

**Virginia Department of Transportation
Fairfax County Parkway Improvements Project**

*UPC 107937
VDOT Project Number 0286-029-259, P101*

Fairfax County, Virginia

PRELIMINARY NOISE ANALYSIS

Prepared For:



Virginia Department of Transportation
Environmental Division
1401 East Broad Street
Richmond, Virginia 23219

October 2018

TABLE OF CONTENTS

I. Executive Summary.....	1
II. Introduction and Background.....	3
III. Noise Analysis Methodology, Terminology and Criteria.....	3
IV. Noise Monitoring Methodology.....	5
V. Undeveloped Lands and Permitted Developments.....	6
VI. Validation (2018) and Existing (2018) Conditions.....	6
Norfolk Southern Rail Noise Modeling.....	8
VII. Evaluation of Design Year (2046) No-Build and Build Noise Levels and Noise Impact Assessment.....	8
Traffic Data for the Noise Analysis.....	9
Selection of Worst Noise Hour.....	9
VIII. Noise Abatement Evaluation.....	20
IX. Construction Noise.....	34
X. Public Involvement/Local Officials Coordination.....	35
XI. Conclusion.....	37

TABLES

Table 1 – FHWA/VDOT Noise Abatement Criteria
Table 2 – TNM Validation
Table 3 – Noise Impact Summary by CNE
Table 4 – Noise Abatement Acoustical Feasibility and Reasonableness Evaluation Summary
Table 5 – CNE Specific Noise Contours

FIGURES

Figure 1 – Regional Location Map
Figures 2-1 through 2-11 – Detailed Study Area Mapping

APPENDICES

Appendix A – Noise Meter and Acoustical Calibrator Calibration Certificates
Appendix B – Noise Monitoring Data Forms
Appendix C – Noise Monitoring Data (2018)
Appendix D – Traffic Data Summary
Appendix E – TNM Noise Modeling Data (CD)
Appendix F – HB 2577 Documentation
Appendix G – Warranted, Feasible, and Reasonable Worksheets
Appendix H – Sound Levels Table
Appendix I – Insertion Loss
Appendix J – References
Appendix K – List of Preparers and Reviewers

I. Executive Summary

The Virginia Department of Transportation (VDOT), in cooperation with the Federal Highway Administration (FHWA), is studying the potential environmental consequences of the proposed Fairfax County Parkway Improvements Project in Fairfax County, Virginia. The project length is approximately 5.5 miles and widens existing Fairfax County Parkway (Route 286) from four to six travel lanes, as well as providing intersection improvements and configuration of pedestrian and bicycle amenities. For the purposes of this preliminary design noise analysis, three separate build alternatives were analyzed and included in this document.

The Preliminary Noise Analysis in this document will focus solely on Common Noise Environments, referred to as CNEs. Noise sensitive receptors that are within approximately 500 feet of the proposed improvements were included for this evaluation. This report documents the predicted Existing (2018), No-Build (2046) and Design Year (2046) Build noise levels associated with the Fairfax County Parkway Improvements Project. A project field reconnaissance was performed to thoroughly review the project area. During this field view, major sources of acoustic shielding (e.g., terrain lines, building rows, etc.) adjacent to the project corridor were noted for inclusion in the noise modeling. Noise monitoring was performed at 29 locations, while noise modeling was conducted for 478 additional sites to gain a thorough understanding of the existing noise environment and to determine how the proposed improvements would change the noise levels throughout the project area. Monitored sites were used solely for noise model validation and not for the purposes of predicting Existing (2018), No-Build (2046) and or Design Year (2046) Build noise impacts.

Coordination with Fairfax County was completed in March 2018 to determine whether any undeveloped permitted land uses were present within the project corridor, including Category G. Category G represents undeveloped lands with no permits. It was determined that there was one active/approved building permit within 600 feet of the project area. This coordination will occur again in Final Design to ensure that no new permitted developments have been approved between the time of the approval of the preliminary design noise report and NEPA approval (Date of Public Knowledge).

Noise modeling was completed for Existing (2018), No-Build (2046), and predicted Design Year (2046) Build conditions. Design Year (2046) Build noise levels were predicted at each modeled receptor site and are specific to each of the proposed build scenarios. Additionally, during the Final Design noise analysis, VDOT's Environmental Traffic Data (ENTRADA) tool will be used to develop final traffic data in support of this project. Under Design Year (2046) Alternative 1A Build conditions, a total of 97 receptors representing 86 residences, one soccer field (three grid units), one baseball field (one grid point), one playground and one trail (six grid units) are predicted to experience noise impacts. Under Design Year (2046) Alternative 2 Build conditions, a total of 96 receptors representing 85 residences, one soccer field (three grid units), one baseball field (one grid point), one playground, and one trail (six grid units) are predicted to experience noise impacts. Under Design Year (2046) Alternative 2D Build conditions, a total of 96 receptors representing 85 residences, one soccer field (three grid units), one baseball field (one grid point), one

playground, and one trail (six grid units) are predicted to experience noise impacts. Impacts for each alternative are summarized in **Table E.S. 1 below**.

Table E.S. 1 <i>Fairfax County Parkway Improvements Project</i> <i>Alternatives Impact Summary</i>		
Alternative 1A Impacts Summary	Alternative 2 Impacts Summary	Alternative 2D Impacts Summary
86 Residences, One Soccer Field (three grid units), One Baseball Field (one grid unit), One playground, One Trail (six grid units)	85 Residences, One Soccer Field (three grid units), One Baseball Field (one grid unit), One playground, One Trail (six grid units)	85 Residences, One Soccer Field (three grid units), One Baseball Field (one grid unit), One playground, One Trail (six grid units)

Three existing noise barriers are present within the southern portion of the project area and were evaluated using VDOT’s Highway Traffic Noise Impact Analysis Guidance Manual “in-kind” replacement as detailed in Section 6.3.6. All three existing barriers are not physically impacted by the proposed build alternatives. However, the existing noise barrier protecting the sensitive land uses for CNE F (Existing Barrier F-2) was evaluated and is proposed to be replaced in-kind. The existing noise barriers within CNE E (Existing Barrier E) and CNE F (Existing Barrier F-1) did not warrant evaluation since no noise impacts were predicted at their protected noise sensitive receptors.

A total of 22 barriers were evaluated throughout the project corridor. Five of these barriers (Barrier F-2 Replacement, Barrier U, Barrier W, Barrier X, and Barrier Y) were found to be feasible and reasonable at this time. A detailed discussion of the noise abatement evaluation follows in **Section VIII** of this report. A summary of the barriers found to be feasible and reasonable is shown below in **Table E.S. 2**.

TABLE E.S. 2 <i>Fairfax County Parkway Improvements Project</i> <i>Feasible and Reasonable Barrier Summary</i>							
Barrier I.D.	Combined Noise Barrier Length (ft.)	Average Noise Barrier Height (ft.)	Square Footage (SF)	Net SF per Benefited Receptor	Barrier Cost	Feasible?	Reasonable?
Barrier F2 (Replacement)	2,150	15.00	32,252	1,195	\$1,354,584	Yes	Yes
Additional SF			8,364	492			
Barrier U	1,167	14.57	17,005	1,546	\$714,210	Yes	Yes
Barrier W	2,100	15.83	33,256	1,584	\$1,396,752	Yes	Yes
Barrier X	1,650	12.55	20,706	1,593	\$869,652	Yes	Yes
Barrier Y	3,000	15.00	44,997	417	\$1,889,874	Yes	Yes

No considerable, long-term construction related noise impacts are anticipated. Any noise impacts that do occur as a result of roadway construction measures are anticipated to be temporary in nature and would cease upon completion of the project construction phase.

The findings in this document are based on conceptual information. Therefore, noise barriers that are found to be feasible and/or reasonable during the Preliminary Noise Analysis may not be found to be feasible and/or reasonable during the Final Design Noise Analysis. Conversely, noise barriers that were not considered feasible and/or reasonable may meet the established criteria and be recommended for construction. A Final Design Noise Analysis will be performed for this project based on detailed engineering information. Thus, any conclusions derived in this report should be considered preliminary in nature and subject to change.

II. Introduction and Background

Impacts associated with noise are often a prime concern when evaluating roadway improvement projects. Roadway construction at a new location or improvements to the existing transportation network may cause impacts to the noise sensitive environment located adjacent to the project corridor. For this reason, FHWA and VDOT have established a noise analysis methodology and associated noise level criteria to assess the potential noise impacts attributed to the construction and use of transportation related projects.

This report details the steps involved in the Preliminary Noise Analysis for the Fairfax County Parkway Improvements Project (hereafter referred to as the Fairfax County Parkway Project), including noise monitoring, noise modeling methodologies, results, and impact evaluation, and potential noise abatement. The regional study area can be seen in **Figure 1**. Relevant information and assumptions used for this analysis are included in this report's appendices.

The proposed project length is approximately 5.5 miles and widens existing Fairfax County Parkway (Route 286) from four to six travel lanes beginning near the intersection with Ox Road (Route 123) and ending near the intersection with Lee Highway (Route 29), as well as providing intersection improvements and configuration of pedestrian and bicycle amenities. In addition, three separate build alternatives were analyzed and focus on different interchange options at Pope's Head Road. The identification of a general widening concept along the length of the study corridor is consistent with FHWA's objective of analyzing transportation solutions on a broad-enough scale to provide meaningful analysis. The project area can be referenced on **Figures 2-1 through 2-11** in this document.

III. Noise Analysis Methodology, Terminology and Criteria

The methodologies applied to the noise analysis for the Fairfax County Parkway Project are in accordance with VDOT's "*State Noise Abatement Policy*" effective July 13, 2011 and the "*Highway Traffic Noise Impact Analysis Guidance Manual*", updated February 20, 2018. VDOT guidelines are based on Title 23 of the Code of Federal Regulations, Part 772 and the Procedures for Abatement of Highway Traffic Noise and Construction Noise, (23 CFR 772).

To determine the degree of highway noise impact, Noise Abatement Criteria (NAC) has been established for a number of different land use categories that are considered to be sensitive to highway traffic noise. **Table 1**, located at the end of this report, documents the NAC for the associated activity land use category shown in the adjacent column. The project corridor is considered partially developed with areas of residential development, interspersed with mixed commercial and undeveloped land uses. For the purposes of this analysis, all land uses are considered Activity Category B, Category C, and Category D. It should be noted that three existing concrete noise barriers were identified in CNE E and CNE F. If warranted, the sensitive receptors behind the identified existing barriers will be evaluated using VDOT's "in-kind" replacement as detailed in Section 6.3.6 of the VDOT Highway Traffic Noise Impact Analysis Guidance Manual.

Category D land uses address interior noise levels associated with hospitals, libraries, schools, medical facilities, places of worship, public or nonprofit institutions, etc. Potential interior noise level impacts in the project area were analyzed. To assess potential interior noise impacts, modeling sites are placed in close proximity to the existing structure. The standard noise reduction for masonry construction with modern windows is 25 dB(A) when comparing the exterior versus the interior noise levels. Using this methodology, both exterior and interior noise levels are provided in **Appendix H**.

The NAC are given in terms of an hourly, A-weighted, equivalent noise level. The A-weighted noise level frequency is used for human use areas because it is comprised of the noise level frequencies that are most easily distinguished by the human ear, out of the entire noise level spectrum. Highway traffic noise is categorized as a linear noise source, where varying noise levels occur at a fixed point during a single vehicle pass by. It is acceptable to characterize these fluctuating noise levels with a single number known as the equivalent noise level (L_{eq}). The L_{eq} is the value of a steady noise level that would represent the same acoustic energy as the actual time-varying sound evaluated over the same time period. For highway noise assessments, L_{eq} is typically evaluated over a one-hour period.

Noise abatement determination is based on VDOT's three-phased approach. The first phase (**Phase 1**) distinguishes if a sensitive receptor within a project corridor warrants highway traffic noise abatement. The following describes the **Phase 1** warranted criterion, as discussed in the VDOT policy. Receptors that satisfy either condition warrant consideration of highway traffic noise abatement.

- Predicted highway traffic noise levels (for the design year) approach or exceed the highway traffic noise abatement criteria in **Table 1**. "Approach" has been defined by VDOT as 1 dB(A) below the noise abatement criteria.
- ~or~
- A substantial noise increase has been defined by VDOT as a 10 dB(A) increase above existing noise levels for all noise sensitive exterior activity categories. A 10 dB(A) increase in noise reflects the generally accepted range of a perceived doubling of the loudness.

If a traffic noise impact is identified within the project corridor, then consideration of noise abatement measures is necessary. The final decision on whether or not to provide noise abatement along a project corridor will take into account the feasibility of the design and an overall weighting of cost to benefits.

Phase 2 and **Phase 3** of VDOT's three-phased approach, which consider noise abatement feasibility and reasonableness, are discussed further in *Section VIII* of this report.

IV. Noise Monitoring Methodology

The identification of noise sensitive land uses with aerial imagery and local government parcel data guided the selection of noise monitoring locations along the project corridor. In order to validate the noise models, noise monitoring was conducted at 29 representative noise sensitive receptor sites. *Figures 2-1 through 2-11* show an overview of the project area as well as the locations of the 29 noise monitoring sites.

Monitoring was performed at each of the selected noise sensitive receptors using Rion NL-42 sound level meters. Prior to monitoring at the beginning of the day, each sound level meter was calibrated using a Rion NC-74 Calibrator. The noise meters were placed at each receptor site in a manner that would yield a typical absolute ambient environment noise reading and allowed for minimal influence from atypical background noise sources. Readings were taken on the A-weighted scale and reported in decibels (dB(A)). The noise monitoring equipment meets all requirements of the American National Standard Specifications for Sound Level Meters, ANSI S1.4-1983 (R1991), Type 2, 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).

Short-term noise monitoring was performed on February 20th and 27th, 2018 during hours of free flow traffic conditions. Data collected by the sound analyzers included time, average noise level (L_{av}), maximum noise level (L_{max}), and instantaneous peak noise level (L_{pk}) for each recorded interval. The output of the noise meters is L_{av} , which is the average noise level over the duration of the monitoring test. This data is then converted into an average, hourly noise level (L_{eq}), for assessment purposes. Additional data collected at each monitoring location included atmospheric conditions, wind speed, background noise sources, and unusual/atypical noise events. 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 of three categories: cars, medium trucks and heavy trucks, per VDOT procedures. Combined, this data is used during the noise model validation process.

Short-term noise monitoring is not a process used to determine design year noise impacts or barrier locations. Short-term noise monitoring provides a level of consistency between what is present in real-world situations and how that is represented in the computer noise model. Short-term monitoring does not need to occur within every CNE to validate the computer noise model. CNEs

are groupings of receptor sites that, by location, form distinct communities within the project area. These areas are used to evaluate traffic noise impacts and potential noise mitigation options to residential developments or communities as a whole, as well as for consideration of feasibility and reasonableness of possible noise abatement measures for specific communities.

V. Undeveloped Lands and Permitted Developments

Highway traffic noise analyses are performed for developed lands as well as undeveloped lands if they are considered “permitted.” Undeveloped lands are deemed to be permitted when there is a definite commitment to develop land with an approved specific design of land use activities as evidenced by the issuance of at least one building permit.

In accordance with the *VDOT State Noise Policy*, an undeveloped lot is considered to be planned, designed, and programmed if a building permit has been issued by the local authorities prior to the Date of Public Knowledge for the relevant project. VDOT considers the Date of Public Knowledge as the date that the final National Environmental Policy Act (NEPA) approval is made. VDOT has no obligation to provide noise mitigation for any undeveloped land that is permitted or constructed after this date. The Fairfax County Parkway Project has not yet received NEPA approval and therefore does not have a Date of Public Knowledge.

Coordination with Fairfax County was completed in March 2018 to determine whether any undeveloped permitted land uses were present within the project corridor, including Category G. Category G represents undeveloped lands with no permits. It was determined that there was one active/approved building permit within 600 feet of the project area. This coordination will occur again in Final Design to ensure that no new permitted developments have been approved between the time of the approval of the preliminary design noise report and NEPA approval (Date of Public Knowledge).

VI. Validation (2018) and Existing (2018) Conditions

Computer modeling is the accepted technique for predicting Existing (2018), and future No-Build (2046), and Design Year (2046) Build noise levels associated with traffic-induced noise. Currently, the FHWA Traffic Noise Model (TNM 2.5) is the approved highway noise prediction model. The Traffic Noise Model has been established as a reliable tool for representing noise generated by highway traffic. The information applied to the modeling effort includes the highway design files (existing and proposed conceptual design) and traffic data, roadway profiles, and survey TIN files. In addition, it should be noted that as-built plans were not available for the three existing noise barriers within the project corridor. In order to accurately represent each existing noise barrier within the TNM, field survey utilizing a survey pole and aerial photography was used to accurately measure the dimensions of each noise barrier. Base mapping, aerial photography, and field identification were used to identify noise sensitive land uses within the corridor and any terrain features that may shield roadway noise. The land uses identified and included in the noise

analysis are residential, active sport areas, a church, two daycares, a playground, and a trail. These land uses are categorized as Activity Category B, Category C, and Category D.

The modeling process begins with model validation, as per VDOT requirements. This is accomplished by comparing the monitored noise levels with noise levels generated by the computer model, using the traffic volumes, speeds, and composition that were witnessed during the monitoring effort performed in February 2018. This comparison ensures that reported changes in noise levels between Existing (2018) and predicted Design Year (2046) Build conditions are due to changes in traffic conditions and not to discrepancies between monitoring and modeling techniques. A difference of three dB(A) or less between the monitored and modeled level is considered acceptable, since this is the limit of change detectable by the typical human ear. **Table 2** provides a summary of the model validation for the existing monitored conditions. Column 4 represents the difference between the modeled levels produced by the noise model (Column 3) and the monitored level (Column 2). Since all 29 analyzed receptors show a difference of less than three dB(A) between the monitored and modeled noise levels, the model is considered an accurate representation of actual existing conditions throughout the project area.

The validated noise model was the base noise model for the remainder of the noise analysis. Modeling sites were added to the validated model to thoroughly predict Existing (2018) noise levels throughout the project corridor. Additional noise modeling was then performed for existing conditions using 2018 traffic data supplied by Whitman, Requardt & Associates, LLP (WRA) and approved by VDOT (see **Appendix D**). This modeling step was performed to predict Existing (2018) worst-case noise levels associated with existing worst-case traffic volumes and composition. Columns 3 and 4 of **Table 3** provide a summary of the Existing (2018) worst-case minimum and maximum noise levels for each CNE along the project corridor.

Analysis locations were grouped into 25 CNEs. These areas are groupings of receptor sites that, by location, form distinct communities within the project area and have a common noise environment. These areas were used to evaluate traffic noise impacts and potential noise abatement options as well as to assess the feasibility and reasonableness of potential noise abatement measures for impacted communities. Where residential communities or groupings of noise sensitive land use areas exist, both noise monitoring and noise modeling-*only* sites were grouped into corresponding CNEs. A detailed discussion of each CNE and its respective, monitored and modeled noise levels is contained in **Section VII** of this report.

The presence of a pedestrian / bicycle trail was noted within the project limits beginning along Burke Centre Parkway and continuing north to Route 29. Additional trail facilities are proposed to be constructed as part of this project, running from Burkes Center Parkway to Route 123 (Ox Road). Through coordination with VDOT Northern Virginia District staff and VDOT noise staff, it was determined that any portion of the trail which falls outside of VDOT ROW, but within the noise analysis study area should be included within this noise study. Further analysis revealed that the majority of the trails within the project corridor fall within VDOT ROW and are considered a transportation use and therefore were not included within the study. However, one trail was

identified within CNE Y outside VDOT ROW and therefore was included within the noise analysis.

Norfolk Southern Rail Noise Modeling

Another factor considered within this analysis is the noise emanating from the trains on the existing Norfolk Southern rail line, which is located north of the intersection of Fairfax County Parkway and Burke Centre Parkway, along Fairfax Station Road. TNM does not include transit vehicle noise modeling capabilities directly, but it can be used to incorporate rail transit noise so that TNM's noise barrier design computations are performed correctly and comprehensively. To integrate the noise computations of the highway and rail line together, the rail line was modeled in TNM using automobiles (to best match the noise source) on narrow roadways aligned with the locations of the rail lines. To ensure that loudest-hour noise levels from the rail line were incorporated accurately, the computed L_{eq} noise levels at a reference distance of 50 feet from the rail line in TNM were matched to values computed using the Federal Transit Administration (FTA) guidance manual procedures, by adjusting the vehicle volumes on the TNM roadways.

All train noise was removed from the noise monitoring effort to obtain a roadway-only noise reading. Subsequently, rail noise was not included for the noise model validation effort. However, to account for this noise source for all other noise modeling scenarios, the methodology discussed above was applied to the Existing (2018), Design Year (2046) No-Build and Design Year (2046) Build noise models.

VII. Evaluation of Design Year (2046) No-Build and Build Noise Levels and Noise Impact Assessment

Following the development of the existing conditions model and the prediction of Existing (2018) worst-case noise levels, the assessment continued with the prediction of Design Year (2046) No-Build and Build noise levels. Design Year (2046) No-Build and Build noise levels were predicted by applying Design Year (2046) No-Build and Build traffic volumes and composition to the validated computer model. Design Year (2046) Build noise levels were predicted with the conceptual improvements of the Build Alternatives in place and in use. At the time of this analysis, future design TIN files were not available for the proposed design and were subsequently not included in the noise modeling effort. As a supplement and based on VDOT direction, design profiles were used to determine elevations for the proposed roadway design.

The next step in the noise analysis is to determine if future noise levels at the noise sensitive receptors would approach or exceed the FHWA/VDOT NAC. If the criteria are approached or exceeded at any receptor, under the future design year Build condition, noise mitigation is considered warranted and would be evaluated in an attempt to reduce future noise to acceptable levels. The minimum and maximum noise levels associated with the Design Year (2046) No-Build modeling analysis are summarized in Columns 6 and 7 of **Table 3**. The minimum and

maximum noise levels associated with the Design Year (2046) Build modeling analysis are summarized in Columns 9 and 10 (Alternative 1A), Columns 12 and 13 (Alternative 2) and Columns 15 and 16 (Alternative 2D) of **Table 3**. Noise levels at each receptor site for the Existing (2018) and predicted Design Year (2046) No-Build and Build conditions are shown in **Appendix H**.

Traffic Data for the Noise Analysis

VDOT's Environmental Traffic Data (ENTRADA) tool was used to develop traffic data needed for the Fairfax County Parkway Project noise analysis. Existing (2018) and Design Year (2046) No-build and (2046) Build traffic volumes, vehicle composition, and speeds were assigned to influential roadways.

Traffic data for traffic noise computations was developed by Whitman, Requardt & Associates, LLP (WRA) and approved by VDOT. This data was reported in hourly segments for 24 hours in ENTRADA analysis sheets. Medium and heavy truck percentages were provided separately for each roadway segment. Hourly volumes and operating speeds for each roadway segment for the Existing (2018) and Design Year (2046) No-Build and (2046) Build conditions were documented and analyzed for inclusion within the noise analysis. Per FHWA and VDOT policy, the traffic data used in the noise analysis must produce sound levels that are representative of the worst (loudest) hour of the day. The year 2046 is the defined analysis year for the project-level noise analysis.

For the purposes of this analysis, the operating speed was used to predict the absolute worst-case highway traffic noise levels. Traffic tables as well as other pertinent information can be referenced in **Appendix D**. During the Final Design noise analysis, VDOT's Environmental Traffic Data (ENTRADA) tool will be used to develop final traffic data in support of this project.

Selection of Worst Noise Hour

As required by FHWA and VDOT, the noise analysis was performed for the loudest ("worst noise") hour of the day. As part of the preliminary noise analysis, noise levels were predicted for that hour of the day when the vehicle volume, operating speed, and number of trucks (vehicles with 3 or more axles) combine to produce the worst noise conditions. According to FHWA guidance, the "worst hourly traffic noise impact" occurs at a time when truck volumes and vehicle speeds are the greatest, typically when traffic is free flowing and at or near level of service (LOS) C conditions. In coordination with WRA and VDOT, ENTRADA was linked into VDOT's latest "Loudest Hour Spreadsheet", version 2.0 for determination and identification of the loudest hour for noise modeling purposes. This predictive tool calculates reference L_{eq} 's at 50 feet for each TNM vehicle type, utilizing interrupted operational speeds, hourly peak-hour volumes over flat ground. When implementing the methodology described above, 8:00 AM was determined to be the loudest hour. The Loudest Hour Determination Memorandum and additional details supporting the selection of the worst noise hour are provided within **Appendix D**.

In Virginia, either the posted speed or operating speed (whichever is greater) may be used to predict highway traffic noise levels on Type I federally-funded projects. In the case of the Fairfax County Parkway Project, operational speeds were used in the model, for all traffic segments, since those speeds were greater than the posted speeds. The traffic volumes and operating speeds that were used for this study are located in *Appendix D*.

Flow control devices such as stop signs and traffic lights were not used in the Preliminary Noise Analysis because they were not determined to be a significant factor in sound level prediction for this analysis. This was to ensure a worst-case noise environment would be modeled. However, flow control devices will be modeled, where necessary, during the final design phase when more detailed engineering plans are available.

Federal regulations (23 CFR Part 772) state that if a noise level at any given receptor approaches or exceeds the appropriate impact criterion, or if predicted traffic noise levels substantially exceed the Existing (2018) noise levels abatement considerations are warranted. A substantial noise increase has been defined by VDOT as a 10 dB(A) increase above existing noise levels for all noise sensitive exterior activity categories. *Table 1* summarizes the Federal and State criteria for a variety of activity categories. Upon review of the initial TNM sound level output, no areas were predicted to experience substantial increase impacts within the project area.

The following describes the locations and predicted sound levels of each CNE within the Fairfax County Parkway Project area. Additionally, the proposed alternatives are identical throughout significant portions of the project corridor, with the exception of the area of the proposed interchange with Popes Head Road. As a result, Build (2046) sound levels are consistent throughout each alternative in all CNEs except CNEs O, P, Q, R, and S in the area of Popes Head Road. Alternative specific Build (2046) sound levels are provided in those specific CNE descriptions below. The CNEs are shown in *Figure 2-1 through 2-11*.

CNE A

CNE A is located south of U.S. Route 286 (Fairfax County Parkway) and east of Route 123 (Ox Road) and encompasses noise sensitive land uses between Little Ox Road and Rice Field Place. CNE A contains five modeling-*only* sites (A-001 - A-005) which represent five residences. CNE A contains no monitoring sites. The locations of the receptor sites are shown on *Figures 2-1 and 2-2*. The modeled Existing (2018) worst-case noise level within CNE A is predicted to range from 52-54 dB(A) as shown in Columns 3 and 4 of *Table 3*. The dominant noise sources within CNE A are Fairfax County Parkway and Ox Road. As shown in Columns 6 and 7 of *Table 3*, the Design Year (2046) No-Build sound level is predicted to range from 52-55 dB(A). As shown in Columns 9 through 16 of *Table 3*, the Design Year (2046) Build sound levels are predicted to range from 53-56 dB(A) and are consistent for each evaluated alternative. Since sound levels do not exceed the NAC, noise abatement is not warranted and will not be discussed further within this report.

CNE B

CNE B is located east of Route 123 (Ox Road) and encompasses noise sensitive land uses along Rice Field Place and Little Ox Road. CNE B contains eight modeling-*only* sites (B-001 – B-008) which represent The Church of the Living God (exterior and interior) and seven residences. CNE B contains no monitoring sites. The locations of the receptor sites are shown on **Figure 2-2**. The modeled Existing (2018) worst-case noise level within CNE B is predicted to range from 58(33)-58 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise source within CNE B is Ox Road. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to range from 59(34)-59 dB(A). As shown in Columns 9 through 16 of **Table 3**, the Design Year (2046) Build sound levels are predicted to range from 60(35)-60 dB(A) and are consistent for each evaluated alternative. Since the Church is Category D land use, the prediction of interior noise levels is required. The interior sound levels associated with the school are shown in **Appendix H**. Since sound levels do not exceed the NAC, noise abatement is not warranted and will not be discussed further within this report.

CNE C

CNE C is located east of Route 123 (Ox Road) and encompasses noise sensitive land uses along Little Ox Road. CNE C contains four modeling-*only* sites (C-001 - C-004) which represent four residences. CNE C contains no monitoring sites. The locations of the receptor sites are shown on **Figure 2-2**. The modeled Existing (2018) worst-case noise level within CNE C is predicted to range from 60-67 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise sources within CNE C is Ox Road. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to range from 61-68 dB(A). As shown in Columns 9 through 16 of **Table 3**, the Design Year (2046) Build sound levels are predicted to range from 62-69 dB(A) with noise impacts at three receptors representing three residences and are consistent for each evaluated alternative. Since sound levels exceed the NAC, noise abatement is warranted and will be discussed in **Section VIII** of this report.

CNE D

CNE D is located west of Route 123 (Ox Road) and encompasses noise sensitive land uses along Chapel Road and Wolf Run Shoals Road. CNE D contains three modeling-*only* sites (D-001 – D-003) which represent three residences. CNE D contains no monitoring sites. The locations of the receptor sites are shown on **Figure 2-2**. The modeled Existing (2018) worst-case noise level within CNE D is predicted to range from 50-60 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise sources within CNE D is Ox Road. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to range from 51-61 dB(A). As shown in Columns 9 through 16 of **Table 3**, the Design Year (2046) Build sound levels are predicted to range from 52-62 dB(A) and are consistent for each evaluated alternative. Since sound levels do not exceed the NAC, noise abatement is not warranted and will not be discussed further within this report.

CNE E

CNE E is located west of Route 123 (Ox Road) and encompasses noise sensitive land uses along Chapel Road, Travilah Court, Emmett Guards Court, and Robert Carter Road. CNE E contains 28 modeling-*only* sites (E-001 – E-028) which represent 27 residences and one daycare. CNE E contains one monitoring site (M03) which was used for model validation. The locations of the receptor sites are shown on **Figure 2-2**. It should also be noted one existing noise barrier (Existing Barrier E) is protecting portions of the noise sensitive land uses within CNE E. This barrier will not be physically impacted by the project and was included in all modeling scenarios. VDOT’s Highway Traffic Noise Impact Analysis Guidance Manual will be referenced when predicting Design Year (2046) Build noise levels and potential “in-kind” replacement as detailed in Section 6.3.6.

The modeled Existing (2018) worst-case noise level within CNE E is predicted to range from 44-64 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise source within CNE E is Ox Road. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to range from 45-65 dB(A). As shown in Columns 9 through 16 of **Table 3**, the Design Year (2046) Build sound levels are predicted to range from 46-65 dB(A) and are consistent for each evaluated alternative. Since sound levels do not exceed the NAC, noise abatement is not warranted and will not be discussed further within this report.

CNE F

CNE F is located south and west of U.S. Route 286 (Fairfax County Parkway) and west of Route 123 (Ox Road) and encompasses sensitive land uses along Robert Carter Drive and Housatonic Court. CNE F contains 55 modeling-*only* sites (F-001 – F-055) which represent the Fairfax Station Swim & Tennis pool (four grid units) and tennis courts (four grid units) and 47 residences. CNE F contains three monitoring sites (M04, M06, and M08) which were used for model validation. The locations of the receptor sites are shown on **Figures 2-2 and 2-3**. It should also be noted two existing noise barriers (Existing Barrier F-1 and F-2) are protecting portions of the noise sensitive land uses within CNE F. These barriers will not be physically impacted by the project and were included in all modeling scenarios. VDOT’s Highway Traffic Noise Impact Analysis Guidance Manual will be referenced when predicting Design Year (2046) Build noise levels and potential “in-kind” replacement as detailed in Section 6.3.6. A detailed discussion can be referenced in **Section VIII** of this report.

The modeled Existing (2018) worst-case noise level within CNE F is predicted to range from 49-65 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise sources within CNE F are Fairfax County Parkway and Ox Road. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to range from 50-66 dB(A). As shown in Columns 9 through 16 of **Table 3**, the Design Year (2046) Build sound levels are predicted to range from 50-68 dB(A) with noise impacts at two receptors representing two residences and are consistent for each evaluated alternative. These impacts were present behind the existing barrier (Existing

Barrier F-2). Since sound levels exceed the NAC, noise abatement is warranted and will be discussed in *Section VIII* of the report.

CNE G

CNE G is located east of U.S. Route 286 (Fairfax County Parkway) and south of Clara Barton Drive and encompasses sensitive land uses along Arrington Drive and Deuaughn Court. CNE G contains 11 modeling-*only* sites (G-001 – G-011) which represent 11 residences. CNE G contains two monitoring sites (M05 and M07) which were used for model validation. The locations of the receptor sites are shown on *Figure 2-3*. The modeled Existing (2018) worst-case noise level within CNE G is predicted to range from 56-73 dB(A) as shown in Columns 3 and 4 of *Table 3*. The dominant noise source within CNE G is Fairfax County Parkway. As shown in Columns 6 and 7 of *Table 3*, the Design Year (2046) No-Build sound level is predicted to range from 57-74 dB(A). As shown in Columns 9 through 16 of *Table 3*, the Design Year (2046) Build sound levels are predicted to range from 61-76 dB(A) with noise impacts at five receptors representing five residences and are consistent for each evaluated alternative. Since sound levels exceed the NAC, noise abatement is warranted and will be discussed in *Section VIII* of the report.

CNE H

CNE H is located east of U.S. Route 286 (Fairfax County Parkway) and encompasses sensitive land uses along Clara Barton Drive. CNE H contains three modeling-*only* sites (H-001 – H-003) which represent three residences. CNE H contains no monitoring sites. The locations of the receptor sites are shown on *Figure 2-3*. The modeled Existing (2018) worst-case noise level within CNE H is predicted to range from 55-60 dB(A) as shown in Columns 3 and 4 of *Table 3*. The dominant noise source within CNE H is Fairfax County Parkway. As shown in Columns 6 and 7 of *Table 3*, the Design Year (2046) No-Build sound level is predicted to range from 56-61 dB(A). As shown in Columns 9 through 16 of *Table 3*, the Design Year (2046) Build sound levels are predicted to range from 59-64 dB(A) and are consistent for each evaluated alternative. Since sound levels do not exceed the NAC, noise abatement is not warranted and will not be discussed further within this report.

CNE I

CNE I is located west of U.S. Route 286 (Fairfax County Parkway) and north of Clara Barton Drive and encompasses sensitive land uses along Station View Court and Robert Carter Drive. CNE I contains 14 modeling-*only* sites (I-001 – I-014) which represent 14 residences. CNE I contains one monitoring site (M10) which was used for model validation. The locations of the receptor sites are shown on *Figure 2-3 and 2-4*. The modeled Existing (2018) worst-case noise level within CNE I is predicted to range from 56-71 dB(A) as shown in Columns 3 and 4 of *Table 3*. The dominant noise source within CNE I is Fairfax County Parkway. As shown in Columns 6 and 7 of *Table 3*, the Design Year (2046) No-Build sound level is predicted to range from 56-72 dB(A). As shown in Columns 9 through 16 of *Table 3*, the Design Year (2046) Build sound levels are predicted to range from 58-74 dB(A) with noise impacts at five receptors representing five

residences and are consistent for each evaluated alternative. Since sound levels exceed the NAC, noise abatement is warranted and will be discussed in *Section VIII* of the report.

CNE J

CNE J is located east of U.S. Route 286 (Fairfax County Parkway), north of Clara Barton Drive and south of Burke Centre Parkway and encompasses sensitive land uses along Fairview Woods Drive and Captain Jones Court. CNE J contains 24 modeling-*only* sites (J-001 – J-024) which represent 24 residences. CNE J contains one monitoring site (M09) which was used for model validation. The locations of the receptor sites are shown on *Figure 2-3 and 2-4*. The modeled Existing (2018) worst-case noise level within CNE J is predicted to range from 53-69 dB(A) as shown in Columns 3 and 4 of *Table 3*. The dominant noise source within CNE J is Fairfax County Parkway. As shown in Columns 6 and 7 of *Table 3*, the Design Year (2046) No-Build sound level is predicted to range from 54-70 dB(A). As shown in Columns 9 through 16 of *Table 3*, the Design Year (2046) Build sound levels are predicted to range from 54-71 dB(A) with noise impacts at eight receptors representing eight residences and are consistent for each evaluated alternative. Since sound levels exceed the NAC, noise abatement is warranted and will be discussed in *Section VIII* of the report.

CNE K

CNE K is located east of U.S. Route 286 (Fairfax County Parkway) and north of Burke Centre Parkway and encompasses sensitive land uses along Fairview Woods Drive. CNE K contains eight modeling-*only* sites (K-001 – K-008) which represent eight residences. CNE K contains one monitoring site (M11) which was used for model validation. The locations of the receptor sites are shown on *Figure 2-4*. The modeled Existing (2018) worst-case noise level within CNE K is predicted to range from 58-66 dB(A) as shown in Columns 3 and 4 of *Table 3*. The dominant noise source within CNE K is Fairfax County Parkway. As shown in Columns 6 and 7 of *Table 3*, the Design Year (2046) No-Build sound level is predicted to range from 59-67 dB(A). As shown in Columns 9 through 16 of *Table 3*, the Design Year (2046) Build sound levels are predicted to range from 60-69 dB(A) with noise impacts at two receptors representing two residences and are consistent for each evaluated alternative. Since sound levels exceed the NAC, noise abatement is warranted and will be discussed in *Section VIII* of the report.

CNE L

CNE L is located west of U.S. Route 286 (Fairfax County Parkway) and encompasses sensitive land uses along Fairfax Station Road and One Penny Drive. CNE L contains seven modeling-*only* sites (L-001 – L-007) which represent seven residences. CNE L contains one monitoring site (M12) which was used for model validation. The locations of the receptor sites are shown on *Figure 2-4*. The modeled Existing (2018) worst-case noise level within CNE L is predicted to range from 55-66 dB(A) as shown in Columns 3 and 4 of *Table 3*. The dominant noise source within CNE L is Fairfax County Parkway. As shown in Columns 6 and 7 of *Table 3*, the Design Year (2046) No-Build sound level is predicted to range from 56-67 dB(A). As shown in Columns

9 through 16 of **Table 3**, the Design Year (2046) Build sound levels are predicted to range from 57-68 dB(A) with noise impacts at two receptors representing two residences and are consistent for each evaluated alternative. Since sound levels exceed the NAC, noise abatement is warranted and will be discussed in **Section VIII** of the report.

CNE M

CNE M is located west of U.S. Route 286 (Fairfax County Parkway) and encompasses sensitive land uses along Ladues End Court and Four Penny Lane. CNE M contains eight modeling-*only* sites (M-001 – M-008) which represent eight residences. CNE M contains no monitoring sites. The locations of the receptor sites are shown on **Figure 2-5**. The modeled Existing (2018) worst-case noise level within CNE M is predicted to range from 55-61 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise source within CNE M is Fairfax County Parkway. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to range from 56-62 dB(A). As shown in Columns 9 through 16 of **Table 3**, the Design Year (2046) Build sound levels are predicted to range from 57-63 dB(A) and are consistent for each evaluated alternative. Since sound levels do not exceed the NAC, noise abatement is not warranted and will not be discussed further in this report.

CNE N

CNE N is located east of U.S. Route 286 (Fairfax County Parkway) and encompasses sensitive land uses along Fairfax Station Road, Dangerfield Way, Nomes Court, and West Ridge View Drive. CNE N contains 18 modeling-*only* sites (N-001 – N-018) which represent 18 residences. CNE N contains two monitoring sites (M13 and M14) which were used for model validation. The locations of the receptor sites are shown on **Figure 2-4 and 2-5**. The modeled Existing (2018) worst-case noise level within CNE N is predicted to range from 55-71 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise source within CNE N is Fairfax County Parkway. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to range from 55-72 dB(A). As shown in Columns 9 through 16 of **Table 3**, the Design Year (2046) Build sound levels are predicted to range from 57-73 dB(A) with noise impacts at four receptors representing four residences and are consistent for each evaluated alternative. Since sound levels exceed the NAC, noise abatement is warranted and will be discussed in **Section VIII** of the report.

CNE O

CNE O is located west of U.S. Route 286 (Fairfax County Parkway) and encompasses sensitive land uses along Ladues End Lane, Colchester Meadow Lane and Popes Head Road. CNE O contains 16 modeling-*only* sites (O-001 – O-016) which represent 16 residences. CNE O contains two monitoring sites (M15 and M17) which were used for model validation. CNE O contains no monitoring sites. The locations of the receptor sites are shown on **Figure 2-5 and 2-6a**. The modeled Existing (2018) worst-case noise level within CNE O is predicted to range from 47-71 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise source within CNE O is

Fairfax County Parkway. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to range from 48-72 dB(A). As shown in Columns 9 and 10 of **Table 3**, the Design Year (2046) Build (Alternative 1A) sound level is predicted to range from 50-71 dB(A) with noise impacts at five receptors representing five residences. As shown in Columns 12 and 13 of **Table 3**, the Design Year (2046) Build (Alternative 2 (**Figure 2-5 and 2-6b**)) sound level is predicted to range from 50-71 dB(A) with noise impacts at five receptors representing five residences. As shown in Columns 15 and 16 of **Table 3**, the Design Year (2046) Build (Alternative 2D (**Figure 2-5 and 2-6c**)) sound level is predicted to range from 50-71 dB(A) with noise impacts at five receptors representing five residences. Since sound levels exceed the NAC, noise abatement is warranted and will be discussed in **Section VIII** of the report.

CNE P

CNE P is located east of U.S. Route 286 (Fairfax County Parkway) and encompasses sensitive land uses along Colchester Meadow Lane and Popes Head Road. CNE P contains 14 modeling-only sites (P-001 – P-014) which represent 14 residences. CNE P contains one monitoring site (M16) which were used for model validation. The locations of the receptor sites are shown on **Figure 2-6a and 2-7a**. The modeled Existing (2018) worst-case noise level within CNE P is predicted to range from 49-69 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise source within CNE P is Fairfax County Parkway. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to range from 49-70 dB(A). As shown in Columns 9 and 10 of **Table 3**, the Design Year (2046) Build (Alternative 1A) sound level is predicted to range from 56-71 dB(A). with noise impacts at four receptors representing four residences. As shown in Columns 12 and 13 of **Table 3**, the Design Year (2046) Build (Alternative 2 (**Figure 2-6b and 2-7b**)) sound level is predicted to range from 53-71 dB(A) with noise impacts at three receptors representing three residences. As shown in Columns 15 and 16 of **Table 3**, the Design Year (2046) Build (Alternative 2D (**Figure 2-6c and 2-7c**)) sound level is predicted to range from 52-71 dB(A) with noise impacts at three receptors representing three residences. Since sound levels exceed the NAC, noise abatement is warranted and will be discussed in **Section VIII** of the report.

CNE Q

CNE Q is located east of U.S. Route 286 (Fairfax County Parkway) and encompasses sensitive land uses along Popes Head Road. CNE Q contains six modeling-only sites (Q-001 – Q-006) which represent six residences. CNE Q contains no monitoring sites. The locations of the receptor sites are shown on **Figure 2-7a**. The modeled Existing (2018) worst-case noise level within CNE Q is predicted to range from 51-59 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise source within CNE Q is Fairfax County Parkway. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to range from 52-60 dB(A). As shown in Columns 9 and 10 of **Table 3**, the Design Year (2046) Build (Alternative 1A) sound level is predicted to range from 52-61 dB(A). As shown in Columns 12 and 13 of **Table 3**, the Design Year (2046) Build (Alternative 2 (**Figure 2-7b**)) sound level is predicted to range from 51-60 dB(A). As shown in Columns 15 and 16 of **Table 3**, the Design Year (2046) Build (Alternative

2D (**Figure 2-7c**) sound level is predicted to range from 50-60 dB(A). Since sound levels do not exceed the NAC, noise abatement is not warranted and will not be discussed further in this report.

CNE R

CNE R is located west of U.S. Route 286 (Fairfax County Parkway) and encompasses sensitive land uses along Popes Head Road and Marlstone Lane. CNE R contains 11 modeling-*only* sites (R-001 – R-011) which represent 11 residences. CNE R contains one monitoring site (M18) which were used for model validation. The locations of the receptor sites are shown on **Figure 2-6a and 2-8**. The modeled Existing (2018) worst-case noise level within CNE R is predicted to range from 52-63 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise source within CNE R is Fairfax County Parkway. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to range from 53-64 dB(A). As shown in Columns 9 and 10 of **Table 3**, the Design Year (2046) Build (Alternative 1A) sound level is predicted to range from 54-65 dB(A). As shown in Columns 12 and 13 of **Table 3**, the Design Year (2046) Build (Alternative 2 (**Figure 2-6b and 2-8**)) sound level is predicted to range from 54-65 dB(A). As shown in Columns 15 and 16 of **Table 3**, the Design Year (2046) Build (Alternative 2D (**Figure 2-6c and 2-8**)) sound level is predicted to range from 54-65 dB(A). Since sound levels do not exceed the NAC, noise abatement is not warranted and will not be discussed further in this report.

CNE S

CNE S is located east of U.S. Route 286 (Fairfax County Parkway) and encompasses sensitive land uses along Washington Street. CNE S contains one modeling-*only* site (S-001) which represents one residence. CNE S contains no monitoring sites. The location of the receptor site is shown on **Figure 2-7a**. The modeled Existing (2018) worst-case noise level within CNE S is predicted to be 49 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise source within CNE S is Fairfax County Parkway and ambient noise. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to be 49 dB(A). As shown in Columns 9 and 10 of **Table 3**, the Design Year (2046) Build (Alternative 1A) sound level is predicted to be 52 dB(A). As shown in Columns 12 and 13 of **Table 3**, the Design Year (2046) Build (Alternative 2 (**Figure 2-7b**)) sound level is predicted to be 53 dB(A). As shown in Columns 15 and 16 of **Table 3**, the Design Year (2046) Build (Alternative 2D (**Figure 2-7c**)) sound level is predicted to be 52 dB(A). Since sound levels do not exceed the NAC, noise abatement is not warranted and will not be discussed further in this report.

CNE T

CNE T is located west of U.S. Route 286 (Fairfax County Parkway) and encompasses sensitive land uses along Blue Topaz lane. CNE T contains two modeling-*only* sites (T-001 – T-002) which represent one residence and one daycare. CNE T contains one monitoring site (M19) which was used for model validation. The locations of the receptor sites are shown on **Figure 2-9**. The modeled Existing (2018) worst-case noise level within CNE T is predicted to range from 59-62 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise source within CNE T is

Fairfax County Parkway. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to range from 60-63 dB(A). As shown in Columns 9 through of **Table 3**, the Design Year (2046) Build sound levels are predicted to range from 63-64 dB(A) and are consistent for each evaluated alternative. Since sound levels do not exceed the NAC, noise abatement is not warranted and will not be discussed further in this report.

CNE U

CNE U is located east of U.S. Route 286 (Fairfax County Parkway) and encompasses sensitive land uses within Patriot Park. CNE U contains 25 modeling-*only* sites (U-001 – U-025) which represent one residence, one soccer field (15 grid units), and one baseball field (nine grid units). CNE U contains one monitoring site (M20) which was used for model validation. The locations of the receptor sites are shown on **Figure 2-9**. The modeled Existing (2018) worst-case noise level within CNE U is predicted to range from 58-68 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise sources within CNE U are Fairfax County Parkway and Braddock Road. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to range from 59-69 dB(A). As shown in Columns 9 through 16 of **Table 3**, the Design Year (2046) Build sound levels are predicted to range from 60-69 dB(A) with noise impacts at five receptors representing one residence, a soccer field (three grid units), and a baseball field (one grid unit) and are consistent for each evaluated alternative. Since sound levels exceed the NAC, noise abatement is warranted and will be discussed in **Section VIII** of the report.

CNE V

CNE V is located east of U.S. Route 286 (Fairfax County Parkway) and encompasses sensitive land uses along Sasher Lane, Thoreau Lane and Sunrise Green. CNE V contains eight modeling-*only* sites (U-001 – U-008) which represent eight residences. CNE V contains one monitoring site (M21) which was used for model validation. The locations of the receptor sites are shown on **Figure 2-9 and 2-10**. The modeled Existing (2018) worst-case noise level within CNE V is predicted to range from 56-73 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise source within CNE V is Fairfax County Parkway. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to range from 57-74 dB(A). As shown in Columns 9 through 16 of **Table 3**, the Design Year (2046) Build sound levels are predicted to range from 59-74 dB(A) with noise impacts at three receptors representing three residences and are consistent for each evaluated alternative. Since sound levels exceed the NAC, noise abatement is warranted and will be discussed in **Section VIII** of the report.

CNE W

CNE W is located west of U.S. Route 286 (Fairfax County Parkway) and encompasses sensitive land uses along Winfield road, Ramrod Court, Caisson Road, Gunpowder Road and Caster Court. CNE W contains 25 modeling-*only* sites (W-001 – W-025) which represent 25 residences. CNE W contains two monitoring sites (M22 and M23) which were used for model validation. The locations of the receptor sites are shown on **Figure 2-10**. The modeled Existing (2018) worst-case

noise level within CNE W is predicted to range from 54-70 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise sources within CNE W is Fairfax County Parkway. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to range from 55-71 dB(A). As shown in Columns 9 through 16 of **Table 3**, the Design Year (2046) Build sound levels are predicted to range from 56-72 dB(A) with noise impacts at 10 receptors representing 10 residences and are consistent for each evaluated alternative. Since sound levels exceed the NAC, noise abatement is warranted and will be discussed in **Section VIII** of the report.

CNE X

CNE X is located east of U.S. Route 286 (Fairfax County Parkway) and encompasses sensitive land uses along Pheasant Ridge Road, Cannonball Road and Singing Pines Road. CNE X contains 31 modeling-*only* sites (X-001 – X-031) which represent 31 residences. CNE X contains one monitoring site (M24) which was used for model validation. The locations of the receptor sites are shown on **Figure 2-10**. The modeled Existing (2018) worst-case noise level within CNE X is predicted to range from 56-70 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise sources within CNE X is Fairfax County Parkway. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to range from 58-71 dB(A). As shown in Columns 9 through 16 of **Table 3**, the Design Year (2046) Build sound levels are predicted to range from 58-71 dB(A) with noise impacts at four receptors representing four residences and are consistent for each evaluated alternative. Since sound levels exceed the NAC, noise abatement is warranted and will be discussed in **Section VIII** of the report.

CNE Y

CNE Y is located east of U.S. Route 286 (Fairfax County Parkway) and North of U.S. Route 29 (Lee Highway) and encompasses sensitive land uses along Heron Ridge Drive, Birkdale Way, Royal Wolf Place and Carromar Place. CNE Y contains 143 modeling-*only* sites (Y-001 – Y-143T) which represent 129 residences, one playground, and a trail (13 grid units). CNE Y contains five monitoring sites (M25, M26, M27, M28 and M29) which were used for model validation. The locations of the receptor sites are shown on **Figure 2-11**. The modeled Existing (2018) worst-case noise level within CNE Y is predicted to range from 48-73 dB(A) as shown in Columns 3 and 4 of **Table 3**. The dominant noise sources within CNE Y are Fairfax County Parkway and Lee Highway. As shown in Columns 6 and 7 of **Table 3**, the Design Year (2046) No-Build sound level is predicted to range from 48-73 dB(A). As shown in Columns 9 through 16 of **Table 3**, the Design Year (2046) Build sound levels are predicted to range from 48-74 dB(A) with noise impacts at two receptors representing 28 residences, one playground, and one trail (six grid units) and are consistent for each evaluated alternative. Since sound levels exceed the NAC, noise abatement is warranted and will be discussed in **Section VIII** of the report.

VIII. Noise Abatement Evaluation

Design Year (2046) Build noise levels are predicted to exceed the NAC in 15 of 25 CNEs. As per FHWA/VDOT procedures discussed in **Phase 1** of VDOT's three-phased approach, noise abatement considerations are warranted for the impacted land uses within this CNE.

Phase 2 and **Phase 3** of VDOT's three-phased approach to considering noise abatement and determining the feasibility and reasonableness of noise barriers is discussed below in detail.

Phase 2: Feasibility Criteria for Noise Barriers

All receptors that meet the warranted criterion must progress to the "feasible" phase. **Phase 2** of the noise abatement criteria requires that both of the following acoustical and engineering conditions be considered:

- At least a 5 dB(A) highway traffic noise reduction at impacted receptors. Per 23 CFR 772, FHWA requires the highway agency to determine the number of impacted receptors required to achieve at least 5 dB(A) of reduction. VDOT requires that fifty percent (50%) or more of the impacted receptors experience 5 dB(A) or more of insertion loss to be feasible; and
- The determination that it is possible to design and construct the noise abatement measure. The factors related to the design and construction include: safety, barrier height, topography, drainage, utilities, maintenance of the abatement measure, maintenance access to adjacent properties, and general access to adjacent properties (i.e. arterial widening projects).

The noise abatement measure is said to be feasible if it meets both criteria described above.

FHWA and VDOT guidelines recommend a variety of abatement measures that should be considered in response to transportation-related noise impacts. While noise barriers and/or earth 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. A brief description of VDOT-approved noise abatement measures is provided below:

Traffic Control Measures (TCM): Traffic control measures, such as speed limit restrictions, truck traffic restrictions, and other traffic control measures that may be considered for the reduction of noise emission levels are not practical for this project. Reducing speeds will not be an effective noise mitigation measure since a substantial decrease in speed is necessary to provide adequate noise reduction. Typically, a 10 mph reduction in speed will result in only a 2 dB(A) decrease in noise level, which is not considered a sufficient level of attenuation to be considered feasible. Likewise, a 2 dB(A) change in noise is not perceptible to the human ear. Additionally, a reduction in speed is not practical for this project since the posted speed is 50 miles per hour along Fairfax County Parkway (Route 286). A significant reduction in speeds of greater than 10 mph to this

roadway would create a safety hazard for motorists traveling the Route 286 corridor and would not be consistent with the project's purpose and need.

Alteration of Horizontal and Vertical Alignments: The alteration of the horizontal and vertical alignment has not been considered because typically, for a straight-line scenario, where noise is unimpeded between the noise source and the receiver, noise levels will only decrease 3 dB(A) if the distance between the noise source and the receptor is doubled (i.e. the road is shifted further away from the impacted receptor). This is not a practical alternative due to the existing location of Fairfax County Parkway, which is the main noise source within the project area.

Acoustical Insulation of Public-Use and Non-Profit Facilities: This noise abatement measure option applies only to public and institutional use buildings. Since no public use or institutional structures are anticipated to have interior noise levels exceeding FHWA's interior NAC, this noise abatement option will not be applied.

Acquisition of Buffering Land: The purchase of property for noise barrier construction or the creation of a "buffer zone" to reduce noise impacts is only considered for predominantly unimproved properties because the amount of property required for this option to be effective would create significant additional impacts (e.g., in terms of residential displacements), which were determined to outweigh the benefits of land acquisition.

Construction of Berms / Noise Barriers: Construction of noise barriers can be an effective way to reduce noise levels at areas of outdoor activity. Noise barriers can be wall structures, earthen berms, or a combination of the two. The effectiveness of a noise barrier depends on the distance and elevation difference between roadway and receptor and the available placement location for a barrier. Gaps between overlapping noise barriers also decrease the effectiveness of the barrier, as opposed to a single continuous barrier. The barrier's ability to attenuate noise decreases as the gap width increases.

Noise walls and earth berms are often implemented into the highway design in response to the identified noise impacts. The effectiveness of a freestanding (post and panel) noise barrier and an earth berm of equivalent height are relatively consistent; however, an earth berm is perceived as a more aesthetically pleasing option. In contrast, the use of earth berms is not always an option due to the excessive space they require adjacent to the roadway corridor. At a standard slope of 4:1, every one-foot in height would require four feet of horizontal width. This requirement becomes more complex in urban settings where residential properties often abut the proposed roadway corridor. In these situations, implementation of earth berms can require significant property acquisitions to accommodate noise mitigation, and the cost associated with the acquisition of property to construct a berm can significantly increase the total costs to implement this form of noise mitigation and make it unreasonable.

Availability of fill material to construct the berm also needs to be considered. On proposed projects where proposed grading yields excess waste material, earth berms can often be a cost-effective mitigation option. On balance or borrow projects the implementation of earth berms is

often an expensive solution due to the need to identify, acquire, and transport the material to the project site. Earth berms are not currently considered a viable mitigation option throughout the project area. However, this option will be evaluated further where possible in the final design stage.

Additionally, the Code of Virginia (§33.1-223.2:21) states: “Whenever the Commonwealth Transportation Board or the Department plan for or undertake any highway construction or improvement project and such project includes or may include the requirement for the mitigation of traffic noise impacts, first consideration should be given to the use of noise reducing design and low noise pavement materials and techniques in lieu of construction of noise walls or noise barriers. Vegetative screening, such as the planting of appropriate conifers, in such a design would be utilized to act as a visual screen if visual screening is required.” Since there is a noise impact, HB 2577 requires coordination with the Project Manager and Environmental Contact to inquire about the possibility of noise reducing design, the usage of low noise pavement, and visual screening. The HB 2577 documentation and coordination for this project is ongoing and will be included in the final version of this report. It will be available for reference within *Appendix F*. Detailed engineering has not been completed; therefore, methods to reduce noise through engineering will be looked at during the final design phase of the project where applicable.

In summary, due to right-of-way constraints, noise barriers were considered the only form of abatement having the potential to reduce Design Year (2046) Build noise levels.

Phase 3: Reasonableness Criteria for Noise Barriers

A determination of noise barrier reasonableness will include the consideration of the parameters listed below. The parameters used during the NEPA process are also used during the Final Design phase when making a determination of noise barrier reasonableness. All reasonableness factors must collectively be achieved in order for a noise abatement measure to be deemed reasonable.

- **Viewpoints of the benefited receptors**
VDOT shall solicit the viewpoints of all benefited receptors through certified mailings and obtain enough responses to document a decision as to whether or not there is a desire for the proposed noise abatement measure. Fifty percent (50%) or more of the respondents shall be required to favor the noise abatement measure in determining reasonableness. Community views in and of themselves are not sufficient for a barrier to be found reasonable if one or both of the other two reasonableness criteria are not satisfied.
- **Cost-effectiveness**
Typically, the limiting factor related to barrier reasonableness is the cost effectiveness value, where the total surface area of the barrier is divided by the number of benefited receptors receiving at least a 5 dB(A) reduction in noise level. VDOT’s approved cost is based on a maximum square footage of abatement per benefited receptor, a value of 1,600 square feet per benefited receptor.

For non-residential properties such as parks and public use facilities, a special calculation is performed in order to quantify the type of activity and compare to the cost effectiveness criterion. The determination is based on cost, severity of impact (both in terms of noise levels and the size of the impacted area and the activity it contains), and amount of noise reduction.

- **Noise Reduction Design Goals**

The design goal is a reasonableness factor indicating a specific reduction in noise levels that VDOT uses to identify that a noise abatement measure effectively reduces noise. The design goal establishes a criterion, selected by VDOT, which noise abatement must achieve. VDOT's noise reduction design goal is defined as a 7 dB(A) insertion loss for at least one impacted receptor, meaning that at least one impacted receptor is predicted to achieve a 7 dB(A) or greater noise reduction with the proposed barrier in place. The design goal is not the same as acoustic feasibility, which defines the minimum level of effectiveness for a noise abatement measure. Acoustic feasibility indicates that the noise abatement measure can, at a minimum, achieve a discernible reduction in noise levels.

Noise reduction is measured by comparing the future Design Year Build condition pre-and post-barrier noise levels. This difference between unabated and abated noise levels is known as "insertion loss" (IL). It is important to optimize the noise barrier design to achieve the most effective noise barrier in terms of both noise reduction (insertion losses) and cost. Although at least a 5 dB(A) reduction is required to meet the feasibility criteria, the following tiered noise barrier abatement goals are used to govern barrier design and optimization.

- Reduction of future highway traffic noise by 7 dB(A) at one (1) or more of the impacted receptor sites (required criterion)
- Reduction of future highway traffic noise levels to the low-60-decibel range when practical (desirable).
- Reduction of future highway traffic noise levels to existing noise levels when practical (desirable).

The following is a discussion of the potential abatement measures for the impacted CNEs under the Design Year (2046) Build Alternative. Noise abatement was evaluated where noise impacts were predicted to occur. Where a noise barrier was evaluated, the effectiveness was measured in terms of achievable insertion loss. Noise abatement measures in the project area were evaluated at heights ranging from 10 to 30 feet, at five-foot increments. Due to the preliminary nature of this project, detailed elevation and terrain information beyond the roadway surfaces was not available, therefore base elevations of barriers were assumed to be at the edge of pavement when placed along the roadway, while existing elevations were used in all other locations. Detailed noise barriers were not optimized during this abatement analysis, as a more detailed process will

be performed in Final Design. *Appendix I* lists the Design Year (2046) Build noise levels, the abated noise levels, and the net insertion losses for the evaluated barriers and barrier systems that were determined to be feasible and reasonable.

Feasible and reasonable noise abatement was evaluated based on constructability and the VDOT acoustic design goals. Evaluation of existing noise barriers within CNE E (Existing Barrier E) and CNE F (Existing Barrier F-1) was not warranted because no impacts were predicted at their protected sites. The existing noise barrier F-2 within CNE F was determined to be feasible but not reasonable and will be evaluated using VDOT's Highway Traffic Noise Impact Analysis Guidance Manual "in-kind" replacement as detailed in Section 6.3.6. New noise barriers were evaluated and determined to be both feasible and reasonable for CNE F (Barrier F-2 - Replacement), CNE U (Barrier U), CNE W (Barrier W), CNE X (Barrier X) and CNE Y (Barrier Y). Further study is required in Final Design to refine the abatement options and no commitments on noise abatement are made until the Final Design phase of the project. *Appendix G* provides completed warranted, feasible, and reasonable worksheets.

CNE C

Barrier C

Design year (2046) Build noise levels are predicted to exceed the NAC at three receptors representing three residences within CNE C. A preliminary noise barrier was evaluated for these specific impacts within CNE C. Specifically, Barrier C located along the east side of Ox Road, beginning north of Little Ox Road and continuing for approximately 1000 feet to the north with an average height of 10.00 feet. The location of the barrier is shown on *Figure 2-2*. Barrier C achieves feasible (>5 dB(A)) noise reductions at the all three impacted receptors (see *Appendix I*) representing three residences. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The total area for the barrier is 9,997 square feet. It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 3,332, which exceeds the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier C is shown in *Table 4*. Therefore, Barrier C is considered feasible, but not reasonable at this time.

CNE F

Barrier F-2 (Existing Barrier)

Design Year (2046) Build sound levels are predicted to range from 50-73 dB(A), with noise impacts at two receptors representing two residences. CNE F is protected by an existing noise barrier that is not physically impacted by the build alternative. However, as detailed in VDOT's Highway Traffic Noise Impact Analysis Guidance Manual within Section 6.3.6, *Scenario 2*, when an existing barrier is not physically impacted by the project, but the project creates noise impacts that the existing barrier does not completely address, any modifications to, or the improvement of,

the noise barrier to address the impacts associated with the Type I improvement would be subject to the cost-effectiveness criterion.

In order to determine the existing noise barrier's effectiveness, the noise barrier was removed in the noise model to determine unabated sound levels throughout this portion of CNE F. The unabated noise levels were then compared to Design Year Build (2046) conditions (with the barrier in-place) to determine if the noise barrier is still considered feasible and reasonable. In total, the existing noise barrier evaluated for this project has a length of 2,138 feet (see **Table 4**), with an average height of 11.17 feet. The location of the barrier is shown on **Figure 2-3**. The existing noise barrier achieves feasible (>5 dB(A)) noise reductions at 8 of the 11 impacted receptors (see **Appendix I**) representing six residences and the Fairfax Station Swim & Tennis pool (two grid units). The barrier also benefits two non-impacted receptors which represent one residence and the Fairfax Station Swim & Tennis pool (one grid point). It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 2,389, which exceeds the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Existing Barrier F-2 is shown in **Table 4**. Therefore, Existing Barrier F-2 is considered feasible, but not reasonable at this time.

Barrier F-2 (Replacement Barrier)

Since the existing barrier was found to be not reasonable due to insufficient panel heights (**Table 4**); a new barrier is being evaluated for CNE F using VDOT's "in-kind" replacement as detailed in Section 6.3.6 of the VDOT Highway Traffic Noise Impact Analysis Guidance Manual. It should be noted that only the square footage of the new noise barrier, beyond the square footage of the existing barrier (8,364 ft²) and only the additional benefited receptors (17) will be considered in the reasonableness calculation, per Section 6.3.6, *Scenario 2*. A new noise barrier was evaluated for CNE F along the southbound travel lanes of Fairfax County Parkway. In total, the new evaluated barrier for CNE F has a length of approximately 2,150 feet (see **Table 4**), with an average height of 15.00 feet. The location of the barrier is shown on **Figure 2-3**. The noise barrier achieves feasible (>5 dB(A)) noise reductions at all 11 impacted receptors, which represent 11 residences (see **Appendix I**). The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The barrier also benefits 16 non-impacted receptors which represent 12 residences, a pool (two grid units), and a tennis court (two grid units). It is considered reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 492, which is below the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for this evaluated barrier is shown in **Table 4**. Therefore, Barrier F-2 (Replacement Barrier) is considered feasible and reasonable at this time and is recommended for further consideration.

CNE G

Barrier G

Design year (2046) Build noise levels are predicted to exceed the NAC at five receptors representing five residences within CNE G. A preliminary noise barrier was evaluated for these specific impacts within CNE G. Specifically, Barrier G located along the east side of Fairfax County Parkway, beginning near the on-ramp from southbound Ox Road and continuing for approximately 1,300 feet to the north with an average height of 11.54 feet. The location of the barrier is shown on **Figure 2-3**. Barrier G achieves feasible (>5 dB(A)) noise reductions at the all five impacted receptors (see **Appendix I**) representing five residences. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier does not provide any benefits to non-impacted receptors. The total area for the barrier is 14,999 square feet. It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 3,000, which exceeds the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier G is shown in **Table 4**. Therefore, Barrier G is considered feasible, but not reasonable at this time.

CNE I

Barrier System I

Design year (2046) Build noise levels are predicted to exceed the NAC at five receptors representing five residences within CNE I. A preliminary noise barrier system was evaluated for these specific impacts within CNE I. Specifically, Barrier System I located along the west side of Fairfax County Parkway, beginning north of Clara Barton Drive and continuing for approximately 1,501 feet to the north with an average height of 15.50 feet. The location of the barrier system is shown on **Figure 2-3**. Barrier System I achieves feasible (>5 dB(A)) noise reductions at all five impacted receptors (see **Appendix I**) representing five residences. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier provides benefits at two non-impacted receptors representing two residences. The total area for the barrier system is 22,512 square feet. It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 3,216, which exceeds the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier System I is shown in **Table 4**. Therefore, Barrier System I is considered feasible, but not reasonable at this time.

CNE J

Barrier J

Design year (2046) Build noise levels are predicted to exceed the NAC at eight receptors representing eight residences within CNE J. A preliminary noise barrier was evaluated for these specific impacts within CNE J. Specifically, Barrier J located along the east side of Fairfax County

Parkway and the south side of Burke Centre Parkway, beginning north of Clara Barton Drive and continuing for approximately 1,600 feet to the north with an average height of 20.75 feet. The location of the barrier is shown on **Figure 2-3**. Barrier J achieves feasible (>5 dB(A)) noise reductions at all eight impacted receptors (see **Appendix I**) representing eight residences. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier provides benefits at eight non-impacted receptors representing eight residences. The total area for the barrier system is 33,206 square feet. It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 2,075, which exceeds the allowable (MaxSF/BR) value of 1,600. It should be noted that partial mitigation was evaluated for this CNE. However, no partial mitigation barrier scenarios were found to be feasible and reasonable. A summary of the abatement for Barrier J is shown in **Table 4**. Therefore, Barrier J is considered feasible, but not reasonable at this time.

CNE K

Barrier K

Design year (2046) Build noise levels are predicted to exceed the NAC at two receptors representing two residences within CNE K. A preliminary noise barrier was evaluated for these specific impacts within CNE K. Specifically, Barrier K located along the east side of Fairfax County Parkway and the north side of Burke Centre Parkway, beginning west of Fairview Woods Drive and continuing for approximately 500 feet to the north with an average height of 13.00 feet. The location of the barrier is shown on **Figure 2-4**. Barrier K achieves feasible (>5 dB(A)) noise reductions at both impacted receptors (see **Appendix I**) representing two residences. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier does not provide any benefits to non-impacted receptors. The total area for the barrier system is 6,497 square feet. It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 3,249, which exceeds the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier K is shown in **Table 4**. Therefore, Barrier K is considered feasible, but not reasonable at this time.

CNE L

Barrier L

Design year (2046) Build noise levels are predicted to exceed the NAC at two receptors representing two residences within CNE L. A preliminary noise barrier was evaluated for these specific impacts within CNE L. Specifically, Barrier L located along the west side of Fairfax County Parkway, beginning near the overpass of Fairfax Station Drive and continuing for approximately 1000 feet to the north with an average height of 11.00 feet. The location of the barrier is shown on **Figure 2-4**. Barrier L achieves feasible (>5 dB(A)) noise reductions at both impacted receptors (see **Appendix I**) representing two residences. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height.

The evaluated barrier does not provide any benefits to non-impacted receptors. The total area for the barrier system is 11,005 square feet. It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 5,503, which exceeds the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier L is shown in **Table 4**. Therefore, Barrier L is considered feasible, but not reasonable at this time.

CNE N

Design year (2046) Build noise levels are predicted to exceed the NAC at four receptors representing four residences within CNE N. However, due to the sparse layout of sensitive receptors and the rural nature of this CNE, four separate barrier analyses were investigated in an attempt to mitigate noise impacts within different sections of the CNE. The results of each scenario are described in detail below.

Barrier N-1

A preliminary noise barrier was evaluated for impacted receptor N-003 within CNE N. Specifically, Barrier N-1 located along the east side of Fairfax County Parkway, near Daingerfield Way for a distance of approximately 901 feet to the with an average height of 15.00 feet. The location of the barrier is shown on **Figure 2-4**. Barrier N-1 achieves feasible (>5 dB(A)) noise reductions at the impacted receptor (see **Appendix I**) representing one residence. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier provides benefits at one non-impacted receptor representing one residence. The total area for the barrier is 13,508 square feet. It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 6,754, which exceeds the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier N-1 is shown in **Table 4**. Therefore, Barrier N-1 is considered feasible, but not reasonable at this time.

Barrier N-2

A preliminary noise barrier was evaluated for impacted receptor N-006 within CNE N. Specifically, Barrier N-2 located along the east side of Fairfax County Parkway, near Nomes Court for a distance of approximately 400 feet to the with an average height of 13.75 feet. The location of the barrier is shown on **Figure 2-5**. Barrier N-2 achieves a feasible (>5 dB(A)) noise reduction at the impacted receptor (see **Appendix I**) representing one residence. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier does not provide any benefits to non-impacted receptors. The total area for the barrier is 5,499 square feet. It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 5,499, which exceeds the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier N-2 is shown in **Table 4**. Therefore, Barrier N-2 is considered feasible, but not reasonable at this time.

Barrier N-3

A preliminary noise barrier was evaluated for impacted receptor N-011 within CNE N. Specifically, Barrier N-3 located along the east side of Fairfax County Parkway, beginning near the intersection with Nomes Court and continuing approximately 400 feet to the north with an average height of 10.00 feet. The location of the barrier is shown on **Figure 2-5**. Barrier N-3 achieves a feasible (>5 dB(A)) noise reduction at the impacted receptor (see **Appendix I**) representing one residence. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier does not provide any benefits to non-impacted receptors. The total area for the barrier is 4,001 square feet. It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 4,001, which exceeds the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier N-3 is shown in **Table 4**. Therefore, Barrier N-3 is considered feasible, but not reasonable at this time.

Barrier N-4

A preliminary noise barrier was evaluated for impacted receptor N-018 within CNE N. Specifically, Barrier N-4 located along the east side of Fairfax County Parkway, in the vicinity of West Ridge View Drive and continuing north for approximately 600 feet with an average height of 16.67 feet. The location of the barrier is shown on **Figure 2-5**. Barrier N-4 achieves a feasible (>5 dB(A)) noise reduction at the impacted receptor (see **Appendix I**) representing one residence. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier does not provide any benefits to non-impacted receptors. The total area for the barrier is 10,007 square feet. It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 10,007, which exceeds the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier N-4 is shown in **Table 4**. Therefore, Barrier N-4 is considered feasible, but not reasonable at this time.

CNE O

In the area of CNE O, the future build alternatives vary due to the future Popes Head Interchange. Therefore, several barrier alignments were evaluated in this area. Additionally, site O-009 is proposed to be acquired under all three Build alternatives.

Barrier O (Alternative 1A)

Alternative 1A Design year (2046) Build noise levels are predicted to exceed the NAC at five receptors representing five residences within CNE O. A preliminary noise barrier was evaluated for these specific impacts within CNE O. Specifically, Barrier O (Alternative 1A) located along the west side of Fairfax County Parkway, beginning north of Ladues End Lane and continuing for approximately 1,800 feet to the north with an average height of 17.22 feet. The location of the barrier is shown on **Figure 2-6a**. Barrier O (Alternative 1A) achieves feasible (>5 dB(A)) noise

reductions at the all five impacted receptors (see *Appendix I*) representing five residences. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier provides benefits at one non-impacted receptor representing one residence. The total area for the barrier system is 31,000 square feet. It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 5,167, which exceeds the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier O (Alternative 1A) is shown in *Table 4*. Therefore, Barrier O (Alternative 1A) is considered feasible, but not reasonable at this time.

Barrier O (Alternative 2)

Alternative 2 Design year (2046) Build noise levels are predicted to exceed the NAC at five receptors representing five residences within CNE O. A preliminary noise barrier was evaluated for these specific impacts within CNE O. Specifically, Barrier O (Alternative 2) located along the west side of Fairfax County Parkway, beginning north of Ladues End Lane and continuing for approximately 1,900 feet to the north with an average height of 15.00 feet. The location of the barrier is shown on *Figure 2-6b*. Barrier O (Alternative 2) achieves feasible (>5 dB(A)) noise reductions at the all five impacted receptors (see *Appendix I*) representing five residences. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier provides benefits at one non-impacted receptor representing one residence. The total area for the barrier system is 28,501 square feet. It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 4,750, which exceeds the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier O (Alternative 2) is shown in *Table 4*. Therefore, Barrier O (Alternative 2) is considered feasible, but not reasonable at this time.

Barrier O (Alternative 2D)

Alternative 2D Design year (2046) Build noise levels are predicted to exceed the NAC at five receptors representing five residences within CNE O. A preliminary noise barrier was evaluated for these specific impacts within CNE O. Specifically, Barrier O (Alternative 2D) located along the west side of Fairfax County Parkway, beginning north of Ladues End Lane and continuing for approximately 1,800 feet to the north with an average height of 18.06 feet. The location of the barrier is shown on *Figure 2-6c*. Barrier O (Alternative 2D) achieves feasible (>5 dB(A)) noise reductions at the all five impacted receptors (see *Appendix I*) representing five residences. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier provides benefits at one non-impacted receptor representing one residence. The total area for the barrier system is 32,502 square feet. It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 5,417, which exceeds the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier O (Alternative 2D) is shown in *Table 4*. Therefore, Barrier O (Alternative 2D) is considered feasible, but not reasonable at this time.

CNE P

In the area of CNE P, the build alternatives vary, due to the proposed Popes Head Interchange. Therefore, several barrier alignments were evaluated in this area. Additionally, due to variations within the design between Alternative 1A, 2, and 2D, impacts were not consistent throughout all alternatives. Specifically, Alternatives 2 and 2D did produce an impact at site P-005 under design year conditions. Partial mitigation was evaluated for all alternatives for this CNE. However, no partial mitigation barrier scenarios were found to be feasible and reasonable.

Barrier P (Alternative 1A)

Alternative 1A Design year (2046) Build noise levels are predicted to exceed the NAC at four receptors representing three residences within CNE P. A preliminary noise barrier was evaluated for these specific impacts within CNE P. Specifically, Barrier P (Alternative 1A) located along the east side of Fairfax County Parkway, beginning south of Colchester Meadow Lane and continuing for approximately 1,850 feet to the north with an average height of 19.32 feet. The location of the barrier is shown on **Figure 2-6a**. Barrier P (Alternative 1A) achieves feasible (>5 dB(A)) noise reductions at the all four impacted receptors (see **Appendix I**) representing four residences. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier provides benefits at five non-impacted receptors representing five residences. The total area for the barrier system is 35,756 square feet. It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 3,973, which exceeds the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier P (Alternative 1A) is shown in **Table 4**. Therefore, Barrier P (Alternative 1A) is considered feasible, but not reasonable at this time.

Barrier P (Alternative 2)

Alternative 2D Design year (2046) Build noise levels are predicted to exceed the NAC at three receptors representing three residences within CNE P. A preliminary noise barrier was evaluated for these specific impacts within CNE P. Specifically, Barrier P (Alternative 2) located along the east side of Fairfax County Parkway, beginning south of Colchester Meadow Lane and continuing for approximately 1,700 feet to the north with an average height of 13.82 feet. The location of the barrier is shown on **Figure 2-6b**. Barrier P (Alternative 2) achieves feasible (>5 dB(A)) noise reductions at the all three impacted receptors (see **Appendix I**) representing three residences. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier provides benefits at one non-impacted receptor representing one residence. The total area for the barrier system is 23,495 square feet. It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 5,874, which exceeds the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier P (Alternative 2) is shown in **Table 4**. Therefore, Barrier P (Alternative 2) is considered feasible, but not reasonable at this time.

Barrier P (Alternative 2D)

Alternative 2 Design year (2046) Build noise levels are predicted to exceed the NAC at three receptors representing three residences within CNE P. A preliminary noise barrier was evaluated for these specific impacts within CNE P. Specifically, Barrier P (Alternative 2D) located along the east side of Fairfax County Parkway, beginning south of Colchester Meadow Lane and continuing for approximately 1,600 feet to the north with an average height of 13.12 feet. The location of the barrier is shown on **Figure 2-6c**. Barrier P (Alternative 2D) achieves feasible (>5 dB(A)) noise reductions at the all three impacted receptors (see **Appendix I**) representing three residences. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier does not provide any benefits to non-impacted receptors. The total area for the barrier system is 21,000 square feet. It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 7,000, which exceeds the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier P (Alternative 2D) is shown in **Table 4**. Therefore, Barrier P (Alternative 2D) is considered feasible, but not reasonable at this time.

CNE U

Design year (2046) Build noise levels are predicted to exceed the NAC at five receptors representing one residence, a soccer field, and a baseball field within CNE U. Further analysis showed that two impacts (U-016 and U-019) were a result of traffic noise from Braddock Road. As stated in Section 6.2.1 of the VDOT Highway Traffic Noise Impact Analysis Guidance Manual, impacts that are not caused by the primary proposed roadway improvements may not qualify for noise abatement. After coordination with VDOT staff, it was determined that there were no improvements along this area of Braddock Road, therefore a barrier was not analyzed for these specific impacts.

Barrier U

A preliminary noise barrier was evaluated for the three remaining impacts within CNE U. Specifically, Barrier U located along the east side of Fairfax County Parkway, beginning south of the soccer fields within Patriot Park and continuing for approximately 1,167 feet to the north with an average height of 14.57 feet. The location of the barrier is shown on **Figure 2-9**. Barrier U achieves feasible (>5 dB(A)) noise reductions at all three impacted receptors (see **Appendix I**) representing a soccer field (three grid units). The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier provides benefits at 8 non-impacted receptors representing a soccer field (eight grid units). The total area for the barrier system is 17,005 square feet. It is considered reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 1,546, which is below the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for this evaluated barrier is shown in **Table 4**. Therefore, Barrier U is considered feasible and reasonable at this time and is recommended for further consideration.

CNE V

Barrier System V

Design year (2046) Build noise levels are predicted to exceed the NAC at three receptors representing three residences within CNE V. A preliminary noise barrier system was evaluated for these specific impacts within CNE V. Specifically, Barrier System V located along the west side of Fairfax County Parkway, beginning along the southbound off-ramp to Braddock Road and continuing approximately 1,600 feet to the north with an average height of 13.67 feet. The location of the barrier is shown on **Figure 2-9 and 2-10**. Barrier System V achieves feasible (>5 dB(A)) noise reductions at all three impacted receptors (see **Appendix I**) representing three residences. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier provides benefits at one non-impacted receptor representing one residence. The total area for the barrier system is 21,991 square feet. It is considered not reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 5,498, which exceeds the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier System V is shown in **Table 4**. Therefore, Barrier System V is considered feasible, but not reasonable at this time.

CNE W

Barrier W

Design year (2046) Build noise levels are predicted to exceed the NAC at 10 receptors representing 10 residences within CNE W. A preliminary noise barrier was evaluated for these specific impacts within CNE W. Specifically, Barrier W located along the west side of Fairfax County Parkway, beginning in the vicinity of Winfield Road and continuing for approximately 2,100 feet to the north with an average height of 15.83 feet. The location of the barrier is shown on **Figure 2-10**. Barrier W achieves feasible (>5 dB(A)) noise reductions at all 10 impacted receptors (see **Appendix I**) representing 10 residences. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier provides benefits at 11 non-impacted receptors representing 11 residences. The total area for the barrier system is 33,256 square feet. It is considered reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 1,584, which is within the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier W is shown in **Table 4**. Therefore, Barrier W is considered feasible and reasonable at this time and is recommended for further consideration.

CNE X

Barrier X

Design year (2046) Build noise levels are predicted to exceed the NAC at four receptors representing four residences within CNE X. A preliminary noise barrier was evaluated for these

specific impacts within CNE X. Specifically, Barrier X located along the east side of Fairfax County Parkway, beginning south of Cannonball Road and continuing for approximately 1,650 feet to the north with an average height of 12.55 feet. The location of the barrier is shown on **Figure 2-10**. Barrier X achieves feasible (>5 dB(A)) noise reductions at all four impacted receptors (see **Appendix I**) representing four residences. The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier provides benefits at nine non-impacted receptors representing nine residences. The total area for the barrier system is 20,706 square feet. It is considered reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 1,593, which is within the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier X is shown in **Table 4**. Therefore, Barrier X is considered feasible and reasonable at this time and is recommended for further consideration.

CNE Y

Barrier Y

Design year (2046) Build noise levels are predicted to exceed the NAC at 35 receptors representing 28 residences, one playground, and one trail within CNE Y. A preliminary noise barrier was evaluated for these specific impacts within CNE Y. Specifically, Barrier Y located along the east side of Fairfax County Parkway, beginning along Route 29 and continuing for approximately 3,000 feet to the north with an average height of 15.00 feet. The location of the barrier is shown on **Figure 2-11**. Barrier Y achieves feasible (>5 dB(A)) noise reductions at all 35 impacted receptors (see **Appendix I**) representing 28 residences, one playground, and one trail (six grid units). The barrier meets the design goal of an insertion loss (IL) of 7 dB(A) for at least one impacted receptor at the evaluated height. The evaluated barrier provides benefits at 73 non-impacted receptors representing 66 residences and one trail (seven grid units). The total area for the barrier system is 44,997 square feet. It is considered reasonable due to its Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 417, which is within the allowable (MaxSF/BR) value of 1,600. A summary of the abatement for Barrier Y is shown in **Table 4**. Therefore, Barrier Y is considered feasible and reasonable at this time and is recommended for further consideration.

IX. Construction Noise

VDOT is also concerned with noise generated during the construction phase of the proposed project. While the degree of construction noise impact will vary, it is directly related to the types and number of equipment used and the proximity to the noise sensitive land uses within the project area. Land uses that are sensitive to traffic noise are also potentially sensitive to construction noise.

Any construction noise impacts that do occur as a result of roadway construction measures are anticipated to be temporary in nature and will cease upon completion of the project construction

phase. A method of controlling construction noise is to establish the maximum level of noise that construction operations can generate.

In view of this, VDOT has developed and FHWA has approved a specification that establishes construction noise limits. This specification can be found in VDOT's 2016 *Road and Bridge Specifications, Section 107.16(b.3), "Noise"*. The contractor will be required to conform to this specification to reduce the impact of construction noise on the surrounding community.

The specifications have been reproduced below:

- The Contractor's operations shall be performed so that exterior noise levels measured during a noise sensitive activity shall not exceed 80 decibels. Such noise level measurements shall be taken at a point on the perimeter of the construction limit that is closest to the adjoining property on which a noise sensitive activity is occurring. A noise sensitive activity is any activity for which lowered noise levels are essential if the activity is to serve its intended purpose and not present an unreasonable public nuisance. Such activities include, but are not limited to, those associated with residences, hospitals, nursing homes, churches, schools, libraries, parks, and recreational areas.
- VDOT may monitor construction-related noise. If construction noise levels exceed 80 decibels during noise sensitive activities, the Contractor shall take corrective action before proceeding with operations. The Contractor shall be responsible for costs associated with the abatement of construction noise and the delay of operations attributable to noncompliance with these requirements.
- VDOT may prohibit or restrict to certain portions of the project any work that produces objectionable noise between 10 PM and 6 AM. If other hours are established by local ordinance, the local ordinance shall govern.
- Equipment shall in no way be altered so as to result in noise levels that are greater than those produced by the original equipment.
- When feasible, the Contractor shall establish haul routes that direct his vehicles away from developed areas and ensure that noise from hauling operations is kept to a minimum.
- These requirements shall not be applicable if the noise produced by sources other than the Contractor's operation at the point of reception is greater than the noise from the Contractor's operation at the same point.

X. Public Involvement/Local Officials Coordination

FHWA and VDOT policies require that VDOT provides certain information to local officials within whose jurisdiction the highway project is located to minimize future traffic noise impacts of Type I projects on currently undeveloped lands (Type I projects involve highway improvements

with noise analysis). This information must include details on noise-compatible land-use planning and noise impact zones for undeveloped lands within the project corridor. The aforementioned details are provided below and shown on **Figures 2-1 through 2-11**. Additional information about VDOT's noise abatement program has also been included in this section.

Sections 12.1 and 12.2 of VDOT's 2011 *Highway Traffic Noise Impact Analysis Guidance Manual* outline VDOT's approach to communication with local officials and provide information and resources on highway noise and noise-compatible land-use planning. VDOT's intention is to assist local officials in planning the uses of undeveloped land adjacent to highways to minimize the potential impacts of highway traffic noise.

Entering the Quiet Zone is a brochure that provides general information and examples to elected officials, planners, developers, and the general public about the problem of traffic noise and effective responses to the noise. The following is a link to this brochure on FHWA's website: http://www.fhwa.dot.gov/environment/noise/noise_compatible_planning/federal_approach/land_use/qz00.cfm.

A wide variety of administrative strategies may be used to minimize or eliminate potential highway noise impacts, thereby preventing the need or desire for costly noise abatement structures such as noise barriers in future years. There are five broad categories of such strategies:

- Zoning
- Other legal restrictions (subdivision control, building codes, health codes)
- Municipal ownership or control of the land
- Financial incentives for compatible development
- Educational and advisory services

The Audible Landscape: A Manual for Highway and Land Use is a very well-written and comprehensive guide addressing these noise-compatible land use planning strategies, with detailed information. This document is available through FHWA's website, at: http://www.fhwa.dot.gov/environment/noise/noise_compatible_planning/federal_approach/audible_landscape/al00.cfm.

Also required under the revised FHWA and VDOT noise policies is information on the noise impact zones adjacent to project roadways in undeveloped lands. To determine these zones, noise levels are computed at various distances from the edge of the project roadways in each of the undeveloped areas of the project study area. The distances from the edge of the roadway to the NAC noise levels are then determined through interpolation. Distances vary in the project corridor due to changes in traffic volumes or terrain features. The distances for this project are summarized in **Table 5**. Any noise sensitive sites within these zones should be considered noise impacted if no barrier is present to reduce noise levels.

Noise level contours are lines of equal noise exposure that typically parallel roadway alignments. Highway traffic noise is considered a linear noise source and noise levels can drop considerably over distance. The degree that noise levels decrease can vary based on a number of different

factors including objects that shield the roadway noise, terrain features and ground cover type (e.g., pavement, grass or snow). The use of noise level contours has become increasingly popular over the last several years, as they have been implemented in planning programs for undeveloped areas with roadway noise influence. Through conscious planning efforts and noise contour generation, municipal officials can restrict future development inside the noise impact zone (i.e., the area within the 66 dB(A) noise contour). *Figures 2-1 through 2-11* show the approximate 66 dB(A) noise level contours when considering the improvements made to the Fairfax County Parkway Project with the Design Year (2046) Build traffic volumes, speeds and composition. *Table 5* shows the approximate distance of the 66 dB(A) contour line from the centerline of the 2046 Build Alternative to each CNE throughout the Project Study Area.

XI. Conclusion

Under Design Year (2046) Build Alternative 1A Build conditions, a total of 97 receptors representing 86 residences, one soccer field (three grid units), one baseball field (one grid point), one playground and one trail (six grid units) are predicted to experience noise impacts. Under Design Year (2046) Alternative 2 Build conditions, a total of 96 receptors representing 85 residences, one soccer field (three grid units), one baseball field (one grid point), one playground, and one trail (six grid units) are predicted to experience noise impacts. Under Design Year (2046) Alternative 2D Build conditions, a total of 96 receptors representing 85 residences, one soccer field (three grid units), one baseball field (one grid point), one playground, and one trail (six grid units) are predicted to experience noise impacts. The three existing noise barriers present within the southern portion of the project area are not physically impacted by the proposed build alternatives. The existing noise barrier protecting the sensitive land uses for CNE F (Existing Barrier F-2) was evaluated and is proposed to be replaced in-kind. The existing noise barriers within CNE E (Existing Barrier E) and CNE F (Existing Barrier F-1) did not warrant evaluation since no noise impacts were predicted at their protected noise sensitive receptors. In an attempt to mitigate Design Year (2046) Build noise impacts, a total of 22 barriers were evaluated throughout the project corridor. Five of these barriers (Barrier F-2 Replacement, Barrier U, Barrier W, Barrier X, and Barrier Y) were found to be feasible and reasonable at this time. A detailed discussion of the noise abatement evaluation can be found in *Section VIII* of this report. Further study should be completed in Final Design to refine the abatement options. No commitments on noise abatement are made until the Final Design phase of the project.

TABLES

TABLE 1*Fairfax County Parkway Improvements Project**FHWA/VDOT Noise Abatement Criteria**Hourly-A-Weighted Sound Level in Decibels (dB(A))¹*

Activity Category	Activity $L_{eq}(h)$ ⁴	Criteria ² L10 (h)	Evaluation Location	Description of Activity Category
A	57	60	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B³	67	70	Exterior	Residential.
C³	67	70	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or non-profit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	55	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or non-profit institutional structures, radio studios, recording studios, schools, and television studios.
E³	72	75	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties of activities not included in A-D or F.
F	--	--	Exterior	Agriculture, airports, bus yards, emergency services, industrial logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	--	--	--	Undeveloped lands that are not permitted.

1 Either $L_{eq}(h)$ or L10 (h) (but not both) may be used on a project.

2 The $L_{eq}(h)$ and L10 (h) Activity Criteria values are for impact determination only, and are not design standards for noise abatement measure.

3 Includes undeveloped lands permitted for this Activity Criteria.

4 VDOT utilizes the $L_{eq}(h)$ designation.

TABLE 2
Fairfax County Parkway Improvements Project
TNM Validation

1	2	3	4	5
Receptor	Monitored Level	Modeled Level	Difference	Validated
M01	59.1	57.7	-1.4	Yes
M02	57.4	58.4	1.0	Yes
M03	63.1	61.8	-1.3	Yes
M04	59.1	56.9	-2.2	Yes
M05	68.7	70.1	1.4	Yes
M06	65.5	64.9	-0.6	Yes
M07	62.7	65.3	2.6	Yes
M08	60.9	59.4	-1.5	Yes
M09	66.8	65.7	-1.1	Yes
M10	67.7	67.8	0.1	Yes
M11	62.9	64.0	1.1	Yes
M12	63.6	64.4	0.8	Yes
M13	63.7	65.6	1.9	Yes
M14	60.4	60.9	0.5	Yes
M15	61.1	61.9	0.8	Yes
M16	61.9	61.7	-0.2	Yes
M17	58.9	58.2	-0.7	Yes
M18	58.0	59.3	1.3	Yes
M19	60.6	58.1	-2.5	Yes
M20	60.6	59.3	-1.3	Yes
M21	62.0	63.6	1.6	Yes
M22	62.8	64.8	2.0	Yes
M23	63.4	65.3	1.9	Yes
M24	68.9	67.2	-1.7	Yes
M25	51.6	53.8	2.2	Yes
M26	61.3	62.1	0.8	Yes
M27	61.2	61.3	0.1	Yes
M28	66.9	68.2	1.3	Yes
M29	64.9	67.3	2.4	Yes

TABLE 3
Fairfax County Parkway Improvements Project
Noise Impact Summary by CNE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
CNE	Site Representation	Worst-Case Existing 2018 Noise Level Range (dB(A))			No-Build 2046 Noise Level Range (dB(A))			Alternative 1A Build 2046 Noise Level Range (dB(A))			Alternative 2 Build 2046 Noise Level Range (dB(A))			Alternative 2D Build 2046 Noise Level Range (dB(A))		
		Min	Max	# Impacts	Min	Max	# Impacts	Min	Max	# Impacts	Min	Max	# Impacts	Min	Max	# Impacts
A	Five Residences	52	54	No Impacts	52	55	No Impacts	53	56	No Impacts	53	56	No Impacts	53	56	No Impacts
B	Seven Residences and One Church	33	58	No Impacts	34	59	No Impacts	35	60	No Impacts	35	60	No Impacts	35	60	No Impacts
C	Four Residences	60	67	Two Residences	61	68	Two Residences	62	69	Three Residences	62	69	Three Residences	62	69	Three Residences
D	Three Residences	50	60	No Impacts	51	61	No Impacts	52	62	No Impacts	52	62	No Impacts	52	62	No Impacts
E	Twenty-Seven Residences and One Daycare	44	64	No Impacts	45	65	No Impacts	46	65	No Impacts	46	65	No Impacts	46	65	No Impacts
F	Forty-Seven Residences, One Tennis Court (four grid units), and One Pool (four grid units)	49	65	No Impacts	50	66	One Residence	50	68	Two Residences	50	68	Two Residences	50	68	Two Residences
G	Eleven Residences	56	73	Four Residences	57	74	Five Residences	61	76	Five Residences	61	76	Five Residences	61	76	Five Residences
H	Three Residences	55	60	No Impacts	56	61	No Impacts	59	64	No Impacts	59	64	No Impacts	59	64	No Impacts
I	Fourteen Residences	56	71	Four Residences	56	72	Four Residences	58	74	Four Residences	58	74	Four Residences	58	74	Four Residences
J	Twenty-Four Residences	53	69	Five Residences	54	70	Five Residences	54	71	Eight Residences	54	71	Eight Residences	54	71	Eight Residences
K	Eight Residences	58	66	Two Residences	59	67	Two Residences	60	69	Two Residences	60	69	Two Residences	60	69	Two Residences
L	Seven Residences	55	66	One Residence	56	67	Two Residences	57	68	Two Residences	57	68	Two Residences	57	68	Two Residences
M	Eight Residences	55	61	No Impacts	56	62	No Impacts	57	63	No Impacts	57	63	No Impacts	57	63	No Impacts
N	Eighteen Residences	55	71	Four Residences	55	72	Four Residences	57	73	Four Residences	57	73	Four Residences	57	73	Four Residences
O	Sixteen Residences	47	71	Two Residences	48	72	Four Residences	50	71	Five Residences	50	71	Five Residences	50	71	Five Residences
P	Fourteen Residences	49	69	Three Residences	49	70	Three Residences	56	71	Four Residences	53	71	Three Residences	52	71	Three Residences
Q	Six Residences	51	59	No Impacts	52	60	No Impacts	52	61	No Impacts	51	60	No Impacts	50	60	No Impacts
R	Eleven Residences	52	63	No Impacts	53	64	No Impacts	54	65	No Impacts	54	65	No Impacts	54	65	No Impacts
S	One Residence	49	49	No Impacts	49	49	No Impacts	52	52	No Impacts	53	53	No Impacts	52	52	No Impacts
T	One Residence and One Daycare	59	62	No Impacts	60	63	No Impacts	63	64	No Impacts	63	64	No Impacts	63	64	No Impacts
U	One Residence, One Soccer Field (15 grid units), and One Baseball Field (nine grid units)	58	68	One Residence, One Soccer Field (two grid units), and One Baseball Field (one grid unit)	59	69	One Residence, One Soccer Field (three grid units), and One Baseball Field (one grid unit)	60	69	One Residence, One Soccer Field (three grid units), and One Baseball Field (one grid unit)	60	69	One Residence, One Soccer Field (three grid units), and One Baseball Field (one grid unit)	60	69	One Residence, One Soccer Field (three grid units), and One Baseball Field (one grid unit)
V	Eight Residences	56	73	Two Residences	57	74	Three Residences	59	74	Three Residences	59	74	Three Residences	59	74	Three Residences
W	Twenty-Five Residences	54	70	Six Residences	55	71	Six Residences	56	72	Ten Residences	56	72	Ten Residences	56	72	Ten Residences
X	Thirty-One Residences	56	70	Three Residences	58	71	Four Residences	58	71	Four Residences	58	71	Four Residences	58	71	Four Residences
Y	One Hundred Twenty-Nine Residences, One Playground, and One Trail (13 grid units)	48	73	Twenty-Five Residences and One Trail (four grid units)	48	73	Twenty-Five Residences and One Trail (four grid units)	48	74	Twenty-eight Residences, One Playground, and One Trail (six grid units)	48	74	Twenty-eight Residences, One Playground, and One Trail (six grid units)	48	74	Twenty-eight Residences, One Playground, and One Trail (six grid units)

Totals	429 Residences, One Church, Two Daycares, One Tennis Court (four grid units), One Pool (four grid units), One Soccer Field (15 grid units), One Baseball Field (nine grid units), One Playground, and One Trail (13 grid units)	33	73	64 Residences, One Soccer Field (three grid units), One Baseball Field (one grid unit), One Trail (six grid units)	34	74	69 Residences, One Soccer (three grid units) Field, One Baseball Field (one grid unit), One Trail (six grid units)	35	76	86 Residences, One Soccer (three grid units)Field, One Baseball Field (one grid unit), One playground, One Trail (six grid units)	35	76	85 Residences, One Soccer (three grid units)Field, One Baseball Field (one grid unit), One playground, One Trail (six grid units)	35	76	85 Residences, One Soccer (three grid units)Field, One Baseball Field (one grid unit), One playground, One Trail (six grid units)
--------	---	----	----	--	----	----	--	----	----	---	----	----	---	----	----	---

TABLE 4

*Fairfax County Parkway Improvements Project
Noise Abatement Acoustical Feasibility and Reasonableness Evaluation Summary*

Proposed and Existing Barrier Evaluations									
CNE	Barrier I.D.	Number of Benefited Receptor Units	Combined Noise Barrier Length (ft.)	Average Noise Barrier Height (ft.)	Square Footage (SF)	Net SF per Benefited Receptor	Barrier Cost	Feasible?	Reasonable?
C	Barrier C	3	1,000	10.00	9,997	3,332	\$419,874	Yes	No
F	Barrier F2 (Existing)	10	2,138	11.17	23,888	2,389	\$1,003,296	Yes	No
	Barrier F2 (Replacement)	27	2,150	15.00	32,252	1,195	\$1,354,584	Yes	Yes
	Additional SF	17			8,364	492			
G	Barrier G	5	1,300	11.54	14,999	3,000	\$629,958	Yes	No
I	Barrier System I	7	1,501	15.50	22,512	3,216	\$945,504	Yes	No
J	Barrier J	16	1,600	20.75	33,206	2,075	\$1,394,652	Yes	No
K	Barrier K	2	500	13.00	6,497	3,249	\$272,874	Yes	No
L	Barrier L	2	1,000	11.00	11,005	5,503	\$462,210	Yes	No
N	Barrier N-1	2	901	15.00	13,508	6,754	\$567,336	Yes	No
	Barrier N-2	1	400	13.75	5,499	5,499	\$230,958	Yes	No
	Barrier N-3	1	400	10.00	4,001	4,001	\$168,042	Yes	No
	Barrier N-4	1	600	16.67	10,007	10,007	\$420,294	Yes	No
O	Barrier O (Alternative 1A)	6	1,800	17.22	31,000	5,167	\$1,302,000	Yes	No
	Barrier O (Alternative 2)	6	1,900	15.00	28,501	4,750	\$1,197,042	Yes	No
	Barrier O (Alternative 2D)	6	1,800	18.06	32,502	5,417	\$1,365,084	Yes	No
P	Barrier (Alternative 1A)	9	1,850	19.32	35,756	3,973	\$1,501,752	Yes	No
	Barrier (Alternative 2)	4	1,700	13.82	23,495	5,874	\$986,790	Yes	No
	Barrier (Alternative 2D)	3	1,600	13.12	21,000	7,000	\$882,000	Yes	No
U	Barrier U	11	1,167	14.57	17,005	1,546	\$714,210	Yes	Yes
V	Barrier System V	4	1,600	13.67	21,991	5,498	\$923,622	Yes	No
W	Barrier W	21	2,100	15.83	33,256	1,584	\$1,396,752	Yes	Yes
X	Barrier X	13	1,650	12.55	20,706	1,593	\$869,652	Yes	Yes
Y	Barrier Y	108	3,000	15.00	44,997	417	\$1,889,874	Yes	Yes

TABLE 5

*Fairfax County Parkway Improvements Project
Distance from Centerline of Proposed Design
CNE Specific Noise Contours*

**Design Year (2046)
Noise Level Contours
66 dB(A)**

CNE	Alternative	Distance (feet)
A	All	N/A
B	All	173
C	All	210-280
D	All	141
E	All	80-134
F	All	65-306
G	All	218-365
H	All	351
I	All	377
J	All	58-385
K	All	55-229
L	All	283
M	All	187
N	All	128-376
O	Alt 1A	40-414
	Alt 2	
	Alt 2D	
P	Alt 1A	25-361
	Alt 2	25-312
	Alt 2D	25-346
Q	Alt 1A	206
	Alt 2	
	Alt 2D	
R	Alt 1A	30-218
	Alt 2	
	Alt 2D	
S	Alt 1A	N/A
	Alt 2	
	Alt 2D	
T	All	116
U	All	274
V	All	316
W	All	371-401
X	All	329-382
Y	All	145-396