
BIOLOGICAL ASSESSMENT TO ADDRESS
POTENTIAL EFFECTS ON FEDERALLY LISTED SPECIES FOR THE
MOUNTAIN VALLEY PIPELINE PROJECT
IN WEST VIRGINIA AND VIRGINIA

October 2016

CONTAINS PRIVILEGED INFORMATION – NOT FOR RELEASE



Prepared by:

Environmental Solutions & Innovations, Inc.

4525 Este Avenue
Cincinnati, OH 45232

Syracuse, NY • Stow, OH • Indianapolis, IN • Orlando, FL • Springfield, MO • Pittsburgh, PA • Teays Valley, WV

www.ENVSI.com

Executive Summary

The purpose of this Biological Assessment (BA) is to evaluate the effects to the Indiana (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*), Roanoke logperch (*Percina rex*), James spinymussel (*Pleurobema collina*), clubshell (*Pleurobema clava*), snuffbox (*Epioblasma triquetra*), northeastern bulrush (*Scirpus ancistrochaetus*), running buffalo clover (*Trifolium stoloniferum*), shale barren rock cress (*Arabis serotina*), small whorled pogonia (*Isotria medeoloides*), smooth coneflower (*Echinaceae laevigata*), and Virginia spiraea (*Spiraea virginiana*) resulting from development of the Mountain Valley Pipeline Project (Project) in 17 counties through West Virginia and Virginia. This BA has been prepared by Environmental Solutions & Innovations (ESI) on behalf of the Project proponent (Mountain Valley Pipeline, LLC [MVP]) at the direction of the Federal Energy Regulatory Commission (FERC) and will be submitted to the U.S. Fish and Wildlife Service (USFWS) in compliance with requirements of Section 7 of the Endangered Species Act of 1973 (ESA; 16 USC 1536[c], 50 CFR 402.12[f] and 402.14[c]), and in conjunction with requests for authorization from the FERC to grant a Certificate of Public Convenience and Necessity pursuant to Section 7(c) of the Natural Gas Act of 1938(NGA).

MVP proposes to develop an approximately 488.3-kilometer (303.4-mi), 106.7-centimeter (42-in) diameter natural gas pipeline. It will extend from the existing Equitrans, L.P. transmission system and other natural gas facilities in Wetzel County, West Virginia to the existing Transcontinental Gas Pipe Line Company, LLC's (Transco) Zone 5 compressor station 165 in Pittsylvania County, Virginia. The Project is being proposed to provide timely, cost-effective access to the growing demand for natural gas for use by local distribution companies (LDCs), industrial users, and power generation in the Mid-Atlantic and southeastern markets, as well as potential markets in the Appalachian region. This BA includes information regarding the construction, operation, and maintenance of the Project.

The Project location is within the range of the federally endangered Indiana bat and federally threatened northern long-eared bat. Furthermore, the Project traverses multiple protective capture, roost, and hibernacula buffers associated with both species. Because the Project is in a forested landscape, impacts to woodlands during construction are unavoidable. As currently designed, the Project will permanently remove approximately 646.8 hectares (1,598.3 ac) of forested habitat with potential to contain trees ≥ 7.6 centimeters (3 in) in diameter at breast height (dbh) from the Project Area during construction. Consultation with the USFWS further specified that clearing of any trees ≥ 7.6 centimeters (3 in) dbh between April 1 and November 15 would require formal consultation under Section 7 of the ESA between the USFWS and FERC due to the known occurrences of Indiana bats. Furthermore, removing known northern long-eared bat maternity roosts and any trees within 45.7 meters (150 ft) of those roosts is prohibited between June 1 and July 31 according to the final 4(d) rule published January 14, 2016.

Privileged & Confidential



The proposed Project traverses a large portion of the Roanoke River basin within the geographic distribution of the federally endangered Roanoke logperch. Within the basin, the Project crosses a total of 38 perennial streams with potential to support populations of Roanoke logperch. Of these, USFWS requested assumed presence of Roanoke logperch at any crossing of the North Fork Roanoke, Roanoke, and Pigg rivers (n=5), as the streams are known to currently support populations of this species. The remaining 33 stream crossings were assessed to determine habitat suitability or potential presence for Roanoke logperch populations.

The proposed Project also crosses numerous perennial streams that support populations of state and federally protected freshwater mussels. In West Virginia, the Project traverses Leading Creek and Little Kanawha River that potentially support federally endangered clubshell and snuffbox mussels. However, given the lack of critical habitat, lack of known occurrences, and probable absence in the vicinity of the Project, clubshell and snuffbox mussels were excluded from further analysis. In Virginia, the Project will cross Craig Creek which supports known populations of the federally endangered James spiny mussel.

In addition to these animal species, the Project is also within the distribution range of six federally-listed plant species. These include plants adapted to wetlands and streams (northeastern bulrush and Virginia spiraea), open forests (small whorled pogonia), upland open habitats (running buffalo clover and smooth coneflower), and shale barrens (shale barren rock cress).

To address potential effects of the Project on federally listed species, ESI was contracted by Tetra Tech on behalf of MVP to complete mist net, winter hibernacula, and detailed summer habitat assessment surveys for the Indiana and northern long-eared bat within the Project Area, qualitative stream assessments for the Roanoke logperch and presence/absence stream surveys for mussels, as well as habitat assessments and surveys for plants.

ESI conducted mist net surveys for bats at 338 net sites (1,953 complete and 426 partial net nights) from May 15 to August 15, 2015 and 3 net sites (6 complete and 6 partial net nights) from May 15 to May 26, 2016. A total of 1,476 bats representing nine species was captured: 763 big brown bats (*Eptesicus fuscus*), 538 eastern red bats (*Lasiurus borealis*), 74 northern long-eared bats, 38 silver-haired bats (*Lasionycteris noctivagans*), 24 eastern small-footed bats (*Myotis leibii*), 16 tri-colored bats (*Perimyotis subflavus*), 10 eastern hoary bats (*Lasiurus cinereus*), 10 evening bats (*Nycticeius humeralis*), and 3 little brown bats (*Myotis lucifugus*). No federally endangered Indiana bats were captured.

Radio transmitters were attached to 56 (six lactating, eight post-lactating, and four non-reproductive adult females, twenty-two adult males, nine juvenile females, and seven juvenile males) northern long-eared bats. Forty-three radio-tagged northern long-eared bats were tracked to 69 diurnal roosts. One tagged bat was never tracked due to

Privileged & Confidential



transmitter failure on the first day, and 12 tagged bats were never located during telemetry studies. Emergence counts were conducted at all roosts for a minimum of two counts per tree. Two hundred sixty-seven emerging bats were recorded over 145 observation-nights. The greatest number of bats emerging from a single roost on a single night consisted of 40 individuals.

Searches for underground voids to identify suitable winter habitat for the Indiana and northern long-eared bat in the Project Area occurred from November 2014 to October 2016. Forty-one previously undocumented voids and seven known caves were observed during field efforts. Of these, 20 were determined potentially suitable for hibernating bats. Four potentially suitable portals found in West Virginia were sampled using harp traps between September 25 and October 22, 2015. One northern long-eared bat was captured at a portal in Braxton County during these efforts. No bats were captured at the other three portals sampled in West Virginia. One suitable portal in Virginia was sampled using a harp trap on September 29 and October 20, 2015, but no bats were captured during this effort. One known cave in Virginia, Overlooked Cave, and two unknown caves were sampled using a harp trap on April 17-21, 2016 and September 27 to October 4, 2016, respectively. No bats were captured during these efforts. Presence has been assumed in the remaining potentially suitable, known, and previously undocumented portals in West Virginia and Virginia as land access prevented sampling in Virginia and spring sampling efforts are not accepted in West Virginia.

In addition, an evaluation of summer habitat suitability for the Indiana and northern long-eared bat in the Project Area was completed from February 10 to November 22, 2015. Over one-third of the delineated summer habitat patches identified had no roosting potential for Indiana bat (n= 343) and northern long-eared bat (n= 314). Fifty-five habitat patches were ranked as having high roosting potential for the Indiana bat and 137 patches were ranked as high roosting potential for the northern long-eared bat. The majority of potential roost trees ranked as low for Indiana (n= 5,084) and moderate for northern long-eared bats (n= 5,344). Of the 10,978 potential roost trees, 986 (9.0%) ranked as high potential for the Indiana bat and 3,203 for the northern long-eared bat (29.2%). Approximately one-third (n= 265) of habitat patches identified had high foraging potential for northern long-eared bats and 21.8 percent (n = 200) of patches had high foraging for Indiana bats.

Indiana bats were not captured during mist-net surveys, but it is assumed the species occupies summer habitat from Project milepost 0 to 10.3 in association with the capture of a pregnant female on an unrelated project in 2010. In addition to this area, the species is also assumed in 62 portals and forested habitat where sampling was not completed due to land access permissions (e.g., portals outside the limits of disturbance [LOD] but within the Action Area for the Project) or incomplete sampling events. Based on the results from the effects analysis, it is expected that 177 and 4 individuals will be harassed and harm, respectively, during construction and operation of the Project. Thus, the Project **May Effect – Is Likely to Ad-versely Affect** the

Privileged & Confidential



Commented [TML1]: How many of those are in WV and how many are in VA?

Indiana bat. This determination constitutes a take under ESA and will thus require an Incidental Take Statement (ITS) from USFWS.

Results of summer mist net and harp trap surveys confirm presence of northern long-eared bats within the Project Area. MVP will avoid take of adults and non-volant young by suspending tree clearing activities during June 1 through July 31. However, individuals present during hibernation, spring staging, and autumn swarming may be harmed or harassed during Project development. Results from the effects analysis demonstrated the potential to harass and harm 225 and 3 northern long-eared bats, respectively, during Project construction or operations. Thus, the Project **May Affect – Is Likely to Adversely Affect** the northern long-eared bat, which constitutes a take under ESA and will thus require an ITS from USFWS.

In accordance with the recommendations from the USFWS, ESI completed a desktop review and analysis as well as in situ qualitative habitat assessments to determine habitat suitability or potential presence of Roanoke logperch populations. Thirty-eight stream crossings were identified and assessed for potentially suitable habitat and presumed presence. Five stream were determined suitable with assumed presence based on agency correspondence. Two stream crossings were deemed unsuitable based on geographic features prohibiting colonization or desktop analyses. In situ habitat assessments were completed at the remaining 33 stream crossings from April 2015 to May 2016. Based on in situ assessments and USFWS correspondence, 9 of 33 streams had potential habitat capable of supporting Roanoke logperch. Thus, combined with the areas identified by the USFWS, 14 stream crossings were designated as having the potential to host Roanoke logperch.

Collectively throughout the Roanoke River basin, it is estimated that Project activities could potentially harass 10,182 Roanoke logperch individuals and harm 27 individuals of all age classes. The majority of individuals (99 %) are harassed via temporary augmented sediment loading rates that enter into waterways as a result of construction activities. Harm estimates are from 12 stream crossings, with harm estimates for Young of Year (YOY) and Age 1+ of one individual for each age category at each crossing with the exception of the Roanoke River where four Age-1+ individuals are expected to be harmed. Harm estimates are derived from individuals that may be inadvertently injured or killed during depletion fish surveys. Because take of individuals is predicted, the Project **May Affect – Is Likely to Adversely Affect** Roanoke logperch. This determination constitutes a take under ESA and will thus require an ITS from USFWS.

Surveys for the presence of freshwater mussels were completed within acceptable mussel survey field seasons from July 2015 to September 2016 in West Virginia and Virginia. Streams traversed in West Virginia, identified within the West Virginia Mussel Survey Protocol (WVMSP), and with upstream drainages greater than 25.9 square kilometers (10 mi²) were surveyed for the presence of freshwater mussels. Mussel surveys were successfully completed at nine Group 1 stream crossings and three

Privileged & Confidential



Group 2 stream crossings. No federally endangered mussels were encountered during these survey efforts, but live, non-listed mussel species were observed in Sand Fork, Little Kanawha River (access road), and Greenbrier River. One stream crossing, Gauley River, was not fully assessed because of high stream velocities (i.e., whitewater rapids) and unsafe diving conditions. In Virginia, stream crossings with upstream drainages greater than 13 square kilometers (5 mi²) were surveyed for the presence of freshwater mussels or potentially suitable habitat from April to October 2015 and April to September 2016. Of the 23 stream crossings identified during the desktop analyses and traversed by the Project, four crossings yielded live mussels and two crossings yielded deadshell mussels only. Mussels are assumed present at one additional stream crossing (i.e., North Fork Roanoke River AR2) based on agency correspondence. The remaining 16 stream crossings assessed or surveyed did not yield live mussels or exhibit suitable habitat.

James spiny mussel were not present during mussel survey efforts that encompassed multiple proposed crossings of Craig Creek in Montgomery County, Virginia. The nearest known population of James spiny mussel in Craig Creek occurs downstream of its confluence with Johns Creek which is approximately 48.75 stream kilometers (30.3 mi) of the Project crossings. The Action Area in Craig Creek extends approximately 15.07 stream kilometers (9.36 mi) downstream of the downstream-most crossing. The Action Area is more than 33 kilometers (21.2 mi) upstream of the nearest James spiny mussel occurrence. Based on the location of known populations of this species relative to the crossings at Craig Creek, the Project **May Affect– Is Not Likely to Adversely Affect** James spiny mussel. No individuals are expected to be directly or indirectly harmed or harassed and no James spiny mussel designated critical habitat will be impacted by the Project. This determination does not constitute a take under ESA and will not require an ITS from USFWS.

Neither clubshell nor snuffbox **mussels** were present during mussel survey efforts at crossings of the Elk River and Little Kanawha River. Mussel survey efforts were not warranted at Leading Creek because the crossing location has an upstream drainage area less than 25.9 square kilometers (10 mi²) and is consequently unlikely to support freshwater mussels. The nearest known populations of clubshell and snuffbox in Elk River, Little Kanawha River, and Leading Creek in West Virginia occur outside of the Action Area therefore the Project **May Affect–Is Not Likely to Adversely Affect** clubshell or snuffbox mussels. The determinations for these species do not constitute a take under ESA and will not require an ITS from USFWS.

Plant surveys were performed between May 2015 and September 2016. All potential habitat defined during consultation and desktop analyses was surveyed, with the exception of 10 kilometers (6 mi) of right-of-way (ROW) with potential habitat for smooth cone flower, 0.95 kilometer (0.59 mi) of potential running buffalo clover habitat, 0.19 kilometer (0.12 mi) of potential shale barren rock cress habitat, 0.19 kilometer (0.12 mi) of potential small whorled pogonia habitat, and 0.14 kilometer (0.09 mi) of potential Virginia spiraea habitat due to denied land access. No individuals of federally

Privileged & Confidential



Commented [TML2]: How is this being dealt with? We can't concur with a NLAA if surveys haven't been completed.

endangered or threatened plants were detected during surveys; however, potential habitat was found for running buffalo clover, small whorled pogonia, smooth coneflower, and Virginia spiraea in the Project area. The nearest populations of these four species occur outside the Project area therefore the Project **May Affect-Is Not Likely to Adversely Affect** running buffalo clover, small whorled pogonia, smooth coneflower, or Virginia spiraea. No individuals are expected to be directly or indirectly harmed or harassed and no designated critical habitat will be impacted by the Project for these species. No potential habitat was found for northeastern bulrush or shale barren rock cress throughout the Project area; therefore, the Project will have **No Effect** on these species.

TABLE OF CONTENTS

	<u>Page</u>
1.0 Introduction	1
1.1 Regulatory Compliance.....	1
1.2 Consultation	3
1.3 Species Covered.....	4
1.4 Studies Completed in Support of the Biological Assessment.....	5
1.4.1 Bats.....	5
1.4.1.1 Mist Net and Telemetry Surveys - Summary	5
1.4.1.2 Hibernacula Search and Harp Trapping Surveys - Summary	6
1.4.1.3 On-Site Detailed Habitat Assessment - Summary	7
1.4.2 Roanoke Logperch Stream Habitat Assessments - Summary	7
Freshwater Mussel Surveys – Summary	8
1.4.3	
1.4.3.1 West Virginia	9
1.4.3.2 Virginia	9
1.4.4 Plant Surveys – Summary.....	9
1.5 Species Considered for Further Analysis in the Biological Assessment ..	10
1.6 Purpose of the Biological Assessment.....	10
2.0 Project Description	11
2.1 Purpose and Location	11
2.2 Construction Timeline	13
2.3 Life of the Project	13
2.4 Route Selection.....	13
2.5 Facilities and Infrastructure	13
2.5.1 Aboveground Facilities.....	13
2.5.2 Access Roads	15
2.5.3 Additional Temporary Workspace	15
2.5.4 Pipe Storage and Contractor Yards	15
Operation and Maintenance.....	15
2.5.5	
2.6 Project Design Features to Avoid and Minimize Impacts to Natural Resources.....	16
2.6.1 Wetlands and Waterbodies	16
Federally Listed Terrestrial Species	18
2.6.2	
2.6.2.1 Bats	18
2.6.2.2 Plants	20
2.6.3 Federally Listed Aquatic Species	21
3.0 Action Area.....	22
3.1 Project Action Area	22
Dust – Health, Safety Effects, and Standards	23
3.1.1	
3.1.1.1 Dust Production and Presence	23

3.1.1.2	Movement of Dust Offsite	24
3.1.1.3	Action Area for Dust	24
	Changes in Light Levels.....	25
3.1.2		
3.1.2.1	Effects of Artificial Light on Bats	25
3.1.2.2	Effects of Artificial Light on Aquatic Species.....	27
3.1.2.3	Effects of Artificial Light on Plant Species	27
3.1.2.4	Distance of Light Pollution.....	27
3.1.2.5	Action Area for Light Pollution	28
	Changes in Noise.....	283.1.3
3.1.3.1	Effects of Noise on Wildlife	28
3.1.3.2	Measuring Noise Levels	30
3.1.3.3	Sources of Noise	31
3.1.3.4	Sound Attenuation.....	33
3.1.3.5	Action Area for Noise Pollution.....	33
3.1.4	Changes in Water Quality	33
3.1.4.1	Impact of Sediment on Aquatic Communities.....	34
3.1.4.2	Level of Impact Considered Significant	34
3.1.4.3	Sedimentation Model.....	35
3.1.4.4	Action Area For Water Quality	36
3.1.5	Cumulative Action Area.....	36
3.2	Habitat in the Action Area	37
3.2.1	Physiography	37
	Land Cover Types.....	383.2.2
4.0	Target Species within the Action Area.....	40
4.1	Indiana Bat.....	40
4.1.1	Activity Patterns	40
4.1.2	Site-specific Data	44
4.1.2.1	Summer Occurrence	44
4.1.2.2	Summer Habitat	45
4.1.2.3	Winter Hibernation, Autumn Swarming, and Spring Staging	45
4.2	Northern Long-eared Bat	49
4.2.1	Activity Patterns	49
4.2.2	Site-specific Data	53
4.2.2.1	Summer Occurrence	53
4.2.2.2	Summer Habitat	53
4.2.2.3	Winter Hibernation, Autumn Swarming, and Spring Staging	54
4.3	Roanoke Logperch.....	54
4.3.1	Activity Patterns	55
	Site-specific Data	564.3.2
4.3.2.1	Habitat.....	59
4.3.2.2	Occurrence.....	60
4.4	James Spiny mussel	62
4.4.1	Activity Patterns	62

4.4.2	Site-specific Data	64
4.4.2.1	Occurrence	64
4.4.2.2	Habitat	65
4.5	Clubshell	65
	Activity Patterns	654.5.1
	Occurrence	674.5.2
4.6	Snuffbox	68
4.6.1	Activity Patterns	69
4.6.2	Site-specific Data	69
4.7	Northeastern Bulrush	71
4.7.1	Habitat Requirements	72
4.7.2	Site-specific Data	72
4.7.2.1	Habitat	74
4.8	Running Buffalo Clover	74
4.8.1	Habitat Requirements	74
	Site-specific data	744.8.2
4.8.2.1	Habitat	75
4.9	Shale Barren Rock Cress	75
4.9.1	Habitat Requirements	75
	Site-specific Data	814.9.2
4.9.2.1	Habitat	81
4.10	Small Whorled Pogonia	81
4.10.1	Habitat Requirements	81
	Site-specific Data	844.10.2
4.10.2.1	Habitat	84
4.10.2.2	Occurrence	84
4.11	Smooth Coneflower	84
4.11.1	Habitat Requirements	90
4.11.2	Site-specific Data	90
4.11.2.1	Habitat	91
4.11.2.2	Occurrence	91
4.12	Virginia Spiraea	91
4.12.1	Habitat Requirements	94
4.12.2	Site-specific Data	95
4.12.2.1	Habitat	95
4.12.2.2	Occurrence	95
5.0	Effects Analysis	98
5.1	Indiana Bats	98
5.1.1	Direct Effects to Individuals	98
5.1.1.1	Winter Season of Hibernation	98
5.1.1.2	Autumn Swarming and Spring Staging	105
5.1.1.3	Summer Season of Reproduction	106
5.1.1.4	Spring and Autumn Migration/Transient Period	107
	Direct Effects on Habitat	1085.1.2

5.1.2.1	Winter Season of Hibernation.....	108
5.1.2.2	Autumn Swarming and Spring Staging.....	108
5.1.2.3	Summer Season of Reproduction	108
5.1.2.4	Spring and Autumn Migration/Transient Period	109
	Indirect Effects	109
5.1.3.1	Detrimental	109
5.1.3.2	Beneficial.....	111
5.2	Northern Long-eared Bats	111
5.2.1	Direct Effects to Individuals.....	116
5.2.1.1	Winter Season of Hibernation.....	116
5.2.1.2	Autumn Swarming and Spring Staging.....	118
5.2.1.3	Summer Season of Reproduction	119
5.2.1.4	Spring and Autumn Migration/Transient Period	119
	Direct Effects on Habitat	1205.2.2
5.2.2.1	Winter Season of Hibernation.....	120
5.2.2.2	Autumn Swarming and Spring Staging.....	120
5.2.2.3	Summer Season of Reproduction	120
5.2.2.4	Spring and Autumn Migration/Transient Period	121
5.2.3	Indirect Effects	121
5.2.3.1	Detrimental	121
5.2.3.2	Beneficial.....	121
5.3	Roanoke Logperch.....	122
5.3.1	Direct Effects to Individuals.....	122
5.3.1.1	Adults and Subadults	122
5.3.1.2	Young-of-the-Year	130
	Direct Effects on Habitat	1315.3.2
5.3.2.1	Adults	132
5.3.2.2	Young-of-the-Year	133
5.3.3	Indirect Effects on Individuals	134
	Indirect Effects on Habitat.....	1345.3.4
5.4	James Spiny mussel	135
	Direct Effects on Individuals	1365.4.1
5.4.2	Direct Effects on Habitat	136
5.4.3	Indirect Effects on Individuals	136
5.4.4	Indirect Effects on Habitat	136
5.5	Clubshell	136
5.5.1	Elk River.....	137
5.5.2	Little Kanawha River	137
5.5.3	Leading Creek.....	137
	Direct Effects on Individuals.....	1375.5.4
5.5.5	Direct Effects on Habitat	137
5.5.6	Indirect Effects on Individuals	137
5.5.7	Indirect Effects on Habitats	138
5.6	Snuffbox.....	138

5.6.1	Elk River.....	138
5.6.2	Little Kanawha River	138
5.6.3	Leading Creek.....	138
5.6.4	Direct Effects on Individuals.....	139
	Direct Effects on Habitat	139
5.6.6	Indirect Effects on Individuals	139
5.6.7	Indirect Effects on Habitats	139
5.7	Northeastern Bulrush	139
5.7.1	Direct Effects on Individuals.....	139
5.7.2	Direct Effects on Habitat	139
5.7.3	Indirect Effects on Individuals	139
	Indirect Effects on Habitat.....	140
5.8	Running Buffalo Clover	140
5.8.1	Direct Effects on Individuals.....	140
5.8.2	Direct Effects on Habitat	140
5.8.3	Indirect Effects on Individuals	140
5.8.4	Indirect Effects on Habitat.....	140
5.9	Shale Barren Rock Cress	142
5.9.1	Direct Effect on Individuals.....	142
5.9.2	Direct Effects on Habitat	142
5.9.3	Indirect Effects on Individuals	142
5.9.4	Indirect Effects on Habitat.....	142
5.10	Small Whorled Pogonia	142
5.10.1	Direct Effects on Individuals.....	142
5.10.2	Direct Effects on Habitat	142
5.10.3	Indirect Effects on Individuals	144
5.10.4	Indirect Effects on Habitat.....	144
5.11	Smooth Coneflower	144
5.11.1	Direct Effects on Individuals.....	144
5.11.2	Direct Effects on Habitat	144
5.11.3	Indirect Effects on Individuals	144
5.11.4	Indirect Effects on Habitat.....	146
5.12	Virginia Spiraea.....	146
5.12.1	Direct Effects on Individuals.....	146
5.12.2	Direct Effects on Habitat	146
5.12.3	Indirect Effects on Individuals	146
5.12.4	Indirect Effects on Habitat.....	146
6.0	Cumulative Effects	148
6.1	Large Scale Construction.....	148
6.1.1	Natural Gas and Oil Transmission Projects	148
6.1.2	Transportation.....	151
6.1.3	Coal and Mineral Extraction.....	151
6.2	Forest Trends and Fragmentation.....	151
6.2.1	State-wide Forest Trends.....	151

6.2.2	Forest Fragmentation.....	152
6.3	Other Land Use Changes	153
6.3.1	Agricultural Lands	153
6.4	Protected Lands.....	154
6.5	Concluding Comments.....	157
6.5.1	Indiana Bats	157
6.5.2	Northern Long-eared Bats.....	157
6.5.3	Roanoke Logperch.....	157
6.5.4	James Spiny mussel	158
6.5.5	Clubshell.....	158
6.5.6	Snuffbox.....	158
6.5.7	Northeastern Bulrush	158
6.5.8	Running Buffalo Clover	158
6.5.9	Shale Barren Rock Cress.....	158
6.5.10	Small Whorled Pogonia.....	158
6.5.11	Smooth Coneflower	158
6.5.12	Virginia Spiraea.....	158
7.0	Determination of Effects and Rationale	159
7.1	Indiana Bats	159
7.1.1	Direct Effects to Individuals	159
7.1.1.1	Winter Season of Hibernation.....	159
7.1.1.2	Autumn Swarming and Spring Staging.....	159
7.1.1.3	Summer Resident Indiana Bats	160
7.1.1.4	Spring and Autumn Migration/Transient Period	160
7.1.2	Direct Effects to Habitat	160
7.1.2.1	Winter Hibernacula	160
7.1.2.2	Habitat Used During Autumn Swarming and Spring Staging....	160
7.1.2.3	Habitat Used During the Summer Season of Reproduction	160
7.1.2.4	Spring and Autumn Migration/Transitory Period	161
7.1.3	Indirect Effects	161
7.1.4	Indiana Bat Determination Summary	161
7.2	Northern Long-eared Bats	161
7.2.1	Direct Effects to Individuals	161
7.2.1.1	Winter Season of Hibernation.....	161
7.2.1.2	Autumn Swarming and Spring Staging.....	162
7.2.1.3	Summer Resident Northern Long-eared Bats	162
7.2.1.4	Spring and Autumn Migration/Transient Period	162
7.2.2	Direct Effects to Habitat	162
7.2.2.1	Winter Hibernacula	162
7.2.2.2	Habitat Used During Autumn Swarming and Spring Staging....	162
7.2.2.3	Habitat Used During the Summer Season of Reproduction	163
7.2.2.4	Spring and Autumn Migration/Transitory Period	163
7.2.3	Indirect Effects	163
7.2.4	Northern Long-eared Bat Determination Summary	163

7.3	Roanoke Logperch.....	163
7.3.1	Direct Effects on Individuals.....	164
7.3.1.1	Adults	164
7.3.1.2	Young-of-the-Year.....	164
7.3.2	Direct Effects on Habitat	164
7.3.2.1	Adults	165
7.3.2.2	Young-of-the-Year.....	165
7.3.3	Indirect Effects on Individuals	165
7.3.4	Indirect Effects on Habitat.....	165
7.4	James Spnymussel.....	165
7.4.1	Direct Effects to Individuals.....	166
7.4.2	Direct Effects to Habitat	166
7.4.3	Indirect Effects to Individuals	166
7.4.4	Indirect Effects to Habitats	166
7.4.5	James Spnymussel Determination Summary.....	166
7.5	Clubshell	167
7.5.1	Direct Effects to Individuals.....	167
7.5.2	Direct Effects to Habitat	167
7.5.3	Indirect Effects to Individuals	167
7.5.4	Indirect Effects to Habitats	167
7.5.5	Clubshell Determination Summary.....	167
7.6	Snuffbox.....	168
7.6.1	Direct Effects to Individuals.....	168
7.6.2	Direct Effects to Habitat	168
7.6.3	Indirect Effects to Individuals	168
7.6.4	Indirect Effects on Habitats	168
7.6.5	Snuffbox Determination Summary	168
7.7	Northeastern Bulrush	169
7.7.1	Direct Effects on Individuals.....	169
7.7.2	Direct Effects on Habitat	169
7.7.3	Indirect Effects on Individuals	169
7.7.4	Indirect Effects on Habitat.....	169
7.7.5	Northeastern Bulrush Determination Summary.....	169
7.8	Running Buffalo Clover	170
7.8.1	Direct Effects on Individuals.....	170
7.8.2	Direct Effects on Habitat	170
7.8.3	Indirect Effects on Individuals	170
7.8.4	Indirect Effects on Habitat.....	170
7.8.5	Running Buffalo Clover Determination Summary.....	170
7.9	Shale Barren Rock Cress	171
7.9.1	Direct Effects on Individuals.....	171
7.9.2	Direct Effects on Habitat	171
7.9.3	Indirect Effects on Individuals	171
7.9.4	Indirect Effects on Habitat.....	171

7.9.5	Shale Barren Rock Cress Determination Summary	171
7.10	Small Whorled Pogonia	172
7.10.1	Direct Effects on Individuals.....	172
7.10.2	Direct Effects on Habitat	172
7.10.3	Indirect Effects on Individuals	172



7.10.4	Indirect Effects on Habitat	172
7.10.5	Small Whorled Pogonia Determination Summary	172
7.11	Smooth Coneflower	173
7.11.1	Direct Effects on Individuals	173
7.11.2	Direct Effects on Habitat	173
7.11.3	Indirect Effects on Individuals	173
7.11.4	Indirect Effects on Habitat	173
7.11.5	Smooth Coneflower Determination Summary	173
7.12	Virginia Spiraea	174
7.12.1	Direct Effects on Individuals	174
7.12.2	Direct Effects on Habitat	174
7.12.3	Indirect Effects on Individuals	174
7.12.4	Indirect Effects on Habitat	174
7.12.5	Virginia Spiraea Determination Summary	174
8.0	Proposed Voluntary Conservation Measures	175
8.1	Bats	175
8.1.1	Understanding Effects of Disturbance on Hibernating Bats	175
8.1.2	Landscape Setting and ROW Use	176
8.1.3	Maternity colony and fall swarm day-roost selection and foraging habitat of northern long-eared bats and Indiana bats	176
8.2	Roanoke Logperch	177
8.2.1	Impacts of Sedimentation on Roanoke logperch	177
8.2.2	Long-term Population Monitoring in Pigg and Nottoway Rivers	177
8.2.3	Occurrence Monitoring	177
9.0	Literature Cited	178

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
Figure 1. Location of the Mountain Valley Pipeline Project in West Virginia and Virginia.	2
Figure 2. Acoustic characteristics of eastern North American bats and the 35 kHz line where bats are most sensitive to noise associated with compressor stations.	30
Figure 3. Seasonal chronology of Indiana bat activities	42
Figure 4. Range-wide distribution of the Indiana bat during summer, showing counties with reproductive (adult female and/or young-of-the-year) and non-reproductive records.	43
Figure 5. Seasonal chronology of northern long-eared bat activities.	51
Figure 6. Range-wide distribution of the northern long-eared bat during summer.	52
Figure 7. Potential watershed occurrence of Roanoke logperch (<i>Percina rex</i>).	57
Figure 8. Potential watershed occurrence of James spinymussel (<i>Pleurobema collina</i>).	63
Figure 9. Potential watershed occurrence of clubshell (<i>Pleurobema clava</i>).	66
Figure 10. Potential watershed occurrence of snuffbox (<i>Epioblasma triquetra</i>).	70
Figure 11. Potential occurrence of northeastern bulrush (<i>Scirpus ancistrochaetus</i>) in the Project Area.	73
Figure 12 (Maps 1-5). Potential occurrence of running buffalo clover (<i>Trifolium stoloniferum</i>) in the Project Area.	76
Figure 13 (Maps 1 and 2). Potential occurrence of shale barren rock cress (<i>Arabis serotina</i>) in the Project Area.	82
Figure 14 (Maps 1-5). Potential occurrence of small whorled pogonia (<i>Isotria medeoloides</i>) in the Project Area.	85
Figure 15 (Maps 1 and 2). Potential occurrence of smooth coneflower (<i>Echinaceae laevigata</i>) in the Project Area.	92
Figure 16 (Maps 1 and 2). Potential occurrence of Virginia spiraea (<i>Spiraea virginiana</i>) in the Project Area.	96
Figure 17. (Maps 1-4) Location and timing of timber clearing activity in relation to known and potentially occupied Indiana bat staging and swarming habitat.	99
Figure 18. (Maps 1-4) Location and timing of timber clearing activity in relation to known or potentially occupied northern long-eared bat staging and swarming habitat.	112

LIST OF TABLES

<u>Table</u>	<u>Page</u>
Table 1. Acres and miles of Project Area searched for federally threatened and endangered plant species along the Mountain Valley Pipeline in Virginia and West Virginia.....	10
Table 2. Length of proposed pipeline by county.....	11
Table 3. Land requirements for the Mountain Valley Pipeline Project.	12
Table 4. Locations of proposed aboveground facilities for the Mountain Valley Pipeline.	14
Table 5. Risk categories of earth moving activities estimated by the Institute of Air Quality Management.....	24
Table 6. Distance of each receptor from the associated compressor station, receptor ambient noise levels, and resulting increases over ambient.	32
Table 7. Land cover types and acreages within the Project Area and Action Area as indicated by NLCD and field assessments.....	40
Table 8. Summary of potential hibernacula within the Project Action Area as determined by field searches or desktop analysis.....	46
Table 9. Stream crossings warranting assessments for Roanoke logperch habitat along the proposed Mountain Valley Pipeline Project within the Roanoke River watershed in Virginia.....	58
Table 10. Known Indiana bat occurrences within the Action Area.	98
Table 11. Known northern long-eared bat occurrences within the Action Area.	116
Table 12. Estimated densities, expected number of individuals, and respective harassment and harm estimates at stream crossings for adult and young-of-the-year (YOY) Roanoke logperch.....	125
Table 13. Estimated harassment for adult and young-of-the-year (YOY) Roanoke logperch from impacts immediately downstream of pipeline and access road crossings.....	127
Table 14. Estimated harassment for adult and young-of-the-year (YOY) Roanoke logperch from impacts from increased sediment loads from upland construction.	130
Table 15. Effects analysis on running buffalo clover (<i>Trifolium stoloniferum</i>).....	141
Table 16. Effects analysis on small whorled pogonia (<i>Isotria medeoloides</i>).....	143

Table 17. Effects analysis on smooth coneflower (<i>Echinacea laevigata</i>).	145
Table 18. Effects analysis on Virginia spiraea (<i>Spiraea virginiana</i>).	147
Table 19. Energy and transportation projects in the vicinity of the Mountain Valley Pipeline Project.	149
Table 20. Agricultural census data reflecting changes in agricultural land uses and practices between 2007 and 2012 in counties traversed by the Project in West Virginia and Virginia	153
Table 21. Protected lands crossed or within the vicinity of the Project.	155
Table 22. Summary of effects and effects determinations for Indiana Bats.	159
Table 23. Summary of effects and effects determinations for northern long-eared bats.	161
Table 24. Summary of effects and effects determinations for Roanoke Logperch. .	163
Table 25. Summary of effects determinations for James spiny mussel.	166
Table 26. Summary of effects determinations for clubshell.	167
Table 27. Summary of effects determinations for snuffbox	168
Table 28. Summary of effects determinations for northeastern bulrush.	169
Table 29. Summary of effects determinations for running buffalo clover.	170
Table 30. Summary of effects determinations for shale barren rock cress.	171
Table 31. Summary of effects determinations for small whorled pogonia.	172
Table 32. Summary of effects determinations for smooth coneflower.	173
Table 33. Summary of effects determinations for Virginia spiraea.	174

Appendices

Appendix A: Agency Correspondence

Appendix B: Action Area Maps

Appendix C: Estimate of Take for Federally Listed Species

LIST OF ACRONYMS AND ABBREVIATIONS

°F	Fahrenheit
ACGIH	American Conference of Government Industrial Hygienists
ADI	Area of Direct Impact
AEP	Appalachian Power Company
API	American Petroleum Institute
AR	access road
ATV	All-Terrain Vehicle
ATWS	additional temporary workspace
BA	Biological Assessment
BMPs	best management practices
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cm	centimeter(s)
dB	decibel
dBA	A-weighted decibels
dbh	diameter at breast height
DCH	designated critical habitat
DS	downstream
E&SC	Erosion and Sediment Control
ESA	Endangered Species Act
ESI	Environmental Solutions & Innovations, Inc.
FAA	Federal Aviation Administration
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FHWA	Federal Highway Administration
FR	Federal Register
FRRRP	Forest and Rangeland Renewable Resources Planning Act
ft	foot (feet)
HDD	horizontal directional drilling
hp	horsepower
HUC	hydrologic unit code
Hz	Hertz
IAQM	Institute of Air Quality Management
in	inch(es)
ITS	Incidental Take Statement
kHz	kilohertz
LDB	left descending bank
LDC	local distribution companies
Ldn	day/night average sound level
Leq	equivalent sound level
LOD	limits of disturbance
LRMP	Land and Resource Management Plan



m	meter(s)
m ²	square meter(s)
MarkWest	MarkWest Liberty Midstream & Resources, LLC
mg/m ³	micrograms per cubic meter
mi	mile(s)
mi ²	square mile(s)
MLV	mainline block valve
MMDth/d	million dekatherms per day
MP	milepost
MVP	Mountain Valley Pipeline, LLC
n	sample size
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NGA	Natural Gas Act
NHRP	National Register of Historic Places
NIOSH	National Institute for Occupational Safety and Health
NLAA	May affect, not likely to adversely affect
NLCD	National Land Cover Database
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NSAs	noise sensitive areas
OSHA	Occupational Safety & Health Administration
PM	particulate matter
PM10	particulate matter under 10 microns
Project	Mountain Valley Pipeline Project
Project Area	Project's Limits of Disturbance
psig	Pounds Per Square Inch Gage
RCNM	Federal Highway Administration's Roadway Construction Noise Model
RDB	right descending bank
ROW	right-of-way
RUSLE	Revised Universal Soil Loss Equation
SSURGO	Soil Survey Geographic
STATSGO	State Soil Geographic
Transco	Transcontinental Gas Pipe Line Company, LLC
TSS	total suspended solids
U.S.	United States
US	upstream
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey



UV	ultraviolet
VA	Virginia
VAC	Virginia Annotated Coded
VDCR-DNH	Virginia Department of Conservation and Recreation's Division of Natural Heritage
VDGIF	Virginia Department of Game and Inland Fisheries
VDHR	Virginia Department of Historic Resources
VDMME	Virginia Department of Mines, Minerals, and Energy
VSS	Virginia Speleological Society
WERMS	Wildlife Environmental Review Map Service
WNS	White Nose Syndrome
WV	West Virginia
WVDEP	West Virginia Department of Environmental Protection
WVDNR	West Virginia Division of Natural Resources
WVDOT	West Virginia Department of Transportation
WVMSP	West Virginia Mussel Survey Protocol
WVNHP	West Virginia Natural Heritage Program
X-ray	radiography
YOY	Young of Year
µg/m3	micrograms per cubic meter

Copyright ©2016 by Environmental Solutions & Innovations, Inc.



LIST OF PREPARERS

Document Principal Authors:

_____ Virgil Brack Jr., Ph.D. Environmental Solutions & Innovations, Inc.	_____ Date
_____ Valerie Clarkston, M.S. Environmental Solutions & Innovations, Inc.	_____ Date
_____ John Spaeth, M.S. Environmental Solutions & Innovations, Inc.	_____ Date
_____ Gregory Anderson, M.S. Environmental Solutions & Innovations, Inc.	_____ Date
_____ Dale Sparks, Ph.D. Environmental Solutions & Innovations, Inc.	_____ Date
_____ Taina Pankiewicz Environmental Solutions & Innovations, Inc.	_____ Date

The following individuals at Environmental Solutions & Innovations, Inc. provided assistance with document production:

- Michael Bruening
- Jo Garofalo
- Daniel Judy
- Casey Swecker



1.0 Introduction

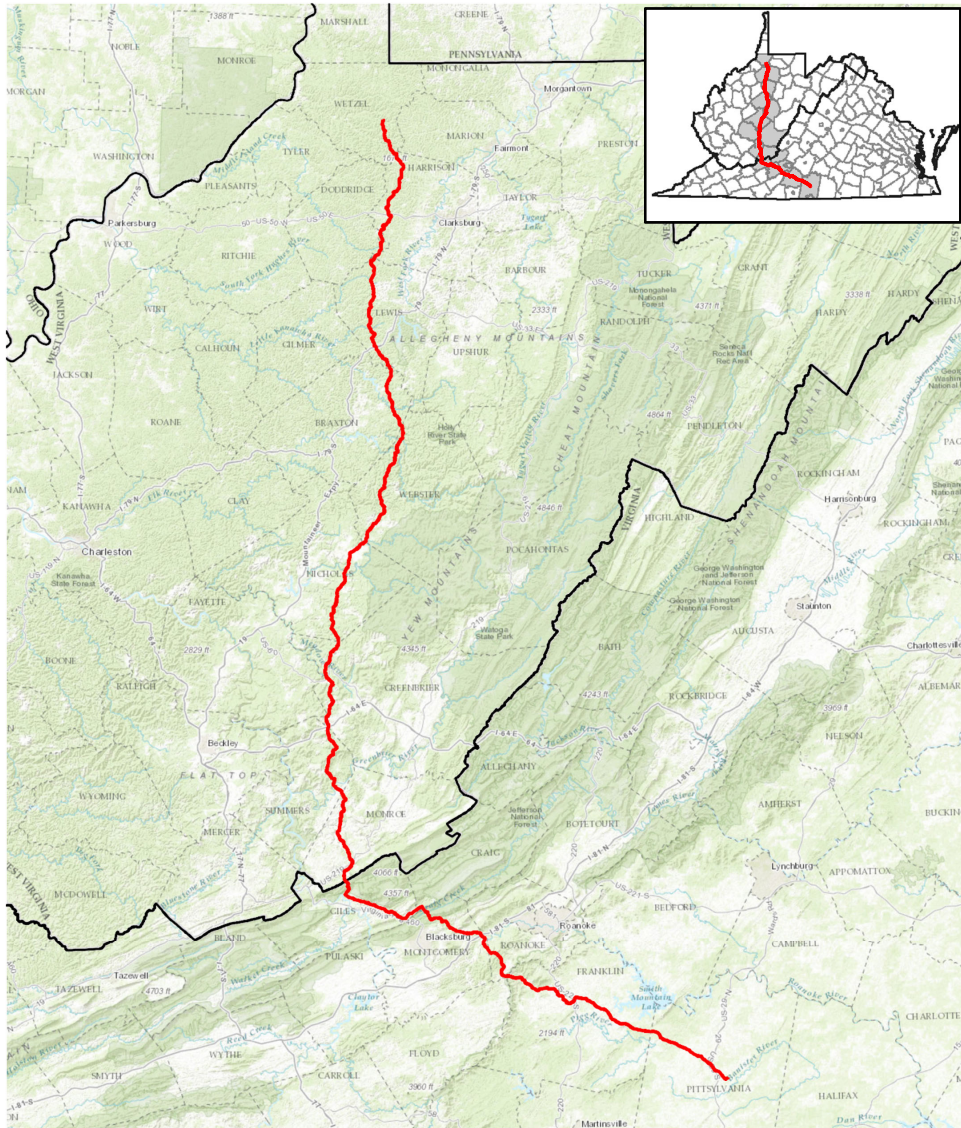
Mountain Valley Pipeline, LLC (MVP), a joint venture between EQT Midstream Partners, LP, NextEra Energy, Inc., WGL Holdings, Inc., Vega Energy Partners, Ltd., Con Edison Gas Midstream, LLC, and RGC Midstream, LLC, is seeking a Certificate of Public Convenience and Necessity from the Federal Energy Regulatory Commission (FERC) pursuant to Section 7(c) of the Natural Gas Act (NGA) 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 488.3-kilometer (303.4-mi), 106.7-centimeter (42-in) diameter natural gas pipeline to provide timely, cost-effective access to the growing demand for natural gas for use by local distribution companies (LDCs), 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 the existing Transcontinental Gas Pipe Line Company, LLC's (Transco) Zone 5 compressor station 165 in Pittsylvania County, Virginia (Figure 1). In addition to the pipeline, the Project will require approximately 171,600 horsepower (hp) of compression at three compressor stations currently planned along the route as well as measurement, regulation, and other ancillary facilities required for the safe operation of the pipeline. The pipeline is designed to transport up to 2.0 million dekatherms per day (MMDth/d) of natural gas.

1.1 Regulatory Compliance

As described below, MVP is working with multiple entities to assure compliance with state and federal environmental regulations. Efforts to address the following regulations have influenced Project design as it relates to federally and state-listed bats:

- Section 7 (c) of the Natural Gas Act
- The National Environmental Policy Act
- The Endangered Species Act (16 USC A-1535-1543, P.C. 93-205)
- The National Forest Management Act
- Virginia Annotated Code Title 29.1 Chapter 5, Article 6: Endangered Animal Species



Privileged & confidential