

APPENDIX D
SUPPLEMENTAL INFORMATION
BASED UPON USFS AND USFWS COMMENTS

**MOUNTAIN VALLEY PIPELINE LLC (MOUNTAIN VALLEY)
MOUNTAIN VALLEY PROJECT (MVP)
DOCKET NO. CP16-10-000**

**ENVIRONMENTAL INFORMATION REQUEST (EIR)
On Applicant-Prepared Draft Biological Assessment (BA)**

Threatened and Endangered and Special Status Species

- 1. Address the following regarding Mountain Valley's revised Applicant-Prepared Draft Biological Assessment (BA) filed with the Commission on March 14, 2017.**

- a. Clarify whether Mountain Valley would remove any known Indiana bat roost trees. If so, provide specific locations and timeframe for removal.**

There are no known Indiana bat roost trees proposed to be removed.

- b. Section 5.1.2.3 (page 183 of the draft BA) states "Cumulatively, forest loss from the proposed Project represents a tiny fraction of the summer habitat available on the landscape that can sustain roosting bats, and is thus unlikely to result in take."**
 - i. Quantify the amount of Indiana bat roosting/foraging/travel habitat proposed for removal as low/moderate/high quality within the following two areas: Indiana bat known use areas (5 miles around a documented hibernacula or summer capture) and within areas Mountain Valley is assuming presence of Indiana bat.**

A total of 3,065 acres of land is contained within the limits of disturbance (LOD) within 5 miles of the two documented Indiana bat hibernacula (Canoe Cave and Greenville Salt Peter), the Wetzel County maternity summer capture, and the 1-kilometer segments where mist netting was not completed and Mountain Valley is assuming presence of Indiana bats. Field detailed habitat assessments to determine overall bat roosting habitat and count specific roost trees were completed within the LOD along approximately 147 miles of the route centerline and 104 miles of access roads. These field verified assessments account for approximately 76 percent of the 3,065 acres of LOD in question. Because field data are not available for all areas, data from areas where surveys were completed were used to extrapolate and estimate missing data. The process used is as follows:

- 1. During field data collection, biologists recorded overall roosting and foraging habitat quality, and assigned a National Land Cover Dataset (NLCD) class (based on field conditions).**

2. NLCD data were overlaid on the project LOD to calculate the acreage within each class contained within the known and assumed portions of the Project.
3. Percentages of each NLCD class ranked as high, moderate, low, or none for roosting and foraging/travel, during field detailed habitat assessments, were then applied to all lands contained within the NLCD class for all land cover type polygons.
4. Four land cover classes within the standard NLCD data set were not field assessed.

These were assigned values as follows:

	Foraging	Roosting
Barren Land	Low	None
Cultivated Crops	Moderate	None
Developed, High Intensity	Low	None
PEM Wetlands	High	None

Based on this process, the following acreage estimates were calculated:

Rank	Foraging/Travel	Roosting
None	16	539
Low	1,471	1,259
Moderate	1,199	910
High	380	358
Total	3,065	3,065

- ii. In addition, quantify the number of Indiana bat potential roost trees proposed for removal within the following Indiana bat known use areas (5 miles around a documented hibernacula or summer capture) and within areas Mountain Valley is assuming presence of Indiana bat. Areas proposed for tree removal, where surveys were conducted but Indiana bats were not captured, need not be included.

A similar process as outlined above was also used to estimate numbers of potential roost trees. During field detailed habitat assessments, biologists ranked individual trees as none, low, moderate, or high. The number of each type of roost per NLCD class where surveys were completed was used to estimate the number of each type of roost across all land cover = polygon(s) by land cover type. The results of that analysis are as follows:

Roost Potential	Number of Trees
None	450
Low	3,848
Moderate	3,294
High	1,132
Total Trees	8,724



The total number of trees of moderate or high roost potential for Indiana bats within know or assumed presence areas within the LOD is estimated to be 4,426.

- iii. **Although we are aware of reporting that no Indiana bats were captured during Mountain Valley's surveys, the BA goes on to discuss removal of roost trees. Resolve the apparent discrepancy.**

Language in the BA referring to "removal of roost trees" for Indiana bats is related to potential or assumed roost trees.

- c. **Regarding the northern long-eared bat – the U.S. Fish and Wildlife Service (FWS) notified FERC staff of a recent email from Mountain Valley highlighting a change in the reported location of the entrance to Canoe Cave in relation to the MVP pipeline. According to FWS, Mountain Valley has indicated that tree clearing is planned within the 0.25 mile buffer around the entrance to Canoe Cave. Tree clearing within the 0.25 mile buffer of a known hibernacula is not exempt under the northern long-eared bat 4d rule. Confirm the location of the entrance to Canoe Cave in relationship to the MVP pipeline construction workspace, including illustrating the relationship of the cave to the pipeline on a 7.5-minute USGS topographic quadrangle map, and the revised distance (in feet) from the cave entrance to the proposed construction right-of-way. Provide the amount of tree clearing within the 0.25 mile buffer, and estimate take that would not be exempt under the northern long-eared bat 4d rule. Also, if the pipeline workspace is now closer to Canoe Cave than indicated in previous filings with the FERC, provide a revised hydrological and geological analysis, and discuss measures Mountain Valley would implement to reduce impacts on the cave.**

A review of aerial data shows that approximately 0.5-acre will be cleared within the 0.25-mile buffer around the entrance to Canoe Cave (USGS 7.5 minute topographic and aerial maps are both provided). Historically, the maximum number of northern long eared bats detected in Canoe Cave was one individual. This individual is already included in the assessment for harassment from noise (see section 5.2.1.1 on p. 193 – 194 of the BA). However, because the Project was believed to be outside the 0.25-mile buffer, take associated with tree clearing was not estimated. Due to the very small acreage of tree clearing, the take estimate is a fraction of a bat. Since take of partial bats is not possible, this is rounded up to one individual. Within the BA, take calculations were completed across all habitat areas, summed, then rounded. However, for purposes of this discussion, the rounding is occurring on a per feature basis.

In addition, a hydrologic and geologic analysis was performed, which demonstrated that there is negligible risk to karst features, hydrology and biological resources at Canoe Cave. This conclusion is based on several factors, including the nature and scale of construction, the separation between the cave and the proposed construction right-of-way (ROW), and importantly the relative position of the proposed alignment compared to the cave and upland karst watershed. The Project is located approximately 275 meters (902 ft) from the nearest entrance to Canoe Cave and approximately 244 meters (800 ft) from the mapped extent of the cave system. In a previous route adjustment Mountain Valley shifted approximately 396 meters (1,300 ft) to the north to avoid the cave and known karst features. This adjustment also moved the route into a cleared agricultural area, which will minimize tree removal within 0.4-kilometer (0.25-mi) of the entrance to Canoe Cave. In addition, the proposed alignment will be located topographically lower and downgradient of the spring associated with Canoe Cave within the Virginia Department of Conservation and Recreation (DCR) Conservation Site, thereby eliminating the potential for impacts. Within the potential catchment for Canoe Cave, the proposed trench will be approximately 30.5 to 70 meters (100 to 200 ft) above base flow levels leading to Sinking Creek. Mountain Valley will employ rigorous erosion and sedimentation controls, as well as implement karst inspection and mitigation to minimize potential impacts to karst features. Mountain Valley will be adequately prepared for and will reduce the probability and risk of a potential spill or release of oil or hazardous material during construction by adhering to measures specified in the Project-specific Spill Prevention, Control, and Countermeasure Plan, the Karst-Specific Erosion and Sediment Control Plan for Virginia, and the Karst Mitigation Plan.

- d. Section 5.2 of the draft BA (page 187) and table 21 (page 192) indicates that Mountain Valley would clear trees within the 0.25 mile buffer within known northern long-eared bat hibernacula which would include Tawney's Cave in Virginia and PS-WV3-Y-P1 in West Virginia, which would not be exempt under the northern long-eared bat 4d rule. However, on pages 256 to 257 (of the revised draft BA), Mountain Valley indicates all take would be exempt under the northern long-eared bat 4d rule. Resolve the apparent discrepancies, estimate the amount of tree clearing within the 0.25 mile buffer(s) of these caves, and estimate take. In an April 3, 2015 letter, the FWS-Virginia Field Office recommended a 5-mile buffer from known hibernaculum openings and any mapped passages.**

Total tree clearing within the 0.25-mile buffer for Tawney's Cave is approximately 1.4 acres based on review of aerial photography. Total tree clearing within the 0.25-mile buffer for PS-WV3-Y-P1 is approximately 12.0 acres based on review of aerial photography. (The take analysis within the BA was based upon NLCD data which estimates total tree clearing within the 0.25-mile buffer of these two caves at 2.7 and 13.3 acres respectively.) While the majority of take outlined in the BA for the

northern long-eared bat is exempt under the final 4(d) rule, some take is prohibited, including habitat within Tawney's Cave and PS-WV3-Y-P1. Where take numbers are defined within Section 7.2.1 (as based on NLDC data), these calculations represent take that is not exempted under the 4(d) rule. These quantities are summarized in Table 35 on page 256 of the BA. Take that is exempted by 4(d) was not quantified. Likewise the statement "This take is exempted under the final 4(d) rule." should be revised to "All other take is exempted under the final 4(d) rule."

- e. **In previous filings with the FERC, Mountain Valley indicated that its proposed pipeline would be 800 feet away from the entrance to Tawney's Cave, which is a historically known Indiana bat and northern long-eared bat hibernacula. However, FWS believes the pipeline would be within 195 feet of Tawney's Cave. Confirm the location of the entrance to Tawney's Cave in relationship to the MVP pipeline construction workspace, including illustrating the relationship of the cave to the pipeline on a 7.5-minute USGS topographic quadrangle map, and the revised distance (in feet) from the cave entrance to the proposed construction right-of-way. If the cave is closer to the pipeline workspace than previously filed, revise the hydrological and geological analysis for Tawney's Cave and discuss measures Mountain Valley would implement to reduce impacts on the cave. Mountain Valley indicated that bats have not been documented in hibernacula surveys of Tawney's Cave conducted in 2013, 2015, and 2017. Address the FWS comments that it recommends the proposed route be located 5 miles away from the entrance of Tawney's Cave to minimize impacts from tree clearing to Indiana bat and the northern long-eared bat swarming habitat.**

Mountain Valley considered the recommendation to relocate the proposed route further away from the entrance of Tawney's Cave. As a result of pipeline siting studies completed by Mountain Valley, and requests made by the Federal Energy Regulatory Commission (FERC) and the U.S. Forest Service (USFS) during Project review, Mountain Valley identified six route alternatives that would move the pipeline further from Tawney's Cave and one alternative that would cross near but in a different location than the proposed route. The general location of these seven alternatives are shown on the attached figure (Pipeline Alternatives Overview), and a summary of each alternative is included below. Most of the alternatives are also evaluated in the FERC's Environmental Impact Statement (EIS) for the MVP Project.

Route Alternative 1

Route Alternative 1 was identified in Mountain Valley's application to FERC and evaluated in the FERC EIS. This alternative would be approximately 12 miles southwest of Tawney's Cave at its closest point. Route Alternative 1 is about 20 miles longer than the proposed route. While Route Alternative 1 would avoid some areas of

karst along the proposed route near Tawney's Cave, it would actually cross more karst area than the proposed route. Route Alternative 1 would cross about 50 miles more steep terrain than the proposed route. Route Alternative 1 would include an approximately 300-foot-wide crossing of the Gauley River within the Monongahela National Forest and two crossings of the New River, all of which are avoided by the proposed route.

In addition to crossing about 171 miles of steep slopes, Route Alternative 1 would also cross about 105 miles of severe side slope, which represent insurmountable construction challenges as well as a high risk of slope failure and pipeline slips once the pipeline is in operation. Because of the significant length of severe side slope crossed by Alternative 1 and the associated increased footprint in these areas, together with the other impacts identified above, Mountain Valley does not consider Route Alternative 1 to be environmentally preferable for pipeline construction.

Northern Pipeline-ACP Collocation Alternative

The Northern Pipeline-ACP Collocation Alternative was identified in Mountain Valley's application to FERC and evaluated in the FERC EIS. This alternative would be approximately 85 miles east of Tawney's Cave at its closest point. The Northern Pipeline ACP - Collocation Alternative would be collocated for some of its length with Dominion's proposed ACP project. This alternative has also been called the "two pipelines – one route" alternative. This alternative would involve the installation of the MVP adjacent to the pipeline proposed for the ACP project. This alternative would begin at about MP 37 of the proposed MVP pipeline route where it would begin paralleling the proposed ACP at its point of origin. The alternative would then generally be routed parallel to the proposed ACP for about 191 miles in a southeasterly direction before intersecting the existing Transco pipeline. Then it would generally parallel the Transco pipeline corridor to the southwest for about 60 miles to reach the end of the MVP pipeline near Transco Station 165.

The alternative is generally comparable to the proposed route in overall length and land disturbance, however the Northern Pipeline – ACP Collocation Alternative would be approximately 9 miles longer and would disturb about 144 acres more during construction, than the proposed route. The alternative would cross a significantly greater length of FS lands (approximately 16 more miles), side slopes (approximately 22 more miles), and landslide prone areas (approximately 35 more miles). The major disadvantage of the Northern Pipeline – ACP Collocation Alternative route is the necessity to construct two parallel pipelines along approximately 191 miles of the ACP route, much of which presents significant constructability issues related to topography and space. In many areas such as in Lewis and Upshur Counties, West Virginia and Augusta and Nelson Counties, Virginia, there is insufficient space along the narrow ridgelines to accommodate two parallel 42-inch-diameter parallel pipelines. The amount of right-of-way necessary to construct the two pipelines would be considerable, given the amount space needed to safely accommodate equipment



and personnel, as well as spoil storage. Mountain Valley believes that because of the significant constructability issues, this alternative is not feasible.

Forest Service Avoidance Alternative

Mountain Valley identified the Forest Service Avoidance Alternative at the Request of the Forest Service, and filed an analysis of this conceptual alternative with the Forest Service and FERC on April 8, 2016. The Forest Service Avoidance Alternative would be about 85 miles east of Tawney's Cave at its closest point.

The Forest Service Avoidance Alternative route would add approximately 50 miles of additional pipeline and approximately 760 additional acres of impact during construction, nearly all of which would be on private lands. By crossing less than 4 miles of the Jefferson National Forest, Mountain Valley has reduced the impact to the Jefferson National Forest to the greatest extent practicable and reduced the overall environmental impact while meeting the purpose and need of the Project. Because of the additional length and associated environmental impacts by the alternative, Mountain Valley does not consider the Forest Service Avoidance Alternative to be a reasonable alternative. Further, FERC did not evaluate this conceptual alternative in the EIS.

Highway Collocation Alternative

Mountain Valley identified the Highway Collocation Alternative at the Request of the FERC, and FERC evaluated this conceptual alternative in the EIS. The Highway Collocation Alternative would be about 30 miles west of Tawney's Cave at its closest point. The alternative would follow interstate highways where available starting at the Webster Interconnect in Wetzel County, West Virginia, then following U.S. Highway 250 and head generally southeast, following U.S. Highway 19, Interstate 79, Interstate 77, U.S. Highway 58, and U.S. Highway 29 to the Project terminus at the Transco Station 165.

In general, the proposed route is not sited along highways because most major roads trend either north-south or east-west, making it difficult to connect the proposed starting point in the production area of northern West Virginia with the Project terminus at Transco Station 165 in Virginia. Further, certain federal and state restrictions have been established for utilities along the rights-of-way of access-controlled freeways, and use of highway medians for installation of major utilities is generally not allowed. While there are no restrictions on placement of natural gas pipelines adjacent to, but outside of highway rights-of-way, the Highway Collocation Alternative would present numerous and substantive construction challenges, including traversing roadway overpasses and underpasses, large interchanges, elevated sections of roadway including bridges, areas congested with development and homes, and narrow valleys where suitable terrain for pipeline construction is already partially or fully encumbered by the roadway. The Highway Collocation Alternative route would also be about 143 miles longer than the proposed route,



affecting over 2,200 additional acres during construction. Construction of this alternative would significantly increase impact on numerous resources, including USFS lands, residences, and perennial waterbodies, while also crossing significantly more side slope and areas with landslide potential. Based on the above, Mountain Valley does not consider the Highway Collocation Alternative to be a reasonable alternative. The FERC reached a similar conclusion in its EIS.

Straight Line Alternative

Mountain Valley evaluated general impacts of a straight line alternative at the request of FERC, and filed the information with FERC on January 22, 2016. A Straight Line Alternative would be a straight line between the Project start and end points, and would be about 50 miles northeast of Tawney's Cave at its closest point.

The purpose of this conceptual alternative was to evaluate the shortest possible route between the proposed Project start and end points, and as a result the alternative would be about 100 miles shorter than the proposed route. However, the straight line alternative does not consider environmental conditions, topography, or constructability and Mountain Valley does not consider this alternative to be a reasonable alternative. The FERC did not include this conceptual alternative in the EIS.

Alternative 110

Mountain Valley identified Alternative 110 and two modifications to Alternative 110 (110J and 110R) in coordination with the USFS to evaluate possible alternative crossing locations of the Appalachian National Scenic Trail (ANST) and Jefferson National Forest. The alternative would also avoid some areas of concern identified by stakeholders in the Pembroke and Newport areas, including karst terrain features including Tawney's Cave. Alternative 110 would be about 11 miles northeast of Tawney's Cave at its closest point.

Alternative 110 would be shorter than the proposed route, however it would cross designated wilderness area within the Jefferson National Forest. This alternative would cross the only known population of the James spinymussel in West Virginia at the South Fork of Potts Creek, and would cross about three times more mapped old growth forest within the Jefferson National Forest. During site surveys, two USFS-designated sensitive plants, American barberry and Rock Skullcap, were found within this alternative route. This alternative would also cross the Alleghany Trail which would not be crossed by the proposed route. Variation 110 would also cross the Mudlick Branch Woodland, Craig Creek-Johns Creek, Sinking Creek Mountain, Lynn Hollow, and Fort Lewis Mountain Conservation Sites. Because of the impacts described above, Mountain Valley believes that Alternative 110 would have a greater overall environmental impact than the proposed route. In its EIS FERC concludes that Alternative 110 does not provide a significant environmental advantage over the proposed route.



AEP-Newport Alternative

The AEP-Newport Alternative, or variation, is the route initially identified by Mountain Valley in the Newport, Virginia and Brush Mountain area. This alternative was the preferred pipeline route in Mountain Valley's April 2015 filing with FERC, however, since that time, in order to respond to stakeholder concerns, including concerns about pipeline construction in karst areas and impacts to residences in the Preston Forest neighborhood, Mountain Valley revised the proposed route in this area. The AEP-Newport Alternative would 131 feet north of the entrance to Tawney's Cave, slightly closer than the proposed route is to the south.

The AEP-Newport Alternative would be about 4.1 miles shorter, would cross less karst terrain and designated historic district, and would be adjacent to more existing right-of-way than the Proposed Route. However, the alternative would be within 50 feet of about eight residences, most within the Preston Forest area, compared to one residence within 50 feet of an access road associated with the proposed route. The AEP-Newport Alternative would also cross along the edge of the Newport Recreation Area athletic fields, and about 0.2 mile of a parcel protected under easement to the Virginia Outdoors Foundation. These properties are avoided by the proposed route.

Mountain Valley modified the proposed route in this area to move the pipeline farther from Tawney's Cave, while also maintaining as much distance as possible from the historic Link Farm covered bridge. The AEP-Newport Alternative would deviate to the north of the AEP right-of-way in this area, closer to the Tawney's Cave opening, while the proposed route is south of the AEP right-of-way and then deviates farther to the south to move further from the Tawney's and other cave openings. However, this also moves the proposed route closer to the Link Farm covered bridge, which would be about 380 feet from the construction work space, compared to about 550 feet for the alternative. Mountain Valley evaluated moving the pipeline farther from the covered bridge to the southwest, but that was determined to be not feasible due to multiple crossings of Route 460 which would be required. Mountain Valley met with the property owner of the covered bridge, who desired that if necessary, the pipeline pass on the east side of an existing concrete bridge, which is closer to Tawney's Cave.

A hydrologic and geologic analysis was performed for this proposed route location, which demonstrated that there is negligible risk to the karst features, hydrology and biological resources of Tawney's Cave. This conclusion is based on several factors, including the nature and scale of construction, the separation between the cave and the proposed construction ROW, and importantly the relative position of the proposed alignment compared to the cave and upland catchments (i.e., karst watershed). Specifically, in relation to Tawney's Cave, the proposed Project is located on an opposite ridge west of the cave and approximately [REDACTED] ([REDACTED]) from and topographically below the cave passages at the crossing of [REDACTED] and [REDACTED]. The Project is not located within the Virginia DCR Clover Hollow

Conservation Site that encompasses Tawney's Cave. Based on the nature of construction, and the relative location of the alignment, no impacts to the cave system are anticipated.

f. Regarding the 124 features with unknown suitability for Indiana bat and northern long-eared bat, provide the following:

i. The number of features located within the proposed construction right-of-way;

During field surveys, a number of portals were found within the LOD. These are detailed in the January and November 2016 portal search reports. None of these portals are included in the 124 portals with unknown suitability for Indiana bat and northern long-eared bats. All portals found within the LOD were either (1) assessed as unsuitable by qualified, permitted bat biologists, or (2) assessed as suitable, but had no captured bats during surveys. Zero portals with unknown suitability for Indiana bat and/or northern long-eared bats are within the LOD.

ii. Indicate whether any of these features would be affected directly by construction of the pipeline; examples of impacts may include destruction of the feature or tree removal within the 5-mile buffer (if so, provide the acreage of trees to be cleared within the buffer) Provide a list of the features that would be directly affected and how they would be affected;

Table 12 in the BA lists 124 portals as being of unknown suitability for Indiana and/or northern long eared bats. Of these, zero features will be destroyed by Project construction since none are within the LOD. All 124 features will be directly affected by tree removal within the 5-mile buffer. The total acreage of tree removal within the 5-mile buffers of these features equals 970.6 acres. Acreage of tree removal within each buffer is not provided due to the overlap of buffers. Harm and harassment associated with tree removal within these buffers is included in the spring, summer and autumn take calculations included in the BA.

iii. Indicate whether any of these features would be indirectly affected by the project (e.g., noise, dust, lighting, etc.). If so, provide a list of these features and how they would be affected; and

Sixty-four features are within the action area for the Project (within 0.6 mile of the LOD) and therefore will be impacted by noise. These features are listed on the attached table and associated impacts are included in the harassment calculation included within the BA.

iv. Provide this information in a table of potential hibernacula within the project action area as determined by field searches or desktop analysis. This table is currently table 12 of the BA.

The attached table lists the 124 features, proximity to the LOD, and whether each would be directly affected by tree removal and/or indirectly affected by noise.

- g. If impacts are anticipated to any of the 124 features, provide impact avoidance and minimization measures to reduce negative impacts to features. For example, see the avoidance and minimization measures referred to the NiSource Habitat Conservation Plan (Chapter 6, Page 29) which is on the FWS-Midwest Region website.**

Due to the potential impacts from tree removal and noise to the 124 identified features, Mountain Valley is committed to the following avoidance and minimization measures.

1. When burning brush piles within 0.25 mile of known or presumed occupied hibernacula from August 15 to May 15, the brush piles can be no more than 25 feet by 25 feet, must be spaced at least 100 feet apart, and located at least 100 feet from known hibernacula entrances and associated sinkholes, fissures, or other karst features.
2. No woody vegetation or spoil (e.g., soil, rock, etc.) disposal will occur within 100 feet of known or presumed occupied hibernacula entrances and associated sinkholes, fissures, or other karst features.
3. Potential recharge areas of cave streams and other karst features that are hydrologically connected to known or presumed occupied hibernacula will be protected by employing relevant erosion control standards for stream and wetland crossings, as well as spill prevention, containment and control.
4. Blasting within 0.5 mile of known or presumed occupied hibernacula will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of the hibernacula (e.g., maximum charge of two inches per second ground acceleration avoids impact to nearby structures).
5. Equipment servicing and maintenance areas will be sited at least 100 feet away from streambeds, sinkholes, fissures, or other karst features.
6. Operators, employees, and contractors working in areas of known or presumed Indiana Bat habitat will be educated on the biology of the Indiana bat, activities that may affect bat behavior, and ways to avoid and minimize these effects.
7. Herbicides will not be used for vegetation management to maintain any portion of the Project ROW or aboveground facilities, except as requested by a landowner and in the Jefferson National Forest as requested by the U.S. Forest Service.
8. Sediment and erosion control measures will be strictly implemented, any ground disturbance will be restored to pre-existing topographic contours, and restoration will use native vegetation (where possible) as specified in the Project-specific Restoration Plan upon completion of work within and known or presumed occupied spring staging and fall swarming habitat.

h. Provide the following regarding the Indiana bat and northern long-eared bat:

i. If blasting is proposed to occur in proximity (0.5 mile) to known or potential Indiana bat or northern long-eared bat hibernacula or features, provide site-specific blasting plans for review;

Blasting for grade or trench excavation will be considered only after all other reasonable means of excavation have been evaluated and determined to be unlikely to achieve the required results. The amount of blasting will be minimized to the extent practical, but may be required in areas of shallow bedrock where unrippable subsurface rock is encountered. In these areas, Mountain Valley is committed to taking measures to prevent damage to potential hibernacula or features, underground structures (e.g., cables, conduits, and pipelines), and springs, water wells, or other water sources. Blasting mats or padding, restricted charge sizes and/or charge delays will be used to minimize airblast, peak sound pressure levels, and ground vibration. Specific locations requiring blasting will be determined in the field, based on the limitations of the mechanical excavation equipment.

ii. If specific blast locations are not known at this time, provide site-specific blast plans prior to blasting if blasting is planned within a 0.5 mile of known or potential Indiana bat or northern long-eared bat hibernacula or features;

Mountain Valley will submit site-specific blast plans prior to blasting within 0.5-mile of potential Indiana bat or northern long-eared bat hibernacula during the hibernation period. The site-specific plans will specify mitigation measures to reduce noise and vibration (such as blasting mats or padding, restricted charge sizes, and/or charge delays).

iii. Clarify if blast noise is included as part of construction noise. If not, provide an estimate, based on knowledge of the geology of the area and past experience constructing pipelines, of the amount of blasting anticipated and associated noise; and

Blast noise was not included as part of construction noise in the Biological Assessment. The pipeline will be installed to allow a minimum cover of 36 inches in areas of shallow bedrock. Therefore, the proposed Project area was evaluated for areas where bedrock might be encountered above a depth of 80 inches (attached shallow bedrock table). However, specific locations requiring blasting will be determined in the field, based on the limitations of the mechanical excavation equipment. Surface excavation blasting uses the release of energy from a confined explosive to break up rocks to facilitate removal. Most of the energy released goes towards rock breakage and movement, but a small portion passes outside the intended work zone in the form of ground or air vibrations. Air vibrations are pressure waves generated by the blast, referred to as "airblast" or "air overpressure." Higher frequency pressure waves may be heard by people or wildlife as sound, while lower frequency pressure waves may be felt rather than heard, similar to a gust of wind.

Different species have differing sensitivities to sound, so that frequencies that may be audible to some species are not detected as well by other species. In general, surface detonations involving unconfined or poorly confined blasts will cause louder, higher frequency noise, while well confined blasts such as those used to excavate rock generate lower frequency effects with airblast energy predominantly at very low frequencies (often less than 10 Hz, below the range of most human hearing). For this reason, and because noise from blasting is inherently short-term, there are no audible noise limits applicable to blasting for this Project. The MVP Project General Blasting Plan (MVP, 2017) describes the procedures and safety measures the contractor will be required to adhere to while implementing blasting activities. The Blasting Plan specifies compliance with ground vibration limits recommended in the US Bureau of Mines Report of Investigations 8507 (Siskind et al. 1980).

iv. Indicate whether blasting would affect (via noise, concussive effects, or otherwise) roosting volant and/or non-volant bats and/or bats within hibernacula; describe impacts, and list impact avoidance, minimization, and mitigation measures.

As stated above, confined blasts such as those used to excavate rock generate lower-frequency effects with airblast energy predominantly in the inaudible range. Bats echolocate and communicate using ultrasonic frequencies that are well above the human hearing range and that are much higher than the low-frequency dominated sounds generated by blasting. In addition, all blasting will occur in daytime hours when the bats are least active. Blasting may potentially disturb bats breeding, feeding, or sheltering in the area. Bats could return to the area once the blasting ceases.

Bats are not particularly sensitive to sound during hibernation. Big brown bats did not respond during hibernation when presented sound at 30-15,000 Hz and 95 dB (Twente and Twente, 1987). Hibernating bats may be “deaf” if the auditory nervous system shuts down at lower temperatures used for hibernation. Harrison (1965) found no neural activity in auditory nerves of little brown bats hibernating below 54°F (12°C).

Several field studies have assessed the effect of noise on hibernating bats. In Missouri, Myers (1975) studied the effect of blasting on Indiana bats and three other bats species. The acoustic frequency of blasts ranged between 1 and 40 Hz; seismic vibrations of blasting are between 3 to 1000 Hz. With blasts as close as 394 feet (120 m) to hibernating Indiana bats and 98 feet (30 m) to eastern pipistrelle bats, he found no evidence of disturbance.

In New York, Besha (1984) identified increasing populations of hibernating Indiana bats near Jamesville with a quarrying operation 1,000 feet (304.8 m) from the cave, with blasts involving up to 200 pounds (90.7 kg) of explosive. He noted a similar

situation at Howes Cave and at Glen Park. Blasting at Glen Park occurred within 400 feet (121.9 m) of the bats.

At Fort Leonard Wood, Missouri, training mission activities near hibernacula of endangered Indiana and gray bats included small arms fire, construction engineers' training (clamshells, bulldozers, graders, earthmovers, CEVS, and scrappers), demolition of explosive ordnances, heavy ordnance demolition, and F16 and A10 strafing and inert bomb training. Indiana bats and surrogate bat species were brought into the laboratory and presented sound and seismic stimuli during hibernation. Stimuli duration and intensity mimicked those under field conditions, up to 25 percent of actual distances to hibernacula. Sound stimuli was presented for 3 to 10 minutes at 93 to 126 decibels, at frequencies like those at each of the training ranges (Range 1: 20 - 20,000 Hz with a dominant frequency of 1,000 Hz; Range 4: 20-20,000 Hz with dominant frequency bands at 50, 63, 80, and 100 Hz; Range 36: 25 - 20,000 Hz with dominant frequency bands at 25, 31.5, 50, 63, 80, 200, and 250 Hz; Range TA 244: 24 - 20,000 Hz with dominant frequency bands at 200, 400, 500, 630, 800, and 1000 Hz). Bats were also presented seismic stimuli of magnitudes representing 250-pound charges at 531 feet and 985 feet. This study concluded that sound and seismic stimuli from training activities would not affect hibernating bats (3D/Environmental, 1996).

If blasting is necessary in an area where a potential hibernaculum would be within 0.5-mile of the blast site then potential short-term impacts would be minimized by utilizing blasting mats or padding, restricted charge sizes and/or charge delays, as necessary.

i. Provide a list of the 124 features with unknown suitability located in West Virginia counties with potential gray bat habitat present.

The USFWS West Virginia Field Office determined that there is a potential for gray bats to be present within Boone, Fayette, Kanawha, Lincoln, Logan, McDowell, Mercer, Mingo, Monroe, Raleigh, Summers, Wayne, and Wyoming counties in West Virginia. Eleven of the 124 features with unknown suitability are located in Monroe County.

These features are listed below with distances to the project LOD.

Feature Name	Distance (meters)	Distance (miles)
Greenville Glenray Cave	252.0	0.2
Bobcat Cave	321.0	0.2
Rich Creek Cave	452.9	0.3
Wolf Cave	895.3	0.6
Hans Creek Cave	1,723.3	1.1
Scampering Simmons Pit	2,956.6	1.8
Post Puke Pit	3,072.0	1.9
Lost Skier Pit	3,124.8	1.9



Feature Name	Distance (meters)	Distance (miles)
Coburn Cave	3,229.2	2.0
Ogdens Hole	3,730.6	2.3
Big Mother Sink	4,009.2	2.5

j. Indicate whether blasting would affect (via noise, concussive effects, or otherwise) rusty patched bumble bees; describe impacts, and list impact avoidance, minimization, and mitigation measures.

The last known population of rusty patched bumble bees near the Project area was in Fauquier (2014) County, Virginia. Fauquier County is over 100 miles from the Project. Historical records from Montgomery County are about 3.7 miles from the Action Area and from Giles County are approximately four and seven miles from the Action Area. Historical records in Braxton, Fayette, Lewis, and Nicholas counties, West Virginia are difficult to ascertain, as specific data often were not collected. Many experts believe it is extirpated from most areas east of Indiana. Thus the Project Action Area is considered unoccupied. A general discussion of noise impacts on rusty patched bumble bees are discussed in the Biological Assessment.

If the species were present, blasting could have potential direct and indirect effects; however, these effects are currently unknown and have not been studied. Potential short-term impacts would be minimized by utilizing blasting mats or padding, restricted charge sizes and/or charge delays, as necessary.

k. Provide the following regarding un-surveyed areas of running buffalo clover, shale barren rock cress, small whorled pogonia, and Virginia spiraea:

i. Clarify if additional plant surveys are planned;

Remaining surveys include areas of running buffalo clover (0.14 mi), shale barren rock cress (0.12 mi), small whorled pogonia (0.12 mi), and Virginia spiraea (0.09 mi). Permission to access these parcels has not been granted; therefore, Mountain Valley is unable to complete surveys at this time. The intent is to complete these surveys as soon as possible. However, pending surveys are dependent upon access prior to construction during the applicable survey windows. Should an attempt need to be made outside the approved survey window, a field habitat assessment will be conducted to identify the amount of potentially suitable habitat for these species within the Project LOD.

ii. Specify the distance and direction of each of the un-surveyed areas from the proposed construction right-of-way; and

Running buffalo clover - Associated with access road approximately 2.41 miles and parcel approximately 0.35-mile west of proposed centerline construction right-of-way.



Shale barren rock cress - Associated with, and centered along, the proposed centerline construction right-of-way.

Small whorled pogonia - Associated with, and centered along, the proposed centerline construction right-of-way.

Virginia spiraea - Associated with, and centered along, the proposed centerline construction right-of-way.

iii. Estimate impacts (including take, as appropriate) using best available information, and provide impact avoidance, minimization, and mitigation measures to reduce adverse effects to listed plants.

Surveys will be conducted for listed plant species prior to construction if land access timing coincides with appropriate survey windows. If listed species are located, they will be fenced off and avoided if possible. If listed populations occur within the LOD such that they cannot be avoided, they will be transplanted.

Take cannot be estimated without abundance or occurrence information. These variables can be extrapolated if there is surrogate species data or occurrence or abundance data for a nearby geographic area. None of those data are available in this instance. In addition, take of listed plants is not covered under Section 9 of the Endangered Species Act. See 16 U.S.C. § 1538(a)(2).

I. For the un-surveyed area of running buffalo clover, provide a discussion of how the proposed use of waterbars may alter hydrology and microclimate for this species.

The access road associated with the remaining running buffalo clover survey area is on a timber property that has recently been timbered. The road is existing; however, it will require modifications such as grading and gravel installation. While this species prefers minor disturbance and is often found along old logging roads, the recent nature of the timber activity has resulted in rutting of the road which has likely impacted potential plant habitat along the edges. Additionally, the road is located in a valley with elevation rapidly increasing on each side. Given the small remaining survey area, location of this road, and current condition of the immediate area, hydrology and microclimate, the species is unlikely to be present and thus impacts to it are not expected as a result of Project activities.

The parcel is located near the Project Area from MP 85.8 to 89.0. The nearest point of the parcel to the pipeline is approximately 0.35-mile from the edge of the parcel (measured from MP 85.8 to nearest edge – aerial miles). The farthest point is approximately 1.6 miles (edge of parcel to MP 89.0). From MP 85.8 to 88.4, the existing drainage/smaller watersheds adjacent to the pipeline all drain to the Elk River before crossing on to the property. From MP 88.4 to 89.0 the existing

drainage/smaller watersheds adjacent to the pipeline all drain to Bear Run or the unnamed tributary to Bear Run before crossing on to the property. Due to the distance and lack of overland connectivity, Mountain Valley does not anticipate any changes in microclimate or overall environmental integrity of the parcel due to pipeline construction.

- m. If the proposed construction right-of-way would be within the upslope drainage of the small whorled pogonia un-surveyed area, provide a discussion of the potential effects of proposed activities (e.g., change in direct and indirect light, and hydrology, and increase sedimentation and run-off). Provide the distance of the un-surveyed area from the proposed construction right-of-way.**

The remaining survey area for small whorled pogonia is associated with, and centered along, the proposed centerline construction right-of-way. If small whorled pogonia is located along the edge of the LOD it could be impacted by increased sunlight, animal browsing and competition. However, the permanent waterbars will still keep the overland flow in the same watershed and the same drainage patterns would be present post-construction. Post –construction hydrology would not be directed away from the parcel. Runoff and sedimentation would be controlled by the waterbars and permanent vegetation, and once the permanent stabilization is achieved, impacts from sedimentation or erosion are not anticipated.

- n. Provide a full analysis, similar for the BA analyses provided for other mussel species, for the yellow lance. The yellow lance (*Elliptio lanceolata*) was proposed as a federally threatened species on April 5, 2017.**

Mountain Valley will address this species through 7(a)(4) conferencing (rather than Section 7 consultation since the species is not listed yet), if necessary.

FOREST SERVICE COMMENTS ON THE BIOLOGICAL ASSESSMENT MOUNTAIN VALLEY PIPELINE PROJECT

- 1. The BA says: In addition, agriculture contributes to these declines as populations often occur in areas that cannot be plowed or in which it is not economically feasible (Wagenius 2004). Plowing destroys the large single taproot. Comment: This section is unclear; rewrite to be accurate and clear.**

Corrected to say: In addition, remnant populations of Echinacea persist in isolated areas where the terrain is too steep for agricultural production, in fence corners inaccessible to farm machinery, along road and railroad rights-of-way, and on abandoned pastureland (Wagenius 2004).

- 2. BA statement: Small Whorled Pogonia - No cumulative impacts are anticipated for this species since it does not exist within the Action Area.**

Comment: Because SWP can remain dormant for many years, it is not possible to say it does not occur in the Action Area. Presence must be assumed.

Surveys for presence of aboveground, non-dormant small whorled pogonia were conducted during appropriate survey windows and within areas approved and recommended by the USFWS. While it is true that small whorled pogonia can and will remain dormant for many years, recent studies suggest the presence of Russulaceae fungi determine whether or not a dormant pogonia will survive dormancy (<http://insider.si.edu/2017/01/dormant-orchids-need-fungi-rise/>). It is not known whether this fungi is present within the Action Area, or if the existing soil is currently suitable to support this group of fungi. If presence is to be assumed to account for the possibility that some individuals may be dormant, the regulatory agency for the species (USFWS) would direct all applicants to assume presence in potentially suitable habitat. However, this was not the case during Mountain Valley's informal consultation with USFWS.

3. **BA statement: 7.12 Shale Barren Rock Cress - The Project will not directly or indirectly impact known-occupied habitats of running buffalo clover. Comment: Correct this statement, because it refers to RBC in the shale barren rock cress determination of effect.**

Corrected to say: The Project will not directly or indirectly impact known-occupied habitats of shale barren rock cress.

4. **The USFWS is proposing the federal listing of yellow lance as threatened under the Endangered Species Act. Include this information in the BE and include the yellow lance as a Proposed Threatened species in the BA.**

Mountain Valley will address this species through 7(a)(4) conferencing (rather than Section 7 consultation since the species is not listed yet), if necessary.

5. **Under the section on consultation, the document states that USFWS issued a letter on Sept 29, 2016 concerning the capture and subsequent range expansion of gray bat in West Virginia. This represents new information. The letter was not found in Appendix A.**

The letter was a general announcement to those on USFWS Elkins Field Office distribution list. It was not direct communication between Mountain Valley and the USFWS, thus it was not included within the Project-specific agency coordination appendix.

6. **Please discuss mitigation measures to minimize potential concussive effects of blasting on volant and non-volant roosting bats in adjacent forested areas to proposed pipeline corridor.**

Blasting for grade or trench excavation will be considered only after all other reasonable means of excavation have been evaluated and determined to be unlikely

to achieve the required results. The amount of blasting will be minimized to the extent practical, but may be required in areas of shallow bedrock where unrippable subsurface rock is encountered. In these areas, Mountain Valley is committed to taking measures to prevent damage to potential hibernacula or features, underground structures (e.g., cables, conduits, and pipelines), and springs, water wells, or other water sources. Blasting mats or padding, restricted charge sizes and/or charge delays will be used as necessary to minimize airblast, peak sound pressure levels, and ground vibration. Specific locations requiring blasting will be determined in the field, based on the limitations of the mechanical excavation equipment.

7. **Selective herbicides for native woody invasive species control can be used that would not kill adjacent herbaceous species.**

Noted.

8. **This is a good literature review of potential effects of noise on wildlife with emphasis on bats and bees. The noise impacts of blasting, including concussive impacts on roosting volant and non-volant bats, as well as bees, needs to be included here.**

Bats:

Confined blasts such as those used to excavate rock generate lower frequency effects with airblast energy predominantly in the inaudible range. Bats echolocate and communicate using ultrasonic frequencies that are well above the human hearing range, and which are much higher than the low-frequency dominated sounds generated by blasting. In addition, all blasting will occur in daytime hours when the bats are least active. Blasting may potentially disturb bats breeding, feeding, or sheltering in the area. Bats could return to the area once blasting ceases.

Bees:

The last known population of rusty patched bumble bee near the Project area was in Fauquier (2014) County, Virginia. Fauquier County is over 100 miles from the Project. Historical records from Montgomery County are about 3.7 miles from the Action Area and from Giles County are approximately four and seven miles from the Action Area. Historical records in Braxton, Fayette, Lewis, and Nicholas counties, West Virginia are difficult to ascertain, as specific data often were not collected. Many experts believe it is extirpated from most areas east of Indiana. Thus the Project Action Area is considered unoccupied. A general discussion of noise impacts on rusty patched bumble bees are discussed in the Biological Assessment.

If the species were present, blasting could have potential direct and indirect effects; however, these effects are currently unknown and have not been studied. Potential short-term impacts would be minimized by utilizing blasting mats or padding, restricted charge sizes and/or charge delays, as necessary.

9. **Blasting as source of noise is not specifically mentioned here. Please clarify if blasting as a source of noise is included.**

Blasting as a source of noise was not included.

10. **BA statement: "Construction noise along the ROW is anticipated to be no greater than construction at the compressor sites." Comment: Clarify if this includes blasting.**

Blasting as a source of noise was not included.

11. **Clarify if the noise impact area (including concussive zone) of blasting is included in the action area analyses.**

The noise impact area did not include blasting.

12. **A new county in the piedmont/coastal plain of Virginia has been documented for breeding Indiana bats. Contact Dr. Mark Ford, USGS, for more information.**

Mountain Valley reached out to Dr. Ford to inquire if any of his research shows bat use of lands in the Project vicinity. Mountain Valley has not received a response from Dr. Ford yet.

13. **This is an excellent literature review and write-up of rusty patched bumble bee. The detail and thoroughness of write-up is appreciated.**

Thank you.

14. **Historical counties listed by the USFWS lead field office sent 9/15/2016 to the GWJNF list Monroe county, WV, as well as Putnam, Clay, Cabell, Lincoln, Greenbrier, Boone, Raleigh, Mingo, Summers, and Mercer counties as being part of the historical range, though the year of the records are not listed. The Forest Service can share this information upon request.**

Mountain Valley would appreciate this information.

15. **Noise impacts to hibernating bats – Clarify if blasting would occur during the winter season. The season for blasting is not identified in this document. Identify if the noise associated with blasting is included in this effects analysis. It is not specifically identified here. If blasting is an activity that could occur during the winter season, it should be analyzed and disclosed, especially the potential concussive effects of blasting on bats within a certain distance from the blast site.**

Blasting for grade or trench excavation will be considered only after all other reasonable means of excavation have been evaluated and determined to be unlikely to achieve the required results. The amount of blasting will be minimized to the extent practical, but may be required in areas of shallow bedrock where unrippable subsurface rock is encountered. In these areas, Mountain Valley is committed to

taking measures to prevent damage to potential hibernacula or features, underground structures (e.g., cables, conduits, and pipelines), and springs, water wells, or other water sources. Blasting mats or padding, restricted charge sizes and/or charge delays will be used as necessary to minimize airblast, peak sound pressure levels, and ground vibration. Specific locations requiring blasting will be determined in the field, based on the limitations of the mechanical excavation equipment.

Blast noise was not included as part of construction noise in the Biological Assessment. Surface excavation blasting uses the release of energy from a confined explosive to break up rocks to facilitate removal. Most of the energy released goes towards rock breakage and movement, but a small portion passes outside the intended work zone in the form of ground or air vibrations. Air vibrations are pressure waves generated by the blast, referred to as “airblast” or “air overpressure.” Higher frequency pressure waves may be heard by people or wildlife as sound, while lower-frequency pressure waves may be felt rather than heard, similar to a gust of wind. Different species have differing sensitivities to sound, so that frequencies that may be audible to some species are not detected as well by other species. In general, surface detonations involving unconfined or poorly confined blasts will cause louder, higher frequency noise, while well confined blasts such as those used to excavate rock generate lower frequency effects with airblast energy predominantly at very low frequencies (often less than 10 Hz, below the range of most human hearing). For this reason, and because noise from blasting is inherently short-term, there are no audible noise limits applicable to blasting for this Project. The MVP Project General Blasting Plan (MVP, 2017) describes the procedures and safety measures the contractor will be required to adhere to while implementing blasting activities. The Blasting Plan specifies compliance with ground vibration limits recommended in the US Bureau of Mines Report of Investigations 8507 (Siskind et al. 1980).

Bats are not particularly sensitive to sound during hibernation. Big brown bats did not respond during hibernation when presented sound at 30-15,000 Hz and 95 dB (Twente and Twente, 1987). Hibernating bats may be “deaf” if the auditory nervous system shuts down at lower temperatures used for hibernation. Harrison (1965) found no neural activity in auditory nerves of little brown bats hibernating below 54°F (12°C).

Several field studies have assessed the effect of noise on hibernating bats. In Missouri, Myers (1975) studied the effect of blasting on Indiana bats and three other bat species. The acoustic frequency of blasts ranged between 1 and 40 Hz; seismic vibrations of blasting are between 3 to 1000 Hz. With blasts as close as 394 feet (120 m) to hibernating Indiana bats and 98 feet (30 m) to eastern pipistrelle bats, he found no evidence of disturbance.

In New York, Besha (1984) identified increasing populations of hibernating Indiana bats near Jamesville with a quarrying operation 1,000 feet (304.8 m) from the cave, with blasts involving up to 200 pounds (90.7 kg) of explosive. He noted a similar situation at Howes Cave and at Glen Park. Blasting at Glen Park occurred within 400 feet (121.9 m) of the bats.

At Fort Leonard Wood, Missouri, training mission activities near hibernacula of endangered Indiana and gray bats included small arms fire, construction engineers' training (clamshells, bulldozers, graders, earthmovers, CEVS, and scrappers), demolition of explosive ordnances, heavy ordnance demolition, and F16 and A10 strafing and inert bomb training. Indiana bats and surrogate bat species were brought into the laboratory and presented sound and seismic stimuli during hibernation. Stimuli duration and intensity mimicked those under field conditions, up to 25 percent of actual distances to hibernacula. Sound stimuli was presented for 3 to 10 minutes at 93 to 126 decibels, at frequencies like those at each of the training ranges (Range 1: 20 - 20,000 Hz with a dominant frequency of 1,000 Hz; Range 4: 20-20,000 Hz with dominant frequency bands at 50, 63, 80, and 100 Hz; Range 36: 25 - 20,000 Hz with dominant frequency bands at 25, 31.5, 50, 63, 80, 200, and 250 Hz; Range TA 244: 24 - 20,000 Hz with dominant frequency bands at 200, 400, 500, 630, 800, and 1000 Hz). Bats were also presented seismic stimuli of magnitudes representing 250-pound charges at 531 feet and 985 feet. This study concluded that sound and seismic stimuli from training activities would not affect hibernating bats (3D/Environmental, 1996).

As stated above, if blasting is necessary in an area where a potential hibernaculum would be within 0.5-mile of the blast site then potential short-term impacts would be minimized by utilizing blasting mats or padding, restricted charge sizes and/or charge delays, as necessary.

- 16. Construction Impacts during spring and autumn swarming - Impacts from blasting, especially potential concussive impacts within a certain radius of the blast site on potential roosting bats in adjacent forested areas, should be analyzed and disclosed here. The time of year and amount of blasting has not been identified or quantified in the document. Therefore it needs to be assumed that it could happen anytime during the pipeline construction phase and anywhere the rock substrate is too close to the surface to be avoided.**

Blasting for grade or trench excavation will be considered only after all other reasonable means of excavation have been evaluated and determined to be unlikely to achieve the required results. The amount of blasting will be minimized to the extent practical, but may be required in areas of shallow bedrock where unrippable subsurface rock is encountered. In these areas, Mountain Valley is committed to taking measures to prevent damage to potential hibernacula or features, underground structures (e.g., cables, conduits, and pipelines), and springs, water

wells, or other water sources. Blasting mats or padding, restricted charge sizes and/or charge delays will be used as necessary to minimize airblast, peak sound pressure levels, and ground vibration. Specific locations requiring blasting will be determined in the field, based on the limitations of the mechanical excavation equipment.

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- 17. Construction impacts during summer - Impacts from blasting, especially potential concussive impacts within a certain radius of the blast site on potentially roosting volant and non-volant bats in adjacent forested areas, should be analyzed and disclosed here. The time of year and amount of blasting has not been identified or quantified in the document. Therefore it should be assumed that it could happen anytime during the pipeline construction phase and anywhere the rock substrate is too close to the surface to be avoided.**

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- 18. Construction impacts during summer - Impacts from blasting, especially potential concussive impacts within a certain radius of the blast site on potentially roosting volant and non-volant bats in adjacent forested areas, should be analyzed and disclosed here. The time of year and amount of blasting has not been identified or quantified in the document. Therefore it should be assumed that it could happen anytime during the pipeline construction phase and anywhere the rock substrate is too close to the surface to be avoided.**

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- 19. Noise impacts to hibernating bats – Identify if blasting would occur during the winter season. The season for blasting is not identified in this document. Identify if the noise associated with blasting included in this effects analysis. It is not specifically identified here. The time of year and amount of blasting has not been identified or quantified in the document. Therefore it should be assumed that it could happen anytime during the pipeline construction phase and anywhere the rock substrate is too close to the surface to be avoided. The potential concussive effects of blasting on bats within a certain distance from the blast site should be analyzed and disclosed here.**

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As stated above, if blasting is necessary in an area where a potential hibernaculum would be within 0.5-mile of the blast site then potential short-term impacts would be minimized by utilizing blasting mats or padding, restricted charge sizes and/or charge delays, as necessary.

- 20. This is a good effects analysis for rusty-patched bumble bee. An additional potential benefit (5.9.3.2.2) is a landscape level connectivity corridor that provides and connects all three required habitat features (when including adjacent forested habitat) based on the lifecycle needs of this species.**

Noted.

- 21. BA statement: "one commonly used impact threshold is one in which the metric of impact is increased by 10 percent or more (USEPA 2003)...Comment: The commonly used threshold of 10% may be a valid assumption for reaches meeting water quality standards or that do not contain sensitive aquatic biota. However, in downstream areas where TES aquatic species are present, it is important to further evaluate cumulative impacts less than 10 percent increase in sediment load, particularly if construction may coincide with low flow conditions. For**

example, Stony Creek with the presence of Candy Darter and Craig Creek with several TES species, including the James spinymussel. Sensitive species must receive special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for Federal listing. If there are impacts to sensitive species the FS must analyze the significance of adverse effects on the populations, its habitat, and on the viability of the species as a whole. (FSM 2672.1) The agency is required to document in the BE activities in sufficient detail to determine how an action may affect sensitive species. Thus, project actions taken on private property that may affect these species must be analyzed to determine any and all direct, indirect, and cumulative impacts of the proposed action. See additional FS comments on the Hydrological Analysis of Sedimentation.

A level of 10 percent increase over background was used to measure impacts, assuming that a 10 percent increase would be within the normal variance experienced in a stream system. As part of the EIS for the Revised Land and Resource Management Plan (Forest Plan) for the Jefferson National Forest, the USFS evaluated if sediment from the proposed management actions would produce a detectable change in sediment loads. Using data from the Clinch River at Speers Ferry over 62 years, it was determined that a change of annual sediment yield of 52 percent represents the natural variation that would occur within one standard deviation of the long-term mean. This is a common occurrence in streams, and Bunte and MacDonald (1999) suggest that the coefficient of variation ranges between 50 and 100 percent. Based on this information, the Forest Plan EIS suggests that changes as a result of the Forest Plan of 5, 8, and 14 percent may not be detectable because it would take 415, 162, or 53 years of sediment data, respectively, to detect such a change. Based on this same logic and the formula provided in Bunte and MacDonald (1999; see below), it may take nearly 104 years to detect a change of 10 percent. In implementing the ESA (USFWS and NMFS, 1998), the USFWS has indicated that insignificant effects relate to the size or severity of the impact and are effects that are undetectable, not measurable, or so minor that they cannot be meaningfully evaluated.

$$\text{Sampling Years} = \left(\frac{1.96}{z} \times CV \right)^2$$

Where z is the percent increase and CV is the coefficient of variation.

22. **BA statement:** “By adherence to aforementioned standards, a 0.47-kilometer (0.29-mile) stream reach of Craig Creek is anticipated to experience sediment load increases in excess of 10 percent above baseline.” **Comment:** The commonly used threshold of 10% may be a valid assumption for reaches meeting water quality standards or do not

contain sensitive aquatic biota. However, in downstream areas where TES aquatic species are present, it is important to further evaluate cumulative impacts less than 10 percent increase in sediment load, particularly if construction may coincide with low flow conditions. For example, Stony Creek with the presence of Candy Darter and Craig Creek with several TES species, including the James spiny mussel. In addition, Section 2.3.5 in the hydrological analysis clearly demonstrates the wide variety of effectiveness, even citing as low as 10% (EPA 1993). Yet the assumption chosen for the practice factor is very high. $p=0.21$ such that containment is 79%. Because many of the literature citations are laboratory based and proper installation is widely understood in the industry to be a limiting factor for effectiveness in the field, this seems to be a vast overestimate of containment. It is more appropriate to err on the side of the worst case scenario, rather than the best case (equal to or less than 48% containment). As such, for this section (and similar sections) in BAK, erosion containment is likely over-estimated and sedimentation underestimated.

While it is true that many of the studies cited within this section come from laboratory investigations (e.g., Farias et al. [2006], Faucette et al. [2008], Faucette et al. [2009]); however, these studies were used in tandem with information from field-scale tests to provide a range of efficiencies that are reasonably attainable. The chosen practice factor supporting 79% containment is not the best case scenario, but rather the mean reported value, for both silt fences and compost filter socks, two predominant controls proposed to be used on the Mountain Valley ROW. The 79% containment is directly related to a study conducted by Dubinsky (2014) that predicts containment performance using a field-scale test. Field-scale tests represent a compromise between laboratory and field tests, allowing for the ability to incorporate conditions relevant to typical installations while operating in a controlled environment that allows for standardized testing procedures. Field-scale testing has become common practice for the assessment of best management practices (BMPs) or sediment retention devices because they incorporate full-scale, “as installed” conditions (TRI/Environmental 2012). The 79% from Dubinsky (2014) is a mean value, which represents a reasonable expectation of overall performance efficiency.

In addition, these field-scale tests look exclusively at the performance of the perimeter control in isolation without consideration of other erosion controls and sediment detention devices. Mountain Valley intends to use a variety of BMPs in addition to sediment barriers, including, but not limited to: trench breakers, permanent slope breakers, temporary seeding, mulching, soil stabilization mats and blankets, rock check dams, temporary ROW diversions, and/or sediment basins and traps. Denuded areas remaining idle for more than 14 days will be stabilized with temporary seeding. In addition, stabilization through temporary seeding. In addition, stabilization through temporary seeding will occur within seven days for areas within

a Clean Water Act 303(d)-impaired watershed, and within four days for Craig Creek Watershed areas. In addition, temporary spoil piles will be mulched/seeded at the end of each day that they are generated within the Craig Creek Watershed. Although mulching and seeding have been incorporated into the estimate of the cover management factor within the Revised Universal Soil Loss Equation applied for the proposed pipeline, these other BMPs have not been incorporated directly into the model. The use of these devices will further limit soil erosion and slow and/or pond runoff to encourage sedimentation within the limits of disturbance rather than at the sediment perimeter control. In combination, these measures will reasonably attain a sediment containment of 79% or higher.

Mountain Valley recognizes and understands the variability in sediment control performance as a function of proper installation and maintenance. For that reason Mountain Valley is committed to proper installation, maintenance, and frequent inspections to reduce BMP failures or inadequacies. Mountain Valley, at the request of the VADEQ, has developed a Project Specific Annual Standards and Specifications for review and approval. The Annual Standards and Specifications outline the BMPs, stormwater management methods, and site restoration measures that are proposed for use on the Project, and explain in specific detail the installation and maintenance requirements of all proposed BMPs. The Annual Standards and Specifications outline the inspection staffing requirements for Project activities in Virginia including, at minimum, one Lead Environmental Inspector (LEI) and at least one Environmental Inspector (EI) per construction spread. In addition to the Mountain Valley inspectors, the FERC will employ a third party inspector and the VADEQ will also have inspectors. VADEQ oversight of the Project will include pre-scheduled and random site inspections for the project. Random site inspections in response to complaints may be conducted without prior notification to Mountain Valley, its contractors and/or inspection staff. Inspections are intended to ensure compliance with the federal Clean Water Act, Virginia Stormwater Management Act, the Virginia Erosion and Sedimentation Control Law, and regulations adopted under these statutes. The VADEQ may take enforcement actions if areas of non-compliance are identified during the routine inspection or in response to a complaint report.

The LEI and EI will be experienced in erosion and sedimentation control and stormwater management BMP installation, operation and maintenance requirements and the FERC's Plan and Procedures. Mountain Valley will also conduct project specific training, focusing on project sensitive resources, state and federal regulations, and Project permit conditions. Mountain Valley will also require at least one EI per construction spread to obtain/maintain a valid Responsible Land Disturber Certification and ESC Inspector certification from VADEQ throughout the Project construction and restoration activities, which will ensure proper installation and maintenance of BMPs.

BMP inspections will occur:

- immediately following initial installation of erosion and sediment controls;
- on a daily basis in areas of active construction or equipment operation;
- on a weekly basis in areas with no construction or equipment operation;
- to ensure revegetation/restoration requirements are being met;
- within 24-hours of a rainfall event producing 0.25 inch of rain or greater over 24 hours; and
- until Project completion.

For 303(d)-impaired watersheds, BMP inspections will be conducted at a frequency of (i) at least once every four business days or (ii) at least once every five business days and no later than 48 hours following a measurable storm event. In the event that a measurable storm event occurs when there are more than 48 hours between business days, the inspection shall be conducted on the next business day.

Mountain Valley explicitly requires that all Company and Contractor personnel comply with environmental permits authorizing the construction, operation, and restoration of the Project and requires all Company and Contractor personnel to immediately notify the Mountain Valley Environmental Coordinator and the EI when there is the potential for noncompliance, including any visible sedimentation outside of the limits of disturbance, so that the issue can be resolved in a timely and appropriate manner.

It is also important to note that in sensitive areas of the Jefferson National Forest, such as the Craig Creek drainage, Mountain Valley committed to construction during times of the year with minimal rainfall (i.e., low flow time periods). Within the Craig Creek drainage, Mountain Valley committed to an expedited time frame that reduces the chance (through reduced exposure) of a large rainfall event occurring during active construction. These additional conservation measures will help ensure that erosion is minimized, thus limiting sedimentation in adjacent waterbodies.

Based on these commitments and requirements, it is appropriate to use the 79% containment standard. Moreover, the suggestion to use 48% containment as a worst-case scenario is inconsistent with case law and regulations for implementing the impact analysis under the National Environmental Policy Act (NEPA). At one point, the Council on Environmental Quality's (CEQ's) NEPA regulations contained a requirement to prepare a worst-case analysis when complete information was lacking. CEQ rescinded this regulation, finding that the worst-case-analysis requirement was "an unproductive and ineffective method" of achieving NEPA's disclosure goals and could "breed endless hypothesis and speculation." The current regulation directs agencies to provide "a summary of existing credible scientific

evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment” and “the agency’s evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community.” The U.S. Supreme Court has confirmed that the NEPA analysis should focus on “reasonably foreseeable impacts” and that no worst-case scenario is required. Other courts have likewise stressed that NEPA does not require a worst-case analysis. Because the 79% containment is supportable and represents the reasonably foreseeable impacts, using a 48% containment “worst case” scenario is neither warranted nor appropriate.

- 23. BA statement: “Collectively, a May Affect–Not Likely to Adversely Affect determination is appropriate for James spinymussel. The nearest known or potential population of James spinymussel occurs outside of the Action Area in Craig Creek.” Comment: See above comments on James spinymussel occurrence and potential sedimentation.**

See responses to above comments.

- 24. The USFWS is proposing the federal listing of yellow lance as threatened under the Endangered Species Act as of 4/5/2017. Include this information and the yellow lance as a Proposed Threatened species in the BA. In addition, the Atlantic pigtoe, green floater, and candy darter were petitioned for listing in April 2010, the FWS determined listing may be warranted, and initiated status reviews which may overlap with this project.**

Mountain Valley will address any candidate species through 7(a)(4) conferencing (rather than Section 7 consultation since the species are not listed yet), if necessary.

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NAD 1983 UTM 17N

1:1,750,000

0 5 10 20 30 40 Miles



Pipeline Alternatives Overview

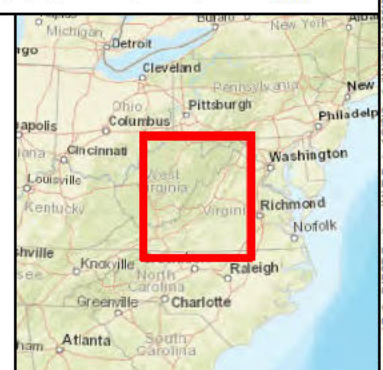
May 2017

Data Sources: ESRI Streaming Data, 2014, Ventyx 2014, NPS, 2017.

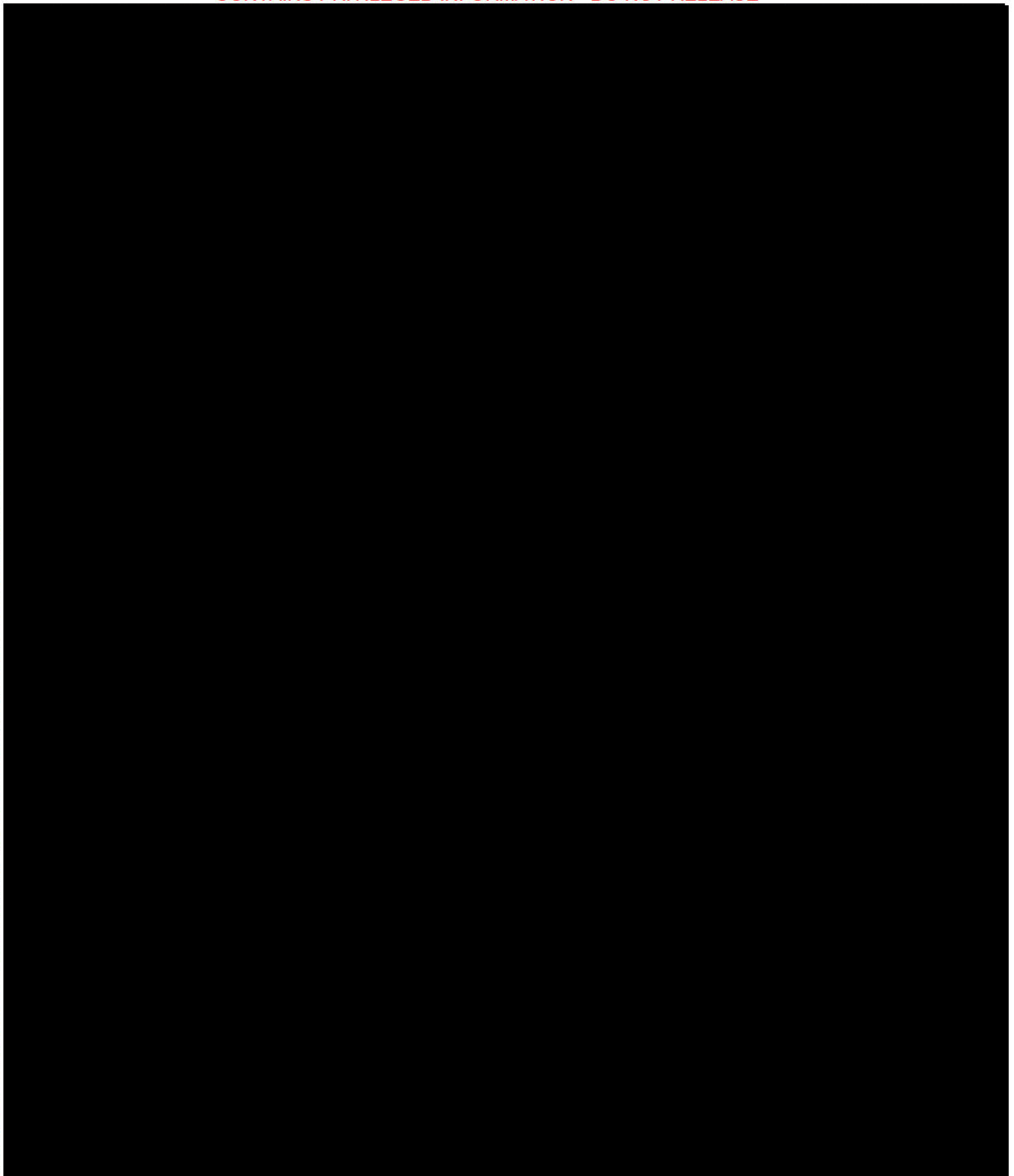
Legend

-  Milepost
 Proposed Route
 Alternative Route
 U.S. Forest Service
 (National Forest) Lands

Privileged & Confidential



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 Cave Entrance 0.25-mile buffer  Project Limits of Disturbance

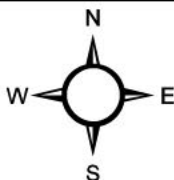


Figure depicting the 0.25-mile buffer around the Canoe Cave opening located near MVP's proposed Mountain Valley Pipeline Project within the States of Virginia and West Virginia.

Project No.
593

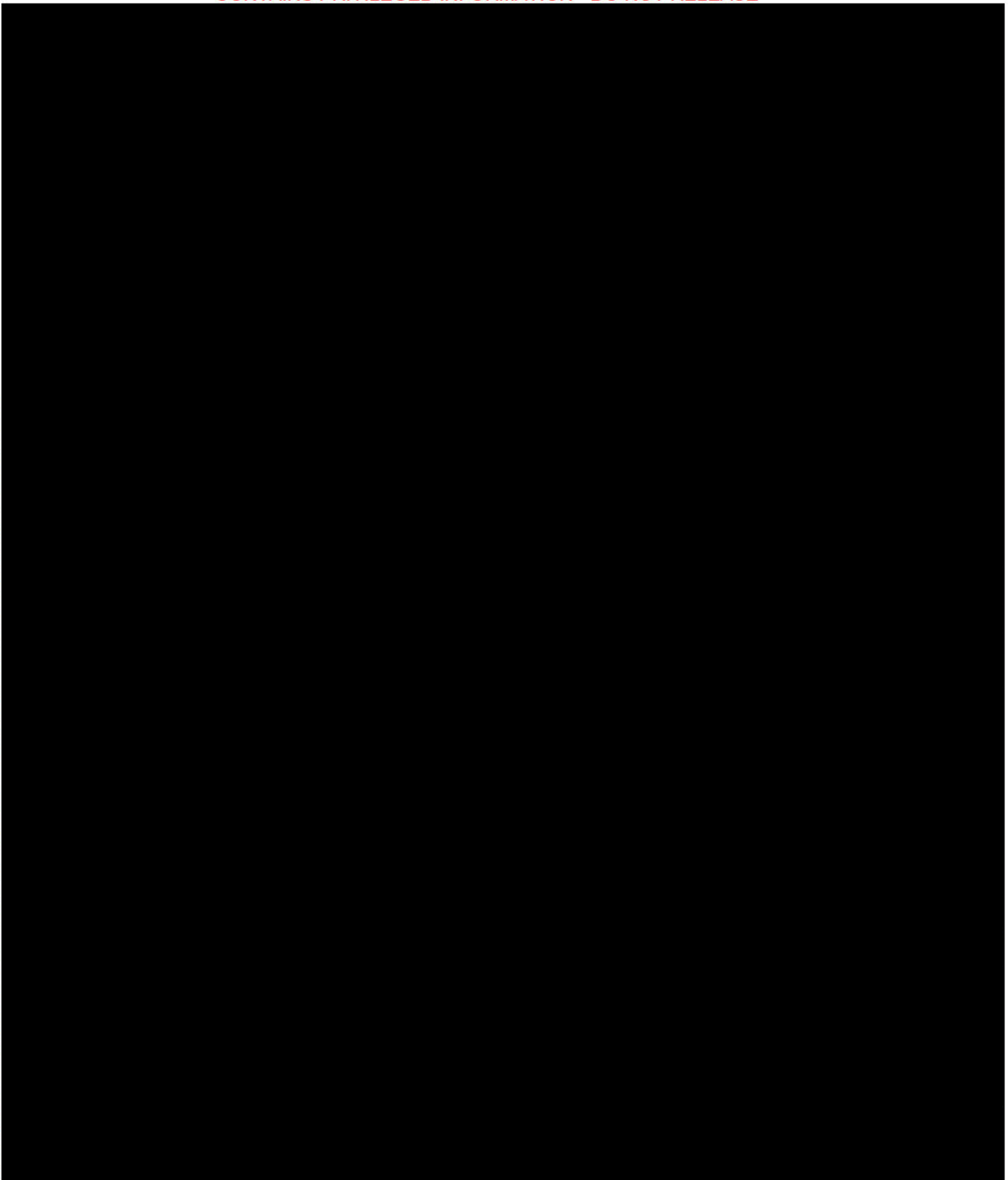
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 Cave Entrance 0.25-mile buffer  Project Limits of Disturbance

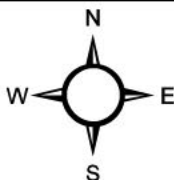


Figure depicting the 0.25-mile buffer around the PS-WV3-Y-P1 opening located near MVP's proposed Mountain Valley Pipeline Project within the States of Virginia and West Virginia.

Project No.
593

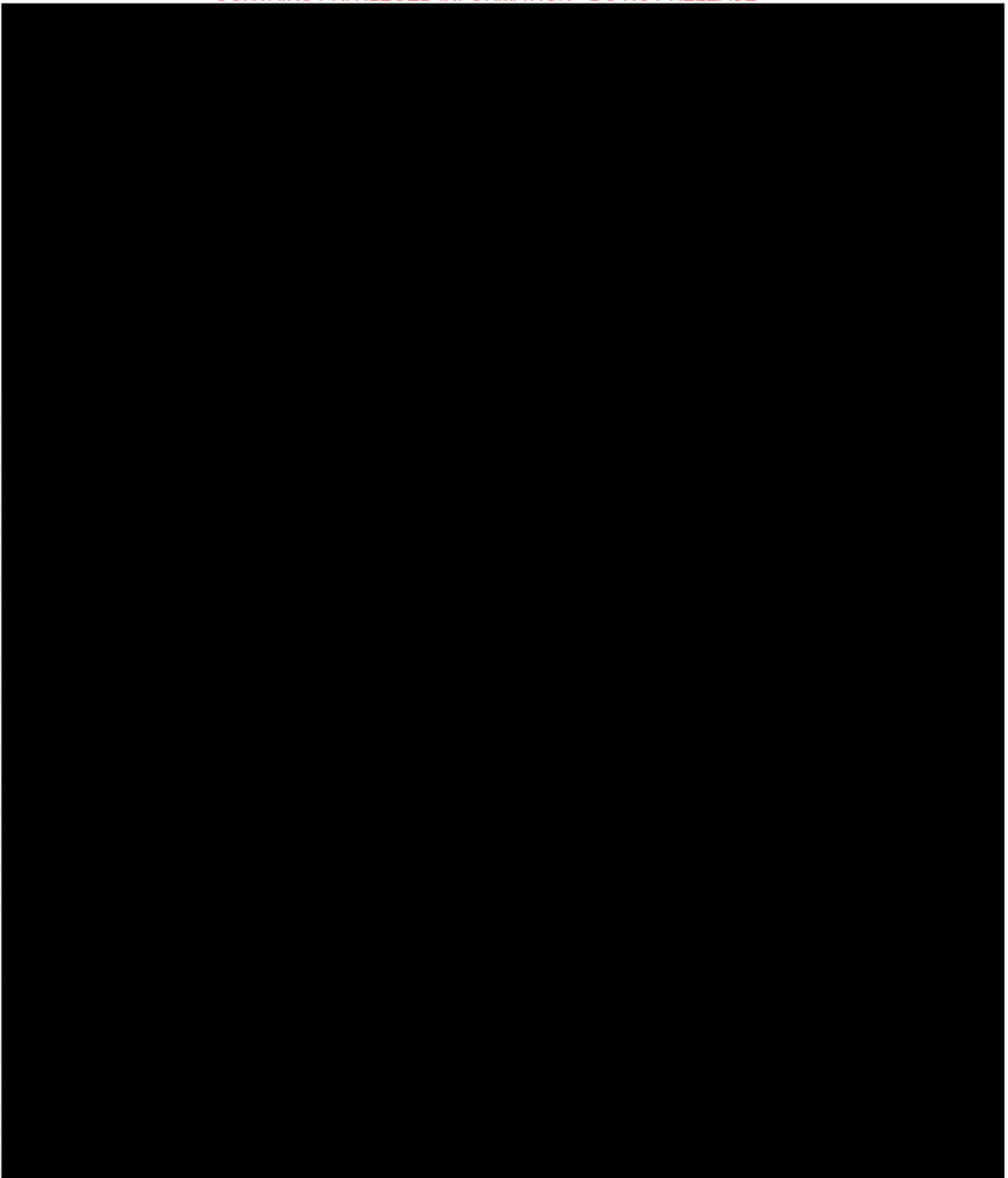
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ENVIRONMENTAL SOLUTIONS
& INNOVATIONS, INC.

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Cave Entrance 0.25-mile buffer
 Cave Entrance 5-mile buffer
 Project Limits of Disturbance

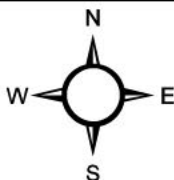
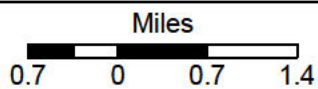


Figure depicting the 0.25-mile buffer around the Tawneys Cave opening located near MVP's proposed Mountain Valley Pipeline Project within the States of Virginia and West Virginia.

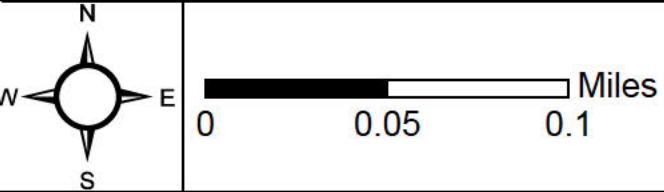
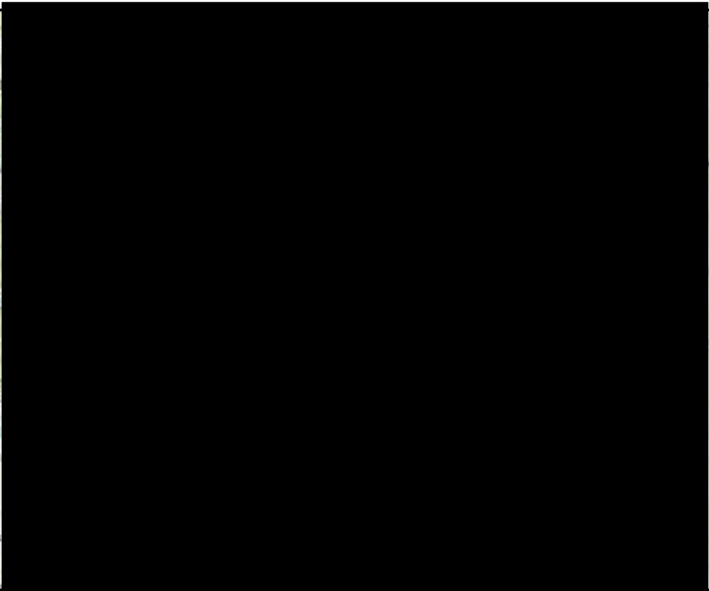
Project No.
593



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Location of Canoe Cave in relation to the Mountain Valley Pipeline Project in Virginia

- Milepost
- Canoe Cave Entrance
- Existing Access Road
- October 2016 Proposed Route (Revised)
- Access Road Workspace
- Limits of Disturbance
- 0.25-mile Buffer



Base Map: ESRI ArcGIS Web service - "World Imagery"



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Project No. 593

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DEIS APPENDIX M (Updated February 2017)				
Shallow Bedrock along the Mountain Valley Project a/				
State	County	MP Start	MP End	Distance (miles)
West Virginia	Wetzel	0.0	0.6	0.591
West Virginia	Wetzel	0.7	0.7	0.036
West Virginia	Wetzel	0.8	1.3	0.469
West Virginia	Wetzel	1.4	2.3	0.945
West Virginia	Wetzel	2.4	2.7	0.496
West Virginia	Wetzel	2.8	4.9	2.227
West Virginia	Wetzel	5.0	5.5	0.494
West Virginia	Wetzel	5.6	6.5	0.928
West Virginia	Wetzel	6.6	7.8	1.272
West Virginia	Wetzel	7.9	8.7	0.868
West Virginia	Wetzel	8.8	9.5	0.697
West Virginia	Harrison	9.6	11.1	1.612
West Virginia	Harrison	11.2	12.0	0.823
West Virginia	Harrison	12.1	15.3	3.158
West Virginia	Harrison	15.4	17.7	2.323
West Virginia	Harrison	17.8	18.7	0.864
West Virginia	Harrison	18.8	20.7	1.984
West Virginia	Harrison	20.8	21.5	0.760
West Virginia	Harrison	21.6	22.9	1.345
West Virginia	Harrison	23.0	25.7	2.719
West Virginia	Harrison	25.9	30.0	4.112
West Virginia	Harrison	30.1	31.2	1.057
West Virginia	Harrison	31.3	31.4	0.205
West Virginia	Doddridge	31.5	32.3	0.889
West Virginia	Doddridge	32.4	32.5	0.103
West Virginia	Harrison	33.0	33.3	0.328
West Virginia	Harrison	33.4	33.5	0.160
West Virginia	Harrison	33.6	33.6	0.141
West Virginia	Doddridge	33.7	34.1	0.433
West Virginia	Doddridge	34.2	34.8	0.599
West Virginia	Doddridge	34.9	36.8	2.001
West Virginia	Doddridge	36.9	37.3	0.551
West Virginia	Harrison	37.4	38.0	0.582
West Virginia	Lewis	38.1	41.1	3.086
West Virginia	Lewis	41.2	42.5	1.244
West Virginia	Lewis	42.6	43.0	0.491
West Virginia	Lewis	43.1	44.6	1.528
West Virginia	Lewis	44.8	45.8	0.940
West Virginia	Lewis	46.2	47.9	1.707
West Virginia	Lewis	48.0	48.0	0.078
West Virginia	Lewis	48.1	51.0	2.945
West Virginia	Lewis	51.1	52.2	1.138
West Virginia	Lewis	52.3	55.0	2.779
West Virginia	Lewis	55.1	58.5	3.374
West Virginia	Lewis	58.6	60.1	1.468
West Virginia	Lewis	60.2	60.3	0.147
West Virginia	Lewis	60.4	61.1	0.707
West Virginia	Lewis	61.3	62.1	0.852
West Virginia	Lewis	62.2	65.4	3.156
West Virginia	Braxton	65.5	67.3	1.800
West Virginia	Braxton	67.4	68.6	1.212
West Virginia	Braxton	68.7	69.9	1.228
West Virginia	Braxton	70.0	71.6	1.587
West Virginia	Braxton	71.7	72.2	0.530

DEIS APPENDIX M (Updated February 2017)				
Shallow Bedrock along the Mountain Valley Project a/				
State	County	MP Start	MP End	Distance (miles)
West Virginia	Braxton	72.3	72.3	0.086
West Virginia	Braxton	72.4	73.4	0.995
West Virginia	Braxton	73.6	73.9	0.309
West Virginia	Braxton	74.0	74.0	0.037
West Virginia	Braxton	74.1	74.7	0.645
West Virginia	Braxton	75.0	76.6	1.558
West Virginia	Braxton	76.7	77.3	0.602
West Virginia	Braxton	77.4	77.6	0.234
West Virginia	Braxton	77.7	78.0	0.311
West Virginia	Braxton	78.1	79.6	1.531
West Virginia	Braxton	79.8	80.2	0.441
West Virginia	Webster	80.3	81.6	1.357
West Virginia	Webster	81.9	82.2	0.318
West Virginia	Webster	82.4	82.6	0.248
West Virginia	Webster	82.7	84.0	1.343
West Virginia	Webster	84.1	87.3	3.202
West Virginia	Webster	87.7	92.4	4.705
West Virginia	Webster	92.5	93.0	0.557
West Virginia	Webster	93.2	97.6	4.426
West Virginia	Webster	97.7	98.6	0.856
West Virginia	Webster	98.8	102.2	3.429
West Virginia	Webster	102.3	104.8	2.545
West Virginia	Webster	104.9	106.3	1.389
West Virginia	Webster	106.4	107.0	0.611
West Virginia	Webster	107.1	109.7	2.668
West Virginia	Nicholas	109.8	109.9	0.278
West Virginia	Webster	110.0	110.1	0.058
West Virginia	Webster	110.2	110.5	0.344
West Virginia	Webster	110.6	110.8	0.310
West Virginia	Nicholas	110.9	111.1	0.227
West Virginia	Nicholas	111.3	111.7	0.351
West Virginia	Nicholas	111.8	112.0	0.246
West Virginia	Nicholas	112.1	112.1	0.089
West Virginia	Nicholas	112.2	113.2	0.997
West Virginia	Nicholas	113.3	114.3	0.963
West Virginia	Nicholas	114.4	115.4	0.953
West Virginia	Nicholas	115.5	116.1	0.651
West Virginia	Nicholas	116.2	117.0	0.810
West Virginia	Nicholas	117.1	117.4	0.400
West Virginia	Nicholas	117.5	117.5	0.063
West Virginia	Nicholas	117.6	117.8	0.257
West Virginia	Nicholas	117.9	118.0	0.130
West Virginia	Nicholas	118.1	118.8	0.646
West Virginia	Nicholas	119.0	120.2	1.168
West Virginia	Nicholas	120.3	122.2	1.900
West Virginia	Nicholas	122.3	122.5	0.194
West Virginia	Nicholas	122.6	122.9	0.341
West Virginia	Nicholas	123.0	123.1	0.142
West Virginia	Nicholas	123.2	123.3	0.182
West Virginia	Nicholas	123.4	124.5	1.094
West Virginia	Nicholas	124.6	124.6	0.072
West Virginia	Nicholas	125.0	125.4	0.459
West Virginia	Nicholas	125.5	126.0	0.477
West Virginia	Nicholas	126.1	126.7	0.671

DEIS APPENDIX M (Updated February 2017)				
Shallow Bedrock along the Mountain Valley Project a/				
State	County	MP Start	MP End	Distance (miles)
West Virginia	Nicholas	126.9	128.2	1.321
West Virginia	Nicholas	128.5	130.4	1.942
West Virginia	Nicholas	130.5	131.3	0.829
West Virginia	Nicholas	131.5	132.2	0.653
West Virginia	Nicholas	132.4	135.3	2.900
West Virginia	Greenbrier	135.4	140.4	5.039
West Virginia	Greenbrier	140.5	143.9	3.379
West Virginia	Greenbrier	144.2	147.0	2.767
West Virginia	Greenbrier	147.1	149.9	2.764
West Virginia	Greenbrier	150.0	154.1	4.225
West Virginia	Fayette	154.2	154.4	0.286
West Virginia	Fayette	154.5	154.6	0.237
West Virginia	Greenbrier	154.7	154.7	0.082
West Virginia	Greenbrier	155.0	155.2	0.179
West Virginia	Greenbrier	155.3	155.7	0.474
West Virginia	Greenbrier	155.8	157.1	1.318
West Virginia	Summers	157.2	161.0	3.809
West Virginia	Summers	161.1	162.9	1.831
West Virginia	Summers	163.0	165.1	2.114
West Virginia	Summers	165.2	169.6	4.434
West Virginia	Summers	170.0	171.3	1.269
West Virginia	Summers	171.9	172.6	0.688
West Virginia	Summers	172.7	173.1	0.441
West Virginia	Summers	173.8	174.2	0.522
West Virginia	Monroe	174.3	174.3	0.027
West Virginia	Monroe	174.4	179.1	4.658
West Virginia	Monroe	179.2	179.6	0.488
West Virginia	Monroe	179.7	182.2	2.565
West Virginia	Monroe	182.5	182.7	0.298
West Virginia	Monroe	182.8	184.0	1.275
West Virginia	Monroe	184.3	185.6	1.395
West Virginia	Monroe	185.7	186.1	0.366
West Virginia	Monroe	186.2	187.5	1.410
West Virginia	Monroe	187.6	190.0	2.348
West Virginia	Monroe	190.1	190.9	0.814
West Virginia	Monroe	191.0	191.7	0.816
West Virginia	Monroe	191.8	191.8	0.057
West Virginia	Monroe	191.9	191.9	0.063
West Virginia	Monroe	192.0	194.5	2.491
West Virginia	Monroe	194.6	195.1	0.524
West Virginia	Monroe	196.0	196.3	0.328
Virginia	Giles	196.4	197.4	1.209
Virginia	Giles	200.6	200.6	0.014
Virginia	Giles	200.7	200.9	0.208
Virginia	Giles	201.0	201.0	0.051
Virginia	Giles	201.6	202.2	0.598
Virginia	Giles	202.3	202.9	0.536
Virginia	Giles	204.3	205.4	1.105
Virginia	Giles	206.6	206.6	0.040
Virginia	Giles	206.7	206.9	0.135
Virginia	Giles	207.2	207.7	0.509
Virginia	Giles	207.9	208.0	0.138
Virginia	Giles	208.1	208.3	0.235
Virginia	Giles	208.4	208.5	0.106

DEIS APPENDIX M (Updated February 2017)				
Shallow Bedrock along the Mountain Valley Project a/				
State	County	MP Start	MP End	Distance (miles)
Virginia	Giles	208.6	208.9	0.344
Virginia	Giles	210.9	211.0	0.109
Virginia	Giles	211.4	212.4	1.079
Virginia	Giles	216.1	216.2	0.171
Virginia	Giles	216.6	216.8	0.201
Virginia	Craig	216.9	216.9	0.103
Virginia	Craig	218.0	218.5	0.472
Virginia	Montgomery	218.6	218.6	0.079
Virginia	Montgomery	219.6	219.6	0.039
Virginia	Montgomery	219.7	221.8	2.156
Virginia	Montgomery	222.0	222.0	0.047
Virginia	Montgomery	222.1	222.1	0.004
Virginia	Montgomery	222.2	222.4	0.163
Virginia	Montgomery	222.5	222.6	0.127
Virginia	Montgomery	222.8	222.9	0.090
Virginia	Montgomery	223.4	223.8	0.377
Virginia	Montgomery	223.9	224.0	0.178
Virginia	Montgomery	224.5	225.5	0.995
Virginia	Montgomery	226.2	226.4	0.227
Virginia	Montgomery	226.8	227.1	0.286
Virginia	Montgomery	227.3	227.5	0.202
Virginia	Montgomery	227.6	227.9	0.346
Virginia	Montgomery	228.0	228.3	0.348
Virginia	Montgomery	228.4	228.4	0.060
Virginia	Montgomery	229.1	229.2	0.141
Virginia	Montgomery	229.3	229.5	0.284
Virginia	Montgomery	229.6	229.6	0.066
Virginia	Montgomery	229.7	229.7	0.014
Virginia	Montgomery	229.8	230.8	0.991
Virginia	Montgomery	231.0	234.3	3.247
Virginia	Montgomery	234.5	234.5	0.049
Virginia	Montgomery	234.6	234.6	0.040
Virginia	Montgomery	235.3	235.4	0.139
Virginia	Montgomery	235.5	235.5	0.019
Virginia	Montgomery	235.6	235.6	0.044
Virginia	Montgomery	235.7	235.7	0.023
Virginia	Montgomery	235.8	237.5	1.764
Virginia	Montgomery	237.6	237.7	0.160
Virginia	Montgomery	237.8	238.1	0.294
Virginia	Roanoke	238.2	241.0	2.860
Virginia	Roanoke	241.5	241.6	0.181
Virginia	Roanoke	242.8	242.9	0.041
Virginia	Franklin	246.5	246.9	0.498
Virginia	Franklin	247.0	247.3	0.336
Virginia	Franklin	247.4	248.6	1.185
Virginia	Franklin	249.6	249.7	0.060
Virginia	Franklin	249.8	251.0	1.176
Virginia	Franklin	251.1	251.1	0.072
Virginia	Franklin	251.3	251.3	0.006
Virginia	Franklin	251.5	251.5	0.004
Virginia	Franklin	251.9	251.9	0.022
Virginia	Franklin	252.1	252.1	0.030
Virginia	Franklin	252.2	252.2	0.044
Virginia	Franklin	252.3	252.3	0.093

DEIS APPENDIX M (Updated February 2017)				
Shallow Bedrock along the Mountain Valley Project a/				
State	County	MP Start	MP End	Distance (miles)
Virginia	Franklin	252.4	252.4	0.070
Virginia	Franklin	252.5	252.6	0.103
Virginia	Franklin	252.8	252.8	0.048
Virginia	Franklin	252.9	253.9	1.024
Virginia	Franklin	254.2	254.2	0.051
Virginia	Franklin	254.3	254.9	0.605
Virginia	Franklin	255.2	255.3	0.065
Virginia	Franklin	255.4	255.5	0.086
Virginia	Franklin	255.9	256.0	0.082
Virginia	Franklin	256.3	256.3	0.032
Virginia	Franklin	256.4	256.4	0.023
Virginia	Franklin	256.8	256.8	0.022
Virginia	Franklin	257.0	257.1	0.071
Virginia	Franklin	257.6	257.6	0.017
Virginia	Franklin	257.8	257.9	0.065
Virginia	Franklin	258.0	258.2	0.219
Virginia	Franklin	258.3	258.3	0.030
Virginia	Franklin	259.2	259.4	0.191
Virginia	Franklin	259.5	260.1	0.608
Virginia	Franklin	260.2	260.3	0.057
Virginia	Franklin	260.4	260.5	0.044
Virginia	Franklin	260.7	260.9	0.166
Virginia	Franklin	261.0	261.0	0.033
Virginia	Franklin	261.2	261.2	0.017
Virginia	Franklin	261.3	261.4	0.071
Virginia	Franklin	261.5	261.6	0.142
Virginia	Franklin	261.8	261.9	0.037
Virginia	Franklin	262.0	262.2	0.267
Virginia	Franklin	262.4	262.4	0.053
Virginia	Franklin	262.8	262.9	0.132
Virginia	Franklin	263.3	263.3	0.036
Virginia	Franklin	264.8	264.9	0.041
Virginia	Franklin	265.0	265.0	0.040
Virginia	Franklin	265.1	265.1	0.010
Virginia	Franklin	265.2	265.2	0.075
Virginia	Franklin	265.6	265.7	0.070
Virginia	Franklin	266.0	266.0	0.024
Virginia	Franklin	266.3	266.3	0.014
Virginia	Franklin	267.0	267.1	0.084
Virginia	Franklin	268.9	269.0	0.087
Virginia	Franklin	269.1	269.2	0.157
Virginia	Franklin	269.4	269.4	0.065
Virginia	Franklin	269.8	269.8	0.038
Virginia	Franklin	274.0	274.1	0.041
Virginia	Franklin	274.2	274.3	0.112
Virginia	Franklin	274.4	274.4	0.052
Virginia	Franklin	275.2	275.3	0.078
Virginia	Franklin	276.6	276.8	0.230
Virginia	Franklin	277.3	277.3	0.005
Virginia	Franklin	277.4	277.5	0.064
Virginia	Franklin	277.7	277.8	0.051
Virginia	Franklin	277.9	277.9	0.030
Virginia	Franklin	278.0	278.1	0.055
Virginia	Franklin	278.3	278.3	0.046

DEIS APPENDIX M (Updated February 2017)				
Shallow Bedrock along the Mountain Valley Project ^{a/}				
State	County	MP Start	MP End	Distance (miles)
Virginia	Franklin	278.7	278.7	0.012
Virginia	Franklin	278.8	278.9	0.094
Virginia	Franklin	279.1	279.1	0.030
Virginia	Franklin	279.3	279.5	0.213
Virginia	Franklin	279.6	280.0	0.354
Virginia	Franklin	280.1	280.1	0.058
Virginia	Franklin	280.6	280.7	0.049
Virginia	Franklin	280.8	280.8	0.043
Virginia	Franklin	280.9	281.0	0.078
Virginia	Franklin	281.5	281.6	0.087
Virginia	Franklin	281.7	281.7	0.071
Virginia	Franklin	281.8	281.9	0.068
Virginia	Franklin	282.0	283.5	1.496
Virginia	Franklin	283.8	283.9	0.128
Virginia	Pittsylvania	284.0	284.2	0.233
Virginia	Pittsylvania	293.7	293.7	0.090
Virginia	Pittsylvania	293.9	294.0	0.055
Virginia	Pittsylvania	296.7	297.0	0.245
Total				216.384
^{a/} Bedrock within 7 feet of surface as mapped by NRCS 2016 (Natural Resources Conservation Service. 2016. Gridded Soil Survey Geographic (gSSURGO) by State, Tabular and vector digital dataset. Available online at: https://gdg.sc.egov.usda.gov/ . Accessed March 29, 2016).				

Potential hibernacula near project.

State	Feature Name	County	Bat Suitability	Indiana Bat Status	Northern Long-eared Bat Status	Distance (meters)	Within 5 mi of Project	Within 0.6 mi Noise Impact
Virginia	Echols Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1.2	Yes	Yes
	Hog Hole	Giles	Unknown	Suitability Unknown	Suitability Unknown	22.3	Yes	Yes
	High Voltage Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	31.5	Yes	Yes
	Jones Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	38.3	Yes	Yes
	Mill Creek Pit	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	53.5	Yes	Yes
	Unknown	Giles	Unknown	Suitability Unknown	Suitability Unknown	61.0	Yes	Yes
	Williams Contact Shaft	Giles	Unknown	Suitability Unknown	Suitability Unknown	73.9	Yes	Yes
	Lhoist Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	102.3	Yes	Yes
	Johnsons Cave	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	123.3	Yes	Yes
	Newport Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	138.4	Yes	Yes
	Conklin Sink Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	139.2	Yes	Yes
	Slussers Chapel Cave	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	165.0	Yes	Yes
	Mahaffey Trash Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	190.4	Yes	Yes
	Plumb Bob Pit	Giles	Unknown	Suitability Unknown	Suitability Unknown	192.6	Yes	Yes
	Hoges Farm Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	251.3	Yes	Yes
	Unnamed	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	257.5	Yes	Yes
	Missing Link Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	289.5	Yes	Yes
	Big Stony Canyon Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	294.9	Yes	Yes
	Jimzuther Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	303.7	Yes	Yes
	Links Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	336.7	Yes	Yes
	Kimbalton Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	349.0	Yes	Yes
	Smokehole Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	405.7	Yes	Yes
	Conklin Air Hole	Giles	Unknown	Suitability Unknown	Suitability Unknown	439.9	Yes	Yes
	Kanodes Pit	Giles	Unknown	Suitability Unknown	Suitability Unknown	474.1	Yes	Yes
	Terrible Tortoise Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	480.7	Yes	Yes
	Pighole Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	499.5	Yes	Yes
	Bob Henderson Pit	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	522.8	Yes	Yes
	Freeman Pit	Giles	Unknown	Suitability Unknown	Suitability Unknown	552.1	Yes	Yes
	Hancock Blowhole	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	557.1	Yes	Yes
	Maroon Canyon Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	559.4	Yes	Yes
	Pedlar Hills Cave	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	585.8	Yes	Yes
	Small Room Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	593.3	Yes	Yes
	Knipling Slot Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	600.9	Yes	Yes
	Just a Little Farther Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	638.9	Yes	Yes
	Thompsons Cave	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	642.8	Yes	Yes

State	Feature Name	County	Bat Suitability	Indiana Bat Status	Northern Long-eared Bat Status	Distance (meters)	Within 5 mi of Project	Within 0.6 mi Noise Impact
	Gardners Little Cave	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	658.8	Yes	Yes
	Porterfields Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	716.3	Yes	Yes
	Spruce Run Mountain Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	720.4	Yes	Yes
	Longs Cave No.2	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	734.2	Yes	Yes
	Freeman Treestand Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	757.7	Yes	Yes
	Andrews Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	777.0	Yes	Yes
	Mill Creek Cave	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	785.9	Yes	Yes
	Chockstone Pit	Giles	Unknown	Suitability Unknown	Suitability Unknown	815.1	Yes	Yes
	McDonalds Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	839.0	Yes	Yes
	Key Ridge Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	841.3	Yes	Yes
	Doe Mountain Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	843.5	Yes	Yes
	Freeman Hole	Giles	Unknown	Suitability Unknown	Suitability Unknown	862.9	Yes	Yes
	Trap Door Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	868.7	Yes	Yes
	Barkers Cave	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	888.7	Yes	Yes
	Corkscrew Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	904.6	Yes	Yes
	Unnamed	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	906.3	Yes	Yes
	Bob Henderson Cave	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	936.7	Yes	Yes
	Windsor Pit	Giles	Unknown	Suitability Unknown	Suitability Unknown	941.2	Yes	Yes
	Klotz Quarry Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	983.0	Yes	No
	Spider Cave	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	991.5	Yes	No
	Calamity Chasm Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,007.2	Yes	No
	Red Hawk Cave	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	1,055.3	Yes	No
	Virginian Cliff Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,082.0	Yes	No
	Elliston Cliff Cave	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	1,087.2	Yes	No
	Williams Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,101.0	Yes	No
	Devils Den Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,115.2	Yes	No
	Phlegars Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,121.1	Yes	No
	Big Stony Fissure Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,243.7	Yes	No
	Salem Quarry Cave	Roanoke	Unknown	Suitability Unknown	Suitability Unknown	1,250.9	Yes	No
	Isaac Williams Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,314.7	Yes	No
	Thorn Tree Pot	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,322.5	Yes	No
	Hoot Owl Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,343.5	Yes	No
	John Smith Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,359.2	Yes	No
	Arthur Dowdys Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,366.0	Yes	No
	Almosta Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,376.6	Yes	No
	Johnnys Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,376.6	Yes	No
	Smith Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,399.7	Yes	No

State	Feature Name	County	Bat Suitability	Indiana Bat Status	Northern Long-eared Bat Status	Distance (meters)	Within 5 mi of Project	Within 0.6 mi Noise Impact
	Gardners Cave	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	1,429.7	Yes	No
	Frankies Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,430.7	Yes	No
	Glacial Leaf Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,456.4	Yes	No
	Niagara Hole	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,461.4	Yes	No
	Jake Williams Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,557.9	Yes	No
	Sams Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,568.1	Yes	No
	Underwoods Cave No.1	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	1,624.9	Yes	No
	Claude Links Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,755.4	Yes	No
	Pyrtles Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,771.2	Yes	No
	Garrisons Cave	Roanoke	Unknown	Suitability Unknown	Suitability Unknown	1,804.6	Yes	No
	Bear Hole	Roanoke	Unknown	Suitability Unknown	Suitability Unknown	1,845.4	Yes	No
	Will Johnsons Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,864.3	Yes	No
	New Dixie Cave	Roanoke	Unknown	Suitability Unknown	Suitability Unknown	1,893.7	Yes	No
	Pseudo-Garrisons Cave	Roanoke	Unknown	Suitability Unknown	Suitability Unknown	1,906.3	Yes	No
	Maybrook Sinkhole Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,914.0	Yes	No
	Rocky Sink School Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	1,978.8	Yes	No
	Givens Cave	Roanoke	Unknown	Suitability Unknown	Suitability Unknown	2,002.0	Yes	No
	Pembroke Railroad Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	2,006.5	Yes	No
	Dixie Caverns	Roanoke	Unknown	Suitability Unknown	Suitability Unknown	2,079.7	Yes	No
	Jan 1 2000 Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	2,166.6	Yes	No
	Reads Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	2,169.4	Yes	No
	Hoge Brothers Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	2,206.3	Yes	No
	Kays Cave	Roanoke	Unknown	Suitability Unknown	Suitability Unknown	2,207.8	Yes	No
	Dixie Annex Cave	Roanoke	Unknown	Suitability Unknown	Suitability Unknown	2,237.9	Yes	No
	Cliff Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	2,254.7	Yes	No
	Dead Cat Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	2,280.4	Yes	No
	Blankenship Cave	Roanoke	Unknown	Suitability Unknown	Suitability Unknown	2,321.3	Yes	No
	Mike Breens Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	2,380.3	Yes	No
	Jim Millers Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	2,502.1	Yes	No
	Sniders Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	2,546.3	Yes	No
	Kings Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	2,546.4	Yes	No
	460 Pit	Giles	Unknown	Suitability Unknown	Suitability Unknown	2,572.3	Yes	No
	460 Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	2,582.4	Yes	No
	Claypools Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	2,587.5	Yes	No
	Lucas Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	2,665.7	Yes	No
	Ripplemead Cliff Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	2,739.2	Yes	No
	Rebel Yelp Cave	Roanoke	Unknown	Suitability Unknown	Suitability Unknown	2,770.0	Yes	No

State	Feature Name	County	Bat Suitability	Indiana Bat Status	Northern Long-eared Bat Status	Distance (meters)	Within 5 mi of Project	Within 0.6 mi Noise Impact
West Virginia	Caldwell Cave	Giles	Unknown	Suitability Unknown	Suitability Unknown	3,207.9	Yes	No
	Agnews Cave	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	4,111.5	Yes	No
	Thornhill Cave	Montgomery	Unknown	Suitability Unknown	Suitability Unknown	4,238.0	Yes	No
	Poor Mountain Cave	Roanoke	Unknown	Suitability Unknown	Suitability Unknown	4,317.9	Yes	No
	Greenville Glenray Cave	Monroe	Unknown	Suitability Unknown	Suitability Unknown	252.0	Yes	Yes
	Bobcat Cave	Monroe	Unknown	Suitability Unknown	Suitability Unknown	321.0	Yes	Yes
	Rich Creek Cave	Monroe	Unknown	Suitability Unknown	Suitability Unknown	452.9	Yes	Yes
	Wolf Cave	Monroe	Unknown	Suitability Unknown	Suitability Unknown	895.3	Yes	Yes
	Hans Creek Cave	Monroe	Unknown	Suitability Unknown	Suitability Unknown	1,723.3	Yes	No
	Scampering Simmons Pit	Monroe	Unknown	Suitability Unknown	Suitability Unknown	2,956.6	Yes	No
	Post Puke Pit	Monroe	Unknown	Suitability Unknown	Suitability Unknown	3,072.0	Yes	No
	Lost Skier Pit	Monroe	Unknown	Suitability Unknown	Suitability Unknown	3,124.8	Yes	No
	Coburn Cave	Monroe	Unknown	Suitability Unknown	Suitability Unknown	3,229.2	Yes	No
	Ogdens Hole	Monroe	Unknown	Suitability Unknown	Suitability Unknown	3,730.6	Yes	No
	Big Mother Sink	Monroe	Unknown	Suitability Unknown	Suitability Unknown	4,009.2	Yes	No