

## Natural hazards

This report assesses the extent to which the natural hazard management objectives and anticipated environmental outcomes of the Waikato District Plan are being achieved. The objectives and anticipated environmental outcomes are:

### Objective

Risks from natural hazards to health, safety and property, resulting from use, development or protection of land, are minimised.

### Anticipated environmental outcomes

- Identification of areas within the district that are prone to natural hazards
- Reduction in the risks to people's health, safety and property from natural hazards
- Recognition of and provision for avoiding coastal hazards
- No new use, development or protection works on land subject to increased risk from natural hazards
- Subdivision, use and development do not increase the scale of the existing natural hazard
- Provision of adequate firebreaks and water source for plantation forests
- Maintenance and continued hazard protection of natural buffers such as flood plains, ponding areas, wetlands, sand dunes and cliffs
- Avoidance or mitigation of the additional effects of natural hazards caused by global climate change.

### Executive summary

Waikato District Council as a territorial authority is governed by several legislative documents in the management of natural hazards and land hazard information. Governing legislation is as follows:

- The Resource Management Act 1991 (RMA)

Section 31 of the RMA dictates that territorial authorities shall prevent or mitigate any adverse effects of the development, subdivision or use of land subject to natural hazards. Section 11A of the Local Government Act describes a core service to be considered by territorial authorities as being the avoidance and mitigation of natural hazards.

Furthermore in October 2011, the Government established an independent Technical Advisory Group (TAG) to review the principles in sections 6 and 7 of the RMA. Sections 6 and 7 list 'matters of national importance' and 'other matters' that have a substantial role in shaping and directing how the RMA's purpose is given effect through planning and decision-making. The report is largely focussed on how sections 6 and 7 could be improved to reflect contemporary values and priorities and address current and emerging issues, such as managing natural hazard risks and urban and infrastructure development (Ministry for the Environment, 2013).

- The Civil Defence and Emergency Management (CDEM) Act, 2002

The CDEM Act 2002 also plays a role in the management and emergency response surrounding natural hazards. The CDEM Act aims to improve and promote the sustainable management of hazards in a way that contributes to the social, economic, cultural, and

environmental well-being and safety of the public and also to the protection of property (Ministry of Civil Defence and Emergency Management).

- The Waikato Regional Plan

Waikato District Council is also largely governed by Section 3.8 of the Waikato Regional Council's Regional Policy Statement which specifies that objectives, policies, rules and/or other methods must be included in district plans to control the use of land for the avoidance or mitigation of natural hazards.

- The Local Government Official Information and Meetings Act (LGOIMA)

Section 44A of LGOIMA dictates that territorial authorities must disclose information identifying each (if any) special feature or characteristic of the land concerned, including but not limited to potential erosion, avulsion, falling debris, subsidence, slippage, alluvion, or inundation, or likely presence of hazardous contaminants.

- The Building Act 2004

Sections 71 and 72 of the Building Act 2004 relate specifically to building on land subject to land hazards. In accordance with section 71, a building consent authority must refuse to grant a building consent for construction of a building, or major alterations to a building, if the land on which the building work is to be carried out is subject or is likely to be subject to one or more natural hazards; or the building work is likely to accelerate, worsen, or result in a natural hazard on that land or any other property. However Section 72 of the Building Act stipulates that a building consent must be granted if the building work will not accelerate, worsen, or result in a natural hazard on the land.

Both sections of the Waikato District Plan have a section dedicated to the avoidance and mitigation of natural hazards with high risk areas identified as specified policy areas. Each section imposes specific rules to manage activities on land subject to natural hazards.

In accordance with Section 35(5) of the RMA, territorial authorities must keep records of natural hazards to the extent that the local authority considers appropriate for the effective discharge of its functions. Council has a dedicated Land Hazard Register which acts as a common repository for all land hazard information. This information is mapped spatially on Council's GIS system. Flooding and subsidence dominate the natural hazards faced in the Waikato district.

Avoidance of development in high risk areas is preferred to attempting to mitigate the effects, while development may be allowed in low risk areas with effective mitigation measures in place. Knowledge of such areas is paramount in natural hazard management and clear recording of information is fundamental in this process

## **Background**

The Waikato and Waipa Rivers run through the Waikato district carrying with them large flood flows that create a hazard for development along the valley floors. The Waikato District Plan imposes rules and regulations around development and flood protection in such areas to effectively avoid or mitigate potential effects.



**Figure 3.1: Taken from *Geology of the Waikato Area*, Edbrooke, 2005.**

*The Waikato River, flowing north past Taupiri (left foreground) from Ngaruawahia (left middle distance), has a less entrenched course across the Hinuera surface than further up river. Terraces immediately right of the river have a cover of Taupo Formation pumice alluvium. The Hakarimata Range on the right of the river forms the northwestern margin of the Hamilton lowlands. In the southwest, Karioi volcano is visible on the horizon (centre).*

*Photo CN466/6: D.L. Homer*

Second only to flood risk in the district is the potential for subsidence. Drained peatlands, alluvial deposits and historical mining all contribute to subsidence within the district. Waikato District Council has policy areas identified within the district plan that impose specific rules in those zones identified as high risk and has the majority of known flood hazards recorded in the land hazards register.

When developing such areas, we must also consider the potential effects of climate change. Climate change is not expected to create new hazards but may change the frequency and intensity of existing risks. Waikato District Council has an obligation to manage the associated risks based upon available guidance and accordingly factors this into their decision making processes.

Slippage is another natural hazard of note within the district. This generally relates to steep slopes that have been subject to vegetation clearance, have low cohesion soils and or have been subjected to concentrated discharges of water. In instances where Waikato Coal Measures exist however, very low slope angles may be subject to movement.

The basal Waikato Coal Measures (Etw; Kear & Schofield 1959; Edbrooke et al. 1994) overlie deeply weathered Mesozoic basement rocks, and grade up into shallow marine formations. Outcrops are rare and are usually very weathered, but coal exploration drilling has shown that the Waikato Coal Measures are a persistent subsurface formation in the northern Waikato region. The coal measures are up to 200m thick in the Rotowaro area in the north, but elsewhere in the region are mainly less than 80m thick. Where the coal measures are present in the southwest, south of the Marokopa Fault and west of the Waipa Fault, thicknesses are less than 10m (Edbrooke, 2004).

There are also a number of natural processes that impact on the natural and physical environment on the coastal margin including inundation and erosion. Waikato District Council also manages risk associated with development along coastal margins. This includes risk to human life, property and the environment.

In terms of the potential for earthquakes and associated liquefaction, this is a fast developing area and is likely to be further addressed through the RMA if the Technical Advisory Group recommendations are adopted. In reality, few earthquakes have been experienced in the Waikato district to date, despite several active fault lines running adjacent to communities. The Waikato District Council however, realises the risk and in response to recent events and changing legislation is ensuring that resource consent assessments include a review of the potential for liquefaction to occur where relevant. The building code addresses building requirements in terms of potential earthquake risk.

## Pressure

### Population growth

Over the next ten years the projected population growth for the Waikato district is estimated to be 18.6 per cent or 1.7 per cent per annum. Over the past 20 years the population growth has averaged 1.2 per cent, with the past five years being at 2 per cent. This latter increase has been in the non-urban areas consistent with higher demand for countryside living and rural residential sections, following the trend of people moving away from the cities such as Auckland and Hamilton. As detailed below, this trend is likely to remain relatively constant.

	2012	2022	Change
Estimated population	65,114	77,331	12,217
Estimated dwellings	23,240	27,975	4,735
Estimated urban/rural mix	47/53	49/51	

*Note: These growth estimates are from our detailed population modelling prepared in conjunction with the National Institute of Demographic and Economic Analysis and includes base information from the 2006 census. The 2010 census was postponed because of the Canterbury earthquakes.*

The census Usually Resident Population (URP) counts show that Waikato district is in the top ten territorial authority areas with an increase of population from 2006 to 2013 of 10.1% (Statistics New Zealand). The URP counts as detailed below show that the estimated population count for the district in 2013 is below the 2012 estimate and would not have taken into account the boundary change with the creation of Auckland Super City (incorporation of Franklin district).

	2001	2006	2013
<b>Usually Resident Population</b>	<b>51,843</b>	<b>57,585</b>	<b>63,378</b>

As the population grows, so too does the demand for land and as a result development may encroach on areas that are subject to natural hazards and may have not otherwise been considered. This does not come without its challenges and careful management is required to ensure that areas subject to natural hazards are avoided or the potential adverse effects are mitigated.

### **Financial constraints**

Financial constraints play a major role in the development of land that is subject to natural hazards. While the land may be purchased for a reduced price, it is important that a purchaser does their homework and is aware of any natural hazards and geotechnical requirements in the development of the land. Particular regard should be given to the potential financial implications of developing such land and a thorough understanding of the constraints of the land, the requirements of the district plan and of the Building Code should be explored.

### **Lack of knowledge**

Many people remain unaware of the legal requirements placed upon Waikato District Council to manage natural hazards. The Council has an obligation under section 31 of the RMA to control any actual or potential effects of the use, development or protection of land in the avoidance or mitigation of natural hazards. The Council is further governed by Waikato Regional Council's Regional Policy Statement which provides specific requirements in relation to achieving this objective.

Accordingly the rules within the Waikato District Plan reflect the legislative requirements imposed upon the Council in their management of natural hazards within the district.

Another oversight is often the potential for cumulative effects if not managed, to exacerbate the effects of a natural hazard which must also be addressed by the Council in their district wide planning.

Waikato District Council is currently working through a natural hazards plan change and is awaiting the outcomes of the recommendations of the Technical Advisory Group in relation to Natural Hazard Management to better inform this plan change.

Following any amendments and the completion of the district plan review, Council will work to educate residents of the requirements under the reforms.

### **Climate change**

Climate change refers to the gradual warming of our planet as a result of trapped green house gases, including carbon dioxide, methane and nitrous oxide in our atmosphere. Since the industrial revolution, carbon dioxide emissions into the atmosphere have risen at an increasing rate. These

emissions are caused primarily by fossil fuel use and land-use change. Methane and nitrous oxide emissions into the atmosphere primarily result from agriculture.

The increased concentration of gases, trap more of the earth's warmth than normal, leading to a gradual warming of the atmosphere. This in turn leads to changes in temperature and weather patterns.



(Image courtesy of Ministry for the Environment, 2012)

As published by the Ministry for the Environment, the Waikato Region is likely to experience the following changes in the future as a result of climate change:



## **Temperature**

Temperatures are likely to be around 0.9°C warmer by 2040 and 2.1°C warmer by 2090, compared to 1990. By the end of the century, the Waikato is projected to have about 30–60 extra days per year where maximum temperatures exceed 25°C. The number of frosts could decrease by around 10–15 days per year with frosts becoming rare in the Coromandel.



## **Rainfall**

Rainfall will vary locally within the region. Higher annual rainfall is likely in the south and west of Waikato, and less rainfall is expected annually in Coromandel. Very heavy rainfall events are likely to become more frequent in the Waikato.



## **Sea-level rise**

New Zealand tide records show an average rise in relative mean sea level of 1.7mm per year over the 20th century. Sea levels are expected to continue to increase into the future. The Ministry for the Environment recommends planning for a future sea level rise of at least 0.5m, along with consideration of the consequences of a mean sea level rise of at least 0.8m (relative to the 1980–1999 average) by the 2090s.



## **Storms**

The number of storms crossing the Tasman Sea is expected to increase in summer and decrease in winter, by the end of the century. The intensity of these storms is likely to decrease in both summer and winter.



## **Wind**

The frequency of extreme winds over this century is likely to increase by between two and five per cent in almost all regions of New Zealand in winter, and decrease by a similar amount in summer. There may be more north-easterly events over the north of the North Island and less frequent westerly winds.

Waikato District Council has a duty of care to adopt best practise and guidance in the management of climate change and in the protection of future development. The reality is that the buildings we create today may still be in situ in 100 years. Our job is to ensure that development is situated in sensible locations and protected into the future. We take our guidance from Ministry for the Environment and Waikato Regional Council on this matter.



## State

As evident from Figure 3.1 flooding (Inundation) was by far the greatest natural hazard faced by the Franklin section of the Waikato district at the time of transition. This was followed by the potential for land subsidence. As is the case with the southern portion of the district, the Franklin area has a number of low lying flood prone areas, including the Aka Aka Otaua drainage district, Port Waikato drainage district and low lying areas adjoining the Waikato River. Such areas have been recorded in our land hazard register to ensure that development in these areas is carefully managed to mitigate any risk of inundation.

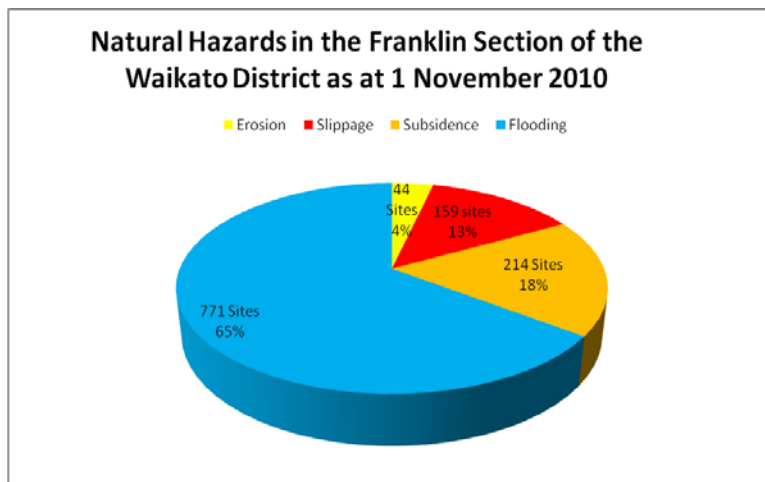
Current rules surrounding development within the one per cent Annual Exceedance Probability (AEP) flood zone or the highest observed flood level, whichever is greater, were adopted with the introduction of Plan Change 25 (PC25), the Hazards, Stormwater, Esplanade Reserves and Earthworks Plan Change which became operative in February 2012. The rules strictly manage development in flood prone areas through avoidance and/or mitigation.

In the southern portion of the district avoidance is preferred to mitigation and rules are in place to carefully manage development in areas that may be subject to flooding. These rules include set minimum floor levels, restrictions on the modification of overland flow paths and requirements for stormwater management as well as careful management of site drainage.

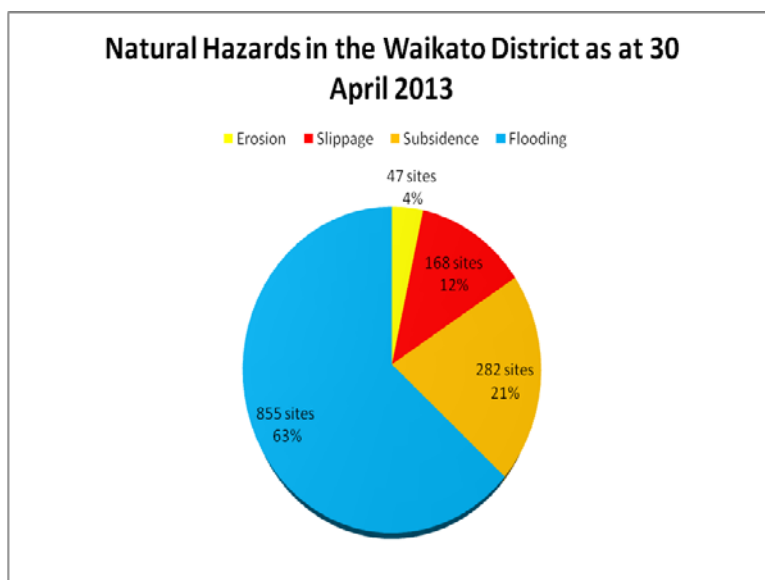
Subsidence in the Franklin section of the district was the second highest category of land hazard at the time of amalgamation as evident in Figure 3.1. As evident from Figures 3.1 and 3.2, the overall percentages of the most common natural hazards within the district have not significantly changed since the councils' amalgamation in November 2010.

In both the northern and southern portions of the district, subsidence is in the most part related to alluvial deposits associated with historical flood plains. These deposits break down over time and therefore require specific foundation design and careful management to ensure that development is sound and complies with governing legislation. The other major cause of subsidence within the district is as a result of uncertified filling. It is very common, particularly in rural areas for landowners to create farm dumps and areas of uncertified filling that upon development require addressing.

**Figure 3.1**



**Figure 3.2 Natural hazards in the district today.**



At the time of amalgamation it was decided to consolidate all land hazard data into a common repository. Hence a new Land Hazards Register was developed which retains all land hazard information and also links to our GIS system allowing information to be mapped spatially. Approximately one quarter of the data imported into the register at the time of development needs to be reviewed to ensure accuracy, as historical recording procedures do not necessarily meet today's requirements. For this reason the data that is yet to be reviewed has been recorded as 'advisory' only and has been excluded from these calculations. A general overview of the data, does however, indicate that percentages are likely to stay relatively constant following the completion of data cleansing.

## Response

- **Continued development of Land Hazard Register.** Waikato District Council will continue to develop and further refine the Land Hazards Register and supporting processes. A data cleansing project will be undertaken to ensure that all information held within the register is a true reflection of the information held by Council.
- **District Plan review of natural hazards.** We are currently undertaking a review of the Hazards section of the Waikato District Plan. This review has however been put on hold until the outcomes of the Technical Advisory Group recommendations for the RMA have been realised. This is likely to have a large influence on the way in which councils manage land hazards in the future and it would be optimal to include any required amendments during this review.
- **Structure planning.** Structure plans for both Tuakau and Ngaruawahia are currently underway. Land hazard information is an important planning tool for these structure plans and for this going forward. Development continues to be avoided or mitigated in areas at risk from land hazards.
- **Liquefaction assessment.** Liquefaction assessment through development remains very topical following on from the Christchurch earthquakes and the devastation caused by this phenomenon. The Waikato District Council always adopts a conservative approach through land development. They will continue to follow guidance from geological and nuclear sciences and local government on the best practise for avoidance in relation to land development.

## **District Plan review**

Chapter five of the Waikato section of the district plan outlines the issues, objectives and policies for the southern portion of the district. To manage specific areas of known natural hazards within the district, policy areas dedicated to addressing and managing the associated risks of the known hazard through development are imposed. The Waikato section of the district plan has several policy areas to this effect. These include:

- Huntly East Mine subsidence area

Subdivision is a controlled activity except when in the Huntly South Assessment Area, Huntly East Mine Subsidence Area or Flood Risk Area. In these areas subdivision is considered discretionary. No earthworks are permitted within the Huntly East Mine Subsidence Area and would be considered discretionary. There have been 13 consents granted within the Huntly East Subsidence Area since 2009 and none declined.

- Huntly Flood Risk Policy Area

Rules are as detailed above under Huntly East Mine Subsidence Area. There has been one consent granted and none declined within this policy area since 2009.

- Huntly South Assessment Area 1 and 2

Rules are as detailed above under Huntly East Mine Subsidence Area. There has been one consent granted in this policy area since 2009 and none declined.

- Land Stability Policy Area

The construction of a dwelling and/or dependent persons dwelling in this area would be considered a Restricted Discretionary Activity (RDA) with discretion limited to geotechnical and stormwater aspects ensuring the stability of the site through development. Any non-compliance with the criteria for RDA would result in the consent being considered non-complying meaning that the consent could ultimately be declined.

Earthworks are not permitted in the Landscape Policy Area or Flood Policy Area except where filling occurs to establish a building platform authorised under a building consent or to enable minor upgrading of existing electricity lines. Only one consent has been sought in this policy area since 2009 and in this case, the applicant was able to meet all requirements to gain their consent.

- River Stability Policy Area

Any buildings shall be set back at least 50m from the river on sites where the River Bank Stability Policy Area applies. Any development that does not meet this requirement is deemed to be a discretionary activity. Six consents have been sought in this policy area since 2009, all of which have been able to effectively meet legislative requirements to gain consent.

## **District Plan review**

The Franklin section of the district plan does not contain any policy areas dedicated to the management of natural hazards but instead, chapter seven of the district plan imposes specific rules

across all zones for the management of natural hazards. Land hazards are recorded in the land hazard register at a property specific level. Specific areas are also recorded in the register including the Aka Aka drainage district, the Port Waikato flood zone and know flood zones bounding the Waikato River.