3.8 Noise

3.8.1 Affected Environment

Traffic on the proposed alignment would affect noise levels in areas adjacent to the proposed alignment. This section describes existing noise levels in those areas and the likely future increase in noise levels. The noise analysis contrasted existing conditions, predicted design year (2040, Build and No-Build) noise levels, and the FHWA's Noise Abatement Criteria (NAC) to determine whether noise abatement measures should be considered. A noise abatement analysis was conducted at impacted receptors to determine if feasible and reasonable noise abatement measures could be developed.

3.8.1.1 Noise Abatement Criteria

The criteria used to evaluate noise impacts are contained in Title 23 CFR 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, and the IDOT *Bureau of Design and Environment Manual*, Chapter 26, "Noise Analysis" (IDOT, 2011). The Activity Category B and C NAC of 67 A-weighted sound level-decibels (dB[A]) in the *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, apply to residences, churches, schools, recreation areas, and similar activities. Other developed land (e.g., hotels/motels or other business areas) is included in Activity Category E, with a NAC of 72 dB(A). Primary consideration is given to exterior areas where frequent human use occurs. Noise levels are determined under worst case traffic noise conditions.

Table 3-19 shows the FHWA NAC for specific land uses. The FHWA considers a traffic noise impact to occur if predicted traffic noise levels approach or exceed the NAC, or if predicted future traffic noise levels are substantially higher than existing levels. The IDOT defines "approach" as noise levels within 1 dB(A) of NAC. For Activity Categories B and C, this is equal to 66 dB(A). For Activity Category E, this is equal to 71 dB(A).

TABLE 3-19
Noise Abatement Criteria
Hourly A-Weighted Sound Level-decibels (dB[A])

Activity Category	$L_{eq}(h)$ [a] NAC	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, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, daycare centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.

TABLE 3-19
Noise Abatement Criteria
Hourly A-Weighted Sound Level-decibels (dB[A])

Activity Category	$L_{eq}(h)$ [a] NAC	Evaluation Location	Activity Description
E	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	---[b]	---[b]	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	---[c]	---[c]	Undeveloped lands that are not permitted.

Note: The NAC are noise impact thresholds for considering abatement. (Abatement must be considered when predicted traffic noise levels for the design year approach [i.e., within 1 decibel] or exceed the NAC, or when the predicted traffic noise levels are substantially higher [i.e., more than 14 decibels greater] than the existing noise level.) The NAC are not attenuation design criteria or targets. The goal of noise abatement measures is to achieve the feasibility noise reduction criteria and the noise reduction design goal. The reductions may or may not result in design year noise levels at or below the NAC.

[a] L_{eq} = Equivalent sound level
[b] No noise analysis is required for these locations.
[c] There is no NAC for undeveloped lands.

The IDOT defines "substantially higher" as an increase of greater than 14 dB(A) over existing noise level conditions. Consequently, noise abatement must be considered if predicted design year noise levels result in an increase of greater than 14 dB(A) over existing noise levels. The NAC are noise impact thresholds for determining when consideration of noise abatement measures could be warranted. The NAC are not noise abatement design criteria or targets.

3.8.1.2 Field Measurements

Noise level measurements were conducted at 18 representative locations throughout the project corridor. The noise monitoring locations were selected based on their representativeness of Common Noise Environments (CNEs) within the project limits. CNEs are defined as a grouping of receptors of the same type and experience similar exposure to noise levels, topography, and traffic characteristics. The purpose of the noise level measurements was to validate the use of the Traffic Noise Model (TNM) in predicting traffic noise exposure within the study area.

Modeled noise levels for all but three receptors were within 3 dB(A) of those measured. Such agreement between measured and modeled noise levels indicates that the TNM may be used to accurately calculate noise exposure at these locations. Measured and modeled noise levels differ by more than 3-dB(A) at the three locations because of extensive aircraft activity at the O'Hare Airport during the measurement period. In each case, the monitored noise levels were higher than the modeled levels, indicating excessive background noise during the measurement period.

3.8.1.3 Existing Noise Environment

The study area is an urban highway and arterial corridor, surrounded by residential, commercial, and industrial land uses, with O'Hare Airport at the eastern end of the study

area. The principal noise sources are vehicular traffic and frequent overhead commercial aircraft.

Using the year 2010 traffic data, existing condition noise levels were predicted at noise-sensitive locations within the project area. Forty-four CNEs, organized into six sections (A-F), were used to identify worst case noise levels at representative receptors in the project area. Table 3-20 lists the worst case noise level at each CNE.

Under existing traffic noise conditions, 21 of the 44 CNEs approach or exceed the NAC, with existing representative noise levels ranging from 50 to 77 dB(A). Existing traffic noise levels are the loudest along I-90 and near the Elgin-O'Hare Expressway/I-290 interchange. Existing noise barriers in the corridor along the Elgin-O'Hare Expressway suppress traffic noise levels for many residences in CNE Sections B and C. CNE Section D, with a similar noise environment as CNE Sections B and C, experiences notably louder traffic noise levels at residences because there is not an existing noise barrier constructed in this section.

The LOS C traffic volumes, which consist of the highest traffic volumes under free flow conditions and typically represent the worst-case noise hour, were used in the existing condition analysis, resulting in the worst-case noise condition for the existing facility. Peak-hour traffic under the 2040 No-Build Alternative would be severely congested, resulting in reduced speeds and lower noise levels. Therefore, noise levels under the existing condition are considered to represent the worst case noise environment for the No-Build Alternative as well.

Appendix H presents existing and predicted (Build and No-Build) condition noise levels. The CNEs and receptor locations are indicated on Exhibits 3-11A to 3-11O.

3.8.2 Environmental Consequences

Traffic noise impacts were evaluated for sensitive receptors such as residences and public park land as well as wildlife resources. This section focuses on traffic noise impacts to sensitive receptors. The discussion regarding traffic noise impacts to wildlife resources can be found in subsection 3.14.2.3. Peak-hour noise levels under the Build Alternative are predicted to approach or exceed the NAC at 24 CNEs, compared to 21 CNEs under the existing condition. Noise levels range from 50 to 77 dB(A) under the Build Alternative, with increases above existing conditions of up to 14 dB(A), as shown in Table 3-20. Impacted locations consist primarily of residences (single-family residences and multi-family residences), but locations also include public park land. Attenuation, provided by existing noise barriers, was included in the analysis.

CNE Section A remains relatively unchanged between existing and the Build Alternative, and low increases in traffic volumes result in minor increases in noise levels. The largest increase in traffic noise levels occurs in CNE Sections B and C. Predicted noise levels remain the highest along I-90 and at the Elgin-O'Hare Expressway/I-290 interchange in CNE Sections D and E.

The difference in noise levels between existing and the Build Alternative is a result of several factors such as shifts in the alignment from the existing to the proposed facility (i.e., a shift to one side or another of the bypass alignment), additional travel lanes, changes in traffic volumes between the existing and design year, and shifts in the roadway elevation.

TABLE 3-20
Common Noise Environments

CNE	Representative Receptor (Type)	NAC Approach Threshold (dB[A])	Existing (dB[A])	No-Build (db[A])	Build (dB[A])	Increase Above Existing	Impact
A1	ANC-04 (park)	66	61	61	64	+3	No
A2	ANB-07 (residence)	66	70	70	69	-1	Yes
A3	ASC-01 (park)	66	67	67	68	+1	Yes
A4	ASB-13 (residence)	66	63	63	61	-2	No
A5	ASB-01 (residence)	66	58	58	56	-2	No
A6	ANB-48 (residence)	66	69	69	68	-1	Yes
B1	BNB-08 (residence)	66	59	59	70	+11	Yes
B2	BSB-16 (residence)	66	67	67	70	+3	Yes
C1	CNE-01 (restaurant)	71	67[a]	67[a]	68	+1	No
C2	CNB-51 (residence)	66	59[a]	59[a]	73	+14	Yes
C3	CSE-01 (restaurant)	71	64[a]	64[a]	64	0	No
C4	CSB-08 (residence)	66	69[a]	69[a]	75	+6	Yes
C5	CNB-75 (residence)	66	61	61	69	+8	Yes
C6	CNE-02 (office)	71	66	66	69	+3	No
C7	CNB-98 (residence)	66	73	73	73	0	Yes
D1	DNB-07 (residence)	66	71	71	73	+2	Yes
D2	DNE-01 (office)	71	75	75	77	+2	Yes
D3	DSB-03 (residence)	66	75	75	75	+0	Yes
D4	DSE-01 (office)	71	68	68	66	-2	No
D5	DSB-56 (residence)	66	65	65	65	0	No
D6	DNE-10 (office)	71	68	68	68	0	No
D7	DSE-02 (office)	71	60	60	69	+9	No
D8	DNC-07 (recreation)	66	67	67	69	+2	Yes
E1	EE-04 (office)	71	65	65	67	+2	No
E2	EB-26 (residence)	66	77	77	77	+0	Yes
E3	EE-05 (office)	71	68	68	72	+4	Yes
E4	EE-10 (hotel)	71	66	66	67	+1	No
E5	EB-31 (residence)	66	69	69	69	0	Yes

TABLE 3-20
Common Noise Environments

CNE	Representative Receptor (Type)	NAC Approach Threshold (dB[A])	Existing (dB[A])	No-Build (db[A])	Build (dB[A])	Increase Above Existing	Impact
E6	EC-04 (recording studio)	66	67	67	67	0	Yes
E7	EE-13 (hotel)	71	73	73	74	+1	Yes
E8	EC-03 (park)	66	73	73	75	+2	Yes
E9	EB-46 (residence)	66	70	70	71	+1	Yes
E10	EB-59 (residence)	66	67	67	69	+2	Yes
E11	EB-67 (residence)	66	67	67	67	0	Yes
E12	EE-35 (restaurant)	71	68	68	68	0	No
E13	EE-32 (office)	71	67	67	66	-1	No
E14	EB-82 (residence)	66	69	69	68	-1	Yes
E15	EE-34 (restaurant)	71	67	67	65	-2	No
F1	FE-01 (office)	71	52	52	62	+10	No
F2	FB-06 (residence)	66	60	60	61	+1	No
F3	FB-14 (residence)	66	69	69	70	+1	Yes
F4	FC-01 (cemetery)	66	69	69	65	-4	No
F5	FB-27 (residence)	66	66	66	65	-1	No
F6	FC-04 (cemetery)	66	64	64	64	0	No

[a] Attenuation, provided by existing noise barriers, was included in the analysis.

3.8.3 Measures to Minimize Harm and Mitigation

3.8.3.1 Evaluation of Abatement Measures

The FHWA regulations indicate that noise abatement should be considered when design year future predicted traffic noise levels approach or exceed the NAC, or when design year predicted traffic noise levels substantially exceed the existing condition noise levels. None of the sites evaluated is expected to experience substantial increases in noise levels. However, 24 CNEs are expected to experience noise levels that approach or exceed the NAC. As a result, noise abatement measures were evaluated for those locations. As outlined in FHWA's guidelines, such measures may include noise barriers, TSM measures, alignment modifications, property acquisitions, and land use controls.

Of the noise abatement measures mentioned, the noise barrier is the most practical, reasonable, and effective abatement measure. As such, the noise barrier is the measure evaluated for this project.

3.8.3.2 Noise Barrier Analysis

Noise barriers reduce noise levels by blocking the sound path between a roadway and noise-sensitive site. To be effective in reducing traffic noise, a noise barrier must have certain characteristics. The barrier must be long (theoretically about four times the distance from the receptor to the noise wall), continuous (with no intermittent openings), and high enough to provide the necessary reduction in noise levels. According to IDOT's noise policy, for a barrier to be implemented, it must be considered feasible and reasonable and meet the following minimum criteria described below.

Feasibility

Feasibility is based on the minimum required noise reduction and constructability.

- It must provide a minimum insertion loss (noise reduction) of 5 dB(A) for at least one *impacted* receptor.
- The barrier must be compatible with safety, drainage, and utility considerations.

Reasonableness

The reasonableness evaluation is based on the noise reduction design goal, cost-effectiveness, and the viewpoints of the benefited receptors.

- The noise barrier must provide a minimum insertion loss of 8 dB(A) for at least one *benefited* receptor.
- The cost to construct the barrier should not exceed $37,000 per benefited receptor based on adjustment factors per IDOT policy. The IDOT noise policy unit cost of $25 per square feet was used to calculate barrier cost. For the purposes of this determination, benefited receptors are those that would experience a reduction of 5 dB(A) or more as a result of the noise barrier. The base cost for allowable noise abatement is $24,000 per benefited receptor, but may be adjusted based on three factors: the absolute noise level, the incremental increase between existing and build levels, and the date of development compared to when the highway was built (see Table 3-21). The base cost may be adjusted to a maximum allowable limit of $37,000 per benefited receptor.
- If the barrier is determined to meet the design goal and be cost-effective, the viewpoints of benefited receptors must be solicited to determine the desire for building the noise barrier.

TABLE 3-21
Cost per Benefited Receptor Adjustment Factors

Absolute Noise Level Consideration	
Predicted Build Noise Level Before Noise Abatement	**Dollars Added to Base Value Cost per Benefited Receptor**
Less than 70 dB(A)	$0
70 to 74 dB(A)	$1,000
75 to 79 dB(A)	$2,000
80 dB(A) or greater	$4,000

TABLE 3-21
Cost per Benefited Receptor Adjustment Factors

Increase in Noise Level Consideration	
Incremental Increase in Noise Level Between the Existing Noise Level and the Predicted Build Noise Level Before Noise Abatement	**Dollars Added to Base Value Cost per Benefited Receptor**
Less than 5 dB(A)	$0
5 to 9 dB(A)	$1,000
10 to 14 dB(A)	$2,000
15 dB(A) or greater	$4,000
New Alignment/Construction Date Consideration	
Project is on new alignment or the receptor existed prior to the original construction of the highway	**Dollars Added to Base Value Cost per Benefited Receptor**
No for both	$0
Yes for either	$5,000

Source: IDOT, 2011.

The TNM was used to determine the noise level reduction provided by various barrier heights along the proposed project. The program calculates barrier insertion loss by accounting for such variables as distance from source to barrier, distance from barrier to receptor, source and receptor elevations, and barrier height. Per standard assumptions, effective acoustical heights of automobiles, medium trucks and heavy trucks are at roadway surface, two and eight feet above the road, respectively. Receptor height is assumed to be about five feet above the ground.

Barriers were not evaluated at the following representative receptors: ANB-02 (CNE A2), EE-14 to 31 (CNE E7), and FB-11 to 18 (CNE F3). Noise barriers at these locations were determined to not be feasible due to design constraints (i.e., number of driveways that would require a break in the barrier for access and sight distance limitations).

Preliminary noise barrier locations were presented in the Tier Two Draft EIS for public review and input (see subsection 3.8.3.2 of the Tier Two Draft EIS). Some residents affected by noise barriers requested shifts in the location of proposed noise barriers for various aesthetic and personal reasons. Barrier shifts were also warranted with refinements in the roadway design and accommodation of drainage features. The noise barriers analysis below reflects the modifications to the locations based on public input and design advancements since the Tier Two Draft EIS.

The analysis found that barriers would be feasible and meet the reasonableness noise reduction design goal at all locations, with the exception of Barrier E5. Barrier E5 would not meet the reasonableness design goal, as an 8-dB(A) reduction could not be achieved by this barrier. The barrier would be located on the right-of-way line at this location. The residences in this area are located back from the roadway a substantial distance, limiting the ability of the barrier to effectively attenuate noise levels. The remaining 20 barriers were further

evaluated for cost-effectiveness. Nine of the remaining 20 barriers were determined to also meet the reasonableness criteria on an individual cost-effectiveness basis.

Each barrier is summarized in Table 3-22 and shown on Exhibits 3-11A to 3-11O.

TABLE 3-22
Summary of Noise Mitigation: Barrier Descriptions

Barrier	Benefited Receptors	Height (feet)	Length (feet)	Construction Cost	Noise Reduction Potential (dB[A])	Estimated Build Cost Per Benefited Receptor	Allowable Cost Per Benefited Receptor	Likely to be Implemented if Desired by Benefited Receptor	If no, reason why?
A1 (residences, church)	2	19-25	1,824	$1,115,350	5-8	$557,675	$24,000	No	Exceeds allowable cost
A2 (ball field)	1	9	500	$242,300	8	$242,300	$24,000	No	Exceeds allowable cost
A3 (residence)	0	25	333	$8,325	< 5	---[b]	---[b]	No	Not Feasible
B1 (residence, church)	7	9-17	2,510	$904,725	5-8	$129,246	$27,000	No	Exceeds allowable cost
B2 (residences)	18	11-15	2,102	$623,175	5-8	$34,620	$25,000	No	Exceeds allowable cost
C1 (residences, park)	322	17-23	9,312	$4,540,700	5-15	$14,101	$27,000	Yes	NA
C2 (residences)	40	11-19	2,174	$906,440	5-10	$22,661	$24,000	Yes	NA
C3 (residences)	209	13-17	6,602	$2,641,750	5-13	$12,640	$27,000	Yes	NA
C4 (residences)	171	11-21	3,521	$1,309,075	5-12	$7,655	$25,000	Yes	NA
D1 (residences)	113	9-25	3491	$1,859,650	5-13	$16,457	$25,000	Yes	NA
D2 (offices)	1	13-15	298	$109,800	8	$109,800	$26,000	No	Exceeds allowable cost
D3 (residences, park)	184	15-25	8,096	$4,040,325	5-17	$21,958	$27,000	Yes	NA
D4 (recreation)	2	23	1,402	$806,400	5-8	$403,200	$24,000	No	Exceeds allowable cost
E1 (residences)	48	15	3,185	$1,194,450	6-13	$24,884	$26,000	Yes	NA
E2 (residences)	57	15-21	1,900	$982,375	6-9	$17,234	$24,000	Yes	NA

TABLE 3-22
Summary of Noise Mitigation: Barrier Descriptions

Barrier	Benefited Receptors	Height (feet)	Length (feet)	Construction Cost	Noise Reduction Potential (dB[A])	Estimated Build Cost Per Benefited Receptor	Allowable Cost Per Benefited Receptor	Likely to be Implemented if Desired by Benefited Receptor	If no, reason why?
E3 (residences)	27	9-13	2,400	$679,975	5-8	$25,184	$24,000	No	Exceeds allowable cost
E4 (residences)	15	9-17	1,083	$340,725	5-10	$22,715	$25,000	Yes	NA
E5 (residences)	NA	25	928	$580,000	7	---[a]	---[a]	No	Cannot meet design goal
E6 (residences)	4	13-15	448	$151,325	5-8	$37,831	$24,000	No	Exceeds allowable limit
E7 (recording studio)	1	25	2,000	$1,249,975	8	$1,249,975	$24,000	No	Exceeds allowable limit
E8 (park)	3	9-25	2096	$993,975	5-8	$331,325	$26,000	No	Exceeds allowable limit

Note: NA = Not Applicable

[a] Cost estimates were not conducted because the noise barrier analysis could not achieve an 8-dB(A) traffic noise level reduction to meet the design goal criteria.

[b] Noise barrier analysis could not achieve the 5 dB(A) noise level reduction to meet feasibility criteria.

Noise barriers were also evaluated for cost-effectiveness on a cumulative basis. For a barrier to be considered for cost averaging, the cost per benefited receptor cannot exceed twice the adjusted allowable limit. As shown in Table 3-23, the noise barriers were ranked in decreasing order of cost-effectiveness based on the ratio of build cost per benefited receptor to the adjusted allowable limit. Ratios less than 1.0 would be cost-effective on an individual basis. Barriers with a ratio greater than 2.0 were removed from the evaluation in accordance with FHWA regulations and IDOT policy, as the estimated build cost is more than double the adjusted allowable limit.

TABLE 3-23
Summary of Barrier Cost Reasonableness Analysis

Barrier	Benefited Receptors	Noise Wall Cost[a]	Cost per Benefited Receptor	Adjusted Allowable Cost per Benefited Receptor	Ratio of Est. Build/ Adjust. Allowable	Cumulative Estimated Build Cost/ Benefited	Cumulative Adjusted Allowable Cost/ Benefited	Determination
C4 (residences)	171	$1,309,075	$7,655	$25,000	0.31	$7,655	$25,000	Cost-Effective Stand-Alone
C3 (residences)	209	$2,641,750	$12,640	$27,000	0.47	$10,397	$26,100	Cost-Effective Stand-Alone
C1 (residences, park)	322	$4,540,700	$14,101	$27,000	0.52	$12,096	$26,513	Cost-Effective Stand-Alone

TABLE 3-23
Summary of Barrier Cost Reasonableness Analysis

Barrier	Benefited Receptors	Noise Wall Cost[a]	Cost per Benefited Receptor	Adjusted Allowable Cost per Benefited Receptor	Ratio of Est. Build/ Adjust. Allowable	Cumulative Estimated Build Cost/ Benefited	Cumulative Adjusted Allowable Cost/ Benefited	Determination
D1 (residences)	113	$1,859,650	$16,457	$25,000	0.66	$12,701	$26,303	Cost-Effective Stand-Alone
E2 (residences)	57	$982,375	$17,234	$24,000	0.72	$12,997	$26,153	Cost-Effective Stand-Alone
D3 (residences, park)	184	$4,040,325	$21,958	$27,000	0.81	$14,559	$26,300	Cost-Effective Stand-Alone
E4 (residences)	15	$340,725	$22,715	$25,000	0.91	$14,673	$26,282	Cost-Effective Stand-Alone
C2 (residences)	40	$906,440	$22,661	$24,000	0.94	$14,960	$26,200	Cost-Effective Stand-Alone
E1 (residences)	48	$1,194,450	$24,884	$26,000	0.96	$15,371	$26,192	Cost-Effective Stand-Alone
E3 (residences)	27	$679,975	$25,184	$24,000	1.05	$15,595	$26,142	Cost-Effective Cumulative
B2 (residences)	18	$623,175	$34,620	$25,000	1.38	$15,879	$26,125	Cost-Effective Cumulative
E6 (residences)	4	$151,325	$37,831	$24,000	1.58	$15,926	$26,114	Cost-Effective Cumulative
D2 (offices)	1	$109,800	$109,800	$26,000	4.22	Not part of evaluation as estimated cost is more than two times the adjusted allowable cost.		Not Cost-Effective
B1 (residence, church)	7	$904,725	$129,246	$27,000	4.79	Not part of evaluation as estimated cost is more than two times the adjusted allowable cost.		Not Cost-Effective
A2 (ball field)	1	$242,300	$242,300	$24,000	10.10	Not part of evaluation as estimated cost is more than two times the adjusted allowable cost.		Not Cost-Effective
E8 (park)	3	$993,975	$331,325	$26,000	12.74	Not part of evaluation as estimated cost is more than two times the adjusted allowable cost.		Not Cost-Effective
D4 (recreation)	2	$806,400	$403,200	$24,000	16.80	Not part of evaluation as estimated cost is more than two times the adjusted allowable cost.		Not Cost-Effective
A1 (residences, church)	2	$1,115,350	$557,675	$24,000	23.24	Not part of evaluation as estimated cost is more than two times the adjusted allowable cost.		Not Cost-Effective
E7 (recording studio)	1	$1,249,975	$1,249,975	$24,000	52.08	Not part of evaluation as estimated cost is more than two times the adjusted allowable cost.		Not Cost-Effective

[a] The current unit cost used by IDOT to determine the estimated build cost for noise barriers is $25 per square feet.

Nine barriers would be considered cost-effective when considered individually, as the adjusted allowable cost per benefited receptor is less than the estimated build cost per benefited receptor. Under the cost averaging approach, an additional three barriers would

also be considered cost-effective. The remaining seven barriers would not be cost-effective when considered individually or under the cost averaging approach. As a result, the technical analysis supports a total of 12 barriers for inclusion in the project; however, the public viewpoint provided during the Tier Two Draft EIS public comment period also affects the outcome of the recommended noise barriers.

To assess reasonableness from a public viewpoint perspective, benefited receptors of the 12 noise barriers that were found to be feasible and reasonable from a noise reduction and cost standpoint were sent postcards requesting them to vote on their preference for implementation of the barrier. The goal was to receive responses from at least one third of the benefited receptors, of which a majority must be in favor of the barrier for it to be implemented. As shown in Table 3-24 below, at least one third of the benefited receptors responded in all cases except Barrier E2, where no responses were received during the first or second mailing. A third mailing was distributed on October 12, 2012 for Barrier E2, and a subsequent final determination of likelihood will be made following the results of that mailing. The remainder of the barriers received responses from at least one-third of the benefited receptors, and in only one case was a noise barrier rejected by the majority of those who responded; therefore, Barrier E4 along Elmhurst Road will not be built. All other noise barriers were supported by the majority of benefited receptors, as such, continue to be recommended for inclusion in the project. Table 3-24 describes the results of the viewpoint solicitation activity.

TABLE 3-24
Results of the Viewpoint Solicitation Activity

Barrier	Percent Responses Received	Percent Responses Favoring Barrier Implementation	Recommended for Inclusion in the Project
B2 (residences)	53	100	Yes
C1 (residences, park)	39	92	Yes
C2 (residences)	40	94	Yes
C3 (residences)	36	97	Yes
C4 (residences)	42	99	Yes
D1 (residences)	38	98	Yes
D3 (residences, park)	50	94	Yes
E1 (residences)	36	97	Yes
E2 (residences)	0	0	TBD
E3 (residences)	41	100	Yes
E4 (residences)	100	27	No
E6 (residences)	100	83	Yes

Note: TBD = To Be Determined

The following includes descriptions of each barrier.

Barrier A1: Irving Park Road (north side) from Springinsguth Road to the eastern end of Meadow Drive (Receptors ANB-05 to ANB-11, ANC-01, Barrier Exhibit 3-11A)

The placement of a 1,824-linear-foot barrier was evaluated along the northeast corner of Springinsguth Road, Irving Park Road, and Elgin-O'Hare Expressway Frontage Road along the right-of-way. This barrier would be located along the Elgin O'Hare corridor and included several breaks to allow for access to residences. Barrier heights between 19 to 25 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. The total cost to construct the barrier would be nearly $1,115,350, or $557,675 per benefited receptor, which would exceed the allowable cost criterion for reasonableness of $24,000 per benefited receptor. In addition, this barrier was not included in the cost averaging analysis since the estimated build cost is more than double the adjusted allowable limit. Therefore, a barrier is not likely at this location.

Barrier A2: Elgin-O'Hare Expressway Frontage Road (south side) from Springinsguth Road to the Alexian Field driveway (Receptor ASC-01, Barrier Exhibit 3-11A)

The placement of a 500-linear-foot barrier was evaluated for the picnic area at the north end of the Alexian Baseball Field along the south side of the Elgin-O'Hare Expressway Frontage Road between Springinsguth Road and the Alexian Field driveway along the right-of-way. This barrier would be located along the Elgin O'Hare corridor. A barrier height of 9 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. The total cost of the barrier would be nearly $242,300, or $242,300 per benefited receptor, and would exceed the allowable cost criterion for reasonableness of $24,000 per benefited receptor. In addition, this barrier was not included in the cost averaging analysis since the estimated build cost is more than double the adjusted allowable limit. Therefore, a barrier is not likely at this location.

Barrier A3: Irving Park Road (south side) from Keystone Place to Georgetown Drive (Receptors ANB-43 to ANB-53, Barrier Exhibit 3-11B)

The placement of a 333-linear-foot barrier was evaluated along the south side of Irving Park Road from Keystone Place to Georgetown Drive. This barrier would be located along the Elgin O'Hare corridor. Barrier heights of up to 25 feet were analyzed. No impacted receptors would experience a 5-dB(A) reduction with Barrier A4; thus, this barrier would not satisfy the 5 dB(A) feasibility criteria and was not analyzed further. Therefore, a barrier is not likely at this location.

Barrier B1: Elgin-O'Hare Expressway (north side) from approximately the railroad tracks to west of Roselle Road (Receptors BNB-02 to BNB-09, Barrier Exhibit 3-11C)

The placement of a 2,510-linear-foot barrier was evaluated for the residences on the north side of the Elgin-O'Hare Expressway between the railroad tracks and west of Roselle Road along the right-of-way. This barrier would be located along the Elgin O'Hare corridor. Barrier heights between 9 to 17 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. Barrier B1 is represented by BNB-08, with a build noise level of 70 dB(A) (+ $1,000) and increase above existing levels of 11 dB(A) (+ $2,000), resulting in an adjusted allowable cost of $27,000. The total cost to construct the barrier would be nearly $904,725, or $129,246 per benefited receptor, which would exceed the adjusted allowable cost criterion for reasonableness of $27,000 per benefited receptor. In addition, this barrier was not included in the cost

averaging analysis since the estimated build cost is more than double the adjusted allowable limit. Therefore, a barrier is not likely at this location.

Barrier B2: Elgin-O'Hare Expressway (south side) from approximately east of Mitchell Boulevard to Roselle Road off-ramp (Receptors BSB-01 to BSB-16, Barrier Exhibit 3-11C)

The placement of a 2,393-linear-foot barrier was evaluated for the residences on the south side of the Elgin-O'Hare Expressway from east of Mitchell Boulevard to the Roselle Road off-ramp along the right-of-way. This barrier would be located along the Elgin O'Hare corridor. Barrier heights between 11 to 15 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. Barrier B2 is represented by BSB-16, with a build noise level of 70 dB(A) (+ $1,000) and increase above existing levels of 3 dB(A), resulting in an adjusted allowable cost of $25,000. The total cost to construct the barrier would be nearly $623,175, or $34,620 per benefited receptor, which would exceed the adjusted allowable cost criterion for reasonableness of $25,000 per benefited receptor. Extending the barrier east to BSB-22 was also evaluated, but the additional length was determined to not be cost effective. This barrier was included in the cost averaging analysis, and was determined to be cost-effective from a cumulative approach. Further, it received the requisite support from benefited receptors. Therefore, a barrier is likely at this location.

Barrier C1: Elgin-O'Hare Expressway (north side) from Roselle Road to west of Meacham Road (Receptors CNB-10 to CNB-63, Barrier Exhibits 3-11D and 3-11E)

The placement of an 8,765-linear-foot barrier was evaluated for the residences on the north side of the Elgin-O'Hare Expressway between Roselle Road and west of Meacham Road along the right-of-way. A short segment of the barrier immediately west of Meacham Road would be located along the mainline edge of shoulder. This barrier would be located along the Elgin O'Hare corridor. Barrier heights between 17 to 23 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. Barrier C1 is represented by CNB-51, with a build noise level of 73 dB(A) (+ $1,000) and increase above existing levels of 14 dB(A) (+ $2,000), resulting in an adjusted allowable cost of $27,000. The total cost to construct the barrier would be nearly $4,540,700, or $14,101 per benefited receptor, below the adjusted allowable cost criterion for reasonableness of $27,000 per benefited receptor. As a result, this barrier would be cost-effective as a stand-alone barrier. Further, it received the requisite support from benefited receptors. Therefore, a barrier is likely at this location.

Barrier C2: Elgin-O'Hare Expressway (north side) from Meacham Road to east of Volkamer Trail (Receptors CNB-66 to CNB-81, Barrier Exhibit 3-11E)

The placement of a 2,174-linear-foot barrier was evaluated for the residences on the north side of the Elgin-O'Hare Expressway between Meacham Road and east of Volkamer Trail along the right-of-way. This barrier would be located along the Elgin O'Hare corridor. Barrier heights between 11 to 19 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. The total cost to construct the barrier would be nearly $906,440, or $22,661 per benefited receptor, below the allowable $24,000 reasonableness cost criterion per benefited receptor. As a result, this barrier would be cost-effective as a stand-alone barrier. Further, it received the requisite support from benefited receptors. Therefore, a barrier is likely at this location.

Barrier C3: Elgin-O'Hare Expressway (south side) from Roselle Road to the eastern end of Poplar Avenue (Receptors CSB-01 to CSB-47, Barrier Exhibits 3-11D and 3-11E)

The placement of a 6,602-linear-foot barrier was evaluated for the residences along the south side of the Elgin-O'Hare Expressway from Roselle Road to the eastern end of Poplar Avenue along the right-of-way. This barrier would be located along the Elgin O'Hare corridor. A barrier height of 13 to 17 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. Barrier C3 is represented by CSB-08, with a build noise level of 75 dB(A) (+ $2,000) and increase above existing levels of 6 dB(A) (+ $1,000), resulting in an adjusted allowable cost of $27,000. The total cost to construct the barrier would be nearly $2,641,750, or $12,640 per benefited receptor, below the adjusted allowable $27,000 reasonableness cost criterion per benefited receptor. As a result, this barrier would be cost-effective as a stand-alone barrier. Further, it received the requisite support from benefited receptors. Therefore, a barrier is likely at this location.

Barrier C4: I-290 (west side) south of Biesterfield Road to north of Devon Avenue (Receptors CNB-84 to CNB-118, Barrier Exhibit 3-11F)

The placement of a 3,521-linear-foot barrier was evaluated for the apartments on the west side of I-290, north of Devon Avenue and south of Biesterfield Road along the right-of-way. This barrier would be located along I-290. Barrier heights between 11 to 21 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. Barrier C4 is represented by CNB-98, with a build noise level of 73 dB(A) (+ $1,000) with no increase above existing levels, resulting in an adjusted allowable cost of $25,000. The total cost to construct the barrier would be nearly $1,309,075, or $7,655 per benefited receptor, below the adjusted allowable $25,000 reasonableness cost criterion per benefited receptor. As a result, this barrier would be cost-effective as a stand-alone barrier. Further, it received the requisite support from benefited receptors. Therefore, a barrier is likely at this location.

Barrier D1: I-290 (east side) north of Devon Avenue and south of Biesterfield Road (Receptors DNB-07 to DNB-20, Barrier Exhibit 3-11F)

The placement of a 3,491-linear-foot barrier was evaluated for the residences on the east side of I-290 north of Devon Avenue and south of Biesterfield Road along the right-of-way. This barrier would be located along I-290. Barrier heights between 9 to 25 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. Barrier D1 is represented by DNB-07, with a build noise level of 73 dB(A) (+ $1,000) and increase above existing levels of 2 dB(A), resulting in an adjusted allowable cost of $25,000. The total cost to construct the barrier would be nearly $1,859,650, or $16,457 per benefited receptor, below the adjusted allowable $25,000 reasonableness cost criterion per benefited receptor. As a result, this barrier would be cost-effective as a stand-alone barrier. Further, it received the requisite support from benefited receptors. Therefore, a barrier is likely at this location.

Barrier D2: I-290 (east side) south of Devon Avenue (Receptors DNE-01 to DNE-02, Barrier Exhibit 3-11F)

The placement of a 298-linear-foot barrier was evaluated for the office building on the east side of I-290 south of Devon Avenue along the right-of-way. This barrier would be located along I-290. The owner of the building was contacted to determine the number of

businesses. Barrier heights between 13 to 15 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. Barrier D2 is represented by DNE-01, with a build noise level of 77 dB(A) (+ $2,000) and no increase above existing levels, resulting in an adjusted allowable cost of $26,000. The cost to construct the barrier would be nearly $109,800, or $109,800 per benefited receptor, which would exceed the adjusted allowable cost criterion for reasonableness of $26,000 per benefited receptor. In addition, this barrier was not included in the cost averaging analysis since the estimated build cost is more than double the adjusted allowable limit. Therefore, a barrier is not likely at this location.

Barrier D3: I-290 (east side) from Milwaukee District West Railroad to Thorndale Avenue and Thorndale Avenue (south side) from I-290 to Nicol Way (Receptors DSB-01 to DSB-52, Barrier Exhibit 3-11G)

The placement of an 8,096-linear-foot barrier was evaluated for the residences on the east side of I-290 from the Milwaukee District West Railroad, north to Thorndale Avenue, and along Thorndale Avenue on the south side from I-290 to Nicol Way along the right-of-way. This barrier would be located along the Elgin O'Hare corridor and I-290. Barrier heights between 15 to 25 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. Barrier D3 is represented by DSB-03, with a build noise level of 75 dB(A) (+ $2,000) and no increase above existing levels, resulting in an adjusted allowable cost of $27,000. The cost to construct the barrier would be nearly $4,040,325, or $21,958 per benefited receptor, below the adjusted allowable $27,000 reasonableness cost criterion per benefited receptor. As a result, this barrier would be cost-effective as a stand-alone barrier. Further, it received the requisite support from benefited receptors. Therefore, a barrier is likely at this location.

Barrier D4: Thorndale Avenue (north side) east of North Prospect Avenue (Receptor DNC-01-DNC-02, Barrier Exhibit 3-11H)

The placement of a 1,402-linear-foot barrier was evaluated for a Section 4(f) property on the north side of Thorndale Avenue just east of North Prospect Avenue along the proposed right-of-way. This barrier would be located along the Elgin O'Hare corridor. Barrier heights of 23 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. The cost to construct the barrier would be nearly $806,400, or $403,200 per benefited receptor, which would exceed the allowable cost criterion for reasonableness of $24,000 per benefited receptor. In addition, this barrier was not included in the cost averaging analysis since the estimated build cost is more than double the adjusted allowable limit. Therefore, a barrier is not likely at this location.

Barrier E1: I-90 (north side) from South Cedar Glen Drive to Briarwood Drive East (Receptors EB-01 to EB-29, Barrier Exhibit 3-11I)

The placement of a 3,185-linear-foot barrier was evaluated for the residences on the north side of I-90 between South Cedar Glen Drive and Briarwood Drive East along the edge of pavement. This barrier would be located along I-90. A barrier height of 15 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. Barrier E1 is represented by EB-26, with a build noise level of 77 dB(A) (+ $2,000) and no increase above existing levels, resulting in an adjusted allowable cost of $26,000. The cost to construct the barrier would be nearly $1,194,450, or $24,884 per benefited receptor, below the adjusted allowable $26,000 reasonableness cost criterion per

benefited receptor. As a result, this barrier would be cost-effective as a stand-alone barrier. Further, it received the requisite support from benefited receptors. Therefore, a barrier is likely at this location.

Barrier E2: I-90 (north side) from Terminal Drive to southeast of Oakton Street (Receptors EB-30 to EB-35, Barrier Exhibit 3-11J)

The placement of a 1,900-linear-foot barrier was evaluated for the residences on the north side of I-90 between Terminal Drive and southeast of Oakton Street along the edge of pavement. This barrier would be located along I-90. Barrier heights between 15 to 21 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. The total cost to construct the barrier would be nearly $982,375, or $17,234 per benefited receptor, below the allowable $24,000 reasonableness cost criterion per benefited receptor. As a result, this barrier would be cost-effective as a stand-alone barrier. While viewpoints were not received by at least one-third of the benefited receptors during the first or second mailing, the barrier does meet the feasibility and reasonableness criteria from a noise reduction and cost standpoint. A third mailing was distributed on October 12, 2012 for Barrier E2, and a subsequent final determination of likelihood will be made following the results of that mailing.

Barrier E3: I-90 (north side) from west of Wolf Road to east Webster Lane (Receptors EB-71 to EB-84, Barrier Exhibit 3-11L)

The placement of a 2,400-linear-foot barrier was evaluated for the residences on the north side of I-90 from west of Wolf Road to east of Webster Lane along the edge-of-shoulder. This barrier would be located along I-90. Barrier heights between 9 to 13 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. The cost to construct the barrier would be nearly $679,975, or $25,184 per benefited receptor, which would exceed the allowable cost criterion for reasonableness of $24,000 per benefited receptor. This barrier was included in the cost averaging analysis, and was determined to be cost-effective from a cumulative approach. Further, it received the requisite support from benefited receptors. Therefore, a barrier is likely at this location.

Barrier E4: Elmhurst Road (east side) from Tyler Road to south of Taft Road (Receptors EB-44 to EB-53, Barrier Exhibit 3-11K)

The placement of a 1,083-linear-foot barrier was evaluated for the residences on the east side of Elmhurst Road from approximately Tyler Road to south of Taft Road along the right-of-way. This barrier would be located along Elmhurst Road, and consists of two barriers with a break in between to provide access to the mobile home park. Barrier heights between 9 to 17 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. Barrier E4 is represented by EB-46, with a build noise level of 71 dB(A) (+ $1,000) and increase above existing levels of 1 dB(A), resulting in an adjusted allowable cost of $25,000. The cost to construct the barrier would be nearly $340,725, or $22,715 per benefited receptor, below the adjusted allowable $25,000 reasonableness cost criterion per benefited receptor. As a result, this barrier would be cost-effective as a stand-alone barrier. However, a majority of benefited receptors that responded to the voting solicitation opposed the implementation of this barrier. Therefore, a barrier is not likely at this location.

Barrier E5: Touhy Avenue (north side) east of Elmhurst Road (Receptors EB-61 to EB-67, Barrier Exhibit 3-11K)

The placement of a 928-linear-foot barrier was evaluated for the residences on the north side of Touhy Avenue and east of Elmhurst Road along the right-of-way. This barrier would be located along Touhy Avenue, and consists of two barriers with a break in between to provide access to the mobile home park. Barrier heights of up to 25 feet were analyzed. A 5-dB(A) reduction would be achieved to satisfy the 5-dB(A) feasibility criteria; however, the barrier would not satisfy the 8-dB(A) reasonableness noise reduction design goal and was not analyzed further. Therefore, a barrier is not likely at this location.

Barrier E6: I-90 (south side) (Receptors EB-58 to EB-60, Barrier Exhibit 3-11K)

The placement of a 448-linear-foot barrier was evaluated for the residences on the south of I-90 along the right-of-way. This barrier would be located along I-90. Barrier heights between 13 to 15 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. The cost to construct the barrier would be nearly $151,325, or $37,831 per benefited receptor, which would exceed the allowable cost criterion for reasonableness of $24,000 per benefited receptor. This barrier was included in the cost averaging analysis, and was determined to be cost-effective from a cumulative approach. Further, it received the requisite support from benefited receptors. Therefore, a barrier is likely at this location.

Barrier E7: I-90 (south side) at Higgins Road and Commerce Drive (Receptor EC-04, Barrier Exhibit 3-11J)

The placement of a 2,000-linear-foot barrier was evaluated for a recording studio on the south side of I-90 at approximately Higgins Road and Commerce Drive along the edge of pavement. This barrier would be located along the toll road right-of-way. A barrier height of 25 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. The total cost to construct the barrier would be nearly $1,249,975 or $1,249,975 per benefited receptor, which would exceed the allowable cost criterion for reasonableness of $24,000 per benefited receptor. In addition, this barrier was not included in the cost averaging analysis since the estimated build cost is more than double the adjusted allowable limit. Therefore, a barrier is not likely at this location.

Barrier E8: I-90 (north side) east of Elmhurst Road (Receptors EC-01 to EC-03, Barrier Exhibit 3-11K)

The placement of a 2,096-linear-foot barrier was evaluated for the park and baseball fields north of I-90 and east of Elmhurst Road along the right-of-way. This barrier would be located along the toll road right-of-way. Barrier heights of 9 to 25 feet would be required to achieve an 8-dB(A) reduction, satisfying the 5-dB(A) feasibility and 8-dB(A) reasonableness design goals. Barrier E8 is represented by EC-03, with a build noise level of 75 dB(A) (+ $2,000) and increase above existing levels of 2 dB(A), resulting in an adjusted allowable cost of $26,000. The total cost to construct the barrier would be nearly $993,975, or $331,325 per benefited receptor, which would exceed the adjusted allowable cost criterion for reasonableness of $26,000 per benefited receptor. In addition, this barrier was not included in the cost averaging analysis since the estimated build cost is more than double the adjusted allowable limit. Therefore, a barrier is not likely at this location.

Coordination with Local Officials for Undeveloped Lands

For the undeveloped lands along the project, the existing zoning and comprehensive plans of these lands were reviewed to determine the future goals of the lands.

For any undeveloped lands (lands that are not permitted), or agriculture land zoned for development, coordination occurred with local officials, informing them of the predicted noise levels as a result of the proposed project. Appendix B includes letters that were sent to the local officials having jurisdiction over the undeveloped lands, and an exhibit (as an attachment to the letter), depicting where the NAC is approached.

Statement of Likelihood

Based on the traffic noise analysis and noise abatement evaluation conducted, highway traffic noise abatement measures are likely to be implemented based on preliminary design. The noise barriers determined to meet the feasible and reasonable criteria are identified in Table 3-24. If constraints not foreseen in the preliminary design subsequently develop during final design or public input substantially changes reasonableness, the abatement measures may need to be modified or removed from the project plans. A final decision on the installation of abatement measure(s) would be made upon completion of project's final design and the public involvement process.

3.8.3.3 Construction Noise

Trucks and machinery used for construction produce noise that may affect some land uses and activities during the construction period. Residents along the alignment would at some time experience perceptible construction noise from implementation of the project. To minimize or eliminate the effect of construction noise on these receptors, mitigation measures have been incorporated into the IDOT's *Standard Specifications for Road and Bridge Construction* as Article 107.35 (IDOT, 2012).

3.9 Air Quality

3.9.1 Affected Environment

The National Ambient Air Quality Standards (NAAQS), established by USEPA, set maximum allowable concentration limits for six criteria air pollutants. Areas in which air pollution levels persistently exceed the NAAQS may be designated as "nonattainment." States where a nonattainment area is located must develop and implement a state implementation plan (SIP) containing policies and regulations that would bring about attainment of the NAAQS. Areas that had been designated as nonattainment, but have attained the NAAQS for the criteria pollutant(s) associated with the nonattainment designation, would be designated as maintenance areas.

In the greater Chicago area, Cook, DuPage, Kane, Lake, McHenry, and Will Counties, as well as Aux Sable and Goose Lake Townships in Grundy County and Oswego Township in Kendall County, have been designated as nonattainment areas for the 1997 8-hour ozone standard and the 1997 annual $PM_{2.5}$ standard. The Lake Calumet area and Lyons Township in Cook County have been designated as a maintenance area for the PM_{10} standard. The EO-WB project is located within DuPage County and Cook County. The project is not located in the areas of Cook County that are designated maintenance for PM_{10}.