Delaware River Joint Toll Bridge Commission

Scudder Falls Bridge Replacement Project Final Design

Township of Lower Makefield, Bucks County, Pennsylvania
Township of Ewing, Mercer County, New Jersey

Addendum:
Final Design Noise Analysis Report
(Post-Meeting Supplemental Field Work and Analysis)

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Prepared by:

Michael Baker International, Inc.
300 American Metro Boulevard, Suite 154
Hamilton, NJ 08619

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1. OVERALL PROJECT BACKGROUND

The Delaware River Joint Toll Bridge Commission (DRJTBC) proposes improvements to the Scudder Falls Bridge over the Delaware River and 4.4 miles of the adjoining I-95 mainline to alleviate traffic congestion and improve operational and safety conditions. The I-95/Scudder Falls Bridge, which was constructed in 1959, carries Interstate 95 (I-95) over the Delaware River, between Lower Makefield Township in Bucks County, Pennsylvania, and Ewing Township, a suburb of Trenton, in Mercer County, New Jersey as shown in Figure 1.

Figure 1: Aerial View of the Existing Scudder Falls Bridge

(LOWER SIDE IS NEW JERSEY, UPPER SIDE IS PENNSYLVANIA)

2. SUPPLEMENTAL REPORT INTRODUCTION

This draft report provides a supplemental analysis of the noise measurements performed in Noise Sensitive Areas (NSA) 5, 6 and 7 after the December 3, 2015 public meeting in response to the public involvement process. The overall project limits are shown in Figure 2. The NSA's for the entire project are shown in Figure 3.

It also provides the results of predicted future sound levels at NSA 5, which was not considered for noise abatement in the original analysis performed by Gannett Fleming in 2007 nor in the 2015 final design analysis performed by Michael Baker International, Inc. because there were no predicted noise impacts in NSA 5 according to PennDOT Noise Policy as per Publication 24 or the adapted DRJTBC criteria for this project.

3. SUPPLEMENTAL NOISE STUDY AREAS

The supplemental measurement program and analysis was performed for the following three (3) NSA groups as described below:

- **NSA 3 and 6:** Specifically, in the NSA 6 section of this barrier set, the residences located along the north side of Quarry Road in Pennsylvania.

- **NSA 5:** The residences north of I-95 in or near Makefield Brook I and II along Brentwood Road, Wheatsheaf Road, Quarry Road and Ashbourne Drive in Pennsylvania.

- **NSA 7:** Longshore Estates subdivision residences along Pownal Drive and Bartlett Court located immediately north of the PennDOT Rest Area in Pennsylvania.

Figure 2: Scudder Falls Bridge Replacement Project Limits

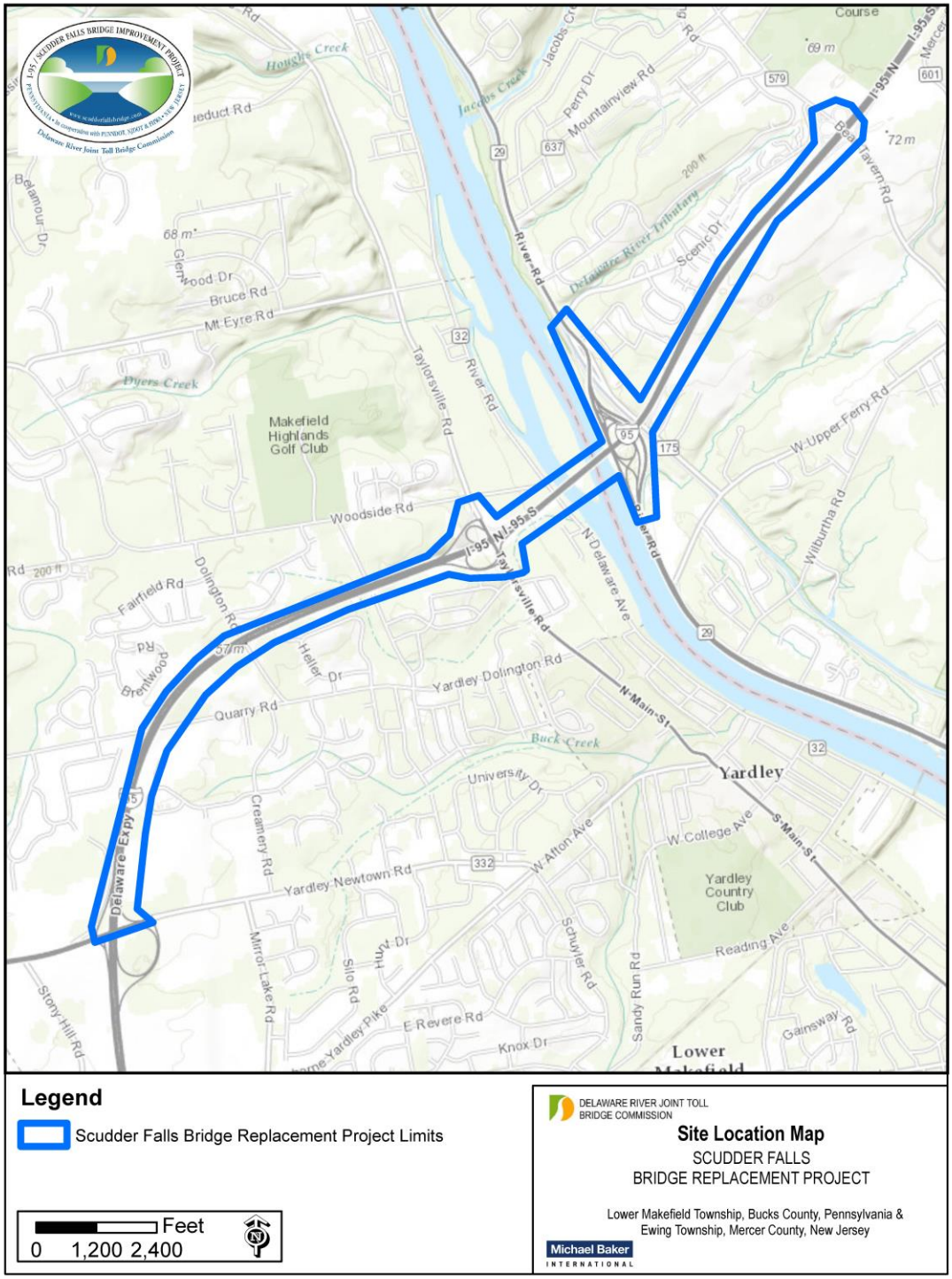
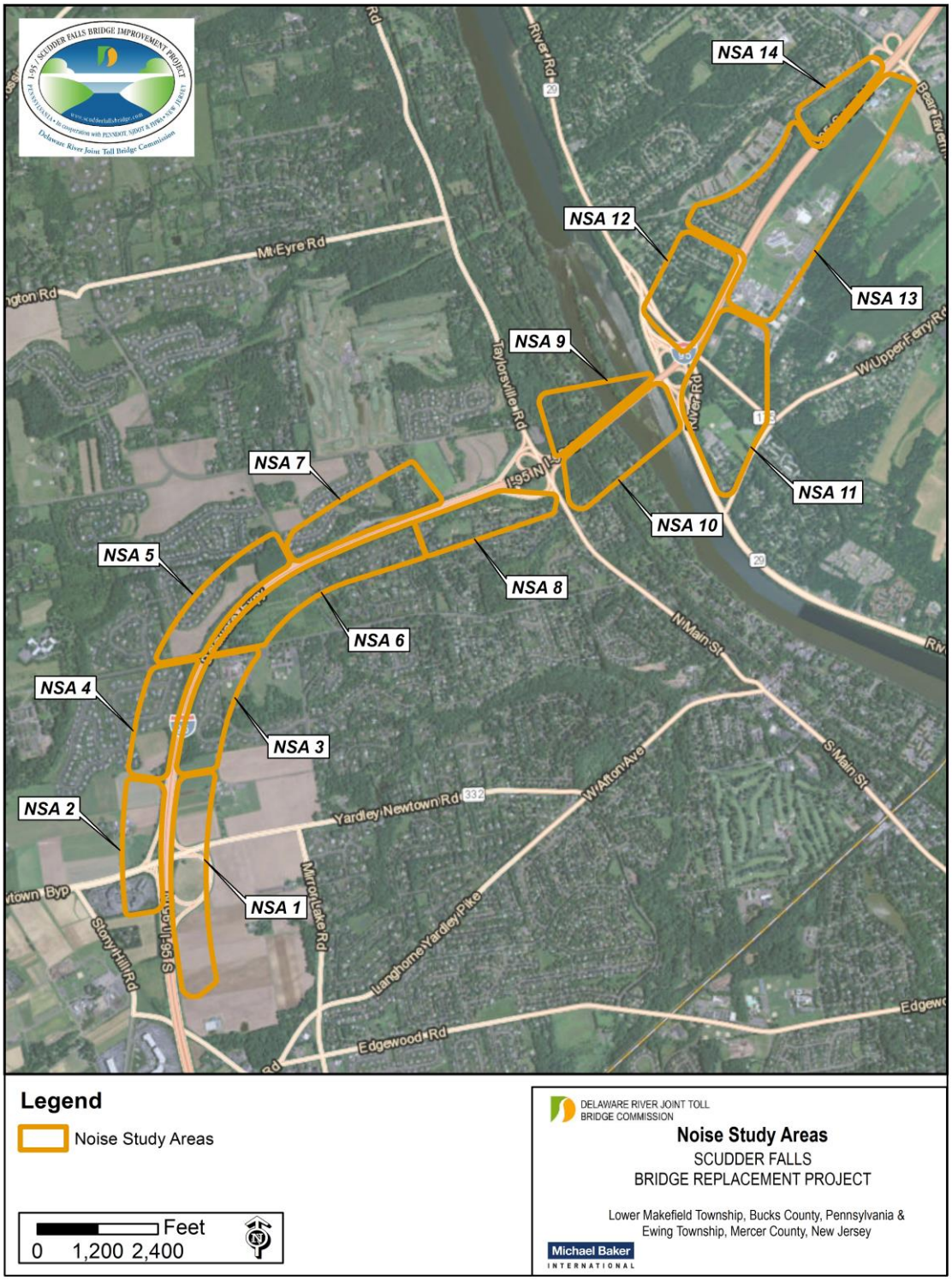


Figure 3: Project Area NSAs



4. NOISE MEASUREMENT PROGRAM

Long-term noise monitoring sessions were conducted at 1371 Brentwood Road and at 1751 Ashbourne Drive. The previous long-term site in the initial study was at 1373 Brentwood Road. Access was not granted to redo the study at the same location and the adjoining parcel was instead selected with the owner's approval. The long-term measurement on Brentwood Road was conducted from January 11-13, 2016. The long-term measurement on Ashbourne Drive was conducted from January 13-14, 2016. Figure 4 shows the long-term measurement site locations as well as the short-term peak and off-peak measurement locations.

The long-term noise study indicated the "noisiest" hour of the day was measured to be during the 5:00-6:00 PM period at the Brentwood Road Site. At the Ashbourne Drive site, the "noisiest" hour of the day was measured to be during the 6:00-7:00 AM period.

Short term measurements during peak and off-peak traffic volume periods were performed at the following locations from January 12-14, 2016 to augment the long-term measurements:

1751 Ashbourne Drive	1385 Brentwood Road	1423 Wheatsheaf Road	1505 Pownal Road
1660 Quarry Road	1596 Quarry Road	1449 Bartlett Road	1746 Quarry Road

Measurements were taken at various times of the day, in addition to the typical rush hour periods, because of the potential traffic queuing conditions.

5. NOISE MEASUREMENT PARAMETERS

Short-term measurements of 15 and 30 minutes were performed throughout the measurement period (January 12-14, 2016) during the peak traffic and off-peak traffic periods. Additionally, a long term monitor collected continuous data at two sites: 1371 Brentwood Road (January 11-13, 2016) and 1751 Ashbourne Drive (January 13-14, 2016).

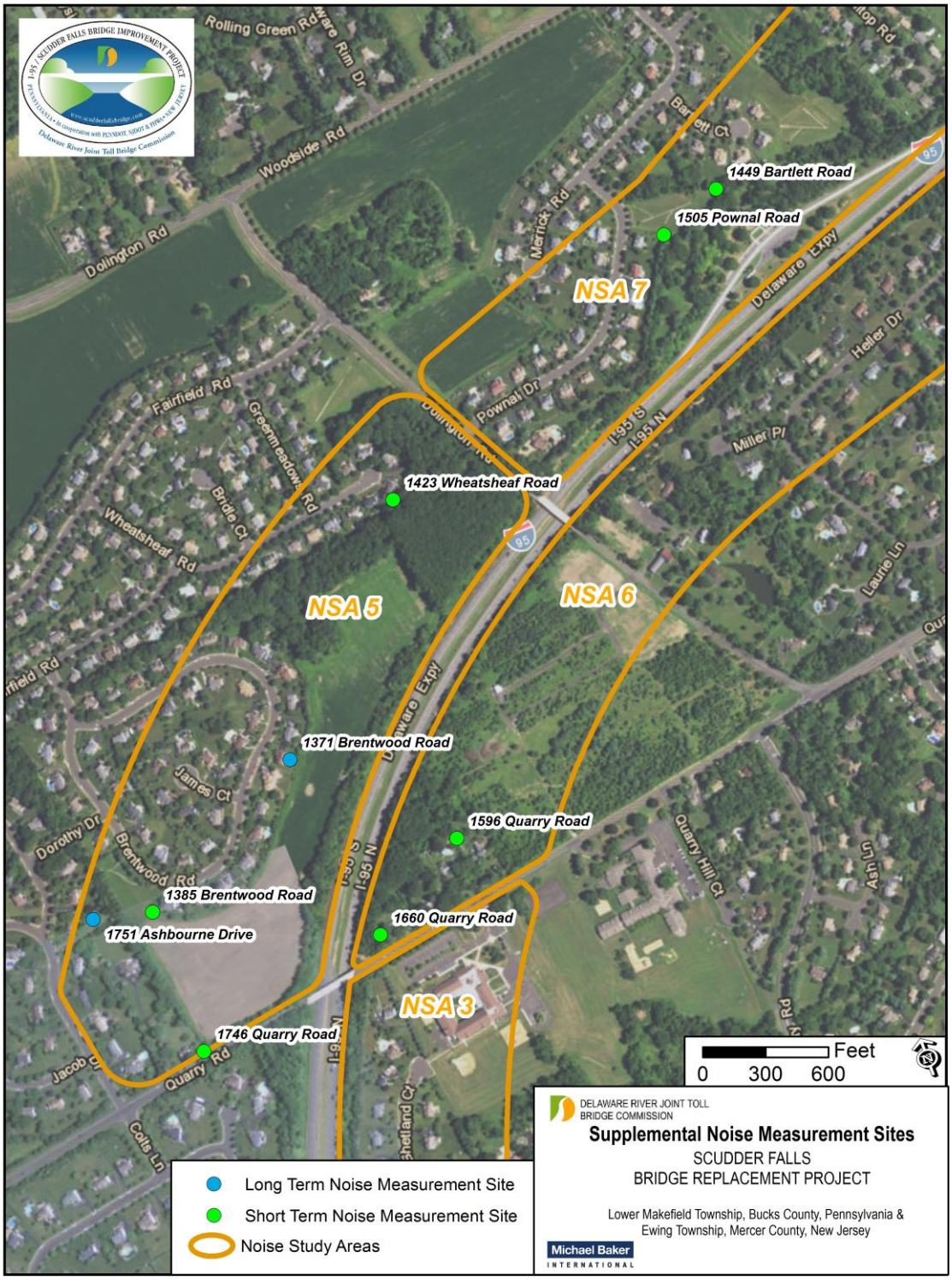
Meteorological conditions were noted. The temperatures ranged from the 20's to the 40's (F^o) during the day and were lower at night. Short-term measurements were not performed during windy periods. Aircraft, helicopters, sirens, wind gusts and birds were noted but not removed from the long-term readings to show the worst-case levels. As a result, highway traffic sound level contributions would be less than the total values shown in the report.

6. NOISE MODELING PARAMETERS FOR NSA 5

To predict worst-case Design Year noise levels for evaluation of noise abatement options, the FHWA's Traffic Noise Model (FHWA TNM), Version 2.5, was used. The FHWA TNM predicts noise levels at specific sites based on traffic volume, roadway design and topographic data. Traffic data used for prediction of the Design Year 2030 Build Alternative noise levels were applied. The Leq, the Level Equivalent (Averaged) Sound Level over the peak noise hour is the only approved PennDOT criteria for impact determination.

To provide a worst-case sound level, the NSA was modeled with no trees and the land in this NSA was modeled as 100% hard soil (higher reflectivity).

Figure 4: Supplemental Long Term and Short Term Noise Measurement Sites



7. EVALUATION OF THE SUPPLEMENTAL NOISE MEASURMENTS AND NSA 5 MODELING WITH TNM 2.5

7.1 SUPPLEMENTAL NOISE ANALYSIS

The graphic results for the Brentwood and Ashbourne Sites are shown in Figures 5 and 6, respectively. The tabular results for each site are shown in Tables 1 and 2, respectively.

Existing short-term measured noise levels during the peak AM and PM periods are summarized in Table 3. Each location was validated with simultaneous traffic counts. The validations were within the approved PennDOT/FHWA ±3 dBA range.

The result of the measurement program show that the sites that were predicted to be impacted in the previous reports are still impacted and the proposed noise barriers will benefit the impacted NSAs as per the DRJTBC criteria. The sites that were predicted to not be impacted in the previous reports were measured to be below the impact criteria level.

7.2 NSA 5 MODELING

Figure 7 shows the modeling locations of the nearest noise-sensitive receptors in NSA 5 and those included in the supplemental noise monitoring program located in NSA 5. These sites were modeled to determine if noise impacts are predicted and if abatement consideration is required. The PennDOT impact criteria is 67 dBA Leq with the approach impact criteria being 66 dBA. The greatest predicted design year peak traffic period sound level with the build alternative is 61 dBA. The results are shown in Table 4. Please note that there are no substantial increase criteria impacts (10 or more dBA over the existing condition) as per the recent noise report.

As a result, the 66 dBA noise impact criteria is not met and abatement is not warranted. All other residences in the NSA are located farther away and will have lower sound levels from I-95 traffic. Therefore, they too are not impacted.

Figure 5: Long Term Site 1 – 1371 Brentwood Road

Figure 6: Long Term Site 2 – 1751 Ashbourne Road

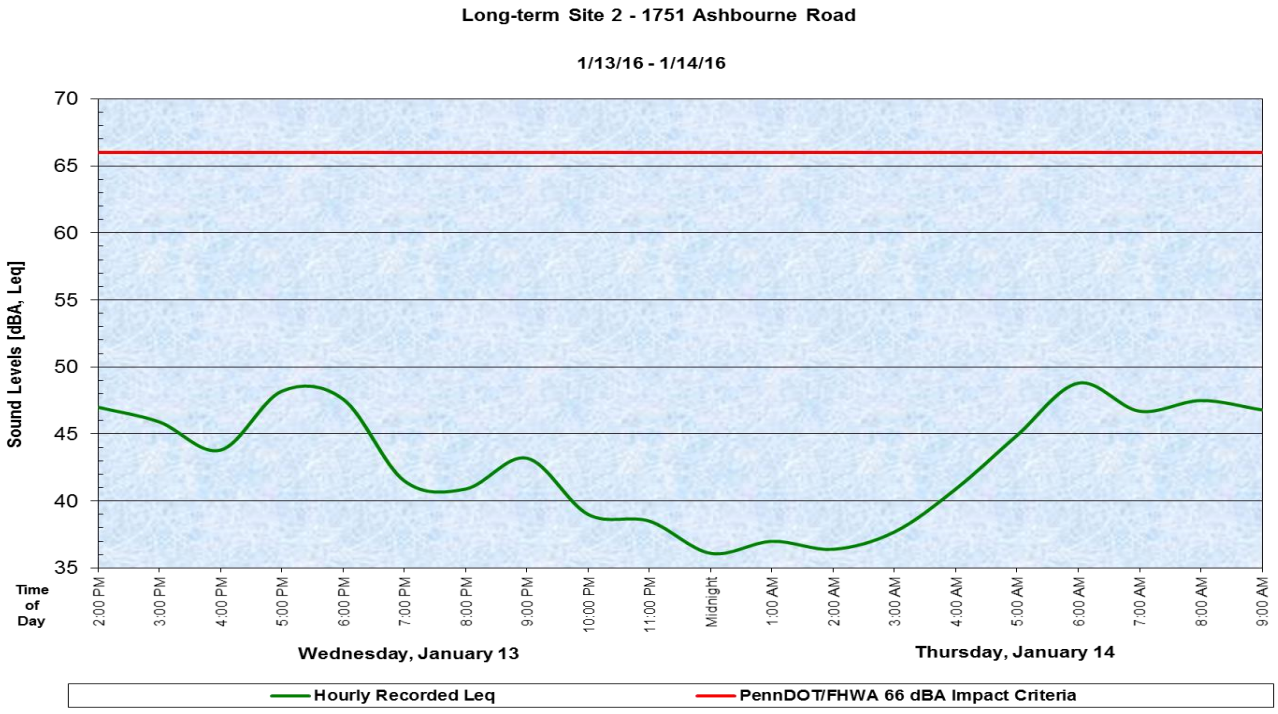


Table 1: Existing Measured Long Term Noise Levels (Leq dBA) - 1371 Brentwood Road

Hourly Time Period	Date	Measured Sound Level	Hourly Time Period	Date	Measured Sound Level	Hourly Time Period	Date	Measured Sound Level
2 PM	1-11-16	51.9	6 AM	1-12-16	56.8	10 PM	1-12-16	51.0
3 PM	1-11-16	51.3	7 AM	1-12-16	56.9	11 PM	1-12-16	50.2
4 PM	1-11-16	51.2	8 AM	1-12-16	53.9	Midnight	1-13-16	48.4
5 PM	1-11-16	51.7	9 AM	1-12-16	55.3	1 AM	1-13-16	45.5
6 PM	1-11-16	50.5	10 AM	1-12-16	57.8	2 AM	1-13-16	46.6
7 PM	1-11-16	49.4	11 AM	1-12-16	58.6	3 AM	1-13-16	46.7
8 PM	1-11-16	49.5	Noon	1-12-16	58.5	4 AM	1-13-16	48.4
9 PM	1-11-16	50.8	1 PM	1-12-16	58.6	5 AM	1-13-16	51.2
10 PM	1-11-16	52.0	2 PM	1-12-16	59.4	6 AM	1-13-16	54.0
11 PM	1-11-16	52.2	3 PM	1-12-16	57.7	7 AM	1-13-16	55.3
Midnight	1-12-16	52.1	4 PM	1-12-16	57.0	8 AM	1-13-16	53.8
1 AM	1-12-16	51.1	5 PM	1-12-16	61.0	9 AM	1-13-16	53.0
2 AM	1-12-16	50.8	6 PM	1-12-16	60.6	10 AM	1-13-16	51.5
3 AM	1-12-16	51.6	7 PM	1-12-16	57.8	11 AM	1-13-16	50.8
4 AM	1-12-16	53.0	8 PM	1-12-16	52.0	Noon	1-13-16	52.2
5 AM	1-12-16	55.9	9 PM	1-12-16	51.0	1 PM	1-13-16	49.0

Shaded areas represent the 5 highest measured peak hours during the monitoring period.

67 dBA is the PennDOT/FHWA impact criteria and 66 dBA is the approach criteria. None of the measured Leq's meet or exceed this criteria.

Table 2: Existing Measured Long-Term Noise Levels (Leq dBA) – 1751 Ashbourne Road

Hourly Time Period	Date	Measured Sound Level	Hourly Time Period	Date	Measured Sound Level	Hourly Time Period	Date	Measured Sound Level
2 PM	1-13-16	47	9 PM	1-13-16	43.2	4 AM	1-14-16	40.9
3 PM	1-13-16	45.9	10 PM	1-13-16	39.0	5 AM	1-14-16	44.9
4 PM	1-13-16	43.8	11 PM	1-13-16	38.5	6 AM	1-14-16	48.8
5 PM	1-13-16	48.2	Midnight	1-14-16	36.1	7 AM	1-14-16	46.7
6 PM	1-13-16	47.6	1 AM	1-14-16	37.0	8 AM	1-14-16	47.5
7 PM	1-13-16	41.5	2 AM	1-14-16	36.4	9 AM	1-14-16	46.8
8 PM	1-13-16	40.9	3 AM	1-14-16	37.7	-	-	-

Shaded areas represent the 5 highest measured peak hours during the monitoring period

67 dBA is the PennDOT/FHWA impact criteria and 66 dBA is the approach criteria. None of the measured Leq's meet or exceed this criteria.

Table 3: Existing Peak and Off-Peak Traffic Measured and Modeled Short-Term Noise Levels (dBA)

Site	Location	Measurement Time Period(s)	AM Peak Traffic Sound Level (6-9AM)	PM Peak Traffic Sound Level (4-8PM)
1	1751 Ashbourne Drive	Short-term Peak, then 20 Hours	49	48
2	1371 Brentwood Road	48 Hours	57	61
3	1385 Brentwood Road	Short-term Peak and Off-Peak	50	51
4	1423 Wheatsheaf Road	Short-term Peak and Off-Peak	53	60
5	1505 Pownal Road	Short-term Peak and Off-Peak	53	53
6	1449 Bartlett Road	Short-term Peak and Off-Peak	53	54
7	1746 Quarry Road	Short-term Peak and Off-Peak	57	61
8	1660 Quarry Road	Short-term Peak	**66***	**66***
9	1596 Quarry Road	Short-term Peak	55	59

Numbers are rounded off.

67 dBA is the PennDOT/FHWA impact criteria and 66 dBA is the approach criteria. BOLD values indicate a sound level that meets or exceeds the 66 dBA approach impact criteria.

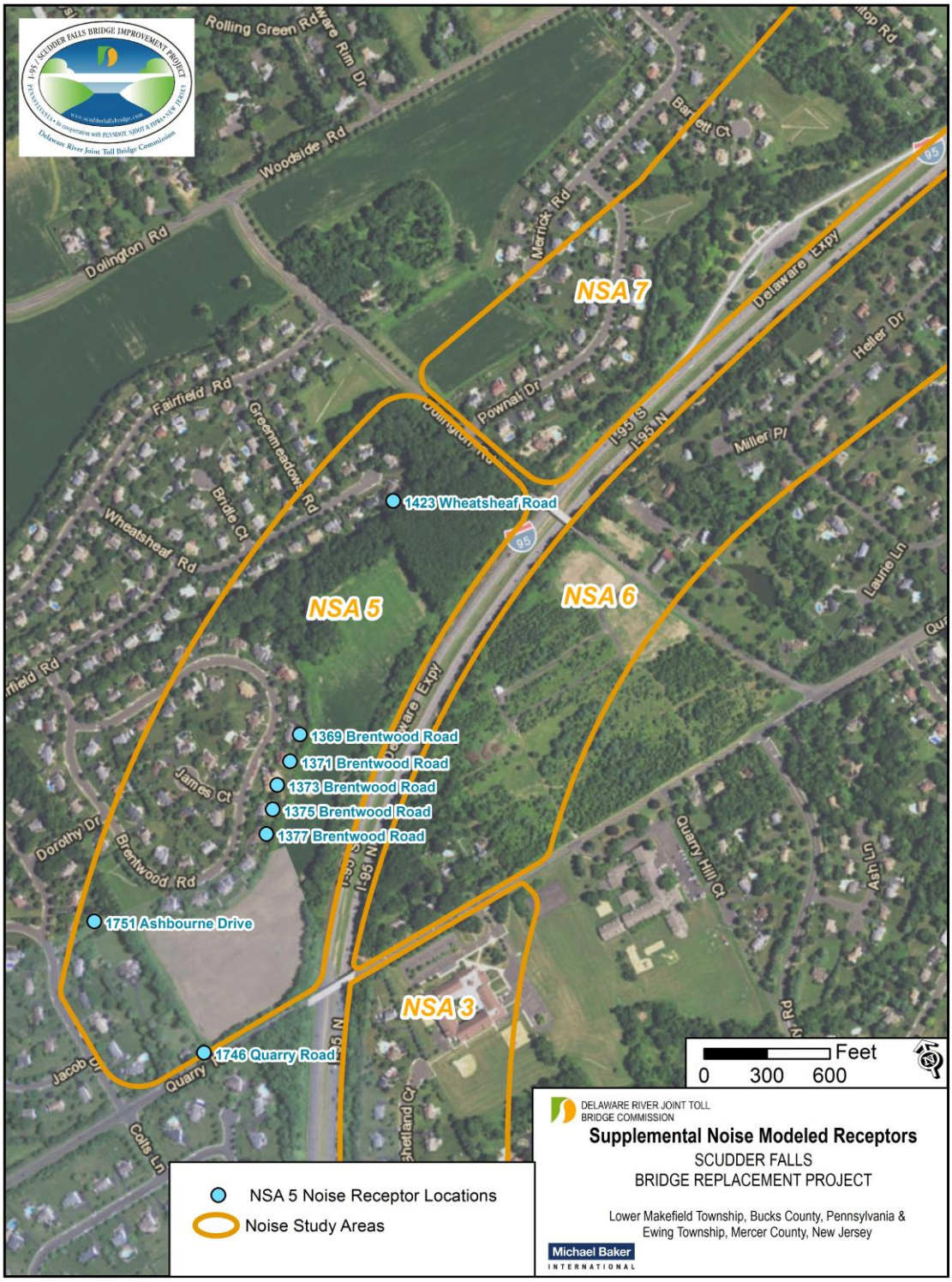
*1660 Quarry Road site was predicted to be impacted in the noise report. This site is predicted to be benefited by the current proposed sound barrier design.

Table 4: NSA 5 Design Year Modeled Sound Levels (dBA)

Receptor Site Location	Design Year Modeled Leq	Impact Criteria?	Impact?
1379 Brentwood Road	61	66	No
1377 Brentwood Road	59	66	No
1375 Brentwood Road	61	66	No
1373 Brentwood Road	58	66	No
1371 Brentwood Road	59	66	No
1369 Brentwood Road	60	66	No
1746 Quarry Road	61*	66	No
1751 Ashbourne Drive	55	66	No
1423 Wheatsheaf Road	60	66	No

*Quarry Road total sound level also influenced by Quarry Road traffic. The I-95 sound level contribution to this site is 60 dBA.

Figure 7: Supplemental Noise Modeling Locations - NSA 5



8. CONCLUSIONS

The supplemental analysis was performed as a result of the public involvement process. There were additional long-term and short-term peak and off-peak sound level measurements collected in NSAs 5, 6, and 7 with regards to potential noise abatement. Additionally, NSA 5 was computer modeled to show the predicted future peak hour highway traffic sound levels. (In the previous report, NSA 5 was not carried forward into the final design study because impacts were not predicted.)

The result of the measurement program and additional modeling show that the sites that were predicted to be impacted in the previous reports are still impacted (within NSA 6 near Quarry Road) and the proposed noise barriers will benefit the impacted NSAs as per the DRJTBC criteria. The sites that were predicted to not be impacted in the previous reports were measured to be below the impact criteria level (within NSA 5 and NSA 7 behind the Rest Area).

As a result of these measurements and modeling, no further design modifications to the proposed noise barriers are recommended.