EXCERPTS

REVIVE I-70

MORE LANES, SAFER TRAVEL

Traffic Noise Impact Analysis

Wayne County
Des. No. 2002424
July 2023

Prepared by Parsons

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LIST OF ABBREVIATIONS

- CFR – Code of Federal Regulations
- CNE – Common Noise Environment
- CRC – Continuously Reinforced Concrete
- dB – Decibels
- EB – Eastbound
- FHWA – Federal Highway Administration
- Leq(h) – Hourly Equivalent Sound Level
- ICC – Index of Crash Cost
- ICF – Index of Crash Frequency
- LOS – Level of Service
- MPH – Miles Per Hour
- NEPA – National Environmental Policy Act
- NRR – Non-Residential Receptor
- NAC – Noise Abatement Criteria
- IDM – Indiana Design Manual
- INDOT – Indiana Department of Transportation
- IRI – International Roughness Index
- PCCP – Portland Cement Concrete Pavement
- ROADHAT – Road Hazard Analysis Tool
- SB - Southbound
- TNM – Traffic Noise Model
- TTTR - Truck Travel Time Reliability
- TTTRI- Truck Travel Time Reliability Index
- WB – Westbound
- ZOI – Zone of Intrusion

Executive Summary

A Traffic Noise Impact Analysis was conducted for the Interstate 70 (I-70) Road Reconstruction Project (hereinafter referred to as “Revive I-70 Project”) in Wayne County, Indiana. The project involves adding two travel lanes (one eastbound (EB) and one westbound (WB)) in the grass median along I-70; reconfiguring the I-70 and US 40 interchange; modifying acceleration/deceleration lengths of the ramps at the other four interchanges, weigh station, and rest area; replacing existing mainline pavement with continuously reinforced concrete (CRC) pavement; replacing shoulder pavement with standard Portland Cement Concrete Pavement (PCCP), placing continuous concrete barrier at the centerline of the median; replacing the I-70 bridges over East Fork of the East Fork of the Whitewater River; widening and improving 40 bridges to accommodate the added travel lanes; rehabilitating and replacing culverts; and improving the stormwater drainage system.

The Federal Highway Administration (FHWA) Traffic Noise Model (TNM) Version 2.5 was used to predict existing and future design year noise levels. Because design year noise levels are predicted to approach or exceed the FHWA Noise Abatement Criteria (NAC), the project was found to have traffic noise impacts. Based on the Indiana Department of Transportation (INDOT) *Traffic Noise Analysis Procedure* (2022), noise abatement was considered at all locations in the noise study area where noise impacts were identified under the future build alternative (Appendix A). Based on this evaluation, no feasible and reasonable barriers were identified for this project.

Based on the studies thus far accomplished, INDOT has not identified any locations where noise abatement is likely. Noise abatement at these locations is based upon preliminary design criteria. Noise abatement has not been found to be reasonable based on no barriers being able to meet the less than 1,000 square feet/benefited receptor threshold. A reevaluation of the noise analysis will occur during final design. If during final design it has been determined that conditions have changed such that noise abatement is feasible and reasonable, the abatement measures might be provided. The final decision on the installation of any abatement measure(s) will be made upon the completion of the project’s final design and the public involvement processes.

1.0 Project History and Background Information

1.1 PURPOSE OF THE TRAFFIC NOISE IMPACT ANALYSIS

The purpose of this Traffic Noise Impact Analysis is to evaluate noise impacts and abatement under the requirements of Title 23, Part 772 of the Code of Federal Regulations (23 CFR 772) "Procedures for Abatement of Highway Traffic Noise and Construction Noise" for the Revive I-70 Project. The project involves adding travel lanes (one EB and one WB) on the I-70 mainline, which makes this a Type I project in accordance with 23 CFR 772. This regulation provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects. According to 23 CFR 772.3, all highway projects that are developed in conformance with this regulation are deemed to be in conformance with FHWA noise standards.

The INDOT *Traffic Noise Analysis Procedure* (2022) establishes INDOT policy for implementing 23 CFR 772 in Indiana. The INDOT *Traffic Noise Analysis Procedure* outlines the requirements for analyzing highway traffic noise. Noise impacts associated with this project will be included in the environmental document prepared for this project in compliance with the National Environmental Policy Act (NEPA).

1.2 PROJECT DESCRIPTION

The Revive I-70 project involves a 21-mile section of I-70 from approximately 1.5 miles west of the I-70/SR 1 interchange to the Indiana/Ohio State Line in Wayne County, Indiana (Des. 2002424). The project limits are shown in Figure 1-1. Work includes adding two travel lanes (one EB and one WB) in the grass median, separated by a continuous concrete barrier; widening the inside and outside shoulders; replacing mainline pavement; replacing and upgrading existing lighting, signage, and guardrail systems; reconstructing on and off ramps at SR 1, Centerville Road, US 35, US 27, SR 227, the rest area, and the weigh station; extending the US 35 southbound (SB) to I-70 EB loop ramp; reconstructing the I-70 and US 40 interchange to a diamond interchange with roundabout termini; full replacement of the EB and WB bridges over the East Fork of the East Fork of the Whitewater River, Cardinal Greenway Trail, and Access Road; widening and improving 41 bridges to accommodate added travel lanes; rehabilitating and replacing culverts; upgrading pedestrian facilities along US 40; and improving stormwater drainage systems.

Within the project area, I-70 is a divided highway consisting of two 12-foot-wide travel lanes in each direction with a 60-foot-wide grass median. There are variable-width ramps and auxiliary lanes at the interchanges, weigh station, and rest area. Existing inside and outside shoulders range from four to 12 feet wide. There are six interchanges within the project area located at SR 1, North Centerville Road, US 35, Chester Boulevard (hereinafter referred to as US 27), SR 227, and US 40. Along westbound I-70, there is a rest area between SR 1 and Centerville Road, and a weigh station between Centerville Road and US 35. There are 47 bridges and 81 culverts within the project area.

The majority of the project area does not have pedestrian facilities, with the following exceptions. The Cardinal Greenway Trail crosses the project area via an underpass west of US 27. There are sidewalk segments along US 27 south of the I-70 interchange, which terminate at the project area boundary and do not connect to other pedestrian facilities within the project area. There is a 200-foot-long sidewalk segment along US 40 which does not connect to other pedestrian facilities. There are no existing noise abatement measures along this section of I-70.

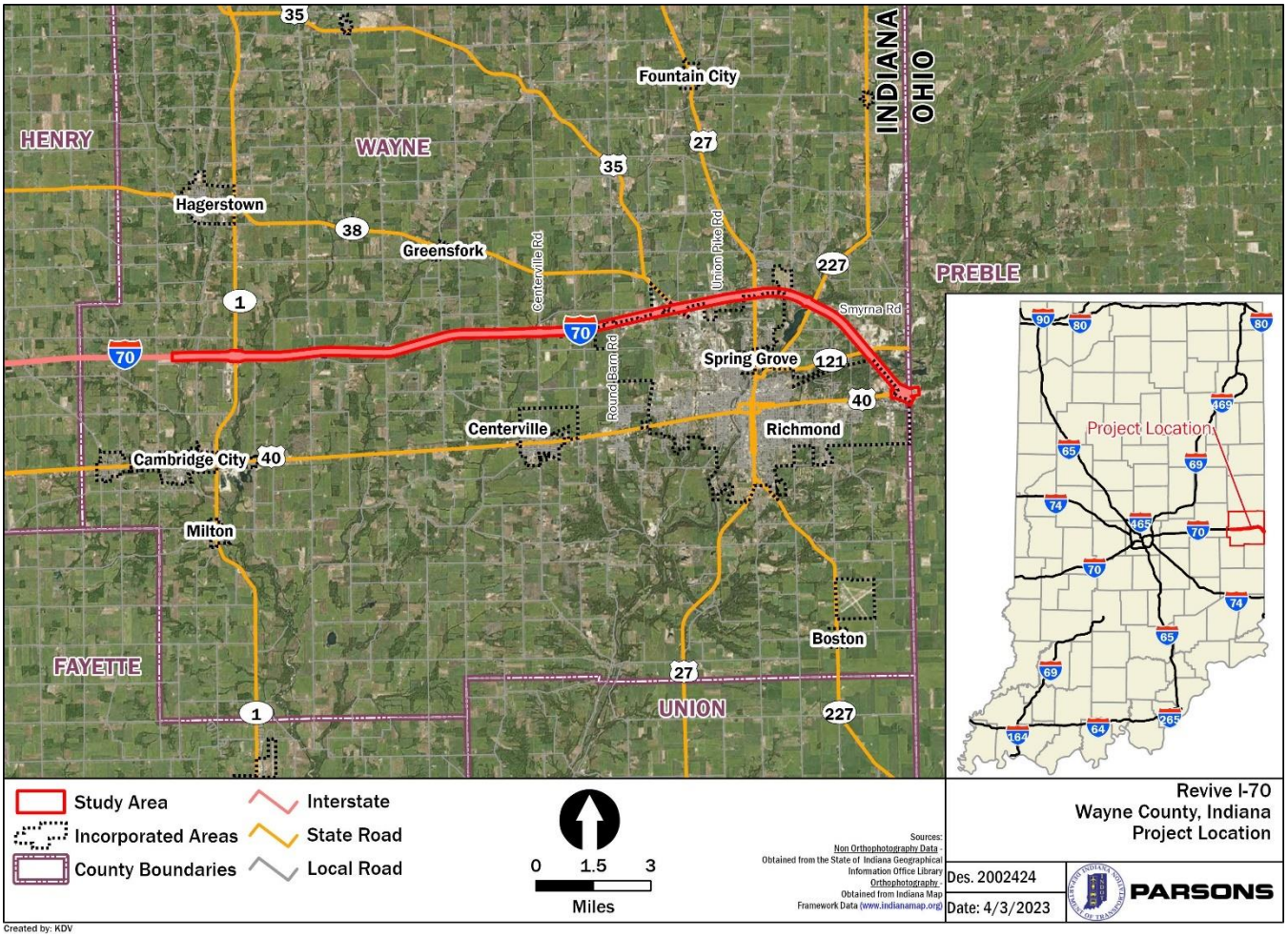


FIGURE 1-1. PROJECT LOCATION MAP

1.3 PROJECT PURPOSE AND NEED

The needs for this project stem from existing pavement conditions and geometric deficiencies within the project area, as well as safety and congestion issues along this section of I-70.

Pavement Conditions: Sections of I-70 within the project area were originally constructed with reinforced cement concrete pavement between 1962 and 1963. From circa 1981 to 2015, segments of I-70 within the project area received various maintenance treatments such as asphalt overlays and resurfacing. The existing 60-year-old concrete pavement is now showing age-related distress including joint failure, polishing, faulting, and transverse cracking, as well as poor rideability. Pavement conditions for the majority of I-70, between 0.62 mile west of US 27 and 0.26 mile east of US 40, were documented in an INDOT Pavement Scoping Application dated September 8, 2020. The International Roughness Index (IRI), which is a measure of ride quality, for this section of I-70 was reported to be 123 inches per mile (in/mi). An IRI measurement of 95 in/mi or below is considered “good”.

Geometric Deficiencies: Within this section of I-70, most of the existing ramp acceleration and deceleration lanes and merge/diverge points do not meet current Indiana Design Manual (IDM) standards, and mainline shoulder

widths are too narrow in many locations. There are also operational issues associated with the acceleration/deceleration lanes and loop ramps at both the US 35/Williamsburg Pike and the US 40 interchanges.

Safety: The four-lane sections of I-70 across Indiana, have higher than average index values for crash rates and/or crash severity, based on functional class and current traffic volumes. According to the *2022 I-65 and I-70 Safety and Mobility Needs Summary*, approximately 19 percent of I-70 crash indices are in the medium or high categories, which indicates potential safety issues. The 2023 *Revive I-70 Traffic and Safety Analysis* assessed existing safety conditions on I-70 within the project area using five years of crash data from 2017 through 2021. A total of 735 crashes over the five-year period were analyzed. Areas with the highest crash frequencies in the EB direction are the US 35 interchange, and the section between the US 27 and SR 227 interchanges. Areas with the highest crash frequencies in the WB direction are the US 40 and SR 227 interchanges, and the section between the US 27 and US 35 interchanges.

The 2023 *Revive I-70 Traffic and Safety Analysis* analyzed crash frequency and crash severity within the project area using INDOT's Road Hazard Analysis Tool (RoadHAT) version 4.1. The RoadHAT software calculates two indices, which indicate the number of standard deviations that a particular segment's safety performance is above or below the expected number of crashes for similar segments in Indiana. An index above 0.0 is considered elevated crash activity in terms of frequency or severity and an index 1.0 or above is considered substantially elevated. The index of crash frequency (ICF) indicates the frequency of all crashes within a segment and the index of crash cost (ICC) indicates the severity of all crashes within a segment. The segment of I-70 between the SR 227 and US 40 interchanges shows the highest ICF in the project area in both the EB and WB directions of travel, at 2.06 and 2.97, respectively. The highest ICC segments of I-70 EB are US 27 to SR 227 and SR 227 to US 40, at 1.4 and 1.31, respectively. The highest ICC segments of I-70 WB are US 27 to US 35 and weigh station to Centerville Road, at 1.83 and 1.46, respectively.

Congestion: Annual average daily traffic on I-70 is 39,600 vehicles per day within the project area and approximately 50 percent of these vehicles are trucks. Substantial congestion along the I-70 corridor has been addressed in INDOT's transportation plans. INDOT's *2018 Indiana Multi-Modal Freight Plan Update* identifies I-70 from the Illinois State Line to the Ohio State Line as a heavily traveled freight and passenger corridor that experiences significant congestion. INDOT's 2045 *Long-Range Transportation Plan* identifies the I-70 corridor as critical to the state's mobility and economic activity. The long-range plan recommends maximizing its performance to ensure the efficient movement of people and goods, increase regional connectivity and freight truck mobility, and plan for the future.

During normal traffic flow conditions, congestion meets levels of service (LOS) criteria on I-70 within the project area. The traffic analysis presented in the 2023 *Revive I-70 Traffic and Safety Analysis* determined that existing LOS range between A and C and future year (2048) LOS will range between A and C within the project area. However, with high truck percentages and projected growth, future 2048 LOS is projected to be LOS C in multiple segments during the PM peak hour. Levels of Service is a performance measure that represents quality of service, measured on an A – F scale, with LOS A representing a free flow of traffic and LOS F representing a breakdown in flow (e.g., start-and-stop congestion). The project area is both rural and urban. The minimum criteria during peak travel hours (i.e., rush hour) is LOS C in the rural section and LOS D in the urban area. The *Highway Capacity Manual (7th Edition)* description of LOS C notes that freedom to maneuver within the traffic stream is noticeably restricted. Due to the high volume of truck traffic along the I-70 corridor, drivers feel that traffic is restricted and lane changes are difficult to execute.

Queuing Due to Maintenance of Traffic: Excessive queuing occurs on I-70 when there are lane closures due to crashes, maintenance work, and other events. Lane closures on this four-lane section of I-70 result in traffic back-ups beyond INDOT policy limits. The Indiana Highway Congestion Policy defines acceptable queuing at interstate work zones, based on the length of the queue and the time it remains in place. According to INDOT's *2022 I-65 and I-70 Safety and Mobility Needs Summary*, on about 85 percent of the four-lane sections of I-70, a lane closure will result in queues beyond INDOT policy limits more than 50 percent the time. Work zones requiring lane closure

are common since routine maintenance is required on I-70. INDOT's queue analysis tool was used to identify expected queues from closing one lane in each direction on four-lane segments of I-70. The queue analysis determined that the traffic backups exceed INDOT's policy limits 98 to 100 percent of the time within the project area. It is important to note that work zone lane closures are only allowed at night. The queue analysis is equally applicable for crashes and other incidents where lane closure is required.

Travel time reliability for trucks is also a concern on I-70. *The Indiana Multimodal Freight Plan Update 2018* assessed truck travel time reliability (TTTR), which is an indicator of a highway system's ability to consistently meet demand for travel. The TTTR Index (TTTRI) is a measure of how much additional time shippers must plan for in order to arrive on-time 95 percent of the time. The FHWA defines TTTRI as "the consistency or dependability in travel times, as measured from day-to-day and/or across different times of day". Federal performance measures require states to report the worst TTTRI across five times of day. The segment of I-70 through Richmond is documented as unreliable in the Multimodal Freight Plan.

The purpose of the Revive I-70 project is to:

- Restore the pavement to extend the service life of these sections of roadway by at least 30 years, and provide a ride quality with an IRI of at least 95 in/mi;
- Correct geometric deficiencies to meet current IDM standards;
- Reduce the frequency and severity of crashes;
- Fulfill state and federal long-range plans for increasing mobility; and
- Improve truck travel time reliability.

2.0 Methodology

2.1 FUNDAMENTALS OF TRAFFIC NOISE

The human ear perceives noise as a form of vibration that causes pressure variations. The ear is sensitive to this variation and perceives it as sound. The intensity of these pressure variations causes the ear to discern different levels of loudness. These pressure differences are commonly measured in decibels (dB).

The dB scale that is audible to the human ear spans about 140 dB. A dB level of zero is barely audible to the human ear while 140 dB is an unrecognizable sound which is painful to the listener. The decibel scale is a logarithmic representation of the actual sound pressure variation. This means that a 26 percent change in energy level only changes the sound level by 1 dB, which would only be possible for the human ear to detect this difference only in a laboratory. Increasing the energy level 100 percent would result in a 3 dB increase, which would be barely perceptible outdoors. A tripling in sound energy level would result in a clearly noticeable change of 5 dB in the sound level. An increase of ten times the energy level would result in a 10 dB increase in the sound level, which would be perceived as a doubling of the sound level.

The human ear has a non-linear sensitivity to noise. To account for this in noise measurement, electronic weighting scales are used to define the relative loudness of different frequencies. The "A" weighting scale, expressed as dB(A), is widely used in environmental documentation because it most nearly matches the non-linear nature of human hearing.

The measurement that is most commonly used to express dB(A) levels for traffic noise is the Hourly Equivalent Sound Level (Leq(h)). The Leq(h) describes a noise sensitive receptor's cumulative exposure from all noise-producing events over a 1-hour period.

Traffic noise studies for road projects in Indiana are performed in accordance with 23 CFR 772 and INDOT's *Traffic Noise Analysis Procedure*. There are five main steps comprising traffic noise studies:

1. Identify noise sensitive receptors (Section 2.2),
2. Determine existing ambient peak noise levels (Section 2.3),
3. Predict future peak noise levels (Section 2.3),
4. Identify traffic noise impacts (Section 2.4), and
5. Evaluate mitigation measures for sensitive receptors where traffic noise impacts occur (Section 2.4).

These steps are completed through desktop and field investigations and by utilizing FHWA's TNM 2.5 software.

2.2 METHODS FOR IDENTIFYING LAND USES AND SELECTING NOISE MEASUREMENT AND MODELING LOCATIONS

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. Land use in the project area was classified by Activity Category, as defined in Table 2-1, and the extent of frequent human use. Although all developed land uses are evaluated in this analysis, the focus is on locations of frequent human use that would benefit from a lowered noise level. Accordingly, this impact analysis focuses on locations with defined outdoor activity areas, such as residential backyards (Activity Category B) and common use areas at recreational facilities (Activity Category C). Existing land uses within the project area are described in Sections 3.1 and 3.2.

Table 2-1. Noise Abatement Criteria in 23 CFR 772

ACTIVITY CATEGORY	$L_{Aeq}(h)$	EVALUATION LOCATION	ACTIVITY DESCRIPTION
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67	Exterior	Residential.
C	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structure, radio stations, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structure, radio studios, recording studios, schools, and television studios.
E	72	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: 23 CFR 772

2.3 TRAFFIC NOISE LEVEL PREDICTION METHODS

Traffic noise levels were predicted using FHWA TNM 2.5. Traffic noise was evaluated under design year conditions for the proposed design. The model considers traffic volumes, vehicle types, vehicle speeds, roadway geometry, and sensitive receptor locations to calculate traffic-generated noise levels. The loudest hour traffic volumes, vehicle classification percentages, and traffic speeds under design year (2048) conditions were developed for input into the traffic noise model. Traffic speeds along I-70 were modeled at the posted speed limits which are 70 miles per hour (mph) for cars and motorcycles, and 65 mph for trucks and buses. The loudest hour is generally characterized by free-flowing traffic at the highway design speed (i.e., LOS C or better). The afternoon (PM) peak hour traffic was used in the TNM modeling for this project which was characterized by LOS C or better. PM peak hour traffic volumes were chosen over AM due to the generally higher traffic volume which better exhibited worst-case traffic-related noise levels. Hourly traffic volumes used in this study were taken from the *Revive I-70* 2023 *Traffic and Safety Analysis Report.* The total vehicle volume per roadway segment used in the existing and proposed design TNM models is included in Appendix E. Future noise levels predicted for the project area are included in Appendix C.

A receiver point was placed in the FHWA TNM 2.5 model to represent the identified receptors per Section 2.2. In some cases, a single receiver represents multiple receptors. For residential receivers, the number of receptors represented by each receiver was determined by examining the number of dwellings in the vicinity of the receiver that are located in similar proximity to the roadway.

2.4 TRAFFIC NOISE IMPACTS AND MITIGATION MEASURES

According to the INDOT Traffic Noise Analysis Procedure, a traffic noise impact occurs when either of the following conditions results at a sensitive receptor:

- The future predicted Leq(h) noise level either approaches (is within 1 dB(A)) or exceeds the Noise Abatement Criteria (NAC) shown in Table 2-1.
- The future predicted Leq(h) noise level substantially exceeds (by 15 or more dB(A)) the existing Leq(h) noise level. Traffic-generated noise level increases of 15 dB(A) or more are typically associated with roadway improvements on a new alignment.

Where traffic noise impacts are identified, noise abatement must be considered for reasonableness and feasibility as required by 23 CFR 772 and the INDOT Traffic Noise Analysis Procedure. Details of this evaluation are provided in Sections 4.2-4.5.

3.0 Existing Noise Environment

3.1 EXISTING LAND USES

A desktop investigation utilizing parcel data and aerial imagery was conducted to identify land uses that could be subject to noise impacts from the proposed project. Field investigations were conducted on July 26 and 28, 2022 and March 2, 2023, to confirm the initial findings and record existing ambient traffic noise levels for model validation (Section 3.4). Single-family residences, apartments, hotels, commercial/retail, office, light industrial, places of worship, recreational areas, and undeveloped parcels were identified as Activity Categories B, C, E, F, and G land uses in the project area.

Noise levels were predicted at Activity Categories B, C, and E land uses. Areas of frequent outdoor human activity were identified for Categories B, C, and E uses, and noise levels were predicted at these areas. Noise levels were not predicted for Activity Categories F and G land uses. For the majority of this project, one receptor was modeled for a single corresponding dwelling unit or area of frequent outdoor use at single-family residences,

commercial/retail, and office land uses. At apartment complexes and hotels, one receptor typically represents several dwelling units. Dwelling units for hotels and receptors were determined by average occupancy rates and utilization of outdoor use areas. Receptor points were then placed at areas of outdoor use. If no outdoor use area was identified on the property, no receptor was modeled.

For institutional land uses in the project area (i.e., schools, churches, parks, trails, and recreational areas), the number of receptors assigned was determined on Non-Residential Receptors (NRR), a value calculated in accordance with FHWA noise regulations (23 CFR 772). For the frontage-based methodology, the number of receptors was calculated by dividing the parcel's total frontage length by the average residential frontage length for the project area. NRRs were then placed near outdoor use areas, if available, or spaced out within the property. Table 3-1 lists the number of NRRs assigned to their institutional land use. For the daily-use-based methodology, the number of estimated daily users was divided by the average people per household in Indiana (2.65), multiplied by the percent of the parcel within the study area, and then multiplied by the average use of the parcel each year. Table 3-2 lists the number of receptors for recreational and trail land uses.

Table 3-1. Number of Non-Residential Receptors for Institutional Land Uses

LAND USE	FRONTAGE LENGTH WITHIN STUDY AREA (FT)	AVERAGE RESIDENTIAL FRONTAGE LENGTH (FT)	NUMBER OF RECEPTORS
Church – Faith Christian Fellowship International	1060	206	5
Church – Full Gospel Chapel	200	206	1
Church – Lighthouse Assembly of God	735	206	4
Social Services – Achieva Resources Corp, Inc.	845	206	4
Medical Facility – Reid Health Orthopedics & Spine	418	206	2

Table 3-2. Number of Receptors for Parks and Trails

LAND USE	NUMBER OF DAILY USERS	PERCENTAGE OF FACILITY WITHIN STUDY AREA (800 FT)	PERCENT YEARLY USE	NUMBER OF RECEPTORS
Recreation – Martindale State Fishing Area	15	83	58	3
Recreation – Richmond KOA Campground	120	77	63	22
Trail – Cardinal Greenway (Union Pike to Tingler Road Trailheads)	115	15	67	4
Recreation – Ivy Tech Community College Tennis Court	25	100	63	1
Recreation – Highland Lake Golf Course	110	11	58	3

3.2 COMMON NOISE ENVIRONMENT (CNE) DESCRIPTIONS

Land uses in the project area were grouped into a series of numbered CNEs that are identified on exhibits provided in Appendix A.

Activity Category B (Residential)

- B-1: Located along the north side of I-70, between Cambridge Road and SR 1
- B-2: Located along the south side of I-70, between Cambridge Road and SR 1
- B-3: Located along the north side of I-70, between SR 1 and Centerville Road
- B-4: Located along the south side of I-70, between SR 1 and Mineral Springs Road
- B-5: Located along the north side of I-70, between Round Barn Road and Salisbury Road

- B-6: Located along the north side of I-70, from near Union Pike to US 27
- B-7: Located along the south side of I-70, from near Union Pike to US 27
- B-8: Located along the north side of I-70, from near US 27 to near Cart Road
- B-9: Located along the south side of I-70, between US 27 and SR 227
- B-10: Located along the south side of I-70, from near Weiss Road to US 40
- B-11: Located along the north side of I-70, from near Reservoir Road to SR 121
- B-12: Located along the south side of I-70, from US 40 to near the Indiana/Ohio State Line

Activity Category C (Recreational Facilities, Places of Worship, Medical Facilities)

- C-1: Located on the north and south sides of I-70, between the US 35 and US 27 interchanges, includes the Cardinal Greenway Trail, Achieva Resources Corporation, Inc., and Full Gospel Chapel
- C-2: Located on the north side of I-70, east of US 27, includes Reid Health Orthopedics & Spine, Highland Lake Golf Course, and Richmond KOA Campground
- C-3: Located on the south side of I-70, east of US 27, includes Ivy Tech Community College and Lighthouse Assembly of God
- C-4: Located on the north side of I-70, west of the Indiana/Ohio State Line, includes New Creations Church
- C-5: Located on the south side of I-70, south of US 40, includes State Line Family Medicine
- C-6: Located on the south side of I-70, west of Jacksonburg Road, includes Martindale State Fishing Area

Activity Category E (Restaurants, Offices, Hotels)

- E-1: Located on the north and south side of I-70, adjacent to Centerville Road, includes Golden Engineering, Super 8, and Stone Hearth Cafe
- E-2: Located on the north and south side of I-70, adjacent to US 27, includes Fricker's Restaurant and Baymont by Wyndham
- E-3: Located on the south side of I-70, north of US 40, includes Holiday Inn, Home 2 Suites by Hilton, Motel 6, and Cracker Barrel
- E-4: Located on the north side of I-70, east of the Indiana/Ohio State Line, includes Fairfield Inn

3.3 NOISE SENSITIVE RECEPTORS AND EXISTING NOISE CONDITONS

Noise sensitive receptors are locations where activities described by Activity Categories A-E could be affected by increased traffic noise levels (e.g., residences, motels/hotels, churches, schools, parks, and libraries). Existing noise levels are determined for the most commonly used outdoor living areas at sensitive receptors. For residences, this is typically the backyard or front porch, and for commercial areas it could be a picnic table or bench.

Due to the sparse nature of developed land uses along the project corridor, noise sensitive receptors were modeled up to 800 feet from I-70's outermost travel lane. If no noise impacts or abatement benefits were observed past 500 feet on developed land uses along the corridor, receptors were typically not modeled to 800 feet (Appendix A).

A total of 175 receiver were evaluated to represent approximately 233 residential units and other noise sensitive uses in the project area for analysis as part of the noise study (Appendix A). These receptors include Activity Categories B, C, and E land uses.

3.4 MEASUREMENT PROCEDURES, EQUIPMENT, AND RESULTS

Noise level measurements were taken throughout the project area. The measurements were conducted over three days using a Larson-Davis SoundExpert LxT and Quest SoundPro DL-1 sound meter. Measurements were taken at 12 locations, each for a 15-minute period. Calibration of the meter was checked before and after field

work using a Larson-Davis Model Cal 200 calibrator. When the measurements were taken, meteorological conditions were within the manufacturer's recommended guidelines. Noise measurement field sheets and a figure that identifies the noise measurement locations are included in Appendix E. The noise level measurements were taken on July 26 and 28, 2022 and March 2, 2023. Temperatures in July ranged from 69 to 81 degrees. Wind speeds ranged from three to eight miles per hour, and skies were sunny to partly sunny. In March, temperatures ranged from 39 to 45 degrees, while wind speeds were seven to ten miles per hour, and skies were partly sunny. Table 3-3 summarizes the results of the existing noise measurements.

Table 3-3. Comparison of Measured to Predicted Sound Levels in the TNM Model

CNE	MEASUREMENT ID	DURATION (MINUTES)	MEASURED Leq(h)	PREDICTED SOUND LEVEL (dB(A))	MEASURED MINUS PREDICTED (dB(A))
B-1	7094_001	15	68.5	66.5	2.0
B-3	7094_002	15	71.1	72.8	-1.7
B-4	6997_001	15	69.0	71.6	-2.6
B-6	7094_003	15	70.1	67.4	2.7
B-10/B-11	7094_011	15	63.2	65.4	-2.2
B-12	40009_013	15	59.2	60.4	-1.2
C-1/B-7/E-2	40009_007	15	62.8	65.2	-2.4
C-3/B-9	40009_009	15	67.7	66.7	1.0
C-4	7094_005	15	63.3	63.6	-0.3
E-1	7094_012	15	70.4	69.4	1.0
E-3	7094_010	15	68.1	65.1	3.0
E-4	40009_010	15	61.9	64.6	-2.7
B-1	7094_001	15	68.5	66.5	2.0

Traffic-generated hourly equivalent noise levels (Leq(h)) were predicted using FHWA TNM 2.5, described in Section 2.3. As shown in Table 3-3, comparing the modeled and measured noise levels using observed traffic counts confirms the applicability of the model to the study area. Predicted traffic noise levels using the traffic counts observed during the measurements are within +/- 3 dB(A) of the measured levels, indicating reasonable correlation. Therefore, this model is validated per 23 CFR 722.11 (d)(2), and no modifications to the model were needed.

4.0 Future Noise Environment, Impacts, and Abatement

4.1 FUTURE NOISE ENVIRONMENT AND IMPACTS

Appendix C summarizes the traffic noise modeling results for existing and design-year conditions with and without noise barriers. Results tables from TNM are provided in Appendix G. As described in Section 2.3, these predictions utilize forecasted design hour traffic conditions to ensure a conservative estimate of noise levels for the loudest noise hour. The comparison to existing conditions is included in the analysis to identify traffic noise impacts under 23 CFR 772.

Existing noise levels range from 52 to 76 dB(A). Under the future build conditions, the predicted noise levels range from 54 to 77 dB(A). Noise impacts were identified in 13 of the 22 CNEs. Impacts include 69 receptors in Activity Categories B and C. All noise impacts are a result of the predicted noise level approaching or exceeding the NAC. Predicted noise level increases under the build conditions range from -0.9 dB(A) to 2.1 dB(A). No predicted noise level increases exceed 15 dB(A). The results shown in Appendix C indicate that predicted traffic noise levels for the design-year (2048) with project conditions approach or exceed the NAC. Therefore, traffic noise impacts are

predicted to occur within the project area, and noise abatement must be considered. A discussion of the noise abatement analysis is provided in the following section.

4.2 NOISE ABATEMENT ANALYSIS

In accordance with 23 CFR 772, noise abatement is considered where noise impacts are predicted in areas of frequent human use that would benefit from a lowered noise level. Potential noise abatement measures include the following:

- Avoiding the impact by using design alternatives, such as altering the horizontal and vertical alignments;
- Realignment of the project;
- Construction of noise barriers;
- Acquiring property to serve as a buffer zone;
- Using traffic management measures to regulate types of vehicles and speeds; and
- Acoustically insulating public-use or nonprofit institutional structures (Activity Category D facilities)

Major alteration of the roadway geometry that would have a substantial effect on predicted noise levels is not feasible. The preferred alternative was developed to best meet the transportation need of the corridor while minimizing impacts to the immediate area and meeting the purpose of the project. Horizontal geometry changes significant enough to affect noise levels would require more environmental impacts and potential relocations and is not a practical alternative. Similarly, changes to the vertical geometry that would significantly affect noise levels are not practical through the project area. Thus, any changes to these alignments would be limited and have only minimal effects on sound levels.

Noise barriers placed along roadways on state-owned right-of way can effectively shield locations from traffic-related noise. A barrier's feasibility is based on its acoustic effectiveness, which depends on the area's geometry, the barrier's configuration, and the effects of other (unblocked) noise sources. Noise barriers were evaluated, and the results are described below in Section 4.5 and Table 4-1.

Vacant or undeveloped property may be acquired to provide a buffer zone from noise generating facilities. However, there is no vacant land in the study area that, if acquired, would provide effective abatement as a buffer zone.

Traffic management measures would not be effective for this project. Traffic management measures that could reduce sound levels include "traffic calming" actions, such as reducing volumes, especially truck volumes, or travel speeds. Such measures are not consistent with the transportation needs in the area or purpose of the project.

Insulation of public structures, nonprofit institutions, and other Category D land uses is not applicable, since there are no public-use or nonprofit institutional structures impacted by the project.

All of these abatement options have been considered. However, because of the configuration and location of the project, noise barriers are the only abatement suited for this project.

4.3 FEASIBILITY OF ABATEMENT

INDOT considers engineering feasibility and acoustic feasibility when determining if noise abatement is feasible. INDOT requires noise abatement measures to be based on sound engineering practices and standards and requires that any measures be evaluated at the optimum location. For instances in which the roadway is located on fill and is at a higher location than nearby receptors, a barrier will be evaluated near the shoulder. For instances in which the roadway is located below the nearby receptors, a barrier will be evaluated near the edge of the right-of-

way near the receptors. Engineering feasibility also considers topography, drainage, safety, barrier height, utilities, and access/maintenance needs (which may include right-of-way considerations).

In terms of acoustic feasibility, INDOT requires that noise barriers achieve a 5 dB(A) reduction at a majority (greater than 50%) of the impacted receptors. If a barrier cannot achieve this acoustic goal, abatement is considered not acoustically feasible.

4.4 REASONABLENESS OF ABATEMENT

Reasonable means that abatement of traffic noise impacts is prudent based on consideration of the following factors:

1. **Consideration and Obtaining Views of Residents and Property Owners**

   The following steps will be taken to solicit public input on recommended noise barriers.

   - A survey will be mailed to each benefited resident. If the property owner is different from the current resident, both the resident and the property owners are surveyed. The concerns and opinions of the property owner and the unit occupants will be balanced with other considerations such as a design change, natural, historic, and human impacts, in determining whether a barrier is appropriate for a given location.
   - Consideration of noise barriers can cause conflicts in mixed-use developments, as noise barriers to protect residences may block line of sight to adjacent businesses. If a barrier is proposed directly adjacent to the property line of a business, the business will be coordinated with to determine whether they have any concerns about line of sight. If a mutually satisfactory compromise cannot be reached between business(es) and residences, the noise barrier shall proceed as proposed. These conflicts can be minimized by noise-compatible planning. Additionally sensitive receptors, such as National Register eligible properties, may require consideration of effects that noise abatement may have on the property that may affect the feasibility and reasonableness of the noise barrier.

2. **Maximum Square Footage of Abatement per Benefited Receptor**

   - For a noise abatement measure to be reasonable the required barrier area (in square feet) per benefited receptor must be less than or equal to the allowable barrier area per benefited receptor for that noise abatement location. The allowable maximum square footage per benefited receptor in Indiana is 1000 square feet per benefited receptor or less if a majority of the nearby receptors in a given common noise environment were not constructed prior to the roadway. If a majority of the nearby receptors in a common noise environment were constructed prior to the roadway being constructed, the allowable maximum square footage per benefited receptor is 1250 square feet per benefited receptor or less.
   - Placing noise barriers on structures creates additional challenges, since reinforcement of the structure may be necessary to support the increased load or Zone of Intrusion (ZOI) concerns. In these situations, other options should be assessed to determine whether the maximum square footage of abatement can be provided without requiring complicated and expensive structural modifications. These could include lighter-weight barriers, shorter barriers, or other considerations.

Any variations will be evaluated in coordination between the FHWA division office and INDOT's Divisions of Structural Services, Environmental Services, and Construction Management.

3. INDOT's Design Goal for Noise Abatement

- INDOT's goal for substantial noise reduction is to provide at least a 7.0 dB(A) reduction for benefited first row receptors in the design year. However, conflicts with adjacent lands may make it impossible to achieve substantial noise reduction at all benefited first row receptors. Therefore, the noise reduction design goal for Indiana is 7dB(A) for a majority (greater than 50%) of the benefited first row receptors.

4.5 PROJECT NOISE BARRIER ANALYSIS

Noise barriers were modeled at 11 locations within the study area. Noise barriers were not modeled for isolated impacted receptors, as they would not meet maximum square footage of abatement per benefited receptor. The location of each of the noise barriers evaluated is shown on figures in Appendix A and summarized below:

- EB Barrier 1: South side of I-70, crosses Jacksonburg Road
- EB Barrier 2: South side of I-70, crosses Union Pike
- EB Barrier 3: South side of I-70, along the exit ramp to US 27
- EB Barrier 4: South side of I-70, along the entrance ramp from US 27
- EB Barrier 5: South side of I-70, along I-70 and the exit ramp to SR 227
- EB Barrier 6: South side of I-70, along the exit ramp to US 40
- EB Barrier 7: South side of I-70, along the entrance ramp from US 40
- WB Barrier 1: North side of I-70, crosses the Cardinal Greenway Trail and Union Pike
- WB Barrier 2: North side of I-70, near the intersection of Highland Road and Cart Road
- WB Barrier 3: North side of I-70, along the entrance ramp from SR 227
- WB Barrier 4: North side of I-70, crosses SR 121

None of the 11 noise barriers analyzed met INDOT's feasibility and reasonableness criteria. The results of the noise barrier analysis are summarized in the Table 4-1, below. Maps of the analyzed noise barrier locations and noise receptors are in Appendix A. Tables showing the sound level results from the noise barrier optimization are in Appendix D.

Table 4-1. Barrier Summary

PROPOSED BARRIER	CNE	LENGTH (FT)	AVG HEIGHT (FT)	SQUARE FOOTAGE	BENEFITED RECEPTORS *	SQUARE FOOTAGE PER BENEFITED RECEPTOR	MAXIMUM ALLOWABLE SQUARE FOOTAGE	UNDER MAXIMUM SQUARE FOOTAGE?	FEASIBILITY CRITERIA MET?	DESIGN GOAL MET?
EB Barrier 1	B-4	1,600	13.75	22,000	15	1,467	1,000	No	Yes	Yes
EB Barrier 2	B-7, C-1	2,750	16.43	43,300	6	7,217	1,000	No	Yes	Yes
EB Barrier 3	B-7, C-1	1,495	18.54	27,708	3	9,236	1,000	No	Yes	Yes
EB Barrier 4	B-9, C-3	2,161	21.40	46,247	37	1,250	1,000	No	Yes	Yes
EB Barrier 5	B-9, C-3	4,136	18.22	75,365	18	4,187	1,000	No	Yes	No
EB Barrier 6	B-10, E-3	1,707	17.89	30,417	16	1,901	1,250	No	Yes	Yes
EB Barrier 7	B-12	2,026	14.35	29,070	5	5,814	1,000	No	Yes	Yes
WB Barrier 1	B-6, C-1	2,012	13.70	27,573	5	5,515	1,000	No	Yes	Yes
WB Barrier 2	C-2, B-8	1,850	14.49	26,800	6	4,467	1,000	No	Yes	Yes
WB Barrier 3	C-2	1,424	17.20	24,494	18	1,361	1,000	No	Yes	Yes
WB Barrier 4	B-11	1,400	13.29	18,600	3	6,200	1,000	No	Yes	Yes

*NRRs were utilized for this value on appropriate receptors as discussed in Section 3.1 above.

5.0 Construction Noise

During construction of the project, noise from construction activities may intermittently dominate the noise environment in the immediate area of construction.

Table 5-1 summarizes noise levels produced by construction equipment that is commonly used on roadway construction projects. Construction equipment is expected to generate noise levels ranging from 70 to 90 dB(A) at a distance of 50 feet, and noise produced by construction equipment would be reduced over distance at a rate of approximately 6 dB(A) per doubling of distance.

Table 5-1. Construction Equipment Noise

EQUIPMENT	MAXIMUM NOISE LEVEL (DB(A) AT 50 FEET)
Scrapers	89
Bulldozers	85
Heavy Trucks	88
Backhoe	80
Pneumatic Tools	85
Concrete Pump	82

Source: U.S. Environmental Protection Agency 1971.

No adverse noise impacts from construction are anticipated because construction noise would be short-term and intermittent. Measures to minimize the temporary impacts will include requiring equipment to have sound-control devices that are no less effective than those provided on the original equipment and requiring all equipment to be muffled.

6.0 Coordination with Local Officials

Much of the land along Revive I-70's corridor is undeveloped (Activity Categories F and G). Compatible noise planning for these undeveloped areas can minimize future noise conflicts. Sharing the project's specific noise impacts with local officials provides them with the relevant information for future planning and zoning decisions within the project area. In accordance with INDOT's *Traffic Noise Analysis Procedure* (2022) and 23 CFR 772, the *Revive I-70 Traffic Noise Impact Analysis* will be provided to the City of Richmond, the Wayne County Office of Planning and Zoning, and the Preble County Planning Commission following the completion of the environmental document. This allows the local government planning units to effectively plan for compatible land use types and avoid traffic noise impacts in Activity Categories B, C, and E that exist within the approximate 66 and 71 dBA contours.

The 66 and 71 dBA contours are an estimation of the future receptor impact zone following the construction of the project. These contours are to be used to help guide planning and development on currently undeveloped lands. On developed lands, the mapped contours in Appendix A do not account for the potential noise shielding effects that any existing buildings may provide. The 66 dBA contour for the proposed design is approximately 420 feet from the edge of I-70's pavement on the north side and 445 feet from the south side. The 71 dBA contour for the proposed design is approximately 220 feet from the edge of I-70's pavement on the north side and 210 feet from the south side (Appendix A).

7.0 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 for noise barriers that meet feasibility and reasonableness. As no noise barriers met feasibility and reasonableness, public involvement specific for noise abatement is not anticipated. A reevaluation of the noise analysis will occur during final design. The final decision on the installation of any abatement measure(s) will be made upon the completion of the project's final design and the public involvement processes.

8.0 Conclusion and Recommendations

Based on this noise analysis, no reasonable and feasible barriers were identified for this project.

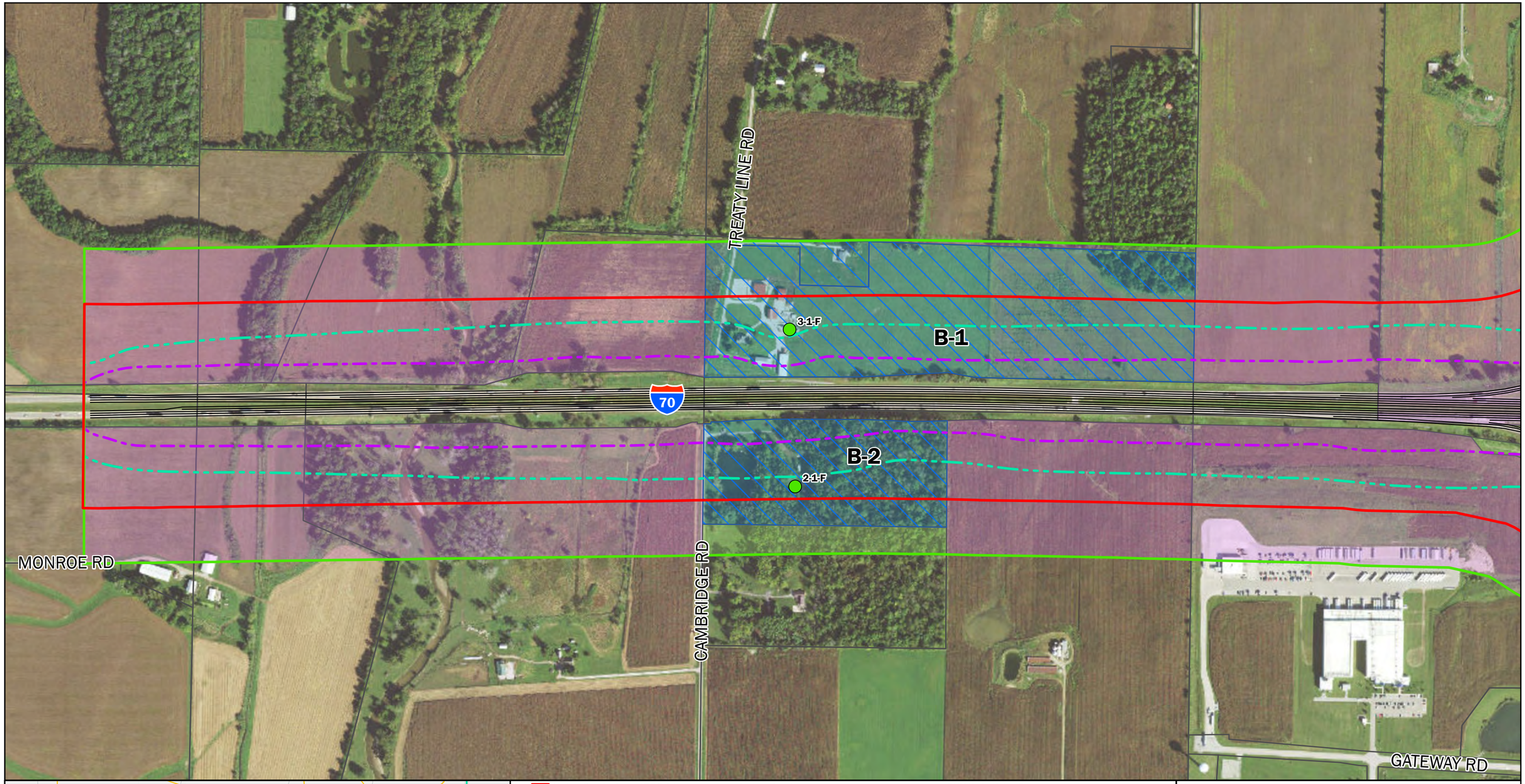
8.1 STATEMENT OF LIKELIHOOD

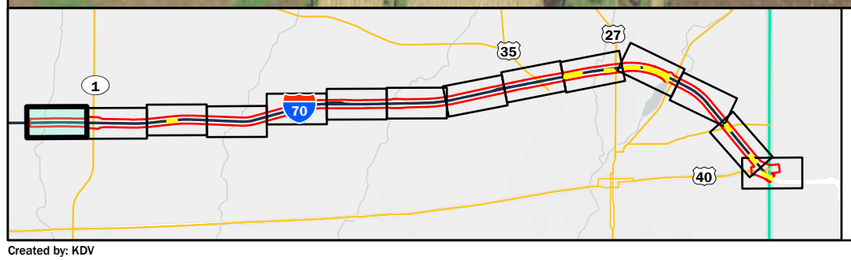
Based on the studies thus far accomplished, INDOT has not identified any locations where noise abatement is likely. Noise abatement at these locations is based upon preliminary design criteria. Noise abatement has not been found to be reasonable based on no barriers being able to meet the less than 1,000 square feet/benefited receptor threshold. A reevaluation of the noise analysis will occur during final design. If during final design it has been determined that conditions have changed such that noise abatement is feasible and reasonable, the abatement measures might be provided. The final decision on the installation of any abatement measure(s) will be made upon the completion of the project's final design and the public involvement processes.

9.0 References

- 23 CFR 772 (2011). “Procedures for Abatement of Highway Traffic Noise and Construction Noise.” Accessed May 30, 2019. https://www.fhwa.dot.gov/legsregs/directives/fapg/cfr0772.htm
- INDOT 2022. “Indiana Department of Transportation Traffic Noise Analysis Procedure,” Office of Environmental Services. https://www.in.gov/indot/engineering/files/2022-INDOT-Noise-Policy-Signed-Final-101222.pdf
- Parsons 2023. “Revive I-70 Traffic and Safety Analysis Report,” INDOT and FHWA.
- U.S. Environmental Protection Agency, “Noise from Construction Equipment and Operations, Building Equipment and Home Appliances,” NTID300.1, December 31, 1971. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=9101NN3I.PDF

Appendix A
Noise Receptor and Noise Barrier Locations





Noise Study Area (500 ft)
Noise Study Area (800 ft)
Noise Receptor
Impacted - Benefited
Impacted - Not Benefited
Not Impacted - Benefited
Not Impacted - Not Benefited
66 dBA Contour
71 dBA Contour

Noise Barriers
Evaluated Not Recommended
Feasible and Reasonable
Proposed Build Alignment

FHWA Activity Category
Category B
Category C
Category E
Category F
Category G

0 500 1,000 Feet
1 Inch = 500 feet

Sources:
Non Orthophotography Data - Obtained from the State of Indiana Geographical Information Office Library
Orthophotography - Obtained from Indiana Map Framework Data (www.indianamap.org)

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Wayne County, Indiana
Noise Receptor and Noise Barrier Locations
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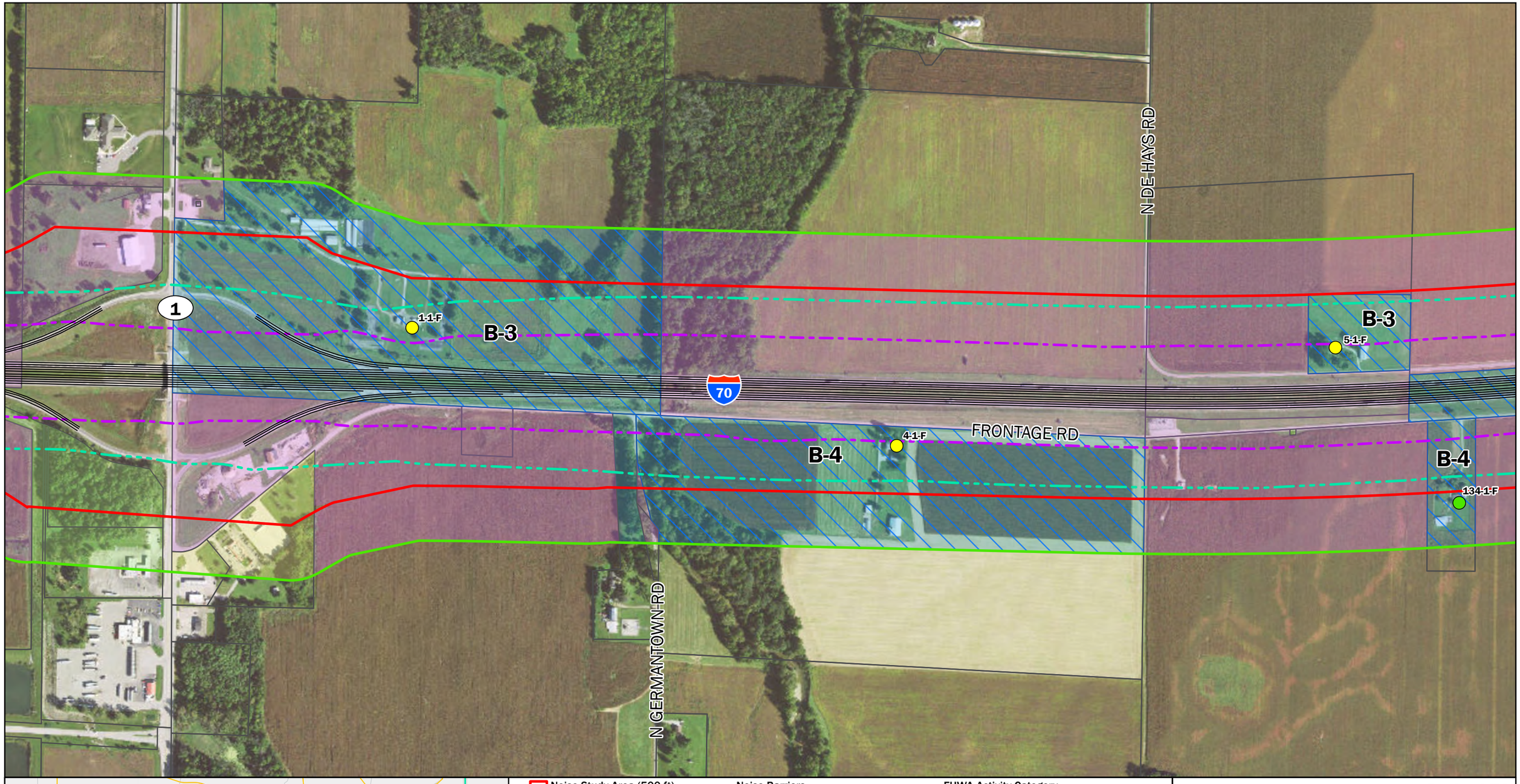

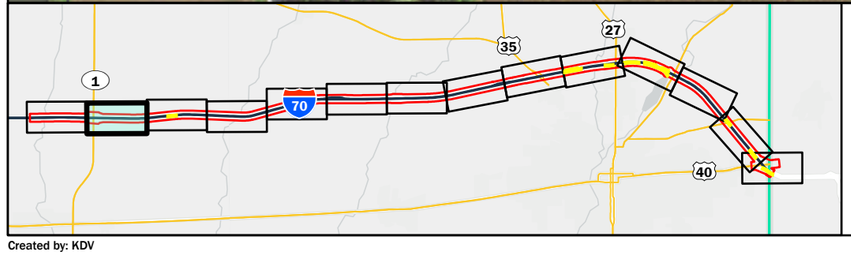

Noise Study Area (500 ft)
Noise Study Area (800 ft)

Noise Receptor
- Impacted - Benefited
- Impacted - Not Benefited
- Not Impacted - Benefited
- Not Impacted - Not Benefited
- 66 dBA Contour
- 71 dBA Contour

Noise Barriers
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- Feasible and Reasonable
- Proposed Build Alignment

FHWA Activity Category
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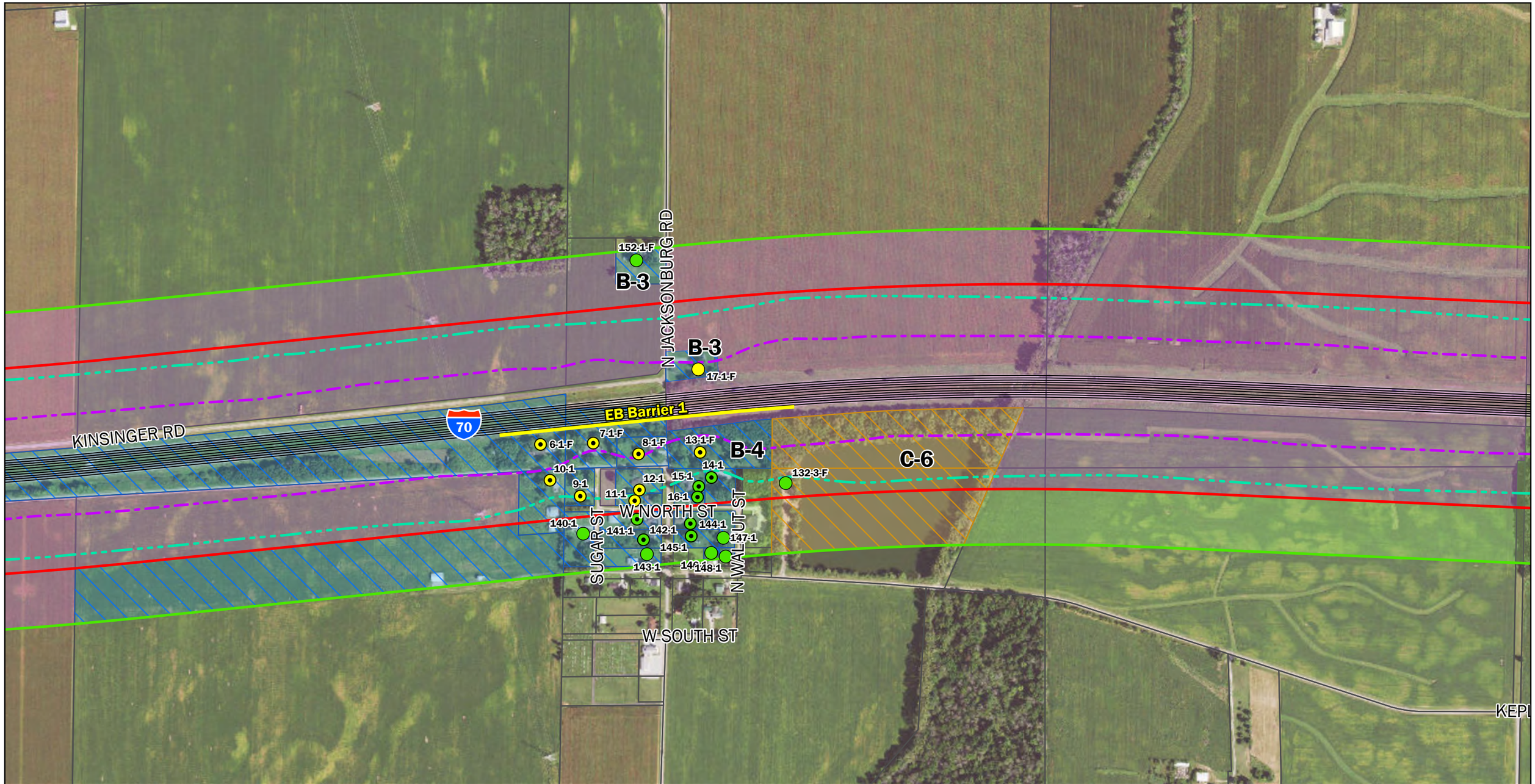

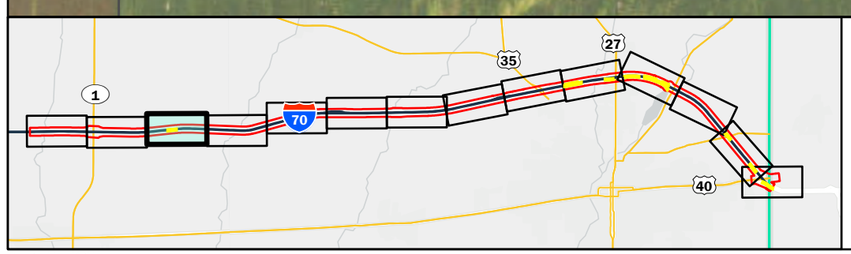

Noise Study Area (500 ft)
Noise Study Area (800 ft)

Noise Receptor
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- Impacted - Not Benefited
- Not Impacted - Benefited
- Not Impacted - Not Benefited
- 66 dBA Contour
- 71 dBA Contour

Noise Barriers
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FHWA Activity Category
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Wayne County, Indiana
Noise Receptor and Noise Barrier Locations
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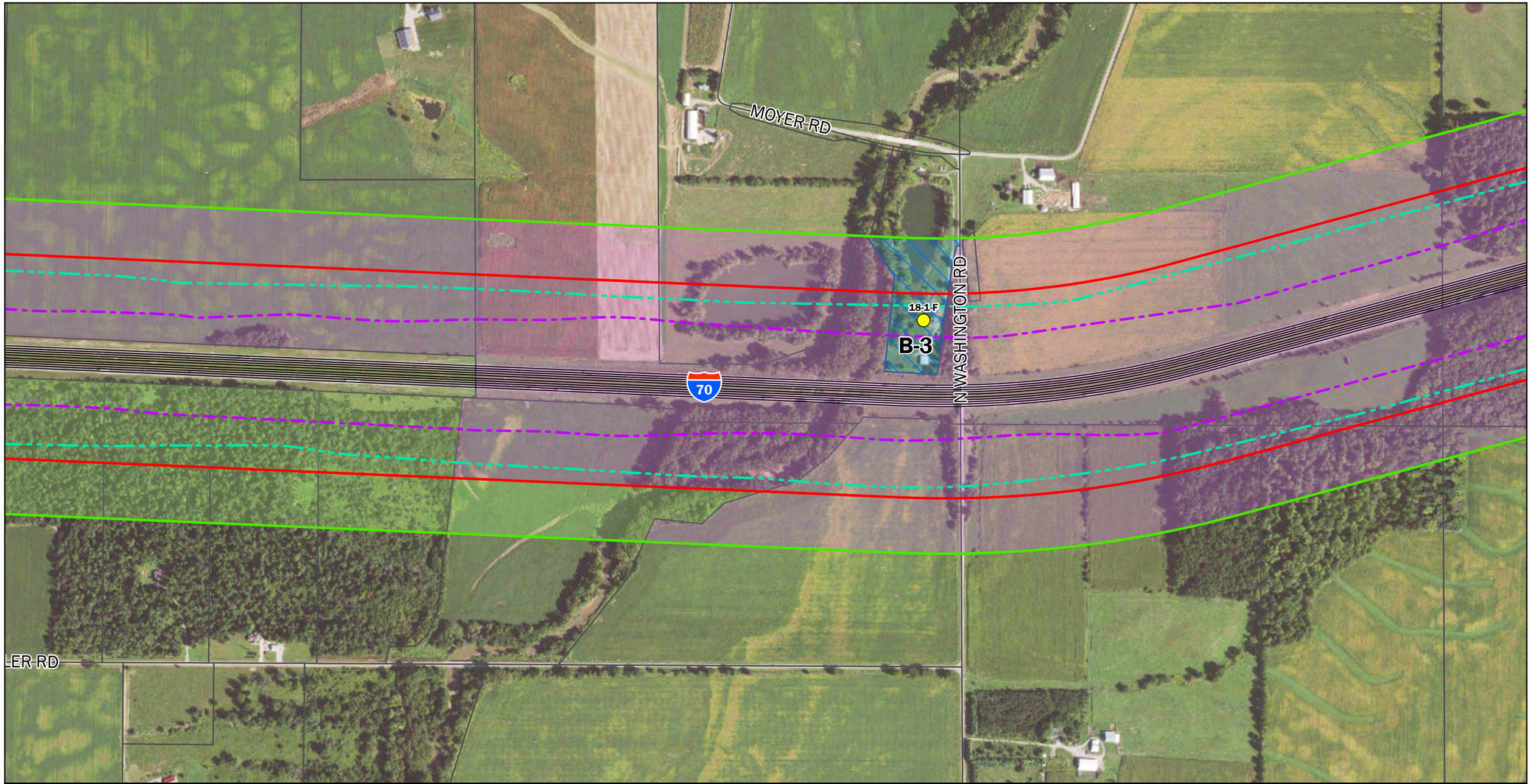

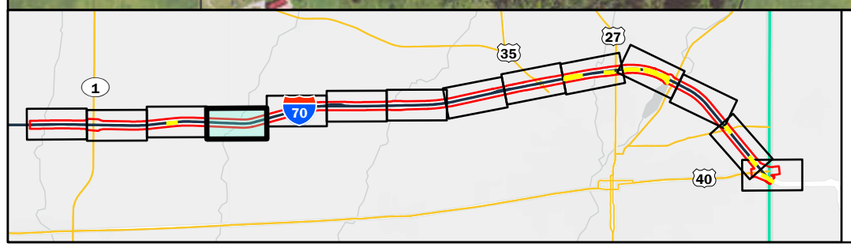

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Noise Receptor and Noise Barrier Locations
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GARRETT RD

N MINERAL SPRINGS RD

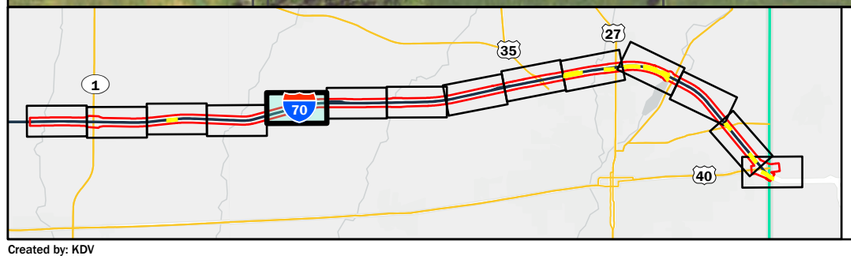
B-4

135-1-F

B-4

19-1-F

70



Noise Study Area (500 ft)
Noise Study Area (800 ft)

Noise Receptor
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- Impacted - Not Benefited
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- Not Impacted - Not Benefited
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Noise Barriers
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Wayne County, Indiana
Noise Receptor and Noise Barrier Locations
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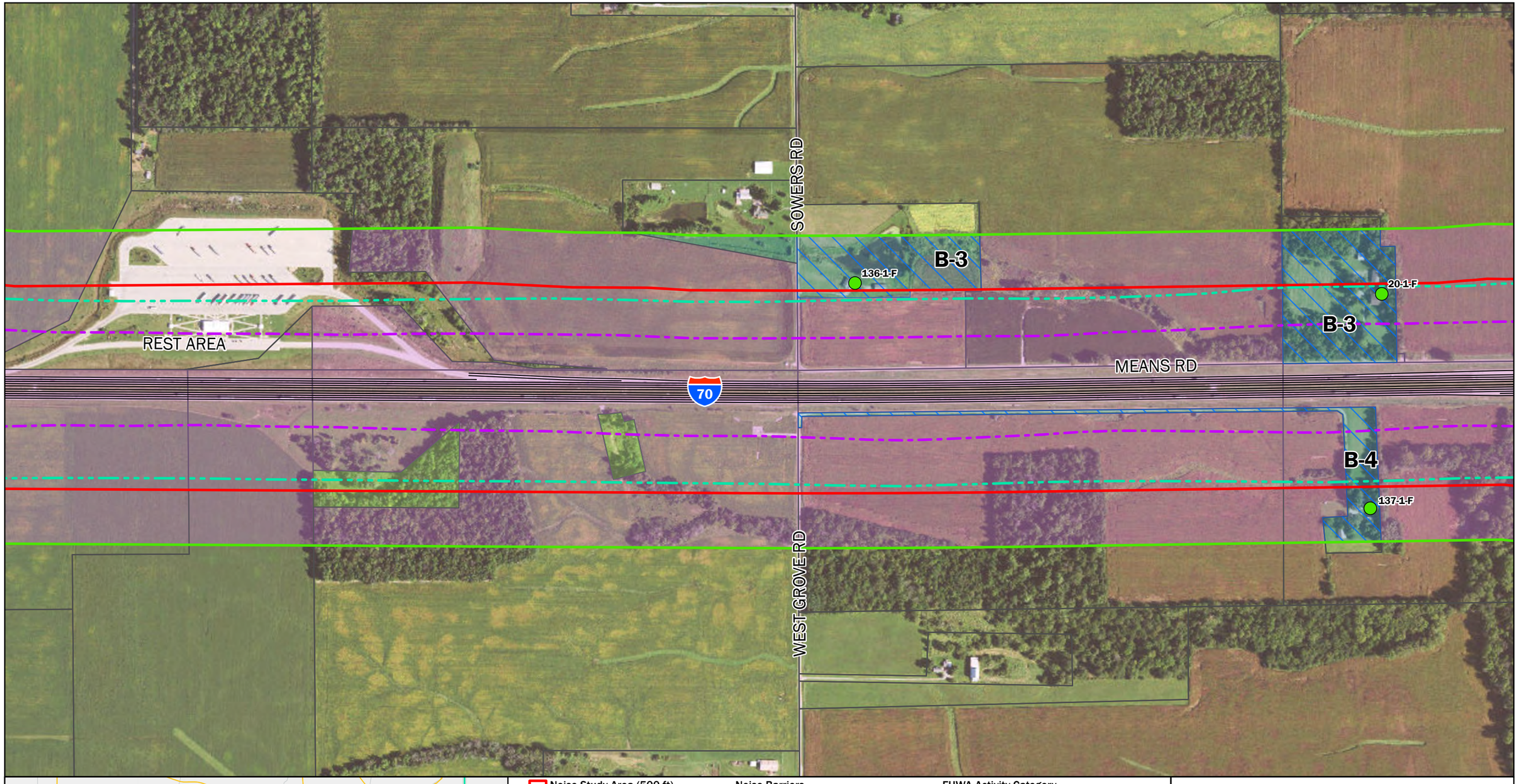

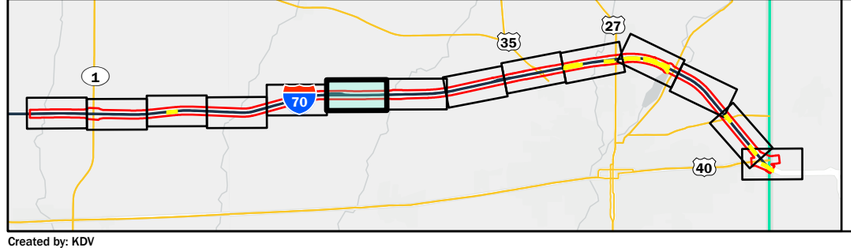

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Noise Receptor and Noise Barrier Locations
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NOLANDS FORK RD

E-1

22-1-F

21-1-F

E-1

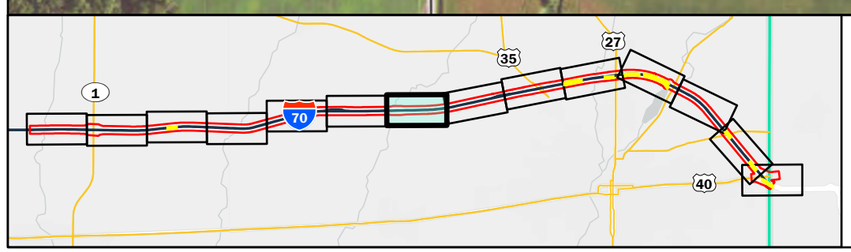
MEANS RD

N CENTERVILLE RD

E-1

133-1-F

70



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Wayne County, Indiana
Noise Receptor and Noise Barrier Locations
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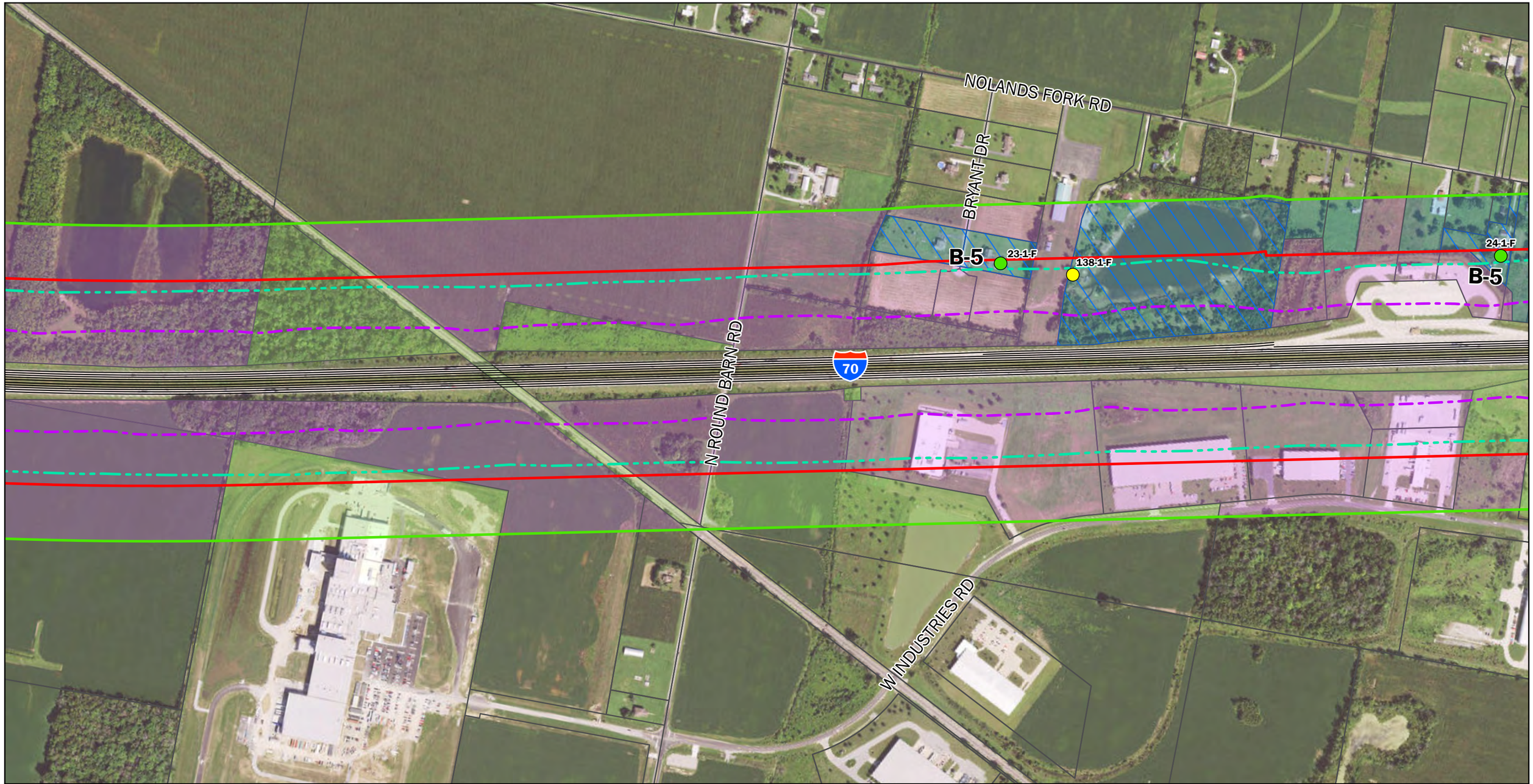

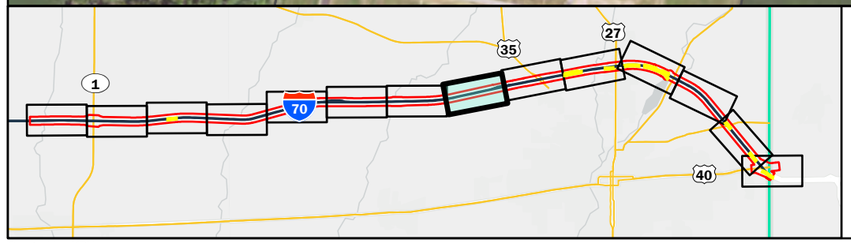

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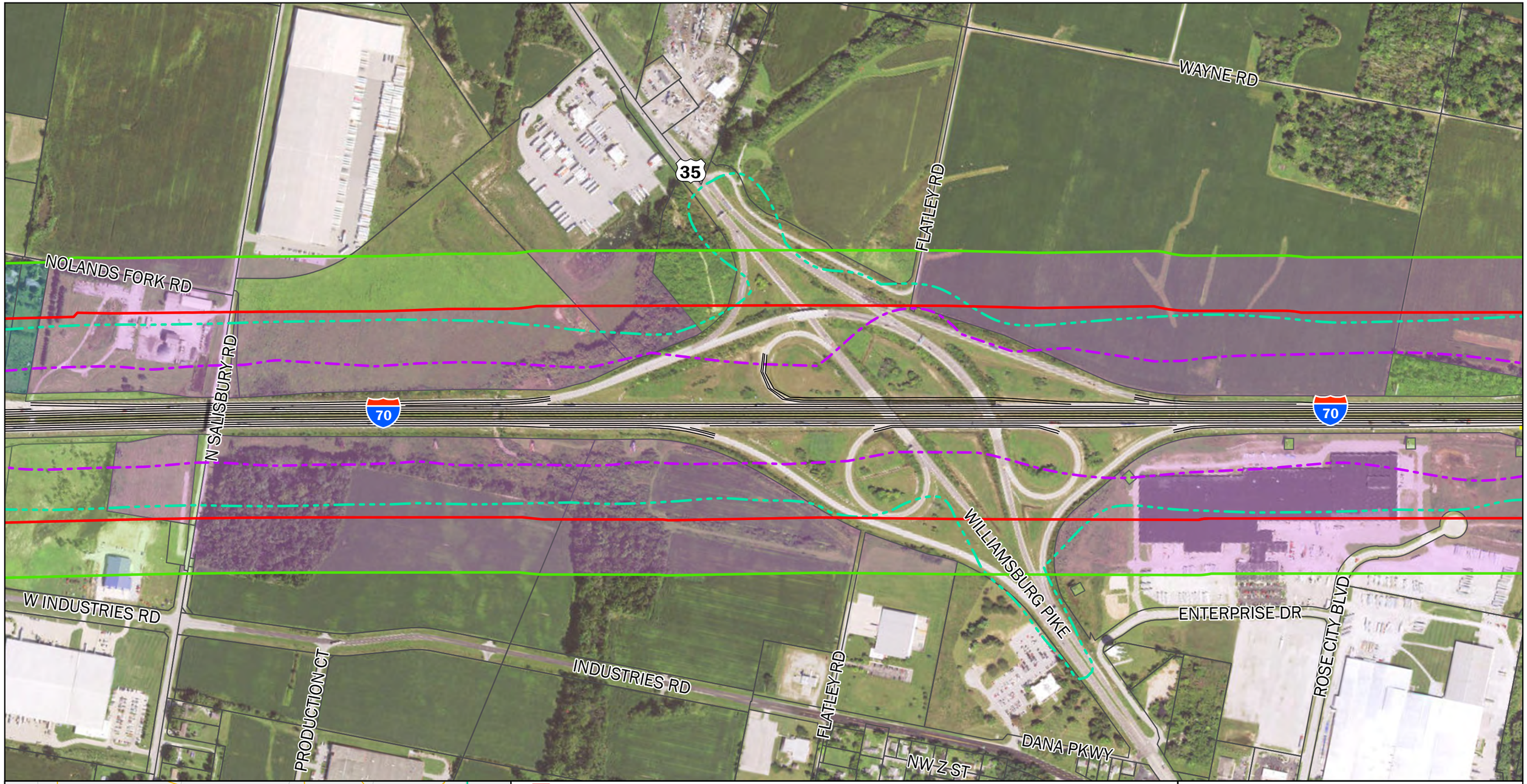

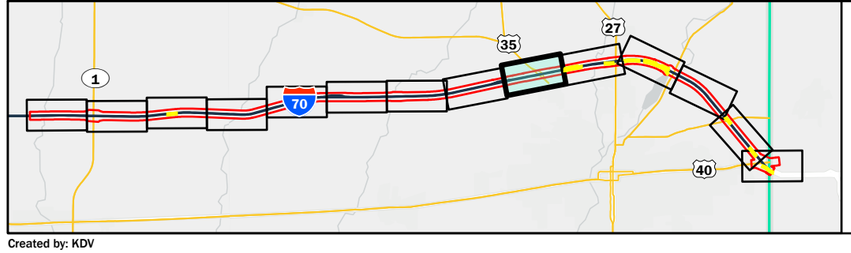

Noise Study Area (500 ft)
Noise Study Area (800 ft)

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Date: 7/13/2023

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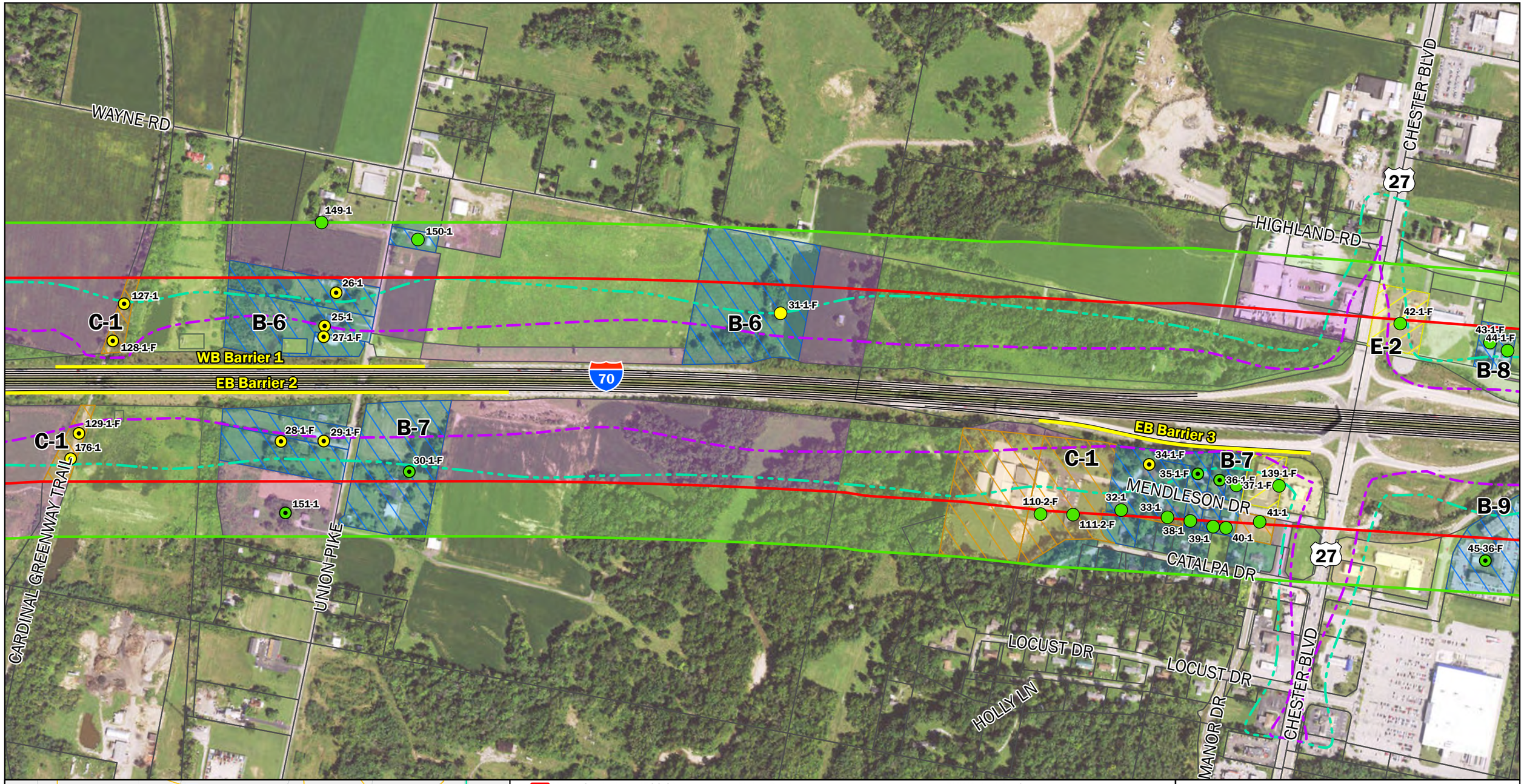

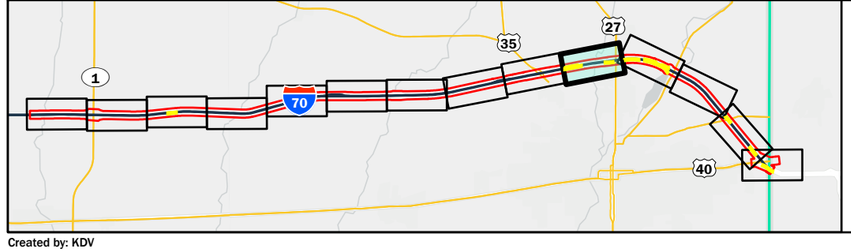

Noise Study Area (500 ft)
Noise Study Area (800 ft)

Noise Receptor
- Impacted - Benefited
- Impacted - Not Benefited
- Not Impacted - Benefited
- Not Impacted - Not Benefited
- 66 dBA Contour
- 71 dBA Contour

Noise Barriers
- Evaluated Not Recommended
- Feasible and Reasonable
- Proposed Build Alignment

FHWA Activity Category
- Category B
- Category C
- Category E
- Category F
- Category G

0 500 1,000 Feet
1 Inch = 500 feet

Sources:
Non Orthophotography Data - Obtained from the State of Indiana Geographical Information Office Library
Orthophotography - Obtained from Indiana Map Framework Data (www.indianamap.org)

Revive I-70
Wayne County, Indiana
Noise Receptor and Noise Barrier Locations
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Des. 2002424

Date: 7/13/2023

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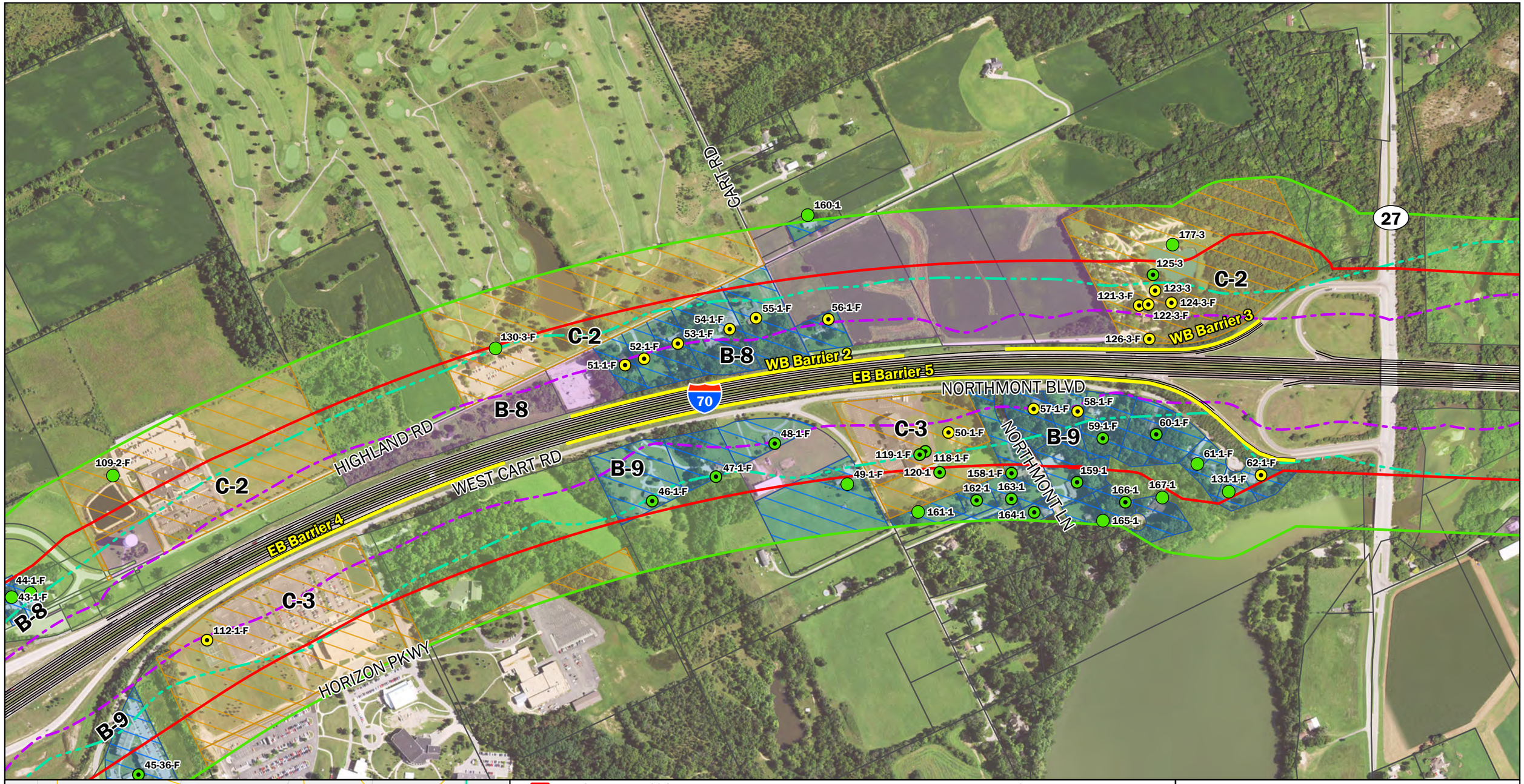

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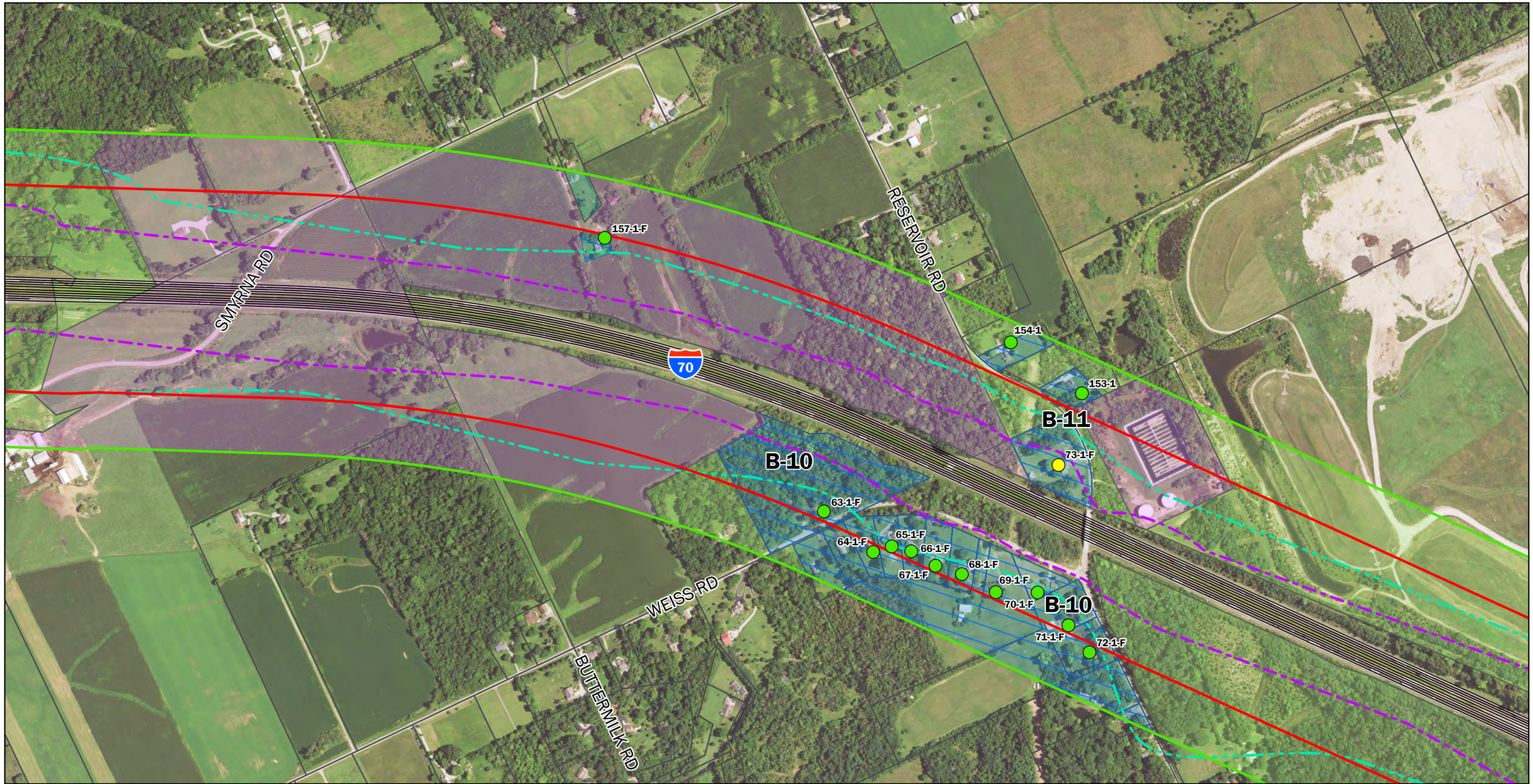

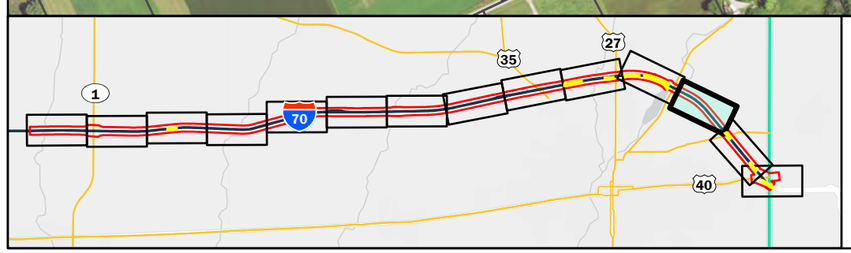

Noise Study Area (500 ft)
Noise Study Area (800 ft)
Noise Receptor
Impacted - Benefited
Impacted - Not Benefited
Not Impacted - Benefited
Not Impacted - Not Benefited
66 dBA Contour
71 dBA Contour

Noise Barriers
Evaluated Not Recommended
Feasible and Reasonable
Proposed Build Alignment

FHWA Activity Category
Category B
Category C
Category E
Category F
Category G

0 500 1,000 Feet
1 Inch = 500 feet

Sources:
Non Orthophotography Data - Obtained from the State of Indiana Geographical Information Office Library
Orthophotography - Obtained from Indiana Map Framework Data (www.indianamap.org)

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Noise Receptor and Noise Barrier Locations
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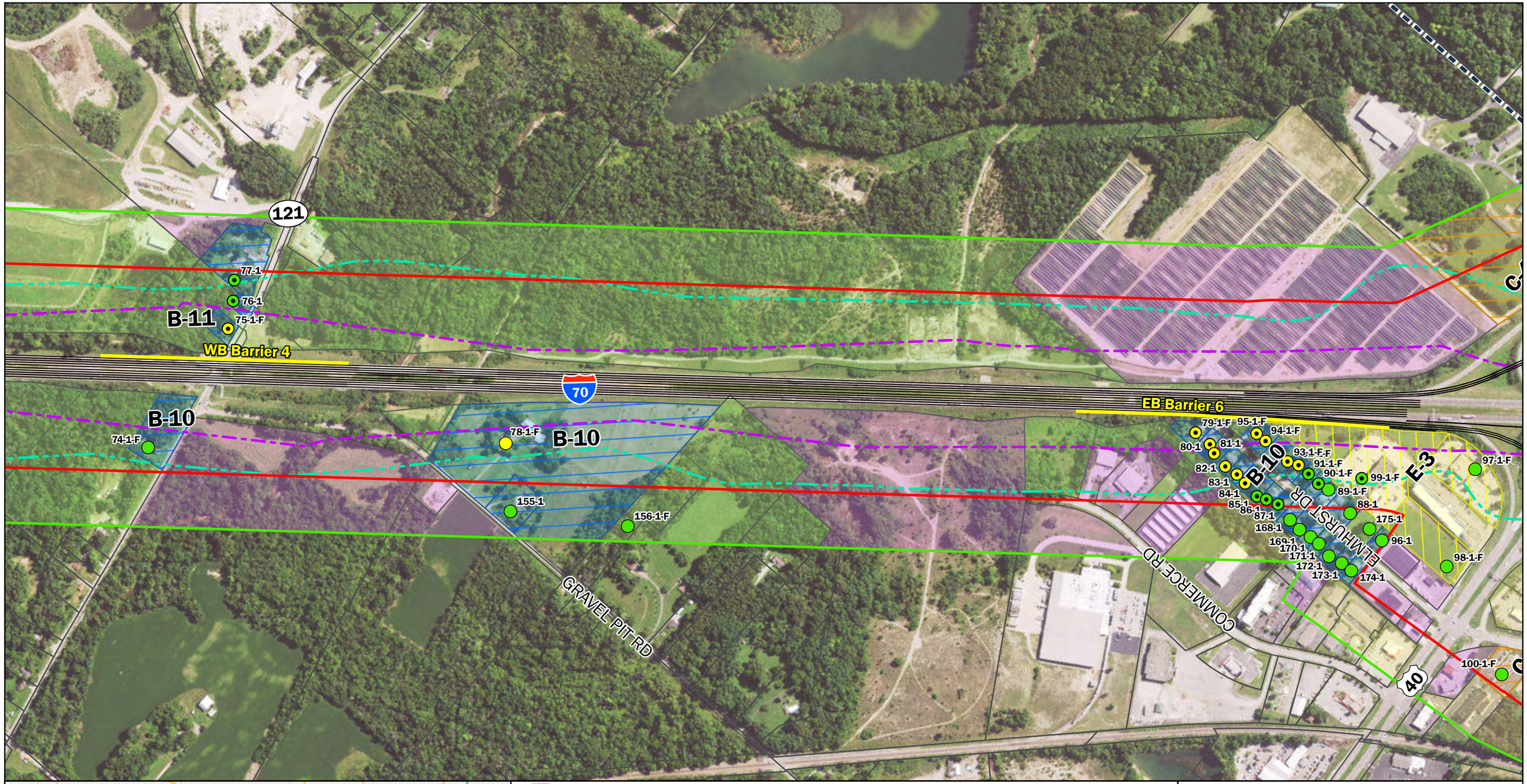
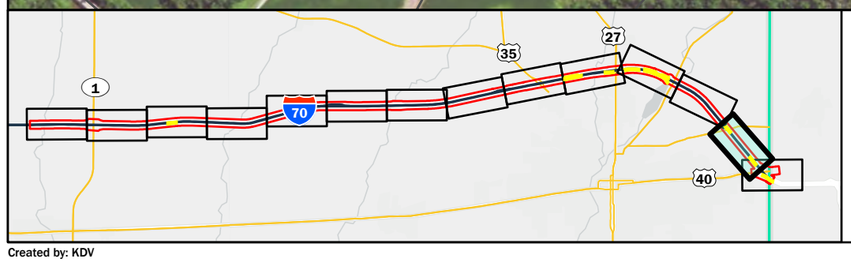
Date: 7/13/2023

PARSONS





Noise Study Area (500 ft)
Noise Study Area (800 ft)

Noise Receptor
- Impacted - Benefited
- Impacted - Not Benefited
- Not Impacted - Benefited
- Not Impacted - Not Benefited
- 66 dBA Contour
- 71 dBA Contour

Noise Barriers
- Evaluated Not Recommended
- Feasible and Reasonable
- Proposed Build Alignment

FHWA Activity Category
- Category B
- Category C
- Category E
- Category F
- Category G

0 500 1,000 Feet
1 Inch = 500 feet

Sources:
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Revive I-70
Wayne County, Indiana
Noise Receptor and Noise Barrier Locations
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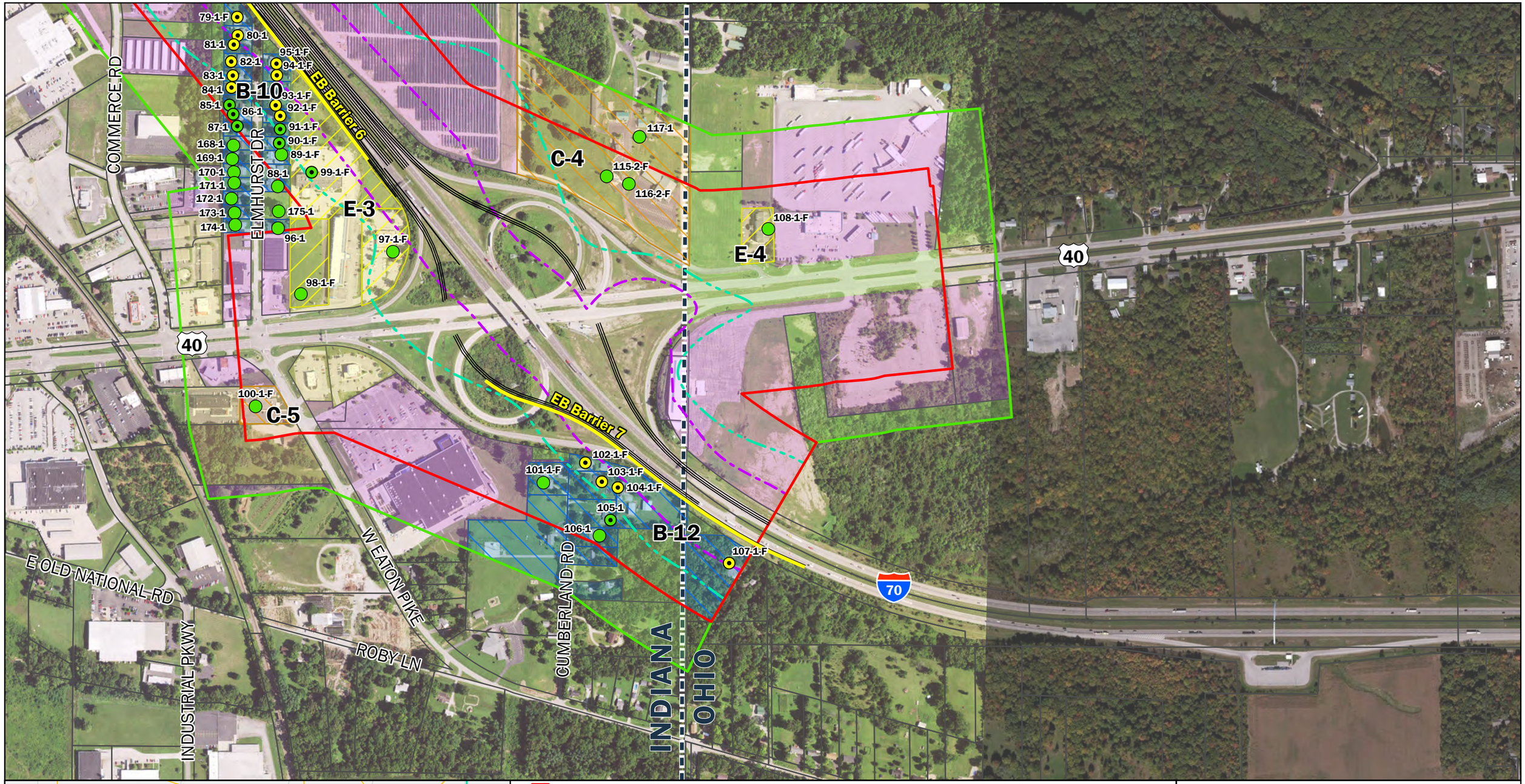

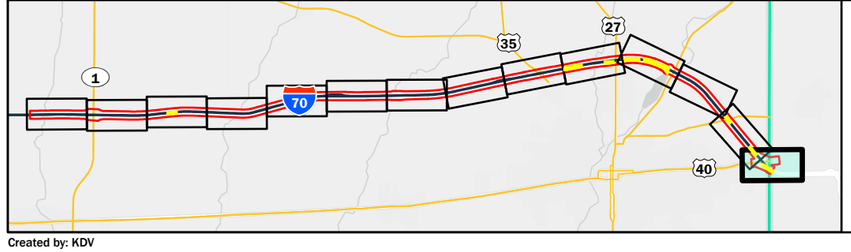

Noise Study Area (500 ft)
Noise Study Area (800 ft)

Noise Receptor
- Impacted - Benefited
- Impacted - Not Benefited
- Not Impacted - Benefited
- Not Impacted - Not Benefited
- 66 dBA Contour
- 71 dBA Contour

Noise Barriers
- Evaluated Not Recommended
- Feasible and Reasonable
- Proposed Build Alignment

FHWA Activity Category
- Category B
- Category C
- Category E
- Category F
- Category G

0 500 1,000 Feet
1 Inch = 500 feet

Sources:
Non Orthophotography Data - Obtained from the State of Indiana Geographical Information Office Library
Orthophotography - Obtained from Indiana Map Framework Data (www.indianamap.org)

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Wayne County, Indiana
Noise Receptor and Noise Barrier Locations
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Appendix C
Predicted Noise Levels

North side of I-70, between Cambridge Road and SR 1

CNE B-1			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
3-1-F	B	67	64.1	65.5	1.4	No	No impact(s); no barrier analysis required			

North side of I-70, between Cambridge Road and SR 1

CNE B-2			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
2-1-F	B	67	62.9	64.6	1.7	No	No impact(s); no barrier analysis required			

North side of I-70, between SR 1 and Centerville Road

CNE B-3			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
1-1-F	B	67	69.1	70.0	0.9	Yes	70	0.0	Yes	No
5-1-F	B	67	68.4	69.8	1.4	Yes	69.8	0.0	Yes	No
17-1-F	B	67	71.2	72.1	0.9	Yes	72.1	0.0	Yes	No
18-1-F	B	67	65.2	66.4	1.2	Yes	66.4	0.0	Yes	No
20-1-F	B	67	63.5	64.7	1.2	No	64.7	0.0	Yes	No
136-1-F	B	67	62.0	62.8	0.8	No	62.0	0.0	Yes	No
152-1-F	B	67	60.6	61.6	1.0	No	60.6	0.0	Yes	No

South side of I-70, between SR 1 and Mineral Springs Road

CNE B-4			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
4-1-F	B	67	67.7	69.1	1.4	Yes	69.1	0.0	Yes	No
6-1-F	B	67	71.9	72.8	1.2	Yes	65.4	7.4	Yes	Yes
7-1-F	B	67	70.9	71.7	1.0	Yes	63.5	8.2	Yes	Yes
8-1-F	B	67	68.6	69.5	0.8	Yes	60.9	8.6	Yes	Yes
9-1	B	67	64.8	66.2	1.3	Yes	60.7	5.5	No	Yes
10-1	B	67	67.8	69.6	1.7	Yes	64.5	5.1	No	Yes
11-1	B	67	64.7	66.1	1.4	Yes	59.4	6.7	No	Yes
12-1	B	67	64.7	65.9	1.3	Yes	59.6	6.3	No	Yes
13-1-F	B	67	68.1	69.1	0.9	Yes	61	8.1	Yes	Yes
14-1	B	67	64.9	65.8	0.9	No	59.8	6.0	No	Yes
15-1	B	67	62.1	63.0	0.9	No	58	5.0	No	Yes
16-1	B	67	63.1	64.2	1.1	No	57.8	6.4	No	Yes
19-1-F	B	67	65.2	66.3	1.1	Yes	66.3	0.0	Yes	No
134-1-F	B	67	62.2	62.8	0.6	No	62.8	0.0	Yes	No
135-1-F	B	67	60.8	61.8	1.0	No	61.8	0.0	Yes	No
137-1-F	B	67	60.9	61.9	1.0	No	61.9	0.0	Yes	No
140-1	B	67	62.5	63.9	1.4	No	63.9	1.4	No	No
141-1	B	67	60.4	61.5	1.1	No	56.4	5.1	No	Yes
142-1	B	67	61.4	62.6	1.2	No	57.5	5.1	No	Yes
143-1	B	67	59.8	60.9	1.1	No	56.5	4.4	No	No
144-1	B	67	61.7	62.8	1.1	No	57.4	5.4	No	Yes
145-1	B	67	61.4	62.4	1.0	No	57.4	5.0	No	Yes
146-1	B	67	60.4	61.4	1.0	No	57.1	4.3	No	No
147-1	B	67	61.2	62.3	1.1	No	58	4.3	No	No
148-1	B	67	59.9	60.9	1.0	No	56.7	4.2	No	No

North side of I-70, between Round Barn Road and Salisbury Road

CNE B-5			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
23-1-F	B	67	62.9	64.8	1.9	No	64.8	0.0	Yes	No
24-1-F	B	67	64.6	65.0	0.4	No	65.0	0.0	Yes	No
138-1-F	B	67	64.4	66.4	2	Yes	66.4	0.0	Yes	No

North side of I-70, from near Union Pike to US 27

CNE B-6			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
25-1	B	67	68.4	69.0	0.6	Yes	62.1	7.0	No	Yes
26-1	B	67	65.4	66.1	0.7	Yes	60.6	5.4	No	Yes
27-1-F	B	67	68.7	69.1	0.4	Yes	61.8	7.1	Yes	Yes
31-1-F	B	67	65.7	66.3	0.6	Yes	66.3	0.0	Yes	No
149-1	B	67	60.4	61.1	0.7	No	57.8	3.3	No	No
150-1	B	67	61.0	61.6	0.6	No	59.4	2.2	No	No

South side of I-70, from near Union Pike to US 27

CNE B-7			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
28-1-F	B	67	68.0	68.8	0.8	Yes	60.5	8.0	Yes	Yes
29-1-F	B	67	66.0	66.8	0.8	Yes	59.6	7.0	Yes	Yes
30-1-F	B	67	64.5	65.2	0.7	No	60.1	5.1	Yes	Yes
32-1	B	67	60.5	61.6	1.1	No	59.2	2.4	No	No
33-1	B	67	58.9	60.2	1.3	No	57.9	2.3	No	No
34-1-F	B	67	68.4	69.5	1.1	Yes	62.5	7.0	Yes	Yes
35-1-F	B	67	65.0	65.9	0.9	No	60.3	5.6	Yes	Yes
36-1-F	B	67	63.0	63.9	0.9	No	58.9	5.0	Yes	Yes
37-1-F	B	67	61.1	62.3	1.2	No	58.3	4.0	Yes	No
38-1	B	67	58.4	59.7	1.3	No	57.4	2.3	No	No
39-1	B	67	56.5	57.8	1.3	No	56.5	1.3	No	No
40-1	B	67	56.1	57.4	1.3	No	56.4	1.0	No	No
151-1	B	67	61.4	62.4	1.0	No	56.8	5.6	No	Yes

North side of I-70, between US 27 to near Cart Road

CNE B-8			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
43-1-F	B	67	56.8	57.9	1.1	No	57.9	0.0	Yes	No
44-1-F	B	67	58.5	58.1	-0.4	No	58.1	0.0	Yes	No
51-1-F	B	67	68.2	69.2	1.0	Yes	62.2	7.0	Yes	Yes
52-1-F	B	67	68.3	69.5	1.2	Yes	62	7.5	Yes	Yes
53-1-F	B	67	68.2	70.2	2.0	Yes	62.6	7.6	Yes	Yes
54-1-F	B	67	67.4	69.2	1.8	Yes	62.1	7.1	Yes	Yes
55-1-F	B	67	65.6	67.2	1.6	Yes	60.4	6.8	Yes	Yes
56-1-F	B	67	64.8	66.9	2.1	Yes	61.8	5.0	Yes	Yes
160-1	B	67	58.4	59.4	1.0	No	56.8	2.6	No	No

South side of I-70, between US 27 and SR 227

CNE B-9			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
45-36-F	B	67	54.5	55.5	1.1	No	48.5	7.0	Yes	Yes
46-1-F	B	67	63.7	64.8	1.1	No	59.3	5.5	Yes	Yes
47-1-F	B	67	62.7	63.8	1.1	No	58.8	5.0	Yes	Yes
48-1-F	B	67	60.8	62.1	1.3	No	56.3	5.8	Yes	Yes
49-1-F	B	67	52.6	54.1	1.5	No	50.7	3.4	Yes	No
57-1-F	B	67	67.9	69.0	1.1	Yes	59.4	9.6	Yes	Yes
58-1-F	B	67	66.0	66.6	0.6	Yes	58.8	8.0	Yes	Yes
59-1-F	B	67	63.9	64.8	0.9	No	58.0	6.9	Yes	Yes
60-1-F	B	67	63.1	63.7	0.6	No	59.1	5.1	Yes	Yes
61-1-F	B	67	59.8	60.5	0.7	No	56.7	4.1	Yes	No
62-1-F	B	67	65.0	66.1	1.1	Yes	58.9	7.3	Yes	Yes
131-1-F	B	67	55.8	56.4	0.6	No	53.3	3.2	Yes	No

CNE B-9 cont'd			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
158-1-F	B	67	61.3	62.2	0.9	No	55.1	7.1	Yes	Yes
159-1	B	67	59.7	60.4	0.7	No	54.3	6.1	No	Yes
161-1	B	67	58.6	58.9	0.3	No	54.3	4.6	No	No
162-1	B	67	58.6	59.4	0.8	No	52.6	6.8	No	Yes
163-1	B	67	58.6	59.3	0.7	No	52.5	6.8	No	Yes
164-1	B	67	57.1	57.6	0.5	No	52.2	5.4	No	Yes
165-1	B	67	54.6	55.3	0.7	No	51.4	3.9	No	No
166-1	B	67	57.3	57.9	0.6	No	52.9	5.0	No	Yes
167-1	B	67	53.1	53.4	0.3	No	49.5	3.9	No	No
173-1	B	67	58.6	59.0	0.4	No	55.9	3.1	No	No
174-1	B	67	57.8	58.3	0.5	No	55.7	2.6	No	No
175-1	B	67	59.5	59.6	0.1	No	57.9	1.7	No	No

South side of I-70, from near Weiss Road to US 40

CNE B-10			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
63-1-F	B	67	63.5	63.9	0.4	No	63.9	0.0	Yes	No
64-1-F	B	67	62.0	63.1	1.1	No	63.1	0.0	Yes	No
65-1-F	B	67	64.2	65.3	1.1	No	65.3	0.0	Yes	No
66-1-F	B	67	64.4	65.6	1.2	No	65.6	0.0	Yes	No
67-1-F	B	67	63.0	64.2	1.2	No	64.2	0.0	Yes	No
68-1-F	B	67	63.0	64.2	1.2	No	64.2	0.0	Yes	No
69-1-F	B	67	62.0	63.1	1.1	No	63.1	0.0	Yes	No
70-1-F	B	67	62.8	63.9	1.1	No	63.9	0.0	Yes	No
71-1-F	B	67	62.6	63.8	1.2	No	63.8	0.0	Yes	No
72-1-F	B	67	62.7	63.8	1.1	No	63.8	0.0	Yes	No

CNE B-10 cont'd	FHWA Activity Category	Noise Abatement Criterion	Predicted Noise Levels (dBA)			Impact	Predicted Noise Levels (dBA)		First Row Receptor	Benefited Receptor
Receptor			Existing	Build	Noise Level Increase		Build w/Barrier	Noise Level Reduction		
74-1-F	B	67	64.2	65.0	0.8	No	65.0	0.0	Yes	No
78-1-F	B	67	66.8	68.0	1.2	Yes	68.0	0.0	Yes	No
79-1-F	B	67	71.4	73.1	1.7	Yes	62.6	10.4	Yes	Yes
80-1	B	67	68.2	69.6	1.4	Yes	60.7	9.0	No	Yes
81-1	B	67	68.5	69.6	1.1	Yes	60.5	9.1	No	Yes
82-1	B	67	66.8	67.8	1.0	Yes	59.4	8.4	No	Yes
83-1	B	67	66.0	66.7	0.7	Yes	58.8	8.0	No	Yes
84-1	B	67	65.5	66.0	0.5	Yes	58.4	7.6	No	Yes
85-1	B	67	63.6	64.1	0.5	No	57.5	6.6	No	Yes
86-1	B	67	63.5	63.9	0.4	No	57.4	6.6	No	Yes
87-1	B	67	61.1	61.7	0.6	No	56.3	5.4	No	Yes
88-1	B	67	60.7	60.8	0.1	No	57.1	4.0	No	No
89-1-F	B	67	64.5	64.4	-0.1	No	59.8	4.7	Yes	No
90-1-F	B	67	65.0	64.7	-0.3	No	59.8	5.0	Yes	Yes
91-1-F	B	67	65.9	65.7	-0.2	No	59.7	6.0	Yes	Yes
92-1-F	B	67	67.0	66.9	-0.1	Yes	59.9	7.0	Yes	Yes
93-1-F	B	67	67.5	67.6	0.1	Yes	60.1	7.5	Yes	Yes
94-1-F	B	67	70.3	70.7	0.4	Yes	60.8	10.0	Yes	Yes
95-1-F	B	67	71.3	71.9	0.6	Yes	61.6	10.4	Yes	Yes
96-1	B	67	58.2	58.1	-0.1	No	56.7	1.5	No	No
155-1	B	67	60.6	61.7	1.1	No	61.7	0.0	No	No
156-1-F	B	67	61.9	63.8	1.9	No	63.8	0.0	No	No
168-1	B	67	60.1	60.6	0.5	No	55.8	4.8	No	No
169-1	B	67	59.6	60.1	0.5	No	55.6	4.5	No	No
170-1	B	67	59.2	59.7	0.5	No	55.9	3.8	No	No
171-1	B	67	58.8	59.3	0.5	No	55.4	3.9	No	No
172-1	B	67	59	59.5	0.5	No	55.8	3.7	No	No

North side of I-70, from near Reservoir Road to SR 121

CNE B-11			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
73-1-F	B	67	68.9	70.5	1.6	Yes	70.5	0.0	Yes	No
75-1-F	B	67	69.9	71.2	1.3	Yes	63.0	8.2	Yes	Yes
76-1	B	67	63.5	64.6	1.1	No	58.9	5.7	No	Yes
77-1	B	67	64.6	65.7	1.1	No	60.6	5.1	No	Yes
153-1	B	67	59.4	60.8	1.4	No	60.8	0.0	No	No
154-1	B	67	58	59.4	1.4	No	59.4	0.0	No	No
157-1-F	B	67	60.7	62.1	1.4	No	62.1	0.0	Yes	No

South side of I-70, from US 40 to near the Indiana/Ohio State line

CNE B-12			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
101-1-F	B	67	59.7	58.9	-0.8	No	54.3	4.6	Yes	No
102-1-F	B	67	71.3	70.8	-0.5	Yes	61.9	8.9	Yes	Yes
103-1-F	B	67	69.2	69.0	-0.2	Yes	62.1	6.9	Yes	Yes
104-1-F	B	67	68.4	68.3	-0.1	Yes	61.1	7.2	Yes	Yes
105-1	B	67	61.3	62.0	0.7	No	56.5	5.4	No	Yes
106-1	B	67	61.0	61.5	0.5	No	57.0	4.4	No	No
107-1-F	B	67	71.3	71.2	-0.1	Yes	64.1	7.1	Yes	Yes

North and south sides of I-70, between the US 35 and US 27 interchanges

CNE C-1			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
41-1	C	67	58.6	59.8	1.2	No	58.3	1.5	No	No
110-2-F	C	67	55.6	57.1	1.5	No	56.0	1.1	Yes	No
111-2-F	C	67	61.7	62.9	1.2	No	59.9	3.0	Yes	No
127-1	C	67	65.5	66.2	0.7	Yes	61.1	5.1	No	Yes
128-1-F	C	67	68.9	69.4	0.5	Yes	62.9	6.6	Yes	Yes
129-1-F	C	67	68.0	68.2	0.2	Yes	61.1	7.0	Yes	Yes
176-1	C	67	65.4	66.0	0.6	Yes	60.7	5.3	No	Yes

North side of I-70, east of US 27

CNE C-2			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
109-2-F	C	67	58.4	58.6	0.2	No	58.6	0.0	Yes	No
121-3-F	C	67	67.4	68.0	0.8	Yes	60.7	7.3	Yes	Yes
122-3-F	C	67	68.0	67.7	-0.2	Yes	60.4	7.3	Yes	Yes
123-3	C	67	66.3	66.2	-0.1	Yes	59.8	6.4	No	Yes
124-3-F	C	67	68.5	67.9	-0.5	Yes	60.1	7.8	Yes	Yes
125-3	C	67	64.2	64.4	0.2	No	59.4	5.0	No	Yes
126-3-F	C	67	76.9	77.2	0.2	Yes	65.3	11.9	Yes	Yes
130-3-F	C	67	63.9	65.7	1.8	No	64.9	0.8	Yes	No
177-3	C	67	61.8	62.2	0.4	No	58.9	3.3	No	No

South side of I-70, east of US 27

CNE C-3			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
50-1-F	C	67	66.3	68.1	1.8	Yes	58.4	9.7	Yes	Yes
112-1-F	C	67	69.6	69.6	0.0	Yes	62.6	7.0	Yes	Yes
118-1-F	C	67	62.5	64.1	1.6	No	55.8	8.3	Yes	Yes
119-1-F	C	67	60.7	62.1	1.4	No	54.5	7.6	Yes	Yes
120-1	C	67	61.2	62.5	1.3	No	55.9	6.6	No	Yes

North side of I-70, west of the Indiana/Ohio State Line

CNE C-4			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
115-2-F	C	67	64.0	64.1	0.1	No	No impact(s); no barrier analysis required			
116-2-F	C	67	63.6	63.6	0.0	No				
117-1	C	67	59.2	59.1	-0.1	No				

South side of I-70, south of US 40

CNE C-5			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
100-1-F	C	67	54.3	56.0	1.7	No	No impact(s); no barrier analysis required			

South side of I-70, west of Jacksonburg Road

CNE C-6			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
132-3-F	C	67	64.7	65.9	1.2	No	63.1	2.8	Yes	No

North and south side of I-70, adjacent to Centerville Road

CNE E-1			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
21-1-F	E	72	59.7	60.5	0.8	No	No impact(s); no barrier analysis required			
22-1-F	E	72	56.9	58.1	1.2	No				
133-1-F	E	72	68.7	70.2	1.5	No				

North and south side of I-70, east of US 27

CNE E-2			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
42-1-F	E	72	64.9	66.0	1.1	No	66.0	0.0	Yes	No
139-1-F	E	72	58.2	59.4	1.2	No	58.2	1.2	Yes	No

South side of I-70, north of US 40

CNE E-3			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
97-1-F	E	72	63.8	64.0	0.2	No	64.0	0.0	Yes	No
98-1-F	E	72	60.5	62.1	1.6	No	62.1	0.0	Yes	No
99-1-F	E	72	66.1	66.2	0.1	No	61.1	5.4	Yes	Yes

North side of I-70, east of the Indiana/Ohio State Line

CNE E-4			Predicted Noise Levels (dBA)				Predicted Noise Levels (dBA)			
Receptor	FHWA Activity Category	Noise Abatement Criterion	Existing	Build	Noise Level Increase	Impact	Build w/Barrier	Noise Level Reduction	First Row Receptor	Benefited Receptor
108-1-F	E	72	56.5	55.6	-0.9	No	No impact(s); no barrier analysis required			