

11. Natural Hazards

Introduction

A natural hazard is defined in the Resource Management Act 1991 (RMA) as any atmospheric, earth or water related occurrence that may adversely affect human life, property or other aspects of the environment. They include earthquake, tsunami, liquefaction, erosion, volcanic and geothermal activity, landslip, subsidence, sedimentation, wind, drought, fire and flooding. On their own, natural processes do not constitute a hazard; they only become hazardous when they adversely affect human lives, property and infrastructure.

Marlborough is characterised by its physical contrasts. The diversity of landscape, climatic conditions and coastline, combined with dynamic geological forces mean that most of the hazards described above can be experienced in Marlborough. The only exceptions are volcanic and geothermal hazards.

Civil defence emergency management in New Zealand is based on four principles – reduction, readiness, response and recovery. The Marlborough Civil Defence Emergency Management Plan (CDEMP) provides strategic direction for the effective and efficient management of all hazards in the District. The CDEMP details the frameworks for readiness, response and recovery. A risk assessment of all likely hazards and consequences is identified in the CDEMP. Earthquakes are identified as having an extreme risk rating, flooding and wildfire have a high risk rating, while coastal erosion and tsunami have a low risk profile.

The Council can act to reduce the risk of natural hazards adversely affecting life, property and regionally significant infrastructure. Using its functions under the RMA to control the use of land to avoid or mitigate natural hazards, the Council can influence the location and management of new developments to ensure that they are not subject to unreasonable risk. Other land uses may adversely affect hazard mitigation works and these can be similarly controlled to ensure that the integrity of the works is not compromised.

Issue 11A – Natural hazards in Marlborough, particularly flooding, earthquakes and land instability, have the potential to cause loss of life and significant damage to property and regionally significant infrastructure.

Marlborough is subject to a wide range of naturally occurring hazards. Earthquakes, tsunamis, land instability, severe rainfall, flooding, wind, drought, fire, hail and snowfall can occur in Marlborough. From experience, the two most potentially damaging natural hazards in Marlborough are major floods in the Wairau River catchment and high magnitude earthquakes from the rupture of a fault. However, the likelihood of any of these hazards occurring in any given year varies significantly. Similarly, the consequences of any natural hazard will depend on the nature, size and location of the hazard event and the land use in the area.

Flooding has been the most regular natural hazard experienced in Marlborough. Historically it has caused considerable damage to properties and infrastructure, especially to residential properties in both rural and urban environments, farm properties (including stock losses) and transportation links. Significant investment has been made to reduce the risk of flooding, including flood protection works along the Wairau River and its tributaries, and along the Waitohi and Waikawa Rivers in Picton. These works include changing the location of rivers through the construction of diversions and blocking off alternative outlet channels through the provision of

stopbanks. Due to the development that these works have enabled, it is not possible to reverse them and the Council has a responsibility to maintain the current “artificial” river pattern.

Eastern Marlborough contains the Wairau, Awatere and Clarence faults onshore and significant and proximate faults in Cook Strait, as well as a number of lesser but still active faults. These faults have the potential to cause significant damage to property and infrastructure and create considerable disruption. Seismic activity can also result in a number of different natural hazards, including liquefaction of soils, inundation by sea, salt water intrusion into freshwater aquifers and tsunamis.

Other potential hazards may have localised effects, such as flooding from streams and stormwater overflows, slope instability and fire. Slope instability involves the falling or sliding of material downslope caused by ground failure within bedrock or the overlying soil. This is of particular concern in some parts of Marlborough because of the potential for earth movements to affect residential sites, rivers and transportation routes.

Our actions in using and developing natural and physical resources can increase the risk and consequences of natural hazards. Building in areas prone to flooding, fault rupture and/or liquefaction and land instability will put peoples’ lives, property and infrastructure at risk. In some cases, the severity of the hazard may be able to be mitigated through good location, design and construction to the extent that the consequences are minimal.

Climate change has the potential to worsen the effects of some natural hazards and itself creates a new hazard of a rise in sea level. These issues are dealt with in Chapter 19 - Climate Change (Volume 1 of the Marlborough Environment Plan (MEP)).

[RPS, R, D]

Objective 11.1 – Reduce the risks to life, property and regionally significant infrastructure from natural hazards.

Natural hazards can have significant adverse effects on individuals and the community, including loss of life, personal injury, damage to property and disruption of day-to-day life, business and the provision of community infrastructure. For this reason, the objective seeks to reduce the risks and consequences of natural hazards. This objective also implements direction from the CDMP, which signals that resource management provisions have an important role to play in risk reduction.

General

[R, D]

Policy 11.1.1 – Establish the extent of land subject to flooding, liquefaction and tunnel gully erosion and identify this land within the Marlborough Environment Plan as a hazard overlay.

In order to reduce the risk of natural hazards it is first important to establish the land likely to be subject to these hazards. This will allow new land uses in these areas to be managed in a way that recognises the inherent risks of the development proceeding. The natural hazards identified in the policy are those to which management can be applied to reduce risk using the provisions of the RMA. The result of implementing this policy will be the production of natural hazard overlays. These will be mapped (or otherwise identified) and included in the MEP. Where there is uncertainty over the spatial extent of a natural hazard, a precautionary approach has been taken. This means that the overlay may be a conservative estimation. However, this approach is considered appropriate given the potentially significant consequences of natural hazards, especially the loss of life.

[RPS, R, D]

Policy 11.1.2 – In conjunction with Civil Defence, provide an emergency response to natural hazard events.

The provision of an emergency response to a natural hazard event is important in managing the adverse effects of the hazard. The Council is actively involved in the provision of a response to natural hazard events for which they are the lead agency, including floods, urban stormwater, sewer or water supply failure. The Council may also provide support or ancillary services to agencies leading the response to other emergency events such as earthquake or major fire. Once a state of local or national civil defence emergency has been declared, the Council will continue to provide services under the direction of the Civil Defence Controller. Details of the roles and responsibilities of emergency agencies and a commitment to a coordinated and collaborative approach to hazards events are included in the CDEMP. This policy also records the intent to continue to be involved in emergency responses on an ongoing basis and recognises that the role of the Council is complimentary to that of Civil Defence.

Flooding – Flood management

[R]

Policy 11.1.3 – To actively manage any flood hazard through the provision and maintenance of flood defences and other flood mitigation works, where there is significant community benefit.

One of the means of reducing the risk of flooding is to provide flood defences to protect the existing population, properties and community infrastructure. On the Lower Wairau Plain, a significant investment has been made over a considerable period of time to protect Blenheim, other towns and the surrounding rural land through the construction and maintenance of stopbanks and the training and diversion of rivers. The Waitohi and Waikawa Rivers in Picton are the only other rivers to which the Council has administered flood defences.

The costs of managing flood hazards are significant. This policy identifies a threshold for justifying such intervention. The initial expenditure to establish flood defences and the ongoing maintenance expenditure must be warranted by significant community benefit. Those benefits will have to be identified and evaluated on a case-by-case basis.

This policy is also moderated by the remaining provisions of this chapter, which seek to avoid or mitigate the adverse effects of flooding by management of new land uses in flood prone areas. This should reduce the demand for additional flood defences.

[R]

Policy 11.1.4 – Establish and maintain floodway capacities for Marlborough’s rivers to the following standards:

- (a) to an annual recurrence interval of 1 in 100 years for major rivers on the Wairau River floodplain (below the confluence with the Waihopai River);
- (b) to an annual recurrence interval of 1 in 50 years for the Waitohi and Waikawa Rivers; and
- (c) to an annual recurrence interval of 1 in 50 years for rivers and drainage channels that provide for urban stormwater disposal.

This policy establishes standards for the rivers for which the Council provides flood defences. It also applies to rivers and drainage channels that receive urban stormwater discharges. An annual recurrence interval is the expected period between river flows of a particular magnitude (in other words, a flood of that magnitude has a certain probability of being exceeded in any year). Historical records of flood flows are used to determine the annual recurrence intervals specified in the policy. The standards in (a) to (c) reflect those adopted by the Council in the Rivers and Land Drainage Asset Management Plan. They provide a measure of the level of protection provided by

stopbanks, river diversions, detention dams, stopbank erosion protection measures, river channel clearing, channel excavation channel training, flow control gates and other flood mitigation measures.

[R, D]

Policy 11.1.5 – Enable the maintenance of existing Marlborough District Council administered flood defences and other Council initiated flood mitigation works.

Given the population and community infrastructure that relies on the protection provided by existing Council administered flood defences, it is important that flood defences be maintained to the standards specified in Policy 11.1.4. This policy signals that the maintenance of the flood defences and other flood mitigation works will be enabled. Maintenance could involve works in the river bed or floodway, or on the landward side of flood banks. Regional and district rules will therefore both be required to implement the policy. These rules will assist to provide for the social and economic wellbeing and safety of the communities protected by the Council administered flood defences. The designation of Council administered floodways also enables any maintenance works that would otherwise be covered by Section 9(3) of the RMA to occur (see Policy 11.2.1).

[R]

Policy 11.1.6 – Recognise and provide for gravel extraction as a means of mitigating the adverse effects of gravel deposition in river beds.

Gravel that naturally accumulates in river beds can act to impede flood flows and encourage bank erosion. There is a history of strategic removal of accumulated gravel in Marlborough's rivers (especially the Wairau River) to maintain the floodway capacities specified in the standards of Policy 11.1.4 and reduce the potential for bank undercutting and erosion. This extracted gravel also provides a significant resource that is used in road construction and maintenance and the construction industry.

Provided the adverse environmental effects of gravel extraction are avoided, remedied or sufficiently mitigated, the removal of gravel from the river bed in these circumstances has positive outcomes. The rate and permanence of gravel accumulation is variable and depends on the occurrence of floods and other characteristics specific to each river. A single large flood can significantly change the amount of gravel available and the location of extraction. Regular riverbed monitoring and observations are undertaken to determine the acceptability of gravel extraction at any location and any extraction operation will need to be limited in duration so that its impact can be monitored.

[R]

Policy 11.1.7 – Mitigate the adverse effects of gravel extraction on ecological and recreational values, water clarity and bank stability by:

- (a) **avoiding, where practicable, extraction from the wet bed of any river;**
- (b) **placing limits on:**
 - (i) **the timing of operations (especially to avoid bird nesting);**
 - (ii) **the method of extraction;**
 - (iii) **the location of the extraction and access to the location;**
 - (iv) **the amount of gravel that can be extracted; and**
 - (v) **the length of time over which the extraction can occur.**

The main adverse effects caused by the extraction of gravel from river beds are disturbance of bird nesting, impacts on fish habitat, disturbance of recreational activity, sedimentation causing reduced clarity of water, river bank erosion and its potential impact on existing structures located in the riverbed. These effects can be minimised by controlling the method, location, timing, amount and duration of the gravel extraction operation as set out in (a) and (b).

Flooding – management of activities in flood prone areas

[D]

Policy 11.1.8 – Unless provided for by Policy 11.1.10(a), avoid locating houses and other habitable structures, including associated on-site wastewater management systems, where they could be inundated or otherwise damaged by flood events.

The policy directs that to avoid or mitigate the adverse effects of flooding, any house or other habitable structure should be free from inundation. It also recognises that the servicing of the house in terms of domestic wastewater is important in terms of avoiding material damage to properties. The exception recognises that Policy 11.1.10(a) provides a means of mitigating the adverse effects of flooding by establishing minimum floor levels.

[R, D]

Policy 11.1.9 – Establish a hierarchy of flood risk as follows:

- (a) **Level 1: Land that suffers flooding of shallow, low velocity water in a flood event with an annual recurrence interval of 1 in 50 years;**
- (b) **Level 2: Land that suffers flooding but the depth/velocity of the flooding is not well understood, or cannot easily be expressed relative to natural ground level, in a flood event with an annual recurrence interval of 1 in 50 years, or land within 8 metres of any lake, river or wetland;**
- (c) **Level 3: Land that suffers flooding of deep, fast flowing water in a flood event with an annual recurrence interval of 1 in 50 years, or land in the bed of any lake or river or in any wetland; and**
- (d) **Level 4: Land that has the potential to suffer flooding of deep, fast flowing water in an extreme flood event that overwhelms stopbanks and other constructed flood defences.**

Through a combination of historical records and modelling, the Council has been able to characterise the nature of likely flood events. The different flood hazard levels in the policy (in terms of depth and velocity) reflect the potential severity of flooding. Flood risk increases from Level 1 to Level 4, creating a hierarchy of flood risk. The hierarchy allows the management of flooding to be specifically tailored to reflect the risk. In other words, avoiding or mitigating a Level 1 flood risk requires a different response to avoiding or mitigating a Level 4 flood risk. This is reflected in subsequent policies. The four levels of flood risk will each be represented by separate flood hazard overlays.

An annual recurrence interval of 50 years has been used as the relevant measure of flood risk as it reflects the standard specified in the New Zealand Building Code for managing flood risk to buildings. Level 2 and Level 3 also include land within or in close proximity to lakes, rivers and wetlands. This is because this land has a greater potential to be flooded. It also ensures that the risk of flooding is managed where no historical records exist or where no modelling has been undertaken. Level 4 is an extreme flood event and is rarer than a flood with an annual recurrence interval of 1 in 100 years.

[D]

Policy 11.1.10 – Control the erection and placement of houses and other habitable structures within areas subject to a flood hazard overlay, and reduce the risks to life and property by:

- (a) **establishing minimum floor levels for houses and other habitable structures subject to a Level 1 flood risk, set at least 450 mm above the natural ground level as measured at any point of the building footprint. The building footprint includes any associated on-site wastewater management system;**
- (b) **requiring houses and other habitable structures subject to a Level 2 flood risk to be subject to evaluation of the flooding hazard and effective mitigation actions; and**

(c) avoiding houses and other habitable structures in locations where they will be subject to a Level 3 flood risk.

Given the potential consequences of a person choosing to reside in a flood prone area, it is considered appropriate to exercise control over any such proposal. This will enable the Council to reduce the risk to life and property from flooding. The matters in (a) to (c) identify how that risk reduction will occur given the likely severity of any flooding event.

Minimum floor levels will be sufficient where land is subject to Level 1 flood risk, as this will mitigate any adverse effects by ensuring any house or other habitable structure is above flood waters and that people can still safely reside in the house/structure during and immediately after a flood event. The appropriate minimum floor level will be determined through the building consent process and in many cases a floor level of 450 mm above the natural ground level will be sufficient.

Where the flood hazard is not well understood (i.e. Level 2 flood risk), it is appropriate that a precautionary approach is taken and that the flood hazard is evaluated. The results of this evaluation may trigger other policies in this chapter. It is not appropriate to allow people to reside on land subject to a Level 3 flood risk, as the deep and fast flowing water would present an unacceptable risk to life and property.

[D]

Policy 11.1.11 – Avoid locating intensive residential, commercial or industrial developments on land subject to a Level 4 flood risk.

It is possible that areas protected by flood defences will experience extraordinary flood events that exceed the annual recurrence intervals specified in Policy 11.1.4 and subsequently overwhelm stop banks or other flood defences. In some areas, this will result in a sudden occurrence of deep, fast flowing waters that could endanger life, property and regionally significant infrastructure. Although such an event has a very low probability of occurring in any given year, the adverse effects could be catastrophic if intensive development is allowed to occur in these areas.

The Council has considered this and has signalled through this policy that it would be inappropriate to allow any future commercial, industrial or multi-lot residential developments to occur in areas subject to a Level 4 flood risk. This policy applies to the rezoning of land that would facilitate these developments or to resource consent applications for subdivision or development. In the case of resource consent applications for residential subdivision and development, the threshold for the application of the policy is the creation or development of lots less than one hectare. The density of development where lots are in excess of one hectare is considered an acceptable risk given the probability of flood breakout occurring.

[D]

Policy 11.1.12 – Where an activity within an area subject to a flood hazard overlay is dependent upon the provision of flood defences to reduce the risk of flooding, there must be an ongoing commitment to the maintenance of the flood defences over time.

The provision of flood defences (either new or existing) may be sufficient to reduce the risk of flooding of any proposed development. The protection afforded by the flood defence (whether public or private) will only be provided if it is maintained on an ongoing basis. For example, stopbanks can erode and vegetation can compromise the efficiency of a floodway or the integrity of a stopbank. If resource consent is to be granted for a development within an area subject to a flood hazard overlay and that resource consent is dependent on a flood defence, then a requirement for the private flood defence to be maintained should be imposed.

The Council is only likely to undertake maintenance of privately constructed flood defences where they directly adjoin and integrate with existing Council administered defences. In other situations, the obligation for maintenance will be that of the consent holder.

[D]

Policy 11.1.13 – Recognise that the risk to life and property during flood events is greater in rural environments.

Isolation of properties affects the ability of the Council and Civil Defence to provide an emergency response in the event of flooding. The greater the distance of flooded properties from Blenheim (the location of the Emergency Operations Centre) and other towns, the longer it will take to respond to the flooding, especially in the event of large scale or District-wide events. Some communities are proactively preparing readiness plans in recognition of the additional risks created by isolation.

The potential increase in flood risk caused by locating development in rural areas needs to be taken into account by individuals when purchasing properties. The Council can also recognise this issue when planning for residential growth in Marlborough. Consolidation of growth in and around existing urban areas will facilitate effective responses to flood events. This needs to be taken into account when considering the rezoning of land in rural environments to provide for residential, commercial or industrial developments.

[D]

Policy 11.1.14 – Require applicants for subdivision consent for land not serviced by a Marlborough District Council administered reticulated stormwater system to demonstrate that the method of stormwater management will not adversely affect any third party.

The subdivision of land often acts a precursor for land use change, including the use of rurally zoned land for residential, commercial or industrial purposes. Buildings and hardstand areas (e.g. drives, car parking and yards) constructed following the subdivision of land intercept rainwater that would otherwise have soaked into the ground (or ponded) and quickly directs it to other parts of the property or offsite. If the property is not serviced by a Council administered reticulated stormwater system, this stormwater has the potential to adversely affect neighbouring properties or properties further afield. It is important that the potential for flooding is considered as part of the process of creating future allotments. This will require consideration of the likely volume, rate and direction of stormwater runoff. The policy excludes allotments to be serviced by Council administered reticulated stormwater systems, as connection to these systems allows stormwater to be removed from the property effectively.

[D]

Policy 11.1.15 – Any allotment of less than one hectare proposed to be created in the Rural Environment Zone or the Rural Living Zone must be shown to have a minimum area free of flooding during a flood event with an annual recurrence interval of 1 in 50 years of:

- (a) 1,000 square metres; or
- (b) 80 percent of the property,

whichever is the greater.

Section 106(1)(a) of the RMA provides the Council with options through the subdivision consent process for managing the material damage to land or any structure on that land as a result of flooding (and other hazards). Policy 11.1.10 sets standards for new dwellings and associated servicing to minimise material damage. However, property owners will also have a reasonable expectation that they can also use the remainder of their property on an ongoing basis. This policy establishes a standard to minimise the amount of material damage that can occur to land. The threshold of one hectare is used to differentiate between residential properties and properties used for rural purposes. The Council's experience is that people residing on properties smaller than one hectare have expectations similar to residentially zoned properties, which is that their property will not be affected by flood events. The standards set in (a) and (b) ensure that most of a property remains capable of use during a flood event. An annual recurrence interval of 1 in 50 years reflects the standard specified in the New Zealand Building Code as the relevant measure of flood risk.

[R, D]

Policy 11.1.16 – Refine the boundaries of flood hazard overlays in response to:

- (a) changes to levels of protection provided by flood defences and other flood mitigation/management works; or
- (b) new observations of flood events or more detailed assessment of the flood hazard; or
- (c) changes in catchment hydrology due to land use change or climate change; or
- (d) changes in flood hydraulics due to channel aggradation or erosion, vegetation growth within the floodway or sea level rise.

The mapped flood risk will change from time to time either because the flood risk physically changes or because the Council's knowledge of flood risk improves with more information and/or analysis. Where the extent of the flood hazard changes as a result of the matters set out in (a) to (d), it will be necessary to refine the boundaries of the flood hazard overlay in the MEP. This refinement is likely to occur on an ongoing basis. Any such changes will have to pass through the First Schedule process of the RMA.

Earthquake and liquefaction

[D]

Policy 11.1.17 – Avoid locating residential, commercial or industrial developments on Rural Environment or Rural Living zoned land on the Wairau Plain east of State Highway 1/Redwood Street, unless remediation methods are to be used to reduce the level of liquefaction risk to an acceptable level.

Liquefaction is the process by which earthquake shaking causes increased pore water pressure in soils that in turn reduces the strength of the soils. The potential for shaking intensities sufficient to trigger liquefaction is significant given the overall seismicity of the District. Land underlain by the "Dillons Point Formation" on the Wairau Plain has an elevated risk of liquefaction. The Dillons Point formation is marine sediment deposited on the eastern margin of the Plain by previous marine processes and consists of grains of small and relatively uniform particle size. These characteristics, combined with high groundwater levels, are conducive to liquefaction. The western extent of the Dillons Point formation (at a thickness that represents a significant liquefaction risk) is approximately State Highway 1 and Redwood Street.

This policy signals that it would be unwise to allow any future commercial, industrial or multi-lot residential developments to occur on rurally zoned land underlain by the Dillons Point formation due to the high risk of liquefaction. Such liquefaction has the potential to cause significant damage to buildings and infrastructure and would therefore cause significant disruption to residential, commercial or industrial activity. A policy of avoiding such development of land ensures that significant investments and community infrastructure is not subject to unnecessary risk.

In some situations, it may be possible to implement remediation methods to reduce the level of risk to an acceptable level. This will be assessed on a case-by-case basis.

This policy applies to the rezoning of land that would facilitate these developments or to resource consent applications for subdivision or development. In the case of resource consent applications for residential subdivision and development, the threshold for the application of the policy is the creation or development of lots smaller than one hectare. The density of development where lots are in excess of one hectare is considered an acceptable risk given the probability of an earthquake occurring.

[D]

Policy 11.1.18 – Where it is proposed to subdivide land zoned Urban Residential 2 – Greenfields and land identified in Appendix 23 for residential purposes, the subsoil of the site must be investigated to establish if specific foundation designs of buildings are required to mitigate the effects of liquefaction or lateral spread.

There are areas of land zoned for residential development that may have localised soils susceptible to liquefaction and/or lateral spread. The policy requires that, in the event of proposals to subdivide land within the Urban Residential 2 – Greenfields Zone and within the land identified in Appendix 23 for residential development, that the subsoil be specifically investigated to establish the risk of these hazards occurring in the event of an earthquake. For land zoned Urban Residential 2 – Greenfields, standards set out the nature of those investigations. The results of the investigation will determine whether specific foundation design will be required to mitigate the effects of liquefaction and/or lateral spread.

Land instability

[D]

Policy 11.1.19 – Control the erection and placement of structures within areas prone to tunnel gully erosion.

The extent of land potentially subject to tunnel gully erosion in Marlborough and the nature of the resulting hazard are well understood. The hazard is directly linked to loess soils that exist predominantly in the hill country along the southern boundary of the Wairau Plain. The Council (and its predecessor) has a long history of managing the risk of tunnel gully erosion. In areas prone to tunnel gully erosion, it is important that any new structure is not subject to an unreasonable risk of damage. The controls will be primarily applied through the Building Act 2004. The policy allows, in conjunction with Policy 11.1.20, the risks to life and property created by unstable ground to be reduced. Areas of loess soil are identified in the MEP.

[RPS, R, D]

Policy 11.1.20 – Continue to manage the Wither Hills Soil Conservation Reserve to maintain and enhance soil stability.

The Wither Hills Soil Conservation Reserve comprises 1,100 hectares of land the length of the southern boundary of the Blenheim urban area. The soils over the Reserve are loess and are particularly vulnerable to tunnel gully erosion. Eroded material has the potential to fill stream channels at the base of the Wither Hills and create a flood risk for the Blenheim urban area. This policy signals that soil conservation management will continue for the foreseeable future to manage this flood hazard. This will be achieved through an active programme aimed at maintaining and enhancing soil stability over the Reserve.

[D]

Policy 11.1.21 – Locate new structures and works to:

- (a) avoid them being damaged from the adverse effects of land instability; and
- (b) avoid any increase in the adverse effects of slope instability that the structure or work may cause.

Marlborough is characterised by steep terrain and in some locations, unstable geology. Combined with the potential for intense rainfall events, these factors create the potential for slope instability. Examples historically include rock/debris slumps, debris slides or flows, coastal erosion and tunnel gully erosion in various parts of the District. Establishing residential, commercial or industrial development or infrastructure supporting that development or linking our communities in locations prone to land instability will lead to unsustainable outcomes. This policy requires new structures and works to be located in environments that avoid adverse effects caused by land instability. It also addresses the situation of a structure or work exacerbating

those adverse effects. The policy will primarily be implemented through the zoning of land and the scale/intensity of activity that the zone rules enable. However, the policy can also be applied in a resource consent context when an assessment of environmental effects for the structure or work identifies a risk of land instability. This includes subdivision undertaken to enable more intensive use of the land. A safe and stable building platform will have to be established for the subdivision of land in certain environments.

Fire

[D]

Policy 11.1.22 – Require a buffer between dwellings, ancillary structures and land used for commercial forestry.

To reduce the risk of fire in rural environments, a setback distance will be imposed to restrict the proximity of:

- (a) houses and ancillary structures to existing plantations of commercial forestry; and
- (b) new plantations of commercial forestry to existing dwellings and other habitable structures.

The setback will create a buffer between the plantations and residential (and associated) activity, a potential source of ignition. The buffer will also reduce the risk of fires in plantations spreading to houses and other habitable structures.

Issue 11B – The use of natural and physical resources can make existing natural hazards worse.

Issue 11B recognises the undesirability of placing people and property in areas subject to natural hazards. People's actions can also increase the severity of existing hazards. Placing or constructing buildings, walls, fences and other impermeable structures, or depositing material in floodways will create a barrier to flood flows and potentially increase water levels or divert flood flows elsewhere. Planting of unsuitable trees and other vegetation within a floodway could also create similar effects, although trees also assist to maintain bank stability.

Excavation on or near a stopbank can compromise the integrity of the stopbank and any failure could result in the breakthrough of flood waters. The construction of structures on stopbanks can have similar effects, while structures constructed in close proximity to a stopbank can compromise the ability of the Council to access the flood defence for maintenance work or emergency response. In areas prone to land instability, the discharge of stormwater from buildings and impervious surfaces to land increases soil moisture saturation, making the soil more prone to ground failure.

Activities may be undertaken without any awareness that they may result in the adverse effects described above.

[R, D]

Objective 11.2 – Natural hazard mitigation measures, structural works and other activities do not increase the risk and consequences of natural hazard events.

Given the serious nature of the adverse effects caused by natural hazards, it is important that human activities do not increase the risk and consequences of natural hazard events. This objective seeks to ensure that this does not occur. The following policies identify activities of particular concern.

It is desirable that the potential for an increase in the risk and consequences of natural hazard events is considered prior to the activity occurring. This would avoid the need for remedial work to rectify the effects of inappropriate activities as well as the potential for significant adverse effects should a hazard event occur prior to the Council becoming aware of the activity or remedial work being carried out. This objective does not mean that the activities listed in the policies cannot occur, but it may mean that they have to be undertaken in a manner that sufficiently mitigates the potential for adverse effects.

[D]

Policy 11.2.1 – Designate Marlborough District Council administered floodways.

Land within Council administered floodways will be designated. This means that the floodways will be included, by way of a schedule and mapping, within the MEP. The land designated will be a combination of Council and privately owned land. The effect is that any person wanting to undertake work in a floodway (that may adversely affect the floodway) will require the written permission of the Council. This will allow the Council, as the requiring authority, to assess the proposal and its potential adverse effects on the floodway prior to the activity commencing.

[D]

Policy 11.2.2 – Control land uses on or in close proximity to existing Marlborough District Council administered flood defences and within floodways to ensure that they do not compromise the effectiveness of any defence or the efficiency of any floodway.

Land use activities undertaken on or in close proximity to existing flood defences and within floodways have the very real potential to compromise the effectiveness of the defence or the efficiency of the floodway. Of particular concern are activities that could affect the integrity of the flood defence (especially excavation on or close to stopbanks) and activities that physically obstruct flows within the floodway (e.g. planting of unsuitable vegetation, construction of structures and deposition of material). Activities that might impede access to the flood defence or floodway for maintenance purposes are also of concern.

Given the reliance of some communities on the performance of the flood defences and/or floodway, it is important that consideration is given to the potential for these adverse effects to occur and therefore the appropriateness of undertaking the activity. The most effective way to do this is to require resource consent to undertake the activities, as this will allow a thorough assessment of the proposal and its potential adverse effects prior to the activity occurring.

[R, D]

Policy 11.2.3 – Where appropriate, ensure that privately initiated and constructed flood defences integrate with Marlborough District Council administered flood defences.

In some situations, individuals may choose to privately construct flood defences to protect their own property. If these defences are not constructed to integrate with the protection already provided by existing Council administered flood defences in the vicinity, then the new flood defence may be counter-productive. Regard can be had to the need for integration of flood defences when considering resource consent applications to construct the new defence.

[D]

Policy 11.2.4 – Where appropriate, require the creation of esplanade reserves and esplanade strips (as part of the subdivision consent process) to enable the mitigation of flooding hazards and to provide access for maintenance purposes. Priority rivers for setting aside esplanade reserves and esplanade strips for this purpose are:

- (a) rivers on the Wairau River Floodplain; and
- (b) rivers flowing through or in the vicinity of residential development in the Marlborough Sounds.

Maintenance of floodways and river channels can help to mitigate and manage flood hazards. For some rivers, it is desirable for erosion resistant vegetation to be planted and maintained on the

river channel edge. For other rivers, it is necessary for vegetation to be removed to provide for the free flow of flood water. Access to carry out river control works in the channel, such as gravel extraction, rock placement, aquatic vegetation removal or stop bank maintenance, may also be required. Council control of vegetation and access to and along a river bed can therefore be important. Vegetation control and access can be achieved through the creation of esplanade reserves and esplanade strips as part of the subdivision consent process.

The waterbodies identified in (a) and (b) are those where multiple landowners or a community would benefit from the flood mitigation works identified above. In this way, the policy acts to provide greater certainty about when the Council will utilise the esplanade reserve provisions of the RMA for flood hazard mitigation purposes.

[D]

Policy 11.2.5 – The width of any esplanade reserve or esplanade strip set aside for flood hazard mitigation shall generally be 8 metres, except on land adjoining the Wairau River, Omaka River, Waihopai River, Pelorus River or Rai River, where the width shall be 20 metres.

Under the RMA (Section 230), esplanade reserves of 20 metres width are required where any allotment of less than 4 hectares is created when land is subdivided. The Council has the discretion to vary this requirement for esplanade reserves or strips. The policy identifies that in many circumstances a reduction in width is appropriate if the reserve or strip is being taken for flood hazard mitigation. In most circumstances, 8 metres is sufficient to undertake river control works and to access the river for this purpose. Exceptions are set out in the policy and include larger rivers which, because of their scale, require a wider reserve or strip to undertake river control works.

Regard should also be had to the special circumstances identified in policies in Chapter 15 - Resource Quality (Water, Air, Soil), Chapter 8 - Indigenous Biodiversity and Chapter 9 - Public Access and Open Space.

[R, D]

Policy 11.2.6 – When considering any application for resource consent or notice of requirement for hazard mitigation works, have regard to:

- (a) the likely effectiveness of the mitigation works and the residual risks remaining after mitigation works are in place;
- (b) whether non-structural or soft engineering methods are a more appropriate option;
- (c) the cumulative effects of isolated structural mitigation works;
- (d) any adverse effect on existing hazard mitigation works;
- (e) responsibility for the ongoing maintenance of the mitigation works to the required standard; and
- (f) the method and effects of construction on the surrounding environment.

Although hazard mitigation works act to protect the community, the construction and ongoing presence of these works can themselves have adverse effects on the environment. Where they involve substantial modification to the natural character of the waterbody, these effects can be significant. Recognising the potential for adverse effects, this policy provides direction to ensure that any proposed new works are effective in the first instance and that the method of hazard mitigation is the most appropriate. These principles can be applied when processing resource consent applications required to undertake the work or any notice of requirement application to provide for the work. This will ensure that any adverse effects, including those on existing hazard mitigation works, are avoided or mitigated, and that mitigation works are maintained in an effective state on an ongoing basis.

[D]

Policy 11.2.7 – Where stormwater is to be discharged into a surface waterbody or drainage channel, there must be sufficient capacity within the waterbody to accommodate the likely rate of discharge without overtopping the banks or causing any scour.

Where land disposal of stormwater is not a viable option, it is likely that the collected stormwater will be discharged into a surface waterbody/drainage channel. To ensure that this discharge does not cause a flooding hazard downstream, it is important that there is sufficient capacity within the waterbody/drainage channel to accommodate the discharge. If this is not the case, the discharge will cause overtopping of the banks. Breakout can also occur when the discharge velocity causes scour of the bed and/or banks of the waterbody/drainage channel.

Methods of implementation

The methods listed below are to be implemented by the Council unless otherwise specified.

[D]

11.M.1 Zoning

Zoning will be used as a means to ensure that the scale and/or intensity of residential, commercial or industrial development recognises the inherent risk of natural hazards. Environments more prone to natural hazards will not be zoned to explicitly provide for such land uses in recognition of the potential threat to life, property and infrastructure.

A Floodway Zone will be used to identify river channels and land on Council-managed berms to reduce the risk of flooding on adjoining land. The use of the zone will allow the application of regional and district rules, as set out below, to avoid people undertaking activities that might impair the hydraulic efficiency of the floodway or the effectiveness of any flood defences.

[R, D]

11.M.2 Overlay

Areas subject to flooding and tunnel gully erosion hazards will be identified on the MEP maps through overlays. This will allow the application of regional and district rules, and other methods, (as set out below) to avoid and mitigate these natural hazards.

[D]

11.M.3 Designations

Floodways and floodway land will continue to be designated for river control works. This will enable the Council to undertake necessary maintenance work (where that is covered by Section 9(3) of the RMA) and to control activities on land that it does not own that might impair the functioning of the floodway.

[R]

11.M.4 Regional rules

Resource consent will be required to erect or place houses and other structures on land covered by Level 2 and Level 3 flood hazard overlays. This will allow the policies of this chapter to be applied to determine whether it is appropriate to establish these structures within areas subject to natural hazards.

A permitted activity standard will be used to establish an appropriate setback for structures from rivers as an additional means of avoiding or mitigating flood hazards. This recognises that where there is no flood hazard overlay, there is still a risk of flooding when building in close proximity to rivers. In addition, a setback acts to maintain the integrity of the river channel and the stability of the river bank.

Rules will be used to set minimum standards for the investigation of subsoils of land zoned Urban Residential 2 – Greenfields. In the event of proposals for the subdivision of land for residential purposes, the investigations will establish the risk of liquefaction and lateral spread and the need for specific foundation design of buildings to mitigate this risk.

Resource consent will be required to undertake land uses within the Floodway Zone to ensure that the activity does not reduce the capacity of any floodway or otherwise impair flood flow. Land uses to be controlled include:

- *construction of structures;*
- *inappropriate planting or removal of vegetation; and*
- *deposition of cleanfill and other material.*

This will allow the policies of this chapter to be applied to determine whether it is appropriate to undertake activities that have the potential to inhibit the channel efficiency of floodways.

Permitted activity standards will be used to establish appropriate setbacks for activities from stopbanks or any other flood mitigation structure. Resource consent will be required to undertake specified activities within close proximity to these flood defences to ensure that they do not adversely affect the effectiveness of the defence.

Permitted activity rules will be used to enable the Council to undertake the maintenance and repair of existing flood defences and other flood mitigation works. The permitted activity rules will link to works required to achieve and maintain the design intentions established for the waterbody/drainage channel. Works include gravel extraction required to maintain floodway capacity.

Permitted activity standards will be used to establish appropriate setbacks for:

- *dwelling and other habitable buildings from existing commercial forestry plantations; and*
- *commercial forestry plantations from existing dwelling and other habitable structures.*

[D]

11.M.5 District rules

Applications for subdivision consent involving land likely to be subject to material damage by erosion, falling debris, subsidence, slippage or inundation, will be required to demonstrate that a safe and stable building platform exists for each proposed allotment and the balance parcel. The building platform must be shown on the scheme plan and be supported by a report prepared by a chartered professional engineer with relevant skills and consistent with any relevant Council standards.

[R, D]

11.M.6 Building Act 2004

The Building Act 2004 requires a building consent to be refused for the construction of a building or major alterations to a building if land on which the building work is to be carried out is subject to, or is likely to be subject to, natural hazards. Consent is also to be refused if the building work will accelerate, worsen or result in a natural hazard on that land or any other property.

A minimum floor level will be established for new dwellings and other new habitable structures where those structures are proposed to be constructed on land subject to a Level 1 flood hazard. The floor level will be a minimum of 450 mm above natural ground conditions. Site specific factors, especially the elevation of the land at the site of the proposed building platform, will determine the minimum floor level.

[R, D]

11.M.7 Council activities

Maintain flood defences and other flood mitigation works to provide protection from flood events as set out in a Council Asset Management Plan. Policies 11.1.3 and 11.1.4 provide guidance as to when the Council will actively manage flood hazards through such intervention and the standards to which protection will be provided.

The Council will continue to maintain soil conservation works within the Wither Hills Soil Conservation Reserve in accordance with Rivers and Land Drainage Asset Management Plan.

[R]

11.M.8 Gravel permits

In addition to regional rules, the Council will utilise a system of gravel permits to authorise the extraction of gravel from river beds. These permits will be issued by a Council Rivers and Drainage Engineer and will specify the location of extraction and the amount of material to be extracted. Conditions can be imposed on the gravel permits to manage any site-specific adverse effects not addressed through regional rules. The permits provide the flexibility to respond to the accumulation of gravel in river beds in the short term. The duration of the permits will be limited to enable effective monitoring of the effect of the extraction on river bed levels and the surrounding environment.

[D]

11.M.9 Geotechnical reporting standards

The Council has established minimum requirements for the reporting of geotechnical investigations. These identify the expectations for geotechnical investigations and the reporting of those investigations. They also set out the reliance that the Council places on the information provided in geotechnical reports so that this is understood and appreciated.

[R, D]

11.M.10 Incentives

Where the Council owns or controls access to floodway land, differential pricing on gravel extracted under a gravel permit may be used to encourage gravel to be extracted from priority areas in terms of maintaining floodway capacity or other river control objectives.

[R, D]

11.M.11 Civil Defence Emergency Management Plan

The CDEMP provides strategic direction to assist the community to prepare for and respond to natural hazards in Marlborough. The CDEMP also details the responsibilities for readiness, response and recovery in the event of a hazard at an operational level.

Communities are supported to improve their readiness under the CDEMP, especially communities in remote locations.

[R, D]

11.M.12 Emergency response

Where information is available, the Council will help Civil Defence to provide an emergency warning of and response to natural hazards.

[R, D]

11.M.13 Information

Property specific hazard information, including whether the property is affected by a hazard overlay, will be available to the public through the MEP maps, the issue of LIMs or through general enquiry.

[R, D]

11.M.14 Monitoring

Monitor the performance of rivers and floodways against the operational standards established in Policy 11.1.4. This will involve regular surveys of river beds to establish the extent of sediment build-up or impeding vegetation growth, monitoring of relevant flood hydrology (including the effects of climate change) and hydraulic calculations to reassess flood carrying capacity. This work will establish whether further intervention is required to maintain floodway capacity.

[R]

11.M.15 Gravel Management Strategy

Using the information gathered through Method 11.M.14, the Council will determine the sustainable yield of gravel from Marlborough rivers on an ongoing basis. The allowable annual extraction is recorded in the Gravel Management Strategy. The Strategy is used to guide the processing of gravel permit applications. The Gravel Management Strategy is incorporated into the MEP by reference.

[D]

11.M.16 Reserve management plans

The Council will continue to manage farming and other activities on the Wither Hills Soil Conservation Reserve through a management plan prepared under the Reserves Act 1977. This plan clearly sets out soil conservation objectives, which then influence the nature of any lease to use the land for farming purposes through lease conditions.

Anticipated environmental results and monitoring effectiveness

The following table identifies the anticipated environmental results of the natural hazard provisions of the MEP. The anticipated environmental results are ten year targets, unless otherwise specified. For each anticipated environmental result, a series of indicators will be used to monitor the effectiveness of the natural hazard provisions.

Anticipated environmental result	Monitoring effectiveness
<p>11.AER.1</p> <p>Residential, commercial and industrial development does not locate in areas where natural hazards are most likely to occur.</p>	<p>The number of building consent and/or resource consent applications to erect or construct a structure or building refused for natural hazard reasons.</p>

Anticipated environmental result	Monitoring effectiveness
<p>11.AER.2</p> <p>Where development must occur in areas subject to natural hazard, the potential adverse effects of those natural hazards are sufficiently mitigated or otherwise managed by appropriate design and/or placement of structures and/or works.</p>	<p>Analysis of damage caused by specific hazard events demonstrates that there is no damage to development authorised under the provisions of the MEP.</p>
<p>11.AER.3</p> <p>The floodway capacity of Marlborough rivers (as specified in Policy 11.1.4) is maintained.</p>	<p>Results of monitoring undertaken in accordance with Method 11.M.14.</p> <p>The record of Council works to maintain floodway capacity.</p>