Mountain Valley Pipeline Project

Docket No. CP16-__-000

Resource Report 7 – Soils

October 2015

Mountain Valley Pipeline Project
Resource Report 7 – Soils

Resource Report 7 Filing Requirements	
Information	**Location in Resource Report**
Minimum Filing Requirements	
1. Identify, describe, and group by milepost the soils affected by the proposed pipeline and aboveground facilities. (§ 380.12(I)(1)) • List the soil associations by milepost and describe their characteristics.	Section 7.2 Appendices 7-A1, 7-A2 and 7-B
2. For aboveground facilities that would occupy sites over 5 acres, determine the acreage of prime farmland soils that would be affected by construction and operation. (§ 380.12(I)(2)) • List the soil series, describe their characteristics and percentages within the site. • Indicate the onsite percentage of each series that would be permanently affected. • Indicate which series are considered “prime or unique farmland.”	Section 7.2
3. Describe by milepost potential impacts on soils. (§ 380.12(I)(3,4))	Section 7.3
4. Identify proposed mitigation to minimize impact on soils and compare with the staff’s Upland Erosion Control, Revegetation, and Maintenance Plan. (§ 380.12(I)(5)) • Identify any measures of the Plan that are deemed unnecessary, technically infeasible, or unsuitable and describe alternative measures that will ensure an equal or greater level of protection.	Section 7.3

FERC Environmental Information Request for Resource Report 7 Dated March 13, 2015	
Request	**Location in Resource Report**
1. In response to comments received from stakeholders, identify areas where uranium may be found near the ground surface along the pipeline route. As appropriate, based on soil concentrations and potential for exposure, outline measures that Mountain Valley would implement to handle radioactive soils if encountered, and measures to minimize or mitigate any possible impacts on the public health. Document consultations with appropriate local, state, and federal resource agencies regarding uranium in the project area.	Section 7.2.2.3 and Section 7.3.1.9
2. List, by MP, any hazardous waste sites crossed or within 0.5-mile of the pipeline route. Document that data bases were reviewed at the West Virginia Department of Environmental Protection and the Virginia Department of Environmental Quality. Include a discussion of industrial sludge that may have been spread by farmers, according to a stakeholder’s comment filed with the FERC. Outline the measures Mountain Valley would implement to avoid known hazardous waste sites, and describe what actions would be taken if hazardous wastes from any known or unknown sites are encountered during construction.	Resource Report 6 and Section 7.3
3. List, by MP, all soils found along the pipeline route. The table should identify soil types and characteristics, including prime farmland, erosion potential, shallow bedrock, high watertable, compaction, and reclamation potential. Document consultations with the local offices of the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service regarding potential Project impacts on soils.	Section 7.2 Appendix 7-A1 Appendix 7-A2 Appendix 7-B

FERC Environmental Information Request for Resource Report 7 Dated August 11, 2015		
	Request	**Location in Resource Report**
1.	Section 7.3 states "actual mitigation measures and controls will be developed based upon field conditions and permit requirements." Revise section 7.3 to include Mountain Valley's proposed avoidance, minimization, and mitigation measures.	Section 1.4
2.	Include a discussion of contaminated areas that may be located along the proposed route and the potential for discovery of unknown soil contamination that could be encountered during construction of the proposed Project. Include the following: a. sources searched to identified potentially contaminated areas; and b. an Unanticipated Discovery of Contamination Plan.	Section 7.1.3.8
3.	For soil limitation tables 7.2-1, 7-A1, 7-A2 include the following: a. acres impacted in addition to miles crossed; b. county crossed; and c. soil impact information for all aboveground facilities (including compressor stations, meter stations, MLVs), extra work spaces, contractor yards, pipe storage yards, and access roads.	Appendix 7-A1 Appendix 7-A2 Appendix 7-B Tables 7.2.2—7.2.4 Appendix 7-D
4.	Generate a table to include soil limitation that identify the following: a. impacts for all Project components including the pipeline, compressor stations, meter stations, contractor yards, pipe storage yards, extra work spaces, and access roads (separate tables for each); b. total acres of soils impacted for all soil limitations by Project component and county; and c. both permanent and temporary impacts that would be caused by the proposed Project's construction and operation.	Appendix 7-A1 Appendix 7-A2 Appendix 7-B Tables 7.2.2—7.2.4 Appendix 7-C Appendix 7-D
5.	Include a discussion of potential hazards to the proposed pipeline from ground heaving.	Section 7.3
6.	Revise section 7.1.2.2 to include a separate discussion of prime farmland and hydric soils (using the example table below) and include the following: a. a separate table that identifies total impacts on prime farmland and farmlands of statewide importance in acres by Project component and county; and b. impacts on farmland types including active agricultural land, agricultural land/fallow field, managed forest land, and open field/open land for the proposed pipeline and aboveground facilities for both temporary and permanent impacts.	Appendix 7-A1 Appendix 7-A2 Appendix 7-B Appendix 7-C
7.	Clarify if Mountain Valley would use hydric soil mitigation methods for soils identified to be partially hydric and if not identify how partially hydric soils would be handled during construction of the proposed Project.	Section 7.3
8.	Revise section 7.2.1 to include a table of the number of Major Land Resource Area (MLRA) miles crossed by Project component.	Section 7.2.1
9.	Revise section 7.3.1 to include a discussion of monitoring in agricultural areas. Specify: a. who would be responsible for monitoring; b. what would be monitored; c. the frequency of monitoring; and d. how long monitoring would be conducted post construction.	Section 7.3.1.6

FERC Environmental Information Request for Resource Report 7 Dated August 11, 2015	
Request	**Location in Resource Report**
10. Section 7.3.1.2 states Mountain Valley would either conserve topsoil or import topsoil in residential areas. Clarify who would make this decision, and indicate if landowner approval would be required.	Section 7.3.1.2
11. Section 7.3.1.2 states "rock will not be used as upper backfill in rotated or permanent cropland." Clarify that rock would only be used to backfill the trench to the top of the existing bedrock profile as stated in our Plan.	Section 7.3.1.7
12. Specify the following details regarding soil decompaction mitigation measures: a. how areas of heavy compaction would be identified by Environmental Inspectors; b. the specific methods MVP would employ if shallow tilling is not effective in mitigating compaction; and c. when decompaction would be considered complete.	Section 7.3.1.3
13. Revise section 7.3.1.6 to include the type of soil amendments and conditions under which soil amendments would or would not be used. Also include all methods Mountain Valley would use to aid in revegetation (i.e. seed bed preparation, seeding methods, seeding rates, and anchoring methods).	Section 1.4 & Resource Report 3
14. Revise section 7.3.1.7 to identify the method that Mountain would use to remove excess rock and stone greater than four inches.	Section 7.3
Appendix 7A Pipeline Route Soil Map Units and Descriptions	
1. Revise tables 7-A1 and 7-A2 to include descriptions of the soil series cross by the proposed Project.	Appendix 7-A1 Appendix 7-A2

U.S. Forest Service Comments on Resource Report 7		
Page/Section	**Request**	**Location in Resource Report**
General	The final resource reports should indicate that MVP will include the use of Virginia Erosion and Sediment Control Handbook (Virginia Department of Conservation and Recreation) to minimize impacts to soils, which is also required by the Jefferson NF Land and Resource Management Plan.	Section 7.3.4
General	NRCS local contacts Jeannine Freyman (Jeannine.Freyman@va.usda.gov) and/or Don Flegel (Donald.Flegel@va.usda.gov) should be used for soil resource information verification and potential impacts as well as the FS (thomasbailey@fs.fed.us).	Table 1.7.1 and Section 7.2.4
General	Soil resource information must come from the NRCS SSURGO Soil Survey for the Jefferson National Forest available from the NRCS Web Soil Survey and other NRCS SSURGO databases. This soil survey was mapped at 1:24000. The STATSGO database and mapping is not appropriate to use for this project due to scale of mapping. MUID's are not appropriate to use due to availability of more detailed mapping available for the Jefferson National Forest.	Section 7.1
General	The final resource reports should include a comparison of MVP's method of determining erosion potential with the NRCS Erosion Hazard rating for soil series found in the corridor, which uses K-factor, slope and rockiness. The FS will review the comparison. The FS is not concerned about wind erosion.	Section 7.2.4

U.S. Forest Service Comments on Resource Report 7		
Page/Section	**Request**	**Location in Resource Report**
General	Display on a map the prime farmland and hydric soils and explain how they affect design, construction and maintenance of the pipeline.	Appendix 7-C
General	The final resource reports should display pipeline corridor and additional facility sites, and display and describe any new access construction needed for construction and maintenance.	Resource Report 1
General	The final resource reports should identify the total acres and location of pipeline corridors and construction of new road and facilities.	Resource Report 1
General	The final resource reports should identify the width of the expected equipment/vehicle use area within the 300 foot ROW. Unless specified in the final resource reports, the FS will assume this width multiplied by length will be used for compaction effects.	Resource Report 1
General	Final resource reports should address the following requirements on NFS lands: • All erosion and sediment control plans will be reviewed and approved by USFS; • any variances requested by MVP to State or Federal permit requirements will be reviewed by the USFS; • Straw bales (not hay) should be used for erosion and sediment control where appropriate; • Slopes disturbed greater than 5% will be revegetated using plant species selected for erosion control purposes; • Erosion control seed and fertilizer mixtures will be approved by the USFS.	Section 7.3.4

U.S. Environmental Protection Agency Comments on Resource Report 7		
Page/Section	**Request**	**Location in Resource Report**
7-12	As mentioned in this report, there is a high possibility of erosion. BMP's for mitigation for soil erosion should be discussed with the proper state and Federal agencies.	Section 1.4
7-13	The page number and a link to the FERC Plans and Procedure should be included in the resource report. It also should be mentioned if additional review of erosion post-completion of the project will be done to check if permanent erosion control worked.	Resource Report 1
7-14	Topsoil segregation should be defined for the reader. An example should also be given.	Section 7.3
7-15	The resource report and the draft EIS need to show how hydric soils are determined along the alignment wither it is using USDA mapping or on-sight delineation. Hydric soils are an important part of wetlands and should be determined using methods used by one of the Federal agencies.	Section 7.1 & 7.3

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SOILS

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LIST OF ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
EI	Environmental Inspector
FERC	Federal Energy Regulatory Commission
GIS	Geographic Information System
hp	horsepower
MLRA	Major Land Resource Area
MMDth/d	million dekatherms per day
MVP	Mountain Valley Pipeline, LLC
NRCS	Natural Resources Conservation Service
Plan	FERC May 2013 version of the Upland Erosion Control, Revegetation, and Maintenance Plan
Procedures	FERC May 2013 version of the Wetland and Waterbody Construction and Mitigation Procedures
Project	Mountain Valley Pipeline Project
SPCC Plan	Spill Prevention, Control, and Countermeasure Plan
SSURGO	State Soil Survey Geographic database
Transco	Transcontinental Gas Pipe Line Company, LLC
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture

RESOURCE REPORT 7
SOILS

Introduction

Mountain Valley Pipeline, LLC (MVP), a joint venture between EQT Midstream Partners, LP and affiliates of NextEra Energy, Inc., WGL Holdings, Inc., Vega Energy Partners, Ltd., and RGC Midstream, LLC, is seeking a Certificate of Public Convenience and Necessity from the Federal Energy Regulatory Commission (FERC) pursuant to Section 7(c) of the Natural Gas Act authorizing it to construct and operate the proposed Mountain Valley Pipeline Project (Project) located in 17 counties in West Virginia and Virginia. MVP plans to construct an approximately 301-mile, 42-inch-diameter natural gas pipeline to provide timely, cost-effective access to the growing demand for natural gas for use by local distribution companies, industrial users and power generation in the Mid-Atlantic and southeastern markets, as well as potential markets in the Appalachian region.

The proposed pipeline will extend from the existing Equitrans, L.P. transmission system and other natural gas facilities in Wetzel County, West Virginia to Transcontinental Gas Pipe Line Company, LLC's (Transco) Zone 5 compressor station 165 in Pittsylvania County, Virginia. In addition to the pipeline, the Project will include approximately 171,600 horsepower of compression at three compressor stations along the route, as well as measurement, regulation, and other ancillary facilities required for the safe and reliable operation of the pipeline. The pipeline is designed to transport up to 2.0 million dekatherms per day of natural gas. Resource Report 1 provides a complete summary of the Project facilities and a general location map of the Project facilities (Figure 1.2-1).

In order to minimize impacts to soils along the pipeline route, MVP is committed to implementing the best management practices and mitigation measures included in the May 2013 version of the FERC *Upland Erosion Control, Revegetation and Maintenance Plan* (Plan) and FERC *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures). MVP will also develop a Project-specific Erosion and Sediment Control Plan (E&SCP) to further minimize impacts on soil resources.

Environmental Resource Report Organization

Resource Report 7 is prepared and organized according to the FERC *Guidance Manual for Environmental Report Preparation* (August 2002). The report provides a description and supporting information regarding soils and sediments in the area of the Project. A description of methods used to characterize soils in included in Section 7.1. Soils underlying the Project are described in Section 7.2. Potential impacts to soils due to construction and operation of the Project, and measures that MVP will implement to avoid and minimize impacts, are described in Section 7.3. Section 7.4 discusses impacts to the Jefferson National Forest, and Section 7.5 provides references.

7.1 IDENTIFICATION OF SOIL CONDITIONS

7.1.1 SSURGO Databases

MVP has compiled information on erosion potential, Prime Farmland, hydric soils, compaction potential, and shallow bedrock. This information is presented in Resource Report 1 and 6, as well as this Resource Report.

The characteristics of the soils crossed by the pipeline route were identified using a group of computerized Geographic Information Systems (GIS) data products developed by the United States Department of

Agriculture (USDA) Natural Resources Conservation Service (NRCS) that provide information on soil characteristics and limitations for various uses. MVP considered the use of this electronic data to be the most practical method for assessing the soils crossed by a project of this size. A detailed discussion of the methodology and assumptions that were used to identify and evaluate the information contained in the database is presented below.

Soil interpretations and tables for the pipeline route were developed using the state Soil Survey Geographic (SSURGO) databases (USDA NRCS 2003, 2005a). The SSURGO database provides soil series level information, similar to what is provided in a traditional county soil survey (USDA NRCS 1994, 1995a, 1995b, 1997a, 1997b, 1998, 2005c, 2007, 2009), for all counties crossed by the Project.

7.1.2 Methodology for Assessing Soil Resources

A digital version of the pipeline route was overlain onto a spatial database SSURGO using ArcGIS. The specific length of pipeline crossing a particular soil series was obtained by a query of the spatial database for beginning and ending mileposts.

Based on the data provided by the USDA NRCS through SSURGO (USDA NRCS 2003, 2005a), soils were grouped and evaluated according to characteristics that could affect construction or right-of-way restoration, or increase the potential for soil impacts. These characteristics include: highly erodible soils; Prime Farmland; hydric soils; compaction-prone soils; the presence of stones and shallow bedrock; and percent slope. Additional soil-related issues considered in the analysis include revegetation potential and soil contamination.

7.1.2.1 Highly Erodible Soils

Soil erosion potential is affected by the soil lithology, including mineralogy, grain size, texture, and organic content. Soil erosion potential can also be influenced by slope and exposure to erosion mechanisms. Soil erosion increases in inverse proportion to the effectiveness of vegetation cover (i.e., soils with denser vegetation cover are less susceptible to erosion). Removal of vegetation as a result of construction activities, either by direct stripping or by other mechanical means, greatly increases erosion potential. Highly erodible soils, as classified by the NRCS, are directly related to the susceptibility of a soil to erosion by water or wind. These soil types are listed in Appendices 7-A1, 7-A2 and 7-B. To determine erosion potential of the soils crossed by the pipeline, MVP examined slope, soil capability class, and wind erodibility group, which provides an indication of potential soil loss by water and wind action and discussed in Resource Report 1.

7.1.2.2 Prime Farmland and Hydric Soils

Prime Farmland soils are defined by the USDA as those best suited for growing food, feed, forage, fiber, and oilseed crops (USDA NRCS 2005b). Soil map units designated as Prime Farmland do not have to be actively cultivated to receive this designation. In addition to Prime Farmland, the database describes Farmland soils of both state and local concern.

Hydric soils are, by definition, soils that are saturated, flooded, or ponded long enough during the growing seasons to develop anaerobic conditions in the upper part of the soil column (USDA NRCS, 2005b).

Both Prime Farmland and hydric soil designations are component soil series attributes in the SSURGO databases. Hydric soils may indicate the presence of wetlands or agricultural drain tiles. The Prime Farmland and hydric soils encountered along the pipeline route are discussed in more detail in Section 7.2 and listed by milepost in Appendices 7-A1 and 7-A2 and by acreage in Appendix 7-B. Appendix 7-C presents a map book of Prime Farmland and hydric soils for the pipeline and compressor stations.

7.1.2.3 Compaction Potential

Soils with a high potential for compaction can be adversely affected during construction activities through the repeated movement of machinery across the soil surface. Soils with high shrink-swell potential and poor drainage characteristics tend to be susceptible to compaction, particularly when wet. These soils tend to have high clay content comprised of platy particles with water in interstitial spaces, and the packing of the clay particles can be compressed through repeated stress. Soils with a high silt or sand content tend to be comprised of sub-rounded to rounded particles and are less compactable. Although surface “crusts” may form on these types of soils when subjected to repeated traffic, upon drying, the compacted particles are often readily separated.

Formation of hardpans is a potential result of repeated traffic over susceptible soils. The formation of hardpans is typically limited to soils with high to very high shrink-swell potential. Hardpan layers tend to form at horizons where there is a significant physical or chemical change in the subsoil, often between the A and B or B and C horizons. Hardpans related to artificial compaction tend to form at relatively shallow depth where mechanical stress is not effectively dissipated by the overlying soil column. Hardpans also commonly form at the base of the plow zone, where a change in the soil porosity and permeability may cause perching of water and subsequent physical and chemical changes resulting in the formation of a hardpan.

7.2 EXISTING SOIL RESOURCES

A list including descriptive information of each soil series crossed by the pipeline is provided in Appendix 7-A1 (West Virginia) and 7-A2 (Virginia) by milepost. A listing of the approximately 350 soil types crossed by the pipeline is provided in Appendix 7-B.

7.2.1 Major Land Resource Areas

Soil interpretations at the broadest scale in the United States are based on Major Land Resource Areas (MLRAs). MLRAs are geographically associated land resource units, usually encompassing several thousand acres, characterized by a particular pattern of soils, geology, climate, water resources, and land use (USDA NRCS 2006). MLRAs are a useful tool for describing the general soils crossed by the pipeline and the natural and anthropomorphic features affecting those soils. The pipeline crosses six MLRAs: the Central Allegheny Plateau; the Cumberland Plateau and Mountains; the Eastern Allegheny Plateau and Mountains; the Southern Appalachians Ridges and Valleys; Southern Blue Ridge; and Southern Piedmont. MLRAs crossed by the pipeline are listed in Table 7.2-1 and summarized below.

7.2.1.1 Central Allegheny Plateau

The first MLRA crossed (72.83) by the pipeline is the Central Allegheny Plateau MLRA (USDA NRCS 2006). The Central Allegheny Plateau MLRA is in West Virginia (49 percent), Ohio (28 percent), Pennsylvania (22 percent), and Kentucky (1 percent). It makes up about 18,040 square miles (46,750 square kilometers). The cities of Huntington, Charleston, Parkersburg, Clarksburg, Fairmont, Morgantown, and Wheeling, West Virginia, and Pittsburgh, Uniontown, and Indiana, Pennsylvania, are in this area. Steubenville, Marietta, and Athens, Ohio, also are in this MLRA.

Table 7.2-1

MLRA Crossed by the Pipeline

MLRA	Length Crossed (miles)
Central Allegheny Plateau	72.83
Cumberland Plateau and Mountains	15.84
Eastern Allegheny Plateau and Mountains	105.12
Southern Appalachian Ridges and Valleys	42.30
Southern Blue Ridge	14.53
Southern Piedmont	50.34
Total	**300.97**

The Central Allegheny Plateau is a dissected plateau that is underlain mainly by horizontally bedded sedimentary rocks. The narrow, level valleys and narrow, sloping ridgetops are separated by long, steep and very steep side slopes. Elevation throughout the Central Allegheny Plateau ranges from 650 feet on the lowest valley floors to 1,310 feet or more on the highest ridgetops. Local relief is approximately 330 feet.

The major Hydrologic Unit Areas or watersheds that make up this MLRA are identified here in percentage: Upper Ohio, 48 percent; Monongahela, 19 percent; Kanawha, 10 percent; Muskingum, 9 percent; Middle Ohio, 6 percent; Allegheny, 5 percent; and Big Sandy-Guyandotte, 3 percent.

Precipitation in the Central Allegheny Plateau MLRA is unevenly distributed throughout the year. The maximum normally occurs in midsummer, and the minimum occurs in autumn and early winter. Rainfall occurs during high-intensity, convective thunderstorms in summer. The freeze-free period averages 190 days.

The dominant soil orders in the Central Allegheny Plateau MLRA are Alfisols, Ultisols, and Inceptisols. The soils in the area have a mesic soil temperature regime, a udic soil moisture regime, and mixed mineralogy. They generally are shallow to very deep, excessively drained to somewhat poorly drained, and skeletal to clayey. Dystrudepts (Dekalb and Hazleton series) formed in sandstone residuum that caps the ridges. Hapludults (Wharton series) formed on the broader summits. Hapludalfs (Culleoka, Dormont, Lowell, Peabody, Upshur, and Westmoreland series), Hapludults (Gilpin series), and Dystrudepts (Weikert series) formed on the hillsides of red shale, limestone, calcareous shale, and acid shale. The Dystrudepts on these hillsides are less extensive than the Hapludalfs and Hapludults. Hapludalfs (Guernsey, Vandalia, and Beech series) formed in colluvium on footslopes. Fragiudults (Monongahela series), Dystrudepts (Philo series), Endoaquepts (Newark series), and Eutrudepts (Chagrin and Sensabaugh series) formed in alluvium along the major streams. Udorthents (Bethesda, Fairpoint, and Morristown series) formed in material derived from the surface mining of coal.

Most of the Central Allegheny Plateau MLRA consists of farms, but less than one-half of the area consists of income-producing farms. The farm income is predominantly from beef cattle operations and dairy farms associated with hay, grassland, and cultivated crops. More than one-half of the area is forested, and the sale of timber is important in some areas. Urban expansion, including industrial and residential development, is increasing along the Ohio River and its major tributaries. Much of the cropland has been converted to urban uses. Large acreages are owned or leased for surface mining of coal.

The major soil resource concerns in the Central Allegheny Plateau MLRA are sheet and rill erosion on pasture, land slippage, subsidence resulting from mining, stream bank erosion, gullying, surface compaction caused by livestock trampling, and a reduced content of organic matter on cropland. Conservation practices on cropland generally include crop rotations, contour farming, nutrient management, grassed and forested riparian buffers, cover crops, hayland planting, diversions, and grassed waterways. Pasture management includes rotational grazing, watering systems, fencing, managed livestock access to streams, pasture planting, and nutrient management. Forest management includes forest harvest trails, critical area planting, and water bars on trails.

7.2.1.2 Cumberland Plateau and Mountains

The second MLRA (15.84miles) crossed by the pipeline is the Cumberland Plateau and Mountains province in Kentucky (43 percent), Tennessee (25 percent), West Virginia (20 percent), Virginia (9 percent), and Alabama (3 percent). It makes up about 20,330 square miles (52,685 square kilometers). The towns of Logan, Madison, Welch, and Williamson, West Virginia, and Norton and Wise, Virginia, are in the northeastern part of this MLRA. The Daniel Boone and Jefferson National Forests are also located in this area, along with many state parks.

The northern third of this area is primarily in the Kanawha Section of the Appalachian Plateaus Province of the Appalachian Highlands. The southern two-thirds is primarily in the Cumberland Plateau Section of the same province and division. A strip along the central part of the east edge of the area is in the Cumberland Mountain Section of the same province and division, and small areas of the MLRA along the southwestern edge are in the Highland Rim Section of the Interior Low Plateaus Province of the Interior Plains. This MLRA occurs mainly as a series of long, steep side slopes between narrow ridgetops or crests and narrow stream flood plains. Elevation ranges from 650 feet on the flood plain along the Ohio River to about 980 feet on nearby ridgetops. It gradually rises from these areas to areas near the Virginia-Kentucky border, where it is about 1,650 feet on local flood plains and 3,950 feet on the higher mountains.

The extent of the major Hydrologic Unit Areas that make up this MLRA is as follows: Cumberland, 30 percent; Big Sandy-Guyandotte, 24 percent; Kentucky-Licking, 19 percent; Upper Tennessee (0601), 10 percent; Kanawha, 8 percent; Middle Tennessee-Elk, 5 percent; Middle Tennessee-Hiwassee, 3 percent; and Middle Ohio, 1 percent.

Most of the soils in the undulating to rolling areas on the Cumberland Plateau are Hapludults. Moderately deep or deep, well drained, loamy Hapludults (Lily, Lonewood, and Hartsells series) formed in sandstone residuum. Shallow, somewhat excessively drained, loamy Dystrudepts (Ramsey series) also formed in sandstone residuum. They are less extensive than the other soils in the undulating to rolling areas on the Cumberland Plateau. Most of the remaining soils in the undulating to rolling areas are deep or very deep, moderately well drained, loamy Hapludults (Clarkrange and Hendon series), which formed in a loamy mantle and sandstone residuum. The dominant soils in hilly to steep areas are Hapludults (Gilpin and Lily series) and Dystrudepts (Petros and Matewan series). These soils are shallow to moderately deep, well drained or somewhat excessively drained, and loamy and formed in sandstone or shale residuum. The remaining soils on steep slopes generally are deep or very deep, well drained, loamy Hapludults (Bouldin, Grimsley, Jefferson, Pineville, and Shelocta series) and Dystrudepts (Varilla, Highsplint, and Guyandotte series), which formed in gravelly or stony colluvium derived from sandstone and/or shale.

Soils on flood plains are of small extent on the Cumberland Plateau and are slightly more extensive in the Cumberland Mountains. Most of these soils are well drained or moderately well drained Dystrudepts (Ealy, Pope, Philo, and Sewanee series) or Eutrudepts (Grigsby, Sensabaugh, and Chagrin series) or poorly drained Endoaquepts (Bonair and Atkins series). They are deep or very deep, are loamy, and formed in alluvium derived from sandstone and shale. Material derived from surface and deep mines is common in this area. Udorthents (Bethesda, Cedarcreek, Fairpoint, and Kaymine series) formed in this material.

Most of this area consists of small and medium-size farms. An extensive acreage in Kentucky is in the Daniel Boone National Forest, and some large tracts are owned by coal and timber companies. The forested areas support mostly mixed hardwoods. Lumber is an important product. Corn, hay, and tobacco are the major crops grown on the small acreage of cropland in the area. More than one-tenth of the area is pasture, which is used mostly for grazing by beef cattle. Some areas are used for urban development. Stabilizing surface-mined areas is a major management concern.

The major soil resource concerns are water erosion, deposition of sediment, depletion of organic matter, surface compaction, and soil contaminants. Conservation practices on cropland generally include systems of crop residue management, especially no-till systems; cover crops; and nutrient management. The most important conservation practice on pasture is prescribed grazing. Forest management practices generally include planting and harvesting methods that minimize disturbance of the surface.

7.2.1.3 Eastern Allegheny Plateau and Mountains

The third MLRA crossed by the pipeline is the Eastern Allegheny Plateau and Mountains MLRA (USDA NRCS 2006). This MLRA is in Pennsylvania (57 percent), West Virginia (37 percent), Maryland (4 percent), and New York (2 percent). It makes up about 19,440 square miles. The towns of Warren, Oil City, and Johnstown, Pennsylvania, and Beckley, West Virginia, are in this area. Titusville, Pennsylvania is in the northwest corner of the area, and Cumberland, Maryland is on the eastern border of this MLRA.

The deeply dissected Eastern Allegheny Plateau and Mountains terminates in a high escarpment, the Allegheny Front, in the eastern part of the area. Steep slopes are dominant, but level to gently rolling plateau remnants are conspicuous in the northern part of the area. Elevation ranges from 980 feet in the lowest valleys to 1,970 to 2,620 feet throughout much of the top of the plateau. It is 3,600 to 4,600 feet on the mountains in the southeastern part of the area. Local relief is mainly about 330 feet, but some mountain peaks in the southern part of the area rise 980 feet or more above the plateau or adjacent valleys.

The major Hydrologic Unit Areas or watersheds that make up this MLRA are identified here in percentage: Allegheny, 28 percent; Susquehanna, 25 percent; Kanawha, 22 percent; Monongahela, 20 percent; and Potomac, 5 percent.

The average annual precipitation in the Eastern Allegheny Plateau and Mountains MLRA is 33 to 68 inches, increasing to the south and with elevation. The maximum precipitation occurs in spring and summer, and the minimum occurs in fall. Most of the rainfall occurs as high-intensity, convective thunderstorms. The average annual snowfall ranges from 35 inches in the southern part of the area to more than 90 inches in the northern part. The average annual temperature is 43 to 54 °F. The freeze-free period averages 160 days and ranges from 115 to 205 days, decreasing in length to the north and with elevation.

The dominant soil orders in the Eastern Allegheny Plateau and Mountains MLRA are Ultisols and Inceptisols. The soils dominantly have a mesic or frigid soil temperature regime, a udic soil moisture regime, and mixed or siliceous mineralogy. They generally are moderately deep to very deep, excessively drained to somewhat poorly drained, and loamy. Fragiudults formed in colluvium on footslopes and alluvial fans (Buchanan and Ernest series) and in residuum on ridges (Cookport series). Endoaquults (Cavode series) and Dystrudepts (Dekalb and Hazleton series) formed in residuum on hills and ridges. Hapludults (Gilpin, Hartleton, Leck Kill, Rayne, and Wharton series) formed in residuum and/or till on hills and ridges. Frigid Dystrudepts (Leatherbark and Mandy series) and Fragiudepts (Simoda and Snowdog series) are at high elevations. Udorthents formed in material derived from the surface mining of coal in mesic areas (Cedarcreek and Kaymine series) and frigid areas (Briery series).

Most of the Eastern Allegheny Plateau and Mountains MLRA consists of farms. Corn, small grains, and forage for dairy and beef cattle are the principal crops grown in the area. Other important crops are potatoes and soybeans. Dairy, beef, and poultry farms are important enterprises. About three-fourths of the area is in hardwood forests. Most of the forestland is privately owned, although the area has large blocks of state forest and game lands and national forests. Less than one-tenth of the MLRA consists of urban areas and disturbed land, including surface-mined areas.

Stabilizing and revegetating surface-mined areas and controlling acid drainage water from deep mines are major management concerns in this MLRA. The major soil resource concerns are sheet and rill erosion on pasture, land slippage, subsidence caused by mining, streambank erosion, gullying, surface compaction caused by livestock trampling, and a reduced content of organic matter on cropland. Conservation practices on cropland generally include crop rotations, contour farming, nutrient management, grassed and forested riparian buffers, cover crops, hayland planting, diversions, and grassed waterways. Pasture management includes rotational grazing, watering systems, fencing, managed livestock access to streams, pasture planting, and nutrient management. Forest management includes properly constructed forest harvest trails, critical area planting, and water bars on trails.

7.2.1.4 Southern Appalachian Ridges and Valleys

The fourth MLRA crossed by the pipeline is the Southern Ridges and Valleys MLRA (USDA NRCS 2006). This MLRA is in Tennessee (36 percent), Alabama (27 percent), Virginia (25 percent), and Georgia (12 percent). It makes up about 21,095 square miles. It is heavily populated. It includes Decatur, Huntsville, and Hartselle in the separate area of the MLRA in northern Alabama; Scottsboro, Gadsden, Anniston, Talladega, and Birmingham in the part of the MLRA in northeastern Alabama; Dalton and Rome, Georgia; Knoxville, Chattanooga, Cleveland, Athens, Maryville, Oak Ridge, Morristown, Greeneville, Johnson City, and Bristol, Tennessee; and Blacksburg and Abingdon, Virginia.

The western side of the Southern Ridges and Valleys MLRA is dominantly hilly to very steep and is rougher and much steeper than the eastern side, much of which is rolling and hilly. Elevation ranges from 660 feet near the southern end of the area to more than 2,400 feet in the part of the area in the western tip of Virginia. Some isolated linear mountain ridges rise to nearly 4,920 feet above sea level. The topography in this MLRA is highly diversified. It has many parallel ridges, narrow intervening valleys, and large areas of low, irregular hills. Many ridges and valleys have a difference in elevation of 660 feet.

The major Hydrologic Unit Areas or watersheds that make up this MLRA are identified here in percentage: Upper Tennessee, 37 percent; Alabama, 24 percent; Middle Tennessee-Elk, 12 percent; Middle Tennessee-Hiwassee, 11 percent; Kanawha, 9 percent; Lower Chesapeake, 3 percent; Chowan-Roanoke, 2 percent; and Mobile-Tombigbee, 2 percent.

The average annual precipitation in most of the Southern Ridges and Valleys MLRA is 41 to 55 inches. It increases to the south and is as much as 66 inches at the highest elevations in east Tennessee and the northwest corner of Georgia. The maximum precipitation occurs in midwinter and midsummer, and the minimum occurs in autumn. Most of the rainfall occurs as high-intensity, convective thunderstorms. Snowfall may occur in winter. The average annual temperature is 52 to 63 °F, increasing to the south. The freeze-free period averages 205 days and ranges from 165 to 245 days. It is longest in the southern part of this MLRA and shortest at high elevations and at the northern end.

The soils in the Southern Ridges and Valleys MLRA are mainly Udults and, to a lesser extent, Udepts. They have a udic soil moisture regime and a thermic or mesic soil temperature regime; are dominantly well drained, strongly acid, and highly leached; and have a clay-enriched subsoil. They range from shallow on sandstone and shale ridges to very deep in valleys and on large limestone formations. Paleudults (Decatur, Dewey, Frederick, Fullerton, and Pailo series, commonly cherty) are in the many extensive areas underlain by limestone that traverse the MLRA from southwest to northeast. Hapludults (Townley and Armuchee series) are dominant in valleys underlain by acid shale. Steep, shallow or moderately deep, shaly and stony Dystrudepts (Weikert, Wallen, Montevallo, and Calvin series) are on the sides of steep ridges. Shallow, shaly Eutrudepts (Bays and Dandridge series) are in areas of the shale formation extending along the eastern side of the MLRA. Eutrudepts (Hamblen, Sullivan, and Pettyjon series) are on narrow bottom land.

Most of the Southern Ridges and Valleys MLRA consists of small and medium-sized farms. More than two-fifths of the area supports mixed hardwoods. Most of the forestland, except for a few wooded mountain ridges, is in small farm woodlots. Hay, pasture, and some grain for beef cattle and dairy cattle are the principal crops grown in this area. Burley tobacco is the important cash crop in the southern two-thirds of the area, excluding Georgia. Some cotton is grown south of Chattanooga. Corn and soybeans are grown on small acreages throughout the area, mainly in narrow strips of bottom land and on the adjacent low terraces.

The major soil resource concerns in the Southern Ridges and Valleys MLRA are sheet and rill erosion on pasture, land slippage, stream bank erosion, gullying, surface compaction caused by livestock trampling, and a reduced content of organic matter on cropland. Conservation practices on cropland generally include crop rotations, contour farming, nutrient management, grassed and forested riparian buffers, cover crops, hayland planting, diversions, and grassed waterways. Pasture management includes rotational grazing, watering systems, fencing, managed livestock access to streams, pasture planting, and nutrient management. Forest management includes properly constructed forest harvest trails, critical area planting, and water bars on trails.

7.2.1.5 Southern Blue Ridge

This MRLA is crossed by (14.52 miles) of the pipeline and covers areas in North Carolina (51 percent), Tennessee (18 percent), Georgia (17 percent), Virginia (10 percent), and South Carolina (4 percent). It makes up about 16,080 square miles (41,665 square kilometers). It is locally known as the Southern Appalachians. It includes Lenoir, Morganton, Marion, Hendersonville, Waynesville, and Asheville, North Carolina; Gatlinburg, Tennessee; Damascus and Galax, Virginia; Walhalla, South Carolina; and Cleveland, Dahlonega, and Ellijay, Georgia. Many national forests are in the area, including the Jefferson, Cherokee, Nantahala, Pisgah, and Chattahoochee National Forests.

This MLRA is mainly in the Southern Section of the Blue Ridge Province of the Appalachian Highlands. The southern tip of the MLRA and areas to the east are in the Piedmont Uplands Section of the Piedmont Province of the Appalachian Highlands. This MLRA consists of several distinct topographic areas, including the Blue Ridge Escarpment on the eastern edge of the area, the New River Plateau on the northern end, interior low and intermediate mountains throughout the MLRA, intermountain basins between the major mountains, and the high mountains making up the bulk of the MLRA. Elevation ranges from about 900 feet at the south and southwest boundaries of the area to more than 6,600 feet at the crest of the Great Smoky and Black Mountain ranges.

The extent of the major Hydrologic Unit Areas that make up this MLRA is as follows: Upper Tennessee, 46 percent; Kanawha, 13 percent; Middle Tennessee-Hiwassee, 12 percent; Edisto-Santee, 9 percent; Alabama, 8 percent; Ogeechee-Savannah, 6 percent; Pee Dee, 4 percent; Chowan-Roanoke, 1 percent; and Apalachicola, 1 percent.

The dominant soil orders in this MLRA are Inceptisols and Ultisols. The soil moisture regime is udic. The soil temperature regime typically is mesic, but it is frigid at elevations above 4,200 feet. Soil depth ranges from shallow to very deep. The general textural class is loamy or clayey. In areas at elevations of less than 3,500 feet, the soils on uplands generally are red, fine-loamy or fine Typic Hapludults (Evard, Junaluska, and Hayesville series). Humic Hapludults (Trimont and Snowbird series) are on north and east aspects. Soils that formed in colluvium in coves are Typic Dystrudepts (Tate, Greenlee, and Northcove series), Typic Hapludults (Lonon and Keener series), or Humic Hapludults (Saunook and Thunder series). At elevations between 3,500 and 4,200 feet, the soils on uplands generally are brown, fine-loamy or coarse-loamy Dystrudepts. Humic Dystrudepts (Plott, Porters, and Cheoah series) are common on north and east aspects, and Typic Dystrudepts (Edneyville, Chestnut, Ditney, and Stecoah series) are common on south and west aspects. Soils that formed in colluvium in coves are Humic Dystrudepts (Cullasaja, Spivey, Tuckasegee, and Santeetlah series) or Humic Hapludults (Saunook and Thunder series). In areas at elevations above 4,200 feet, the soils on uplands generally are brown, fine-loamy or coarse-loamy Humic Dystrudepts with a frigid soil temperature regime (Burton, Oconaluftee, and Breakneck series). Soils that formed in colluvium also are Humic Dystrudepts (Balsam and Chiltoskie series). Soils that formed in alluvium vary with stream gradient, energy, and entrenchment into the valley floor. In the upper reaches of watersheds where flood plains are narrow, the soils are Oxyaquic and Fluvaquentic Dystrudepts (Dellwood, Reddies, and Cullowhee series). In the lower and broader river valleys, Udipsamments (Biltmore series) and coarse-loamy Dystrudepts (Rosman series) are in areas closest to rivers and streams on flood plains. Humaquepts (Ela, Nikwasi, and Toxaway series) are in low-lying, frequently flooded or ponded areas. Ultisols are most common on the more stable stream terraces. Fine-loamy Aquic and Typic Hapludults (Dillard and Statler series) are on low terraces, and fine Typic Hapludults (Braddock and Unison series) are on high terraces.

More than two-thirds of this area is forestland used for timber production, watershed protection, recreation, and wildlife habitat. The federally owned forestland in the area is mainly United States Forest Service or National Park Service land. The small acreage of cropland is used for vegetables, fruit orchards, native ornamental crops, and Christmas trees, as well as corn and small grain. About 10 percent of the MLRA is in pastured areas used for dairy, beef, and wool production. The largest urban area in this MLRA is Asheville, North Carolina. The MLRA is a popular area for tourism and retirement living.

Erosion from poorly constructed and maintained access roads is a major management concern in this area. Sediment from access roads and urban development is the main pollutant of streams in the area. Proper woodland management is extremely important since privately held forestland makes up a significant portion of the land area in this MLRA. Proper design and construction of access roads and stabilization of roadbanks can minimize the impact of timber management on water quality. Conservation practices in agricultural areas include field borders, grassed waterways, diversions, and riparian buffers along streams.

7.2.1.6 Southern Piedmont

This area is crossed by approximately (50.3 miles) of the pipeline. This MLRA includes in North Carolina (29 percent), Georgia (27 percent), Virginia (21 percent), South Carolina (16 percent), and Alabama (7 percent). It makes up about 64,395 square miles (166,865 square kilometers). It includes the cities of Auburn, Alabama; Atlanta, Georgia; Greenville, South Carolina; Charlotte, Raleigh, and Winston- Salem, North Carolina; and Richmond and Arlington, Virginia.

Almost all of this area is in the Piedmont Upland Section of the Piedmont Province of the Appalachian Highlands. A very small part of the MLRA, in central North Carolina, is in the Atlantic Plain Division. A very small part in the Roanoke, Virginia, area is on the eastern edge of the Blue Ridge Province of the Appalachian Highlands. This MLRA is a rolling to hilly upland with a well-defined drainage pattern. Streams have dissected the original plateau, leaving narrow to fairly broad upland ridgetops and short slopes adjacent to the major streams. The valley floors are generally narrow and make up about 10 percent or less of the land area. The associated stream terraces are minor. Elevation ranges from 330 to 1,310 feet.

The extent of the major Hydrologic Unit Areas that make up this MLRA is as follows: Edisto-Santee, 18 percent; Chowan-Roanoke, 14 percent; Apalachicola, 10 percent; Pee Dee, 10 percent; Ogeechee-Savannah, 10 percent; Alabama, 9 percent; Altamaha-St. Marys, 9 percent; Lower Chesapeake, 9 percent; Neuse-Pamlico, 5 percent; Cape Fear, 5 percent; and Potomac, 1 percent. Some of the major rivers in this MLRA are, from north to south, the Roanoke, Cape Fear, Savannah, Altamaha, Chattahoochee, and Alabama Rivers.

The dominant soil orders in this MLRA are Ultisols, Inceptisols, and Alfisols. The soils in the area dominantly have a thermic soil temperature regime, and udic soil moisture regime, kaolinitic or mixed mineralogy. They are shallow to very deep, generally well drained, and loamy or clayey. Hapludalfs (Enon and Wilkes series), Hapludults (Badin, Nason, and Tatum series), and Kanhapludults (Appling, Cecil, Georgeville, Herndon, Madison, Pacolet, and Wedowee series) formed in residuum on hills and ridges. Dystrudepts (Chewacla series) formed in alluvium on flood plains. Udults in the Rhodic subgroup (Davidson, Hiwassee, and Lloyd series) formed in old-alluvium on stream terraces or in residuum derived from mafic rocks.

Most of this area is small farms, but a sizable acreage is controlled by forest products companies, although most of the land was once cultivated. Much of this land reverted to mixed stands of pine and hardwoods. Most of the open areas are used as pasture, but some crops, such as soybeans, corn, cotton, and wheat and other small grains, as well as tobacco, are grown here. Dairy cattle and poultry are important locally. Rural land adjacent to the major cities is being converted to residential development and associated urban development. This land use conversion is occurring rapidly in the corridor called the Piedmont Crescent, which extends from Atlanta, Georgia, to Raleigh, North Carolina. The major soil resource concerns are water erosion and the increasing conversion of Prime Farmland and Farmland of Statewide Importance to urban uses. Conservation practices on cropland generally include conservation tillage, crop residue management, field borders, vegetative wind barriers, and nutrient and pest management.

7.2.2 Special Designated Soils and Soils with Limitations Crossed by the Pipeline

Soils crossed by the pipeline that have special designation, or that may have limiting characteristics relevant to pipeline construction and right-of-way restoration, are discussed below.

7.2.2.1 Erosion Potential

Soils with a high percentage of silt and fine sand, as well as those that occur at steeper slopes, are more susceptible to erosion than those with a high clay content and in relatively flat areas. To determine erosion potential of the soils crossed by the pipeline, MVP evaluated slope, soil capability class, and the wind erodibility group, which provides an indication of potential soil loss by water and wind action. Approximately 70 percent of the pipeline route crosses slopes greater than 20 percent, which indicates a high potential for erosion in these areas. MVP will address this potential via construction and reclamation techniques in compliance with the FERC Plan and Procedures and the E&SCP.

7.2.2.2 Prime Farmland Soils

Prime Farmland soils were identified based on information in the SSURGO database and NRCS soil surveys (USDA NRCS 1997b). Approximately 2.5 percent of soil crossed by the pipeline in West Virginia is considered Prime Farmland (see Appendix 7-C-A1 and 7-A2). An additional 38 percent is classified as Farmland of Statewide or Local Importance. Approximately 6 percent of soil crossed by the pipeline in

Virginia is considered Prime Farmland. An additional 46 percent is classified as Farmland of Statewide Importance.

The acreage of each type of soil farmland within the 50 foot permanent easement can be found in Appendix 7-B and is shown in the map book in Appendix 7-C. The typical groundcover type for these soils is listed by milepost in Appendices 7-A1 and 7-A2. Resource Report 8 discusses the current land uses.

7.2.2.3 Hydric Soils

Less than one percent of the soil crossed by the pipeline in both West Virginia and Virginia is considered hydric. Listed hydric soils crossed by the pipeline are identified in Appendices 7-A1, 7-A2 and 7-B. Hydric soils are illustrated on the maps in Appendix 7-C.

Approximately one percent of the soils crossed by the pipeline are considered poorly drained. The rest are considered moderately to excessively well-drained.

7.2.2.4 Uranium Enriched Bedrock

In West Virginia, uranium is primarily found in coal, and uranium concentrations are typically low (<2 parts per million (ppm)) and similar to mean background concentration world-wide (WVES 2015). The pipeline route in West Virginia is not known to cross significant expanses of coal deposits or any known or suspected uranium deposits.

In Virginia, (Draper Aden Associates 2015) 50 terrestrial uranium occurrences have been identified using published reports. Of these occurrences, only the uranium deposits at Coles Hill, located in Pittsylvania County, Virginia, are notable for relative enrichment above background. Two separate uranium mineral deposits have been delineated at the Coles Hill site, the South Coles Hill Deposit and North Coles Hill Deposit. The enriched bedrock at these locations is mainly covered by a few meters of barren material. However, some bedrock is exposed at the surface at the north site (Christopher 2007). At the closest point to the pipeline, the north deposit is about 4 miles northeast and the south deposit is about 3.8 miles northeast, respectively, of the southern end of the pipeline.

7.2.3 Special Designated Soils and Soils with Limitations at Aboveground Facility Sites

Table 7.2-2 provides a detailed listing of soil map units within the properties identified for the compressor station sites, and a listing of Prime Farmland and soil limitations for those soil units. In each case the footprint of actual impact will be less than the total area of the properties, and area of soil impacts will be less than shown. However, it is expected that soils within each compressor station facility will be considered permanently unavailable for other uses.

In addition to compressor stations, other aboveground facilities will include pig launchers and receivers, mainline block valves (MLVs), and meter stations. Pig launchers and receivers will be located at the measurement and compressor stations, MLVs will be located directly along the pipeline, and disturbance associated with construction and operation of these facilities will be contained entirely within the pipeline right-of-way. Meter stations will also generally be located within the pipeline right-of-way depending on the interconnect requirements. Soils that will be affected by these other aboveground facilities are the same as described for the pipeline in Appendices 7-A1, 7-A2, and 7-B.

Soils temporarily impacted by construction are identified in Table 7.2-3, 7.2-4 and Appendix 7-D. These soils will be restored as close as practicable to pre-construction conditions.

Table 7.2-2

Soils at Proposed Aboveground Facilities

Compressor Station	County	Map Unit Symbol	Map Unit Name	Acres	Prime Farmland	Hydric	Drainage	Slope
Bradshaw Compressor Station Pad	Wetzel	GpD	Gilpin-Peabody complex, 15 to 25 percent slopes	3.56	Farmland of statewide importance	No	Well drained	20
Bradshaw Compressor Station Pad	Wetzel	GpE	Gilpin-Peabody complex, 25 to 35 percent slopes	2.20	Farmland of local importance	No	Well drained	30
Harris Compressor Station Pad	Braxton	GaF	Gilpin silt loam, 35 to 70 percent slopes, very stony	1.77	Not prime farmland	No	Well drained	53
Harris Compressor Station Pad	Braxton	GlD	Gilpin-Lily complex, 15 to 25 percent slopes	2.44	Farmland of statewide importance	No	Well drained	20
Harris Compressor Station Pad	Braxton	GlE	Gilpin-Lily complex, 25 to 35 percent slopes	0.12	Farmland of local importance	No	Well drained	30
Stallworth Compressor Station Pad	Fayette	CaC	Cateache channery silt loam, 8 to 15 percent slopes	5.46	Farmland of statewide importance	No	Well drained	12
Stallworth Compressor Station Pad	Fayette	CcG	Cateache-Pipestem complex, 35 to 80 percent slopes, very stony	0.27	Not prime farmland	No	Well drained	58

Table 7.2-3 Soils at Proposed Aboveground Facilities with Temporary Workspace								
Compressor Station	**County**	**Map Unit Symbol**	**Map Unit Name**	**Acres**	**Prime Farmland**	**Hydric**	**Drainage**	**Slope**
Bradshaw Compressor Station Limits-of-Disturbance	Wetzel	GpD	Gilpin-Peabody complex, 15 to 25 percent slopes	6.54	Farmland of statewide importance	No	Well drained	20
		GpE	Gilpin-Peabody complex, 25 to 35 percent slopes	11.37	Farmland of local importance	No	Well drained	30
		GpF	Gilpin-Peabody complex, 35 to 70 percent slopes	6.10	Not prime farmland	No	Well drained	53
Harris Compressor Station Limits-of-Disturbance	Braxton	BuE	Buchanan channery loam, 15 to 35 percent slopes, extremely stony	0.22	Not prime farmland	No	Moderately well drained	25
		GaF	Gilpin silt loam, 35 to 70 percent slopes, very stony	10.06	Not prime farmland	No	Well drained	53
		GlD	Gilpin-Lily complex, 15 to 25 percent slopes	7.21	Farmland of statewide importance	No	Well drained	20
		GlE	Gilpin-Lily complex, 25 to 35 percent slopes	3.58	Farmland of local importance	No	Well drained	30
Stallworth Compressor Station Limits-of-Disturbance	Fayette	CaC	Cateache channery silt loam, 8 to 15 percent slopes	11.36	Farmland of statewide importance	No	Well drained	12
		CcG	Cateache-Pipestem complex, 35 to 80 percent slopes, very stony	13.33	Not prime farmland	No	Well drained	58

Table 7.2-4

Soils at Proposed Contractor Yards

Contractor Yard	County	Map Unit	Map Unit Name	Acres	Prime Farmland	Hydric	Drainage	Slope
MVP-LY-001	Wetzel	EkB	Elk silt loam, 3 to 8 percent slopes	4.66	All areas are prime farmland	No	Well drained	4
		GpD	Gilpin-Peabody complex, 15 to 25 percent slopes	0.17	Farmland of statewide importance	No	Well drained	20
		No	Nolin loam	0.05	Prime farmland	No	Well drained	2
MVP-LY-002	Harrison	ClC	Clarksburg silt loam, 8 to 15 percent slopes	0.14	Farmland of statewide importance	Yes	Poorly drained	1
				6.12	Farmland of statewide importance	Yes	Poorly drained	1
		GyC	Guernsey silt loam, 8 to 15 percent slopes	3.45	Farmland of statewide importance	No	Moderately well drained	12
		Sm	Strip mines	7.65	Not prime farmland	No	-	32
		WmD	Westmoreland silt loam, 15 to 25 percent slopes	0.06	Farmland of statewide importance	No	Well drained	20
		WmF	Westmoreland silt loam, 35 to 60 percent slopes	1.79	Not prime farmland	No	Well drained	50
MVP-LY-003	Harrison	UL	Urban land	8.45	Not prime farmland	No	-	18
MVP-RD-001	Braxton	GuC	Gilpin-Upshur silt loams, 8 to 15 percent slopes	1.06	Farmland of statewide importance	No	Well drained	12
		GuD	Gilpin-Upshur silt loams, 15 to 25 percent slopes	3.29	Farmland of statewide importance	No	Well drained	20
		GuE	Gilpin-Upshur silt loams, 25 to 35 percent slopes	4.29	Farmland of local importance	No	Well drained	30
		MgB	Monongahela silt loam, 3 to 8 percent slopes	0.21	Farmland of statewide importance	No	Moderately well drained	5
		SrB	Sensabaugh silt loam, 3 to 8 percent slopes, rarely flooded	5.80	All areas are prime farmland	Yes	Poorly drained	2
		VaE	Vandalia silt loam, 25 to 35 percent slopes	1.22	Farmland of local importance	No	Well drained	30
		ZoB	Zoar silt loam, 3 to 8 percent slopes	0.03	Farmland of statewide importance	No	Moderately well drained	6

Table 7.2-4

Soils at Proposed Contractor Yards

Contractor Yard	County	Map Unit	Map Unit Name	Acres	Prime Farmland	Hydric	Drainage	Slope
MVP-LY-004	Braxton	GuD	Gilpin-Upshur silt loams, 15 to 25 percent slopes	5.04	Farmland of statewide importance	No	Well drained	20
		Ud	Udorthents, smoothed	4.19	Not prime farmland	No	-	-
MVP-LY-005	Nicholas	Pr	Pope-Craigsville complex	0.03	Prime farmland	No	Well drained	2
		Ud	Udorthents, smoothed	2.55	Not prime farmland	No	-	-
		W	Water	0.013	Not prime farmland	No	-	-
MVP-LY-007	Nicholas	Ed	Elkins silt loam, drained	17.98	Prime farmland	Yes	Poorly drained	2
		Pr	Pope-Craigsville complex	2.45	Prime farmland	No	Well drained	2
MVP-PY-003	Greenbrier	CfC	Cateache silt loam, 8 to 15 percent slopes	0.49	Farmland of statewide importance	No	Well drained	12
		Lo	Lobdell silt loam	1.38	All areas are prime farmland	No	Moderately well drained	2
		Ml	Melvin-Lindside complex	26.44	Farmland of local importance	Yes	Poorly drained	2
		Ux	Udorthents, smoothed-rock outcrop complex	0.01	Not prime farmland	No	-	40
MVP-PY-006	Montgomery	25	McGary and Purdy soils	10.38	Farmland of statewide importance	No	Somewhat poorly drained	1
		11B	Duffield-Ernest complex, 2 to 7 percent slopes	7.51	Farmland of statewide importance	Yes	Poorly drained	1
		11C	Duffield-Ernest complex, 7 to 15 percent slopes	4.00	Farmland of statewide importance	Yes	Poorly drained	1
		19B	Guernsey silt loam, 2 to 7 percent slopes	0.11	All areas are prime farmland	No	Moderately well drained	5
		30C	Unison and Braddock soils, 7 to 15 percent slopes	0.03	Farmland of statewide importance	Yes	Poorly drained	1
		30D	Unison and Braddock soils, 15 to 25 percent slopes	0.79	Farmland of statewide importance	Yes	Poorly drained	1
MVP-PY-005	Franklin County	7C	Clifford fine sandy loam, 8 to 15 percent slopes	14.10	Farmland of statewide importance	No	Well drained	12
		8E	Clifford-Hickoryknob complex, 25 to 45 percent slopes	0.90	Not prime farmland	No	Well drained	35

7.3 GENERAL IMPACTS AND MITIGATION

To minimize or avoid impacts on soils, MVP will implement soil mitigation measures as outlined in the FERC Plan and Procedures and in the Project-specific E&SCP. The FERC Plan and Procedures address project planning, construction, and right-of-way restoration. Additional project-specific measures for minimizing soil impacts may also be required as a result of other federal and state permits and consultations. Any such measures will be identified when final permits are received and plans are developed. Final mitigation measures and controls will be developed based upon field conditions and permit requirements.

7.3.1 Pipeline Construction Phase Impacts and Mitigation

7.3.1.1 Loss of Soil Due to Water or Wind Erosion

Erosion is a continuing natural process that can be accelerated by human disturbance. Factors that influence the degree of erosion include the time the construction area is exposed to the elements, soil texture, structure, length and percent of slope, vegetative cover, and rainfall or wind intensity. Soils most susceptible to erosion by water are typified by bare or sparse vegetative cover, non-cohesive soil particles with low infiltration rates, and moderate to steep slopes. Wind erosion processes are less affected by slope angles. Clearing, grading, and equipment movement accelerates the erosion process, and without adequate protection, can result in transport of sediment to waterbodies and wetlands. Soil loss due to erosion could also reduce soil fertility and impair revegetation.

MVP identified the soils along the pipeline route that are considered potentially highly erodible. The occurrence of highly erodible soils in the Project area is primarily a factor of slope. Approximately 78 percent of the pipeline route crosses areas with an average slope more than 15 percent; therefore, it is anticipated that the pipeline route will affect soils with a relatively high erosion potential.

Timely erosion controls will be implemented during construction and maintained in accordance with the FERC Plan and Procedures. Erosion control measures from the Plan are also consistent with the expected United States Army Corps of Engineers (USACE) 404 permit requirements and state and local guidelines.

During construction and initial right-of-way restoration, the effectiveness of temporary erosion control devices will be monitored by Federal and state inspectors as well as Environmental Inspectors (EIs) hired by MVP as specified in the Plan and Procedures. The effectiveness of revegetation and permanent erosion control devices will be monitored by MVP operating personnel during the long-term operation and maintenance of the pipeline. Except in active agricultural areas, temporary erosion control devices will be maintained until the right-of-way is successfully revegetated. Following successful revegetation of construction areas and upon authorization from the Federal and state agencies temporary erosion control devices will be removed. Monitoring of physical structures, their effectiveness and any effects on surrounding vegetation in agricultural areas will follow the requirements of the FERC Plan and Procedures. The EI will ensure use of topsoil certified as free of noxious weeds and soil pests, unless otherwise approved by the landowner, if soil needs to be imported into agricultural areas. The EI will also ensure trench breakers are installed in agricultural fields in accordance with the FERC Plan. The EI will be responsible for monitoring revegetation in agricultural areas. In agricultural areas, revegetation will be considered successful when crop growth and vigor are similar to adjacent undisturbed portions of the same or adjacent fields. This determination would be based on visual survey by the Federal and/or state inspectors and to the satisfaction of the landowner.

Temporary erosion controls, including interceptor diversions and sediment filter devices (e.g., silt fences and erosion control sock), will be installed following initial ground disturbance. As required, temporary trench breakers will be installed following ditch excavation. Temporary erosion control devices will be inspected and maintained on a routine basis in accordance with the FERC Plan and Procedures.

Minimizing sediment transport to streams and waterbodies crossed by the pipeline is a primary objective of the erosion control measures. Resource Report 2, Water Use and Quality, discusses mitigation to address the potential for runoff from the construction right-of-way.

Specific erosion control measures included in the FERC Plan and Procedures include the following:

- Slope Breakers – MVP will construct slope breakers across the pipeline construction right-of-way to slow the velocity of runoff and move water off the right-of-way. Temporary slope breakers (e.g., silt fence, and earthen berms) will be used during construction, and permanent slope breakers will be installed during final grading. Permanent slope breakers will not be installed on active agricultural lands unless requested by landowners. The spacing of slope breakers will be according to the FERC Plan and Procedures at a minimum. The spacing of slope breakers may be increased if considered necessary by the EI to protect downslope resources.

- Temporary Sediment Barriers – Sediment barriers (e.g., silt fences and erosion control socks) protect surface waters and roadways by controlling the flow of sediment on the construction right-of-way and by preventing the flow of sediment off the construction right-of-way. MVP will install and maintain these devices at the base of slopes adjacent to road crossings, waterbody crossings, and wetlands, as appropriate, and in other areas as necessary, until permanent revegetation measures have been judged successful and the potential for siltation has been minimized.

- Permanent Trench Breakers – Permanent trench breakers consisting of sacks of soil or sand, or bentonite clay bags will be installed around the pipe in the trench in areas with steep slopes to prevent subsurface channeling of water along the trench. Topsoil will not be used for trench breakers. Permanent trench breakers will be installed on slopes just before backfilling. Trench breakers will also be installed on slopes greater than 5 percent that are adjacent to waterbodies and wetlands. The spacing of permanent trench breakers will be according to the FERC Plan and Procedures and the E&SCP.

- Timing – To minimize the duration of soil disturbance, MVP will attempt to complete final cleanup and installation of permanent erosion control measures in an area within 30 days after backfilling the trench in that area, weather and soil conditions permitting. In residential areas final cleanup and installation of permanent erosion control measures, as needed, will be completed within 10 days after the trench is backfilled, weather conditions permitting. If it appears that circumstances will require construction activity beyond the normal growing season. MVP will adhere to restoration as outlined in the Winter Construction Plan located in Resource Report 1, Appendix 1-J.

- Revegetation – Long term erosion control will be accomplished by ensuring that areas disturbed by the Project are successfully revegetated. MVP will make every effort to ensure the rapid, successful establishment of vegetation on areas requiring revegetation, which will generally include all areas disturbed by construction with the exception of agricultural lands where requested otherwise by the landowner. Following final grading and cleanup, MVP will condition the construction workspace for planting including the preparation of a seedbed and application and incorporation of soil amendments at rates agreed to by the landowner. MVP has partnered with the Wildlife Habitat

Council for development of seed mixes to be used for Project restoration. MVP will seed areas to be revegetated in accordance with written recommendations for seed mixes, rates, and dates obtained from the appropriate soil conservation authorities, Wildlife Habitat Council, or as requested by landowners. . See additional discussion of seed mixes in Resource Report 3.

7.3.1.2 Reduction of Topsoil Quality Particularly Prime Farmland and Farmland of Statewide and Local Importance

During construction, topsoil and subsoil will be disturbed during grading of the right-of-way, trench excavation, and by heavy equipment moving along corridor. The potential mixing of topsoil or surface soil with the subsoil from these activities could result in a loss of soil fertility, due to loss nutrients and suitable soil structure to support the plants/trees growth.

The USDA defines Prime Farmland as "land that is best suited to food, feed, forage, fiber, and oilseed crops" (USDA NRCS 2005b). This designation relates to soil characteristics and not necessarily the existing land use; hence, it includes cultivated land, pasture, woodland, or other lands that are either used for food or fiber crops or vacant land that could be made available for these uses. Developed land and open water are excluded from Prime Farmland designation. Prime Farmland typically contains few or no rocks, is permeable to water and air, is not excessively erodible or saturated with water for long periods, and is not subject to frequent, prolonged flooding during the growing season. Soils that do not meet the above criteria may be considered Prime Farmland if the limiting factor is mitigated (e.g., artificial drainage in bottomlands).

Approximately 38 percent of the soils in West Virginia and 52 percent of the soils in Virginia crossed by the pipeline are considered either Prime Farmland or Farmland of Statewide/ Local Importance, with the bulk of these soils in the latter category.

To prevent mixing of the soil horizons or incorporation of additional rock into the topsoil, topsoil segregation (topsoil set in a separate pile) will be performed in non-saturated wetlands, croplands, pastures, hayfields, and in areas requested by the landowner. Up to 12 inches of topsoil will be removed from the ground surface, segregated, as appropriate, from all subsoil and replaced in the proper order during backfilling and final grading. Figures showing typical construction right-of-way cross sections with topsoil segregation are included in Resource Report 1. Implementation of proper topsoil segregation will help ensure post-construction revegetation success, thereby minimizing loss of crop productivity and the potential for long-term erosion problems.

MVP will conserve topsoil in actively cultivated and rotated cropland, improved pastureland, and non-saturated wetlands. In residential areas, MVP will either conserve topsoil or import topsoil as an alternative to topsoil segregation and conservation. Importation of soil would only be done after consultation with the landowner.

A maximum of 12 inches of topsoil will be segregated, as described in the FERC Plan, and in other areas at the specific request of the landowner or land management agency, if applicable (e.g., Forest Service, National Park Service). Where topsoil is less than 12 inches deep, the actual depth of the topsoil will be removed and segregated. The topsoil and subsoil will be temporarily stockpiled in separate windrows on the construction right-of-way. Rock would only be used to backfill the trench to the top of the existing bedrock profile in accordance with the FERC Plan. Rock will not be used as upper backfill in rotated or permanent cropland.

Under typical conditions, the trench will be adequate to accommodate the 42-inch diameter pipeline with 36 inches of cover and 48 inches of cover in actively cultivated agricultural lands. The trench width will vary based on site conditions (e.g., soil types, bedrock, and presence of groundwater). In agricultural areas and at certain crossings (e.g., road, waterbody), the trench depth will be greater in order to achieve the greater depth of cover requirements. Additional temporary workspace, including where required for topsoil segregation, are shown on the alignment sheets (Appendix 1-A) and are listed in the additional temporary workspace table in Resource Report 8. Once landowner consultations have been completed, topsoil additional workspaces may be added and the alignment sheets will be updated accordingly. Additional workspace may also be requested by MVP during construction if conditions encountered are found to be conducive to topsoil segregation in areas not previously designated for topsoil segregation. Upon completing construction, MVP will cooperate with affected farmers to allow continued agricultural use of property while minimizing impacts to pipeline operations.

7.3.1.3 Compaction of Soils

Soil compaction modifies the structure and reduces the porosity and moisture-holding capacity of soils. Compaction decreases infiltration and increases the potential for erosion. Construction equipment traveling over wet soils could disrupt the soil structure, reduce pore space, increase runoff potential, and cause rutting. The degree of compaction depends on moisture content and soil texture. Fine-textured soils with poor internal drainage that are moist or saturated during construction are the most susceptible to compaction and rutting. Based on the particle size, soil description of the various soil types presented by milepost in Appendices 7-A1 and 7-A2, it is expected that approximately 80 percent of the pipeline route could see some evidence of compaction.

In order to minimize compaction, MVP will limit construction traffic within the pipeline construction right-of-way to only that required to accomplish the construction. Following completion of construction, areas of heavy compaction will be identified by EIs, and these areas will be tilled, as necessary, when soil moisture conditions are suitable. To determine the extent of compaction, the EI will conduct tests on the same soil type under similar moisture conditions in undisturbed areas to establish approximate preconstruction conditions using a penetrometer or other appropriate device. The results of the compaction tests in undisturbed areas will be matched in the construction right-of-way. Since impacts related to mechanical compaction are expected to be limited to the upper soil horizon or the contact between the upper horizons, tilling is expected to effectively mitigate the impact. If tilling is not effective, MVP will identify additional mechanical methods (such as deep tilling) to restore the area, in consultation with state agencies and the landowner to meet the desired land use.

In areas where topsoil has been segregated, the subsoil will be de-compacted before replacing the segregated topsoil.

7.3.1.4 Construction Activities in Hydric Soils

Hydric soils are defined as “soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part” (USDA NRCS 2005b). Soils that are artificially drained or protected from flooding (e.g., by levees) are still considered hydric if the soil in its undisturbed state would meet the definition of a hydric soil. Generally, hydric soils are those soils that are poorly drained and very poorly drained. Hydric soils types are listed by soil type in Appendices 7-A1 and 7-A2. This hydric listing includes soils that are considered hydric and partially hydric per current SSURGO compilation methods. Partially hydric soils will be treated as hydric soils.

Less than one percent of the soils in West Virginia and less than one percent of the soils Virginia crossed by the pipeline are listed as hydric soils or have hydric inclusions. In addition, a high groundwater table associated with hydric soils could create a buoyancy hazard for the pipeline in limited areas.

Due to extended periods of saturation, hydric soils are susceptible to compaction and rutting depending on the saturation levels. MVP will minimize compaction and rutting of hydric soils that are not classified as wetlands by limiting access during wet periods. If necessary to prevent rutting of hydric soils not in wetlands, MVP will also require use of low-ground-pressure equipment, or temporary equipment mats will be installed to allow passage of equipment with minimal disturbance of the surface and vegetation. Construction in hydric soils in wetlands will follow the measures included in the FERC Procedures, as further described in Resource Report 2. Special construction methods such as concrete coating of pipe and or aggregate filled sacks will be used, as necessary, to overcome buoyancy hazards. Ground heaving in areas of heavy freezing with high water tables should not affect the pipeline because the pipeline will be installed below the frost line, and weighting of the pipeline will increase stabilization.

7.3.1.5 Disruption of Surface and Subsurface Drainage Systems

Pipeline construction could disrupt surface or subsurface drainage systems. To avoid or minimize this impact, MVP will question landowners and local agricultural agency personnel regarding the potential presence of drain tiles and irrigation systems in affected agricultural fields. In addition, observations will be made before and during construction for evidence of the presence of drain tiles and irrigation systems. MVP is in the process of identifying known drain tile and irrigation systems are along the pipeline route.

In fields with drain tiles and irrigation systems, pipeline construction will be conducted in accordance with the FERC Plan and Procedures. The pipe will be installed below agricultural drainage lines, except in the rare circumstance of a deep main drainage line. If agricultural drainage features must be modified during pipeline installation, these features will be restored to pre-construction condition or repositioned if necessary in a manner consistent with drainage orientation.

Should drainage tiles or irrigation piping be damaged during construction, MVP will repair/restore their function. MVP will carefully mark the location of the damage in a prominent manner, such as a securely staked lath with survey tape attached. Drain tile used for replacement shall be of the same size and quality as the original tile encountered on site. If original tile is not available, replacement tiles will be of appropriate size and materials to connect with the existing line without loss of function. See also the discussion of drain tiles in Resource Report 8.

Operation of the pipeline following construction and repair of damaged tiles and irrigation lines is not expected to affect operation of drainage and irrigation systems.

7.3.1.6 Potential for Poor Revegetation of Disturbed Areas

There is the potential for some disturbed areas not to revegetate adequately after construction is complete. In many areas of steep and rough terrain, the soil profile is very thin and it may be more difficult to establish vegetative cover. To maximize successful restoration of these areas, MVP may utilize soil amendments to increase coverage potential. Additionally, a surface erosion control fabric such as curlex/jute may be installed as necessary to control erosion. If post-construction grading is completed after the end of the growing season, the area will be mulched and seeding will take place during the next growing season. A Winter Construction Plan has been prepared to address how restoration and revegetation would proceed if seeding could not be completed before the onset of winter. Unless requested by a landowner, areas will be seeded by the next available seeding season (Appendix 1-J). Post-construction inspections will be conducted in accordance with the FERC Plan and Procedures to ensure that revegetation is adequate.

In active agricultural areas, MVP will conduct post-construction monitoring of planted crops and evaluate crop growth to determine whether soils are adequately restored. Restoration will be considered successful when upon visual survey, crop growth and vigor are similar to adjacent undisturbed portions of the same field, unless the specific easement agreement specifies otherwise. Monitoring will be conducted by EIs or other environmental staff prior to harvest during the first and second growing seasons following construction, or as requested by the landowner.

See Resource Reports 1 and 3 for additional discussion of right-of-way revegetation planning, seed mixes, and post-construction revegetation monitoring.

7.3.1.7 Mixing of Stones or Rock in Surface Soil

Introducing stones or rocks to surface soil layers that are not currently rocky may reduce soil moisture-holding capacity, resulting in a reduction of soil productivity. Additionally, in cultivated fields some agricultural equipment may be damaged by contact with large rocks and stones. Rock fragments and stones at the surface and in the surface layer may be encountered during grading, trenching, and backfilling.

Construction through soils with shallow bedrock could result in the incorporation of bedrock fragments into surface soils. MVP anticipates that mechanical rock removal will be required over much of the pipeline route. Specific locations where bedrock is expected to be encountered within the depth of the trench is discussed in Resource Report 6, Geological Resources.

The introduction of subsoil rocks/stones into agricultural topsoil will be minimized by segregating topsoil from trench spoil and replacing topsoil in agricultural areas after cleanup. This practice will prevent subsoil rocks from being brought to the surface and mixed with the topsoil layer. MVP will make diligent efforts to remove excess rock/stone greater than four inches in size from the topsoil and exposed subsoil of all disturbed soils, to the extent practicable, in cultivated and rotated croplands, hayfields, pastures, residential areas, and at the landowner's request in other areas by both hand and mechanical means. MVP will also remove excess rock/stone from surface soils disturbed by construction such that the size, density, and distribution of rock on the construction right-of-way will be similar to adjacent non-right-of-way areas. MVP will not remove rocks from backfilled areas if the rocks/stones in the backfill are consistent in size and density with conditions before construction.

If bedrock is encountered, MVP will take precautions to minimize the mixing of excavated bedrock with backfill and will replace rock in the trench to a level that is not higher than the original bedrock profile. Where necessary, excess rock will be hauled off-site away from the right-of-way or, subject to the landowner’s request and applicable permit conditions, disposed of on the right-of-way.

7.3.1.8 Potential for Soil Contamination

Soil contamination along the route may result from at least two sources: material spills during construction and trench excavation through pre-existing contaminated areas as discussed in Resource Report 6. Contamination from spills or leaks of fuels, lubricants, and coolant from construction equipment could adversely affect soils. The effects of contamination are typically minor because of the low frequency and volumes of spills and leaks.

MVP is developing a Spill Prevention, Control, and Countermeasure Plan (SPCC Plan) that specifies cleanup procedures in the event of soil contamination from spills or leaks of fuel, lubricants, coolants, or solvents. MVP and its contractors will use the SPCC Plan to prevent and contain, if necessary, accidental spills of any material that may contaminate soils and to ensure that inadvertent spills of fuels, lubricants, or solvents are contained, cleaned up, and disposed of in an appropriate manner.

If contaminated or suspect soils (e.g., oil-stained soils) are identified during trenching operations, MVP's plan to address the contamination is as follows: the construction contractor will notify MVP, and work in the area of the suspected contamination will be halted until the type and extent of the contamination is determined. MVP will notify all applicable agencies of the discovered material. The response action will be identified based on the type and extent of contamination; the responsible party; and local, state, and federal regulations, depending on the type of contamination.

7.3.1.9 Potential to Encounter Uranium in Soil

There is one known location in the vicinity of the Project, Coles Hill in Pittsylvania County, Virginia, where uranium deposits are notable for relative enrichment above background levels. Uranium enriched bedrock is known to occur at two locations at the Coles Hill site; the north deposit located about 4 miles northeast of the south end of the pipeline, and the south deposit located about 3.8 miles northeast of the south end of the pipeline. The pipeline does not cross known areas of uranium enriched bedrock at the Coles Hill site. Therefore, it is not expected that uranium above background levels will be encountered or exposed during Project construction.

7.3.2 Pipeline Operation and Maintenance Phase Impacts

After the pipeline right-of-way is restored and properly revegetated, operation and maintenance of the pipeline will not result in significant impacts to soil resources.

7.3.3 Impacts and Mitigation Due to Construction and Operation of Aboveground Facilities

Operation of the permanent aboveground facilities, including compressor stations, meter stations, and cathodic protection sites, will result in the permanent conversion of approximately 70 acres of land to commercial/industrial uses. Table 7.2-2 describes the soil types and properties of the soils on each property within which the compressor stations will be sited.

Mitigation measures associated with the compressor stations and other aboveground facilities will be similar to those described for construction of the pipeline facilities; however, some impacts, such as removal of soils excavated for the compressor stations, will be permanent. Construction of aboveground facilities could result in the loss of soil due to water or wind erosion. MVP will minimize impacts to the extent possible by employing erosion control and soil conservation techniques during construction in accordance with the FERC Plan and Procedures. No additional mitigation requirements are anticipated.

MVP has attempted to avoid locating aboveground facilities within active agricultural areas in order to avoid permanent impacts on these areas. However, if construction and operation of aboveground facilities will result in temporary and/or permanent impacts to agricultural areas, MVP will compensate landowners accordingly. The amount of land affected will be small compared to the total area of agricultural land in each county. The footprint of the permanently impacted land will be minimized to the extent possible, while complying with United States Department of Transportation regulations for pipeline construction and operation (49 CFR Part 92, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards).

7.4 JEFFERSON NATIONAL FOREST

MVP will cross approximately 3.4 miles of the Jefferson National Forest (JNF) where it crosses Peters Mountain between MPs 195.3 and 196.9 (1.6 miles), Sinking Creek Mountain between MPs 217.2 and 218.0 (0.8 mile), and Brush Mountain between MPs 218.4 and 219.4 (1.0 mile). There are approximately 15 NRCS soil types described within the MVP route. These 15 soil types soils are similar in texture (sandy loams), and drainage (all well drained), with the bedrock either outcrop (at or above the surface) or relatively shallow. Slopes in the forest are steep and range from 11 to 70 percent.

Representatives of the USFS have indicated that much of this area was mapped only by aerial photography and that, because of slope, the NRCS soil mapping in this type of terrain was not well documented by “on the ground” soil evaluators. This is mainly because these areas do not tend to be good farmland where soil type is more important. MVP has presented a plan to the USFS to ground truth the NRCS soil and geologic mapping of the portion of the MVP pipeline that will cross USFS land. The field mapping effort will be a combination of intrusive test pits to confirm soil taxonomy, with a test hole dug in at least each of the current 15 mapped soil types. The corridor will be walked, looking for and examining bedrock outcrops, examining the stratigraphy (overburden and bedrock if exposed) in any road cuts, and looking for signs of shallow bedrock. In addition, this field effort will identify historic landslides, seeps or groundwater breakout and areas of bedrock outcrop, rock type and fracture patterns.

This evaluation will be compared to currently mapped conditions to confirm these conditions or used to revise the mapped conditions. The results of this mapping will be incorporated into the final design and erosion sedimentation control plans which will include methods of determining erosion potential with the NRCS Erosion Hazard rating for soil series found in the corridor, which uses K-factor, slope and rockiness.

Impacts and mitigation due to construction within USFS land will be similar to those described in Section 7.3.1. In order to meet additional USFS Land Resource Management Plan requirements, the Virginia Erosion and Sediment Control Handbook will be incorporated into the final design and erosion control plans for the USFS portion of the Project. These erosion and sediment control plans will be submitted to the USFS for review prior to construction. Variance requests to state and federal permits will also be submitted to the USFS for review. No hay bales are anticipated to be used on USFS land for sediment and erosion control.

While within the JNF, erosion control plant species, seed and fertilizer mixtures will be pre-approved by the USFS. See Resource Report 3 for additional discussion of right-of-way revegetation planning, seed mixes, and post-construction revegetation monitoring.

7.5 REFERENCES

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Mountain Valley Pipeline Project

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Appendix 7-A1 and 7-A2
Pipeline Route Soil Map Units and Descriptions in West Virginia and Virginia by Milepost

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Appendix 7-B
Pipeline Route Soil Map Units Acreage

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Appendix 7-C
Prime Farmland and Hydric Soil Mapbook

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Appendix 7-D
Soils at Additional Temporary Workspace