US 6/Wadsworth

Environmental Assessment

Noise Technical Memorandum

CDOT Project STU #0062-019 (15215)
CH2M HILL Project No. 358660

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for

CH2MHILL

Contents

EXECUTIVE SUMMARY

Measured noise levels in 2007 at the residences adjacent to the US 6 and Wadsworth interchange exceed 70 dBA during the loudest hour of the day. Measured levels at residences that are located two or more rows of houses removed from US 6 and Wadsworth Boulevard range from 60 to 70 dBA during the loudest hour of the day. In general, measured noise levels exceed CDOT's 66 dBA Noise Abatement Criteria at all of the residences adjacent to the project.

A Traffic Noise Model (TNM, version 2.5) of the interchange was constructed, and was "validated" by predicting noise levels at the measurement locations using the traffic volumes, speeds, and truck percentages that were present during the measurements. Thus, if the model accurately represents noise from traffic, the predicted and measured noise levels should agree. Noise levels were measured at nine locations, and the difference between the measured and predicted noise levels ranged from -1.1 dBA to +2.9 dBA. The average of the differences was 1.9 dBA. This is within the stated accuracy of TNM, which is ±3 dBA.

The validated model was used to predict noise levels that will exist under the Preferred Alternative in the Design Year (2035). Noise levels were predicted at each of the businesses adjacent to the interchange, and at each of the residences located within approximately 700 feet of US 6 and Wadsworth Blvd. The model took into account the proposed location and elevation of US 6, Wadsworth Boulevard, and all associated ramps and frontage roads. In the model, traffic on each road was set to the theoretical maximum volume that could travel under Level of Service "C" conditions (as traffic projections exceed "C"). Also included in the model as barriers were existing noise walls and structures (both commercial buildings and individual residences). Predicted noise levels at the closest residences to the interchange range from 70 to 77 dBA. Thus, residences in all four quadrants of the interchange, as well as those along US 6, exceed CDOT's 66 dBA NAC for residential land use and are considered "impacted" by noise.

Noise mitigation was analyzed for impacted residences. Noise walls were determined to be the only feasible mitigation option. Fifteen foot tall walls are recommended in all four quadrants of the interchange.

1.0 INTRODUCTION

This report describes the noise impact and abatement analysis conducted for the US 6 & Wadsworth Boulevard Interchange Environmental Assessment. The project is located in Lakewood, Colorado, as shown in Figure 1-1. The analysis was conducted according to the Colorado Department of Transportation's (CDOT) *Noise Analysis and Abatement Guidelines* (December 2002). The analysis consisted of the following main elements:

- Measuring existing noise levels in the neighborhoods located within the project study area
- Using the measurements to validate a Traffic Noise Model (TNM) of the site
- Using the model to predict the noise levels that will exist at nearby residences and businesses under the Preferred Alternative
- Comparing predicted noise levels to CDOT's Noise Abatement Criteria (NAC)
- Assessing the "feasibility and reasonableness" of providing noise abatement (walls) for neighborhoods where predicted noise levels equal or exceed the NAC

This report is organized into the following sections:

2. A description of the methodology used to conduct the study, including an overview of CDOT's Noise Analysis and Abatement Guidelines (2002)
3. Noise measurement locations and results
4. TNM validation procedures, input data, and results
5. Predicted noise levels under the Preferred Alternative, and a comparison of the predicted levels to CDOT's NAC
6. The analysis of "feasible and reasonable" noise abatement alternatives
7. A qualitative analysis of No Action noise levels
8. A qualitative analysis of Construction noise levels

The following information is provided in the appendices:

A. Relevant noise terminology

B. TNM input data

C. Existing and Preferred Alternative noise levels at individual locations

D. Predicted noise level reductions from proposed walls at individual locations

E. CDOT Noise Abatement Determination forms

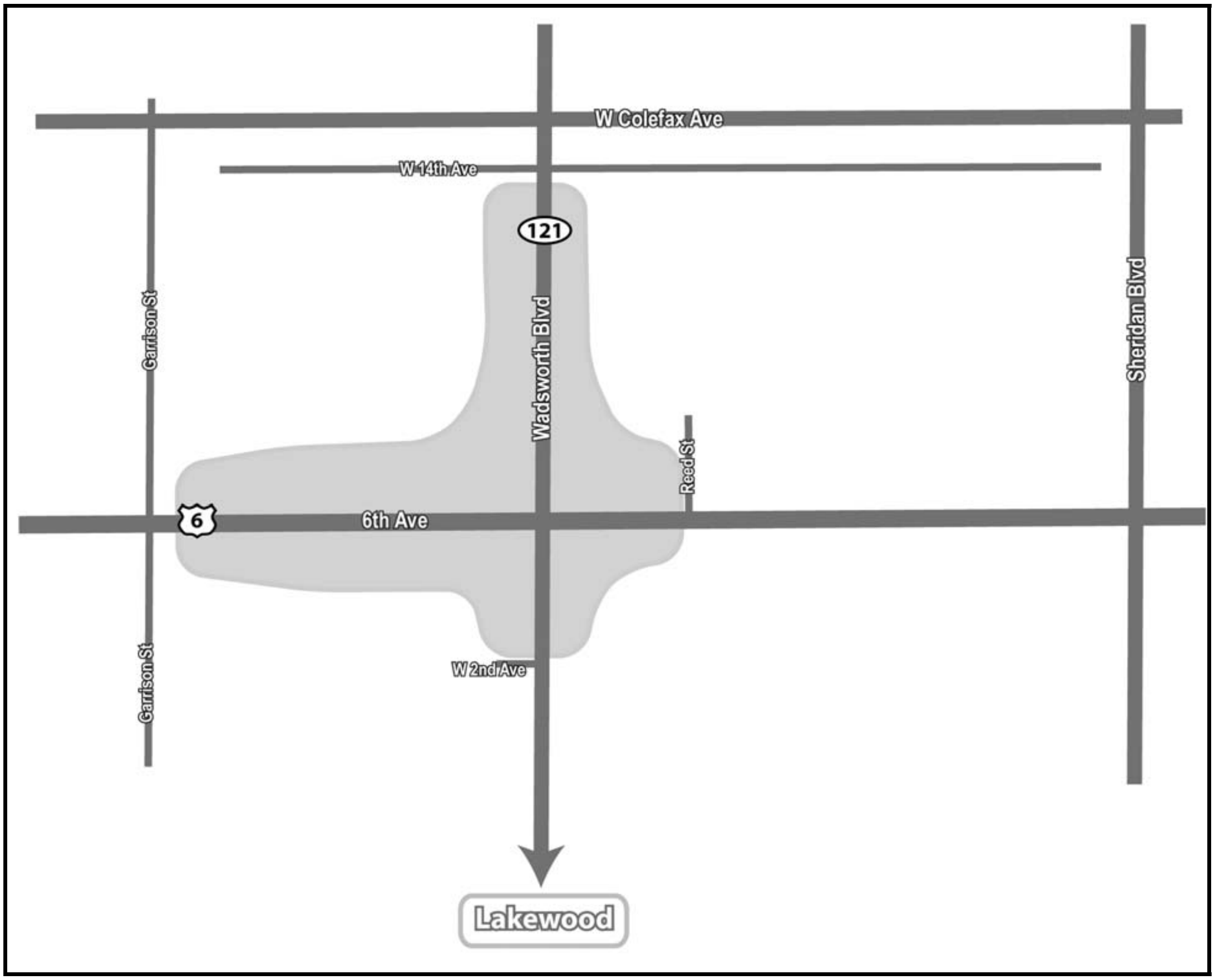


Figure 1-1: Project Location

2.0 NOISE ANALYSIS METHODOLOGY

CDOT Noise Guidelines

The noise analysis for the US 6 and Wadsworth Interchange Environmental Assessment is being conducted according to Colorado Department of Transportation (CDOT) noise guidelines, which are set forth in *CDOT Noise Analysis and Abatement Guidelines*, December 1, 2002. The CDOT noise guidelines are consistent with those of the Federal Highway Administration (FHWA) (23 CFR 772) and have been approved by the FHWA for use on Federal-aid projects in Colorado. CDOT's guidelines establish noise abatement criteria and design requirements for noise mitigation. The guidelines state that noise mitigation should be considered for any receptor or group of receptors where predicted traffic noise levels, using future traffic volumes and roadway conditions, equal or exceed CDOT's Noise Abatement Criteria (NAC), which are shown in Table 2-1. The guidelines also state that noise mitigation should be considered for any receptors where predicted noise levels for future conditions are greater than existing noise levels by 10 dBA or more. This standard is referred to hereafter as the Increase Criterion.

TABLE 2-1 – CDOT NOISE ABATEMENT CRITERIA

Activity Category	L_{eq} (1), (2) (dBA)	Description of Activity Category
A	56 (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	66 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals.
C	71 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	51 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

(1) Hourly A-weighted equivalent level for the noisiest hour of the day in the design year

(2) CDOT noise impact criteria are 1 dBA lower (more stringent) than FHWA values in 23 CFR 772, to identify noise levels that "approach" the FHWA criteria.

To be included in a project, a proposed noise mitigation measure must first be found to be feasible. A summary of the feasibility criteria is as follows:

- The proposed mitigation measure must be predicted to achieve at least 5 dBA of noise reduction at front row receptors, with 10 dBA being a goal to be achieved where feasible.
- The proposed mitigation measure must not create any "fatal flaw" safety or maintenance issues such as reduced sight distances, shadowing of ice-prone areas, and interference with snow/debris removal.
- If a barrier, it must be possible to construct it in a continuous manner, as gaps in noise barriers, e.g. for driveways, significantly degrade their performance.

If a mitigation measure is found to be feasible, it is then analyzed for its "reasonableness". A summary of the reasonableness criteria is as follows:

- The cost benefit index of the proposed measure should not exceed $4,000 per dB of reduction per benefited receptor.
- The predicted design year noise levels should equal or exceed the Noise Abatement Criteria shown in Table 1-1, above.
- At least 50% of the affected properties should support the proposed measure.
- Land use in the affected area should be at least 50% Category B (refer to Table 2-1).
- At least 50% of the residences under study should be at least 15 years old.
- The predicted design year noise levels should exceed existing levels by at least 5 to 10 dBA.

Noise Measurement Methodology

Existing noise levels were measured within the project study area for one week at two locations. Continuous noise monitors were placed at each location, and configured to measure the one-hour L_{eq} (dBA). Larson Davis Model 820 sound level meters were used, which meet American National Standards Institute (ANSI) Type 1 specifications (accuracy of approximately ± 1 dBA). The meters were calibrated by an accredited laboratory within 18 months of being used, and were calibrated in the field using a Bruel and Kjaer handheld acoustical calibrator. Each microphone was placed five feet above the ground, and fitted with a 3.5" diameter outdoor windscreen.

Noise levels were measured at two additional locations within the study area for approximately one week as part of a study funded by the developers of the Colorado Mills Mall in Golden, Colorado. Similar equipment and procedures were employed.

Finally, noise levels were measured for 20 minutes at nine other locations for the purpose of validating the TNM noise model constructed for this project. These measurements were conducted using a Larson Davis Model 824 sound level meter. The Model 824 meets ANSI Type 1 specifications, was calibrated within the past year by the manufacturer, and was field calibrated prior to the measurement. The meter was configured to record the one-third octave band sound levels (L_{eq}, dBA). Also, traffic volumes and truck percentages were counted, and traffic speeds were measured during each of the noise measurements in order to validate the TNM model of the site.

Noise Level Prediction Methodology

The Federal Highway Administration's (FHWA) Traffic Noise Model (TNM, version 2.5) was used to predict existing and future traffic noise levels within the study area. TNM was also used to predict the reduction in noise that will be provided by proposed noise barriers. TNM calculates the hourly, A-weighted L_{eq} at a receptor location given the noise emission level of automobiles, medium, and heavy trucks; the volume and speed of each of these vehicle types on each roadway of interest; the relative location of all roadways, receptors, and terrain features (i.e., natural and man-made barriers); and the type of terrain that exists between each receptor and each roadway. Roadway and terrain data were obtained from CAD files (2-foot elevation contours). The location and land-use of receptors were obtained by conducting a field survey.

Traffic data was obtained from CH2M HILL and corresponds to Level-of-Service (LOS) “C” conditions. Refer to Attachment B for more details regarding the TNM input data used to predict noise levels on this project.

The TNM model was “validated” by using the model to predict noise levels at the nine validation measurement locations using the traffic volumes and speeds measured during the noise measurements. These predicted levels were then compared to the measured levels.

3.0 MEASURED NOISE LEVELS

Noise Level Measurement Locations

Existing noise levels were measured for one week at five locations for the purpose of identifying loudest-hour noise levels. Also, noise levels were also measured for 20 minutes at each of nine other locations for the purpose of validating the TNM model of the site that was used to predict future noise levels. The measurement locations are shown in Figure 3-1. A brief description of each measurement location, as well as the dates of the measurements, is as follows:

- WL1 (8126 6th Avenue): As shown in Figure 3-2, the microphone was located near the stone fence that separates the residential property from the US 6 Frontage Road. This location is 80 feet from the centerline of the eastbound lanes of US 6, and there was direct line of sight between the microphone and US 6 and the US 6 Frontage Road. Measurements were conducted here between June 17 and 23, 2007.
- WL2 (7555 Highland Drive): As shown in Figure 3-3, the microphone was located near the chain-link fence that separates the property from the adjacent lot. This location is 210 feet from the centerline of the northbound lanes of Wadsworth Boulevard, and there was direct line of sight between the microphone and Wadsworth Boulevard. Measurements were conducted here between June 17 and 23, 2007.
- WL3 (605 Cody Court): As shown in Figure 3-4, the microphone was located in the side yard of a residence with direct line of sight to the highway (except for a wooden privacy fence that provides little noise reduction). Measurements were conducted here between October 3 and 10, 2002.
- WL4 (585 Dudley Street): As shown in Figure 3-5, the microphone was located in the side yard of a residence with direct line of sight to US 6. Measurements were conducted here between October 3 and 10, 2002.
- WL5 (555 Dudley Street): As shown in Figure 3-6, the microphone was located in the front yard of a residence, three houses down Dudley Street from US 6. There was direct line of sight to US 6 down Dudley Street, but no direct line of sight in other directions due to houses. Measurements were conducted here between October 3 and 10, 2002.

- S1 (Wadsworth Boulevard and Highland Drive): Direct line of sight to Wadsworth, 60 feet from centerline of northbound lanes. Measurements conducted on June 13, 2008.
- S2 (7555 Highland Drive): Mostly direct line of sight to Wadsworth, 210 feet from centerline of northbound lanes. Measurements conducted on June 13, 2008.
- S3 (8126 6th Avenue): Direct line of sight to US 6, 75 feet from centerline of eastbound lanes. Measurements conducted on June 13, 2008.
- S4 (west end of 5th Avenue): Partial line of sight to US 6, ~500 feet from centerline of eastbound lanes. Measurements conducted on June 13, 2008.
- S5 (south of Wal-Mart parking lot): Line of sight to Wadsworth partially blocked, 450 feet from centerline of northbound lanes. Measurements conducted on June 20, 2008.

- S6 (north of 9th Avenue near sidewalk): Direct line of sight to Wadsworth, 50 feet from centerline of southbound lanes. Measurements conducted on June 20, 2008.
- S7 (behind S6 through parking lot of office building): Represents the 2nd row of home along Wadsworth, 300 feet from centerline of southbound lanes. Measurements conducted on June 20, 2008.
- S8 (Brentwood Street): Direct line of sight to US 6, 140 feet from centerline of westbound lanes. Measurements conducted on June 20, 2008.
- S9 (Brentwood Street): 2nd row home along US 6, 220 feet from centerline of westbound lanes. Measurements conducted on June 20, 2008.

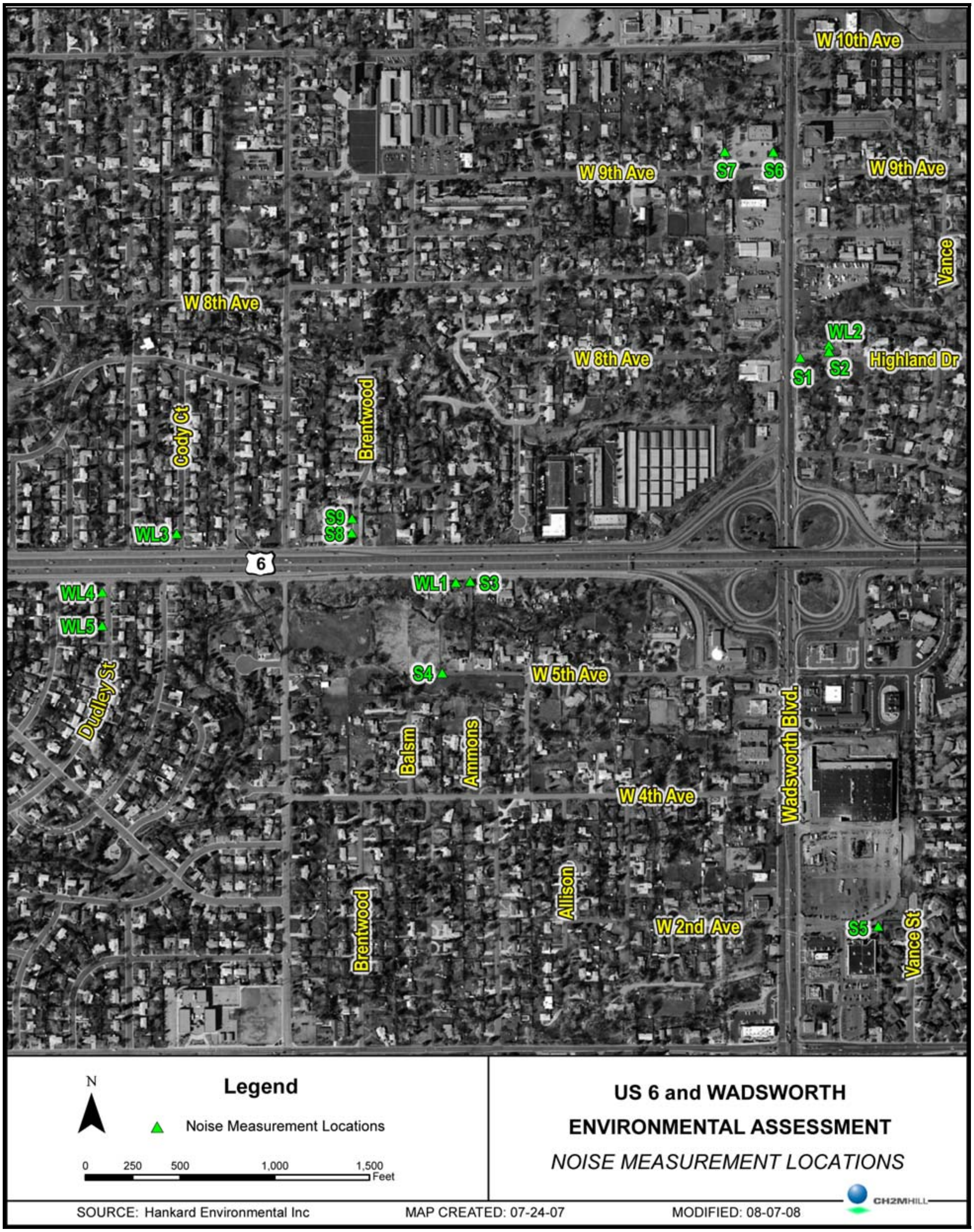


Figure 3-1: Noise Measurement Locations

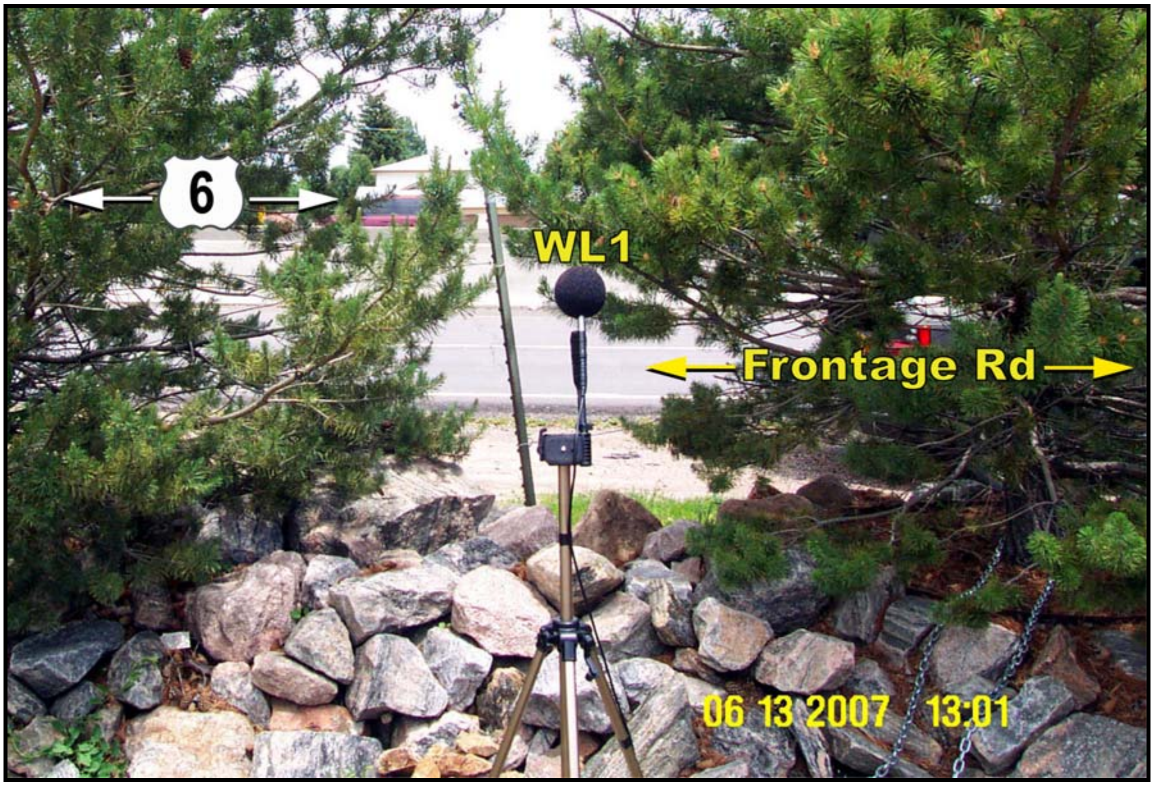


Figure 3-2: Measurement Location WL1

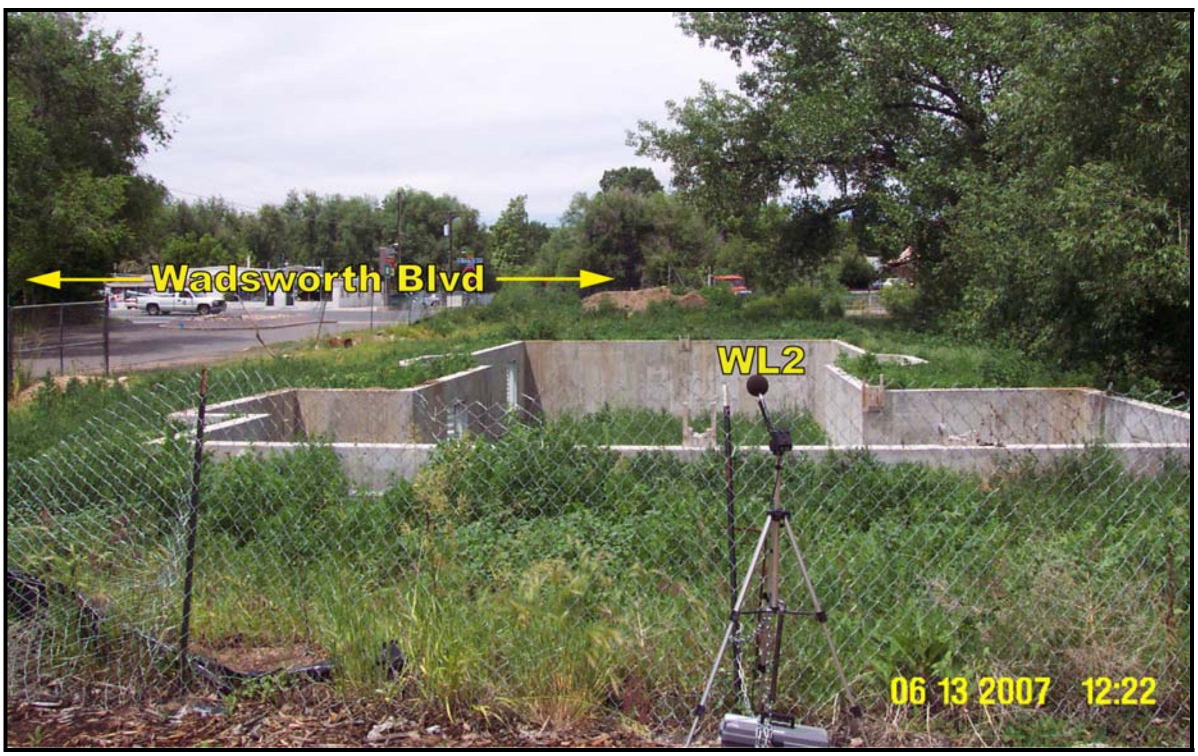


Figure 3-3: Measurement Location WL2

Figure 3-4: Measurement Location WL3

Figure 3-5: Measurement Location WL4

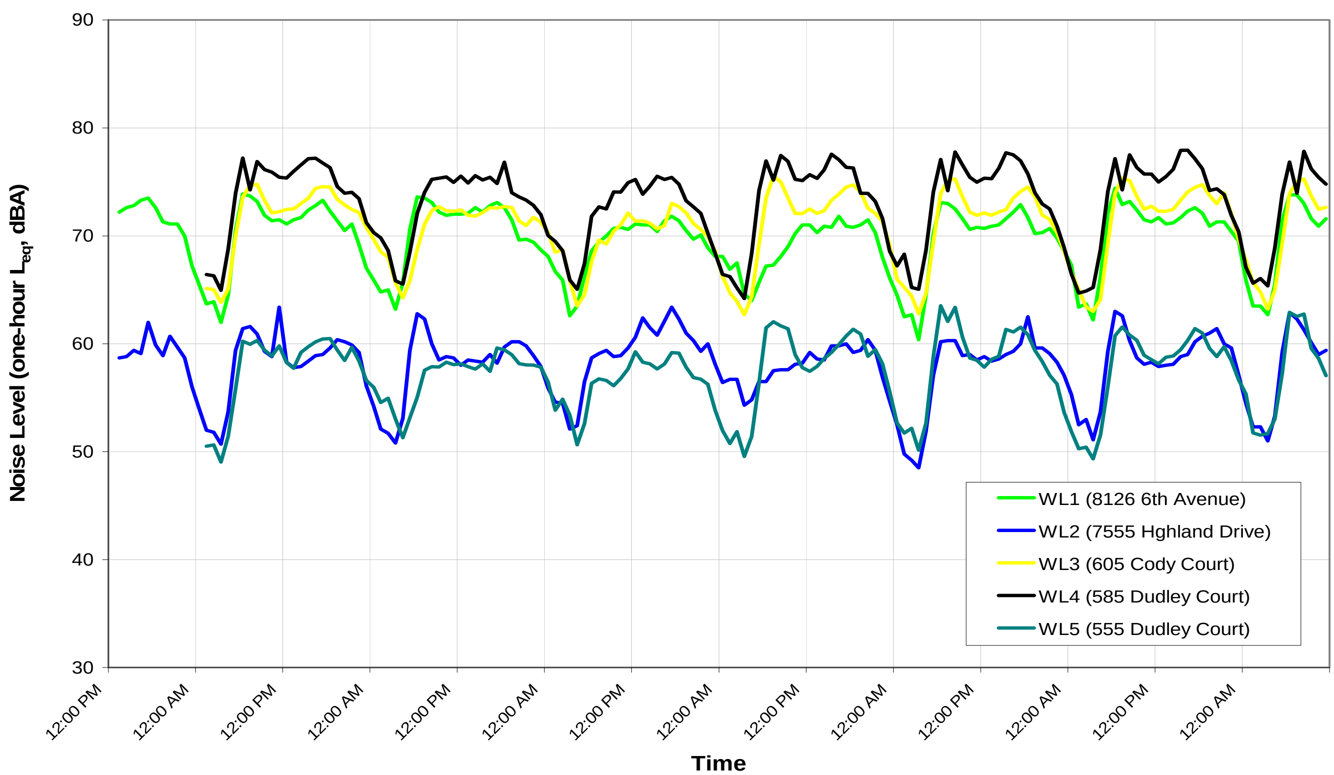
Figure 3-6: Measurement Location WL5

Noise Level Measurement Results

The measured noise levels at WL1 through WL5 are shown in Figure 3-7. Loudest hour noise levels at the three locations along US 6 where there is clear line of sight between the microphone and the highway (WL1, WL3, and WL4) range from 71 to 78 dBA, and exceeds CDOT's 66 dBA Noise Abatement Criterion for residences on a daily basis. Loudest hour noise levels at WL2 (along Wadsworth) and WL5 (three houses back from US 6) range from 59 to 63 dBA.

Overall, the measured noise levels show a typical daily pattern for traffic noise, with maximum one-hour L_{eq} levels during the morning and evening rush-hours, relatively high levels during the day, and lower levels at night. This is an expected result given the heavy volume of traffic on US 6 and the frontage roads, the proximity of the roadways, and the speed of traffic on US 6.

Figure 3-7: Measured Week-Long Noise Levels



Validation Noise Level and Traffic Measurement Results

The measured noise levels at S1 through S9 are listed in Table 3-1. The traffic volumes and speeds measured during the noise measurements are listed in Table 3-2.

TABLE 3-1: MEASURED NOISE LEVELS AT S1 – S9
(20-MINUTE L_{eq}, dBA)

Location	Measured Noise Level (20 minute L_{eq}, dBA)
S1	72
S2	60
S3	74
S4	62
S5	63
S6	71
S7	54
S8	69
S9	62

TABLE 3-2: MEASURED TRAFFIC VOLUMES AND SPEEDS FOR TNM VALIDATION

Noise Measurement Location	Roadway	Autos (one-hour volume)	Medium Truck (one-hour volume)	Heavy Truck (one-hour volume)	Speed (mph)
S1 and S2	Wadsworth SB	1,833	45	30	42
	Wadsworth NB	1,719	30	9	44
S3 and S4	6th Ave. EB	3,039	81	42	64
	6th Ave. WB	4,731	30	45	59
	Frontage Rd. (both dir.)	27	0	3	38
S5	Wadsworth NB	1,680	48	30	38
	Wadsworth SB	1,635	48	24	40
S6 and S7	Wadsworth NB	1,620	24	3	35
	Wadsworth SB	1,932	30	6	35
S8 and S9	6th Ave. EB	1,665	45	45	67
	6th Ave. WB	2,649	33	24	68
	Exit Lane	246	30	0	57
	Frontage Rd. (both dir.)	30	33	0	20

4.0 VALIDATION OF TNM MODEL

A Traffic Noise Model (TNM), version 2.5, of the existing layout and configuration of US 6 and Wadsworth was constructed. The model was created using the procedures outlined in *Evaluation of the FHWA Traffic Noise Model (TNM) for Highway Traffic Noise Prediction in the State of Colorado*, CDOT Research Report No. 2005-21. The area around each of the nine validation measurement locations was modeled individually. The relative location and elevation of the measurements, roadway centerlines per direction of travel, existing noise barriers, concrete safety barriers, and buildings were obtained from the scaled CAD produced for this project. The measured traffic volumes and speeds listed in Table 3-2 were used in the models to predict noise levels at each measurement location. Ideally, the measured and predicted values would be identical, but the generally held desired accuracy for highway noise modeling is ± 3dBA.
Table 4-1 shows the measured and predicted traffic noise levels, and the differences in the levels at each site. The differences are all less than 3 dBA.

TABLE 4-1: RESULTS OF TNM MODEL VALIDATION

Location	Measured Noise Level (one-hour Leq, dBA)	Predicted Noise Level (one-hour Leq, dBA)	Predicted Minus Measured Noise Level (20 minute Leq, dBA)
S1	71.8	70.7	-1.1
S2	59.7	62.2	2.5
S3	73.9	75.9	2.0
S4	62.0	62.3	0.3
S5	63.1	62.2	-0.9
S6	71.4	69.0	-2.4
S7	54.3	57.2	2.9
S8	68.7	70.9	2.2
S9	61.5	64.0	2.5

A description of the modeling procedures and validation results at each location is as follows:

S1 and S2: The modeling at S1 and S2 is straightforward, as both locations are close to the roadway (60 and 210 feet, respectively), there are no significant barriers of any kind, and the terrain is flat and acoustically soft ("lawn" ground type modeled). As a result the difference between the predicted and measured noise levels is within the desired range.

S3: The model of S3 included the 3-foot tall concrete safety barrier that separates the frontage road from the mainline. The model predicted an insertion loss of 1.9 dBA as a result of this barrier, which is appropriate based the fact that S3 is only 75 feet from the centerline of eastbound US 6. With the barrier in the model, the difference between the predicted and measured noise levels is within the desired range, and without it the model predicts too high.

S4: The initial model of S4 also included the 3-foot-high concrete safety barrier that separates the frontage road from the mainline. However, the model predicted an insertion loss of 3.8 dBA as a result of this barrier, which is too high based the fact that S4 is more than 500 feet from the centerline of eastbound US 6. Therefore, the barrier was not included in the model. Houses near the measurement location were modeled as barriers. The difference between the predicted and measured noise levels is within the desired range.

S5: The model of S5 included a default ground type of Pavement, given the large parking lots and roadways that exist between the measurement and the roadway. The grassy area around the measurement location was modeled using a Lawn Ground Zone. Also, the measurement location sits on a small knoll that is approximately 25 feet higher than the road. This was modeled by placing a terrain line at the base of the knoll and at the top of the knoll. The receiver was then place on top of the knoll, with an elevation of 5 feet above the ground. Finally, the large commercial buildings nearby were modeled as barriers. With all of these elements in the model the difference between the predicted and measured noise levels is within the desired range.

S6 and S7: The initial model of S6 and S7 included a default ground type of Pavement, given the large parking lots and roadways that exist between the measurement locations and the roadway, and the grassy area around the measurement location was modeled using a Lawn Ground Zone (as was done for S5). However, the resulting predicted level at S7 was too high. The default ground type was then changed to "Lawn", and the pavement areas modeled as a Pavement Ground Zone. This, along with modeling the nearby large commercial buildings as barriers, provided a result that was within the desired range.

S8 and S9: The model of S8 and S9 included the nearby houses represented as barriers, as well as the 3-foot tall concrete safety barrier that separates the directions of travel on the mainline. With these elements in the model the difference between the predicted and measured noise levels is within the desired range.

5.0 PREDICTED NOISE LEVELS AND NOISE IMPACT

Noise levels were predicted within the study area at each residence located within approximately 600 feet of US 6 and 500 feet of Wadsworth Boulevard, and at each business located adjacent to US 6 and Wadsworth, in order to determine noise "impact". As described in Section 2.0, above, a home or business located within the project study area is considered impacted by noise under CDOT guidelines when either of two conditions exists:

- When loudest hour noise levels under the Preferred Alternative are predicted to equal or exceed CDOT's 66 dBA Noise Abatement Criterion for Category B receivers or 71 dBA for Category C receivers (refer to Table 2-1)
- When loudest hour noise levels under the Preferred Alternative are predicted to exceed existing noise levels by 10 dBA or more.

Using the validated TNM (v2.5) model of the site, noise levels were predicted for existing conditions, including the existing alignment and elevation of the roadways, existing noise walls, existing structures, and Level of Service C traffic conditions. The model was also used to predict noise levels for the Preferred Alternative, including the proposed alignment and elevation of the roadways, existing noise walls minus those sections of the walls that would need to be removed to make way for the proposed improvements, existing structures minus those that would need to be removed to make way for the proposed improvements, and Level of Service C traffic conditions.

Impact At Residential Receivers

For the purposes of this analysis, the project study area was divided into the five sections shown in Figure 5-1. Noise levels were predicted at each of the residences shown in Figures 5-2 through 5-9. Table 5-1 lists the average predicted noise level at each row of houses in each of these areas. The predicted levels at each individual residence are provided in Appendix C. Table 5-2 lists the number of residences where predicted noise levels exceed CDOT's 66 dBA NAC for Category B receivers (residences, schools). Table 5-3 describes the receptors where predicted design year noise levels equal or exceed 66 dBA. Noise mitigation for these areas is discussed in the following section.

Impact At Commercial Receivers

Noise levels were predicted at each of the businesses shown in Figure 5-10. The figure shows the location of each commercial receptor where the predicted loudest hour noise level in the design year equals or exceeds CDOT's NAC of 71 dBA for Category C receptors (commercial). Noise mitigation was not considered for any of these receptors, however, due to the following:

- Generally, businesses prefer to be visible from the road
- Each of the impacted businesses has direct access onto local streets, making the construction of continuous noise walls infeasible
- The City of Lakewood is desirous of not having any noise walls along Wadsworth Boulevard
- Most businesses have little to no outdoor use, which is what CDOT's noise mitigation policy is geared toward

TABLE 5-1: PREDICTED AVERAGE LOUDEST HOUR TRAFFIC NOISE LEVELS
(WITHOUT PROPOSED NOISE WALLS)

Area	Row	Existing Conditions (dBA)	Preferred Alternative (dBA)	Increase (dBA)
North	All	57	59	2
Northeast	1st	67	72	5
	2nd	62	64	2
	3+	58	61	3
Southeast	1st	68	75	7
	2nd	60	67	7
	3+	58	64	6
Northwest	1st	77	77	0
	2nd	72	72	0
	3+	64	64	0
Southwest	1st	77	77	0
	2nd	72	72	0
	3+	62	62	0

TABLE 5-2: NUMBER OF RESIDENCES WHERE PREDICTED NOISE LEVELS EXCEED 66 dBA

Area	Existing	Project
North	1	2
Northeast	8	7
Southeast	7	12
Northwest	54	55
Southwest	45	44

TABLE 5-3: DESCRIPTION OF RECEPTORS WHERE PREDICTED NOISE LEVELS EXCEED 66 dBA

Area	Description
North	Single residence along Wadsworth and Jefferson County Open School
Northeast	Residences along both US 6 and Wadsworth
Southeast	Residences along US 6
Northwest	Residences along US 6
Southwest	Residences along US 6

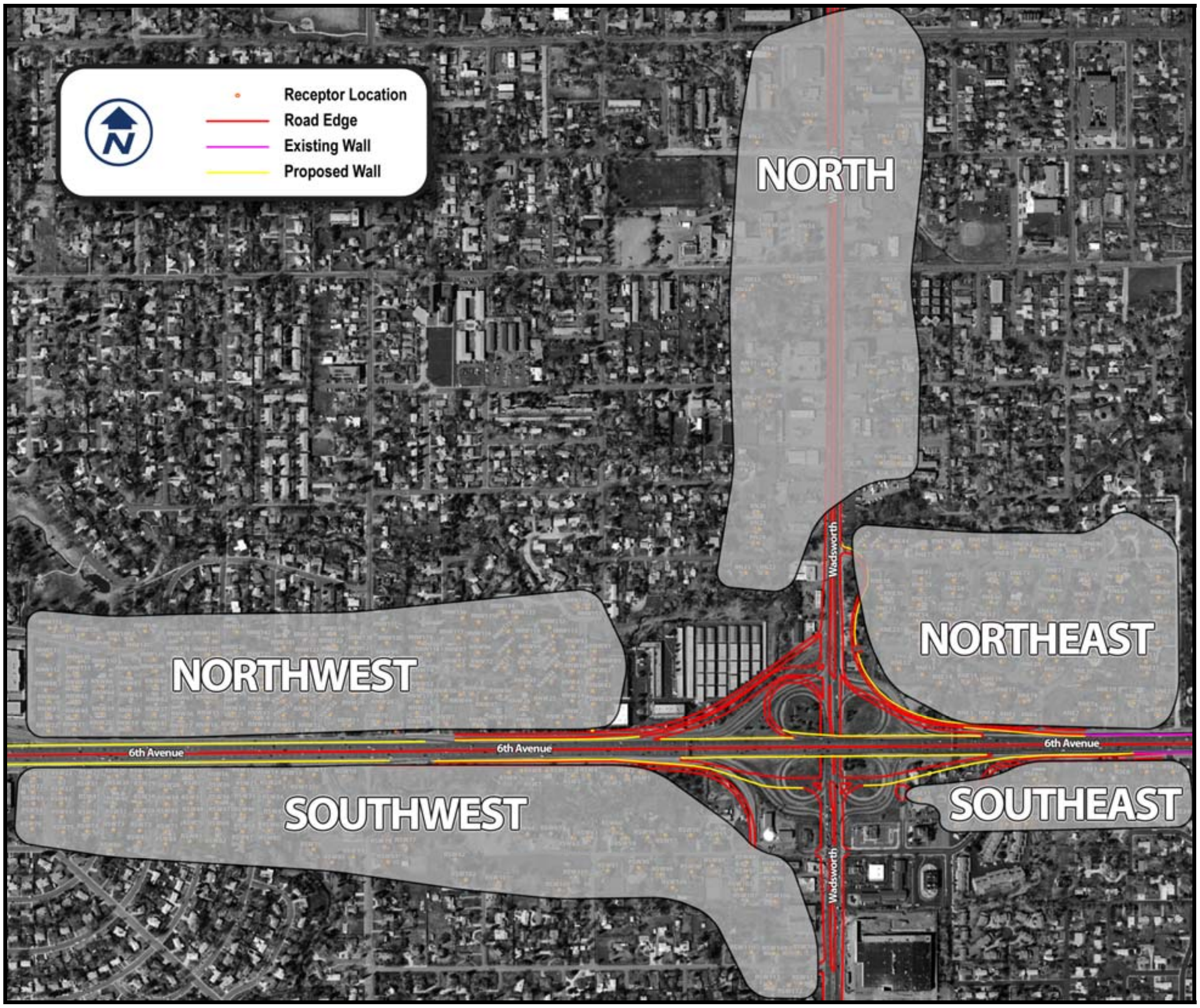


FIGURE 5-1: RESIDENTIAL NOISE STUDY AREAS

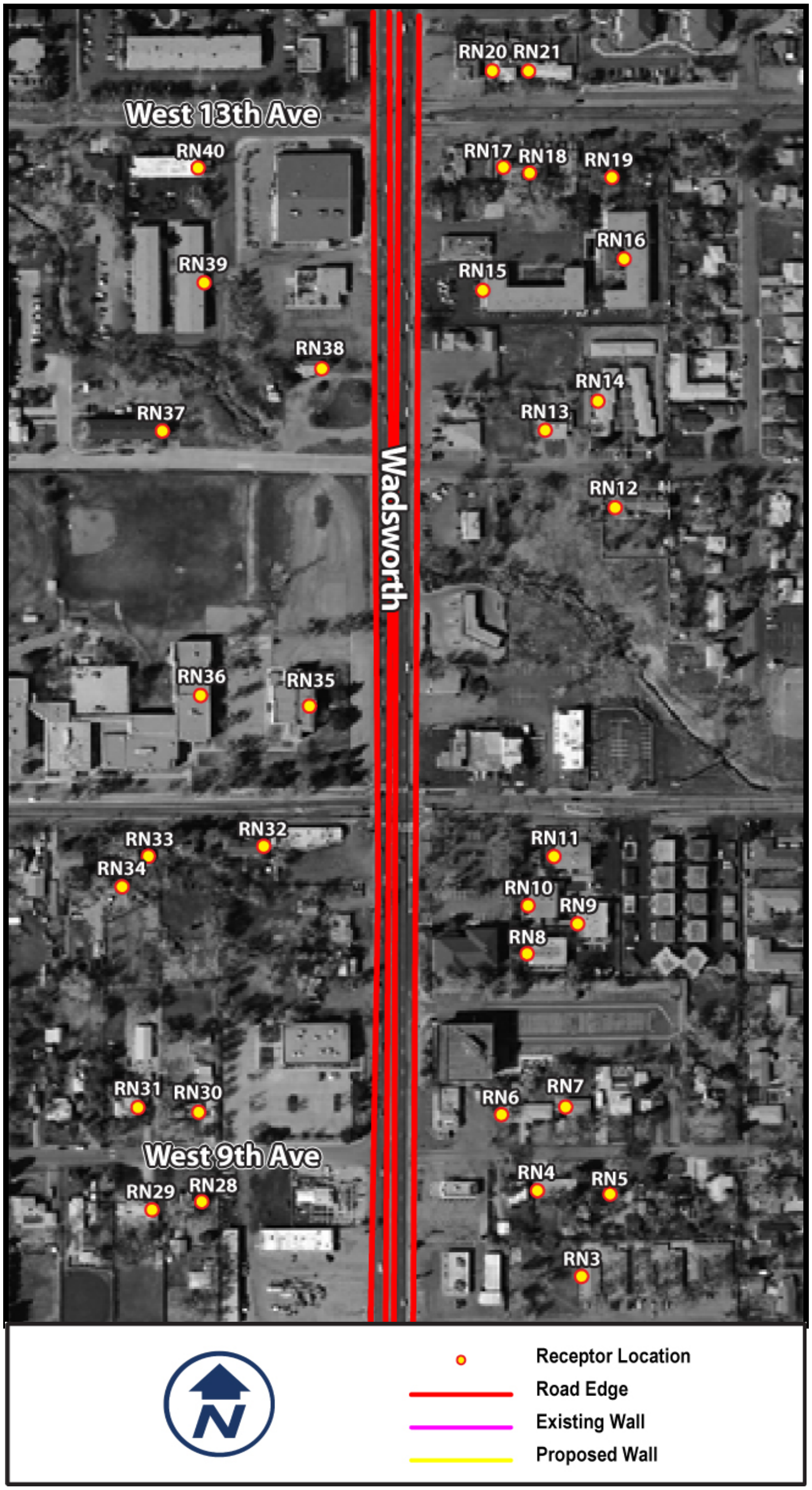


FIGURE 5-2: NORTH RECEPTORS (9TH TO 13TH STREETS)

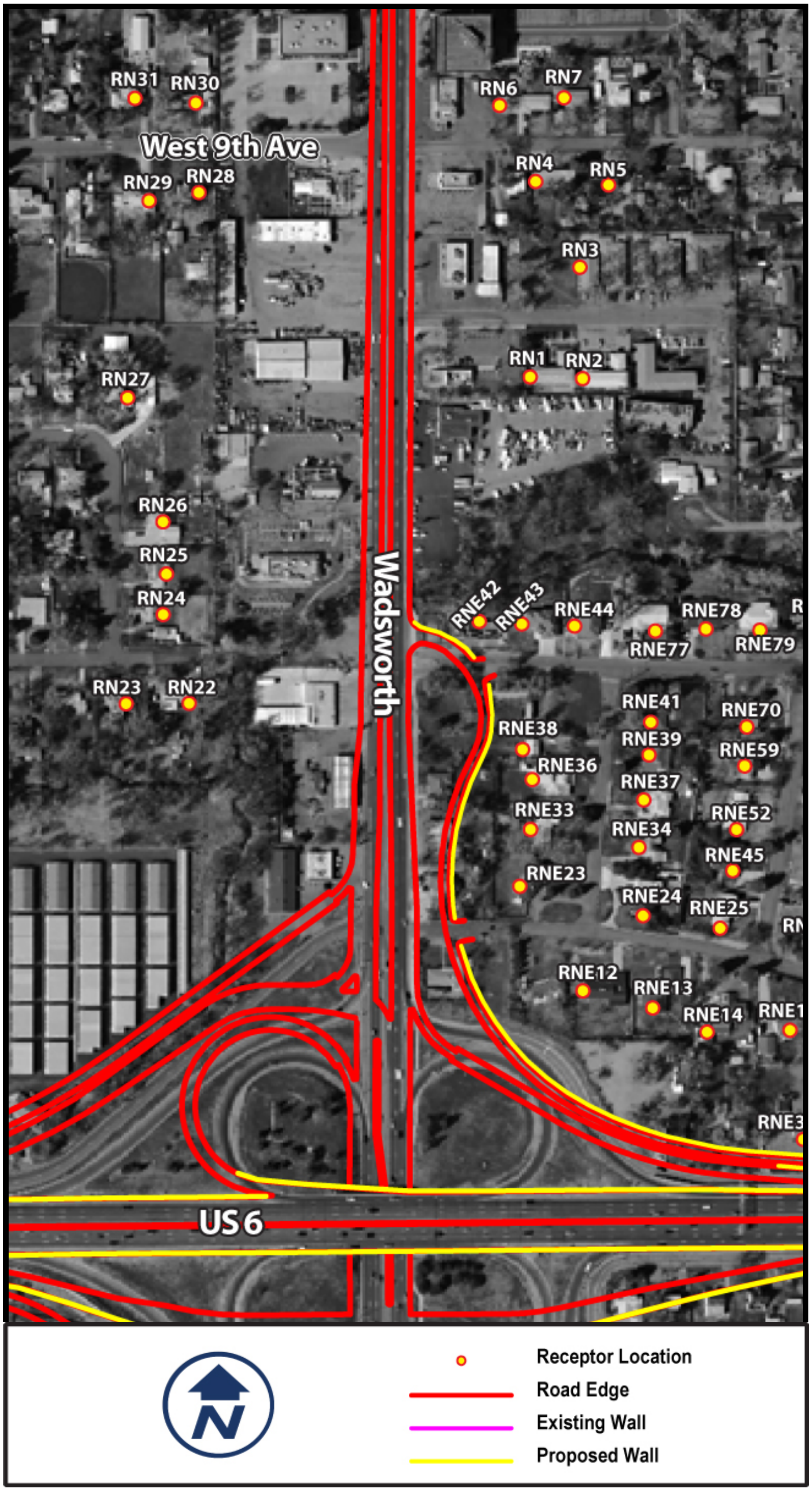


FIGURE 5-3: NORTH RECEPTORS (US 6 TO 9TH STREET)

FIGURE 5-4: NORTHEAST RECEPTORS

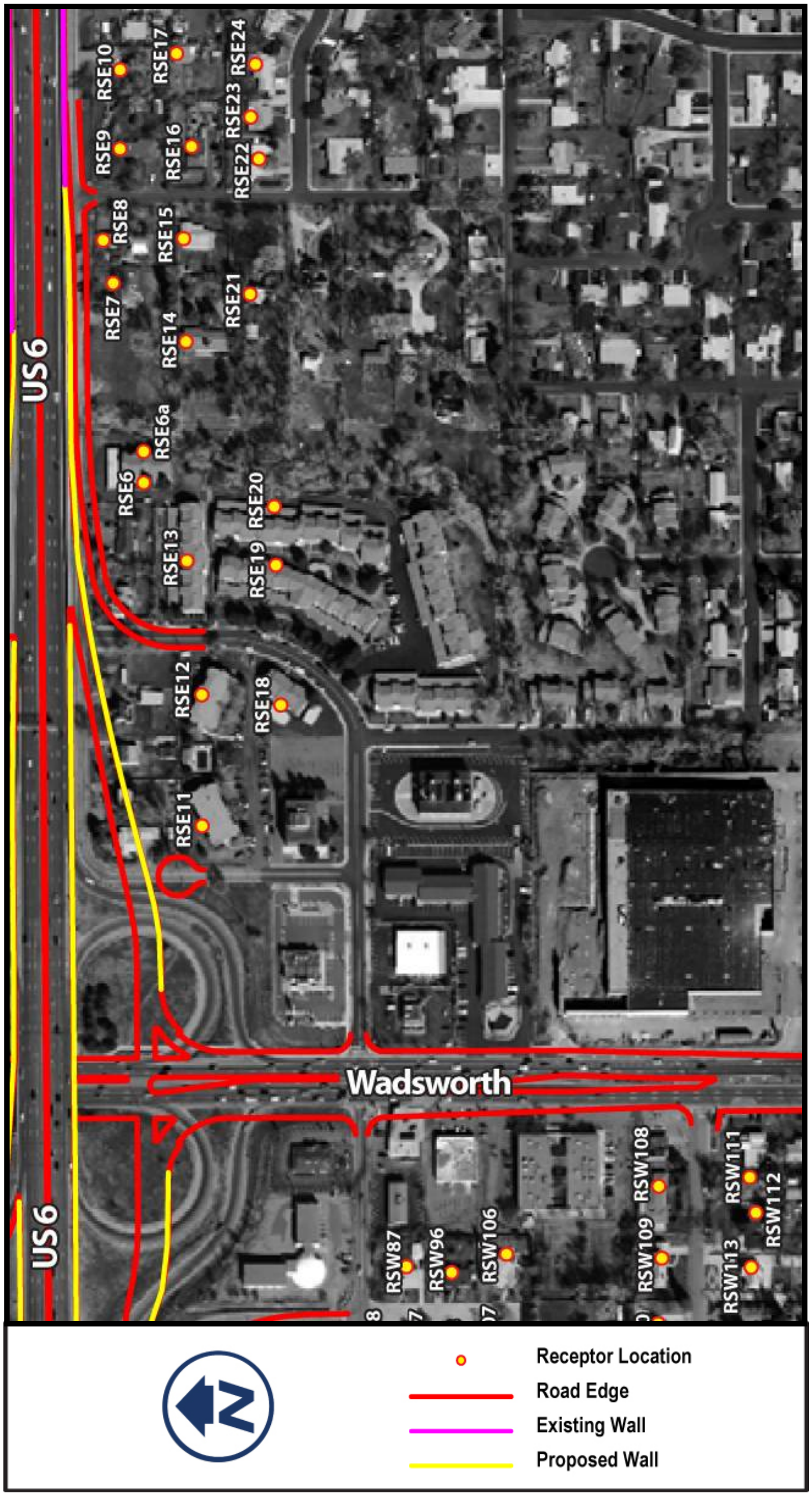


FIGURE 5-5: SOUTHEAST RECEPTORS

FIGURE 5-6: SOUTHWEST RECEPTORS (WADSWORTH BLVD. TO 300 FEET EAST OF CARR STREET)

FIGURE 5-7: SOUTHWEST RECEPTORS (300 FEET EAST OF CARR STREET TO GARRISON STREET)

FIGURE 5-8: NORTHWEST RECEPTORS (WADSWORTH BLVD. TO BRENTWOOD STREET)

FIGURE 5-9: NORTHWEST RECEPTORS (BRENTWOOD STREET TO GARRISON STREET)

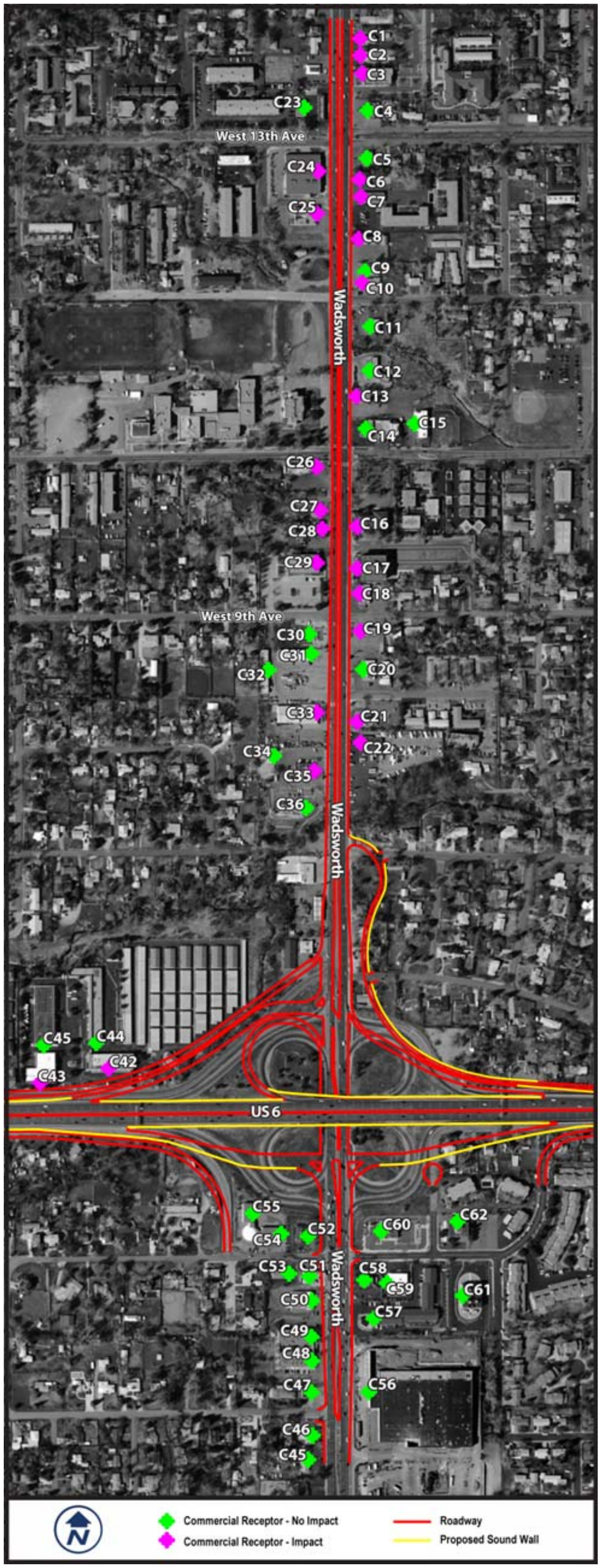


FIGURE 5-10: COMMERCIAL RECEPTORS

6.0 NOISE MITIGATION

Noise mitigation was analyzed at each of the residential areas predicted to be impacted by noise according to CDOT guidelines. There are a number of methods available to reduce traffic noise levels. As described in the first subsection, below, most of them do not apply to this project and are considered infeasible according to CDOT's noise guidelines. The one mitigation measure that is deemed feasible and reasonable is the construction of noise walls. The analyses conducted to determine this, and the noise reduction that the walls are predicted to provide, is described in the second subsection below.

Noise Abatement Measures Deemed Infeasible on This Project

Restricting Access to Heavy Trucks

Restricting heavy trucks from operating on US 6 would provide only a moderate reduction in traffic noise, due to the relatively low percentage of trucks (2%). Also, if prohibited, trucks would likely seek other local roads, thus only shifting impact onto others. As a result, this is not considered a viable noise mitigation measure on this project.

Acquisition of Property to Form Buffer Zone

Generally, this mitigation measure is a viable alternative only for undeveloped lands where noise impact *prevention* is the goal. Land within the US 6 and Wadsworth Boulevard project study area is almost completely developed. As a result, this is not considered a viable noise mitigation measure on this project.

Alteration of Horizontal Alignment

In order to provide significant noise reduction (at least 5 dBA), the distance that currently exists between a receptor and the highway would need to be doubled. For example, if a residence were currently 100 feet from the highway, the highway would need to be shifted another 100 feet away. This is not a viable mitigation alternative on this project given that both sides of both US 6 and Wadsworth Boulevard are almost completely developed.

Alteration of Vertical Alignment

Changing the vertical alignment of US 6, by depressing it into the ground, could provide a significant noise reduction. This option was not recommended for design implementation due to its extremely high cost and complexity.

Reducing Speed Limits

The reduction of speed limits is another option to control vehicle noise. In general, noise levels decrease by 1 dBA for each 5 mph decrease in speed. This is not a viable noise mitigation measure on this project, given that the proposed roadway will be grade-separated in order to accommodate projected traffic volumes, and that this will actually create an increase in speed (posted speeds will be 65 mph).

Noise Insulation of Buildings

CDOT guidelines state that applying sound insulation to private residences can be considered where there is a severe impact (absolute noise levels of 75 dBA or an increase of 30 dBA over existing levels) and where other exterior noise mitigation measures are found to be infeasible. While noise levels in excess of 75 dBA do exist within the study area, other mitigation measures (noise walls) were found to feasible.

Using a Low-noise Pavement

FHWA *Highway Traffic Noise Analysis and Abatement Policy and Guidance* (June 1995) states that: "Pavement is sometimes mentioned as a factor in traffic noise. While it is true that noise levels do vary with changes in pavements and tires, it is not clear that these variations are substantial when compared to the noise from exhausts and engines, especially when there are a large number of trucks on the highway. Additional research is needed to determine to what extent different types of pavements and tires contribute to traffic noise. It is very difficult to forecast pavement surface condition into the future. Unless definite knowledge is available on the pavement type and condition and its noise generating characteristics, no adjustments should be made for pavement type in the prediction of highway traffic noise levels. Studies have shown open-graded asphalt pavement can initially produce a benefit of 2-4 dBA reduction in noise levels. However, within a short time period (approximately 6-12 months), any noise reduction benefit is lost when the voids fill up and the aggregate becomes polished. The use of specific pavement types or surface textures must not be considered as a noise abatement measure." Therefore, at this time, asphalt is not viewed as a noise mitigation measure in and of itself.

Analysis of the Feasibility and Reasonableness of Noise Walls

Noise barriers, either in the form of walls or earthen berms, are the most commonly employed highway noise mitigation measure. Noise walls are more common than berms, particularly in developed areas such as the US 6 and Wadsworth interchange, because they require less space. Noise walls achieve between 5 and 15 dB of reduction, depending on height, topography (less reduction is achievable for receptors located above the highway), and proximity (barriers are most effective for receptors located within approximately 300 feet of the barrier).

The locations of all the proposed noise walls are shown in Figure 5-1 (above). More detailed views of each wall are shown in Figures 2 through 5-9. Generally, the walls are located along the shoulder of US 6, and continue down the ramps to Wadsworth Boulevard. The walls are all proposed to be 15 feet tall, with the exception of the sections that run over the bridge that are approximately 4 feet tall, and the sections along Wadsworth Boulevard north of US 6 which are 8 feet tall. The 15 foot height was derived by analyzing wall heights of 12, 15, and 18 feet. Twelve foot tall walls were predicted to provide less than the requisite noise level reduction of 5 to 10 dBA at front row residences. Eighteen foot tall walls were predicted to perform better than the 15 foot tall walls, but insignificantly so, and at a greater cost. The 15 foot tall walls were predicted to provide the requisite noise level reduction, and this height is consistent with many other walls along CDOT highways statewide. Tall walls are not proposed for the bridge due to the significant expense that this would require the fact that they are not necessary to achieve the requisite noise reductions, and the fact that the City of Lakewood desires drivers to be able to see some of the City as they drive through the area.

A brief description of each proposed wall is as follows:

- Northeast (Figure 5-4): Beginning at the existing noise wall along US 6, part of which will need to be relocated to make room for the expanded off-ramp, the first section of the wall system would skirt the shoulder of US 6, follow the shoulder of the off-ramp for approximately X feet. This section is proposed to be 15 feet tall. The second section of the wall system overlaps the first, but skirts the northeast shoulder of the frontage road to Broadview Drive. This section is also 15 feet tall. The third section of the proposed wall system skirts the east side of the frontage road from Broadview Drive to Highland

Drive, and is 8 feet tall. The forth section of the proposed wall system skirts the northeast side of the frontage road from Highland Drive to Wadsworth Blvd., and is 8 feet tall.

- Southeast (Figure 5-5): Beginning at the existing noise wall along US 6, part of which will need to be relocated to make room for the expanded on-ramp, the southeast wall would skirt the shoulder of US 6, and follow the shoulder of the on-ramp to Wadsworth Blvd. This entire wall is 15 feet tall.
- Southwest (Figures 5-6 and 5-7): Beginning at Wadsworth Boulevard, the southeast wall would follow the shoulder of the off-ramp, and then skirt the shoulder of US 6 west to the slip ramp. There is a gap in the wall for the slip ramp, the exact location and size of which will need to be refined during final design. The wall then continues from the slip ramp to the residences located on the west side of Meadowlark Drive. The exact endpoint of this wall will need to be refined during final design. This entire wall is 15 feet tall.
- Northwest (Figures 5-8 and 5-9): Beginning along US 6 in front of the residences on the east side of Allison Street, the northwest wall would follow the shoulder of US 6 west to the slip ramp. There is a gap in the wall for the slip ramp, the exact location and size of which will need to be refined during final design. The wall then continues from the slip ramp to the residences located on the west side of Field Street. This entire wall is 15 feet tall.

Feasibility

CDOT's main Feasibility criterion is that the proposed walls must achieve at least 5 dBA of noise reduction at front-row receptors, and preferably 10 dBA. Table 6-1 lists the average predicted noise level reduction at the front row of residences behind each of the proposed walls, as well as the reduction at 2^{nd} and 3^{rd}+ rows of houses. The average reductions at front-row receptors range from 7 to 12 dBA; all exceed 5 dBA, and some exceed 10 dBA. The noise level reductions predicted at each individual receptor location (residence) are provided in Appendix D.

Other CDOT Feasibility criteria include safety (sight distances, shadowing/icing) and maintenance (room for adequate snow and debris removal). The exact endpoints of the walls may need to be refined during final design to ensure adequate sight distances, particularly on the US 6 "slip ramps". There are no significant icing or debris removal issues that we are aware of, based on the fact that there are similar walls located along US 6 in this area.

The final CDOT Feasibility criterion is Constructability. The proposed walls do not appear to offer any engineering or cost challenges over that which is typical and reasonable for such structures, and the walls can be built in a continuous manner, with only a few gaps for slip ramps and side roads. Walls along Wadsworth in front of the single impacted residence and the Jefferson County Open School are considered infeasible, because they cannot be constructed in a continuous manner due to the need for pedestrian and vehicular access into these properties.

In summary, the proposed walls are considered feasible according to CDOT noise guidelines.

Reasonableness

CDOT's Reasonableness criteria were applied to each of the proposed noise walls. The results of this analysis are described below. Overall, all of the walls are considered Reasonable. The proposed walls scored a rank of "Extremely Reasonable" in four out of the six standard Reasonableness categories. None of the walls scored a rank of "Unreasonable" in any of the categories.

1. *Cost Benefit*
   Table 6-2 lists the cost-benefit calculated for each of the proposed noise walls. The cost for each wall was calculated by multiplying the wall's area by CDOT's standard sound wall unit cost of $30 per square foot. The number of benefited receptors was calculated as the number of receptors where the predicted noise level reduction was 3 dBA or more. The noise level reduction used in the calculations was the average reduction at the benefited receptors. With the exception of the Northeast wall, the cost-benefits rank as "Extremely Reasonable" according to CDOT's criteria. The Northeast wall ranks as "Marginally Reasonable". The reason for the lower ranking in the northeast quadrant of the interchange is the presence of the existing noise wall, which limits the amount of additional reduction that the proposed wall will yield. Nonetheless, none of the walls are ranked "Unreasonable".

2. *Build Noise Level*
   Referring to Table 5-1 (above), the predicted design-year loudest hour noise levels at the front row of receivers in the four impacted regions range from 72 to 77 dBA. All of these level rank as "Extremely Reasonable" according to CDOT criteria.

3. *Impacted Persons Desires*
   No specific survey of resident's desires was conducted as part of this project. However, a noise-specific public meeting was conducted, was well attended, and an overwhelming majority of attendees were in favor of the proposed walls. Secondly, this area was on CDOT's Type II barrier list, and has long been known as a site for walls. Finally, CDOT has received numerous complaints and comments over the years regarding noise from the residents of this area. For the purposes of this analysis, it is assumed that at least 50% of area residents approve of the wall, which ranks as "Reasonable" according to CDOT criteria.

4. *Development Type*
   The development behind the proposed noise walls is over 75% residential, which ranks as "Extremely Reasonable" according to CDOT criteria.

5. *Development Existence*
   More than 75% of the residences located behind the proposed noise walls is at least 15 years old, which ranks as "Extremely Reasonable" according to CDOT criteria.

6. *Build Noise Level Versus Existing Noise Level*
   Referring to Table 5-1 (above), the predicted increases in noise levels between existing and design-year conditions range from 0 to 7 dBA. Zero dBA ranks as "Marginally Reasonable" according to CDOT criteria, and 7 dBA ranks as "Reasonable".

7. *Special Consideration for Severe Impacts*
   Special consideration is given to residences where predicted noise levels exceed 75 dBA, and where other abatement measures are not feasible or reasonable. While predicted noise levels on this project do exceed 75 dBA, other abatement measures (walls) are feasible and reasonable. Therefore, special consideration for mitigation is not applicable on this project.

8. *Special Consideration for Non-Profits*
   Special consideration is given to schools, churches, etc. on a case by case basis. There are no such receivers located within the project study area.

TABLE 6-1: AVERAGE PROJECT AND MITIGATION NOISE LEVELS

Area	Row	Project Average (dBA)	Mitigated Project Average (dBA)	Average Decrease (dBA)
Northeast	1st	70	63	7
	2nd	64	59	5
	3+	57	54	2
Southeast	1st	73	63	10
	2nd	64	57	7
	3+	64	57	7
Northwest	1st	77	66	11
	2nd	71	60	11
	3+	61	54	7
Southwest	1st	77	66	12
	2nd	72	60	12
	3+	61	55	6

TABLE 6-2: PROJECT COST BENEFIT ANALYSIS BY SECTION

Location	Area (sqft)	Cost Per Sqft	# of Benefited Receptors	Avg. Noise Reduction At Benefited Receptors (dBA)	Cost Benefit
Northeast	23053	$30	29	6	$3,820.94
Southeast	25305	$30	76	8	$1,180.45
Northwest	62925	$30	151	8	$1,566.60
Southwest	73800	$30	125	8	$2,214.00

7.0 NO ACTION ALTERNATIVE

Traffic noise is loudest when there is a significant amount of traffic traveling at relatively high speeds. This is referred to as Level-of-Service C (LOS C) conditions. When more traffic is added to the flow, noise levels will increase as long as there is no decrease in speed. At some point, the capacity of the highway will be exceeded, resulting in a decrease in speeds and noise levels. Therefore, the loudest hour occurs just before and just after periods of congestion.

Loudest hour noise levels along US 6 and Wadsworth will not change appreciably between existing and 2035 No-Action conditions, because the highway is already at capacity during at least part of the typical day and because the No Action alternative adds no additional capacity to either roadway.

As the No Action Alternative does not include any construction, no noise mitigation will be provided under this Alternative.

8.0 CONSTRUCTION NOISE IMPACTS

Construction for the build alternatives will generate noise from diesel-powered earth moving equipment such as dump trucks and bulldozers, back-up alarms on certain equipment, compressors, and pile drivers (near bridge abutments and retaining walls, if necessary). Construction noise at off-site receptor locations will usually be dependent on the loudest one or two pieces of equipment operating at the moment. Noise levels from diesel-powered equipment range from 80 to 95 dB(A) at a distance of 50 feet. Impact equipment such as rock drills and pile drivers can generate louder noise levels. Construction noise impacts, while temporary, can be mitigated by limiting work to daylight hours and requiring the contractor to use well-maintained equipment (particularly with respect to mufflers).

ATTACHMENT A

Relevant Noise Terminology

A-Weighted Sound (dBA) - A-weighting network was developed and is applied to either measured or predicted noise levels to mimic the ear's varying sensitivity to frequency. Resulting noise levels are expressed in dBA. Table A-1 shows the A-weighted noise levels of some common noise sources.

TABLE A-1 – TYPICAL NOISE LEVELS

Noise Source	Noise Level (dBA)
Amplified rock band	115 – 120
Commercial jet takeoff at 200 feet	105 – 115
Community warning siren at 100 feet	95 – 105
Busy urban street	85 – 95
Construction equipment at 50 feet	75 – 85
Freeway traffic at 50 feet	65 – 75
Normal conversation at 6 feet	55 – 65
Typical office interior	45 – 55
Soft radio music	35 – 45
Typical residential interior	25 – 35
Typical whisper at 6 feet	15 – 25
Human breathing	5 – 15
Threshold of hearing	0 – 5

Decibel (dB) – A decibel is one-tenth of a Bel. For sound pressure levels, it is a measure on a logarithmic scale, which indicates the squared ratio of sound pressure to a reference sound pressure.

Equivalent Sound Level (L_{eq}) - The equivalent steady state sound level which in a stated period of time would contain the same acoustical energy as the time-varying sound level during the same period. The time period used for highway noise analysis is one hour. All noise levels described in this report are hourly, A-weighted L_{eq}'s.

Frequency (f) - The number of oscillations per second of a periodic wave sound expressed in units of Hertz (Hz). The value is the reciprocal (1/x) of the period of oscillations in seconds. The human ear is, in general, capable of detecting frequencies between 20 to 20,000 Hertz. The human ear is more sensitive to high frequency sounds than to low frequency sounds.

Noise – Unwanted sound, usually loud or unexpected.

Noise Receptors - Areas in which people are typically located, which include places such as residences, hotels, commercial buildings, parks, etc. Usually, one noise receptor location is used to analyze an area unless the area is quite large and covers various distances from the roadway. The noise receptor is typically located on the façade of a structure that faces the noise source or roadway.

Pascal (Pa) – A unit of pressure (in acoustics, normally RMS sound pressure) equal to one Newton per square meter (N/m2). A reference pressure for a sound pressure level of 0 dB is 20 μPa (20 micro Pascal).

Sound – Caused by pressure fluctuations in the air. The range of sound pressures, which the human ear is capable of detecting, is very large (0.00002 to 200 Pascals). To facilitate easier discussion, sound pressures are described on a decibel (dB) scale.

Sound Absorption – This typically occurs when sound is converted to heat or another form of energy. A common sound absorptive material is fiberglass insulation.

Sound Pressure Level (SPL) – Sound pressure level in dB is equal to $10Log_{10}(p^2/p_o^2)$ where p is the instantaneous sound pressure and p_o is the reference sound pressure of 0.00002 Pa. This results in a scale of 0 dB (threshold of audibility) to 120 dB (threshold of pain).

Sound Reflection – The reflection of sound occurs when an object is able to significantly increase the impedance when compared to the surrounding air. This would require an object to be non-porous and to have enough density, stiffness and thickness.

Sound Transmission Loss (STL or TL) – The conversion of sound energy to another form of energy (usually heat) from one side of a barrier to the other.

ATTACHMENT B

TNM Input Data

TNM Default Parameters

TNM's built-in Reference Energy Mean Emission Levels (REMELs) were used on this project. Also, the standard temperature and relative humidity settings were used. "Lawn" was used as the default terrain type in all models. This is the most commonly used ground type in TNM, as it best matches the typical condition.

Traffic Volumes and Speeds

The traffic volumes used in the noise analysis were provided by CH2M Hill, and consisted of 1,700 vehicles per lane per hour (vplph) on US 6, 1,100 vphph on Wadsworth Boulevard, and 1,600 vplph on all ramps and frontage roads. Vehicle classifications of 93% automobiles, 5% medium trucks, and 2% heavy trucks were used in the model, and these were also provided by CH2M Hill. These volumes represent the loudest hour condition, as they are the greatest volumes these roads can carry before the onset of congestion slowing. These volumes were used for both existing and Preferred Alternative conditions. The speeds used in the model are also listed in Table B-1.

TABLE B-1 – TRAFFIC VOLUMES AND SPEEDS USED TO PREDICT NOISE LEVELS

Roadway	Automobiles (vehicles per hour)	Medium Trucks (vehicles per hour)	Heavy Trucks (vehicles per hour)	Speed (miles per hour)
US 6 (each direction)	4,938	266	106	60
Wadsworth Blvd. North of 6th Ave (each direction)	3,069	165	66	35
Wadsworth Blvd. South of 6th Ave (each direction)	2,046	110	44	35
Northwest Frontage (both directions)	419	23	9	35
Northeast Frontage (both directions)	577	31	12	35
Southwest Frontage (both directions)	446	24	10	35
Southeast Frontage (both directions)	809	44	17	35
Ramps	744	40	16	45
Loops and Turns	372	20	8	35

Location of Roadways

The centerline of each direction of travel on US 6 and Wadsworth Boulevard was modeled as a TNM Roadway element. In addition, the US 6 frontage roads and all ramps were modeled as Roadway elements. The location of existing roadways was determined from scaled aerial photographs. Elevation data was taken from 2-foot contours provided electronically (CAD) by CH2M Hill. The location and elevation of design-year roadways was taken from digital design files provided by CH2M Hill.

Location of Receptors

Noise levels were predicted at over 100 receptor locations, which were selected as representative of each Category B and C land use located within the project study area. The location of receptors was determined using scaled aerial photographs, and their elevations were determined using contour maps (2-foot increments). Table B-2 lists the number of living units associated with the multi-tenant residential buildings located in the southeast and northeast quadrants of the interchange.

TABLE B-1: MULTI-UNIT RESIDENCES

Receptor	# units
RSE6	4
RSE6a	4
RSE11	6
RSE12	6
RSE13	10
RSE18	6
RSE19	14
RSE20	14
RNE7	3
RNE7a	3
RNE19	2

Location of Terrain Features and Structures

Existing terrain features such as embankments, the edge of the highway itself, and structures can act as barriers that reduce noise propagation. On this project the following were modeled as fixed-height barriers in TNM: the existing noise walls on the east side of the interchange, all commercial buildings, each individual residence located in the three rows of homes closest to US 6 and Wadsworth. Their locations were obtained from scaled aerial photographs, and elevations were obtained from CAD files.

ATTACHMENT C

Existing and Project Noise Levels at Individual Locations

TABLE C-1: EXISTING VS. PROJECT NOISE LEVELS - NORTH

Receptor	Existing	Project	Increase
RN1	60	62	2
RN2	57	58	1
RN3	55	57	2
RN4	58	60	2
RN5	54	55	1
RN6	58	60	2
RN7	53	55	2
RN8	58	60	2
RN9	53	56	3
RN10	59	61	2
RN11	57	59	2
RN12	54	55	1
RN13	57	59	2
RN14	53	55	2
RN15	62	65	3
RN16	51	53	2
RN17	59	61	2
RN18	57	59	2
RN19	51	51	0
RN20	60	62	2
RN21	57	59	2
RN22	59	61	2
RN23	57	59	2
RN24	58	60	2
RN25	58	60	2
RN26	58	59	1
RN27	57	58	1
RN28	57	57	0
RN29	56	56	0
RN30	57	58	1
RN31	55	55	0
RN32	60	63	3
RN33	55	57	2
RN34	53	56	3
RN35	65	68	3
RN36	56	58	2
RN37	55	57	2
RN38	67	68	1
RN39	56	58	2
RN40	55	56	1

TABLE C-2: EXISTING VS. PROJECT NOISE LEVELS - SOUTHEAST

Receptor	Row	Existing	Project	Increase
RSE6	1st	62	74	12
RSE6a	1st	63	74	11
RSE7	1st	68	77	9
RSE8	1st	69	78	9
RSE9	1st	67	76	9
RSE10	1st	67	75	8
RSE11	1st	70	73	3
RSE12	1st	68	72	4
RSE13	1st	65	72	7
RSE14	2nd	60	71	11
RSE15	2nd	61	71	10
RSE16	2nd	61	70	9
RSE17	2nd	62	68	6
RSE18	2nd	62	66	4
RSE19	2nd	62	63	1
RSE20	2nd	54	63	9
RSE21	2nd	57	65	8
RSE22	3+	58	64	6
RSE23	3+	58	64	6
RSE24	3+	58	63	5

TABLE C-3: EXISTING VS. PROJECT NOISE LEVELS - NORTHEAST

Receptor	Row	Existing	Project	Increase
RNE3	1st	68	74	6
RNE4	1st	67	75	8
RNE5	1st	68	77	9
RNE6	1st	67	77	10
RNE7	1st	68	72	4
RNE7a	1st	63	65	2
RNE8	1st	66	66	0
RNE9	1st	67	64	-3
RNE12	2nd	68	65	-3
RNE13	2nd	67	66	-1
RNE14	2nd	66	66	0
RNE15	2nd	61	66	5
RNE16	2nd	60	66	6
RNE17	2nd	60	68	8
RNE18	2nd	60	69	9
RNE19	2nd	58	57	-1
RNE20	2nd	62	61	-1
RNE21	2nd	61	60	-1
RNE23	3+	63	65	2
RNE24	3+	61	60	-1
RNE25	3+	59	61	2
RNE26	3+	57	60	3
RNE27	3+	57	61	4
RNE28	3+	56	64	8
RNE29	3+	57	61	4
RNE30	3+	56	60	4
RNE31	3+	58	58	0
RNE33	3+	61	64	3
RNE34	3+	58	58	0
RNE36	3+	60	64	4
RNE37	3+	57	58	1
RNE38	3+	61	65	4
RNE39	3+	56	57	1
RNE41	3+	56	58	2
RNE42	3+	67	69	2
RNE43	3+	60	63	3
RNE44	3+	58	60	2
RNE45	3+	--	56	--
RNE46	3+	--	56	--
RNE47	3+	--	55	--
RNE48	3+	--	55	--
RNE49	3+	--	57	--

TABLE C-3: EXISTING VS. PROJECT NOISE LEVELS – NORTHEAST (CONT.)

Receptor	Row	Existing	Project	Increase
RNE50	3+	--	56	--
RNE51	3+	--	56	--
RNE52	3+	--	56	--
RNE53	3+	--	55	--
RNE54	3+	--	56	--
RNE55	3+	--	55	--
RNE56	3+	--	56	--
RNE57	3+	--	55	--
RNE58	3+	--	55	--
RNE59	3+	--	55	--
RNE60	3+	--	55	--
RNE61	3+	--	55	--
RNE62	3+	--	54	--
RNE63	3+	--	55	--
RNE64	3+	--	54	--
RNE65	3+	--	54	--
RNE66	3+	--	54	--
RNE67	3+	--	54	--
RNE68	3+	--	54	--
RNE69	3+	--	53	--
RNE70	3+	--	55	--
RNE71	3+	--	55	--
RNE72	3+	--	54	--
RNE73	3+	--	54	--
RNE74	3+	--	53	--
RNE75	3+	--	53	--
RNE76	3+	--	53	--
RNE77	3+	--	58	--
RNE78	3+	--	57	--
RNE79	3+	--	56	--
RNE80	3+	--	55	--
RNE81	3+	--	54	--
RNE82	3+	--	54	--
RNE83	3+	--	54	--
RNE84	3+	--	53	--
RNE85	3+	--	53	--
RNE86	3+	--	53	--
RNE87	3+	--	52	--
RNE88	3+	--	52	--

Note: The existing conditions for receptors RNE45 through RNE88 were not modeled. These receptors were only modeled for the mitigation analysis.

TABLE C-4: EXISTING VS. PROJECT NOISE LEVELS – SOUTHWEST

Receptor	Row	Existing	Project	Increase
RSW1	1st	77	78	1
RSW2	1st	76	77	1
RSW3	1st	76	76	0
RSW4	1st	76	77	1
RSW5	1st	76	77	1
RSW6	1st	77	78	1
RSW7	1st	75	75	0
RSW8	1st	78	78	0
RSW9	1st	77	78	1
RSW10	1st	77	77	0
RSW11	1st	78	78	0
RSW12	1st	76	76	0
RSW13	1st	77	77	0
RSW14	1st	77	77	0
RSW15	1st	78	78	0
RSW16	1st	77	77	0
RSW17	1st	78	78	0
RSW18	1st	78	78	0
RSW19	1st	78	78	0
RSW20	1st	78	78	0
RSW21	1st	78	78	0
RSW22	1st	78	78	0
RSW23	1st	77	78	1
RSW24	2nd	72	72	0
RSW25	2nd	73	73	0
RSW26	2nd	72	72	0
RSW27	2nd	71	71	0
RSW28	2nd	71	71	0
RSW29	2nd	73	73	0
RSW30	2nd	70	70	0
RSW31	2nd	73	73	0
RSW32	2nd	72	72	0
RSW33	2nd	72	72	0
RSW34	3+	68	68	0
RSW35	3+	69	69	0
RSW36	3+	68	68	0
RSW37	3+	68	68	0
RSW38	3+	68	68	0
RSW39	3+	67	67	0
RSW40	3+	69	69	0
RSW41	3+	68	68	0
RSW42	3+	69	69	0

TABLE C-4: EXISTING VS. PROJECT NOISE LEVELS – SOUTHWEST (CONT.)

Receptor	Row	Existing	Project	Increase
RSW43	3+	68	68	0
RSW44	3+	67	66	-1
RSW45	3+	65	65	0
RSW46	3+	64	64	0
RSW47	3+	64	64	0
RSW48	3+	62	62	0
RSW49	3+	64	64	0
RSW50	3+	63	63	0
RSW51	3+	63	63	0
RSW52	3+	65	65	0
RSW53	3+	64	65	1
RSW54	3+	63	63	0
RSW55	3+	65	65	0
RSW56	3+	67	67	0
RSW57	3+	65	64	-1
RSW58	3+	63	62	-1
RSW59	3+	65	65	0
RSW60	3+	66	66	0
RSW61	3+	65	65	0
RSW62	3+	64	64	0
RSW63	3+	65	65	0
RSW64	3+	65	64	-1
RSW65	3+	64	63	-1
RSW66	3+	66	66	0
RSW67	3+	64	64	0
RSW68	3+	61	60	-1
RSW69	3+	61	61	0
RSW70	3+	61	61	0
RSW71	3+	61	61	0
RSW72	3+	60	60	0
RSW73	3+	63	63	0
RSW74	3+	59	59	0
RSW75	3+	62	62	0
RSW76	3+	59	59	0
RSW77	3+	64	62	-2
RSW78	3+	64	62	-2
RSW79	3+	63	63	0
RSW80	3+	61	61	0
RSW81	3+	58	58	0
RSW82	3+	60	60	0
RSW83	3+	58	58	0

TABLE C-4: EXISTING VS. PROJECT NOISE LEVELS – SOUTHWEST (CONT.)

Receptor	Row	Existing	Project	Increase
RSW84	3+	57	57	0
RSW85	3+	57	57	0
RSW86	3+	60	60	0
RSW87	3+	61	62	1
RSW88	3+	62	63	1
RSW89	3+	63	64	1
RSW90	3+	61	62	1
RSW91	3+	61	61	0
RSW92	3+	62	61	-1
RSW93	3+	60	60	0
RSW94	3+	61	60	-1
RSW95	3+	61	60	-1
RSW96	3+	59	59	0
RSW97	3+	59	60	1
RSW98	3+	61	62	1
RSW99	3+	60	59	-1
RSW100	3+	60	60	0
RSW101	3+	60	60	0
RSW102	3+	59	58	-1
RSW103	3+	56	56	0
RSW104	3+	59	59	0
RSW105	3+	58	58	0
RSW106	3+	59	59	0
RSW107	3+	57	57	0
RSW108	3+	59	60	1
RSW109	3+	57	57	0
RSW110	3+	56	57	1
RSW111	3+	62	62	0
RSW112	3+	59	59	0
RSW113	3+	57	58	1
RSW114	3+	--	55	--
RSW115	3+	--	55	--
RSW116	3+	--	56	--
RSW117	3+	--	58	--
RSW118	3+	--	57	--
RSW119	3+	--	56	--
RSW120	3+	--	58	--
RSW121	3+	--	57	--
RSW122	3+	--	57	--
RSW123	3+	--	58	--
RSW124	3+	--	58	--
RSW125	3+	--	61	--

TABLE C-4: EXISTING VS. PROJECT NOISE LEVELS – SOUTHWEST (CONT.)

Receptor	Row	Existing	Project	Increase
RSW126	3+	--	58	--
RSW127	3+	--	58	--
RSW128	3+	--	59	--
RSW129	3+	--	55	--
RSW130	3+	--	55	--
RSW131	3+	--	57	--
RSW132	3+	--	57	--
RSW133	3+	--	57	--
RSW134	3+	--	57	--
RSW135	3+	--	59	--
RSW136	3+	--	59	--

Note: The existing conditions for receptors RSW114 through RSW136 were not modeled. These receptors were only modeled for the mitigation analysis.

TABLE C-5: EXISTING VS. PROJECT NOISE LEVELS - NORTHWEST

Receptor	Row	Existing	Project	Increase
RNW1	1st	79	79	0
RNW2	1st	74	75	1
RNW3	1st	76	76	0
RNW4	1st	77	77	0
RNW5	1st	76	77	1
RNW6	1st	77	77	0
RNW7	1st	77	77	0
RNW8	1st	77	77	0
RNW9	1st	78	78	0
RNW10	1st	73	73	0
RNW11	1st	77	77	0
RNW12	1st	77	77	0
RNW13	1st	77	77	0
RNW14	1st	77	77	0
RNW15	1st	77	77	0
RNW16	1st	77	77	0
RNW17	1st	78	78	0
RNW18	1st	77	77	0
RNW19	1st	77	77	0
RNW20	1st	77	77	0
RNW21	1st	77	77	0
RNW22	1st	76	76	0
RNW23	2nd	69	69	0
RNW24	2nd	68	68	0
RNW25	2nd	70	71	1
RNW26	2nd	72	72	0
RNW27	2nd	70	70	0
RNW28	2nd	71	71	0
RNW29	2nd	71	71	0
RNW30	2nd	74	73	-1
RNW31	2nd	73	72	-1
RNW32	2nd	72	72	0
RNW33	2nd	72	72	0
RNW34	2nd	71	71	0
RNW35	2nd	72	72	0
RNW36	2nd	72	72	0
RNW37	2nd	72	72	0
RNW38	2nd	72	72	0
RNW39	2nd	72	72	0
RNW40	2nd	73	73	0
RNW41	2nd	73	73	0
RNW42	3+	65	65	0

TABLE C-5: EXISTING VS. PROJECT NOISE LEVELS – NORTHWEST (CONT.)

Receptor	Row	Existing	Project	Increase
RNW43	3+	63	64	1
RNW44	3+	64	64	0
RNW45	3+	65	65	0
RNW46	3+	68	68	0
RNW47	3+	67	67	0
RNW48	3+	66	66	0
RNW49	3+	67	67	0
RNW50	3+	66	67	1
RNW51	3+	64	64	0
RNW52	3+	62	62	0
RNW53	3+	66	66	0
RNW54	3+	65	65	0
RNW55	3+	68	67	-1
RNW56	3+	68	68	0
RNW57	3+	68	68	0
RNW58	3+	68	68	0
RNW59	3+	65	65	0
RNW60	3+	67	67	0
RNW61	3+	68	68	0
RNW62	3+	66	66	0
RNW63	3+	69	69	0
RNW64	3+	67	67	0
RNW65	3+	68	68	0
RNW66	3+	68	68	0
RNW67	3+	61	61	0
RNW68	3+	61	61	0
RNW69	3+	58	58	0
RNW70	3+	61	61	0
RNW71	3+	61	61	0
RNW72	3+	58	58	0
RNW73	3+	56	56	0
RNW74	3+	60	60	0
RNW75	3+	62	61	-1
RNW76	3+	62	62	0
RNW77	3+	63	63	0
RNW78	3+	65	65	0
RNW79	3+	66	66	0
RNW80	3+	65	64	-1
RNW81	3+	62	62	0
RNW82	3+	64	64	0
RNW83	3+	64	64	0

TABLE C-5: EXISTING VS. PROJECT NOISE LEVELS – NORTHWEST (CONT.)

Receptor	Row	Existing	Project	Increase
RNW84	3+	64	64	0
RNW85	3+	63	63	0
RNW86	3+	62	62	0
RNW87	3+	64	64	0
RNW88	3+	64	64	0
RNW89	3+	--	59	--
RNW90	3+	--	59	--
RNW91	3+	--	59	--
RNW92	3+	--	59	--
RNW93	3+	--	57	--
RNW94	3+	--	59	--
RNW95	3+	--	58	--
RNW96	3+	--	57	--
RNW97	3+	--	53	--
RNW98	3+	--	57	--
RNW99	3+	--	60	--
RNW100	3+	--	60	--
RNW101	3+	--	61	--
RNW102	3+	--	62	--
RNW103	3+	--	63	--
RNW104	3+	--	62	--
RNW105	3+	--	62	--
RNW106	3+	--	60	--
RNW107	3+	--	62	--
RNW108	3+	--	60	--
RNW109	3+	--	60	--
RNW110	3+	--	61	--
RNW111	3+	--	60	--
RNW112	3+	--	62	--
RNW113	3+	--	56	--
RNW114	3+	--	59	--
RNW115	3+	--	57	--
RNW116	3+	--	56	--
RNW117	3+	--	55	--
RNW118	3+	--	60	--
RNW119	3+	--	59	--
RNW120	3+	--	59	--
RNW121	3+	--	60	--
RNW122	3+	--	58	--
RNW123	3+	--	61	--
RNW124	3+	--	62	--
RNW125	3+	--	61	--

TABLE C-5: EXISTING VS. PROJECT NOISE LEVELS – NORTHWEST (CONT.)

Receptor	Row	Existing	Project	Increase
RNW126	3+	--	60	--
RNW127	3+	--	60	--
RNW128	3+	--	60	--
RNW129	3+	--	60	--
RNW130	3+	--	61	--
RNW131	3+	--	60	--
RNW132	3+	--	57	--
RNW133	3+	--	57	--
RNW134	3+	--	57	--
RNW135	3+	--	56	--
RNW136	3+	--	55	--
RNW137	3+	--	58	--
RNW138	3+	--	59	--
RNW139	3+	--	57	--
RNW140	3+	--	59	--
RNW141	3+	--	60	--
RNW142	3+	--	58	--
RNW143	3+	--	58	--
RNW144	3+	--	58	--
RNW145	3+	--	59	--
RNW146	3+	--	58	--
RNW147	3+	--	58	--
RNW148	3+	--	58	--
RNW149	3+	--	58	--
RNW150	3+	--	58	--
RNW151	3+	--	57	--
RNW152	3+	--	57	--
RNW153	3+	--	60	--
RNW154	3+	--	59	--

Note: The existing conditions for receptors RNW89 through RSW154 were not modeled. These receptors were only modeled for the mitigation analysis.

ATTACHMENT D

Noise Level Reductions From Proposed Walls at Individual Locations

TABLE D-1: PROJECT VS. MITIGATION NOISE LEVELS - SOUTHEAST

Receptor	Row	Project	W/Walls	Reduction
RSE6	1st	74	63	11
RSE6a	1st	74	63	11
RSE7	1st	77	67	10
RSE8	1st	78	68	10
RSE9	1st	76	65	11
RSE10	1st	75	63	12
RSE11	1st	73	65	8
RSE12	1st	72	63	9
RSE13	1st	72	62	10
RSE14	2nd	71	60	11
RSE15	2nd	71	60	11
RSE16	2nd	70	60	10
RSE17	2nd	68	60	8
RSE18	2nd	66	59	7
RSE19	2nd	63	58	5
RSE20	2nd	63	54	9
RSE21	2nd	65	56	9
RSE22	3+	64	57	7
RSE23	3+	64	57	7
RSE24	3+	63	57	6

TABLE D-2: PROJECT VS. MITIGATION NOISE LEVELS - NORTHEAST

Receptor	Row	Project	W/Walls	Reduction
RNE3	1st	74	62	12
RNE4	1st	75	66	9
RNE5	1st	77	66	11
RNE6	1st	77	66	11
RNE7	1st	72	64	8
RNE7a	1st	65	60	5
RNE8	1st	66	62	4
RNE9	1st	64	62	2
RNE12	2nd	65	61	4
RNE13	2nd	66	61	5
RNE14	2nd	66	61	5
RNE15	2nd	66	60	6
RNE16	2nd	66	60	6
RNE17	2nd	68	59	9
RNE18	2nd	69	59	10
RNE19	2nd	57	56	1
RNE20	2nd	61	60	1
RNE21	2nd	60	59	1
RNE23	3+	65	62	3
RNE24	3+	60	57	3
RNE25	3+	61	57	4
RNE26	3+	60	57	3
RNE27	3+	61	56	5
RNE28	3+	64	56	8
RNE29	3+	61	56	5
RNE30	3+	60	55	5
RNE31	3+	58	57	1
RNE33	3+	64	60	4
RNE34	3+	58	56	2
RNE36	3+	64	60	4
RNE37	3+	58	55	3
RNE38	3+	65	60	5
RNE39	3+	57	56	1
RNE41	3+	58	56	2
RNE42	3+	69	65	4
RNE43	3+	63	63	0
RNE44	3+	60	59	1
RNE45	3+	56	54	2
RNE46	3+	56	54	2
RNE47	3+	55	53	2
RNE48	3+	55	53	2

TABLE D-2: PROJECT VS. MITIGATION NOISE LEVELS – NORTHEAST (CONT.)

Receptor	Row	Project	W/Walls	Reduction
RNE49	3+	57	54	3
RNE50	3+	56	54	2
RNE51	3+	56	55	1
RNE52	3+	56	54	2
RNE53	3+	55	53	2
RNE54	3+	56	53	3
RNE55	3+	55	53	2
RNE56	3+	56	53	3
RNE57	3+	55	53	2
RNE58	3+	55	54	1
RNE59	3+	55	54	1
RNE60	3+	55	54	1
RNE61	3+	55	53	2
RNE62	3+	54	53	1
RNE63	3+	55	53	2
RNE64	3+	54	53	1
RNE65	3+	54	53	1
RNE66	3+	54	52	2
RNE67	3+	54	52	2
RNE68	3+	54	52	2
RNE69	3+	53	52	1
RNE70	3+	55	54	1
RNE71	3+	55	53	2
RNE72	3+	54	53	1
RNE73	3+	54	52	2
RNE74	3+	53	52	1
RNE75	3+	53	52	1
RNE76	3+	53	52	1
RNE77	3+	58	57	1
RNE78	3+	57	56	1
RNE79	3+	56	55	1
RNE80	3+	55	54	1
RNE81	3+	54	53	1
RNE82	3+	54	53	1
RNE83	3+	54	52	2
RNE84	3+	53	52	1
RNE85	3+	53	51	2
RNE86	3+	53	51	2
RNE87	3+	52	51	1
RNE88	3+	52	51	1

TABLE D-3: PROJECT VS. MITIGATION NOISE LEVELS - SOUTHWEST

Receptor	Row	Project	W/Walls	Reduction
RSW1	1st	78	66	12
RSW2	1st	77	65	12
RSW3	1st	76	64	12
RSW4	1st	77	65	12
RSW5	1st	77	65	12
RSW6	1st	78	66	12
RSW7	1st	75	63	12
RSW8	1st	78	66	12
RSW9	1st	78	66	12
RSW10	1st	77	67	10
RSW11	1st	78	67	11
RSW12	1st	76	64	12
RSW13	1st	77	65	12
RSW14	1st	77	66	11
RSW15	1st	78	66	12
RSW16	1st	77	65	12
RSW17	1st	78	66	12
RSW18	1st	78	66	12
RSW19	1st	78	66	12
RSW20	1st	78	66	12
RSW21	1st	78	66	12
RSW22	1st	78	66	12
RSW23	1st	78	67	11
RSW24	2nd	72	60	12
RSW25	2nd	73	61	12
RSW26	2nd	72	60	12
RSW27	2nd	71	59	12
RSW28	2nd	71	59	12
RSW29	2nd	73	60	13
RSW30	2nd	70	59	11
RSW31	2nd	73	61	12
RSW32	2nd	72	60	12
RSW33	2nd	72	60	12
RSW34	3+	68	58	10
RSW35	3+	69	57	12
RSW36	3+	68	56	12
RSW37	3+	68	57	11
RSW38	3+	68	57	11
RSW39	3+	67	56	11
RSW40	3+	69	58	11
RSW41	3+	68	57	11

TABLE D-3: PROJECT VS. MITIGATION NOISE LEVELS – SOUTHWEST (CONT.)

Receptor	Row	Project	W/Walls	Reduction
RSW42	3+	69	57	12
RSW43	3+	68	56	12
RSW44	3+	66	60	6
RSW45	3+	65	57	8
RSW46	3+	64	55	9
RSW47	3+	64	55	9
RSW48	3+	62	54	8
RSW49	3+	64	54	10
RSW50	3+	63	54	9
RSW51	3+	63	54	9
RSW52	3+	65	55	10
RSW53	3+	65	55	10
RSW54	3+	63	54	9
RSW55	3+	65	61	4
RSW56	3+	67	60	7
RSW57	3+	64	57	7
RSW58	3+	62	56	6
RSW59	3+	65	58	7
RSW60	3+	66	58	8
RSW61	3+	65	57	8
RSW62	3+	64	56	8
RSW63	3+	65	57	8
RSW64	3+	64	57	7
RSW65	3+	63	60	3
RSW66	3+	66	59	7
RSW67	3+	64	57	7
RSW68	3+	60	53	7
RSW69	3+	61	53	8
RSW70	3+	61	53	8
RSW71	3+	61	52	9
RSW72	3+	60	52	8
RSW73	3+	63	54	9
RSW74	3+	59	52	7
RSW75	3+	62	54	8
RSW76	3+	59	55	4
RSW77	3+	62	57	5
RSW78	3+	62	57	5
RSW79	3+	63	59	4
RSW80	3+	61	55	6
RSW81	3+	58	54	4
RSW82	3+	60	52	8

TABLE D-3: PROJECT VS. MITIGATION NOISE LEVELS – SOUTHWEST (CONT.)

Receptor	Row	Project	W/Walls	Reduction
RSW83	3+	58	51	7
RSW84	3+	57	51	6
RSW85	3+	57	51	6
RSW86	3+	60	52	8
RSW87	3+	62	59	3
RSW88	3+	63	60	3
RSW89	3+	64	59	5
RSW90	3+	62	55	7
RSW91	3+	61	55	6
RSW92	3+	61	55	6
RSW93	3+	60	56	4
RSW94	3+	60	57	3
RSW95	3+	60	56	4
RSW96	3+	59	57	2
RSW97	3+	60	58	2
RSW98	3+	62	56	6
RSW99	3+	59	54	5
RSW100	3+	60	54	6
RSW101	3+	60	55	5
RSW102	3+	58	52	6
RSW103	3+	56	54	2
RSW104	3+	59	53	6
RSW105	3+	58	53	5
RSW106	3+	59	58	1
RSW107	3+	57	56	1
RSW108	3+	60	59	1
RSW109	3+	57	57	0
RSW110	3+	57	55	2
RSW111	3+	62	62	0
RSW112	3+	59	59	0
RSW113	3+	58	58	0
RSW114	3+	55	52	3
RSW115	3+	55	52	3
RSW116	3+	56	52	4
RSW117	3+	58	52	6
RSW118	3+	57	52	5
RSW119	3+	56	52	4
RSW120	3+	58	52	6
RSW121	3+	57	53	4
RSW122	3+	57	53	4
RSW123	3+	58	54	4

TABLE D-3: PROJECT VS. MITIGATION NOISE LEVELS – SOUTHWEST (CONT.)

Receptor	Row	Project	W/Walls	Reduction
RSW124	3+	58	53	5
RSW125	3+	61	56	5
RSW126	3+	58	55	3
RSW127	3+	58	52	6
RSW128	3+	59	55	4
RSW129	3+	55	51	4
RSW130	3+	55	51	4
RSW131	3+	57	51	6
RSW132	3+	57	51	6
RSW133	3+	57	51	6
RSW134	3+	57	52	5
RSW135	3+	59	55	4
RSW136	3+	59	55	4

TABLE D-4: PROJECT VS. MITIGATION NOISE LEVELS - NORTHWEST

Receptor	Row	Project	W/Walls	Reduction
RNW1	1st	79	68	11
RNW2	1st	75	62	13
RNW3	1st	76	65	11
RNW4	1st	77	65	12
RNW5	1st	77	65	12
RNW6	1st	77	68	9
RNW7	1st	77	74	3
RNW8	1st	77	72	5
RNW9	1st	78	69	9
RNW10	1st	73	61	12
RNW11	1st	77	66	11
RNW12	1st	77	66	11
RNW13	1st	77	66	11
RNW14	1st	77	66	11
RNW15	1st	77	65	12
RNW16	1st	77	65	12
RNW17	1st	78	65	13
RNW18	1st	77	64	13
RNW19	1st	77	65	12
RNW20	1st	77	64	13
RNW21	1st	77	65	12
RNW22	1st	76	66	10
RNW23	2nd	69	58	11
RNW24	2nd	68	58	10
RNW25	2nd	71	59	12
RNW26	2nd	72	60	12
RNW27	2nd	70	65	5
RNW28	2nd	71	61	10
RNW29	2nd	71	59	12
RNW30	2nd	73	61	12
RNW31	2nd	72	60	12
RNW32	2nd	72	61	11
RNW33	2nd	72	60	12
RNW34	2nd	71	59	12
RNW35	2nd	72	60	12
RNW36	2nd	72	60	12
RNW37	2nd	72	59	13
RNW38	2nd	72	60	12
RNW39	2nd	72	60	12
RNW40	2nd	73	62	11
RNW41	2nd	73	63	10

TABLE D-4: PROJECT VS. MITIGATION NOISE LEVELS – NORTHWEST (CONT.)

Receptor	Row	Project	W/Walls	Reduction
RNW42	3+	65	57	8
RNW43	3+	64	56	8
RNW44	3+	64	55	9
RNW45	3+	65	57	8
RNW46	3+	68	60	8
RNW47	3+	67	62	5
RNW48	3+	66	62	4
RNW49	3+	67	61	6
RNW50	3+	67	63	4
RNW51	3+	64	59	5
RNW52	3+	62	58	4
RNW53	3+	66	57	9
RNW54	3+	65	56	9
RNW55	3+	67	57	10
RNW56	3+	68	57	11
RNW57	3+	68	57	11
RNW58	3+	68	58	10
RNW59	3+	65	56	9
RNW60	3+	67	56	11
RNW61	3+	68	57	11
RNW62	3+	66	56	10
RNW63	3+	69	58	11
RNW64	3+	67	57	10
RNW65	3+	68	59	9
RNW66	3+	68	58	10
RNW67	3+	61	55	6
RNW68	3+	61	54	7
RNW69	3+	58	53	5
RNW70	3+	61	55	6
RNW71	3+	61	56	5
RNW72	3+	58	55	3
RNW73	3+	56	53	3
RNW74	3+	60	56	4
RNW75	3+	61	54	7
RNW76	3+	62	54	8
RNW77	3+	63	55	8
RNW78	3+	65	56	9
RNW79	3+	66	56	10
RNW80	3+	64	55	9
RNW81	3+	62	54	8
RNW82	3+	64	55	9

TABLE D-4: PROJECT VS. MITIGATION NOISE LEVELS – NORTHWEST (CONT.)

Receptor	Row	Project	W/Walls	Reduction
RNW83	3+	64	55	9
RNW84	3+	64	55	9
RNW85	3+	63	54	9
RNW86	3+	62	54	8
RNW87	3+	64	55	9
RNW88	3+	64	55	9
RNW89	3+	59	54	5
RNW90	3+	59	54	5
RNW91	3+	59	54	5
RNW92	3+	59	54	5
RNW93	3+	57	53	4
RNW94	3+	59	54	5
RNW95	3+	58	55	3
RNW96	3+	57	53	4
RNW97	3+	53	51	2
RNW98	3+	57	54	3
RNW99	3+	60	53	7
RNW100	3+	60	53	7
RNW101	3+	61	53	8
RNW102	3+	62	54	8
RNW103	3+	63	54	9
RNW104	3+	62	53	9
RNW105	3+	62	54	8
RNW106	3+	60	53	7
RNW107	3+	62	53	9
RNW108	3+	60	53	7
RNW109	3+	60	53	7
RNW110	3+	61	53	8
RNW111	3+	60	53	7
RNW112	3+	62	53	9
RNW113	3+	56	53	3
RNW114	3+	59	54	5
RNW115	3+	57	53	4
RNW116	3+	56	53	3
RNW117	3+	55	53	2
RNW118	3+	60	59	1
RNW119	3+	59	55	4
RNW120	3+	59	53	6
RNW121	3+	60	53	7
RNW122	3+	58	53	5
RNW123	3+	61	53	8

TABLE D-4: PROJECT VS. MITIGATION NOISE LEVELS – NORTHWEST (CONT.)

Receptor	Row	Project	W/Walls	Reduction
RNW124	3+	62	54	8
RNW125	3+	61	53	8
RNW126	3+	60	53	7
RNW127	3+	60	53	7
RNW128	3+	60	53	7
RNW129	3+	60	53	7
RNW130	3+	61	53	8
RNW131	3+	60	52	8
RNW132	3+	57	53	4
RNW133	3+	57	53	4
RNW134	3+	57	53	4
RNW135	3+	56	52	4
RNW136	3+	55	52	3
RNW137	3+	58	52	6
RNW138	3+	59	52	7
RNW139	3+	57	52	5
RNW140	3+	59	52	7
RNW141	3+	60	52	8
RNW142	3+	58	52	6
RNW143	3+	58	51	7
RNW144	3+	58	51	7
RNW145	3+	59	52	7
RNW146	3+	58	51	7
RNW147	3+	58	52	6
RNW148	3+	58	52	6
RNW149	3+	58	51	7
RNW150	3+	58	51	7
RNW151	3+	57	51	6
RNW152	3+	57	52	5
RNW153	3+	60	56	4
RNW154	3+	59	56	3