A Response to the November 23, 2016 Letter from Robert Jones regarding Mountain Valley Pipeline Construction in Karst Terrain of the Mount Tabor Area

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1.0 INTRODUCTION AND PURPOSE

The Mountain Valley Pipeline Project (Project) entails construction and operation of a 42-inch diameter natural gas conveyance pipeline system spanning approximately 303 miles from Wetzel County, West Virginia, to Transcontinental Gas Pipeline Company's (Transco) Zone 5 compressor station 165 in Pittsylvania County, Virginia. The Project will be constructed and owned by Mountain Valley Pipeline, LLC (Mountain Valley). The Project is governed by the United States Natural Gas Act, which requires a Certificate of Convenience and Necessity from the Federal Energy Regulatory Commission (FERC) before construction can commence.

Draper Aden Associates (Draper), and more specifically, the karst hydrogeologists and construction experts, reviewed the November 23, 2016 letter submitted by Robert Jones to the FERC in Docket CP16-10-000, with the subject specified as "Report on Why MVP Needs to Go Along the Ridge of Brush Mountain in Mt. Tabor". Draper reviewed Robert Jones' letter and found the opinions and assertions that are presented to be misdirected, and generally inaccurate in portrayal of risk associated with Project construction in karst terrain. In particular, it is apparent that the intent of the Robert Jones letter is to influence the FERC with specious arguments in order to have the proposed alignment directed away from the Jones property, and therefore is not an objective, scientifically-based analysis.

Overall, Robert Jones reaches erroneous conclusions regarding the risk presented by the Project and does not account for the true nature of karst hydrogeologic systems in question. Robert Jones' letter does not reflect the reality of construction practices in karst terrain; does not fully recognize the volumes of technical information that Mountain Valley has provided to the FERC that

characterized karst features; does not credit the considerable efforts of Mountain Valley's plans for avoidance, assessment and risk mitigation; and has not considered the information provided to the FERC by Mountain Valley regarding the Virginia Department of Conservation and Recreation (DCR) Slussers Chapel avoidance route versus the current October 2016 Proposed Route. Robert Jones does not present any new information that MVP has not previously considered, which further demonstrates the author's lack of understanding of karst hydrology, and modern construction practices and how such processes can be used to avoid and minimize impacts. Furthermore, Robert Jones relies heavily on a July 2016 report by Ernst Kastning entitled "An Expert Report on Geologic Hazards in the Karst Regions of Virginia and West Virginia", which Mountain Valley effectively discredited as misdirected and inaccurate in a December 21, 2016 submittal to the FERC.

2.0 METHODS

The proposed Project route was carefully designed to utilize existing gas and electric transmission corridors when possible; to avoid sensitive or protected areas when feasible; and to limit surface disturbance and minimize the overall environmental footprint. As part of Mountain Valley's commitment to the environment, the Project team considered thousands of miles of alternatives and variations to the proposed route in an effort to alleviate concerns posed by interested and informed stakeholders along the route.

Evaluation of the proposed route and alternatives for the Project included civil surveying and evaluating various routes to help determine a proposed route with the least overall impact to landowners, cultural and historic resources, and the environment. Starting in 2014, the Project

team conducted numerous environmental and civil surveys, hosted open houses, and participated in FERC scoping meetings, all in an effort to encourage open discussion with community members, landowners, local elected officials, and public agencies. These public meetings generated valuable feedback that helped shape the proposed route.

Draper was contracted by Mountain Valley to serve as the core of the Karst Specialist Team for identifying, assessing and mitigating karst hazards along the Project route and associated alternatives and variations. The Karst Specialist Team possesses more than 160 years combined experience in relevant hazards inherent to southern West Virginia and southwest Virginia. The lead scientist in the Karst Specialist Team is a registered Professional Geologist with more than 44 years of experience in hydrogeology and karst hydrogeology of West Virginia and Virginia, who has published scientific studies of karst systems and who has also served as a director of state and national speleological societies. The Karst Specialist Team also includes a karst specialist, surveyor and geospatial analyst with over 30 years of direct experience in karst assessments of southern West Virginia and southwestern Virginia. Other members of the Karst Specialist team include: a registered Professional Geologist with more than 26 years of experience in engineering geology, hydrogeology and geophysical and geotechnical analysis in karst terrain; a geologist with more than 18 years of experience in geophysical and geotechnical analysis of karst terrain; a registered Professional Geologist with 26 years of experience in hydrogeology and geochemistry in karst terrain; and a registered Professional Geologist with 16 years of experience in karst terrain geotechnical evaluation and hydrogeology. Each and every member of the Karst Specialist Team has direct experience with the specific karst terrain hydrogeology in southern West Virginia and southwestern Virginia. Furthermore, the Karst Specialist Team has over 45 years' experience in

permitting, construction and installation of linear infrastructure projects including water lines, sewer lines, and natural gas pipelines in karst terrain of the Valley and Ridge and Appalachian Plateau geologic provinces.

With regard to the Project, the Karst Specialist Team has identified and assessed karst features and related risks starting with a detailed desk top analysis derived from public and proprietary data, then as land access was granted, direct and applied observations, utilizing their combined years of field experience. The Karst Specialist Team will be deployed to conduct inspections during construction in karst terrain to ensure identification and protection of karst features, including avoidance and proper mitigation.

The Karst Specialist Team is concerned that Robert Jones neither documents nor demonstrates experience in the analysis of geologic hazards for natural gas pipeline construction in karst terrain. It is vital that infrastructure projects such as the Mountain Valley Pipeline Project be evaluated for efficacy by scientific and engineering analyses. In contrast to Robert Jones' assertions, the Mountain Valley Project team, including the Karst Specialist Team, developed numerous detailed analyses and documents on the topics of karst terrain, hydrogeology, foundation and slope analyses, water resources and seismic hazards analysis, and materials design. The resulting documents include the Karst Hazards Assessment, Karst Mitigation Plan, Seismic Hazards Assessment, Materials Engineering and Design, and the Water Supply Identification and Testing Plan. Robert Jones neither acknowledges nor considers this documented information, which was previously submitted to the FERC and is available to the public.

The information presented below identifies various inaccurate and fundamentally flawed assumptions presented by Robert Jones. The information provided herein highlights examples where Robert Jones does not acknowledge or mischaracterizes Mountain Valley's route-specific investigation and results. Importantly, as the planning and development stage of the Project progressed and environmental survey results were evaluated, numerous route adjustments were made in order to avoid karst features and geologic hazards. In particular, Mountain Valley considered the proposed DCR Slussers Chapel avoidance route that is referenced by Robert Jones (that would re-locate the pipeline away from the Jones' property) and found the avoidance route to have serious limitations for construction effectiveness. However, Robert Jones does not accurately reflect this relevant information.

3.0 DISCUSSION

The following discussion highlights several examples where Robert Jones asserts claims that are unsupported, misdirected, or incorrect:

Robert Jones asserts that pipeline construction and operation will cause a collapse or clogging of the Mount Tabor aquifer (p.2, 5, 11, 12, 14, 15, 17, 21, 22, 23). On several occasions it is implied that even slight disturbances such as vibrations from construction vehicles (p.5) will have near catastrophic impact on the karst system and related aquifer. Robert Jones further speculates that known or suspected caverns within a quarter-mile will collapse as a result of construction (p.19, 20). These assertions are not reflective of actual construction in karst terrain. The Project entails clearing ground cover from a narrow right-of-way, excavation of a trench approximately 10 feet deep for installation of the pipeline, followed by backfill and grading to restore the ground to pre-

construction grades and revegetation. Overall construction activities will be conducted rapidly (on the scale of days to weeks) and the trench will be exposed for only a minimal amount of time (days) prior to backfill and reclamation. This therefore entails a short-lived temporary construction procedure that presents a commensurately minimal risk. Clearing, trenching and grading for the Project will be accomplished using standard and typical construction equipment (similar to grading a residential driveway, installing a water or sewer conveyance line, etc.,). Vibrations associated with operating this equipment for pipeline installation will quickly dissipate in the subsurface and will be no more intense than that resulting from the construction of a residential foundation, barn, road, etc., and likely less than drilling a water well, and there is no reasonable expectation for an induced collapse scenario asserted by Robert Jones.

Robert Jones claims that Mountain Valley did not identify locations of limestone and dolomite in karst terrain, and does not understand the hydrologic system of the area (p.7, 10, 21). Robert Jones, however, does not consider the significant amount of work that Mountain Valley has performed in identifying and assessing karst terrain through desktop research, field reconnaissance, and in some areas geophysical studies (refer to the Mountain Valley Karst Hazards Assessment, Karst Mitigation Plan, Water Supply Identification and Testing Plan, Project-specific Erosion and Sediment Control Plan, Data Request responses to the FERC regarding Mount Tabor karst, Electrical Resistivity study, etc.).

Robert Jones further names a steep hillside in the Price Formation as “Dyers Grotto”, frequently putting it in quotes (p.4, 11, 12, 13, 14, 21). However, a grotto is a small cavern-like feature or structure, often man-made. This reflects the author’s inexperience in evaluating karst terrain, and

seems to be an attempt to conflate or elevate karst structures where none exist simply to misdirect the reader. Additionally, the Price Formation is comprised primarily of sandstone and shale, and is not karst forming bedrock.

Robert Jones discusses four areas of stream crossings. Two of these appear to be in the Elbrook dolomite, and two appear to be above the Pulaski Thrust Fault (ancient, inactive reverse fault) in the Price Formation. Stream crossings are discussed at length in submittals by Mountain Valley, and in other portions of the FERC's Draft Environmental Impact Statement (DEIS), which Robert Jones fails to recognize or credit.

Robert Jones mentions (p.2, 8) that there are as many as 100 homes within the community. Indeed, the area referenced as the Mount Tabor Sinkhole Plain is largely deforested to allow for home construction, lawns, and livestock pastures. Robert Jones idealizes the connectivity of the karst aquifer with the surface topography, and fails to acknowledge that the greatest threat to local karst terrain is continued residential development, and that the greatest threats to groundwater are the use of septic fields for residences and drilled residential water wells. Septic fields leach harmful bacteria, contaminated water, and solids into the upper aquifer on a daily basis. Drilling a residential water well can create direct conduits for contamination between the shallow epikarst and the deeper karst aquifer (proper installation of well casing can mitigate potential conduits, but there is typically no post-construction analysis to confirm). In addition, many small farms in the area contribute chemical fertilizers and animal waste to the ground surface that has potential to enter and impact groundwater.

Robert Jones references other submittals to the Docket that are in opposition to the Project that describe what are common occurrences in karst terrain, such as turbid storm water infiltrating the karst system via insurgence points and cave features such as Slussers Chapel Cave. This shallow, upper karst system is considered a non-potable water source because of potential for surface water contamination. Temporary construction on the scale of a 10-foot deep trench for bedding the pipeline will not have an additive negative impact on the shallow karst system that is already impacted by natural storm events. And as a corollary, Project construction carries an extremely unlikely risk for adding contamination to the deeper potable aquifer. Robert Jones (p.15) describes a neighbor's well, which may have turned cloudy during one or more periods of extended precipitation or flood events. This is not an unusual event in karst areas. It is commonly understood that during a major storm/flooding event, short lived siltation of karst aquifers can and does occur under naturally occurring conditions. A 10-foot deep narrow trench is not reasonably considered to present an elevated level of risk beyond the naturally occurring processes in karst aquifer systems.

4.0 CONCLUSION

The information presented in this document refutes and clarifies the unsupported and erroneous assertions by Robert Jones regarding construction of the Project in karst terrain of the Mount Tabor area, Montgomery County, Virginia. Mountain Valley has submitted to the FERC a rigorous assessment of environmental, engineering, and construction concerns related to karst terrain, along with detailed methods to mitigate risks. Robert Jones either omits or mischaracterizes this information. Robert Jones also presents claims of risks that are not commensurate with the nature

of the Project and are not supported by the facts gathered by numerous environmental and engineering professionals.

Robert Jones demonstrates a lack of expertise in karst hydrology, and in evaluating linear infrastructure projects in karst, and more specifically a lack of expertise in evaluating natural gas pipeline construction. Robert Jones ascribes an unsupported and unreasonable level of risk for design and construction of a natural gas pipeline in karst. Overall, the Project's Karst Specialist Team concludes that Robert Jones does not present a scientifically-robust analysis. There is no new or relevant information presented by Robert Jones that Mountain Valley has not already considered. The Karst Specialist Team concludes that Robert Jones presents a flawed and biased evaluation of the Mountain Valley Pipeline Project, with the suspected attempt to influence the FERC to request Mountain Valley to utilize the DCR Slussers Chapel avoidance route in order to remove the proposed pipeline route from the vicinity of the author's property.