Part 4: Dam break analysis

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"One of the jobs that I did at the Ministry of Works Central Labs was a dam break analysis. At that point they were considering putting up a hydro dam on the Whanganui, and had spent a significant amount of money drilling tunnels in hills at a place called Atene, and it's not all that far up from Whanganui - probably no more than 30-40 kms. Then they abandoned the idea for various reasons. One of which would have been the concern about the issue of dam failure, and if the dam failed what would happen to Whanganui? "

"We built a physical model of the Whanganui catchment and did a dam break analysis. We were modelling the flow resistance. The Whanganui catchment is gigantic, and although we had a huge laboratory there, it was an old warehouse, it was still not big enough to fit the part of the Whanganui catchment that we needed to fit in. It's such a long, long catchment, and such a gentle gradient by New Zealand standards that there was just a vast volume of water there."

"At the very top end we put in a tank. I had a look at all the contours back up there, made an estimate of the land elevation and the water which would have been stored, and attempted to reproduce that in this tank. We were attempting to study what would have been a hyper, mega flood if the dam broke. And there was not a lot of actual flood data collected."

"We had a look at the best flood data we had, looked at the flood way, and we roughened our model at the lower parts of the channel so that we could reproduce that particular flood event. We made a gross assumption that the sort of roughness that we were putting in the lower part of the valley walls, we could extend it up the side of the valley walls to the height of the dam. Those are the days before you had sophistic computer modelling of flood routing. So we built our model with all these assumptions and caveats built into it. And the actual dam

itself was made out of a mixture of sand and heavy grease so we could hand mould it to the correct height. Then we filled the reservoir in behind it and then we broke the dam."

"First of all we decided to break it catastrophically and rip the thing out, And then what happened was that Whanganui just vanished under metres of water. So then we went ahead and broke it gently. We just sort of scoop it out, scoop it out, scoop it out. Didn't matter, there was so much water back in the reservoir that Whanganui just got drowned. And so that I think would have been a major factor as to why they never ever went ahead with that dam on the Whanganui."

"In the 1940s, I really think the dam designs were probably very crude in terms of thinking about the hydrological effects in dam break and so on. But the Whanganui job had an unusual minor spin off. About 1968 there was a big earthquake over on the West Coast, the Inangahua Earthquake, which resulted in a large landslide that blocked the Buller River. And I remember it quite well because we felt that earthquake in Wellington, and it was early morning. And that night I was at home and the phone rang and it was Bill Duncan, the chief power engineer. He knew that I'd done this dam break analysis in Whanganui, and said," Look Hugh, we're a bit worried about the Buller River, it's blocked, and Westport's down at the mouth. We want to know what's the risk to Westport because we might have to evacuate the town." So I jumped into my car and I went down to the lab, Got the topographic maps out, and sat down and did a bit of hard thinking and some very, very rough calculations. Then rang Bill Duncan and said, "I think it will be all right Bill, even if it goes in a hurry I don't think there's going to be enough water stored behind that landslide to worry Westport. At worst it would be a serious flood"."

"It turned out, and not surprisingly, that that landslide did not fail catastrophically. It came down as a mixture of huge rocks and little rocks and sand and mud, just all mixed up. The fine stuff washed away first, then the sand, and then the small rocks, and still today I think there are some big rocks there in the bottom of the Buller River. But the dam failure was slow and so the release of water was slow, and so I don't think Westport even noticed what had happened."