

Plan Change 34 – Flood Hazards

DRAFT Section 32 report

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1. WHAT ARE THE RESOURCE MANAGEMENT ISSUES?

Plan Change 34 helps Council meet their responsibilities to identify flood hazards and manage development to mitigate risks to people and property. Those responsibilities stem from the Waikato Regional Policy Statement and the Resource Management Act.

The resource management issues that this plan change will address are:

- Flooding from several rivers and Lake Taupō adversely affects peoples safety and property
- The operative District Plan does not identify all of the known flood hazard areas associated with rivers and Lake Taupo
- New modelling information shows that some of the flood hazard areas in the operative District Plan are no longer expected to be affected by future flood events
- The current flood hazard information doesn't consider the future effects of climate change and tectonic subsidence
- Recent changes to the Waikato Regional Policy Statement now impose a risk based approach to managing flood hazards which is not mirrored in the operative District Plan
- The operative District Plan provisions do not provide sufficient control over development in high risk flood areas
- The operative District Plan provisions impose unnecessary regulatory costs on those with a low level of risk.

2. BACKGROUND

Lake Taupo Erosion and Flood Strategy 2009

Taupo District Council and Waikato Regional Council adopted the *Lake Taupo Erosion and Flood Strategy in 2009*. The strategy provides guidance on the management of the erosion and flood hazards around the margins of Lake Taupo. The strategy is based on scientific analysis by Beca (erosion hazards) and Opus (flood hazards).

Importantly in the context of this plan change, the strategy represented the first time that flood hazard around the margins of the lake had been assessed. The strategy established an agreed methodology for the assessment of the flood risk. In addition to the static water level record Opus identified the need to incorporate the effects of seiche¹ and the likely future effects related to climate change and tectonic subsidence.

The flood hazard was presented using a risk classification based on a combination of anticipated water depth and velocity. Waikato Regional Council indicated an expectation that this classification approach will be consistently applied throughout the region.

A static water level was set for a 1% Annual Exceedance Probability (AEP) event. However the strategy also recognised that wave run up had the potential to pose a risk to some parts of the foreshore. Although wave run up was related to the lake level the effects of the hazard were different and required a different management approach.

There was extensive community and stakeholder consultation during the development of the strategy. This involved public testing of the scientific analysis and the policy direction through a special consultative process in accordance with the Local Government Act 2002. Significant stakeholders were involved in that process including the hydro electricity operators around the lake, Ngati Tuwharetoa, infrastructure providers, environmental groups and the Department of Conservation.

Waikato Regional Policy Statement

The Waikato Regional Policy Statement became operative on 20 May 2016. The regional policy statement introduced a new risk based framework for managing natural hazards including planning for

¹ Seiche is the free oscillation of a body of water as it 'slops' back and forth in an enclosed, or partially enclosed, basin

defended areas. The District Plan is required by section 75(3)(c) of the Resource Management Act 1991 to give effect to the regional policy statement.

There are clear signals in the regional policy statement that Council should plan for a 1% AEP flood event consistent with the direction in the Lake Taupo Erosion and Flood Strategy and the New Zealand Coastal Policy Statement. There is also support for the classification system based on a combination of water depth and velocity.

Operative District Plan

The operative Taupo District Plan recognises a number of natural hazards which the district is vulnerable to and has a related generic set of objectives and policies. This ensures that communities are aware of hazards and able to plan appropriately. Furthermore it ensures Council meets its responsibilities to plan for natural hazards under the Resource Management Act 1991.

Flood hazards related to the Tongariro and Tauranga Taupo Rivers and the Tokaanu Stream are identified in the District Plan. Activities in those areas are managed through a controlled activity rule. The rules uses a blanket approach to development as all activities are considered as a controlled activity and require a resource consent. This simplistic approach does not use the risk based approach to managing flood hazards as fails to reflect different risk profiles, creating regulatory costs for low risk activities and failing to appropriately address high risk activities.

The flood hazard mapping in the operative District Plan is outdated as it:

- does not cover all areas of urban development affected by flooding from the lake and rivers
- identifies areas as subject to flooding that are now not considered subject to flooding
- does not include the future effects of climate change and tectonic subsidence

3. TECHNICAL INFORMATION

After the development of the Lake Taupo Erosion and Flood Strategy in 2009, Opus International Consultants were engaged by Taupo District Council and Waikato Regional Council to assess and report on the flood hazards associated with the following:

- The Hinemaiaia River;
- The Tauranga-Taupo River;
- The Tongariro River;
- The Tokaanu Stream;
- The Kuratau River,
- The Whareroa Stream; and
- Lake Taupo.

These rivers and the lake were modelled because of their history of flooding and their location next to urban areas where there is a greater level of risk to people and property. There are a number of other waterways within the Taupo District which were not included in the study because they:

- Are spring fed and therefore not as susceptible to flood flows
- Have a small catchment area, or
- They are located in areas where there are relatively few people, limited property at risk and outside future growth areas.

The assessments by Opus were presented in a suite of reports which were made available to the public. These reports modelled a 1% Annual Exceedance Probability flood, allowing for climate change and tectonic deformation for these rivers and Lake Taupo and mapped these flood hazard areas. Flood hazard mapping identified areas of high, medium and low flood hazard including likely depth and velocity for river flooding and likely depth for lake flooding.

These reports were written for lay readers; however they are supported by a technical compendium describing the underlying assumptions and methodology.

The identification of the flood hazards was based on the 1% AEP event. This is based on accepted best practice, requirements in the Waikato Regional Policy Statement, and reflects the direction around

hazard assessment in the New Zealand Coastal Policy Statement. This approach recognises that subdivision of land establishes urban land uses that persist for over 100 years, and that buildings are invariably occupied for more than 50 years.

Results from the flood modelling were presented spatially in a series of cells based on a 5m by 5m grid. This grid of cells sat over the top of a digital terrain model developed using LIDAR survey information. The use of the 5m grid reflected a compromise between wanting to provide a high level of detail at a property level, while recognising that computer based modelling of the hazard has limitations.

WRC advised TDC to assume that the existing stop banks on the Tauranga Taupo and Tongariro Rivers would not be raised over time to mitigate the effects of climate change and tectonic subsidence. While WRC regularly assess whether stopbanks need to be raised to address climate change they acknowledge that it should not be assumed that this work will take place as the community may make decisions about the level of service required and associated costs of raising stopbanks in the future.

4. QUALITY ASSURANCE PROCESSES

The flood assessments prepared by Opus were peer reviewed by the National Institute of Water and Atmospheric Research (NIWA). Their review² confirmed that the methodology used was appropriate, while highlighting a number of more minor improvements that could be made to the reports. Council contracted both NIWA and Opus to discuss and address these changes and report on this. The peer review discussion report³, which was signed by both Opus and NIWA, outlines those changes that were made and those that were not made and why. As a result some of the original river and lake flooding reports were updated by Opus. Opus were also contracted to prepare a technical compendium⁴ to address the gaps in technical information identified by NIWA in their peer review report.

As a result of this work the technical data has been peer reviewed and there is agreement on the assumptions and methodologies used in the flood hazard reports being the most appropriate for the purpose. This review process, combined with Waikato Regional Council's technical review of the Opus reports, provided Council with the confidence in the robustness of the technical information underlying the plan change.

The various flood hazard studies included consideration of the potential effects of climate change as recommended by the Ministry for the Environment in their guidance for local government. Subsequent to this, the Intergovernmental Panel on Climate Change has released more recent reports on global climate change in 2014 and again in 2016. Opus reviewed these reports and the subsequent advice from the Ministry for the Environment. There are significant challenges downscaling the global models to particular catchments. In addition, the more recent climate scenarios are different to those used in the earlier guidance material. This makes a direct comparison difficult. Despite these difficulties, Opus were able to confirm that the climate change projections used in the modelling of the flood hazard on Lake Taupo and its various tributaries are consistent with, and within the range of, those projections provided in the latest Intergovernmental Panel on Climate Change reports. On that basis, and recognising the inherent uncertainty in modelling extreme flood events, they recommended that there was no need to adjust the climate change assumptions adopted for the various flood hazard models.

5. ENGAGEMENT

Council undertook two rounds of engagement with those directly affected by the new flood hazard information. The focus of the initial engagement was on sharing the information around the extent of the flood hazard and the nature of the risk. It extended from September 2015 for several months and enabled interested people to meet with council officers to better understand how the flood hazard was identified and what it might mean for them.

² National Institute of Water & Atmospheric Research Ltd 2015: Peer review of Taupō District flood hazard reports

³ Opus International Consultants Ltd 2015 Peer Review Discussion Taupō District Flood Hazard Studies

⁴ Opus International Consultants Ltd 2015 Technical Compendium Taupō District Flood Hazard Studies

During that period of initial engagement we also tested the following set of principles that would ultimately be used to guide the drafting of the proposed District Plan provisions:

- Principle 1 – Discourage development in high risk flood areas
- Principle 2 – Manage development in low and medium flood areas
- Principle 3 – Recognise existing investment
- Principle 4 – Plan for vulnerable people and emergency services
- Principle 5 – Provide for infrastructure that is not vulnerable to flooding

The feedback provided from the community and stakeholders assisted with the development of draft plan provisions. In late 2015 a second letter and a copy of the draft provisions were sent to affected ratepayers and stakeholders for consideration and feedback. This second period of engagement was open for two months from November 2015 and 63 responses were received. Of those responses, five property owners indicated that they believed there were differences between the digital terrain model underpinning the flood modelling and the current ground levels of their properties. This information was reviewed by Opus and resulted in a number of changes to the flood hazard areas.

During this second period of engagement we also contacted those ratepayers whose properties were identified in the defended areas. The defended areas were identified through modelling by Waikato Regional Council to establish which properties would be at risk of flooding if flood stop banks were to fail. There is no intention to impose rules on the use of that land given the uncertainty around the level of risk associated with the hazard.

During the preparation of the plan change quality assurance processes identified an error in the Tokaanu flood hazard mapping. This was corrected by Opus and those affected property owners were advised and invited to discuss the matter further with Council. (March/April 2017)

6. DECISION MAKING

Council has been involved in the development of this plan change through regular Council workshops. A councillor working group of three councillors was established in May 2015 to ensure members get a good understanding and involvement in the plan change, provide guidance to staff and to act as an advocate for the plan change. The Tongariro Turangi Community Board has been updated on the progress of this plan change throughout the plan change development process.

7. OPERATIVE DISTRICT PLAN PROVISIONS

The operative District Plan contains objectives, policies and rules to manage development in identified flood hazard areas of the Taupo district. In addition to flood hazards, there are a number of other natural hazards contained within the Taupo district. So a broad set of objectives and policies were developed to consider all natural hazards rather than specific objectives and policies for each hazard. The objectives and policies are contained in Section 31 of the operative District Plan.

The rules managing activities within flood hazard areas are contained in Section 4e.9 of the operative District Plan. The rules enforce a blanket approach to development, whereby any activity is considered as a controlled activity and therefore requires a resource consent to be sought. An activity that is unable to comply with the requirements of the controlled activity rule, which includes complying with performances standards and rules of the underlying environment, is then considered as a discretionary activity. The existing framework therefore imposes unnecessary costs on landowners, particularly those where the flood risk is minimal.

The following issues have been identified with the operative district plan provisions:

- The operative District Plan does not identify all of the known flood hazard areas associated with rivers and Lake Taupo that may adversely affects peoples safety and property
- New modelling information shows that some of the flood hazard areas in the operative District Plan are no longer expected to be affected by future 1% AEP flood events

- The current flood hazard areas identified in the operative District Plan doesn't consider the future effects of climate change and tectonic subsidence
- The operative District Plan does not use the risk based approach to managing flood hazards as required in the Waikato Regional Policy Statement.
- The operative District Plan provisions do not provide sufficient control over development in high risk flood areas as required by the Waikato Regional Policy Statement
- The operative District Plan provisions impose unnecessary regulatory costs on those with a low level of risk.

8. WILL ADDRESSING THE OBJECTIVES MEET THE REQUIREMENTS OF THE REGIONAL POLICY STATEMENT?

Under section 31 (1)(b)(i) of the RMA the management of use, development or protection of land for the avoidance or mitigation of natural hazards is clearly a Council role under the RMA.

The overarching objectives of the plan change relate to keeping people safe and protecting property in flood hazard areas.

The outcomes that Council is looking to achieve through this plan change are:

1. People and their property will be protected from the adverse effects of flood events
2. The District Plan accurately identifies all known flood hazard areas
3. Flood hazard areas in the District Plan reflect the anticipated future effects from climate change and tectonic subsidence
4. A risk based approach is incorporated into the District Plan to reflect the direction from the Regional Policy Statement
5. Avoid increasing the exposure of people and property in flood hazard areas where there is a high level of risk
6. Reduce the regulatory costs for those developing in flood hazard areas where there is a low or medium level of risk

Achieving these outcomes and meeting the objectives will meet the requirements of the Waikato Regional Policy Statement as the plan change incorporates:

- a risk-based approach for the management of subdivision, use and development in flood hazard areas
- identifies and maps (on the planning maps) areas of high, medium and low risk flood areas for a 1% AEP flood, which incorporates climate change and tectonic subsidence
- manages the development of new buildings, subdivision, assembly care and community care activities, emergency services, and infrastructure activities to ensure that people and property are safe in flood hazard areas
- ensures that the risk to people, the community, property and the environment does not exceed acceptable levels or risk is reduced to tolerable levels
- identifies new buildings in high risk flood areas as an intolerable risk due to the risk to life and property
- controls subdivision to avoid new buildings in high risk flood areas
- controls new buildings, including habitable structures, new assembly care and community care activities, new emergency services, new subdivision and new infrastructure within high risk flood areas and manages them in medium and low risk flood areas
- identifies residual risk zones. However the plan change does not control subdivision, use and development within the residual risk zones as required by the RPS. Instead residual risk zones in the plan change are for information purposes only.

So the plan change will manage the effects of natural hazards on people, property and the environment by:

- increasing community resilience to hazard risks;
- reducing the risks from hazards to acceptable or tolerable levels; and

- enabling the effective and efficient response and recovery from natural hazard events.

As the RPS gives effect to the relevant provisions of the RMA the plan change, by meeting the requirements of the RPS, will meet the requirements of Part 2 of the RMA.

9. WHAT ARE THE PRACTICABLE OPTIONS FOR ACHIEVING THOSE OUTCOMES?

The following options are considered the most practicable to achieve the flood hazard objectives discussed earlier.

Option 1: Create specific objectives and policies and apply a risk based approach with provisions based on the level of risk to people and property (Plan Change 34 as proposed).

Option 2: Identification of new flood hazard areas and retain operative District Plan provisions

Option 3: Identification of new flood hazard areas, retain broad objectives and policies and consider all activities/subdivision as discretionary activities

Option 4: Identification of new flood hazard areas and manage the design of buildings and flood risk through the Building Act 1991.

10. EVALUATION OF THE PRACTICABLE OPTIONS

Each of the four options identified above in Section 10 have various benefits and costs associated with them. Each option is briefly evaluated below, while a more detailed assessment which considers environmental, economic and social benefits and costs, the efficiency, effectiveness and appropriateness of each option is provided in Appendix 7. This detailed evaluation has determined the best overall option to achieve the outcomes sought.

Option 1: Create specific objectives and policies and apply a risk based approach with provisions based on the level of risk to people and property (Plan Change 34 as proposed).

Option 1 would introduce a specific objective, policy and rule framework for flood hazard management. The objectives, policies and rules relate to those properties identified as being affected by the flood hazard modelling data provided by Opus. This data identifies low, medium and high flood hazard areas. The rules use the risk approach and so are tailored to the low and medium flood hazard areas and the high flood hazard area.

This option, as directed by the Waikato Regional Policy Statement, is a risk based approach to manage people and property within low, medium and high flood risk areas. This option will achieve the purpose of the RMA, meet Councils obligations under the RMA and give effect to the Waikato Regional Policy Statement.

Whilst there are costs to the ratepayer associated with undertaking a Plan Change under the RMA, the introduction of such a framework will provide more certainty for communities and developers and avoid inappropriate development within flood hazard areas. This therefore avoids risk and the potential for greater costs to these affected communities and Taupo ratepayers. This targeted style of resource management will also remove the current blanket approach to development in flood hazard areas by being more responsive to the likely level of risk. For example, some development can be undertaken without resource consent where the risk is considered negligible, in comparison to under the operative district plan where all development in flood hazard areas must obtain a resource consent.

Option 2: Identification of new flood hazard areas and retain operative District Plan provisions

Option 2 would retain the operative District Plan objectives, policies and rule framework, but with the planning maps being updated with the new flood modelling data provided by Opus.

Proceeding with Option 2 would still require Council to undertake a plan change. Council would meet its statutory obligations however not give effect to the Waikato Regional Policy Statement.

This approach would retain the blanket resource management approach of the operative District Plan. However there would be costs associated with undertaking the plan change process to update the flood hazard areas on the planning maps with the new flood data, costs associated with more properties affected by flooding and therefore more landowners are subject to regulatory costs i.e. resource consents. The possible benefits of identifying low, medium and high risk flood areas in the District Plan and minimum floor level requirements are outweighed by the costs to undertake the plan change, ongoing regulatory costs and not meeting legislative requirements.

Option 3: Identification of new flood hazard areas, retain broad objectives and policies and consider all activities/subdivision as discretionary activities

Option 3, similar to Option 2 would retain the operative District Plan objectives and policies, however will amend the rule framework by removing the controlled activity rule but retaining the discretionary activity rule. Option 3 will also involve planning maps being updated with new flood modelling data provided by Opus, thus identifying low, medium and high risk flood hazard areas. Option 3 will require a plan change process.

In proceeding with Option 3, Council would meet its obligations under the purpose of the RMA, but as this option would not give effect to the Waikato Regional Policy Statement (RPS) as the risk management approach will not be used it would not meet Section 75(3)(c) of the RMA that requires a district plan to give effect to the RPS. Whilst the retention of the discretionary activity would enable Council to consider activities and the ability to decline resource consents where effects are more than minor, the RPS seeks to avoid particular activities which this framework may not enable to the same degree. In addition this approach would maintain the blanket resource consent approach whereby all landowners would continue to need resource consent approval prior to development. All development and activities being treated as discretionary would also require much more information to be provided by applicants in accordance with the RMA. This approach would therefore continue to impose high regulatory costs.

Option 4: Identification of new flood hazard areas and manage the design of buildings and flood risk through the Building Act 1991.

Option 4 would involve the removal of the existing flood hazard rules from the district plan, identification of new flood hazard areas on the District Plan Maps and the reliance of the Building Act to manage buildings in these flood hazard areas.

Utilising the Building Act would allow Council to manage minimum floor levels but only for housing, communal residential and communal non-residential buildings. However under the Building Act there is no ability for Council to decline activities from establishing with low, medium or high hazard areas where effects would be more than minor. This approach therefore does not avoid risk to people and property to the degree directed by the RPS, so Option 4 would not give effect to the RPS. Option 4 would also not meet Council obligations under the RMA.

Option 4 would remove regulatory costs for landowners affected by flood hazards, as resource consents would no longer be required. However, there would still be costs for undertaking the plan change process to introduce the new flood hazard areas onto the District Planning Maps.

11. PROPOSED DISTRICT PLAN PROVISIONS

The overarching objectives of the plan change relate to keeping people safe and protecting property. These new objectives are specific to the flood hazard and sit separately to the generic natural hazard objectives.

The development of the proposed District Plan provisions was driven by a need to reflect the risk based approach in the regional policy statement. This led to a strong emphasis on avoiding increasing the

exposure of people and buildings in the high risk areas. Conversely, there was also an emphasis on minimising regulatory costs for those properties in the low or medium flood risk areas.

It was recognised that most the communities within the identified flood hazard areas were already well established with limited opportunities for intensification or expansion. This drove a need to recognise the existing investment and provide the flexibility for some additional building of a minor scale. Setting that acceptable scale of development relied upon the engagement and testing with the community.

The engagement had identified the importance of removing unnecessary compliance costs. In response the proposed provisions looked to enable well designed development for new buildings and extensions to buildings in the low and medium hazard areas through the use of a permitted activity status. In those situations a minimum freeboard of 300mm was identified, reflecting the historical practice for building consents in the district. In the high hazard areas new buildings and large extensions are not encouraged. This reflects the approach in the RPS of avoiding increasing the exposure of people and buildings in the high risk areas. However as some high flood hazard areas are already developed small extensions to buildings in high flood hazard areas are permitted provided they are no lower than the existing floor level.

A more conservative approach was identified for emergency services and care facilities for more vulnerable people. Both of these activities are discouraged in high flood risk areas and require a resource consent in the low and medium flood risk areas. This results from recognition of the importance and vulnerability of these services in a flood event.

To ensure that the exposure of people and buildings in the high risk areas is not increased subdivision in high risk hazard areas is discouraged except where the building platforms are outside of the high risk flood area. Subdivision within the low and medium risk flood areas is not controlled as the rule for new buildings in these areas adequately addresses the risks from flooding.

There was also a conscious decision to enable infrastructure maintenance, operation and construction as much as possible through the use of a permitted activity status. This reflected both the direction through national policy statements and standards, as well the desire to minimise compliance costs. However this desire to be enabling needed to be balanced by the reality that infrastructure covers a wide variety of structures and services, and that some of those will be vulnerable to flood hazards and require assessment.

12. WHAT IS THE SIGNIFICANCE OF THE EFFECTS FROM IMPLEMENTING THE PLAN CHANGE?

The level of detail contained in a Section 32 report is determined by the scale and significance of the environmental, economic, social, and cultural effects that will result from the plan change. The new flood hazard information affects⁵ just over 1000 properties, just under 800 of which are not already affected by a flood hazard notation in the current district plan. The plan change will include an additional 800 properties in the flood hazard area and subject to the new policy and rules approach. However approximately 200 properties affected by the current flood hazard areas in the operative district plan are no longer affected by the new flood hazard areas.

Most of the communities within the identified flood hazard areas are already well established with limited opportunities for intensification or expansion and the majority of properties are in the low and medium hazard areas. As the plan change provisions are targeted to proposed activities and to removing unnecessary compliance costs they proposes many activities (including new buildings and additions) in the low and medium flood hazard areas are a permitted activity provided a minimum floor level is met. So the environmental, economic, social, and cultural effects of the plan change on the properties in these areas are low. This has been reflected in the low response rate from the two phases of targeted consultation with affected landowners and stakeholders (see section 6 of this report).

⁵ Figures are very approximate and will be recalculated from the revised 2017 mapping tool.

In the high hazard areas the proposed approach is to avoid increasing the exposure of people and buildings to flood hazards and so is restrictive. This will result in high economic, social, and cultural effects on the properties in these high hazard areas. However only 500 properties⁶ are affected by high hazard areas and very little feedback has been received from these affected landowners to our targeted consultation.

The impact of the plan change on multiple owned Maori land is relatively high given much of this Maori land is lower lying and adjacent to the lake and rivers. Much of the high hazard areas are on multiple owned Maori land. Despite continued offers of site meetings and discussions about this proposal very few owners or representatives of owners on multiple owned Maori land have taken up these offers.

Based on this the scale and significance of the proposal is medium. For further information on the significance of the effects of implementing the plan change see Appendix 2.

13. EXTREME WAVE ACTIVITY

The assessment of flood risks around the margins of Lake Taupo by Opus focused on the hazard created by lake water inundation land. However their assessment also identified that there is a secondary risk associated with wave activity. While there is a standard methodology for identifying the inundation risk, Opus had to develop a new methodology for establishing what the risk associated with wave activity might be.

That initial modelling work by Opus identified a wide area that might potentially be at risk from wave activity. There was a set of underlying assumptions that drove the computer modelling, however the lack of historical data meant that calibration of the model was not possible. Importantly, the modelling has not taken into account existing structures or vegetation that would likely impact wave activity. Opus have clarified⁷ that these model results provide an initial guide, but that the constraints on the availability of data and the computer modelling mean that it is problematic trying to apply the results at an individual property level.

Both Mercury and the Omori Kuratau Preservation Society raised concerns during early engagement on the development of the plan change. They believed that the risks from wave activity needed to be managed through the District Plan. In response Council officers engaged further with Opus, NIWA and officers from Waikato Regional Council to better understand the nature of the potential hazard. Furthermore, both Opus and NIWA indicated that actual wave records would need to be compiled in order to calibrate any computer modelling before those results could be relied upon.

Discussions with Waikato Regional Council officers clarified that the hazard related to wave activity was likely to result in erosion of the foreshore area rather than widespread inundation. This means that risks associated with extreme wave activity are likely to be localised around the foreshore of the Lake. With that in mind site visits to the more vulnerable parts of the Lake foreshore were undertaken in February 2017 with experienced officers from Waikato Regional Council to assess the likely risks.

There is a risk of damage to the foreshore as a result of extreme wave activity. This has been reflected in a number of vulnerable areas around the Lake such as Kuratau and Tauranga Taupo. Better understanding the spatial extent of that hazard will require further investigations and modelling, however that work needs to be prioritised, through the long term plan, against other parts of the District Plan which require review.

In the meantime the risks can be managed through a range of mechanisms. Any significant urban subdivision along the foreshore of the Lake will be subject to the requirements of the Rural Environment with a minimum lot size of 10 hectares. Furthermore, any subdivision is also subject to section 106 of the Resource Management Act 1991, which enables Council to decline subdivision consent if the land is

⁶ Figures are very approximate and will be recalculated from the revised 2017 mapping tool.

⁷ <http://www.taupodc.govt.nz/our-council/consultation/Documents/Flood%20Hazard%20Consulation/Wave%20run%20up/2015-Wave-Run-Up-Report-Opus.pdf>

subject to material damage by erosion. Lastly, the operative District Plan already includes the Foreshore Protection Area, a 20m wide buffer area around the margins of Lake Taupo. Building within that area is a discretionary activity with the assessment criteria making specific reference to erosion. As a combination all of these existing tools provide a means for Council to continue to manage the risks associated with extreme wave activity until such time as further modelling work can be undertaken.

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14. KEY DECISIONS MADE DURING PLAN CHANGE DEVELOPMENT

Decision	Commentary
To prepare the plan change	Directed by the Lake Taupo Erosion and Flood Strategy 2009 and required by RMA and the RPS.
To include six specific rivers and exclude others	<p>The following rivers were assessed:</p> <ul style="list-style-type: none"> • Hinemaiaia • Tauranga Taupo • Tongariro • Tokaanu • Kuratau • Whareroa <p>This was based on these rivers having a history of flooding and the presence of substantial urban areas that would put people and property at risk.</p> <p>Other rivers were not modelled due to a combination of factors:</p> <ul style="list-style-type: none"> • small catchment areas • no history of flooding • an absence of significant urban areas
To include the future effects of climate change and tectonics	<p>Directed by the Lake Taupo Erosion and Flood Strategy 2009, RMA (section 7) and the RPS. New Zealand Coastal Policy Statement (NZCPS) also indicates the importance of addressing climate change.</p> <p>Tectonic subsidence was included given its potential to have a significant impact on the spatial extent of flooding. Areas anticipated to experience long term uplift were disregarded because flood events in the near future would still affect the land.</p>
To include defended areas Not to manage land use and subdivision in defended areas	<p>Directed by the RPS to include areas of residual risk. Discussion with WRC identified a desire to call them defended areas.</p> <p>Decided not to include rules for land use and subdivision activities because the level of risk was unable to be quantified. This approach was agreed with WRC and reflected the limitations of the modelling.</p>
To use the 1% AEP event	Directed to by the RPS. Best practice as identified in the NZCPS. Agreed to through the Lake Taupo Erosion and Flood

Decision	Commentary
	Strategy.
To map all of the flood hazard information on a consistent grid	The model outputs from the flood assessments of the rivers and Lake Taupo were based on two different grid sizes – 2m ² and 5m ² . Opus agreed to standardise the grid size to 5m ² cells to cater for the overlap of the different model areas. The choice of the larger grid size reflected a balance between providing detail at a property specific level, while still recognising the limitations of the computer model.
To round the depth and velocity data to the nearest centimetre	The original model outputs for depth and velocity went to four decimal places. This implied a level of accuracy in the model outputs that was unrealistic. They were rounded to two decimal places to better reflect the level of accuracy from the model results and to make it easier for users of the data.
To remove flooding under 10cm	The model outputs originally identified inundation below 10cm in depth. It was decided that water below 10cm did not pose a risk to people or property. This was on the basis that the Building Code requires habitable dwellings to have a floor level at least 15cm above the adjacent ground level. This decision was supported by legal advice.
To use the hazard matrix from WRC	The Lake Taupo Erosion and Flood Strategy identified that the flood hazard should be defined using a combination of water depth and velocity. The propose matrix had previously been used by Thames Corromandel District Council and was supported by Waikato Regional Council. It was subsequently confirmed in the Regional Policy Statement.
To use 300mm of freeboard	The proposed rules require a minimum level of 300mm of freeboard above identified building floor levels. This reflects the historical practice in the Taupo District related to building consents in flood hazard areas. It also reflects the Transitional District Planning documents (Kinloch area). The NZ standard (NZS 4404:2010) provides direction for planning for stormwater and notes that District and Regional plans can set appropriate local standards for freeboard.
To have specific flood hazard objectives	The Taupo District Plan has a single objective for all natural hazards. The RPS introduced a new risk based approach to managing hazards. This needed to be reflected through specific objectives and policies in the plan change. The operative objective and policies are expected to be reviewed as Council progresses plan changes for the various natural hazards.
To have objectives covering both people and property (not to rely on the Building Act)	There is clear direction from the RMA and RPS to manage land use activities to protect people. Council considered the option of leaving the Building Act to deal with the safety of buildings, however section 31 of the RMA requires the district plan to address this issue. Additionally the building code only requires consideration of a 2% AEP event, where as managing the land use through the District Plan enabled Council to plan for the 1% AEP event. The Building Act alone would not have provided the ability for Council to avoid building in high risk areas so we would not have given effect to the requirements of the RPS.
To base the defended areas on today's 1% AEP not including climate change or tectonic	The methodology was developed by WRC who modelled the risk for TDC. It was based on the existing stop banks at the current level of service. It is acknowledged that this is a snapshot in time.

Decision	Commentary
subsidence	
To remove small isolated defended areas	Removed clusters of 4 squares or less because we considered these small areas did not help inform people about a real risk within these areas. WRC agreed to this approach.
To remove defended areas that were affected by flooding from an alternative source.	Because the flood assessments for the rivers included a bigger design event than the defended areas, there were some defended areas that were also affected by river flooding. These areas were identified as being better managed under the provisions relating to flooding rather than being identified as defended areas.
To remove non-contiguous flood areas from the mapping outputs for the Lake.	This reflected that the modelling was using a bath tub approach which led to anomalies where lower areas near the lake were shown as flooding but there was no way for the water to get there. Note: some areas of river flooding appear to be non contiguous, however these areas are connected by flooding although the areas of connection are less than 10cm.
Not to include extreme wave activity	The preliminary modelling of the potential wave activity risk produced an overly conservative spatial extent. Limitations on the modelling and a lack of calibration data made the model results unsuitable for regulating land use at a property specific level. It was recognised that further technical work would be required to further refine that hazard information. In the meantime land use and subdivision could be controlled through existing Rural Environment and Foreshore Protection Area provisions along with section 106 of the RMA.
To limit building additions to 15 square metres	It was recognised that the flood hazard affected largely established urban areas and that this investment in the existing buildings needed to be acknowledged. A threshold of 15m ² would enable people to make minor additions that were unlikely to significantly alter the level of risk to people or property. This was tested with the community through the engagement processes confirming that it was an acceptable level of risk.
To have a peer review of the Opus reports by NIWA	This was undertaken to ensure Council and community confidence in the technical data that the plan change is based upon. It reinforced the earlier technical reviews of the flood reports by officers from WRC.
To take a targeted approach to managing land use based on risk	Directed by the RPS to take a risk based approach.
To use the care facility definitions from the building code	Using the building code definitions helped to ensure a consistent approach to activities that involve vulnerable people.
To manage the development of all buildings not just habitable	It was recognised that uninhabited buildings could be of significant value or house equipment of high value. Furthermore, any building that is damaged during a flood event could create debris that would pose a risk to people. It was noted that people spend significant time in the workplace and that those buildings should also provide a place of refuge for people

Decision	Commentary
buildings	during a flood event.
To rely on the underlying rules for subdivision in low and medium risk area	The land use rules related to buildings provided sufficient control without the need for additional subdivision controls in low and medium risk areas.
To have a two step engagement process	This provided sufficient time for people to understand the project, technical data and level of personal risk. The second round enabled further community discussion on draft planning provisions. This gave Council the ability to refine the plan change to reflect the community's acceptable level of risk prior to notification.
To proceed with caution when developing the plan change	There are examples around the country where communities had been rushed into understanding the level of risk associated with hazards. Council needed to undertake sufficient quality assurance to ensure a high level of confidence in the technical information for the community.
To enable infrastructure that was unlikely to be adversely affected by flooding	Engaged with infrastructure providers to clarify which types of infrastructure are more resilient to flood waters. Also recognised the direction in national policy statements and standards as well as the need to locate some infrastructure in flood areas.
Not to review the flood assessments post the 2016 IPCC report	A review of the IPCC report by Opus showed that the climate change component in the flood reports was still within the broad range of potential scenarios mapped by the IPCC.
Not to rerun the flood models in 2016	A significant amount of time has passed since the first flood models were run and actual flooding during that time period could be used to update the calculation of the 1% AEP. Advice from Opus indicated that while there may be some changes in the calculation of the 1% AEP, any such changes are unlikely to result in significant change to the spatial extent of the flood hazard areas. The costs of re running the modelling are not balanced by the benefits.
To assume that stop banks wont be changed over time	Advice from WRC confirmed that their planning for stop banks did not include an allowance for climate change. It was recognised that the level of service provided may change over time to reflect the desires of the community and the ability to fund improvements to the stop banks. There may also be situations where physical constraints prevent further increases in the height of stop banks. It is impractical for WRC to increase stop bank heights now to provide for climate change or tectonic subsidence which may not occur for 50 years.
The lake level will continue to be a managed	The Lake has been managed since 1941 and has been a significant part of the national electricity generation network. This is unlikely to change into the foreseeable future. Mercury have an existing resource consent to manage the lake which is not due to expire until 2041. Mercury has a limited ability to discharge water from the lake through the control gates. During a flood event the inflows into the lake are significantly greater than the maximum out flow capacity.

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