Appendix C - Noise Technical Study

Ski Back Trail Noise Impact Analysis

Mammoth Mountain Ski Back Trail

Mammoth Ranger Station, Inyo National Forest
Inyo County, CA

Submitted to:

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INTRODUCTION

This noise impact analysis has been prepared to evaluate the potential noise impacts and mitigation measures associated with the proposed Ski Back Trail from the Mammoth Mountain Ski Area (MMSA) garage facility to the North Village complex in the Town of Mammoth Lakes (Town), California. Figure 1 illustrates the regional location of the proposed Ski Back Trail project. This report is intended to satisfy the requirements of Inyo National Forest (INF) for a project-specific noise impact analysis by examining the short-term and long-term impacts in the project vicinity and by evaluating the effectiveness of mitigation measures incorporated as part of the project designs.

The need for alternative trails, including this Ski Back Trail, has been included in several planning documents and publications. This trail was included in the approved ski area Master Development Plan in 1981, as well as the Transportation Systems Management and Air Quality Mitigation Plan for State Route 203 (SR-203) in the Vicinity of Mammoth Lakes in Mono County that was adopted by the Mono County Board of Supervisors in 1980. Additionally, the North Village Specific Plan (adopted in 2000) proposes improved circulation partly based on construction of this Ski Back Trail.

Proposed Action

The proposed Ski Back Trail is located within a relatively localized and narrow area between SR-203 and existing residential development (Mammoth Slopes). The proposed trail alignment extends in a west to east direction, paralleled by SR-203 to the north and at a higher elevation than the proposed trail alignment and the Mammoth Slopes residential development located to the south of and at a lower elevation than the proposed trail alignment.

Although SR-203 and the residential areas are relatively close to each other, there are only a few areas along this entire proposed alignment where these facilities are visible to each other due to the elevation differences and existing stands of trees.

The proposed Ski Back Trail will provide primarily skiers (not snowboarders) an alternative modal choice to reach The Village without the use of private autos, transit, or the gondola.

Figure 2 illustrates the proposed alignment for the Ski Back Trail. This trail will enable skiers from the ski area to return to the lodging facilities or meeting places in The Village without the use of private or public motor vehicles or the gondola from Canyon Lodge. The trail will originate near the top of Chair 7 and will generally parallel the southerly side of SR-203.

The proposed trail will be at the upper beginner/lower intermediate level. It will be approximately 7,800 feet long with a width of approximately 22 feet (which will accommodate snowcat grooming).

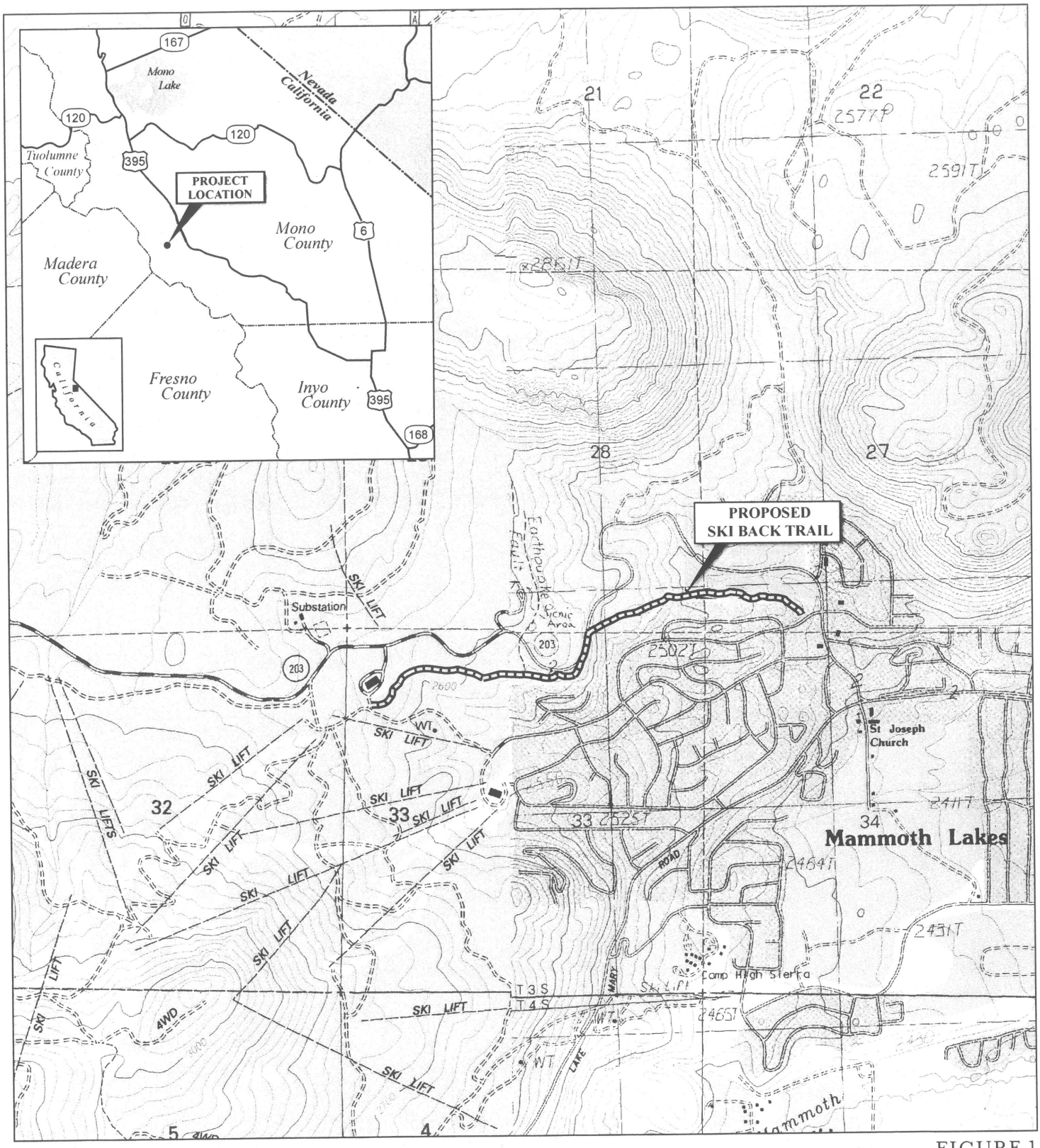

FIGURE 1

LSA

PROJECT AREA

0 1000 2000

FEET

SOURCE: USGS 7.5' Quads - *Mammoth Mt. & Old Mammoth, CA.*

Mammoth Mountain Ski Back Trail

Project Location

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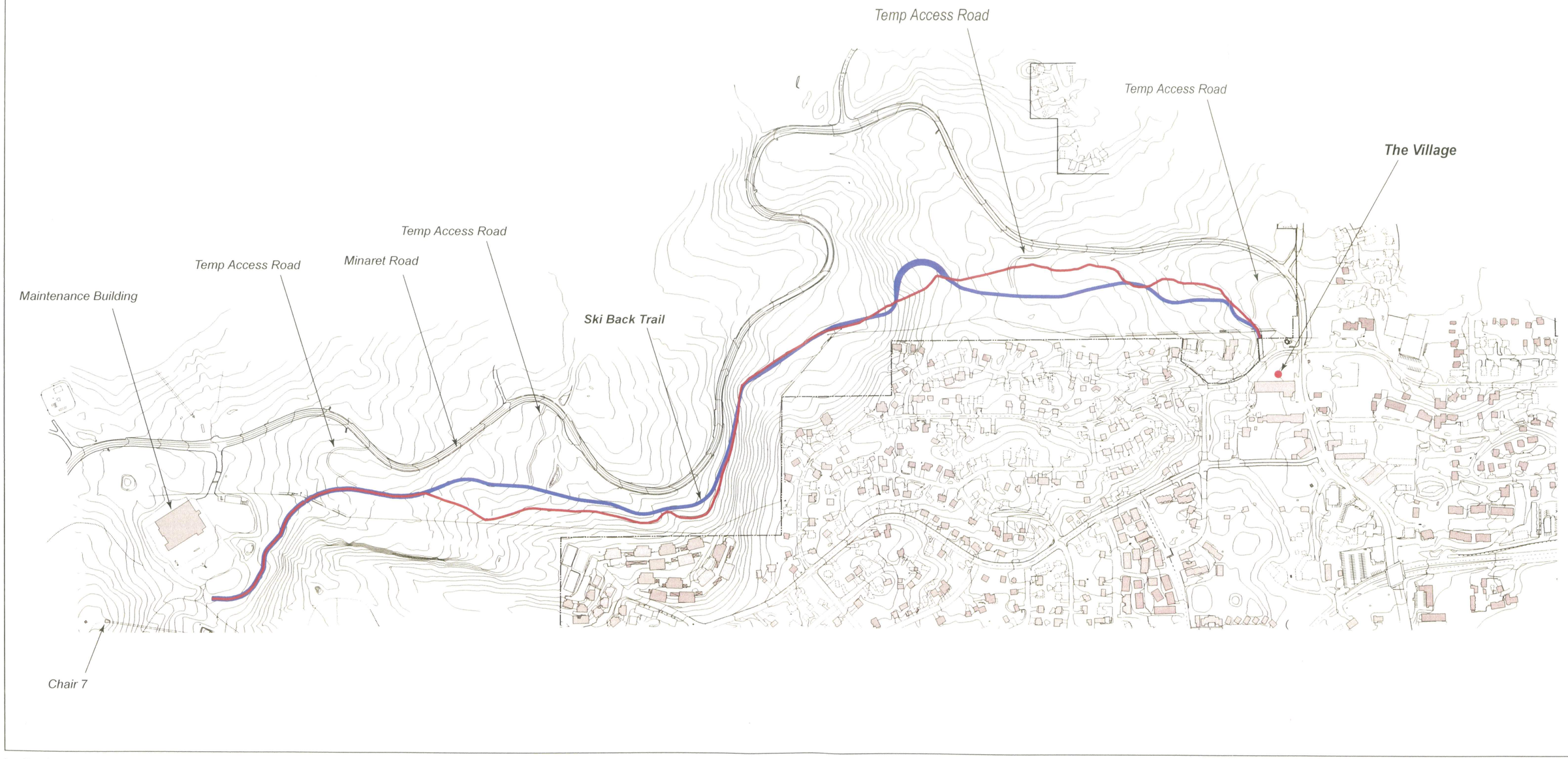

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Proposed Ski Back Trail Alignment

Original Ski Back Trail Alignment

FIGURE 2

NO SCALE
SOURCE: TRIAD HOLMES ASSOCIATES

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Mammoth Mountain Ski Back Trail
Vicinity Map

The overall vertical drop along the entire length of the trail would be from 8,620 feet in elevation to 8,080 in elevation, a drop of approximately 540 feet. The Ski Back Trail would generally range from less than 6 percent to 12 percent slope, with the exception of the beginning and end of the trail, which would range from 3.6 percent to 5.6 percent slope.[1]

The trail would have a 2:1 slope for the majority of the alignment. However, six retaining walls would be necessary to allow for a trail that traverses the steep slopes of the project area at a suitable pitch. As proposed, all but one of the retaining walls would comprise a combination of geotextile/native boulder construction approximately 4-feet high, using native rock with colors representative of the area. It is anticipated that there would be a sufficient number of rocks from trail excavation to construct the walls using all local materials. The remaining retaining wall extending from Stations 38 to 42 would vary in height from 2 to 15 feet and would be constructed utilizing soil nail construction techniques. In all, the wall areas would total 570 square feet and extend for a total of approximately 36 linear feet along the trail alignment.

Trail construction would utilize cut slopes as much as possible rather than fill in order to minimize the visual impact to residents in the adjacent Mammoth Slopes neighborhood. Construction of the Ski Back Trail would require removal of vegetation of between 40 and 100 feet. Trail design and construction would avoid tree removal to the extent feasible, while allowing for construction of a safe, viable skier route. Both temporary and permanent erosion control measures would be installed, including revegetation of the trail surface with grasses and a mix of native shrubs, wildflowers, and grasses for the disturbed slope. No hauling would be required for the project since the existing dirt that would be cut would be utilized to fill in the areas of the Ski Back Trail. It should also be noted that no construction activities would occur along the two optional segments since they would extend along existing paths following utility line poles.

Trail and retaining wall construction would generally utilize exiting access corridors, including utility pole lines and utility access roads from SR-203. However, establishment of additional corridors would be necessary in order to provide adequate access points to the trail. As illustrated on Figure 3, a total of four temporary access roads would be developed from SR-203 to Stations 66, 55, 18, and 2, of the proposed Ski Back Trail. The temporary access roads would be approximately 10- to 15-feet wide, accommodating one-way traffic and appropriate traffic safety measures at the access points to SR-203. The temporary access road surfaces would be unimproved but would be constructed with appropriate drainage controls. After completion of the Ski Back Trail, the temporary access roads would be decommissioned by grading the compacted soils and revegetating the areas with natives plants.

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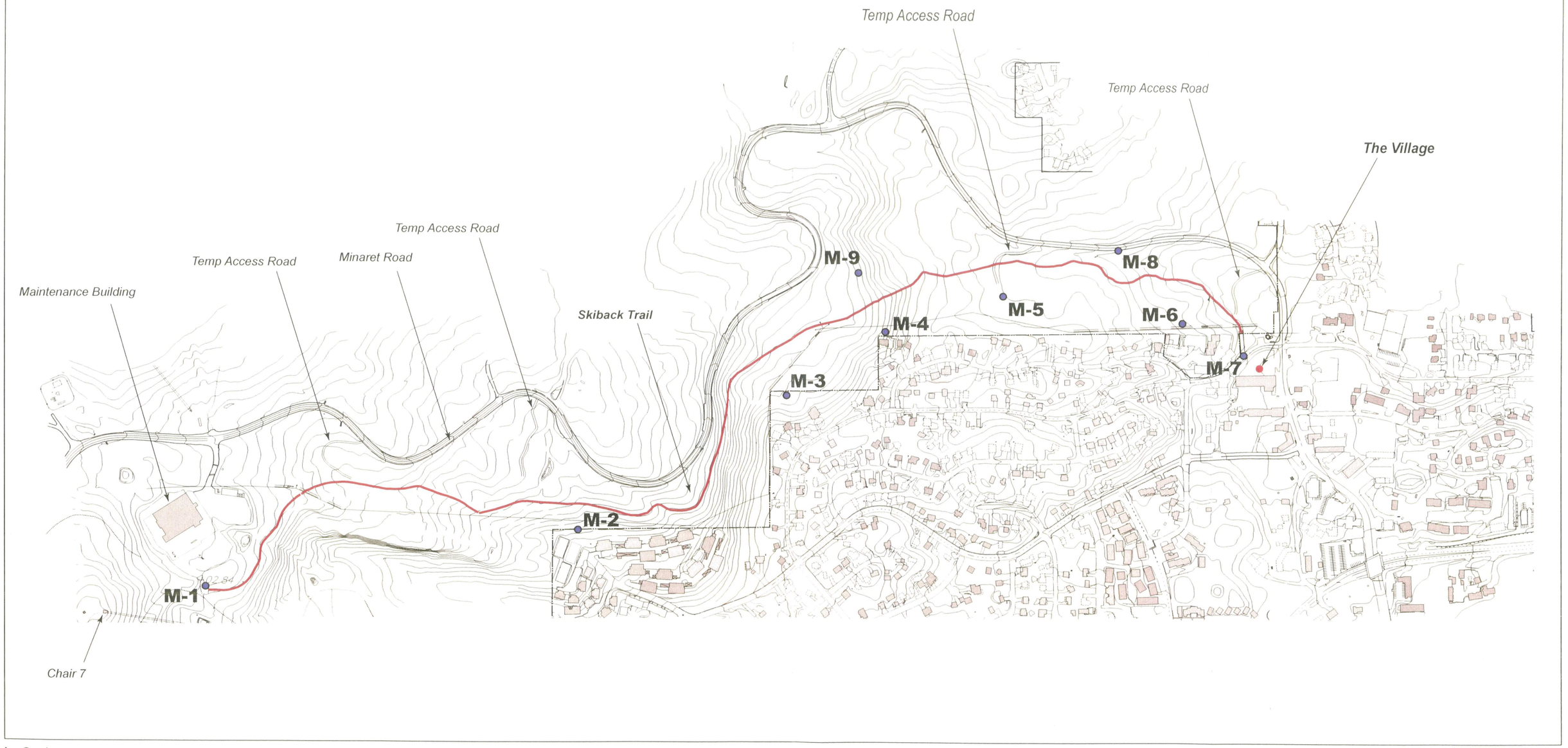
[1] While an ideal grade of eight to nine percent would ensure continued skier movement in any snow conditions, a grade of seven percent will ensure continued movement on most days.



LSA

Proposed Ski Back Trail Alignment

M-7 Noise Monitoring Location & Number

FIGURE 3

NO SCALE
SOURCE: TRIAD HOLMES ASSOCIATES

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Mammoth Mountain Ski Back Trail
Noise Monitoring Locations

The Ski Back Trail would terminate on an Intrawest-owned parcel on Forest Trail, immediately downhill of the Val d'Isere condominiums. Intrawest owns the parcel on which the trail terminates and would be responsible for the design and construction of a bridge over the Forest Trail that would connect skiers from the Ski Back Trail to The Village.

Snow-making is also proposed, but implementation isn't planned until snow retention information on the trail has been collected over several snow seasons. Based on the currently proposed project, snow-making and grooming will not take place between the hours of 8:00 p.m. and 7:00 a.m. Snow-making generally only takes place early in the ski season (November–December). It is estimated that a total of 60 hours would be required for snow-making activities for the entire ski season. Times of day for snow-making vary and are dependent upon ambient temperatures around 32 degrees Fahrenheit. When required, it is anticipated that up to 10 snow guns would be dispersed along the Ski Back Trail. Snow guns are not fixed and will be placed in the most optimal spot if necessary to minimize the noise impact. On average, the trail will be groomed once daily, although on heavily trafficked days, an additional grooming pass may be required. It is anticipated that it would take approximately 15 minutes each way for the bio-diesel snowcat groomers to groom the trail.

Proposed Alternatives

Alternative 1 – Original Proposal

As shown in Figure 2, the Original Proposal alternative coincides with the proposed alignment for approximately 1,600 feet at the upper reach and then turns north at approximately Station 60 for approximately 200 feet. The Original Proposal alternative proceeds for approximately 400 feet upslope in a direct west to east direction until approximately Station 45, where it turns to parallel the Proposed Action alignment for approximately 1,100 feet. At approximately Station 27, the Original Proposal turns northward and loops around to cross the Proposed Action alignment at approximately Station 20 and continues in a southeast direction, approximately 400 feet south of the Original Proposal alignment. The two trail alignments intersect at approximately 1,800 feet from the trail terminus, but the Original Proposal alignment shifts to the south across more rugged terrain, where the two alignments parallel to the trail's terminus.

The Original Proposal Alternative would be similar to the proposed action except for this alternative would require a substantial more amount of cut and fill along the proposed alignment. Specifically, this alternative would require the export of 40,000 cubic yards of cut and the import of 2,000 cubic yards of rock stack walls and 17,000 cubic yards of fill. Under this alternatives, construction of the trail would still require the six retaining walls and the temporary access corridors, which would maintain the same alignments as under the Proposed Action. All other construction and maintenance activities (snowmaking and grooming) would be the same under this alternative and the Proposed Action i.e., snowmaking would occur for approximately 60 hours throughout the ski season, and the trail would generally be groomed once a day.

Alternative 2 – Transit Emphasis Alternative

Under Alternative 2, the Ski Back Trail would not be constructed. Rather, there would be an increased emphasis on transit provisions focused on returning skiers from the Main Lodge, Chair 2/10, and Chair 4/20 to The Village, and other destinations in Town.

The increased Transit Emphasis Alternative was designed to be roughly equivalent to the projected level of skiers that could be carried on the Ski Back Trail under the Proposed Action and originating from the Main Lodge and associated parking areas. This alternative would require the addition of four buses during the peak hour (3:30 p.m. to 5:00 p.m.) running only from the Main Lodge to The Village. The buses would have a total capacity of 240 skiers, which represents approximately 10 percent of the total skiers coming down via private auto from the Main Lodge and associated parking areas in the peak afternoon hour.

Alternative 3 – No Action Alternative

As required by the National Environmental Policy Act (NEPA), a No Action Alternative has been included in this analysis for review alongside the action alternatives. The No Action alternative reflects a continuation of existing management practices without changes, additions, or upgrades. Selection of the No Action Alternative would result in continued operation of the existing public transit system, Village Gondola, parking facilities, and mountain operations with no changes. No new ski trails, trail improvements, snowmaking, or transit improvements would occur under the No Action alternative. The No Action alternative provides a baseline for comparing the effects of the Proposed Action and Alternatives 1 and 2.

METHODOLOGY RELATED TO NOISE IMPACT ASSESSMENT

Evaluation of noise impacts associated with the proposed residential project includes the following:

- Determine the noise impacts associated with short-term construction of the proposed project on adjacent noise-sensitive uses
- Determine the long-term traffic and industrial noise impacts on on-site noise-sensitive uses
- Determine the required mitigation measures to reduce short-term and long-term noise impacts

Because the area that will be affected by the proposed Ski Back Trail is within the Town of Mammoth Lakes, the Town's noise standards, including its General Plan Noise Element and noise control ordinance, are used in this analysis as thresholds for potential noise impacts.

CHARACTERISTICS OF SOUND

Sound is increasing in the environment and can affect quality of life. Noise is usually defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: pitch and loudness. Pitch is generally an annoyance, while loudness can affect the ability to hear. Pitch is the number of complete vibrations (cycles per second) of a wave, resulting in the tone's range from high to low. Loudness is the strength of a sound and describes a noisy or quiet environment; it is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves combined with the reception characteristics of the human ear. Sound intensity refers to how hard the sound wave strikes an object, which in turn produces the sound's effect. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effect on adjacent sensitive land uses.

MEASUREMENT OF SOUND

Sound intensity is measured through the A-weighted scale to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound similar to the human ear's de-emphasis of these frequencies. Unlike linear units, such as inches or pounds, decibels are measured on a logarithmic scale representing points on a sharply rising curve.

For example, 10 decibels (dB) are 10 times more intense than 1 decibel, 20 decibels are 100 times more intense, and 30 decibels are 1,000 times more intense. Thirty decibels represent 1,000 times as much acoustic energy as one decibel. The decibel scale increases as the square of the change, representing the sound pressure energy. A sound as soft as human breathing is about 10 times greater than 0 decibels. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. A 10-decibel increase in sound level is perceived by the human ear as only a doubling of the loudness of the sound. Ambient sounds generally range from 30 dBA (very quiet) to 100 dBA (very loud).

Sound levels are generated from a source, and their decibel level decreases as the distance from that source increases. Sound dissipates exponentially with distance from the noise source. For a single point source, sound levels decrease approximately six decibels for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by stationary equipment. If noise is produced by a line source, such as highway traffic or railroad operations, the sound decreases three decibels for each doubling of distance in a hard site environment. Line source, noise in a relatively flat environment with absorptive vegetation, decreases four and one-half decibels for each doubling of distance.

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. Equivalent continuous sound level (L_{eq}) is the total sound energy of time-varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the L_{eq} and community noise equivalent level (CNEL) or the day-night average level (L_{dn}) based on A-weighted decibels (dBA). CNEL is the time-varying noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and 10 dBA weighting factor applied to noise occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale but without the adjustment for events occurring during the evening hours. CNEL and L_{dn} are within 1 dBA of each other and are normally exchangeable. The noise adjustments are added to the noise events occurring during the more sensitive hours.

Other noise rating scales of importance when assessing the annoyance factor include the maximum noise level (L_{max}), which is the highest exponential time-averaged sound level that occurs during a stated time period. The noise environments discussed in this analysis are specified in terms of maximum levels denoted by L_{max} for short-term noise impacts. L_{max} reflects peak operating conditions and addresses the annoying aspects of intermittent noise.

Another noise scale often used together with the L_{max} in noise ordinances for enforcement purposes is noise standards in terms of percentile noise levels. For example, the L_{10} noise level represents the noise level exceeded 10 percent of the time during a stated period. The L_{50} noise level represents the median noise level. Half the time the noise level exceeds this level, and half the time it is less than this level. The L_{90} noise level represents the noise level exceeded 90 percent of the time and is considered the background noise level during a monitoring period. For a relatively constant noise source, the L_{eq} and L_{50} are approximately the same.

Noise impacts can be described in three categories. The first is audible impacts, which refers to increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3.0 dB or greater, since this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1.0 and 3.0 dB. This range of noise levels has been found to be noticeable only in laboratory environments. The last category is changes in noise level of less than 1.0 dB, which are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

PSYCHOLOGICAL AND PHYSIOLOGICAL EFFECTS OF NOISE

Physical damage to human hearing begins at prolonged exposure to noise levels higher than 85 dBA. Exposure to high noise levels affects the entire system, with prolonged noise exposure in excess of 75 dBA increasing body tensions and thereby affecting blood

pressure and functions of the heart and the nervous system. In comparison, extended periods of noise exposure above 90 dBA would result in permanent cell damage. When the noise level reaches 120 dBA, a tickling sensation occurs in the human ear even with short-term exposure. This level of noise is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by the feeling of pain in the ear. This is called the threshold of pain. A sound level of 160–165 dBA will result in dizziness or loss of equilibrium.

The ambient or background noise problem is widespread and generally more concentrated in urban areas than in outlying, less-developed areas.

Table A lists "Definitions of Acoustical Terms," and Table B shows "Common Sound Levels and Their Noise Sources." Table C shows "Land Use Compatibility for Exterior Community Noise," recommended by the California Department of Health, Office of Noise Control.

SETTING

Existing Sensitive Land Uses in the Project Area

Sensitive receptors include residences, schools, hospitals, and similar uses that are sensitive to noise. There are existing residences on the south side of the proposed alignment. The closest distance from about 10 residences to the proposed alignment is about 200 feet. Most residences are more than 500 feet from the alignment. These sensitive land uses may be potentially affected by the noise generated along the proposed Ski Back Trail.

Overview of the Existing Noise Environment

The project area is considered a suburban area just north of the Town of Mammoth Lakes. Traffic on SR-203, remote construction activities (in the Town), and residents in the community to the south are the sources of ambient noise in the project vicinity.

Ambient Noise Monitoring Results

LSA conducted an ambient noise survey at representative locations along the proposed alignment on November 12, 2004. LSA's field survey observed that SR-203 is a two-lane undivided roadway (one lane in each direction). Vehicles travel between 30 to 40 miles per hour (mph). Table D lists the noise measurement location and noise sources observed during the noise measurement periods. Table E lists the ambient noise monitoring results. Figure 3 depicts these noise monitoring locations along the proposed alignment. Table E shows that ambient noise in the project area is moderate with the L_{eq} ranging from 43 to 58 dBA. Ambient noise levels are higher in areas where vehicular traffic is closer to the

Table A. Definitions of Acoustical Terms

Term	Definition
Decibel, dB	A unit of level that denotes the ratio between two quantities that are proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hz	Of a function periodic in time, the number of times that the quantity repeats itself in one second (i.e., number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted, unless reported otherwise.
L_{02}, L_{08}, L_{50}, L_{90}	The fast A-weighted noise levels that are equaled or exceeded by a fluctuating sound level 2 percent, 8 percent, 50 percent, and 90 percent of a stated time period.
Equivalent Continuous Noise Level, L_{eq}	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time-varying sound.
Community Noise Equivalent Level, CNEL	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 5 decibels to sound levels occurring in the evening from 7:00 p.m. to 10:00 p.m. and after the addition of 10 decibels to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
Day/Night Noise Level, L_{dn}	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 decibels to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all-encompassing noise associated with a given environment at a specified time, usually a composite of sound from many sources at many directions, near and far; no particular sound is dominant.
Intrusive	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurement and Noise Control 1991.

Table B. Common Sound Levels and Their Noise Sources.

Noise Source	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Evaluations
Near Jet Engine	140	Deafening	128 times as loud
Civil Defense Siren	130	Threshold of Pain	64 times as loud
Hard Rock Band	120	Threshold of Feeling	32 times as loud
Accelerating Motorcycle at a Few Feet Away	110	Very Loud	16 times as loud
Pile Driver; Noisy Urban Street/Heavy City Traffic	100	Very Loud	8 times as loud
Ambulance Siren; Food Blender	95	Very Loud	
Garbage Disposal	90	Very Loud	4 times as loud
Freight Cars; Living Room Music	85	Loud	
Pneumatic Drill; Vacuum Cleaner	80	Loud	2 times as loud
Busy Restaurant	75	Moderately Loud	
Near Freeway Auto Traffic	70	Moderately Loud	Reference Level
Average Office	60	Quiet	½ times as loud
Suburban Street	55	Quiet	
Light Traffic; Soft Radio Music in Apartment	50	Quiet	¼ times as loud
Large Transformer	45	Quiet	
Average Residence without Stereo Playing	40	Faint	⅛ times as loud
Soft Whisper	30	Faint	
Rustling Leaves	20	Very Faint	
Human Breathing	10	Very Faint	Threshold of Hearing
	0	Very Faint	

Source: Compiled by LSA Associates, Inc., 2004.

Table C. Land Use Compatibility for Exterior Community Noise.

Land Use Category	Noise Range (L_{dn} or CNEL), dB			
	I	II	III	IV
Passively used open spaces	50	50–55	55–70	70+
Auditoriums, concert halls, amphitheaters	45–50	50–65	65–70	70+
Residential: low density single family, duplex, mobile homes	50–55	55–70	70–75	75+
Residential: multifamily	50–60	60–70	70–75	75+
Transient lodging: motels, hotels	50–60	60–70	70–80	80+
Schools, libraries, churches, hospitals, nursing homes	50–60	60–70	70–80	80+
Actively used open spaces: playgrounds, neighborhood parks	50–67	—	67–73	73+
Golf courses, riding stables, water recreation, cemeteries	50–70	—	70–80	80+
Office buildings, commercial business and professional	50–67	67–75	75+	—
Industrial, manufacturing, utilities, agriculture	50–70	70–75	75+	—

Source: Office of Noise Control, California Department of Health , 1976.

Noise Range I—Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

Noise Range II—Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice.

Noise Range III—Normally Unacceptable: New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

Noise Range IV—Clearly Unacceptable: New construction or development should generally not be undertaken.

Table D. Noise Measurement Location and Noise Sources

Site	Location Description	Noise Sources
M-1	Near start of the Ski Back Trail; Station 78; 400 feet southeast of Maintenance Building	Truck beeping and idling near Maintenance Building; conversation; birds chirping
M-2	Mammoth Ski & Racquet Club; 200 feet south of Station 52; approximately 400 feet from and 30 feet below SR-203	Bus beeping; passing cars; conversation
M-3	Residential area 400 feet south of Station 33; approximately 400 feet east of SR-203	Traffic on SR-203 and local streets; conversation
M-4	Residential area 200 feet south of Station 27; approximately 600 feet from SR-203	Traffic on SR-203 and local streets; conversation
M-5	Near Station 17; approximately 400 feet from SR-203	Traffic on SR-203; conversation
M-6	200 feet south of Station 7; approximately 550 feet from SR-203	Traffic on SR-203; truck/bus passing; children playing nearby; conversation
M-7	On sidewalk near end of Ski Back Trail at the proposed bridge area just north of The Village	Traffic on local streets; construction activities; conversation
M-8	Along SR-203; 200 feet north of Station 10	Traffic on SR-203; conversation
M-9	Approximately 150 feet west of Station 25 and 250 feet from SR-203	Traffic on SR-203; conversation; remote construction activities

Source: LSA Associates, Inc., November 2004

Table E. Short-Term Ambient Noise Monitoring Results.

Site	Date	Duration	L_{eq}	L_{max}	L_{min}
M-1	11/12/04	10 minutes	45	55	40
M-2	11/12/04	10 minutes	47	55	45
M-3	11/12/04	5 minutes	45	59	42
M-4	11/12/04	5 minutes	43	47	42
M-5	11/12/04	10 minutes	45	50	43
M-6	11/12/04	5 minutes	46	60	42
M-7	11/12/04	10 minutes	58	75	52
M-8	11/12/04	5 minutes	52	72	43
M-9	11/12/04	10 minutes	47	58	42

Source: LSA Associates, Inc., November 2004

noise monitoring locations. Along the proposed Ski Back Trail alignment, the dominant noise source is traffic on SR-203, with some traffic on other local streets also contributing to the ambient noise. Sporadic construction activity noise as well as other community noises (children playing and conversation) add to the background noise levels.

Based on Table D, only the locations (M-7 and M-8) that are immediately adjacent to SR-203 were affected by relatively high traffic noise. For receptor locations that are away from SR-203, traffic noise contributed to the relatively low background noise.

Based on Caltrans traffic counts on SR-203 for Saturday, November 13, 2004, daily westbound traffic volumes were 5,129 and eastbound traffic volumes were 5,079 in the project area. In addition, the morning peak hour (8:00 a.m.–9:00 a.m.) westbound traffic volumes of 1,032 vehicles and afternoon peak hour (4:00 p.m.–5:00 p.m.) eastbound traffic volumes of 994 vehicles depict a peak winter Saturday traffic pattern on SR-203. The relatively high traffic volumes on SR-203 before the ski season officially began was because the only area that was open to skiers was the Main Lodge, which resulted in all skiers traffic using SR-203 on that day.

Thresholds of Significance

A project will normally have a significant effect on the environment related to noise if it will substantially increase the ambient noise levels for adjoining areas or conflict with adopted environmental plans and goals of the community in which it is located. The applicable noise standards governing the project site are the criteria in the Town's Noise Element and noise control ordinance.

Town of Mammoth Lakes Noise Standards

Noise Element

The Town has set land use standards for noise in its Noise Element of the General Plan (adopted June 18, 1997).

Transportation Source

Policy 4.2.2 states that noise created by new transportation noise sources, including roadway improvement projects, shall be mitigated so as not to exceed 60 dBA L_{dn} within outdoor activity areas and 45 dBA L_{dn} within interior spaces of existing noise-sensitive land uses.

Stationary Source

Policy 4.2.4 states that noise created by new proposed stationary noise sources or existing stationary noise sources that undergo modifications that may increase noise levels shall be mitigated so as not to exceed the noise level standards (Table F) at noise-sensitive uses.

Table F. Maximum Allowable Noise Exposure at Stationary Noise Sources. [1]

Noise Scale	Daytime (7:00 a.m.–10:00 p.m.)	Nighttime (10:00 p.m.–7:00 a.m.)
Hourly L_{eq}, dBA	50	45
Maximum Level, dBA	70	65

Source: Town of Mammoth Lakes General Plan Noise Element, 1997.

[1] As determined at the property line of the receiving land use. When determining the effectiveness of noise mitigation measures, the standards may be applied on the receptor side of noise barriers or other property line noise mitigation measures.

Noise Control Ordinance

Chapter 8.16, Noise Regulation, of the Town's Health and Safety Code in its Municipal Code sets noise limits during different times of the day, as shown in Table G.

Exterior Noise

The above noise level limits may not be exceeded for a cumulative period of more than 30 minutes in any hour. If the existing ambient L_{50} exceeds these levels, then the ambient L_{50} becomes the exterior noise levels. For events shorter than 30 minutes, higher noise limits are used for the exterior noise standards. For example, 5, 10, and 15 dBA are added to the above noise limits for events less than 15, 5, and 1 minutes, respectively. 20 dBA plus the above noise limits (e.g., for suburban one- and two-family residential, 75 dBA L_{max} during the day and 65 dBA L_{max} during the night) may not be exceeded for any period of time.

Table G. Exterior Noise Limits,1 dBA.

Receiving Land Use Category	Time Period	Rural Suburban	Suburban	Urban
One- and two-family residential	10:00 p.m.–7:00 a.m.	40	45	50
One- and two-family residential	7:00 a.m.–10:00 p.m.	50	55	60
Multiple-dwelling residential	10:00 p.m.–7:00 a.m.	45	50	55
Multiple-dwelling residential	7:00 a.m.–10:00 p.m.	50	55	60
Limited commercial/some multiple-dwelling	10:00 p.m.–7:00 a.m.	55		
Limited commercial/some multiple-dwelling	7:00 a.m.–10:00 p.m.	60		
Commercial	10:00 p.m.–7:00 a.m.	60		
Commercial	7:00 a.m.–10:00 p.m.	65		
Light industrial	Anytime	70		
Heavy industrial	Anytime	75		

Source: Town of Mammoth Lakes Municipal Code.

1 Levels not to be exceeded by more than 30 minutes in any hour (L_{50}).

Interior Noise

For interior noise standards, the Town sets an allowable interior noise level of 45 dBA for the period from 7 a.m. to 10 p.m. and 35 dBA for the period from 10 p.m. to 7 a.m. for all multifamily residential uses. For events shorter than five minutes in any hour, the noise standard is increased in 5 dBA increments in each standard. For example, 5 and 10 dBA are added to these noise limits for events less than five minutes (50 dBA during daytime hours and 40 dBA during nighttime hours) and one minute (55 dBA during daytime hours and 45 dBA during nighttime hours), respectively. If the measured ambient noise reflected by the L_{50} exceeds that permissible within any of the interior noise standards, the allowable interior noise level shall be increased in 5 dBA increments in each standard as appropriate to reflect said ambient noise level.

Although the above interior noise standards have been identified for multifamily residential uses, they are used in this analysis for all residential uses, including single-family dwelling units.

Construction Noise

Town of Mammoth Lakes also has the following construction noise restrictions:

A. Operating or causing the operation of any tools or equipment used in construction, drilling, repair, alteration or demolition work is subject to the hours of work permitted by the Municipal Code, except for emergency work of public service agencies.

B. Noise Restrictions at Affected Structures. The contractor shall conduct construction activities in such a manner that the maximum noise levels at the affected buildings will not exceed those listed in the following schedule:

1. At Residential Properties.

a. **Mobile Equipment.** Maximum noise levels for nonscheduled, intermittent, short-term operation (less than 10 days) or of mobile equipment:

	Single-family Residential	Multifamily Residential	Semiresidential/ Commercial
Daily, except Sundays and legal holidays: 7:00 a.m. to 8:00 p.m.	75 dBA	80 dBA	85 dBA
Daily, 8:00 p.m. to 7:00 a.m. and all day Sundays and legal holidays	60 dBA	64 dBA	70 dBA

b. **Stationary Equipment.** Maximum noise level for repetitively scheduled and relatively long-term operation (periods of 10 days or more) of stationary equipment:

	Single-family Residential	Multifamily Residential	Semiresidential/ Commercial
Daily, except Sundays and legal holidays: 7:00 a.m. to 8:00 p.m.	60 dBA	65 dBA	70 dBA
Daily, 8:00 p.m. to 7:00 a.m. and all day Sundays and legal holidays	50 dBA	55 dBA	60 dBA

2. At Business Structures.

a. Mobile equipment. Maximum noise levels for nonscheduled, intermittent, short-term operation of mobile equipment:

Daily, including Sundays and legal holidays, all hours: maximum of 85 dBA.

C. All mobile or stationary internal-combustion-engine powered equipment or machinery shall be equipped suitable exhaust and air-intake silencers in proper working order.

PROJECT IMPACTS

Construction Noise Impact

Proposed Action

Short-term noise impacts would be associated with excavation, grading, and construction of retaining walls along the Ski Back Trail alignment during construction of the proposed project. Construction-related short-term noise levels would be higher than existing ambient noise levels in the project area today but would no longer occur once construction of the project is completed.

Two types of short-term noise impacts could occur during the construction of the proposed project. First, construction crew commutes and the transport of construction equipment and materials to the site for the proposed project would incrementally increase noise levels on access roads leading to the site. There will be a relatively high single-event noise exposure potential at a maximum level of 87 dBA L_{max} with trucks passing at 50 feet. However, the projected construction traffic will be small when compared to the existing traffic volumes on SR-203 and other affected streets, and its associated longer-term (e.g., hourly or daily) noise level changes will not be measurable. Therefore, short-term construction-related worker commutes and equipment transport noise impacts would not be substantial.

The second type of short-term noise impact is related to noise generated during excavation, grading, and construction of the retaining walls on the project site. Construction is performed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on the site. Therefore, the noise levels vary as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table H lists maximum noise levels recommended for noise impact assessments for typical construction equipment based on a distance of 50 feet between the equipment and a noise receptor. These levels are based on information provided by the manufacturers, reported in the available literature, and used by other agencies for similar planning-level analysis. Although these noise emission levels represent typical values, there can be wide fluctuations in the noise emissions of similar equipment, particularly if the mufflers or tracks (for tracked vehicles) are defective. Typical maximum noise levels range up to 91 dBA at 50 feet during the noisiest construction phases. The site preparation phase, which includes excavation and grading of the site, tends to generate the highest noise levels, because the noisiest construction equipment is earthmoving equipment. Earthmoving equipment includes excavating machinery such as backfillers, bulldozers, draglines, and front loaders. Earthmoving and compacting equipment includes compactors, scrapers, and graders. Typical operating cycles for these types of construction equipment may involve one or two minutes of full power operation followed by three or four minutes at lower power settings.

Construction of the proposed project is expected to require the use of one large bulldozer (D7, 85 dBA L_{max} at 50 feet, same for the rest equipment noise); one large excavator (330 or 345, 86 dBA L_{max}); one mid-sized excavator (325, 86 dBA L_{max}) with a compactor plate (85 dBA L_{max}) and rock hammer (82 dBA L_{max}); one or two roller vibrating compactors (80 dBA L_{max}); one excavator (86 dBA L_{max}) that will set the rockery (325); three off-road haulers (88 dBA L_{max}); two truck and trailers (88 dBA L_{max}); six pickup trucks (85 dBA L_{max}); one water truck (85 dBA L_{max}); one microdrill rig (for the soil nail wall, 96 dBA L_{max}); one stump grinder (90 dBA L_{max}); two large size loaders (86 dBA L_{max}); one to two backhoes (86 dBA L_{max}); and one compressor (86 dBA L_{max}).

Table H. Typical Maximum Construction Equipment Noise Levels (L_{max}).

Type of Equipment	Range of Maximum Sound Level Measured at 50 Feet (dBA)	Suggested Maximum Sound Level for Analysis at 50 Feet (dBA)
Pile Drivers, 12,000 to 18,000 ft-lb/blow	81–96	93
Rock Drills	83–99	96
Jackhammers	75–85	82
Pneumatic Tools	78–88	85
Pumps	74–84	80
Scrapers	83–91	87
Haul Trucks	83–94	88
Cranes	79–86	82
Portable Generators	71–87	80
Rollers	75–82	80
Dozers	77–90	85
Tractors	77–82	80
Front-End Loaders	77–90	86
Hydraulic Backhoes	81–90	86
Hydraulic Excavators	81–90	86
Graders	79–89	86
Air Compressors	76–89	86
Trucks	81–87	86

Source: Noise Control for Buildings and Manufacturing Plants, Bolt, Beranek, & Newman, 1987.

Equipment usage will depend on the task at hand. It's highly unlikely that more than a couple of pieces of equipment will be used at the same time given the tight terrain. It is anticipated that an excavator and bulldozer or loader will be used simultaneously with one or two trucks swapping out to remove material. It is not expected that the entire length of the project area will be under construction at the same time. In particularly rocky areas, a hammer attachment may be used to break up the rocks. The stump grinder will be used in the last one to two weeks after the use of most heavy equipment is completed. Each doubling of a sound source with equal strength increases the noise level by 3 dBA. Construction along the approximately 8,000-foot-long trail will move linearly on a daily basis, affecting a specific area for a short duration time period rather than over the entire project construction. Construction noise at a given location depends on the magnitude of noise during each construction phase, the duration of the noise, the distance from the construction activities, and the shielding provided by any existing natural or manmade barriers/buildings between the construction site and the receiver. It is anticipated that the use of the equipment will be used less than 10 days in any particular area along the alignment and is considered mobile equipment.

Based on the likely construction scenario described above, the worst-case combined noise level during this phase of construction would be 89 dBA L_{max} at a distance of 50 feet from the active construction area. The closest existing residences in the vicinity of the project area are located more than 150 feet from the project construction areas. Typically, noise attenuation from a point source through distance divergence gets 6 dBA reduction per doubling of the distance (-6 dBA/DD). However, based on Caltrans Traffic Noise Analysis Protocol Technical Noise Supplements (TeNS, October 1998), noise attenuation from ground absorption and reflective wave canceling adds to the attenuation associated with geometric spreading. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface, such as soft dirt, grass, or scattered bushes and trees, between the source and the receiver), an excess ground attenuation value of 1.5 dBA per doubling of the distance (-1.5 dBA/DD) is normally assumed. Since the project area resembles a soft site scenario, total attenuation per doubling of the distance would be 7.5 dBA (-7.5 dBA/DD). At 150 feet, the noise attenuation is 12 dBA compared to the noise level measured at 50 feet from the point source of interest. There are existing intervening terrain between these homes and the project site. The closest homes are at elevations (sometimes 30–40 feet) lower than the Ski Back Trail alignment and are blocked by hills and trees. As a rule of thumb, when the line-of-sight between a receiver and a noise source is blocked, the receiver receives a minimum of 5 dBA noise reduction. The existing residences that are at elevations (much) lower than the project alignment would be blocked by the terrain (edge of the hills) from active project construction equipment/activities. This terrain shielding provides at least 5 dBA in noise reduction. Additional noise attenuation that may be provided by the trees between the residences and the project alignment was not accounted for or factored into the impact analysis. Therefore, these closest residences may be subject to short-term noise reaching 74 dBA L_{max}, generated by on-site construction activities. This range of maximum construction noise would comply with the City's noise ordinance requirements, which state that the maximum construction noise level at the existing residences needs to be reduced to 75 dBA or lower for residences in a single-family residential zone (80 dBA for

multifamily residential zone and 85 dBA for semiresidential/ commercial zone). Therefore, compliance with the construction hours specified in the Town's Noise Control Ordinance would be sufficient to reduce the potential construction noise impacts to less than significant.

Alternative 1 – Original Proposal

This project alternative would be very similar to the proposed project, with substantially more amount of cut and fill along the proposed alignment. Potential construction noise impacts associated with this project alternative would be similar to but higher than those of the proposed action.

Alternative 2 – Transit Emphasis Alternative

Because the Ski Back Trail will not be constructed, no construction noise impacts would occur under this project alternative.

Alternative 3 – No Action Alternative

Because the Ski Back Trail will not be constructed, no construction noise impacts would occur under this project alternative.

Traffic Noise Impact

Proposed Action

Under the proposed project, there would be reduction in private auto trips on SR-203. Exterior land uses on the north side of the existing residences are currently exposed to traffic noise levels from SR-203. The existing (2004) winter Saturday traffic volumes for SR-203 in the project vicinity are obtained from Caltrans traffic counts (January–November 2004). Total daily traffic volumes were 10,128 (5,129 westbound and 5,079 eastbound) vehicles. The existing (2004) winter weekday traffic volumes for SR-203 in the project vicinity were also obtained from Caltrans traffic counts (November 2004). Total daily traffic volumes for Wednesday, November 10, 2004, were 3,895 (1,976 westbound and 1,919 eastbound) vehicles. These residences would continue to be exposed to similar traffic noise with the proposed Ski Back Trail, which would result in a reduction of 80 vehicular trips a day.

The Federal Highway Administration (FHWA) highway traffic noise prediction model (FHWA RD-77-108) was used to evaluate highway traffic-related noise conditions in the vicinity of the project site. This model requires various parameters, including traffic volumes, vehicle mix, vehicle speed, and roadway geometry to compute typical equivalent noise levels during daytime, evening, and nighttime hours. Similar to the noise attenuation through distance divergence and ground absorption for a point source, Caltrans guidelines recommended a drop-off rate of 4.5 dBA per doubling of the distance

(-4.5 dBA/DD) from a line source (i.e., highways or freeways) for a soft ground (e.g., plowed farmland, grass, crops, soft dirt, or scattered bushes and trees). The resultant noise levels are weighted and summed over 24-hour periods to determine the L_{dn} values. Tables I and J provide the existing (2004) background and existing (2004) plus project traffic noise levels, respectively, along SR-203. These noise levels represent the worst-case scenario, which assumes that no shielding is provided between the traffic and the location where the noise contours are drawn. The specific assumptions used in developing these noise levels and the model printouts are provided in Appendix A.

Table I. Existing (2004) SR-203 Background Traffic Noise Levels.

Category	ADT	Centerline to 70 dBA L_{dn} (feet)	Centerline to 65 dBA L_{dn} (feet)	Centerline to 60 dBA L_{dn} (feet)	L_{dn} (dBA) 50 Feet from Centerline of Outermost Lane
Winter weekday	3,895	17[1]	37	80	62.3
Winter Saturday	10,208	32	70	151	66.5

Source: LSA Associates, Inc., January 2005.

[1] Traffic noise levels within 50 feet of roadway centerline were calculated manually.

Table J. Existing (2004) Background Plus Project Traffic Noise Levels.

Category	ADT	Centerline to 70 dBA L_{dn} (feet)	Centerline to 65 dBA L_{dn} (feet)	Centerline to 60 dBA L_{dn} (feet)	L_{dn} (dBA) 50 Feet from Centerline of Outermost Lane
Winter weekday	3,815	17[1]	37	79	62.2
Winter Saturday	10,128	32	70	150	66.5

Source: LSA Associates, Inc., January 2005.

[1] Traffic noise levels within 50 feet of roadway centerline were calculated manually.

Table J shows that the proposed project would subtract 0.1 dBA from existing SR-203 traffic noise on weekdays and would have no measurable change on weekend traffic noise. The change in traffic noise levels on weekdays is not perceptible by human ear. In addition, the 60 dBA L_{dn} noise contour does not and would not impact any residences along SR-203, which are more than 200 feet away from SR-203.

Interior Noise Levels

Table J shows that existing homes closest to SR-203 are and would continue to be exposed to peak winter Saturday traffic noise levels below 58 dBA L_{dn}. Based on the data provided in the EPA's Protective Noise Levels (EPA 550/9-79-100, November 1979), standard homes in (cold climate) Central and Northern California provide at least 17 dBA of exterior to interior noise attenuation with windows open and 27 dBA with windows closed. Therefore, homes exposed to exterior traffic noise levels lower than 58 dBA L_{dn} (58 dBA - 27 dBA = 31 dBA) would not have their interior noise level exceeding the 45 dBA L_{dn} standard with windows closed. With windows open, homes exposed to exterior traffic noise levels below 58 dBA L_{dn} (58 dBA - 17 dBA = 41 dBA) would also be below the 45 dBA L_{dn} interior noise standard.

Alternative 1 – Original Proposal

This project alternative would be very similar to the proposed project in terms of the effects on vehicular traffic trips on SR-203. Potential traffic noise impacts associated with this project alternative would be similar to those of the proposed action.

Alternative 2 – Transit Emphasis Alternative

Although under this project alternative an additional 240 skiers could, theoretically, be transported to The Village in the winter afternoon peak hours, it is not likely that this scenario would actually reduce traffic demand in the peak hour. This is because the demand for this additional transit would primarily come from other transit riders riding before or after the peak hour. The daily reduction of 240 skiers using private autos among the 7,000 total skiers and snowboarders on typical winter Saturdays or 14,000 total skiers and snowboarders represent less than 4 percent and 2 percent, respectively, of the total skiers and snowboarders. The resulting change in traffic noise, similar to the changes for the proposed project discussed below, would not be measurable and would have less than significant traffic noise impacts.

Alternative 3 – No Action Alternative

Because the Ski Back Trail will not be constructed, traffic noise impacts would remain similar to the existing condition.

Stationary Noise Impact

Proposed Action

Under the proposed project, there are activities that are not related to transportation and are considered stationary noise sources by the Town's noise ordinance associated with the proposed Ski Back Trail. These activities would result in potential noise impacts on the residential uses adjacent to the project alignment. These stationary sources of noise

include noises associated with snow-making, snow-grooming, and skiers as they pass through areas adjacent to the residences. Such isolated peak noises are measured in dBA L_{max} and L_{eq}, and are evaluated against the applicable noise standards based on these noise scales, not a weighted averaged calculation over a 24-hour period, such as the L_{dn}.

Snow-Making Activities

Noise from snow-making activities would be from the snow guns. Normal-year best-estimate by the MMSA's staff (Clifford Mann and Alex Fabbro, November 2004) for gun placement is 10 guns, as documented in the file. Figure 4 depicts these snow-making gun locations.

Implementation of the snow-making activities would not occur until snow retention information on the trail has been collected over several seasons. If and when snow-making is installed, all activities would occur at times of the day and with machinery that complies with the Town's noise ordinances. Based on the currently proposed project, snow-making will not take place between the hours of 8:00 p.m. and 7:00 a.m. Snow-making generally takes place only early in the ski season (November–December). It is estimated that a total of 60 hours is required for snow-making activities for the entire ski season. Times of day for snow-making vary and are generally dependent upon ambient temperatures around 32 degrees Fahrenheit. Snow guns are not fixed and will be placed in the most optimal sport to minimize the noise impact.

It is anticipated that snow-making guns manufactured by HKD Spectrum will be the typical guns used along the proposed Ski Back Trail. Based on the sound test results provided by HKD Spectrum, at a distance of 200 feet, noise levels from the snow-making guns range from 64 dBA (at 180 degrees, or behind the snow-making gun tower), 67 dBA (at 135 degrees), 68 dBA (0 degree), to 73 dBA (at 45 and 90 degrees). Sound levels from the HKD Spectrum Tower Sound Test provided by the manufacturer are included in Appendix B.

Based on the project's site plan for the proposed Ski Back Trail alignment, the closest existing residences on the south side of project alignment are located 200 feet or more from the proposed alignment. These residences are located at elevations approximately 30–40 feet below the proposed Ski Back Trail. To allow for snow placement in consideration of the terrain (cross-slope) and dominant wind direction (west–northwest), snow-making guns will be placed in an upslope configuration the majority if not all of the time. Placement direction will be between 270–0–190 degrees with 0 at due north. Therefore, it is assumed that the snow-making gun is at 180 degrees from the nearest residence. Peak noise levels associated with the snow-making activities would range up to 64 dBA L_{max}. The difference in elevation and shielding provided by the terrain and trees would provide a minimum of 6 dBA in noise attenuation to the residences south of the proposed alignment. Therefore, the homes 200 feet from snow-making activities would experience exterior noise levels up to 58 dBA L_{max} (64 dBA - 6 dBA = 58 dBA) outside the buildings.

Temp Access Road

Temp Access Road

The Village

Temp Access Road

Minaret Road

Temp Access Road

Maintenance Building

Ski Back Trail

Chair 7

LSA

Proposed Ski Back Trail Alignment

Snow Gun Locations (Approximate)

N

NO SCALE

SOURCE: TRIAD HOLMES ASSOCIATES

I:\INT430\G\Noise\Snow_Guns II.ai (5/14/07)

FIGURE 4

Mammoth Mountain Ski Back Trail

Snow Gun Locations

This range of noise levels is comparable with the measured ambient noise levels included in Table E. Although if this maximum sound level lasts continually for more than a few minutes, the noise could exceed the 50 dBA L_{eq} maximum allowable Noise Exposure at Stationary Noise Sources (Table F) identified by the City during daytime hours during winter season, no noise-sensitive active outdoor use such as residents sitting outside or barbecuing in the backyards or patios is anticipated at these residences. Occasional activities such as a snowball fight or playing in the snow by children would not be considered noise sensitive and would not be affected by snow-making noise. In addition, windows would be closed to keep the heat inside the house. Therefore, potential noise impacts are evaluated for interior noise levels at these residences.

Based on the data provided in the EPA's Protective Noise Levels (EPA 550/9-79-100, November 1979), standard homes in Central and Northern California with cold climate provide at least 17 dBA of exterior-to-interior noise attenuation with windows open and 27 dBA with windows closed.

Therefore, these closest homes exposed to exterior noise levels reaching 58 dBA L_{max} would have interior noise levels reaching 31 dBA L_{max} with windows closed. This range of maximum interior noise levels is lower than the Town's 55 dBA and 50 dBA interior noise standards not to be exceeded by more than one minute and five minutes, respectively, in any hour during the daytime hours between 7:00 a.m. and 10:00 p.m. It is also lower than the interior noise standard of 45 dBA for noise lasting longer than five minutes in any hour during the daytime hours between 7:00 a.m. and 10:00 p.m. Based on the above discussion, no homes along the project alignment would be exposed to noise from snow-making that would exceed the Town's daytime exterior noise standards. Similarly, during the nighttime hours between 10:00 p.m. and 7:00 a.m., snow-making noise would be below the Town's interior noise standard of 35 dBA not to be exceeded for more than five minutes in any hour. Therefore, no significant noise impacts would occur for the existing residential uses adjacent to the project alignment.

It should be noted that there are existing snow-making guns placed within 50 feet of homes and no exceedance of the Town noise ordinance has been identified. The snow-making guns are generally quiet and are operated during daytime hours to comply with the Town's noise ordinance.

Snow-Grooming Activities

In general, the trail will be groomed once daily; although on heavily trafficked days, an additional grooming pass may be considered. Similar to the snow-making activities, snow-grooming will not take place between the hours of 8:00 p.m. and 7:00 a.m. The closest residences on the south side of the trail alignment are approximately 200 feet from the alignment.

Snow-grooming would occur along the trail when needed. When it occurs, it would move along quickly and would affect a specific area for a very short period of time. It is anticipated that it would take approximately 15 minutes each way for the bio-diesel snowcat groomers to groom the trail. Therefore, noise standards in terms of the

maximum noise level (L_{max}) are needed to evaluate potential noise impacts from snow-grooming activities. Based on the sound level readings provided by Pisten Bully, the manufacturer of snow-grooming machines most likely will be used for this project, noise levels from snow-grooming activities showed a noise level of 55–59 dBA L_{max} at 200 feet, depending on the speed of the motor. Attenuation provided by the terrain and trees is 6 dBA. Therefore, the snow-grooming noise would be reduced to below 53 dBA L_{max} at the nearest residences along the Ski Back Trail. It is anticipated that snow-grooming would take place less than a few minutes for a specific area due to the continuously moving nature of the snow-grooming machine. Even without noise attenuation from the terrain and trees, noise levels associated with snow-grooming activities would be below the Town's standards at the nearest residences adjacent to the project site.

The closest homes exposed to exterior noise levels reaching 53 dBA L_{max} would have interior noise levels reaching 26 dBA L_{max} with windows closed. This range of maximum interior noise levels is lower than the Town's 55 dBA and 50 dBA interior noise standards not to be exceeded by more than one minute and five minutes, respectively, in any hour during the daytime hours between 7:00 a.m. and 10:00 p.m. It is also lower than the interior noise standard of 45 dBA for noise lasting longer than five minutes in any hour during the daytime hours. Based on the above discussion, no homes along the project alignment would be exposed to noise from snow-grooming activity that would exceed the Town's daytime exterior noise standards. The maximum interior noise level is also lower than the Town's 45 dBA and 40 dBA interior noise standards not to be exceeded by more than one minute and five minutes, respectively, in any hour during the nighttime hours between 10:00 p.m. and 7:00 a.m. It is also lower than the interior noise standard of 35 dBA for noise lasting longer than five minutes in any hour during the nighttime hours. Therefore, no significant noise impacts would occur for the existing residential uses adjacent to the project alignment from snow-grooming activities.

Skier Pass-By Noise

There is a human noise potential when skiers pass through the areas closest to the existing residences. The minimum distance between the proposed Ski Back Trail to the surrounding residential uses is 200 feet. It is assumed that up to 16 skiers would be passing through at any one time during the peak afternoon hour.

Based on the average dBA of speech for different vocal efforts under quiet conditions at a distance of one meter (three feet) in a free field, quoted by Harry Levitt and John C. Webster in *Handbook of Acoustical Measurements and Noise Control* (Third Edition, edited by Cyril M Harris, 1991), male shouting would result in 88 dBA, while female shouting is 82 dBA. Loud voice for male is 75 dBA and for female is 71 dBA. Raised voice is 65 dBA for male and 62 dBA for female. These are all maximum sound pressure levels (L_{max}) measured at one meter, or three feet, from the person. In acoustics, every doubling of an equal sound energy would result in a 3 dBA increase in combined noise level. Therefore, 2 males shouting at the same time (worst-case scenario to have them reaching the peak level at the same time) would result in 91 dBA, 4 males in 94 dBA, 8 males in 97 dBA, and 16 males in 100 dBA, all at one meter (three feet) from these males. Similarly, for females shouting at one meter (three feet), 2 would result in

85 dBA, 4, 88 dBA, 8, 91 dBA, and 16, 94 dBA. The above calculation shows that as the number of people increase from 1 to 16, the peak noise level would increase by 12 dBA. It should be noted that this is the worst-case assumption since it is rarely possible for 16 people to generate peak vocal level at the same time. In addition, it is impossible to maintain a distance of one meter (three feet) from all 16 people, since it is assumed they remain a point source. Similarly, for loud voice, 16 males would result in an increase from 75 dBA to 87 dBA at one meter (three feet), and 16 females would result in 83 dBA at one meter (three feet). For raised voice, 16 males would result in 77 dBA at one meter (three feet), and 16 females would result in 74 dBA at one meter (three feet). Since male voice levels are higher than female voice levels, it is assumed that all skiers are male for a worst-case analysis scenario.

At a distance of 200 feet, the distance attenuation would provide approximately 36 dBA in noise reduction, compared to the noise level at three feet (one meter) from the point source(s). Therefore, noise level from a single male person would be reduced to 52 dBA L_{max}, 39 dBA L_{max}, and 29 dBA L_{max}, respectively, for shouting, loud, and raised voice levels. At this distance, the above male shouting noise from 16 people would be reduced to 64 dBA L_{max}. Male loud voice from 16 people would be reduced to 51 dBA. Male raised voice from 16 people would be reduced to 41 dBA. In addition, noise attenuation provided by terrain and trees would further reduce the skier noise by 6 dBA or more.

The closest homes exposed to exterior noise levels reaching 64 dBA L_{max} would have interior noise levels reaching 37 dBA L_{max} with windows closed. This range of maximum interior noise levels is lower than the Town's 55 dBA and 50 dBA interior noise standards not to be exceeded by more than one minute and five minutes, respectively, in any hour during the daytime hours between 7:00 a.m. and 10:00 p.m. It is also lower than the interior noise standard of 45 dBA for noise lasting longer than five minutes in any hour during the daytime hours. Based on the above discussion, no homes along the project alignment would be exposed to noise from skiers passing by that would exceed the Town's daytime exterior noise standards. Therefore, no significant noise impacts would occur for the existing residential uses adjacent to the project alignment from snow-grooming activities.

Alternative 1 – Original Proposal

This project alternative would have stationary source noise impacts similar to the proposed project.

Alternative 2 – Transit Emphasis Alternative

Because the Ski Back Trail would not be constructed, no noise impacts from stationary sources along the project alignment would occur under this project scenario.

Alternative 3 – No Action Alternative

Because the Ski Back Trail would not be constructed, no noise impacts from stationary sources along the project alignment would occur under this project scenario.

MITIGATION MEASURES

Because no construction, traffic, or stationary source noise impacts would occur under the No Action and Transit Emphasis alternatives, the following mitigation measures apply only to the Proposed Action and Original Proposal alternatives.

Construction Impacts

Construction will be limited to the hours of 7:00 a.m. to 7:00 p.m. Monday through Saturday in accordance with the Town's Noise Control Ordinance. No construction activities are permitted outside of these hours or on Sundays and federal holidays.

The following measures can be implemented to reduce potential construction noise impacts on nearby sensitive receptors:

1. During all site excavation and grading, the project contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers consistent with manufacturers' standards.
2. The project contractor shall place all stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site.
3. The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.

Traffic Noise Impacts

No mitigation measures are required for traffic-related noise impacts.

Stationary Noise Impacts

Proposed Project

- Snow-making activities will generally be limited to daytime hours between 7:00 a.m. and 8:00 p.m.
- No snow-making shall be allowed during nighttime hours between 10 p.m. and 7:00 a.m.

Reduced Grading Alternative

- Snow-making will not occur between 10:00 p.m. and 7:00 a.m. at placements within 250 feet of residences.
- Restrict snow-making at all locations between 8:00 p.m. and 7:00 a.m.
- Maintain or establish vegetative screening between gun placements and residences.

LEVEL OF SIGNIFICANCE AFTER MITIGATION

With implementation of the identified mitigation measures, potential short-term and long-term noise impacts would be reduced to below the level of significance.

REFERENCES

Bolt, Beranek & Newman, Noise Control for Buildings and Manufacturing Plants, 1987.

Town of Mammoth Lakes, Municipal Code Noise Control Ordinance.

Town of Mammoth Lakes, Noise Element of the General Plan.

Federal Highway Administration, Highway Traffic Noise Prediction Model, FHWA RD-77-108, 1977.

APPENDIX A
FHWA TRAFFIC NOISE MODEL PRINTOUTS

TABLE MMS431NP
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 1/3/05
ROADWAY SEGMENT: HIGHWAY 203
NOTES: PEAK WINTER SATURDAY TRAFFIC

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 10208 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 66.50

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	70.4	151.1	325.3

TABLE MMS431NP2
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 1/3/05
ROADWAY SEGMENT: HIGHWAY 203
NOTES: WEEKDAY TRAFFIC

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 3895 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 62.32

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	0.0	79.7	171.2

TABLE MMS431WP
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 1/3/05
ROADWAY SEGMENT: HIGHWAY 203
NOTES: WITH PROJECT WINTER SATURDAY TRAFFIC

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 10128 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 66.47

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	70.0	150.3	323.6

TABLE MMS431WP2
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 1/3/05
ROADWAY SEGMENT: HIGHWAY 203
NOTES: WITH PROJECT WEEKDAY TRAFFIC

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 3815 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 62.23

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	0.0	78.6	168.9

TABLE MSS431NP
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 1/5/05
ROADWAY SEGMENT: HIGHWAY 203
NOTES: PEAK WINTER WEEKEND TRAFFIC

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 8692 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 65.80

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	63.3	135.8	292.2

TABLE MSS431WP
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 1/5/05
ROADWAY SEGMENT: HIGHWAY 203
NOTES: WITH PROJECT PEAK WINTER WEEKEND TRAFFIC

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 8612 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	NIGHT
AUTOS	88.08	9.34
M-TRUCKS	1.65	0.19
H-TRUCKS	0.66	0.08

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

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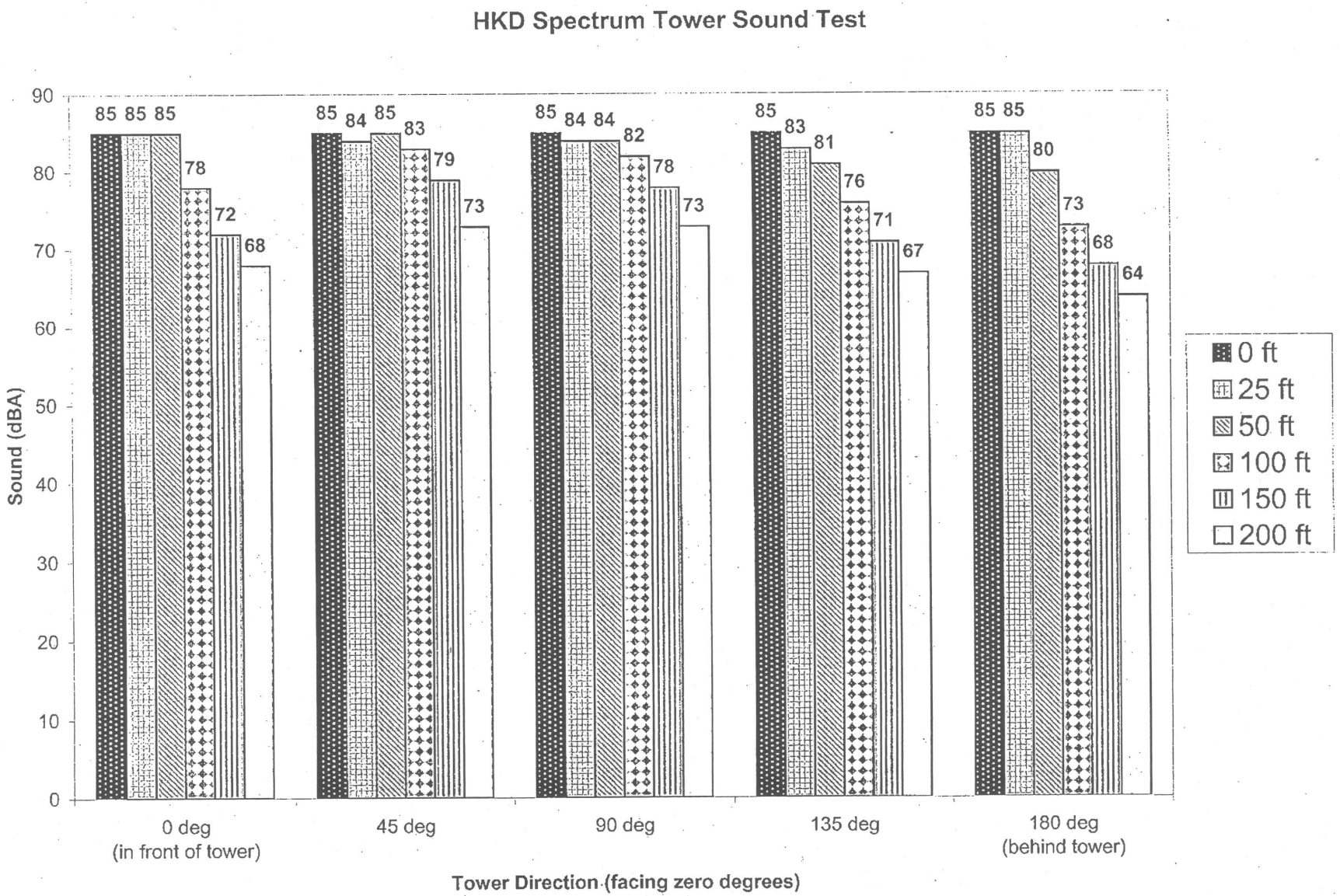
* * CALCULATED NOISE LEVELS * *

Ldn AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 65.76

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO Ldn

70 Ldn	65 Ldn	60 Ldn	55 Ldn
0.0	62.9	134.9	290.4

APPENDIX B
SNOW-MAKING AND SNOW-GROOMING EQUIPMENT NOISE


HKD Spectrum Tower Sound Test
Sound (dBA)
90
80
70
60
50
40
30
20
10
0
85 85 85 78 72 68
85 84 85 83 79 73
85 84 84 82 78 73
85 83 81 76 71 67
85 85 80 73 68 64
0 ft
25 ft
50 ft
100 ft
150 ft
200 ft
0 deg
(in front of tower)
45 deg
90 deg
135 deg
180 deg
(behind tower)
Tower Direction (facing zero degrees)

Tony Chung

From: afabbro@mammoth-mtn.com
Sent: Wednesday, December 29, 2004 12:39 PM
To: mschlafmann@fs.fed.us; Les.Card@lsa-assoc.com; tony.chung@lsa-assoc.com
Subject: Pisten Bully Sound Levels

All,

Since it's been problematic getting the Pisten Bully guys down here to MMSA what with the storms and all, I'm forwarding the results from their testing, which obviously isn't site-specific. We're still working on getting them to visit and take measurements using our equipment and on our terrain, but it could be a week or more until that happens. So for now, this is what we have.

Thanks,
Alex

-----Original Message-----
From: Ted Ferrato [mailto:tferrato@pistenbullyusa.com]
Sent: Thursday, December 23, 2004 2:59 PM
To: John Walline
Subject: Sound

Per your request
Ted

100ft @ 1200rpm 57 decibels
100ft @ 1500rpm 56 decibels
100ft @ 1800rpm 61 decibels

200ft @ 1200rpm 55 decibels
200ft @ 1500rpm 56 decibels
200ft @ 1800rpm 59 decibels