



## STAFF REPORT

**TO:** Environment & Planning Committee

**FROM:** Martin Doyle, Hydrologist

**REFERENCE:** H900

**SUBJECT:** **TASMAN DISTRICT COUNCIL  
RAINFALL – RUNOFF MODEL 08/01/07**

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### 1. INTRODUCTION

Council is required to be prepared for civil emergency, including *reducing* the risk of hazards, being *prepared* for hazards, and *responding* to hazards. The most prevalent hazard this district faces, and the one that has caused the most damage in recent times, is flooding. At present Council provides flood warnings for around 10 major rivers, and other smaller river systems. At risk is the life and property of landowners along rivers, but more significantly the townships of Takaka, Motueka, and Brightwater. Additionally, parts of the district's roads and state highways can be inundated by flooding.

The purpose of this report is to further explain the funding bid via the annual plan to improve the flood forecasting capability of Council, allowing us to provide greater warning times, better prediction accuracy, and improved distribution of warnings. This is the culmination of a project which started some 15 years ago with the installation of backcountry telemetered rain gauges.

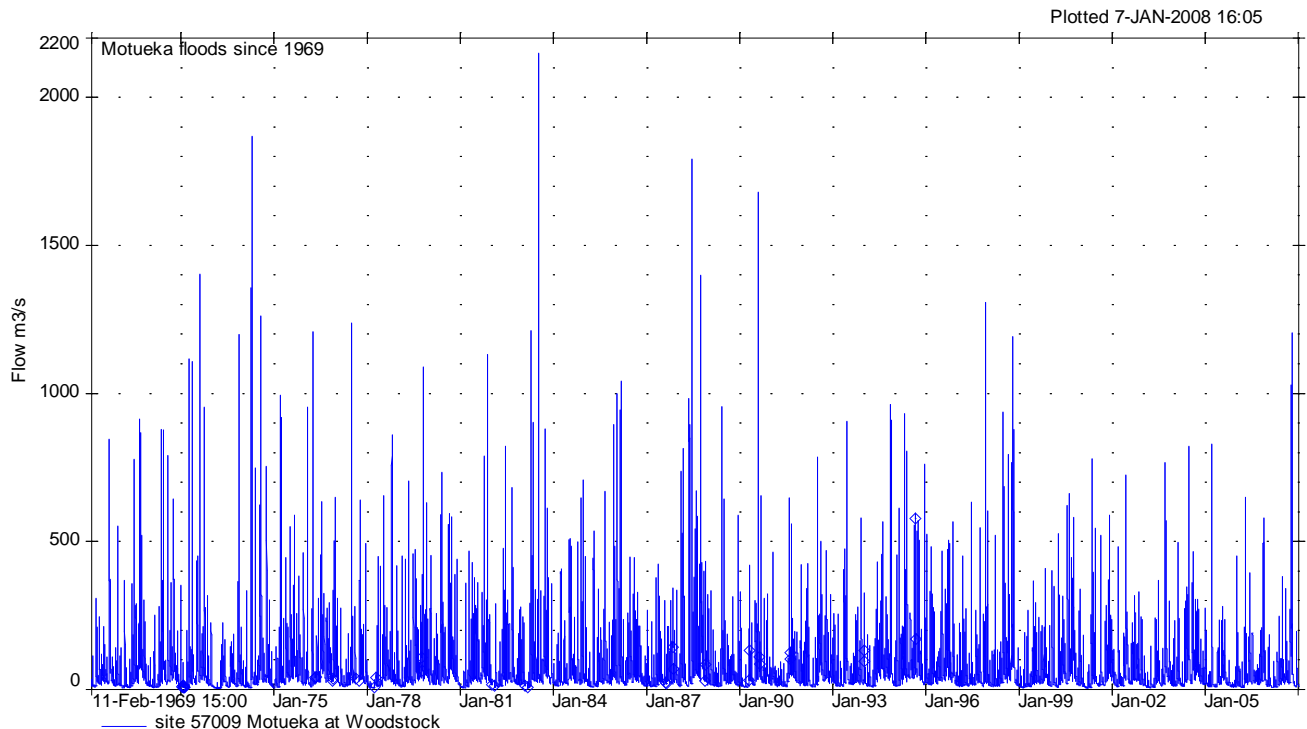
### 2. THE PRESENT SYSTEM

At present our flood forecasting consists of looking at upstream river flows, and making 'seat of the pants' predictions based on rainfall information. This system requires staff with many years local experience to work effectively, is outdated, and gives little warning time for a major flood. It is entirely reliant on individual staff making the right call in a pressured situation.

Once the majority of rural people were long term residents and knew the dangers of flooding, but now many people living alongside rivers have no experience of floods. In today's world there is a greater expectation of information being readily available by electronic means such as the web, and there are difficulties passing on information to phone-trees that quickly become outdated. The engineering adequacy of two of TDC's stopbank systems have been reviewed and show that they have an inadequate level of protection for current and future expectations. This puts people and their assets in the downstream communities at great risk due to their perception that our present systems are satisfactory.

It may be easy to regard our present systems as suitable, however staff consider that there is a level of misunderstanding within the community regarding flooding issues. This was evident after the Motueka flood last October which was regarded by some as a large flood, when in fact it could really only be considered moderate. A graph of floods in the Motueka River is shown below for comparison. It is noticeable that the last flood (far right on graph) had only been exceeded once in the past 17 years, and that by another moderate flood in 1999.

The larger floods seen in the 70's and 80's will return, and recent experiences in other communities such as Northland, the Bay of Plenty, and the Manawatu should be kept in mind.



**Figure 1 - Floods experienced in the Motueka River since 1969**

### 3. ADVANCES IN FLOOD WARNING

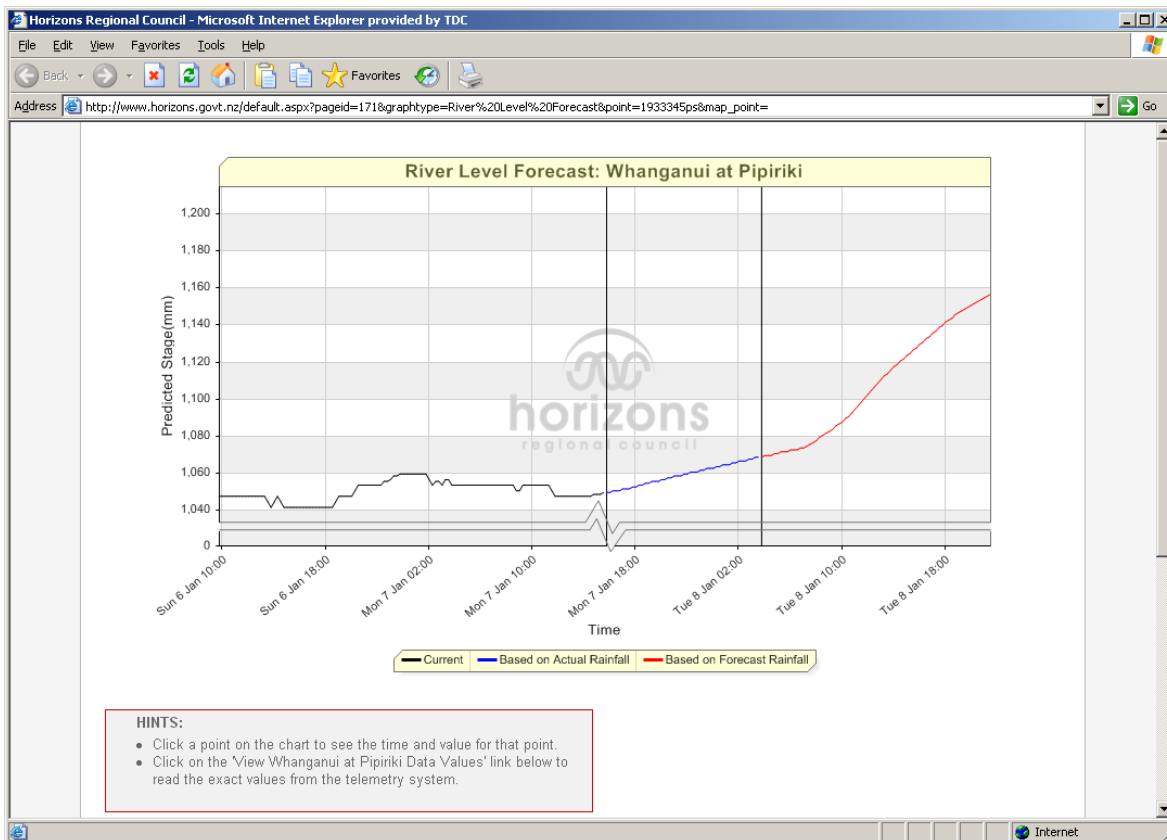
The following advances have occurred which enable better flood prediction ability:

1. Computerised models can now take rainfall as an input and produce reliable and accurate forecasts of river flow. This provides greater warning time of flooding.
2. Council now has enough reliable rainfall information from its backcountry gauges to enable this modelling to occur.
3. MetService and NIWA can provide 48 hour forecasts of hourly rainfall for any defined point, thus allowing us to extend the real-time rainfall information at our existing raingauges, and giving us greater lead-in time for warnings.
4. The web easily allows us to continuously publish forecasts of river levels.
5. GIS systems allow for much better spatial analysis of flooding impact.

## 4. THE PROPOSAL

Improving the flood forecasting system is seen as high priority by both the local Civil Defence staff, and the Hydrology and Engineering staff of Council. To enable this work to happen, it is proposed that Council lets a contract to implement a district wide rainfall/runoff model in the 08/09 year. The model would run continuously and would regularly update plots on the Council's web site. The plots would show the actual flow data recorded, the flow data modelled from actual rainfall, and the flow data modelled from predicted rainfall. An example of this is shown below from the Horizons Regional Council who implemented a similar system after the 2003 Manawatu floods. The system has been very successful.

Indications are that the work would cost around \$150,000. A crucial part of the contract would be to train Council staff in the development and use of the model, enabling the final stages of the project to be completed in-house. This ensures staff fully understand the model and are able to make future adjustments and improvements. Aside from training, there would be development work on the models, creation of datasets showing predicted flows, and provision of a web plotting facility. There would be no on-going maintenance costs.



**Figure 2 - An example of output from the Horizons Regional Council website. The plot shows (from left to right), actual river level over time, river level predicted from actual rainfall, river level predicted from Metservice rainfall estimates.**

## 5. ADVANTAGES

This project seeks to improve our ability to ensure the safety of people and assets along rivers and on floodplains, and on roads affected by flood waters. The principal benefits will be:

- A greater warning time of the size and timing of impending floods. At present we can only provide 1 ¼ hours for Takaka, 3 hours for Motueka, and about 1 hour for Brightwater. The model will provide up to 8 hrs warning and 24 hrs indication (based on Metservice/NIWA data)
- Improved accuracy and reliability of predicted flood size.
- Clear indications of flood height at stopbanks, and the duration that water will be contained within the stopbanks (important for assessing stopbank safety)
- Less reliance on the expertise of staff making forecasts. If key staff are unavailable or have left Council, the system will still operate.
- Better ability to distribute warnings and inform people about the nature and extent of likely flooding.
- Ability to link forecasts to Civil Defence managers during an emergency situation.
- There is less opportunity for confusion and misinformation - at present the public make their own predictions based on what they can see on the Council's river plots.

## 7. CIVIL DEFENCE EMERGENCY MANAGEMENT OFFICE

The Nelson Tasman Emergency Management Office (EMO) fully supports this proposal. The EMO comments:

“Under the Civil Defence and Emergency Management (CDEM) Act 2002 there is an obligation on local authorities to provide for civil defence emergency management. This is defined in broad terms to encompass not only responding to an emergency that has occurred, but also on-going work across all council activity to reduce the risk of an emergency occurring and to take action in readiness for a potential emergency. The current proposal therefore supports the requirement on the Nelson Tasman CDEM Group to identify, assess, and manage hazards and risks; and to take all steps necessary to provide services and information (amongst other things) for effective civil defence emergency management (s.17 of the CDEM Act).

It is also worth recalling that when our region's major civil defence plan was completed (“Nelson Tasman Emergency Management Group Plan 2005”) a hazards and risks analysis of the Nelson Tasman region was undertaken. This Plan, which was endorsed by both Councils, concluded that “floods are the most commonly occurring major natural hazard in Nelson Tasman. They occur across the entire region and have caused the most damage in recent times among the hazards identified.” The recent past has been no exception. In May last year a relatively minor rain event over Stoke caused an estimated \$300,000 in damage. The “one in five year” flood last October in the Motueka River caused \$285,000 in damage, similar to the \$340,000 estimate for the Buller catchment. The Good Friday floods of 2005 also involved repair work of \$295,000.

## 6. RECOMMENDATION

That Council confirm the proposal to include a funding provision of \$150,000 in the 08-09 draft annual plan to allow a district wide flood modelling project to commence in the 2008/09 year.