Final

Traffic Noise Study

for the

NV FLAP US 50(1) Round Hill Pines Access Project

Douglas County, Nevada

Prepared for:

Federal Highway Administration
Central Federal Lands Highway Division
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Acronyms and Abbreviations

CNEL	community noise equivalent level
dB	decibel
dBA	A-weighted decibels
FHWA	Federal Highway Administration
Lden	Day Evening Night Sound Level
NAC	Noise Abatement Criteria
NDOT	Nevada Department of Transportation
STA	station
TNM	Traffic Noise Model
TRPA	Tahoe Regional Planning Agency
US	U.S. Route

Executive Summary

The Federal Highway Administration (FHWA) Central Federal Lands Highway Division, in cooperation with the United State Department of Agriculture Forest Service Lake Tahoe Basin Management Unit, the Tahoe Regional Planning Agency (TRPA), and the Nevada Department of Transportation (NDOT), is proposing to improve safety for visitors entering and exiting the Round Hill Pines Resort from U.S. Highway 50 (US 50). The Project begins south of the existing entrance into the resort and extends north along US 50. The Project is located in Douglas County near Zephyr Cove, Nevada.

The purpose of this Traffic Noise Study technical report is to evaluate potential noise impacts at noise-sensitive receptor locations near the Round Hill Pines Access Project.

- Existing peak hour traffic (2016) would be up to 59 dBA.
- Under the No-Build Alternative (2036), noise levels do not approach or exceed the FHWA or NDOT NAC at any of the modeled receivers. In addition, the calculated noise levels show that future no-build increases would be up to approximately 1 A-weighted decibel (dBA) above existing noise levels.
- Under the Build Alternative, design-year (2036) noise level predictions would not approach or exceed the NDOT NAC or TRPA noise levels at any of the modeled receivers nor would they experience substantial increases. The calculated noise levels show that future build increases would be up to 3 dBA above existing noise levels. Therefore, no noise impacts would result from the proposed Project.

1.0 Introduction

The Round Hill Pines Access Project is proposing to improve safety for visitors entering and exiting the Round Hill Pines Resort from U.S. Highway 50 (US 50). This Project involves relocating the Round Hill Pines access road intersection with US 50, constructing the Round Hill Pines access road on new alignment, widening US 50 to accommodate a center median turn and acceleration lane in Douglas County, Nevada. The relocated Round Hill Pines access road would connect to existing parking areas for the Round Hill Pines Resort. Additional improvements include roadway drainage improvements, permanent water quality structures, signing, and striping.

The northern edge of the study area for this project extends from 140 feet north of Sierra Sunset Lane to 500 feet south of the Round Hill Pines access road. The Round Hill Pines Resort Beach and Marina, to the west of US 50, are also included in the study area (**Figure 1**). Land use within the study area consists of residential development and recreational use.

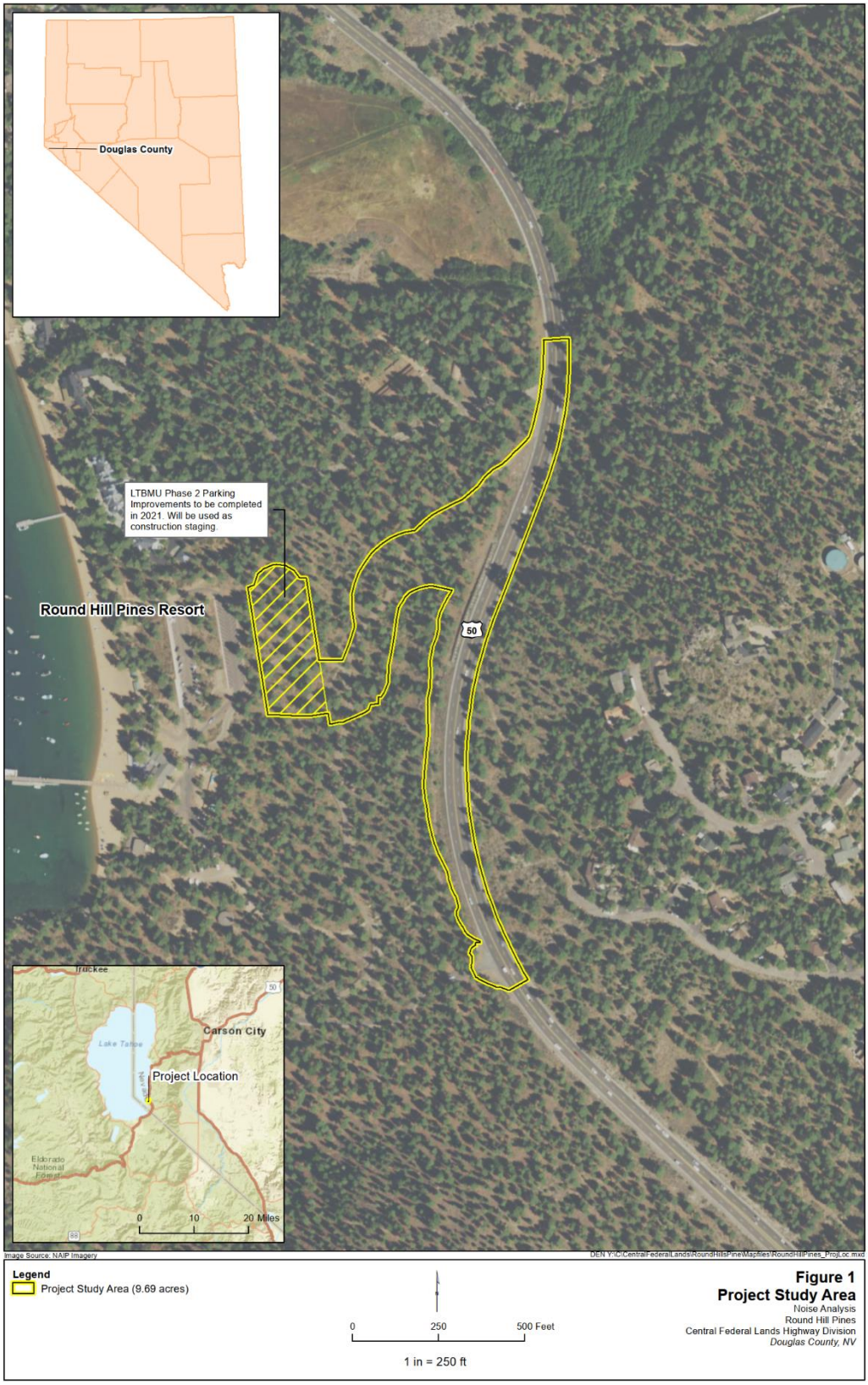
Douglas County
LTBMU Phase 2 Parking Improvements to be completed in 2021. Will be used as construction staging.
Round Hill Pines Resort
50
Truckee
Carson City
Lake Tahoe
Project Location
Eldorado National Forest
0
10
20 Miles
Image Source: NAIP Imagery
Legend
Project Study Area (9.69 acres)
0
250
500 Feet
1 in = 250 ft
Figure 1
Project Study Area
Noise Analysis
Round Hill Pines
Central Federal Lands Highway Division
Douglas County, NV

Figure 1. Project Study Area

2.0 Build Alternative

Under the Build Alternative, the Round Hill Pines Resort access road and US 50 intersection would be relocated approximately 0.2 mile further to the north from the existing location. US 50 would be widened at the relocated intersection to accommodate a new median left-turn bay and eastbound US 50 acceleration lane. The US 50 cross section at the relocated intersection would consist of two 12-foot eastbound lanes, two 12-foot westbound lanes, a 12-foot-wide median left-turn bay, and an eastbound US 50 acceleration lane. Shoulder widths along US 50 would remain the same as existing, consisting of 4-foot-wide shoulders along US 50 westbound and 6-foot-wide shoulders along US 50 eastbound. The US 50 alignment would not change as part of the proposed project. The remaining areas of US 50 adjacent to the relocated intersection would receive a pavement mill and overlay, lane striping, pavement markings, and a safety edge, in addition to the widening.

An existing concrete slab retaining wall is located along the western US 50 slope embankment facing into the Round Hill Pines Resort. The existing retaining wall would remain in place, and the slope paving would be removed. Guardrail would be used at this location along with 1:2 slopes to minimize the construction footprint. A curb section with minimal ditching would be added along the western side of US 50, and no ditches would be constructed along the eastern side of US 50. Roadway slopes would be constructed using boulders and vegetation to enhance visual aesthetics and blend into the natural setting.

Existing 18- and 36-inch culverts within the project area would be replaced as well as armored with riprap where feasible. The clear zone, which is the area available for safe use by errant vehicles, would be improved through removal of obstructions, including clearing vegetation adjacent to the roadway as feasible. All traffic control signs would be reviewed and replaced, if needed, to meet current standards.

The Round Hill Pines access road would be constructed on new alignment. The access road would be reconstructed to accommodate two 12-foot lanes with 2-foot-wide shoulders. The new access road would have barnroof slopes consisting of 1:4 within the clear zone (12 feet from edge of traveled way) with 1:2 slopes to reduce construction impacts.

3.0 Noise Standards and Fundamentals

Noise is defined as unwanted sound. Sound is defined as a form or energy transmitted by vibrations in the air which are received by the ear through sense of hearing. The terms noise and sound are used synonymously.

Sound is measured in sound pressure levels. The most common unit of measurement is a decibel (dB). For the purposes of environmental studies, the A-weighted scale on a common sound level instrument is used because it closely approximates the range of frequencies an average human ear can detect. The A-weighted noise levels are defined as dBA. Generally, changes in noise levels less than 3 A-weighted decibels (dBA) are barely perceived by the human ear, whereas a 10-dBA change is normally perceived as a doubling of noise levels.

Noise may be continuous or intermittent and of high frequency or low frequency. Traffic noise is typically measured over a 1-hour period, which is defined as the level equivalent (Leq(h)).

The CNEL averages dB levels over a 24-hour period, with noise late at night and early in the morning being weighted greater because humans and wildlife are more sensitive to noise during these periods. The CNEL adds a penalty of 5 dBA to evening hours between 1900 to 2200 and a penalty of 10 dBA added to the nighttime hours of 2200 to 0700.

4.0 Federal, State, and Local Regulations

The Federal Highway Administration (FHWA) Noise Abatement Criteria (NAC) define noise levels for land activity categories. The Nevada Department of Transportation (NDOT) has adopted these NAC and defines noise levels that if approached (1 dBA less than the FHWA NAC) or exceeded, require noise abatement consideration (see **Table 1** for various land use categories). FHWA guidelines also state that noise abatement should be considered when the noise levels substantially exceed the existing noise levels (Code of Federal Regulation Title 23, Section772.5(g)). This criterion is defined by NDOT as increases in the L_{eq} of 12.0 dBA or more above existing noise levels. Douglas County has adopted both FHWA and NDOT guidelines for assessing traffic noise impacts.

Table 1. NAC, Hourly A-Weighted Sound Level Decibels (dBA) [1]

Activity Category	Activity Criteria[2]		Evaluation Location	Description of Activity Category
	Leq(h)	L10(h)		
A	57	60	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[3]	67	70	Exterior	Residential.
C[3]	67	70	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structure, radio stations, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	55	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structure, radio studios, recording studios, schools, and television studios.
E[3]	72	75	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D, or F.
F	---	---	---	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	---	---	---	Undeveloped lands that are not permitted.

[1] Either Leq(h) or L10(h) (but not both) may be used on a project.

[2] The Leq(h) and L10(h) Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.

[3] Includes undeveloped lands permitted for this activity category.

The Tahoe Regional Planning Agency (TRPA) has identified noise as an environmental threshold and has established carrying capacity standards for noise. The TRPA Goals and Policies addresses single event noise standard and uses a community noise equivalent level (CNEL) to measure whether noise levels exceed established levels. This Project is in the TRPA Plan Area identified as US 50 near Round Hill with a threshold of 65 dB (TRPA 2020).

5.0 Methodology

The FHWA traffic noise model (TNM) version 2.5 (FHWA 2004) is an approved analytical method developed for highway-traffic noise prediction. The model is based upon reference energy emission levels for automobiles, medium trucks (two axles), and heavy trucks (three or more axles), with consideration given to vehicle volume, speed, roadway configuration, distance to the receptor, terrain features, atmospheric conditions, and acoustical characteristics of the site. TNM was developed to predict hourly Leq and CNEL values for free-flowing and interrupted-flow traffic conditions, and is generally considered to be accurate, within ±3 decibels (dBA). The model enables the user to account for the effects of graded roadways, terrain variations, and attenuation over/through rows of buildings and dense vegetation. The model uses traffic noise-emission curves, which FHWA recommends, to accurately calculate noise levels that highway traffic generates. The model for the Existing condition used 2016 traffic data, while 2036 traffic data were used for the No-Build and the Build models. Traffic information was provided by 30% plans from April 2019 for the Leq levels. Traffic used for the CNEL levels was obtained from the Traffic Signal Warrant Study NVFLAP US 50(1) Round Hill Pines Access (FHWA, 2019).

6.0 Traffic Data

Traffic was provided as a part of the plan set (**Table 2**). The posted speed of 45 miles per hour (mph) was used for existing and no-build models. The proposed speed on US 50 will be 50 mph, and 25 mph was used for the access road, as shown in the plan set, and in the build model.

Table 2. Existing and Future Peak Hour Traffic Data

	Existing Peak Hour Traffic (2016)			Future Peak Hour Traffic (2036)		
Roadway	Autos	Medium Trucks	Heavy Trucks	Autos	Medium Trucks	Heavy Trucks
US 50, northbound	945	28	28	1211	35	35
US 50, southbound	945	28	28	1211	35	35
Access road, eastbound*	59	1	1	87	1	1
Access road, westbound*	59	1	1	87	1	1

*Access Road to Round Hill Pines is only open seasonally, May to September, exact dates are weather dependent

7.0 Noise Analysis

7.1 Noise-sensitive Receptors

Noise-sensitive receptors within the Project study area include recreational use (Round Hills Pines Beach and Marina trail) and residential development (at Sierra Sunset Lane and Round Hill Village, east of US 50). These noise-sensitive areas are described in **Table 3** and depicted on **Figure 2**. Noise-sensitive

receptors are defined as those areas where frequent outdoor human use would occur that may be affected by future transportation conditions.

Table 3. Modeled Noise Details

Receiver No.	Land Use	X	Y	Z
R1	Single-family Residence	2,236,438.00	14,670,952.00	6,273.00
R2	Single-family Residence	2,236,239.50	14,670,826.00	6,267.00
R3	Marina Trail	2,236,411.00	14,670,586.00	6,277.52
R4	Marina Trail	2,236,111.25	14,669,624.00	6,296.00
R5	Marina Trail	2,236,166.50	14,669,241.00	6,334.00
R6	Single-family Residence	2,236,846.75	14,669,976.00	6,415.00
R7	Single-family Residence	2,236,888.25	14,669,770.00	6,416.00
R8	Single-family Residence	2,236,793.25	14,669,514.00	6,404.00

7.2 Noise Measurements and Model Validation

On July 22, 2019, noise measurements were taken at four locations within the Project study area to determine ambient noise levels. **Figure 2** depicts the locations of the field measurements. Weather conditions were clear with winds ranging from 0 to 5 mph and a temperature of approximately 80 degrees. Meters were calibrated and placed at 5 feet above ground surface, the average height of the human ear. Short-term noise readings were collected for 15 minutes for each event as required by NDOT. Traffic counts, by vehicle type, were collected simultaneously with the noise measurements. Operating speeds and existing geometry were also collected and input into the FHWA-approved TNM 2.5 for validation (**Table 4**).

The difference between the field recordings and the model-predicted noise levels for ground receivers (M1 – M4) was less than 3 dBA, which is considered validated. The TNM is considered validated when the difference in the field recorded noise levels and the TNM-predicted noise levels are 3 dBA or less because the human ear can detect change over 3 dBA.

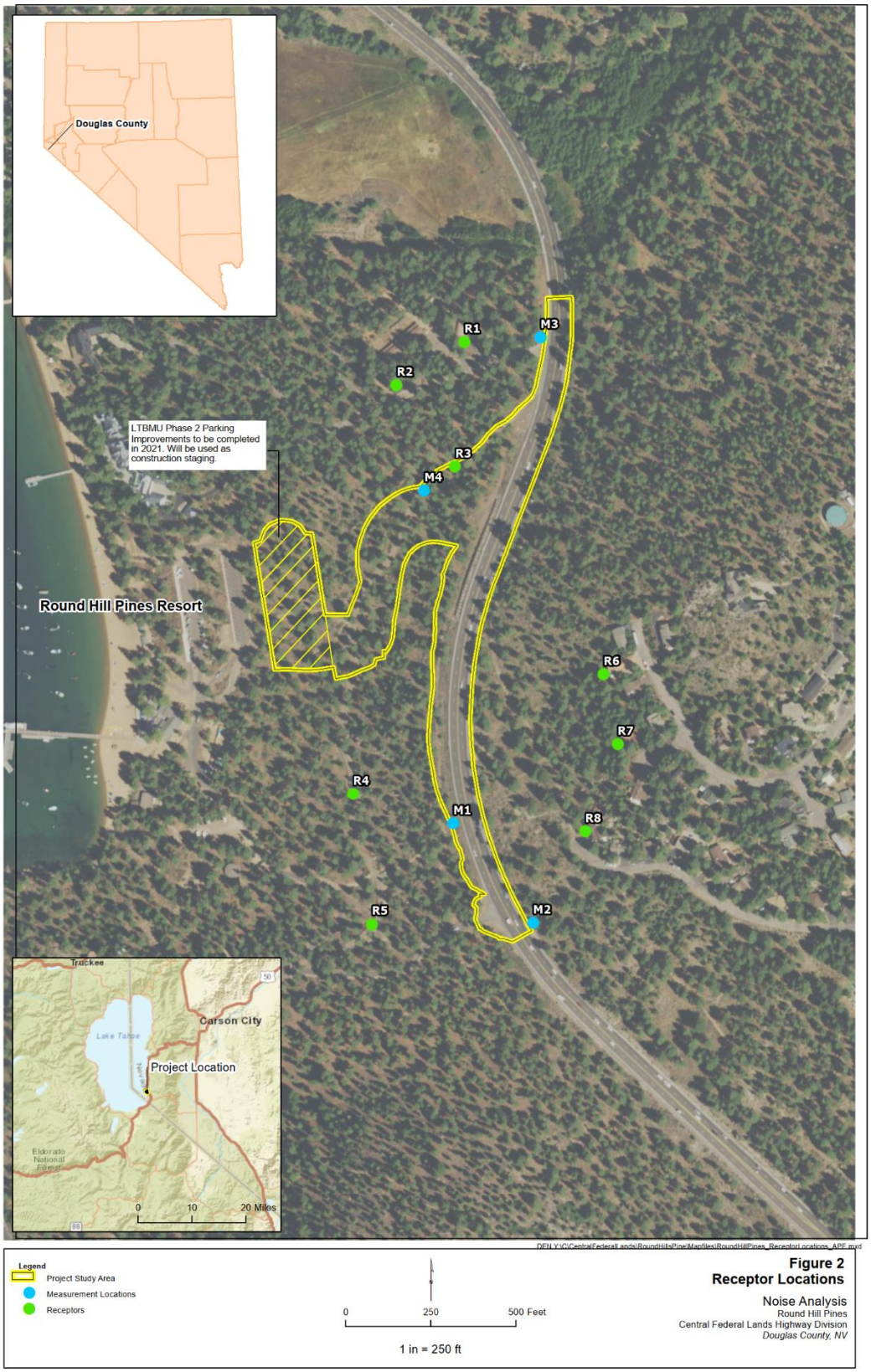
Douglas County
R1
M3
R2
LTBMU Phase 2 Parking Improvements to be completed in 2021. Will be used as construction staging.
R3
M4
Round Hill Pines Resort
R6
R7
R4
M1
R8
R5
M2
Truckee
Carson City
Lake Tahoe
Project Location
Eldorado National Forest
0
10
20 Miles
Legend
Project Study Area
Measurement Locations
Receptors
0
250
500 Feet
1 in = 250 ft
Figure 2
Receptor Locations
Noise Analysis
Round Hill Pines
Central Federal Lands Highway Division
Douglas County, NV

Figure 2. Receptor Locations

Table 4. Field Recorded and TNM-Predicted Noise Levels

Meter #	Location	Field-recorded Noise Levels $L_{(eq)}(h)$	TNM-predicted Noise Levels $L_{(eq)}(h)$	Difference $L_{(eq)}(h)$
M1	25 feet from paved edge of US 50, west of US 50	64.1	66.6	2.5
M2	20 feet from paved edge of US 50, east of US 50	68.5	70.6	2.1
M3	10 feet from paved edge of US 50, north of entrance at Sierra Sunset Lane	74.2	71.4	-2.8
M4	225 feet from paved edge of US 50, on trail at Round Hill Pines Beach and Marina	55.8	54.7	-1.1

7.3 Existing and Future Modeled Noise Levels

Noise models were developed for the Round Hill Pines Beach Resort and surrounding area.

The western side of the road slopes away from the road and the eastern side is elevated above the roadway. **Table 5** shows the existing and future noise levels at the receivers.

Table 5. Modeled Noise Levels

Receiver No.	No. of Receiver by Activity	NAC (dBA)	Leq				CNEL				Noise Impact
			Existing 2016 Leq (dBA)	No-Build Alternative Leq 2036 (dBA)	Build Alternative Leq 2036 (dBA)	Build increase over Existing	Existing 2016 CNEL (dBA)	No-Build CNEL 2036 (dBA)	Build CNEL 2036 (dBA)	Build increase over Existing	
R1	1	66/B	58	59	61	3	62	63	63	1	No
R2	1	66/B	54	55	57	3	57	58	58	1	No
R3	1	66/B	59	60	61	2	62	63	63	1	No
R4	1	66/B	54	55	55	1	57	58	58	1	No
R5	1	66/B	53	54	55	2	57	58	58	1	No
R6	3	66/B	56	57	59	3	59	60	62	3	No
R7	2	66/B	55	56	58	3	58	59	60	2	No
R8	2	66/B	58	59	61	3	61	62	63	2	No

As shown in **Table 5**, there are no impacts at any of the noise-sensitive receivers, which are set back between 175 and 475 feet from the road. The largest increase between the Existing and Build alternatives is less than 3 dBA and would therefore not be a noticeable increase to the human ear. Additionally, the noise levels are below the CNEL limit of 65 dB for this plan area and, therefore, this Project is consistent with the TRPA community noise level equivalent standard.

8.0 Construction-related Noise

Construction would generate noise from diesel-powered earth-moving equipment, such as dump trucks and bulldozers, back-up alarms on certain equipment, and compressors. Construction noises at off-site receptor locations would depend on the loudest piece of equipment operating at the moment. According to the FHWA *Construction Noise Handbook* (2006), noise levels from diesel-powered equipment range from 80 to 95 dBA at a distance of 50 feet. Impact equipment, such as pile drivers, can generate louder noise levels. Construction activities would be temporary and would mostly occur during normal daytime hours when occasional loud noises are more tolerable. None of the receptors are expected to be exposed to construction noise for a long duration; therefore, any extended disruption of normal daytime activities is not expected. Coordination will be conducted with local agencies to secure necessary construction permits which may include variances for any nighttime construction work and/or exceedance of any maximum thresholds specified in local ordinances.

9.0 Conclusions

The following are a summary of results:

- Existing peak hour traffic (2016) noise levels do not approach or exceed the FHWA and NDOT NAC at any of the eight modeled receivers.
- Under the No-Build Alternative, noise levels are below the NAC with future increases up to approximately 1 dBA above existing noise levels.
- Under the Build Alternative, design-year (2036) noise levels are predicted to remain below the NDOT and TRPA noise levels and not experience substantial increases, and thus not result in any impacts.
- Noise abatement would not be necessary, as impacts would not result from the proposed project.
- There is no increases in existing Community Noise Equivalency Levels (CNEL) beyond th 65 dBA CNEL permitted in the applicable Plan Area Statement, Community Plan or Master Plan.
- There will be no exposure of people to severe noise levels nor would the Project exceed the single event of noise level limit set forth in the TRPA Noise Environmental Threshold.
- There is no residential or tourist accommodation uses in areas where the existing CNEL would exceed the 65 dBA set forth in the TRPA Environmental Threshold.
- The Project would not generate an incompatible noise level in close proximity to existing residential or tourist accommodation uses.

- No exposure of existing structures to levels of ground vibration that could result in structural damage would be expected to occur.

10.0 References

U.S. Department of Transportation, Federal Highway Administration (FHWA). 2004. *FHWA Highway Traffic Noise Model User's Guide,(Version 2.5 Addendum) Final Report.* April.

FHWA. 2010. 23 CFR Parts 772 – *Procedures for Abatement of Highway Traffic Noise and Construction Noise.* July.

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U.S. Federal Highway Administration (FHWA). 2006. *Construction Noise Handbook*. https://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/. August.

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