2.28 - Natural hazards - section 32 evaluation for the Proposed Auckland Unitary Plan

1 Overview and Purpose

Auckland is at risk from a multitude of natural hazards that may impact the region at any time. Natural hazards are an important function that Auckland Council must address under the RMA. The Proposed Auckland Unitary Plan (the Unitary Plan) is an important component in managing this risk and ultimately how resilient Auckland can be in the future.

For the purposes of this report, the topic has been split into three distinct parts:

Issue one: natural hazard mapping
Issue two: precautionary approach (rules)
Issue three: coastal inundation and sea level rise.

Where appropriate, these issues have either been discussed together or separately. This will be made apparent at the beginning of each section.

The approach to flooding is addressed separately in the section 32 evaluation report 2.26 Flooding.

1.1 Subject Matter of this Section

The Unitary Plan manages natural hazards primarily through a risk based approach. A risk based approach looks at both the likelihood and consequences of an event in order to determine the level of risk posed to communities and the environment. Determining risk is an important step in understanding Auckland's vulnerabilities and also resilience, which is a key priority of the Auckland Plan. The Unitary Plan is an important mechanism to help achieve this along with other mechanisms such as emergency management planning.

The section will discuss how natural hazard risk is managed through the Unitary Plan. The main mechanism is through the precaution approach adopted in the plan along with the approach taken for natural hazard maps.

Coastal inundation and sea level rise is also discussed in this section as a separate topic. The incorporation of region wide coastal inundation and sea level rise data is a significant step forward for Auckland in terms of an integrated approach being applied across the region. This is in comparison to the inconsistent approach that was taken across the region by legacy councils.

1.2 Resource Management Issue to be Addressed

Auckland's unique geographical location, coupled with significant infrastructure, property and human investments, means that Auckland is constantly at risk from natural hazards, this is an important issue that Auckland Council must address. Natural hazards in Auckland range from those that occur frequently, such as flooding, to those that occur rarely such as earthquakes and volcanic eruptions.

The risk from natural hazards can be effectively managed through a combination of tools such as hazard identification and analysis, risk communication and land use controls in the Unitary Plan.

<u>Issue one: Natural Hazard mapping</u>

Mapping natural hazards is an integral part of how Council manages, communicates and minimises the risk of natural hazards. Natural hazard maps are not included within the Unitary Plan, instead they are provided in a non-statutory GIS viewer as well as within Council databases and commissioned reports. These can be accessed when requested as well as within LIM and PIM reports. The exception to this is coastal inundation and sea level rise which has been mapped in the Unitary Plan, this is discussed separately below.

Auckland Council has inherited a range of natural hazard maps including flooding, land instability, coastal erosion as well as liquefaction. When compiled into maps to cover the region, the maps are 'patchy'. This means that they vary in methodology, coverage, usability and scale. These factors significantly decrease the defensibility of the maps and including them in the Unitary Plan would result in many negative impacts (outlined in 3 Alternatives below).

Natural hazard maps that sit outside of the Unitary Plan are easily accessible by the community and can also be updated as required. Providing the most up to date information is an important function of Council and keeping natural hazard maps outside of the Unitary Plan ensures that the best available information is used when assessing and managing the risk from natural hazards.

Issue two: precautionary approach

As the Unitary Plan does not include the majority of natural hazard maps held by Council, a precautionary approach to the management of natural hazard risk within Auckland must be taken. This approach is very similar to the approach taken by the Auckland City Hauraki Gulf Islands District Plan.

The precautionary approach applies to land that may be subject to natural hazards, this is defined as:

a. within a horizontal distance of 20m landward from the top of any cliff with a slope angle steeper than 1 in 3 (18 degrees)
b. on any slope with an angle greater than or equal to 1 in 2 (26 degrees)
c. at an elevation less than 3m above MHWS if the activity is within 20m of MHWS
d. any natural hazard area identified in the Council's natural hazard register or database or GIS viewer.

This approach enables Council to use any information it may have on natural hazards at a site to assess the risks to life, property and the environment. This may mean that a greater level of resource consents will be needed to assess the risks (which will often require engineering investigation to prove the land is suitable).

Issue three: Hazard specific – coastal inundation and sea level rise

Coastal inundation of low lying coastal land has occurred in Auckland under extreme storm events. The January 2011 event has recently been confirmed as being close to a 1 in 100 year event. This saw parts of Auckland inundated, including Devonport, Kohimaramara and parts of the city's motorways. In the Unitary Plan, coastal inundation refers to a 1 in 100 year storm tide event which is a combination of tides and storm surge. Wave conditions during an event can also be an important factor.

Civil Defence Auckland commissioned the mapping work to be undertaken on a regional scale of coastal inundation in Auckland specifically for inclusion in the Unitary Plan. This work looked at coastal inundation events with a return period of 100 years combined with sea level rise scenarios of 1m and 2m.

The mapping was undertaken by the National Institute of Water and Atmosphere (NIWA). (Appendix 3.28.7)

1.3 Significance of this Subject

Natural hazards are a significant risk for Auckland's people, property, infrastructure and the environment. Auckland Council is required by the RMA, the CDEM Act, and the Building Act etc to manage natural hazards and subsequent risk. The proposed approach in the Unitary Plan is considered significant as it reflects a shift in policy approach as well as a new approach (coastal inundation and sea level rise).

As outlined in detail below, the policy approach for natural hazards in the Unitary plan includes not mapping natural hazards, except for coastal inundation, and instead using the best information available to Council in databases etc coupled with a precautionary approach for land use activities on land which may be subject to natural hazard. This approach is an important step for Auckland and will enable the risks from natural hazards to be minimised and managed better on a consistent basis across Auckland whilst using the best information available. Conversely, this approach may result in increased costs on property owners for consent and building related costs under the proposed precautionary approach. This is detailed further within 3.0 Evaluations.

1.4 Auckland Plan

The Auckland Plan sets a mandate to manage natural hazards through increasing Auckland's resilience. This falls under the broad Strategic direction (7) of 'Acknowledge that nature and people are inseparable'.

The following actions are included in the Auckland Plan:

- Target – Increase the proportion of residents who understand their risk from natural hazards and are undertaking measures to mitigate or reduce their risk from 2011 levels (baseline to be determined) to 80% by 2040.

- Priority – Build resilience to natural hazards

- Environmental principle – Natural hazards can affect our well-being – we need to ensure that Auckland and its people are resilient to the effects of natural hazards.

- Directive 7.14 – Take account of environmental constraints as identified on Map 7.6 and Figure 7.1 when considering the location and nature or any future development.

Much of the above largely falls under the domain of Civil Defence Auckland. Building resilience against natural hazards largely refers to adaptation and mitigation. Minimising the risk from natural hazards is a key component of adaptation and mitigation. Responding to the effects of climate change on natural hazards is also noted by the Auckland Plan as an important aspect of natural hazard management. This is not discussed in much length in this section but along with the inclusion of the coastal inundation and sea level rise data, several policies in the natural hazards chapter include provision for recognising and managing the likely effects of climate change.

1.5 Current Objectives, Policies, Rules and Methods

Legacy councils managed natural hazards in very different ways. This was based on numerous factors including degree of information known by each Council and the type of natural hazards affecting each legacy Council area.

Overview:

- Most common policy approach was to include general objectives and policies for mitigating natural hazards in district plans
- Very few plans avoided development totally in natural hazard areas, mitigation was preferred. This includes raised finished floor levels, setbacks from coastal areas etc
- Natural hazard information was largely kept within databases and reports by each Council, very few plans mapped natural hazards in their statutory plans (Rodney and North Shore did)
- Most plans included methods such as identifying, mapping and communicating the risk of natural hazards to communities

- Some plans included hazard specific rules such as minimum finished floor levels (North Shore) but largely, natural hazard management was dealt with at the policy level

The above approaches were all inconsistent and resulted in very different management of natural hazard risk across Auckland. For the first time, the proposed Unitary Plan will provide an opportunity to consistently manage natural hazard risk in Auckland.

1.6 Information and Analysis

Natural hazard mapping

Natural hazard maps inherited from legacy Councils (regional and district scales, cadastral and non-cadastral maps), were collected for analysis to understand the current extent of map coverage, scale, methodology and quality. Information on natural hazard databases and reports held by Auckland Council was also analysed to understand what kind of information Council holds and how it used for the management of natural hazard risk.

This research task gave a clearer picture of the extent of natural hazard mapping and information storage across Auckland Council and also solidified that the maps were not of a high enough quality for inclusion in the Unitary Plan. The recently developed Natural Hazard and Risk Management Action Plan is a Council wide task force that is looking into collecting and organising all natural hazard related information (including maps and LIMs) into one central location for widespread use across Council.

Precautionary approach

In order to reach this proposed approach, an analysis of legacy Council's plan provisions was undertaken. This involved collecting and analysing each regional and district plan from across Auckland relevant to natural hazards. From this work, a consistent regional approach was developed which has largely been based on the current provisions from the Auckland City Council Hauraki Gulf Islands District Plan.

Coastal inundation and sea level rise

Civil Defence Auckland commissioned mapping work to be undertaken on a regional scale of coastal inundation and sea level rise in Auckland specifically for inclusion in the Unitary Plan. This work looked at coastal inundation events with a return period of 100 years combined with sea level rise scenarios of 1m and 2m.

The mapping was undertaken by the National Institute of Water and Atmosphere (NIWA). This is the first time a regionally consistent picture of coastal inundation and sea level rise has been done in Auckland.

1.7 Consultation Undertaken

Consultation on natural hazards was included within the extended engagement period for the Draft Unitary Plan which ran from mid March 2013 to May 31st.

More than 100 pieces of feedback from individuals and groups was received which related to natural hazards. This feedback was used to make changes to the natural hazard provisions including minor text amendments for consistency as well as more significant changes such as activity status changes.

1.8 Decision-Making

Elected members have seen early drafts of the provisions from a conceptual level (issues and options papers) through to the March draft. This has meant that they have had several opportunities to comment on and refine the draft policies and rules prior to notification.

Proposed changes to the March draft of the Unitary Plan as a result of feedback are reviewed by the Unitary Plan Oversight Group, which comprises senior council managers. The changes are then referred to the Auckland Plan Committee for feedback. Final decisions will be signed off at a meeting of the Committee between 28-30 August 2013.

1.9 Proposed Provisions

Objectives and policies
General natural hazard objectives and policies are included within the regional policy statement as well as within the regional and district objectives and policies section.

The objectives in both sections are aimed at minimising the risk from natural hazards. Policies seek to identify natural hazard areas, undertake risk assessments and encourage existing activities to not increase risk.

Rules
The natural hazard rules (Auckland wide rules section, not mapped) take a precautionary approach towards natural hazard risk management. Some areas of land (e.g. low elevation areas near the coast, on steep cliffs) within the region are classified as being likely to be subject to natural hazards. In order to undertake development in these areas, a suitably qualified engineer must undertake an assessment of the land to prove that the land is not subject to natural hazards or that sufficient mitigation will resolve the concerns set out in the restricted discretionary assessment criteria. Activities within these areas are restricted discretionary, but if the land is deemed suitable by a suitably qualified engineer the activity status changes to permitted and a resource consent is not required.

Maps
Coastal inundation and sea level rise – two data sets:
1 in 100 year event + 1m SLR – applicable only to brownfield areas
1 in 100 year event + 2m SLR – applicable only to greenfield areas

1.10 Reference to other evaluations

This section 32 report should be read in conjunction with the following evaluations:

- 2.1 Urban form and land supply
- 2.2 Rural urban boundary location
- 2.11 Biodiversity
- 2.22 Future Urban zone
- 2.25 Freshwater
- 2.26 Flooding
- 2.31 Earthworks
- 2.35 Rural subdivision

2 Objectives, Policies and Rules

2.1 Objective

The following objectives are proposed:-

Objective 1 of the RPS – Natural Hazards section - Reduce the risk to people, property and infrastructure from natural hazards while minimising any adverse effects on the environment.

Appropriateness
Relevance
This objective addresses issue 1.5 ‘Sustainably managing our natural resources’ as identified in Chapter B, the Regional Policy Statement (RPS) of the Unitary Plan.

Auckland's people, property and infrastructure are at risk from a range of natural hazards such as flooding, land instability, coastal inundation and volcanic eruptions. Objective 1 in section 6.7 of the RPS seeks to reduce the risks to people, property and infrastructure from natural hazards. The concept of risk is commonly thought about as a combination of the likelihood of an event happening and its consequences. This takes into consideration the magnitude and scale of an event as well as what is at risk i.e. human life, houses, infrastructure, property etc. These are the things that Aucklanders value the most and need to be protected, which was outlined in the Auckland Plan's priority of 'Building resilience to natural hazards'.

The purpose of the RMA, as set out in Part 2 Section 5, is "to promote the sustainable management of natural and physical resources by managing their use, development, and protection". Reducing risk to people, property and infrastructure while minimising adverse effects on the environment includes considering natural hazards in the wider context of sustainable management. This objective also meets the three social, economic and cultural well-beings to ensure health and safety.

Natural hazards are not currently included as matter of national importance within s.6 of the RMA. However, in light of the 2012 Technical Advisory Group Report on s.6 and 7 of RMA and the subsequent release of the RMA discussion document 'Incorporating our resource management system', it is anticipated that natural hazards will be included as a s.6 matter or equivalent, within the coming years.

Usefulness
Sitting within the RPS, this objective helps to set the direction for natural hazard risk management in the Unitary Plan, including the objectives and policies in Part 2 and rules in Part 3. In particular, it provides the framework for adopting a risk based approach, which reflects current best practice in the management of natural hazards. A risk based approach takes into consideration the things that human value, which has been set out in the objective e.g. property, property and infrastructure.

This objective also adds value as it closely aligns with the Civil Defence Emergency Management Act, 2002, meaning natural hazard management functions across Council will be well aligned.

Achievability
Using functions set out in Section 30(1) of the RMA, Auckland Council has the ability to achieve the objective. This includes:
"c. the control of the use of land for the purpose of-
(iv) the avoidance of natural hazards
d. in respect of any coastal marine area in the region, the control (in conjunction with Minister of Conservation) of –
(v) any actual or potential effects of the use, development, or protection of land, including the avoidance or mitigation of natural hazards…
(g) in relation to any bed of a water body, the control of the introduction or planting of any plant in, on, or under that land, for the purpose of:
(iv) the avoidance or mitigation of natural hazards"

Whilst this objective does not specify how risk will be reduced, the supporting policies and rules do. These are listed below in section 2.1.1 and include identifying natural hazards and undertaking risk assessments. These are both key ways in which this objective will be achieved, and to a certain extent they are already being undertaken e.g. the recent coastal inundation and sea level maps identifies this hazard across Auckland.

Reasonableness
This objective is seen to be reasonable as it is required under sections 30 and 31 of the RMA. The objective is also reasonable as it aims to reduce the risk of natural hazards across people, property and the environment rather than to completely remove all risk. This is reasonable as it recognised world wide in natural hazard literature that risk can never be fully removed. This also means that the natural hazard rules still enable development in Auckland, provided it is appropriate and reduces the risks. This will help to ensure Auckland builds its resilience to natural hazards in the future through adaptation and mitigation.

Legacy Issues
This objective is consistent with the comparable objective in the legacy RPS which sought to minimise risk as much as possible largely through mitigation measures.

2.1.1 Policies
Policy 1 of the RPS – Natural hazards section - Identify areas potentially affected by natural hazards, giving priority to those at high risk of being affected.

Policy 2 of the RPS – Natural hazards section - Undertake hazard identification and risk assessments for subdivision, use and development using the best available and up-to-date hazard information.

Policy 3 of the RPS – Natural hazards section - Assess the risk of development locating in areas subject to natural hazards based on the:
a. type and severity of the event
b. the effects of other activities from development
c. vulnerability of the activity to adverse effects, including safety, resilience to damage and effects on the environment and human health.
across a range of timeframes appropriate to the hazard, including a 100 year timeframe for flooding and coastal hazards.

Policy 4 of the RPS – Natural hazards section - Adopt a precautionary approach to natural hazard management and risk assessment in circumstances when:
a. the effects of natural hazards are either unknown or may be significant, including the possibility of low frequency, high magnitude events
b. the level of information on the probability and/or consequences of the hazard is limited
c. considering the location and design of significant infrastructure and future urban areas.

Policy 5 of the RPS – Natural hazards section - Protect, as a priority, maintain and where appropriate enhance natural defence systems, such as retention of flood plains, sand dunes and vegetation and riparian margins in their natural state, as opposed to using hard engineering methods.

Policy 6 of the RPS – Natural hazards section - Avoid or mitigate the effect of activities, such as earthworks, changes to natural and man-made drainage systems and/or vegetation clearance so that the risk of natural hazards in the locality is not worsened.

Policy 7 of the RPS – Natural hazards section - Encourage activities that reduce, or do not increase, the risk posed by natural hazards, including:
a. protecting and restoring natural landforms and vegetation
b. managing retreat by relocation, removal or abandonment of structures
c. replacing or modifying existing development to reduce risk without using hard engineering structures
d. designing for relocatable or recoverable structures
e. providing for low intensity activities that are less vulnerable to the effects of relevant

hazards, including modifying their design and management.

Policy 8 of the RPS – Natural hazards section - Encourage existing development, on land subject to natural hazards, to reduce existing risk and ensure that it does not create new risk by:
a. using a range of measures such as the placement of buildings and structure
b. design
c. managing activities to increase their resilience to hazard events
d. change of use to a less vulnerable activity.

Policy 9 of the RPS – Natural hazards section - Minimise the risk to new significant infrastructure which functions as a lifeline utility by:
a. assessing the risk from a range of hazard events including low likelihood, high consequence events such as tsunami, earthquake and volcanic eruptions;
b. utilising design, location and network diversification to minimise the adverse effects on that piece of infrastructure and to minimise the adverse effects on the community from the failure of that piece of infrastructure.

The above objective sets out that Council will reduce the risk to people, property and infrastructure from natural hazards. These policies support this objective by:

1. Identifying areas potentially affected by natural hazards. This can reduce risk by communicating where at risk areas are as well as spatially limiting where rules apply.
2. Using the most up to date information when undertaking risk identifications and assessments. This reduces risk by ensuring that the appropriate information is used during risk assessments.
3. using a risk based approach (likelihood and consequences) to assess risk
4. using a precautionary approach to natural hazards to ensure that appropriate responses are taken when natural hazard information is limited
5. protecting and enhancing natural defence systems as opposed to hazard engineering methods. This will help Auckland build resilience by incorporating aural systems into solutions from the outset
6. avoiding or mitigating the adverse effects of activities so that risk is not worsened.
7. encouraging activities that do not increase the risk posed by natural hazards. This could be through adaptation measures such as relocatable houses etc, which will build Auckland's resilience
8. encourage existing development to reduce risk through design, change of use etc.
9. minimise the risk to significant infrastructure by assessing risk.

2.1.2 Rules

Not relevant - The above objectives and policies are from the Regional Policy Statement of which there are no direct rules.

2.1.3 Costs and Benefits of Proposed Policies and Rules

The above objectives and policies will help to reduce Auckland's people, property and infrastructure risk to natural hazards across the three aspects of this topic discussed; natural hazard mapping, the precautionary approach and the inclusion of coastal inundation and sea level rise data. This however is difficult to quantitatively analyse and as stated in the Auckland Plan, no baseline has been set for the natural hazard target (discussed in 1.4 above).

Benefits of the above objectives and policies could include:

- increased resilience to natural hazards. Examples of this include adaptation methods such as relocatable houses, development in appropriate areas etc. This will become

increasingly important over time as the effects of climate change are seen more readily and existing natural hazards are exacerbated e.g. sea level rise and coastal inundation
- safer communities that understand their risks to natural hazards and are able to make informed decisions
- increased protection and enhancement of natural defence systems, this will also help to build resilience as communities will have to depend less on hard engineering solutions
- natural hazard information held by Council is regularly updated and disseminated by the public

Costs of the above objectives and policies could include:
- possible loss of development capacity e.g. avoid greenfield development in areas subject to natural hazards. This will be discussed more in section 2.2 in relation to coastal inundation.
- increased building costs to mitigate against the effects of natural hazards e.g. especially if more risk assessments/engineering reports are required meaning consents could take longer and cost more

2.1.4 Adequacy of Information and Risk of Not Acting

It is considered that there sufficient information on which to base the proposed policies and methods. The risks of not acting are significant and include possible loss of life, injury and damage to property and infrastructure if natural hazard risk is not reduced. Effective natural hazard management is also imperative for Council to undertake as Council may be liable for damages otherwise i.e. if correct information is not provided or natural hazards are not taken into consideration.

2.2 Objective

The following objectives are proposed:-

Part 2 – Chapter C - Auckland-wide Objectives and Policies - 5.12 Natural Hazards

Objective 1– Development on land subject to natural hazards only occurs where the risks to people, property and the environment are well managed or minimised.

Objective 2– Natural features and buffers are used in preference to hard engineering solutions where management of natural hazards is required.

Objective 3– Subdivision and development does not worsen the natural hazard or its effects.

4. The risk of bushfire to life and property in existing developments is able to be managed and new subdivision and development is designed and located to avoid bushfire risk.

5. The process of permanent coastal inundation from sea level rise and temporary inundation from storm tide events are managed to minimise risk to people, buildings and infrastructure.

Appropriateness

Relevance

These objectives address issue 1.5 ‘Sustainably managing our natural resources’ as identified in the Regional Policy Statement of the Unitary Plan.

The purpose of the RMA, as set out in Part 2 Section 5, is "to promote the sustainable management of natural and physical resources by managing their use, development, and protection". These objectives are in accordance with this as it relates to the sustainable use of natural and physical resources through ensuring that development on land subject to natural hazards is well managed. Economic, social and cultural well-being can also be met be enabling development on land so long as the risks to people, property and the environment are well managed.

Natural hazards are not currently included as matter of national importance within s.6 of the RMA. However, in light of the 2012 Technical Advisory Group Report on s.6 and 7 of RMA and the subsequent release of the RMA discussion document 'Incorporating our resource management system', it is anticipated that natural hazards will be included as a s.6 matter or equivalent, within the coming years.

Usefulness
These objectives are useful as they set out how in more detail how natural hazard risk will be reduced (RPS objective as discussed above) i.e. minimising risk through development and subdivision. These objectives will also be useful for assisting decision making when assessing resource consent proposals involving land that may be subject to natural hazards by setting parameters to assess risk against e.g. what kind of development and to choose natural defence systems in preference to hard engineering solutions.

Achievability
Using functions set out in Section 31(1) of the RMA, Auckland Council has the ability to achieve the objective. This includes:
"(b) the control of land actual or potential effects of the use, development, or protection of land, including for the purpose of –
(i) the avoidance or mitigation of natural hazards".

The above objectives are achievable under the mandate provided by Section 31 of the RMA as Council can assess the risk to land uses based on natural hazard information.

Reasonableness
Objectives 1, 3, 4 and 5 are reasonable as they still allow for development on land so long as the risks are well managed, rather than taking a strict regulatory approach that may have left some parts of Auckland 'off limits'.

Objective 2 is also reasonable as it chooses natural defences as a preference to manage natural hazard risks, but if this is not appropriate, hard engineering solutions can be used. This is reasonable as the benefits of natural defence systems in comparison to hard engineering solutions are becoming more accepted and integrated across Council functions.

Legacy Issues
Generally, this objective fits with legacy objectives for natural hazard management at a district level.

2.2.1 Policies
Part 2 – Chapter C - Auckland wide Objectives and Policies - 5.12 Natural hazards

Policy 1- Classify land that may be subject to natural hazards as being:
a. within a horizontal distance of 20m from the top of any cliff with a slope angle steeper than 1 in 3 (18 degrees)
b. on any slope with an angle greater than or equal to 1 in 2 (26 degrees)
c. at an elevation less than 3m above MHWS if the activity is within 20m of MHWS
d. any natural hazard area known by Auckland Council as identified in a natural hazard

register, database, GIS viewer or commissioned natural hazard study held by Auckland Council

Policy 2- Manage subdivision and development on land that may be subject to natural hazards by requiring an engineering assessment to confirm whether the land is or will be subject to erosion, inundation or instability over the next 100 years.

Policy 3- Allow subdivision and development of land that is subject to natural hazards only where the proposed activity does not:
a. accelerate or worsen the natural hazard and/or its potential impacts
b. expose vulnerable activities, to unacceptable risk from natural hazards
c. create an unacceptable risk to human life
d. involve the use and storage of hazardous substances in commercial quantities
e. increase risk to neighbouring properties.

Policy 4- Consider, as part of a risk assessment of proposals to subdivide and develop land that is subject to natural hazards:
a. the type, frequency and scale of the natural hazard and whether adverse effects on the development will be temporary or permanent.
b. the type of activity being undertaken and its vulnerability to natural hazard events
c. the consequences of a natural hazard event in relation to more or less vulnerable activities
d. the possible effects on public safety and other property
e. any exacerbation of an existing natural hazard or creation of a new natural hazard
f. any adverse effects on landscape values
g. any adverse effects on public access
h. whether any building, structure or activity located on land subject to natural hazards near the coast can be relocated in the event of severe coastal erosion or shoreline retreat
i. the ability to use non structural solutions, such as planting or the retention of natural landform buffers to avoid, remedy or mitigate the hazard, rather than hard engineering solutions
j. the design and construction of buildings and structures to mitigate the effects of natural hazards, such as raising habitable floor levels
k. site layout and management to avoid the adverse effects of natural hazards, including access and egress during a natural hazard event.

Policy 5 - Consider hard engineering coastal protection works to protect development only where existing natural features, such as sand dunes in coastal hazard areas will not provide protection from the natural hazard present and enhancement of natural defence systems is not practical.

Policy 6- Avoid hard engineering solutions in Outstanding Natural Character Areas, High Natural Character Areas and Significant Ecological Areas.

Policy 7- Allow the modification, alteration or removal of sand dunes and vegetation on sand dunes for development within an area subject to coastal hazards only if erosion of the sand dunes is avoided or mitigated.

Policy 8 - Require coastal protection works involving the placement of any material, objects or structures in or on any area located above MHWS to be designed and located to avoid, remedy or mitigate adverse environmental effects including:
a. any likely increase in the coastal hazard, including increased rates of erosion, accretion, subsidence or slippage
b. undermining of the foundations at the base of the structure

c. erosion in front of, behind or around the ends of the structure
d. settlement or loss of foundation material
e. movement or dislodgement of individual structural elements
f. offshore or long-shore loss of sediment from the immediate vicinity
g. long-term adverse visual effects on coastal landscape and amenity values.

Policy 9 - Require proposals to subdivide and develop in natural hazard areas to give effect to coastal and riparian yards for the relevant zone, precinct or overlay. Where there is conflict between the yards and any land identified as being subject to natural hazards, the greater distance shall prevail.

Policy 11 -
Design new residential and commercial subdivision and development in high bushfire risk areas where a threat index above 601 is identified using the National Rural Fire Authority, Wildfire Threat Analysis (WTA) Workbook 2006, to reduce bushfire risk and the need for vegetation removal while making adequate provision for:
a. appropriate access and exit for emergency service vehicles
b. permanent static or mains reticulated water supply fitted with appropriate coupling for emergency services
c. separation from and management of hazardous vegetation having regard to:
i. extent of contiguous vegetation
ii. vegetation type
iii. slope
iv. aspect
v. the ability to manage understory vegetation on an ongoing basis
vi. the biodiversity value of any vegetation that may require removal or management
d. design and materials of construction of any building.

Policy 12. Avoid new subdivision and development in high bushfire risk areas where the risk of bushfire cannot be adequately mitigated without significant effects on landscape or biodiversity.

Policy 13. Provide the ability for existing development in high bushfire risk areas to manage the risk of bushfire through modification to existing buildings and vegetation management where this can be undertaken without significant effects on landscape or biodiversity.

Policy 14 –
Require the finished floor levels of:
a. new dwellings and habitable rooms of non-dwellings
b. substantial additions, modifications or extensions to existing dwellings
c. located in coastal inundation areas to be above the mapped 1 per cent AEP coastal storm tide event plus 1m projected sea level rise

Policy 15 –
Avoid subdivision and development in greenfield areas on land affected by coastal inundation, taking account of projected sea level by 2m over 100 years.
16. Allow for the construction of new infrastructure in the 1 per cent AEP coastal inundation plus 2m sea level rise area only where:
a. it is functionally required or cannot practically be located elsewhere
b. the infrastructure does not increase inundation risk, and
c. the infrastructure is designed to withstand 1 per cent AEP coastal inundation events.

The above objectives set out that development on land subject to natural hazards can only occur where the risks to people, property and the environment are well managed. The above policies support these objectives by:

1. classifying which land may be subject to natural hazards
2. requiring an engineering assessment to confirm whether land as set out in policy 1 is subject to natural hazards over a 100 year time frame
3. allowing development and subdivision to occur if it does not exacerbate or cause a hazard (increase risk)
4. setting out what parameters are to be assessed as a part of a risk assessment
5. setting the parameters for choosing hard engineering solutions over natural defence systems
6. avoiding hard engineering solutions in inappropriate locations
7. allowing the appropriate modification of sand dunes and vegetation
8. requiring coastal protection works to avoid, remedy or mitigate adverse environmental effects
9. requiring proposals to subdivide and develop in natural hazard areas to give effect to coastal and riparian yards as set out in each zone
11. reducing the risk of bushfire hazards to new residential and commercial developments through threat analysis and recognising the need to manage vegetation
12. avoiding risk of bushfire hazards in new subdivisions and developments
13. enabling existing development to minimise the risk of bushfire hazards
14. minimsing the risk of coastal inundation and sea level rise in existing areas
15. avoiding the risk of coastal inundation and sea level rise in greenfield areas.

2.2.2 Rules

Refer to Natural hazards section of the Unitary Plan.
The proposed rules are summarised in 1.10 above.

Excerpt from Chapter H: 4.11 Natural hazards section in proposed Unitary Plan:

Activity	**Activity status**
Development	
Buildings on land which may be subject to natural hazards	RD
Exterior additions or alterations to any building or structure on land which may be subject to natural hazards	RD
The placement of any septic tank, wastewater treatment and disposal system, effluent disposal field, underground storage tank, water tank or stormwater pipe or soakage field on land which may be subject to natural hazards	RD
Development - coastal areas	
The placement of any materials, objects or structures, in or on any beach above mean MHWS that may serve as a defence against coastal erosion	D
The modification, alteration or removal of sand dunes and vegetation on sand dunes within 40m of MHWS	D
Development - coastal inundation and sea level rise	
New dwellings and habitable floors of non-dwellings on land identified as being subject to coastal inundation and sea level rise	P

2. Controls

2.1 Permitted activities – development in coastal areas

1.Finished floor levels for new dwellings and habitable rooms within coastal inundation areas must be at least 500mm above the mapped 1 per cent AEP storm tide inundation plus 1 metre projected sea level rise but with the following exceptions that is not required to meet this control:
a.minor additions of less than 25m^2 to existing buildings.

2.All new buildings in coastal inundation areas must be designed to ensure that structural integrity will be maintained during a 1 per cent ARI storm tide event taking account of the 100 year sea level rise figure.

2.2 Restricted discretionary activities
1. The following development controls apply on land that may be subject to natural hazards:
a. development on land that may be subject to natural hazards are permitted provided:
i. a report by a suitably qualified engineer confirms that the land on which the activity is located is not subject to the following:

- *coastal erosion over a 100-year timeframe*
- *land instability.*

The precautionary approach rules are based on the natural hazard provisions within the Auckland City Hauraki Gulf Islands District Plan; this will help to ensure the natural hazard provisions across the whole region are consistent. The thresholds set within the rules are seen as appropriate as they spatially set areas of likely high hazard risk e.g. on steep slopes and low elevations near the coast.

As the Unitary Plan has not included the majority of natural hazard maps, it is important to include a classification of where to apply natural hazard rules. This is provided in the definition of 'Land which may be subject to natural hazards'. This is an effective and efficient approach as it spatially limits the extent to which the rules apply; either to known natural hazard areas or areas that are likely to be subject to natural hazards e.g. on a steep slope. This classification is preferable to a blanket approach which would have captured all land in Auckland. It is also more effective than applying the rules to areas which Council already knows about. This is because natural hazard mapping and identification across Auckland has been inconsistent and not widely achieved across the region, therefore having a set classification of likely natural hazard areas means that the risk from natural hazards can be reduced to a far greater extent.

Conversely, this approach will mean that more resource consents may be required on land which may be subject to natural hazards. This will mean increased development and resource consent costs, such as an engineers report which are estimated to cost anywhere between $5,000 to $20,000 depending on the nature and size of the site and development. But ultimately, reducing the risk from natural hazards at an early stage in development is far more preferable to having to mitigate the effects of natural hazards in years to come e.g. hard engineering solutions such as sea walls and ground stabilisation which can cost millions of dollars to create and maintain.

The coastal inundation rules were developed after a series of meetings with Unitary Plan senior managers. A two pronged approach was developed, greenfield areas vs. brownfield areas. As natural hazard risk in greenfield areas is able to be avoided from the outset, it was agreed that the policy approach would use the more onerous 1 in 100 coastal inundation event + a 2m sea level rise data set. This approach will future proof greenfield areas against both coastal inundation events as well as sea level rise. This approach will also lessen the possible burden of having to develop hard engineering solutions to likely impacts of climate change in the future which may be the case for existing brownfield areas. The approach for

brownfield is a less strict regulatory approach which is aimed at continuing to enable development and intensification in existing urban areas in Auckland, provided the risk from coastal inundation and sea level rise is mitigated through raised finished floor levels for habitable floor levels. As existing brownfield areas are already significantly developed, it was decided to use the 1 in 100 year coastal inundation + 1m sea level rise data set.

2.2.3 Costs and Benefits of Proposed Policies and Rules

The above objectives, policies and rules will help to minimise the risk from development and land uses such as subdivision across the three aspects of this topic discussed; natural hazard mapping, the precautionary approach and the inclusion of coastal inundation and sea level rise data. This however is difficult to quantitatively analyse and as stated in the Auckland Plan, no baseline has been set for the natural hazard target (discussed in 1.4 above).

Benefits of the above objectives, policies and rules could include:

- development is still enabled, provided the risks from natural hazards are well minimised and mitigated e.g. maximum potential heights in residential zones affected by coastal inundation and sea level can still be achieved provided habitable floor levels are raised
- natural features are accepted as preferred. This will help to increase Auckland's resilience by lessening the reliance on hard engineering solutions and our ability to cope with hazard events
- the classification of land that the natural hazard rules applies to is spatially limited to known areas as well as areas that are likely to be affected e.g. on steep slopes. This means that new, likely areas will be captured by the rules rather than relying on old data inherited from the legacy councils
- this approach also means that Council has to ability to update natural hazard databases easily and efficiently with any new information
- it is preferable, and most likely cheaper, to reduce the risk from natural hazards through mitigation at an early stage in a development in comparison to years afterwards. This may mean there may be less need in the future to develop expensive hard engineering solutions

Costs of the above objectives, policies and rules could include:

- resource consents will be required for activities that are permitted elsewhere within the plan i.e. engineers report required to prove land will not be subject to hazards over a set timeframe appropriate to the hazard
- an engineers report may be a added cost to a development (likely to already be required for larger scale developments such as subdivisions)
- continuing to develop potentially affected areas in Auckland may mean that the onus is on Council to develop sea walls and other hard engineering structures in decades to come (brownfield areas)

2.2.4 Adequacy of Information and Risk of Not Acting

It is considered that there sufficient information on which to base the proposed policies and methods. The risks of not acting are significant and include possible loss of life, injury and damage to property and infrastructure if natural hazard risk is not reduced. Effective natural hazard management is also imperative for Council to undertake as Council may be liable for damages otherwise i.e. if correct information is not provided or natural hazards are not taken into consideration.

3 Alternatives

The proposed preferred alternative is discussed in 2.0 above. The status quo alternative is outlined in 1.5 above.

Natural hazard mapping
Alternatives are:

1. Status quo
2. Proposed option – no maps in the Unitary Plan
3. Plan change or variation to include information in the Unitary Plan in 2 to 3 years time
4. Regulatory – map all known natural hazards in the Unitary Plan

Precautionary approach
Alternatives are:

1. Status quo
2. Regulatory control
3. Proposed approach – precautionary approach

Coastal inundation and sea level rise
Alternatives are:

1. Status quo
2. Policy to not upzone/intensify areas affected by inundation, no other controls
3. Regulatory - No upzoning of residential, commercial and industrial areas plus development rules to mitigate effects e.g. minimum floor levels
4. Proposed approach – include maps, some rules but development potential maintained

The table below discusses each alternative compared to the Proposed Alternative

Natural hazards - Mapping

	Status Quo Alternative Roll over existing maps from legacy plans into the Unitary Plan	**Alternative 1 - Preferred Option (no maps in Unitary Plan)** No natural hazard maps in the Unitary Plan, all maps kept outside of the plan in databases and non statutory GIS viewer	**Alternative 2 - Change or variation to include information** No maps in Unitary Plan at notification, date set to incorporate via plan change/variation in 2 to 3 years time	**Alternative 3 - Map all known natural hazards**
Appropriateness	This approach is not appropriate as it would mean that the Unitary Plan would not have a consistent approach across the region. This would likely result in adverse environmental outcomes and it would also be socially unbalanced, with some property owners across the region having more regulatory controls than their neighbours in other parts of the region.	This approach is seen appropriate as it was used by several legacy councils in Auckland. It is also appropriate as the public can still access any information on natural hazards that they require, along with the assurance that the information is up to date.	This approach is not appropriate as it hinges on Council committing to a process that has not yet been decided/confirmed.	This approach is not appropriate as it would most likely result in Council including inappropriate information within the Unitary Plan e.g. outdated and inconsistent (scale, methodology etc). Providing up to date and correct information is a clear function for Council to achieve under the RMA and LGOIMA.
Effectiveness	This approach would not be an effective approach to managing natural hazard risk in Auckland. As much of the mapping information is outdated, it is likely that much of the natural hazard risk would not be accurately portrayed in the maps. This would mean that natural hazard risk across Auckland would not be reduced, which is the main objective of the natural hazards section within the Unitary Plan.	This approach is effective as it allows the Council and property owners to have the ability to use the most up to date information when assessing natural hazard risk. This is an important factor in natural hazard risk assessment to ensure appropriate development occurs. The approach also allows the most recent information to be provided to the public at all times. This would not occur if the maps are included within the Unitary Plan, where the maps could be outdated quickly. A lengthy and costly plan change would be necessary to update the information. This is the same approach that has been taken for the flooding rules.	This approach would be effective to a point as it would allow for Council to identify natural hazards across the region and update maps over the next two to three years. It could also allow natural hazard risk to be reduced further through community engagement around the plan change. Awareness and understanding is a large part of reduce natural hazard and building resilience.	This approach would not be effective as Auckland Council needs to do a significant amount of work to enable all natural hazards mapping to be incorporated appropriately into the Unitary Plan. The mapping that would be included in the Unitary Plan as a result of this would be inconsistent in scale, methodology and coverage. The information held by Council is also often not at an appropriate scale to be included within a statutory document i.e. mapped to a cadastral level. Combined with use of the precautionary approach outlined below, this could result in an over the top burden being placed on Auckland communities in which more resource consents for development on land subject to natural hazards is when required inappropriately.
Efficiency	This approach would be efficient to implement in the short term. In the long term however this approach would not be efficient as outdated information would be included within the Unitary Plan which could result in unnecessary resource consents or that resource consents are not triggered for land that may be subject to natural hazards. The information would also need to be updated via a variation or plan change in the future.	This approach is efficient as the latest information is provided to the public at all times. This approach also ensures that information can be updated efficiently i.e. because it sits outside of the Unitary Plan and would not need to go through a plan change or variation. This is in the favour of both Auckland Council as well as the public as both parties are able to update information relevant to them based on the latest research.	This approach is not likely to be very efficient as it will take several years to complete and an interim approach would need to be established would need to be established during that time anyway. On a purely time and money basis, this is likely to be one of the more expensive options.	This approach is not efficient and realistically, this approach would have never been able to be included within the Unitary Plan. Preliminary work began on collating map data and research reports commissioned by legacy Councils but it was apparent from early on that it was not feasible to undertake for inclusion within the Unitary Plan. This was due to both time and financial constraints. This work is however being included within the Natural Hazard Risk Management Action Plan, timeline of five years, which was launched officially on the 14th of August 2013.
Costs	**Existing inconsistencies** Natural hazard maps within legacy plans do not provide an accurate picture of hazards across the region. Many issues exist including: - Inconsistent regional coverage of different hazards - Scale and quality - Mapping methodology used - Extent of mapping For example, some plans mapped natural hazards (Rodney – coastal inundation maps) whereas	Resources required to prepare maps to put into external GIS viewer and databases. As information will be presented in a non statutory way, the information may only reach a select audience. All information not mapped in the Unitary Plan will need to be provided in LIMs. Information may not communicate risk before land proposals are developed.	Likely to be the most expensive option. Would include costs of revisions and research to existing data as well as costs of including via a plan change or variation. Likely to involve challenges to the UP as land owners challenge the position of the maps, especially in areas that are already developed. Revision of natural hazard provisions will also need to occur to match the inclusion of maps.	This would be very costly and time consuming; all information (especially from legacy councils) would need to be ground truthed. Maps are inconsistent (scale, coverage, methodology etc) as there is not enough time before notification to update all maps to use the same methodology, scale etc. Using inappropriate maps in the Unitary Plan is also likely to result in adverse environmental outcomes due to inappropriate development i.e. natural hazard risk

	others did not at all (Waitakere). Coastal inundation maps currently only cover the Eastern Coast of Auckland, there are few maps for the West Coast. Analysis has shown that very small percentages of the region are actually covered by hazard maps within legacy plans (See Appendix 3.26.1 - Options paper - hazard mapping (specific) v16 - FINAL) which is not an accurate representation of hazard risk within Auckland. Maintaining the status quo would provide a poor basis for implementing robust land use controls and may lure property owners into a false sense of security. For example, property owners may believe that their land is free of natural hazard risk even though the neighbouring suburb/property is mapped. Many of the maps are outdated and would need to be updated very quickly to ensure that accurate and robust information was given. This would however not happen quickly as any updates or inclusions would be required to go through a plan change or variation process and be the subject of challenge. Using inappropriate maps in the Unitary Plan is also likely to result in adverse environmental outcomes due to inappropriate development i.e. natural hazard risk is not reduced. This could result in liability issues for Council in the future and hard engineering solutions may be required.	The information is subject to change at any time, may not provide the certainty that property owners need or want.	Funding for new mapping projects is not guaranteed to be available to meet this timeline.	is not reduced. This could result in liability issues for Council in the future and hard engineering solutions may be required. This approach would require constant updating in the future to incorporate new information to ensure maps show the best available information. The inability to update maps quickly would likely result in inappropriate development occurring in areas newly identified that cannot be included quickly. This approach is likely to be challenged by the public on many grounds including: - inconsistencies in information across the region - perceptions of increased/new limitations on development rights
Benefits	This option would be inexpensive (in the short term) and could be achieved easily (maps already exist, just a matter of including them in the Plan). This option would also, to an extent, implement the requirements of the NZCPS to identify areas affected by coastal hazards.	Keeping natural hazard mapping information in external GIS viewers and databases will ensure the Unitary Plan is streamlined. Any natural hazard information held by Council can be used when assessing developments. Maps will be able to be updated when required without having to go through a plan change process. This is important to note as departments within Council e.g. Stormwater, update flood hazard maps every week based on new information collected by Council as well as property owners. Not being able to update this information is a big deal to property owners who can prove that their properties are not subject to natural hazards e.g. perceived decreased in property values, stress, costs etc. Having up to date information means that Council will not permit inappropriate development using out of date information as would likely happen if the status quo approach was taken. Greater flexibility will be used when assessing developments in areas that may be subject to natural hazards and a range of sources rather than a static line within the Plan.	Ensures that the accuracy of risk identification and mapping techniques is monitored in a timely way over time. Enable community interest groups have well prepared to review and comment on maps. Provide time for the Unitary Plan to incorporate any legislative changes e.g. proposed changes to the RMA regarding the inclusion of natural hazards as a matter of national importance. Also enables progressive implementation of NZCPS requirements. Enable introduction of associated appropriate land use controls that are formulated in response to known natural hazards – this could provide greater certainty to land owners rather than using the precautionary approach. It is also therefore likely that less burden would be placed on the community as less areas of Auckland would be subject to a resource consent for natural hazards (no engineers report required either) as the precautionary approach criteria would not be required.	This approach would present all natural hazard information that Council has to a wide audience raising awareness and understanding of natural hazard risk across the region. This approach may also add clarity to the implementation of land use controls as it easy to see why the rules are in place and what they are trying to achieve. All information that is included statutorily within the Unitary Plan would not be required on LIMs. This is a benefit to the community as it means they would not need to pay for a LIM to receive statutory information on natural hazards.

		This approach will likely defer any challenges from land owners unhappy with their site being mapped in the Unitary Plan as being subject to natural hazards. The public may respond positively to a non regulatory approach to mapping. The information that is held within external GIS viewers can be viewed 24/7 and other information in databases can be requested from Council anytime.		
Risks	There are many risks associated with this approach including: - not providing in the most upfront way the most up to date and accurate information that Council has could result in liability issues in the future - landowners may be lured into a false sense of security if their land is not mapped with a natural hazard, even though neighbouring areas have been (most likely this would be missing data rather than the hazard not existing) - the data would need to be updated in the near future. Risk of wasted time and resources if maps are put in now when they actually need to be updated immediately - the inconsistencies in scale, coverage and methodology would surely lead to challenges by the public - the maps would need to go through a lengthy plan change or variation process to become updated	The maps are not in the public eye as much as they would be if they were within the Plan. Outside of the Plan, the maps would not be subject to the schedule 1 process. This raises the possibility of them not carrying the same weight in the consenting or plan change process as would be the case if there were maps 'within the plan'. Rather, the maps provide controls on where a hazard exists that are not definitive in all cases.	Risks of this approach include: - interim approach not effective or efficient - costs (monetary and time) of plan change or variation	- Information may be of a poor quality - Not enough time for analysis of natural hazard mapping and what it might mean for the community. It is best if this information is assessed on a site specific basis during resource consent applications.

Natural hazards – Precautionary approach

	Status Quo Alternative Roll over existing inconsistent approach from legacy plans	**Alternative 1 - Stricter regulatory control** Stricter regulatory control – in conjunction with maps, specific approach for each natural hazard.	**Alternative 2 - Preferred Option (precautionary approach)** Consistent and general Auckland wide approach that covers development/activities on land subject to land instability, coastal erosion and inundation. If Council identifies that land is subject to natural hazards, engineering investigation is required to prove otherwise.
Appropriateness	This approach is not appropriate as it is not in keeping with key Unitary Plan principles of consistency and ease of understanding. The approach is also not appropriate as it will most likely not reduce Auckland's natural hazard risk which is a key function of Council under the RMA and our own RPS. This is because different approaches would be used across different parts of the region, possibly resulting in lower or higher levels of risk minimisation.	The approach is not seen to be appropriate as the level of quantitative and qualitative information that would be required to support it is currently not available. This would include analysis on how much of Auckland would be affected, development potential from both legacy plans and the draft Unitary Plan and resource consent burden vs. planning gain.	This approach is seen to be appropriate as it uses a precautionary approach to deal with natural hazard management which has recently been included within a recent district plan (Auckland City Hauraki Gulf Islands Plan). The approach is consistent and allows Council and property owners to use the up to date information to assess natural hazard risk. It also ensures that natural hazard risk is reduced in Auckland by requiring development in likely risky areas or known risk areas to be assessed by a suitably qualified engineer. This is appropriate at the long terms of inappropriate development due to natural hazards is huge i.e. costs of remediation and possible hard engineering solutions.

Effectiveness	This approach would not be an effective means of reducing natural hazard risk in Auckland as it is likely that different levels of risk reduction across the region would occur. It would also be an ineffective approach from a Council function perspective as having multiple approaches across the region would result in operational inefficiencies. This would go against one of the main purposes of setting up Auckland Council – reduce inefficiencies across the region.	This approach would be effective as it would reduce the risk to the community from natural hazards, which is ultimately the main purpose of the provisions. This would only be possible however if detailed quantitative and qualitative analysis was taken to ensure robust land use provisions were developed. As detailed above, this was not possible for the Unitary Plan.	This approach is effective as it is consistent across the whole of Auckland. While taking a precautionary approach, the approach is flexible to individual cases as the most up to date information can be used and brought in at anytime. The approach also uses a multiple time periods and assessment criteria to assess risk which is an effective approach to managing natural hazard risk. This approach would ensure that natural hazard risk is always assessed in known or likely to be at risk areas which will result in positive environmental outcomes as well as social benefits i.e. increased awareness and resilience.
Efficiency	In the short term this approach is efficient as the information is already available and has been in place for a long time, but the ongoing costs of an inconsistent and outdated approach means that in the long run the approach is not efficient for Council or the community. Examples of this include operational inefficiencies and unclear rules.	This approach would not be efficient as it cannot be undertaken in time for the notification of the Unitary Plan. This would mean that the information in the Unitary Plan would not be of a high quality which could result in inefficiencies later down the track when Council has to update the content e.g. expensive and lengthy plan change or variation. It could also produce inefficiencies for the community as they may be required to get consent for more activities that they have not had to in the past. This may mean that developments take longer and are more expensive.	It is operationally efficient for Council to use the same approach across the region i.e. the same rules across the whole region meaning certainty can be given to landowners and clear strategy of reducing natural hazard risk can be implemented. The approach can easily be brought into the Unitary Plan as it is based on the Auckland City Hauraki Gulf Islands district plan.
Costs	Legacy approaches to natural hazard management varied significantly across the region. The was no common method meaning that if the status quo was maintained, very different natural hazard regimes would need to be used in the UP. The costs of this include: - logistics, it would be very hard and costly for Council to manage the different approaches - it would be a confusing approach for both Council and the public - many of the approaches are outdated and it is likely they would not reduce natural hazard risk - likely that this approach would be challenged by the public	Requires detailed mapping at a cadastral level to inform strict regulatory controls. This would be costly and take a significant amount of time. Approach would not be flexible as the information would be locked statutorily in the Unitary Plan and would require a plan change or variation to update/amend. Likely to receive challenge from the public. Likely to result in the need for more property owners to gain consents, especially for less than minor activities. Financial costs - $1500 deposit for a restricted discretionary resource consent - Estimates of between $5,000 and $20,000 for an engineers report (depending on the nature and size of the site and development) As the criteria for land which may be subject to natural hazards is not mapped, it is not possible to known how many properties this approach would affect across the region) Overly burdensome controls increasing levels of known non compliance placing life and property at unacceptable risk.	- Approach may result in more resource consents that would not have been required under current approaches - Responsibility is put on property owner to prove that their land is not subject to natural hazards i.e. resource consent and possible engineers report required Financial costs - $1500 deposit for a restricted discretionary resource consent - Estimates of between $5,000 and $20,000 for an engineers report (depending on the nature and size of the site and development) As the criteria for land which may be subject to natural hazards is not mapped, it is not possible to known how many properties this approach would affect across the region) - Council may be seen to be taking a risk adverse approach by using a precautionary approach rather than undertaking significant mapping work to determine more accurately the risk.
Benefits	This approach could easily be incorporated into the Unitary Plan as the information is already available, but the costs of updating and maintaining this approach in the future means that it is not viable.	Approach would provide property owners with certainty into the future and could potentially lessen Council's liability risks. Council may be able to significantly reduce the risk of natural hazards to areas of Auckland. A strict regulatory approach could be ideal to ensure the safety of the public.	This approach is modelled on the recent approach taken in the Auckland City Hauraki Gulf Islands district plan. This means the approach is the most up to date of those in Auckland and takes into consideration current thinking surrounding risk assessments and use of the precautionary approach. The approach enables Council to use the most up to date information and allows property owners to prove that their land is not subject to natural hazards. This essentially means that Council is not limiting the use of a site or development potential if an activity can be proven to be appropriate. The approach takes into consideration a range of natural hazards

			over timescales appropriate to land use and risk assessment. The Plan would therefore be meeting the requirements of the NZCPS which is to assess coastal hazards over a 100 year time period. A precautionary approach also allows Council and the community to adjust its thinking in relation to natural hazards, especially under the changing nature of natural hazards including climate change and associated sea level rise. Large scale developments would not be over burdened by the approach as they would already be required to provide an engineers report for geotechnical issues etc. in an AEE.
Risks	- Inconsistent approach across Auckland that is not likely to reduce Auckland natural hazard risk - Confusing for Council officers and the community, certainty is not given around how hazard risk is to be minimised or dealt with operationally - Outdated approach that could be updated now through alternative 3 - Likely to cost a lot in the future as the approaches would need to updated via plan change or variation - Likely to be challenged by the community	Likely to result in challenge from the community both with respect of areas affected and level of constraint on development. Overly burdensome controls increasing levels of known non compliance placing life and property at unacceptable risk. This approach would not be as flexible as other approaches potentially constraining innovative solutions.	The risks of this approach include: - possible 'kick back' from the community regarding the use of a precautionary approach rather than detailed and specific mapping, certainty is not provided from the outset - more resource consents may be required than has previously been the case under current approaches

Natural hazards – Coastal inundation and sea level rise

	Status Quo Alternative Do nothing - UP to be silent, with no mapping. Rely solely on Building Act provisions	**Alternative 1** Policy to not upzone/intensify areas affected by inundation, no other controls	**Alternative 2 Regulatory** No upzoning of residential, commercial and industrial areas plus development rules to mitigate effects e.g. minimum floor levels. Avoidance policy approach for Greenfield areas.	**Alternative Preferred approach** Include maps, avoidance policy approach for Greenfield (1 in 100 + 1m SLR). Brownfield areas, rules for minimum finished floor levels of habitable floors (1 in 100 + 2m SLR)
Appropriateness	As Council now has regional, detailed, cadastral level mapped information on coastal inundation, it would inappropriate to not include this information in the Unitary Plan and instead rely solely on Building Act provisions. One reason for this is because Council has a duty under the RMA and LGOIMA to provide the public with the most up to date information on natural hazards.	Inclusion of maps: Following advice from NIWA, the IPCC and Civil Defence Auckland it is appropriate to include this information as it would mean that Auckland Council is following the advice of the nation's top experts. Rules: This would be a partially appropriate approach as it would ensure that intensification would not occur in a known hazard areas (Greenfield and brownfield areas). This would mean that existing risk levels are maintained. It would however not be appropriate to not include any associated rules as potentially inappropriate development could still occur. The Building Act would need to be used to ensure that risk was mitigated against.	Inclusion of maps: Following advice from NIWA, the IPCC and Civil Defence Auckland it is appropriate to include this information as it would mean that Auckland Council is following the advice of the nation's top experts. Rules: This would be the most appropriate response as the existing level of risk in brownfield areas could be maintained at current levels, rather than increasing the risk by intensifying and allowing more development and people into the area. An avoidance approach for Greenfield areas is an appropriate response as it makes sense to completely avoid current, and future, risk from the outset of large scale development.	Inclusion of maps: Following advice from NIWA, the IPCC and Civil Defence Auckland it is appropriate to include this information as it would mean that Auckland Council is following the advice of the nation's top experts. Rules: This is an appropriate rule response as it still allows for development potential to be maintained whilst ensuring that the risk to the public is communicated. Conversely, this approach could be seen as inappropriate for brownfield areas as it means that more people are being put into a known hazard area, (risk is not being reduced) even though they are raised out of the depth of flow. This may mean that in the future the onus is on Council to protect these areas, most likely through the use of hard engineering solutions which can cost millions of dollars and need to be repaired and maintained constantly. This may also have a spin off effect on insurance premiums or even the ability to get insurance. An avoidance approach for Greenfield areas is an appropriate response as it makes sense to

				completely avoid current, and future, risk from the outset of large scale development.
Effectiveness	This approach would be an ineffective means of managing natural hazard risk from coastal inundation and sea level rise in Auckland. It is likely that inconsistent effects would occur due to consent planners interpreting the Building Act differently and requiring different levels of risk mitigation across the region.	Mapping coastal inundation and sea level rise in the Unitary Plan is an important step in communicating risk to landowners and communities in an effective manner. This approach would however not be effective as it is likely that having maps and no rules would not result in the risk from natural hazards being reduced. Rather existing levels of risk would be maintained under the Unitary Plan as legacy zones would be rolled to Unitary Plan equivalents.	Mapping coastal inundation and sea level rise in the Unitary Plan is an important step in communicating risk to landowners and communities in an effective manner. This approach would be the most effective out the alternatives discussed in this document. This is because it combines the use of detailed, cadastral scale maps that identify areas of hazards with specific rules to manage the risk from coastal inundation and sea level rise. This includes not upzoning areas (roll of equivalent legacy plan zone into the Unitary Plan), which means the risk in existing areas is not being increased. Use of minimum finished floor levels also means that any possibility of increased risk in the future can also be mitigated. This approach is also effective in that an avoidance policy approach could be applied to Greenfield areas. It is far more effective in terms of financial cost overtime to avoid risk from natural hazards from the outset rather than try to mitigate the problem once development, infrastructure and people have already established.	Mapping coastal inundation and sea level rise in the Unitary Plan is an important step in communicating risk to landowners and communities. Combining this with FFL levels communicates risk even further and provides the opportunity for Council to control the effects on new residential development from coastal inundation and sea level rise across the region for the first time. This is particularly true for Greenfield areas when new development will be avoided from the outset. The effectiveness of the approach is however lessened by the fact that the risk in existing areas is not being reduced as only new residential development in those areas are required to raise finished floor levels.
Efficiency	This approach would not be efficient as the risk of coastal inundation would not be communicated well enough to land owners i.e. because different messages would be given across the region. It would also take Council a significant amount of time to update all the LIM reports for affected properties. If this information is mapped within the Unitary Plan, LIM reports do not need to contain the updated information.	As set out in LGOIMA, Council has a duty to keep this type of information either within its district plan (The Auckland Unitary Plan) or within LIM reports, as a method of communicating risk. Mapping coastal inundation would therefore be an efficient means of achieving this when compared to including information within LIMs (could take months-years to organise). Inefficiencies would however arise from not including rules as it is likely that consent planners and the public would interpret mitigation responses differently (would be required by the Building Act).	As set out in LGOIMA, Council has a duty to keep this type of information either within its district plan (The Auckland Unitary Plan) or within LIM reports, as a method of communicating risk. Mapping coastal inundation would therefore be an efficient means of achieving this when compared to including information within LIMs (could take months-years to organise). This approach would also be efficient as a consistent approach to managing natural hazard risk would be able to be applied in Auckland i.e. all new dwellings and habitable floors in the 1 in 100 + 1m SLR area need to be raised 500mm above the depth of water. This would reduce operational inefficiencies.	As set out in LGOIMA, Council has a duty to keep this type of information either within its district plan (The Auckland Unitary Plan) or within LIM reports, as a method of communicating risk. Mapping coastal inundation would therefore be an efficient means of achieving this when compared to including information within LIMs (could take months-years to organise). This approach would also be efficient as a consistent approach to managing natural hazard risk would be able to be applied in Auckland i.e. all new dwellings and habitable floors in the 1 in 100 + 1m SLR area need to be raised 500mm above the depth of water. This would reduce operational inefficiencies.
Costs	Does not meet requirements of the NZCPS – need to identify coastal hazard areas If new mapping is not included in UP, it needs to be organised to be included within LIM reports. This is likely to take a long time (possible years). Few legacy plans included coastal inundation mapping – inappropriate approach to roll over existing maps in the UP for only a few areas of Auckland. May lead other landowners in the region to falsely believe they are not affected. Relying on Building Act provisions may mean that	Development potential lost from draft UP and legacy zones. Examples (1 in 100 + 1m SLR data): - 0.86% of the Terrace housing and apartment buildings zone - 2.02% of the single house zone - 0.39% of the mixed housing zone - 1.45% of town centre zone New development built in known hazard areas (e.g. single house) will still be in the way of coastal inundation and SLR, no controls to manage avoidance or finished floor levels (as a minimum)	Added development costs for dwellings/new habitable floors that need to raise finished floor levels to 500mm above depth of flow Natural hazard risk is minimised, but only to a limited extent. Upzonings in these areas will occur meaning: - more people will be put into known coastal inundation areas - hard engineering solutions will need to be looked at in the future in order to protect these areas Auckland Council liability is minimised – raised	Added development costs (building materials, site works, resource consents etc) for dwellings/new habitable floors that need to raise finished floor levels to 500mm above depth of flow. Natural hazard risk is minimised, but to a limited extent. Upzonings provided in the UP (in comparison to legacy zoning) in these areas will occur, meaning: - more people will be put into known coastal inundation and sea level rise areas - hard engineering solutions will need to be looked at in the future in order to protect these areas

	the issue is not managed consistently – Building Act states to mitigate risk (which can be done many ways). Natural hazard risk is not minimised – inappropriate development will occur in known hazard areas. This could increase Council's liability.		finished floor levels will minimise the risk that events may have on people, property and infrastructure Development potential from the draft Unitary Plan (and possible some from legacy plans) lost. Examples (1 in 100 + 1m SLR data): - 0.86% of the Terrace housing and apartment buildings zone - 2.02% of the single house zone - 0.39% of the mixed housing zone	Some development capacity in Greenfield areas lost – 2.97% of the Future Urban zone is covered by the 1 in 100 year +2m SLR data.
Benefits	Easy option to implement. Maintains status quo - Approach is unlikely to have much opposition from landowners in affected areas as they would already know about the hazard risk. Can rely on Building Act provisions – this method was used by legacy councils. Development potential maintained in both existing areas and Greenfield areas.	Meets the requirements of the NZCPS – need to identify coastal hazard areas Development potential from legacy plans and the draft Unitary Plan maintained Can rely on Building Act provisions – this method was used by legacy councils.	Minimises AC liability toward increasing hazard risk. Uses RMA provisions to address floor levels Meets the requirements of the NZCPS – need to identify coastal hazard areas Auckland Council liability is minimised – raised finished floor levels will minimise the risk that events may have on people, property and infrastructure. Risk communicated to public through inclusion of mapping in the UP.	Natural hazard risk is minimised to an extent – new habitable floors and all new dwellings required to have minimum finished floor levels of 500mm above depth of flow. This amounts to (1 in 100 + 1m SLR data): - 0.86% of the Terrace housing and apartment buildings zone - 2.02% of the single house zone - 0.39% of the mixed housing zone Existing areas - development 'adapting' to risk by raising floor levels above water flows Greenfield areas - development in coastal inundation and SLR rise areas is totally avoided (2.97% of the zone based on the 1 in 100 +2m SLR data). Future proofing. Meets the requirements of the NZCPS – need to identify coastal hazard areas Auckland Council liability is minimised – raised finished floor levels will minimise the risk that events may have on people, property and infrastructure. Development potential in existing areas not lost. Risk communicated to public through inclusion of mapping in the UP.
Risks	A significant risk of this approach is that a key requirement of the NZCPS would not be met – this is to identify areas affected by coastal hazards. Another risk of this approach is also that it is likely that overtime, different environmental outcomes and effects would likely arise from relying on the Building Act to manage natural hazard risk. This is because each case would be dealt with on an individual, subjective basis and it is likely that inconsistent approaches would be used each time. This will not enable Auckland to build resilience. Also, as Auckland Council is in possession of the coastal inundation and sea level rise data and did not act it would be likely that Council would be liable in the future for any damages. The financial and social impacts would be extremely high and it is	A significant risk of this approach is that natural hazard risk in existing areas is not being reduced. This approach still allows for development potential as provided in the draft Unitary Plan to be realised, meaning that more people, infrastructure and development is being put into known hazard areas. This is a significant risk, especially when the likely impacts of climate change i.e. sea level rise are taken into consideration. This may mean that the onus will be on Council to provide hard engineering solutions in the future. This would be a significant cost in the future given the scale of the problem (main coastline is around 1600km) – around 4.3% of Auckland is affected by the 1 in 100 year + 1m SLR.	This approach has the least risks out of all of the alternatives discussed in the document. Some risks are still involved however such as that new development in these areas is not totally prohibited. Rather risk is minimised through not intensifying areas and through use of minimum finished floor levels. In the long term, if the likely effects of climate change and sea level rise occur, more permanent solutions such as hard engineering solutions or managed retreat will need to be analysed.	A significant risk of this approach is that natural hazard risk in existing areas is not being reduced, unless a new residential development is being undertaken. This approach still allows for development potential as provided in the draft Unitary Plan to be realised, meaning that more people, infrastructure and development is being put into known hazard areas. This is a significant risk, especially when the likely impacts of climate change i.e. sea level rise are taken into consideration. This may mean that the onus will be on Council to provide hard engineering solutions in the future. This would be a significant cost in the future given the scale of the problem (main coastline is around 1600km) – around 4.3% of Auckland is affected by the 1 in 100 year + 1m SLR.

	likely that intensive hard engineering solutions would be required to mitigate the problem.			

4 Conclusion

Based on the above discussion, the following conclusions are drawn:

Natural hazard management is important for Auckland. It is imperative that natural hazard risk is reduced; this will ensure that Auckland's resilience is built and the economic, social and cultural well being of the region is maintained and enhanced. It is particularly important that natural hazard risk is assessed and communicated to the community in a timely manner that accurately reflects the risk. Natural hazard risk can be effectively communicated through maps but unless the maps accurately reflect the hazard and can be updated quickly if necessary, their effectiveness is lessened.

The use of a precautionary approach as is set out in the draft Unitary Plan is therefore important. This allows for a flexible approach to managing natural hazard risks which change between locations and over time.

Coastal inundation and sea level rise is the exception to the 'no natural hazards maps' stance taken into the Unitary Plan. These maps are however worthy for inclusion as they are regionally consistent and are mapped to a cadastral level.

5 Record of Development of Provisions

5.1 Information and Analysis

Relevant legislation

Resource Management Act
Building Act
Local Government Act
Civil Defence Emergency Management Act
New Zealand Coastal Policy Statement

Appendices

Appendix 3.28.1 Option evaluation paper: Natural hazard mapping 2012
Appendix 3.28.2 Issues paper: Natural hazard risk
Appendix 3.28.3 Options evaluation paper: Natural hazard mapping 2011
Appendix 3.28.4 Natural Hazard Mapping: Paper for the Senior Leadership Team 2012
Appendix 3.28.5 Coastal inundation presentation 5th August 2013
Appendix 3.28.6 UP Summary of mapping information
Appendix 3.28.7 Coastal inundation by storm-tides and waves in the Auckland region

5.2 Consultation Undertaken

Consultation on natural hazards was included within the extended engagement period for the Draft Unitary Plan which ran from mid March 2013 to May 31st.

More than 100 pieces of feedback from individuals and groups was received which related to natural hazards. This feedback was used to make changes to the natural hazard provisions including minor text amendments for consistency as well as more significant changes such as activity status changes.

5.3 Decision-Making

Elected members have seen early drafts of the provisions (no mapping approach and no maps) from a conceptual level (issues and options papers) through to the March draft. This has meant that they have had several opportunities to comment on and refine the draft policies and rules prior to notification.

Coastal inundation and sea level rise was taken to the Auckland Plan Committee on the 12th of August 2013. The preferred approach outlined in this report was accepted.

Proposed changes to the March draft of the Unitary Plan as a result of feedback are reviewed by the Unitary Plan Oversight Group, which comprises senior council managers. The changes are then referred to the Auckland Plan Committee for feedback. Final decisions will be signed off at a meeting of the Committee between 28 and 30 August 2013.