I-80 Reconstruction – Ramp I Noise Analysis

(June 2019 Addendum to the *I-80 Reconstruction– Preliminary Noise Analysis report, July 2016*)

Executive Summary

The purpose of this noise analysis addendum report is to assess potential new noise impacts and evaluate possible noise mitigation options associated with a recent design change to the I-80 / US 209 interchange in Stroudsburg, Pennsylvania. Noise impacts and mitigation were originally evaluated in the I-80 Reconstruction– Preliminary Noise Analysis report, July 2016.

Ramp I conveys traffic from I-80 westbound to US 209 southbound in Stroudsburg, Pennsylvania. Previously, the ramp was designed on the south side of Pocono Creek (*I-80 Reconstruction– Preliminary Noise Analysis report, July 2016*). Due to a variety of reasons (primarily related to constructability), the ramp needed to be pushed out to the north side of Pocono Creek. This design change is being incorporated into the Environmental Assessment as a refinement of the Preferred Alternative (Build Alternative 2D). The Area of Potential Impact (API) has been expanded to encompass the proposed Ramp I structure, a 50-foot buffer around the proposed Ramp I, and additional areas outside of the FEMA-mapped floodway and floodplain for temporary workspaces. The ramp will be elevated above the floodplain on a viaduct. Due to the presence of a residential area nearby, an updated noise analysis was completed.

Design Year (2045) No-Build noise levels increase by approximately 1 decibel (dBA) over the existing (2013) noise levels in the study area but will not exceed the Noise Abatement Criteria (NAC) at any receptor sites (representing 24 residences). Design Year (2045) Build condition noise levels for Alternative 2D are projected to increase between 4–8 dBA over existing (2013) noise levels as a result of widening and reconstruction of I-80 and the associated ramps. Noise levels are projected to exceed the NAC at five (5) receptor sites (M-02–M-06) which represent seven (7) residences.

The following discussions detail the noise analysis methodology and results for each new (2019 Addendum) Noise Study Area (NSA) under the Preferred Alternative (Build Alternative 2D), and present noise mitigation options where warranted. Based on the noise modeling results under the Preferred Alternative, it has been determined that, within these limits of this study, noise abatement is warranted, feasible (i.e. capable of reducing Design Year noise levels by at least five (5) dBA), and reasonable (cost-effective) for one NSA under one scenario. The details of the proposed mitigation measures are contained within this addendum report. The 2016 Preliminary Noise Analysis report did not include or evaluate noise impacts to the residential areas contained in NSA P and NSA Q. The NSAs analyzed in the 2016 preliminary noise report are not impacted by the proposed Ramp I alignment shift.

Methodology

The methodologies applied to this noise analysis are in accordance with the Pennsylvania Department of Transportation (PennDOT) "Project Level Highway Traffic Noise Handbook" Publication No. 24, May 2019. PennDOT guidelines are based upon the latest provisions contained in Title 23 of the Code of Federal Regulations Part 772 (23 CFR 772), Procedures for Abatement of Highway Traffic Noise and Construction Noise. In accordance with 23 CFR 772, the project is defined as a Type I project and the results of the Ramp I noise analysis are included in the following sections of this addendum report.

Noise Modeling Methodology and Existing Conditions Computer modeling is the accepted technique for predicting existing and Design Year noise levels associated with traffic-induced noise. Currently, the Federal Highway Administration (FHWA) Traffic Noise Model (TNM) 2.5 computer-modeling program is the FHWA-approved highway noise prediction model. The TNM has been established as a reliable tool for representing noise generated by highway traffic. The information applied to the modeling effort includes the following: highway design files (existing, as-built, and proposed design), traffic data, 3-D cut/fill lines and surveying of terrain. Base mapping and field views were used to identify Activity Category noise-sensitive land uses within the corridor.

Industry procedures allow a previously calibrated model to be utilized in this analysis. This Ramp I noise analysis utilized the final TNM run from the previously performed preliminary noise analysis. As a note, the alignment of I-80 has shifted slightly from the original alignment used in the preliminary noise analysis. This alignment shift was updated in the model used for this Ramp I noise analysis.

Traffic Data

The traffic and vehicle composition used in the preliminary analysis was also utilized for this Ramp I noise analysis. Speeds on I-80 (both eastbound and westbound) were 55 miles per hour (mph) for the middle and left lanes, and 50 mph for the right lane. Ramp speeds varied between 25 and 45 mph. The traffic and vehicle composition is shown in **Table 1**.

Table 1: Worst Case 2045 Hourly Traffic Volumes and Vehicle Composition (loudest noise hour)

Build Alternative 2D (2045)				
Description	**Cars**	**Medium Trucks**	**Heavy Trucks**	**Total**
I-80 EB	2,217	462	378	3,057
I-80 WB	2,961	570	531	4,062
Ramp E (US 209 NB to I-80 WB)	183	38	30	251
Ramp F (I-80 EB to US 209 SB)	69	14	12	95
Ramp G (I-80 EB to Bus 209)	225	47	39	311
Ramp H (Bus 209 to I-80 WB)	262	51	47	360
Ramp I (I-80 WB to US 209 SB)	1,455	281	262	1,998
Ramp K (Bus 209 to I-80 EB)	128	27	22	177
Ramp L (US 209 NB to Bus 209)	328	68	56	452

Note: 2045 build traffic data from the 2016 preliminary noise analysis was utilized for this analysis

Analysis

NSA P

Noise Study Area P (NSA P) is located north of I-80 and the proposed Ramp I, along Flagler Street, Fritz Avenue, Fairview Avenue, and a portion of Rosemond Avenue. NSA P is composed of 15 modeling sites (M-01–M-15). The locations of these receptor sites can be seen in **Figure 1**. NSA P primarily contains residential homes, but also includes two commercial buildings (a collision service shop and dentist office) along Fairview Avenue. Existing (2013) noise levels within NSA P range from 51-61 dBA. Future (2045) No-Build noise levels are predicted to range from 52–62 dBA. Future (2045) Build noise levels are predicted to range from 57–68 dBA. As expected, noise levels are highest at receivers in closest proximity to I-80.

NSA Q

Noise Study Area Q (NSA Q) is located north of I-80 and the proposed Ramp I, along Columbus Avenue. NSA Q is composed of three modeling sites (M-16–M-18). The locations of these receptor sites can be seen in **Figure 1**. NSA Q contains residential homes. Existing (2013) noise levels within NSA Q range from 56–57 dBA. Future (2045) No-Build noise levels are predicted to range from 56–58 dBA. Future (2045) Build noise levels are predicted to range from 60–62 dBA. As expected, noise levels are highest at receivers in closest proximity to I-80.

Noise Abatement Evaluation and Mitigation

NSA P – Multiple barrier scenarios were modeled to provide attenuation to the residential community along Fritz Avenue and Flagler Street. The nature of the terrain in this area is unique due to the Pocono Creek being located between the community and I-80. Pocono Creek is approximately 48' below the community and 22' below I-80. The community is situated approximately 26' above I-80 with no intervening terrain to shield the community from highway traffic noise. For all four scenarios, a single continuous post-and-panel noise barrier was modeled for NSA P under the Preferred Alternative 2D. Moving from west to east, the barrier was modeled in various locations. **Figure1** displays the location and limits of the preliminary noise barriers.

NSA Q – This residential community is situated further from I-80 and was studied to determine if it was impacted by highway traffic noise. Analysis shows that NSA Q is not impacted by highway traffic noise; therefore a noise barrier analysis was not warranted.

See **Table 2** for sound level results.

- Scenario 1: Barrier on Ramp H

In this scenario, a barrier 1,367' in length and an average 29' in height was modeled along proposed Ramp H. The noise wall was 39,902 square feet. Seven (7) receptors (representing nine (9) residences) were benefited by this noise barrier by reducing noise levels by at least five (5) dBA. The barrier does provide a minimum of five (5) dBA reduction at nine (9) of the impacted residences; however, the preliminary barrier for NSA P has a maximum square foot per benefited residence value of 4,433, which would far exceed PennDOT's maximum square foot per benefited residence value of 2,000. Considering this factor, the noise barrier in this scenario is not reasonable at this time.

- Scenario 2: Barrier on Ramp I

In this scenario, a barrier 1,040' in length and 10' in height was mounted to the parapet wall (for an effective height of 13.5') and was modeled along proposed Ramp I. Ramp I is on a bridge structure and elevated approximately 40' above the community. This elevation difference is the main reason that an effective barrier cannot be designed. The noise wall was 10,040 square feet. No residences were significantly benefited by this noise barrier; therefore, it was dropped from further consideration. This noise barrier is not feasible.

- Scenario 3: Barrier on both Ramp H and along Property Lines

Barriers were modeled along both Ramp H and the Flagler Street/Fritz Avenue residences' property lines. The proposed barrier along Ramp H was 967' in length with an average height of 25'. The noise wall was 24,001 square feet. The property line barrier was 900' in length with an average height of 12'. This noise wall was 10,419 square feet. The combination of these two walls results in a total length of 1,867' and a

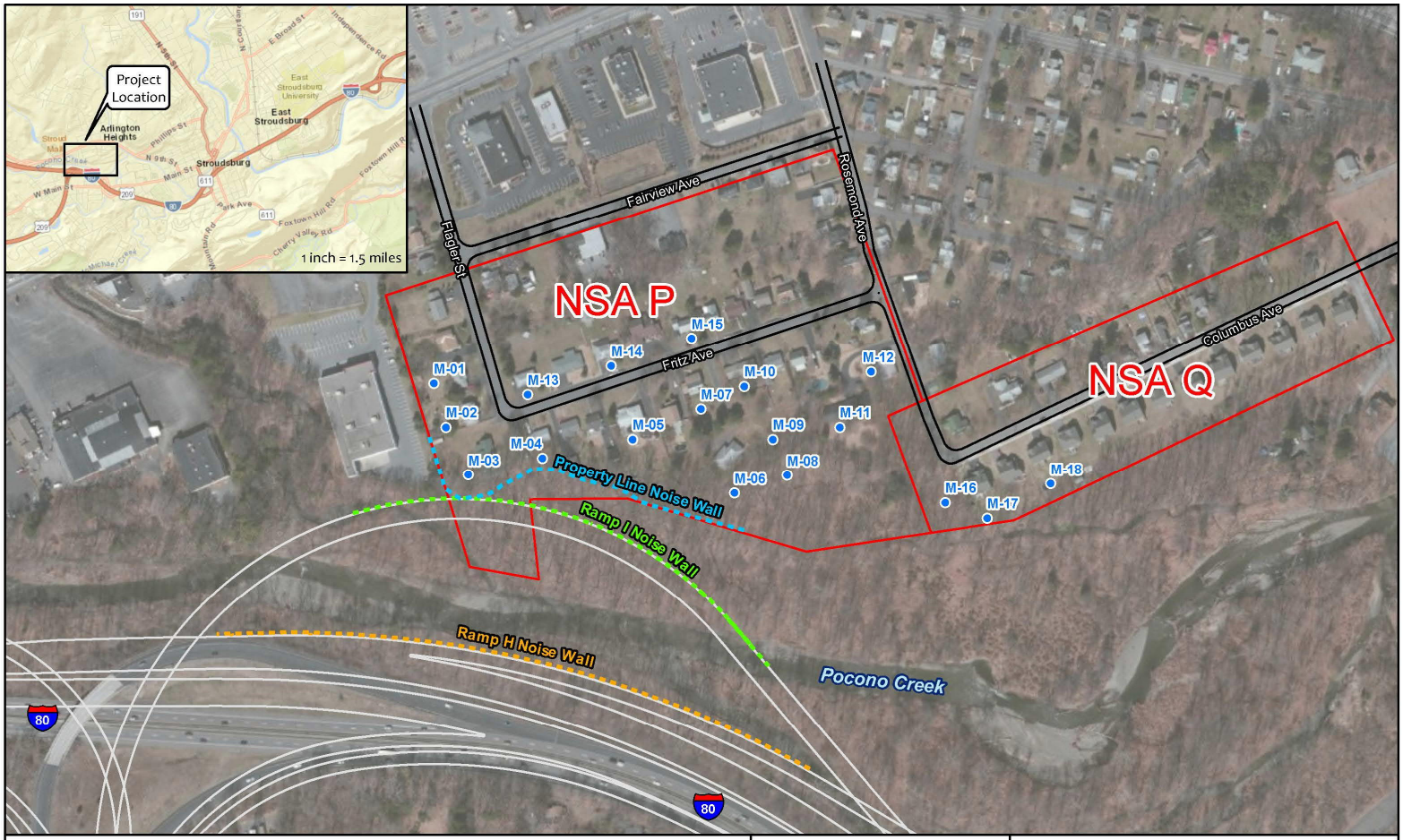
total square footage of 34,420. This barrier scenario benefits six (6) receptors (representing eight (8) residences) by reducing noise levels by at least five (5) dBA. The square foot per benefited residence is 4,303, which would exceed PennDOT's maximum square foot per benefited residence value of 2,000. Considering this factor, the noise barrier in this scenario is not reasonable at this time.

- Scenario 4: Barrier along Property Lines

In this scenario, a barrier 860' in length ranging 10'–24' in height (with an average height of 16') was modeled at the end of the residential property lines (with the exception of the property represented by receptor M-03, where due to the terrain drop off to Pocono Creek, the property is reduced by approximately half). The noise wall was 13,927 square feet. Five (5) receptors (representing seven (7) residences) were benefited by this noise barrier by reducing noise levels by at least five (5) dBA. The total square foot per residence was 1,990. Due to the terrain, the barrier had to be significantly higher in one area to provide adequate attenuation. This wall ultimately provided adequate attenuation to the impacted residences and is warranted, feasible, and reasonable. This scenario should be re-evaluated during the Final Design phase of the I-80 Reconstruction project.

Conclusion

The results of the preliminary Ramp I noise analysis indicate that Design Year (2045) noise levels are anticipated to exceed the FHWA/PennDOT Noise Abatement Criteria at five (5) of the noise-sensitive receptor sites (representing seven (7) residences) in the project area under the Preferred Alternative (Build Alternative 2D). The results indicate that noise mitigation is not warranted for NSA Q, but is warranted for NSA P. A noise barrier mitigation evaluation of four scenarios concluded that three of the scenarios (Scenario 1, Scenario 3, and Scenario 4) provide adequate noise abatement to NSA P and are feasible (Scenario 2 did not provide the required 5 dBA reduction and is not considered feasible). However, two of the three feasible scenarios (Scenario 1 and Scenario 3) do not meet the reasonableness criteria under PennDOT's Reasonableness Criteria for Noise Abatement Devices. Scenario 4 (a barrier along the residential property lines) does meet the criteria for feasibility and reasonableness, as per FHWA and PennDOT procedures. **Table 2** provides the noise impact summary information for all barrier scenarios considered in the analysis. **Table 3** presents the noise barrier feasibility and reasonableness summary information for all evaluated barrier scenarios. A detailed noise analysis will be conducted and final recommendations on the construction of any noise abatement measures will be determined during the Final Design phase of the I-80 Reconstruction project.



I-80 Reconstruction - Ramp I Relocation Study Addendum Noise Report

Figure 1:
Receptor/NSA Locations and Noise Barrier Options

Stroudsburg, PA

Table 2: Sound Level Results

NSA	Receptor Site	Site Representation	Existing Noise Level (2013)	Future No-Build Noise Level (2045)	Future Build Noise Level (2045)	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
						Mitigated Noise Level	Insertion Loss	Mitigated Noise Level	Insertion Loss	Mitigated Noise Level	Insertion Loss	Mitigated Noise Level	Insertion Loss
P	M-01	1 Residence	57	57	62	57	6	62	1	60	2	62	1
	M-02	1 Residence	59	59	66	61	5	66	1	59	7	61	5
	M-03	1 Residence	61	62	68	63	6	68	0	60	8	63	5
	M-04	2 Residences	60	60	67	61	6	67	1	60	7	60	7
	M-05	2 Residences	58	59	66	61	5	66	1	61	5	61	5
	M-06	1 Residence	59	60	66	62	5	66	1	61	5	61	5
	M-07	1 Residence	56	56	64	58	6	64	0	58	6	61	3
	M-08	1 Residence	59	59	65	60	4	64	1	60	4	63	1
	M-09	1 Residence	57	57	64	60	4	63	1	60	4	63	1
	M-10	2 Residences	55	56	62	59	4	62	0	59	3	60	1
	M-11	1 Residence	57	57	63	60	4	63	0	60	3	61	0
	M-12	1 Residence	54	55	60	58	2	60	0	58	2	60	0
	M-13	1 Residence	53	53	60	58	3	60	1	56	4	57	3
	M-14	2 Residences	51	52	57	55	2	56	2	55	2	55	1
	M-15	2 Residences	51	52	57	55	2	55	2	55	1	56	2
Q	M-16	1 Residence	57	58	62	60	3	62	0	60	2	61	0
	M-17	1 Residence	57	58	62	60	2	62	0	60	2	61	0
	M-18	2 Residences	56	56	60	58	2	60	0	58	2	59	0

All sound levels documented as one hour Leq (Leq(h)).
Decibels are rounded to the nearest whole number.

= Impacted receptor (receptors that approach or exceed the exterior residential area Noise Abatement Criteria)
= Barrier passes feasibility criteria of five (5) dBA reduction minimum
= Feasible/optimized barrier modeled

Table 3: Noise Barrier Feasibility and Reasonableness

Scenario	NSA	Number of Benefited Residences	Combined Noise Barrier Length	Feasible Noise Barrier Height	Square Footage	Total sf. per benefit (max 2,000 sf)	Feasible?	Reasonable?
1	**P**	9	1,367’	29’	39,902	4,433	Yes	No
	Q	*Barrier Not Warranted*						
2	**P***	0	N/A	N/A	N/A	N/A	No	No
	Q	*Barrier Not Warranted*						
3	**P**	8	1,867’	19’	34,420	4,303	Yes	No
	Q	*Barrier Not Warranted*						
4	**P**	7	860’	16’	13,927	1,990	Yes	Yes
	Q	*Barrier Not Warranted*						

* Barriers do not receive a minimum five (5) dBA decrease at the majority (50%) of impacted receptor sites.