PENNSYLVANIA TURNPIKE COMMISSION | MON/FAYETTE TRANSPORTATION PROJECT PA ROUTE 51 TO I-376

FINAL DESIGN NOISE ANALYSIS REPORT

Construction Section 53B1A
Boroughs of Dravosburg and West Mifflin
Allegheny County, Pennsylvania

Prepared for:

U.S. Department of Transportation
Federal Highway Administration

and

Commonwealth of Pennsylvania
Pennsylvania Turnpike Commission

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1.0 EXECUTIVE SUMMARY

The Pennsylvania Turnpike Commission (PTC) is currently in the final design engineering phase for Construction Section 53B1A of the Mon/Fayette Expressway (MFE) project in the Boroughs of Dravosburg and West Mifflin, Allegheny County, Pennsylvania. **Figure 1** provides a Project Location Map to present the limits of the project area.

To support the MFE Reevaluation of the Final Environmental Impact Statement (FEIS), the 2017 MFE Preliminary Engineering Noise Analysis Report was prepared for and approved by the Federal Highway Administration (FHWA) on April 10, 2017. The Preliminary Engineering Noise Analysis provides a complete assessment of the noise environment and traffic noise abatement recommendations considered for the entire project corridor (from PA Route 51 to I-376) during the preliminary engineering design phase. **Figure 2** provides a depiction of the Project Construction Sections for reference. The FEIS Reevaluation for the project was approved on March 8, 2019. This Final Design Noise Analysis Report documents the portion of the prior-phase larger project area that falls within Construction Section 53B1A, beginning north of the proposed Camp Hollow Road interchange in West Mifflin, PA and extending to Pittsburgh McKeesport Boulevard/Richland Avenue access point in Dravosburg, PA.

The project proposes to construct a new four-lane, limited access, tolled expressway to provide safe and efficient regional transportation improvements. Construction Section 53B1A will include a northern tie-in to the proposed interchange at Camp Hollow Road, which features a relocation of Camp Hollow Road, a bridge structure over the MFE, and incorporation of two roundabouts and associated mainline access ramps. Additionally, construction will include an access point at Pittsburgh McKeesport Boulevard with associated ramp movements. Local roadway improvements to Pittsburgh McKeesport Boulevard/Richland Avenue will also be included approaching the mainline access point.

The proposed project is considered a Type 1 Transportation Improvement Project and is eligible for consideration of noise abatement, if warranted, following the final design noise analyses and community input regarding the desire for noise abatement in the corridor. The "Type 1" determination is based on the magnitude of the proposed improvements, as described below:

- the construction of a new four-lane highway and associated ramp access on new location.

This final design analysis documents existing (2015) and design year (2045) traffic noise conditions within the MFE Section 53B1A corridor. The noise analysis involved noise monitoring of existing conditions and noise modeling of existing and future conditions using the FHWA's Traffic Noise Model (TNM), version 2.5. Noise modeling was performed to predict noise levels throughout the project area under worst-case, peak-hour traffic conditions associated with existing conditions, the design year No-Build Alternative, and the design year Build Alternative.

Note that Section 53B1A includes three Noise Study Areas (NSAs) from the preliminary engineering phase: NSAs 6, 34 and 35. These NSAs are presented in **Figure 3**. However, assessment of NSA 5 (located in adjacent construction Section 53A2 to the south) is also included in this analysis given that the acoustically significant portions of the proposed roadways and the layout of related abatement features would be constructed under Section 53B1A contracts and schedules.

Acoustically significant design changes have been proposed to the Camp Hollow Road Interchange following the approval of the preliminary engineering noise analysis. The scale of the design changes triggered an expanded impact and abatement assessment during final design. Preliminary engineering analyses identified that abatement consideration was warranted in NSA 6 and NSA 34, but found to be not feasible for both areas. A review of the updated roadway and grading design confirmed the preliminary engineering results for those two communities; the design changes do not affect the original recommendations. Abatement remains not feasible in NSA 6 and NSA 34.

The updated interchange design changes the preliminary engineering recommendations for NSA 5 and NSA 35. Although initially warranted, abatement had been found to be not feasible and/or reasonable in both NSAs. The updated design continues to yield traffic noise levels in excess of PennDOT/FHWA Noise Abatement Criteria (NAC) within NSA 5 and NSA 35. Therefore, abatement consideration remains warranted in these NSAs. Abatement in the form of vertical noise barriers for portions of both NSAs has now been identified to be both feasible and reasonable, and proposed for construction (see **Figures 3 through 5**). Note that the proposed abatement consists of a two-barrier system in NSA 5, and a single barrier in NSA 35.

Following PTC/FHWA review and approval of this Draft Final Design Highway Traffic Noise Report, the project team will initiate noise-specific public involvement activities. This allows the affected communities the opportunity to express their desire for or against the proposed abatement, and is a required component of reasonableness. The public will also be solicited for feedback regarding aesthetic features of the barriers at that time.

The Final Design Highway Traffic Noise Report will then be developed to comprehensively document reasonableness of the proposed abatement alternatives, including barrier-specific community feedback resulting from public outreach.

2.0 INTRODUCTION

The PTC has authorized the development of final design engineering for Section 53B1A of the MFE, located in the Boroughs of Dravosburg and West Mifflin in Allegheny County, Pennsylvania. **Figure 1** provides a Project Location Map to present the limits of the project area.

MFE Section 53B1A involves the construction of an approximate 1.1-mile new four-lane, limited access, tolled expressway on new location. The limits of work extend from approximately 0.25 miles north of Camp Hollow Road to Pittsburgh McKeesport Boulevard. Additional proposed improvements include linkage to the northern portion of the adjacent interchange at Camp Hollow Road/Lebanon School Road, which is primarily located in Section 53A2 to the south. That interchange features a relocation of Camp Hollow Road to the east, elevation of the local roadway over the top of the new four-lane roadway, and incorporation of two roundabouts and associated mainline access ramps, serving both northbound and southbound mainline traffic. Mainline northbound exit and southbound entry ramp access will be provided via a three-way intersection at Pittsburgh McKeesport Boulevard. Local roadway improvements to Pittsburgh McKeesport Boulevard/Richland Avenue will be provided approaching the access point intersection. The dual overhead structures at the eastern end of the project limits will now be constructed as part of construction Section 53B2 (still in the development phase).

Section 53B1A is one of seven (7) Mon/Fayette Expressway construction sections (see **Figure 2**). Section 53A1 is located at the southern end of the larger corridor, and extends from the termination of existing SR 43 (near the existing crossing over PA 51) to north of Coal Valley Road. Section 53A2 continues north generally from Coal Valley Road to Curry Hollow Road, where it abuts Section 53B1A. Section 53B2 continues north from Section 53B1A, from Pittsburgh McKeesport Boulevard to south of Homeville Road. Section 53C1 runs from Homeville Road to a new interchange (Exit 61) and connector road to a new Overland Avenue Extension. Section 53C2 is centered on improvements to the local roadway network adjacent to proposed Exit 61 including Commonwealth Avenue and Hoffman Boulevard in Duquesne. Section 53C3 is the northernmost construction section, and includes tie-ins to PA Route 837 (Duquesne Boulevard) as well as a new Lower Connector Road to a proposed Overland Avenue Extension. Final design noise memos/reports were previously prepared for Sections 53A1, 53A2, 53C2, and 53C3.

The purpose of the southern portion of the MFE project (of which Section 53B1A is a part) is to provide safe, efficient transportation improvements from PA Route 51 in the Borough of Jefferson Hills to PA Route 837 in the City of Duquesne. These improvements will complement the regional transportation network, improve roadway capacity, improve safety of the traveling public, enhance accessibility to social and emergency services and support economic development and redevelopment of brownfield sites within the Monongahela River Valley.

Noise sensitive land uses are present in the project corridor. Land use relevant to the Section 53B1A study is composed of single-family and multi-unit residences, as well as outdoor use areas associated with the multi-unit residential community (playgrounds, maintained open space/fields and a basketball court). Noise sensitive land use is generally located along Blueberry Street and Blackberry Street in NSA 5, and Glencoe Drive and Curry Hollow Road in NSA 35. **Figure 3** provides an overview of the Section 53B1A project limits.

A comprehensive noise analysis of the project area was conducted during the preliminary engineering phase of the project. That assessment is documented in the "Mon/Fayette Transportation Project, PA Route 51 to I-376, Preliminary Noise Analysis Report", dated April 2017. A digital copy of that report is available upon request. Public outreach occurred on April 3, 4, and 5, 2018 at the Georgetown Centre, 526 East Bruceton Road; the public provided an initial response to the preliminary engineering noise study at that time.

As documented in the preliminary design noise analysis, design year (2045) noise levels are projected to approach or exceed the PennDOT/FHWA Noise Abatement Criteria (NAC) at various locations throughout the limits of the project area. NSAs 5, 6, 34 and 35 were all found to contain impacts in the preliminary engineering assessment. A review of the subsequent changes to the roadway and grading design confirmed the initial recommendation against noise abatement for NSAs 6 and NSA 34; no further discussion of these NSAs is included in this analysis. However, changes to the updated design require detailed final design review for NSAs 5 and NSA 35.

This assessment has been prepared to provide an overview of existing and future-predicted noise levels in NSAs 5 and 35 and verify that noise abatement continues to be warranted in these communities in light of engineering design refinements to the Camp Hollow Road interchange. Interim changes to the design include a substantial revision to the mainline horizontal and vertical alignment and the addition of a bridge to span Curry Hollow Road, in lieu of fill to avoid costly utility impacts.

Additionally, the assessment serves to determine if noise abatement measures are potentially feasible and reasonable for these areas; and if so, optimize those noise abatement measures to meet PennDOT/FHWA noise reduction design criteria and goals. The following sections of this report provide a complete assessment of the noise environment in those NSAs, documents the noise abatement alternatives designed and evaluated to feasibly and reasonably alleviate anticipated noise impacts, and presents the final noise abatement measures (noise barrier alternatives) that are recommended for construction as part of the project.

3.0 NOISE ANALYSIS METHODOLOGY

The methodologies applied to this noise analysis are in accordance with PennDOT's *Project Level Highway Traffic Noise Handbook,* Publication No. 24, May 2019. PennDOT guidelines are based on the U.S. Department of Transportation, Federal Highway Administration (FHWA), Federal Aid Policy Guide 23, Code of Federal Regulations (CFR), Part 772 – *Procedures for Abatement of Highway Traffic Noise and Construction Noise*. Additional guidance and policy interpretation applied to this analysis is based on the U.S. Department of Transportation, Federal Highway Administration, *Highway Traffic Noise Analysis and Abatement Guidance* (FHWA-HEP-10-025, December 2011).

The proposed project, as described in Section 2.0 of this report, is considered a Type 1 transportation improvement project. Specifically, the project proposes to construct a new four-lane, limited access, tolled expressway. Construction Section 53B1A will also include tie-ins to a proposed interchange at Camp Hollow Road in the west and Pittsburgh McKeesport Boulevard in the east. Additionally, there will be local improvements to Pittsburgh McKeesport Boulevard/Richland Avenue approaching the Mon/Fayette Expressway access intersection.

Given the magnitude of the proposed improvements, detailed noise analyses were conducted during both the preliminary and final engineering design phases of the project, in accordance with PennDOT/FHWA procedures. Analyses included noise monitoring of existing (2016) conditions to allow for computer modeling of worst-case existing (2015) and design year (2045) conditions using the FHWA TNM 2.5 computer model.

Table 1 provides the PennDOT/FHWA Land Use Activity Categories, along with descriptions of specific land uses associated with each Activity Category. Also included in **Table 1** are the Noise Abatement Criteria (NAC) for each of the identified Activity Categories. Noise impacts are described as impacts that occur when predicted (design year) noise levels approach or exceed the NAC shown in **Table 1**. The term "approach" has been defined by PennDOT as 1-dBA below the criteria identified in **Table 1** for Activity Categories A, B, C, D and E.

In addition to the absolute criteria defined in **Table 1**, noise impacts can also occur when design year noise levels substantially exceed existing noise levels. PennDOT defines the "Substantial Noise Increase" Criteria for Activity Categories A, B, C, D and E Land Uses as increases of 10-dBA or greater when comparing worst-case existing noise levels to worst-case design year conditions. A 10-dBA (or more) increase in noise levels reflects the generally accepted range of increase which is likely to cause sporadic to widespread complaints, and is perceived by the human ear as a doubling of traffic noise emissions. Noise levels at receptors that satisfy either of the criteria described above "warrant" further consideration for noise abatement to mitigate the predicted impacts. Note that the majority of the impacts identified in MFE Section 53B1A are due to the substantial noise increase criteria.

The evaluation of noise abatement (where "warranted") is performed in two phases. Noise abatement must be evaluated for "feasibility" and for "reasonableness" to determine if it is appropriate to incorporate noise abatement measures into the final roadway design plans. Noise abatement feasibility addresses acoustical and engineering parameters to determine if a specific abatement measure is effective at reducing noise levels, as well as if that abatement measure can be constructed without introducing significant engineering or safety problems which would preclude construction.

There are seven (7) parameters that must be satisfied in order for noise abatement at a specific location to be determined feasible. For noise abatement (e.g., noise barrier) to be found feasible, the answers to all seven (7) parameters must be "yes". The parameters to be considered when determining noise barrier feasibility are:

1. Can a noise reduction of at least 5-dBA be achieved at the majority of the impacted receptor units (i.e., 50% or greater)?
2. Can the noise barrier be designed and physically constructed at the proposed location?
3. Can the noise barrier be constructed without causing a safety problem?
4. Can the noise barrier be constructed without restricting access to vehicular or pedestrian travel?
5. Can the noise barrier be constructed in a manner that allows for access for required maintenance and inspection operations?
6. Can the noise barrier be constructed in a manner that allows utilities to adequately function?
7. Can the noise barrier be constructed in a manner that allows drainage features to adequately function?

Noise barriers that successfully pass the feasibility test, considering the parameters above, are then evaluated for reasonableness to ensure noise abatement is appropriate for a given area or project. As per PennDOT Publication No. 24, noise barrier reasonableness is determined by assessing multiple issues including (1) Noise Barrier Cost Reasonableness Values; (2) Noise Reduction Design Criteria and Goals; and (3) Consideration of Viewpoints (of benefitted receptors). The following is a summary of each of the items that are evaluated to determine if a specific noise abatement measure (e.g., a vertical noise barrier) is reasonable.

PennDOT's "Noise Barrier Cost Reasonableness Value" is based upon a Maximum Square Footage of Abatement per Benefitted Receptor (MaxSF/BR) value of 2,000 or less. This MaxSF/BR criterion is applied statewide as part of the reasonableness determination process for all projects. In determining the "Square Footage per Benefitted Receptor (SF/BR)" value, the total square footage (SF) of a noise barrier is divided by the total number of "Benefitted Receptors" (BR) to determine if the abatement measure would be considered "reasonable". Any receptor that receives a 5-dBA or greater noise reduction (or insertion loss (IL)) is considered a "Benefitted Receptor" and included in the MaxSF/BR calculation and index comparison. Noise abatement measures that are calculated with a MaxSF/BR value of 2,000 or less are further considered for incorporation into the project.

PennDOT's "Noise Reduction Design Criteria and Goals" are intended to ensure that an optimized noise barrier design is established to achieve the most effective noise barrier in terms of both noise reduction and cost. While a 5-dBA noise reduction at the majority of the impacted receptors is required as part of the feasibility criteria, the following (tiered) noise barrier abatement goals should be addressed when evaluating the reasonableness of any abatement measure for Activity Category A, B, C, and E land use facilities:

1. It is <u>required</u> that exterior noise levels be reduced by at least 7-dBA for at least one (1) benefitted receptor.
2. While conforming to the MaxSF/BR Criteria, it is <u>desirable</u> to obtain the 7-dBA minimum exterior insertion loss for additional impacted receptor sites if justified by a "point of diminishing returns" evaluation.
3. While conforming to the MaxSF/BR Criteria, it is <u>desirable</u> to provide additional exterior insertion loss above the 7-dBA minimum if justified by a "point of diminishing returns" evaluation.
4. If possible, it is <u>desirable</u> to reduce exterior noise levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60-decible range (65-68) for Category E receptors.
5. If possible, it is <u>desirable</u> to reduce future exterior noise levels back to existing exterior noise levels.

When optimizing a potential noise barrier, the tiered sets of required and desirable abatement goals listed above are evaluated in terms of establishing noise reductions for impacted receptors only, and not for non-impacted receptors.

The final test associated with noise abatement reasonableness is the "Consideration of Viewpoints" (of property owners and residences benefitted by the proposed abatement). During this step, the viewpoints of all benefitted receptors are solicited in order to document the desires for a specific noise abatement option that is being considered for incorporation into the project. Although the public may express opinions regarding the desire for (or against) particular noise abatement measures at any point in the development of a project, the solicitation of viewpoints does not formally occur until information contained within the Draft version of the Final Design Noise Analysis Report has been approved for circulation to the public by the PTC and FHWA.

This final step of the noise abatement reasonableness determination allows the affected community the opportunity to provide input based on the proposed location, type, height, and length of the noise abatement feature. Community feedback on a specific noise abatement measure (such as a noise barrier) includes input on whether the community is in favor of or opposed to construction of the noise barrier(s), as well as limited input on the color and texture on the residential side (assuming it is accepted by the community). When considering a specific noise abatement option, 50% or greater of the "benefitted receptors" must be in favor of the option for that option to be considered reasonable. Noise abatement options that are not supported by 50% or greater of the benefitted receptors are typically determined to be not reasonable. Generally, this phase of the reasonableness analysis cannot be determined until the end of the final design phase of the project.

The final design noise analysis for MFE Section 53B1A has been performed in accordance with the methodology outlined above. This methodology is in accordance with current PennDOT and FHWA procedures, as detailed in PennDOT's Publication No. 24. The results of this analysis are fully documented within this report.

4.0 EXISTING HIGHWAY TRAFFIC NOISE ENVIRONMENT

The noise analysis was initiated during the preliminary design phase by evaluating the project area to identify the locations of noise-sensitive land uses within meaningful proximity to the proposed improvements. The selection of noise monitoring locations was guided by the location of noise-sensitive land uses, influence of non-highway noise sources on ambient sound levels, the location of existing (local) roadways in the project area, and the limits and design details associated with the proposed improvements. **Figure 3** provides an overview of project mapping for the MFE Section 53B1A project area.

Noise-sensitive land uses listed in **Table 1** are present and adjacent to the proposed transportation facility. Residential structures, classified as Land Use Activity Category B receptors, are the sole land use in this section. Residential parcels are typified by detached single-family homes and multi-family units (portions of the Mifflin Estates apartment complex), as well as dedicated outdoor recreational areas associated with the multi-family community. The complex's shared-use recreational area includes a basketball court, two playgrounds, two benches, and a mowed and maintained grassy field.

For organizational purposes, the project was split into multiple individual NSAs based on common areas of highway traffic noise influence. NSAs are groupings of noise-sensitive land uses that have similar noise levels and common noise influences. NSAs are also useful for considering the benefits of noise abatement and evaluating noise abatement measures for feasibility and reasonableness. **Figure 3** identifies the locations of the NSAs that have been evaluated for MFE Section 53B1A.

The preliminary design noise analysis concluded that noise abatement assessment was warranted, but not feasible and/or reasonable for NSA 5 and NSA 35. As noted previously, subsequent changes to the mainline roadway, interchange configuration, access ramps, and local roadway network have necessitated a re-evaluation of these findings.

4.1 Noise Monitoring

In order to evaluate existing noise levels and provide data to assist with noise model validation, noise monitoring was conducted at a total of two (2) locations within NSA 5 and three (3) locations within NSA 35 for short-term (15-minute) durations. Noise monitoring receptor site data is presented in **Table 2**.

Noise Monitoring was performed at each of the selected noise monitoring locations using RION NL-42 sound analyzers. Readings were taken on the A-weighted scale and reported in decibels (dBA). The noise monitoring equipment meets all requirements of the American National Standard Specifications for Sound Level Meters, ANSI S1.4-1983

(R2006), and meets all requirements as defined by FHWA. Noise monitoring was conducted in accordance with the methodologies contained in FHWA-PD-96-046, *Measurement of Highway-Related Noise* (FHWA, May 1996).

It was determined that 24-hour monitoring was not necessary for the noise analysis since the project is a new limited access highway on new alignment, surrounded by local roads that are not typical commuter routes that influence existing noise levels. In general, noise levels are consistent throughout the day adjacent to the local roadway network while other rural areas are dominated by non-roadway background ambient noise sources.

Noise levels were monitored for 15-minute durations at each monitoring location. Noise level data was recorded at 10-second intervals for the 15-minute duration of each sample. Data collected by the sound analyzers include date, time, average noise level (Lav) and maximum noise level (Lmax) for each 10-second interval. Additional data collected at each monitoring location included atmospheric conditions, wind speed, background noise sources, and atypical or non-traffic-related noise influences. Traffic data (vehicle volume and speed) were also video-recorded on all roadways which were visible from the monitoring sites and substantially contributed to the overall noise levels. Traffic was grouped into one (1) of five (5) categories: automobiles, medium trucks, heavy trucks, busses, and motorcycles, as per PennDOT/FHWA procedures. Copies of the noise monitoring data sheets and noise monitoring data are included in **Appendix B**.

Short-term noise monitoring was conducted on June 21, 2016. During the monitoring sessions, traffic on contributing roadways was generally free flow, allowing for TNM model calibration where local roadways are the dominant noise source.

The following is a summary of existing conditions and monitored noise levels in the NSAs being carried forward into the final design phase analysis:

NSA 5

NSA 5 is located east of Camp Hollow Road and north of Lebanon School Road. This NSA includes multiple single-family residential units on Lebanon School Road and Blueberry St, and a multi-unit apartment complex (Mifflin Estates) along Blackberry Street. The existing community centered around Village Lane and Village Court will be displaced as a result of the project. The terrain in this NSA steadily climbs in elevation heading north from Lebanon School Road, leveling off at the top end of Blackberry Street.

NSA 5 is comprised of Category B (residential) land use. NSA 5 includes two monitored sites (R4 and R5) and 46 modeled sites (5-M1 through 5M-11, 5-E01 through 5-E35), representing 81 residences and two (2) equivalent residential units (ERUs).

Monitoring site R4 represents a single-family residential unit along Lebanon School Road in the vicinity of Blueberry Street, and is acoustically influenced by the local roadway. Monitoring site R5 represents a location within the multi-unit Mifflin Estates apartment complex along Blackberry Street, facing the proposed mainline roadway. Non-traffic ambient noise sources are the primary acoustical influence at this monitoring site. Noise levels at these sites were monitored at 58 and 47 dBA, respectively.

NSA 35

NSA 35 is located along Curry Hollow Road, Glencoe Drive and Creston Drive. This NSA includes multiple single-family residential units. Several of the homes along Curry Hollow Road will be displaced as a result of the project. The terrain in this NSA steadily climbs in elevation heading from west to east away from the proposed mainline.

NSA 35 is comprised of Category B (residential) land use. NSA 35 includes three monitored sites (R50, R51 and R52) and 21 modeled sites (35-M1 through 35-M21) representing 60 residences.

Site R50 represents a single-family residential unit along the northern end of Glencoe Drive, facing the proposed mainline. Site R51 represents a single-family residential unit along the southern end of Glencoe Drive, facing the proposed mainline. Site R52 represents a single-family residential unit along Curry Hollow Road, facing the proposed mainline. This parcel will be displaced as part of the proposed roadway improvements. Non-traffic noise sources are the primary acoustical influence at all of these monitoring sites. Noise levels at these sites were monitored at 55, 56 and 56 dBA, respectively.

4.2 Noise Modeling of Existing Conditions

Computer modeling is the accepted technique for predicting and evaluating existing and future noise levels associated with traffic-induced noise. FHWA's Traffic Noise Model (TNM) version 2.5 was the modeling platform used in this analysis. The TNM software package has been established as a reliable tool for predicting noise generated by highway traffic. TNM incorporates three-dimensional engineering design and project area mapping elements to evaluate traffic-induced noise levels. The information applied to the modeling effort includes geo-referenced base-mapping, existing and proposed contour files, existing and proposed roadway design files, and existing and future traffic data (including vehicle volume, class composition, and speed).

Additional features identified in the field and accounted for in the TNM noise modeling effort include existing terrain features, tree zones and building rows, as well as existing local roadways that provide measurable noise influences at adjacent noise receptors. Base mapping and field views were used to identify and verify noise-sensitive land uses within the project corridor, as well as areas of frequent outdoor human activity for Category C land uses.

The noise modeling process is initiated with computer model validation, as per PennDOT/FHWA requirements. This is accomplished by comparing monitored noise levels with noise levels generated by TNM, using traffic characteristics that were present during the noise monitoring effort. This comparison ensures that reported changes in noise levels between existing and future conditions are due to changes in roadway/traffic conditions and not to discrepancies between monitoring and modeling techniques. Differences of three (3) decibels or less between monitored and modeled levels are considered acceptable for TNM validation as this is the limit of change detectable by the typical human ear, and is used by PennDOT as the validation benchmark.

Table 2 provides a summary of the model validation for NSA 5 and NSA 35. Column 6 of **Table 2** provides the monitored noise level at two (2) locations. Column 7 provides the modeled noise levels using traffic characteristics witnessed in the field during the noise monitoring phase. Column 8 displays the difference between monitored and modeled values. Receptor R4 shows a difference of 3 dBA or less between monitored and modeled values, indicating the model accurately represents the existing conditions at that location. Receptors R5, R50, R51 and R52 were not able to be validated by the model, as ambient noise levels are dominated by non-traffic noise sources. Where applicable, ambient noise levels reported in the preliminary engineering noise study have been maintained in the final design analysis for consistency. Ambient noise levels of 47 dBA were identified for NSA 5. Ambient noise levels noise levels of 42 dBA, 45 dBA and 49 dBA were identified for various portions of NSA 35.

Following the noise model validation phase, additional noise modeling was performed to more comprehensively evaluate existing (2015) noise levels under worst-case traffic conditions. As part of the worst-case existing condition modeling effort, additional "modeled-only" sites were added to thoroughly predict existing traffic noise levels and propagation characteristics throughout the project corridor.

The locations of all noise modeling sites are displayed on **Figures 4 and 5**. The modeling sites used in the final design phase differ from those utilized and reported in the preliminary design phase, as models were refined to predict noise levels more accurately at individual properties and across the full breadth outdoor shared-use recreational areas. Additional non-reported sites were used in the analysis to ensure accurate representation of the full extent of noise sensitive parcels, particularly at barrier transitions and end points.

Noise modeling sites were selected to be representative of one or more noise-sensitive receptors present within the NSAs. In the majority of cases the modeling sites represent single-family detached or multi-unit residences. However, several of the sites in NSA 5 (5-E21 through 5-E25) represent the outdoor shared-use recreational area associated with the Mifflin Estates apartment complex. Noise receptor attributes for this area were developed using the Equivalent Residential Unit (ERU) guidelines set forth in Appendix E of PennDOT's Publication 24. The ERU value is developed to represent the degree of use which occurs at a given site. Therefore, while the ERU for a single-family dwelling is always one, ERU values for other sites will vary based primarily on usage. The guidelines outlined in Appendix E of Publication 24 allow for development of ERUs utilizing "any reasonably supported approach" at the discretion of the noise analyst. ERU values were assigned to the shared-use outdoor recreational area consistent with those used in the preliminary engineering noise analysis. However, the preliminary engineering analysis used two (2) receptors valued at one (1) ERU each in a perpendicular linear array. The final design analysis used five (5) receptors valued at 0.4 ERUs each, to better represent the full extents of the recreational area. These five (5) receptors have been located generally within a 130-foot grid spacing, consistent with Publication 24 guidelines.

The worst-case existing condition modeling effort relies on worst-case existing traffic data (supplied by the project's traffic engineering team) to predict peak noise levels. Traffic data employed for the noise analysis can be found in **Appendix C**. Review of the traffic data indicated that the PM peak traffic volumes and speeds represent the worst-case existing condition.

Column 6 of **Table 3** provides a summary of worst-case existing (2015) noise levels throughout the project area under peak travel periods.

Based on a review of the modeling data, existing peak-hour noise levels do not currently approach or exceed the PennDOT/FHWA NAC in NSA 5 or NSA 35.

5.0 FUTURE HIGHWAY TRAFFIC NOISE ENVIRONMENT

There is currently one (1) design alternative being evaluated as part of the final design phase of MFE Section 53B1A. **Figure 3** displays the section limits and general engineering details associated with the project. See **Section 2.0 Introduction** for a complete description of the proposed improvements. There are multiple displacements associated with the proposed improvements. East of the proposed highway mainline, the multi-family residences centered around Village Lane and Village Court Drive in NSA 5 will all be displaced. Displacements in NSA 35 occur at select parcels along Curry Hollow Road. Displaced parcels are shown in **Figures 4 and 5**, and have been excluded from this analysis.

PennDOT Publication 24 and associated FHWA guidance requires the prediction and reporting of both Future No-Build (the existing roadway network, absent the MFE Section 53B1A design) and Build (incorporating all design elements) condition worst-case traffic noise levels.

The design year No-Build models were created by incorporating design year (2045) No-Build peak hour traffic into the existing-condition baseline TNM models. Design year traffic volumes, vehicle composition, and speeds were assigned to existing roadways represented in the models.

The design-year Build-condition noise models were created by incorporating the proposed future roadway improvements (including the new limited access highway, changes to existing roadway's vertical and horizontal alignment as well as necessary re-grading of terrain along traffic-noise propagation pathways) into the baseline noise model. Design year (2045) traffic volumes, vehicle composition, and speeds were then assigned to all modeled roadways in the project study area.

5.1 Design Year (2045) No-Build Conditions

Design year (2045) traffic noise levels were evaluated for the No-Build Alternative for comparative purposes, as required by PennDOT/FHWA procedures and guidelines.

As shown in Column 7 of **Table 3,** the design-year No-Build traffic noise levels are generally not anticipated to change at receptors within the project area. Some locations closer to existing roadways will experience a 1-2 dBA increase over existing noise levels. This is expected given the relative increases in traffic volumes on the local roadway network identified by the traffic study.

5.2 Design Year (2045) Build Conditions

Design year (2045) Build Alternative traffic noise levels were modeled to determine if future noise levels are projected to approach or exceed the PennDOT/FHWA NAC under the current project design. The prediction of design year (2045) Build Alternative noise levels was performed consistent with PennDOT/FHWA procedures. If the PennDOT/FHWA NAC are approached or exceeded at any receptor under the Build Alternative, noise abatement consideration is warranted for those locations. Column 8 of **Table 3** provides a summary of design year worst-case noise levels at each receptor site under the Build Alternative. The following discussion provides a summary of the Build Alternative noise levels for NSA 5 and NSA 35. Digital copies of all FHWA TNM noise modeling files for the project are available upon request.

NSA 5

As shown in column 8 of **Table 3**, future design year (2045) worst-case noise levels associated with the Build Alternative are projected to range from 51 to 67 dBA. Based on the noise modeling results, design year noise levels are predicted to increase up to 20 dBA, as compared to existing (2015) conditions.

Twenty-seven (27) modeled receptor sites representing 45 residences and ERUs are predicted to approach or exceed the PennDOT/FHWA NAC for Activity Category B under the Build Alternative. Impacts are due to both the absolute and substantial noise increase criteria. Therefore, noise abatement consideration is warranted for NSA 5.

NSA 35

As shown in column 8 of **Table 3**, future design year (2045) worst-case noise levels associated with the Build Alternative are projected to range from 53 to 63 dBA. Based on the noise modeling results, design year noise levels are predicted to increase up to 17 dBA, as compared to existing (2015) conditions.

Twenty-one (21) modeled receptor sites representing 54 residences are predicted to approach or exceed the PennDOT/FHWA NAC for Activity Category B under the Build Alternative. Impacts are all due to substantial noise increase criteria. Therefore, noise abatement consideration is warranted for NSA 35.

6.0 HIGHWAY TRAFFIC NOISE CONSIDERATION AND ABATEMENT OPTIONS

Design year noise levels associated with the Build Alternative are projected to approach or exceed the PennDOT/FHWA NAC in NSA 5 and NSA 35. Therefore, noise abatement consideration is warranted for the impacted receptors within each NSA. This section of the report documents the noise abatement alternatives that were considered to reduce noise levels within each NSA, and evaluate those potential abatement measures for feasibility and reasonableness.

PennDOT and FHWA guidelines recommend a variety of noise abatement measures which should be considered in response to transportation-related noise impacts. While noise barriers and/or earthen berms are generally the most effective form of noise abatement, additional abatement measures exist that have the potential to provide considerable noise reductions under certain circumstances. Noise Abatement measures to be considered for a given project include:

- Construction of noise barriers (or earth berms), including acquisition of property rights, either within or outside the highway right-of-way. Landscaping is not a viable noise abatement feature.
- Traffic management measures including, but not limited to, traffic-control devices and signing for the prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive land designations.
- Alteration of horizontal and vertical alignments.
- Acquisition of real property or interests therein (predominately unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise. This measure may be included in Type 1 projects only.
- Noise Insulation of Activity Category D land use facilities listed in **Table 1**. Post installation maintenance and operational costs for noise insulation are not eligible for State or Federal-aid funding.

Based on the project need (see Section 2.0 INTRODUCTION) and the nature of the proposed improvements, traffic management and control measures were not considered an appropriate solution. Opportunities for alignment modifications are limited given the challenging terrain and existing development adjacent to the corridor. Property acquisition (to provide buffer zones or to construct/provide noise abatement) is not necessary or supported by the analysis. Noise insulation of Activity Category D land uses is also not necessary or supported by the noise analysis, since no (interior) noise impacts are anticipated to Category D Land Uses resulting from the proposed project. Therefore, noise barriers and/or earthen berms were considered the only form of noise abatement having the potential to reduce future noise levels at impacted receptor sites.

Noise barriers and earthen berms are often implemented into the highway design in response to identified noise impacts. The effectiveness of a free-standing (post and panel) noise barrier and an earthen berm of equivalent height are relatively consistent; however, an earthen berm is often perceived as a more aesthetically pleasing option. Therefore, where possible, earthen berms are typically preferred over noise barriers. Unfortunately, the use of earthen berms is not always an option due to the excessive space they require within the roadway corridor. At a standard slope of 2:1, every one (1) foot of berm height requires approximately four (4) feet of horizontal width to accommodate the required slopes. This requirement becomes more complex in roadway corridors where previously-developed parcels are adjacent to the proposed corridor right-of-way. In these situations, the implementation of earthen berms can require significant property acquisition to accommodate noise abatement. Due to the desire to minimize right-of-way acquisition and the lack of space to accommodate a viable berm for the impacted areas identified in MFE Section 53B1A, berms were not considered a viable option for this project. Therefore, noise barriers appear to be the only form of noise abatement available to reduce noise impacts. Accordingly, noise barriers were evaluated for NSA 5 and NSA 35, where noise impacts were identified.

When designing abatement, barrier footprints are typically located (in roadway cut environments) at the top of a cut-slope no less than ten (10) feet inside the existing ROW and/or (in roadway fill environments) along the top of the fill-slope, typically adjacent to the roadway shoulder. In areas where a break in the barrier is required to accommodate utilities or other design considerations, an overlap section can be effective wherein the length of the overlapped panels is typically a minimum of three times the distance between the two barrier sections. For example, a gap of fifteen (15) feet between overlapping barriers would typically require an overlap section forty-five (45) feet or greater in length.

As discussed in Section 3.0 NOISE ANALYSIS METHODOLOGY, noise abatement measures must be evaluated for feasibility and reasonableness, and must satisfy the applicable parameters associated with each criterion in order to be recommended as part of the final design of the project. These parameters are identified and listed in PennDOT's Noise Barrier Warranted, Feasibility and Reasonableness Worksheets. Copies of the Noise Barrier Warranted, Feasible, and Reasonable Worksheets for each noise abatement option evaluated in the MFE Section 53B1A project area are provided in **Appendix D.**

Noise abatement was evaluated to achieve the requirements necessary to pass PennDOT's feasibility and reasonableness criteria. These parameters include the feasibility requirement to provide noise reductions of at least 5 dBA for the majority of the impacted receptors in a given NSA. Additionally, reasonableness requires that exterior noise levels be reduced by at least 7 dBA for at least one (1) benefitted receptor. PennDOT's Noise Barrier Cost Reasonableness Value is based on a Maximum Square Footage of Abatement per Benefitted Receptor (MaxSF/BR). Noise abatement measures that are calculated with a MaxSF/BR value of 2,000 or less are considered "reasonable".

Once a barrier has been developed that addresses minimum performance goals for feasibility, it is further optimized to a “point of diminishing returns”. The relationship between noise barrier square footage and noise barrier performance is non-linear. This means that noise benefits typically increase with increased barrier height and/or length; however, at some point, further increases in barrier height and/or length result in reduced increases in benefit until a point of diminishing returns is reached. A point can be identified where a potential noise barrier provides the best balance between square footage and benefit. All barriers presented in this analysis were developed to achieve feasibility and reasonableness design goals first, then optimized to the point of diminishing returns (while still maintaining feasibility and reasonableness objectives).

Noise barriers presented in this final design study were not proposed for construction during the preliminary engineering phase. This is due to multiple factors, most notably the subsequent changes to the Camp Hollow Road interchange alignment. Interim changes to the design include a substantial revision to the mainline horizontal and vertical alignment and the addition of a bridge to span Curry Hollow Road, in lieu of fill to avoid costly utility impacts. The final design noise models also incorporated additional receptor sites to provide a more concise understanding of traffic noise propagation through the noise-sensitive areas proposed for abatement consideration. Noise barriers were evaluated using reduced iterative gradations in panel length and height (e.g., 16-foot panel lengths as opposed to 25- and 50-foot panel lengths as well as one-foot height perturbations - or less - in final design, versus two-foot perturbations used in the preliminary design study;). Additionally, logical termini for barrier panels were also considered to resolve aesthetic, engineering design, and public acceptance considerations during the final design phase.

Following PennDOT/FHWA concurrence and approval of the Final Design Highway Traffic Noise Draft Report, and approval of the barrier options under consideration, these options will be presented to the public to solicit input on the desires for noise mitigation. Following is a summary of the options that were developed, refined, and optimized to provide feasible and reasonable noise abatement.

6.1 NSA 5 Barrier

Noise impacts are generally concentrated in proximity to the multi-family residences and associated outdoor shared-use areas at the northern end of this NSA. This area includes receptors 5-E01 through 5-E06, 5-E08 through 5-E12, 5-E14, 5-E16, 5-E18, 5-E20 through 5-E30, 5-E35, and 5-M11 representing 43 residences and two (2) ERUs. A continuous post-and-panel noise barrier system was modeled to identify feasible and reasonable noise abatement for these receptors. An overlapping two-barrier system was initially evaluated to address minimum performance goals at impacted receptors, then refined in both height and length based on additional PennDOT feasibility and reasonableness considerations. The overlap section is necessary to accommodate maintenance access for a stormwater management basin.

As shown in **Figure 4** (moving from south to north), the refined two-barrier system for NSA 5 was modeled between approximate mainline stations 1866 +00 and 1876 +75. This barrier system generally follows along the edge-of-shoulder of the northbound on-ramp and the mainline. At the southern end, the barrier system ties into an existing slope, taking advantage of the natural shielding provided by the terrain. The NSA 5 noise barriers were modeled at multiple heights ranging from six (6) feet above ground level to 20 feet above ground level, at one (1) foot increments. The noise barriers were then optimized to evaluate feasibility and reasonableness, as well as to establish logical termini for barrier end points.

Table 4, columns 5 and 6, provide a performance summary for the optimized noise barriers evaluated for impacted sites in NSA 5. As shown, the optimized noise barriers provide noise reductions of 5 dBA or greater for at least 50% of the impacted sites, indicating the optimized barrier option is feasible relative to performance goals. The optimized noise barriers provide at least a 7 dBA noise reduction for at least one impacted receptor. As summarized in **Table 4**, the optimized barriers have a cumulative length of 1,288 feet. The optimized barriers range from 10 to 20 feet in height and have a cumulative area of 20,570 square feet. Providing benefits to 30 residential units, the barrier for NSA 5 has a MaxSF/BR Value of 686, indicating that the optimized barrier option is reasonable.

Therefore, the optimized barrier design is recommended for further consideration and public input through the final design phase of the project. PennDOT's Noise Abatement Warranted, Feasible and Reasonable Worksheet has been updated for this NSA and included in **Appendix D**.

6.2 NSA 35 Barrier

Noise impacts are prevalent throughout this NSA along Curry Hollow Road and Glencoe Drive. These areas include receptors 35-M2 through 35-M16, 35-M18 through 35-M21, R50, and R51 representing 54 residences. A continuous post-and-panel noise barrier was modeled to identify feasible and reasonable noise abatement for these receptors. A barrier was initially evaluated to address minimum performance goals at impacted receptors, then refined in both height and length based on additional PennDOT feasibility and reasonableness considerations.

As shown in **Figure 5** (moving from south to north), the refined barrier for NSA 35 was modeled between approximate mainline stations 1867 +25 and 1897 +50. This barrier generally follows along the edge-of-shoulder of the southbound mainline and exit-ramp, and extends the full length of the proposed structure spanning Curry Hollow Road. The NSA 35 noise barrier was modeled at multiple heights ranging from six (6) feet above ground level to 20 feet above ground level at one (1) foot increments, with the exception of the portions that are located on the structure spanning Curry Hollow Road. Where barrier is placed on structure, panels were limited in height to 12 feet above the parapet (per the PTC's *Design Consistency Guidelines*, April 2022). The noise barrier was then optimized to evaluate feasibility and reasonableness, as well as to establish logical termini for barrier end points.

Table 5, columns 5 and 6, provide a performance summary for the optimized noise barrier evaluated for impacted sites in NSA 35. As shown, the optimized noise barriers provide noise reductions of 5 dBA or greater for at least 50% of the impacted sites, indicating the optimized barrier option is feasible relative to performance goals. The optimized noise barrier provides at least a 7 dBA noise reduction for at least one impacted receptor. As summarized in **Table 5**, the optimized barrier has a total length of 3,195 feet. The optimized barrier ranges from 8 to 14 feet in height and has a total area of 44,221 square feet. Providing benefits to 50 residential units, the barrier for NSA 35 has a MaxSF/BR Value of 884, indicating that the optimized barrier option is reasonable.

Therefore, the optimized barrier design is recommended for further consideration and public input through the final design phase of the project. PennDOT's Noise Abatement Warranted, Feasible and Reasonable Worksheet has been updated for this NSA and included in **Appendix D**.

7.0 CONSTRUCTION NOISE CONSIDERATION AND ABATEMENT OPPORTUNITIES

Throughout the construction phase of the project, noise sensitive land uses in close proximity to proposed improvements are susceptible to construction noise impacts. Activities and equipment associated with construction are likely to temporarily elevate noise within the project area. Sensitive receptors within close proximity to proposed improvements may experience varying noise levels and durations, depending on the nature of the activity, the type of equipment being used, and the relative distance from the temporary noise source.

Reductions in noise emissions at the source are an effective means of reducing construction noise impacts. Contractors should perform regular maintenance and upkeep of vehicles and equipment. Common areas of focus include engine and exhaust maintenance (including muffler systems), and regular lubrication of moving parts.

Additional methods should be considered to further reduce or respond to construction noise concerns. Implementation of workplace protocols should be considered, including elimination of “tailgate banging”, consideration of the location of “staging” areas, and potential incorporation of smart back-up alarms. Restrictions on work-hours should also be considered, where appropriate. Where construction noise impacts are unavoidable, the use of temporary noise barriers should be considered. Community input on sequencing of operations as well as a complaint-response mechanism may also serve to reduce construction noise impacts on the community.

The PTC has ongoing coordination with the local municipalities to determine potential issues with construction noise, including any constraints on active work periods. Any municipal concerns will be addressed through the PTC’s ongoing public involvement processes. If construction noise specifications are required for inclusion in the Plans, Specifications, and Estimates package, detailed coordination is suggested between the PTC and the local municipality.

8.0 PUBLIC INVOLVEMENT PROCESS

The MFE Section 53B1A project has been active for several years. Public and municipal involvement has been ongoing throughout the life of the project. In April 2018, public plans display meetings were held during the preliminary design phase to present the engineering specifics and environmental concerns associated with the project. As documented in Section 3.0 NOISE ANALYSIS METHODOLOGY, the public involvement phase is also necessary during final design to conclude the reasonableness evaluation for the proposed noise barrier concepts presented in the draft noise report. Final design noise abatement concepts have been developed in order to provide the benefitted receptors with the details necessary to make an informed decision.

Noise-specific public involvement will be conducted for NSA 5 and NSA 35 following PTC and FHWA conditional approval of the Draft Final Design Noise Report. Community-specific public outreach will be conducted with benefitted property owners and residents within NSA 5 and NSA 35. The goal of the community-specific public outreach will be to formally solicit input from the affected community related to the desires for noise abatement, as well as aesthetic options on the community side of the proposed barrier options.

The benefited property owners (and renters) will be provided detailed information about the noise analysis process employed and the specific abatement measures proposed for construction as part of this project. Copies of the public outreach participation list, as well as all public outreach informational sheets, graphics, and survey forms, will be provided in the final version of the Final Design Noise Report.

TABLES

Table 1 **PennDOT and FHWA** **Hourly Weighted Sound Levels dB(A) For Various Land Use Activity Categories***		
Land Use Activity Category	Leq(h)[1]	Description of Land Use Activity Category
A	57 (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[2]	67 (exterior)	Residential
C[2]	67 (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 (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[2]	72 (exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A, B or C.
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 Impact thresholds should not be used as design standards for noise abatement purposes. 2 Includes undeveloped lands permitted for this activity category		

** PennDOT has chosen to use Leq(h) [not L10(h)] on all of its transportation improvement projects.*

Table 2

Mon/Fayette Expressway - Section 53B1A

Existing (2018) Monitored Noise Levels (Leq(h) in dBA)

(1) NSA	(2) Site ID	(3) Site Description	(4) PennDOT/FHWA Activity Category	(5) Noise Abatement Criteria (NAC)* in dBA	(6) Existing (2018) Monitored Noise Level	(7) Validation Modeled Noise Level	(8) Difference
5	R4	1125 Lebanon School Road, West Miflin, PA 15122	B	66	57.5	54.5	-3.0
	R5	601 D Drive, West Miflin, PA 15122	B	66	47.2	ambient	---
35	R50	215 Glencoe Drive, West Miflin, PA 15122	B	66	54.8	ambient	---
	R51	307 Glencoe Drive, West Miflin, PA 15122	B	66	55.9	ambient	---
	R52	528 Curry Hollow Road, West Miflin, PA 15122	B	66	56.2	ambient	---

* Noise levels that are within 1 dBA of the PennDOT/FHWA NAC (Table 1)

[shaded] Monitored level dominated by non-traffic noise influences

Table 3
Mon/Fayette Expressway - Section 53B1A
Noise Level Summary (Leq(h))

(1) NSA	(2) Site Descriptor	(3) Site Representation	(4) PennDOT/FHWA Activity Category	(5) Noise Abatement Criteria (NAC)*	(6) Existing (2015) Peak Hour Noise Level	(7) Design Year (2045) No Build Noise Level	(8) Design Year (2045) Build Noise Level
5	5-M1	2 residences	B	66	48	49	57
	5-M2	2 residences	B	66	47	47	52
	5-M3	2 residences	B	66	47	47	51
	5-M4	2 residences	B	66	53	54	60
	5-M5	2 residences	B	66	49	50	57
	5-M6	3 residences	B	66	47	47	51
	5-M7	3 residences	B	66	50	52	57
	5-M8	2 residences	B	66	47	49	57
	5-M9	1 residence	B	66	48	49	55
	5-M10	1 residence	B	66	46	47	55
	5-M11	1 residence	B	66	47	47	57
	5-E01	2 residences	B	66	47	47	66
	5-E02	2 residences	B	66	47	47	67
	5-E03	2 residences	B	66	47	47	60
	5-E04	2 residences	B	66	47	47	66
	5-E05	2 residences	B	66	47	47	57
	5-E06	2 residences	B	66	47	47	66
	5-E07	2 residences	B	66	47	47	56
	5-E08	2 residences	B	66	47	47	65
	5-E09	2 residences	B	66	47	47	57
	5-E10	2 residences	B	66	47	47	65
	5-E11	2 residences	B	66	47	47	58
	5-E12	2 residences	B	66	47	47	64
	5-E13	2 residences	B	66	47	47	53
	5-E14	2 residences	B	66	47	47	64
	5-E15	2 residences	B	66	47	47	53
	5-E16	2 residences	B	66	47	47	64
	5-E17	2 residences	B	66	47	47	52
	5-E18	2 residences	B	66	47	47	63

Table 3
Mon/Fayette Expressway - Section 53B1A
Noise Level Summary (Leq(h))

(1) NSA	(2) Site Descriptor	(3) Site Representation	(4) PennDOT/FHWA Activity Category	(5) Noise Abatement Criteria (NAC)*	(6) Existing (2015) Peak Hour Noise Level	(7) Design Year (2045) No Build Noise Level	(8) Design Year (2045) Build Noise Level
5	5-E19	2 residences	B	66	47	47	56
	5-E20	2 residences	B	66	47	47	63
	5-E21	0.4 ERU	C	66	47	47	66
	5-E22	0.4 ERU	C	66	47	47	67
	5-E23	0.4 ERU	C	66	47	47	66
	5-E24	0.4 ERU	C	66	47	47	65
	5-E25	0.4 ERU	C	66	47	47	65
	5-E26	2 residences	B	66	47	47	58
	5-E27	2 residences	B	66	47	47	58
	5-E28	2 residences	B	66	47	47	58
	5-E29	2 residences	B	66	47	47	58
	5-E30	2 residences	B	66	47	47	57
	5-E31	2 residences	B	66	47	47	54
	5-E32	2 residences	B	66	47	47	54
	5-E33	2 residences	B	66	47	47	54
	5-E34	2 residences	B	66	47	47	55
	5-E35	2 residences	B	66	47	47	57
35	35-M1	3 residences	B	66	49	49	55
	35-M2	3 residences	B	66	49	49	59
	35-M3	2 residences	B	66	49	49	59
	35-M4	3 residences	B	66	49	49	60
	35-M5	3 residences	B	66	49	49	61
	35-M6	3 residences	B	66	49	49	63
	35-M7	3 residences	B	66	49	49	61
	35-M8	3 residences	B	66	49	49	62
	35-M9	3 residences	B	66	49	49	61
	35-M10	3 residences	B	66	49	49	61
	35-M11	3 residences	B	66	49	49	63
	35-M12	3 residences	B	66	49	49	61
	35-M13	4 residences	B	66	49	49	62
	35-M14	2 residences	B	66	49	49	61
	35-M15	2 residences	B	66	49	49	60
	35-M16	2 residences	B	66	49	49	60
	35-M17	3 residences	B	66	49	49	57
	35-M18	1 residence	B	66	42	42	57
	35-M19	1 residence	B	66	42	42	55
	35-M20	2 residences	B	66	42	43	54
	35-M21	2 residences	B	66	42	44	53
	R50	3 residences	B	66	45	45	62
	R51	3 residences	B	66	49	49	61

* Noise levels that are within 1 dBA of the PennDOT/FHWA NAC (Table 1) OR exceed existing noise levels by 10 dBA or greater WARRANT abatement consideration.

[shaded box] Noise level approaches or exceeds PennDOT/FHWA NAC

TNM-predicted noise levels below ambient have been reported at the ambient level

Table 4
Mon/Fayette Expressway - Section 53B1A
NSA 5 - Noise Barrier Analysis

(1)	(2)	(3)	(4)	(5)	(6)
			Design year (2045)	Optimized Design	
NSA	Site Descriptor	Site Representation	Peak Hour Noise Level*	Mitigated Noise Level*	Insertion Loss*
5	5-M11	1 residence	57	54	3
	5-E01	2 residences	66	57	9
	5-E02	2 residences	67	57	10
	5-E03	2 residences	60	53	7
	5-E04	2 residences	66	57	9
	5-E05	2 residences	57	52	5
	5-E06	2 residences	66	57	8
	5-E07	2 residences	56	52	4
	5-E08	2 residences	65	58	7
	5-E09	2 residences	57	55	2
	5-E10	2 residences	65	58	7
	5-E11	2 residences	58	53	5
	5-E12	2 residences	64	58	6
	5-E13	2 residences	53	51	2
	5-E14	2 residences	64	58	6
	5-E15	2 residences	53	50	2
	5-E16	2 residences	64	58	6
	5-E17	2 residences	52	50	2
	5-E18	2 residences	63	58	5
	5-E19	2 residences	56	55	1
	5-E20	2 residences	63	58	5
	5-E21	0.4 ERU	66	57	8
	5-E22	0.4 ERU	67	59	8
	5-E23	0.4 ERU	66	59	7
	5-E24	0.4 ERU	65	58	7
	5-E25	0.4 ERU	65	59	6
	5-E26	2 residences	58	54	4
	5-E27	2 residences	58	54	4
	5-E28	2 residences	58	54	4
	5-E29	2 residences	58	54	4
	5-E30	2 residences	57	54	3
	5-E31	2 residences	54	54	0
	5-E32	2 residences	54	54	0
	5-E33	2 residences	54	54	0
	5-E34	2 residences	55	54	0
	5-E35	2 residences	57	55	2

Barrier Analysis	NSA or Receiver(s)	Number of Benefits	Barrier Length	Minimum Height (ft.)	Maximum Height (ft.)	Total Area (Sq./Ft.)	MaxSF/BR Value	Barrier Feasible?	Barrier Reasonable?
Optimized Design	NSA 5	30	1,288	10	20	20,570	686	Yes	Yes

Noise level approaches or exceeds PennDOT/FHWA NAC
Insertion Loss of 5 dBA or greater
Insertion loss of 7 dBA or greater
* Noise values, comparisons and Insertion Loss are calculated to the tenth of a dBA and then rounded for presentation purposes
Predicted noise levels below ambient have been reported at the ambient level of 51 dBA

Table 5
Mon/Fayette Expressway - Section 53B1A
NSA 35 - Noise Barrier Analysis

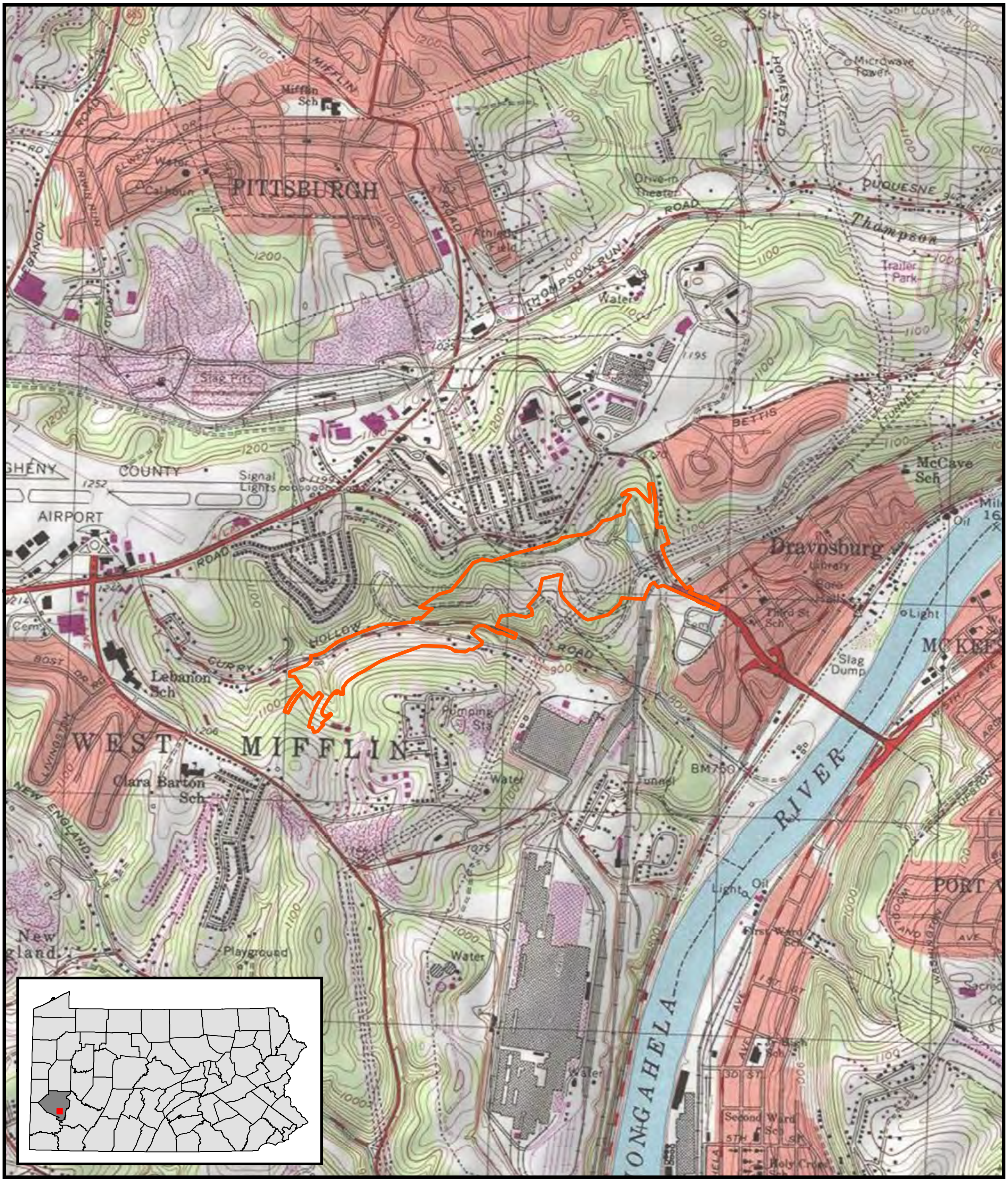
(1)	(2)	(3)	(4)	(5)	(6)
			Design year (2045)	Optimized Design	
NSA	Site Descriptor	Site Representation	Peak Hour Noise Level*	Mitigated Noise Level*	Insertion Loss*
35	35-M1	3 residences	55	51	5
	35-M2	3 residences	59	54	5
	35-M3	2 residences	59	55	4
	35-M4	3 residences	60	54	5
	35-M5	3 residences	61	56	5
	35-M6	3 residences	63	57	7
	35-M7	3 residences	61	56	5
	35-M8	3 residences	62	55	8
	35-M9	3 residences	61	57	4
	35-M10	3 residences	61	54	7
	35-M11	3 residences	63	54	10
	35-M12	3 residences	61	53	8
	35-M13	4 residences	62	53	9
	35-M14	2 residences	61	52	9
	35-M15	2 residences	60	52	9
	35-M16	2 residences	60	52	8
	35-M17	3 residences	57	51	7
	35-M18	1 residence	57	52	5
	35-M19	1 residence	55	51	4
	35-M20	2 residences	54	52	3
	35-M21	2 residences	53	51	2
	R50	3 residences	62	57	5
	R51	3 residences	61	52	9

Barrier Analysis	NSA or Receiver(s)	Number of Benefits	Barrier Length	Minimum Height (ft.)	Maximum Height (ft.)	Total Area (Sq./Ft.)	MaxSF/BR Value	Barrier Feasible?	Barrier Reasonable?
Optimized Design	NSA 35	50	3,195	8	14	44,221	884	Yes	Yes

[orange] Noise level approaches or exceeds PennDOT/FHWA NAC
[yellow] Insertion Loss of 5 dBA or greater
[peach] Insertion loss of 7 dBA or greater

* Noise values, comparisons and Insertion Loss are calculated to the tenth of a dBA and then rounded for presentation purposes
Predicted noise levels below ambient have been reported at the ambient level of 51 dBA

FIGURES



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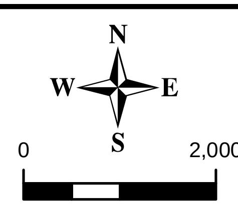
53B1A LOD (September 2024)

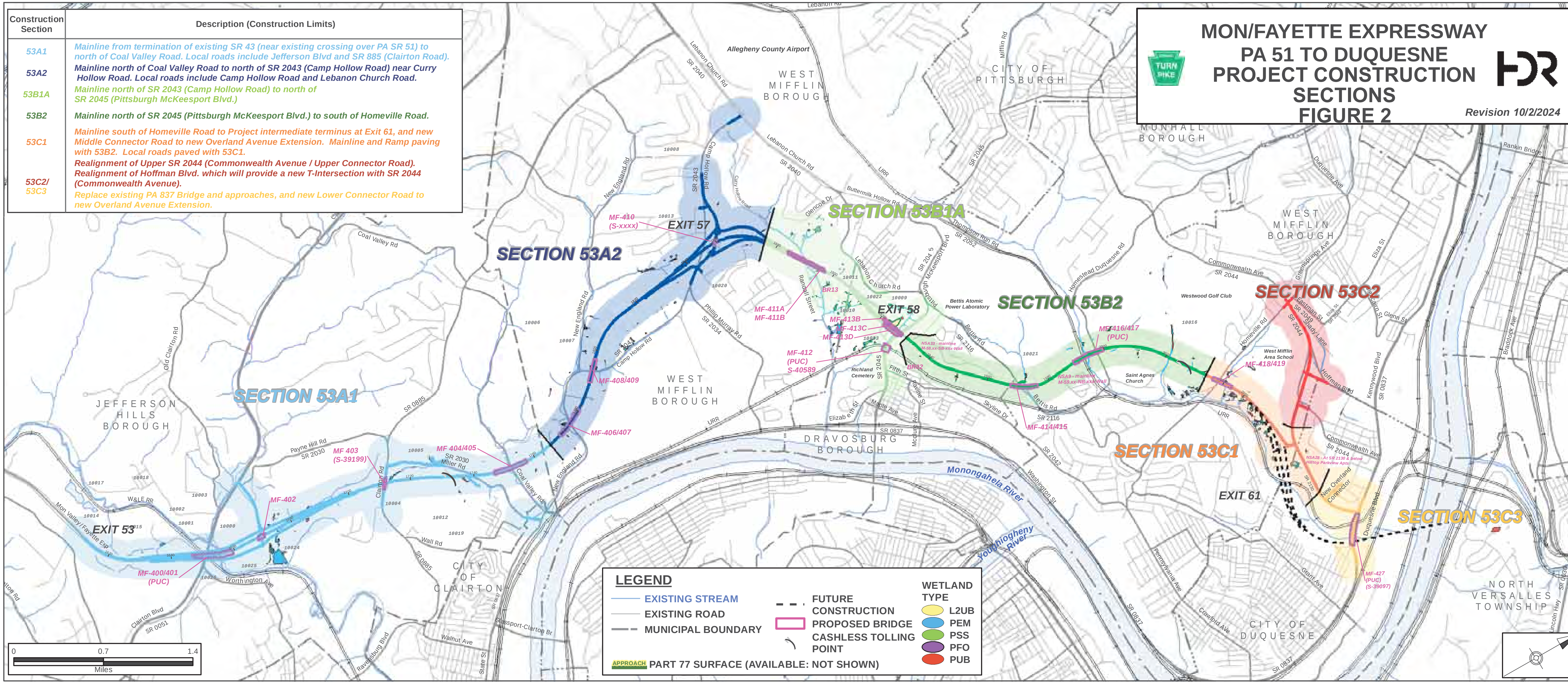
Figure 1
Project Location Map
MFE Section 53B1A
Final Design Noise Analysis Report
West Mifflin & Dravosburg Boroughs
Source: Streaming USGS Map Service



MON/FAYETTE EXPRESSWAY
PA 51 TO DUQUESNE
PROJECT CONSTRUCTION SECTIONS
FIGURE 2

Revision 10/2/2024

Construction Section	Description (Construction Limits)
53A1	Mainline from termination of existing SR 43 (near existing crossing over PA SR 51) to north of Coal Valley Road. Local roads include Jefferson Blvd and SR 885 (Clairton Road).
53A2	Mainline north of Coal Valley Road to north of SR 2043 (Camp Hollow Road) near Curry Hollow Road. Local roads include Camp Hollow Road and Lebanon Church Road.
53B1A	Mainline north of SR 2043 (Camp Hollow Road) to north of SR 2045 (Pittsburgh McKeesport Blvd.)
53B2	Mainline north of SR 2045 (Pittsburgh McKeesport Blvd.) to south of Homeville Road.
53C1	Mainline south of Homeville Road to Project intermediate terminus at Exit 61, and new Middle Connector Road to new Overland Avenue Extension. Mainline and Ramp paving with 53B2. Local roads paved with 53C1.
53C2/ 53C3	Realignment of Upper SR 2044 (Commonwealth Avenue / Upper Connector Road). Realignment of Hoffman Blvd. which will provide a new T-Intersection with SR 2044 (Commonwealth Avenue). Replace existing PA 837 Bridge and approaches, and new Lower Connector Road to new Overland Avenue Extension.



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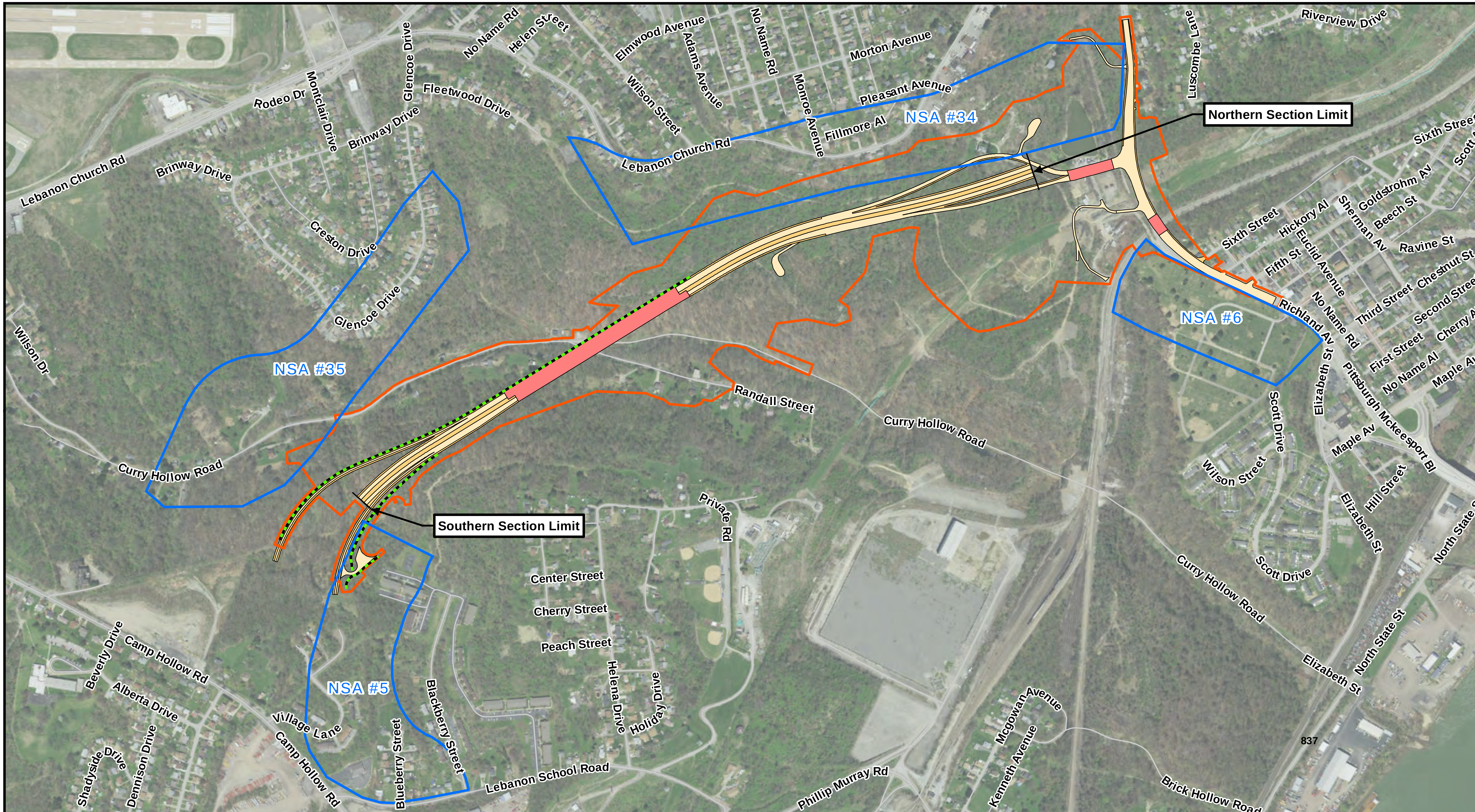
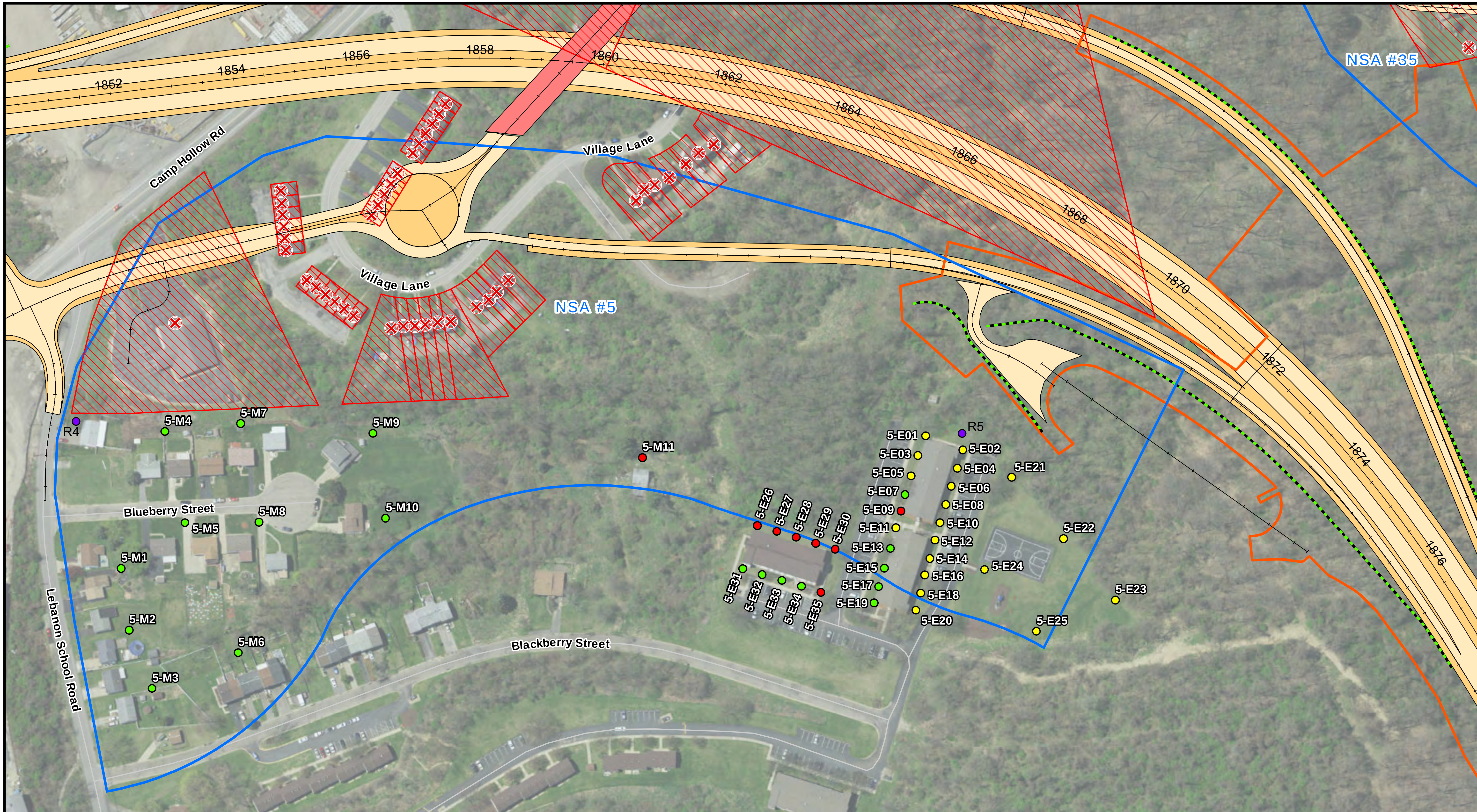


53B1A LOD (September 2024)
Noise Sensitive Area (NSA)
Proposed Barrier
Lane
Shoulder
Bridge

Figure 3
Project NSA Locations
MFE Section 53B1A
Final Design Noise Analysis Report
West Mifflin & Dravosburg Boroughs
Source: PEMA, 2018

N
W E
S
0 600
Feet

5764_04_058_NoiseTechMemo53B1A_Fig3_11x17 11/7/2024 10:52:26 PM



5764_04_059_NoiseTechMemo53B1A_Fig4_NSA5_11x17 11/7/2024 11:05:57 PM

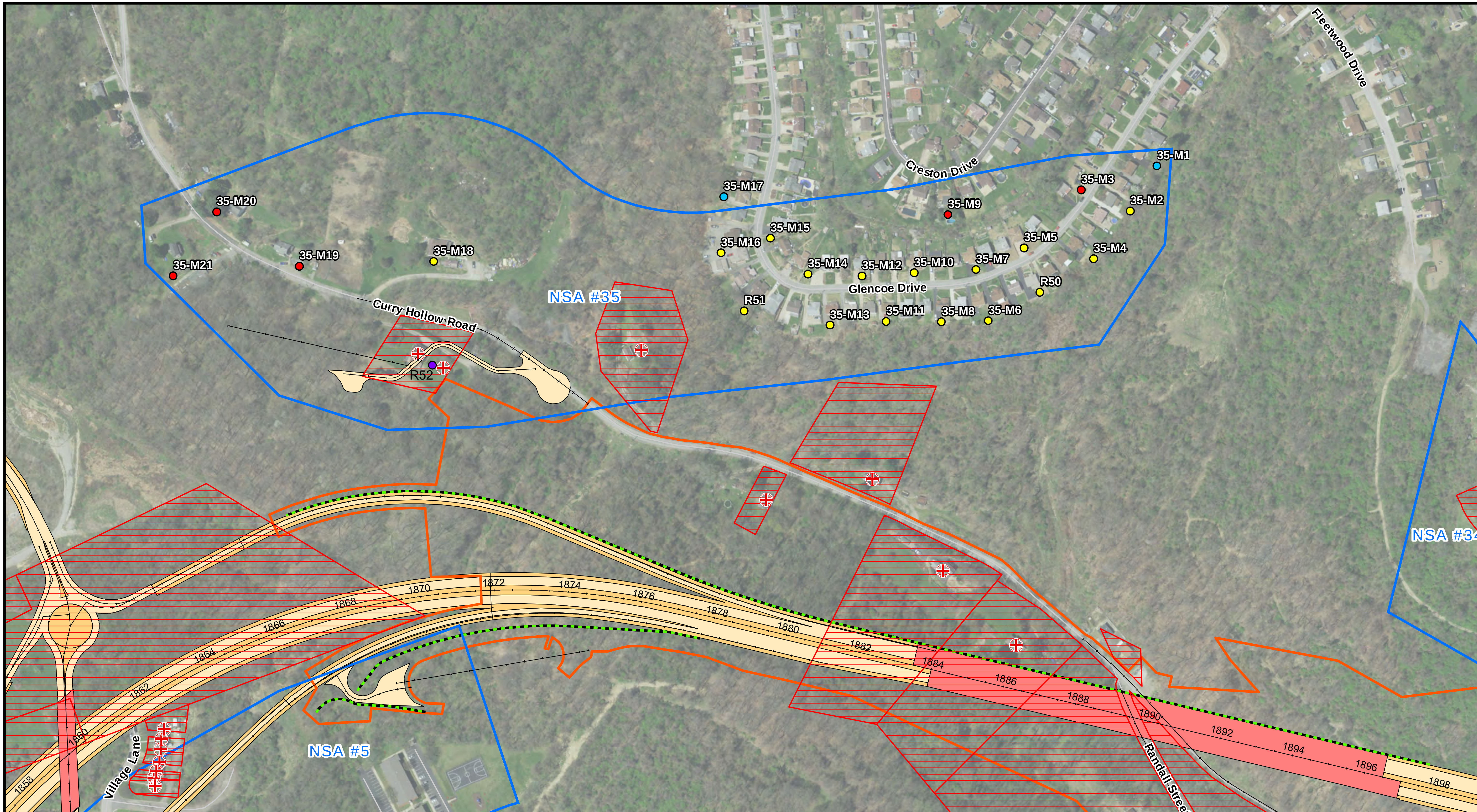
53B1A LOD (September 2024)
Noise Sensitive Area (NSA)
Proposed Barrier
Displacement Structure
Monitored-only Sites

Lane
Shoulder
Bridge
Displacement Parcels

NSA 5 Receptors
Impact, Benefit
Impact, No Benefit
Not Impacted, Benefit
Not Impacted, No Benefit

Figure 4
NSA 5 Barrier
MFE Section 53B1A
Final Design Noise Analysis Report
West Mifflin Borough
Source: PEMA, 2018

W N E S
0 150
Feet



5764_04_060_NoiseTechMemo53B1A_Fig5_NSA35_11x17 11/7/2024 11:00:44 PM

- 53B1A LOD (September 2024)
- Noise Sensitive Area (NSA)
- Proposed Barrier
- Displacement Structure
- Monitored-only Sites
- Lane
- Shoulder
- Bridge
- Displacement Parcels

NSA 35 Receptors

- Impact, Benefit
- Impact, No Benefit
- Not Impacted, Benefit
- Not Impacted, No Benefit

Figure 5
NSA 35 Barrier
MFE Section 53B1A
Final Design Noise Analysis Report
West Mifflin Borough
Source: PEMA, 2018

W N S E

0 250
Feet

APPENDICES

Appendix A

List of Preparers

List of Preparers and Reviewers

Name: Nathaniel Weinstock
Organization: Navarro & Wright Consulting Engineers, Inc.
Role: Noise Modeling, Abatement Analysis, Report Development, QA/QC
Experience: 24 years
Education: BS, Public Service

Name: Robert C. Kolmansberger
Organization: Navarro & Wright Consulting Engineers, Inc.
Role: Abatement Analysis, Report Development, QA/QC
Experience: 32 years
Education: BA, Geography and Environmental Planning

Name: Frederick E. Schiller
Organization: Navarro & Wright Consulting Engineers, Inc.
Role: Noise Modeling, Abatement Analysis, Report Development, QA/QC
Experience: 17 years
Education: Associates Degree, General Studies

Appendix B

Noise Monitoring Data

Site # R4

Meter # 8

Done By: JCL

Description :

Monitoring Data:	AM Peak		Off-Peak		PM Peak	
Date					6/21/16	
Start Time					6:09 PM	
End Time					6:24 PM	
Duration	MIN		MIN		15 MIN	
Leq.					57.5	
Traffic Data						
Roadway					Camp Hollow	
Direction						
Traffic Count:	0	0	0	0	137	
Cars					133	
MT					2	
HT					2	
Weather Conditions						

Atmospheric Data
Wind Speed (mph)
5
Temp. (°F)
82
Humidity (%)
60

Site Data: Site Surface (alpha): ______ Shielding Factor : ______ Pavement Type : ______

Profile View:

Monitoring Notes

AM Peak:

Off-Peak:

PM Peak

*Distances in photo to left are from noise meter to nearest structure and from noise meter to edge of closeset travel lane measured in ***feet.***

Site # R5

Meter # 8

Done By: JCL

Description :

Monitoring Data:	AM Peak	Off-Peak	PM Peak
Date			6/21/16
Start Time			5:41 PM
End Time			5:56 PM
Duration	MIN	MIN	15 MIN
Leq.			**46.5**

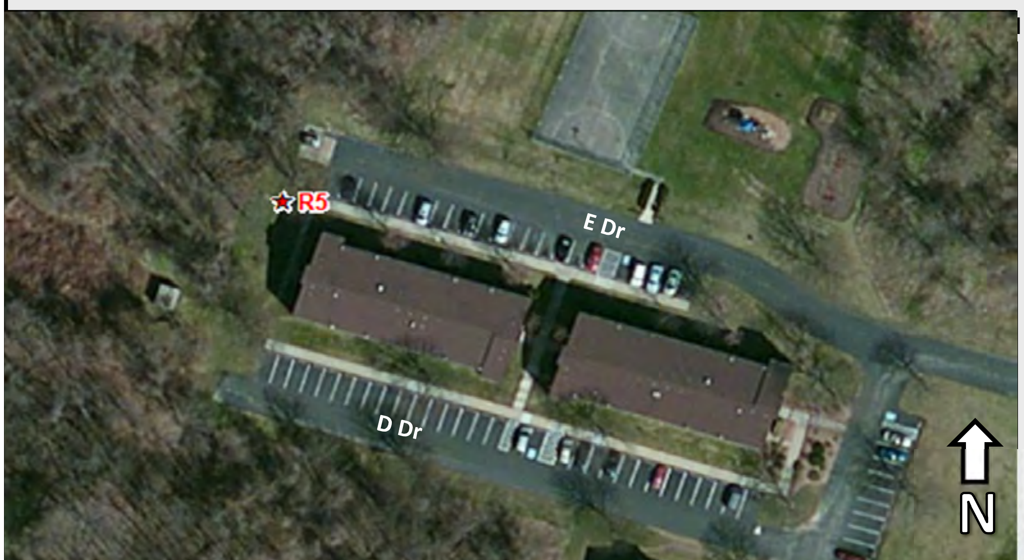
Atmospheric Data	
Wind Speed (mph)	5
Temp. (°F)	82
Humidity (%)	60

Traffic Data

	AM Peak		Off-Peak		PM Peak	
Roadway						
Direction						
Traffic Count:	0	0	0	0		
Cars						
MT						
HT						

Weather Conditions

Site Data: Site Surface (alpha): ____ Shielding Factor : ____ Pavement Type : ____



Profile View: Ambient

Monitoring Notes

AM Peak:

Off-Peak:

PM Peak

*Distances in photo to left are from noise meter to nearest structure and from noise meter to edge of closeset travel lane measured in ***feet.***

Site # R50

Meter # 2

Done By: AD

Description :

Monitoring Data:	AM Peak	Off-Peak	PM Peak
Date			6/21/16
Start Time			5:51 PM
End Time			6:06 PM
Duration	MIN	MIN	15 MIN
Leq.			54.8

Atmospheric Data	
Wind Speed (mph)	5
Temp. (°F)	82
Humidity (%)	60

Traffic Data	AM Peak		Off-Peak		PM Peak	
Roadway						
Direction						
Traffic Count:	0	0	0	0		
Cars						
MT						
HT						
Weather Conditions						

Site Data: Site Surface (alpha): ____ Shielding Factor : ____ Pavement Type : ____

Profile View: Ambient

Monitoring Notes

AM Peak:

Off-Peak:

PM Peak Plane flyover at 6:04 and Helicopter at 6:05.

*Distances in photo to left are from noise meter to nearest structure and from noise meter to edge of closeset travel lane measured in ***feet.***

Site # R51

Meter # 3

Done By: AD

Description :

Monitoring Data:	AM Peak		Off-Peak		PM Peak	
Date					6/21/16	
Start Time					5:56 PM	
End Time					6:11 PM	
Duration	MIN		MIN		15 MIN	
Leq.					55.9	
Traffic Data						
Roadway						
Direction						
Traffic Count:	0	0	0	0		
Cars						
MT						
HT						
Weather Conditions						

Atmospheric Data	
Wind Speed (mph)	5
Temp. (°F)	8
Humidity (%)	60

Site Data: Site Surface (alpha): ____ Shielding Factor : ____ Pavement Type : ____

Monitoring Notes

AM Peak:

Off-Peak:

PM Peak Plane flyover at 6:04 and Helicopter at 6:05.

Profile View: Ambient

*Distances in photo to left are from noise meter to nearest structure and from noise meter to edge of closeset travel lane measured in ***feet.***

McCormick Taylor, Inc

Site # R52 **Description :**

Meter # 6

Done By: JCL

Monitoring Data:

	AM Peak	Off-Peak	PM Peak
Date			6/21/16
Start Time			6:39 PM
End Time			6:54 PM
Duration	MIN	MIN	15 MIN
Leq.			56.2

Atmospheric Data	
Wind Speed (mph)	5
Temp. (°F)	82
Humidity (%)	60

Traffic Data

	AM Peak		Off-Peak		PM Peak	
Roadway						
Direction						
Traffic Count:	0	0	0	0		
Cars						
MT						
HT						
Weather Conditions						

Site Data: Site Surface (alpha): ___ Shielding Factor : ___ Pavement Type : ___

Profile View: Ambient

Monitoring Notes

AM Peak:

Off-Peak:

PM Peak Airplane flyover 6:45-6:46.

*Distances in photo to left are from noise meter to nearest structure and from noise meter to edge of closeset travel lane measured in ***feet.***

Appendix C

Traffic Data

2015 Existing Traffic
Camp Hollow Road

FHWA TNM 2.5

File Edit View Setup Input Calculate Barrier Analysis Parallel Barriers Contours Tables Window Help

Plan View : Section B:1

Name: Camp Hollow Rd.

Segment: point3729

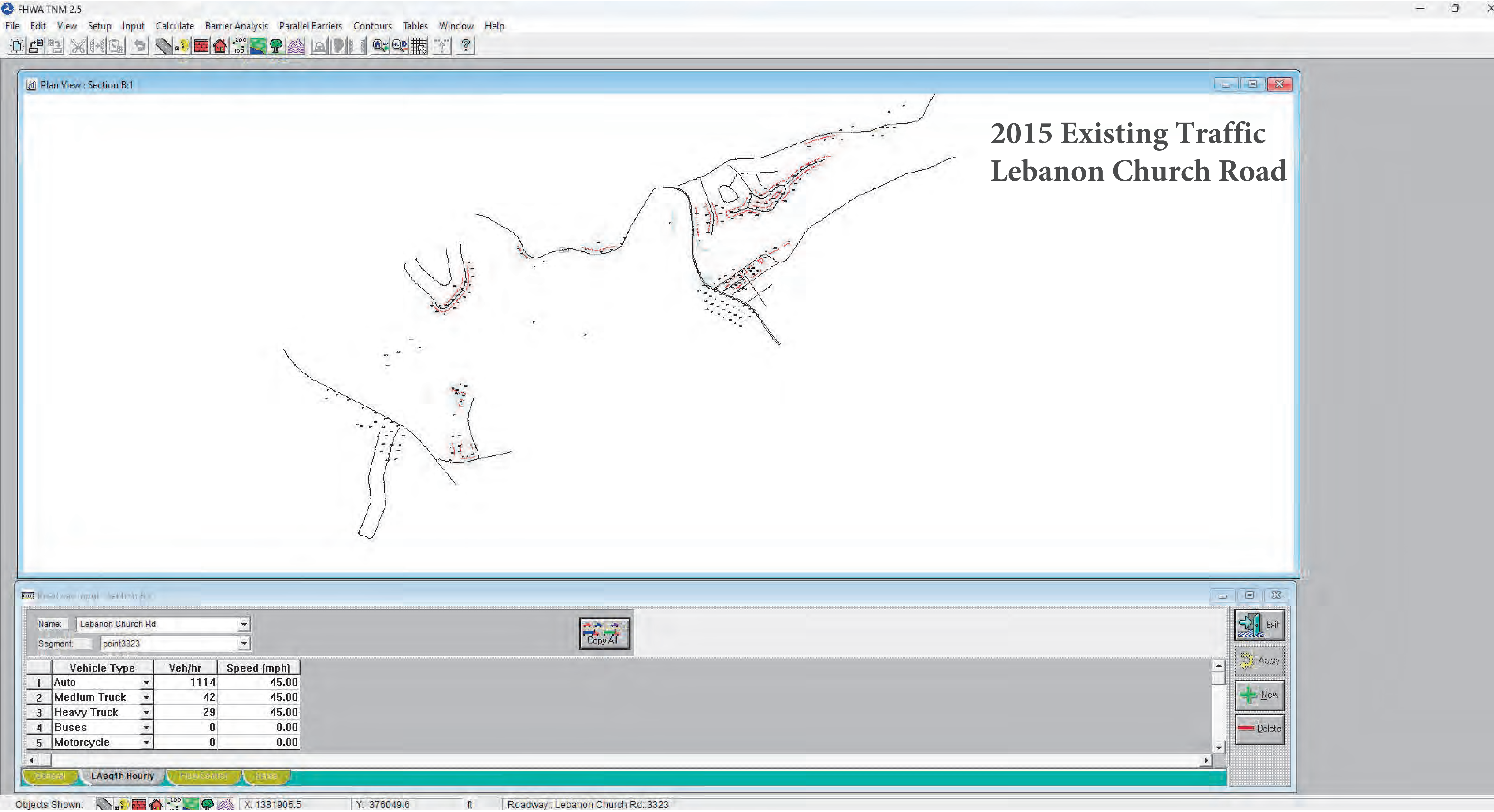
Copy All

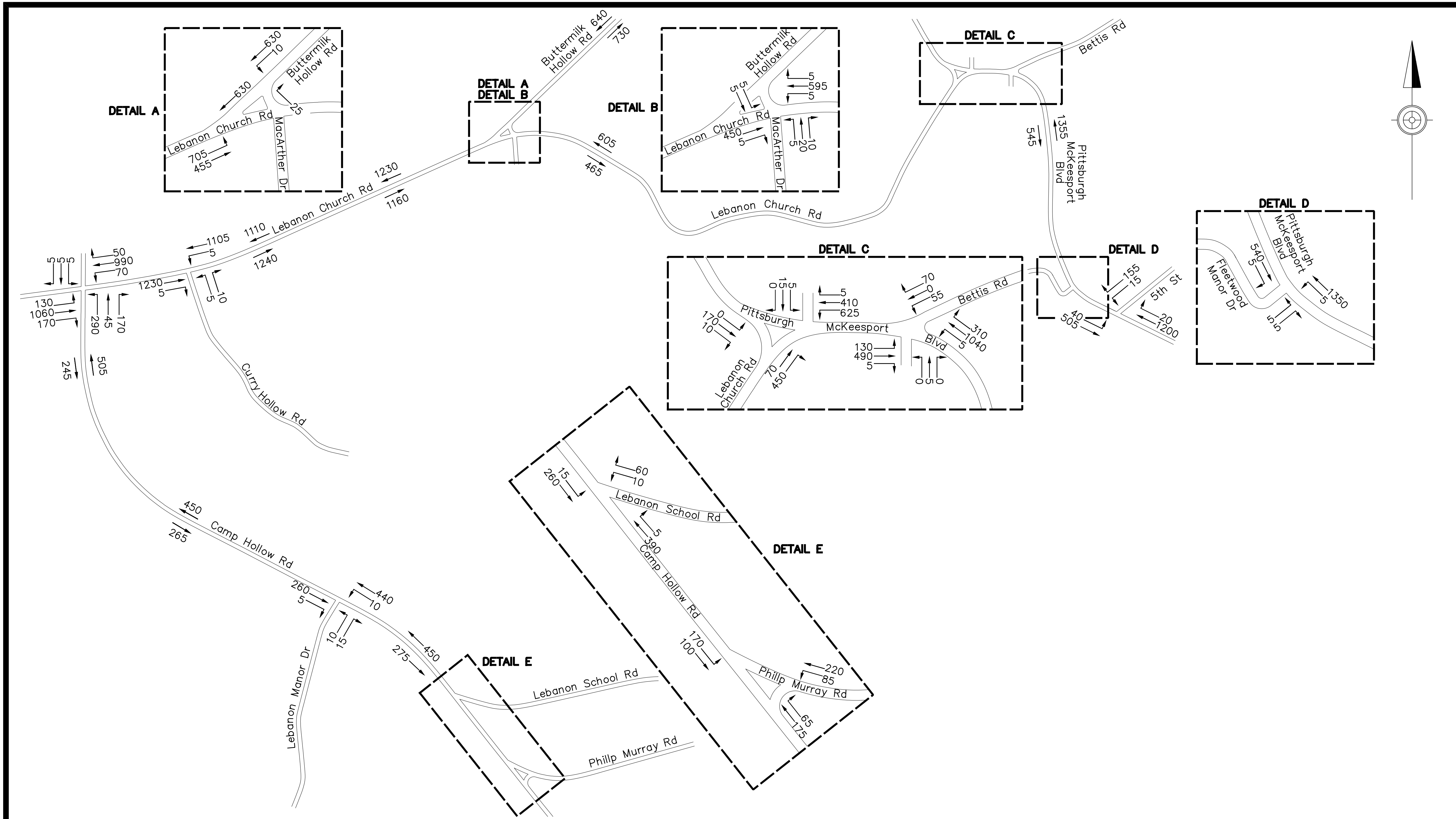
	Vehicle Type	Veh/hr	Speed (mph)
1	Auto	718	40.00
2	Medium Truck	40	40.00
3	Heavy Truck	17	40.00
4	Buses	0	0.00
5	Motorcycle	0	0.00

Exit Apply New Delete

LAeq1h Hourly

Objects Shown: X: 1381254.2 Y: 372809.2 ft Roadway : Camp Hollow Rd.::3729


FHWA TNM 2.5
File Edit View Setup Input Calculate Barrier Analysis Parallel Barriers Contours Tables Window Help
Plan View : Section B:1
2015 Existing Traffic
Lebanon Church Road
Name: Lebanon Church Rd
Segment: point3323
Copy All
Exit
Apply
New
Delete
Vehicle Type | Veh/hr | Speed [mph]
1 Auto 1114 45.00
2 Medium Truck 42 45.00
3 Heavy Truck 29 45.00
4 Buses 0 0.00
5 Motorcycle 0 0.00
LAeq1h Hourly
Objects Shown:
X: 1381905.5
Y: 376049.6
ft
Roadway : Lebanon Church Rd::3323



PENNA TURN PIKE

MON/FAYETTE EXPRESSWAY PA 51 TO I-376

SECTION 53B

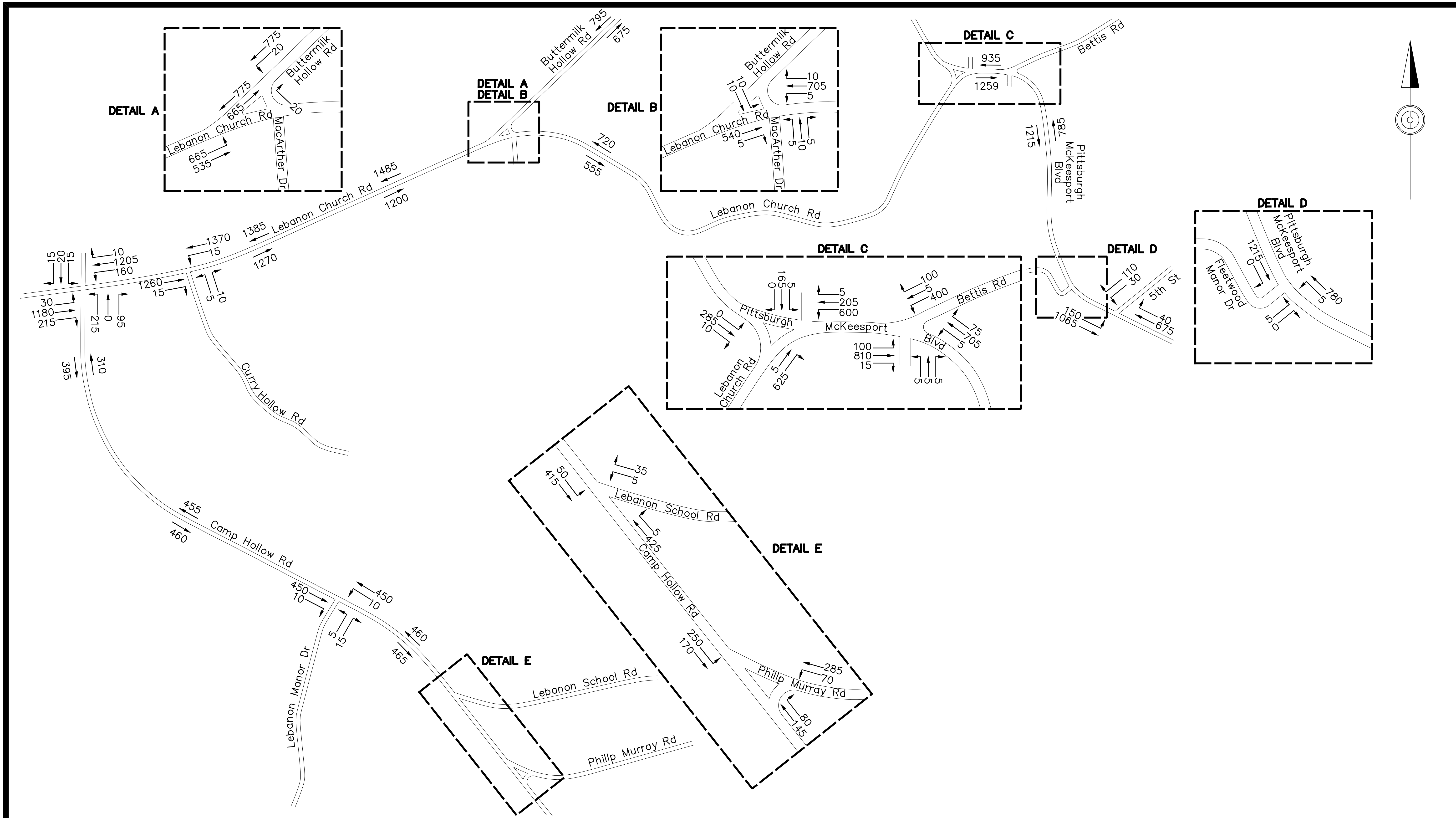
2045 NO-BUILD AM PEAK HOUR VOLUMES

AECOM

SHEET 10B

NOT TO SCALE

10-01-2020



MON/FAYETTE EXPRESSWAY PA 51 TO I-376

SECTION 53B

2045 NO-BUILD PM PEAK HOUR VOLUMES

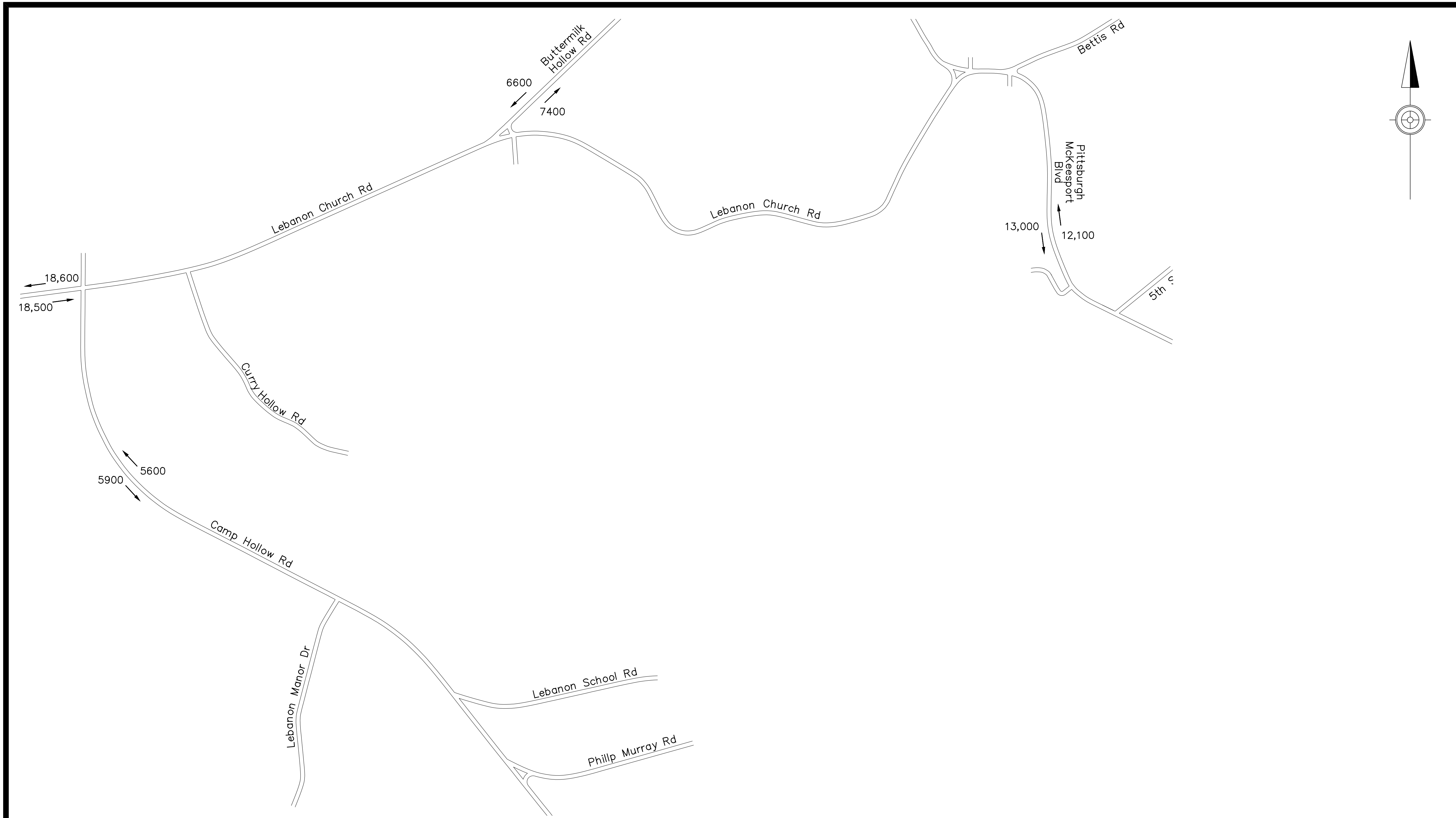
AECOM

SHEET 11B

REV. 2

NOT TO SCALE

10-01-2020



MON/FAYETTE EXPRESSWAY PA 51 TO I-376

SECTION 53B

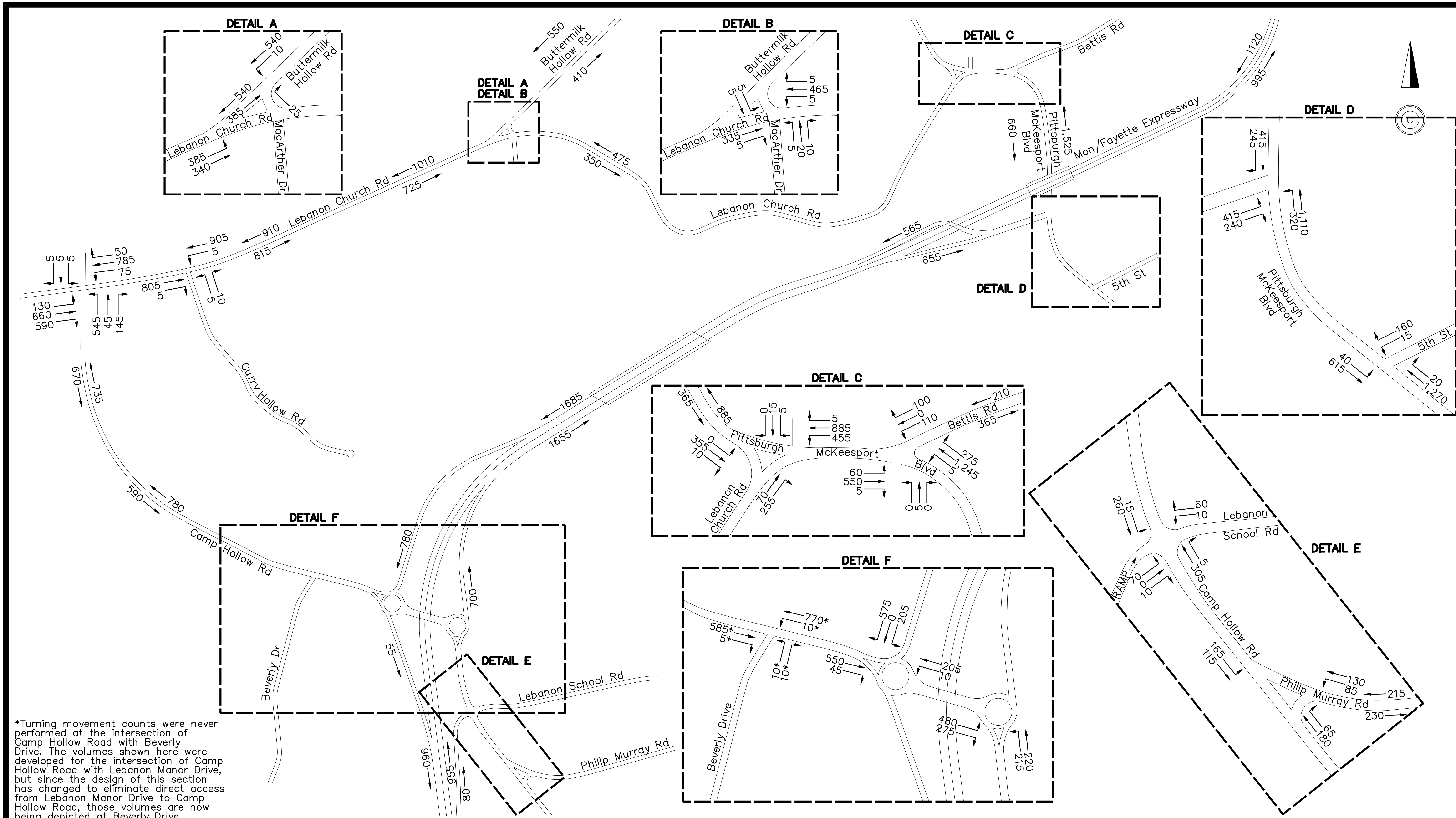
2045 NO-BUILD ADT VOLUMES

AECOM

SHEET 12B

NOT TO SCALE

10-01-2020



*Turning movement counts were never performed at the intersection of Camp Hollow Road with Beverly Drive. The volumes shown here were developed for the intersection of Camp Hollow Road with Lebanon Manor Drive, but since the design of this section has changed to eliminate direct access from Lebanon Manor Drive to Camp Hollow Road, those volumes are now being depicted at Beverly Drive.

PENNA TURN PIKE

MON/FAYETTE EXPRESSWAY PA 51 TO I-376

SECTION 53B

2045 BUILD AM PEAK HOUR VOLUMES

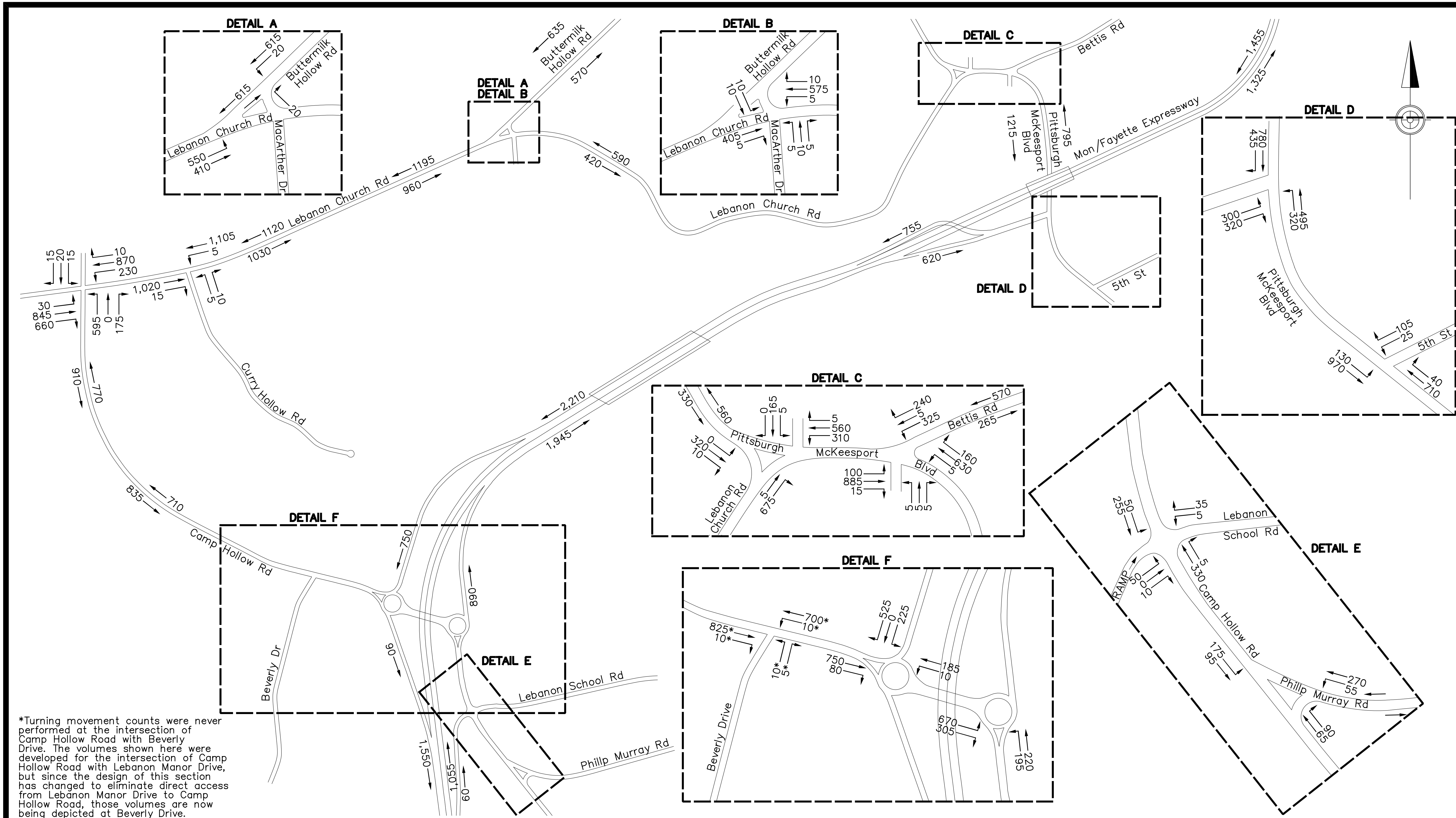
AECOM

SHEET 13B

REV. 2

NOT TO SCALE

10-01-2020



PENNA TURNPIKE

MON/FAYETTE EXPRESSWAY PA 51 TO I-376

SECTION 53B

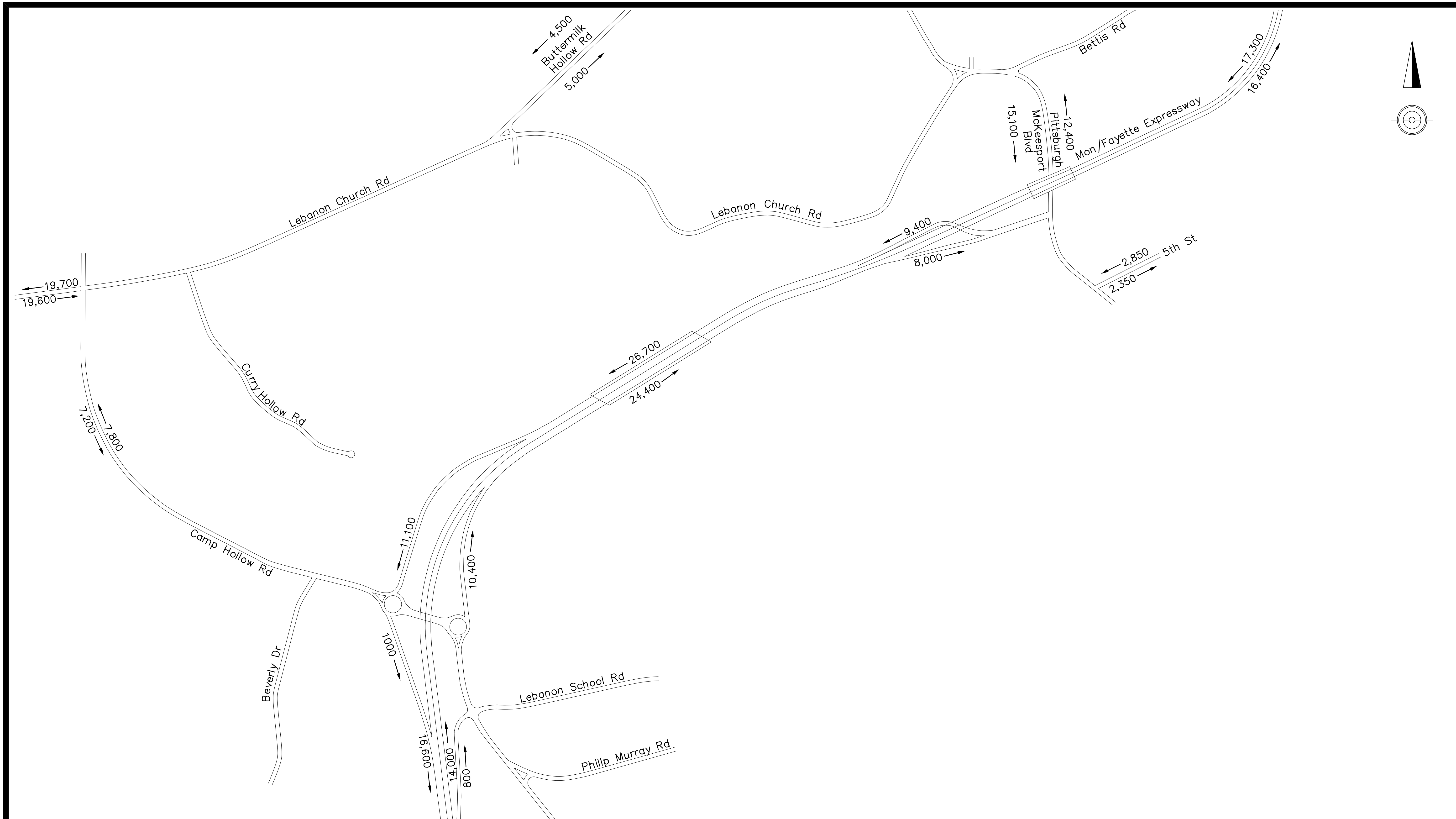
2045 BUILD PM PEAK HOUR VOLUMES

AECOM

SHEET 14B
REV. 3

NOT TO SCALE

10-01-2020



MON/FAYETTE EXPRESSWAY PA 51 TO I-376

SECTION 53B

2045 BUILD ADT VOLUMES

AECOM

SHEET 15B

NOT TO SCALE

10-01-2020

"rachel.myers"

15B 2045 Build ADT

...\124_MFE_53B_Figures.dgn

This Memorandum provides traffic design assumptions for Peak Hour Factors, Percent Trucks and traffic K factors for each design section for the Mon/Fayette Expressway PA 51 to I-376 Project

The memorandum is divided into the following Design Sections:

- 53A
- 53 B
- 53C-D
- 53E-F
- 53G

Please use the factors for your specific Design Section

Mon Fayette Expressway: Section 53B
Traffic Assumptions for Peak Hour Factors and Percent Trucks
& K Factors for Local Roads

Peak Hour Factors:
The Peak Hour Factor (PHF) is the relationship between the peak 15-minute flow rate and the full hourly volume. Lower values signify greater variability of flow within the subject hour, and higher values signify little flow variation. In the absence of field data the Highway Capacity Manual (HCM) provides typical PHF default values of 0.92 for urban areas and 0.88 for rural areas.

The project team has completed an extensive traffic volume data collection effort to establish the traffic model. From this data existing PHF for the intersections along Section 53B provide the following data seen in Table 1. At the bottom of the table, a weighted average PHF by volume has been calculated.

Table 1: Measured Intersection PHFs at Section 53B Project Intersections.

Intersection	AM PHF	PM PHF
Bettis Plant at Pittsburgh McKeesport Blvd	0.93	0.97
Buttermilk at Lebanon Church Rd Connector	0.98	0.95
Camp Hollow at Lebanon Church	0.92	0.97
Camp Hollow at Lebanon Manor	0.91	0.98
Camp Hollow at old Lebanon School	0.95	0.92
Camp Hollow at Philip Murray	0.92	0.92
Curry Hollow at Lebanon Church	0.91	0.95
Lebanon Church at Buttermilk Connector and MacArthur Dr.	0.84	0.97
Pittsburgh McKeesport Blvd at Fleetwood Manor	0.96	0.96
Pittsburgh McKeesport Blvd at Lebanon Church	0.93	0.96
Weighted Average PHF FOR SECTION 53B	**0.93**	**0.96**

Percent Trucks:
Heavy vehicles are vehicles that have more than four tires touching the pavement and include trucks, buses, and recreational vehicles. Heavy vehicles or just simply trucks affect the number of vehicles that can be served. Trucks affect traffic in two ways:

- They are larger than passenger cars and occupy more roadway space
- They have poorer operating capabilities than passenger cars, particularly accelerating, decelerating, and maintaining speed on upgrades.

For the future analysis, the percentage of trucks on the roadways will be assumed to equal the existing percentage. For the new roadways (i.e. the mainline section), the existing percentage of trucks for the adjacent roadways were used to determine the truck percentage. This information is provided below.

Table 2: Measured Truck Percentages on Section 53B Roadways.

Location	24 Hr. Truck Percent	AM Truck Percent	PM Truck Percent	Directional Distribution
Pittsburgh McKeesport Blvd NB	5.8%	8.9%	8.5%	52
Pittsburgh McKeesport Blvd SB	8.4%	8.9%	8.5%	
Buttermilk Hollow Rd NB	4.9%	4.4%	5.5%	53
Buttermilk Hollow Rd SB	8.0%	6.4%	3.7%	
Camp Hollow ~~EB~~ SB	5.6%	3.8%	1.5%	52
Camp Hollow ~~WB~~ NB	2.6%	3.6%	0.5%	
Lebanon Church Rd EB	2.5%	2.4%	1.5%	50
Lebanon Church Rd WB	4.7%	4.7%	2.6%	

Table 3: Projected Mainline Truck Percentages by Classification

VEHICLE CLASS	VEHICLE TYPE	% DISTRIBUTION
1	Motorcycles	1.80%
2	Cars	67.93%
3	2A - 4T	13.72%
4	Buses	4.82%
5	2A - SU	7.06%
6	3A - SU	1.22%
7	4A - SU	0.77%
8	4A - ST	0.89%
9	5A - ST	1.16%
10	6A - ST	0.31%
11	5A - MT	0.12%
12	6A - MT	0.10%
13	7A - MT	0.10%
TOTAL		100%

Table 4: Projected Mainline Truck Percentages by Number of Axles

No. of Axles	FHWA Classes	Distribution
2-AXLE	1,2,3 & 5	90.5%
3-AXLE	4 & 6	6.0%
4-AXLE	7 & 8	1.7%
5-AXLE	9 & 11	1.3%
6-AXLE	10,12 & 13	0.5%
TOTAL		100%

K Factors:
K factors are used for design and analysis of traffic flow on highways. This factor is typically used to determine peak hour volumes when compared to the AADT. It can also be applied to the highest of the AM or PM Peak hour traffic volumes to determine the ADT for side roads along the project corridor. K factors calculated from local road count locations along the project corridor are provided below.

Table 5: Local Road K Factors

Location	AM K	Mid K	PM K	Max
Jefferson Blvd EB	5.9	9.5	10.3	10.3
Jefferson Blvd WB	9.7	6.7	7.5	9.7
Buttermilk Hollow Rd NB	7.7	6.8	8.0	8.0
Buttermilk Hollow Rd SB	5.7	7.7	8.7	8.7
Camp Hollow EB	9.8	6.7	7.6	9.8
Camp Hollow WB	6.3	9.0	9.4	9.4
Commonwealth Ave EB	6.3	8.8	9.2	9.2
Commonwealth Ave WB	6.3	9.1	8.8	9.1
Hoffman Blvd EB	7.2	8.4	8.4	8.4
Hoffman Blvd WB	4.9	10.0	10.0	10.0
SR 2068 EB	4.6	7.7	10.3	10.3
SR 2068 WB	4.9	6.3	8.0	8.0
Braddock Ave EB	3.3	7.0	10.9	10.9
Braddock Ave WB	11.5	8.5	6.1	11.5
EB-Old Will. Penn Hwy East of Thompson	8.0	8.0	10.0	10.0
WB-Old Will. Penn Hwy East of Thompson	6.0	7.0	9.0	9.0
EB-Old Will. Penn Hwy West of Thompson	5.0	9.0	12.0	12.0
WB-Old Will. Penn Hwy West of Thompson	8.0	7.0	8.0	8.0
Thompson Run Rd	8.0	8.0	10.0	10.0
LOCAL ROAD K FACTORS				**9.6**

Table 3: Projected Mainline Truck Percentages by Classification

VEHICLE CLASS	VEHICLE TYPE	% DISTRIBUTION
1	Motorcycles	1.80%
2	Cars	67.93%
3	2A - 4T	13.72%
4	Buses	4.82%
5	2A - SU	7.06%
6	3A - SU	1.22%
7	4A - SU	0.77%
8	4A - ST	0.89%
9	5A - ST	1.16%
10	6A - ST	0.31%
11	5A - MT	0.12%
12	6A - MT	0.10%
13	7A - MT	0.10%
TOTAL		100%

Table 4: Projected Mainline Truck Percentages by Number of Axles

No. of Axles	FHWA Classes	Distribution
2-AXLE	1,2,3 & 5	90.5%
3-AXLE	4 & 6	6.0%
4-AXLE	7 & 8	1.7%
5-AXLE	9 & 11	1.3%
6-AXLE	10,12 & 13	0.5%
TOTAL		100%

K Factors:

K factors are used for design and analysis of traffic flow on highways. This factor is typically used to determine peak hour volumes when compared to the AADT. It can also be applied to the highest of the AM or PM Peak hour traffic volumes to determine the ADT for side roads along the project corridor. K factors calculated from local road count locations along the project corridor are provided below.

Table 5: Local Road K Factors

Local Road K Factors				
Location	**AM K**	**Mid K**	**PM K**	**Max**
Jefferson Blvd EB	5.9	9.5	10.3	10.3
Jefferson Blvd WB	9.7	6.7	7.5	9.7
Buttermilk Hollow Rd NB	7.7	6.8	8.0	8.0
Buttermilk Hollow Rd SB	5.7	7.7	8.7	8.7
Camp Hollow EB	9.8	6.7	7.6	9.8
Camp Hollow WB	6.3	9.0	9.4	9.4
Commonwealth Ave EB	6.3	8.8	9.2	9.2
Commonwealth Ave WB	6.3	9.1	8.8	9.1
Hoffman Blvd EB	7.2	8.4	8.4	8.4
Hoffman Blvd WB	4.9	10.0	10.0	10.0
SR 2068 EB	4.6	7.7	10.3	10.3
SR 2068 WB	4.9	6.3	8.0	8.0
Braddock Ave EB	3.3	7.0	10.9	10.9
Braddock Ave WB	11.5	8.5	6.1	11.5
EB-Old Will. Penn Hwy East of Thompson	8.0	8.0	10.0	10.0
WB-Old Will. Penn Hwy East of Thompson	6.0	7.0	9.0	9.0
EB-Old Will. Penn Hwy West of Thompson	5.0	9.0	12.0	12.0
WB-Old Will. Penn Hwy West of Thompson	8.0	7.0	8.0	8.0
Thompson Run Rd	8.0	8.0	10.0	10.0
			LOCAL ROAD K FACTORS	**9.6**

Appendix D

PennDOT Noise Barrier Warranted, Feasible, and Reasonable Worksheets

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – NSA 5

Date	6/4/2024
Project Name	Mon/Fayette Expressway
County	Allegheny
SR, Section	SR 0043, Section 53B1A
Community Name and/or NSA #	NSA 5
Noise Wall Identification (i.e., Wall 1)	Barriers 5-1 and 5-2 (two-barrier system)

General

1. Type of project (new location, reconstruction, etc.): new construction/new location

2. Total number of impacted receptor units in community
   - Category A units impacted: ______
   - Category B units impacted: 43
   - Category C units impacted: 2
   - 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): N/A
   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)? X Yes ______ 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: 45
   b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 67%
   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 N/A
   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: 20,570
   b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss): 30
   c. SF/BR = 2a/2b: 686
   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? — ___ Yes X 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? — ___ 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? — X Yes ___ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

______________________ ______________
PTC Project Environmental Manager — Date

Frederick E Schiller, Acoustical Scientist, Navarro & Wright — 6/4/2024

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

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – NSA 35

Date	6/4/2024
Project Name	Mon/Fayette Expressway
County	Allegheny
SR, Section	SR 0043, Section 53B1A
Community Name and/or NSA #	NSA 35
Noise Wall Identification (i.e., Wall 1)	Barrier 35

General

1. Type of project (new location, reconstruction, etc.): new construction/new location

2. Total number of impacted receptor units in community

Category A units impacted	
Category B units impacted	54
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) N/A
   - 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? ______ 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)? __X__ Yes ______ 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: 54
   b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 81%
   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 N/A
   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: 44,221
   b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss): 50
   c. SF/BR = 2a/2b: 884
   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? ____ Yes X 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? ____ 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? X Yes ____ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

____________________ ____________
PTC Project Environmental Manager Date

Frederick E Schiller, Acoustical Scientist, Navarro & Wright 6/4/2024
Qualified Professional Performing the Analysis Date
(name, title, and company name)