FINAL REPORT

TRAFFIC NOISE TECHNICAL REPORT FULL DEPTH ROADWAY RECONSTRUCTION AND WIDENING OF THE PENNSYLVANIA TURNPIKE (I-76) FROM MILEPOST 316.6 TO 319.4.

Prepared for

Pennsylvania Turnpike Commission
P.O. Box 67676
Harrisburg, Pennsylvania 17106

Jessica Mahoney, INCE Member
Acoustics Specialist

Paul L. Burgé, INCE.Bd.Cert.
Principal Engineer, Acoustics and Noise Control

April 2024

AECOM

625 West Ridge Pike, Suite E-100
Conshohocken, PA 19428

May 2024

This page intentionally left blank

TABLE OF CONTENTS

Executive Summary **ES-1**

Section 1 Introduction and Project Description **1-1**

Project Description 1-1

Section 2 Noise Analysis Overview **2-1**

2.1 Regulatory Overview 2-1
2.1.1 Federal Regulations 2-1
2.1.2 FHWA Noise Abatement Criteria (NAC) 2-1
2.1.3 State Regulations and Policies 2-3
2.2 Defining Area of Potential Impact 2-4
2.3 Noise Measurement Procedures 2-4
2.4 Analysis Objectives 2-5
2.5 Selection of Noise Sensitive Receptors 2-6
2.6 Worst-Case Noise Conditions 2-6
2.7 Noise Abatement Requirements 2-7
2.8 Noise Modeling Methodology 2-7
2.9 Project Traffic Data 2-8

Section 3 Existing Noise Environment and Noise Sensitive Areas **3-1**

3.1 Existing Land Use and Zoning 3-1
3.1.1 Existing Land Uses 3-1
3.1.2 Noise Sensitive Areas 3-1
3.2 Existing Noise Levels 3-2
3.2.1 Noise Measurements 3-2
3.2.2 Noise Monitoring Equipment and Atmospheric Conditions 3-4
3.2.3 Noise Model Validation and Results 3-6
3.2.4 Observed Traffic Counts 3-7
3.2.5 Existing Noise Levels 3-7

Section 4 Future Noise Levels and Impacts **4-1**

4.1 Predicted noise levels and noise impacts 4-1
4.2 Predicted Impact Distance for Undeveloped Lands 4-3

Section 5 Noise Abatement Evaluation **5-1**

5.1 Noise Abatement Measures 5-1
5.2 Feasible and Reasonable Criteria and Requirements 5-1
5.3 Design Goal Requirements 5-1
5.4 Findings and Recommendations for Noise Abatement 5-2
5.5 Viewpoints of Benefitted Receptors 5-13

Section 6 Construction Noise Control & Community Coordination **6-1**

Section 7 Information for Local Government Officials **7-1**

TABLE OF CONTENTS

Section 8 Conclusions and Recommendations 8-1

Section 9 References 9-1

Tables

Table ES-1 Summary of Identified Noise Sensitive Areas (NSAs)
Table ES-2 Recommended Noise Abatement, by NSA
Table ES-3 Proposed Noise Abatement Recommendation Summary
Table ES-4 Noise Impact Distances for Undeveloped Lands
Table 2-1 FHWA Noise Abatement Criteria[1]
Table 3-1 Noise Sensitive Areas (NSAs)
Table 3-2 Short-Term Measurement Summary
Table 3-3 Long-Term Measurement Summary
Table 3-4 Measurement Weather Data
Table 3-5 TNM Validation Summary Table
Table 3-6 Predicted Existing Noise Levels
Table 4-1 Predicted Noise Levels and Impact Summary
Table 4-2 Noise Impact Distances for Undeveloped Land
Table 5-1 Summary of Barrier Analysis for Each NSA Location
Table 5-2 Barrier Analysis Summary-NSA17
Table 5-3 Barrier Analysis Summary-NSA18
Table 5-4 Barrier Analysis Summary-NSA19
Table 5-5 Barrier Analysis Summary-NSA20
Table 5-6 Barrier Analysis Summary-NSA21
Table 5-7 Barrier Analysis Summary-NSA23
Table 5-8 Barrier Analysis Summary-NSA24
Table 5-9 Barrier Analysis Summary-NSA25
Table 5-10 Barrier Analysis Summary-NSA26
Table 5-11 Recommended Noise Abatement Summary
Table D-1 Predicted Noise Level Data
Table D-2 Barrier Segment Information

Figures

Figure 1 Project Location Map
Figure 2 Land Use Maps (Figure 2-1 through Figure 2-3)
Figure 3 Measured Noise Levels (Figure 3-1 through Figure 3-3)
Figure 4 Future Build Noise Levels (Figure 4-1 through Figure 4-3)
Figure 5 Noise Wall Barrier Locations

Appendices

Appendix A Fundamentals of Traffic Noise Assessment and Control
Appendix B Noise Measurement Data
Appendix C Traffic Data Used for Noise Analysis
Appendix D TNM Predicted Noise Levels

Appendix E Warranted, Feasible and Reasonable Worksheets from PennDOT Pub. 24, Appendix A

ANSI	American National Standards Institute
BR	Benefited Receptors
CE	Categorical Exclusion
dB	Decibel (measure of sound pressure level on a logarithmic scale)
dBA	A-weighted decibel (sound pressure level)
DU	Dwelling Unit
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
Hz	Hertz
IL	Insertion Loss
Lx	Measured noise level exceeded x percent of the measurement period
Leq	Equivalent sound level (energy averaged sound level)
Leq(1h)	A-weighted, energy average sound level during a 1-hour period
Lmax	Maximum measured noise level
LOS	Level of Service
LT	Long Term
Max SF/BR	Maximum Square Foot per Benefited Receptor
MP	Mile Post
NAC	Noise Abatement Criteria
NSA	Noise Sensitive Area
PennDOT	Pennsylvania Department of Transportation
PTC	Pennsylvania Turnpike Commission
ROD	Record of Decision
ROW	Right of Way
SF/BR	Square Foot per Benefited Receptor
SLM	Sound Level Meter
ST	Short Term
SR	State Route
TNM	Traffic Noise Model
v/c	Volume to capacity ratio
vph	Vehicles per hour

ES.1 PROJECT DESCRIPTION SUMMARY

The Project under analysis entails the proposed widening and reconstruction of the existing Pennsylvania Turnpike (I-76) from four lanes to six lanes between MP 316.6 and MP 319.3. The proposed design indicates the existing 82-foot pavement will be widened to approximately 122 feet. Two superstructure replacements will take place at PA Turnpike over SR 1003 (Phoenixville Pike) at MP 319.2 and PA Turnpike over Charlestown Road/SR 29 at MP 319.3. This analysis is the eastern portion of the I-76 proposed widening and reconstruction which in its entirety stretches from MP 311.4 to MP 319.4. The western portion of this project, MP 311.4 to MP 316.6, was analyzed in a previous report. Figure 1 contains an overview of the Project location.

ES.2 NOISE LEVELS AND NOISE IMPACTS

The Pennsylvania Turnpike Commission follows Pennsylvania Department of Transportation (PennDOT) noise guidelines as stated in "*Pennsylvania Department of Transportation, Project Level Highway Traffic Noise Handbook, Publication No. 24, dated July 2011*". The noise analysis included a total of 99 measurement/modeled prediction locations (receivers) representing 154 individual noise sensitive dwelling units (receptors). In order to simplify the reporting of noise levels, noise impacts, noise mitigation, and in adherence with preferred PennDOT analysis methodology, these receptors were organized in 10 defined Noise Sensitive Areas (NSAs) within the general project area. The NSAs are shown in Figures 3-1 through 3-3.

Existing noise levels were predicted to determine the extent of the noise impact relative to the Project edge of pavement (PennDOT requires analysis out to 500 feet unless impacts are determined beyond that limit). Existing condition noise models were successfully validated at ten (10) short-term measurement locations, with predicted and measured noise levels differing by less than 3.0 dBA at each location, in keeping with PennDOT policy. 2023 measurements were updated to confirm model validation after some modifications were made to these areas. Existing and future (Year 2048) noise levels were determined and modeled using standard Federal Highway Administration (FHWA) and PennDOT methodologies. These predicted levels were compared to the existing noise conditions and evaluated for potential impacts as defined by FHWA and PennDOT criteria.

Table ES-1 presents a summary of each of the identified NSAs in the project area along with its associated FHWA/PennDOT noise impact, Land Use, Activity Category, Noise Abatement Criteria (NAC), number of modeled receptor locations, number of representative equivalent units (dwelling units), predicted existing noise level, future noise level and type of impact.

Table ES-1
Summary of Identified Noise Sensitive Areas (NSAs)

NSA ID	Land Use	Activity Category	Noise Abatement Criteria	# of Modeled Receivers	# of Receptors/ Equivalent Residential Units (Dwelling Units)	Predicted Existing Noise Level. Range of Leq(1h), dBA	Predicted Future Noise Level Range of Leq(1h), dBA	Type of Impact NAC/ Increase/ None or Both
17	Residential	B	66	4	4	57 - 65	60 – 67	NAC
18	Residential	B	66	4	4	62 - 74	64 – 75	NAC
19	Residential	B	66	14	14	58 - 65	60 – 66	NAC
20	Residential	B	66	15	44	58 - 69	60 – 70	NAC
21	Residential	B	66	30	30	45 - 74	47 – 76	NAC
22	Residential	B	66	4	4	53 - 64	55 – 65	None
23	Residential	B	66	3	3	59 - 64	61 – 66	NAC
24	Church	C	66	2	1	66 - 73	67 – 73	NAC
25	School/ Residential	B, C	66	18	45	51 – 70	53 – 72	NAC
26	Residential	B	66	5	5	66 - 70	67 - 72	NAC
TOTAL				99	154			

Noise levels were predicted for all receptor locations for the Existing and Future Build alternative using the FHWA Traffic Noise Model (TNM), Version 2.5, the version currently accepted by PennDOT. Predictions assumed worst case hourly equivalent noise levels (1-hour Leq, dBA) using projected peak-hour design year traffic volumes and speeds. The highest predicted future noise levels for each NSA (among the range of noise levels for all modeled receptors within the NSA), are summarized in Table ES-1. Figures 4-1 through 4-3 show the modeling results graphically.

The PennDOT noise manual defines a traffic noise impact under two separate conditions: 1) when the future predicted traffic noise level is equal to or exceeds the PennDOT NAC, or 2) when the future predicted traffic noise level creates a substantial increase of 10 dBA over existing noise levels. NAC values vary depending on land use but are generally either 66 dBA (1-hr Leq, exterior) for residential, institutional, and outdoor active use areas; or 71 dBA (1-hr Leq, exterior) for noise sensitive commercial areas, (including hotels and offices). NAC values for each NSA are indicated in Table ES-1. A summary of predicted noise impacts for NSAs recommended for noise abatement is presented in Table ES-2. It should be noted that no receptors expected to experience substantial increase over existing noise levels.

Table ES-2
Recommended Noise Abatement, by NSA

NSA ID	Highest Predicted Noise Level by Alternative Leq (1h), dBA	Number of Impacted Receptors	Impact Type
	Future 2048 Build	Future 2048 Build	
20	70	18	NAC
Total		**18**	**-**

ES.3 NOISE ABATEMENT CONSIDERATIONS AND COMMITMENTS

FHWA and PennDOT policy require that when noise impacts are identified, noise abatement must be evaluated; and if noise abatement is found to be feasible and reasonable, it must be incorporated into the project. PennDOT noise manual specifies that for noise abatement to be feasible it must be capable of providing a 5 dBA insertion loss (the net noise reduction provided by the barrier) for the majority (50% or greater) of impacted receptors, and that it must meet safety, constructability, and access requirements. For an abatement measure to be reasonable it must meet a maximum square foot per benefited receptor (Max SF/BR) criterion. PennDOT noise barrier cost reasonableness value is based on a Max SF/BR value of 2,000 square feet. The square footage of a barrier is based on its length multiplied by its height above the finished ground at its base to the top elevation. The benefited receptor values are determined by counting all receptors receiving a 5 dBA or greater insertion loss (IL). Although at least a 5 dBA IL for the majority of receptors is required to meet the feasibility criterion, the proposed barrier must reduce noise level by at least 7 dBA for at least one benefited receptor. It is desirable to provide this IL for additional impacted receptors while confirming to the Max SF/BR criteria and if justified by a "point of diminishing returns" evaluation. While optimizing a proposed noise barrier, the desired abatement goals should be evaluated in terms of establishing insertion loss for impacted receptors only.

The final factor of reasonableness is determined by the benefited receptors. The benefited receptors must be surveyed to get their input on whether or not they would approve the barrier. If a majority of the benefited receptors approve of the barrier (greater than 50%), then the barrier is deemed as reasonable.

Each impacted NSA was evaluated to determine if noise abatement, typically in the form of noise walls, was feasible and reasonable. The analyses for each NSA are presented in Section 5. A summary of recommended noise abatement are presented in Table ES-3. Figure 5 shows the proposed placement of the barrier wall. Final wall design and placement is pending approval from PTC.

Table ES-3
Proposed Noise Abatement Recommendation Summary

Descriptions	NSA20
Number of Impacted Receptors	18
Number of Benefited Receptors	25
Barrier Evaluation Method	TNM
Length (ft)	1366
Average Height (ft)	10.88
Minimum Height (ft)	8.00
Maximum Height (ft)	16.00
Area (ft^2)	14856
Calculated SF/ BR	594
Number of Receptors meeting Design Goal (7 dBA)	7
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	Yes

ES.4 CONSTRUCTION NOISE

This work consists of making every effort to minimize the effect of construction noise on the surrounding community, and conducting an initial community meeting or distributing a Construction Notice to adjacent property owners prior to commencing construction, and at other times prior to critical phases of the project. Section 6 includes a sample Construction Noise Specification that can be used for this project.

ES.5 INFORMATION FOR LOCAL OFFICIALS

FHWA and PennDOT policy specify that local officials should be provided appropriate information to assist with future compatible land use planning, especially with regard to the future planning and development of currently undeveloped lands near the proposed project right-of-way.

This technical noise report will serve as the primary information source to help local officials avoid future incompatible land use planning with regard to noise generated by this project. In particular, refer to Table 4-2 for noise impact contour distances for various regions of the project. Two representative undeveloped lands were used as references for the entire project site; one of the undeveloped land contours represent topographically flat areas (unobstructed) and the other represents a ‘cut’ section (unobstructed). The shorter distance represents a typical ‘cut’ section, the longer distance represents a typical flat section. For convenience this table is presented below as Table ES-4.

Table ES-4
Noise Impact Distances for Undeveloped Lands

Representative Undeveloped Land	Estimated Impact Distance (feet)	
	66 dBA (Categories B and C)	71 dBA (Category E)
Typical Unobstructed Areas (line of sight to the roadway)	425	200
Typical Obstructed Areas (no line of sight to roadway)	220	100

Notes:
1: The impact distances are from the edge of I-76.

This page intentionally left blank

SECTION 1 INTRODUCTION AND PROJECT DESCRIPTION

PROJECT DESCRIPTION

The Project entails the proposed widening and reconstruction of the existing Pennsylvania Turnpike (I-76) from four lanes to six lanes between MP 316.6 and MP 319.39. The proposed design indicates the existing 82-foot pavement will be widened to approximately 122 feet. Two superstructure replacements will take place at PA Turnpike over SR 1003 (Phoenixville Pike) at MP 319.2 and PA Turnpike over Charlestown Road/SR 29 at MP 319.3. This report covers the eastern portion of the I-76 proposed widening and reconstruction which in its entirety stretches from MP 311.4 to MP 319.4. The western portion of this project, MP 311.4 to MP 316.6, was analyzed in a previous report.

This page intentionally left blank

SECTION 2 NOISE ANALYSIS OVERVIEW

This section identifies and reviews the methodology and policy for the technical tasks and analyses used in this report. The actual results of these tasks and analyses are presented in subsequent sections of this report.

2.1 REGULATORY OVERVIEW

2.1.1 Federal Regulations

The FHWA noise policy is contained within The Code of Federal Regulations, Title 23, Part 772 (23 CFR 772) which provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects. Under the current version of 23 CFR 772.5, projects are categorized as Type I, Type II or Type III projects. The FHWA defines a Type I project as a proposed federal or federal-aid highway project for the construction of a highway on a new location, or the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment, or increases the number of through-traffic lanes.

Type I projects include those that create a completely new noise source, as well as those that increase the volume or speed of traffic or move the traffic closer to a receptor. Type I projects include the addition of through traffic lanes, an interchange, ramp, auxiliary lane, or truck-climbing lane to an existing highway, or the widening of an existing ramp by a full lane width for its entire length. Projects unrelated to increased noise levels, such as lighting, signing, and landscaping, are not normally considered Type I projects.

Due to the addition of through traffic lanes throughout the project area, the proposed project would be considered Type I.

2.1.2 FHWA Noise Abatement Criteria (NAC)

Under 23 CFR 772.13, noise abatement must be considered for Type I projects if the project is predicted to result in traffic noise impacts. In such cases, 23 CFR 772 requires that the project sponsor “consider” noise abatement before adoption of the final PTC document. This process involves identification of noise abatement measures that are reasonable, feasible, and likely to be incorporated into the project, and of noise impacts for which no apparent solution is available.

Traffic noise impacts, as defined in 23 CFR 772.5, occur when the design year condition noise levels approach or exceed the noise abatement criteria (NAC) specified in 23 CFR 772, or design year condition noise levels create a substantial noise increase over existing noise levels. 23 CFR 772 does not specifically define the terms “substantial increase” or “approach”; these criteria are defined in the PennDOT *Publication No. 24 (May 2011)*, as described in the following section.

Table 2-1 summarizes the FHWA NAC corresponding to various defined land use activity categories. Activity categories and related traffic noise impacts are determined based on the actual land use in a given area. Background information on noise levels and noise metrics can be found in Appendix A.

In identifying noise impacts, primary consideration is given to exterior areas of frequent human use. In situations where there are no exterior activities, or where the exterior activities are far from the roadway or physically shielded in a manner that prevents an impact on exterior activities, the interior criterion (Activity Category D) may be used as the basis for determining a noise impact.

Table 2-1
FHWA Noise Abatement Criteria[1]

Activity Category	Activity Criteria[2]		Evaluation Location	Activity description
	Leq(h)	L10(h)		
A	57	60	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[3]	67	70	Exterior	Residential.
C[3]	67	70	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	55	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E[3]	72	75	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	--	--	--	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	--	--	--	Undeveloped lands that are not permitted.

[1] Either Leq(h) or L10(h) (but not both) may be used on a project.
[2] The Leq(h) and L10(h) Activity Criteria values are for impact determination only, and are not design standards for noise
[3] Includes undeveloped lands permitted for this activity

The federal regulation also covers such topics as traffic noise prediction, analysis of traffic noise impacts, analysis of noise abatement, information for public officials, and construction noise issues, all of which have been incorporated into the current PennDOT noise manual, as discussed in the next section.

2.1.3 State Regulations and Policies

The Pennsylvania Turnpike Commission follows Pennsylvania Department of Transportation (PennDOT) noise guidelines. PennDOT's noise policy provides guidance in the analysis of highway traffic noise and the evaluation of noise mitigation measures. The noise guidelines are entitled "*Pennsylvania Department of Transportation, Project Level Highway Traffic Noise Handbook, Publication No. 24, dated July 2011*". (hereafter referred to as "noise manual"). It includes current policies, procedures, and practices to be used by agencies that sponsor new construction or reconstruction of federal or federal-aid highway projects. The NAC specified in the noise manual are the same as those specified in the most recent version of 23 CFR 772. The PennDOT noise manual states that a sound level is considered to approach the NAC level when the Leq(h) sound level is 1 dBA less than the NAC identified in 23 CFR 772. This means that a peak hour noise level of 66 dBA is considered to approach the NAC of 67 dBA, but 65 dBA does not. The PennDOT noise manual defines a noise increase as substantial when the predicted traffic noise levels with project implementation exceed existing noise levels by 10 dBA. The PennDOT noise manual provides detailed technical guidance for the evaluation of highway traffic noise. This includes field measurement methods, noise modeling methods, and report preparation guidance.

In addition to the NAC criteria above, the PennDOT noise manual also specifies the following definitions and policies:

A **Benefited Receptor** is a receptor predicted to receive at least 5 dBA net noise reduction, also referred to as insertion loss (IL), from the proposed mitigation and inclusive of all such residences, not limited to those receptors in the first row.

A **Feasible Noise Abatement Measure** is a mitigation measure that is acoustically feasible and meets engineering requirements for constructability. A feasible noise barrier must provide a minimum of 5 dBA IL for a majority (50% or greater) of the impacted receptors.

The **Insertion loss Design Goal** is the optimum desired dBA noise reduction determined from calculating the difference between future build noise levels with abatement, to future build noise levels without abatement. The PENNDOT design goal is a 7 dBA IL for at least one benefited receptor.

A **Reasonable Noise Abatement Measure** is defined by PennDOT as a Maximum Square Footage of Abatement Per Benefited Receptor (MaxSF/BR) value of 2,000. In determining the MaxSF value, the square footage of the barrier shall be based upon its length and its height from the finished ground elevation at the base of the barrier to its top elevation. In determining the Benefited Receptor (BR) value, count any receptor receiving 5 dBA IL or greater as being benefited.

Consideration of Viewpoints of benefited property owners and residence is ultimately required for noise abatement to be considered Reasonable.

2.2 DEFINING AREA OF POTENTIAL IMPACT

PennDOT noise manual references the FHWA "Highway Traffic Noise: Analysis and Abatement Guideline", FHWA-HEP-10-025HP dated December 2011. The extent of the noise study analysis area should include all receptors potentially impacted by the project. The FHWA does not establish a fixed distance to define the noise impact analysis area. Historically, absolute noise impacts (those areas with noise levels approaching or exceeding the NAC – 66 dBA for residential land uses) rarely exist beyond about 400 to 500 feet from the roadway. It is also established that the FHWA Traffic Noise Model is less reliable at predicting noise levels beyond this range, so a 500 foot screening distance from the edge of the proposed highway is established as a default value for the area of potential impact. However, in some areas with low existing noise levels (say below 55 dBA during the loudest hour), substantial increase in noise impacts could exist without the predicted project noise level approaching or exceeding the NAC, so in these areas a more extensive analysis area may be required.

2.3 NOISE MEASUREMENT PROCEDURES

A variety of field noise measurements were conducted for this project. In general, the noise measurement procedures in the field follow recommended standard procedures, including those outlined in the FHWA's Measurement of Highway Related Noise, May 1996, and the PennDOT noise manual. Specifically, the following practices and procedures were used.

- Both long- and short-term noise measurements were conducted. (Appendix B)

- The long-term measurements (typically 24 hours) were used primarily to document the daily variation in existing traffic noise levels and to identify the worst case noise hour, if there was one. Long-term measurements were generally conducted at or near the highway right-of-way (ROW) line in order to best document hourly variation in traffic noise level with minimal influence from non-highway noise sources.

- The short-term noise measurements (typically 15-30 minutes) were conducted at actual noise sensitive receptor locations and were used primarily to validate noise models (at locations where traffic noise was dominant).

- Short-term noise measurements were generally conducted at areas of frequent exterior human use and were only conducted during periods of free-flowing traffic, dry roadways, and low to moderate wind speeds (less than 12 mph to avoid extraneous wind noise).

- Only ANSI (American National Standards Institute) Rated Type 1 or Type 2 sound levels meters were used (Type 1 for short-term and Type 2 for long-term). The meters were subjected to a field calibration check before and after each measurement. Calibration certificates and raw data for each meter used in the Project can be found in Appendix B.

- Concurrent classified (auto, medium and heavy trucks, buses, and motorcycles) traffic counts for the acoustically dominant road were conducted for each short-term measurement (either via live

count, or by videotape). Observed traffic counts can be found in Appendix B, official traffic counts used in the TNM modeling can be found in Appendix C.

- All field data was recorded on field data sheets, which included the time, name and location of the measurement, instrumentation data, 5-minute Leq noise levels, observed meteorological data, field calibration data, a measurement site diagram, GIS coordinates, and notes as to the dominant noise sources and any other observed acoustically relevant events (such as aircraft over-flights, emergency vehicle pass bys, etc.). Field sheets used in this project can be found in Appendix B.

- Photographs were taken for each measurement location showing the location relative to the dwelling and the noise source. Photographs of the measurement locations, along with a general description of the location, can be found in Appendix B.

2.4 ANALYSIS OBJECTIVES

The purpose of this final noise analysis report is to identify and document potential noise impacts associated with the future alternative of the proposed Project and to identify feasible and reasonable abatement. The general analysis procedure for the Project noise study includes the following steps:

1. **Review Project Description:** Review the project description and project data to be analyzed and collect additional required data (including roadway design files, existing and future traffic data, land use data, etc.). Consider all alternatives, design options, and construction phasing scenarios. This information is presented in Section 1 of this report.
2. **Identify Regulatory Framework:** Investigate and establish the regulatory framework to be followed for the noise analysis, including federal and state regulations. This information is presented in Section 2.1 of this report.
3. **Establish Existing Land Use and Noise Environment:** Investigate and document the existing noise environment for the Project area, including existing noise sensitive land uses and existing noise levels in the Project area. These were accomplished with a careful review of local zoning information, review of aerial photography and a site visit to the Project area. This information is presented in Section 3 of this report and background information can be found in Appendix B.
4. **Predict Future Noise Levels:** Future noise levels at noise sensitive land uses for the future Project alternative are predicted using the FHWA Traffic Noise Model (TNM) Version 2.5. This information is presented in Section 4 of this report and a summary of the TNM modeling can be found in Appendix D.
5. **Assess Future Noise Impacts:** For each alternative/design option, compare future noise levels (as well as increases in future noise levels over existing noise levels) to appropriate identified noise impact criteria and quantify resulting noise impacts. This information is presented in Section 4 of this report and a summary of the TNM modeling can be found in Appendix D.
6. **Evaluate Noise Abatement:** Where noise impacts are identified, evaluate potential noise abatement measures. Abatement measures are evaluated for feasibility and reasonableness according to FHWA and PENNDOT standards. This information is presented in Section 5 of this report and a summary of the TNM modeling can be found in Appendix D. Worksheets from

PennDOT Pub. #24 Appendix A ""Warranted, Reasonable and Feasible Worksheets" are located in Appendix E.

7. **Consider Construction Noise Impacts:** Analyze potential construction noise impacts, and discuss available mitigation options. This information is presented in Section 6 of this report.
8. **Information for Public Officials:** Provide or identify appropriate information for local public officials to help avoid future noise impacts. This information is presented in Section 7 of this report.

A more detailed accounting of the specific procedures involved in each of the above analysis steps is provided in the indicated report section.

2.5 SELECTION OF NOISE SENSITIVE RECEPTORS

In general, noise-sensitive receptors are selected to represent potentially impacted land uses within the Project area. Initially, the entire Project area was reviewed and noise sensitive areas were identified. A noise sensitive area, or NSA, is generally defined as a geographical area covering multiple properties with similar land uses and noise environments and that might benefit from a single noise abatement measure, such as a noise wall. An NSA might represent a single isolated property or an entire neighborhood. The delineated NSAs for this Project are described in Section 3 of this report. Within each NSA, several representative noise measurement and noise prediction locations may be identified. Typically, each NSA would have one measurement location and multiple noise prediction locations, although some smaller adjacent NSAs may share a single measurement location. The number and locations of the receptors (measurement and modeling locations) within each NSA are selected to adequately represent all of the noise-sensitive property units (dwellings) within that NSA, and these properties may include Activity Categories A through E in Table 2-1 (including residential, noise sensitive commercial, parks, schools, hotels, etc.). Activity Categories F and G (agriculture, retail, industrial, transportation, utilities, and undeveloped land), typically would not have associated NSAs or receptor locations. For residential properties in particular, more isolated residences would generally be modeled as individual receptors, while residences in multi-family buildings and densely populated neighborhoods may be modeled with one modeled receptor location representing multiple dwelling units or homes (receptors).

All receptor locations (short-term measurement locations and all modeled locations) are located to represent an area of frequent exterior human use. For residential properties, this would normally be an exterior activity area between the structure and the proposed project roadway. If no specific outdoor activity area is identified, a position at approximately 10 to 20 feet from the building façade exposed to the project roadway would be used. For commercial and other non-residential properties, some other area of frequent exterior human use would be selected.

2.6 WORST-CASE NOISE CONDITIONS

When determining noise impacts, traffic noise predictions must be made for the worst case noise hour (generally during level of service [LOS] C or D with high heavy truck volumes and speeds close to the posted speed limit or design speed). The worst case noise hour is typically either the peak vehicular truck

hour or the peak vehicular volume hour (with LOS A through D conditions). Long-term noise measurements were used to evaluate peak traffic noise hours at two locations within the Project area.

2.7 NOISE ABATEMENT REQUIREMENTS

According to the PennDOT noise manual, once a noise impact has been identified, feasible and reasonable noise abatement measures must be considered. For noise abatement, primary consideration is given to exterior areas of frequent human use. When traffic noise impacts are identified, noise barrier walls, at a minimum, are required to be considered.

When noise barriers are considered, a preliminary noise barrier design analysis must show that the barrier is feasible and reasonable. This typically requires that the barrier provides a minimum level of insertion loss. According to the PennDOT noise manual, feasible noise barriers must provide at least 5 dBA of insertion loss for the majority (50% or greater) of impacted receptors. In addition to meeting minimum insertion loss requirements, noise barriers must also meet engineering and constructability feasibility requirements in terms of safety, property and emergency access, drainage control, overhead and underground utilities clearance, and other issues.

For an abatement measure to be reasonable it must meet a maximum square foot per benefited receptor (Max SF/BR) criterion. PennDOT noise barrier cost reasonableness value is based on a Max SF/BR value of 2,000 square feet. The square footage of a barrier is based on its length multiplied by its height above the finished ground at its base to the top elevation. The benefited receptor values are determined by counting all receptors receiving a 5 dBA or greater insertion loss (IL). Although at least a 5 dBA IL for the majority of receptors is required to meet the feasibility criterion, the proposed barrier must reduce noise level by at least 7 dBA for at least one benefited receptor.

If noise barriers are determined to be reasonable and feasible then the viewpoints of property owners and residences should be taken into consideration. Half (50%) of all responding benefited owners and residences must be in favor of implementing noise abatement. The polling is typically conducted after the Final Noise Analysis is prepared and approved.

2.8 NOISE MODELING METHODOLOGY

Future build noise levels, along with existing noise levels, were predicted using the FHWA TNM Version 2.5, the most recent version available at the time of the analysis. All conventional modeling techniques and recommendations for TNM by both FHWA and PennDOT were implemented. These included the following modeling procedures and conventions:

- All roadway pavement types were modeled as “Average”.
- Traffic speeds and volumes for peak traffic hour as provided in the traffic data were modeled to predict worst case noise levels. Traffic speeds and volumes used in this analysis were provided by the project engineers and are listed in Appendix C.
- Existing terrain lines (topography), buildings, ground zones and tree zones were modeled.
- All TNM model runs were detail checked for accuracy by an independent noise analyst.

2.9 PROJECT TRAFFIC DATA

Existing traffic data and traffic mix (autos, medium trucks, and heavy trucks) was provided by the Pennsylvania Turnpike Commission (PTC) and PennDOT. Project engineers generated the traffic projections for future years based on the existing traffic data and an estimated growth percentage. Traffic data used in this analysis can be found in Appendix C.

This page intentionally left blank

SECTION 3 EXISTING NOISE ENVIRONMENT AND NOISE SENSITIVE AREAS

3.1 EXISTING LAND USE AND ZONING

3.1.1 Existing Land Uses

The vicinity of the Project area consists of land uses, such as residential, industrial, commercial, public, and vacant, agricultural or open space. The areas at the eastern end of the project, along SR29, contains a majority of industrial and commercial businesses with a few residential homes interspersed. The rest of the project area mostly contains single-family and multi-family residences, and open space. Figure 2 shows the land use division within the project area.

3.1.2 Noise Sensitive Areas

In order to better categorize the potential noise impacts and evaluate noise abatement for the various project alternatives, all of the potentially impacted, noise-sensitive receptors have been organized into Noise Sensitive Areas, or NSAs. An NSA is defined as a geographical area that includes a variety of individual noise-sensitive receptor units (individual homes, apartment units, institutional properties, etc.) which have a similar land use and noise environment, and if impacted, would likely be protected by a single noise abatement element, such as a noise barrier. NSAs begin at NSA-17 and end at NSA-26. NSA-1 through NSA-16 have been analyzed in a previous study and will not appear in this analysis. Descriptions of delineated NSAs, including geographic area, primary land use, and type of noise-sensitive receptors are listed in Table 3-1. Figures 3-1 through 3-3 show all of the defined NSAs and their associated noise measurement locations.

Table 3-1
Noise Sensitive Areas (NSAs)

NSA	Description	Long-term Measurement ID	Short-term Measurement ID
17	South of I-76, East of Valley Hill Road Single-Family Residence		ST-17
18	North of I-76, East of Valley Hill Road Single-Family Residence		ST-18
19	North of I-76, South of Hollow Drive Single-Family Residences	LT03	ST-19
20	South of I-76, at intersection of Yellow Springs Road and Brandywine Road Single-Family and Multi-Family Residences	LT04	ST-20
21	North of I-76, east of Yellow Springs Road (homes on Blackberry Lane) Single-Family Residences		ST-21
22	South of I-76, North of Phoenxiville Pike (Rt 29) Single-Family Residence		ST-22
23	South of I-76, North of Phoenixville Pike (Rt 29) Single-Family Residence		ST-23
24	South of I-76, North of Phoenixville Pike (Rt 29) Church		ST-24
25	North of I-76, West of Phoenixville Pike (Rt 29), North of Charlestown Road School, Housing Development		ST-25
26	South of I-76, east of Charlestown Road and north of Yellow Springs Road Single Family Homes		ST-26

3.2 EXISTING NOISE LEVELS

3.2.1 Noise Measurements

Multiple noise measurements were conducted for this project on November 26-30, 2012 and October 27-28, 2013 including long-term (24-hour) and short-term (10 to 30 minutes) measurements. Two additional short-term (10 to 30 minutes) were conducted on November 14, 2023. Noise measurements were conducted for several reasons, including:

1. To empirically determine the peak noise hour, if one exists, in different areas of the project (long-term measurement). Leq values reported in Tables 3-2 and 3-5 and subsequently used for model validation were a result of an energy average of the individual interval values recorded on the data sheets.
2. To provide information for noise model validation (short-term measurements with accompanying classified traffic counts).
3. 2023 measurements were conducted in two locations to confirm model validation after some road

modifications were made to these areas.

A total of ten (10) short-term (ST) noise measurements were conducted as summarized in Table 3-2. Figures 3-1 through 3-3 show an overview of the Project area with each measurement location.

Table 3-2
Short-Term Measurement Summary

Receptor[1]	Location	Date	Start Time	End Time	Measured Leq, dBA
ST-17	2198 Valley Hill Rd.	11/30/2012	09:25	09:40	62
ST-18	2236 Valley Hill Rd.	11/30/2012	09:50	10:05	66
ST-19	12 Pyle Ct.	11/14/2023	09:38	17:10	62
ST-20	2062 Yellow Springs Rd.	10/28/2013	16:35	16:55	64
ST-21	181 Blackberry Ln.	11/29/2012	15:55	16:10	69
ST-22	3149 Phoenixville Pike	10/28/2013	15:45	16:10	62
ST-23	3199 Phoenixville Pike	10/28/2013	15:30	16:05	60
ST-24	3281 Phoenixville Pike	11/30/2012	12:25	12:45	59
ST-25	166 Shilling Ave.	11/14/2023	10:17	10:33	68
ST-26	1022 Yellow Springs Rd.	10/28/2013	14:50	15:15	60

A total of two (2) long-term (LT) noise measurements were conducted as summarized in Table 3-4 and Figures 3-1 through 3-3 show an overview of the Project area with each measurement location. Appendix B contains a graphical presentation of the long-term data collected.

Table 3-3
Long-Term Measurement Summary

Receptor	Location	Start Date	Start Time	End Date	End Time	Minimum and Maximum Measured Leq, dBA
LT3	57 Deerfield Drive	11/29/12	10:15	11/30/12	10:00	66 - 72
LT4	Across street from 2111 Yellow Springs Road	10/28/13	17:15	10/29/13	17:00	64 - 75

Long-term noise measurements were conducted at fence-line locations in order to identify general trends in noise variation over the course of the day. These were used to determine if or when noise levels peaked during the day, or if noise levels were reduced at peak traffic hours due to traffic congestion. In general the measurement data showed that while traffic noise levels fluctuated somewhat over the course of the day there was generally no identified discrete “worst hour”, with noise levels loudest between

about 6:00 AM and 6:00 PM. The data also provided no indication that noise levels were substantially reduced due to congestion at any time during the day. Long-term data charts shown in Appendix B.

3.2.2 Noise Monitoring Equipment and Atmospheric Conditions

Only ANSI (American National Standards Institute) Rated Type 1 or Type 2 Sound Levels Meters were used (Type 1 for short-term and Type 2 for long-term). Meters were subjected to a field calibration check before and after each measurement. Current annual factory calibration certificates for the meters used on this project can be found in Appendix B.

Weather conditions in the Project area were recorded using hand-held anemometers. Table 3-4 contains the weather data recorded at each measurement position. This data can also be found on the noise measurement field sheets in Appendix B. Meteorological conditions were noted for all short-term noise measurements to document that conditions were appropriate. All measurements were conducted during appropriate and acceptable meteorological weather conditions with dry roadways (i.e., acceptable temperature and humidity ranges, wind less than 12 mph).

All field data was recorded on field data sheets, which included the time, name and location of the measurement, instrumentation data, 5-minute Leq noise levels (for short-term readings), meteorological data, field calibration data, a measurement site diagram, GIS coordinates, and notes as to the dominant noise sources and any other observed acoustically relevant events (such as aircraft over-flights, emergency vehicle pass-bys, etc.). Classified traffic counts were generally taken from video shot during the noise measurements. Speeds used for validation runs were values indicated on the field data sheets as "Observed" speeds. Existing speeds were estimated by driving through the project roadway during periods with similar traffic conditions and noting vehicle speed. For this project, the observed speeds during noise measurement activities were approximately the same as posted speeds. Field sheets used for this project can be found in Appendix B.

Table 3-4
Measurement Weather Data

Receptor	Atmospheric Conditions						
	Temperature (°F)	Wind Descriptor	Avg. Wind Speed (mph)[1]	Wind Direction	Relative Humidity (%)	Barometric Pressure (Hg)	Cloud Cover (%)
ST-17	32	Calm	-	-	62.1	1004.0	90
ST-18	32	Calm	-	-	59.1	1004.8	60
ST-19	49	Steady	3	-	56.3	1000	10
ST-20	60	Calm	-	-	53.2	1002.6	10
ST-21	43	Calm	-	-	53.0	1003.4	0
ST-22	64	Calm, occasional light gusts	1 - 3	-	52.4	1005.0	10
ST-23	64	Calm, occasional light gusts	0 - 3	-	54.5	1008.0	10
ST-24	43	Steady	0 - 8	east	55.2	1010.5	100
ST-25	49	Steady	3	-	56.3	1000	10
ST-26	42	Calm	-	-	75.0	1011.6	0

[1] Measurements were not conducted if wind speeds exceeded 12mph.

3.2.3 Noise Model Validation and Results

The FHWA TNM Version 2.5 was used to predict noise levels for the future build alternative as well as existing noise levels at receptor locations where noise levels are dominated by traffic noise on project roadways. To demonstrate that the noise model is predicting noise levels within a reasonable margin of error, the noise model runs are validated by comparing predicted noise levels to measured noise levels for similar traffic conditions. Acoustical measurements were only taken when traffic was free-flowing. However, since the TNM only predicts noise levels associated with traffic noise, the model runs can only be validated at measurement locations where current noise levels are dominated by project roadways. For this project, noise model validation was possible for all noise measurement locations. Noise models are considered to be validated according to the PennDOT noise manual if the difference between measured and modeled noise levels for comparable conditions is 3 dBA or less. The results of the noise validation effort are presented in Table 3-5.

While it is usually preferred to conduct model validation measurements without snow cover that is not always possible given field conditions and project deadlines. Due to a recent snowfall preceding the November 12 measurement trip there was a light snow cover for some of the validation site measurements (generally less than a few inches), as shown in some of the noise measurement location photographs. In this case the snow cover was apparently light enough that validation models did not require any special modeling or adjustments to account for the snow and all measurement location were validated within an acceptable margin of error (+/- 3 dBA).

Table 3-5
TNM Validation Summary Table

Receptor	Location	Date	NSA	Measured Leq, dBA	Modeled Leq, dBA	Delta
ST-17	2198 Valley Hill Rd.	11/30/2012	17	61.9	63.3	-1.4
ST-18	2236 Valley Hill Rd.	11/30/2012	18	66.5	64.9	1.6
ST-19	12 Pyle Ct.	11/14/2023	19	66.5	64.9	1.6
ST-20	2062 Yellow Springs Rd.	10/28/2013	20	64.1	63.6	0.5
ST-21	181 Blackberry Ln.	11/29/2012	21	68.7	71.3	-2.6
ST-22	3149 Phoenixville Pike	10/28/2013	22	62.3	59.5	2.8
ST-23	3199 Phoenixville Pike	10/28/2013	23	60.4	58.2	2.2
ST-24	3281 Phoenixville Pike	11/30/2012	24	59.5	61.8	-2.3
ST-25	166 Shilling Ave.	11/14/2023	25	67.7	69.1	-1.4
ST-26	1022 Yellow Springs Rd.	10/28/2013	26	60.3	62.4	-2.1

As shown in Table 3-5, all calculated differences between modeled and measured noise levels are less than 3.0 dBA. Therefore, the noise models in those locations are considered validated.

3.2.4 Observed Traffic Counts

The observed traffic counts are used for validating the TNM models. The field-observed values are compared to the predicted values. If the difference between the two values is less than ±3 decibels, then the model is considered to be within an acceptable level of accuracy. All NSAs were within ±3 decibels. The observed traffic data videotaped or hand-counted during the noise measurements and used in the validation process can be found in Appendix B. TNM validation runs developed for this Project are available on request.

3.2.5 Existing Noise Levels

Existing noise levels for NSAs were predicted by modeling the receptor locations using the FHWA TNM. Table 3-6 presents a summary of existing noise levels for all modeled receptors in the Project area. Existing levels range from 45 to 74 dBA. Figures 3-1 through 3-3 contains an overview of the Project area showing measured receptor locations within each NSA, represented by a blue triangle. Figures 4-1 through 4-3 show the modeling results for the measurement location.

Table 3-6
Predicted Existing Noise Levels

NSA	NSA Description	# of Modeled Receivers	# of Receptors/ Equivalent Residential Units	Predicted Existing Noise Level, Range of Leq (1h) dBA
17	South of I-76, East of Valley Hill Road Single-Family Residence	4	4	57 - 65
18	North of I-76, East of Valley Hill Road Single-Family Residence	4	4	62 – 74
19	North of I-76, South of Hollow Drive Single-Family Residences	14	14	58– 65
20	South of I-76, Northside of Yellow Springs Road Single-Family and Multi-Family Residences	15	44	58– 69
21	North of I-76, End of Blackberry Lane Single-Family Residences	30	30	45 - 74
22	South of I-76, North of Phoenxiville Pike (Rt 29) Single-Family Residence	4	4	53- 64
23	South of I-76, North of Phoenixville Pike (Rt 29) Single-Family Residence	3	3	59 - 64
24	South of I-76, North of Phoenixville Pike (Rt 29) Church	2	2	66 - 73
25	North of I-76, West of Phoenixville Pike (Rt 29), North of Charlestown Road School, Housing Development	18	45	51 - 70
26	South of I-76 and east of Charlestown Rd.	5	5	66 - 70

This page intentionally left blank

SECTION 4 FUTURE NOISE LEVELS AND IMPACTS

This section presents predicted noise levels and noise impacts (or noise impact distances for both identified NSA areas and general undeveloped areas

4.1 PREDICTED NOISE LEVELS AND NOISE IMPACTS

Future build alternative noise levels, along with existing noise levels, were predicted using the FHWA TNM Version 2.5, the version currently accepted by PennDOT. All conventional modeling techniques and recommendations for TNM by both FHWA and PennDOT were implemented. These included the following modeling procedures and conventions:

- All roadway pavement types were modeled as “Average”.
- Traffic speeds and volumes for peak traffic hour as provided in the traffic data were modeled to predict worst case noise levels. Traffic speeds and volumes used in this analysis were provided by the project engineers and are listed in Appendix C. Modeled vehicle-type traffic data (i.e., car, medium truck, heavy truck, bus, motorcycle) is located in Appendix C.
- All TNM runs were detail checked for accuracy by an independent noise analyst.

An “Approach or Exceed” noise impact occurs when the predicted future noise level at an identified noise receptor location approaches or exceeds the FHWA NAC within 1 dBA. Table 4-1 below summarizes the number of absolute or “Approach or Exceed” noise impacts for the Future Build alternative.

A “Substantial Increase” noise impact occurs when the predicted future noise level at an identified noise receptor location exceeds the existing condition noise level by 10 dBA or more. No substantial increase impacts have been identified for the Project area.

Table 4-1 below contains a summary of the predicted noise levels and noise impacts at all NSA locations in the Project area for the existing condition and the future Build alternative. Predicted levels for each individual modeled receiver location for each condition (existing, future build, and future no-build) are provided in Appendix D

Figures 4-1 through 4-3 contain an overview of the Project area showing all Future Build modeled receptor locations.

Table 4-1
Predicted Noise Levels and Impact Summary

NSA ID	Total # of Dwelling Units	Predicted Noise Levels (range) Leq (1H), dBA		# of Impacted Receptors/Dwelling Units	Impact Type
		Existing	Future Build		
17	4	57 - 65	60 - 67	2	NAC
18	4	62 – 74	64 - 75	3	NAC
19	14	58– 65	60 - 66	3	NAC
20	44	58– 69	60 - 70	18	NAC
21	30	45 - 74	47 - 76	21	NAC
22	4	53- 64	55 - 65	0	None
23	3	59 - 64	61 - 66	1	NAC
24	2	66 - 73	67 - 73	2	NAC
25	45	51 - 70	53 - 72	21	NAC
26	5	66 - 70	67 - 72	5	NAC

4.2 PREDICTED IMPACT DISTANCE FOR UNDEVELOPED LANDS

For use in Land Use Planning, distances to potential noise impact contours have been calculated for generalized regions within the project corridor, as presented in Table 4-2 below. Two representative undeveloped lands were used as references for the entire project site; one of the undeveloped land contours represent topographically flat areas (unobstructed between receptor and sources) and the other represents a 'cut' section (obstructed). The shorter distance represents a typical 'cut' section, the longer distance represents a typical flat section. The distances are measured from the outside edge of the Pennsylvania Turnpike shoulder in each direction.

Table 4-2
Noise Impact Distances for Undeveloped Land

Representative Undeveloped Land	Estimated Impact Distance (feet)	
	66 dBA (Categories B and C)	71 dBA (Category E)
Typical Unobstructed Areas (line of sight to the roadway)	425	200
Typical Obstructed Areas (no line of sight to roadway)	220	100

Notes:
1: The impact distances are from the edge of pavement of I-76.

This page intentionally left blank

SECTION 5 NOISE ABATEMENT EVALUATION

5.1 NOISE ABATEMENT MEASURES

According to FHWA and PennDOT policies, when noise impacts are identified, noise barriers (at a minimum) must be considered as noise abatement. Noise barriers were evaluated for nine (9) of the ten NSAs for feasibility and reasonableness. NSA 22 was the only NSA predicted to not have any receptors that approached or exceeded the NAC criteria in the future build condition. The following sections describe results of barrier assessment.

5.2 FEASIBLE AND REASONABLE CRITERIA AND REQUIREMENTS

In order for mitigation to be recommended, the barrier must meet certain feasibility and reasonability requirements established by PennDOT in the noise manual.

When noise barriers are considered, a preliminary noise barrier design analysis must show that the barrier is feasible. This typically requires that the barrier provides a minimum level of insertion loss (IL). According to PennDOT policy, feasible noise barriers must provide at least 5 dBA of IL for a majority (50% or greater) of impacted receptors. In addition to meeting minimum IL requirements, noise barriers must also meet engineering and constructability feasibility requirements in terms of safety, property and emergency access, drainage control, overhead and underground utilities clearance, and other issues.

Noise barrier reasonableness generally is related to cost effectiveness. PennDOT noise barrier cost reasonableness value is based on a Maximum Square Foot per Benefited Residence (Max SF/BR) value of 2,000 square feet. The square footage of a barrier is based on its length multiplied by its height above the finished ground at its base to the top elevation. The benefited receptor values are determined by counting all receptors receiving a 5 dBA or greater IL. Although at least a 5 dBA IL for the majority of receptors is required to meet the feasibility criterion, the proposed barrier must reduce noise level by at least 7 dBA for at least one benefited receptor.

If noise barriers are determined to be reasonable and feasible then the viewpoints of property owners and residents should be taken into consideration. Agreement of half (50%) of all responding benefited owners and residences is needed to implement noise abatement. Polling for the viewpoints of benefited receptors typically occurs after the Final Noise Analysis is prepared and approved.

5.3 DESIGN GOAL REQUIREMENTS

PennDOT defines its IL design goal as 7 dBA. The IL design goal is not to be confused with the 5 dBA feasibility criterion (see section 3.3.3.2 *"Noise Reduction Design Criteria and Goals"* of the PennDOT noise manual). It is PennDOT policy that at least one benefited property must receive at least a 7 dBA reduction in noise levels with the proposed abatement measure. The IL design goal results in the construction of more effective barriers.

5.4 FINDINGS AND RECOMMENDATIONS FOR NOISE ABATEMENT

Noise abatement was considered for each NSA with noise impacted receptors. Initially, noise abatement was checked for feasibility (5 dBA reduction at a minimum of half of impacted receptors and access restrictions). If abatement was feasible, the abatement was analyzed for reasonableness factors. For all impacted receptors meeting feasibility requirements, preliminary barrier designs were evaluated using TNM. For some NSAs with only one or two isolated impacted receptors, a simplified screening analysis was used rather than TNM modeling. In this estimation calculation it was assumed that a barrier would need to be at least 4 times as long as the distance from the end receptor to the barrier and at least 8 feet tall.

If the abatement was found to be both reasonable and feasible, it would be recommended for inclusion in the project pending a polling of viewpoints from benefited receptors per PennDOT Pub. 24, Section 6.4 "Voting Procedures". The narrative results of abatement evaluations for each impacted NSA are summarized below. Table 5-1 summarizes the barrier analysis for each NSA location. Figures 5-1 and 5-2 illustrate the three NSA locations that barrier walls are recommended for and the location of the barrier wall. Appendix D contains a summary of the TNM modeling results. Appendix E presents PennDOT Pub. #24's Appendix A "Warranted, Reasonable and Feasible Worksheets".

Table 5-1
Summary of Barrier Analysis for Each NSA Location

NSA	Description	Number of Impacted Receptors	Method	Feasible?[1]	Reasonable?[2]	Proposed Barrier Length, in feet	Average Height, in feet	Barrier Total Sq. Ft.	Number of Benefited Receptors	Sq. Ft. / BDU[3]	Recommend?
17	South of I-76 and east of Valley Hill Rd.	2	TNM	Yes	No	1235	14.00	17290	1	17290	No
18	North of I-76 and east of Valley Hill Rd.	3	TNM	Yes	No	1507	17.87	26918	3	8973	No
19	North of I-76 and west of Yellow Springs Rd.	3	TNM	Yes	No	2406	19.24	46298	4	11575	No
20	South of I-76 at the intersection of Yellow Springs Rd. and Brandywine Rd.	18	TNM	Yes	Yes	1366	10.88	14856	25	594	Yes
21	North of I-76 and east of Yellow Springs Rd. (homes on Blackberry Ln.)	21	TNM	Yes	No	3562	14.35	50928	16	3183	No
22	South of I-76 and north of Phoenixville Pike	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
23	South of I-76 and north of Phoenixville Pike, near Spring Mill Rd.	1	TNM	Yes	No	1841	22.76	41882	2	20941	No
24	South of I-76 and north of Phoenixville Pike, near Spring Mill Rd.	2	TNM	Yes	No	1064	20	21283	1	21283	No
25	North of I-76 and Charlestown Rd., west of Phoenixville Pike	21	TNM	No	No	2699	20	53972	4	13493	No
26	South of I-76 and east of Charlestown Rd.	5	TNM	No	No	2000	20.00	40000	2	20001	No

1 Noise abatement considered feasible if a minimum of 5 dBA Insertion Loss (IL) for a majority (50% or greater) of the impacted receptors.

2 Noise abatement considered reasonable if the Maximum Square Footage per Benefited Receptor (MaxSF/BR) has a value of 2000 or less. One benefited receptor must have an IL of 7 dBA.

Tables 5-2 through 5-10 summarizes the narrative results for abatement evaluations for each of the nine (9) NSAs that were determined to have impacted receptors. Table 5-11 presents the summary of recommended noise abatement.

NSA17 Residential

NSA17 contains two (2) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family residences located south of I-76, and east of Valley Hill Road. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 17290 square feet per benefited receptor) to provide the minimum required noise reduction far exceeded the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-2 summarizes the barrier analysis for this NSA location.

Table 5-2
Barrier Analysis Summary – NSA17

Descriptions	Results
Number of Impacted Receptors	2
Number of Benefited Receptors	1
Barrier Evaluation Method	TNM
Length (ft)	1235
Average Height (ft)	14.00
Minimum Height (ft)	10.00
Maximum Height (ft)	20.00
Area (ft^2)	17290
Calculated SF/BR	17290
Number of Receptors meeting Design Goal (7 dBA)	0
Design Goal Met?	No
Feasible?	Yes
Reasonable?	No
Recommended?	**No**

NSA18 Residential

NSA18 contains three (3) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family residences located north of I-76, and east of Valley Hill Road. Noise abatement was evaluated at one location along the alignment and is considered feasible. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 8973 square feet per benefited receptor) to provide the minimum required noise reduction far exceeded the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-3 summarizes the barrier analysis for this NSA location.

Table 5-3
Barrier Analysis Summary – NSA18

Descriptions	Results
Number of Impacted Receptors	3
Number of Benefited Receptors	3
Barrier Evaluation Method	TNM
Length (ft)	1507
Average Height (ft)	17.87
Minimum Height (ft)	16.00
Maximum Height (ft)	18.00
Area (ft^2)	26918
Calculated SF/BR	8973
Number of Receptors meeting Design Goal (7 dBA)	3
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	No
Recommended?	**No**

NSA19 Residential

NSA19 contains three (3) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family and multi-family residences located North of I-76 and west of Yellow Springs Rd. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 11575 square feet per benefited receptor) to provide the minimum required noise reduction is significantly more than the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-4 summarizes the barrier analysis for this NSA location.

Table 5-4
Barrier Analysis Summary – NSA19

Descriptions	Results
Number of Impacted Receptors	3
Number of Benefited Receptors	4
Barrier Evaluation Method	TNM
Length (ft)	2406
Average Height (ft)	19.24
Minimum Height (ft)	18.00
Maximum Height (ft)	20.00
Area (ft^2)	46298
Calculated SF/BR	11575
Number of Receptors meeting Design Goal (7 dBA)	1
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	No
Recommended?	**No**

NSA20 Residential

NSA20 contains eighteen (18) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family residences located south of I-76 at the intersection of Yellow Springs Road. and Brandywine Road. Noise abatement was evaluated and is considered feasible and reasonable. A barrier in this location was determined to be reasonable because the size of the barrier required (approximately 594 square feet per benefited receptor) to provide the minimum required noise reduction is within the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-5 summarizes the barrier analysis for this NSA location.

Table 5-5
Barrier Analysis Summary – NSA20

Descriptions	Results
Number of Impacted Receptors	18
Number of Benefited Receptors	25
Barrier Evaluation Method	TNM
Length (ft)	1366
Average Height (ft)	10.88
Minimum Height (ft)	8.00
Maximum Height (ft)	16.00
Area (ft^2)	14856
Calculated SF/BR	594
Number of Receptors meeting Design Goal (7 dBA)	7
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	Yes
Recommended?	**Yes**

NSA21 Residential

NSA21 contains twenty-one (21) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family residences located north of I-76, and east of Yellow Springs Road, along Blackberry Lane. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 3183 square feet per benefited receptor) to provide the minimum required noise reduction is well beyond the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-6 summarizes the barrier analysis for this NSA location.

Table 5-6
Barrier Analysis Summary – NSA21

Descriptions	Results
Number of Impacted Receptors	21
Number of Benefited Receptors	16
Barrier Evaluation Method	TNM
Length (ft)	3562
Average Height (ft)	14.35
Minimum Height (ft)	8.00
Maximum Height (ft)	18.00
Area (ft^2)	50928
Calculated SF/BR	3183
Number of Receptors meeting Design Goal (7 dBA)	10
Design Goal Met?	No
Feasible?	Yes
Reasonable?	No
Recommended?	**No**

NSA23 Residential

NSA23 contains one (1) receptor with NAC impacts associated with the proposed alternative. These receptors are representative of single-family residences located south of I-76 and north of Phoenixville Pike, near Spring Mill Road. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 20941 square feet per benefited receptor) to provide the minimum required noise reduction is significantly more than the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-7 summarizes the barrier analysis for this NSA location.

Table 5-7
Barrier Analysis Summary – NSA23

Descriptions	Results
Number of Impacted Receptors	1
Number of Benefited Receptors	2
Barrier Evaluation Method	TNM
Length (ft)	1841
Average Height (ft)	22.76
Minimum Height (ft)	24.00
Maximum Height (ft)	18.00
Area (ft^2)	41882
Calculated SF/BR	20941
Number of Receptors meeting Design Goal (7 dBA)	0
Design Goal Met?	No
Feasible?	Yes
Reasonable?	No
Recommended?	**No**

NSA24 Residential/ Church

NSA24 contains two (2) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family residences located south of I-76 and north of Phoenixville Pike, near Spring Mill Rd. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 21283 square feet per benefited receptor) to provide the minimum required noise reduction is significantly more than the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-8 summarizes the barrier analysis for this NSA location.

Table 5-8
Barrier Analysis Summary – NSA24

Descriptions	Results
Number of Impacted Receptors	2
Number of Benefited Receptors	1
Barrier Evaluation Method	TNM
Length (ft)	1064
Average Height (ft)	20
Minimum Height (ft)	20
Maximum Height (ft)	20
Area (ft^2)	21283
Calculated SF/BR	21283
Number of Receptors meeting Design Goal (7 dBA)	0
Design Goal Met?	No
Feasible?	Yes
Reasonable?	No
Recommended?	**No**

NSA25 School/Future Residential

NSA25 contains Twenty-One (21) receptors with NAC impacts associated with the proposed alternative. These receptors represent a school (Charlestown Elementary School) and a residential development currently under construction east of the school, They are both located north of I-76 and Charlestown Road, and west of Phoenixville Pike. A noise barrier for this NSA was determined to be not feasible and reasonable because a barrier within the Highway Right-of-way line could not provide sufficient noise reduction to meet the noise barrier design goal at the impacted receptors. This was primarily due to significant noise contributions from the local arterial roadways between the Highway and impacted receptors (Charlestown Road and Phoenixville Pike). Table 5-9 summarizes the barrier analysis for this NSA location.

Table 5-9
Barrier Analysis Summary – NSA25

Descriptions	Results
Number of Impacted Receptors	21
Number of Benefited Receptors	4
Barrier Evaluation Method	TNM
Length (ft)	2699
Average Height (ft)	20.00
Minimum Height (ft)	20.00
Maximum Height (ft)	20.00
Area (ft^2)	53972
Calculated SF/BR	13493
Number of Receptors meeting Design Goal (7 dBA)	0
Design Goal Met?	No
Feasible?	No
Reasonable?	No
Recommended?	**No**

NSA26 Residential

NSA26 contains five (5) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family residences located south of I-76, east of Morehall Road and north of Yellow Springs Road. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 20001 square feet per benefited receptor) to provide the minimum required noise reduction far exceeded the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-10 summarizes the barrier analysis for this NSA location.

Table 5-10
Barrier Analysis Summary – NSA26

Descriptions	Results
Number of Impacted Receptors	5
Number of Benefited Receptors	2
Barrier Evaluation Method	TNM
Length (ft)	2000
Average Height (ft)	20.00
Minimum Height (ft)	20.00
Maximum Height (ft)	20.00
Area (ft^2)	40000
Calculated SF/BR	20001
Number of Receptors meeting Design Goal (7 dBA)	0
Design Goal Met?	No
Feasible?	No
Reasonable?	No
Recommended?	**No**

Table 5-11
Recommended Noise Abatement Summary

Descriptions	NSA20
Number of Impacted Receptors	18
Number of Benefited Receptors	25
Barrier Evaluation Method	TNM
Length (ft)	1366
Average Height (ft)	10.88
Minimum Height (ft)	8.00
Maximum Height (ft)	16.00
Area (ft^2)	14856
Calculated SF/BR	594
Number of Receptors meeting Design Goal (7 dBA)	7
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	Yes

5.5 VIEWPOINTS OF BENEFITTED RECEPTORS

When proposed noise abatement is found to be reasonable and feasible in accordance with PennDOT policy, benefited residents and owners are polled to determine if they are in favor of having the noise abatement constructed. When noise abatement is recommended, a "Statement of Likelihood" is required that states that the recommended abatement is based upon preliminary design data, and that the abatement might not be provided if the final design changes significantly.

Polling for the viewpoints of benefited receptors will be conducted by the PTC Engineer's office and typically occurs after the Draft Noise Analysis is prepared and approved.

SECTION 6 CONSTRUCTION NOISE CONTROL & COMMUNITY COORDINATION

The Commission is committed to minimizing disruption to local residents, business owners, and the traveling public while also providing for the efficient construction of the proposed improvements. To this end, it is anticipated that a specification will be included in the construction contract(s) detailing responsibilities and actions relative to pending disruptions and noise levels (a sample of which is included below):

SAMPLE CONSTRUCTION NOISE SPECIFICATION

The Commission is committed to minimizing disruption to local residents, business owners, and the traveling public. The Commission will assign an individual to support this commitment. Indicate at the pre-construction conference the individual assigned this responsibility.

Coordinate activities with the Commission's Manager of Public Information & Involvement. Refer media contacts to the Commission's Manager of Public Information & Involvement.

At least two (2) weeks in advance of the start of construction activity affecting the local residents, business owners, and traveling public, make arrangements with the local municipality to conduct an initial community meeting or distribute a Construction Notice to adjacent property owners. For this meeting, have appropriate company personnel attend and be prepared to inform the public of the planned construction activities and their impacts. At other times as necessary, attend municipal meetings to inform the public of anticipated major changes to construction activities. If distribution of a Construction Notice is chosen, the contractor must have personnel distribute a handout to adjacent property owners stating:

(a) *that the contractor is performing work for the Commission*
(b) *the type of work to be performed*
(c) *the specific nights of the week , with dates, and the hours of work*
(d) *the contractor's Name and Phone Number to provide further information*

Coordinate with local municipalities and schedule short-term road closures so as not to impact civic or sport events.

Throughout the project duration, provide notifications to local residents, business owners, and the traveling public for any temporary inconveniences such as utility service interruptions, driveway construction, traffic interruptions, temporary and permanent road closures, detours, and other construction coordination as required.

COMMUNITY AWARENESS - Keep the Representative aware of all planned activities and specifically identify those that could have significant noise impact on the community due to close proximity of work to receptors.

This page intentionally left blank

SECTION 7 INFORMATION FOR LOCAL GOVERNMENT OFFICIALS

To minimize future traffic noise impacts on currently undeveloped lands of Type I projects, PennDOT is required to inform local jurisdictions (where the proposed highway project is located) of the following:

1. Noise compatible planning concepts.

2. The best estimation of the future design year noise levels at various distances from the edge of the nearest travel lane of the highway, where the future noise levels meet PennDOT's definition of "approach" for undeveloped lands or properties within the project limits. At a minimum, the distance to PennDOT's exterior NAC from Table 2-1 must be identified (this information is provided in Table 4-2).

To fulfill these two requirements, at a minimum, PTC must send a cover letter to local jurisdictions, along with copies of the noise study, explaining noise compatible planning concepts. A face-to-face meeting between PTC and the local jurisdiction(s) will likely better convey information than only sending a letter with attachments. The letter must also include a table of future noise levels at specific locations or a figure showing the distances to typical noise levels along the roadway for unpermitted, undeveloped lands in the project area. The letter should encourage local officials to make this information available for disclosure in real estate transactions. Local officials should be made aware that funds for traffic noise abatement are not available for development that occurs after the date of public knowledge of the project as explained in the letter.

The letter and copies of the noise technical report must be provided to and reviewed by City and/or County planning departments. The letter and the report should be distributed with the environmental document. The distribution information, including names and date distributed, and any follow-up contact with local agencies must be documented in the project files.

This page intentionally left blank

SECTION 8 CONCLUSIONS AND RECOMMENDATIONS

The noise analysis included a total of 99 measurement/prediction locations (receivers) representing 154 individual noise sensitive dwelling units (receptors). In order to simplify the reporting of noise levels, noise impacts, and noise mitigation, and in adherence with preferred PennDOT analysis methodology, these receptors were organized in 10 NSAs within the general project area.

Of the ten (10) NSAs evaluated, nine (9) NSAs contained receptors with predicted future noise levels approaching or exceeding the NAC. These nine NSAs were evaluated for noise abatement by modeling with TNM. Noise barriers for one NSA was found to be both feasible and reasonable following PennDOT's noise handbook. Therefore, noise abatement is recommended for NSA 20.

This page intentionally left blank

SECTION 9 REFERENCES

Pennsylvania Department of Transportation, Publication #24, Revision 2 "*Project Level Highway Traffic Noise Handbook*", 12-12-13.

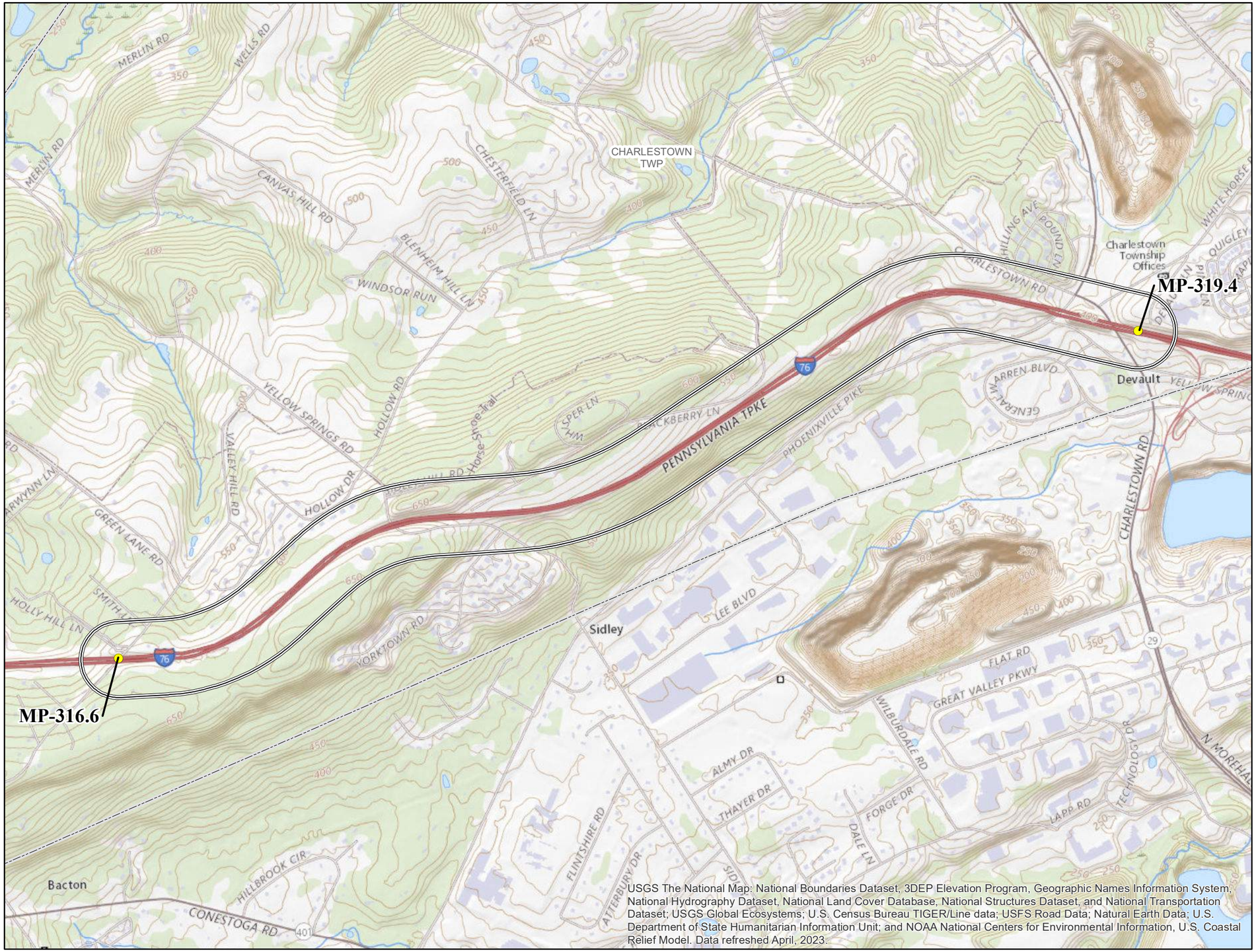
Federal Highway Administration, 23 CFR 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise, July 2010.

Federal Highway Administration (FHWA). 2011. Highway Traffic Noise: Analysis and Abatement Guidance. U.S. Department of Transportation, Federal Highway Administration, Washington, DC.

Lee, C.S.Y. and G.G. Fleming. 1996. Measurement of Highway Related Noise, Federal Highway Administration Report FHWA-PD-96-046. U.S. Department of Transportation, Research and Special Programs Administration, John A. Volpe National Transportation Systems Center, Cambridge, MA.

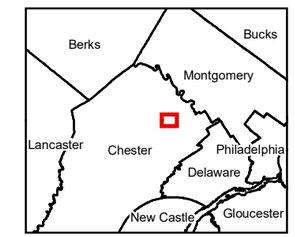
This page intentionally left blank

All Figures for this document are located in this section.



Legend

- Milepost
- Buffer: 500 Feet (either side)
- Municipal Boundary



Key Map
Not to Scale

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

Reference:
Toll Plazas and Municipalities
provided by PennDOT
USGS 7.5' Topographic Maps:
Malvern, PA (2023)

0 0.25 0.5 Miles

1 inch = 0.25 miles

AECOM

Figure 1
Project Overview Map

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

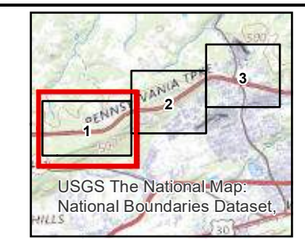
Prepared By: BSF	Checked By: JM/PB
Job: 21387722.00031	Date: 1/22/2024

Path: L:\DCS\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 1 PTC Project Overview Map_20240108.mxd

Legend

- Milepost
- Noise Sensitive Area (NSA)
- Buffer: 500 Feet (either side)
- Municipal Boundary

County/State/Nat'l Land	Residential
Farm/Agricultural	Transitional (in construction)
Forested	Utilities/Roads
Forested Wetland	Water Feature/Basin
Open Space	Vacant Land
Parcels with Land Trust Easements	



Key Map
Not to Scale

Note:
Undeveloped lands data unavailable in the Chester County Land Use GIS Dataset.

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Municipal Boundaries provided by PennDOT
Land Use Data (Chester County, 2005)
URS Custom Data

0 350 700 1,400 Feet

1 inch = 700 feet

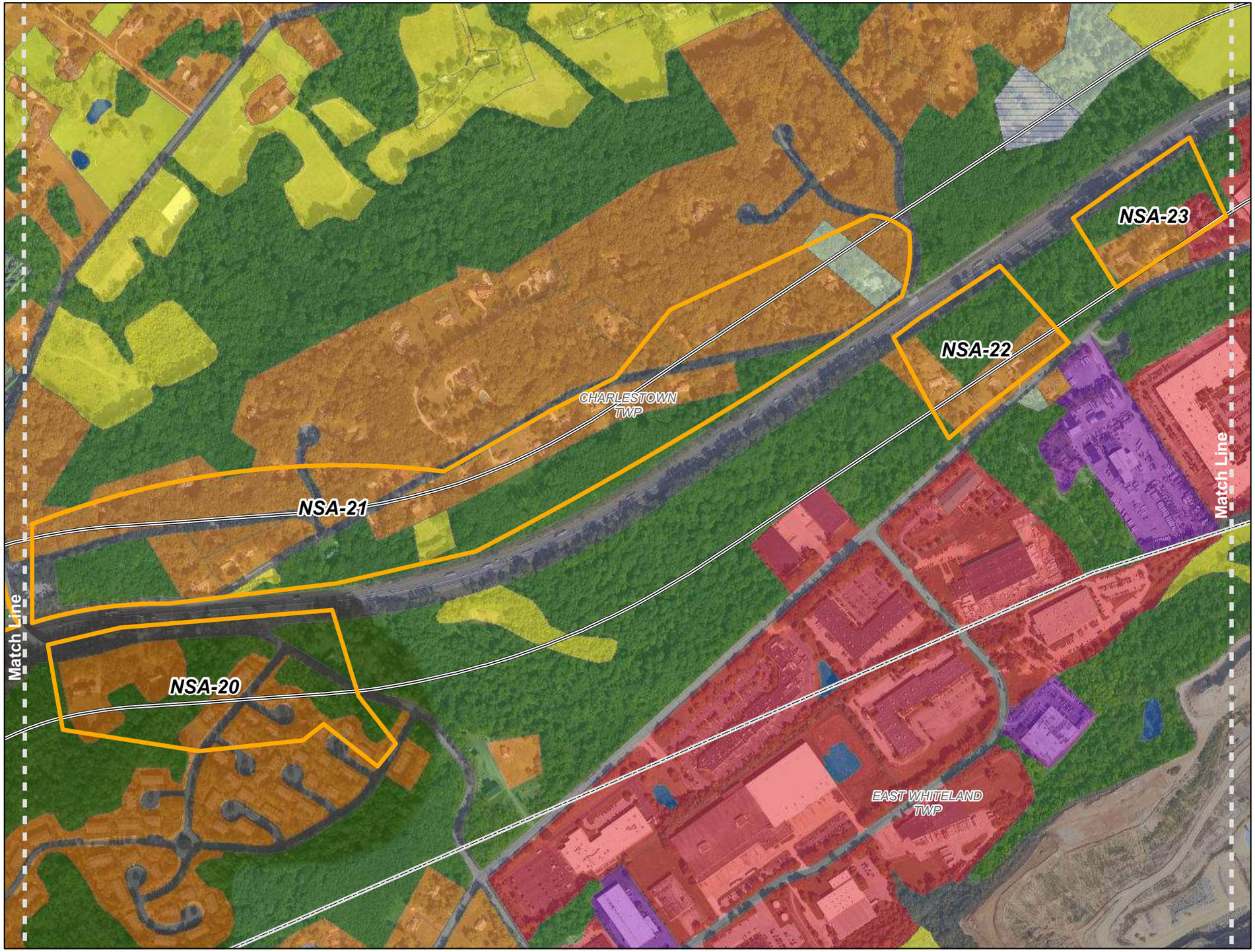
AECOM

Figure 2 -1
Land Use Map
Noise Sensitve Areas 17 to 19

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: BSF	Checked By: JM/PB
Job: 21387722.00031	Date: 1/22/2024

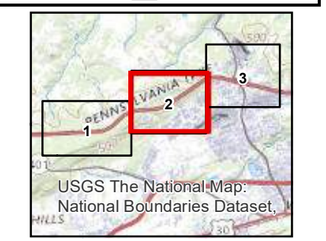
Path: L:\DCS\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 2 PTC Land Use_20240108.mxd



Legend

- Milepost
- Noise Sensitive Area (NSA)
- Buffer: 500 Feet (either side)
- Municipal Boundary

Commercial	Parcels with Land Trust Easements
Farm/Agricultural	Residential
Forested	Utilities/Roads
Industrial	Water Feature/Basin
Open Space	Vacant Land



Key Map
Not to Scale

Note:
Undeveloped lands data unavailable in the Chester County Land Use GIS Dataset.

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Municipal Boundaries provided by PennDOT
Land Use Data (Chester County, 2005)
URS Custom Data

0 275 550 1,100 Feet

1 inch = 550 feet

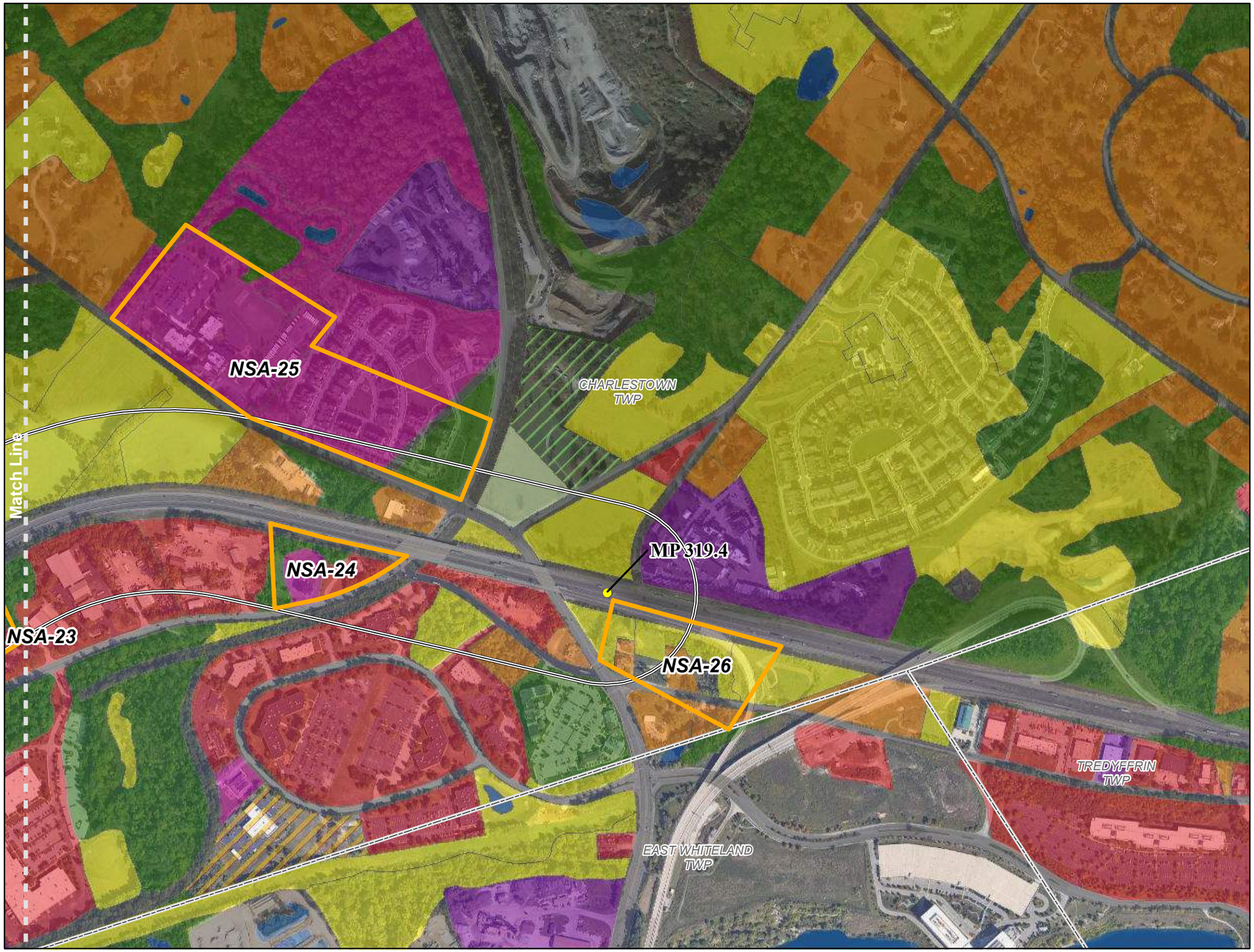
AECOM

Figure 2 -2
Land Use Map
Noise Sensitve Areas 20 to 23

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: BSF	Checked By: JM/PB
Job: 21387722.00031	Date: 1/22/2024

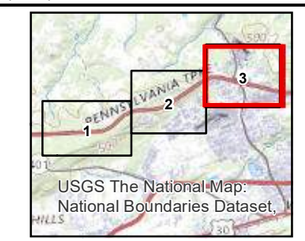
Path: L:\DCS\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 2 PTC Land Use_20240108.mxd



Legend

- Milepost
- Noise Sensitive Area (NSA)
- Buffer: 500 Feet (either side)
- Municipal Boundary

Commercial	Residential
Education/Church Facility	Transitional (in construction)
Farm/Agricultural	Utilities/Roads
Forested	Water Feature/Basin
Industrial	Vacant Land
Open Space	



Key Map
Not to Scale

Note:
Undeveloped lands data unavailable in the Chester County Land Use GIS Dataset.

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Municipal Boundaries provided by PennDOT
Land Use Data (Chester County, 2005)
URS Custom Data

0 275 550 1,100 Feet

1 inch = 550 feet

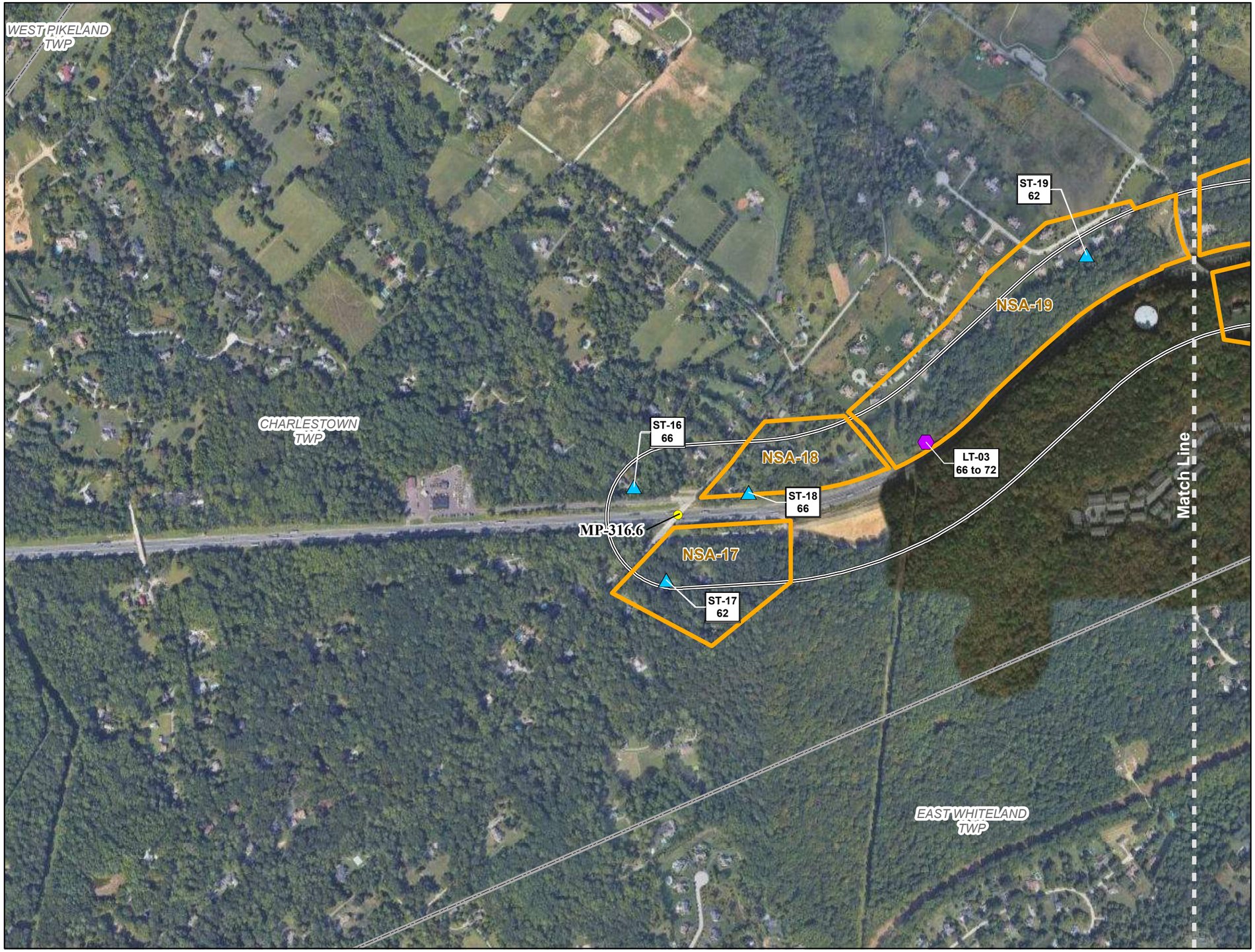
AECOM

Figure 2 -3
Land Use Map
Noise Sensitve Areas 24 to 26

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

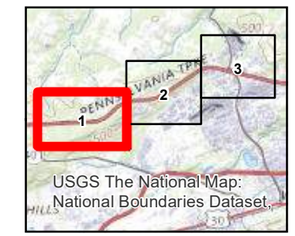
Prepared By: BSF	Checked By: JM/PB
Job: 21387722.00031	Date: 1/22/2024

Path: L:\DCS\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 2 PTC Land Use_20240108.mxd



Legend

- Milepost
- Short-Term Measurement Location
- Long-Term Measurement Location
- Buffer: 500 Feet (either side)
- Noise Sensitive Area (NSA)
- Municipal Boundary



Key Map
Not to Scale

ST-01
66.6

Receiver ID
Measured Noise Level
in dBA (A-weighted decibels)

Note: ST-10* could not be accessed during second site survey (Oct 2013).

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries
provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 700 1,400 Feet

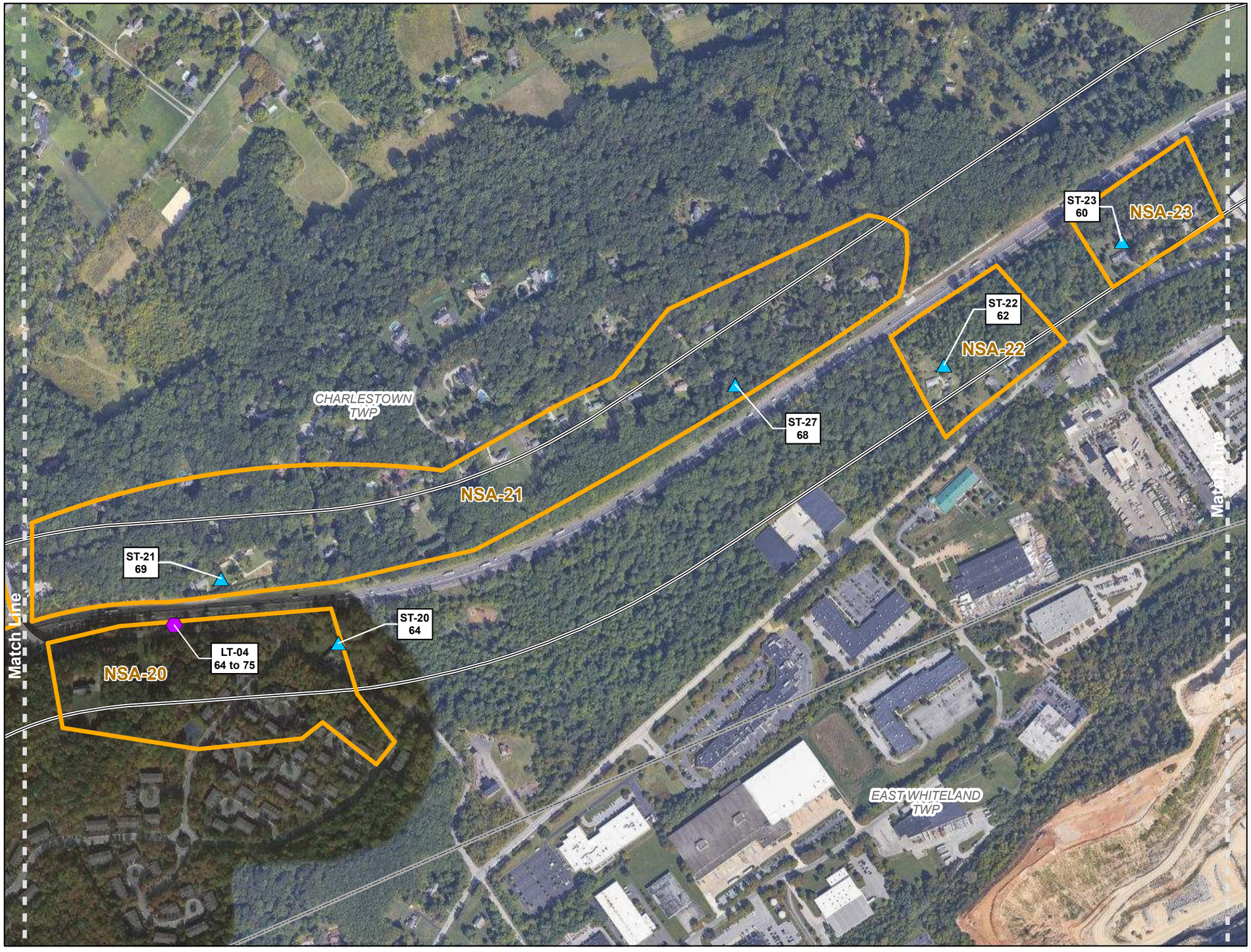
AECOM

Figure 3 - 1
Measured Noise Levels
Noise Sensitve Areas 17 to 19

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

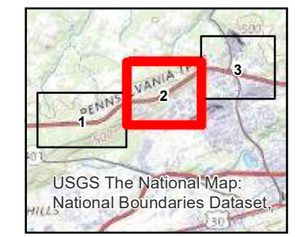
Prepared By: BSF	Checked By: JM/PB
Job: 21387722.00031	Date: 1/22/2024

Path: L:\DCS\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 3 PTC Noise Receptors and Measured Noise Levels_20240108.mxd



Legend

- Milepost
- Short-Term Measurement Location
- Long-Term Measurement Location
- Buffer: 500 Feet (either side)
- Noise Sensitive Area (NSA)
- Municipal Boundary



Key Map
Not to Scale

ST-01
66.6

Receiver ID
Measured Noise Level
in dBA (A-weighted decibels)

Note: ST-10* could not be accessed during second site survey (Oct 2013).

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries
provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 550 1,100 Feet

AECOM

Figure 3 - 2
Measured Noise Levels
Noise Sensitve Areas 20 to 23

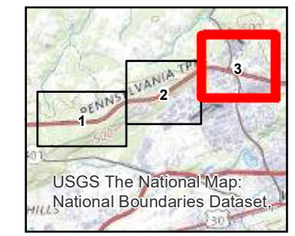
Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: BSF	Checked By: JM/PB
Job: 21387722.00031	Date: 1/22/2024

Path: L:\DCS\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 3 PTC Noise Receptors and Measured Noise Levels_20240108.mxd

Legend

- Milepost
- Short-Term Measurement Location
- Long-Term Measurement Location
- Buffer: 500 Feet (either side)
- Noise Sensitive Area (NSA)
- Municipal Boundary



Key Map
Not to Scale

ST-01
66.6

Receiver ID
Measured Noise Level
in dBA (A-weighted decibels)

Note: ST-10* could not be accessed during second site survey (Oct 2013).

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries
provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 550 1,100 Feet

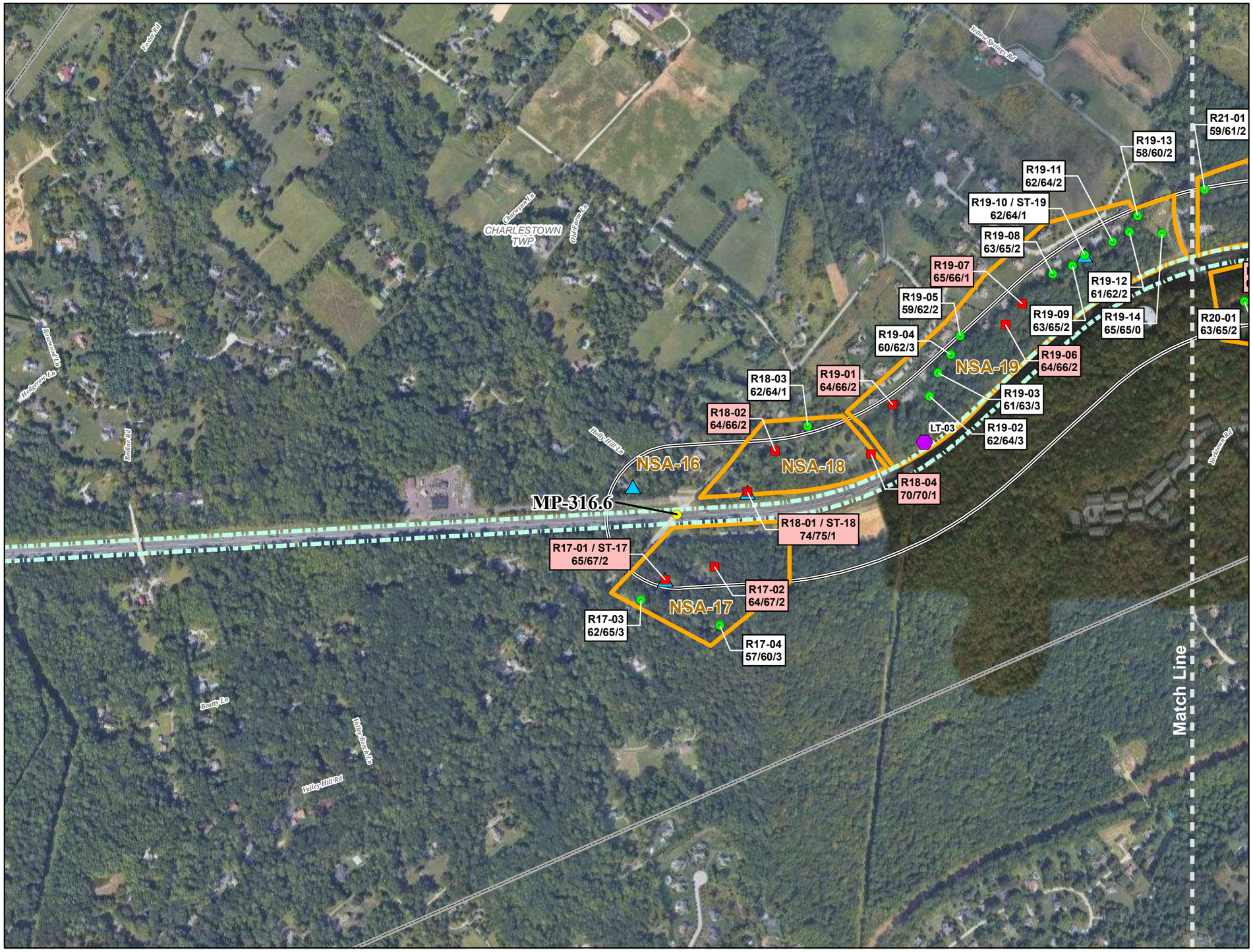
AECOM

Figure 3 - 3
Measured Noise Levels
Noise Sensitve Areas 24 to 26

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: BSF	Checked By: JM/PB
Job: 21387722.00031	Date: 1/22/2024

Path: L:\DCS\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 3 PTC Noise Receptors and Measured Noise Levels_20240108.mxd

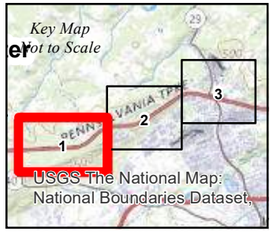


Legend

- Impacted Noise Receiver
- Non-Impacted Noise Receiver
- Milepost
- Short-Term Measurement Location
- Long-Term Measurement Location
- Future Roadway
- Buffer: 500 Feet (either side)
- Noise Sensitive Area (NSA)
- Municipal Boundary

Note: Noise Levels (NL) in dBA (A-weighted decibels)

R01-01 64/67/3 — Receiver ID; Existing NL/Future NL/decibel increase



N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 700 1,400 Feet

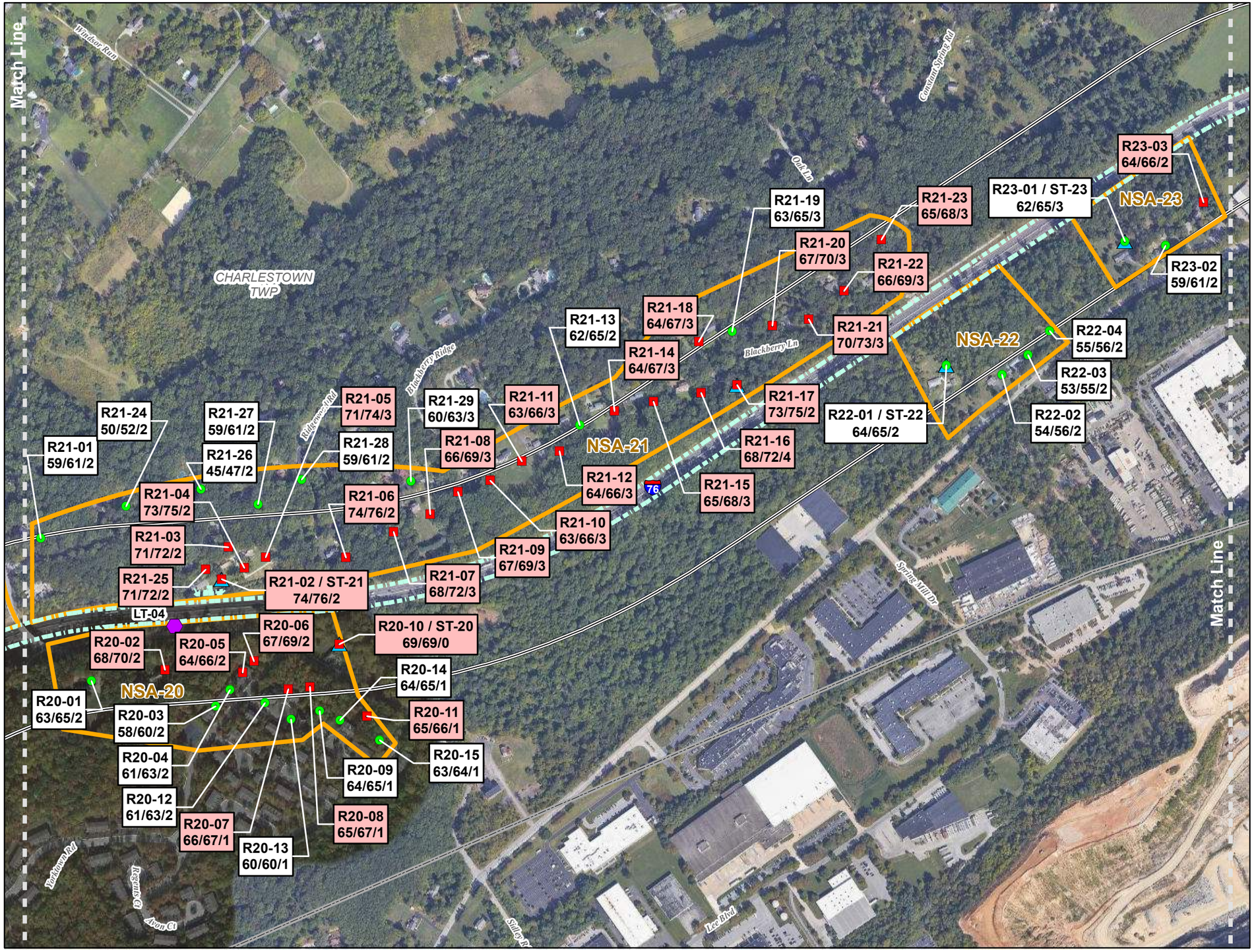
AECOM

Figure 4 - 1
Future Build Noise Levels
Noise Sensitve Areas 17 to 19

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: BSF	Checked By: JM/PB
Job: 21387722.00031	Date: 1/23/2024

Path: L:\DCS\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 4 PTC Overall Receivers Future Build Noise Levels_20240122.mxd

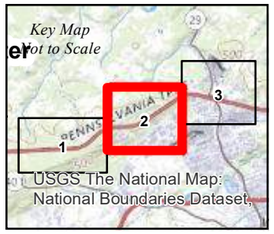


Legend

- Impacted Noise Receiver
- Non-Impacted Noise Receiver
- Milepost
- Short-Term Measurement Location
- Long-Term Measurement Location
- Future Roadway
- Buffer: 500 Feet (either side)
- Noise Sensitive Area (NSA)
- Municipal Boundary

Note: Noise Levels (NL) in dBA (A-weighted decibels)

R01-01 64/67/3 — Receiver ID; Existing NL/Future NL/decibel increase



NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

N

0 550 1,100 Feet

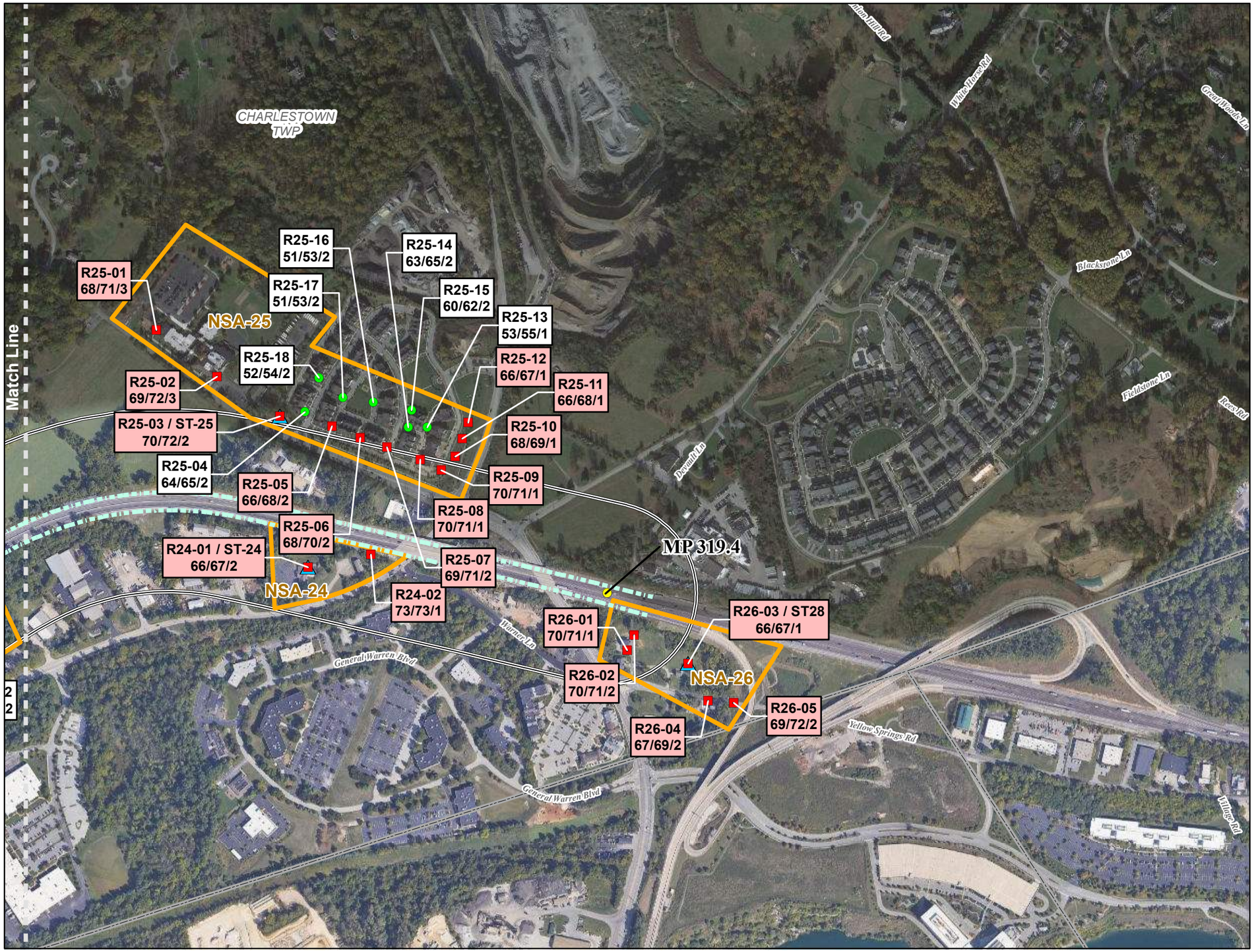
AECOM

Figure 4 - 2
Future Build Noise Levels
Noise Sensitve Areas 20 to 23

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: BSF	Checked By: JM/PB
Job: 21387722.00031	Date: 1/23/2024

Path: L:\DCS\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 4 PTC Overall Receivers Future Build Noise Levels_20240122.mxd



Legend

- Impacted Noise Receiver
- Non-Impacted Noise Receiver
- Milepost
- Short-Term Measurement Location
- Long-Term Measurement Location
- Future Roadway
- Buffer: 500 Feet (either side)
- Noise Sensitive Area (NSA)
- Municipal Boundary

Note: Noise Levels (NL) in dBA (A-weighted decibels)

R01-01 64/67/3 — Receiver ID; Existing NL/Future NL/decibel increase

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

N

0 550 1,100 Feet

AECOM

Figure 4 - 3
Future Build Noise Levels
Noise Sensitve Areas 24 to 26

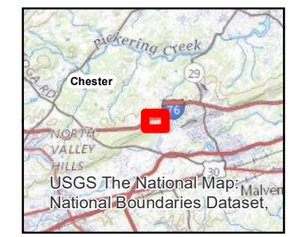
Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: BSF	Checked By: JM/PB
Job: 21387722.00031	Date: 1/23/2024

Path: L:\DCS\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 4 PTC Overall Receivers Future Build Noise Levels_20240122.mxd

Legend

- Receivers with Noise Reduction less than 5 dBA
- Receivers with Noise Reduction 5 dBA or greater
- Proposed Noise Barrier
- Future Roadway
- Buffer: 500 Feet (either side)
- Noise Sensitive Area (NSA)



Key Map
Not to Scale

R20-01
64 (4 NR)

Receiver ID
DY NL: Design Year Noise Level
NR: Noise Reduction from Barrier in dBA (A-weighted decibels)

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 300 600 Feet

AECOM

Figure 5
Noise Wall Barrier Locations

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: BSF	Checked By: JM/PB
Job: 21387722.00031	Date: 1/23/2024

Path: L:\DCS\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 5 PTC Recommended Noise Barriers_20240122.mxd

This page intentionally left blank

Appendix A contains a brief discussion on traffic noise fundamentals and control.

Fundamentals of Traffic Noise Assessment and Control

Noise is generally regarded as unwanted sound. Man-made noise is everywhere, from the busiest urban centers to the most remote national park. Excessive noise can interfere with sleep, work, recreation, and even one's health. One of the major contributors of noise in our society, perhaps the greatest contributor in terms of the number of people affected, is highway or traffic noise. In this appendix, we will briefly discuss:

- How noise is measured and defined;
- How highway noise is generated;
- How highway noise can be reduced; and
- Where to get more information.

How Noise is Measured and Defined

Sound, Noise and Acoustics

Sound is a disturbance created by a moving or vibrating source in a gaseous or liquid medium or the elastic stage of a solid and is capable of being detected by the hearing organs. Sound may be thought of as the mechanical energy of a vibrating object transmitted by pressure waves through a medium to a hearing organ, such as the human ear. For traffic sound, the medium of concern is air. *Noise* is defined as sound that is loud, unpleasant, unexpected, or undesired.

Sound transmission is a process that consists of three components: the sound source, the sound path, and the sound receiver. All three components must be present for sound to exist. Without a source to produce sound, there is no sound. Likewise, without a medium to transmit sound pressure waves, there is also no sound. Finally, sound must be received; a hearing organ, sensor, or object must be present to perceive, register, or be affected by sound or noise. In most situations, there are many different sound sources, paths, and receptors rather than just one of each. *Acoustics* is the field of science that deals with the production, propagation, reception, effects, and control of sound.

Frequency and Hertz

A continuous sound can be described by its *frequency* (pitch) and its *amplitude* (loudness). Frequency relates to and is expressed as the number of pressure oscillations, or cycles, per second. Low-frequency sounds are low in pitch, like the low notes on a piano, whereas high-frequency sounds are high in pitch, like the high notes on a piano. Cycles per second are commonly referred to as Hertz (Hz). A frequency of 250 cycles per second is referred to as 250 Hz. High frequencies are sometimes more conveniently expressed in units of kilo-Hertz (kHz, *i.e.*, thousands of Hertz). The extreme range of frequencies that can be heard by the healthiest human ear spans from 16-20 Hz on the low end of the audible spectrum to about 20,000 Hz (or 20 kHz) on the high end.

Sound Pressure Level and Decibels

The amplitude of a sound determines its loudness. Loudness of sound increases and decreases with increasing and decreasing amplitude, respectively. Sound pressure amplitude is measured in units of micro-Newton per square meter (N/m^2), also called micro-Pascal (µPa). The pressure of a very loud sound may be 200 million µPa, or 10 million times the pressure of the weakest audible sound (20 µPa). Because expressing sound levels in terms of µPa could therefore be very cumbersome, sound pressure level (SPL) is used instead to describe, in logarithmic units, the ratio of actual sound pressures to a reference pressure squared. These units are called bels, named after Alexander Graham Bell. To provide a finer resolution, a bel is subdivided into 10 decibels, abbreviated dB.

Addition of Decibels

Because decibels are logarithmic units, sound pressure levels cannot be added or subtracted by ordinary arithmetic means. For example, if one automobile produces an SPL of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB; they would, in fact, combine to produce 73 dBA. When two sounds of equal SPL are combined, they will produce a combined SPL 3 dBA greater than the original individual SPL. In other words, sound energy must be doubled to produce a 3-dBA increase. If two sound levels differ by 10 dBA or more, the combined SPL is equal to the higher SPL; in other words, the lower sound level does not increase the higher sound level.

A-Weighted Decibels

Sound pressure level alone is not a reliable indicator of loudness. The frequency, or pitch, of a sound also has a substantial effect on how humans will respond. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human Response to Changes in Noise Levels

Under controlled conditions in an acoustics laboratory, the trained, healthy human ear is able to discern changes in sound levels of 1 dBA when exposed to steady, single-frequency signals in the mid-frequency range. Outside such controlled conditions, the trained ear can detect changes of 2 dBA in normal environmental noise. It is widely accepted that the average healthy ear, however, can barely perceive noise level changes of 3 dBA. A change of 5 dBA is readily perceptible, and an increase or decrease of 10 dBA is perceived as being twice or half as loud, respectively. As discussed above, a doubling of sound energy results in a 3-dBA increase in sound, which means that a doubling of sound energy (*e.g.*, doubling the volume of traffic on a highway) would result in a barely perceptible change in sound level. **Table A.1** illustrates sound pressure levels in dBA of various sound sources between 0 dBA (threshold of hearing) and 140 dBA (threshold of pain). A relationship between changes in noise level and loudness is indicated in **Table A.2**.

Table A.1
Common Indoor and Outdoor Noise Levels*

Common Outdoor Noise Levels	Noise Level (A-weighted decibels)	Common Indoor Noise Levels
	110	Rock Band
Jet Flyover at 1000 feet	100	Inside Subway Train (NY)
Gas Lawn Mower at 3 feet		
Diesel Truck at 50 feet	90	Food Blender at 3 feet
Noisy Urban Daytime	80	Garbage Disposal at 3 feet
Gas Lawn Mower at 100 feet	70	Vacuum Cleaner at 10 feet
Commercial Area		Normal Speech at 3 feet
	60	
		Large Business Office
Quiet Urban Daytime	50	Dishwasher Next Room
Quiet Urban Nighttime	40	Small Theater
Quiet Suburban Nighttime		Library
	30	
Quiet Rural Nighttime		Bedroom at Night
	20	
		Broadcast & Recording Studio
	10	Threshold of Hearing
	0	

[1] Adapted from Guide on Evaluation and Attenuation of Traffic Noise, AASHTO-1974.

Table A.2
Relationship Between Changes in Noise Level and Perceived Loudness

Increase (or Decrease) in Noise Level	Loudness Multiplied (or Divided) by
3 decibels	1.2
6 decibels	1.5
10 decibels	2
20 decibels	4

Noise Descriptors

Noise in our daily environment fluctuates over time. Some of the fluctuations are minor; some are substantial. Some noise levels occur in regular patterns; others are random. Some noise levels fluctuate rapidly, others slowly. Some noise levels vary widely; others are relatively constant. Various noise descriptors have been developed to describe time-varying noise levels. The following is a list of the noise descriptors most commonly used in traffic noise analysis.

- *Equivalent Sound Level (L_{eq})* — L_{eq} represents an average of the sound energy occurring over a specified period. L_{eq} is, in effect, the steady-state sound level that, in a stated period, would contain the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour A-weighted equivalent sound level, L_{eq}(h), is the energy average of the A-weighted sound levels occurring during a 1-hour period and is the basis for noise abatement criteria (NAC) used by Caltrans and FHWA.
- *Percentile-Exceeded Sound Level (L_x)* — L_x represents the sound level exceeded for a given percentage of a specified period. For example, L_{10} is the sound level exceeded 10% of the time, and L_{90} is the sound level exceeded 90% of the time.
- *Maximum Sound Level (L_{max})* – L_{max} is the highest instantaneous sound level measured during a specified period.
- *Day-Night Level (L_{dn})* – L_{dn} is the energy average of the A-weighted sound levels occurring during a 24-hour period with 10 dBA added, as a nighttime penalty, to the A-weighted sound levels occurring between 10 p.m. and 7 a.m.

Sound Propagation

When sound propagates over a distance, it changes in both level and frequency content. The manner in which noise reduces with distance depends on the following factors.

- *Geometric Spreading* – Sound from a small, localized source (*i.e.*, a point source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates (or drops off) at a rate of 6 dBA for each doubling of distance. Highway noise is not a single, stationary point source of sound. The movement of the vehicles on a highway makes the source of the sound appear to emanate from a line (*i.e.*, a line source) rather than a point. This line source results in cylindrical spreading rather than the spherical spreading that results from a point source. The change in sound level from a line source is 3 dBA per doubling of distance.
- *Ground Absorption* – Most often, the noise path between the highway and the observer is very close to the ground. Noise attenuation from ground absorption and reflective wave canceling adds to the attenuation associated with geometric spreading. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is done for simplification only; for distances of less than 60 meters (200 feet) prediction results based on this scheme are sufficiently accurate. For acoustically hard sites (*i.e.*, those sites with a reflective surface, such as a parking lot or a smooth body of water, between the source and the receiver), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (*i.e.*, those sites with an absorptive ground surface, such as soft dirt, grass, or scattered bushes and trees, between

the source and the receiver), an excess ground attenuation value of 1.5 dBA per doubling of distance is normally assumed. When added to the geometric spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dBA per doubling of distance for a line source and 7.5 dBA per doubling of distance for a point source.

- *Atmospheric Effects* – Research by Caltrans and others has shown that atmospheric conditions can have a significant effect on noise levels within 60 meters (200 feet) of a highway. Wind has been shown to be the most important meteorological factor within approximately 150 meters (500 feet) of the source, whereas vertical air temperature gradients are more important for greater distances. Other factors such as air temperature, humidity, and turbulence also have significant effects. Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lower noise levels. Increased sound levels can also occur as a result of temperature inversion conditions (*i.e.,* increasing temperature with elevation).
- *Shielding by natural or human-made features* – A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by this shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (*e.g.,* hills and dense woods) and human-made features (*e.g.,* buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receiver specifically to reduce noise. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dBA of noise reduction. A taller barrier may provide as much as 20 dBA of noise reduction.

How Highway Noise is Generated

Highway noise is generated from three primary sources: tire/pavement noise, engine noise, and exhaust noise. Tire/pavement noise is the noise generated by the rubber tires rolling over the pavement surface and may vary in intensity and character depending on the type and condition of both the tires and the pavement. For automobiles and light trucks traveling at typical highway speeds (over 50 MPH), tire/pavement noise is generally the dominant noise source. For medium and heavy trucks (like large commercial delivery vehicles and long haul tractor-trailers) engine and exhaust noise also contribute to the noise that they produce. At typical highway speeds one large truck can produce as much noise energy as ten automobiles. How highway noise is experienced at nearby homes is controlled by a number of factors, including: the total number of vehicles on the highway, the percentage of large trucks, the average speed of the vehicles, the distance to the highway, obstructions blocking the view of the highway, and meteorological conditions. Generally speaking, the more vehicles, the higher percentage of large trucks or the closer one is to the highway, the greater the noise will be. Intervening obstructions, either manmade (buildings, walls, berms) or natural (such as intervening terrain) will reduce noise levels. Foliage and vegetation can reduce noise levels, but it must be dense (completely obscuring the view of the highway) and thick (on the order of 50 to 100 feet) in order to make a significant difference.

How Highway Noise Can Be Reduced

Highway noise can be reduced in a number of ways. Here are some of the most commonly recognized:

Land Use Controls

Perhaps the most common sense and fiscally responsible solution to highway noise, and one favored by most highway agencies, is to restrict the development of lands near highways. Restricting development of land near new highway corridors to non-noise sensitive land uses, such as commercial or industrial activities, can eliminate most noise problems. However, this approach is not suitable for circumstances when land near existing of future highways has already been developed for residential land use.

Quieter Vehicle Noise Sources

Quieter vehicles mean less highway noise. For automobiles this means quieter tires (since tire/pavement noise is the dominant noise source). For large trucks the EPA has established standards for maximum noise levels for new and in-use trucks. The maximum noise levels for new trucks are lower than those for existing trucks, so as old trucks are phased out and replaced with newer ones the noise produced by the average truck may go down.

Noise Barrier Walls and Berms

Noise barriers, both structural walls and earthen berms, are often constructed specifically for the purpose of reducing highway noise levels. Noise barrier can be very effective for reducing noise levels at nearby homes. Because of their cost, the construction of noise barriers is often restricted to large highway improvement or construction projects.

How Noise Barriers Work

Noise barriers reduce noise levels by interrupting or lengthening the path that the noise takes between the source and the receiver. In order to be effective at reducing noise, noise barriers must be able to block the "line of sight" between the object producing the noise (like vehicles on the highway) and the person subjected to the noise (like residents living near the highway). The amount that the noise will be reduced is related to the path length difference between the "direct path" that the uninterrupted sound would take between the source and receiver (with no barrier) and the "diffracted path" that the sound must take going over or around the barrier, as illustrated in **Figure A.1**.

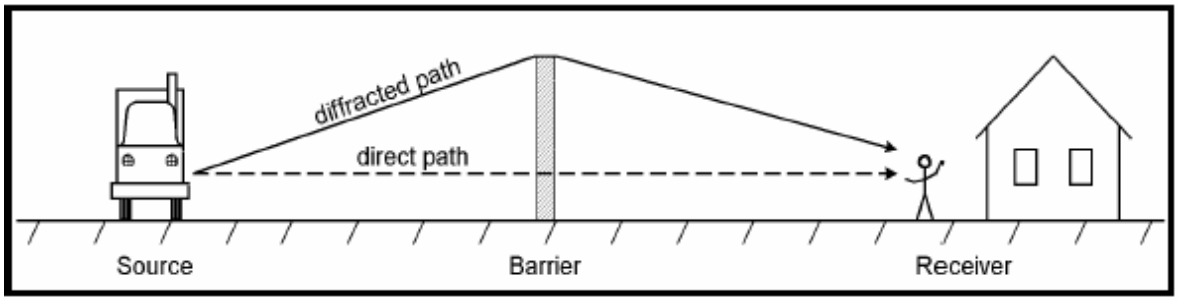


Figure A.1 Simple Noise Barrier Geometry

Noise barriers may work better for some homes than for others. In **Figure A.2**, below, home "A" is relatively close to the highway where the noise barrier can provide a large path length difference between the direct and diffracted paths, resulting in a substantial noise reduction (perhaps as much as 10 to 15 decibels). Home "B" is further from the barrier and the path length difference is not as great, resulting in less noise reduction (perhaps 7 to 10 decibels). Home "C" is even further from the highway, and also elevated above the highway level, providing an even smaller path length difference (resulting in a noise reduction of perhaps 3 to 5 decibels). In general, for a given barrier height and location, the further the receiver is from the barrier or the higher the receiver is elevated, the smaller the path length difference (or angle of diffraction) and the smaller the resulting noise reduction.

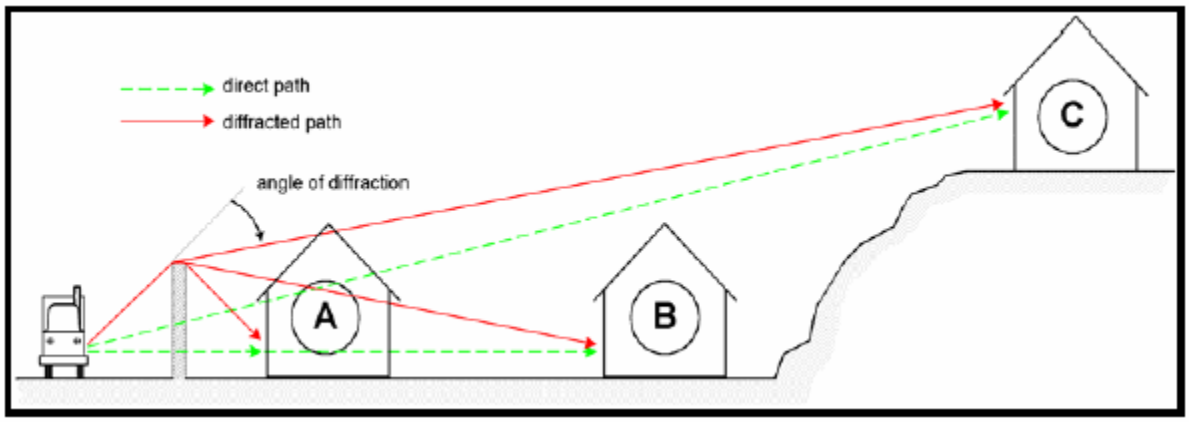


Figure A.2 Path Length Difference for Varying Receiver Geometry

References

1. *Fundamentals and Abatement of Highway Traffic Noise*, Bolt Beranek and Newman, 1973.

2. *Assessment of Noise with Respect to Community Response*, ISO R1996, International Organization for Standardization, Switzerland.

3. Federal Highway Administration, *Procedures for Abatement of Highway Noise and Construction Noise.* 23 CFR Part 772, Final Rule, effective 9 August 1992.

4. Office of Environment and Planning, Memorandum HEP-41 December 1993.

This page intentionally left blank

Appendix B contains the following noise measurement data collected while conducting field noise measurements as part of the noise analysis:

- Photographs and descriptions of measurement locations;
- Hand-written field measurement data sheets containing sketches, noise levels, weather data, traffic information, and other data pertinent to the noise measurement process;
- Traffic counts observed in the field while measurements were being conducted. Classified traffic counts were generally taken from video shot during the noise measurements. Speeds used for validation runs were values indicated on the field data sheets as "Observed" speeds. Existing speeds were estimated by driving through the project roadway during periods with similar traffic conditions and noting vehicle speed. The observed speed was the posted speed limit.
- Sound Level Meter (SLM) data;
- Long Term Measurement Data Charted Time vs. Decibel Level; and
- Calibration certificates for each SLM used to conduct field measurements.

Photograph 1
Date: 11/30/12

Comments:
ST17: Short-Term Monitor, reference position in the front yard of the residence at 2198 Valley Hill Road. Camera facing north.

IMG_0180

Photograph 2
Date: 11/30/12

Comments:
ST17: Short-Term Monitor, reference position in the front yard of the residence at 2198 Valley Hill Road. Camera facing south.

IMG_0178

Photograph 3
Date: 11/30/12

Comments:
ST18: Short-Term Monitor, reference position in the side yard of the residence at 2236 Valley Hill Road. Camera facing north.

IMG_0181

Photograph 4
Date: 11/30/12

Comments:
ST18: Short-Term Monitor, reference position in the side yard of the residence at 2236 Valley Hill Road. Camera facing south.

IMG_0183

	**Photograph 5** **Date:** 11/14/23 **Comments:** ST19: Short-Term Monitor, reference position in the back yard of the residence at 12 Pyle Court. Camera facing residence (North) IMG_1095
	**Photograph 6** **Date:** 10/29/13 **Comments:** ST19: Short-Term Monitor, reference position in the back yard of the residence at 12 Pyle Court.Camera facing project area (South). IMG_1100

Photograph 7
Date: 10/29/13

Comments:
ST20: Short-Term Monitor, reference position in the back yard of the residence at 20624 Yellow Springs Road. Camera facing north.

IMG_1102

Photograph 8
Date: 10/29/13

Comments:
ST20: Short-Term Monitor, reference position in the back yard of the residence at 20624 Yellow Springs Road. Camera southeast.

IMG_1105

Photograph 9
Date: 11/29/12

Comments:
ST21: Short-Term Monitor, reference position in the side yard of the residence at 181 Blackberry Lane. Camera facing southeast.

IMG_0166

Photograph 10
Date: 11/29/12

Comments:
ST21: Short-Term Monitor, reference position in the side yard of the residence at 181 Blackberry Lane. Camera facing northeast.

IMG_0163

Photograph 11
Date: 10/29/13

Comments:
ST22: Short-Term Monitor, reference position in the back yard of the residence at 3149 Phoenixville Pike. Camera facing north.

IMG_1084

Photograph 12
Date: 10/29/13

Comments:
ST22: Short-Term Monitor, reference position in the back yard of the residence at 3149 Phoenixville Pike. Camera facing south.

IMG_1088

Photograph 13
Date: 10/29/13

Comments:
ST23: Short-Term Monitor, reference position in the back yard of the residence at 3199 Phoenixville Pike. Camera facing north.

IMG_1077

Photograph 14
Date: 10/29/13

Comments:
ST23: Short-Term Monitor, reference position in the back yard of the residence at 3199 Phoenixville Pike. Camera facing south.

IMG_1081

Photograph 15
Date: 11/30/12

Comments:
ST24: Short-Term Monitor, reference position in the side yard of the church at 3281 Phoenixville Pike. Camera facing north.

IMG_0204

Photograph 16
Date: 11/30/12

Comments:
ST24: Short-Term Monitor, reference position in the side yard of the church at 3281 Phoenixville Pike. Camera facing east.

IMG_0205

Photograph 17
Date: 11/30/12

Comments:
ST25: Short-Term Monitor, reference position near Charleston Elementary School at 2060 Charlestown Road. Camera facing south.

New measurements were taken in this location 11/14/ 2023.

IMG_0208

Photograph 18
Date: 11/30/12

Comments:
ST25: Short-Term Monitor, reference position near Charleston Elementary School at 2060 Charlestown Road. Camera west.

New measurements were taken in this location 11/14/ 2023.

IMG_0210

Photograph 19
Date: 10/29/13

Comments:
ST26: Short-Term Monitor, reference position in the back yard of the residence at 3501 Eaton Court. Camera facing south.

IMG_1129

Photograph 20
Date: 10/29/13

Comments:
ST26: Short-Term Monitor, reference position in the back yard of the residence at 3501 Eaton Court. Camera facing north.

IMG_1134

Photograph 21
Date: 11/29/12

Comments:
LT03: Long-Term Monitor, reference position in the open area next to the residence at 57 Deerfield Drive. Camera facing southeast.

IMG_0097

Photograph 22
Date: 11/29/12

Comments:
LT03: Long-Term Monitor, reference position in the open area next to the residence at 57 Deerfield Drive. Camera facing north.

IMG_0094

Photograph 23
Date: 11/29/12

Comments:
LT04: Long-Term Monitor, reference position across street from 2111 Yellow Springs Road. Camera facing northwest.

IMG_0101

Photograph 24
Date: 11/29/12

Comments:
LT04: Long-Term Monitor, reference position across street from 2111 Yellow Springs Road. Camera facing south.

IMG_0106

Project Name: PTC 319-312 Project #: _____ Date: 11/29/12 Page ___ of ___

Monitoring Location: LT-03 57 DEERFIELD DRIVE Analyst: JDD

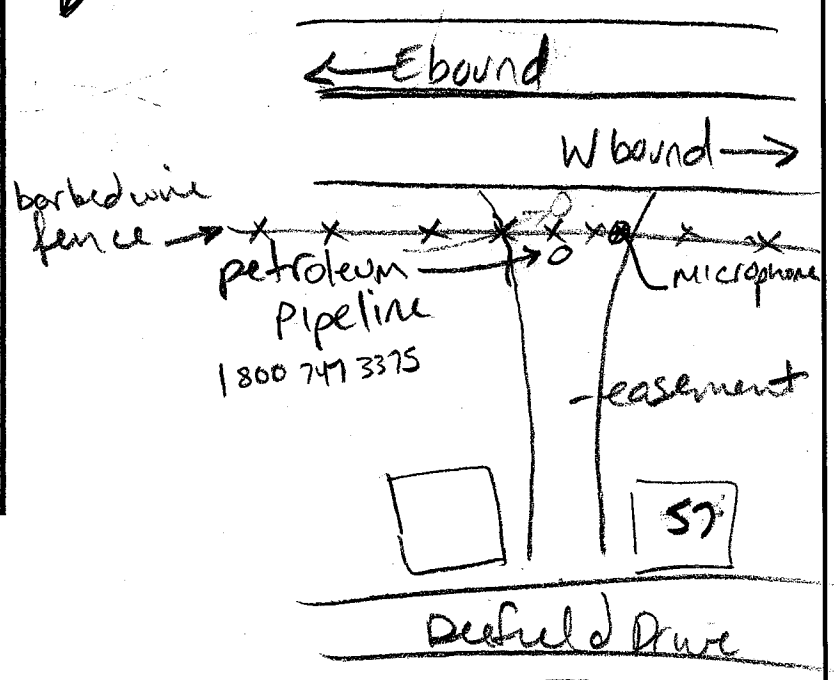
Sound Level Meter		Field Calibration		Weather Data	
Model #:	LD720	Model #:	CAL 200	Model #:	K3500
Serial #:	0436	Serial #:	5789	Serial #:	1703474
Weighting: A / C / Flat		Calibration Level (dBA):	94 / 114	Wind: Steady/Gusty/Calm	
Response: Slow / Fast / Impl		Pre-Test	114.0 dBA	Precipitation: Yes (explain) / No	
Windscreen : Yes / No (explain)		Post-Test	/ dBA	Avg Wind Speed/Direction:	0-2mph
Topo: Flat / Hilly		GPS Coordinates (at SLM location)#		Temp (°F): 36°F	RH (%): 56%
Terrain: Hard/Soft/Mixed/Snow		N40°03.91.9' W75°34.737'		Bar Psr (Hg): 1006	Cloud Cover (%): 100%

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	10:14	11/29/12	24-hour MEASUREMENT						
	≈	10:00	11/30/12	STOPPED METER					

Roadway Name/Dir	PA TURNPIKE	
Speed (post/obs)*	55/65	
Number of Lanes	4	
Width (pave/row)	N/A	
1- or 2- way	2	
Grade	Flat	
Bus Stops	Ø	
Stoplights	Ø	
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No 6 photos

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: _____ Date: 10/28/13 Page ___ of ___

Monitoring Location: LT-04 ACROSS FROM 2111 YELLOW SPRINGS RD Analyst: JDD

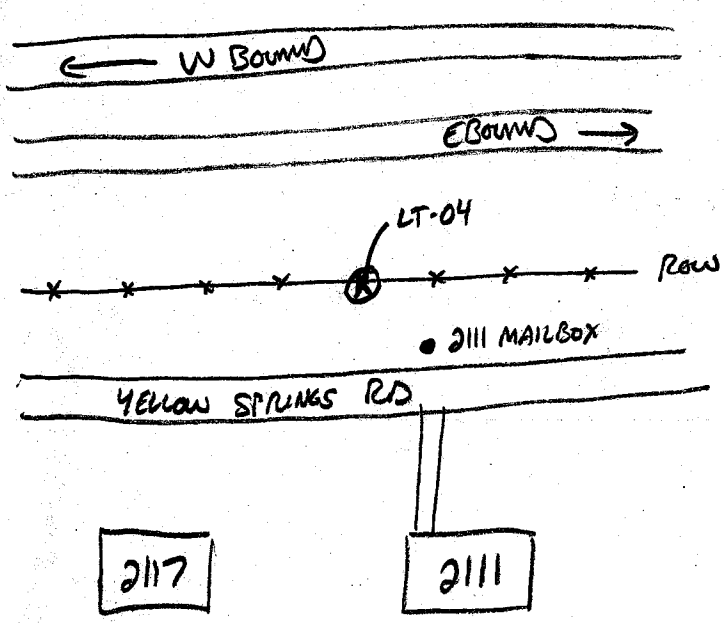
Sound Level Meter	Field Calibration	Weather Data
Model #: LD 712 SLM	Model #: CAL 200	Model #: K3500
Serial #: 0418	Serial #: 5789	Serial #: 1703474
Weighting: A / C / Flat	Calibration Level (dBA): 94 / 114	Wind: Steady/Gusty/Calm
Response: Slow / Fast / Impl	Pre-Test 114.0 dBA	Precipitation: Yes (explain) / No
Windscreen: Yes / No (explain)	Post-Test — dBA	Avg Wind Speed/Direction: NONE
Topo: Flat / Hilly	GPS Coordinates (at SLM location)#	Temp (°F): 60.0 RH (%): 50.4
Terrain: Hard/Soft/Mixed/Snow	N 40°04.180' W 75°34.105'	Bar Psr (Hg): 000.2 Cloud Cover (%): 10% light clouds

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	17:03	10/28/13		BEGIN 24-HOUR MEASUREMENT					PA turnpike dominates traffic on yellow springs road audible when present
	0853	10/29/13		check batteries / replaced batteries and reading					
	1704	10/29/13							
									Receptor above turnpike grade

Roadway Name/Dir	PA TURNPIKE	
Speed (post/obs)*	65/70	
Number of Lanes	4	
Width (pave/row)	N/A	
1- or 2- way	2	
Grade	FLAT	
Bus Stops	Ø	
Stoplights	Ø	
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No 8 photos

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse

Project Name: PTC 319-312 Project #: _____ Date: 11/30/12 Page ___ of ___

Monitoring Location: ST-17 2198 Valley Hill Rd Analyst: JDD

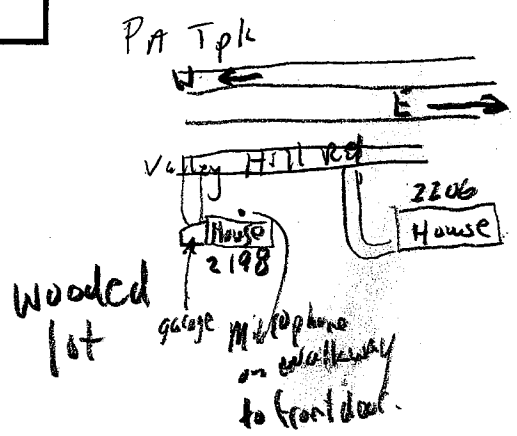
Sound Level Meter		Field Calibration		Weather Data	
Model #:	LD 820	Model #:	Cal 200	Model #:	K3500
Serial #:	1651	Serial #:	5789	Serial #:	1703474
Weighting: A / C / Flat		Calibration Level (dBA):	94 / 114	Wind: Steady/Gusty/Calm	
Response: Slow / Fast / Impl		Pre-Test	114.0 dBA	Precipitation: Yes (explain) No	
Windscreen: Yes / No (explain)		Post-Test	— dBA	Avg Wind Speed/Direction:	—
Topo: Flat / Hilly		GPS Coordinates (at SLM location)#		Temp (°F): 32	RH (%): 62.1
Terrain: Hard/Soft/Mixed/Snow		N40° 3.834' W75° 35.103'		Bar Psr (Hg): 1004.0	Cloud Cover (%): 90

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	0925	0930	62.0	57.3	67.4	64.1	61.5	58.9	
	0930	0935	61.3	54.7	65.3	63.8	61.0	57.2	
	0935	0940	62.2	54.8	67.2	64.7	61.6	57.1	

Roadway Name/Dir	PA Tpk	
Speed (post/obs)*	55/65	
Number of Lanes	4	
Width (pave/row)	NA	
1- or 2- way	2	
Grade	Flat	
Bus Stops	0	
Stoplights	0	
Motorcycles	W 0 E	
Automobiles	188 297	
Medium Trucks	12 13	
Heavy Trucks	57 50	
Buses	3 2	
Count duration	15 mins	

compass N

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No 4 photos

Additional Notes/Comments:

Homes are at elevation above the PA Tpk

Field change: #2198 substituted for #2206 (unable to reach resident at 2206.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTL 319-312 Project #: _____ Date: 11/30/12 Page ___ of ___

Monitoring Location: ST-18 2236 Valley Hill Road Analyst: JDD

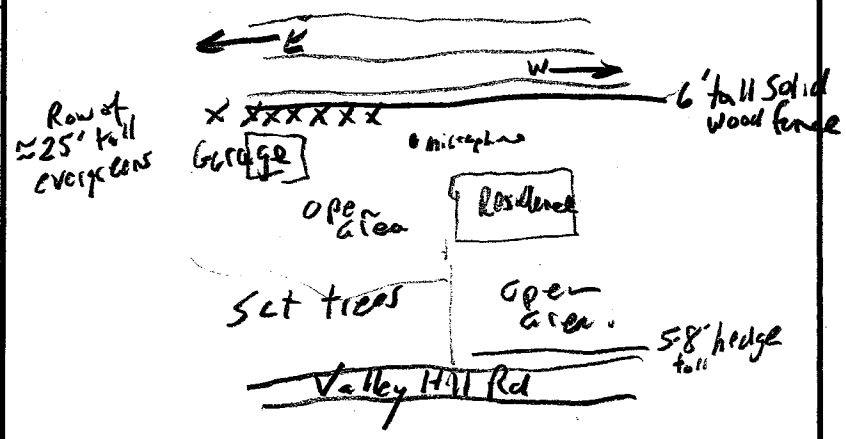
Sound Level Meter		Field Calibration		Weather Data	
Model #:	LD 820	Model #:	Cal 200	Model #:	K3500
Serial #:	1651	Serial #:	5789	Serial #:	1703474
Weighting: A / C / Flat		Calibration Level (dBA):	94 / 114	Wind: Steady/Gusty/Calm	
Response: Slow / Fast / Impl		Pre-Test	114.0 dBA	Precipitation: Yes (explain) / No	
Windscreen: Yes / No (explain)		Post-Test	— dBA	Avg Wind Speed/Direction:	0
Topo: Flat / Hilly		GPS Coordinates (at SLM location)#		Temp (°F): 32	RH (%): 59.1
Terrain: Hard/Soft/Mixed/Snow		N 40°3.931'	W 75°34.979'	Bar Psr (Hg): 1004.8	Cloud Cover (%): 60

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	0950	0955	66.7	54.6	74.0	69.6	66.1	61.3	
	0955	1000	66.0	54.0	72.3	68.9	64.9	60.5	
	1000	1005	66.7	53.8	73.8	69.8	65.6	60.4	

Roadway Name/Dir	PA Tpk	
Speed (post/obs)*	55/65	
Number of Lanes	4	
Width (pave/row)	NA	
1- or 2- way	2	
Grade	Flat	
Bus Stops	0	
Stoplights	0	
Motorcycles	* See ST-17 traffic counts	
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? ~~Yes~~/No

Additional Notes/Comments:

This is an address change from 2252 Valley Hill Rd

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse

GENERAL

AECOM Acoustics and Noise Control Practice

FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC widening MP316-314 Project #: 60392460 Date: 11/14/2023 Page 1 of 1

Measurement Location: ST-19 12 Pyle Ct Analyst: JM

Sound Level Meter	Field Calibration	Meteorological Data
Model #: 831 C	Model #: CAL200	Model #: Kestrel
Serial #: 10613	Serial #: 1238	Serial #: 2025
Weighting: (A) / C / Flat	Calibration Level (dB): 94 / (114)	Precipitation: Yes (explain) / (No)
Response: (Slow) / Fast / Impl	Pre-Test -0.20 dBA	Wind: (Steady) / Gusty / Calm
Windscreen: (Yes) / No (explain)	Post-Test -0.30 dBA	Avg Wind Speed/Direction: 3 m/s / (MPH)
Topo: Flat / Hilly	GPS Coordinates (at SLM location)	Temp (°F): 49.6 RH (%): 56.3
Terrain: Hard / Soft / Mixed / Agg / Snow		Bar Psr (Hg): 1010 Cloud Cover (%): 10

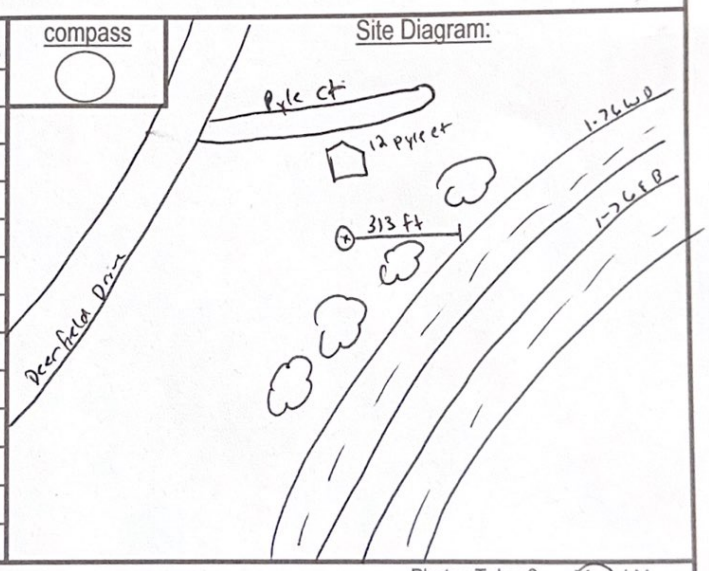
Time Obs/Meas: 9:45

Loc. ID	Start Time (hh:mm)	Stop Time (hh:mm)	Notes/Events
	09:38	09:53	

Roadway Name/Dir.	PA-TP EB	PA-TP WB
Speed (post/obs*)	65	65
Number of Lanes	2	2
Width (pave/row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles	Ø	Ø
Automobiles	183	182
Medium Trucks	11	24
Heavy Trucks	56	52
Buses	1	1
Count duration	15 min	15 min

compass

Site Diagram:



* - Speed estimated by Radar / Driving / Observation

Photos Taken? (Yes) / No

Additional Notes/Comments:

Noise Sources (circle all that apply): distant aircraft • roadway traffic • rail ops • landscaping • rustling leaves • children playing • dogs barking/birds • vocalizing/insects/mechanical

Additional Notes and Sketches on Reverse or Indicated Separate Sheet(s)

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: _____ Date: 10/28/13 Page ___ of ___
Monitoring Location: ST-20 2062 Yellow Springs Rd Analyst: JDD / SRS

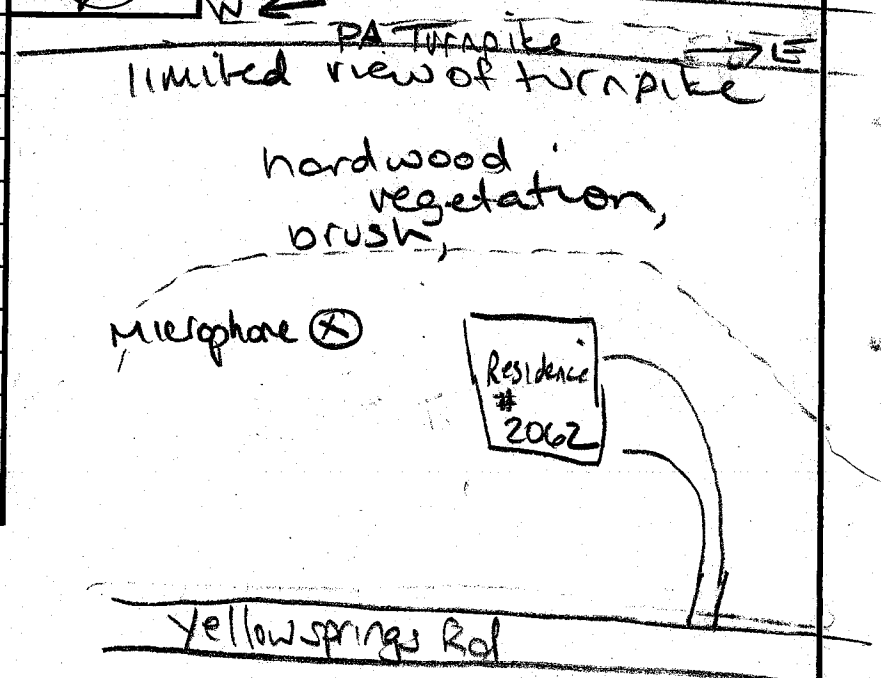
Sound Level Meter	Field Calibration	Weather Data
Model #: LD820	Model #: CAL200	Model #: K3500
Serial #: 1657	Serial #: 5789	Serial #: 1703474
Weighting: A / C / Flat	Calibration Level (dBA): 94 / 114	Wind: Steady/Gusty/Calm
Response: Slow / Fast / Impl	Pre-Test 114 dBA	Precipitation: Yes (explain) / No
Windscreen: Yes / No (explain)	Post-Test — dBA	Avg Wind Speed/Direction: None
Topo: Flat / Hilly	GPS Coordinates (at SLM location)#	Temp (°F): 60.0 RH (%): 53.2
Terrain: Hard/Soft/Mixed/Snow	N40°04.165 W75°33.931	Bar Psr (Hg): 1002.6 Cloud Cover (%): Light

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1635	1640	64.4	59.4	68.5	66.7	64.1	61.3	
	1640	1645	65.2	59.4	69.9	67.5	64.8	62.2	
	1645	1650	62.9	59.0	67.7	65.0	62.3	60.1	
	1650	1655	63.5	58.6	68.5	65.3	63.2	60.4	
									YELLOW SPRINGS ROAD
									15 MIN COUNT
									AUTOS = 40

Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	2	2
Width (pave/row)	50	50
1- or 2- way	1	1
Grade	flat	flat
Bus Stops	/	/
Stoplights	/	/
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No 7 photos

Additional Notes/Comments:

Other Noise Sources: distant aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: _____ Date: 11/29/12 Page ___ of ___

Monitoring Location: ST-21 181 Blackberry Ln Analyst: JDD

Sound Level Meter	Field Calibration	Weather Data
Model #: LD820	Model #: Cal 200	Model #: K3500
Serial #: 1651	Serial #: 5789	Serial #: 1703474
Weighting: A / C / Flat	Calibration Level (dBA): 94 / 114	Wind: Steady/Gusty/Calm
Response: Slow / Fast / Impl	Pre-Test 114.0 dBA	Precipitation: Yes (explain) / No
Windscreen: Yes / No (explain)	Post-Test — dBA	Avg Wind Speed/Direction: 0
Topo: Flat / Hilly	GPS Coordinates (at SLM location)#	Temp (°F): 43 RH (%): 53
Terrain: Hard/Soft/Mixed/Snow	N 40° 4.227' W 75° 34.066'	Bar Psr (Hg): 1003.9 Cloud Cover (%): 0

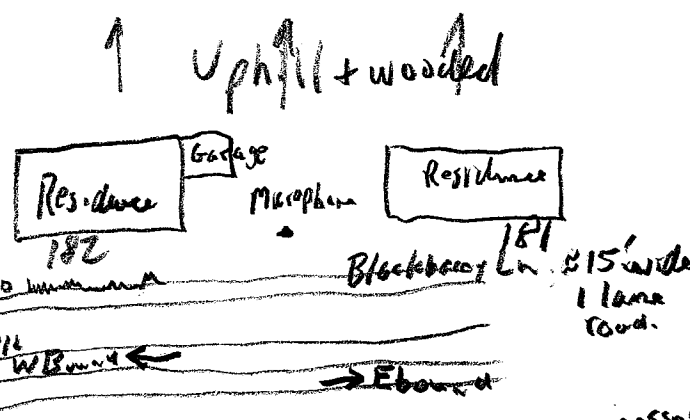
ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1555	1600	68.1	57.7	75.2	71.1	67.3	62.3	
	1600	1605	69.5	62.9	74.5	71.9	69.1	65.9	
	1605	1610	68.4	60.1	72.9	71.0	68.0	64.0	

Roadway Name/Dir	PA Tpk	
Speed (post/obs)*	55/65	
Number of Lanes	4	
Width (pave/row)	N/A	
1- or 2- way	2	
Grade	flat	
Bus Stops	0	
Stoplights	0	
Motorcycles	W 0	E
Automobiles	411	301
Medium Trucks	21	11
Heavy Trucks	42	33
Buses	2	1
Count duration	15 min	

compass

N

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken: Yes/No 9

Additional Notes/Comments: 4 (m80) Jets flew directly overhead @ low altitude; inaudible 1 cessna airplane (was audible) Very close to Tpk + on same grade. Very noisy.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: _____ Date: 10/28/13 Page ___ of ___
Monitoring Location: ST22 3149 Phoenixville Pike Analyst: JDD / SRS

Sound Level Meter
Model #: LD 820SLM
Serial #: 1652
Weighting: A / C / Flat
Response: Slow / Fast / Impl
Windscreen / Yes / No (explain)

Field Calibration
Model #: CAL 200
Serial #: 5789
Calibration Level (dBA): 94 / 114
Pre-Test 114 dBA
Post-Test — dBA

Weather Data
Model #: K3500
Serial #: 1703474
Wind: Steady/Gusty/Calm ocassional gusts
Precipitation: Yes (explain) / No
Avg Wind Speed/Direction: 1-3 mph
Temp (°F): 64.1 RH (%): 52.4
Bar Psr (Hg): 1005 Cloud Cover (%): 10 (light clou

Topo: Flat / Hilly
Terrain: Hard/Soft/Mixed/Snow

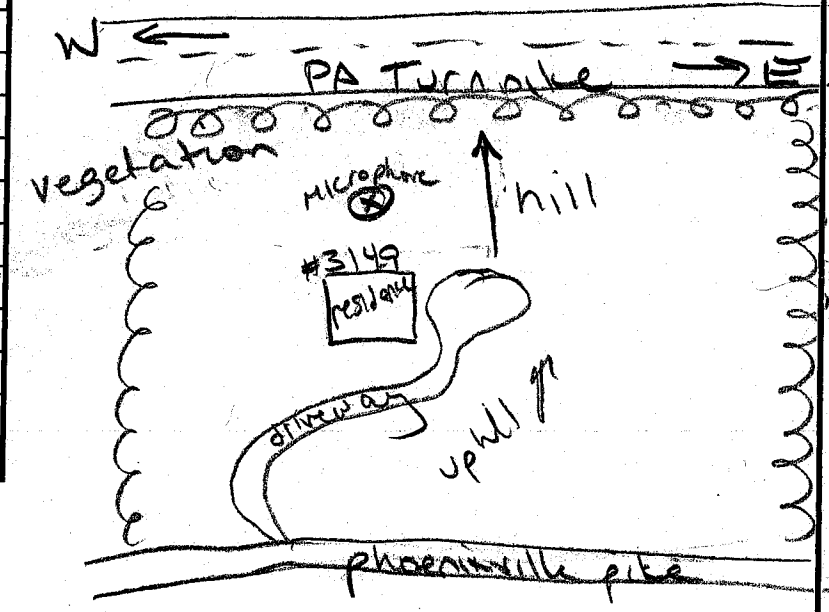
GPS Coordinates (at SLM location)#
N 40°04.398' W 75°33.209'

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	15:45	15:50	62.9	57.3	66.2	65.1	62.6	59.7	
	15:50	15:55	62.1	57.8	66.0	64.2	61.7	59.3	
	15:55	16:00	62.1	55.0	66.2	63.9	61.9	58.6	
	16:00	16:05	61.5	55.7	65.4	63.3	61.3	58.4	
	16:05	16:10	62.8	57.3	75.2	64.6	62.4	60.2	

Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	2	2
Width (pave/row)	50	50
1- or 2- way	1	1
Grade	flat	flat
Bus Stops	/	/
Stoplights	/	/
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass ↑

Site Diagram:
partial line-of-sight to turnpike



- note coordinate system * - Speed estimated by Radar / Driving / Observation
Photos Taken? Yes/No 7 photos
Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects
Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-317 Project #: _____ Date: 10/28/13 Page ___ of ___
Monitoring Location: ST 23 3199 Phoenixville Pike Analyst: JDO / SRS

Sound Level Meter
Model #: LD 820 SLM
Serial #: 1651
Weighting: A / C / Flat
Response: Slow / Fast / Impl
Windscreen: Yes / No (explain)

Field Calibration
Model #: CAL 200
Serial #: 5789
Calibration Level (dBA): 94 / 114
Pre-Test 114 dBA
Post-Test — dBA

Weather Data
Model #: K3500
Serial #: 1703474
Wind: Steady/Gusty/Calm / light
Precipitation: Yes (explain) / No
Avg Wind Speed/Direction: 0-3 mph
Temp (°F): 64.1°F RH (%): 54.5%
Bar Psr (Hg): 1008.0 Cloud Cover (%): 10% light clouds

Topo: Flat / Hilly
Terrain: Hard/Soft/Mixed/Snow

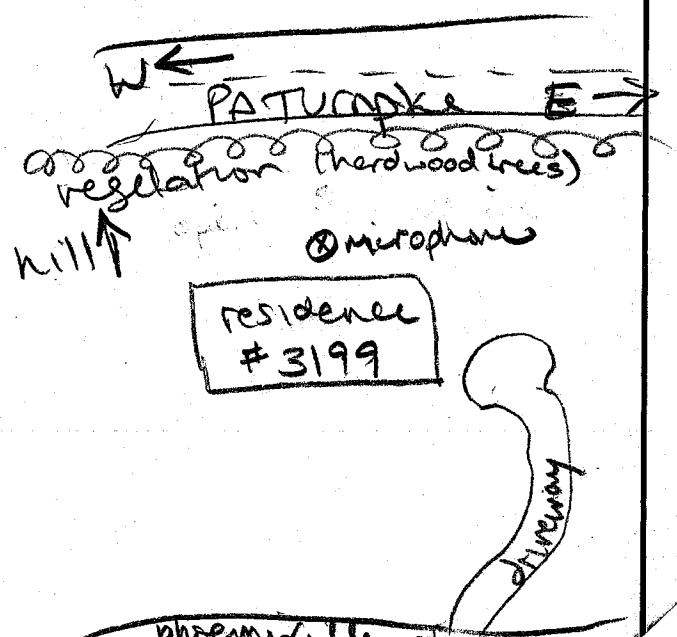
GPS Coordinates (at SLM location)#
N40°04.572' W75°32.989'

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1530	1535	60.6	56.9	63.4	62.2	60.5	58.1	
	1535	1540	60.3	55.1	64.4	62.3	60.1	56.9	
	15:40	15:45	60.7	56.2	64.6	62.5	60.4	58.1	
	15:45	15:50	61.0	55.4	64.2	63.2	60.7	58.6	
	15:50	15:55	60.2	56.5	63.7	62.3	60.0	57.5	
	15:55	16:00	60.1	55.5	63.6	62.0	59.8	57.4	
	16:00	16:05	60.0	57.4	62.7	61.5	59.7	58.1	

Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	2	2
Width (pave/row)	50	50
1- or 2- way	1	1
Grade	Flat	Flat
Bus Stops	/	/
Stoplights	/	/
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:
no direct line-of sight to turnpike



- note coordinate system * - Speed estimated by Radar / Driving / Observation
Photos Taken? Yes/No 9 photos
Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects
Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice

FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: _____ Date: 11/30/12 Page ___ of

Monitoring Location: ST24 3291 Phoenixville Pike Analyst: JDD

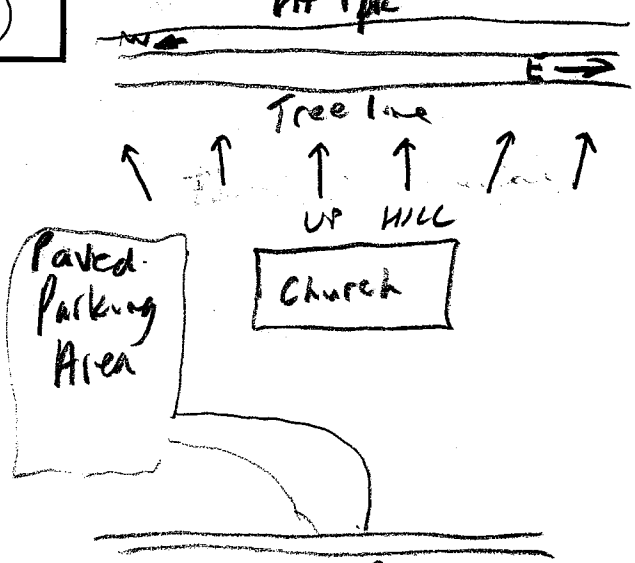
Sound Level Meter	Field Calibration	Weather Data
Model #: LD 820	Model #: Cal 200	Model #: K3500
Serial #: 1651	Serial #: 5789	Serial #: 703474
Weighting: A / C / Flat	Calibration Level (dBA): 94 / 114	Wind: Steady/Gusty/Calm
Response: Slow / Fast / Impl	Pre-Test 114.0 dBA	Precipitation: Yes (explain) / No
Windscreen: Yes / No (explain)	Post-Test — dBA	Avg Wind Speed/Direction: 1.8 from East
Topo: Flat / Hilly	GPS Coordinates (at SLM location)#	Temp (°F): 43 RH (%): 55.2
Terrain: Hard/Soft/Mixed/Snow	N40° 4.593' W75° 32.533'	Bar Psr (Hg): 10105 Cloud Cover (%): 100

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	12:25	12:30	58.6	52.0	63.7	60.8	58.4	55.0	
	12:30	12:35	60.2	54.7	67.6	62.4	59.3	58.5	
	12:35	12:40	58.7	53.9	62.8	61.2	58.3	55.6	
	12:40	12:45	60.1	55.6	69.2	62.0	59.4	56.8	

Roadway Name/Dir	PA Tpk	
Speed (post/obs)*	55/65	
Number of Lanes	4	
Width (pave/row)	NA	
1- or 2- way	2	
Grade	Flat	
Bus Stops	0	
Stoplights	0	
Motorcycles	W 0 E	
Automobiles	181 213	
Medium Trucks	10 13	
Heavy Trucks	74 43	
Buses	1 0	
Count duration	15 mins	

compass

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No 4 photos

Additional Notes/Comments: Apostolic Christian Church Slight grade from church to Phoenixville Pike (2 lanes) Steeper grade from church to Tpk. Overcast is thicker and lower now than it was at previous samples today.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse

GENERAL

AECOM Acoustics and Noise Control Practice

FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC widening MP 316-35 Project #: 60392460 Date: 11/14/2023 Page 1 of

Measurement Location: 425 Shirley ave Analyst: JM

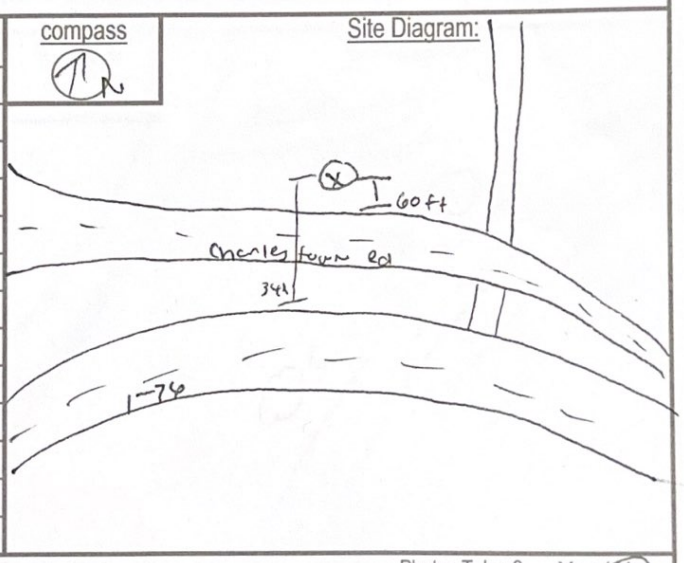
Sound Level Meter	Field Calibration	Meteorological Data
Model #: 831 C	Model #: CAL200	Model #: Kestel 2025 — Time Obs/Meas: 9:45
Serial #: 10 613	Serial #: 1238	Precipitation: Yes (explain) No
Weighting: A / C / Flat	Calibration Level (dB): 94 / 114	Wind: Steady / Gusty / Calm
Response: Slow / Fast / Impl	Pre-Test -0.20 dBA	Avg Wind Speed/Direction: ~3 m/s / MPH
Windscreen: Yes / No (explain)	Post-Test -0.30 dBA	
Topo: Flat / Hilly	GPS Coordinates (at SLM location)	Temp (°F): 49.0 RH (%): 56.3
Terrain: Hard / Soft / Mixed / Agg / Snow		Bar Psr (Hg): 1000 Cloud Cover (%): 10

Loc. ID	Start Time (hh:mm)	Stop Time (hh:mm)	Notes/Events
	10:17	10:34	

Roadway Name/Dir.	PATP EB	PA-TP WB
Speed (post/obs*)	65	65
Number of Lanes	2	2
Width (pavel/row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles	Ø	Ø
Automobiles	178	172
Medium Trucks	36	32
Heavy Trucks	62	52
Buses	1	0
Count duration	15 min	15 min

compass: N

Site Diagram:



* - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes / No

Additional Notes/Comments:

Noise Sources (circle all that apply): distant aircraft • roadway traffic • rail ops • landscaping • rustling leaves • children playing • dogs barking/birds • vocalizing/insects/mechanical

Additional Notes and Sketches on Reverse or Indicated Separate Sheet(s)

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: _____ Date: 10/29/13 Page ___ of ___
Monitoring Location: ST 26 (NSA4) 3501 Eaton Ct Analyst: JDD SRS

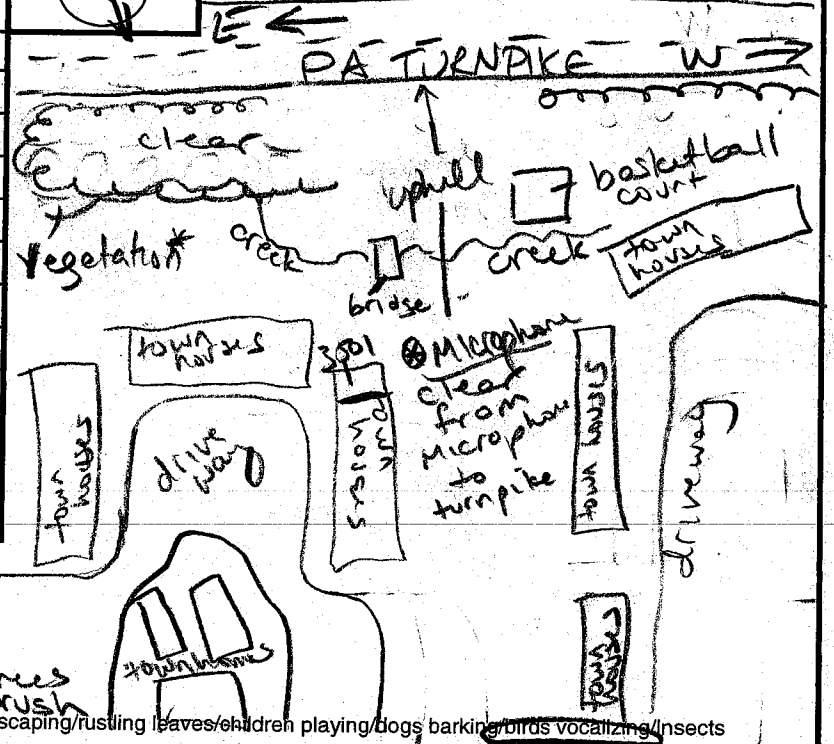
Sound Level Meter	Field Calibration	Weather Data
Model #: LD820SLM	Model #: CAL200	Model #: K3500
Serial #: 1652	Serial #: 5789	Serial #: 703474
Weighting: A / C / Flat	Calibration Level (dBA): 94 / 114	Wind: Steady/Gusty/Calm
Response: Slow / Fast / Impl	Pre-Test 114 dBA	Precipitation: Yes (explain) / No
Windscreen: Yes / No (explain)	Post-Test — dBA	Avg Wind Speed/Direction: —
Topo: Flat / Hilly	GPS Coordinates (at SLM location)#	Temp (°F): 42.0 RH (%): 75%
Terrain: Hard/Soft/Mixed/Snow	N40° 03.947' W75° 38.554'	Bar Psr (Hg) 101.66 Cloud Cover (%): clear

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1005	1010	66.8	59.0	73.8	69.5	66.5	61.4	
	1010	1015	65.3	58.3	71.7	68.4	64.0	60.5	
	1015	1020	65.7	55.9	74.0	68.2	64.9	60.0	
	10:20	10:25	65.8	56.0	71.7	68.8	65.0	60.8	
	10:25	10:30	65.3	55.0	74.3	68.5	63.4	58.1	

Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	2	2
Width (pave/row)	50'	50'
1- or 2- way	1	1
Grade	flat	flat
Bus Stops	/	/
Stoplights	/	/
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram: clear line-of-sight to PA Turnpike



- note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No 7 photos

Additional Notes/Comments: * hardwood trees and brush

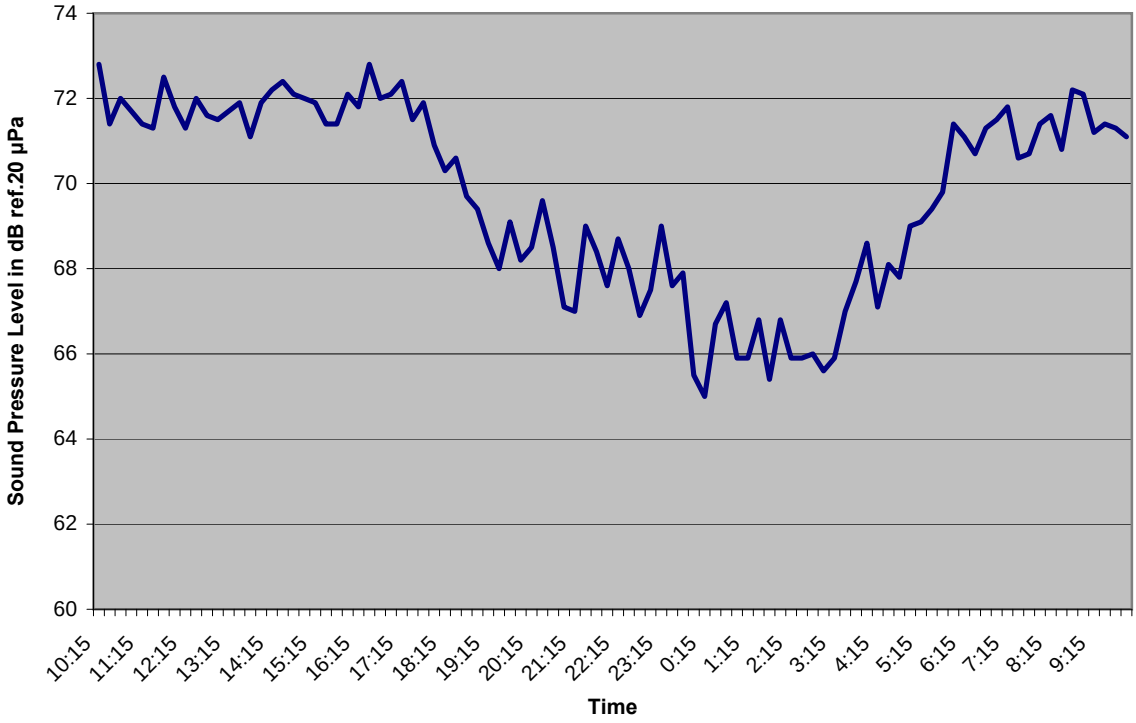
Other Noise Sources: distant aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse

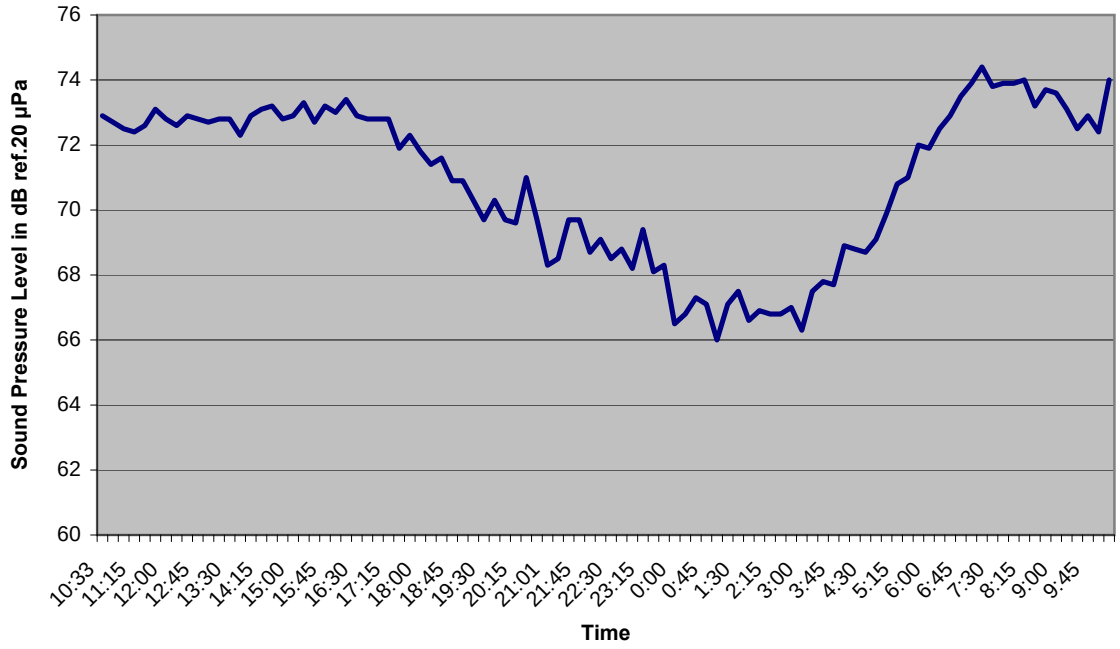
Longgate @ Chester Springs Community

Observed Traffic Count Conducted During Acoustical Surveys					
Receiver	**Road**	**Vehicle Type**	**Count**	**Count-Hour Adj.**	**Speed**
ST-17	PA Turnpike EB	Auto	297	1188	65
		MT	13	52	60
		HT	50	200	60
		Bus	2	8	60
	PA Turnpike WB	Auto	188	752	65
		MT	12	48	60
		HT	57	228	60
		Bus	3	12	60
ST-18	PA Turnpike EB	Auto	297	1188	65
		MT	13	52	60
		HT	50	200	60
		Bus	2	8	60
	PA Turnpike WB	Auto	188	752	65
		MT	12	48	60
		HT	57	228	60
		Bus	3	12	60
ST-19	PA Turnpike EB	Auto	183	732	65
		MT	11	44	60
		HT	56	224	60
		Bus	1	4	60
	PA Turnpike WB	Auto	182	728	65
		MT	24	96	60
		HT	52	208	60
		Bus	1	4	60
ST-20	PA Turnpike EB	Auto	287	1148	65
		MT	8	32	30
		HT	24	96	60
		Bus	0	0	NA
	PA Turnpike WB	Auto	616	2464	65
		MT	9	36	60
		HT	44	176	60
		Bus	0	0	NA
ST-21	PA Turnpike EB	Auto	301	1204	65
		MT	11	44	60
		HT	33	132	60
		Bus	1	4	60
	PA Turnpike WB	Auto	411	1644	65
		MT	21	84	60
		HT	42	168	60
		Bus	2	8	60
ST-22	PA Turnpike EB	Auto	253	1012	65
		MT	12	48	60
		HT	35	140	60
		Bus	2	8	60

	PA Turnpike WB	Auto	409	1636	65
		MT	12	48	60
		HT	52	208	60
		Bus	1	4	60
ST-23	PA Turnpike EB	Auto	253	1012	65
		MT	12	48	60
		HT	35	140	60
		Bus	2	8	60
	PA Turnpike WB	Auto	409	1636	65
		MT	12	48	60
		HT	52	208	60
		Bus	1	4	60
ST-24	PA Turnpike EB	Auto	213	852	65
		MT	13	52	60
		HT	43	172	60
		Bus	0	0	NA
	PA Turnpike WB	Auto	181	724	65
		MT	10	40	60
		HT	74	296	60
		Bus	1	4	60
ST-25	PA Turnpike EB	Auto	178	712	65
		MT	36	144	60
		HT	62	248	60
		Bus	1	4	NA
	PA Turnpike WB	Auto	172	688	65
		MT	32	128	60
		HT	57	228	60
		Bus	0	0	60
	Charlestown Road NB/SB	Auto	54	216	65
		MT	4	16	60
		HT	6	24	60
		Bus	8	32	60
ST-26	PA Turnpike EB	Auto	223	892	65
		MT	9	36	60
		HT	67	268	60
		Bus	0	0	NA
	PA Turnpike WB	Auto	232	928	65
		MT	18	72	60
		HT	51	204	60
		Bus	0	0	60



Pennsylvania Turnpike Authority Widening Project 312-319
Long Term Noise Measurement LT3



Pennsylvania Turnpike Authority Widening Project 312-319
Long Term Noise Measurement LT4

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2013-180218

Instrument Model 820, Serial Number 1651, was calibrated on 02OCT2013. The instrument meets factory specifications per Procedure D0001.8160, ANSI S1.4 1983, IEC 651-Type 1 1979, and IEC 804-Type 1 1985.

Instrument found to be in calibration as received: YES
Date Calibrated: 02OCT2013
Calibration due:

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	LDSigGn/2209	0277 / 0109	12 Months	08MAR2014	2013-171090

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 32 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"AS RECEIVED" data same as shipped data.
Tested with PRM828-2581

Signed: Ron Harris
Technician: Ron Harris

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2013-180220

Instrument Model 820, Serial Number 1652, was calibrated on 02OCT2013. The instrument meets factory specifications per Procedure D0001.8160, ANSI S1.4 1983, IEC 651-Type 1 1979, and IEC 804-Type 1 1985.

Instrument found to be in calibration as received: YES
Date Calibrated: 02OCT2013
Calibration due:

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	LDSigGn/2209	0277 / 0109	12 Months	08MAR2014	2013-171090

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 32 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"AS RECEIVED" data same as shipped data.
Tested with PRM828-2582

Signed: Ron Harris
Technician: Ron Harris

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2013-180213

Instrument Model PRM828, Serial Number 2581, was calibrated on 02OCT2013. The instrument meets factory specifications per Procedure D0001.8135.

Instrument found to be in calibration as received: YES
Date Calibrated: 02OCT2013
Calibration due:

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Agilent Technologies	34401A	MY41044529	12 Months	25JAN2014	5954339
Larson Davis	LDSigGn/2209	0277 / 0109	12 Months	08MAR2014	2013-171090

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 32 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"As received" data is the same as shipped data.

Signed: Ron Harris
Technician: Ron Harris

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2013-180214

Instrument Model PRM828, Serial Number 2582, was calibrated on 02OCT2013. The instrument meets factory specifications per Procedure D0001.8135.

Instrument found to be in calibration as received: YES
Date Calibrated: 02OCT2013
Calibration due:

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Agilent Technologies	34401A	MY41044529	12 Months	25JAN2014	5954339
Larson Davis	LDSigGn/2209	0277 / 0109	12 Months	08MAR2014	2013-171090

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 32 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"As received" data is the same as shipped data.

Signed: Ron Harris

Technician: Ron Harris

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2013-180698

Microphone Model 377B20, Serial Number 137300, was calibrated on 10OCT2013. The microphone meets factory specifications per Test Procedure D0001.8167.

New Instrument
Date Calibrated: 10OCT2013
Calibration due:

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Hewlett Packard	34401A	3146A62099	12 Months	26NOV2013	5884920
Larson Davis	PRM915	0102	12 Months	04DEC2013	2012-167168
Larson Davis	PRM916	0102	12 Months	13DEC2013	2012-167454
Larson Davis	2559	2504	12 Months	03JAN2014	19648-1
Larson Davis	CAL250	42630	12 Months	04JAN2014	2013-168402
Larson Davis	2900	0575	12 Months	24JUL2014	2013-177110
Larson Davis	PRM902	0206	12 Months	15AUG2014	2013-178254
Larson Davis	MTS1000 / 2201	1000 / 0100	12 Months	03SEP2014	SM090313

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Environmental test conditions as printed on microphone calibration chart.

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

Signed: Abraham Ortega
Technician: Abraham Ortega

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2013-180699

Microphone Model 377B20, Serial Number 137305, was calibrated on 10OCT2013. The microphone meets factory specifications per Test Procedure D0001.8167.

New Instrument
Date Calibrated: 10OCT2013
Calibration due:

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Hewlett Packard	34401A	3146A62099	12 Months	26NOV2013	5884920
Larson Davis	PRM915	0102	12 Months	04DEC2013	2012-167168
Larson Davis	PRM916	0102	12 Months	13DEC2013	2012-167454
Larson Davis	2559	2504	12 Months	03JAN2014	19648-1
Larson Davis	CAL250	42630	12 Months	04JAN2014	2013-168402
Larson Davis	2900	0575	12 Months	24JUL2014	2013-177110
Larson Davis	PRM902	0206	12 Months	15AUG2014	2013-178254
Larson Davis	MTS1000 / 2201	1000 / 0100	12 Months	03SEP2014	SM090313

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Environmental test conditions as printed on microphone calibration chart.

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

Signed: Abraham Ortega
Technician: Abraham Ortega

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2013-180256

Instrument Model CAL200, Serial Number 5789, was calibrated on 02OCT2013. The instrument meets factory specifications per Procedure D0001.8190, IEC 60942:2003.

Instrument found to be in calibration as received: YES
Date Calibrated: 02OCT2013
Calibration due:

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	PRM915	0112	12 Months	08OCT2013	2012-164811
Larson Davis	2559	2504	12 Months	03JAN2014	19648-1
PCB	1502B02FJ15PSIA	1342	12 Months	14JAN2014	3441014716
Larson Davis	2900	0661	12 Months	08APR2014	2013-172252
Larson Davis	MTS1000/2201	0111	12 Months	22AUG2014	SM082213
Larson Davis	PRM902	0480	12 Months	23AUG2014	2013-178669
Hewlett Packard	34401A	3146A10352	12 Months	03SEP2014	6214490

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Environmental test conditions as shown on calibration report.

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

Before: 113.95 dB, 93.94 dB, 1000.0 Hz @ sea level.
After: Refer to Certificate of Measured Output.

Signed: Scott Montgomery
Technician: Scott Montgomery

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

Odin Metrology, Inc.
Calibration of Sound & Vibration Instruments

Certificate Number: **28228-4**

Certificate of Calibration for Larson Davis Calibrator

This calibration is performed by comparison with measurement reference standard microphone:

Type No.	4134
Serial No.	1315901
Calibrated by	HL
Cal Date	14 FEB 2023
Due Date	14 FEB 2024

a) Estimated uncertainty of comparison: ± **0.05** dB
b) Estimated uncertainty of calibration service for standard pistonphone: ± **0.06** dB
c) Total uncertainty: $\sqrt{a^2+b^2}$ = ± **0.08** dB
d) Expanded uncertainty (coverage factor k = 2 for 95% confidence level): = ± **0.16** dB

This acoustic calibrator has been calibrated using standards with values traceable to the National Institute of Standards and Technology. This calibration is traceable to NIST Test Number **683/289533-17.**

CONDITION OF TEST		
Ambient Pressure	**990.35**	hPa
Temperature	**23**	°C
Relative Humidity	**36**	%
Date of Calibration	**03 NOV 2023**	
Re-calibration due on	**03 NOV 2024**	

The calibration of this acoustic calibrator was performed using a test system conforming to the requirements of ANSI/NCSLZ540-1, 1994, ISO 17025, and ISO 9001:2015, Certification NQA No. 11252.

Calibration procedure: **OM-P-1001-Acoustic_Calibrator, Rev. 1.0 20130522.**

Calibration performed by

Harold Lynch

Harold Lynch, Service Manager

Calibrator type	**CAL200**
Serial no.	**1238**
Submitted by	**AECOM**
	San Diego, CA 92101
Purchase order no.	**Credit Card**
Asset no.	**N/A**

This calibrator has been found to perform **within** the specifications listed below at the normalized conditions stated.

SPL produced in coupler terminated by a loading volume of a ½" microphone	94.0 ± 0.2 dB 114 ± 0.2 dB
Frequency	1,000 Hz ± 1%
Distortion	< 2%
At 1,013 hPa, 23°C, and 65% relative humidity	

PERFORMANCE AS RECEIVED		
Frequency	**999.7**	Hz
SPL (94 dB)	**94.05**	dB
SPL (114 dB)	**113.98**	dB
Distortion (at 94 dB)	**0.3**	%
Battery Voltage	**9.4**	V

Was adjustment performed? **No**
Were batteries replaced? **No**

FINAL PERFORMANCE		
Frequency	**999.7**	Hz
SPL (94 dB)	**94.05**	dB
SPL (114 dB)	**113.98**	dB
Distortion (at 94 dB)	**0.3**	%

Note: This calibrator was **within** manufacturer's specifications as received.

ODIN METROLOGY, INC.
3537 OLD CONEJO ROAD, SUITE 108
THOUSAND OAKS, CA 91320
PHONE: (805) 375-0830; FAX: (805) 375-0405

This page intentionally left blank

Appendix C contains the following traffic data used in this analysis:

- Certified traffic data for existing and future conditions;
- Modeled existing traffic data;
- Modeled future traffic data.

Traffic for Existing Models (2022)										
Roadway	Traffic Volumes and Speeds (mph) for One Hour									
	Auto		Medium Truck		Heavy Truck		Bus		Motorcycle	
	Volume	Speed	Volume	Speed	Volume	Speed	Volume	Speed	Volume	Speed
I-76 EB (entire corridor)	1850	65	144	65	408	65	0	0	0	0
I-76 WB (entire corridor)	1897	65	148	65	408	65	0	0	0	0
Yellow Springs NB	297	35	6	35	6	35	0	0	0	0
Yellow Springs SB	297	35	6	35	6	35	0	0	0	0
Phoenixville NB	876	45	9	45	9	45	0	0	0	0
Phoenixville SB	876	45	9	45	9	45	0	0	0	0
Charleston NB	712	40	19	40	19	40	0	0	0	0
Charleston SB	712	40	19	40	19	40	0	0	0	0
Warner EB	297	35	6	35	6	35	0	0	0	0
Warner WB	297	35	6	35	6	35	0	0	0	0
Warner WB at Phoenixville	148	35	3	35	3	35	0	0	0	0
Morehall NB	875	40	23	40	23	40	0	0	0	0
Morehall SB	875	40	23	40	23	40	0	0	0	0
76EB-Ramp to 29	403	25	14	25	46	25	0	0	0	0
76EB-East of 29 ramp	1687	65	58	65	227	65	0	0	0	0

Traffic for Future Models (2048)										
Roadway	Traffic Volumes and Speeds (mph) for One Hour									
	Auto		Medium Truck		Heavy Truck		Bus		Motorcycle	
	Volume	Speed	Volume	Speed	Volume	Speed	Volume	Speed	Volume	Speed
I-76 EB (entire corridor)	2723	70	212	70	601	70	0	0	0	0
I-76 WB (entire corridor)	2794	70	218	70	617	70	0	0	0	0
Yellow Springs NB	384	40	8	40	8	40	0	0	0	0
Yellow Springs SB	384	40	8	40	8	40	0	0	0	0
Phoenixville NB	979	50	10	50	10	50	0	0	0	0
Phoenixville SB	979	50	10	50	10	50	0	0	0	0
Charleston NB	1133	45	30	45	30	45	0	0	0	0
Charleston SB	1133	45	30	45	30	45	0	0	0	0
Warner EB	384	40	8	40	8	40	0	0	0	0
Warner WB	384	40	8	40	8	40	0	0	0	0
Warner WB at Phoenixville	192	40	4	40	4	40	0	0	0	0
Morehall NB	1133	45	30	45	30	45	0	0	0	0
Morehall SB	1133	45	30	45	30	45	0	0	0	0
76EB-Ramp to 29	593	30	20	30	68	30	0	0	0	0
76EB-East of 29 ramp	2912	70	100	70	335	70	0	0	0	0

This page intentionally left blank

Appendix D contains tables summarizing the TNM output data.

Table D-1 includes predicted noise levels for receptors identified in the noise sensitive areas (NSAs). Each row in the table summarizes a TNM receiver, showing the following information:

- NSA
- Receiver ID
- Dwelling Unit (how many families are represented at each point)
- Predicted existing noise level
- Predicted Future ‘No Build’ noise level
- Predicted Future “Build’ noise level
- Predicted Future “Build with Barrier’ noise level (where applicable)
- Predicted Future Barrier Insertion Loss (IL) (where applicable)

Table D-2 contains panel-by-panel information specific to the barriers for NSA 20.

The complete TNM 2.5 runs used for this report have been digitally archived and are available upon request.

Table D-1
Predicted Noise Level Data

NSA	Receiver ID	Dwelling Units	TNM Predicted Noise Level, dBA Leq				
			Existing	Future No-Build	Future Build	Future Build "With Barrier"	IL
17	R17-01 / ST-17	1	65.3	67.0	67.4	65.0	2.4
	R17-02	1	64.2	65.9	66.5	60.6	5.9
	R17-03	1	61.6	63.3	64.6	63.7	0.9
	R17-04	1	57.0	58.7	59.6	58.9	0.7
18	R18-01 / ST-18	1	74.0	75.7	75.2	67.5	7.7
	R18-02	1	64.0	65.7	65.7	58.7	7
	R18-03	1	62.3	64.0	63.6	--	--
	R18-04	1	69.5	71.2	70.2	61.0	9.2
19	R19-01	1	64.3	66.0	66.2	61.3	4.9
	R19-02	1	61.8	63.5	64.4	59.9	4.5
	R19-03	1	60.5	62.1	63.2	58.8	4.4
	R19-04	1	59.7	61.4	62.4	58.0	4.4
	R19-05	1	59.1	60.8	61.3	57.3	4
	R19-06	1	63.6	65.2	65.6	59.1	6.5
	R19-07	1	64.7	66.4	65.8	60.0	5.8
	R19-08	1	63.0	64.7	64.6	--	--
	R19-09	1	63.1	64.8	64.8	--	--
	R19-10 / ST-19	1	62.4	64.1	63.8	--	--
	R19-11	1	62.0	63.7	64.2	--	--
	R19-12	1	60.5	62.2	62.4	--	--
	R19-13	1	57.8	59.5	60.2	--	--
	R19-14	1	65.0	66.7	64.6	--	--
20	R20-01	1	63.2	64.9	65.3	62.1	1.6
	R20-02	1	67.8	69.5	69.9	62.3	3.0
	R20-03	3	58.0	59.7	59.6	58.5	1.9
	R20-04	3	61.4	63.1	62.9	55.6	6.9
	R20-05	3	64.1	65.8	65.7	63.5	2.4
	R20-06	3	67.1	68.8	68.6	63.5	5.2
	R20-07	3	65.7	67.3	66.9	61.7	3.0
	R20-08	3	65.4	67.2	66.6	62.0	4.6
	R20-09	3	63.5	65.2	64.7	61.6	5.3
	R20-10 / ST-20	1	68.5	70.2	68.7	62.4	6.2
	R20-11	4	64.6	66.3	65.9	59.0	6.7
	R20-12	4	60.9	62.6	62.5	56.9	6.0
	R20-13	4	59.5	61.2	60.4	54.7	4.9
	R20-14	3	64.0	65.8	65.3	65.5	4.4
	R20-15	5	62.7	64.4	63.7	64.3	1.0
21	R21-01	1	59.3	61.3	61.3	61.3	0

NSA	Receiver ID	Dwelling Units	TNM Predicted Noise Level, dBA Leq				
			Existing	Future No-Build	Future Build	Future Build "With Barrier"	IL
	R21-02 / ST-21	1	74.3	76	76.1	63.4	12.7
	R21-03	1	70.6	72.3	72.4	68	4.4
	R21-04	1	73.1	74.8	75.4	63.3	12.1
	R21-05	1	71.1	72.8	74.3	63.4	10.9
	R21-06	1	73.6	75.3	75.6	65.6	10.0
	R21-07	1	68.4	70.1	71.8	62.7	9.1
	R21-08	1	66.3	68	69.4	60.9	8.5
	R21-09	1	66.5	68.2	69.2	61.0	8.2
	R21-10	1	63.4	65.1	66.1	59.3	6.8
	R21-11	1	63.4	65.1	65.9	59.4	6.5
	R21-12	1	63.8	65.5	66.3	61.0	5.3
	R21-13	1	62.1	63.8	64.6	60.6	4.0
	R21-14	1	63.9	65.6	67.2	62.4	4.8
	R21-15	1	65.1	66.8	68.3	63.3	5.0
	R21-16	1	68.1	69.8	71.7	65.7	6.0
	R21-17 / ST-27	1	72.5	74.1	74.9	68.4	6.5
	R21-18	1	64	65.7	67.2	64.9	2.3
	R21-19	1	62.5	64.2	65.3	63.2	2.1
	R21-20	1	66.5	68.2	69.7	68.4	1.3
	R21-21	1	70	71.7	72.7	72.2	0.5
	R21-22	1	66.2	67.9	68.9	68.6	0.3
	R21-23	1	65.2	66.8	67.8	52.3	0.1
	R21-24	1	50	51.7	52.4	66.8	5.5
	R21-25	1	70.8	72.5	72.3	46.8	0.3
	R21-26	1	45.4	47.1	47.1	57.4	3.3
	R21-27	1	58.8	60.5	60.7	58.3	2.9
	R21-28	1	59.1	60.8	61.2	57.9	5.3
	R21-29	1	60.3	62	63.2	61.3	0.0
22	R22-01 / ST-22	1	63.6	65.3	65.3	--	--
	R22-02	1	53.8	55.5	56.2	--	--
	R22-03	1	52.5	54.1	54.9	--	--
	R22-04	1	54.8	56.5	56.3	--	--
23	R23-01 / ST-23	1	62	63.7	64.8	59.7	4.5
	R23-02	1	58.5	60.1	60.8	57.4	3.1
	R23-03	1	64	65.6	66.1	59.1	6.4

NSA	Receiver ID	Dwelling Units	TNM Predicted Noise Level, dBA Leq				
			Existing	Future No-Build	Future Build	Future Build "With Barrier"	IL
24	R24-01 / ST-24	1	65.6	67.3	67.2	67	2.6
	R24-02	0	72.7	74.4	73.4	61.8	5.2
25	R25-01	1	68.1	70.6	70.6	70.6	0
	R25-02	1	69.1	71.7	71.6	71.6	0
	R25-03 / ST-25	0	69.6	71.5	71.5	71.2	0.3
	R25-04	4	63.7	65.5	65.4	--	--
	R25-05	4	65.8	67.6	67.6	65.2	2.4
	R25-06	5	67.8	69.6	69.6	65.5	4.1
	R25-07	4	69	70.8	70.8	66.1	4.7
	R25-08	4	70	71.7	71.4	67.7	3.7
	R25-09	2	69.7	71.3	71	68.6	2.4
	R25-10	2	67.5	69	68.7	--	--
	R25-11	2	66.3	67.9	67.5	--	--
	R25-12	2	65.9	67.6	67	--	--
	R25-13	4	53.1	55	54.5	--	--
	R25-14	2	62.5	64.2	64.6	--	--
	R25-15	2	59.6	61.3	61.6	--	--
	R25-16	1	51	52.7	52.6	--	--
	R25-17	2	51.2	53.3	52.8	--	--
	R25-18	4	52.3	54.3	54.2	--	--
26	R26-01	1	69.9	71.5	71.3	70.1	1.2
	R26-02	1	69.7	71.9	71.2	66.7	4.5
	R26-03 / ST28	1	65.7	67.9	66.9	62.0	4.9
	R26-04	1	67.2	69.5	69.2	--	--
	R26-05	1	69.4	71.7	71.5	--	--

Table D-2
Barrier Segment Information

NSA	Panel #	X (ft)	Y (ft)	Bottom-Z (ft)	Height (ft)	Top-of-Wall Z (ft)*	Length (ft)
20	1	2,578,999.5	275,814.1	597.6	8	605.6	12
	2	2,579,011.3	275,816.1	596.1	8	604.1	12
	3	2,579,023.0	275,818.1	595.6	11	606.6	12
	4	2,579,035.0	275,820.1	594.1	12	606.1	12
	5	2,579,046.8	275,822.1	593.0	13	606.0	12
	6	2,579,058.5	275,824.1	592.3	13	605.3	12
	7	2,579,070.5	275,826.1	591.5	14	605.5	12
	8	2,579,082.3	275,828.1	590.3	15	605.3	12
	9	2,579,094.0	275,830.1	589.6	15	604.6	12
	10	2,579,106.0	275,832.1	588.5	16	604.5	12
	11	2,579,117.8	275,834.1	587.8	16	603.8	12
	12	2,579,129.5	275,836.1	587.4	16	603.4	12
	13	2,579,141.5	275,838.1	586.7	16	602.7	12
	14	2,579,153.3	275,840.1	586.3	14	600.3	12
	15	2,579,165.0	275,842.1	585.6	14	599.6	4
	16	2,579,169.3	275,842.8	586.0	14	600.0	12
	17	2,579,181.3	275,843.7	585.5	15	600.5	12
	18	2,579,193.3	275,844.5	585.0	15	600.0	12
	19	2,579,205.3	275,845.4	584.7	15	599.7	12
	20	2,579,217.3	275,846.3	584.3	15	599.3	12
	21	2,579,229.3	275,847.1	584.1	15	599.1	12
	22	2,579,241.3	275,847.9	584.0	15	599.0	12
	23	2,579,253.3	275,848.8	583.7	15	598.7	12
	24	2,579,265.0	275,849.7	583.3	12	595.3	12
	25	2,579,277.0	275,850.5	583.1	12	595.1	12
	26	2,579,289.0	275,851.3	583.0	12	595.0	12
	27	2,579,301.0	275,852.2	582.8	12	594.8	12
	28	2,579,313.0	275,853.0	582.3	12	594.3	12
	29	2,579,325.0	275,853.9	582.1	12	594.1	12
	30	2,579,337.0	275,854.8	582.0	12	594.0	12
	31	2,579,349.0	275,855.6	581.8	12	593.8	12
	32	2,579,360.8	275,856.4	581.3	12	593.3	12
	33	2,579,372.8	275,857.3	581.1	12	593.1	12
	34	2,579,384.8	275,858.1	581.0	12	593.0	12
	35	2,579,396.8	275,859.0	580.9	12	592.9	12
	36	2,579,408.8	275,859.8	580.4	12	592.4	12
	37	2,579,420.8	275,860.7	580.2	12	592.2	12
	38	2,579,432.8	275,861.5	580.1	12	592.1	12
	39	2,579,444.8	275,862.4	579.9	12	591.9	12

NSA	Panel #	X (ft)	Y (ft)	Bottom-Z (ft)	Height (ft)	Top-of-Wall Z (ft)*	Length (ft)
	40	2,579,456.5	275,863.2	579.5	13	592.5	12
	41	2,579,468.5	275,864.1	579.3	13	592.3	12
	42	2,579,480.5	275,864.9	579.1	13	592.1	12
	43	2,579,492.5	275,865.8	578.9	13	591.9	12
	44	2,579,504.5	275,866.6	578.5	13	591.5	12
	45	2,579,516.5	275,867.5	578.3	13	591.3	12
	46	2,579,528.5	275,868.3	578.1	13	591.1	12
	47	2,579,540.5	275,869.2	577.9	13	590.9	12
	48	2,579,552.5	275,870.0	577.5	13	590.5	12
	49	2,579,564.3	275,870.9	577.3	13	590.3	12
	50	2,579,576.3	275,871.7	577.1	13	590.1	12
	51	2,579,588.3	275,872.6	577.0	13	590.0	12
	52	2,579,600.3	275,873.4	576.6	13	589.6	12
	53	2,579,612.3	275,874.3	576.4	13	589.4	12
	54	2,579,624.3	275,875.1	576.2	13	589.2	12
	55	2,579,636.3	275,876.0	576.1	13	589.1	12
	56	2,579,648.3	275,876.8	575.9	13	588.9	12
	57	2,579,660.0	275,877.7	575.5	13	588.5	12
	58	2,579,672.0	275,878.5	575.3	13	588.3	12
	59	2,579,684.0	275,879.4	575.2	13	588.2	12
	60	2,579,696.0	275,880.2	575.1	13	588.1	12
	61	2,579,708.0	275,881.1	575.0	13	588.0	12
	62	2,579,720.0	275,881.9	574.9	13	587.9	12
	63	2,579,732.0	275,882.8	574.6	13	587.6	12
	64	2,579,744.0	275,883.6	574.4	13	587.4	12
	65	2,579,755.8	275,884.5	574.3	13	587.3	12
	66	2,579,767.8	275,885.3	574.2	13	587.2	12
	67	2,579,779.8	275,886.2	574.1	13	587.1	12
	68	2,579,791.8	275,887.1	574.0	13	587.0	12
	69	2,579,803.8	275,888.0	573.8	13	586.8	12
	70	2,579,815.8	275,888.9	573.4	12	585.4	12
	71	2,579,827.8	275,889.8	573.3	12	585.3	12
	72	2,579,839.8	275,890.8	573.2	12	585.2	12
	73	2,579,851.5	275,891.7	573.1	12	585.1	12
	74	2,579,863.5	275,892.7	573.0	12	585.0	12
	75	2,579,875.5	275,893.7	572.8	12	584.8	12
	76	2,579,887.5	275,894.7	572.4	12	584.4	12
	77	2,579,899.5	275,895.8	572.3	12	584.3	12
	78	2,579,911.3	275,896.9	572.2	12	584.2	12
	79	2,579,923.3	275,898.0	572.1	12	584.1	12
	80	2,579,935.3	275,899.1	572.0	12	584.0	12
	81	2,579,947.3	275,900.3	571.8	12	583.8	12
	82	2,579,959.3	275,901.5	571.4	12	583.4	12
	83	2,579,971.0	275,902.8	571.3	12	583.3	12

NSA	Panel #	X (ft)	Y (ft)	Bottom-Z (ft)	Height (ft)	Top-of-Wall Z (ft)*	Length (ft)
	84	2,579,983.0	275,904.0	571.1	12	583.1	12
	85	2,579,995.0	275,905.4	571.0	12	583.0	12
	86	2,580,006.8	275,906.7	570.5	12	582.5	12
	87	2,580,018.8	275,908.1	570.3	12	582.3	12
	88	2,580,030.8	275,909.6	570.1	12	582.1	12
	89	2,580,042.5	275,911.0	570.0	12	582.0	12
	90	2,580,054.5	275,912.5	569.5	12	581.5	12
	91	2,580,066.5	275,914.1	569.3	12	581.3	12
	92	2,580,078.3	275,915.7	569.2	12	581.2	12
	93	2,580,090.3	275,917.3	569.0	12	581.0	12
	94	2,580,102.0	275,918.9	568.8	11	579.8	12
	95	2,580,114.0	275,920.6	568.4	11	579.4	12
	96	2,580,125.8	275,922.4	568.3	11	579.3	12
	97	2,580,137.8	275,924.1	568.1	11	579.1	12
	98	2,580,149.5	275,925.9	567.8	11	578.8	12
	99	2,580,161.5	275,927.8	567.4	11	578.4	12
	100	2,580,173.3	275,929.7	567.3	11	578.3	12
	101	2,580,185.0	275,931.6	567.1	11	578.1	12
	102	2,580,197.0	275,933.5	566.9	11	577.9	12
	103	2,580,208.8	275,935.5	566.4	11	577.4	12
	104	2,580,220.8	275,937.5	566.3	10	576.3	12
	105	2,580,232.5	275,939.6	566.1	10	576.1	12
	106	2,580,244.3	275,941.7	566.0	10	576.0	12
	107	2,580,256.0	275,943.8	565.6	10	575.6	12
	108	2,580,268.0	275,946.0	565.3	10	575.3	12
	109	2,580,279.8	275,948.2	565.1	10	575.1	12
	110	2,580,291.5	275,950.4	565.0	10	575.0	12
	111	2,580,303.3	275,952.7	564.8	10	574.8	12
	112	2,580,315.0	275,955.0	564.4	10	574.4	12
	113	2,580,326.8	275,957.3	564.3	9	573.3	12
	114	2,580,338.5	275,959.8	564.1	9	573.1	12
	115	2,580,350.3	275,962.2	563.8	9	572.8	12
	116	2,580,362.0	275,964.6	563.4	9	572.4	12
	117	2,580,373.8	275,967.1	563.2	9	572.2	12
	118	2,580,385.5	275,969.7	563.1	9	572.1	12
	119	2,580,397.3	275,972.2	562.9	9	571.9	12
	120	2,580,409.0	275,974.8	562.5	9	571.5	12
	121	2,580,420.8	275,977.5	562.3	9	571.3	12
	122	2,580,432.3	275,980.1	562.1	9	571.1	12
	123	2,580,444.0	275,982.8	562.0	9	571.0	12
	124	2,580,455.8	275,985.6	561.5	9	570.5	12
	125	2,580,467.5	275,988.4	561.3	9	570.3	12
	126	2,580,479.0	275,991.2	561.1	9	570.1	12
	127	2,580,490.8	275,994.1	561.0	9	570.0	12

NSA	Panel #	X (ft)	Y (ft)	Bottom-Z (ft)	Height (ft)	Top-of-Wall Z (ft)*	Length (ft)
	128	2,580,502.3	275,996.9	560.5	9	569.5	12
	129	2,580,514.0	275,999.9	560.3	9	569.3	12
	130	2,580,525.8	276,002.8	560.3	9	569.3	12
	131	2,580,537.3	276,005.8	560.1	9	569.1	12
	132	2,580,548.8	276,008.9	559.9	9	568.9	12
	133	2,580,560.5	276,012.0	559.4	9	568.4	12
	134	2,580,572.0	276,015.1	559.3	9	568.3	12
	135	2,580,583.8	276,018.2	559.1	9	568.1	12
	136	2,580,595.3	276,021.4	558.9	9	567.9	12
	137	2,580,606.8	276,024.6	558.4	9	567.4	12
	138	2,580,618.3	276,027.8	558.3	8	566.3	12
	139	2,580,629.8	276,031.1	558.1	8	566.1	12
	140	2,580,641.5	276,034.5	558.0	8	566.0	12
	141	2,580,653.0	276,037.8	557.5	8	565.5	12
	142	2,580,664.5	276,041.2	557.3	8	565.3	12
	143	2,580,676.0	276,044.7	557.2	8	565.2	12
	144	2,580,687.5	276,048.1	557.0	8	565.0	12
	145	2,580,699.0	276,051.6	556.6	8	564.6	12
	146	2,580,710.3	276,055.2	556.3	8	564.3	12
	147	2,580,721.8	276,058.7	556.2	8	564.2	12
	148	2,580,733.3	276,062.3	556.1	8	564.1	12
	149	2,580,744.8	276,066.0	555.8	8	563.8	-

* The top of wall value reported here is the minimum required height to meet the predicted noise levels found in this report. Panels may be higher than the stated value, but not lower.

This page intentionally left blank

Appendix E presents PennDOT Pub. #24's Appendix A "Warranted, Reasonable and Feasible Worksheets"

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	1/20/2024
Project Name	PTC 316 - 319
County	Chester
SR, Section	I-76, M.P. 316 - 319
Community Name and/or NSA #	NSA17
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.):	Widening and Reconstruction
2. Total number of impacted receptor units in community	
Category A units impacted	
Category B units impacted	2
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction)	na	
b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):	na	
c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ."	Yes	No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1?	x Yes	No
b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)?	Yes	x No
c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category?	Yes	x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units:	1	
b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss:	50%	
c. Is the percentage 50 or greater?	x Yes	No
2. Can the noise wall be designed and physically constructed at the proposed location?	x Yes	No
3. Can the noise wall be constructed without causing a safety problem?	x Yes	No
4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel?	x Yes	No
5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations?	x Yes	No
6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner?	x Yes	No
7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner?	x Yes	No

Reasonableness

1. Community Desires Related to the Barrier — TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall."

_____ Yes _____ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall — 17290

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) — 1

c. SF/BR = 2a/2b — 17290

d. Is 2c less than or equal to the MaxSF/BR value of 2000? _____ Yes x No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. — na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? _____ Yes _____ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _____ Yes _____ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _____ Yes _____ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? _____ Yes _____ No

e. Does the noise wall reduce design year noise levels back to existing levels? _____ Yes _____ No

4. Noise Reduction Design Goals (Activity Category D) A "yes" answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility's analysis point? _____ Yes _____ No

b. While conforming to the MaxSF/BR criteria and justified by a "point of diminishing returns' evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum _____ Yes _____ No

Decision

Is the Noise Wall WARRANTED?	x Yes	_____ No
Is the Noise Wall FEASIBLE?	x Yes	_____ No
Is the Noise Wall REASONABLE?	_____ Yes	x No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

_____ _____

PennDOT, Engineering District Environmental Manager Date

_____ _____

Qualified Professional Performing the Analysis Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	1/20/2024
Project Name	PTC 316 - 319
County	Chester
SR, Section	I-76, M.P. 316- 319
Community Name and/or NSA #	NSA18
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.):	Widening and Reconstruction
2. Total number of impacted receptor units in community	
Category A units impacted	
Category B units impacted	3
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) — na

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): — na

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ." — ___ Yes ___ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? — x Yes ___ No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? — ___ Yes x No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? — ___ Yes x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: — 3

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: — 100%

c. Is the percentage 50 or greater? — x Yes ___ No

2. Can the noise wall be designed and physically constructed at the proposed location? — x Yes ___ No

3. Can the noise wall be constructed without causing a safety problem? — x Yes ___ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? — x Yes ___ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? — x Yes ___ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? — x Yes ___ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? — x Yes ___ No

Reasonableness

1. Community Desires Related to the Barrier — TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall."

_____ Yes _____ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall — 26918

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) — 3

c. SF/BR = 2a/2b — 8973

d. Is 2c less than or equal to the MaxSF/BR value of 2000? _____ Yes x No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. — na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? _____ Yes _____ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _____ Yes _____ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _____ Yes _____ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? _____ Yes _____ No

e. Does the noise wall reduce design year noise levels back to existing levels? _____ Yes _____ No

4. Noise Reduction Design Goals (Activity Category D) A "yes" answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility's analysis point? _____ Yes _____ No

b. While conforming to the MaxSF/BR criteria and justified by a "point of diminishing returns' evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum _____ Yes _____ No

Decision

Is the Noise Wall WARRANTED?	x Yes	_____ No
Is the Noise Wall FEASIBLE?	x Yes	_____ No
Is the Noise Wall REASONABLE?	_____ Yes	x No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

_____ _____

PennDOT, Engineering District Environmental Manager Date

_____ _____

Qualified Professional Performing the Analysis Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	1/20/2024
Project Name	PTC 316- 319
County	Chester
SR, Section	I-76, M.P. 316 - 319
Community Name and/or NSA #	NSA19
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.):	Widening and Reconstruction
2. Total number of impacted receptor units in community	
Category A units impacted	
Category B units impacted	3
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction)	na	
b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):	na	
c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ."	Yes	No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1?	X Yes	No
b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)?	Yes	x No
c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category?	Yes	x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units:	3	
b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss:	100%	
c. Is the percentage 50 or greater?	X Yes	No
2. Can the noise wall be designed and physically constructed at the proposed location?	x Yes	No
3. Can the noise wall be constructed without causing a safety problem?	x Yes	No
4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel?	x Yes	No
5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations?	x Yes	No
6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner?	x Yes	No
7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner?	x Yes	No

Reasonableness

1. Community Desires Related to the Barrier — TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall."

_____ Yes _____ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall — 46298

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) — 4

c. SF/BR = 2a/2b — 11575

d. Is 2c less than or equal to the MaxSF/BR value of 2000? _____ Yes x No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. — na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? _____ Yes _____ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _____ Yes _____ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _____ Yes _____ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? _____ Yes _____ No

e. Does the noise wall reduce design year noise levels back to existing levels? _____ Yes _____ No

4. Noise Reduction Design Goals (Activity Category D) A "yes" answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility's analysis point? _____ Yes _____ No

b. While conforming to the MaxSF/BR criteria and justified by a "point of diminishing returns' evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum _____ Yes _____ No

Decision

Is the Noise Wall WARRANTED? x Yes _____ No

Is the Noise Wall FEASIBLE? x Yes _____ No

Is the Noise Wall REASONABLE? _____ Yes x No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

_____ _____

PennDOT, Engineering District Environmental Manager Date

_____ _____

Qualified Professional Performing the Analysis Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	1/20/2024
Project Name	PTC 316 - 319
County	Chester
SR, Section	I-76, M.P. 316 - 319
Community Name and/or NSA #	NSA20
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.):	Widening and Reconstruction
2. Total number of impacted receptor units in community	
Category A units impacted	
Category B units impacted	18
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction)	na	
b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):	na	
c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ."	Yes	No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1?	x Yes	No
b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)?	Yes	x No
c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category?	Yes	x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units				
a. Total number of impacted receptor units:	18			
b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss:	100%			
c. Is the percentage 50 or greater?	x	Yes		No
2. Can the noise wall be designed and physically constructed at the proposed location?	x	Yes		No
3. Can the noise wall be constructed without causing a safety problem?	x	Yes		No
4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel?	x	Yes		No
5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations?	x	Yes		No
6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner?	x	Yes		No
7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner?	x	Yes		No

Reasonableness

1. Community Desires Related to the Barrier				
a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall."	TBD	Yes	TBD	No
2. Square Footage Per Benefited Receptor (SF/BR) Evaluation				
a. Area (SF) of the proposed noise wall	14856			
b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss)	25			
c. SF/BR = 2a/2b	594			
d. Is 2c less than or equal to the MaxSF/BR value of 2000?	x	Yes		No
3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall.				
a. Does the noise wall reduce design year exterior_noise levels by at least 7 dB(A) for at least one benefited receptor?	x	Yes		No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? x Yes ____ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? x Yes ____ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? x Yes ____ No

e. Does the noise wall reduce design year noise levels back to existing levels? x Yes ____ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? x Yes ____ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum x Yes ____ No

Decision

Is the Noise Wall WARRANTED? x Yes ____ No

Is the Noise Wall FEASIBLE? x Yes ____ No

Is the Noise Wall REASONABLE? x Yes ____ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

PennDOT, Engineering District Environmental Manager	Date
Qualified Professional Performing the Analysis (name, title, and company name)	Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	1/20/2024
Project Name	PTC 312 - 319
County	Chester
SR, Section	I-76, M.P. 312 - 319
Community Name and/or NSA #	NSA21
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.):	Widening and Reconstruction
2. Total number of impacted receptor units in community	
Category A units impacted	
Category B units impacted	21
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation		
a. Date community was permitted (for new developments or developments planned for or under construction)	na	
b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):	na	
c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ."	Yes	No
2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.		
a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1?	x Yes	No
b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)?	Yes	x No
c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category?	Yes	x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units				
a. Total number of impacted receptor units:	21			
b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss:	95%			
c. Is the percentage 50 or greater?	x	Yes		No
2. Can the noise wall be designed and physically constructed at the proposed location?	x	Yes		No
3. Can the noise wall be constructed without causing a safety problem?	x	Yes		No
4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel?	x	Yes		No
5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations?	x	Yes		No
6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner?	x	Yes		No
7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner?	x	Yes		No

Reasonableness

1. Community Desires Related to the Barrier				
a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall."	TBD	Yes	TBD	No
2. Square Footage Per Benefited Receptor (SF/BR) Evaluation				
a. Area (SF) of the proposed noise wall	50928			
b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss)	16			
c. SF/BR = 2a/2b	3183			
d. Is 2c less than or equal to the MaxSF/BR value of 2000?		Yes	x	No
3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall.				
a. Does the noise wall reduce design year exterior_noise levels by at least 7 dB(A) for at least one benefited receptor?	x	Yes		No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation?		Yes	x	No
c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation?		Yes	x	No
d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors?	x	Yes		No
e. Does the noise wall reduce design year noise levels back to existing levels?	x	Yes		No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point?	x	Yes		No
b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum		Yes	x	No

Decision

Is the Noise Wall WARRANTED?	x	Yes		No
Is the Noise Wall FEASIBLE?	x	Yes		No
Is the Noise Wall REASONABLE?		Yes	x	No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

PennDOT, Engineering District Environmental Manager	Date
Qualified Professional Performing the Analysis (name, title, and company name)	Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	5/15/2014
Project Name	PTC 312 - 319
County	Chester
SR, Section	I-76, M.P. 312 - 319
Community Name and/or NSA #	NSA22
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.):	Widening and Reconstruction
2. Total number of impacted receptor units in community	
Category A units impacted	
Category B units impacted	0
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction)	na	
b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):	na	
c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ."	Yes	No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1?	Yes	x No
b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)?	Yes	x No
c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category?	Yes	x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units:	0	
b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss:	0%	
c. Is the percentage 50 or greater?	Yes	x No
2. Can the noise wall be designed and physically constructed at the proposed location?	x Yes	No
3. Can the noise wall be constructed without causing a safety problem?	x Yes	No
4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel?	x Yes	No
5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations?	x Yes	No
6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner?	x Yes	No
7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner?	x Yes	No

Reasonableness

1. Community Desires Related to the Barrier — TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall." _____ Yes _____ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall — na

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) — na

c. SF/BR = 2a/2b — na

d. Is 2c less than or equal to the MaxSF/BR value of 2000? _____ Yes _____ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. — na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? _____ Yes _____ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _____ Yes _____ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _____ Yes _____ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? _____ Yes _____ No

e. Does the noise wall reduce design year noise levels back to existing levels? _____ Yes _____ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? _____ Yes _____ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum _____ Yes _____ No

Decision

Is the Noise Wall WARRANTED? _____ Yes ___x___ No

Is the Noise Wall FEASIBLE? _____ Yes ___x___ No

Is the Noise Wall REASONABLE? _____ Yes ___x___ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

_____ _____

PennDOT, Engineering District Environmental Manager Date

_____ _____

Qualified Professional Performing the Analysis Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	1/20/2024
Project Name	PTC 312 - 319
County	Chester
SR, Section	I-76, M.P. 312 - 319
Community Name and/or NSA #	NSA23
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.):	Widening and Reconstruction
2. Total number of impacted receptor units in community	
Category A units impacted	
Category B units impacted	1
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction)	na	
b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):	na	
c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ."	Yes	No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1?	Yes	x No
b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)?	Yes	x No
c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category?	Yes	x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units:	1	
b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss:	100%	
c. Is the percentage 50 or greater?	x Yes	No
2. Can the noise wall be designed and physically constructed at the proposed location?	x Yes	No
3. Can the noise wall be constructed without causing a safety problem?	x Yes	No
4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel?	x Yes	No
5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations?	x Yes	No
6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner?	x Yes	No
7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner?	x Yes	No

Reasonableness

1. Community Desires Related to the Barrier — TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall."

_____ Yes _____ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall — 41882

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) — 2

c. SF/BR = 2a/2b — 20941

d. Is 2c less than or equal to the MaxSF/BR value of 2000? _____ Yes X No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. — na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? _____ Yes _____ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _____ Yes _____ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _____ Yes _____ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? _____ Yes _____ No

e. Does the noise wall reduce design year noise levels back to existing levels? _____ Yes _____ No

4. Noise Reduction Design Goals (Activity Category D) A "yes" answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility's analysis point? _____ Yes _____ No

b. While conforming to the MaxSF/BR criteria and justified by a "point of diminishing returns' evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum _____ Yes _____ No

Decision

Is the Noise Wall WARRANTED? X Yes _____ No

Is the Noise Wall FEASIBLE? X Yes _____ No

Is the Noise Wall REASONABLE? _____ Yes x No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

_____ _____

PennDOT, Engineering District Environmental Manager Date

_____ _____

Qualified Professional Performing the Analysis Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	1/20/2024
Project Name	PTC 312 - 319
County	Chester
SR, Section	I-76, M.P. 312 - 319
Community Name and/or NSA #	NSA24
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.):	Widening and Reconstruction
2. Total number of impacted receptor units in community	
Category A units impacted	
Category B units impacted	2
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction)	na	
b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):	na	
c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ."	Yes	No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1?	x Yes	No
b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)?	Yes	x No
c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category?	Yes	x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units:	2	
b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss:	100%	
c. Is the percentage 50 or greater?	x Yes	No
2. Can the noise wall be designed and physically constructed at the proposed location?	x Yes	No
3. Can the noise wall be constructed without causing a safety problem?	x Yes	No
4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel?	x Yes	No
5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations?	x Yes	No
6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner?	x Yes	No
7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner?	x Yes	No

Reasonableness

1. Community Desires Related to the Barrier — TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall."

_____ Yes _____ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall — 21283

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) — 1

c. SF/BR = 2a/2b — 21283

d. Is 2c less than or equal to the MaxSF/BR value of 2000? _____ Yes x No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. — na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? _____ Yes _____ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _____ Yes _____ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _____ Yes _____ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? _____ Yes _____ No

e. Does the noise wall reduce design year noise levels back to existing levels? _____ Yes _____ No

4. Noise Reduction Design Goals (Activity Category D) A "yes" answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility's analysis point? _____ Yes _____ No

b. While conforming to the MaxSF/BR criteria and justified by a "point of diminishing returns' evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum _____ Yes _____ No

Decision

Is the Noise Wall WARRANTED?	x Yes	_____ No
Is the Noise Wall FEASIBLE?	x Yes	_____ No
Is the Noise Wall REASONABLE?	_____ Yes	x No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

_____ _____

PennDOT, Engineering District Environmental Manager Date

_____ _____

Qualified Professional Performing the Analysis Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	1/20/2024
Project Name	PTC 312 - 319
County	Chester
SR, Section	I-76, M.P. 312 - 319
Community Name and/or NSA #	NSA25
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.):	Widening and Reconstruction
2. Total number of impacted receptor units in community	
Category A units impacted	
Category B units impacted	21
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) — 9/3/2013

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): ____

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ." ____ Yes ____ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? x Yes ____ No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? ____ Yes x No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? ____ Yes x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: 21

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 19%

c. Is the percentage 50 or greater? ____ Yes X No

2. Can the noise wall be designed and physically constructed at the proposed location? x Yes ____ No

3. Can the noise wall be constructed without causing a safety problem? x Yes ____ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? x Yes ____ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? x Yes ____ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? x Yes ____ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? x Yes ____ No

Reasonableness

1. Community Desires Related to the Barrier — TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall."

_____ Yes _____ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall — 53972

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) — 4

c. SF/BR = 2a/2b — 13493

d. Is 2c less than or equal to the MaxSF/BR value of 2000? _____ Yes x No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. — na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? _____ Yes _____ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _____ Yes _____ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _____ Yes _____ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? _____ Yes _____ No

e. Does the noise wall reduce design year noise levels back to existing levels? _____ Yes _____ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? _____ Yes _____ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum _____ Yes _____ No

Decision

Is the Noise Wall WARRANTED? x Yes _____ No

Is the Noise Wall FEASIBLE? _____ Yes X No

Is the Noise Wall REASONABLE? _____ Yes x No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

_____ _____

PennDOT, Engineering District Environmental Manager Date

_____ _____

Qualified Professional Performing the Analysis Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	1/20/2024
Project Name	PTC 312 - 319
County	Chester
SR, Section	I-76, M.P. 312 - 319
Community Name and/or NSA #	NSA26
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.):	Widening and Reconstruction
2. Total number of impacted receptor units in community	
Category A units impacted	
Category B units impacted	5
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction)	na	
b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):	na	
c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ."	____ Yes	____ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1?	x Yes	____ No
b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)?	____ Yes	x No
c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category?	____ Yes	x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units:	5	
b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss:	40%	
c. Is the percentage 50 or greater?	____ Yes	x No
2. Can the noise wall be designed and physically constructed at the proposed location?	x Yes	____ No
3. Can the noise wall be constructed without causing a safety problem?	x Yes	____ No
4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel?	x Yes	____ No
5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations?	x Yes	____ No
6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner?	x Yes	____ No
7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner?	x Yes	____ No

Reasonableness

1. Community Desires Related to the Barrier — TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall."

_____ Yes _____ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall — 40000

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) — 2

c. SF/BR = 2a/2b — 20001

d. Is 2c less than or equal to the MaxSF/BR value of 2000? _____ Yes x No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. — na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? _____ Yes _____ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _____ Yes _____ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _____ Yes _____ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? _____ Yes _____ No

e. Does the noise wall reduce design year noise levels back to existing levels? _____ Yes _____ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? _____ Yes _____ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum _____ Yes _____ No

Decision

Is the Noise Wall WARRANTED? x Yes _____ No

Is the Noise Wall FEASIBLE? _____ Yes X No

Is the Noise Wall REASONABLE? _____ Yes x No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

_____ _____

PennDOT, Engineering District Environmental Manager Date

_____ _____

Qualified Professional Performing the Analysis Date
(name, title, and company name)

This page intentionally left blank