

Historical flooding research and assessment

Suky Thompson, Peninsula Projects: "Historical Flooding Research and Mapping Project", February 2008

Tonkin and Taylor: "Preliminary Assessment of Historical Flooding", May 2008

Summary

The purpose of the reports by Suky Thomson and Tonkin and Taylor was to provide the Christchurch City Council with a preliminary assessment of the flood hazards in the Akaroa Harbour Basin settlements, based on an assessment of historical flood events.

The research and assessment of historical flooding was carried out in two parts:

- **Suky Thompson of Peninsula Projects** identified and mapped areas where floods have occurred in the past, primarily based on historical photographs, memories of long-term residents and articles on flooding and storm events in the Akaroa Mail.
- **Tonkin and Taylor** reviewed the information on historical flood events and rainfall data and converted Suky's findings into an electronic GIS (Geographic Information Systems) format, commented on possible frequency and return periods, and provided a preliminary scope for future flooding studies.

The key findings arising from the two reports were as follows:

Akaroa Harbour Basin catchment and rainfall characteristics:

- Because catchments are relatively short and steep, peak flood discharges are generally expected as 'flash floods' arising from short duration, high intensity rain storm events. These may be 'embedded' in longer duration storms.
- Critical storm durations need to be in the 20 minutes to 1 hour range to generate highest peak flows.
- There is a lack of short duration rainfall data, which would be most useful for flood modelling.
- Significant flooding appears to have been noted historically when daily rainfall exceeded 120 mm at Akaroa and 50 mm at Onawe. The most significant events seem to have been noted when daily rainfall has occurred with a return period of about 20 to 100 years.
- There is a variation in reported flooding in different catchments around the harbour, which is due to short duration 'cloud bursts' affecting 1 or 2 neighbouring catchments but not affecting other catchments around the rest of the harbour.

Historical characteristics of flooding:

- Peak flood flows seem to occur for relatively short periods (eg flash flooding). These are often not witnessed, but identified by debris levels and flood marks.
- Flood flows are often bank full in the streams, with breakout occurring onto flood plains at bends and restrictions in the channel. This does not always occur at the same place, due to differences in local restrictions between flood events:
 - Vegetation and small landslides has been cited as a cause of breakout of flood water from stream channels. Local channel restricting events such as these can cause flooding from smaller rainfall events.
 - Bridges and culverts are restrictions that have contributed to historic out-of-channel flooding.
- Secondary flow paths are often down roads.

Settlement-specific flooding:

- Ponding on low lying areas has been observed near sea-level in Akaroa, Takamatua, Robinsons Bay and French Farm.
- Flood waters have been noted to spread from relatively confined upstream channels to alluvial fans at Duvauchelle Golf Course (Pawsons) and Barrys Bay between the Cheese factory and Half Moon Cottage.
- The broad valley floor at Wainui has potential for flooding, but no historical flooding has been recognised. This lack of history may be due to a lack of witnesses rather than an absence of flood waters.
- Storm surge events have been observed at Wainui, Tikao Bay and Duvauchelle, affecting the foreshore main road and potentially the first row of properties upslope of the road.

Recommended further study (Tonkin and Taylor):

- Determination of design rainfall data for the catchments in order to model rainfall runoff.

- Establish catchment models for the 12 significant catchments and assess peak flood flows for design purposes.
- Identify and 'catalogue' stream channel restrictions and common breakout points for each stream.
- Survey stream channel cross-sections, along with secondary out-of-channel flow paths and low lying areas around historical flood ponds as appropriate.
- Develop stream flow models for the lower catchments to assess design flood levels, and confirm likely extent of future flooding especially at likely restrictions and known breakout points in the channels.
- Develop concept designs for improvement of channel capacity and containment of flood flows as feasible. For example, mitigation work on bridges and culverts in Akaroa Township.
- Prepare flood hazard maps which identify areas likely to be affected by flooding during the selected design events, from which Council might require specific analysis to confirm the suitability of development projects within these areas.