Annex C – Hazard Summaries

TSUNAMI

Risk Description				
Context	**Likelihood (Urgency & Growth)**	**Consequences (Seriousness)**	**Manageability**	**Gaps**
The entire coastline of the Chatham Islands is likely to be subject to tsunami from distant source. Further work is required to define the tsunami hazard from local sources. No information on parts of the coast likely to be affected. No updated information on inundation extents, depths, or velocities is currently available.	**Urgency:** Medium return 20-100 yrs **Growth:**	**Human:** Medium: Potentially lives could be lost and trauma type injuries expected. **Physical:** Medium: Destruction of some coastal homes resulting in short term accommodation issues. There may be some loss of infrastructure roads, power, & communications. **Social:** There may be some short to medium term accommodation issues. **Economic:** Disruptions may occur through the loss of the roading and some power and communication loss. In a large event, there will also be some damage to business in coastal communities.	**Reduction:** Education in the schools and public awareness. Land use zoning controls. **Readiness:** Warning times for distant events will help mitigate some of the effect on people but this will not be the case for local events where the only warning trigger for some of the events will be an earthquake. **Response:** A Contingency Plan that will enhance normal response procedures. **Recovery:** Recovery plan that will help stabilise the affected communities, and ensure that life support systems are operational. Ensure that all lifeline utilities work together.	Need to collate all existing information on past events. Based on this literature search, develop a program to better define the hazard. This may involve some modelling, some investigations (Paleotsunami) or just document the observations from walkover survey.

FLOODING

Risk Description				
Context	**Likelihood (Urgency & Growth)**	**Consequences (Seriousness)**	**Manageability**	**Gaps**
Historically the areas most likely to be affected from flooding are Kaingaroa, Owenga, Port Hutt and Waitangi.	**Urgency:** A major rainfall event is likely at any time. **Growth:** Climate change indicates that changes to the sea levels are most likely to rise 30-50cm by 2100. This rise will accelerate coastal erosion, inundation, flooding from storms. Weather events are likely to become more frequent and intense. Heavy rainfall will become more common.	**Human:** Warning of large events should be sufficient to avoid any loss of lie. The main human impact will be displacement, accommodation issues, and distress through loss of possessions. **Physical:** Loss of infrastructure will be significant especially roads, bridges. Loss of pasture for farming/ Horticulture.	**Reduction:** The Islands Plan should prevent inappropriate activities establishing in high-risk flood prone areas. This includes structures that may obstruct flow paths or desired ponding areas. Raising houses in flood prone areas. Relocating structures in flood prone areas. Flood proofing structures.	Understanding of climatic change impacts. Better education to explain statistics relating to correlation of rainfall events and return periods of flooding. Research more information regarding flooding on the Chatham Islands.

		Could this affect the town water supplies? **Social:** Noticeable disruption to some aspects of normal social functions. Education, employment, and business interruption. **Economic:** The financial implications are major, through under or non-insurance. A number of housing/business that could impact on.	**Readiness:** Warning systems for large events would be sufficient to avoid any loss of life in conjunction with radio communication. **Response:** Normal response procedures have been enhanced by the production of evacuation plans for the high-risk areas. **Recovery:** While much of the infrastructure damage can be anticipated and planned for its loss may still cause disruption for some time. Returning people to their homes may also take sometime.	

WIND STORMS

Risk Description				
Context	**Likelihood (Urgency & Growth)**	**Consequences (Seriousness)**	**Manageability**	**Gaps**
	Urgency: Less than 20yr return This is a high level of impact. With climate change, the extreme weather events are likely to become more frequent and intense. **Growth:** Increase in climate change of 40% by 2030 and 100% by 2080 in annual frequency of winds above on m/s There is unlikely to be any significant increase of population in local areas prone to the effects of windstorms.	**Human:** Damaging wind events on the Island have tended to be localized, there is always the possibility of injuries. **Physical:** More widespread events while creating disruption to power supplies, knocking trees down and damaging the odd roof, have tended to be of short duration, and not intensive enough to cause significant damage. **Social:** Short localised disruption to activities, especially if the infrastructure is damage. Would be noticeable disruption to some services. **Economic:** Moderate impact is anticipated.	**Reduction:** Building Act should ensure structures are resistant to wind storm events. **Readiness:** Long-range weather forecasting provides a significant warning system for large cyclonic events. **Response** Local areas affected would require assistance to clear debris from roads etc. **Recovery:** Depending on the scale of the event will determine the time involved for the recovery.	

EARTHQUAKE

Risk Description				
Context	**Likelihood (Urgency & Growth)**	**Consequences (Seriousness)**	**Manageability**	**Gaps**
Need to assess earthquake hazards that actually may have the potential to impact the Chatham's.	**Urgency:** Moderate return of 20-100yrs. **Growth:** Population growth is expected to remain static in the medium term. Climate change will influence the likelihood of more coastal storms, erosion, flooding etc. There is a change, increase in the physical character of the hazards and our exposure to the hazard also increasing (greater population, and more development etc…	**Human:** Potential for a small number of deaths, unless there is a consequential fire and again a small number of crush/trauma injuries. Loose items in homes, work places, will cause most casualties. **Physical:** Destruction of some homes resulting in short term accommodation issues. There may be some loss of infrastructure roads, power, and communications. **Social:** There may be some short to medium term accommodation issues. Following a large event there may be a problem repopulating some coastal areas either through fear or imposed restrictions that could threaten recovery and the viability of the area. **Economic:** Monetary loss will be significant, none and under insured people/organisations will have difficulty recovering.	**Reduction:** Building Act requirements should ensure structures withstand certain levels. **Readiness:** A national reporting system helps identify likely impact areas. **Response:** Covered by Civil Defence Plans and procedures. **Recovery:** Not enough information concerning the likelihood or size of an earthquake happening.	Lack of understanding and research on the likelihood of an event. Need to know which roads could be closed? Research on the active faulting, that is ground rupture from amplified ground shaking, liquefaction potential, induced instability.

STORM SURGE

Risk Description				
Context	**Likelihood (Urgency & Growth)**	**Consequences (Seriousness)**	**Manageability**	**Gaps**
Coastal Communities are the areas mostly likely to be effected by an emergency scale storm surge.	**Urgency:** Less than 20yrs. **Growth:** The populations exposed to the effects of storm surges are not likely to change significantly.	**Human:** There is small potential for casualties but hopefully warning systems will be robust enough to evacuate people from at risk areas before impact. **Physical:** Destruction of some coastal homes resulting in short term accommodation issues. There may be some loss of infrastructure roads, power, and	**Reduction:** Council to have coastal hazard plans and a strategy is to be formulated. Flood hazard zones need to be identified in the Island Plan. These may restrict activities within areas prone to coastal hazards and river flooding and specify minimum floor heights. **Readiness:** Warning systems are	Time to research needed.

		communications. **Social:** There may be some short to medium term accommodation issues. There may also be distress and hardship caused through loss of infrastructure. **Economic:** Disruptions may occur through the loss of the coastal roads and some localized power and communication loss. In a large event, there will also be some damage to business in coastal communities.	the same as for any other adverse event. **Response:** Follow the same procedures as for flooding or Tsunami. **Recovery:** Based on major event look at the communities to give estimated period for recovery.	

EROSION

Risk Description				
Context	**Likelihood (Urgency and Growth)**	**Consequences (Seriousness)**	**Manageability**	**Gaps**
The impacts of erosion and instability will be localised in heavily capitalised areas.	**Urgency:** Less than 20yr return. **Growth:** Climate change causing intense rainfall events, heavy rain causing saturated soils or intense storm events of relatively short durations are likely to increase erosion activities and instability problems. However, the populations exposed to the effects of erosion/instability are not likely to change significantly.	**Human:** Potential for small number of injuries. **Physical:** Building damage or collapse is possible and some buildings may have to be demolished, Local infrastructure, road, power etc could be out of service for a time. **Social:** There may be some short term accommodation issues. There may also be distress and hardship caused through loss of infrastructure and primary production. **Economic:** Disruptions may occur through the localized loss of infrastructure, power, and communication. Monetary loss may be significant for individual property owners.	**Reduction:** Building Act (S.36) raises awareness of the hazard. Generally, encourage and educate landowners to use land appropriately for erosion control. **Readiness:** Slips may give some warning that can be observed as land slips occur progressively with heavy rain or storm events. **Response:** As areas affected are likely to be small there should be sufficient resource to cope. **Recovery:** Will probably involve resettlement of these affected.	Need for information in order to assess full existent of impact.

HAZARDOUS SUBSTANCES

Risk Description				
Context	**Likelihood (Urgency & Growth)**	**Consequences (Seriousness)**	**Manageability (Given what is presently in place)**	**Gaps**
Hazardous substances by virtue of their very nature present a risk	**Urgency:**	**Human:** Dependant on the individual substance and	**Reduction:** Environment and hazard audits, advice, and	Mapping of hazardous substances storage.

to people and the environment. The degree of risk is dependent on the substance, its state, concentration, quantity, and concentration, also the conditions surrounding it. The degree of risk can increase with a change in its state or the conditions surrounding it. It may in itself present a risk by way of a leak explosion or may be in association with another hazard event e.g. fire, traffic accident. Most hazardous substances are stored, used, and transported in relatively small quantities but still have the potential to cause damage to life.	**Growth:**	incident, reasonable to expect small number injuries or disease. **Flora/Fauna:** Death, damage, disease or transmission of effect on to humans. **Physical:** There is potential for building and other structural damage due either to contamination or destruction through secondary events such as fire. **Social:** Closure of residential or commercial areas. **Economic:** Image effects on exports and tourism. Effects on earning capacity, sales, exports. Costs associated with any reconstruction.	promotion of contingency plans etc are must. **Readiness:** Some preparedness through a HSTLC, MOS approach. **Response:** Depends on the magnitude and simultaneous problems. **Recovery:** Worst long-term effects would be export tourism and feel good components.	SOPs for may specific hazardous substances event. A list from all business/users on the Chathams of all the hazardous substances that they keep on site and where and how it is stored would give us more information to work with in the event of an emergency. Could there be any long-term impact on the farming and fishing industries.

BIO-SECURITY

Risk Description				
Context	**Likelihood (Urgency & Growth)**	**Consequences (Seriousness)**	**Manageability (Given what is presently in place)**	**Gaps**
The introduction of pests and organisms could have a devastating effect on the economy and many of the ecosystems of the Islands. Lack of border control is creating Opportunity for infestation.	**Urgency:** Return less than 20yrs. Land and sea posse a threat to the economy and continued growth of the Islands. **Growth:** Increases in vessels coming to the Islands lead to greater pest and disease pressures. Increases in tourism are also increasing the risk to the Islands.	**Human:** Spread of some disease coursing sickness. **Physical:** Likelihood of a major event could lead to all coming and going from the Islands be controlled or temporary haltered. **Social:** Emotional impacts likely **Economic:** If a major event warrants restriction of movement this affect's farmers, fishermen, tourism and the general public. Some sectors may never recover.	**Reduction:** Increased border control, monitoring and public awareness campaigns. **Readiness:** A lot of planning/research needs to be undertaken. **Response:** Council is aware of the need to prepare contingency plans so that a plan of action is in place in the event of the arrival of key pests. **Recover:** Difficult to determine, could take a long time to recover if at all in some areas.	Development of national bio-security strategy underway. Limited integration with other agencies. Little knowledge is widely known on bio security and what affects it could impact the Chatham Islands.

FIRE – URBAN

Risk Description				
Context	**Likelihood (Urgency & Growth)**	**Consequences (Seriousness)**	**Manageability (Given what is presently in place)**	**Gaps**
Significant damage to a range of buildings. Hazardous substance kept on site.	**Urgency:** Return less than 20yrs. **Growth:** Probability increase unlikely.	**Human:** Moderate to high **Physical:** Significant infrastructure impact is dependent on the buildings and environment involved. **Social:** Dependent on the nature of the incident, emotional impact to whole Island if human loss of life. **Economic:** Loss of business or homes: Factories would have high impact affecting the factory owners, workers, fisherman, families, and other business on the Island, and export. Loss of homes could be long term depending on insurance or non-insurance.	**Reduction:** Utility operator prevention plans, processes. **Readiness:** Fire Service has systems & procedures in place. Some warning systems in place. **Response:** Through emergency Fire services base on the Chatham Islands. **Recovery:** Dependent on the nature of the incident, the building or the environment involved. Would expect that in most cases recovery commence the same day of the incident.	Volunteers available. Need for multi skill multi agencies emergency team.

FIRE – RURAL

Risk Description				
Context	**Likelihood (Urgency & Growth)**	**Consequences (Seriousness)**	**Manageability (Given what is presently in place)**	
Vegetation fire: Given a dry hot summer a fire may be expected to travel very fast on fern covered peaty soil, a wind change at this point would result in a very large fire that would be extremely difficult to contain or extinguish. Some peat fires can go on to burn/smoulder for years.	**Urgency:** Return 20-200yrs. **Growth:** Climate change may increase both the possibility and the severity of a fire due to longer burn times.	**Human:** Unlikely. **Physical:** Farm buildings and private dwellings are the most likely affected. Possible forest damage. Dependent on where the fire occurs, power and roading may be affected. **Social:** The community may be affected by an emergency event in the short and long term; likely effects will involve disruption to services during the incident, road access, loss of property and threats to well-being and safety. The possibility of evacuations smoke, noise etc. Long-term effects could include loss of employment, loss of amenities	**Reduction:** Restricted fire seasons all year round, restricted or prohibited fire seasons as required. Limiting access and operations within high-risk areas. Fire weather monitoring. Close co-operation with NZ Fire Service, DOC, volunteers. Removal of flammable vegetation using Forest and Rural fires Act and the Local Government Act. **Readiness:** Response equipment located throughout the Island. Joint Agency Training programs in place for all volunteers. **Response:** A fire as described in the context is unlikely to be	Wild fire threat.

		land erosion, stress and trauma to individuals. **Economic:** Impacts will depend on fuel type, values damaged or of exotic forests.	contained until it has finished its run, or until the life and property, protection would be the main priority. **Recovery:** Dependant on fuel type, fire location and severity. Land types in relation to erosion would play a significant part. Recovery might take long term.	

PUBLIC HEALTH

Risk Description				
Context	**Likelihood (Urgency & Growth)**	**Consequences (Seriousness)**	**Manageability (Given what is presently in place)**	**Gaps**
Water supply: Contamination to the water supply, either at source or in transmission. Failure in water treatment. **Air contamination:** Accidental or deliberate. **Disease:** Viral or Bacterial or other influenza pandemic may trigger emergency response. **Hospital:** system failure as a result of other events, emergency response triggered by major failure, hospital emergency plan triggered by smaller failure. **Food contamination:** Accidental or Deliberate emergency response triggered by mass poisoning.	**Urgency:** 20yrs return time. **Growth:** Financial imperative raise risk of accidental event. Exposure related to supply distribution.	**Human:** All consequences are entirely dependent on contaminant (Chemical or Biological) Extent of impact from major to minor. Dependent on event. Mainly event dependent, but major event damage, earthquake has potential to restrict access to essential health care.	**Reduction:** Water supply protection tends to be good against accident, however not malicious intent. Surveillance at local levels. Hospital emergency plan. Food legislation impossible to truly prevent deliberate act. **Readiness:** Limited because of unpredictability. Poorly prepared not expected as an event, no readiness. Pretty good for responding in short term	Unpredictability of event means gaps inevitable. Ability to respond present, major gap will be rapidity and willingness to share information. Gaps lie in risk assessment, is there enough knowledge.

TRANSPORT – MARINE

Risk Description				
Context	**Likelihood (Urgency & Growth)**	**Consequences (Seriousness)**	**Manageability (Given what is presently in place)**	**Gaps**
There are 2 main scenarios that may have a major impact from the marine sector. • A fire on board a ship in the port that may spread toxic fumes or endanger facilities.	**Urgency:** High **Growth:** There is a likelihood of threat with the increase to shipping.	**Human:** Death is unlikely except to those directly affected by fire or sinking, there may be a small health risk to the public through toxic fumes or eating contaminated seafood. There is also a significant health & safety	**Reduction:** Marine oil spills plans and control of unsafe shipping practices. **Readiness:** Maritime safety and council have good monitoring and warning systems in place to	

• A marine oil spill from a ship at sea or in the port affecting the environment, some direct human impact and damage to the sea. While both these events have potentially serious consequences, the main impact will be from damage to agriculture. Most natural disaster has the potential to affect shipping and restrict movement of cargo and people.		issue for those involved in the response. **Physical:** Generally on the ship although there is a risk to the Port facilities. **Social:** A major marine spill has the potential to impact on coastal food supplies for several years. **Economic:** Apart from loss to ship owner, there is potential loss to fishing operators, exporting and the tourism industry.	allow a timely response. Fire Services normal procedures would be in place for a ship fire in the event. **Response:** MOS procedures should cope with oil spill, some question re co-ordination of Fire Service. **Recovery:** Dependant on scale of event and effectiveness of response. But could take some time.	

TRANSPORT - ROAD

Risk Description				
Context	**Likelihood (Urgency & Growth)**	**Consequences (Seriousness)**	**Manageability (Given what is presently in place)**	**Gaps**
Tsunami: Several sections of the Islands road network along coastal fringes may be susceptible to Tsunami attack. **Flooding:** Roads on the coastal flats are at risk from flooding and being closed for a number of days. **Erosion/Stability:** Some hill sections of roading will be affected by erosion and instability.	**Urgency:** 20-30yrs **Tsunami:** 20-30yrs **Flooding:** Climate change courses flooding at any time. **Erosion/Instability:** Heavy rain falls at any time. **Growth:** Low probability of population increasing, but climate change may increase flooding and erosion occurrences.	**Human:** Low - Medium **Physical:** Links expected to be restored within days. Due to heavy rain likely loss of some road access for days to weeks. Erosion/Instability Temporary reinstatement should only take days to clear. **Social:** Potential to affect rural life for sometime. **Economic:** Will have an effect at certain times of the year on some exports.	**Reduction:** Extension of river and coastal protection works normally undertaken as a result of storm events will reduce risk, as will installation of drainage and stability measures. **Readiness:** Roading Authorities have procedures in place to inspect and react to emergency events when they occur. Contracts for roading maintenance include an emergency response requirement. **Response:** Response would be immediate by trained contractors. **Recover:** Temporary access would be gained within days to most places; some could remain isolated for longer periods.	Little information available on likely impact and extent of damage from a tsunami.

TRANSPORT - AIR

Risk Description				
Context	**Likelihood (Urgency & Growth)**	**Consequences (Seriousness)**	**Manageability (Given what is presently in place)**	**Gaps**
Due to the Islands geographical isolation in terms of sea, air being the only way in which to get on the Island, the airport is an important asset during both normal times and times of an emergency. **Infrastructure failure:** Any failure of the airport infrastructure could affect the airports ability to function. 1 The most likely failure would be **run way failure.** 2 The second most likely failure would be **Natural Hazards or Events:** These events will affect the airport depending on how large scale the event is. - Flooding - Earthquake - Storm - Tsunami	**Urgency:** Return time anytime. **Growth:** No population change but climate change will affect probability of events occurring.	**Human:** Fatalities Aircraft passenger 36-40 Injuries on the ground would depend on location and time of event in a major event. **Physical:** Airport closure, damage to runways and possibly buildings. **Social:** Inconvenience to passengers and possible compromise of emergency medical services. Loss in confidence in flying by some. Those who had loved ones killed on aircraft or on the ground would be grieving. **Economic:** (1) Loss of income to airline. Loss of aircraft. Loss of exporting importing for the Island. Loss of income and business for the business community. Loss off service to the Island community. (2) Depending on water depth and where event occurs, it could close airport or restrict vehicle access to the airport. A large earthquake could render the airport inoperative.	**Reduction:** Island Plan to prevent activities, which attract large populations from establishing within critical areas e.g. the final phase of approach and departure paths from the runway. Ensure that future works to flood protection schemes take into account the airport and direct floodwater. **Readiness:** Airport to have an Airport Emergency plan, which involves all emergency services. Response would be immediate by trained personal. Have response equipment maintained and ready at all times. **Response:** The plan is tested every year with a live exercise. **Recovery:** Depending on the extent of the damage to the Airport, unknown	Need to prepare recovery plan in order to get airport back to operation as soon as possible as it will be an essential asset to aid the recovery process.

COMMUNICATIONS

Risk Description				
Context	**Likelihood (Urgency & Growth)**	**Consequences (Seriousness)**	**Manageability (Given what is presently in place)**	**Gaps**
The Island is dependent on Telecommunications both the public and business continuity functions such as computer links, paging systems, in addition to normal voice connection. A temporary loss of this service could have negative consequences for the public. Hazards identified in the CDEM Plan with potential impact on Telecommunications are: • Tsunami • Flooding • Wind Storms • Earthquake • Storm Surge • Fire Urban • Fire Rural • Internal Telecommunications System failure	**Urgency:** Serious Telecommunication failures within the Islands are infrequent. Significant telecommunication outages in the future are a possibility, although experience shows that the more significant events are more likely to be related to a natural hazard than a technological issue.	The most severe consequences for this region from telecommunication failure centre around the Island becoming cut off from NZ. And economic impact on business, these consequences being amplified when the failure is associated with another event **Human:** There could be disruption to the public ability to notify emergency services of accidents. This disruption will also extend to the emergency services. **Physical:** Could be structure damage result of a fire. **Social:** Emotions stretch with inability to contact loved ones. **Economic:** There are likely to be disruptions as a result of an inability to use computers, phone systems, and normal banking.	**Reduction:** Ensuring communication system has contingency plans. Flooding Tsunami and Instability Hazards, selecting optimum sites to minimise these hazards? **Readiness:** Emergency plans that covers the processes and responsibilities. Implementing a calling restriction on all phones entering the Chatham Islands. Able to provide priority service for lines used for emergency purposes. Recovery: Telecom processes, and systems to achieve timely recovery.	Could Telecom deploy as necessary restoration with the key objective being to restore permanent fix at a later time.