

Stephen Pattinson – Submitter 65, UHCC IPI Hearing, 08 May 2023 (Contd. from 26 April 2023)

The NPS-UD 2020 requires the enabling of intensification that results in urban forms of appropriate densities in the right locations. The first objective of the NPS-UD 2020 is:

Objective 1: New Zealand has well-functioning urban environments that enable all people and communities to provide for their social, economic, and cultural wellbeing, and for their health and safety, now and into the future. [emphasis mine]

Urban development must be done in a strategic way that looks ahead to the effects of development in the medium and long term (Objective 6b).

Council's planning decisions must be based on robust and up-to-date information:

Objective 7: Local authorities have robust and frequently updated information about their urban environments and use it to inform planning decisions. [emphasis mine]

The large volumes of stormwater absorbed by the highly permeable forested and bush-clad hills protect Pinehaven in big storm events, replenish the aquifer, and maintain stream ecological health.

The hydrology for the Pinehaven Stream flood modelling was done in 2008 and updated in 2009. It is now 14 years since it was last updated. In the meantime, we've had one significant storm event on 8 December 2019. Council has not updated the flood model even though peer reviewed expert reports for this storm event have been made freely available by Save Our Hills (SOH) to the Council.

Focussing today on the slide where we left off on 26 April, this slide (photos of higher water levels at No. 5 and No. 12 Birch Grove, and a graph of Flood Frequency Curves) shows how poor the data was (in fact, absurd data) that informed the Council's flood model and flood hazard maps for Pinehaven.

The slide shows 2 photos published by SKM in their Pinehaven Stream Flood Hazard Investigation Report (2010) for GWRC. These photos show a red dashed line by SKM at the peak water mark levels on buildings at No. 5 and No. 12 Birch Grove that were flooded on 23 July 2009.

Then there was a flood on 8 December 2019, a 30-year rainfall event and a 25-year flood event. During this storm 52mm of rain fell in 2 hours from 3am to 5:00am. I spent all that day, beginning at 5:00am with my wife, photographing all flooding in Pinehaven and Silverstream as it happened.

Mr Kinley (Jacobs) told the Pinehaven Streamworks Panel that we underestimated the flood extents. That's incorrect. We were there that day. Mr Kinley wasn't. We observed first-hand and accurately mapped the full flood extents for this event from our observations and detailed eyewitness accounts.

"Mr Kinley advised that he has reviewed the model outputs and compared them to the available data for this event [8 December 2019]. He found that the modelled flood extents are a good match for the observed flood extents." That is a false statement. Jacobs never modelled or observed the December 2019 event. No SKM/Jacobs flood maps match the extents of any real flood events in Pinehaven.

We also witnessed and videoed the peak flood flow of the 8 December 2019 flood at around 6:30am at the Pinehaven Road culvert which comfortably coped with this 25-year flood flow.

I was helped later in the day by a local retired civil engineer Alex Ross. We pegged the peak flow in the open stream channel in Pinehaven Reserve, which was easy to do because of the debris trails along the high-water line left on the grass. We later surveyed the cross-sectional area and gradient of the stream channel in the Reserve as requested by flood expert RJ Hall and sent him this information, along with a channel survey and photos of the peak water level at the gauge site in Whitemans Road.

All this detailed information, including photographs, eye-witness accounts, and flood maps, is available in SOH's Report on the 8 December 2019 Storm that I have provided to the Panel.

We added onto the two SKM photos the December 2019 high water levels (blue lines) at No. 5 and No.12 Birch Grove (see photos on the slide), and the depths in mm for both the 2009 and 2019 floods based on the residents' eye-witness accounts to us of both these floods on their properties.

Michael Law, of Beca, Council's flood expert at the Pinehaven Streamworks hearing, told the hearing panel (which included Commissioner Falkner), that he did not think the 2009 flood was a very big event, about a 3-year event. Yet these two photos clearly show the 2009 flood was bigger than the 1-in-25-year December 2019 flood. RJ Hall estimates the 2009 flood was about a 40-year event.

Expert hydrologist Graeme Horrell refers to RJ Hall's Flood Frequency Curves (FFC) on the graph on this slide as "a thorough reality check" for floods in the Pinehaven Stream Catchment. RJ Hall did an exhaustive study using 6 different methods, all of which produced about the same FFC (see graph).

At the Pinehaven Streamworks hearing, Michael Law discounted RJ Hall's method of scaling from the Mangaroa River, which has 30-years of rainfall and gauged river flow record and is just over the hill from Pinehaven. But Mr Hall discussed this scaling method with Dr Alistair McKerchar, one of New Zealand's foremost and highly respected hydrologists at NIWA in Christchurch and our understanding is that Dr McKerchar told Mr Hall that this method and the way Mr Hall was applying it for a FFC for Pinehaven Stream is valid. The FFC from this method closely aligns with the FFCs from the 5 other methods Mr Hall used, giving a high level of confidence in Mr Hall's FFCs on this graph.

Looking now at the SKM (2010) FFC for GWRC on this graph (the grey line). You'll notice it's a lot higher on the graph than Mr Hall's FFCs. What does this mean?

To illustrate what these FFCs mean we only have time to look at one flood on this graph. We'll look at the 2009 flood, the only flood that GWRC based the Pinehaven flood maps on. The horizontal axis on this graph shows the return period, the vertical axis is the peak flow. Mr Hall estimates that the 2009 flood had a peak flow of 12.5m³/s, similar to Mr Horrell's estimate of 12m³/s. So, 12.5m³/s on Mr Hall's FFC gives a return period of 1-in-38, about a 40-year event, for the 2009 flood.

But on SKM's FFC, 12.5m³/s has a return period of 1-in-1.2 years. In other words, a flood that according to SKM occurs about annually. But a 40-year flood does not happen annually!

Furthermore, G. Horrell and RJ Hall based their estimates of the peak flow for the 2009 flood on the peak flow depth that was actually recorded by the stream gauge in the channel at Whitemans Road. The recorded peak was 1.6m deep. However, SKM's 2010 report states that they didn't use this stream depth but chose instead to use a lower (incorrect) peak of 1.2m and a peak flow (calculated for them by GWRC) of 8.8m³/s. The panel at the Pinehaven Streamworks hearing was told by Peter Kinley (Jacobs) that he relied on this peak flow of 8.8m³/s for his design of the streamworks.

But where does 8.8m³/s sit on SKM's own FFC? It's off the left-hand side of the chart! The horizontal axis starts at 0.1, which is a return period of monthly. A peak flow of 8.8m³/s on SKM's own FFC off to the left of the chart means that according to SKM (Jacobs) the 2009 flood (which the tide marks in the photos show was bigger than the 25-year flood in 2019) occurs about weekly or fortnightly! Mr Hall states this is "an absurdity". Yet Mr Kinley stated that he relied on this information for his design of the Pinehaven streamworks. The streamworks hearing panel failed to address this absurdity and (wrongfully) accepted Mr Kinley's work as reliable. It isn't. It is based on absurd information. And so are Council's Pinehaven Flood Hazard Maps which are also based on this absurd data.

One of the consequences of relying on absurdly inaccurate information has been the unnecessary replacement of the Pinehaven Road culvert for a 25-year flood, a culvert that was in good condition, good for another 30-years according to an inspection report by A. K. Ross, retired civil engineer. We witnessed and video recorded the existing culvert coping perfectly well with the 25-year peak flood flow on 8 December 2019. This unnecessary culvert replacement cost ratepayers about \$5M!

This graph is showing that SKM's FFC and flood maps grossly overestimate the size of current floods in Pinehaven. The flawed flood model is dangerous as the base model for assessing hydraulic neutrality for proposed future development in Council's Southern Growth Area (primarily proposed Guildford development). Hydraulic neutrality will not be achieved using this base model; it will allow thousands of tons of unmanaged stormwater from future Guildford development on the hills to devastate Pinehaven, including the potential loss of life.

In summary, there are gross inaccuracies in the Pinehaven Stream flood modelling and flood hazard maps which Council now wants to make "qualifying matter areas" in this IPI, preventing the MDRS from being applied in many parts of Pinehaven and Silverstream that would be suitable for intensive development. Strategically it is better in my view to intensify on the impervious valley floor rather than on the highly permeable forested hills. Council's flawed flood maps are preventing this sensible and strategic approach to future development in Pinehaven and enabling instead proposed future development on the hills that will endanger Pinehaven residents if the base model isn't rectified.

The s42A Report author has recommended to the Panel that you reject my submission point S65.2 due to lack of technical information about the inaccuracy of the flood maps. Given the peer reviewed expert evidence I have now provided to the Panel showing the flood maps are seriously flawed, I ask that the Panel recommend my submission be accepted and my request granted for the Pinehaven Stream flood model and flood hazard maps to be reassessed using reliable input data that accurately represents the catchment before they are used to define "qualifying matter areas" in the IPI.

Stephen Pattinson, 8 May 2023