



**MARLBOROUGH SOUNDS HARBOUR
NAVIGATIONAL RISK ASSESSMENT REVIEW**

Prepared For : Marlborough District Council
Report Number : 09NZ190
Issue : 1
: December 2009

MARICO MARINE NZ LIMITED

MARLBOROUGH SOUNDS HARBOUR NAVIGATIONAL RISK ASSESSMENT REVIEW

Prepared for: Marlborough District Council
PO Box 443
Blenheim 7315

Author: John Riding

Checked By: Sally Kopp

Marico Marine NZ Limited
Level 11
156 Willis Street
PO Box 11509
Wellington

December, 2009

CONTENTS

EXECUTIVE SUMMARY	1
1 INTRODUCTION	1
1.1 TERMS OF REFERENCE	1
1.2 MARLBOROUGH SOUNDS - RISK ASSESSMENT AREAS	2
1.3 RISK MANAGEMENT DEFINITIONS	2
1.4 RISK MANAGEMENT DECISIONMAKING CRITERIA	3
2 METHODOLOGY	5
2.1 THE 2005 RISK ASSESSMENT – PARTICIPATION AND CONSULTATION	6
2.2 HAZARD RE-SCORING	6
2.3 RISK MITIGATION ACTION CRITERIA	9
2.4 REVIEW OF PLANNED RISK CONTROL	10
3 MARLBOROUGH SOUNDS HARBOUR - OVERVIEW OF CHANGES	12
4 REVIEW OF KEY RISKS	16
4.1 HAZARD RISK RANKING	16
4.2 REVIEW OF RISK	19
5 RISK CONTROL MEASURES	20
5.1 THE STATUS OF RISK CONTROL MEASURES- 2009	20
5.2 STATUS OF THE HARBOUR SAFETY MANAGEMENT SYSTEM	21
5.3 CONSULTATION	22
5.4 ANTI COLLISION MEASURES – RoRo OPERATORS	23
5.5 OPERATIONAL RISK CONTROL MEASURES	23
5.6 HARBOUR TRAFFIC INTERFACE	24
5.7 OPTIONS FOR THE HARBOUR INTERFACE	26
5.8 TECHNICAL RISK CONTROL MEASURES	27
5.9 PILOTAGE	30
5.10 CONCLUSIONS AND RECOMMENDATIONS – PILOTAGE	32
5.11 OTHER TRAFFIC MANAGEMENT OPTIONS - ONE WAY OPTION	33
6 CONCLUSIONS	34
7 RECOMMENDATIONS	35

ANNEX A – Risk Assessment Criteria

ANNEX B - Ranked Hazard List

ANNEX C - Incident Data Summary

ANNEX D - Risk Result Summary Tables

ANNEX E - Risk Control Status and Control Adequacy Rating

EXECUTIVE SUMMARY

This document reports a review of the hazards identified in the 2004 risk assessment for the Marlborough Sounds Harbour, under the jurisdiction of Marlborough District Council in its role as Harbour Authority.

The work comprises a review, and, where data evidence provided, a rescoring of the original hazard list. The review concentrated on incident data collected by Council over the period since the original risk assessment. The scope remains wide ranging, considering ferry transits in the relatively busy parts of Tory Channel and Queen Charlotte Sound through to marine farm operations in Pelorus and Kenepuru. It is normal to review a risk assessment at around 5 yearly intervals as risk changes only slowly with time. This review has been undertaken after a period of only 4 years, but against a background of significant reported change, especially to the on-board transit management of RoRo ferries. Although such changes cannot be properly evaluated without further involvement with Bridge Teams on board vessels, it is pleasing to note the effort that has been made following the positive acceptance of the 2005 risk findings.

At time of the 2005 risk assessment, a total of 84 hazards were identified, at an overview level. These were re-ranked using incident data with the frequency and consequence information driving the result. Since then, a notable number of mooring failures have occurred, involving both recreational craft and commercial barges; this demonstrated the need for a new hazard. This has increased the total number of recorded navigational hazards to 85, in 2009.

The use of incident data for rescoring has allowed risk levels to be updated, with hazard outcomes aligned further with the incident record of the harbour. The quantum of risk for this rescoring is further underpinned by the neutrality of hard data.

The data suggests that risk of a large vessel grounding is receding, but collision risk remains a concern. It is likely that collision risk between RoRo ferries has reduced further than data is recording, due mostly to new bridge transit management procedures and systems. An evaluation of on-board systems was not possible during the course of this review, but is needed for any further verification of risk reduction. The result shows risks are bounded within the ALARP region, but that action is recommended to continue to address the harbour management interface; work towards this has already reached the stage where implementation could be achieved at

reasonable cost. Outstanding are decisions to be taken over the detail of system implementation.

There are a number of risk control measures that can reasonably be deferred. However the implementation of a participatory Safety Management System needs to be progressed and this is becoming somewhat urgent.

Objective stakeholder feedback was overshadowed by ongoing bylaw consultation. There was feedback from users of a wish to engage in a forum to develop and take decisions about harbour safety management, which is a provision of the draft Marlborough Harbour Safety Management System. However participants in such a forum need to accept the position of safety responsibility and accountability of Council in its role as Harbour Authority. These obligations are clearly set out in the NZ Port and Harbour Marine Safety Code.

Individual recommendations arising from this review are contained in the main body of the report. Key conclusions are as follows:

1. The quantum of risk has been reviewed and is now aligned with the significant volume of incident data available for the harbour, which may be falling due to improved systems of on-board transit management.
2. The level of harbour traffic, especially recreational, has risen significantly since the 2005 risk assessment. This was predicted and the increase is expected to be ongoing, with Queen Charlotte Sound receiving the greatest traffic density.
3. A key traffic increase is the transit of Tory Channel entrance by small craft wishing to fish in the seas adjacent to Tory Channel entrance. This increase has been influenced by the Cod Fishing ban in the Sounds.
4. The risk review was based on the existing hazard records and suggests that risk of grounding is receding. However in the five years since the risk assessment there have been three worst-credible collision events recorded across all sectors of harbour users. Collision risk has thus been rising, with the exception, it appears, of RoRo ferry on RoRo ferry.
5. Given the foregoing, a key finding of this risk review is the need to continue to make improvements to the harbour monitoring interface, and progress the implementation of the Safety Management System. Options for this service have been laid out in Section 5.
6. The deployment of AIS receiving equipment and software to monitor the result is already providing information of Safety benefit to Marlborough Harbour. Harbour monitoring software to IALA Standards has been procured and is awaiting a decision for its implementation in either the Port Company; the Harbour Office, or a combination. Decision-making information against each of the options is provided in this report.

7. The Harbour Safety Management System has been developed by agreement of both the Port Company and the Harbour Office. It has been submitted to maritime New Zealand and obtained the first stage of approval. The system has since stalled, with components and proceduralised systems needing to be developed. Its progression is resource dependent, but there is a somewhat urgent need for progression to continue.
8. The review of risk control measures to determine the most cost effective solution is presented in Section 5. There are considerable harbour budgetary savings to be made, especially with the choice for development of the Harbour Interface. These need to be evaluated as a result of this report.
9. RoRo operators report having introduced systems to manage their transits through Marlborough Harbour. However tripping to evaluate and understand the benefit was declined until the process of bylaw review was complete.
10. Port Marlborough announced its own risk assessment of its operations during this risk review.
11. The review of some risk controls to determine the most cost effective solution is presented in Section 5. There is the potential for considerable harbour budgetary savings to be made, dependant on the choice for development of the harbour interface. These need to be evaluated as a result of this report.
12. There is a risk control option to consider a one way system for traffic using Tory Channel. It is not taken forward by this report as it would need both consultation and further development. As an option, it may have has the merit of providing savings in the provision of risk management.

Key Recommendations are

1. Given the foregoing, a key finding of this risk review is the need to continue to make improvements to the harbour monitoring interface, and progress the implementation of the Safety Management System. Options for this service have been laid out in Section 5.
2. Harbour monitoring software to IALA Standards has been procured and is awaiting a decision for its implementation in either the Port Company, the Harbour Office, or a combination. Decision-making information against each of the options is provided in this report.
3. Based on data to suggest that RoRo on RoRo collision is receding, implementation of radar deployment should be delayed, whilst stakeholder systems managing harbour transit are evaluated and incorporated into the Harbour Safety Management System. The use of CCTV at known choke points in conjunction with requiring more vessels

to be fitted with AIS transponders will assist in the evaluation of a future need for radar.

4. The option above, if taken, should be supported by increased Class B transponder requirements for small commercial vessels. This is occurring in other New Zealand Harbours.
5. As a minimum, it is recommended that a Deputy Harbour Master be appointed and administration support provided from the existing pool of council expertise.
6. The development of the Marlborough Harbour Safety management System should be progressed. The aspects of organised consultation in its design should be implemented to allow users and harbour interface to share information. The consultation should recognise the role of the Marlborough District Council as the decision-making Harbour Authority responsible for Navigational Safety.
7. The option to deploy a wave rider buoy at Tory Channel entrance should be taken forward, but costed in detail before final decision-making. As there is already communications band-width available to transmit the data ashore, there is only installation cost to consider. Wave and wind monitoring, combined with a replacement tidal height monitor would provide the base data on which the criteria parameters for use of Tory Channel entrance can be based.
8. A review of Pilotage boarding from AIS data, underpins the practical need for Marlborough Harbour to develop an effective harbour monitoring interface. This would assist in decision making for marginal conditions and adherence to procedures based on best practice. Such procedures should be developed.

1 INTRODUCTION

This document records a review of hazard risk by rescoring of the Marlborough Sounds Navigational Risk Assessment, originally undertaken in 2004/2005. The rescoring, based on incident data alone, has been undertaken independently on behalf of Marlborough District Council.

The fundamental objective of the rescoring was, as much as possible, to factually establish the risk levels in relation to the frequency and severity of the incident data that has been collected on Marlborough Harbour since the 2005 risk assessment was completed. The 2005 risk assessment methodology was approved by Maritime New Zealand, who provided an extremely positive approval response. The same risk criteria have been employed to facilitate comparison.

This document should be used to inform the existing Harbour Safety Plan and the developing harbour Safety Management System (SMS).

1.1 TERMS OF REFERENCE

The scope of this risk review is to provide a hazard re-scoring of the 2005 risk assessment hazards to determine changes in risk levels apparent since 2005, using incident data recorded by Marlborough District Council.

The scope of the risk assessment review included consideration of:

- Incident data and near-miss reports.
- Limited further consultation as appropriate to the needs of a data based review.
- Consideration of trade routes or commercial or recreational activities ongoing in the Sounds.
- The organisation available to manage any identified risks of significance.
- Take the existing hazards as agreed in 2005 and rescore these based on data.

It should be clearly noted that this project was not designed to conduct a full review of the risk assessment content, but was work designed to consider the changes in risk levels that had occurred since the 2005 risk baseline was delivered. Thus, the original risks, identified with the input from wide ranging stakeholder consultation, remain valid.

1.2 MARLBOROUGH SOUNDS - RISK ASSESSMENT AREAS

To undertake the risk assessment review, the same area breakdown was used as the 2005 risk assessment. These are attached at **Annex A** in diagrammatic form.

1.3 RISK MANAGEMENT DEFINITIONS

Using the risk matrix (**Table 1**, below) taken from **Annex A**, the incident data was used to populate each hazard was scored against a scale of 1 to 10 for each of the four consequence categories within the NZ Risk Assessment Guidelines (i.e. impacts on: Life; Property; Environment; Harbour Stakeholders).

C o n s e q u e n c e	C4	5	6	7	8	10
	C3	4	5	6	7	9
	C2	3	3	4	6	8
	C1	1	2	2	3	6
	C0	0	0	0	0	0
Frequenc y		F 5	F 4	F 3	F 2	F 1

Table 1 - Risk Matrix

- 0 & 1 Negligible Risk
- 2 & 3 Low risk
- 4, 5, 6 Assessed to be in the ALARP region
- 7, 8 & 9 Significant Risk
- 10 High Risk

1.4 RISK MANAGEMENT DECISIONMAKING CRITERIA

The risk assessment used the same risk criteria as in 2005, thus allowing a reasoned comparison to be made with the situation then. These are presented below in **Table 2**.

Matrix Outcome	Risk Definition	Action Taken
0 & 1	Negligible Risk	A level where operational safety is unaffected.
2 & 3	Low risk	A level where operational safety is assumed.
4, 5, 6	As Low As Reasonably Practicable (ALARP)	A level defined by Study at which risk control in place is reviewed. It should be kept under review in the ensuing Safety Management System.
7, 8 & 9	Significant Risk:	A level where existing risk control is automatically reviewed and suggestions made where additional risk control could be applied if appropriate. Significant risk can occur in the average case or in individual categories. New risk controls identified should be introduced in a timescale of two years.
10	High Risk	An area where the Harbourmaster needs to recommend rapid action.

Table 2 Risk Treatment Criteria

1.4.1 Control Adequacy Rating

The NZ Port and Harbour Marine Safety Code guidelines references a review of the risk control effectiveness in a harbour, using a methodology called Control Adequacy. At an initial risk assessment, where new risk control is recommended, there is little utility in the methodology. The adequacy rating is totally reliant on the judgement of those that provide the assessment. At the time of the report compilation a bylaw review consultation was in progress, which can (obviously) negate the value of input into this stage, other than it being independent.

However in a review of the effectiveness of the changed risk control as introduced to the harbour as a whole, it is a useful tool.

It has to be noted here that without review of all the additional risk control said by users to be in place, the control adequacy rating assessment can only be related to that introduced directly by Marlborough District Council as a result of risk assessment recommendations. The scoring is therefore in relation to risk control and development of the safety management system as required by the Code.

The Risk Control Adequacy Rating, as set by the Maritime New Zealand Guidelines is shown in **Table 3**, below.

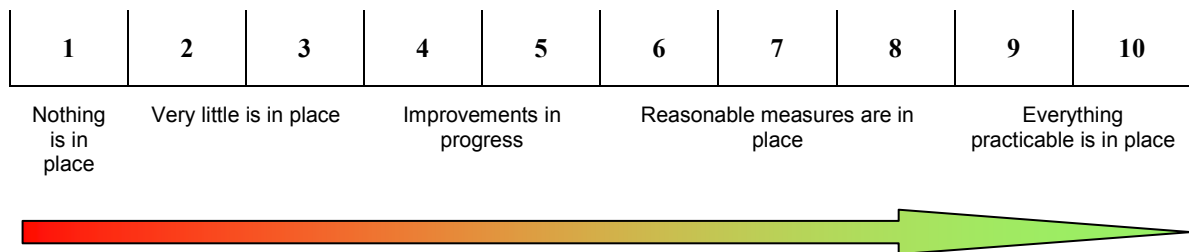


Table 3: Risk Control Adequacy Rating Criteria

2 METHODOLOGY

The methodology deployed is intentionally practical and used data analysis experience drawn from over 76 port, harbour and risk projects. Key harbour users were approached to participate, but with the project proceeding at the same time as a Council Consultation associated with a Bylaw review, obtaining objective consultation was not possible. The risk review project was thus designed from the start to rely on the neutrality of incident data. Both RoRo Operators providing passenger and freight capacity on the Wellington-Picton route advised that significant improvements had been made, since 2005, to bridge procedures and navigational systems managing their own transits. A request for on-board attendance in order to record and verify procedural risk control now deployed was declined or deferral requested.

For scoring of the risk, the only source used was incident data. If incident data was not recorded for any particular hazard, its 2005 scores were assessed as unchanged unless there was any factual evidence for change.

Many marine risk assessments undertaken for presentation to IMO¹ members use incident data for the assessment of risk; this being because of the politically motivated nature of IMO. Data-based risk analysis is more factually based and can provide impressive results², especially in a situation where opinion of safety is predetermined by other considerations. The process used remains valid to the Port and Harbour Marine Safety Code as this risk review is one of quantum in nature only.

It is not the case that the project was conducted without successful feedback consultation with key stakeholders. However apart from reference to systems managing risk, opinion was not used as a basis for modification of risk quantum without evidence, such as new and effective proceduralised systems.

Since 2005, a considerable volume of incident data has been collected by Marlborough District Council. The information has been used to inform the consequence of outcome for the most likely case and the frequency of occurrence of the worst credible case.

¹ IMO = International Maritime Organization. A UN body with governmental membership that collectively sets the regulatory standards for international shipping.

² One project that Authors managed at IMO brought the annual loss of life on Bulk Carriers down from 1600 fatalities per annum to 39 in 2008.

Council, in its role as the responsible Harbour Authority should expect to continue to document ongoing hazard identification and review to ensure that all relevant hazards, both existing and new, have been considered and accurately assessed.

2.1 THE 2005 RISK ASSESSMENT – PARTICIPATION AND CONSULTATION

A review of the 2005 risk assessment was undertaken to consider the sources for the original hazard identification and risk scoring. The review also defined the scope of the hazards that were to be reviewed in the 2009 review. In 2005, core hazards were initially developed from the feedback of officers serving on RoRo ferries, whose perception of Marlborough Sounds safety at that time, as well as referenced incidents, were captured. Further hazards were then generated from also a considerable number of meetings held in Picton, Havelock, Port Marlborough and Wellington. Separate meetings were held with recreational users and representatives of water taxi operators were visited, together with fishing interests. On site visits to each of the Sounds were made by boat, including the Port Marlborough assets at Havelock. A trip on a mussel barge was conducted, water taxi operators interviewed and representatives of kayak hirers met (Picton based). Other, wider stakeholders were written to by the Harbour Office to seek as wide an input as reasonably practicable.

The final 2005 list of hazards was filtered out of the information received, during four continuous meeting days at Blenheim Civil Defence building. Port Marlborough was closely involved in hazard development, with the CEO at that time, a qualified pilot, participating directly both in hazard development and risk scoring, as well as suggesting options for risk mitigation and commenting positively on the risk scores. Maritime New Zealand expertise participated in a review of the derived risk scores, held in Wellington. RoRo operators and other stakeholders were circulated with the finalised and risk assessed hazards and feedback comments included. The risk assessment as submitted to Maritime New Zealand was positively received and methodology followed approved.

2.2 HAZARD RE-SCORING

With a project design decision to align hazard scoring and content with incident data, access was provided to the Council incident database for the harbour. This holds data of all reported incidents between 2005 and 2009, with detail as appropriate. As personal information is attached (which is inevitable) only summary information is published.

For the review of risk, incidents were first listed against the identified hazards, providing the basis to review both most likely and worst credible frequency scores. Worst credible frequency also required consideration of incident data in the longer term. The potential consequences of outcomes recorded were also reviewed against the incident data.

Hazards were thus considered against the risk frequency and consequence criteria set for Marlborough Harbour using factual data. This was achieved for both most likely and worst credible scenarios. Using the existing risk ranking methodology, the hazards were ranked in risk order on the basis of the most likely and worst credible scoring.

Expert judgement, as used in the 2005 risk assessment, is a necessary part of any risk scoring process that does not have complete data to underpin the assessment. When assessing risk in a diverse subject such as presented by a harbour, it can result in some subjectivity associated with user's perception of risk. This can be objectively assessed if experience across a number of harbours is included in the scoring makeup. In the case of the Marlborough Sounds review, this subjectivity has been negated by referencing known and reported incidents only, and re-scoring the hazards on the basis of the data alone.

If a reasonable assumption is made that not all incidents are reported, the review could be considered conservative, even though it is based on incidents that are factual in nature. Conversely, in a safety system where much work has been undertaken to improve the level of proceduralised safety management, risks based on data can show higher scores – this because risk decay measured from incident data will lag the actual risk reduction achieved by the new control measures.

2.2.1 Use of Data for “Most Likely” and “Worst Credible” Risk Assessment

The risk methodology advice provided by Maritime New Zealand in their NZ Risk Assessment Guidelines this is based on the most-likely and worst-credible approach to risk assessment. This is a useful approach to assess subjects for risk assessment that have considerable diversity, such as a harbour. It is also used for maritime subjects in general, with its adoption into step one of the IMO's Formal Safety Assessment (FSA) process.

When data is employed, this approach comes into its own. The incident data can readily be categorised into incidents representing the most likely case and incidents representing the worst credible case. A majority of Marlborough incidents represent the most-likely case, the consequence of

which is known from incident reports, as is the frequency of occurrence. As the most-likely case reflects the type of incidents most commonly occurring, it is easy to relate these together. Thus the existing incident situation can be directly related to the recent incident history. The most likely scores in the reviewed hazard list (see **Annex B**) reflect risk associated with the most common incidents (frequency and consequence). To do this alone reflects only the recent history of the harbour and history is proven time and again to be a poor guide to the future. In considering this, the worst-credible consequence outcomes need to be considered, along with their much lower frequency of occurrence.

Worst credible frequency data is often scarce, simply because it relates to the most serious incidents and as such it has to be used as a guide across a number of relevant hazards. In some cases, near miss data with potentially serious consequences can also be included in the worst credible data set. In the case of Marlborough, there is some good data associated with worst credible event frequency. Marlborough Harbour experienced a worst credible collision event in 2005 involving the RoRo passenger and recreational sector, another in 2008 involving the small craft commercial sector and one in 2009 involving the recreational sector. This data has been used for worst credible risk scoring.

A record of the data used for the risk assessment review in relation to the existing Marlborough hazards is attached at **Annex C**, providing the detail. **Table 4**, below, summarises this information.

Accident Category	Review Hazard Reference	Total Identified Hazards in Category (2005 RA)	Total Incidents Linked to Hazards
Collision (including close quarters incidents that could have potentially escalated to result in collision)	48, 18, 3, 1, 10, 9, 60, 39, 15, 4, 37, 42, 24, 51, 56, 8, 6, 65, 70, 5, 50, 7, 53, 20, 52, 59, 58, 49, 54, 17, 19, 55, 47, 68	34	152
Contact Berthing	26, 27, 46, 29, 28	5	13
Contact Navigation	73, 74, 32, 43, 36, 30, 31, 33	8	38
Fire/Explosion	71, 64, 44, 75	4	7
Foundering	40, 35	2	0
Girting	66	1	0
Grounding	11, 79, 12, 77, 13, 14, 86, 41, 38, 2, 78, 87, 76	13	48
Man Overboard	34	1	1
Mooring Failure	85	1	37
Personal Injury	83, 21, 67, 57, 45, 62, 82	7	29
Pollution	72	1	6
Swamping	16, 81, 69, 22	4	3
Tsunami	61	1	0
Wash	25, 23	2	5

Table 4 – Summary of Incidents linked to Accident Category

From the frequency and consequence data, as aligned to the incident data, risk scores were categorised for each hazard, in both the most-likely and worst-credible scenarios (i.e. providing eight risk scores per hazard).

It should be noted that occasionally, most likely scenarios can generate higher risk levels than worst credible; this is due to the increased frequency naturally associated with the most likely event. In effect, the assessment is scoring the risk associated with two different outcomes from the same initiating event. This can occur when consequence levels are similar between most likely and worst case and/or where the frequency of the worst credible is very much less than that of the most likely.

Where the most likely event does show higher risk levels it is worthy of special note as, for example, in the case of berthing contact, it may be suggesting that a large number of small berthing contact damages are of greater loss significance than a single heavy contact at a much lesser frequency.

2.2.2 Hazard Ranking for Risk Mitigation Assessment

The risk data of each of the four categories (Life, Property, Environment and Harbour Stakeholders) were analysed within the Hazman risk software to obtain four indices for each hazard as follows:

- a) The average risk value of the four categories in the 'most likely' set.
- b) The average risk value of the four categories in the 'worst credible' set.
- c) The maximum risk value of the four categories in the 'most likely' set.
- d) The maximum risk value of the four categories in the 'worst credible' set.

Average risk values are sensitive towards hazards that score moderately or highly over a number of categories, whilst the maximum risk values are sensitive towards hazards which score particularly high in any category.

These values are combined in the Hazman software to produce a numeric value representing each of the four indices. The hazard list was then sorted in order of the aggregate of the four indices to produce a Ranked Hazard List, in descending order, with the highest risk hazards prioritised at the top. This Ranked Hazard List describes the updated risk profile of the Harbour with regard to navigational operations. It is produced in full at **Annex B**.

2.3 RISK MITIGATION ACTION CRITERIA

Table 5, below describes the approach that was taken to risk mitigation, based on the developed risk profile. The "As Low As Reasonably Practicable"

(ALARP) principle of risk management has been used in the derivation of risk management recommendations. This can be applied for risks that should only be tolerated if the risk mitigation measures in place provide risk reduction into the ALARP region, and where they cannot be reduced further without grossly disproportionate cost or disruption.

For this risk assessment, the principles of reducing risk to ALARP need to be applied for the longer term to ensure that risk reduction measures are considered for all identified risks. However at this stage in the process of compliance with the Code, particular emphasis has been placed on identifying additional risk reduction measures for those risks that are found to be “significant”.

Matrix Outcome	Risk Definition	Action Taken
0 & 1	Negligible Risk	A level where operational safety is unaffected.
2 & 3	Low risk	A level where operational safety is assumed.
4, 5, 6	As Low As Reasonably Practicable (ALARP)	A level defined by Study at which risk control in place is reviewed. It should be kept under review in the ensuing Safety Management System.
7, 8 & 9	Significant Risk:	A level where existing risk control is automatically reviewed and suggestions made where additional risk control could be applied if appropriate. Significant risk can occur in the average case or in individual categories. New risk controls identified should be introduced in a timescale of two years.
10	High Risk	An area where the Harbourmaster needs to recommend rapid action.

Table 5 - Risk Management Action Criteria

2.4 REVIEW OF PLANNED RISK CONTROL

The previously identified risk control measures were reviewed with respect to the revised ranked hazard list. These were then considered in relation to the

key hazards as appear at the top end of the raked hazard list, taking account of changes since 2005. Those hazards with heightened scores in individual consequence categories were also reviewed.

The outcome of the re-scored hazard list and a review of the current status of risk control measures dictated the approach taken in identifying any new or modified risk control measures. This is addressed in more detail in **Section 6** of this report.

2.4.1 Control Adequacy Assessment

Annex E presents a detailed summary of the achievements made in the process of risk control implementation in Marlborough Harbour. A Control Adequacy Assessments is made, using the criteria supplied by the NZ risk assessment guidelines.

3 MARLBOROUGH SOUNDS HARBOUR - OVERVIEW OF CHANGES

The Marlborough Sounds Harbour is both geographically extensive and diverse. It has exposed coastal and inshore waters, areas of high tidal velocity, as well as relatively sheltered areas in the inner Marlborough Sounds. Accordingly a variety of marine environments exist, some of which provide natural hazards for the navigator; most notably exposed coastal sea areas directly influenced by weather systems in Cook Strait and narrow passages where strong tidal streams create extremely turbulent conditions.

The prevailing wind is from the north. However, winds flowing through valleys and over ridges results in local accelerations, variable direction and gustiness at sea level. As a result sailing is variable in the area; accordingly there is a predominance of power-driven vessels in marinas on the Sounds. The potential for uneducated leisure owners with high powered craft being involved in near misses and collision is reflected in the large number of incident reports. There has been a worst credible collision off the Snout at about the time of this review.

Navigational use within harbour limits is varied with a large range of vessel types including ships engaged on international and coastal trades, fishing and small commercial vessels, marine farming and supporting craft. The population of recreational craft has been rapidly growing, with increasing demand for berths, especially in Queen Charlotte Sound. This growth in the period since the 2005 risk assessment has continued, facilitating marina expansion. A dry store was planned, which would facilitate recreational use by those who do not have the time for the maintenance commitment associated with craft kept in water. At the time of report preparation, it is understood that progress on the dry-store has been deferred.

The Sounds may be divided up into distinct areas, these being the Queen Charlotte and Pelorus (including Kenepuru) Sounds, Admiralty Bay and Croisilles Harbour. The areas differ somewhat in physical characteristics, but more significant is the difference in the patterns of navigational use. Distinct patterns are evident, with the greatest range and concentration of use confined to the Queen Charlotte Sound and Tory Channel, with corresponding greater potential for conflict between harbour traffic. Pelorus Sound, Admiralty Bay and Crossilles Harbour are used more extensively for marine farming and large ships are generally absent from this area (with the exception of occasional cruise vessel and ferry visits into Pelorus Sound).

However, as identified in the 2005 risk assessment the problems of Marine Farm lighting and their compliance remain.

The principal port for the Marlborough District is still Picton, close to the head of Queen Charlotte Sound. Shipping includes ferries, bulk carriers (engaged on international and coastal trades) and visiting cruise liners. Cruise vessel numbers have risen, with a number choosing to not visit Picton wharves, but instead providing a scenic visit for passengers, alongside a call into Ship Cove. Apart from pilotage, there is no cost to a cruise vessel operator for visiting the Marlborough Sounds and to land passengers at an attractive historic site.

3.1.1 Cod Fishing Ban

In the last year, a blue cod fishing ban has entered into force, with a view to the protection of stocks. This has had the measureable effect of influencing more small recreational vessels to transit to the outer sounds area to fish. The limited consultation feedback that was made available strongly suggested that Tory Channel entrance has experienced a significant increase in recreational fishing charters and private craft that transit the Tory Channel entrance and anchor to fish in the seaward side of the approaches.

The resident fishing vessel fleet is supplemented during the Hoki fishing season over winter, and many small commercial vessels supply services to marine farms, residents in outlying areas and forestry activities throughout the Sounds. Lack of road access to much of the Sounds limits opportunity to launch trailerable boats and Water Taxis do provide a vital link to remote properties.

3.1.2 Port Marlborough (Port Company)

Port Marlborough operates the Picton and Shakespeare Bay facilities. In addition, it owns the Marinas at Picton, Havelock and Waikawa Bay. It also owns the wharf facilities at Port Underwood and Elaine Bay, which are used principally for marine farm related activities.

The Picton facility comprises five berths which can accommodate RoRo ferries; large passenger vessels; fishing vessels; cement (bulk Carriers) and marine farming vessels. The ferry wharves (no.1 and no.2) are dedicated berths for Interisland Ferries, whilst Waitohi Wharf is dedicated the remaining commercial shipping.

Port Marlborough's commercial interests are focussed around its terminals and other facilities. It has limited involvement in navigation but does

provide the Picton Harbour Radio service. Pilotage is provided by a wholly owned subsidiary of Port Marlborough with towage services provided by external contractors. The Port Company is 100% owned by Marlborough District Council via Marlborough Holdings Limited.

Both Marlborough District Council and Port Marlborough employ risk assessment techniques in their internal management processes. At time of this risk review, Port Marlborough announced that it was to conduct a risk assessment of its own operations.

3.1.3 Navigational Traffic in the Marlborough Sounds - Overview

Ferry movements still dominate the Marlborough Sounds traffic profile, transiting into and out of Picton via Queen Charlotte Sound and Tory Channel. 95% of all commercial vessel traffic movements can be attributed to ferry movements with transit patterns concentrated to discrete times of the day. In daylight hours, this can and does coincide with dense leisure use (including racing).

Other large vessel visits to Picton comprise; Log Carriers, Cruise Vessels, and Bulk carriers. Water Taxis operate on scheduled routes and also on demand; these provide a vital service to remote areas of the Sounds.

Numerous tug and barge operations occur on a daily basis throughout the sounds.

There are over 600 marine farms in the Sounds, with a considerable fleet of support and service vessels. The majority of marine farms are concentrated in Pelorus Sound, but some are located in Queen Charlotte Sound and Tory Channel.

Growth of commercial movements in the Sounds over 10 years is continuing. However it is the growth in recreational use which needs to be highlighted. Leisure growth (up until the adverse commercial climate) has been reported to be in the order of 5,000-10,000 craft per annum nationally in New Zealand. There is little doubt that this statistic has been reflected in the Marlborough Sounds since the 2005 risk assessment and strong Growth in recreational use is set to continue. There are presently 2,292 marina berths available and storage facilities for a further 547. A large number of itinerant leisure users are also present in the Harbour System who are thought to travel from both North and South island locations to enjoy the area. The Leisure and commercial vessel interface is concentrated in the Queen Charlotte Sound area. Havelock, although perceived to be relatively quiet,

supports a significant marine farming support fleet and, in line with leisure use in general, is becoming busier.

3.1.3.1 Tory Channel - Incidents and Issues

Most recorded incidents are close-quarters in nature (i.e. near misses). Indeed, in the 2009 review, the highest ranking hazard is a close quarters situation between a ferry and a leisure vessel, this being a data driven result based on frequency. The total recorded number of such incidents was 152 in the five year period since the risk assessment. The majority of these incidents involved leisure craft. The number of near miss collision incidents highlights a need for an effective traffic interface and communication. This is an item that is training related and if addressed will enhance the ability to respond to incidents at the time they are raised by transiting vessels. Reports strongly suggest that leisure craft are often unaware that they are becoming involved in a close quarters incident, or lack the understanding of the situation. If intervention follow-up was introduced combined with local publicity, it would be a problem shared and thus a problem addressed. What cannot be ignored are the ongoing number actual collisions, causing harm. This will raise risk in any form of risk assessment (liability or safety based).

Other frequent occurrences continue to be close quarters situations between smaller vessels proceeding at speed and meeting on rounding a headland. In both cases, incidents are more likely to occur during the summer months when the leisure load is highest. Evidence from the period between 2005 and 2009 suggests that the incidences of close-quarters situations are not receding. This is probably due to the increasing numbers of leisure craft on the sounds generally, but can also be attributable to the cod fishing ban within the sounds, forcing the numbers of fishing vessels transiting the sounds and using Tory Channel entrance up.

Groundings have historically occurred throughout Tory Channel, most notably as a result of fishing vessel watchkeepers falling asleep or navigating on autopilot with watchkeepers absent from the wheelhouse, although in the period that the data was analysed for this review, no groundings were recorded. Near groundings were, however, recorded and there were several incidents that could potentially have escalated in to a grounding situation.

4 REVIEW OF KEY RISKS

There are now 85 hazards in the Hazman database relating to the navigation in The Marlborough Sounds. In the 2005 risk assessment, 84 hazards were identified. An additional hazard was added to the hazard database because incident data reports showed a significant number of mooring failures in the interim between completion of the risk assessment and the 2009 update. Failure reports include small craft, barge and marine farm moorings.

As in 2005, hazards by necessity remain at an overview level and therefore represent “hazard groups”. It is doubtless that further hazards could be identified if the groups were broken down into variants.

Most hazards are important in themselves and a considerable number score significantly on one or more individual risk categories. This should be borne in-mind when setting periodic review and when considering risk management implementation. Before considering the rankings, two points from the risk assessment review should be borne in mind:

- The hazard list has been populated using incident data alone, removing the reliance on expert judgement. This leaves the assessment in a sustainable and simple position to underpin its later recommendations for risk management.
- The hazard list numerically reflects both present risk levels and the present status of risk control effectiveness on the Sounds. Adding further effective risk management can only reduce risk levels.

4.1 HAZARD RISK RANKING

The top thirty ranked hazards are presented in summary form below in **Table 6**. They are ranked by the overall average risk score, from which it can be appreciated the highest ranked hazards have all now entered the so called “ALARP” region on a weighted average basis (showing a rating of 4,5,6 using the criteria in section 2.3). However, a number of risks in the top 30 still score appreciably in individual risk categories.

In many cases the hazards are scoring highly due to potential injury and loss of life if the risk is realised. Following the study risk assessment policy, Most Likely risks have been scored optimistically (i.e. most likely consequences have been scored lower). This is because a large number of near misses (near-hits) are recorded in the data. However, this belies the

underlying frequency of incident reports, which in the opinion of Authors is in need of attention.

The full list of hazards, ranked by risk, is attached at **Annex B**. For good reason, this report has not taken a course to consider hazards individually, but has reviewed Risk Control Measures which should improve underlying incident frequency across the board. The Safety Management System can then begin to review these top 20 hazards and seek evidence of decaying risk levels.

Rank No.	Hazard Reference	Hazard Description	Overall Averaged Risk Score	Most Likely Risk				Worst Credible Risk			
				People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders
1	3	Collision involving Ferry at key headlands. Ferry meets leisure craft in centre of channel on blind headland.	6.85	6	0	0	8	8	6	6	8
2	79	Vessel over 120m in length in grounding situation in narrow passage with strong tidal flows. This is possible in French Pass, Stephens Passage and off Cape Jackson and in outer Sounds area generally.	6.24	0	6	3	7	4	7	7	7
3	12	Fishing vessel grounds within Controlled Navigation Zone or in Channel.	6.2	0	6	6	6	7	7	6	7
4	18	Collision involving Ferry and leisure craft in areas of ferry route, excluding Tory Channel and Approaches.	6.16	6	0	0	8	7	4	4	7
5	40	Recreational fishing vessel or leisure craft loses hull integrity while engaged in recreational fishing in Tory Channel.	6.07	6	6	6	6	7	4	4	6
6	76	Leisure vessel in grounding situation in narrow passage with strong tidal flow (such as French Pass, Stephens Passage, Cape Jackson, Greville Harbour).	5.96	6	6	0	6	7	6	3	7
7	9	Vessels of any type approaching or departing Picton Harbour in developing collision situation. Scenario is affected by one or other vessel in process of manoeuvring. Hazard scenario can include leisure craft.	5.95	6	6	0	6	7	7	6	6
8	11	Grounding of ferry at Tory Channel Entrance. Ferry off track within the Controlled Navigation Zone or approaches.	5.87	6	3	0	7	6	6	6	6
9	73	Small vessel, leisure or commercial in contact with marine farm while navigating.	5.81	0	6	3	3	7	6	6	7
10	1	Two ferries in developing collision situation within the Controlled Navigation Zone.	5.72	6	0	0	6	7	7	7	7
11	83	Personal injury to recreational divers within the Sounds.	5.69	9	0	0	8	6	0	0	6
12	10	Leisure craft in developing collision situation with another leisure craft in the Sounds generally.	5.59	6	0	0	6	7	6	3	7
13	35	Fishing vessel foundering in heavy weather while transiting Tory Channel Controlled Navigation Zone.	5.45	4	6	4	6	6	5	3	5

Rank No.	Hazard Reference	Hazard Description	Overall Averaged Risk Score	Most Likely Risk				Worst Credible Risk			
				People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders
14	48	Ferry and fishing vessel in collision situation within the Tory Channel Controlled Navigation Zone and approaches.	5.42	6	0	0	6	7	6	4	6
15	20	Small commercial vessel and leisure craft in developing collision situation generally in the sounds.	5.37	0	0	0	6	7	6	6	7
16	39	Kayak and power driven craft in developing collision situation.	5.29	6	0	0	6	7	0	0	8
17	4	Ferry/leisure craft in conflict in darkness. Ferry fails to detect leisure craft or either fails to take appropriate avoiding action.	5.18	3	0	0	3	8	6	6	8
18	37	Ferry and leisure craft or small commercial vessel in developing collision situation on approach to Picton Harbour by night.	5.07	6	0	0	0	7	3	3	7
19	14	Leisure craft grounds on rocks within the Tory Channel Controlled Navigation Zone.	5	6	0	0	6	6	4	4	6
20	74	Vessel greater than 500GT in contact with marine farm while navigating.	4.96	0	6	0	6	2	6	6	6
21	44	Small vessel Fire/ explosion. Fire in engine room or food preparation space of passenger vessel, water taxi or other commercial floating asset.	4.96	0	6	0	6	6	6	2	6
22	77	Fishing vessel in grounding situation in narrow tidal flow. This is possible in French Pass, Stephen's Passage and off Cape Jackson.	4.87	0	6	0	6	2	6	4	6
23	72	Pollution occurs through fuel spill at small commercial / leisure vessel fuel berth	4.83	0	0	6	0	0	0	8	6
24	15	Ferry and ship >500GT in developing collision situation while entering or transiting Central Queen Charlotte Sound.	4.81	0	0	0	6	6	6	6	6
25	21	Person in water run over by powered vessel (swimmer or diver in path of a vessel or craft).	4.78	6	0	0	6	6	0	0	7
26	13	Small commercial vessel grounds within the Tory Channel Controlled Navigation Zone, or within Tory Channel or approaches.	4.71	2	2	2	4	6	4	6	6
27	25	Personal injury to occupants of a moored or anchored leisure craft or small workboat (wash related).	4.66	6	0	0	6	6	3	0	6
28	71	Fire\Explosion during re-fuelling of small commercial or leisure vessel alongside a fuel berth.	4.63	0	0	6	0	6	4	4	6
29	16	Kayak Group or one Kayak caught in rapidly changing weather conditions.	4.44	6	0	0	3	6	2	0	6
30	60	Racing Yacht engaged in racing in developing collision situation with a ferry or other vessel over 500GT.	4.44	3	0	0	6	6	2	0	6
31	86	Charter leisure craft grounds at a narrow or tidally influenced area of the Sounds.	4.41	0	0	0	6	2	4	4	6

Table 6:- Top 30 Ranked Hazards

This data-based review shows that risk overall is reducing, especially the risk of Grounding at Tory Channel entrance. The alignment of the hazard

data with incident data has produced some falling risks and some rising risks. These are summarised for Collision and Grounding hazards in **Annex D**. The tables show a reducing in grounding risk of an order of magnitude.

The passenger ferry services remain at the top of the table, although the number of such hazards within the top 20 has fallen from 7 in 2005 to 6 now. Collision risk overall appears to have risen, this in part being driven by a worst credible collision event in 2005, and others since, but it is also in part being driven by an increase in close quarters reporting associated with the recreational sector. However not all collision risks have risen and the data suggests that the risk of RoRo on RoRo collision has also receded – this is shown in the tables in **Annex D**.

It is recognised that an increase in most-likely frequency (i.e. that associated with the close quarters reports) is due to an improvement in reporting by officers engaged on the RoRo passenger services.

4.2 REVIEW OF RISK

The 2005 risk assessment provided risk scores that suggested that risk of grounding was lying outside the ALARP scale as set for the review. These scores were based on consensus. This was especially the case at Tory Channel entrance and a number of risk control measures identified were then designed to address this. Risk scores were based on incident and near miss rates that were pertaining at the time. With the passage of time, the number (and frequency) of near miss grounding and contact reports has subsided.

With an incident data set having now been generated, risk quantum is now accurately aligned with the data.

The review of risk control measures has considered the changed risk profile after the hazards were reviewed and rescored to align with the last four years of incident data. The review was undertaken with the objective of prioritising risk control measures, providing risk reduction at the most economical cost, taking due account of the risks as they fall.

The review of Hazards suggests that that grounding risk is receding, but collision risk overall is not, this being underpinned by three worst credible events in the past four years. Apart from a significant growth in traffic in the four years since the initial risk assessment, there has also been a dramatic growth in small recreational craft transiting Tory Channel Entrance in recent months; this being due to the imposition of a ban on cod fishing in the Marlborough Sounds.

5 RISK CONTROL MEASURES

Marlborough Harbour is geographically large and its maritime activities needing Harbour Master attention in some form are diverse. Activities range from the offloading of large offshore oil rig structures in Admiralty Bay, through to an extensive and successful Marine Farm industry, through to it providing the main passenger and rail link between the North and South Islands. The final ingredient is a growing recreational component, which is a key driver for ongoing development of marina capacity, concentrated in Queen Charlotte Sound.

Like any harbour enjoying the benefits of a significant flow of passengers from international jurisdictions transiting its waters, there are due diligence considerations to take into account. These passengers will have a different perception and expectations of safety standards as well as different tolerance of safety. An incident affecting the interests of affluent foreigners provides a different type of due diligence problem to address than one wholly involving domestic interests. The New Zealand ACC system provides clear limits of compensation for harm to personnel, but there are legal case examples whereby such a system can be bypassed to concentrate on the fundamental processes of an organisation managing due-diligence. Such examples include harbours and their regulatory systems.

The fundamental driver for introducing a voluntary port and harbour marine safety code into New Zealand is to avoid the high cost of marine accidents and associated liability litigation. It is a cost effective due-diligence exercise for a harbour regulator to put in place reasonable systems of managing risk, or to have structured plans in place to achieve this. Implementation of risk mitigation that is considered costly can be reconsidered over a longer timescale through giving consideration to cost benefit.

5.1 THE STATUS OF RISK CONTROL MEASURES- 2009

Since the 2005 assessment, many of the key risk control measures have been significantly progressed. The thrust of the 2005 risk control measures were to address the harbour interface with the Harbour Masters' office and thus develop further knowledge of the harbour traffic patterns and risks.

Annex E presents a detailed review of the present status of risk control implementation, using the MNZ recommended Control Adequacy Assessment Rating methodology. From this it can be appreciated that much has already been achieved at Marlborough (summarised below) and that targeted progress can now be planned to take forward key aspects of the risk control,

but reduce cost by delaying some parts and reviewing the risk control achieved by some harbour users.

Although risks appear to be subsiding, the outcome of this review suggests that addressing the harbour interface should still remain a risk management priority as it is not a significant cost item if addressed holistically. Key milestones that have been achieved in the period 2005-2009 are:

- A Harbour Monitoring system based on AIS transmissions from vessels over 300gt is generally in place, providing reception in most of the key harbour areas required. This has included installation of a structure on Arapawa Island to provide reception in Tory Channel and its entrance.
- A Wireless LAN communication system with substantial band-width has been installed (RCM 3.1), capable of backhauling AIS data to the Harbour Office, as well as being capable of carrying radar and/or camera data strings.
- An IALA Compliant monitoring software system has been procured (which would meet the requirements for traffic management), which is currently monitoring traffic passively from the Harbour Office.
- A VHF recording system has been installed capably of recording 4 VHF channels with the ability to monitor and broadcast on 1, 16, 19, 63.
- Significant inroads have been made into the provision of summer patrols for the harbour, this having a recorded beneficial effect.
- Reporting of incidents has improved, especially near-miss collision events involving RoRo ferries and recreational craft. A database of such records continues to be populated as incidents occur. Although it is recognised that a margin of under-reporting in any harbour, the size of the data set is such that it can be used statistically to assist in risk assessment scoring.
- The incident data records, together with harbour monitoring systems have assisted in the harbour regulatory system becoming better informed about harbour risks.

5.2 STATUS OF THE HARBOUR SAFETY MANAGEMENT SYSTEM

Marlborough District Council and Port Marlborough jointly developed a Safety Management System document (SMS) in compliance with the Port and Harbour Safety Code. The Harbour Office also developed a comprehensive Harbour Safety Plan. Both were approved by Council and subsequently

submitted to Maritime New Zealand in 2006, where the Safety Management Document reached qualified approval. Approval of the SMS is based on the requirement of further components to be developed. Since then, progress of SMS development has stalled, with resource limitations being referenced by both parties. Progress has been made in some areas; the Harbour Master drafted a standard operating procedure for pilotage and pilot exempt transits, which included some limiting criteria. This work is ongoing, with pilots taking it forward.

The Safety Management System has standard good-practice systems described within it and a process of consultation is an integral part. The SMS is a key element of the Harbour Interface and it needs progressing. Some RoRo operators were keen to participate, but need to under a framework provided by the harbour safety management system.

5.3 CONSULTATION

Consultation was necessarily limited in this review because of ongoing bylaw consultation. Most harbour users who were met reflected this, provided strong opinion about bylaw consultation issues, taking the focus of any discussion away from the review of harbour risk levels. RoRo operators expressed a view that a forum needs to be set up to determine the way forward to jointly manage risk and take associated decisions about deployment of radars or other sensing devices on the Sounds.

Ironically, such a forum is intended by the Safety Management System design, which emphasises the need for its ongoing development. The consultation by user groups and for relevant user interests to be involved in the development of, for example, harbour monitoring, is integral to the safety management system as submitted to MNZ.

However, users who did provide feedback have misunderstood the role of the Council as Harbour Authority as laid down in the Port and Harbour Marine Safety Code. It is legally responsible and accountable for the Safety Management of the harbour. It's decision making needs to take consultation and feedback into account, but it is responsible for decision making in the detached interests of harbour safety management. The Harbour Authority participates in the risk that harbour users essentially create which rapidly translates into liability in the aftermath of a serious incident. That such liability exists in New Zealand has been demonstrated by the Gisborne Grounding incident.

5.4 ANTI COLLISION MEASURES – RORO OPERATORS

There has been much work reported by the passenger RoRo operators to address the risk of Grounding and Collision in the Sounds. Much of this still needs to be recorded and it is with regret that this could not be achieved at the time of this project. There was apprehension amongst operators to do this before the bylaw consultation process had closed, and valuable information still needs to be recorded about the overall system of risk control measures. Although an understanding of the detail of RoRo ferry bridge operational systems would provide understanding to differentiate between a receding risk and one that is being actively driven down, there is little doubt that the frequency of near miss groundings by RoRo ferries has receded. It is also possible that the collision potential has been affected. The recorded events suggest action still needs to be considered.

5.5 OPERATIONAL RISK CONTROL MEASURES

5.5.1 Harbour Staffing

When considering full time staff appointed to the Harbour Master function, Marlborough Harbour has a Harbour Master and one Maritime Officer. After-hours maritime rostered cover is provided by both the full time staff, with an additional person utilised solely for the on-call duty. In practice, the arrangement results in the Harbour Master being on constant call, even when on leave, in order to satisfy a Harbour Code requirement for a suitably qualified Harbour Master to be available at all times. In the summer months a pool of part time Harbour Rangers are employed to solely provide a harbour patrol function. The present harbour patrol arrangements (together with patrol craft) were implemented by Council as a result of the 2005 risk assessment.

It is understood that a proposal for the appointment of a Deputy Harbour Master, two full-time Maritime Officers and administrator has already been adopted by the Council, but is dependant on a sustainable funding stream.

Although it is difficult to generalise across different Harbours, it is the case that other equivalent Harbours in New Zealand have suitable arrangements in place, to provide a continuity of appropriately qualified Harbour Master service.

For comparison, Northland Harbour, which is also geographically large, has a full time staff complement comprising Harbour Master, Deputy Harbour Master and six marine support staff. Environment Bay of Plenty, another harbour of significant extents also has a Harbour Master, Deputy Harbour

Master and six support staff, also full time. The nearest equivalent Harbour handling the same volume of RoRo passenger traffic is, of course, Wellington. Wellington Harbour is geographically smaller than Marlborough, but has a Harbour Master, a Deputy, administrator and two maritime officers (a total of five full time staff). Like Marlborough, Wellington also employs harbour rangers for the summer months.

From the review of harbour staffing and considering a minimum, there appears a clear need to provide for a suitably qualified Deputy Harbour Master to provide cover for the statutory function. In all probability, Council would be able to provide an administrator for the Picton Harbour office from its existing resources.

5.5.1.1 Recommendation – Harbour Staffing

It is recognised that Council had adopted a strategy to provide the Harbour Office with two full time Marine Officers as well as a Deputy to the Harbour Master. However in the interests of providing a minimal cost response for risk control, the following is recommended:-

As a minimum, fund the appointment of a suitably qualified Deputy Harbour Master and provide administrator for the Picton Harbour Office from the existing pool of council expertise.

5.6 HARBOUR TRAFFIC INTERFACE

5.6.1 Background

There was little doubt in 2005 that improvements to the harbour interface were needed to provide a direct connection to harbour activities and the flow of information. In 2009, although it can be recognised that other improvements have been made, the harbour interface remains fragmented, with large vessels transiting to Picton terminals using Picton Harbour Radio and recreational craft (where fitted with VHF) interfacing the Marlborough Marine Radio. Small commercial vessels use various means for communication, some interfacing with Picton Harbour radio, some not. There is no linkage between fragments and without training and cooperation it is not possible for an interface to be developed.

Maritime New Zealand has IALA monitoring standards for Harbours in draft for use in New Zealand, and it is prudent to adopt these, not just from the ability to comply with the national standards, but more from the management of liability perspective. The standards that Maritime New Zealand are drafting were agreed internationally as a framework some 15

years ago and traffic management is a requirement of Chapter V of the SOLAS Convention.

5.6.2 Harbour Interface - Present Status

Picton Harbour Radio presently provides an interface with transiting ferries and vessels using the port company terminals. Currently the service is delivered by staff, who also have security functions.

Although much of the equipment that is needed to deliver improvements to the harbour interface has been procured and installed in the Harbour Office (at least for a system using AIS transmissions), its introduction is awaiting manning arrangements to be solved and appropriate training to be identified and sourced. The equipment procured is presently used in a passive way, providing a record of events.

The IALA compliant software introduced into the Harbour Master's office has not been extended into the Port Company operations. Since the IALA system of traffic interface relies on training to both make full use of the available capability and to manage inadvertent liability issues³, training is thus required before an effective vessel management/monitoring tool can be realised. Such training is part of the IALA standard.

Marlborough Marine Radio presently provides a service to small commercial subscribers and recreational users. It provides a service from 0600 to 2200hrs year-round, with Havelock radio providing a radio interface from 0800 to 2200hrs. Operators are rostered volunteers, who are located in different sites, such as Picton, Blenheim or Wellington. They monitor the recreational and small commercial VHF radio frequencies (Commercial operators use Channel 66, which is encoded to maintain privacy). The recreational channels experience very high call volume in the summer months (chat).

The existence of Marlborough Marine Radio has significant benefit as it allows the port operational channel to be kept clear. A co-ordinated Harbour Interface would be able to monitor Marlborough Marine Radio's channels during out of hours periods (small craft working late or transiting into the sounds late are known to attempt calls when MMR is not active). The service provided by Marlborough Marine radio during working hours, can allow a Harbour Interface to be manned by one duty operator.

³ There are significant liabilities associated with the delivery of any traffic management function, the mandatory delivery of which is written into the SOLAS Convention (Chapter V). Cases exist where a traffic management function has become the target of legal action. The best defence is to ensure a proper system is in place with appropriate equipment and training.

An interface relationship assisting Marlborough Marine radio to coordinate information for recreational and small commercial users would also provide benefit.

5.7 OPTIONS FOR THE HARBOUR INTERFACE

There are a number of options to be explored to provide the Harbour Interface.

5.7.1 Option 1 - Use of Wellington's Beacon Hill Station

With modern equipment, training and provided local knowledge is available, it is possible to operate a harbour monitoring service from any location. Beacon Hill, the Wellington signal station, provides a monitoring service for Wellington Harbour and its approaches. Its extension to Marlborough would provide the benefit of existing experience. However Wellington Harbour Master has advised that running an extended system from Wellington without additional staff is not feasible. It would require another person with local knowledge per watch to do this, providing no cost advantage over a service being provided from Picton.

Any form of harbour monitoring, needs to be to IALA standards (in some form) to protect the Council, in it's role as Harbour Authority, from liability. A back-up system would still be required in Marlborough, but the present equipment located in the Harbour office is already in service and could meet that need.

Enquiries concluded that Beacon Hill is a prohibitively expensive option for providing a Harbour Interface. This option is not recommended further.

5.7.2 Option 2 - Development of Port Marlborough's Harbour Radio

Port Marlborough presently provides a radio service and security patrols using their own staff. The current situation is that the Picton Harbour Radio staff are not trained in the supply of a harbour monitoring. The IALA concept is designed to take existing staff with aptitude and deliver training. The Port Company considers there is a significant cost that would need to be charged to Council as it has a view that Harbour Regulation is solely a Council responsibility.

Although the Port Company does not bear any statutory responsibility for harbour safety beyond the ends of its wharves, it is fair to say that the Port Company participates in the risk of the vessels that are trading to its terminals, a point clarified by the New Zealand Port and Harbour Safety Code. It is unfortunate that evaluation of the Port Company service was not able to be undertaken during the course of this review.

5.7.3 Option 3 - Marlborough District Council Provide a Service

This is the option on which present budgetary estimates have been based. It introduces a harbour interface that is developed from the Harbour Office. In addition to the provision of a Deputy Harbour Master, a manager and six staff are taken on. This essentially duplicates something that is already partly available using resources from the Port Company (with development), suggesting that cost savings can be made. Accordingly, as a result of the 2009 review, providing the service solely by the Council is not necessarily a preferred option.

5.7.4 Option 4- Marlborough District Council and Port Marlborough both contribute resources - a Joint System

This option develops and improves Picton Harbour Radio into a harbour monitoring service using personnel already available to the port company, with the Council Harbour Office providing the staff needed to complete the complement.

This option has the potential to provide significant savings over the options for the Port Company to charge out the service and for the Council to provide the service solely from its harbour resources.

If this option is taken, which appears from this review to be both practical and cost effective, the Deputy Harbour Master (referenced above) could take responsibility of the shared management of a harbour monitoring service as part of the job description. This role, in relation to the Port Company Interface, would need to be clarified and agreed between the two organisations.

5.7.5 Recommendation – Harbour Monitoring

This section has partly referenced the procurement of IALA compliant software and hardware, which resides in the Harbour Office awaiting the next phase of implementation.

Having made significant progress, Authors of this report urge, as a result of this review, that development of the Harbour Interface be given at least equal priority with some of the technical options planned.

5.8 TECHNICAL RISK CONTROL MEASURES

5.8.1 Present Status

Marlborough Sounds has achieved reasonable AIS reception in areas of the harbour frequented by vessels required to carry AIS transponders.

Extending the type and size of vessel that carry AIS transponders has been introduced in other New Zealand harbours. These devices provide significant SAR benefits in the event of, say, a water taxi grounding. A number of jurisdictions now use AIS devices to record passenger numbers on board small passenger vessels. Class B AIS devices have fallen in cost dramatically as availability has risen. There are a number of harbours in New Zealand contemplating the carriage of transponders for all craft carrying passengers. In international jurisdictions, the safety benefit of being identified to a large passing vessel has provided for strong take up even by recreational users.

5.8.2 Deployment of Radar and AIS

There was a 2005 recommendation to place radar capability at Tory Channel entrance designed to interface with the traffic management system, which would be able to re-transmit identified targets as AIS signals. This would enable a ferry bridge team being made aware of the presence of a small vessel on the blind side of Tory Channel entrance.

Given the reported improvements made in bridge management by crews of vessels using Tory Channel, but subject to the demonstration of such systems, it is recommended to defer implementation of radar. A deferral would allow for further clarification of the problem and solution, given that at time of this review, consultation with RoRo operator stakeholders was minimalised.

However, without radar it is not possible to detect transiting craft at blind headlands or entrances that are not fitted with AIS transponders. As noted above AIS reception in the Sounds now has significant coverage. There is a realistic option to require more vessels to carry Class B AIS transponders, which assists in identification to each other as well as providing for immediate information for search and rescue response. This would improve knowledge of users at Tory Channel entrance, but there would always be small craft without transponders.

An alternative to radar and the equipment required to retransmit targets as AIS signals is to deploy a CCTV camera, overlooking Tory Channel entrance (this is likely to be a more economic option) is seen as a viable alternative. In addition to assisting in the evaluation of the problem, a camera would allow harbour interface operators to verbally advise an approaching RoRo ferry of the presence of a recreational craft transiting Tory Entrance⁴.

Based on data collected over a period of time it would be possible to consult with stakeholders in an open forum on the need for Radar at Tory Channel entrance.

⁴ Some recreational vessels are not fitted with VHF and it is not known how many vessels fall within this category.

5.8.2.1 AIS

The deployment of AIS transponders internationally has had a significant effect on the safety of navigation. AIS Class B has been introduced in many harbours, especially for small vessels carrying passenger traffic. As well as positional and identification records that are updated every three minutes, these can be used to provide passive records of passenger numbers and location, which are vital pieces of information in the aftermath of a serious incident.

AIS Class B transponders are significantly cheaper than Class A units, as required by vessels over 300GT (or NZ maritime rule equivalent). The advantages of vessel to vessel identification are significant and users of recreational cruisers fit them to be seen in a seaway by a larger vessel. There is no doubt these are being introduced to New Zealand and other such harbours are implementing bylaw requirements. Although Class A transponders produce records readily suitable for incident investigation, the cost effectiveness of the (less precise) Class B units should be considered for Marlborough. For emergency response and SAR, a transponder carrying vessel can be provided with immediate assistance to the correct location. The AIS receiving system that is in place at the Harbour Office can already deliver this role.

5.8.3 Recommendation – Radar and AIS

It is recommended that procurement of radar be deferred and the alternative option of CCTV camera procurement be considered. As there is already communications band-width available, there is only installation cost to consider. This option should be supported by Class B transponder requirements for small commercial vessels. This would allow RoRo ferries to identify such vessels on board and be aware of their position. Enquiries suggest that Class B transponders supplied in bulk could be available at a cost circa \$1000 per unit.

5.8.4 Environmental Instruments – Tory Channel

The risk control measure identified the need to obtain environmental conditions at a number of sites in the area of the Marlborough Sounds. The primary focus was on the area of highest risk and risk benefit - Tory Channel Entrance.

The only means of addressing the delivery of accurate weather information conditions at Tory Channel entrance is to provide environmental monitoring equipment. Establishing a wave rider buoy not only has safety benefits for

closure of Tory Channel Entrance (i.e. the setting of agreed environmental limits) and allows ferry operators to have the most efficient use of the Tory Channel entrance. Direct knowledge of the sea conditions at the Entrance would be available to all users, thus providing benefit for those wishing to transit the entrance to fish outside the Sounds. As noted earlier a key chance of harbour usage since 2005 is the marked increase in Tory Channel entrance transit by recreational craft engaged in fishing, pursuant to the Cod fishing ban in the Sounds.

5.8.5 Recommendations – Environmental Monitoring

The primary focus on the area of highest risk and risk benefit is Tory Channel Entrance.

It is recommended that the option to deploy a wave rider buoy at Tory Channel entrance be taken forward, but costed in detail before final decision-making. As there is already communications band-width available to transmit the data ashore, there is only installation cost to consider. There is also the option for NIWA to deploy, take responsibility for data transmission and to maintain a buoy.

5.9 PILOTAGE

Pilotage was the subject of recommendations arising out of the 2005 risk assessment. Pilotage has now been taken in house by Port Marlborough, it being the sole pilotage service on the Queen Charlotte Sound. The ongoing development of pilotage is now a matter for the Port Company, which has indicated it was taking an assessment of its operations at the commencement of this review. Pilotage is key to movement risk management and its effective Safety Management Interface with shipping is vital. As part of the risk review and to assist with frequency, extracted AIS data of some reported incidents were reviewed and the data combed for vessel interaction in key hazard areas. Pilotage boarding occurs at Tory Channel entrance and the following data extract is from a record of boarding activity in the area, which occurred within the timescales of the assessment of changed risk quantum. It is included to assist in the development of the Marlborough Safety Management system and demonstrates the value of recorded data to improve Safety Management awareness. Figures 2 and 3, reference the same boarding event.

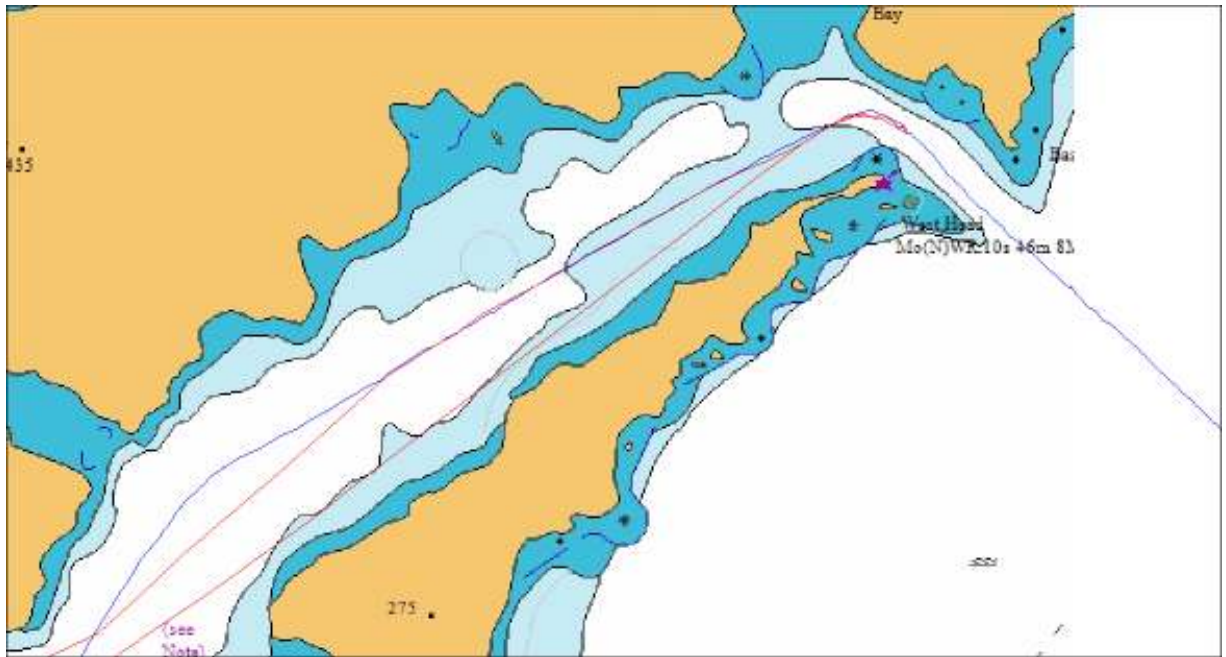


Figure 2: Record of Inbound Passenger Vessel Via Tory Channel – Pilot

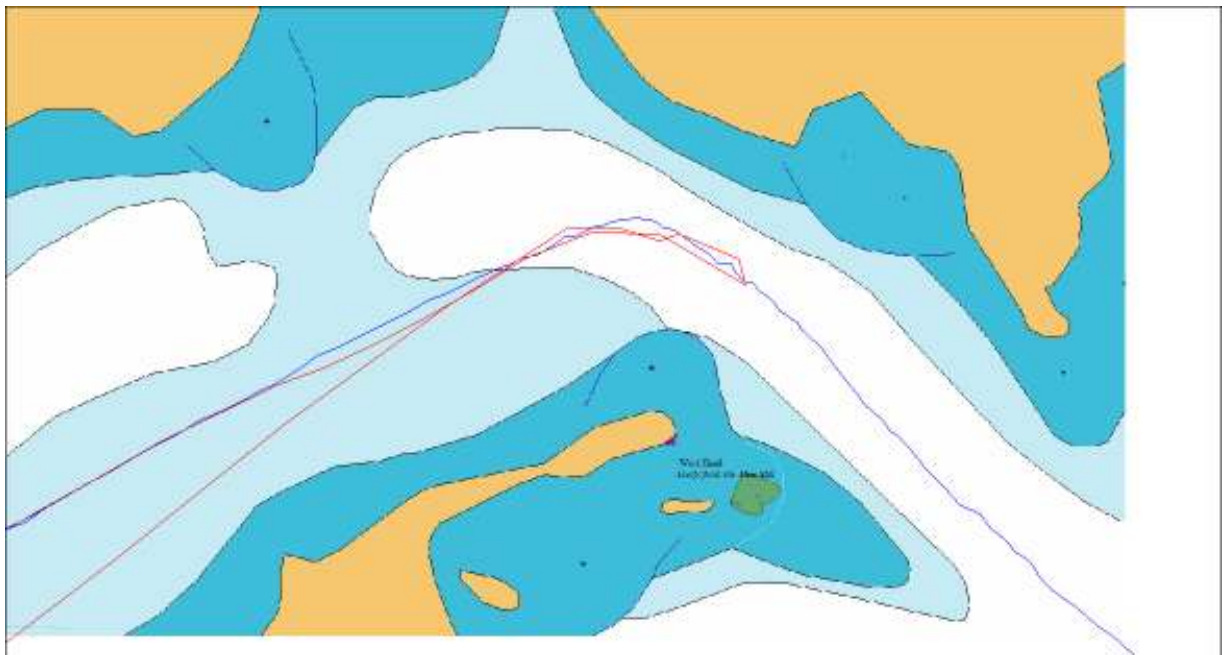


Figure 3: Pilot Boarding Location - Tory Channel Entrance.

The referenced boarding event occurred in the middle of the vessel transit from sea into Tory Channel in the timescales of this rescoring work. Sea conditions on that day were marginal at the entrance, probably making

boarding difficult for the lightweight rib employed for the pilot transfer. AIS time stamps suggest the pilot boat and inbound vessel came together at the outer location shown. The vessel is in the middle of transit through a known hazard and already entered without a boarded pilot. It is difficult to comply with IMO guidelines for boarding practice and the Master Pilot Exchange (MPX) under such circumstances. There is a legal argument available for leading in, but planned leading in would produce a totally different track result, with the pilot vessel being aligned with leads to show the inbound vessel the route to take⁵ and, literally, transiting itself. Leading-in is also only recommended via developed procedural controls and with established communication protocols, shore, pilot and vessel. It is pointless a pilot boarding a vessel once it has passed the key hazard at Tory Channel. This event is referenced for both safety management reasons and evidential for the need to provide an improved harbour interface only. In liability terms, the responsible Harbour Authority can unknowingly participate in the decision which can result in a reduced safety margin, however well intentioned the decision was.

5.10 CONCLUSIONS AND RECOMMENDATIONS – PILOTAGE

- Figures 2 and 3, above, underpin a practical the need for Marlborough Harbour to develop an effective harbour monitoring interface. This would assist in decision making for marginal conditions and adherence to procedures based on best practice. Such procedures should be developed.
- Port Marlborough is conducting its own risk assessment, which should include its pilotage operation and transfers in marginal sea conditions.
- The suitability of a lightweight RHIB for pilot transfers in the sea conditions in the outer Sounds needs to be considered as part of the Port Company's own risk assessment.
- In accordance with the requirements of the Port and Harbour Marine Safety Code, the Port Company risk assessment needs to dovetail into the existing Harbour Risk Assessment findings.
- The wave monitoring device recommended as a result of the main harbour risk assessment would provide the parameters needed for decision-making to be taken for vessels requiring pilotage to be boarded at the Northern Entrance.

⁵ In 1996 the passenger vessel ALBATROS suffered a serious grounded incident on an underwater reef in the Isles of Scilly, UK. It was being led in after being without prior planning or MPX and the pilot vessel did not take a controlled shallow turn, causing the led vessel to divert across the reef. The pilotage company was independent, but this did not prevent significant liability cost being incurred to the responsible harbor authority. New Zealand law, like English law provides liability limitation to the Pilot, not the harbour system.

5.11 OTHER TRAFFIC MANAGEMENT OPTIONS - ONE WAY OPTION

There is a need to consider the option of one way transit down Tory Channel, this being tabled at commencement of this review as an option for risk control, in the event all other options were cancelled on grounds of cost. Subject to full understanding of the anti-collision measures now in place on board passenger RoRos, this risk is the highest ranked of the 2009 review.

If a one way system were introduced, the risk of large vessel to large vessel collisions in Tory Channel would effectively be isolated⁶. It would also allow the introduction of the traditional protocol of transit on the starboard side of the channel⁷ for all large vessels proceeding past Dieffenbach. This would be achieved by entry via the Northern Entrance and exit for RoRo vessels only through Tory Channel.

It would not, however, affect the collision potential between a large vessel and a small recreational craft in the one way zone.

The costs and benefits of such an option would need to be carefully considered in conjunction with the RoRo operators.

⁶ The Isolation of risk is one of the recommended options in the Australia New Zealand Risk Assessment Standards (ANZ4360, 1999).

⁷ Commercial vessels (other than RoRo ferries) outbound from Port Picton move over to the northern side of Queen Margaret Sound in order to transit clear of the Dieffenbach entrance to Tory Channel, in case there is an inbound ferry.

6 CONCLUSIONS

1. The quantum of risk has been reviewed and is now aligned with the significant volume of incident data available for the harbour. Risk is showing signs of falling, possibly due to improved systems of on-board transit management for RoRo ferries.
2. The level of harbour traffic, especially recreational, has risen significantly since the 2005 risk assessment. This was predicted and the increase is expected to be ongoing, with Queen Charlotte Sound receiving the greatest traffic density.
3. A key traffic increase is the transit of Tory Channel entrance by small craft wishing to fish in the seas adjacent to Tory Channel entrance. This increase has been influenced by the Cod Fishing ban in the Sounds.
4. The risk review was based on the existing hazard records and suggests that risk of grounding is receding. However in the five years since the risk assessment there have been three worst-credible collision events recorded across all sectors of harbour users. Collision risk has thus been rising, with the exception, it appears of RoRo ferry on RoRo ferry.
5. Given the foregoing, a key finding of this risk review is the need to continue to make improvements to the harbour monitoring interface, and progress the implementation of the Safety Management System. Options for this service have been laid out in Section 5.
6. The deployment of AIS receiving equipment and software to monitor the result is already providing information of Safety benefit to Marlborough Harbour. Harbour monitoring software to IALA Standards has been procured and is awaiting a decision for its implementation in either the Port Company; the Harbour Office, or a combination. Decision-making information against each of the options is provided in this report.
7. The Harbour Safety Management System has been developed by agreement of both the Port Company and the Harbour Office. It has been submitted to maritime New Zealand and obtained the first stage of approval. The system has since stalled, with components and proceduralised systems needing to be developed. Its progression is resource dependent, but there is a somewhat urgent need for progression to continue.
8. The review of risk control measures to determine the most cost effective solution is presented in Section 5. There are considerable harbour budgetary savings to be made, especially with the choice for development of the Harbour Interface. These need to be evaluated as a result of this report.
9. RoRo operators report having introduced systems to manage their transits through Marlborough Harbour. However tripping to evaluate and understand the benefit was declined until the process of bylaw review was complete.

10. Port Marlborough announced its own risk assessment of its operations during this risk review.
11. There is a risk control option to consider a one way system for traffic using Tory Channel. It is not taken forward by this report as it would need both consultation and further development. As an option, it may have has the merit of providing savings in the provision of risk management.

7 RECOMMENDATIONS

1. The process of available risk control assessment should be continued with passenger RoRo operators to confirm the data driven findings of this risk review. It may be that some risks are being lowered further, but their effect cannot at this time be integrated into the findings of this report.

7.1.1 Risk Control Deferral and Equivalent

2. It is suggested that high cost items, such as radar deployment should be deferred, whilst stakeholder systems managing harbour transit are evaluated and incorporated into the Harbour Safety Management System. There are alternatives suggested to instead consider the use of CCTV in conjunction with requirements for more vessels to be fitted with Class B AIS transponders.
3. Alongside deferral of radar installation, the alternative option of CCTV camera procurement should be considered. As there is already communications bandwidth available, there is only installation cost to consider. This option, combined with an improved monitoring interface for the harbour would remove the need for an AIS base station at Tory Channel entrance.
4. The option above, if taken, should be supported by increased Class B transponder requirements for small commercial vessels. This is occurring in other New Zealand Harbours. Enquiries suggest that Class B transponders supplied in bulk could be available at a cost circa \$1000 per unit.

7.1.2 Key Risk Control - Harbour Interface Monitoring

5. Having made significant progress, Authors of this report urge, as a result of this review, that development of the Harbour Interface be given at least equal priority with some of the technical options planned.

7.1.3 Key Risk Control – Safety Management System Development

6. The development of the Marlborough Harbour Safety management System should be progressed. The aspects of organised consultation in its design should be implemented to allow users and harbour interface to share information. The consultation should recognise the role of the

Marlborough District Council as the decision-making Harbour Authority responsible for Navigational Safety.

7.1.4 Harbour Staffing

7. As a minimum, it is recommended that a Deputy Harbour Master be appointed and an administrator be provided to the Picton Harbour Office from the existing pool of council expertise.

7.1.5 Environmental Monitoring

8. The option to deploy a wave rider buoy at Tory Channel entrance should be taken forward, but costed in detail before final decision-making. As there is already communications band-width available to transmit the data ashore, there is only installation cost to consider. There is also the option for NIWA to deploy, take responsibility for data transmission and to maintain a buoy.
9. Wave and wind monitoring, combined with a replacement tidal height monitor would provide the base data on which the criteria parameters for use of Tory Channel entrance can be based.

7.1.6 Pilotage Systems

10. A review of Pilotage boarding from AIS data, underpins the practical need for Marlborough Harbour to develop an effective harbour monitoring interface. This would assist in decision making for marginal conditions and adherence to procedures based on best practice. Such procedures should be developed.
11. Development of Pilotage Systems at Marlborough is now a Port Company Function, supported by the Harbour Office, which will be aided by the Port Marlborough risk assessment commenced during this review. There are a number of points that need to be forwarded to those conducting this risk assessment.
 - The risk assessment should include pilotage operations and transfers in marginal sea conditions.
 - The 2005 joint harbour risk assessment had recommendation for Queen Charlotte Boarding to occur further to seaward to allow adequate time for Master Pilot Exchange to occur. This should be taken forward to the Port Company risk assessment.
 - The suitability of a lightweight RHIB for pilot transfers in the sea conditions in the outer Sounds needs to be considered as part of the Port Company's risk assessment.

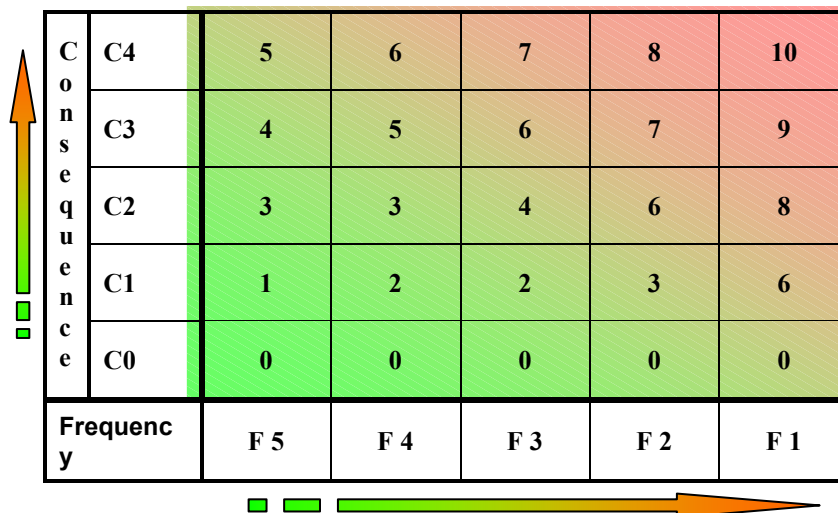
ANNEX A

RISK CRITERIA USED FOR THE ASSESSMENT

The risk assessment criteria used for this risk assessment is as follows:

Category	Description (AS/NZS 4360)	Definition	Operational Interpretation
F1	Frequent	An event occurring in the range once a week to once an operating year.	yearly
F2	Likely	An event occurring in the range once a year to once every 10 operating years.	1 - 9 years
F3	Possible	An event occurring in the range once every 10 operating years to once in 100 operating years.	10 - 99 years
F4	Unlikely	An event occurring in the range less than once in 100 operating years.	100 - 999 years
F5	Rare	Considered to occur less than once in 1000 operating years (e.g. it may have occurred at a similar port or harbour elsewhere in the world).	>1000 years

Frequency Matrix Scales Used to Score This Risk Assessment



Risk Matrix Used to Score This Risk Assessment

Scale	People	Property	Environment	Harbour Stakeholders
C0	Insignificant Possible very minor injury (e.g. bruise).	Insignificant (NZ\$0-10,000).	Insignificant Negligible environmental impact. Tier 1 may be declared but criteria not necessarily met. (NZ\$0-10,000).	Insignificant (NZ\$0-10,000).
C1	Minor Single slight injury.	Minor (NZ\$10K-100K).	Minor Tier 1 to Tier 2 criteria reached. (small operational spill). (NZ\$10K-100K).	Minor Bad local publicity or short-term loss of revenue, etc. (NZ\$10K-100K).
C2	Moderate multiple minor or single major injury.	Moderate (NZ\$100K-1M).	Moderate Tier 2 Spill criteria Reached, capable of being limited to immediate area within harbour or port zone. (NZ\$100K-1M).	Moderate Bad widespread publicity, temporary navigation closure or prolonged restriction of navigation (NZ\$100K-1M).
C3	Major Multiple major injuries or single fatality.	Major (NZ\$1M-10M).	Major Lower Tier 3 criteria reached, with pollution outside harbour or port zone expected. Chemical spillage or small gas release. Potential loss of environmental amenity. (NZ\$1M-10M).	Major National Publicity Harbour faces temporary closure of a navigation channel affecting movements to a port or ports for several days. Ensuing loss of trade. (NZ\$1M-10M).
C4	Catastrophic Multiple fatalities.	Catastrophic (NZ\$10M+).	Catastrophic Tier 3 criteria oil spill reached with support from international clean up funds. Widespread beach contamination or serious chemical\gas release. Significant threat to environmental amenity. (NZ\$10M+).	Catastrophic International media publicity. Port closes, navigation seriously disrupted for an extended period. Serious and long term loss of trade. (NZ\$10M+).

Consequence Matrix Used to Score This Risk Assessment

1	2	3	4	5	6	7	8	9	10
Nothing is in place	Very little is in place	Improvements in progress	Reasonable measures are in place	Everything practicable is in place					



Risk Control Adequacy Rating Criteria

Vessel Types Used in the Risk Assessment

Vessel Type	Comments
RoRo	Freight and/or Passenger RoRo
Bulk Carrier	Log Vessels; Salt or Cement
Dry Cargo	
Fishing Vessel	Hoki Scallop Fishing Vessel over 500GT
Harbour Tug	
Kayak	Used specifically where necessary
Leisure Craft	Small Cruiser Sail Small Cruiser Motor Waterski Craft Personal Water Craft Self-drive Hire Racing Yacht NB; Leisure Craft are used for many activities on the Sounds, including recreational fishing or recreational diving.
Passenger	Large Passenger Vessel (Cruise Liner). Small Passenger Vessel (Locally Operating within the Sounds).
Water Taxi	High Speed service either on schedule or demand.
Pilot Vessel	Vessel or Craft used to deliver Pilot to large vessels.

It should be noted that the hazards can relate to more than one vessel type grouping e.g. Leisure, but vessel types related to are made clear in the hazard detail on hazard sheets. These are attached to Hazards in the HAZMAN risk assessment software. Hazman allows attachment of primary and secondary vessel types to each hazard.

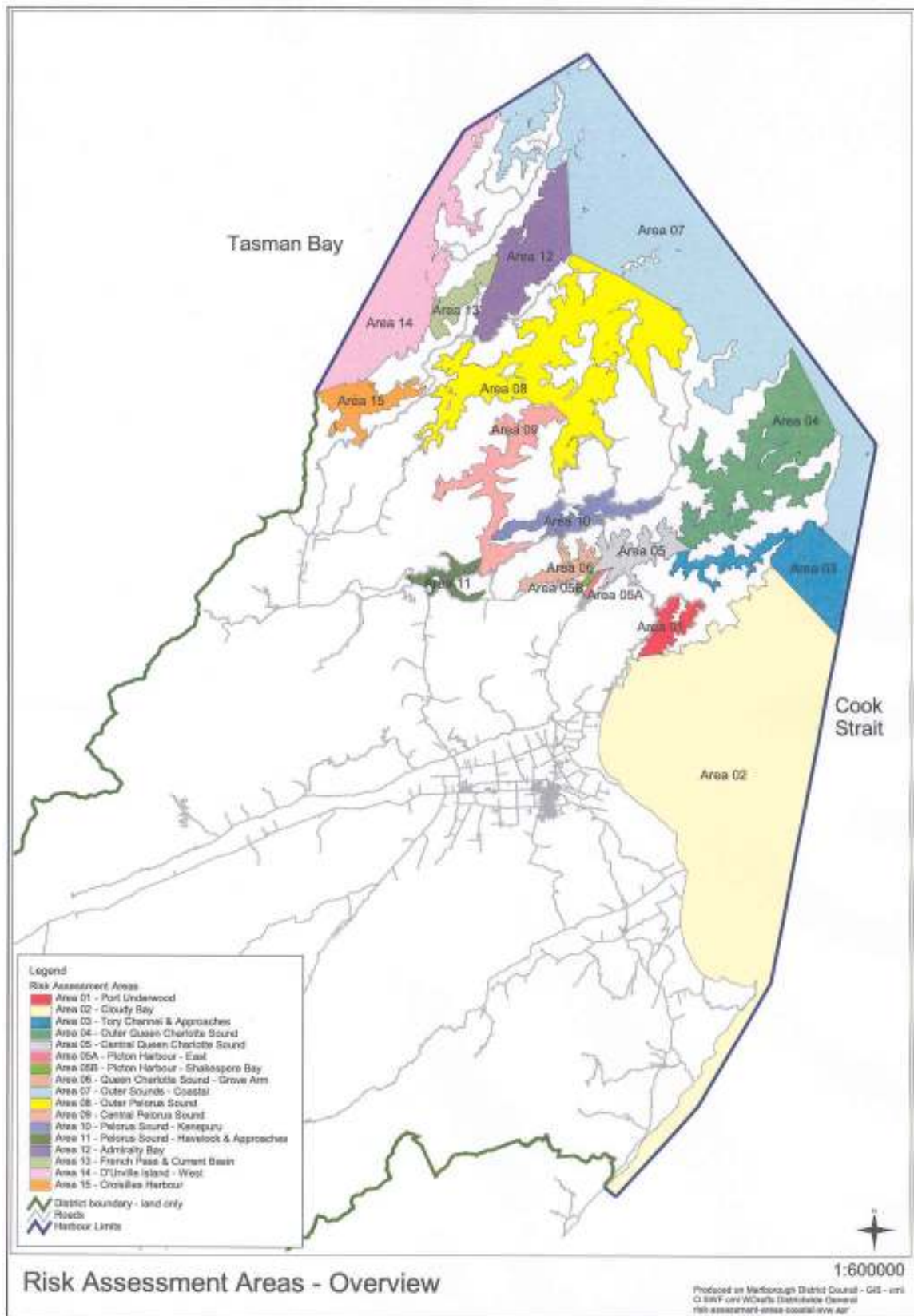
Accident Categories Used in the Risk Assessment

Collision	Man Overboard
Contact Berthing	Mooring Failure
Contact navigation	Personal Injury
Fire \ Explosion	Pollution
Foundering	Swamping
Girting	Tsunami
Grounding	Wash

Risk Assessment Areas for the Sounds

Area Name	Area Identification
Port Underwood	Area 01
Cloudy Bay	Area 02
Tory Channel and Approaches	Area 03
Outer Queen Charlotte Sound	Area 04
Central Queen Charlotte Sound	Area 05
Picton Harbour – East	Area 05a
Picton Harbour – Shakespeare Bay	Area 05b
Queen Charlotte Sound – Grove Arm	Area 06
Outer Sounds – Coastal	Area 07
Outer Pelorus Sound	Area 08
Central Pelorus Sound	Area 09
Pelorus Sound – Kenepuru	Area 10
Pelorus Sound – Havelock and Approaches	Area 11
Admiralty Bay	Area 12
French Pass and Current Basin	Area 13
Durville Island West	Area 14
Croisilles Harbour	Area 15

A chartlet of the Marlborough Sounds is attached over the page, depicting the areas geographically.



ANNEX B

MARLBOROUGH HAZARD REVIEW - RANKED HAZARD LIST

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category						Risk Overall	Remarks		
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property			Environment	Stakeholders
1	3	Tory Channel & Approaches	Collision	Ferry/leisure craft in conflict in Tory Channel (headlands)	Ferry meets leisure craft in centre of channel on rounding Clay, Heaphy, or any blind headland.	RoRo, Leisure	Leisure users, Ships Master / Crew, Vessel Owners	Lack of local knowledge by leisure craft (ferry routes and navigational requirements). Leisure craft fails to comply with Harbour Bylaws and Collision Regulations, navigates by 'Point to Point' method based on headlands. Improper lookout on either vessel. Poor positional or spatial awareness on either vessel or craft. Sudden mechanical failure on either vessel or craft while navigating in close proximity to other vessels. Small vessel or craft stemming tide at Tory Channel Entrance causing collision risk by being unable to transit controlled navigation zone within reasonable time (e.g. 25 mins). Yacht under sail in light winds. Small craft operating in restricted visibility without radar or navigating at speed by GPS. Small craft not detected by ferry radar in restricted visibility or by night (inadequately lit).	Serious close-quarters situation but collision averted by actions of bridge team and leisure craft skipper. Leisure craft heels and rolls heavily from sudden deviation to recover situation.	Leisure vessel attempting to cross track of ferry is in collision and sinks with potential for multiple fatalities. Ferry manoeuvres to avoid collision and runs aground sustaining significant damage to hull and propulsion, requiring subsequent dry dock.	6	0	0	8	8	6	6	8	6.85	Many leisure vessels only monitor 'Marlborough Marine Radio' or are not equipped with VHF radio and not necessarily aware of large vessel movements in this area. Ferry masters have reported power craft standing on for the ferry at high speed and turning away at a late stage, sometimes turning into ferry wake. Queen Charlotte Sound; Picton Harbour and Shakespear Bay are covered by a separate hazard. Actual groundings in Tory have occurred in last 100 years.
2	79	Outer Sounds - Coastal, French Pass & Current Basin	Grounding	Vessel over 120m Length Grounding in outer Sounds area.	Vessel over 500 GT in grounding situation in narrow passage with strong tidal flows. This is possible in French Pass, Stephen's Passage and off Cape Jackson and in outer Sounds area generally.	All Vessels	Environmental Interests, General Public, Regional Council, Ships Master / Crew, Vessel Owners	Vessel loses steerage through mechanical or other systems failure. Tidal influence greater than vessels forward momentum. Loss of control with strong following tide. Failure to monitor position and poor BRM. Lack of local knowledge. Vessel runs out of sea room through manoeuvre to avoid another vessel. Incorrect tide calculation or local correction from tide tables. Vessel fails to comply with Harbour Bylaws regarding maximum length or tonnage permitted to transit area.	Scenario of vessel running aground in strong tidal area (e.g. French Pass or other similar area. Vessel requiring subsequent dry docking.	Scenario of cruise ship grounding on outlying/remote area (e.g. Walker Rock area) and subsequently lost. Potential for loss of life. Discharge of up to 500 tonnes of heavy or intermediate fuel oil into local sea area.	0	6	3	7	4	7	7	6.24	Following groundings, Bylaws prevent vessels of above 500 GT from transiting French Pass. Harbour Master policy is to limit exemptions to this to a maximum of 6m draught. However, 120 metres of length is considered a limit for exemption on the basis that the width of French Pass is 120 metres. The policy is facilitated by a Bylaw requirement for such users to obtain exemption from the Harbour Master for French Pass transit. At time of the risk assessment there was no means of monitoring compliance other than by voluntary reporting. Risk levels associated with this are likely to be reducing due to Bylaw requirements. Most likely case occurred in last 9 years. Worst credible case is a scenario similar to the large passenger vessel loss at Cape Jackson. At time of the risk assessment there was no means of monitoring compliance other than by voluntary reporting. 2009 review, AIS monitoring coverage is in place at Bulwer and in most parts of the Sounds, but blind sectors remain in the French pass area. Cruise vessel calls to the Sounds have shown a significant increase in numbers.	

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category							Risk Overall	Remarks
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property	Environment		
3	12	Tory Channel & Approaches	Grounding	Fishing Vessel Grounds in any part Tory Channel	Fishing vessel grounds within Controlled Navigation Zone or in Channel.	Fishing Vessel	Environmental Interests, Fishing Users, General Public, Leisure users, Ships Master / Crew, Vessel Owners	Vessel loses steerage through mechanical or other systems failure. Influence of tidal current pushes fishing vessel or craft onto Arrowsmith point. Poor positional awareness, lack of local knowledge of tidal stream characteristics. Fishing vessel runs out of sea room during manoeuvres to avoid another vessel. Steerage lost in heavy weather and/or strong rate of tidal flow. Propulsion fouled on cray pot line. Fatigue. Sea Conditions too severe for safe transit of Tory Channel entrance.	Averted grounding or fishing vessel aground for a short period and refloats. Loss of fish stored on deck.	Vessel grounds on one of the rocks in Tory Channel Entrance. Loss of up to 20 tonnes of diesel. Vessel drifts off rock and drifts into deeper water, loses stability and sinks. Potential for a fatality.	0	6	6	7	7	6	7	6.2	No current navigational control of vessels under 500GT transiting Controlled Navigation Zone. Fishing vessel has been lost and not found after Grounding on Rocks in calm conditions at Tory Channel entrance. Fishing vessel came off the rocks and the vessel sank, but was never located. There have been several incidents of Fishing Vessel Groundings, a number of which have occurred at Arrowsmith Point. Two have sunk, but to date no one has been killed on commercial fishing vessels. Number of groundings were occurring annually; record thought to be improving. 2009 review determined factually that the "most likely" grounding outcomes are occurring annually. There were 4 reported events of FV Groundings in Tory Channel in four years. These were all events where FV was refloated.
4	18	Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - Shakespeare Bay	Collision	Ferry and leisure craft in conflict generally	Ferry and leisure craft in developing collision situation in key areas of ferry route, excluding Tory Channel and Approaches; Picton Harbour.	RoRo, Leisure	General Public, Leisure users, Regional Council, Ships Master / Crew, Vessel Owners	Lack of local knowledge by leisure craft (ferry routes and navigational requirements). Leisure craft fails to comply with Harbour Bylaws and Collision Regulations, navigates by 'Point to Point' method based on headlands. Improper lookout on either vessel. Poor positional or spatial awareness on either vessel or craft. Sudden mechanical failure on either vessel or craft while navigating in close proximity to other vessels. Yacht under sail in light winds. Small craft operating in restricted visibility without radar or navigating at speed by GPS. Small craft not detected by ferry radar in restricted visibility or by night (inadequately lit).	Serious close-quarters situation but collision averted by actions of bridge team and leisure craft skipper. Leisure craft heels and rolls heavily from sudden deviation to recover situation.	Leisure vessel attempting to cross track of ferry is in collision and sinks with potential for multiple fatalities.	6	0	8	7	4	4	7	6.16	The probability of collision between a leisure craft and ferry in the Sounds is likely to be low except in periods of restricted visibility, or by night if leisure craft are inadequately lit. Picton Harbour and Tory Channel are dealt with by separate hazards.
5	40	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Admiralty Bay, Croisilles Harbour	Foundering	Recreational craft ingress	Recreational craft engaged in fishing loses hull integrity in area providing wind over tide conditions.	Leisure	Fishing Users, Leisure users, Regional Council	Vessel overloaded with occupants resulting in inadequate freeboard and stability for prevailing sea conditions and weight distribution of crew. Lack of local knowledge regarding weather and sea conditions. Power driven vessels failing to comply with Harbour Regulations (50m/5knot rule) creating steep wash close to fishing vessel. Lack of general seafaring knowledge including poor appreciation of affect of passing vessels wash on stability of vessel. Occupants of vessel or person in charge under influence of excess alcohol, impairing judgement. Fishing gear of recreational vessel or anchor fouled on bottom, capsizes moment on attempted retrieval. Sea conditions unsuitable for transit ((area of rip in wind over tide).	Recreational craft suffers controllable water ingress.	Recreational craft with low freeboard in a damaged condition rolls heavily heavy seas in outer area of the Sounds. Water ingress and loss. Potential for fatality.	6	6	6	7	4	4	6	6.07	There are a large number of areas in the Sounds and outer coastal areas that are susceptible to tidal rips and hazardous wind over tide conditions. Risk varies with the state of tide and weather direction. 2009 review. The Cod fishing ban in the Sounds has resulted in a significant increase in small fishing craft (recreations) transiting Tory Channel entrance and fishing in the surrounding area.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category						Risk Overall	Remarks		
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property			Environment	Stakeholders
6	Port Underwood, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - West, Shakespear Bay, Queen Charlotte Sound - Grove Arm, Outer Sounds - Grounding	Leisure craft in grounds in Sounds	Grounding	Leisure craft grounds in Sounds	Leisure craft in grounding situation in the Sounds overall, this being more likely in a narrow passage with strong tidal flow. French Pass, Stephens passage, Cape Jackson, Greville Harbour are mentioned, but hazard relates to Sounds area generally.	Leisure	Leisure users, Regional Council	<p>Craft loses steerage through mechanical or other systems failure. Sailing vessel becalmed in light airs loses steerage. Tidal influence greater than vessels forward momentum. Failure to monitor position. Lack of local knowledge. Craft runs out of sea room through manoeuvre to avoid another vessel. Incorrect tide calculation or extraction from tide tables. Excessive speed within the 200m zone.</p> <p>Craft lightly grounds in calm weather, occupants able to abandon safely or refloat. Hole punched in hull, but temporary repair possible and bilge pumps able to cope.</p> <p>Low powered craft attempting transit of narrow passage or other remote area strikes rock in adverse weather. Craft holed runs on and is lost rapidly with persons in water in isolated area, potential for fatalities.</p>	Worst Credible (WC)	Most Likely (ML)	6	6	0	6	7	6	3	7	5.96	Several narrow passages with strong tidal flows exist within Marlborough Harbour Limits for which local knowledge is required. Uncharted rocks are reported by Fishing stakeholders at Stephens Passage, but between Saddle Rocks and Stephen's Island, where navigation should not be undertaken in any event (Charts report area last surveyed in 1989). Greville Harbour has a number of minor groundings, but it is remote. 2009 review, 22 Leisure Craft Grounding records had occurred in 4 years and around 3-4 per month in summer months.
7	Picton Harbour - East	Vessels in collision situation in Picton Harbour	Collision	Vessels in collision situation in Picton Harbour	Vessels of any type approaching or departing Picton Harbour in developing collision situation. Scenario is affected by one or other vessel in process of manoeuvring. Hazard scenario can include leisure craft.	All	<p>Environmental Interests, Fishing Users, General Public, Leisure users, Pilots, Regional Council, Ships Master / Crew, Tug Owners, Vessel Owners</p>	<p>By night, back scatter of shore lights obscuring lights of vessels under way. Vessels fail to detect one another in restricted visibility. Failure of either vessel to comply with Harbour Bylaws and Collision Regulations. Either vessel unaware of approach of other prior to rounding Picton Point. Failure of either vessel to report departure or arrival to Picton Harbour Radio. Lack of Harbour movement management. Poor positional or spatial awareness on either vessel. Urgent medical condition affecting skipper of a craft. Presence of other vessels limits sea room available to manoeuvre to avoid collision.</p> <p>Close quarters situation but collision averted or possibility of minor scrape.</p> <p>Ferry in collision with other passenger vessel on rounding Picton Point. Worst Credible is based on involvement of a water taxi. One vessel loses hull integrity and sinks with persons in water/trapped in hull, potential for multiple fatalities. Discharge of bunker fuel into surrounding sea area (up to 10 cubic metres).</p>	Worst Credible (WC)	Most Likely (ML)	6	6	0	6	7	7	6	6	5.95	Mabel Island rule by night for ships over 500gt. It is possible for ships rounding Picton Point to sight one another with little time available to manoeuvre to avoid a close quarters situation. Although unlikely, vessel could also be entering Picton harbour on the opposite side to convention (i.e. does not keep to starboard). Picton point tends to be used as a reporting point for inbound vessels. Other vessels (e.g. outbound) can be relied on information from Picton Harbour Radio (or AIS) about the presence of another vessel approaching this point.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category						Risk Overall	Remarks		
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property			Environment	Stakeholders
8	11	Tory Channel & Approaches	Grounding	Ferry grounding at Tory Channel Entrance	Ferry off track and likely to ground within the Tory Channel Controlled Navigation Zone or approaches in either direction.	RoRo	Environmental Interests, Fishing Users, General Public, Leisure users, Ships Master / Crew, Vessel Owners	Ferry loses steerage through, loss of power, mechanical or other systems failure. Poor positional awareness or failure to appreciate affect of tidal flow. Ferry manoeuvres to avoid collision with another vessel and runs out of sea room. Ferry loses steerage in heavy weather and/or strong rate of tidal flow. Inexperienced Helmsman. Poor BRM (attention oversight) or training in integrated navigation equipment. Sea conditions unsuitable for safe Transit of Tory Channel entrance. Inappropriate reliance on technologically advanced electronic navigation systems. Loss of interface between navigators and control of vessel track.	Grounding averted by recovery action of bridge team or rapid propulsion recovery. Possibility of striking submerged rock struck with glancing blow, elderly passenger caught off balance and injury, but no loss of bunkers.	Ferry grounds in controlled navigation zone. Potential breach of fuel tanks and loss of up to 300 tonnes of intermediate fuel oil and/or Packaged Dangerous Goods. Rapid flooding, loss of stability reserve, or ferry drifts into deeper water. Potential for multiple fatalities but realistic outcome is ferry being intentionally run up the beach to mitigate loss of life. Propulsion failure at seaward side of entrance in Southerly would provide scenario of vessel driven into Wellington Bay. High Cliff and difficult access for response, although possibility of anchoring close at the 20m contour.	6	3	0	7	6	6	6	6	5.87	Tory channel entrance may be closed to shipping in heavy weather. Ferries have suffered system failures and groundings have occurred inside the entrance. 3 have occurred in last 50 years; last occurred just over 10 years ago. Groundings have been averted. 2009 review, three occurrences of power / propulsion failure are recorded in Tory Channel approaches. Worst Credible Frequency reduced on evidence of improved systems.
9	73	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - Shakespear Bay, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Contact Navigation	Small vessel or craft in contact with marine farm	Small vessel, leisure or commercial in contact with marine farm while navigating.	Leisure	Leisure users, Regional Council, Vessel Owners	Poor lookout on vessel or craft. Marine farm difficult to see with low angle of sun reflecting on water. Marine farm inadequately lit. Marine farm not detected by sight or radar in poor visibility or vessel reliant on GPS navigation. Loss of spatial awareness at night. Broken lines. Marine farm not moored in charted position. Broken or stray lines in heavy weather.	Vessel runs over marine farm mooring lines but does not foul propeller, no or minor damage to either vessel or marine farm.	Leisure vessel runs over marine farm mooring lines while navigating at high speed. Propeller fouled and propulsion unit pulled off transom resulting in loss of hull integrity; possible loss of vessel or craft. People in water with potential fatality.	0	6	3	3	7	6	6	7	A vessel could also be holed in contact with a marine farm structure with a similar worst credible outcome. Diesel outdrives and outboard motors have been severely damaged by contact with marine farm ropes. Compliance checks have been difficult to achieve and process with present resources of harbour regulatory system. Reports of problems exist. Lighting of marine farms is reported to now be improving. 2009 review. Marine Farms have now got approved lighting plans and resource consents in place. Monitoring of compliance with new lighting plans. Six incidents reported in four years, including a marine farm mooring failure and closure of Tory Channel. WC event has occurred. Risk scoring remains.	

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category						Risk Overall	Remarks	
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property			Environment
10	1	Tory Channel & Approaches	Collision	Two Ferries in conflict at Tory Channel Entrance.	Two ferries in developing collision situation within the Controlled Navigation Zone.	RoRo	Environmental Interests, General Public, Ships Master / Crew, Vessel Owners	Two passenger carrying vessels over 500GT transiting Tory Channel sea entrance controlled Navigation Zone at the same time. Failure of either or both vessels to transmit/receive 'All Ships' VHF call prior to entering the Controlled Navigation Zone. Poor BRM on each vessel. Miscalculation of timings for approach VHF transmission. Mechanical or electronic system failure on either ferry. Ferry transiting pilotage waters reliant on autohelm control satellite navigation system (i.e. watchkeeper not continually interfacing with ships heading and track at Tory Channel entrance). Poor positional/spatial awareness on either/both vessels. Presence of another craft in close proximity compromises ability of one or both ferries to alter course. Inappropriate sea conditions at Tory Channel entrance affects entry track and timing of inbound vessel. Complacency from routine experience of many Tory Channel transits.	Averted collision or glancing blow (side contact by interaction) between passing vessels.	T-bone collision. One ferry rapid loss of stability and sinking. One ferry suffers glancing grounding on any of the rocks at entrance. Passengers in water in rough conditions on ebb tide with likelihood of multiple fatalities.	6	0	6	7	7	7	7	5.72	All ships approaching Tory Channel Controlled Navigation Zone must provide 10 mins VHF "All ships Call" and monitor other ships transmissions. Transmission made on ch.16 and 19. Diffebach Point is an area of special interest. Ferry on Ferry Collision is likely to be a reducing risk with the mitigation in place, but mitigation could be improved.
11	83	Port Underwood, Cloudy Bay, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Shakespear Bay, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Personal Injury	Injury to recreational divers	Personal injury to recreational divers within the Sounds.	Leisure	Leisure users, Regional Council	Divers have insufficient experience for nature of attempted dive. Divers operating in areas of strong tidal flow. Lack of local knowledge. Divers injured by power driven craft failing to comply with Harbour Regulations. Divers fail to display Flag A or flag is of insufficient size. Inexperience or lack of care on part of dive vessel operator. Faulty diving equipment.	Diver swept away from dive boat by current is picked up from surface by other vessel.	Diving in vicinity of French Pass when strong tidal flow is present results in multiple fatalities. Alternatively a number of incidents of single diver fatalities in a season.	9	0	8	6	0	6	5.69	204 - There had been ten fatalities in the past 10 years and 21 in 20 years. Commercial divers have not been involved in reports of fatality incidents. 2009 review. 11 reported incidents and 3 fatalities have occurred in four years.	

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category						Risk Overall	Remarks	
									Most Likely (ML)	Worst Credible (WC)	People	Stakeholders	People	Property	Environment	Stakeholders			Property
12	10	French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour, Port Underwood, Cloudy Bay, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespear Bay, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay	Collision	Two leisure craft in conflict - Sounds generally.	Leisure craft in developing collision situation with another leisure craft in the Sounds generally.	Leisure	Leisure users, Vessel Owners	Improper look out on either craft. Failure to comply with Collision Regulations and/or Harbour Bylaws. Sudden mechanical failure while navigating at high speed in close proximity to other craft inadequate or improper navigation lights shown on either craft. Navigation lights obscured by deck working lights of fishing vessel in close proximity (night). Vessels meet on rounding a headland. Either vessel fails to comply with Harbour and/or Collision Regulations. Lack of local knowledge regarding patterns of leisure use.	Close quarters situation or collision causing shock, but no injuries.	Two power driven craft collide at high speed. One vessel takes on water and in danger of total loss. People in water. Potential for one or more fatalities.	6	0	6	7	6	3	7	5.59	Craft navigating at high speed close to shore may have insufficient time to avoid collision upon meeting another vessel or craft rounding a headland. Leisure with Leisure is most likely to occur in Queen Charlotte Sound generally; Picton Harbour Entrance; Croisilles; Kenepuru and Havelock and approaches. Lack of compliance with 200m and 50m 5 knot Bylaws has been reported.
13	35	Tory Channel & Approaches	Foundering	Fishing vessel founders	Fishing vessel encountered heavy weather while transiting Tory Channel Controlled Navigation Zone.	Fishing Vessel	Environmental Interests, Ships Master / Crew, Vessel Owners	Vessel has inadequate buoyancy, stability or hull strength for sea conditions. Vessel loses steerage through mechanical failure resulting in water ingress. Hatchway or hatchcover breaks open or is inadequately secured. Sea conditions unsuitable for transit of Tory Channel entrance or approaches.	Vessel sinks at entrance to Tory Channel. Evacuated successfully but loss of life could be expected in heavy weather.	Fishing vessel sinks at entrance to Tory Channel in heavy weather with strong SE going tide, loss of vessel (disappears without trace) with all hands.	4	6	4	6	5	3	5	5.45	If foundering occurs in heavy weather then the possibility of crew making shore is remote. 2009 Review. Risk scoring remained unchanged as hazard event has occurred in last 10 years. Recognition is made to the personnel improvements made to NZ fisheries operations.
14	48	Tory Channel & Approaches	Collision	Ferry in conflict with fishing vessel	Ferry and fishing vessel in developing collision situation within the Tory Channel Controlled Navigation Zone and approaches.	RoRo, Fishing Vessel	Fishing Users, General Public, Regional Council, Ships Master / Crew, Vessel Owners	Both vessels attempting to use line of the leads at the same time. 'All Ships' 10 minute VHF call not transmitted / received by either or both vessels. Incorrect ETA for entrance and lack of monitoring on either vessel. Lack of local knowledge on fishing vessel. Either vessel loses steerage through gear failure or state of sea and tide in close proximity to other vessel. Either vessel unaware of position of other vessel prior to rounding headland. Poor lookout on either vessel. Fishing vessel fouls propeller on cray pot line and drifts into path of ferry. Fatigue impairs watchkeeping ability of fishing vessel crew.	Extreme close quarters situation but collision either averted or situation results in glancing blow.	Ferry in collision with fishing vessel in controlled navigation zone. Fishing vessel capsizes with fatalities (up to 5).	6	0	6	7	6	4	6	5.42	Fishing vessels

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category						Risk Overall	Remarks		
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property			Environment	Stakeholders
15	20	Port Underwood, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespear Bay, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin, Croisilles Harbour	Collision	Commercial vessel & leisure craft in conflict	Small commercial vessel and leisure craft in developing collision situation generally in the sounds.	All, Leisure	Leisure users, Ships Master / Crew, Tug Owners, Vessel Owners	Poor lookout. By night, inadequate or inappropriate lights shown. Lack of local knowledge regarding traffic patterns. Lack of knowledge of Harbour and Collision Regulations. Lack of positional or spatial awareness on either vessel. Loss of steerage on one vessel due to sudden mechanical or other systems failure. Reduced Visibility.	Close quarters situation but collision averted.	Leisure vessel run down by larger commercial vessel. Leisure vessel rapidly loses stability and sinks with potential fatalities.	0	0	0	6	7	6	6	7	5.37	Lack of obvious compliance with Collision Regulations by leisure vessels is reported by commercial operators. Unlit craft navigating have been reported in proximity to areas where other craft normally navigate.
16	39	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespear Bay, Queen Charlotte Sound - Grove Arm, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin, Croisilles Harbour	Collision	Kayak in conflict with leisure craft	Kayak and power driven craft in developing collision situation.	Kayak, Leisure	Leisure users, Regional Council, Ships Master / Crew, Tug Owners, Vessel Owners	Power driven craft navigating at speed over 5 knots within 50m of other vessels or 200m of shore. Low visibility of kayak and poor look out on either craft.	Close quarters situation collision averted.	Kayak run down by power driven craft at speed. Potential for fatalities.	6	0	0	6	7	0	0	8	5.29	Although reported to occur anywhere within the Sounds, Kayak activity may concentrate in specific patterns in some areas, an example of this is Picton Harbour entrance where Kayaks will cross to Mable Island. Conflict can arise where power driven craft use these same areas for transit or water-sports (e.g. Kayak inadvertently enters water ski area). Kayaks can be very difficult to spot in hazy, overcast or drizzle type conditions. Kayaks recommended to carry lights at night. WC Hazard scoring is international reporting due to the international nature of Kayak hirers.
17	4	Tory Channel & Approaches, Central Queen Charlotte Sound, Picton Harbour - East	Collision	Ferry/leisure craft in conflict in darkness in Sounds transit generally	Ferry fails to detect leisure craft or vice versa at night at Tory Channel entrance or elsewhere on the transit and is involved in collision.	RoRo	Environmental Interests, General Public, Ships Master / Crew, Vessel Owners	Fishing vessel working lights compromise night vision and ferry fails to reduce speed. Radar on ferry unable to detect small target at close range (height of scanner or human factor). Lack of positional or spatial awareness (error in judgement). Leisure vessel fails to comply with Harbour Bylaws and Collision Regulations. Inadequate or inappropriate navigation lights on leisure craft. Lack of experience of leisure user. Small vessel or craft stemming tide at Tory Channel Entrance causing collision risk by being unable to transit controlled navigation zone within reasonable time (e.g. 25 mins). Greater likelihood of alcohol being involved.	Close quarters situation but collision averted.	Leisure craft run over resulting in potential for multiple fatalities.	3	0	0	3	8	6	6	8	5.18	Ferry masters have reported occasional problems with fishing vessel deck working lights removing ability to see small craft at night. Feedback from ferry masters advised it is not uncommon to enter Tory Channel and meet a leisure craft in the middle of the channel. Reports of close quarters situation at night at Tory channel entrance have occurred.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category						Risk Overall	Remarks	
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property			Environment
18	37	Picton Harbour - East	Collision	Ferry in conflict with small craft, Picton Hbr.	Ferry and leisure craft or small commercial vessel in developing collision situation on approach to Picton Harbour by night.	RoRo, Leisure	Leisure users, Regional Council, Ships Master / Crew, Vessel Owners	Navigating lights of either vessel not detected against shore lights in background. Vessels fail to show correct navigation lights. Vessels approaching Picton Harbour not aware of recent departures (small craft fails to monitor VHF Ch.19 or departing vessel fails to report departure).	Close quarters situation but collision averted.	Ferry runs down leisure vessel, providing the potential for capsizing. Possibility of at least one fatalities, but multiple fatalities possible.	6	0	0	7	3	3	7	5.07	There is presently no harbour movement management for small commercial craft engaged in passenger service.
19	14	Tory Channel & Approaches	Grounding	Leisure craft grounds in Tory Channel or entrance	Leisure craft grounds on rocks within the Tory Channel Controlled Navigation Zone.	Leisure	Leisure users, Vessel Owners	Vessel loses steerage through mechanical or other systems failure. Poor navigation or disorientation (loss of spatial awareness) during periods of restricted visibility. Vessel unable to maintain steerage in heavy swell and/or strong rate of tidal flow. Vessel runs out of sea room during manoeuvres to avoid another vessel. Vessel fouls propulsion or rudder on cray pot line with subsequent loss of control. Lack of local knowledge. Sea Conditions too severe for safe transit of Tory Channel entrance.	Grounding on rock reef, damage to bottom. Potential for fuel or diesel spillage (up to 500lts). Pollution unlikely from small gasoline powered craft. Small craft affected by wash of passing vessel.	Craft grounds and spills some fuel into surrounding sea area. A maximum of 500 litres is assumed. Craft loses stability and can capsize, drifts into deeper water and sinks. Potential for fatalities.	6	0	6	6	4	4	6	5	Recreational craft and small fishing vessels are reported to have grounded on Teriyaki Rock, on more than one occasion in 10 years. Other rocks in the area are Weke Rick, or Rocks on East Head side. Cray pots are set on either side of the channel at the entrance to Tory Channel where small recreational craft navigate. There has not been loss of life to date. Gasoline driven craft often fuelled by tote tanks. 2009 review: Transits of Tory Channel Entrance have increased with Cod fishing ban. Within Sounds, with fishing occurring outside the entrance. 2009 review, two leisure craft grounding incidents reported, one on Tory Entrance rocks and one wash related grounding reportedly requiring recovery by contractor assistance.
20	74	Port Underwood, Cloudy Bay, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - Shakespear Bay, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Contact Navigation	Vessel over 500GT in contact with marine farm.	Vessel greater than 500GT in contact with marine farm while navigating.	Bulk Carrier	Environmental Interests, General Public, Pilots, Regional Council, Ships Master / Crew, Vessel Owners	Marine farm inadequately lit. Marine farm out of charted position through dragging moorings, not detected by sight or radar on vessel. Vessel navigating outside usual passage plan in close proximity to marine farms. Lack of positional awareness or manoeuvre to avoid collision or other danger. Vessel dragging anchor.	Vessel runs over marine farm resulting in significant damage to the marine farm installation, vessel's propulsion and steering not affected.	Vessel of approx 500GT runs over loose marine farm. Propeller and/or rudder gear fouled resulting in loss of steerage. Vessel drifts and grounds on shoreline holing double bottom tanks. Fuel spillage (circa 100 tonnes estimate; marine diesel). Dry-dock required.	0	6	0	6	2	6	6	4.96	Twin screw vessels such as ferries, and larger deep draught bulk carriers are likely to cause significant damage to a marine farm but are unlikely to become completely disabled themselves. A number of recommended vessel anchorages and safe havens are located adjacent to marine farm sites (recommended in New Zealand Pilot). Modern cruise vessel podded propulsion systems are susceptible to damage. 2009 review: One incident of marine farm mooring failure, resulting in the closure of Tory Channel recorded. WC event has thus occurred after as predicted by original risk assessment. Scoring remained unchanged.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category							Risk Overall	Remarks	
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property	Environment			Stakeholders
21	44	Port Underwood, Cloudy Bay, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Shakespear Bay, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Fire/Explosion	Small vessel Fire/explosion.	Fire in engine room or food preparation space of passenger vessel, water taxi or other commercial floating asset.	Passenger	General Public, Regional Council, Ships Master / Crew, Vessel Owners	Build up of oily or combustible material in engine room ignites. Fracture of fuel line in engine room sprays fuel onto hot surfaces or provides explosive concentration of fuel vapour. Mechanical or alignment fault in machinery. Electrical fault in galley equipment.	Minor fire extinguished by crew or attending assistant without significant damage.	Fire on large GRP water taxi requires immediate evacuation of passengers. Alternatively a barge accommodation in remote location suffers fire overnight Potential for fatality.	0	6	0	6	6	6	2	6	4.96	Small passenger vessels may operate some distance away from dedicated search and rescue facilities resulting in delay obtaining assistance. Passengers may be required to enter the water after evacuation. Use of Open Reversible Life rafts (winter water temp 12 Celsius). 2009 review. There have been 6 fire events on commercial vessels and barges recorded in years 2005 to 2008. Frequency increased.
22	77	Port Underwood, Cloudy Bay, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Shakespear Bay, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Grounding	Fishing vessel in grounding situation.	Fishing vessel in grounding situation in the Sounds, excludng Tory Channel, most likely scenario being in a tidal passage with strong tidal flow. Candidates for severe outcome are French Pass, Stephen's Passage and off Cape Jackson. Hazard is related to Sounds in general, but excludes the records of groundings in Tory Channel.	Fishing Vessel	Fishing Users, Regional Council, Vessel Owners	Fishing vessel loses steerage through mechanical or other systems failure. Tidal influence greater than vessels forward momentum or moving with tide. Failure to monitor position. Lack of local knowledge. Fatigue impairs judgement of watchkeepers. Craft runs out of sea room through manoeuvre to avoid another vessel. Incorrect tide calculation or extraction\correction from tide tables. Vessel strikes uncharted underwater obstruction.	Vessel runs aground in fair weather, crew able to abandon safely or refloat. Possible minor ingress managed by pumps.	Vessel attempts to abort transit of narrow passage in mid-tide and is carried onto rocks. Vessel rolled in strong tidal influence or serious damage resulting in loss. Potential for loss of life. Diesel spillage.	0	6	0	6	2	6	4	6	4.87	Some fishing vessel operators no longer transit French Pass due to safety concerns. Five events have occurred in the last five years at time of original risk assessment. 2009 review, there had been three fishing vessels groundings in four years. Scoring remained unchanged for the most likely outcome, but no data evidence of serious vessel loss had occurred and frequency of worst credible event accordingly lowered an order of magnitude. To shift national pollution clean up resources, a tier three would need to be declared, but environmental consequence scoring references tier 2

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category							Risk Overall	Remarks			
									Most Likely (ML)	Worst Credible (WC)	M	L	W	C	People	Property	Environment			Stakeholders	People	Property
23	72	Port Underwood, Central Queen Charlotte Sound, Picton Harbour - East, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin	Pollution	Pollution at fuel berth	Pollution occurs through fuel spill at small commercial / leisure vessel fuel berth	Leisure	Environmental Interests, Fishing Users, General Public, Leisure users, Regional Council, Ships Master / Crew, Tug Owners, Vessel Owners	Misuse or careless use of equipment by operator. Re-fuelling vessel not properly secured to wharf. Wash from passing vessel parts lines/fuel line or pulls delivery nozzle from filling point. No absorbent mats/cofferdams in deck area around filling point. Fuel pump equipment poorly maintained. Emergency shut off on pump not clearly marked. Alternatively oil discharged from pumped bilges. No save-all's fitted to fuelling equipment. Wilful act of vandalism.	Minor spill of less than one litre. Alternatively hose parts during refuelling, up to 40litres lost	Vessel left unattended while refuelling, nozzle comes out of filling point and discharges up to 500 litres of diesel into sea before being detected.	0	0	6	0	0	0	0	0	8	6	4.83	Most fuel berths are unsupervised. There are reports of a large number of small spills. Fuel jetties are open and no savealls fitted. 2009 review 6 spillage events reported in four years. Up 100litres per event, most smaller. Scoring remained unchanged.
24	15	Central Queen Charlotte Sound	Collision	Ferry and ship over 500GT in conflict, QC central.	Ferry and ship >500GT in developing collision while entering or transiting Central Queen Charlotte Sound.	RoRo, Bulk Carrier	General Public, Pilots, Ships Master / Crew, Vessel Owners	Neither vessel aware of position of other prior to rounding headland (e.g.. Diffenbach Point). Misunderstanding of information passed by VHF radio by either ship. Poor positional or spatial awareness on either vessel. Presence of other vessels limits sea room available to manoeuvre to avoid collision. Depth of water available limits sea room available to manoeuvring room.	Close quarters situation but collision averted.	Other ship T bones ferry which suffers rapid loss of stability and capsizes with multiple fatalities. Alternatively, Ferry is striking vessel, floods RoRo deck and loses stability, with similar worst-credible outcome.	0	0	0	6	6	6	6	6	6	4.81	Ferries inbound to Picton have been in conflict with outbound log ships while ferry is rounding Diffenbach Point. Potential for bottle neck in vicinity of Allports Island with in and out bound ships in conjunction with heavy concentrations of yachts and other leisure craft at times.	
25	21	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Shakespear Bay, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Personal Injury	Person in water run over by powered vessel.	Swimmer or diver in path of a vessel.	All	Leisure users, Pilots, Ships Master / Crew, Vessel Owners	Vessel not aware of swimmers/divers operating more than 200m from shore or structure (Dive vessel not showing proper flag). Vessel navigating at excessive speed within 200m from shore or structure. Vessel navigating at excessive speed within 50m of a raft or vessel from which people are swimming/diving. Person under influence of excessive alcohol navigates power-driven craft recklessly in proximity to swimmers or divers. Swimming in waterski or Jet-Ski (PWC) designated area. Divers or swimmers in wharf area. Poor look-out. People (students) jumping over side of berthing ferry. Non use of dead-mans shutdown for outboard motor (fall overboard and run over by own craft).	Diver or swimmer narrowly missed by powered vessel.	Person in water run over with fatality.	6	0	0	6	6	0	0	0	7	4.78	Unlikely to involve larger vessels. Vessels or craft often have swimmers or divers in the water. Swimmers or persons in charge of vessels may be under influence of alcohol especially during summer period. Event has occurred in sounds on at least two previous occasions. 2009 review, 6 incidents in four years reported of people in water where close quarters events occurred.	

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category							Risk Overall	Remarks	
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property	Environment			Stakeholders
26	13	Tory Channel & Approaches	Grounding	Small commercial vessel grounds in Tory Channel or approaches.	Small commercial vessel grounds within the Tory Channel Controlled Navigation Zone, or within Tory Channel.	Small Commercial Vessel.	Environmental Interests, Fishing Users, General Public, Leisure users, Ships Master / Crew, Vessel Owners	Vessel loses steerage through mechanical or other systems failure. Poor BRM (failure to monitor position). Vessel runs out of sea room during manoeuvres to avoid another vessel. Vessel loses steerage in heavy weather and/or strong rate of tidal flow. Lack of local knowledge. Propulsion fouled on cray pot line and loses control. Sea Conditions too severe for safe transit of Tory Channel entrance.	Grounding on rock reef, damage to bottom. Potential for diesel spillage (up to 10000lbs). Diesel seeps out until fuel removed.	Vessel grounds, backs off and then sinks in deeper water. Loss of all hydrocarbons onboard (up to 10 tonnes Marine Diesel). Potential for fatalities in conditions at Tory Channel Entrance.	2	2	4	6	4	6	6	4.71	This hazard has occurred at Tory Channel entrance. Loss of life from grounding event has as yet not occurred. Transits of vessels in the order of 350 tonnes are reported to occur in the order of 10 visits per year. 2009 review. Fishing vessel charters transiting outside the Sounds have increased due to cod fishing ban in the Sounds. No small commercial incidents recorded for Tory Channel (2004-2008).	
27	25	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin, Croisilles Harbour	Wash	Wash injury to occupants of leisure craft or small workboat.	Personal injury to occupants of a moored or anchored leisure craft or small workboat.	Leisure	Leisure users, Ships Master / Crew, Vessel Owners	Wash from passing vessel causes heavy rolling of moored or anchored leisure vessel. Vessels passing too close at speed - breach of Harbour Bylaws. Fast Ferry in breach of bylaws by way of medical emergency.	Discomfort for occupants of moored/anchored vessel.	Rolling causes spillage of hot cooking oil in galley of moored vessel with potential for severe injury. People attempting to fend off craft rafted alongside suffer moderate crush injury.	6	0	6	6	3	0	6	4.66	Reports are made of vessels passing within 50m of other vessels at excessive speed creating dangerous wash. The wash generated from large vessels passing at a greater distance may also produce an adverse affect. 2009 review: five reports of incidents involving wash in four years.	
28	71	Central Queen Charlotte Sound, Picton Harbour - East, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin	Fire/Explosion	Fire/Explosion at a fuel berth in Sounds	Fire/Explosion during re-fuelling of small commercial or leisure vessel alongside a fuel berth.	Leisure	General Public, Leisure users, Regional Council, Ships Master / Crew, Tug Owners, Vessel Owners	Person smoking/ causing naked flame within explosive concentration of fuel vapour. Fuel spilled on hot engine parts or other source of ignition aboard re-fuelling vessel. Electrical system not isolated prior to refuelling. Build up of fuel vapour in bilge undetected / not cleared prior to restarting vessel engine. Fuel spillage on berth is ignited. Cell phone in use.	Explosive concentration of fuel vapour not reached, explosion averted.	Explosion aboard vessel re-fuelling with petrol destroys vessel to waterline. Potential for loss of life.	0	0	6	0	6	4	4	6	4.63	Most fuelling facilities are unsupervised. 2009 Review, one event in 2005-2009 reflecting the W/C event.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category						Risk Overall	Remarks		
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property			Environment	Stakeholders
29	16	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Queen Charlotte Sound - Grove Arm, Outer Sounds - Swamping	Swamping	Swamping or Capsizing of Kayaks	Kayak Group or one Kayak caught in rapidly changing weather conditions.	Kayak	Leisure users, Regional Council	Distance too great for good shelter location in weather conditions experienced. Kayaks caught unawares by sudden change in weather conditions (organised event). Failure to take advice from weather information sources prior to setting out. Poor briefing by companies hiring Kayaks. Lack of contingency planning or harbour notice for planning.	Capsize recovery by Kayak group working together. Lone Kayak recovers but exhausted, possibility of hypothermia. Shelter not available in vicinity.	Capsize of large Kayak Group with up to 25 capsized and people in water. Strong winds create spray and chop, making identification of capsized Kayaks difficult. SAR response needed as shelter not available. Group forced onto a Lee Shore or unable to get out of way of ferry. SAR response needed. Loss of life and cases of hypothermia.	6	0	0	3	6	2	0	6	4.44	Different locations in Sounds better for shelter, dependent on wind direction. Kayaks are used in all parts of the Sounds, even the outer areas. It is possible for a kayak to round a headland experiencing a light southerly breeze and meet a strong northerly gale on rounding the headland. Deployment random in nature. Spray impairs vision in heavy weather conditions. 2009 Review: A potential serious event involving the capsizing of 25 Kayaks occurred in the last four years.
30	60	Tory Channel & Approaches, Central Queen Charlotte Sound, Picton Harbour - East	Collision	Racing yacht and vessel over 500GT in conflict	Yacht engaged in racing in developing collision situation with a ferry or other vessel over 500GT.	RoRo and Leisure	Leisure users, Regional Council, Ships Master / Crew, Vessel Owners	Yacht impedes navigation of vessel >500GT. Racing course regularly crosses track of ferries. Individuals in race ignoring vessel through competitive intent. Misinterpretation or disregard of Harbour Bylaws and Collision Regulations. Centreboard yacht capsizes in path of ferry. Yacht becalmed in light airs in path of larger vessel.	Racing Yacht disappears from vision under bow of larger vessel or a full astern movement needed to avoid serious collision.	Yacht is run down by ferry, persons in water with potential for fatalities.	3	0	0	6	6	2	0	6	4.44	2009 review suggests situation has improved. Course Diagrams have been introduced and these provided to Ferries and Picton Harbour Radio. Race organisers now report the course they are using to Picton Harbour radio. Improved dialogue between race organizers and Picton Harbour and race organizers and the ferries. Ferries now stopped being used for tactical advantage as racers are disqualified. 2009 review showed 3 reports of close quarters with yachts in four years, but no indication of racing at the time or not. Risk levels appear to have receded over the four years of review. Ferry masters unaware in a number of cases that deviation around Allports Island is an option. A race does occur in Tory Channel on an annual basis, but the risk is assessed on the probability at Picton.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category						Risk Overall	Remarks			
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property			Environment	Stakeholders	M
31	86	Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Grounding	Charter cruiser grounds in restricted width area or high current area.	Charter leisure craft grounds at a narrow or tidally influenced area of the Sounds.	Charter Leisure	Leisure users, Vessel Owners	Vessel loses steerage through mechanical or other systems failure. Poor navigation or disorientation (loss of spatial awareness) during periods of restricted visibility. Vessel fouls propulsion or rudder on cray pot line with subsequent loss of control. Lack of local knowledge or appreciation of the dangers posed by semi submerged or rocks close to the surface within in Marlborough Sounds.	Averted grounding or aground for short period and refloat. Damage to keel and propellers/rudders. Possible minor seepage into hull. Repair possible by berthing alongside jetty and grounding over low tide.	Craft grounds and spills some diesel fuel oil into surrounding sea area. A maximum of 500 litres is assumed. Craft grounds on falling tide and rolls on side, flooding on flood tide. Running over a rock and total loss of charter cruiser.	0	0	0	0	6	2	4	4	6	4.41	Charter cruisers are surveyed to MSA standards and cannot pass through Tory Entrance. Systems are in place to check the experience and competence of crew. Often hirer is experienced vessel owner from another location, so only area of weakness is local knowledge. There are a fleet of around 50 larger (28 foot upwards) cruise vessels and motor cruisers available for 'professional' charter. About 15 motor launches, rest yachts. Grounding have been minor and sailing related. 2009 review, three incidents in four years recorded of charter craft grounding scenarios. Scoring remained unchanged.
32	26	Picton Harbour - East	Contact Berthing	Ferry involved in contact during berthing	Ferry contacts berth during berthing operations in Picton Harbour East.	RoRo	General Public, Ships Master / Crew, Tug Owners, Vessel Owners	Error in judgement by ship handler. Mechanical or other systems failure. Manoeuvre to avoid collision with other vessel. Adverse environmental effects during berthing (gust of wind, 50 to 60 knots of northerly or southerly).	Minor damage to wharf fendering or structure of berth supporting fendering.	Ferry lands heavily on end of the Long Arm and fractures shell plating with potential to cause ingress, including to machinery spaces. Potential for minor to moderate injuries as crew/passengers thrown to deck. Ship disabled with economic loss to operator. One jetty (Long Arm) out of service until survey is carried out. Loss service capacity. Loss of revenue to Port Company.	0	6	0	0	4	6	0	6	4.35	Since 'freezing works' hill was excavated, berths are more open to the effects of a Norwest wind. Norwest pushes vessels onto wharfs. Loss of Long Arm would prevent discharge of rail cargo. 2009 review, Berthing contact damage is regular in nature, reports to the database are limited, but ferries do occasionally request tugs for berthing. There are one or more reports per annum of berthing damage. No changes to scoring made.	
33	41	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Central Pelorus - Shakespear Bay, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin	Grounding	Water Taxi Grounding	Water taxi grounds while navigating close to shore.	Water Taxi	General Public, Regional Council, Ships Master / Crew	Craft navigating at speed close to shore, fails to comply with Harbour Regulations. Disorientation of launchmaster in restricted visibility. Loss of steerage through mechanical or other systems failure. Avoiding action to prevent collision with small leisure craft close to shore.	Grounding is averted through evasive action. Water taxi continues on passage; wash affects other users..	Vessel grounds on rock reef, runs on over. Alternatively, runs ashore at 25 knots with passengers onboard. De-acceleration causes passengers to be thrown off seats and injuries. Possibility of rupturing fuel tank, up to 2500 lts possible loss.	3	3	0	3	6	4	4	6	4.31	Water taxis are reported to navigate at speed within 200m of shore at times ("headland hopping") and may carry up to 150 passengers. Grounding at speed has occurred in Pelorus. Also at Punga Cove. Small taxi has climbed wharf at Picton after throttle stuck open. 2009 review, a significant number (8) of reports of speed complaints recorded of transits at speed close to shore (four years of records).	

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category						Risk Overall	Remarks		
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property			Environment	Stakeholders
34	63	Central Queen Charlotte Sound	Mooring Failure	Mooring failure of Anchored Barge.	Large Commercial Barge drags anchor from either of the two designated anchoring areas.	Barge	Leisure users, Regional Council	Inadequate securing of anchors for the prevailing conditions. Present difficulty in monitoring barges remotely.	Barge dragging across the channel. Notification or alert raised by passing craft. Response by barge operator recovers drifting barge.	Barge drags into Marine Farm or other anchored vessel/craft, causing significant loss. Alternatively grounding and structural damage to barge occurs. Worst credible extreme is Leisure craft (or small commercial) at speed is involved in collision with drifting barge during hours of darkness.	0	3	0	3	6	4	2	7	4.3	Large seagoing commercial barges anchor for relatively long periods awaiting cargos or charter. Designated anchorages are located behind Mable Island or North-East of the wedge. Large barge moorings are checked regularly. Barges are now lit at night. Requirements for additional lighting overside have been made as minimum requirements are a light fore and aft, but lights are a considerable distance apart. 2009 review - there were three reported events of anchor dragging involving large barges, two actual dragging and one perceived. Requirements of large barges entering or anchoring the sounds is suggested for Harbour Master review.
35	38	Outer Queen Charlotte Sound	Grounding	Vessel over 500GT grounds in Queen Charlotte Sound	Vessel transiting Outer Queen Charlotte Sound grounds while proceeding to or from Pilot Station.	SOLAS Vessel	Environmental Interests, General Public, Leisure users, Pilots, Regional Council, Ships Master / Crew, Vessel Owners	Navigational error. Ship loses propulsion or steerage through mechanical or other systems failure and drifts into shallow water. Low visibility contributes to lack of positional awareness on bridge. Failure of land based navigational aids contributes to lack of positional awareness on bridge. Ship encounters unreported shoal or other underwater obstruction while navigating with minimum UKC.	Grounding averted or rapid refloat.	Ship grounds in rock area and suffers loss of hull integrity, at least one bunker tank opened up. Potential to discharge up to 500 tonnes of heavy oil.	0	2	2	5	0	5	6	6	4.27	Area of 13.5m depth marked on chart and noted in risk assessment to be in need of review. Last survey in 1943, accretion rates unknown. Draught limitation of 10.5m imposed for the area. 2009 review. Hydro survey completed and draughts over 10.5 metres now must use East Channel past Long Island.
36	34	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Outer Sounds - Coastal	Man Overboard	Man overboard from ferry.	Passenger falls or jumps overboard while ferry transiting Marlborough Sounds.	RoRo	General Public, Ships Master / Crew, Vessel Owners	Passenger climbs deck railings or enters non-passenger area of external deck. Passenger falls overboard while under the influence of excess alcohol. Depression\suicide.	Person recovered by ship's rescue boat . Serious injury escaped associated height of fall.	Person swept away in tidal flow and rough sea, lost to sight of ferry crew with fatality.	2	0	0	6	0	0	6	4.22	Ferries have reported MOB situations while transiting Sounds. 2009 review. One incident involving 2 people jumping overboard from a RoRo ferry reported in 4 years. This is a reasonable result for a ferry operation. Frequency of event unchanged.	

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category							Risk Overall	Remarks	
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property	Environment			Stakeholders
37	42	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay	Collision	Water taxi and kayak in conflict	Water taxi meets group of kayakers, particularly on rounding a headland.	Water Taxi, Kayak	General Public, Leisure users, Regional Council, Ships Master / Crew, Vessel Owners	Water taxi navigated at excessive speed close to shore, fails to comply with Harbour Regulations. Poor lookout. Lack of local knowledge by water taxi launchmaster.	Averted collision, wash problem causes injury potential to Kayak occupant.	Water taxi runs down two kayaks with likelihood of fatalities.	6	0	0	0	6	0	2	6	4.22	Kayaks are reported to generally navigate within 200m of shore and should not encounter vessels proceeding at speeds greater than 5 knots.
38	66	Picton Harbour - East, Picton Harbour - Shakespeare Bay	Girting	Tug founders during ship berthing operations	Tug in potential loss situation while assisting larger vessel wishing to berth. Girting likely to occur.	Harbour Tug	Environmental Interests, Pilots, Regional Council, Ships Master / Crew, Tug Owners, Vessel Owners	Tug girted by towline. Error in judgement by tugmaster, pilot or ship's master. Poor communication between tugmaster, pilot and ship's master. Poor procedures on tug. Mechanical or other systems failure on tug or ship. Severe environmental conditions.	Capsize averted by recovery but significant list. Towline parts.	Tug unable to release towline, is girted and capsizes. Potential fatalities amongst Tug Crew.	4	0	2	6	5	3	5	4.21	Tug towline is presently on a drum and incapable of quick release. About 40-50 Tug assisted visits a year involve Tug.	
39	85	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Mooring Failure	Leisure craft swing mooring failure.	Small craft or leisure cruiser mooring fails and vessel drifts away in the Sounds.	Leisure	Leisure users, Regional Council	Inadequate mooring maintenance. Craft or cruiser too large for mooring components. Extremes of severe weather. Improper attachment of craft or cruiser to mooring buoy\chain. Wilful act.	Craft or cruiser is recovered and returned to owner (towage). Alternatively a grounding occurs as drifting craft is blown aground.	Craft or cruiser drifts into fairway at twilight or during darkness and involved in collision with larger vessel.	0	6	0	0	4	2	6	4.13	This scenario occurs several times a year. The hazard case is also applicable to anchored craft. 2008 review - a significant number of mooring failures have occurred in four years. There is no feedback loop to follow up on reports, or to regulate the requirement for independent inspection. 38 leisure mooring failure events recorded in 4 years.	

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category							Risk Overall	Remarks	
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property	Environment			Stakeholders
40	24	Tory Channel & Approaches	Collision	Two Ferries in Conflict at Arrowsmith	Developing Close Quarters situation between Two Ferries at Arrowsmith. Scenario complicated by the presence of leisure, leisure fishing or small commercial vessels.	RoRo	Fishing Users, Leisure users, Regional Council, Ships / Master / Crew, Vessel Owners	Narrowness of channel, combined with alteration of required for normal transit. Recreational fishing off Arrowsmith point, Strong tidal set in area affects steerage and track of vessel or craft. Presence of other small vessels making effective channel width further confined. Overhead cables return spurious radar echo, fine on the bow, easily mistaken for an approaching vessel or small craft; inappropriate action taken. Genuine targets misinterpreted as echoes from overhead cables. Poor BRM (failure to monitor position or tidal set). Lack of local knowledge.	Interaction between ferry hulls causes track deviation. Close quarters situation recovered.	Fine angle of blow collision between ferries. Potential escalation to grounding of a ferry. Alternative of a collision with recreational craft. Potential loss of life.	3	0	0	3	6	4	4	6	4.09	Recreational fishing often occurs off Arrowsmith point (anchor and or drift). Overhead power lines cross Tory Channel at Arrowsmith. A tidal set exists (recorded as up to 2 knots) which pushes a vessel or craft towards the point. A number of groundings have occurred in the area involving fishing vessels. A recreational user grounded on Arrowsmith at speed (20 Knots), resulting in loss of life.
41	31	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespear Bay, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, D'Urville Island - West, Croisilles Harbour	Contact Navigation	Contact by Small Commercial vessel.	Small commercial vessel (in tug and tows, motorised barges, etc) in contact with moored or anchored vessel or aid to navigation.	Small Commercial	General Public, Leisure users, Ships / Master / Crew, Vessel Owners	Poor lookout on commercial vessel. Anchored vessels showing inadequate or no lights. Vessels anchored in fairway. Small commercial vessel navigating at excessive speed within 200 metres of shore.	Contact averted or light damage.	Small commercial vessel, tug and tow, or motorised barge in contact with anchored yacht or motor cruiser. Damage to yacht's hull results in loss or serious damage to struck vessel. Potential loss of life if anchored vessel is unlit at night and struck.	0	3	0	0	7	4	2	6	4.08	Unlit craft at anchor have been reported in areas where other craft/vessels normally navigate. Small craft may be anchored near headlands close to shore, vessels rounding headland at speed have little time to take avoiding action. Moored or anchored vessels have dragged into fairway. Contact with Aids to Navigation has occurred on a number of occasions. 2009 review, Luke Rock Aton reported missing - had been run over by shallow draught vessel - (Luke Rock 2-3metres below surface). Moored Ex Navy IPC run into y small commercial vessel; two fatalities (Flightless). Consequence impact on WC increased.
42	64	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespear Bay	Fire/Explosion	Fire/explosion onboard ferry	Fire or explosion onboard ferry	RoRo	Environmental Interests, General Public, Regional Council, Ships / Master / Crew, Vessel Owners	DG's stowed in inappropriate containers. Insufficient separation in stowage of DG's. Incorrect identification of DG's prior to loading /undisclosed DG's. Inadequate lashing of cargo (moves when ferry heels or with heavy weather motion). Ignition of fuels carried in vehicles. Loss of fuel containment in engine room.	DG spillage detected and contained, fire/explosion prevented. Minor engineroom fire brought under control rapidly.	Vehicle deck fire initiated by vehicle fire on ferry. Dangerous goods in adjacent vehicle involved. Serious fire difficult to contain. Evacuation required in Sounds.	3	3	0	3	4	6	0	6	4.03	DG reporting systems may be operating on an out of date basis due to backlog of DG shipments. 2009 review - no fire incidents reported 2005-2008, one DG incident on Ferry - contamination of RoRo deck bilges.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category						Risk Overall	Remarks	
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property			Environment
43	2	Tory Channel & Approaches, Outer Sounds - Coastal, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin	Grounding	Tug and Tow Grounding in Narrow Tidal Channel	Tug and Tow grounds within an area of narrows or one of the Passages with strong tidal streams. Tug remains afloat, but tow grounds.	Tug & Tow	Environmental Interests, Fishing Users, General Public, Leisure users, Ships Master / Crew, Vessel Owners	Tug loses steerage through mechanical or other systems failure. Poor BRM (failure to monitor position or tidal set). Tow runs out of sea room during manoeuvres to avoid another vessel. Tidal influence greater than tug's forward momentum, tide pushes tow ashore. Tug moving on flood tide. Tow rope too long for conditions or area (failure to shorten tow). Lack of local knowledge. Tug not engaging pilot Sea conditions too severe for safe transit of Tory Channel entrance.	Grounding averted or touch Grounding and rapid refloating of tow.	Tow grounds, barge holed and sinks. Partial obstruction of channel; channel closed or limited use for extended period, whilst salvage occurs. Cargo lost.	3	0	3	4	4	4	6	3.99	Tugs can have difficulty steering tows through narrow entrances during spring tides or during periods of heavy weather. Hazard has occurred in Tory Channel as well as French Pass. Steven's Passage and French Pass have a 500GT restriction without Harbourmaster's permission. French Pass has an additional 120m length restriction. Cape Jackson is another difficult area for Tugs and Tows, with local strong tides pushing vessels unexpectedly into rocks. Barges can have 2-300 lts of hydraulic oil on board. 2009 Review: Tog and tow use on the Sounds has increased, but little knowledge is available about routing. Some large barges in use and can be anchored in no.1 anchorage (Collision risk). Carriage of forest products and construction materials most cargoes.
44	78	Outer Sounds - Coastal, French Pass & Current Basin	Grounding	Small commercial vessel Grounding	Small commercial vessel in grounding situation in the Sounds in General, the scenario being more likely in a passage with strong tidal flows. Candidates are French Pass, Stephen's Passage and off Cape Jackson. Scenario specifically excludes Tory Channel to identify Sounds risk level.	Small Commercial Vessel	Environmental Interests, Regional Council, Ships Master / Crew, Vessel Owners	Vessel loses steerage through mechanical or other systems failure. Tidal influence greater than vessels forward momentum. Failure to monitor position. Lack of local knowledge. Vessel runs out of sea room through manoeuvre to avoid another vessel. Incorrect tide calculation or extraction from tide tables. Excessive speed close inshore.	Vessel in potential grounding overwhelmed by tide, but grounding averted. Most Likely scenario of mussel barge transiting French Pass sideways, spilling load in total, has occurred.	Commercial vessel attempts to abort passage (e.g. French Pass in mid-tide). Vessel grounds on rocks. Severe hull damage results followed by rapid sinking if laden, potential loss of life (up to five crew considered in scenario).	0	3	0	6	6	4	6	3.96	Actual tidal conditions at French Pass can be unpredictable. Decision is needed to abort quite early on approach to allow for sea room to swing away. Groundings have occurred but relatively infrequently in the areas covered by this hazard. A number of mussel barges have suffered groundings. 2009 review, scorings remain unchanged.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category							Risk Overall	Remarks		
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property	Environment			Stakeholders	M
45	56	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Admiralty Bay, French Pass & Current Basin	Collision	Tug and tow in conflict with leisure vessel	Tug and tow in developing collision situation with leisure craft.	Tug & Tow, Leisure	Leisure users, Regional Council, Ships Master / Crew, Tug Owners, Vessel Owners	Poor lookout on either vessel. Leisure craft fails to comply with Collision Regulations. Leisure craft passes between tug and tow at speed. Leisure vessel operated by persons under influence of alcohol.	Close quarters situation but collision averted.	Leisure vessel runs over towline and is disabled, then in collision with tow. Leisure vessel loses hull integrity and sinks with potential for fatalities. Potential for person to hit tow wire and hull to pass under it.	3	0	0	3	6	2	4	4	6	3.96	Tug operators have reported close quarters situations with leisure vessels failing to comply with relevant Collision Regulations. Leisure craft at speed has passed between tug and its tow. Barging is on the increase as is leisure use. Towlines are relatively short in Sounds. On 2009 review one incident of leisure vessel attempting to cross between Tug and Tow
46	51	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Shakespeare Bay, Queen Charlotte Sound - Grove Arm	Collision	Fishing vessel and small commercial vessel in conflict	Fishing vessel and small commercial vessel in developing collision situation.	Fishing Vessel, Small Commercial Vessel	Fishing Users, Regional Council, Ships Master / Crew, Tug Owners, Vessel Owners	Neither vessel aware of position of other vessel prior to rounding headland. Vessels navigating close to shore reducing available sea room for manoeuvre. Presence of other vessels in close proximity limits sea room to manoeuvre. Improper lookout on either vessel. Failure to comply with Collision Regulations. Fatigue of watchkeepers on either vessel impairs alertness and judgement. Disorientation or improper use of radar in restricted visibility, vessel navigating on GPS alone without reduction in speed.	Close quarters situation but collision averted.	Fishing vessel and small tug or marine farm workboat in wide angle collision. One vessel holed below waterline and potential loss of stability with potential for fatalities.	0	0	0	3	6	6	4	6	3.96	Smaller vessels may be navigating close to shore in an attempt to keep clear of shipping. This is currently not perceived to be a problem in the Sounds. 2009 review consultation suggested commercial activities had improved, but headland hopping still continues.	

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category						Risk Overall	Remarks		
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property			Environment	Stakeholders
47	53	Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespear Bay, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin	Collision	Small Commercial Vessel Conflict	Commercial vessels meet on rounding a headland with developing collision situation	Small Commercial Vessel, Tug & Tow	Leisure users, Regional Council, Ships Master / Crew, Vessel Owners	Vessels navigating close to shore at excessive speed with limited sea room available to manoeuvre. Poor lookout. Vessels not aware of position of other prior to rounding headland (lack of VHF reporting). GPS or automated navigation in restricted visibility without reduction in speed. Concentration of traffic in close proximity. Headland Hopping.	Close quarters situation but collision averted.	Wide angle collision between laden self propelled barge and a workboat. Workboat holed below waterline, rapidly loses stability and capsizes. Mussel Barge Laden (about 100 tonnes on deck) would sink rapidly. Fatality likely.	0	0	0	3	6	4	6	3.96	Commercial operators aware of potential risk assessed as low. Cullen Point, approaching Havelock is blind. Headland Hopping is common.	
48	8	Pelorus Sound - Havelock & Approaches, French Pass & Current Basin	Collision	Commercial and leisure craft conflict in narrows	A small commercial craft and a leisure craft are involved in a developing collision situation within an area of confined waters, such as Cullen Point at Havelock. Scenario of a powered leisure craft travelling at speed striking a marine farm service vessel clearing Havelock Channel. T Bone Collision geometry is likely.	Small Commercial Vessel, Leisure	General Public, Leisure users, Ships Master / Crew, Vessel Owners	Either or both craft fail to comply with Harbour Bylaws and Collision Regulations (rule 9, wrong side of the channel; regularly occurs). Lack of local knowledge regarding patterns of traffic in the area. Mechanical failure of either vessel while navigating in close proximity to other vessels. Leisure craft transiting Cullen Point bend at high speed.	Close quarters situation but collision averted.	Larger commercial vessel struck in side by powered leisure craft, travelling at speed. Craft seriously damaged, occupants thrown out of craft, possibly onto deck of large vessel - serious injury or fatality.	3	0	0	0	6	4	2	6	3.74	Commercial operators have reported lack of Collision Regulation compliance shown by yachts and power driven craft. Cullen point is blind and the channel exacerbates this. 5 five knot speed limit is in place in the area, but the tide can reach 5-7 knots (but actual velocity may not have been measured).

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category						Risk Overall	Remarks		
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	ML	WC			People	Property
49	32	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Shakespear Bay, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Contact Navigation	Leisure vessel in contact while navigating	Leisure vessel in contact with moored/anchored vessel or AtoN.	Leisure	Leisure users, Ships Master / Crew, Vessel Owners	Poor lookout on leisure vessel. Anchored vessels showing inadequate or no lights. Inexperienced user at night entering bay with moored craft. Vessels moored or anchored in fairway. Moored or anchored vessels have dragged into fairway. Leisure vessel navigating at excessive speed within 200 metres of shore.	Minor contact.	Leisure vessel navigating at speed contacts anchored leisure vessel, loss of watertight integrity to both vessels resulting in sinking and potential for multiple fatalities.	3	0	0	0	6	4	2	6	3.74	2009 review; two events recorded in four years, ML frequency modified accordingly.
50	58	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Queen Charlotte Sound - Grove Arm, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, Croisilles Harbour	Collision	Personal Water Craft in conflict with other vessel or swimmer.	Personal water craft (PWC) in developing collision situation with another vessel at high speed.	Leisure, Leisure	Leisure users, Regional Council	Poor lookout on either vessel or PWC. PWC operated at speed in area of high traffic density. PWC impedes navigation of vessel >500GT PWC fails to comply with Collision Regulations. PWC operated within 200 metres of shore or 50metres of other vessel at speed >5knots. PWC operated by inexperienced or underage rider. PWC operated by person under influence of alcohol. PWC engaged in towage of "biscuit" or water-skier and attention diverted.	Close quarters situation but collision averted. Complaints raised by stakeholder.	PWC collides with double seater kayak or other leisure craft at speed. Fatalities likely. Alternatively, an incident involving a swimmer results in loss of life.	0	0	0	3	6	2	2	6	3.62	Since 1997 around 7 fatalities involving PWCs have been reported in New Zealand Waters. PWCs are noted to be towing water-skiers or "biscuit". In Marlborough Sounds, PWC deployment in 2004 was low. On 2009 review reported use of PWCs has increased significantly and incidents reported involving PWC have also increased.
51	81	Cloudy Bay	Swamping	Leisure craft suffers ingress crossing bar	Leisure craft is swamped by large steep swell when attempting to cross Wairau Bar.	Leisure	Leisure users, Regional Council	Operator of craft attempts to cross bar in adverse conditions. Operator of craft lacks local or general boating knowledge. Craft loses steerage through mechanical or other systems failure including running out of fuel. Craft of unsuitable design for use in bar harbour conditions. Sudden change in Weather conditions.	Misjudgement in sea conditions, severe rolling and takes on water. Situation recovered.	Craft rolled in steep swell or swamped. Persons in water. Potential loss of life.	3	0	0	0	6	2	2	6	3.62	Cloudy Bay is a low use area. 2009 review no reported incidents, no change in risk scoring.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category							Risk Overall	Remarks	
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property	Environment			Stakeholders
52	6	Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - Shakespear Bay, Outer Sounds - Coastal, Outer Pelorus Sound, French Pass & Current Basin	Collision	Two vessels over 500GT in collision situation.	Two vessels over 500GT in developing collision situation within the Sounds.	SOLAS Vessels	Environmental Interests, General Public, Pilots, Regional Council, Ships Master / Crew, Vessel Owners	Neither vessel aware of position of other prior to rounding headland. Either vessel fails to comply with Collision Regulations. Misunderstanding of information passed by VHF radio by either ship. Poor positional or spatial awareness on either vessel. Presence of other vessels limits sea room available to manoeuvre to avoid collision. Depth of water available limits sea room available to manoeuvre for laden out-bound log ship or other vessel operating with minimum UKC.	Close quarters situation but collision averted.	Passenger vessel in T bone collision with laden bulk cement carrier (PEC Holder). Passenger vessel loses watertight integrity. Bulk Carrier more likely to be lost. Potential for fatalities amongst Bulk Carrier Crew in evacuation..	0	0	0	2	5	5	6	6	3.59	The probability of worst credible outcome is probably low given the relative infrequency of movements of vessels over 500gt, other than ferries. With only one Pilot the event could only occur with a piloted vessel and a vessel with a PEC holder on board.
53	61	Port Underwood, Cloudy Bay, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Shakespear Bay, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Tsunami	Serious earthquake in Region	Serious earthquake or slippage causes series of surge waves affecting Sounds	All	Environmental Interests, Fishing Users, General Public, Leisure users, Regional Council, Ships Master / Crew, Tug Owners, Vessel Owners	Far field Tsunami. Six hours warning, water surge (seicheing). Sufficient warning for vessels to be at sea. Effect likely to be limited at Picton as wave energy is lost due to alignment of Sounds. Loss of live associated with navigation unlikely.	Near field Tsunami. Little or no warning, 12M peak arriving on the beach in 90 seconds. Cook Strait initiation more likely to affect the Sounds. Seicheing takes out shore interface and vessels alongside severely damaged. Vessels navigating unaffected, but parting of mooring lines and passenger walkways likely.	0	3	0	4	4	4	0	5	3.55	NZ is part of the Farfield Tsunami early warning system. Advice taken from Blenheim emergency response centre. Direction would have to be from the Northwest and thus align with Queen Charlotte sound to cause major damage. Events have occurred off Wellington 1855, 10M surge. Kaikoura affected 139 years ago by a large underwater slippage. Tsunamis from the North are not expected to seriously affect the Sounds due to shelter provided by the North Island. 2009 review - no change.	
54	70	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Shakespear Bay, Queen Charlotte Sound - Grove Arm	Collision	Leisure craft (hire or charter) in conflict with other vessel	Self-drive hire vessel in developing collision situation with other vessel in Picton Harbour and approaches.	Leisure	Leisure users, Regional Council, Vessel Owners	Lack of knowledge or compliance with Harbour By-Laws and Collision Regulations on either vessel. Lack of knowledge of local traffic patterns on either vessel. Hirer fails to brief hirer on applicable regulations and traffic patterns. Mechanical failure of steering or propulsion system on either vessel. Operators of either vessel under influence of excessive alcohol. Hire boat operated by youths (under age of 15).	Close quarters situation but collision averted.	Hire charter vessel runs over a two seater kayak at speed. Kayak occupants struck by hull or propeller with fatalities possible (up to 2).	3	0	0	0	6	2	0	6	3.47	Power-driven vessels capable of high speed are offered for hire from Picton. Potential exists for conflict with swimmers/divers and other forms of accident. Few incidents have come to light.
55	5	Outer Queen Charlotte Sound, Central Queen Charlotte Sound	Collision	Two ferries in collision situation generally	Two ferries in developing collision situation within the Sounds generally.	RoRo	Environmental Interests, General Public, Regional Council, Ships Master / Crew, Vessel Owners	Failure of either or both vessels to comply with Collision Regulations. Poor BRM on each vessel. Mechanical or electronic system failure on either ferry. Ferry transiting pilotage waters reliant on autohelm control satellite navigation system. Poor positional/spatial awareness on either/both vessels. Presence of another vessel in close proximity compromises ability of one or both ferries to alter course. Other circumstance may result in a ferry navigating outside its usual track.	Close quarters situation but collision averted.	Collision between two passenger carrying ferries shortly after rounding a headland. Fine angle collision, damage to accommodation. Potential for injury to passengers and fatalities.	0	0	0	2	5	5	3	6	3.43	In the Sounds generally, this is considered to be a low probability event. Its likelihood rises in the scenario whereby a ferry has to deviate from the normal track to avoid a smaller vessel or craft.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category						Risk Overall	Remarks	
									Most Likely (ML)	Worst Credible (WC)	M	L	W	C	People	Property			Environment
56	69	Outer Queen Charlotte Sound	Swamping	Pilot boat in loss of hull integrity situation	Pilot boat (Rhib) suffers loss of side airbag coming alongside and ships water during pilot transfer operation.	Pilot vessel	Pilots, Regional Council, Ships Master / Crew, Vessel Owners	Pilot vessel heavy landing alongside. Damage to airbags occurs on one side, bilge pumps cope with ingress of water, vessel makes port safely.	Bow sections of pontoon come away from hull in rough sea, vessel loses stability and capsizes with potential fatality.	2	2	0	0	6	4	0	6	3.41	At least two recorded incidents in NZ waters have occurred with RHIBs where inflatable bags have come away from the hull, resulting in either capsize or severely reduced stability. Marlborough Maritime Pilots use a RHIB for pilotage operations. 2009 review - no incidents.
57	36	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - West, Shakespear Bay, Queen Charlotte Sound - Grove Arm, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Croisilles Harbour, Port Underwood	Contact Navigation	Small vessel suffers contact during navigation	Small commercial vessel or leisure craft in contact with partly submerged object (e.g. Logs).	Small Commercial Vessel	General Public, Leisure users, Regional Council, Ships Master / Crew, Vessel Owners	Debris/logs washed into Sounds during heavy rainfall, not detected. Floating fishing gear.	Vessel navigating at speed strikes log and suffers rapid water ingress. Loss of a small craft may occur. Possibility of person being thrown out of a small craft (e.g. RIB).	3	3	0	0	4	4	2	4	3.4	Logs are reported to wash into the Sounds during flood events causing a hazard to small craft. Department of Conservation ruling forbids clearing of debris on beaches, this debris may later be washed into the Sounds area. 2009 review; 10 reports of log related problems in 4 years, but minimal damage reported. Scoring unchanged.
58	43	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, D'Urville Island - West	Contact Navigation	Water taxi in contact navigation situation.	Water taxi or charter fishing vessel (up to 20 persons) in contact with fixed object (aids to navigation) debris or semi-submerged object.	Water Taxi	Fishing Users, General Public, Regional Council, Ships Master / Crew, Vessel Owners	Poor lookout on water taxi. Marine Farm inadequately lit. Anchored vessel inadequately lit. Water taxi proceeding at speed in close proximity to moored or anchored vessels / marine farms. Lack of local knowledge by seasonal or new staff (staff training). semi submerged logs or other debris difficult to detect.	Water taxi navigating at speed contacts large floating log and suffers loss of hull integrity, leading to flooding risk of loss of vessel. Potential for loss of life in extreme case.	3	3	0	0	4	4	2	4	3.4	Marine farming is reported as a growth industry in many areas of the Sounds. Logs and other debris is likely to be washed into the Sounds during heavy rainfall events. 2009 review, 10 reports of log related problems and 2 of excessive speed close inshore recorded in four years. 3 reports of inadequately lit anchored leisure craft (moored no requirement). Minimal damage reports, risk scoring unchanged.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category							Risk Overall	Remarks	
									Most Likely (ML)	Worst Credible (WC)	People	Stakeholders	People	Property	Environment	Stakeholders	ML			WC
59	87	Pelorus Sound - Havelock & Approaches	Grounding	Leisure Craft Grounds at Havelock	Leisure vessel in grounding at Havelock and approaches.	Leisure	Leisure users, Regional Council	Craft loses steerage through mechanical or other systems failure. Tidal influence. Failure to monitor position. Lack of local knowledge. Incorrect tide calculation (incorrect application of tidal correction - secondary port). Storm aftermath results in logs and other debris in channel. Fog or restricted visibility. Excessive speed in the Havelock channel or Cullen Point area. Mooring failure in remote area (high winds).	Craft grounds in sheltered waters, occupants able to abandon or refloat on change of tide.	Powered craft approaching Havelock grounds across channel. Channel closed for a tidal cycle, craft liable to suffer structural damage or roll over. Craft strikes submerged log held in soft mud, is holed, floods and requires salvage assistance to recover.	0	0	0	0	6	6	3	7	3.28	Havelock is an area of regular minor groundings, but it is soft mud and outcomes are likely to be minor overall. After a deluge, there is a lot of debris and semi submerged logs in the Havelock Channel and its approaches. Logs become stuck in underwater mud and are difficult to find and remove. A number of incidents have occurred. Leisure craft category includes small self drive day charters (15 foot - 4-5metres). Fog is a problem in the area and small leisure craft rarely have radar fitted. 2009 review, 4 in four years and minor injury. Scoring of most likely case now reflecting data record. This is a high frequency event, but minimal consequences, possibly due to the muddy nature of the bottom.
60	30	Picton Harbour - East, Picton Harbour - Shakespeare Bay	Contact Navigation	Ferry Contact Incident	Ferry contacts a moored vessel or barge whilst underway.	RoRo	Leisure users, Ships Master / Crew, Vessel Owners	Another vessel anchors or moors in shipping channel. Poor positional or spatial awareness on ferry. Inadequately lit vessel or object moored behind Mabel Island. Ferry not aware of vessel or object moored behind Mabel Island prior to approach. Vessel or moored object drags into shipping channel and is not detected in darkness or restricted visibility. Barge illegally anchored outside designated area.	Close quarters situation but contact averted. Complaint made.	Ferry runs into moored barge at back of Mabel Island. Watertight integrity compromised. Barge of 500 tonnes involved. Flooding of one compartment of ferry; placed alongside alternative wharf. Passengers evacuated; Ferry out of service for a month.	0	0	0	6	6	4	7	3.2	Barges have dragged anchor or mooring failure has resulted in a barge drifting into path of ferries. This hazard has been realised in the last five years. Ferries on approach to their Picton berth have been involved in contact with moored craft during periods of restricted visibility. 2008 review, no change.	
61	7	Tory Channel & Approaches	Collision	Ferry and commercial vessel in conflict	Ferry and small commercial vessel (workboat) in developing collision situation in Tory Channel or approaches.	RoRo, Small Commercial Vessel	Environmental Interests, Ships Master / Crew, Vessel Owners	Commercial craft or workboat fails to give way and impedes navigation of ferry. Either vessel unaware of other vessel position prior to rounding a headland. Mechanical failure on either vessel or craft while navigating in close proximity to other vessels. Poor positional or spatial awareness on either vessel or craft/workboat. Either or both vessels fail to transmit or receive the 'All Ships' 10 minute call. Call made on wrong frequency (has occurred). Small vessel stemming tide at Tory Channel Entrance causing collision risk by being unable to transit controlled navigation zone within reasonable time (e.g. 25 mins).	Close quarters situation but collision averted.	Smaller vessel capsizes or sinks causing fatalities.	0	0	0	7	6	4	6	3.2	Tug and barge operators report that they are unable to cross some parts of Tory Channel at right angles in time to remain clear of any ferries which may round a headland without warning. Charter vessels of approx. 300GT may transit Tory Channel occasionally while relocating between Wellington and the Sounds. An incident has occurred with a marine farm vessel towing, which was not aware of 10 minute call rule. Commercial vessels are reported to be good.	

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category						Risk Overall	Remarks		
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property			Environment	Stakeholders
62	50	Cloudy Bay, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Outer Sounds - Coastal, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West	Collision	Fishing vessel in conflict with vessel over 500GT	Fishing vessel on passage and vessel over 500GT in developing collision situation.	Fishing Vessel, Bulk Carrier	Fishing Users, Pilots, Regional Council, Ships Master / Crew, Vessel Owners	Fishing vessel impedes passage of vessel over 500GT within harbour limits. Fishing vessel on autopilot with improper lookout kept. Either vessel unaware of local traffic movements. Improper lookout on vessel >500GT. Poor BRM on vessel. Limited sea room available for vessel >500GT to manoeuvre to avoid collision.	Close quarters situation but collision averted or small glancing scrape.	Laden vessel >500GT runs down fishing vessel which could capsize. Potential for fatalities (up to 5).	0	0	0	0	7	6	4	6	3.2	
63	19	Outer Queen Charlotte Sound, Central Queen Charlotte Sound	Collision	Ferry and small commercial vessel in conflict	Ferry and small commercial vessel in developing collision situation in the Sounds, other than Tory Channel and Approaches.	RoRo, Small Commercial Vessel	Environmental Interests, Regional Council, Ships Master / Crew, Vessel Owners	Commercial craft or workboat fails to give way and impedes navigation of ferry. Either vessel unaware of other vessel position prior to rounding a headland. Mechanical failure on either vessel or craft while navigating in close proximity to other vessels. Poor positional or spatial awareness on either vessel or craft/workboat.	Close quarters situation but collision averted.	Small commercial vessel attempts to cross ferry track and is run down. Smaller vessel capsizes with potential for multiple fatalities. Ferry attempts to take avoiding action at a late stage and runs aground with significant damage to hull and possible discharge of IFO.	0	0	2	5	5	3	5	3.1	The probability for this type of worst credible outcome is likely to be low as most commercial operators are reported to comply with Harbour Regulations and are familiar with ferry routes and tracks.	
64	75	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East	Fire/Explosion	Ferry struck by aircraft	Aircraft, helicopter or debris strikes overhead cables. Passing ferry in vicinity hit by debris. Overhead cables at Arrowsmith Point.	RoRo	General Public, Regional Council, Ships Master / Crew, Vessel Owners	Aircraft flies into power cables which cross Tory Channel at Arrowsmith Point, ferry has insufficient time to avoid falling debris or airframe. Helicopter accident during emergency services transfer.	Ferry is not in vicinity when aircraft collides with power cables.	Aircraft in collision with power cables as fully laden passenger ferry passes underneath. Burning debris from aircraft lands on ferry upper deck. Alternatively, helicopter ditching strikes ferry.	0	0	0	3	5	3	1	5	3.08	Aircraft have collided with the power cables crossing Tory Channel with ferry in close location. Overhead cables at Arrowsmith Point. Other possibilities exist for a similar outcome elsewhere in the Sounds, for example helicopters routinely fly over the Sounds at relatively low altitude.
65	65	Picton Harbour - East, Picton Harbour - Shakespeare Bay	Collision	Berthing Tug in collision with berthing vessel	Tug in collision with vessel when assisting during berthing.	Harbour Tug, Bulk Carrier	Environmental Interests, Pilots, Regional Council, Ships Master / Crew, Tug Owners, Vessel Owners	Error in judgement by tugmaster. Poor communication between pilot, ship and tugmaster. Error in judgement by ship's master or pilot or poor spatial awareness. Mechanical or other systems failure on tug or ship. Interaction between tug and ship hulls.	Minor collision, minor indents damage to either vessel.	Tug suffers fractured shell plating in collision or very heavy landing with ship resulting in water ingress. Low speed - potential for injury. Tug out of action, vessel subsequently takes ground (soft seabed).	3	3	0	3	3	3	3	3.06	Maintaining currency on equipment and procedures in shipping operations has been identified as a potential issue due to the low frequency of ship visits that occur at Picton. Tug has only recently arrived at Picton.	

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category							Risk Overall	Remarks			
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property	Environment			Stakeholders	M	L
66	27	Picton Harbour - East, Picton Harbour - Shakespeare Bay	Contact Berthing	Vessel >500GT contact during berthing	Vessel > 500GT contacts wharf during berthing in Picton Harbour East or Shakespeare Bay.	Vessel	Environmental Interests, Pilots, Ships Master / Crew, Tug Owners, Vessel Owners	Error in judgement by shiphandler. Error in judgement by tug master. Adverse environmental conditions during berthing (sudden gust of wind) Mechanical or other systems failure aboard any assisting tug. Mechanical or other systems failure aboard ship. Small vessels navigating in close proximity limit sea room available to larger vessel for manoeuvre.	Minor contact damage to wharf. Indented shell plating.	Vessel lands heavily on wharf and fractures shell plating causing ingress. Potential for minor to moderate injuries as crew /passengers thrown to deck. Ship disabled with significant economic loss to operator and delays to other vessels (up to one week). Loss of revenue to Port Company. Widespread reporting if cruise vessel.	0	3	0	0	4	4	0	4	0	4	3.03	2009 review. No reports providing evidence to modify existing scorings.
67	22	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West, Croisilles Harbour	Swamping	Leisure vessel tender in swamping situation	Leisure vessel tender takes on water while taking persons and gear out to moored craft.	Leisure	Leisure users	Tender is overloaded for prevailing conditions. Lack of local and/or general boating knowledge by person in charge of tender. Swamping by wash of passing vessel. Craft used as a tender is unsuitable or in unseaworthy condition. Person in charge of tender under influence of excess alcohol, impairing judgement.	Tender takes water but kept afloat by internal buoyancy while occupants bail, craft makes place of safety.	Tender capsizes in choppy sea, occupants without buoyancy aids unable to cling to vessel or make shore. Potential for loss of life.	0	0	0	7	3	0	7	3	0	7	3	Buoyancy aids may not be worn routinely. Some tenders lack internal buoyancy to enable swamped or capsized craft to stay afloat and support occupants. Resorts provide tenders to pick up and drop off people. 2009 review - two events reported in four years. An incident in the Bay of Many Coves reflected the worst credible outcome.
68	57	Port Underwood, Central Queen Charlotte Sound, Queen Charlotte Sound - Grove Arm, Central Pelorus Sound, Pelorus Sound - Kenepuru, French Pass & Current Basin	Personal Injury	Water skier/recreational object in contact	A craft towing a water skier or other recreational object in developing contact situation with other vessel or fixed object.	Leisure	Leisure users, Pilots, Regional Council, Ships Master / Crew, Tug Owners, Vessel Owners	Other vessels navigating within water ski lanes at the same time as water ski vessels. Water skiers active in areas of high traffic density. Poor look out on either vessel. No observer aboard water ski vessel. Water ski/recreational object towing vessel operator fails to appreciate arc of travel of towed object.	Water-ski towing vessel /skier or biscuit near strike to a fixed object.	Water ski vessel executes tight turn and towed object/person is brought into contact with fixed object with potential for fatality.	0	0	0	7	3	0	7	3	0	7	3	Contact instances resulting in severe injury have been reported (3 in 10 years). 2009 review 6 events of near misses reported. Frequency increased to reflect an event occurring at least once per annum.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category							Risk Overall	Remarks			
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property	Environment			Stakeholders		
69	67	Tory Channel & Approaches, Outer Queen Charlotte Sound, Outer Pelorus Sound	Personal Injury	Personal injury during pilot transfer operation.	Personal injury during operation of embarking / picking up pilot from vessel over 500GT.	Pilot vessel	Pilots, Regional Council, Ships Master / Crew, Vessel Owners	Pilot loses grip while using pilot ladder. Pilot vessel fails to stay alongside ship as pilot transfers to or from ladder. Improperly rigged or poorly maintained pilot ladder. Heavy weather. Misjudgement by pilot craft coxn.	Pilot falls short distance to pilot vessel with minor injury, or ends up in water.	Pilot vessel comes away from ships side in heavy weather while pilot transferring from pilot vessel deck to pilot ladder. Pilot falls in water and is caught between hulls with severe injury or fatality. Alternatively, Pilot ends up in water during hours of darkness and is difficult to find.	2	0	0	0	0	0	6	0	0	6	2.98	A light displacement pilot vessel may not provide a stable platform for pilot transfers in all weathers. Pilots boarding in relatively sheltered waters in Sounds at present. Low risk recorded because of low frequency of boarding and no reports of incidents. 2009 review. No incidents reported. No risk scoring changes made.
70	23	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, East, Picton Harbour - Shakespear Bay, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, Croisilles Harbour	Wash	Personal injury on commercial vessel - Wash	Wash causes heavy rolling of a small commercial vessel or tug alongside.	Small Commercial Vessel	Pilots, Ships Master / Crew, Tug Owners, Vessel Owners	Small tug with barge alongside rolled heavily from wash of other vessel causing relative movement and snatching of lines. High Speed Craft exceeding 18 knots in a medical emergency.	Vessel being towed alongside bumps heavily on tug with minor damage. Loss of product off a mussel barge or propelled barge carrying, e.g., harvested salmon.	Tow-lines part and injury to crew member. Tow drifts and grounds. Crew injury from sudden rolling or shifting cargo.	2	2	0	2	4	2	0	4	0	4	2.88	Tug and barge operators have reported ferries failing to slow when passing laden tug and tows. 2009 Review - High Speed Passenger craft have ceased operations in the Sounds. No incidents reported. Frequency scoring reduced = receding risk.
71	49	Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Outer Sounds - Coastal, Outer Pelorus Sound, French Pass & Current Basin	Collision	Leisure craft and vessel over 500GT in conflict	Leisure craft and vessel over 500GT in developing collision situation in the Sounds (outer areas). RoRo Ferries considered elsewhere.	Leisure, SOLAS vessel	Environmental Interests, Leisure users, Pilots, Regional Council, Ships Master / Crew, Vessel Owners	Leisure craft impedes passage of vessel over 500GT (fails to comply with Harbour Bylaws). Poor lookout on either vessel. Inadequate lights shown on leisure craft by night. Small craft not detected by ships radar. Mechanical failure on either vessel or craft while navigating in close proximity to other vessels. Poor positional or spatial awareness on either vessel or craft.	Close quarters situation but collision averted.	Leisure craft attempts to cross track of vessel over 500gt and is run down. Potential for multiple fatalities on small vessel.	0	0	0	6	4	4	6	0	0	2.78	Due to relative infrequency of shipping traffic other than ferries, the probability for this situation is likely to be low, other than in periods of restricted visibility. On 2009 review there are and increased number of leisure craft going out of the Sounds because of the closure of Blue Cod fishing within the Sounds.	

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category							Risk Overall	Remarks			
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property	Environment			Stakeholders	M	L
72	52	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Shakespear Bay, Central Pelorus Sound, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin	Collision	Fishing vessel and leisure vessel in conflict	Fishing vessel and leisure vessel meet on rounding a blind headland.	Fishing Vessel, Leisure	Fishing Users, Leisure users, Regional Council, Vessel Owners	Vessels navigating close to shore with limited sea room to manoeuvre. Improper lookout. Either or both vessels fail to comply with Collision Regulations. Lack of local knowledge of traffic patterns. Vessels navigating by GPS in restricted visibility without reduction in speed. Headland Hopping.	Close quarters situation but collision averted.	Fishing vessel T bones and holes leisure vessel which rapidly loses buoyancy and sinks. Persons in water with potential for fatalities.	0	0	0	0	0	0	6	4	4	6	2.78	Number of fishing vessels in commercial service is falling. Conversely, the number of leisure raft is rising and there is a need to go out further due to Cod ban. Headland Hopping is reported to be ongoing and a common problem.
73	59	Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Queen Charlotte Sound - Grove Arm	Collision	Water taxi and ferry in conflict	Water taxi and Ferry (RoRo) other vessel in developing collision situation within Queen Charlotte Sound or Grove Arm.	Water Taxi, RoRo	General Public, Regional Council, Ships Master / Crew, Vessel Owners	Either vessel unaware of position of other. Poor lookout on either vessel. Water taxi impedes passage of vessel over 500gt. Presence of other vessels, or proximity of navigational hazard, limits sea room available. Launchmaster unaware of ferry routes and operation. Ferry operating outside usual route. Sudden mechanical or other systems failure compromises either vessels ability to take avoiding action.	Close quarters situation but collision averted.	Watertaxi misjudges a crossing of the bow of a Ferry under way. Ferry T bones water taxi which rapidly loses stability and capsizes. Persons in water with multiple fatalities.	0	0	0	0	0	0	6	5	3	6	2.74	Reports of conflict, (ferry to watertaxi) have occurred. However Watertaxis and Ferries are in regular radio contact, this being operator dependent. Water taxis well aware of timing of ferry movements and have good local knowledge, but there are occasions when ferries deviate from their normal route. On 2009 review, there were no reports of problems between ferries and water taxis.
74	46	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Queen Charlotte Sound - Grove Arm, Outer Sounds - Coastal, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West	Contact Berthing	Small passenger vessel suffers berthing Contact.	Small passenger vessel contacts berth heavily during passenger service (including water taxis or charter services).	Passenger	General Public, Regional Council, Ships Master / Crew, Vessel Owners	Error in judgement by launchmaster. Loss of steerage or engine control through mechanical or electrical failure. Wash from other vessels carries taxi onto berth. Water taxi manoeuvres to avoid vessel, person or debris in water on approach.	Minor contact.	Vessel contacts wharf at speed throwing persons to the deck with multiple moderate to major injuries. Water Ingress.	0	0	0	0	0	6	4	2	6	2.65	Excessive speed of approach with subsequent mechanical failure has in the past resulted in injuries to passengers. 2009 review, worst credible frequency considered up to 1 in 100 year event. Scoring remained unchanged.	

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category							Risk Overall	Remarks	
									Most Likely (ML)	Worst Credible (WC)	People	Property	Stakeholders	Environment	ML	WC	People			Property
75	45	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Admiralty Bay	Personal Injury	Small passenger vessel in adverse seas in Sounds.	Small Passenger vessel (or Cruise Liner Tender) operating outside advisable limits in adverse weather conditions and personnel injured.	Water Taxi	General Public, Regional Council, Tug Owners, Vessel Owners	Water conditions poor in area in which passenger vessel is trading on a particular day. Limited training or experience of local conditions required for operation of vessel. Sudden change in weather conditions. Excessive speed. Cruise vessel tender operations involving personnel without local knowledge. Difficulties in boarding or departing at jetties.	Vessel turns back for shelter, passenger safety not compromised.	Operation proceeds in poor weather conditions. Passengers thrown around in heavy seas. Injuries. Alternatively craft alongside jetty in poor conditions. Difficulty in disembarking passengers - broken leg.	2	0	0	2	4	0	0	2	2.45	2009 review:- Cruise vessel operators have been actioned to reduce speed of tenders in use. Cruise liner visits had increased significantly 2004 to 2008. No reports of injuries in four years.
76	62	Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Queen Charlotte Sound - Grove Arm, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, French Pass & Current Basin, Croisilles Harbour	Personal Injury	PWC in conflict with person in water.	Personal water craft operating at speed in close proximity to persons in the water.	Personal Water Craft	Leisure users, Regional Council	PWC navigating within 200 metres of shore or dive vessel at speed > 5knots. PWC navigating within 50 metres of swimmers or raft at speed > 5 knots. Poor lookout on PWC. PWC operated by underage or inexperienced rider. Dive vessel fails to display Alpha flag correctly. PWC operated by person under influence of excessive alcohol.	PWC avoids swimmer at close quarters.	PWC runs over swimmer with fatality.	0	0	0	6	2	0	0	6	2.37	Dive flags may not always be shown correctly/at all and dive vessels may be difficult to distinguish from other craft. Low risk because of low deployment numbers. 2009 review. Two reported incidents in four years. Use of PWC in Marlborough Sounds is increasing.
77	54	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East	Collision	Kayak and ferry generally in collision situation.	Kayak and ferry in developing collision situation in Sounds area generally.	RoRo, Kayak	Leisure users, Regional Council, Ships Master / Crew, Vessel Owners	Poor lookout on kayak. Kayak not detected from bridge of another large vessel. Kayak impedes navigation of vessel. Lack of local knowledge of speed and passage plans of ships transiting.	Kayaks spotted at close quarters, but collision averted; wash effect.	Kayaks travelling in company run down by ferry with potential for multiple fatalities.	0	0	0	5	0	0	6	2.15	Ferry masters report that kayaks are not generally encountered in close quarters situations along the ferry route. However, where kayaks regularly cross ferry routes, such as off Picton Point, the likelihood is increased. Organised Kayaking intentionally keeps well away from the areas they report as being ferry routes.	

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category							Risk Overall	Remarks						
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property	Environment			Stakeholders					
78	29	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, Croisilles Harbour	Contact Berthing	Leisure vessel in contact during berthing.	Leisure vessel in contact with jetty during berthing or in contact with moored vessel during final berthing manoeuvres.	Leisure	Leisure users, Ships Master / Crew, Vessel Owners	Error in judgement by leisure vessel skipper. Mechanical or other systems failure. Wash from passing vessel results in leisure vessel landing heavily.	Minor contact.	Leisure vessel contacts wharf at speed resulting in moderate or major injuries.	0	0	0	0	0	0	0	0	0	0	0	0	2.07	2009 review, 2 records in four years. Scoring remained unchanged.	
79	17	Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - Shakespear Bay, Outer Sounds - Coastal, Outer Pelorus Sound, French Pass & Current Basin	Collision	Small Commercial vessel and vessel over 500GT	Small commercial vessel >500GT in developing collision situation in the Sounds.	Small Commercial Vessel and SOLAS Vessel	General Public, Pilots, Ships Master / Crew, Tug Owners, Vessel Owners	Vessels meet on rounding headland Density and proximity of other traffic limits sea room available to manoeuvre. Poor positional or spatial awareness on either vessel. Small vessel impedes navigation of larger vessel (fails to comply with Harbour Bylaws). Mechanical or other systems failure resulting in one vessel losing steerage.	Close quarters situation but collision averted.	Small commercial vessel run over by larger vessel and capsizes or sinks with potential for fatalities.	0	0	0	0	0	0	0	0	0	0	0	0	1.96	Movements of small commercial vessels may not always be reported to shipping traffic management at Picton Harbour Radio.	
80	55	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespear Bay, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, D'Urville Island - West	Collision	Kayak in conflict with small commercial vessel	Kayak and small commercial vessel meet in developing collision situation.	Small Commercial Vessel, Kayak	Leisure users, Regional Council, Ships Master / Crew, Vessel Owners	Failure by lookout to detect Kayak on commercial vessel. Small commercial vessel proceeding in restricted visibility or in conditions where kayaks difficult to detect (sun reflecting off water).	Close quarters situation but collision averted.	Commercial vessel at displacement speed runs down kayak. Kayak split. Potential for fatality.	0	0	0	0	0	0	0	0	0	0	0	0	0	1.85	Commercial operators report that kayaks are difficult to see in certain sea states and also when setting or rising sun is reflecting off the water. Hazard is related to displacement speed vessel operators feedback, such as log barges or tugs.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category						Risk Overall	Remarks				
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property			Environment	Stakeholders		
81	47	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Shakespeare Bay, Outer Pelorus Sound, Central Pelorus Sound, Admiralty Bay, French Pass & Current Basin	Collision	Kayak and large vessel in conflict	Kayak and large vessel (over 500GT) in developing collision situation with kayak crossing intended vessel track. This excludes RoRo ferry operations.	Kayak, RoRo	Leisure users, Regional Council, Ships Master / Crew, Vessel Owners	Poor lookout on kayak. Kayak not detected from bridge of large vessel. Kayak impedes navigation of vessel. Lack of local knowledge of speed and passage plans of ships transiting area. Log carrier restricted manoeuvrability.	Collision averted at close quarters, wash effect.	kayak run down with possibility of multiple fatalities (up to 2).	0	0	0	0	0	0	5	0	0	5	1.82	Kayak hirers may brief customers on where to cross shipping channels in the vicinity of Picton Harbour but kayak users without this knowledge, or operating beyond Picton Harbour must rely on own judgement. Kayaks hired through reputable commercial operators or on guided trips are reportedly less likely to become involved in close quarters situations with shipping.
82	82	Picton Harbour - East, Picton Harbour - Shakespeare Bay	Personal Injury	Injury to divers at commercial berth	Personal injury to divers operating at a commercial berth in Picton harbour or Shakespeare Bay.	All	Regional Council, Ships Master / Crew, Vessel Owners	Divers have not informed appropriate authority before commencing operation. Shipping not informed that divers are operating in vicinity of berth. Vessel watchkeepers not informed of diving operations due to breakdown of onboard communication procedures. Unqualified divers.	Diver not in vicinity of propulsive or steering gear when tested or started, injury averted.	Propeller started when diver inspecting rudder bracket or jetty with potential for fatality.	0	0	0	0	0	0	5	0	0	5	1.82	At present the port operator must inform the Harbour Office when diving operations are to take place around commercial berths. This information should be passed to vessels by Picton Harbour Radio. Communication link between harbour master office and port company. 2009 review no incident reports. Data unchanged.
83	28	Port Underwood, Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Shakespeare Bay, Queen Charlotte Sound - Grove Arm, Outer Pelorus Sound, Central Pelorus Sound, Pelorus Sound - Kenepuru, Pelorus Sound - Havelock & Approaches, Admiralty Bay, French Pass & Current Basin, Croisilles Harbour	Contact Berthing	Commercial vessel contact during berthing.	Small commercial vessel lands heavily on wharf while berthing.	All	General Public, Ships Master / Crew, Vessel Owners	Error in judgement by shiphandler. Mechanical or other systems failure. Wash from passing vessel results in heavy landing. Adverse environmental conditions during berthing.	Minor contact with no significant damage.	Small commercial vessel in heavy contact with wharf resulting in significant structural damage and potential water ingress, minor to moderate injury to crew member or passenger. Potential for serious injury.	0	0	0	0	0	0	4	4	0	2	1.81	2009 review; two recorded incidents, but reporting limited apart from some damage complaints from jetty owners associated with unknown vessels/craft. Most Likely case assumed to be a high frequency, with no consequence impact. Scoring remained unchanged.
84	33	Tory Channel & Approaches, Outer Queen Charlotte Sound, Central Queen Charlotte Sound, Picton Harbour - East, Picton Harbour - Shakespeare Bay, Admiralty Bay, French Pass & Current Basin	Contact Navigation	Vessel >500GT in contact while navigating	Vessel greater than 500GT in contact situation with anchored or moored vessel.	All	Leisure users, Pilots, Ships Master / Crew, Vessel Owners	Craft or vessel anchored in fairway. During heavy weather moored or anchored craft or vessel drags into fairway. Inadequate lookout or positional monitoring on vessel. Radar on vessel fails to detect small moored vessel at adequate range. Machinery failure or loss of control in adverse weather on vessel >500gt shaping for berth.	Minor contact.	Anchored or moored leisure vessel run down by ship with potential loss of life.	0	0	0	0	0	0	4	3	1	4	1.8	A ferry transiting in fog had near miss with moored yacht and barge in approaches to Picton. Moorings in Shakespeare Bay raised by Port Company as contact risk, but no reports of incidents raised by Port Company or mooring holders. 2009 review, no change to scoring.

Rank No.	Hazard Reference	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Affected Vessel Types	Affected Stakeholders	Possible Causes	Consequence Descriptions		Risk By Consequence Category						Risk Overall	Remarks	
									Most Likely (ML)	Worst Credible (WC)	People	Property	Environment	Stakeholders	People	Property			Environment
85	68	Outer Queen Charlotte Sound, Outer Pelorus Sound	Collision	Pilot vessel in collision when embarking Pilot	Pilot vessel in collision with vessel >500GT during pilot transfer operations.	Pilot vessel	Environmental Interests, Pilots, Regional Council, Ships Master / Crew, Vessel Owners	Error in judgement of launchmaster on approach to ships side. Poor communication between launchmaster, pilot and ships master. Disorientation and poor spatial awareness of launchmaster. Mechanical or other systems failure on either vessel. Interaction between pilot vessel and ship hulls. Adverse weather conditions.	Moderate landing of pilot vessel on ships hull without major damage or injury.	Pilot vessel coxn misjudges approach in heavy weather. Heavy landing and damage to hull of pilot launch. RHIB in use, bags burst down one side.	0	0	0	0	0	0	2	0.91	RHIBs in use for pilot boarding. About 60 pilot movements per year. There was an incident on 2009 review involving the pilot boat in near miss with ferry, loss of special awareness occurring. At that time, pilot boat was being run by pilots themselves and operation taken over by the port company.

Annex C

Incidents and Hazard Frequency Data Mapping

Hazard Reference 2004	Rank 2005	Rank 2009	Marlborough incident Data Associated with Hazard Data	Total Related Incidents	Derived Frequency
1	11	10	533, 658	2	0.5
2	39	43	No data	-	-
3	5	1	834, 514, 528, 541, 628, 689, 698, 765, 766, 782, 861, 862, 879, 918, 927, 992, 1095, 1098, 1123, 1162	20	5
4	27	17	No data	-	-
5	51	55	658	1	0.25
6	47	52	No data	-	-
7	56	60	834	1	0.25
8	44	48	627, 916	2	0.5
9	15	7	1080, 420, 424, 453, 771, 777, 905, 402, 403, 437, 455, 465, 468, 474, 478, 480, 500, 508, 505, 512, 525, 552, 551, 592, 607, 628, 631, 658, 668, 707, 740, 751, 762, 790, 821, 854, 893, 914, 942, 965, 981, 1097, 424	43	10.75
10	13	12	407, 420, 424, 439, 905, 1043, 470, 627, 645, 724, 774, 809	12	3
11	1	8	467, 1153	2	0.5
12	8	3	626, 695, 739, 1026	4	1
13	22	26	No data	-	-
14	24	19	852	1	0.25
15	18	23	No data	-	-
16	26	29	No data	-	-
17	75	79	No data	-	-
18	4	4	403, 464, 470, 475, 581, 615, 622, 773, 870, 956, 987, 1162	12	3
19	76	63	613, 1123	2	0.5
20	64	15	439, 1043, 533, 838, 932	5	1.25
21	10	25	421, 423, 920, 576, 618, 625, 922	7	1.75
22	63	67	No data	-	-

Hazard Reference 2004	Rank 2005	Rank 2009	Marlborough incident Data Associated with Hazard Data	Total Related Incidents	Derived Frequency
23	54	70	No data	-	-
24	36	40	533	1	
25	23	27	732, 857, 943, 979, 845	5	1.25
26	31	32	419, 518, 647, 708, 1071, 498, 1152	7	1.75
27	59	66	No data	-	-
28	83	83	669, 705	2	0.5
29	74	78	428, 855, 424	3	0.75
30	57	61	No data	-	-
31	69	41	1000, 1043	2	0.5
32	30	49	424	1	0.25
33	82	84	No data	-	-
34	38	36	975	1	0.25
35	14	13	No data	-	-
36	53	57	1113, 1119, 1130, 1132, 1139, 1140, 1142, 1150, 1155, 1173	10	2.5
37	29	18	1080, 453, 402, 403, 437, 455, 465, 468, 474, 478, 480, 500, 508, 505, 512, 525, 552, 551, 592, 607, 628, 658, 668, 707, 740, 751, 762, 821, 854, 893, 914, 942, 981, 1097	34	8.5
38	33	35	No data	-	-
39	17	16	No data	-	-
40	6	5	No data	-	-
41	32	33	443, 610, 612 781, 885, 910, 963, 969, 1141	9	2.25
42	34	37	789, 1025	2	0.5
43	52	58	206, 789, 957, 1113, 1119, 1130, 1132, 1139, 1140, 1142, 1150, 1155, 1173	13	3.25
44	45	20	454, 499, 639, 680, 710, 926	6	1.5
45	71	75	No data	-	-
46	68	74	No data	-	-
47	80	81	No data	-	-
48	2	14	418	1	0.25

Hazard Reference 2004	Rank 2005	Rank 2009	Marlborough incident Data Associated with Hazard Data	Total Related Incidents	Derived Frequency
49	72	71	No data	-	-
50	55	62	No data	-	-
51	41	44	No data	-	-
52	65	72	No data	-	-
53	62	45	1191	1	0.25
54	73	77	751	1	0.25
55	78	80	No data	-	-
56	42	46	777, 790	2	0.5
57	67	68	513, 406, 720, 919, 1143, 1195	6	1.5
58	70	50	422, 513, 532, 618, 932	5	1.25
59	66	73	No data	-	-
60	16	29	403, 581, 956	3	0.75
61	48	53	No data	-	-
62	77	76	1143, 1187, 935	3	0.75
63		New Hazard 34	579, 646, 696	3	0.75
64	43	42	No data	-	-
65	49	65	No data	-	-
66	35	38	No data	-	-
67	60	69	No data	-	-
68	84	85	No data	-	-
69	58	56	No data	-	-
70	50	54	No data	-	-
71	25	28	926	1	0.25
72	21	23	863, 884, 909, 931, 1024, 1090	6	1.5
73	9	9	442, 589, 597, 848, 877, 917, 913, 991, 1106, 1134	10	2.5
74	20	21	No data	-	-
75	79	64	No data	-	-
76	19	6	413, 400, 426, 427, 428, 433, 561, 578, 586, 637, 651, 652, 666, 673, 676, 702, 784, 860, 891, 904, 1178, 983, 1052	23	5.75
77	12	22	859, 989, 495	3	0.75
78	40	47	829	1	0.25

Hazard Reference 2004	Rank 2005	Rank 2009	Marlborough incident Data Associated with Hazard Data	Total Related Incidents	Derived Frequency
79	3	2	No data	-	-
81	46	51	No data	-	-
82	81	82	No data	-	-
83	7	11	421, 423, 920, 405, 496, 556, 642, 660, 714, 876, 962, 1145	12	3
85	37	39	550, 410, 526, 578, 593, 610, 609, 620, 629, 633, 643, 650, 655, 656, 661, 713, 742, 761, 818, 825, 850, 865, 890, 898, 903, 945, 950, 968, 1006, 1010, 1032, 1036, 1042, 1059, 1062, 1093, 1149	37	9.25
86	28	31	413, 983, 1052	3	0.75
87	61	59	1052, 983, 578, 400, 1052	5	1.25

Annex D

Rising and Falling Risk Summaries

Rising Collision Risks

Hazard No.	Hazard Title	Accident Category	Risk 2004	Risk 2009	Rank 2004	Rank 2009	Rank Change	Risk Delta
20	Commercial vessel & leisure craft in conflict	Collision	2.78	5.37	64	15	49	2.59
19	Ferry and small commercial vessel in conflict	Collision	1.96	3.1	76	63	13	1.14
58	Personal Water Craft in conflict with other vessel or swimmer.	Collision	2.52	3.62	70	50	20	1.1
53	Small Commercial Vessel Conflict	Collision	2.87	3.96	62	45	17	1.09
4	Ferry/leisure craft in conflict in darkness	Collision	4.42	5.18	27	17	10	0.76
37	Ferry in conflict with small craft, Picton Hbr.	Collision	4.38	5.07	29	18	11	0.69
3	Ferry/leisure craft in conflict in Tory Channel (headlands)	Collision	6.16	6.85	5	1	4	0.69
9	Vessels in collision situation in Picton Harbour	Collision	5.42	5.95	15	7	8	0.53
49	Leisure craft and vessel over 500GT in conflict	Collision	2.26	2.78	72	71	1	0.52
1	Two Ferries in conflict at Tory Channel Entrance.	Collision	5.65	5.72	11	10	1	0.07

Falling Collision Risks

Hazard No.	Hazard Title	Accident Category	Risk 2004	Risk 2009	Rank 2004	Rank 2009	Rank Change	Risk Delta
24	Two Ferries in Conflict at Arrowsmith	Collision	4.18	4.09	36	40	-4	-0.09
54	Kayak and ferry generally in collision situation.	Collision	2.26	2.15	73	77	-4	-0.11
15	Ferry and ship over 500GT in conflict, QC central.	Collision	5.28	4.81	18	23	-5	-0.47
65	Berthing Tug in collision with berthing vessel	Collision	3.59	3.06	49	65	-16	-0.53
60	Racing yacht and vessel over 500GT in conflict	Collision	5.35	4.44	16	29	-13	-0.91
48	Ferry in conflict with fishing vessel	Collision	6.4	5.42	2	14	-12	-0.98

Falling Grounding Risks

Hazard No.	Hazard Title	Accident Category	Risk 2004	Risk 2009	Rank 2004	Rank 2009	Rank Change	Risk Delta
11	Ferry grounding at Tory Channel Entrance	Grounding	7.08	5.87	1	8	-7	-1.21
77	Fishing vessel in grounding situation generally (excluding Tory).	Grounding	5.59	4.87	12	22	-10	-0.72

Rising Grounding Risks

Hazard No.	Hazard Title	Accident Category	Risk 2004	Risk 2009	Rank 2004	Rank 2009	Rank Change	Risk Delta
76	Leisure craft grounds in Sounds	Grounding	5	6	19	6	13	0.72
14	Leisure craft grounds in Tory Channel or entrance	Grounding	5	5	24	19	5	0.5
87	Leisure Craft Grounds at Havelock	Grounding	3	3	61	59	2	0.31
12	Fishing Vessel Grounds in any part Tory Channel	Grounding	6	6	8	3	5	0.3

ANNEX E

Details of Risk Control Status Assessment of Control Adequacy Rating

No.	Risk Control Measure Intent	Risk Control Measure Description (<i>2009 Updates in Italics</i>)	2009 Status	Control Adequacy Rating Assessment (2009 Review)	Decision Making Recommendations
1	<p>Development of a Harbour Organization to provide co-ordination of marine services and navigational usage for the waterways within Marlborough District Council Harbour Limits.</p> <p>There is a need to provide the Harbour Master role with a raised profile and interface with users.</p> <p>Alongside this Risk Control Measure would be the wider review of the appropriate location for movement management and navigational safety in the Sounds.</p> <p>An improved harbour management system could provide ability for targeted Harbour Ranger Patrols, follow-up action and education.</p> <p>Make key policies of enhanced Harbour Authority and Safety Management System clear to users (e.g. Havelock speed).</p> <p>Co-ordination of requests for port services such as hot work permits, through Picton Harbour Radio.</p>	<p>Develop a harbour organisation to bring the Harbourmaster function and Port Company operations closer together to deliver in the wider interests of all harbour navigational users.</p> <p>A central harbour organization is needed to serve as the interface between the Harbour Master and larger vessels using the harbour. Core functions of the harbour organisation would include:</p> <ul style="list-style-type: none"> Harbour Organisation to become 'focal point' for all navigational users within Harbour Limits. The organization would be located in premises readily accessible by the public. <i>The Harbour Organisation definition includes the contributions potentially made by the port company.</i> Vessel Management Service for vessels transiting to Harbour Limits (see RCM 2). Co-ordination of marine services to commercial vessels. Competence availability monitoring of pilot and PEC holder currency. Audit of moorings and marine farm installations. 	<p><i>This is a risk control measure with many facets, which is given an overall rating score in this row.</i></p> <p><i>Progression limited and question of interface delivery stalled. Requires addressing.</i></p> <p><i>AIS Receiving Equipment has been installed and monitoring software set up in Harbour Office. Question of interface delivery and training requires addressing.</i></p> <p><i>Currently a port company role, but information not flowing freely between harbour office and port company.</i></p> <p><i>Pilotage is now a function of the port company as recommended in 2005 risk assessment. Since then Maritime Rule Part 90 has been drafted and should address competency and currency issues. SMS system work to progress</i></p> <p><i>Occurring and resource available. Auditing of marine farms put in abeyance for lighting plans to be implemented. Auditing then to recommence.</i></p> <p><i>Mooring failure reports are increasing and new hazard created. Mooring issues are presently passed on to Council compliance team. Would be addressed by organisational recommendations made in the 2009 review.</i></p>	<p>4 (overall)</p> <p>2/3</p> <p>4</p> <p>4</p> <p>6</p> <p>6</p> <p>3</p>	<p>Most recommended aspect to progress and cost the benefits identified in this report.</p> <p>Take forward and progress.</p> <p>This should be progressed at most effective solution. Port Company and Harbour Office need to agree what has to be done as it affects both operations and both participate in the risk.</p> <p>Addressed by improvements to Harbour Interface</p> <p>Now part 90 implementation.</p> <p>Process in place recommended to progress</p> <p>Mooring failure issues are recognised and hard data is informative. Solution being progressed. Recommended to continue.</p>

No.	Risk Control Measure Intent	Risk Control Measure Description (<i>2009 Updates in Italics</i>)	2009 Status	Control Adequacy Rating Assessment (2009 Review)	Decision Making Recommendations
		<ul style="list-style-type: none"> Facilitation of liaison meetings between key stakeholder groups e.g. Ferry operators and yacht racing clubs. Facilitate the introduction of monitoring for the sounds. 	<p><i>Ad hoc meetings have occurred as needs arise. Brokered a significant agreement with yacht racing stakeholders</i></p> <p><i>Monitoring is passive only and progression can only occur with improvements in the harbour interface.</i></p>	6	This has been successful, but harbour office should plan a meeting once a year with a recreational organisation.
2	<p>Improvements to Picton Harbour Radio.</p> <p>VHF operators with relevant skills for ship movement management would provide accurate information to vessels transiting the sounds about the locations of other traffic. Local navigational warnings and safety broadcasts would also occur. The Coordination of movements on or off any berth would be via the movement management system as would entry to or exit from any Controlled navigation Zone. The role would include acting as point of contact for ships requiring a pilot or tug or liaison for any intention by master's to anchor or deviate from passage plan. Would also act as a point of contact for yacht racing or any other organised leisure event on the water.</p>	<p>Develop the current operation at Picton Harbour Radio (PHR) into a Vessel Information Service (VIS) throughout the Marlborough Regional Council Harbour Limits. Provide this with a skill base able to interpret and advise on traffic locations as a Regional Council delivery on behalf of all navigational users. Consider this as a core function of the Harbourmaster role.</p> <p>Include system upgrade to record Voice Transmissions.</p> <p>The Vessel Management Service would include the following elements:</p> <p>(i) Receipt of VHF calls made by vessels intending to enter Harbour Limits and recording relevant information relating to draft, carriage of DG's, PEC holders name, and ETA's for salient points within Sounds limits.</p> <p>(ii) Monitoring of calls made by vessels approaching Controlled Navigation Zones and providing a proactive response to vessels broadcasting incomplete or ambiguous calls</p> <p>(iii) Traffic monitoring and provision of traffic information to navigational users based on information obtained in (i) and subsequent electronic traffic monitoring systems established by the harbour Organization (RCM's 3, 3.1, 3.2.1, 3.2.2, 4)</p>	<p><i>RCM overall is stalled, but fragmented implementation.</i></p> <p><i>In Place and operational</i></p> <p><i>Being undertaken by Picton Harbour radio. Electronic log sheets starting to be introduced.</i></p> <p><i>Not occurring, vessel to vessel calls occurring, but no monitoring assistance from Picton.</i></p> <p><i>Variable and without consistency. Improvements attempted, but arrangements have yet to reach decision. Training required.</i></p>	2	<p>Recommended as priority to address.</p> <p>Complete.</p> <p>System is improving.</p> <p>Recommended as priority to address with Harbour interface.</p> <p>Recommended as priority to address with Harbour interface.</p>

No.	Risk Control Measure Intent	Risk Control Measure Description (<i>2009 Updates in Italics</i>)	2009 Status	Control Adequacy Rating Assessment (2009 Review)	Decision Making Recommendations
		<p>(iv) Receipt and promulgation of hazards to navigation or other information of significance to shipping e.g. Tsunami warning received from Civil Defence.</p> <p>(v) Co-ordination of marine services for the port, including pilotage, tugs, linesmen and hot work permits.</p>	<p><i>Receipt taken, but promulgation is by Harbour Master request to do so. Training needed to address potential liability issues.</i></p> <p><i>Tsunami warnings would go to Harbour Master directly and not to Picton Harbour radio, unless harbour interface organisation decision taken.</i></p> <p><i>Hot Work Permits are statutory issue for Harbour Master. System is in place. System presently free, but normally a charge is made.</i></p> <p><i>Port Company presently co-ordinates other activities</i></p>	<p>3</p> <p>7</p> <p>7</p>	<p>Communication an promulgation of faults and marine hazards recommended as priority to address.</p> <p>Hot work permit response would improved with deputy appointment as recommended.</p>
3	<p>Introduce AIS monitoring at Tory Channel Entrance.</p> <p>AIS is a transponder device required for all ships over 300 Gross Tons that transmits the identity, position, course and speed of a vessel and receives the same information from other vessels.</p>	<p>(vi) A contact point for any navigational user requiring to contact the Harbourmaster in connection with an incident/accident or relevant navigational issue, e.g. to report a hazard to navigation or oil spill.</p> <p>Place either an AIS base station at Tory Channel Entrance to monitor and record movements of AIS equipped ships through Tory Channel Entrance.</p>	<p><i>Presently inconsistent and may users see Picton Harbour radio as the point of contact, but by no means all. Incident reporting appears to have improved as numbers are up.</i></p> <p><i>AIS Base station not introduced, but AIS monitoring capability has been implemented.</i></p> <p><i>If radar procurement is suspended a base station is not required</i></p>	<p>4/5</p>	<p>Recommended as priority to address with Harbour interface.</p> <p>This option recommended to be placed on hold for review with RoRo and large commercial vessel users forum.</p>

No.	Risk Control Measure Intent	Risk Control Measure Description (<i>2009 Updates in Italics</i>)	2009 Status	Control Adequacy Rating Assessment (2009 Review)	Decision Making Recommendations
3.1	<p>Introduce Wireless LAN or other communication linkage to feedback AIS tracks to Picton Harbour Radio.</p> <p>This would provide real time information and therefore a significant reduction in the probability of collision by vessels within the confines of any Controlled Navigation Zone.</p> <p>A webcam could be sited to provide imaging of the entrance for number, location and possible identity of vessels, and also for assessment of weather and sea conditions (linked with RCM 5).</p>	<p>PHR operators provided with the ability to monitor progress of AIS equipped vessels through the entrance and pass this information to other vessels in the area intending transit.</p>	<p><i>WLAN introduced to Tory Channel and Bulwer. Extensive coverage available to the Harbour Office but some development still required.</i></p> <p><i>Picton Harbour radio presently cannot monitor Tory Channel entrance. Picton harbour has AIS receive system to Diefenbach. Solution for joint harbour interface required.</i></p>	<p>8</p> <p>3</p>	<p>The hardware system has been procured and is working in the harbour office.</p> <p>Development of the Harbour Interface needs to involve both Port Company and Harbour Office to develop a solution. Both need the same information and both participate in the risk.</p> <p>Recommended for action.</p>
3.2	<p>Additionally introduce Radar coverage of Tory Channel Entrance (connected to Picton Harbour Radio) and retransmit targets as AIS data to ferries.</p> <p>Introduction of this RCM would require siting of a radar at a height and range setting to track small craft in Tory Channel</p>	<p>PHR operators are able to track some AIS vessels as far as Diefenbach and pass this information to vessel intending transit. Reduction in probability of vessels meeting and risk of collision within confines of Controlled Navigation Zone.</p>	<p><i>Recommended for deferral. This RCM was based on a high grounding risk and deferral is recommended.</i></p> <p><i>An alternative option is the use of Cameras which will assist in determining the long term need for radars.</i></p>	<p>N/A</p>	<p>Defer and investigate the need further via consultation.</p>
3.3	<p>AIS and Radar coverage extended to incorporate all routes commonly used by shipping in Tory Channel and Central Queen Charlotte Sound.</p>	<p>Provision of full AIS and Radar Coverage in the Sounds using a progressive implementation strategy.</p>	<p><i>Radar as above.</i></p> <p><i>AIS coverage introduced and shown to be effective. There are some areas for reception still requiring to be addressed, which should be costed.</i></p>	<p>5/6</p>	<p>This has been a successful risk control measure, with coverage of all high risk areas achieved. Ongoing development can progress at a planned and cost effective rate</p>

No.	Risk Control Measure Intent	Risk Control Measure Description (<i>2009 Updates in Italics</i>)	2009 Status	Control Adequacy Rating Assessment (2009 Review)	Decision Making Recommendations
4	<p>Introduce requirement for the carriage of Class B AIS Equipment.</p> <p>Identification of targets allows for more efficient PHR operation and passing of information to and between commercial vessels and small craft fitted with AIS.</p> <p>This links with RCM 3 with PHR ability to monitor movements of all commercial craft within Tory Channel and other areas as monitoring system is expanded.</p>	<p>Introduce national requirement for commercial vessels of less than 300GT and fishing vessels of any size to carry an approved Class B AIS transponder.</p>	<p><i>Not in place, but part of a bylaw process at time of review. Pilot boat and patrol boat successfully fitted with Class B transponders.</i></p> <p><i>Introduction of Class B transponders becomes quite an important trade-off if radar is not introduced.</i></p>	1	<p>The benefits of AIS technology are clear to many harbour users and Class Bs at a cost of circa NZ\$ 950 are popular. Benefits are numerous. Any AIS fitted vessel can also identify another. AIS Class B introduction to NZ harbours is inevitable and a number have already commenced this.</p> <p>Class B transponders only transmit every three mins by default.</p>
5	<p>Establishment of improved Environmental Monitoring Instrumentation for narrow Tidal Passages and Picton Harbour Berths.</p> <p>Feedback by ferry masters recorded a wish to have accurate environmental information for the Sounds from Picton to Tory entrance.</p>	<p>Measurement of tidal, wind and sea state values at French Pass, Tory Channel entrance, Northern Entrance; Havelock, Picton Harbour East and Shakespeare Bay, by instrument. This information relayed to PHR in real time for passing to ships intending to transit narrow tidal passages or berth at main commercial facilities.</p> <p>Introduce windspeed readouts to Picton ferry berths.</p> <p>Make data available online to vessels.</p>	<p><i>Tory Channel Tide gauge was in place prior to the 2005 risk assessment. Gauge instrumentation damaged in storm in 2008 and needs replacing with a more robust solution.</i></p> <p><i>Implemented, but recording is in one location and different gust directions occur across the ferry terminal than occur across Waitohi Wharf. The cut to Shakespeare Bay also affected windspeed and direction.</i></p> <p><i>Information is available on Port Marlborough Website. Geographical location of sensor recommended to also be provided on line.</i></p>	1	<p>The provision of data for Tory Channel entrance is key to decision making, both for heavy weather transit and for pilotage boarding decision-making.</p> <p>Recommendation to concentrate on Tory Channel as other transits would now be under pilotage as part of Rule Part 90.</p> <p>Improvements have been made. Take forward by Port Company risk assessment.</p> <p>Completed and a good clear solution.</p>

No.	Risk Control Measure Intent	Risk Control Measure Description (<i>2009 Updates in Italics</i>)	2009 Status	Control Adequacy Rating Assessment (2009 Review)	Decision Making Recommendations
6	<p>Use of Harbour Masters powers of direction to set environmental limits on transit of Tory Channel entrance</p> <p>RCM 5 would allow for informed decision to be made by Harbourmaster regarding closure of Tory Channel Entrance to shipping in adverse conditions. RCM 2 ensures passing of information to vessels.</p>	<p>Setting of environmental limits for transit of Tory Channel Entrance by any vessel.</p>	<p><i>Dependent on RCM 5 implementation. Tory Channel presently closed based on local knowledge and occasional inspection.</i></p> <p><i>No criteria can be developed without measured data.</i></p> <p><i>The entrance is now popular with small craft exiting the Sounds to fish and the population of small craft transiting has increased</i></p>	1	<p>This is the key hazard area and its environmental limits would be agreed and accepted by users if hard data was made available.</p> <p>Criteria cannot be developed without also development of the SMS interfaces with user groups.</p>
7	<p>Manage transit time of Tory Channel Controlled Navigation Zone.</p>	<p>Setting of minimum engine rating or proper speed capability for vessels intending to transit Tory Channel Entrance or other narrow passage against the tidal stream.</p> <p>Minimum proper speed capability of 12 knots for vessels intending to transit entrance against the tidal stream.</p> <p>Slower vessels to avoid entering the Tory Channel Controlled Navigation Zone where their own ETA at East Head is within 15 minutes of that given by a vessel of more than 500GT.</p>	<p><i>Appears to be operating on a self managed basis and improved since the 205 risk assessment. Knowledge of exact status not known.</i></p> <p><i>Vessels operating at less than 15 knots have a changed requirement for transiting the controlled navigation zone.</i></p> <p><i>'Class B' AIS identification of targets navigating within harbour limits would assist.</i></p>	3-6	<p>Requires improved harbour interface to progress.</p>
8	<p>Setting of Environmental Limits for Berthing Operation where normal capability is reduced by defect in steering, bowthruster, engine or other systems</p> <p>Any environmental limit set may be related to the towing capacity of the available tug when considering Shakespear Bay (same probably applies to Picton Harbour East, eg when a ferry or other PEC vessel is affected by defect).</p>	<p>Setting of environmental limits for ships berthing or sailing from either Picton Harbour East or Shakespear Bay berths.</p> <p>Declaration of defects in steering, thrusters or other systems which results in impaired manoeuvring capability to be reported to PHR either during initial call to PHR stating intention to enter harbour Limits, or as soon as practical if the defect occurs within Harbour Limits. PHR will inform the Harbour Master who may direct the vessel to engage a tug, pilot or use an alternative berth.</p>	<p><i>Work has commenced by Port Marlborough, following development of a framework document by the Harbour Master.</i></p> <p><i>Defects are being reported, but onward transmission to Harbour Office for any advice or decision making are not in place. Defect reporting dramatically improved since 2005.</i></p>	4 4/5	<p>To be taken forward by the Port Company Risk Assessment</p>

No.	Risk Control Measure Intent	Risk Control Measure Description (<i>2009 Updates in Italics</i>)	2009 Status	Control Adequacy Rating Assessment (2009 Review)	Decision Making Recommendations
9	Modification of existing Radio Reporting Procedures and Introduction of additional reporting of ETA at key points (e.g. East Head, The Snout and Diffenbach). Passive listening to radio transmissions provides other users (e.g. tugs and tows, recreational users) with information about vessel positions.	Radio reporting point (to PHR) to be established at Arrowsmith in Tory Channel until AIS monitoring system established in this area. 'Defects and Limitations' phrase to be included in report made to PHR by vessels intending to enter QS Sound. Standard phrase to be used in making 'All Ships' calls for narrow passages and ETA's amended by further 'All Ships' call where ETA likely to be more than 2 minutes in , error.	<i>AIS monitoring has been established in that area. Radio reporting point not implemented. Standard phrase of defects and limitations are being made by ferries as a matter of course. All ships calls are made by some but not by all, but especially small recreational craft. Amended ETA calls; status is unknown without improvements in harbour interface.</i>	4	The Tory entrance risk levels will benefit from an improved harbour interface. Set up an SMS forum of RoRo Operators to take this option forward, in accordance with the Safety Management System document.
10	Routing Measures to reduce Traffic Conflict at Diffenbach Point.	Routing measures established around 'pinch points' in the Sounds. Controlled Navigation Zone established to include a 1 mile radius around Diffenbach. Within this zone no vessel over 500GT would be permitted to enter the zone where a crossing situation would result with another vessel of more than 500GT. Compliance monitored by PHR through RCM 's 2 and 3. Alternatively, improved management of movements by an enhanced Picton Harbour Radio.	<i>Review, but risk reduced due to improvements in ferry communication. Keep under review until improvements in Harbour interface have occurred.</i>	N/A	Defer on the basis of reported Bridge procedures
11	Review pilotage requirements for Tory Channel Entrance	Pilot or Pilot Exemption Certificate to be required for vessels over 100 GT or 20m. Rules would include any passenger vessel intending to transit Tory Channel Entrance. Move Pilot station to seaward of the entrance to Tory Channel.	<i>RCM now subject to new maritime rule 90 where 30m is to be the overall length limit for pilotage. Pilotage limits for Tory Channel being extended to 3 miles.</i>	4/5	Now superseded by Part 90 proposals.
12	Maintain Currency of Marine Operations Personnel	Standard Operating Procedures developed between Pilot, tug operators and Harbourmaster. Operators of tugs and providers of lines men to introduce training and monitoring system for operational staff to ensure on-going competence for tasks undertaken.	<i>Improvements in progress by Port Company's own internal risk assessment work. However not completed at time of report compilation.</i>	4	Important SMS component to progress. Clear procedures assist all involved. Progress uncertain and liaison between Port Company and Harbour Master office important

No.	Risk Control Measure Intent	Risk Control Measure Description (<i>2009 Updates in Italics</i>)	2009 Status	Control Adequacy Rating Assessment (2009 Review)	Decision Making Recommendations
13	Maintain up to date bathymetric information of fairways	Update the bathymetric survey of routes, berths and anchorages used by vessels of more than 500 gross tonnes. Routes Berths Anchorages	<i>Hydrographic survey conducted of Northern entrance, confirming a draught limitation, which is now in place. However accretion found to be minimal in Sounds. Anchorages may require confirmation of available depth. Berths form part of the Port Companies overall risk assessment.</i>	6	Important Knowledge gained. Risk Control SMS intend for further areas to survey subject to Lins programme.
14	Review the present deployment of Navigation Aids and provide additional Aids on isolated dangers and narrow channels.	Review placement and any operating characteristics of current marks, and requirement for additional marks or functions.	<i>Review completed by Harbour Office and ferry swinging light implemented and blue recreational craft of moving ferry.</i>	7	Risk Control Implemented, but reliability can be improved.
15	Reduction of collision and grounding risk in the approaches to Havelock Primarily for marine farm vessels which may not be able to comply with maximum speed of 5 knots through design or through inability to maintain steerage at this speed in a strong tidal stream and influence of river discharge into the channel.	Increase of maximum proper speed in Havelock Approaches to between 6 and 10 knots. Establish Cullen Point as a radio reporting point for commercial vessels, by way of an 'All Ships' VHF call. Increase number of starboard hand channel markers in vicinity of Cullen Point to improve definition of channel and water available for manoeuvres to avoid risk of collision. Improve signage informing users of requirement to keep to the Starboard side of the channel and observe the speed limit. Monitoring (e.g. Camera	<i>Consultation with operators and need to find common ground. Recommended for further consultation</i>	3	Take Forward

No.	Risk Control Measure Intent	Risk Control Measure Description (<i>2009 Updates in Italics</i>)	2009 Status	Control Adequacy Rating Assessment (2009 Review)	Decision Making Recommendations
16	<p>Improve safety standard of leisure user by Education.</p> <p>Yacht clubs could be encouraged by the Harbourmaster to take self-enforcement action on members who impede the passage of vessels over 500GT (RCM 22 also).</p>	<p>Commence a programme of presentations and deploy harbour rangers to improve the level of basic navigational understanding amongst leisure users of the Sounds.</p> <p>Allow attendance on a Coastguard Day Skipper Course within a set period as an alternative to an infringement notice.</p>	<p><i>Harbour Patrols introduced throughout the Sounds in the summer months. Patrols have focussed on Queen Charlotte sound, where the majority of conflicts have been identified. Patrols have enjoyed positive stakeholder reaction.</i></p> <p><i>Not possible legally to trade a coastguard course for an infringement. Close out.</i></p>	<p>7-8</p> <p>N/A</p>	<p>This risk control appears to be working and resource recommendations allow effectiveness to be improved.</p>
17	<p>Improvements in incident Reporting System.</p> <p>PHR and harbour rangers may become well known contact points for the harbour authority. Other agencies and organisations, such as MNZ, local Coastguard and private marine radio stations could be encouraged directly by the harbour department to report back to the Harbourmaster.</p>	<p>Encouragement for all incidents, mishaps and accidents to be reported to the Harbourmaster for subsequent action and/or determination of future risk.</p> <p>Make reporting policies clear to users and seek immediate reporting of mechanical or electrical failure of any type on board ferries. Review Dangerous Goods incident reports.</p> <p>Maintenance of regular patrols.</p>	<p><i>There has been a significant improvement in the reporting of incidents, which has been sustained. The data has provided the ability to undertake the 2009 review based on data.</i></p> <p><i>However AIS data analysis does suggest that not all ferry mechanical problems are being reported as they occur.</i></p> <p><i>Dangerous goods incident reports – there have been few which have involved the harbour office.</i></p> <p><i>Patrols as referenced above.</i></p>	<p>7</p> <p>6</p> <p>¾</p> <p>7</p>	<p>Significant improvement in harbour knowledge has already occurred.</p> <p>AIS data has made a significant difference to the factual knowledge to understand risks faced by transiting vessels.</p> <p>Important system to develop.</p>
18	<p>Laying and inspection of moorings regulated by Harbourmaster.</p>	<p>All moorings to be subject to ongoing regular inspection by an accredited person.</p> <p>Introduction of mandatory specification for mooring tackle.</p> <p>Bring mooring operations under Harbourmaster function.</p>	<p><i>Waikawa Bay moorings are being addressed. Harbour office is providing navigational safety input into the positioning of all other moorings.</i></p> <p><i>Incident data is suggesting that the ongoing inspection of moorings (which is attached to resource consent), can still be improved.</i></p>	<p>4</p> <p>Developing</p> <p>4</p>	<p>Location for new moorings to be approved by the Harbourmaster and laid by competent provider to a minimum standard, which is to be maintained through regular inspection throughout the life of the mooring. The position of moorings and signs of neglect to be audited by harbour department staff.</p> <p>Present Mooring standards are advisory only.</p>

No.	Risk Control Measure Intent	Risk Control Measure Description (<i>2009 Updates in Italics</i>)	2009 Status	Control Adequacy Rating Assessment (2009 Review)	Decision Making Recommendations
19	Requirement for Kayak Hirer to Comply With Industry Code of Practice	Commercial hirers of kayaks to demonstrate compliance with the Industry Code of Practice.	<i>Ongoing and bylaw process in draft has proposals for a licensing regime for Kayak Hirers</i>	3/4 Developing	This compliance to be a requirement for licensing of the kayak hire operation by the Harbourmaster. Membership of SKOANZ is not compulsory.
20	Upgraded Signage for Display of Local Information and Regulations	Speed limits to be clearly marked on signs affixed to channel markers or on shore.	<i>Implementation has commenced, which relates more to speed within 200m of shore at present. Further work required to progress.</i>	4 Developing	Information on local hazards, regulations and any special features such as proximity of ferry routes or water-ski lanes, to be posted on signs at launching ramps and fuel berths.
21	Yacht Racing Management to Minimize Conflict with Shipping Traffic.	Yacht clubs encouraged to liaise with the changed Picton Harbour Radio prior to any race or event commencing, and on completion of event. In event of unusual traffic flows, i.e. greater than usual number of large movements, the Harbourmaster may require the start time to be postponed, or the race course modified to minimise conflict with shipping movements. Yacht clubs would need to provide flexibility to adjust start times of races to reduce conflict with shipping movements. Liaison with Clubs to introduce a race penalty points scheme for yachts which are recorded to impede the passage of a ferry when racing.	<i>Racing liaison has improved significantly and proactive reporting to Picton Harbour radio has occurred. Set courses are now marked advised in advance of the race commencing.</i> <i>Clubs have introduced a penalty points scheme.</i> <i>Reports of race conflict with transiting RoRo ferries have fallen off dramatically.</i>	9 9 8	Details to be passed to PHR should include type and number of yachts involved, the race course and contact details for the race safety craft or race officer. Yacht race course set to minimise crossing of shipping fairway Yacht race management should include the Cook Strait Race, ie all races which start outside MDC Harbour Limits.
22	Promote Deviation from Passage Plan as option for ferries or other large vessels to avoid other traffic.	Direct communication between Harbourmaster and ship's pilots and masters that deviation from their lodged Passage Plan is allowable under reasonable circumstances such as presence of racing yachts across the fairway.	<i>This is now happening regularly, confirmed by VHF interaction. Further promulgation will help.</i>	8	Control is implemented
23	Regular audit of Pilot and PEC holder currency.	Introduce a monitoring of the number of movements by each Pilot (or PEC Holder) and introduce minimum number of acts or movements per annum to maintain currency (or lose licence/exemption). Use of database technology. Consider annual interview.	<i>Pilot/PEC holder records now being generation at Picton Harbour radio to confirm PEC holder providing the transit advice. These reviewed and monitored monthly by the Harbour Office.</i>	7-8	Rule 90 has been reissued for consultation and part of Marlborough submission will refer to the need for simulator training. Take forward within Part 90. Scoring assumes Part 90 will be implemented
23.1	Reduce grounding risk for vessels proceeding to pilot station at the Northern Entrance	Consider moving pilot boarding station further out and away from the marine reserve. Tory Channel boarding station to be moved to seaward of channel entrance.	<i>Discussions have been held with pilotage company. Pilots remain to be convinced of the need. Further work required</i> <i>The new part 90 rule (in draft) is introducing an extended Pilotage District of 3 miles.</i>	4 6	Progress and take forward to Port Company Risk Assessment. It is not possible to have an adequate Master Pilot exchange without time between boarding and hazard negotiation.. Part 90 is in an advanced stage and needs final input by harbours.

No.	Risk Control Measure Intent	Risk Control Measure Description (<i>2009 Updates in Italics</i>)	2009 Status	Control Adequacy Rating Assessment (2009 Review)	Decision Making Recommendations
24	<p>Harbour Patrols and Enforcement</p> <p>Harbour Patrols were recently introduced. Enforcement action should commence with the 200m and 50m transiting rules.</p>	<p>Deployment of regular harbour patrols throughout the year to audit marine farm lighting and position by GPS, nav aid performance, mooring quality, public education.</p> <p>Enhance patrols during fishing season.</p> <p>Provide video camera for Patrol Vessel.</p>	<p><i>Audits have been undertaken and results reported to Council. Ongoing development work is required.</i></p> <p><i>Patrols have remained constant due to resource constraints.</i></p> <p><i>Video camera not supplied, but still camera supplied instead, which has been a success for enforcement action.</i></p>	<p>3</p> <p>5</p> <p>6/7</p>	<p>Progression/implementation of new lighting plans is ongoing as a result of the findings of the audit that followed the risk assessment.</p> <p>Patrols are at least happening at greater frequency than before, especially in summer months and should carry on within budget constraints.</p> <p>Equivalence provided by stills camera</p>
25	<p>Marine Farm monitoring and Service vessels.</p> <p>Mandatory Traffic reporting may be necessary for the approaches to Havelock, in particular for commercial vessels rounding Cullen Point, which is blind (ship to ship). A number of operators already have this in place.</p>	<p>Develop a register of marine farm vessels operating in the Sounds. Monitor marine farm positions; provide Notices to Mariners; local information for recreational users and supply information for LINZ charts.</p>	<p><i>A rough register is now available, which needs to be revised and updated.</i></p>	<p>3-4</p>	<p>Recommended to take forward</p>
26	<p>Fuel Installations</p> <p>Fuel service is not manned in many places, with fuel being served by users from credit card details.</p> <p>Liaison with fuel suppliers may be required.</p> <p>Leisure brochure to include advice about auto bilge pump discharges.</p>	<p>Introduce savealls for all fuel delivery points to reduce contamination of water from the large number of minor spills occurring at present.</p> <p>Drain petrol to sumps.</p> <p>Educate users.</p> <p>Publicise a spill response SMS policy to encourage reporting by public.</p> <p>Investigate partial manning of fuel delivery points (probably expensive).</p>	<p><i>Subject to marine protection rules. Education ongoing.</i></p> <p><i>Savealls have been investigated and turned down as too expensive.</i></p> <p><i>Partial manning reported to be prohibitively expensive.</i></p>	<p>3</p>	<p>Incident data suggests that user education about for the dangers of refuelling with Gasoline in semi enclosed spaces and the need to shut down all electrical equipment and stop for any leakage. Similar problems are being experienced in Australia.</p> <p>Risk not directly one of the harbour, but associated with safe navigation.</p>
27	<p>Modifications to Mabel Island Anchorage.</p>	<p>Review the position of the Anchorage at Mabel Island to seek relocation to facilitate and clarify a Master's option to route behind the island.</p> <p>Designate the area from the Snout to Wedge Point as a prohibited area for anchoring.</p>	<p><i>A Mabel Island anchorage has been reduced in size and a new security anchorage has been introduced.</i></p> <p><i>The Snout to Wedge point has been designated as a prohibited anchorage</i></p>	<p>8</p> <p>9</p>	<p>This has been implemented. Incident data suggests that the number of mooring failures are the next in line to address.</p>

No.	Risk Control Measure Intent	Risk Control Measure Description (<i>2009 Updates in Italics</i>)	2009 Status	Control Adequacy Rating Assessment (2009 Review)	Decision Making Recommendations
28	Review speed restrictions on high speed craft in Outer Queen Charlotte Sound with a view to relaxing present requirements for that location.	Allow a high Speed craft taking the Northern entrance to maintain higher speed until passing a newly defined point in Queen Charlotte Channel, further inside the channel than the present limits. This makes the option to use the Northern Entrance (as opposed to Tory Channel) more viable for high speed craft in marginal weather conditions.	<i>Superseded by the withdrawal of large scale high speed services.</i>	N/A	Option closed out as high speed craft no longer transit.