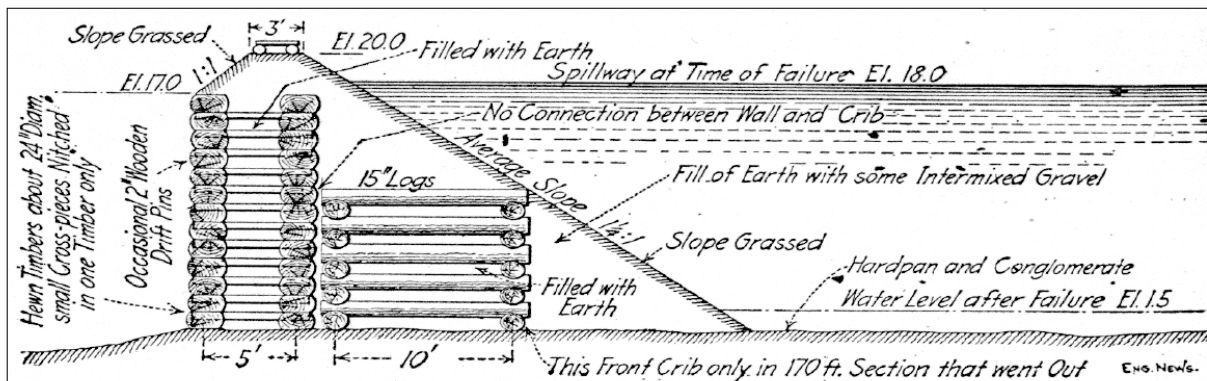


## Failure of Langley Lake Dam, Union Bay (1912)

The failure of a dam above Union Bay, British Columbia in 1912 illustrated how a combination of poor choices lead to a disaster.

In approximately 1908, a 6.6 metre high dam was built 6.4 kilometres upstream from Union Bay – a town north of Nanaimo on Vancouver Island. The dam raised the level of a lake located about 183 m above sea level creating a reservoir with a capacity of 7.4 million cubic metres. A pipeline supplied water from this lake for the Canada Collieries coal washing and screening plant.

As shown in Figure 1, the dam was comprised of a timber wall downstream of a timber crib both filled with earth and with earth on the upstream face. There was no connection between the timber crib and the foundation, or between the crib and the wall. The Engineering News of 1912 reported, “The earth fill was of wretched surface scrapings and apparently no attempt had been made to deposit it properly or to compact it” (Mitchell, 1912)



**Figure 1: Union Bay Dam Timber Crib Cross-Section (Mitchell, 1912)**

In plan, the dam had had four straight sections that formed an arch shape, as shown in Figure 2. The arch bulged out of the reservoir instead of into it, and the weight of the water tended to pull the sections apart. There was no connection between the sections as the timbers merely overlapped. Within each section, 50 mm diameter drift pins joining some of the timbers but only about half of the holes drilled for these pins had pins installed.

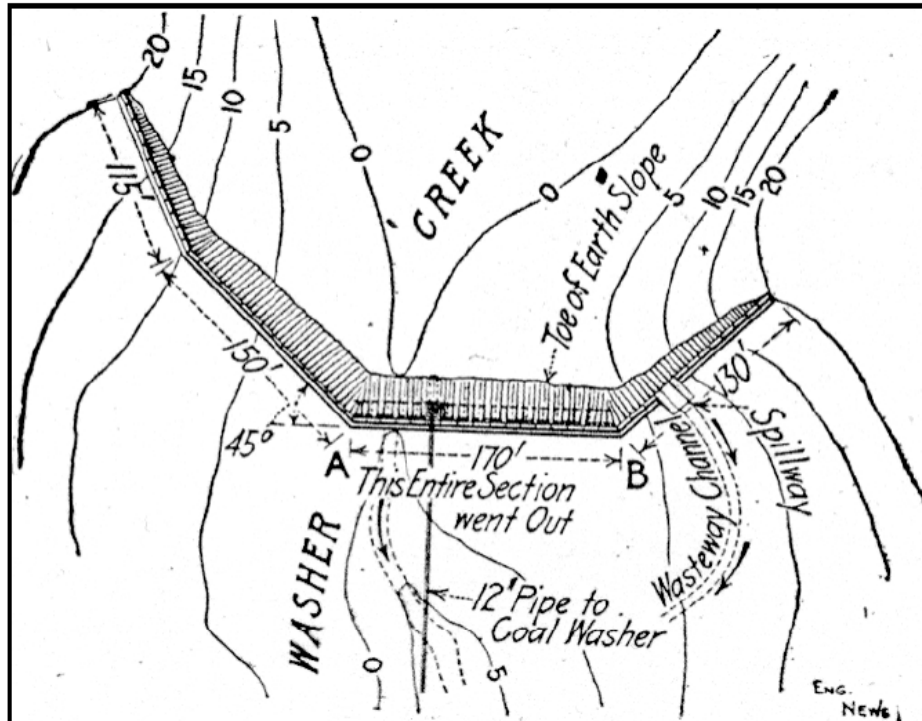


Figure 2: Union Bay Dam Plan View (Mitchell, 1912).

The spillway, seen in Figure 3, was an opening in the crib of the right wing wall with short flashboards and a centre post. Prior to the failure, heavy rain had raised the reservoir too close to the crest, the flashboards were not removed from the spillway and debris blocked the narrow opening.

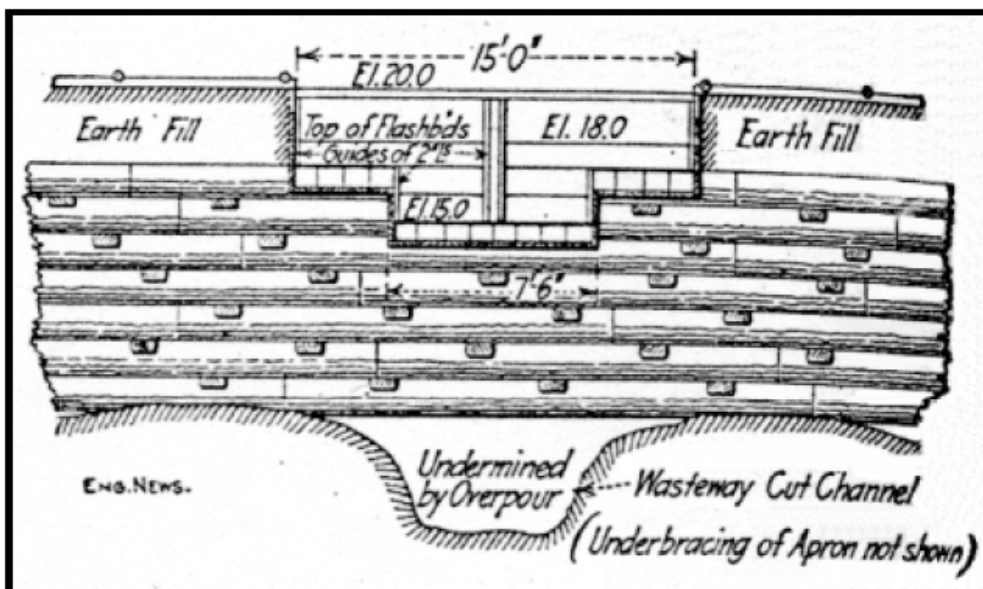


Figure 3: Union Bay Dam Spillway (Mitchell, 1912).

On February 10, 1912 about 5 pm, a 52 m section of the crib pivoted to open like a door. Water rushed down the narrow valley knocking down trees and a timber trestle for a logging railway. Without any warning, a 3.3 m high wall of water and debris slammed into the town of Union Bay. Scores of workers' shacks were washed out into the bay and many caught fire. Rescuers used the light from these fires to locate survivors. Several other buildings were destroyed as well. One person was drowned and an estimated \$50,000 (1912) worth of property was lost. This was the only fatality on record for Canadian dam failures. Had the dam failed at night, hundreds of lives could have been lost.

The unexpected component of this event was not that the dam failed but that the dam had survived for as long as it had, despite its obviously substandard design, construction, maintenance and operation even according to the standards of almost 100 years ago. The contemporary report, Mitchell 1912, called it a ludicrous example of a dam, and blamed "inexcusable ignorance and carelessness" for the failure.

Excerpted from:

### **The Unexpected in Dam Safety**

<sup>1</sup>  
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