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LEWITZ, INC.
Acoustical and Audiovisual Consultants

ENVIRONMENTAL NOISE STUDY FOR:

US 6/19th Street Interchange – Lookout Lid

Golden, CO

RGDL Project #: 14-043

PREPARED FOR:

City of Golden
1445 10th Street
Golden, CO 80401

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1.0 Introduction

The scope of the Lookout Lid project is to create a grade-separated intersection at 19th Street and US 6, as shown in Figures 1a and 1b. This grade separation includes the creation of an extended lid that will be used to separate pedestrian and bike traffic from the vehicular component of the intersection. This Noise Study assesses the existing and future noise levels with respect to the noise abatement criteria of the Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA).

1.1. Project Description

The Proposed Action would create a grade-separated, unsignalized interchange at US 6 and 19th Street. The proposed improvements would include:

- US 6 would be lowered approximately 22 feet on its current alignment, under 19th Street, allowing 19th Street to remain at existing grade. Ramps would be constructed to allow traffic to access 19th Street from US 6.
- An extended lid (bridge structure) would be constructed over US 6 that would separate pedestrian and bicycle traffic from vehicle traffic on US 6. The new at-grade crossings to the north side of 19th Street would have lower volume ramps, thereby improving safety at the intersection for pedestrian, bicycle, and motor vehicle users.
- The extended lid would also include landscaping, trails, and design for potential park amenities. The 6th Avenue Trail, which runs parallel to and north of US 6, would be realigned both vertically and horizontally to integrate with the proposed grade separation. A spur of the regional trail would be added to provide access to the existing sidewalk along the south side of 19th Street.
- The proposed improvements to 19th Street include a reconfigured intersection on top of the lid to provide unimpeded travel for the westbound traffic to the southbound US 6 lanes. The existing footprint of 19th Street east of US 6 would not change except for the addition of a roundabout at Elm Street.

The roundabout at the intersection of 19th Street and Elm Street (one block east of US 6) would improve pedestrian safety, further improve traffic operations at the Elm Street intersection, and provide access from eastbound 19th Street to northbound US 6. The proposed roundabout configuration would include:

- Two eastbound traffic lanes to accommodate left-turning traffic into the CSM campus and through traffic heading into the City.
- One westbound traffic lane with a hardscape truck apron in the center to accommodate larger vehicles.
- A pedestrian crossing of 19th Street east of the roundabout.

Specific proposed improvements to US 6 would include:

- A cross-section of US 6 with an 18-foot-wide raised landscaped median north of the intersection, a 32-foot-wide raised landscaped median south of the intersection, and a concrete barrier adjacent to the bridge piers under the 300-foot extended lid.
- Two 12-foot-wide lanes with 10-foot outside shoulders and variable width inside shoulders in each direction underneath the structure/lid.
- Retaining walls for the lid structure placed to accommodate a third future 12-foot travel lane in both directions on US 6 (to be constructed as necessary, based on future traffic volumes).

Figure 1a: Project Site Plan

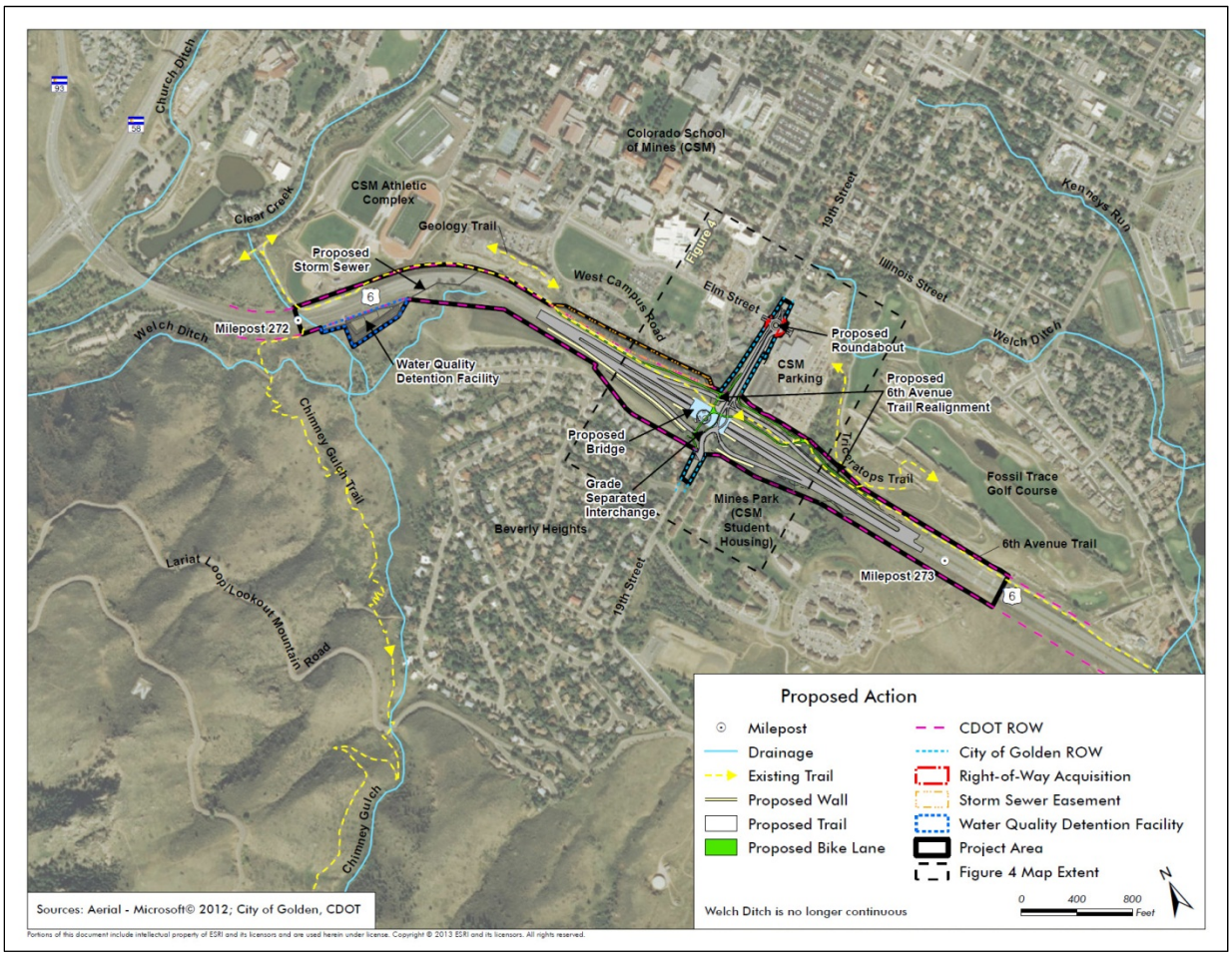
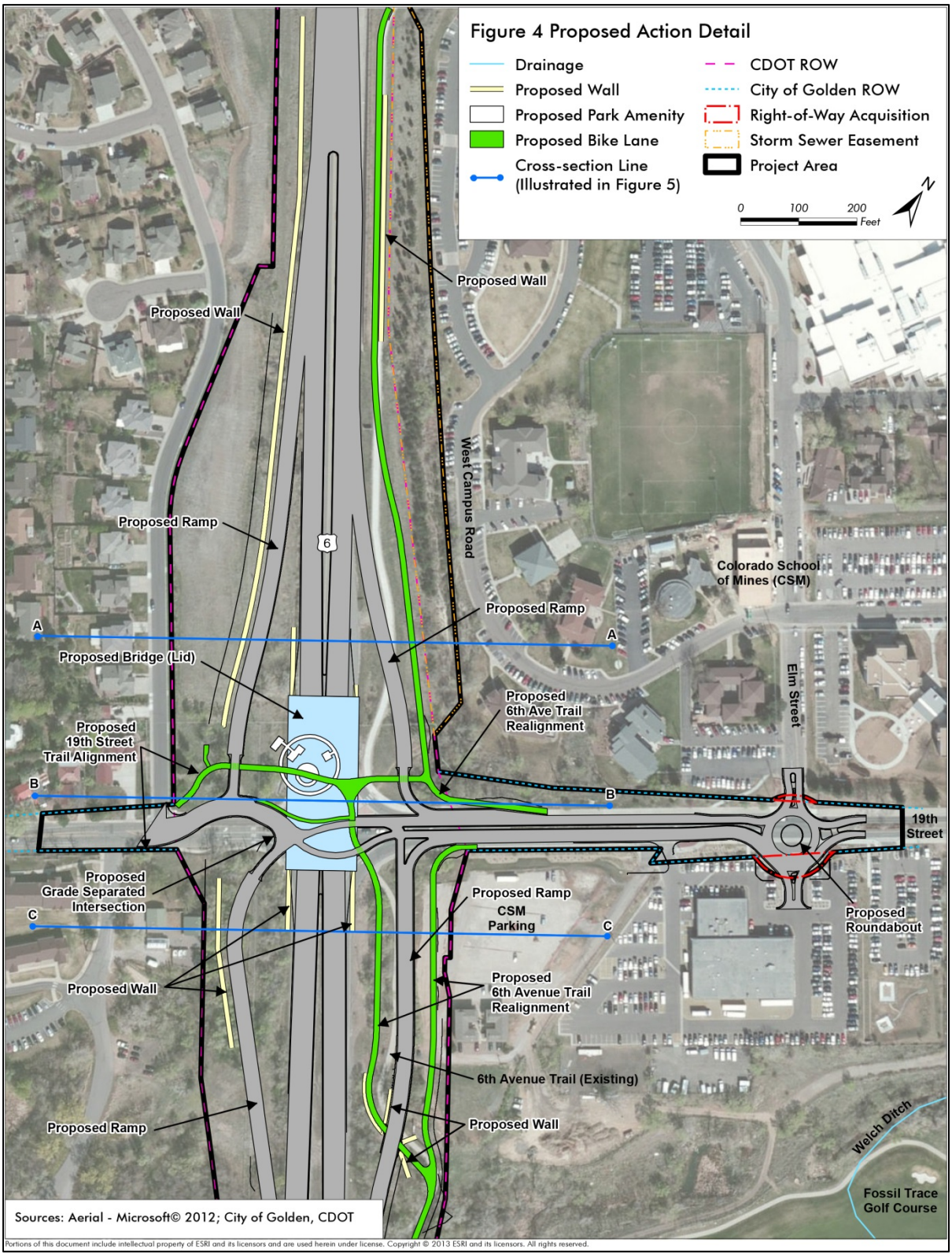


Figure 1b: Project Site Plan



1.2. Environmental Noise Fundamentals

Noise can be defined as unwanted sound. It is commonly measured with an instrument called a sound level meter. The sound level meter captures the sound with a microphone and converts it into a number called a sound level. Sound levels are expressed in units of decibels. To correlate the microphone signal to a level that corresponds to the way humans perceive noise, the A-weighting filter is used. A-weighting de-emphasizes low-frequency and very high-frequency sound in a manner similar to human hearing. The use of A-weighting is required by most local General Plans as well as federal and state noise regulations (e.g. CDOT, FHWA, EPA, OSHA and HUD). The abbreviation dBA is sometimes used when the A-weighted sound level is reported.

Because of the time-varying nature of environmental sound, there are many descriptors that are used to quantify the sound level. Although one individual descriptor alone does not fully describe a particular noise environment, taken together, they can more accurately represent the noise environment. The maximum instantaneous noise level (L_{max}) is often used to identify the loudness of a single event such as a car passby or airplane flyover. To express the average noise level the L_{eq} (equivalent noise level) is used. The L_{eq} can be measured over any length of time but is typically reported for periods of 15 minutes to 1 hour. The background noise level (or residual noise level) is the sound level during the quietest moments. It is usually generated by steady sources such as distant freeway traffic. It can be quantified with a descriptor called the L_{90} which is the sound level exceeded 90 percent of the time.

In environmental noise, a change in noise level of 3 dB is considered a just noticeable difference. A 5 dB change is clearly noticeable, but not dramatic. A 10 dB change is perceived as a halving or doubling in loudness. Table 1 presents typical noise levels in the environment.

Table 1: Typical Noise Levels

Noise Source	Noise Level (dBA)
Commercial Jet	110-120
Shouting at 5 feet	95-105
Heavy Truck/Motorcycle at 25 feet	85-95
Freeway Traffic at 50 feet	70-80
Conversational Speech at 5 feet	55-65
Quiet Neighborhood	45-55
Living Room	35-45
Remote Outdoor Location (no wind)	20-30
Threshold of Hearing	0

Source: CDOT Website Noise FAQ

2.0 ANALYSIS METHODOLOGY

The existing noise conditions are quantified through on-site acoustical measurements and traffic noise computer modeling. The future conditions are calculated with computer modeling which includes the effect of the new roadway geometry and future traffic volume increases. The future traffic noise levels are compared with the existing noise levels and the applicable CDOT Noise Abatement Criteria to identify noise impacts associated with the project. Noise abatement measures (noise barriers) are evaluated for locations where noise impacts are identified. Recommendations for noise barriers are based on an assessment of the feasibility and reasonableness of the barriers using CDOT methodology. A review of construction period noise impacts is also presented.

2.1. Acoustical Criteria

The FHWA has procedures for the abatement of highway traffic noise and construction noise (23 CFR 772). CDOT has adopted guidelines for transportation noise analysis and abatement guidelines (Ref. 1 and 2) which, among other things, serve to guide the implementation of the FHWA criteria and procedures for projects in Colorado. The *Guidelines* are intended not only for Federal-aid and Federal action projects, but also for state, local, and public-private partnership projects overseen by CDOT or requiring CDOT approval.

Table 2 presents the CDOT Noise Abatement Criteria (NAC). The criteria vary depending on the land use being evaluated. The land uses are divided into activity categories and the noise level criteria are lower for more noise sensitive land uses. When determining impacts, primary consideration is to be given to exterior areas of frequent human use, where a lowered noise level will be of benefit. CDOT will consider interior noise abatement only for NAC Activity Category D facilities.

It is important to note that noise impacts are identified where noise levels reach or exceed the *noise abatement criteria* regardless of whether the project is increasing the noise levels. A separate methodology is used to identify noise impacts due to *substantial increase* over existing noise levels. In this case a noise impact is identified when a receptor is to experience an increase in noise levels of at least 10 dBA over existing noise levels, regardless of the absolute noise levels.

Table 2: CDOT Noise Abatement Criteria

Activity Category	Activity Leq(h)*	Evaluation Location	Activity Description
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[1]	66	Exterior	Residential
C[1]	66	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreational areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	51	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E[1]	71	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	NA	NA	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, ship yards, utilities (water resources, water treatment, electrical), and warehousing.
G	NA	NA	Undeveloped lands that are not permitted for development.

[1] Includes undeveloped lands permitted for this activity category.
* Hourly A-weighted sound level in dBA, including a 1-dBA approach value below 23CFR772 values

2.2. Traffic Noise Modeling

CDOT guidelines require the use of the FHWA's Traffic Noise Model computer program (TNM) to calculate noise future traffic noise levels. This model uses a three-dimensional model of roads, terrain and receivers along with traffic volumes (autos and trucks) and speeds to calculate traffic noise levels at individual receptors. The model takes into account many factors including noise attenuation from terrain and walls as well as noise increases from uphill grades and stop-and-go traffic.

Traffic volumes used in modeling the existing and future noise conditions are based the traffic forecasts for the project (Ref. 3). Vehicle classifications (i.e. truck percentages) are based on automated traffic counts conducted during the ambient noise measurement program (Ref. 4). Visual counts of vehicles by the technician conducting the noise measurements were used to supplement the automated counts for the purpose of the TNM model verification. Travel speeds are based on the posted speed limits. Speeds measured during the automated counts indicated that the average travel speeds were at or below the speed limits. The future, with project, speeds were assumed to be the same because the speed limit on US 6 will not change with the project.

The TNM computer model has limitations regarding its calculations in certain situations. For example, the calculations in the current version (TNM 2.5) do not include the effect of acoustical reflections from noise barriers or retaining walls. Also, there is no object in TNM to model the increase in traffic noise that occurs at tunnel portals. To address these effects, appropriate adjustments are determined by calculations using the commercially available noise modeling program, SoundPLAN (Version 7.2). The Transportation Research Board (TRB), in their recent report (Ref. 5, prepared in cooperation with the FWHA), used SoundPLAN to help validate methodologies for calculating the effect of tunnels in TNM. For the geometry of the project, SoundPLAN calculates an adjustment of less than 1 dBA for all of the residential and school receivers due the contribution of the tunnel portals. This finding is consistent with the TRB recommended adjustments of 0 to 1 dBA for similarly situated receivers. The use of SoundPLAN also allowed the modeling of a receptor on the proposed lid, a situation which TRB recommends modeling with SoundPLAN.

The project will involve new retaining walls along both sides of US 6 as the road enters the tunnel from the north and from the south, as well as a roundabout on 19th at Elm Street. The retaining walls will be concrete and, therefore, acoustically reflective. A textured surface finish will not significantly reduce the reflectivity of the walls. Since there will be walls on both sides of the highway, the effect of multiple reflections is a concern. To address this effect, the TNM results are supplemented by adjustments based on the results of detailed SoundPLAN modeling which includes acoustical reflections from surfaces such as noise barriers and retaining walls.

The analyses and findings of this report are based on the calculations which include the adjustments for acoustical reflections and tunnel portals. However for clarity to the reader, Appendix A provides the calculation results with and without these

adjustments. Appendix A also includes detailed information regarding the TNM roadway input parameters such as traffic volumes, speeds and truck percentages.

2.3. Identification of Sensitive Receptors

Figure 2 shows the location of each receptor used for assessing the traffic noise impacts. These receptors include residences and other noise sensitive land uses around the project area.

The Parfet Estates residential development is located west of US 6 and north of 19th Street. The front yard is the noise assessment location for the homes along Parfet Estates Drive which face east and the homes along 19th Street facing south. At the north end of Parfet Estates Drive the rear of the homes face US 6. Each of these homes has two outdoor use spaces, the ground level backyard and an elevated rear deck attached to the house. There is an existing earthen berm between these homes and US 6. Because of the geometry, the earthen berm is more effective in reducing noise at the backyards than at the elevated decks. For a more complete noise analysis, both the backyard and deck of these homes are analyzed in the noise modeling. All of the receptors in this area are in Activity Category B.

The Colorado School of Mines is located east of US 6 on both sides of 19th Street and west of US 6 south of 19th Street. Land uses include classroom buildings, housing, sororities/fraternities and service/office buildings. The housing is considered Activity Category B and the remaining uses are considered Activity Category C. Since there are not outdoor use areas at the Public Safety Building, the indoor criteria, Category D, is used.

The 6th Avenue Trail is a paved multi-use trail (pedestrian and biking) along the east side of US 6 in the study area. It provides critical north-south access to the community along US 6 and a connection to Clear Creek Trail and downtown Golden. The Triceratops Trail is a gravel hiking trail that winds between large, vertical walls of sandstone and into reclaimed clay pits. Along the trail are several stops highlighting clay mining and dinosaur, bird, mammal, insect, and invertebrate tracks and traces. This noise analysis defines two noise assessment locations along the 6th Avenue Trail as it parallels US 6, one north of 19th Street and one south of 19th Street. Along the Triceratops trail a noise assessment location is defined at the geologic point of interest nearest to the highway. The trails are considered Activity Category C. The Fossil Trace Golf Course east of US 6 and south of 19th Street is considered Activity Category C.

In the future, with project, conditions there will be public outdoor recreation area on the new bridge structure over US 6, Lookout Lid. This analysis defines a noise assessment location near a seating/shelter area north of 19th Avenue. This location is considered Activity Category C. Figure 3 shows the undeveloped land in the vicinity of the project.

Figure 2: Noise Receptor Locations

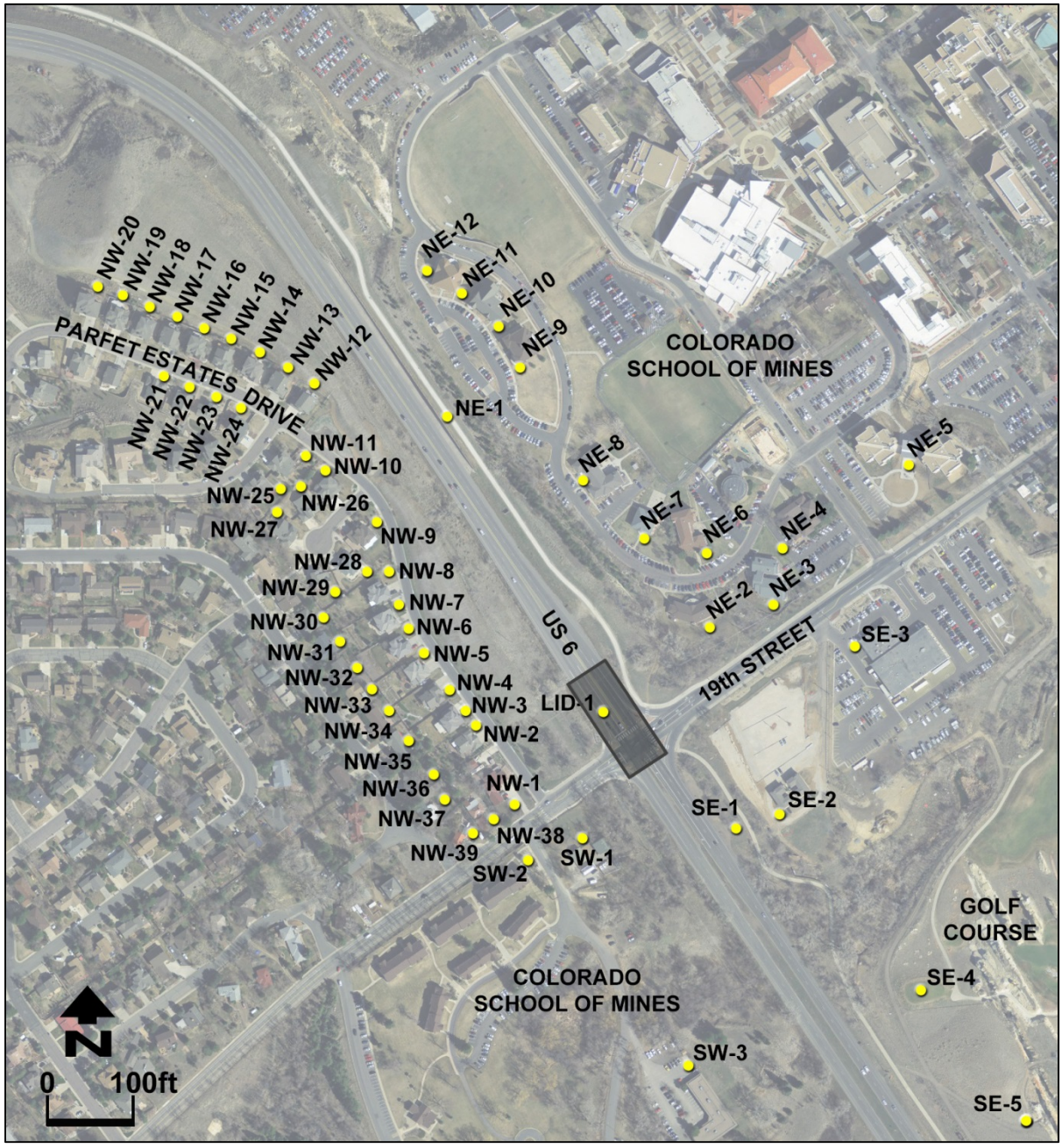
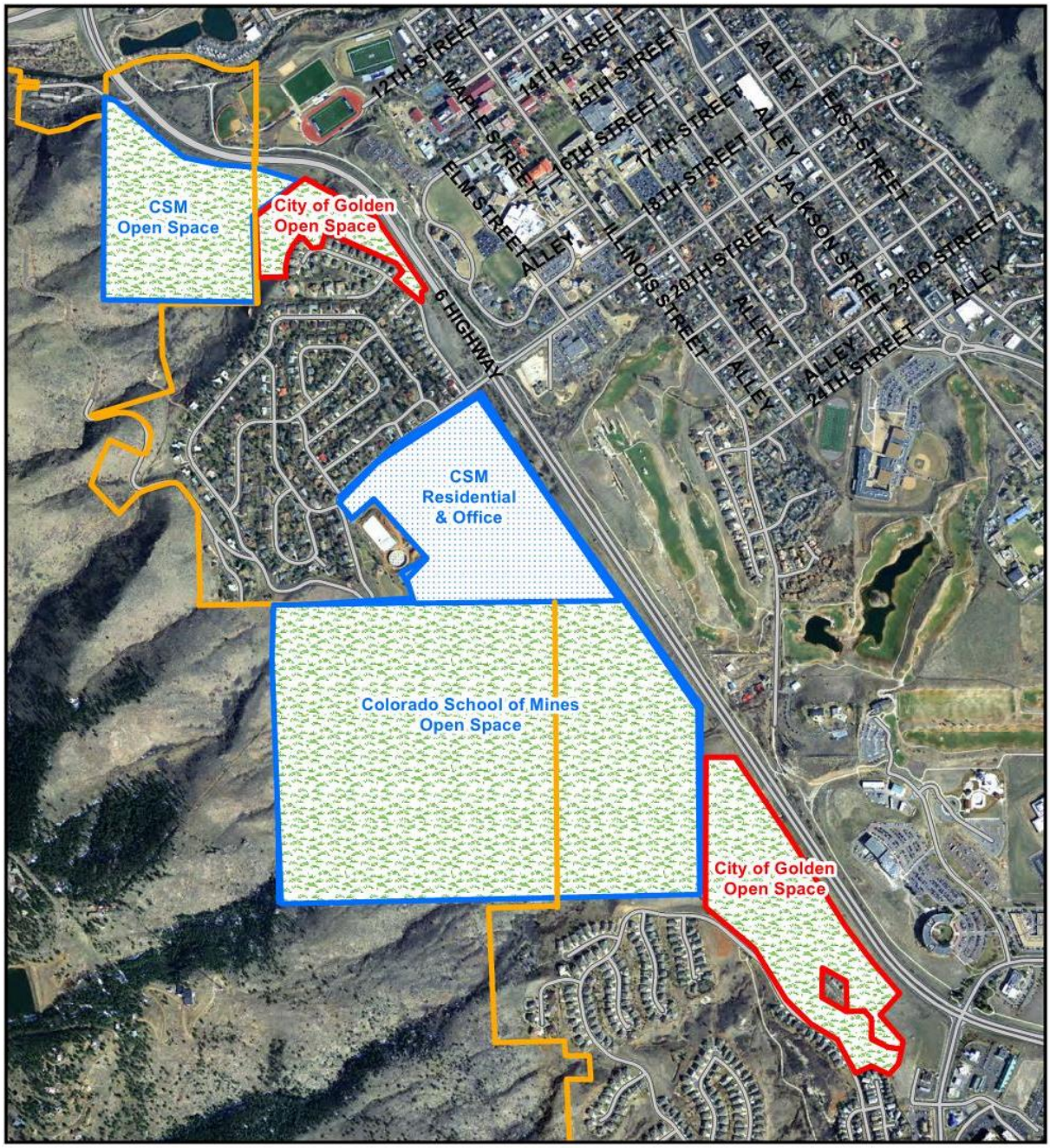


Figure 3: Undeveloped Lands Near Project Area



Source: City of Golden Land Use Map and Colorado School of Mines Campus Master Plan of October 2010

3.0 EXISTING CONDITIONS

3.1. Noise Measurements

Short-term (15- to 30-minute) and one 24-hour traffic noise measurements were conducted in the study area. The sound level meters were Larson Davis Model 824 and 820 which were checked with a Larson Davis Model CAL200 acoustical calibrator before and after the measurements. This equipment conforms to American National Standards Institute (ANSI S1.4) for Type 1 sound level meters. The microphone was located approximately 5 feet above the ground and was protected by a windscreen. The noise measurements locations were chosen to represent noise sensitive land uses and for verification of the TNM computer model. The locations are shown in Figure 3 and the results summarized in Table 3 and Figure 4. Traffic counts, including vehicle classifications, were collected during the noise measurement program.

Figure 4: Noise Measurement Locations

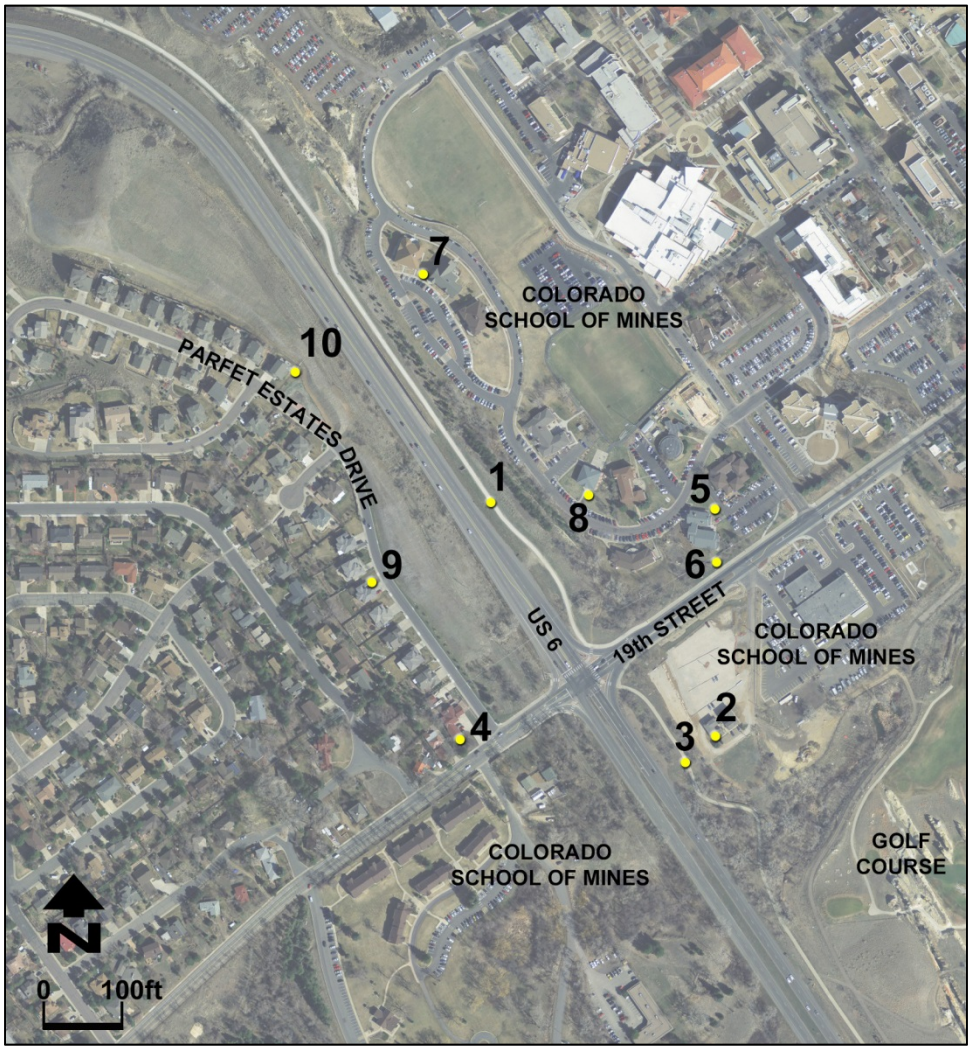
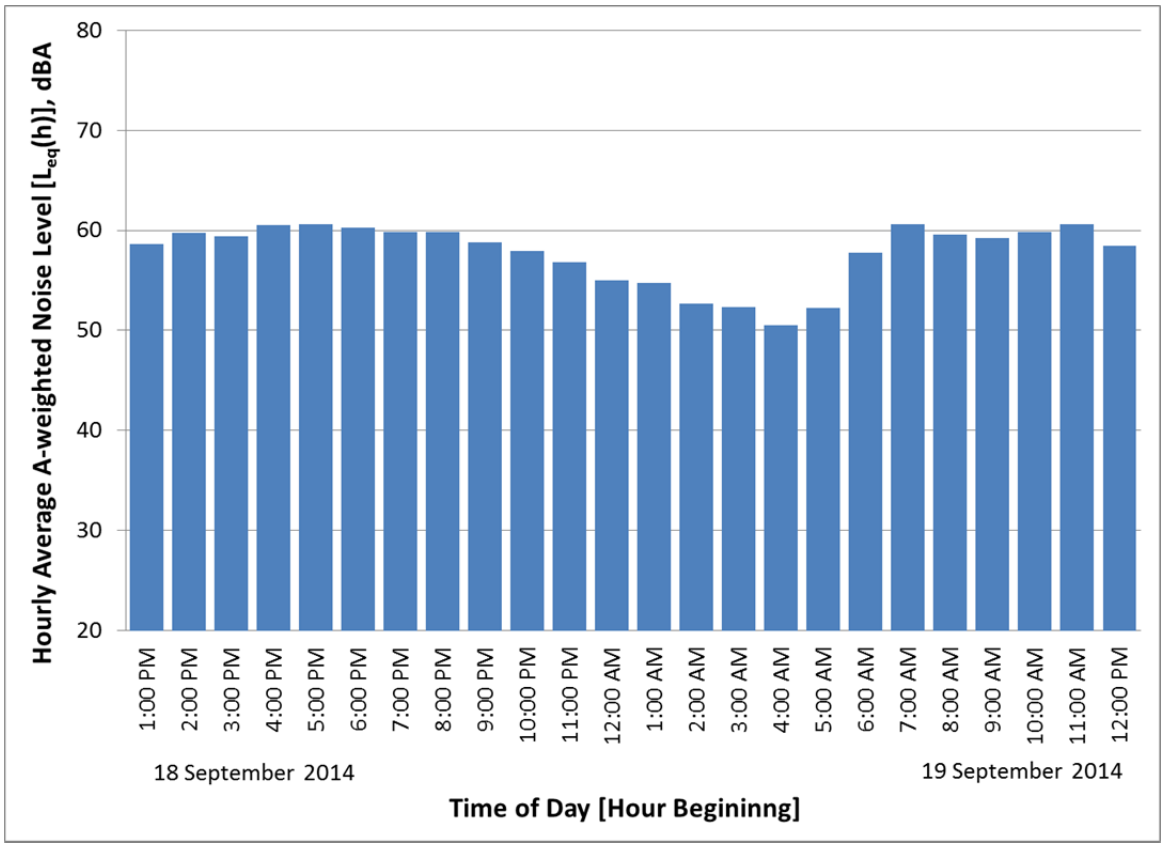


Table 3: Short-Term Noise Measurement Results

Location		Date	Time	L_{eq}, dBA
1	Trail along east side of US 6 north of 19th Street	18-Sep-14	12:05 – 12:35 PM	68
2	Inside School of Mines Police Building	18-Sep-14	1:30 – 1:45 PM	42
3	Trail along east side of US 6 south of 19th Street	18-Sep-14	3:15 – 3:45 PM	64
4	Front yard of residence at 19th Street and Parfet Estates Drive	18-Sep-14	4:05 – 4:20 PM	62
5	School of Mines lawn	19-Sep-14	12:45 – 1:00 PM	54
6	Along 19th Street east of US 6	19-Sep-14	1:10 – 1:40 PM	64
7	School of Mines outside sorority house	19-Sep-14	2:15 – 2:30 PM	51
8	School of Mines outside fraternity house	19-Sep-14	2:45 – 3:00 PM	54
9	Front yard of residence along Parfet Estates Drive	19-Sep-14	3:20 – 3:35 PM	56

Figure 5: Hourly Noise Levels at Location 10 – Parfet Estates Drive



3.2. Traffic Noise Model Verification

To check the general accuracy of the TNM calculations, the noise measurement results were compared with calculations of traffic noise using the existing alignment and the traffic data counted during the noise measurement program. This comparison is shown in Table 4. The verification results show differences between measured and modeled levels of 3 dBA or less. This is considered acceptable agreement according to the CDOT guidelines. The comparison at Location 2 is not applicable because the measurement was conducted indoors while the calculated noise level is outdoors. The 20 dBA difference is typical for a building with closed windows.

Table 4: Verification Noise Model Results

Measurement Location		Measurement Leq (dBA)	Verification Model Result Leq (dBA)	Difference (dBA)
1	Trail along east side of US 6 north of 19th Street	68	67	-1
2	Inside School of Mines Police Building	42 (indoors)	62 (outdoors)	N/A
3	Trail along east side of US 6 south of 19th Street	64	66	2
4	Front yard of residence at 19th Street and Parfet Estates Drive	62	61	-1
5	School of Mines lawn	54	52	-2
6	Along 19th Street east of US 6	64	63	-1
7	School of Mines outside sorority house	51	50	-1
8	School of Mines outside fraternity house	54	54	0
9	Front yard of residence along Parfet Estates Drive	56	53	-3

3.3. Existing Conditions Traffic Noise Model Results

The traffic noise levels were calculated for the existing conditions. The existing roadway alignment and existing traffic volume were used as inputs to the TNM model. In general, the L_{eq} at the model receptors ranged from 41 to 71 dBA. The effect of acoustical reflections from the existing retaining wall along the east side of US 6 north of 19th Street results in an increase in noise of roughly 1 dBA at some residences along Parfet Estates Drive with decks that overlook US 6.

Three receptors, the 6th Avenue Trail alongside US 6 (NE-1 and SE-1) and a residence along Parfet Estates Drive (NW-12) are exposed to a noise level which equals or exceeds the Noise Abatement Criterion (L_{eq} 66 dBA for recreational and residential land use). A full list of receptors and noise levels is contained in Appendix A. The Appendix shows the results with and without the adjustments for acoustical reflections since these adjustments were determined by calculations with the SoundPLAN traffic noise model instead of TNM.

4.0 FUTURE CONDITIONS WITH PROJECT

4.1. Project Conditions Traffic Noise Model Results

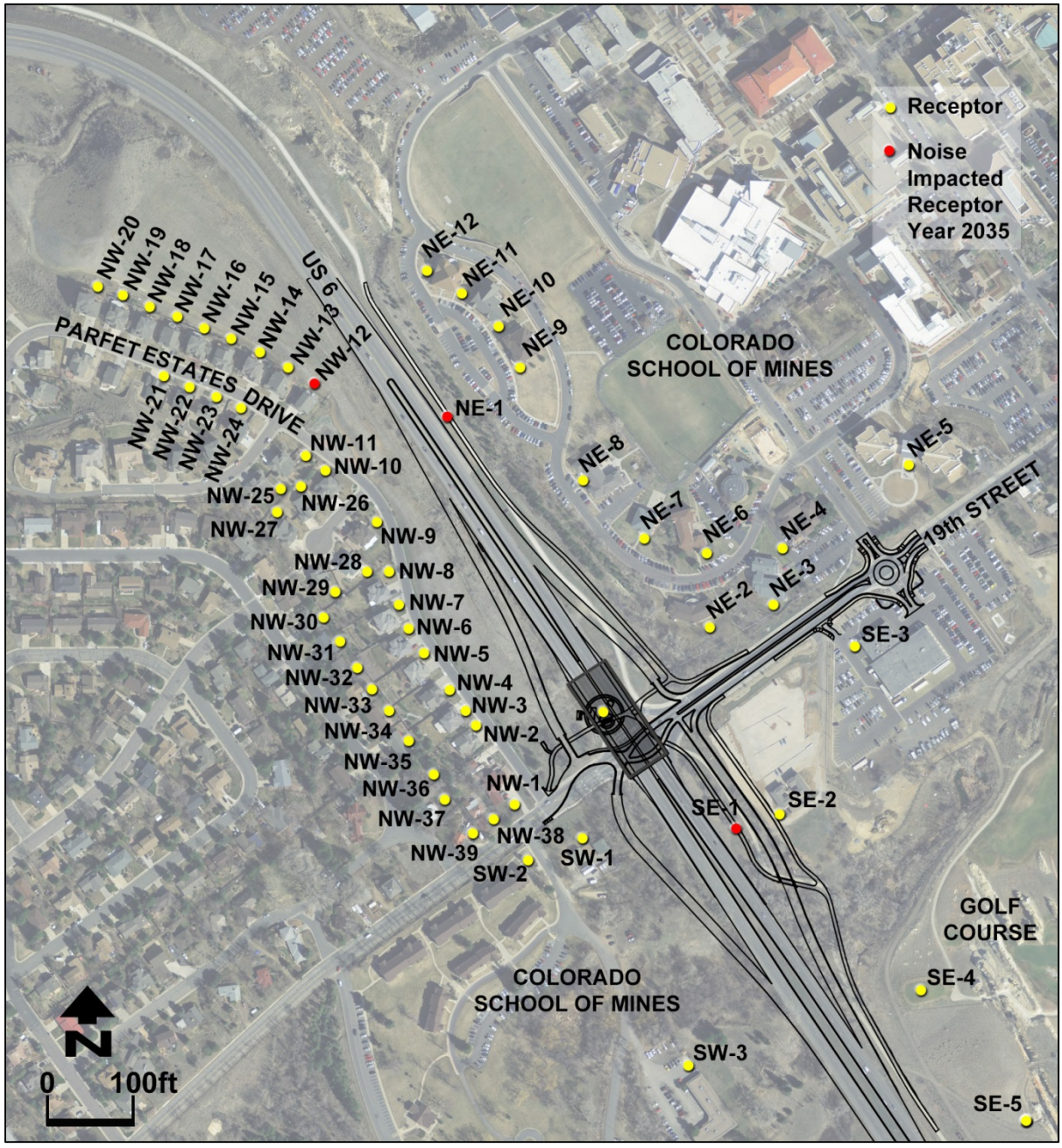
The traffic noise levels were calculated for the future (2035), with project, conditions. The project roadway alignment and future traffic volumes developed by Muller Engineering (Ref. 3) were used as input to the TNM model. In general, the L_{eq} at the model receptors ranges from 41 to 74 dBA.

The increase in noise levels over existing conditions generally range from 1 to 3 dBA. The increase is due to a combination of increased traffic volumes and additional acoustical reflections from the new retaining walls along both sides of US 6. The increased noise from reflections is somewhat offset by the extra acoustical shielding provided by the terrain of the depressed highway. A few receptors are predicted to experience a decrease in noise of 1 to 3 dBA. The increase in noise near the tunnel portal due to acoustical reflections from the tunnel's interior vertical and horizontal surfaces is less than 0.5 dBA at all receptors.

Figure 5 identifies those receptors that are considered noise impacted based on the CDOT criteria. A full list of receptors and noise levels is contained in Appendix A. The tables in the appendix shows the results with and without the adjustments for acoustical reflections since these adjustments were determined by calculations with the SoundPLAN traffic noise model instead of TNM. Likewise, the adjustment for noise increase due to the tunnel portal is also shown for each receptor.

The interior noise level presented for the Colorado School of Mines Public Safety Building (SE-2) is the exterior noise level calculated by TNM reduced by the 20 dBA of noise reduction provided by the building structure. This is the noise reduction calculated using the measurements and modeling of the existing conditions.

Figure 6: Noise Impacted Receptor Locations



4.2. Summary of Traffic Noise Impacts

One residence along Parfet Estates Drive (NW-12) is exposed to a noise level which equals or exceeds the Noise Abatement Criterion (L_{eq} 66 dBA for residential land use). At this residence the future L_{eq} is 67 dBA at the elevated deck overlooking US 6 while the backyard would be exposed to noise levels less than L_{eq} 66 dBA. The backyard receiver, since it is at a lower elevation, benefits from acoustical shielding provided by an existing earthen berm located next to the home. The berm is outside of the CDOT right-of-way. Acoustical reflections from the retaining walls along US 6 contribute slightly to these calculated noise levels, however, the TNM calculations indicate a noise impact at the residence even without the adjustment for acoustical reflections determined using the SoundPLAN model.

The 6th Avenue Trail alongside US 6 (Receptor locations NE-1 and SE-1) is exposed to a noise levels of L_{eq} 74 and 67 dBA which exceed the Noise Abatement Criterion of L_{eq} 66 dBA for recreational land use.

No receptors are expected to experience an increase in noise of 10 dBA or greater, CDOT's threshold for a substantial increase in noise.

Because noise impacts were identified, noise abatement was evaluated (see Section 5).

Noise impacts are not assessed on undeveloped lands (see Figure 3), however noise modeling indicates that areas within approximately 225 feet of the roadway centerline would be exposed to future noise levels of 66 dBA or greater.

4.3. Construction Noise and Vibration

Temporary noise impacts may occur to nearby residents and properties. Noise will occur from large earthmoving equipment, backup alarms, additional truck traffic, and concrete placing equipment. Construction noise differs from traffic noise in several ways:

- Construction noise lasts only for the duration of the construction event, with most construction activities in noise-sensitive areas being conducted during hours that are least disturbing to adjacent and nearby residents.
- Construction activities generally are short term and, depending on the nature of the construction operations, could last from seconds (e.g., a truck passing a receptor) to months (e.g., constructing a bridge).
- Construction noise is intermittent and depends on the type of operation, location, and function of the equipment, and the equipment usage cycle.

Construction noise is not assessed like operational traffic noise; there are no CDOT noise abatement criteria for construction noise. Construction noise would be subject to relevant local regulations and ordinances, and any construction activities would be expected to comply with them.

The project area abuts residential areas. To address the temporary elevated noise levels that may be experienced during construction, standard abatement measures should be incorporated into construction contracts, where it is feasible to do so. These would include:

- Notify neighbors in advance when construction noise may occur and its expected duration so that they may plan appropriately.
- Manage construction activities to keep noisy activities as far from sensitive receptors as possible.
- Exhaust systems on equipment would be in good working order. Equipment would be maintained on a regular basis, and equipment may be subject to inspection by the construction project manager to ensure maintenance.
- Properly designed engine enclosures and intake silencers would be used where appropriate.
- Use temporary noise barriers where appropriate and possible.
- New equipment would be subject to new product noise emission standards.
- Stationary equipment would be located as far from sensitive receptors as possible.
- Limiting construction traffic in residential areas.
- Limiting work hours in noise sensitive areas to specified times of day that are least disturbing to adjacent and nearby residents (i.e. 7 AM to 7 PM). This would be in addition to complying with the City of Golden Municipal Code Noise Ordinance (Chapter 5.15) which exempts temporary construction activities between 7 AM and 9 PM.

5.0 NOISE ABATEMENT EVALUATION

5.1. Evaluation of Abatement Other than Barriers

CDOT guidelines require the evaluation of several non-barrier abatement options. For various reasons that are described below, none of these options appeared to be viable for the project.

Traffic management measures such as lane closures or reduced speeds could reduce noise but broad application of these concepts is neither reasonable for the roads of primary interest to the project nor compatible with the purpose of the project. Changes in horizontal or vertical alignments of the roads near the impacted receptors could reduce noise but are not practical as a noise abatement action because of the right-of-way constraints. Sound absorptive material on the faces of the retaining walls would reduce noise levels as some receptors; however, the potential noise level reduction of 1 dBA at the noise impacted receptors would not meet the CDOT minimum requirement of 5 dBA for noise abatement to be considered *feasible*.

5.2. Noise Barrier Evaluations

For noise impacted receptors, noise barriers were evaluated with the TNM computer model. Each potential barrier was assessed for effectiveness and feasibility according to CDOT guidance. If a barrier was determined to be feasible and reasonable, then it is recommended for the project.

Briefly, for an abatement action to be feasible it must:

- Provide at least 5 dBA of noise reduction
- Not have any "fatal flaw" issues (safety, maintenance, access, drainage, etc.)
- Be constructible using reliable and common practices
- Not exceed 20 feet in height

For an abatement action to be reasonable it must:

- Meet the minimum design goal of at least 7 dBA of noise reduction
- Meet the cost/benefit index of not more than $6,800/dBA/receptor of benefit
- Have support from more than 50 percent of the potentially benefitting receptors

Barrier cost-effectiveness was based on an assumed cost of $45/square foot of barrier and compared to the CDOT upper threshold of $6,800/dBA/receptor of benefit. The barriers evaluated are described in the following sections. The barrier performance results for each receptor are presented in in Appendix A.

5.2.1. Barrier 1 – Parfet Estates

The calculated L_{eq} equals or exceeds 66 dBA at the elevated deck of one residence along Parfet Estates Drive that overlooks US 6. This location is shown in red in Figure 5. Because the noise abatement criterion of 66 dBA is exceeded, noise abatement is considered.

To reduce traffic noise at this home, a noise barrier wall within the CDOT right-of-way was considered. The height and length of the wall is based on achieving a noise reduction of at least 7 dBA at the noise impacted elevated deck. Since the homes are elevated above the roadway the wall needs to be relatively tall, 20 feet, to provide the noise reduction goal of 7 dBA at the noise impacted receiver. The wall location is at the top of a slope near the right-of-way. The extents and height of the wall were determined by iteration to maximize the number of benefitting receivers, as practical. The location of the wall is shown in Figure 7.

Based on CDOT methodology receptors are considered to be *benefitting* if the barrier noise reduction is 5 dBA or greater. Figure 7 identifies the benefitting receptors. The cost/benefit criterion results are shown in Table 5. For the cost/benefit analysis each residence is considered one "unit" even though it is represented by two receptors, one at the elevated deck and one at the ground level backyard. The elevated decks

receive more noise reduction from the wall than the ground level backyard and, therefore, this noise reduction value is used in the cost/benefit calculation. Using the reduction values from the elevated decks shown in Appendix Table A-4, the sum of the noise reductions for the three homes resulted in a "Total Benefit" of 20 dBA. Combining this with the cost of the wall (calculated based on a CDOT standard of $45/sq. ft.) resulted in a Cost Benefit Index of $91,286.

Figure 7: Parfet Estates ROW Noise Barrier Location/Heights and Benefitting Receptors

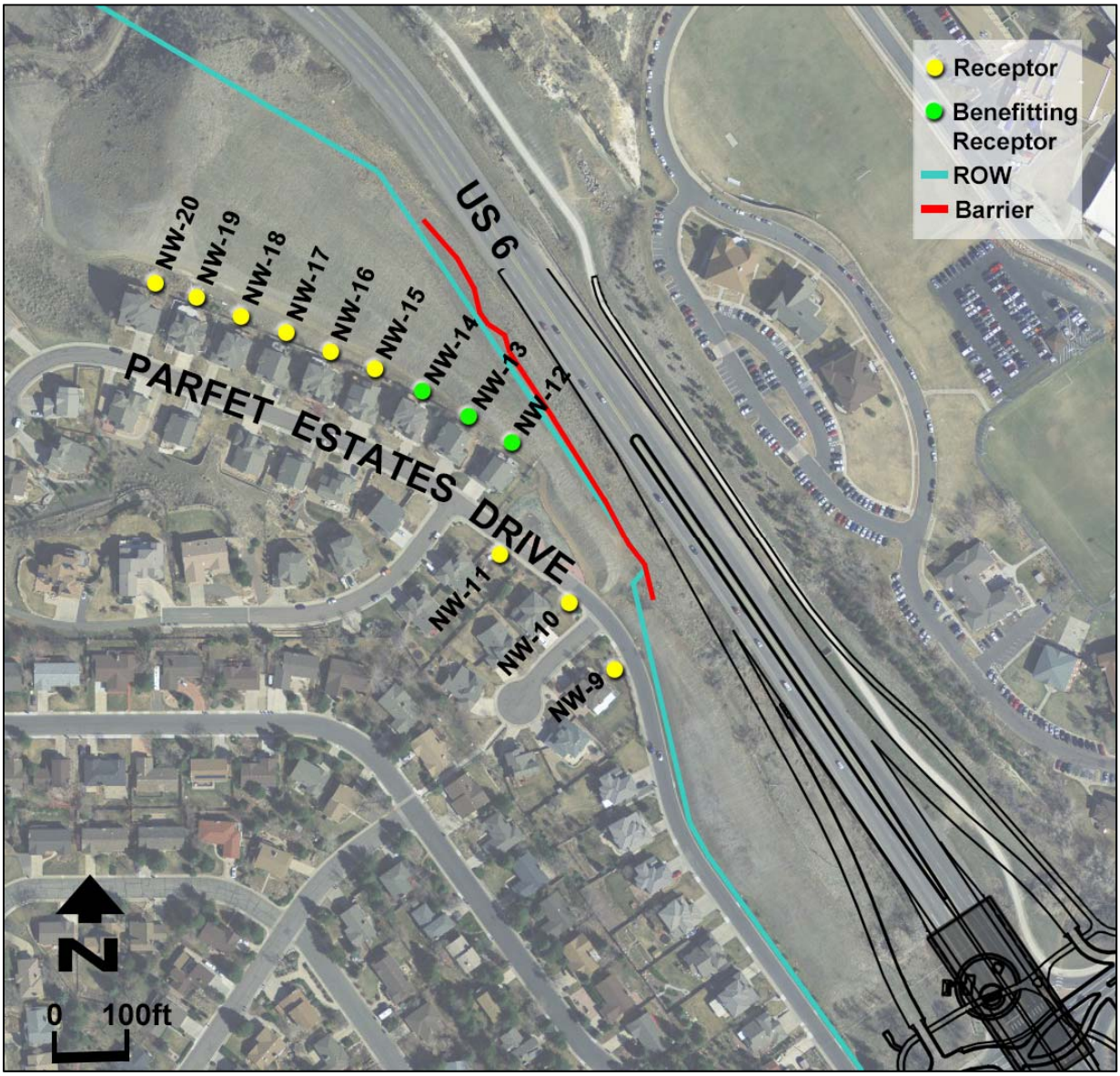


Table 5: Noise Abatement Cost/Benefit Summary
Barrier 1 - Parfet Estates Noise Barrier Wall

Approximate Barrier Segment Dimensions (ft.)	Total Barrier Size (sq. ft.)	Approximate Barrier Cost[1]	Benefiting Units	Total Benefit (dBA)	Average Benefit (dBA/unit)	Cost Benefit Index ($/dBA)
20 x 710	14,200	$639,000	3	20	7	$91,286

*Total Benefit calculated using the greatest noise reduction achieved at either the ground level (yard) or elevated deck area. Noise reduction values used to calculate Total Benefit are highlighted in Appendix Table A-4

Since the Parfet Estates ROW noise barrier wall cost/benefit is well over the CDOT criterion of $6,800 it is not considered feasible and, therefore, not recommended for the project.

5.2.2. Barrier 2 – 6th Avenue Trail

The traffic noise modeling indicates that the existing and 'future with project' noise levels along the 6th Avenue Trail are greater than the Noise Abatement Criterion of 66 dBA. A noise barrier wall would need to range between 10 and 13 feet high to reduce noise levels along this trail by the 7 dBA goal. The wall would need to extend for roughly the length of the project area. South of 19th Street, the trail would be between the mainline and the northbound off-ramp, so a wall would be needed on both sides of the trail. The effect of such a wall was modeled in TNM. The wall location and the benefitting receptors are shown in Figure 8. The cost/benefit analysis results are shown in Table 6. Although two noise receptor locations were used for the TNM calculations, for the purpose of the required cost/benefit analysis, the trail is considered to be one receptor. Since the 6th Avenue Trail noise barrier wall cost/benefit is well over the CDOT criterion of $6,800 it is not considered feasible and, therefore, not recommended for the project.

Figure 8: 6th Avenue Trail Noise Barrier Location/Heights and Benefitting Receptors

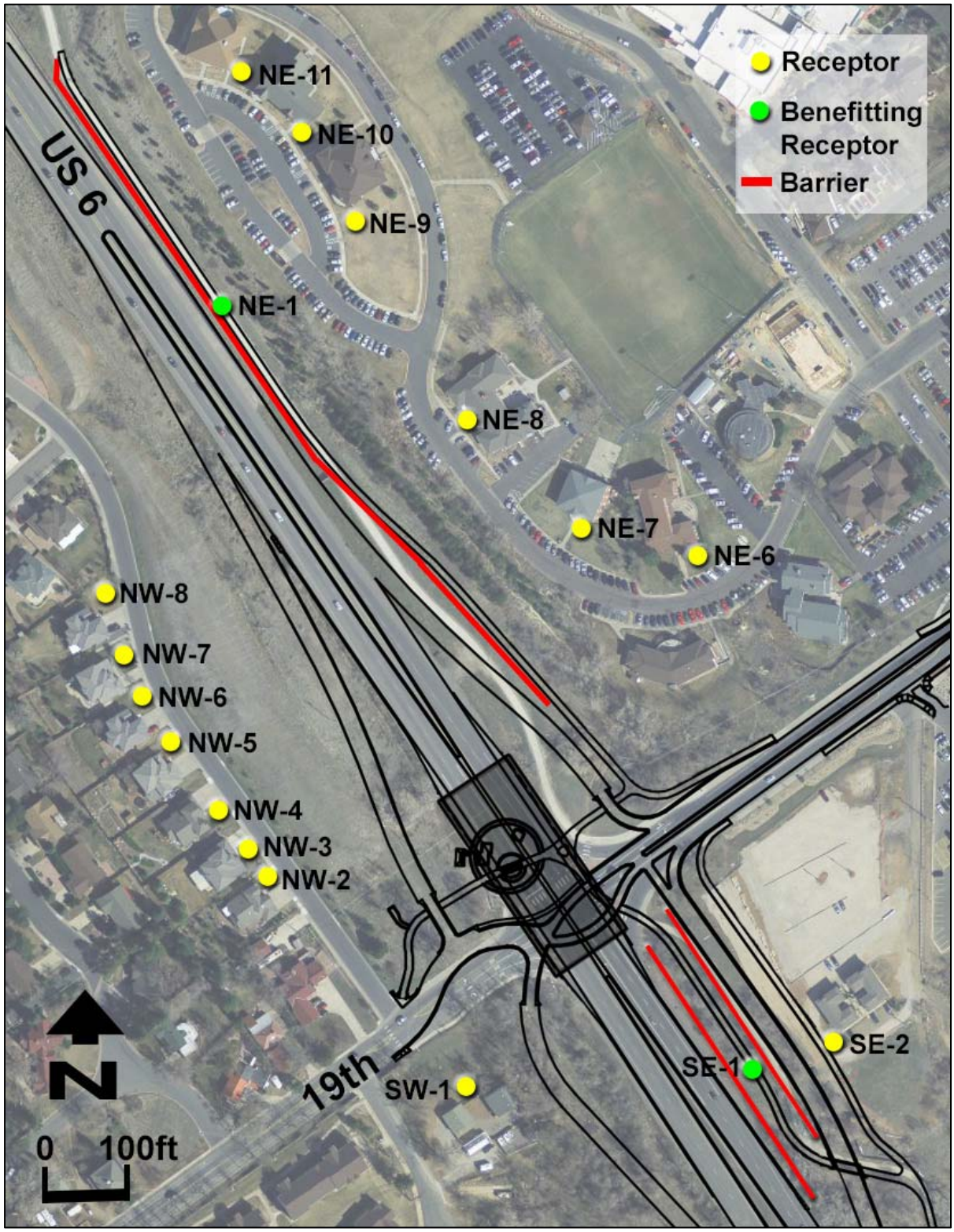


Table 6: Noise Abatement Cost/Benefit Summary
Barrier 2 - 6th Avenue Trail Noise Barrier Wall

Approximate Barrier Segment Dimensions (ft.)	Total Barrier Size (sq. ft.)	Approximate Barrier Cost[1]	Benefiting Units	Total Benefit (dBA)	Average Benefit (dBA/unit)	Cost Benefit Index ($/dBA)
10 x 1,180 13 x 420 13 x 390	23,510	$1,057,950	1	8	8	$132,244

*Noise reduction values used to calculate Total Benefit are highlighted in Appendix Table A-5

5.3. Summary of Recommended Abatement

Noise abatement measures were considered for each of the noise impacted receptors identified in this analysis. Although two barriers we found to be feasible, they are not recommended since they did not meet the cost-benefit criteria necessary to be considered reasonable. Therefore, there are no recommended noise abatement measures for this project.

The findings provided here are based on current project design (30% complete). If the final design differs from the design examined here, corresponding adjustments to the abatement analysis and recommendations would be required.

6.0 References

Ref. 1. Colorado Department of Transportation, *Noise Analysis and Abatement Guidelines*, January 15, 2015.

Ref. 2. Colorado Department of Transportation, *Traffic Noise Model User's Guide*, November 2006.

Ref. 3. Muller Engineering Company, Inc., *Memo: US 6/19th Street Interchange 2035 Forecasting Methodology,* July 25, 2014

Ref. 4. City of Golden, *All Traffic Data Services, Inc US 6/19th Street Counts and Classifications Prepared September 18, 2014*, Email dated January 15, 2015.

Ref. 5. Transportation Research Board National Cooperative Highway Research Program, Supplemental Guidance on the Application of FHWA's Traffic Noise Model (TNM) Report 791, 2014.

Table A-1: TNM Existing Traffic Volume Inputs

Existing Traffic Volumes						
Road	Cars per hour	Medium Trucks per hour	Heavy Trucks per hour	Buses per hour	Motorcycles per hour	Speed (MPH)
US-6 SB n/o 19th Lane 1/2	1087	56	58	7	19	45
US-6 NB n/o 19th Lane 1/2	1204	24	82	5	26	45
US-6 SB s/o 19th Lane 1/2	1518	35	87	1	28	45
US-6 NB s/o 19th Lane 1/2	1656	28	75	8	55	45
19th EB w/o US-6	207	3	2	0	6	30
19th WB w/o US-6	391	10	0	0	2	30
19th EB e/o US-6	440	20	10	1	4	30
19th WB e/o US-6	601	10	6	0	3	30

Table A-2: TNM Future Traffic Volume Inputs

Future Traffic Volumes (2035)						
Road	Cars per hour	Medium Trucks per hour	Heavy Trucks per hour	Buses per hour	Motorcycles per hour	Speed (MPH)
US-6 SB n/o 19th Lane 1/2	1324	68	71	8	23	45
US-6 NB n/o 19th Lane 1/2	1393	28	95	6	30	45
US-6 SB s/o 19th Lane 1/2	1766	40	101	1	32	45
US-6 NB s/o 19th Lane 1/2	1914	33	86	10	63	45
19th EB w/o US-6	313	4	3	0	9	30
19th WB w/o US-6	521	14	0	0	2	30
19th EB e/o US-6	471	22	10	1	4	30
19th WB e/o US-6	589	10	6	0	3	30
US6 SB On Ramp	555	13	32	0	10	30
US6 SB Off Ramp	137	7	7	1	2	30
US6 NB On Ramp	130	3	9	1	3	30
US6 NB On Ramp	591	10	27	3	19	30

Table A-3: Existing and Future Noise Levels

Model Point	CDOT NAC L_{eq} (dBA)	No. of Units	Existing Conditions (2014)					Future Conditions with Project (2035)					
			TNM Calculations		TNM Calculations with Adjustment for Reflections			TNM Calculations		TNM Calculations with Adjustment for Reflections and Tunnel Portals			
			L_{eq} (dBA)	Result	Adjustment for Reflections (dBA)	L_{eq} (dBA)	Result	L_{eq} (dBA)	Result	Adjustment for Reflections (dBA)	Adjustment for Tunnel Portal (dBA)	L_{eq} (dBA)	Result
NE-1	66	1	71	Impact	0	71	Impact	72	Impact	2.4	0	74	Impact
NE-2	66	Multi	58	--	0	58	--	56	--	0.3	0	56	--
NE-3	66	Multi	57	--	0	57	--	56	--	0.1	0	56	--
NE-4	66	Multi	52	--	0	52	--	52	--	0.2	0	52	--
NE-5	66	Multi	53	--	0	53	--	53	--	0.2	0	53	--
NE-6	66	Multi	53	--	-0.1	53	--	51	--	0.7	0	52	--
NE-7	66	Multi	56	--	0	56	--	55	--	0.9	0.5	56	--
NE-8	66	Multi	56	--	0	56	--	54	--	0.9	0.2	55	--
NE-9	66	Multi	54	--	0	54	--	54	--	1.1	0.1	55	--
NE-10	66	Multi	53	--	0.1	53	--	53	--	1.6	0	55	--
NE-11	66	Multi	53	--	0.1	53	--	54	--	1.4	0.1	56	--
NE-12	66	Multi	55	--	0.1	55	--	57	--	1	0	58	--
NW-1	66	1	63	--	0	63	--	63	--	0.1	0	63	--
NW-2	66	1	57	--	0	57	--	54	--	1.1	0	55	--
NW-3	66	1	56	--	0	56	--	54	--	1.2	0.1	55	--
NW-4	66	1	55	--	0.2	55	--	54	--	0.6	0.1	54	--
NW-5	66	1	54	--	0.3	54	--	52	--	0.7	0.2	53	--
NW-6	66	1	53	--	0.5	53	--	51	--	0.9	0	52	--
NW-7	66	1	53	--	0.5	54	--	52	--	1	0.1	53	--
NW-8	66	1	53	--	0.7	54	--	53	--	1.4	0.1	54	--
NW-9	66	1	55	--	0.9	56	--	54	--	1.6	0	56	--

Table A-3: Existing and Future Noise Levels

Model Point	CDOT NAC L_{eq} (dBA)	No. of Units	Existing Conditions (2014)					Future Conditions with Project (2035)					
			TNM Calculations		TNM Calculations with Adjustment for Reflections			TNM Calculations		TNM Calculations with Adjustment for Reflections and Tunnel Portals			
			L_{eq} (dBA)	Result	Adjustment for Reflections (dBA)	L_{eq} (dBA)	Result	L_{eq} (dBA)	Result	Adjustment for Reflections (dBA)	Adjustment for Tunnel Portal (dBA)	L_{eq} (dBA)	Result
NW-10	66	1	53	--	0.5	53	--	53	--	0.3	0.1	53	--
NW-11	66	1	52	--	0.6	52	--	52	--	0.5	0	52	--
NW-12 Yard	66	1	58	--	1.1	59	--	59	--	1	0	60	--
NW-12 Deck	66		65	--	1.1	66	Impact	66	Impact	0.3	0	67	Impact
NW-13 Yard	66	1	59	--	0.8	59	--	59	--	0.4	0	60	--
NW-13 Deck	66		64	--	1	65	--	65	--	0.4	0	65	--
NW-14 Yard	66	1	58	--	0.9	59	--	59	--	0.3	0	59	--
NW-14 Deck	66		64	--	0.9	65	--	64	--	0.4	0	65	--
NW-15 Yard	66	1	54	--	1.2	56	--	55	--	0.6	0	56	--
NW-15 Deck	66		61	--	0.7	62	--	62	--	0.3	0	63	--
NW-16 Yard	66	1	52	--	1.3	54	--	53	--	0.8	0	54	--
NW-16 Deck	66		57	--	1.3	58	--	58	--	0.7	0	58	--
NW-17 Yard	66	1	51	--	1	52	--	51	--	0.9	0	52	--
NW-17 Deck	66		54	--	2	56	--	54	--	1	0	55	--
NW-18 Yard	66	1	50	--	1	51	--	51	--	0.7	0	51	--
NW-18 Deck	66		52	--	1.5	54	--	52	--	0.9	0	53	--
NW-19 Yard	66	1	51	--	0.7	51	--	51	--	0.4	0	51	--
NW-19 Deck	66		53	--	0.9	53	--	53	--	0.6	0	54	--
NW-20 Yard	66	1	53	--	0.2	53	--	54	--	0.2	0	54	--
NW-20 Deck	66		54	--	0.2	54	--	55	--	0.2	0	55	--
NW-21	66	1	41	--	0	41	--	41	--	0	0	41	--

Table A-3: Existing and Future Noise Levels

Model Point	CDOT NAC L_{eq} (dBA)	No. of Units	Existing Conditions (2014)					Future Conditions with Project (2035)					
			TNM Calculations		TNM Calculations with Adjustment for Reflections			TNM Calculations		TNM Calculations with Adjustment for Reflections and Tunnel Portals			
			L_{eq} (dBA)	Result	Adjustment for Reflections (dBA)	L_{eq} (dBA)	Result	L_{eq} (dBA)	Result	Adjustment for Reflections (dBA)	Adjustment for Tunnel Portal (dBA)	L_{eq} (dBA)	Result
NW-22	71	1	41	--	0	41	--	40	--	0	0	40	--
NW-23	71	1	42	--	0	42	--	41	--	0	0	41	--
NW-24	66	1	43	--	0.2	43	--	40	--	0	0	40	--
NW-25	66	1	42	--	0.5	43	--	43	--	0.5	0	43	--
NW-26	66	1	44	--	0.7	45	--	45	--	0.1	0	45	--
NW-27	66	1	43	--	0.3	44	--	42	--	0	0	42	--
NW-28	66	1	51	--	0.8	52	--	50	--	1.3	0	51	--
NW-29	66	1	43	--	0	43	--	41	--	0	0	41	--
NW-30	66	1	44	--	0	44	--	44	--	0	0	44	--
NW-31	66	1	45	--	0.6	46	--	44	--	0.6	0.1	45	--
NW-32	66	1	45	--	0	45	--	44	--	0.1	0	44	--
NW-33	66	1	45	--	0	45	--	45	--	0.1	0	45	--
NW-34	66	1	45	--	0	45	--	44	--	0.1	0	44	--
NW-35	66	1	45	--	0.1	45	--	45	--	0.1	0	45	--
NW-36	66	1	51	--	0	51	--	48	--	0.3	0	48	--
NW-37	66	1	51	--	0	51	--	48	--	0.5	0.1	48	--
NW-38	66	1	60	--	0	60	--	60	--	0.1	0	60	--
NW-39	66	1	57	--	0	57	--	57	--	0.2	0	57	--
SE-1	66	1	69	Impact	0	69	Impact	67	Impact	0.1	0.1	67	Impact
SE-2 (interior)	51	1	63	--	0.1	63	--	65	--	0.1	0.1	65	--
SE-3	66	1	57	--	0	57	--	56	--	0.1	0	56	--

Table A-3: Existing and Future Noise Levels

Model Point	CDOT NAC L_{eq} (dBA)	No. of Units	Existing Conditions (2014)					Future Conditions with Project (2035)					
			TNM Calculations		TNM Calculations with Adjustment for Reflections			TNM Calculations		TNM Calculations with Adjustment for Reflections and Tunnel Portals			
			L_{eq} (dBA)	Result	Adjustment for Reflections (dBA)	L_{eq} (dBA)	Result	L_{eq} (dBA)	Result	Adjustment for Reflections (dBA)	Adjustment for Tunnel Portal (dBA)	L_{eq} (dBA)	Result
SE-4	66	1	63	--	0	63	--	63	--	0	0.1	64	--
SE-5	66	1	58	--	0	58	--	58	--	0	0	58	--
SW-1	66	1	61	--	0	61	--	59	--	1.5	0.2	61	--
SW-2	66	1	60	--	0	60	--	60	--	0.4	0	60	--
SW-3	66	1	60	--	0	60	--	60	--	0	0.1	60	--
LID-1	66	1	--	--	--	--	--	64	--	0.7	0.1	65	--

Note: For NW-12 through NW-20, each residence has a ground level yard and an elevated deck, approximately 10 feet above the yard. Each location was modeled separately and the model points are identified accordingly (e.g. NW-12 Yard and NW-12 Deck).

Table A-4: Barrier 1 - Parfet Estates Noise Barrier TNM Abatement Results

Model Point	No. of Units	TNM Results			TNM Results with Adjustment for Reflections and Tunnel Portal		
		Without Wall	With Recommended Wall		Without Wall	With Recommended Wall	
		L_{eq} (dBA)	L_{eq} (dBA)	Reduction (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	Reduction (dBA)
NW-12 Yard	1	59	53	5.9	60	54	6.1
NW-12 Deck		66	57	9.2	67	58	8.3*
NW-13 Yard	1	59	56	3.1	60	57	3.0
NW-13 Deck		65	58	6.8	65	59	6.6*
NW-14 Yard	1	59	55	3.3	59	56	3.4
NW-14 Deck		64	59	5.2	65	59	5.3*
NW-15 Yard	1	55	52	3.3	56	52	3.5
NW-15 Deck		62	59	3.6	63	59	3.7
NW-16 Yard	1	53	50	2.8	54	51	3.1
NW-16 Deck		58	56	2.0	58	56	2.5
NW-17 Yard	1	51	49	2.3	52	50	2.7
NW-17 Deck		54	52	2.0	55	52	2.7
NW-18 Yard	1	51	49	1.8	51	49	2.1
NW-18 Deck		52	51	1.5	53	51	2.1
NW-19 Yard	1	51	50	0.9	51	50	1.1
NW-19 Deck		53	52	0.8	54	52	1.3
NW-20 Yard	1	54	53	0.4	54	53	0.5
NW-20 Deck		55	54	0.4	55	54	0.6
NW-21	1	41	40	0.9	41	40	0.8
NW-22	1	40	40	0.9	40	40	0.8
NW-23	1	42	41	1.0	42	41	0.9
NW-24	1	40	39	1.0	40	39	1.0

*Noise reduction values used for calculating barrier cost benefit index

Table A-5: Barrier 2 - 6th Avenue Trail Noise Barrier TNM Abatement Results

Model Point	No. of Units	TNM Results			TNM Results with Adjustment for Reflections and Tunnel Portal		
		Without Wall	With Recommended Wall		Without Wall	With Recommended Wall	
		L_{eq} (dBA)	L_{eq} (dBA)	Reduction (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	Reduction (dBA)
NE-1 Trail	1	72	60	12.0	74	66	7.7*
SE-1 Trail		67	59	8.5	67	62	5.4
NE-12	1	57	56	0.9	58	58	0.4
NE-11	1	54	53	1.3	56	56	-0.4
NE-10	1	54	52	1.2	55	56	-0.9
NE-9	1	54	53	1.2	55	56	-0.4
NE-8	1	54	50	4.1	55	52	3.0
NE-7	1	55	51	4.3	56	53	3.6
NE-2	1	56	55	0.4	56	56	0.2
NE-6	1	51	49	2.3	52	50	2.0
SE-2	1	65	63	1.5	65	64	1.1

*Noise reduction values used for calculating barrier cost benefit index

Noise Analysis and Abatement Guidelines

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION WORKSHEET

Instructions: To complete this form refer to CDOT Noise Analysis Guidelines

STIP # _____ Date of Analysis: 6/19/15

Project Name & Location: Lookout Lid - Golden, CO - Wall at Parfet Estates ROW

A. FEASIBILITY:
1. Can a 5dBA noise reduction be achieved by constructing a noise barrier or berm?
   ■ YES ❒ NO
2. Are there any fatal flaw drainage, terrain, safety, or maintenance issues involving the proposed noise barrier or berm?
   ❒ YES ■ NO
3. Can a noise barrier or berm less than 20 feet tall be constructed?
   ■ YES ❒ NO

B. REASONABLENESS:
1. Has the Design goal of 7 dBA noise reduction for abatement measure been met for at least one impacted receptor?
   ■ YES ❒ NO
2. Is the Cost Benefit Index below $6800 per receptor per dBA?
   ❒ YES ■ NO
3. Are more than 50% of benefited resident/owners in favor of the recommended noise abatement measure?
   ❒ YES ❒ NO ■ TBD

C. INSULATION CONSIDERATION:
1. Are normal noise abatement measures physically infeasible or economically unreasonable?
   ❒ YES ■ NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to NAC Activity Category D?
      ❒ YES ❒ NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings?
      ❒ YES ❒ NO

D. ADDITIONAL CONSIDERATIONS:
Barrier was considered at the top of a slope within CDOT ROW. The extents and height of the wall were determined by iteration to maximize the number of benefiting receivers, as practical

E. STATEMENT OF LIKELIHOOD:
1. Are noise mitigation measures feasible?
   ■ YES ❒ NO
2. Are noise mitigation measures reasonable?
   ❒ YES ■ NO
3. Is insulation of buildings both feasible and reasonable?
   ❒ YES ■ NO
4. Shall noise abatement measures be provided?
   ❒ YES ■ NO

F. ABATEMENT DECISION DESCRIPTION AND JUSTIFICATION:
The barrier was not deemed feasible as the Cost Benefit Index was greater than $6,800 per receptor per dBA and therefore is not recommended.

Completed by: _____ Date: 6/17/15

CDOT Form #1209 Revised 02/11

DEPARTMENT OF TRANSPORTATION

Noise Analysis and Abatement Guidelines

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION WORKSHEET

Instructions: To complete this form refer to CDOT Noise Analysis Guidelines

STIP # _____ Date of Analysis: 6/19/15

Project Name & Location: Lookout Lid - Golden, CO - Trail Wall

A. FEASIBILITY:
1. Can a 5dBA noise reduction be achieved by constructing a noise barrier or berm?
   ■ YES ❒ NO
2. Are there any fatal flaw drainage, terrain, safety, or maintenance issues involving the proposed noise barrier or berm?
   ❒ YES ■ NO
3. Can a noise barrier or berm less than 20 feet tall be constructed?
   ■ YES ❒ NO

B. REASONABLENESS:
1. Has the Design goal of 7 dBA noise reduction for abatement measure been met for at least one impacted receptor?
   ■ YES ❒ NO
2. Is the Cost Benefit Index below $6800 per receptor per dBA?
   ❒ YES ■ NO
3. Are more than 50% of benefited resident/owners in favor of the recommended noise abatement measure?
   ❒ YES ❒ NO ■ TBD

C. INSULATION CONSIDERATION:
1. Are normal noise abatement measures physically infeasible or economically unreasonable?
   ❒ YES ■ NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to NAC Activity Category D?
      ❒ YES ❒ NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings?
      ❒ YES ❒ NO

D. ADDITIONAL CONSIDERATIONS:

Trail was continuous so needed to be evaluated at two locations, one on each side of 19th Ave.

E. STATEMENT OF LIKELIHOOD:
1. Are noise mitigation measures feasible?
   ■ YES ❒ NO
2. Are noise mitigation measures reasonable?
   ❒ YES ■ NO
3. Is insulation of buildings both feasible and reasonable?
   ❒ YES ■ NO
4. Shall noise abatement measures be provided?
   ❒ YES ■ NO

F. ABATEMENT DECISION DESCRIPTION AND JUSTIFICATION:

The barrier was not deemed feasible as the Cost Benefit Index was great than $6,500 per receptor per dBA and therefore is not recommended.

Completed by: _____ Date: 6/19/15

ENVIRONMENTAL NOISE SURVEY DATA SHEET

Project #					Date	18 Sep 14
Project	US 6/19th Ave				Site	
Location	NE Quad on trail				SLM	820 – A B C D E F G 824 – A B
Description	Loc 1				Cal	94.0
Roadway	major		distance to site	lanes 4 total 2 lane ea.	speed	car count	truck count
Store 3	minor						
Temp	85°	Wind	Calm	Sky	Clear	Engr	~~KTR~~

Site			
SLM height above ground			
Start Time	12 : 05	:	:
Stop Time	12 : 35	:	:
L_{eq}	68.7 / 68.1		
L_{min}			
L_{max}			
L_1			
L_{10}			
L_{33}			
L_{50}			
L_{90}			
L_{95}			

Cars	
Medium Trucks	11
Heavy Trucks	𝍸 𝍸 𝍸 𝍸 𝍸 1
Buses	11
Motorcycles	𝍸 1111
Gen Aviation	
Jets	
Sirens	
HVAC	

NB 76, NB 75, SB 76, NB 78, NB 75

14.5 x 3' to edg of travel lane (nearest) = 13.24 m
61 x 3' South of CSU sign = 55.7 m
Edge of sidewalk/trail

ROSEN GOLDBERG DER & LEWITZ, INC. 1100 Larkspur Landing Circle #375 • Larkspur CA 94939 • Tel 415 464 0150 • Fax 415 464 0155 • RGDLacoustics.com

ENVIRONMENTAL NOISE SURVEY DATA SHEET

Project #						Date	16 Sept 14
Project	US 6/19th Ave					Site	
Location	Mines Campus Police Bldg					SLM	820 – A B C D E F G 824 – A B
Description	2nd FL Conf room			Loc 2		Cal	
Roadway	major		distance to site	lanes	speed	car count	truck count
Stone S	minor						
Temp		Wind		Sky		Engr	

Site		
SLM height above ground		
Start Time	:	:
Stop Time	:	:
L_{eq}	42.1/41.9/41.9	
L_{min}		
L_{max}		
L_1		
L_{10}		
L_{33}		
L_{50}		
L_{90}		
L_{95}		

Cars	
Medium Trucks	
Heavy Trucks	46, 47,
Buses	
Motorcycles	52, 55
Gen Aviation	
Jets	
Sirens	
HVAC	

Window Ajar for A/C vent (see photo)

52

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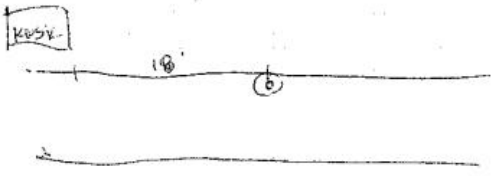
ENVIRONMENTAL NOISE SURVEY DATA SHEET

Project #
Project
Location US 6 - South leg of path along Hwy
Description Loc 3
Roadway major / minor
Store 6
Date 18 Sept 14
Site
SLM 820 – A B C D E F G / 824 – A B
Cal
distance to site
lanes
speed 45
car count
truck count
Temp 85° Wind Calm - 3 Sky Clear Engr ATR

Site
SLM height above ground
Start Time 3 :15 : :
Stop Time 3 :45 : :
L_{eq} 64.2 / 64.1
L_{min}
L_{max}
L_1
L_{10}
L_{33}
L_{50}
L_{90}
L_{95}

Cars
Medium Trucks
Heavy Trucks
Buses
Motorcycles
Gen Aviation
Jets 1
Sirens
HVAC

car 65 average
pickup 68
path 14
people 11
bike 11



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ENVIRONMENTAL NOISE SURVEY DATA SHEET

Project #		Date	18 Sept 19
Project	Loc 4	Site	
Location	19th St (Ludwig)	SLM	820 – A B C D E F G 824 – A B
Description	30' from curb edge of near travel lane	Cal	
Roadway	major / minor	distance to site / lanes / speed	car count / truck count
State 7			
Temp	86	Wind 0-3 NW	Sky Clear
Engr	AJR		

Site	
SLM height above ground	
Start Time	1:05
Stop Time	1:20
L_{eq}	61.0 / 64.5 / 61.6
L_{min}	
L_{max}	
L_1	
L_{10}	
L_{33}	
L_{50}	
L_{90}	
L_{95}	

Cars	
Medium Trucks	70
Heavy Trucks	
Buses	
Motorcycles	
Gen Aviation	
Jets	
Sirens	
HVAC	

Lookout/19th St

cars 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 1 — 64, 63, 65, 68, 68

truck

bus 1 (67 EB)

moto 1

MT 11

Study 58 from SH 6.
56 – 60

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ENVIRONMENTAL NOISE SURVEY DATA SHEET

Project #						Date	19 Sept 14
Project	US 6/19th Ave					Site	
Location						SLM	820 – A B 824 – 1 (5)
Description	Loc 5					Cal	
Roadway	major		distance to site	lanes	speed	car count	truck count
Steve 10	minor						
Temp	84°	Wind	Calm	Sky	pt cldy	Engr	AJR

Site				
SLM height above ground				
Start Time	12 : 45	:	:	:
Stop Time	:	:	:	:
L_{eq}	55.5 (5) / 51.0 (10) / 53.5			
L_{min}				
L_{max}				
L_1				
L_{10}				
L_{33}				
L_{50}				
L_{90}				
L_{95}				

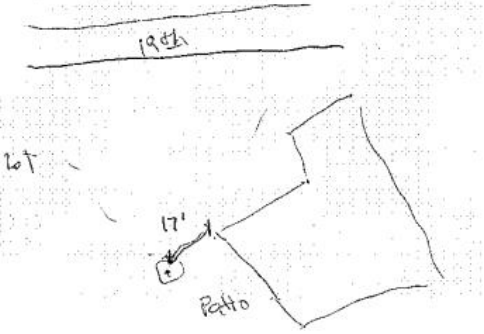
Cars	
Medium Trucks	
Heavy Trucks	60
Buses	
Motorcycles	
Gen Aviation	
Jets	
Sirens	
HVAC	
Voices from fraternity (5) / 54, 55	

- traffic visible on 19th but not audible due to exhaust fan from bldg across lawn. (Steady 50-51 dBA)

on loop

car:

mark on loop? 70



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ENVIRONMENTAL NOISE SURVEY DATA SHEET

Project #
Project
Location: 19th St. East of Hwy 6
Description: LOC 6
Roadway: major | distance to site | lanes | speed | car count | truck count
Storell: minor
Temp: 88 | Wind: 2-5 SW | Sky: Pt cldy

Date: 19 Sept 14
Site
SLM: 820 – A B C D E F G; 824 – A (B)
Cal
Engr: ATR

Site			
SLM height above ground			
Start Time	1 :10	:	:
Stop Time	1 :40	:	:
L_{eq}	64.7/64.2		
L_{min}			
L_{max}			
L_1			
L_{10}			
L_{33}			
L_{50}			
L_{90}			
L_{95}			

Cars	64, 63, 67, 78, 69, 67, 70, 72
Medium Trucks	
Heavy Trucks	
Buses	
Motorcycles	
Gen Aviation	
Jets	1
Sirens	
HVAC	

x10 / 15

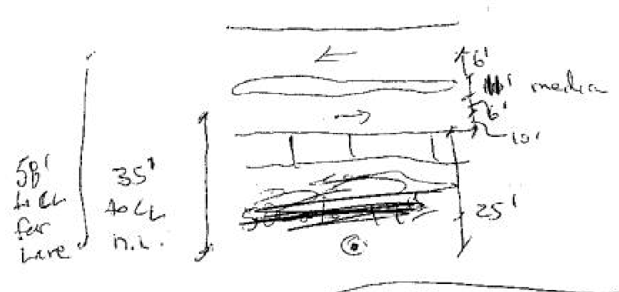
Cars: HHH HHH HHH HHH HHH 1111 + 1 / HHH HHH HHH HHH HHH

MT: 1 1(67), 1(68), 1, 1, 1, 1

HT

MoT: 83 1, 1, 1, 1, 1(74), 1(66)

BUS: 1 (76)



ROSEN GOLDBERG DER & LEWITZ, INC. SOXBA w/o 19th

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ENVIRONMENTAL NOISE SURVEY DATA SHEET

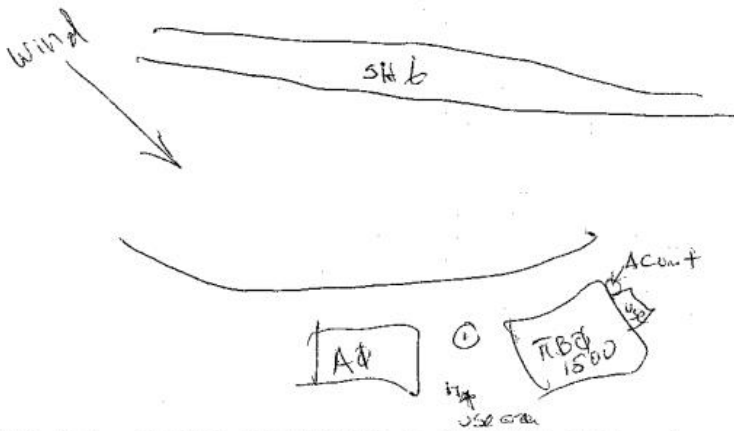
Project #				Date	19 Sep 14
Project				Site	
Location	SH 6, North of 19th (2) first row north			SLM	820 – A B C D E F G 824 – A B
Description	Loc 7 back TBΦ + AΦ			Cal	
Roadway	major	distance to site	lanes	speed	car count	truck count
Stone 12	minor					
Temp	88°	Wind 2-5 SW just to S	Sky	Pt Cldy	Engr	

Site			
SLM height above ground			
Start Time	2 :15	:	:
Stop Time	:	:	:
L_{eq}	50.8/50.8/50.8 (5 / 10)		
L_{min}			
L_{max}			
L_1			
L_{10}			
L_{33}			
L_{50}			
L_{90}			
L_{95}			

Cars	
Medium Trucks	
Heavy Trucks	57,
Buses	
Motorcycles	
Gen Aviation	
Jets	52
Sirens	
HVAC	

- Hiking to not visible from spot

53 on local



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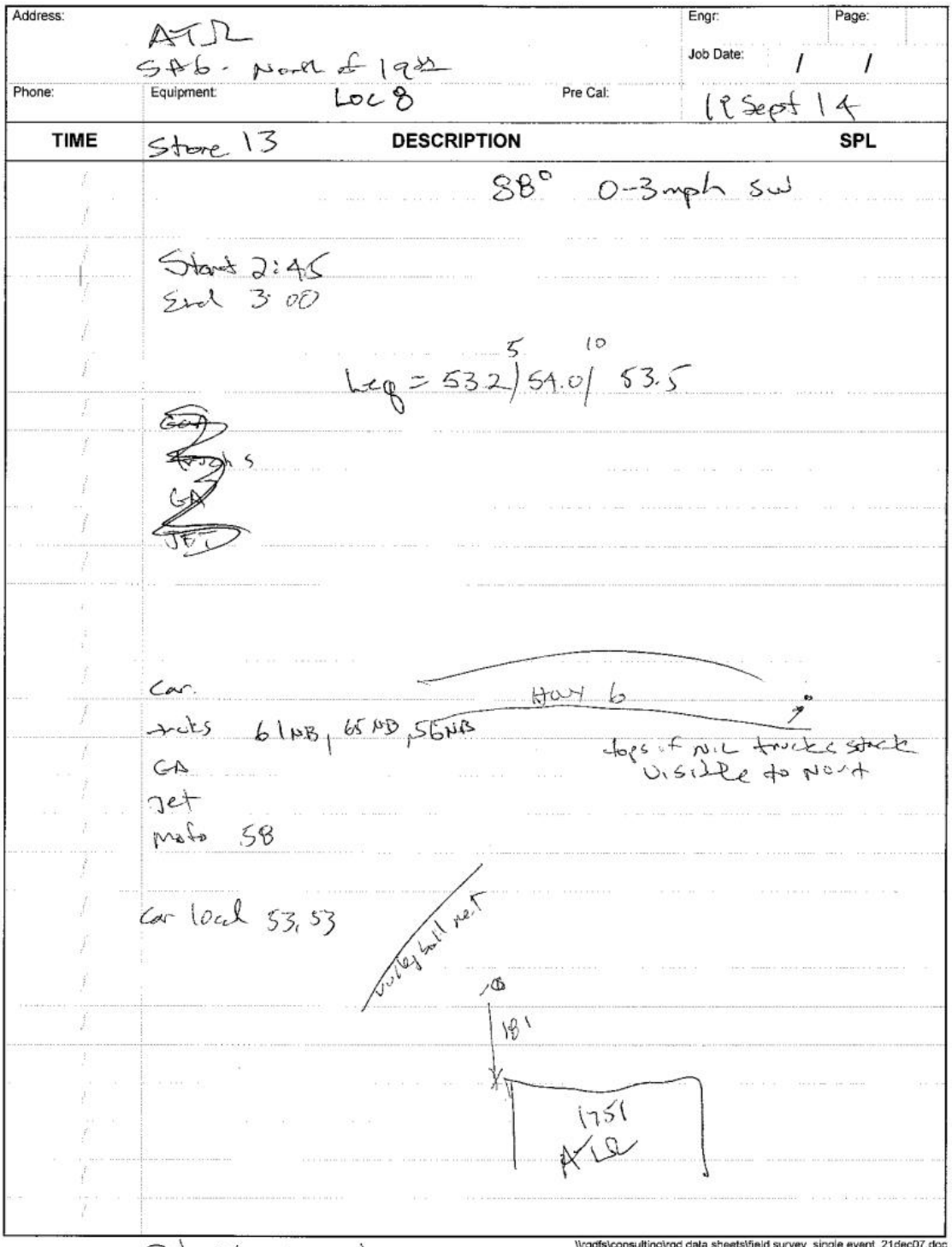

Address: ATL
SR6 - North of 19th
Phone: Equipment: Loc 8 Pre Cal: 18 Sept 14
Engr: Page: Job Date: / /

TIME | Store 13 | DESCRIPTION | SPL

88° 0-3 mph SW

Start 2:45
End 3:00

Leq = 53.2 (5) / 54.0 (10) / 53.5

Car.
trucks 61 NB, 65 NB, 56 NB
GA
Jet
moto 58

Hwy 6

tops of NB trucks stack visible to North

Car local 53, 53

building will not

181

1751
ATL

\\rgdfs\consulting\rgd data sheets\field survey_single event_21dec07.doc

Pat O'Reskovich
1831 Parfet Street

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ENVIRONMENTAL NOISE SURVEY DATA SHEET

Project #						Date	19 Sept 14
Project						Site	
Location	1831 Parfet Estates Dr. Loc 9					SLM	820 – A B C D E F G 824 – A B
Description	@ setback of home.					Cal	
Roadway	major SH6	distance to site	lanes	speed	car count	truck count	
Shore 14	minor						
Temp	90°	Wind	0-2 South	Sky	Clear	Engr	ATR

Site			
SLM height above ground			
Start Time	3 :20	:	:
Stop Time	3 :35	:	:
L_{eq}	56.0 (5) / 57.9 (10) / 57.0		
L_{min}			
L_{max}			
L_1			
L_{10}			
L_{33}			
L_{50}			
L_{90}			
L_{95}			

Parfet Cars	63, 59, 61, 64 / 10
6 Medium Trucks	~~58~~
6 Heavy Trucks	58
Buses	
Motorcycles	5 / 61 on 19th, 70 SB SH6, 1 / 10 57
Gen Aviation	
Jets	
Sirens	69 on SH6 (6 mins in measure) @ 3:26
HVAC	

steady 55 from SH6
51 when stopped?
no just varies

M is Parfet
D is Pine Ridge 50' from edge of near travel lane

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RESULTS: SOUND LEVELS — **14-043 Golden Overpass Phase 2**

RGD Acoustics
Peter Huson / Harold Goldberg

19 June 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 14-043 Golden Overpass Phase 2
RUN: Future Conditions 2
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 20 deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
NE-0 (19th)	1	1	64.3	64.0	66	-0.3	10	----	64.0	0.0	7	-7.0
NE-1 (Trail)	1	1	70.7	71.6	66	0.9	10	Snd Lvl	71.6	0.0	7	-7.0
NE-2 (Fraternity)	1	1	58.0	55.5	66	-2.5	10	----	55.5	0.0	7	-7.0
NE-3 (Fraternity)	1	1	57.2	56.1	66	-1.1	10	----	56.1	0.0	7	-7.0
NE-4 (Fraternity)	1	1	51.6	51.6	66	0.0	10	----	51.6	0.0	7	-7.0
NE-5 (School of Mines)	1	1	53.0	52.6	66	-0.4	10	----	52.6	0.0	7	-7.0
NE-6 (Fraternity)	1	1	53.3	51.3	66	-2.0	10	----	51.3	0.0	7	-7.0
NE-7 (Fraternity)	1	1	55.5	54.8	66	-0.7	10	----	54.8	0.0	7	-7.0
NE-8 (Fraternity)	1	1	55.9	54.3	66	-1.6	10	----	54.3	0.0	7	-7.0
NE-9 (Sorority)	1	1	54.4	53.9	66	-0.5	10	----	53.9	0.0	7	-7.0
NE-10 (Sorority)	1	1	52.9	53.4	66	0.5	10	----	53.4	0.0	7	-7.0
NE-11 (Sorority)	1	1	52.7	54.2	66	1.5	10	----	54.2	0.0	7	-7.0
NE-12 (Sorority)	1	1	54.6	56.9	66	2.3	10	----	56.9	0.0	7	-7.0
NW-0 (Parfet)	1	1	58.4	59.2	66	0.8	10	----	59.2	0.0	7	-7.0
NW-1 (19th and Parfet)	1	1	62.7	62.5	66	-0.2	10	----	62.5	0.0	7	-7.0
NW-2 (Parfet)	1	1	57.0	53.9	66	-3.1	10	----	53.9	0.0	7	-7.0
NW-3 (Parfet)	1	1	56.2	53.5	66	-2.7	10	----	53.5	0.0	7	-7.0
NW-4 (Parfet)	1	1	55.2	53.5	66	-1.7	10	----	53.5	0.0	7	-7.0
NW-5 (Parfet)	1	1	53.6	52.4	66	-1.2	10	----	52.4	0.0	7	-7.0
NW-6 (Parfet)	1	1	52.7	51.3	66	-1.4	10	----	51.3	0.0	7	-7.0
NW-7 (Parfet)	1	1	53.0	52.1	66	-0.9	10	----	52.1	0.0	7	-7.0
NW-8 (Parfet)	1	1	53.0	52.5	66	-0.5	10	----	52.5	0.0	7	-7.0
NW-9 (Parfet)	1	1	54.6	54.4	66	-0.2	10	----	54.4	0.0	7	-7.0
NW-10 (Parfet)	1	1	52.8	52.5	66	-0.3	10	----	52.5	0.0	7	-7.0

C:\TNM25\PROGRAM\SOUNDPLAN\JUNE RUNS\150619 - Future Conditions FINAL 1

RESULTS: SOUND LEVELS **14-043 Golden Overpass Phase 2**

NW-11 (Parfet)	1	1	51.8	51.8	66	0.0	10	----	51.8	0.0	7	-7.0
NW-12A (Parfet)	1	1	57.9	58.6	66	0.7	10	----	58.6	0.0	7	-7.0
NW-12B (Parfet)	1	1	65.1	66.4	66	1.3	10	Snd Lvl	66.4	0.0	7	-7.0
NW-13A (Parfet)	1	1	58.6	59.2	66	0.6	10	----	59.2	0.0	7	-7.0
NW-13B (Parfet)	1	1	63.9	64.8	66	0.9	10	----	64.8	0.0	7	-7.0
NW-14A (Parfet)	1	1	57.8	58.6	66	0.8	10	----	58.6	0.0	7	-7.0
NW-14B (Parfet)	1	1	63.6	64.2	66	0.6	10	----	64.2	0.0	7	-7.0
NW-15A (Parfet)	1	1	54.3	54.9	66	0.6	10	----	54.9	0.0	7	-7.0
NW-15B (Parfet)	1	1	61.3	62.2	66	0.9	10	----	62.2	0.0	7	-7.0
NW-16A (Parfet)	1	1	52.4	53.0	66	0.6	10	----	53.0	0.0	7	-7.0
NW-16B (Parfet)	1	1	57.1	57.6	66	0.5	10	----	57.6	0.0	7	-7.0
NW-17A (Parfet)	1	1	50.9	51.3	66	0.4	10	----	51.3	0.0	7	-7.0
NW-17B (Parfet)	1	1	53.6	53.9	66	0.3	10	----	53.9	0.0	7	-7.0
NW-18A (Parfet)	1	1	50.1	50.6	66	0.5	10	----	50.6	0.0	7	-7.0
NW-18B (Parfet)	1	1	52.0	52.4	66	0.4	10	----	52.4	0.0	7	-7.0
NW-19A (Parfet)	1	1	50.5	51.0	66	0.5	10	----	51.0	0.0	7	-7.0
NW-19B (Parfet)	1	1	52.5	53.0	66	0.5	10	----	53.0	0.0	7	-7.0
NW-20A (Parfet)	1	1	52.8	53.5	66	0.7	10	----	53.5	0.0	7	-7.0
NW-20B (Parfet)	1	1	54.1	54.8	66	0.7	10	----	54.8	0.0	7	-7.0
NW-21 (Parfet)	1	1	40.7	40.6	66	-0.1	10	----	40.6	0.0	7	-7.0
NW-22 (Parfet)	1	1	40.5	40.2	66	-0.3	10	----	40.2	0.0	7	-7.0
NW-23 (Parfet)	1	1	41.8	41.2	66	-0.6	10	----	41.2	0.0	7	-7.0
NW-24 (Parfet)	1	1	42.5	39.7	66	-2.8	10	----	39.7	0.0	7	-7.0
NW-25 (Kohinoor)	1	1	42.2	42.6	66	0.4	10	----	42.6	0.0	7	-7.0
NW-26 (Yucca)	1	1	44.2	44.6	66	0.4	10	----	44.6	0.0	7	-7.0
NW-27 (Yucca)	1	1	43.2	42.0	66	-1.2	10	----	42.0	0.0	7	-7.0
NW-28 (Yucca)	1	1	50.7	49.9	66	-0.8	10	----	49.9	0.0	7	-7.0
NW-29 (Yucca)	1	1	43.0	41.0	66	-2.0	10	----	41.0	0.0	7	-7.0
NW-30 (Mt. Zion)	1	1	44.4	43.8	66	-0.6	10	----	43.8	0.0	7	-7.0
NW-31 (Mt. Zion)	1	1	45.0	43.9	66	-1.1	10	----	43.9	0.0	7	-7.0
NW-32 (Mt. Zion)	1	1	44.7	44.3	66	-0.4	10	----	44.3	0.0	7	-7.0
NW-33 (Mt. Zion)	1	1	45.4	44.6	66	-0.8	10	----	44.6	0.0	7	-7.0
NW-34 (Mt. Zion)	1	1	45.1	44.2	66	-0.9	10	----	44.2	0.0	7	-7.0
NW-35 (Mt. Zion)	1	1	45.3	44.9	66	-0.4	10	----	44.9	0.0	7	-7.0
NW-36 (Mt. Zion)	1	1	51.1	47.5	66	-3.6	10	----	47.5	0.0	7	-7.0
NW-37 (Mt. Zion)	1	1	50.9	47.6	66	-3.3	10	----	47.6	0.0	7	-7.0
NW-38 (19th)	1	1	60.0	60.3	66	0.3	10	----	60.3	0.0	7	-7.0
NW-39 (19th)	1	1	57.3	57.2	66	-0.1	10	----	57.2	0.0	7	-7.0
SE-1 (Trail)	1	1	68.5	67.2	66	-1.3	10	Snd Lvl	67.2	0.0	7	-7.0
SE-2 (Police)	1	1	63.1	64.5	66	1.4	10	----	64.5	0.0	7	-7.0
SE-3 (Shipping)	1	1	57.3	56.2	66	-1.1	10	----	56.2	0.0	7	-7.0

C:\TNM25\PROGRAM\SOUNDPLAN\JUNE RUNS\150619 - Future Conditions FINAL **2**

RESULTS: SOUND LEVELS **14-043 Golden Overpass Phase 2**

SE-4 (Golf Tee)	1	1	63.1	63.4	66	0.3	10	----	63.4	0.0	7	-7.0
SE-5 (Fossils)	1	1	57.5	57.9	66	0.4	10	----	57.9	0.0	7	-7.0
SW-1 (Lab)	1	1	60.9	59.3	66	-1.6	10	----	59.3	0.0	7	-7.0
SW-2 (Apartments)	1	1	59.5	59.5	66	0.0	10	----	59.5	0.0	7	-7.0
SW-3 (Health Dept.)	1	1	59.8	60.1	66	0.3	10	----	60.1	0.0	7	-7.0
X- LID	1	1	0.0	64.3	66	64.3	10	----	64.3	0.0	7	-7.0

Dwelling Units	**# DUs**	**Noise Reduction**		
		Min	**Avg**	**Max**
		dB	**dB**	**dB**
All Selected	71	0.0	0.0	0.0
All Impacted	3	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

RESULTS: SOUND LEVELS **14-043 Golden Overpass Phase 2**

RGD Acoustics **19 June 2015**
Peter Huson / Harold Goldberg **TNM 2.5**
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: **14-043 Golden Overpass Phase 2**
RUN: **Future Conditions 2 - Parfet Wall ROW**
BARRIER DESIGN: **INPUT HEIGHTS** **Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.**
ATMOSPHERICS: **20 deg C, 50% RH**

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
NE-0 (19th)	1	1	64.3	64.0	66	-0.3	10	----	64.0	0.0	7	-7.0
NE-1 (Trail)	1	1	70.7	71.6	66	0.9	10	Snd Lvl	71.6	0.0	7	-7.0
NE-2 (Fraternity)	1	1	58.0	55.5	66	-2.5	10	----	55.5	0.0	7	-7.0
NE-3 (Fraternity)	1	1	57.2	56.1	66	-1.1	10	----	56.1	0.0	7	-7.0
NE-4 (Fraternity)	1	1	51.6	51.6	66	0.0	10	----	51.6	0.0	7	-7.0
NE-5 (School of Mines)	1	1	53.0	52.6	66	-0.4	10	----	52.6	0.0	7	-7.0
NE-6 (Fraternity)	1	1	53.3	51.3	66	-2.0	10	----	51.3	0.0	7	-7.0
NE-7 (Fraternity)	1	1	55.5	54.8	66	-0.7	10	----	54.8	0.0	7	-7.0
NE-8 (Fraternity)	1	1	55.9	54.3	66	-1.6	10	----	54.3	0.0	7	-7.0
NE-9 (Sorority)	1	1	54.4	53.9	66	-0.5	10	----	53.9	0.0	7	-7.0
NE-10 (Sorority)	1	1	52.9	53.3	66	0.4	10	----	53.3	0.0	7	-7.0
NE-11 (Sorority)	1	1	52.7	54.2	66	1.5	10	----	54.2	0.0	7	-7.0
NE-12 (Sorority)	1	1	54.6	56.9	66	2.3	10	----	56.9	0.0	7	-7.0
NW-0 (Parfet)	1	1	58.4	59.2	66	0.8	10	----	53.3	5.9	7	-1.1
NW-1 (19th and Parfet)	1	1	62.7	62.5	66	-0.2	10	----	62.5	0.0	7	-7.0
NW-2 (Parfet)	1	1	57.0	53.9	66	-3.1	10	----	53.9	0.0	7	-7.0
NW-3 (Parfet)	1	1	56.2	53.5	66	-2.7	10	----	53.5	0.0	7	-7.0
NW-4 (Parfet)	1	1	55.2	53.5	66	-1.7	10	----	53.4	0.1	7	-6.9
NW-5 (Parfet)	1	1	53.6	52.4	66	-1.2	10	----	52.3	0.1	7	-6.9
NW-6 (Parfet)	1	1	52.7	51.3	66	-1.4	10	----	51.3	0.0	7	-7.0
NW-7 (Parfet)	1	1	53.0	52.1	66	-0.9	10	----	51.9	0.2	7	-6.8
NW-8 (Parfet)	1	1	53.0	52.5	66	-0.5	10	----	52.3	0.2	7	-6.8
NW-9 (Parfet)	1	1	54.6	54.4	66	-0.2	10	----	53.8	0.6	7	-6.4
NW-10 (Parfet)	1	1	52.8	52.5	66	-0.3	10	----	50.0	2.5	7	-4.5

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RESULTS: SOUND LEVELS **14-043 Golden Overpass Phase 2**

NW-11 (Parfet)	1	1	51.8	51.8	66	0.0	10	----	49.2	2.6	7	-4.4
NW-12A (Parfet)	1	1	57.9	58.6	66	0.7	10	----	52.7	5.9	7	-1.1
NW-12B (Parfet)	1	1	65.1	66.4	66	1.3	10	Snd Lvl	57.2	9.2	7	2.2
NW-13A (Parfet)	1	1	58.6	59.2	66	0.6	10	----	56.1	3.1	7	-3.9
NW-13B (Parfet)	1	1	63.9	64.8	66	0.9	10	----	58.0	6.8	7	-0.2
NW-14A (Parfet)	1	1	57.8	58.6	66	0.8	10	----	55.4	3.2	7	-3.8
NW-14B (Parfet)	1	1	63.6	64.2	66	0.6	10	----	59.0	5.2	7	-1.8
NW-15A (Parfet)	1	1	54.3	54.9	66	0.6	10	----	51.6	3.3	7	-3.7
NW-15B (Parfet)	1	1	61.3	62.2	66	0.9	10	----	58.6	3.6	7	-3.4
NW-16A (Parfet)	1	1	52.4	53.0	66	0.6	10	----	50.2	2.8	7	-4.2
NW-16B (Parfet)	1	1	57.1	57.6	66	0.5	10	----	55.6	2.0	7	-5.0
NW-17A (Parfet)	1	1	50.9	51.3	66	0.4	10	----	49.0	2.3	7	-4.7
NW-17B (Parfet)	1	1	53.6	53.9	66	0.3	10	----	51.9	2.0	7	-5.0
NW-18A (Parfet)	1	1	50.1	50.5	66	0.4	10	----	48.8	1.7	7	-5.3
NW-18B (Parfet)	1	1	52.0	52.4	66	0.4	10	----	50.9	1.5	7	-5.5
NW-19A (Parfet)	1	1	50.5	51.0	66	0.5	10	----	50.1	0.9	7	-6.1
NW-19B (Parfet)	1	1	52.5	53.0	66	0.5	10	----	52.2	0.8	7	-6.2
NW-20A (Parfet)	1	1	52.8	53.5	66	0.7	10	----	53.1	0.4	7	-6.6
NW-20B (Parfet)	1	1	54.1	54.8	66	0.7	10	----	54.4	0.4	7	-6.6
NW-21 (Parfet)	1	1	40.7	40.6	66	-0.1	10	----	40.0	0.6	7	-6.4
NW-22 (Parfet)	1	1	40.5	40.1	66	-0.4	10	----	39.5	0.6	7	-6.4
NW-23 (Parfet)	1	1	41.8	41.2	66	-0.6	10	----	40.6	0.6	7	-6.4
NW-24 (Parfet)	1	1	42.5	39.6	66	-2.9	10	----	39.3	0.3	7	-6.7
NW-25 (Kohinoor)	1	1	42.2	42.5	66	0.3	10	----	39.2	3.3	7	-3.7
NW-26 (Yucca)	1	1	44.2	44.5	66	0.3	10	----	37.5	7.0	7	0.0
NW-27 (Yucca)	1	1	43.2	42.0	66	-1.2	10	----	37.4	4.6	7	-2.4
NW-28 (Yucca)	1	1	50.7	49.9	66	-0.8	10	----	49.9	0.0	7	-7.0
NW-29 (Yucca)	1	1	43.0	40.9	66	-2.1	10	----	40.7	0.2	7	-6.8
NW-30 (Mt. Zion)	1	1	44.4	43.7	66	-0.7	10	----	43.6	0.1	7	-6.9
NW-31 (Mt. Zion)	1	1	45.0	43.9	66	-1.1	10	----	43.8	0.1	7	-6.9
NW-32 (Mt. Zion)	1	1	44.7	44.4	66	-0.3	10	----	44.2	0.2	7	-6.8
NW-33 (Mt. Zion)	1	1	45.4	44.6	66	-0.8	10	----	44.4	0.2	7	-6.8
NW-34 (Mt. Zion)	1	1	45.1	44.2	66	-0.9	10	----	44.0	0.2	7	-6.8
NW-35 (Mt. Zion)	1	1	45.3	44.9	66	-0.4	10	----	44.7	0.2	7	-6.8
NW-36 (Mt. Zion)	1	1	51.1	47.5	66	-3.6	10	----	47.5	0.0	7	-7.0
NW-37 (Mt. Zion)	1	1	50.9	47.6	66	-3.3	10	----	47.5	0.1	7	-6.9
NW-38 (19th)	1	1	60.0	60.3	66	0.3	10	----	60.3	0.0	7	-7.0
NW-39 (19th)	1	1	57.3	57.2	66	-0.1	10	----	57.2	0.0	7	-7.0
SE-1 (Trail)	1	1	68.5	67.2	66	-1.3	10	Snd Lvl	67.2	0.0	7	-7.0
SE-2 (Police)	1	1	63.1	64.5	66	1.4	10	----	64.5	0.0	7	-7.0
SE-3 (Shipping)	1	1	57.3	56.2	66	-1.1	10	----	56.2	0.0	7	-7.0

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RESULTS: SOUND LEVELS **14-043 Golden Overpass Phase 2**

SE-4 (Golf Tee)	1	1	63.1	63.4	66	0.3	10	----	63.4	0.0	7	-7.0
SE-5 (Fossils)	1	1	57.5	57.9	66	0.4	10	----	57.9	0.0	7	-7.0
SW-1 (Lab)	1	1	60.9	59.3	66	-1.6	10	----	59.3	0.0	7	-7.0
SW-2 (Apartments)	1	1	59.5	59.5	66	0.0	10	----	59.5	0.0	7	-7.0
SW-3 (Health Dept.)	1	1	59.8	60.1	66	0.3	10	----	60.1	0.0	7	-7.0
X- LID	1	1	0.0	64.3	66	64.3	10	----	64.3	0.0	7	-7.0

Dwelling Units	**# DUs**	**Noise Reduction**		
		Min	**Avg**	**Max**
		dB	**dB**	**dB**
All Selected	71	0.0	1.2	9.2
All Impacted	3	0.0	3.1	9.2
All that meet NR Goal	2	7.0	8.1	9.2

RESULTS: SOUND LEVELS **14-043 Golden Overpass Phase 2**

RGD Acoustics **19 June 2015**
Peter Huson / Harold Goldberg **TNM 2.5**
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: **14-043 Golden Overpass Phase 2**
RUN: **Future Conditions w Trail Wall Wall**
BARRIER DESIGN: **INPUT HEIGHTS**
Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.
ATMOSPHERICS: **20 deg C, 50% RH**

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact	With Barrier Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
NE-0 (19th)	1	1	64.3	64.0	66	-0.3	10	----	64.0	0.0	7	-7.0
NE-1 (Trail)	1	1	70.7	71.6	66	0.9	10	Snd Lvl	59.6	12.0	7	5.0
NE-2 (Fraternity)	1	1	58.0	55.5	66	-2.5	10	----	55.2	0.3	7	-6.7
NE-3 (Fraternity)	1	1	57.2	56.1	66	-1.1	10	----	56.0	0.1	7	-6.9
NE-4 (Fraternity)	1	1	51.6	51.4	66	-0.2	10	----	51.0	0.4	7	-6.6
NE-5 (School of Mines)	1	1	53.0	52.6	66	-0.4	10	----	52.5	0.1	7	-6.9
NE-6 (Fraternity)	1	1	53.3	51.0	66	-2.3	10	----	49.1	1.9	7	-5.1
NE-7 (Fraternity)	1	1	55.5	53.2	66	-2.3	10	----	50.5	2.7	7	-4.3
NE-8 (Fraternity)	1	1	55.9	53.9	66	-2.0	10	----	50.2	3.7	7	-3.3
NE-9 (Sorority)	1	1	54.4	54.0	66	-0.4	10	----	52.8	1.2	7	-5.8
NE-10 (Sorority)	1	1	52.9	53.5	66	0.6	10	----	52.3	1.2	7	-5.8
NE-11 (Sorority)	1	1	52.7	54.3	66	1.6	10	----	52.9	1.4	7	-5.6
NE-12 (Sorority)	1	1	54.6	57.0	66	2.4	10	----	56.0	1.0	7	-6.0
NW-0 (Parfet)	1	1	58.4	59.2	66	0.8	10	----	59.2	0.0	7	-7.0
NW-1 (19th and Parfet)	1	1	62.7	62.5	66	-0.2	10	----	62.5	0.0	7	-7.0
NW-2 (Parfet)	1	1	57.0	53.9	66	-3.1	10	----	53.9	0.0	7	-7.0
NW-3 (Parfet)	1	1	56.2	53.5	66	-2.7	10	----	53.4	0.1	7	-6.9
NW-4 (Parfet)	1	1	55.2	53.5	66	-1.7	10	----	53.4	0.1	7	-6.9
NW-5 (Parfet)	1	1	53.6	52.4	66	-1.2	10	----	52.4	0.0	7	-7.0
NW-6 (Parfet)	1	1	52.7	51.3	66	-1.4	10	----	51.3	0.0	7	-7.0
NW-7 (Parfet)	1	1	53.0	52.1	66	-0.9	10	----	52.1	0.0	7	-7.0
NW-8 (Parfet)	1	1	53.0	52.5	66	-0.5	10	----	52.5	0.0	7	-7.0
NW-9 (Parfet)	1	1	54.6	54.4	66	-0.2	10	----	54.3	0.1	7	-6.9
NW-10 (Parfet)	1	1	52.8	52.5	66	-0.3	10	----	52.5	0.0	7	-7.0

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RESULTS: SOUND LEVELS									14-043 Golden Overpass Phase 2			
NW-11 (Parfet)	1	1	51.8	51.8	66	0.0	10	----	51.8	0.0	7	-7.0
NW-12A (Parfet)	1	1	57.9	58.6	66	0.7	10	----	58.6	0.0	7	-7.0
NW-12B (Parfet)	1	1	65.1	66.4	66	1.3	10	Snd Lvl	66.4	0.0	7	-7.0
NW-13A (Parfet)	1	1	58.6	59.2	66	0.6	10	----	59.2	0.0	7	-7.0
NW-13B (Parfet)	1	1	63.9	64.8	66	0.9	10	----	64.8	0.0	7	-7.0
NW-14A (Parfet)	1	1	57.8	58.7	66	0.9	10	----	58.7	0.0	7	-7.0
NW-14B (Parfet)	1	1	63.6	64.2	66	0.6	10	----	64.2	0.0	7	-7.0
NW-15A (Parfet)	1	1	54.3	54.9	66	0.6	10	----	54.9	0.0	7	-7.0
NW-15B (Parfet)	1	1	61.3	62.2	66	0.9	10	----	62.2	0.0	7	-7.0
NW-16A (Parfet)	1	1	52.4	53.0	66	0.6	10	----	53.0	0.0	7	-7.0
NW-16B (Parfet)	1	1	57.1	57.6	66	0.5	10	----	57.6	0.0	7	-7.0
NW-17A (Parfet)	1	1	50.9	51.3	66	0.4	10	----	51.3	0.0	7	-7.0
NW-17B (Parfet)	1	1	53.6	53.9	66	0.3	10	----	53.9	0.0	7	-7.0
NW-18A (Parfet)	1	1	50.1	50.6	66	0.5	10	----	50.6	0.0	7	-7.0
NW-18B (Parfet)	1	1	52.0	52.4	66	0.4	10	----	52.4	0.0	7	-7.0
NW-19A (Parfet)	1	1	50.5	51.0	66	0.5	10	----	51.0	0.0	7	-7.0
NW-19B (Parfet)	1	1	52.5	53.0	66	0.5	10	----	53.0	0.0	7	-7.0
NW-20A (Parfet)	1	1	52.8	53.5	66	0.7	10	----	53.5	0.0	7	-7.0
NW-20B (Parfet)	1	1	54.1	54.8	66	0.7	10	----	54.8	0.0	7	-7.0
NW-21 (Parfet)	1	1	40.7	40.7	66	0.0	10	----	40.7	0.0	7	-7.0
NW-22 (Parfet)	1	1	40.5	40.2	66	-0.3	10	----	40.2	0.0	7	-7.0
NW-23 (Parfet)	1	1	41.8	41.3	66	-0.5	10	----	41.3	0.0	7	-7.0
NW-24 (Parfet)	1	1	42.5	40.0	66	-2.5	10	----	40.0	0.0	7	-7.0
NW-25 (Kohinoor)	1	1	42.2	42.6	66	0.4	10	----	42.6	0.0	7	-7.0
NW-26 (Yucca)	1	1	44.2	44.6	66	0.4	10	----	44.6	0.0	7	-7.0
NW-27 (Yucca)	1	1	43.2	42.1	66	-1.1	10	----	42.1	0.0	7	-7.0
NW-28 (Yucca)	1	1	50.7	49.9	66	-0.8	10	----	49.9	0.0	7	-7.0
NW-29 (Yucca)	1	1	43.0	41.1	66	-1.9	10	----	41.1	0.0	7	-7.0
NW-30 (Mt. Zion)	1	1	44.4	43.8	66	-0.6	10	----	43.8	0.0	7	-7.0
NW-31 (Mt. Zion)	1	1	45.0	44.0	66	-1.0	10	----	44.0	0.0	7	-7.0
NW-32 (Mt. Zion)	1	1	44.7	44.4	66	-0.3	10	----	44.4	0.0	7	-7.0
NW-33 (Mt. Zion)	1	1	45.4	44.6	66	-0.8	10	----	44.6	0.0	7	-7.0
NW-34 (Mt. Zion)	1	1	45.1	44.2	66	-0.9	10	----	44.3	-0.1	7	-7.1
NW-35 (Mt. Zion)	1	1	45.3	44.9	66	-0.4	10	----	44.9	0.0	7	-7.0
NW-36 (Mt. Zion)	1	1	51.1	47.6	66	-3.5	10	----	47.5	0.1	7	-6.9
NW-37 (Mt. Zion)	1	1	50.9	47.7	66	-3.2	10	----	47.7	0.0	7	-7.0
NW-38 (19th)	1	1	60.0	60.3	66	0.3	10	----	60.3	0.0	7	-7.0
NW-39 (19th)	1	1	57.3	57.3	66	0.0	10	----	57.2	0.1	7	-6.9
SE-1 (Trail)	1	1	68.5	66.9	66	-1.6	10	Snd Lvl	58.7	8.2	7	1.2
SE-2 (Police)	1	1	63.1	64.7	66	1.6	10	----	63.1	1.6	7	-5.4
SE-3 (Shipping)	1	1	57.3	56.2	66	-1.1	10	----	56.1	0.1	7	-6.9

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RESULTS: SOUND LEVELS									14-043 Golden Overpass Phase 2			
SE-4 (Golf Tee)	1	1	63.1	63.4	66	0.3	10	----	63.3	0.1	7	-6.9
SE-5 (Fossils)	1	1	57.5	57.9	66	0.4	10	----	57.9	0.0	7	-7.0
SW-1 (Lab)	1	1	60.9	59.3	66	-1.6	10	----	59.3	0.0	7	-7.0
SW-2 (Apartments)	1	1	59.5	59.5	66	0.0	10	----	59.5	0.0	7	-7.0
SW-3 (Health Dept.)	1	1	59.8	60.1	66	0.3	10	----	60.1	0.0	7	-7.0
X- LID	1	1	0.0	64.3	66	64.3	10	----	64.3	0.0	7	-7.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	71	-0.1	0.5	12.0
All Impacted	3	0.0	6.7	12.0
All that meet NR Goal	2	8.2	10.1	12.0