NOISE ANALYSIS REPORT

INTERSTATE 65 ADDED TRAVEL LANES - FROM SR 32 TO SR 47
BOONE COUNTY, INDIANA

DES. NO. 1802967

Prepared for:

INDIANA DEPARTMENT OF TRANSPORTATION

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Executive Summary

This analysis was developed to determine the traffic noise levels and traffic noise impacts associated with the proposed construction of additional travel lanes along Interstate 65 (I-65) from State Road (SR) 32 to SR 47 and the reconfiguration of the I-65 and US 52/Lafayette Avenue interchange, north of the City of Lebanon, Boone County. The proposed project occurs along the existing I-65 roadway and extends east and west beyond the existing right-of-way on new alignment for the proposed reconfiguration of the I-65 and US 52/Lafayette Avenue interchange. The proposed project begins approximately 3,500 feet north of the SR 32 overpass and continues north to approximately 2,000 feet north of the SR 47 northern ramp terminus. The total length of the project is approximately 6 miles.

The proposed project is considered a Type I Project as it involves the addition of through lanes and the reconfiguration of interchange ramps. This noise analysis was prepared in accordance with the Federal Highway Administration's (FHWA's) Highway *Traffic Noise: Analysis and Abatement Guidance (December 2011),* and the Indiana Department of Transportation's (INDOT's) *Traffic Noise Analysis Procedure (July 1, 2017)*.

The existing year (2020) noise levels, as well as the design year (2043) noise levels were predicted using FHWA'S approved noise predicting program, *Traffic Noise Model, Version 2.5 (TNM 2.5)*. To validate the model, short-term (15 minute) field measurements were taken at 10 sites within the analysis area; all applicable sites were validated.

A total of 308 receptors were identified within the noise analysis area, representing two different noise abatement criteria (NAC) land use activity categories, Activity Categories B and C. Of the 308 receptors analyzed, 304 are classified as single family residential units (Activity Category B), two receptors are associated with the recreational amenities of Kise Estate Apartments (Activity Category C), and two receptors are associated with Trophy Club Golf Course (Activity Category C). The analysis area also includes agricultural, industrial, and undeveloped land that, at the time of this analysis, was not permitted for future development (i.e., new subdivision or commercial building that has been platted). These areas are considered to be Activity Category F and Activity Category G land use types for which there is no NAC criteria. While receptors were not placed in these areas, an approximate contour representing the area likely to experience noise exposure levels of 66 dBA has been defined (Appendix A, Page A-8 to A-21). This will assist City planning officials responsible for the permitting of future development in ensuring incompatible land use types do not encroach upon this contour.

The results of this analysis identified 72 receptors as approaching/exceeding the NAC in the design year (2043). Six noise barrier locations were modeled within the analysis area. Based on the studies completed to date, it has been determined that noise abatement is likely, but not guaranteed, at one of these locations; east of I-65 northbound lanes and south of the Lafayette Avenue exit ramp. A re-evaluation of the noise analysis will occur during final design. If during final design it is determined that conditions have changed such that noise abatement is not feasible and reasonable, the abatement measures might not be provided. The final decision on the installation of noise abatement measures will be made after completion of the project's final design and the public involvement process. The views of the benefited property owners will be considered in determining the reasonableness of noise abatement measures for this project.

1.0 Introduction

The INDOT is advancing a federal-aid project to construct additional travel lanes along I-65 between SR 32 and SR 47 and reconfigure the I-65 and US 52/Lafayette Avenue interchange, north of the City of Lebanon, Boone County (Des. No. 1802967). The proposed project begins approximately 3,500 feet north of the SR 32 overpass and continues north to approximately 2,000 feet north of the SR 47 northern ramp terminus. The total length of the project is approximately 6 miles.

1.1 Purpose of Analysis

The purpose of this noise analysis is to assess existing and future traffic noise levels associated with I-65 Added Travel Lanes project, identify impacted receptors within common noise environments (CNEs), and evaluate potential abatement solutions for feasibility and reasonableness if impacted receptors are present. The analysis was performed in accordance with the current INDOT's *Traffic Noise Analysis Procedure (July 1, 2017)*.

1.2 Project Description

The proposed project area is located near Lebanon, in Central and Washington Townships, Boone County, Indiana. Specifically, the project is located in Sections 3, 10, 15, 14, 23, 26, and 35, Township 19 North, Range 1 West and Section 34, Township 20 North, Range 1 West of the Thorntown, Hazelrigg, and Lebanon USGS 7.5 Minute Quadrangle Maps. (Appendix A)

1.2.1 Existing Road Conditions

This section of I-65 is currently a four lane *Interstate*. The existing typical cross section of I-65 consists of two 12-foot travel lanes bordered by a 10-foot paved outside shoulder and a 4-foot paved inside shoulder in each direction. An approximately 50-foot-wide grassed median separates the northbound lanes and southbound lanes for a majority of the project area. A six lane section of I-65 is present at the southern extent of the project corridor. The surrounding land use is primarily residential and agricultural uses, with some scattered industrial and maintenance facilities.

1.2.2 Proposed Road Improvements

The current project proposes the addition of travel lanes (one in each direction) along I-65 within the roadway median. A pavement design will be prepared to determine the pavement treatment for the mainline added travel lanes, the existing travel lanes, and shoulders. The Prairie Creek Bridge (I65-140-5571B) will be widened to accommodate the added travel lanes in the median. Clearing of brush and small trees may be necessary along Prairie Creek, within the existing right-of-way limits, to complete the proposed widening. An alternatives analysis was completed for the US 52/Lafayette Avenue interchange. The preferred alternative, which is utilized within this analysis, includes a right-hand flyover ramp for the Lafayette Avenue exit (Appendix A, Page A-6).

2.0 Existing Noise Environments

In accordance with the INDOT *Traffic Noise Analysis Procedure (July 1, 2017)*, potential receptors were identified within the analysis area, which is roughly defined as the area 500 feet off the proposed edge of pavement. Due to the presence of impacted receptors at 500 feet along I-65, the analysis area was extended to 800 feet along I-65. A total of 308 receptors were identified within the analysis area and evaluated as part of this noise impact analysis. Of the 308 receptors identified and analyzed, 304 were classified as Activity Category B land uses and four were classified as Activity Category C land uses. **Section 2.1** below provides a more comprehensive description of each modeled receptor and its associated activity category.

2.1 Common Noise Environments

The overall land use within the analysis area is primarily residential and agricultural uses, with some scattered industrial and maintenance facilities. The analysis area defined for this project is divided into eleven Common Noise Environments (CNEs) and discussed further below (Appendix A, Page A-8 to A-21). **Table 2-1** identifies the composition of receptors within each CNE.

TABLE 2-1 - RECEPTOR COMPOSITION WITHIN CNE'S

CNE	Single Family Res.	Rec. Facilities (ERUs)	Total DU / ERU
CNE 1	0	0	0
CNE 2	146[3]	0	146
CNE 3	137	25	162
CNE 4	4	0	4
CNE 5	4	0	4
CNE 6	2	2	4
CNE 7	5	0	5
CNE 8	2	0	2
CNE 9	5	0	5
CNE 10	0	0	0
CNE 11	1	0	1
Total DUs[1]	*306*		***333***
Total ERUs[2]		*27*	

1 – DU = dwelling unit. Each single family residence or business with an exterior use is considered to represent one DU. One apartment would represent 1 DU.

2 – ERU =equivalent residential unit. Special use lands, such as recreational facilities, require a conversion to ERUs. This conversion is accomplished using an algorithm that factors usage, area of resource within the noise analysis area and seasonal / daily availability.

3 – Two of the Single Family Residences within CNE were identified as duplexes and therefore counted as two DUs each.

2.1.1 Common Noise Environment 1

CNE 1 is comprised of agricultural land uses west of I-65 southbound. The surrounding topography is generally flat with elevations ranging between 918 to 927 feet above MSL. The main traffic noise source for this CNE is I-65.

2.1.2 Common Noise Environment 2

CNE 2 is comprised of agricultural land uses, single family residences, and two duplex residences east of I-65 northbound. Recent development of a residential neighborhood has begun east of I-65 northbound, south of the I-65 to Lafayette Avenue exit ramp. Residential receptors have been placed based upon the established lots. It is anticipated that all of the lots will be sold by December 2021. The surrounding topography is generally flat with general elevations of 923 to 928 feet above mean sea level (MSL). The main traffic noise source for this CNE is I-65. A noise barrier is currently located along the east side of I-65 northbound lanes within the southern portion of CNE 2.

2.1.3 Common Noise Environment 3

CNE 3 is comprised primarily of single family residences and residential units in Kise Estate Apartments and Eden Garden Homes along Lafayette Avenue, east of I-65 northbound. The surrounding topography is generally flat with general elevations of 923 to 930 feet above MSL. The main traffic noise sources for this CNE are I-65 and Lafayette Avenue.

Within Kise Estate Apartments are two recreational amenities reserved for the residents, including a playground and basketball court. These recreational areas are modeled as Activity Category C receptors. Since these amenities do not contain any dwelling units, the use of an algorithm to convert usage data into an appropriate number of

receptors, or equivalent residential units (ERUs), was required. The algorithm used to determine the appropriate number of ERUs to be applied to the recreational facilities within Kise Estate Apartments is shown below.

The standard INDOT algorithm for converting special use lands into ERUs is as follows:

$$\frac{\text{Daily No. of Users}}{\text{2.52 people on average per household}} \times \text{Percentage of property within 500 ft.} = \text{Number of Receptors (Rounded Up)}$$

Since the recreational facilities associated with Kise Estate Apartments are restricted to residents of the complex, the total number of apartments was utilized as the number of daily users. In addition, other factors added to the algorithm included the average available daylight per day, and the average months over the course of a year the facilities are likely to be used (i.e., spring, summer and fall). The total ERU's determined to be appropriate for modeling purposes was 25. Two receptors, R254 and R255, were assigned 15 and 10 ERUs respectively to represent these recreational facilities. The algorithm below was utilized to determine the appropriate ERUs.

$$\frac{144 \text{ (total units)}}{2.52} \times \frac{0.15 \text{ ac. (within 500 ft.)}}{0.15 \text{ ac. (total size)}} \times \frac{\boxed{\text{Avg. Daylight / Day}}}{24 \text{ hrs./day}} \times \frac{\boxed{\text{Avg. Months of Usability}}}{12 \text{ mo./yr.}} = \textbf{25 Total ERUs}$$

2.1.4 Common Noise Environment 4

CNE 4 is comprised of agricultural land uses, scattered single family residences, and maintenance and industrial facilities, west of I-65 southbound and the US 52 interchange. The surrounding topography is generally flat with elevations ranging between 910 to 926 feet above MSL. The main traffic noise sources for this CNE are I-65 and US 52.

2.1.5 Common Noise Environment 5

CNE 5 is comprised of agricultural land uses, with four single family residences, east of I-65 southbound and the US 52 interchange. The surrounding topography is generally flat with elevations ranging between 910 to 926 feet above MSL. The main traffic noise sources for this CNE are I-65 and the I-65 to US 52 exit ramp.

2.1.6 Common Noise Environment 6

CNE 6 is comprised of agricultural land uses, scattered single family residences, and one recreational facility, the Trophy Club Golf Course, west of I-65 southbound. The surrounding topography is generally flat with general elevations of 877 to 920 feet above MSL. The main traffic noise source for this CNE is I-65.

Within the Trophy Club Golf Course are two recreational receptors, representing varying distances from I-65. These recreational areas are modeled as Activity Category C receptors. Since these amenities do not contain any dwelling units, the use of an algorithm to convert usage data into an appropriate number of receptors, or ERUs, was required.

In order to determine the approximate number of daily users, the Trophy Club Golf Course was contacted on October 31, 2019. According to the Trophy Club Golf Course, there are approximately 25,000 users per year. Utilizing the assumption of 9 months of usage each year, the average daily number of users was calculated to be 91.3. In addition to the standard INDOT algorithm, the algorithm utilized included the average available daylight per day. Total ERU's determined to be appropriate for modeling purposes for Trophy Club Golf Course was 2. Two

receptors, R301 and R302, were assigned 1 ERU each to represent this recreational facility. The algorithm below was utilized to determine the appropriate ERUs.

$$\frac{\text{91.3 (avg. daily users)}}{\text{2.52}} \times \frac{\text{23 ac. (within 800 ft.)}}{\text{210 ac. (total size)}} \times \frac{\text{14 hrs. (Avg. Daylight / Day)}}{\text{24 hrs./day}} = \textbf{2 Total ERUs}$$

2.1.7 Common Noise Environment 7

CNE 7 is comprised of agricultural land uses and scattered single family residences east of I-65 northbound. The surrounding topography is generally flat with general elevations of 877 to 920 feet above MSL. The main traffic noise source for this CNE is I-65.

2.1.8 Common Noise Environment 8

CNE 8 is comprised of single family residences and agricultural land uses along CR 300 N, west of I-65 southbound. The surrounding topography is generally flat with general elevations of 917 to 929 feet above MSL. The main traffic noise sources for this CNE are I-65 and CR 300 N.

2.1.9 Common Noise Environment 9

CNE 9 is comprised of single family residences and agricultural land uses along CR 300 N, east of I-65 northbound. The surrounding topography is generally flat with general elevations of 921 to 927 feet above MSL. The main traffic noise sources for this CNE are I-65 and CR 300 N.

2.1.10 Common Noise Environment 10

CNE 10 is comprised of agricultural land uses along SR 47, west of I-65 southbound. The surrounding topography is generally flat with general elevations of 895 to 903 feet above MSL. The main traffic noise sources for this CNE are I-65 and SR 47.

2.1.11 Common Noise Environment 11

CNE 11 is comprised of agricultural land uses, a single family residence and maintenance facility along SR 47, east of I-65 northbound. The surrounding topography is generally flat with general elevations of 896 to 903 feet above MSL. The main traffic noise sources for this CNE are I-65 and SR 47.

2.2 Field Measurements and Validation

For this analysis a Larson Davis Class 1 Integrating Sound Level Meter (SLM) / Analyzer 831 was used to obtain short-term field measurements of ambient noise levels at representative receptors in the analysis area. The field measurements were taken by personnel of American Structurepoint on July 22-25, 2019. Short term measurements were collected for a duration of 15 minutes at 10 sites. The field data sheets for each measurement taken are included in Appendix B of this analysis. Prior to use, the SLM was calibrated to 94 dBA and 114 dBA using the appropriate calibrator for this model. The Certificate of Calibration for this SLM is included in Appendix C. During the sampling time atmospheric conditions and any unanticipated noise events were noted.

Short-term field measurements are typically collected and used to validate the constructed *TNM 2.5* model prepared for the existing conditions. In such cases, existing noise levels are generated from a baseline condition model, where field observed traffic counts over the 15 minute sampling period are multiplied times four for a Leq(h) volume equivalent and entered into the model. Sites are considered to be validated when the field

measured reading is found to be within 3 dBA (+/-) of the modeled reading. The results of the validation effort are illustrated in Table 2-4 below.

TABLE 2-4 – MODEL VALIDATION

Site No.	Receptor No.	CNE No.	Measured Level (dBA)	Modeled Level (dBA)	Difference	Validated
1	R15	1	61.1	63.7	2.6	Yes
2	R94	1	57.2	58.2	1.0	Yes
3	R79	1	63.0	65.8	2.8	Yes
4	R148	2	58.1	55.1	-3.0	Yes
5	R236/R239	2	52.2	**	**	**
6	R277	2	56.8	58.2	1.4	Yes
7	R284	3	68.1	69.4	1.3	Yes
8	R307	3	66.3	63.4	-2.9	Yes
9	R291	4	60.3	62.8	2.5	Yes
10	R296	5	65.2	67.8	2.6	Yes

**Not evaluated for validation due to distance from I-65 (>800 feet)

As noted in Table 2-4, 9 of the 10 sites modeled were validated. The remaining site, Site 5 (R236/239), cannot be validated due to the distance from I-65, the major roadway noise contributor. The FHWA approved noise modeling software, *TNM 2.5*, did not run initial validations beyond 800 feet. Therefore Site 5 (R236/239), which is located approximately 840 feet from I-65, is located outside of the maximum distance for validation and included for informational purposes only.

All applicable sites were validated, therefore the noise model developed for this analysis is considered to be valid.

3.0 Methodology and Assumptions

This noise analysis is developed as part of the National Environmental Policy Act (NEPA) environmental documentation for the project. In accordance with 23 Code of Federal Regulations (CFR) Part 772, FHWAs Highway *Traffic Noise: Analysis and Abatement Guidance (December 2011)* and the INDOT *Traffic Noise Analysis Procedure (July 1, 2017)*, design year (2043) noise exposure levels were predicted using FHWAs approved noise modeling software, *TNM 2.5*.

3.1 Noise Abatement Criteria

The FHWA has developed NAC that INDOT has adopted in their *Traffic Noise Analysis Procedure* (Table 3-1). These criteria define when noise impacts occur for specific types of land uses. Residential receptors fall into Activity Category B. The applicable noise criterion for this form of land use is 67 dBA, defined in terms of the one-hour equivalent noise level, expressed as Leq (1h). The recreational facilities associated with Kise Estate Apartments and the Trophy Club Golf Course fall under Activity Category C with the same criterion of 67 dBA.

Because Part 772 of 23 CFR defines potential impacts in terms of noise levels approaching or exceeding the NAC and INDOT's *Traffic Noise Analysis Procedure* defines approaching as one decibel, the effective value for impact analysis in Indiana for Activity Categories B and C is 66 dBA, rather than 67 dBA. Commercial uses including motels and restaurants having exterior functionalities such as, patios/decks, picnic benches or outdoor pools, fall into NAC Activity Category E, which has an effective criterion of 71 dBA. Retail uses, together with industrial and trucking/logistics/warehousing, and agriculture are in NAC Activity Category F, for which there is no noise impact criterion. It should be noted this definition of "approach" does not apply to Activity Category D land uses.

TABLE 3-1 - FHWA NAC LAND USES

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

Source: FHWA Highway *Traffic Noise: Analysis and Abatement Guidance (December 2011)*

For this analysis, Activity Categories B, C, F and G land uses were identified within the analysis area.

3.2 Traffic Volumes

Base traffic volumes were taken from INDOT's *Traffic Count Database System*; for which the most recent year of counts recorded was 2018. The INDOT Technical Modeling team provided compound annual growth rates of 0.3% per year for I-65 and 1.1% per year for the remainder of roadways within the project area (US 52, Lafayette Avenue, CR 300 N, and SR 47). These linear growth rates were used to project the traffic volumes for 2020 and 2043. The volumes are illustrated in Appendix F of this report.

3.3 Model Assumptions

The following TNM 2.5 model assumptions were incorporated into the analysis of this project:

- Traffic volumes were assigned to the appropriate TNM vehicle classifications. For the purposes of this analysis, automobiles and heavy trucks were designated the appropriate vehicle classifications for 2020 and 2043 projections. Assignments were not made to the medium truck, motorcycle or bus classifications.
- The percent heavy vehicles used in *TNM 2.5* was 29% for I-65. The percent heavy vehicles along the remaining roadways can be found in Appendix F.
- A constant vehicle speed of 70 miles per hour (mph) was used for automobiles and 65 mph was used for heavy trucks along I-65, 30 mph was used along Lafayette Avenue, 40 mph was used along CR 300 N, 55 mph was used along SR 47, 25 mph was used along the proposed Lafayette Avenue flyover ramp, and 45 mph was used along the remaining on and off ramps.
- Traffic volumes were not included along the remainder of auxiliary roadways due to the low traffic volumes and utilization as residential access.
- Terrain lines and ground zones were included within the model. The default ground zone was lawn. Water, pavement, and loose soil ground zones were also identified and included within the model.
- Noise Reduction Coefficient (NRC) values of 0.7 were utilized for noise barriers with receptors present on the opposite side of the roadway (NB 2, NB 3, and NB 4). NRC values of 0.7 were also utilized for the existing noise barrier, east of I-65 northbound, at the southern extent of the project area.

4.0 Impact Assessment

The analysis of the proposed I-65 Added Travel Lanes project was completed using the FHWA's approved model for predicting noise levels associated with highway projects, *TNM 2.5*. TNM generated noise emission levels for the project, which are reported in dBA, and compared against the NAC thresholds identified in **Table 3-1** to determine whether a receptor is impacted. As defined in the INDOT *Traffic Noise Analysis Procedures (2017)*, a traffic noise impact occurs if one of the following criteria is found to be true:

- Predicted dBA levels approach (within at least 1 dBA) or exceed the NAC identified in **Table 3-1**, or
- Predicted dBA levels substantially exceed the existing ambient levels (at least 15 dBA above the existing conditions).

FHWA assesses noise impacts based upon the Leq(h). That is, a receptors cumulative noise exposure from all events over a one hour period. The one hour period used for highway projects is identified as the peak travel hour, or busiest hour of the day. Based upon the completed analysis, 72 receptors were identified as approaching or exceeding the NAC. No receptors were identified as having predicted levels substantially exceeding the existing ambient levels. The noise level at the 72 impacted receptors range from 66.0 to 74.5 dBA. A breakdown of impacted receptors per CNE is provided in Table 4 below:

TABLE 4 – Impacted Receptors by CNE

	Number of Impacted Receptors
CNE 1	0
CNE 2	64
CNE 3	0
CNE 4	1
CNE 5	4
CNE 6	1
CNE 7	1
CNE 8	1
CNE 9	0
CNE 10	0
CNE 11	0

5.0 Noise Abatement

Consideration of measures to mitigate or abate traffic noise impacts must be afforded if impacted receptors have been identified in the analysis area. In order for abatement to be considered and implemented into the project it must undergo scrutiny to determine if it is both feasible and reasonable to construct. The definition of feasible and reasonable is identified in the INDOT *Traffic Noise Analysis Procedures (2017)*, but is summarized below.

Noise abatement is **feasible** if it meets all of the following conditions:

Engineering Feasibility:

- Engineering considerations to determine if a particular form of abatement can actually have an effect on the traffic noise levels at a receptor. These considerations include topography, drainage, barrier height, utilities, safety and access / maintenance needs control.

Acoustic Feasibility:

- A majority (greater than 50%) of the impacted receptors achieve a 5 dBA reduction in noise.

The **reasonableness** of noise abatement is based on a measured design goal for noise abatement, cost effectiveness and views of impacted receptors:

Design Goal:

- A majority of the impacted first row receptors achieve at least a 7 dBA reduction in noise.

Cost Effectiveness:

- The estimated cost of constructing a noise barrier does not exceed $25,000 per benefited receptor. In those cases where a majority of the development (more than 50%) was in place prior to construction of the highway, a barrier is considered cost effective if the estimated cost does not exceed $30,000 per benefited receptor.

Views of the Impacted and/or Benefited Receptors:

- A survey will be mailed to each benefited receptor to consider the views of residents and property owners. The concerns and opinions of the property owners and residents will be balanced with other considerations in determining whether a barrier is appropriate for a given location.

5.1 Traffic Noise Barriers

The construction of noise barriers is often viewed as an effective way to shield or deflect the noise exposure path between the source (i.e., road) and the impacted receptors. Traditionally, constructed noise barriers are a post and precast panel system. With the post and precast panel wall, steel posts are driven into the ground followed by the installation of several noise absorbing panels between the posts. Several factors weigh into determining the feasibility of a barrier. Both barrier types need to be allowed to extend uninterrupted (i.e., no drive access points, utility crossings) the length of area it is intended to shield. Additionally, the barrier length needs to extend at either end at least four times the distance between the noise source and receptor to adequately deflect noise that spills around the end of the barrier. The barrier should also avoid interference with the line of sight at intersections, which could affect a driver's ability to see approaching traffic and create an unsafe condition to enter roadway. The inability to address these factors weighs heavily in the consideration of barrier abatement as a feasible measure of mitigation.

Noise barriers were modeled at six locations within the study area (Appendix E, Page E-1 to E-3). The analyzed barriers are described below:

- Noise Barrier (NB) 1: NB 1 is located along the east side of I-65 northbound lanes, south of the Lafayette Avenue exit ramp in CNE 2. NB 1 extends south to meet the existing noise barrier along I-65. This noise barrier location analyzes impacts to receivers R1 to R145.
- NB 2: NB 2 is located along the east side of I-65 northbound lanes and the US 52 exit ramp in CNE 5. This noise barrier location analyzes impacts to receivers R284 to R287.
- NB 3: NB 3 is located along the west side of I-65 southbound lanes, just south of the US 52 onramp in CNE 4. This noise barrier location analyzes impacts to receiver R308.
- NB 4: NB 4 is located along the west side of I-65 southbound lanes, north and south of CR 300 N in CNE 8. This noise barrier location analyzes impacts to receiver R303.
- NB 5: NB 5 is located along the west side of I-65 southbound lanes, north of CR 300 N in CNE 6. This noise barrier location analyzes impacts to receiver R302.
- NB 6: NB 6 is located along the east side of I-65 northbound lanes, north of CR 300 N in CNE 7. This noise barrier location analyzes impacts to receiver R296.

Of the six noise barriers modeled, one meets the INDOT's feasible and reasonable criteria. NB 1 was determined to meet feasible and reasonable criteria. NB 2, NB 3, NB 5, and NB 6 were determined to be meet feasible criteria but not meet cost effectiveness criteria to be considered reasonable. NB 4 was determined to not meet feasible or reasonable criteria. The results of the noise barrier analysis are summarized in Table 5.1 below. Maps showing the noise barrier locations and noise receptors are located in Appendix A, Page A-8 to A-21. Tables showing the optimization and analysis of the noise barriers are located in Appendix E, Page E-4 to E-12.

TABLE 5.1 – Noise Barrier Analysis Summary

Proposed Barrier	CNE	Length (feet)	Average Height (feet)	Benefitted Receptors	Feasibility Criteria Met	Design Goal Met	Cost of Barrier (assuming $30/sq ft)	Cost per Benefitted Receptor	Cost Effective Threshold	Cost Reasonable Criteria Met
NB 1	2	2,076	14.12	116	Yes	Yes	$879,363.00	$7,580.72	$30,000*	Yes
NB 2	5	1,140	15.65	4	Yes	Yes	$535,114.00	$133,778.50	$30,000	No
NB 3	4	1,000	15.40	1	Yes	Yes	$462,000.00	$462,000.00	$30,000	No
NB 4	8	1,483	21.37	0	No	No	$948,318.00	N/A	$30,000	No
NB 5	6	800	15.5	1	Yes	Yes	$371,997.00	$371,997.00	$30,000	No
NB 6	7	1,106	17.98	1	Yes	Yes	$596,384.00	$596,384.00	$30,000	No

**A cost effective threshold of $30,000 was utilized as it is anticipated that all currently unoccupied lots within CNE 2 will be constructed by the completion of this project*

5.2 Additional Noise Abatement Measures

Additional noise abatement measures considered for this project include the restriction or prohibiting of truck traffic, altering of the horizontal and vertical alignments, acquisition of property for construction of berms, and acquisition of buffer zones to prevent development that could be adversely impacted.

The restriction or prohibiting of trucks traffic along I-65 is beyond the scope of this project and would require changes in legislation. Alteration of the horizontal and vertical alignment within the current right-of-way and design criteria would not provide sufficient changes in the traffic noise levels to the abutting properties. The current project proposes to maintain the existing alignment along I-65 and add the additional travel lanes to the median, away from abutting properties. Acquisition of property for construction of berms or as a buffer zone was not considered reasonable as it would require a substantial amount of additional right-of-way.

6.0 Construction Noise

The identified receptors will be affected by the noise generated from power-operated equipment utilized during construction. This equipment will be operated intermittently and will likely produce noise in the range of 70-98 dBA, with louder experiences occurring at those receptors closest to the construction limits. To minimize these impacts, construction equipment should be operated in compliance with all applicable local noise ordinances and regulations pertaining to construction noise for Boone County and the City of Lebanon. Also, restricting construction activities to daytime working hours may help minimize construction noise impacts during nighttime hours. The project plans and specifications should include provisions requiring the contractor to make every reasonable effort to minimize construction noise through abatement measures such as work-hour controls and maintenance of muffler systems. If such measures are applied, the temporary effects to the nearby receptors should be minimized.

7.0 Coordination with Local Officials

Conflicts with future development along the proposed corridor are able to be minimized with appropriate noise compatible planning. This effort starts with knowledge about a project's specific noise impacts being shared with those local officials having the decision-making authority over the planning and zoning status of land within the analysis area. In accordance with the *INDOT Traffic Noise Analysis Procedure (July 1, 2017) and 23 CFR 772.15* this report will be provided to the City of Lebanon's Area Planning Organization following the completion of the environmental document. This is typically done to allow the local government planning branches to protect incompatible land use types, such as Activity Categories B and C, from developing within the approximate 66 dBA contour.

The 66 dBA contour is an estimation of the future receptor impact zone following construction of the project. The 66 dBA contour for the proposed project is estimated to occur 500 feet from the I-65 edge of pavement, varying slightly depending on topography (Appendix A, Page A-8 to A-21).

8.0 Public Involvement

As stated in the *INDOT Traffic Noise Analysis Procedure*, INDOT is required to seek the input of owners and residents of all benefited properties. The concerns and opinions of the property owners and the unit occupants will be taken into consideration in determining whether a barrier is appropriate for a given location. This information will be gathered during the public involvement process that will commence following the approval of this *Noise Analysis Report* and the results of this process will be detailed in a *Final Noise Analysis Report*.

9.0 Statement of Likelihood

Based upon the analysis completed to date, 72 impacted receptors have been identified and it has been determined that noise abatement is likely, but not guaranteed, at one location. Noise abatement at this location is based on preliminary design costs and criteria. Noise abatement at this location has been estimated at $879,363. A re-evaluation of the noise analysis will occur during final design. If during final design it is determined the conditions have changed such that noise abatement is not feasible and reasonable, the abatement measures might not be provided.

The final decision on the installation of any abatement measures will be made upon the completion of the project's final design and public involvement process.

10.0 Conclusion

A total of 72 receptors were identified within the noise analysis area as approaching/exceeding the NAC in the 2043 design year. Six noise barrier locations were evaluated within the noise analysis area. One noise barrier location (NB 1) was determined to be feasible and reasonable; east of I-65 northbound lanes, south of the Lafayette Avenue exit ramp. Noise abatement at this location is based upon preliminary estimated costs and design criteria. Noise abatement is likely, but not guaranteed at this location. Additional information regarding the evaluated noise barriers is provided in Appendix E.

11.0 References

Environmental Protection Agency Publication EPAPB 206717, December 1971, *Noise from Construction Equipment and Operations.*

Federal Highway Program Manual, Volume 7, Section 3, August 9, 1982.

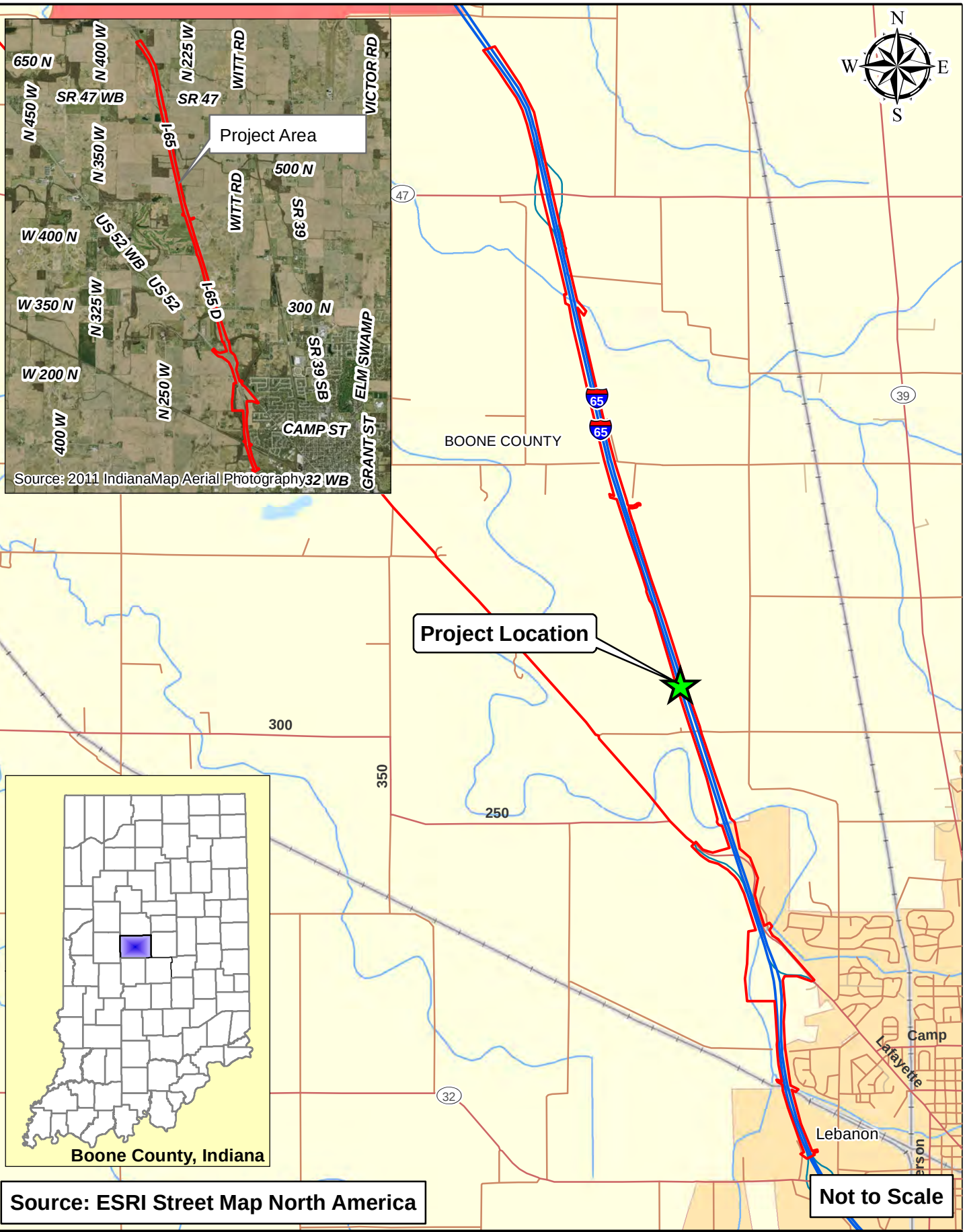
23 CFR 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, July 13, 2010.

FHWA *Highway Traffic Noise: Analysis and Abatement Guidance,* December 2011.

Federal Highway Administration, *Federal Lands Highway Project Development and Design Manual*, February 8, 2008.

INDOT *Traffic Noise Analysis Procedure*, July 1, 2017.

Appendix A – Project Mapping



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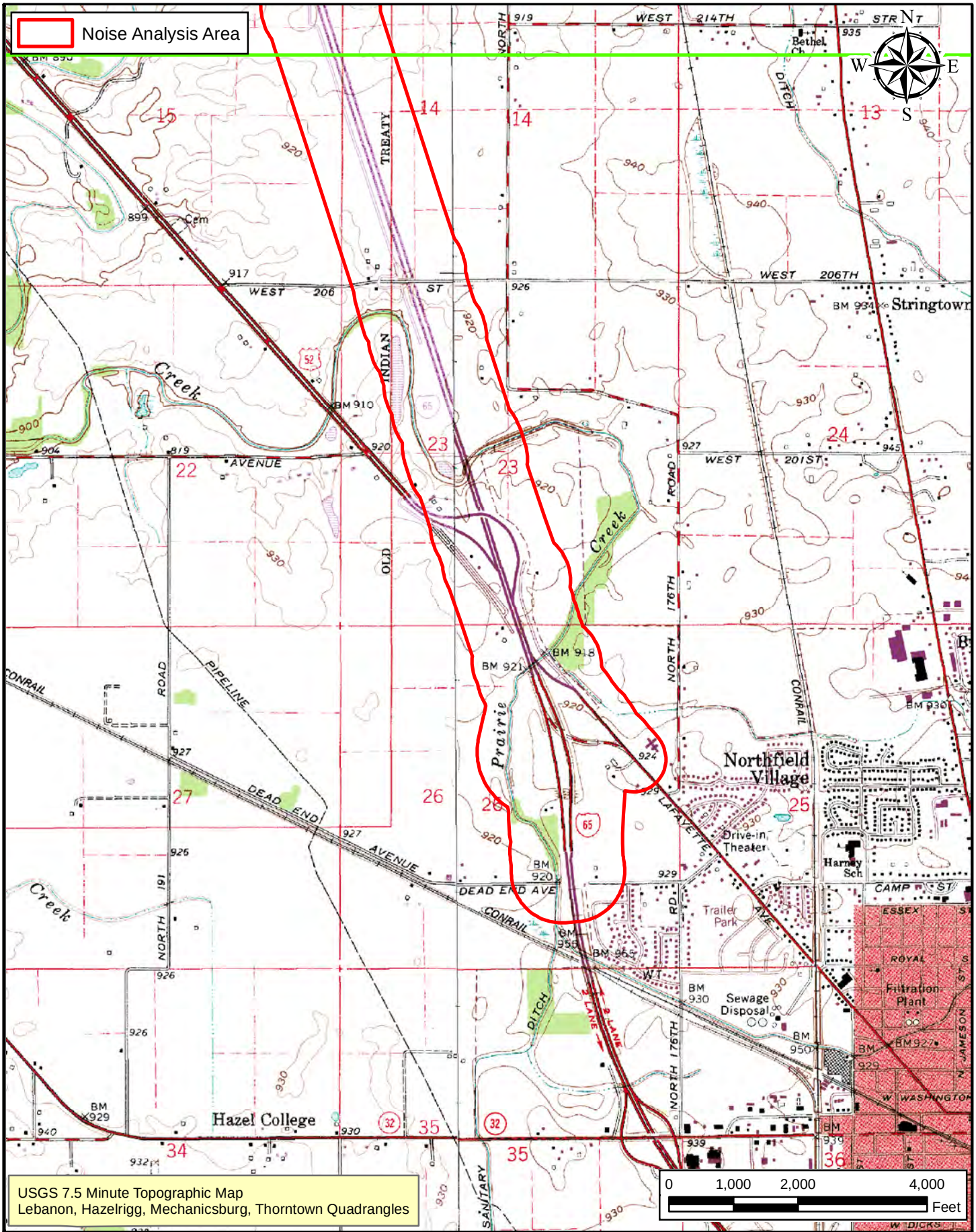
AMERICAN STRUCTUREPOINT INC.

Figure 1: State Location Map

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes SR 32 to SR 47
Des. No. 1802967
Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana
Date: 09/27/2019



USGS 7.5 Minute Topographic Map
Lebanon, Hazelrigg, Mechanicsburg, Thorntown Quadrangles

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Figure 2: USGS Topographic Map
Map 1 of 2

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes SR 32 to SR 47
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 11/14/2019

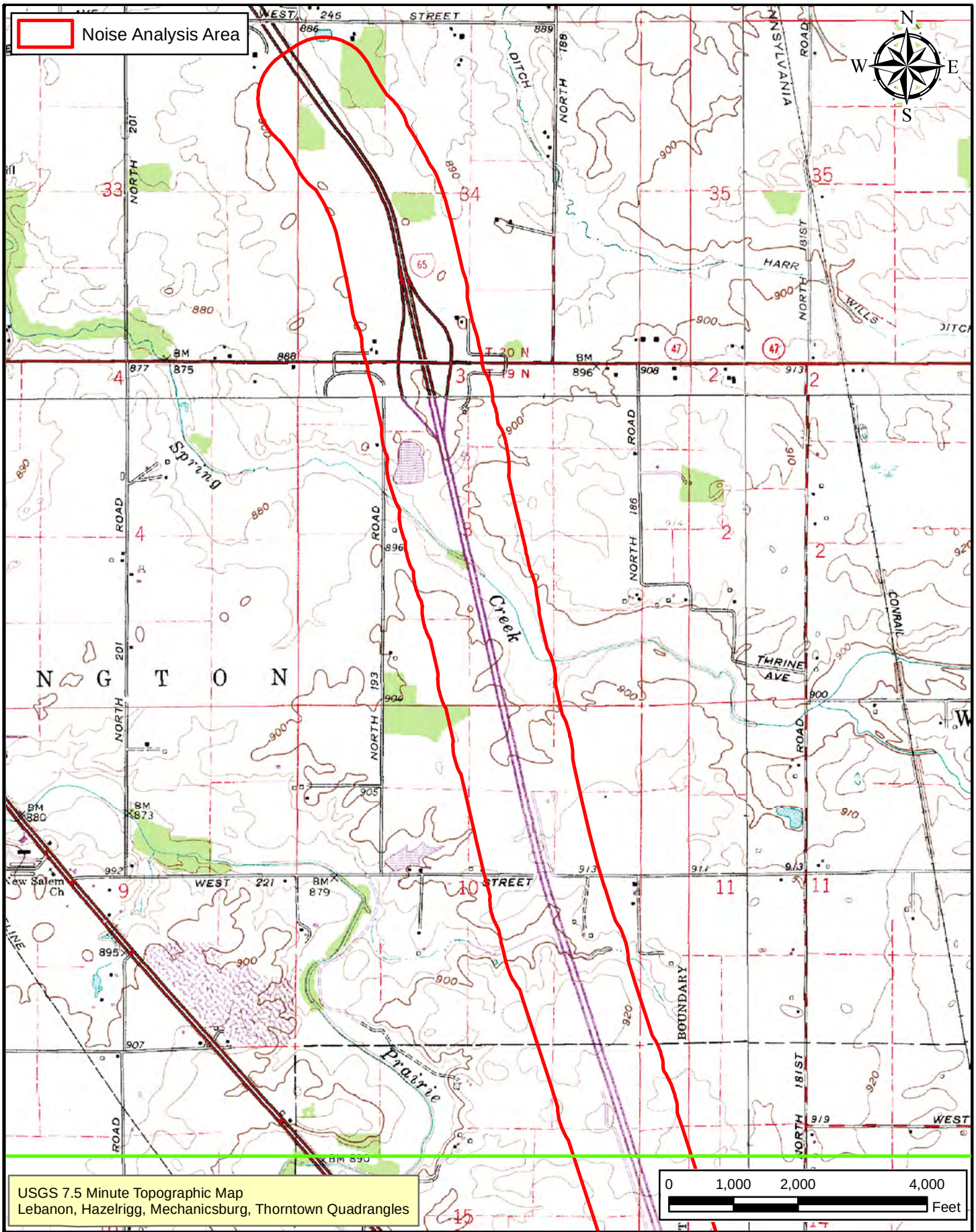

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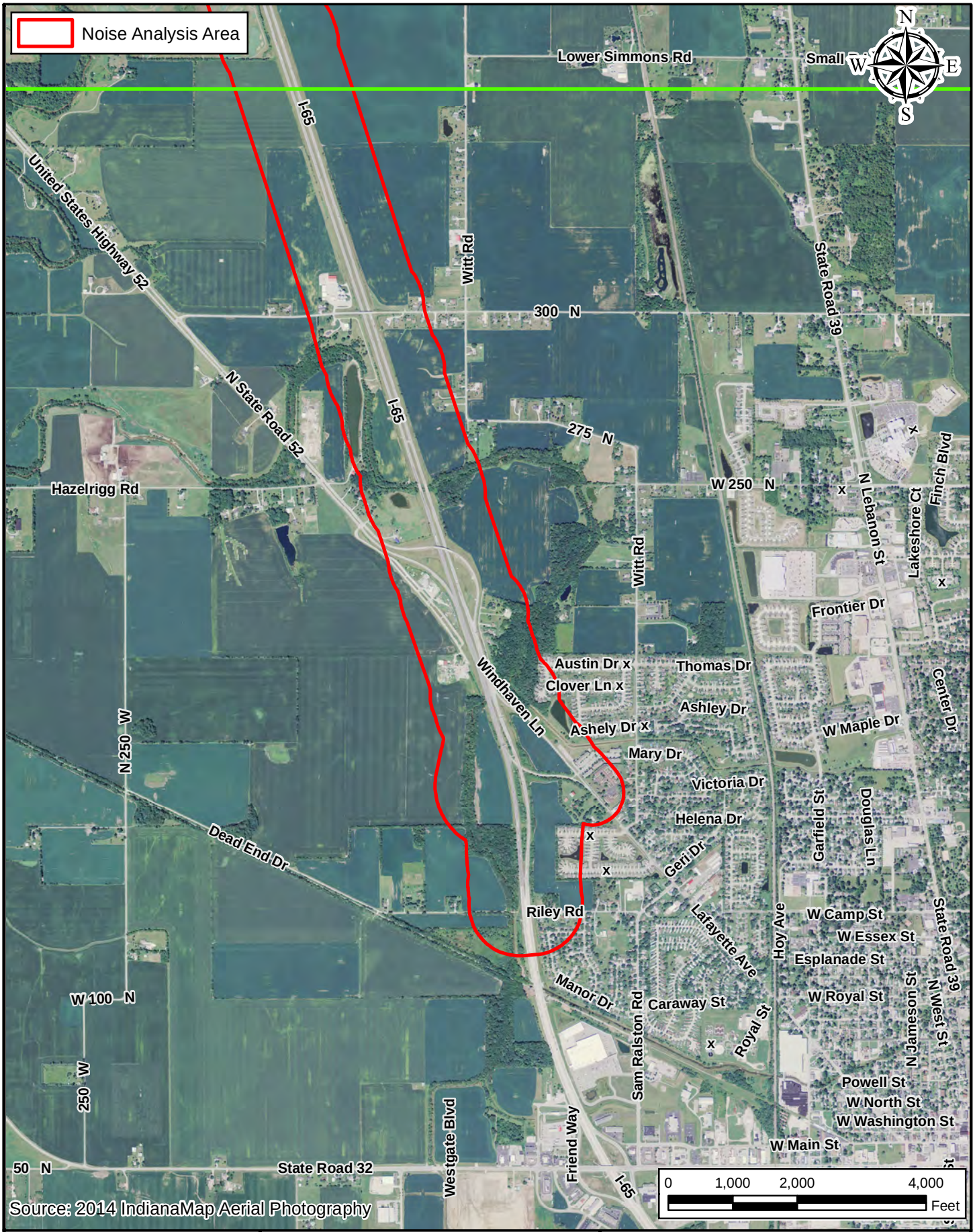
Figure 2: USGS Topographic Map
Map 2 of 2

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes SR 32 to SR 47
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 11/14/2019



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AMERICAN STRUCTUREPOINT INC.

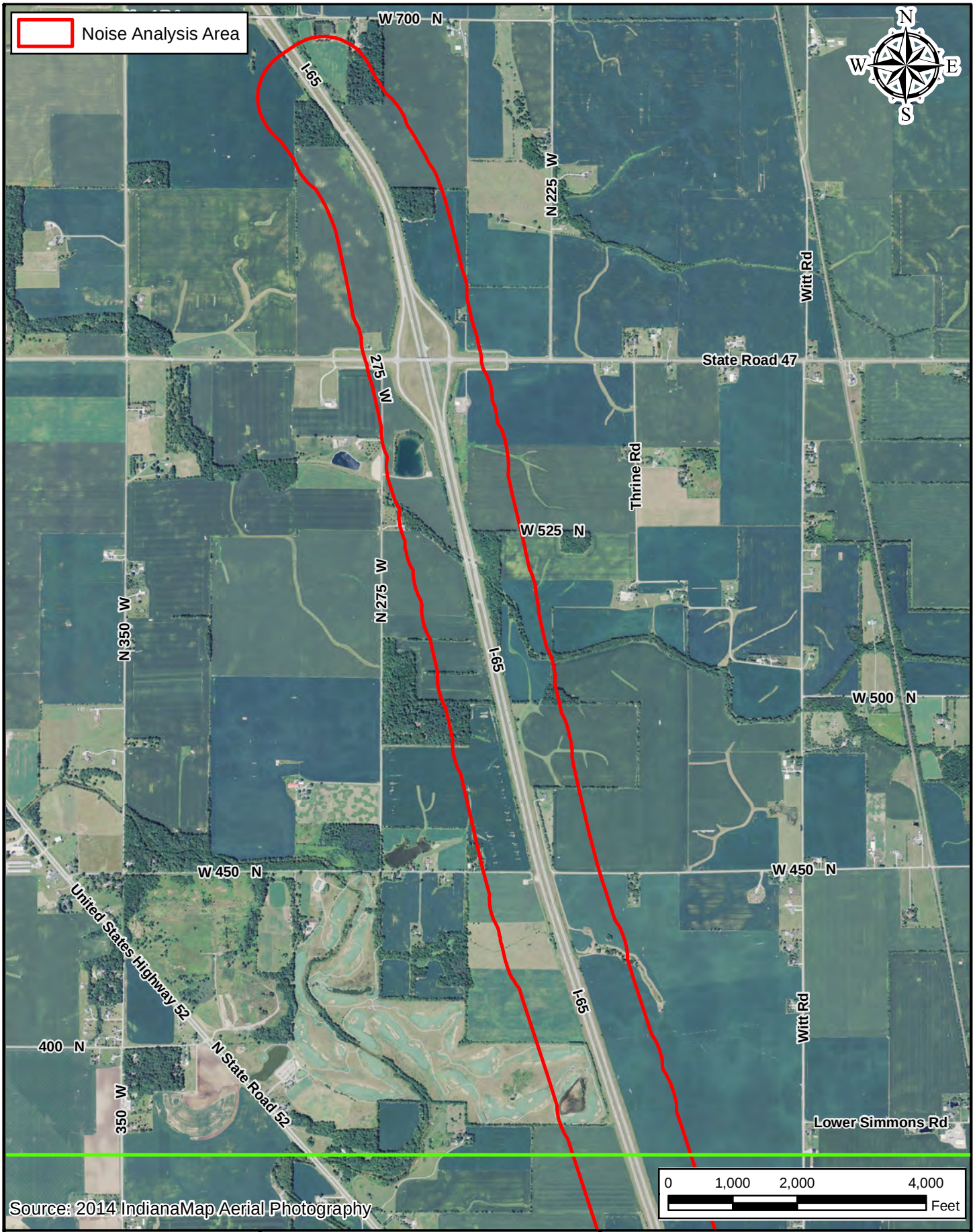
Figure 3: 2014 Aerial Photography
Map 1 of 2

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes SR 32 to SR 47
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 11/14/2019



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AMERICAN STRUCTUREPOINT INC.

Figure 3: 2014 Aerial Photography
Map 2 of 2

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes SR 32 to SR 47
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 11/14/2019

SCALE: 1" = 200'

0' 100' 200'

Lafayette Avenue Flyover Ramp

CONCEPTUAL DRAWING -
NOT FOR CONSTRUCTION

Prairie Creek

I-65 SB

I-65 NB

Windhaven Ln

Prairie Creek

Lafayette Ave

PC28+79.71

PT26+49.15

P.I. 25+06.01

PC23+59.44

POT20+00.00

20+00

25+00

30+00

35+00

40+00

POT41+98.53

CURVE DATA
P.I. = 36+66.10
D = 136° 28' 00.15" (LT)
T = 786.38
L = 747.88
R = 314.00
E = 532.76
S.E. = 8.0 %
V = 35 MPH

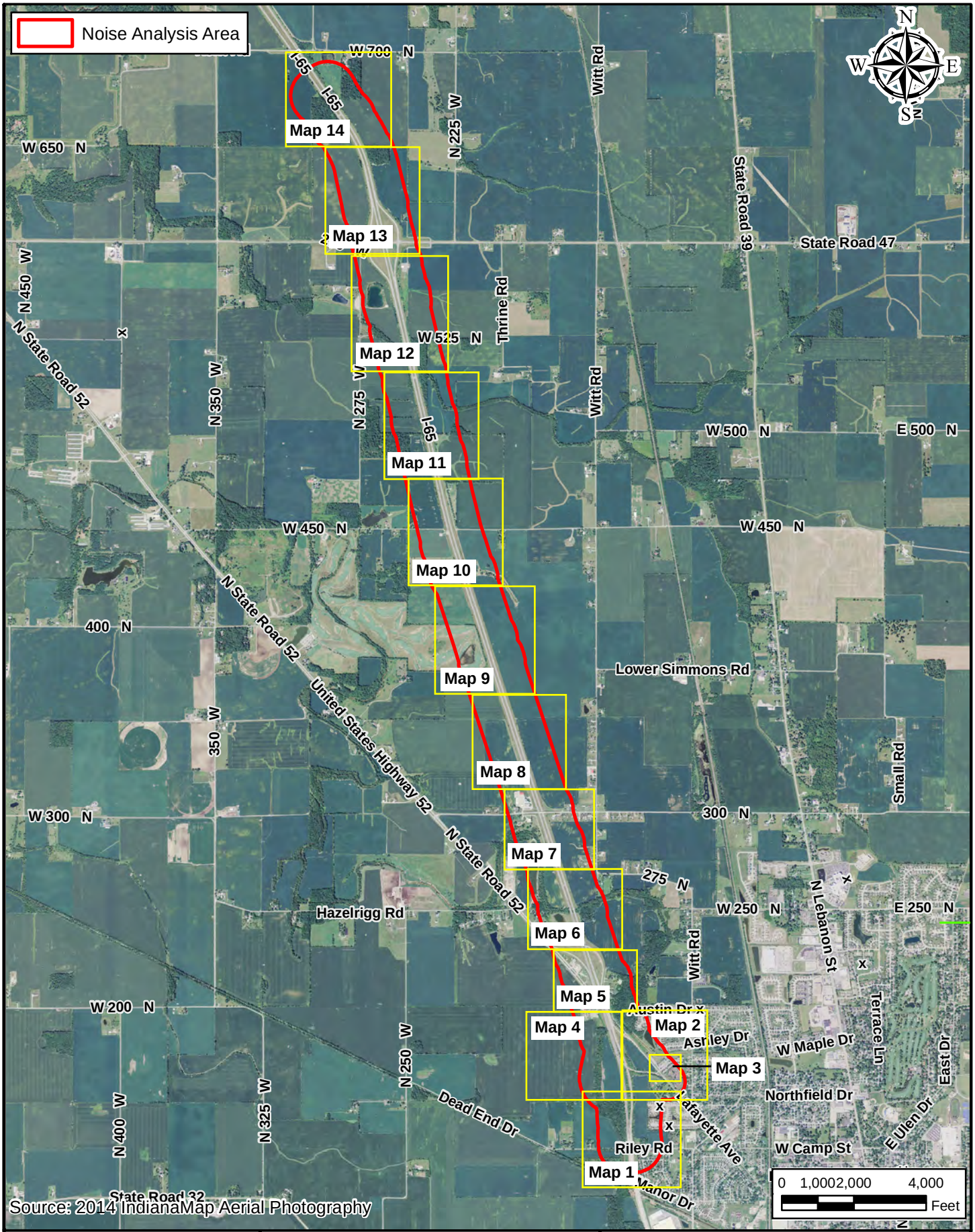
CURVE DATA
P.I. = 25+06.01
D = 21° 26' 44.44" (RT)
T = 146.57
L = 289.71
R = 774.00
E = 13.75
S.E. = 8.0 %
V = 50 MPH

27'-0"

Indiana Department of Transportation
Boone County
I-65 at Lafayette Ave Exit
Alternative 2 Flyover

Legend

- Residential
- Wetland (Potential)
- Floodway
- Proposed I-65 Lanes (Shoulder Lines Shown)
- Max Allowable Shift of I-65 Lanes to Median (Shoulder Lines Shown)



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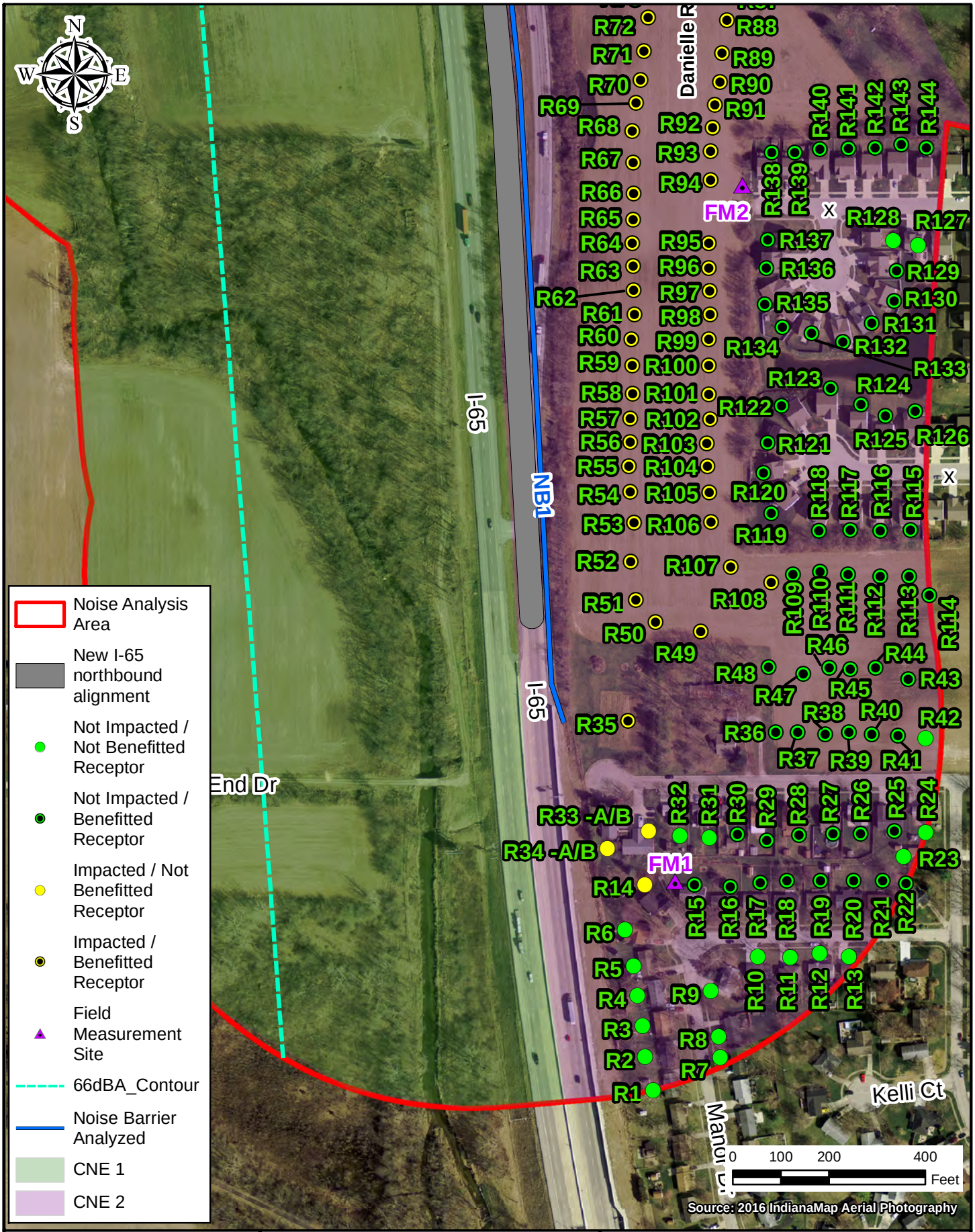
Noise Analysis Map - Key

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes SR 32 to SR 47
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 11/14/2019



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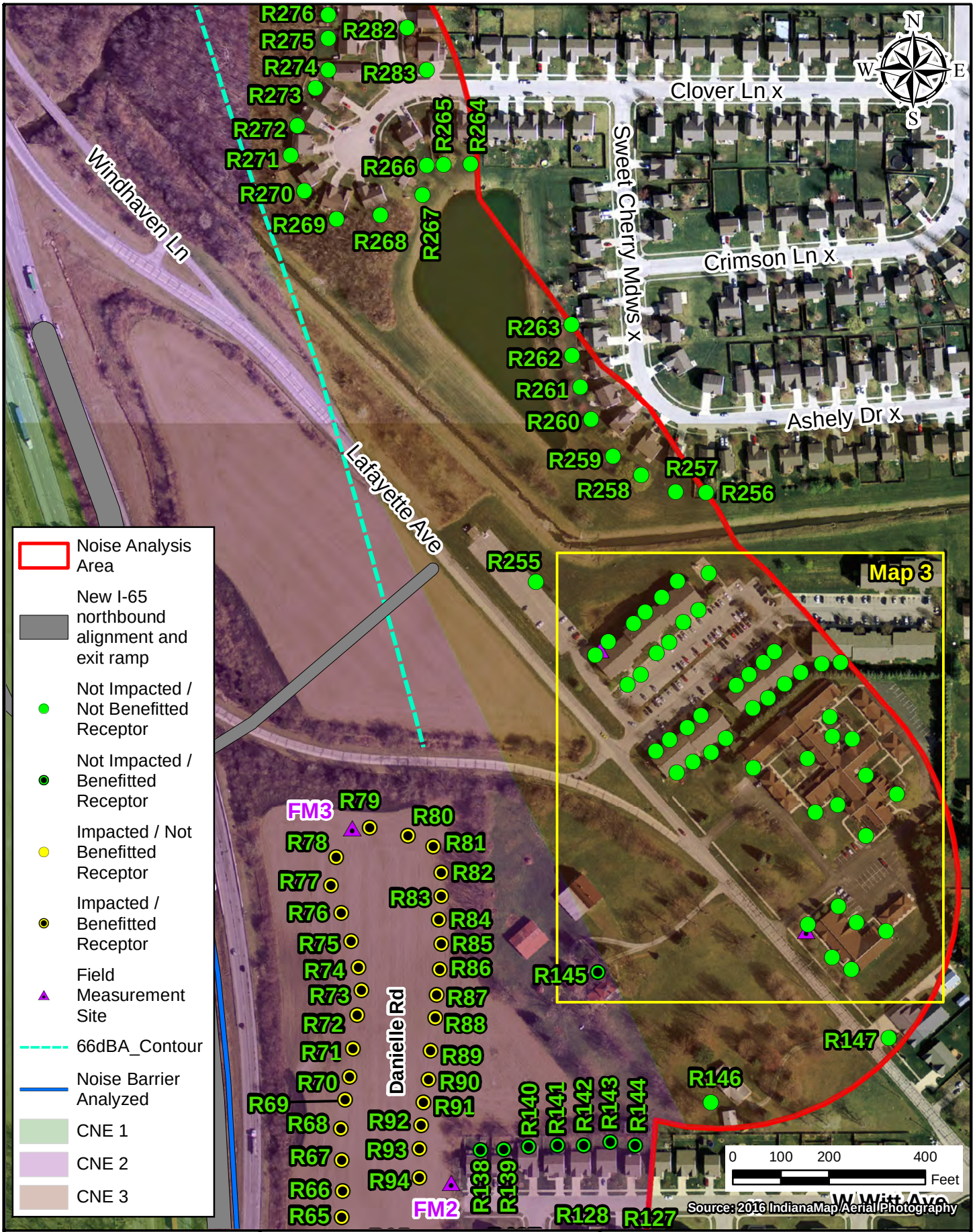
Noise Analysis Map - Map 1

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 01/08/2020



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AMERICAN STRUCTUREPOINT INC.

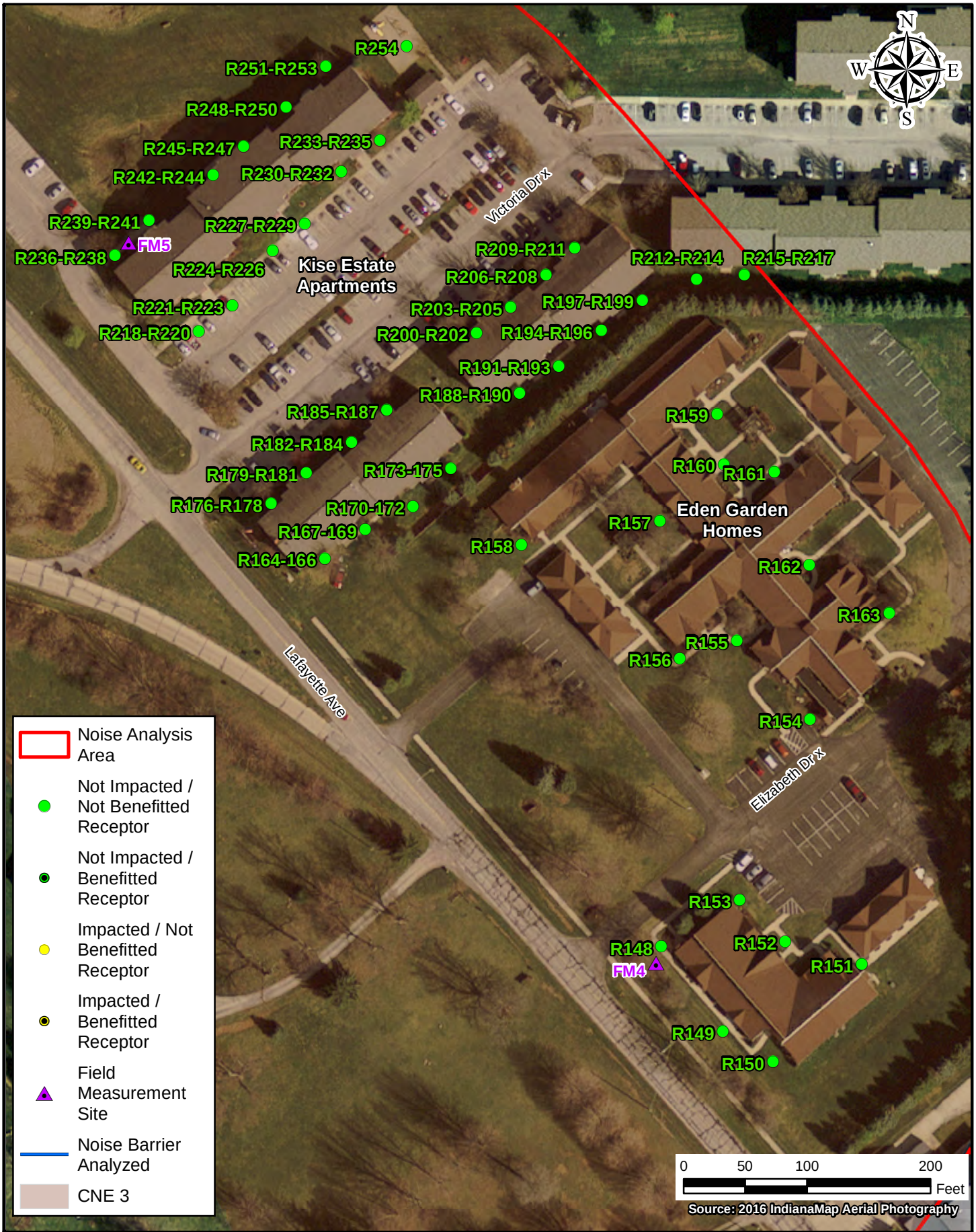
Noise Analysis Map - Map 2

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 01/08/2020



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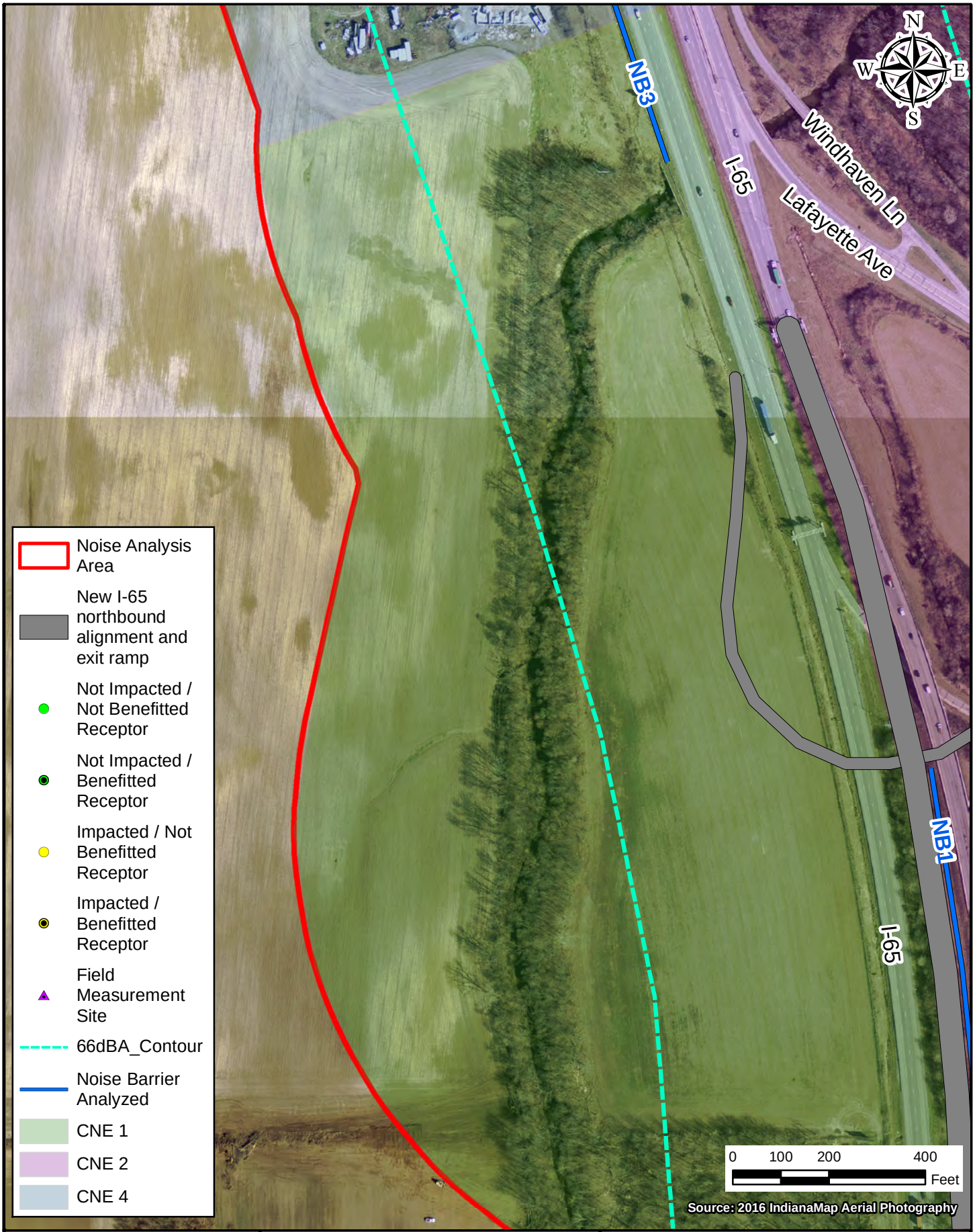
Noise Analysis Map - Map 3

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 01/08/2020



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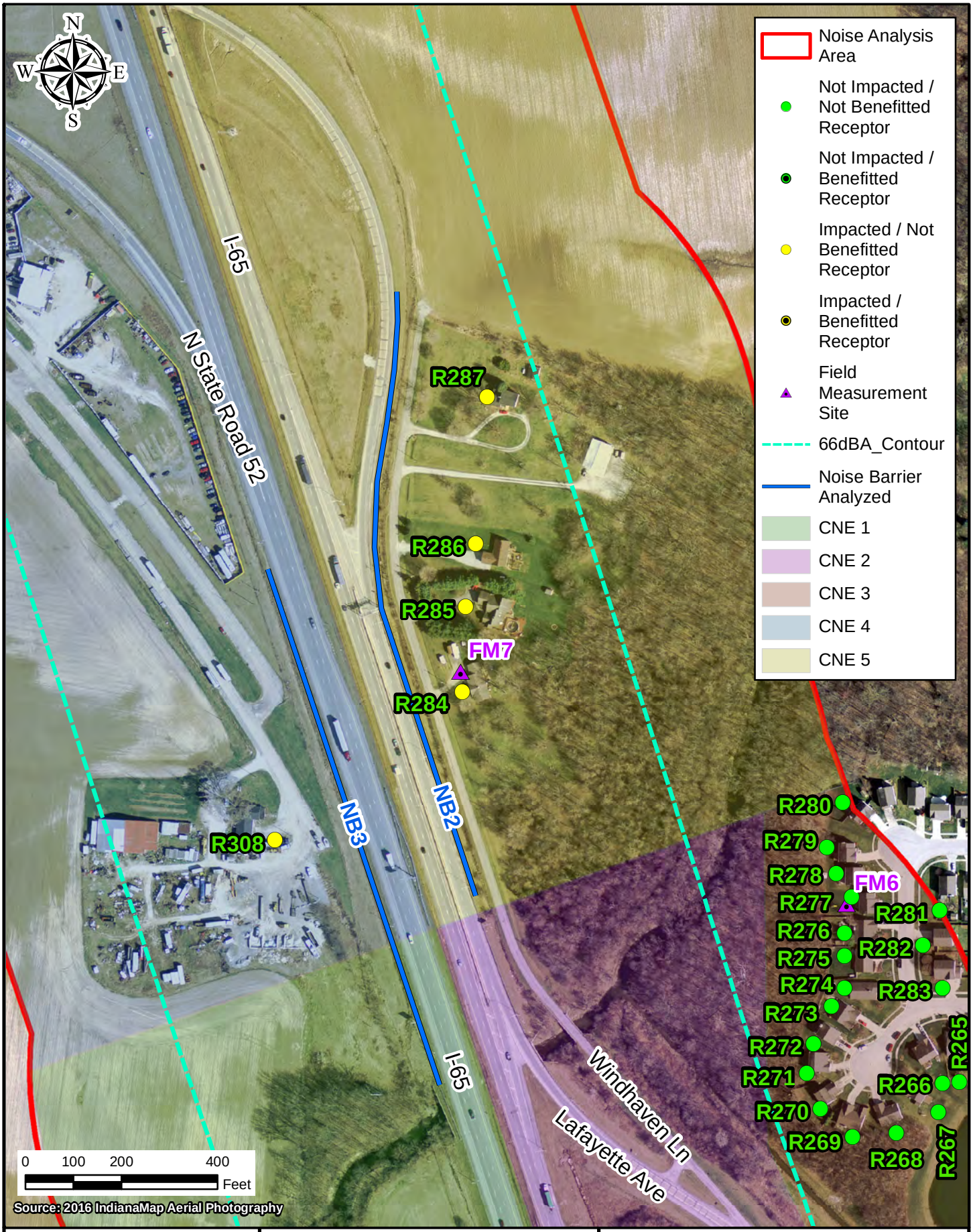
Noise Analysis Map - Map 4

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 01/08/2020



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AMERICAN STRUCTUREPOINT INC.

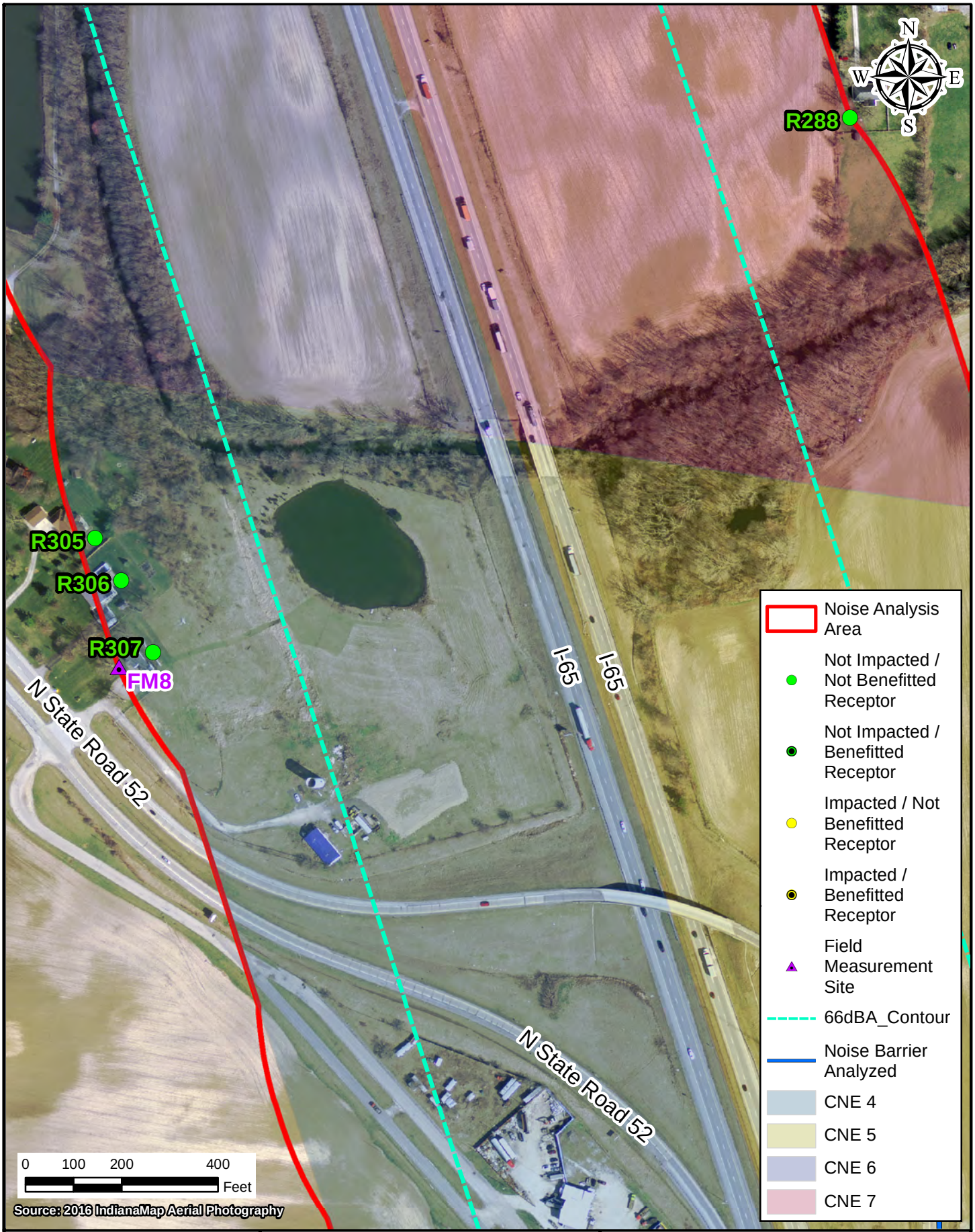
Noise Analysis Map - Map 5

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 01/08/2020



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AMERICAN STRUCTUREPOINT INC.

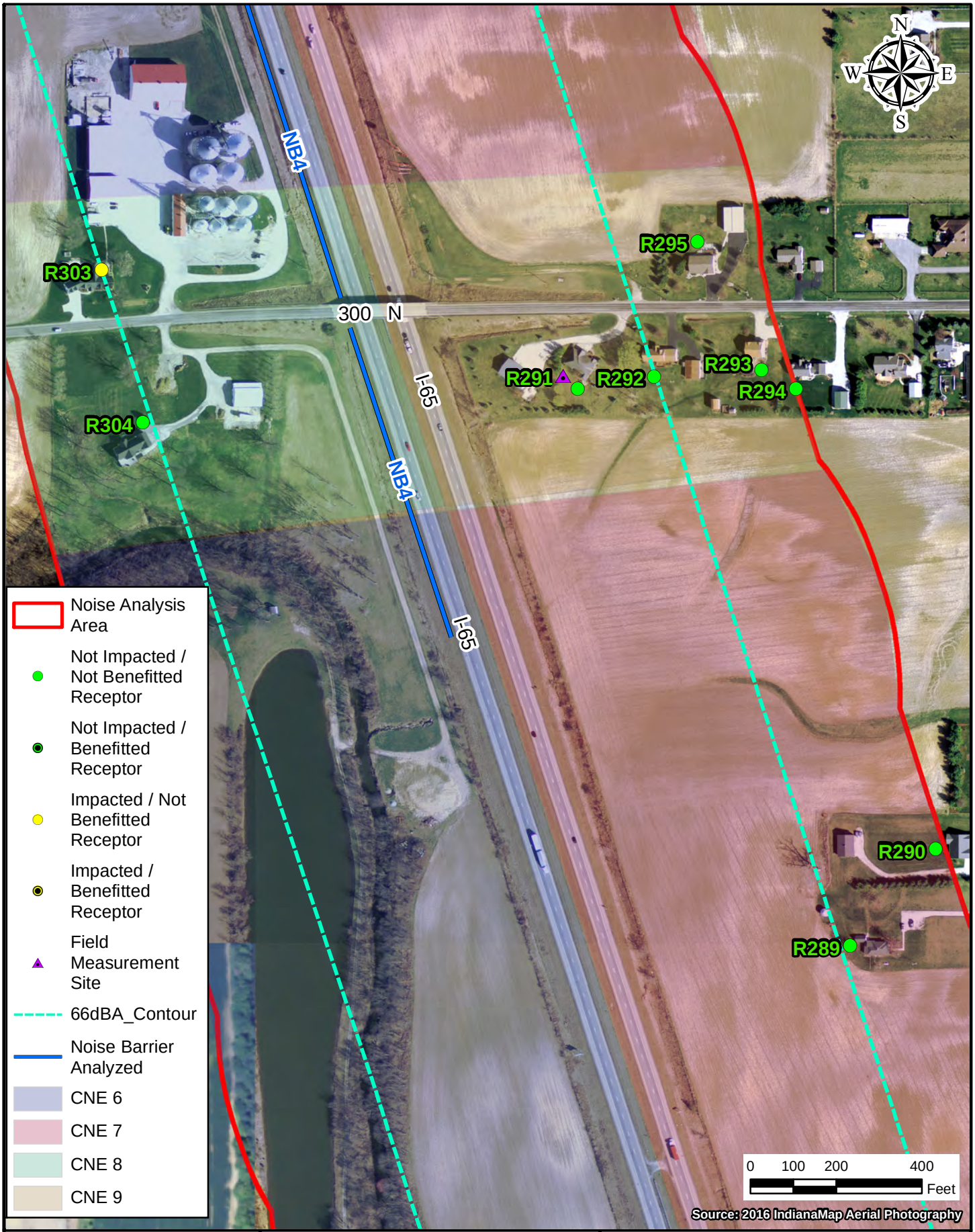
Noise Analysis Map - Map 6

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 01/08/2020



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AMERICAN STRUCTUREPOINT INC.

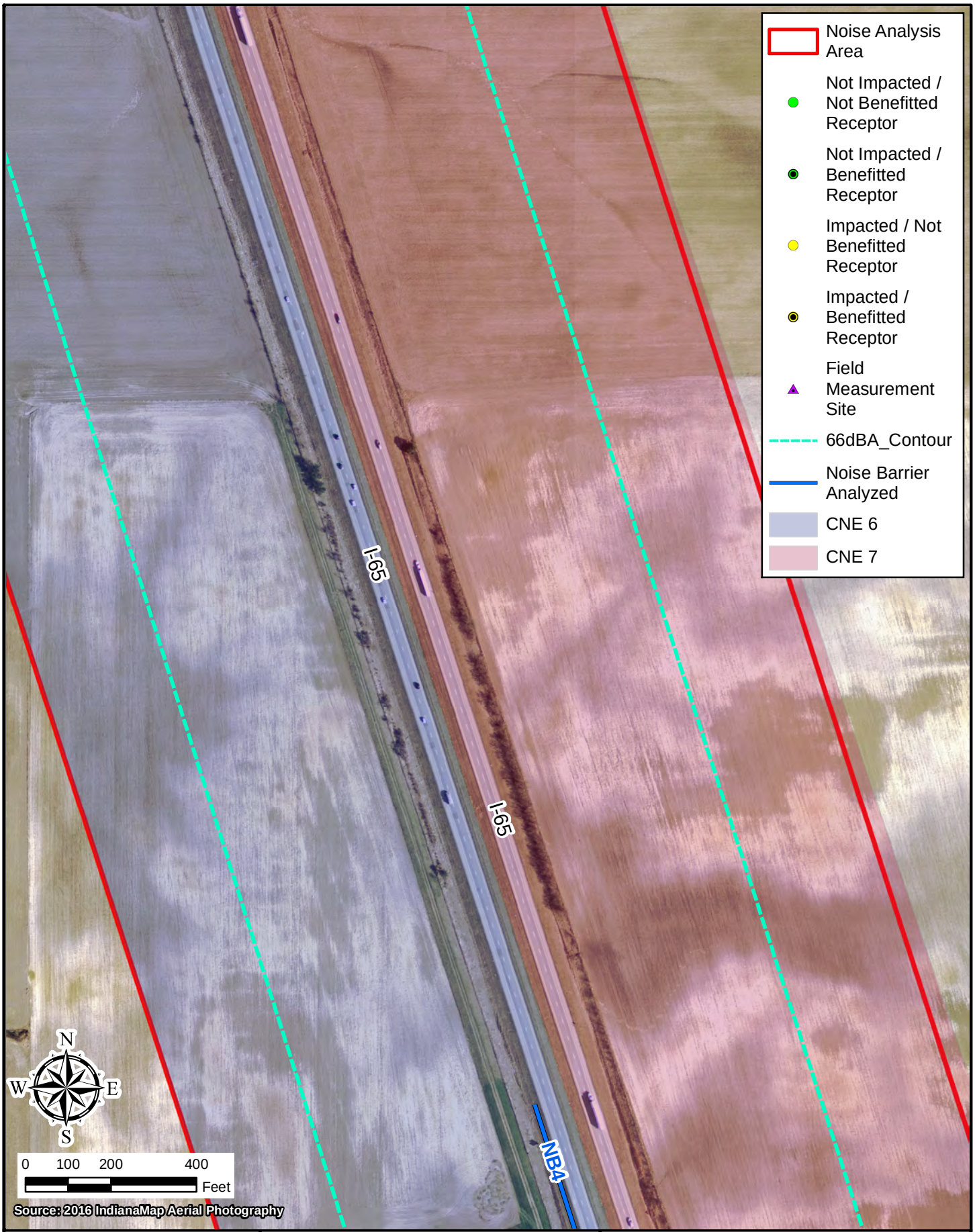
Noise Analysis Map - Map 7

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 01/08/2020



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AMERICAN STRUCTUREPOINT INC.

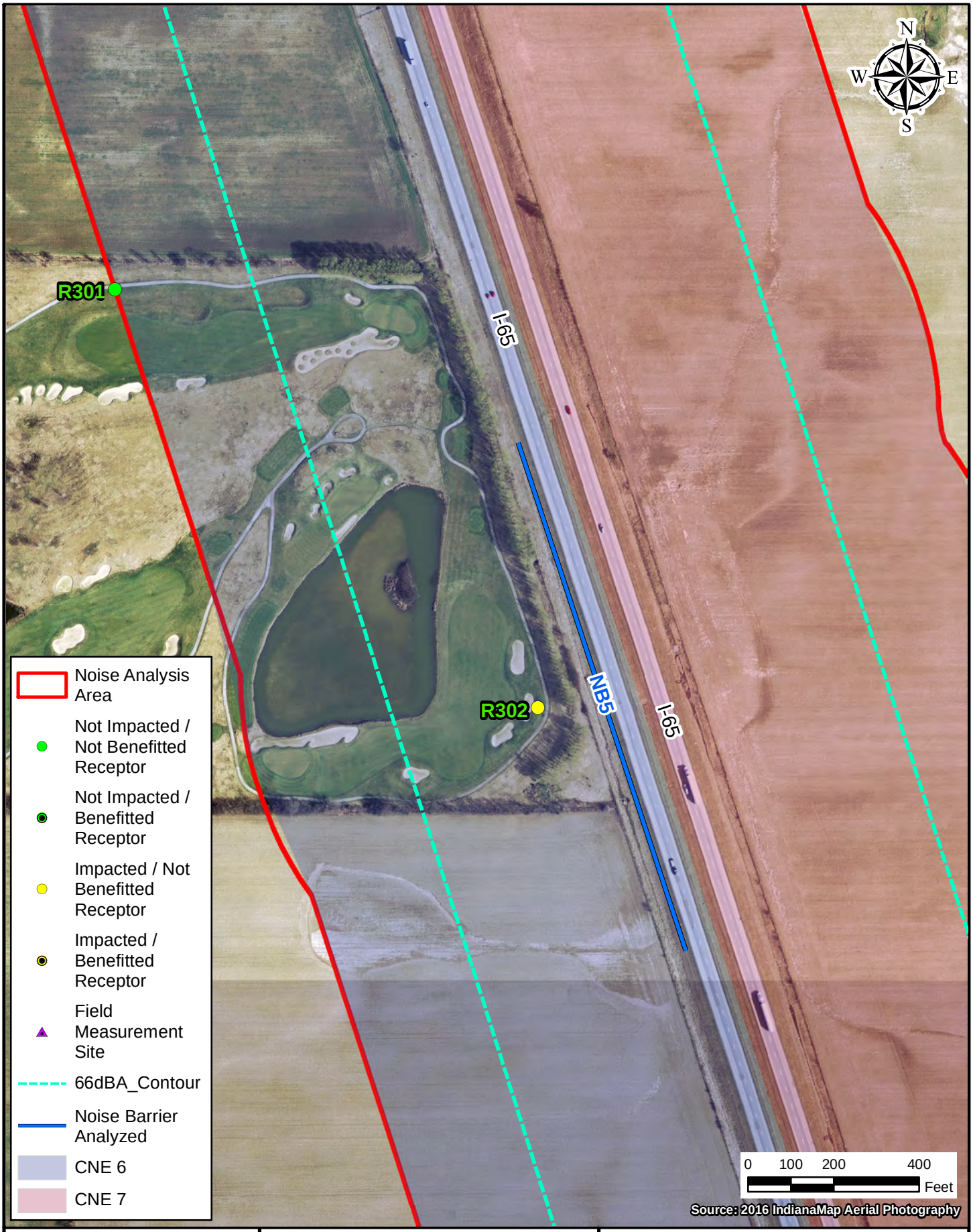
Noise Analysis Map - Map 8

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 01/08/2020



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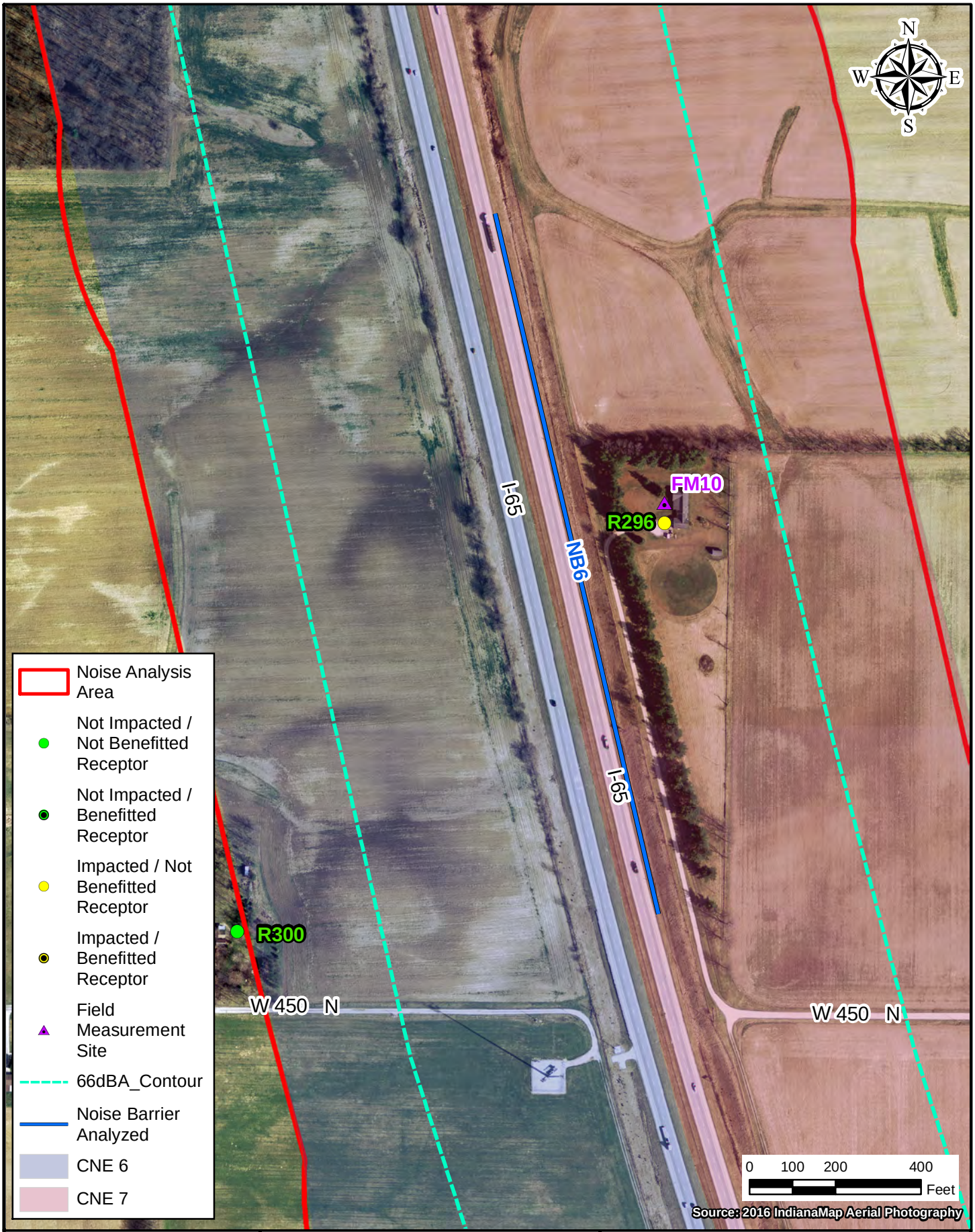
Noise Analysis Map - Map 9

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 01/08/2020



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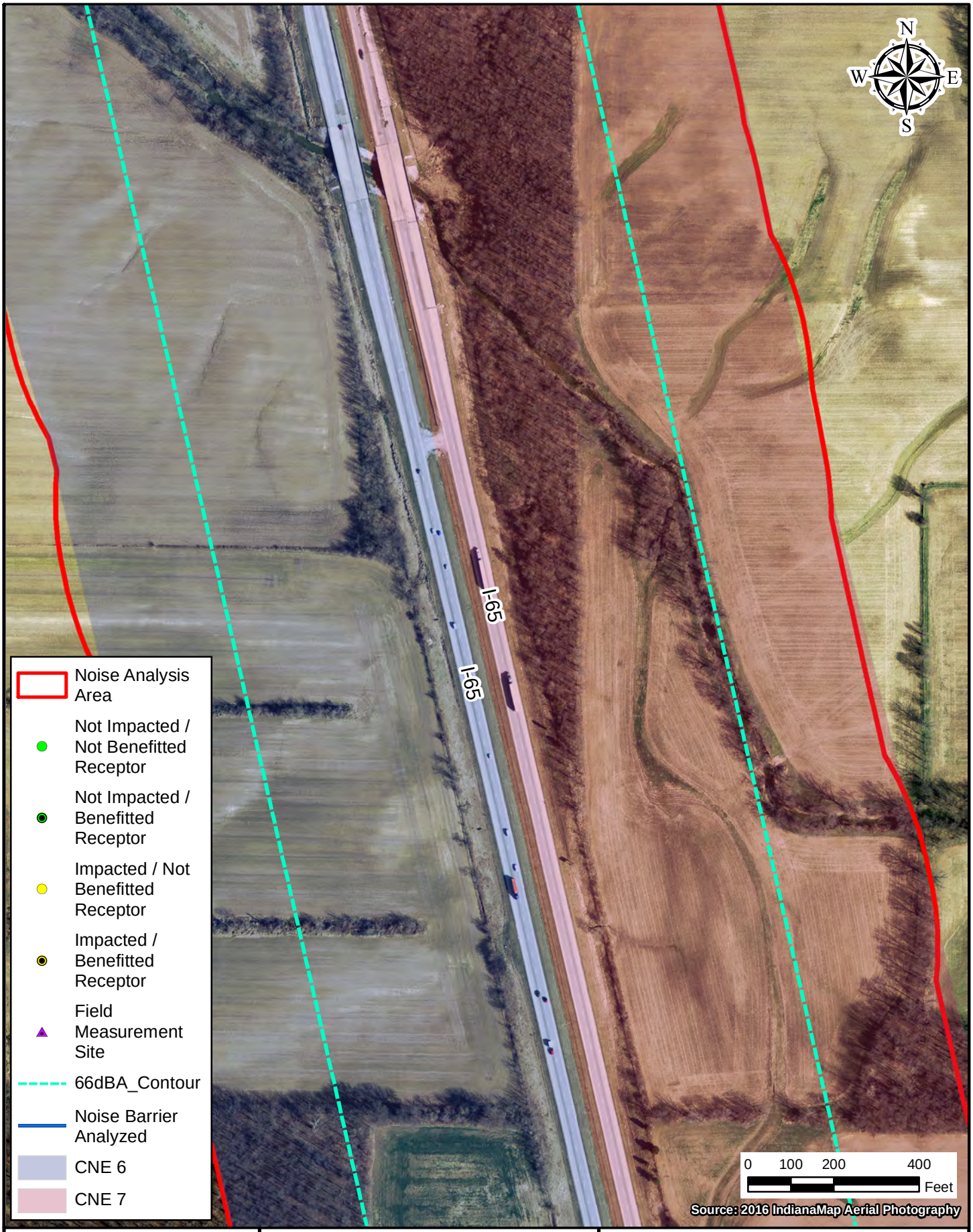
Noise Analysis Map - Map 10

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 01/08/2020



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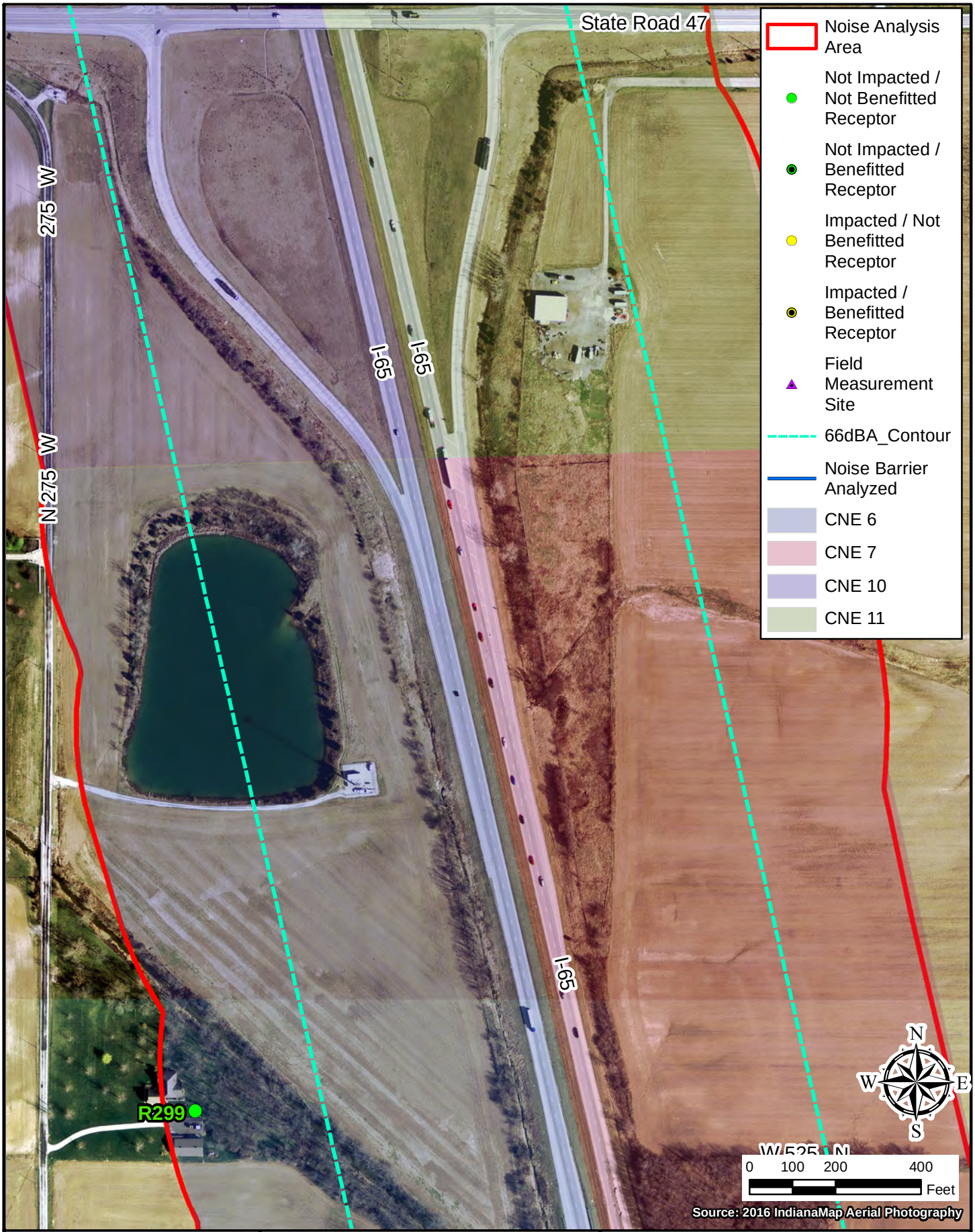
Noise Analysis Map - Map 11

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 01/08/2020



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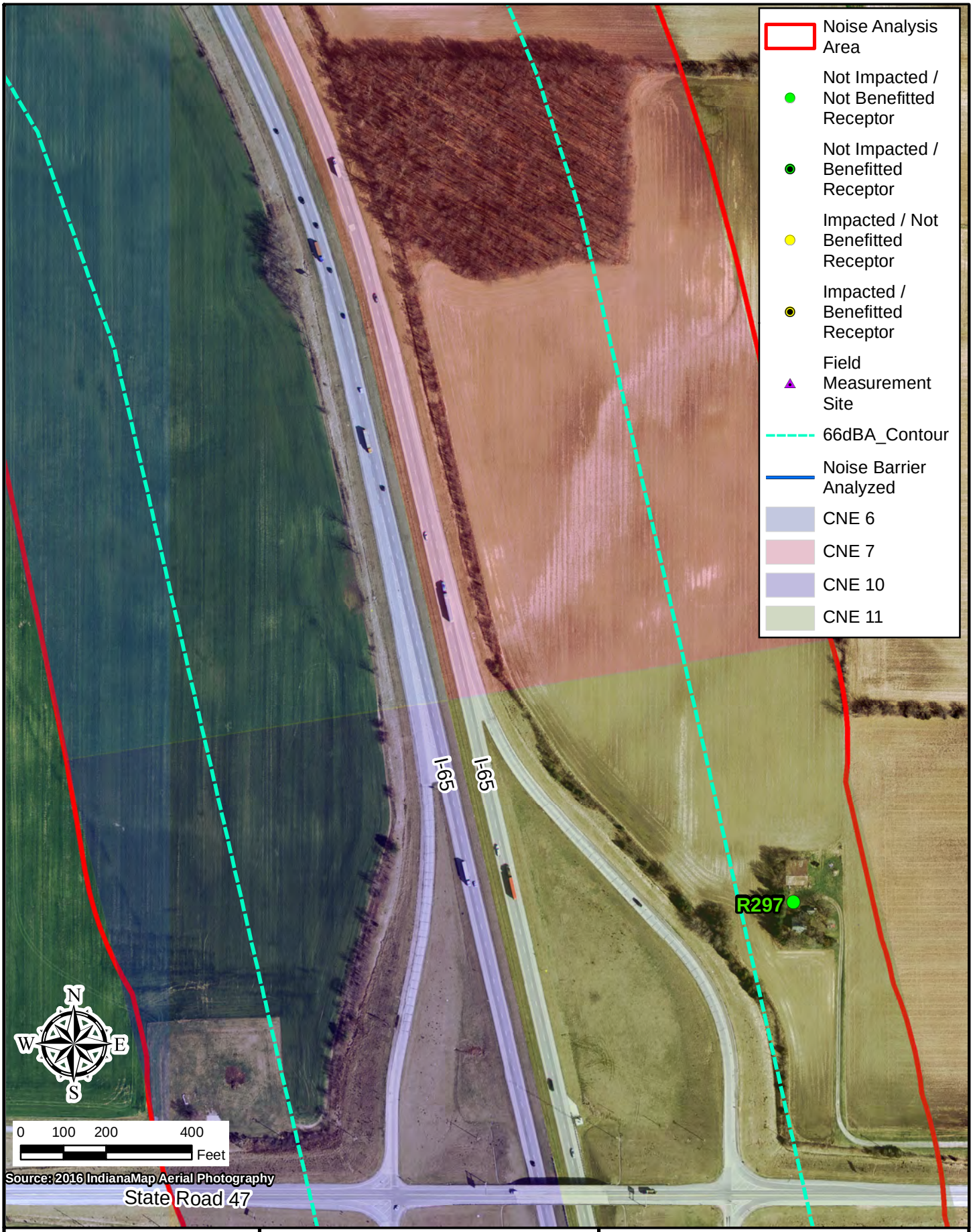
Noise Analysis Map - Map 12

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 01/08/2020



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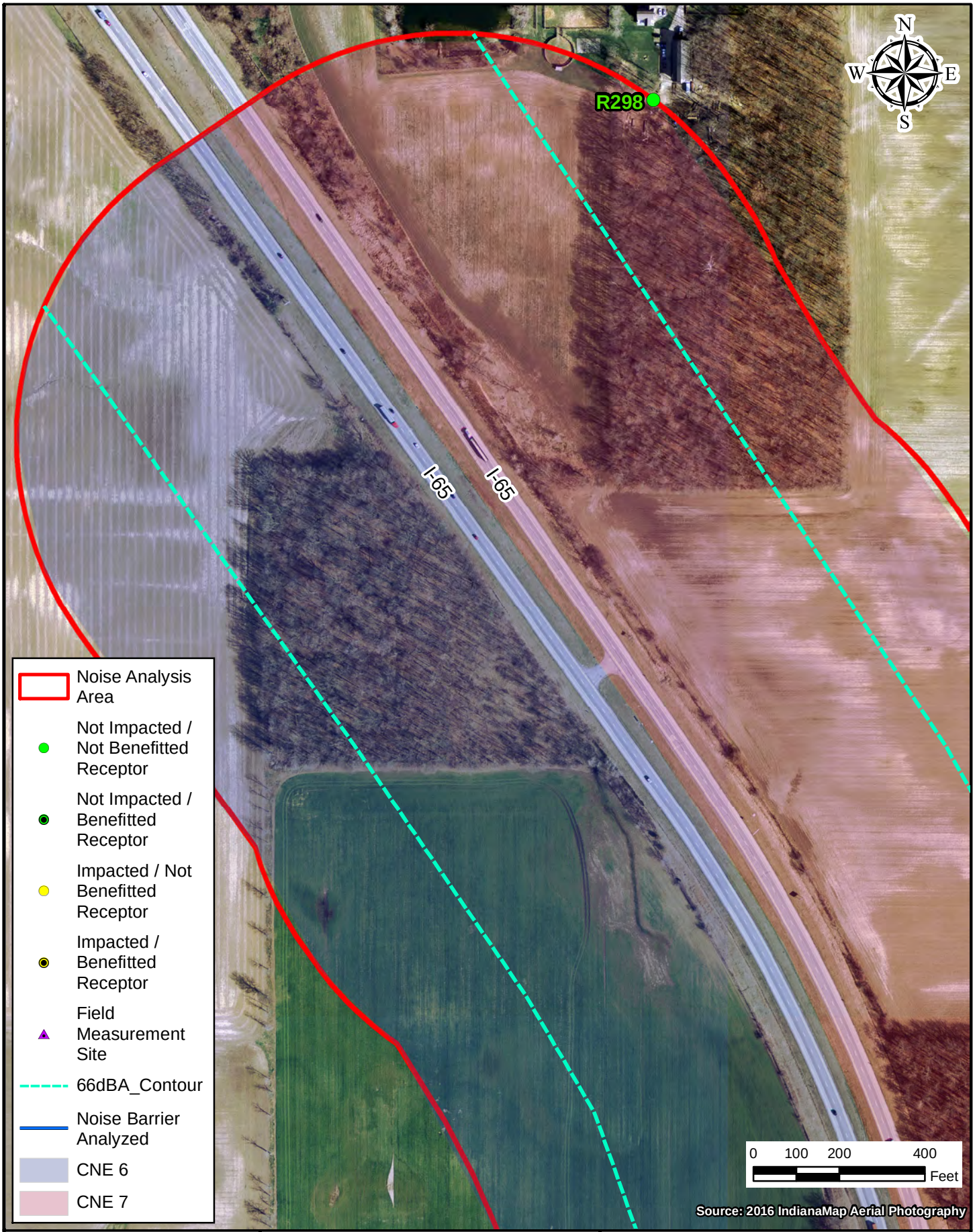
Noise Analysis Map - Map 13

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 01/08/2020



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AMERICAN STRUCTUREPOINT INC.

Noise Analysis Map - Map 14

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 01/08/2020

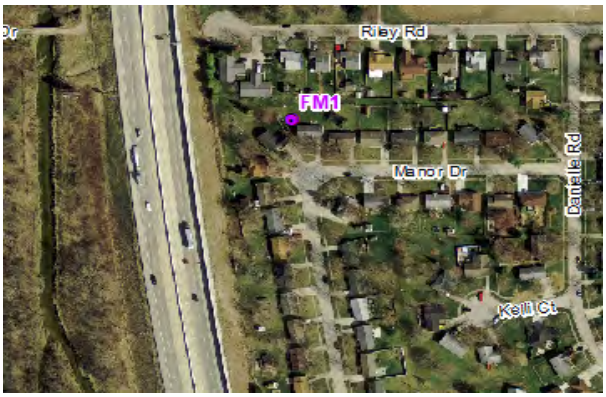
Appendix B – Field Measurement Data Sheets

NOISE FIELD MEASUREMENT DATA SHEET

							AM / **PM**	Site: FM 1
Job No.:2018.02792		Des. No.: 1802967		Location (City / County): Lebanon / Boone			Date:	7/23/2019
Project:	Interstate 65 Added Travel Lanes from SR 32 to SR 47						Atmospheric Cond.	
Instrument:	Larson Davis (LD) Class 1 Integrating Sound Level Meter (SLM) / Analyzer 831						Temp:	73 F
Calibrator:	Model CAL200 Calibrator			Calibrated: ☑ 94 dBA ☑ 114 dBA			Weather:	Sunny
Data Sheet Completed by:	Monica Del Real and Kaitlynn Walker						Relative Humidity:	43.00%
Measurement Location:	R15, CNE 1						Avg. Windspd.:	12 mph
Major Noise Source:	I-65						Pavement:	**Dry** / Wet
Secondary Source:	N/A						Other Observations:	
Land Use Cat. (*Select All Applicable*)	A - 57 dBA Serene Areas	**B - 67 dBA Residential**	C - 67 dBA Hosp/Parks/Schls/Church/ Cem/Trail/Historic/Day Care	E - 72 dBA Hotels/Offices /Rest.	F - N/A Ag/Manuf/Mai nt./Retail	G - NA Undev. Land Not Permit.		

Road Config.:	# of Lanes	Lane Width (ft.)	Median Width (ft.)	Posted Speed (mph)	Observed Speed (mph)
Primary Road:	4	12	25-50	70/65	70/65
Secondary Road:	N/A	N/A	N/A	N/A	N/A

Test Time	Start: 16:38		Finish: 16:53	
Measured dBA	61.1 L_{Aeq}		87.1 L_{max}	
Unexpected Events	None			
Traffic Volumes	Primary Road		Secondary Road	
	NB/EB	**SB**/WB	NB/EB	SB/WB
Cars	397	344	N/A	N/A
Med. Trucks	5	18	N/A	N/A
Heavy Trucks	130	118	N/A	N/A
Buses	1	1	N/A	N/A
Motorcycles	1	3	N/A	N/A

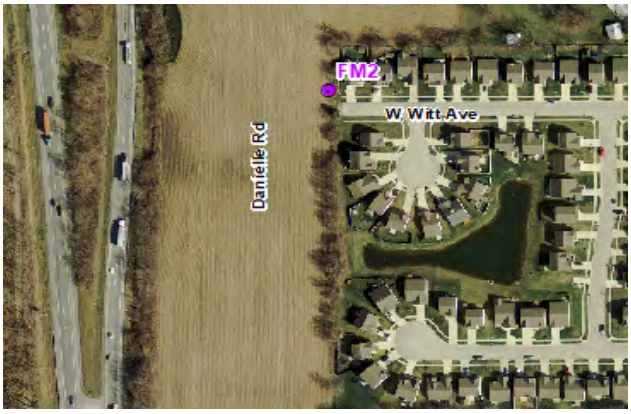


NOISE FIELD MEASUREMENT DATA SHEET

							AM / PM	Site: FM2
Job No.:2018.02792		Des. No.: 1802967		Location (City / County): Lebanon / Boone			Date:	7/25/2019
Project:	Interstate 65 Added Travel Lanes from SR 32 to SR 47						Atmospheric Cond.	
Instrument:	Larson Davis (LD) Class 1 Integrating Sound Level Meter (SLM) / Analyzer 831						Temp:	57
Calibrator:	Model CAL200 Calibrator			Calibrated: ☑ 94 dBA ☑ 114 dBA			Weather:	Sunny
Data Sheet Completed by:	Monica Del Real and Kaitlynn Walker						Relative Humidity:	91.00%
Measurement Location:	R94, CNE 1						Avg. Windspd.:	0 mph
Major Noise Source:	I-65						Pavement:	**Dry** / Wet
Secondary Source:	N/A						Other Observations:	
Land Use Cat. (*Select All Applicable*)	A - 57 dBA Serene Areas	**B - 67 dBA Residential**	C - 67 dBA Hosp/Parks/Schls/Church/ Cem/Trail/Historic/Day Care	E - 72 dBA Hotels/Offices /Rest.	F - N/A Ag/Manuf/Mai nt./Retail	G - NA Undev. Land Not Permit.		

Road Config.:	# of Lanes	Lane Width (ft.)	Median Width (ft.)	Posted Speed (mph)	Observed Speed (mph)
Primary Road:	4	12	70-120	70/65	70/65
Secondary Road:	N/A	N/A	N/A	N/A	N/A

Test Time	Start: 7:52		Finish: 8:07	
Measured dBA	57.2 L_{Aeq}		78.2 L_{max}	
Unexpected Events				
Traffic Volumes	Primary Road		Secondary Road	
	NB/EB	**SB**/WB	NB/EB	SB/WB
Cars	286	351	N/A	N/A
Med. Trucks	22	10	N/A	N/A
Heavy Trucks	93	122	N/A	N/A
Buses	3	0	N/A	N/A
Motorcycles	0	0	N/A	N/A



NOISE FIELD MEASUREMENT DATA SHEET

							AM / PM	Site: FM3
Job No.:2018.02792		Des. No.: 1802967		Location (City / County): Lebanon / Boone			Date:	7/25/2019
Project:	Interstate 65 Added Travel Lanes from SR 32 to SR 47						Atmospheric Cond.	
Instrument:	Larson Davis (LD) Class 1 Integrating Sound Level Meter (SLM) / Analyzer 831						Temp:	62
Calibrator:	Model CAL200 Calibrator			Calibrated: ☑ 94 dBA ☑ 114 dBA			Weather:	Sunny
Data Sheet Completed by:	Monica Del Real and Kaitlynn Walker						Relative Humidity:	85.00%
Measurement Location:	R79, CNE 1						Avg. Windspd.:	1 mph
Major Noise Source:	I-65						Pavement:	**Dry** / Wet
Secondary Source:	Lafayette Avenue Exit Ramp						Other Observations:	
Land Use Cat. (*Select All Applicable*)	A - 57 dBA Serene Areas	**B - 67 dBA Residential**	C - 67 dBA Hosp/Parks/Schls/Church/ Cem/Trail/Historic/Day Care	E - 72 dBA Hotels/Offices /Rest.	F - N/A Ag/Manuf/Mai nt./Retail	G - NA Undev. Land Not Permit.		

Road Config.:	# of Lanes	Lane Width (ft.)	Median Width (ft.)	Posted Speed (mph)	Observed Speed (mph)
Primary Road:	4	12	70-120	70/65	70/65
Secondary Road:	1	12	N/A	45	45

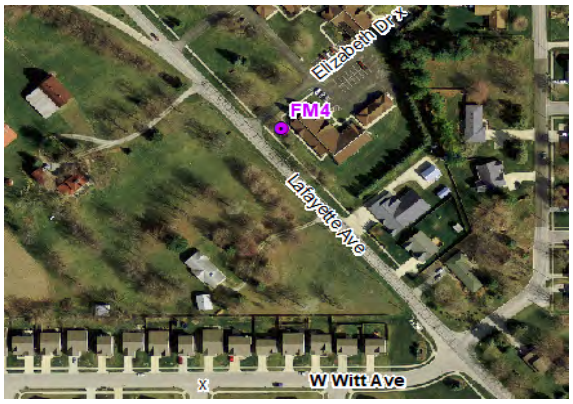
Test Time	Start: 8:44		Finish: 8:59	
Measured dBA	63.0 L_{Aeq}		86.0 L_{max}	
Unexpected Events	Construction			
Traffic Volumes	Primary Road		Secondary Road	
	NB/EB	**SB**/WB	NB/EB	SB/**WB**
Cars	322	368	N/A	11
Med. Trucks	16	19	N/A	0
Heavy Trucks	150	155	N/A	0
Buses	0	2	N/A	0
Motorcycles	1	2	N/A	0

NOISE FIELD MEASUREMENT DATA SHEET

						AM / **PM**	Site: FM4
Job No.:2018.02792		Des. No.: 1802967	Location (City / County): Lebanon / Boone			Date:	7/22/2019
Project:	Interstate 65 Added Travel Lanes from SR 32 to SR 47					Atmospheric Cond.	
Instrument:	Larson Davis (LD) Class 1 Integrating Sound Level Meter (SLM) / Analyzer 831					Temp:	73
Calibrator:	Model CAL200 Calibrator		Calibrated: ☑ 94 dBA ☑ 114 dBA			Weather:	Cloudy
Data Sheet Completed by:	Monica Del Real and Kaitlynn Walker					Relative Humidity:	70.00%
Measurement Location:	R148, CNE 2					Avg. Windspd.:	10 mph
Major Noise Source:	Lafayette Avenue					Pavement:	**Dry** / Wet
Secondary Source:	N/A					Other Observations:	
Land Use Cat. (*Select All Applicable*)	A - 57 dBA Serene Areas	**B - 67 dBA Residential**	C - 67 dBA Hosp/Parks/Schls/Church/ Cem/Trail/Historic/Day Care	E - 72 dBA Hotels/Offices /Rest.	F - N/A Ag/Manuf/Mai nt./Retail	G - NA Undev. Land Not Permit.	

Road Config.:	# of Lanes	Lane Width (ft.)	Median Width (ft.)	Posted Speed (mph)	Observed Speed (mph)
Primary Road:	2	11	N/A	30	30
Secondary Road:	N/A	N/A	N/A	N/A	N/A

Test Time	Start: 16:10		Finish: 16:25	
Measured dBA	58.1 L_{Aeq}		83.9 L_{max}	
Unexpected Events				
Traffic Volumes	Primary Road		Secondary Road	
	NB/EB	**SB**/WB	NB/EB	SB/WB
Cars	21	22	N/A	N/A
Med. Trucks	2	2	N/A	N/A
Heavy Trucks	0	0	N/A	N/A
Buses	0	0	N/A	N/A
Motorcycles	0	0	N/A	N/A



NOISE FIELD MEASUREMENT DATA SHEET

							AM / PM	Site: FM5
Job No.:2018.02792		Des. No.: 1802967		Location (City / County): Lebanon / Boone			Date:	7/25/2019
Project:	Interstate 65 Added Travel Lanes from SR 32 to SR 47						Atmospheric Cond.	
Instrument:	Larson Davis (LD) Class 1 Integrating Sound Level Meter (SLM) / Analyzer 831						Temp:	59
Calibrator:	Model CAL200 Calibrator			Calibrated: ☑ 94 dBA ☑ 114 dBA			Weather:	Sunny
Data Sheet Completed by:	Monica Del Real and Kaitlynn Walker						Relative Humidity:	91.00%
Measurement Location:	R236/R239, CNE 2						Avg. Windspd.:	0 mph
Major Noise Source:	I-65						Pavement:	**Dry** / Wet
Secondary Source:	Lafayette Avenue and Exit Ramp (recorded southbound traffic is from the Exit Ramp only)						Other Observations:	
Land Use Cat. (*Select All Applicable*)	A - 57 dBA Serene Areas	**B - 67 dBA Residential**	C - 67 dBA Hosp/Parks/Schls/Church/ Cem/Trail/Historic/Day Care	E - 72 dBA Hotels/Offices /Rest.	F - N/A Ag/Manuf/Mai nt./Retail	G - NA Undev. Land Not Permit.		

Road Config.:	# of Lanes	Lane Width (ft.)	Median Width (ft.)	Posted Speed (mph)	Observed Speed (mph)
Primary Road:	4	12	70-120	70/65	70/65
Secondary Road:	2	11	N/A	30/45	30/45

Test Time	Start: 8:18		Finish: 8:33	
Measured dBA	52.2 L_{Aeq}		80.6 L_{max}	
Unexpected Events	AC unit			
Traffic Volumes	Primary Road		Secondary Road	
	NB/EB	**SB**/WB	**NB**/EB	**SB**/WB
Cars	281	339	13	10
Med. Trucks	13	27	0	0
Heavy Trucks	87	117	0	0
Buses	2	0	0	0
Motorcycles	1	0	0	0

NOISE FIELD MEASUREMENT DATA SHEET

							AM / PM	Site: FM6
Job No.:2018.02792		Des. No.: 1802967		Location (City / County): Lebanon / Boone			Date:	7/23/2019
Project:	Interstate 65 Added Travel Lanes from SR 32 to SR 47						Atmospheric Cond.	
Instrument:	Larson Davis (LD) Class 1 Integrating Sound Level Meter (SLM) / Analyzer 831						Temp:	74
Calibrator:	Model CAL200 Calibrator			Calibrated: ☑ 94 dBA ☑ 114 dBA			Weather:	Sunny
Data Sheet Completed by:	Monica Del Real and Kaitlynn Walker						Relative Humidity:	43.00%
Measurement Location:	R277, CNE 2						Avg. Windspd.:	12 mph
Major Noise Source:	I-65						Pavement:	**Dry** / Wet
Secondary Source:	N/A						Other Observations:	
Land Use Cat. (*Select All Applicable*)	A - 57 dBA Serene Areas	**B - 67 dBA Residential**	C - 67 dBA Hosp/Parks/Schls/Church/ Cem/Trail/Historic/Day Care	E - 72 dBA Hotels/Offices /Rest.	F - N/A Ag/Manuf/Mai nt./Retail	G - NA Undev. Land Not Permit.		

Road Config.:	# of Lanes	Lane Width (ft.)	Median Width (ft.)	Posted Speed (mph)	Observed Speed (mph)
Primary Road:	4	12	30	70/65	70/65
Secondary Road:	N/A	N/A	N/A	N/A	N/A

Test Time	Start: 8:48		Finish: 9:03	
Measured dBA	56.8 L_{Aeq}		75.3 L_{max}	
Unexpected Events	Garbage truck, birds			
Traffic Volumes	Primary Road		Secondary Road	
	NB/EB	**SB**/WB	NB/EB	SB/WB
Cars	285	240	N/A	N/A
Med. Trucks	4	14	N/A	N/A
Heavy Trucks	20	144	N/A	N/A
Buses	0	0	N/A	N/A
Motorcycles	0	0	N/A	N/A

NOISE FIELD MEASUREMENT DATA SHEET

							AM / PM	Site: FM7
Job No.:2018.02792		Des. No.: 1802967		Location (City / County): Lebanon / Boone			Date:	7/23/2019
Project:	Interstate 65 Added Travel Lanes from SR 32 to SR 47						Atmospheric Cond.	
Instrument:	Larson Davis (LD) Class 1 Integrating Sound Level Meter (SLM) / Analyzer 831						Temp:	55
Calibrator:	Model CAL200 Calibrator			Calibrated: ☑ 94 dBA ☑ 114 dBA			Weather:	Sunny
Data Sheet Completed by:	Monica Del Real and Kaitlynn Walker						Relative Humidity:	92.00%
Measurement Location:	R284, CNE 3						Avg. Windspd.:	5 mph
Major Noise Source:	I-65						Pavement:	**Dry** / Wet
Secondary Source:	N/A						Other Observations:	
Land Use Cat. (*Select All Applicable*)	A - 57 dBA Serene Areas	**B - 67 dBA Residential**	C - 67 dBA Hosp/Parks/Schls/Church/ Cem/Trail/Historic/Day Care	E - 72 dBA Hotels/Offices /Rest.	F - N/A Ag/Manuf/Mai nt./Retail	G - NA Undev. Land Not Permit.		

Road Config.:	# of Lanes	Lane Width (ft.)	Median Width (ft.)	Posted Speed (mph)	Observed Speed (mph)
Primary Road:	4	12	40	70/65	70/65
Secondary Road:	N/A	N/A	N/A	N/A	N/A

Test Time	Start: 7:10		Finish: 7:25	
Measured dBA	68.1 L_{Aeq}		96.8 L_{max}	
Unexpected Events	Garbage truck			
Traffic Volumes	Primary Road		Secondary Road	
	NB/EB	**SB**/WB	NB/EB	SB/WB
Cars	278	273	N/A	N/A
Med. Trucks	13	8	N/A	N/A
Heavy Trucks	81	115	N/A	N/A
Buses	0	0	N/A	N/A
Motorcycles	0	0	N/A	N/A

NOISE FIELD MEASUREMENT DATA SHEET

							AM / **PM**	Site: FM 8
Job No.:2018.02792		Des. No.: 1802967		Location (City / County): Lebanon / Boone			Date:	7/22/2019
Project:	Interstate 65 Added Travel Lanes from SR 32 to SR 47						Atmospheric Cond.	
Instrument:	Larson Davis (LD) Class 1 Integrating Sound Level Meter (SLM) / Analyzer 831						Temp:	73
Calibrator:	Model CAL200 Calibrator			Calibrated: ☑ 94 dBA ☑ 114 dBA			Weather:	Partly cloudy
Data Sheet Completed by:	Monica Del Real and Kaitlynn Walker						Relative Humidity:	70.00%
Measurement Location:	R307, CNE 3						Avg. Windspd.:	10 mph
Major Noise Source:	US 52						Pavement:	**Dry** / Wet
Secondary Source:	I-65						Other Observations:	
Land Use Cat. (*Select All Applicable*)	A - 57 dBA Serene Areas	**B - 67 dBA Residential**	C - 67 dBA Hosp/Parks/Schls/Church/ Cem/Trail/Historic/Day Care	E - 72 dBA Hotels/Offices /Rest.	F - N/A Ag/Manuf/Mai nt./Retail	G - NA Undev. Land Not Permit.		

Road Config.:	# of Lanes	Lane Width (ft.)	Median Width (ft.)	Posted Speed (mph)	Observed Speed (mph)
Primary Road:	2 to 4	11	20	60	60
Secondary Road:	4	12	40	70/65	70/65

Test Time	Start: 17:25		Finish: 17:40	
Measured dBA	66.3 L_{Aeq}		88.1 L_{max}	
Unexpected Events				
Traffic Volumes	Primary Road		Secondary Road*	
	NB/EB	**SB**/WB	**NB**/EB	**SB**/WB
Cars	127	101	367.5	367.5
Med. Trucks	1	3	0	0
Heavy Trucks	3	3	150	150
Buses	0	0	0	0
Motorcycles	0	0	0	0

**Traffic counts were not taken in the field for FM8 due to the distance of I-65 being over 800 ft. from the measurement site. However I-65 was determined to be a major noise source, therefore the projected traffic counts for 2023 were used along I-65 for validation purposes.*

NOISE FIELD MEASUREMENT DATA SHEET

							AM / PM	Site: FM 9
Job No.:2018.02792		Des. No.: 1802967		Location (City / County): Lebanon / Boone			Date:	7/23/2019
Project:	Interstate 65 Added Travel Lanes from SR 32 to SR 47						Atmospheric Cond.	
Instrument:	Larson Davis (LD) Class 1 Integrating Sound Level Meter (SLM) / Analyzer 831						Temp:	55
Calibrator:	Model CAL200 Calibrator			Calibrated: ☑ 94 dBA ☑ 114 dBA			Weather:	Sunny
Data Sheet Completed by:	Monica Del Real and Kaitlynn Walker						Relative Humidity:	92.00%
Measurement Location:	R291, CNE 4						Avg. Windspd.:	5 mph
Major Noise Source:	I-65						Pavement:	**Dry** / Wet
Secondary Source:	CR 300 N						Other Observations:	
Land Use Cat. (*Select All Applicable*)	A - 57 dBA Serene Areas	**B - 67 dBA Residential**	C - 67 dBA Hosp/Parks/Schls/Church/ Cem/Trail/Historic/Day Care	E - 72 dBA Hotels/Offices /Rest.	F - N/A Ag/Manuf/Mai nt./Retail	G - NA Undev. Land Not Permit.		

Road Config.:	# of Lanes	Lane Width (ft.)	Median Width (ft.)	Posted Speed (mph)	Observed Speed (mph)
Primary Road:	4	12	50	70/65	70/65
Secondary Road:	2	11	0	40	40

Test Time	Start: 7:47		Finish: 8:02	
Measured dBA	60.3 L_{Aeq}		84.9 L_{max}	
Unexpected Events				
Traffic Volumes	Primary Road		Secondary Road	
	NB/EB	**SB**/WB	NB/**EB**	SB/**WB**
Cars	218	200	21	16
Med. Trucks	14	11	1	1
Heavy Trucks	99	110	0	0
Buses	1	1	0	0
Motorcycles	1	0	0	0

NOISE FIELD MEASUREMENT DATA SHEET

							AM / **PM**	Site: FM10
Job No.:2018.02792		Des. No.: 1802967		Location (City / County): Lebanon / Boone			Date:	7/22/2019
Project:	Interstate 65 Added Travel Lanes from SR 32 to SR 47						Atmospheric Cond.	
Instrument:	Larson Davis (LD) Class 1 Integrating Sound Level Meter (SLM) / Analyzer 831						Temp:	73
Calibrator:	Model CAL200 Calibrator			Calibrated: ☑ 94 dBA ☑ 114 dBA			Weather:	Partly Cloudy
Data Sheet Completed by:	Monica Del Real and Kaitlynn Walker						Relative Humidity:	70.00%
Measurement Location:	R296, CNE 5						Avg. Windspd.:	10 mph
Major Noise Source:	I-65						Pavement:	**Dry** / Wet
Secondary Source:	N/A						Other Observations:	
Land Use Cat. (*Select All Applicable*)	A - 57 dBA Serene Areas	**B - 67 dBA Residential**	C - 67 dBA Hosp/Parks/Schls/Church/ Cem/Trail/Historic/Day Care	E - 72 dBA Hotels/Offices /Rest.	F - N/A Ag/Manuf/Mai nt./Retail	G - NA Undev. Land Not Permit.		

Road Config.:	# of Lanes	Lane Width (ft.)	Median Width (ft.)	Posted Speed (mph)	Observed Speed (mph)
Primary Road:	4	12	50	70/65	70/65
Secondary Road:	N/A	N/A	N/A	N/A	N/A

Test Time	Start: 16:45		Finish: 17:00	
Measured dBA	65.2 L_{Aeq}		87.1 L_{max}	
Unexpected Events				
Traffic Volumes	Primary Road		Secondary Road	
	NB/EB	**SB**/WB	NB/EB	SB/WB
Cars	286	297	N/A	N/A
Med. Trucks	10	12	N/A	N/A
Heavy Trucks	94	133	N/A	N/A
Buses	0	0	N/A	N/A
Motorcycles	1	0	N/A	N/A

Appendix C – Sound Level Meter Calibration Certificates

Certificate of Calibration and Conformance

This document certifies that the instrument referenced below meets published specifications per Procedure PRD-P263; ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 0; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 0; 61252-2002.

Manufacturer:	Larson Davis	Temperature:	77.3	°F
Model Number:	831		25.17	°C
Serial Number:	3397	Rel. Humidity:	31.4	%
Customer:	TMS Rental	Pressure:	1008.2	mbars
Description:	Sound Level Meter		1008.2	hPa
Note:	As Found/As Left: In Tolerance			

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 2/11/2019 Calibration Due:

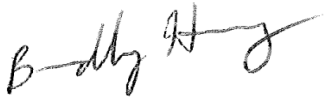
Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	5/7/2019

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

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of The Modal Shop.

Technician: Brad Haarmeyer Signature:



THE MODAL SHOP
A PCB GROUP CO.

3149 East Kemper Road
Cincinnati, OH. 45241
Phone: (513) 351-9919
(800) 860-4867
www.modalshop.com

Calibration Certificate

Certificate Number 2019003789

Customer:
The Modal Shop
3149 East Kemper Road
Cincinnati, OH 45241, United States

Model Number	CAL200	***Procedure Number***	D0001.8386		
Serial Number	16685	***Technician***	Scott Montgomery		
Test Results	**Pass**	***Calibration Date***	26 Mar 2019		
Initial Condition	As Manufactured	***Calibration Due***			
		Temperature	22	°C	± 0.3 °C
Description	Larson Davis CAL200 Acoustic Calibrator	***Humidity***	38	%RH	± 3 %RH
		Static Pressure	101.3	kPa	± 1 kPa

Evaluation Method The data is aquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 µPa.

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2017 ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Agilent 34401A DMM	09/06/2018	09/06/2019	001021
Larson Davis Model 2900 Real Time Analyzer	04/10/2018	04/10/2019	001051
Microphone Calibration System	03/04/2019	03/04/2020	005446
1/2" Preamplifier	09/20/2018	09/20/2019	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/07/2018	08/07/2019	006507
1/2 inch Microphone - RI - 200V	05/10/2018	05/10/2019	006510
Pressure Transducer	07/18/2018	07/18/2019	007368

Output Level

Nominal Level [dB]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
114	101.0	113.99	113.80	114.20	0.14	Pass
94	101.3	94.00	93.80	94.20	0.15	Pass

-- End of measurement results--

Frequency

Nominal Level [dB]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
114	101.0	1,000.16	990.00	1,010.00	0.20	Pass
94	101.3	1,000.16	990.00	1,010.00	0.20	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N)

Nominal Level [dB]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
114	101.0	0.38	0.00	2.00	0.25 ‡	Pass
94	101.3	0.42	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Level Change Over Pressure

Tested at: 114 dB, 24 °C, 35 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
108.0	108.0	-0.03	-0.30	0.30	0.04 ‡	Pass
101.3	101.2	0.00	-0.30	0.30	0.04 ‡	Pass
92.0	91.9	0.03	-0.30	0.30	0.04 ‡	Pass
83.0	83.0	0.03	-0.30	0.30	0.04 ‡	Pass
74.0	73.9	-0.02	-0.30	0.30	0.04 ‡	Pass
65.0	65.1	-0.12	-0.30	0.30	0.04 ‡	Pass

-- End of measurement results--

Frequency Change Over Pressure

Tested at: 114 dB, 24 °C, 35 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
108.0	108.0	0.00	-10.00	10.00	0.20 ‡	Pass
101.3	101.2	0.00	-10.00	10.00	0.20 ‡	Pass
92.0	91.9	0.00	-10.00	10.00	0.20 ‡	Pass
83.0	83.0	0.00	-10.00	10.00	0.20 ‡	Pass
74.0	73.9	-0.01	-10.00	10.00	0.20 ‡	Pass
65.0	65.1	-0.01	-10.00	10.00	0.20 ‡	Pass

-- End of measurement results--

Certificate Number 2019003789

Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 24 °C, 35 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
108.0	108.0	0.37	0.00	2.00	0.25 ‡	Pass
101.3	101.2	0.38	0.00	2.00	0.25 ‡	Pass
92.0	91.9	0.39	0.00	2.00	0.25 ‡	Pass
83.0	83.0	0.41	0.00	2.00	0.25 ‡	Pass
74.0	73.9	0.44	0.00	2.00	0.25 ‡	Pass
65.0	65.1	0.47	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Signatory: *Scott Montgomery*

LARSON DAVIS - A PCB PIEZOTRONICS DIV.
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA A2LA ACCREDITED Cert. #3622.01

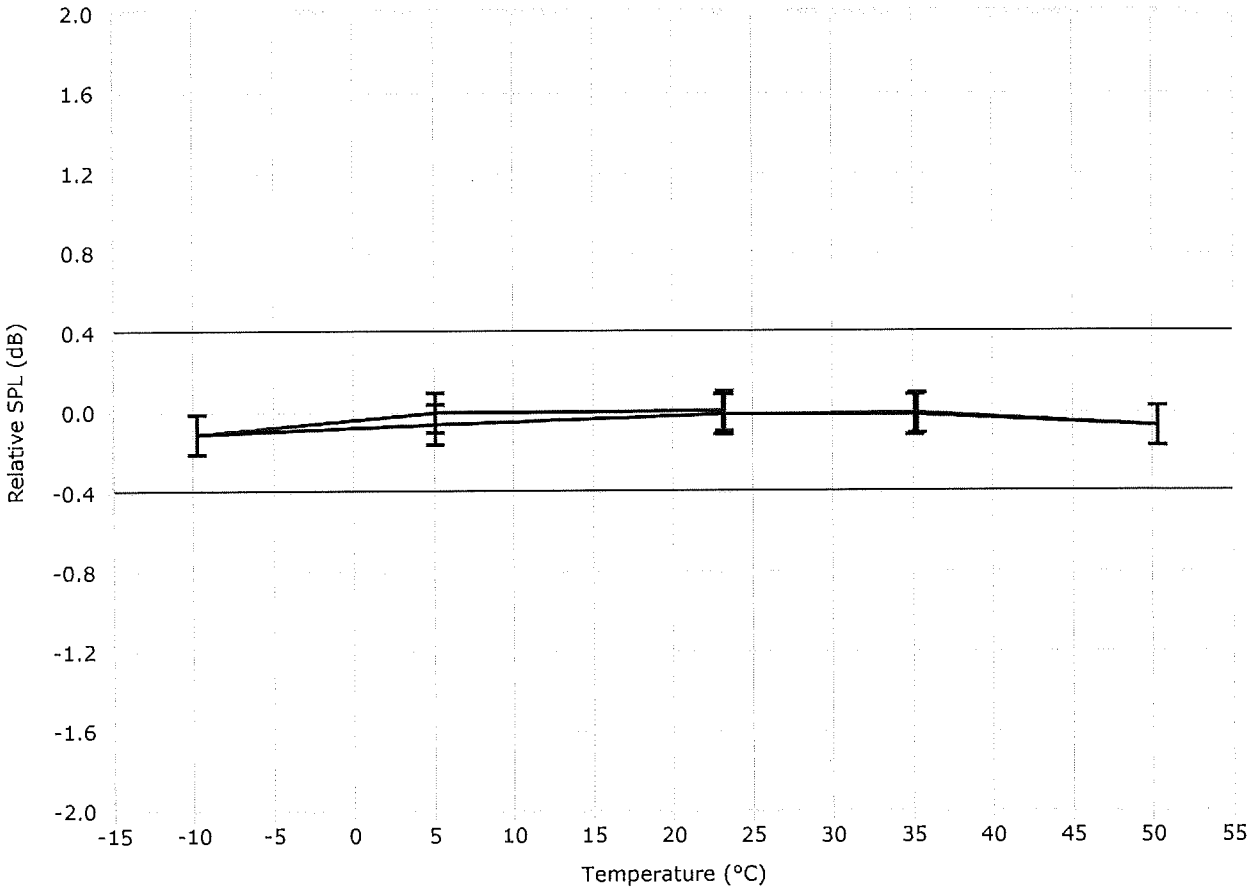
LARSON DAVIS A PCB PIEZOTRONICS DIV.

Model CAL200 Relative SPL vs. Temperature

Larson Davis Model CAL200 Serial Number: 16685

Model CAL200 Relative SPL vs. Temperature at 50% RH.
A 2559 Mic (SN: 2911) with a PRM901 Preamp (SN: 0168), station 6 was used to check the levels.

Test Date: 08 Mar 2019 2:05:24 PM



0.1dB expanded uncertainty at ~95% confidence level (k=2)

Sequence File: CAL250w200.SEQ

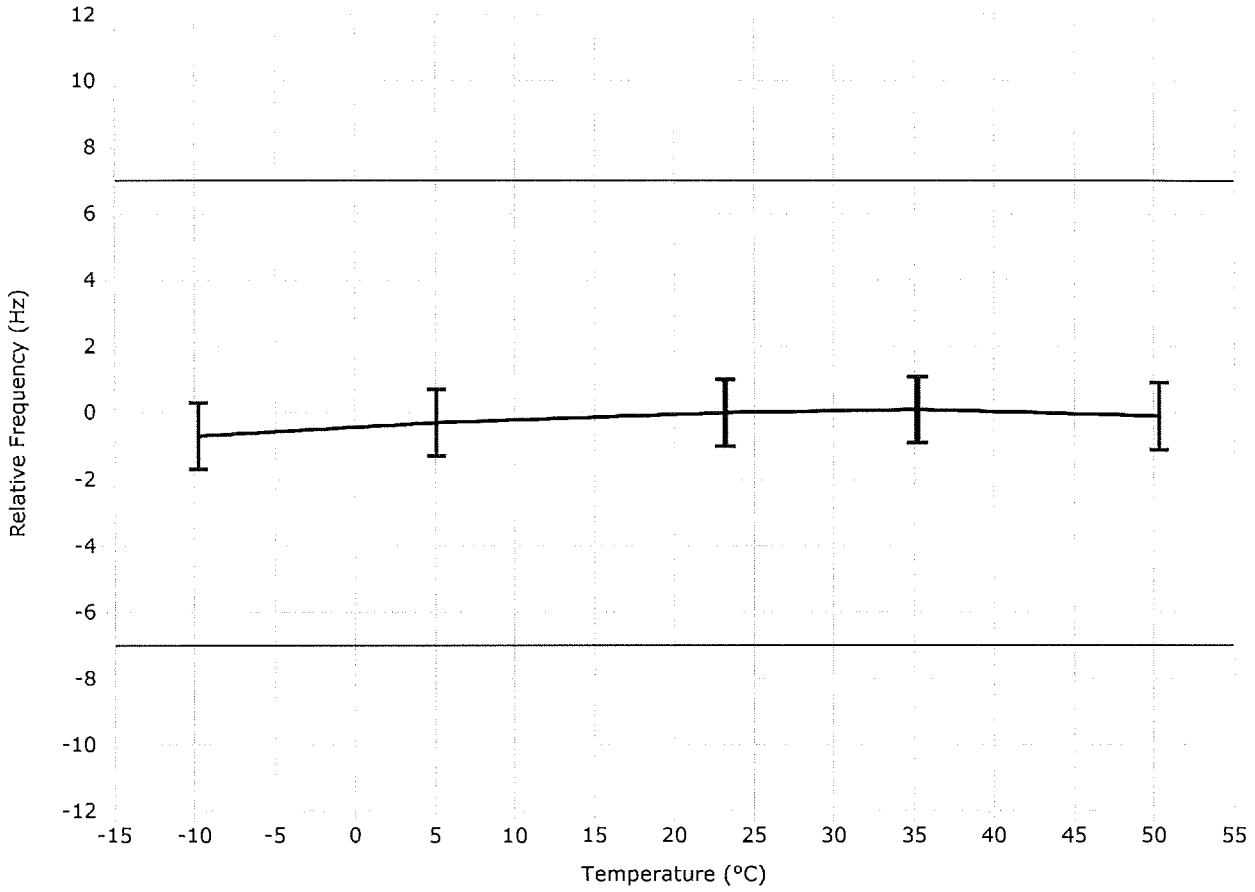
Test Location: Larson Davis, a division of PCB Piezotronics, Inc.
1681 West 820 North, Provo, Utah 84601
Tel: 716 684-0001 www.LarsonDavis.com

Model CAL200 Relative Frequency vs. Temperature

Larson Davis Model CAL200 Serial Number: 16685

Model CAL200 Relative Frequency vs. Temperature at 50% RH.
A 2559 Mic (SN: 2911) with a PRM901 Preamp (SN: 0168), station 6 was used to check the levels.

Test Date: 08 Mar 2019 2:05:24 PM



1.0 Hz expanded uncertainty at ~95% confidence level (k=2)

Sequence File: CAL250w200.SEQ

Test Location: Larson Davis, a division of PCB Piezotronics, Inc.
1681 West 820 North, Provo, Utah 84601
Tel: 716 684-0001 www.LarsonDavis.com

~ Calibration Report ~

Microphone Model: 377B02 Serial Number: 314288 Description: 1/2" Free-Field Microphone

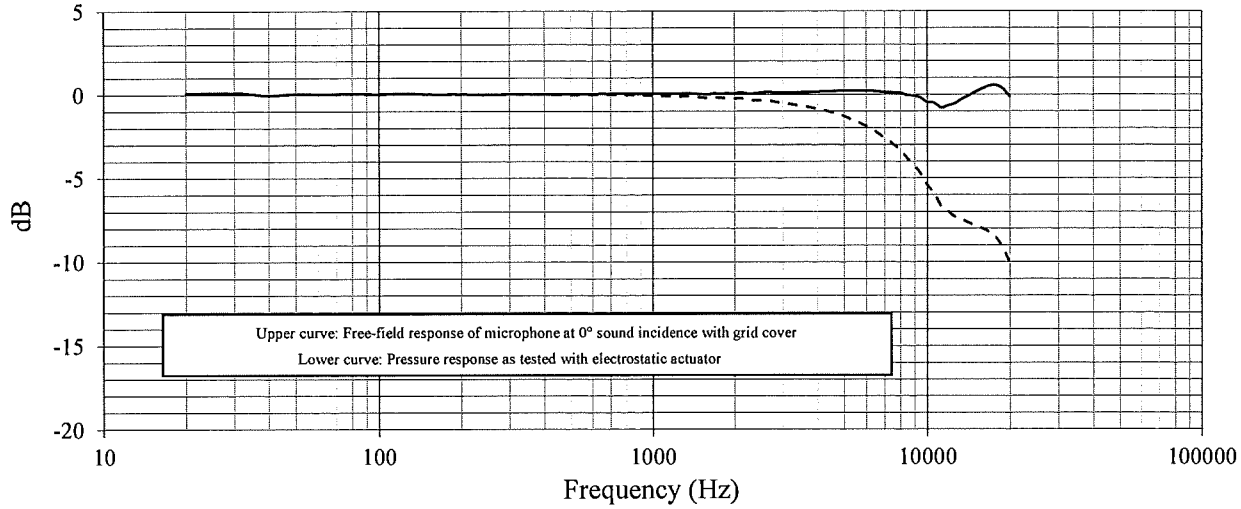
Calibration Data

Open Circuit Sensitivity @ 251.2 Hz: 53.59 mV/Pa
-25.42 dB re 1V/Pa

Polarization Voltage, External: 0 V
Capacitance: 11.9 pF

Temperature: 72 °F (22°C) Ambient Pressure: 991 mbar Relative Humidity: 40 %

Frequency Response (0 dB @ 251.2 Hz)



Freq (Hz)	Lower (dB)	Upper (dB)	Freq (Hz)	Lower (dB)	Upper (dB)	Freq (Hz)	Lower (dB)	Upper (dB)	Freq (Hz)	Lower (dB)	Upper (dB)
20.0	0.08	0.08	1679	-0.17	0.06	7499	-2.96	0.11	-	-	-
25.1	0.11	0.11	1778	-0.20	0.05	7943	-3.29	0.10	-	-	-
31.6	0.10	0.10	1884	-0.22	0.06	8414	-3.76	-0.03	-	-	-
39.8	-0.04	-0.04	1995	-0.24	0.07	8913	-4.19	-0.08	-	-	-
50.1	0.04	0.04	2114	-0.22	0.12	9441	-4.71	-0.19	-	-	-
63.1	0.04	0.04	2239	-0.32	0.05	10000	-5.41	-0.46	-	-	-
79.4	0.05	0.05	2371	-0.35	0.07	10593	-5.91	-0.51	-	-	-
100.0	0.03	0.03	2512	-0.34	0.12	11220	-6.65	-0.79	-	-	-
125.9	0.07	0.07	2661	-0.37	0.14	11885	-6.98	-0.66	-	-	-
158.5	0.02	0.02	2818	-0.44	0.12	12589	-7.30	-0.53	-	-	-
199.5	0.03	0.03	2985	-0.52	0.10	13335	-7.47	-0.28	-	-	-
251.2	0.00	0.00	3162	-0.57	0.11	14125	-7.67	-0.08	-	-	-
316.2	0.02	0.03	3350	-0.63	0.11	14962	-7.82	0.15	-	-	-
398.1	0.01	0.01	3548	-0.68	0.14	15849	-8.00	0.35	-	-	-
501.2	-0.02	0.02	3758	-0.76	0.14	16788	-8.21	0.51	-	-	-
631.0	0.00	0.04	3981	-0.85	0.15	17783	-8.56	0.55	-	-	-
794.3	-0.02	0.07	4217	-0.93	0.18	18837	-9.16	0.35	-	-	-
1000.0	-0.07	0.05	4467	-1.05	0.18	19953	-10.05	-0.12	-	-	-
1059.3	-0.08	0.05	4732	-1.16	0.21	-	-	-	-	-	-
1122.0	-0.10	0.04	5012	-1.31	0.22	-	-	-	-	-	-
1188.5	-0.10	0.05	5309	-1.49	0.21	-	-	-	-	-	-
1258.9	-0.11	0.05	5623	-1.66	0.22	-	-	-	-	-	-
1333.5	-0.11	0.07	5957	-1.85	0.22	-	-	-	-	-	-
1412.5	-0.14	0.05	6310	-2.07	0.22	-	-	-	-	-	-
1496.2	-0.17	0.03	6683	-2.35	0.17	-	-	-	-	-	-
1584.9	-0.20	0.01	7080	-2.65	0.13	-	-	-	-	-	-

Technician: Leonard Lukasik Date: May 6, 2019

ilac-MRA A2LA ACCREDITED
CALIBRATION CERT #1862.01

PCB PIEZOTRONICS INC
VIBRATION DIVISION

3425 Walden Avenue, Depew, New York, 14043
TEL: 888-684-0013 FAX: 716-685-3886 www.pcb.com

IO:CAL112-3639999761.046+0

~ Certificate of Calibration and Compliance ~

Microphone Model: 377B02 Serial Number: 314288 Manufacturer: PCB

Calibration Environmental Conditions

Environmental test conditions as printed on microphone calibration chart.

Reference Equipment

Manufacturer	Model #	Serial #	PCB Control #	Cal Date	Due Date
National Instruments	PCIe-6351	1896F08	CA1918	10/19/18	10/18/19
Larson Davis	PRM915	131	CA1205	1/11/19	1/10/20
Larson Davis	PRM902	4407	CA1248	5/23/18	5/23/19
Larson Davis	PRM916	125	TA469	6/26/18	6/26/19
Larson Davis	CAL250	5220	CA2213	3/6/19	2/14/20
Larson Davis	2201	145	CA2046	6/4/18	6/4/19
Bruel & Kjaer	4192	2954556	CA2323	3/11/19	3/11/20
Larson Davis	GPRM902	4163	CA1089	6/12/18	6/12/19
Newport	iTHX-SD/N	1080002	CA1511	2/8/19	2/7/20
Larson Davis	PRA951-4	234	CA1154	10/24/18	10/24/19
Larson Davis	PRM915	147	CA2179	6/8/18	6/7/19
PCB	68510-02	N/A	CA2672	12/21/18	12/20/19
0	0	0	0	not required	not required
0	0	0	0	not required	not required
0	0	0	0	not required	not required

Frequency sweep performed with B&K UA0033 electrostatic actuator.

Condition of Unit

As Found: n/a

As Left: New Unit, In Tolerance

Notes

1. Calibration of reference equipment is traceable to one or more of the following National Labs; NIST, PTB or DFM.
2. This certificate shall not be reproduced, except in full, without written approval from PCB Piezotronics, Inc.
3. Calibration is performed in compliance with ISO 10012-1, ANSI/NCSL Z540.3 and ISO 17025.
4. See Manufacturer's Specification Sheet for a detailed listing of performance specifications.
5. Open Circuit Sensitivity is measured using the insertion voltage method following procedure AT603-5.
6. Measurement uncertainty (95% confidence level with coverage factor of 2) for sensitivity is +/-0.20 dB.
7. Unit calibrated per ACS-20.

Technician: Leonard Lukasik Date: May 6, 2019

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Appendix D – Predicted Noise Levels

TNM 2.5 Model Outputs							
Receptor(s)	Dwelling Units	NAC Criteria	2020 Leq(1h)	2043 Leq(1h)	Change in Leq(1h)	Substantial Increase Threshold	Impact
R1-R2	2	66	62.7	62.9	0.2	15	----
R3-R4	2	66	63.0	63.6	0.6	15	----
R5-R6	2	66	64.0	64.9	0.9	15	----
R7-R8	2	66	61.1	61.6	0.5	15	----
R-9	1	66	61.5	62.4	0.9	15	----
R10-R11	2	66	59.8	60.9	1.1	15	----
R12-R13	2	66	59.0	59.7	0.7	15	----
R14	1	66	64.9	66.0	1.1	15	Snd Lvl
R15-16	2	66	63.7	64.9	1.2	15	----
R17-R18	2	66	61.8	63.2	1.4	15	----
R19-R20	2	66	60.0	61.1	1.1	15	----
R21-R22	2	66	58.8	59.4	0.6	15	----
R23-R24	2	66	58.9	58.9	0.0	15	----
R25-R26	2	66	59.7	59.9	0.2	15	----
R27-R28	2	66	60.9	62.1	1.2	15	----
R29-R30	2	66	62.2	63.6	1.4	15	----
R31-R32	2	66	62.6	63.6	1.0	15	----
R33	2	66	65.4	66.3	0.9	15	Snd Lvl
R34	2	66	65.6	66.6	1.0	15	Snd Lvl
R35	1	66	73.3	74.5	1.2	15	Snd Lvl
R36-R37	2	66	63.6	65.5	1.9	15	----
R38-R39	2	66	62.0	63.8	1.8	15	----
R40-R41	2	66	60.5	62.2	1.7	15	----
R42	1	66	59.1	57.2	-1.9	15	----
R43-R44	2	66	60.5	60.9	0.4	15	----
R45-R46	2	66	62.1	63.8	1.7	15	----
R47-R48	2	66	64.0	65.5	1.5	15	----
R49	1	66	67.4	69.6	2.2	15	Snd Lvl
R50	1	66	70.3	72.7	2.4	15	Snd Lvl
R51-R52	2	66	72.6	74.5	1.9	15	Snd Lvl
R53-R54	2	66	72.9	74.3	1.4	15	Snd Lvl
R55-R56	2	66	73.1	74.0	0.9	15	Snd Lvl
R57-R58	2	66	73.1	73.6	0.5	15	Snd Lvl
R59-R60	2	66	73.3	73.4	0.1	15	Snd Lvl
R61-R62	2	66	73.7	73.2	-0.5	15	Snd Lvl
R63-R64	2	66	73.6	73.0	-0.6	15	Snd Lvl
R65-R66	2	66	73.1	72.6	-0.5	15	Snd Lvl
R67-R68	2	66	72.5	71.9	-0.6	15	Snd Lvl
R69-R70	2	66	71.9	71.5	-0.4	15	Snd Lvl
R71-R72	2	66	70.7	70.9	0.2	15	Snd Lvl
R73-R74	2	66	70.2	70.5	0.3	15	Snd Lvl
R75-R76	2	66	69.3	69.9	0.6	15	Snd Lvl
R77-R78	2	66	69.2	69.4	0.2	15	Snd Lvl
R79	1	66	65.8	67.3	1.5	15	Snd Lvl
R80-R81	2	66	64.7	67.0	2.3	15	Snd Lvl
R82-R83	2	66	65.6	67.2	1.6	15	Snd Lvl
R84-R85	2	66	65.8	67.4	1.6	15	Snd Lvl
R86-R87	2	66	66.3	67.9	1.6	15	Snd Lvl

TNM 2.5 Model Outputs							
Receptor(s)	Dwelling Units	NAC Criteria	2020 Leq(1h)	2043 Leq(1h)	Change in Leq(1h)	Substantial Increase Threshold	Impact
R88-R89	2	66	66.7	68.3	1.6	15	Snd Lvl
R90-R91	2	66	67.1	68.5	1.4	15	Snd Lvl
R92-R93	2	66	66.8	68.8	2.0	15	Snd Lvl
R94	1	66	65.5	68.8	3.3	15	Snd Lvl
R95-R96	2	66	67.2	69.0	1.8	15	Snd Lvl
R97-R98	2	66	68.0	69.3	1.3	15	Snd Lvl
R99-R100	2	66	67.9	69.4	1.5	15	Snd Lvl
R101-R102	2	66	67.8	69.5	1.7	15	Snd Lvl
R103-R104	2	66	67.8	69.6	1.8	15	Snd Lvl
R105-R106	2	66	67.9	69.8	1.9	15	Snd Lvl
R107-R108	2	66	66.1	68.1	2.0	15	Snd Lvl
R109-R110	2	66	63.7	63.7	0.0	15	----
R111-R112	2	66	61.6	61.6	0.0	15	----
R113-114	1	66	59.5	59.9	0.4	15	----
R115-R116	2	66	60.0	59.9	-0.1	15	----
R117-R118	2	66	62.7	62.9	0.2	15	----
R119	1	66	65.0	65.1	0.1	15	----
R120-R121	2	66	65.7	65.4	-0.3	15	----
R122-R123	2	66	64.1	64.4	0.3	15	----
R124-R125	2	66	59.6	60.1	0.5	15	----
R126	1	66	58.0	58.2	0.2	15	----
R127-R128	2	66	55.1	54.5	-0.6	15	----
R129-R130	2	66	57.8	58.0	0.2	15	----
R131-R132	2	66	62.4	62.9	0.5	15	----
R133-R134	2	66	65.0	65.3	0.3	15	----
R135-R136	2	66	64.6	65.3	0.7	15	----
R137-R138	2	66	62.8	65.4	2.6	15	----
R139-R140	2	66	60.7	61.5	0.8	15	----
R141-R142	2	66	59.8	60.2	0.4	15	----
R143-R144	2	66	59.0	59.6	0.6	15	----
R145	1	66	61.7	62.1	0.4	15	----
R146	1	66	58.4	59.2	0.8	15	----
R147	1	66	60.1	60.8	0.7	15	----
R148	1	66	59.8	60.6	0.8	15	----
R149	1	66	59.3	60.1	0.8	15	----
R150	1	66	58.6	59.4	0.8	15	----
R151	1	66	49.9	48.8	-1.1	15	----
R152-R153	2	66	50.8	49.7	-1.1	15	----
R154-R155	2	66	53.8	54.5	0.7	15	----
R156	1	66	53.6	54.3	0.7	15	----
R157	1	66	49.4	49.3	-0.1	15	----
R158	1	66	54.6	55.3	0.7	15	----
R159-R161	3	66	43.8	43.3	-0.5	15	----
R162-R163	2	66	43.1	42.3	-0.8	15	----
R164 R167	2	66	55.7	56.6	0.9	15	----
R165 R168	2	66	58.6	59.5	0.9	15	----
R166 R169	2	66	59.7	60.4	0.7	15	----
R170 R173	2	66	52.5	53.3	0.8	15	----

TNM 2.5 Model Outputs							
Receptor(s)	Dwelling Units	NAC Criteria	2020 Leq(1h)	2043 Leq(1h)	Change in Leq(1h)	Substantial Increase Threshold	Impact
R171 R174	2	66	55.8	56.7	0.9	15	----
R173 R175	2	66	57.7	58.4	0.7	15	----
R176 R179	2	66	59.5	60.5	1.0	15	----
R177 R180	2	66	62.3	63.4	1.1	15	----
R178 R181	2	66	63.3	64.7	1.4	15	----
R182 R185	2	66	57.5	58.6	1.1	15	----
R183 R186	2	66	59.9	61.2	1.3	15	----
R184 R187	2	66	61.0	62.6	1.6	15	----
R188 R191	2	66	50.1	51.0	0.9	15	----
R189 R192	2	66	53.1	54.0	0.9	15	----
R190 R193	2	66	55.7	56.5	0.8	15	----
R194 R197	2	66	48.6	49.6	1.0	15	----
R195 R198	2	66	51.8	52.9	1.1	15	----
R196 R199	2	66	54.6	55.4	0.8	15	----
R200 R203	2	66	55.3	56.4	1.1	15	----
R201-R204	2	66	56.7	58.3	1.6	15	----
R202R205	2	66	57.9	59.7	1.8	15	----
R206 R209	2	66	54.4	55.9	1.5	15	----
R207 R210	2	66	56.0	57.3	1.3	15	----
R208 R211	2	66	57.4	58.9	1.5	15	----
R212 R215	2	66	47.8	47.5	-0.3	15	----
R213 R216	2	66	51.5	52.0	0.5	15	----
R214 R217	2	66	54.5	55.3	0.8	15	----
R218 R221	2	66	53.7	54.6	0.9	15	----
R219 R222	2	66	57.2	58.3	1.1	15	----
R220 R223	2	66	59.0	60.1	1.1	15	----
R224 R227	2	66	52.6	52.8	0.2	15	----
R225 R228	2	66	55.5	56.2	0.7	15	----
R226 R229	2	66	57.7	58.4	0.7	15	----
R230 R233	2	66	52.1	52.1	0.0	15	----
R231 R234	2	66	54.3	54.9	0.6	15	----
R232 R235	2	66	56.6	57.3	0.7	15	----
R236 R239	2	66	58.9	60.4	1.5	15	----
R237 R240	2	66	61.8	63.3	1.5	15	----
R238 R241	2	66	63.3	64.9	1.6	15	----
R242 R245	2	66	58.0	59.1	1.1	15	----
R243 R246	2	66	61.0	62.2	1.2	15	----
R244 R247	2	66	62.3	64.0	1.7	15	----
R248 R251	2	66	57.3	57.9	0.6	15	----
R249 R252	2	66	60.2	61.6	1.4	15	----
R250 R253	2	66	61.7	63.3	1.6	15	----
R254	1	66	56.8	57.8	1.0	15	----
R255	1	66	61.4	63.5	2.1	15	----
R256-R257	2	66	57.6	58.8	1.2	15	----
R258-R259	2	66	58.8	60.3	1.5	15	----
R260-R261	2	66	59.3	60.9	1.6	15	----
R262-R263	2	66	59.3	60.8	1.5	15	----
R264-R265	2	66	60.0	61.0	1.0	15	----

TNM 2.5 Model Outputs							
Receptor(s)	**Dwelling Units**	**NAC Criteria**	**2020 Leq(1h)**	**2043 Leq(1h)**	**Change in Leq(1h)**	**Substantial Increase Threshold**	**Impact**
R266-R267	2	66	60.2	60.8	0.6	15	----
R268-R269	2	66	63.5	64.4	0.9	15	----
R270-R271	2	66	64.7	65.5	0.8	15	----
R272-R273	2	66	63.6	64.4	0.8	15	----
R274-R275	2	66	62.4	63.3	0.9	15	----
R276-R277	2	66	61.9	62.7	0.8	15	----
R278-R279	2	66	61.7	62.4	0.7	15	----
R280	1	66	61.1	61.9	0.8	15	----
R281-R282	2	66	59.6	60.5	0.9	15	----
R283	1	66	59.9	60.8	0.9	15	----
R284	1	66	71.3	72.2	0.9	15	Snd Lvl
R285	1	66	70.2	71.1	0.9	15	Snd Lvl
R286	1	66	68.7	69.7	1.0	15	Snd Lvl
R287	1	66	66.6	68.0	1.4	15	Snd Lvl
R288	1	66	59.9	61.4	1.5	15	----
R289	1	66	63.2	64.3	1.1	15	----
R290	1	66	59.8	60.7	0.9	15	----
R291	1	66	64.4	64.6	0.2	15	----
R292	1	66	61.7	62.1	0.4	15	----
R293	1	66	59.2	59.9	0.7	15	----
R294	1	66	58.8	59.5	0.7	15	----
R295	1	66	60.8	62.1	1.3	15	----
R296	1	66	68.8	70.6	1.8	15	Snd Lvl
R297	1	66	62.7	64.0	1.3	15	----
R298	1	66	59.7	61.4	1.7	15	----
R299	1	66	60.3	62.4	2.1	15	----
R300	1	66	58.0	58.8	0.8	15	----
R301	1	66	62.2	64.1	1.9	15	----
R302	1	66	70.4	72.3	1.9	15	Snd Lvl
R303	1	66	64.3	66.1	1.8	15	Snd Lvl
R304	1	66	62.9	64.6	1.7	15	----
R305	1	66	61.7	63.8	2.1	15	----
R306	1	66	62.1	64.8	2.7	15	----
R307	1	66	63.2	64.7	1.5	15	----
R308	1	66	70.7	72.0	1.3	15	Snd Lvl

Appendix E – Noise Barrier Analysis and Optimization

Path: P:\2018\02792\D. Drawings\Environmental\Arc View\I-65 ATL\Exhibits\Noise\2018.02792.EV.2019-11-14.I-65ATL.Noise barrier location.mxd Date:1/9/2020 User:mdelreal

AMERICAN STRUCTUREPOINT INC.

Noise Barrier Locations (1 of 3)

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes SR 32 to SR 47
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 01/07/2020

Path: P:\2018\02792\D. Drawings\Environmental\Arc View\I-65 ATL\Exhibits\Noise\2018.02792.EV.2019-11-14.I-65ATL.Noise barrier location.mxd Date:1/9/2020 User:mdelreal

AMERICAN STRUCTUREPOINT INC.

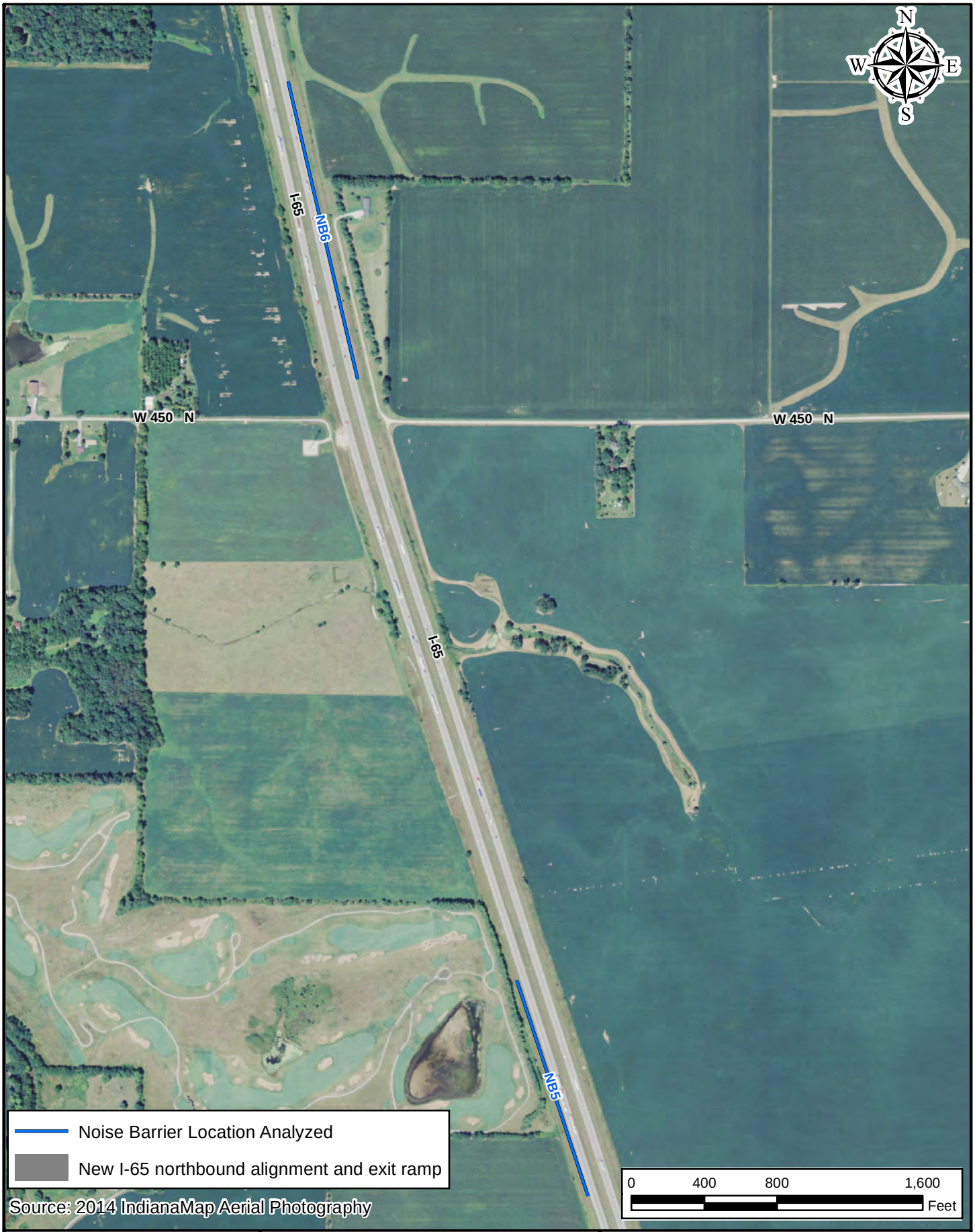
Noise Barrier Locations (2 of 3)

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes SR 32 to SR 47
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 01/07/2020



Path: P:\2018\02792\D. Drawings\Environmental\Arc View\I-65 ATL\Exhibits\Noise\2018.02792.EV.2019-11-14.I-65ATL.Noise barrier location.mxd Date:1/9/2020 User:mdelreal

AMERICAN STRUCTUREPOINT INC.

Noise Barrier Locations (3 of 3)

INDOT Crawfordsville District
41 West County Road 300 North
Crawfordsville, Indiana 47933

I-65 Added Travel Lanes SR 32 to SR 47
Des. No. 1802967

Location: Lebanon
Townships: Center and Washington
County: Boone
State: Indiana

Date: 01/07/2020

Noise Barrier Optimization - Noise Barrier 1 (NB1)			
	Analysis 1.0	**Analysis 2.0**	**Analysis 3.0**
Total Number of Impacted Receptors	66	66	66
Impacted Receptors Receiving 5 dBA Decrease	62	62	62
% Impacted Receptors Receiving 5dBA Decrease	94%	94%	94%
Total Number of 1st Row Receptors	30	30	30
First Row Receptors Receiving 7dBA Decrease	22	22	22
% First Row Receptors Meeting 7dBA Decrease	73%	73%	73%
Total Number of Benefited Receptors	108	110	116
Total Barrier Cost	$ 862,456.00	$ 868,113.00	$ 879,363.00
Cost per Benefitted Receptor	$ 7,985.70	$ 7,891.94	$ 7,580.72

TNM 2.5 Model Outputs for Noise Barrier 1 (NB1)											
Receptor(s)	Dwelling Units	2020 Leq(1h)	2043 Leq(1h); With no Barrier	NAC Criteria	Change in Leq(1h) from 2020 to 2043	Substantial Increase Threshold	Receptor Impact Type	2043 Leq(1h); With NB1	Noise Reduction from NB1	Noise Reduction Goal	Calculated Noise Reduction minus Noise Reduction Goal
R1-R2	2	62.7	62.9	66	0.2	15	----	61.6	1.3	5	-3.7
R3-R4	2	63.0	63.6	66	0.6	15	----	62.0	1.6	5	-3.4
R5-R6	2	64.0	64.9	66	0.9	15	----	62.8	2.1	5	-2.9
R7-R8	2	61.1	61.6	66	0.5	15	----	59.6	2.0	5	-3.0
R-9	1	61.5	62.4	66	0.9	15	----	59.8	2.6	5	-2.4
R10-R11	2	59.8	60.9	66	1.1	15	----	57.3	3.6	5	-1.4
R12-R13	2	59.0	59.7	66	0.7	15	----	56.4	3.3	5	-1.7
R14	1	64.9	66.0	66	1.1	15	Snd Lvl	62.5	3.5	5	-1.5
R15-16	2	63.7	64.9	66	1.2	15	----	59.9	5.0	5	0.0
R17-R18	2	61.8	63.2	66	1.4	15	----	57.7	5.5	5	0.5
R19-R20	2	60.0	61.1	66	1.1	15	----	55.7	5.4	5	0.4
R21-R22	2	58.8	59.4	66	0.6	15	----	54.3	5.1	5	0.1
R23-R24	2	58.9	58.9	66	0.0	15	----	54.2	4.7	5	-0.3
R25-R26	2	59.7	59.9	66	0.2	15	----	54.9	5.0	5	0.0
R27-R28	2	60.9	62.1	66	1.2	15	----	56.8	5.3	5	0.3
R29-R30	2	62.2	63.6	66	1.4	15	----	58.5	5.1	5	0.1
R31-R32	2	62.6	63.6	66	1.0	15	----	60.2	3.4	5	-1.6
R33	2	65.4	66.3	66	0.9	15	Snd Lvl	62.0	4.3	5	-0.7
R34	2	65.6	66.6	66	1.0	15	Snd Lvl	63.4	3.2	5	-1.8
R35	1	73.3	74.5	66	1.2	15	Snd Lvl	63.5	11.0	5	6.0
R36-R37	2	63.6	65.5	66	1.9	15	----	58.6	6.9	5	1.9
R38-R39	2	62.0	63.8	66	1.8	15	----	56.5	7.3	5	2.3
R40-R41	2	60.5	62.2	66	1.7	15	----	55.2	7.0	5	2.0
R42	1	59.1	57.2	66	-1.9	15	----	53.9	3.3	5	-1.7
R43-R44	2	60.5	60.9	66	0.4	15	----	54.8	6.1	5	1.1
R45-R46	2	62.1	63.8	66	1.7	15	----	56.9	6.9	5	1.9
R47-R48	2	64.0	65.5	66	1.5	15	----	58.6	6.9	5	1.9

TNM 2.5 Model Outputs for Noise Barrier 1 (NB1)											
Receptor(s)	Dwelling Units	2020 Leq(1h)	2043 Leq(1h); With no Barrier	NAC Criteria	Change in Leq(1h) from 2020 to 2043	Substantial Increase Threshold	Receptor Impact Type	2043 Leq(1h); With NB1	Noise Reduction from NB1	Noise Reduction Goal	Calculated Noise Reduction minus Noise Reduction Goal
R49	1	67.4	69.6	66	2.2	15	Snd Lvl	61.1	8.5	5	3.5
R50	1	70.3	72.7	66	2.4	15	Snd Lvl	63.7	9.0	5	4.0
R51-R52	2	72.6	74.5	66	1.9	15	Snd Lvl	64.5	10.0	5	5.0
R53-R54	2	72.9	74.3	66	1.4	15	Snd Lvl	64.5	9.8	5	4.8
R55-R56	2	73.1	74.0	66	0.9	15	Snd Lvl	64.4	9.6	5	4.6
R57-R58	2	73.1	73.6	66	0.5	15	Snd Lvl	64.2	9.4	5	4.4
R59-R60	2	73.3	73.4	66	0.1	15	Snd Lvl	64.1	9.3	5	4.3
R61-R62	2	73.7	73.2	66	-0.5	15	Snd Lvl	63.9	9.3	5	4.3
R63-R64	2	73.6	73.0	66	-0.6	15	Snd Lvl	63.7	9.3	5	4.3
R65-R66	2	73.1	72.6	66	-0.5	15	Snd Lvl	63.5	9.1	5	4.1
R67-R68	2	72.5	71.9	66	-0.6	15	Snd Lvl	63.1	8.8	5	3.8
R69-R70	2	71.9	71.5	66	-0.4	15	Snd Lvl	62.8	8.7	5	3.7
R71-R72	2	70.7	70.9	66	0.2	15	Snd Lvl	62.9	8.0	5	3.0
R73-R74	2	70.2	70.5	66	0.3	15	Snd Lvl	63.1	7.4	5	2.4
R75-R76	2	69.3	69.9	66	0.6	15	Snd Lvl	63.4	6.5	5	1.5
R77-R78	2	69.2	69.4	66	0.2	15	Snd Lvl	63.3	6.1	5	1.1
R79	1	65.8	67.3	66	1.5	15	Snd Lvl	61.6	5.7	5	0.7
R80-R81	2	64.7	67.0	66	2.3	15	Snd Lvl	60.4	6.6	5	1.6
R82-R83	2	65.6	67.2	66	1.6	15	Snd Lvl	59.6	7.6	5	2.6
R84-R85	2	65.8	67.4	66	1.6	15	Snd Lvl	59.6	7.8	5	2.8
R86-R87	2	66.3	67.9	66	1.6	15	Snd Lvl	59.8	8.1	5	3.1
R88-R89	2	66.7	68.3	66	1.6	15	Snd Lvl	60.0	8.3	5	3.3
R90-R91	2	67.1	68.5	66	1.4	15	Snd Lvl	59.9	8.6	5	3.6
R92-R93	2	66.8	68.8	66	2.0	15	Snd Lvl	59.8	9.0	5	4.0
R94	1	65.5	68.8	66	3.3	15	Snd Lvl	59.7	9.1	5	4.1
R95-R96	2	67.2	69.0	66	1.8	15	Snd Lvl	59.7	9.3	5	4.3
R97-R98	2	68.0	69.3	66	1.3	15	Snd Lvl	59.9	9.4	5	4.4

TNM 2.5 Model Outputs for Noise Barrier 1 (NB1)											
Receptor(s)	Dwelling Units	2020 Leq(1h)	2043 Leq(1h); With no Barrier	NAC Criteria	Change in Leq(1h) from 2020 to 2043	Substantial Increase Threshold	Receptor Impact Type	2043 Leq(1h); With NB1	Noise Reduction from NB1	Noise Reduction Goal	Calculated Noise Reduction minus Noise Reduction Goal
R99-R100	2	67.9	69.4	66	1.5	15	Snd Lvl	60.0	9.4	5	4.4
R101-R102	2	67.8	69.5	66	1.7	15	Snd Lvl	59.9	9.6	5	4.6
R103-R104	2	67.8	69.6	66	1.8	15	Snd Lvl	60.0	9.6	5	4.6
R105-R106	2	67.9	69.8	66	1.9	15	Snd Lvl	60.2	9.6	5	4.6
R107-R108	2	66.1	68.1	66	2.0	15	Snd Lvl	59.1	9.0	5	4.0
R109-R110	2	63.7	63.7	66	0.0	15	----	55.8	7.9	5	2.9
R111-R112	2	61.6	61.6	66	0.0	15	----	53.9	7.7	5	2.7
R113-114	1	59.5	59.9	66	0.4	15	----	52.4	7.5	5	2.5
R115-R116	2	60.0	59.9	66	-0.1	15	----	51.7	8.2	5	3.2
R117-R118	2	62.7	62.9	66	0.2	15	----	53.4	9.5	5	4.5
R119	1	65.0	65.1	66	0.1	15	----	55.3	9.8	5	4.8
R120-R121	2	65.7	65.4	66	-0.3	15	----	55.8	9.6	5	4.6
R122-R123	2	64.1	64.4	66	0.3	15	----	55.0	9.4	5	4.4
R124-R125	2	59.6	60.1	66	0.5	15	----	51.4	8.7	5	3.7
R126	1	58.0	58.2	66	0.2	15	----	50.5	7.7	5	2.7
R127-R128	2	55.1	54.5	66	-0.6	15	----	49.7	4.8	5	-0.2
R129-R130	2	57.8	58.0	66	0.2	15	----	50.6	7.4	5	2.4
R131-R132	2	62.4	62.9	66	0.5	15	----	53.2	9.7	5	4.7
R133-R134	2	65.0	65.3	66	0.3	15	----	55.8	9.5	5	4.5
R135-R136	2	64.6	65.3	66	0.7	15	----	56.8	8.5	5	3.5
R137-R138	2	62.8	65.4	66	2.6	15	----	56.3	9.1	5	4.1
R139-R140	2	60.7	61.5	66	0.8	15	----	54.5	7.0	5	2.0
R141-R142	2	59.8	60.2	66	0.4	15	----	54.1	6.1	5	1.1
R143-R144	2	59.0	59.6	66	0.6	15	----	54.2	5.4	5	0.4
R145	1	61.7	62.1	66	0.4	15	----	56.5	5.6	5	0.6

Noise Barrier Optimization - Noise Barrier 2 (NB2)			
	Analysis 1.0	**Analysis 2.0**	**Analysis 3.0**
Total Number of Impacted Receptors	4	4	4
Impacted Receptors Receiving 5 dBA Decrease	4	3	3
% Impacted Receptors Receiving 5dBA Decrease	100%	75%	75%
Total Number of 1st Row Receptors	4	4	4
First Row Receptors Receiving 7dBA Decrease	3	3	3
% First Row Receptors Meeting 7dBA Decrease	75%	75%	75%
Total Number of Benefited Receptors	4	3	3
Total Barrier Cost	$ 535,114.00	$ 510,890.00	$ 510,991.00
Cost per Benefitted Receptor	$ 133,778.50	$ 170,296.67	$ 170,330.33

Noise Barrier Optimization - Noise Barrier 3 (NB3)			
	Analysis 1.0	**Analysis 2.0**	**Analysis 3.0**
Total Number of Impacted Receptors	1	1	1
Impacted Receptors Receiving 5 dBA Decrease	1	1	1
% Impacted Receptors Receiving 5dBA Decrease	100%	100%	100%
Total Number of 1st Row Receptors	1	1	1
First Row Receptors Receiving 7dBA Decrease	1	1	1
% First Row Receptors Meeting 7dBA Decrease	100%	100%	100%
Total Number of Benefited Receptors	1	1	1
Total Barrier Cost	$ 462,000.00	$ 462,004.00	$ 469,438.00
Cost per Benefitted Receptor	$ 462,000.00	$ 462,004.00	$ 469,438.00

Noise Barrier Optimization - Noise Barrier 4 (NB4)	
	Analysis 1.0
Total Number of Impacted Receptors	1
Impacted Receptors Receiving 5 dBA Decrease	0
% Impacted Receptors Receiving 5dBA Decrease	0%
Total Number of 1st Row Receptors	1
First Row Receptors Receiving 7dBA Decrease	0
% First Row Receptors Meeting 7dBA Decrease	0%
Total Number of Benefited Receptors	0
Total Barrier Cost	$948,318.00
Cost per Benefitted Receptor	N/A

Noise Barrier Optimization - Noise Barrier 5 (NB5)			
	Analysis 1.0	Analysis 2.0	Analysis 3.0
Total Number of Impacted Receptors	1	1	1
Impacted Receptors Receiving 5 dBA Decrease	1	1	1
% Impacted Receptors Receiving 5dBA Decrease	100%	100%	100%
Total Number of 1st Row Receptors	1	1	1
First Row Receptors Receiving 7dBA Decrease	1	1	1
% First Row Receptors Meeting 7dBA Decrease	100%	100%	100%
Total Number of Benefited Receptors	1	1	1
Total Barrier Cost	$ 371,997.00	$ 395,988.00	$ 395,991.00
Cost per Benefitted Receptor	$ 371,997.00	$ 395,988.00	$ 395,991.00

Noise Barrier Optimization - Noise Barrier 6 (NB6)			
	Analysis 1.0	**Analysis 2.0**	**Analysis 3.0**
Total Number of Impacted Receptors	1	1	1
Impacted Receptors Receiving 5 dBA Decrease	1	1	1
% Impacted Receptors Receiving 5dBA Decrease	100%	100%	100%
Total Number of 1st Row Receptors	1	1	1
First Row Receptors Receiving 7dBA Decrease	1	1	1
% First Row Receptors Meeting 7dBA Decrease	100%	100%	100%
Total Number of Benefited Receptors	1	1	1
Total Barrier Cost	$ 615,066.00	$ 602,382.00	$ 596,384.00
Cost per Benefitted Receptor	$ 615,066.00	$ 602,382.00	$ 596,384.00

Appendix F – Traffic Data

I-65 ATL Boone County - Design Traffic Data

Roadway	AADT		DHV		D%	% Trucks	
	2020	2043	2020	2043		AADT	DHV
I-65	51,090	55,060	4,090	4,400	51%	35%	29%
SR 32	13,090	17,210	1,180	1,550	57%	5%	3%
Lafayette Ave*	1,760	2,310	230	300	55%	6%	5%
US 52	9,430	12,400	940	1,240	59%	22%	12%
CR 300 N	1,880	2,470	230	300	59%	2%	2%
SR 47	6,410	8,430	640	840	67%	16%	11%
SR 32 NB On-Ramp	2,120	2,280	280	300	100%	15%	9%
SR 32 NB Off-Ramp	5,630	6,070	560	610	100%	20%	13%
SR 32 SB On-Ramp	5,920	6,380	590	640	100%	16%	10%
SR 32 SB Off-Ramp	2,420	2,610	290	310	100%	14%	7%
Lafayette Ave NB On-Ramp	800	1,050	100	140	100%	5%	6%
US 52 NB Off-Ramp	5,580	7,340	610	810	100%	13%	8%
Lafayette Ave SB Off-Ramp	960	1,260	120	160	100%	6%	4%
US 52 SB On-Ramp	6,050	7,950	670	870	100%	11%	7%
SR 47 NB On-Ramp	1,210	1,300	130	140	100%	16%	8%
SR 47 NB Off-Ramp	1,500	1,620	200	210	100%	13%	3%
SR 47 SB On-Ramp	1,580	1,700	210	220	100%	12%	7%
SR 47 SB Off-Ramp	1,040	1,120	150	160	100%	13%	4%

**Reflects the segment of Lafayette Ave south of the exit ramp and north of Witt Rd*

Data Sources: INDOT Traffic Count Database System (base year 2018) and INDOT Technical Modeling team