

# **ATTACHMENT C**

## **Snow Deposition and Avalanche Hazard Survey Report**

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Planning Department  
Town of Mammoth Lakes

RE: Snow Deposition and Avalanche Hazard Survey  
The Bluffs at Mammoth,  
Lot #40, 365 Fir, APN 022-393-013-000  
Lot #41, 385 Fir, APN 022-392-014-000

## INTRODUCTION

This report was prepared at the request of Steve Johnson. It is based upon my observations during an on-site visit in July 2017, review of topographic maps of the property, previous visits to the Bluffs at Mammoth, my review of the previous avalanche studies of the area, snow and avalanche reports by Norm Wilson and Art Mears, as well as my knowledge of avalanche phenomenon and my extensive experience with avalanche behavior in the Sierra Nevada.

The owner of the property has proposed to build houses on Lots #40 & 41. In consideration of this proposal the objective of this site specific Avalanche Hazard Survey was to determine the feasibility of building on the property, and to determine if the proposed houses will result in changes in snow deposition and avalanche potential. Since the property is located within a designated Snow Deposition Design Zone it is necessary to determine if and where structures can be located on the property and what other measures may be necessary to meet the conditions required in the Town of Mammoth's Zoning Code requirement for Snow Deposition Zone which states ".....that there will be not greater snow deposition in the related avalanche starting zones and no overall increase in the avalanche hazard in the balance".

## SNOW TRANSPORT AND AVALANCHE HAZARD

The redistribution of snow by wind is a common feature in the mountain snowpacks and is frequently responsible for avalanche formation. Once a critical wind speed is reached, snow is picked up or scoured from the surface and transported and deposited downwind. Deposition usually occurs when the wind speed is reduced by local terrain or vegetative features. This results in drifts on the downwind side of features. This same phenomena also occurs on the lee side of ridge crests or where slopes become abruptly steeper. In this situation snow is picked up from the area upwind of the crest or steep slope and as the wind decreases in velocity, as it passes over the terrain change, the snow is deposited on the lee slope. This is a common occurrence in some locations and results in considerably more snow accumulation on slopes which are downwind or to the lee of the general wind direction. This additional loading can occur very rapidly and frequently results in an unstable avalanche prone snowpack on these lee slopes.

In the general vicinity of the Bluffs Subdivision the transport of snow picked up from the relatively flat area to the south and west and redeposited on to the steep slopes and cliffs to

the north and east has been well documented. This natural process has been occurring since the formation of the landscape and will continue even if the Bluffs Subdivision is completely built out. As the landscape is altered by the construction of homes and other improvements, the wind patterns and snow deposition patterns will be altered.

Lots #40 & 41, which front on Fir Street are relatively level from the street for 100 + feet to the north, where steep slopes and cliffs are located. Based upon terrain there is a potential that avalanches originating from these steep slopes may descend through the forest and down to the gentler slopes below. There is no evidence of, observations or reports of any avalanche activity from these slopes. In its present relative natural state, prevailing storm winds from the west and southwest pick up snow from the level areas to the west and southwest of Lots 40 & 41, transport the snow across the property and the snow is then deposited to the east and northeast. Trees and other natural terrain features located on Lots #40 & 41 and upwind interrupt the flow of the wind resulting in snow deposition and drifting downwind (northeast and east) from these objects. Based on observations there is limited snow transport onto the steep slope to the north of the property site.

## STRUCTURES AND DRIFTING SNOW

Structures, both buildings and fences placed perpendicular to the wind flow will result in snow accumulation (drifting) both windward and leeward of the structure, with greatest amounts to the leeward. Road Departments often utilize this effect to reduce snow drifting on roads by placing fences to the windward of roads. These fences interrupt the wind flow and snow which may have been deposited on the road is caught by the fence with most of the drifting immediately to the leeward of the fence. This same principle is also used for water storage purposes. Buildings built with their windward wall perpendicular or close to perpendicular will also result in snow drifting in the immediate vicinity of the building with the greatest amount to the leeward.

When structures are built which interrupt the wind flow and cause drifting in their immediate vicinity, most of the snow deposited near the structure would have been transported downwind if the structure were not present. This phenomena also occurs in nature. Smooth bare slopes to the windward of a mountain crest are often stripped of snowcover by wind while adjacent windward forested slopes have deep snow cover. Ski areas often place snow fences on smooth windward slopes to catch snow so the area is skiable. In some situations snow fences are used as a method to decrease the amount of snow drifting onto the adjacent leeward slope as a method of avalanche control. In this circumstance the snow is caught before it reaches the avalanche prone slope, thereby reducing the snow accumulation and the potential for avalanches.

It is this author's opinion that properly placed structures on Lot #40 & 41 will result in snow which may have been transported to and deposited on the steep slopes and cliffs to the north, to instead be deposited upwind in the immediate vicinity of the structures. This will result in a net reduction in the amount of snow available for transport and deposition onto the steep slopes on Lots 40 & 41. With less snow accumulation avalanche potential will be reduced.

## PROPOSED BUILDING DESIGN AND LOCATION EVALUATION

Based upon my review of the design and locations of the proposed buildings on Lots #40 and #41 I conclude they conform with the Town's Snow Deposition Design Zone requirements.

Specifically:

Separation from the 30 degree point: The proposed buildings' back walls (north) will be located approximately 42 feet (Lot #41) and approximately 32 feet (Lot# 40) from the point where the slope to the north increases to 30 degrees. The back (north) decks and deck covers for both buildings are more than 30 feet from the 30 degree point. These are horizontal distances and do not include the additional distance due to the slope of the property from the northeast wall to the 30 degree point. As a result of the prevailing west and southwest storm winds, snow deposition will be directly towards the east and northeast direction. This should allow an adequate area for snow deposition downwind of the buildings onto the relatively flat areas immediately east and northeast of the proposed building sites.

#### CONCLUSION

It is this author's opinion that structures built south of the steep slopes on Lots #40 & #41 will result in snow which may have been transported to and deposited on the steep slopes and cliffs to the North to be deposited upwind in the immediate vicinity of the structures. This will result in a net reduction in the amount of snow available for transport and deposition onto the steep slopes to the north. With less snow accumulation avalanche potential will be reduced.

The design and locations of the proposed buildings for Lots #40 & #41 represented in the site plan, elevations and site profile drawn by Steve Johnson will comply with the Town of Mammoth's requirement for Snow Deposition Zone which states ".....that there will be not greater snow deposition in the related avalanche starting zones and no overall increase in the avalanche hazard in the balance".

If you need additional information or have questions please contact me.

Yours truly,

A handwritten signature in cursive script that reads "Larry Heywood".

Larry Heywood