HISTORY OF AVALANCHE WORK ON THE SEWARD HIGHWAY

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The Seward Highway follows a route through the Chugach and Kenai Mountains between Alaska's largest population center of Anchorage and the ice-free deep-water port of Seward. The highway was completed in 1951, but avalanches have had a long history of affecting this transportation corridor dating back to the early 1900's during the construction of the Alaska Railroad. Early records of avalanches include an accident that occurred two miles north of Girdwood on April 28, 1920 when six railroad workers were killed by a secondary avalanche while removing debris from a previous snow slide (AMSC, 2003).

Photo: USDA Forest Service

The northern section of the highway between Anchorage and Portage is located at sea-level and parallels Turnagain Arm where its alignment traverses the run out zones of approximately 55 known avalanche paths in a 30 mile span. This section also includes parts of Portage Road and Whittier. Vertical reliefs along this stretch of road rise as high as 4300 feet (1300 meters) above the highway. These steep slopes hold a continuous pitch up to high alpine basins that are separated with rocky ribs creating multiple and complex avalanche starting zones. Heavy precipitation creates deep snow in the alpine; while, rain can fall at sea level and up to the ridge tops during any month of the year. Strong winds are also common along Turnagain Arm which can cross load the starting zones with deep snow making this stretch of road a high frequency avalanche area.

On the southern section between Turnagain Arm and Seward, the highway leaves the Chugach Mountains as it climbs into the Kenai Mountains beginning at Turnagain Pass. The roadway reaches a maximum elevation of about 1300 feet (396 meters) near milepost 44 at Summit Lake. The peaks rise as much as 4800 vertical feet (1463 meters) higher than the road surface near milepost 21. The southern section of the highway crosses approximately 40 known avalanche paths in a 57 mile span. The highest frequency avalanche areas in this stretch of road have historically been near mileposts 21, 37 and 44. However, the Hope Road and Sterling Highway also have paths that have hit the road.

Photo: Don Bachman

Vegetative clues and other records indicate that there are avalanche paths in this section that slide less frequently, but could still affect the highway. One example is a path above the town of Moose Pass near milepost 29. In 1910, before the railroad was built, a large avalanche crossed the present location of several homes and alignments for both the highway and railroad. It reportedly terminated on the shore of Upper Trail Lake (AMSC, 2003).

Most of the southern section of highway is located in an area of the Kenai Mountains that is more interior from the coast. The snow climate is a bit colder with relatively less snow than that of Girdwood creating shallower snow covers that are more susceptible to structural weakness and persistent weak layers. However, these mountains are close enough to the coast that is also common to receive heavy loads of maritime snow on top of the thin cold snow, which can create large avalanches.

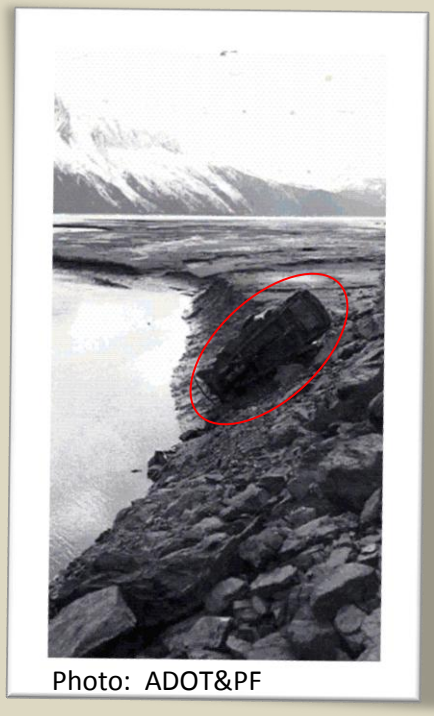
Photo: ADOT&PF

During the first year of operation in May of 1952, a highway related avalanche fatality in occurred in the northern section near milepost 92. One car was destroyed and pushed into Turnagain Arm and one pedestrian was killed by the second of two avalanches (Mears, 1983). This accident highlighted the importance for the Department of Highways to begin an avalanche program.

During the early years of the Seward Highway, attempts were made to reduce the avalanche hazard which included:

- building earth mounds as avalanche breakers north of Girdwood in the mid 1950's
- working with the U.S. Army and Alaska National Guard for artillery support between 1955-1968
- establishing an Alaska's first avalanche research station near Girdwood in 1958
- the installation of a ridge top weather station above Turnagain Arm in 1959

There were only 3 years during this first era of avalanche work (1959-1962) when full-time personnel had the primary duties of avalanche observations and forecasting (Hamre, 1979). There was staffing for avalanche specialists during the other years, but it was intermittent and avalanche decisions were made by foremen and superintendents. Problems with rime ice destroying ridge top weather stations and inaccessible terrain made alpine weather and snowpack observations stations difficult and unreliable; so, most


Photo: USDA Forest Service

of the data came from lower elevation weather stations and road patrols.

Between the years 1955-1968, the U.S. Army proved to be very cooperative for artillery support for avalanche blasting, but there were certain limitations making it difficult for the Department of Highways to have immediate access to artillery during avalanche cycles. In 1969, The Department of Highways entered an agreement with the United States Forest Service to lease a 75mm Recoilless Rifle from the U.S. Army for highway avalanche control work. At the time, the U.S. Forest Service was the only civilian agency in the United States that was allowed to use military weapons leased from the U.S. Army for the purpose of avalanche control. Primarily, the USFS used artillery for ski resort avalanche operations, but the Alaska Department of Highways was able get assistance from the USFS for avalanche work for the Seward Highway. Between 1969 and 1975 U.S. Forest Service employees fired this weapon for the Department of Highways; but similar to the Army, there were problems with immediate access to personnel and artillery. This affected the efficient timing of shooting, and did not produce the most desirable avalanche hazard reduction results. (Hamre, 1979)

Photo: ADOT&PF

In 1976, the Alaska Department of Highways acquired a 105mm Recoilless Rifle that was under a direct lease from the U.S. Army. For the first time, this weapon was fired by the Department of Highways employees, which improved the previous logistical problems experienced with the Army and the Forest Service. During the next several years, gun mounts were built and blind fire data was obtained allowing AK DOT&PF to shoot during storms and at night, which did not occur in the earlier artillery operations. These capabilities greatly improved the effectiveness of avalanche artillery. (Hamre, 1979)

Also during the mid to late 1970's, helicopter delivery of explosives was used for the Seward Highway. This method is cost effective and it is still used occasionally; however, it is limited to periods of good weather, which does not always coincide with when the snowpack is most receptive to explosives. Helicopters were used almost exclusively during a massive avalanche cycle in March 1979 (Hamre, 1979). It is a valuable supplement for explosive avalanche work, but artillery is still the primary

Photo: ADOT&PF

tool for triggering avalanches in a controlled manner for ADOT&PF.

Since the early 1980's, the Seward Highway Avalanche Program has been working under the Maintenance and Operations Division of Alaska Department of Transportation and Public Facilities. It is staffed by two full-time avalanche specialists and supported part-time by foremen and equipment operators who stop regular highway maintenance during avalanche cycles to fire artillery, conduct traffic control, and remove debris from the highway in support of avalanche work.

Prior to 1999, the most active avalanche area that affected the Seward Highway was the section between Girdwood and Bird Point between mileposts 90-96. A new road alignment was completed in 1999 and it has greatly reduced small to medium sized avalanche occurrences from hitting the highway; however, large and fast moving avalanches are still a threat to this section of road. This realignment has proven to be one of the most effective avalanche hazard reduction methods in the history of ADOT&PF's avalanche work. The old highway is now being managed by Alaska State Parks as a recreational bike path in the summer, but is closed in the winter for avalanche hazard and blasting.


Photo: ADOT&PF

1999 also started the transition from the 105mm Recoilless Rifle to the M101A1 105mm Howitzer for avalanche work. Ammunition availability and replacement parts for the Recoilless Rifles started to arise in the early 1990's; so, a suitable replacement was needed. The M101A1 Howitzer was agreed upon as the next weapon of choice for avalanche operations by the U.S. Army and avalanche artillery users. Presently, ADOT&PF uses 2 howitzers and the Alaska Railroad Corporation uses one of their howitzers at 8 different gun mounts to shoot the highest frequency avalanche paths along the Seward Highway between mileposts 21-99.

The Alaska Railroad Corporation began a formal avalanche hazard reduction program following a train derailment in January 1980 after a train collided with debris from an avalanche that had previously buried the railroad tracks four miles north of Girdwood (Hamre, 1979). Alaska Department of Transportation and Public Facilities and the Alaska Railroad Corporation each have their own individual avalanche programs, but both agencies have worked in a successful partnership for nearly 30 years. There are many avalanche paths along the Seward Highway corridor where these two agencies share similar avalanche challenges. Tragically, the Alaska Railroad suffered a fatality while


Photo: Doug Fessler

they and ADOT&PF had equipment operators working together eight miles north of Girdwood removing avalanche debris that had blocked both the highway and the railroad tracks in February 2000. An additional avalanche occurred that partially buried and injured two ADOT&PF operators, and killed Kerry Brookman from the railroad after his dozer was blasted out into Turnagain Arm. Modifications to safety procedures were made following this accident for railroad and highway maintenance personnel. Despite the adversity of potentially hazardous avalanche work, ADOT&PF and the Alaska Railroad Corporation have maintained a strong team approach toward reducing destructive avalanches for employees, public, and infrastructure.

The history of the Seward Highway Avalanche Program is based on a foundation of an interagency effort with federal, state and private partnerships. This holds strong today and will continue for the future. In addition to the Alaska Railroad, ADOT&PF regularly works with professional avalanche forecasters from organizations like: Alyeska Resort Ski Patrol, Chugach National Forest Avalanche Information Center, Chugach Electric Association and Chugach Powder Guides.

Photo: ADOT&PF

The best way to eliminate the avalanche hazard is move a highway alignment away from avalanche paths. Given the terrain along the Seward Highway, it probably is not possible to find a route completely free of avalanche hazard without significant cost and exposure to other risks. For example, if the highway was moved further out into Turnagain Arm, it would trade avalanche hazard for seismic and tidal risks (Mears, 2000). Significant improvements in avalanche hazard reduction have been made since the 1950's; however, traffic volumes continue to increase which in turn continues to increase the probability of avalanches affecting motorists. The Seward Highway Avalanche Program will continue to evolve and adjust to increasing traffic volumes, while attempting to reduce the avalanche frequency in the avalanche terrain that has been above the highway since its original construction.

Photo: ADOT&PF

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REFERENCES

AMSC, 2003. Avalanche atlas. Report prepared by Alaska Mountain Safety Center, Inc for Chugach Electric Association; Anchorage, Alaska.

Hamre, D., 1979. Seward highway avalanche safety plan. Report prepared by Alcan Avalanche Services for the Alaska Department of Transportation and Public Facilities; Central Region, Maintenance & Operations and Graphics Section.

Mears, A. 2000. Avalanche Hazard Analysis, Seward Highway MP97-99 (Bird Flats). Prepared for the Alaska Department of Transportation and Public Facilities.

Mears, A., 1983. Snow avalanche hazard and control analysis-seward highway, bird creek to girdwood turnoff. Prepared for the Alaska Department of Transportation and Public Facilities.

USDA Forest Service, 1961. Agriculture Handbook No. 194. Snow Avalanches, a Handbook of Forecasting and Control Measures.