Exhibit 6

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August 11, 2003

Mr. Steve Alters
CH2M Hill
Power Block Building
7 West 6th Avenue, Ste. 3W
Helena, MT 59601

Re: Missoula – I-90 East & West Corridor Study Phase I
IM 90-2(104)94, UPN4855
Draft Baseline Traffic Noise Study
BSA Project #02180

Dear Steve:

Big Sky Acoustics, LLC (BSA) has completed the draft Baseline Traffic Noise Study for Phase I of the I-90 Missoula – East & West Corridor Study project, and the attached report provides the details of the noise analysis. Comments received on this draft report will be incorporated into a final version.

Thank you for the opportunity to work with CH2M Hill again. If you have any questions concerning this report, please do not hesitate to call me at (406) 457-0407, or email me at sean@bigskyacoustics.com.

Sincerely,

Sean Connolly, P.E.
BIG SKY ACOUSTICS, LLC

Attachment

DRAFT
MISSOULA – I-90 EAST & WEST CORRIDOR STUDY
PHASE I
BASELINE TRAFFIC NOISE STUDY
IM 90-2(104)94, UPN4855

Prepared for:

CH2M Hill
Power Block Building
7 West 6th Avenue, Ste. 3W
Helena, MT 59601

Completed by:

Big Sky Acoustics, LLC

August 11, 2003

MISSOULA – I-90 EAST & WEST CORRIDOR STUDY PHASE I
DRAFT BASELINE TRAFFIC NOISE STUDY
IM 90-2(104)94, UPN4855
August 11, 2003

EXECUTIVE SUMMARY

The Baseline Traffic Noise Study for Phase I of the Missoula – I-90 East & West Corridor Study project was conducted by Big Sky Acoustics, LLC (BSA) according to the U.S. Code of Federal Regulations Part 772 (23 CFR 772) *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, and Montana Department of Transportation's (MDT's) *Traffic Noise Analysis and Abatement: Policy and Procedure Manual* (June 2001). The noise levels at noise-sensitive receptor locations (e.g., single-family residences, mobile homes, apartments, hotels, parks, and a medical center) due to vehicles traveling on the existing Interstate 90 (I-90) highway within the project limits were studied.

The project is begins at Reference Post (RP) 94.4, extending southeasterly 25.9 km (16.1 miles) to RP 110. The adjacent terrain is level to steeply rolling, and I-90 passes through rural-farming and urban areas. The primary urban land use is mixed-use with residential and commercial properties located adjacent to the I-90 corridor.

For traffic noise studies, the equivalent noise level during a one-hour period, $L_{eq}(h)$ is used, and the units of the $L_{eq}(h)$ are A-weighted decibels (dBA). The equivalent noise level is defined as the steady state noise level that has the same acoustical energy as the actual, time-varying noise signal during the same time period. The $L_{eq}(h)$ metric is useful for traffic noise studies because it uses a single number to describe the constantly fluctuating noise levels at a receptor location as vehicles pass by during a one-hour period.

According to 23 CFR 772 and MDT's Policy and Procedure Manual, traffic noise impacts occur at single-family residences, mobile homes, apartments, hotels, parks, and medical receptors if $L_{eq}(h)$ traffic noise levels for a roadway are 66 dBA or greater in the Design Year, or if the predicted $L_{eq}(h)$ noise levels in the Design Year are 13 dBA or greater than those in the Present Year. For reconstruction projects, if either criterion is met then an impact occurs and traffic noise abatement measures need to be considered to determine if they are reasonable and feasible.

For the analysis, BSA conducted 13 ambient noise level measurements on July 22-23, 2003 in areas adjacent to I-90 (Section 5.0), and predicted traffic noise levels at 71 receptor locations, including groups of receptors (Section 6.0). FHWA's Traffic Noise Model (TNM) Version 2.0 computer program was used to predict the traffic noise levels due to the existing highway configuration. The measurement and receptor locations are shown on Figures 1 through 8.

Based on the existing I-90 highway configuration, the traffic noise impact criteria was met or exceeded in the Present Year and Design Year of the project (Section 5.2). Of the 71 Category B receptors identified for the baseline noise study, the predicted traffic noise levels equal or exceed the traffic noise impact criteria (66 dBA) in the Present Year of the project at 28 receptors, and at 48 receptors in the Design Year. Receptors the meet or exceed the criteria are generally located throughout the corridor. However, the predicted noise levels are less than the criteria in the Northside neighborhood, where I-90 is approximately 3-to-4 stories above the ground level of the neighborhood, which shields the receptors. In addition, the railroad grade blocks the line of sight and shields the apartment buildings located between the Rattlesnake neighborhood and the East Missoula Interchange, and the predicted noise levels are less than the criteria. Since the criteria is predicted to be met or exceeded at some of the I-90 receptors, then traffic noise abatement measures may need to be considered and evaluated during Phase II of this project.

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1.0 INTRODUCTION

The Baseline Traffic Noise Study for Phase I of the Missoula – I-90 East & West Corridor Study project was conducted by Big Sky Acoustics, LLC (BSA) according to U.S. Code of Federal Regulations Part 772 (23 CFR 772) – *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, and Montana Department of Transportation's (MDT's) *Traffic Noise Analysis and Abatement: Policy and Procedure Manual* (June 2001). The noise levels at noise-sensitive receptors due to vehicles traveling on the existing Interstate 90 (I-90) highway within the project limits were studied.

The project is located in Missoula County on I-90, beginning at Reference Post (RP) 94.4, located 3.1 kilometers (km) (1.9 miles) northwest of the Desmet Interchange, extending southeasterly 25.9 km (16.1 miles) to RP 110, located 0.4 km (0.26 miles) east of the Bonner Interchange. The highway consists of four, 3.7-meter (12-foot) travel lanes, 3-meter (10-foot) outside shoulders, and the two travel lanes in each direction are separated by a median of varying width. The adjacent terrain is level to steeply rolling, and I-90 passes through rural-farming and urban areas. The primary urban land use is mixed-use with residential and commercial properties located adjacent to the I-90 corridor. The following seven interchanges are located within the project limits: Desmet, Airport, Reserve Street, Orange Street, Van Buren Street, East Missoula, and Bonner.

Noise sensitive receptors were identified within approximately 150 meters (492 feet) of the existing I-90 centerline using aerial photographs from the City and County of Missoula and site observations. The approximate receptor locations are shown on Figures 1 through 8, and include single-family residences, mobile homes, apartments, hotels, parks, and a medical center. For this noise study, BSA completed 13 noise level measurements and predicted traffic noise levels for the I-90 existing highway configuration at the receptors.

2.0 NOISE TERMINOLOGY

Noise levels are quantified using units of decibels (dB). Noise levels can also be expressed as A-weighted decibels (dBA). Humans typically have reduced hearing sensitivity at low frequencies compared with their response at high frequencies, and the A-weighting of noise levels closely correlates to the frequency response of normal human hearing. By utilizing A-weighted noise levels in a study, a person's response to noise can be assessed. Decibels are logarithmic values, and cannot be combined using normal algebraic addition. For example, the combined noise level of two 50-dBA-noise sources would be 53 dBA, not 100 dBA.

Traveling from a noise source to a receptor in an outdoor environment, noise levels decrease with increasing distance between the source and receptor. Traffic noise levels typically decrease between approximately 3 and 4.5 dBA every time the distance between the highway and receptor is doubled depending on the characteristics of the source and the conditions over the path that the noise travels. The reduction in noise levels can be increased if a solid barrier, such as a man-made wall, or natural topography is located between the source and receptor.

The ambient noise at a receptor location in a given environment is the all-encompassing sound associated with that environment, and is due to the combination of noise sources from many directions, near and far, including the noise source of interest. The background noise at a given location is due to any sources that are not associated with the noise source of interest.

For environmental noise studies, ambient noise levels and noise impact criteria are typically based on A-weighted equivalent noise levels, L_{eq}, during a certain time period. The equivalent noise level during a one-hour period is represented as $L_{eq}(h)$. The equivalent noise level is defined as the steady state noise level that has the same acoustical energy as the actual, time-varying noise signal during the same time period. The $L_{eq}(h)$ metric is useful for traffic noise studies because it uses a single number to describe the constantly fluctuating ambient noise levels at a receptor location during one hour of time.

3.0 MDT AND FHWA TRAFFIC NOISE POLICIES

23 CFR 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, outlines the procedures to determine if traffic noise impacts will occur for a project and when traffic noise abatement measures will be considered. FHWA and MDT identify traffic noise impacts according to Noise Abatement Criteria (NAC) for various land uses and zoning (Table 3-1). 23 CFR 772 and MDT's Traffic Noise Policy, *Traffic Noise Analysis and Abatement: Policy and Procedure Manual* (June 2001) state that traffic noise impacts occur for reconstruction projects when the predicted $L_{eq}(h)$ noise level at a receptor location in a project's Design Year approaches or exceeds the NAC values listed in Table 3-1, or when the predicted traffic noise levels in the Design Year substantially exceed the existing ambient noise levels at a receptor. In determining and abating traffic noise impacts, 23 CFR 772, Section 772.11– *Noise Abatement*, gives primary consideration to receptor locations that represent exterior areas where frequent human use occurs and a lowered noise level would be of benefit. MDT defines "approach" as 1 dBA, and "substantially exceed" as 13 dBA.

Table 3-1: 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)	Residences, hotels, hotels, schools, churches, libraries, picnic areas, recreation areas, playgrounds, active sports areas, parks, and hospitals.
C	72 dBA (exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	-- dBA (exterior)	Undeveloped lands.
E	52 dBA (interior)	Residences, hotels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

For Activity Category B land uses, such as single-family residences, mobile homes, apartments, hotels, parks, and the medical center along the I-90 corridor, the NAC is 67 dBA, and therefore, the traffic noise impact criteria is 66 dBA or greater in the Design Year of a project, or at levels greater than 13 dBA greater than the Present Year noise levels. For Activity Category C land uses, including commercial and

other developed properties along the I-90 corridor that are considered less sensitive, the NAC is 72 dBA (Table 3-1). For this baseline noise study, noise levels at Activity Category C land uses were not evaluated. For reconstruction projects, when traffic noise impacts are identified at noise-sensitive receptor locations, MDT requires that reasonable and feasible noise abatement measures be considered to reduce the traffic noise levels at the receptor. Noise abatement measures may be evaluated during Phase II of this project.

4.0 AMBIENT NOISE LEVEL MEASUREMENTS

Noise level measurements were conducted to determine the existing ambient noise levels at representative locations near receptors located within 150 meters (492 feet) of the existing I-90 centerline (Figures 1 through 8). The measurement results were also used to verify that the computer model used to predict the traffic noise levels was reasonably accurate, and will help determine the effectiveness of traffic noise abatement measures that may be evaluated during Phase II of this project.

A total of 13 noise level measurements were completed at 12 locations during heavy volume traffic periods on July 22-23, 2003, and the $L_{eq}(h)$ at each location was estimated based on the 15-or 30-minute measurements. Details concerning the equipment used to take the measurements and the weather conditions are summarized in Appendix A. MDT used automatic counters to tally the traffic that passed the measurement locations, and the traffic data is presented in Appendix B. During the field activities, vehicles on I-90 appeared to be traveling within approximately 5 mph (8 km/h) of the posted speed limits. The posted speed limit for trucks throughout the project corridor is 65 mph (105 km/h). The posted speed limit for cars is 75 mph (121 km/h) in the rural sections and 65 mph (105 km/h) in the urban sections. The noise level measurement locations are shown on Figures 1 through 8, and the results of the measurements are listed in Table 4-1.

During 12 of the 13 measurement periods, it appeared that the traffic noise on I-90 was the dominant noise source. However, at Location 7, approximately three blocks north of I-90 in the Rattlesnake neighborhood, the combined I-90, Cherry Street, and Monroe Street traffic was the dominant noise source during the measurement period (Table 4-1). Although other sources were audible during the measurements, they were either brief or typically quieter than the dominant noise source, and therefore, did not appear to significantly affect the measured noise levels (Appendix B). Because MDT has received noise-related complaints from residents in the Rattlesnake neighborhood, the majority of the measurements were taken in this area (Figure 5). In addition, nine of the measurements were conducted with the microphone located approximately 3.8 meters (12.5 feet) above the ground surface to determine noise levels at the second story locations of the residential receptors (Table 4-1).

5.0 TRAFFIC NOISE LEVEL PREDICTIONS

The purpose of the traffic noise level predictions for this project was to determine the traffic noise levels at noise-sensitive receptors (i.e., single-family residences, mobile homes, apartments, hotels, parks, and a medical center) due to traffic on the existing I-90 highway. A total of 71 noise-sensitive receptors were identified within approximately 150 meters (492 feet) of the existing I-90 centerline using aerial photographs from the City and County of Missoula and site observations. Some receptors were combined and represent groups of single-family residences, apartment buildings, or mobile homes.

Appendix B summarizes how the FHWA's Traffic Noise Model (TNM) computer program was created and used to predict the traffic noise levels. The model was used to compare the measured and predicted $L_{eq}(h)$ levels for the traffic volumes that were tallied during the measurements to verify the accuracy of the TNM model. Once the model's accuracy was verified, the MDT-projected traffic volumes shown in Appendix C were input into the TNM model so that the traffic noise levels for the existing I-90 highway configuration could be could be estimated at the receptor locations (Figures 1 through 8).

5.1 Existing Conditions

The I-90 grade elevation varies throughout the corridor compared to the land adjacent to the highway. In most areas, the highway grade is above the ground surface (i.e., above the receptors), but in other locations, the highway and adjacent ground surface are approximately level. When a highway grade is located above the adjacent ground surface, upper floors of a building, such as a residence or a hotel, are typically not as well shielded from highway traffic noise as the first floor, and therefore, can experience higher noise levels than the first floor level of the building.

Many of the existing single-family residences, apartment buildings and hotels along the I-90 corridor are two stories high or higher. It is the understanding of BSA that MDT has received specific complaints from residents in the Rattlesnake neighborhood regarding I-90 traffic noise, and that some of those complaints indicated that the highway traffic noise appeared louder in the rooms located on the second story of their homes. Residents reiterated these comments to BSA during the fieldwork.

Therefore, during the fieldwork, BSA determined if a building consisted of single or multiple stories. Noise level measurements were conducted at a height of 1.4 meters (4.6 feet) above the ground surface near single story structures, and 3.8 meters (12.5 feet) above the ground surface near multiple story structures. For the TNM model, the height of a receptor was based on the observed height of the building in the field, and BSA used the highest floor level as a receptor height.

5.2 Discussion of Results

Based on the existing I-90 highway configuration, the traffic noise impact criteria was met or exceeded in the Present Year and Design Year of the project (Table 5-1). Of the 71 Category B receptors identified for the baseline noise study, the predicted traffic noise levels equal or exceed the traffic noise impact criteria (66 dBA) in the Present Year of the project at 28 receptors, and at 48 receptors in the Design Year (Table 5-1). Receptors the meet or exceed the criteria are generally located throughout the corridor. However, the predicted noise levels are less than the criteria in the Northside neighborhood (Table 5-1), where I-90 is approximately 3-to-4 stories above the ground level of the neighborhood, which shields the receptors. In addition, the railroad grade blocks the line of sight and shields the apartment buildings located between the Rattlesnake neighborhood and the East Missoula Interchange, and the predicted noise levels are less than the criteria. Since the criteria is predicted to be met or exceeded at some of the I-90 receptors, then traffic noise abatement measures may need to be considered and evaluated during Phase II of this project.

Table 4-1: Measured Ambient Noise Levels

Meas. Location	Approx. Reference Posts	Date	Time	Description	Microphone Height Above Ground Surface (meters/feet)	Approx. Distance and Direction from Existing Centerline (meters/feet)	Measured $L_{eq}(h)$ (dBA)[a]	Noise Sources During Measurements
1	105.9	7/22/03	7:00 - 7:30 a.m.	**Rattlesnake neighborhood:** Intersection of Vine and Polk streets.	1.4 m/4.6 ft	77 m/252.6 ft north	62 dBA	I-90 traffic was the dominant noise source. Other noise sources included: people talking, birds chirping, a brief siren, and leaves rustling in breeze.
1	105.9	7/22/03	8:00 – 8:30 p.m.	**Rattlesnake neighborhood:** Intersection of Vine and Polk streets.	3.8 m/12.5 ft	77 m/252.6 ft north	63 dBA	I-90 traffic was the dominant noise source. Other noise sources included: cars on Polk and Vine streets, propeller plane overhead, birds chirping, and sprinklers across Polk street.
2	105.7	7/22/03	8:06 – 8:36 a.m.	**Rattlesnake neighborhood:** Intersection of Vine and Harrison streets.	3.8 m/12.5 ft	64.5 m/211.6 ft north	68 dBA	I-90 traffic was the dominant noise source. Other noise sources included: birds chirping, cars traveling on Vine and Harrison streets, and a weed-trimming machine.
3	98.4	7/22/03	11:30 a.m. – 12:00 p.m.	**Desmet:** Front yard of residence located northeast of bridge and north of I-90.	1.4 m/4.6 ft	73.6 m/241.5 ft north	67 dBA	I-90 traffic was the dominant noise source. Other noise sources included: small plane taking off, cars on Frontage Road, people talking, and hammering in distance.
4	109.5	7/22/03	3:01 – 3:31 p.m.	**Pinegrove neighborhood:** Between residence and auto salvage shop located south of I-90.	1.4 m/4.6 ft	70 m/230 ft south	63 dBA	I-90 traffic was the dominant noise source. Other noise source included cars on Frontage Road.
5	107.5	7/22/03	4:00 – 4:30 p.m.	**East Missoula neighborhood:** At the end of Peacock Street.	1.4 m/4.6 ft	33.5 m/109.9 ft north	72 dBA	I-90 traffic was the dominant noise source. Other noise sources included: a freight train, sirens, and a small plane in distance.
6	105.6	7/22/03	5:00 – 5:30 p.m.	**Rattlesnake neighborhood:** Front yard of residence at 718 Vine Street.	3.8 m/12.5 ft	68.8 m/225.7 ft north	65 dBA	I-90 traffic was the dominant noise source. Other noise sources included: music at residence, leaves rustling in breeze, and cars on Vine Street.
7	105.6	7/23/03	8:02 – 8:17 a.m.	**Rattlesnake neighborhood:** Intersection of Monroe and Cherry streets.	3.8 m/12.5 ft	270.5 m/887.5 ft north	57 dBA[b]	The combination of I-90, Monroe Street and Cherry Street traffic was the dominant noise source. Other noise sources included: a train whistle, sprinklers across Cherry Street, small plane in distance, birds singing, and a dog barking.
8	105.7	7/23/03	8:30 – 9:00 a.m.	**Rattlesnake neighborhood:** Intersection of Harrison and Poplar streets.	3.8 m/12.5 ft	148 m/485.6 ft north	57 dBA	I-90 traffic was the dominant noise source. Other noise sources included: Van Buren intersection traffic, dog barking in distance, cars on Poplar and Harrison streets, people talking, and a lawn mower.
9	101.8	7/23/03	12:00 – 12:30 p.m.	**Reserve Street Intersection:** Best Western Hotel.	3.8 m/12.5 ft	107.9 m/354 ft northeast	64 dBA	I-90 traffic was the dominant noise source. Other noise sources included: birds chirping, train whistle in distance, and cars in hotel parking lot.

Table 4-1: Measured Ambient Noise Levels

Meas. Location	Approx. Reference Posts	Date	Time	Description	Microphone Height Above Ground Surface (meters/feet)	Approx. Distance and Direction from Existing Centerline (meters/feet)	Measured $L_{eq}(h)$ (dBA)[a]	Noise Sources During Measurements
10	104.3	7/23/03	3:00 – 3:30 p.m.	**Northside Park**. Northeast corner of shelter in middle of park.	3.8 m/12.5 ft	84.4 m/277 ft northeast	58 dBA	I-90 traffic was the dominant noise source. Other noise sources included: cars on side streets, birds chirping, train whistle in distance, and children's voices.
11	105.6	7/23/03	4:01 – 4:31 p.m.	**Rattlesnake neighborhood:** Jackson Street near northwest corner of Sgt. Don Gregory Park.	3.8 m/12.5 ft	108.5 m/356 ft north	62 dBA	I-90 traffic was the dominant noise source. Other noise sources included: side street traffic, cars on Poplar and Jackson streets, cars in/out of nearby residences, and birds chirping.
12	105.8	7/23/03	5:00 – 5:30 p.m.	**Rattlesnake neighborhood:** Intersection of Vine and Taylor streets.	3.8 m/12.5 ft	62.5 m/205.1 ft north	69 dBA	I-90 traffic was the dominant noise source. Other noise sources included cars on Taylor and Vine streets and leaves rustling in breeze.

Notes:

[a] Noise levels are based on 30-minute measurement periods, unless otherwise noted.

[b] Noise level based on 15-minute measurement period.

Shading Measured noise levels meet or exceed the traffic noise impact criteria.

Table 5-1: Noise-Sensitive Receptors and Predicted Traffic Noise Levels

Receptor	Description of Receptor[ab]	Distance and Direction from5 Existing I-90 Centerline (meters/feet)	Representative Level of Receptor Building	Present Year Leq(h) (dBA)	Design Year Leq(h) (dBA)
US 93 Interchange – RP 96.3					
US93:H1	Redwood Lodge (2 Stories).	81.6 m/267.7 ft south	2nd Story	68 dBA	72 dBA
Desmet Interchange – RP 98 to 100					
DSM:R1	Single-family residence.	96 m/314 ft north	Ground Level	66 dBA	70 dBA
DSM:R2	Represents 2 single-family residences.	144 m/472.4 ft south	Ground Level	61 dBA	64 dBA
DSM:R3	Single-family residence.	120 m/393.7 ft north	Ground Level	66 dBA	69 dBA
DSM:R4	Single-family residence.	124.8 m/409.4 ft north	Ground Level	65 dBA	68 dBA
DSM:R5	Single-family residence.	86.4 m/283.5 ft north	Ground Level	67 dBA	71 dBA
DSM:R6	Represents 3 single-family residences.	150 m/492.1 ft north	Ground Level	64 dBA	69 dBA
DSM:R7	Single-family residence.	120 m/393.7 ft south	Ground Level	62 dBA	66 dBA
Reserve Street Interchange – RP 101 to 102					
RSV:R1	Single-family residence.	91 m/298.6 ft north	Ground Level	64 dBA	68 dBA
RSV:H1	Hotel 6 (3 stories).	93.2 m/305.7 ft north	3rd Story	68 dBA	72 dBA
RSV:H2	C'mon Inn (3 stories).	146.3 m/480 ft north	3rd Story	66 dBA	69 dBA
RSV:H3	Microtel Inn and Suites (2 stories).	119.5 m/392.1 ft south	2nd Story	64 dBA	68 dBA
RSV:H4	Best Western (4 stories).	108 m/354.3 ft north	4th Story	68 dBA	72 dBA
Northside Neighborhood – RP 103 to 105					
NS:R1	Represents 7 single-family residences (1 to 2 stories).	50 m/164 ft south	2nd Story	58 dBA	61 dBA
NS:A1	Represents 11 apartment buildings (2 stories).	50 m/164 ft south	2nd Story	58 dBA	61 dBA
NS:R2	Represents 20 single-family residences (1 to 2 stories)	100 m/328 ft south	2nd Story	57 dBA	60 dBA
NS:A2	Represents 19 apartment buildings (2 stories).	100 m/328 ft south	2nd Story	57 dBA	60 dBA
NS:P1	Northside Park	100 m/328 ft south	2nd Story	57 dBA	60 dBA
NS:SC1	St. Patrick's Surgery Center	100 m/328 ft south	2nd Story	57 dBA	60 dBA
NS:R3	Represents 26 single-family residences (1 to 2 stories).	150 m/492 ft. south	2nd Story	55 dBA	58 dBA
NS:A3	Represents 20 apartment buildings (2 stories).	150 m/492 ft. south	2nd Story	55 dBA	58 dBA
Rattlesnake Neighborhood – RP 105.5 to 106					
RTL:R1	Single-family residence (1 story).	124.8 m/409.4 ft south	Ground Level	60 dBA	63 dBA
RTL:A1	Apartment Building (2 stories).	138.7 m/455.1 ft south	2nd Story	62 dBA	65 dBA
RTL:P1	Greenough Park Receptor.	62.3 m/204.4 ft north	Ground Level	64 dBA	67 dBA
RTL:A2	Apartment Building (3 stories).	62.3 m/204.4 ft north	2nd Story	67 dBA	70 dBA
RTL:R2	Represents 5 single-family residences (2 stories) on Vine Street between Monroe and Jackson streets.	62.8 m/225.7 ft north	2nd Story	66 dBA	69 dBA
RTL:R3	Represents 5 single-family residences (2 stories) on Poplar Street between Monroe and Jackson streets (2nd row homes).	116.7 m/382.9 ft north	2nd Story	63 dBA	66 dBA
RTL:P2	Sgt. Don Gregory Park (west of Van Buren Street).	77.4 m/253.9 ft north	Ground Level	64 dBA	68 dBA
RTL:R4	Represents 4 single-family residences (2 stories) on Poplar Street between Jackson and Van Buren streets (2nd row homes).	121.7 m/399.3 ft north	2nd Story	63 dBA	67 dBA
RTL:P3	Park east of Van Buren Street.	79.7 m/261.5 ft north	Ground Level	64 dBA	68 dBA
RTL:R5	Represents 5 single-family residences (2 stories) on Poplar Street between Van Buren and Harrison streets (2nd row homes).	122.2 m/400.9 ft north	2nd Story	64 dBA	67 dBA
RTL:R6	Represents 7 single-family residences (2 stories) on Vine Street between Harrison and Taylor streets.	66.4 m/217.8 ft north	2nd Story	68 dBA	72 dBA
RTL:R7	Represents 5 single-family residences (2 stories) on Poplar Street between Harrison and Taylor streets (2nd row homes).	125.6 m/412.1 ft north	2nd Story	58 dBA	62 dBA
RTL:R8	Represents 6 single-family residences (2 stories) on Vine Street between Taylor and Filmore streets.	69.1 m/226.7 ft north	2nd Story	66 dBA	69 dBA

Table 5-1: Noise-Sensitive Receptors and Predicted Traffic Noise Levels

Receptor	Description of Receptor[ab]	Distance and Direction from5 Existing I-90 Centerline (meters/feet)	Representative Level of Receptor Building	Present Year Leq(h) (dBA)	Design Year Leq(h) (dBA)
RTL:R9	Represents 4 single-family residences (2 stories) on Poplar Street between Taylor and Filmore streets (2nd row homes).	131.9 m/432.7 ft north	2nd Story	61 dBA	64 dBA
RTL:R10	Represents 5 single-family residences (2 stories) on Vine Street between Filmore and Polk streets.	76.3 m/250.3 ft north	2nd Story	67 dBA	71 dBA
RTL:R11	Represents 6 single-family residences (2 stories) on Poplar Street between Filmore and Park streets (2nd row homes).	128.4 m/421.3 ft north	2nd Story	60 dBA	64 dBA
RTL:R12	Single-family residence (2 stories).	73.7 m/241.8 ft north	2nd Story	67 dBA	71 dBA
RTL:R13	Single-family residence (2 stories).	66.9 m/219.5 ft north	2nd Story	68 dBA	72 dBA
Between Rattlesnake Neighborhood and East Missoula Interchange – RP 106 to 107					
EM-R:A1	Represents 8 apartment buildings.	130 m/427 ft south	2nd Story	54 dBA	58 dBA
EM-R:A2	Represents 9 apartment buildings.	108 m/354 ft south	2nd Story	55 dBA	58 dBA
East Missoula Interchange – RP 107-108					
EM:R1	Represents 25 single-family residences.	150 m/492 ft south	Ground Level	58 dBA	61 dBA
EM:R2	Represents 2 single-family residences.	40.2 m/131.9 ft north	Ground Level	69 dBA	73 dBA
EM:R3	Single-family residence.	53.3 m/174.9 ft north	Ground Level	68 dBA	71 dBA
EM:R4	Single-family residence.	50 m/164 ft north	Ground Level	68 dBA	71 dBA
EM:R5	Represents 2 single-family residences.	43.8 m/143.7 ft north	Ground Level	70 dBA	73 dBA
EM:R6	Single-family residence.	73 m/239.5 ft north	Ground Level	65 dBA	68 dBA
EM:R7	Single-family residence.	84.2 m/276.2 ft north	Ground Level	64 dBA	67 dBA
EM:R8	Represents 2 single-family residences.	39.7 m/130.2 ft north	Ground Level	70 dBA	73 dBA
EM:R9	Represents 3 single-family residences.	59 m/193.6 ft north	Ground Level	67 dBA	71 dBA
EM:R10	Represents 3 single-family residences.	36 m/118 ft north	Ground Level	71 dBA	75 dBA
EM:R11	Single-family residence.	50.4 m/165.4 ft north	Ground Level	68 dBA	72 dBA
EM:MH1	Represents 5 mobile homes.	61 m/200 ft north	Ground Level	67 dBA	71 dBA
EM:MH2	Represents 8 mobile homes.	42.5 m/139.4 ft north	Ground Level	70 dBA	74 dBA
EM:MH3	Represents 5 mobile homes.	85 m/279 ft north	Ground Level	64 dBA	68 dBA
EM:R12	Single-family residence.	43.6 m/143 ft north	Ground Level	70 dBA	74 dBA
EM:MH4	Represents 3 mobile homes.	91.5 m/300.2 ft north	Ground Level	63 dBA	67 dBA
EM:R13	Represents 2 single-family residences.	55.3 m/181.4 ft north	Ground Level	68 dBA	72 dBA
EM:R14	Single-family residence.	54 m/177 ft north	Ground Level	68 dBA	72 dBA
EM:R15	Single-family residence.	96.9 m/317.9 ft north	Ground Level	63 dBA	66 dBA
EM:R16	Single-family residence.	122.3 m/401.2 ft north	Ground Level	61 dBA	64 dBA
Pinegrove Neighborhood – RP 109 to 110					
PG:R1	Single-family residence.	150.6 m/494.1 ft north	Ground Level	58 dBA	61 dBA
PG:R2	Single-family residence.	140.7 m/461.6 ft north	Ground Level	58 dBA	62 dBA
PG:R3	Single-family residence.	80.7 m/264.8 ft south	Ground Level	65 dBA	68 dBA
PG:R4	Single-family residence.	80.7 m/264.8 ft south	Ground Level	64 dBA	67 dBA
PG:R5	Single-family residence.	137.5 m/445.2 ft north	Ground Level	59 dBA	62 dBA
PG:R6	Single-family residence.	90.7 m/297.6 ft south	Ground Level	63 dBA	66 dBA
PG:A1	Apartment building.	55.7 m/182.7 ft north	Ground Level	67 dBA	71 dBA
PG:R7	Single-family residence.	120.7 m/396 ft south	Ground Level	60 dBA	63 dBA
PG:R8	Single-family residence.	130.7 m/428.8 ft north	Ground Level	59 dBA	63 dBA
PG:R9	Single-family residence.	95.7 m/313 ft north	Ground Level	62 dBA	66 dBA
		Total number of receptors:	**71**		
		Number of receptors where noise levels meet or exceed the impact criteria:		**28**	**48**

Notes:

Shading — Measured noise levels meet or exceed the traffic noise impact criteria.

[a] Receptors are all one-story buildings unless otherwise noted.

[b] Receptors are all first-row buildings (closest to I-90) unless otherwise noted.

6.0 CONCLUSION

For this Baseline Traffic Noise Study, BSA evaluated traffic noise levels for the existing I-90 highway corridor in Missoula, Montana. A total of 71 noise-sensitive receptors, including single-family residences, mobile homes, apartments, hotels, parks, and a medical center were identified within approximately 150 meters (492 feet) of the existing I-90 centerline. Some receptors were combined represent groups of single-family residences, apartment buildings, or mobile homes. A total of 13 field noise level measurements were conducted to determine the existing ambient noise levels along I-90, and were also used to verify that the TNM computer model used to predict the traffic noise levels was reasonably accurate.

Based on the existing I-90 highway configuration, the traffic noise impact criteria was met or exceeded in the Present Year and Design Year of the project (Table 5-1). Of the 71 Category B receptors identified for the baseline noise study, the predicted traffic noise levels equal or exceed the traffic noise impact criteria (66 dBA) in the Present Year of the project at 28 receptors, and at 48 receptors in the Design Year (Table 5-1). Receptors the meet or exceed the criteria are generally located throughout the corridor. However, the predicted noise levels are less than the criteria in the Northside neighborhood (Table 5-1), where I-90 is approximately 3-to-4 stories above the ground level of the neighborhood, which shields the receptors. In addition, the railroad grade blocks the line of sight and shields the apartment buildings located between the Rattlesnake neighborhood and the East Missoula Interchange, and the predicted noise levels are less than the criteria. Since the criteria is predicted to be met or exceeded at some of the I-90 receptors, then traffic noise abatement measures may need to be considered and evaluated during Phase II of this project.

7.0 STANDARD OF CARE

To complete this report, BSA has endeavored to perform its work in a manner consistent with that degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances. BSA makes no warranty, either express or implied, as to the professional services it has rendered to complete this report.

For the completion of this report, BSA has used data provided by MDT and CH2M Hill in performing services and is entitled to rely upon the accuracy and completeness thereof. Therefore, if the information (i.e., traffic data, location of the Build Alternatives alignment, proposed highway sections, etc.) and assumptions used to create this report change, then the noise study may need to be reevaluated.

FIGURES

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FIGURE 1
US 93 INTERCHANGE:
NOISE RECEPTOR LOCATION

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MISSOULA, MT I-90 EAST WEST, CORRIDOR STUDY PHASE 1

Big Sky Acoustics, LLC

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FIGURE 2
DESMET:
NOISE MEASUREMENT & RECEPTOR LOCATIONS

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MISSOULA, MT I-90 EAST WEST, CORRIDOR STUDY PHASE 1

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FIGURE 3
RESERVE STREET INTERCHANGE:
NOISE MEASUREMENT & RECEPTOR LOCATIONS

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FIGURE 4
NORTHSIDE NEIGHBORHOOD:
NOISE MEASUREMENT & RECEPTOR LOCATIONS

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FIGURE 5
RATTLESNAKE NEIGHBORHOOD:
NOISE MEASUREMENT & RECEPTOR LOCATIONS

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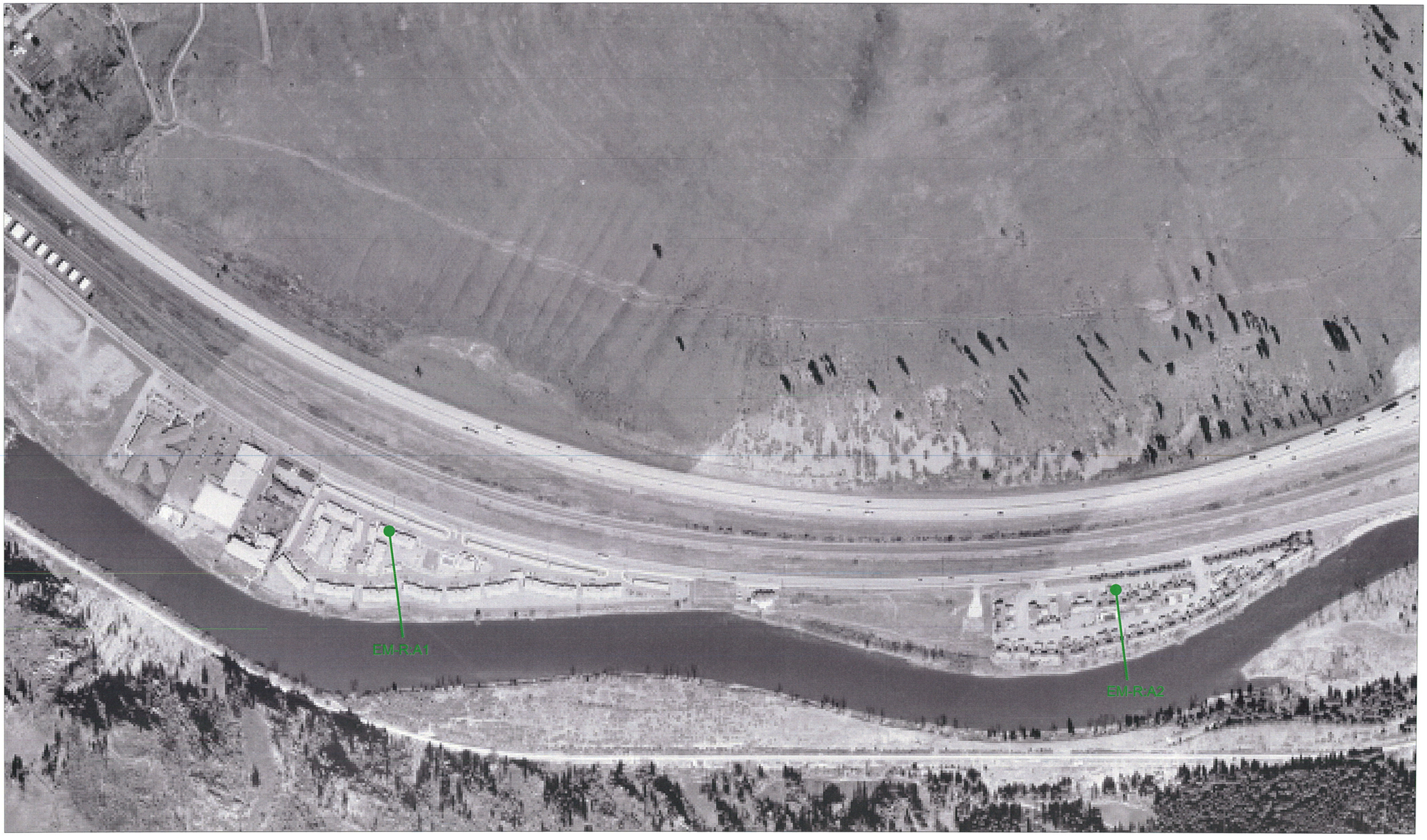

FIGURE 6
BETWEEN THE RATTLESNAKE AND EAST MISSOULA:
NOISE RECEPTOR LOCATIONS

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FIGURE 7
EAST MISSOULA:
NOISE MEASUREMENT & RECEPTOR LOCATIONS

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FIGURE 8
PINEGROVE:
NOISE MEASUREMENT & RECEPTOR LOCATIONS

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MISSOULA, MT I-90 EAST WEST, CORRIDOR STUDY PHASE 1

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APPENDICES

APPENDIX A
AMBIENT NOISE LEVEL MEASUREMENTS

The equipment used to conduct the ambient noise level measurements and the weather conditions described in Section 4.0 are presented below.

Measurement Equipment

BSA conducted the ambient noise level measurements using a CEL Instruments Model 593.C1 Type I Sound Level Meter (Serial #3/0891594) with a preamplifier, and 0.5-inch diameter CEL Instruments Model 192/2F microphone (Serial #23724). The meter was calibrated using a CEL Instruments Model 284/2 Acoustical Calibrator (Serial #03513069) prior to the measurement periods. The sound level meter was set to "slow" response for the measurements per FHWA requirements. The sound level meter was mounted on a tripod, so that the microphone was approximately 1.4 meters (4.6 feet) above the ground, or on a pole so that the microphone was approximately 3.8 meters (12.5 feet) above the ground surface. A windscreen was used over the microphone.

Atmospheric Conditions

Temperature and relative humidity were measured during the ambient noise level measurements using a Radio Shack Model 63-867A Thermometer and Humidity Gauge (Serial #02A99). Wind speed was measured using an R.A. Simerl Instruments Model BTC Series 994 Anemometer (Serial #96066). Table A-1 summarizes the atmospheric conditions during the field measurements.

Table A-1: Atmospheric Conditions

Measurement Location	Date	Time	Temperature (°F)	Relative Humidity (%)	Wind Speed (mph) / Direction
1	7/22/03	7:00 - 7:30 a.m.	55 to 60 °F	60 to 70 %	3 mph, variable
1	7/22/03	8:00 – 8:30 p.m.	80 to 85 °F	20 to 30 %	Calm
2	7/22/03	8:06 – 8:36 a.m.	60 to 65 °F	60 to 70 %	Calm
3	7/22/03	11:30 a.m. – 12:00 p.m.	80 to 85 °F	30 to 40 %	Calm
4	7/22/03	3:01 – 3:31 p.m.	95 to 100 °F	10 to 20 %	Calm
5	7/22/03	4:00 – 4:30 p.m.	95 to 100 °F	10 to 20 %	Calm
6	7/22/03	5:00 – 5:30 p.m.	95 to 100 °F	10 to 20 %	Calm to 5 mph, west
7	7/23/03	8:02 – 8:17 a.m.	65 to 70 °F	20 to 30 %	Calm
8	7/23/03	8:30 – 9:00 a.m.	65 to 70 °F	20 to 30 %	Calm
9	7/23/03	12:00 – 12:30 p.m.	90 to 95 °F	10 to 20 %	Calm
10	7/23/03	3:00 – 3:30 p.m.	95 to 100 °F	10 to 20 %	Calm
11	7/23/03	4:01 – 4:31 p.m.	95 to 100 °F	10 to 20 %	Calm
12	7/23/03	5:00 – 5:30 p.m.	95 to 100 °F	10 to 20 %	Calm to 5 mph, west

APPENDIX B
CREATING AND VERIFYING THE TRAFFIC NOISE MODEL

BSA predicted traffic noise levels for the existing I-90 configuration using the FHWA-approved Traffic Noise Model (TNM), Version 2.0 software program. This section describes the information and assumptions that were used to create the TNM model. The ambient noise level measurements taken by BSA were used to verify that the TNM model was accurate. The TNM model was used to estimate the traffic noise levels and determine if traffic noise impacts would occur in the project Design Year.

Creating the TNM Model

TNM 2.0 uses a three-dimensional coordinate system (x, y, and z) to define the location of the highway, receptor locations and terrain elevations. The number and type of vehicles that were tallied during each measurement, the approximate speed of the traffic, the location of the centerlines of the travel lanes, the approximate ground elevations between the measurement locations and the highway, and the measurement locations were entered into the model. The model predicted the traffic noise levels at the measurement location for the conditions during the measurement.

Measured vs. Predicted Traffic Noise Levels

MDT used automatic counters to tally the traffic that passed the measurement locations. Table B-1 lists the traffic data used to compare the field-measured noise levels to the traffic noise levels predicted by the TNM model at the measurement locations. Based on field observations, it appeared that I-90 traffic was typically traveling within 5 mph (8 km/h) of the posted speed limits.

As listed in Table B-1, the difference between each field-measured $L_{eq}(h)$ level and the level predicted by the TNM model for the traffic conditions during each measurement period was 0 to 2 dBA. According to Section A.6 of Appendix A, *FHWA Policies for Highway Traffic Noise Prediction Using TNM*, of the TNM User's Guide (1998), a difference of 3 dBA or less between measured and predicted traffic noise levels indicates that a TNM model is reasonably accurate.

Table B-1: Measured Ambient vs. Predicted Noise Levels

Meas. Location	Date	Time	Distance and Direction to Existing I-90 Centerline (meters/feet)	I-90 Eastbound Traffic Tallied During Measurement*	I-90 Westbound Traffic Tallied During Measurement*	Measured $L_{eq}(h)$	Predicted I-90 $L_{eq}(h)$ by TNM Model
1	7/22/03	7:00 - 7:30 a.m.	77 m/252.6 ft north	Cars: 364 MT: 26 HT: 64	Cars: 686 MT: 30 HT: 56	62 dBA	62 dBA
1	7/22/03	8:00 – 8:30 p.m.	77 m/252.6 ft north	Cars: 442 MT: 20 HT: 76	Cars: 448 MT: 16 HT: 50	63 dBA	64 dBA
2	7/22/03	8:06 – 8:36 a.m.	64.5 m/211.6 ft north	Cars: 414 MT: 40 HT: 62	Cars: 670 MT: 40 HT: 72	68 dBA	67 dBA
3	7/22/03	11:30 a.m. – 12:00 p.m.	73.6 m/241.5 ft north	Cars: 530 MT: 44 HT: 86	Cars: 592 MT: 36 HT: 102	67 dBA	68 dBA
4	7/22/03	3:01 – 3:31 p.m.	70 m/230 ft south	Cars: 862 MT: 44 HT: 84	Cars: 570 MT: 66 HT: 100	63 dBA	65 dBA
5	7/22/03	4:00 – 4:30 p.m.	33.5 m/109.9 ft north	Cars: 962 MT: 48 HT: 84	Cars: 676 MT: 46 HT: 92	72 dBA	72 dBA
6	7/22/03	5:00 – 5:30 p.m.	68.8 m/225.7 ft north	Cars: 1,144 MT: 42 HT: 98	Cars: 726 MT: 54 HT: 78	65 dBA	66 dBA
7	7/23/03	8:02 – 8:17 a.m.	270.5 m/887.5 ft north	Cars: 414 MT: 38 HT: 120	Cars: 716 MT: 34 HT: 74	57 dBA[b]	55 dBA
8	7/23/03	8:30 – 9:00 a.m.	148 m/485.6 ft north	Cars: 396 MT: 50 HT: 106	Cars: 682 MT: 50 HT: 66	57 dBA	59 dBA
9	7/23/03	12:00 – 12:30 p.m.	107.9 m/354 ft northeast	Cars: 522 MT: 28 HT: 108	Cars: 558 MT: 36 HT: 96	64 dBA	66 dBA
10	7/23/03	3:00 – 3:30 p.m.	84.4 m/277 ft northeast	Cars: 718 MT: 36 HT: 80	Cars: 612 MT: 56 HT: 108	58 dBA	57 dBA
11	7/23/03	4:01 – 4:31 p.m.	108.5 m/356 ft north	Cars: 838 MT: 38 HT: 72	Cars: 738 MT: 40 HT: 116	62 dBA	64 dBA
12	7/23/03	5:00 – 5:30 p.m.	62.5 m/205.1 ft north	Cars: 1,258 MT: 34 HT: 90	Cars: 884 MT: 44 HT: 110	69 dBA	69 dBA

Notes:

Cars	Vehicles with two axles and four tires (up to 20 feet in length)
MT	Medium truck, vehicles with six tires on two axles (20-to 35 feet in length)
HT	Heavy truck, vehicles with more than two axles (35 feet and longer)
Shading	Measured noise levels meet or exceed the traffic noise impact criteria.
*	Traffic tallied during 30-minute periods was doubled to represent hourly traffic counts in Table B-1.

APPENDIX C
TRAFFIC DATA USED FOR THE TRAFFIC NOISE PREDICTIONS

For highway construction projects, MDT determines the projected traffic volumes, and the Present and the Design Years for the project. The current and projected traffic volumes for I-90 were included in MDT's Preliminary Field Review Report dated May 20, 2002. MDT determined the traffic volumes by highway segment, which are listed by Reference Post (RP) sections in Table C-1.

Because the TNM predicts hourly L_{eq} noise levels, the vehicle percentages were applied to the Design Hourly Volume (DHV) supplied by MDT, to estimate the traffic noise levels associated with the existing I-90 highway configuration. Based on the traffic volumes that were tallied by MDT during the ambient noise measurements, BSA assumed the following: 50% of the projected traffic on I-90 would be traveling in the eastbound lanes, 50% would be traveling westbound, 73% of all vehicles would be in the driving lanes, 27% in the passing lanes, 69% of all the trucks would be "heavy trucks" (vehicles 35 feet or longer), and 31% would be "medium trucks" (vehicles 20-to 35 feet in length). Table C-1 shows the traffic data that were used for the noise level predictions.

Table C-1: Traffic Data Used for Noise Level Predictions

Highway Segment	Year	ADT	DHV	Hourly Volume: Cars	Hourly Volume: Medium Trucks (MT)	Hourly Volume: Heavy Trucks (HT)
RP 94.41 to 96.34	2001	9,900	1,238	EB: 513 WB: 513	EB: 33 WB: 33	EB: 73 WB: 73
	2025	22,600	2,825	EB: 1,173 WB: 1,172	EB: 74 WB: 74	EB: 166 WB: 166
RP 96.34 to 101.71	2001	16,950	1,864	EB: 818 WB: 818	EB: 36 WB: 36	EB: 78 WB: 78
	2025	38,710	4,258	EB: 1,869 WB: 1,869	EB: 81 WB: 81	EB: 179 WB: 179
RP 101.71 to 105.66	2001	19,280	2,121	EB: 938 WB: 937	EB: 38 WB: 38	EB: 85 WB: 85
	2025	44,020	4,842	EB: 2,140 WB: 2,140	EB: 88 WB: 88	EB: 193 WB: 193
RP 105.66 to 109+1.204	1999	19,300	2,125	EB: 952 WB: 951	EB: 34 WB: 34	EB: 77 WB: 77
	2021	42,600	4,690	EB: 2,098 WB: 2,098	EB: 77 WB: 77	EB: 170 WB: 170

Notes:

ADT	Average Daily Traffic
DHV	Design Hourly Volume
EB	Eastbound
WB	Westbound
RP	Reference Post
Cars	Vehicles with two axles and four tires (up to 20 feet in length)
MT	Medium truck, vehicles with six tires on two axles (20-to 35 feet in length)
HT	Heavy truck, vehicles with more than two axles (35 feet and longer)