

## LITTLE COTTONWOOD CANYON TRANSPORTATION STUDY

Jon Nepstad  
Fehr & Peers Associates\*  
Ritchie Taylor  
Utah Department of Transportation  
Chris Stethem  
Chris Stethem and Associates  
Andrea Clayton  
HW Lochner

**ABSTRACT:** This project was commissioned by the Utah Department of Transportation (UDOT) in conjunction with Alta Ski Lifts, Snowbird, the Town of Alta, and the Utah Transit Authority. The purpose was to quantify the risk associated with SR-210, a.k.a. Little Cottonwood Canyon road. Traffic management in Little Cottonwood Canyon relies on the hard work of avalanche forecasters, maintenance and law enforcement staff, and extensive coordination with the ski resorts. Due to the diligent efforts of all the parties, the highway has been relatively safe during ski seasons, in spite of being one of the most avalanche-prone highways in North America. However, with the increasing popularity and growth of the resorts, additional measures can be taken to continue to ensure a high level of safety for all modes. This unique project examined a wide variety of options to improve the highway safety from avalanche danger. The study investigated some extreme measures such as realigning the highway out of slide paths (but into protected Wilderness Areas), building snow sheds or tunnels, innovative demand management concepts such as increased transit service, parking lot metering and ITS measures such as traveler information systems at park and rides and the resorts. One of more interesting tasks was actually determining “packages” of improvements for the long corridor. These packages were compounded further by the need to recommend short term and long term projects as well. The study provided direction for UDOT, UTA, Forest Service and the ski resorts for future transportation improvements.

**KEYWORDS:** Risk reduction, transportation, planning, traffic

### I. INTRODUCTION

The Little Cottonwood Canyon Transportation Study focuses on risk assessment and management. The purpose of this study is to:

- Analyze the risk to the highway from avalanches
- Analyze ways to reduce the dependence on artillery
- Develop risk reduction measures
- Develop preliminary costs and associated risks, and
- Provide a blueprint for the future of the canyon

Little Cottonwood Canyon Road, or SR-210, connects the Salt Lake Valley with the Town of

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\* Jon Nepstad, AICP, Fehr & Peers Associates, 2180 South 1300 East, Suite 220, Salt Lake City, Utah 84106; tel: 801-463-7600; fax: 801-486-4683; email: [j.nepstad@fehrandpeers.com](mailto:j.nepstad@fehrandpeers.com)

Alta, Alta Ski Lifts, and Snowbird Ski Resort at the top of Little Cottonwood Canyon. SR-210 is a state highway, so the operation and maintenance is the responsibility of the Utah Department of Transportation (UDOT). The partnership between UDOT's snow safety staff and the snow safety managers at Alta and Snowbird is a critical component of Little Cottonwood Canyon's success: without the diligent and effective teamwork of these individuals, Little Cottonwood Canyon would represent a far greater hazard. Much is owed to these teams, and they deserve continued recognition and support. The road is the only access for the communities, resorts, trailheads, and private properties along the canyon's length. Part of Little Cottonwood Canyon is federally designated Wilderness Area, with quite severe restrictions. Other land ownership includes the Wasatch-Cache National Forest, the Town of Alta, and privately held lands.

### II. PROJECT SPONSORS

This project relied heavily on the trust and good will of all participants. The sponsors of the project included:

- UDOT
- UTA
- Alta Ski Lifts
- Snowbird
- Town of Alta

Other participants included:

- United States Forest Service
- Salt Lake City Public Utilities
- Salt Lake County Planning and Public Safety
- Wasatch Front Regional Council
- Save Our Canyons

The consultant team was led by Fehr & Peers Associates, with support from:

- Chris Stethem and Associates
- HW Lochner
- Bio-West
- Carter-Burgess
- Penna Powers Brian Haynes

### III. METHODOLOGY

The study relied on a methodology called the Avalanche Hazard Index (AHI) to understand the existing risk and evaluate alternatives. The AHI has several important variables that are calculated, including the frequency of the slides reaching the road, the quantity of paths along the corridor, and the volume and speed of traffic. These factors all contribute to the risk to vehicles along Little Cottonwood Canyon. The table below shows the range of risk for the AHI.

<i>Hazard Category</i>	<i>Avalanche Hazard Index</i>
Very Low	<1
Low	1 to 10
Moderate	10 to 40
High	40 to 150
Very High	>150

### IV. CURRENT CONDITIONS

According to the AHI methodology, Little Cottonwood Canyon is one of the highest-risk

roads in North America. The graphic below shows the AHI for Little Cottonwood Canyon. There are times of the season when the risk is around 1,000. However, with the control program and the bypass road in use, the AHI hovers near 100: still high, but roughly 10% of the risk without the control program and bypass road in place. Snow safety operators agree that Mid-Canyon (the section of canyon surrounding White Pine and Little Pine slide areas) is the most risky.

Traffic has held fairly constant over the last several years with Average Daily Traffic around 5,000 vehicles while peaking around 8,000 cars during heavy use. Congestion during these peak days is a major contributor to the high hazard rating. UTA, the local transit provider, has a very successful ski bus service and play a major role in the success of the transportation system to date. They operate service from TRAX stations and also serve several park-and-ride lots located along the foothills of the Wasatch.

### V. CONSTRAINTS

Many environmental and jurisdictional constraints limit activity in Little Cottonwood Canyon, and were identified in this study. Little Cottonwood Canyon is an important watershed for the Salt Lake Valley, and has many water-related features such as wetlands and Little Cottonwood Creek that require protection. The canyon contains considerable areas of wildlife habitat, as well as major recreation areas popular among many Utah residents. Two designated wilderness areas, Lone Peak and Twin Peaks, are within the boundaries of Little Cottonwood Canyon. The wilderness designations affect implementation of several risk reduction strategies discussed in this study.

### VI. ALTERNATIVES

There are two very fundamental ways to lower the AHI: change the road and how avalanches affect it, or change traffic characteristics. The graphic below illustrates the strategies evaluated in this study, and how they relate to these two fundamental methods.

There are two ways to change the road: “active” and “passive” measures. Active measures influence how snow is managed by

technology and/or people. Active measures analyzed in this study include Gaz-ex exploders; increasing the current artillery program; and using infrasound to improve slide detection. Passive measures are structural changes to the road. They are permanent and as such can have impacts to the built and natural environment in the canyon. Examples of passive measures analyzed in this study include realigning the road to avoid slide paths; construct snow sheds so that snow goes over the road; and build berms to deflect or absorb as much of the slide as possible. The other fundamental way to influence the AHI is by changing traffic. As traffic increases, speeds decrease, and the AHI rises. Reducing the number of cars on the road allows the



remaining cars to go faster, which decreases the avalanche risk. This can be accomplished through increased transit service; better use of park-and-rides; improved travel information for drivers; and making sure traffic exits the resorts at day's end in an efficient manner.

## VII. RECOMMENDATIONS

Short term recommendations include:

- Additional artillery at Tanner's Flat
- Infrasound detectors
- Improve berms
- Install Gaz-ex at the Hilton slide area
- Implementing an ITS project for park-and-ride management, and for improvements to canyon communication systems
- Explore driveway metering

The intent of this study was to explore, analyze and present long term options. Because the long term solution has so many

possible combinations, relative high costs, and likely high levels of regulatory hurdles, there are no specific long term recommendations. Those should be decided through a more formal process, likely triggered by a NEPA process. Stakeholders in the canyon should pursue funding for a larger NEPA study that will analyze the costs (both in dollars and impacts) and benefits of large infrastructure changes, be that transit, snow sheds, toll road, tunnel, or road realignment.

In the meantime, there are two additional recommendations. First, continue to promote the use of alternatives to the private vehicle. Increased bus service and transit amenities should be encouraged. The added amenities at Snowbird's Creekside Lodge are excellent examples of how the resorts can support transit use.

Second, continue to support the "human element" of canyon operations. SR-210's great safety record is due to the high level of dedication, training, and collaboration of UDOT, S.L. County Sheriff, USFS, and resort snow safety personnel. This public/private partnership has functioned well, albeit with some bumps along the way, for many years. Regardless of future technology, infrastructure, or changes in the way the canyon risks are managed, this human element must be continued.