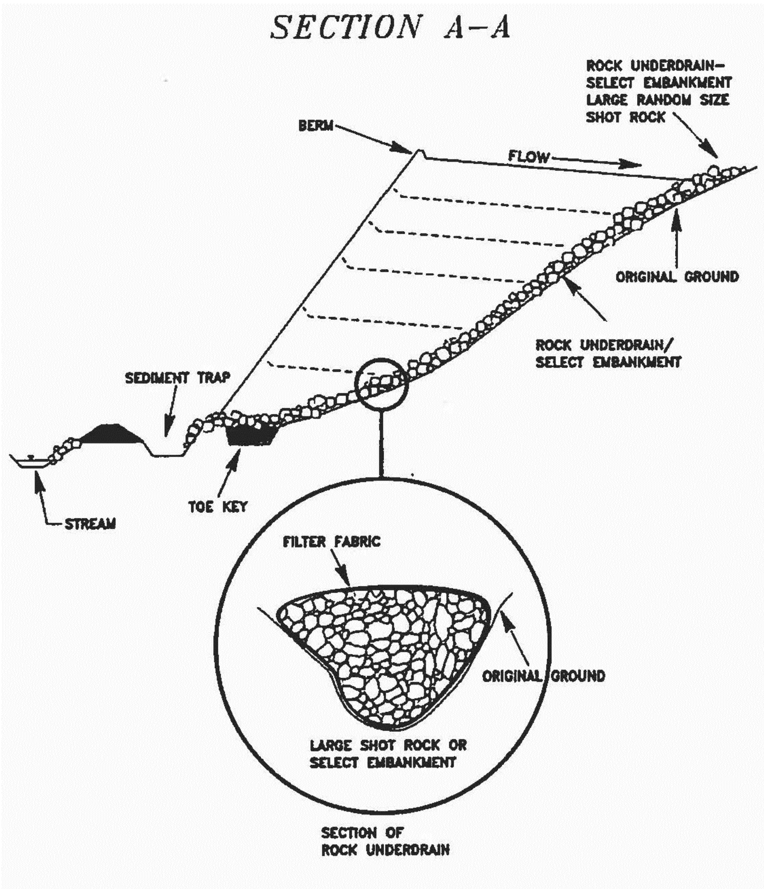


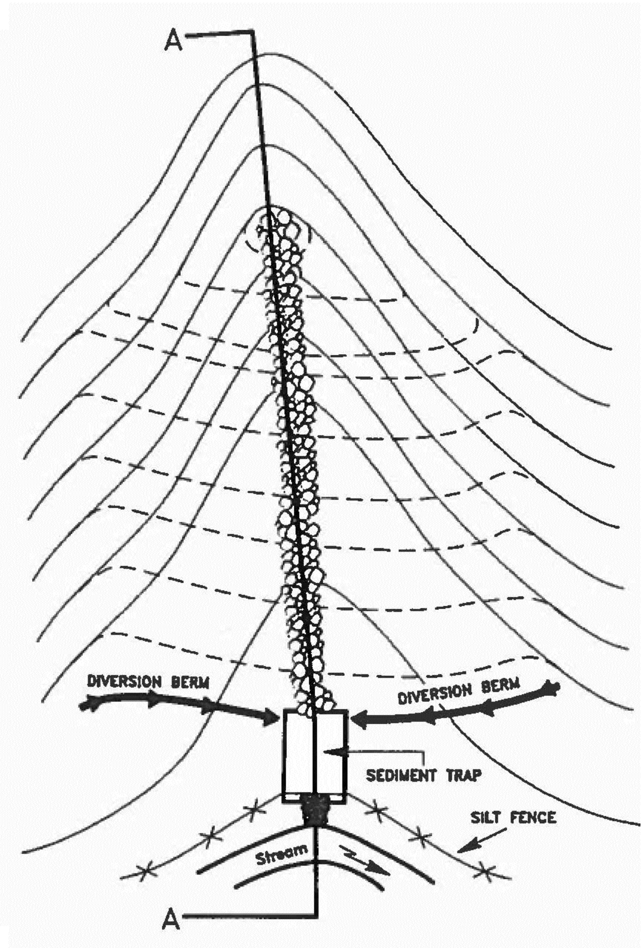


IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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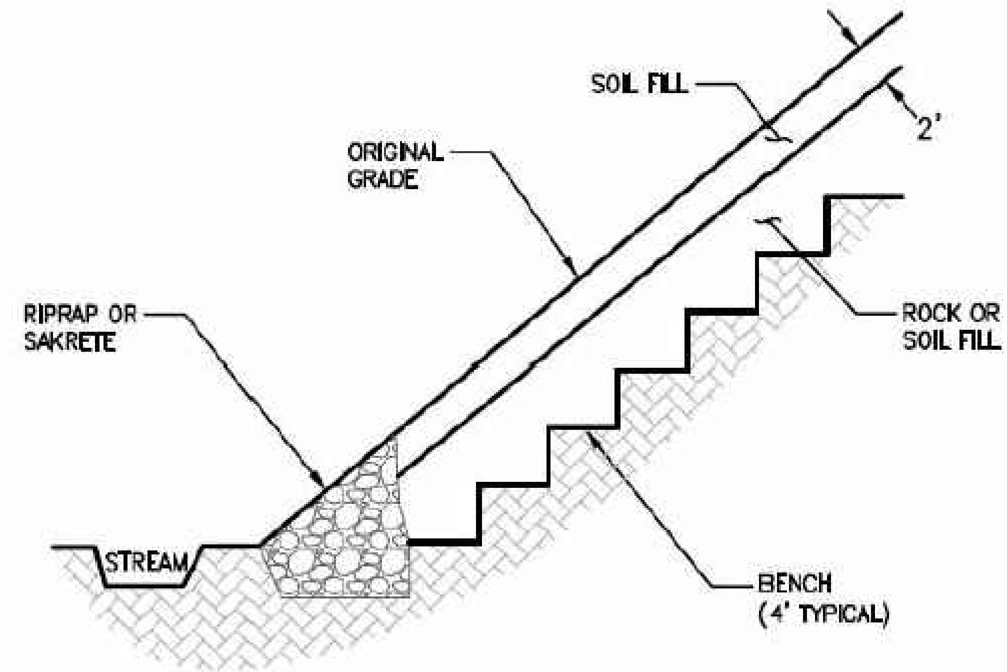
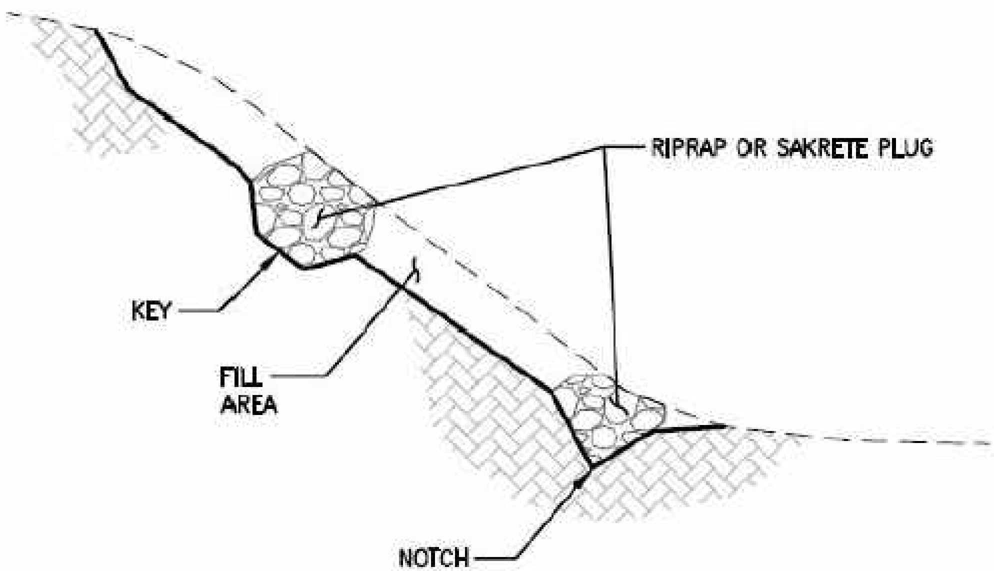
|---|---|---|---|
| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT<br>Golder Associates | YYYY-MM-DD: 2017-02-28<br>PREPARED: REDMOND<br>DESIGN: DBC<br>REVIEW: -<br>APPROVED: AQK | TITLE<br>**TYP FILL WITH ROCK UNDER DRAIN** | |
| | | PROJECT No. 1535050 | PHASE 500 |
| | | Rev. F | FIGURE 2R |




BENCH AND REGRADE TYPICAL
N.T.S.




KEYING TYPICAL
N.T.S.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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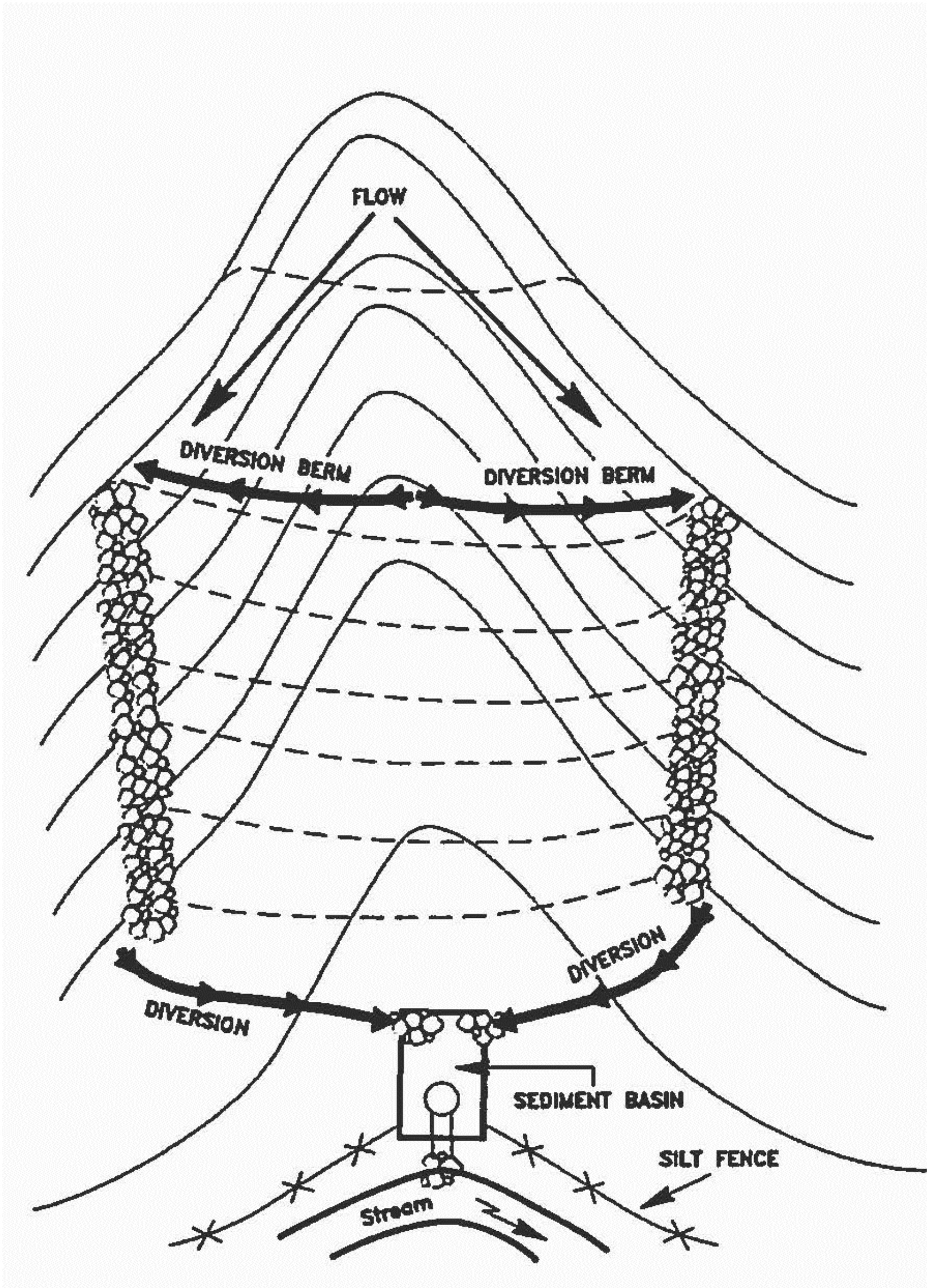


IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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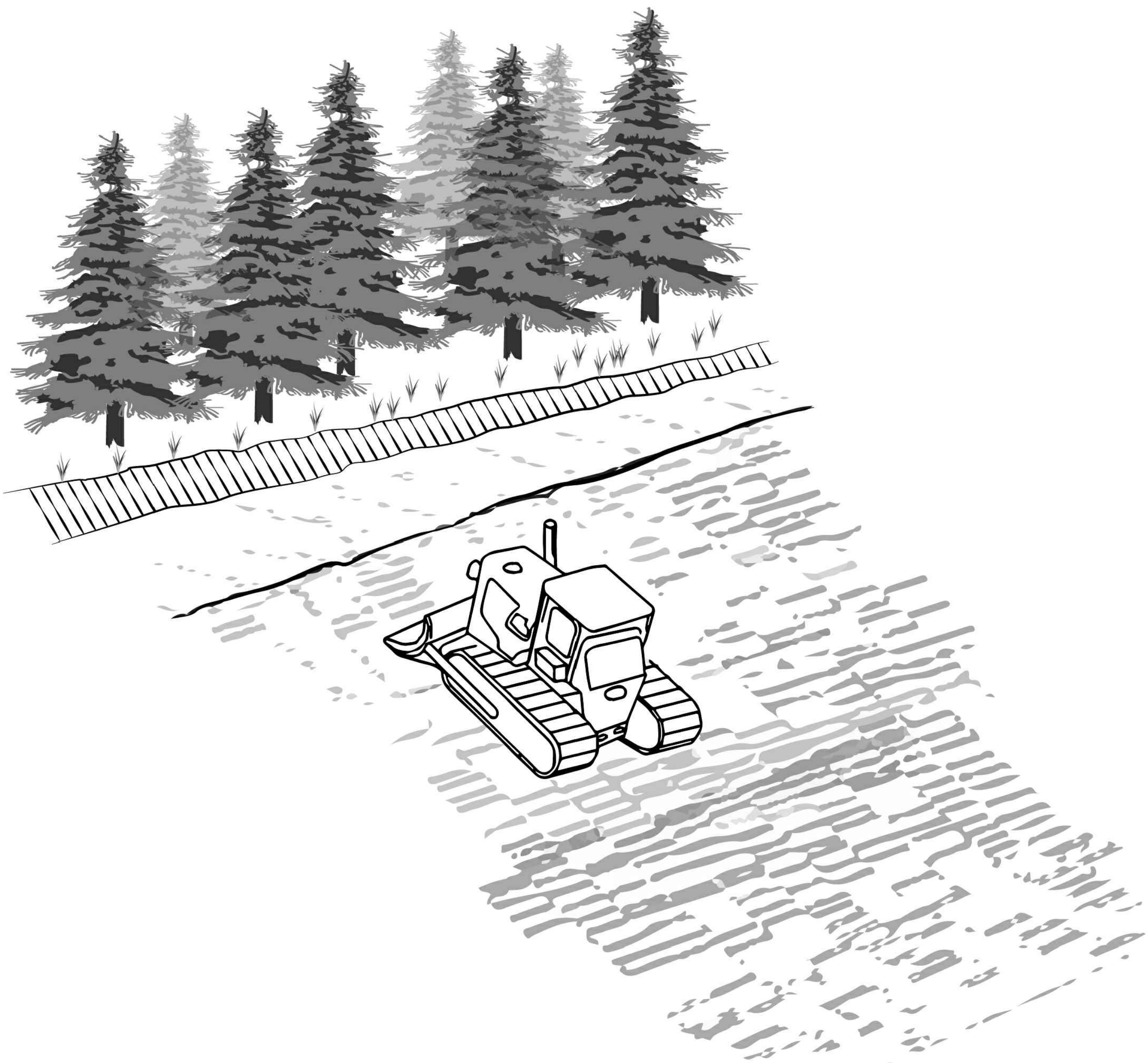
|---|---|---|---|
| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT | YYYY-MM-DD: 2017-02-28 | TITLE<br>**TYP FILL WITH MULTIPLE ROCK CHANNELS** | |
| | PREPARED: REDMOND | | |
| | DESIGN: DBC | | |
| | REVIEW: - | | |
| | APPROVED: AQK | PROJECT No. 1535050 · PHASE 500 | Rev. F · 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

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| CLIENT<br>DOMINION | PROJECT<br>BIC/INCREMENTAL CONTROLS |

| CONSULTANT | | |
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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

**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.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

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| 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 |

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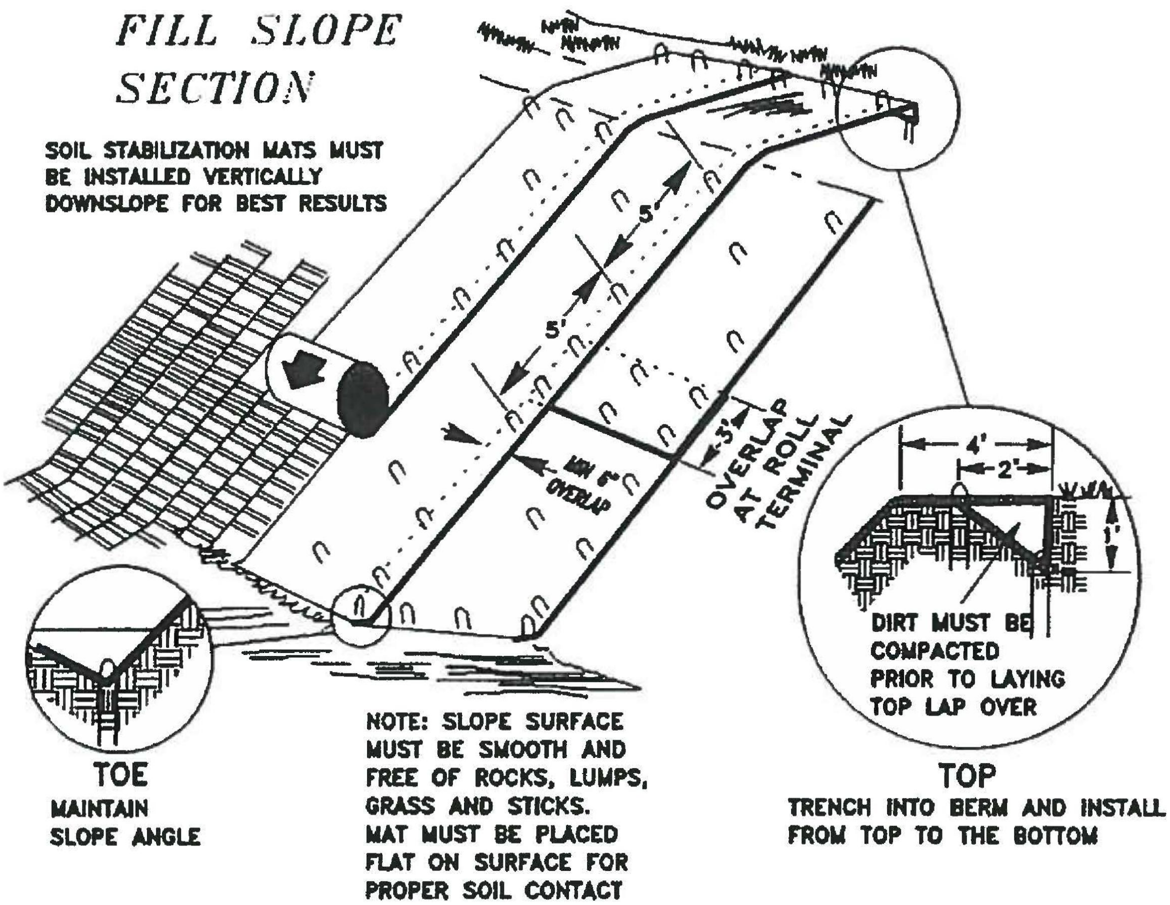
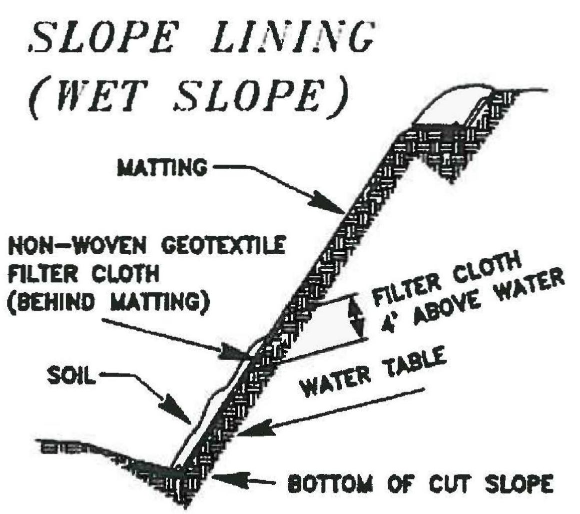
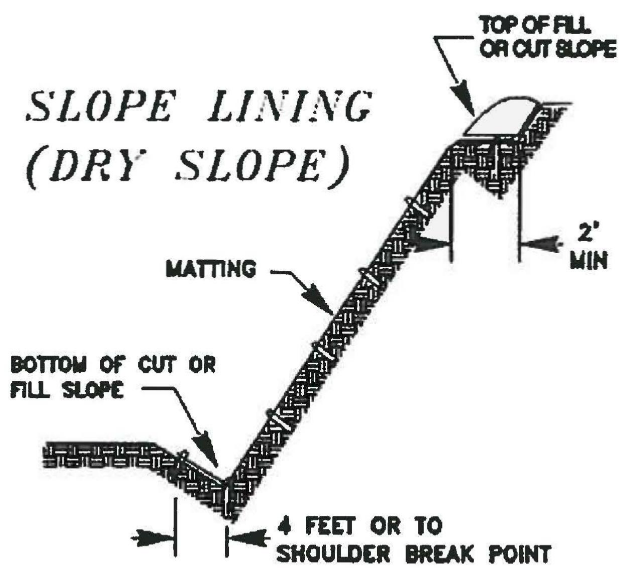
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A




SOURCE: VDOT STANDARDS AND VIRGINIA DCR-DSWC

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|---|---|---|---|
| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT<br>Golder Associates | YYYY-MM-DD | 2017-02-28 | TITLE<br>COIR CLOTH ON DISTRUBED SLOPES |
| | PREPARED | REDMOND | |
| | DESIGN | DBC | |
| | REVIEW | - | |
| | APPROVED | AQK | PROJECT No. 1535050 · PHASE 500 · Rev. F · FIGURE 3C |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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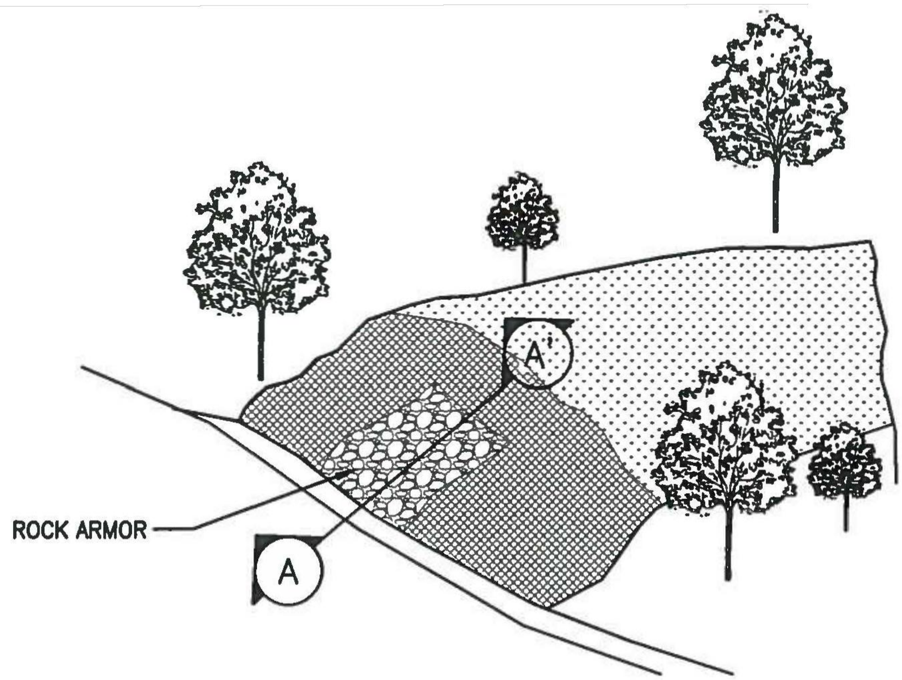
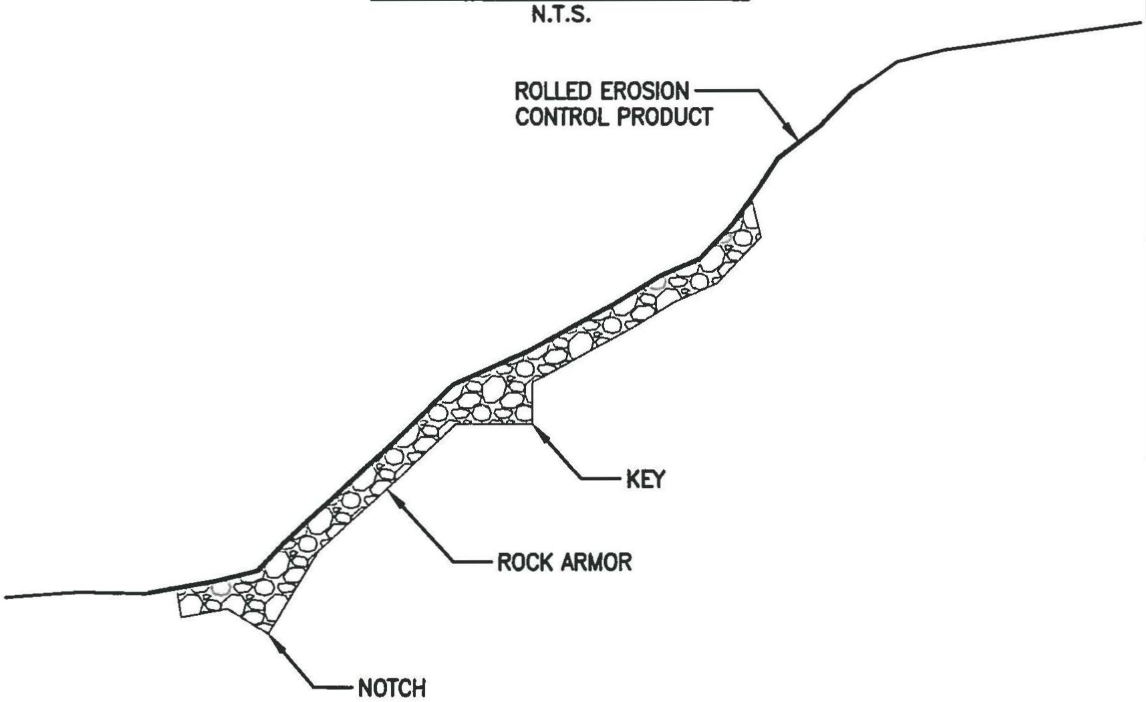



PERSPECTIVE VIEW
N.T.S.




A–A' ROCK ARMOR ON STEEP SLOPE
N.T.S.

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| CLIENT<br>DOMINION | PROJECT<br>BIC/INCREMENTAL CONTROLS |

CONSULTANT

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| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**ROCK ARMORING ON DISTRUBED SLOPES**

| 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

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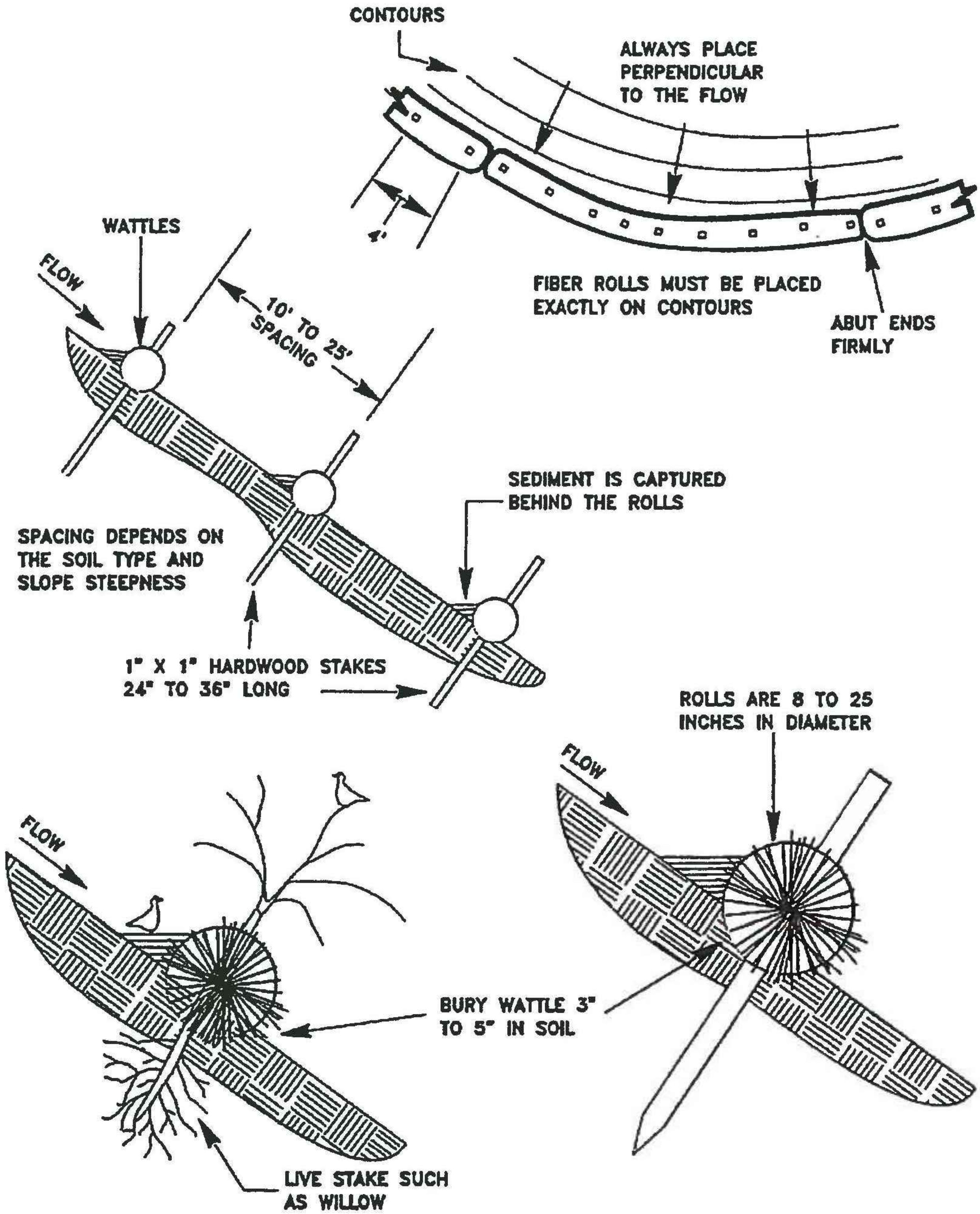


IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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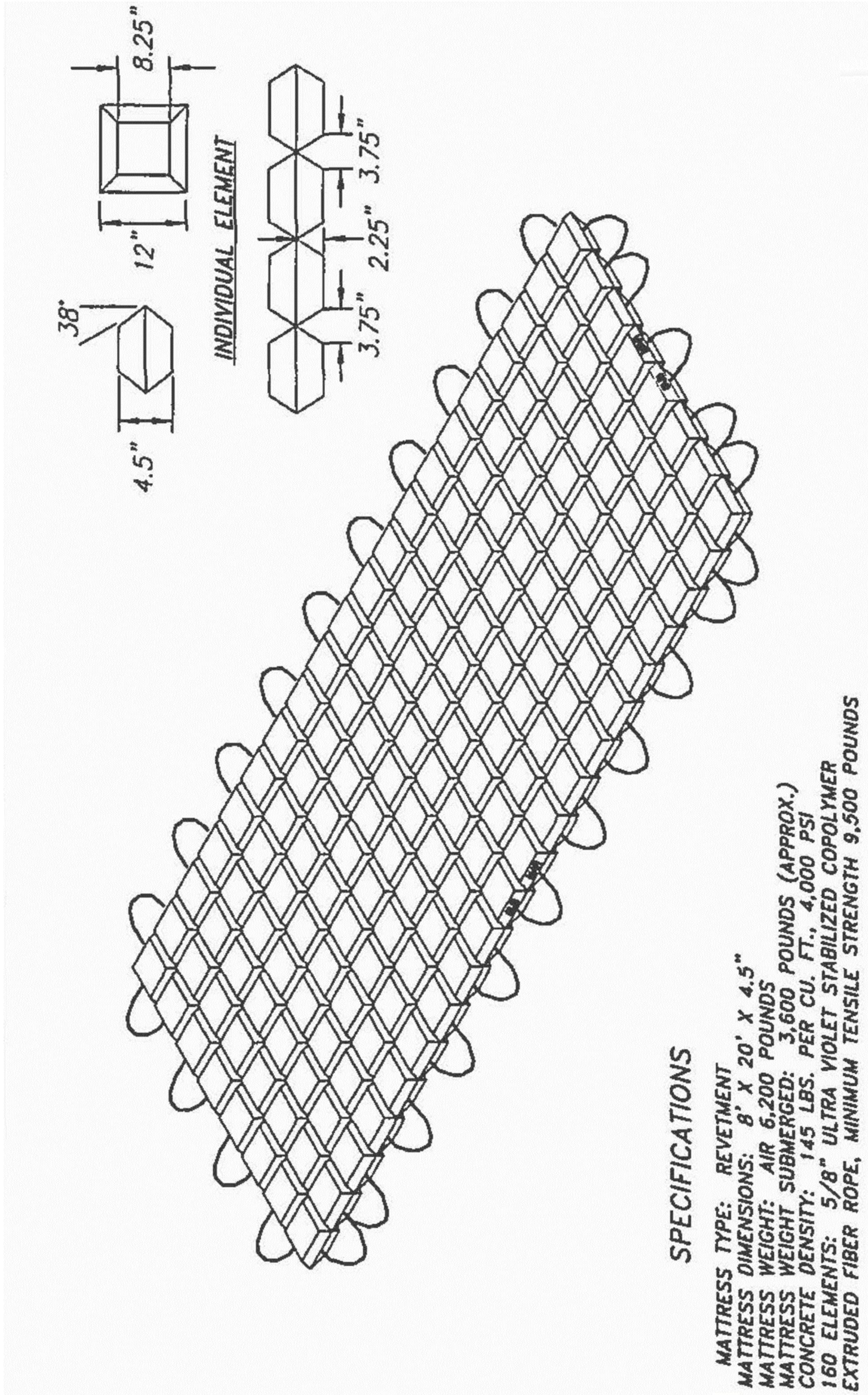
|---|---|---|---|
| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT<br>Golder Associates | YYYY-MM-DD | 2017-02-28 | TITLE<br>COIR LOGS ON DISTURBED SLOPES |
| | PREPARED | REDMOND | |
| | DESIGN | DBC | |
| | REVIEW | - | |
| | APPROVED | AQK | PROJECT No. 1535050 · PHASE 500 · Rev. F · FIGURE 3E |




CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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| 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

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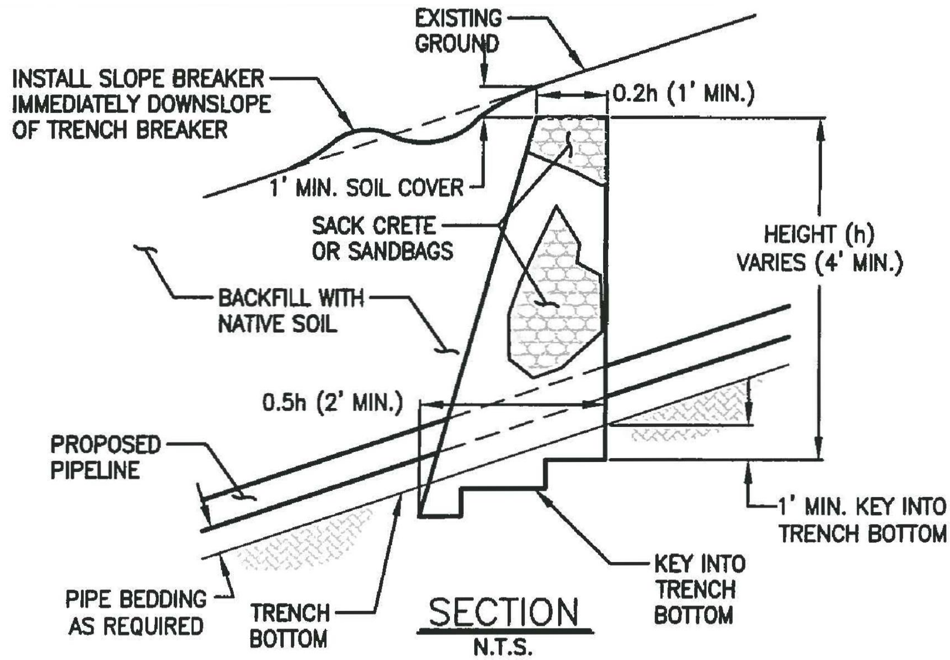
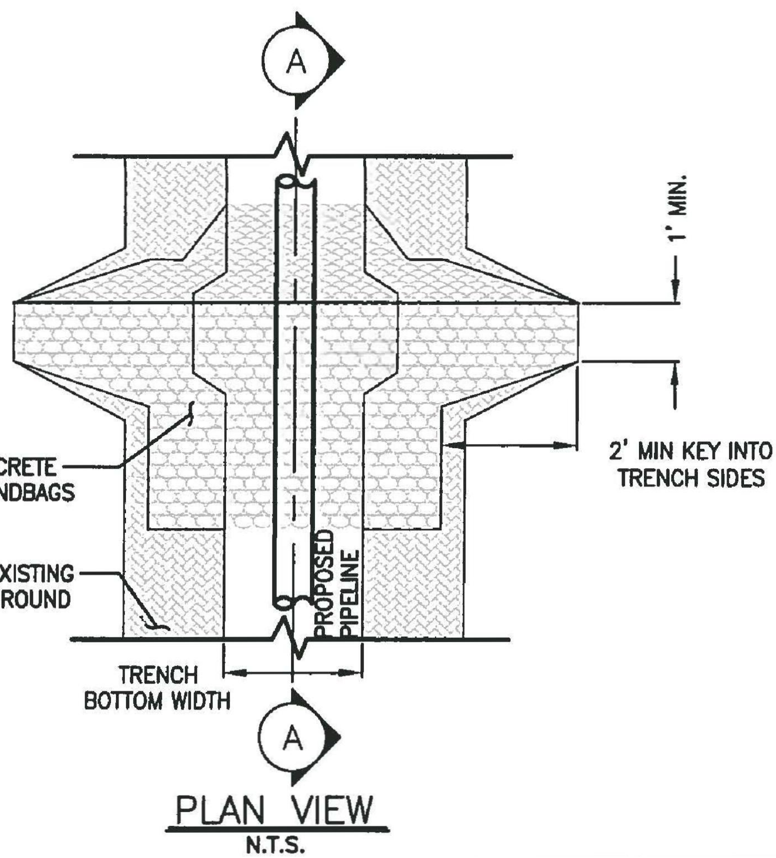



SECTION
N.T.S.




PLAN VIEW
N.T.S.

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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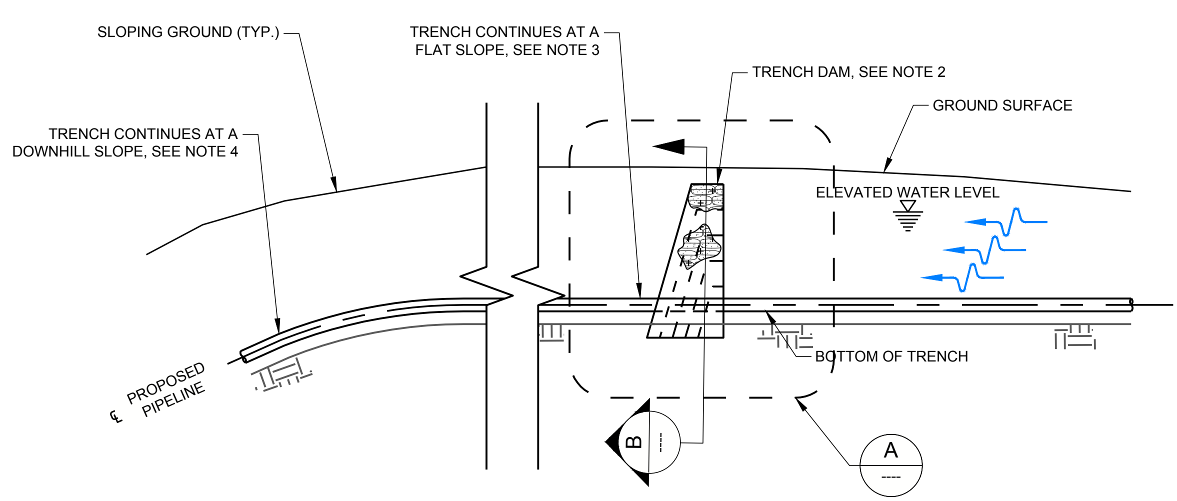
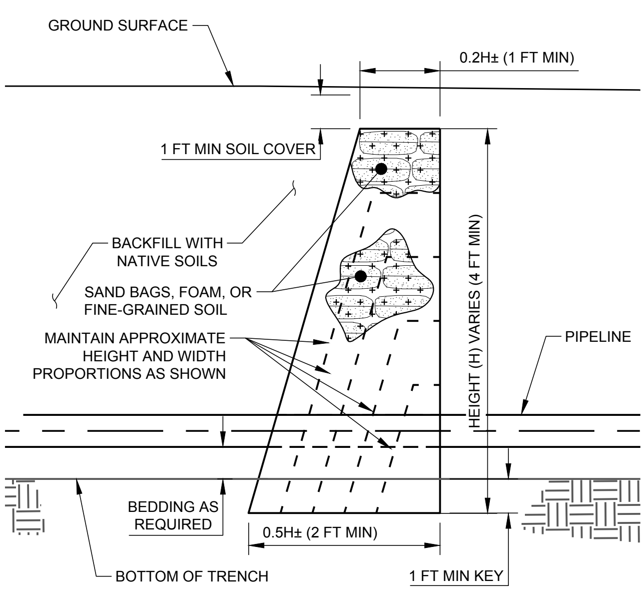
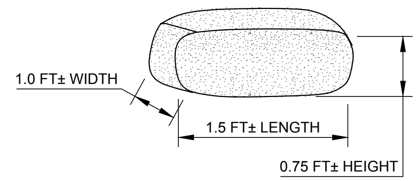
|---|---|---|---|
| CLIENT | DOMINION | PROJECT | BIC/INCREMENTAL CONTROLS |
| CONSULTANT: Golder Associates | YYYY-MM-DD: 2017-02-28 | TITLE | TRENCH BREAKERS (FOAM AND SANDBAGS) |
| | PREPARED: REDMOND | | |
| | DESIGN: DBC | | |
| | REVIEW: - | PROJECT No. 1535050 | PHASE 500 |
| | APPROVED: AQK | Rev. F | FIGURE 4A |



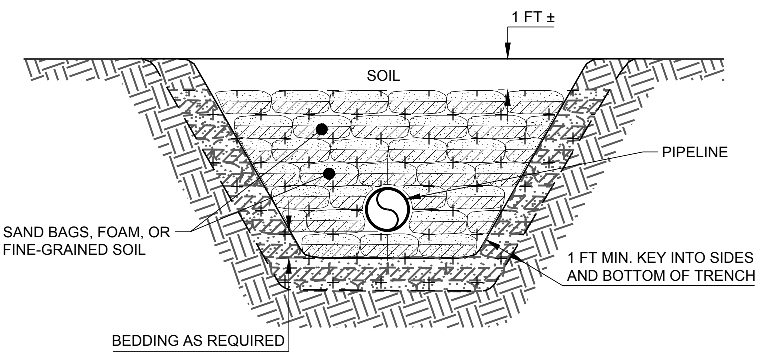

TRENCH DAM CONFIGURATION
N.T.S.




N.T.S A ---- TRENCH DAM DETAIL




SAND BAG DETAIL
N.T.S.




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

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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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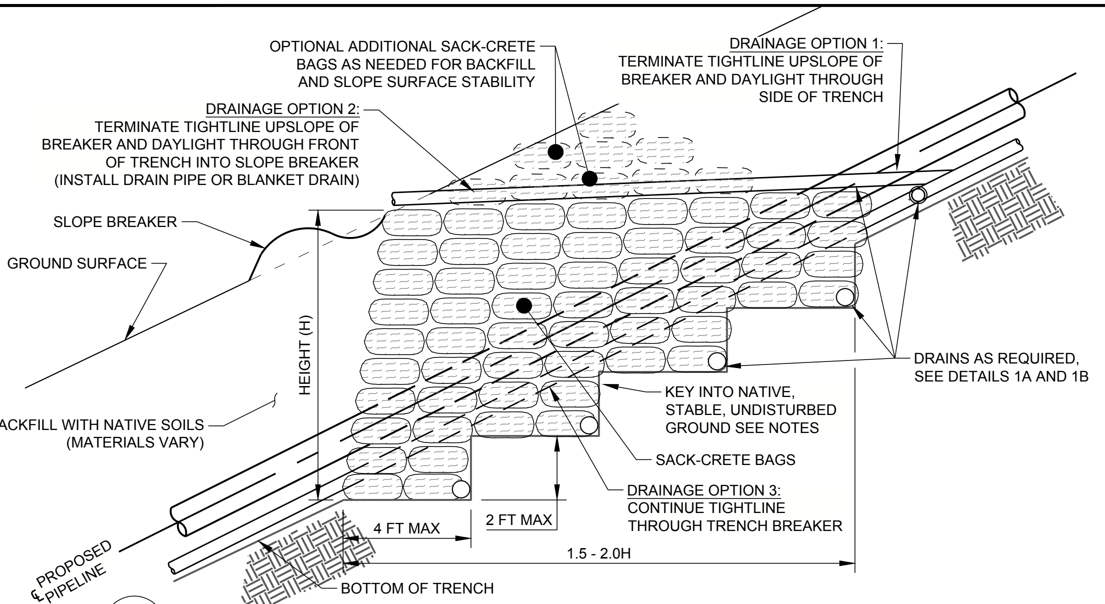
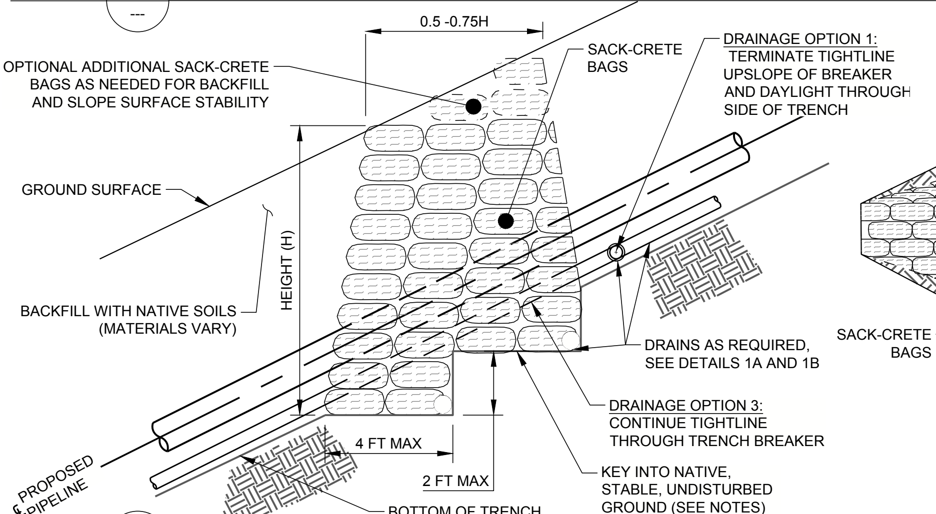
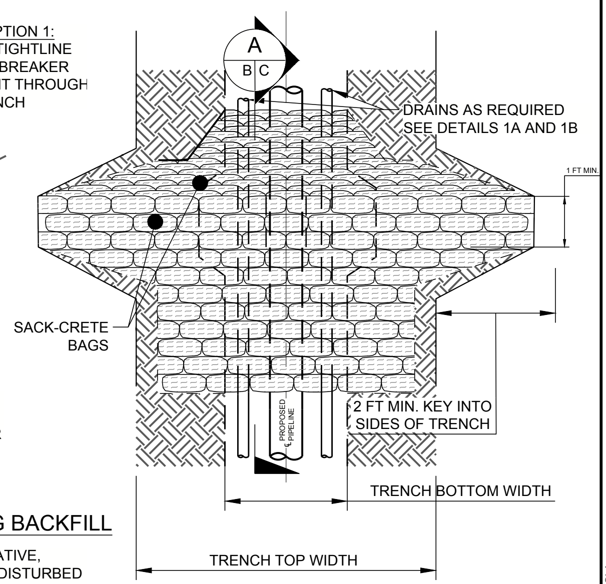


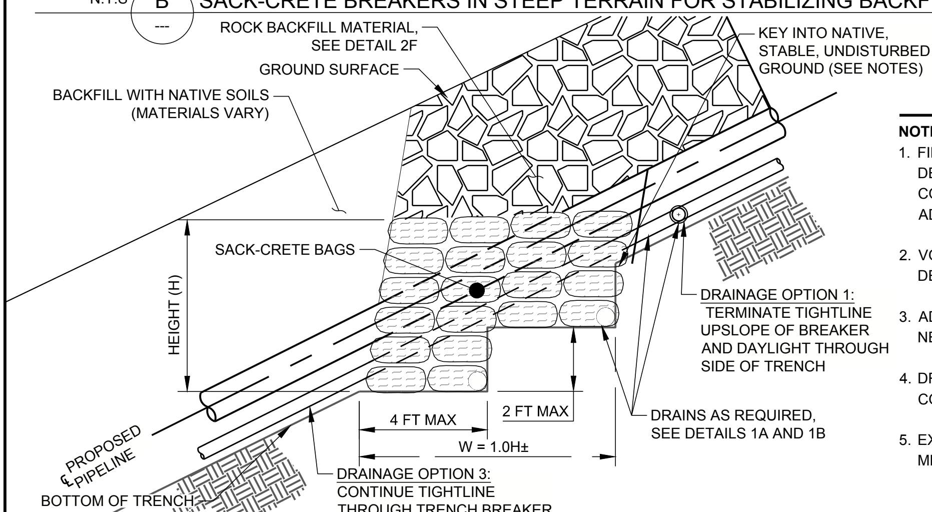

SACK-CRETE BREAKERS IN STEEP TERRAIN FOR STABILIZING ROW AND TRENCH BACKFILL




SACK-CRETE BREAKERS IN STEEP TERRAIN FOR STABILIZING BACKFILL




PLAN VIEW
N.T.S.




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.

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
Golder Associates

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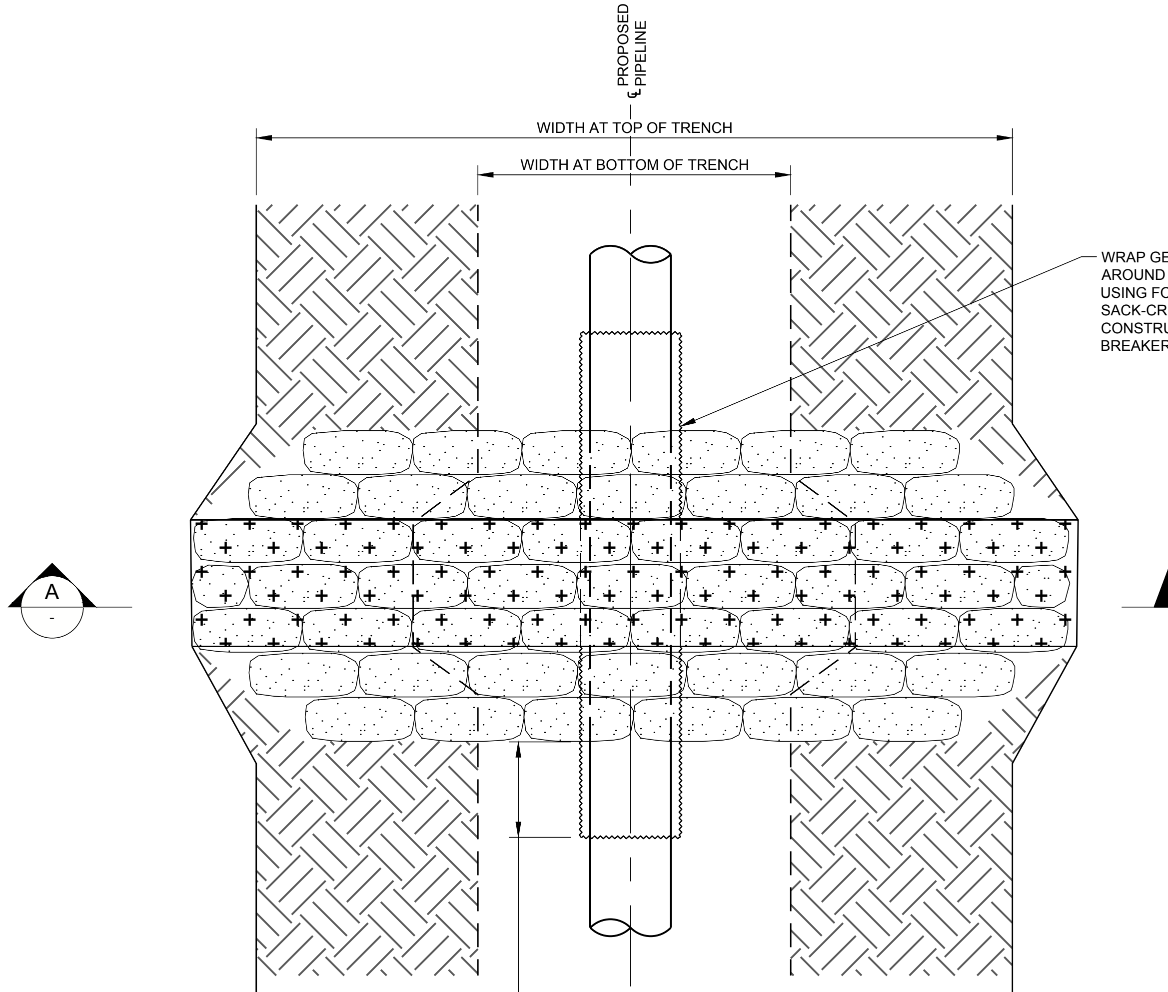
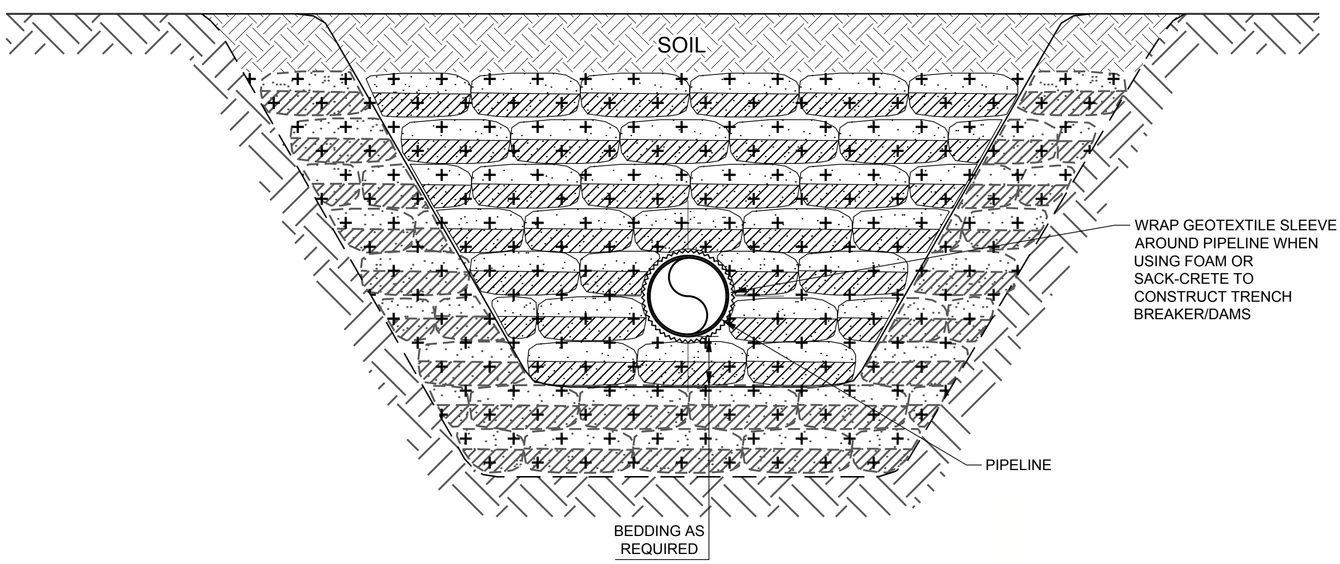
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

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

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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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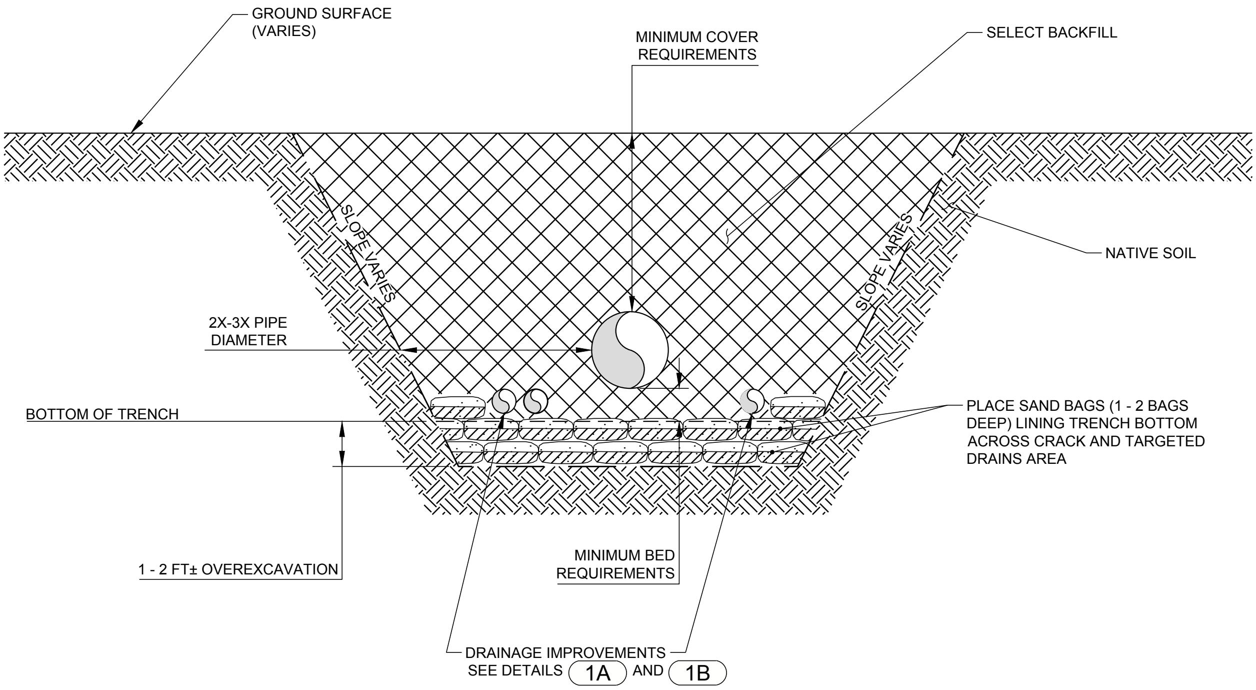


TYPICAL TRENCH SECTION WITH SEALED BOTTOM

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.

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

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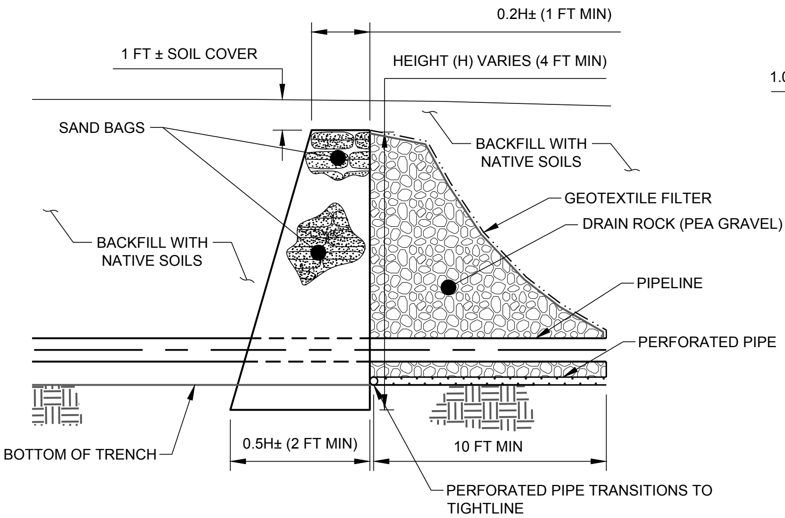
|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE

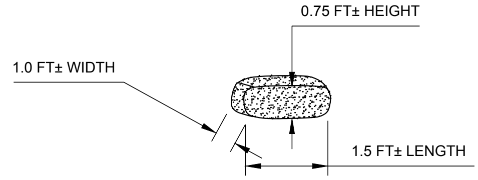
**SEAL BOTTOM OF TRENCH WITH SANDBAGS**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 4E |



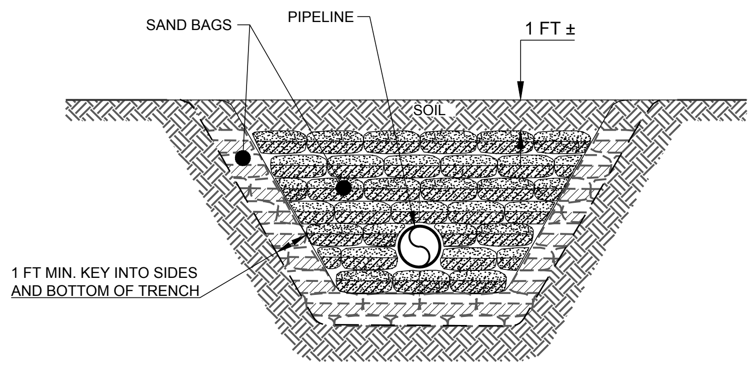

TRENCH BREAKER PROFILE VIEW

SCALE: N.T.S.



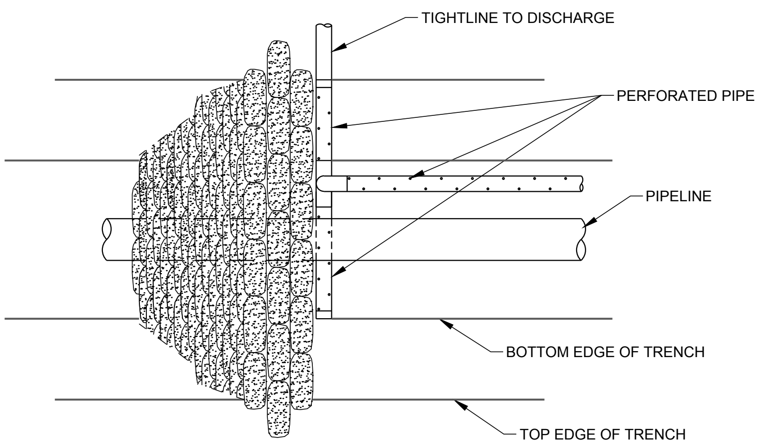

SAND BAG DETAIL

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
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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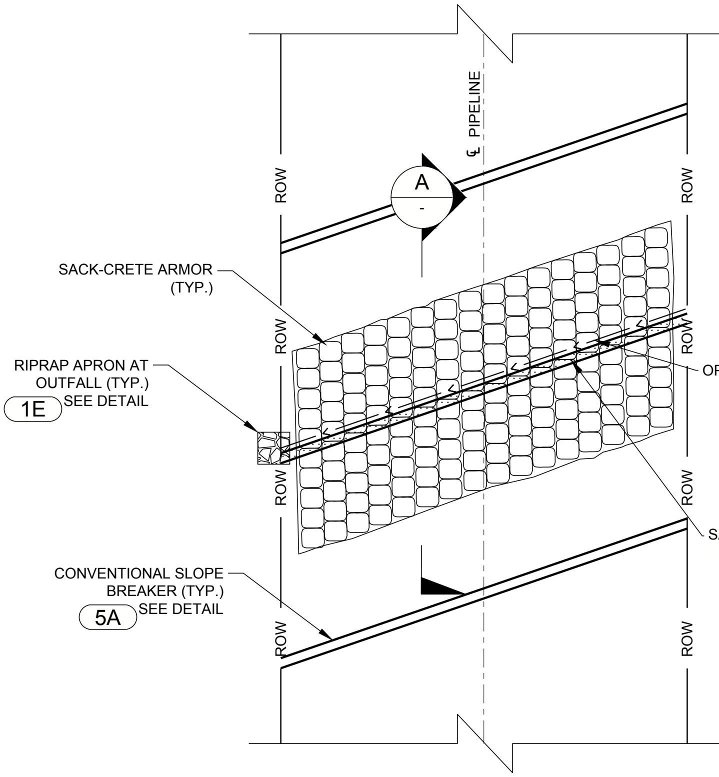
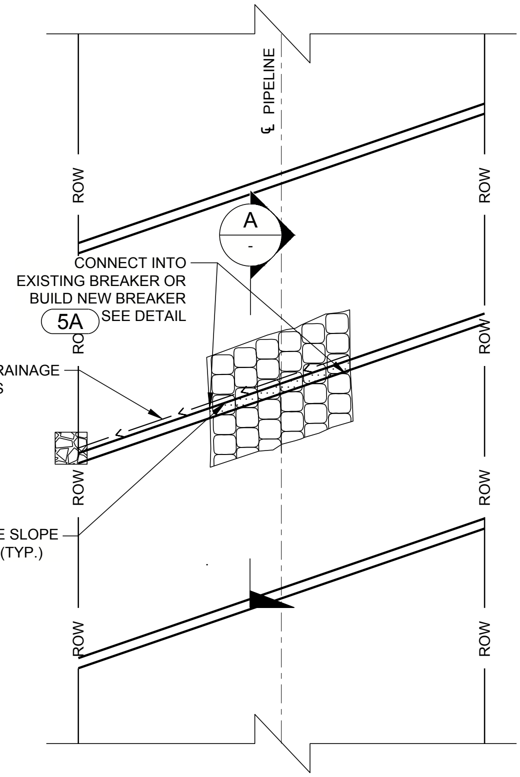
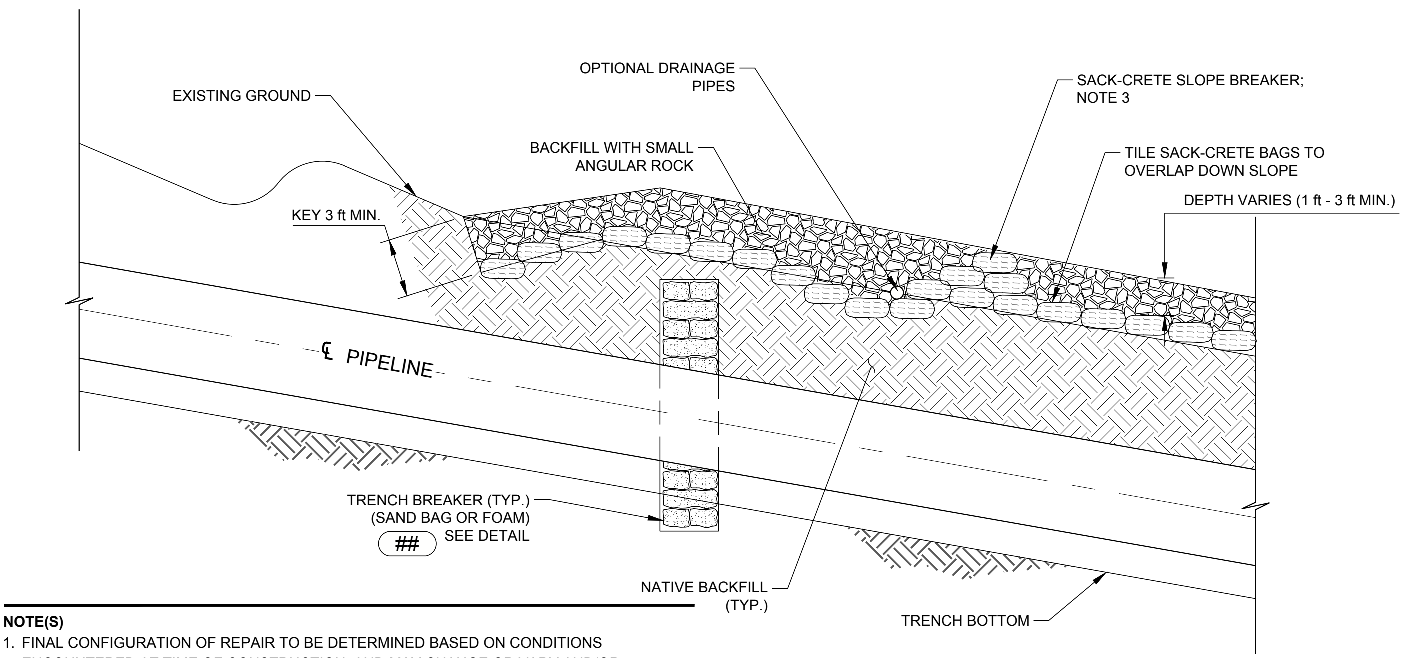
1 in




OPTION A - EXTEND FULL WIDTH OF ROW




OPTION B - TARGETED REPAIR AREA




A
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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.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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| 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 |

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 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.

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
Golder Associates

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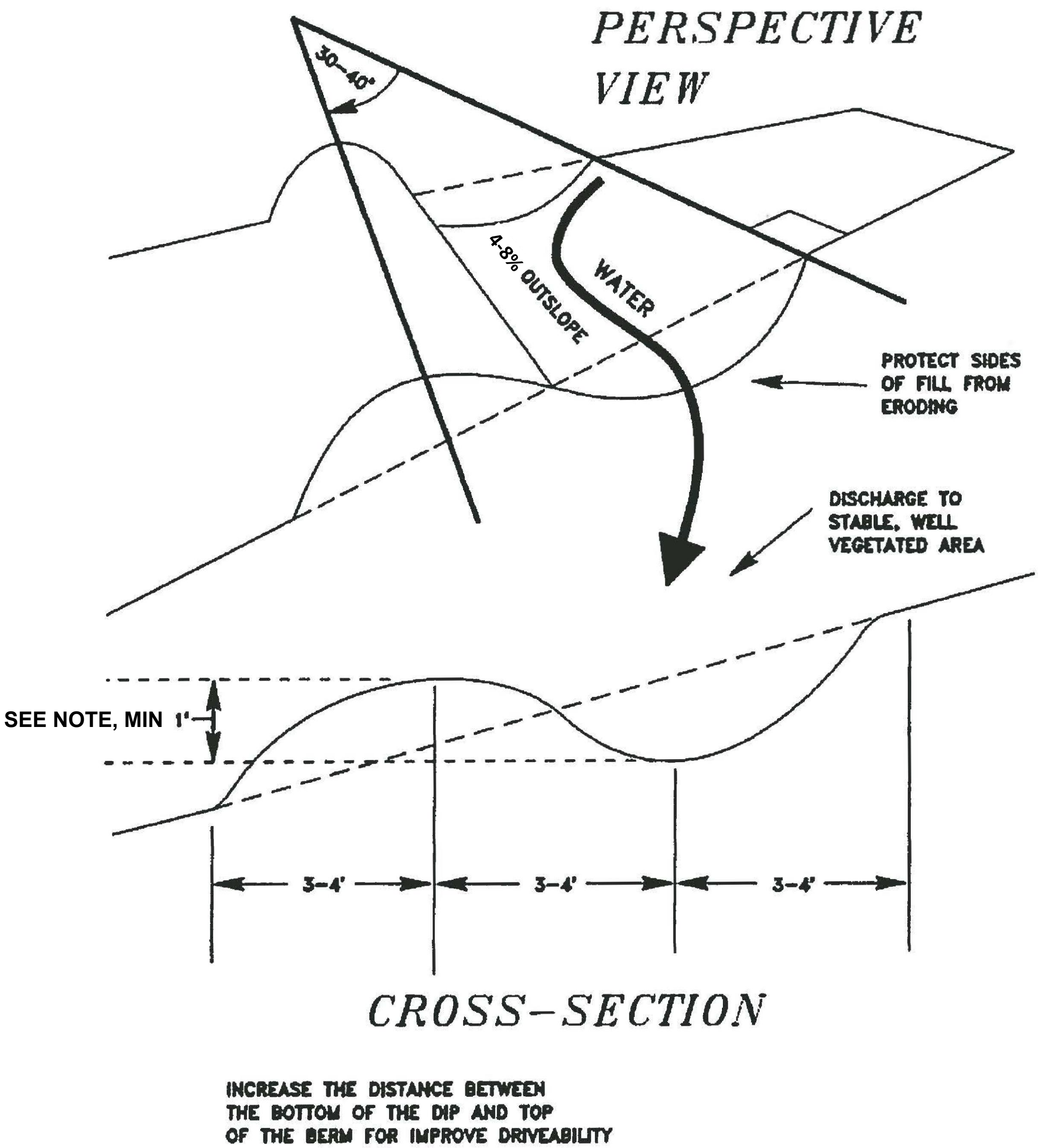
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**FLOWABLE FILL FOR TRENCH BACKFILL**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 4H |




**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<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT<br>Golder Associates | YYYY-MM-DD: 2017-02-28<br>PREPARED: REDMOND<br>DESIGN: DBC<br>REVIEW: -<br>APPROVED: AQK | TITLE<br>**SLOPE BREAKERS (TEMP AND PERMANENT)** | |
| | | PROJECT No. 1535050 · PHASE 500 · Rev. F | FIGURE 5A |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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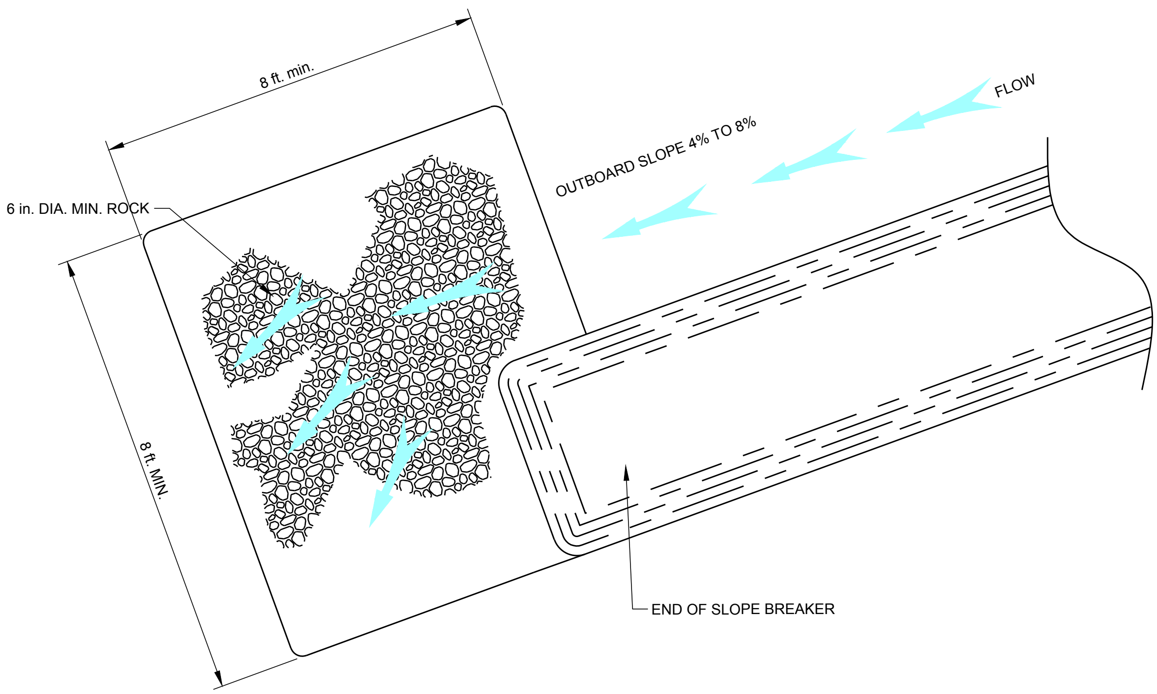


**NOTE(S)**

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.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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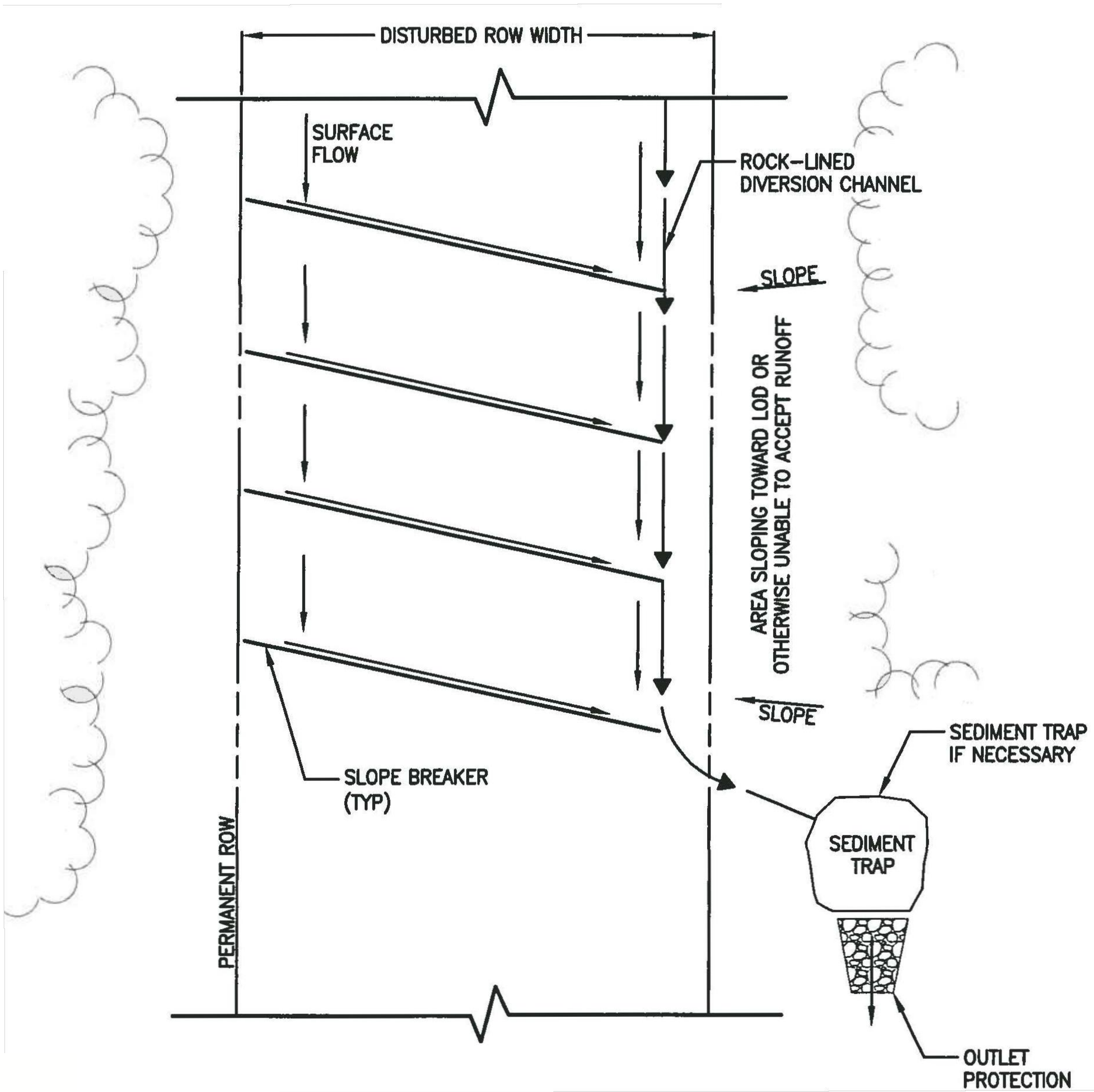


**NOTE(S)**

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. 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

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| 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 |

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. 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

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CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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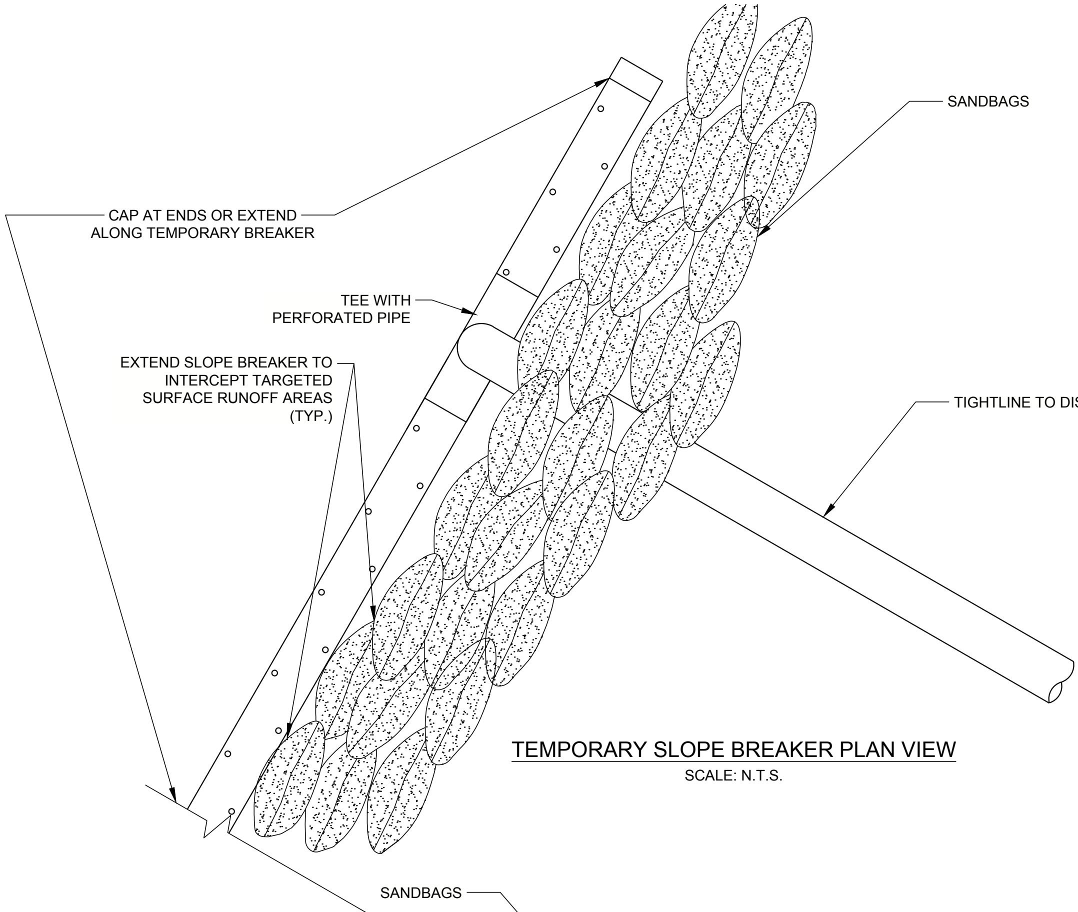
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

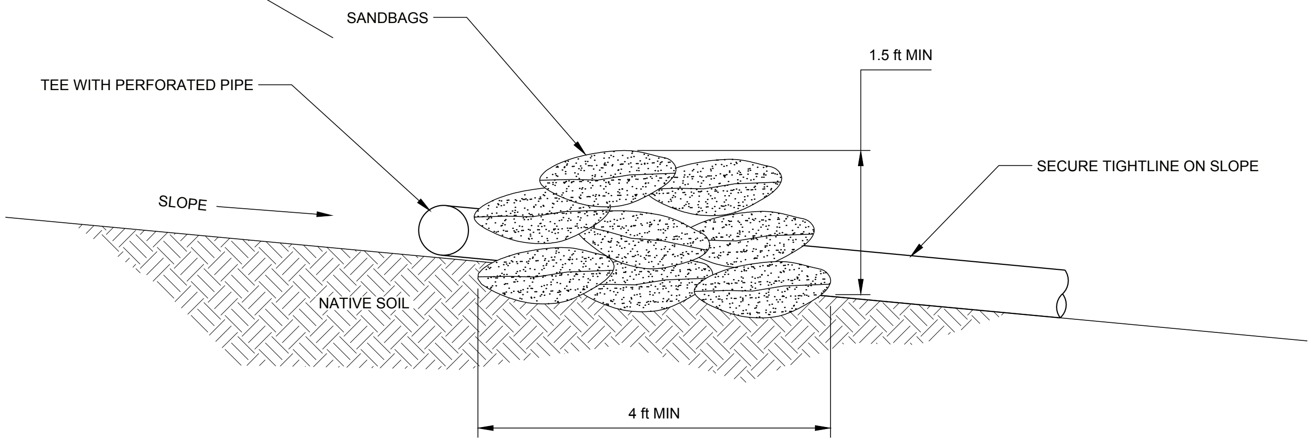
TITLE
**ACCESS ROADS**

| 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

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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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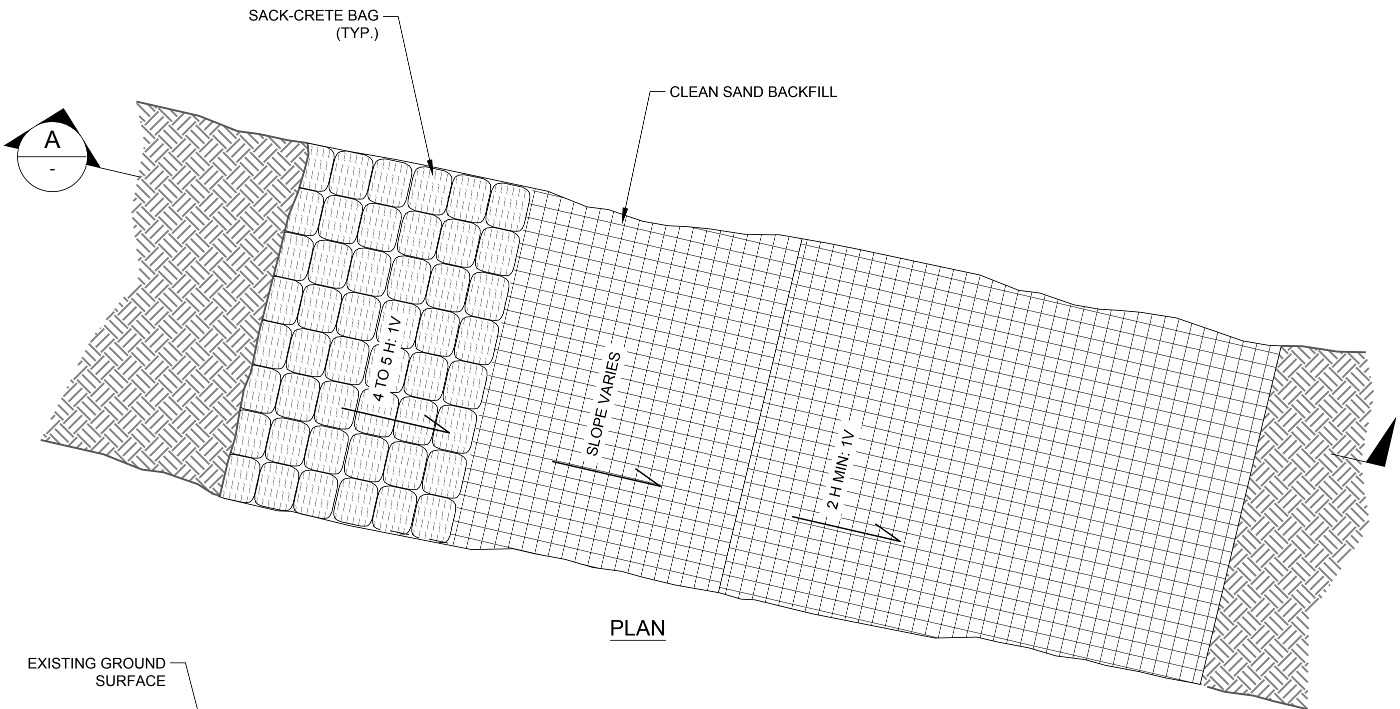
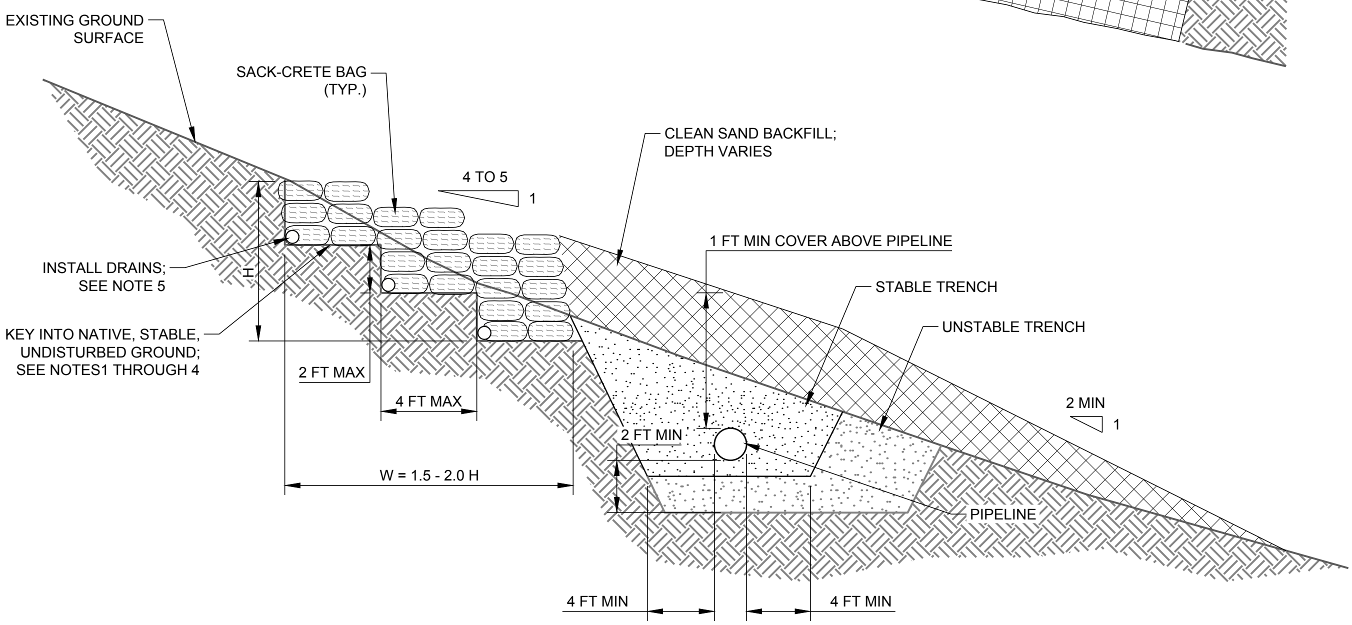



PLAN




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. 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).

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

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| 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 |

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 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

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CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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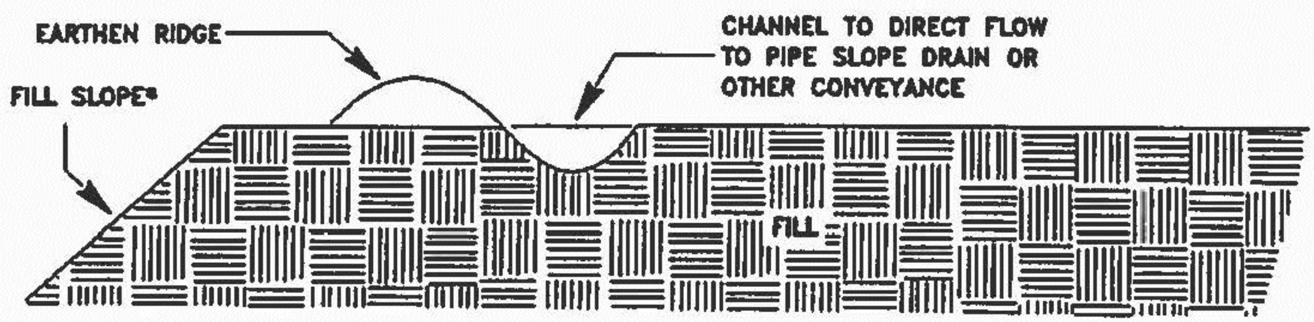
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

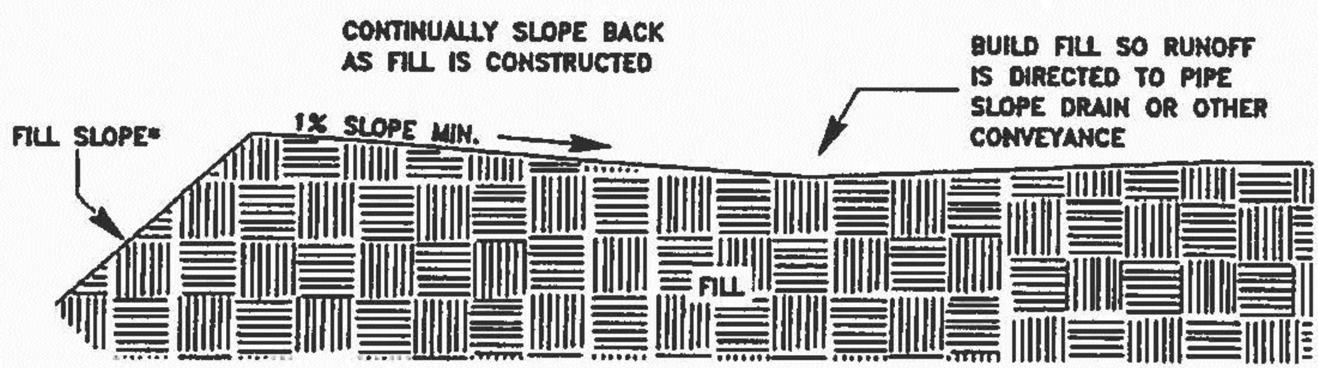
TITLE
**NO WOOD CHIPS IN ROW**

| 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*

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| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT<br>Golder Associates | YYYY-MM-DD: 2017-02-28<br>PREPARED: REDMOND<br>DESIGN: DBC<br>REVIEW: -<br>APPROVED: AQK | TITLE<br>**SURFACE WATER DIVERSIONS** | |
| | | PROJECT No. 1535050 | PHASE 500 |
| | | Rev. F | FIGURE 5H |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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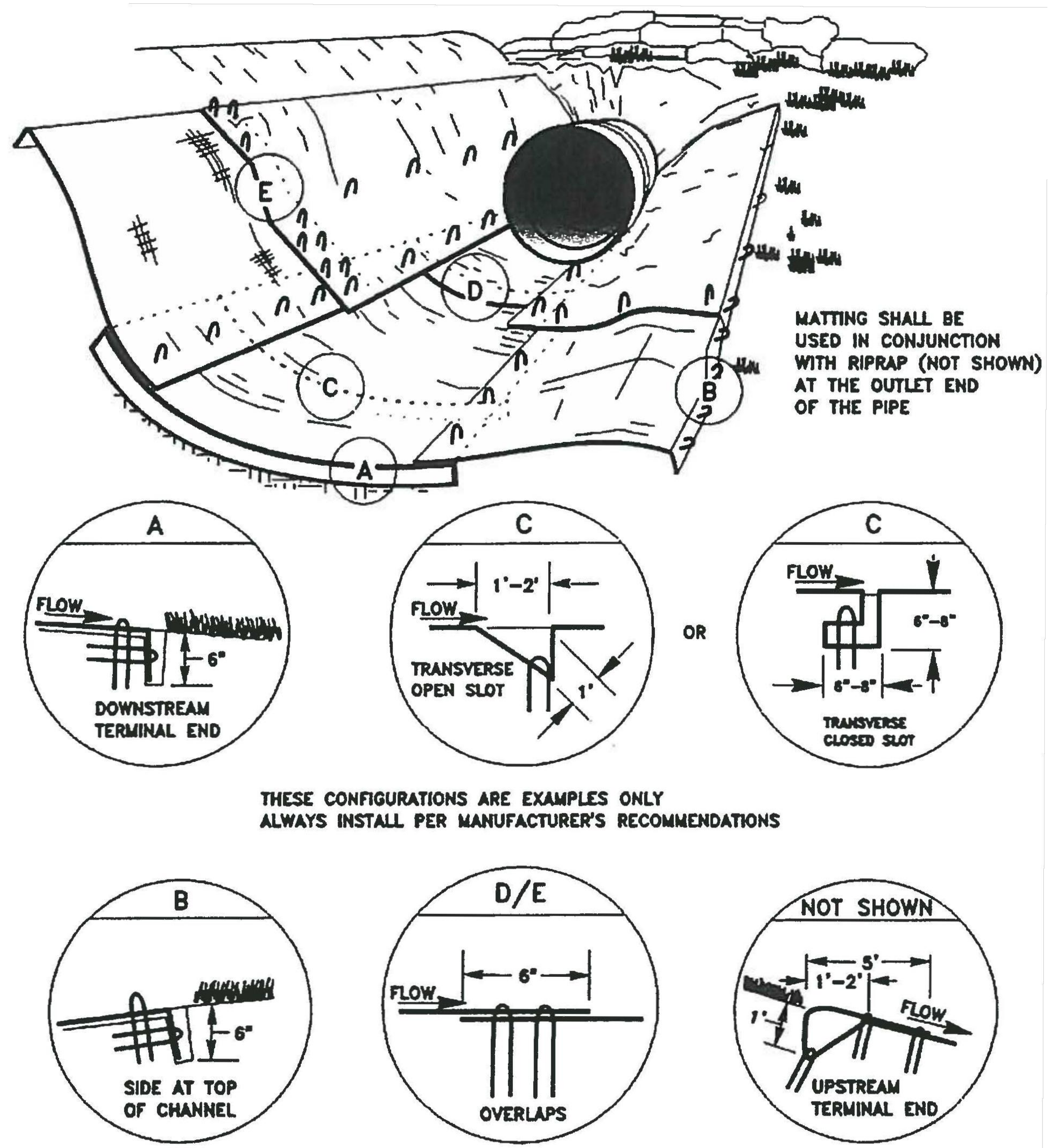


| CLIENT | PROJECT |
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| DOMINION | BIC/INCREMENTAL CONTROLS |

CONSULTANT

Golder Associates

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| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**COIR-LINED VEGETATED DIVERSION CHANNEL**

| 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
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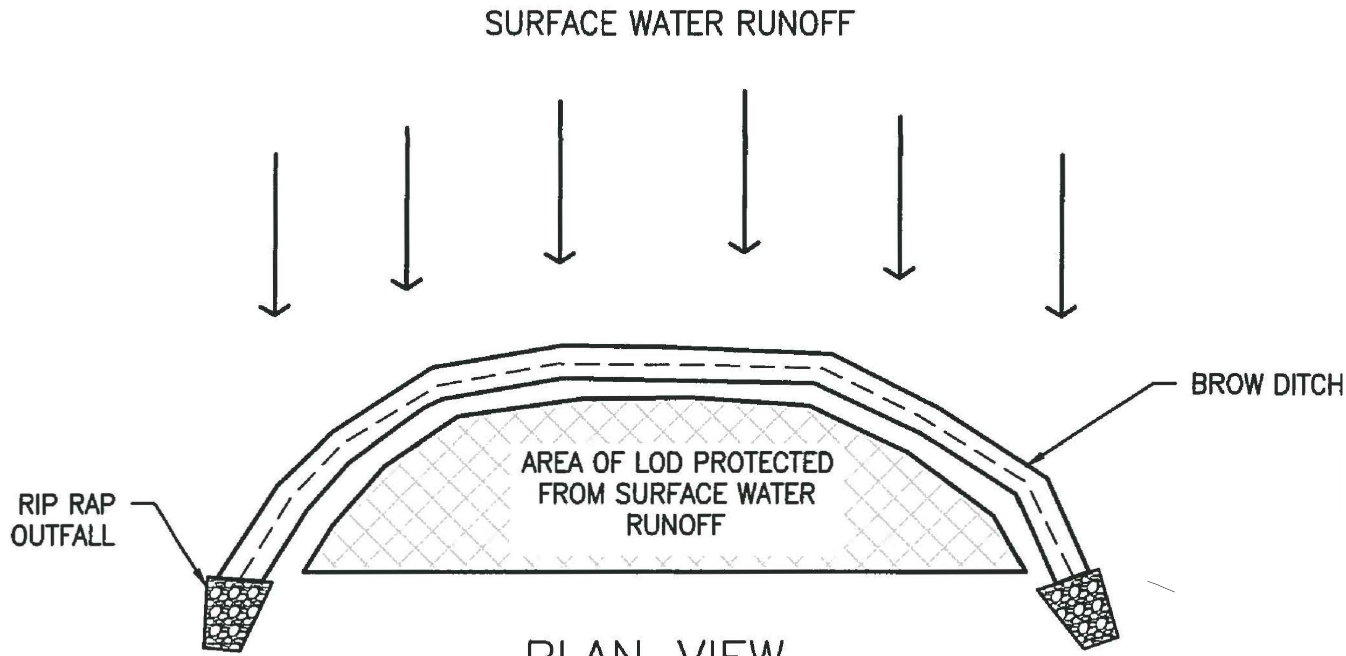
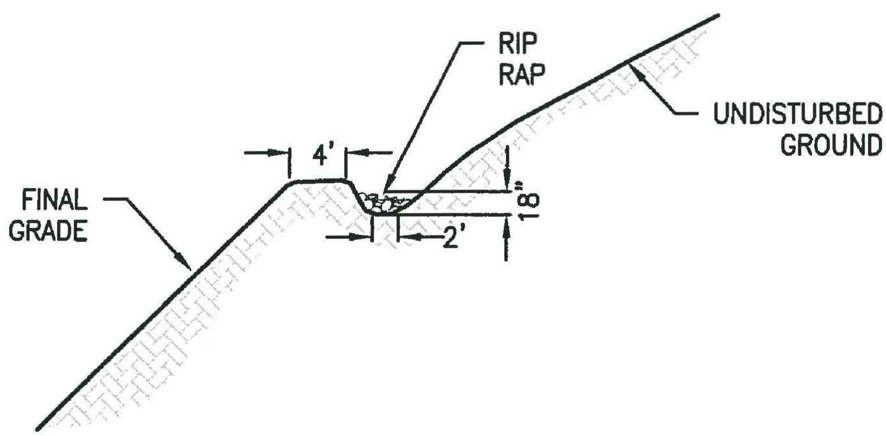



PLAN VIEW
N.T.S.




SECTION
N.T.S.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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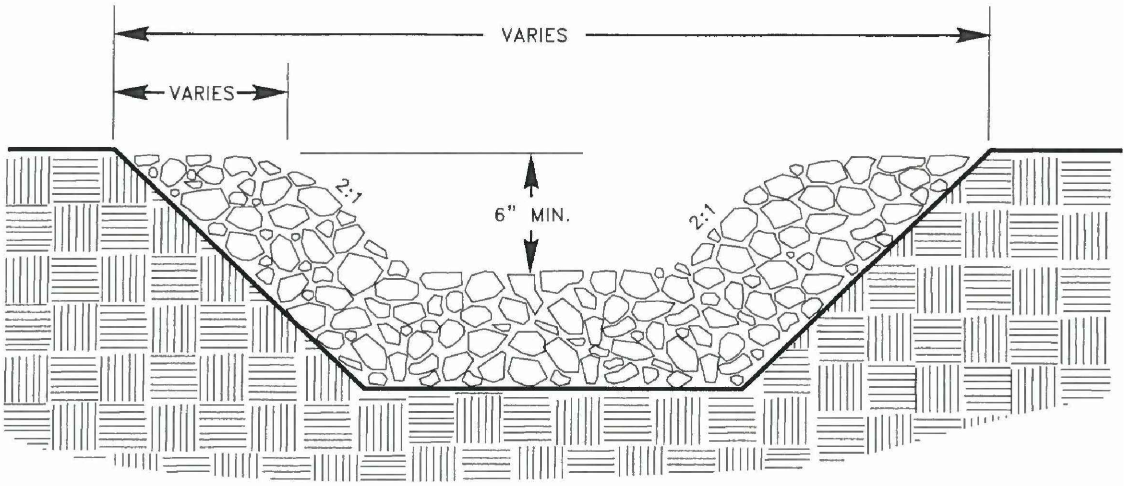
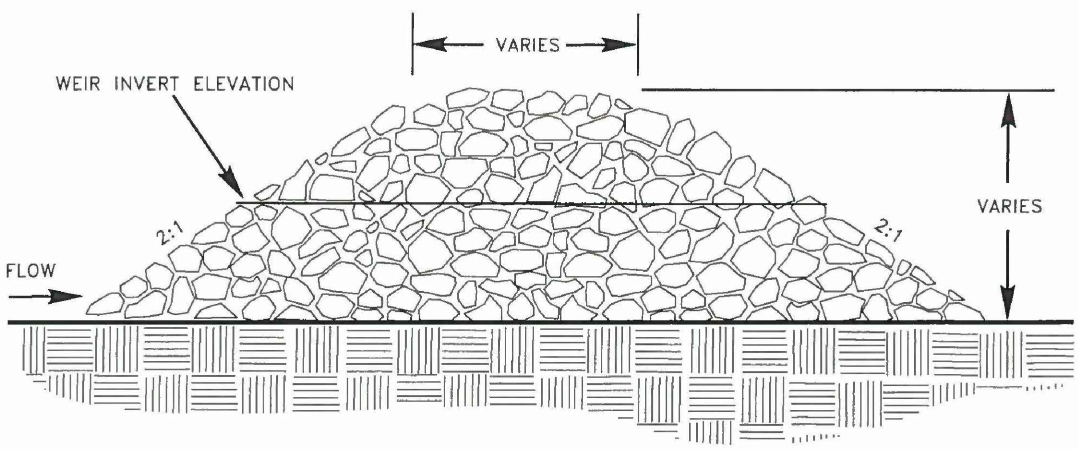



ELEVATION




CROSS SECTION

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| CLIENT<br>DOMINION | PROJECT<br>BIC/INCREMENTAL CONTROLS |

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| CONSULTANT | 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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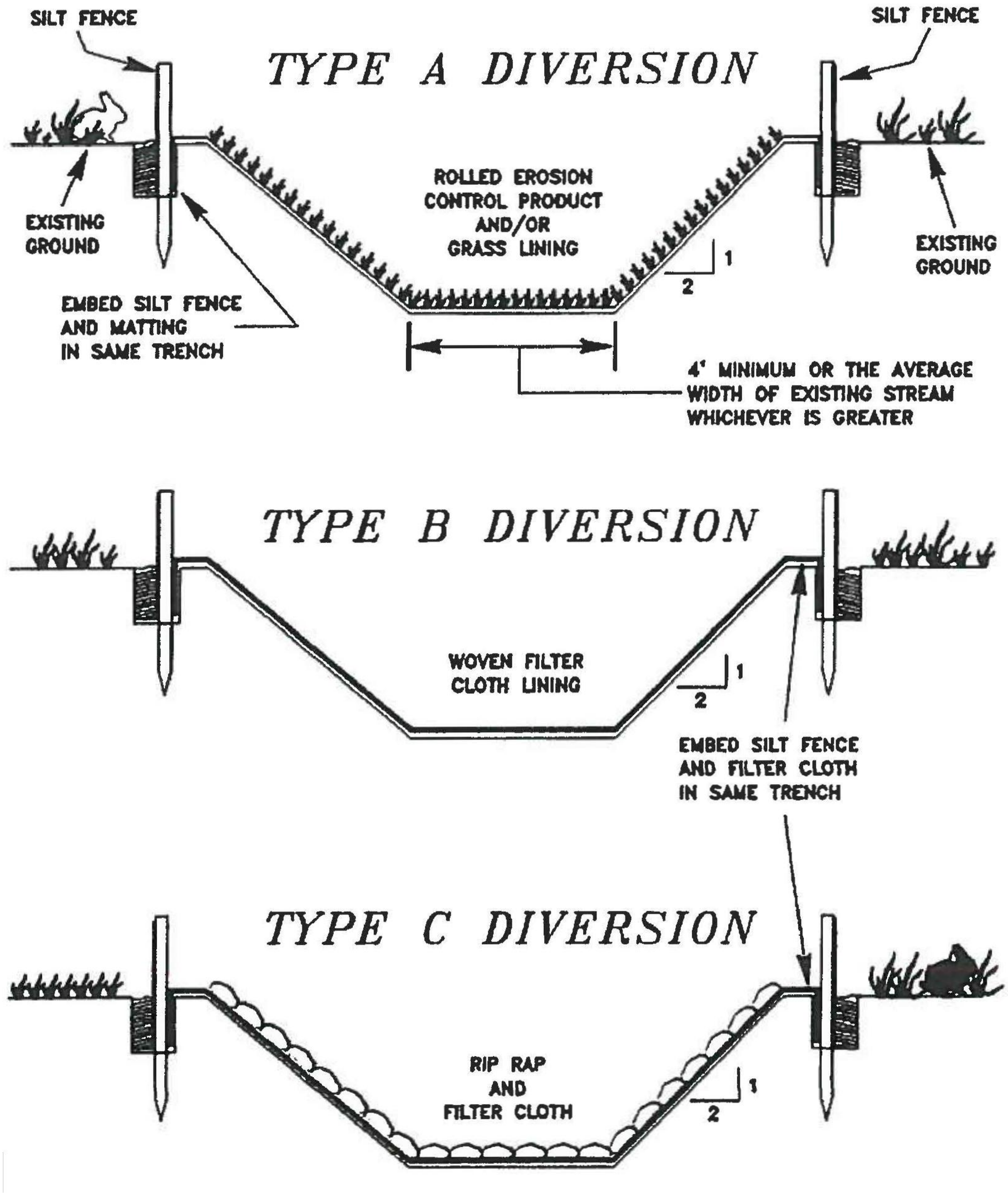


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| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT<br>Golder Associates | YYYY-MM-DD | 2017-02-28 | TITLE<br>**ARMORED CHANNEL** |
| | PREPARED | REDMOND | |
| | DESIGN | DBC | |
| | REVIEW | - | |
| | APPROVED | AQK | PROJECT No. 1535050 · PHASE 500 · Rev. F · FIGURE 6D |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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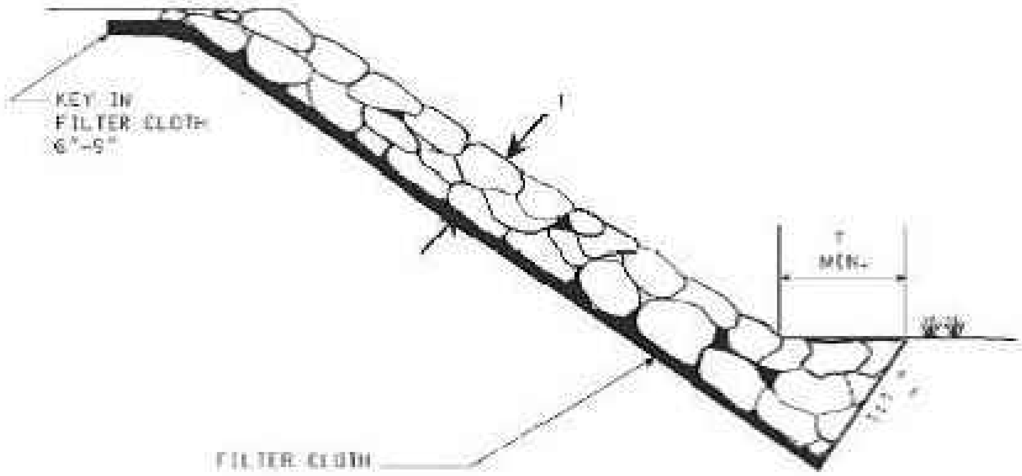
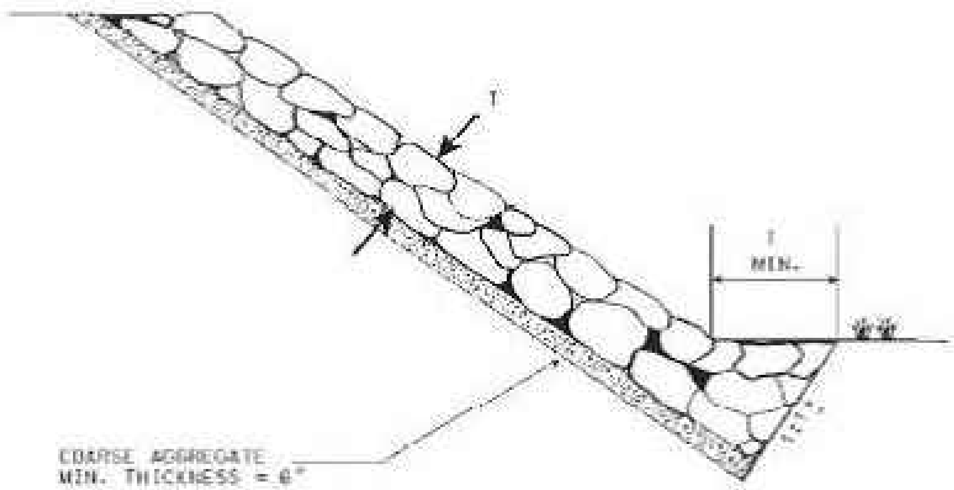
# FILTER CLOTH UNDERLINER

(PREFERRED)




# GRANULAR FILTER

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| CLIENT<br>DOMINION | PROJECT<br>BIC/INCREMENTAL CONTROLS |

CONSULTANT

Golder Associates

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| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**TYP BANK ARMORING**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 6E |


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. 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

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BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
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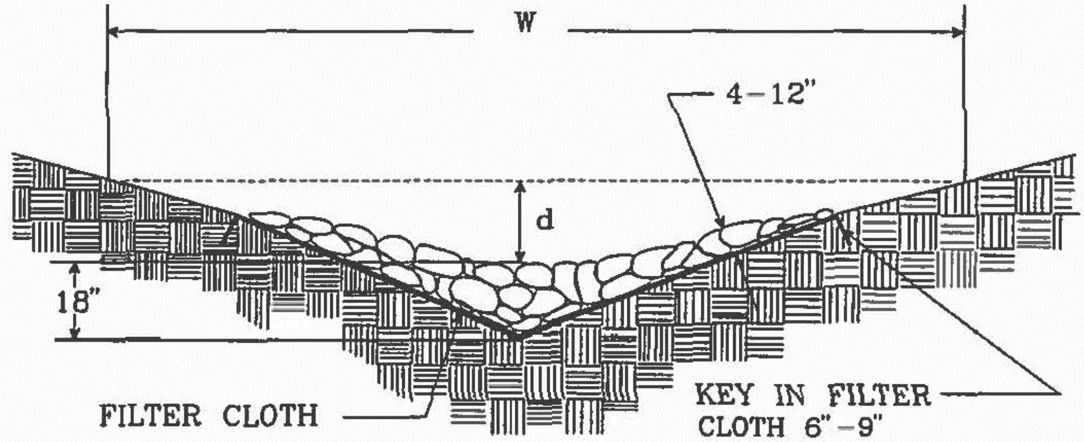
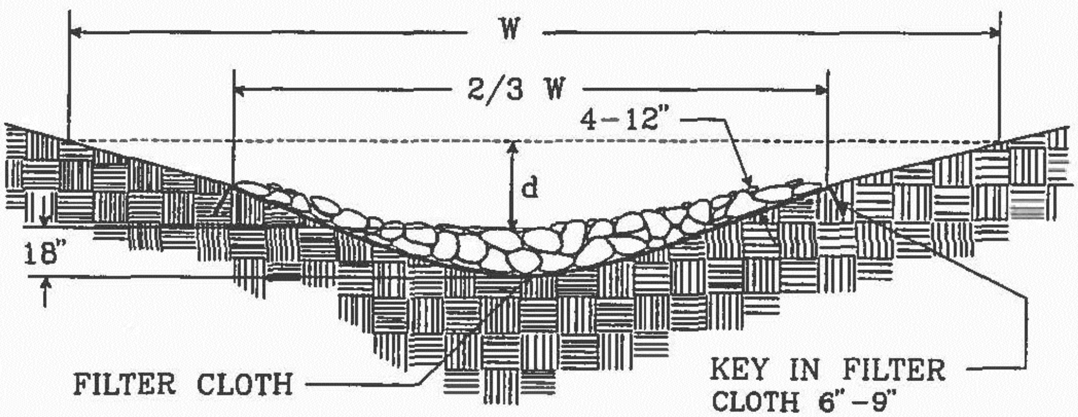



V-SHAPED WATERWAY WITH STONE CENTER DRAIN

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

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|---|---|
| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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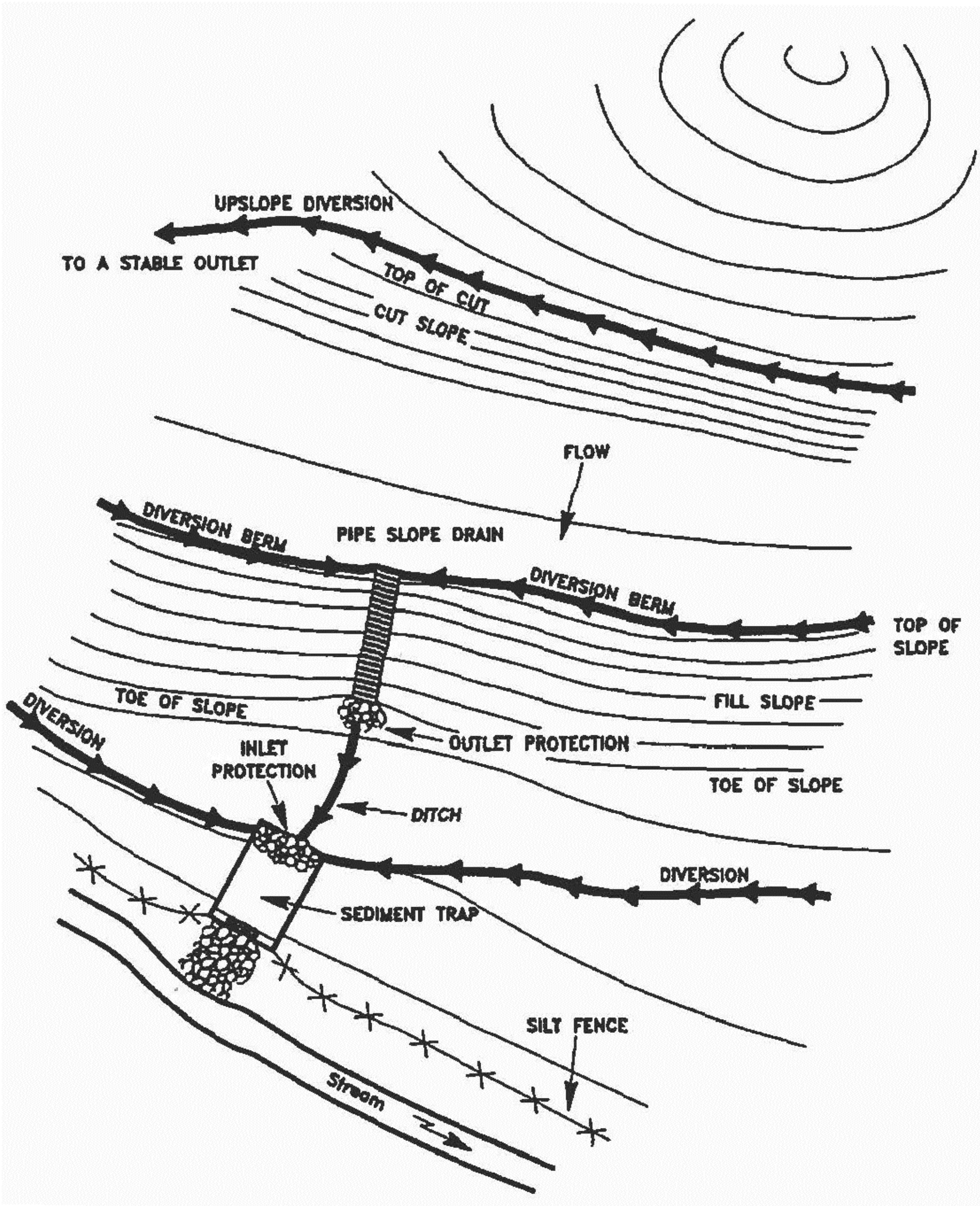


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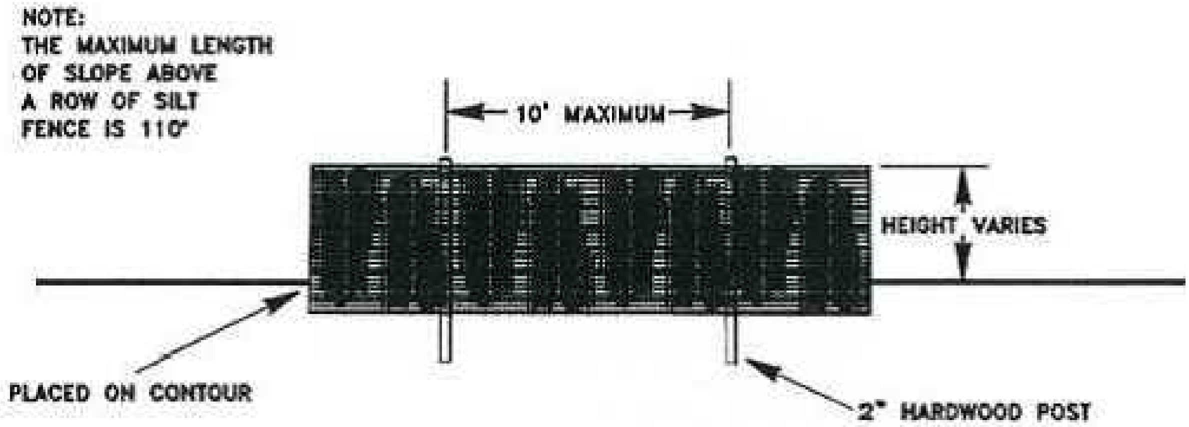
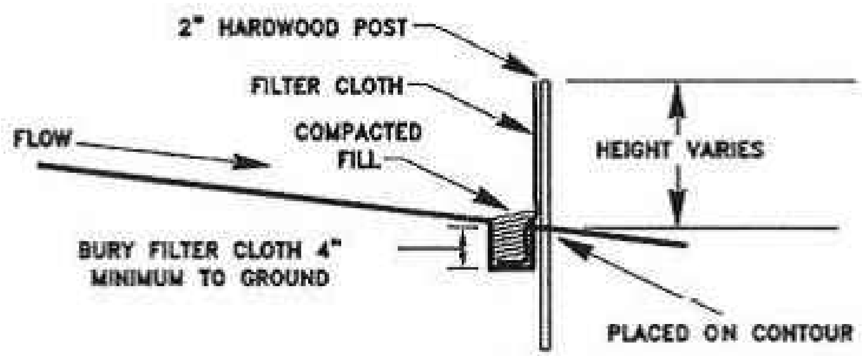
|---|---|---|---|
| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT | YYYY-MM-DD: 2017-02-28 | TITLE<br>TYP SURFACE WATER CONTROL LAYOUT | |
| Golder Associates | PREPARED: REDMOND | | |
| | DESIGN: DBC | | |
| | REVIEW: - | | |
| | APPROVED: AQK | PROJECT No. 1535050 / PHASE 500 / Rev. F | FIGURE 6H |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

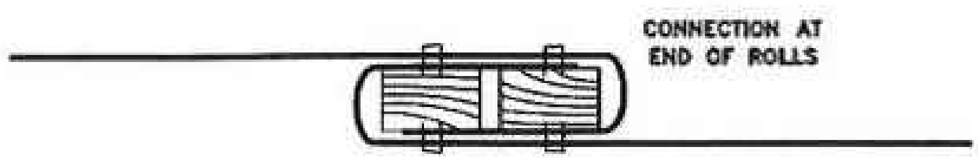
0 1 in




FRONT ELEVATION




SIDE ELEVATION




TOP VIEW

| | | | |
|---|---|---|---|
| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT<br>Golder Associates | YYYY-MM-DD: 2017-02-28 | TITLE<br>**SILT FENCE** | |
| | PREPARED: REDMOND | | |
| | DESIGN: DBC | | |
| | REVIEW: - | | |
| | APPROVED: AQK | PROJECT No. 1535050 | PHASE 500 · Rev. F · FIGURE 7A |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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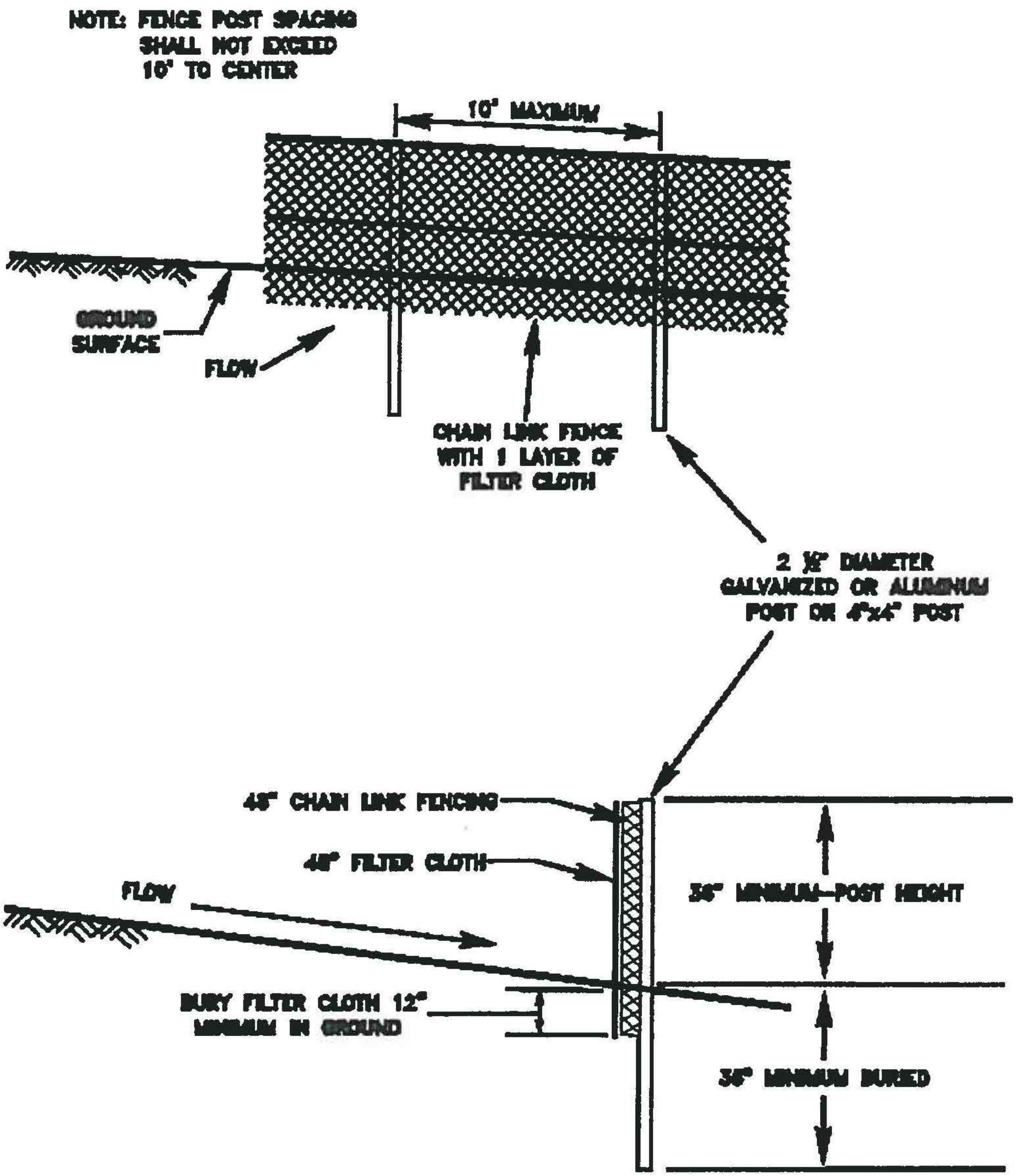


| CLIENT | PROJECT |
|---|---|
| DOMINION | BIC/INCREMENTAL CONTROLS |

| CONSULTANT | | | TITLE |
|---|---|---|---|
| Golder Associates | YYYY-MM-DD | 2017-02-28 | SUPER SILT FENCE |
| | PREPARED | REDMOND | |
| | DESIGN | DBC | |
| | REVIEW | - | |
| | APPROVED | AQK | |

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 7B |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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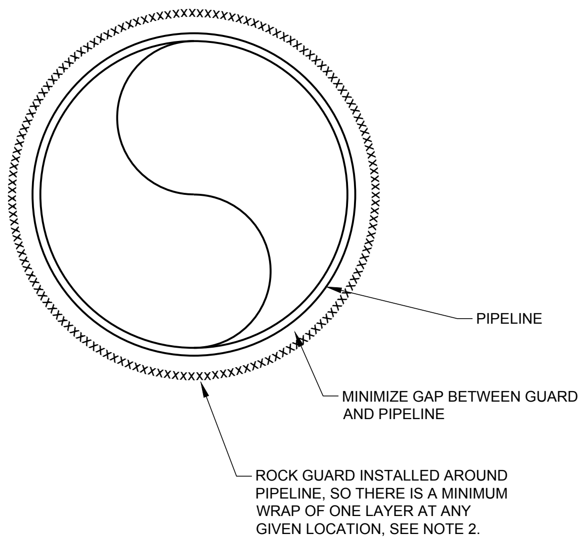


**NOTE(S)**

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. SECURE ROCK GUARD PER MANUFACTURER SPECIFICATIONS , OR AS DIRECTED BY THE ENGINEER.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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. 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.

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

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CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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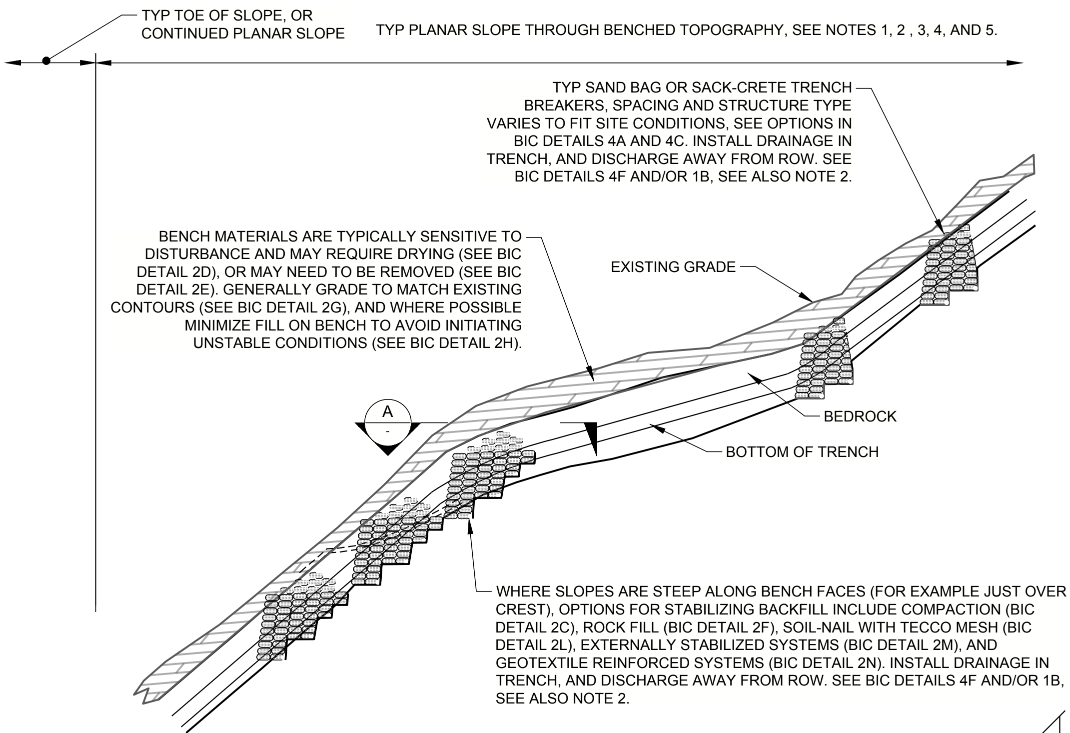
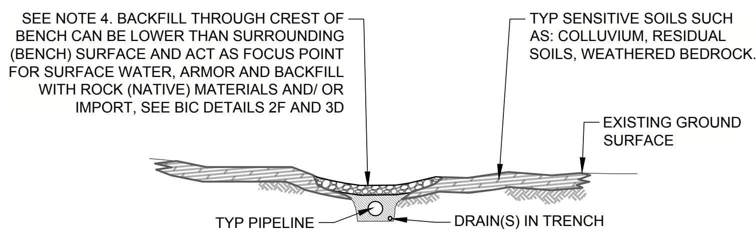
|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**BUOYANCY MITIGATION**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 9A |

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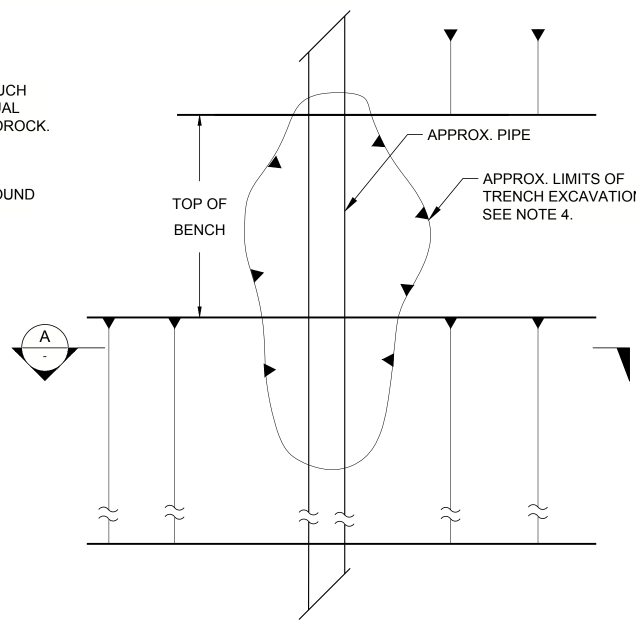
**TYP SECTION VIEW**




A
-
**TYP PLAN VIEW**

**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 | PROJECT |
|---|---|
| DOMINION | BIC/INCREMENTAL CONTROLS |

CONSULTANT

Golder Associates

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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
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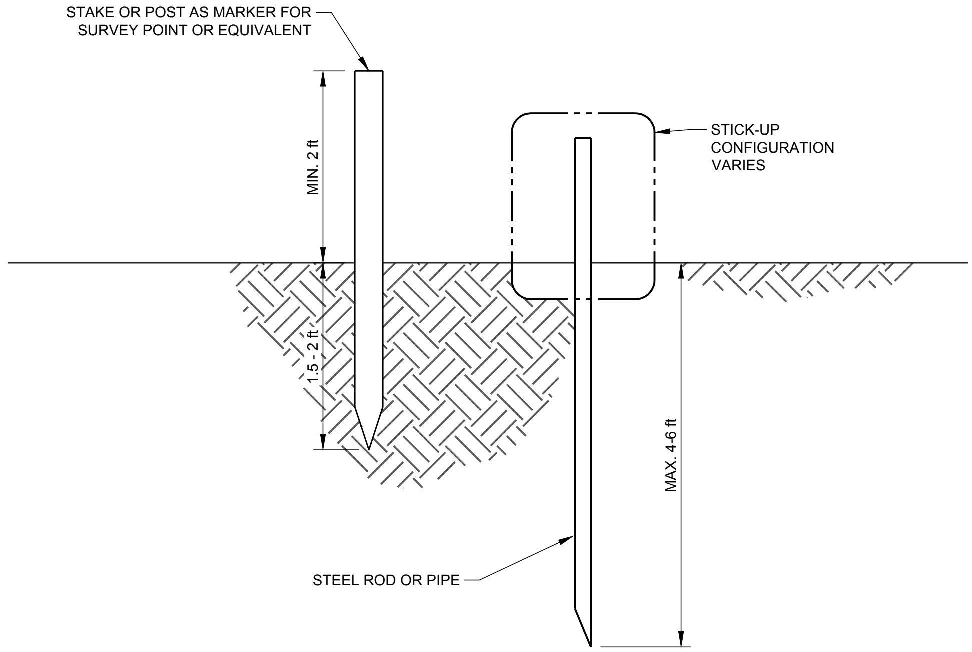


**NOTE(S)**

1. FINAL CONFIGURATION OF 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

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|---|---|
| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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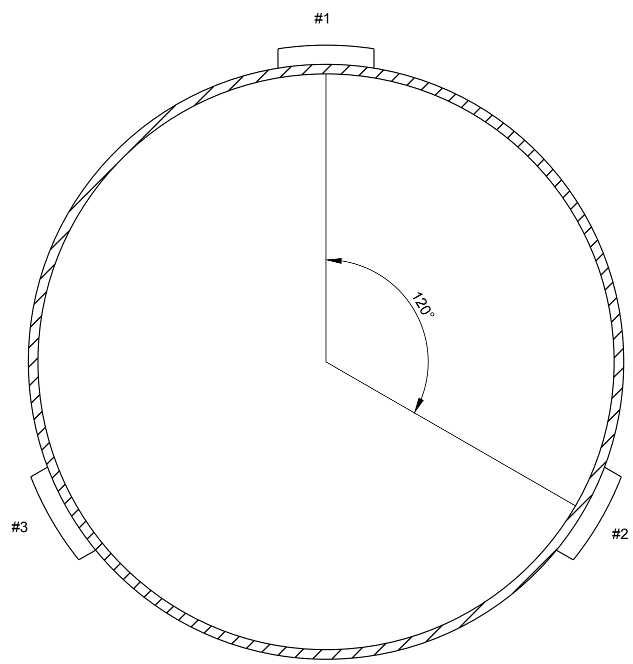


**NOTE(S)**

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.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

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|---|---|
| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
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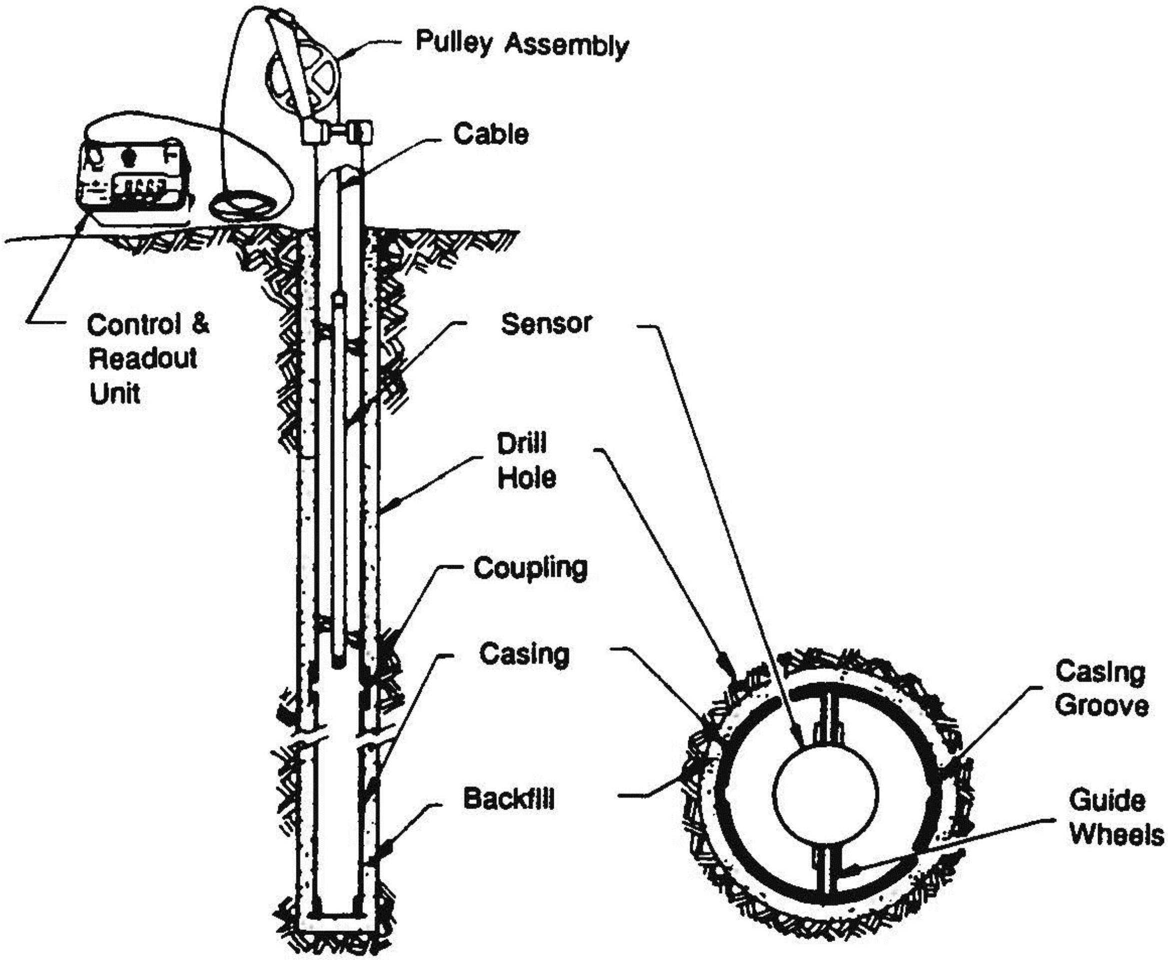


**NOTE(S)**

1. FINAL CONFIGURATION OF 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

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|---|---|
| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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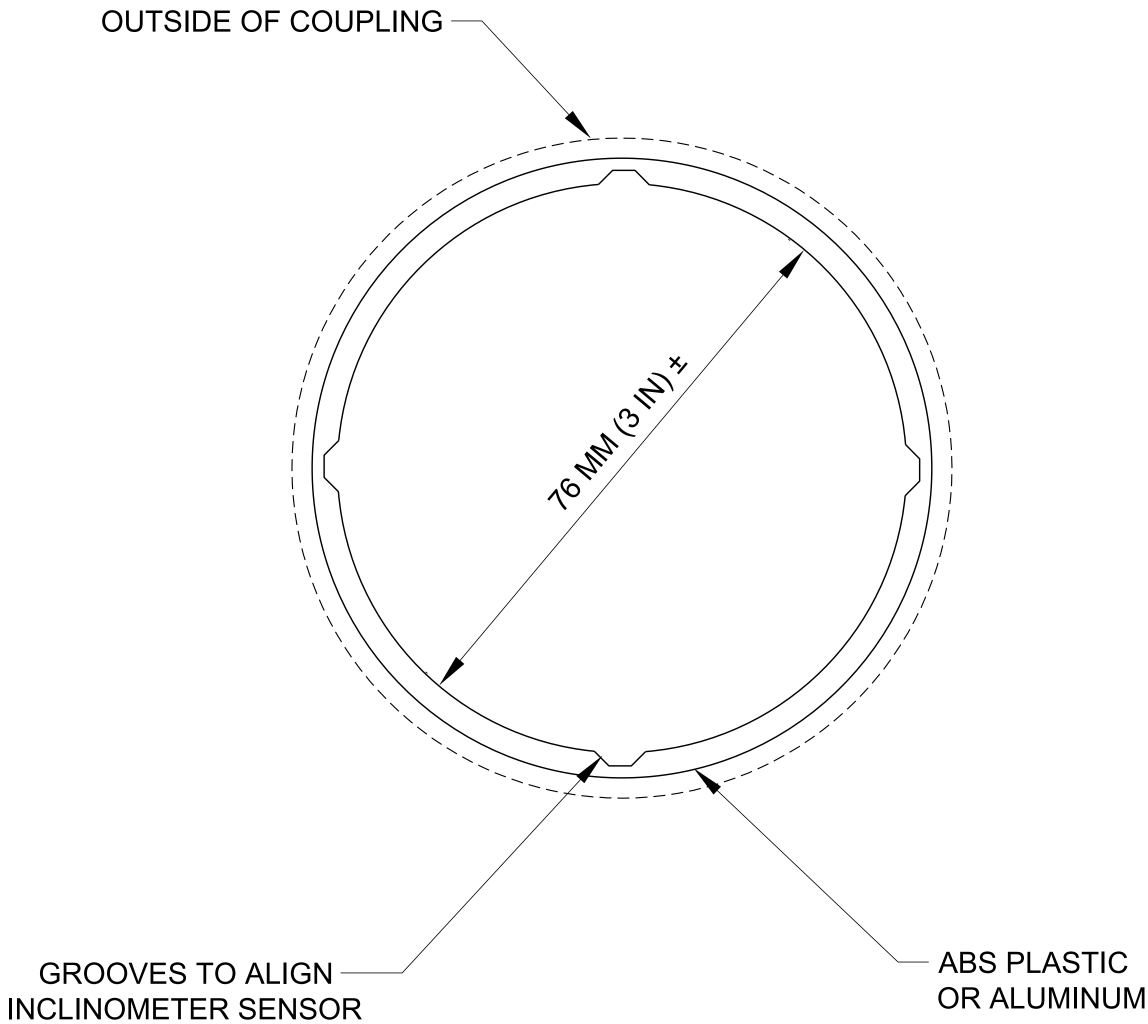


**NOTE(S)**

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.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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|---|---|
| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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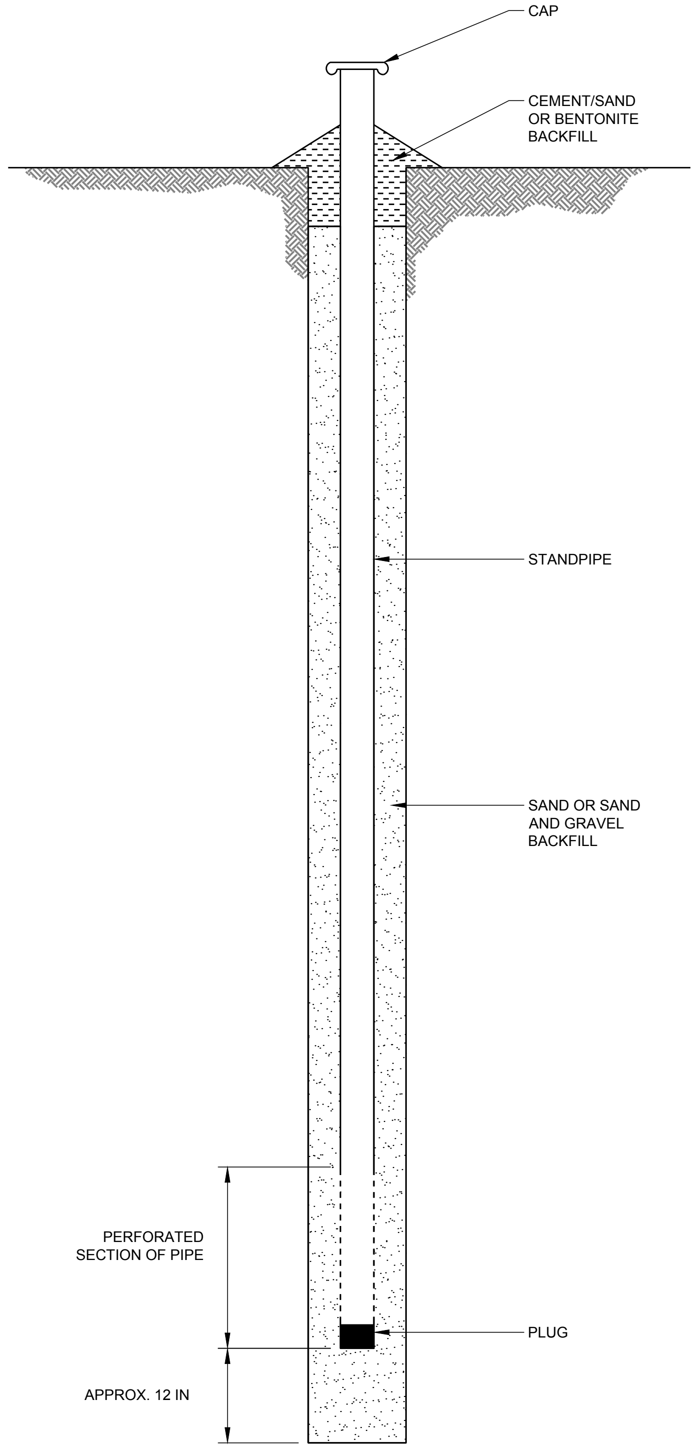


**NOTE(S)**

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.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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| 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 |

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. 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

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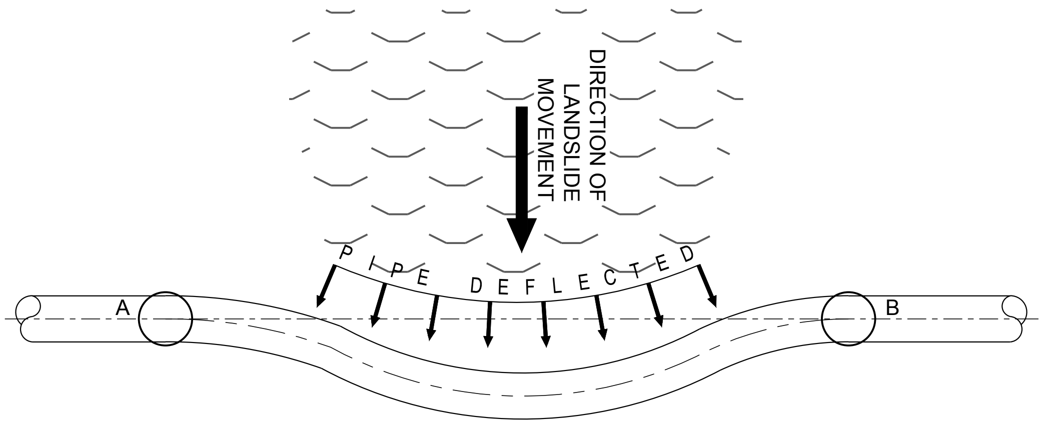
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**AS-BUILT SURVEY TRENCH AND SLOPE BREAKERS**

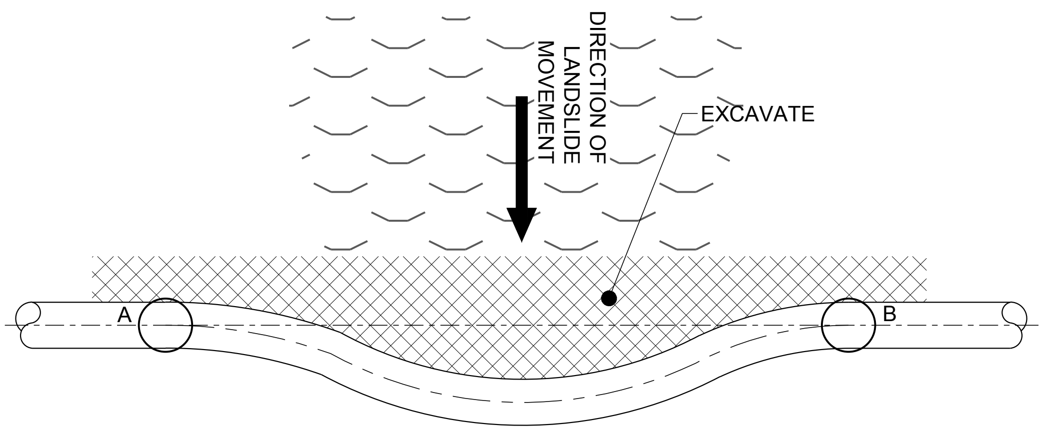
| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 11F |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0

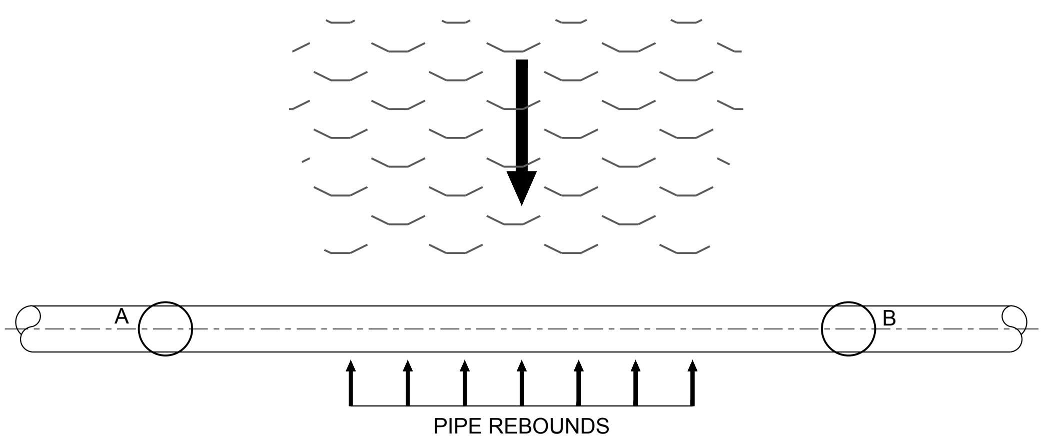
## BEFORE STRAIN RELIEF EXCAVATION




## DURING STRAIN RELIEF EXCAVATION




## AFTER STRAIN RELIEF EXCAVATION




**NOTE(S)**

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

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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
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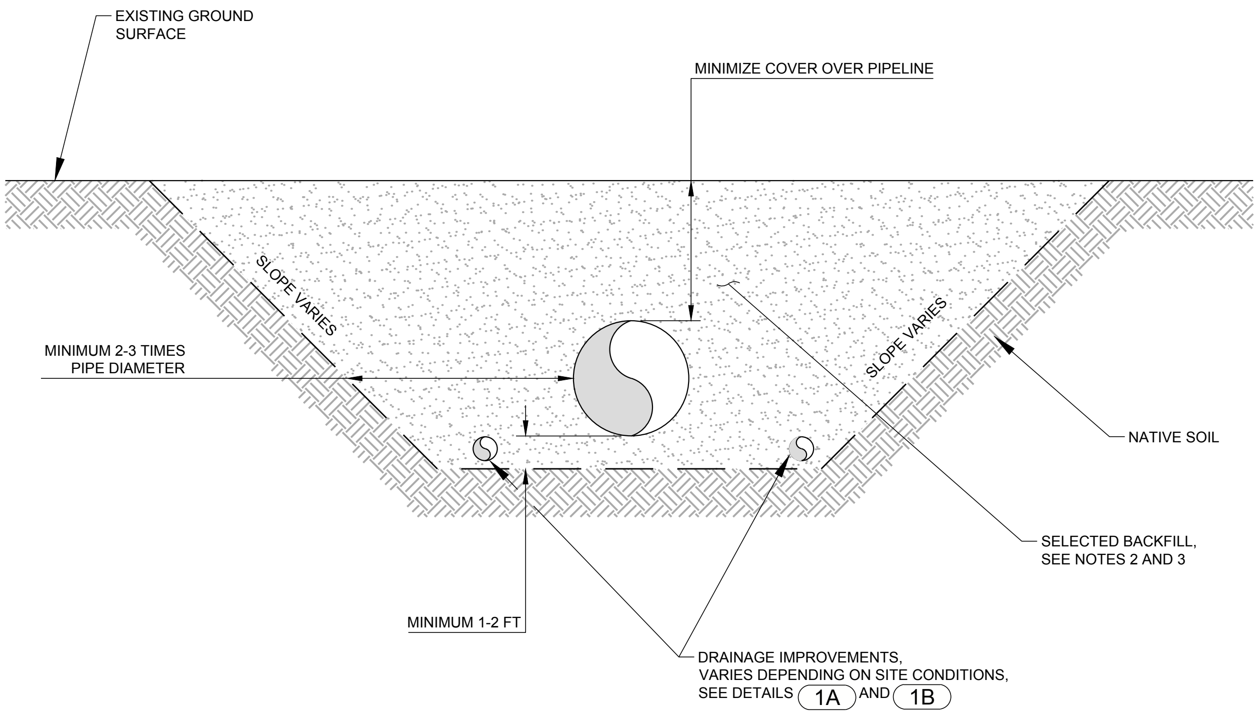


## GRAIN SIZE TABLE

| 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

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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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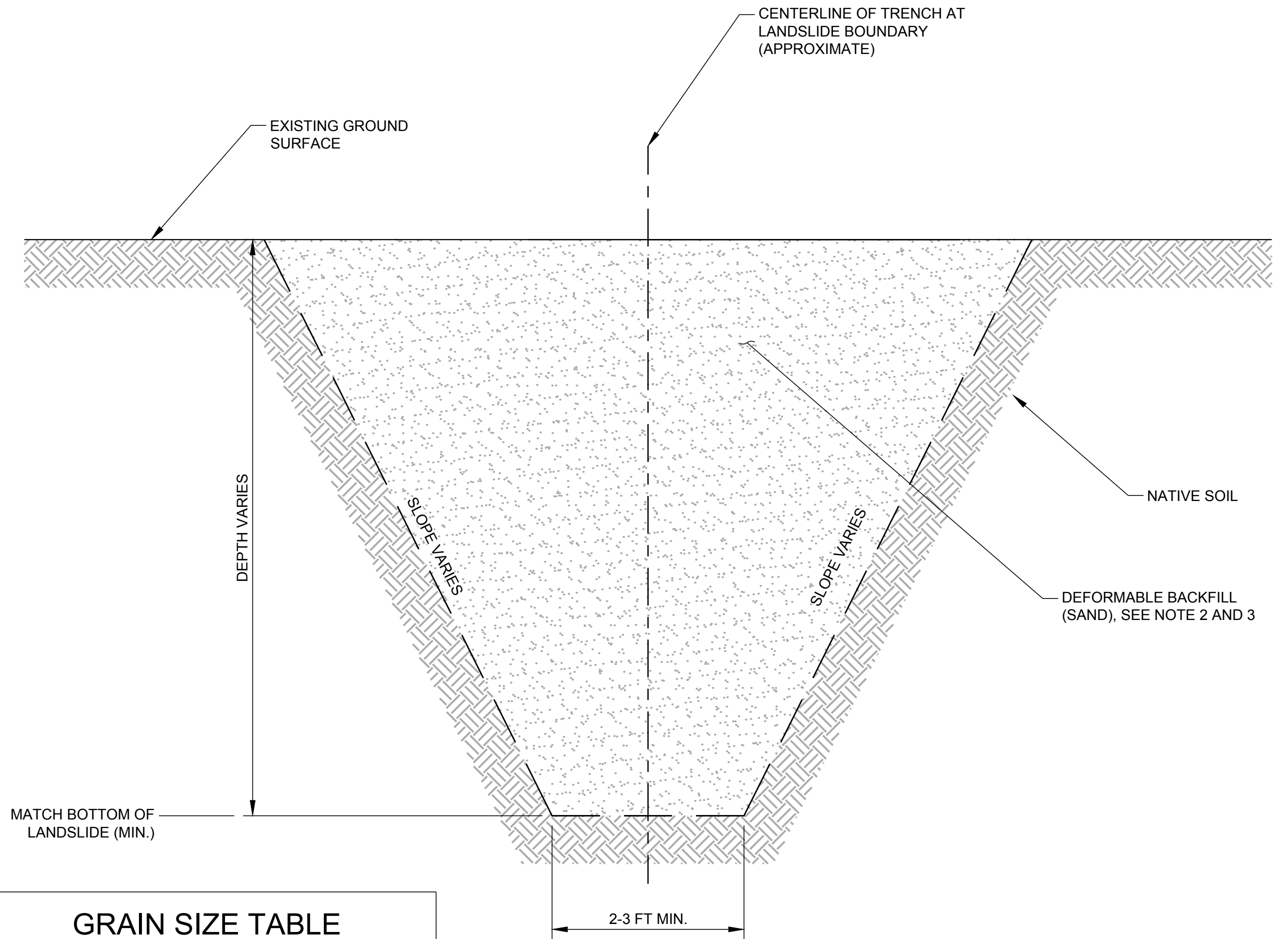


## GRAIN SIZE TABLE

| 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

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| 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 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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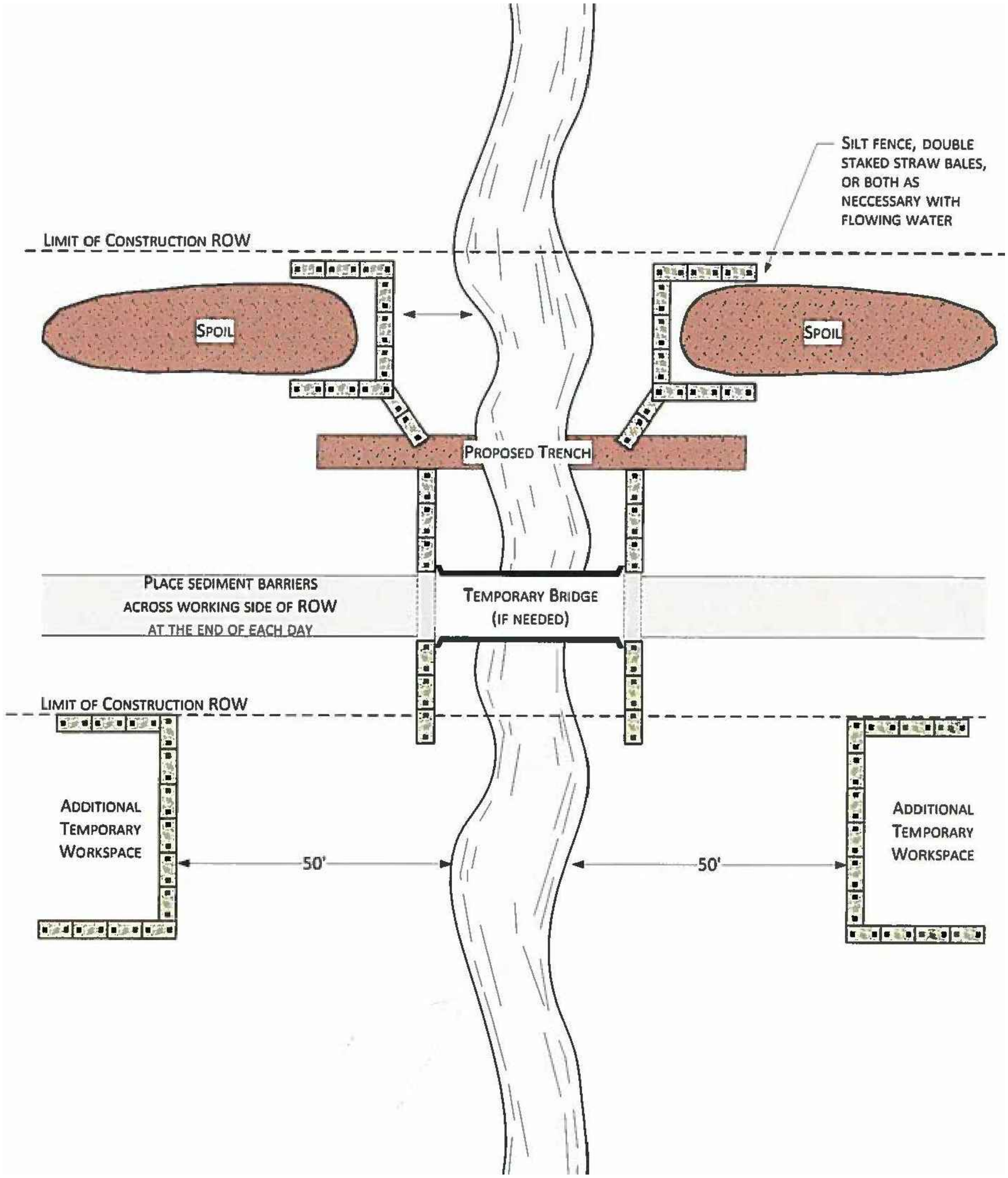


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| CLIENT<br>DOMINION | PROJECT<br>BIC/INCREMENTAL CONTROLS |
| CONSULTANT<br>Golder Associates | TITLE<br>**TYP WATERBODY OPEN CUT** |

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|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 13A |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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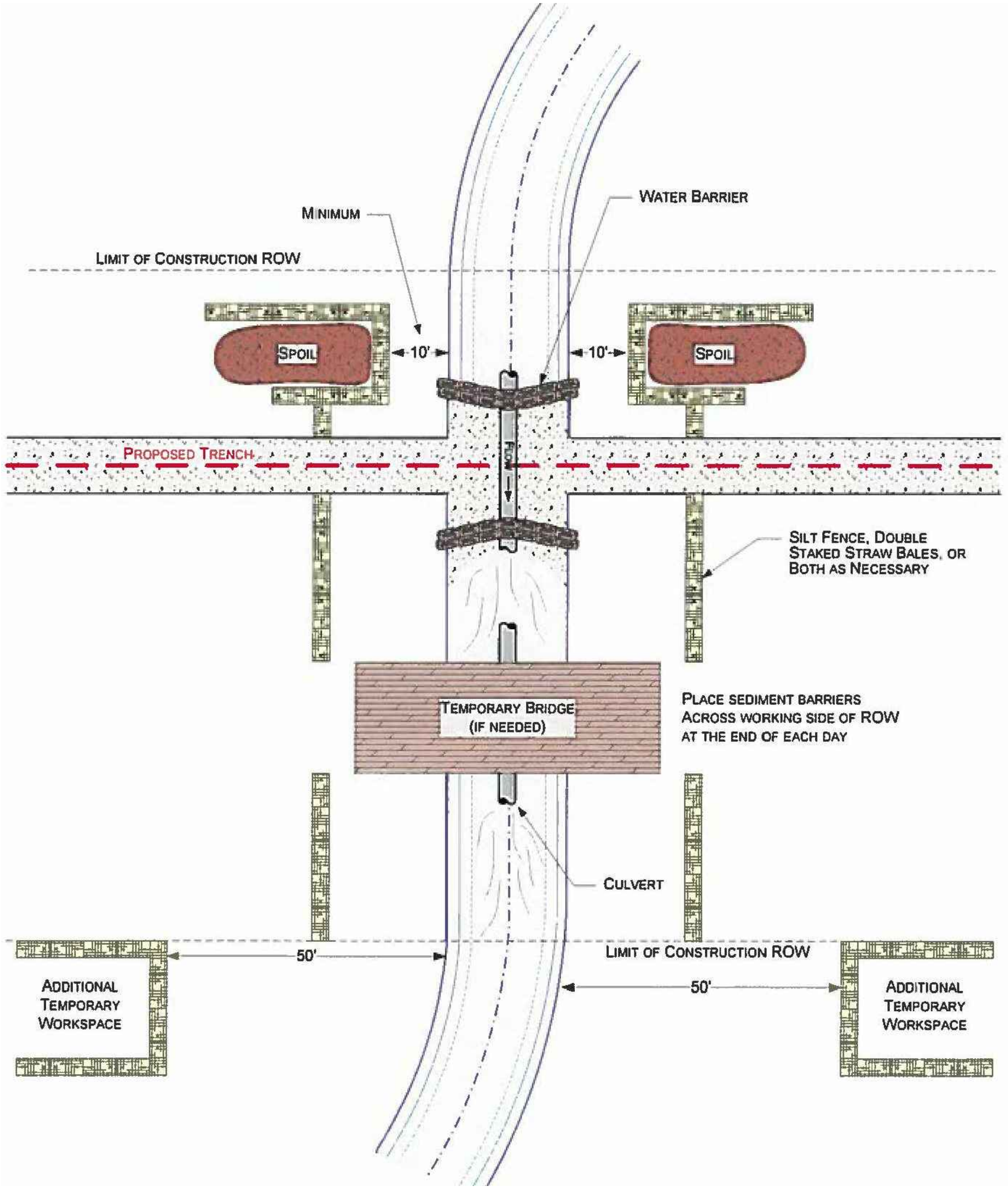


CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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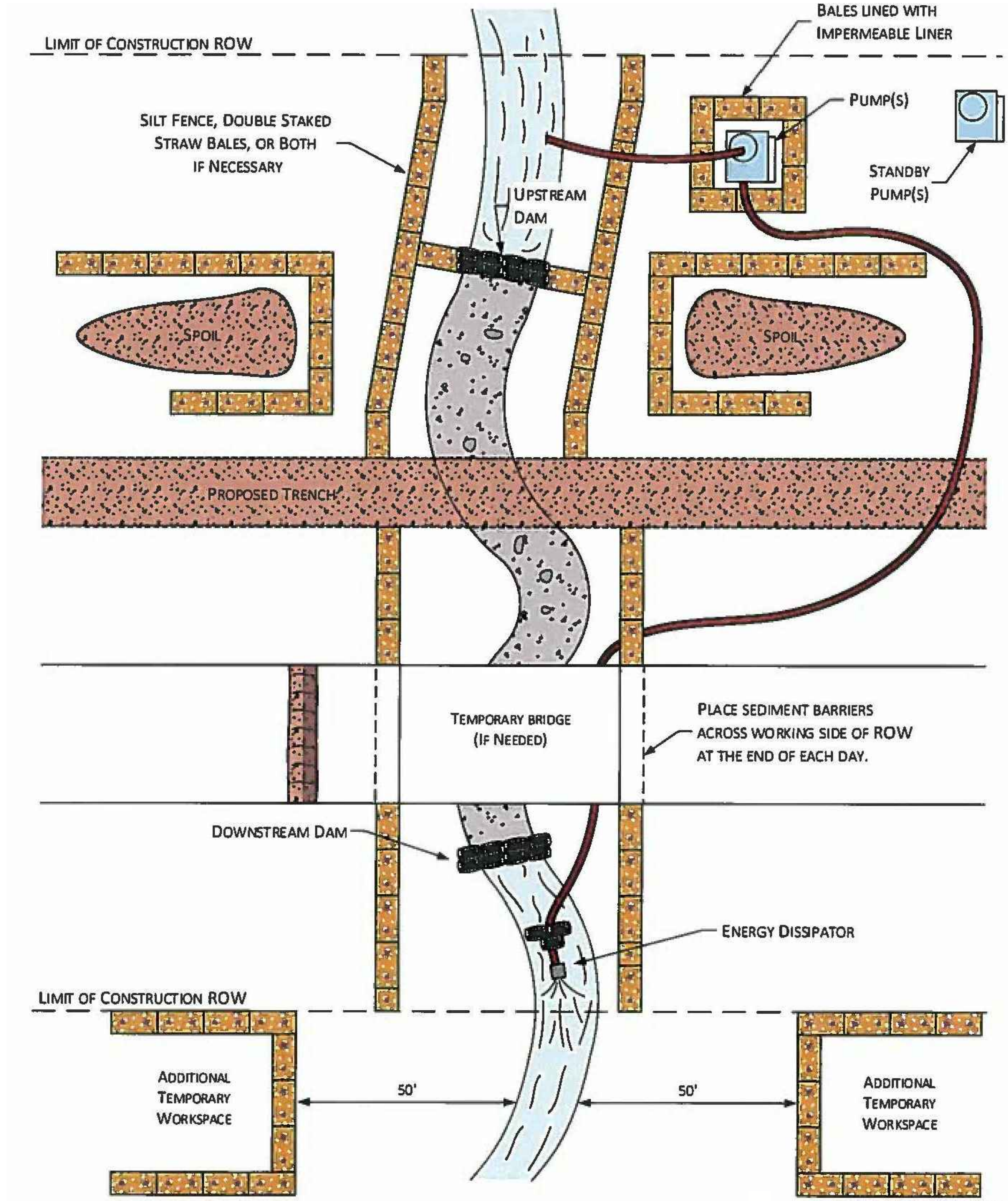
|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**TYP WATERBODY FLUME METHOD**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 13B |

0 1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A




| | |
|---|---|
| CLIENT<br>DOMINION | PROJECT<br>BIC/INCREMENTAL CONTROLS |

CONSULTANT

Golder Associates

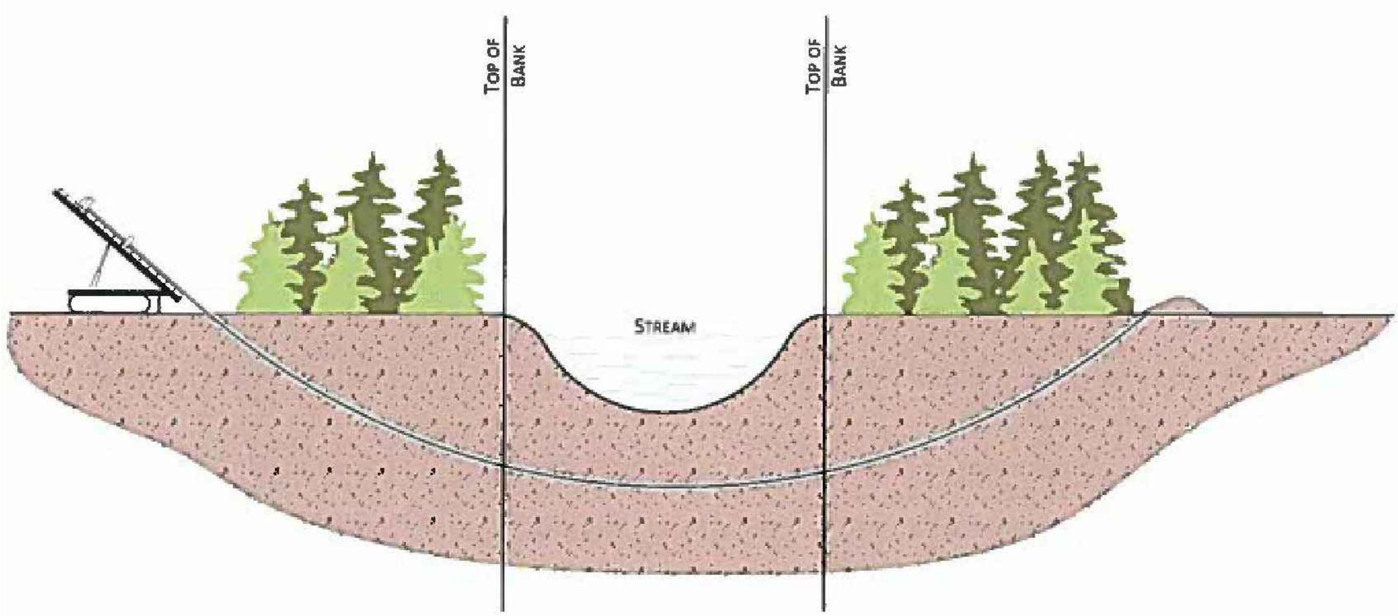
| | |
|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**TYP WATERBODY DAM AND PUMP**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 13C |

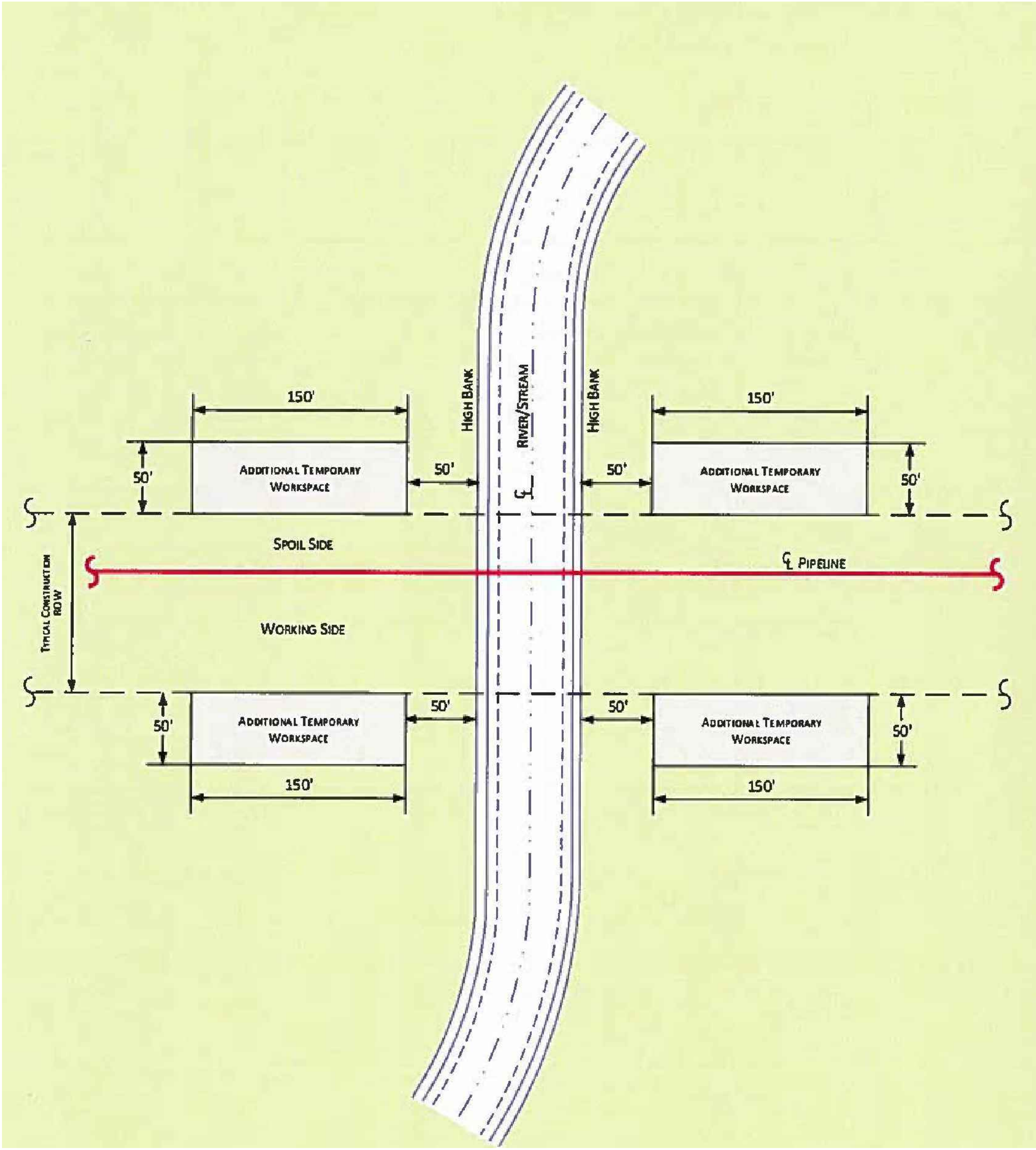
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 1 in




| | | | |
|---|---|---|---|
| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT | YYYY-MM-DD: 2017-02-28 | TITLE<br>**TYP WATERBODY HDD METHOD** | |
| Golder Associates | PREPARED: REDMOND | | |
| | DESIGN: DBC | | |
| | REVIEW: - | | |
| | APPROVED: AQK | PROJECT No. 1535050 · PHASE 500 · Rev. F | FIGURE 13D |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
0 1 in

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|---|---|
| CLIENT<br>DOMINION | PROJECT<br>BIC/INCREMENTAL CONTROLS |

CONSULTANT

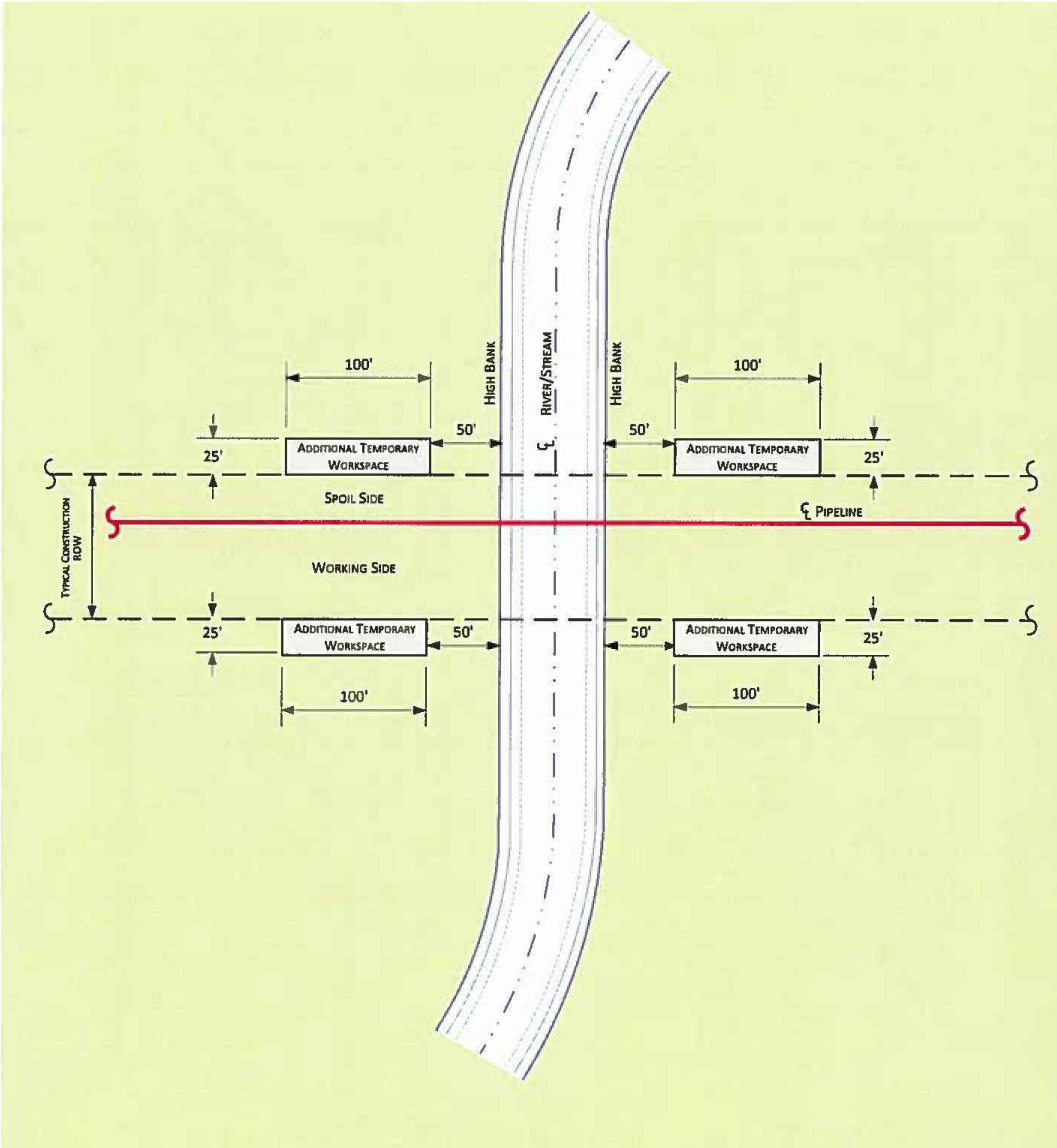
Golder Associates

| | |
|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**TYP ADDITIONAL WORKSPACE AT WATERBODY ACP AP-1**

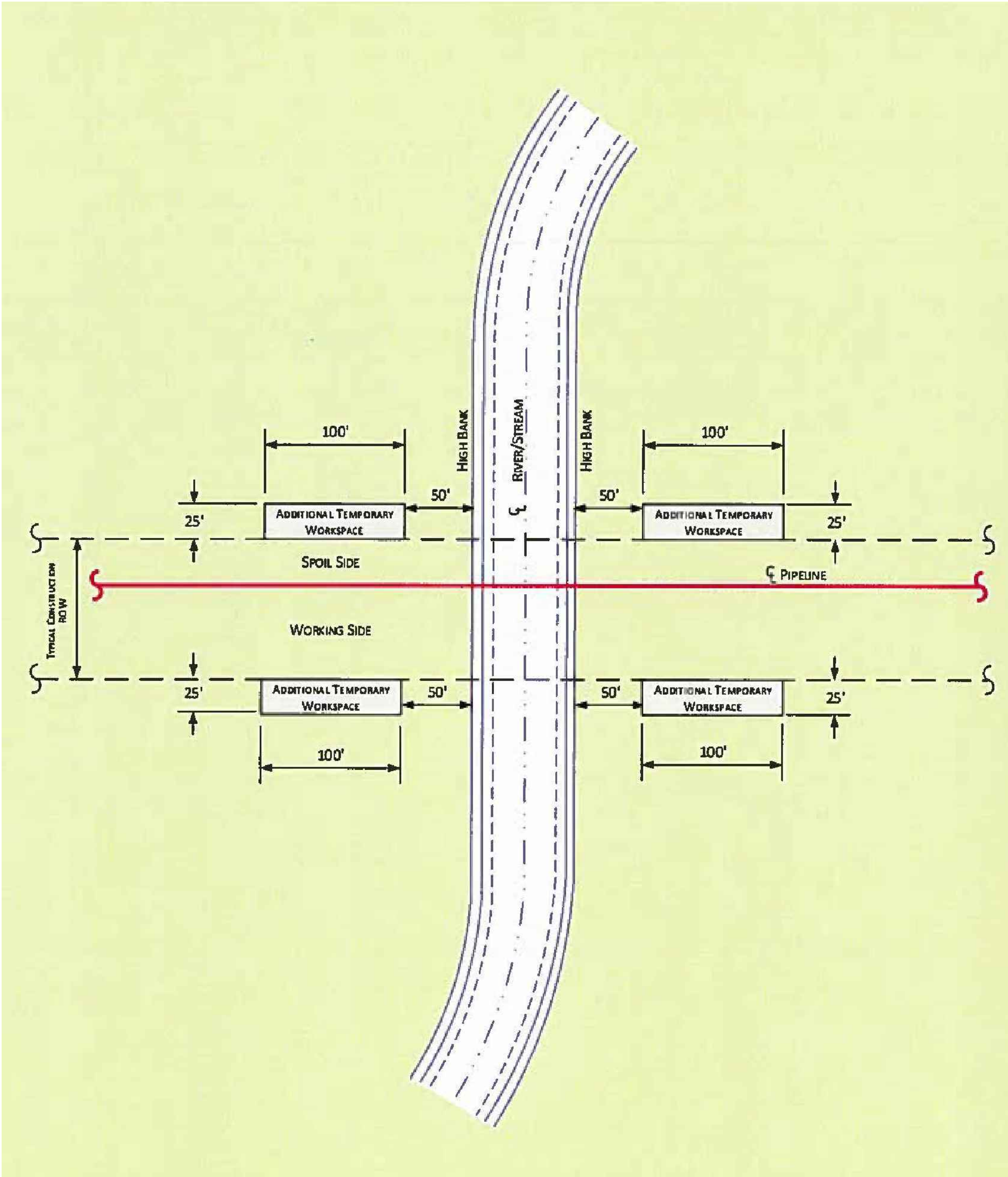
| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 13E-1 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0




| | | | |
|---|---|---|---|
| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT | YYYY-MM-DD: 2017-02-28 | TITLE<br>**TYP ADDITIONAL WORKSPACE AT WATERBODY ACP AP-1 AP-2 AP-3 AP-4 AP-5** | |
| Golder Associates | PREPARED: REDMOND | | |
| | DESIGN: DBC | | |
| | REVIEW: - | | |
| | APPROVED: AQK | PROJECT No. 1535050 / PHASE 500 / Rev. F | FIGURE 13E-2 |

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

| | |
|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

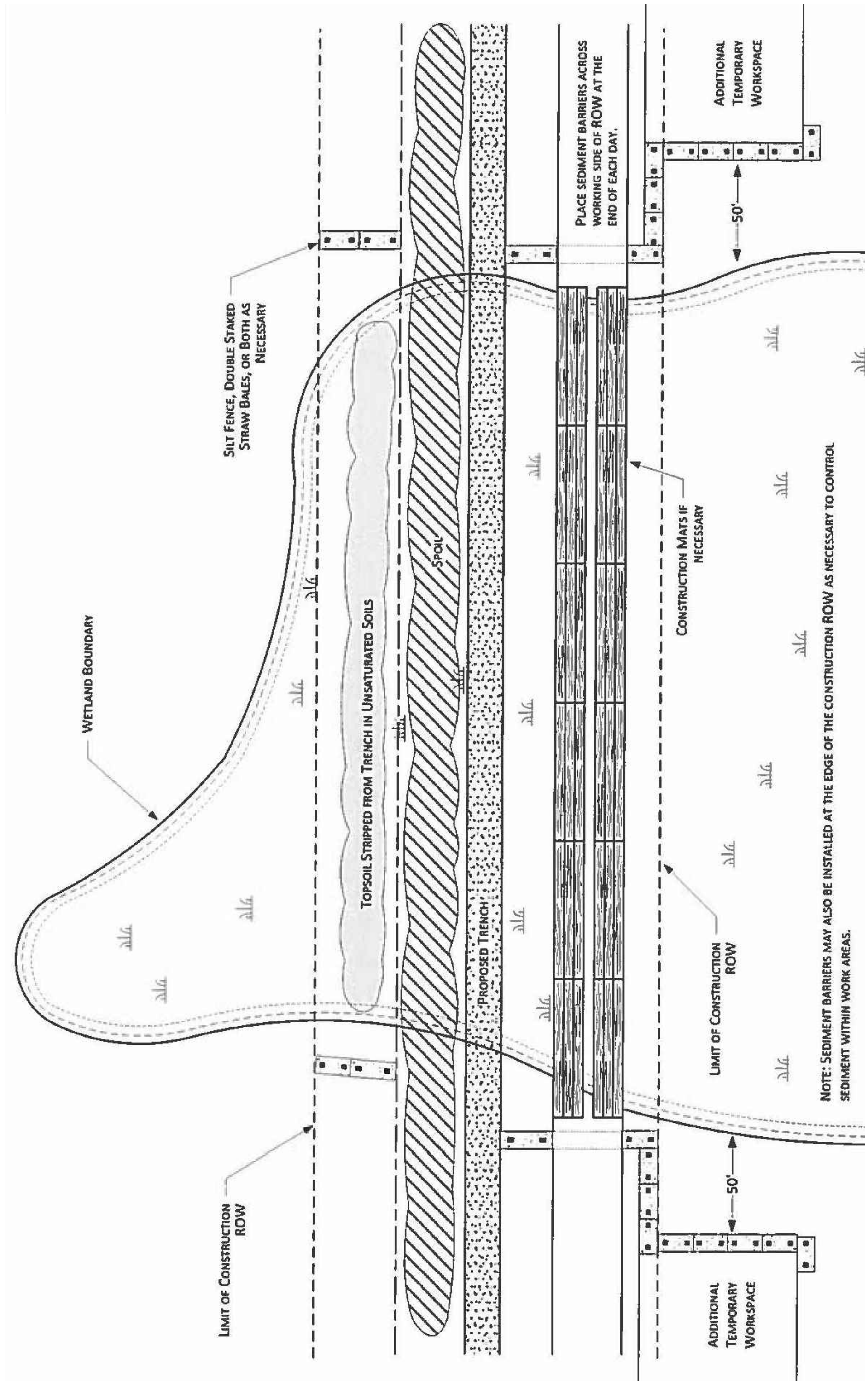
TITLE
**TYP ADDITIONAL WORKSPACE AT WATERBODY SHP TL-635 TL-636**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 13E-3 |

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

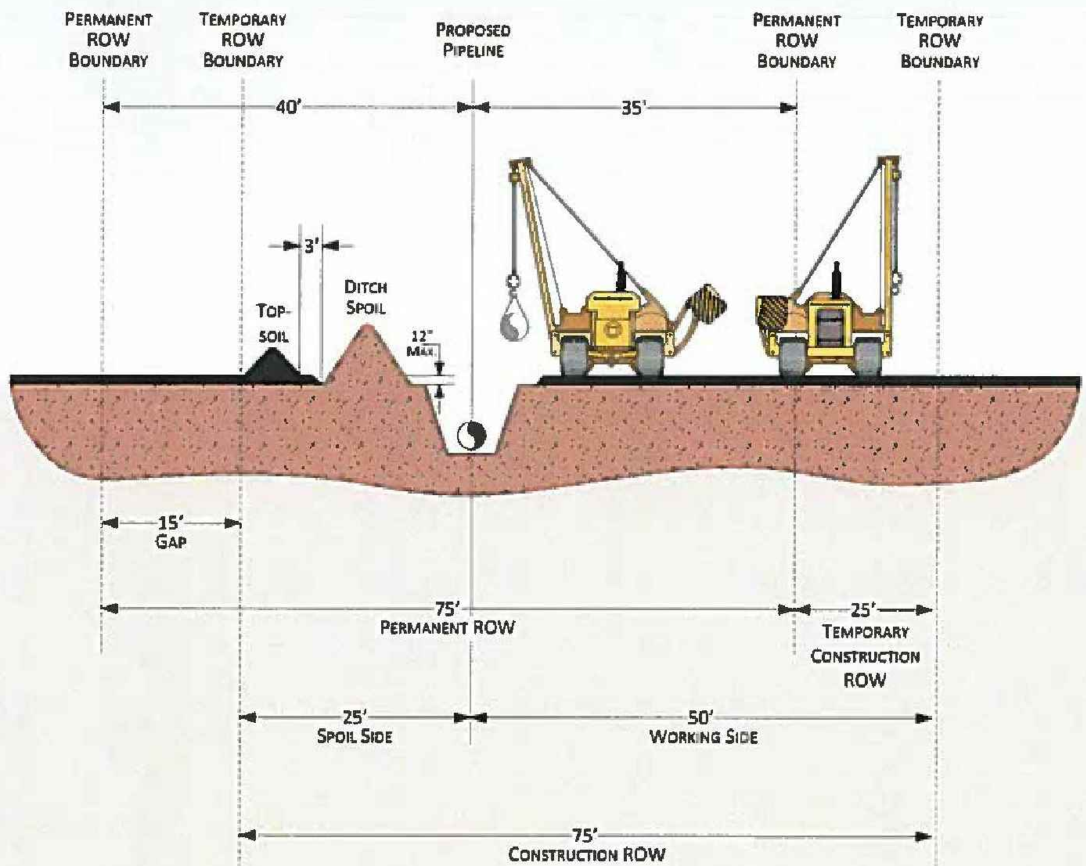
CONSULTANT

| | |
|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**TYP WETLAND OPEN CUT METHOD ACP AP-1 AP-2 AP-3 AP-4 AP-5**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 13F |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0



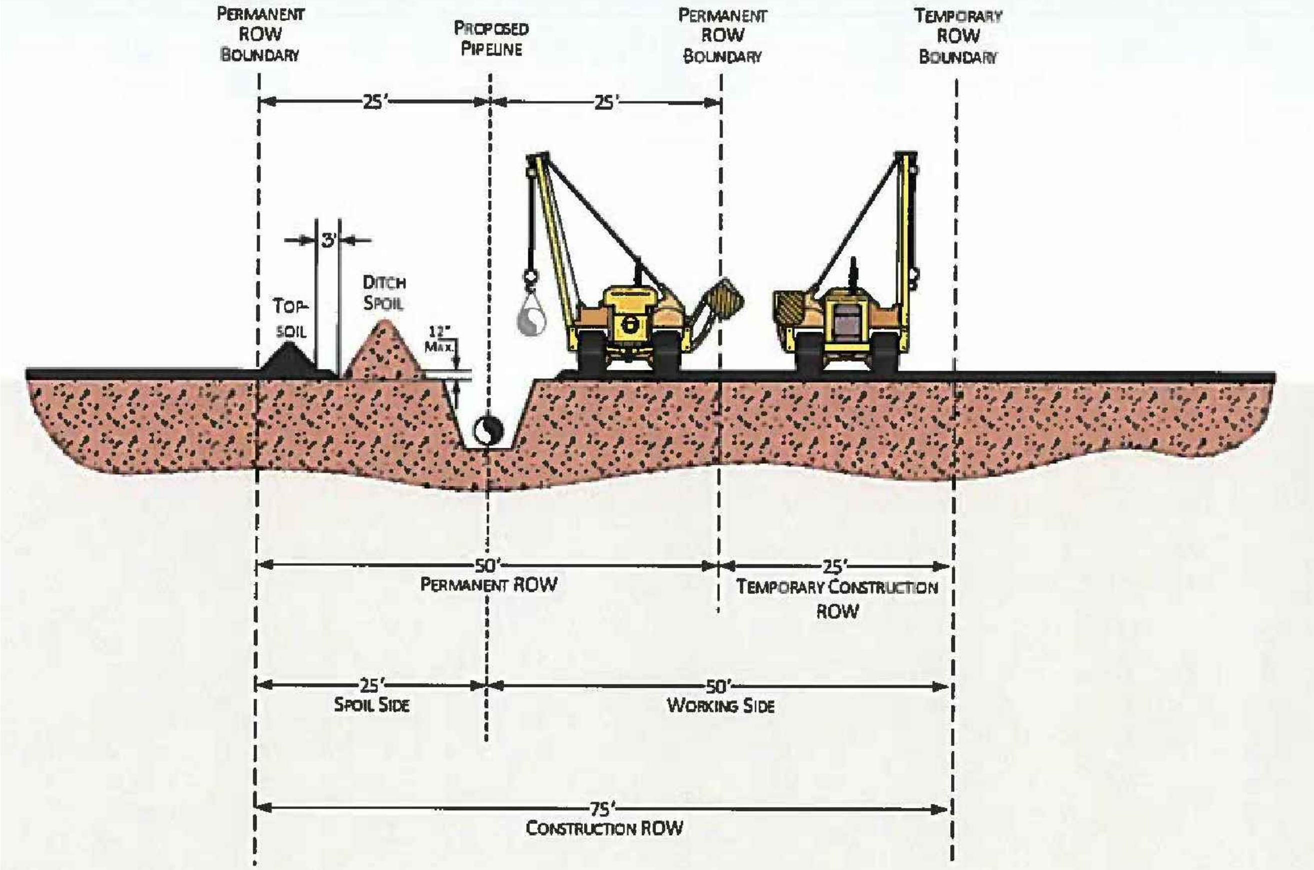

PROFILE

**NOTES:**

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 75' WIDE WITH 25' ON THE SPOIL SIDE AND 50' ON THE WORKING SIDE. THE PERMANENT ROW WILL BE 75' WIDE WITH 40' ON THE SPOIL SIDE AND 35' ON THE WORKING SIDE. THIS WILL LEAVE A 15' GAP BETWEEN THE AREA OF DISTURBANCE DURING CONSTRUCTION AND THE BOUNDARY OF THE PERMANENT ROW. NO IMPACT IS EXPECTED IN THIS AREA.
2. DURING CONSTRUCTION, A WORKING SIDE OF 50 FEET IN WETLANDS WILL BE NECESSARY GIVEN THE DIAMETER OF THE PIPE.
3. DURING OPERATIONS, ATLANTIC PROPOSES A STANDARD PERMANENT EASEMENT IN WETLANDS CONSISTENT WITH OTHER SEGMENTS OF THE PIPELINE. MAINTENANCE ACTIVITIES IN THE PERMANENT EASEMENT WILL BE CONSISTENT WITH THE PROCEDURES.

| | | | |
|---|---|---|---|
| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT | YYYY-MM-DD: 2017-02-28 | TITLE<br>TYP CONSTRUCTION ROW IN WETLANDS ACP AP-1 | |
| Golder Associates | PREPARED: REDMOND | | |
| | DESIGN: DBC | | |
| | REVIEW: - | PROJECT No. 1535050 | PHASE 500 |
| | APPROVED: AQK | Rev. F | FIGURE 13G-1 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A




PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 75' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 25' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

| | |
|---|---|
| CLIENT<br>DOMINION | PROJECT<br>BIC/INCREMENTAL CONTROLS |

CONSULTANT

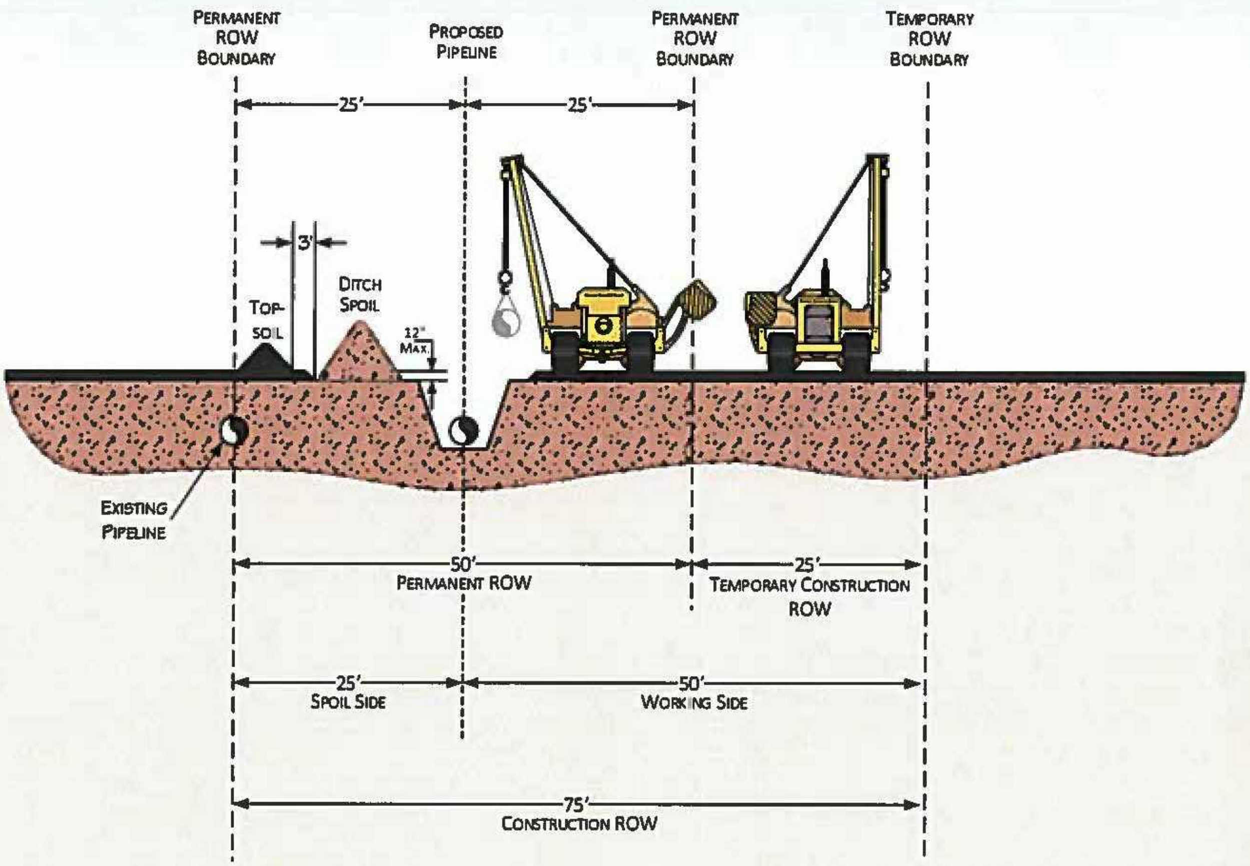
Golder Associates

| | |
|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**TYP CONSTRUCTION ROW IN WETLANDS ACP AP-2**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 13G-2 |

0 1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A



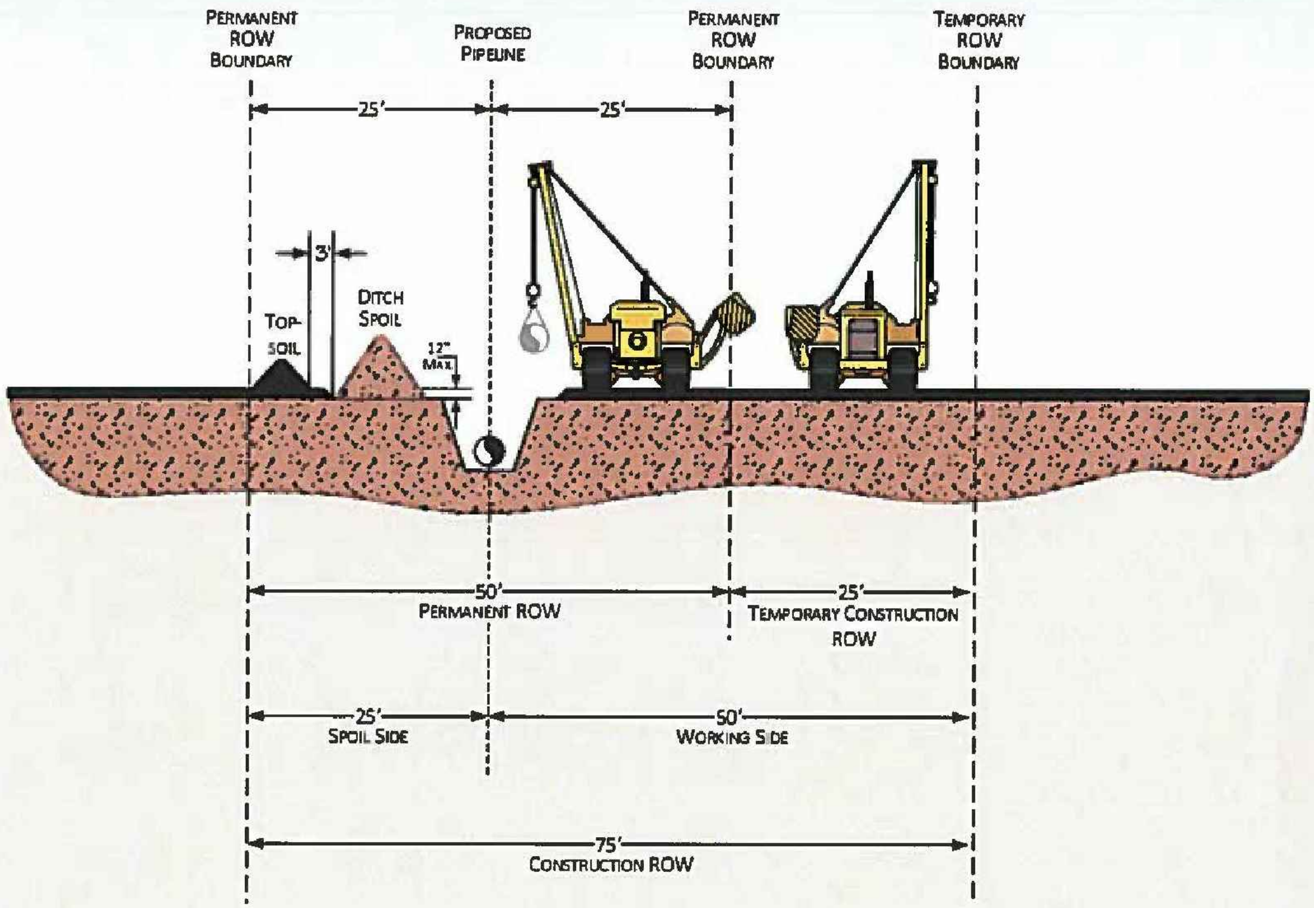

PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 75' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 25' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

| | | | |
|---|---|---|---|
| CLIENT<br>DOMINION | | | PROJECT<br>BIC/INCREMENTAL CONTROLS |
| CONSULTANT | YYYY-MM-DD | 2017-02-28 | TITLE<br>TYP CONSTRUCTION ROW IN WETLANDS COLLOCATED SHP TL-635 TL-636 |
| Golder Associates | PREPARED | REDMOND | |
| | DESIGN | DBC | |
| | REVIEW | - | PROJECT No. 1535050 / PHASE 500 / Rev. F / FIGURE 13G-3 |
| | APPROVED | AQK | |

1 in 0 IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A




PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 75' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 25' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

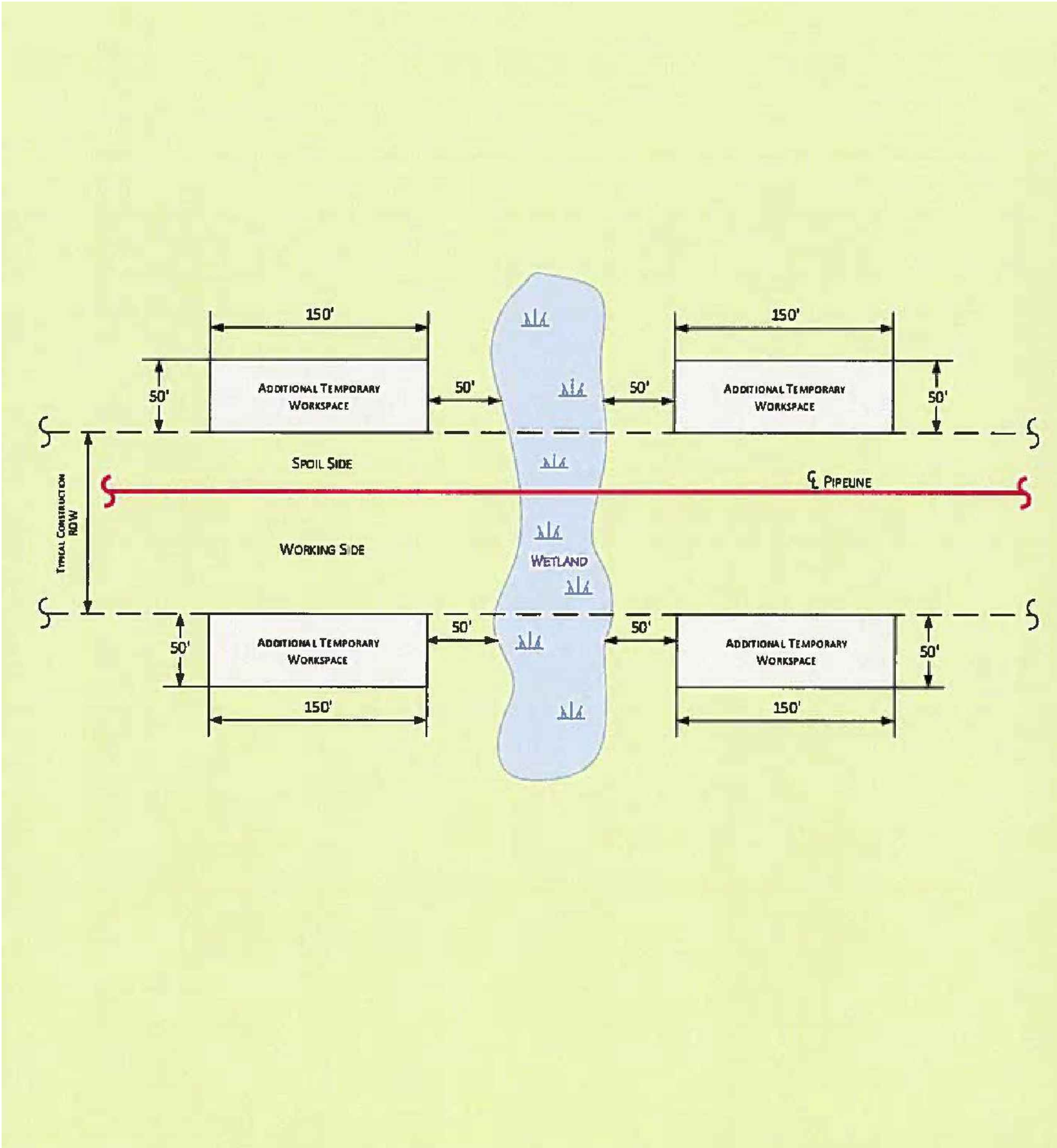
| CLIENT | PROJECT |
|---|---|
| DOMINION | BIC/INCREMENTAL CONTROLS |

| CONSULTANT | | |
|---|---|---|
| Golder Associates | YYYY-MM-DD | 2017-02-28 |
| | PREPARED | REDMOND |
| | DESIGN | DBC |
| | REVIEW | - |
| | APPROVED | AQK |

TITLE
**TYP CONSTRUCTION ROW IN WETLANDS NOT-COLLOCATED SHP TL-635 TL-636**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 13G-4 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
0 1 in

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|---|---|---|---|
| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT | YYYY-MM-DD: 2017-02-28 | TITLE<br>**TYP ADDITIONAL WORKSPACE AT WETLAND CROSSINGS ACP AP-1** | |
| Golder Associates | PREPARED: REDMOND | | |
| | DESIGN: DBC | | |
| | REVIEW: - | PROJECT No. 1535050 | PHASE 500 |
| | APPROVED: AQK | Rev. F | FIGURE 13H-1 |

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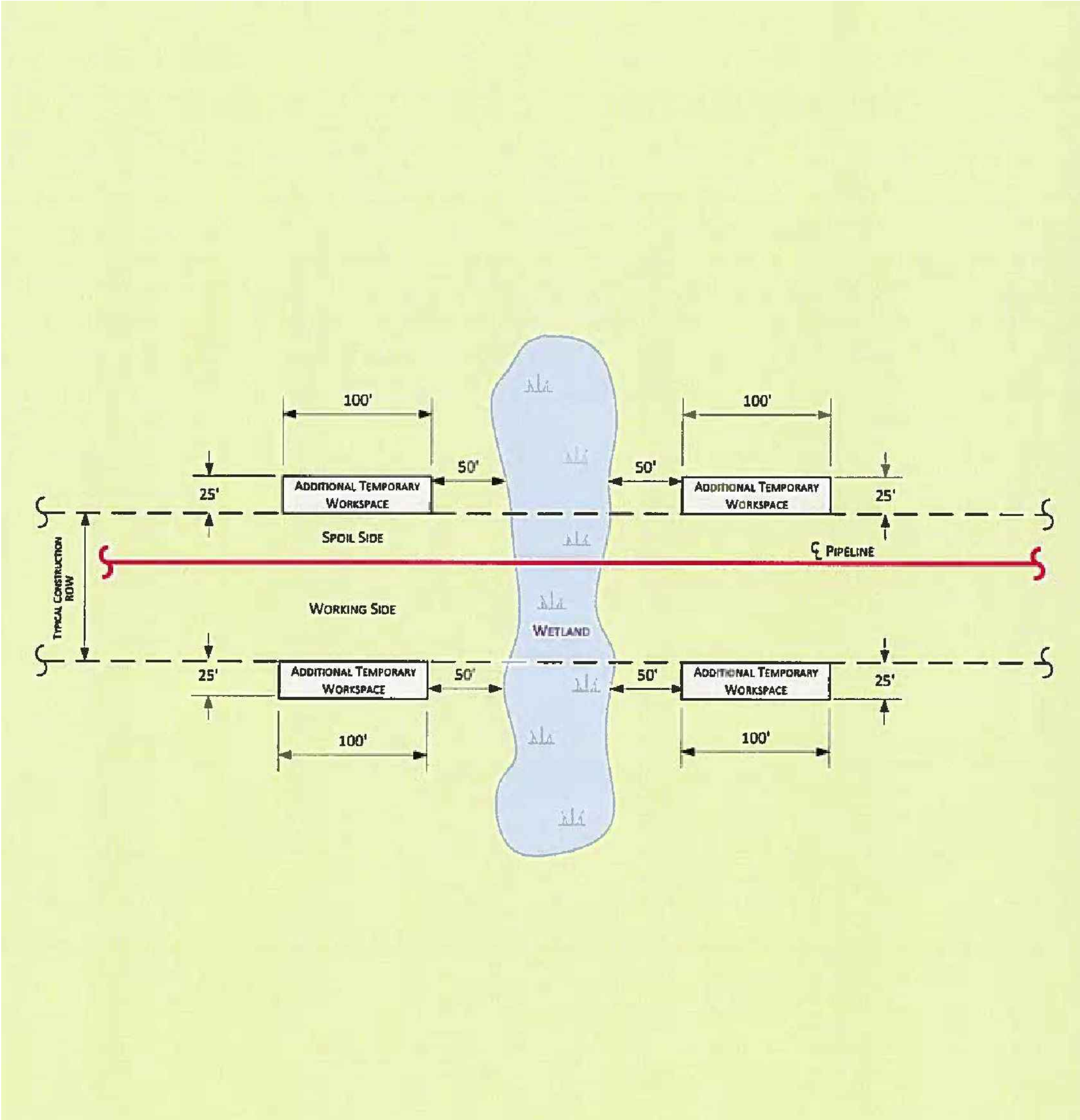
0
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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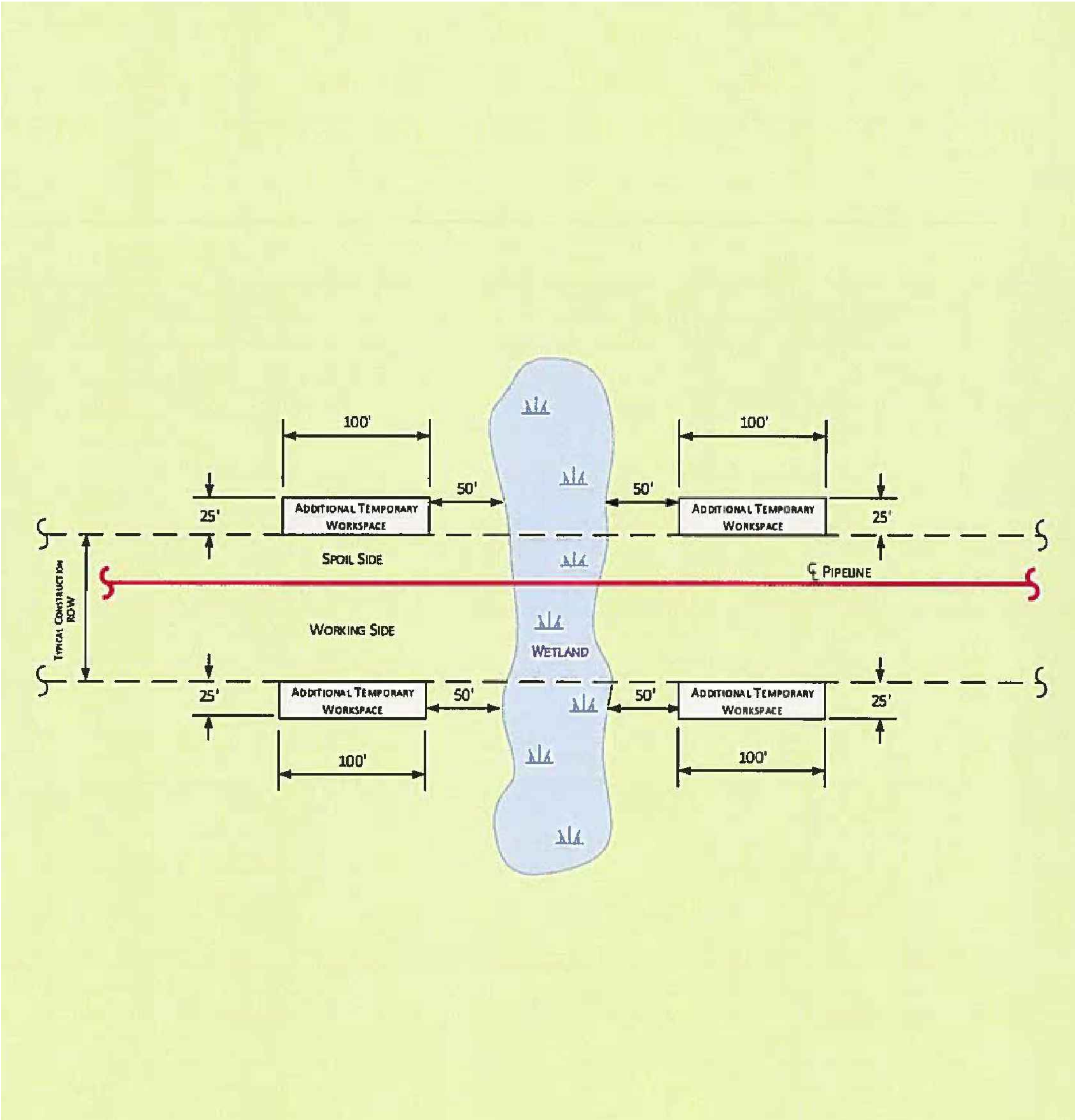
|---|---|---|---|
| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT | YYYY-MM-DD: 2017-02-28 | TITLE<br>**TYP ADDITIONAL WORKSPACE AT WETLAND CROSSINGS ACP AP-2 AP-3 AP-4 AP-5** | |
| Golder Associates | PREPARED: REDMOND | | |
| | DESIGN: DBC | | |
| | REVIEW: - | PROJECT No. 1535050 | PHASE 500 |
| | APPROVED: AQK | Rev. F | FIGURE 13H-2 |

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

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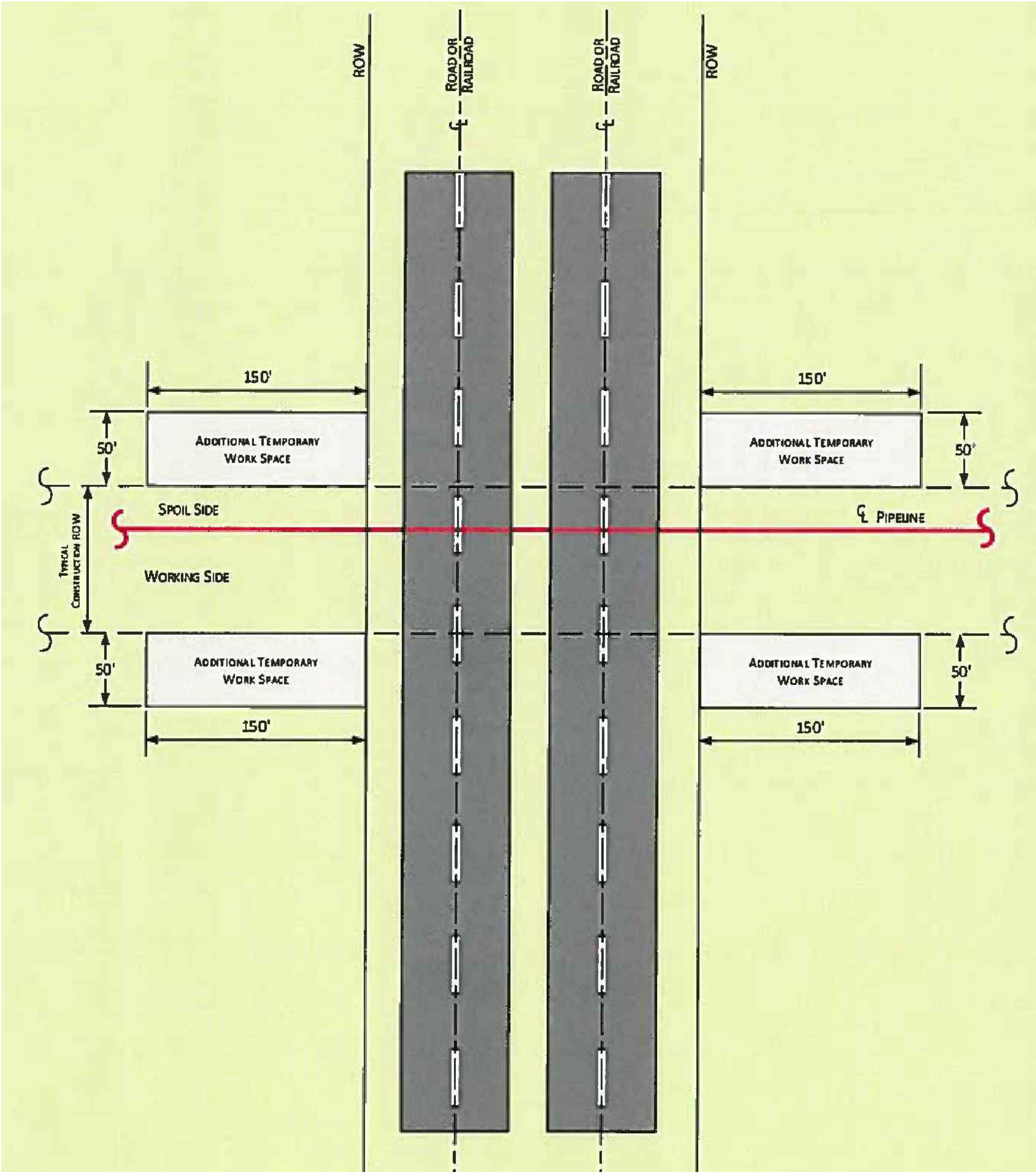
|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**TYP ADDITIONAL WORKSPACE AT WETLAND CROSSINGS SHP TL-635 TL-636**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 13H-3 |

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

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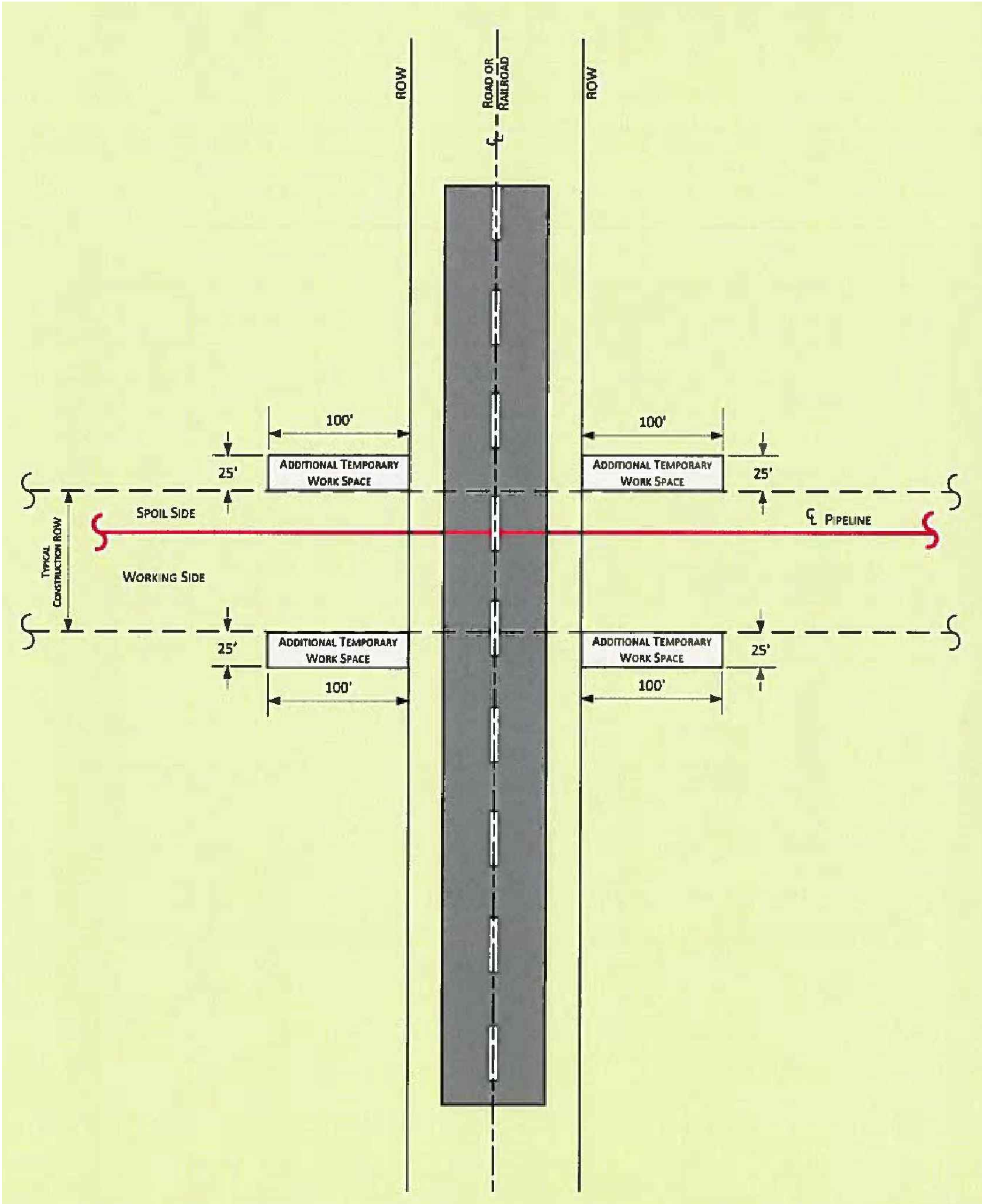
|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**WORKSPACE AT BORED CROSSINGS FOR 2-LANE ROADS AND RAILROADS**

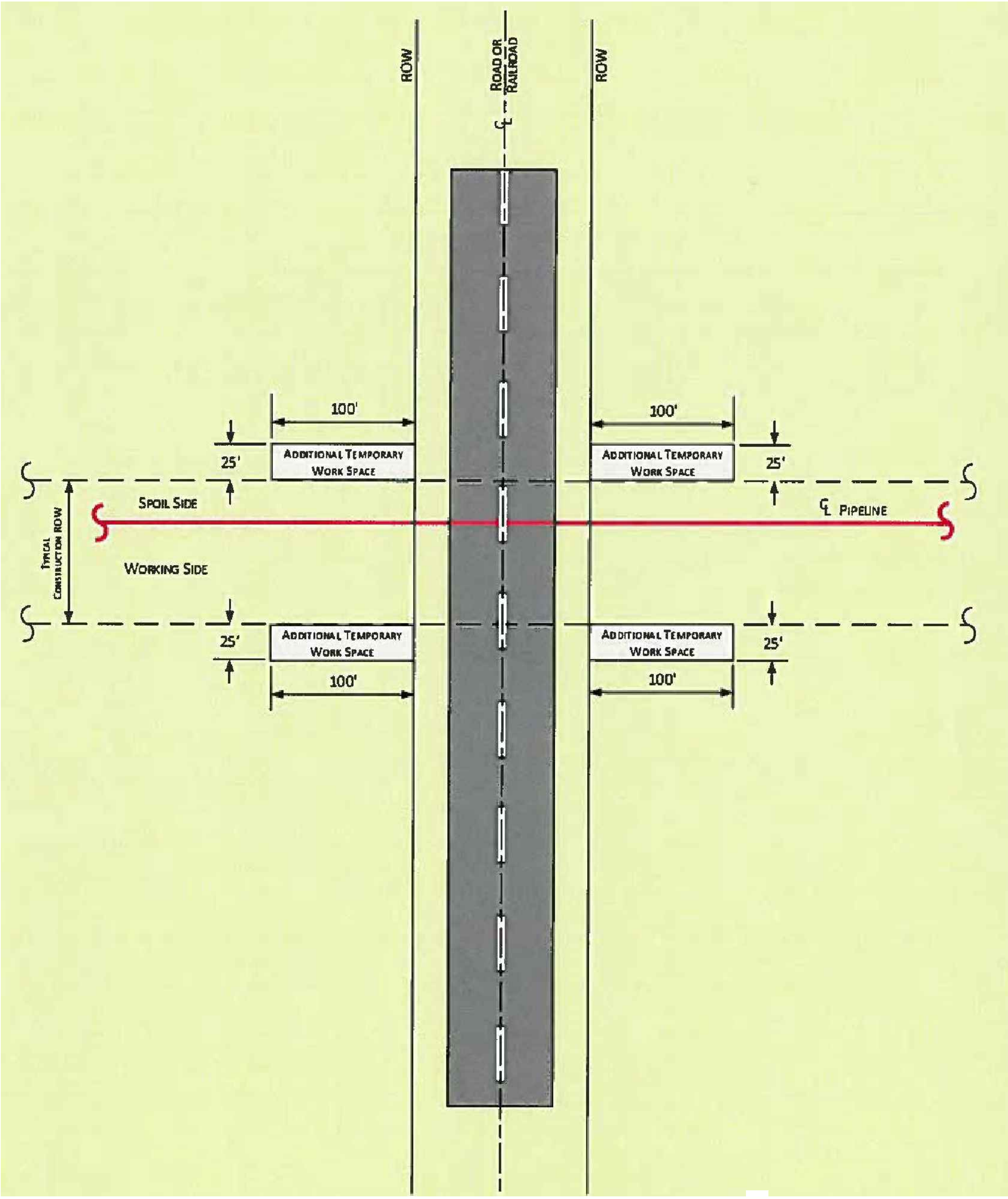
| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 13I-1 |

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 | YYYY-MM-DD | 2017-02-28 | TITLE | | | |
| Golder Associates | PREPARED | REDMOND | **TYP ADDITIONAL WORKSPACE AT SINGLE-LANE ROADS AND BORED ROADS ACP AP-1 AP-2 AP-3 AP-4 AP-5** | | | |
| | DESIGN | DBC | | | | |
| | REVIEW | - | PROJECT No. | PHASE | Rev. | FIGURE |
| | APPROVED | AQK | 1535050 | 500 | F | 13I-2 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A




| | |
|---|---|
| CLIENT<br>DOMINION | PROJECT<br>BIC/INCREMENTAL CONTROLS |

CONSULTANT

Golder Associates

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|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE

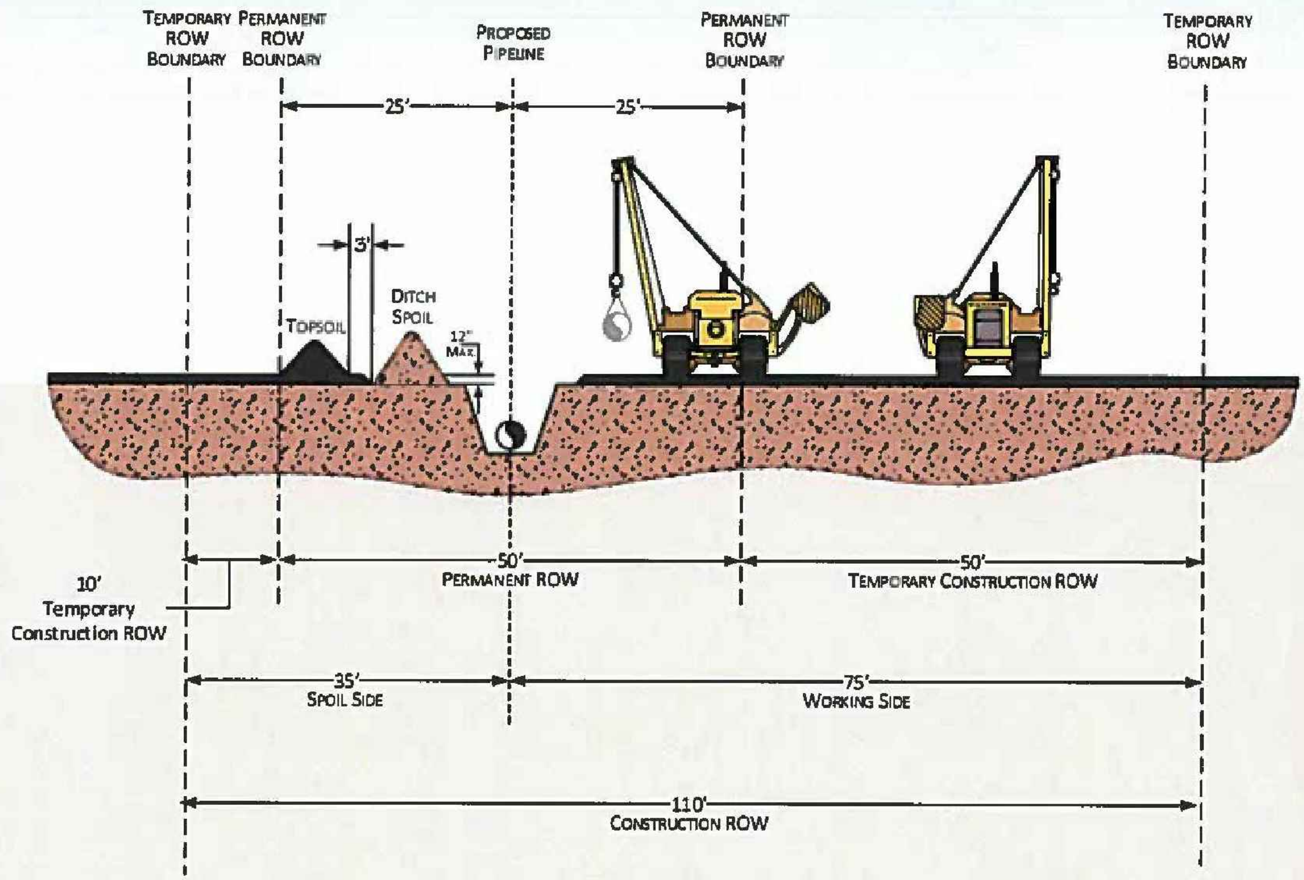
**TYP ADDITIONAL WORKSPACE AT ALL BORED ROADS SHP TL-635 TL-636**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 13I-3 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

0




**PROFILE**

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 110' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 60' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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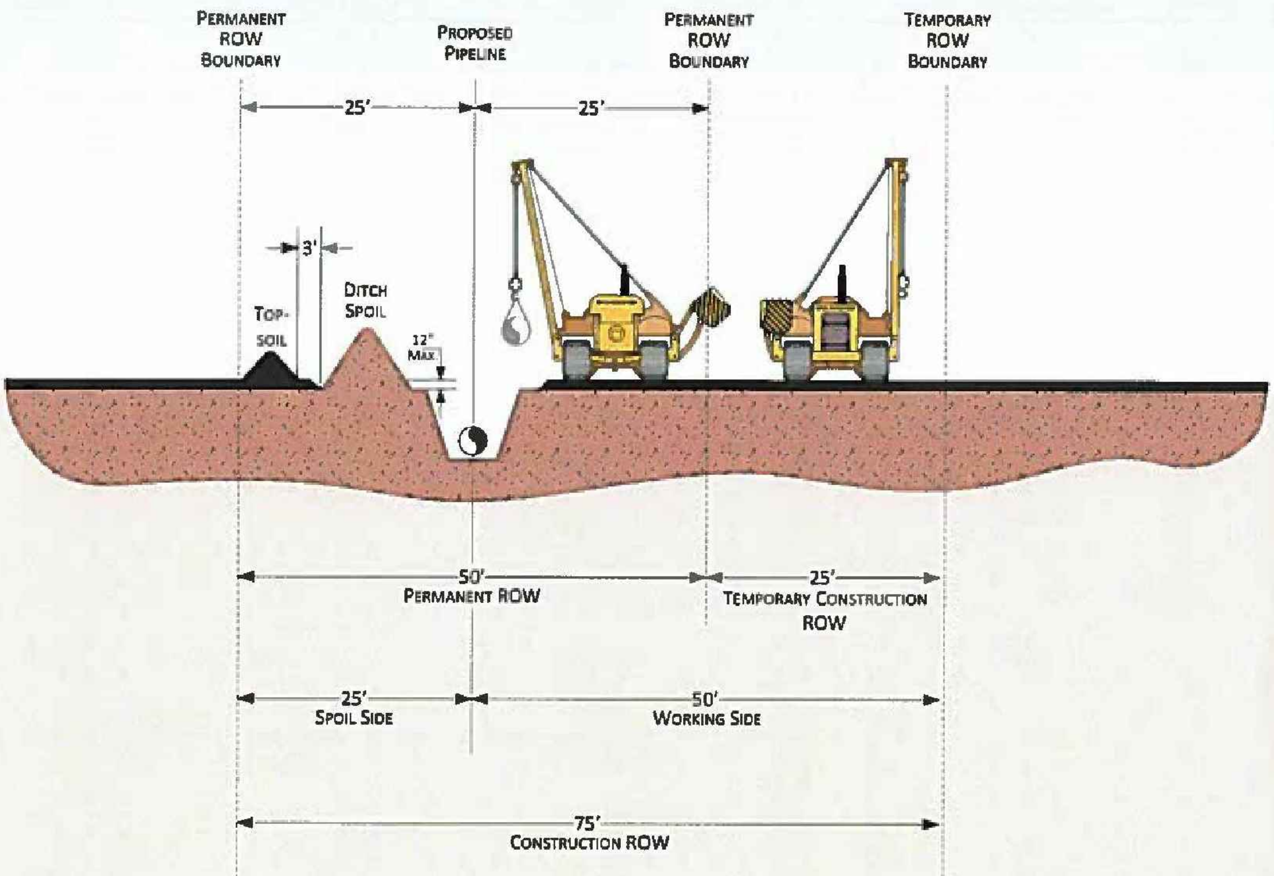
|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**TYP CONSTRUCTION ROW IN NON-AG AREAS ACP AP-2**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 13J-1 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0




PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 75' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 25' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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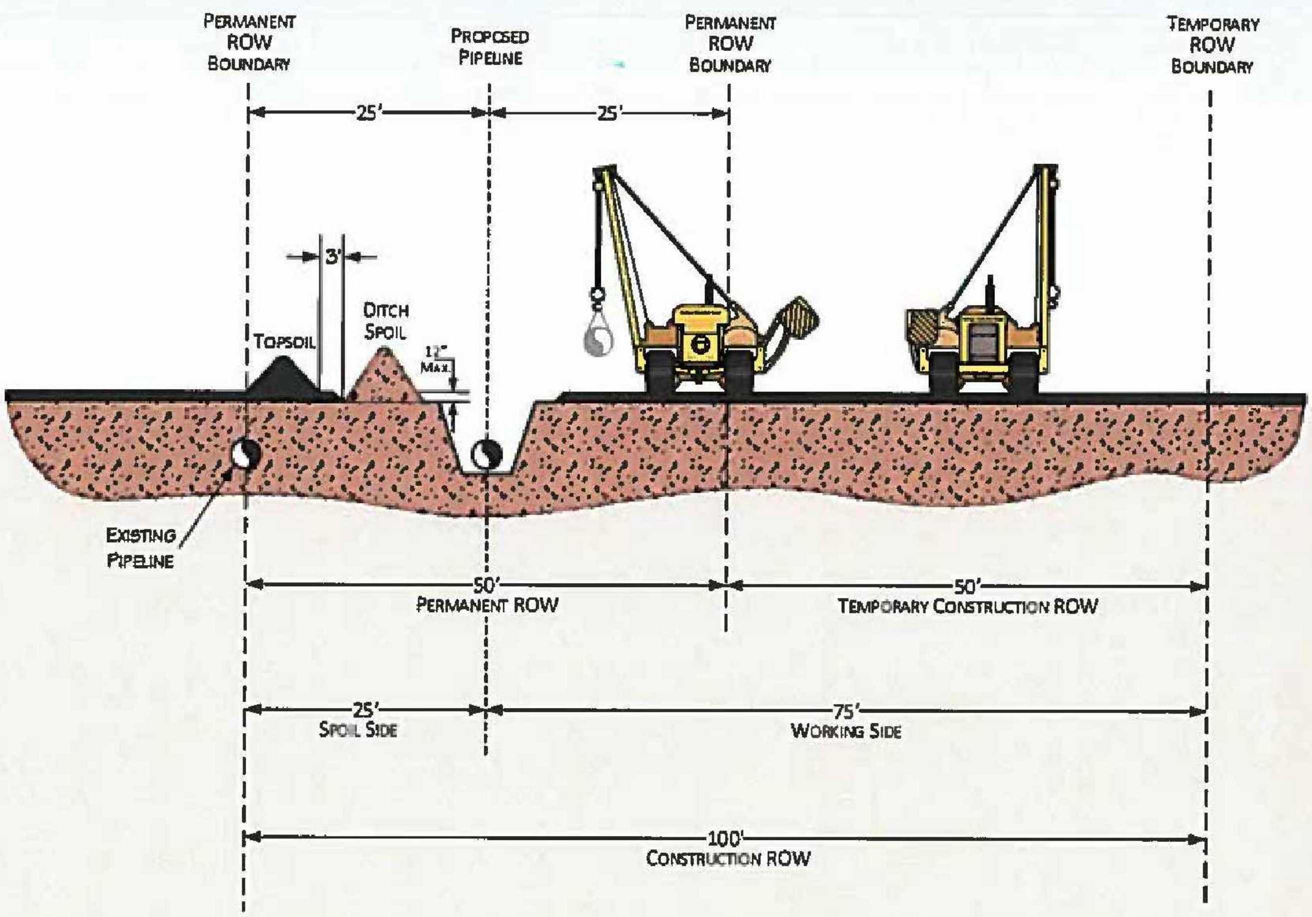
|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**TYP CONSTRUCTION ROW IN NON-AG AREAS AND WETLANDS ACP AP-3 AP-4 AP-5**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 13J-2 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0




**PROFILE**

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 100' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 50' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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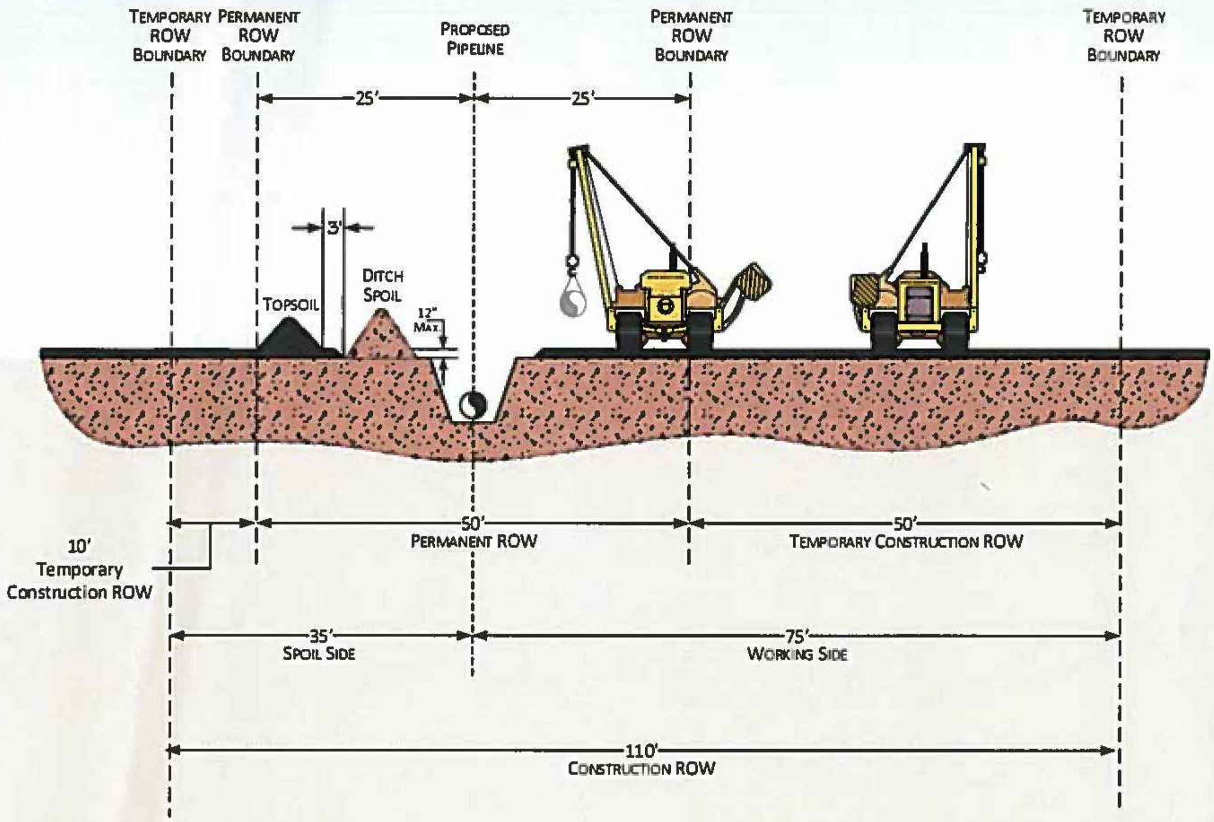
|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**TYP CONSTRUCTION ROW IN COLLOCATED NON-AG AREAS SHP TL-635 TL-636**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 13J-3 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0



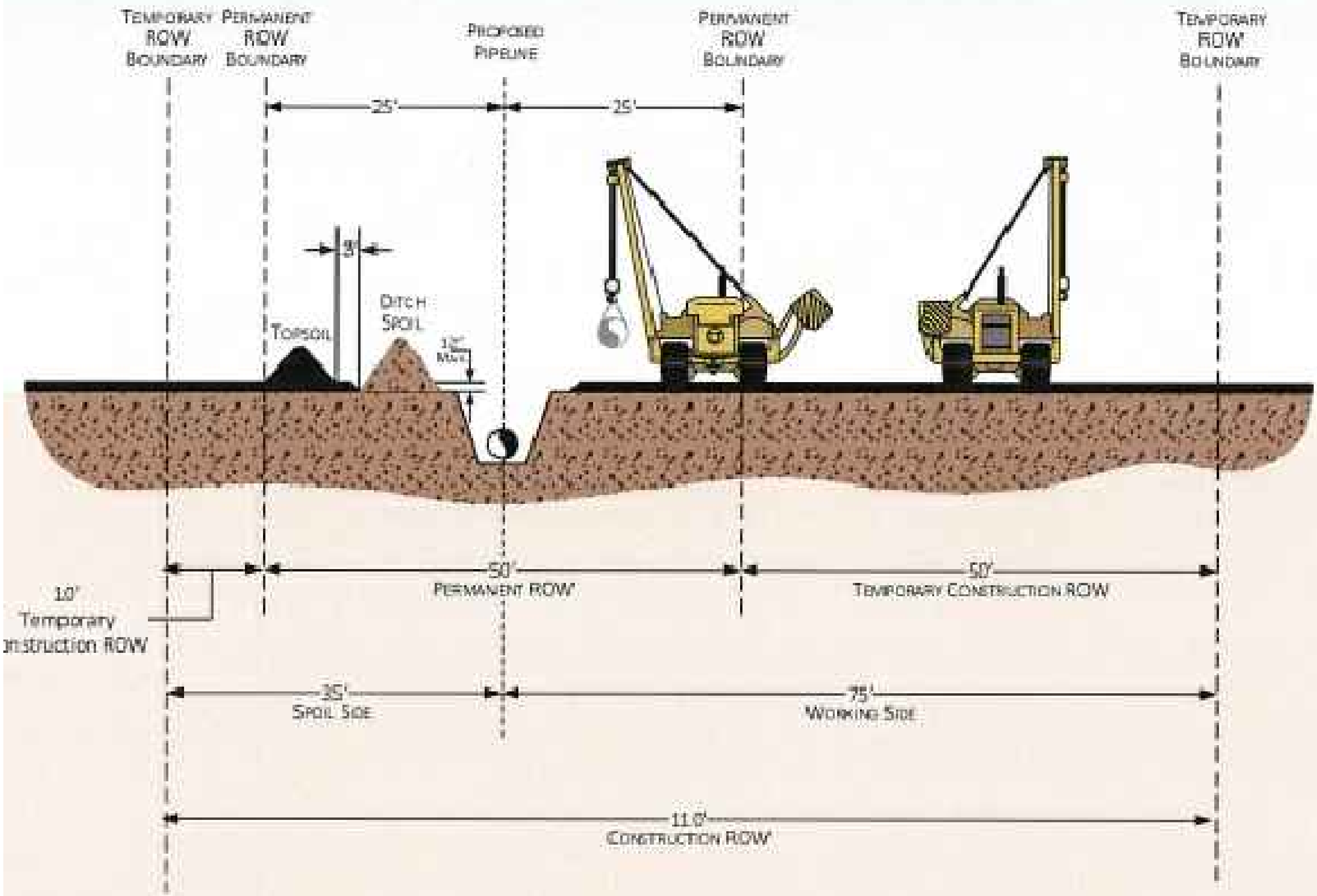

PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 110' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 60' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

| | | | |
|---|---|---|---|
| CLIENT<br>DOMINION | | | PROJECT<br>BIC/INCREMENTAL CONTROLS |
| CONSULTANT<br>Golder Associates | YYYY-MM-DD | 2017-02-28 | TITLE<br>**TYP CONSTRUCTION ROW NOT-COLLOCATED IN NON-AG AREAS SHP TL-635 TL-636** |
| | PREPARED | REDMOND | |
| | DESIGN | DBC | |
| | REVIEW | - | PROJECT No. 1535050 · PHASE 500 · Rev. F · FIGURE 13J-4 |
| | APPROVED | AQK | |

1 in
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A




PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 110' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 60' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

| CLIENT | | | PROJECT | | | |
|---|---|---|---|---|---|---|
| DOMINION | | | BIC/INCREMENTAL CONTROLS | | | |
| CONSULTANT | YYYY-MM-DD | 2017-02-28 | TITLE | | | |
| Golder Associates | PREPARED | REDMOND | TYP CONSTRUCTION ROW IN AG AREAS ACP AP-2 | | | |
| | DESIGN | DBC | | | | |
| | REVIEW | - | PROJECT No. | PHASE | Rev. | FIGURE |
| | APPROVED | AQK | 1535050 | 500 | F | 13K-1 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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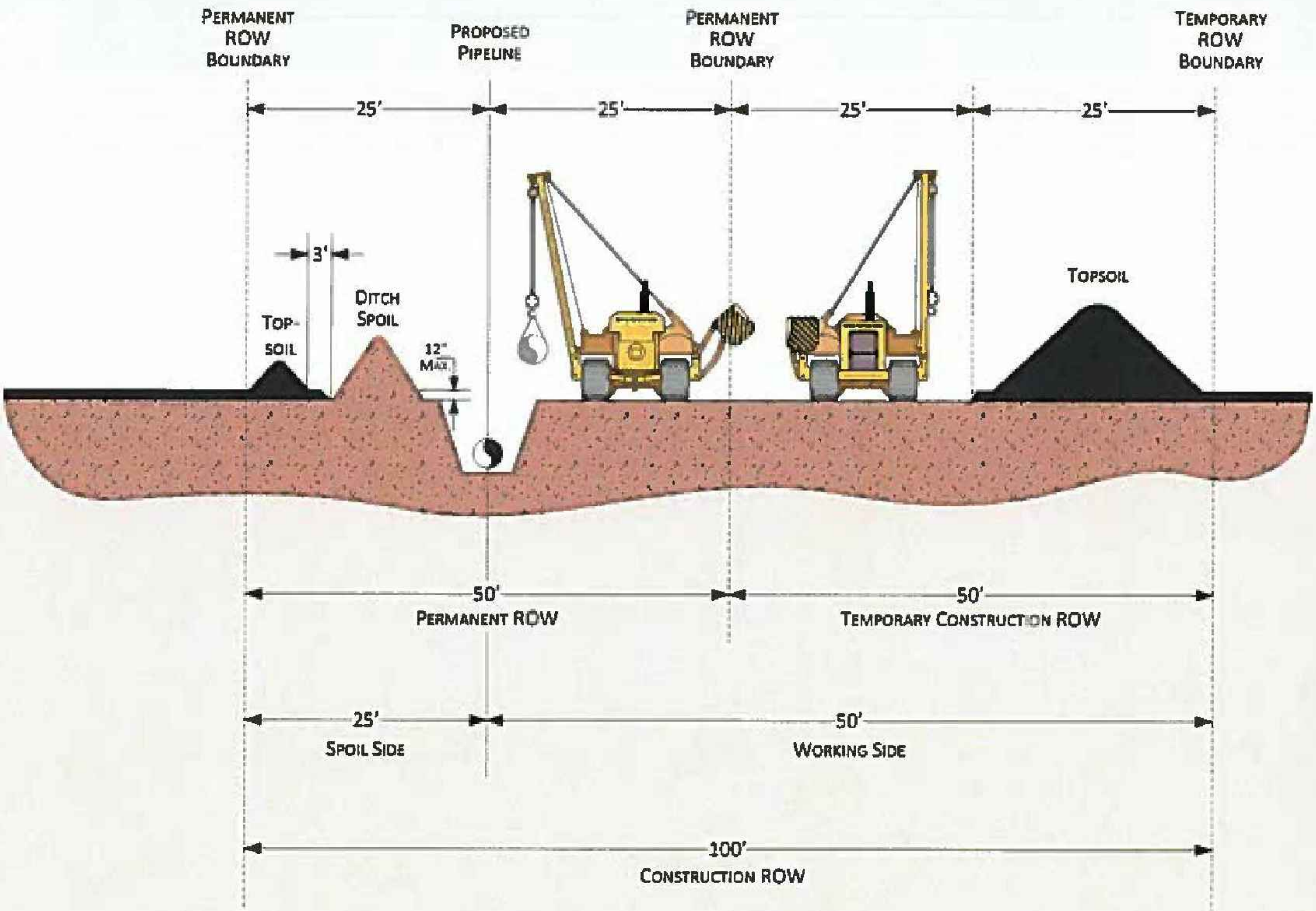


## PROFILE

**Notes:**

1. In agricultural areas where full width topsoil stripping is required, an additional 25' of temporary workspace will be required. In this scenario, the construction right-of-way will be 100' wide, consisting of 50' of permanent right-of-way and 50' of temporary construction right-of-way. Additional temporary workspace will be necessary at major road, rail, river crossings, sideslopes, and other special circumstances as required.

| | | | |
|---|---|---|---|
| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT<br>Golder Associates | YYYY-MM-DD: 2017-02-28<br>PREPARED: REDMOND<br>DESIGN: DBC<br>REVIEW: -<br>APPROVED: AQK | TITLE<br>TYP CONSTRUCTION ROW IN AG AREAS ACP AP-3 AP-4 AP-5 | |
| PROJECT No.<br>1535050 | PHASE<br>500 | Rev.<br>F | FIGURE<br>13K-2 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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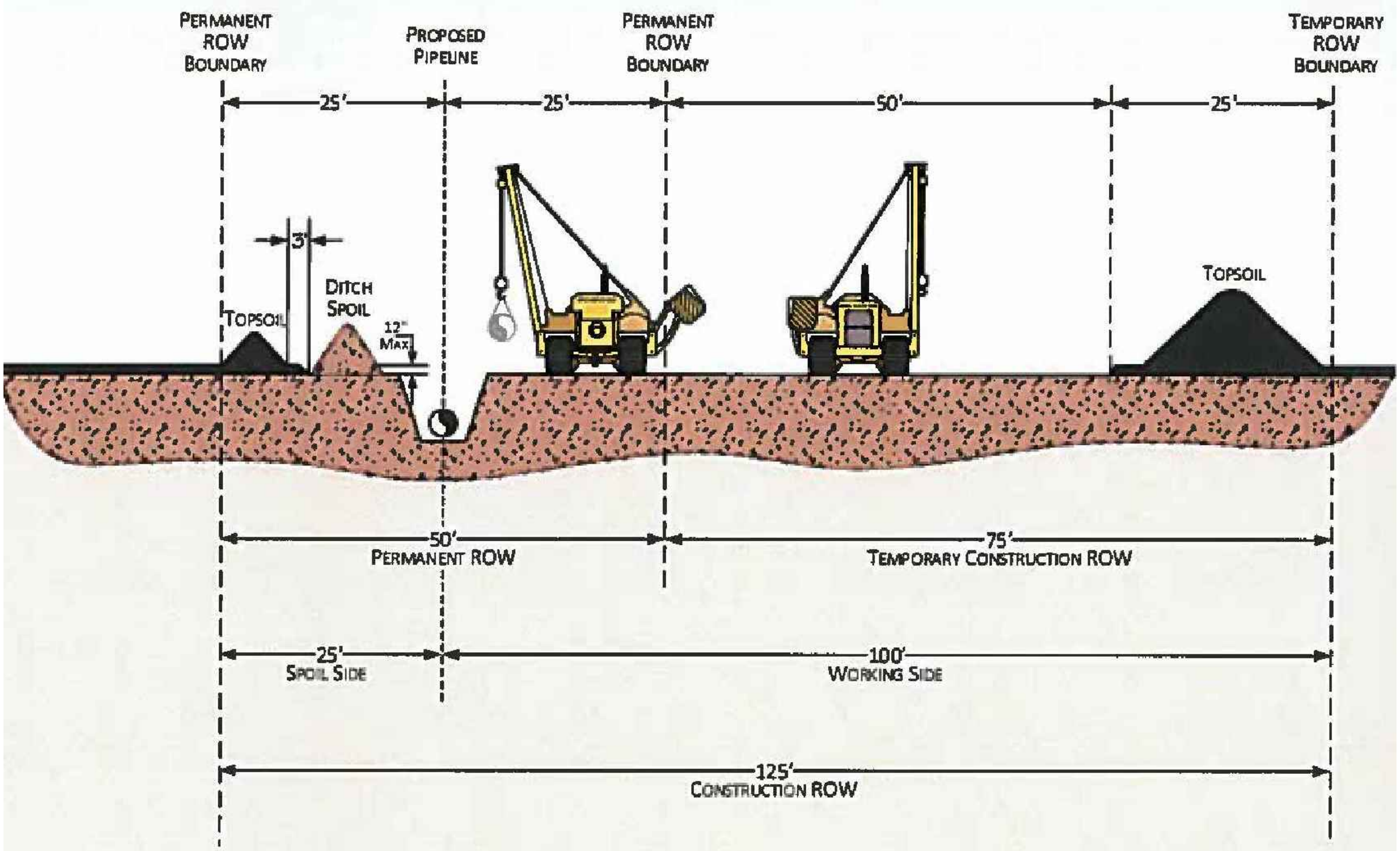


**PROFILE**

NOTES:

1. IN AGRICULTURAL AREAS WHERE FULL WIDTH TOPSOIL STRIPPING IS REQUIRED, AN ADDITIONAL 25' OF TEMPORARY WORKSPACE WILL BE REQUIRED. IN THIS SCENARIO, THE CONSTRUCTION RIGHT-OF-WAY WILL 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, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**TYP CONSTRUCTION ROW COLLOCATED IN AG AREAS SHP TL-635 TL-636**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 13K-3 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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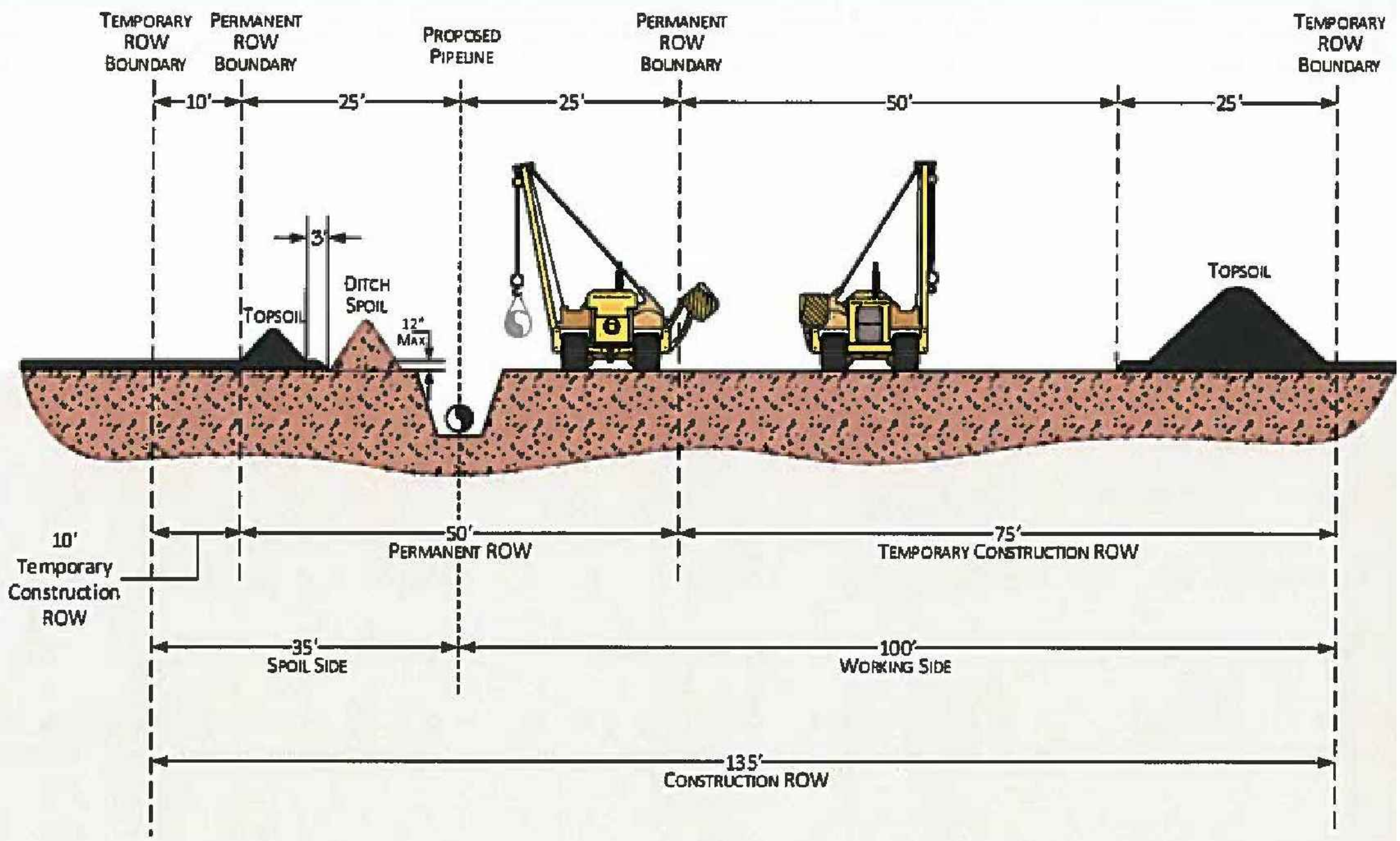


**PROFILE**

NOTES:

1. IN AGRICULTURAL AREAS WHERE FULL WIDTH TOPSOIL STRIPPING IS REQUIRED, AN ADDITIONAL 25' OF TEMPORARY WORKSPACE WILL BE REQUIRED. IN THIS SCENARIO, THE CONSTRUCTION RIGHT-OF-WAY WILL BE 135' WIDE, CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 85' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

| | | | |
|---|---|---|---|
| CLIENT<br>DOMINION | | PROJECT<br>BIC/INCREMENTAL CONTROLS | |
| CONSULTANT<br>Golder Associates | YYYY-MM-DD: 2017-02-28<br>PREPARED: REDMOND<br>DESIGN: DBC<br>REVIEW: -<br>APPROVED: AQK | TITLE<br>**TYP CONSTRUCTION ROW NOT-COLLOCATED IN AG AREAS SHP TL-635 TL-636** | |
| | | PROJECT No.: 1535050<br>PHASE: 500 | Rev.: F<br>FIGURE: 13K-4 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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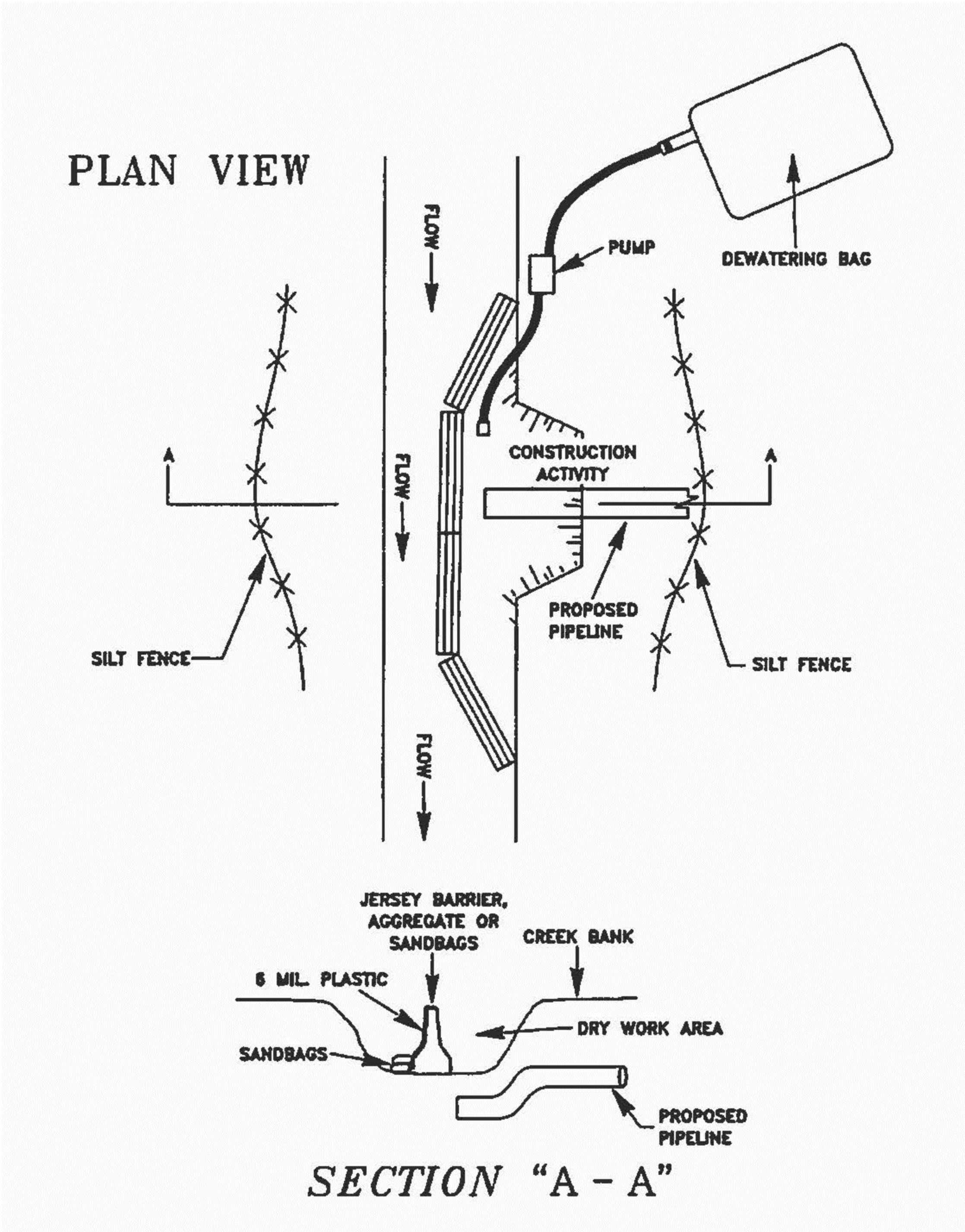


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| CLIENT<br>DOMINION | PROJECT<br>BIC/INCREMENTAL CONTROLS |

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|---|---|---|
| CONSULTANT | YYYY-MM-DD | 2017-02-28 |
| Golder Associates | PREPARED | REDMOND |
| | DESIGN | DBC |
| | REVIEW | - |
| | APPROVED | AQK |

TITLE
**TYP COFFERDAM CROSSING**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 13L |

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. INCLUDES, BUT IS NOT LIMITED TO, SITE SPECIFIC INVESTIGATIONS, ASSESSMENTS, ANALYSIS, DETAILED ENGINEERING, AND DESIGN WORK DEVELOPED TO MITIGATE FOR SPECIALIZED SITE GEOTECHNICAL, HYDROTECHNICAL, OR GEOLOGIC CONDITIONS THAT MAY BE IMPOSED ON THE PIPELINE.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**SITE SPECIFIC DETAILED ENGINEERING**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 14A |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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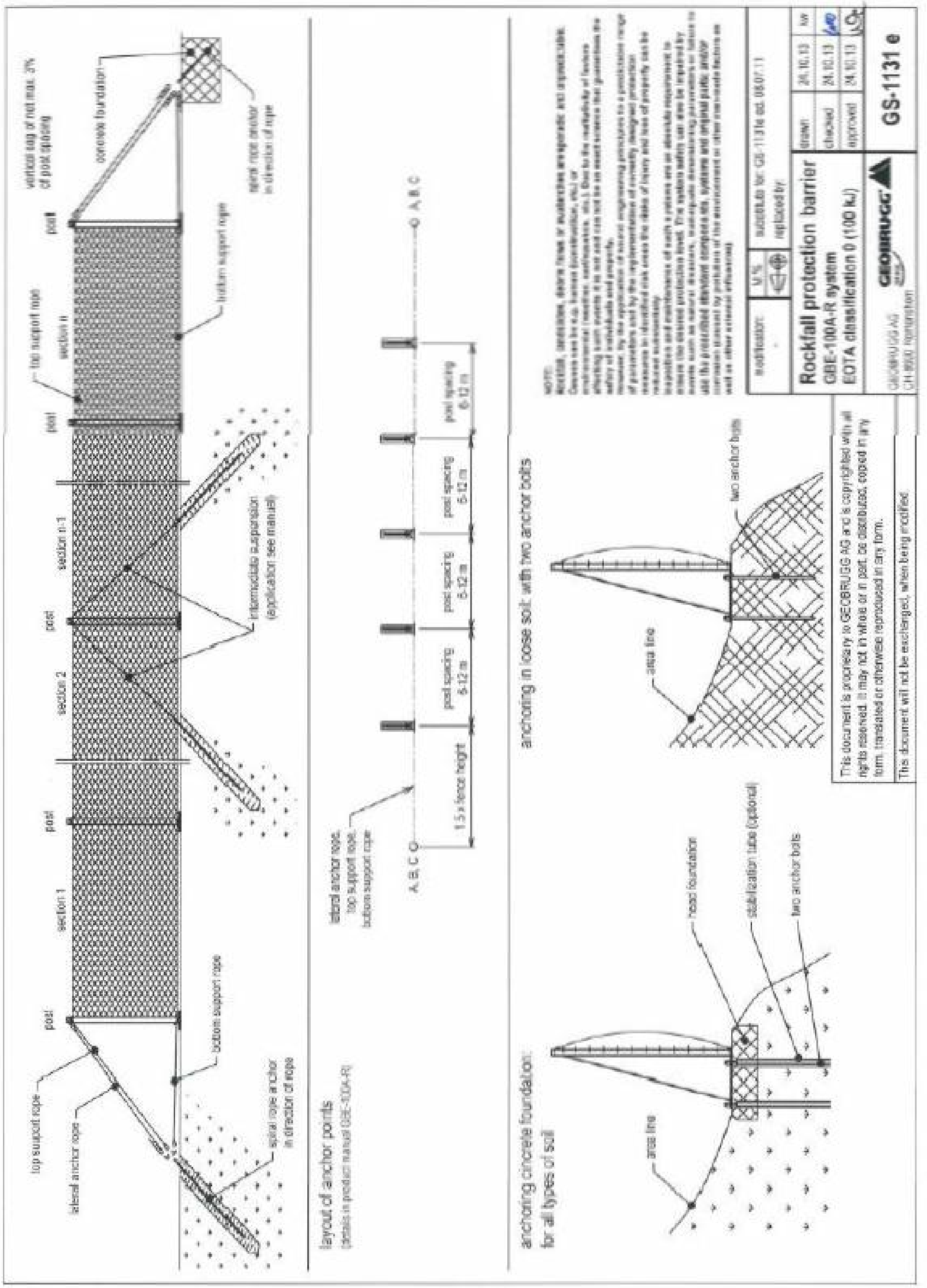


**NOTE(S)**

1. FINAL CONFIGURATION OF ROCK FALL PROTECTION 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

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| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**MESH FENCE - ROCK FALL PROTECTION**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 14B |

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 PLANNING, DESIGN, AND IMPLEMENTATION OF BLASTING ACTIVITIES TO BE DETERMINED BASED ON SITE SPECIFIC CONDITIONS, AND MUST FOLLOW SPECIFICATIONS AND REQUIREMENTS AS DIRECTED BY DOMINION.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**BLASTING PLANS**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 14C |

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. ADJUST ROUTING, ALIGNMENT, LOCATION (VERTICALLY OR HORIZONTALLY), OR POSITION WITHIN THE ROW OF THE PIPELINE TO AVOID IDENTIFIED HAZARDS. EXAMPLES MAY INCLUDE, BUT ARE NOT LIMITED TO, NEW ROW LOCATIONS THAT DEPART ENTIRELY FROM THE CURRENT ALIGNMENT BY SIGNIFICANT DISTANCES, RELATIVELY SMALLER ALIGNMENT SHIFTS THAT OFFSET FOR SHORTER DISTANCES FROM THE CURRENT ALIGNMENT, MINOR ADJUSTMENTS TO THE ALIGNMENT THAT REMAIN WITHIN THE ROW BOUNDARIES, LOWERING THE PIPELINE BELOW IDENTIFIED HAZARDS WHILE STAYING WITHIN THE ROW, ETC. CHANGING ROW ALIGNMENTS REQUIRES SITE SPECIFIC PLANNING, PERMITTING, ASSESSMENTS, LAND AND PROPERTY REVIEW AND COORDINATION, ENGINEERING DESIGN TO FIT THE NEW SITE CONDITIONS, AND OTHER TECHNICAL SUPPORT EFFORTS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**AVOIDANCE**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 15A |

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. SITE INVESTIGATIONS NEEDED TO CONFIRM LATERAL AND VERTICAL EXTENT OF IDENTIFIED LANDSLIDE OR OTHER UNSTABLE SLOPE CONDITIONS.

3. INVESTIGATION MAY INCLUDE PROBES, TEST PITS, EXCAVATIONS ALONG PIPELINE TRENCH, GEOPHYSICAL METHODS (I.E. NON-INTRUSIVE GPR, SEISMIC OR ELECTRICAL METHODS), OR MAY REQUIRE DEEPER SUBSURFACE DRILLING METHODS. FINAL INVESTIGATION METHONGS(S) TO BE DETERMINED BASED ON SITE CONDITIONS AND REQUIREMENTS OF SITE WORK.

4. EXCAVATIONS TO REMOVE IDENTIFIED LANDSLIDE OR OTHER UNSTABLE SLOPE CONDITIONS SHOULD BE COMPLETED FOR THE FULL EXTENT OF CHARACTERIZED HAZARD AREA, AT A MINIMUM MATCHING OR EXCEEDING THE UNDERLYING AND/OR LATERAL BOUNDING FAILURE SURFACE AND/OR SLIP PLANE. THE GOAL AND INTENT OF THIS MITIGATION APPROACH IS TO ESSENTIALLY REMOVE THE SLOPE HAZARD FROM THE SITE BY DIGGING OUT THE LIMITS OF THE IDENTIFIED HAZARD.

5. REMOVAL OF TARGETED LANDSLIDE AND/OR UNSTABLE SLOPE MATERIALS MAY REQUIRE SPECIAL CONSIDERATIONS FOR OTHER DIRECTLY OR INDIRECTLY RELATED OR CONNECTED SITE MITIGATION MEASURES AND/OR SITE ACTIVITIES TO ADDRESS SAFETY, SLOPE STABILITY, ACCESS, CONSTRUCTION FEASIBILITY, ETC, THEREFORE, PLANNING FOR IMPLEMENTATION OF THIS OPTION SHOULD INCLUDE A COMPREHENSIVE REVIEW OF EXISTING PROPOSED WORK AT THE SITE.

6. EXCAVATED MATERIALS SHOULD BE SPOILED IN LOCATION(S) THAT DO NOT ACCELERATE OR EXACERBATE THE TARGETED LANDSLIDE OR UNSTABLE SLOPE AREA, OR IMPACT OTHER NEIGHBORING LANDSLIDES OR UNSTABLE SLOPE AREAS.

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

Golder Associates

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| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**EXCAVATION REMOVAL OF HAZARD**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 15B |

**NOTE(S)**

1. ACCESS FOR PIPELINE ROW'S IN RUGGED AND REMOTE TERRAIN MAY BE LIMITED TO THE CONSTRUCTED ROW. IN THESE SCENARIOS, CONSTRUCTING INDEPENDENT ACCESS POINTS AND ROADS IS TYPICALLY MINIMIZED TO THEREBY ALSO MINIMIZE DISTURBANCE. AS SUCH, THE PRIMARY ACCESS IS COMMONLY ALONG THE TEMPORARY CONSTRUCTED ROW FOLLOWING THE PIPELINE ALIGNMENT, AND IS THEN NO LONGER AVAILABLE AFTER THE ROW IS RESTORED. THIS BIC MITIGATION MEASURE IS INTENDED TO IDENTIFY AREAS WHERE ACCESS MAY BE NEEDED TO SUPPORT MONITORING, OPERATION, AND MAINTENANCE OF THE ROW; AND TO COMPLETE THE PLANNING, PERMITTING, DESIGN, AND CONSTRUCTION FOR ACCESS TO THESE LOCATIONS. ADDITIONAL PLANNING, PERMITTING, LAND COORDINATION, ENVIRONMENTAL, AND TECHNICAL EFFORTS ARE REQUIRED TO SUPPORT THIS MITIGATION MEASURE, NOT SPECIFICALLY OUTLINED AND ADDRESSED HEREIN, BUT ANTICIPATED TO BE NEEDED TO IMPLEMENT THIS MITIGATION MEASURE.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

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|---|---|
| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**ACCESS TO REMOTE ROW LOCATIONS**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 15C |

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. SITE SPECIFIC STUDIES FOR POTENTIAL KARST HAZARDS WILL BE COMPLETED TO IDENTIFY, CHARACTERIZE, AND DEVELOP MITIGATION RECOMMENDATIONS, AS NEEDED.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

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| YYYY-MM-DD | 2017-02-28 |
| PREPARED | REDMOND |
| DESIGN | DBC |
| REVIEW | - |
| APPROVED | AQK |

TITLE
**KARST HAZARDS**

| PROJECT No. | PHASE | Rev. | FIGURE |
|---|---|---|---|
| 1535050 | 500 | F | 16A |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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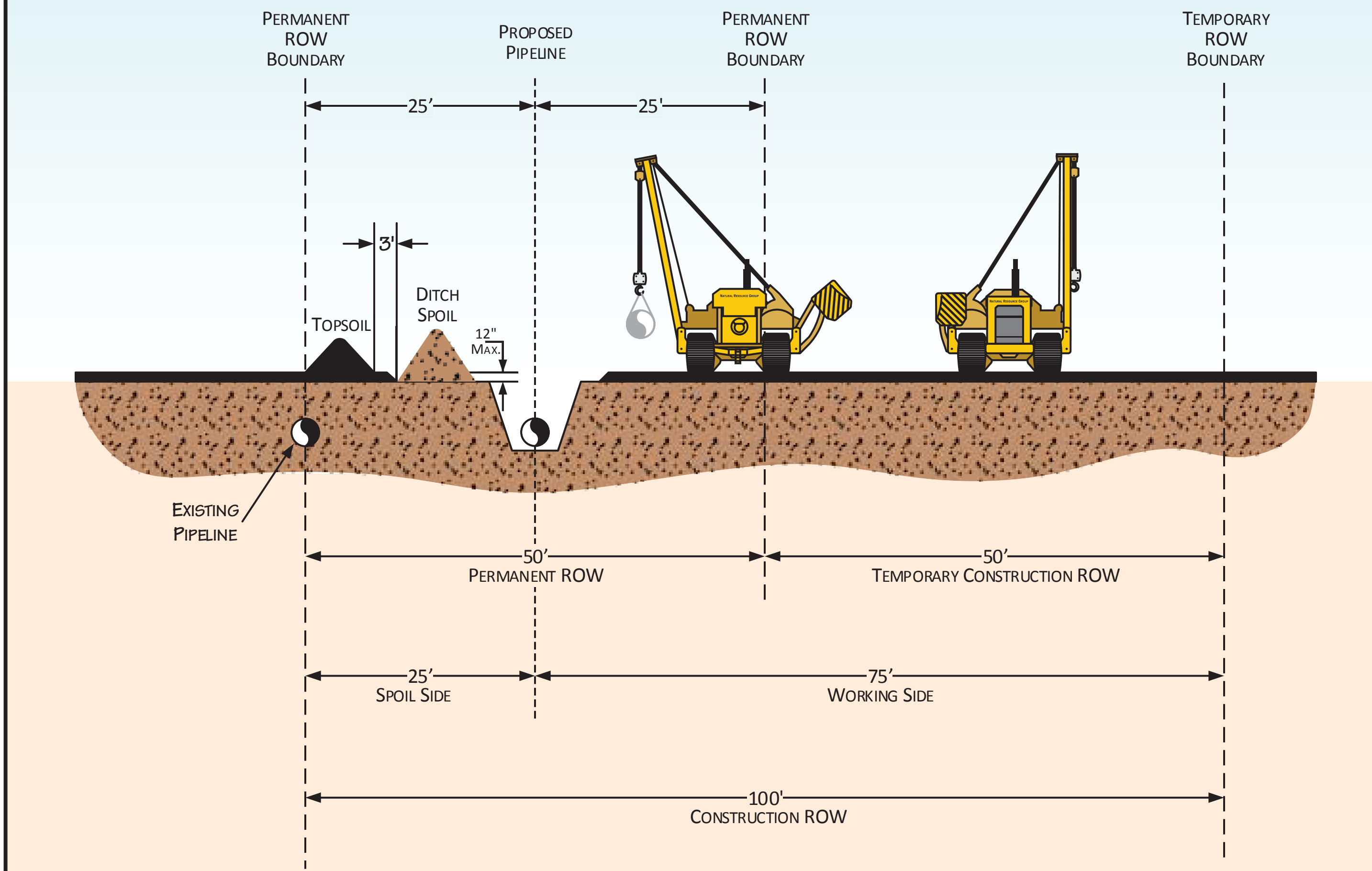
# APPENDIX L

Pipeline Construction Typical Details




PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 100' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 50' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

For environmental review purposes only.

**Supply Header Project**

**TL-635 (30" Outside Diameter) and TL-636 (30" Outside Diameter)**

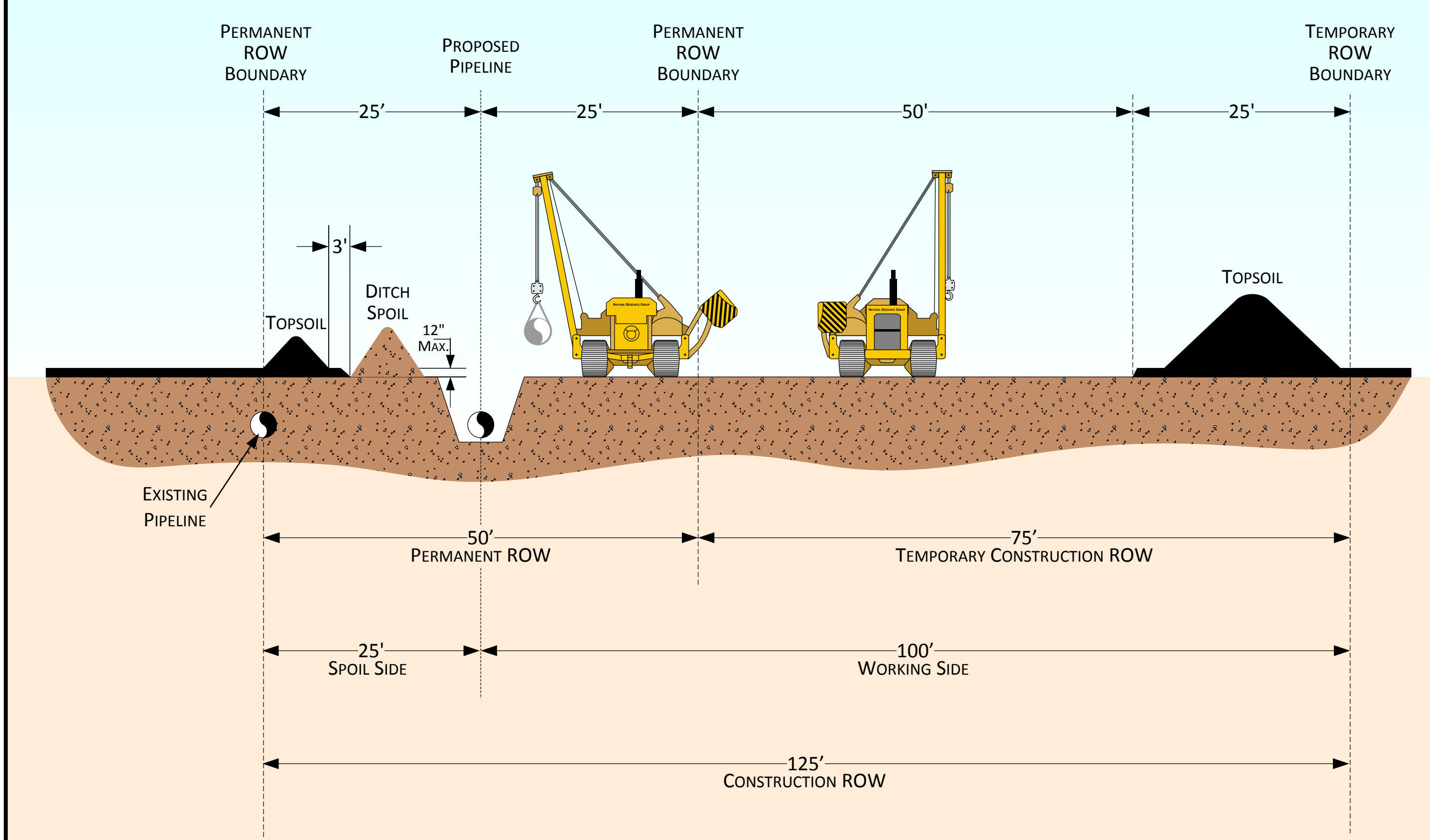
Typical Construction Right-of-Way - Collocated
Non-Agricultural Areas

Dominion

NATURAL RESOURCE GROUP
an ERM Group company

K:_CLIENT_PROJECTS\D-F\DOM\SUPPLY_HEADER\TYPICAL_CONSTRUCTION\TYP_CON_NONAG_COLLOCATED.VSD, Date: 5/23/2007, REVISED: 4/15/2015

DRAWN BY: GIS




PROFILE

Notes:

1. In agricultural areas where full width topsoil stripping is required, an additional 25' of temporary workspace will be required. In this scenario, the construction right-of-way will 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, and other special circumstances as required.

For environmental review purposes only.

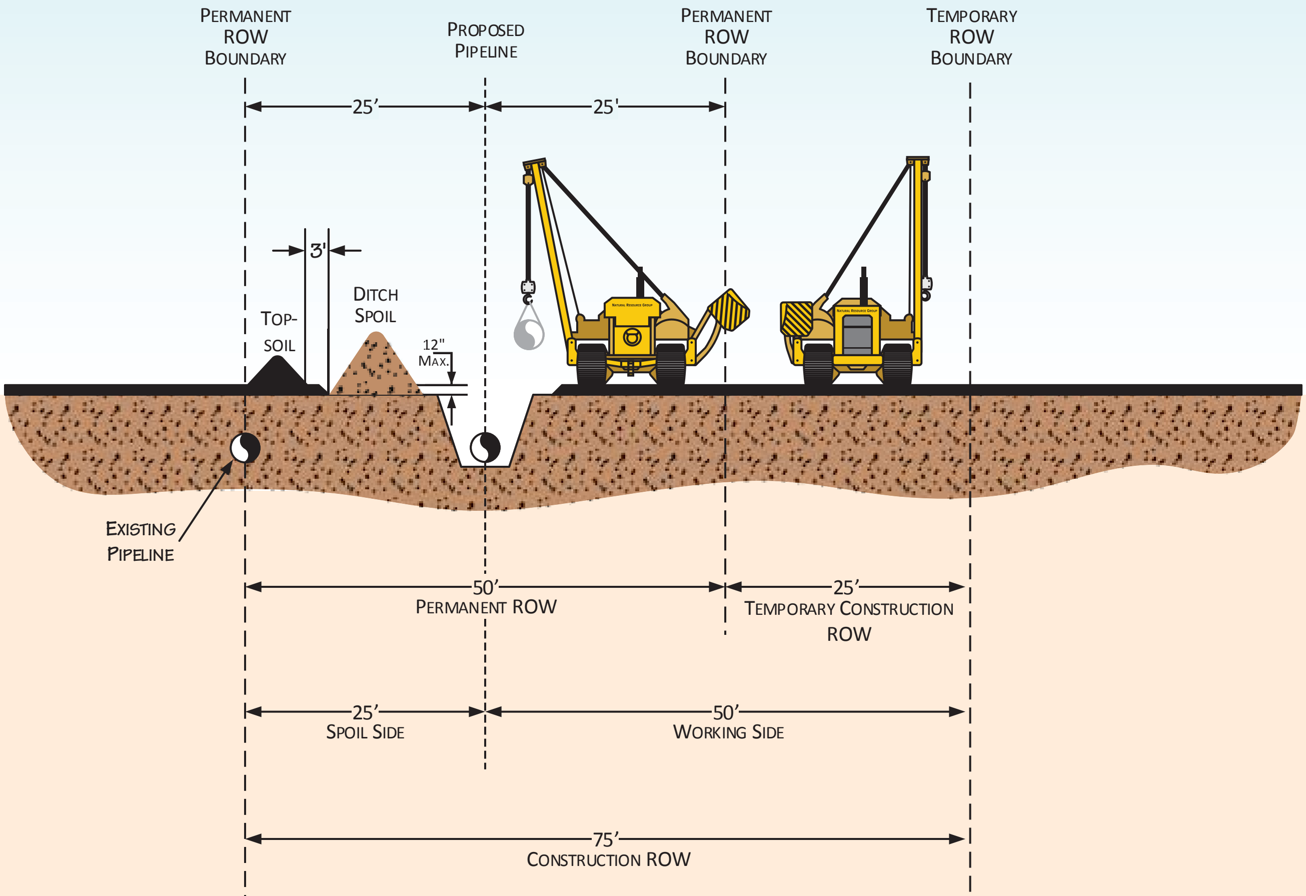
Dominion

**Supply Header Project**
**TL-635 (30" Outside Diameter) and TL-636 (30" Outside Diameter)**
Typical Construction Right-of-Way - Collocated
Agricultural Areas

NATURAL RESOURCE GROUP
an ERM Group company

M:\TYPICALS_CLIENT_PROJECTS\D-F\DOM\SUPPLY_HEADER\TYPICAL_CONSTRUCTION\TYP_CON_AG_COLLOCATED.VSD, Date: 5/23/2007, REVISED: 2/7/2017

DRAWN BY: GIS




PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 75' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 25' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

For environmental review purposes only.

Dominion

**Supply Header Project**

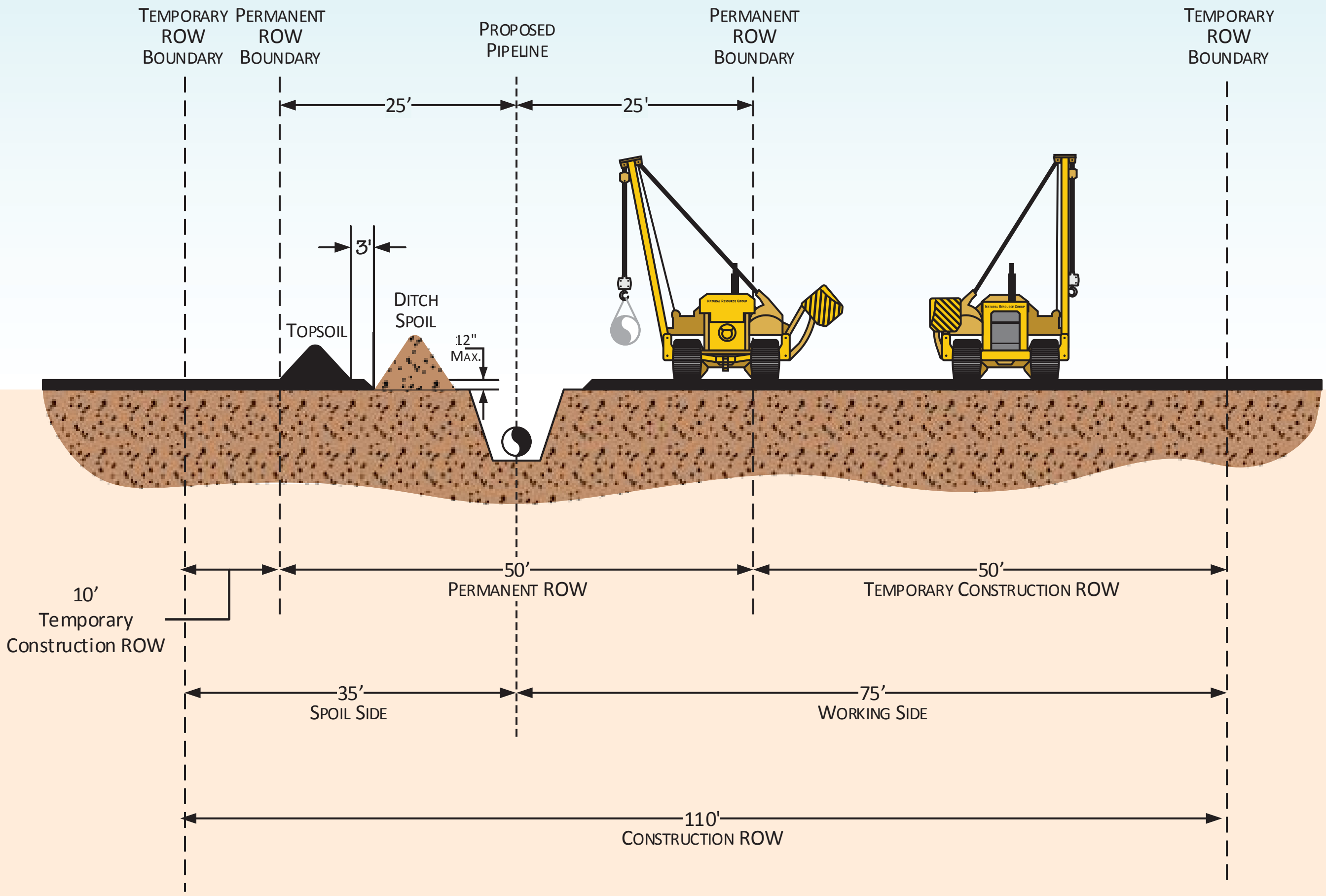
**TL-635 (30" Outside Diameter) and TL-636 (30" Outside Diameter)**

Typical Construction Right-of-Way in Wetlands - Collocated

NATURAL RESOURCE GROUP
an ERM Group company

K:_CLIENT_PROJECTS\D-F\DOM\SUPPLY_HEADER\TYPICAL_CONSTRUCTION\TYP_CON_WETLAND_COLLOCATED.VSD, | REVISED: 4/15/2015

DRAWN BY: GIS




PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 110' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 60' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

For environmental review purposes only.

Dominion

# Supply Header Project

## TL-635 (30" Outside Diameter) and TL-636 (30" Outside Diameter)

Typical Construction Right-of-Way – Not Collocated
Non-Agricultural Areas

NATURAL RESOURCE GROUP
an ERM Group company

K:_CLIENT_PROJECTS\D-F\DOM\SUPPLY_HEADER\TYPICAL_CONSTRUCTION\TYP_CON_NONAG_NONCOLLOCATED.VSD, Date: 5/23/2007, REVISED: 4/15/2015

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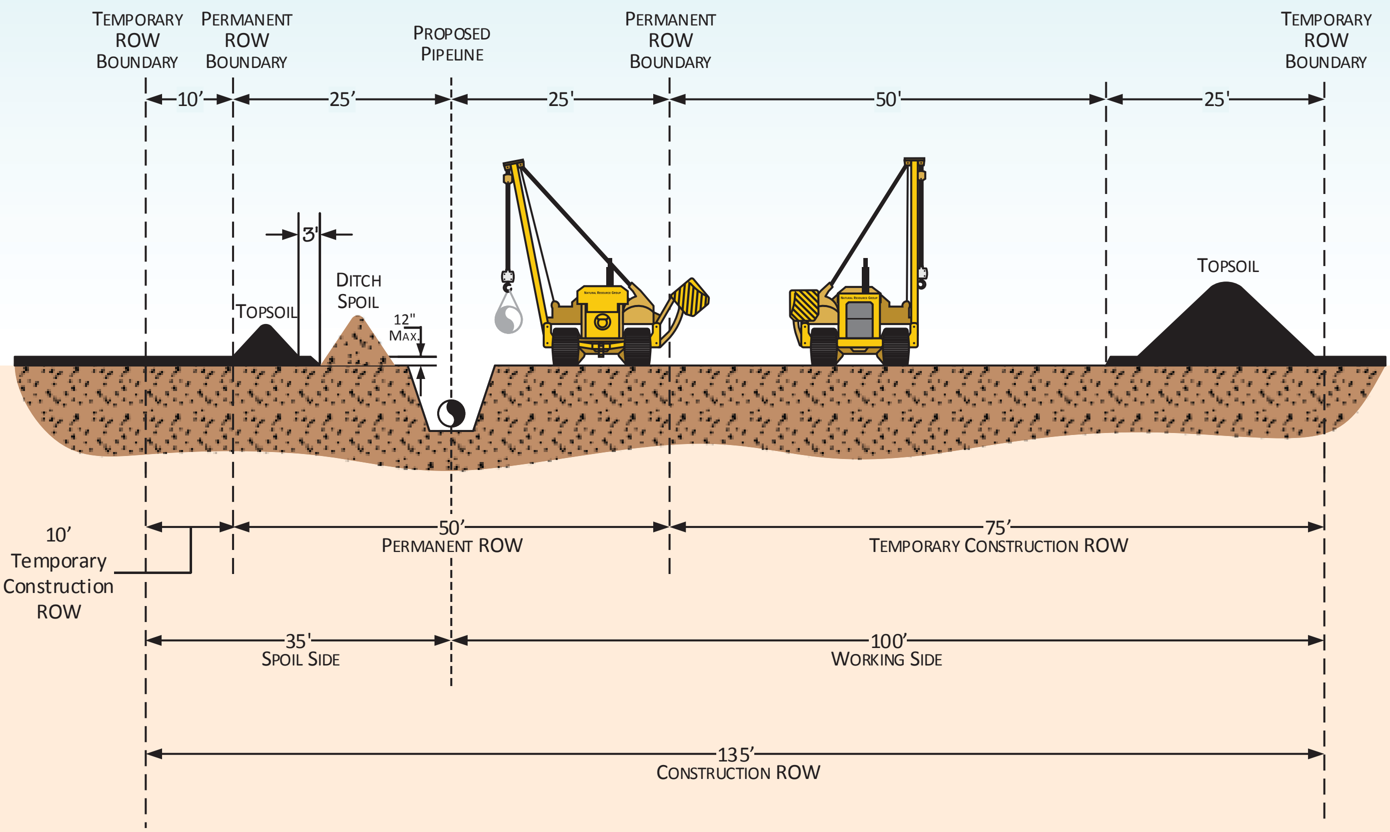


PROFILE

NOTES:

1. IN AGRICULTURAL AREAS WHERE FULL WIDTH TOPSOIL STRIPPING IS REQUIRED, AN ADDITIONAL 25' OF TEMPORARY WORKSPACE WILL BE REQUIRED. IN THIS SCENARIO, THE CONSTRUCTION RIGHT-OF-WAY WILL BE 135' WIDE, CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 85' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

For environmental review purposes only.

# Supply Header Project

## TL-635 (30" Outside Diameter) and TL-636 (30" Outside Diameter)

Typical Construction Right-of-Way – Not Collocated
Agricultural Areas

Dominion

NATURAL RESOURCE GROUP
an ERM Group company

K:_CLIENT_PROJECTS\D-F\DOM\SUPPLY_HEADER\TYPICAL_CONSTRUCTION\TYP_CON_AG_NONCOLLOCATED.VSD, Date: 5/23/2007, REVISED: 4/15/2015

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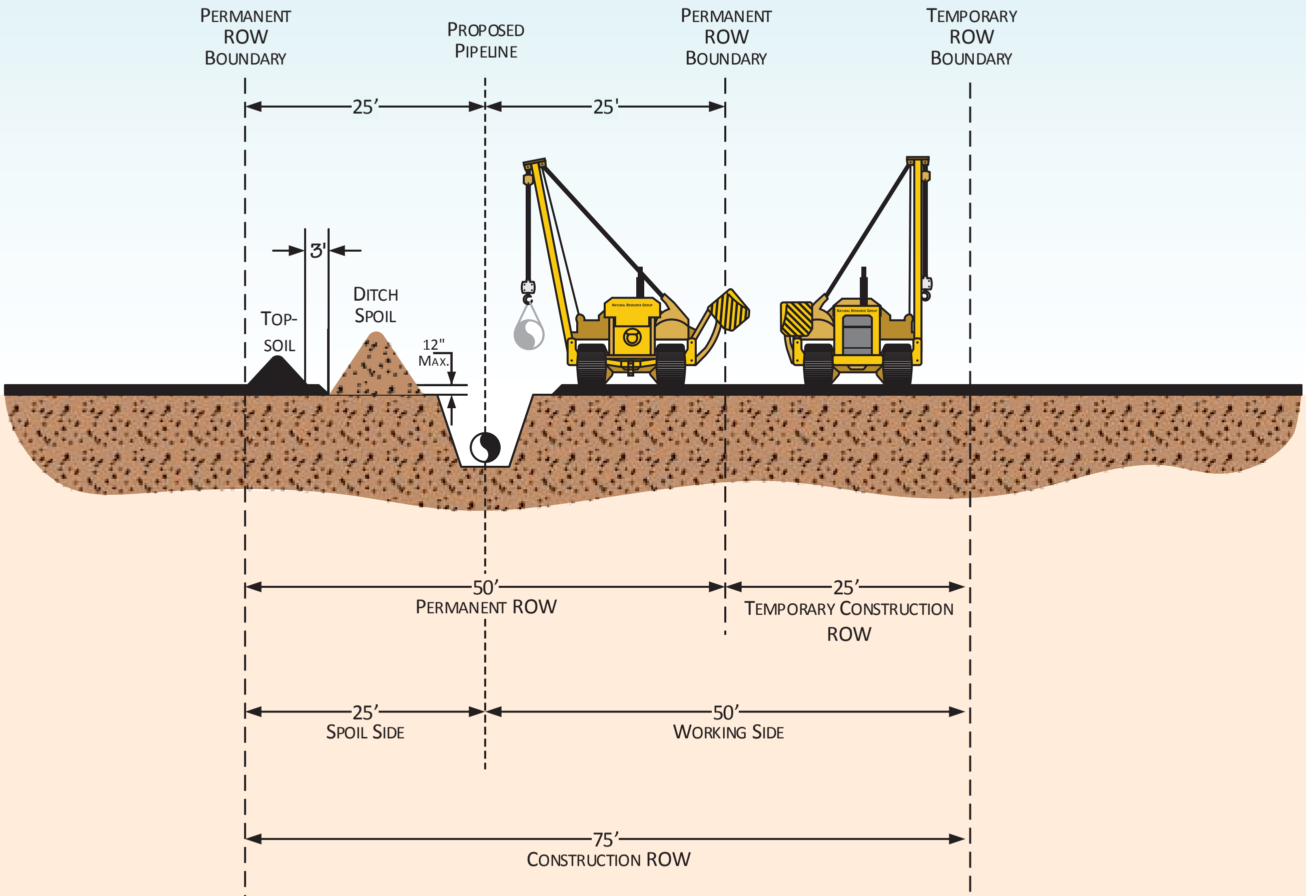



PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 75' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 25' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

For environmental review purposes only.

# Supply Header Project

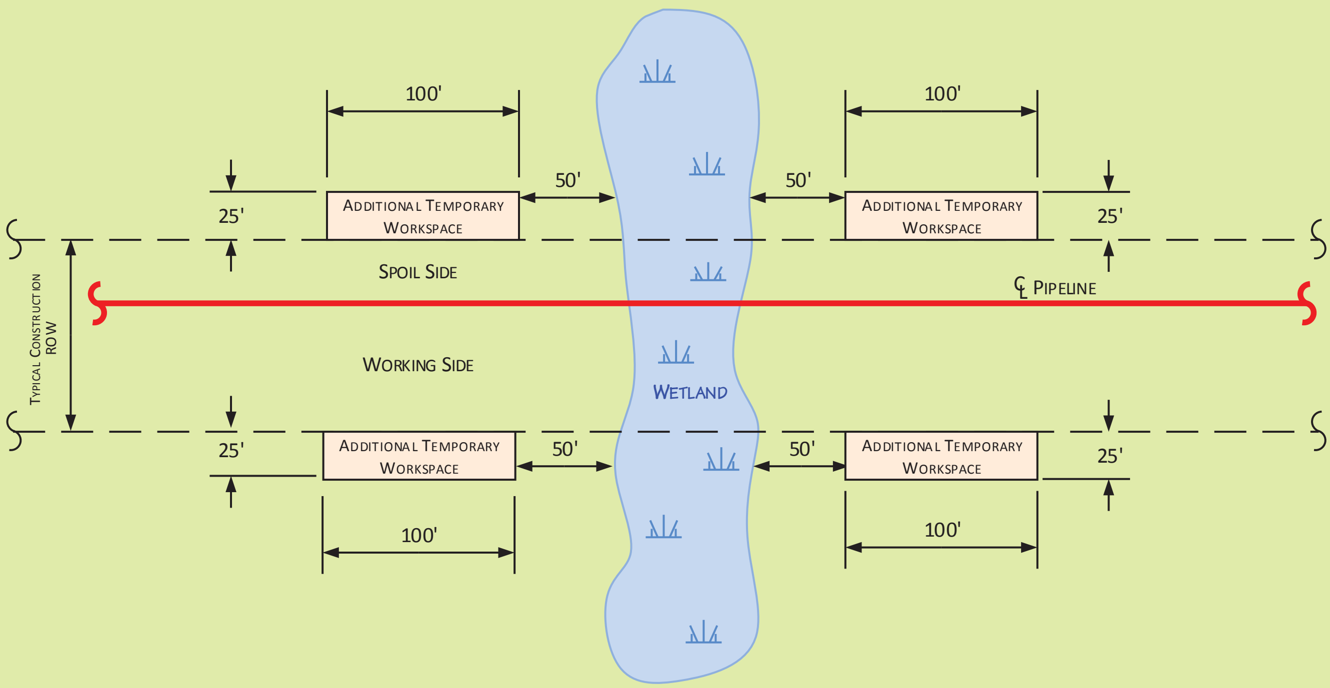
## TL-635 (30" Outside Diameter) and TL-636 (30" Outside Diameter)

Typical Construction Right-of-Way
in Wetlands – Not Collocated

an ERM Group company

K:_CLIENT_PROJECTS\D-F\DOM\SUPPLY_HEADER\TYPICAL_CONSTRUCTION\TYP_CON_WETLAND_NONCOLLOCATED.VSD, | REVISED: 4/15/2015

DRAWN BY: McGregor




For environmental review purposes only.

# Supply Header Project

## TL-635 (30" Outside Diameter) and TL-636 (30" Outside Diameter)

Typical Additional Workspace at
Wetland Crossings

Dominion

NATURAL RESOURCE GROUP
an ERM Group company

K:_CLIENT_PROJECTS\D-F\DOM\SUPPLY_HEADER\TYPICAL_CONSTRUCTION\XING_WETLAND_SMALL.VSD, Date: 10/10/2014, REVISED: 4/15/2015

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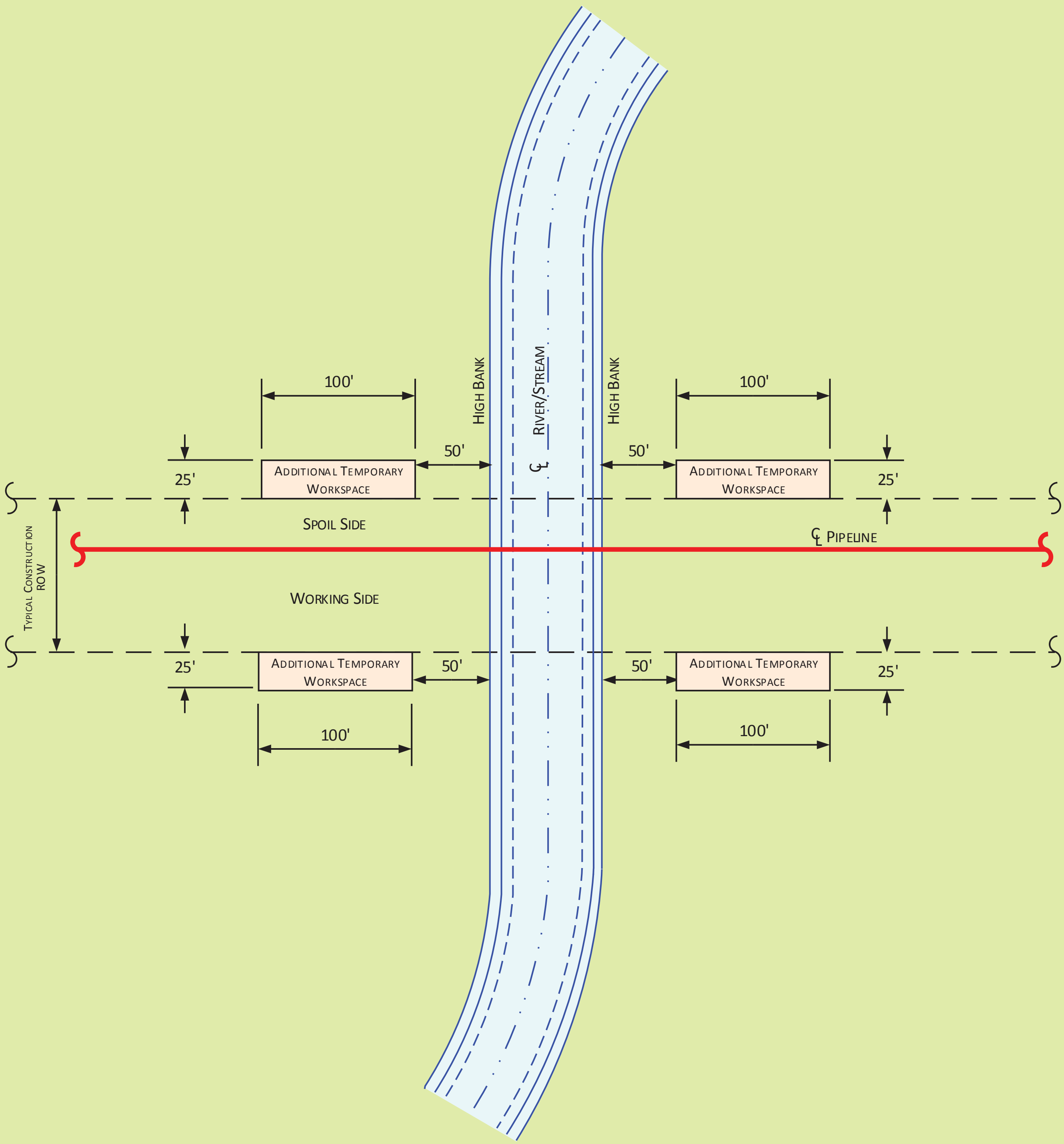


For environmental review purposes only.

Dominion

**Supply Header Project**

**TL-635 (30" Outside Diameter) and TL-636 (30" Outside Diameter)**

Typical Additional Workspace at all Waterbodies

NATURAL RESOURCE GROUP

an ERM Group company

K:_CLIENT_PROJECTS\D-F\DOM\SUPPLY_HEADER\TYPICAL_CONSTRUCTION\XING_STREAM.VSD, Date: 10/10/2014, REVISED: 4/15/2015

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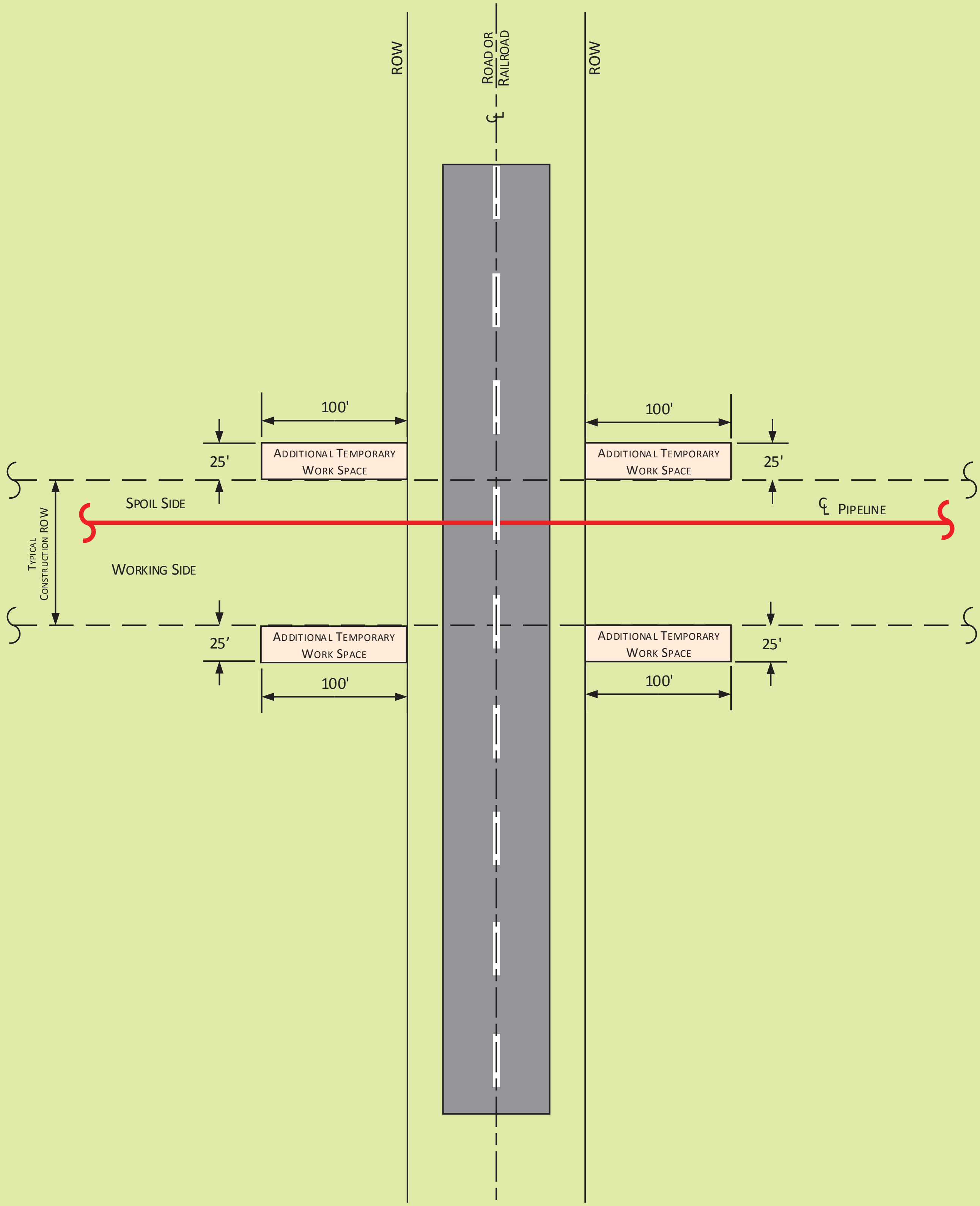



For environmental review purposes only.

# Supply Header Project

## TL-635 (30" Outside Diameter) and TL-636 (30" Outside Diameter)

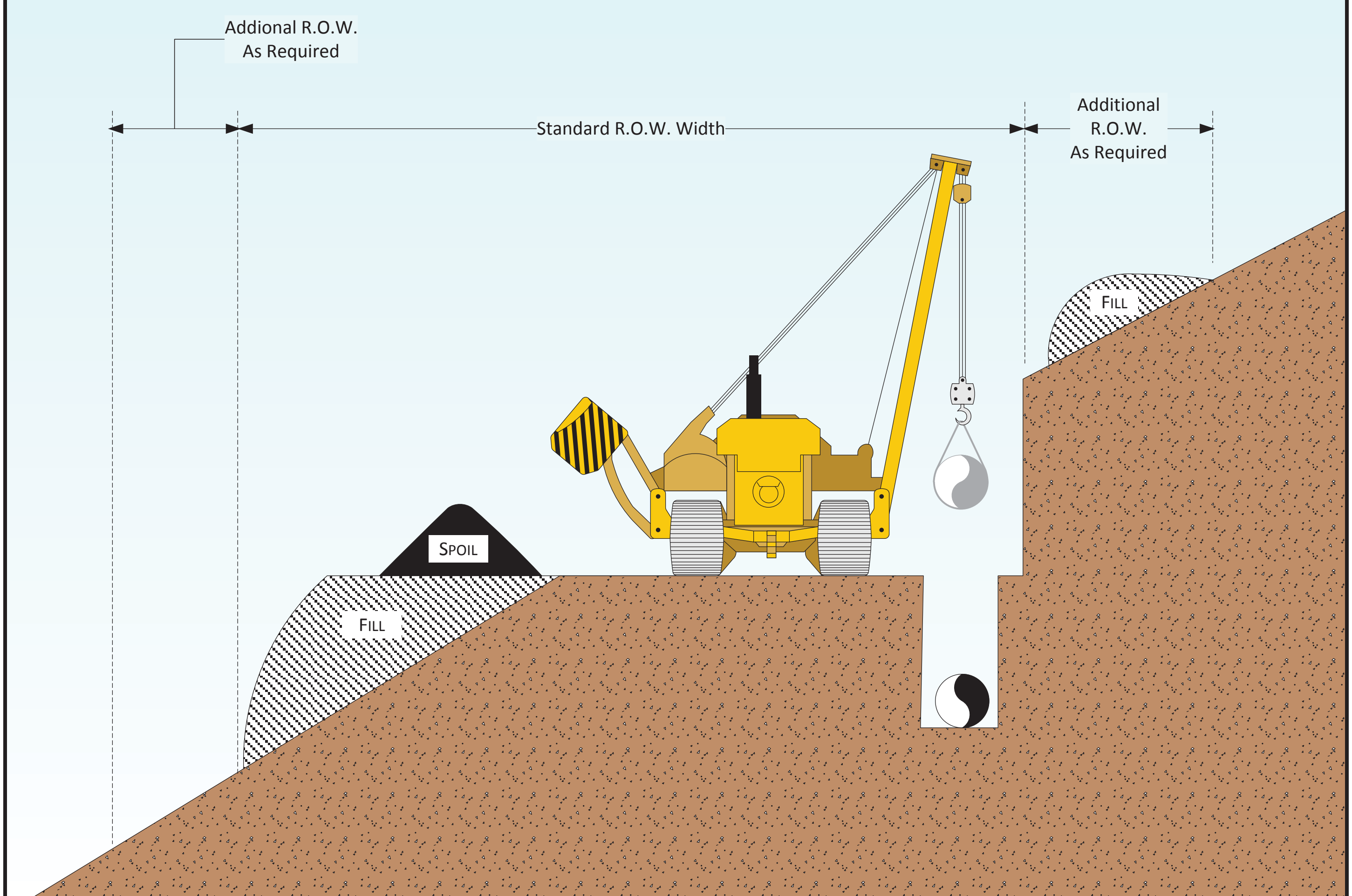
Typical Additional Workspace at all Bored Roads

Dominion

NATURAL RESOURCE GROUP
an ERM Group company

K:_CLIENT_PROJECTS\D-F\DOM\SUPPLY_HEADER\TYPICAL_CONSTRUCTION\XING_BORED_ROADS.VSD, Date: 10/10/2014, REVISED: 4/15/2015

DRAWN BY: GIS




Notes:

1. Two-Tone the right of way to limit the need for deep cuts and additional right of way on steep soils.
2. Clear additional right of way to allow for extra spoil
3. Ensure side boom tractors are equipped with boom extenders and counterweights if required
4. Use backhoe to assist bulldozers with replacing cuts. Recontour to maximum 1:3 grade unless otherwise Directed by geotechnical engineer.
4. Employ erosion control measures such as breakers, cross ditches, and berms and revegetation.

Atlantic Coast Pipeline[SM]

# Atlantic Coast Pipeline and Supply Header Projects
## Cut and Fill Construction

Natural Resource Group
an ERM Group company

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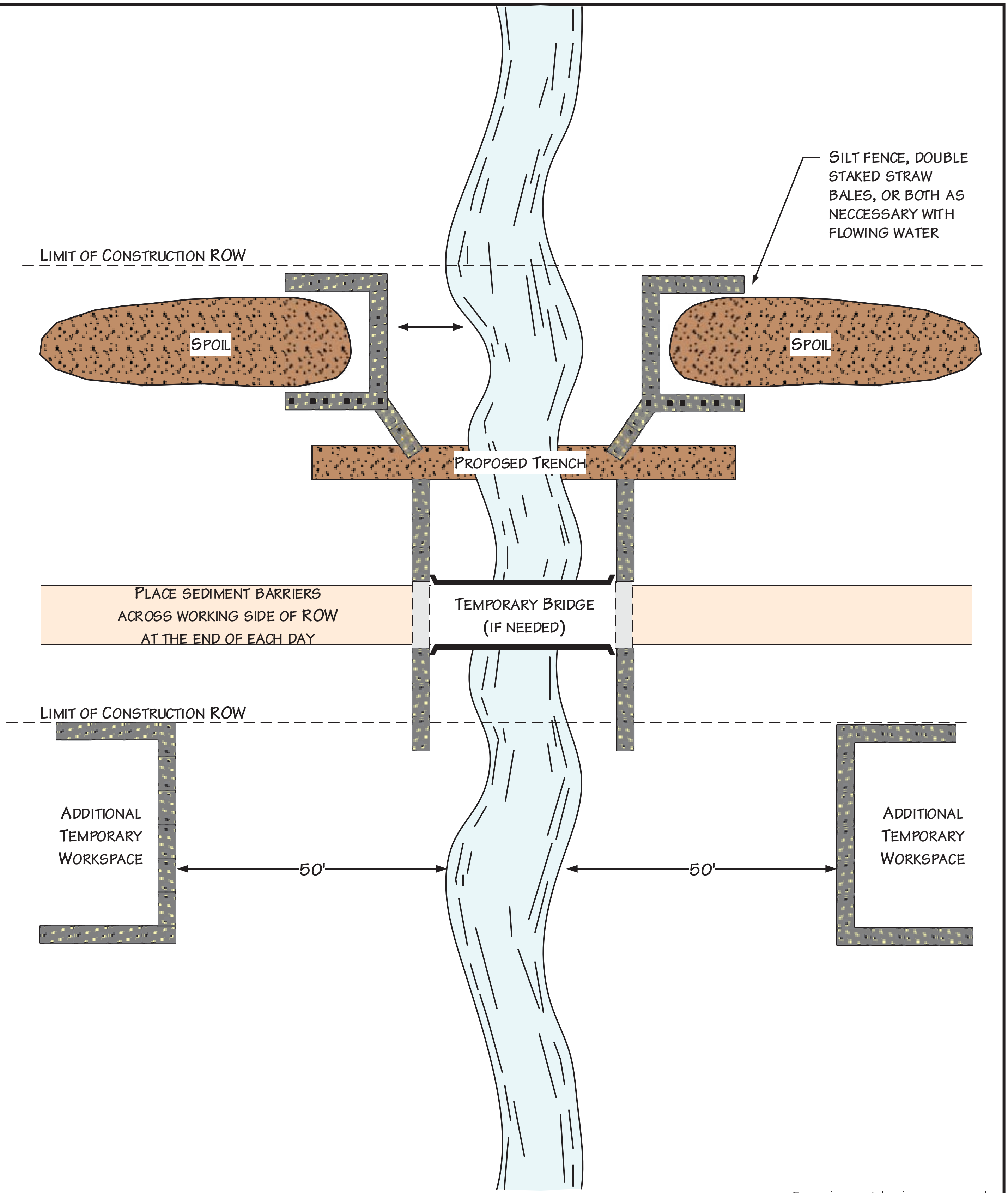



For environmental review purposes only.

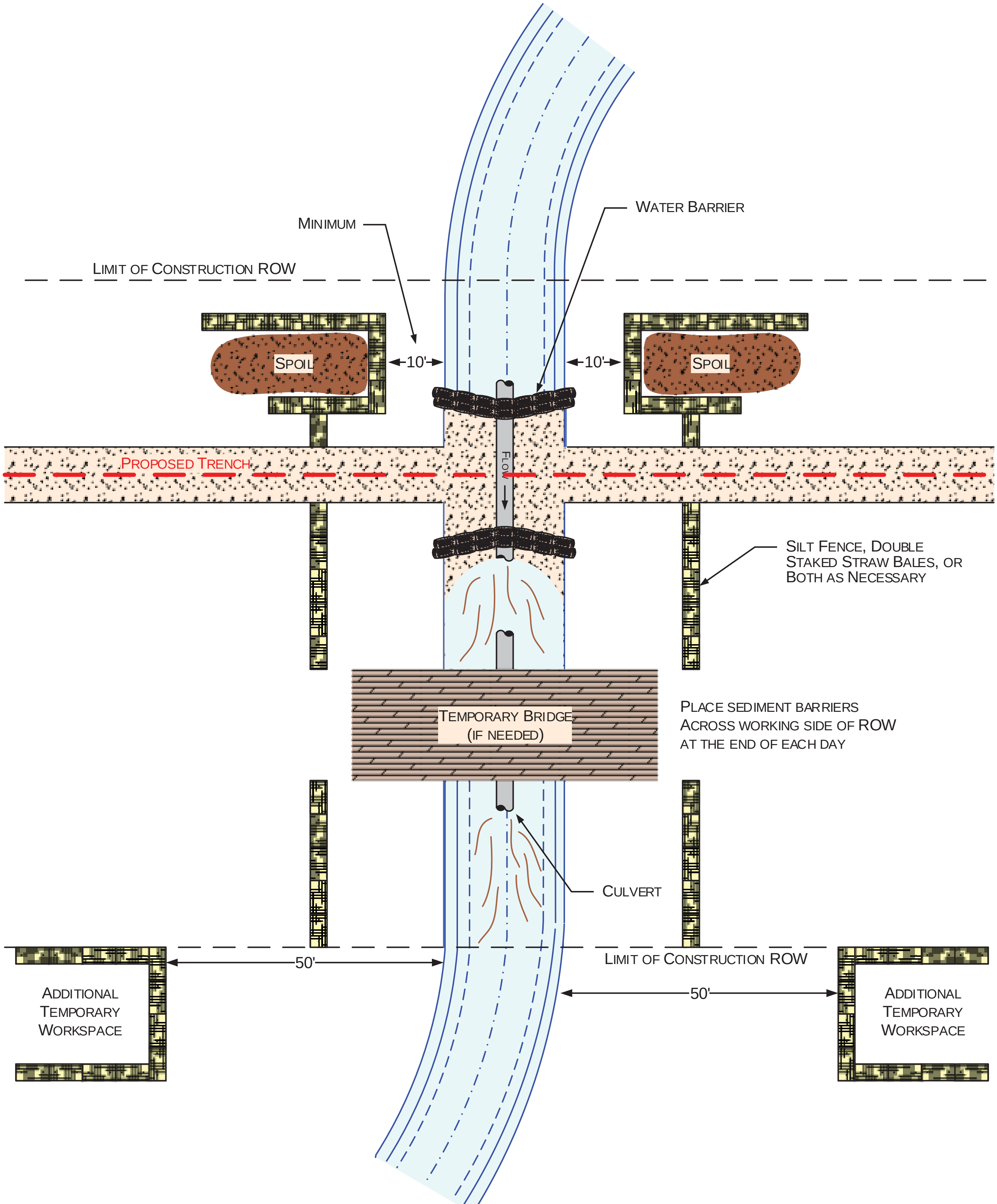
**Supply Header Project**

**TL-635 (30" Outside Diameter) and TL-636 (30" Outside Diameter)**

Typical Waterbody Crossing
Open Cut Method

Dominion

NATURAL RESOURCE GROUP
an ERM Group company




For environmental review purposes only.

**Supply Header Project**
**TL-635 (30" Outside Diameter) and TL-636 (30" Outside Diameter)**
Typical Waterbody Crossing
Flume Method

Dominion

NATURAL RESOURCE GROUP
an ERM Group company

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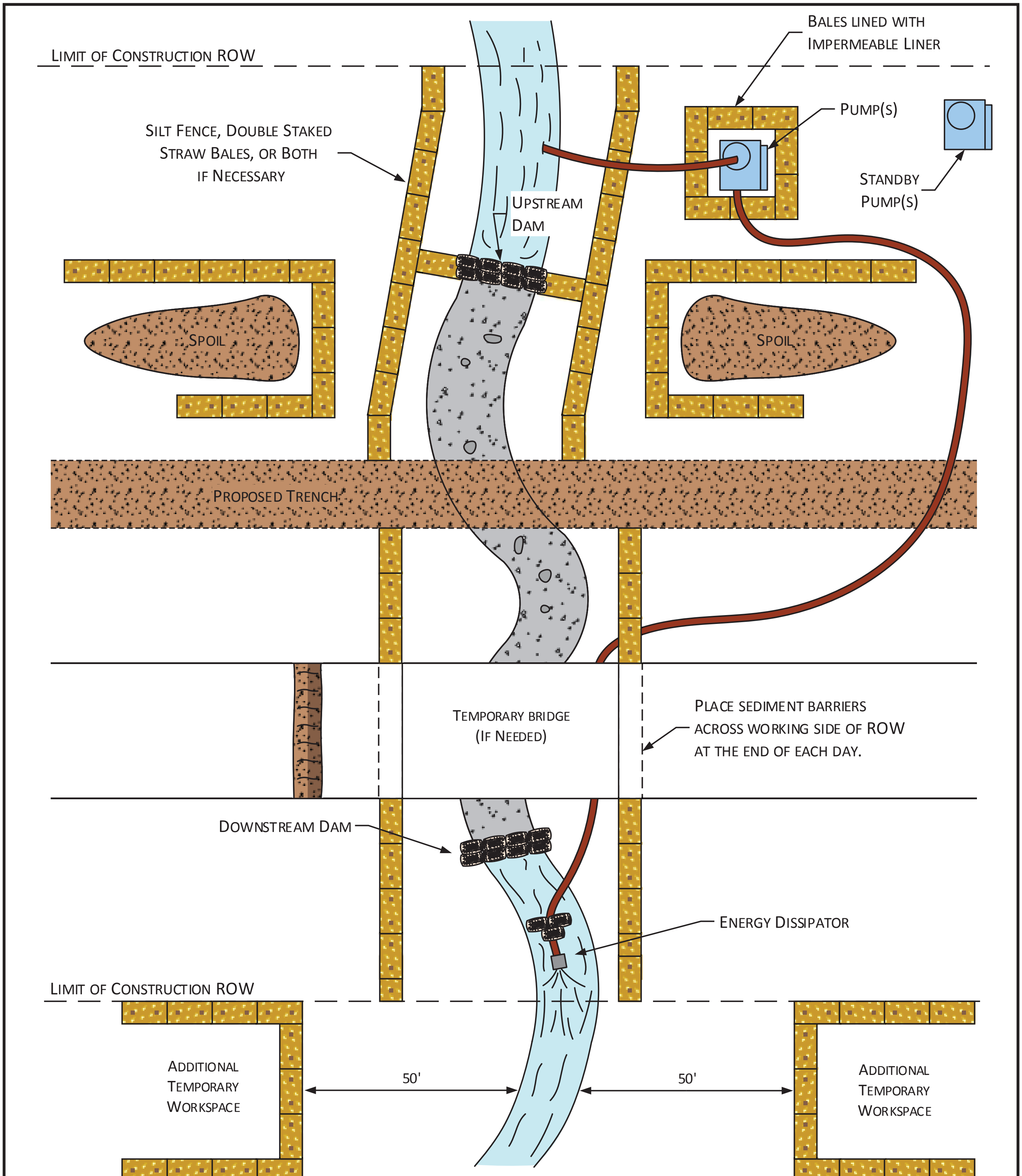


For environmental review purposes only.

# Supply Header Project

## TL-635 (30" Outside Diameter) and TL-636 (30" Outside Diameter)

Dam and Pump Method

Dominion

NATURAL RESOURCE GROUP
an ERM Group company

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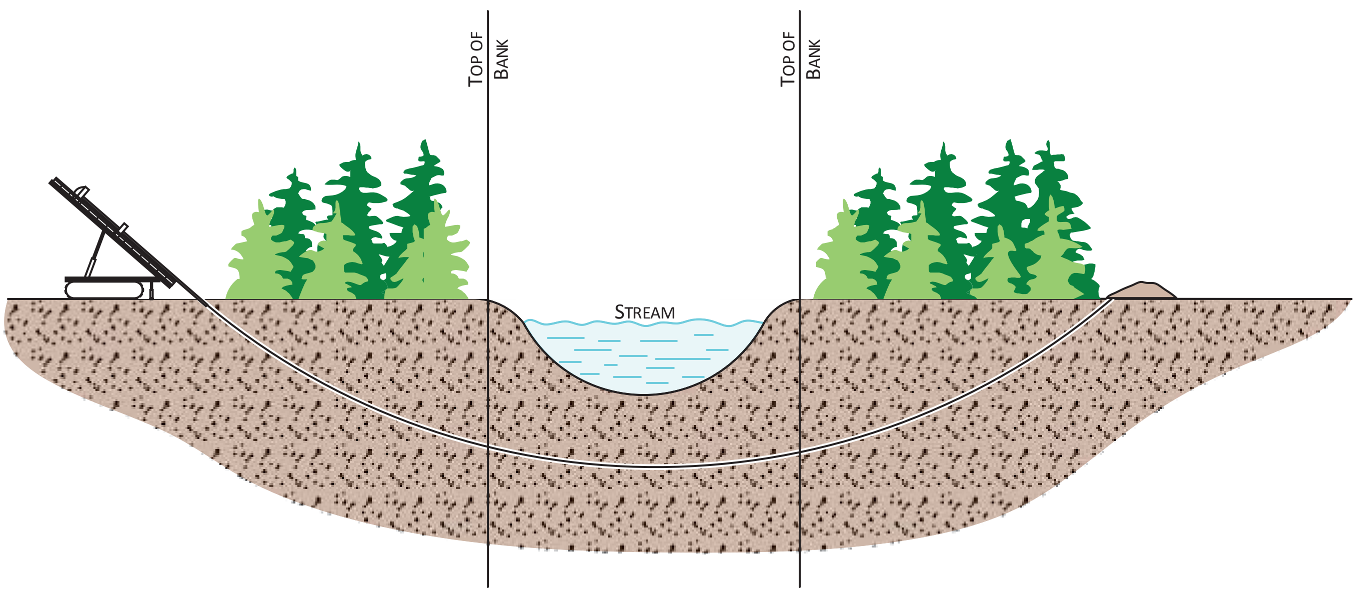


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# Supply Header Project

**TL-635 (30" Outside Diameter) and TL-636 (30" Outside Diameter)**

Typical Waterbody Crossing
Directional Drill Method

NATURAL RESOURCE GROUP
an ERM Group company

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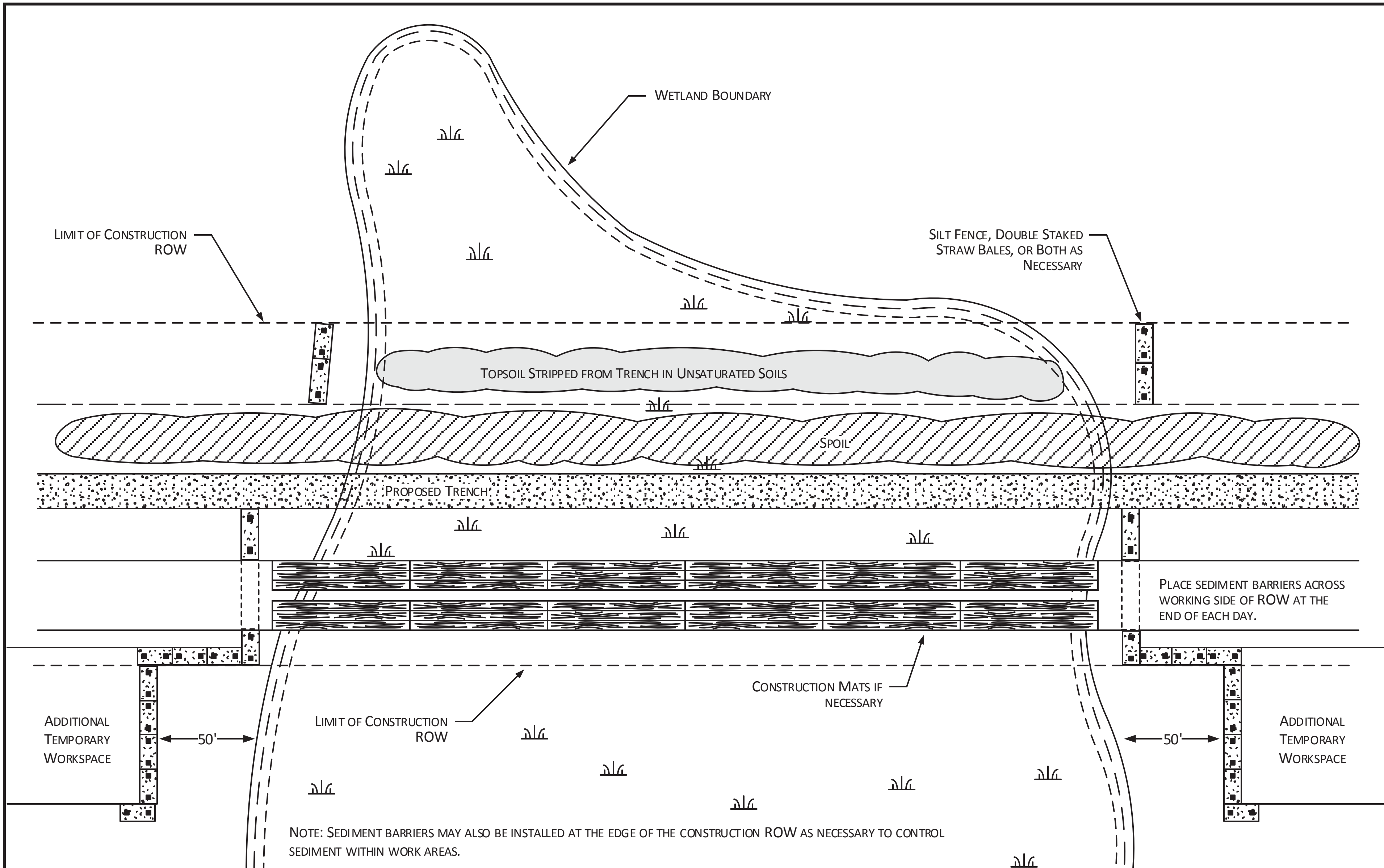


For environmental review purposes only.

# Supply Header Project

## TL-635 (30" Outside Diameter) and TL-636 (30" Outside Diameter)

Typical Wetland Crossing
Open Cut Method

Dominion

NATURAL RESOURCE GROUP
an ERM Group company

K:_CLIENT_PROJECTS\D-F\DOM\SUPPLY_HEADER\TYPICAL_CONSTRUCTION\XING_WETLAND_OPEN_CUT.VSD, Date: 10/10/2014, REVISED: 4/15/2015

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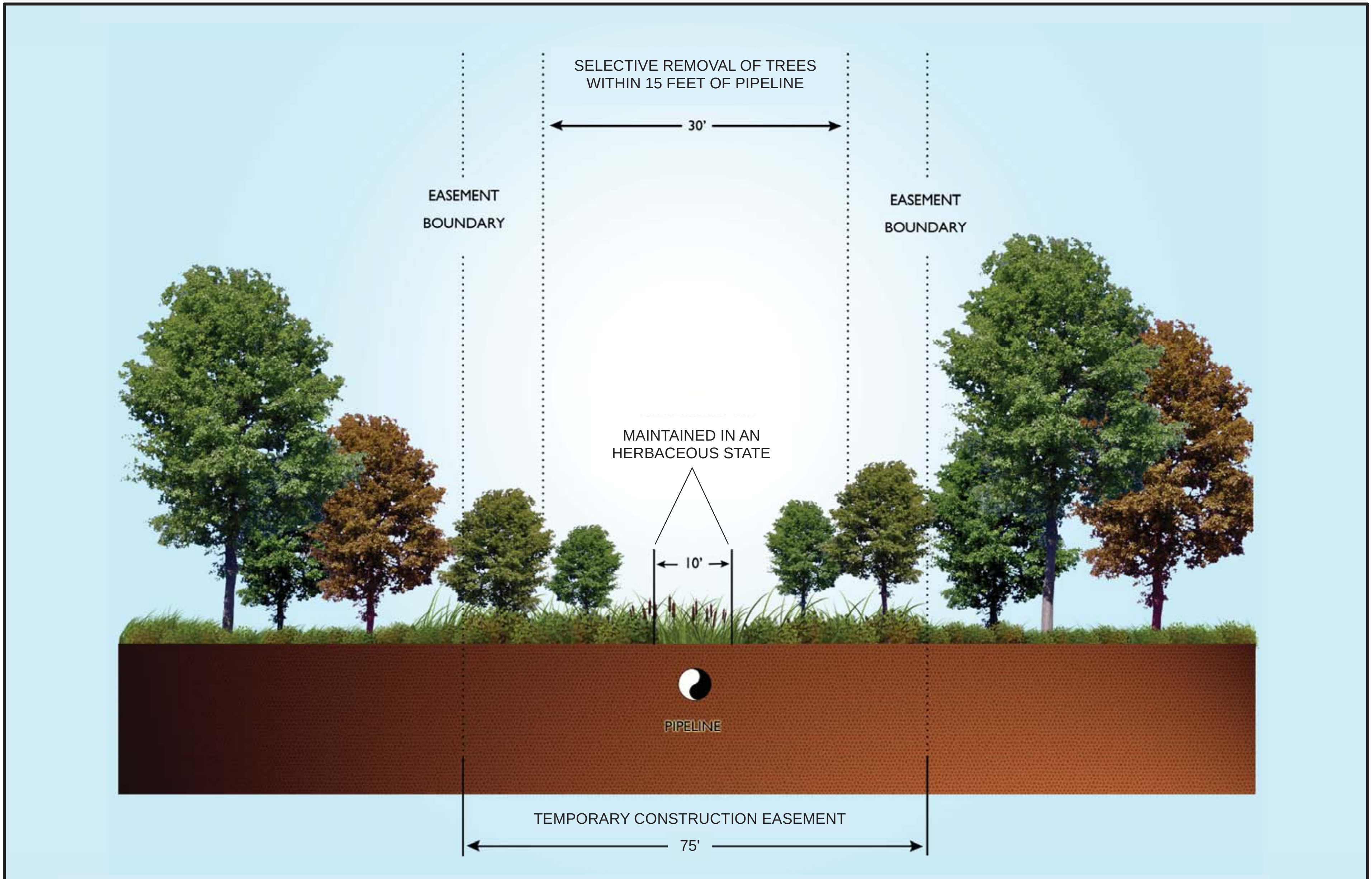


Atlantic Coast Pipeline SM

# Atlantic Coast Pipeline and Supply Header Project
## Corridor Wetland Maintenance

NATURAL RESOURCE GROUP
an ERM Group company

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DRAWN BY: Randy McGregor

# APPENDIX M

Restoration and Rehabilitation Plan

Revision 3 July 18, 2016

West Virginia specific in Appendix B Section 2.1

**ATLANTIC COAST PIPELINE, LLC**
**ATLANTIC COAST PIPELINE**

**and**

**DOMINION TRANSMISSION, INC.**
**SUPPLY HEADER PROJECT**

**Supplemental Filing**
**January 10, 2017**

# APPENDIX P

# Restoration and Rehabilitation Plan

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

**and**

# DOMINION TRANSMISSION, INC.
# SUPPLY HEADER PROJECT
**Docket No. CP15-555-000**

# Restoration and Rehabilitation Plan

*Updated, Rev 4*

Prepared by
NATURAL RESOURCE GROUP
an ERM Group company

December 30, 2016

## TABLE OF CONTENTS

**LIST OF TABLES**

**LIST OF FIGURES**



**LIST OF APPENDICES**

## LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ACP | Atlantic Coast Pipeline |
| Atlantic | Atlantic Coast Pipeline, LLC |
| BFM | bonded fiber matrix |
| BMP | best management practice |
| DTI | Dominion Transmission, Inc. |
| EI | Environmental Inspector |
| FERC | Federal Energy Regulatory Commission |
| lbs/acre/PLS | pounds per acre of pure live seed |
| NRCS | Natural Resources Conservation Service |
| Plan | Upland Erosion Control, Revegetation, and Maintenance Plan |
| Procedures | Wetland and Waterbody Construction and Mitigation Procedures |
| Projects | Atlantic Coast Pipeline and Supply Header Projects |
| RU | revegetation unit |
| SHP | Supply Header Project |
| USFS | U.S. Forest Service |
| WMA | Wildlife Management Area |

## 1.0 INTRODUCTION

Atlantic Coast Pipeline, LLC (Atlantic) – a company formed by four major energy companies – Dominion Resources, Inc.; Duke Energy Corporation; Piedmont Natural Gas Co., Inc.; and AGL Resources, Inc. – proposes to construct and operate approximately 600 miles of natural gas transmission pipelines and associated aboveground facilities in West Virginia, Virginia, and North Carolina. This Project, referred to as the Atlantic Coast Pipeline (ACP), will deliver up to 1.5 million dekatherms per day of natural gas from supply areas in the Appalachian region to demand areas in Virginia and North Carolina. Atlantic has contracted with Dominion Transmission, Inc. (DTI), a subsidiary of Dominion Resources, Inc., to construct and operate the ACP on behalf of Atlantic.

In conjunction with the ACP, DTI proposes to construct and operate approximately 37.5 miles of pipeline loop and modify existing compression facilities in Pennsylvania and West Virginia. This Project, referred to as the Supply Header Project (SHP), will enable DTI to provide firm transportation service to various customers, including Atlantic.

## 2.0 PURPOSE

This *Restoration and Rehabilitation Plan* was prepared for the ACP and SHP (collectively, the Projects) to address post-construction restoration and rehabilitation activities. The plan will be implemented in conjunction with the 2013 versions of the Federal Energy Regulatory Commission's (FERC) *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) (FERC, 2013a) and *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures) (FERC, 2013b) as well as Atlantic's and DTI's other construction, restoration, and mitigation plans (e.g., *Spill Prevention, Control, and Countermeasures Plan*, *Invasive Species Management Plan*, and *Winter Construction Plan*). The measures described in this plan reflect generally accepted best management practices (BMP) for restoration and rehabilitation of pipeline projects.

Atlantic and DTI have consulted with the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) and are still in the process of consulting with other Federal, State/Commonwealth, and local agencies, including Federal and State/Commonwealth land managing agencies, to identify appropriate seed mixes for use during restoration. Based on discussions to date with the local NRCS offices, seed mixes have been developed and added to this plan. Seed mixes and how they were developed are described below. A more detailed description of seed mixes by region is presented in Appendix B.

On most pipeline projects, the seed mixes used for rights-of-way restoration generally consist of cool season grass species that grow well in the local area. Cool season grasses typically become established quickly and form a dense mat of grass and roots that is effective in controlling soil erosion in areas that have been disturbed by pipeline construction. These grasses may also provide food and habitat for some wildlife.

Atlantic is planning to incorporate regionally-specific and endemic forb (flowering plant) seeds in its traditionally all-grass seed mix. The incorporation and development of native flowering plants on the pipeline rights-of-way will create, where conditions and land management practices are suitable (i.e., areas with slope less than or equal to about 15 percent), substantial acreages of pollination habitat where this type of habitat is currently non-existent, primarily previously forested areas.

Atlantic has consulted and continues to consult with various county offices of the NRCS, Federal land management resource specialists at the U.S. Forest Service (USFS) and U.S. Fish and Wildlife Service, soil and water conservation districts, the Xerces Society, private groups, and organizations that have specific knowledge of both perennial cover grasses as well as native pollinator forb species seed mixes. Atlantic has obtained recommendations regarding species, seeding rates, mulching during planting, and maintenance mowing. Atlantic has also met and consulted with various national, State/Commonwealth, and local groups and experts on pollinators and pollination species endemic to the region that the pipeline crosses to learn which native forb seed mixes will be complimentary to the various grass seed mixes. These meetings and consultations provided information about the appropriate seeding rates and percentages of each type of seed within a specific seed mix, as well as the location each seed mix is to be used considering the various soil types, elevations, temperatures, and other growing conditions along the rights-of-way.

Through consultations with regional native seed experts, particularly those working with the NRCS and the Xerces Society, Atlantic has determined that native flowering forbs grow best and reproduce most successfully when planted with native warm season grasses. Warm season grasses are slower to establish than cool season grasses, and are bunch grasses instead of mat forming. Warm season grasses and forbs do not provide soil coverage that is as dense or as effective at controlling erosion as cool season grasses. Therefore, Atlantic was advised and has elected to use native warm season grass and forb mixtures only in areas with gradual or low percent slopes. In general, in areas of the rights-of-way with slopes greater than 15 percent Atlantic will use cool season grass mixes without flowering forbs to most effectively control the potential for erosion. These areas are specified in Section 5.7.5 and in Appendix B.

Atlantic is committed to use only forb species that are native to the area or region where they will be planted, to try to source seed from local growers, as available, and to avoid the introduction of non-native and potentially invasive species to the extent practicable.

## 3.0 TRAINING

Prior to the start of construction, Atlantic and DTI 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 and DTI will provide large-group training sessions before each work crew commences construction with periodic follow-up training for groups of newly assigned personnel.

## 4.0 VEGETATION TYPES IN PROJECT AREA

Atlantic and DTI characterized vegetation types in the ACP Project area and SHP Project area based on review of the U.S. Geological Survey's National Gap Analysis Program Land Cover Data and recent digital aerial photography augmented by field reconnaissance (2014 and

2015). Based on these data, the proposed ACP pipeline facilities cross upland forest/woodland (241.8 miles), cultivated cropland (86.8 miles), wetlands (69.9 miles), pasture land (64.2 miles), tree plantation/harvested forest (59.4 miles), developed land (21.7 miles), open land (17.0 miles), and open water (3.3 miles). The proposed SHP pipeline facilities cross upland forest/woodland (33.0 miles), pasture land (2.2 miles), developed land (1.3 miles), cultivated cropland (0.5 mile), wetlands (0.3 mile), open water (0.2 mile), tree plantation/harvested forest (less than 0.1 mile), and open land (less than 0.1 mile). The types of upland woodland/forest crossed by the Projects include coniferous forests, deciduous forests, mixed forests, deciduous savanna and glades, and floodplain and riparian forests.

## 5.0 BEST MANAGEMENT PRACTICES

Based on FERC requirements identified in the Plan and Procedures and industry-accepted practices, Atlantic and DTI have identified and developed BMPs for restoration and rehabilitation of areas disturbed by construction. These BMPs have been used to establish Atlantic's and DTI's standards for restoration and revegetation as described below.

### 5.1 Erosion Control

Atlantic and DTI anticipate that construction activities requiring the installation of temporary erosion control devices will begin with access road preparation and timber clearing in 2017, and continue through the completion of construction in late 2019. Construction of the pipelines will be followed by restoration of the rights-of-way, stabilization of the soil, and seeding (where needed). Atlantic and DTI 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 (10 days in residential areas), 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 and DTI will resume clean-up and restoration efforts the following Spring. Atlantic and DTI 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 below. Atlantic and DTI will continue to consult with the applicable land managing agencies to identify other site-specific measures which may be required on Federal or State/Commonwealth lands.

- Slope Breakers – Temporary and permanent slope breakers will be installed, where required, to slow runoff velocity and direct water off the rights-of-way. Temporary slope breakers, such as hay bales (weed free), silt fence, or earthen berms, will be installed prior to the start of construction activities. Permanent slope breakers will be installed during final grading.

- Temporary Sediment Barriers – Temporary sediment barriers, such as silt fences, staked hay or straw bales (weed free), or a combination of barriers, will be installed at the base of slopes adjacent to road, wetland, and waterbody crossings, and in other areas where required to prevent the transport of sediment off the construction rights-of-way.

- Permanent Trench Breakers – Sacks of subsoil or sand, polyurethane foam, or bentonite clay bags installed around the pipe will remain in the trench to prevent subsurface channeling of water along the trench.

- Mulch – Straw (weed free), hay (weed free), erosion-control fabric, or other equivalent material will be placed on the rights-of-way, where required, to protect the soil surface from water and wind erosion and to optimize the soil moisture regime necessary for successful revegetation, especially on dry, sandy sites.

During construction, the effectiveness of temporary erosion control devices will be monitored by Atlantic's and DTI's Environmental Inspectors (EI). Where appropriate for local resource needs, the role of the EI may be filled by agricultural or horticultural monitors. The effectiveness of revegetation and permanent erosion control devices will be monitored for the life of the project by Atlantic and DTI operating personnel during the long-term operation and maintenance of the pipeline systems.

### 5.2 Soil Restoration

Successful revegetation is dependent on appropriate soil conditions and can be influenced by several factors, including soil texture, drainage class, salinity, and acidity. Soil characteristics along the pipeline routes and access roads and at contractor yards and aboveground facility sites are identified in Resource Report 7. Unless otherwise approved by a land managing agency or landowner, soil restoration will include:

- removal of excavated rock that is not returned to the trench and is considered construction debris;

- distribution of rock on the work area that is of similar size and density to adjacent areas not disturbed by construction;

- grading of the rights-of-way to restore preconstruction contours to the extent practicable; and

- preparation of the soil for revegetation.

### 5.3 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 and rutting. Atlantic and DTI will minimize impacts by implementing the mitigation measures for compaction and rutting as described in the Plan and Procedures. Atlantic and DTI will test for soil compaction:

- in residential and agricultural areas (e.g., active croplands, pastures, nurseries, and orchards);

- in other areas requested by the land managing agency or landowner;

- in undisturbed areas adjacent to the construction workspace with the same soil type under similar moisture conditions to approximate preconstruction conditions; 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 impacts will be mitigated through the use of tillage equipment during restoration activities such as a paraplow or similar implement. In areas where topsoil segregation occurs, plowing with a paraplow or other deep tillage implement to alleviate subsoil compaction will be conducted before replacement of the topsoil. In rocky or heavily rooted soils, compaction may be impossible to measure and rectify without additional damage. If compaction testing is impeded by rock or roots, Atlantic and DTI may conclude that there is a suitable amount of large material in the soil to rectify potential compaction. Soil compaction will be remediated prior to re-spreading of salvaged topsoil.

### 5.4 Topsoil Segregation, Replacement, and Soil Conditioning

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, topsoil segregation will be:

- performed in the trenchline within non-saturated wetlands, croplands, pastures, hayfields, residential areas, and in other areas requested by the land managing agency or landowner;

- conducted as described in the Plan and Procedures;

- stockpiled on the rights-of-way; and

- excluded from materials used for padding the pipe.

Topsoil will be layered above subsoil where seeds stored in the soil will be encouraged to grow. Topsoil segregation will generally not occur in forested areas. Most forested areas are not conducive to topsoil segregation due to the amount of root materials present and the wider construction rights-of-way that would be required to store segregated topsoil. Topsoil segregation may be required on certain public lands as identified by land managing agencies; these will be identified and addressed through ongoing consultations with the land managing agencies (see Sections 5.0 and 6.0).

### 5.5 Re-Contouring

Grading will be conducted prior to construction where necessary to provide a reasonably level work surface. Upon completion of construction, Atlantic and DTI 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.

## 5.6 Steep Slope Areas

Areas with steep slopes along the pipeline routes may make the establishment of vegetation more difficult due to the increased potential for stormwater runoff and erosion by water. In areas with slopes greater than 15 percent, Atlantic and DTI are planning to use seed mix prescriptions that utilize appropriate cool season grass species to quickly stabilize the disturbed areas and minimize erosion and sedimentation. Table 5.6-1 in Appendix A quantifies by county the major soil drainage and slope classes crossed by the Projects. Soil drainage classes were used to determine some of the grass seed types utilized in specific mixes (see Section 5.7.5).

The use of fast-growing cool season grasses will help to ensure faster soil stabilization in steeper terrain because of the faster development of stable root systems, which hold the soil in place. Additionally, in areas with slopes greater than 35 percent, the rights-of-way will be restored to natural contours to the extent practicable or in accordance with requests from land managing agencies or landowners. These steep slope areas are mostly located along the route in the Appalachian region of West Virginia and western Virginia but occasionally in other areas along the entire rights-of-way. 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 rights-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 and DTI 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 rights-of-way in steep slope areas. Specifically, as discussed in Resource Report 6, Atlantic and DTI are committed to employing best in class 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.

Also as discussed in Resource Report 6, Atlantic and DTI will implement the Slip Avoidance, Identification, Prevention, and Remediation – Policy and Procedure, and are conducting geotechnical studies along the proposed pipeline routes in Pennsylvania, 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 Projects.

The following lists some of the design and construction mitigation measures that 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 rights-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 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.

## 5.7 Site Preparation and Seeding

Atlantic and DTI will complete final grading and permanent erosion control measures within 20 days after backfilling of the trench (10 days in residential areas), seasonal or other weather conditions permitting. In the event that these timeframes cannot be met or construction or restoration activities are interrupted for an extended period, mulch will be spread prior to seeding. In these cases, all slopes within 100 feet of wetlands or waterbodies will be mulched at a rate of 3 tons per acre.

### 5.7.1 Seedbed Preparation

Proper preparation of the soil surface and seedbed is essential for rapid and healthy revegetation (Virginia Department of Environmental Quality, 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 rights-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.

Unless otherwise specified by land managing agencies or landowners or as needed to support the establishment of pollinator habitat, the seedbed will be prepared in disturbed areas to a depth of 3 to 4 inches using appropriate equipment (e.g., cultipacker roller) to provide a seedbed that is firm, yet rough. Atlantic and DTI will imprint exposed soils with a sheepsfoot, landfill compactor, tractor with studded tires, or land imprinter equipment. Soil imprinting, or tracking, leaves divots on the ground surface that trap moisture and seeds, creating catchments for native plant material to be spread across the seeded area (West Virginia Department of Environmental Protection, 2012). In addition, a seedbed with a rough surface is conducive to the capturing or lodging of seed when broadcasted or hydroseeded, and can 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, which are needed to prepare an adequate seedbed. When hydroseeding, Atlantic and DTI will scarify the soil surface prior to seeding to anchor the seed to the soil surface and encourage germination. Where residential lawns or landscaped areas are disturbed or as needed to support the establishment of pollinator habitat, more intensive ground and seedbed preparations may be required, including rock collection, grading, and soil preparation/amending.

### 5.7.2 Seeding

Seeding will not be conducted in actively cultivated croplands unless requested by the landowner. In residential areas, lawns will be restored on a schedule established during easement negotiations with the landowner. On all other lands, Atlantic and DTI will perform seeding of permanent vegetation during the Fall of the year construction is completed, within the recommended seeding dates, and within six working days of final grading, weather and soil conditions permitting. Atlantic and DTI 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 recommended Fall timeframes, 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 addition, as part of the restoration and rehabilitation plan to revegetate disturbed areas along the pipeline routes, Atlantic and DTI will use cool season grasses to revegetate areas with slopes greater than 15 percent.

All seed will be certified weed free. The EIs will review all seed tags prior to use to ensure that the seed is properly certified.

#### 5.7.2.1 Pollinator Habitat Planting

Atlantic, in support of a 2014 Presidential Memorandum that directs federal agencies to cooperate on the development of a national pollinator strategy, has committed to a pollinator habitat initiative where suitable along the rights-of-way. The successful establishment of pollinator habitat will require specialized: soil preparation, seeding techniques, and maintenance practices.

The most common causes for failed establishment when planting pollinator species are: (1) poor soil/seed contact and planting the seed more than one-quarter inch deep in the soil, and (2) competition from annual weeds, non-natives or invasive vegetation. To prevent competition from other vegetation, Atlantic will reduce the existing seed bank in the rights-of-way. The seed bank will be reduced by clearing the existing vegetation (done during construction) and by using herbicides.

Additional soil preparation is also needed to ensure seed germination. The soil surface must be relatively smooth and compact to allow shallow seeding, no more than one-quarter inch deep. Typically, planting will include the use of a nurse crop or cover crop to ensure proper soil erosion control and the survival of the pollinator plant species. Cover crops (e.g., annual oats) are also generally used in traditional rights-of-way seeding.

The warm season grasses and endemic forbs used to establish pollinator habitat need to be planted in the Spring. Therefore,

- For Fall, Rights-of-way Restoration: Plant a cover crop and then plant the pollinator seed mix with a nurse crop in the Spring after a herbicide application.
- For Spring, Rights-of-way Restoration: Apply a herbicide prior to planting but after the weed seeds germinate and then plant the pollinator seed mix and a nurse crop together.
- For Summer, Rights-of-way Restoration: Plant a cover crop and then plant the pollinator seed mix with a nurse crop in the Spring after a herbicide application.

Atlantic plans to plant the pollinator species in both the permanent and construction rights-of-way. Atlantic has proposed seed mixes based on the recommendations from consultations with state and federal agencies. These seed mixes are described in more detail below and in Appendix B. Pollinator species seed mixes will be finalized in consultation with these agencies.

#### 5.7.2.2 Pollinator Habitat Maintenance

Additional mowing is required in the first two years to reduce the height of the weeds and to prevent them from going to seed which will greatly reduce weed competition. Spot use of herbicides should be an option to control woody and invasive plants. Pollinator habitat experts recommend periodic prescription burning of the rights-of-way to reduce accumulated duff (i.e., dead vegetation on top of the ground) so that the pollinator species (flowers) can continue to reseed and maintain a viable population. Mowing close, 4 inches, and or thatching/raking may be viable alternatives to prescribed burning. Maintenance practices should be adapted to what is proven to be the best practices to ensure quality pollinator habitat.

### 5.7.3 Seeding Revegetation Units along the Pipeline Route

After consultations with Federal, State/Commonwealth, local resource and land managing agencies, and subject matter experts and in order to ensure optimum seed germination and growth, the areas crossed by the Projects were divided into four Revegetation Units (RU). One of the RUs is dependent on and defined by the steepness of the slopes crossed by the proposed pipelines. This RU can occur in site-specific locations anywhere along the pipeline corridors. The three other RUs are based on physiographic regions, and cover areas that are relatively homogenous with regards to factors such as soil type, vegetation, and climate that will affect the revegetation potential of the area. Each RU has distinct seed mix prescriptions. The four RUs include the following:

- Steep to Very Steep Slope RU;
- Mountain Physiographic Region RU;
- Piedmont Physiographic Region RU; and
- Coastal Plain Physiographic Region RU.

Figure 5.7.3-1 shows the distribution of the RUs, including the areas with slopes greater than 15 percent, along the pipeline route. Seed mix descriptions specific for each RU are provided in Appendix B.

#### 5.7.3.1 Steep to Very Steep Slope

Although the Steep to Very Steep Slope RU includes areas with greater than 15 percent slope located anywhere along the Projects, most of these areas are located within the mountainous areas of the western Piedmont Physiographic RU and the Mountain Physiographic RU (see Figure 5.7.3-1). To a much lesser extent, the Steep to Very Steep Slope RU may also be found in smaller, site-specific areas along the pipeline rights-of-way where the steepness of the local terrain increases the erosion potential. The areas in this RU require appropriate seed mix prescriptions, erosion control measures, and BMPs that are able to quickly stabilize the disturbed areas to minimize erosion and sedimentation.

#### 5.7.3.2 Mountain Physiographic Region

The ACP Project area extends across the Mountain Physiographic Region RU in West Virginia and western Virginia (see Figure 5.7.3-1). In West Virginia, the RU encompasses the Western Allegheny Plateau, Central Appalachians, and Ridge and Valley ecoregions. The SHP Project area also extends across the Western Allegheny Plateau in northeastern West Virginia and southwestern Pennsylvania. In Virginia, this RU encompasses the Ridge and Valley, Blue Ridge (mountains), and the Southeastern Plains ecoregions. The soils in the Mountain Region RU generally consist of shallow soils with a loamy surface and subsoil texture. Steep slopes with shallow, stony, droughty soils are common throughout the area, and many mountainous soils have been severely eroded due to steepness. In less steep areas, the soils are deep and stable (less erodible).

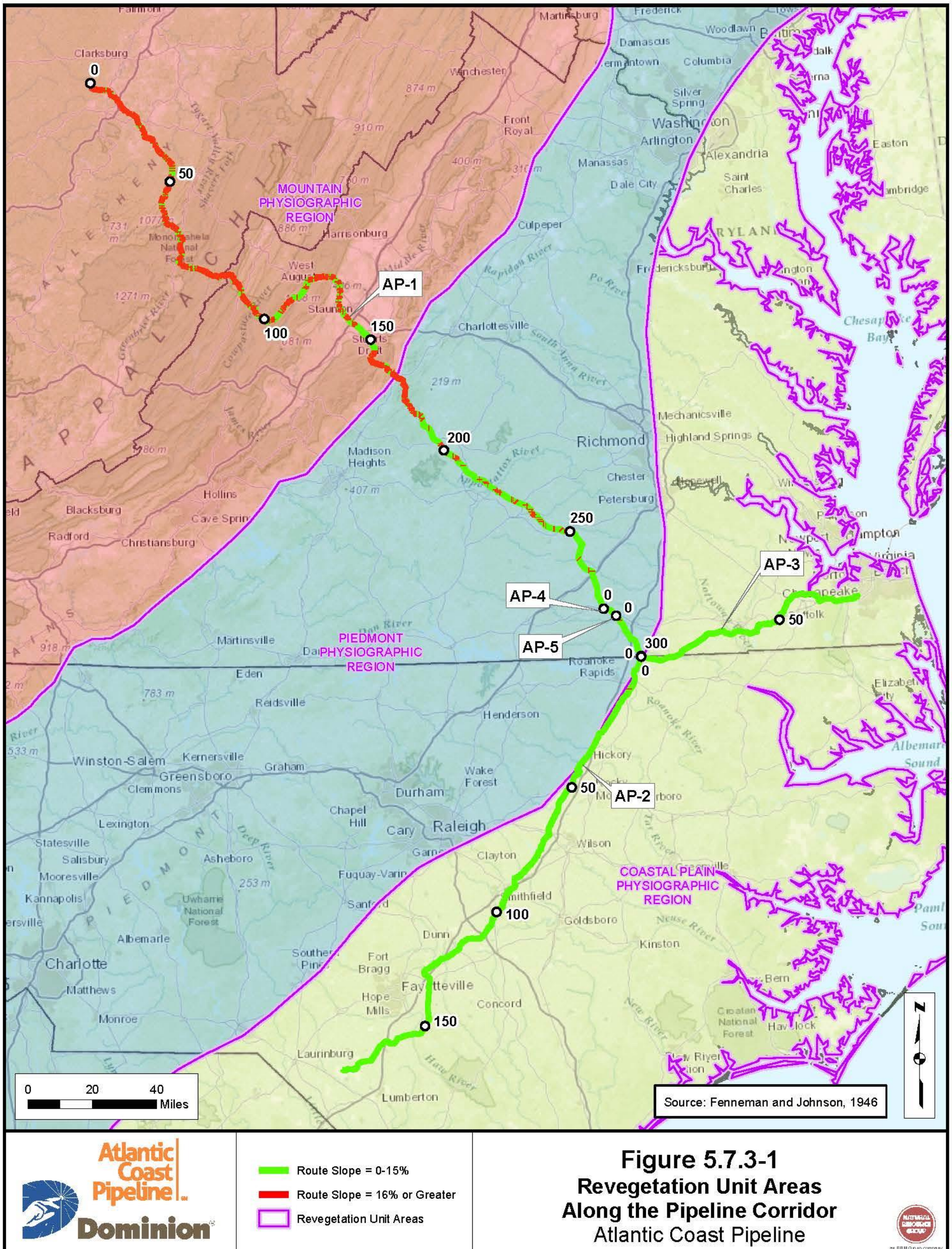


**Figure 5.7.3-1**
**Revegetation Unit Areas Along the Pipeline Corridor**
Atlantic Coast Pipeline

FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\2015\12\09_Slope_for_Seeding_for_Doug_DRS_ACP_Seed_Phys_Prov.mxd, REVISED: 03/14/2016, SCALE: 1:2,500,000 DRAWN BY: 0239

The recommended seed mix prescriptions identified for each of the RUs will be identified by milepost in Appendix C, which will be filed with the FERC prior to construction. The site-specific seed mixes will also be included on the construction alignments sheets to identify the seed mixes to be used by the construction contractors during restoration.

TABLE 5.7.4-1

**Summary of Federal and State/Commonwealth Agencies and Subject Matter Expert Consultations**

| Contact Name | Agency/ Organization | County | Title/Role | Phone | Email |
|---|---|---|---|---|---|
| **West Virginia** | | | | | |
| Greg Stone | NRCS - State Office | All Counties | Acting State Resource Conservationist | 304-284-7579 | greg.stone@wv.usda.gov |
| Jeff Griffith | USDA NRCS | Harrison; Lewis; Doddridge | District Conservationist | 304-624-9232 x 110 | jeff.griffith@wv.usda.gov |
| Jack O'Connell | USDA NRCS | Pocahontas | District Conservationist | 304-799-4317 | jack.oconnell@wv.usda.gov |
| Barbara Sargent | West Virginia Department of Natural Resources | Wetzel | Wildlife Biologist | 304-637-0245 | barbara.d.sargent@wv.gov |
| Cliff Brown | West Virginia Department of Natural Resources | Wetzel | Wildlife Biologist | 304-637-0245 | clifford.l.brown@wv.gov |
| Idun Guenther | NRCS | Pocahontas | District Conservationist | 304-255-9225 | idun.guenther@wv.usda.gov |
| Susan Davis | NRCS | Pocahontas | Soil Conservationist | 304-799-4317 | susan.davis@wv.usda.gov |
| Rob Silvester | West Virginia Department of Natural Resources | Randolph | District Wildlife Biologist | 304-924-6211 | rob.a.silvester@wv.gov |
| Steve Rauch | West Virginia Department of Natural Resources | Randolph; Wetzel | District Wildlife Biologist | 304-825-6787 | steven.e.rauch@wv.gov |
| Ben Collier | NRCS | Randolph; Upshur | District Conservationist | 304-636-6703 x 305 | ben.collier@wv.usda.gov |
| Jeremy Bennett | NRCS | Randolph; Upshur | District Conservationist | 304-457-4516 | jeremy.bennett@wv.nrcs.gov |
| Dustin Adkins | NRCS | Tyler; Wetzel | District Conservationist | 304-758-2173 x 1 | dustin.adkins@wv.usda.gov |
| Katie Fitzsimmons | NRCS | Marshall | District Conservationist | 304-242-0576 x 108 | katie.fitzsimmons@wv.usda.gov |
| **Virginia** | | | | | |
| Amy Ewing | Virginia Department of Game and Inland Fisheries | Virginia Counties | Environmental Services Biologist/Fish & Wildlife Information Manager | 804-367-2211 | Amy.Ewing@dgif.virginia.gov |
| Charles Ivins | NRCS | Augusta; Highland | District Conservationist | 540-248-6218 x 122 | charles.ivins@va.usda.gov |
| Charles Simmons | NRCS | Bath | District Conservationist | 540-463-7124 x111 | charles.simmons@va.usda.gov |
| Justin Folk | NRCS/Virginia Department of Game and Inland Fisheries | Bath | Private Lands Wildlife Biologist | 540-248-6218 x 108 | justin.folks@va.usda.gov |
| Davie Wade Harris | NRCS | Brunswick | District Conservationist | 434-848-2145 x 102 | davie.harris@va.usda.gov |
| David Harris | NRCS | Buckingham; Cumberland | District Conservationist | 434-983-4757 x 101 | david.harris@va.usda.gov |

TABLE 5.7.4-1

**Summary of Federal and State/Commonwealth Agencies and Subject Matter Expert Consultations**

| Contact Name | Agency/ Organization | County | Title/Role | Phone | Email |
|---|---|---|---|---|---|
| Bryan Poovey | U.S. Fish and Wildlife Service | Chesapeake; Suffolk (City); (Great Dismal Swamp National Wildlife Refuge) | Forestry Scientist | 757-986-3705 | bryan_poovey@fws.gov |
| David Bryd | U.S. Fish and Wildlife Service | Great Dismal Swamp NWR | Forestry Scientist | 804-824-2412 | david_byrd@fws.gov |
| Robert E. Williams | NRCS | Chesapeake | District Conservationist | 757-547-7172 x 102 | robert.williams@va.usda.gov |
| Bob Glennon | NRCS | Eastern Virginia Counties | Private Lands Biologist | 757-357-7004 x 126 | robert.glennon@va.usda.gov |
| Anthony Howell | NRCS | Dinwiddie | District Conservationist | 804-469-7297 x 106 | anthony.howell@va.usda.gov |
| Harvey Baker | NRCS | Greensville | District Conservationist | 434-634-2115 x 109 | harvey.baker@va.usda.gov |
| Jay Jeffreys | Virginia Department of Game and Inland Fisheries | Highland; Nelson | Biologist | 540-248-9360 | jay.jeffreys@dgif.virginia.gov |
| Kory Kirkland | NRCS | Nelson | District Conservationist | 540-967-0233 x 111 | kory.kirkland@va.usda.gov |
| Jeffray Jones | NRCS | All Counties | State Biologist | 804-287-1691 | jeffray.jones@va.usda.gov |
| J.B. Daniel | NRCS | Prince Edward | Agronomist Director | 434-392-4171 | j.b.daniel@va.usda.gov |
| Derek Hancock | NRCS | Nottoway; Prince Edward | District Conservationist | 434-392-4127 x 101 | derek.hancock@va.usda.gov |
| Yamika Bennett | NRCS | Southampton | District Conservationist | 757-653-2532 x 122 | yamika.bennett@va.usda.gov |
| Michael A. Faulk | NRCS | Suffolk (City) | District Conservationist | 757-357-7004 x 114 | mike.faulk@va.usda.gov |
| Ryan McCormick | National Park Service | | Specialist Coordinator | 828-348-3441 | |
| J. Christopher Ludwig | DCR | All Counties | Chief Biologist | 804-371-6206 | Chris.Ludwig@dcr.virginia.gov |
| Marc Puckett | DGIF | All Counties | QMAP Coordinator | 434-392-9645 | Marc.Puckett@dgif.virginia.gov |
| **North Carolina** | | | | | |
| Renessa Hardy-Brown | NRCS | Cumberland | District Conservationist | 910-484-8479 | renessa.brown@nc.usda.gov |
| Terry Best | NRCS | Halifax | District Conservationist | 252-583-3481 | terry.best@nc.usda.gov |
| Brian Loadholt | NRCS | Johnston | District Conservationist | 919-934-7156 | brian.loadholt@nc.usda.gov |
| Patrick Evens | NRCS | Nash | District Conservationist | 252-459-4116 x 124 | patrick.evans@nc.usda.gov |
| Paul Boone | NRCS | Northampton | District Conservationist | 252-534-2591 | paul.boone@nc.usda.gov |
| Jeremy Ruston | NRCS | Robeson | District Conservationist | 910-739-5478 | jeremy.roston@usda.gov |
| Gavin Thompson | NRCS | Sampson | District Conservationist | 910-592-7963 | gavin.thompson@nc.usda.gov |
| David Little | NRCS | Wilson | District Conservationist | 252-237-2711 | david.little@nc.usda.gov |
| **Pennsylvania** | | | | | |
| Chris Droste | Westmoreland Conservation District | Westmoreland | Erosion Control Specialist | 724-837-5271 | chris@wcdpa.com |
| **Subject Matter Experts** | | | | | |
| Mark Fiely | Ernst Seeds | All Counties | Horticulturist | 800-873-3321 | hortpath@ernstseed.com |

TABLE 5.7.4-1

**Summary of Federal and State/Commonwealth Agencies and Subject Matter Expert Consultations**

| Contact Name | Agency/ Organization | County | Title/Role | Phone | Email |
|---|---|---|---|---|---|
| Jeremy Hamlington | Roundstone Native Seed | All Counties | Horticulturist | 270-531-3034 | jeremy@roundstoneseed.com |
| Bob Glennon | NRCS / The Xerces Society | All Counties | Private Lands Biologist | 757-357-7004 x 126 | robert.glennon@va.usda.gov |
| Nancy Lee Adamson | The Xerces Society for Invertebrate Conservation & NRCS East National Technology Support Center | All Counties | Pollinator Conservation Specialist | 336-370-3443 | nancy@xerces.org |

### 5.7.5.1 Steep to Very Steep Slope Seed Mixes

As described in Sections 5.7.3, the Steep to Very Steep Slope RU includes areas with high erosion potential (e.g., slopes greater than 15 percent). These areas require appropriate seed mixtures and erosion control measures that are able to quickly stabilize disturbed areas. The recommended seed mixes include the use of cool season grasses, which are identified by County in Appendix B.

### 5.7.5.2 Mountain Physiographic Region Seed Mixes

**Excessively to Moderately Well Drained Sites**

West Virginia

The proposed Mountain Physiographic Region Seed Mix P-MUDW01 (Tables 5.7.5-1 and 5.7.5-2) was designed to be compatible with the Mountain Physiographic Region RU in areas with slopes of 15 percent or less. The mix is based on selected native grass and forb species suitable for the restoration of excessively to moderately well-drained mountainous areas in West Virginia.

Virginia

The proposed Mountain Physiographic Region Seed Mix P-VABCHNP01 (Tables 5.7.5-3 and 5.7.5-4) was designed to be compatible with the Mountain Physiographic Region RU in areas with slopes of 15 percent or less. The mix is based on selected native grass and forb species suitable for restoration in excessively to moderately well-drained mountainous areas in Virginia.

**Somewhat Poorly to Very Poorly Drained Sites**

West Virginia

The proposed Mountain Physiographic Region Seed Mix P-MUDW02 (Tables 5.7.5-5 and 5.7.5-6) was designed to be compatible with the Mountain Physiographic Region RU in areas with slopes of 15 percent or less. The mix is based on selected native grasses and forb species suitable for restoration in somewhat poorly to very poorly-drained mountainous areas in West Virginia.

Virginia

The proposed Mountain and Upland Seed Mix P-VABCHNP02 (Tables 5.7.5-7 and 5.7.5-8) was designed to be compatible with the Mountain Physiographic Region RU in areas with slopes of 15 percent or less. The mix is based on selected native grasses and forb species suitable for restoration in somewhat poorly to very poorly-drained mountainous areas in Virginia.

TABLE 5.7.5-1

**Seed Mix P-MUDW01: Recommended Mountain Physiological Region**
**Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in West Virginia [a]**

| Common Name | Scientific Name | Height (feet) | Sun Exposure | Seed Mix Rate (lbs/acre/PLS) [b] |
|---|---|---|---|---|
| Little Bluestem | *Schizachyrium scoparium* | 2 - 4 | Full Sun | 0.250 |
| Virginia Wild Rye | *Elymus virginicus* | 2 - 4 | Full Sun | 0.250 |
| Tall Dropseed | *Sporobolus compositus* | 2 - 3 | Full Sun | 0.050 |
| Purple Top | *Tridens flavus* | 3 - 5 | Part Shade | 0.058 |
| Indian Grass | *Sorghastrum nutans* | 3 - 6 | Full Sun | 0.167 |
| Switchgrass | *Panicum virgatum* | 3 - 7 | Full Sun | 0.183 |
| Fall Panicum | *Panicum anceps* | 2 - 4 | Part Shade | 0.042 |
| Total | — | — | — | 1.0 |

Sources: Roundstone Native Seed, 2015; Glennon, 2015

[a] Recommended seeding application rate is 8 to 18 pounds per acre.

[b] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 5.7.5-2

**Seed Mix P-MUDW01: Recommended Mountain Physiological Region**
**Forb Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in West Virginia**

| Common Name | Scientific Name | Color | Bloom Period | Seed Application Rate (lbs/acre/PLS) [a] |
|---|---|---|---|---|
| Lance Leaved Coreopsis | *Coreopsis lanceolata* | Yellow | Spring,Summer | 0.385 |
| Smooth Beardtongue | *Penstemon digitalis* | White | Spring | 0.146 |
| Common Milkweed | *Asclepias syriaca* | Pink | Spring, Summer | 0.128 |
| Goat's Rue | *Tephrosia virginiana* | White/Pink | Spring, Summer | 0.128 |
| Partridge Pea | *Cassia fasciculata* | Yellow | Summer | 0.745 |
| Slender Mountain Mint | *Pycnanthemum tenuifolium* | White | Summer | 0.069 |
| Early Goldenrod | *Solidago juncea* | Yellow | Summer | 0.086 |
| Bergamot | *Monarda fistulosa* | Lavender | Summer | 0.103 |
| Spiked Blazing Star | *Liatris spicata* | Pink | Summer | 0.343 |
| Sneezeweed | *Helenium autumnale* | Yellow | Summer, Fall | 0.128 |
| Gray Goldenrod | *Solidago nemoralis* | Yellow | Fall | 0.086 |
| Iron Weed | *Vernonia altissima* | Purple | Summer, Fall | 0.343 |
| Tall Coreopsis | *Coreopsis tripteris* | Yellow | Summer, Fall | 0.051 |
| Total | | | | 2.74 |

TABLE 5.7.5-2

**Seed Mix P-MUDW01: Recommended Mountain Physiological Region**
**Forb Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in West Virginia**

Sources: Roundstone Native Seed, 2015; Glennon, 2015
[a] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 5.7.5-3

**Seed Mix P-VABCHNP01: Recommended Mountain Physiographic Region**
**Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in Virginia**

| Common Name | Scientific Name | Cultivar or Germplasm | Drilled Seeding Rate [a] (weight of pure live seed (PLS) per acre) | Seeds per Square Foot |
|---|---|---|---|---|
| Little Bluestem | *Schizachyrium scoparium* | Cimarron (OK) or Suther Germplasm (NC) | 0.5 pound | 3 |
| Splitbeard Bluestem | *Andropogon ternarius* | Missouri or Kentucky Ecotype | 0.5 pound | 3 |

Source: Glennon, 2015
[a] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 0.25 pounds.

TABLE 5.7.5-4

**Seed Mix P-VABCHNP01: Recommended Mountain Physiographic Region**
**Forb Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in Virginia**

| Common Name [a] | Scientific Name | Flowering Season | Seeding Rate (weight of bulk seed per acre) | Seeds per Square Foot |
|---|---|---|---|---|
| Bearded Beggartick (A) | *Bidens aristosa* | Late Summer | 1 pound | 3 |
| Plains Coreopsis (A) | *Coreopsis tinctoria* | Late Spring | 1 ounce | 3 |
| Partridge Pea (A) | *Chamaecrista fasciculata* | Mid-Summer | 2 pounds | 3 |
| Black-eyed Susan (B) | *Rudbeckia hirta* | Early Summer | 2 ounces | 3 |
| Wild Bergamot (P) | *Monarda fistulosa* | Summer | 1 ounce | 3 |
| Lanceleaf Coreopsis (P) | *Coreopsis lanceolata* | Late Summer | 10 ounces | 3 |
| Maximilian Sunflower (P) | *Helianthus maximilianii* | Late Summer | 11 ounces | 3 |
| Slender Mountain Mint (P) | *Pycnanthemum tenuifolium* | Late Summer | 1 ounce | 3 |
| Purple Coneflower (P) | *Echinacea purpurea* | Early Summer | 1.2 pound | 3 |
| Total | — | — | 6.8 lbs/acre | 33 |

Source: Glennon, 2015
[a] Forb types include (A) for annual flowers, (B) for biennial flowers, and (P) for perennial flowers.

TABLE 5.7.5-5

**Seed Mix P-MUMP02: Recommended Mountain Physiographic Region**
**Grass Seed Mix and Application Rate for Somewhat Poorly to Very Poorly Drained Sites in West Virginia [a]**

| Common Name | Scientific Name | Height (feet) | Sun Exposure | Seed Mix Rate (lbs/acre/PLS)[b] |
|---|---|---|---|---|
| Switchgrass | *Panicum virgatum* | 3 - 7 | Full Sun | 0.233 |
| Red Top Panicum | *Panicum rigidulum* | 2 - 4 | Full Sun | 0.017 |
| Fowl Manna Grass | *Glyceria striata* | 3 - 5 | Part Shade | 0.008 |
| Virginia Wild Rye | *Elymus virginicus* | 2 - 4 | Full Sun | 0.217 |
| Canada Wild Rye | *Elymus canadensis* | 2 - 5 | Part Shade | 0.167 |
| Deer Tongue Grass | *Panicum clandestinum* | 2 - 4 | Full Sun | 0.058 |
| Big Bluestem | *Andropogon gerardii* | 4 - 10 | Full Sun | 0.167 |
| Frank's Sedge | *Carex frankii* | 1 - 2 | Part Shade | 0.042 |
| Fox Sedge | *Carex vulpinoidea* | 2 - 3 | Part Shade | 0.025 |
| Fall Panicum | *Panicum anceps* | 2 - 4 | Part Shade | 0.067 |
| Total | — | – | — | 1.0 |

Sources: Roundstone Native Seed, 2015; Glennon, 2015
[a] Recommended seeding application rate is 8 to 18 pounds per acre.
[b] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 5.7.5-6

**Seed Mix P-MUMP02: Recommended Mountain Physiographic Region**
**Forb Seed Mix Application Rate for Somewhat Poorly to Very Poorly Drained Sites in West Virginia**

| Common Name | Scientific Name | Color | Bloom Period | Seed Application Rate (lbs/acre/PLS)[a] |
|---|---|---|---|---|
| Ohio Spiderwort | *Tradescantia ohiensis* | Blue | Spring, Summer | 0.167 |
| Smooth Beardtongue | *Penstemon digitalis* | White | Spring | 0.083 |
| Butterfly Milkweed | *Asclepias tuberosa* | Orange | Spring, Summer | 0.083 |
| Blackeyed Susan | *Rudbeckia hirta* | Yellow | Spring, Summer | 0.134 |
| Wild Senna | *Senna marilandica* | Yellow | Summer | 0.668 |
| Hoary Mountain Mint | *Pycnanthemum incanum* | White | Summer | 0.033 |
| Lupine | *Lupinus perennis* | Blue | Summer | 0.501 |
| Bergamot | *Monarda fistulosa* | Lavender | Summer | 0.083 |
| Boneset | *Eupatorium perfoliatum* | White | Summer | 0.083 |
| Joe-Pye Weed | *Eupatorium fistulosum* | Pink | Summer, Fall | 0.125 |
| Showy Tickseed | *Bidens aristosa* | Yellow | Summer, Fall | 0.501 |
| Sneezeweed | *Helenium autumnale* | Yellow | Summer, Fall | 0.125 |
| Rough Goldenrod | *Solidago rugosa* | Yellow | Fall | 0.083 |
| Total | — | — | — | 2.67 |

Sources: Roundstone Native Seed, 2015; Glennon, 2015
[a] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 5.7.5-7

**Seed Mix P-VABCHNP02: Recommended Mountain Physiographic Region**
**Grass Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in Virginia [a]**

| Common Name | Scientific Name | Cultivar or Germplasm | Drilled Seeding Rate [a] (weight of pure live seed (PLS) per acre) | Seeds per Square Foot |
|---|---|---|---|---|
| Beaked Panicum | *Panicum anceps* | SC or MD Ecotype | 0.25 pound | 3 |
| Redtop Panicum | *Panicum rigidulum* | NC Ecotype | 0.20 pound | 3 |

Source: Glennon, 2015
[a] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 0.25 pounds.

TABLE 5.7.5-8

**Seed Mix P-VABCHNP02: Recommended Mountain Physiographic Region**
**Forb Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in Virginia**

| Common Name [a] | Scientific Name | Flowering Season | Seeding Rate (weight of bulk seed per acre) | Seeds per Square Foot |
|---|---|---|---|---|
| Aster, Purple-stemmed (P) | *Symphyotrichum puniceum var. puniceum* | Fall | 3 ounces | 3 |
| Bergamot, Wild (P) | *Monarda fistulosa* | Summer | 1 ounce | 3 |
| Coreopsis, Plains (A) | *Coreopsis tinctoria* | Late Spring | 1 ounce | 3 |
| Goldenrod, Pine Barrens (P) | *Solidago fistulosa* | Late Summer | 3 ounces | 3 |
| Joe Pye Weed, Spotted (P) | *Eupatoriadelphus fistulosus* | Late Summer | 2 ounces | 3 |
| Partridge Pea (A) | *Chamaecrista fasciculata* | Mid-Summer | 2 pounds | 3 |
| Rattlesnake Master (P) | *Eryngium yuccifolium* | Summer | 8 ounces | 3 |
| Rosemallow (P) | *Hibiscus moscheutos* | Summer | 2 ounces | 3 |
| Narrowleaf Sunflower (P) | *Helianthus angustifolius* | Late Summer | 4 ounces | 3 |
| **Total** | — | — | **4.0 lbs/acre** | **33** |

Source: Glennon, 2015
[a] Forb types include (A) for annual flowers, (B) for biennial flowers, and (P) for perennial flowers

## Pennsylvania

In Pennsylvania, the SHP pipeline (approximately 3.9 miles) will be collocated with DTI's existing LN-25 pipeline in Westmoreland County. In general, the SHP pipeline will be constructed within and directly adjacent to the existing LN-25 pipeline rights-of-way which is seeded with cool season grasses. As presented in Appendix B, the recommended seed mixtures, rates, and amendments for the SHP were based on existing site conditions and compatibility with existing grasses, which includes the use of cool season grasses. No pollinator species specific to the area were recommended.

#### 5.7.5.3 Piedmont Physiographic Region Seed Mixes

**Excessively to Moderately Well Drained Sites**

Virginia

The proposed Mountain Physiographic Seed Mix P-VABCHNP01 that is described in Section 5.7.5.2 was designed to also be compatible with the Piedmont Physiographic Region RU in excessively to moderately well drained areas in Virginia.

**Somewhat Poorly to Very Poorly Drained Sites**

Virginia

The proposed Mountain Physiographic Seed Mix P-VABCHNP02 described in Section 5.7.5.2 was designed to also be compatible with the Piedmont Physiographic Region RU in somewhat poorly to very poorly drained sites in Virginia.

#### 5.7.5.4 Coastal Plain Physiographic Region Seed Mixes

**Excessively to Moderately Well Drained Sites**

Virginia

The proposed Coastal Plain Seed Mix P-VACSDGS01 (Tables 5.7.5-9 and 5.7.5-10) was designed to be compatible with the Coastal Plain Physiographic Region RU in areas with slopes of 15 percent or less. The mix is based on selected native grass and forb species suitable for restoration in excessively to moderately well drained coastal areas in Virginia.

North Carolina

The proposed Coastal Plain Seed Mix P-CPDW01 (Tables 5.7.5-11 and 5.11.5-12) was designed to be compatible with the Coastal Plain Physiographic Region RU in areas with slopes of 15 percent or less and is based on selected native grass and forb species suitable for restoration in excessively to moderately well drained coastal areas in North Carolina.

**Somewhat Poorly to Very Poorly Drained Sites**

Virginia

The proposed Coastal Plain Seed Mix P-VACSDGS02 (Tables 5.7.5-13 and 5.7.5-14) was designed to be compatible with the Coastal Plain Physiographic Region RU in areas with slopes of 15 percent or less. The mix is based on selected native grass and forb species suitable for restoration in somewhat poorly to very poorly drained coastal areas in Virginia.

TABLE 5.7.5-9

**Seed Mix P-VACSDGS01: Recommended Coastal Plain Physiographic Region**
**Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in Virginia**

| Common Name | Scientific Name | Cultivar or Germplasm | Drilled Seeding Rate [a] (weight of pure live seed (PLS) per acre) | Seeds per Square Foot |
|---|---|---|---|---|
| Little Bluestem | *Schizachyrium scoparium* | Cimarron (OK) or Suther Germplasm (NC) | 0.5 pound | 3 |
| Splitbeard Bluestem | *Andropogon ternarius* | Missouri or Kentucky Ecotype | 0.5 pound | 3 |

Source: Glennon, 2015
[a] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 0.25 pounds.

TABLE 5.7.5-10

**Seed Mix P-VACSDGS01: Recommended Coast Plain Physiographic Region**
**Forb Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in Virginia**

| Common Name [a] | Scientific Name | Flowering Season | Drilled Seeding Rate (weight of bulk seed per acre) | Seeds per Square Foot |
|---|---|---|---|---|
| Narrowleaf Mountain Mint (P) | *Pycnanthemum tenuifolium* | Late Summer | 1 ounce | 3 |
| Plains Coreopsis (A) | *Coreopsis tinctoria* | Late Spring | 1 ounce | 3 |
| Partridge Pea (A) | *Chamaecrista fasciculata* | Mid-Summer | 2 pounds | 3 |
| Black-eyed Susan (B) | *Rudbeckia hirta* | Early Summer | 2 ounces | 3 |
| Bergamot, Spotted (P) | *Monarda fistulosa* | Summer | 1 ounce | 3 |
| Lanceleaf Coreopsis (P) | *Coreopsis lanceolata* | Late Summer | 10 ounces | 3 |
| Maximilian Sunflower (P) | *Helianthus maximilianii* | Late Summer | 11 ounces | 3 |
| Indian Blanket (A) | *Gaillardia pulchella* | Indeterminate | 9 ounces | 3 |
| Purple Coneflower (P) | *Echinacea purpurea* | Early Summer | 1.2 pound | 3 |
| **Total** | — | — | **6.4 lbs/acre** | **33** |

Source: Glennon, 2015
[a] Forb types include (A) for annual flowers, (B) for biennial flowers, and (P) for perennial flowers.

TABLE 5.7.5-11

**Seed Mix P-CPDW01: Recommended Coastal Plain Physiographic Region**
**Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in North Carolina**

| Common Name | Scientific Name | Height (feet) | Sun Exposure | Seed Mix Rate (lbs/acre/PLS)[b] |
|---|---|---|---|---|
| Little Bluestem | *Schizachyrium scoparium* | 2- 4 | Full Sun | 0.250 |
| Virginia Wild Rye | *Elymus virginicus* | 2 - 4 | Full Sun | 0.250 |
| Tall Dropseed | *Sporobolus compositus* | 2 - 3 | Full Sun | 0.050 |
| Purple Top | *Tridens flavus* | 3 - 5 | Part Shade | 0.058 |
| Indian Grass | *Sorghastrum nutans* | 3 - 6 | Full Sun | 0.167 |
| Switchgrass | *Panicum virgatum* | 3 - 7 | Full Sun | 0.183 |
| Fall Panicum | *Panicum anceps* | 2 - 4 | Part Shade | 0.042 |
| **Total** | — | — | — | **1.0** |

Sources: Roundstone Native Seed, 2015; Glennon, 2015
[a] Recommended seeding application rate is 8 to 18 pounds per acre.
[b] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 5.7.5-12

**Seed Mix P-CPDW01: Recommended Coastal Plain Physiographic Region**
**Forb Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in North Carolina**

| Common Name | Scientific Name | Color | Bloom Period | Seed Application Rate (lbs/acre/PLS)[a] |
|---|---|---|---|---|
| Lance Leaved Coreopsis | *Coreopsis lanceolata* | Yellow | Spring, Summer | 0.266 |
| Spotted Beebalm | *Monarda punctata* | Pink | Spring, Summer | 0.124 |
| Common Milkweed | *Asclepias syriaca* | Pink | Spring, Summer | 0.107 |
| Smooth Beardtongue | *Penstemon digitalis* | White | Spring | 0.107 |
| Bergamot | *Monarda fistulosa* | Lavender | Summer | 0.124 |
| Partridge Pea | *Cassia fasciculata* | Yellow | Summer | 0.621 |
| Spiked Blazing Star | *Liatris spicata* | Pink | Summer | 0.222 |
| Lupine | *Lupinus perennis* | Blue | Summer | 0.497 |
| Early Goldenrod | *Solidago juncea* | Yellow | Summer | 0.160 |
| Starry Silphium | *Silphium asteriscus* | Yellow | Summer, Fall | 0.178 |
| Iron Weed | *Vernonia altissima* | Purple | Summer, Fall | 0.222 |
| Sneezeweed | *Helenium autumnale* | Yellow | Summer, Fall | 0.124 |
| Hairy Mountain Mint | *Pycnanthemum pilosum* | White | Summer, Fall | 0.089 |
| **Total** | — | — | — | **2.84** |

Sources: Roundstone Native Seed, 2015; Glennon, 2015
[a] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 5.7.5-13

**Seed Mix P-VACSDGS02: Recommended Coastal Plant Physiographic Region**
**Grass Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in Virginia**

| Common Name | Scientific Name | Cultivar or Germplasm | Drilled Seeding Rate [a] (weight of pure live seed (PLS) per acre) | Seeds per Square Foot |
|---|---|---|---|---|
| Beaked Panicum | *Panicum anceps* | SC or MD Ecotype | 0.25 pound | 3 |
| Redtop Panicum | *Panicum rigidulum* | NC Ecotype | 0.20 pound | 3 |

Source: Glennon, 2015
[a] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 0.25 pounds.

TABLE 5.7.5-14

**Seed Mix P-VACSDGS02: Recommended Coastal Plant Physiographic Region**
**Forb Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in Virginia**

| Common Name [a] | Scientific Name | Flowering Season | Drilled Seeding Rate (weight of bulk seed per acre) | Seeds per Square Foot |
|---|---|---|---|---|
| Aster, Purple-stemmed (P) | *Symphyotrichum puniceum var. puniceum* | Fall | 3 ounces | 3 |
| Sneezeweed, Common (P) | *Helenium autumnale* | Fall | 2 ounces | 3 |
| Coreopsis, Plains (A) | *Coreopsis tinctoria* | Late Spring | 1 ounce | 3 |
| Goldenrod, Wrinkleleaf (P) | *Solidago rugosa* | Late Summer | 2 ounces | 3 |
| Joe Pye Weed, Spotted (P) | *Eupatoriadelphus fistulosus* | Late Summer | 2 ounces | 3 |
| Partridge Pea (A) | *Chamaecrista fasciculata* | Mid-Summer | 2 pounds | 3 |
| Rattlesnake Master (P) | *Eryngium yuccifolium* | Summer | 8 ounces | 3 |
| Rosemallow (P) | *Hibiscus moscheutos* | Summer | 2 ounces | 3 |
| Narrowleaf Sunflower (P) | *Helianthus angustifolius* | Late Summer | 4 ounces | 3 |
| **Total** | — | — | **4.0 lbs/acre** | **33** |

Source: Glennon, 2015
[a] Forb types include (A) for annual flowers, (B) for biennial flowers, and (P) for perennial flowers

North Carolina

The proposed Coastal Plain Seed Mix P-CPDW02 (Tables 5.7.5-15 and 5.7.5-16) was designed to be compatible with the Coastal Plain Physiographic Region RU in areas with slopes of 15 percent or less and is based on selected native grass and forb species suitable for restoration in somewhat poorly to very poorly drained coastal areas in North Carolina.

TABLE 5.7.5-15

**Seed Mix P-CPDW02: Recommended Coastal Plain Physiographic Region**
**Grass Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in North Carolina [a]**

| Common Name | Scientific Name | Height (feet) | Sun Exposure | Seed Mix Rate (lbs/acre/PLS)[b] |
|---|---|---|---|---|
| Switchgrass | *Panicum virgatum* | 3 - 7 | Full Sun | 0.233 |
| Red Top Panicum | *Panicum rigidulum* | 2 - 4 | Full Sun | 0.017 |
| Fowl Manna Grass | *Glyceria striata* | 3 - 5 | Part Shade | 0.008 |
| Virginia Wild Rye | *Elymus virginicus* | 2 - 4 | Full Sun | 0.217 |
| Canada Wild Rye | *Elymus canadensis* | 2 - 5 | Part Shade | 0.167 |
| Deer Tongue Grass | *Panicum clandestinum* | 2 - 4 | Full Sun | 0.058 |
| Big Bluestem | *Andropogon gerardii* | 4 - 10 | Full Sun | 0.167 |
| Frank's Sedge | *Carex frankii* | 1 - 2 | Part Shade | 0.042 |
| Fox Sedge | *Carex vulpinoidea* | 2 - 3 | Part Shade | 0.025 |
| Fall Panicum | *Panicum anceps* | 2 - 4 | Part Shade | 0.067 |
| Total | — | — | — | 1.0 |

Sources: Roundstone Native Seed, 2015; Glennon, 2015

[a] Recommended seeding application rate is 8 to 18 pounds per acre.

[b] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 5.7.5-16

**Seed Mix P-CPDW02: Recommended Coastal Plain Physiographic Region**
**Forb Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in North Carolina**

| Common Name | Scientific Name | Color | Bloom Period | Seed Application Rate (lbs/acre/PLS)[a] |
|---|---|---|---|---|
| Smooth Beardtongue | *Penstemon digitalis* | White | Spring | 0.169 |
| Butterfly Milkweed | *Asclepias tuberosa* | Orange | Spring, Summer | 0.056 |
| Ohio Spiderwort | *Tradescantia ohiensis* | Blue | Spring, Summer | 0.084 |
| Blackeyed Susan | *Rudbeckia hirta* | Yellow | Spring, Summer | 0.180 |
| Spiked Blazing Star | *Liatris spicata* | Pink | Summer | 0.264 |
| Hoary Mountain Mint | *Pycnanthemum incanum* | White | Summer | 0.034 |
| Early Goldenrod | *Solidago juncea* | Yellow | Summer | 0.113 |
| Bergamot | *Monarda fistulosa* | Lavender | Summer | 0.169 |
| Showy Tickseed | *Bidens aristosa* | Yellow | Summer, Fall | 0.366 |
| Starry Silphium | *Silphium asteriscus* | Yellow | Summer, Fall | 0.113 |
| Narrow-Leaved Sunflower | *Helianthus angustifolius* | Yellow | Summer, Fall | 0.113 |
| Joe-Pye Weed | *Eupatorium fistulosum* | Pink | Summer, Fall | 0.141 |
| Total | — | — | — | 2.84 |

Sources: Roundstone Native Seed, 2015; Glennon, 2015

[a] lbs/acre/PLS = pounds per acre of pure live seed

### 5.7.6 Seeding Methods

Seeding may be conducted with the use of a seed drill, a mechanical broadcast seeder, or by hydroseeding. In the absence of requirements to the contrary, the standard application method will be seeding with a seed drill equipped with a cultipacker. 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. Broadcast or hydroseeding at double the recommended seeding rates may be used in lieu of drilling (see Appendix B for recommendations).

Broadcast seeding will 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 and DTI will rake the area lightly to encourage plant establishment and minimize the seed that migrates from the site (North Carolina Department of Environment and Natural Resources, 2009).

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 steep slopes greater than 60 percent, where site conditions require seed adherence to the disturbed soil. Prior to hydroseeding, Atlantic and DTI 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 and applicable agency guidelines. In addition, hydroseeding near wetlands or waterbodies will only be conducted in accordance with the FERC Plan and Procedures and other applicable agency regulations.

## 5.8 Seedbed Augmentation

### 5.8.1 Lime and Fertilizer Application

Lime and fertilizer recommendations provided by the various Federal, State/Commonwealth, local and land management and subject matter experts consulted for each County/City are provided in Appendix B. Each county crossed by the Projects may have different fertilization and liming requirements based on the soil characteristics and the proposed seed mix prescriptions. In general, and in accordance with the Plan and Procedures, upland areas will have a fertilizer and pH supplement (i.e., lime) mixed in to 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 and DTI will:

- apply 150 pounds per acre of 10-20-20 (or similar) fertilizer;
- apply phosphorus or potassium during the same installation, if required;
- avoid fertilizer drift through restricted application times that exclude periods of high winds or heavy rains; and
- store and mix all fertilizers in upland areas and away from karst features, so as to avoid wetlands, waterbodies, or karst features.

### 5.8.2 Mulching

Mulching recommendations provided by the various Federal, State/Commonwealth, local and land management agencies, and subject matter experts consulted for each County/City are provided in Appendix B. Each County/City crossed by the Projects may have different mulching requirements based on the landscape characteristics, soil types, and the proposed seed mix prescriptions. In general, and in accordance with the Plan, Atlantic and DTI will apply mulch to slopes immediately after seeding to prevent erosion. In non-forested areas, mulch will be spread uniformly over a minimum of 75 percent of the surface at a rate of 2 tons per acre, or 1 ton per acre if wood chips are used, or per directions from land managing agencies or landowners. In forested areas, if the amount of mulch will likely exceed these parameters due to the shredding of non-merchandisable forest materials cleared from the rights-of-way, Atlantic and DTI will request a variance from FERC prior to applying mulch greater than 1 ton/acre. 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 rights-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 rights-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.

- Straw or hay that has been certified as weed-free 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 and DTI will apply one bale of clean straw or hay per 1,000 square feet. Where broadcast seeding is used, Atlantic and DTI will apply two bales of clean straw or hay per 1,000 square feet, or in accordance with requirements specified by Federal or State/Commonwealth land managing agencies.

### 5.8.3 Supplemental Plantings

Where required, Atlantic and DTI may supplement seeding with the planting of tree seedlings or small shrubs. No supplemental plantings are anticipated for maintained areas within the permanent easements for the pipelines. Public lands will be revegetated in accordance with land management objectives and direction from land managing agencies (see Sections 5.0 and 6.0).

## 5.9 Riparian Restoration

Following initial stream bank stabilization, Atlantic and DTI will restore the banks of waterbodies 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, including both shore crossings up to the ordinary high water mark;
- 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 to permanently stabilize the banks and minimize sediment deposition into waterbodies.

### 5.9.1 Non-forested Riparian Areas

All disturbed banks and riparian work areas will be seeded as soon as possible after final grading, weather and soil conditions permitting and subject to the recommended seeding dates for the area. Seeding is intended to stabilize the soil, improve the appearance of the area disturbed by construction, and restore native flora. As discussed above, Atlantic and DTI will determine appropriate seeding prescriptions based upon the vegetative community of the disturbed area, and will continue to consult with land managing agencies regarding seeding requirements for riparian areas.

### 5.9.2 Forested Riparian Areas

Restoration of forested riparian areas will include seeding as discussed above, and may include supplemental plantings of tree seedlings and shrubs. 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. Forested riparian areas will be restored and enhanced using plantings of native shrubs and trees, excluding the permanent easement, which will be retained in an herbaceous state. On a site-specific basis and in consultation with land managing agencies or landowners, Atlantic and DTI will design riparian revegetation with the use of fast growing native trees and shrubs placed closest to the bank top to provide canopy recovery as quickly as possible to shade and overhang the waterbodies. Restoration of forested riparian areas on Federal and State/Commonwealth lands will be determined based upon consultations with the appropriate land managing agencies.

## 5.10 Wetland Restoration

Atlantic and DTI 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 Procedures, sediment barriers will be installed immediately following clearing activities occurring within wetlands or adjacent upland areas along the pipeline rights-of-way. Where necessary, sediment barriers will be installed across the construction rights-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.

Seeding of wetlands is not anticipated as wetlands are expected to naturally revegetate. Unless specified by landowners or land managing agencies, revegetation will be monitored annually until wetland revegetation is successful in accordance with the Procedures. Wetland revegetation will be considered successful when vegetation community characteristics are similar to the vegetation in adjacent wetland areas that were not disturbed by construction. As described in the Procedures, restored wetland vegetation will include at least 80 percent of the species targeted for restoration, and the density (i.e., percent cover) and distribution (e.g., microsites and patches) of individual plants will be similar to areas not disturbed by construction. Revegetation requirements appropriate for Federal and State/Commonwealth lands will be determined through consultation with those agencies.

After revegetation, Atlantic and DTI anticipate no permanent impact on emergent wetland vegetation within the rights-of-way. Scrub-shrub and forested wetlands will not be allowed to fully reestablish within portions of the permanent rights-of-way centered over the pipeline trench lines. Atlantic and DTI will periodically remove woody species from wetlands to facilitate post-construction inspections of the permanently maintained rights-of-way. Where the pipelines cross wetlands, Atlantic and DTI will maintain a 10-foot-wide corridor centered over the pipelines in an herbaceous condition, and remove deep rooted trees within a 30-foot-wide corridor centered over the pipelines.

### 5.11 Agricultural Areas

Atlantic and DTI will work with individual landowners to address restoration of active agricultural areas. Generally, agricultural areas will be replanted by the landowner or tenant, unless otherwise requested by the landowner. Anticipated impacts on and restoration of irrigation systems, drain tiles, gates, and other structures are discussed in Resource Report 8.

### 5.12 Exposed Bedrock

In areas with exposed bedrock or bedrock, Atlantic and DTI will restore the area using crushed rock rather than attempting to revegetate the area.

### 5.13 Upland Forest

Atlantic and DTI have prepared and will implement a *Timber Removal Plan*, which describes construction and restoration activities in areas where timber is removed. The plan also addresses compensation for loss of merchantable timber as well as elements of timber removal/sale that are unique to public lands. Elements of the plan include:

- completion of a timber cruise to appraise the value of merchantable timber;

- installation of flagging/fencing of timber removal limits, riparian areas, and other exclusion zones prior to timber removal operations;

- identification of access and staging requirements for timber removal, including log landing locations, temporary bridges at waterbody crossings, etc.; and

- identification of timber removal methods (e.g., high line yarder logging, mechanical harvesting, helicopter logging).

Following construction in forested areas, seed mixes and/or seedlings will be planted in temporary workspace areas in accordance with recommendations from the NRCS, land managing or other applicable agencies, and operators of commercial tree farms. In non-cultivated uplands, including forested areas, the permanent easement for each pipeline will be maintained in an herbaceous state.

## 6.0 FEDERAL LANDS

The AP-1 mainline will cross approximately 5.5 miles of Federal lands in the Monongahela National Forest and approximately 14.5 miles of Federal lands in the George Washington National Forest, which are administered by the USFS. As described in Atlantic's and DTI's Resource Reports, Federal lands are managed in accordance with various management directives, including standards and guidelines for restoration and revegetation activities. Restoration activities on Federal lands will be in accordance with these standards and guidelines. Additional or site-specific requirements for restoration of Federal lands will be addressed in a Construction, Operations, and Maintenance Plan to be developed in conjunction with USFS staff.

Consultation with USFS staff regarding seed mixes, soil amendments, and application rates, including appropriate cultural practices recommended by USFS staff to be used in the Monongahela National and George Washington National Forest is ongoing. This information will be provided in Appendix B when consultation is complete.

In addition to USFS lands, the AP-1 mainline will also cross approximately 0.1 mile of National Park Service lands along the Blue Ridge Parkway. Atlantic is proposing the use of the horizontal directional drill construction method to install the proposed pipeline under the Blue Ridge Parkway at this location. The horizontal directional drill method will avoid direct impacts on the parkway, including impacts on adjacent vegetation.

## 7.0 STATE LANDS

In West Virginia, the AP-1 mainline crosses 3.8 miles of the Seneca State Forest in Pocahontas County, West Virginia, and the SHP crosses approximately 3.6 miles of the Lewis Wetzel WMA in Wetzel County, West Virginia. Seneca State Forest is managed by the WV Division of Forestry and the Lewis Wetzel WMA is managed by the West Virginia Department of Natural Resources. The AP-1 mainline crosses 1.2 miles of the James River WMA in Nelson County, Virginia, which is managed by the Virginia Department of Game and Inland Fisheries.

The seed mixes, soils amendments, and application rates, including appropriate cultural practices recommended by the State/Commonwealth staff, for the Lewis Wetzel WMA and

James River WMA are provided in Appendix B. In Virginia, the DGIF has indicated that it may want to be responsible for replanting the rights-of-way on its lands. Consultation with the WV Division of Forestry regarding seed mixes, soil amendments, and application rates is ongoing. This information will be provided in Appendix B when consultation is complete.

## 8.0 RESTORATION MONITORING AND MAINTENANCE

### 8.1 Monitoring

The general objectives of the monitoring program will be to determine the status and effectiveness of restoration efforts and to determine locations where additional maintenance may be required. Atlantic and DTI will inspect disturbed areas after the first and second growing seasons to determine the success of revegetation. In agricultural areas, revegetation will be considered successful when the area has been revegetated and is similar to adjacent undisturbed areas of the same field. In all other non-forested areas, revegetation will be considered successful when the density and cover of non-nuisance vegetation is similar to adjacent areas that were not disturbed by construction activities. In Federal and State/Commonwealth forested areas, monitoring activities will be performed until reforestation is determined successful based on pre-defined success criteria, as determined through consultations with Federal and State/Commonwealth land managing agencies.

Atlantic and DTI will continue revegetation efforts until they are successful. Restoration will be considered successful when construction debris is removed, similar vegetative cover or bedrock has been restored, the original surface elevations are restored as closely as practicable to preconstruction contours, the surface condition is similar to adjacent non-disturbed areas, and proper drainage is restored.

### 8.2 Grazing Deferments

Where warranted, Atlantic and DTI will work with landowners or lessees to implement grazing deferment plans (e.g., by fencing off restoration sites) to minimize impacts on emergent vegetation due to grazing.

### 8.3 Permanent Rights-of-way Maintenance

In order to maintain accessibility of the rights-of-way and to accommodate pipeline integrity surveys, vegetation within the permanent easements will be periodically cleared over the pipelines. In accordance with the Plan, in non-cultivated uplands, a 10-foot-wide herbaceous corridor may be maintained annually, as needed. In addition, trees and brush will be cleared over the entire width of the permanent rights-of-way on an as-needed basis not to exceed once every 3 years. In wetlands and riparian areas, the Procedures allow a 10-foot-wide corridor centered over pipelines to be permanently maintained in an herbaceous state. The Procedures also allow for cutting and removing trees greater than 15 feet in height within 15 feet of pipelines in wetlands.

Atlantic and DTI will use mechanical mowing or cutting along their rights-of-way for normal vegetative maintenance. Atlantic and DTI will monitor the rights-of-way for infestations of invasive species that may have been created or exacerbated by construction, restoration, or maintenance activities, and will treat such infestations in consultation with landowners and applicable agencies in accordance with its *Invasive Species Management Plan*.

# 9.0 ROLES AND RESPONSIBILITIES

## 9.1 Environmental Inspectors

EIs will have the authority to stop activities that violate environmental conditions of Federal or State/Commonwealth environmental permits and landowner agreements and to order appropriate corrective action. During revegetation and restoration, the EIs will be responsible for:

- ensuring compliance with the requirements of the Plan and Procedures; Atlantic's and DTI's construction, restoration, and mitigation plans; conditions required by permits and other approvals; this Restoration and Rehabilitation Plan; and environmental requirements identified 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;
- verifying the location of restoration sites, and maintaining appropriate signage for boundaries of sensitive resource areas, waterbodies, wetlands, farm improvements (i.e., repair of fences, drain tiles, irrigation systems, or structures), or areas with special restoration requirements;
- monitoring erosion and sediment control devices and soil stabilization measures in construction areas, and identifying additional needs for new controls or maintenance of existing controls;
- verifying that dewatering activities are properly monitored and do not result in the deposition of sand, silt, and/or sediment into sensitive environmental resource areas, including but not limited to wetlands, waterbodies, cultural resource sites, and sensitive species habitats;
- ensuring that subsoil and topsoil are tested in agricultural and residential areas to measure compaction and determine the need for corrective action;
- advising the Construction Inspector when environmental conditions (such as wet 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 soils imported for agricultural or residential use have been certified as free of invasive species and soil pests, unless otherwise approved by the landowner;

- determining the need for and ensuring that erosion controls are properly installed, as necessary, to prevent sediment flow into wetlands, waterbodies, sensitive areas, and onto roads;

- inspecting and ensuring the maintenance of temporary erosion control measures at least:

    - 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.

- ensuring the repair of all ineffective temporary erosion control measures within 24 hours of identification;

- keeping records of compliance or non-compliance with conditions of environmental regulatory permits and approvals, including activities that could result in decertification of organic farms; and

- identifying areas that will require special attention to ensure stabilization and restoration success.

Where appropriate for local resource needs, the role of EIs may be filled by agricultural or horticultural specialists.

## 9.2 Documentation

In accordance with the Plan, Atlantic and DTI will maintain post-construction records of activities performed and will submit quarterly activity reports to the FERC. Reports will document any issues that arise during revegetation, including those identified by the landowner or land managing agency, and corrective actions taken for at least two years following construction. Reports will identify by milepost:

- method of application, application rate, and type of fertilizer, pH modifier, 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 subsurface drainage repairs or improvements made during restoration; and

- problem areas, such areas where vegetation did not establish or erosion occurred, and how they were addressed.

## 10.0 REFERENCES

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**ATLANTIC COAST PIPELINE, LLC**
**ATLANTIC COAST PIPELINE**

**and**

**DOMINION TRANSMISSION, INC.**
**SUPPLY HEADER PROJECT**

**Restoration and Rehabilitation Plan**

# Appendix A
# Major Soil Drainage and Slope Classes Crossed by the Projects

TABLE 5.6-1

**Atlantic Coast Pipeline and Supply Header Project**
**Major Soil Drainage and Slope Classes Crossed by the Projects**

| Project /State or Commonwealth/County | Drainage Class [a] | Crossing Length (miles) | | |
|---|---|---|---|---|
| | | Total | 0-15% [b] | >16% [b] |
| **ATLANTIC COASTAL PIPELINE** | | | | |
| **West Virginia** | | | | |
| Harrison | Excessively to Moderately Well Drained | 1.0 | 0.2 | 0.8 |
| | Somewhat Poorly to Very Poorly Drained | 0.1 | <0.1 | <0.1 |
| | Total | 1.1 | 0.3 | 0.8 |
| Lewis | Excessively to Moderately Well Drained | 19.8 | 6.9 | 12.9 |
| | Null [b/] | 0.1 | <0.1 | 0.1 |
| | Total | 19.9 | 6.9 | 13.0 |
| Upshur | Excessively to Moderately Well Drained | 21.5 | 8.8 | 12.7 |
| | Somewhat Poorly to Very Poorly Drained | 0.6 | 0.6 | <0.1 |
| | Null | 0.1 | 0.1 | <0.1 |
| | Total | 22.2 | 9.5 | 12.7 |
| Randolph | Excessively to Moderately Well Drained | 28.6 | 12.3 | 16.3 |
| | Somewhat Poorly to Very Poorly Drained | 0.3 | 0.3 | 0.00 |
| | Null | 1.9 | 1.4 | 0.5 |
| | Total | 30.8 | 14.0 | 16.8 |
| Pocahontas | Excessively to Moderately Well Drained | 23.4 | 8.4 | 15.0 |
| | Somewhat Poorly to Very Poorly Drained | 0.8 | 0.8 | <0.1 |
| | Null | <0.1 | <0.1 | 0.00 |
| | Total | 24.3 | 9.3 | 15.0 |
| **Virginia** | | | | |
| Highland | Excessively to Moderately Well Drained | 10.5 | 3.0 | 7.5 |
| | Somewhat Poorly to Very Poorly Drained | 0.1 | 0.1 | 0.0 |
| | Null | <0.1 | <0.1 | 0.0 |
| | Total | 10.6 | 3.1 | 7.5 |
| Bath | Excessively to Moderately Well Drained | 20.4 | 9.6 | 10.8 |
| | Somewhat Poorly to Very Poorly Drained | 1.2 | 1.2 | 0.00 |
| | Null | <0.1 | <0.1 | <0.1 |
| | Total | 21.6 | 10.8 | 10.8 |
| Augusta | Excessively to Moderately Well Drained | 50.4 | 35.5 | 14.9 |
| | Somewhat Poorly to Very Poorly Drained | 1.9 | 1.9 | <0.1 |
| | Null | 2.0 | 1.1 | 0.9 |
| | Total | 54.3 | 38.5 | 15.8 |
| Nelson | Excessively to Moderately Well Drained | 26.9 | 10.3 | 16.7 |
| | Somewhat Poorly to Very Poorly Drained | 0.3 | 0.3 | <0.1 |
| | Null | <0.1 | <0.1 | 0.0 |
| | Total | 27.3 | 10.6 | 16.7 |
| Buckingham | Excessively to Moderately Well Drained | 22.8 | 20.0 | 2.7 |
| | Somewhat Poorly to Very Poorly Drained | 4.9 | 4.6 | 0.3 |
| | Null | <0.1 | <0.1 | 0.0 |
| | Total | 27.7 | 24.7 | 3.0 |
| Cumberland | Excessively to Moderately Well Drained | 8.5 | 7.8 | 0.7 |
| | Somewhat Poorly to Very Poorly Drained | 0.5 | 0.5 | 0.0 |
| | Null | <0.1 | <0.1 | 0.0 |
| | Total | 9.1 | 8.4 | 0.7 |

TABLE 5.6-1 (continued)

**Atlantic Coast Pipeline and Supply Header Project**
**Major Soil Drainage and Slope Classes Crossed by the Projects**

| Project /State or Commonwealth/County | Drainage Class [a] | Crossing Length (miles) | | |
|---|---|---|---|---|
| | | Total | 0-15% [b] | >16% [b] |
| Prince Edward | Excessively to Moderately Well Drained | 5.0 | 4.1 | 0.9 |
| | Somewhat Poorly to Very Poorly Drained | 0.2 | 0.2 | <0.1 |
| | Null | <0.1 | <0.1 | 0.0 |
| | Total | 5.2 | 4.3 | 0.9 |
| Nottoway | Excessively to Moderately Well Drained | 21.1 | 19.1 | 2.0 |
| | Somewhat Poorly to Very Poorly Drained | 2.3 | 2.2 | 0.1 |
| | Null | <0.1 | <0.1 | 0.0 |
| | Total | 23.4 | 21.3 | 2.1 |
| Dinwiddie | Excessively to Moderately Well Drained | 11.0 | 10.9 | 0.1 |
| | Somewhat Poorly to Very Poorly Drained | 0.8 | 0.8 | 0.0 |
| | Total | 11.8 | 11.7 | 0.1 |
| Brunswick | Excessively to Moderately Well Drained | 21.4 | 21.2 | 0.2 |
| | Somewhat Poorly to Very Poorly Drained | 1.6 | 1.6 | <0.1 |
| | Total | 23.0 | 22.8 | 0.2 |
| Greensville | Excessively to Moderately Well Drained | 11.4 | 11.1 | 0.3 |
| | Somewhat Poorly to Very Poorly Drained | 7.1 | 7.1 | 0.0 |
| | Null | 0.1 | 0.1 | 0.0 |
| | Total | 18.6 | 18.3 | 0.3 |
| Southampton | Excessively to Moderately Well Drained | 16.1 | 16.0 | <0.1 |
| | Somewhat Poorly to Very Poorly Drained | 10.0 | 10.0 | 0.0 |
| | Null | <0.1 | <0.1 | 0.0 |
| | Total | 26.1 | 26.1 | <0.1 |
| City of Suffolk | Excessively to Moderately Well Drained | 16.2 | 15.8 | 0.4 |
| | Somewhat Poorly to Very Poorly Drained | 16.4 | 16.3 | 0.1 |
| | Null | 0.6 | 0.6 | 0.0 |
| | Total | 33.2 | 32.7 | 0.5 |
| City of Chesapeake | Excessively to Moderately Well Drained | 0.6 | 0.6 | 0.0 |
| | Somewhat Poorly to Very Poorly Drained | 9.0 | 9.0 | 0.0 |
| | Null | 1.7 | 1.7 | 0.0 |
| | Total | 11.3 | 11.3 | 0.0 |
| **North Carolina** | | | | |
| Northampton | Excessively to Moderately Well Drained | 17.8 | 17.6 | 0.2 |
| | Somewhat Poorly to Very Poorly Drained | 4.2 | 4.2 | <0.1 |
| | Null | 0.1 | 0.1 | 0.0 |
| | Total | 22.1 | 21.9 | 0.2 |
| Halifax | Excessively to Moderately Well Drained | 16.8 | 16.6 | 0.2 |
| | Somewhat Poorly to Very Poorly Drained | 7.5 | 7.5 | <0.1 |
| | Null | 0.0 | 0.0 | 0.0 |
| | Total | 24.3 | 24.1 | 0.2 |
| Nash | Excessively to Moderately Well Drained | 20.1 | 19.9 | 0.2 |
| | Somewhat Poorly to Very Poorly Drained | 11.8 | 11.8 | 0.0 |
| | Null | <0.1 | <0.1 | 0.0 |
| | Total | 31.9 | 31.7 | 0.2 |
| Wilson | Excessively to Moderately Well Drained | 6.5 | 6.5 | 0.0 |
| | Somewhat Poorly to Very Poorly Drained | 5.4 | 5.4 | <0.1 |
| | Total | 11.9 | 11.9 | <0.1 |

TABLE 5.6-1 (continued)

**Atlantic Coast Pipeline and Supply Header Project**
**Major Soil Drainage and Slope Classes Crossed by the Projects**

| Project /State or Commonwealth/County | Drainage Class [a] | Crossing Length (miles) | | |
|---|---|---|---|---|
| | | Total | 0-15% [b] | >16% [b] |
| Johnston | Excessively to Moderately Well Drained | 19.0 | 19.0 | <0.1 |
| | Somewhat Poorly to Very Poorly Drained | 19.1 | 19.1 | 0.0 |
| | Null | <0.1 | <0.1 | 0.0 |
| | Total | 38.1 | 38.1 | <0.1 |
| Sampson | Excessively to Moderately Well Drained | 4.7 | 4.7 | 0.0 |
| | Somewhat Poorly to Very Poorly Drained | 3.1 | 3.1 | 0.0 |
| | Total | 7.8 | 7.8 | 0.0 |
| Cumberland | Excessively to Moderately Well Drained | 16.8 | 16.7 | 0.1 |
| | Somewhat Poorly to Very Poorly Drained | 22.7 | 22.7 | 0.0 |
| | Null | 0.1 | 0.1 | 0.0 |
| | Total | 39.6 | 39.5 | 0.1 |
| Robeson | Excessively to Moderately Well Drained | 9.4 | 9.4 | 0.0 |
| | Somewhat Poorly to Very Poorly Drained | 13.1 | 13.1 | 0.0 |
| | Total | 22.5 | 22.5 | 0.0 |
| **TOTAL** | | **599.7** | **482.1** | **117.6** |
| **SUPPLY HEADER PROJECT** | | | | |
| **Pennsylvania** | | | | |
| Westmoreland | Excessively to Moderately Well Drained | 3.8 | 2.2 | 1.6 |
| | Somewhat Poorly to Very Poorly Drained | 0.1 | 0.1 | 0.0 |
| | Total | 3.9 | 2.3 | 1.6 |
| **West Virginia** | | | | |
| Harrison | Excessively to Moderately Well Drained | 0.3 | 0.2 | 0.1 |
| | Somewhat Poorly to Very Poorly Drained | 0.3 | 0.1 | 0.2 |
| | Total | 0.6 | 0.3 | 0.3 |
| Doddridge | Excessively to Moderately Well Drained | 22.1 | 4.2 | 17.9 |
| | Null | 0.1 | 0.1 | <0.1 |
| | Total | 22.2 | 4.3 | 17.9 |
| Tyler | Excessively to Moderately Well Drained | 0.8 | 0.1 | 0.7 |
| | Total | 0.8 | 0.1 | 0.7 |
| Wetzel | Excessively to Moderately Well Drained | 10.0 | 1.2 | 8.8 |
| | Total | 10.0 | 1.2 | 8.8 |
| **TOTAL** | | **37.5** | **8.2** | **29.3** |
| **GRAND TOTAL** | | **637.2** | **490.3** | **146.9** |

a Null = soil map units with no assigned drainage class.
b Slope were determined using available digital elevation model raster data and running the slope analysis tool in ArcGIS: ArcMap. The drainage classes were determined using the SSURGO database.

**ATLANTIC COAST PIPELINE, LLC**
**ATLANTIC COAST PIPELINE**

**and**

**DOMINION TRANSMISSION, INC.**
**SUPPLY HEADER PROJECT**

**Restoration and Rehabilitation Plan**

# Appendix B
# Recommended Seed Mix Prescriptions and Soil Amendments

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

**and**

**DOMINION TRANSMISSION, INC.**
**SUPPLY HEADER PROJECT**
**Docket No. CP15-555-000**

# Recommended Seed Mixes by Milepost

*Updated, Rev 3*

**Prepared by**

ERM

**July 15, 2016**

## TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF ATTACHMENTS



## LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ACP | Atlantic Coast Pipeline |
| NRCS | Natural Resources Conservation Service |
| SHP | Supply Header Project |
| WMA | Wildlife Management Area |

**ATLANTIC COAST PIPELINE – Docket Nos. CP15-554-000 & CP15-554-001**
**SUPPLY HEADER PROJECT – Docket No. CP15-555-000**

# 1.0 INTRODUCTION

This appendix compiles seed mix prescriptions and soil amendment recommendations provided by Federal and State/Commonwealth agencies, and subject matter experts consulted for the restoration and rehabilitation of the proposed Atlantic Coast Pipeline (ACP) and Supply Header Project (SHP). The recommendations are summarized by county in Attachment A and discussed below.

# 2.0 ATLANTIC COAST PIPELINE

## 2.1 WEST VIRGINIA

### 2.1.1 Harrison, Lewis, Randolph, and Upshur Counties

The following seed mixtures and application rates, seeding dates, soil amendments recommendations, and planting recommendations are for Harrison, Lewis, Randolph, and Upshur counties in West Virginia. These recommendations are based on the collection of correspondences and discussions with Federal and State agencies, including communication with Greg Stone (Natural Resources Conservation Service [NRCS] Acting State Resource Conservationist) and Jeff Griffith (NRCS Conservationist). The tables and lists below provide the specific recommendations for these counties. No specific recommendations were made in these counties regarding tackifiers, mulching, or anchoring of mulch or seed.

**Recommended Seed Mixes and Application Rates**

TABLE 2.1.1-1

**Seed Mix WVHLRU01: Recommended Cool Season Seed Mixture**

| Seed Mixture | Potentially Suitable Land Use | Common Species Name [a] | Seed Application Rate (lbs/acre/PLS)[b] |
|---|---|---|---|
| 1 | Pasture or Hay | Orchardgrass | 10 |
| | | ***Ladino Clover*** | 2 |
| | | Red Clover | 3 |
| | | ***Redtop*** | 3 |
| 2 | Pasture | **Kentucky Bluegrass** | 20 |
| | | ***Ladino Clover*** | 2 |
| | | Red Clover | 3 |
| | | ***Redtop*** | 3 |
| 3 | Pasture or Hay | Orchardgrass | 20 |
| | | ***Redtop*** | 5 |
| | | Birdsfoot Trefoil | 10 |

[a] Species in bold are more wildlife-friendly; species in italics are suitable for use in filter strips.
[b] lbs/acre/PLS = pounds per acre of pure live seed

## Recommended Seeding Dates

TABLE 2.1.1-2

**Harrison, Lewis, Randolph, and Upshur Counties, West Virginia Recommended Seeding Dates for Permanent Cover**

| Seeding Dates | Suitability |
|---|---|
| March 1 to April 15 | Best seeding period |
| August 1 to October 1 | Best seeding period |
| December 1 to March 1 | Good seeding period (dormant seeding) |
| April 15 to August 1 | High risk (moisture stress likely) |
| October 1 to December 1 | High risk (potential freeze damage to young seedlings) |

## Recommended Soil Amendments and Application Rates

TABLE 2.1.1-3

**Harrison, Lewis, Randolph, and Upshur Counties, West Virginia Recommended Soil Amendments and Application Rates**

| Soil Amendment Type | Application Rate |
|---|---|
| Lime | 3 tons per acre |
| Fertilizer [a] | 400 pounds per acre |

[a] Fertilizer with a 10-20-20 ratio of nitrogen, phosphorus, and potassium is recommended.

## Planting Recommendations

- Certified seed is preferred.
- Use proper inoculants prior to seeding for all legumes.
- Amend soil fertility and pH levels to satisfy the needs of the plant species.
- For unprepared seedbeds or seeding outside the optimum timeframes:
    - Add 50 percent more seed to the specified application rate, particularly during the periods of April 15 – August 1, and October 1 – March 1.
    - Double the seed application rate and consider planting an annual small grain like wheat (2 bushels [120 pounds] per acre) to act as a nurse crop.

### 2.1.2 **Pocahontas County**

The following seed mixtures, application rates, and soil amendment recommendations are for Pocahontas County, West Virginia. The recommendations are based on correspondence and discussions with Iden Gunther (NRCS Conservationist) and Susan Davis (West Virginia Department of Natural Resources). Seed Mix WVPO01 provides seeding recommendations for disturbed areas from the NRCS Critical Area Planting Standard that is commonly used with a high success rate in the County.

## Recommended Seed Mixes and Application Rates

TABLE 2.1.2-1

**Seed Mix WVPO01: Recommended Cool or Warm Seed Mixes for Pocahontas County, West Virginia**

| Seed Mixture | Species / Mixture [a] | Seeding Application Rate (lbs/acre/PLS)[b] | Soil Drainage Preference | pH Range |
|---|---|---|---|---|
| 1 | Crownvetch | 10 – 15 | Well – Moderately Well | 5.0 – 7.5 |
| | Perennial Ryegrass | 20 | | |
| 2 | **KY Bluegrass** | 20 | Well – Moderately Well | 5.5 – 7.5 |
| | **Redtop** | 3 | | |
| | **Ladino Clover or** | 2 | | |
| | **Birdsfoot Trefoil** | 10 | | |
| 3 | **Timothy** | 8 | Well - Poorly | 5.5 – 7.5 |
| | **Birdsfoot Trefoil** | 8 | | |
| 4 | ***Orchardgrass*** | 10 | Well – Moderately Well | 5.5 – 7.5 |
| | ***Ladino Clover*** | 2 | | |
| | ***Redtop*** | 3 | | |
| 5 | ***Orchardgrass*** | 10 | Well – Moderately Well | 5.5 – 7.5 |
| | ***Ladino Clover*** | 2 | | |
| 5 | **Birdsfoot Trefoil** | 10 | Well – Moderately Well | 5.5 – 7.5 |
| | **Redtop** | 5 | | |
| | **Orchardgrass** | 20 | | |

Source: WVDEP, 2012

[a] Species in bold are more wildlife-friendly; species in italics are suitable for use in filter strips.

[b] lbs/acre/PLS = pounds per acre of pure live seed

## Recommended Soil Amendments and Application Rates

TABLE 2.1.2-2

**Recommended Lime and Fertilizer Application**

| pH of Soil [a] | Lime Application Rate (tons/acre)[b] | Fertilizer Application Rate (10-20-20 or equivalent) (lbs/acre) |
|---|---|---|
| > 6.0 | 2 | 500 |
| 5.0 to 6.0 | 3 | |
| < 5.0 | 4 | |

Source: WVDEP, 2012

[a] The pH can be determined with a portable pH testing kit or by sending the soil samples to a soil testing laboratory. When four tons of lime per acre is applied it must be incorporated into the soil by disking, backblading, or tracking up and down the slope.

[b] lbs/acre/PLS = pounds per acre of pure live seed

### Recommended Mulch Material and Application Rates

TABLE 2.1.2-3

**Recommended Mulch Material Rates and Uses**

| Material | Minimum Rates Per Acre | Coverage | Remarks |
|---|---|---|---|
| Hay or Straw | 2-3 Tons (100 – 150 Bales) | 75% - 90% | Subject to wind blowing or washing unless tied down |
| Wood Fiber, Pulp Fiber, Wood-Cellulose, Recirculated Paper | 1,000 – 1,500 lbs | Cover all disturbed areas | Hydroseeding |

Source: WVDEP, 2012

### Chemical Mulches, Soil Binders, and Tackifiers Recommendations

- Determine mulch-type and its appropriate application rate;
- A wide range of synthetic tackifiers (e.g., spray-on materials) are marketed to stabilize and protect the seeds and soil surfaces. These tackifiers are mixed with water and seed mixtures, and sprayed over the mulch and soils. They may be used alone in some cases as temporary stabilizers, or in conjunction with fiber mulch, straw or hay; and
- Chemical tackifiers, when used alone, do not have the capability to insulate the soil or retain soil moisture as effectively as organic mulches such wood fiber, straw, or hay.

<u>Mulch Anchoring</u>

- Depending on field conditions, mulch anchoring (e.g., mechanical methods or netting) may become necessary due to environmental conditions, including heavy winds or rapid water runoff (e.g., rain or snowmelt).
- Mechanical Anchoring
    - Apply mulch and pull a mulch anchoring tool over the mulch. When a disk is used, set the disk straight and pull across the slope. Mulch material should be tucked into the soil about three inches.
- Mulch Netting
    - Follow manufacturer's recommendations when positioning and stapling mulch netting into the soil.

### 2.1.3 **Federal Lands**

### Monongahela National Forest – Pocahontas County

*This section is pending additional consultation with the U.S. Forest Service.*

### 2.1.4 **State Lands**

**Seneca State Forest – Pocahontas County**

*This section is pending additional consultation with the West Virginia Department of Natural Resources.*

### 2.1.5 **Recommended Native Grasses and Pollinators Seed Mixtures, Application Rates, and Non-Native Cover Crop by Physiographical Region**

**Recommended Seed Mixtures by Geographical Region (Mountain Physiographic Region) and Drainage Class**

The following seed mixtures are for the mountain and upland areas of West Virginia. These recommendations are based on discussions with Roundstone Native Seed and Robert Glennon, private lands biologist from the Conservation Management Institute, Virginia Tech and NRCS, and the Xerces Society.

<u>West Virginia Excessively to Moderately Well Drained Sites</u>

TABLE 2.1.5-1

**Seed Mix P-MUDW01: Recommended Mountain Physiological Region**
**Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in West Virginia**

| Common Name | Scientific Name | Height (feet) | Sun Exposure | Seed Mix Rate (lbs/acre/PLS)[b] |
|---|---|---|---|---|
| Little Bluestem | *Schizachyrium scoparium* | 2 - 4 | Full Sun | 0.250 |
| Virginia Wild Rye | *Elymus virginicus* | 2 - 4 | Full Sun | 0.250 |
| Tall Dropseed | *Sporobolus compositus* | 2 - 3 | Full Sun | 0.050 |
| Purple Top | *Tridens flavus* | 3 - 5 | Part Shade | 0.058 |
| Indian Grass | *Sorghastrum nutans* | 3 - 6 | Full Sun | 0.167 |
| Switchgrass | *Panicum virgatum* | 3 - 7 | Full Sun | 0.183 |
| Fall Panicum | *Panicum anceps* | 2 - 4 | Part Shade | 0.042 |
| **Total** | — | — | — | **1.0** |

Sources: Roundstone Native Seed, 2015; Glennon, 2015
[a] Recommended seeding application rate is 8 to 18 pounds per acre.
[b] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 2.1.5-2

**Seed Mix P-MUDW01: Recommended Mountain Physiological Region**
**Forb Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in West Virginia**

| Common Name | Scientific Name | Color | Bloom Period | Seed Application Rate (lbs/acre/PLS)[a] |
|---|---|---|---|---|
| Lance Leaved Coreopsis | *Coreopsis lanceolata* | Yellow | Spring, Summer | 0.385 |
| Smooth Beardtongue | *Penstemon digitalis* | White | Spring | 0.146 |
| Common Milkweed | *Asclepias syriaca* | Pink | Spring, Summer | 0.128 |
| Goat's Rue | *Tephrosia virginiana* | White/Pink | Spring, Summer | 0.128 |
| Partridge Pea | *Cassia fasciculata* | Yellow | Summer | 0.745 |
| Slender Mountain Mint | *Pycnanthemum tenuifolium* | White | Summer | 0.069 |
| Early Goldenrod | *Solidago juncea* | Yellow | Summer | 0.086 |
| Bergamot | *Monarda fistulosa* | Lavender | Summer | 0.103 |
| Spiked Blazing Star | *Liatris spicata* | Pink | Summer | 0.343 |
| Sneezeweed | *Helenium autumnale* | Yellow | Summer, Fall | 0.128 |
| Gray Goldenrod | *Solidago nemoralis* | Yellow | Fall | 0.086 |
| Iron Weed | *Vernonia altissima* | Purple | Summer, Fall | 0.343 |
| Tall Coreopsis | *Coreopsis tripteris* | Yellow | Summer, Fall | 0.051 |
| **Total** | — | — | — | **2.74** |

Sources: Roundstone Native Seed, 2015; Glennon, 2015
[b] lbs/acre/PLS = pounds per acre of pure live seed

## West Virginia Somewhat Poorly to Very Poorly Drained Sites

TABLE 2.1.5-3

**Seed Mix P-MUMP02: Recommended Mountain Physiographic Region**
**Grass Seed Mix and Application Rate for Somewhat Poorly to Very Poorly Drained Sites in West Virginia**

| Common Name | Scientific Name | Height (feet) | Sun Exposure | Seed Mix Rate (lbs/acre/PLS)[b] |
|---|---|---|---|---|
| Switchgrass | *Panicum virgatum* | 3 - 7 | Full Sun | 0.233 |
| Red Top Panicum | *Panicum rigidulum* | 2 - 4 | Full Sun | 0.017 |
| Fowl Manna Grass | *Glyceria striata* | 3 - 5 | Part Shade | 0.008 |
| Virginia Wild Rye | *Elymus virginicus* | 2 - 4 | Full Sun | 0.217 |
| Canada Wild Rye | *Elymus canadensis* | 2 - 5 | Part Shade | 0.167 |
| Deer Tongue Grass | *Panicum clandestinum* | 2 - 4 | Full Sun | 0.058 |
| Big Bluestem | *Andropogon gerardii* | 4 - 10 | Full Sun | 0.167 |
| Frank's Sedge | *Carex frankii* | 1 - 2 | Part Shade | 0.042 |
| Fox Sedge | *Carex vulpinoidea* | 2 - 3 | Part Shade | 0.025 |
| Fall Panicum | *Panicum anceps* | 2 - 4 | Part Shade | 0.067 |
| **Total** | — | – | — | **1.0** |

Sources: Roundstone Native Seed, 2015; Glennon, 2015
[a] Recommended seeding application rate is 8 to 18 pounds per acre.
[b] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 2.1.5-4

**Seed Mix P-MUMP02: Recommended Mountain Physiographic Region**
**Forb Seed Mix Application Rate for Somewhat Poorly to Very Poorly Drained Sites in West Virginia**

| Common Name | Scientific Name | Color | Bloom Period | Seed Application Rate (lbs/acre/PLS)[a] |
|---|---|---|---|---|
| Ohio Spiderwort | *Tradescantia ohiensis* | Blue | Spring, Summer | 0.167 |
| Smooth Beardtongue | *Penstemon digitalis* | White | Spring | 0.083 |
| Butterfly Milkweed | *Asclepias tuberosa* | Orange | Spring, Summer | 0.083 |
| Blackeyed Susan | *Rudbeckia hirta* | Yellow | Spring, Summer | 0.134 |
| Wild Senna | *Senna marilandica* | Yellow | Summer | 0.668 |
| Hoary Mountain Mint | *Pycnanthemum incanum* | White | Summer | 0.033 |
| Lupine | *Lupinus perennis* | Blue | Summer | 0.501 |
| Bergamot | *Monarda fistulosa* | Lavender | Summer | 0.083 |
| Boneset | *Eupatorium perfoliatum* | White | Summer | 0.083 |
| Joe-Pye Weed | *Eupatorium fistulosum* | Pink | Summer, Fall | 0.125 |
| Showy Tickseed | *Bidens aristosa* | Yellow | Summer, Fall | 0.501 |
| Sneezeweed | *Helenium autumnale* | Yellow | Summer, Fall | 0.125 |
| Rough Goldenrod | *Solidago rugosa* | Yellow | Fall | 0.083 |
| **Total** | — | — | — | **2.67** |

Sources: Roundstone Native Seed, 2015; Glennon, 2015
[a] lbs/acre/PLS = pounds per acre of pure live seed

## Recommended Non-Native Temporary Cover Crop Species and Non-Native Grass Cover Mix for Inclusion with Pollinator Mixtures

In areas where the erosion potential is high (e.g., steep slope areas) and/or sites that require stabilization within 30 days of disturbance, non-native temporary cover species in seed mixture P-NNTC, as shown in Table 2.1.5-5, should be used. In areas where erosion is likely to occur on steep slopes prior to the germination of native grasses and forbs, non-native grass mixture P-NNGC should be used in combination with the forb mixtures that are prescribed for non-steep slope areas within the Mountain Physiographic Region of West Virginia. Table 2.1.5-6 provides the specific non-native grass species to be included with the native forb seed mix in these areas.

TABLE 2.1.5-5

**Seed Mix P-NNTC: Recommended Mountain Physiographic Region**
**Non-Native Temporary Cover Crop Species for Steep Slope Areas in West Virginia**

| Common Name | Scientific Name | Height (Inches) | Sun Exposure | Seeding Application Rate (lbs/acre/PLS)[a] | Seed Mix Planting Season |
|---|---|---|---|---|---|
| Brown Top Millet | *Panicum ramosum* | 3 - 3.5 | Full sun | 5.0 | Summer |
| Spring Oats | *Avena sativa* | 2 – 2.5 | Full sun | 30.0 | Spring and Fall |
| Annual Rye Grass | *Lolium multiflorum* | 2 – 2.5 | Part shade | 6.0 | Fall and Winter |

Source: Roundstone Native Seed, 2015
[a] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 2.1.5-6

**Seed Mix P-NNGC: Recommended Mountain Physiographic Region Non-Native Grass Cover Mix for Steep Slope Areas in West Virginia [a]**

| Common Name | Scientific Name | Height (Inches) | Sun Exposure | Seed Mix Rate (lbs/acre/PLS)[b] |
|---|---|---|---|---|
| Fescue | *Festuca arundinacea* | 2 - 3 | Part Shade | 0.300 |
| Timothy | *Phleum pratense* | 2 - 4 | Part Shade | 0.100 |
| Orchard Grass | *Dactylis glomerata* | 2 - 3 | Part Shade | 0.100 |
| Red Top | *Agrostis alba* | 2 - 3 | Full Sun | 0.020 |
| Ladino Clover | *Trifolium repens* | 1 - 1.5 | Part Shade | 0.040 |
| Annual Rye Grass | *Lolium multiflorum* | 2 - 2.5 | Part Shade | 0.170 |
| Creeping Red Fescue | *Festuca rubra* | 1 - 2 | Full Sun | 0.250 |
| Kentucky Bluegrass | *Poa pratensis* | 1-2 | Full Sun | 0.020 |
| **Total** | — | — | — | **1.0** |

Source: Roundstone Native Seed, 2015

[a] Recommended seeding application rate is 30 to 50 pounds per acre.

[b] lbs/acre/PLS = pounds per acre of pure live seed

## 2.2 VIRGINIA

### 2.2.1 Augusta, Brunswick, Buckingham, Cumberland, Highland, Bath, Nelson, Nottoway, and Prince Edward Counties

The following erosion control prevention, forage species seed mixtures, and recommended soil amendments are for the Mountain and Piedmont Physiographic Regions of Virginia, which include Augusta, Brunswick, Buckingham, Cumberland, Highland, Nelson, Nottoway, and Prince Edward Counties. These recommendations are based on the U.S. Department of Agriculture-NRCS Virginia Plant Establishment Guide (Jones, et. al., 2014), which was recommended by Federal and Commonwealth agency contacts, including Charles Ivins (NRCS Conservationist), Charles Simmons (NRCS Conservationist), Davie Wade Harris (NRCS Conservationist), Jeffray Jones (State Biologist), J.B. Daniel (NRCS Conservationist), and Derek Hancock (NRCS Conservationist).

**Recommended Grass Seed Mixtures, Species, Application Rates, and Planting Dates**

Seed Mix VABCHNP01 (Table 2.2.1-1) provides a cool season species list mixture for erosion prevention, while Seed Mix VABCHNP02 (Table 2.2.1-2) provides cool and warm season species mixtures for forage.

TABLE 2.2.1-1

**Seed Mix VABCHNP01: Recommended Cool Season Erosion Prevention Species and Seed Mixtures**

| Seeding Mix | Common Species Name | Virginia Native | Seeding Rate (lbs/acre/PLS)[a] B:broadcast; D:drill (4-9" row) | Plant Depth (inches) | Mountain/Valley/Northern Piedmont Best Dates | Mountain/Valley/Northern Piedmont Possible Dates | Southern Piedmont Best Dates | Southern Piedmont Possible Dates |
|---|---|---|---|---|---|---|---|---|
| | Average Last Frost | | | | May 1 | | Apr 15 | |
| Perennial Grass | | | | | | | | |
| 1 | Tall Fescue (use in high velocity and highly erosive situations | | B: 60 | ¼-½ | Aug 15-Sep 10; Mar 15-Apr 10 | Aug 1-Sep 30; Mar 1-Apr 30 | Sep 1-Sep 20; Mar 1-Apr 1 | Aug 25-Nov 1; Feb 15-Apr 15 |
| 2 | Switchgrass | √ | D:10; B:15 | ¼ | Mar 15-Jun 30 | | Mar 1-Jun15 | |
| Mixtures | | | | | | | | |
| 3 | Tall Fescue + Ladino Clover | | B:40+3 | ¼ | Aug 15-Sep 10; Mar 15-Apr 10 | Aug 1-Sep 30; Mar 1-Apr 30 | Sep 1-Sep 20; Mar 1-Apr 1 | Aug 25-Nov 1; Feb 15-Apr 15 |
| 4 | Tall Fescue + Red Clover | | B:40+6 | ¼ | Aug 15-Sep 10; Mar 15-Apr 10 | Aug 1-Sep 30; Mar 1-Apr 30 | Sep 1-Sep 20; Mar 1-Apr 1 | Aug 25-Nov 1; Feb 15-Apr 15 |
| 5 | Tall Fescue + Annual Lespedeza | | B:40+10; D:30+8 | ¼ | Mar 1-Apr 15 | Mar 1-Apr 15 | Feb 15-Apr 1 | Feb 15-Apr 1 |
| 6 | Tall Fescue + Redtop | | D/B: 40+10 | ¼-½ | Jul 25-Sep 1; Mar 20-Apr 20 | Jul 15-Sep 15; Mar 1-May 15 | Aug 25-Sep 15 | Aug 25-Oct 25; Feb 15-Mar 31 |
| 7 | Switchgrass + Red Fescue + Partridge Pea | | D/B: 10+15+4 | ¼ | Mar 15-April 30 | Mar 15-Jun 30 | Mar 1-Apr 15 | Feb 15-May 31 |
| 8 | Switchgrass + Indiangrass + Big Bluestem | | D/B: 5 each | ¼ | Mar 15-Jun 30 | Mar 15-Jun 30 | Mar 1-Jun 15 | Mar 1-Jun 15 |
| 9 | Tall Fescue + Redtop + Birdsfoot Trefoil | | D/B: 60+6+10 | ¼-½ | Jul 25-Sep 1; Mar 20-Apr 20 | Jul 15-Sep 15; Mar 1-May 15 | Aug 25-Sep 15 | Aug 25-Oct 25; Feb 15-Mar 31 |
| 10 | Switchgrass + Deer tongue + Partridge Pea | √ | D/B: 8+8+4 | ¼ | Mar 15-April 30 | Mar 15-Jun 30 | Mar 1-Apr 15 | Feb 15-May 31 |
| 11 | Perennial Ryegrass + Redtop | | D:5+2; B:7+3 | ½-¾ | Mar 1-Apr 15 | Aug 1-Sep 15 | Feb 15-April 1 | Aug 15-Oct 1 |

Source: Jones, et. al., 2014

[a] lbs/acre/PLS = pounds per acre of pure live seed

Note: The Virginia Plant Establishment Guide (Jones, et. al., 2014) provides acceptable seed mixtures and/or plant species rates, seeding dates, and other information that may be needed in the planning of practices and development of specifications for individual sites.

TABLE 2.2.1-2

**Seed Mix VABCHNP02: Recommended Cool and Warm Season Forage Species and Seed Mixtures**

| Seeding Mix | Common Species Name | Virginia Native | Seeding Rate (lbs/acre/PLS) B:broadcast; D:drill (4-9" row) | Plant Depth (inches) | Mountain/Valley/Northern Piedmont [a] Best Dates | Mountain/Valley/Northern Piedmont [a] Possible Dates | Southern Piedmont Best Dates | Southern Piedmont Possible Dates |
|---|---|---|---|---|---|---|---|---|
| | Average Last Frost | | | | May 1 | | Apr 15 | |
| Perennial Grasses | | | | | | | | |
| 101 | Bermudagrass (Hybrid) [b] Sprigs – 1 bushel = 1.25 $ft^3$ | | B:30-40 bushels D:15-20 bushels | 2"-4" | Not well adapted | May 1-Jun 15 | Apr 15-Jun 1 | Apr 1thru Jun 15 or thru Jul if irrigated |
| 102 | Bermudagrass [b], Coated Seeds (Common & Cultivars) | | B:10-12; D:8-10 | ¼ | Not well adapted | May 1-Jun 15 | Apr 15– May 15 | Apr 15-Jun 15 |
| 103 | Big Bluestem [c] | √ | B:10-12; D:8-10 | ¼ | Mar 15-Jun 30 | Mar 15-Jun 30 | Mar 1-Jun 15 | Mar 1-Jun 15 |
| 104 | Bluegrass | | B:10-15; D:8-12 4-5 in mixtures | ¼ | Aug 15-Sep 1; Mar 15-Apr 1 | Aug 1-Sep 15; Mar 1-Apr 15 | Seed in mixtures Mar 1- Apr 1; Aug 15 - Oct 1 | Seed in mixtures Mar 1- Apr 1; Aug 15 - Oct 1 |
| 105 | Eastern Gamagrass [d] (use non-stratified seed for winter planting and stratified seed for spring plantings) | √ | R:8-10 | 1- 1.5 | Nov 15-Feb 15; May 1-May30 | Nov 15- Feb 15: May 1-Jun 30 | Nov 25-Jan 31; Apr 20- May 15 | Nov 25-Jan 31; Apr 15 - Jun 10 |
| 106 | Indiangrass [c] | √ | B:10-12; D:8-10 | ¼ | Mar 15-Jun 30 | Mar 15-Jun 30 | Mar 1-Jun 15 | Mar 1-Jun 15 |
| 107 | Orchardgrass [e] | | B:12-15; D:8-12 | ¼-½ | Aug 20-Sep 10; Mar 15-Apr 1 | Aug 15-Oct 1; Mar 1-Apr 15 | Aug 25-Sep 15; Mar 1-Apr 1 | Aug 25-Oct 25; Mar 1-Apr 15 |
| 109 | Perennial Ryegrass [e] | | D: 12-15 B:20-25; 6-10 in mixtures | ¼-½ | Aug 20-Sep 10; Mar 15-Apr 1 | Aug 15-Sep 25; Mar 1-Apr 15 | Not well adapted | Aug 25-Oct 1; Feb 25-April 1 |
| 110 | Prairiegrass | | D:20-25; B:30-35 10-15 in mixtures | ¼-½ | Aug 15 - Sep 15; Mar 15-Apr 15 | Aug 15-Oct 15; Mar 1-Apr 30 | Sep 1 - Oct 1; Mar 1-Mar 20 | Aug 15-Oct 25; Feb 20-Apr 15 |
| 111 | Switchgrass [c] | √ | B:8-10; D:6-8 | ¼ | Mar 15-Jun 30 | Mar 15-Jun 30 | Mar 1-Jun 15 | Mar 1-Jun 15 |
| 112 | Tall Fescue | | B:20-25; D:15-20 | ¼-½ | Aug 15-Sep 10; Mar 15-Apr 15 | Aug 1-Sep 30; Mar 1-Apr 30 | Sep 1-Sep 30; Mar 1-Apr 1 | Aug 25-Nov 1; Feb 25-Apr 15 |
| 113 | Timothy | | B:10-12; D: 8-10 | ¼-½ | Aug 15-Sep 10; Mar 15-Apr 1 | Aug 15-Oct 1; Mar 1-Apr 15 | Not well adapted | Not well adapted |
| Mixtures | | | | | | | | |
| 114 | Orchardgrass + Alfalfa [f] | | B:5+20; D:3+15 | ¼-½ | Aug 15-Sep 1; Mar 15-Apr 1 | Aug 1-Sep 15; Mar 1-Apr15 | Aug 25-Sep 15; Mar 1-Mar 20 | Aug 25-Oct 15; Feb 25-Apr 1 |

TABLE 2.2.1-2

**Seed Mix VABCHNP02: Recommended Cool and Warm Season Forage Species and Seed Mixtures**

| Seeding Mix | Common Species Name | Virginia Native | Seeding Rate (lbs/acre/PLS) B:broadcast; D:drill (4-9" row) | Plant Depth (inches) | Mountain/Valley/Northern Piedmont [a] Best Dates | Mountain/Valley/Northern Piedmont [a] Possible Dates | Southern Piedmont Best Dates | Southern Piedmont Possible Dates |
|---|---|---|---|---|---|---|---|---|
| 115 | Orchardgrass with 1 or more of the following:<br>Ladino Clover<br>Red Clover<br>Annual Lespedeza | | B: 10-12; D:8-10 1-2 4-6 10-12 | ¼-½ | Aug 20-Sep 10; Mar 15-Apr 1 | Aug 15-Oct 1; Mar 1-Apr 15 | Aug 25-Sep 15; Mar 1-Mar 20 | Aug 25-Oct 15; Feb 25-Apr 1 |
| 116 | Orchardgrass and<br>Timothy<br>with 1 or more of the following:<br>Ladino Clover Red Clover<br>Annual Lespedeza | | B: 10-12; D:8-10<br>B: 4; D:2<br>1-2<br>4-6<br>10-12 | ¼-½ | Aug 20-Sep 10;<br>Mar 15-Apr 1 | Aug 15-Oct 1;<br>Mar 1-Apr 15 | Aug 25-Sep 15;<br>Mar 1-Mar 20 | Aug 25-Oct 15;<br>Feb 25-Apr 1 |
| 117 | Tall Fescue with 1 or more of the following: Ladino Clover Red Clover Annual Lespedeza | | B:20-25; D:15-20 1-2 4-6 10-12 | ¼-½ | Aug 15- Oct 1;<br>Mar 1-Apr 15 | Aug 15- Oct 1;<br>Mar 1-Apr 15 | Aug 25 - Oct 15;<br>Feb 20-Apr 1 | Aug 25 - Oct 15;<br>Feb 20-Apr 1 |
| 118 | Prairiegrass with 1 or more of the following: Red Clover Alfalfa [f] | | B:20-25; D:15-20; 4-6 15 | ¼-½ | Aug 15 - Sep 15;<br>Mar 10-Apr 10 | Aug 1-Sep 20;<br>Mar 1-Apr 15 | Aug 25 - Sep 15;<br>Mar 1-Mar 20 | Aug 15-Oct 15;<br>Feb 25-Apr 1 |
| Annual Grasses | | | | | | | | |
| 119 | Crabgrass [g] | | B:6-8; D:4-6 | ¼ | May 15-May 31 | May 1-Jun 30 | May 1-May 31 | Apr 15-Jun 30 |
| 120 | Barley | | B:140; D:120 | 1 – 1.5 | Aug 15-Sep 15 | Aug 10-Sep 30 | Aug 25-Sep 15 | Aug 15-Sep 30 |
| 121 | Millet, Pearl | | B:30-40; D:15-20 | ½ - 1 | May 15-May 31 | May 1-Jun 30 | May 1-May 31 | Apr 25-Jun 30 |
| 122 | Millet, German Foxtail, Japanese | | B:20-30;D:15-20 | ¼ | May 15-May 31 | May 1-Jun 30 | May 1-May 31 | May 1-Jun 30 |
| 123 | Oats, Winter [h] | | B:80-96; D:65-80 | 1 – 1.5 | Aug 15-Sep 10 | Aug 10-Sep 15;<br>Feb 1-Mar 1 | Sep 1-Sep 15 | Aug 25-Oct 1; Feb 1-Mar 1 |
| 124 | Oats, Spring | | B:80-96; D:65-80 | 1 – 1.5 | Mar 15-Apr 1 | Mar 15-Apr 10 | Mar 5-Mar 20 | Mar 5-Apr 1 |
| 125 | Rye | | B:120-150; D:90-110 | 1 – 1.5 | Aug 15-Aug 31 | Aug 15-Oct 25 | Aug 25-Sep 15 | Aug 20-Oct 31 |
| 126 | Ryegrass | | B:30-40; D:20-30 | ¼-½ | Aug 15-Sep 10 | Aug 10-Sep 30 | Aug 25-Sep 15 | Aug 20-Oct 31 |
| 127 | Teff [g, i] | | B: 6-8; D 5-6 | 1/8 | Jun 1-Jun 15 | May 15 - Jul 1 | May 20-Jun 10 | May 1 - Jul 1 |
| 128 | Wheat | | B:150;<br>D: 120 | 1 – 1.5 | Aug 15-Aug 31 | Aug 15-Oct 25 | Aug 25-Sep 15 | Aug 20-Oct 31 |
| 129 | Small grain Mix<br>(2 Grains) | | Reduce each selection by 50% | 1 – 1.5 | See dates for small grains. | See dates for small grains. | See dates for small grains. | See dates for small grains. |
| 130 | Small grain mixed with annual ryegrass | | Reduce Small grain 25% & ryegrass 50% | ½ - 1 | See dates for grains and ryegrass. | | See dates for grains and ryegrass. | |
| 131 | Sorghum-Sudangrass | | B:30-40; D:20-30 | ½ - 1 | May 15-May 31 | May 1-Jun 30 | May 1- May 31 | Apr 25-Jun 30 |

TABLE 2.2.1-2

**Seed Mix VABCHNP02: Recommended Cool and Warm Season Forage Species and Seed Mixtures**

| Seeding Mix | Common Species Name | Virginia Native | Seeding Rate (lbs/acre/PLS) B:broadcast; D:drill (4-9" row) | Plant Depth (inches) | Mountain/Valley/Northern Piedmont [a] | | Southern Piedmont | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Best Dates | Possible Dates | Best Dates | Possible Dates |
| 132 | Sorghum, Forage | | B: 15-20; R:5-10 | 1 – 1 ½ | May 15-May 31 | May 1 – Jun 30 | May 1–May 31 | Apr 25 – Jun 30 |
| 133 | Sudangrass | | B:30-35; D:15-20 | ½ - 1 | May 15 -May 31 | May 1 – Jun 30 | May 1–May 31 | Apr 25 – Jun 30 |
| 134 | Triticale | | B:140-180; D: 120-140 | 1 – 1.5 | Aug 15-Aug 31 | Aug 15-Oct 25 | Aug 25-Sep 15 | Aug 20-Oct 31 |
| Perennial Legumes | | | | | | | | |
| 135 | Alfalfa [f] | | B:20-25; D:15-20 | ¼ | Aug 25-Sep 15; Mar 20–Apr 7 | Aug 15-Sep 25; Mar 15-Apr 15 | Sep 1-Sep 15; Mar 10-Mar 20 | Aug 25-Oct 1; Mar 5-Apr 5 |
| 136 | Alfalfa (no-till seeding into grass) | | D:10-12 | ¼ - ½ | Mar 20–Apr 7 | Mar 15-Apr 15 | Mar 10-Mar 20 | Mar 5-Apr 5 |
| 137 | Birdsfoot Trefoil (no-till into suppressed grass sod) | | D:6-8 | ¼ | Aug 15-Sep 1 | Aug1-Sep 15 | Not adapted | Not adapted |
| 138 | Birdsfoot Trefoil (frost seed onto pasture) | | B: 8-10 | 0 | Feb 1-Mar 1 | Jan 25-Mar 10 | Not adapted | Not adapted |
| 139 | Ladino or White Clover (no-till into suppressed grass sod) | | D:1-2 | ¼ | Aug 20-Sep 10; Mar 15-Apr 1 | Aug 15-Sep 25; Mar 1-Apr 15 | Aug 25-Sep 15; Mar 1-Mar 20 | Aug 25-Oct 15; Feb 25-Apr 1 |
| 140 | Ladino or White clover (frost seed onto pasture) | | B:1-2 | 0 | Feb 1-Mar 1 | Jan 25-Mar 10 | Jan 25-Feb 15 | Jan 20-Mar 1 |
| 141 | Red Clover (no-till into suppressed grass sod) | | D:4-6 | ¼ - ½ | Aug 20-Sep 10; Mar 15-Apr 1 | Aug 15-Sep 25; Mar 1-Apr 15 | Aug 25-Sep 15; Mar 1-Mar 20 | Aug 25-Oct 15; Feb 25-Apr 1 |
| 142 | Red Clover (frost seed onto pasture) | | B:4-6 | 0 | Feb 1-Mar 1 | Jan 25-Mar 10 | Jan 25-Feb 15 | Jan 20-Mar 1 |
| Annual Legumes | | | | | | | | |
| 143 | Crimson Clover w/Ryegrass or small grain | | B:20; D:15 & reduce small grain by 1/3 | ¼ - ½ | Aug 15-Sep 10 | Aug 10-Sep 30 | Aug 25-Sep 15 | Aug 20-Oct 15 |
| 144 | Lespedeza, Kobe (Southeast VA) (frost seeded onto pastures) | | B:10-15 | 0 | Not adapted | Not adapted | Not well adapted | Not well adapted |
| 145 | Lespedeza, Korean (frost seeded onto pastures) | | B:10-15 | 0 | Feb 1-Mar 1 | Feb 1-Mar 15 | Jan 25-Mar 1 | Jan 25-Mar 10 |
| 146 | Hairy Vetch w/ small grain | | B: 15; D 10 & reduce small grain by 50% | ½ - 1 ½ | Aug 15-Aug 31 | Aug 15-Sep 15 | Aug 25-Sep 15 | Aug 20-Oct 1 |

TABLE 2.2.1-2

**Seed Mix VABCHNP02: Recommended Cool and Warm Season Forage Species and Seed Mixtures**

| Seeding Mix | Common Species Name | Virginia Native | Seeding Rate (lbs/acre/PLS) B:broadcast; D:drill (4-9" row) | Plant Depth (inches) | Mountain/Valley/Northern Piedmont [a] Best Dates | Mountain/Valley/Northern Piedmont [a] Possible Dates | Southern Piedmont Best Dates | Southern Piedmont Possible Dates |
|---|---|---|---|---|---|---|---|---|
| Other Species | | | | | | | | |
| 147 | Chicory (in mixture w/grass & legume) | | B: 3-4 D: 1-2 | ¼ - ½ | Apr 15-May5 | Apr 1-May 15 | Sep 1-Sep 15 | Sep 1-Oct 10 |
| 148 | Brassicas [j] (sow 1-2 of the following in a 50% rate mix of summer or winter annual grasses in late spring or late summer respectively) Rape, Kale, Turnip, Turnip X Rape, Radish | | B: 2-3 D: 1-2 | ¼ - ½ | May 1 - Jun 30 Aug 1 - Sep 1 | May 1 - Jun 30 Aug 1 - Sep 1 | Apr 20 - Jun 20 Aug 1 - Sep 10 | Apr 20 - Jun 20 Aug 1 - Sep 10 |

Source: Jones, et. al., 2014

[a] The northern piedmont planting dates may be on the opposite end of the planting range compared to the mountains and valley in Southwest VA.

[b] Sprigged and seeded Bermudagrass have been established in the mountain and valley region of the state but are not well adapted and have a higher chance of winter kill.

[c] Native warm season grass planting date will vary within the planting window depending on dormancy of seed and expected annual grass/weed competition in the field.

[d] Eastern Gama grass can be planted with a corn planter (30" row) or with a drill on approximately 15" row centers (by blocking every other seed tube).

[e] This species tends to be a short lived perennial when planted and managed in monocultures in the piedmont and eastern regions of VA; it seems does better in the mountain and valley regions of the state especially when managed with rotational stocking in a mixed stand with other grasses and legumes.

[f] Fall planted alfalfa should not be no-tilled; alfalfa should be planted in spring 30 days prior to last killing frost and in fall 30-60 days before first killing fros.t

[g] Planting too deep is a common cause of stand failure.

[h] It is generally not recommended to plant oats in the fall west of the Blue Ridge because they will winter kill, however they are sometimes planted late summer and grazed in the fall and early winter.

[i] Not recommended for no-till planting, needs a clean firm seedbed to ensure establishment.

[j] Brassicas are not recommended in a monoculture, they are low in fiber and have highly digestible protein and can cause problems with rumen function; they should be planted mixed with summer or winter annuals to avoid problems (50 percent seeding rate of brassicas and 50 percent annuals).

TABLE 2.2.1-3

**Recommended Soil Amendments**

| Type | Application Rate |
|---|---|
| Lime | 2 tons/acre |
| Fertilizer 10-10-10 | 1,000 lbs/acre |

## Mulching

The NRCS Conservation Practice Standard - Mulching (Code 484) (NRCS, 2014) provides a general recommendation for mulching in Virginia. Mulching materials should consist of natural/artificial materials that can provide a certain depth/thickness and durability to achieve adequate cover. Mulch should be applied evenly and, if necessary, anchored into the soil. As a minimum, apply manufactured mulches in accordance with the manufacturer's specifications. The Mulch Specifications table provides some general guidelines when using certain mulches.

TABLE 2.2.1-4

**Mulch Specifications**

| Mulch Type | Suggested Cover |
|---|---|
| Cereal Grain/Grass Hay | 70% Ground Cover |
| Wood Products (Wood Chips, Bark) | ≤ 2-inch thickness |
| Gravel / Other Inorganic Materials | 0.75 to 2-inch diameter / 2-inch thickness |

Mulch should be applied to provide adequate protection from erosion, yet allow light and moisture to penetrate into the seedbed. Typical mulching provides 70 percent cover (approximately 2,000 pounds of straw per acre) with the appropriate erosion control measure to hold the seed and straw in place during establishment, depending on slope (NRCS Code 342) (NRCS, 2011). There are several types of mulches that can be used to conserve soil moisture, promote plant growth, and reduce erosion; however, there are also mulches that can have the reverse affect (see Mulch Considerations table). Consider potential benefit or detrimental effects of mulching to the impacted and surrounding areas.

TABLE 2.2.1-5

**Mulch Considerations**

| Type | Warning | Recommendation |
|---|---|---|
| Rice Hulls (finely textured) | Limited oxygen penetration | <2 inches thick |
| Thick/Tightly Packed Materials | Soggy, anaerobic conditions during wet weather<br>Interference with insect movements, increase of rate of crop pests/diseases<br>Provides nesting habitat for ground-burrowing rodents that can chew extensively on tree trunks/roots | Avoid excessively thick/tightly packed mulches |
| Sawdust (finely-divided plant residues) | Similar Carbon/Nitrogen ratio ties up soil nitrogen and necessitate supplemental nitrogen applications on crops | Use coarser materials, such as grain straw/chipped brush |
| Plastic (Low permeability) | Increase concentrated flow and erosion on nearby sites | Refrain from using low permeability mulches |
| Black Mulch | Warm the soil by conduction | Good for weed control |

Source: NRCS, 2014

An operation and maintenance plan should clearly document:

- Purpose of mulch and type;
- Percent cover and/or thickness of mulch material;
- Timing of application;
- Site preparation; and
- Method of anchoring (i.e., netting, tackifiers, etc.).

## Recommended Perennial Grasses and Pollinator Seed mixtures, Species, and Rates for Mountainous and Piedmont Regions

The following seed mixtures are for the Mountainous and Piedmont Regions of Virginia. These recommendations are based on discussions and information provided by Robert Glennon, private lands biologist from the Conservation Management Institute, Virginia Tech and NRCS, and the Xerces Society.

TABLE 2.2.1-6

**Seed Mix P-VABCHNP01: Recommended Mountain Physiographic Region**
**Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in Virginia**

| Common Name | Scientific Name | Cultivar or Germplasm | Drilled Seeding Rate [a] (weight of pure live seed (PLS) per acre) | Seeds per Square Foot |
|---|---|---|---|---|
| Little Bluestem | *Schizachyrium scoparium* | Cimarron (OK) or Suther Germplasm (NC) | 0.5 pound | 3 |
| Splitbeard Bluestem | *Andropogon ternarius* | Missouri or Kentucky Ecotype | 0.5 pound | 3 |

Source: Glennon, 2015
[a] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 0.25 pounds.

TABLE 2.2.1-7

**Seed Mix P-VABCHNP01: Recommended Mountain Physiographic Region**
**Forb Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in Virginia**

| Common Name [a] | Scientific Name | Flowering Season | Seeding Rate (weight of bulk seed per acre) | Seeds per Square Foot |
|---|---|---|---|---|
| Bearded Beggartick (A) | *Bidens aristosa* | Late Summer | 1 pound | 3 |
| Plains Coreopsis (A) | *Coreopsis tinctoria* | Late Spring | 1 ounce | 3 |
| Partridge Pea (A) | *Chamaecrista fasciculata* | Mid-Summer | 2 pounds | 3 |
| Black-eyed Susan (B) | *Rudbeckia hirta* | Early Summer | 2 ounces | 3 |
| Wild Bergamot (P) | *Monarda fistulosa* | Summer | 1 ounce | 3 |
| Lanceleaf Coreopsis (P) | *Coreopsis lanceolata* | Late Summer | 10 ounces | 3 |
| Maximilian Sunflower (P) | *Helianthus maximilianii* | Late Summer | 11 ounces | 3 |
| Slender Mountain Mint (P) | *Pycnanthemum tenuifolium* | Late Summer | 1 ounce | 3 |
| Purple Coneflower (P) | *Echinacea purpurea* | Early Summer | 1.2 pound | 3 |
| **Total** | — | — | **6.8 lbs/acre** | **33** |

Source: Glennon, 2015
[a] Forb types include (A) for annual flowers, (B) for biennial flowers, and (P) for perennial flowers.

TABLE 2.2.1-8

**Seed Mix P-VABCHNP02: Native Grasses and Forbs for Somewhat Poorly to Very Poorly Drained Soils and have a High Pollinator Value**

| Common Name | Scientific Name | Cultivar or Germplasm | Drilled Seeding Rate (weight of pure live seed (PLS) per acre) | Seeds per Square Foot |
|---|---|---|---|---|
| ***Grasses*** | | | | |
| Beaked Panicum | *Panicum anceps* | SC or MD Ecotype | 0.25 pound | 3 |
| Redtop Panicum | *Panicum rigidulum* | NC Ecotype | 0.20 pound | 3 |
| Forbs (W*ildflowers) – 8 of 9 High Value Pollinator Value* | | | | |
| Common Name<br>A = Annual<br>B = Biennial,<br>P = Perennial | Scientific Name | Flowering Season | Seeding Rate (weight of bulk seed per acre) | Seeds per Square Foot |
| Aster, Purple-stemmed (P) | *Symphyotrichum puniceum var. puniceum* | Fall | 3 ounces | 3 |
| Bergamot, Wild (P) | *Monarda fistulosa* | Summer | 1 ounce | 3 |
| Coreopsis, Plains (A) | *Coreopsis tinctoria* | Late Spring | 1 ounce | 3 |
| Goldenrod, Pine Barrens (P) | *Solidago fistulosa* | Late Summer | 3 ounces | 3 |
| Joe Pye Weed, Spotted (P) | *Eupatoriadelphus fistulosus* | Late Summer | 2 ounces | 3 |
| Partridge Pea (A) | *Chamaecrista fasciculata* | Mid-Summer | 2 pounds | 3 |
| Rattlesnake Master (P) | *Eryngium yuccifolium* | Summer | 8 ounces | 3 |
| Rosemallow (P) | *Hibiscus moscheutos* | Summer | 2 ounces | 3 |
| Narrowleaf Sunflower (P) | *Helianthus angustifolius* | Late Summer | 4 ounces | 3 |
| **Total** | — | — | **4.0 lbs/acre** | **33** |

Source: Glennon, 2015
Note: If the broadcast method is more feasible, increase the perennial grasses in the mixture by 0.25 pounds.

### 2.2.2 Federal Lands

#### George Washington National Forest – Augusta, Bath, and Highland Counties

*This section is pending additional consultation with the U.S. Forest Service.*

### 2.2.3 State Lands

#### James River Wildlife Management Area – Nelson County

The following seed mixtures and application rates recommendations are for the James River WWA in Nelson County, Virginia. The recommendations are based on correspondence and discussions with Virginia Department of Game and Inland Fisheries regional specialist staff (Amy Ewing, environmental services biologist/FWIS Manager, Virginia Department of Game and Inland Fisheries). These seed mixes are considered suitable for planting of the ACP pipeline. The specialist staff is supportive of the use of native vegetation mixes that stabilize the corridor while providing food and cover for a variety of wildlife.

## James River Wildlife Management Area (WMA) Excessively to Moderately Well Drained – Partially Shade Sites

TABLE 2.2.1-9

**Seed Mix VJRWMA01: Recommended Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained – Partially Shade Sites [a]**

| Common Name | Scientific Name | Seed Mix Rate (lbs/acre/PLS)[b] |
|---|---|---|
| June Grass | *Koeleria macrantha* | 0.012 |
| Canada Wild Rye | *Elymus canadensis* | 0.083 |
| Virginia Wild Rye | *Elymus virginicus* | 0.208 |
| Creeping Red Fescue | *Festuca rubra* | 0.167 |
| Purple Top | *Tridens flavus* | 0.083 |
| Upland Bentgrass | *Agrostis perennans* | 0.005 |
| Little Bluestem | *Schizachyrium scoparium* | 0.208 |
| Broomsedge | *Andropogon virginicus* | 0.033 |
| Fall Panicum | *Panicum anceps* | 0.167 |
| Nimblewill | *Muhlenbergia schreberii* | 0.033 |
| **Total** | **—** | **1.0** |

Source: Recommendations provided by the Virginia Department of Game and Inland Forest.
a Recommended seeding application rate is 6.3 to 9.0 pounds per acre.
b lbs/acre/PLS = pounds per acre of pure live seed

## James River WMA Excessively to Moderately Well Drained – Wildlife Sites

TABLE 2.2.1-10

**Seed Mix VJRWMA02: Recommended Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained – Wildlife Sites [a]**

| Common Name | Scientific Name | Seed Mix Rate (lbs/acre/PLS)[b] |
|---|---|---|
| Big Bluestem | *Andropogon gerardii* | 0.070 |
| Indian Grass | *Sorghastrum nutans* | 0.070 |
| Little Bluestem | *Schizachyrium scoparium* | 0.141 |
| Switchgrass (Blackwell) | *Panicum virgatum* | 0.070 |
| Canada Wild Rye | *Elymus canadensis* | 0.106 |
| Tall Dropseed | *Sporobolus compositus* | 0.070 |
| Purple Top | *Tridens flavus* | 0.035 |
| Plains Coreopsis | *Coreopsis tinctoria* | 0.019 |
| Purple Prairie Clover | *Dalea purpurea* | 0.057 |
| Blackeyed Susan | *Rudbeckia hirta* | 0.033 |
| Illinois Bundleflower | *Desmanthus illinoensis* | 0.077 |
| Partridge Pea | *Cassia fasciculata* | 0.120 |
| Browneyed Susan | *Rudbeckia triloba* | 0.025 |
| Maximilian Sunflower | *Helianthus maximiliani* | 0.060 |
| Roundhead Lespedeza | *Lespedeza capitata* | 0.033 |
| New England Aster | *Aster novae-angliae* | 0.012 |
| **Total** | — | 1.0 |

Source: Recommendations provided by the Virginia Department of Game and Inland Forest.
a Recommended seeding application rate is 6.3 to 9.0 pounds per acre.
b lbs/acre/PLS = pounds per acre of pure live seed.

James River WMA Steep Slope Stabilization Sites

TABLE 2.2.1-11

**Seed Mix VJRWMA03: Recommended Grass Seed Mixes and Application Rates for Steep Slopes Stabilization – Sites**

| Common Name | Scientific Name | Seed Mix Rate (lbs/acre/PLS)[b] |
|---|---|---|
| Seed Mix [a] | | |
| Creeping Red Fescue | *Festuca rubra* | 0.050 |
| Virginia Wild Rye | *Elymus virginicus* | 0.083 |
| Fall Panicum | *Panicum anceps* | 0.083 |
| Side Oats Grama | *Bouteloua curtipendula* | 0.083 |
| Big Bluestem | *Andropogon gerardii* | 0.083 |
| Indian Grass | *Sorghastrum nutans* | 0.083 |
| Purple Top | *Tridens flavus* | 0.033 |
| Switchgrass | *Panicum virgatum* | 0.083 |
| Little Bluestem | *Schizachyrium scoparium* | 0.083 |
| Bird's Foot Trefoil | *Lotus corniculatus* | 0.025 |
| Lance Leaved Coreopsis | *Coreopsis lanceolata* | 0.042 |
| Blackeyed Susan | *Rudbeckia hirta* | 0.008 |
| Partridge Pea | *Cassia fasciculata* | 0.058 |
| Illinois Bundleflower | *Desmanthus illinoensis* | 0.033 |
| False Sunflower | *Heliopsis helianthoides* | 0.042 |
| Showy Tickseed | *Bidens aristosa* | 0.042 |
| Maximilian Sunflower | *Helianthus maximiliani* | 0.042 |
| Iron Weed | *Vernonia altissima* | 0.025 |
| Hairy Mountain Mint | *Pycnanthemum pilosum* | 0.003 |
| Gray Goldenrod | *Solidago nemoralis* | 0.013 |
| **Total** | — | 1.0 |
| Common Name | | Seed Application Rate (lbs/acre/PLS)[b] |
| Seed Mix | | |
| Buckwheat[c] | | 15-20 |
| Millet | | 5-7 |
| Korean lespedeza | | 5-7 |
| Perennial Ryegrass | | 5-8 |
| Blackwell switchgrass | | 3-4 |

Source: Recommendations provided by the Virginia Department of Game and Inland Forest.
[a] Recommended seeding application rate is 7.4 to 10.7 pounds per acre.
[b] lbs/acre/PLS = pounds per acre of pure live seed.
[c] Buckwheat is somewhat frost sensitive and deepening on the planting date, increase the application rate Korean lespedeza to compensate and decrease or remove the application of buckwheat.

## 2.2.4 Dinwiddie, Greensville, and Southampton Counties, and Chesapeake and Suffolk Cities (Coastal Plain Region)

The following seed mixtures, site preparation, seeding techniques, and amendments recommendations are for Dinwiddie, Greensville, Suffolk, Southampton, and Chesapeake Counties. These recommendations are based on information provided by Mr. Robert Glennon. NRCS Conservationists in these counties referred to Mr. Robert Glennon's recommendations.

### 2.2.4.1 Recommended Grass Seed Mixtures, Application Rates, and Planting Dates

Seeding species, cultivars, rates, and planting dates are contained in the table below. The materials identified as "common" do not require a specific cultivar for successful establishment and performance. Nurse crops must be sown at the same time as the perennial cover species to ensure that the site will have quick cover. The temporary cover specifications are intended for use when the site will not be sown to a perennial cover immediately after construction and a temporary cover is needed until the seed can be sown during the proper seeding season.

TABLE 2.2.4-1

**Seed Mix VACSDGS01: Recommended Cool and Warm Season Species, Cultivars, Seeding Rates, Seeding Dates, and Temporary Cover**

| Species | Cultivars | Seeding Application Rate (lbs/acre) | Seeding Dates |
|---|---|---|---|
| Tall Fescue and White Clover (Cool Season Mixture) | | | |
| Tall Fescue | Bronson – endophyte free, Max-Q<br>Jessup – friendly endophyte | 20-25 pounds broadcast<br>15-20 drilled | September 1 – October 31;<br>February 1 – March 31 |
| White Clover | White Dutch Type | 2 pounds broadcast,<br>1 pound drilled | September 1 – October 31;<br>February 1 – March 31 |
| Bermudagrass and Japanese Lespedeza (Warm Season Mixture) | | | |
| Bermudagrass | Common<br>Cheyenne II<br>Pasto Rico<br>Ranchero Frio | 10-12 pounds broadcast;<br>8-10 pounds drilled | April 1 – June 10 |
| Japanese Lespedeza | Kobe | 10-12 pounds broadcast or drilled | April 1 – June 10 |
| Nurse Crops (Sow with the Perennial Seed Mixtures for Quick Cover) | | | |
| Oats | Common | 25-30 pounds broadcast;<br>20-25 drilled | September 1 – November 15;<br>February 1 – April 20 |
| Rye | Common | 35-50 broadcast;<br>25-40 drilled | September 1 – November 15;<br>February 1 – April 20 |
| Wheat | Common | 40-50 broadcast;<br>30-40 drilled | September 1 – November 15;<br>February 1 – April 20 |
| Millet (Browntop, German, Italian, Foxtail, Proso) | Common | 10-15 broadcast;<br>7-10 drilled | April 20 – August 1 |
| Temporary Crops (Sow on Areas that will not be Seeded Immediately) | | | |
| Oats | Common | 80-95 broadcast;<br>65-80 drilled | September 1 – November 15;<br>February 1 – April 20 |
| Rye | Common | 120 broadcast;<br>100 drilled | September 1 – November 15;<br>February 1 – April 20 |
| Wheat | Common | 120 broadcast;<br>100 drilled | September 1 – November 15;<br>February 1 – April 20 |
| Millet (Browntop, German, Italian, Foxtail, Proso | Common | 20-30 broadcast;<br>15-20 drilled | April 20 – August 31 |

Note: Seeding Rates in Bulk Pounds per Acre – Non-Native Seed Must Have a minimum Germination and Purity to be Sold.

## Site Preparation

The soils on the Coastal Plain of Virginia in Dinwiddie, Greensville, Suffolk, and Southampton counties typically have sandy topsoil but have a heavy clay subsoil close to the soil surface. The sandy topsoil must be kept separate during construction to prevent mixing with the subsoil, which will ensure easy till-ability and compaction and allow seeds to sow without restriction. To ensure optimum conditions in the soil for germination and early growth for soils sown to non-native species, the species should be tested, limed, and fertilized according to the soil test recommendations.

### Seeding Technique

Seed may be established by broadcasting on a firm seedbed and packing the seed, or by drilling the seed into a firm seedbed and packing the seed. Drilled seed of the perennial seed grass species, legumes, and annual millets should only be placed at a depth of ¼ inch. The nurse crops and temporary cover species oats, rye, and wheat may be broadcast but will perform best if drilled at a one-inch depth.

### Mulching

To ensure that the seed will remain in place through germination and growth, seedlings must be mulched. Synthetic or processed mulch must be applied and anchored according to the manufacturer's recommendations. Straw (seed stalks of small grains – usually wheat) may be used as mulch at a rate of 75 to 100 pounds per acre (1.5 to 2.5 tons per acre). The mulch must be anchored with a sprayed on product or netting applied according to the manufacturer's recommendations. It should be noted that hay must not be used as mulch, as hay typically contains weeds that would negatively impact the restoration of the area.

### 2.2.4.2 Recommended Perennial Grasses and Pollinator Seed Mixtures, Species, and Application Rates for the Coastal Plain Region

The following seed mixtures are for the Coastal Plain Region of Virginia. These recommendations are based on discussions and information provided by Robert Glennon.

TABLE 2.2.4-2

**Seed Mix P-VACSDGS01: Perennial Grass and Forb Mixture for Excessively to Moderately Well Drained Soils that Meets NRCS Pollinator Mix Requirements – Higher Pollinator Value (7 of 9 High Value) Drilled**

| Common Name | Scientific Name | Cultivar or Germplasm | Seeding Rate (weight of pure live seed (PLS) per acre) Drilled | Seeds per Square Foot |
|---|---|---|---|---|
| *Perennial Grasses in Mixture* | | | | |
| Little Bluestem | *Schizachyrium scoparium* | 'Cimarron' (OK) or Suther Germplasm (NC) | 0.5 pound | 3 |
| Splitbeard Bluestem | *Andropogon ternarius* | Missouri or Kentucky Ecotype | 0.5 pound | 3 |
| *Forbs (Wildflowers) in Mixture* | | | | |
| Common Name<br>A = Annual<br>B = Biennial<br>P = Perennial | Scientific Name | Flowering Season | Seeding Rate (weight of bulk seed per acre) Drilled | Seeds per Square Foot |
| Narrowleaf Mountain Mint (P) | *Pycnanthemum tenuifolium* | Late Summer | 1 ounce | 3 |
| Plains Coreopsis (A) | *Coreopsis tinctoria* | Late Spring | 1 ounce | 3 |
| Partridge Pea (A) | *Chamaecrista fasciculata* | Mid-Summer | 2 pounds | 3 |
| Black-eyed Susan (B) | *Rudbeckia hirta* | Early Summer | 2 ounces | 3 |
| Bergamot, Spotted (P) | *Monarda fistulosa* | Summer | 1 ounce | 3 |
| Lanceleaf Coreopsis (P) | *Coreopsis lanceolata* | Late Summer | 10 ounces | 3 |
| Maximilian Sunflower (P) | *Helianthus maximilianii* | Late Summer | 11 ounces | 3 |
| Indian Blanket (A) | *Gaillardia pulchella* | Indeterminate | 9 ounces | 3 |
| Purple Coneflower (P) | *Echinacea purpurea* | Early Summer | 1.2 pound | 3 |
| **Total** | — | — | **6.4 lbs/acre** | **33** |

Source: Glennon, 2015
Note: If the broadcast method is more feasible, increase the perennial grasses in the mixture by 0.25 pounds.

TABLE 2.2.4-3

**Seed Mix P-VACSDGS02: Native Grasses and Forbs for Somewhat Poorly to Very Poorly Drained Soils and have a High Pollinator Value - Higher Pollinator Value (8 of 9 High Value)**

| Common Name | Scientific Name | Cultivar or Germplasm | Seeding Rate (weight of pure live seed (PLS) per acre) Drilled | Seeds per Square Foot |
|---|---|---|---|---|
| Grasses in Mixture | | | | |
| *Beaked Panicum* | *Panicum anceps* | SC or MD Ecotype | 0.25 pound | 3 |
| Redtop Panicum | *Panicum rigidulum* | NC Ecotype | 0.20 pound | 3 |
| *Forbs (Wildflowers) in Mixture* | | | | |
| Common Name<br>A = Annual<br>B = Biennial,<br>P = Perennial | Scientific Name | Flowering Season | Seeding Rate (weight of bulk seed per acre) Drilled | Seeds per Square Foot |
| Aster, Purple-stemmed (P) | *Symphyotrichum puniceum var. puniceum* | Fall | 3 ounces | 3 |
| Sneezeweed, Common (P) | *Helenium autumnale* | Fall | 2 ounces | 3 |
| Coreopsis, Plains (A) | *Coreopsis tinctoria* | Late Spring | 1 ounce | 3 |
| Goldenrod, Wrinkleleaf (P) | *Solidago rugosa* | Late Summer | 2 ounces | 3 |
| Joe Pye Weed, Spotted (P) | *Eupatoriadelphus fistulosus* | Late Summer | 2 ounces | 3 |
| Partridge Pea (A) | *Chamaecrista fasciculata* | Mid-Summer | 2 pounds | 3 |
| Rattlesnake Master (P) | *Eryngium yuccifolium* | Summer | 8 ounces | 3 |
| Rosemallow (P) | *Hibiscus moscheutos* | Summer | 2 ounces | 3 |
| Narrowleaf Sunflower (P) | *Helianthus angustifolius* | Late Summer | 4 ounces | 3 |
| Total | — | — | 4 lbs/acre | 33 |

## 2.3 NORTH CAROLINA

### 2.3.1 Northampton County

The following recommendations of seed mixtures, rates, planting dates, and amendments are for Northampton County, North Carolina. The recommendation is from Paul Boone (NRCS District Conservationist).

### Recommended Grass Seed Mixtures, Application Rates, Planting Dates, and Amendments

TABLE 2.3.1-1

**Seed Mix NCNO01: Recommended Cool Season Seed Mixture**

| Common Species Name [a] | Seed Application Rate (lbs/acre/PLS)[b] | Planting Date |
|---|---|---|
| Spring (February - March) and Fall (September - November) Seeding | | |
| Tall Fescue mixed with any of the following grains: | 60 | Feb - Nov |
| Wheat | 60 | Oct 25 - Nov 15 |
| Oats and Barley | 60 | Sept 1 - Oct 15 |
| Rye | 60 | Sept 15 - Nov 1 |
| Korean Lespedeza | 20 | March - May |
| Sercia Lespedeza | 20 | Oct - May |

[a] Recommendations provided by the Northampton County NRCS office District Conservationist.
[b] lbs/acre/PLS = pounds per acre of pure live seed
Note: Apply small grain mulch at 2 tons/acre or check with the NRCS office for alternatives mulches.

TABLE 2.3.1-2

**Seed Mix NCNO02: Recommended Warm Season Seed Mixture**

| Common Species Name [a] | Seed Application Rate (lbs/acre/PLS) | Planting Date |
|---|---|---|
| Temporary Cover | | |
| Brown Top Miller | 30-40 | May 5 – July 5 |
| Japanese Millet | 25 | May 5 – July 5 |
| Permanent Cover | | |
| Pensacola Bahia | 25 | March 15 – June 15 |
| Pensacola Bahia mixed with any of the following: | 20 | March - May |
| Annual Lespedeza | 20 | March - May |
| Kolb Lespedeza | 20 | March - May |
| Common Lespedeza | 20 | March - May |
| Korean Lespedeza | 20 | March - May |
| Bermuda Grass (Hulled) | 8-10 | April - July |
| Bermuda Grass | | |
| Hulled Bermunda (up June) | 6-10 | April – July |
| Unhulled Bermuda | 15-18 | January - March |

[a] Recommendations provided by the Northampton County NRCS office District Conservationist.

TABLE 2.3.1-3

**Recommended Soil Amendments**

| Type | Application Rate |
|---|---|
| Lime | 2 tons/acre |
| Fertilizer 10-10-10 | 1,000 lbs/acre |

### 2.3.2 Halifax and Wilson Counties

The following seed mixture, planting dates, and cover crop recommendations are primarily for Wilson County, but are also applicable for Halifax County. The recommendation is from David Little (NRCS District Conservationist).

## Recommended Grass Seed Mixtures, Application Rates, Planting Dates, and Cover Crops

TABLE 2.3.2-1

**Seed Mix NCHW01: Recommended Cool Season Seed Mixture**

| Common Species Name [a] | Seed Application Rate (lbs/acre/PLS) [b] | Planting Date |
|---|---|---|
| Tall Fescue and White Clover | 30-50 | Sept 1 – Sept 30 (Coastal Plain) |
| Cover Crop [a] | | |
| Buckwheat | 80 | Late Winter-Spring |
| Oats | 180 | Late Winter-Spring |
| Rye | 120-180 | Late Winter-Spring |
| Ryegrass | 30-40 | Late Winter-Spring |
| Oats and Ryegrass | 90 | Late Winter-Spring |
| Oats and Korean Lespedeza | 20 | Late Winter-Spring |
| Browntop Miller | 30-40 | Summer |
| Rye | 120-180 | Late Summer/Early Winter |
| Ryegrass | 30-40 | Late Summer/Early Winter |
| Oats (Before Oct 1) | 120-180 | Late Summer/Early Winter |
| Barley (Before Oct 15) | 120-180 | Late Summer/Early Winter |
| Wheat (After Oct 1) | 120-180 | Late Summer/Early Winter |
| Rye and Ryegrass mixture | 60 Rye + 20 Ryegrass | Late Summer/Early Winter |
| Little barley | 75-80 | Late Summer/Early Winter |

[a] Temporary cover vegetation is desirable to minimize erosion and pollution and permanent vegetation cannot be established due to seasons of the year, and where a temporary seeding is needed to control erosion and water pollution prior to the establishment of finished grade or perennial vegetation. The temporary measures should be coordinated with the permanent erosion control measures planned, to assure economical and effective control.

[b] lbs/acre/PLS = pounds per acre of pure live seed

### 2.3.3 Nash and Johnston Counties

The following species and cover crop seeding application rates, planting dates, and amendments recommendations are for Nash and Johnston counties. The seed mixture recommendations are from correspondence with Patrick Evans (NRCS District Conservationist Nash County) and Brian Loaholt (NRCS District Conservationist). Seed Mix NCNJ01 provides seeding specifications for conservation work.

### Recommended Grass Seeding Species, Application Rates, Planting Dates, Cover Crops, and Amendments

TABLE 2.3.3-1

**Seed Mix NCNJ01: Recommended Cool Season Grass Seed Mixture**

| Common Species Name [a] | Seed Application Rate (lbs/acre/PLS)[b] | Planting Date |
|---|---|---|
| Tall Fescue | 30-40 | Sept 1 – Sept 30 (Coastal Plain) |
| Sorghum (Cover crop) [c] | 60-120 | — |

[a] Recommendations provided by the Nash County NRCS office District Conservationist.
[b] lbs/acre/PLS = pounds per acre of pure live seed
[c] Temporary cover vegetation is desirable to minimize erosion and pollution and permanent vegetation cannot be established due to seasons of the year, and where a temporary seeding is needed to control erosion and water pollution prior to the establishment of finished grade or perennial vegetation. The temporary measures should be coordinated with the permanent erosion control measures planned, to assure economical and effective control.
Notes: Mulch seeded area with small grain straw. Spread evenly over the area at the rate of 1-2 tons/acre. Apply mulch so that about 25 percent of the ground is visible.

TABLE 2.3.3-2

**Recommended Lime and Fertilizer Application**

| Type | Application Rate |
|---|---|
| Lime | 2 tons/acre |
| Fertilizer - 10-10-10 | 500 - 700 lbs/acre |

## 2.3.4 **Sampson County**

The following recommendations for seed mixtures, rates, planting dates, and amendments are for Sampson County. The recommendations are based on correspondence with Gavin Thompson (NRCS District Conservationist) and Susan Davis (West Virginia Department of Natural Resources). Seed Mixes NCSA01 and NCSA02 are NRCS recommended cool and warm season mixtures for disturbed areas. No pollinator species specific to the County were recommended by the Conservationist.

### 2.3.4.1 Recommended Grass Seed Mixtures, Application Rates, and Planting Dates

TABLE 2.3.4-1

**Seed Mix NCSA01: Recommended Cool Season Seed Mixture**

| Common Species Name [a] | Seeding Application Rate (lbs/acre/PLS)[b] | Planting Date |
|---|---|---|
| Tall Fescue or | 40-50 | Sept - March |
| Bermudagrass (hull attached) | 15 | January - March |

[a] Recommendations provided by the Sampson County NRCS office District Conservationist. Used Tall Fescue to seed wet spots along the pipeline.
[b] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 2.3.4-2

**Seed Mix NCSA02: Recommended Warm Season Seed Mixture**

| Common Species Name | Seeding Application Rate (lbs/acre/PLS) | Planting Date |
|---|---|---|
| Bermudagrass (hull removed) | 8-10 | April – August |

[a] Recommendations provided by the Sampson County NRCS office District Conservationist.
[b] lbs/acre/PLS = pounds per acre of pure live seed

### 2.3.4.2 Recommended Lime and Fertilizer Application

Where soils are relatively uniform and amendments can be incorporated, use appropriate lime and fertilize according to a soils test. In the absence of a soil test, use the recommended lime and fertilizers application rates in the table below.

TABLE 2.3.4-3

**Recommended Lime and Fertilizer Application**

| Type | Application Rate |
|---|---|
| Lime (dolomite) | 1-2 tons/acre |
| Fertilizer 10-10-10 | 500 - 800 lbs/acre [a] |

Notes: Any seeding should also be mulched with small grain straw or equivalent at a rate of 1 to 2 tons per acre. When mulching, be sure to eave approximately 25 percent of the ground exposed to allow light to penetrate. Mulch should be anchored to prevent loss.

### 2.3.4.3 Planting Recommendations

Where conventional equipment is used for planting, seed shall be applied uniformly with cultipacker-seeders, drills, seeders or other mechanical seeders. Any equipment that will apply seed uniformly is acceptable. Seeding may be done by hand where it is not practical or feasible to use equipment.

### 2.3.4.4 Mulching Recommendations

- Mulching is essential on all sites, especially steep, erosive sites where plant establishment may be expected to be difficult.

- Use of dry, unchopped, and unweathered small grain straw or hay-free-seeds (from completing plant species). Spread at the rate of 1-2 tons per acre depending upon the site and season.

- Apply mulch uniformly so that about 25 percent of the ground surface is visible.

- Anchor mulch immediately after placement to minimize loss by water and/or wind.

### 2.3.5 **Cumberland County**

The following recommended seed mixture, rates, planting dates, cover crop, and amendments are for Cumberland County. The recommendations are from correspondence with Renessa Brown (NRCS District Conservationist). No pollinator species recommendations specific to the County were provided.

#### 2.3.5.1 Recommended Seed Mixtures, Application Rates, and Planting Dates

TABLE 2.3.5-1

**Seed Mix NCCU01: Recommended Cool and Warm Season Seed Mixture**

| Common Species Name [a] | Seeding Application Rate (lbs/acre/PLS)[b] | Planting Date |
|---|---|---|
| Common or Hybrid Bernudagrass (hull removed or scarified) | 5-7 (drill)<br>6-8 (broadcast) | April 1 – May 15 (best);<br>April 1 – June 7 (possible) |
| Cover Crop [c] | | |
| Buckwheat | 80 | Late Winter-Spring |
| Oats | 180 | Late Winter-Spring |
| Rye | 120-180 | Late Winter-Spring |
| Ryegrass | 30-40 | Late Winter-Spring |
| Oats and Ryegrass | 20 and 90 | Late Winter-Spring |
| Oats and Korean Lespedeza | 20 and 90 | Late Winter-Spring |
| Browntop Miller | 30-40 | Summer |
| Rye | 120-180 | Late Summer/Early Winter |
| Ryegrass | 30-40 | Late Summer/Early Winter |
| Oats (Before Oct 1) | 180 | Late Summer/Early Winter |
| Barley (Before Oct 15) | 120-180 | Late Summer/Early Winter |
| Wheat (After Oct 1) | 120-180 | Late Summer/Early Winter |
| Rye and Ryegrass mixture | 60 Rye + 20 Ryegrass | Late Summer/Early Winter |
| Little barley | 75-80 | Late Summer/Early Winter |

[a] Recommendations provided by the Cumberland County NRCS office District Conservationist.

[b] lbs/acre/PLS = pounds per acre of pure live seed

[c] Select from the following table a quick growing grass with high seedling vigor that is suited to the area, When temporary vegetation is desirable to minimize erosion and pollution and permanent vegetation cannot be established due to seasons of the year, and where a temporary seeding is needed to control erosion and water pollution prior to the establishment of finished grade or perennial vegetation. The temporary measures should be coordinated with the permanent erosion control measures planned, to assure economical and effective control.

TABLE 2.3.5-2

**Recommended Lime and Fertilizer Application**

| Planting | Fertilizer Analysis | Fertilizer Rate (lbs/acre) | Lime Rate (lbs/acre) |
|---|---|---|---|
| Perennial Grasses with or without Legumes, Fertilizer no incorporated | 10-10-10 | 10 lbs / 1,000 sq. ft. | 46 lbs / 1,000 sq. ft. |
| Temporary Cover, Fertilizer not incorporated | 10-10-10 | 12 – 16 lbs / 1,000 sq. ft. | 92 lbs / 1,000 sq. ft. |

TABLE 2.3.5-3

**Recommended Mulch Material Rates and Uses**

| Material | Minimum Rates Per Acre | Coverage | Remarks |
|---|---|---|---|
| Dry unchopped, unweathered small grain straw or hay-free-seeds (of competing plants) | 1 – 2 tons/acre | 75% (25% of ground is visible) | Evenly spread mulch over the area by hand or blower-type spreading equipment |
| burlap and pine boughs | — | 100% | Secure in place if flowing water is involved |
| Jute matting | — | 100% | May be used in the place of mulch or sod; has the strength to withstand water flow. It is an accepted practice to sow half the seed before placing the matting. Sow the remaining half after the matting is laid. |
| Barnyard manure and bedding | — | 75% (25% of ground is visible) | Do not apply within 50 feet of surface waters |
| Wood fiber (excelsior) | — | — | Available as mulch material to be blown on after seeding or as a matting to be stapled on steep slopes, waterways, etc. |

Source: WVDEP, 2012

### 2.3.5.2 Planting Recommendations

Mulching should be specified to reduce damage from water run-off and improve moisture conditions for seedlings. Temporary vegetation can be satisfactorily established without the use of mulch.

## 2.3.6 Robeson County

The following seed mixture, rates, and planting date recommendations are for Robeson County. The recommendation comes from Jeremy Ruston (NRCS District Conservationist).

### Recommended Grass Seed Mixtures

TABLE 2.3.6-1

**Seed Mix NCRO01: Recommended Warm Season Seed Mixture**

| Common Species Name [a] | Seeding Rate (lbs/acre/PLS)[b] | Planting Date |
|---|---|---|
| Switchgrass (Carthage or Cave-In-Rock cultivars) | 1 | April 1 – May 15 |
| Little Bluestem | 1.5 | April 1 – May 15 |
| Indian Grass | 1 | April 1 – May 15 |

[a] Recommendations provided by the Robeson County NRCS office District Conservationist.

[b] lbs/acre/PLS = pounds per acre of pure live seed

## Recommended Pollinator Seed Mixtures

TABLE 2.3.6-2

**Seed Mix P-NCRO01: Recommended Pollinator Seed Mixture**

| Common Name | Scientific Name | Bloom Period | Sun | Soil | Seeding Application Seed Rate (lbs/acre/PLS)[a] |
|---|---|---|---|---|---|
| Lanceleaf coreopsis | *Coreopsis lanceolata* | April – June | Full – Shade | Dry – Moist | 0.3 |
| Wrinkleleaf goldenrod | *Solidago rugosa* | Late Summer | Full to Partial shade | Moist | |
| Purple coneflower | *Echinacea purpurea* | April – September | Full to Partial shade | Dry | |

Source: Recommendations provided by the Roberson County NRCS office District Conservationist.
[a] lbs/acre/PLS = pounds per acre of pure live seed

## 2.3.7 Recommended Native Grass and Pollinator Seed Mixtures, Application Rates, and Non-Native Cover Crop by Physiographical Region (Coastal Plain)

The following seed mixtures are for the Coastal Plan Region. These recommendations are from discussions with Roundstone Native Seed and Robert Glennon.

## Recommended Seed Mixtures by Geographical Region (Coastal Plain) and Drainage Class

TABLE 2.3.7-1

**Seed Mix P-CPDW01: Recommended Coastal Plain Physiographic Region**
**Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in North Carolina [a]**

| Common Name | Scientific Name | Height (Inches) | Sun Exposure | Seed Mix Rate (lbs/acre/PLS)[b] |
|---|---|---|---|---|
| Little Bluestem | *Schizachyrium scoparium* | 2- 4 | Full Sun | 0.250 |
| Virginia Wild Rye | *Elymus virginicus* | 2 - 4 | Full Sun | 0.250 |
| Tall Dropseed | *Sporobolus compositus* | 2 - 3 | Full Sun | 0.050 |
| Purple Top | *Tridens flavus* | 3 - 5 | Part Shade | 0.058 |
| Indian Grass | *Sorghastrum nutans* | 3 - 6 | Full Sun | 0.167 |
| Switchgrass | *Panicum virgatum* | 3 - 7 | Full Sun | 0.183 |
| Fall Panicum | *Panicum anceps* | 2 - 4 | Part Shade | 0.042 |
| **Total** | — | — | — | **1.0** |

Sources: Roundstone Native Seed, 2015; Glennon, 2015
[a] Recommended seeding application rate is 8 to 18 pounds per acre.
[b] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 2.3.7-2

**Seed Mix P-CPDW01: Recommended Coastal Plain Physiographic Region**
**Forb Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in North Carolina**

| Common Name | Scientific Name | Color | Bloom Period | Seed Application Rate (lbs/acre/PLS)[b] |
|---|---|---|---|---|
| Lance Leaved Coreopsis | *Coreopsis lanceolata* | Yellow | Spring, Summer | 0.266 |
| Spotted Beebalm | *Monarda punctata* | Pink | Spring, Summer | 0.124 |
| Common Milkweed | *Asclepias syriaca* | Pink | Spring, Summer | 0.107 |
| Smooth Beardtongue | *Penstemon digitalis* | White | Spring | 0.107 |
| Bergamot | *Monarda fistulosa* | Lavender | Summer | 0.124 |
| Partridge Pea | *Cassia fasciculata* | Yellow | Summer | 0.621 |
| Spiked Blazing Star | *Liatris spicata* | Pink | Summer | 0.222 |
| Lupine | *Lupinus perennis* | Blue | Summer | 0.497 |
| Early Goldenrod | *Solidago juncea* | Yellow | Summer | 0.160 |
| Starry Silphium | *Silphium asteriscus* | Yellow | Summer, Fall | 0.178 |
| Iron Weed | *Vernonia altissima* | Purple | Summer, Fall | 0.222 |
| Sneezeweed | *Helenium autumnale* | Yellow | Summer, Fall | 0.124 |
| Hairy Mountain Mint | *Pycnanthemum pilosum* | White | Summer, Fall | 0.089 |
| **Total** | — | — | — | **2.84** |

Sources: Roundstone Native Seed, 2015; Glennon, 2015
[a] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 2.3.7-3

**Seed Mix P-CPDW02: Recommended Coastal Plain Physiographic Region**
**Grass Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in North Carolina [a]**

| Common Name | Scientific Name | Height (Inches) | Sun Exposure | Seed Mix Rate (lbs/acre/PLS)[b] |
|---|---|---|---|---|
| Switchgrass | *Panicum virgatum* | 3 - 7 | Full Sun | 0.233 |
| Red Top Panicum | *Panicum rigidulum* | 2 - 4 | Full Sun | 0.017 |
| Fowl Manna Grass | *Glyceria striata* | 3 - 5 | Part Shade | 0.008 |
| Virginia Wild Rye | *Elymus virginicus* | 2 - 4 | Full Sun | 0.217 |
| Canada Wild Rye | *Elymus canadensis* | 2 - 5 | Part Shade | 0.167 |
| Deer Tongue Grass | *Panicum clandestinum* | 2 - 4 | Full Sun | 0.058 |
| Big Bluestem | *Andropogon gerardii* | 4 - 10 | Full Sun | 0.167 |
| Frank's Sedge | *Carex frankii* | 1 - 2 | Part Shade | 0.042 |
| Fox Sedge | *Carex vulpinoidea* | 2 - 3 | Part Shade | 0.025 |
| Fall Panicum | *Panicum anceps* | 2 - 4 | Part Shade | 0.067 |
| **Total** | — | — | — | **1.0** |

Sources: Roundstone Native Seed, 2015; Glennon, 2015
[a] Recommended seeding application rate is 8 to 18 pounds per acre.
[b] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 2.3.7-4

**Seed Mix P-CPDW02: Recommended Coastal Plain Physiographic Region Forb Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in North Carolina**

| Common Name | Scientific Name | Color | Bloom Period | Seed Application Rate (lbs/acre/PLS)[a] |
|---|---|---|---|---|
| Smooth Beardtongue | *Penstemon digitalis* | White | Spring | 0.169 |
| Butterfly Milkweed | *Asclepias tuberosa* | Orange | Spring, Summer | 0.056 |
| Ohio Spiderwort | *Tradescantia ohiensis* | Blue | Spring, Summer | 0.084 |
| Blackeyed Susan | *Rudbeckia hirta* | Yellow | Spring, Summer | 0.180 |
| Spiked Blazing Star | *Liatris spicata* | Pink | Summer | 0.264 |
| Hoary Mountain Mint | *Pycnanthemum incanum* | White | Summer | 0.034 |
| Early Goldenrod | *Solidago juncea* | Yellow | Summer | 0.113 |
| Bergamot | *Monarda fistulosa* | Lavender | Summer | 0.169 |
| Showy Tickseed | *Bidens aristosa* | Yellow | Summer, Fall | 0.366 |
| Starry Silphium | *Silphium asteriscus* | Yellow | Summer, Fall | 0.113 |
| Narrow-Leaved Sunflower | *Helianthus angustifolius* | Yellow | Summer, Fall | 0.113 |
| Joe-Pye Weed | *Eupatorium fistulosum* | Pink | Summer, Fall | 0.141 |
| **Total** | — | — | — | **1.80** |

Sources: Roundstone Native Seed, 2015; Glennon, 2015
[a] lbs/acre/PLS = pounds per acre of pure live seed

## Recommended Non-native Temporary Cover Crop Species and Non-native Grass Cover

Use of non-native temporary cover species (P-NNTC) on all plantings where erosion potential is high or where the site must be vegetated within 30 days is recommended. Furthermore, use the non-native grass mixes (P-NNGC) with the forb mixes where slope is steep for native species to germinate and where erosion potential is high.

TABLE 2.3.7-5

**Seed Mix P-NNTC: Recommended Non-native Temporary Cover Crop Species**

| Common Name | Scientific Name | Height (Inches) | Sun Exposure | Seeding Application Rate (lbs/acre/PLS)[a] |
|---|---|---|---|---|
| *For Summer Use in Native Mixes* | | | | |
| Brown Top Millet | *Panicum ramosum* | 3 - 3.5 | Full sun | 5.0 |
| *For Spring and Fall Use in Native Mixes* | | | | |
| Spring Oats | *Avena sativa* | 2 – 2.5 | Full sun | 30.0 |
| *For Fall and Winter Use in Native Mixes* | | | | |
| Annual Rye Grass | *Lolium multiflorum* | 2 – 2.5 | Part shade | 6.0 |

Source: Roundstone Native Seed, 2015
[a] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 2.3.7-6

**Seed Mix P-NNGC: Recommended Non-native Grass Cover Mix [a]**

| Common Name | Scientific Name | Height (Inches) | Sun Exposure | Seed Mix Rate (lbs/acre/PLS)[b] |
|---|---|---|---|---|
| Fescue | *Festuca arundinacea* | 2 - 3 | Part Shade | 0.300 |
| Timothy | *Phleum pratense* | 2 - 4 | Part Shade | 0.100 |
| Orchard Grass | *Dactylis glomerata* | 2 - 3 | Part Shade | 0.100 |
| Red Top | *Agrostis alba* | 2 - 3 | Full Sun | 0.020 |
| Ladino Clover | *Trifolium repens* | 1 - 1.5 | Part Shade | 0.040 |
| Annual Rye Grass | *Lolium multiflorum* | 2 - 2.5 | Part Shade | 0.170 |
| Creeping Red Fescue | *Festuca rubra* | 1 - 2 | Full Sun | 0.250 |
| Kentucky Bluegrass | *Poa pratensis* | 1-2 | Full Sun | 0.020 |
| **Total** | — | — | — | **1.0** |

Source: Roundstone Native Seed, 2015
[a] Recommended seeding application rate is 30 to 50 pounds per acre.
[b] lbs/acre/PLS = pounds per acre of pure live seed

# 3.0 SUPPLY HEADER PROJECT

## 3.1 WEST VIRGINIA

### 3.1.1 Wetzel and Tyler Counties

The following recommended seed mixtures, rates, and amendments are primarily for Tyler County but also include a portion of Wetzel County, West Virginia. The recommendation is from correspondence with Dustin Adkins (NRCS District Conservationist). The recommendation is for the area starting at Mile 23 (estimated portion in Tyler County) through Mockingbird Hill (Wetzel County). No pollinator species specific to the County were recommended by the Conservationist.

**Recommended Seed Mixtures, Application Rates, Planting Dates, and Amendments**

TABLE 3.1.1-1

**Seed Mix WVWE01: Recommended Cool Season Seed Mixture**

| Seed Mixture | Common Species Name | Seed Rate (lbs/acre/PLS)[a] |
|---|---|---|
| 1 | Orchard Grass | 8 |
| | Ladino Clover | 2 |
| 2 | White Clover | 2 |
| | Orchardgrass | 5 |
| | Kentucky Bluegrass | 5 |
| 3 | Red Clover | 4 |
| | Alsike Clover | 2 |
| | Orchardgrass | 4 |

[a] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 3.1.1-2

**Recommended Seeding Dates for Permanent Cover**

| Planting Dates | Suitability |
|---|---|
| March 1 to April 15 | Best seeding periods. |
| August 1 to October 1 | |
| December 1 to March 1 | Good seeding period. Dormant seeding. |
| April 15 to August 1 | **HIGH RISK** – moisture stress likely. |
| October 1 to December 1 | **HIGH RISK** – freeze damage to young seedlings. |

Source: WVDEP, 2012

TABLE 3.1.1-3

**Recommended Lime and Fertilizer Application for Permanent Seeding**

| pH of Soil | Lime (tons/ acre) | Fertilizer (10-20-20 or equivalent) (lbs/acre) |
|---|---|---|
| > 6.0 | 2 | 500 |
| 5.0 to 6.0 | 3 | |
| < 5.0 | 4 | |

## Recommended Lime and Fertilizer Application

Lime should be applied to all permanent seedlings. Once pH is known, use the information in the above Table to determine the amount (tons) of lime to use onsite. For the best results, apply the lime and fertilizer at the time of the seedbed preparation. The recommended lime and fertilizer application for temporary seeding in the absence of a soil test is provided in the below table.

TABLE 3.1.1-4

**Recommended Lime and Fertilizer Application for Temporary Seeding (Absent of a Soil Test)**

| Species | Nitrogen (N) (lbs/acre) | Phosphorus ($P_2O_5$) (lbs/acre) | Potassium ($K_2O$) (lbs/acre) | Recommendations (per acre) |
|---|---|---|---|---|
| Cool Season Grass | 40 | 80 | 80 | 400 lbs 10-20-20 |
| Cool Season Grass & Legume | 30 | 60 | 60 | 300 lbs 10-20-20 |
| Temporary Cover | 40 | 40 | 40 | 200 lbs 19-19-19 |

Source: WVDEP, 2012

## 3.1.2 State Lands

## Lewis Wetzel Wildlife Management Area – Wetzel County

The following seed mixtures, application rates, and soil amendments recommendations are for the Lewis Wetzel WMA in Wetzel County, West Virginia. The recommendations are based on correspondence and discussions with the West Virginia Department of Natural Resources (Steve Rauch, District Wildlife Biologist), which recommended the use of the seed mixtures and soil amendments discussed in the West Virginia Enhancing Wildlife Habitat on Oil and Gas Infrastructure booklet (West Virginia Department of Natural Resources, 2015).

Recommended Seed Mixtures and Application Rates

The following planting recommendations are intended to enhance early successional stage habitat found along access roads and pipelines.

TABLE 3.1.2-1

**Seed Mix WVLWWMA01: Recommended Grass Seed Mixes and Application Rates**

| Common Species Name | Scientific Name | Seeding Application Rate (lbs/acre/PLS)[a] |
|---|---|---|
| Perennial, Cool Season Seed Mix [b] | | |
| Ladino White Clover [c] | *Trifolium repens* | 4 |
| Mammoth Red Clover [c] | *Trifolium pratense* | 5 |
| Forage Clover | *Cichorium intybus* | 2 |
| Winter Wheat [d] | *Triticum aestivum* | 50 |
| Perennial, Cool Season, Slopes Seed Mix [e] | | |
| Ladino White Clover [c] | *Trifolium repens* | 8 |
| Red Clover [c] | *Trifolium pratense* | 5 |
| Birdsfoot Trefoil [c] | *Lotus corniculatus* | 8 |
| Orchardgrass | *Dactylis glomerata* | 15 |
| Winter Wheat [d] | *Triticum aestivum* | 50 |

Source: WVDRN, 2015

[a] lbs/acre/PLS = pounds per acre of pure live seed

[b] Ideal for use in areas where the landscape is generally flat and where the objective is to have vegetative cover for pollinator species and wildlife habitat for turkey/grouse broods, and forage for deer

[b] Herbaceous legumes must be treated with the appropriate inoculant before seeding.

[d] Autumn planting: September 1 through October 15 or substitute annual rye. Spring planting: substitute oats at the same rate between February 15 and March 15, and retain the other species as listed.

[e] Ideal for sloped areas, as grasses are typically added to cool season mixes to provide habitat and erosion control measures.

Recommended Lime and Fertilizer Application

Application of soil amendments should be based on soil test recommendations. In the absence of a soil test, fertilizer and lime should be applied at the rates shown in Table 3.1.2-2.

TABLE 3.1.2-2

**Recommended Lime and Fertilizer Application**

| Type | Application Rate |
|---|---|
| Lime | 3 tons/acre |
| Fertilizer - 10-20-20 | 600 lbs/acre |

Source: WVDRN, 2015

### 3.1.3 **Doddridge and Harrison Counties**

The following recommended seed mixtures, planting dates, and amendments are for Doddridge and Harrison counties. These recommendations are based on the collection of correspondences with federal and state agencies, including Greg Stone (NRCS Acting State Resource Conservationist), Jeff Griffith (NRCS District Conservationist). No pollinator species specific to the County were recommended by the Conservationists.

## Recommended Seed Mixtures and Application Rates

TABLE 3.1.3-1

**Seed Mix WVDH01: Recommended Cool Season Seed Mixtures**

| Seed Mixture | Common Species Name [a] | Seed Application Rate (lbs/acre/PLS)[b] | Suitable Land Use |
|---|---|---|---|
| 1 | Orchardgrass | 10 | Pasture or Hay |
| | ***Ladino Clover*** | 2 | |
| | Red Clover | 3 | |
| | ***Redtop*** | 3 | |
| 2 | **Kentucky Bluegrass** | 20 | Pasture |
| | ***Ladino Clover*** | 2 | |
| | Red Clover | 3 | |
| | ***Redtop*** | 3 | Pasture or Hay |
| 3 | Orchardgrass | 20 | |
| | ***Redtop*** | 5 | |
| | Birdsfoot Trefoil | 10 | |

[a] Species in bold are more wildlife-friendly; species in italics are suitable for use in filter strips.
[b] lbs/acre/PLS = pounds per acre of pure live seed

## Recommended Seeding Dates for Permanent Cover and Amendments

TABLE 3.1.3-2

**Recommended Seeding Dates for Permanent Cover**

| Planting Dates | Suitability |
|---|---|
| March 1 to April 15 | Best seeding periods. |
| August 1 to October 1 | |
| December 1 to March 1 | Good seeding period. Dormant seeding. |
| April 15 to August 1 | **HIGH RISK** – moisture stress likely. |
| October 1 to December 1 | **HIGH RISK** – freeze damage to young seedlings. |

TABLE 3.1.3-3

**Recommended Lime and Fertilizer Application**

| Type | Application Rate |
|---|---|
| Lime | 3 tons/acre |
| Fertilizer - 10-20-20 | 400 lbs/acre |

**Planting Recommendations**

- Certified seed is preferred.
- All legumes should be planted with proper inoculants prior to seeding.
- Soil fertility and pH level will be amended to satisfy the needs of the plant species planned.
- For unprepared seedbeds or seeding outside the optimum timeframes:
    - Add 50 percent more seed to the specified rate, particularly during the periods of April 15 – August 1, and October 1 – March 1.
    - Double the seeding rate and consider planning an annual small grain like wheat (2 bushels [120 pounds] per acre) to act as a nurse crop.

### 3.1.4 **Recommended Native Grasses and Pollinators Seed Mixtures, Application Rates, and Non-Native Cover Crop by Physiographical Region**

Use the same recommended pollinator seed mixtures, non-native temporary cover, and non-native grass cover as indicted in Section 1.1.3 for the ACP in West Virginia.

## 3.2 PENNSYLVANIA

### 3.2.1 **Westmoreland County**

Seed mixtures, rates, and amendments were selected based on appropriate site conditions and recommendations from Christopher Droste (Conservation District) and adapted from the Pennsylvania Department of Environmental Protection Erosion and Sediment Pollution Control Program Manual. No pollinator species specific to the County were recommended by the Conservationist.

**Recommended Seed Mixtures and Application Rates**

TABLE 3.2.1-1

**Seed Mix PAWE01: Recommended Cool Season Seed Mixture**

| | Seeding Application Rate (lbs/acre/PLS)[b] | |
|---|---|---|
| Common Species Name | Most Sites | Adverse Sites |
| Birdsfoot trefoil [a], plus | 6 | 10 |
| -Tall fescue | 30 | 35 |

[a] For Birdsfoot trefoil use empire variety. For slopes > 33 percent (3H:1V), add perennial rye at 20 lbs/acre. For planting outside March 1 - October 15, use winter oats at 90 lbs/acre and winter rye at 56 lbs/acre.

[b] lbs/acre/PLS = pounds per acre of pure live seed

## Recommended Soil Amendments

TABLE 3.2.1-2

**Soil Amendment Application Rate Equivalents [a]**

| Soil Amendment | Per Acre | Per 1,000 Square feet (lbs) | Per 1,000 square Yard (lbs) | Notes |
|---|---|---|---|---|
| Agricultural lime | 7.5 tons | 300 | 3100 | Or as per soil test; may not be required in agricultural fields |
| 20-20-20 fertilizer | 1,000 lbs | 25 | 210 | Or as per soil test; may not be required in agricultural fields |

[a] For agricultural or private lands, contractor will use rates above unless otherwise specified by landowner.

TABLE 3.2.1-3

**Recommended Mulch Type and Rates**

| Mulch Type | Per Acre (tons) | Per 1000 Square Feet (lbs) | Per 1000 Square Yard (lbs) | Notes |
|---|---|---|---|---|
| Straw | 3 | 140 | 1240 | Either wheat or oat straw, free of weeds, not chopped or finely broken |
| Hay | 3 | 140 | 1240 | Timothy, mixed clover and timothy or other native forage grasses |
| Wood Chips | 4-6 | 185-275 | 1650-2500 | May prevent germination of grasses and legumes |
| Hydromulch | 1 | 47 | 415 | See limitations above |

## 4.0 REFERENCES


Glennon, Robert. 2015. Personal communication with Herbert Pirela of Environmental Resources Management, Inc. Private Lands Biologist.

Jones, J., Glennon, B., Lawrence, C., Faulkner, D., and C. Gordon. 2014. USDA-NRCS Virginia Plant Establishment Guide. Revised 2014.

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West Virginia Department of Environmental Protection. 2012. West Virginia Erosion and Sediment Control Field Manual. Available online at: http://www.dep.wv.gov/oil-and-gas/Documents/Erosion%20Manual%2004.pdf. Accessed October 2015.

West Virginia Department of Natural Resources. 2015. Enhancing Wildlife Habitat on Oil and Gas Infrastructure. Available online at: http://www.wvdnr.gov/Publications/OilGasAndWildlife.pdf

**Attachment A**
**Summary of Seed Mixes by County for the**
**Atlantic Coast Pipeline and Supply Header Project**

ATTACHMENT A

**Summary of Seed Mixtures by County for the Atlantic Coast Pipeline and Supply Header Project**

| Approximate Milepost Range | County and State | Suggested Cool Season Seed Mix Number [a] | Suggested Warm Season Seed Mix Number [a] | Suggested Pollinator Seed Mix Number [a] | Federal, State/Commonwealth, or local Agency/ Subject Matter Expert Contact Information |
|---|---|---|---|---|---|
| **Atlantic Coast Pipeline** | | | | | |
| Spread 1 (AP-1) | | | | | |
| 0.0–29.1 | Harrison, WV | WVHLRU01 | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | District Conservationist - Jeff Griffith (304) 624-9232 ext. 11; jeff.griffith@wv.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| | Lewis, WV | WVHLRU01 | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | District Conservationist - Jeff Griffith (304) 624-9232 ext. 110; jeff.griffith@wv.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| | Upshur, WV | WVHLRU01 | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | Acting State Conservationist - Greg Stone (304) 284-7579; greg.stone@wv.usda.gov. Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| Spread 2 (AP-1) | | | | | |
| 29.1–50.6 | Upshur, WV | WVHLRU01 | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | Acting State Conservationist - Greg Stone (304) 284-7579; greg.stone@wv.usda.gov,Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| | Randolph, WV | WVHLRU01 | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | District (1) Wildlife Biologist - Steve Rauch (304) 825-6787; Steven.E.Rauch@wv.gov. |
| Spread 2 A (AP-1) | | | | | |
| 50.6-65.3 | Randolph, WV | WVHLRU01 | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | District (1) Wildlife Biologist - Steve Rauch (304) 825-6787; Steven.E.Rauch@wv.gov |
| Spread 3 (AP-1) | | | | | |
| 65.3-79.2 | Randolph, WV | WVHLRU01 | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | District (1) Wildlife Biologist - Steve Rauch (304) 825-6787; Steven.E.Rauch@wv.gov |
| | Pocahontas, WV | WVPO01 | WVPO01; P-MUDW01 or MUMP02; P-NNTC or P-NNGC | P-MUDW01 or MUMP02; P-NNTC or P-NNGC | District Conservationist - Iden Gunther (304) 255-9225; idun.guenther@wv.usda.gov. Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| Spread 3A (AP-1) | | | | | |
| 79.2-91.3 | | | | | |
| | Pocahontas, WV | WVPO01 | WVPO01; P-MUDW01 or MUMP02; P-NNTC or P-NNGC | P-MUDW01 or MUMP02; P-NNTC or P-NNGC | District Conservationist - Iden Gunther (304) 255-9225; idun.guenther@wv.usda.gov. Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |

ATTACHMENT A

**Summary of Seed Mixtures by County for the Atlantic Coast Pipeline and Supply Header Project**

| Approximate Milepost Range | County and State | Suggested Cool Season Seed Mix Number [a] | Suggested Warm Season Seed Mix Number [a] | Suggested Pollinator Seed Mix Number [a] | Federal, State/Commonwealth, or local Agency/ Subject Matter Expert Contact Information |
|---|---|---|---|---|---|
| | Highland, VA | VABCHNP01 | VABCHNP02 | P-VABCHNP01 or P-VABCHNP02 | District Conservationist - Charles Ivins (540) 248-6218 ext. 122; charles.ivins@va.usda.gov, Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. |
| Spread 4 (AP-1) | | | | | |
| 91.3–125.9 | Highland, VA | VABCHNP01 | VABCHNP02 | P-VABCHNP01 or P-VABCHNP02 | District Conservationist - Charles Ivins (540) 248-6218 ext. 122; charles.ivins@va.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. |
| | Bath, VA | VABCHNP01 | VABCHNP02 | P-VABCHNP01 or P-VABCHNP02 | District Conservationist – Charles Simmons; charles.simmons@va.usda.gov, Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. |
| | Augusta, VA | VABCHNP01 | VABCHNP02 | P-VABCHNP01 or P-VABCHNP02 | District Conservationist - Charles Ivins (540) 248-6218 ext. 122; charles.ivins@va.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov |
| Spread 5 (AP-1) | | | | | |
| 125.9–183.3 | Augusta, VA | VABCHNP01 | VABCHNP02 | P-VABCHNP01 or P-VABCHNP02 | District Conservationist - Charles Ivins (540) 248-6218 ext. 122; charles.ivins@va.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov |
| | Nelson, VA | VABCHNP01 | VABCHNP02 | P-VABCHNP01 or P-VABCHNP02 | State Biologist - Jeffray Jones (804) 287-1691; Jeffray.Jones@va.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov |
| Spread 6 (AP-1) | | | | | |
| 183.3–239.6 | Nelson, VA | VABCHNP01 | VABCHNP02 | P-VABCHNP01 or P-VABCHNP02 | State Biologist - Jeffray Jones (804) 287-1691; Jeffray.Jones@va.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov |
| | Nelson, VA; James River WWA | VJRWMA01; VJRWMA02; or VJRWMA03 | VJRWMA01; VJRWMA02; or VJRWMA03 | | Environmental Services Biologists – Amy Ewing (804) 367-2211; Amy.Ewing@dgif.virginia.gov |
| | Buckingham, VA | VABCHNP01 | VABCHNP02 | P-VABCHNP01 or P-VABCHNP02 | District Conservationist - David Harris (434) 983-4757 x 101; david.harris@va.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov |
| | Cumberland. VA | VABCHNP01 | VABCHNP02 | P-VABCHNP01 or P-VABCHNP02 | District Conservationist - David Harris (434) 983-4757 x 101; david.harris@va.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov |
| | Prince Edward, VA | VABCHNP01 | VABCHNP02 | P-VABCHNP01 or P-VABCHNP02 | District Conservationist - J.B. Daniel (434) 392-4171; j.b.daniel@va.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov |
| | Nottoway, VA | VABCHNP01 | VABCHNP02 | P-VABCHNP01 or P-VABCHNP02 | Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov |

ATTACHMENT A

**Summary of Seed Mixtures by County for the Atlantic Coast Pipeline and Supply Header Project**

| Approximate Milepost Range | County and State | Suggested Cool Season Seed Mix Number [a] | Suggested Warm Season Seed Mix Number [a] | Suggested Pollinator Seed Mix Number [a] | Federal, State/Commonwealth, or local Agency/ Subject Matter Expert Contact Information |
|---|---|---|---|---|---|
| Spread 7 (AP-1) | | | | | |
| 239.6–300.1 | Nottoway, VA | VABCHNP01 | VABCHNP02 | P-VABCHNP01 or P-VABCHNP02 | Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov |
| | Dinwiddie, VA | VACSDGS01 | VACSDGS01 | P-VACSDGS01 or P-VACSDGS02 | Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov |
| | Brunswick, VA | VABCHNP01 | VABCHNP02 | P-VABCHNP01 or P-VABCHNP02 | Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov |
| | Greensville, VA | VACSDGS01 | VACSDGS01 | P-VACSDGS01 or P-VACSDGS02 | Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov |
| | Northampton, NC | NCNO01 | NCNO02 | P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC | District Conservationist - Paul Boone (252) 534-2591; paul.boone@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| Spread 8 (AP-2) | | | | | |
| 0.0–61.6 | Northampton, NC | NCNO01 | NCNO02 | P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC | District Conservationist - Paul Boone (252) 534-2591; paul.boone@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| | Halifax, NC | NCHW01 | P-CPDW01 or P-CPMP02 | P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC | District Conservationist -David Little (252) 237-2711; David.Little@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| | Nash, NC | NCNJ01 | P-CDW01 or P-CPMP02 | P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC | District Conservationist - Patrick Evans (252) 459-4116; patrick.evans@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| Spread 9 (AP-2) | | | | | |
| 61.6–61.6 | Nash, NC | NCNJ01 | P-CPDW01 or P-CPMP02 | P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC | District Conservationist - Patrick Evans (252) 459-4116; patrick.evans@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Roundstone Native Seed (270) 234-7160. |
| | Wilson, NC | NCHW01 | P-CPDW01 or P-CPMP02 | P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC | District Conservationist -David Little (252) 237-2711; David.Little@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| | Johnston, NC | NCNJ01 | P-CDW01 or P-CPMP02 | P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC | District Conservationist - Brian Loadholt (919) 934-7156; brian.loadholt@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |

ATTACHMENT A

**Summary of Seed Mixtures by County for the Atlantic Coast Pipeline and Supply Header Project**

| Approximate Milepost Range | County and State | Suggested Cool Season Seed Mix Number [a] | Suggested Warm Season Seed Mix Number [a] | Suggested Pollinator Seed Mix Number [a] | Federal, State/Commonwealth, or local Agency/ Subject Matter Expert Contact Information |
|---|---|---|---|---|---|
| | Sampson, NC | NCSA01 | NCSA02 | P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC | District Conservationist - Gavin Thompson (910) 592-7963; gavin.thompson@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| | Cumberland, NC | NCCU01 | NCCU01 | P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC | District Conservationist - Renessa Hardy-Brown (910) 484-8479; renessa.brown@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| Spread 10 (AP-2) | | | | | |
| 61.5–183.0 | Cumberland, NC | NCCU01 | NCCU01 | P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC | District Conservationist - Renessa Hardy-Brown (910) 484-8479; renessa.brown@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| | Robeson, NC | P-CPDW01 or P-CPMP02 | NCRO01 | P-CPDW01, P-CPMP02, or P-NCRO01; P-NNTC or P-NNGC | District Conservationist - Jeremy Roston ( 910) 739-5478; jeremy.roston@usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| Spread 11 (AP-3) | | | | | |
| 0.0–83.0 | Northampton, NC | NCNO01 | NCNO02 | P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC | District Conservationist - Paul Boone (252) 534-2591; paul.boone@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| | Greensville, VA | VACSDGS01 | VACSDGS01 | P-VACSDGS01 or P-VACSDGS02 | Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov |
| | Southampton, VA | VACSDGS01 | VACSDGS01 | P-VACSDGS01 or P-VACSDGS02 | Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov |
| | Suffolk, VA | VACSDGS01 | VACSDGS01 | P-VACSDGS01 or P-VACSDGS02 | Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov |
| Spread 12 (AP-4; AP-5) | | | | | |
| 0.0–0.4; 0.0-1.1 | Brunswick, VA | VABCHNP01 | VABCHNP02 | P-VABCHNP01 or P-VABCHNP02 | District Conservationist - Davie Wade Harris (434) 848-2145 ext. 102; davie.harris@va.usda.gov |
| | Greensville, VA | VACSDGS01 | VACSDGS01 | P-VACSDGS01 or P-VACSDGS02 | Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov |

ATTACHMENT A

**Summary of Seed Mixtures by County for the Atlantic Coast Pipeline and Supply Header Project**

| Approximate Milepost Range | County and State | Suggested Cool Season Seed Mix Number [a] | Suggested Warm Season Seed Mix Number [a] | Suggested Pollinator Seed Mix Number [a] | Federal, State/Commonwealth, or local Agency/ Subject Matter Expert Contact Information |
|---|---|---|---|---|---|
| **Supply Header Project** | | | | | |
| Spread 13 (TL-635) | | | | | |
| 0.0–33.6 | Wetzel, WV | WVWE01 | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | District Conservationist - Dustin Adkins (304) 758-2173; dustin.adkins@wv.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| | Wetzel, WV; Lewis Wetzel WMA | WVLWWMA01 | | | District Wildlife Biologist - Steve Rauch (304)825-6787; steven.e.rauch@wv.gov |
| | Doddridge, WV | WVDH01 | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | Acting State Conservationist - Greg Stone (304) 284-7579; greg.stone@wv.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| | Tyler, WV | WVWE01 | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | District Conservationist - Dustin Adkins (304) 758-2173; dustin.adkins@wv.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| | Harrison, WV | WVDH01 | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC | Acting State Conservationist - Greg Stone (304) 284-7579; greg.stone@wv.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160. |
| Spread 14 (TL-636) | | | | | |
| 0.0–3.9 | Westmoreland, PA | PAWE01 | None Recommended | None Recommended | Westmoreland Conservation District, Christopher Droste, Senior Erosion Control Specialist (724) 837-5271; chris@wcdpa.com. |

[a] Tables describing each seed mix are located within the text of Appendix A.

**ATLANTIC COAST PIPELINE, LLC**
**ATLANTIC COAST PIPELINE**

**and**

**DOMINION TRANSMISSION, INC.**
**SUPPLY HEADER PROJECT**

**Restoration and Rehabilitation Plan**

**Appendix C**
**Recommended Seed Mixes by Milepost**
**(to be provided prior to construction)**

# APPENDIX N

Access Road Plans

Provided Separately

# APPENDIX O

Road Crossing Methods Table

Appendix O
Road Crossing Methods

| Crossing Number | Road Crossing ID | Spread_Number | Milepost | RID | Road Name | Width | State | County | Crossing Method |
|---|---|---|---|---|---|---|---|---|---|
| 1 | WV-DOD-0001 | Spread 13 | 1.36 | TL-635 | Dry Fork Road (CR 27) | 30 | WV | Doddridge County | Open Cut |
| 2 | WV-DOD-0002 | Spread 13 | 2.08 | TL-635 | Meathouse Fork (CR 25) | 30 | WV | Doddridge County | Open Cut |
| 3 | WV-DOD-0003 | Spread 13 | 2.89 | TL-635 | Johnson Fork (CR 44/3) | 30 | WV | Doddridge County | Open Cut |
| 4 | WV-DOD-0004 | Spread 13 | 6.74 | TL-635 | Greenbrier Fork (CR 17) | 40 | WV | Doddridge County | Conventional Bore |
| 5 | WV-DOD-0005 | Spread 13 | 7.89 | TL-635 | Buffalo Calf Road (CR 24) | 30 | WV | Doddridge County | Open Cut |
| 6 | WV-DOD-0006 | Spread 13 | 9.42 | TL-635 | Long Run Road (CR 38) | 30 | WV | Doddridge County | Open Cut |
| 7 | WV-DOD-0007 | Spread 13 | 10.60 | TL-635 | US Rt 50 | 100 | WV | Doddridge County | Conventional Bore |
| 8 | WV-DOD-0008 | Spread 13 | 10.64 | TL-635 | Old US Rt 50 | 60 | WV | Doddridge County | Open Cut |
| 9 | WV-DOD-0009 | Spread 13 | 12.98 | TL-635 | Big Flint Road (CR 3) | 60 | WV | Doddridge County | Conventional Bore |
| 10 | WV-DOD-0010 | Spread 13 | 15.62 | TL-635 | Yankee Camp Road (CR 20/2) | 30 | WV | Doddridge County | Open Cut |
| 11 | WV-DOD-0011 | Spread 13 | 17.83 | TL-635 | Little Battle/Nazareth Farms Road (CR 55/8) | 30 | WV | Doddridge County | Open Cut |
| 12 | WV-DOD-0012 | Spread 13 | 18.61 | TL-635 | WV Hwy 23 | 60 | WV | Doddridge County | Conventional Bore |
| 13 | WV-DOD-0013 | Spread 13 | 20.69 | TL-635 | Franks Run (CR 6) | 30 | WV | Doddridge County | Open Cut |
| 14 | WV-TYL-0014 | Spread 13 | 23.09 | TL-635 | Indian Creek Road (CR 13) | 30 | WV | Tyler County | Open Cut |
| 15 | WV-WET-0015 | Spread 13 | 29.49 | TL-635 | US Rt 20 | 100 | WV | Wetzel County | Conventional Bore |
| 16 | WV-WET-0016 | Spread 13 | 30.92 | TL-635 | Richwood Run Road (CR 7/6) | 30 | WV | Wetzel County | Conventional Bore |
| 17 | WV-WET-0017 | Spread 13 | 31.80 | TL-635 | Upper Run Road (CR 20/4) | 30 | WV | Wetzel County | Open Cut |

# APPENDIX P

Blasting Plan

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

**and**

**DOMINION TRANSMISSION, INC**
**SUPPLY HEADER PROJECT**
**Docket No. CP15-555-000**

# Blasting Plan

*Updated, Rev. 2*

**Prepared by**

ERM

**July 18, 2016**

**TABLE OF CONTENTS**

**LIST OF ACRONYMS AND ABBREVIATIONS**

| | |
|---|---|
| ACP | Atlantic Coast Pipeline |
| Atlantic | Atlantic Coast Pipeline, LLC |
| DTI | Dominion Transmission, Inc. |
| GPS | global positioning system |
| PPV | peak particle velocity |
| Project | Atlantic Coast Pipeline |
| SHP | Supply Header Project |

## 1.0 INTRODUCTION

Atlantic Coast Pipeline, LLC (Atlantic) – a company formed by four major energy companies - Dominion Resources, Inc.; Duke Energy Corporation; Piedmont Natural Gas Co., Inc.; and AGL Resources, Inc. – proposes to construct and operate approximately 600 miles of natural gas transmission pipelines and associated aboveground facilities in West Virginia, Virginia, and North Carolina. This Project, referred to as the Atlantic Coast Pipeline (ACP), will deliver up to 1.5 million dekatherms per day of natural gas from supply areas in the Appalachian region to demand areas in Virginia and North Carolina. Atlantic has contracted with Dominion Transmission, Inc. (DTI), a subsidiary of Dominion Resources, Inc., to construct and operate the ACP on behalf of Atlantic.

In conjunction with the ACP, DTI proposes to construct and operate approximately 37.5 miles of pipeline loop and modify existing compression facilities in Pennsylvania and West Virginia. This Project, referred to as the Supply Header Project (SHP), will enable DTI to provide firm transportation service to various customers, including Atlantic.

## 2.0 PURPOSE

Based on an analysis of the Natural Resource Conservation Service's Soil Survey Geographic Database, approximately 26 percent (155.8 miles) of the proposed ACP and SHP pipeline routes will cross areas with bedrock at depths of less than 60 inches. More than half (81.7 miles) of this bedrock are considered paralithic (soft) and may not require blasting during construction. The remaining areas will 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* outlines the procedures and safety measures that Atlantic's and DTI's construction contractors (referred to as the Contractor below) will adhere to while conducting blasting activities required for the construction of the ACP and SHP. 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 or DTI for approval. Approval of a site-specific Blasting Specification Plan does not relieve the Contractor from responsibility or liability.

## 3.0 GENERAL REQUIREMENTS

Blasting for grade or trench excavation will be used where deemed necessary by the Contractor, and approved by an Atlantic or DTI representative, after examination of the site. To the extent practical on USFS lands, rock trenching will be accomplished using mechanical means such as rippers, rock hammers, John Henry drills, etc.

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 or DTI with appropriate information documenting the experience, licenses, and permits associated with blasting personnel.

Blasting-related operations will comply with applicable Federal, 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.

## 4.0 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, the Contractor will verify with an Atlantic or DTI representative that all property owners have been notified of the upcoming construction activities. The Contractor will notify all such parties at least 48 hours prior to blasting.
- The Contractor will submit to Atlantic or DTI its site-specific Blasting Specification Plan for approval prior to the execution of blasting activity.

## 5.0 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;
- Global positioning system (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 on steep slopes.

## 6.0 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 or DTI representative upon completion of blasting activities at each blasting site.

## 7.0 SAFETY

### 7.1 Protection of Aboveground and Underground Structures

Where blasting is determined to be required, Atlantic and DTI 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, measures to minimize blasting impacts on steep slopes, 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, the well will be repaired or otherwise restored or the well owner will be compensated for confirmed damages. Atlantic and DTI will provide an alternative potable water supply to the landowner until repairs occur.
- If blasting occurs within 150 feet of any aboveground structures, the Contractor and an Atlantic or DTI 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.
- The Contractor will be responsible for the ultimate resolution of all damage claims resulting from blasting. Such liability is not restricted by the 150-foot inspection requirement cited above.
- Blasting will not be allowed within 15 feet of an existing pipeline, unless specifically authorized by an Atlantic or DTI 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.
- 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 or DTI 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 or DTI 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 or DTI representative for approval.
- Under pipeline crossings and all other areas where drilling and blasting is required within 15 feet of existing facilities:
  - Drill holes will be reduced to a maximum of 2 inches or less in diameter.
  - The number of holes shot at one time will be limited to three unless otherwise approved by an Atlantic or DTI representative.
  - Appropriate delay between charges will be used to attain desired fragmentation.

## 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 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 or DTI representative and the site in question will be visited and examined by the consultant before any approval is granted.
- Atlantic and DTI may employ two-way radios for communication between vehicles and office facilities. The Contractor will advise Atlantic or DTI and other pipeline 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 or DTI. This work will not be left to the cleanup crew.

### 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 or DTI 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 or DTI 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.

## 8.0 KARST

In accordance with Atlantic's and DTI's *Karst Monitoring and Mitigation Plan*, 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).
- 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.

- 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 larger 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.

## 9.0 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.

# APPENDIX Q

Inspection Form

The following form or similar will be used during inspections for the SHP Project

Dominion

Date Approved: ____________________

By: ____________________

# Supply Header Project
# Inspection Checklist

**Check One**

_____ Routine Weekly Inspection  Date: ____________

_____ Precip. event > 0.5-inch  Date: ____________

**Inspector Names/ID #**

1

2

3

**Additional Comments**

**Soil Conditions:**  Notes:

_____ Dry  _____ Saturated

_____ Wet  _____ Frozen

**Weather Conditions:**

| Location | LL No. | Feature Details | Inspector ID | Soil Presently Disturbed? | Inspection Date/Time | | ECDs Functional? | ECDs Need Maintenance /Repair/ Replacement? | Photos | Date Corrected | Comments (include notes of Corrective Actions to address permit requirements) |
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Notes:

Y = Yes

N = No

ECDs = Erosion control devices

EI = Environmental Inspector

Road or railroad crossing

# APPENDIX R

Training Record

**Training Record**
**Storm Water, Sediment, and Erosion Control Training**

Project Name: ______________________

Instructor's Name: ______________________

Location: ______________________

Date: ______________________

Length: ______________________

Topics:

- ☐ Erosion Control BMPs
- ☐ Sediment Control BMPs
- ☐ Non-Storm Water BMPs
- ☐ Emergency Procedures
- ☐ Groundwater Protection Plan
- ☐ Good Housekeeping BMPs
- ☐ SWPPP Provisions
- ☐ Conducting Inspections
- ☐ Turbidity Monitoring
- ☐ Other (Specify):_______

Attendee Roster: (attach additional pages as necessary)

| Name of Attendee | Company/Agency |
|---|---|
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Inspector's Signature: ______________________

Title: ______________________