

Mt Ruapehu Crater Lake Lahar threat response

– SITUATION AT THE CRATER LAKE

The Crater Lake on Mt Ruapehu is refilling after it was emptied by eruptions in 1995 and 1996. This lake lies over the main active vent of the volcano.

Before the eruptions, the level of the Crater Lake was controlled by an outlet that drained water across a hard rim of lava into the head of the Whangaehu Valley. During the 1995-96 eruptions, this outlet was blocked by seven metres of tephra (fine ash particles and other larger materials ejected by the volcano).

The tephra deposits over the outlet have created an unstable dam that is predicted to fail some time after the lake rises above the level of the former outlet. This will trigger a lahar (mudflow) down the Whangaehu Valley. The size and severity of the lahar will depend on the level the lake reaches before the dam collapses. The worst case scenario will be if the lake level reaches the top of the dam before it collapses and the full amount of overfill (i.e. the amount of water between the old outlet level and the top of the dam) is released into the Whangaehu.

The collapse of a more complex tephra and ice barrier caused the Tangiwai Disaster in 1953 - the difference this time is that advance knowledge has made it possible to plan for the predicted lahar to minimise risks, particularly to public safety.

In August 2006, ten years after the last eruption in early 1998, the Crater Lake was one metre higher than the hard rock rim. Predicting when the lake will reach a critical level at which the dam will fail is difficult because the filling rate is dependent on variable factors such as precipitation, evaporation and the rate of snow melt from the glacier surrounding the lake. The lake rises each spring-summer period but the amount of rise is difficult to predict. The lake falls during dry periods, especially when the water is warmed by volcanic processes.

Expected manner of collapse



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Although the tephra dam may initially hold the Crater Lake, it is unlikely to do so forever. The 1953 dam lasted about three years after the water level reached the hard rock rim beneath the tephra dam, created by an eruption in 1945.

Now the lake has risen above the former output level, water is able to seep into and through the tephra deposits into the Whangaehu Valley. This may slow the rise in lake level, but is unlikely to prevent the lake from filling. It is likely therefore that over a period of several months or years, as the lake rises, probably in fits and starts, towards the top of the dam, internal seepage will result in erosion on the downstream surface of the dam and progressively weaken it. The rising lake will also eat into the width of the dam.

These erosive processes will progressively weaken and reduce its mass to a critical point where it is unable to retain the lake water above the former output. This process will most likely result in a rapid (between 15 - 45 minutes) breach of the tephra barrier and discharge of lake water into the head of the Whangaehu valley.

At this stage the critical lake level is expected to be five to six metres above the former outlet level.

The likelihood of the tephra dam failing well before the lake rises to the dam's crest is considered to be relatively low, but cannot be ruled out. Should this occur when the lake level is only three or four metres above the former outlet level, the volume of water released from resulting flow at the lake outlet will be considerably smaller.

* Technical information in this factsheet is drawn from a report by an independent scientific panel advising the Minister of Conservation.

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