THE SVALBARD FATAL ACCIDENT 19TH DECEMBER 2015 – ASSISTING LOCAL AUTHORITIES IN THE ACUTE PHASE

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ABSTRACT: The Svalbard fatal avalanche caused massive destruction when it hit part of the village Longyearbyen Saturday morning at the start of the Christmas holiday. The avalanche released after a furious storm and killed to persons, destroyed 11 houses and numerous cars and snowmobiles. The avalanche revealed that numerous houses in the village where endangered in the current situation. Two avalanche experts from NGI arrived at the site on the remote island in the evening and assisted local authorities.

KEYWORDS: Svalbard, fatal accident

1. INTRODUCTION

Saturday 19th December at 10:25 a.m. an avalanche hit part of the village Longyearbyen at Svalbard (Fig. 1). The avalanche killed two persons, destroyed 11 houses and numerous cars and snowmobiles (Fig. 2).

Two avalanche experts from NGI arrived at the site on the remote island in the evening and assisted local authorities.

This paper gives a short description of the situation and some of the challenges the first days after the accident.

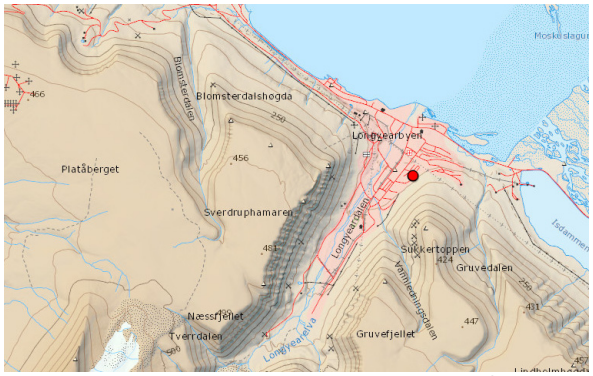

Figure 1: The red dot marks the location of the catastrophic avalanche in Longyearbyen Svalbard.

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Figure 2: The avalanche shortly after the accident. Photo: Svalbardposten.no.

2. WEATHER CAUSING THE AVALANCHE

The avalanche released about 2 hours after the weather had calmed down after a furious storm. Svalbard is in general a dry area and it was very little snow on the ground before the storm.

The storm hit the area with intense snow and extreme wind about 15-20 hours before the fatal release. The official weather station measured only 18 mm precipitation during the storm, but some locals estimate that the storm gave about 1 m of snow. The temperature was about -10 degrees Celsius and the combination of dry snow and extreme wind from East gave intense wind-loading on lee slopes.

3. AVALANCHE FACTS

The about 200 m wide avalanche started at the top of the steep terrain about 90 vertical meters above the houses. It is estimated that the initial release volume was some 20.000 m^3 supposing the

starting zone being 200 x 50 m with average 2 m release thickness. The steepness in the release area was typical 30-40 degrees. NGI measured the runout angle to 15.6 degrees when arriving at the site.

The avalanche was later measured to have started about 125 m a.s.l. and stopped about 35 m a.s.l. (Fig. 3).

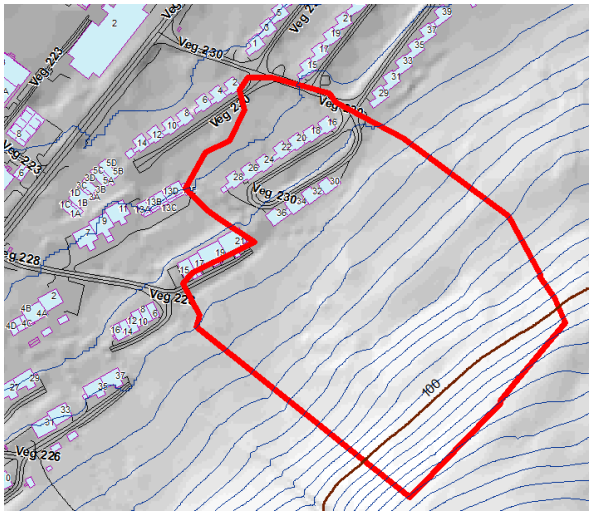

Figure 3: Red line indicating avalanche runout destroying the upper two rows of houses in road 230.

4. EXPANSION OF EVACUATION ZONE

The relatively small terrain above the houses produced a massive slide that caused extensive damage. The power of the avalanche gave an absurd impression of a "chain collision" of houses that were moved up to 80 m (Fig. 4 and 5). The runout was longer than expected on NGIs 1992 hazard map.

The extreme runout length and the enormous damages from the relative small terrain gave concerns about safety for other houses in the acute situation. The fatal avalanche started at the shoulder of the Sukkertoppen mountain at 125 m a.s.l. It was especially a concern that avalanches might start in the release areas near the top of the mountain at about 350 m a.s.l. (Fig 6 and 7). This could cause a very large avalanche with the potential of destroying numerous houses and reach further than indicated on NGIs hazard map from 1992.

After midnight, some 14 hours after the accident, the weather changed again and it started snowing and blowing with new wind transport into the release areas. NGI and the local police (Sysselmannen) discussed the situation and decided to expand the evacuation zone. Another 59 persons were evacuated when the police went from house to house that night.

The size and power of the fatal accident was unexpectedly large, and conservative caution in the acute phase was necessary. Nature is complicated and humility is essential especially at an early stage with limited knowledge.

Figure 4: Example of massive damage.
Photo: Kjetil Brattlien, NGI.

Figure 5: House number (yellow) and preliminary measurements of distance moved (red).
Photo: Svalbardposten.

Figure 6: New wind-loading of release area about 350 m. a.s.l. at Sukkertoppen.
Photo: Kjetil Brattlien, NGI.

Figure 7: Houses in Lia, below Sukkertoppen, with accident site to the left. Photo: Kjetil Brattlien, NGI.

Figure 8: Erik Hestnes, NGI, investigating crown flank. Photo: Kjetil Brattlien, NGI.

5. FIELD OBSERVATIONS AND EVALUATION OF AVALANCHE SITUATION

The weather improved in the morning the day after the accident. NGI hiked up the avalanche debris about 24 hours after the accident. The avalanche was investigated and profiles were made in the release area (Fig. 8).

The avalanche released on a persistent weak layer of faceted crystals with 4 finger hardness (4F) near the ground. The crown was partly filled in with fresh snow, but the crown face indicated that the slab was about 2 m of rounded grains (RG) with 4 finger hardness (4F) in the top gradually increasing to knife hardness (K) above the weak layer (Fig. 9).

In total 171 people were evacuated from their houses on the 2,5 km stretch on the East (lee) side of the Longyear valley from the accident site to Nybyen. NGI investigated the area by car, foot and helicopter 20 and 21 December.

The fieldwork showed that many avalanches had released during the storm and the risk for new avalanches at these places where minimal. In Nybyen a big roof had blown off one off the houses, showing the extreme wind during the storm (Fig. 10)

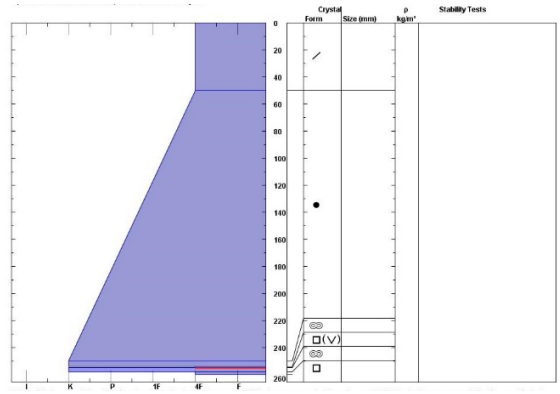

Figure 9: Snow profile at crown face.

Figure 10: Roof blown of house in Nybyen. Photo: Kjetil Brattlien, NGI.

6. END OF EVACUATION AND FINAL REMARKS

The weather situation improved gradually and NGI recommended repealing most of the evacuation 21st December (2 days after the accident). However, evacuation was still enforced for many houses under the Sukkertoppen Mountain closest to the accident site due to uncertain stability of the

snow in the 300 vertical meters with steep terrain above the houses (Fig. 11). The weather forecast predicted a new storm coming in and NGI recommended that the avalanche situation should be watched carefully.

NGI established, on behalf of NVE (The Norwegian Water Resources and Energy Directorate), avalanche forecasting for the endangered areas issuing the first bulletin 23rd December.

NGI recommended to completely repeal evacuation of all areas 4th January 2016 given that avalanche forecasting continued until end of winter.

NGI have more than 25 years experience with detailed fieldwork, hazard mapping and investigation of historical events in Longyearbyen and Svalbard.

In addition to unique local knowledge, NGIs Avalanche Group has more than 40 years of expertise with avalanche situations and avalanche forecasting that were crucial for having confidence in handling the situation and giving the right advices.

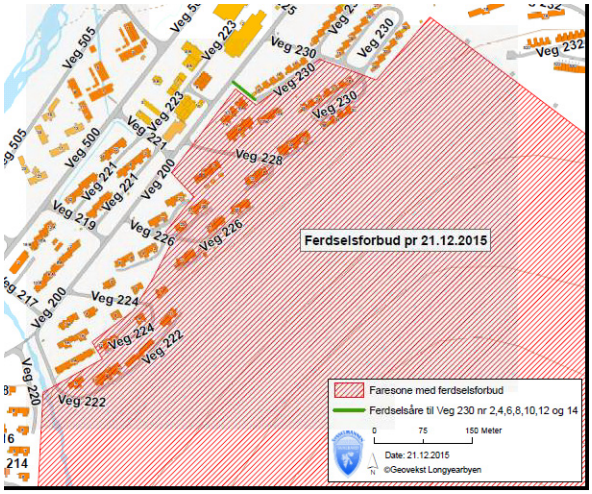

Figure 11: Remaining evacuated areas after 21st December 2015.

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