

Coversheet for Selwyn District Plan Committee decision on:

Preferred Option Report: Natural Hazards - Flooding

On the 19 February 2020 a Preferred Option Report was taken to the District Plan Committee Meeting (Public Excluded) for endorsement.

The Preferred Option Report recommended the following:

"That the Committee notes the report"

"That the Committee endorses the Preferred Option for 'Flooding' for further development and engagement, Section 32 evaluation and drafting phases."

"That the Committee notes the summary plan"

"That the Committee agrees to the release of this recommendation into the public environment from date of commencement of landowner engagement"

PREFERRED OPTION REPORT TO DISTRICT PLAN COMMITTEE

DATE: 19 February 2020

TOPIC NAME: Natural hazards

SCOPE DESCRIPTION: Flooding

TOPIC LEAD: Rachael Carruthers

PREPARED BY: Rachael Carruthers

EXECUTIVE SUMMARY

<i>Issue(s)</i>	<i>Flooding poses a significant risk in parts of Selwyn.</i>
<i>Preferred Options</i>	<p><u><i>Flood area identification</i></u></p> <p><i>Option 2a – to use a combination of the DHI rain on grid modelling (200 year ARI, 8.5 RCP scenario) and the updated ECan Selwyn River/Waikirikirī modelling to identify the Plains Flood Management Overlay.</i></p> <p><i>Option 5 – to amend the existing Waimakariri River Flood Category A flood area by removing that land that is now protected by the secondary stopbanks, and rename it to the Waimakariri Flood Management Overlay</i></p> <p><i>Option 7 – to identify other high hazard areas via a definition of ‘high hazard’ consistent with the CRPS definition, rather than by mapping.</i></p> <p><u><i>Development of provisions</i></u></p> <p><i>Option 9 – to develop new provisions for flood high hazard and flood hazard areas, consistent with the direction of the CRPS</i></p>
<i>Recommendation to DPC</i>	<p><i>That the Committee notes the report.</i></p> <p><i>That the Committee endorses the Preferred Options for ‘Flooding’ for further development and engagement, Section 32 evaluation and drafting phases.</i></p>
<i>DPC Decision</i>	



1.0 Introduction

1.1 Previous reports to DPC

As part of the District Plan Review, Council needs to undertake investigations to understand natural hazards, and to manage those risks to people and property. Natural hazards are a matter of national importance under s6(h) of the RMA and provisions are also required to give effect to the Canterbury Regional Policy Statement (CRPS). This was the subject of Issues and Options reports on flooding and coastal hazards considered by DPC at its meeting on 22 February 2017 and again on 6 December 2017.

In relation to flood risk, DPC agreed on 6 December 2017:

‘That the Committee:

Flood-risk:

1. *Approves the development of a district-wide rain on grid model that is to be run by DHI and requests that Environment Canterbury:*

- a) *carries out a revised modelling of flooding from the Halswell/Huritini River as an update to report R12/68;*
- b) *agrees a programme of flood investigation for the Upper Selwyn, Hawkins, Waianiwaniwa and Hororata Rivers;*

as part of the programme of flood risk investigations and associated programme of variations/ plan changes to incorporate flood mapping into the Proposed District Plan.

A Preferred Options report was presented to DPC in November 2018, but the Committee decided not to consider the options for how flooding is to be managed in advance of the completion of the required modelling to identify the areas that would be affected by the provisions.

Since the matter of flooding was last considered by DPC, DHI NZ Ltd have completed district-wide rain on grid modelling to determine the extent of flood ponding for 200 year and 500 year Average Return Interval (ARI) rainfall events (equivalent to 0.5% and 0.2% Annual Exceedance Probability (AEP) rainfall events).

Environment Canterbury have advised that successful completion of the DHI modelling provides sufficient information that tasks (a) and (b) above are not required in order to determine high hazard and hazard areas in relation to flooding within Selwyn.

1.2 Purpose of this report

The purpose of this report is to provide the Committee with the results of the completed models, and to present options for the identification of flood hazard areas within the Proposed District Plan (PDP) consistent with Council’s s6(h) RMA and CRPS obligations.

2.0 Statement of Operative District Plan approach

As noted in the 22 February 2017 report, the Operative Selwyn District Plan (SDP) maps flood risk areas in the Rural Zone. Within these mapped areas the use, development and subdivision of land is managed by way of standards for minimum floor levels for new buildings, controls on earthworks and assessment of natural hazard risk through consenting processes. The mapped flood risk areas are:

- Waimakariri Flood Category A area (89 properties)
- Te Waihora/ Lake Ellesmere flood area (432 properties)
- Lower Plains flood area (1,409 properties)

These areas were incorporated into the SDP by way of submission from Environment Canterbury. Much of this mapping had been included in the 1995 notified version of the district plan before it was withdrawn and replaced by what became the current operative plan. The mapping is, therefore, based on information that is now over 20 years old and in several instances relies on information dating back to the 1970s. This mapping principally only identifies areas known to have flooded in the past rather than areas at risk of flooding in a 0.2% AEP (1 in 500 years) event or a 0.5% AEP (1 in 200 years) event as now required by the RPS.

Within townships, only Tai Tapu and Rakaia Huts are subject to controls relating to flooding. Within Tai Tapu, dwellings and principal buildings are subject to minimum floor heights, while new dwellings or principal buildings on the lower terrace at Rakaia Huts are a non complying activity.

3.0 Summary of relevant statutory and/or policy context and other background information

3.1 Resource Management Act 1991

As noted in earlier reports to DPC related to natural hazards, the management of significant risks from natural hazards are a s6 matter of national importance that must be recognised and provided for when achieving the purpose of the RMA.

3.2 Canterbury Regional Policy Statement

Section 75(3)(c) of the RMA directs that a district plan must give effect to any regional policy statement.

The objectives and policies of the Canterbury Regional Policy Statement (RPS) relating to natural hazards are set out in Chapter 11. Those relevant to Selwyn District are attached as Appendix A to this report.

In particular, the CRPS requires the PDP to avoid inappropriate development in high hazard areas, which includes land subject to inundation events where:

- the water depth (metres) x velocity (metres per second) is greater than or equal to 1; or
- depths are greater than 1 metre, in a 0.2% AEP flood event; and

outside these areas, to manage new subdivision, use and development in areas subject to inundation in a 0.5% AEP flood event.

Council is directed to have particular regard to the effects of climate change when considering natural hazards, and to limit physical works to mitigate natural hazards to situations only where the natural hazard risk cannot reasonably be avoided, and any adverse effects of the works on the natural and built environment and on the cultural values of Ngāi Tahu are avoided, remedied or mitigated.

3.3 NES for telecommunications facilities

Regulation 57 of the Resource Management (National Environmental Standard for Telecommunication Facilities) Regulation 2016 (Appendix B) (the NESTF) prevents Council from making a natural hazard rules that relates to an activity subject to the NESTF. This is on the basis that resilience is already factored into telecommunication industry practice, and that they will either avoid hazard areas or engineer structures to be resilient to the hazard risk.

4.0 Summary of alternative management responses – other districts

4.1 Christchurch District Plan

As noted in the report to DPC on 22 February 2017, the Christchurch District Plan undertook flood modelling to inform its recent district plan review. This includes the Halswell River whose catchment lies within both Christchurch City and Selwyn District.

The flood risk modelling used the flood event levels contained in the RPS:

- 0.2% AEP (1 in 500 year event) to identify ‘high hazard areas’; and
- 0.5% AEP (1 in 200 year event) to identify areas at risk of inundation.
- For climate change the modelling inputs included: a 1m rise in sea levels, a 16% increased rainfall over next 100 years as well as assumptions for high tide and storm events.

The modelling has been used to identify and map areas of ‘high hazard’ risk and areas at risk of inundation. These mapped areas are shown on the district plan maps and trigger differing land use and subdivision controls depending on the level of risk, with a greater degree of control within the ‘high hazard’ areas.

4.2 Waimakariri District Plan

As noted in the report to DPC on 22 February 2017, Waimakariri District have prepared a draft plan change addressing natural hazards. In relation to flooding, modelling has been undertaken to determine areas that would be subject to the flood levels required by the RPS, including

provision for a 1m sea level rise and a 16% increase in rainfall over the next 100 years. These areas are intended to be incorporated into the district plan maps and trigger differing land use and subdivision controls depending on the level of risk, with a greater degree of control within the 'high hazard' areas. This draft plan change has not yet progressed to notification.

4.3 Hurunui District Plan

As noted in the report to DPC on 22 February 2017, the Hurunui District Plan uses flood assessment zones, where minimum building floor levels are required. The flood assessment zones are based on historical records, topographic maps and aerial photographs.

High hazard areas have not been specifically identified, but the RPS does not require this outside of greater Christchurch.

4.4 Ashburton District Plan

The Ashburton District Plan includes a series of maps showing floodable areas in the district. Unlike Christchurch and Waimakariri, these have been mapped at a high level and are intended for guidance purposes only. They do not trigger any site specific floor level standards or resource consent requirements, although all zones are subject to minimum floor level requirements set at 0.5% AEP flood events. The mapped areas also do not include Ashburton or Tinwald on the basis that these areas are protected by existing stopbanks designed to provide protection from a 1 in 200 year flood event. Consequently it falls to an applicant/landowner, when considering the development or subdivision of their land, to identify whether the land is at risk from a 1 in 200 year flood event and/or to determine minimum floor level requirements. This can be done by obtaining a flood assessment from Environment Canterbury or a "suitably qualified person".

5.0 Update – Selwyn River/Waikirikiri modelling and district-wide rain on grid model

Since the Committee last considered the matter of flooding, two technical reports have been completed. The 2019 Environment Canterbury Report *Selwyn River/Waikirikiri floodplain investigation* is attached as Appendix C, while the 2019 DHI Water and Environment Ltd report *Regional Policy Statement Modelling for Selwyn District Council – District Plan* is attached as Appendix D. Each model examined the likely flooding in a 200 year Average Recurrence Interval (ARI) flood event, and in a 500 year ARI.

The GIS maps of the model results will be forwarded under separate cover.

5.1 Selwyn River/Waikirikiri floodplain investigation

The Selwyn River catchment and floodplain area lies to the south-west of Christchurch in the Selwyn District. Large flood events (including the floods of 1945, 1951, 2000 and 2017) often occur in this area when a slow-moving depression develops to the north of the South Island, moving warm moist air from the north into the Central Canterbury area. This can produce

prolonged periods of persistent rainfall over the catchment, resulting in flooding within the Selwyn and Irwell River systems. During such flood events, State Highway 1 (SH1) can be inundated, causing major disruptions to traffic. Large rural areas of farmland also become inundated, restricting farming operations.

Potential inundation areas, including depths of flooding, are required for land use planning purposes, and the provision of minimum floor levels. At present, this is limited to approximate inundation areas based on historic flooding. This modelling investigation provides accurate inundation maps for more extreme events.

The investigation found that overflows to the Irwell River are calculated to occur at flows around 250 m³/s (e.g. 2008 flood event). These overflows occur along the Selwyn River south bank, between Westenras Road and Old South Road (opposite the Greendale Golf Course). At the same time, floodwater also flows through the Greendale Golf Course.

The current capacity of the Selwyn River Control Scheme is estimated to be equivalent to a 10 to 20 year ARI flood event, with a maximum channel capacity upstream of the Upper Selwyn Huts of ~320 to 330 m³/s. Assuming no stopbank failures (i.e. only overtopping of stopbanks but no scouring or collapsing of stopbanks), approximately 57 km² of floodplain will be inundated for a 50 year ARI flood event, and 88 km² for a 500 year ARI flood event. However, structural failure of stopbanks should not be discounted for flood events of this magnitude, or even more frequent flood events.

To allow for climate change to 2120, current design peak flow estimates were increased by 25%. This 25% flow increase is in line with upper-range Representative Concentration Pathway (RCP) projected increases for relevant extreme rainfall events. No specific allowances have been made for sea level rise as, in the short-term, it is assumed that this will be managed by more frequent lake openings. Modelling of a 200 year ARI design flood event, with Te Waihora/Lake Ellesmere levels raised by 0.5 m, also showed any significant increases in maximum water level were limited to the lake shoreline. The report recommends that these climate change assumptions are updated as better information becomes available.

5.2 Regional Policy Statement Modelling for Selwyn District Council – District Plan (rain on grid model)

The aim of this project was to provide district wide flood hazard mapping for the Selwyn District. ECan were also a stakeholder in the project and were involved at key stages.

A number of different ECan LiDAR ground level datasets were combined together to create the master terrain used in the modelling. These datasets were given different priority to allow for the most accurate data to be used where available – the LiDAR surveys ranged from 2010 to 2018. These were merged together to create an overall Master Terrain of the Selwyn District. Smoothing along the different LiDAR dataset boundaries were also carried out to ensure a good quality Master Terrain, from which the 2D surface consisting of a 10x10m quadrilateral grid was derived.

Additional data to model the existing ground (such as existing building footprints, stopbank, river and road locations and soil types) was sourced from Council, ECan, Landcare Research and Land Information New Zealand.

Design rainfall data were then taken from the NIWA HIRDS v.4 data series, which NIWA describes as a “set of tables containing either rainfall depths or rainfall intensities for given storm durations and recurrence intervals (ARI). The tables also provide the annual exceedance probability (AEP) which is the probability of a given rainfall being exceeded in any one year.” HIRDS v.4 has climate change scenarios built in.

The model results have had water levels of less than 5cm removed. This is on the basis that this level of water is more akin to localised ponding than flooding that needs to be managed.

6.0 Summary of options to address issues

6.1 IDENTIFICATION OF FLOOD HAZARD AREAS

FLOOD MANAGEMENT AREAS

The draft *ECan Flood hazard update for Selwyn District Plan review* was included in the December 2017 report to DPC. This report has been finalised, and is attached as Appendix E.

OPTION 1 – Manage flooding across all of the Plains

Option 1 is to manage flooding across all of the Plains, with (for example) a minimum floor height above a 200 year ARI flood event required to be identified for all new subdivisions, residential units and other principal buildings.

Effectiveness in Addressing Issue:

This approach would involve consistent provisions (such as a rule requirement requiring a minimum building floor height above a 200 year ARI flood event) across the entire Plains. To determine what that floor level should be, an assessment would be required for every development (such as a new building or a subdivision) subject to the rule requirement.

Where Council information (modelling, aerial photographs etc) contains no indication of a flooding risk, then it would be assumed that no further assessment would be required to achieve the rule requirement. Where Council information indicates that there may be a flooding risk, then the building consent applicant would be directed to ECan for a site-specific assessment to determine the floor height required to achieve the rule requirement.

As Council information changes over time, the locations where applicants are referred to ECan can be refined, without needing a plan change.

Risks:

This approach would see flooding assessed only at the time a development, such as a subdivision or new building, was proposed. Although it would be expected that any model results would be

referenced in Land Information Memoranda, or otherwise on request, it would be more difficult for prospective developers to identify the process that they would be required to follow, if they were to refer only to the District Plan in developing their proposal.

In addition, this option would result in an inconsistent approach within the District Plan for the management of natural hazards, where the Committee has already made a decision to map areas where the provisions to manage natural hazards (such as coastal hazards and geotechnical hazards) need to differ from elsewhere in the district.

Further, depending on the details of the provisions drafted, this option may not fulfil Council's CRPS obligations to manage development in high hazard areas more closely.

Time or Budget Implications:

The modelling required to support this approach has already been completed. Should further modelling be undertaken in the future, this approach would allow the new information to be incorporated into assessments of flood risk without the requirement to undertake a Plan Change.

Stakeholder and Community Interests:

Although Option 1 provides certainty of outcome (a floor level above a 200 year ARI flood event is achieved), it does not provide certainty to landowners about the District Plan process that would be required to achieve that outcome.

There is a potential perception that the lack of a mapped flood area within the district means that parts of the district are not prone to flooding. However, the failure to map a natural hazard does not mean that the hazard no longer exists.

Recommendation:

Option 1 does not form part of the preferred approach.

OPTION 2 – Use a combination of the DHI rain on grid modelling and the ECan Selwyn River/Waikirikiriri modelling to identify the Plains flood management overlay

Option 2 is to take the model results as they are, and to use them to describe a flood management area, with a minimum floor height above a 200 year ARI flood event required for all new residential units and other principal buildings. In this example, there would be flood management areas of various sizes throughout the Plains, from 10m² (a single model cell) to multiple km².

Within Option 2, there are two potential variations. Option 2a is to use the extent of the 200 ARI model results to determine the Plains flood management area and would include 24,931 properties. Of these, the majority of properties are only partially affected, with 778 properties completely within the Option 2a flood management area.

Option 2b is to instead use the wider extent of the 500 ARI model results, and would affect 25,573 properties. Of these, the majority of properties are only partially affected, with 1,143 properties completely within the Option 2b flood management area.

These numbers compare to approximately 1,800 properties in the comparable existing Lake Ellesmere and Lower Plains Flood Areas.

Flood hazard would be managed only within the identified areas, with (for example) a minimum floor height above a 200 year ARI flood event required to be identified for all new subdivisions, residential units and other principal buildings.

Where a property is partially affected by the flood management area, only development within the area would be managed for flood risk. Development on any area of the property not within the flood management area would not be managed for flood risk.

Option 2a would be to use the areas identified as at risk of flooding in a 200 year ARI flood event to define the flood management area, while Option 2b would use the areas identified as at risk of flooding in a 500 year ARI flood event. Both options would use the most conservative climate change predictions modelled. Option 2b would provide a buffer, in the event that climate change scenarios are further refined to result in additional areas subject to flood hazard. It would, however, result in areas where a site-specific assessment results in no action being required to mitigate against a 200 year ARI flood.

Option 2a is consistent with the requirements of the CRPS to identify land subject to flooding.

Option 2b would be more conservative than required by the CRPS, and would affect an additional 642 properties than Option 2a. The CRPS requires the 200 year ARI event to be used to identify land subject to flood hazard generally, and only requires the 500 year ARI event to be used to identify high hazard areas where development should generally be avoided.

Effectiveness in Addressing Issue:

This approach would involve consistent provisions (such as a rule requirement requiring a minimum building floor height above a 200 year ARI flood event) within the areas identified as at risk from flooding. To determine what that floor level should be, a site-specific assessment by ECan would be required for every development (such as a new building or a subdivision) subject to the rule requirement.

A site-specific assessment is required for each development, primarily to check the accuracy of the underlying terrain information at a particular site. LiDAR surveys have a high degree of accuracy, but can return false ground levels that then result in the flood hazard at a site being either understated or overstated. For example, a grain crop with consistent growth across the paddock will return a ground level that is in fact the top of the crop. This can result in the flood hazard being understated because the ground level is falsely high. Conversely, a site can show with a lower ground level (and therefore higher flood hazard) where a site had been excavated on the day that the LiDAR survey was flown, even though it has since been filled to match the existing ground level.

Risks:

The modelled areas extend further than the existing district plan flood management areas. As such, care will need to be taken to effectively communicate the proposed changes and their implications.

Time or Budget Implications:

The modelling required to identify a flood management area has already been completed.

A plan change would be required if the areas where flooding needs to be managed later changed to reflect updated information such as altered predictions of rainfall associated with climate change or flood modelling of the Rakaia River. These are possible but unlikely within the life of the Proposed District Plan.

Stakeholder and Community Interests:

There may be community reluctance to map the modelled areas, which are more extensive than the existing flood areas. However, the absence of a map does not mean the absence of a natural hazard.

Recommendation:

Option 2a is the preferred option for the identification of areas where provisions to manage flood hazard are required.

OPTION 3 – ‘Smooth’ the DHI rain on grid modelling and the ECan Selwyn River/Waikirikiriri modelling to identify flood management areas within the model result areas

Option 3 is to take the model results and to then ‘smooth’ them into a more traditional-looking flood management area. The management of flood hazard for development in areas identified in the models but outside the smoothed area would then be a function of building consent processes.

Effectiveness in Addressing Issue:

This approach would generally be the same as the status quo and Option 2, in that it would involve consistent provisions (such as a rule requirement requiring a minimum building floor height above a 200 year ARI flood event) within the areas identified as at risk from flooding. To determine what that floor level should be, a site-specific assessment by ECan would be required for every development (such as a new building or a subdivision) subject to the rule requirement.

A smoothed flood management area is more familiar to plan users, but as a technique is better suited to river flooding, where the management area can be drawn between river terraces, than to the wider flooding experienced in Selwyn District.

A similar number of properties would be affected by this approach as by Option 2, but the actual properties may differ around the margins of the overlay.

Risks:

This approach would result in some inconsistencies of approach across the district, for the same hazard. For example, development on an area modelled as being of risk from flooding but outside the smoothed area would not be subject to a district plan requirement to identify and comply with a minimum floor height. Conversely, a site containing higher ground that hasn't been identified in the models, but which is within the smoothed area would be required to undergo a site-specific assessment, even though it would not provide useful information.

Time or Budget Implications:

The underlying models have been completed, but there would be time and cost associated with smoothing the modelled areas to create the management area.

Stakeholder and Community Interests:

A 'smoothed' flood management area is more familiar to plan users, but can create false impressions of both hazard and freedom from hazard, depending on how the smoothing was undertaken.

Recommendation:

Option 3 does not form part of the recommended approach.

HIGH HAZARD AREAS

OPTION 4 – Retain the existing Waimakariri River Flood Category A flood area

The existing Waimakariri Flood Category A area has the same intended function as a high hazard area. There are 89 properties within this area. They are predominantly owned by Environment Canterbury or the Crown, and include the West Melton Aerodrome and the West Melton Rifle Range.

Option 4 would see the retention of the existing Waimakariri River Flood Category A area as an overlay.

Effectiveness in Addressing Issue:

The Waimakariri River Flood Category A overlay is identified in the Operative District Plan as a high hazard area, but since that overlay was developed, ECan have completed the Waimakariri River secondary stopbanks project, which has constructed a series of secondary stopbanks along the Waimakariri River, to provide a second level of defence should the primary banks fail. The November 2018 draft of the *Waimakariri River floodplain management strategy: Flood hazard risk assessment* identifies that the likelihood of the secondary stopbanks also failing in a 500 year ARI flood event is so low that it can be considered non-existent.

Retaining the existing Waimakariri River Flood Category A overlay, in its current form, would result in land on the landward side of the secondary stopbanks still being classified as being within the high hazard area.

Risks, Time or Budget Implications:

This area has already been mapped, and so there would be no time or budget implications associated with plan drafting. However, given the development of the secondary stopbanks, it is likely that the provisions would be subject to numerous submissions, resulting in a protracted hearings process, with associated time and budget implications.

Stakeholder and Community Interests:

Given the development of the secondary stopbanks, it is likely that the provisions would not be well received by stakeholders who own land that is now protected by the stopbanks.

Recommendation:

Option 4 does not form part of the recommended approach.

OPTION 5 – Amend the existing Waimakariri River Flood Category A flood area to create the Waimakariri flood management area

The *ECan Flood hazard update for Selwyn District Plan review* relies on the ECan November 2018 draft *Waimakariri River floodplain management strategy: Flood hazard risk assessment*. This assessment concludes that, with the construction of the secondary stopbank, there is a 0% chance of flooding in Selwyn District outside the secondary bank in a 0.2% AEP flood event, based on currently available information.

As such, flooding of the Waimakariri River on the landward side of the secondary stopbank does not need to be considered further in relation to flood risk for Selwyn District, although flooding between the secondary stopbanks and the river does need to still be provided for as a high hazard area.

Option 5 is therefore to amend the existing Waimakariri River Flood Category A flood area by removing that land that is now protected by the secondary stopbanks. Within the smaller area, the existing high hazard designation would remain.

The landward boundary of the amended area would align with the Christchurch District Plan Waimakariri Flood Management Area, for consistency on either side of the District border. The area would be renamed as the Waimakariri Flood Management Overlay, which is broadly consistent with the description used by the Christchurch District Plan, updated for consistency with the National Planning Standards. Forty properties are within this proposed Waimakariri flood management overlay (compared to 89 in the existing Waimakariri River Flood Category A flood area).

Effectiveness in Addressing Issue:

Option 5 would ensure that the area where flood hazard remains high is still suitably managed for flooding, while removing those restrictions over areas where they are no longer required.

Risks:

There is a residual risk that the secondary stopbanks could fail in a 500 year ARI flood event, but the technical advice is that this risk is to be so small as to be non-existent.

Time or Budget Implications:

The proposed amended area has already been mapped and included in the information available to the Committee, so there would be no time or budget implications associated with the development of the area.

Stakeholder and Community Interests:

Allowing development to proceed where restrictions are no longer required in a manner consistent with the rest of the surrounding General Rural Zone is unlikely to result in significant submissions in opposition.

Recommendation:

Option 5 forms part of the recommended approach.

OPTION 6 – Map other areas at high hazard from flooding

Option 6 is to identify areas within the Option 2/Option 3 area that are subject to high hazard, and to map them separately from the general flood management overlay, in a manner consistent with either Option 2 or Option 3, whichever is endorsed by the Committee for flood areas more generally. Provisions relating to high hazard areas would then apply within this separate overlay.

The model results suggest that 25 properties within the Option 2/Option 3 area that fall entirely within the definition of 'high hazard', with a further 3,529 properties that contain an area or areas of high hazard.

Effectiveness in Addressing Issue:

Option 6 would give effect to the CRPS Policy 11.3.1 requirement to identify high hazard areas through the provisions of the district plan.

Risks:

As discussed above, LiDAR surveys have a high degree of accuracy, but can occasionally return false ground levels that then result in the flood hazard at a site being either understated or overstated. Identifying high hazard areas via a separate overlay risks areas being excluded from the high hazard areas because LiDAR errors returned a falsely high ground level, or unnecessarily included because the LiDAR returned a falsely low ground level.

Time or Budget Implications:

There would be time and cost required to separately identify all high hazard areas, including checking for falsely high and falsely low ground levels. It is unlikely that this work would be completed before the Proposed District Plan is currently due to be notified.

Stakeholder and Community Interests:

Option 6 has the potential to create a false sense of either hazard or of freedom from hazard for Plan users.

Recommendation:

Option 6 does not form part of the recommended approach.

OPTION 7 – Describe other areas at high hazard from flooding in provisions, without separately mapping them

Option 7 is to identify high hazard areas via a definition of ‘high hazard’, consistent with the CRPS definition. Among other requirements, the site specific assessment for development within the flood management overlay would need to confirm whether the particular land being developed is ‘high hazard’. If it does meet the criteria for ‘high hazard’, then additional restrictions would apply. The definition could read:

High hazard

Means land within any of the:

1. *coastal erosion overlay; or*
2. *coastal inundation overlay; or*
3. *Waimakariri flood management overlay; or*
4. *Plains flood management overlay, but limited to land where, in a 1 in 500 year Average Recurrence Interval flood event, either:*
 - a. *the water depth (measured in metres) x the water velocity (measured in metres per second) is greater than 1; or*
 - b. *the water depth is greater than 1m*

Please refer to the 19 February 2020 Preferred Option report for Coastal Hazards for the discussion about why the coastal erosion overlay and the coastal inundation overlay should be included within the definition of ‘high hazard’.

Effectiveness in Addressing Issue:

This approach would enable a more finely grained assessment of proposed developments, so that only those areas that are actually at high hazard from flooding are managed as such.

Option 7 would also give effect to the CRPS Policy 11.3.1 requirement to identify high hazard areas through the provisions of the district plan.

Risks:

There is a risk that development could be planned for an area on the assumption that the site is not high hazard, only for that status to be identified at the time a site-specific assessment was undertaken. However, given that a site-specific assessment would be required early in the development process, there would be opportunities for the proposal to be modified or withdrawn before the design was finalised.

Time or Budget Implications:

No additional modelling or mapping work would be associated with this approach.

Stakeholder and Community Interests:

Landowners and occupiers may assume that their land is not high hazard at first glance at planning maps, because it is not mapped as such, and so care would need to be taken to communicate the proposed provisions to them.

Recommendation:

Option 7 forms part of the recommended approach.

DEVELOPMENT OF PROVISIONS

Separate from the question of where high hazard and hazard areas are located is the question of how these areas should be managed to avoid inappropriate development, as required by s6(h) and the CRPS.

Consistent with the approach to be taken for other natural hazards, the recommendations are that the areas affected by flooding provisions would be shown on the planning maps as an overlay, rather than as a zone.

OPTION 8 – Transfer existing provisions to new flood areas

The operative SDP requires the management of flood hazard associated with a 50 year ARI flood event, through the imposition of a set minimum floor level in most of Tai Tapu township and the Lake Ellesmere flood area, and site specific assessments in the remainder of Tai Tapu and in the Lower Plains flood area.

Option 8 would transfer these management approaches to the new flood areas.

Effectiveness in Addressing Issue:

Outside high hazard areas, the CRPS requires new buildings to have an appropriate floor level above a 200 year ARI flood event, not just a 50 year ARI flood event. As such, a straight transfer of existing provisions to the new areas would not give effect to the CRPS or the RMA and would not be an effective way to address the issue.

Recommendation:

Option 8 does not form part of the recommended approach.

OPTION 9 – Develop new provisions for flood high hazard and flood hazard areas

Option 9 would see the development of new provisions for flood high hazard and flood hazard areas, consistent with the direction of the CRPS and provisions for other types of natural hazard, particularly coastal hazards.

Within flood high hazard areas, subdivision, use and development would be limited to proposals that met the requirements of RPS Policy 11.3.1 – avoidance of inappropriate development in high hazard areas.

Within flood hazard areas, the types of provisions would be similar to the operative SDP requirements for the Lower Plains flood area, but would require consideration of a 200 year ARI flood event, rather than a 50 year ARI event. The development of provisions would be guided by CRPS Policy 11.3.2 – avoid development in areas subject to inundation unless there is no increased risk to life and the subdivision, use or development meets certain mitigation standards.

ECan staff have indicated that they would prefer to review building floor levels on a site-specific basis to take into account local conditions, rather than setting a minimum floor height that may be overly cautious (and therefore expensive to build) in some locations, while being insufficient to achieve the required level of protection from flooding in others. This site-specific assessment approach is consistent with that taken in the Christchurch District Plan.

Consistent with the current approach, subdivision in areas subject to these provisions would consider the flood risk at the time of subdivision. This means that appropriate minimum building floor heights can be identified for the whole development at the outset and then applied to individual buildings, rather than each building requiring an individual assessment at the time of building consent.

Effectiveness in Addressing Issue:

Option 9 would see the development of provisions directly in response to the RPS and s6(h) of the RMA. As such, it would be an effective way to address the issue of managing flood hazards.

Risks:

The hazard areas identified through Options 2 or 3 will include areas that are not within an SDP flood area. The imposition of restrictions to manage the effects of inundation will need to be clearly communicated to newly affected landowners.

Some of the flood high hazard areas identified through Options 6 or 7 will probably already be in a SDP flood area, but Option 9 would mean that subdivision, use and development in these areas faced more obvious restrictions than in the SDP, because the activity status would be higher than the existing provisions. This may result in landowner pushback so the reasons for the change will also need to be clearly communicated.

Budget or Time Implications:

There would be time and expense associated with the development of provisions and engagement with stakeholders and landowners, but no more than for other DPR topics.

Stakeholder and Community Interests:

Landowners of properties identified as within or containing flood areas.

Recommendation:

Option 9 forms part of the recommended approach

7.0 Summary of partner/stakeholder engagement

7.1 Canterbury Regional Council

Canterbury Regional Council expressed support for the preferred options when they were first presented to DPC in November 2018.

Draft provisions have been developed in conjunction with Canterbury Regional Council technical staff.

7.2 Mahaanui Kurataiao Ltd

Mahaanui Kurataiao Ltd were invited to comment on this report before it was first presented to DPC in November 2018. No response was received in relation to this report, but comments have been received in relation to the draft provisions that are subject to a separate report.

8.0 Conclusion

Flooding is a significant natural hazard in parts of the district, and so its effects in these areas needs to be managed.

This report identifies a preferred set of options for the identification of affected areas and a further preferred option for the development of provisions, including landowner and stakeholder engagement, s32 analysis and drafting.

Partners and stakeholders have been engaged during the development of draft provisions, and landowners will be engaged once DPC confirms the preferred options for managing the flood high hazard and flood hazard areas.

9.0 Preferred Options for further development

The Project Team recommends that the following options be adopted for targeted landowner and stakeholder engagement, s32 analysis and drafting:

1. In relation to flood area identification:

- a. Option 2a – to use a combination of the DHI rain on grid modelling (200 year ARI, 8.5 RCP scenario) and the updated ECan Selwyn River/Waikirikiriri modelling to identify areas of hazard in relation to flooding (Plains Flood Management Overlay); and
 - b. Option 5 – to amend the existing Waimakariri River Flood Category A flood area by removing that land that is now protected by the secondary stopbanks, and rename it to the Waimakariri Flood Management Overlay; and
 - c. Option 7 – to identify other high hazard areas via a definition of ‘high hazard’ consistent with the CRPS definition, rather than by mapping.
2. In relation to the development of provisions, Option 9 – to develop new provisions for flood hazard and flood high hazard areas, consistent with the direction of the CRPS.

10.0 Recommendations

1. That the committee notes the report.
2. That the Committee endorses the Preferred Options for ‘Flooding’ for further development and engagement, Section 32 evaluation and drafting phases.

Appendix A Canterbury Regional Policy Statement (Revised 2017)

Chapter 11 – Natural Hazards

Statement of local authority responsibilities

Section 62 of the Resource Management Act 1991 (RMA) requires that a regional policy statement must state the local authority responsible in whole or any part of the region for specifying the objectives, policies and methods for the control of the use of land to avoid or mitigate natural hazards.

Local authority responsibilities for the control of the use of land for natural hazards in the Canterbury Region are as follows:

1. The Canterbury Regional Council

Will be responsible for specifying the objectives, policies and methods for the control of the use of land in the following areas:

- (a) within the 100-year coastal erosion hazard zones outside of greater Christchurch, as defined by maps in the Canterbury Regional Coastal Environment Plan.
- (b) within areas in greater Christchurch likely to be subject to coastal erosion and sea water inundation including the cumulative effects of sea level rise over the next 100 years where provisions are not specified in an operative district plan; and
- (c) within the beds of rivers and lakes; and
- (d) within the coastal marine area for the purpose of avoiding or mitigating natural hazards.

2. Territorial authorities

Will be responsible for specifying the objectives, policies, and methods for the control of the use of land, to avoid or mitigate natural hazards in their respective areas excluding those areas described in 1(a), 1(c) and 1(d) above.

3. Joint Responsibilities

Local authorities will have joint responsibility for specifying the objectives, policies, and methods for the control of the use of land, to avoid or mitigate natural hazards in areas subject to seawater inundation. The Canterbury Regional Council will be limited to developing objectives, policies and non-regulatory methods. Territorial authorities will develop objectives, policies and methods which may include rules.

Objective 11.2.1 Avoid new subdivision, use and development of land that increases risks associated with natural hazards

New subdivision, use and development of land which increases the risk of natural hazards to people, property and infrastructure is avoided or, where avoidance is not possible, mitigation measures minimise such risks.

Objective 11.2.2 Adverse effects from hazard mitigation are avoided or mitigated

Adverse effects on people, property, infrastructure and the environment resulting from methods used to manage natural hazards are avoided or, where avoidance is not possible, mitigated.

Objective 11.2.3 Climate change and natural hazards

The effects of climate change, and its influence on sea levels and the frequency and severity of natural hazards, are recognised and provided for.

Objective 11.2.4 Effective integration of the management of, and preparedness for, natural hazards

The level of cooperation between agencies and organisations necessary to achieve integrated management of Canterbury's natural hazards, and preparedness for natural hazards is maintained or enhanced.

Policy 11.3.1 Avoidance of inappropriate development in high hazard areas

To avoid new subdivision, use and development (except as provided for in Policy 11.3.4) of land in high hazard areas, unless the subdivision, use or development:

1. is not likely to result in loss of life or serious injuries in the event of a natural hazard occurrence; and
2. is not likely to suffer significant damage or loss in the event of a natural hazard occurrence; and
3. is not likely to require new or upgraded hazard mitigation works to mitigate or avoid the natural hazard; and
4. is not likely to exacerbate the effects of the natural hazard; or
5. Outside of greater Christchurch, is proposed to be located in an area zoned or identified in a district plan for urban residential, industrial or commercial use, at the date of notification of the CRPS, in which case the effects of the natural hazard must be mitigated; or
6. Within greater Christchurch, is proposed to be located in an area zoned in a district plan for urban residential, industrial or commercial use, or identified as a "Greenfield Priority Area" on Map A of Chapter 6, both at the date the Land Use Recovery Plan was notified in the Gazette, in which case the effects of the natural hazard must be avoided or appropriately mitigated; or
7. Within greater Christchurch, relates to the maintenance and/or upgrading of existing critical or significant infrastructure.

Methods – Territorial authorities:

Will

7. (b) Within greater Christchurch: Within 5 years of Policy 11.3.1 becoming operative set out objectives, policies and methods, in district plans to give effect to Policy 11.3.1.
- (c) Within greater Christchurch: Within 5 years of Policy 11.3.1 becoming operative identify high hazard areas through the provisions of their district plans. When identifying land likely to be subject to coastal erosion and sea water inundation over the next 100 years, may take into account the following criteria:
 - (i) The effects of climate change including associated sea level rise.

Methods – Local authorities:*Will:*

9. Work together to investigate and define potential high hazard areas where information is uncertain or insufficient.

Policy 11.3.2 avoid development in areas subject to inundation

In areas not subject to Policy 11.3.1 that are subject to inundation by a 0.5% AEP flood event; any new subdivision, use and development (excluding critical infrastructure) shall be avoided unless there is no increased risk to life, and the subdivision, use or development:

1. is of a type that is not likely to suffer material damage in an inundation event; or
2. is ancillary or incidental to the main development; or
3. meets all of the following criteria:
 - (a) new buildings have an appropriate floor level above the 0.5% AEP design flood level; and
 - (b) hazardous substances will not be inundated during a 0.5% AEP flood event;

provided that a higher standard of management of inundation hazard events may be adopted where local catchment conditions warrant (as determined by a cost/benefit assessment).

When determining areas subject to inundation, climate change projections including sea level rise are to be taken into account.

Methods – Territorial authorities:*Will:*

4. Set out objectives and policies, and may include methods in district plans to avoid new subdivision, use and development of land in known areas subject to inundation by a 0.5% AEP flood event, other than in the circumstances determined in Policy 11.3.2 clauses (1) to (3).
5. Ensure that flooding hazards are assessed before any new areas are zoned or identified, in a district plan, in ways that enable intensification of use, or where development is likely to cause adverse effects.
6. Where there is a known flooding risk, include provision in their district plans that require a 0.5% AEP flood event to be determined, and its effects assessed, prior to new subdivision, use or development of land taking place. Where the territorial authority has adopted a standard less frequent than a 0.5% AEP flood event, the expected flow and effects of that less frequent AEP flood event will be determined.

Policy 11.3.4 Critical infrastructure

New critical infrastructure will be located outside high hazard areas unless there is no reasonable alternative. In relation to all areas, critical infrastructure must be designed to maintain, as far as practicable, its integrity and function during natural hazard events.

Methods – Territorial authorities:*Will:*

5. Set out objectives and policies, and may include methods in district plans to ensure that new critical infrastructure is located outside known high hazard areas, unless there is no reasonable alternative.

Should:

6. Where critical infrastructure is located in high hazard areas, encourage the provider to ensure that it will be able to be maintained and reinstated, if necessary, within a reasonable timeframe.
7. Ensure the potential effects of natural hazards are taken into account in the development of any new critical infrastructure.

Policy 11.3.5 General risk management approach

For natural hazards and/or areas not addressed by policies 11.3.1, 11.3.2, and 11.3.3, subdivision, use or development of land shall be avoided if the risk from natural hazards is unacceptable. When determining whether risk is unacceptable, the following matters will be considered:

1. the likelihood of the natural hazard event; and
2. the potential consequence of the natural hazard event for: people and communities, property and infrastructure and the environment, and the emergency response organisations.

Where there is uncertainty in the likelihood or consequences of a natural hazard event, the local authority shall adopt a precautionary approach.

Formal risk management techniques should be used, such as the Risk Management Standard (AS/NZS ISO 31000:2009) or the Structural Design Action Standard (AS/NZS 1170.0:2002).

Methods – Territorial authorities:*Will:*

3. Ensure that natural hazards are assessed before any new areas are zoned or identified in a district plan, in ways that enable intensification of use, or where development is likely to cause adverse effects.
4. Set out objectives and policies, and may include methods in district plans to ensure that subdivision, use or development of land will be avoided if the risk from natural hazards is unacceptable.
5. Set out objectives and policies, and may include methods in district plans to ensure that where subdivision, use or development occurs in an area where there is residual risk from natural hazards, appropriate mitigation is required to manage that risk.

Should:

6. Request applicants for privately initiated plan changes or resource consents, where relevant, to provide baseline information or fund investigation on risks or impacts of natural hazards such as flooding, land instability, coastal hazards or active faults at a local scale, in order that the environmental effects of the proposal or change can be adequately assessed at an appropriate level of detail. This may include working with the Canterbury Regional Council to gather information.

Policy 11.3.6 Role of natural features

The role of natural topographic (or geographic) and vegetation features which assist in avoiding or mitigating natural hazards should be recognised and the features maintained, protected and restored, where appropriate.

Methods – Local authorities:

Will:

1. When setting out objectives, policies or methods in their regional and district plans, recognise the role of natural features in providing mitigation for the adverse effects of natural hazards and provide for the maintenance and protection of those features where appropriate.
2. Work with stakeholders; including Ngāi Tahu as tāngata whenua and landowners to encourage and promote the maintenance and enhancement of natural features that assist in the avoidance or mitigation of the effects of natural hazards.

Policy 11.3.7 Physical mitigation works

New physical works to mitigate natural hazards will be acceptable only where:

1. the natural hazard risk cannot reasonably be avoided; and
2. any adverse effects of those works on the natural and built environment and on the cultural values of Ngāi Tahu, are avoided, remedied or mitigated.

Alternatives to physical works, such as the relocation, removal or abandonment of existing structures should be considered.

Where physical mitigation works or structures are developed or maintained by local authorities, impediments to accessing those structures for maintenance purposes will be avoided.

Methods – Territorial authorities:

Will:

2. Set out objectives and policies, and may include methods in district plans to avoid impediments to accessing community owned mitigation structures for maintenance purposes.

Methods – Local authorities:*Will:*

3. Set out objectives and policies, and may include methods in regional and district plans to ensure new hazard mitigation works will only be undertaken in accordance with the provisions of Policy 11.3.7.
4. Use iwi management plans and engage with Ngāi Tahu as tāngata whenua and papatipu rūnanga to assist when determining actual or potential adverse effects of hazard mitigation works.

Policy 11.3.8 Climate change

When considering natural hazards, and in determining if new subdivision, use or development is appropriate and sustainable in relation to the potential risks from natural hazard events, local authorities shall have particular regard to the effects of climate change.

Methods – Local authorities:*Will:*

1. When setting out objectives, policies or methods in regional and district plans, take into account the current projections on the effects of climate change.

Policy 11.3.9 Integrated management of, and preparedness for, natural hazards

To undertake natural hazard management and preparedness for natural hazard events in a coordinated and integrated manner by ensuring that the lead agencies have particular regard to:

1. the investigation and identification of natural hazards;
2. the analysis and mapping of the consequential effects of the natural hazards identified;
3. the effects of climate change and resulting sea level rise;
4. the setting of standards and guidelines for organisations involved in civil defence and emergency management;
5. the development and communication of strategies to promote and build community resilience; and
6. any other matters necessary to ensure the integrated management of natural hazards in the Canterbury region.

Methods – Territorial authorities:*Should:*

5. Work with the Canterbury Regional Council, other partner organisations and members of their communities to address the matters relating to natural hazards identified in Policy 11.3.9 (1) to (6) which are of particular relevance to the areas for which each is responsible.

Methods – Local authorities:*Will:*

6. Work with emergency response organisations and critical infrastructure providers, to prepare and implement emergency readiness plans pursuant to the Civil Defence Emergency Management Act 2002.

Should:

7. Raise public awareness of natural hazards, including provision and publicising of information about what natural hazards exist in various localities and what people can do to be prepared.
8. Initiate, coordinate and promote activities that assist communities to build resilience to the effects of natural hazards.
9. Assist vulnerable communities to adapt to the consequences of natural hazards, including those that are likely to be adversely affected by climate change and resultant sea level rise.

Glossary and Definitions***Critical infrastructure***

Infrastructure necessary to provide services which, if interrupted, would have a serious effect on the communities within the Region or a wider population, and which would require immediate reinstatement. This includes any structures that support, protect or form part of critical infrastructure. Critical infrastructure includes:

1. regionally significant airports
2. regionally significant ports
3. gas storage and distribution facilities
4. electricity substations, networks, and distribution installations, including the electricity distribution network
5. supply and treatment of water for public supply
6. storm water and sewage disposal systems
7. telecommunications installations and networks
8. strategic road and rail networks (as defined in the Regional Land Transport Strategy)
9. petroleum storage and supply facilities
10. public healthcare institutions including hospitals and medical centres
11. fire stations, police stations, ambulance stations, emergency coordination facilities.

High hazard area

High hazard areas are:

1. flood hazard areas subject to inundation events where the water depth (metres) x velocity (metres per second) is greater than or equal to 1 or where depths are greater than 1 metre, in a 0.2% annual exceedence probability flood event;
2. land outside of greater Christchurch subject to coastal erosion over the next 100 years; and
3. land within greater Christchurch likely to be subject to coastal erosion including the cumulative effects of sea level rise over the next 100 years. This includes (but is not limited to) the land located within Hazard Zones 1 and 2 shown on Maps in Appendix 5 of this Regional Policy Statement that have been determined in accordance with Appendix 6; and
4. land subject to sea water inundation (excluding tsunami) over the next 100 years. This includes (but is not limited to) the land located within the sea water inundation zone boundary shown on Maps in Appendix 5 of this Regional Policy Statement.

When determining high hazard areas, projections on the effects of climate change will be taken into account.

Appendix B NES for Telecommunications Facilities

Regulation 57 District rules about natural hazard areas disapplied

- (1) A territorial authority cannot make a natural hazard rule that applies to a regulated activity.
- (2) A natural hazard rule that was made before these regulations came into force, does not apply in relation to a regulated activity.
- (3) In this regulation, natural hazard rule means a district rule that prescribes measures to mitigate the effect of natural hazards in an area identified in the district plan as being subject to 1 or more natural hazards.

Appendix C Selwyn River/Waikirikiri Floodplain Investigation

[Preferred Option Report NH - Flood Hazard -Appendix C -Selwyn River floodplain investigation](#)

Appendix D Regional Policy Statement Modelling for Selwyn District Council – District Plan

[Preferred Option Report NH - Flood Hazard -Appendix D-RPS modelling](#)

Appendix E Flood Hazard Update for Selwyn District Plan Review

[Preferred Option Report NH - Flood Hazard -Appendix E - Flood Hazard update for Selwyn DPR](#)