2200 Energy Drive | Canonsburg, PA 15317
844-MVP-TALK | mail@mountainvalleypipeline.info
www.mountainvalleypipeline.info

March 5, 2021

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

RE: Mountain Valley Pipeline, LLC
Docket No. CP21-57-000
Supplemental Information – Resource Report 9; Exhibit A; Exhibit I

Dear Secretary Bose:

On February 19, 2021, Mountain Valley Pipeline, LLC ("Mountain Valley") filed an application in the above-captioned docket requesting that the Commission issue an order on an expedited basis amending Mountain Valley's certificate of public convenience and necessity for the Mountain Valley Pipeline Project to grant Mountain Valley the ability to change the crossing method for specific wetlands and waterbodies yet to be crossed by the Project from the open-cut crossings to one of several trenchless methods.

In Resource Report 9 (Air and Noise Quality) of the Exhibit F-1 Environmental Report, Mountain Valley indicated that it was in the process of conducting a noise analysis. Mountain Valley has completed the analysis and is submitting it herewith to supplement Resource Report 9. Mountain Valley is also submitting revised Appendix A and Appendix I to the Exhibit F-1 Environmental Report that include reference to Wetland W-CD17 that was inadvertently omitted from the application filing. The application references to "181 waterbodies and wetlands" should be "182 waterbodies and wetlands."

If you have any questions, please do not hesitate to contact me at (412) 553-5786 or meggerding@equitransmidstream.com. Thank you.

Respectfully submitted,
Mountain Valley Pipeline, LLC
by and through its operator,
EQM Gathering Opco, LLC

By: 

Matthew Eggerding
Assistant General Counsel

Attachments

RESOURCE REPORT 9 – AIR AND NOISE QUALITY

This report includes discussion of air quality and noise impacts that will result from the proposed trenchless crossings that may differ from the Certificated Project. Air quality resources and potential impacts from the proposed trenchless crossings are discussed in Section 9.1. Noise quality resources and potential impacts from the proposed trenchless crossings are discussed in Section 9.2. The duration of the trenchless crossings may affect both air emissions and construction noise. Estimated bore durations are included in Appendix K.

9.1 AIR QUALITY

Short-term and temporary air quality impacts will result from construction activities necessary to install the proposed trenchless waterbody and wetland crossings. There would be no long-term air quality impacts as a result of the proposed trenchless crossings.

The proposed trenchless crossings are located in the counties of Wetzel, Harrison, Doddridge, Lewis, Webster, Nicholas, Greenbrier, Summers, and Monroe, West Virginia, and Giles, Montgomery, Roanoke, Franklin, and Pittsylvania, Virginia. All counties listed are in attainment with the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants.[1]

Mountain Valley conducted an analysis of estimated emissions from the proposed trenchless crossing methods compared to open-cut crossings, which is attached hereto as Appendix A. Mountain Valley calculated emissions from the equipment used for stream crossing operations using U.S. EPA's MOVES2014b program. The output from the MOVES2014b program was combined with the specific equipment type and anticipated operation for the crossings. Mountain Valley calculated the difference in cumulative emissions for all 120 locations where the crossing method has been proposed to be changed. Other locations not impacted by the proposed changes were not included in this assessment. Cumulative emissions for the crossings where changes are proposed were calculated assuming all crossings were completed using open cuts (prior proposal) and all crossings were completed using the proposed bore methods (new proposal) as follows:

- Open-Cut Crossing: Mountain Valley used the equipment setup for an open-cut crossing and the total cumulative days of operation for the crossings if they were to be completed using an open-cut. Twelve hours of operation were assumed for each day.
- Bore Crossing: A bore crossing includes both a pit excavation and bore portion, each of which uses specific equipment. Mountain Valley used the equipment setup specific to both the pit excavation and boring portions of the boring crossing and the total cumulative days of operation for each portion (pit excavation and boring) of the bore crossings. Twelve hours of operation were assumed for each day. The equipment and duration of the boring portion of the crossings were further categorized by the proposed bore type (conventional, guided conventional, and Direct Pipe).

The proposed trenchless crossings will result in higher construction emissions for the waterbody and wetland crossings for some pollutants, as compared to using the open-cut method as certificated. The potential emissions for the trenchless crossing methods are presented in Table 9.1-1 for comparison to the open-cut method.

[1] Note that per West Virginia Code of State Regulations (CSR), Title 45 section 8 (45 CSR 8), West Virginia follows the NAAQS and has not imposed State Ambient Air Quality Standards that differ from the NAAQS. Note also that, because each of the counties is in attainment with the NAAQS, a General Conformity analysis is not required.

Table 9.1-1 Open-Cut and Bore Construction Emissions Comparison (in tons)

Operation	Construction Emissions (tons)						
	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CO_2
Open Cut	47.50	16.28	0.12	0.40	2.80	2.71	16,159.16
Proposed Bore Type:[1]							
Conventional	93.83	29.38	0.19	0.73	4.90	4.75	25,480.10
Guided Conventional	7.85	2.01	0.01	0.06	0.35	0.34	1,429.18
Direct Pipe	6.57	2.03	0.01	0.05	0.34	0.33	1,551.70
Total Proposed Bore (120 crossings)	**108.26**	**33.42**	**0.22**	**0.84**	**5.59**	**5.42**	**28,460.98**
Cumulative Difference (Proposed Bore Crossings – Open-Cut Crossings)	**60.75**	**17.14**	**0.10**	**0.43**	**2.79**	**2.70**	**12,301.83**
Total Project[2]	**2,389.9**	**5,090.3**	**192.6**	**564.7**	**4,449.6**	**921.9**	**967,411.1**

[1] Emissions include both the pit excavation and boring portion.
[2] Emissions from Year 1-3 from Table 4.11.1-5 in the Final Environmental Impact Statement (FERC 2017).

Table 4.11.1-5 in the FEIS provides the total Project construction emissions for each of these pollutants, which allows the above-described net change in emissions to be put in context. Overall Project construction emissions for NOx were estimated to be 2,389.9 tpy. The additional 60.75 tpy in NOx emissions for the proposed trenchless crossings represents a 2.5% increase. Overall Project construction emissions for CO were estimated at 5,090.3 tpy. The additional 17.14 tpy in CO emissions for the proposed trenchless crossings represents a 0.34% increase. Overall Project construction emissions for SO_2 were estimated to be 192.6 tpy. The additional 0.10 tpy in SO_2 emissions for the proposed trenchless crossings represents a 0.05% increase.

Overall Project construction emissions for VOC were estimated at 564.7 tpy. The additional 0.43 tpy in VOC emissions for the proposed trenchless crossings represents a 0.08% increase. Overall Project construction emissions for PM_{10} were estimated at 4,449.6 tpy. The additional 2.79 tpy in PM_{10} emissions for the proposed trenchless crossings represents a 0.06% increase. Overall Project construction emissions for $PM_{2.5}$ were estimated at 921.9 tpy. The additional 2.70 tpy in $PM_{2.5}$ emissions for the proposed trenchless crossings represents a 0.29% increase. Overall Project construction emissions for CO_2 were estimated at

967,411.1 tpy. The additional 12,301.83 tpy in CO_2 emissions for the proposed trenchless crossings represents a 1.27% increase.

The construction emissions that will result from the proposed trenchless crossings are temporary in nature and are expected to have minimal impact on the air quality in the surrounding area, which is not significantly different than analyzed in the FEIS. However, Mountain Valley will implement the same measures to reduce construction emissions as the Certificated Project and as described in the FEIS.

9.2 NOISE

This section provides a description of the existing sound environment as well as a construction noise assessment for the guided conventional bores, the Direct Pipe bore, and the conventional bores associated with railroad crossings that will include 24-hour boring operations.

9.2.1 Existing Sound Environment

A discussion of the existing ambient acoustic environment was included as part of Resource Report 9, which was filed with the FERC application for the Certificated Project. However, that discussion was limited to the conditions in the vicinity of the Project's compressor stations.

The degree of audibility of a new or modified sound source is dependent in large part upon the relative level of existing acoustic environment. A wide range of noise settings may occur near the Project area. Existing ambient sound levels within that area are expected to be relatively low, although may be sporadically elevated in localized areas due to roadway noise or periods of human activity. Background sound levels will vary both spatially and temporally depending on proximity to area sound sources, roadways, and natural and weather-related sounds. Principal contributors to the existing acoustic environment in the Project area include motor vehicle traffic, mobile farming equipment, farming activities such as plowing and irrigation, timber harvesting activities, all-terrain vehicles, local roadways, periodic aircraft flyovers, and natural sounds such as birds, insects, and leaf or vegetation rustle during elevated wind conditions. Open lands or rural areas will have comparatively lower ambient sound levels. Diurnal effects result in sound levels that are typically quieter during the night than during the daytime, except during periods when evening and nighttime insect noise may dominate in warmer seasons.

9.2.2 Construction Noise Assessment

Mountain Valley expects that the guided conventional bores, the Direct Pipe bore, and the conventional bores associated with railroad crossings will include 24-hour boring operations. Mountain Valley does not expect to conduct nighttime work for the excavation or boring activities for any of the other bores that are included in the Amendment Project. Because there is not a reasonably foreseeable potential for nighttime noise or noise impacts from these bores, an assessment of such impacts is not included.

Mountain Valley conducted construction noise assessments for the guided conventional bores, the Direct Pipe bore, and the railroad bores. Those noise assessment reports are attached as Appendix A. A noise model was developed using Cadna/A version 2020 MR1, and the results of the modeling for each crossing type are summarized below and explained in full in the attached noise assessment reports. Excavation activities will be limited to daytime hours only and Mountain Valley assessed noise levels associated with nighttime boring activities. Mountain Valley will coordinate with landowners near the bore location regarding boring plans.

Per the 2017 FERC guidance document for the preparation of Resource Report 9, "Construction activity that would or may occur during nighttime hours should be performed with the goal that the activity contribute noise levels below 55 dBA Ldn and 48.6 Leq, or no more than 10 dBA over background if ambient noise levels are above 55 dBA Ldn." If construction activities are limited to the daytime hours, with no significant noise production at night, then there is no specific sound level target for those activities.

Guided Conventional Bores

For the guided conventional bores of both Little Stony Creek and the Elk River, sound levels during boring operations are lower than the 48.6 dBA sound levels identified in the FERC guidance; therefore noise mitigation is not required during boring operations.

Direct Pipe Bore

For the Direct Pipe bore of the Greenbrier River, the noise analysis determined that the predicted sound levels during boring operations without mitigation would exceed the 48.6 dBA level. Accordingly, Mountain Valley will adopt site-specific noise mitigation measures including a noise barrier around the site and individual noise mitigation treatments as more fully described in the attached report.

Railroad Bores

Bores associated with railroad crossings are required to be bored continuously. Accordingly, Mountain Valley assessed the noise levels for nighttime boring work at these locations. For the H-016 railroad crossing bore, the noise analysis determined that the predicted sound levels during boring operations without mitigation would exceed the 48.6 dBA level. Accordingly, Mountain Valley will adopt site-specific noise mitigation measures including a noise barrier around the site and individual noise mitigation treatments as more fully described in the attached report. For the E-012 railroad crossing bore, sound levels during boring operations are lower than the 48.6 dBA sound levels identified in the FERC guidance; therefore, noise mitigation is not required during boring operations.

The H-020 railroad crossing conventional bore work areas are located next to a four-lane divided highway and two double track railroad corridors. Accordingly, the background sound levels in the area are typically higher than 55 dBA Ldn due to noise from these nearby transportation sources. Mountain Valley estimated background noise levels due to traffic and railroad noise at the NSAs surrounding the H-020 railroad crossing using the U.S. Department of Housing and Urban Development Day/Night Noise Calculator. The background sound levels at the H-020 railroad crossing are above 55 dBA Ldn or 48.6 dBA Leq/Ln at all NSAs. Per FERC's guidance, nighttime construction activities should contribute no more than 10 dBA over background if ambient noise levels are above 55 dBA Ldn. For the H-020 railroad crossing, the nighttime construction sound levels are much less than 10 dBA over the estimated background sound levels.

APPENDIX A – NOISE STUDIES

March 4, 2021

Megan Neylon
Environmental Manager
Mountain Valley Pipeline

Re: **Construction Noise Study – Water Crossing Bore in West Virginia**
Little Stony Creek Site
Mountain Valley Pipeline (MVP)

TECHNICAL MEMORANDUM

1 INTRODUCTION

Per your request, SLR International Corporation (SLR) has modified a noise model for the Little Stony Creek water body guided conventional boring site, a part of the Mountain Valley Pipeline (MVP) Project, using an updated construction equipment list provided by MVP, received February 17, 2021. This report presents the results of the noise model predictions. The boring sound levels were predicted for the nearest noise sensitive areas (NSAs). No baseline environmental sound monitoring or testing has been requested or conducted.

2 ENVIRONMENTAL SOUND LEVEL CRITERIA

The Federal Energy Regulatory Commission (FERC) limits for noise from nighttime construction work are typically based on a goal of 55 dBA L_{dn}. The L_{dn} is basically the logarithmic average of the sound levels during a 24-hour period, with a 10 dBA penalty added to the sound levels occurring during the more noise sensitive nighttime period from 10:00 p.m. to 7:00 a.m. Because of the nighttime penalty, a constant sound level at 48.6 dBA for 24-hours will result in an L_{dn} of 55 dBA. If that same sound level only operates for 12-hours during the daytime, and therefore has no nighttime penalty, the 12-hours of 48.6 dBA L_{eq} will result in a 24-hour L_{dn} of 45.6 dBA.

As per the 2017 FERC guidance document for the preparation of Resource Report 9, "Construction activity that would or may occur during nighttime hours should be performed with the goal that the activity contribute noise levels below 55 dBA L_{dn} and 48.6 L_{eq}, or no more than 10 dBA over background if ambient noise levels are above 55 dBA L_{dn}." If construction activities are limited to the daytime hours, with no significant noise production at night, then there is no specific sound level target for those activities.

These FERC noise limits apply at the nearest Noise Sensitive Areas (NSAs), which are typically residences, hospitals, or other places people may sleep; but churches, schools, and other locations are usually treated as NSAs also. The FERC noise limits are not property-line limits – they apply at the NSA structure itself.

3 SITE LOCATIONS AND ACTIVITY DURATION

Little Stony Creek's milepost along the pipeline and coordinates are given in **Table 1**. Assumptions for Bore Pit Digging and Boring activity durations for the site are listed in **Table 2**. Bore pit excavation activities will be limited to daytime hours only and were not considered in the noise analysis.

Table 1: Site Location, Milepost, and Coordinates

Location Name	Milepost	Coordinates
Little Stony Creek	204.35	37.3342310, -80.6619483

Table 2: Duration of Bore Pit Excavation and Boring Operations

Location Name	Bore Pit Excavation Duration (hrs/day, # of days)	Boring Operation Duration (hrs/day, # of days)
Little Stony Creek	12 hrs/day, 21 days Daytime only	24 hrs/day, 33 days

Aerial photographs of the site and its nearby NSAs are included as **Figure 1** as an attachment at the end of this memo.

4 SOFTWARE CONFIGURATIONS

A three-dimensional computer noise model was constructed to analyze the noise contributions expected from the proposed station equipment. The model was developed using CadnaA, version 2020 MR 1 (build: 177.5010), a commercial noise modeling package developed by DataKustik GmbH. The software takes into account spreading losses, ground and atmospheric effects, shielding from barriers and buildings, reflections from surfaces and other sound propagation properties. The software is based on published engineering standards. The ISO 9613 standard was used for air absorption and other noise propagation calculations.

To be conservative, foliage was not included in the model. The terrain was modeled based on USGS topographical data at a resolution of 10 by 10 meters. A temperature of 20 degrees Celsius and 70 percent relative humidity were used for the atmospheric absorption calculations. The ground was modeled as mixed, with a 0.5 absorption coefficient.

The bore pit was included in the noise model at 23 foot depth with other dimensions as shown on the layout drawing for the crossing. Only the Boring Machine was located inside the bore pit. All other equipment was arranged at grade surrounding the pit.

5 EQUIPMENT LISTS

A boring noise model was developed for the project using US Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) noise data for the expected construction equipment that will be used during boring. The RCNM manual was used in combination with an equipment schedule provided by MVP (**Table 3)** to obtain sound pressure levels during construction. The noise model was used to predict the boring sound level contribution at the NSAs. Light plants were only modeled during nighttime operations.

Construction equipment does not operate continuously, and typically is operating at maximum sound levels for only a small percentage of the overall period. The percentage of the work period during which the equipment operates at the listed sound level is termed the usage factor. The usage factor for each piece of equipment was taken from the RCNM. The calculated source sound pressure levels at 500 feet for each piece of equipment, based on usage factor, are presented in **Table 4.**

Table 3: Boring Operation Equipment List

Equipment	Quantity
36 x 50 (or similar) HDD Rig For Pilot	1
60' Boring Machine	1
Air Compressor, Sandblasting Unit	1
Bulldozer	1
Excavator**	2
Pump, Dewater, 4"	4
Pump, Mud	1
Pump, Trash, 6" - Trailer Mounted	1
Pump, Well Point Dewatering	4
Skid Steer/Telehandler	1
Welding Rig	2
Diesel Light Towers*	4
Exit Diesel Light Towers*	1

* Used only during nighttime hours

**One excavator was modeled as operating during the night, 2 operating during the day

Table 4: Equipment Sound Pressure Levels

Equipment	Usage Factor	Linear L_p At 50' for 1/3 Octave Frequency Band									Total
		31.5	63	125	250	500	1000	2000	4000	8000	dBA
36 x 50 (or similar) HDD Rig For Pilot	0.5	70.4	75.4	75.4	80.4	75.4	70.4	65.4	60.4	55.4	**77.0**
60' Boring Machine	0.5	70.4	75.4	75.4	80.4	75.4	70.4	65.4	60.4	55.4	**77.0**
Air Compressor, Sandblasting Unit	0.4	69.4	74.4	74.4	79.4	74.4	69.4	64.4	59.4	54.4	**76.0**
Bulldozer	0.4	74.4	79.4	79.4	84.4	79.4	74.4	69.4	64.4	59.4	**81.0**
Excavator	0.4	77.5	82.5	82.5	87.5	82.5	77.5	72.5	67.5	62.5	**84.0**
Excavator w/ Rock Hammer	0.2	73.4	78.4	78.4	83.4	78.4	73.4	68.4	63.4	58.4	**80.0**
Pump, Dewater, 4"	1.0	47.4	52.4	52.4	57.4	52.4	47.4	42.4	37.4	32.4	**54.0**
Pump, Mud	0.5	67.4	72.4	72.4	77.4	72.4	67.4	62.4	57.4	52.4	**74.0**
Pump, Trash, 6" - Trailer Mounted	0.5	66.0	71.0	71.0	76.0	71.0	66.0	61.0	56.0	51.0	**72.6**
Pump, Well Point Dewatering	1.0	47.4	52.4	52.4	57.4	52.4	47.4	42.4	37.4	32.4	**54.0**
Skid Steer/Telehandler	0.3	61.8	66.8	66.8	71.8	66.8	61.8	56.8	51.8	46.8	**68.4**
Welding Rig	0.4	65.5	70.5	70.5	75.5	70.5	65.5	60.5	55.5	50.5	**72.0**
Diesel Light Towers	1.0	56.8	61.8	61.8	66.8	61.8	56.8	51.8	46.8	41.8	**63.4**

Note: The HDD rig for pilot and 60' boring machine are assumed to not operate simultaneously. Crew Trucks were considered transient noise and were not included in calculations.

6 RESULTS AND DISCUSSION

Table 5 and **Table 6** below shows results for the noise model calculations as the A-weighted equivalent sound level, dBA L_{eq} for the construction activity period. If boring activities take place during nighttime hours, then FERC guidance gives a target sound level of 48.6 dBA L_{eq} for those nighttime activities or 10 decibels above the existing ambient sound levels if those are above 55 dBA L_{dn}.

Table 5 shows the predicted sound levels during boring operations without mitigation, which exceed the 48.6 dBA levels identified in the FERC guidance. As shown in **Table 6,** the predicted sound levels during boring operations are lower than the 48.6 dBA levels identified in FERC guidance with the mitigation described in Section 7 for all NSAs.

Figure 2 shows the predicted 48.6 dBA L_n contour for the Little Stony bore without mitigation and **Figure 3** shows the predicted 48.6 dBA L_n contour with mitigation.

Table 5: : Predicted Sound Levels during Boring Operations

Boring Operations (dBA)			
Location	**NSA**	**Predicted Sound Level Day L_{eq} / L_d**	**Predicted Sound Level Night L_{eq} / L_n**
Little Stony Bore	1	58.0	58.3
	2	59.7	59.9
	3	68.5	68.8
	4	60.4	60.7
	5	60.8	61.1
	6	62.3	62.6

Table 6: Predicted Sound Levels during Boring Operations with Noise Mitigation

Mitigated Boring Operations (dBA)			
Locations	**NSAs**	**Predicted Sound Level Day L_{eq} / L_d**	**Predicted Sound Level Night L_{eq} / L_n**
Little Stony Bore	1	47.0	43.1
	2	46.9	41.7
	3	53.4	48.6
	4	49.2	44.4
	5	49.5	45.0
	6	51.4	47.5

7 NOISE MITIGATION OPTIONS

The following section outlines recommended noise mitigation for Little Stony Creek crossing bore location. MVP will notify landowners near the bore location regarding the boring schedule and plan.

7.1 Site Specific Noise Mitigation Recommendations

As shown in **Table 5** and **Figure 2**, the predicted unmitigated sound levels at several NSAs exceed 48.6 dBA during nighttime boring operations. In order to meet the nighttime sound level target, the noise model indicates that a combination of a noise barrier and individual noise mitigation treatments will be required.

There are two modeled barriers in the model with one on the east and north side and the other on the south and west side. The modeled barriers are 24' in height for the southern barrier and 26' in height for the northern barrier. A drawing of the site map of the modeled placement and length of barrier sides is shown in **Figure 4** .

In addition to the barrier around the work site, the Little Stony Bore site will need noise mitigation for the following noise sources to meet a sound level of 48.6 dBA L_{eq} at night at all NSAs:

- Welding Rigs
- Trash pumps
- Slurry pumps

Typically, for fixed noise sources such as pumps and welders, a partial enclosure is the best noise mitigation option. **Figures 5 and 6**, attached, show a typical three-sided noise enclosure with roof installed on a typical diesel-powered pump or welder. At the Little Stony work site, the open side of all enclosures should face west along the pipeline corridor. The engine exhaust should be routed outside of the enclosure, typically with metal ductwork or steel pipe. All connecting piping and cabling should be routed through the open side of the enclosure if possible.

7.2 Enclosures/Barriers in General

For barriers and enclosures there are many suitable material choices. Typically, for short duration projects such as boring work, the best choices are either plywood or acoustical blankets.

For plywood enclosures or barriers, the plywood should be 3/4″ thick at a minimum and the side facing the noise source should be faced with a layer of acoustically absorptive material. A widely available option would be 2 inches of medium-weight fiberglass board insulation such as Owens Corning 703 or Knauf Insulation Board (3 lb/cu.ft. density). Lightweight fiberglass batt insulation can also be used for short term uses. Batt insulation can be purchased with a thin plastic or paper facing that will offer some weather protection and will make installation easier.

Acoustical blankets should have a surface weight of greater than 1.5 pounds per square foot. The side facing the noise sources should be acoustically absorptive. Typically, this is accomplished with a quilted absorber material. Blankets should be installed with as few cracks and gaps as possible. Blankets can be applied directly to equipment skid supports, if desired, as long as there are no significant cracks or gaps between the blankets, and that there is no gap between the bottom of the blankets and the ground.

8 SUMMARY

SLR has created a noise model for the Little Stony water body guided conventional boring site, a part of the MVP Project, using an updated boring equipment list provided by MVP. After the installation of the noise mitigation treatments outlined above, the noise model predicts that sound levels will be lower than the 48.6 dBA L_{eq} FERC nighttime target during nighttime boring operations, as shown in the rightmost column of **Table 6** for all NSAs.

This concludes our Technical Report for the Little Stony Creek Major Water Body Bore. Please contact us if you have any questions.

Sincerely,
SLR International Corporation

David M. Jones, P.E., INCE Bd. Cert.
Acoustics Manager

Joy Rathod, P.E.
Associate Engineer

Daniel Hanley
Project Consultant

Figure 1: Little Stony Creek NSAs

Figure 2: Predicted 48.6 dBA L_n Contour for the Little Stony Creek Crossing Unmitigated

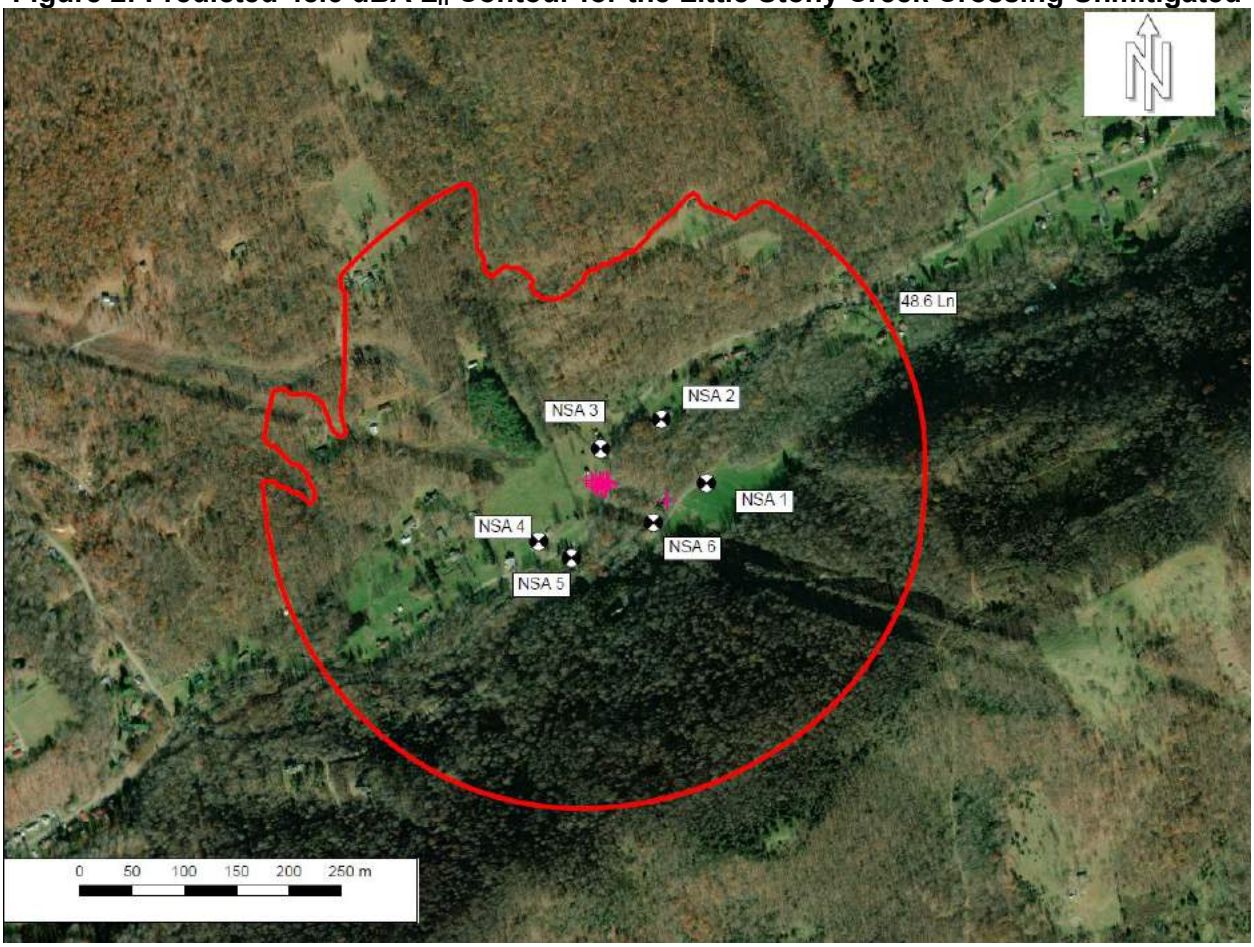


Figure 3: Predicted 48.6 dBA L_n Contour for the Little Stony Creek Crossing Mitigated

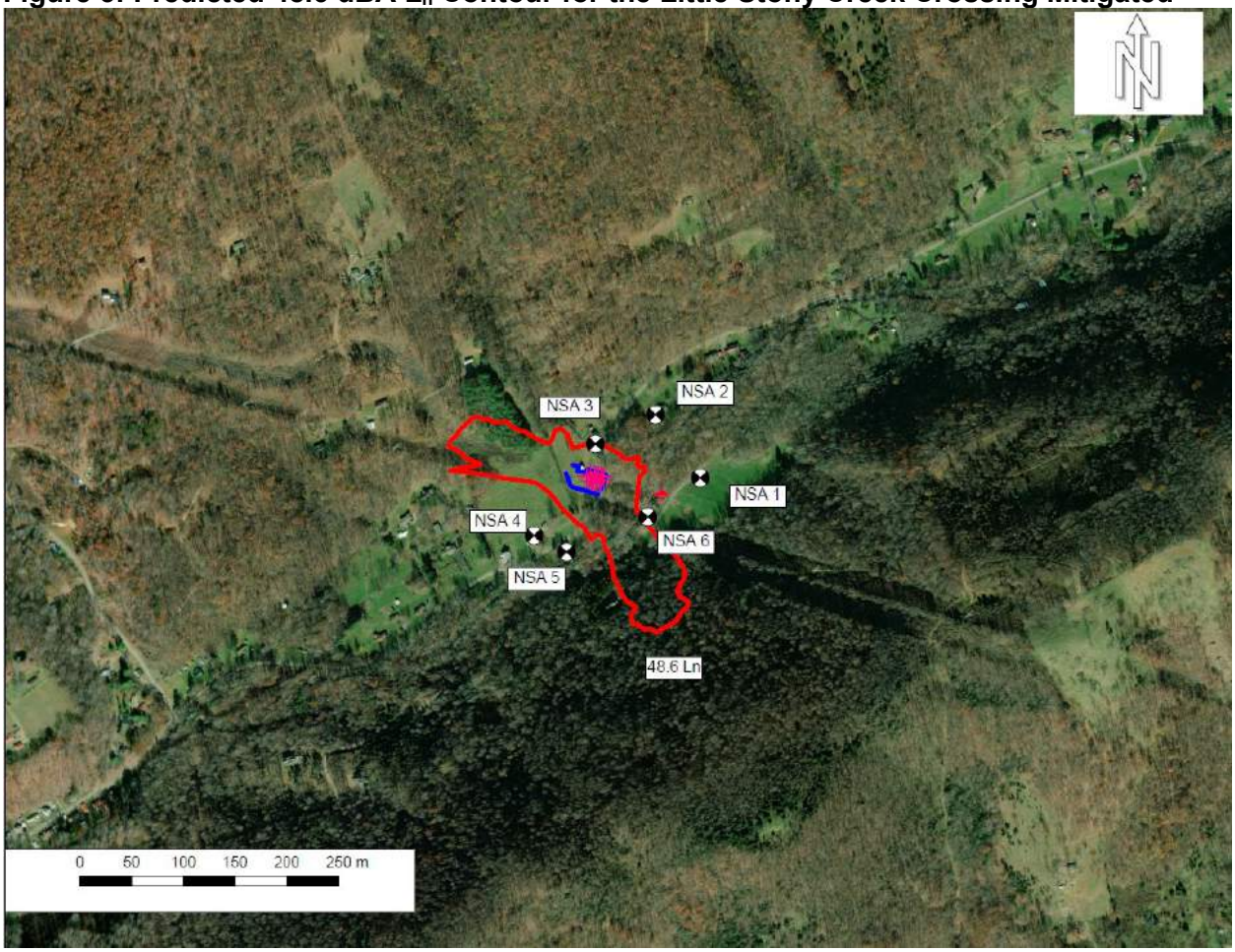


Figure 4: Recommended Barrier Placement

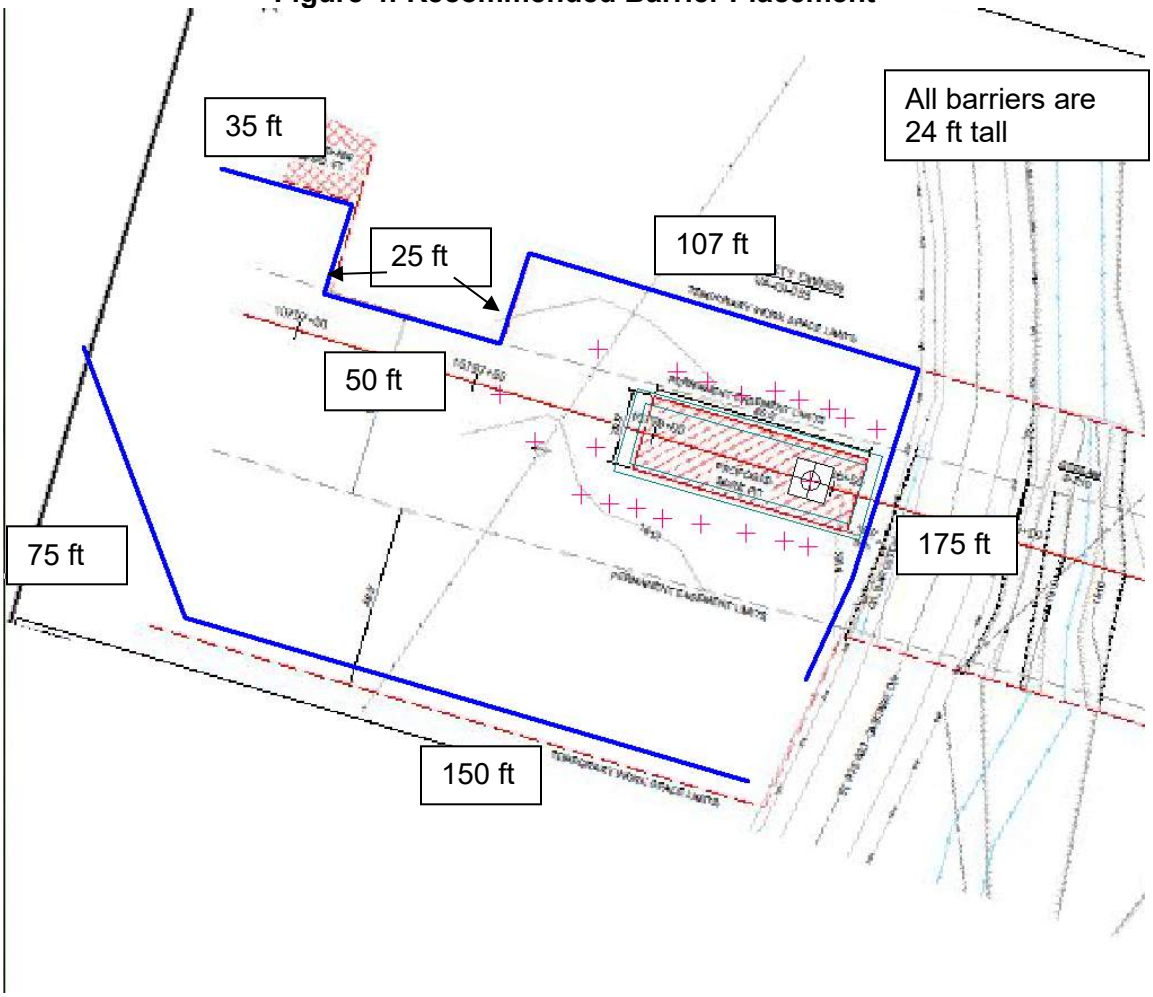


Figure 5: Typical Enclosure Layout for Diesel Powered Pump or Welder
Equipment Axis Oriented North/South

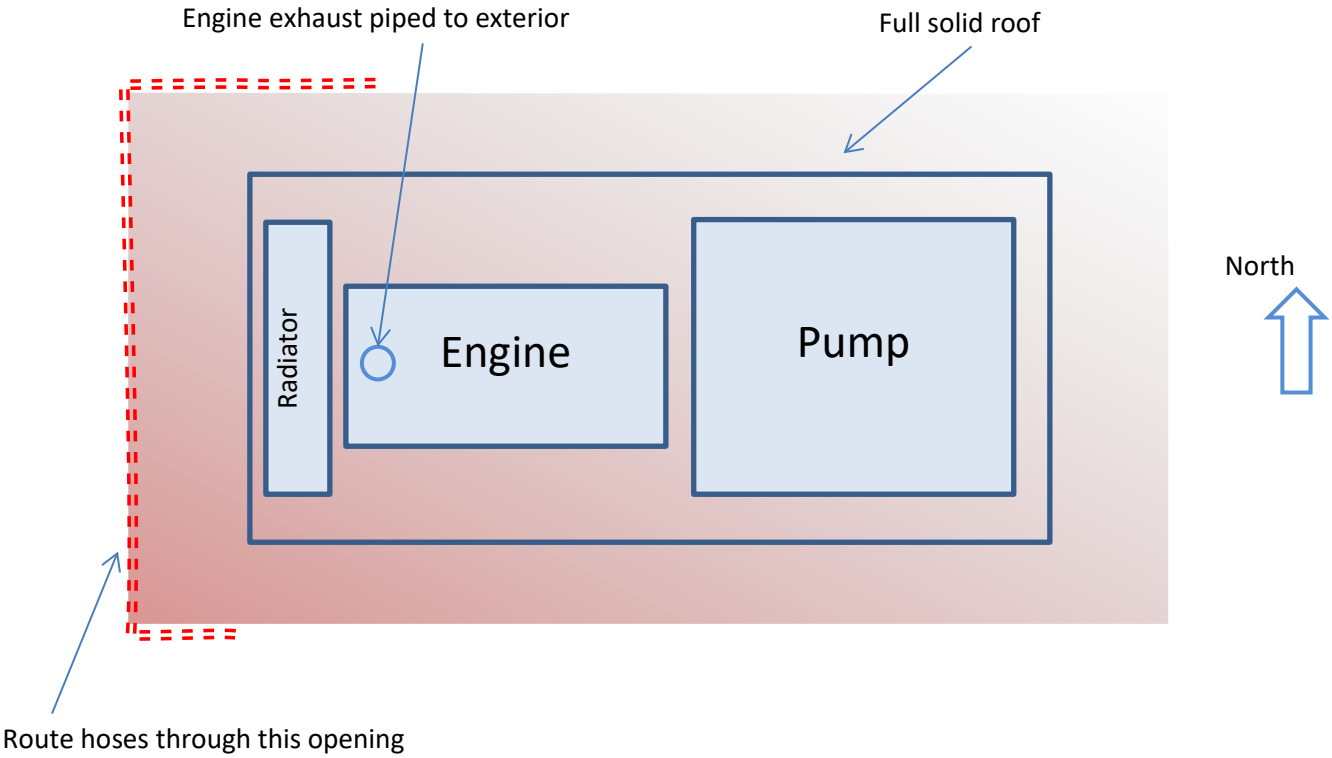
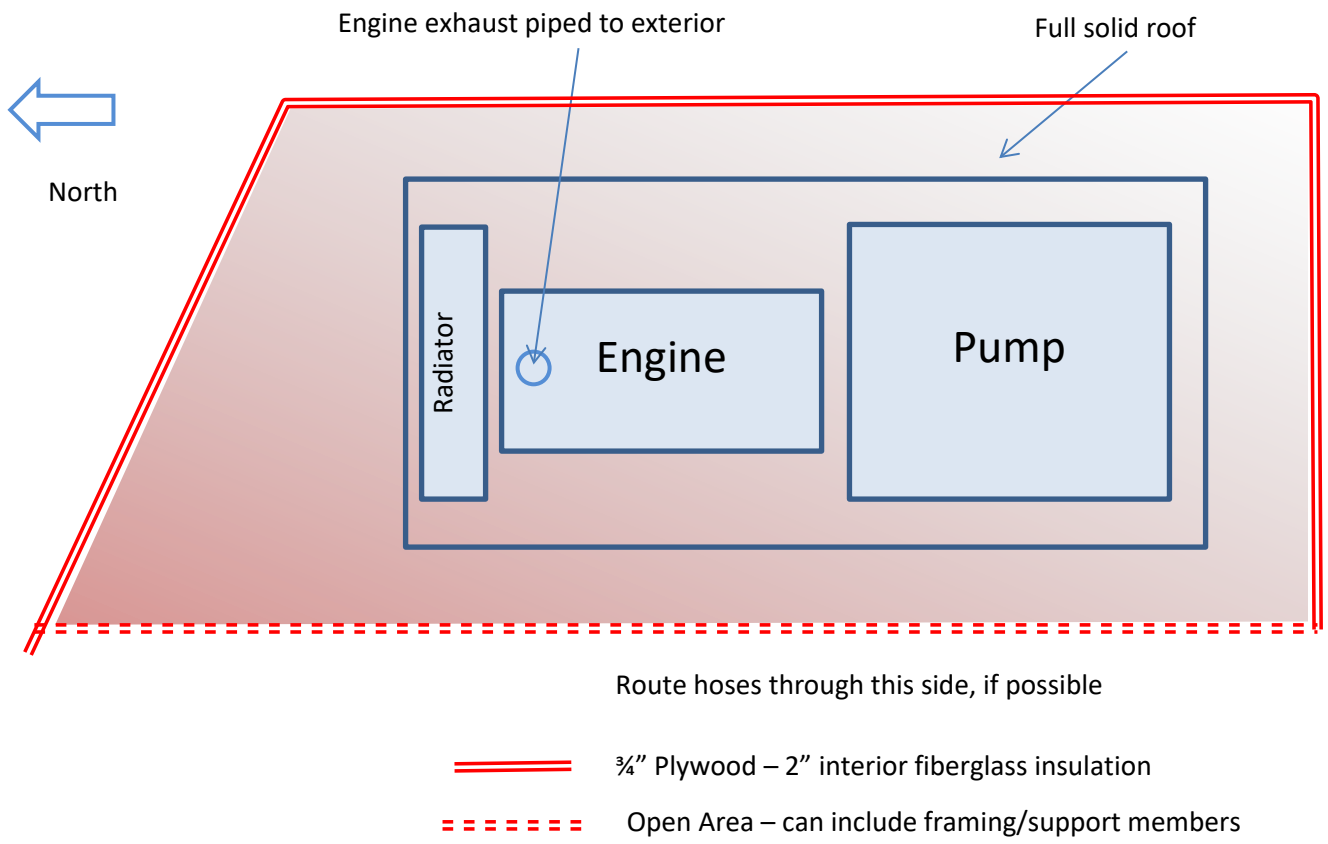


Figure 6: Typical Enclosure Layout for Diesel Powered Pump or Welder
Equipment Axis Oriented East/West



March 5, 2021

Megan Neylon
Environmental Manager
Mountain Valley Pipeline

Re: **Construction Noise Study – Water Crossing in West Virginia**
Elk River Site – 24-Hour Guided Conventional Bore Activities
Mountain Valley Pipeline (MVP)

TECHNICAL MEMORANDUM

1 INTRODUCTION

Per your request, SLR International Corporation (SLR) has constructed a noise model for the Elk River water body guided boring site, a part of the Mountain Valley Pipeline (MVP) Project, using an updated construction equipment list provided by MVP, received February 17, 2021. This report presents the results of the noise model predictions. The boring sound levels were predicted for the nearest noise sensitive areas (NSAs). No baseline environmental sound monitoring or testing has been requested or conducted.

2 ENVIRONMENTAL SOUND LEVEL CRITERIA

The Federal Energy Regulatory Commission (FERC) limits for noise from nighttime construction work are typically based on a goal of 55 dBA L_{dn}. The L_{dn} is basically the logarithmic average of the sound levels during a 24-hour period, with a 10 dBA penalty added to the sound levels occurring during the more noise sensitive nighttime period from 10:00 p.m. to 7:00 a.m. Because of the nighttime penalty, a constant sound level at 48.6 dBA for 24-hours will result in an L_{dn} of 55 dBA. If that same sound level only operates for 12-hours during the daytime, and therefore has no nighttime penalty, the 12-hours of 48.6 dBA L_{eq} will result in a 24-hour L_{dn} of 45.6 dBA.

As per the 2017 FERC guidance document for the preparation of Resource Report 9, "Construction activity that would or may occur during nighttime hours should be performed with the goal that the activity contribute noise levels below 55 dBA L_{dn} and 48.6 L_{eq}, or no more than 10 dBA over background if ambient noise levels are above 55 dBA L_{dn}." If construction activities are limited to the daytime hours, with no significant noise production at night, then there is no specific sound level target for those activities.

These FERC noise limits apply at the nearest Noise Sensitive Areas (NSAs), which are typically residences, hospitals, or other places people may sleep; but churches, schools, and other locations are usually treated as NSAs also. The FERC noise limits are not property-line limits – they apply at the NSA structure itself.

3 SITE LOCATIONS AND ACTIVITY DURATION

Elk River's milepost along the pipeline and coordinates are given in **Table 1**. Assumptions for Bore Pit Digging and Boring activity durations for each site are listed in **Table 2**. Bore pit excavation activities will be limited to daytime hours only and were not considered in the noise analysis.

Table 1: Site Location, Milepost, and Coordinates

Location Name	Milepost	Coordinates
Elk River	87.30	38.615097, -80.506126

Table 2: Duration of Bore Pit and Boring Operations

Location Name	Bore Pit Excavation Duration (hrs/day, # of days)	Boring Operation Duration (hrs/day, # of days)
Elk River	12 hrs/day, 60 days Daytime only	24 hrs/day, 70 days

Aerial photographs of the site and its nearby NSAs are included as **Figure 1** as an attachment at the end of this memo.

4 SOFTWARE CONFIGURATIONS

A three-dimensional computer noise model was constructed to analyze the noise contributions expected from the proposed construction equipment. The model was developed using CadnaA, version 2020 MR 1 (build: 177.5010), a commercial noise modeling package developed by DataKustik GmbH. The software takes into account spreading losses, ground and atmospheric effects, shielding from barriers and buildings, reflections from surfaces and other sound propagation properties. The software is based on published engineering standards. The ISO 9613 standard was used for air absorption and other noise propagation calculations.

To be conservative, foliage was not included in the model. The terrain was modeled based on USGS topographical data at a resolution of 10 by 10 meters. A temperature of 20 degrees Celsius and 70 percent relative humidity were used for the atmospheric absorption calculations. The ground was modeled as mixed, with a 0.5 absorption coefficient.

The bore pit was included in the noise model at 49 foot depth with other dimensions as shown on the layout drawing for the crossing. Only the auger was located inside the bore pit. All other equipment was arranged at grade surrounding the pit.

5 EQUIPMENT LISTS

A boring noise model was developed for the project using US Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) noise data for the expected construction equipment that will be used during boring. The RCNM manual was used in combination with an equipment schedule provided by MVP (**Table 3)** to obtain sound power levels during construction. Light plants were only modeled during nighttime operations. The noise model was used to predict the boring sound level contribution at the NSAs.

Construction equipment does not operate continuously, and typically is operating at maximum sound levels for only a small percentage of the overall period. The percentage of the work period during which the equipment operates at the listed sound level is termed the usage factor. The usage factor for each piece of equipment was taken from the RCNM. The calculated source sound pressure levels at 500 feet for each piece of equipment, based on usage factor, are presented in **Table 4.**

Table 3: Boring Operation Equipment List

Equipment	Quantity
Mud Pump	2
Well Point Dewatering	6
Skid Steer / Telehandler	1
Welding Rigs	2
Air Compressor / Sandblasters	1
Excavators	2
Auger	1
Winch Tractor	2
72" Bore Tracking Machine	1
24" Taurus Hammer	1
Bulldozer	1
John Henry Drill	1
Diesel Light Plants – North pit*	1
Diesel Light Plants – South Pit*	4

*Used during nighttime hours

Crew Trucks were considered transient noise and were not included in calculations.

Table 4: Equipment Sound Pressure Levels

Equipment	Usage Factor	Linear L_p At 50' for 1/3 Octave Frequency Band									Total
		31.5	63	125	250	500	1000	2000	4000	8000	dBA
Mud Pump	0.5	70.4	75.4	75.4	80.4	75.4	70.4	65.4	60.4	55.4	**77.0**
Well Point Dewatering	1	81.2	86.2	86.2	91.2	86.2	81.2	76.2	71.2	66.2	**87.8**
Skid Steer / Telehandler	0.3	61.8	66.8	66.8	71.8	66.8	61.8	56.8	51.8	46.8	**68.4**
Welding Rigs	0.4	65.5	70.5	70.5	75.5	70.5	65.5	60.5	55.5	50.5	**72.0**
Air Compressor / Sandblasters	0.2	71.4	76.4	76.4	81.4	76.4	71.4	66.4	61.4	56.4	**78.0**
Excavators	0.4	65.1	70.1	70.1	75.1	70.1	65.1	60.1	55.1	50.1	**71.6**
Auger	0.2	59.0	64.0	64.0	69.0	64.0	59.0	54.0	49.0	44.0	**65.6**
Winch Tractor	0.4	76.5	81.5	81.5	86.5	81.5	76.5	71.5	66.5	61.5	**83.0**
72" Bore Tracking Machine	0.5	70.4	75.4	75.4	80.4	75.4	70.4	65.4	60.4	55.4	**77.0**
24" Taurus Hammer	0.2	83.0	88.0	88.0	93.0	88.0	83.0	78.0	73.0	68.0	**89.6**
Bulldozer	0.1	68.4	73.4	73.4	78.4	73.4	68.4	63.4	58.4	53.4	**75.0**
John Henry Drill	0.2	71.4	76.4	76.4	81.4	76.4	71.4	66.4	61.4	56.4	**78.0**
Diesel Light Towers	1	56.8	61.8	61.8	66.8	61.8	56.8	51.8	46.8	41.8	**63.4**

Crew Trucks were considered transient noise and were not included in calculations.

6 RESULTS AND DISCUSSION

Table 5 below shows results for the noise model calculations as the A-weighted equivalent sound level, dBA L_{eq} for the construction activity period. If boring activities take place during nighttime hours, then FERC guidance gives a target sound level of 48.6 dBA L_{eq} for those nighttime activities or 10 decibels above the existing ambient sound levels if those are above 55 dBA L_{dn}.

As shown in **Table 5,** the predicted sound levels during boring operations are lower than the 48.6 dBA sound levels identified in FERC guidance; therefore noise mitigation is not required during boring operations. **Figure 2** shows the predicted 48.6 dBA L_n contour for the Elk River Crossing. However, MVP will notify landowners near the bore location regarding the boring schedule and plan.

Table 5: Predicted Sound Levels during Boring Operations

Boring Operations (dBA)			
Location	**NSA**	**Predicted Sound Level Day L_{eq} / L_d**	**Predicted Sound Level Night L_{eq} / L_n**
Elk River	a	17.8	17.8
	b	34.1	34.2
	c	39.8	39.8
	d	45.5	45.5

7 SUMMARY

SLR has updated the noise model for the Elk River water body Guided Conventional Boring site, a part of the MVP Project, using an updated boring equipment list provided by MVP. The noise model predicts that sound levels from boring activities will be lower than 48.6 dBA L_{eq} at all of the closest NSAs during nighttime boring operations.

This concludes our Technical Report for the Elk River Major Water Body Bore crossing. Please contact us if you have any questions.

Sincerely,
SLR International Corporation

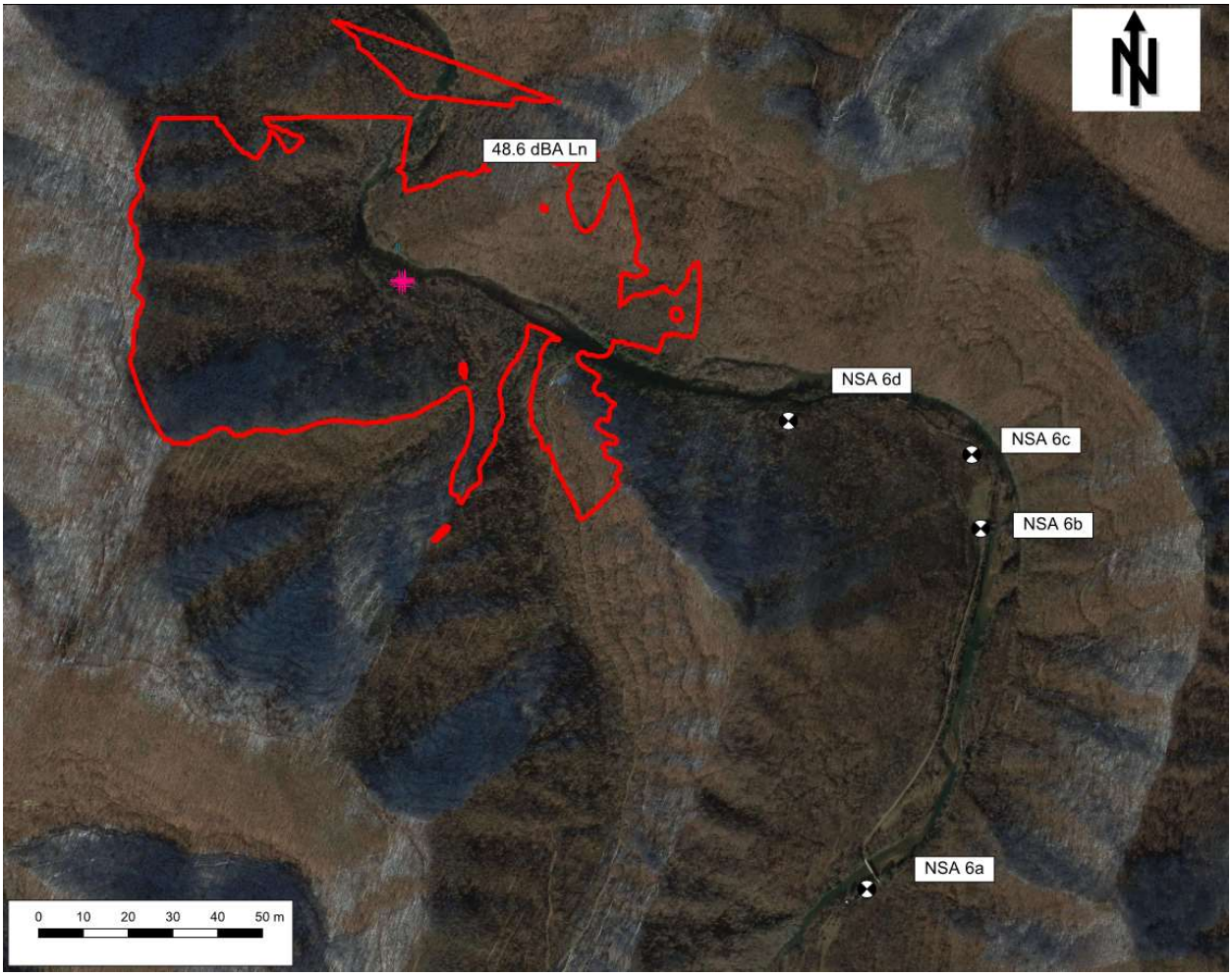
David M. Jones, P.E., INCE Bd. Cert.
Acoustics Manager

Joy Rathod, P.E.
Associate Engineer

Daniel Hanley
Project Consultant

Figure 1: Elk River NSAs

Figure 2: Predicted 48.6 dBA L_n Contour for the Elk River Crossing



March 4, 2021

Megan Neylon
Environmental Manager
Mountain Valley Pipeline

Re: **Construction Noise Study – Water Crossing Bore in West Virginia**
Greenbrier River Site – Nighttime Boring Activities
Mountain Valley Pipeline (MVP)

TECHNICAL MEMORANDUM

1 INTRODUCTION

Per your request, SLR International Corporation (SLR) has modified a noise model for the Greenbrier River water body Direct Pipe boring site, a part of the Mountain Valley Pipeline (MVP) Project, using an updated construction equipment list provided by MVP, received February 17, 2021. This report presents the results of the noise model predictions. The boring sound levels were predicted for the nearest noise sensitive areas (NSAs). No baseline environmental sound monitoring or testing has been requested or conducted.

2 ENVIRONMENTAL SOUND LEVEL CRITERIA

The Federal Energy Regulatory Commission (FERC) limits for noise from nighttime construction work are typically based on a goal of 55 dBA L_{dn}. The L_{dn} is basically the logarithmic average of the sound levels during a 24-hour period, with a 10 dBA penalty added to the sound levels occurring during the more noise sensitive nighttime period from 10:00 p.m. to 7:00 a.m. Because of the nighttime penalty, a constant sound level at 48.6 dBA for 24-hours will result in an L_{dn} of 55 dBA. If that same sound level only operates for 12-hours during the daytime, and therefore has no nighttime penalty, the 12-hours of 48.6 dBA L_{eq} will result in a 24-hour L_{dn} of 45.6 dBA.

As per the 2017 FERC guidance document for the preparation of Resource Report 9, "Construction activity that would or may occur during nighttime hours should be performed with the goal that the activity contribute noise levels below 55 dBA L_{dn} and 48.6 L_{eq}, or no more than 10 dBA over background if ambient noise levels are above 55 dBA L_{dn}." If construction activities are limited to the daytime hours, with no significant noise production at night, then there is no specific sound level target for those activities.

These FERC noise limits apply at the nearest Noise Sensitive Areas (NSAs), which are typically residences, hospitals, or other places people may sleep; but churches, schools, and other locations are usually treated as NSAs also. The FERC noise limits are not property-line limits – they apply at the NSA structure itself.

3 SITE LOCATIONS AND ACTIVITY DURATION

Greenbrier River's milepost along the pipeline and coordinates are given in **Table 1**. Assumptions for Bore Pit Digging and Boring activity durations for each site are listed in **Table 2**. Bore pit excavation activities will be limited to daytime hours only and were not considered in the noise analysis.

Table 1: Site Location, Milepost, and Coordinates

Location Name	Milepost	Coordinates
Greenbrier River	171.45	37.680109, -80.731516

Table 2: Duration of Bore Pit Excavation and Boring Operations

Location Name	Bore Pit Excavation Duration (hrs/day, # of days)	Boring Operation Duration (hrs/day, # of days)
Greenbrier River	12 hrs/day, 21 days Daytime only	24 hrs/day, 100 days

An aerial photograph of the site and its nearby NSAs are attached as **Figure 1**.

4 SOFTWARE CONFIGURATIONS

A three-dimensional computer noise model was constructed to analyze the noise contributions expected from the proposed station equipment. The model was developed using CadnaA, version 2020 MR 1 (build: 177.5010), a commercial noise modeling package developed by DataKustik GmbH. The software takes into account spreading losses, ground and atmospheric effects, shielding from barriers and buildings, reflections from surfaces and other sound propagation properties. The software is based on published engineering standards. The ISO 9613 standard was used for air absorption and other noise propagation calculations.

To be conservative, foliage was not included in the model. The terrain was modeled based on USGS topographical data at a resolution of 10 by 10 meters. A temperature of 20 degrees Celsius and 70 percent relative humidity were used for the atmospheric absorption calculations. The ground was modeled as mixed, with a 0.5 absorption coefficient.

The bore pit was included in the noise model at a 13 foot depth with other dimensions as shown on the layout drawing for the crossing. Only the jacking frame and the direct pipe thruster was located inside the bore pit. All other equipment was arranged at grade surrounding the pit.

5 EQUIPMENT LISTS

A boring noise model was developed for the project using US Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) noise data for the expected construction equipment that will be used during boring. The RCNM manual was used in combination with an

equipment schedule provided by MVP (**Table 3)** to obtain sound power levels during construction. The noise model was used to predict the boring sound level contribution at the NSAs.

Construction equipment does not operate continuously, and typically is operating at maximum sound levels for only a small percentage of the overall period. The percentage of the work period during which the equipment operates at the listed sound level is termed the usage factor. The usage factor for each piece of equipment was taken from the RCNM except for the bulldozer activity level, which was estimated at 10% based on comments from MVP construction personnel. The calculated source sound pressure levels for each piece of equipment at 50 feet, based on usage factor, are presented in **Table 4.**

Table 3: Boring Operation Equipment List

Equipment	Quantity
Mud Pump	1
6” Trash Pump	1
6” Trash Pump – Trailer Mounted	1
Well Point Dewatering	1
Bulldozer	1
Mud Reclamation Unit	1
Skid Steer / Telehandler	1
Welding Rig*	2
Air Compressor / Sand Blasting Units	1
Excavator	2
Direct Pipe Thruster	1
Microtunnel Jacking Frame	1
Slurry Pump	4
300 kW Genset	1
Sideboom	4
Vacuum Truck	1
Light Plants - North Pit*	1
Light Plants - South Pit*	6

* Used during nighttime hours

Crew Trucks were considered transient noise and were not included in calculations.

Table 4: Equipment Sound Pressure Levels

Equipment	Usage Factor	Linear L_p at 50' for 1/3 Octave Frequency Band									Total
		31.5	63	125	250	500	1000	2000	4000	8000	dBA
Mud Pump	0.5	67.4	72.4	72.4	77.4	72.4	67.4	62.4	57.4	52.4	**74.0**
6" Trash Pumps	0.5	66.0	71.0	71.0	76.0	71.0	66.0	61.0	56.0	51.0	**72.6**
6" Trash Pump - Trailer Mounted	0.5	66.0	71.0	71.0	76.0	71.0	66.0	61.0	56.0	51.0	**72.6**
Well Point Dewatering	1.0	73.4	78.4	78.4	83.4	78.4	73.4	68.4	63.4	58.4	**80.0**
Bulldozer	0.1	68.4	73.4	73.4	78.4	73.4	68.4	63.4	58.4	53.4	**75.0**
Mud Reclamation Unit	1.0	65.1	70.1	70.1	75.1	70.1	65.1	60.1	55.1	50.1	**71.7**
Skid Steer / Telehandler	0.3	61.8	66.8	66.8	71.8	66.8	61.8	56.8	51.8	46.8	**68.4**
Welding Rigs	0.4	65.5	70.5	70.5	75.5	70.5	65.5	60.5	55.5	50.5	**72.0**
Air Compressor / Sandblasters	0.2	71.4	76.4	76.4	81.4	76.4	71.4	66.4	61.4	56.4	**78.0**
Excavators	0.4	65.1	70.1	70.1	75.1	70.1	65.1	60.1	55.1	50.1	**71.6**
Direct Pipe Thruster	0.3	67.4	72.4	72.4	77.4	72.4	67.4	62.4	57.4	52.4	**74.0**
Slurry Pump	1.0	78.8	83.8	83.8	88.8	83.8	78.8	73.8	68.8	63.8	**85.4**
300 kW Genset	0.5	48.5	53.5	53.5	58.5	53.5	48.5	43.5	38.5	33.5	**55.1**
Sideboom	0.2	52.5	57.5	57.5	62.5	57.5	52.5	47.5	42.5	37.5	**59.0**
Vacuum Truck	0.4	74.4	79.4	79.4	84.4	79.4	74.4	69.4	64.4	59.4	**81.0**
Diesel Light Towers	1.0	56.8	61.8	61.8	66.8	61.8	56.8	51.8	46.8	41.8	**63.4**

6 RESULTS AND DISCUSSION

Table 5 and **Table 6** below shows results for the noise model calculations as the A-weighted equivalent sound level, dBA L_{eq} for the construction activity period. If boring activities take place during nighttime hours, then FERC guidance gives a target sound level of 48.6 dBA L_{eq} for those nighttime activities or 10 decibels above the existing ambient sound levels if those are above 55 dBA L_{dn}.

Table 5 shows the predicted sound levels during boring operations without mitigation, which exceed the 48.6 dBA levels identified in FERC guidance. As shown in **Table 6,** the predicted sound levels during boring operations are lower than the 48.6 dBA levels identified in FERC guidance with the mitigation described in Section 7.
Figure 2 shows the predicted 48.6 dBA L_n contour for the Greenbrier River Crossing without mitigation and **Figure 3** shows the predicted 48.6 dBA L_n contour with mitigation.

Table 5: Predicted Sound Levels during Boring Operations without Noise Mitigation

Unmitigated Boring Operations (dBA)			
Locations	**NSAs**	**Day L_{eq} / L_d**	**Night L_{eq} / L_n**
Greenbrier River	a	62.4	62.4
	b	67.8	67.8
	c	63.9	64.0
	d	62.0	62.0
	e	60.1	60.1
	f	64.4	64.4

Table 6: Predicted Sound Levels during Boring Operations with Noise Mitigation

Mitigated Boring Operations (dBA)			
Locations	**NSAs**	**Day L_{eq} / L_d**	**Night L_{eq} / L_n**
Greenbrier River	a	43.0	43.3
	b	47.4	48.3
	c	44.2	46.3
	d	43.6	44.8
	e	39.3	40.2
	f	47.7	47.8

7 NOISE MITIGATION OPTIONS

The following section outlines recommended noise mitigation for the Greenbrier River crossing bore location. MVP will notify landowners near the bore location regarding the boring schedule and plans.

7.1 Site Specific Noise Mitigation Recommendations

As shown in **Table 5** and **Figure 2**, the predicted unmitigated sound levels at several NSAs exceed 48.6 dBA during nighttime boring operations. In order to meet the nighttime sound level target, the noise model indicates that a combination of a noise barrier and individual noise mitigation treatments will be required.

The modeled barrier is U shaped, and runs along the northwest, northeast, and southeast sides of the work area. The modeled barrier is 24' in height and a drawing of the site map of the modeled placement and length of barrier sides is shown in **Figure 4**.

In addition to the barrier around the work site, the Greenbrier River site will need noise mitigation for the following noise sources to meet a sound level of 48.6 dBA L_{eq} at night at all NSAs:

- Welding Rigs
- Trash pumps
- Slurry pumps

Typically, for fixed noise sources such as pumps and welders, a partial enclosure is the best noise mitigation option. **Figures 5 and 6**, attached, show a typical three-sided noise enclosure with roof installed on a typical diesel-powered pump or welder. At the Greenbrier work site, the open side of all enclosures should face southwest along the pipeline corridor. The engine exhaust should be routed outside of the enclosure, typically with metal ductwork or steel pipe. All connecting piping and cabling should be routed through the open side of the enclosure if possible.

7.2 Enclosures/Barriers in General

For barriers and enclosures there are many suitable material choices. Typically, for short duration projects such as boring work, the best choices are either plywood or acoustical blankets.

For plywood enclosures or barriers, the plywood should be 3/4″ thick at a minimum and the side facing the noise source should be faced with a layer of acoustically absorptive material. A widely available option would be 2 inches of medium-weight fiberglass board insulation such as Owens Corning 703 or Knauf Insulation Board (3 lb/cu.ft. density). Lightweight fiberglass batt insulation can also be used for short term uses. Batt insulation can be purchased with a thin plastic or paper facing that will offer some weather protection and will make installation easier.

Acoustical blankets should have a surface weight of greater than 1.5 pounds per square foot. The side facing the noise sources should be acoustically absorptive. Typically, this is accomplished with a quilted absorber material. Blankets should be installed with as few cracks and gaps as possible. Blankets can be applied directly to equipment skid supports, if desired, as long as there are no significant cracks or gaps between the blankets, and that there is no gap between the bottom of the blankets and the ground.

8 SUMMARY

SLR has modified a noise model for the Greenbrier River water body Guided Conventional Boring site, a part of MVP Project, using an updated boring equipment list provided by MVP. After the installation of the noise mitigation treatments outlined above, the noise model predicts that sound levels will be lower than the 48.6 dBA L_{eq} FERC nighttime target during nighttime boring operations, as shown in the rightmost column of **Table 6**.

This concludes our Technical Report for the Greenbrier River Major Water Body Bore. Please contact us if you have any questions.

Sincerely,
SLR International Corporation

David M. Jones, P.E., INCE Bd. Cert.
Acoustics Manager

Joy Rathod, P.E.
Associate Engineer

Daniel Hanley
Project Consultant

Figure 1: Greenbrier River NSAs

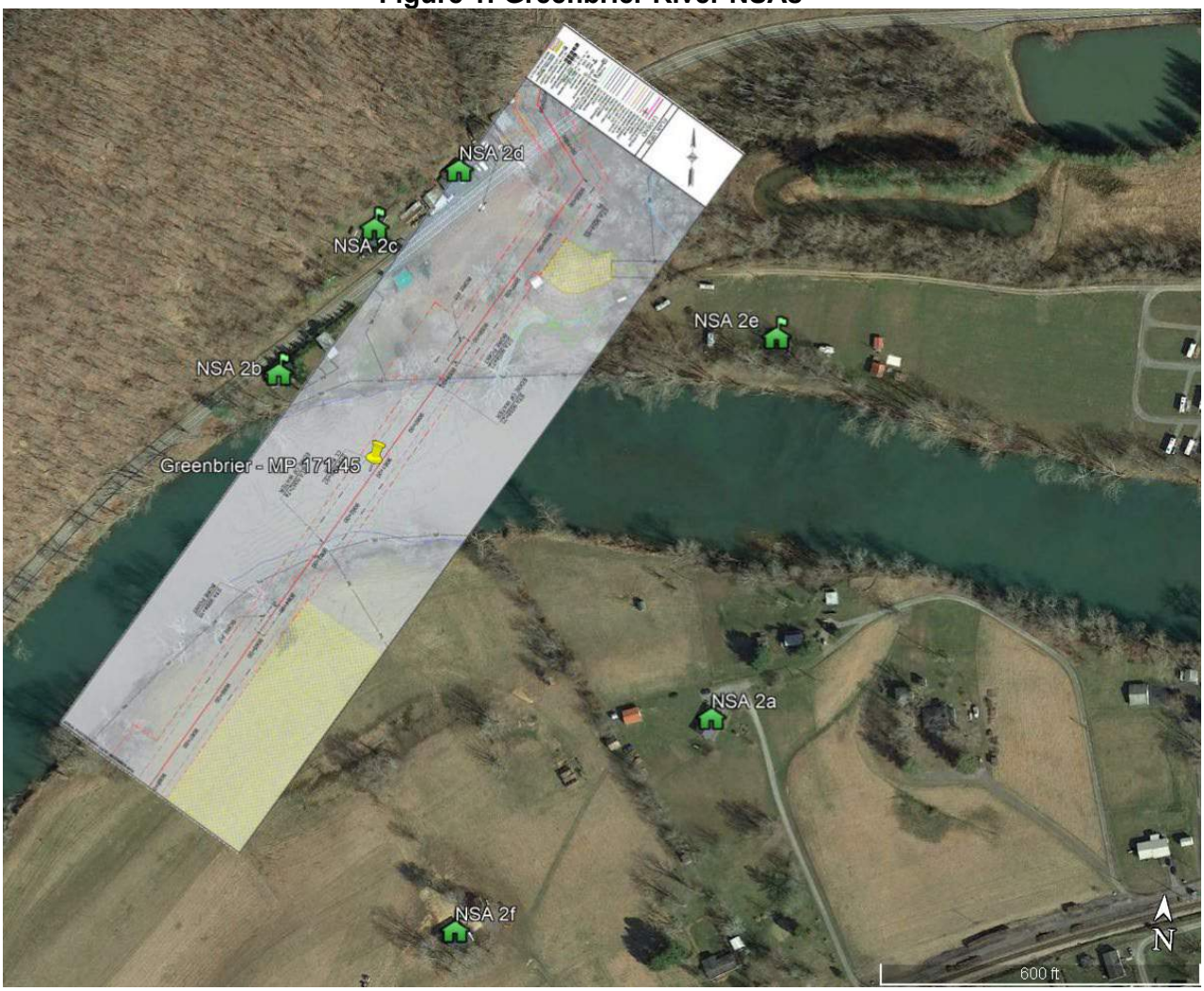


Figure 2: Predicted Unmitigated 48.6 dBA L_n Contour for the Greenbrier River Crossing

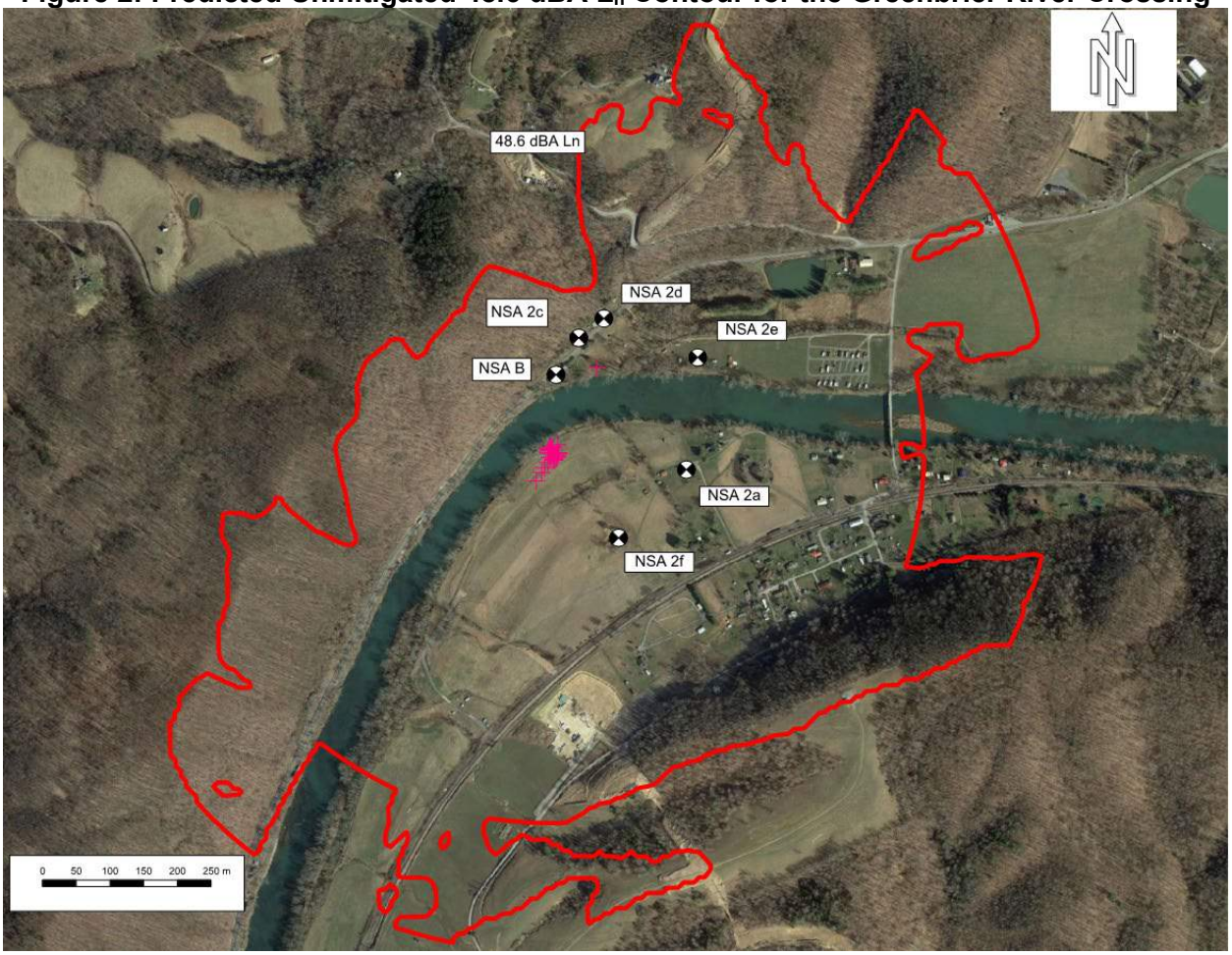


Figure 3: Predicted Mitigated 48.6 dBA L_n Contour for the Greenbrier River Crossing

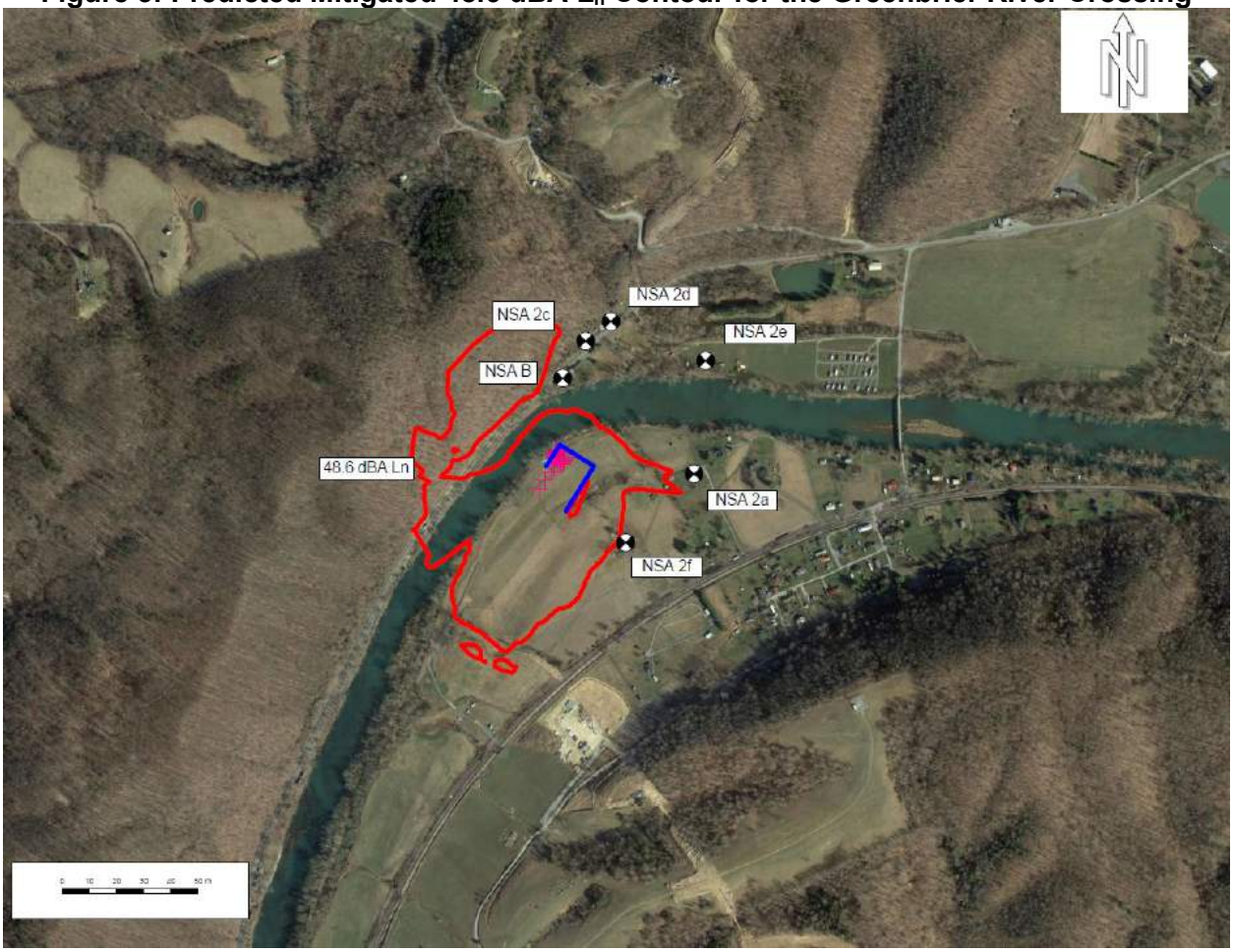


Figure 4: Recommended Barrier Placement

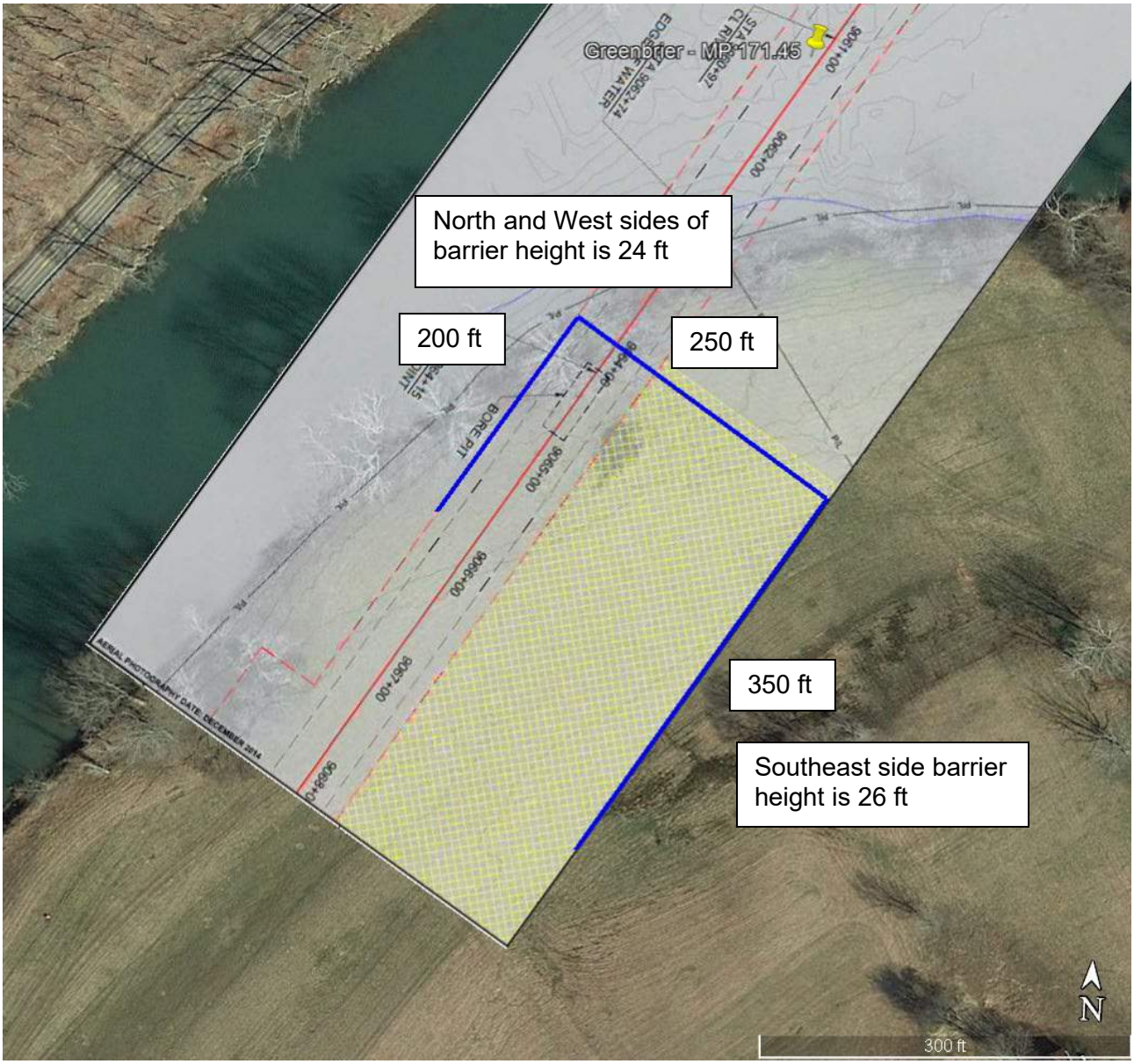


Figure 5: Typical Enclosure Layout for Diesel Powered Pump or Welder
Equipment Axis Oriented North/South

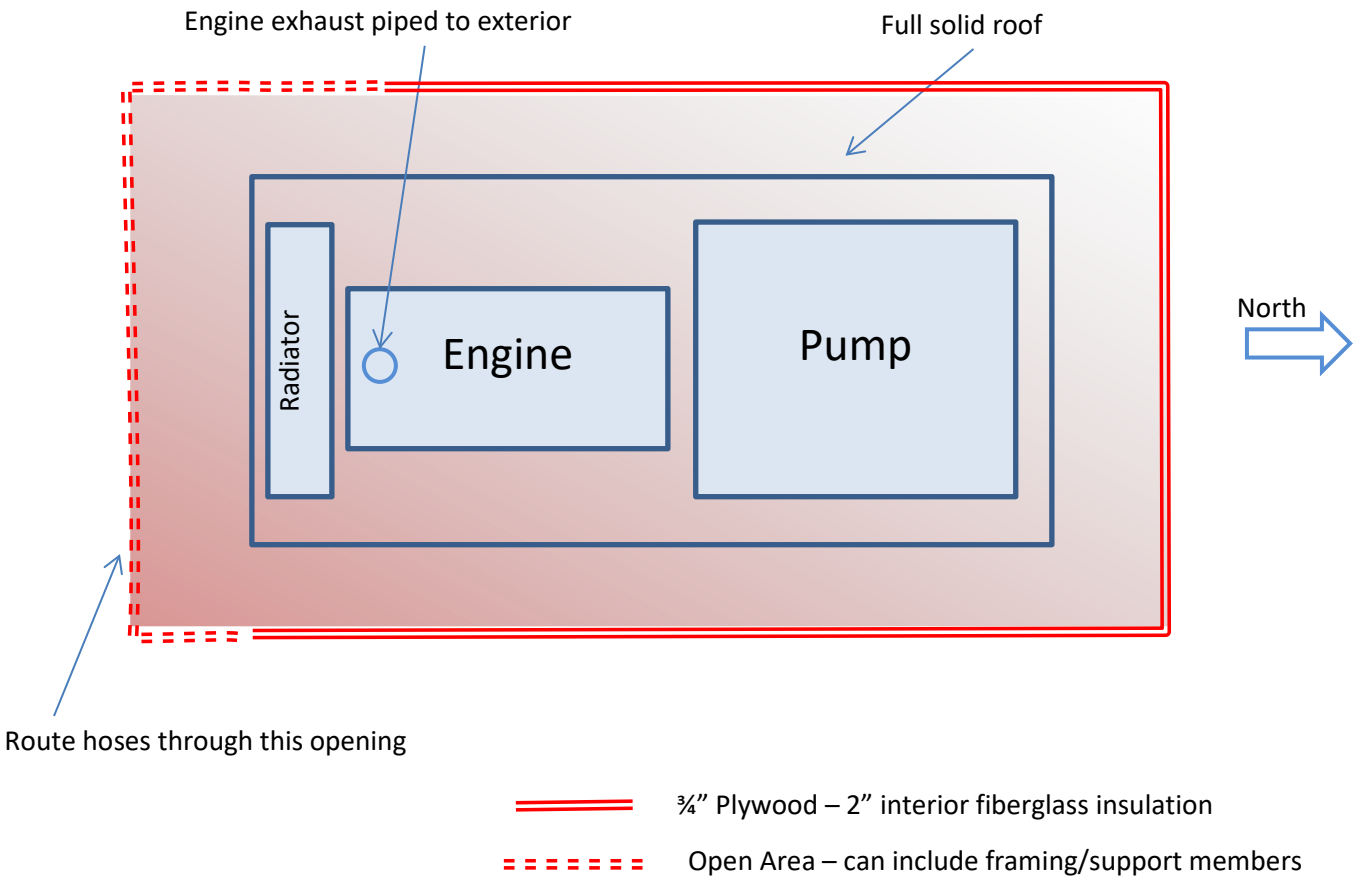
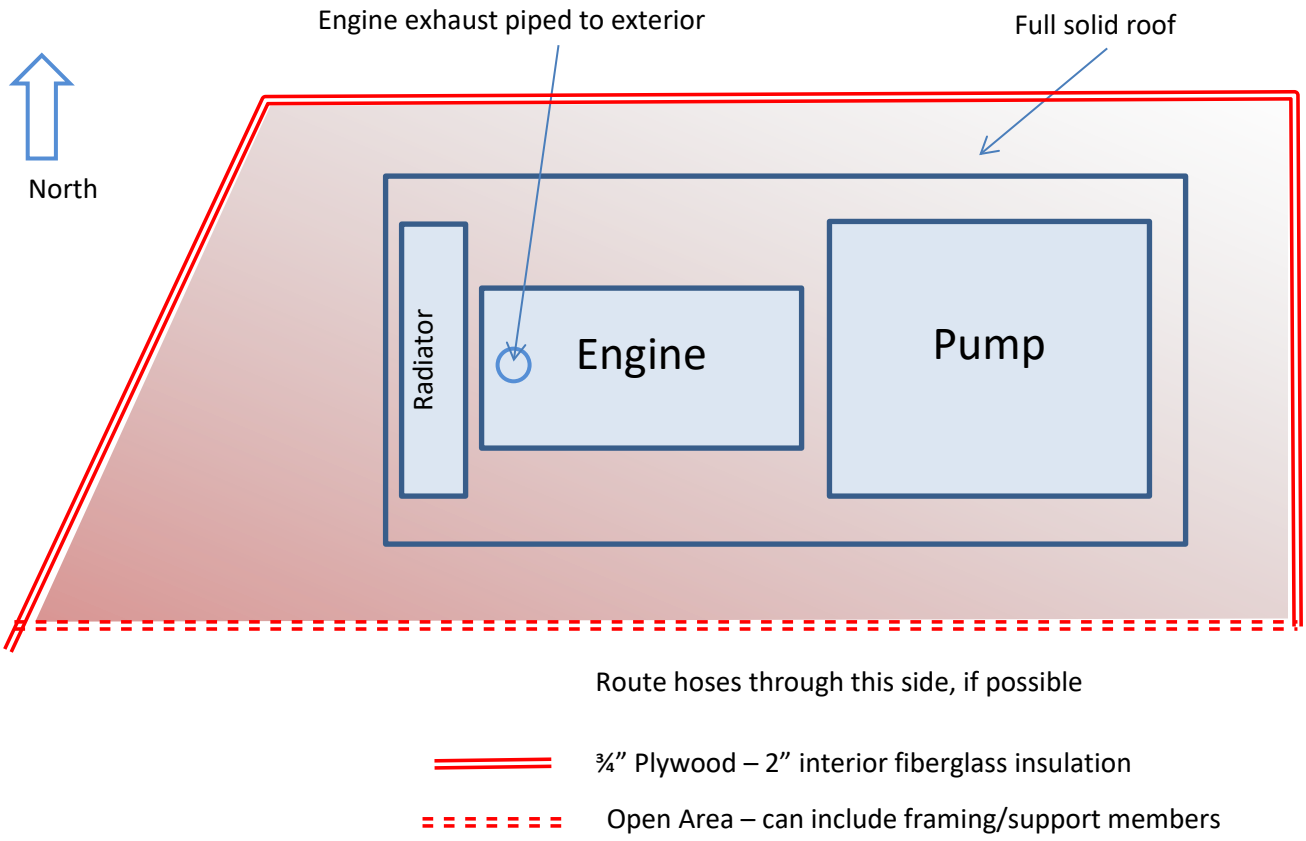


Figure 6: Typical Enclosure Layout for Diesel Powered Pump or Welder
Equipment Axis Oriented East/West



March 4, 2021

Megan Neylon
Environmental Manager
Mountain Valley Pipeline

Re: **Construction Noise Study – Crossing Bore in West Virginia**
E-012 Railroad Crossing
Mountain Valley Pipeline (MVP)

TECHNICAL MEMORANDUM

1 INTRODUCTION

Per your request, SLR International Corporation (SLR) has modified a noise model for the E-012 Railroad Crossing, a part of the Mountain Valley Pipeline (MVP) Project, using an updated construction equipment list provided by MVP, received February 17, 2021. This report presents the results of the noise model predictions. The boring sound levels were predicted for the nearest noise sensitive areas (NSAs). No baseline environmental sound monitoring or testing has been requested or conducted.

2 ENVIRONMENTAL SOUND LEVEL CRITERIA

The Federal Energy Regulatory Commission (FERC) limits for noise from nighttime construction work are typically based on a goal of 55 dBA L_{dn}. The L_{dn} is basically the logarithmic average of the sound levels during a 24-hour period, with a 10 dBA penalty added to the sound levels occurring during the more noise sensitive nighttime period from 10:00 p.m. to 7:00 a.m. Because of the nighttime penalty, a constant sound level at 48.6 dBA for 24-hours will result in an L_{dn} of 55 dBA. If that same sound level only operates for 12-hours during the daytime, and therefore has no nighttime penalty, the 12-hours of 48.6 dBA L_{eq} will result in a 24-hour L_{dn} of 45.6 dBA.

As per the 2017 FERC guidance document for the preparation of Resource Report 9, "Construction activity that would or may occur during nighttime hours should be performed with the goal that the activity contribute noise levels below 55 dBA L_{dn} and 48.6 L_{eq}, or no more than 10 dBA over background if ambient noise levels are above 55 dBA L_{dn}." If construction activities are limited to the daytime hours, with no significant noise production at night, then there is no specific sound level target for those activities.

These FERC noise limits apply at the nearest Noise Sensitive Areas (NSAs), which are typically residences, hospitals, or other places people may sleep; but churches, schools, and other locations are usually treated as NSAs also. The FERC noise limits are not property-line limits – they apply at the NSA structure itself.

3 SITE LOCATIONS AND ACTIVITY DURATION

E-012's milepost along the pipeline and coordinates are given in **Table 1**. Assumptions for Bore Pit Digging and Boring activity durations for the site are listed in **Table 2**. Bore pit excavation activities will be limited to daytime hours only and were not considered in the noise analysis.

Table 1: Site Location, Milepost, and Coordinates

Location Name	Milepost	Coordinates
E-012	140.4	38.023810, -80.747259

Table 2: Duration of Bore Pit Excavation and Boring Operations

Location Name	Bore Pit Excavation Duration (hrs/day, # of days)	Boring Operation Duration (hrs/day, # of days)
E-012	12 hrs/day, 21 days Daytime only	24 hrs/day, 17 days

Aerial photographs of the site and its nearby NSAs are included as **Figure 1** as an attachment at the end of this memo.

4 SOFTWARE CONFIGURATIONS

A three-dimensional computer noise model was constructed to analyze the noise contributions expected from the proposed station equipment. The model was developed using CadnaA, version 2020 MR 1 (build: 177.5010), a commercial noise modeling package developed by DataKustik GmbH. The software takes into account spreading losses, ground and atmospheric effects, shielding from barriers and buildings, reflections from surfaces and other sound propagation properties. The software is based on published engineering standards. The ISO 9613 standard was used for air absorption and other noise propagation calculations.

To be conservative, foliage was not included in the model. The terrain was modeled based on USGS topographical data at a resolution of 10 by 10 meters. A temperature of 20 degrees Celsius and 70 percent relative humidity were used for the atmospheric absorption calculations. The ground was modeled as mixed, with a 0.5 absorption coefficient.

The bore pit was included in the noise model at a 37 foot depth with other dimensions as shown on the layout drawing for the crossing. Only the auger and sand blast nozzle was located inside the bore pit. All other equipment was arranged at grade surrounding the pit.

5 EQUIPMENT LISTS

A boring noise model was developed for the project using US Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) noise data for the expected construction equipment that will be used during boring. The RCNM manual was used in combination with an equipment schedule provided by MVP (**Table 3)** to obtain sound power levels during construction. The noise model was used to predict the boring sound level contribution at the NSAs.

Construction equipment does not operate continuously, and typically is operating at maximum sound levels for only a small percentage of the overall period. The percentage of the work period during which the equipment operates at the listed sound level is termed the usage factor. The usage factor for each piece of equipment was taken from the RCNM except for the bulldozer activity level, which was estimated at 10% based on comments from MVP construction personnel. The calculated source sound pressure levels for each piece of equipment at 50 feet, based on usage factor, are presented in **Table 4.**

Table 3: Boring Operation Equipment List

Equipment	Quantity
Mud Pump	1
6" Trash Pumps	1
Well Point Dewatering	2
Mud Reclamation Unit	1
Skid Steer / Telehandler	1
Welding Rigs	2
Air Compressor / Sandblasters	1
Excavators	2
Crane	1
Auger	1
Sideboom	1
Air Movers	2
Diesel Light Plants*	5

* Used during nighttime hours only

Table 4: Equipment Sound Pressure Level

Equipment	Usage Factor	Linear L_p at 50' for 1/3 Octave Frequency Band									Total
		31.5	63	125	250	500	1000	2000	4000	8000	dBA
Mud Pump	0.5	67.4	72.4	72.4	77.4	72.4	67.4	62.4	57.4	52.4	**74.0**
6" Trash Pumps	0.5	66.0	71.0	71.0	76.0	71.0	66.0	61.0	56.0	51.0	**72.6**
Well Point Dewatering	1.0	76.4	81.4	81.4	86.4	81.4	76.4	71.4	66.4	61.4	**83.0**
Skid Steer / Telehandler	0.3	61.8	66.8	66.8	71.8	66.8	61.8	56.8	51.8	46.8	**68.4**
Welding Rigs	0.4	65.5	70.5	70.5	75.5	70.5	65.5	60.5	55.5	50.5	**72.0**
Air Compressor / Sandblasters	0.2	71.4	76.4	76.4	81.4	76.4	71.4	66.4	61.4	56.4	**78.0**
Excavators	0.4	65.1	70.1	70.1	75.1	70.1	65.1	60.1	55.1	50.1	**71.6**
Auger	0.2	59.0	64.0	64.0	69.0	64.0	59.0	54.0	49.0	44.0	**65.6**
Sideboom	0.2	46.4	51.4	51.4	56.4	51.4	46.4	41.4	36.4	31.4	**53.0**
Air Movers	0.4	72.5	77.5	77.5	82.5	77.5	72.5	67.5	62.5	57.5	**79.0**
Bulldozer	0.1	68.4	73.4	73.4	78.4	73.4	68.4	63.4	58.4	53.4	**75.0**
dewatering pump 3"	1.0	76.4	81.4	81.4	86.4	81.4	76.4	71.4	66.4	61.4	**83.0**
Diesel Light Plants	1.0	56.4	61.4	61.4	66.4	61.4	56.4	51.4	46.4	41.4	**63.0**

Crew Trucks were considered transient noise and were not included in calculations.

6 RESULTS AND DISCUSSION

Table 5 below shows results for the noise model calculations as the A-weighted equivalent sound level, dBA L_{eq} for the construction activity period. If boring activities take place during nighttime hours, then FERC guidance gives a target sound level of 48.6 dBA L_{eq} for those nighttime activities or 10 decibels above the existing ambient sound levels if those are above 55 dBA L_{dn}.

As shown in **Table 5,** the predicted sound levels during boring operations are lower than the 48.6 dBA sound levels identified in FERC guidance; therefore noise mitigation is not required during boring operations. **Figure 2** shows the predicted 48.6 dBA L_n contour for the E-012 Railroad Crossing. However, MVP will notify landowners near the bore location regarding the boring schedule and plan.

Table 5: Predicted Sound Levels during Boring Operations

Boring Operations (dBA)			
Locations	**NSAs**	**Day L_{eq} / L_d**	**Night L_{eq} / L_n**
E-012 Crossing	1	30.5	30.5
	2	48.4	48.4

7 SUMMARY

SLR has created a noise model for the E-012 Railroad Conventional Boring site, a part of the MVP Project, using an updated boring equipment list provided by MVP. The noise model predicts that sound levels from boring activities will be lower than 48.6 dBA L_{eq} at all of the closest NSAs during nighttime boring operations, as shown in the rightmost column of **Table 6**.

This concludes our Technical Report for the E-012 Railroad Crossing Bore. Please contact us if you have any questions.

Sincerely,
SLR International Corporation

David M. Jones, P.E., INCE Bd. Cert.
Acoustics Manager

Joy Rathod, P.E.
Associate Engineer

Daniel Hanley
Project Consultant

Figure 1: E-012 Railroad Crossing NSAs

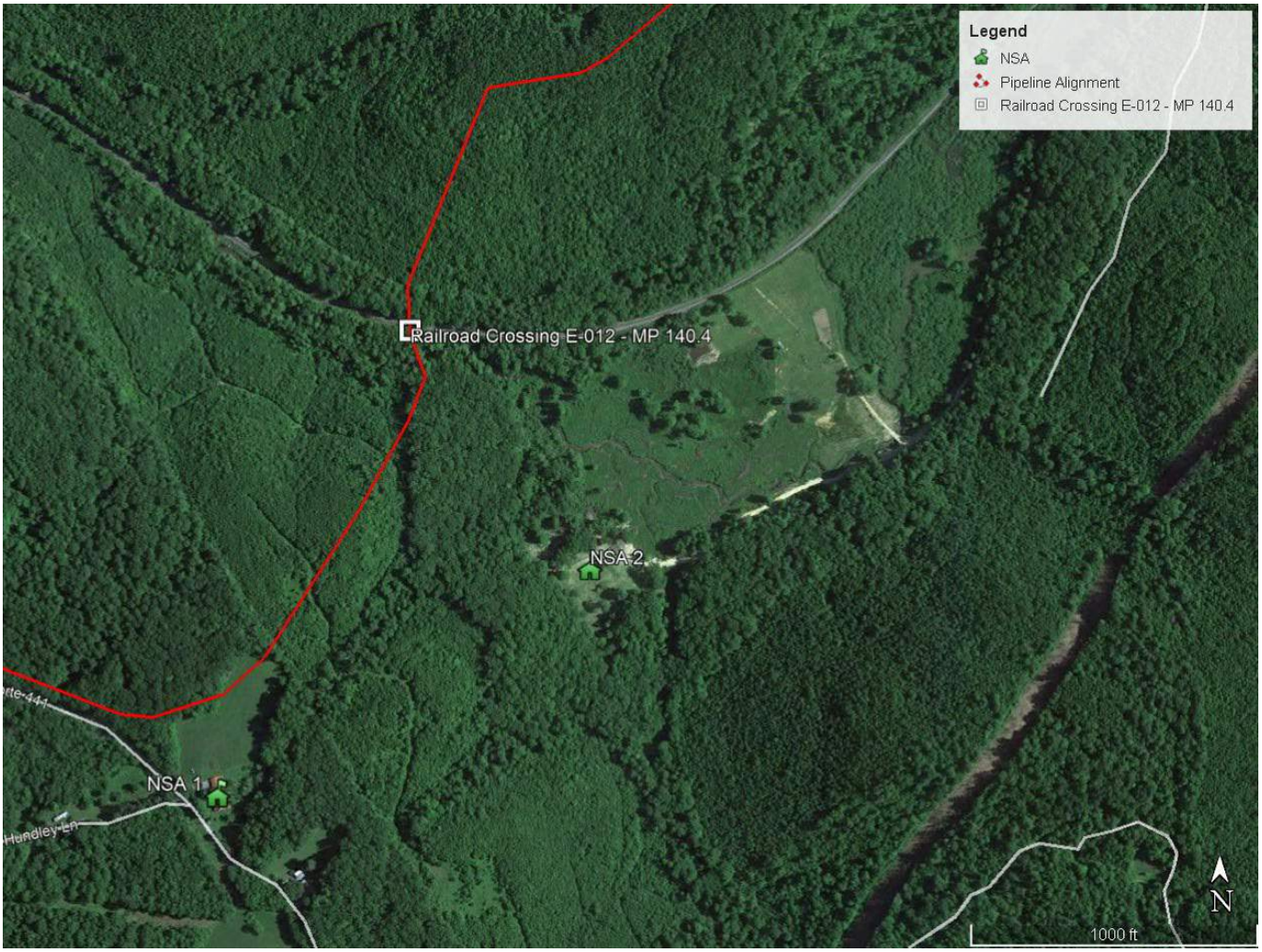
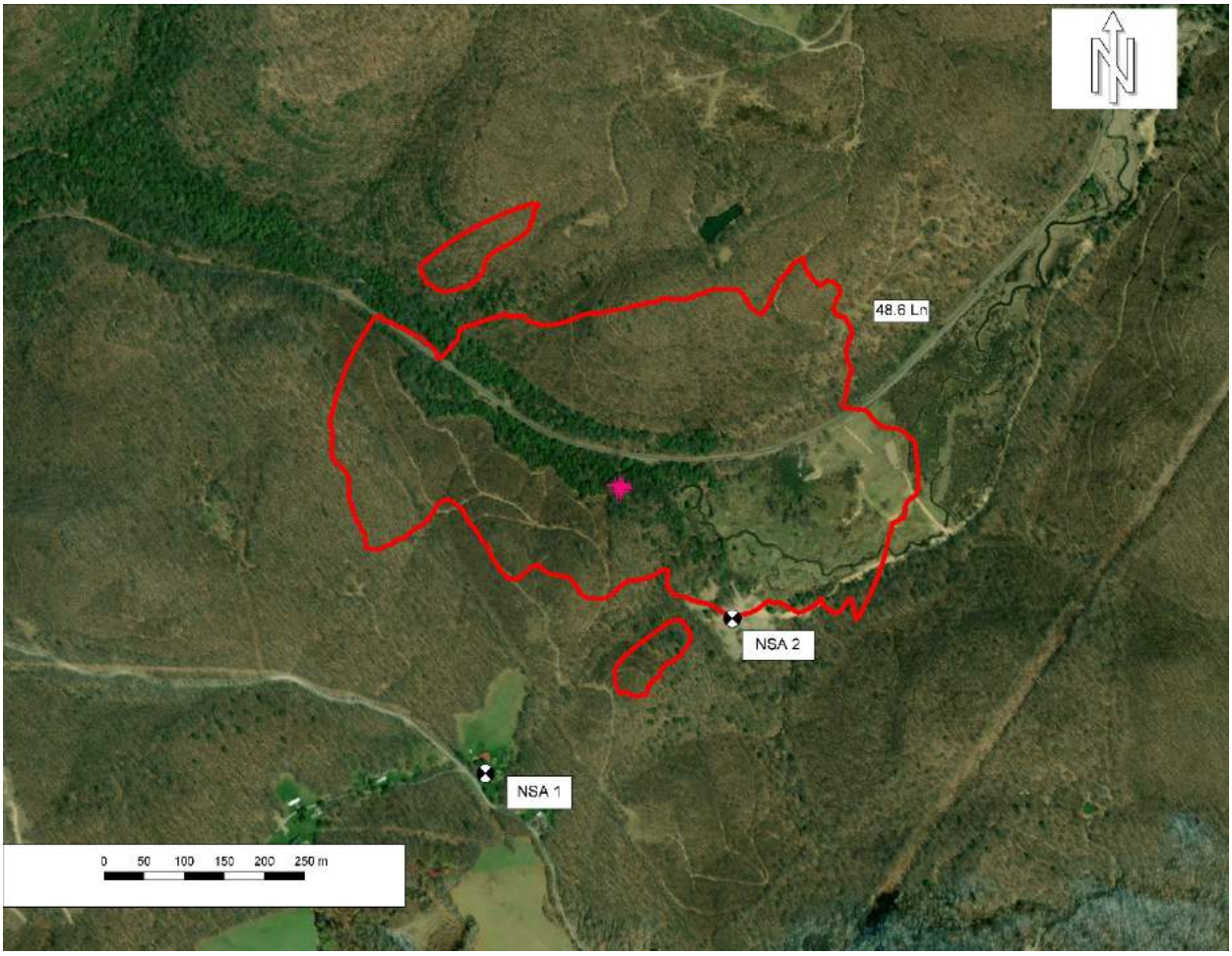


Figure 2: Predicted 48.6 dBA L_n Contour for the E-012 Railroad Crossing



March 5, 2021

Megan Neylon
Environmental Manager
Mountain Valley Pipeline

Re: **Construction Noise Study – Water Crossing Bore in West Virginia**
H-016 Railroad Crossing Bore
Mountain Valley Pipeline (MVP)

TECHNICAL MEMORANDUM

1 INTRODUCTION

Per your request, SLR International Corporation (SLR) has created a noise model for the H-016 Railroad crossing guided conventional boring site, a part of the Mountain Valley Pipeline (MVP) Project, using a construction equipment list provided by MVP, received February 17, 2021. This report presents the results of the noise model predictions. The boring sound levels were predicted for the nearest noise sensitive areas (NSAs). No baseline environmental sound monitoring or testing has been requested or conducted.

2 ENVIRONMENTAL SOUND LEVEL CRITERIA

The Federal Energy Regulatory Commission (FERC) limits for noise from nighttime construction work are typically based on a goal of 55 dBA L_{dn}. The L_{dn} is basically the logarithmic average of the sound levels during a 24-hour period, with a 10 dBA penalty added to the sound levels occurring during the more noise sensitive nighttime period from 10:00 p.m. to 7:00 a.m. Because of the nighttime penalty, a constant sound level at 48.6 dBA for 24-hours will result in an L_{dn} of 55 dBA. If that same sound level only operates for 12-hours during the daytime, and therefore has no nighttime penalty, the 12-hours of 48.6 dBA L_{eq} will result in a 24-hour L_{dn} of 45.6 dBA.

As per the 2017 FERC guidance document for the preparation of Resource Report 9, "Construction activity that would or may occur during nighttime hours should be performed with the goal that the activity contribute noise levels below 55 dBA L_{dn} and 48.6 L_{eq}, or no more than 10 dBA over background if ambient noise levels are above 55 dBA L_{dn}." If construction activities are limited to the daytime hours, with no significant noise production at night, then there is no specific sound level target for those activities.

These FERC noise limits apply at the nearest Noise Sensitive Areas (NSAs), which are typically residences, hospitals, or other places people may sleep; but churches, schools, and other locations are usually treated as NSAs also. The FERC noise limits are not property-line limits – they apply at the NSA structure itself.

3 SITE LOCATIONS AND ACTIVITY DURATION

H-016 Railroad Crossing milepost along the pipeline and coordinates are given in **Table 1**. Assumptions for Bore Pit Digging and Boring activity durations for the site are listed in **Table 2**. Bore pit excavation activities will be limited to daytime hours only and were not considered in the noise analysis.

Table 1: Site Location, Milepost, and Coordinates

Location Name	Milepost	Coordinates
H-016 RR Crossing	231.0	37.251617, -80.257408

Table 2: Duration of Bore Pit Excavation and Boring Operations

Location Name	Bore Pit Excavation Duration (hrs/day, # of days)	Boring Operation Duration (hrs/day, # of days)
H-016 RR Crossing	12 hrs/day, 21 days Daytime only	24 hrs/day, 10 days

An aerial photograph of the site and its nearby NSAs are attached as **Figure 1**.

4 SOFTWARE CONFIGURATIONS

A three-dimensional computer noise model was constructed to analyze the noise contributions expected from the proposed station equipment. The model was developed using CadnaA, version 2020 MR 1 (build: 177.5010), a commercial noise modeling package developed by DataKustik GmbH. The software takes into account spreading losses, ground and atmospheric effects, shielding from barriers and buildings, reflections from surfaces and other sound propagation properties. The software is based on published engineering standards. The ISO 9613-2 standard was used for air absorption and other noise propagation calculations.

From satellite photos and map street views it was determined that NSA 1 has densely planted evergreen trees around the south and east perimeter of the property. These evergreen trees were included in the noise model as foliage as per ISO 9613-2. To be conservative, foliage was not included in other locations in the model. The terrain was modeled based on USGS topographical data at a resolution of 10 by 10 meters. A temperature of 20 degrees Celsius and 70 percent relative humidity were used for the atmospheric absorption calculations. The ground around NSA 1 and NSA 4 were modeled with a 0.8 absorption coefficient to represent the thick grassy lawns around the houses. The remainder of the area in the model was modeled as mixed, with a 0.5 absorption coefficient.

The bore pit was included in the noise model at a 21 foot depth with other dimensions as shown on the layout drawing for the crossing. Only the Bore Tracking Machine was located inside the bore pit. All other equipment was arranged at grade surrounding the pit.

5 EQUIPMENT LISTS

A boring noise model was developed for the project using US Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) noise data for the expected construction equipment that will be used during boring. The RCNM manual was used in combination with an equipment schedule provided by MVP (**Table 3)** to obtain sound power levels during construction. The noise model was used to predict the boring sound level contribution at the NSAs.

Construction equipment does not operate continuously, and typically is operating at maximum sound levels for only a small percentage of the overall period. The percentage of the work period during which the equipment operates at the listed sound level is termed the usage factor. The usage factor for each piece of equipment was taken from the RCNM except for the bulldozer activity level, which was estimated at 10% based on comments from MVP construction personnel. The calculated source sound pressure levels for each piece of equipment at 50 feet, based on usage factor, are presented in **Table 4.**

Table 3: Boring Operation Equipment List

Equipment	Quantity
Excavator - CAT 320 - CAT 325 / JD 210 - JD 245 or Comparable w/ Thumb Attachment	2
Skid Steer (Standard) CAT 257 - 299	1
Bulldozer - assumed only 1 operating at night	1
Welding Rigs	2
Sideboom - 583T / PL83 or Comparable	1
Bore - Track Machine - 42" w/ Push Plate, Head, Auger	1
Air Compressor - 185	1
Waterpump	1
Diesel Light Plants*	5

* Used during nighttime hours only

.

Table 4: Equipment Sound Pressure Levels

Equipment	Usage Factor	Linear L_p at 50' for 1/3 Octave Frequency Band									Total
		31.5	63	125	250	500	1000	2000	4000	8000	dBA
Excavator - CAT 320 - CAT 325 / JD 210 - JD 245 or Comparable w/ Thumb Attachment	0.2	62.0	67.0	67.0	72.0	67.0	62.0	57.0	52.0	47.0	**68.6**
Skid Steer (Standard) CAT 257 - 299	0.3	61.8	66.8	66.8	71.8	66.8	61.8	56.8	51.8	46.8	**68.4**
Bulldozer - assumed only 1 operating at night	0.1	68.4	73.4	73.4	78.4	73.4	68.4	63.4	58.4	53.4	**75.0**
Welding Rigs	0.4	65.5	70.5	70.5	75.5	70.5	65.5	60.5	55.5	50.5	**72.0**
Sideboom - 583T / PL83 or Comparable	0.2	46.4	51.4	51.4	56.4	51.4	46.4	41.4	36.4	31.4	**53.0**
Bore - Track Machine - 42" w/ Push Plate, Head, Auger	0.5	70.4	75.4	75.4	80.4	75.4	70.4	65.4	60.4	55.4	**77.0**
Air Compressor - 185	0.4	69.4	74.4	74.4	79.4	74.4	69.4	64.4	59.4	54.4	**76.0**
Waterpump	0.5	67.4	72.4	72.4	77.4	72.4	67.4	62.4	57.4	52.4	**74.0**
Diesel Light Plants	1.0	56.4	61.4	61.4	66.4	61.4	56.4	51.4	46.4	41.4	**63.0**

Crew Trucks were considered transient noise and were not included in calculations

6 RESULTS AND DISCUSSION

Table 5 and **Table 6** below shows results for the noise model calculations as the A-weighted equivalent sound level, dBA L_{eq} for the construction activity period. If boring activities take place during nighttime hours, then FERC guidance gives a target sound level of 48.6 dBA L_{eq} for those nighttime activities or 10 decibels above the existing ambient sound levels if those are above 55 dBA L_{dn}.

Table 5 shows the predicted sound levels during boring operations without mitigation, which exceed the 48.6 dBA levels identified in the FERC guidance. As shown in **Table 6,** the predicted sound levels during boring operations are lower than the 48.6 dBA levels identified in FERC guidance with the mitigation described in Section 7 for all NSAs.

Figure 2 shows the predicted 48.6 dBA L_n contour for the H-016 Railroad Crossing without mitigation and **Figure 3** shows the predicted 48.6 dBA L_n contour with mitigation.

Table 5: Predicted Sound Levels during Boring Operations without Noise Mitigation

Unmitigated Boring Operations (dBA)			
Locations	**NSAs**	**Day L_{eq} / L_d**	**Night L_{eq} / L_n**
H-016 RR Crossing	1	64.1	64.2
	2	61.5	61.6
	3	47.5	47.6
	4	56.6	56.7
	5	51.5	51.6

Table 6: Predicted Sound Levels during Boring Operations with Noise Mitigation

Mitigated Boring Operations (dBA)			
Locations	**NSAs**	**Day L_{eq} / L_d**	**Night L_{eq} / L_n**
H-016 RR Crossing	1	48.5	48.5
	2	48.1	48.1
	3	40.3	40.3
	4	47.3	47.3
	5	43.3	43.3

7 NOISE MITIGATION OPTIONS

The following section outlines recommended noise mitigation for the Greenbrier River crossing bore location. MVP will notify landowners near the bore location regarding the boring schedule and plan.

7.1 Site Specific Noise Mitigation Recommendations

As shown in **Table 5** and **Figure 2**, the predicted unmitigated sound levels at several NSAs exceed 48.6 dBA during nighttime boring operations. In order to meet the nighttime sound level target, the noise model indicates that a combination of a noise barrier and individual noise mitigation treatments will be required.

There are two barriers in the noise model with one on the north side of the work area, and the other on the south and southwest. The east and west side of the work area is left open for equipment access. The modeled barriers are 24' in height and a drawing of the site map of the modeled placement and length of barrier sides is shown in **Figure 4**.

In addition to the two barriers around the work site, the H-016 Railroad Crossing site will need noise mitigation for the following noise sources:

- Welding Rigs
- Trash pumps
- Slurry pumps

Typically, for fixed noise sources such as pumps and welders, a partial enclosure is the best noise mitigation option. **Figures 5 and 6**, attached, show a typical three-sided noise enclosure with roof installed on a typical diesel-powered pump or welder. At the H-016 Railroad Crossing work site, the open side of all enclosures should face east along the pipeline corridor. The engine exhaust should be routed outside of the enclosure, typically with metal ductwork or steel pipe. All connecting piping and cabling should be routed through the open side of the enclosure if possible.

7.2 Enclosures/Barriers in General

For barriers and enclosures there are many suitable material choices. Typically, for short duration projects such as boring work, the best choices are either plywood or acoustical blankets.

For plywood enclosures or barriers, the plywood should be 3/4″ thick at a minimum and the side facing the noise source should be faced with a layer of acoustically absorptive material. A widely available option would be 2 inches of medium-weight fiberglass board insulation such as Owens Corning 703 or Knauf Insulation Board (3 lb/cu.ft. density). Lightweight fiberglass batt insulation can also be used for short term uses. Batt insulation can be purchased with a thin plastic or paper facing that will offer some weather protection and will make installation easier.

Acoustical blankets should have a surface weight of greater than 1.5 pounds per square foot. The side facing the noise sources should be acoustically absorptive. Typically, this is accomplished with a quilted absorber material. Blankets should be installed with as few cracks and gaps as possible. Blankets can be applied directly to equipment skid supports, if desired, as long as there

are no significant cracks or gaps between the blankets, and that there is no gap between the bottom of the blankets and the ground.

8 SUMMARY

SLR has created a noise model for the H-016 Railroad Crossing Guided Conventional Boring site, a part of MVP Project, using an updated boring equipment list provided by MVP. After the installation of the noise mitigation treatments outlined above, the noise model predicts that sound levels will be lower than the 48.6 dBA L_{eq} FERC nighttime target during nighttime boring operations, as shown in the rightmost column of **Table 6** for all NSAs.

This concludes our Technical Report for the H-016 Railroad Crossing Bore. Please contact us if you have any questions.

Sincerely,
SLR International Corporation

David M. Jones, P.E., INCE Bd. Cert.
Acoustics Manager

Joy Rathod, P.E.
Associate Engineer

Daniel Hanley
Project Consultant

Figure 1: H-016 Railroad Crossing NSAs

Figure 2: Predicted Unmitigated 48.6 dBA L_n Contour for the H-016 Railroad Crossing

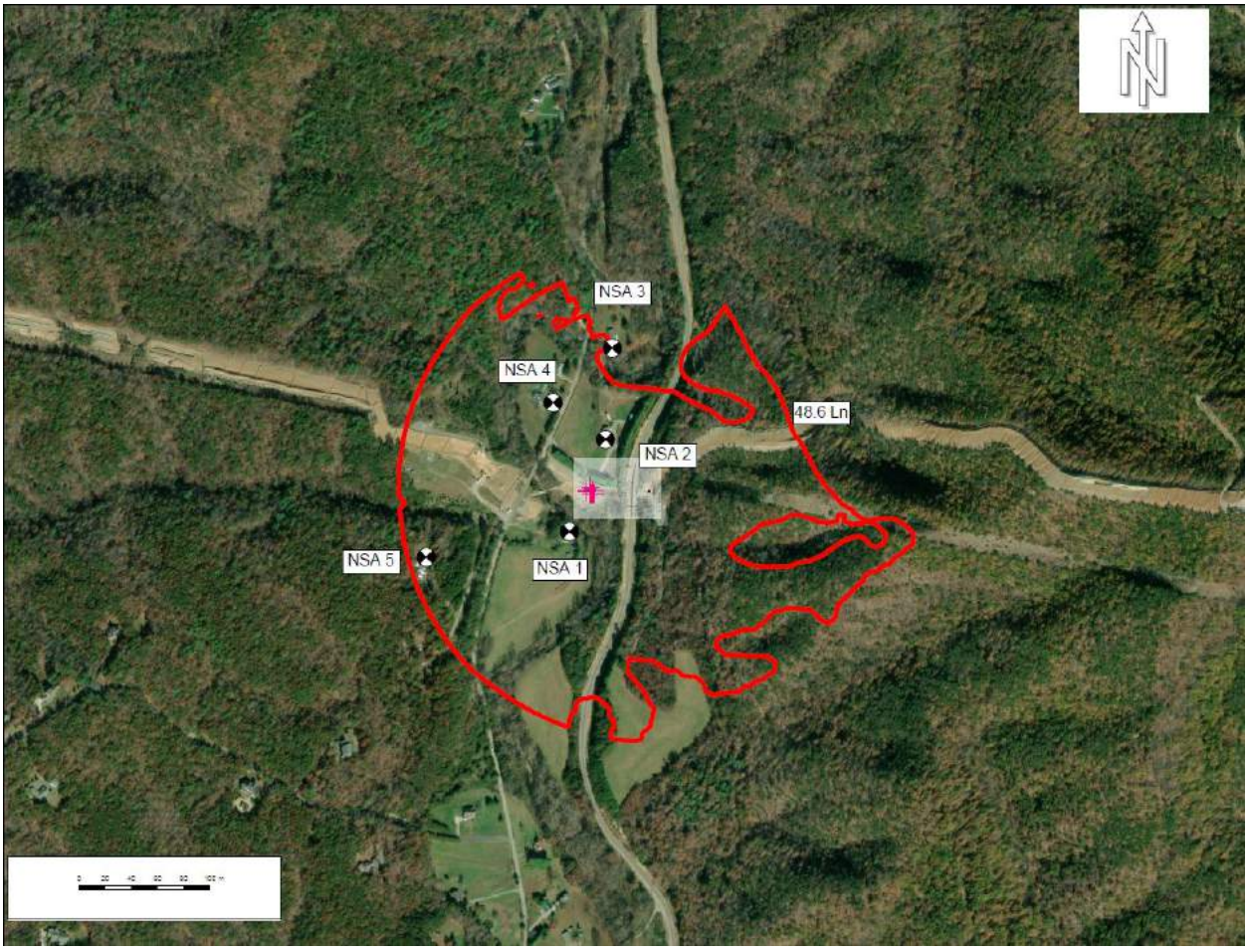


Figure 3: Predicted Mitigated 48.6 dBA L_n Contour for the H-016 Railroad Crossing

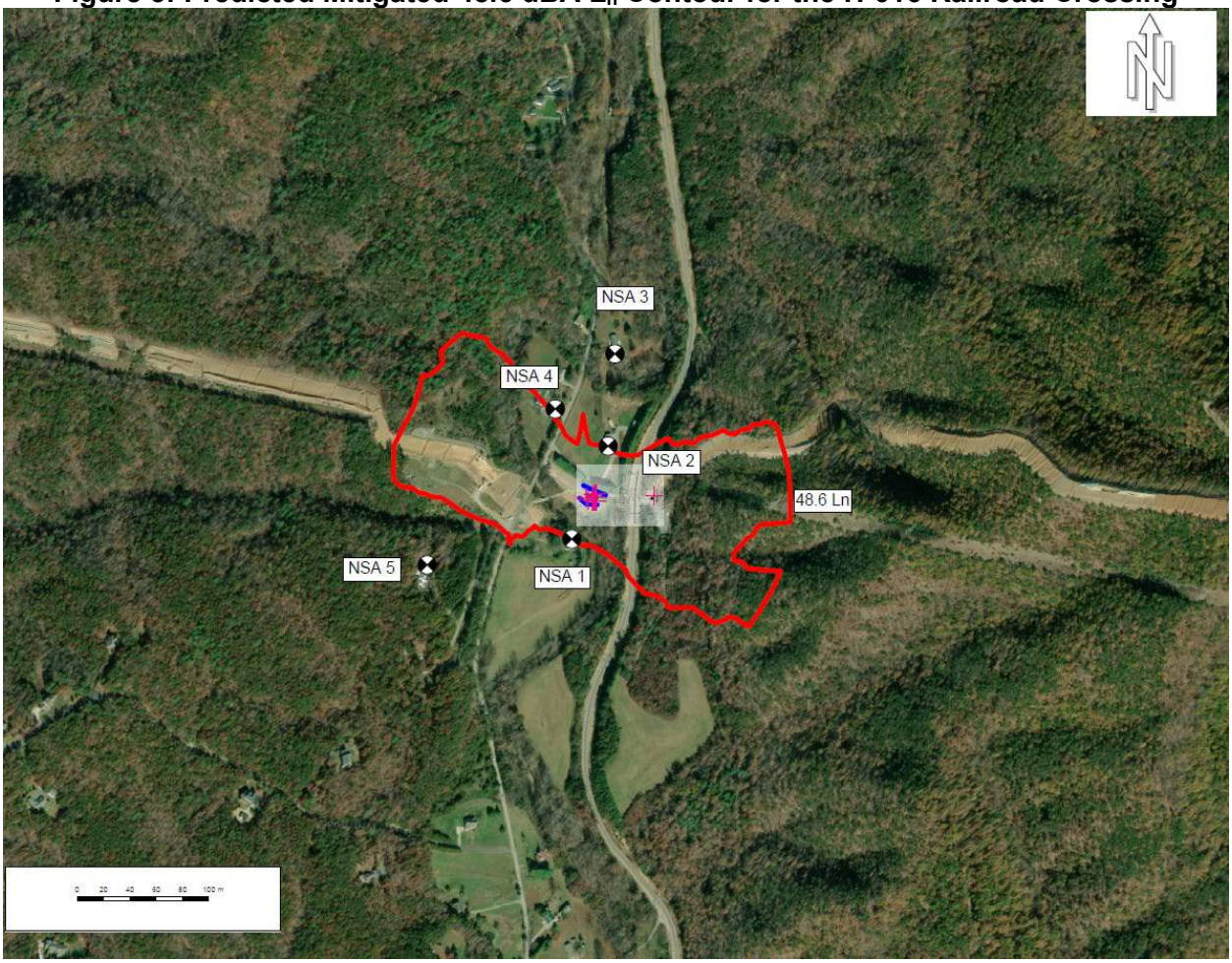


Figure 4: Recommended Barrier Placement

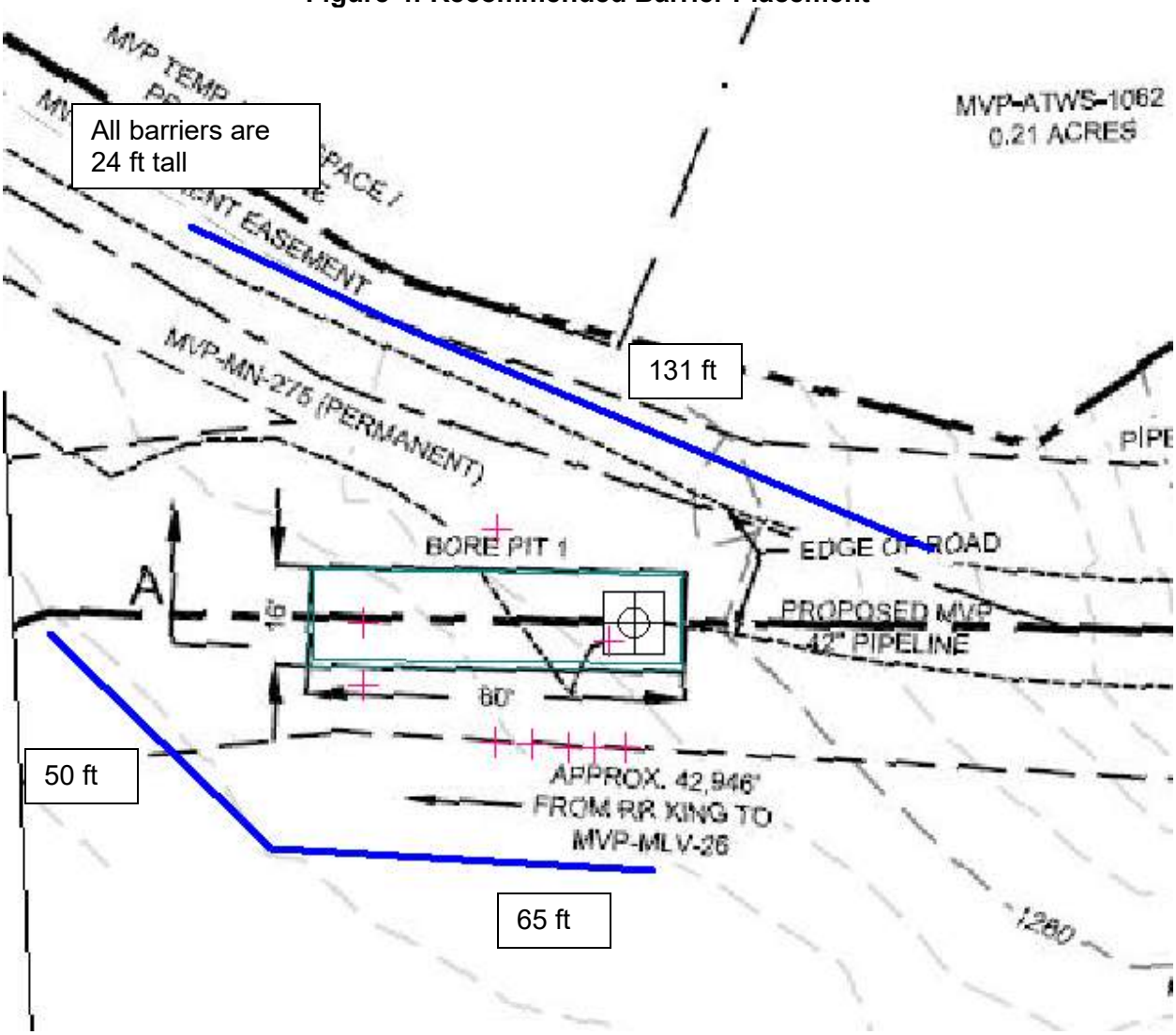


Figure 5: Typical Enclosure Layout for Diesel Powered Pump or Welder
Equipment Axis Oriented North/South

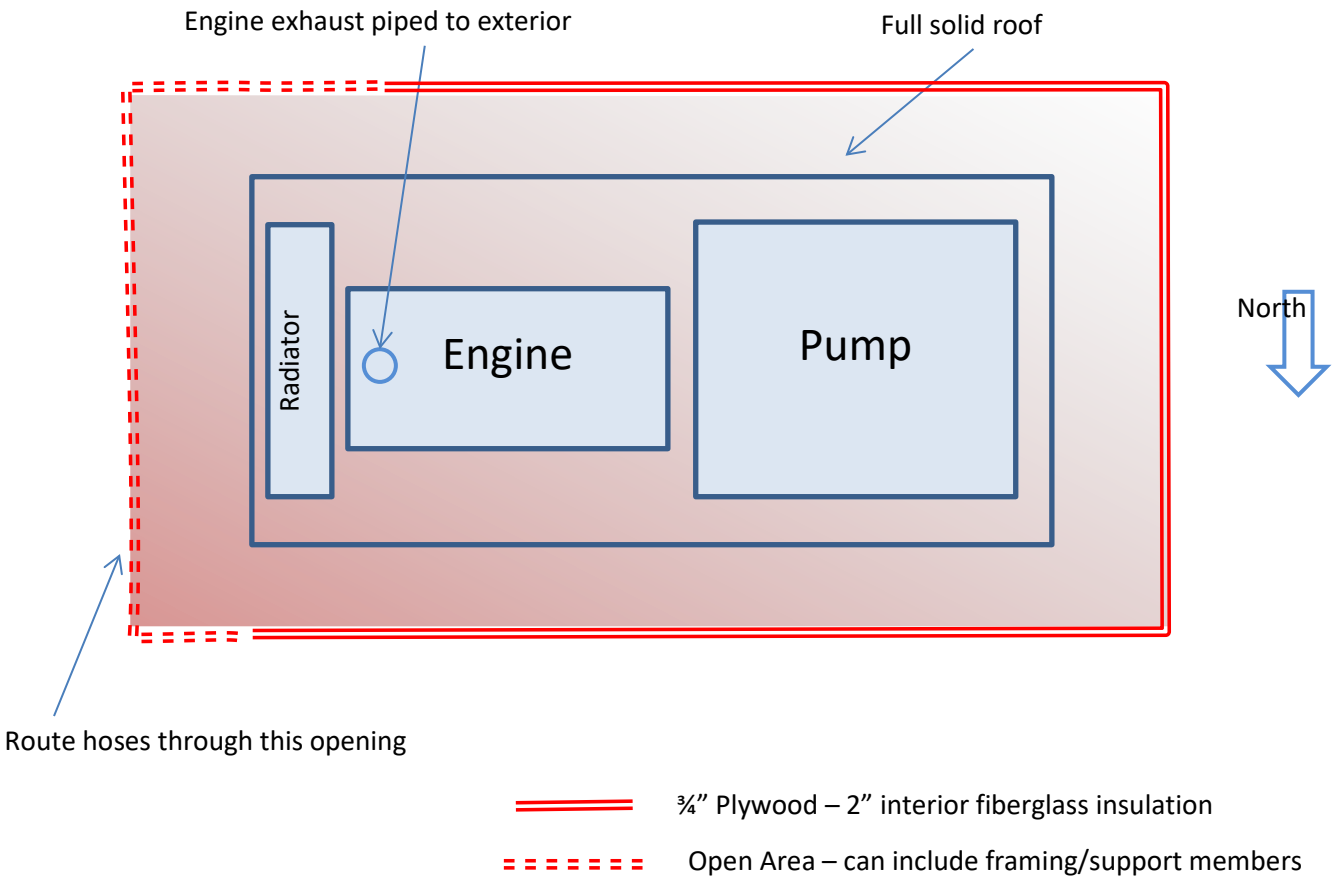
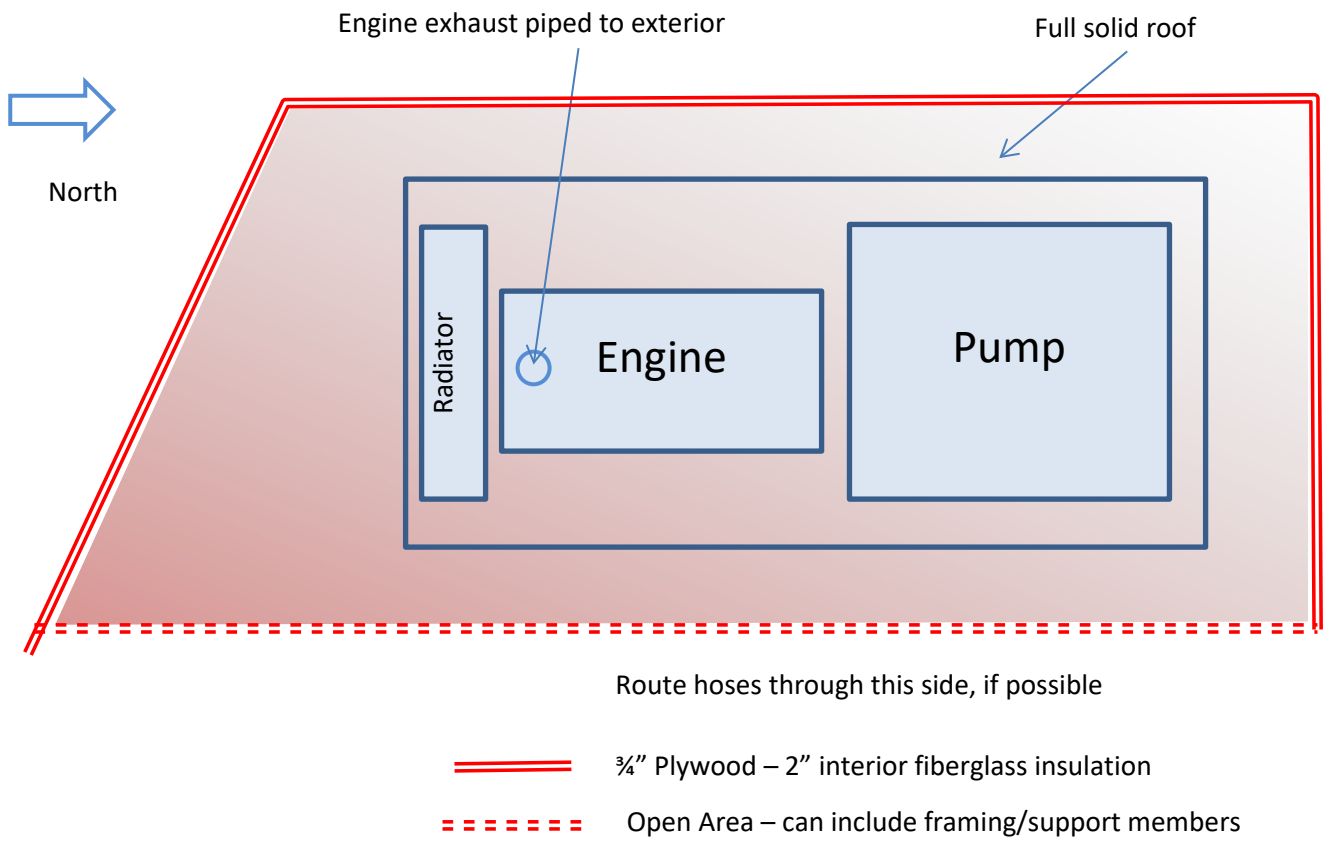


Figure 6: Typical Enclosure Layout for Diesel Powered Pump or Welder
Equipment Axis Oriented East/West



March 4, 2021

Megan Neylon
Environmental Manager
Mountain Valley Pipeline

Re: **Construction Noise Study – Water Crossing Bore in West Virginia**
H-020 Railroad Crossing Bore
Mountain Valley Pipeline (MVP)

TECHNICAL MEMORANDUM

1 INTRODUCTION

Per your request, SLR International Corporation (SLR) has developed a noise model for the H-020 Railroad crossing Guided Conventional Boring site, a part of the Mountain Valley Pipeline (MVP) Project, using a construction equipment list provided by MVP, received February 17, 2021. This report presents the results of the noise model predictions. The boring sound levels were predicted for the nearest noise sensitive areas (NSAs). No baseline environmental sound monitoring or testing has been requested or conducted.

2 ENVIRONMENTAL SOUND LEVEL CRITERIA

The Federal Energy Regulatory Commission (FERC) limits for noise from nighttime construction work are typically based on a goal of 55 dBA L_{dn}. The L_{dn} is basically the logarithmic average of the sound levels during a 24-hour period, with a 10 dBA penalty added to the sound levels occurring during the more noise sensitive nighttime period from 10:00 p.m. to 7:00 a.m. Because of the nighttime penalty, a constant sound level at 48.6 dBA for 24-hours will result in an L_{dn} of 55 dBA. If that same sound level only operates for 12-hours during the daytime, and therefore has no nighttime penalty, the 12-hours of 48.6 dBA L_{eq} will result in a 24-hour L_{dn} of 45.6 dBA.

As per the 2017 FERC guidance document for the preparation of Resource Report 9, "Construction activity that would or may occur during nighttime hours should be performed with the goal that the activity contribute noise levels below 55 dBA L_{dn} and 48.6 L_{eq}, or no more than 10 dBA over background if background noise levels are above 55 dBA L_{dn}." If construction activities are limited to the daytime hours, with no significant noise production at night, then there is no specific sound level target for those activities.

These FERC noise limits apply at the nearest Noise Sensitive Areas (NSAs), which are typically residences, hospitals, or other places people may sleep; but churches, schools, and other locations are usually treated as NSAs also. The FERC noise limits are not property-line limits – they apply at the NSA structure itself.

3 ESTIMATED BACKGROUND SOUND LEVELS

The Bore H-020 work areas are located next to a four-lane divided highway and two double track railroad corridors. The background sound levels in the area are likely higher than 55 dBA Ldn due to noise from these nearby transportation sources.

Background noise levels due to traffic and railroad noise at the NSAs surrounding bore H-020 were estimated using the HUD DNL calculator on the Hud Exchange website. The DNL and L_{dn} are the same metric and are calculated using the same methodology. The HUD typically uses the abbreviation DNL while FERC typically uses L_{dn}. The two abbreviations are used interchangeably in this report.

Bore H-020 is approximately 100 ft north of the center of US Highway 11, 200 ft from a double-track Norfolk Southern rail line to the south and 1600 ft from a second Norfolk Southern double track railroad line to the north. An aerial photograph of the site and its nearby NSAs are attached as **Figure 1.** An aerial photograph of the NSAs and distances to the road and rail noises is shown in **Figure 2** through **Figure 4**.

The railroad inventory for the two lines near the site was used to populate data for rail line usage in the HUD calculator. The closest rail crossings are at Cove Hollow Road, southeast of the bore location, and Cannery Road, northwest of the bore location. According to the rail inventory sheet for the two locations, they are not 24-hour quiet zones and therefore the trains would be required to operate their horns before each crossing. Trains are required to blow their horns fifteen to twenty (15-20) seconds before a road crossing in accordance with 49 CFR Part 222. Horn blow noise was estimated separately from train noise, one for eastbound rail traffic and one for westbound.

The “2019 Virginia Department of Transportation Daily Traffic Volume Estimates Including Vehicle Classification Estimates Jurisdiction Report 60” for Montgomery county was used to populate data for estimated daily traffic along US highway 11 in the HUD calculator. The rail inventory and traffic reports and print-out of the HUD calculation can be found in Appendix A.

The HUD calculator provides results in DNL for all traffic and rail sources individually as well as the combined result of the traffic and rail noise. The DNL result in the calculator averages daytime noise plus nighttime noise.

The FERC guidance for construction noise applies to activities at night, so the HUD DNL result was performed in such a fashion as to allow the separation of the day and night sound levels due to rail and traffic. To facilitate this calculation, only the nighttime traffic elements were included in the DNL calculation. Inputs to the HUD calculator were night-time vehicle traffic and train activity to obtain a result for the DNL assuming nighttime activity only (no contribution from traffic and rail noise for daytime hours).

To calculate the nighttime L_n levels for comparison with the nighttime boring activity levels, 5.7 dB was subtracted from the resulting DNL value obtained from the HUD calculation results. This 5.7 dB factor is the difference between the nighttime sound level and the calculated DNL when there is no daytime sound level contribution.

The resulting nighttime background sound level (L_n) at each NSA is shown in **Table 1**. As can be seen in **Table 1**, the estimated existing background sound levels are above 55 dBA L_{dn} or 48.6 dBA L_{eq} / L_n at all NSAs.

Table 1: Estimated Nighttime Background Sound Levels at NSAs

Noise Sensitive Area	Calculated DNL / L_{dn} (dBA)	Estimated Nighttime Sound Level, L_{eq} / L_n (dBA)
NSA 1	69	63.3
NSA 4	64	58.3
NSA 6	63	57.3

NSA 1, 2, 3, and 5 are approximately the same distance from the rail and traffic noise sources, therefore, the results for NSA 1 will be used for 2, 3, and 5.

4 SITE LOCATIONS AND ACTIVITY DURATION

The H-020 Railroad Crossing milepost along the pipeline and coordinates are given in **Table 2.** Assumptions for Bore Pit Digging and Boring activity durations for the site are listed in **Table 3**. Bore pit excavation activities will be limited to daytime hours only and were not considered in the noise analysis.

Table 2: Site Location, Milepost, and Coordinates

Location Name	Milepost	Coordinates
H-020 RR Crossing	235.75	37.231262, -80.198512

Table 3: Duration of Bore Pit Excavation and Boring Operations

Location Name	Bore Pit Excavation Duration (hrs/day, # of days)	Boring Operation Duration (hrs/day, # of days)
H-020 RR Crossing	12 hrs/day, 21 days Daytime only	24 hrs/day, 10 days

An aerial photograph of the site and its nearby NSAs are attached as **Figure 1**.

5 SOFTWARE CONFIGURATIONS

A three-dimensional computer noise model was constructed to analyze the noise contributions expected from the proposed station equipment. The model was developed using CadnaA, version 2020 MR 1 (build: 177.5010), a commercial noise modeling package developed by DataKustik GmbH. The software takes into account spreading losses, ground and atmospheric effects, shielding from barriers and buildings, reflections from surfaces and other sound propagation properties. The software is based on published engineering standards. The ISO 9613 standard was used for air absorption and other noise propagation calculations.

To be conservative, foliage was not included in the model. The terrain was modeled based on USGS topographical data at a resolution of 10 by 10 meters. A temperature of 20 degrees Celsius and 70 percent relative humidity were used for the atmospheric absorption calculations. The ground was modeled as mixed, with a 0.5 absorption coefficient.

The bore pit was included in the noise model at a 21 foot depth with other dimensions as shown on the layout drawing for the crossing. Only the bore tracking machine was located inside the bore pit. All other equipment was arranged at grade surrounding the pit.

6 EQUIPMENT LISTS

A boring noise model was developed for the project using US Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) noise data for the expected construction equipment that will be used during boring. The RCNM manual was used in combination with an equipment schedule provided by MVP (**Table 4)** to obtain sound power levels during construction. The noise model was used to predict the boring sound level contribution at the NSAs.

Construction equipment does not operate continuously, and typically is operating at maximum sound levels for only a small percentage of the overall period. The percentage of the work period during which the equipment operates at the listed sound level is termed the usage factor. The usage factor for each piece of equipment was taken from the RCNM except for the bulldozer activity level, which was estimated at 10% based on comments from MVP construction personnel. The calculated source sound pressure levels for each piece of equipment at 50 feet, based on usage factor, are presented in **Table 5.**

Table 4: Boring Operation Equipment List

Equipment	Quantity
Excavator - CAT 320 - CAT 325 / JD 210 - JD 245 or Comparable w/ Thumb Attachment	2
Skid Steer (Standard) CAT 257 - 299	1
Bulldozer - assumed only 1 operating at night	1
Welding Rigs	2
Sideboom - 583T / PL83 or Comparable	1
Bore - Track Machine - 42" w/ Push Plate, Head, Auger	1
Air Compressor - 185	1
Water pump	1
Diesel Light Plants*	5

* Used during nighttime hours only

Table 5: Equipment Sound Pressure Levels

Equipment	Usage Factor	Linear L_p at 50' for 1/3 Octave Frequency Band								Total
		31.5	63	125	250	500	1000	2000	4000	8000	dBA
Excavator - CAT 320 - CAT 325 / JD 210 - JD 245 or Comparable w/ Thumb Attachment	0.4	65.1	70.1	70.1	75.1	70.1	65.1	60.1	55.1	50.1	**71.6**
Skid Steer (Standard) CAT 257 - 299	0.3	61.8	66.8	66.8	71.8	66.8	61.8	56.8	51.8	46.8	**68.4**
Bulldozer - assumed only 1 operating at night	0.1	68.4	73.4	73.4	78.4	73.4	68.4	63.4	58.4	53.4	**75.0**
Welding Rigs	0.4	65.5	70.5	70.5	75.5	70.5	65.5	60.5	55.5	50.5	**72.0**
Sideboom - 583T / PL83 or Comparable	0.2	46.4	51.4	51.4	56.4	51.4	46.4	41.4	36.4	31.4	**53.0**
Bore - Track Machine - 42" w/ Push Plate, Head, Auger	0.5	70.4	75.4	75.4	80.4	75.4	70.4	65.4	60.4	55.4	**77.0**
Air Compressor - 185	0.4	69.4	74.4	74.4	79.4	74.4	69.4	64.4	59.4	54.4	**76.0**
Water pump	0.5	67.4	72.4	72.4	77.4	72.4	67.4	62.4	57.4	52.4	**74.0**
Diesel Light Plants*	1.0	56.4	61.4	61.4	66.4	61.4	56.4	51.4	46.4	41.4	**63.0**

Crew Trucks were considered transient noise and were not included in calculations

7 RESULTS AND DISCUSSION

Table 6 below shows results for the noise model calculations as the A-weighted equivalent sound level, dBA L_{eq} for the construction activity period. If boring activities take place during nighttime hours, then FERC guidance gives a target sound level of 48.6 dBA L_{eq} for those nighttime activities or 10 decibels above the existing background sound levels if those are above 55 dBA L_{dn}. **Figure 5** shows the predicted 48.6 dBA L_n contour for the H-020 Railroad Crossing.

Since the background sound levels at all NSAs exceed 55 dBA L_{dn}, nighttime construction activities should contribute no more than 10 dB over background levels. As shown in **Table** 6, the nighttime construction sound levels are much less than 10 decibels over the estimated background sound levels, and the increase due to nighttime construction sound levels is less than 10 dB at all NSAs.

Table 6: Predicted Sound Levels during Boring Operations without Noise Mitigation

Predicted Sound Levels from Unmitigated Boring Operations (dBA)			Estimated Background Levels (dBA)	Boring noise + Estimated Background levels (dBA)	Increase over Background Levels (ΔdB)
Location	**NSAs**	**Night L_{eq} / L_n**	**Night L_{eq} / L_n**	**Night L_{eq} / L_n**	**Night**
H-020 RR Crossing	1	65.0	63.3	67.2	3.9
	2	50.0	63.3	63.5	0.2
	3	46.8	63.3	63.4	0.1
	4	53.7	58.3	59.6	1.3
	5	47.7	63.3	63.4	0.1
	6	54.5	57.3	59.1	1.8

8 SUMMARY

SLR has created a noise model for the H-020 Railroad Crossing Guided Conventional Boring site, a part of MVP Project, using an updated boring equipment list provided by MVP. Background noise levels are estimated to be above 48.6 dBA Leq, noise levels at all NSAs. The noise model predicts that sound levels will be less than 10 dBA above background levels as shown in **Table 6** and no additional mitigation is required. Although mitigation is not required for bore location H-020, MVP will notify landowners near the bore location regarding the boring schedule and plan.

This concludes our Technical Report for the H-020 Railroad Crossing Bore. Please contact us if you have any questions.

Sincerely,
SLR International Corporation

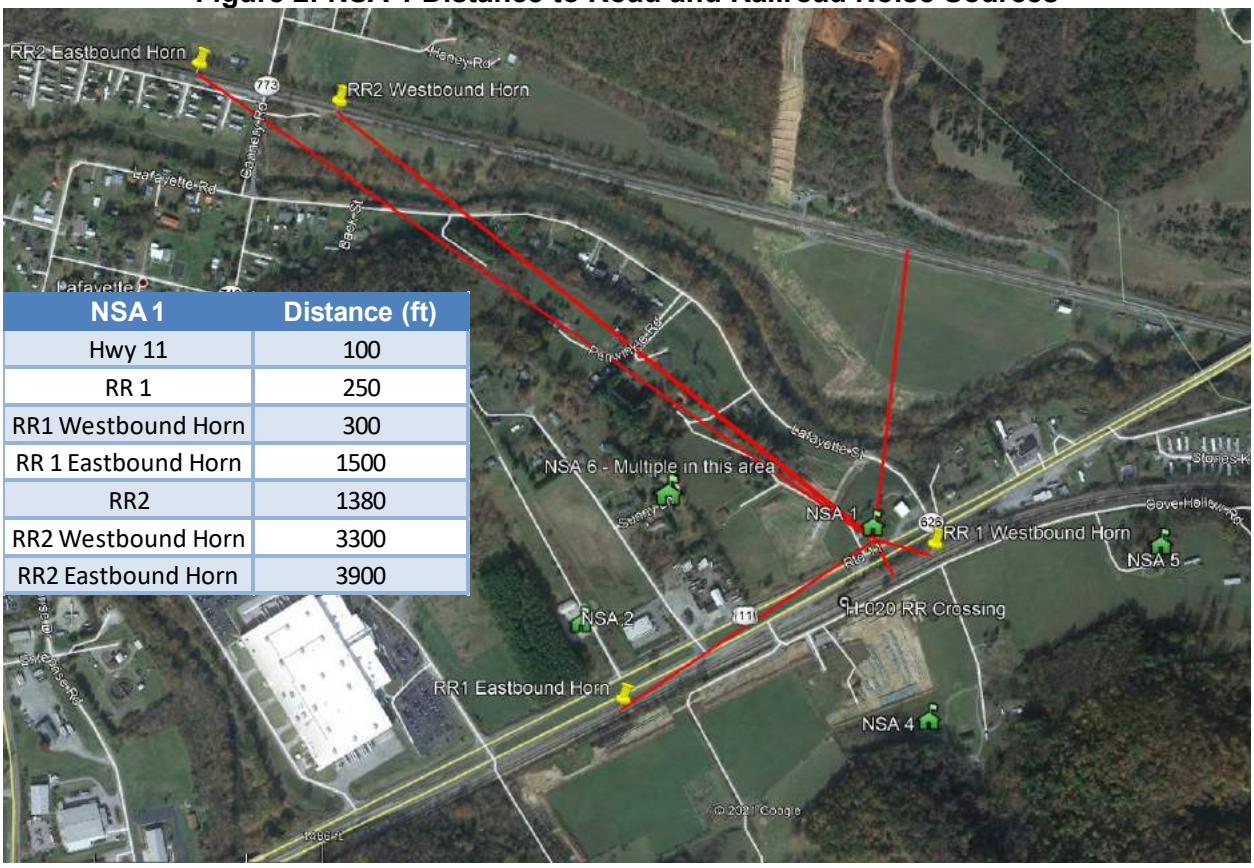
David M. Jones, P.E., INCE Bd. Cert.
Acoustics Manager

Joy Rathod, P.E.
Associate Engineer

Daniel Hanley
Project Consultant

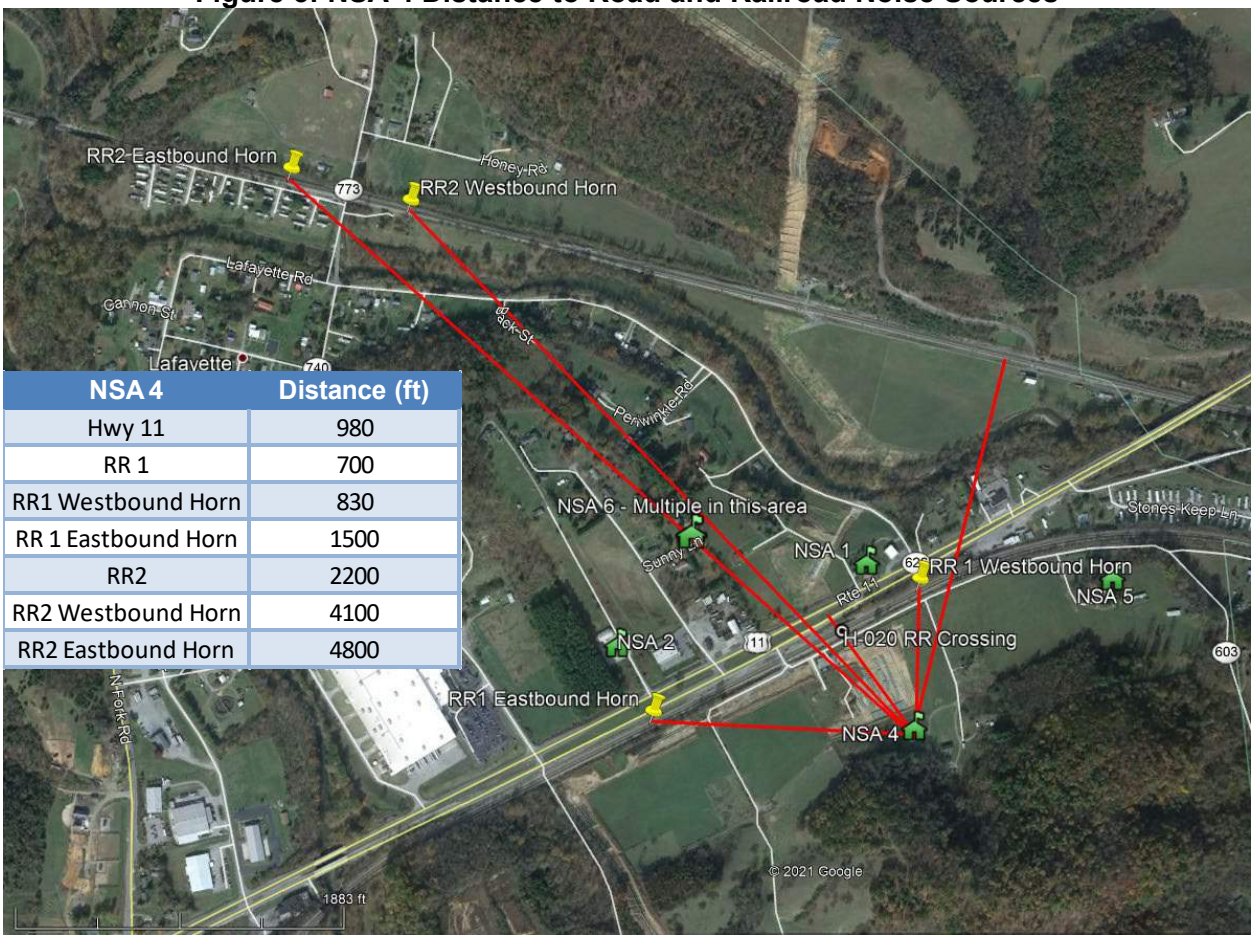
Figure 1: H-020 Railroad Crossing NSAs

Figure 2: NSA 1 Distance to Road and Railroad Noise Sources



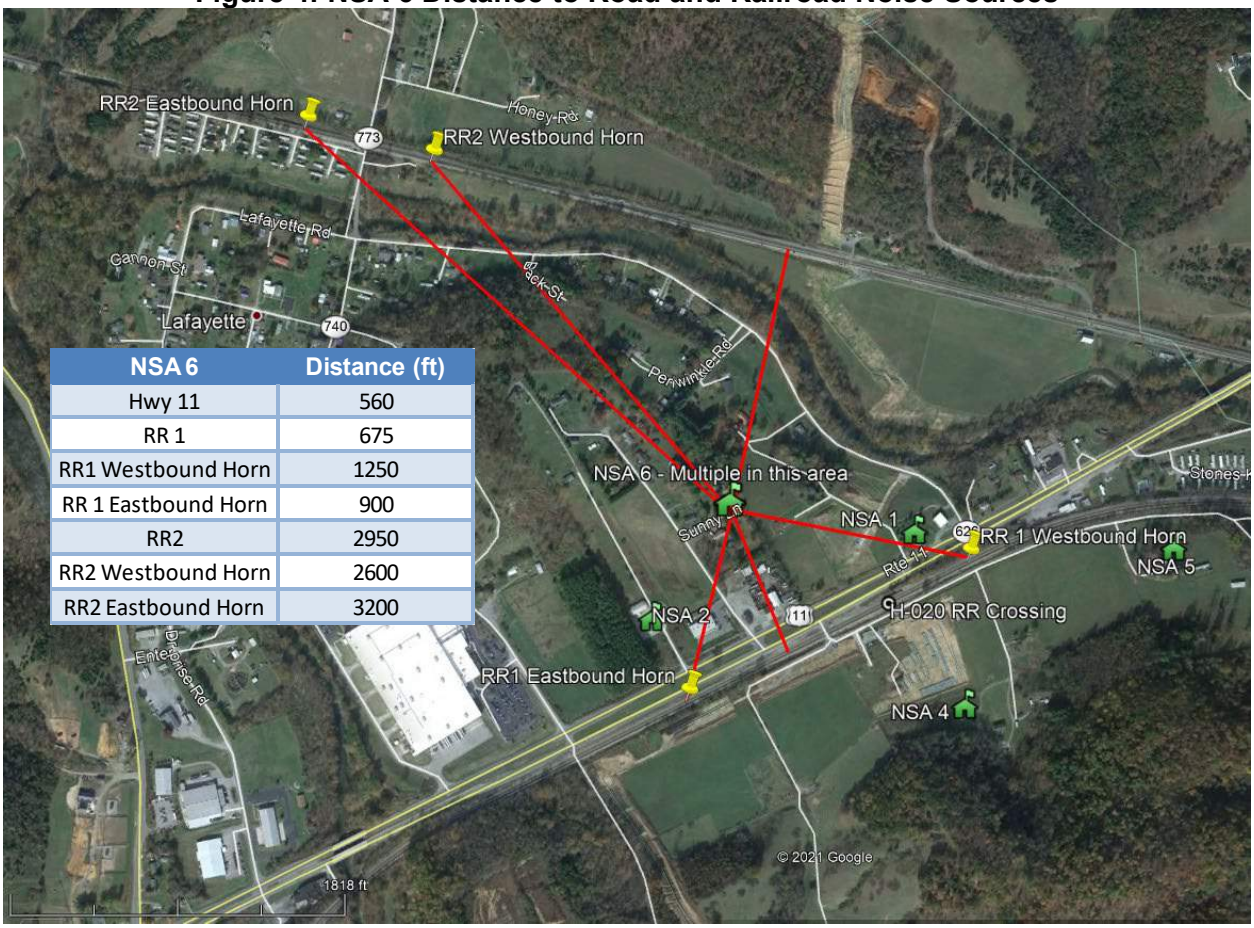
NSA 1	Distance (ft)
Hwy 11	100
RR 1	250
RR1 Westbound Horn	300
RR 1 Eastbound Horn	1500
RR2	1380
RR2 Westbound Horn	3300
RR2 Eastbound Horn	3900

Figure 3: NSA 4 Distance to Road and Railroad Noise Sources



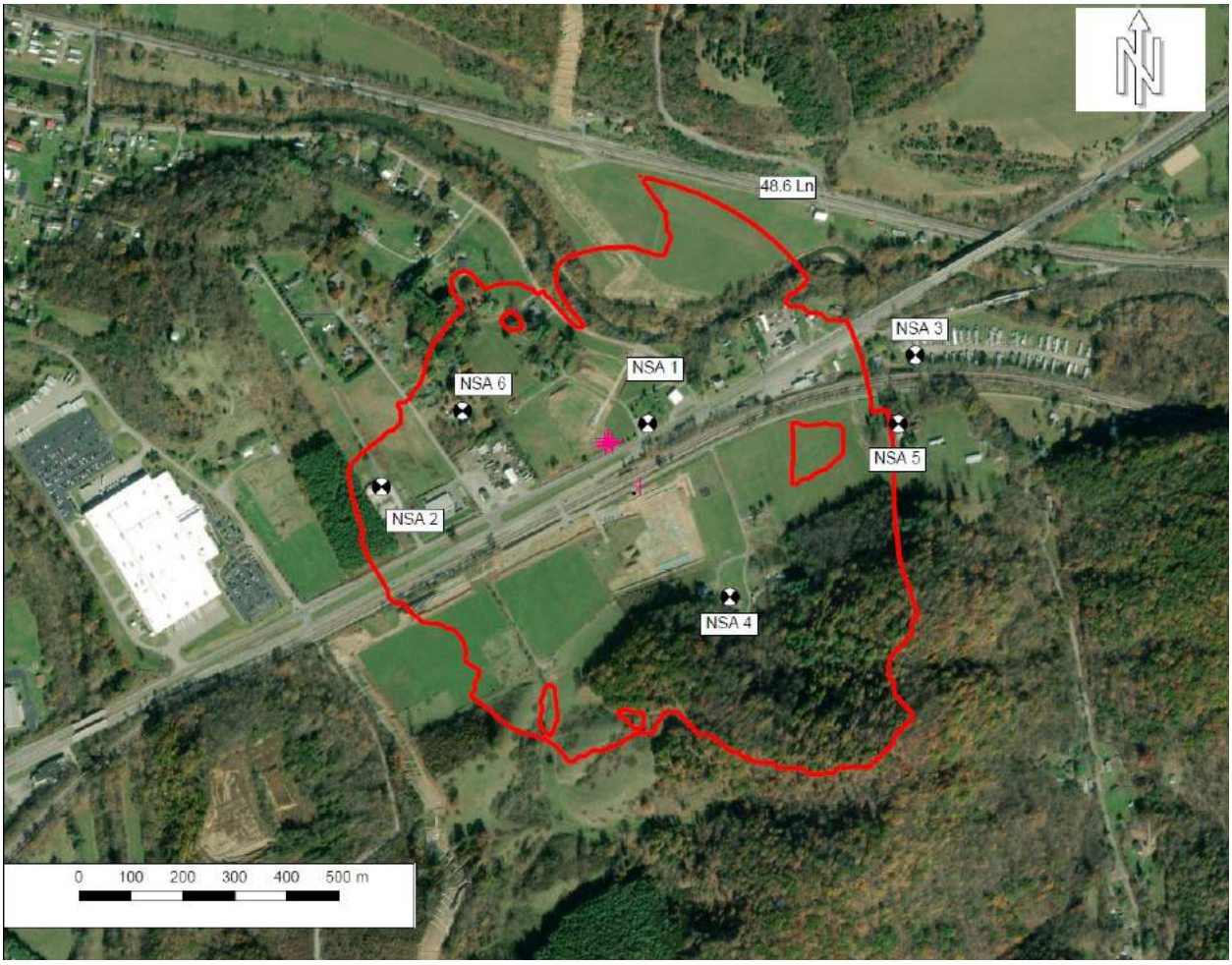
NSA 4	Distance (ft)
Hwy 11	980
RR 1	700
RR1 Westbound Horn	830
RR 1 Eastbound Horn	1500
RR2	2200
RR2 Westbound Horn	4100
RR2 Eastbound Horn	4800

Figure 4: NSA 6 Distance to Road and Railroad Noise Sources



NSA 6	Distance (ft)
Hwy 11	560
RR 1	675
RR1 Westbound Horn	1250
RR 1 Eastbound Horn	900
RR2	2950
RR2 Westbound Horn	2600
RR2 Eastbound Horn	3200

Figure 5: Predicted Unmitigated 48.6 dBA L_n Contour for the H-020 Railroad Crossing



Appendix A:
Background Sound Level Calculation

DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	H-020-NSA 1
Record Date	03/03/2021
User's Name	Joy Rathod

Road # 1 Name:	**US Highway 11**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	100	100	100
Distance to Stop Sign			
Average Speed	55	55	55
Average Daily Trips (ADT)	1123	24	24
Night Fraction of ADT	100	100	100
Road Gradient (%)			2
Vehicle DNL	60	53	61
Calculate Road #1 DNL	64	Reset	

Railroad #1 Track Identifier: **Norfolk Southern Train Line 1 (RR1)**

Rail # 1

Train Type	Electric ☐	Diesel ☑
Effective Distance		250
Average Train Speed		50
Engines per Train		1
Railway cars per Train		40
Average Train Operations (ATO)		15
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑

Train DNL	0	62
Calculate Rail #1 DNL	62	Reset

Railroad #2 Track Identifier:	**RR1 Cove Hollow Road Crossing Westbound Horn nois**

Rail # 2

Train Type	**Electric** ☐	**Diesel** ☑
Effective Distance		300
Average Train Speed		50
Engines per Train		1
Railway cars per Train		0
Average Train Operations (ATO)		7
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☑ No: ☐
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Train DNL	0	66
Calculate Rail #2 DNL	66	Reset

Railroad #3 Track Identifier:	**RR1 Cove Hollow Road Crossing Eastbound Horn nois**

Rail # 3

Train Type	**Electric** ☐	**Diesel** ☑
Effective Distance		1500

Average Train Speed		50
Engines per Train		1
Railway cars per Train		0
Average Train Operations (ATO)		7
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☑ No: ☐
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Train DNL	0	56
Calculate Rail #3 DNL	56	Reset

Railroad #4 Track Identifier:	**Norfolk Southern Train Line 2 (RR2)**

Rail # 4

Train Type	**Electric** ☐	**Diesel** ☑
Effective Distance		1380
Average Train Speed		40
Engines per Train		1
Railway cars per Train		40
Average Train Operations (ATO)		8
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑

Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Train DNL	0	49
Calculate Rail #4 DNL	49	Reset

Railroad #5 Track Identifier:	**RR2 Cannery Road Crossing Westbound Horn Noise**

Rail # 5

Train Type	**Electric** ☐	**Diesel** ☑
Effective Distance		3300
Average Train Speed		40
Engines per Train		1
Railway cars per Train		0
Average Train Operations (ATO)		4
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☑ No: ☐
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Train DNL	0	49
Calculate Rail #5 DNL	49	Reset

Railroad #6 Track Identifier:	**RR2 Cannery Road Crossing Eastbound Horn Noise**

Rail # 6

Train Type	**Electric** ☐	**Diesel** ☑
Effective Distance		3900

Average Train Speed		40
Engines per Train		1
Railway cars per Train		0
Average Train Operations (ATO)		4
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☑ No: ☐
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Train DNL	0	48
Calculate Rail #6 DNL	48	Reset

Add Road Source | Add Rail Source

Airport Noise Level	0
Loud Impulse Sounds?	○**Yes** ◉**No**
Combined DNL for all Road and Rail sources	**69**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate | Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
    - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
    - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
    - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
    - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
    - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	H-020-NSA 4
Record Date	03/03/2021
User's Name	Joy Rathod

Road # 1 Name:	**VA626/11**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	980	980	980
Distance to Stop Sign			
Average Speed	55	55	55
Average Daily Trips (ADT)	1123	24	24
Night Fraction of ADT	100	100	100
Road Gradient (%)			2
Vehicle DNL	45	38	46
Calculate Road #1 DNL	49	Reset	

Railroad #1 Track Identifier: **Norfolk Southern Train line 1**

Rail # 1

Train Type	Electric ☐	Diesel ☑
Effective Distance		700
Average Train Speed		50
Engines per Train		1
Railway cars per Train		40
Average Train Operations (ATO)		15
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑

Train DNL	0	56
Calculate Rail #1 DNL	56	Reset

Railroad #2 Track Identifier:	**Cove Hollow Road Westbound Horn Noise**

Rail # 2

Train Type	**Electric** ☐	**Diesel** ☑
Effective Distance		830
Average Train Speed		50
Engines per Train		1
Railway cars per Train		0
Average Train Operations (ATO)		7
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☑ No: ☐
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Train DNL	0	63
Calculate Rail #2 DNL	63	Reset

Railroad #3 Track Identifier:	**Cove Hollow Road Eastbound Horn Noise**

Rail # 3

Train Type	**Electric** ☐	**Diesel** ☑
Effective Distance		1500

Average Train Speed		50
Engines per Train		1
Railway cars per Train		0
Average Train Operations (ATO)		7
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☑ No: ☐
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Train DNL	0	56
Calculate Rail #3 DNL	56	Reset

Railroad #4 Track Identifier:	**Norfolk southern Train line 2**

Rail # 4

Train Type	**Electric** ☐	**Diesel** ☑
Effective Distance		2200
Average Train Speed		40
Engines per Train		1
Railway cars per Train		40
Average Train Operations (ATO)		8
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑

Bolted Tracks?	Yes: ☐ No: ☐		Yes: ☐ No: ☑
Train DNL	0		41
Calculate Rail #4 DNL	41		Reset

Railroad #5 Track Identifier:	**Cannery Road Crossing Eastbound Horn noise**

Rail # 5

Train Type	**Electric** ☐	**Diesel** ☑
Effective Distance		4800
Average Train Speed		40
Engines per Train		1
Railway cars per Train		0
Average Train Operations (ATO)		4
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☑ No: ☐
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Train DNL	0	47
Calculate Rail #5 DNL	47	Reset

Railroad #6 Track Identifier:	**Cannery Road Crossing Westbound Horn noise**

Rail # 6

Train Type	**Electric** ☐	**Diesel** ☑
Effective Distance		4100

Average Train Speed		40
Engines per Train		1
Railway cars per Train		0
Average Train Operations (ATO)		4
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☑ No: ☐
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Train DNL	0	48
Calculate Rail #6 DNL	48	Reset

Add Road Source | Add Rail Source

Airport Noise Level	0
Loud Impulse Sounds?	○**Yes** ◉**No**
Combined DNL for all Road and Rail sources	**64**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate | Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
    - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
    - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
    - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
    - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
    - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	H-020-NSA 6
Record Date	03/03/2021
User's Name	Joy Rathod

Road # 1 Name:	**US Highway 11**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	560	560	560
Distance to Stop Sign			
Average Speed	55	55	55
Average Daily Trips (ADT)	1123	24	24
Night Fraction of ADT	100	100	100
Road Gradient (%)			2
Vehicle DNL	48	41	48
Calculate Road #1 DNL	52	Reset	

Railroad #1 Track Identifier: **Norfolk Southern Train line 1 (RR1)**

Rail # 1

Train Type	Electric ☐	Diesel ☑
Effective Distance		675
Average Train Speed		50
Engines per Train		1
Railway cars per Train		40
Average Train Operations (ATO)		15
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑

Train DNL	0	56
Calculate Rail #1 DNL	56	Reset

Railroad #2 Track Identifier:	**RR1 Cove Hollow Road Crossing Westbound Horn Noi**

Rail # 2

Train Type	**Electric** ☐	**Diesel** ☑
Effective Distance		1250
Average Train Speed		50
Engines per Train		1
Railway cars per Train		0
Average Train Operations (ATO)		7
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☑ No: ☐
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Train DNL	0	57
Calculate Rail #2 DNL	57	Reset

Railroad #3 Track Identifier:	**RR1 Cove Hollow Road Crossing Eastbound Horn Nois**

Rail # 3

Train Type	**Electric** ☐	**Diesel** ☑
Effective Distance		900

Average Train Speed		50
Engines per Train		1
Railway cars per Train		0
Average Train Operations (ATO)		7
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☑ No: ☐
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Train DNL	0	59
Calculate Rail #3 DNL	59	Reset

Railroad #4 Track Identifier:	**Norfolk Southern Train line 2 (RR2)**

Rail # 4

Train Type	**Electric** ☐	**Diesel** ☑
Effective Distance		2950
Average Train Speed		35
Engines per Train		1
Railway cars per Train		40
Average Train Operations (ATO)		8
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑

Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Train DNL	0	44
Calculate Rail #4 DNL	44	Reset

Railroad #5 Track Identifier:	**(RR2) Cannery Road Crossing Eastbound Horn noise**

Rail # 5

Train Type	**Electric** ☐	**Diesel** ☑
Effective Distance		3200
Average Train Speed		35
Engines per Train		1
Railway cars per Train		0
Average Train Operations (ATO)		4
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☑ No: ☐
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Train DNL	0	50
Calculate Rail #5 DNL	50	Reset

Railroad #6 Track Identifier:	**(RR2) Cannery Road Crossing Westbound Horn noise**

Rail # 6

Train Type	**Electric** ☐	**Diesel** ☑
Effective Distance		2600

Average Train Speed		35
Engines per Train		1
Railway cars per Train		0
Average Train Operations (ATO)		4
Night Fraction of ATO		100
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☑ No: ☐
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Train DNL	0	51
Calculate Rail #6 DNL	51	Reset

Add Road Source | Add Rail Source

Airport Noise Level	0
Loud Impulse Sounds?	○**Yes** ◉**No**
Combined DNL for all Road and Rail sources	**63**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate | Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
    - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
    - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
    - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
    - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
    - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Virginia Department of Transportation
Traffic Engineering Division
2019
Annual Average Daily Traffic Volume Estimates By Section of Route
Montgomery Maintenance Area

Route	Jurisdiction	Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW
Bus 11 460 E Main St	Town of Christiansburg	0.12	**7100**	**G**	98%	0%	1%	0%	1%	0%	F	0.091	F	0.542	7700	G
From: Bus US 460 S Franklin St To: Roanoke St																
Bus 11 460 Roanoke St	Town of Christiansburg	0.11	**11000**	**G**	98%	0%	1%	0%	1%	0%	F	0.098	F	0.57	12000	G
From: E Main St To: First St SE																
Bus 11 460 Roanoke St	Town of Christiansburg	0.98	**12000**	**G**	98%	0%	1%	0%	1%	0%	F	0.103	F	0.577	13000	G
From: SR 111 Depot St To:																
Bus 11 460 Roanoke St	Town of Christiansburg	0.86	**16000**	**G**	98%	0%	1%	1%	0%	0%	C	0.104	F	0.602	17000	G
From: US 460 To:																
11 Roanoke St	Town of Christiansburg (Maint: 60)	1.15	**16000**	**G**	96%	0%	1%	1%	1%	0%	C	0.095	F	0.528	18000	G
From: I-81 To:																
11 460 Roanoke St	Town of Christiansburg (Maint: 60)	0.09	**9500**	**N**	96%	0%	1%	1%	2%	0%	N	0.1	F	0.558	10000	N
From: Tower Rd, Hampton Rd To:																
11 460 Roanoke St	Town of Christiansburg	2.01	**9500**	**G**	96%	0%	1%	1%	2%	0%	F	0.1	F	0.558	10000	G
From: ECL Christiansburg To:																
11 460 Roanoke Rd	Montgomery County	5.11	**7000**	**G**	96%	0%	1%	1%	2%	0%	F	0.1	F	0.521	7400	G
From: 60-753 Old Town Rd To:																
11 460 Roanoke Rd	Montgomery County	3.21	**7600**	**G**	96%	0%	1%	1%	2%	0%	F	0.101	F	0.626	8000	G
From: 60-631 Brake Rd To:																
11 460 Roanoke Rd	Montgomery County	2.43	**7800**	**G**	96%	0%	1%	1%	2%	0%	C	0.115	F	0.618	8300	G
To: Roanoke County Line																
From: US 11 FROM RT 460 TO 81 SOUTH & PARK																
11 Ramp	Town of Christiansburg (Maint: 60)	0.10	**2800**	**G**								0.108	F		2800	G
From: US 11- 120C TO PARKWAY DRIVE To:																
11 Ramp	Town of Christiansburg (Maint: 60)	0.18	**1300**	**G**								0.112	F		1300	G
To: US 460-E124A FROM RT 11 AND PARKWAY DRIV																
From: Ramp from US 460 East																
11 Ramp	Town of Christiansburg (Maint: 60)	0.15	**5700**	**G**								0.140	F		6200	G
To: I-81 South Collector Rd																
From: US 11- 120A TO PARKWAY DRIVE																
11 Ramp	Town of Christiansburg (Maint: 60)	0.13	**1500**	**G**								0.137	F		1500	G
To: US 460 FROM RT 11																
From: US 11, Bus US 460 Roanoke St																
11 Ramp	Town of Christiansburg (Maint: 60)	0.13	**7500**	**G**								0.101	F		7500	G
To: US 460 East																
From: US 11 TO ROUTE RT 81 SOUTH																
North 11 Ramp	Town of Christiansburg (Maint: 60)	0.15	**1200**	**G**								0.097	F		1200	G
To: I-81-S118X FROM RT 11 NORTH																

U. S. DOT CROSSING INVENTORY FORM

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION

OMB No. 2130-0017

Instructions for the initial reporting of the following types of new or previously unreported crossings: For public highway-rail grade crossings, complete the entire inventory Form. For private highway-rail grade crossings, complete the Header, Parts I and II, and the Submission Information section. For public pathway grade crossings (including pedestrian station grade crossings), complete the Header, Parts I and II, and the Submission Information section. For Private pathway grade crossings, complete the Header, Parts I and II, and the Submission Information section. For grade-separated highway-rail or pathway crossings (including pedestrian station crossings), complete the Header, Part I, and the Submission Information section. For changes to existing data, complete the Header, Part I Items 1-3, and the Submission Information section, in addition to the updated data fields. Note: For private crossings only, Part I Item 20 and Part III Item 2.K. are required unless otherwise noted. An asterisk * denotes an optional field.

A. Revision Date (MM/DD/YYYY)	B. Reporting Agency	C. Reason for Update (Select only one)	D. DOT Crossing Inventory Number
07 / 18 / 2020	☒ Railroad ☐ Transit ☐ State ☐ Other	☒ Change in Data ☐ New Crossing ☐ Closed ☐ No Train Traffic ☐ Quiet Zone Update ☐ Re-Open ☐ Date Change Only ☐ Change in Primary Operating RR ☐ Admin. Correction	469404U

Part I: Location and Classification Information

1. Primary Operating Railroad	2. State	3. County
Norfolk Southern Railway Company [NS]	VIRGINIA	MONTGOMERY

4. City / Municipality	5. Street/Road Name & Block Number	6. Highway Type & No.
☒ In ☐ Near ELLISTON	COVE HOLLOW ROAD (Street/Road Name) | * (Block Number)	SR 603

7. Do Other Railroads Operate a Separate Track at Crossing?	8. Do Other Railroads Operate Over Your Track at Crossing?
☐ Yes ☒ No If Yes, Specify RR	☐ Yes ☒ No If Yes, Specify RR

9. Railroad Division or Region	10. Railroad Subdivision or District	11. Branch or Line Name	12. RR Milepost
☐ None POCAHONTAS	☐ None BLUE RIDGE	☒ None	N | 0275.170 | (prefix) | (nnnn.nnn) | (suffix)

13. Line Segment *	14. Nearest RR Timetable Station *	15. Parent RR (if applicable)	16. Crossing Owner (if applicable)
N	ELLISTON	☒ N/A	☒ N/A

17. Crossing Type	18. Crossing Purpose	19. Crossing Position	20. Public Access (if Private Crossing)	21. Type of Train	22. Average Passenger Train Count Per Day
☒ Public ☐ Private	☒ Highway ☐ Pathway, Ped. ☐ Station, Ped.	☒ At Grade ☐ RR Under ☐ RR Over	☐ Yes ☐ No	☒ Freight ☐ Intercity Passenger ☐ Commuter ☐ Transit ☐ Shared Use Transit ☐ Tourist/Other	☐ Less Than One Per Day ☐ Number Per Day 0

23. Type of Land Use
☐ Open Space ☒ Farm ☐ Residential ☐ Commercial ☐ Industrial ☐ Institutional ☐ Recreational ☐ RR Yard

24. Is there an Adjacent Crossing with a Separate Number?	25. Quiet Zone (FRA provided)
☐ Yes ☒ No If Yes, Provide Crossing Number	☒ No ☐ 24 Hr ☐ Partial ☐ Chicago Excused Date Established

26. HSR Corridor ID	27. Latitude in decimal degrees	28. Longitude in decimal degrees	29. Lat/Long Source
☒ N/A	(WGS84 std: nn.nnnnnnn) 37.2307724	(WGS84 std: -nnn.nnnnnnn) -80.1996882	☒ Actual ☐ Estimated

30.A. Railroad Use *	31.A. State Use *
	54 FT S OF RT 11
30.B. Railroad Use *	**31.B. State Use ***
30.C. Railroad Use *	**31.C. State Use ***
30.D. Railroad Use *	**31.D. State Use ***
32.A. Narrative (Railroad Use) *	**32.B. Narrative** (State Use) *

33. Emergency Notification Telephone No. (posted)	34. Railroad Contact (Telephone No.)	35. State Contact (Telephone No.)
800-946-4744	800-946-4744	804-786-2822

Part II: Railroad Information

1. Estimated Number of Daily Train Movements

1.A. Total Day Thru Trains (6 AM to 6 PM)	1.B. Total Night Thru Trains (6 PM to 6 AM)	1.C. Total Switching Trains	1.D. Total Transit Trains	1.E. Check if Less Than One Movement Per Day ☐ How many trains per week?
20	15	3	0	

2. Year of Train Count Data (YYYY)	3. Speed of Train at Crossing
2017	3.A. Maximum Timetable Speed (mph) 50 3.B. Typical Speed Range Over Crossing (mph) From 40 to 50

4. Type and Count of Tracks
Main 2 Siding 0 Yard 0 Transit 0 Industry 0

5. Train Detection (Main Track only)
☒ Constant Warning Time ☐ Motion Detection ☐AFO ☐ PTC ☐ DC ☐ Other ☐ None

6. Is Track Signaled?	7.A. Event Recorder	7.B. Remote Health Monitoring
☒ Yes ☐ No	☒ Yes ☐ No	☐ Yes ☒ No

U. S. DOT CROSSING INVENTORY FORM

A. Revision Date *(MM/DD/YYYY)*	PAGE 2	D. Crossing Inventory Number *(7 char.)*
07/18/2020		469404U

Part III: Highway or Pathway Traffic Control Device Information

1. Are there Signs or Signals? ☒ Yes ☐ No

2. Types of Passive Traffic Control Devices associated with the Crossing

2.A. Crossbuck Assemblies *(count)*	2.B. STOP Signs *(R1-1)* *(count)*	2.C. YIELD Signs *(R1-2)* *(count)*	2.D. Advance Warning Signs *(Check all that apply; include count)* ☒ None
3	0		☐ W10-1 ____ ☐ W10-3 ____ ☐ W10-11 ____ ☐ W10-2 ____ ☐ W10-4 ____ ☐ W10-12 ____

2.E. Low Ground Clearance Sign *(W10-5)*	2.F. Pavement Markings	2.G. Channelization Devices/Medians	2.H. EXEMPT Sign *(R15-3)*	2.I. ENS Sign *(I-13)* Displayed
☐ Yes *(count_____)* ☒ No	☒ Stop Lines ☐ Dynamic Envelope ☒ RR Xing Symbols ☐ None	☐ All Approaches ☐ Median ☐ One Approach ☒ None	☐ Yes ☐ No	☒ Yes ☐ No

2.J. Other MUTCD Signs	2.K. Private Crossing Signs *(if private)*	2.L. LED Enhanced Signs *(List types)*
☒ Yes ☐ No Specify Type ____ Count 2 Specify Type ____ Count 0 Specify Type ____ Count ____	☐ Yes ☐ No	

3. Types of Train Activated Warning Devices at the Grade Crossing *(specify count of each device for all that apply)*

3.A. Gate Arms *(count)*	3.B. Gate Configuration	3.C. Cantilevered *(or Bridged)* Flashing Light Structures *(count)*	3.D. Mast Mounted Flashing Lights *(count of masts)* 3	3.E. Total Count of Flashing Light Pairs
Roadway 2 Pedestrian 0	☐ 2 Quad ☐ 3 Quad ☐ 4 Quad ☐ Full *(Barrier)* Resistance ☐ Median Gates	Over Traffic Lane 0 ☐ Incandescent Not Over Traffic Lane 0 ☐ LED	☒ Incandescent ☐ LED ☒ Back Lights Included ☐ Side Lights Included	6

3.F. Installation Date of Current Active Warning Devices: *(MM/YYYY)*	3.G. Wayside Horn	3.H. Highway Traffic Signals Controlling Crossing	3.I. Bells *(count)*
05 / 1976 ☐ Not Required	☐ Yes Installed on *(MM/YYYY)* ____/____ ☒ No	☐ Yes ☒ No	1

3.J. Non-Train Active Warning	3.K. Other Flashing Lights or Warning Devices
☐ Flagging/Flagman ☐ Manually Operated Signals ☐ Watchman ☐ Floodlighting ☒ None	Count 6 Specify type gate lights

4.A. Does nearby Hwy Intersection have Traffic Signals?	4.B. Hwy Traffic Signal Interconnection	4.C. Hwy Traffic Signal Preemption	5. Highway Traffic Pre-Signals	6. Highway Monitoring Devices *(Check all that apply)*
☐ Yes ☒ No	☒ Not Interconnected ☐ For Traffic Signals ☐ For Warning Signs	☐ Simultaneous ☐ Advance	☐ Yes ☒ No Storage Distance * 0 Stop Line Distance * 0	☐ Yes - Photo/Video Recording ☐ Yes – Vehicle Presence Detection ☒ None

Part IV: Physical Characteristics

1. Traffic Lanes Crossing Railroad	2. Is Roadway/Pathway Paved?	3. Does Track Run Down a Street?	4. Is Crossing Illuminated? *(Street lights within approx. 50 feet from nearest rail)*
☐ One-way Traffic ☐ Two-way Traffic ☐ Divided Traffic Number of Lanes 2	☒ Yes ☐ No	☐ Yes ☒ No	☐ Yes ☒ No

5. Crossing Surface *(on Main Track, multiple types allowed)* Installation Date * *(MM/YYYY)* ____/____ Width * ____ Length * ____
☐ 1 Timber ☐ 2 Asphalt ☒ 3 Asphalt and Timber ☐ 4 Concrete ☐ 5 Concrete and Rubber ☐ 6 Rubber ☐ 7 Metal
☐ 8 Unconsolidated ☐ 9 Composite ☐ 10 Other *(specify)* ____

6. Intersecting Roadway within 500 feet?	7. Smallest Crossing Angle	8. Is Commercial Power Available? *
☒ Yes ☐ No If Yes, Approximate Distance *(feet)* 75	☐ 0° – 29° ☐ 30° – 59° ☒ 60° - 90°	☒ Yes ☐ No

Part V: Public Highway Information

1. Highway System	2. Functional Classification of Road at Crossing	3. Is Crossing on State Highway System?	4. Highway Speed Limit
☐ (01) Interstate Highway System ☐ (02) Other Nat Hwy System (NHS) ☐ (03) Federal AID, Not NHS ☒ (08) Non-Federal Aid	☒ (0) Rural ☐ (1) Urban ☐ (1) Interstate ☐ (5) Major Collector ☐ (2) Other Freeways and Expressways ☐ (3) Other Principal Arterial ☐ (6) Minor Collector ☐ (4) Minor Arterial ☒ (7) Local	☒ Yes ☐ No	55 MPH ☒ Posted ☐ Statutory

5. Linear Referencing System *(LRS Route ID)* *

6. LRS Milepost *

7. Annual Average Daily Traffic *(AADT)*	8. Estimated Percent Trucks	9. Regularly Used by School Buses?	10. Emergency Services Route
Year 2012 AADT 000404	22 %	☒ Yes ☐ No Average Number per Day 8	☐ Yes ☐ No

Submission Information - *This information is used for administrative purposes and is not available on the public website.*

Submitted by ____ Organization ____ Phone ____ Date ____

U. S. DOT CROSSING INVENTORY FORM

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION

OMB No. 2130-0017

Instructions for the initial reporting of the following types of new or previously unreported crossings: For public highway-rail grade crossings, complete the entire inventory Form. For private highway-rail grade crossings, complete the Header, Parts I and II, and the Submission Information section. For public pathway grade crossings (including pedestrian station grade crossings), complete the Header, Parts I and II, and the Submission Information section. For Private pathway grade crossings, complete the Header, Parts I and II, and the Submission Information section. For grade-separated highway-rail or pathway crossings (including pedestrian station crossings), complete the Header, Part I, and the Submission Information section. For changes to existing data, complete the Header, Part I Items 1-3, and the Submission Information section, in addition to the updated data fields. Note: For private crossings only, Part I Item 20 and Part III Item 2.K. are required unless otherwise noted. An asterisk * denotes an optional field.

A. Revision Date (MM/DD/YYYY)	B. Reporting Agency	C. Reason for Update (Select only one)	D. DOT Crossing Inventory Number
08 / 21 / 2019	☒ Railroad ☐ Transit ☐ State ☐ Other	☒ Change in Data ☐ New Crossing ☐ Closed ☐ No Train Traffic ☐ Quiet Zone Update ☐ Re-Open ☐ Date Change Only ☐ Change in Primary Operating RR ☐ Admin. Correction	469485W

Part I: Location and Classification Information

1. Primary Operating Railroad	2. State	3. County
Norfolk Southern Railway Company [NS]	VIRGINIA	MONTGOMERY

4. City / Municipality	5. Street/Road Name & Block Number	6. Highway Type & No.
☐ In ☒ Near ELLISTON	CANNERY ROAD (Street/Road Name) | * (Block Number)	PRIVATE

7. Do Other Railroads Operate a Separate Track at Crossing?	8. Do Other Railroads Operate Over Your Track at Crossing?
☐ Yes ☒ No If Yes, Specify RR	☐ Yes ☒ No If Yes, Specify RR

9. Railroad Division or Region	10. Railroad Subdivision or District	11. Branch or Line Name	12. RR Milepost
☐ None POCAHONTAS	☐ None WHITETHORNE	☒ None	V | 0262.040 | (prefix) | (nnnn.nnn) | (suffix)

13. Line Segment *	14. Nearest RR Timetable Station *	15. Parent RR (if applicable)	16. Crossing Owner (if applicable)
	KUMIS	☒ N/A	☒ N/A

17. Crossing Type	18. Crossing Purpose	19. Crossing Position	20. Public Access (if Private Crossing)	21. Type of Train		22. Average Passenger Train Count Per Day
☐ Public ☒ Private	☒ Highway ☐ Pathway, Ped. ☐ Station, Ped.	☒ At Grade ☐ RR Under ☐ RR Over	☒ Yes ☐ No	☒ Freight ☐ Intercity Passenger ☐ Commuter	☐ Transit ☐ Shared Use Transit ☐ Tourist/Other	☐ Less Than One Per Day ☐ Number Per Day 0

23. Type of Land Use
☐ Open Space ☐ Farm ☒ Residential ☐ Commercial ☐ Industrial ☐ Institutional ☐ Recreational ☐ RR Yard

24. Is there an Adjacent Crossing with a Separate Number?	25. Quiet Zone (FRA provided)
☐ Yes ☒ No If Yes, Provide Crossing Number	☒ No ☐ 24 Hr ☐ Partial ☐ Chicago Excused Date Established

26. HSR Corridor ID	27. Latitude in decimal degrees	28. Longitude in decimal degrees	29. Lat/Long Source
☒ N/A	(WGS84 std: nn.nnnnnnn) 37.2380481	(WGS84 std: -nnn.nnnnnnn) -80.2082795	☒ Actual ☐ Estimated

30.A. Railroad Use *	31.A. State Use *
30.B. Railroad Use *	31.B. State Use *
30.C. Railroad Use *	31.C. State Use *
30.D. Railroad Use *	31.D. State Use *
32.A. Narrative (Railroad Use) *	32.B. Narrative (State Use) *

33. Emergency Notification Telephone No. (posted)	34. Railroad Contact (Telephone No.)	35. State Contact (Telephone No.)
800-946-4744	800-946-4744	804-786-2822

Part II: Railroad Information

1. Estimated Number of Daily Train Movements

1.A. Total Day Thru Trains (6 AM to 6 PM)	1.B. Total Night Thru Trains (6 PM to 6 AM)	1.C. Total Switching Trains	1.D. Total Transit Trains	1.E. Check if Less Than One Movement Per Day ☐ How many trains per week?
10	8	5	0	

2. Year of Train Count Data (YYYY)	3. Speed of Train at Crossing
2017	3.A. Maximum Timetable Speed (mph) 40 3.B. Typical Speed Range Over Crossing (mph) From 30 to 40

4. Type and Count of Tracks
Main 1 Siding 0 Yard 0 Transit 0 Industry 0

5. Train Detection (Main Track only)
☐ Constant Warning Time ☐ Motion Detection ☐AFO ☐ PTC ☐ DC ☐ Other ☒ None

6. Is Track Signaled?	7.A. Event Recorder	7.B. Remote Health Monitoring
☒ Yes ☐ No	☐ Yes ☒ No	☐ Yes ☒ No

U. S. DOT CROSSING INVENTORY FORM

A. Revision Date *(MM/DD/YYYY)*	PAGE 2	D. Crossing Inventory Number *(7 char.)*
08/21/2019		469485W

Part III: Highway or Pathway Traffic Control Device Information

1. Are there Signs or Signals? ☒ Yes ☐ No

2. Types of Passive Traffic Control Devices associated with the Crossing

2.A. Crossbuck Assemblies *(count)*	2.B. STOP Signs *(R1-1)* *(count)*	2.C. YIELD Signs *(R1-2)* *(count)*	2.D. Advance Warning Signs *(Check all that apply; include count)* ☐ None
0	2		☐ W10-1 _____ ☐ W10-3 _____ ☐ W10-11 _____ ☐ W10-2 _____ ☐ W10-4 _____ ☐ W10-12 _____

2.E. Low Ground Clearance Sign *(W10-5)*	2.F. Pavement Markings	2.G. Channelization Devices/Medians	2.H. EXEMPT Sign *(R15-3)*	2.I. ENS Sign *(I-13)* Displayed
☐ Yes *(count_____)* ☐ No	☒ Stop Lines ☐ Dynamic Envelope ☐ RR Xing Symbols ☐ None	☐ All Approaches ☐ Median ☐ One Approach ☐ None	☐ Yes ☐ No	☒ Yes ☐ No

2.J. Other MUTCD Signs ☐ Yes ☒ No	2.K. Private Crossing Signs *(if private)*	2.L. LED Enhanced Signs *(List types)*
Specify Type _____ Count _____ Specify Type _____ Count _____ Specify Type _____ Count _____	☒ Yes ☐ No	

3. Types of Train Activated Warning Devices at the Grade Crossing *(specify count of each device for all that apply)*

3.A. Gate Arms *(count)*	3.B. Gate Configuration	3.C. Cantilevered *(or Bridged)* Flashing Light Structures *(count)*	3.D. Mast Mounted Flashing Lights *(count of masts)* 0	3.E. Total Count of Flashing Light Pairs
Roadway 0 Pedestrian 0	☐ 2 Quad ☐ 3 Quad ☐ 4 Quad ☐ Full *(Barrier)* Resistance ☐ Median Gates	Over Traffic Lane 0 ☐ Incandescent Not Over Traffic Lane 0 ☐ LED	☐ Incandescent ☐ LED ☐ Back Lights Included ☐ Side Lights Included	0

3.F. Installation Date of Current Active Warning Devices: *(MM/YYYY)*	3.G. Wayside Horn	3.H. Highway Traffic Signals Controlling Crossing	3.I. Bells *(count)*
_____/_____ ☒ Not Required	☐ Yes Installed on *(MM/YYYY)* _____/_____ ☒ No	☐ Yes ☒ No	0

3.J. Non-Train Active Warning	3.K. Other Flashing Lights or Warning Devices
☐ Flagging/Flagman ☐ Manually Operated Signals ☐ Watchman ☐ Floodlighting ☒ None	Count 0 Specify type _____

4.A. Does nearby Hwy Intersection have Traffic Signals?	4.B. Hwy Traffic Signal Interconnection	4.C. Hwy Traffic Signal Preemption	5. Highway Traffic Pre-Signals	6. Highway Monitoring Devices *(Check all that apply)*
☐ Yes ☒ No	☒ Not Interconnected ☐ For Traffic Signals ☐ For Warning Signs	☐ Simultaneous ☐ Advance	☐ Yes ☒ No Storage Distance * 0 Stop Line Distance * 0	☐ Yes - Photo/Video Recording ☐ Yes – Vehicle Presence Detection ☒ None

Part IV: Physical Characteristics

1. Traffic Lanes Crossing Railroad	2. Is Roadway/Pathway Paved?	3. Does Track Run Down a Street?	4. Is Crossing Illuminated? *(Street lights within approx. 50 feet from nearest rail)*
☐ One-way Traffic ☐ Two-way Traffic ☐ Divided Traffic Number of Lanes _____	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

5. Crossing Surface *(on Main Track, multiple types allowed)* Installation Date * *(MM/YYYY)* _____/_____ Width * _____ Length * _____
☐ 1 Timber ☐ 2 Asphalt ☐ 3 Asphalt and Timber ☐ 4 Concrete ☐ 5 Concrete and Rubber ☐ 6 Rubber ☐ 7 Metal
☐ 8 Unconsolidated ☐ 9 Composite ☐ 10 Other *(specify)* _____

6. Intersecting Roadway within 500 feet?	7. Smallest Crossing Angle	8. Is Commercial Power Available? *
☐ Yes ☐ No If Yes, Approximate Distance *(feet)* _____	☐ 0° – 29° ☐ 30° – 59° ☐ 60° - 90°	☐ Yes ☐ No

Part V: Public Highway Information

1. Highway System	2. Functional Classification of Road at Crossing	3. Is Crossing on State Highway System?	4. Highway Speed Limit
☐ (01) Interstate Highway System ☐ (02) Other Nat Hwy System (NHS) ☐ (03) Federal AID, Not NHS ☐ (08) Non-Federal Aid	☐ (0) Rural ☐ (1) Urban ☐ (1) Interstate ☐ (5) Major Collector ☐ (2) Other Freeways and Expressways ☐ (3) Other Principal Arterial ☐ (6) Minor Collector ☐ (4) Minor Arterial ☐ (7) Local	☐ Yes ☐ No	_____ MPH ☐ Posted ☐ Statutory

5. Linear Referencing System *(LRS Route ID)* *

6. LRS Milepost *

7. Annual Average Daily Traffic *(AADT)*	8. Estimated Percent Trucks	9. Regularly Used by School Buses?	10. Emergency Services Route
Year 1970 AADT _____	_____ %	☐ Yes ☒ No Average Number per Day 0	☐ Yes ☐ No

Submission Information - *This information is used for administrative purposes and is not available on the public website.*

Submitted by _____ Organization _____ Phone _____ Date _____