City of Ketchum

CITY COUNCIL MEETING AGENDA MEMO

Meeting Date:	January 16, 2024	Staff Member/Dept:	Seth Martin/Fire

Agenda Item:	Recommendation to approve Contract 24041 with David Hamre & Associates, LLC for the purpose of an Urban Avalanche Analysis.

Recommended Motion:

I move to approve a 50% cost share with Blaine County to enter a contract with David Hamre and Associates, LLC. not to exceed $25,000, for the purpose of an Urban Avalanche Analysis.

Reasons for Recommendation:

- The City of Ketchum and surrounding areas have had conflicts with avalanches well back into the days of active mining at the end of the 19th century. Large avalanche cycles at lower elevations have seemingly increased in frequency in the past 20 years as urban development and infrastructure have also increasingly encroached into avalanche terrain. Mid-winter and late winter rain events have also become more common as the earth's climate warms. Wildfires have changed the landscape to a large degree around Sun Valley and have influenced the anchoring of the snowpack, not to mention its resilience to warming events. Overall, it appears that the risk of avalanches impacting the residents and visitors to Ketchum has significantly increased in the 21st Century. Now is an appropriate time to examine the urban avalanche problem and to develop a coordinated response to times of elevated avalanche hazard.
- This study is one of the first steps in a multi-tiered process aimed at equipping emergency managers with tools that will better help predict and plan for avalanche risks and to make more informed decisions regarding evacuations and repopulation decisions after an evacuation.
- Blaine County has already appropriated 50% of the contract cost as part of their FY 23-24 budget.

Sustainability Impact:

None

Financial Impact:

None OR Adequate funds exist in account:	GL: 01-4193-9930

Attachments:

1. Sun Valley Urban Avalanche Problem Proposal
2. Purchase Order 24041

Sun Valley Urban Avalanche Analysis

Proposal by David Hamre and Associates, LLC

May 20, 2023

INTRODUCTION

Sun Valley, Idaho (here defined as the Cities of Bellevue, Hailey, and Ketchum and the mountainous regions of Blaine County) has had conflicts with avalanches well back into the days of active mining at the end of the 19th century. Large avalanche cycles at lower elevations have seemingly increased in frequency in the past 20 years as urban development and infrastructure have also increasingly encroached into avalanche terrain. Mid-winter and late-winter rain events have also become more common as the earth's climate warms. Wildfires have changed the landscape to a large degree around Sun Valley and have influenced the anchoring of the snowpack, not to mention its resilience to warming events. Overall, it appears that the risk of avalanches impacting the residents and visitors to Sun Valley has significantly increased in the 21st Century. Now is an appropriate time to examine the urban avalanche problem and to develop a coordinated response to times of elevated avalanche hazard.

The stakeholders, elements at risk, and the risk owners are multitudinous, and boundaries between agencies/municipalities don't necessarily coincide with the boundaries of the avalanche paths. In some cases, the avalanche start zone may come under one jurisdiction, while the track and run-out may fall under another. Private landowners, Municipal, County, State, and Federal land managers, and agencies all have exposure and responsibility in different areas of Sun Valley. This mélange of land managers is not atypical to the United States, but it does complicate the coordination of avalanche response. David Hamre and Associates, LLC (DHA) is familiar with the challenge of multiple land managers and can help guide the process of *defining the urban avalanche problem* in Sun Valley*, identifying solutions,* and *making recommendations*. The process for doing so would be broken into three phases, all of which would involve interaction and collaboration with the stakeholders of Sun Valley.

METHODOLOGY

Phase 1 – Define the Problem

The goal of this phase is to create tools essential to implementing solutions.

First and foremost, a comprehensive <u>avalanche atlas</u> should be created that defines the avalanche paths that can impact the residents, recreationists, and commuters of Sun Valley. Some of this work may already exist, but not under one banner nor in a standard format. The atlas would include pertinent data about the avalanche path (elevations, vertical fall, aspect, angles, runout angle, historic frequency, notable events…) and a high-resolution oblique image of the full path (including start zone, track, and runout zone). See Figure 1 for an example of an Avalanche Atlas entry. Additionally, the path perimeter would be drawn on SmartMountain™ (an ESRI GIS platform), which could be shared with all community stakeholders. See Figure 2 for an example of a SmartMountain™ depiction of avalanche paths. The process of cataloging and characterizing the avalanche paths would ideally be a collaborative process between DHA and the Sawtooth Avalanche Center (SAC). This atlas-building process would blend with acquiring and analyzing avalanche occurrence records.

Path 14.0

Location	W side of Motherlode Mine access road at KM 12.5	Coordinates	Lat	49°41'5.92"N	Vertical fall (m)	1105
			Lon	117°10'3.20"W		

Starting Zone	Elevation (m)	Top	2290	Avg. Slope Angle (°)	40	Aspect	E	Width (m)	510
		Bottom	1800						
	Terrain Characteristics	Several distinct starting zones separated by rib features converging into three tracks. Upper starting zone consists of rock bluffs, scree, talus and heather slopes. Lower starting zone consists of 1 m brush, and spaced sub-alpine conifers.							
Track	Elevation (m)	Top	1800	Avg. Slope Angle (°)	25	Width (m)	330	Length (m)	750
		Bottom	1320						
	Terrain Characteristics	Three channeled gullies converging into one with 1-2 m vegetation and boulders. Spaced old growth conifers on flanks. Secondary channel and start zone on S side can act as separate path for ≤ Size 2 avalanches.							
Runout Zone	Elevation (m)	Top	1320	Avg. Slope Angle (°)	8	Terrain Trap?	No		
		Bottom	1185						
	Terrain Characteristics	Generally planar with seasonal creek down middle. 2-3 m vegetation and alder. Access road in extreme runout.							

Est. Frequency (avalanches:years)	Size 1	-	Size 2	-	Size 3	1:3	Size 4	1:10	Size 5	-

Historic Avalanche Events	Spring 2014: Size 3 overran road with ≤ 2 m deposit depth on road. Spring 2010: Size 4 overran road with ≤ 5 m deposit depth on road. No records prior to 2010.

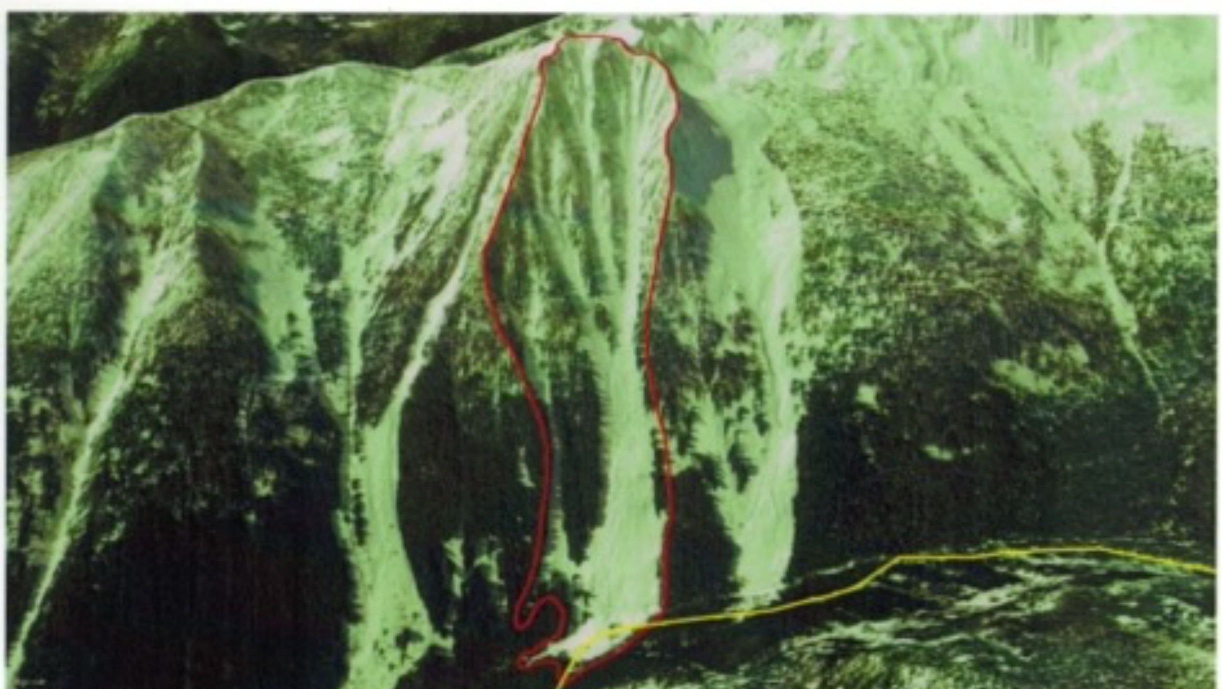

Image © 2015 DigitalGlobe.

Figure 1: An example of a page from an avalanche atlas.[i]

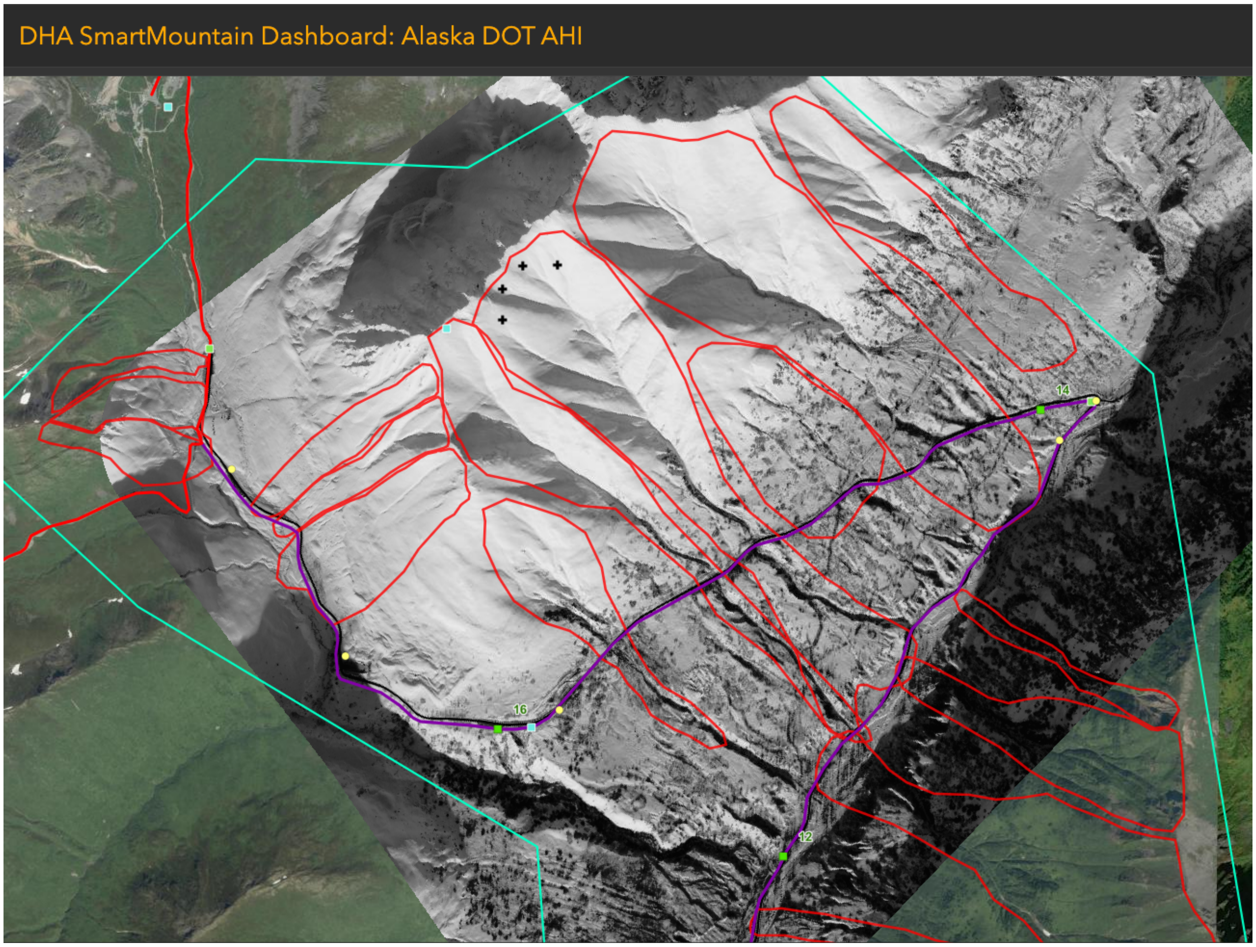

Figure 2: SmartMountain™ depiction of avalanche paths with "snow-on" satellite imagery. Purple represents a roadway. Green dots are mileposts. Yellow dots are signage.

Avalanche occurrence records currently take many forms (newspaper accounts, paper records, print photos, digital photos, and digital data). It is time-intensive to collate all pertinent information into an organized, searchable database. Sources for this information would include the Sawtooth Avalanche Center, Janet Kellam (former director of the SAC), Ketchum City Records, Bruce Smith (private citizen with a reputedly comprehensive archive of urban avalanche data), the Idaho Falls Post Register, KIVI, KBOI, Idaho Mountain Express… This record will serve several purposes once this data is collected and entered into a database. It will enable better estimates of avalanche frequency and magnitude by avalanche path. It will serve as a format for future documentation of avalanche occurrences. It may also give some insight into when urban avalanches are most likely. Many suppositions exist about when and where peak avalanche activity may start; a database can help support or dispel those assumptions.

The avalanche hazard index (AHI) is a quantified hazard analysis for transportation corridors. Not only does it define an existing level of avalanche risk, but it can then be modified by whichever mitigations are chosen for the road. It would be most applicable to Warm Springs Road and State Highway 75.

Although it is beyond the scope of services that DHA can offer, revisiting and expanding the Avalanche Zoning for Sun Valley is essential to the overall analysis of the urban avalanche problem. This work should be done by certified Avalanche Engineers. Wilson and Mears performed this task in 1977 and 1978 for Sun Valley, with additions in 1982, 2001, and 2009[ii]. Mears' peer and business partner, Chris Wilbur, could revisit this work. Particular emphasis should be placed on the areas beneath the recent burns on Warm Springs Road and previously unzoned areas (e.g., Deer Creek).

Identification of elements-at-risk, stakeholders, and the risk owners is essential to including their interests in the analysis as well as who assumes what responsibilities in avalanche response.

A complete list of the elements-at-risk[iii] will take time to develop but can be broadly thought of as:

- Persons (e.g., occupants, pedestrians, recreationists, workers, motorists…)
- Structures (e.g., occupied, unoccupied, essential…)
- Infrastructure (e.g., powerlines, pump houses, communication towers, bridges…)
- Vehicles (personal and commercial, buses…)

Stakeholders are the entities with an interest that could be impacted by urban avalanche activity. This list will also take time to fully develop, but includes private land owners; Blaine County Road Department and ITD, Cities of Bellevue, Hailey, and Ketchum; BCRD; and possibly the Sawtooth Avalanche Center, amongst others.

Risk Owners[iv] are the people or entities with the accountability and/or authority to manage a risk. This would include municipal, county, state, and federal government.

Phase 2 – Identify Solutions

Managing residential neighborhoods is a far cry from managing a ski area where exposure is voluntary, and closures are daily and expected. To gain insight into what works for communities and what does not, we will examine policies from US communities with avalanche exposure (Morgan Basin, UT; Park City, UT; Juneau, AK; Cordova, AK; Anchorage, AK, Ophir, CO; Silverton, CO; Pitkin County, CO; and Washoe County, NV). Additionally, we will look at analogs from British Columbia, Europe, and Norway to look for policies and procedures that could work in Sun Valley.

Undoubtedly, an urban avalanche forecasting program will be one of the recommendations. DHA will offer insights into avalanche forecasting based on our programs for other operations (mining, powerlines, ski areas, pipelines, and transportation corridors). The hazard scale and suggested actions differ significantly from the North American Danger Scale, which is oriented toward public recreationists. Additionally, we will examine the frequency with which urban avalanche bulletins are issued. Key to this process will be determining who is responsible for avalanche forecasting and the chain of command when avalanche hazard is elevated. DHA cannot determine who does the forecasting but can help generate the job responsibilities and considerations for running the program.

Avalanche mitigation can take many forms. We will address both temporary and permanent measures.
Temporary measures reduce avalanche risk for a short time period. They can vary from high risk reduction values (forecasting, evacuations, and closures) to more moderate risk reduction values (Remote Avalanche Control Systems, helicopter bombing). Explosive-based avalanche mitigation work can reduce the hazard effectively when the timing is right but is rarely conducted over residences or critical infrastructure. Explosive-based mitigation would only be presented as an option over transportation corridors where closures can be enforced.

Permanent measures involve engineered structures and relocations that work season-long for avalanches of a specific size (the “design avalanche”). Diversion dams, start zone stabilization structures (aka snow nets), catchment basins, and road relocation are all examples of permanent measures. They are highly effective at reducing risk and have a commensurate price tag. Permitting would be required for many of these structures, and public opposition is likely. Determining the scope and scale of structures would be beyond the scope of the DHA analysis team, but we will recommend which paths these might be most effective on or the most warranted. It should be noted that seasonal closures can be considered permanent measures and have a risk reduction value of 100%.

Phase 3 - Recommendations and Phasing
Many options will come out of Phase 2. Following discussions with the stakeholders, and likely the public, DHA will refine the options to a series of considerations and recommendations. The report will then offer a cost/benefit analysis and a suggested timeline for phasing in those recommendations. The interaction between Phase 1 and Phase 2 and then between Phases 2 and 3 are critical to the success of this project. A field visit is scheduled with each phase to ascertain that DHA is hearing from all the stakeholders and risk owners that want to be heard.

After completing the final report, ten hours of follow-up consultation are also built into the project cost.

TIMELINE

To be determined by the committee. Likely starting in Spring/Summer 2024. To be completed within one year of the start date.

COSTS

A detailed worksheet provides individual breakdowns within each phase. This was sent to Scott Savage and Chris Corwin on May 8, 2023. The costs reflected here are for DHA services only. Avalanche zoning work by an Avalanche Engineer is an expected additional expense.

Billing will occur at the end of each phase.

	Labor	Expenses	
PHASE 1	$40,260.00	$4,968.75	
PHASE 2	$22,710.00	$593.75	
PHASE 3	$13,470.00	$593.75	
Sub- Totals	$76,440.00	$6,156.25	
Government Compliance Costs		$7,644.00	
TOTAL PROJECT COST		$90,240.25	
Potential Cost Reductions			
ESRI License		$2,000.00	If Ketchum ESRI platform is capable of supporting avalanche path polygons and similar data
Snow-On Imagery		$1,500.00	If snow-on imagery is already purchased and ortho-rectified
SAC/Kethum Atlas Assistance = 50%		$4,950.00	Rate variable depending upon how much assistance/guidance is provided
SAC Av. Occ. Data Compilation = 50%		$8,250.00	Rate variable depending upon how much assistance/guidance is provided
TOTAL		$16,700.00	

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[i] Technical Aspects of Snow Avalanche Risk Management (TASARM), 2016, Canadian Avalanche Association, page 117

[ii] Ketchum City Code, Chapter 17.92, Avalanche Zone District A

[iii] TASARM, page 76

[iv] Planning Methods for Assessing and Mitigating Snow Avalanche Risk, 2018, Jamieson et al, Canadian Avalanche Association, p. 269

CITY OF KETCHUM

PO BOX 2315 * 191 5TH ST. * KETCHUM, ID 83340
Administration 208-726-3841 (fax) 208-726-8234

PURCHASE ORDER

BUDGETED ITEM? ____ Yes ____ No

PURCHASE ORDER - NUMBER: 24041

To:	**Ship to:**
6110 DAVID HAMRE & ASSOCIATES LLC PO BOX 111492 ANCHORAGE AK 99511	CITY OF KETCHUM PO BOX 2315 KETCHUM ID 83340

P. O. Date	Created By	Requested By	Department	Req Number	Terms
11/09/2023	KCHOMA	KCHOMA		0	

Quantity	Description		Unit Price	Total
1.00	SUN VALLEY AVALANCHE ANALYSIS	01-4193-9930	25,000.00	25,000.00
		SHIPPING & HANDLING		0.00
		TOTAL PO AMOUNT		25,000.00

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Authorized Signature