Butte Interstate Traffic Study
Phase I
Project No. IM 0002(672), CN 5098

Noise Study

Prepared for:

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1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

A traffic noise study was conducted to identify existing and future traffic noise levels along Interstate 15/90 (I-15/90) through Butte, MT. This noise study was performed as part of the analysis completed for the Butte Interstate Traffic Study – Phase 1 (CN 5098). The noise levels at noise-sensitive receptors due to traffic traveling on I-15/90 and the adjacent ramps and all over/underpasses that cross the highway were studied.

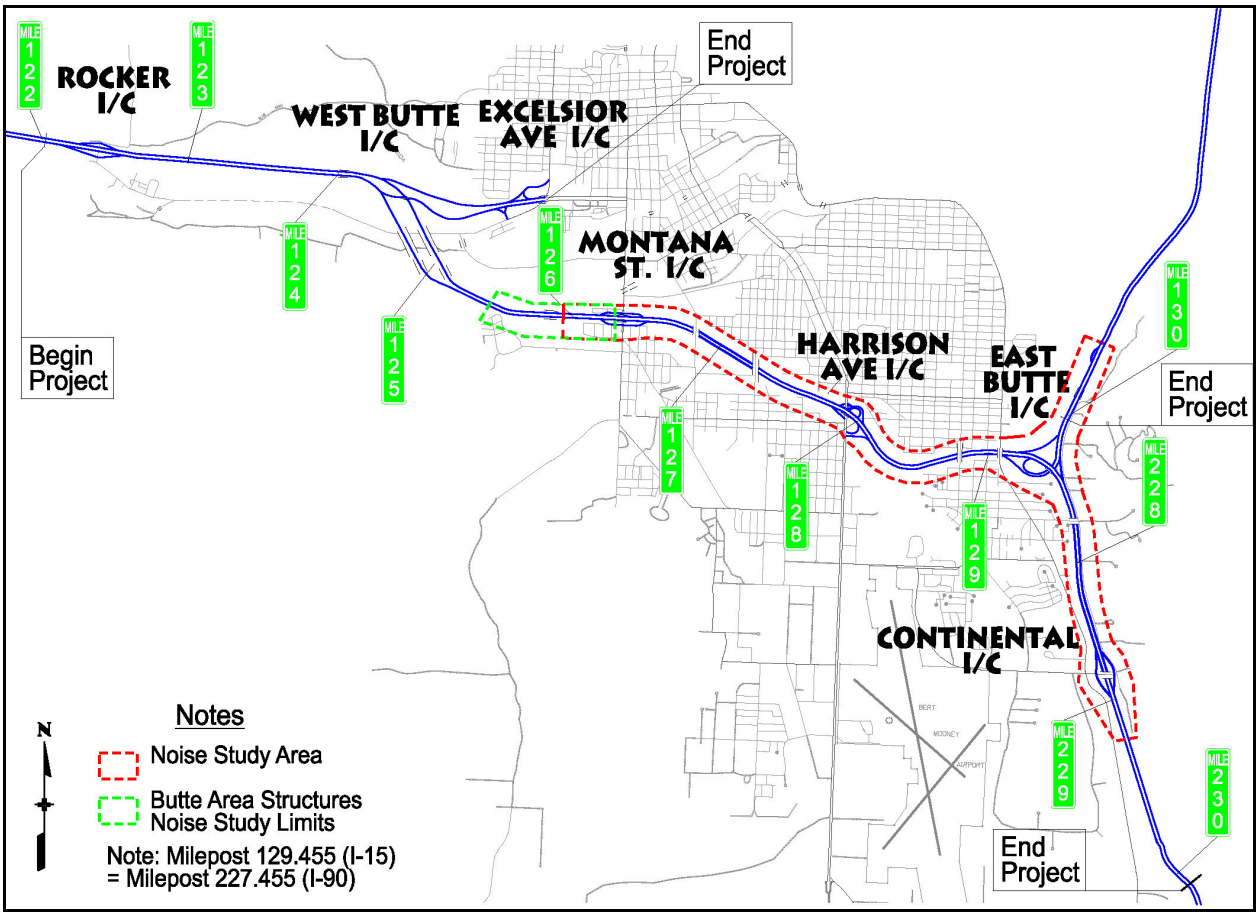
This noise study includes the following tasks:

- Inventorying land uses and identifying noise sensitive receptors
- Measuring existing noise levels within noise sensitive areas
- Developing and calibrating a traffic noise model using Federal Highway Administration's (FHWA) Traffic Noise Model (TNM) Version 2.5 software
- Predicting Existing (2006) and Future No-Build (2025) traffic noise levels
- Identify Existing (2006) and Future No-Build (2025) 66 dBA contour throughout the noise study area
- Documenting the findings

1.2 PROJECT LOCATION/STUDY AREA

The project is located in Silver Bow County in the Butte urban area along the interstates in and around Butte (see figure 1). The noise study area as shown in figure 1 generally covers I-15/90 from just west of the Montana Street Interchange (~milepost 126) to just south of the Continental Interchange (~milepost 229 (I-90 reference)) and along I-15 for approximately one mile north (~milepost 130.3) of the East Butte Interchange. The study area extends approximately 500' from the interstate centerline with a wider area around interchanges and is approximately 6.5 miles long. This study area overlaps a previously completed noise study done for the bridge replacement project just west of Montana Street (Butte Structures, IM 15-2(75) 124). Information from this noise study was reviewed and findings are further discussed within this study. Please note that the noise study area does not include the entire Butte Interstate Traffic Study area.

Figure 1
Project Location/Study Area



The interstate has two 12' travel lanes in each direction separated by a 28-68 foot wide depressed median. Each travel direction has a four foot inside shoulder and 10' outside shoulder. The pavement is primarily concrete in poor condition on the interstate mainline except for a section of I-90 from the East Butte Interchange trough the end of this projects limits, which was recently rehabilitated and overlayed with new asphalt pavement. Interchanges in the study area include the Montana Street (full diamond), Harrison Avenue (half-diamond/cloverleaf), East Butte Interchange (full interstate to interstate trumpet type configuration), and the Continental Interchange (full diamond). Land uses in the study area consist of mixed uses with predominately residential, open lands/parks and commercial or retail. Many residential parcels have been developed along the interstate between the Harrison Avenue interchange and the Continental Interchange since the initial construction of I-15/90 in the late 1960's and early 1970's.

2.0 NOISE DEFINITION

Noise is generally defined as unwanted or undesirable sound. Noise typically affects humans in three different ways:

- Noise intensity or level
- Noise frequency

- Noise variation with time

Noise intensity is determined by how sound pressure fluctuates and is expressed in decibels (dB). The range of noise normally encountered can be expressed by values between 0 and 120 decibels on the decibel scale. A three-decibel change in sound level generally represents a barely-noticeable change in noise level, whereas a ten-decibel change would typically be perceived as a doubling of loudness. The frequency of noise is related to the tone or pitch of the sound and is expressed in terms of cycles per second or Hertz (Hz). The human ear can detect a wide range of frequencies from about 20 Hz to 17,000 Hz. The A-weighting system is commonly used when measuring noise to provide a value that represents human response because human sensitivity to sound varies from person to person. Noise levels measured using this system are called "A-weighted" levels, and are expressed as dBA.

Because environmental noise fluctuates during the course of a day, it is common practice to condense all of this information into a single number, known as an equivalent sound level (Leq). Leq represents a steady sound level over a specified time period (typically 15 minutes).

3.0 APPLICABLE NOISE STANDARDS AND POLICIES

This noise study was conducted in accordance with Montana Department of Transportation's (MDT) *Traffic Noise Analysis and Abatement: Policy and Procedure Manual, June 2001*. The MDT noise guidelines are consistent with the FHWA's 23 CFR 772 *Procedures for Abatement of Highway Traffic Noise and Construction Noise* and have been approved by FHWA. A noise sensitive site is any property (owner occupied, rented, or leased) where frequent exterior human use occurs and where a lowered noise level would be of benefit. MDT has established noise levels at which noise abatement must be considered. Known as Noise Abatement Criteria (NAC), these criteria vary according to a property's land use category (see table 1).

Table 1
FHWA Noise Abatement Criteria (NAC)

Activity Category	$L_{eq}(h)$	Description of Activity Category
A	57 dBA (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 dBA (exterior)	Picnic areas, recreational areas, hospitals, residences, playgrounds, active sports areas, parks, motels, hotels, schools, churches, and libraries
C	72 dBA (exterior)	Developed lands, properties, or activities not included in category A or B.
D	-- dBA (exterior)	Undeveloped lands.
E	52 dBA (exterior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (23 CFR Part 772)

FHWA has defined a traffic noise impact as exterior noise levels that "approach or exceed" the NAC, or when noise levels "substantially exceed" existing conditions. MDT has determined that "approach" be defined as within 1 dBA of the NAC (e.g. 66 dBA for Activity Category B) and that "substantially exceeding existing conditions" be defined as an increase of 13 dBA. Noise

from traffic emanates from four primary sources: tire/road interface, engines, aerodynamics, and exhaust stacks. Each of these is considered in the TNM 2.5 model.

4.0 MODEL INPUTS

4.1 NOISE SENSITIVE SITES

Existing land uses within the study area were inventoried and noise-sensitive land uses were identified. These land uses are designated according to the activity categories within FHWA's NAC (see Table 1). For TNM modeling purposes receivers were assigned to each of the noise sensitive areas. All of the noise-sensitive sites for this noise study are Activity Category B land uses. Receivers representing the noise sensitive sites were located as follows:

- Residential receiver sites were placed at the edge of the building closest to the major traffic source, or in an area of frequent human outdoor use.
- Where more than one noise-sensitive site was clustered together with other similar properties, one receiver was analyzed as representative of several noise sensitive sites.
- Ground floor receiver sites were assumed to be five feet above the ground elevation.
- For two story structures (i.e. two story homes or townhouses) the first floor activity area was analyzed. The only exception to this is at second story apartments, which were analyzed at the second story height.

For the purpose of this baseline noise study, receptors were chosen that would potentially have the greatest impact from traffic noise on I-15/90. These receptors include predominantly residential sites in addition to parks, trails, mobile homes, apartments, hotels and Hillcrest Elementary School. A total of 83 noise-sensitive receptors representing up to 380 single-family residences, 14 mobile homes, 48 apartments, 3 hotels, 1 school, 1 park and 4-Blacktail Creek Bike Path locations were identified within approximately 500 feet of the centerline of I-15/90. The locations of receptors within each of the noise-sensitive areas are shown in the Noise Study Plan Sheets in the appendix.

4.2 TRAFFIC AND ROADWAY DATA

For this study the traffic analysis was reviewed to determine the loudest hour for both the existing and future models. Vehicle counts and classification data from June 2006 were obtained from the Butte Interstate Traffic Study. The average daily traffic (ADT), counts that were collected on all ramps, all cross-streets that had interchanges with I-90/I-15, and on the interstate at the beginning and end of the Traffic Study project limits, the AM and PM peak volumes and truck percentages were compared to determine the loudest hour along the interstate mainline

The heavy and light truck percentages during the loudest hour were determined for the interstate based on these counts. During the loudest hour, the eastbound and westbound light truck percentage varied from zero to three percent, and the heavy truck percentage varied from seventeen to nineteen percent. An average value of 81 percent cars, one percent light trucks, and 18 percent heavy trucks was used for the interstate mainline within the project limits. Classification counts were not collected for the ramps and cross-streets, so a uniform assumption of ninety percent cars, two percent light trucks, and eight percent heavy trucks was made for all of the non-interstate roadways.

It was determined that the AM peak hours with 19 percent of trucks (light and heavy) was the loudest hour for the mainline. At the ramps and cross-streets, classification counts were not taken. However, truck volumes were highest during the PM peak and thus those volumes were used to provide a worst-case scenario.

For roadways not associated with the interstate, data from the 2005 Butte Transportation Plan Update was referenced for the model. In these instances, which only apply to the overpasses without direct access to the interstate, a value of 9% of the ADT was assumed to be the loudest hour, which is typically the percentage of PM peak hour traffic in comparison to the daily value.

Traffic speeds were observed to be at the posted speed limits, so were therefore modeled at 75mph along the highway. All ramps and cross-streets were modeled at 35mph.

Future traffic volumes for the 2025 condition were determined by applying a 1.25 growth factor to all volumes in the existing model. No balancing of volumes was done, and the truck percentages remained the same as in the existing model. Guidance on the growth factor was obtained from the Butte Interstate Traffic Study.

Roadway details including numbers and widths of lanes, shoulders and grades were collected and used in the development of the study model.

5.0 NOISE MEASUREMENTS AND MODEL CALIBRATION

To validate the computer noise model, field measurements were taken within the study area following procedures documented in FHWA's *Measurement of Highway-Related Noise, 1996* and *MDT Traffic Noise Analysis and Abatement: Policy and Procedures Manual.* On November 1st and 2nd, 2006, fourteen field measurements were obtained using a Larson Davis 712 Type 2 Sound Level Meter and a Larson Davis 812 Type 1 Sound Level Meter. Each Monitoring event lasted at least twenty minutes. The noise monitors were calibrated using a Larson Davis sound level calibrator. Traffic speeds were recorded by driving the corridor and noting traffic speeds. Measurements were taken on dry days, with average temperatures in the 40's, with less than 5 mph winds. Surrounding features were noted, such as ground type, and photographs were taken of each site.

Site selection for the field validation measurements is based on the location of noise sensitive sites, safety, and access to monitoring sites where a representative sampling of free-flow traffic can be obtained. Noise measurement locations are shown in the Noise Study Plan sheets in the appendix. Traffic volumes by vehicle classification and vehicle speeds were recorded at each field measurement site with the noise monitoring data. The field measurement results and the corresponding results predicted by TNM are shown in Table 2.

Table 2
Measured Noise Levels

ID	Location	Trial #	Time	Field Measured Level (dBA)	Computer Predicted Level (dBA)	Decibel Difference (dBA)
M1	LaSalle Ave. between Jackson and Washington St.	A	3:30-3:50PM	65.6	66.2	0.6
		B	3:55-4:15 PM	65.8	65.9	0.1
M2	Southside of LaSalle Ave. (EB on-ramp) between Montana Street and Placer Street	A	3:30-3:50PM	68.0	66.1	1.9
		B	3:55-4:15 PM	68.2	65.5	2.7
M3	On Blacktail Creek bike path near Yale Avenue parking area	A	2:10-2:30 PM	71.2	72.4	1.2
		B	2:35-2:55 PM	71.6	72.3	0.7
M4	Intersection of Kennedy Ave. and Evans Ave. adjacent to right of way fence	A	2:10-2:30 PM	75.2	74	1.2
		B	2:35-2:55 PM	76.0	74.5	1.5
M5	Near Father Sheehan Park along bike Path near right of way	A	12:30-12:50 PM	62.0	63.3	1.3
		B	12:55-1:15 PM	63.2	65.4	2.2
M6	In Father Sheehan Park at southeastern corner of Playground	A	12:30-12:50 PM	59.4	58	1.4
		B	12:55-1:15 PM	56.3	59.6	3.3
M7	Intersection of Wharton St. and Porter Ave. (northside) near right of way fence	A	11:25-11:45 AM	72.7	72.2	0.5
		B	11:50-12:10 PM	71.9	71.2	0.7
M8	At end of Sherman Street (north of I-15/90) near right of way fence	A	11:25-11:45 AM	70.5	69.6	0.9
		B	11:50-12:10 PM	70.5	69.1	1.4
M9	Near intersection of Gladstone Street and Goodwin Avenue	A	10:20-10:40 AM	57.8	59.6	1.8
		B	10:45-11:05 AM	57.5	60.3	2.8
M10	Northside of Evans Avenue ~200' east of Hancock Ave. near right of way fence	A	10:20-10:40 AM	70.9	70.8	0.1
		B	10:45-11:05 AM	70.9	71.6	0.7
M11	Northside of Wharton Street east of eastern most house on northside of street	A	5:00-5:30 PM	57.6	57.7	0.1
		B	5:40-6:10 PM	57.8	57.2	0.6
M12	in cul de sac of Wharton Street (far east end) near right of way fence	A	5:00-5:30 PM	64.8	65.1	0.3
		B	5:40-6:10 PM	63.9	64.2	0.3
M13	Near cul de sac of East Lake Street; in field behind homes adjacent to right of way fence	A	3:35-4:05 PM	64.1	65.7	1.6
		B	4:10-4:40 PM	66.1	66.6	0.5
M14	Near Atherton Apartments (off Continental Dr.) behind apartments near right of way fence	A	3:35-4:05 PM	58.1	61.8	3.7
		B	4:10-4:40 PM	60.1	63.1	3
Dates: Measurements M11-M14 were collected on November 1st and M1-M10 were collected on November 2nd.						

The monitored measurements were used to calibrate the model so that field conditions such as ground characteristics and natural or incidental noise barriers can be properly replicated in the model. Results from the field noise measurement efforts serve as baseline information for the overall noise modeling analysis.

MDT guidelines state that that measured and modeled results should be within 2.0 decibels. All receivers for this project are within those guidelines except for one of the M-9 measurements and both M-14 measurements. In both of these cases the measurement location is below the interstate mainline and the surrounding topography has considerable variation. The existing topography data used for this model is two-foot GIS contours, which have variable accuracy in these type of topography areas (depressions, rolling hills), which could explain the measurement and model variations. The model is considered valid and was used for development of the existing and future models.

6.0 PREDICTED NOISE LEVELS

As previously discusses 83 noise-sensitive receptors were identified within the study area. Table 4 identifies each receptor and provides information on the location and number of similar adjacent land uses each receptor represents. Based on the existing interstate (I-15/90, I-15 North, I-90) configuration, the traffic noise impacts occur at several of the receptor locations for both the Present Year and Future Year as shown in the table.

Table 3
Noise-Sensitive Receptors Predicted Noise Levels

ID	Description of NAC B Receptor	Distance & Direction from Centerline	Present Year (2006) $L_{eq}(h)$ (dBA)	Future Year (2025) $L_{eq}(h)$ (dBA)
Sheet 1 of 11 - Montana Street I/C				
R10	Represents 4 first row single-family residence at LaSalle Ave. & Jackson St.	248' south	62	63
R11	Represents 7 single-family residence on Jackson St.	439' south	59	60
R12	Represents 4 first row single-family residence at LaSalle Ave. & Washington St.	243' south	63	64
R13	Represents 8 single-family residence on Washington St.	427' south	60	61
R14	Represents 3 first row single-family residences at LaSalle Ave. & Idaho St.	251' south	65	65
R15	Represents 5 single-family residence on Idaho & Montana St.	467' south	63	64
R16	Represents 4 first row single-family residence at LaSalle Ave. & Placer St.	255' south	66	67
R17	Represents 10 single-family residence on Dakota St.	442' south	60	61
R18	Represents 5 first row single-family residence at LaSalle Ave. & Colorado St.	260' south	63	64
R19	Represents 4 single-family residence on Josette Ave.	530' south	59	60
Sheet 2 of 11 - Lexington Ave. Overpass				
MH1	Represents 6 recreational vehicle sites in Butte KOA	419' north	60	61
MH2	Represents 8 mobile homes in Butte KOA	444' north	60	61
R20	Represents 4 single-family residence on Majors St.	360' north	61	62
R21	Represents 3 single-family residence at the end of Nevada and Wyoming Ave.	461' north	59	60
Sheet 3 of 11 - Oregon Ave. Overpass				
R30	Represents 3 single-family residence on Yale Ave.	392' south	60	61
R31	Represents 3 single-family residence on Ottawa St.	473' north	57	58
R32	Represents 8 single-family residence on Evans Ave.	391' south	60	61
R33	Represents 2 single-family residence on Yale Ave.	262' north	65	66
R34	Represents 6 first row single-family residence on	160' south	69	70

ID	Description of NAC B Receptor	Distance & Direction from Centerline	Present Year (2006) $L_{eq}(h)$ (dBA)	Future Year (2025) $L_{eq}(h)$ (dBA)
	Kennedy St.			
R35	Represents 8 single-family residence on Hobson Ave.	454' south	60	61
P20	Blacktail Creek Bikepath east of Oregon Ave. overpass	200' north	67	68
Sheet 4 of 11 - Harrison Ave. I/C				
P30	Blacktail Creek Bikepath east of Oregon Ave. overpass	136' north	65	66
P31	Father Sheehan Park	594' north	57	58
P32	Father Sheehan Park	355' north	60	61
H10	Comfort Inn	187' south	67	68
H11	Red Lion Hotel	564' north	61	62
H12	Best Western Butte Plaza Inn	184' south	67	68
Sheet 5 of 11 - Sheridan Ave. Overpass				
R40	Represents 6 first row single-family residence at west end of Evans Ave.	265' north	67	68
R41	Represents 8 single-family residence on Goodwin St. between Thomas & Sherman Ave.	540' north	59	60
R42	Represents 6 first row single-family residence on Evans Ave. between Thomas & Sherman Ave.	325' north	63	64
R43	Represents 8 first row single-family residence between Sherman & Sheridan Ave.	339' north	62	63
R44	Represents 8 single-family residence on Goodwin St. between Sherman & Sheridan Ave.	449' north	59	60
R45	Represents 6 single-family residence on Phillips St. between Banks & Sheridan Ave.	480' north	59	60
R46	Represents 6 single-family residence on Phillips St. between Sheridan & Gladstone Ave.	436' north	59	60
R47	Represents 8 first row single-family residence between Sheridan & Gladstone Ave.	212' north	67	68
R48	Represents 7 single-family residence on Sherman Ave.	489' south	57	58
R49	Represents 10 first row single-family residence on Wharton St. west of Banks Ave.	153' south	66	67
R50	Represents 8 single-family residence on Wharton St. between Banks & Sheridan Ave.	448' south	59	60
R51	Represents 6 first row single-family residence on Richardson St. west of Sheridan Ave.	204' south	68	69
R52	Represents 8 single-family residence on Richardson St. east of Sheridan Ave.	489' south	58	59
R53	Represents 9 first row single-family residence between Sheridan & Gladstone Ave.	146' south	69	70
R54	Represents 3 single-family residence at west end of Wharton St.	289' south	63	64
R55	Represents 6 first row single-family residence on Evans Ave. between Thomas & Sherman Ave.	343' north	64	65
R56	Represents 4 first row single-family residence on Evans Ave. between Thomas & Sherman Ave.	240' north	66	67
R57	Represents 4 first row single-family residence on Wharton St. west of Sherman St	195.2' south	65	66
R58	Represents 4 first row single-family residence on Goodwin St. between Banks & Sheridan Ave.	205' north	67	68
R59	Represents 5 single-family residence near Wharton St. & Banks Ave. Intersection	220' south	67	68

ID	Description of NAC B Receptor	Distance & Direction from Centerline	Present Year (2006) $L_{eq}(h)$ (dBA)	Future Year (2025) $L_{eq}(h)$ (dBA)
Sheet 6 of 11 - Continental Drive Overpass & East Butte I/C				
R60	Represents 15 single-family residence on Phillips St. between Gladstone & Sheridan Ave.	447' north	58	59
R61	Represents 5 first row single-family residence on Evans Ave.	152' south	69	70
R62	Represents 13 single-family residence on Richardson St. between Gladstone & Hancock Ave.	446' south	58	59
R63	Represents 8 single-family residence on Richardson St. between Hancock Ave. & Continental Dr.	374' south	60	61
R64	Represents 9 single-family residence on west end of Wharton St. east of Continental Dr.	763' south	58	59
R65	Represents 12 singe-family residence on east end of Wharton St. near I-15 loop ramps	575' south	60	61
R66	Represents 6 first row single-family residence at end of Hancock St. north of I-15/90	165' north	63	64
R67	Represents 5 first row single-family on Evans St. between Hancock St. & Continental Dr.	186' south	67	68
R68	Represents 6 single-family residence on Wharton St. east of Continental Dr.	868' south	56	57
R69	Represents 4 first row single-family residence on east end of Wharton St.	255' south	63	64
S1	Hillcrest Elementary Playground	497' north	58	59
Sheet 8 of 11 - Burlington Ave. Overpass				
R70	Represents 16 single-family residence on Hannibal St. (mid-block) near I-15/90 loop ramps	907' south	55	55
R71	Represents 12 single-family residence on Hannibal St. (east end)	201' southwest	63	64
R72	Represents 9 single-family residence on Quincy St. (east end)	177' southwest	64	65
R73	Represents 5 single-family residence on Keokuk St.	458' southwest	57	58
R74	Represents 4 single-family residence on Saddle Rock Dr. north of Burlington Ave.	426' northeast	57	58
R75	Represents 6 single-family residence on Sacramento Ave.	459' west	55	56
R76	Represents 6 single-family residence on Windameer Ct.	271' west	60	61
R77	Represents 1 single-family residence on Saddle Rock Dr. north of Burlington Ave.	579' east	56	57
R78	Represents 2 single-family residence on Saddle Rock Dr. north of Burlington Ave.	372' east	57	57
Sheet 9 of 11 - I-15 north of East Butte I/C				
R80	Represents 6 single-family residence on Windameer Ct.	500' west	55	56
R81	Represents 3 single-family residence on E. Lake St. (east end)	217' west	61	62
R82	Represents 2 single-family residence on Saddle Rock Dr. south of Burlington Ave.	308' east	61	62
R83	Represents 2 single-family residence on Saddle Rock Dr.	262' east	64	65
R84	Represents 4 single-family residence on Cedar Lake Ct. backing Continental Dr.	530' west	56	57

ID	Description of NAC B Receptor	Distance & Direction from Centerline	Present Year (2006) $L_{eq}(h)$ (dBA)	Future Year (2025) $L_{eq}(h)$ (dBA)
R85	Represents 4 single-family residence on Cedar Lake Ct. backing Continental Dr.	500' east	55	56
R86	Represents 4 single-family residence on Cedar Lake Ct. backing Continental Dr.	559' east	55	56
A1	Represents 4 first row apartments (Atherton)	205' west	54	55
A2	Represents 16 apartments (Atherton)	427' west	60	61
A3	Represents 4 apartments (Atherton)	309' west	61	61
A4	Represents 8 apartments (Atherton)	164' west	57	58
A1	Represents 2 first row-2nd story apartments (Atherton)	205' west	56	57
A2	Represents 8 - 2nd story apartments (Atherton)	427' west	62	63
A3	Represents 2 - 2nd story apartments (Atherton)	309' west	62	63
A4	Represents 4 - 2nd story apartments (Atherton)	164' west	60	61
Sheet 10 of 10 – Continental I/C				
R90	Single-family residence on Saddle Rock Dr. north of Mount Highland Dr.	398' east	58	59
Sheet 11 of 11 – East of Continental				
R91	Single-family residence on Saddle Rock Dr. south of Mount Highland Dr.	268' east	63	64
R92	Represents 3 first row single-family residence at end of Saddle Rock Dr.	193' east	67	68
Sheet 7 of 11 - I-15 north of East Butte I/C				
R100	Single-family residence	357' north	54	56
R101	Single-family residence	455' north	51	53
	Indicates predicted noise level exceeds NAC Criteria			

For this baseline study 60 dBA and 66 dBA noise contours were estimated using the TNM computer model for both the existing and future no-build traffic conditions. These contours are a line, roughly parallel with I-15/90, where either a 60 dBA or 66 dBA noise levels is expected. The contours do not consider any shielding of noise provided by structures or topographic features between the receptor and the roadway. Additionally, the noise contours do not account for traffic noise from roadways other than the existing I-15/90 and may fluctuate near the interchanges. The contours for both the Present Year (existing) and Future Year (2025) are shown in the Noise Study Plan Sheets in the appendix. The 66 dBA contour represents an area that exceeds acceptable noise levels as defined by the land use activity category as shown in Table 1. It should be noted that a 66 dBA noise is not acceptable to live with from a quality of life standpoint and represents areas that must consider noise abatement on future Type 1 projects as defined by MDT and FHWA. In general a Type 1 project along I-15/90 would be defined as any Federal or Federal-Aid highway project that would significantly change the horizontal or vertical alignment or increase the number of lanes. The 66 dBA contour can generally be described as:

66 dBA Contour Present Year (existing):

- Montana Street to Harrison Avenue Interchange – 205 to 235 feet from the centerline of I-15/90.
- Harrison Avenue to East Butte Interchange – 180 to 210 feet from the centerline of I-15/90.

- East Butte Interchange to Continental Interchange – 165 to 195 feet from the centerline of I-90, and

66 dBA Contour Future Year (2025):

- Montana Street to Harrison Avenue Interchange – 225 to 255 feet from the centerline of I-15/90.
- Harrison Avenue to East Butte Interchange – 195 to 225 feet from the centerline of I-15/90.
- East Butte Interchange to Continental Interchange – 190 to 220 feet from the centerline of I-90.

The 60 dBA contour represents an area that should be used for planning purposes by local officials and developers to be more protective of the quality of life for residents, school, parklands and the like. Local officials should use these contour limits for the development and implementation of noise compatible land use planning. New developments should be reviewed against the 60 dBA contour to avoid or mitigate noise in new developments in which potential noise-sensitive receptors may be part of the planned development. The 60 dBA contour can generally be described as:

60 dBA Contour Present Year (existing):

- Montana Street to East Butte Interchange – 405 to 435 feet from the centerline of I-15/90.
- Harrison Avenue to East Butte Interchange – 385 to 415 feet from the centerline of I-15/90.
- East Butte Interchange to Continental Interchange – 320 to 350 feet from the centerline of I-90, and

60 dBA Contour Future Year (2025):

- Montana Street to East Butte Interchange – 470 to 500 feet from the centerline of I-15/90.
- Harrison Avenue to East Butte Interchange – 445 to 475 feet from the centerline of I-15/90.
- East Butte Interchange to Continental Interchange – 360 to 390 feet from the centerline of I-90.

The *Butte Area Structures (BAS) Noise Analysis* identifies receptors in the same area near LaSalle Avenue (west of Montana Street). This study also identified noise-sensitive receptors in the Williamsburg neighborhood further west of Montana Street on the south side of I-15/90. The BAS noise analysis stated that noise-sensitive receptors in the Williamsburg neighborhood are currently and will continue to experience traffic noise impacts. However, mitigation measures (noise barriers) are not feasible in this area because of the topography and criteria for mitigation. The model results from this traffic noise study generally correlate to the BSA Study.

7.0 MITIGATION STRATEGIES

Phase 1 of the Butte Interstate Traffic Study involves the identification of existing deficiencies and does not involve developing alternative build scenarios. Without any build scenarios no noise abatement alternatives were developed or analyzed as part of this Noise Study. Potential mitigation strategies that can be considered during Phase 2 of the Butte Interstate Traffic Study

or during future Type 1 Projects include: alignment modifications, property acquisition, land use controls, and noise barriers. More detailed information in relation to the I-15/90 corridor follows.

- **Alignment Modifications -** Alignment modification involves orientating and/or sitting the roadway at sufficient distances from the noise sensitive areas so as to minimize traffic noise. Alignment modifications will be investigated in Phase 2 of the Interstate Traffic Study, however it is unlikely any modifications will provide significant reductions in noise levels within this corridor because there are noise sensitive receptors on both sides of the interstate.
- **Property Acquisition –** Acquiring vacant land in proximity to noise sensitive sites can provide buffer zones that can also be used for noise barrier construction (i.e., walls and berms) or to limit future development in these areas.
- **Land Use Controls -** Land use controls can be used to minimize noise sensitive sites that may be affected by traffic noise. Local planning officials should use the noise contour information and development site plans to minimize the effects of traffic noise on proposed land uses that would be considered noise sensitive.
- **Noise Barriers -** Noise barriers reduce noise levels by blocking the sound path between a roadway and noise sensitive site. To reduce traffic noise effectively, a noise barrier must be relatively long, continuous (with no intermittent openings), and of sufficient height to break the line of sight to the noise generator. Barriers are considered effective if they provided at least 6 dBA insertion loss to noise sensitive sites.

Noise barriers are considered only if they are "feasible and reasonable." MDT has developed the *Noise Abatement Recommendation Checklist* form to ensure consistent evaluation of noise abatement statewide. Some factors used to determine feasible and reasonable barriers follow.

Feasibility issues include:

- If a noise barrier is to be constructed, can it be constructed in a continuous manner (For example, do gaps in noise barriers, e.g. for driveways, significantly degrade their performance)?
- Can at least six dBA of noise reduction be achieved?
- Are there any "fatal flaw" construction, maintenance, or safety issues involved with the proposed mitigation measure?

Reasonableness issues include:

- Do existing and future noise levels exceed the aforementioned standards?
- What is the Cost Effectiveness Index cost per affected receptor per decibel of noise reduction (must meet $4,200/receptor/dBA limit)?
- Were the impacted receivers in existence prior to the original construction or widening (what percentage was in existence)?
- Are there any local government plans for noise compatible development along existing public facilities?
- Is the "build" scenario noise levels at least 3 dBA higher than the "no build" scenario?
- Would the noise barrier be in use for at least 15 years?
- What are the desires of area residents?

8.0 CONCLUSION

Based on the results of this study various neighborhoods are currently impacted by traffic noise from the I-15/90 interstate facility. The noise analysis evaluated 83 noise-sensitive receptors, including single-family residences, mobile homes, apartments, parks, hotels and a school that were identified within the study area. 15 total receptors in the existing condition and 18 total receptors in the future year exceeded the noise levels as defined by the FHWA and MDT. It is important to note that all receptors that exceeded acceptable noise levels did so based on the "approaching and exceeding" criteria and not the "substantially exceeding existing conditions," criteria. The 15 receptors in the existing condition represent over 80 individual single-family residences.

This report is a reference for understanding the potential issues associated with traffic noise in the neighborhoods surrounding the I-15/90 facility. As future roadway projects are considered or projects are developed during Phase 2 of the Butte Interstate Traffic Study this report provides a baseline for comparison. Noise abatement measures should be considered for future Type 1 projects in areas that are practicing noise compatible land use planning and/or noise mitigated developments. This study can also be used immediately by the Butte-Silver-Bow local government for future land use planning and in reviewing development submittals.

9.0 REFERENCES

Montana Department of Transportation. *Traffic Noise Analysis and Abatement: Policy and Procedure Manual*. June 2001

Federal Highway Administration. *Measurement of Highway-Related Noise*. May 1996.

U.S. Code of Federal Regulations, Title 23, part 772. *Procedures for Abatement of Highway Traffic Noise and Construction Noise.*

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