



CORNWALL COUNCIL

**PORTS OF TRURO AND PENRYN
NAVIGATION RISK ASSESSMENT**

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Ports of Truro and Penryn Navigation Risk Assessment

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EXECUTIVE SUMMARY

This report revisits the Marico Marine Formal Safety Assessment for the Ports of Truro and Penryn conducted in 1999/2000 with a view to update the study and simplify the risk register. It should also act as a template for Formal Safety Assessments of other Cornwall Council ports.

The study only addresses the risks associated with the marine operations in the Ports of Truro and Penryn; it does not address the risks ashore usually covered by the Health and Safety Executive.

The Ports of Truro and Penryn Risk Assessment shows that all marine risks in the Ports of Truro and Penryn remain at As Low As Reasonably Practical or below.

The list of possible additional risk mitigation measures at Section 5 should be considered by the Ports of Truro and Penryn with a mind to:

- Further reduce the navigation risks in the Ports of Truro and Penryn;
- Clarify regulations, instructions, vessel status and responsibilities;
- Reduce exposure to any criticism in the event of an incident.

Consideration should also be given to regular reviews of the hazards log to ensure changes that occur over time within the port are also captured in the risk assessment.

1 INTRODUCTION

In 1999/2000 Marico Marine carried out a Formal Safety Assessment for the ports of Truro and Penryn together with Portscatho and the Prince of Wales Pier¹.

Since the above study was conducted the overall management of the Ports of Truro and Penryn (PoT&P) has been transferred from Carrick District Council to Cornwall Council (CC).

In April 2010 Cornwall Council appointed Marico Marine to conduct Risk Assessments on a number of ports in Cornwall including Truro and Penryn.

This report revisits the Marico Formal Safety Assessment for the Ports of Truro and Penryn conducted in 1999/2000 with a view to update the study and simplify the risk register to make it more user friendly. It should also act as a template for Formal Safety Assessments of other Cornwall Council ports.

¹ Marico report 099NR001 dated 11 May 2000

2 OVERVIEW OF THE PORTS OF TRURO AND PENRYN

This section gives very a brief overview of the Ports of Truro and Penryn (PoT&P); it is not meant to be a comprehensive study of the detail of the ports' operations.

2.1 ACCOUNTABILITY FOR MARINE SAFETY

As set out in the Port Marine Safety Code (Oct 2009) (PMSC) the key positions are held as follows;

- The full council of Cornwall Council is the “Duty Holder”;
- The Cornwall Council Maritime Manager is the “Designated Person”;
and
- The Harbour Master manages the Ports of Truro and Penryn and is based at the Harbour Office in Truro.

2.2 PORT USERS

The port users can be divided into five main categories, coastal shipping, laid up ships, King Harry Chain Ferry, passenger vessels and recreational craft. A brief review of each group of users is given below.

2.2.1 Coastal Shipping

Coastal shipping using the “Not Always Afloat But Safe Aground” (NAABSA) berth at Lighterage Quay, Truro. At present there are between one and five calls per month, mainly planned around Spring Tides. The maximum size of vessel that can be accepted is 85m Length Over All (LOA). The PoT&P are endeavouring to increase the number of vessels using Lighterage Quay.



Figure 1: Lighterage Quay, Truro

2.2.2 Laid-up Ships

Laid-up ships (see **Figure 2**) use the moorings immediately upstream of the Chain Ferry (see **Figure 3**). The maximum sized vessel that can be moored is set at 190m LOA. The number of vessels using the moorings fluctuates, broadly along the trends of World shipping patterns.



Figure 2: Laid-up Ships

2.2.3 King Harry Chain Ferry

The King Harry Chain Ferry (see **Figure 3**), located on the River Fal (see **Figure 8**) operates all year round and runs to a regular timetable with services every 20 minutes, the crossing takes approximately five minutes.



Figure 3: Chain Ferry

2.2.4 Passenger Vessels

A number of companies operate Maritime and Coastguard Agency (MCA) Class V and VI passenger vessels plus some smaller craft (under twelve passengers). The vessels provide ferry services, the “Park and Float” service

in Penryn, sightseeing trips, venues for parties and rod fishing/diving trips within PoT&P waters.



Figure 4: Class V Passenger Vessel

2.2.5 Recreation

Both Truro and Penryn are busy recreational ports with marinas and moorings for cruising yachts, sailing clubs, yacht and dingy racing, PWC and water skiing area and hire craft.



Figure 5: Yacht Moorings

2.3 PORT CONTROL

There is no provision of Vessel Traffic Services (VTS) or Local Port Control (LPS)² anywhere in the River Fal or the approaches. The PoT&P Harbour Office can be contacted by VHF during working hours.

Commercial shipping movements are coordinated by the Harbour Master and the duty Falmouth Pilots Partnership pilot.

2.4 PILOTAGE

Falmouth Harbour Commissioners (FHC) provide pilotage services, through a contract with Falmouth Pilot Partnership (FPP), for the Ports of Falmouth, Falmouth Docks, Truro, Penryn and St Mawes as well as the Helford River, the Quarries on the East side of the Lizard Peninsula and Falmouth, Gerrans and Veryan Bays.

The FHC Pilotage Directions cover and are agreed with the Ports of Truro and Penryn.

2.5 TUGS

Harbour tugs from Falmouth are employed when mooring and slipping vessels from the lay-by moorings.

A PoT&P patrol vessel can provide some assistance to vessels berthing and sailing from Lighterage Quay.

2.6 NAVIGATION MARKS

The navigation channel from Carrick Roads to Lighterage Quay is marked by a series of lit plastic buoys. The Trinity House light defect reporting system (PANAR) is used to make reports on Aids to Navigation which are submitted to Trinity House.

Upstream of Lighterage Quay the channel is mainly marked by beacons.

² Maritime Coastguard Agency Marine Guidance Note 401



Figure 6: Port Lateral Buoy

2.7 MOORING BUOYS

The lay-by ship moorings are operated by PoT&P and a specialist company is employed to carry out inspections and planned maintenance of the buoyage and ground tackle.

PoT&P operate and maintain approximately 165 small vessel moorings and visitor pontoons. There is a well documented allocation and planned maintenance system.

PoT&P leases areas of the harbours to individuals, clubs or companies to lay private moorings.



Figure 7: Laid-up ship mooring buoy

2.8 POLLUTION AND EMERGENCY RESPONSE

PoT&P has an Oil Pollution Preparedness, Response and Co-operation (OPRC)³ contingency plan to deal with a pollution incident along with a stockpile of rapid response equipment stored at Lighterage Quay.

PoT&P has a comprehensive set of Emergency Plans and good liaison with the Emergency Services.

³ MCA Contingency Planning for Marine Pollution Preparedness and Response: Guidelines for Ports dated Mar 2002.

3 METHODOLOGY

The Risk Assessment is divided into four stages:

Stage 1 – Data gathering.

Stage 2 – Hazard Identification.

Stage 3 – Generation of the Risk Profile.

Stage 4 – Develop New Options.

This study only addresses the risks associated with the marine operation in the ports of Truro and Penryn; it does not address the risks ashore usually covered by the Health and Safety Executive.

3.1 REVIEW OF DOCUMENTATION (DATA GATHERING)

The following documentation was studied, the majority of which was provided by the Cornwall Council Marine Manager and Harbour Master;

- Marico report 099NR001 dated 11 May 2000;
- Admiralty Chart 32 - Falmouth to Truro;
- FHC Pilotage Directions;
- Passage plan information;
- Ship pre-arrival information form;
- Maritime Byelaws (harbour);
- Maritime Byelaws (licensing of boats and boatmen);
- Maritime Section Central Safety Log Nov 07 to May 10;
- Laid-up ships mooring conditions and environmental code of conduct;
- Mooring Licence;
- Diving permit;
- Hot work permit;
- Bunkering check-off list;
- Port Masterplan (Sep 07);
- PMSC – Statement of Compliance;
- PMSC – Carrick District Council audit reports dated Mar 2007 and 2008/9;
- Visiting yacht pack;
- Tide tables with water safety reminders.

The PoT&P website also provided good information and was user friendly.

3.1.1 Observations:

The Maritime Section Central Log indicates that there are a low number of recorded incidents in the ports of Truro and Penryn; there does not appear to be a pattern of offences that would indicate a particular area of concern.

The PoT&P documentation appears to be comprehensive and up to date.

3.2 PORT VISIT AND STAKEHOLDERS MEETINGS (HAZARD IDENTIFICATION)

Dr Ed Rodgers and David Foster toured the ports of Truro and Penryn with the Cornwall Council Marine Manager and Harbour Master on 21st July 2010.

On 22nd July 2010 three stakeholder meetings were conducted without senior management representation from PoT&P. These were

09:00 -10:00 **Passenger Vessel Operators**

S Turner – MCA

G Royle – Cornwall Ferries Ltd

P Newman - Tolverne Marine

S Berriman – Enterprise Boat

11:30 – 12:30 **Commercial Shipping**

S Turner – MCA

P Newman – Tolverne Marine

D Barnicoat – FPP

M Williams – PoT&P

C Vinnicombe – Commercial Fishing

13:00 – 14:00 **Recreational Port Users**

B Phipps – Windsport

J Osmond – Premier Yacht Mariners

P Chesworth - Mylor Boat Hire/Aquacab

C Langan - Challenger Marine

On completion of the three stakeholders meetings a final meeting was held with the PoT&P Senior Management.

14:30 -17:00 **PoT&P Senior Management**

A Brigden – CC Maritime Manager

M Killingback – Harbour Master Truro and Penryn

3.2.1 Observations

The participants in all of the above meetings took part in the hazard identification process with enthusiasm providing constructive information and suggestions. Their input is contained in the Hazard Log (**Annex B** and **C**).

Of particular note was the mutual respect that exists between the PoT&P Management and their stakeholders.

3.3 PORT AREAS

The ports of Truro and Penryn have been divided into the same five areas (E to I) as in the Marico Marine 1999/2000 report (see **Figure 8**).

3.4 HAZARD LOG AND RISK ASSESSEMENT (GENERATION OF RISK PROFILE)

The Marico Marine risk assessment process is explained at **Annex A** (Marico Risk Assessment Methodology)

The hazard log has been completely revised from that used in the 1999/2000 report. The overall hazards have been divided into two groups:

- Navigation – Collision, Contact, Grounding, Breakout, Diving incidents etc;
- Health, Safety and Environment – Fire, Personal Injury and Pollution.

The individual hazard definitions have been widened and made more generic. This has the effect of reducing the number of individual risks from approximately a hundred to about thirty. The reduced number of hazards is considered appropriate for a port operation the size of Truro and Penryn and should also be more manageable for future amendment and updating by PoT&P staff.

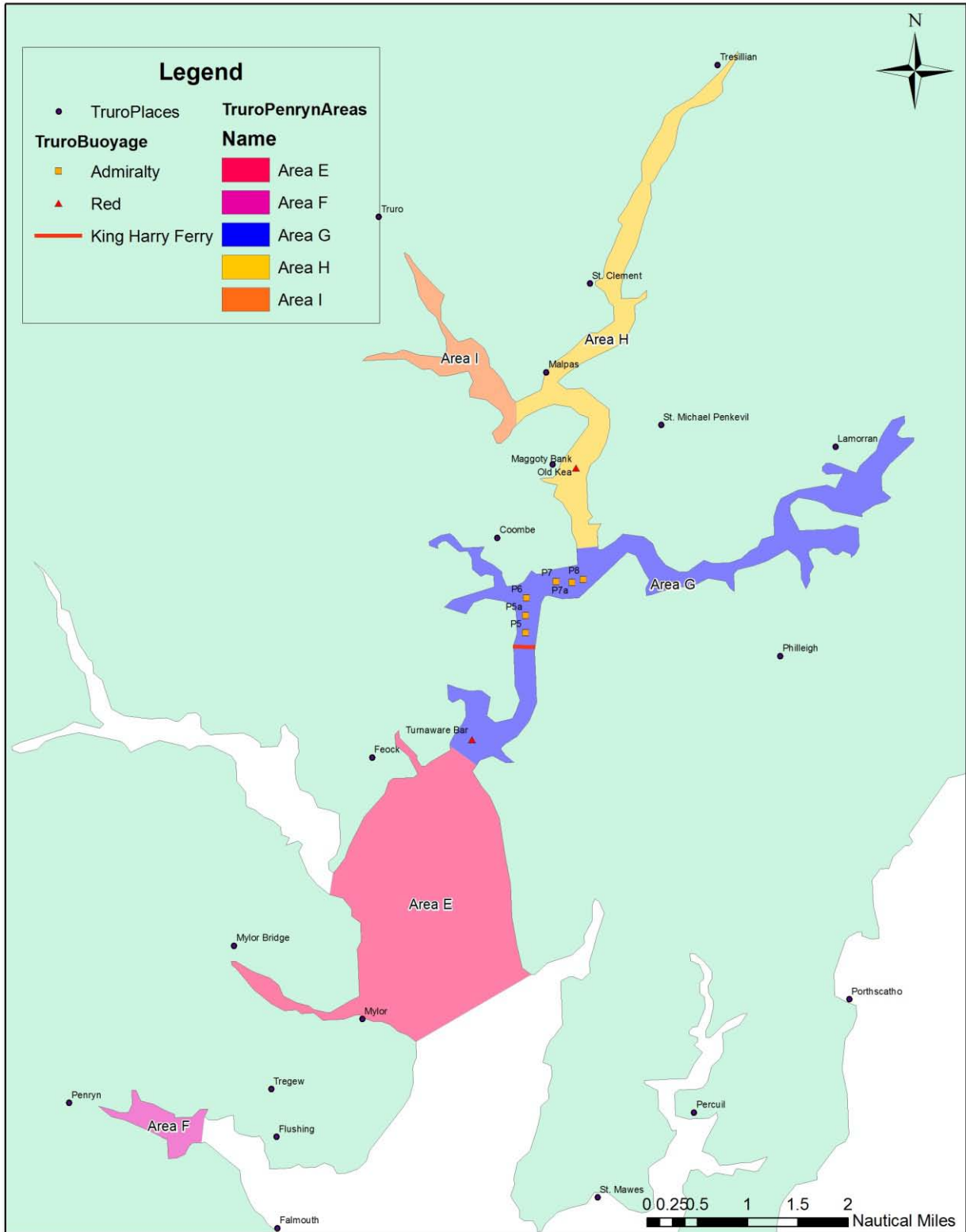


Figure 8: Truro and Penryn Navigation Risk Areas

4 ANALYSIS OF RANKED HAZARDS

4.1 OVERALL

The scoring of the hazards (see **Annex D** and **E**) identified during the stakeholders' and PoT&P Management meetings, the port visit and from the documentation indicates that:

- No hazards are assessed as “High Risk” (9 and 10);
- No hazards are assessed as “Significant Risk” (6,7 and 8);
- Seven hazards are assessed as “ALARP” (4 and 5);
- Twenty two hazards are assessed as “Low Risk” (2 and 3);
- One hazard is assessed as “Negligible Risk” (0 and 1).

4.2 NAVIGATION HAZARDS

A number of potential risks involving passenger vessels lie high in the ranked hazard list (see **Figure 9**). Although there is no history of a serious incident involving passenger vessels in PoT&P, because of the consequences of such an incident are so serious, the risk they pose should not be underestimated. Many issues have been addressed by national regulation⁴ since the Marico Marine 1999/2000 report.

Rank No.	Hazard Reference	Affected Areas	Hazard Title	Hazard Detail	Risk By Consequence Category								Risk Overall
					Most Likely				Worst Credible				
					People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders	
1	3	E, G, H, I	Collision 3	Commercial Shipping - Passenger Boat	4	2	0	2	6	5	5	6	4.52
2	2	G	Collision 2	Commercial Shipping - Chain Ferry	4	2	0	2	6	5	5	5	4.45
3	5	G	Collision 5	Passenger Boats - Chain Ferry	4	2	0	2	6	5	2	6	4.33
4	4	E, G, H, I	Collision 4	Commercial Shipping - Recreational	4	2	0	2	6	5	0	5	4.15
5	13	E, F, G, H, I	Grounding 2	Passenger Boats	0	3	0	3	6	4	0	6	3.81
6	11	E, F, G, H, I	Contact 3	Recreational	6	6	0	0	3	3	0	3	3.75
7	16	G	Break Out/Inappropriate Mooring 2	Lay Up vessel	2	2	0	2	3	5	3	6	3.65
8	8	E, F, G, H, I	Collision 8	Recreational - Recreational	3	3	0	3	5	3	0	5	3.57
9	12	E, G, H, I	Grounding 1	Commercial Shipping	0	3	0	3	2	5	3	5	3.47
10	1	E, G, H, I	Collision 1	Commercial Shipping - Commercial Shipping	0	2	0	2	5	5	5	5	3.34
11	10	E, F, G, H, I	Contact 2	Passenger boats	3	3	0	0	5	3	0	3	3.26
12	7	G	Collision 7	Chain Ferry - Recreational	2	2	0	2	5	3	2	5	3.22
13	6	E, F, G, H, I	Collision 6	Passenger Boat - Recreational	2	2	0	2	5	3	2	5	3.22
14	17	F, G, I	Break Out/Inappropriate Mooring 3	Commercial Vessel/ Passenger Vessel	0	3	0	0	2	5	2	5	3.14
15	9	E, G, H, I	Contact 1	Commercial Shipping	2	2	0	0	3	5	2	3	2.98
16	20	E, F, G, H, I	Person in water struck by other port users. 1	Person in water endangered by other port users.	3	0	0	0	6	0	0	0	2.94
17	14	E, F, G, H, I	Grounding 3	Recreational vessels	0	6	0	0	2	2	0	2	2.91
18	15	G	Break Out/Inappropriate Mooring 1	Chain Ferry	0	2	0	0	2	5	2	3	2.72
19	19	E, F, G, H, I	Diving incident 1	Divers in water endangered by other port users.	3	0	0	0	5	0	0	0	2.61
20	18	E, F, G, H, I	Break Out/Inappropriate Mooring 4	Recreational Vessel	0	0	0	0	3	6	0	0	2.07

Figure 9: Summary of Marine Hazard Ranked Hazards (see Annex D for full details)

⁴ See MSN 1808, MSN 1823, MGN 158 and the Inland Waters Small Passenger Boat Code.

The chain ferry is by far the largest vessel regularly moving in the harbour. Although the PoT&P consider the vessel to be “Restricted in her ability to manoeuvre”⁵ this is not made clear in the harbour regulations nor does the vessel always display the appropriate lights or shapes.

4.3 HEALTH, SAFETY AND ENVIRONMENT HAZARDS

Risks involving fire are placed highest in the ranked hazard list (see **Figure 10**). PoT&P has experienced fires in recreational craft in the recent past and has an educational programme in place to attempt to drive down the likelihood of another incident.

Rank No.	Hazard Reference	Affected Areas	Hazard Title	Hazard Detail	Risk By Consequence Category								Risk Overall
					Most Likely				Worst Credible				
					People	Property	Environment	Stakeholders	People	Property	Environment	Stakeholders	
1	4	E, F, G, H, I	Fire 4	Recreational	3	3	0	3	7	4	0	4	4.27
2	8	E, F, G, H, I	Personal Injury 3	Recreational	6	0	0	6	6	0	0	2	4.22
3	3	E, F, G, H, I	Fire 3	Passenger Boats	4	2	0	2	6	3	2	5	4.18
4	2	G	Fire 2	Chain Ferry	2	2	0	2	6	3	2	3	3.47
5	7	E, F, G, H, I	Personal Injury 2	Chain Ferry and Passenger Boats	3	0	0	3	6	0	0	4	3.44
6	6	E, G, H, I	Personal Injury 1	Commercial Shipping and Layup	3	0	0	3	6	0	0	4	3.44
7	5	G	Fire 5	Lay-up	2	2	0	2	5	5	2	5	3.3
8	1	E, G, H, I	Fire 1	Commercial Shipping	2	2	0	2	5	3	2	3	3.13
9	9	E, G, H, I	Environmental 1	Operational Fuel Spill - Commercial	0	0	3	3	0	0	5	3	3.05
10	10	E, F, G, H, I	Environmental 2	Operational Fuel Spill - Recreational	0	0	0	0	0	0	3	3	1.31

Figure 10: Summary of HS&E Ranked Hazards (see Annex E for full details)

⁵ ColReg Rule 3 (g).

5 POSSIBLE ADDITIONAL MITIGATION MEASURES

The tables below sets out a list of possible additional risk control measures that the PoT&P may wish to consider.

5.1 POSSIBLE ADDITIONAL NAVIGATION MITIGATION MEASURES

Number	Possible Additional Risk Control Measures	Hazard No
1	<p>Consider broadcasting VHF Information on navaid defects, tidal abnormalities, severe weather warnings, shipping movements, diving operations, local events and races etc.</p> <p>At present there is no LPS or VST in the Falmouth area however if one were to be established, routine navigational broadcasts provide an efficient method of promulgating timely navigation information to harbour users.</p>	1,2,3, 4,5,6, 7,8,9, 10,11, 13,14, 16,17, 18,19, 20,
2	<p>Consider revising the Pilotage Directions to reduce the minimum compulsory pilotage threshold.</p> <p>Under the present FHC Pilotage Directions commercial vessels between 20m and 60m can navigate PoT&P waters up to Lighterage Quay day and night without the assistance of a pilot.</p>	1
3	<p>Consider clarification of PoT&P Byelaw 5.</p> <p>Custom and practice suggests that Byelaw 5 applies only to commercial vessels but this is not clear</p>	1,2,3, 4,12,
4	<p>Consider a new Byelaw/(General Direction?)/Notice to Mariners regarding the status of the Chain Ferry.</p> <p>It is local custom and practice that vessels normally give the chain ferry right of way. PoT&P procedures are in place to warn the chain ferry of planned large vessel movements.</p> <p>In order to regularise the present situation and avoid conflict in the event of a legal wrangle PoT&P should clarify the status of the chain ferry in its local regulations, initially by local Notice to Mariners and eventually by amendment to the byelaws. A simple</p>	2,5,7

	<p>solution may be to define the chain ferry as a vessel “Restricted in its ability to Manoeuvre”⁶ whilst maintaining the current additional procedures.</p>	
5	<p>Chain ferry to display Restricted in her Ability to Manoeuvre (RAM) lights and shapes.</p> <p>See 4 above. At present the ferry does not display RAM shapes or routinely display RAM navigation lights.</p>	2,5,7
6	<p>Consider requiring commercial vessels to show "Constrained by Draught" lights or shapes when appropriate.</p> <p>This would make the status of the vessel more clear to other port users and could simplify the legal process in the event of a serious incident.⁷</p>	3,4,12
7	<p>Target unlit recreational craft enforcement.</p> <p>The problem of unlit recreational craft moving round the harbour at night was highlighted at the stakeholder meetings.</p>	4,6,7, 8
8	<p>Encourage better liaison between passenger boat operators and recreational users.</p> <p>The recreational stakeholder considered that a minority of passenger boat operators could be inconsiderate (wash, passing too close etc).</p>	6
9	<p>Consider adding an illumination condition to PoT&P Laid-up Ships Mooring Conditions.</p> <p>The moored vessels can be difficult to see on a very dark night and not all display any illumination. Suggest PoT&P clearly set out a minimum light requirement (e.g. white light fore and aft) in the laid-up vessel conditions.</p>	9,10, 11
10	<p>Consider maintaining a record of navaid and moored vessel inspections.</p> <p>PoT&P vessels routinely patrol the harbours regularly and inspect moorings and nav aids. A record of these inspections (in addition to PANAR) would be helpful both to formalise the checks and in</p>	9,10, 11,12, 13,14, 15,16, 17,18

⁶ ColRegs Rule 3g, Rule 18 and Rule 27.

⁷ ColRegs Rule 3h, Rule 9, Rule 18d and Rule 27.

	event of an incident investigation.	
11	<p>Review hydrographic survey policy and associated review of maintenance dredging and buoy positions.</p> <p>At present it appears that harbour surveys are conducted on an ad hoc basis. PoT&P should consider establishing a survey policy setting out survey intervals for different areas of the ports (e.g. Main channel Malpas to Lighterage Quay once a year), maintenance dredging triggers (e.g. set a survey depth at which maintenance dredging must be initiated), and subsequently arrange any associated maintenance dredging and/or navigational buoy repositioning. (e.g. Penryn Harbour approaches to Falmouth Marina).</p>	12,13, 14
12	<p>PoT&P lay down under keel clearance policy.</p> <p>The current passage plan information does not set out a minimum under keel clearance requirement nor does there appear to be any guidance given to the FPP pilots other than custom and practice. PoT&P Under Keel Clearance (UKC) requirements should be formalised. (e.g. Passage to Lay-up berth: Max clearance = draught +10%).</p>	12
13	<p>Confirm PoT&P is content with current "mud pilotage" practices (i.e. navigating over/through soft mud with minimal UKC).</p> <p>At present "Mud pilotage" is conducted by custom and practice. If PoT&P is content that under keel clearance norms may be dispensed with in certain parts of the harbour this should be formalised and guidance given to FPP the on criteria. (e.g. Passage from Malpas Point to Lighterage Quay: Max Draught = HOT-1.4m).</p>	12
14	<p>Review promulgation of Local Notices to Mariners (PoT&P Website?).</p> <p>Bringing Local Notice to Mariners to the attention of port users is difficult in any port. Consider including a new Local Notice to Mariners section on the PoT&P website.</p>	12,13, 14
15	<p>Review the marking of navigation channel in Penryn Harbour and review requirement for maintenance dredging in Penryn Harbour.</p> <p>Both of the above were mentioned during stakeholders meetings.</p>	13,14

	See also 11 above.	
16	<p>Review the size of the Turnaware Bar Buoy.</p> <p>The recreational users commented that the Turnaware Bar Buoy can be hard to pick up in daylight when making passage from the South. It is the first of the smaller channel navigation buoys.</p>	13,14
17	<p>Ensure MCA and Class Society Inspections include a survey of the Chain Ferry's current chains and inspection of the records of previous chain replacements, surveys and inspection reports.</p> <p>The consequences of chain failure on the chain ferry and overall port operation is significant. The chain ferry operator has a robust maintenance schedule in place however a PoT&P back-up monitoring system may be prudent.</p>	15
18	<p>Consider VHF/Telephone warning of extreme weather (no LPS/VTS) to laid-up vessel crews/watchman.</p> <p>See 1 above. PoT&P staff pass on severe weather warnings to laid-up vessel crews by phone etc.</p>	16
19	<p>Consider determining the maximum load on the lay-by moorings empirically.</p> <p>At present PoT&P determine the maximum load on the lay-by moorings by a mixture of using Admiralty buoy classifications and experience. Admiralty buoy classifications are not completely appropriate to modern, high sided merchant vessels. It is suggested, for peace of mind, that the maximum loading criteria are established formally and used in future.</p>	16
20	<p>Consider revising the PoT&P diving clearance procedure - warning others?</p> <p>PoT&P has a diving permit scheme in place however it does not warn other port users in the vicinity of the possibility of divers in the water. Long term blanket diving approval should be avoided as there is a risk that the warnings to other port users can slip through the cracks.</p>	19

5.2 POSSIBLE ADDITIONAL HEALTH SAFETY AND ENVIRONMENT MITIGATION MEASURES

Number	Possible Additional Risk Control Measures	Hazard No
21	<p>Consider maintaining a work place inspection record.</p> <p>It is suggested that PoT&P introduce a work inspection place record with a “bring-up system”. This should ensure that inspections are carried out in a timely manner and defect rectification is monitored.</p>	6,7,8
22	<p>Agree the PoT&P "H&S Boundary".</p> <p>This report addresses the “marine risks” only. It is suggested that the PoT&P establish where their responsibilities for Health and Safety start and finish ashore. It is Marico’s experience that some municipal ports can have a blurred division between the PMSC and local government H&E regulations.</p>	6,7,8
23	<p>Target recreational power boat wash enforcement.</p> <p>Excessive wash from passing vessels can endanger people on other vessels particular at embarkation and disembarkation. It is suggest that PoT&P set up occasional patrols especially aimed to enforce byelaws 7 and 8.</p>	7,8
24	<p>Consider education of recreational users on precautions that should be taken to prevent oil spills.</p> <p>PoT&P embark on a programme similar to that used to bring the dangers of fire and explosion to the attention of the recreational users.</p>	10
25	<p>Consider recorded routine inspections of recreational vessel fuelling facilities.</p> <p>PoT&P set up a system to routinely inspect and spot check all the recreational vessel fuelling facilities in both ports.</p>	10

6 CONCLUSIONS

The process of updating and refreshing the PoT&P Risk Assessment has shown that all marine risks in the ports of Truro and Penryn remain at ALARP or below.

The list of possible additional risk mitigation measures at Section 5 should be considered by PoT&P with a mind to:

- Reduce navigation risks in the Ports of Truro and Penryn further;
- Clarify regulations, instructions, vessel status and responsibilities; and
- Reduce exposure to any criticism in the event of an incident.

PoT&P have historically updated hazard assessments on an adhoc basis when time permits. In order that all hazards are assessed and updated according to the various changes ongoing in a port it is recommended that PoT&P set up a dedicated review programme for all hazards based on their rank in the risk table. This is the rationale behind simplifying the hazard list generated in 2000 into a manageable list. Such a programme could be undertaken on a monthly cycle and appended to existing senior management/stakeholder meetings. This would provide an auditable trail of continued risk assessment and mitigation, which would prove to regulators and others that PoT&P is effectively and continuously assessing maritime risk in a coherent and defined manner.

6.1 RECOMMENDATIONS

PoT&P take forward the list of possible additional risk mitigation measures at Section 5 that they consider to be appropriate and cost effective.

PoT&P introduces regular updates of the risk assessment.

Annexes

Annex A – Marico Marine Risk Assessment Methodology

Annex B – Navigation Hazard Log

Annex C – Health, Safety and Environment Hazard Log.

Annex D – Navigation Ranked Hazard List

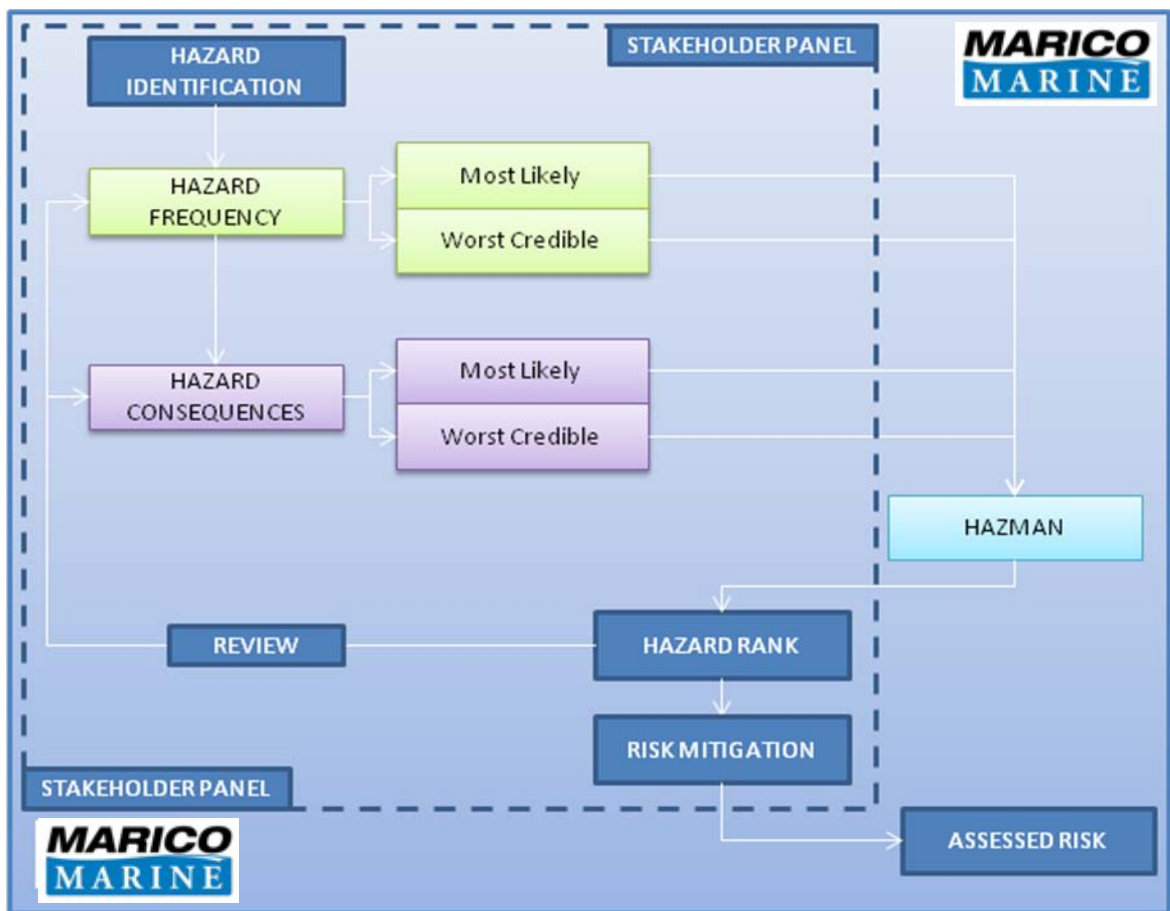
Annex E – Health, Safety and Environment Ranked Hazard List.

Annex A - Marico Marine Risk Assessment Methodology

Navigational Risk Assessment

Introduction

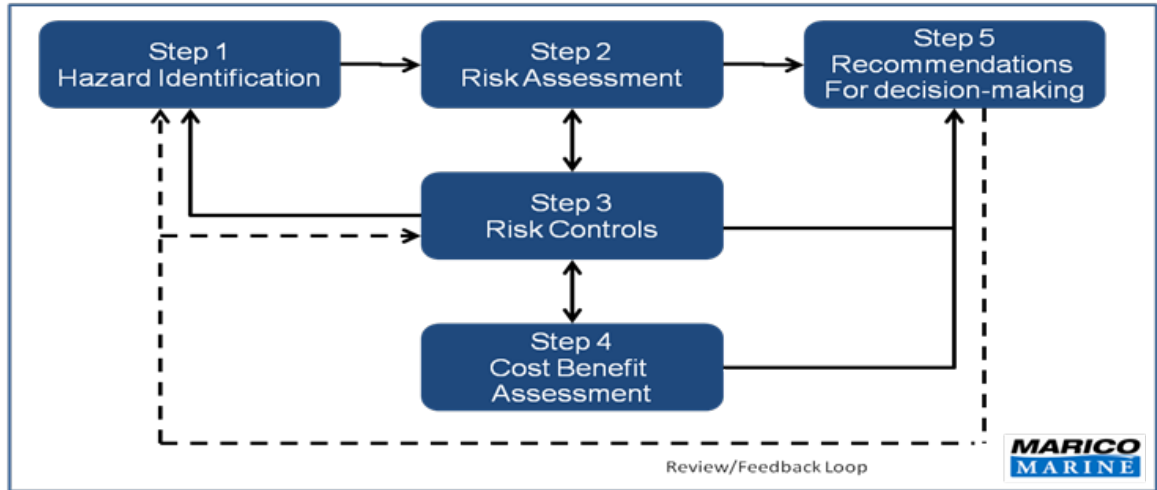
Marico Marine use a form of risk assessment that has been specifically developed for Navigational use. It is unique to MARICO and is fundamentally based on concepts of Most Likely and Worst Credible, which reflects the range of outcomes arising from a shipping accident (see below). This approach fits the available marine incident data perfectly. Incident data shows a high frequency of minor events, separated from a much lower frequency of Worst Credible events.



MARICO hazard identification and risk assessment process

The Navigation Risk Assessment process proposed is based on Formal Safety Assessment methodology as adopted by IMO (see below) and follows the guidance set out within the Maritime and Coastguard Agency MGN 371(M+F).

The Navigation Risk Assessment for the project will be carried out using the MARICO Marine “Hazman” programme to provide the ranked hazard reports.



Formal Safety Assessment Risk Assessment Process

Marico use criteria that have been developed specifically for this type of risk assessment. It is worthwhile considering this in the tender review.

We also use our in-house HAZMAN programme to rank hazards based on risk outcome.

Stakeholder Consultation

A Hazard Identification (HAZID) process will be used to collate information from stakeholders (see stakeholder panel above). Suitable stakeholders will be identified during the scoping phase and may include, but are not limited to;

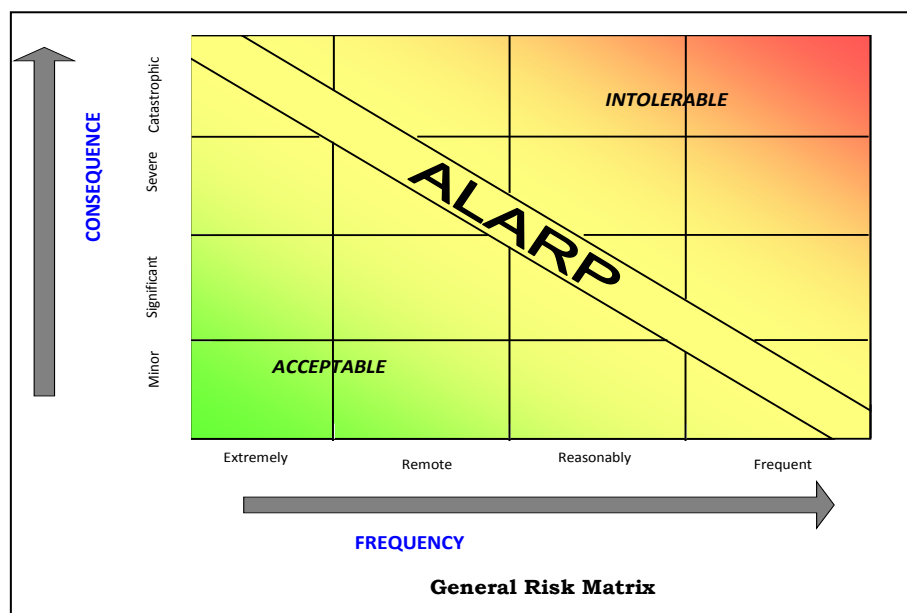
1. Local Port Authorities
2. Royal Yachting Association;
3. Commercial Fisheries;
4. Trinity House;
5. Maritime and Coastguard Agency; and
6. British Chamber of Shipping.

Definitions

IMO Guidelines define a hazard as “something with the potential to cause harm, loss or injury”, the realisation of which results in an accident. The potential for a hazard to be realised can be combined with an estimate or known consequence of outcome. This combination is termed “risk”. Risk is therefore a measure of the frequency and consequence of a particular hazard. One way to compare risk levels is to use a matrix approach as illustrated below.

At the low end of the scale, frequency is extremely remote, consequence insignificant and risk can be said to be negligible. At the high end, where hazards are defined as frequent and the consequence catastrophic, then risk is termed intolerable. Between the two is an area defined As Low As Reasonably Practicable (ALARP). The IMO guidelines allow the selection of definitions of frequency and consequence to be made by the organisation carrying out the NRA. This is important, as it allows risk to be applied in a qualitative and comparative way. To identify high risk levels in the traditional mathematical way would require a large volume of casualty data, which is not generally available.

ALARP can be defined as 'Tolerable', if the reduction of the risk is impracticable, or if the cost of such reduction would obviously be highly disproportionate to the improvement. It can also be defined as 'Tolerable', if the cost of reducing the risk is greater than any improvement gained. This is showed pictorially in figure below.



Frequency/Consequence Chart

Accident Categories

The Navigational Risk Assessment (NRA) uses accident categories to organise hazards for assessment. The hazard categories identified as relevant to this study are likely to be:

- Collision;
- Grounding
- Obstruction;
- Fire;

commercial craft often has a wider implication in terms of business and negative media exposure.

The rating applied is such that the consequences are of broadly equivalent value across the categories (see table below).

Consequence Categories

Category	People	Property	Environment	Business
C0	None	Negligible < £10,000	Negligible < £10,000	Negligible < £10,000
C1	Minor Two or three slight injuries	Minor > £10,000	Minor Tier 1 >£10,000	Minor >£10,000
C2	Moderate Multiple Moderate or single major injury	Moderate > £100,000	Moderate Tier 2 - limited outside assistance required; oil spill or environmental amenity impaired	Moderate Bad local publicity or short-term loss of revenue, etc > £100,000
C3	Serious Multiple injuries or major single fatality	Serious > £1,000,000	Serious Tier 2 - Regional assistance required; oil spill, localised pollution or multiple amenities impaired	Serious Bad widespread publicity, temporary closure of wind farm or prolonged restrictions > £1,000,000
C4	Major More than one Fatality	Major >£10,000,000	Major Tier 3 - National assistance required; oil spill, widespread pollution or extensive damage to amenities	Major Wind farm closes, navigation seriously disrupted for more than 30 days. Long term loss of income >£10,000,000

Project Risk Matrix

Traffic hazards identified are scored for frequency and consequence, in terms of a 'most likely' and 'worst credible' outcome. The frequency is much lower for a Most Likely case when compared with a Worst Credible case. Incident data also reflects this.

Marico use a risk matrix format to quantify risk (see table below)).

MARICO Risk Matrix

Consequence	Cat 4	5	6	7	8	10
	Cat 3	4	5	6	7	9
	Cat 2	3	3	4	6	8
	Cat 1	1	2	2	3	6
	Cat 0	0	0	0	0	0
	Frequency	>1,000 years	99 – 100 Years	9 – 100 years	1 – 9 years	Yearly

Risk Treatment Criteria

Risk scores for each hazard under the ‘most likely’ and ‘worst credible’ scenarios provide four eight risk scores per hazard, when each of the consequence criteria are considered. These can be combined to derive the overall risk score.

From the overall risk score, criteria can be applied for risk diagnosis. The scale used is 0 (low risk) to 10 (high risk). This is shown in **Table 7**

Table 1: Risk Factor Matrix Used for the Assessment

<i>Where:</i>	0 & 1	<i>equates to Negligible Risk</i>
	2 & 3	equates to Low Risk
	4, 5, 6	assessed to be in the ALARP region
	7, 8 & 9	equates to Heightened Risk
	10	equates to Significant Risk

Hazard Review and Risk Control Options

A basic set of hazards are be constructed for each of the three phases of the project. These are then reviewed, expanded and subsequently scored in accordance with the procedures outlined above. Risk control options are suggested against the risk outcome. Meeting attendees are consulted.

The draft of the final Navigation Risk Assessment (NRA) report will then be drawn up for discussion before the final report is issued.

Annex B – Navigation Hazard Log

Annex C – Health, Safety and Environment Hazard Log.

Annex D – Navigation Ranked Hazard Log

Annex E – Health, Safety and Environment Ranked Hazard Log