

# 8. Natural Hazards

## 8.1 Introduction

Natural hazard events include earthquakes, snow, tsunami, erosion, volcanic and geothermal activity, land subsidence, sedimentation, wind, drought, fire, or flooding which may adversely affect life, property, or other aspects of the environment. Natural hazard events may also occur in less obvious forms, such as over-exposure to sunlight.

The District Council is required under the Resource Management Act to control any actual or potential effects of the use, development, or protection of land including for the purpose of the avoidance or mitigation of natural hazard events.

The District Council and the Regional Council both have functions for avoiding or mitigating natural hazard events in the District.

The following natural hazard events are considered to be significant within the Kaikoura District:

### **Flooding**

Historically the fertile Kaikoura Plains and the Kaikoura township have been subject to periodic flooding from the Kowhai River and the numerous Mount Fyffe streams.

The potential effects from flooding of the Kowhai River and Mount Fyffe streams include:

- flooding of farmlands and gravel deposition, particularly to the north-east of the Kowhai River towards the Kaikoura township;
- flooding of the Kaikoura township and surrounding area;
- scouring and damage to the State Highway and South Island Main Trunk Railway, particularly at the bridges over the Kowhai and Hapuku Rivers;
- the loss of water supply, electricity and telephone services.

In other parts of the District debris carried by streams from smaller coastal catchments, and failures of road and track batters triggered by high intensity rainfalls, have the potential to cause relatively frequent blockages to the Main Trunk Railway and State Highway 1, typically between Oaro and Kahutara River, and between Mangamaunu and Kekerengu.

The Kaikoura "Major River Control, Drainage and Erosion Control Scheme" 1969. is an integrated flood, drainage and erosion control scheme administered by the Regional Council, and designed to protect the Kaikoura Township and surrounding plains from flooding and sediment deposition. However, flooding of December 1993, suggests that reliance on flood protection works alone, is not the most effective long term solution to minimise potential damage. The Regional Council has prepared a Draft Kaikoura Flood Plain Management Regional Strategy. The Kaikoura Civil Defence Plan has also been prepared by the Kaikoura District Council.

The areas at most risk from flooding are shown on the Planning Maps Part 4.. These areas are based on a geomorphological study undertaken by the Regional Council and incorporate historical flood data. While the flood hazard maps are based on the best available information, plan users should be aware that in extreme events, localised flooding or ponding may still occur on areas not marked as at-risk areas. In addition, the flood hazard maps relate to the Kaikoura Plains only, and there may be other areas in the District at risk from flood events. If there is any doubt as to the flood risk, it is recommended that developers check with the Regional Council prior to planning any building project.

### **Coastal erosion and inundation from the sea and tsunamis**

Several sections of the Kaikoura coastline are subject to coastal erosion, and this erosion poses a threat to the main transport links which pass through the District. Some 4.7 km of seawall protects the highway against sea-erosion and storm waves along the coastal strips between Oaro and the Kahutara River, and Mangamaunu and Okiwi Bay, where the main road and railway are located adjacent to the coast. Coastal erosion is widespread along the Kaikoura coastline and varies from -0.67 m/yr at Goose Bay to -0.29 m/yr at Oaro Beach. However, these rates are likely to vary significantly due to high intensity storms which can rapidly erode coastal areas. As a consequence of extreme weather events, some areas are potentially prone to inundation from the sea.

Tsunamis also have the potential to cause sudden inundation in low-lying areas. The Kaikoura District is at low risk from far-field tsunamis, which are generated by seismic activity in the mid-Pacific Ocean and along the South American Coast. However, there is some risk to the Kaikoura coastline, the township Esplanade, Beach Road and West End., South Bay and the settlements from a moderately sized near-field tsunami. Near-field tsunamis result from localised seismic activity causing submarine landslides, which in turn creates a large surface wave. As near-field tsunamis are unpredictable it is impractical to include rules to mitigate their effects. Instead, the Council is committed to a Civil Defence network which provides an educative role and which sets in place a process for dealing with the results of any tsunami.

### **Earthquakes**

Within the District there are several major faults capable of generating moderate to large earthquakes, including the Hope, Clarence, Fidget, Jordan Thrust and Kekerengu Faults. The location of these faults are as follows:

- Hope Fault - runs parallel to the Inland Road along the base of the Seaward Kaikoura Mountains from near Hapuku.
- Clarence Fault - runs along the Clarence River Valley from near the coast south towards the main Alpine Fault.
- Fidget Fault - splays off the Kekerengu Fault and Jordan Thrust near the Clarence River.
- Jordan Thrust Fault - runs along the Seaward Kaikoura Mountains and is responsible for the uplifting of this area.
- Kekerengu Fault - connects to the Fidget and Jordan Thrust faults in the Seaward Kaikoura Mountains and runs towards the Kekerengu River Mouth.

It is considered by geologists that the Conway segment of the Hope Fault, and the Jordan Thrust represent the greatest seismic risks in the District, with an earthquake of around 7.5 magnitude expected to occur at a frequency of between 90 and 400 years in the area. The intensity of an earthquake of this magnitude would be likely to result in: damage to masonry, chimneys, towers and elevated tanks, movement of frame houses and slipping of roadside cuttings and unsupported excavations. In addition there is the potential for damage to roads and railway infrastructure, the loss of power and telephone services, and for damage to underground water supply, sewers and drainage services.

## 8.2 Issue 1 - General

Natural hazard events can result in loss of life and damage to assets and infrastructure.

### 8.2.1 Objective 1

To avoid or mitigate loss of life, damage to assets or infrastructure and disruption to the community as a result of natural hazard events.

### 8.2.2 Policies

1. To increase the community awareness of the potential risk of natural hazards, through the provision of information and advice.
2. To develop and refine a natural hazards register to identify areas at risk and to assist in the development of appropriate mitigation methods.
3. To mitigate and where possible, avoid natural hazards in consultation with the Regional Council, by ensuring that emergency response procedures are put in place.
4. To ensure the activities of people, including the taking of gravel and sand, do not affect the ability of flood and coastal protection works and natural features to mitigate the effects of natural occurrences.

### 8.2.3 Implementation methods

1. To require resource consents to be obtained for taking of gravel over a specified amount in rural areas.
2. To consider natural hazard issues and policies in the resource consent process.
3. Through the Council's Annual Planning Process:
  - a. To continually develop and refine a hazards register, in conjunction with the Regional Council, as a basis for Council decisions regarding subdivision and building development. The information on the register may include information collected during the resource or building consent process, and any other information obtained through research. This information will be included on the Council's computer-based Geographic Information System.
  - b. In consultation with the Regional Council, to ensure the community is well advised and informed about the natural hazard risk in the District, and how to be prepared for civil defence emergencies; and facilitate the provision of information to the public about strategies to cope with natural hazards.
  - c. To avoid unnecessary duplication of provisions relating to natural hazards between the Kaikoura District Council and the Regional Council.
  - d. To liaise with the Regional Council to monitor the degree to which the long term trends in land use practices and patterns may increase the vulnerability of land to natural hazards such as flooding, coastal erosion, drought, fire and earthquakes.
  - e. In conjunction with the Regional Council, to ensure that emergency response procedures are in place to mitigate natural emergencies.
  - f. To encourage mutual support between the Kaikoura District Council and the Regional Council by providing information of any requirements under their respective plans.

- g. To negotiate with the Regional Council to avoid or resolve the potential for duplication of methods, such as rules or advocacy, in relation to natural hazards.

#### **Explanation and Reasons**

Education regarding the consequences of hazard events such as earthquakes, fire and severe weather extremes is considered to be the most practical means to mitigate these hazards.

A natural hazards register will contain data and other information on areas at risk from natural hazards in the District. This information will be freely available so that property owners and developers are informed, before undertaking any development of that site, of the information held by the Council regarding the natural hazard risks relating to a site or area.

The District Council and the Regional Council both have functions for avoiding or mitigating natural hazards in the District. This requires that appropriate emergency response procedures are put in place to minimise the consequences of hazard events.

Where protection structures exist or where natural features which mitigate natural hazards exist, it is important that activities of people do not adversely affect these structures or features.

## **8.3 Issue 2 - Flooding**

*Flooding has the potential to adversely affect people and property.*

### **8.3.1 Objective 1**

*To avoid loss of life, damage to assets or infrastructure and disruption to the community as a result of flooding.*

### **8.3.2 Policies**

1. To identify, where sufficient information exists, areas at risk of flooding from any source, and the degree of that risk.
2. To avoid expansion of urban areas of Kaikoura township and the establishment of residential units and habitable buildings on land prone to high flood risk that have been identified on the Flood Hazard Maps, or where the probability of flooding is greater than 0.2% AEP .
3. To discourage expansion of urban areas of Kaikoura township, and the establishment of residential units and habitable buildings, on land prone to moderate flood risk that have been identified on the Flood Hazard Maps, or where the probability of flooding is greater than 0.2% AEP.
4. To mitigate against the effects of flooding on buildings and people by providing for measures such as raised floor levels, setbacks from stopbanks, and clear floodways.
5. To enable the maintenance and replacement of existing flood protection structures.
6. To discourage utility lifelines such as communication and powerline support structures, from locating in the highest risk flood hazard areas where they may fail to provide essential communication during flood events.

### **8.3.3 Implementation Methods**

1. The delineation of flood hazard areas, and inclusion of rules in the Plan to:
  - a. control land use in these areas.

- b. where the Council does not possess sufficient information concerning the potential flood risk of a site, to require applicants for resource consent to fully assess the level of this risk and to provide a site assessment in terms of the specific nature of and likely effects of flooding on their properties.
  - c. control subdivision in these areas.
2. Through the Council's annual planning process:
- a. To co-operate with the Regional Council, and to consult with interested people and organisations, including Te Runanga o Ngai Tahu, regarding the maintenance and construction of river protection works.
  - b. To negotiate with the Regional Council to avoid or resolve the potential for duplication of methods, such as rules, in relation to flooding.

### **Explanation and Reasons**

The steep nature of Kaikoura's catchment areas means that the District's rivers and streams are subject to rapid changes in flow rates. They are also somewhat unpredictable in the short term and subject to build-ups of gravel in the bed aggradation.. Measures such as stopbanks, to control such rivers, are expensive to build and maintain and there is always a residual risk that the protection will fail or be overtopped. In comparison with these costs and residual risks, it is often preferable to avoid development altogether.

Sometimes potential damage may be mitigated sufficiently by locating buildings on higher ground or by raising sites or floor levels. In any case, development should always be set back from rivers or stopbanks, because the greatest risk to life and property exists in that proximity.

None of these considerations entirely rule out accepting some or all the risk of flood damage provided there is a benefit from doing so. If risk to life can be minimised and the economic benefit in periods between flood losses outweighs the risk of occasional damage, certain kinds of development might still be justified provided that the developers / occupiers are aware of the risk.

Essential utilities such as power and communications, which locate in hazard-prone areas, may fail during hazard events, which is when they would be most needed. To ensure that such lifeline services have the least risk of failure, it is important that they are discouraged from locating in high-risk areas.

## **8.4 Issue 3 - Coastal Hazards**

Coastal erosion, tsunami, storm events and salt water inundation have the ability to cause damage to property and threaten life.

### **8.4.1 Objective 1**

To avoid damage to assets or infrastructure, disruption to the community and loss of life as a result of coastal hazard events.

### **8.4.2 Policies**

1. To avoid subdivision, use and development that increases the risk to people and property from coastal hazard events.
2. To permit the establishment of new protection structures in the coastal environment only where they are the best practicable option for the future and so that adverse effects are avoided to the

extent practicable. When considering any application to renew or replace existing structures, the abandonment or relocation of those structures will be considered among the options.

3. To recognise and enhance the ability of natural features such as hard rock shorelines, beaches, sand dunes and wetlands to protect the built environment from coastal hazard events and to recognise that some natural features may migrate inland as the result of dynamic coastal process including sea level rise.
4. To recognise the possibility of sea level rise, to monitor predictions and research relating to sea level rise, and to vary or amend the District Plan as and when necessary so that effects of sea level rise are mitigated or avoided.

### 8.4.3 Implementation Methods

1. To control subdivision in areas subject to coastal hazards.
2. Co-operate with the Regional Council, and consultation with interested people and organisations, including Te Runanga o Ngai Tahu, in the maintenance and construction of coastal protection works.
3. Support the inclusion of rules in Regional Plans of the Regional Council, in relation to activities located in areas subject to the effects of coastal erosion and inundation.
4. Avoid the duplication of relevant provisions, including rules, in the Kaikoura District Plan and Regional Council plans.
5. Through the Council's annual planning process discourage activities which increase the rates of coastal erosion by providing information or advice to adjacent land owners.

#### **Explanation and Reasons**

Past experience indicates that once assets are threatened by coastal erosion and inundation, there is pressure to provide physical protective works, especially where high value assets are involved. However such works are often ineffectual, costly and have an adverse effect on the environment. Such structures should only be established when they are the best practicable option. Therefore, where possible, it is preferable to locate assets away from hazard prone areas rather than build protective works. This is consistent with the direction taken by the New Zealand Coastal Policy Statement.

## 8.5 Issue 4 - Land Instability

*New development should be avoided on land subject to subsidence, slipping, slumping or rockfalls.*

### 8.5.1 Objective 1

*To avoid or mitigate adverse effects such as damage to assets or infrastructure, disruption to the community, loss of life, or sedimentation, as a result of development on unstable land.*

### 8.5.2 Policy

To avoid the building and subdivision on unstable land unless damage to assets or infrastructure can be avoided or mitigated.

### 8.5.3 Implementation Methods

1. The identification of unstable land, and inclusion of rules in the Plan to control subdivision and land use in these areas.
2. At the time resource consent applications are made to subdivide, to take into account the stability of land.

#### **Explanation and Reasons**

Where land is unstable, the potential exists for property to be damaged and people's lives to be threatened. It is preferable for subdivision and building to be avoided on such land unless damage to assets or infrastructure can be avoided or mitigated.

## 8.6 Issue 5 - Over Exposure to the Sun

The increasing and recognised risk of melanoma and skin cancer from over-exposure to the sun.

### 8.6.1 Objective 1

To avoid or mitigate adverse health effects on people from over-exposure to the sun.

### 8.6.2 Policies

1. To retain and enhance natural shade, such as trees, in public areas such as reserves and parks.
2. To erect structures to provide shade in public areas where there is no shade from natural features.
3. To encourage the use of protective measures such as hats and sunscreen.

### 8.6.3 Implementation Methods

1. The provision of information and advice to visitors of the dangers of over-exposure to the sun.
2. The addition of shady areas to provide relief for people from the sun's rays.

#### **Explanation and Reasons**

Some 2000 New Zealanders die annually from melanoma of the skin. In addition, over 20 000 new cases of skin cancer are treated annually in New Zealand. It is estimated that 80% of all skin cancers could be prevented if greater protection from the sun's UV rays was ensured. It is particularly important for places like Kaikoura, which have high visitor numbers, that visitors are aware of the potential harm caused by sunburn.

Shade protection in public places is an obvious part of the solution. The Council is well placed to take a broad pro-active approach to the serious public health issue. In addition, managing the use and development of resources to provide for the health and well-being of people and their communities is within the Council's functions under the Resource Management Act. People are encouraged to take responsibility for their own well-being, but Council recognises that facilities in public places can assist in hazard avoidance."

## 8.7 Anticipated Environmental Results

1. The collation and provision of clear information outlining the natural hazard risk to all sites with the potential to be adversely affected by natural hazard events in the District, where this information is known to the Council.
2. Individual property owners and developers taking appropriate steps to minimise the natural hazard risk to people, property and infrastructure on their land.
3. Co-ordination of information collection and provision between the District and Regional Council and Te Runanga o Ngai Tahu, and the development of emergency response procedures to mitigate the natural hazards in the District.
4. The location of new subdivision and development in areas of low risk from natural hazard events or the mitigation of natural hazard events through the use of mitigation mechanisms such as filling, raised floor levels, etc.
5. The protection of natural features which mitigate natural hazards e.g. coastal cliff and dune systems.
6. A community that is better informed of potential natural hazards and who are better prepared for emergencies.
7. The avoidance of duplication of methods by the District Council and the Regional Council in relation to natural hazards.

# Natural Hazard Rules

## 8.8 Flood Hazard Areas refer to Part 4 of the Planning Maps.

### 8.8.1 General

- a. Stopbanks - All habitable buildings, residential units or camping grounds shall be setback a minimum of 100 metres from the centreline of any stopbank refer to section 4, “Definitions”, for following definitions - “Stopbank”, “Centreline of Stopbank”, “Habitable Building”, “Residential Unit”, “Camping Ground”..
- b. Where the Flood Hazard Maps show flood risk from both the Kowhai River, and the Mt Fyffe Tributaries / Hapuku River, the rules relating to the highest risk area shall apply.

### 8.8.2 Activities

Activities specified in the following table shall be assessed as permitted, controlled, restricted discretionary, unrestricted discretionary, or prohibited as shown, in respect of this section of the Plan.

**Table 8.8.2**

Status	Activity	Conditions
Permitted	<ol style="list-style-type: none"> <li>a. Any activity not listed as a controlled, restricted discretionary, unrestricted discretionary, or prohibited activity.</li> <li>b. All buildings within the Ocean Ridge Comprehensive Living Zone provided that they comply with the conditions set out in the conditions column.</li> </ol>	<p>Within the Ocean Ridge Comprehensive Living Zone all buildings, other than accessory buildings, shall be constructed on natural or finished ground levels that exceed RL 8.0m Lyttelton datum, 1937. For the purposes of this condition a habitable building is not considered an accessory building.</p>
Controlled	All habitable buildings, residential units and camping grounds located within flood hazard areas 3 and 3a, except that this rule does not apply to the Ocean Ridge Comprehensive Living Zone.	<p>Council's ability to impose conditions is limited to the following matters:</p> <ol style="list-style-type: none"> <li>i. Any associated earthworks;</li> <li>ii. Effects of movement of floodwaters including scouring;</li> <li>iii. Location of the building within the site in respect of potential flood risk;</li> <li>iv. Floor heights, based on a 0.2% probability of flooding in any one year.</li> </ol>
Restricted Discretionary	All habitable buildings, residential units and camping grounds located within flood hazard area 2a, except that this rule does not apply to the Ocean Ridge Comprehensive Living Zone.	<p>Council's discretion is restricted to the following matters:</p> <ol style="list-style-type: none"> <li>i. Any associated earthworks;</li> <li>ii. Effects of movement of floodwaters including scouring;</li> <li>iii. Location of the building within the site in respect of potential flood risk;</li> <li>iv. Floor heights, based on a 0.2% probability of flooding in any one year.</li> </ol>

Status	Activity	Conditions
Unrestricted Discretionary	<p>a. All habitable buildings, residential units and camping grounds located within flood hazard areas 2 or P.</p> <p>b. All habitable buildings, residential units and camping grounds located within 100 metres of the centreline of a stopbank except where the buildings or units are exempt under rule 8.8.3.</p> <p>c. All buildings and utility buildings associated with the distribution of electricity and the transmission of telecommunication and radio communication and their support structures located within flood hazard areas 1 or 1a, except for habitable buildings, residential units, campgrounds or flood control structures.</p> <p>d. Any building within the Ocean Ridge Comprehensive Living Zone that does not comply with the condition for permitted activity.</p>	Discretion is not restricted to any particular matter.
Prohibited	All habitable buildings, residential units and camping grounds located within flood hazard areas 1 or 1a.	Application may not be made for a resource consent.

### 8.8.3 Exemption

Rules 8.8.1 and 8.8.2 do not apply to the replacement or repair of a building which was lawfully established at or before May 10th 2000, provided that the floor area of any replacement building does not increase by more than 20m<sup>2</sup> in total to prevent incremental increases.

### 8.8.4 Duplication of Consents

Except for sections 13, 20, and 21 of this Plan, no other sections of this Plan shall apply to any activity seaward of the Hazard 1 or Hazard 2 Lines indicated in the Proposed Regional Coastal Environment Plan, provided that the consent of the Regional Council has already been obtained.

**Note:**

1. Subdivision of any land located within flood hazard areas 1, 1a, 2, 2a, or P is controlled in Section 13 Subdivision., Rule 13.11.2.
2. Please refer to the Regional Council for advice on whether consent is required in terms of the Proposed Regional Coastal Environment Plan.
3. 0.2% AEP Annual Exceedence Probability. equates to a 10% chance in 50 years of a building or site being subject to inundation from a flood event.