MARICO MARINE

JERSEY HARBOURS

ST HELIER SEAPLANE OPERATION NAVIGATION RISK ASSESSMENT

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MARINE AND RISK CONSULTANTS LTD

JERSEY HARBOURS

ST HELIER SEAPLANE OPERATION NAVIGATION RISK ASSESSMENT

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ABBREVIATIONS

Abbreviation	Detail
ALARP	As Low as Reasonably Practicable
AOC	Air Operators Certificate
CHbrA	Clear Harbour Airways
DCA	Director of Civil Aviation
GtGP	The Guide to Good Practice on Port Marine Operations
HA	Harbour Authority
HW	High Water
ICW	In Collision With
IMO	International Maritime Organisation
INS	Information Services
kt	Knot (unit of speed equal to nautical mile per hour, approximately 1.15 mph)
LKE	Local Knowledge Endorsement
LW	Low Water
m	Metre
Marico Marine	Marine and Risk Consultants Ltd
MCA	Maritime and Coast Guard Agency
ML	Most Likely
MSMS	Marine Safety Management System
nm	Nautical Mile
NRA	Navigation Risk Assessment
PEC	Pilotage Exemption Certificate
PIC	Pilot in Command
PMSC	Port Marine Safety Code
PoJ	Ports of Jersey
STOL	Short Take Off and Landing
TOS	Traffic organisation Services
VFR	Visual Flying Rules
VTS	Vessel Traffic Service
WC	Worst Credible

1 INTRODUCTION

This Seaplane Operation Navigation Risk Assessment (NRA) has been prepared by Marine and Risk Consultants Limited (Marico Marine) for Jersey Harbours, as the Harbour Authority (SHA), responsible for the safety of navigation, in St. Helier Harbour. Furthermore, this NRA will supplement the existing NRA and will be included as a separate risk register currently used by Ports of Jersey (PoJ) as the basis for identification and review of navigation hazards.

This NRA complies with the Port Marine Safety Code (PMSC) (see **Section 1.6**) and its associated Guide to Good Practice (GtGP), and was conducted in accordance with the International Maritime Organisation's (IMO) Formal Safety Assessment (FSA) methodology for risk assessments. It comprises the following four stages:

- Stage 1: Data Gathering and Vessel Traffic Analysis;
- Stage 2: Hazard Identification;
- Stage 3: Risk Assessment; and
- Stage 4: Risk Controls.

1.1 BACKGROUND

This Marine NRA will consider a proposed seaplane operation within the limits of the HA area (see for the Port of St Helier. Reference will be made to the requirements of the UK PMSC and the associated GtGP. The operator's proposal is summarised below:

- Plan to run a single engine turbine seaplane such as a De Havilland DHC-3T Turbo Otter or Cessna Grand Caravan (see **Figure 2**);
- Proposing to run up to 10 rotations per day (between Jersey and Guernsey);
- Seeking to land/take-off within the Small Roads (**Figure 1**) i.e. within harbour limits.
- A minimum of 2m water depth is required at the landing site;
- When on the water seaplanes are treated as any other vessel and will abide by "COLREGS" and other local, national and international navigation regulations; and
- Proposing to berth at a pontoon situated at Berth 2 under the Albert Terminal.

It should be noted that this document is only concerned with the marine navigational safety of the proposed seaplane service on the water and within St Helier HA area. It will not be considering other factors such as: air safety, noise, customs procedures, etc.

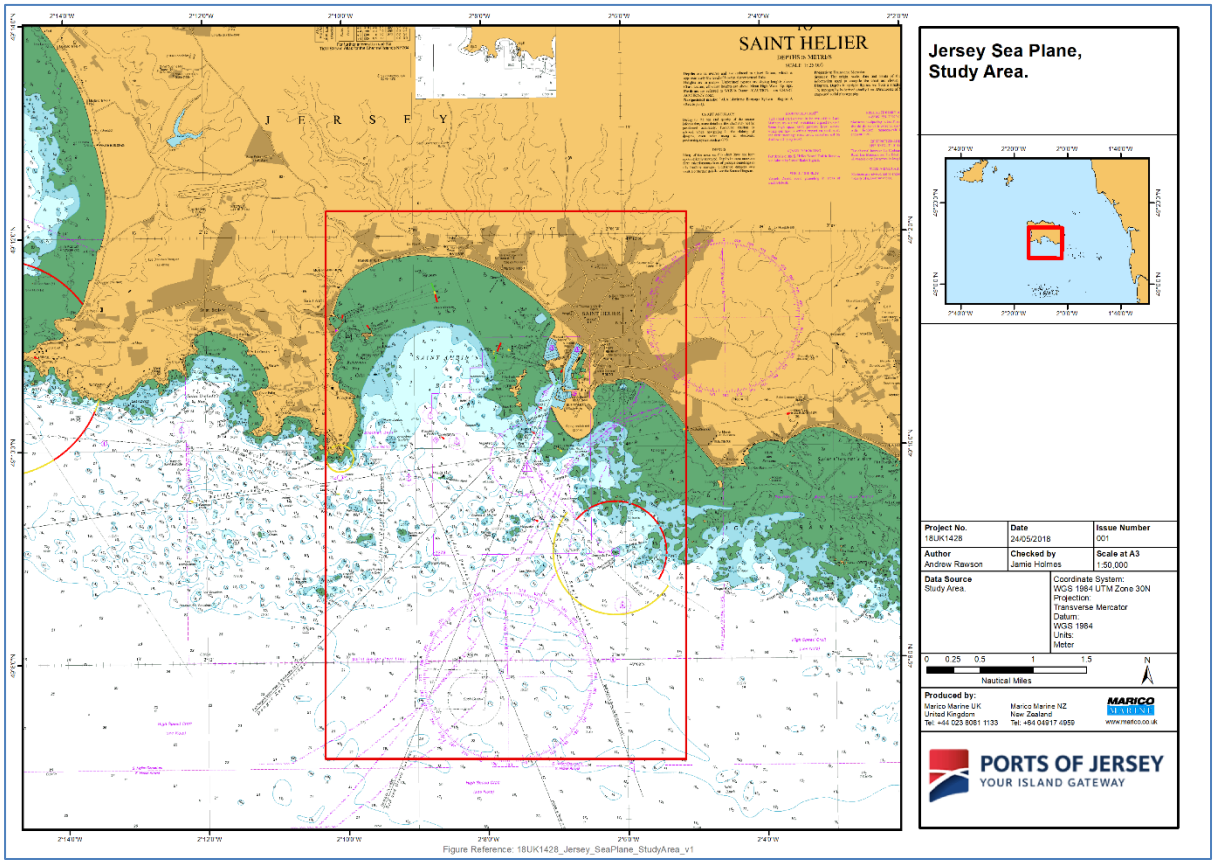


Figure 1: Admiralty Chart – St. Helier Harbour.

1.2 PORTS OF JERSEY MARINE LEGISLATION

The harbours in Jersey are subject to States of Jersey law, rather the United Kingdom law.

The principal legislation is the Harbours (Administration) Jersey Law 1961 as amended in 2016. The recent update includes the establishment of the Harbour Authority, incorporation and the definitions of the harbour limits.

The Ports of Jersey (PoJ) use Jersey marine legislation or permit systems. The following regulation is extracted from "Harbours (Inshore Safety) (Jersey) Regulations 2012":

"***1 Interpretation***

"ship" includes every description of water craft that is used, or is capable of being used, as a means of transportation on, in or under water and includes –

- *A non-displacement craft;*
- *A WIG craft; and*
- *A seaplane.*

5 "Control of passenger ships plying for hire between places in Jersey

- *(1) This Regulation applies to a ship designed to carry more than 12 passengers.*
- *(2) A person must not carry passengers for reward between places in Jersey in a ship to which this Regulation applies unless the person is the holder of a permit that authorizes the person so to carry passengers in the ship.*
- *(3) For the purpose of paragraph (2), a ship that carries passengers and returns to its place of departure in Jersey without putting in at any other place during its voyage is to be taken to be carrying passengers between places in Jersey*
- *(4) A person who contravenes paragraph (2) is guilty of an offence and liable to a fine of level 2 on the standard scale."*

1.3 PORTS OF JERSEY VESSEL TRAFFIC SERVICES (VTS)

Levels of VTS service provided by the PoJ are clearly defined and declared in Admiralty List of Radio Signals:

- Traffic Organisation Service (TOS) in the vicinity of St Helier; and
- Information Service (INS) further off shore and to the East including Gorey.

1.4 INTERNATIONAL REGULATIONS FOR THE PREVENTION OF COLLISIONS AT SEA 1972

Rule 3 (General Definitions) of the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs) states:

"3(a) The word "vessel" includes every description of water craft, including non-displacement craft, Wing in Ground (WIG) craft and seaplanes, used or capable of being used as a means of transportation on water."

Therefore, when a seaplane lands on water, it becomes a vessel and becomes governed by established local, national and international maritime regulations.

1.5 NAVIGATION RISK ASSESSMENT

This NRA will form an essential part of assessing whether the seaplane operation can take place within the port area safely and will ensure that appropriate risk control measures are put in place, eliminating risk where possible, or reducing it to acceptable levels. It is a key part of the industry approved PMSC that states that the NRA process should follow the IMO FSA methodology for risk assessments.

A detailed description of the NRA methodology is provided in **Annex C**.

It should however be noted that PoJ use the "Bow Tie" method of risk assessment rather than the IMO (most likely/worse case) method employed in many UK ports. The "Bow Tie" method is employed for both the harbour and airport operations.

This NRA should therefore be integrated into PoJ preferred method of risk assessment.

1.6 THE PORT MARINE SAFETY CODE AND A GUIDE TO GOOD PRACTICE ON PORT MARINE OPERATIONS

The Port Marine Safety Code (PMSC) sets out a national standard for every aspect of port marine safety. Its aim is to enhance safety for everyone who uses or works in the UK port marine environment. It is endorsed by the UK Government, the devolved administrations and representatives from across the maritime sector and, while the PMSC is not mandatory, these bodies have a strong expectation that all harbour authorities will comply. The PMSC is supported by an accompanying Guide to Good Practice on Port Marine Operations (GtGP). Whilst not governed by UK maritime law the States of jersey have agreed to adopt and comply with the principles of the PMSC and GtGP.

PMSC standards are based on the following general principles established in the code:

- The harbour authority is accountable for their duties and powers and should measure themselves against nationally agreed standards;
- Powers, policies and procedures should be based on formal assessment of hazards and risks, and harbour authorities should have formal safety management systems;
- The aim of a safety management system is to ensure that all risks are tolerable and as low as reasonably practicable;
- Safety management systems depend upon competence standards applied to all parties involved-these have been developed in parallel to the code; and
- Harbour Authorities should monitor and adopt good practice "A Guide to Good Practice" has been developed in parallel with the code.

The GtGP is intended to supplement the PMSC. It contains useful information and more detailed guidance on many issues relevant to the management of ports and other marine facilities.

With regards to risk assessment the PMSC states:

"2.7 - The risks associated with marine operations need to be assessed and a means of controlling them needs to be deployed. The aim of this process is to eliminate the risk or, failing that, to reduce risks as low as reasonably practicable. Formal risk assessments should be used to:

- *Identify hazards and analyse risks;*
- *Assess those risks against an appropriate standard of acceptability; and*

- *Where appropriate consider a cost-benefit assessment of risk-reduction measures.*

2.9 - The process of assessment is continuous so that both new hazards to navigation and marine operations and changed risks are properly identified and addressed. Where appropriate organisations should publish details of their risk assessments."

In September 2016 Marico Marine undertook an audit of PoJ policies and procedures against the PMSC. The findings concluded that: "*from what was seen from the documentation supplied prior to the audit and during the audit itself the Ports of Jersey complies fully with the Port Marine Safety Code".*

2 OUTLINE OF PROPOSED SEAPLANE OPERATION

The operator, Clear Harbour Airways' (CHbrA) goal is to become the leading provider of a frequent, reliable and flexible harbour-to-harbour scheduled seaplane service to the Channel Islands. Initially the route will be a scheduled daylight service between St Helier and St. Peter Port throughout the year. Flying time is estimated to be approximately 15 minutes.

CHbrA will commence operations with one straight floats De Havilland Single Otter (DHC-3T) aircraft and one amphibious Cessna Caravan 208 (see **Figure 2**). The De Havilland Single Otter seaplane is designed as a Short Take Off and Landing (STOL) aircraft and can operate out of very small areas. It is 45 feet (13.7m) long and 60 feet (18.3m) wide

Figure 2: De Havilland DHC-3T Turbo Otter seaplane (l) & The Cessna Caravan 208 (r)

The Cessna Grand Caravan is on amphibious floats meaning it is operational on both water and land making it versatile. The Cessna Grand Caravan has very similar operational performance on water to that of the De Havilland Single Otter seaplane. One of the Cessna Grand Caravans will be used as cover during periods of poor weather when the harbour-based aircraft is unable to operate out of either St. Helier or St. Peter Port; the passengers will be shuttled to and from the airport for their onward journey with CHbrA.

CHbrA's base in St. Helier would be located at Berth 2, Albert Pier Terminal on Albert Quay.

The seaplane can carry a maximum of 14 passengers and will therefore require PoJ to issue a permit as defined in "Harbours (Inshore Safety) (Jersey) Regulations 2012" (see **Section 1.2**). The proposed landing and take-off areas being considered are shown below in **Figure 3**.

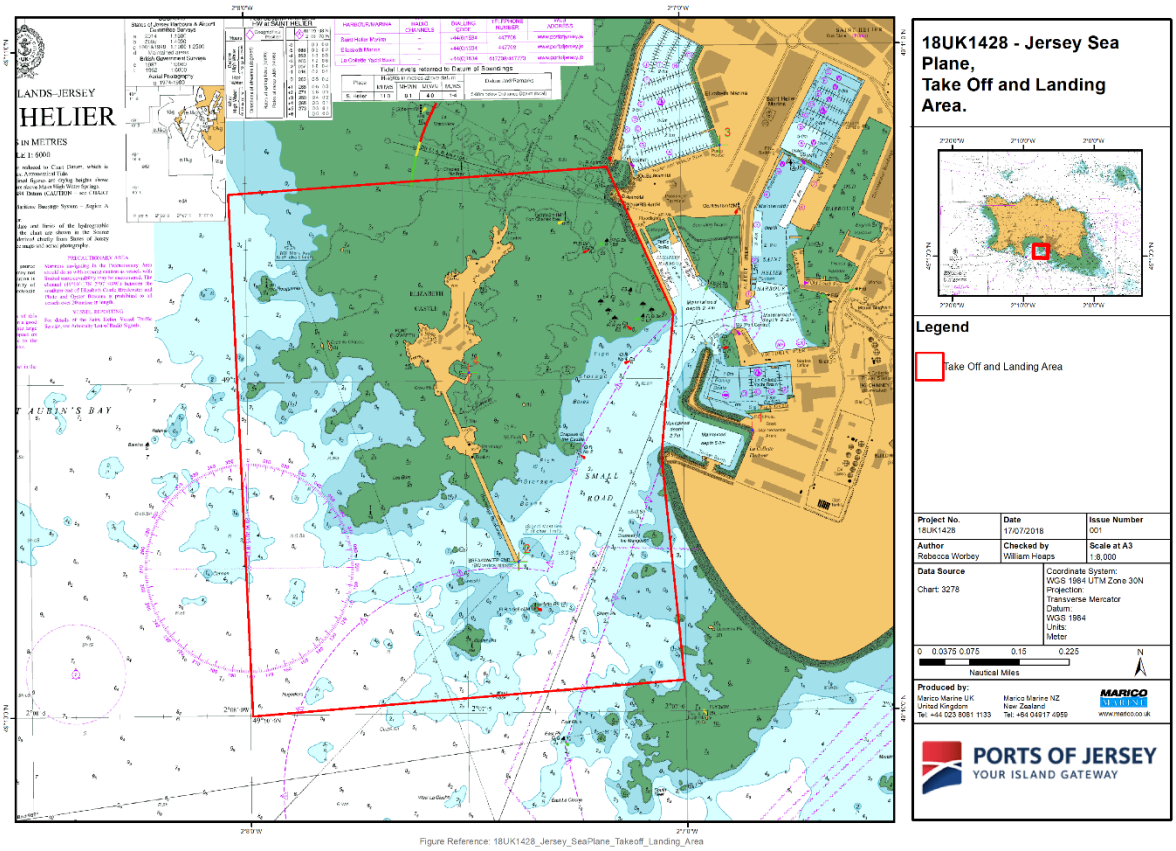


Figure 3: Proposed Take-off and Landing Area in St Helier

CHbrA will fuel the seaplane at the port via a pumped 2,000 litre portable fuel bowser which will be filled at the airport and towed and stored at Albert Terminal base.

Figure 4: No 2 berth Albert Quay (left) and entrance into Saint Helier harbour (51m wide) (right)

A pontoon landing stage approximately 18m x 18m will be used alongside Albert Berth No. 2 (see **Figure 4**) for the transfer of passengers. The internal stairwell will be used by staff and passengers to access the pontoon / jetty.

Harbour Air (based in Vancouver with 35 years seaplane operating experience) are the largest scheduled seaplane service in the world and will initially work as partner to CHbrA. Harbour Air regularly operate:

- More than 22,000 flying hours annually;
- More than 50,000 departures and arrivals; and
- Carry more than 400,000 annual passengers.

During the consultation discussions with representatives of Clear Harbour Airways' and Harbour Air the following facts were established:

- The seaplane will land on the water at approximately 60kts and come to a 5kt speed within 100m and within approximately 5 seconds;
- Take-off from taxiing speed (5kts) is within 300m at a speed of 60kts and will take approximately 15 seconds;
- Aircrew will:
    - Be in communication with the appropriate Air Traffic Control unit; and
    - Be in communication with VTS (Likely to be on Channel 14).
- The seaplane will maintain 45-minute flying time fuel contingency onboard;
- Aircrew must have at least 1,000 hours pilot in command (PIC) float experience and over 2500 hours commercial fixed wing PIC experience. The current aircrew looking to join CHbrA have 10,000 and 3,500 float hours respectively;
- Seaplane berth Albert Berth No. 2 on a 18m rectangular pontoon;
- Access to jetty from Albert Berth No. 2 is via the fixed internal stairwell (subject to algae growth and therefore needs regular cleaning);
- Initially 5 take off and 5 landings per day with potential to increase to 10 round trips (to be confirmed);
- Daylight flying only with seasonal variabilities in timings;
- Operator anticipates 15 – 20% downtime; due to weather and harbour closures etc.;
- Contingency – amphibious seaplane (see **Figure 2**) based at airport;
- Seaplane has a sufficient number of watertight compartments to ensure their rated buoyancy – they are pumped out twice daily i.e. prior to first flight and at the end of the operating day;
- Seaplane will always endeavour to keep clear of all other waterborne craft activity;
- There is no rear vision from cockpit;
- Seaplane will berth port side alongside and when letting go from pontoon ropes trail on float – shore-side staff will indicate when it is clear to manoeuvre off pontoon and turn to starboard;

- Draft of floats minimal 0.2m with minimal wash when under way at full waterborne speed (approximately 60kts);
- The seaplane has a 99.7% mechanical reliability (as operated by Harbour Air);
- Local knowledge endorsement will be required by aircrew, syllabus to be agreed with HM;
- Operator will provide RIB for emergency recovery of seaplane in harbour;
- Water rudders mechanically dropped by the aircrew for steering during taxiing;
- Obstructions will be pushed away by floats or observed during overflight recce prior to landing;
- Pilots in Charge retain the ultimate discretion whilst operating their aircraft to cancel a flight. Circumstances in which this is done would include when they determine that the wind conditions, both on water and in flight, are such that either:
    a) the passenger experience may become uncomfortable and/or
    b) that they have become unsafe;
- Wind operating parameter 15kts speed 90deg from wind direction;
- Operational visibility operating parameter is 2nm;
- Operating depth of water is 2m;
- The seaplane will adopt Visual Flying Rules (VFR);
- The operator, CHbrA has an Air Traffic Management plan that has been vetted by ATC in both Guernsey and Jersey;
- 55,000 take-off /landings Vancouver Harbour – 340 occurrences of which 19 were marine incidents and one was a near miss; and
- Air Operators Certificate (AOC) licence issued in Canada will be used in Jersey as per recommendation from DCA (Director of Civil Aviation).

3 STAGE 1: DATA COLLECTION AND ANALYSIS

Data analysis of the baseline data seeks to quantitatively determine the extent of navigation in the area and requires that data and statistics are available in order to ensure that the risk assessment is as robust and accurate as possible. An assessment of navigation is made based on available data, including:

- Stakeholder consultation, is an important aspect of the risk assessment process and ensures that local knowledge gained by all stakeholders can be effectively elicited and inputted into the risk assessment process. Consultees included:
    - Ports of Jersey Harbour Master's Department including VTS personnel;
    - Ports of Jersey marine pilots;
    - Operators of the proposed seaplane service, CHbrA and their partners Harbour Air;
    - Commercial vessel operators;
    - Terminal / marina Operators;
    - Recreational users of the port;
    - Fishermen; and
    - Other stakeholders as necessary.
- Incident analysis to determine:
    - Trends in accident rates by vessel type/size/transit speed etc.; and
    - Geographic areas of high-risk.
- Port and marina movement data and Automatic Identification System (AIS) data to determine:
    - Vessel types in the area;
    - Gate analysis to discover the frequency and distribution of vessels transiting the area; and
    - Vessel traffic density.

This element of the assessment sets the scope for the risk assessment itself.

3.1 STAKEHOLDER CONSULTATION

Prior to the site visit Marico Marine sent an invitation to all prospective consultees inviting comments on the proposed seaplane operation (**Table 1: List of Invited Consultees**). Over 90 individual written responses were received from various stakeholders following the individual invitations to comment; as well as a general invitation published under cover of a notice to mariners issued by PoJ.

Table 1: List of Invited Consultees

Organisation	Contact Name
RNLI	Nigel Sweeny
St Helier Boat Owners Association	Peter Donne Davis
St Helier Yacht Club	Steve Pearl
Royal Channel Island Yacht Club	Bill Harris
Rowing Club	Ian Blandon
Jersey Fishermens Association	Don Thompson
Dept. of Environment	Greg Morel
St Aubins Boat Owners Association	Alan Le Rossignol
Pilotage Board	Peter Moore
Condor Ferries	Olly Futter
Manches Illes Express	Nelly Depardieu
Channel Seaways – (including visiting vessels/cruise ships)	Iain Phillips
Channel Island Lines	Richard Parker
Jersey Heritage	Jeremy Swetenham
La Collette Fuel Consortium	Adrian Barker
St Helier Port Services – (visiting vessels/cruise ships)	Howard Le Cornu
Emergency Planning Officer	Chris Love
St Helier VTS	Bjorn Risebrow
Jersey Marinas	Mike Tait
Iris Freight	Dave Nuth
Jersey Oyster	Chris Le Masurier
Rozel Shipping	Edward Dunn

Consultation meetings were conducted in St. Helier on 24, 25 and 26 April 2018. The following table (**Table 2**) gives an outline programme of the visit undertaken by Marico Marine consultants.

Table 2: Stakeholder Consultation Meeting Programme

Date	Time	Activity	Consultees
Tuesday April 24th	10:30 – 13:00	Introductory meeting with HM followed by harbour familiarisation – tour in Duc de Normandie.	Captain W Sadler and PoJ tug crew
	13:00 – 16:00	Meet service operators for full description of proposal	CHhrA, Harbour Air & HM
Wednesday April 25th	09:0 0- 10:00	Meeting with Jersey Marinas.	Mike Tait.
	10:00 – 12:00	Consultation with Port operational staff.	HM staff, VTS staff, Marine pilots
	12:00 – 14:00	Harbour tour aboard pilot vessel.	CHbrA, Harbour Air and pilot boat crew
	14:00 – 17:00	Stakeholder consultation meeting (1)	Condor Ferries, Sea Safaris, RYA.
	19:00 – 20:30	Stakeholder consultation meeting (2)	51 x recreational / leisure users'.
Thursday April 26th	09:00 – 12:00	Stakeholder consultation meeting (3)	G Morel -Dept. of Environment. I Buxton – Ornithology. Nick - yachtsman
	12:00 – 14:00	Meeting with harbour staff re NRA procedure	AHM and pilot
	14:00 – 16:00	Washup, with HM and CHbrA and Harbour Air.	HM, CHbrA & Harbour Air

A record of each of the consultation meeting notes can be found in **Annex A**.

Following the invitation to stakeholders for comments, all responses were analysed for common themes and concerns.

Most of the responses were from leisure users of the harbour who had very similar concerns which were well co-ordinated by the various yacht clubs and associations. This was also reflected in the very well attended evening meeting the minutes of which are included in **Annex A.**

The written responses ranged from very short to detailed statements either in support of (or more generally) against the proposals. The majority did however offer constructive opinion on likely potential hazards associated with a seaplane service and included a wealth of detail on existing traffic density and hazards which should be included in the NRA.

In general, commercial organisations and non-leisure representative associations were either in favour of a seaplane service or neutral, and did not identify many new hazards beyond congestion in the Small Roads

Individual leisure users, their representative groups and some commercial organisations directly involved in the leisure industry were either strongly against the proposals or neutral in their responses, though there were a number of responses which were supportive of the proposal if the operation could be carried out safely.

The analysis of the consultation responses is given in **Table 3** below, which has been used to inform the Hazard Identification (see **Section 4: Stage 2: Hazard Identification**)

Table 3: Key Themes Identified in Written Responses

Infringement of 5Knt Speed limit	Congestion in Small Roads	Delays caused to other harbour users	Nourrices present hazard	Fear of increased regulation	Specific Red-light issues (delay)	Bird strikes	General Collison / contact fears (inc. buildings)	Weather	Noise	No specific risk identified
18	72	39	16	29	12	1	21	12	8	11

In terms of hazard identification, the two hazards most frequently identified were collision (seaplane with another vessel, especially leisure vessel) and contact (seaplane with fish boxes [Nourrices], or other floating obstruction).

Collison or contact indirectly caused by additional traffic in the small roads (additional congestion leading to two vessels colliding, or a vessel contacting an obstruction) was also frequently highlighted.

Many responses sought further information about the proposed service, or highlighted concerns which were not relevant to the safety of navigation risk assessment. (For example, aviation and customs regulation issues).

Furthermore, many of the responses highlighted concerns about possible future controls, as well as identifying hazards. As noted in **Table 3** above, the most common concerns were:

- Delays to existing harbour users caused by additional commercial traffic;
- Delays to existing harbour users caused by seaplanes if additional controls were put in place limiting access to certain harbour areas while seaplane operations were underway;
- Concern that the existing 5 knot speed limit control would be breached or extended;
- Specific concerns that the existing “red lights” may be used more frequently limiting harbour entrance and exit windows; and
- A general concern that more regulations would be introduced to the detriment of existing users (e.g. exclusion areas, new traffic management systems, more traffic lights or similar controls).

Other general concerns raised related to the difficulty of communication between the seaplane and shore, and general potential communication issues with visiting yachts (especially those where English may not be first language). There was a general concern mentioned by several respondents that the presence of the new service may in some way discourage visitors, but this was not translated into specific hazard or risk control issues.

These issues have been considered under **Section 6 - Stage 4: Risk Control Measures.**

3.2 INCIDENT ANALYSIS

3.2.1 Port Incidents

Data was obtained from the port incident database covering the period January 2014 to March 2018. This was split into the following categories:

- Contact
- Collision
- Grounding
- Traffic regulation infringements (generally ignoring red light signals)

This data has been collated to extract relevant incidents, and categorisation checked, and is summarised below in **Table 4.**

Table 4: PoJ Incident Summary

Year	Contact	Collison	Grounding	Infringement	Sinking
2014	2	4	3	4	0
2015	3	15	2	13	0
2016	1	5	1	37	0
2017	2	3	0	9	0
2018 (Jan – Mar)	1	0	0	1	1
Totals	**9**	**27**	**6**	**64**	**1**

Contact and collision are the most frequent category of hazard identified from the port incident records, but despite the relatively high traffic density, especially during the summer months, incident frequency is low. (The peak of collision reports during 2015 is not clearly explained, but does seems to be unusual).

The most significant number of incidents do not relate to a hazard, but to infringement of control measures, most commonly vessels ignoring traffic control signals at the harbour entrance.

3.2.2 Coastguard Incidents

To further support the hazard identification and analysis of the frequency of incidents, a review of Jersey Coastguard and Jersey Harbours incident database was also conducted. The following two tables indicate traffic reports logged with Jersey Coastguard within Jersey's Territorial Waters, most of which will be for voyages originating / finishing in St Helier. The statistics shown below in **Table 5** and **Table 6** (including 2017 YTD totals in December 2017) give a cross section of the number of incidents during the height of summer and during mid-winter.

In summary, there were 2 Search and Rescue incidents during December and 24 during July. Similarly, while no persons or vessels were assisted during December, 43 persons and 15 vessels were assisted during July. This trend corresponds closely with vessel annual vessel traffic trends (see **section 3.3** below).

The most common reasons for incidents were recorded as:

- Mechanical Failure
- AGI (Alarm with Good Intent)
- Concern for Welfare
- Stranding
- Fouled Gear
- Hits rocks / Object /Grounding

Table 5: Jersey Coastguard Incident Database July 2017

JERSEY COASTGUARD

Incident Summary

July 2017

0 Operational Downtime (Hours)

No SAR Incidents	
July 2017	24
July 2016	28
2017 To Date	79
2016 to Date	76

Type of Incident 2017 To Date	
AGI	10
Hoax	0
Casualty	69

July	Yr to Date	July Call outs	Launch Time Urgent (Benchmark)	Launch Time Non Urgent	On Scene Time Urgent	On Scene Time Non Urgent
STH ALB	24	5	- (15)	17	-	39
STH ILB	6	3	9 (15)	-	20	-
STC ILB	9	1	- (15)	17	-	35
FIRE/MARINE/CLIFF	1 / 15 / 2	0 / 5 / 0	10	24	17	35
CIAS/HELO	3 / 4	0 / 0				
PORTS VESSEL/CG1	5 / 16	1 / 2				
SAR inv. AMB/DOC	6 / 0	2 / 0				
SAR inv. POLICE	8	1				
SAR inv. OTHER	25	9				

CASUALTY DETAILS	July	2017 to Date
Persons Assisted	43	146
Vessels Assisted	15	41
Persons Saved	0	6
Vessels Saved	0	1
Persons Lost	0	1
Vessels Lost	0	0

REASONS FOR INCIDENT 2017 TO DATE	
1	26 x Mechanical Failure
2	10 x AGI
3	7 x Concern for welfare
4	7 x Fouled Gear
5	6 x Stranded
6	3 x Vessel Hit Rocks

VESSEL'S REGSTRATION 2017 TO DATE	
CSIS Craft	4
Jersey	26
Other CI	2
UK	4
France	9
Other	0

Radio TRs	July	2017 to Date	Jul 2016	2016 to date	2016	2015
Total Traffic Reports (TRs)	1061	3971	1294	3039	5399	4762
Pleasure Boats TRs	479	1965	747	1801	3045	2874
Commercial Vessels TRs	582	2006	547	1238	2354	1888
Check in reports Total	912	3353	1180	2731	4816	4314

Preventative Actions during July

VISITS

Type	Frequency of Visits	No. People Reached
MOC Visit	1	3
Total Face to Face		

MEDIA - Facebook Releases

Type	No. Reached
Post Engagements for July	30,597
Total Via Media	

Oil Pollution Incidents	Dat	Type		Source	Notes

Enforcement and regulatory	Jul 17	Year to Date	Jul 2016	2016 to date
Report received	5	11	4	7
Accident/incidents investigated	1	7	2	4
Regulations Warnings given	2	8	1	2
HM Directions Warnings given	7	7	1	2
ColRegs Warnings Given	0	0	1	2
Bans Issues for breaches of Ts & Cs				
Prosecutions	2	2	0	2
Beach Concession Permits issued	1	1	2	9
Charter Boat Permits issued	0	0	2	18
Fishing Vessel Safety inspections	3	3	1	24
Local Knowledge Endorsements issued	0	0	3	9

Notes:

1: Persons - Life not in immediate danger, ie v/l needs tow or stranded person in a safe position but with no access to shore.
Vessel - not in immediate danger, ie v/l needs tow or is in safe water or a safe anchored position, but unable to make port.
2: Persons - Life was in danger and not able to further assist themselves.
Vessel - was in danger and not able to further assist itself.
3: Person lost before, during or as a result of incident. Not used for human body found drifting & recovered.
Vessel broken up or sunk during incident but may subsequently be found /salvaged

Table 6: Jersey Coastguard Incident Database December 2017

JERSEY COASTGUARD

Incident Summary

December 2017

0 Operational Downtime (Hours)

No SAR Incidents	
December 2017	2
December 2016	11
2017 To Date	128
2016 to Date	144

Type of Incident 2017 To Date	
AGI	18
Hoax	0
Casualty	110

December	Yr to Date	December Call outs	Launch Time Urgent (Benchmark)	Launch Time Non Urgent	On Scene Time Urgent	On Scene Time Non Urgent
STH ALB	40	0	- (15)	-	-	-
STH ILB	9	0	- (15)	-	-	-
STC ILB	18	0	- (15)	-	-	-
FIRE/MARINE/CLIFF	1 / 22 / 2	0 / 0 / 0	-	-	-	-
CIAS/HELO	6 / 8	0 / 1				
PORTS VESSEL/CG1	11 / 23	0 / 1				
SAR inv. AMB/DOC	9 / 0	0 / 0				
SAR inv. POLICE	14	1				
SAR inv. OTHER	41	1				

CASUALTY DETAILS	December	2017 to Date
Persons Assisted	0	246
Vessels Assisted	0	69
Persons Saved	0	7
Vessels Saved	0	1
Persons Lost	0	1
Vessels Lost	0	1

REASONS FOR INCIDENT 2017 TO DATE	
1	43 x Mechanical Failure
2	18 x AGI
3	10 x Concern for welfare
4	9 x Stranded
5	9 x Fouled Gear
6	8x Vessel Hit Rocks/Object/Grounding

VESSEL'S REGSTRATION 2017 TO DATE	
CSIS Craft	5
Jersey	46
Other CI	2
UK	4
France	18
Other	1

Radio TRs	December	2017 to Date	Dec 2016	2016 to date	2016	2015
Total Traffic Reports (TRs)	109	6508	77	5268	5399	4762
Pleasure Boats TRs	29	3156	22	2981	3045	2874
Commercial Vessels TRs	80	3352	55	2287	2354	1888
Check in reports Total	67	5431	38	4746	4816	4314

Preventative Actions during December

VISITS

Type	Frequency of Visits	No. People Reached
MOC Visit		Awaiting Figures.
Total Face to Face		

MEDIA - Facebook Releases

Type	No. Reached
Post Engagements for November	Awaiting Figures
Total Via Media	

Oil Pollution Incidents	Dat	Type		Source	Notes

Enforcement and regulatory	Dec 17	Year to Date	Dec 2016	2016 to date
Report received	1	14	1	24
Accident/incidents investigated	2	9	1	10
Regulations Warnings given	0	9	1	10
HM Directions Warnings given	0	10	1	7
ColRegs Warnings Given	1	1	0	4
Bans Issues for breaches of Ts & Cs				
Prosecutions	0	2	0	2
Beach Concession Permits issued	0	14	0	10
Charter Boat Permits issued	0	18	0	18
Fishing Vessel Safety inspections	0	39	1	36
Local Knowledge Endorsements issued	2	11	0	10

Notes:

1: Persons - Life not in immediate danger, ie v/l needs tow or stranded person in a safe position but with no access to shore.
Vessel - not in immediate danger, ie v/l needs tow or is in safe water or a safe anchored position, but unable to make port.
2: Persons - Life was in danger and not able to further assist themselves.
Vessel - was in danger and not able to further assist itself.
3: Person lost before, during or as a result of incident. Not used for human body found drifting & recovered.
Vessel broken up or sunk during incident but may subsequently be found /salvaged

3.3 VESSEL TRAFFIC ANALYSIS

A full understanding of vessel traffic in the SHA area is an important and integral part of any NRA and therefore the following tools / techniques were used to analyse the traffic disposition in St. Helier SHA, including the traffic profile (i.e. numbers and types), traffic density and traffic routes:

- Vessel movement statistics supplied by PoJ;
- Traffic plots; and
- Traffic density analysis.

3.3.1 Vessel categories and St. Helier Harbour areas

St. Helier harbour is used by a wide variety of commercial and recreational vessels and it comprises a number of distinct areas, each with different geographic and operational characteristics. In order to focus the traffic analysis and to help structure the overall NRA, the following vessel type categories (**Table 7**) and harbour areas (**Table 8**) were used.

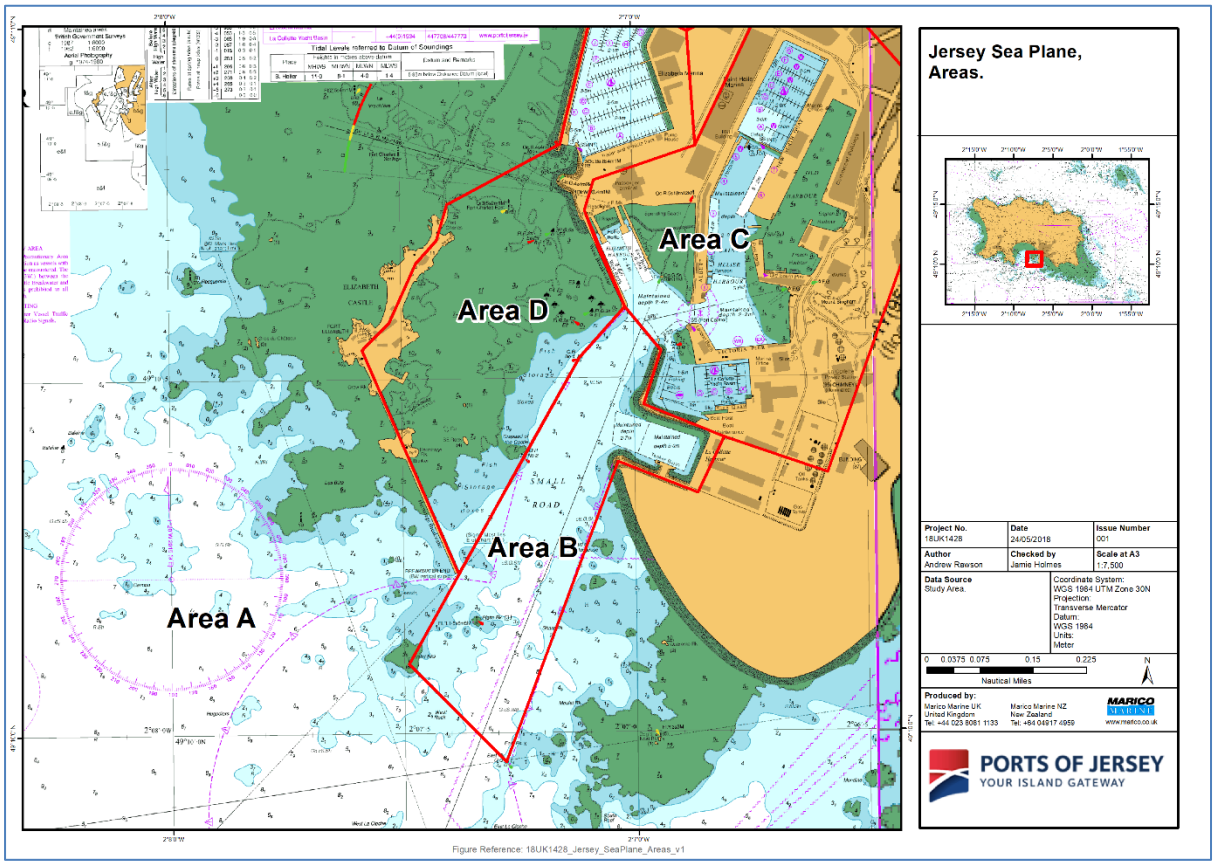
Table 7: Vessel Categories.

Ref	Vessel Type Category	Including
A	Passenger Ferry	Condor Ferries, Manche Iles Express.
B	Commercial Vessels	General cargo vessels.
C	Vessels / Workboats / Fishing vessels	Charter vessels: Jersey Belle, Sea Safaris, RYA vessels and St Helier Harbour Authority Vessels (tugs, pilot boats etc.).
D	Recreational Vessels	Sailing Yacht, Motor Yacht, Sailing Dinghy, Rigid Hull Inflatable Boat (RHIB), Personal Watercraft (PWC), and Rowing Craft.
E	Seaplane	New vessel category for this risk assessment.

Table 8: Harbour Areas

Ref	Area Name	Comments
A	Area A	Approaches to St Helier harbour
B	Area B	The Small Roads channel.
C	Area C	St. Helier Harbour (Albert Quay etc.) as defined on Admiralty Chart
D	Area D	Inner harbour areas including access to and from the marinas and areas across to Elizabeth Castle causeway.

Figure 5: Harbour Areas



3.3.2 Vessel Traffic Data

In order to understand the level of activity in St. Helier Harbour the following data has been collated and considered during the Risk Assessment process.

3.3.2.1 Commercial Traffic

Commercial traffic movements are summarised **Table 9** in and **Table 10** below. Both tables show ship arrivals, therefore vessel movements are double these numbers. In-harbour moves are infrequent and not relevant to the Small Roads.

Table 9: St Helier Harbours Commercial Vessel Arrivals by Month

Month	2017	2016	2015	YTD 2017	YTD 2016	YTD 2015
January	143	113	102	143	113	102
February	131	114	120	274	227	222
March	176	142	143	450	369	365
April	232	209	229	682	578	594
May	272	245	254	954	823	848
June	268	249	230	1,222	1,072	1,078
July	290	277	259	1,512	1,349	1,337
August	307	286	264	1,819	1,635	1,601
September	247	248	228	2,066	1,883	1,829
October	208	201	168	2,274	2,084	1,997
November	147	141	120	2,421	2,225	2,117
December	153	158	128	**2,574**	**2,383**	**2,245**

Table 10: St Helier Harbour Annual Commercial Vessel Movements by type

Type	2017	2016	2015
Passenger	1148	1151	1296
Freight	1373	1135	894
Fuel	43	47	39
Other	10	50	16

It is noted that peak traffic densities occur in the summer months, due to increased passenger ferry services. The majority of vessels recorded are regular passenger and freight services accounting for 5,042 movements in 2017, or an annual average of approximately 14 movements per day. However, this average increases to 20.4 movements per day in the peak month (August).

The proposed additional 10 – 20 seaplane movements per day will therefore significantly increase average daily movements.

3.3.2.2 Condor Ferries

Condor Ferries currently operate four ships, connecting the UK, Guernsey, Jersey and St. Malo. There are two high-speed ferries “Condor Liberation” and “Condor Rapide which operate year-round but at increased frequency during summer months. Two other vessels provide all-year round car and passenger service provided by “Commodore Clipper”, and the daily freight service operated by “Commodore Goodwill”.

3.3.2.3 Manche Iles Express Ferries

Manche Iles Express runs high speed ferries from Jersey to Sark, Guernsey, Dielette, Granville and Carteret. The service is seasonal (March to December, with the majority of sailings being in the summer months (April to September). Timetables are not daily, but in the busy periods the services account for 4-6 ship movements per day. It is noted that this service operates from the Albert Quay, adjacent to the proposed seaplane berth, and requires harbour controls (e.g. red lights) similar to those that are envisaged for seaplane movements.

3.3.2.4 Other vessels

With the very significant exception of leisure vessels (see below), there are few other vessel movements formally recorded in St.Helier Port.

Most significant of these are fuel tankers using the dedicated fuelling berth which is outside the main harbour entrance; on average there is less than 1 tanker arrival and departure per week.

In addition, there is an average of 10 movements a week of cargo liners and ad hoc cement vessel calls. PoJL averages 10-15 cruise ship calls per year from anchorages with associated passenger tender movements, mainly to Albert Pontoons.

Significant numbers of small fishing vessels are based within the port (mainly La Collette Yacht Basin) and frequently transit through the Small Roads, as well as making use of the fish holding “boxes” (Nourrices) moored between the harbour entrance and Elizabeth Castle. Numbers of movements are not recorded, but it was reported that fishermen plan their transits to avoid congested periods and the known commercial traffic arrival and departure times.

3.3.2.5 Recreational Vessel Movements

There are four marinas in St. Helier harbour as follows:

- Elizabeth Marina – 500 berths;
- St Helier Marina – 300 berths;
- La Collette Yacht Basin – 120 berths; and
- Old Harbour (drying) – 600 berths.

Additionally, St Helier Yacht Club has approximately 3,000 members with vessels in the marinas and ashore.

Figure 6: Elizabeth Marina (top), "Old" Harbour (l) and St Helier Marina(r)

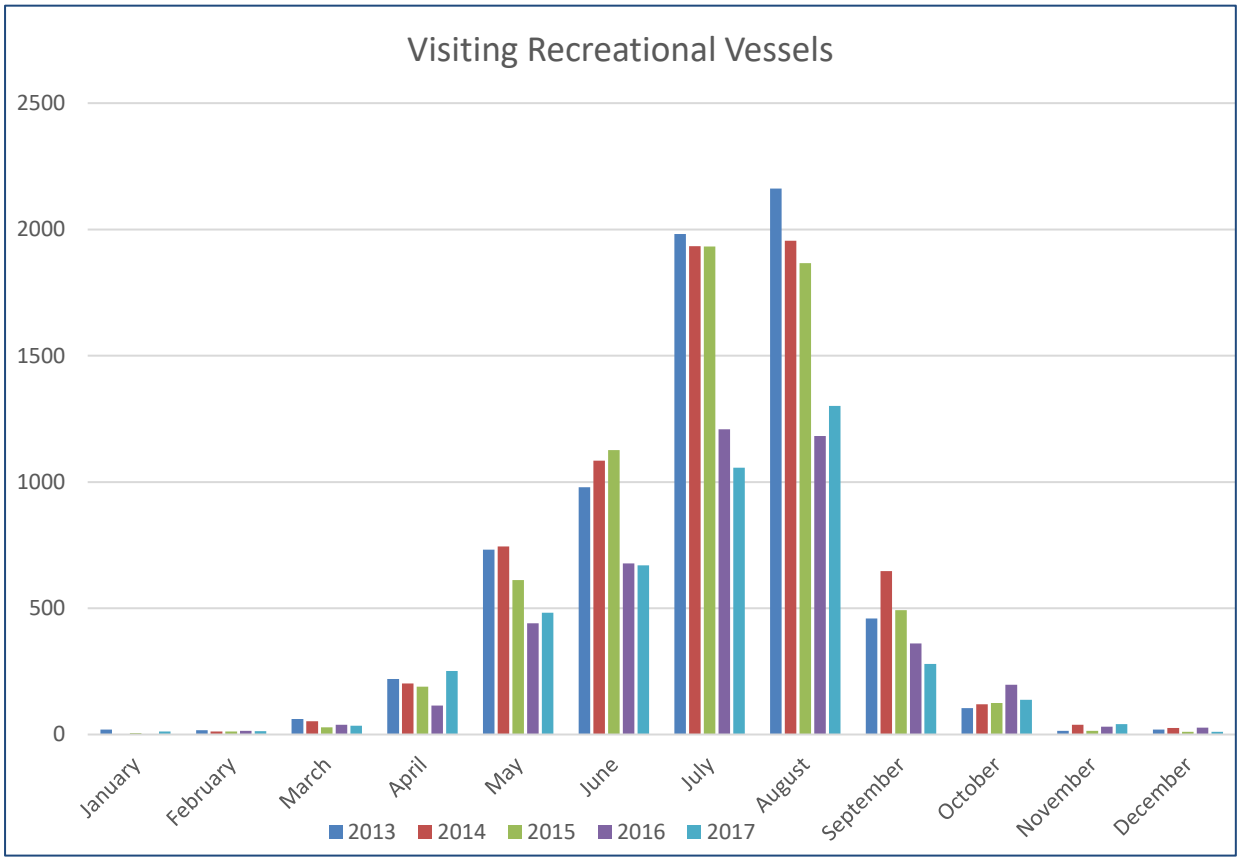
During stakeholder consultation with the PoJ Group Leisure Manager it was established that there are approximately 4,500 annual visitor leisure vessels, the majority of which are between April and October.

The Group Leisure manager provided the following information regarding recreational vessel visitor movements in St. Helier between 2013 and 2017. It is understood that no formal records are kept of movement of local recreational craft; however stakeholder feedback was clear that recreational traffic is very significant, especially during summer weekends and during organised events (regular racing, regattas). It is reasonable to assume (and supported by stakeholder feedback) that peaks in local recreational vessel movements will mirror the peaks in visitor movements shown in **Table 11** below.

Table 11: Recreational vessel movement annual returns 2013- 2017 inclusive

No of Vessels	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec	Total
2013	20	17	61	220	732	979	1,982	2,162	459	105	14	19	**6,770**
2014	2	12	52	202	745	1,084	1,934	1,955	647	120	39	26	**6,818**
2015	6	12	29	189	612	1,126	1,932	1,866	493	125	14	11	**6,415**
2016	2	14	39	115	440	677	1,208	1,182	361	197	31	27	**4,293**
2017	12	13	35	252	482	670	1,057	1,301	279	138	41	11	**4,291**

Figure 7: Visiting Recreational Vessel Trends



3.3.3 Traffic Plots

The Port of Jersey does not routinely collect AIS data for the port and approaches; however Marico Marine does have access to a suitable AIS data set dating from July 2014, which corresponds to the busiest seasonal traffic peaks for the port.

The plots below indicate vessel tracks for the whole period for all vessel classes and also split into vessel types.

These plots should be considered with these caveats:

- The data is four years old, though still considered relevant for indicative purposes; and
- Fishing vessels and recreational craft in particular are not required to carry AIS transmitters, and the numbers of tracks shown for these classes of vessels will be a significant under representation. However, the general areas used by each class of vessel is clearly highlighted (e.g. fishing vessel visits to Nourrices)

Figure 8: Vessel Tracks - All Vessel Types

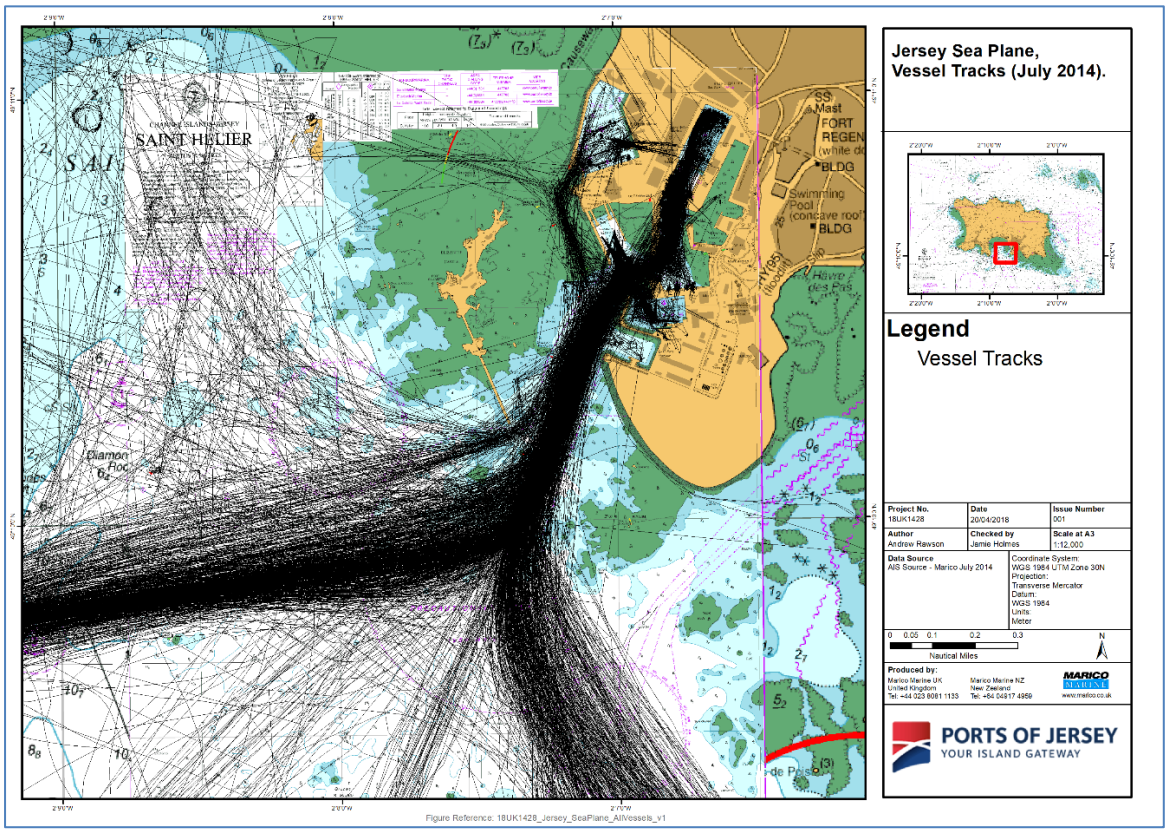


Figure 9: Vessel Tracks – Cargo Vessels

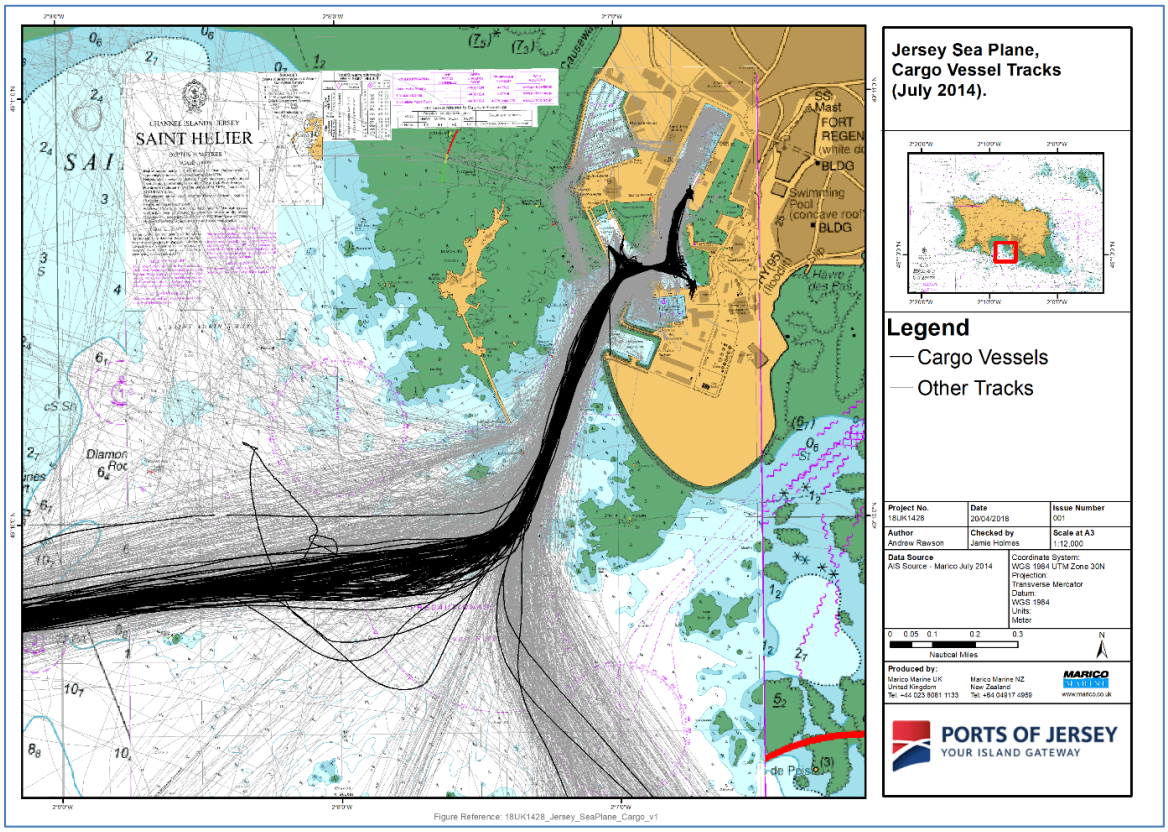


Figure 10: Vessel Tracks - Passenger Vessels

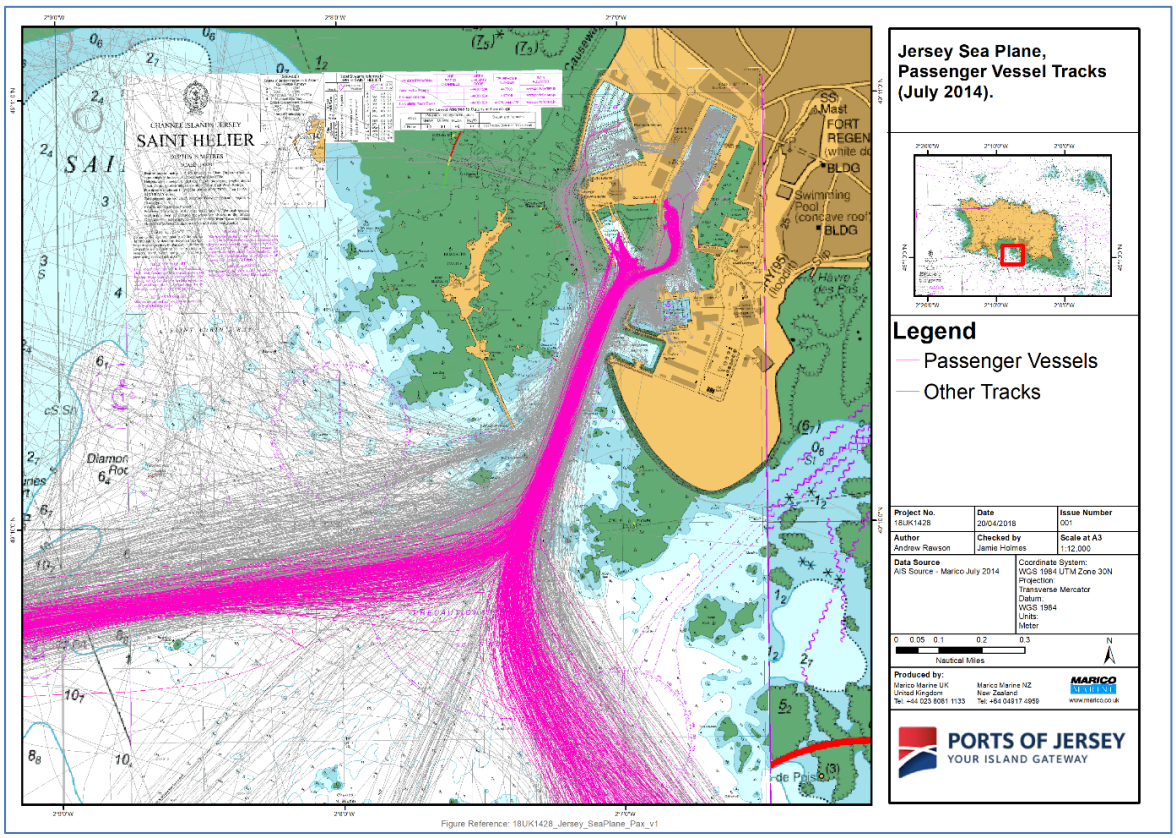


Figure 11: Vessel Tracks - Tankers

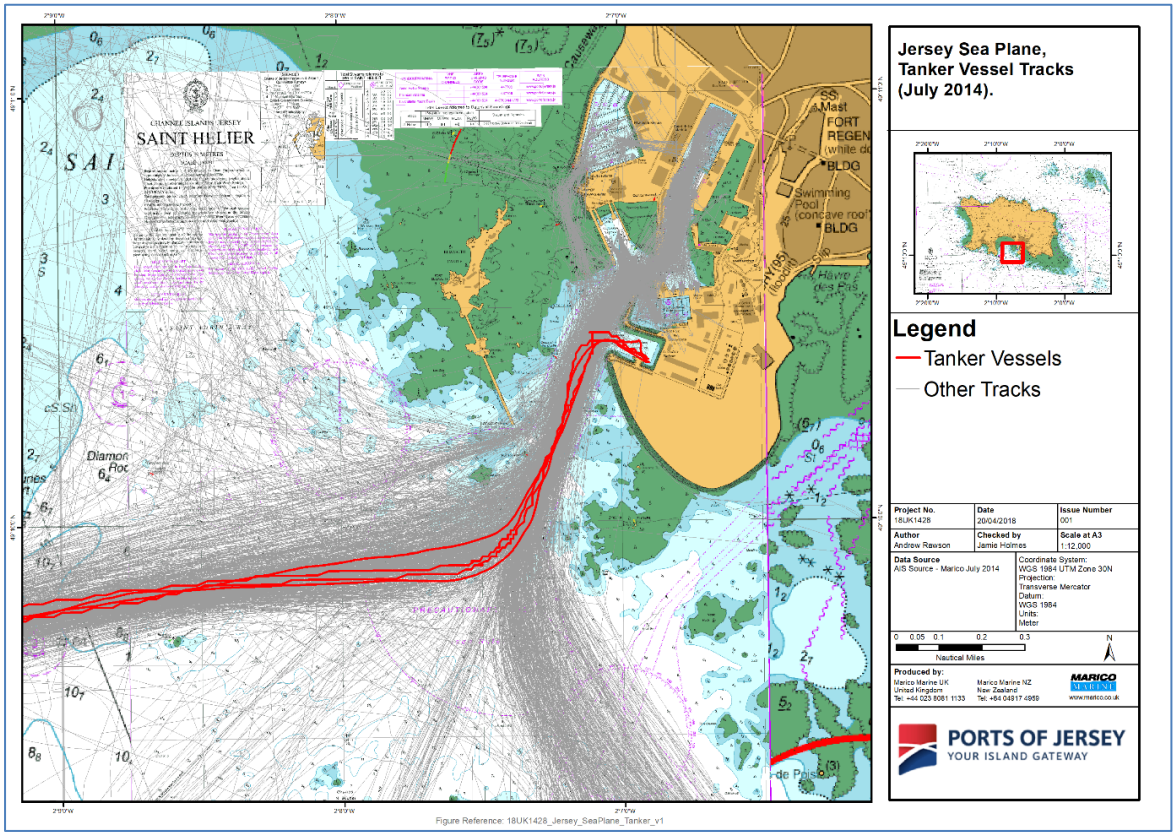


Figure 12: Vessel Tracks - Fishing Vessels

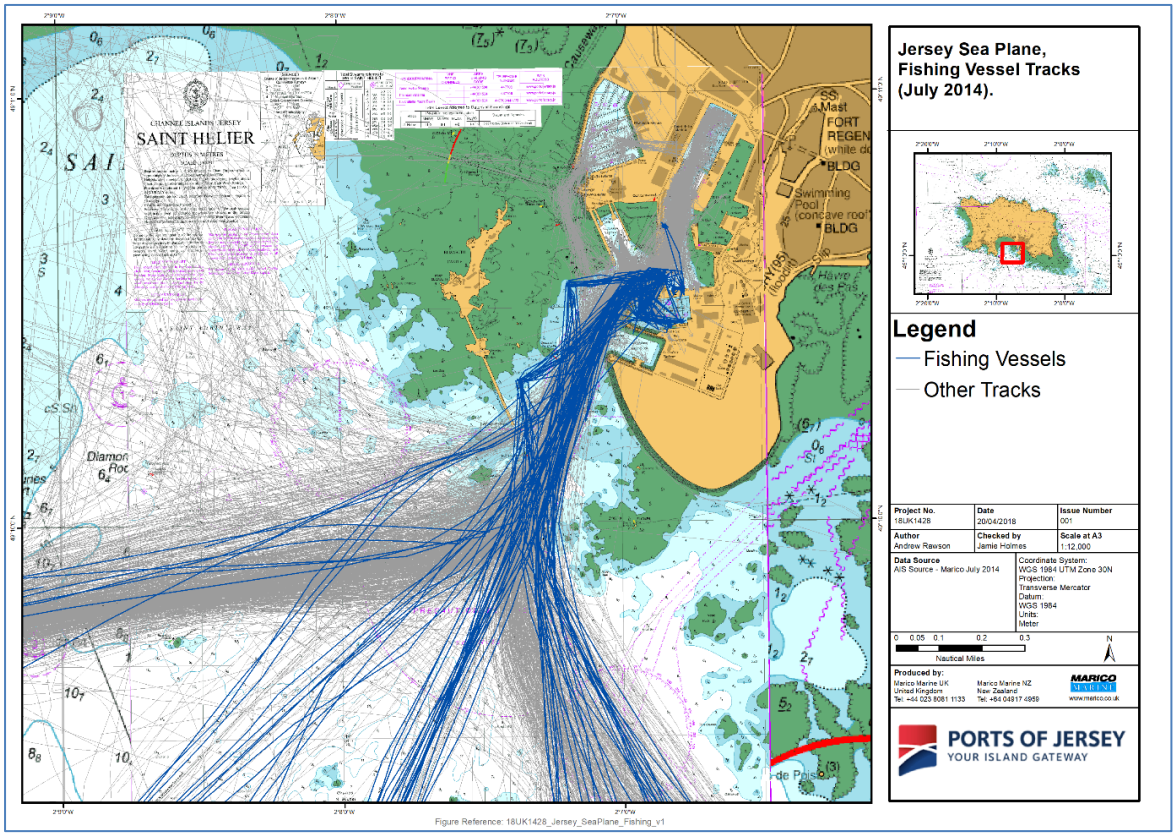


Figure 13: Vessel Tracks - Recreational Vessels - weekdays

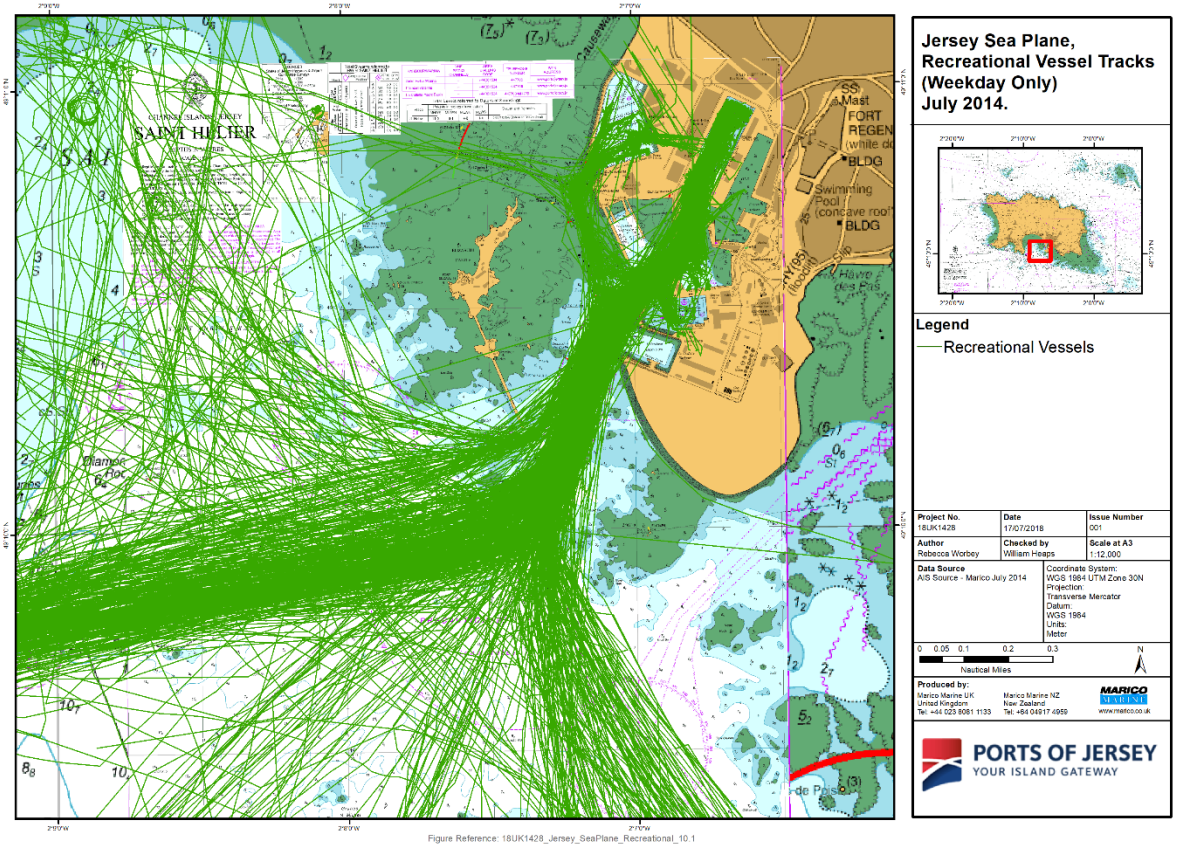
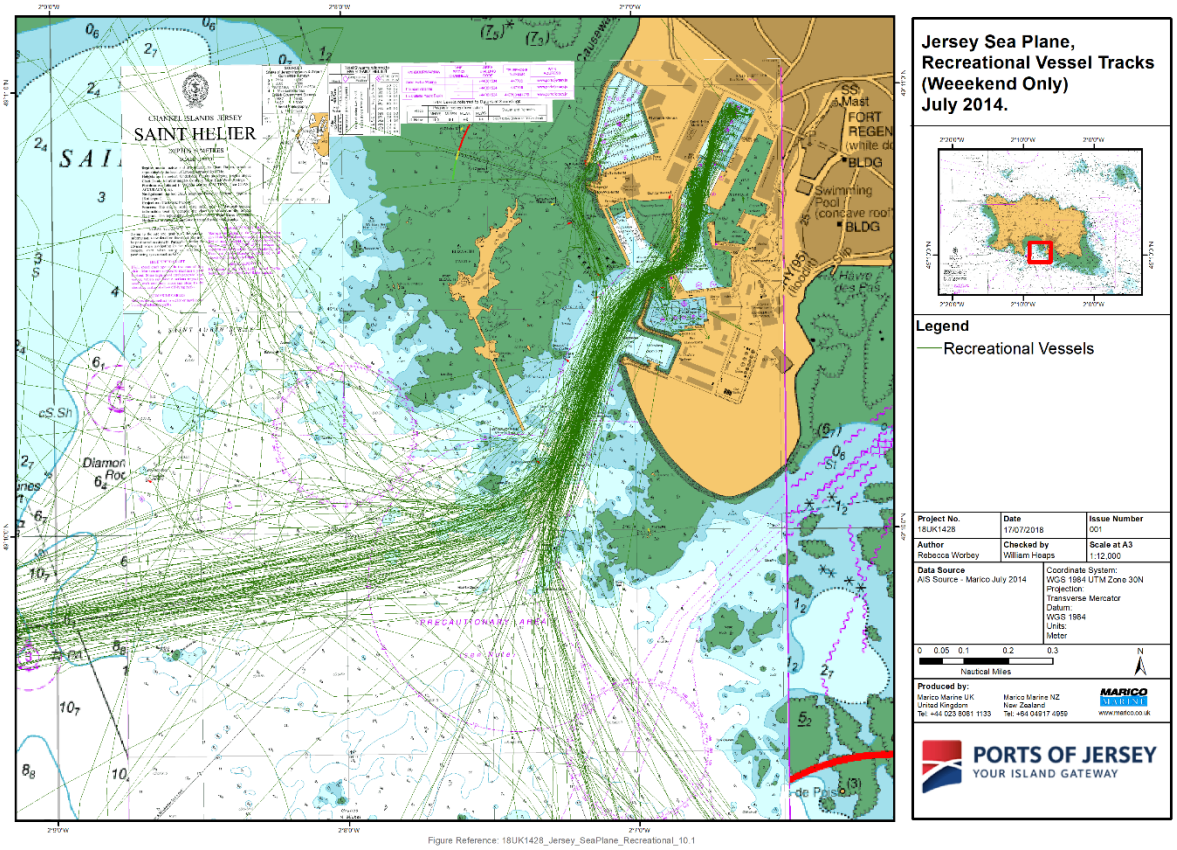


Figure 14: Vessel Tracks - Recreational Vessels – weekends



4 STAGE 2: HAZARD IDENTIFICATION

The IMO Guidelines defines a hazard as *"something with the potential to cause harm, loss or injury"*, the realisation of which results in an accident. The frequency that the hazard will be realised can be combined with an estimate of the consequence, and this combination is termed "risk". Risk is therefore a measure of the "likelihood" and the "consequence" of a particular hazard occurring.

It is important that the hazard identification process follows a structured and systematic process that is thorough and comprehensive. It must identify common hazards as well as hazards that may never have occurred in Jersey Harbours in the past, but are nonetheless possible and credible.

It should be noted that the Port of Jersey uses a different risk assessment / hazard identification methodology from that used by Marico Marine (The "Bow Tie" method). Both methodologies are appropriate and deliver comparable results. The following discussion relates to the Marico standard methodology (see **Annex C** for detailed description).

4.1 HAZARD IDENTIFICATION

Hazards relating to navigation within St. Helier Harbour *following the introduction of the Seaplane service* were identified using a variety of methods, including stakeholder consultation meetings, review of incident records, and traffic analysis. The Data Gathering and Vessel Traffic Analysis (Stage 1) was the principal input to the Hazard Identification (see **Section 4**).

Previously identified hazards were discussed and confirmed in consultation with harbour staff, across; the areas of the port, vessel type, and hazard categories (see **Section 4.1.1**)

Vessel types were summarised into commercial vessels and non-commercial vessels (such as fishing and recreational craft).

4.1.1 Hazard Categories

In order to focus the overall NRA and provide a structured hazard identification process, the following hazard categories were used (**Table 12)**. Categorising hazards in this way also helps in the determination of risk control measures pertinent to the category and geographic location of each hazard.

Note that Health and Safety (H&S) hazards are not included within the scope of this NRA, for example slips/trips/falls.

Table 12: Hazard Categories

Hazard Category	Comments
Collision*	When two or more vessels impact each other whilst manoeuvring.
Contact*	When one or more vessels makes physical contact with a fixed object such as a pier / jetty / dock entrance or a mooring buoy. This hazard is sometimes referred to as "allision" when contact is made with a fixed structure, or a "striking" when contact is made with a floating structure (e.g. navigation buoy or anchored or moored ship).
Grounding*	When a vessel unintentionally makes contact with the seabed.
Mooring Incident / breakout	When a vessel ranges (moves excessively) whilst alongside the berth or when one or more mooring lines fail resulting in the vessel unintentionally breaking away from its moored position. This may be due to a combination of strong winds, large waves, wash or the effect of passing vessels, adverse mooring arrangements (bollards) or poor seamanship / mooring technique.

*These hazard categories are treated as consequences in the PoJ hazard register

4.2 HAZARD RISK REGISTER

The identified hazards shown above in **Table 13** were reviewed and scored at a meeting held in Marico Marine offices on 25 May 2018. Each hazard was discussed in turn and the circumstances and frequency of previous incidents were discussed to inform the assessment of likelihood. On completion of the assessment, the ranking of hazards was reviewed and discussed to determine whether they were an accurate reflection on the level of risk for seaplane operations in St. Helier Harbour, both in significance and order.

Note that the hazard identification process aimed to identify all potential hazards and then to amalgamate similar hazards together to provide a total number that can be effectively managed within the port / harbour safety management system.

Following this hazard identification process an initial list of over 40 vessel type / geographical area / hazard category combinations was refined to a total of 16 hazards for the St. Helier area, as shown in **Table 13**. The full hazard logs with additional information are shown in **Annex D**. This is considered to be a robust and manageable list of appropriate hazards for future review and re-assessment.

All hazards relate to the act of vessel movements in the harbour involving the movement of a seaplane on the water, prior to landing and during take-off. The following hazards were therefore identified:

Table 13: St. Helier navigation hazards relating to seaplane operations

Hazard ID	Area	Category	Hazard Title	Hazard Detail
1	A B C	Collision	Seaplane – Commercial vessel / Passenger Ferry	During landing, taking off or taxiing
2	A B C D	Collision	Seaplane – workboat / fishing vessel	During landing, taking off or taxiing
3	A B C D	Collision	Seaplane – recreational vessel	During landing, taking off or taxiing
4	A B C D	Collision	Commercial / ferry with commercial / ferry	As a direct result of seaplane avoidance
5	A B C D	Collision	Commercial / ferry – Leisure vessel / workboat / fishing	As a direct result of seaplane avoidance
6	A B C D	Collision	Leisure / workboat / fishing– Leisure vessel / workboat / fishing.	As a direct result of seaplane avoidance
7	A B C D	Contact	Seaplane contact with floating obstruction / structure	Seaplane strikes floating AtoN, debris or Nourrice, port infrastructure
8	A B C D	Contact	Commercial vessel / ferry contact with floating / fixed obstruction or structure	As a direct result of seaplane avoidance
9	A B C D	Contact	Workboat / fishing contact with floating/ fixed obstruction or structure	As a direct result of seaplane avoidance
10	A B C D	Contact	Leisure contact with floating / fixed obstruction or structure	As a direct result of seaplane avoidance
11	A B C D	Grounding	Seaplane grounds	As a direct result of other vessel avoidance
12	A B C D	Grounding	Commercial vessel / passenger ferry grounds	As a direct result of seaplane avoidance
13	A B C D	Grounding	Workboat / fishing vessel grounds	As a direct result of seaplane avoidance
14	A B C D	Grounding	Leisure vessel grounds	As a direct result of seaplane avoidance
15	C	Mooring Incident/ breakout	Seaplane mooring incident	Breakout due to vessel wash / weather conditions
16	C	Mooring Incident/ breakout	Workboat / fishing / leisure vessel mooring incident	Wash / wake from seaplane

5 STAGE 3: NAVIGATION RISK ASSESSMENT

This risk assessment complies with the PMSC and its associated Guide to Good Practice[1], and was conducted in accordance with the International Maritime Organisation (IMO) Formal Safety Assessment (FSA) methodology for risk assessments. A detailed description of the methodology is provided in **Annex C**.

The PoJ marine Safety Management System (SMS) is underpinned by an effective identification and assessment of navigational hazards. The MSMS is used as the basis for initial identification and review of hazards, and to ensure consistent and effective review and implementation of control measures. On completion, this seaplane operation NRA should be adopted to the PoJ NRA, as a separate risk register. This in turn should be reviewed with the respective key stakeholders on a regular basis or following an incident.

5.1 INTRODUCTION

A standard 5x5 risk matrix was used (see **Figure 15**) and each hazard was assessed twice; firstly, to determine the risk associated with the "*most likely*" outcome of the hazard and secondly to determine the risk associated with the "*worst credible*" outcome for each hazard. The results are then combined to give a total risk score for each hazard.

This approach provides a thorough assessment of risk, which reflects reality, in that relatively few incidents result in the "worst credible" outcome.

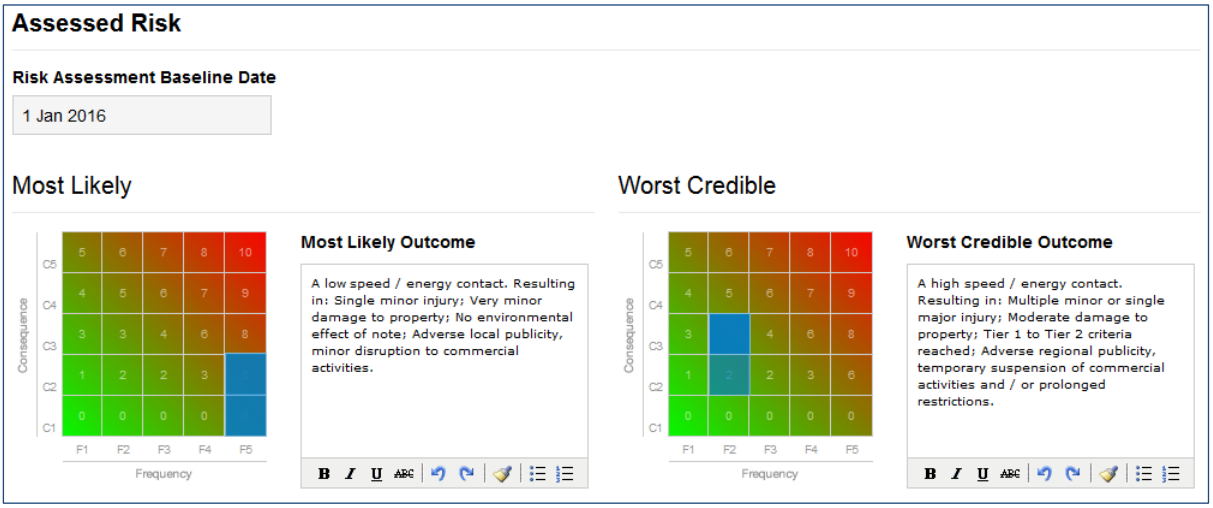


Figure 15: Example Risk Matrix.

[1] A Guide to Good Practice on Port Marine Operations, Prepared in Conjunction with the Port Marine Safety Code 2016, DfT, February 2017

5.2 ASSESSMENT OF FREQUENCY AND CONSEQUENCE

The assessment of frequency was made for a notional "*most likely*" and "w*orst credible*" likelihood of occurrence, for each hazard. These were combined with assessments of typical consequences to people, property, environment and business. The frequency and consequence bands used for this NRA are detailed in **Annex C**.

The frequency and consequence assessments were largely based on the data / information collected, and in particular:

- Review of Jersey Harbours procedures and other documentation / information;
- Stakeholder consultation meetings;
- Review of the vessel activity; and
- Incident database.

This data / information was supplemented by expert judgement and specialist knowledge provided by the assessment team, who have considerable experience in undertaking similar RAs of this type in ports / harbours all around the world.

5.2.1 Risk Scores

The frequency and consequence scores are combined to give two separate risk scores that represent the "*most likely*" and the "*worst credible*" risk for each hazard. These two scores are further combined to give a final risk score for each hazard, between 0 (negligible) and 10 (high). The risk scores (see **Table 14**) are sorted into a "Ranked Hazard List" that shows the highest risk hazards prioritised at the top and the lowest at the bottom (see **Table 15**).

Risks are deemed to be negligible, low, "As Low as Reasonably Practicable" (ALARP), significant or high, as per **Table 14**. ALARP represents that risk band where the level of risk is neither acceptable nor unacceptable. It is the risk band for which further investment of resources for risk reduction may not be justifiable – i.e. risks which fall within the ALARP band have to be reduced unless there is a disproportionate cost to the benefits obtained.

A navigation hazard with a risk score that is "significant" or "high" is termed "unacceptable" and as such additional risk control measures should be implemented. This may range from stopping the activities which bring about such "high risk" hazards or by measures which seek to reduce the likelihood and / or consequence of the hazard occurrence.

Table 14: Risk Scores

Risk Score	Risk Definition	Action Taken
0 - 1.99	Negligible	The risk is acceptable and at level where operational safety is unaffected.
2 - 3.99	Low	The risk is acceptable and at level where operational safety is assumed.
4 - 6.99	ALARP	The risk is neither acceptable nor unacceptable. Risks in the ALARP band are to be managed to a level which is "As Low As Reasonably Practicable", based on the cost-effectiveness of implementing additional risk control measures. These risks and associated risk control measures shall be regularly reviewed as part of the Safety Management System.
7 - 8.99	Significant	The risk is unacceptable and additional risk control measures shall be identified and implemented as soon as possible (or the activity / operation temporarily suspended). These risks and associated risk control measures shall be regularly reviewed as part of the Safety Management System.
9 - 10	High	The risk is unacceptable and additional risk control measures shall be identified and implemented immediately (or the activity / operation permanently suspended). These risks and associated risk control measures shall be regularly reviewed as part of the Safety Management System.

5.3 RISK ASSESSMENT RESULTS

A summary of the Ranked Hazard List for seaplane operations in St Helier Harbour is shown below in **Table 15**. More details on each hazard is provided in **Annex D** (which contains the risk data input scores in terms of the "*most likely*" and the "*worst credible*" consequences to people, property, environment and business, and shows assessment of frequency).

Table 15: Summary of the Ranked Hazard List for Seaplane Operations in St. Helier harbour

Rank	Hazard Ref.	Affected Areas	Accident Category	Hazard Title	Risk by Consequence Category								Risk Overall
					ML				WC				
					Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
1	6	A B C D	Collision	Leisure / workboat / fishing– Leisure vessel / workboat / fishing.	0	6	0	3	4	6	4	6	4.84
2	10	A B C D	Contact	Leisure contact with floating / fixed obstruction or structure	0	6	0	6	0	6	4	6	4.72
3	5	A B C D	Collision	Commercial / ferry – Leisure vessel / workboat / fishing	0	4	2	2	3	6	3	5	4.28
4	7	A B C D	Contact	Seaplane contact with floating obstruction / structure	3	3	0	3	2	6	4	6	4.18
5	3	A B C D	Collision	Seaplane – recreational vessel	0	4	0	2	2	6	3	5	4.03
6	8	A B C D	Contact	Commercial vessel / ferry contact with floating / fixed obstruction or structure	0	4	2	4	2	5	3	5	3.97
7	2	A B C D	Collision	Seaplane – workboat / fishing vessel	0	4	0	2	3	5	4	4	3.82
8	4	A B C D	Collision	Commercial / ferry with commercial / ferry	0	3	2	2	4	5	4	4	3.68
9	12	A B C D	Grounding	Commercial vessel / passenger ferry grounds	0	4	2	2	4	3	4	4	3.65

Rank	Hazard Ref.	Affected Areas	Accident Category	Hazard Title	Risk by Consequence Category								Risk Overall
					ML				WC				
					Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
10	11	A B C D	Grounding	Seaplane grounds	0	2	0	4	2	3	3	5	3.61
11	9	A B C D	Contact	Workboat / fishing contact with floating/ fixed obstruction or structure	0	4	0	2	2	5	3	3	3.61
12	14	A B C D	Grounding	Leisure vessel grounds	0	2	0	4	2	3	3	5	3.61
13	1	A B C	Collision	Seaplane – Commercial vessel / Passenger Ferry	0	3	0	2	1	5	4	4	3.4
14	15	C	Mooring Incident/ breakout	Seaplane mooring incident	0	0	0	3	2	3	5	3	3.16
15	13	A B C D	Grounding	Workboat / fishing vessel grounds	0	2	2	2	3	3	3	3	2.81
16	16	C	Mooring Incident/ breakout	Workboat / fishing / leisure vessel mooring incident	0	2	0	2	3	3	4	4	2.8

The highest ranked single hazard for St. Helier harbour was assessed to be a Leisure / workboat / fishing vessel colliding with another Leisure vessel / workboat / fishing vessel, as a direct result of taking avoiding action as a result of seaplane operations.

The top 5 hazards all resulted in scores in the ALARP region, and all were in the collision / contact categories. As noted in **section 5.4** below, the relatively high scores for all 5 top hazards arise from assessed consequences in the people and stakeholder assessment categories.

However, frequencies of incidents have been assessed to no greater than 1 in 100 years in all of the worst credible scenarios, as existing and future controls are assessed to be sufficiently robust notwithstanding the high traffic densities in the study area at certain times.

5.4 "PEOPLE" AND "STAKEHOLDERS" CONSEQUENCE CATEGORIES

It should be noted that several hazards had individual scores in both the "People" and "Stakeholder" consequence assessments which were identified as being at the upper region of the "ALARP" range. In the case of the two highest ranked hazards this was the case in the most likely scenario as well as the worst credible. This arises because of the risk of serious injuries to more than one person (small vessels involved, with multiple occupants) and because of the significant publicity (negative stakeholder impact) which would consequently arise. Overall, however, the likelihood of such hazards being realised has been assessed as "possible" (one or more times in 100 years) for the worst likely scenario which results in the overall scores for all hazards being in the acceptable "ALARP" range, or less.

As these assessments have been undertaken assuming that existing and future risk controls (**Section 6**) have been applied, it is therefore essential that Jersey Harbours ensure, through inspection and review, that all the identified controls are adhered to and, if considered appropriate, introduce a more robust and effective safety inspection regime than currently followed.

6 STAGE 4: RISK CONTROL MEASURES

There are a number of over-arching merchant shipping regulations that apply in all ports / harbours in the UK, and the most applicable include (but are not limited to):

- International Convention for the Safety of Life at Sea (SOLAS), 1974 (and amendments);
- The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (or STCW), 1978 (and amendments);
- The International Regulations for Preventing Collisions at Sea (COLREGs);
- The Merchant Shipping (Oil Pollution Preparedness, Response Co-operation Convention) Regulations 1998, Statutory Instrument 1998 No. 1056; and
- Marine and Coastguard Agency National regulations (MGNs, MSNs, etc.).

6.1.1 Existing Risk Controls

Vessel operations have inherent risks and these risks can largely be mitigated by good communications with open reporting, dialogue and regular liaison.

The data gathering exercise and stakeholder consultation meetings sought to identify all risk control measures applicable to seaplane operations and currently in place within St. Helier Harbour and these are listed below in **Table 16**.

Table 16: Risk Control List.

ID	Risk Control
1	General Directions, Notice to Mariners, Code of Practices, Safety Bulletins, Permanent Notices, Laws and Regulations
2	PoJ is a CHA providing qualified marine pilots and PEC holders. Appropriate training, examination and revalidation.
3	VTS - Traffic/movement control.
4	Traffic Signals (GD 7 see **Annex B**)
5	Emergency Plans.
6	Rescue Services (Search and Rescue (SAR) and Emergency Services (including Jersey Coastguard, RNLI, Blue Light Services)).
7	Routine stakeholder and Port User Group meetings.
8	Marina information cards for yachtsmen.
9	Tug / workboat assistance.

ID	Risk Control
10	Navaids (Lights, Buoys, Beacons etc.) including regular inspections.
11	Hydrographic survey policy, regular hydrographic surveys and promulgation
12	Approved Passage Plans
13	Harbour Patrol during busy recreational periods.
14	Maintenance dredging.

The seaplane NRA also considered the "vessel", in relation to the existing:

- Port geography;
- Berth facilities, length, fendering, bollard strength, gangway positions;
- Wind strength and direction and effect on seaplane;
- Tidal current rates;
- Tidal heights and under keel clearances in and out of main channels and berth;
- Mooring arrangements and the extent of berth / seaplane overhangs;
- The effect on other vessels using the harbour channels;
- Seaplane beam in relation to entering inner harbour;
- Seaplane engine power in relation to displacement;
- Seaplane handling characteristics;
- Seaplane manoeuvring aids;
- Seaplane turning circle diameter and stopping distance;
- Seaplane windage area; and
- Visibility from the cockpit.

It should be noted that when scoring the hazards associated with this NRA both existing ***and*** the proposed additional risk controls were taken into consideration.

6.2 ADDITIONAL RISK CONTROLS

All the hazards identified and scored for this risk assessment fell into the ALARP (five hazards) or low (11 hazards) categories of risk, and as such the proposed seaplane operation within the CHA area are deemed to be acceptable.

The additional risk controls which were identified during the course of this NRA are listed below in **Table 17** for Jersey Harbours consideration prior to allowing seaplane operations to commence.

Table 17: Additional Risk Controls and Recommendations for Consideration

ID	Additional Risk Control	Action
1	Clear Harbour Airway's (CHbrA) must produce a compliant code of operating practice, method statement and risk assessment for seaplane operations in St Helier Harbour to the satisfaction of the harbour authority prior to an operating permit being issued.	CHbrA
2	PoJ to integrate this NRA into their preferred method of risk assessment.	PoJ
3	PoJ to issue NtM (and later General Direction) with regards to seaplane operations in St. Helier SHA.	PoJ
4	The PoJ marine pilots accompany aircrew on seaplane operations during initial aircrew training which should continue thereafter on an agreed periodical re-familiarisation basis.	PoJ
5	Aircrews to accompany marine pilots on the same basis as above.	CHbrA
6	Ensure any seaplane related incidents are discussed at the harbour user group meetings.	PoJ
7	This NRA should be reviewed on an annual basis with appropriate stakeholders as well as following a serious reported incident.	PoJ
8	Introduce an integrated approach to the training of aircrew and marine pilots where appropriate. This will include the aircrew undertaking and passing a Local Knowledge Endorsement designed to meet the requirements of the harbour	CHbrA
9	In conjunction with the seaplane operators PoJ to update the MSMS.	PoJ/CHbrA
10	Introduce an annual emergency response exercise programme with the seaplane operator.	PoJ
11	CHbrA to install marine VHF band radio capable of receiving/transmitting on seaplanes.	CHbrA
12	CHbrA to install Automatic Identification System (AIS) transponders on both seaplanes.	CHbrA
13	When operating within the 5kt speed limit area (see GD No 2) VTS must give permission for seaplane to exceed the speed limit on every occasion. GD 2 to be updated and reissued accordingly.	PoJ
14	Seaplane to be afforded red light by VTS when entering / departing Inner harbour. GD 7 to be updated and reissued accordingly.	PoJ
15	Seaplane operator to have access to Port CCTV.	PoJ
16	Seaplane operator to comply with all VTS requirements whilst in the SHA area and on the water.	CHbrA
17	Trial runs i.e. sea trials to be undertaken in co-ordination with PoJ and representatives of other interested stakeholders.	PoJ/CHbrA
18	Chart Seaplane operational areas on appropriate charts	PoJ
19	Provide information to harbour users through (for example) leaflets, web page, notices (In addition to NtM at (3) above.	

This does not, however, mean that further mitigation risk control measures for all hazards (and especially those assessed as ALARP) should not be considered. There is a rationale underlying any risk assessments that no matter how low the risk, there remains, no matter how small, a possibility that

accidents or incidents may still occur. There are also underlying principles of the PMSC which encourage port authorities and operators to operate as safely as possible and to implement a coherent and clear MSMS, which specifically requires regular re-assessment of risk.

It should be noted that most of the risk controls, while benefiting all harbour users, are not unduly onerous upon users not directly connected with the seaplane operations.

The exception to this is control number 14, which requires the seaplane to be afforded “red light status” to allow safe transit through the harbour mouth when taxiing to and from the berth in Albert Dock. While (in common with all controls) this requirement should be reviewed in the light of operational experience, it is considered essential to achieve the acceptable level of risk identified in this assessment.

Given the high incidence of red light infringement incidents reported in previous years, particular care must be taken to ensure the effective implementation of this control measure.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

A comprehensive consultation process was undertaken involving all relevant marine stakeholders.

Several meetings were held with the seaplane operators in order to fully understand the operational parameters.

The Port's incident data base was analysed and revealed a historically low level of collision / contact incidents. However there has a significant reported number of regulation infringements, especially vessels ignoring traffic signals.

Previously analysed vessel movement data, as well as the overwhelming evidence of the stakeholder consultation process showed that the Small Roads and St Helier Harbour are very busy areas, especially at certain times. However, the peak traffic periods are closely related to tide and seasonal factors, and generally predictable.

The NRA identified a total of 16 hazards for seaplane operations within the St. Helier SHA area.

The risk of a Leisure / workboat / fishing vessel colliding with another Leisure vessel / workboat / fishing vessel, as a direct result of taking avoiding action as a result of seaplane operations was assessed to be the highest ranked hazard, with risk score of 4.84. This and the remaining top five hazards were within the ALARP band.

Eleven other seaplane related hazards were assessed to be in the "low risk" category, assuming the identified risk control measures are implemented. These additional risk control measures and associated recommendations identified during the course of this NRA, as listed in **Section 6.2**.

Several hazards within the "People" (personal injury) and "Stakeholder" consequence categories individually fell within the upper margins of the ALARP scoring band.

It is concluded that there are a number of reasons why the identified hazards are generally at an acceptable level of risk (ALARP or Low). These include:

- Existing national / international shipping regulations and navigation guidelines are in place;
- Monitoring and responding to the level of commercial traffic interaction is well within the control and capabilities of Jersey Harbours VTS;
- Clear Harbour Airways:
    - Aircrew and ground staff previous experience operating with Harbour Air;

  - Reliable aircraft;
  - Contingency in the event of weather downtime; and
  - Compliance with any additional local regulation imposed on seaplane operation;
- The seaplane will be subject to the use of traffic signals (GD 7) when entering / departing the inner harbour, but this will need to be robustly enforced;
- The combination of clearly defined local marine traffic regulations, active VTS, professional piloting and the existing MSMS contribute to the safe running of the harbour; and
- Notwithstanding periods of high traffic density within the operating area, the combination of identified risk controls, and flexibility on the part of the operator to avoid peaks of congestion are expected to avoid traffic conflicts developing during routine operations;

7.2 RECOMMENDATIONS

It is strongly recommended that a trial period should be completed prior to formal commencement of the seaplane service, to the satisfaction of Ports of Jersey Harbour Master.

The NRA and associated risk controls should be added to the existing port NRA and included as a separate risk register to allow review as experience of seaplane operations is gained.

As part of the Jersey Harbours MSMS the identified hazards and associated risk control measures should be regularly reviewed, including upon completion of the trial period recommended above.

In conclusion the risks associated with seaplane operations in St. Helier Harbour are considered acceptable and therefore safe. However, it is essential that Jersey Harbours fully implement the additional risk control measures and recommendations as listed in **Section 6.2** and any others they deem to be appropriate.

Annex A Consultation Meeting Notes

Tuesday 24th April 2018

Port of Jersey Marine Staff and Seaplane Operators

HM explained ports structure

Clear channel for commercial vessel

General Directions – No7 St Helier Traffic Signals

Traffic light system and how implemented

Pier head to pier head = 52m (Fishing from pier heads)

Tour of VTS Ops room

Tour of harbour with HM aboard Duc de Normandie.

Fishing boxes

Joined by Clear Harbour & Harbour Air staff

Overview of process

Presentation given by operators (valid and informative information)

15 minute flight between Guernsey and Jersey and vice versa

Landing and take-off dynamic decision made by aircrew

45 minute flying time fuel contingency

Landing in 100m / 5 sec

Take off 300m/15sec

Take off / landing speed approx. 60kts

Seaplane berth Albert Berth 2 on a 18m rectangular pontoon

Access to jetty internal stairwell

Initially 5 take off and 5 landings per day

Daylight flying only with seasonal variabilities in timings

Anticipated 15 – 20% downtime

Contingency – amphib seaplane based at airport.

Seaplane has 13 watertight compartments in each float – pumped out twice a day

Seaplane will keep clear of all other waterborne craft activity

No rear vision from cockpit

10 minutes notice to VTS prior to departure

When letting go from pontoon ropes trail on float – shore side indicate clear to manoeuvre off pontoon

Draft of floats minimal 0.2m – minimum wash

5kt speed limit as per GD No 2

Trial runs i.e. sea trials to be undertaken

99.7% mechanical reliability

Safety training

Local knowledge endorsement

Operator will provide RIB for emergency

Marine VHF and AIS transponder on seaplane

Water rudders dropped by pilot for steering during taxiing

Obstructions will be pushed away or observed during reccy

25kts wind from any direction is cut off (passenger comfort)

Wind operating parameter 15kts speed 90deg from wind direction

Visibility 2nm

Operating depth 2m

VFR – Visual Flying Rules

Access to Port CCTV

Abort procedures?

Safe Systems of Work – CoP to be seen

Risk Assessment probably not there!

55,000 take-off /landings Vancouver Harbour – 340 occurrences of which 19 were marine incidents and 1(?) was a near miss

AOC licence issued in Canada will be used in Jersey as per recommendation from DCA (Director of Civil Aviation)

Wednesday 25th April 2018, am

Port of Jersey Marinas

Mike Tait – overview of marina operations

4,500 visitor boats between April and October

St Helier Yacht Club 3,000 members

Elizabeth Marina – 500

St Helier Marina - 300

Old Harbour (drying) - 600

La Collette Yacht Basin?

Operating period 3hrs before and 3hrs after

Can berth up to 14 across of Albert Pier

Regatta starting lines off "Starting hut" max 14 yachts – all yacht races regulated inside SHA by HM

Jersey Belle Class V(VI?) pleasure cruiser

Sea Safaris 3 - RIBs

RYA training on water

Practical disruption to recreational traffic is chief concern of leisure users rather than safety

Cruse tender service from 1 of 5 anchorages (approx. 20 visits per year)

VTS / Marine pilots / Harbour staff

Additional points raised

Loud hailer (operated from VTS will it be heard above sea-plane noise?

VTS will not issue any landing / take off instructions – used as INS only for other harbour users.

Attendance:

The VTS meeting included;

- Stan (HQSE Manager / Pilot)
- Peter M (Maritime Standards / Pilot)
- Ford Ramsden – CG/VTS Watch Officer
- Alex Thelland - CG/VTS Watch Officer
- Fleur Moisan - CG/VTS Watch Officer
- Jono Beaty – CG/VTS Specialist Watch Officer

- Aaron Gavey – CG/VTS Manager

The Coxswain/Crew on the Pilot Boat;

- Rob Cassin
- Nick D'Orleans.

Wednesday 25th April 2018, 19:00

Albert Terminal, Gate 1

MINUTES

Attendees:	Name	Company / Position	Int.
	William Sadler	Harbour Master, Ports of Jersey	HM
	Benjamin Hill	Entrepreneur	BH
	Guillaume Fortin	Flight Operations Manager, Harbour Air	GF
	Peter Evans	Consultant, Harbour Air	PE
	William Heaps	Principal Consultant, Marico Marine	WH
	Paul Fuller	Associate Consultant, Marico Marine	PF
	Members of the Public	X 51	
Note Taker	Iwona Murat	PA to the PoJ Chief Operating Officer	IM

1. Meeting purpose and introductions

HM explained purpose of the meeting to the audience stating it had been arranged to give local boat owners and commercial stakeholders the opportunity to meet with operators of the proposed inter-island sea plane service as part of the current risk assessment and safety review currently being carried out on behalf of Ports of Jersey by Marico Marine consultants. HM emphasized Ports of Jersey's approach to the subject which is strictly safety driven.

William Heaps introduced himself and Marico Marine to the audience, presented an overview of Marico Marine experience and services. He also welcomed constructive feedback received from the public so far and showed understanding to the concerns raised. He also introduced Harbour Air representatives to the attendees.

Benjamin Hill presented reasons for starting a seaplane services in Jersey, main reason being a current poor connectivity between the islands and to enhance travel options for travelling public.

Harbour Air representatives presented their expertise, gave an overview of the main aircraft planned to be used in Jersey (DeHavilland Turbine Single Otter) and its specification. (A second aircraft to provide back up would be operated only from the airport)

2. Questions and Answers

An overview of the proposed seaplane operations was presented to the audience: use of Small Roads for take off and landing operations, they will be using communication with Air Traffic Control units in Jersey, Guernsey and VTS, and potentially cameras with monitors installed in the operations room. Flexibility of the schedule and choosing the take off / landing places was emphasised. Operational safety was re-enforced once again and it has been stated that the aircraft is to be treated as a vessel when on water and will follow marine regulations.

With the above remarks, the members of the public started raising their concerns and questions as listed below.

Schedule flexibility has been questioned by Mr Peter Mourant who wondered how the sea plane schedule will tie up to the on-water events. HM explained, the events are planned a long time in advance. Guilamme Fortin added that the aircraft is designed for a short take-off and landing, landing places can vary and will be chosen by the pilot depending on situation and reassured the audience that safety will never be compromised. In case of the on-the-water events taking place in the harbours or Small Roads, schedule can be altered as required.

Mr William Simpson (St Helier Boats Owners Association) gave an example of specific weather conditions and described Victoria Harbour procedures asking for explanation of the take-off/ landing process in this instance. Similar questions regarding unscheduled movements in the harbours and mutual movement of the plane and any boat has been asked. HM acknowledged the concerns about unscheduled boats movements in the Small Roads and explained that since the plane is treated as a vessel when on water, marine regulations will be respected at all times i.e. the plane cannot take off pointing at any other vessel or obstruction, marine law will be followed in case of cross pathing etc. HM was joined in his explanations by Mr Fortin from Harbour Air who added that seaplane pilots' vast experience will enhance safety in all circumstances.

There were concerns raised by Mrs Penny Gueno (owner of 'Chance', 39ft yacht at Old Harbour) about possibility of using red lights in the take-off / landing cases. HM confirmed that all mitigative actions, detailed procedures and decisions will be made after the Navigational Risk Assessment (NRA) process is completed.

Mr Peter Mourant asked if HM is considering introduction of approved take off / landing on-water areas. HM stated that all mitigation actions will be decided upon NRA completion and Mr Heaps added this solution will be definitely looked at as part of the process, but may not be necessary.

Mr Peter Evans from Harbour Air joined the discussion and added that take-off / landing areas are normally chosen by the pilot depending on wind, tide and on-water movements and safety will not be compromised.

A request from a member of the public came for detailed explanation of procedures during all flight stages. Despite Mr Evans efforts in finding an example, this question could not be answered due to numerous interruptions from the audience and as a result HM once again stated that all procedures will be decided upon NRA completion. Mr Evans added that the pilot will be in constant communication with the VTS, hence the on-water safety will be VTS controlled and not dependant only on the pilot.

There was a question asked by another member of the public if a seaplane will comply with the current speed limits in the harbour. HM gave an explanation as to why the speed limits exist adding that sometimes it is inevitable to go faster than speed limit allows to keep steerage even for conventional vessels.

HM asked a question about the wash made my a sea plane and he response arrived from Mr Evans that it is very minimal (less than a foot) due to a very small draft from the sea plane floats.

A man raised a concern about the type of aircraft, risks of putting the aircraft in the areas of great congestion and aviation incidents in general. He asked what mitigations are being put in place. HM explained the Navigational Risk Assessment purpose of finding mitigations to all hazards and risks.

An unidentified lady asked what is considered as normal conditions by the Harbour Air operators. It has been explained that Harbour Air pilots are trained to operate in a broad

variety of conditions. While aircraft can operate in winds that exceed 25 knots and wave heights greater than 1m, in practice these are the limits for acceptable passenger comfort.

Mrs Gueno asked what is considered as acceptable waiting time before take off / landing and it has been explained that due to the amount of controls in place such as cameras in the operation room, communication with VTS etc. there is no definition of an acceptable waiting time and a pilot will not perform any actions if the conditions are not safe.

It has been asked what air turbulence disruption from the plane propeller to the boats with sails is. Peter Evans said, it is minimal due to the small size of the propeller.

One member of the public inquired if the harbour will become a designated water aerodrome. This question could not be answered as this is decision can only be made by the CAA who will be consulted for advice.

Mr Rhys Perkins from St Helier Yacht Club asked if the start / finish lines of the regattas in the Small Roads will change due to sea plane operations. It has been stressed that sea plane operators will be working with the mariners and local harbour users on all occasions and that the flight schedule can be amended to accommodate on-water events.

A question was asked with regard to how will the boats know from which direction the plane will arrive when landing and it has been stated that during this stage of flight, a plane will not come near any other vessels, no matter what direction the final approach is made from.

3. Closing remarks

A member of the public expressed his feelings that there are many unanswered questions at the moment but he understands the reasons behind it. He thanked HM for calling the meeting and asked for further consultative meetings to be arranged and for the fully transparent report on the NRA findings. HM assured the audience that neither the meeting nor the NRA are tick-the–box exercises.

Mr Heaps explained the NRA process in more detail. The question has been raised by Mr Paul Tinley (owner of a 40 ft yacht) if the data on leisure boats movements number is available and WH confirmed that it is being collected. WH also informed the audience that Marico Marine will recommend the trial period for sea plane operations. This will be subject

to a successful NRA and receiving all necessary permissions for sea plane operations commencement.

It has also been confirmed by the HM that all cost of NRA will be covered by Benjamin Hill.

N.B. An attendance list was kept, but is not reproduced in this report.

Thursday 26th April 2018

Port of Jersey Harbour Users

Additional concerns not already raised:

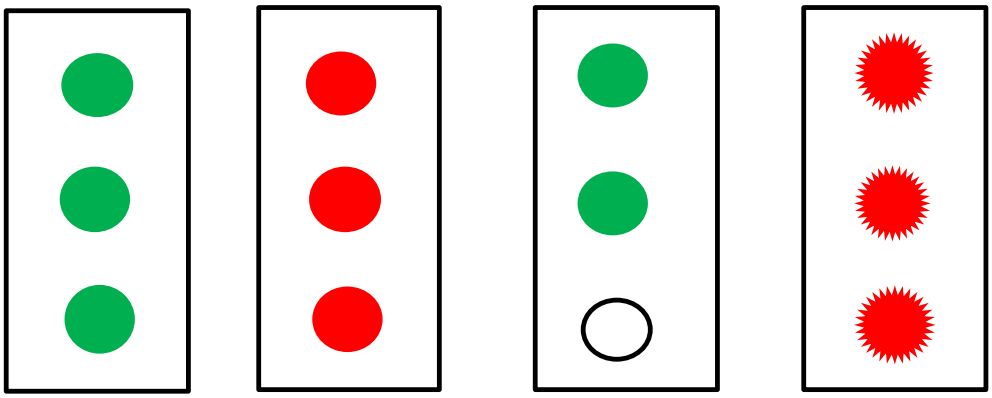
- Ramsar sites etc
- Birds nesting areas / roosting etc.
- Fisherman positive providing not disruptive to their business

Annex B General Direction No 7 St. Helier Traffic Signal Lights

General Direction No: 7[1]

St Helier Traffic Signal Lights

There are three sets of IALA Traffic signal lights mounted on VTS Tower to control small craft movements.



GO – ONE WAY | **STOP** | **GO - TWO WAY** | **EMERGENCY ALL STOP**

Mariners are advised that these signal lights are used to expedite the movement of participating vessels over 25m in length. All other vessels must obey the signals and observe COLREGS Rule 9 in giving way to vessels that can only navigate within the confines of a narrow channel. If vessels are required to stop and wait they should do so in such a position as to avoid impeding the safe passage of vessels that are operating in favour of the lights.

From 26 May 2016 two additional sets of IALA signal lights have been fitted to the west arm of Elizabeth Harbour. One set faces incoming vessels in the Small Road. The other set faces NW towards the Elizabeth Marina channel. These lights mirror the light sequences displayed from the VTS Tower.

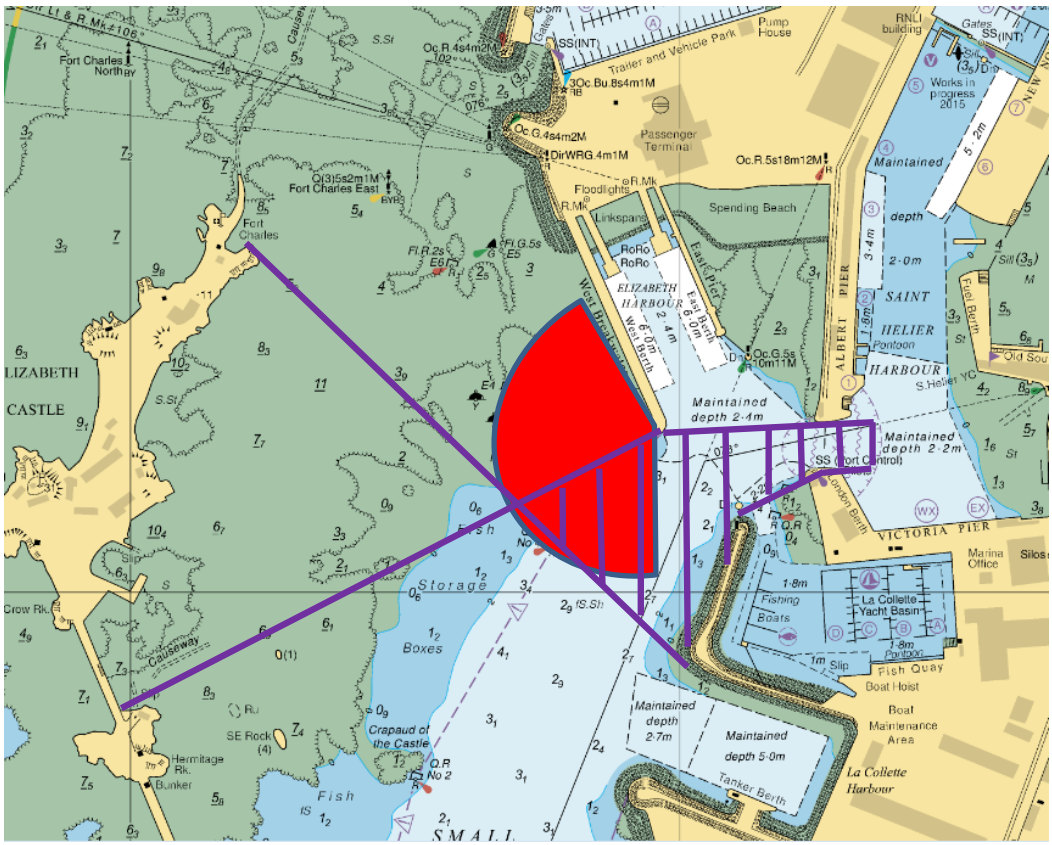
The purpose of the west facing lights is to prevent vessels leaving Elizabeth Marina channel and cutting across the bow of commercial vessels manoeuvring, before they have had time to observe the signal lights on the tower. The south facing lights are designed to give incoming vessels early warning of commercial ship movements before they are in a

[1] **This General Direction is issued under the authority of the Harbours (Jersey) Regulations 1962 – Regulation 3**

position to observe the VTS Tower lights. Vessels should avoid passing south of the line between Elizabeth West Wall and Hermitage Rock until the lights are switched in their favour.

Mariners approaching the port from seaward, upon observing red lights from these positions, should move to the west side of the Small Road well clear of La Collette Dolphin to avoid impeding the safe passage of out bound vessels emerging from the Elizabeth or Main Harbours and wait for the signals to change in their favour. Vessels should avoid passing north of a line between La Collette Yacht Basin Southern Rock Armour and No.4 Fairway Buoy until the lights are switched in their favour.

In all situations mariners should avoid entering the hatched area when lights are showing red.

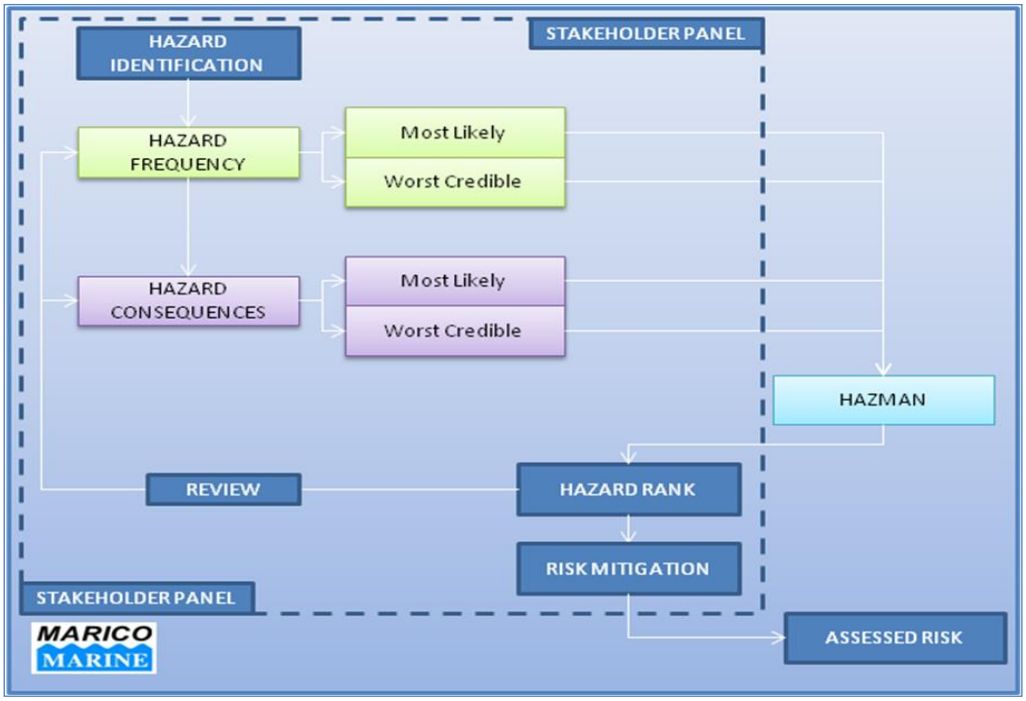


Captain P J A Buckley
Harbour Master, Jersey Harbours
19th July 2016

Annex C Risk Assessment Methodology

Methodology

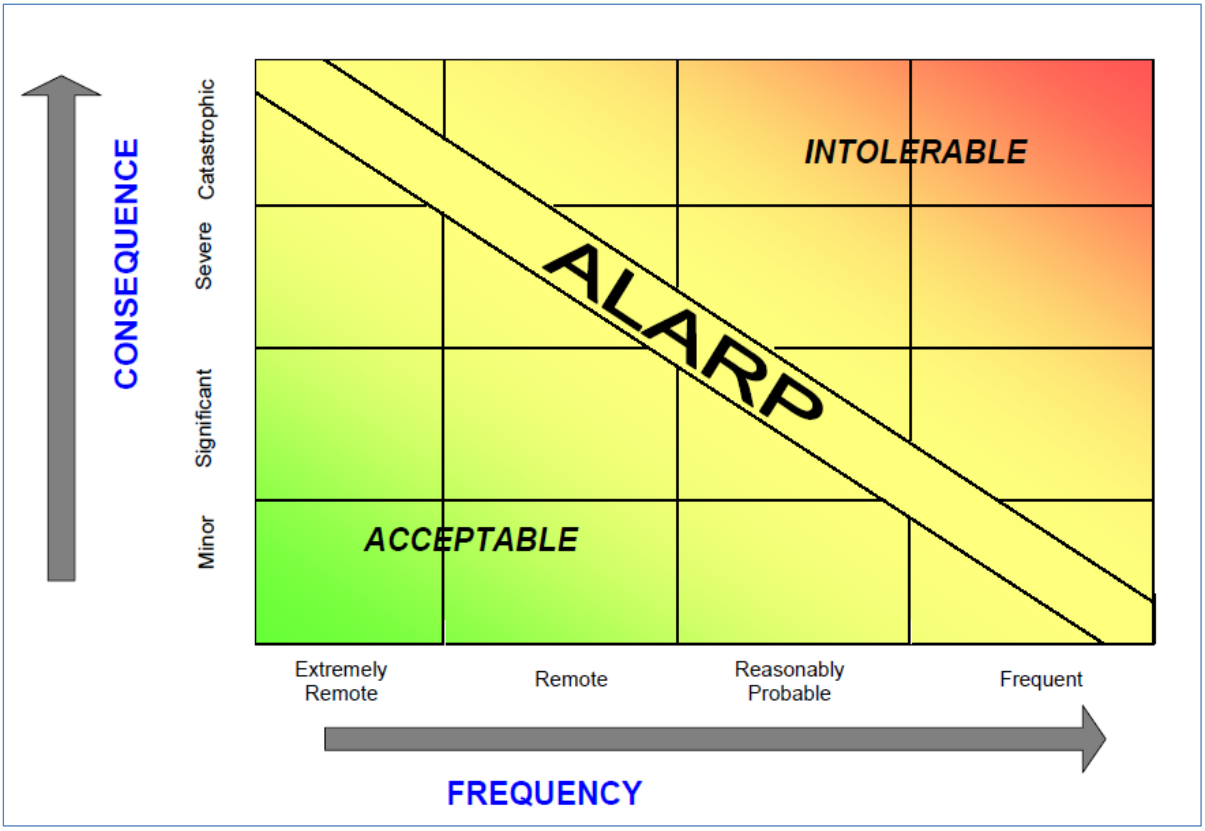
The NRA is limited to identifying and quantifying any additional or increased navigation risk resulting from the proposed seaplane operation. It subsequently identifies possible mitigation measures where appropriate and makes recommendations. The process starts with the identification of all potential hazards pertaining to the seaplane operating on the water as well as during take-off and landing. It then assesses the likelihood (frequency) of a hazard causing an incident and considers the possible consequences of that incident. It does so in respect of two scenarios, namely the "most likely" and the "worst credible". The quantified values of frequency and consequence are then combined using the Marico HAZMAN software to produce a "Risk Score" for each hazard. These are collated into a "Ranked Hazard List" from which the need for possible additional mitigation may be reviewed.



Marico Marine Risk Assessment Methodology.

Criteria for Risk Assessment

Risk is the product of a combination of consequence of an event and the frequency with which it might be expected to occur. In order to determine risk a Formal Safety Assessment (FSA) approach to risk management is used. International Maritime Organisation (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 estimated or known consequence of outcome. This combination is termed "risk". Risk is therefore a measure of the frequency and consequence of a particular hazard.



General risk matrix.

The combination of consequence and frequency of occurrence of a hazard is combined using a risk matrix which enables hazards to be ranked and a risk score assigned. The resulting scale can be divided into three general categories:

- Acceptable;
- As Low As Reasonable Practicable (ALARP); and
- Intolerable.

At the low end of the scale, frequency is extremely remote and consequence minor, and as such the risk can be said to be "acceptable", whilst at the high end of the matrix, where hazards are defined as frequent and the consequence catastrophic, then risk is termed "intolerable". Every effort should be made to mitigate all risks such that they lie in the "acceptable" range. Where this is not possible, they should be reduced to the level where further reduction is not practicable. This region, at the centre of the matrix is described as the ALARP region. It is possible that some risks will lie in the "intolerable" region, but can be mitigated by measures, which reduce their risk score and move them into the ALARP region, where they can be tolerated, albeit efforts should continue to be made when opportunity presents itself to further reduce their risk score.

The FSA methodology used in this NRA, determines where to prioritise risk control options for the proposed seaplane operation. The outcome of this risk assessment process should then act as the

basis for updating the existing Navigation Safety Management System, which can be used to manage any additional navigational risk associated with the seaplane operation and the respective additional risk control measures necessary to reduce such risk.

Hazard Identification

Hazard identification is the first and fundamental step in the risk assessment process. It was undertaken for this project by Marico Marine specialists using the results of the analysis, and feedback from local stakeholders during this consultation period.

In order to ensure that the process was both structured and comprehensive, potential hazards were reviewed under the following headings:

- Incident category;
- Geographical area; and
- Vessel type.

The four incident categories identified as being relevant to this study are:

- Collision;
- Contact;
- Mooring Incident / Breakout and
- Grounding.

It the context of this study, foundering, defined as “filling from above the waterline and sinking” and pollution have been treated as possible consequences of the above accident categories. The geographical areas used for the study were:

- Area A Approaches to St Helier harbour
- Area B The Small Roads channel.
- Area C St. Helier Harbour (Albert Quay etc.) as defined on Admiralty Chart
- Area D Inner harbour areas including access to and from the marinas and areas across to Elizabeth Castle causeway.

The vessel types considered were:

- Passenger Ferry - Condor Ferries, Manche Iles Express.
- Commercial Vessels - General cargo vessels.
- Vessels / Workboats / Fishing vessels - Charter vessels: Jersey Belle, Sea Safaris, RYA vessels and St Helier Harbour Authority Vessels (tugs, pilot boats etc.).
- Recreational Vessels - Sailing Yacht, Motor Yacht, Sailing Dinghy, Rigid Hull Inflatable Boat (RHIB), Personal Watercraft (PWC), and Rowing Craft.

- Seaplane - Specific vessel category for this risk assessment.

Risk Matrix Criteria

As indicated earlier, frequency of occurrence and likely consequence were both assessed for the "most likely" and "worst credible" scenario. Frequencies were assessed according to the levels set out below.

Frequency criteria.

Scale	Description	Definition	Operational Interpretation
F5	Frequent	An event occurring in the range once a week to once an operating year.	One or more times in 1 year
F4	Likely	An event occurring in the range once a year to once every 10 operating years.	One or more times in 10 years 1 - 9 years
F3	Possible	An event occurring in the range once every 10 operating years to once in 100 operating years.	One or more times in 100 years 10 – 99 years
F2	Unlikely	An event occurring in the range less than once in 100 operating years.	One or more times in 1,000 years 100 – 999 years
F1	Remote	Considered to occur less than once in 1,000 operating years (e.g. it may have occurred at a similar site, elsewhere in the world).	Less than once in 1,000 years >1,000 years

Using the assessed notional frequency for the "most likely" and "worst credible" scenarios for each hazard, the probable consequences associated with each were assessed in terms of damage to:

- People - Personal injury, fatality etc.;
- Property – To vessels/infrastructure;
- Environment - Oil pollution etc.; and
- Business - Reputation, economic loss, public relations etc.

The magnitude of each was then assessed using the consequence categories given below. These have been set such that the consequences in respect of property, environment and business have similar monetary outcomes.

Consequence categories and criteria.

Cat.	People	Property	Environment	Business
C1	**Negligible** Possible very minor injury (e.g. bruising)	**Negligible** Costs <£10k	**Negligible** No effect of note. Tier1 may be declared but criteria not necessarily met. Costs <£10k	**Negligible** Costs <£10k
C2	**Minor** (single minor injury)	**Minor** Minor damage Costs £10k – £100k	**Minor** Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity Costs £10K–£100k	**Minor** Bad local publicity and/or short-term loss of revenue Costs £10k – £100k
C3	**Moderate** Multiple minor or single major injury	**Moderate** Moderate damage Costs £100k - £1M	**Moderate** Tier 2 spill criteria reached but capable of being limited to immediate area within site Costs £100k -£1M	**Moderate** Bad widespread publicity Temporary suspension of operations or prolonged restrictions at port Costs £100k - £1M
C4	**Major** Multiple major injuries or single fatality	**Major** Major damage Costs £1M -£10M	**Major** Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release Costs £1M - £10M	**Major** National publicity, Temporary closure or prolonged restrictions on port operations Costs £1M -£10M
C5	**Catastrophic** Multiple fatalities	**Catastrophic** Catastrophic damage Costs >£10M	**Catastrophic** Tier 3 oil spill criteria reached. International support required. Widespread shoreline contamination. Serious chemical or gas release. Significant threat to environmental amenity. Costs >£10M	**Catastrophic** International media publicity. Port closes. Operations and revenue seriously disrupted for more than two days. Ensuing loss of revenue. Costs >£10M

Hazard Data Review Process

Frequency and consequence data was assessed for each hazard drawing initially on the knowledge and expertise of the Marico Marine specialists. This was subsequently influenced by the views and experience of the many stakeholders, whose contribution was greatly appreciated, as well as historic incident where available. It should be noted that the hazards were scored on the basis of the "status quo" i.e. with all existing mitigation measures taken into consideration. The outcome of this process was then checked for consistency against the assessments made in previous and similar risk assessments.

Having decided in respect of each hazard which frequency and consequence criteria are appropriate for the four consequence categories in both the "most likely" and "worst credible" scenarios, eight risk scores were obtained using the following matrix.

Risk factor matrix used for hazard assessment.

Consequences	Cat 5	5	6	7	8	10
	Cat 4	4	5	6	7	9
	Cat 3	3	3	4	6	8
	Cat 2	1	2	2	3	6
	Cat 1	0	0	0	0	0
	Frequency	**>1,000 years**	**100-1,000 years**	**10-100 years**	**1 to 10 years**	**Yearly**

Where:

Risk Number	*Risk*
0 to 1.9	*Negligible*
2 to 3.9	*Low Risk*
4 to 6.9	*As Low as Reasonably Practical*
7 to 8.9	*Significant Risk*
9 to 10.0	*High Risk*

It should be noted that occasionally, a "most likely" scenario will generate a higher risk score than the equivalent "worst credible" scenario; this is due to the increased frequency often associated with a "most likely" event. For example, in the case of a large number of small contact events, the total damage might be of greater significance than a single heavy contact at a much lesser frequency.

Hazard Ranking

The risk scores obtained from the above process were then analysed further to obtain four indices for each hazard as follows:

- The average risk score of the four categories in the "most likely" set;
- The average risk score of the four categories in the "worst credible" set;
- The maximum risk score of the four categories in the "most likely" set; and
- The maximum risk score of the four categories in the "worst credible" set.

These scores were then combined in Marico Marine's hazard management software "HAZMAN" to produce a single 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" with the highest risk hazards prioritised at the top.

Mitigation

Mitigation measures that could be employed to reduce the likelihood or consequence of the hazards occurring are then identified.

Annex D Hazard Logs

Risk Data: 18UK1428 Jersey Seaplane

Rank	Ref	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Possible Causes	Consequence Descriptions: Most Likely (ML)	Consequence Descriptions: Worst Credible (WC)	Risk by Consequence Category: ML Frequency	ML Environment	ML People	ML Property	ML Stakeholders	WC Frequency	WC Environment	WC People	WC Property	WC Stakeholders	Risk Overall
1	6	A B C D	Collision	Leisure / workboat / fishing– Leisure vessel / workboat / fishing.	As a direct result of seaplane avoidance	Seaplane Pilot / Master / Skipper error; Inappropriate speed; Adverse weather; Mechanical failure; Electrical failure.	Minor damage to Leisure vessel / workboat / fishing vessel; Minor injuries. Minor pollution	Moderate damage to vessel with possible loss of vessel; Vessel goes aground; Possible fatalities; Loss of revenue; Moderate pollution.	4	1	3	1	2	3	3	4	3	4	4.84
2	10	A B C D	Contact	Leisure contact with floating / fixed obstruction or structure	As a direct result of seaplane avoidance	Seaplane Pilot / Skipper error; Inappropriate speed; Adverse weather; Mechanical failure; Electrical failure.	Minor damage to vessel; Minor injury. Minor pollution	Moderate damage to leisure vessel; Possible fatality; Loss of revenue; Minor pollution.	5	1	2	1	2	3	1	4	3	4	4.72
3	5	A B C D	Collision	Commercial / ferry – Leisure vessel / workboat / fishing	As a direct result of seaplane avoidance	Seaplane Pilot / Master / Skipper error; Inappropriate speed; Adverse weather; Mechanical failure; Electrical failure.	Minor damage to Leisure vessel / workboat / fishing vessel; Minor injuries. Minor pollution	Moderate damage to commercial / ferry vessel, possible loss of smaller vessel; Vessel goes aground; Possible fatalities; Loss of revenue; Moderate pollution.	3	1	3	2	2	2	3	5	3	4	4.28
4	7	A B C D	Contact	Seaplane contact with floating obstruction / structure	Seaplane strikes floating AtoN, debris or Nourrice, port infrastructure	Mechanical failure; leading to loss of control; Inappropriate speed; Seaplane Pilot error; Adverse weather; Navigational error.	Minor damage to seaplane / infrastructure. Minor injury	Seaplane floats breached and water ingress; Major damage to seaplane / infrastructure with possible loss of seaplane; Possible fatality; Loss of revenue; Minor pollution.	4	2	2	1	2	3	2	4	3	4	4.18
5	3	A B C D	Collision	Seaplane – recreational vessel	During landing, taking off or taxiing	Seaplane Pilot / Skipper error; Inappropriate speed; Adverse weather; Mechanical failure; Electrical failure.	Minor damage to both vessels; Minor injuries.	Seaplane floats breached and water ingress; Major damage to both vessels, possible loss of seaplane / leisure vessel; Vessel goes aground; Possible fatalities; Loss of revenue; Minor pollution.	3	1	3	1	2	2	2	5	3	4	4.03

							Consequence Descriptions		Risk by Consequence Category											Risk Overall
									ML					WC						
Rank	Ref	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely (ML)	Worst Credible (WC)	Frequency	Environment	People	Property	Stakeholders	Frequency	Environment	People	Property	Stakeholders		
6	8	A B C D	Contact	Commercial vessel / ferry contact with floating / fixed obstruction or structure	As a direct result of seaplane avoidance	Seaplane Pilot / Master / Skipper error; Inappropriate speed; Adverse weather; Mechanical failure; Electrical failure.	Minor damage to vessel / infrastructure; Minor injuries. Minor pollution	Moderate damage to commercial / ferry vessel / infrastructure; Possible fatality; Loss of revenue; Moderate pollution.	**3**	1	3	2	3	**2**	2	4	3	4		3.97
7	2	A B C D	Collision	Seaplane – workboat / fishing vessel	During landing, taking off or taxiing	Seaplane Pilot / Pilot/Master error; Inappropriate speed; Adverse weather; Mechanical failure; Electrical failure.	Minor damage to both vessels; Minor injuries.	Seaplane floats breached and water ingress; Major damage to both vessels, possible loss of seaplane / workboat; Vessel goes aground; Possible fatalities; Loss of revenue; Moderate pollution.	**3**	1	3	1	2	**1**	3	5	4	4		3.82
8	4	A B C D	Collision	Commercial / ferry with commercial / ferry	As a direct result of seaplane avoidance	Seaplane Pilot / Master error; Inappropriate speed; Adverse weather; Mechanical failure; Electrical failure.	Minor damage to both vessels; Minor injuries. Minor pollution.	Major damage to both vessels, possible loss of vessel; Vessel goes aground; Possible fatalities; Loss of revenue; Major pollution.	**2**	1	3	2	2	**1**	4	5	4	4		3.68
9	12	A B C D	Grounding	Commercial vessel / passenger ferry grounds	As a direct result of seaplane avoidance	Seaplane Pilot / Pilot/Master error; Navigational error; Failure to monitor navigational warnings; Loss of propulsion; Inaccurate charts; Heavy weather.	Vessel refloated with minor damage; Minor pollution; Minor injuries	Damage to rudders / propellers; Hull breach and water ingress; Pollution; Loss of revenue; Possible multiple injuries.	**3**	1	3	2	2	**1**	4	3	4	4		3.65
10	11	A B C D	Grounding	Seaplane grounds	As a direct result of other vessel avoidance	Navigational error Inappropriate speed; Failure to monitor navigational warnings; Loss of propulsion; Inaccurate charts; Heavy weather	Minor damage to seaplane; Minor injury	Damage to floats and hull breached and water ingress; Seaplane stranded Minor pollution, Loss of revenue; Possible multiple injuries;	**3**	1	2	1	3	**2**	2	3	3	4		3.61
11	9	A B C D	Contact	Workboat / fishing contact with floating/ fixed obstruction or structure	As a direct result of seaplane avoidance	Seaplane Pilot / Master error; Inappropriate speed; Adverse weather; Mechanical failure; Electrical failure.	Minor damage to vessel; Minor injuries. Minor pollution	Moderate damage to workboat / fishing vessel / infrastructure; Possible fatality; Loss of revenue; Moderate pollution.	**3**	1	3	1	2	**2**	2	4	3	3		3.61

							Consequence Descriptions		Risk by Consequence Category										Risk Overall
									ML					WC					
Rank	Ref	Affected Areas	Accident Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely (ML)	Worst Credible (WC)	Frequency	Environment	People	Property	Stakeholders	Frequency	Environment	People	Property	Stakeholders	
12	14	A B C D	Grounding	Leisure vessel grounds	As a direct result of seaplane avoidance	Navigational error Inappropriate speed; Failure to monitor navigational warnings; Loss of propulsion; Inaccurate charts; Heavy weather;	Vessel refloated with minor damage; Minor pollution; Minor injury	Damage to rudders / propellers. Hull breach and water ingress. Pollution Loss of revenue Possible multiple injuries	**3**	1	2	1	3	**2**	2	3	3	4	3.61
13	1	A B C	Collision	Seaplane – Commercial vessel / Passenger Ferry	During landing, taking off or taxiing	Seaplane Pilot / Pilot/Master error; Poor visibility; Adverse weather; Mechanical failure; Electrical failure.	Minor damage to both vessels. Minor injuries	Seaplane floats breached and water ingress; Possible loss of seaplane; Vessel goes aground; Possible fatalities; Loss of revenue; Minor pollution.	**2**	1	3	1	2	**1**	2	5	4	4	3.4
14	15	C	Mooring Incident/ breakout	Seaplane mooring incident	Breakout due to vessel wash / weather conditions	Failure of seaplane mooring gear; Inadequate seamanship / watch-keeping; Extreme weather; Vandalism	Minor damage to seaplane / berth; Minor injury; No pollution	Major damage to seaplane and moderate damage to other moored vessels; Moderate damage to berth; Major injuries during recovery of situation; Grounding leading to capsize; Loss of revenue; Minor pollution.	**4**	1	1	1	2	**2**	2	3	4	3	3.16
15	13	A B C D	Grounding	Workboat / fishing vessel grounds	As a direct result of seaplane avoidance	Navigational error; Inappropriate speed; Failure to monitor navigational warnings; Loss of propulsion; Inaccurate charts; Heavy weather;	Vessel refloated with minor damage; Minor pollution; Minor injury	Damage to rudders / propellers. Hull breach and water ingress. Pollution Loss of revenue Possible multiple injuries	**3**	1	2	2	2	**2**	3	3	3	3	2.81
16	16	C	Mooring Incident/ breakout	Workboat / fishing / leisure vessel mooring incident	Wash / wake from seaplane	Failure of vessel mooring gear due to poor seamanship from seaplane pilot	Minor damage to workboat / fishing / leisure berth; Minor injury; No pollution	Major damage to moored vessel; Moderate damage to berth; Major injuries during recovery of situation; Grounding leading to capsize; Loss of revenue; Minor pollution.	**3**	1	2	1	2	**1**	3	3	4	4	2.8