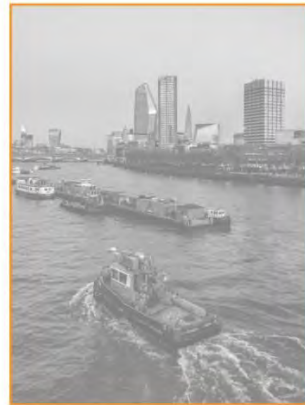


## TECHNICAL APPENDIX 2.2

**ORKNEY ISLANDS COUNCIL**

**HATSTON PIER DEVELOPMENT NRA**



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**Prepared for:** Orkney Islands Council  
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## EXECUTIVE SUMMARY

This Navigation Risk Assessment report has been prepared by Marine and Risk Consultants Limited for Orkney Islands Council to support the proposed re-development of Hatston Pier, Kirkwall, within the Orkney Islands Statutory Harbour Authority Area.

This Navigation Risk Assessment references the Orkney Islands Council Safety Management System, which aims to enhance safety within the Harbour Authority area by ensuring that all marine navigation hazards are identified, control measures are in place, and levels of risks are acceptable.

In order to support the consenting process for this large project, a full Navigation Risk Assessment considering the effects of both the construction and operation phases of the new jetty has been undertaken, and the results of the assessment will be used to update Orkney Island Council's Port Marine Safety Code assessment in due course.

The assessment was undertaken following the collation of detailed input data including information about the project methodology, current vessel traffic densities, historic incident rates in the project area and, importantly, comprehensive stakeholder input.

It was established that both existing and anticipated future traffic levels will be relatively low, and that conflicts between different harbour users are also likely to be low. Historic incident rates are low and indicated that the likelihood of hazards occurring in the future would also be low.

Nevertheless, 50 potential hazards were identified during the project construction phase, and 38 during operation. All of these have been assessed in accordance with the International Maritime Organization Formal Safety Assessment methodology for risk assessments.

No hazards were assessed to be in the High Risk or Significant Risk band for either the construction or operation phase of the project.

For the construction phase, six of the 50 hazards were assessed to be within the ALARP band, with risk scores between 4.3 and 4.56. This is in the lower band of the ALARP region; however, efforts should nonetheless be made to reduce this risk further, based on the cost-effectiveness of implementing additional risk control measures.

For the operation phase, five of the 38 hazards were assessed to be within the ALARP band.

This assessment has concluded that there is little significant new navigational risk associated with either the construction or operation of the proposed Hatston Pier redevelopment.

The project site is located in an area of relatively low present day traffic density (albeit with significant seasonal variations), and which is already subject to numerous effective risk control measures (VTS, Pilotage, Towage, etc). As a result of both of these factors, incident frequency is also low.

There will be an inevitable increase in navigation risk through the introduction of a new structure, generating an increased volume of traffic. However, the increase in risk is low, on top of an already low baseline.

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## ABBREVIATIONS

Abbreviation	Detail
<b>AIS</b>	Automatic Identification System
<b>AToNs</b>	Aids to Navigation
<b>COLREGs</b>	Convention on International Regulations for Preventing Collisions at Sea
<b>CPA</b>	Closest Point of Approach
<b>CMR</b>	Construction Monitoring Report
<b>DML</b>	Deemed Marine Licence
<b>DWR</b>	Deep-Water Route
<b>KWh</b>	Kilowatt-hour
<b>IMO</b>	International Maritime Organization
<b>LNG</b>	Liquefied Natural Gas
<b>LPG</b>	Liquefied Petroleum Gas
<b>LOA</b>	Length Over-All
<b>m</b>	Metre
<b>MAIB</b>	Marine Accident Investigation Branch
<b>Marico Marine</b>	Marine and Risk Consultants Ltd
<b>MCA</b>	Maritime and Coastguard Agency
<b>MGN</b>	Marine Guidance Note
<b>MMO</b>	Marine Management Organisation
<b>nm</b>	Nautical Mile
<b>NRA</b>	Navigation Risk Assessment
<b>NtM</b>	Notice to Mariners
<b>OIC</b>	Orkney Islands Council
<b>OICHA</b>	Orkney Islands Council Harbour Authority
<b>RCM</b>	Risk Control Measures
<b>SHA</b>	Statutory Harbour Authority
<b>SMS</b>	Safety Management System
<b>SOLAS</b>	Safety Of Life At Sea
<b>TSS</b>	Traffic Separation Scheme
<b>VHF</b>	Very High Frequency
<b>VMS</b>	Vessel Monitoring System
<b>VTS</b>	Vessel Traffic Study

# 1 INTRODUCTION

This Navigation Risk Assessment (NRA) report has been prepared by Marine and Risk Consultants Limited (Marico Marine) for Orkney Islands Council (OIC) to support the proposed re-development of Hatston Pier, Kirkwall, within the Orkney Islands Statutory Harbour Authority (SHA) Area.

This NRA references the OIC Safety Management System (SMS), which aims to enhance safety within the Harbour Authority area by ensuring that all marine navigation hazards are identified, control measures are in place, and levels of risks are acceptable. In particular, reference is made to the NRA undertaken on behalf of OIC by Marico Marine for the Kirkwall SHA area (Report 15UK1073\_NRA\_Kirkwall\_OIC\_Issue01, 30 December 2015).

## 1.1 BACKGROUND AND SCOPE

The Port Marine Safety Code (PMSC)<sup>1</sup> establishes a national standard for every aspect of port marine safety and aims to enhance safety for those who use or work within ports, their ships, passengers and the environment. The PMSC applies to all harbour authorities in the UK that have statutory powers and duties.

The PMSC promotes the principle that all harbour authorities shall base their policies and procedures relating to marine operations on a formal identification of hazards and assessment of risk to marine operations. They shall maintain an SMS based on a formal navigational risk assessment, and any subsequent supporting risk assessments deemed necessary as the SMS develops and evolves over time as a result of changing trade and harbour usage.

The development of the proposed new facility is clearly a change in trade and usage warranting a review of the existing NRA. However, in order to support the consenting process for this large project, a full NRA considering the effects of both the construction and operation phases of the new jetty has been undertaken, and the results of the assessment will be used to update OIC's PMSC assessment in due course.

It should be noted that this assessment **only** considers the impact of the project on navigational safety, through assessing risks to vessels navigating in the project area. Other impacts of the project (for example on the land and marine environments) are being assessed separately as part of the consenting process.

This new NRA complies with the PMSC and its associated Guide to Good Practice<sup>2</sup>, and was conducted in accordance with the International Maritime Organization (IMO) Formal Safety Assessment (FSA) methodology for risk assessments. It comprises the following four stages:

- Stage 1: Data Gathering and Vessel Traffic Analysis;

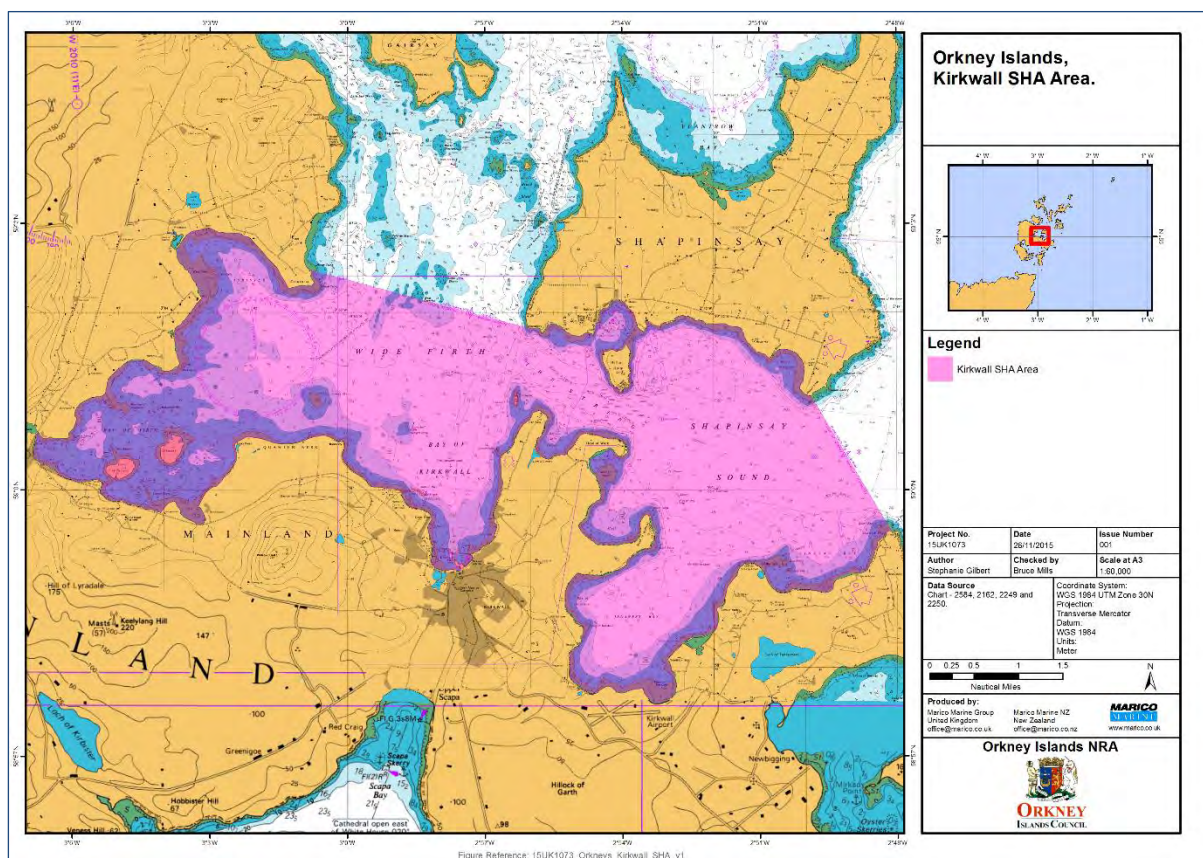
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<sup>1</sup> Port Marine Safety Code, Department for Transport, November 2016

<sup>2</sup> A Guide to Good Practice on Port Marine Operations, Prepared in Conjunction with the Port Marine Safety Code, DfT, February 2018

- Stage 2: Hazard Identification;
- Stage 3: Risk Assessment; and
- Stage 4: Identification of Risk Control Measures.

The Kirkwall SHA area (from the 2015 NRA) is shown in **Figure 1**.



**Figure 1: Kirkwall SHA Area.**

## 1.2 PROJECT DESCRIPTION

OICHA, the Orkney Islands Harbour Authority, has published the “Orkney Harbours Masterplan Phase 1”<sup>3</sup>. This plan has identified “a structured framework for the physical development and transformation of Orkney’s harbours over a 20-year period”. The Orkney Harbours Masterplan Phase 1 comprises proposals at six harbour locations, one of which is Hatston Pier situated near Kirkwall.

The following project description is taken from the Masterplan:

*“Hatston Pier and Terminal is Orkney’s primary commercial terminal and link south to Aberdeen and north to Shetland.*

<sup>3</sup> OIC Master Plan March 2020 <https://www.orkneyharbours.com/masterplan>

*This multi-purpose infrastructure has been hugely successful in accommodating a range of operational activities including the largest cruise ships, renewable energy, ferries, oil and gas and cargo/livestock.*

*The plan for Hatston is focussed on reducing conflicts between users and operational activity and enabling growth across a range of economic sectors. Seasonal lack of availability of berths due to cruise with a resultant year-round constraint on other vessel use would be resolved and the plan also considers how freight and traffic can be handled more efficiently and effectively.*

*Core proposals comprise a significant extension to the existing pier and expansion of landside area through reclamation to futureproof availability of sufficient land for harbour operations.*

*The existing outer quay would be extended by 300m (with water depth of -10m CD) and there would be a 125m inner berth. There will be substantially more quayside available both for the existing pier and the extension.*

*Circa 7.5 hectares of additional land would be made available for harbour-related operations through reclamation. There will also be an ex-pipe fuel supply and fuel storage facility in close proximity to the pier.*

*This new infrastructure will be able to accommodate a range of activities across several sectors.*

*As noted earlier, the design of new infrastructure here will be futureproofed so as to accommodate future provision and storage of alternative (less polluting/carbon-free) fuels and provision of shore power to smaller vessels where viable”.*

An artists impression and proposed layout of the project are given in **Figure 1** and **Figure 2** below.



**Figure 2: Artist's Impression of Proposed Pier and Landside Infrastructure.**

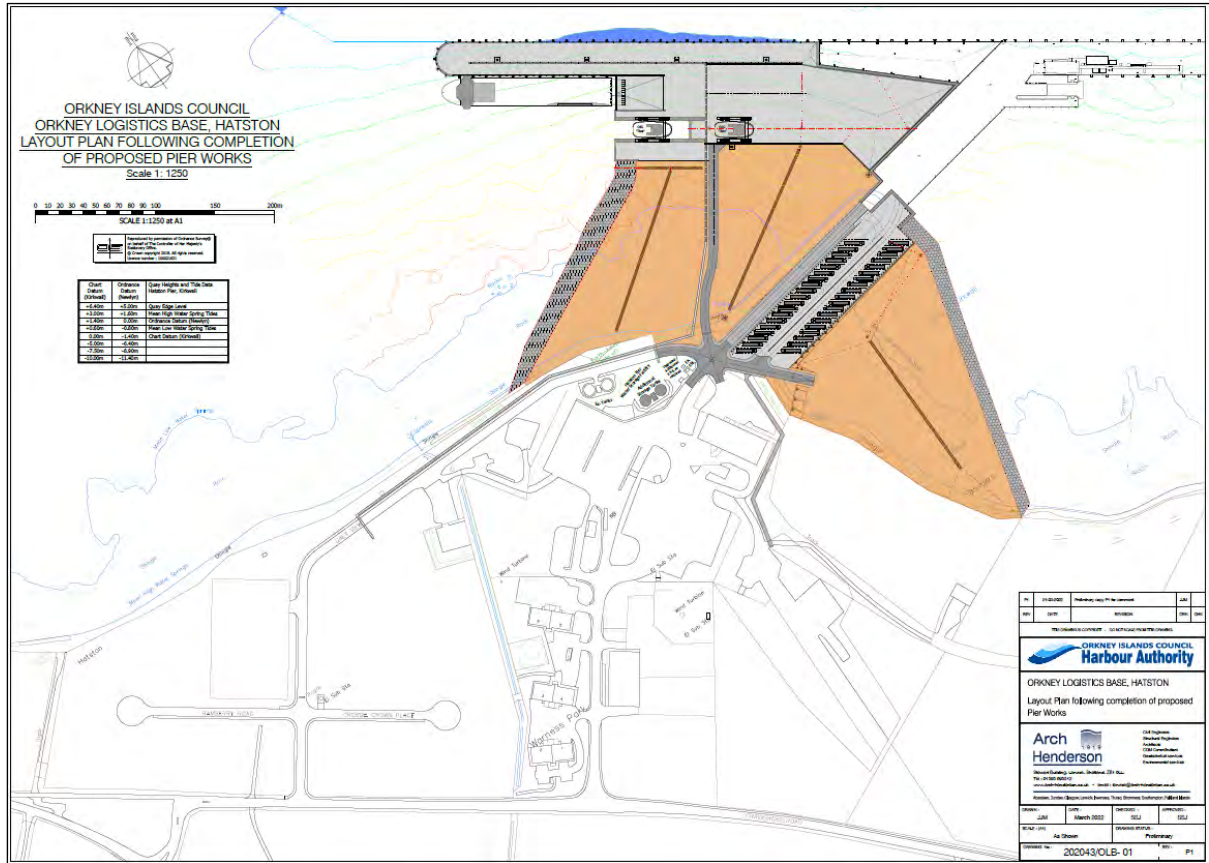


Figure 3: Hatston Pier Site Layout.

## 2 DATA GATHERING

In order to inform the new NRA, the following sources of data were referenced to inform the NRA process:

- A review of the design and location of the enlarged jetty, along with assessment of the volume and type of additional marine vessel traffic that is anticipated to use the facility;
- A review of existing vessel traffic in the immediate vicinity of the study area. (Using the most recent data available, noting that, although regularly reviewed, the PMSC NRA is now 8 years old);
- Review of available navigational incident data for the project area; and
- Consultation with marine stakeholders to verify traffic analysis, and incident data.

### 2.1 PROJECT ASSESSMENT

While the overall detailed project design is still in the early stages, the exemplar design is now well established for Orkney Logistics Base (Hatston) and the anticipated timetable<sup>4</sup> for works will be:

- Phase 1 is likely to be tendered late in 2023 or early 2024 with the Phase 1 project on site in 2024, assuming planning and marine licence can be obtained. Phase 1 shall be operational by 2025 with the aim of supporting the existing operations at Hatston, particularly the lifeline freight and passenger ferry services; and
- Phase 2 and Phase 3 are not likely to be undertaken until 2027. Phase 2 and Phase 3 are to be solid sheet pile wall structures with substantial areas (7 hectares) of land to be reclaimed across the three phases.

### 2.2 PROJECT RELATED VESSEL TRAFFIC

#### 2.2.1 Construction Phase

Until tenders are issued for construction works, the type and volume of vessel traffic associated with the construction of the new facility is unknown. However, it would be reasonable to assume that much of the construction activity will be from landward.

Whilst OIC cannot predict the working methods of the Contractor, nor any future planning issues / restrictions with designated quarry sources, they would anticipate all fill material except for rock armour to come from Orkney-based resources via land.

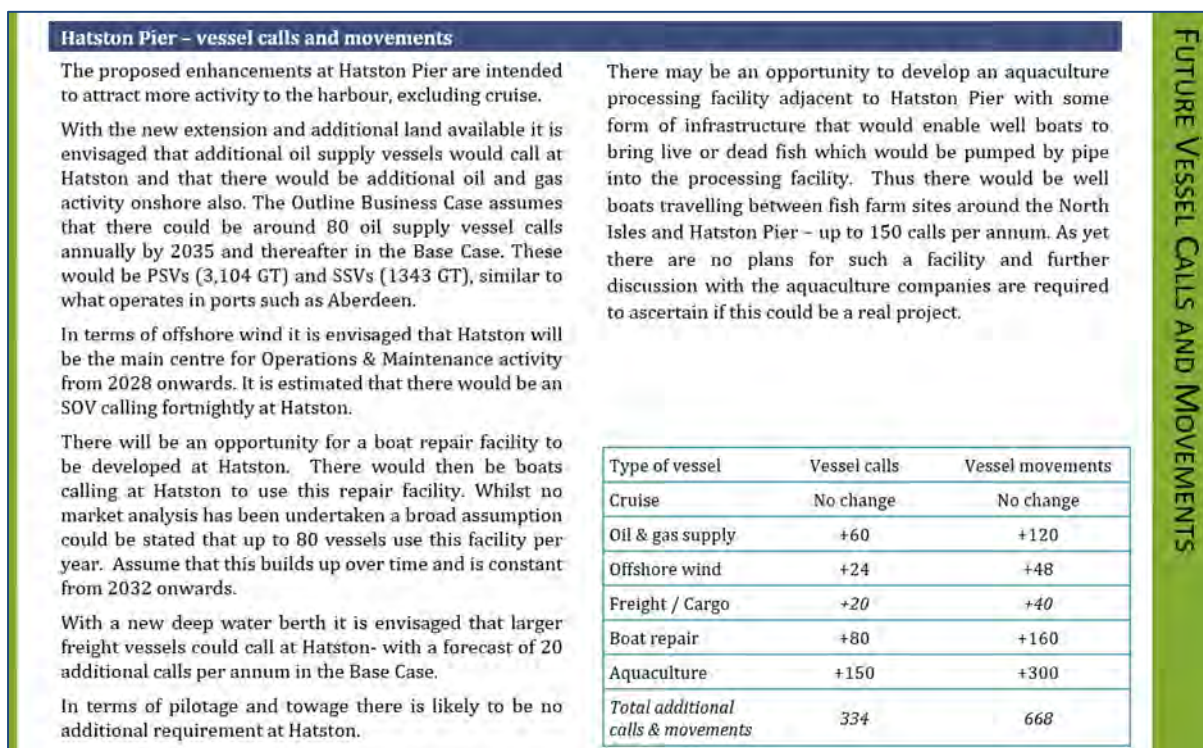
The only other construction vessels imports would be one or two cargo vessels delivering steel piles and approximately 4 to 5 cargo rock carrying vessels delivering imported rock armour stone from mainland UK or more likely Norway or another Scandinavian neighbour.

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<sup>4</sup> Source: OIC Marine Department, email communication.

## 2.2.2 Operational Phase

Traffic volumes during operations will be very dependent on the ultimate commercial users of the new facility, and the success of the project in attracting such users to the facility. However, the economic predictions for the new quay have been made on the following assessment of likely marine traffic (**Figure 4**), once operational, and these numbers have been used during the assessment of navigational risk during the operational phase of the new facility.



**Figure 4: Vessel Movement Information (Source OICHA).**

Total numbers of traffic movements generated are relatively small in relation to existing traffic density, and this has been taken into consideration during the operational phase NRA.

## 2.3 VESSEL TRAFFIC ANALYSIS

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

- Traffic Plots;
- Traffic Density Analysis; and
- Gate Analysis.

### 2.3.1 Vessel Categories

Kirkwall Bay 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. The following vessel type categories (**Table 1**) were identified during the 2015 NRA and have been retained for consistency. For the purposes of this assessment, a new category (I) of Construction Vessels has been added to the 2015 list.

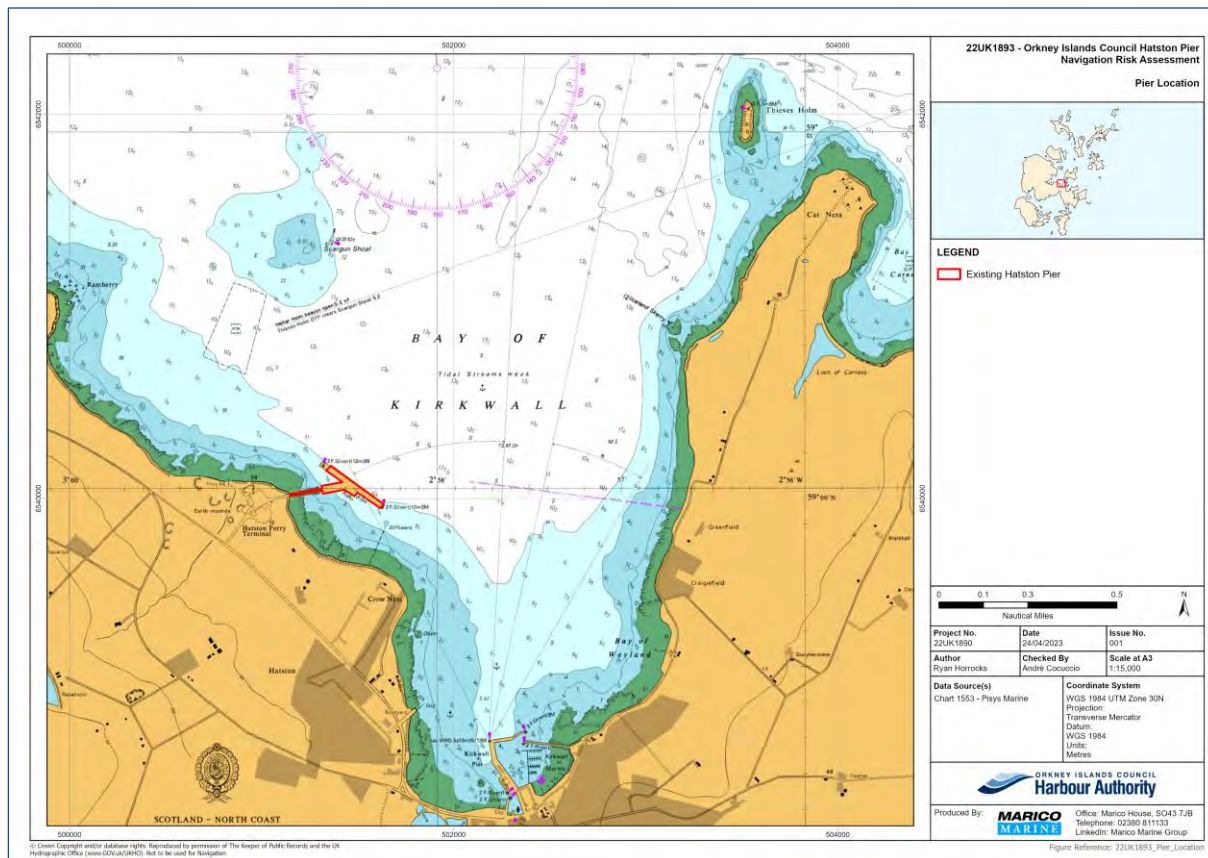
**Table 1: Vessel Categories.**

Ref	Vessel Type Category	Including
A	Cruise Ship	All cruise ships.
B	Inshore Fishing Vessel	Trawler, Creel / Potter.
C	Inter-Island Ferry	Inter-Island Ferry.
D	Large Commercial Vessel	General Cargo, Product Tanker, Large Offshore Support Vessel Inc. ETV, Offshore Fishing Vessel (not fishing in the harbour area). (Military; Cable Layer; Buoy Laying).
E	Mainland Ferry	NorthLink Ferries (freight and passenger)
F	Recreational Vessel	Sailing Yacht, Motor Yacht, Sailing Dinghy, Rigid Hull Inflatable Boat (RHIB), Personal Watercraft (PWC) including kayaks and rowing boats.
G	Small Commercial Vessel	Fish Farm Service Vessel, General Workboat, Harbour Launch, Offshore Renewables Vessel, Diving Support Boat, Pilot Boat, Agent Launch, Small Passenger Vessel (≤12 passengers), Cruise Ship Tender, Law Enforcement Vessel.
H	Towage Vessel	Towage Tug, Escort Tug.
I	Construction vessels	Barges, jack ups, dredgers, aggregate delivery vessels and associated workboats.



## 2.3.2 Study Area

The 2015 NRA considered the SHA area shown in **Figure 1**. However, for this project the area shown in **Figure 5** has been considered to capture the full navigational activity in the vicinity of, and approach to Hatston Pier.



**Figure 5: Hatston Pier Location.**

## 2.3.3 Data Sources

The principal input to the analysis was Automatic Identification System (AIS) data. The following section outlines the data type, extent and duration of the dataset. Incidents data from the Marine Accident Investigation Branch (MAIB), Royal National Lifeboat Institution (RNLI) and Orkney Island Council (OIC) were used within the analysis.

### 2.3.3.1 Automatic Identification System Data

In 2000, the IMO adopted a new requirement as part of a revised Chapter V of Safety of Life at Sea (SOLAS) for ships to be fitted with an AIS receiver. The system aims to improve a mariner's awareness of other vessels by augmenting radar, visual and sound as collision avoidance tools. AIS broadcasts key information about a vessel (such as its identity, position, type, speed, and course) at regular intervals through Very High Frequency (VHF) radio waves.

AIS exists in two forms: Class A and Class B. The former is fitted in all vessels required to carry AIS under SOLAS; the latter is on a voluntary basis by non-SOLAS vessels such as recreational craft and commercial fishing vessels less than 15m in length.

Regulation 19 of SOLAS Chapter V sets out the navigational equipment to be carried on board ships according to ship type, and AIS is required on:

- All ships greater than or equal to 300 gross tonnage and engaged on international voyages;
- Cargo ships greater than or equal to 500 gross tonnage not engaged on international voyages; and
- All passenger ships irrespective of size.

An AIS vessel traffic dataset was sourced from our commercial provider for both a summer and winter two-week period, the extents of which are between:

- Winter – 01/01/2022 – 31/01/2022; and
- Summer – 01/07/2022 – 31/07/2022.

The dataset is composed of terrestrial AIS vessel positions. The dataset was of sufficient duration to identify any seasonality and to provide a reliable sample of vessel traffic in the area. The extent of the dataset was large enough to include the study area and the local vicinity. Please note that some types of vessels are not required by legislation to carry AIS transponders and are therefore under-represented in the AIS data set.

Cruise ship movements are slightly under-represented due to ongoing effects of the Covid pandemic, but this has been taken into account during the assessment. Full months of AIS data have been used, as during consultation it became apparent that some classes of vessels are on three-week rotations. The AIS dataset covers the entire geographic limits of the study area and includes all vessels carrying “Class A” or “Class B” AIS transponders.

An estimate of the percentage of vessels in each category that carry transponders was made during 2015 and is provided in **Table 2**. It is likely that percentages may have increased slightly since that time for those vessels with less than 100% estimates.

**Table 2: Estimated Percentage of Vessels with Class A or Class B AIS Transponders.**

Ref	Vessel Type Category	Percentage
A	Cruise Ship	100%
B	Inshore Fishing Vessel	75%
C	Inter-Island Ferry	100%
D	Large Commercial Vessel	100%
E	Mainland Ferry	100%
F	Recreational Vessel	10%
G	Small Commercial Vessel	80%

Ref	Vessel Type Category	Percentage
H	Towage Vessel	100%

### 2.3.4 Vessel Traffic Overview

All vessel track data that represents the number of vessel tracks within the following report sections has been extracted from the parallel gate as shown in **Section 2.3.4.8**.

The tracks of all vessels within the vicinity of Hatston Pier for both winter and summer periods are shown in **Figure 6**.

Vessel track density within a square kilometre grid is shown within **Figure 7** for both summer and winter periods. The highest density recorded within the winter period within the data extent was 167 tracks (approximately 5 tracks per day) and was located within the approach area to Kirkwall marina. The highest density recorded within the summer period within the data extent was 391 tracks (approximately 13 tracks per day) and was also located within the entrance to Kirkwall marina. For both summer and winter periods, vessel traffic density in the direct vicinity of Hatston Pier is low, however a traffic route can be seen more clearly within the summer dataset, with the highest density across both summer and winter periods being 61 tracks or approximately 2 tracks per day.

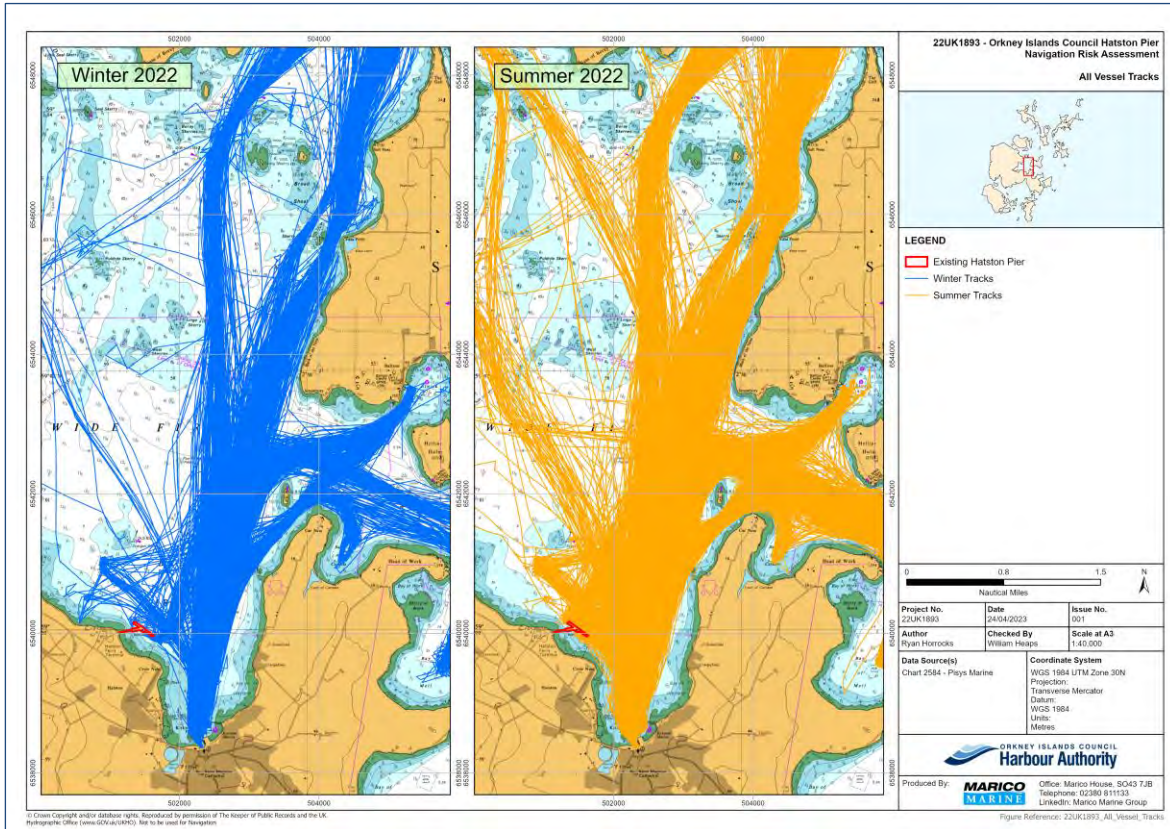


Figure 6: All Vessel Tracks.

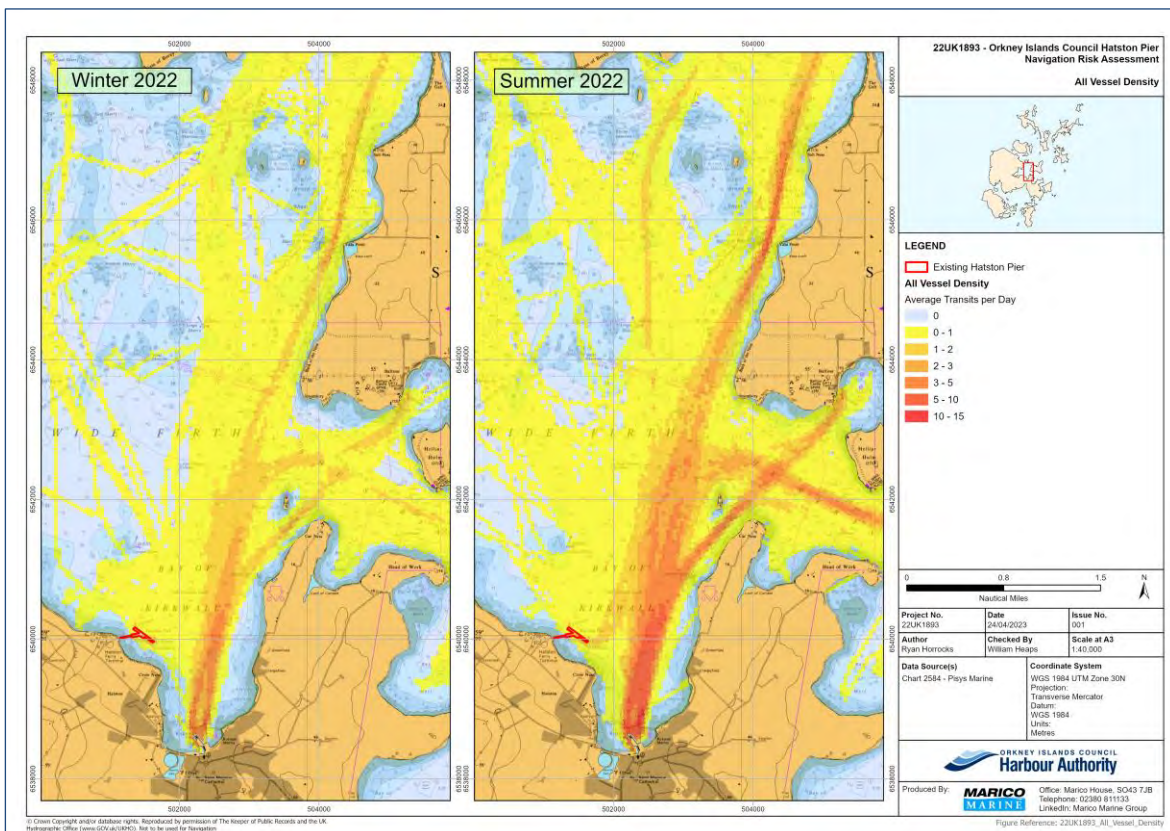
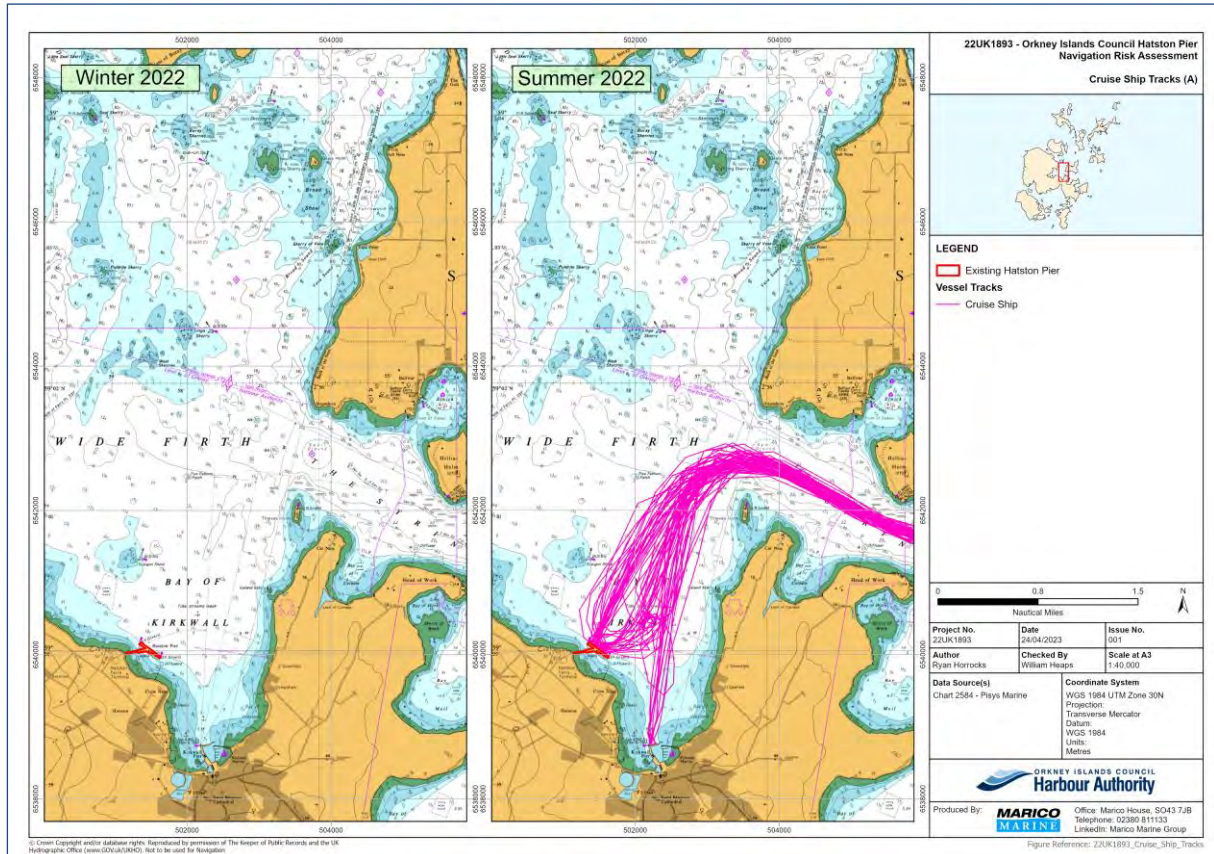


Figure 7: All Vessel Density.

### 2.3.4.1 Cruise Ships (A)

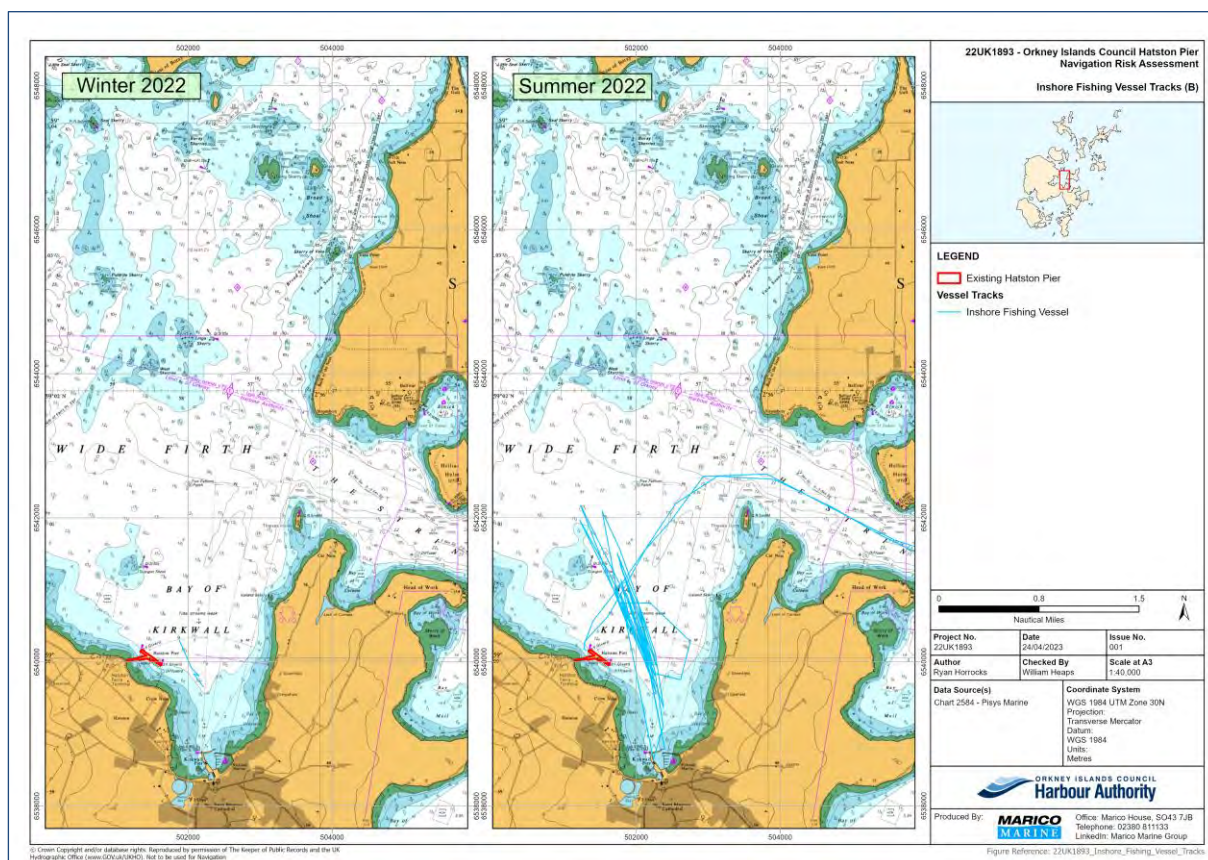
Cruise Ship vessel tracks are illustrated in **Figure 8**. This vessel type can be seen transiting primarily through 'The String'. Cruise Ship vessels are seen to primarily dock at Hatston Pier, with some vessels mooring outside of the Kirkwall marina. A total of 68 Cruise Ship tracks were recorded in the summer period, and no Cruise Ship tracks were recorded in the winter data.



**Figure 8: Cruise Ship Tracks.**

### 2.3.4.2 Inshore Fishing Vessels (B)

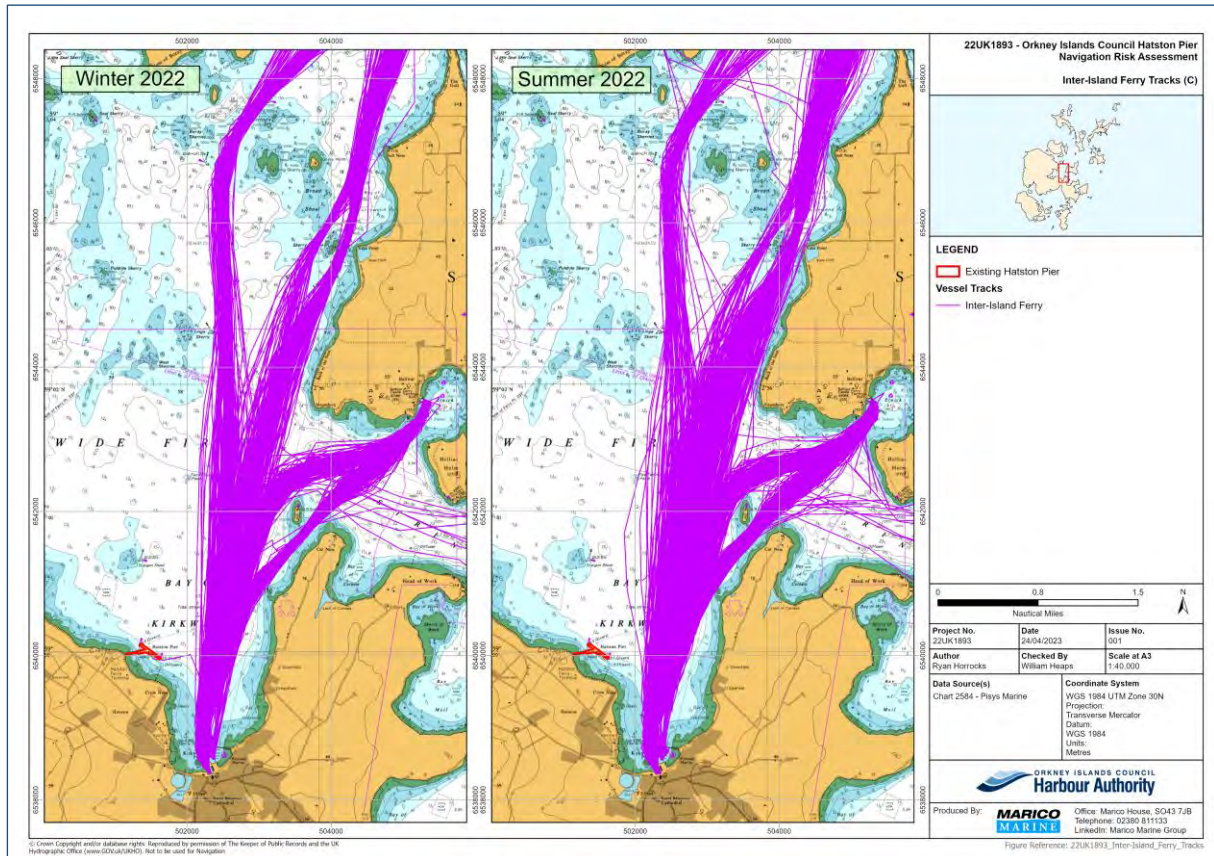
Most fishing vessels are not required to carry AIS under SOLAS Chapter V but vessels longer than 15 metres in length are required to carry AIS under EU regulations. Inshore Fishing vessel tracks are shown in Figure 9. No tracks were recorded within the map extent for the winter period and 16 tracks in the summer period. Only 2 tracks were recorded transiting to Hatston Pier across the summer period.



**Figure 9: Inshore Fishing Vessel Tracks.**

### 2.3.4.3 Inter-Island Ferries (C)

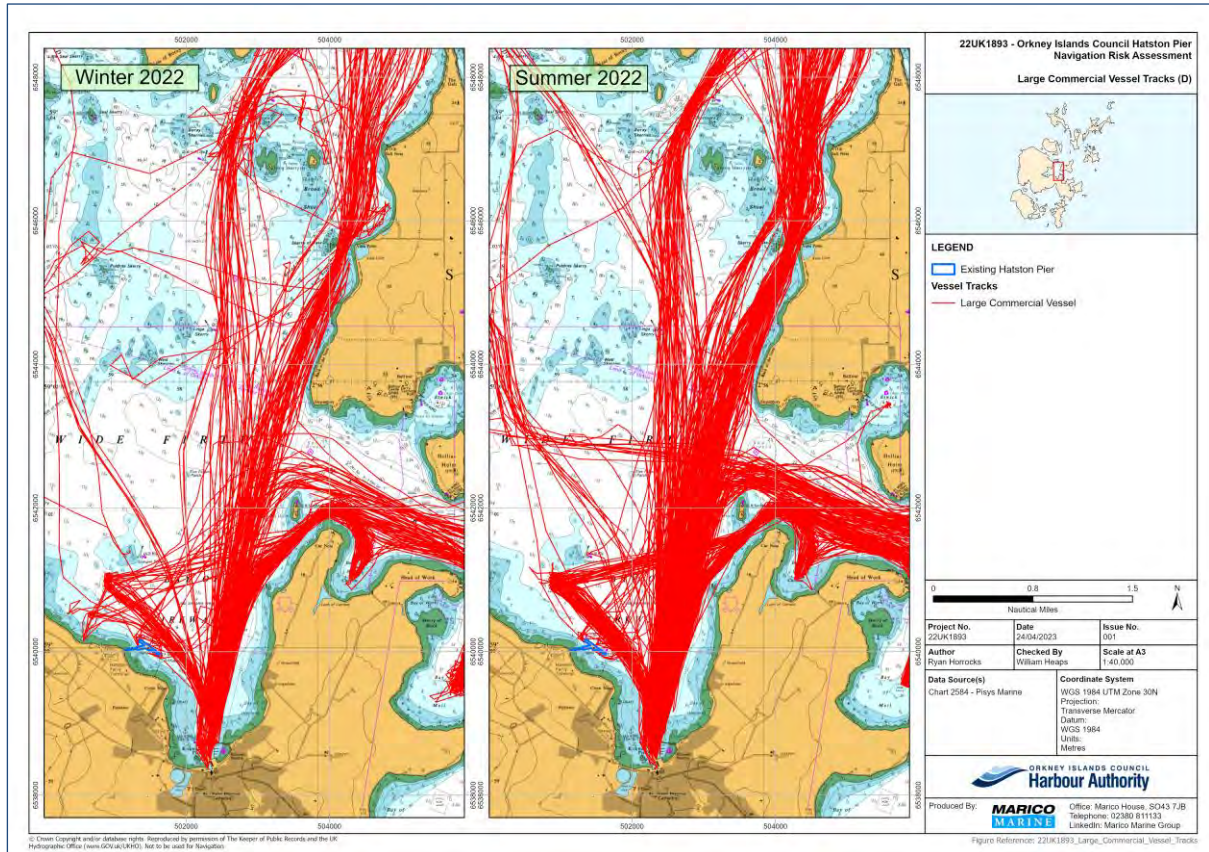
Inter-Island Ferry vessel tracks are shown in **Figure 10**. Inter-Island ferries are a primary form of Transport between islands within Orkney. The recorded tracks are seen to transit predominantly within the Kirkwall area, with only 2 tracks observed within the vicinity of Hatston Pier across both data sets. The Inter-Island Ferries were the most abundant vessels within the study, 609 tracks were recorded during the winter period and 973 recorded in the summer period.



**Figure 10: Inter-Island Ferry Tracks.**

### 2.3.4.4 Large Commercial Vessels (D)

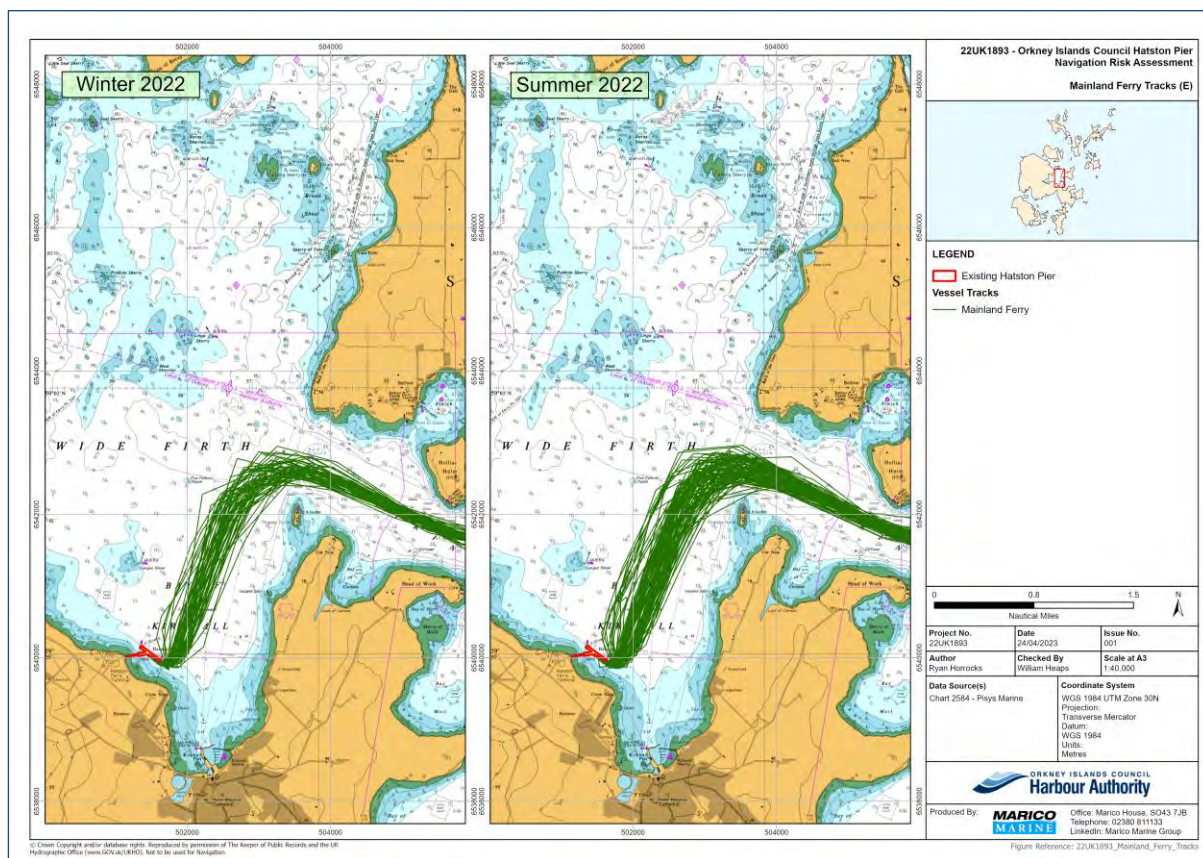
Large Commercial Vessels tracks are shown in **Figure 11**. These vessels include General Cargo, Product Tankers and Large Offshore Support Vessels. These vessels are seen to transit within and around the Hatston Pier location, with 221 recorded tracks in winter and 381 recorded tracks in summer.



**Figure 11: Large Commercial Vessel Tracks.**



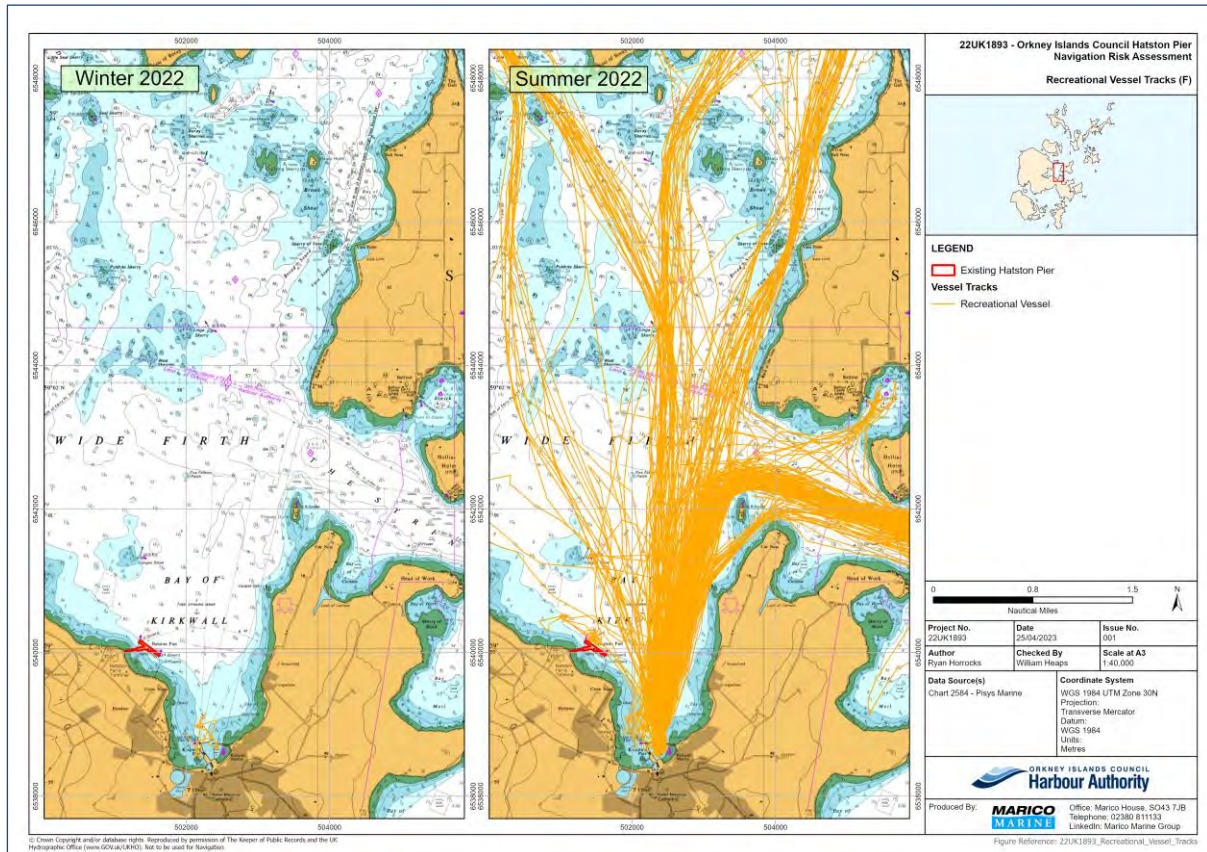
Mainland Ferries are seen to only call at Hatston Pier within the study area shown in **Figure 12**. 59 vessels tracks were recorded in the winter period, equalling approximately 2 tracks per day. Within the summer period there were 101 Mainland Ferry tracks recorded, equalling approximately 3 vessel tracks per day.



**Figure 12: Mainland Ferry Tracks.**

### 2.3.4.5 Recreational Vessels (F)

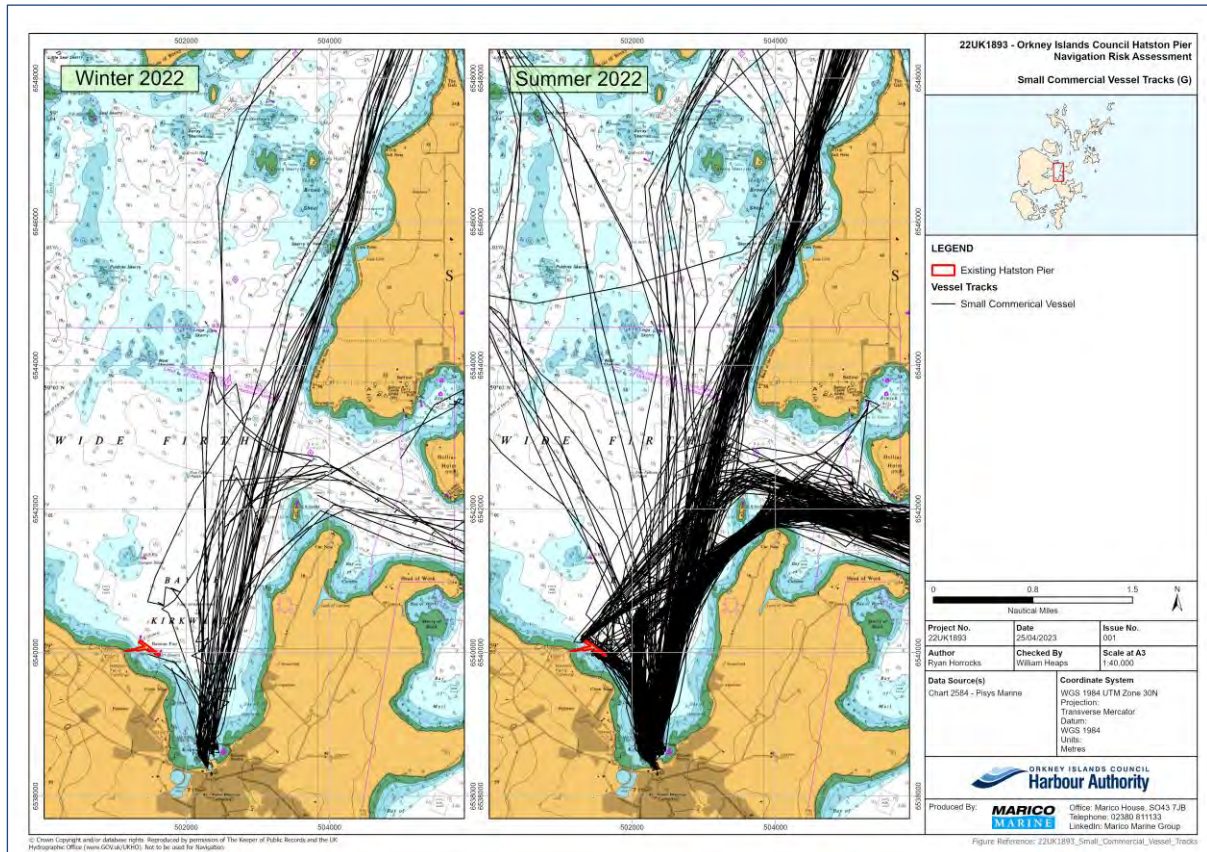
Recreational Vessel tracks can be seen in **Figure 13**. These vessels include Sailing Yachts, Motor Yachts, Sailing Dinghies, Rigid Hull Inflatable Boats and Personal Watercraft. These vessels show seasonal disparity between summer and winter periods. During the winter data set no recreational vessels tracks were recorded through the Gate, with all movements observed to be close into the Kirkwall marina area. The number of vessel tracks recorded in the summer period rises to 242 recorded tracks.



**Figure 13: Recreational Vessel Tracks.**

### 2.3.4.6 Small Commercial Vessels (G)

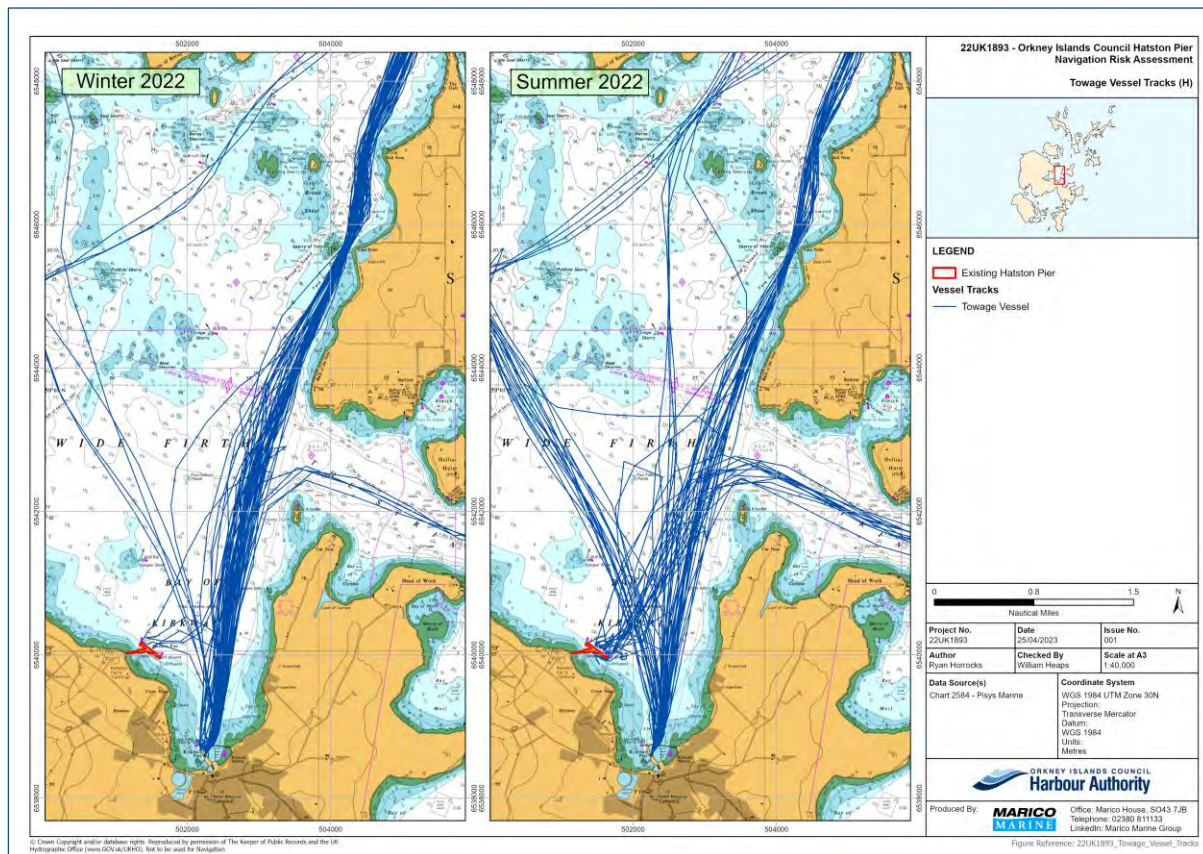
Small Commercial Vessels are classified as Fish Farm Service Vessels, General Workboats, Harbour Launches, Offshore Renewables Vessels, Diving Support Boats, Pilot Boats, Agent Launches, Small Passenger Vessels (≤12 passengers), Cruise Ship Tenders and Law Enforcement Vessels. **Figure 14** shows these Small Commercial Vessels tracks. There were 42 recorded vessel tracks in the winter period and 251 recorded tracks in the summer period.



**Figure 14: Small Commercial Vessel Tracks.**

### 2.3.4.7 Towage Vessels (H)

Towage Vessels tracks are shown in **Figure 15**. A total of 67 transits were recorded in the winter period and 72 transits recorded in the summer. In both periods, these vessels are observed within the vicinity of Hatston pier.

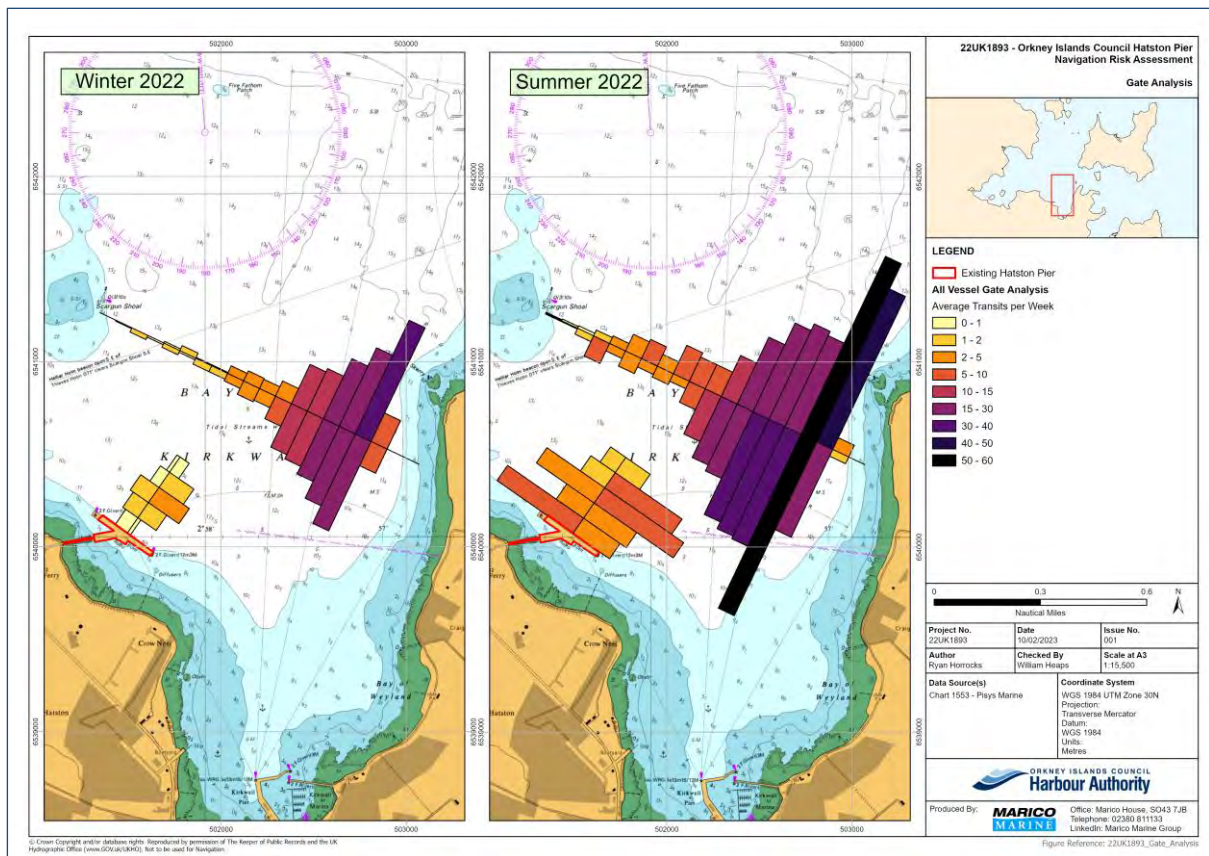


**Figure 15: Towage Vessel Tracks.**

### 2.3.4.8 Gate Analysis

Gate analysis has been undertaken within the Bay of Kirkwall area to examine the frequency and direction of vessel traffic through a linear channel or "Gate". Two transects have been created in the vicinity of the Hatston Pier, one parallel across the main vessel route and one perpendicular to the pier. Columns have been generated depending upon the frequency and direction of intersecting vessel tracks. The parallel gate was the transect used within the data analysis work above.

**Figure 16** illustrates the location of both gates and the frequency and distribution of recorded vessels passing through them. The figure shows the eastern side of the parallel transect being primarily used for vessels travelling both North and South. The smaller transect demonstrates a primarily eastern direction of travel for vessels passing close to Hatston pier.

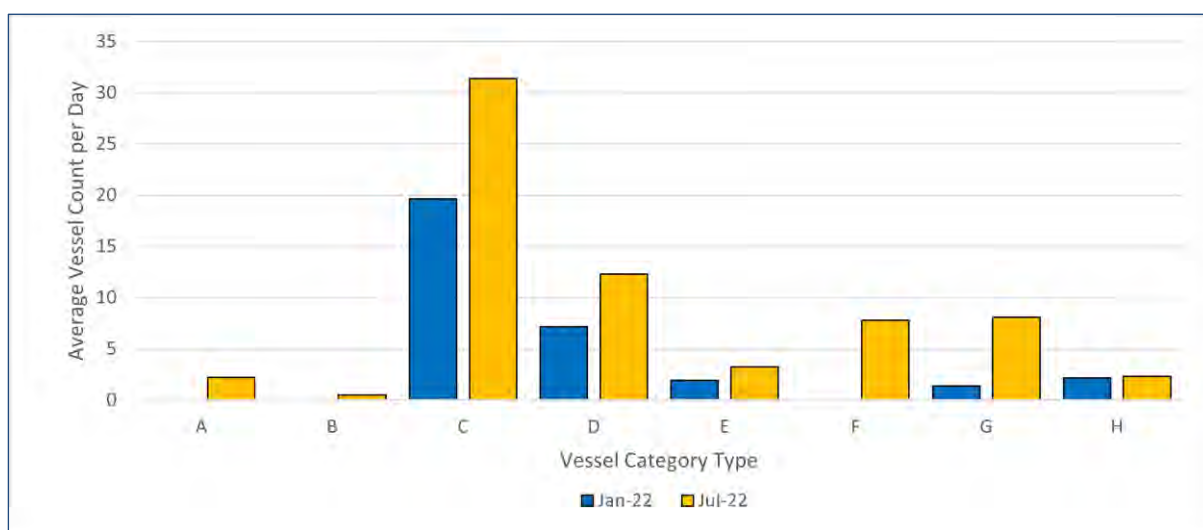


**Figure 16: Gate Analysis.**

### 2.3.4.9 Data Analysis

The figures below represent the recorded tracks through the parallel gate for both summer and winter data periods.

**Figure 17** represents the total number of movements through the parallel gate for both summer and winter periods. Vessel tracks approaching Hatston Pier show variance in summer and winter periods. In total, 998 transits were recorded through the gate in the winter period and 2,104 transits in the summer. The most common vessel type for both data periods was the Category C Vessels (inter-island ferries) which had a total of 609 (approximately 61% of all transits) in the winter and 973 (approximately 46% of all transits) in the summer.



**Figure 17: Vessel Type - Average Vessel Type per Day.**

**Figure 18** and **Figure 19** show the daily recorded number of vessel tracks through the parallel gate. The 04-Jan and 29-Jan are shown to have no vessel transits in **Figure 18**, this is due to extreme weather conditions stopping all vessel movements in the area.

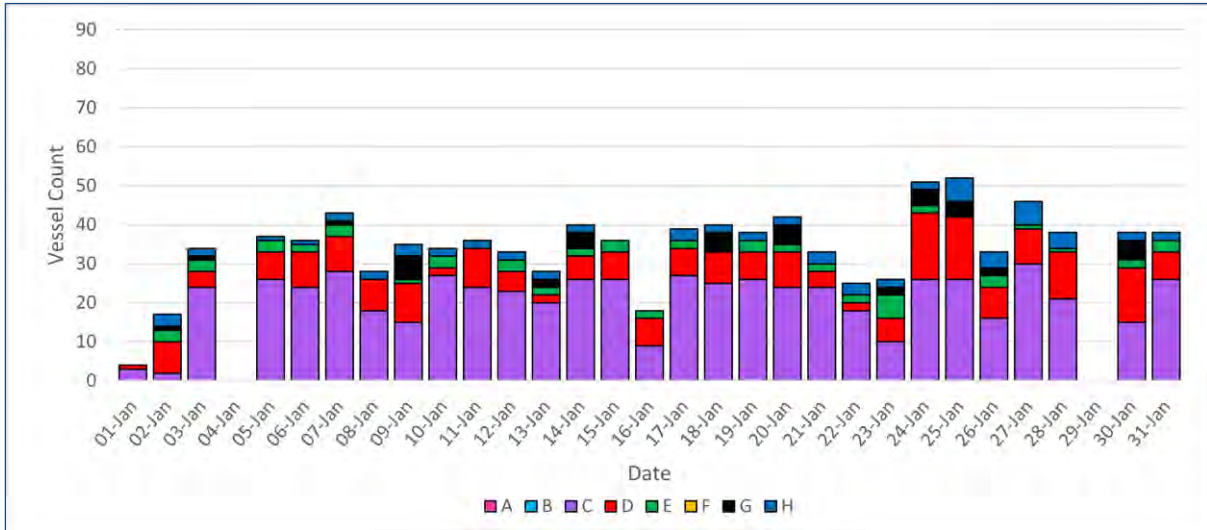


Figure 18: Frequency of Vessel Transits per Day - Jan 22.

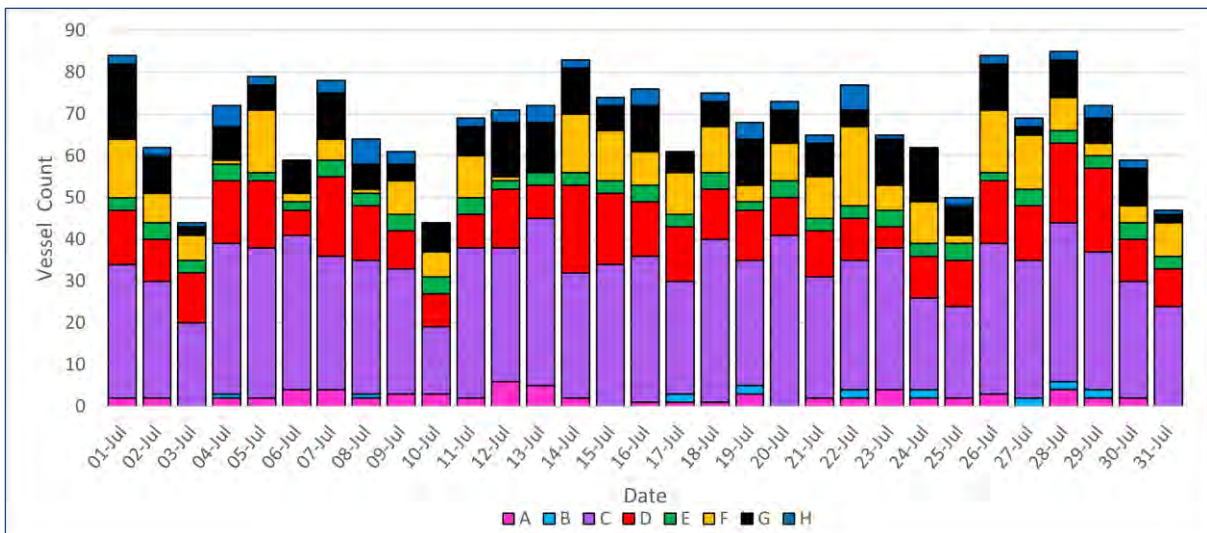


Figure 19: Frequency of Vessel Transits per Day - Jul 22.

### 2.3.5 Commentary

Overall, traffic density in the project area is low, and most traffic is bound for the Pier itself, rather than “passing by”.

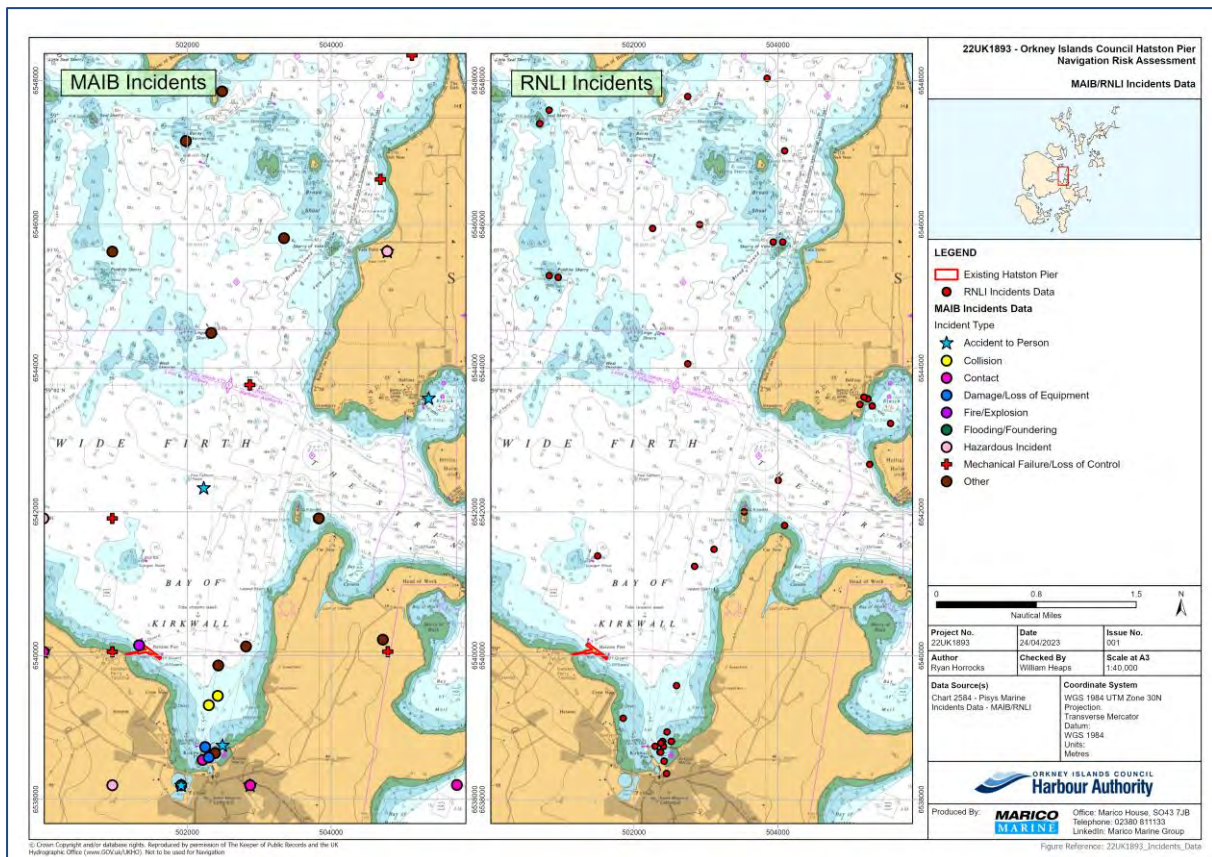
There is a very strong seasonal variation in traffic density, with traffic to both the pier and Kirkwall being much denser during the summer months. In particular, cruise vessels visit almost exclusively during the summer.

Use by some classes of vessel, notably recreation, inshore fishing vessels and inter-island ferries is effectively negligible during the winter and summer seasons. While it is noted that some of these vessels are unlikely to carry AIS and be represented in the preceding track plots, this usage pattern was confirmed by the stakeholders consulted.

## 2.4 INCIDENT ANALYSIS

Information relating to accidents / incidents that have occurred in the past have been used as an input to the hazard identification and risk assessment process. In particular, the incident record helps inform the likely frequency of identified hazards occurring and gives an insight into the most likely and worst credible outcomes in the study area.

**Figure 20** shows the location of both the RNLI and MAIB incidents data within the map extent for Hatston Pier and Bay of Kirkwall area. A total of 48 incidents were recorded for RNLI across the 12-year dataset, of which the most common callout was “Stranding or Grounding”, with 11 callouts. Within the direct vicinity of the Hatston Pier location, no callouts were recorded, the most common location of incidents being around the Kirkwall marina, with 11 recorded. Within the MAIB dataset, a total of 63 incidents were recorded across the 25-year dataset, the most common of which being “Accident to Person” which was recorded 15 times. Only one incident (Fire/Explosion, 2015) was recorded in the vicinity of Hatston Pier in the MAIB dataset.

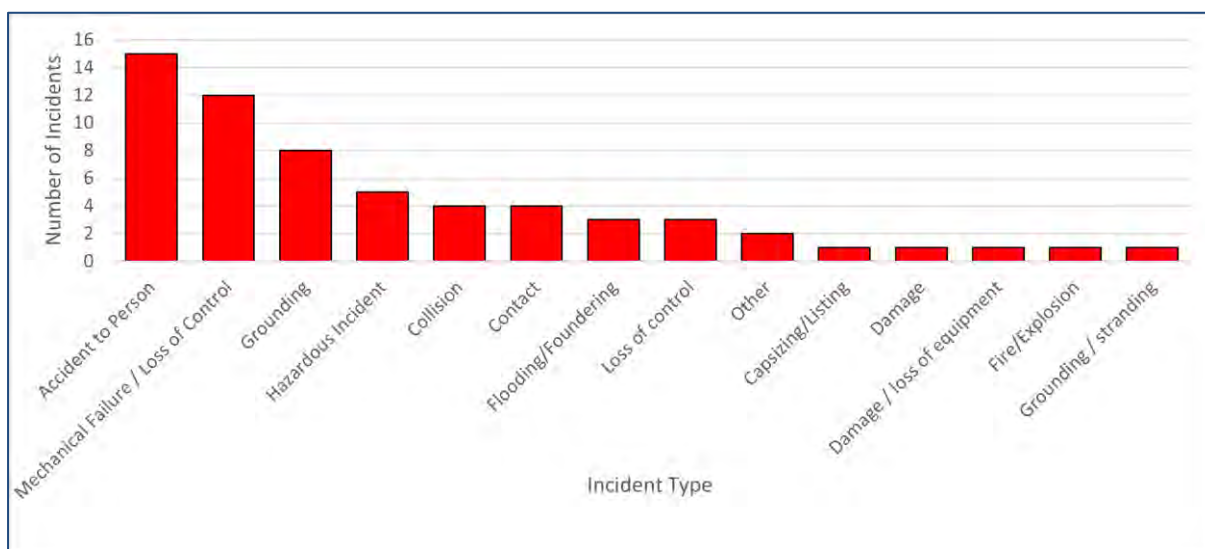


**Figure 20: MAIB and RNLI Incidents Data.**



### 2.4.1 MAIB Incidents

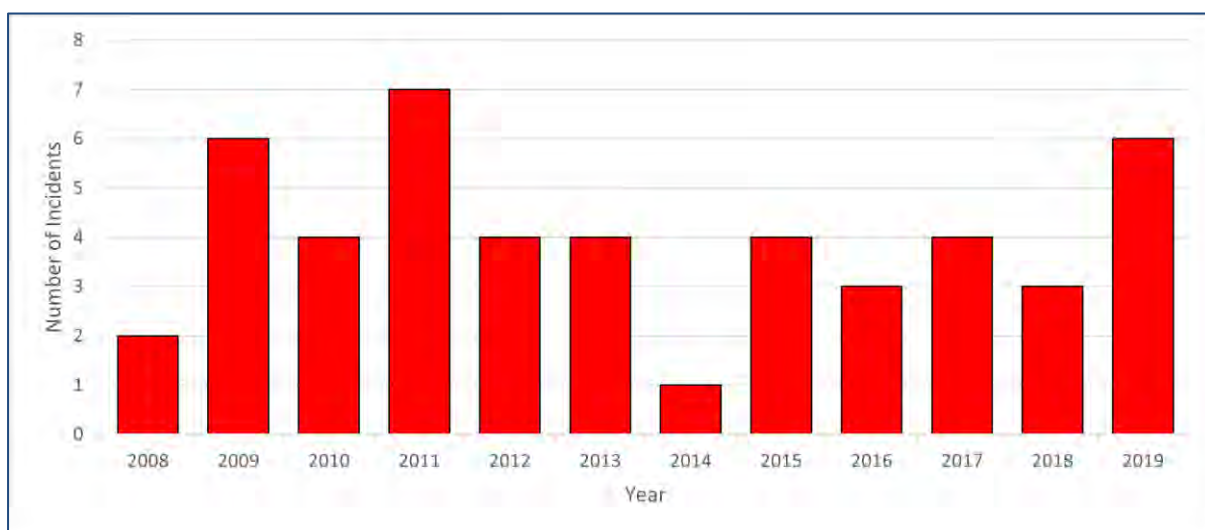
The following incidents have been recorded within the study area by the MAIB between January 1997 and March 2022 as shown in **Figure 20**. **Figure 21** depicts the number of each incident type in the study area and shows 'Accident to Person' as the most frequent incident, with 15 recorded.



*Figure 21: MAIB Incidents by Type for the Bay of Kirkwall Area.*

### 2.4.2 RNLI Incidents

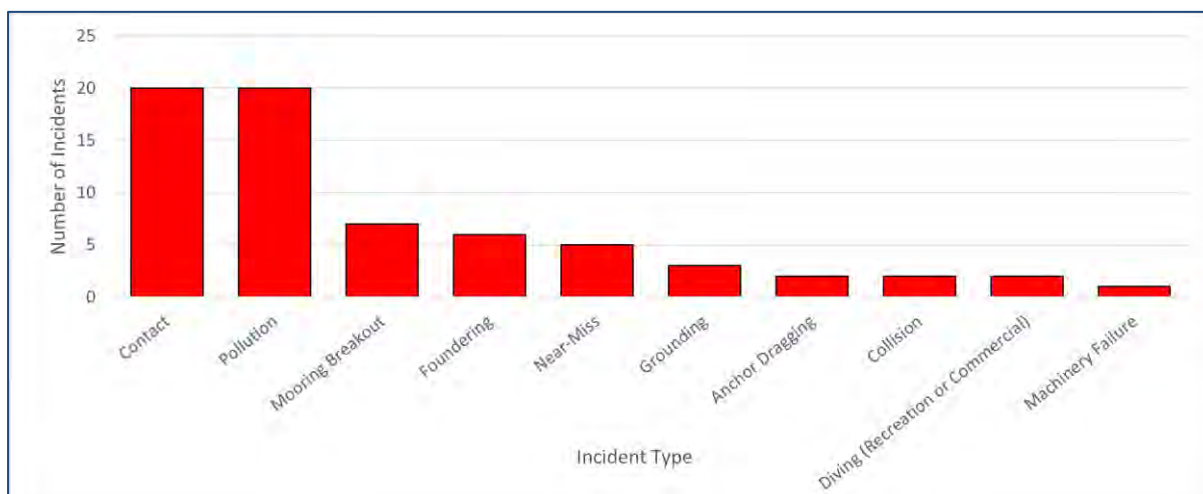
The incidents seen in **Figure 20** have been recorded within the study area by the RNLI between 2008 and 2020. 2011 shows the greatest number of incidents, with 7 recorded, as seen in **Figure 22**.



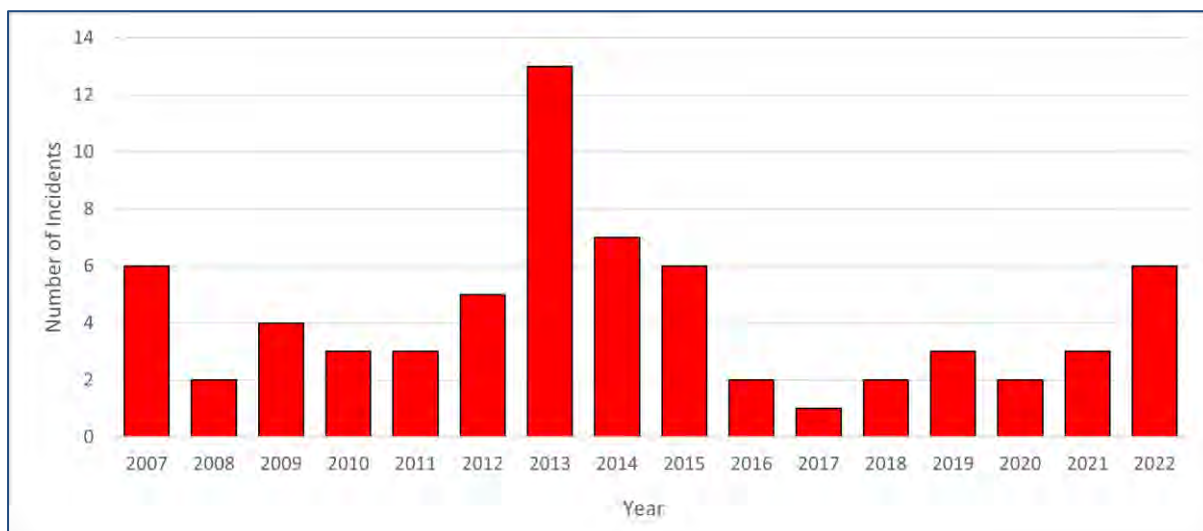
*Figure 22: RNLI incidents by Year for the Bay of Kirkwall Area.*

### 2.4.3 OIC Incidents

The following incidents have been recorded within the study area by the OIC between January 2007 and February 2023. The number of each incident type within the study area is depicted in **Figure 23**. This total number of incidents recorded by OIC is 68, with Contacts and Pollution being the most common incidents at 20 reports each since 2007. **Figure 24** shows the frequency of incidents by year, with 2011 demonstrating the peak annual incidents with 13 recorded.



**Figure 23: OIC Incidents by Type for the Bay of Kirkwall Area.**



**Figure 24: OIC Incidents by Year for the Bay of Kirkwall Area.**

## 2.4.4 Commentary

The available incident data from three separate sources, and covering a period in excess of 10 years, suggests that the number of incidents at Hatston Pier is low. Most of the incidents recorded are spread across the study area, with very few in the vicinity of the project area. The data records a high number of non-navigational incidents such as pollution, which are not relevant to this study.

## 2.5 STAKEHOLDER CONSULTATION

In order to inform this assessment a number of comprehensive consultation meetings were held with OIC Marine Services personnel and other local stakeholders. Full minutes of the meetings (which were held in OIC's offices at Scapa and Kirkwall) are shown in **Annex A**. The primary aim was to collect data and other information to enhance the NRA, and ensure, as far as possible, that all relevant issues are taken into account during the assessment.

These meetings were facilitated by Marico Marine personnel and followed the agenda shown in **Annex B**.

The following stakeholders were approached (**Table 3**).

**Table 3: List of Stakeholders Consulted.**

Stakeholder Group	Meeting time	Consultees	Role / Representing
<b>OIC</b>	14:00 7 November 2022	David Sawkins Peter Bentley Alastair MacDonald	DHM OICHA Pilot VTS
<b>Commercial</b>	09:30 8 November 2022	Stuart Pottinger Abbie Sinclair Dougie Leask John Skuse Daniel Wise Alan Scott Ollie Cameron	Orkney Ferries Orkney Ferries Leask Marine EMEC Orbital (renewables) SERC NorthLink Ferries OIC Kirkwall AHM / Pier Master
<b>Leisure</b>	12:30 8 November 2022	Mike Cooper Ian Hutchison David Flett	Orkney Marinas / RNLI / Cruising Assoc / Ocean Cruising Club Orkney Sailing Club Orkney Rowing club – comments received post meeting
<b>Aquaculture</b>	14:30 8 November 2022	Steve Kolthammer Maddy Walker Robert Petersen Naomi Dempsey	Scottish Seafarms Scottish Seafarms Cooke Aquaculture Cooke Aquaculture
<b>Fishing</b>	By email	Hannah Fennel	Orkney Fisheries Association

## 2.5.1 Consultation Outcome

As indicated in **Table 3** above, there was a good response to the request for stakeholder input into this NRA.

The expert assessors undertaking this NRA, have attempted to consider likely impacts on all users when assessing the navigational risk, and therefore the views of those users are vital to ensure no concerns or observations are missed.

The consultation meetings were wide ranging, and provided confidence that data obtained (vessel types, traffic density, incident history, etc.) was representative and accurate for the purposes of informing the risk assessment.

Key outcomes of the consultation (aside from confirmation of input data) were:

- Grounding was considered a potential hazard, especially inside the new quay face, both during construction and operation. Potential mitigations included buoys, dredging (costly as rock substrate) or fender piles to prevent access to shallow areas;
- It was considered that there would be insufficient water inside the pier extension without dredging (including dredging a pocket for tugs to use);
- The location of the fish farm and Scargun shoal were noted as existing hazards in the approach, although it was later confirmed that the fish farm was relocating out of the project area;
- Although risks to leisure vessels were considered low, a potential additional mitigation was proposed by the Rowing club: inform VTS when leaving and returning to shore (reporting numbers of vessels / people and safe return);
- The current quay space for small vessels inside the existing pier was noted and considered to be very useful for smaller work boats and barges. It was noted that these berths would be lost on the East side of the existing causeway, and current users would therefore be displaced to Kirkwall Pier (if sufficient space could be found), resulting in increased traffic / risk in Kirkwall as a result of the development (cumulative impact); and
- The suggested mitigation was provision of equivalent quay space to the eastern edge of the new fill area (south of proposed boat lift) by replacing rock revetment with sheet piling and suitable dredging.

### 3 HAZARD IDENTIFICATION

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 likelihood 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.

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 the project area in the past but are nonetheless possible and credible.

#### 3.1 HAZARD IDENTIFICATION

Hazards relating to navigation within Kirkwall Bay were identified using a variety of methods, including reference to the previous NRA, stakeholder consultation meetings / workshops, review of incident records, and traffic analysis. The Data Gathering (Stage 1) was the principal input to the Hazard Identification (Stage 2).

##### 3.1.1 Hazard Categories

Kirkwall Bay is used by a wide variety of commercial and recreational operators and this results in a high number of potential hazards. In order to focus the overall NRA and provide a structured hazard identification process, the following hazard categories identified during the original SHA assessment were used, but with two additional specific additional hazards during the construction phase (**Table 4**). Categorising hazards in this way also helps in the determination of risk control measures pertinent to the 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 4: Hazard Categories.**

Ref	Hazard Category	Comments
A	Anchor Dragging	When a vessel unintentionally moves from its anchored position because the anchor has failed to hold. This may be due to a combination of strong winds, large waves, adverse anchoring (seabed) conditions, mechanical failure, or poor seamanship / anchoring technique.
B	Collision	When two or more vessels impact each other whilst manoeuvring.
C	Contact	When one or more vessels makes physical contact with a fixed object such as a pier / jetty 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 ship).
D	Diving	Diving incident involving Recreational or Commercial diving.

Ref	Hazard Category	Comments
E	Girting	Sometimes referred to as "Girding". This is when a towline under tension exerts a heeling moment which results in excessive heel that could cause the tug to capsize.
F	Grounding	When a vessel unintentionally makes contact with the seabed.
G	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, adverse mooring arrangements (bollards) or poor seamanship / mooring technique.

### 3.2 NAVIGATION HAZARDS – CONSTRUCTION PHASE

The Hazard Identification process identified a total of 50 hazards for the study area during the construction phase of the project, as shown in **Table 5**. The full Hazard Logs with additional information are shown in **Annex D**.

**Table 5: Construction Phase Navigation Hazards.**

Hazard ID	Category	Hazard Title	Hazard Detail
1	Anchor Dragging	Anchor Dragging - Construction Vessel	A Construction Vessel unintentionally moves from its anchored position because the anchor has failed to hold.
2	Anchor Dragging	Anchor Dragging - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry	A Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry unintentionally moves from its anchored position because the anchor has failed to hold.
3	Anchor Dragging	Anchor dragging - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	An Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel unintentionally moves from its anchored position because the anchor has failed to hold.
4	Collision	Construction Vessel - Construction Vessel	A Construction Vessel collides with another Construction Vessel

Hazard ID	Category	Hazard Title	Hazard Detail
5	Collision	Construction Vessel - Cruise Ship / Mainland Ferry	A Construction Vessel collides with a Cruise Ship / Mainland Ferry.
6	Collision	Construction Vessel - Inshore Fishing Vessel	A Construction Vessel collides with a Fishing Vessel.
7	Collision	Construction Vessel - Inter-Island Ferry	A Construction Vessel collides with an Inter-Island Ferry.
8	Collision	Construction Vessel - Large Commercial Vessel	A Construction Vessel collides with a Large Commercial Vessel.
9	Collision	Construction Vessel - Recreational Vessel	A Construction Vessel collides with a Recreational Vessel.
10	Collision	Construction Vessel - Small Commercial Vessel	A Construction Vessel collides with a Small Commercial Vessel.
11	Collision	Construction Vessel - Towage Vessel	A Construction Vessel collides with a ship towage Vessel
12	Collision	Cruise Ship / Mainland Ferry - Cruise Ship / Mainland Ferry	A Cruise Ship / Mainland Ferry collides with another Cruise Ship / Mainland Ferry.
13	Collision	Cruise Ship / Mainland Ferry - Inshore Fishing Vessel	A Cruise Ship / Mainland Ferry collides with an Inshore Fishing Vessel.
14	Collision	Cruise Ship / Mainland Ferry - Inter-Island Ferry	A Cruise Ship / Mainland Ferry collides with an Inter-Island Ferry.
15	Collision	Cruise Ship / Mainland Ferry - Large Commercial Vessel	A Cruise Ship / Mainland Ferry collides with a Large Commercial Vessel.
16	Collision	Cruise Ship / Mainland Ferry - Recreational Vessel	A Cruise Ship / Mainland Ferry collides with a Recreational Vessel.
17	Collision	Cruise Ship / Mainland Ferry - Small Commercial Vessel	A Cruise Ship / Mainland Ferry collides with a Small Commercial Vessel.
18	Collision	Cruise Ship / Mainland Ferry - Towage Vessel	A Cruise Ship / Mainland Ferry collides with a Towage Vessel.

Hazard ID	Category	Hazard Title	Hazard Detail
19	Collision	Inshore Fishing Vessel - Inshore Fishing Vessel	An Inshore Fishing Vessel collides with another Inshore Fishing Vessel.
20	Collision	Inshore Fishing Vessel - Inter-Island Ferry	An Inshore Fishing Vessel collides with an Inter-Island ferry.
21	Collision	Inshore Fishing Vessel - Large Commercial Vessel	An Inshore Fishing Vessel collides with a Large Commercial Vessel.
22	Collision	Inshore Fishing Vessel - Recreational Vessel	An Inshore Fishing Vessel collides with a Recreational Vessel.
23	Collision	Inshore Fishing Vessel - Small Commercial Vessel	An Inshore Fishing Vessel collides with a Small Commercial Vessel.
24	Collision	Inshore Fishing Vessel - Towage Vessel	An Inshore Fishing Vessel collides with a Towage Vessel.
25	Collision	Inter-Island Ferry - Inter-Island Ferry	An Inter-Island Ferry collides with another Inter-Island Ferry.
26	Collision	Inter-Island Ferry - Large Commercial Vessel	An Inter-Island Ferry collides with a Large Commercial Vessel.
27	Collision	Inter-Island Ferry - Recreational Vessel	An Inter-Island Ferry collides with a Recreational Vessel.
28	Collision	Inter-Island Ferry - Small Commercial Vessel	An Inter-Island Ferry collides with a Small Commercial Vessel.
29	Collision	Inter-Island Ferry - Towage Vessel	An Inter-Island Ferry collides with a Towage Vessel.
30	Collision	Large Commercial Vessel - Large Commercial Vessel	A Large Commercial Vessel collides with another Large Commercial Vessel.
31	Collision	Large Commercial Vessel - Recreational Vessel	A Large Commercial Vessel collides with a Recreational Vessel.
32	Collision	Large Commercial Vessel - Small Commercial Vessel	A Large Commercial Vessel collides with a Small Commercial Vessel.



Hazard ID	Category	Hazard Title	Hazard Detail
33	Collision	Large Commercial Vessel - Towage Vessel	A Large Commercial Vessel collides with a Towage Vessel.
34	Collision	Recreational Vessel - Recreational Vessel	A Recreational Vessel collides with another Recreational Vessel.
35	Collision	Recreational Vessel - Small Commercial Vessel	A Recreational Vessel collides with a Small Commercial Vessel.
36	Collision	Recreational Vessel - Towage Vessel	A Recreational Vessel collides with a Towage Vessel.
37	Collision	Small Commercial Vessel - Small Commercial Vessel	A Small Commercial Vessel collides with another Small Commercial Vessel.
38	Collision	Small Commercial Vessel - Towage Vessel	A Small Commercial Vessel collides with a Towage Vessel.
39	Collision	Towage Vessel - Towage Vessel	A Towage Vessel collides with another Towage Vessel.
40	Contact	Contact - Construction Vessel	A Construction Vessel contacts a fixed object including the works.
41	Contact	Contact - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry	A Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry contacts a fixed object.
42	Contact	Contact - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	An Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel contacts a fixed object.
43	Diving	Diving Incident (including construction works)	A diving incident involving a Recreational and / or Commercial Vessel.
44	Girting	Girting Incident (including during construction)	A towline under tension exerts a heeling moment which results in excessive heel that causes the tug to capsize.
45	Grounding	Grounding - Construction Vessel	A Construction Vessel runs aground.
46	Grounding	Grounding - Cruise Ship / Mainland Ferry / Large	A Cruise Ship / Mainland Ferry / Large Commercial

Hazard ID	Category	Hazard Title	Hazard Detail
		Commercial Vessel / Inter-Island Ferry	Vessel / Inter-Island Ferry runs aground.
47	Grounding	Grounding - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	An Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel runs aground.
48	Mooring Incident / Breakout	Mooring Breakout - Construction Vessel	A Construction Vessel breaks away from her moorings.
49	Mooring Incident / Breakout	Mooring Breakout - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry.	A Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry breaks away from her moorings.
50	Mooring Incident / Breakout	Mooring Breakout - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	An Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel breaks away from her moorings.

### 3.3 NAVIGATION HAZARDS – OPERATIONAL PHASE

The Hazard Identification process identified a total of 38 hazards for the study area during the operational phase of the project, as shown in **Table 6**. The full Hazard Logs with additional information are shown in **Annex E**.

**Table 6: Operational Phase Navigation Hazards.**

Hazard ID	Category	Hazard Title	Hazard Detail
1	Anchor Dragging	Anchor Dragging - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry	A Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry unintentionally moves from its anchored position because the anchor has failed to hold.
2	Anchor Dragging	Anchor dragging - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	An Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel unintentionally moves from its anchored position

Hazard ID	Category	Hazard Title	Hazard Detail
			because the anchor has failed to hold.
3	Collision	Cruise Ship / Mainland Ferry - Cruise Ship / Mainland Ferry	A Cruise Ship / Mainland Ferry collides with another Cruise Ship / Mainland Ferry.
4	Collision	Cruise Ship / Mainland Ferry - Inshore Fishing Vessel	A Cruise Ship / Mainland Ferry collides with an Inshore Fishing Vessel.
5	Collision	Cruise Ship / Mainland Ferry - Inter-Island Ferry	A Cruise Ship / Mainland Ferry collides with an Inter-Island Ferry.
6	Collision	Cruise Ship / Mainland Ferry - Large Commercial Vessel	A Cruise Ship / Mainland Ferry collides with a Large Commercial Vessel.
7	Collision	Cruise Ship / Mainland Ferry - Recreational Vessel	A Cruise Ship / Mainland Ferry collides with a Recreational Vessel.
8	Collision	Cruise Ship / Mainland Ferry - Small Commercial Vessel	A Cruise Ship / Mainland Ferry collides with a Small Commercial Vessel.
9	Collision	Cruise Ship / Mainland Ferry - Towage Vessel	A Cruise Ship / Mainland Ferry collides with a Towage Vessel.
10	Collision	Inshore Fishing Vessel - Inshore Fishing Vessel	An Inshore Fishing Vessel collides with another Inshore Fishing Vessel.
11	Collision	Inshore Fishing Vessel - Inter-Island Ferry	An Inshore Fishing Vessel collides with an Inter-Island ferry.
12	Collision	Inshore Fishing Vessel - Large Commercial Vessel	An Inshore Fishing Vessel collides with a Large Commercial Vessel.
13	Collision	Inshore Fishing Vessel - Recreational Vessel	An Inshore Fishing Vessel collides with a Recreational Vessel.
14	Collision	Inshore Fishing Vessel - Small Commercial Vessel	An Inshore Fishing Vessel collides with a Small Commercial Vessel.
15	Collision	Inshore Fishing Vessel - Towage Vessel	An Inshore Fishing Vessel collides with a Towage Vessel.

Hazard ID	Category	Hazard Title	Hazard Detail
16	Collision	Inter-Island Ferry - Inter-Island Ferry	An Inter-Island Ferry collides with another Inter-Island Ferry.
17	Collision	Inter-Island Ferry - Large Commercial Vessel	An Inter-Island Ferry collides with a Large Commercial Vessel.
18	Collision	Inter-Island Ferry - Recreational Vessel	An Inter-Island Ferry collides with a Recreational Vessel.
19	Collision	Inter-Island Ferry - Small Commercial Vessel	An Inter-Island Ferry collides with a Small Commercial Vessel.
20	Collision	Inter-Island Ferry - Towage Vessel	An Inter-Island Ferry collides with a Towage Vessel.
21	Collision	Large Commercial Vessel - Large Commercial Vessel	A Large Commercial Vessel collides with another Large Commercial Vessel.
22	Collision	Large Commercial Vessel - Recreational Vessel	A Large Commercial Vessel collides with a Recreational Vessel.
23	Collision	Large Commercial Vessel - Small Commercial Vessel	A Large Commercial Vessel collides with a Small Commercial Vessel.
24	Collision	Large Commercial Vessel - Towage Vessel	A Large Commercial Vessel collides with a Towage Vessel.
25	Collision	Recreational Vessel - Recreational Vessel	A Recreational Vessel collides with another Recreational Vessel.
26	Collision	Recreational Vessel - Small Commercial Vessel	A Recreational Vessel collides with a Small Commercial Vessel.
27	Collision	Recreational Vessel - Towage Vessel	A Recreational Vessel collides with a Towage Vessel.
28	Collision	Small Commercial Vessel - Small Commercial Vessel	A Small Commercial Vessel collides with another Small Commercial Vessel.
29	Collision	Small Commercial Vessel - Towage Vessel	A Small Commercial Vessel collides with a Towage Vessel.

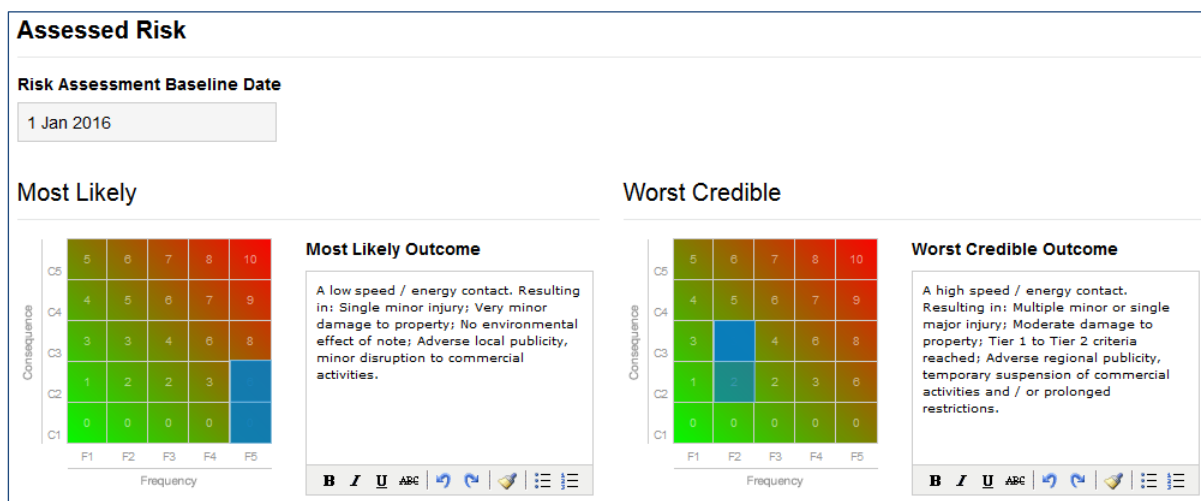
Hazard ID	Category	Hazard Title	Hazard Detail
30	Collision	Towage Vessel - Towage Vessel	A Towage Vessel collides with another Towage Vessel.
31	Contact	Contact - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry	A Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry contacts a fixed object.
32	Contact	Contact - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	An Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel contacts a fixed object.
33	Diving	Diving Incident	A diving incident involving a Recreational and / or Commercial Vessel.
34	Girting	Girting Incident	A towline under tension exerts a heeling moment which results in excessive heel that causes the tug to capsize.
35	Grounding	Grounding - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry	A Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry runs aground.
36	Grounding	Grounding - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	An Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel runs aground.
37	Mooring Incident / Breakout	Mooring Breakout - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry.	A Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry breaks away from her moorings.
38	Mooring Incident / Breakout	Mooring Breakout - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	An Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel breaks away from her moorings.

## 4 RISK ASSESSMENT

This risk assessment complies with the PMSC and its associated Guide to Good Practice and was conducted in accordance with the IMO FSA methodology for risk assessments. A detailed description of the methodology is provided in **Annex C** Overview of the Risk Assessment Methodology.

A standard 5x5 risk matrix was used (see **Figure 25**) 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 realistic and thorough assessment of risk, which reflects reality, in that relatively few incidents result in the “worst credible” outcome.



*Figure 25: Example Risk Matrix.*

### 4.1.1 Assessment of Frequency and Consequence

For both the construction and operational phases of the proposed new facility, an assessment of frequency was made for a notional “most likely” and “worst 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 shown in **Annex C**.

The frequency and consequence assessments were largely based on the data / information collected during Stage 1 of this NRA.

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

## 4.1.2 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 are sorted into a Ranked Hazard List that shows the highest risk hazards prioritised at the top and the lowest at the bottom (see **Section 4.2**).

Risks are deemed to be negligible, low, As Low as Reasonably Practicable (ALARP), significant or high, as per **Table 7**. 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 7: Risk Scoring.**

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.

## 4.2 RISK ASSESSMENT RESULTS

### 4.2.1 Construction Phase

**Table 8** shows a summary of the Ranked Hazard List for the construction phase of the new quay. More details on each hazard are provided in **Annex D**, which also contains the associated risk scores in terms of the “most likely” and the “worst credible” consequences to people, property, environment and business.

**Table 8: Summary of the Ranked Hazard List – Construction Phase.**

Rank	Hazard Ref.	Accident Category	Hazard Title	Risk Overall
1	5	Collision	Construction Vessel - Cruise Ship / Mainland Ferry	4.56
2	7	Collision	Construction Vessel - Inter-Island Ferry	4.45
3	45	Grounding	Grounding - Construction Vessel	4.41
4	41	Contact	Contact - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry	4.31
5	49	Mooring Incident / Breakout	Mooring Breakout - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry.	4.19
6	28	Collision	Inter-Island Ferry - Small Commercial Vessel	4.03
7	14	Collision	Cruise Ship / Mainland Ferry - Inter-Island Ferry	3.90
8	15	Collision	Cruise Ship / Mainland Ferry - Large Commercial Vessel	3.90
9	50	Mooring Incident / Breakout	Mooring Breakout - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	3.82
10	23	Collision	Inshore Fishing Vessel - Small Commercial Vessel	3.80
11	17	Collision	Cruise Ship / Mainland Ferry - Small Commercial Vessel	3.70
12	13	Collision	Cruise Ship / Mainland Ferry - Inshore Fishing Vessel	3.69
13	6	Collision	Construction Vessel - Inshore Fishing Vessel	3.64



Rank	Hazard Ref.	Accident Category	Hazard Title	Risk Overall
14	10	Collision	Construction Vessel - Small Commercial Vessel	3.64
15	25	Collision	Inter-Island Ferry - Inter-Island Ferry	3.55
16	47	Grounding	Grounding - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	3.52
17	12	Collision	Cruise Ship / Mainland Ferry - Cruise Ship / Mainland Ferry	3.50
18	37	Collision	Small Commercial Vessel - Small Commercial Vessel	3.40
19	46	Grounding	Grounding - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry	3.40
20	29	Collision	Inter-Island Ferry - Towage Vessel	3.27
21	16	Collision	Cruise Ship / Mainland Ferry - Recreational Vessel	3.25
22	32	Collision	Large Commercial Vessel - Small Commercial Vessel	3.18
23	30	Collision	Large Commercial Vessel - Large Commercial Vessel	3.00
24	26	Collision	Inter-Island Ferry - Large Commercial Vessel	2.95
25	38	Collision	Small Commercial Vessel - Towage Vessel	2.81
26	9	Collision	Construction Vessel - Recreational Vessel	2.76
27	21	Collision	Inshore Fishing Vessel - Large Commercial Vessel	2.71
28	27	Collision	Inter-Island Ferry - Recreational Vessel	2.71
29	35	Collision	Recreational Vessel - Small Commercial Vessel	2.71
30	36	Collision	Recreational Vessel - Towage Vessel	2.71
31	40	Contact	Contact - Construction Vessel	2.68

Rank	Hazard Ref.	Accident Category	Hazard Title	Risk Overall
32	31	Collision	Large Commercial Vessel - Recreational Vessel	2.65
33	24	Collision	Inshore Fishing Vessel - Towage Vessel	2.61
34	48	Mooring Incident / Breakout	Mooring Breakout - Construction Vessel	2.41
35	1	Anchor Dragging	Anchor Dragging - Construction Vessel	2.34
36	2	Anchor Dragging	Anchor Dragging - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry	2.34
37	19	Collision	Inshore Fishing Vessel - Inshore Fishing Vessel	2.28
38	4	Collision	Construction Vessel - Construction Vessel	2.26
39	8	Collision	Construction Vessel - Large Commercial Vessel	2.26
40	18	Collision	Cruise Ship / Mainland Ferry - Towage Vessel	2.24
41	44	Girting	Girting Incident (including during construction)	2.24
42	33	Collision	Large Commercial Vessel - Towage Vessel	2.15
43	20	Collision	Inshore Fishing Vessel - Inter-Island Ferry	2.07
44	43	Diving	Diving Incident (including construction works)	2.00
45	22	Collision	Inshore Fishing Vessel - Recreational Vessel	1.85
46	11	Collision	Construction Vessel - Towage Vessel	1.80
47	34	Collision	Recreational Vessel - Recreational Vessel	1.69
48	42	Contact	Contact - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	1.69

Rank	Hazard Ref.	Accident Category	Hazard Title	Risk Overall
49	3	Anchor Dragging	Anchor dragging - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	1.54
50	39	Collision	Towage Vessel - Towage Vessel	1.26

## 4.2.2 Operational Phase

**Table 9** shows a summary of the Ranked Hazard List for the operational phase of the new quay. More details on each hazard are provided in **Annex E** which also contains the associated risk scores in terms of the “most likely” and the “worst credible” consequences to people, property, environment and business.

**Table 9: Summary of the Ranked Hazard List – Operational Phase.**

Rank	Hazard Ref.	Accident Category	Hazard Title	Risk Overall
1	35	Grounding	Grounding - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry	4.40
2	31	Contact	Contact - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry	4.31
3	37	Mooring Incident / Breakout	Mooring Breakout - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry.	4.19
4	8	Collision	Cruise Ship / Mainland Ferry - Small Commercial Vessel	4.03
5	19	Collision	Inter-Island Ferry - Small Commercial Vessel	4.03
6	5	Collision	Cruise Ship / Mainland Ferry - Inter-Island Ferry	3.90
7	6	Collision	Cruise Ship / Mainland Ferry - Large Commercial Vessel	3.90

Rank	Hazard Ref.	Accident Category	Hazard Title	Risk Overall
8	38	Mooring Incident / Breakout	Mooring Breakout - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	3.82
9	14	Collision	Inshore Fishing Vessel - Small Commercial Vessel	3.80
10	28	Collision	Small Commercial Vessel - Small Commercial Vessel	3.80
11	4	Collision	Cruise Ship / Mainland Ferry - Inshore Fishing Vessel	3.69
12	16	Collision	Inter-Island Ferry - Inter-Island Ferry	3.55
13	36	Grounding	Grounding - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	3.52
14	3	Collision	Cruise Ship / Mainland Ferry - Cruise Ship / Mainland Ferry	3.50
15	23	Collision	Large Commercial Vessel - Small Commercial Vessel	3.40
16	29	Collision	Small Commercial Vessel - Towage Vessel	3.40
17	20	Collision	Inter-Island Ferry - Towage Vessel	3.27
18	7	Collision	Cruise Ship / Mainland Ferry - Recreational Vessel	3.25
19	21	Collision	Large Commercial Vessel - Large Commercial Vessel	3.00
20	17	Collision	Inter-Island Ferry - Large Commercial Vessel	2.95
21	12	Collision	Inshore Fishing Vessel - Large Commercial Vessel	2.71
22	18	Collision	Inter-Island Ferry - Recreational Vessel	2.71
23	26	Collision	Recreational Vessel - Small Commercial Vessel	2.71
24	27	Collision	Recreational Vessel - Towage Vessel	2.71
25	22	Collision	Large Commercial Vessel - Recreational Vessel	2.65

Rank	Hazard Ref.	Accident Category	Hazard Title	Risk Overall
26	15	Collision	Inshore Fishing Vessel - Towage Vessel	2.61
27	10	Collision	Inshore Fishing Vessel - Inshore Fishing Vessel	2.28
28	9	Collision	Cruise Ship / Mainland Ferry - Towage Vessel	2.24
29	24	Collision	Large Commercial Vessel - Towage Vessel	2.15
30	11	Collision	Inshore Fishing Vessel - Inter-Island Ferry	2.07
31	1	Anchor Dragging	Anchor Dragging - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry	1.96
32	34	Girting	Girting Incident	1.88
33	13	Collision	Inshore Fishing Vessel - Recreational Vessel	1.85
34	25	Collision	Recreational Vessel - Recreational Vessel	1.69
35	32	Contact	Contact - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	1.69
36	33	Diving	Diving Incident	1.63
37	2	Anchor Dragging	Anchor dragging - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	1.54
38	30	Collision	Towage Vessel - Towage Vessel	1.26

## 5 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 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); and
- The Merchant Shipping (Oil Pollution Preparedness, Response Co-operation Convention) Regulations 1998, Statutory Instrument 1998 No. 1056.

### 5.1 EXISTING RISK CONTROL MEASURES

The current NRA maintained by OIC for Kirkwall references the following active risk controls:

- Aids to Navigation;
- Charts and Publications;
- Emergency Plans;
- Fendering;
- Hydrographic Policy and Survey Programme;
- International / National Regulations;
- Local Traffic Control;
- Permit System;
- Pier Manning;
- Pilotage Service;
- Pollution Control Equipment;
- Prior notification procedure;
- SAR and Emergency Services;
- Ship Towage;
- Towage Guidelines; and
- VTS.

### 5.2 ADDITIONAL RISK CONTROL MEASURES

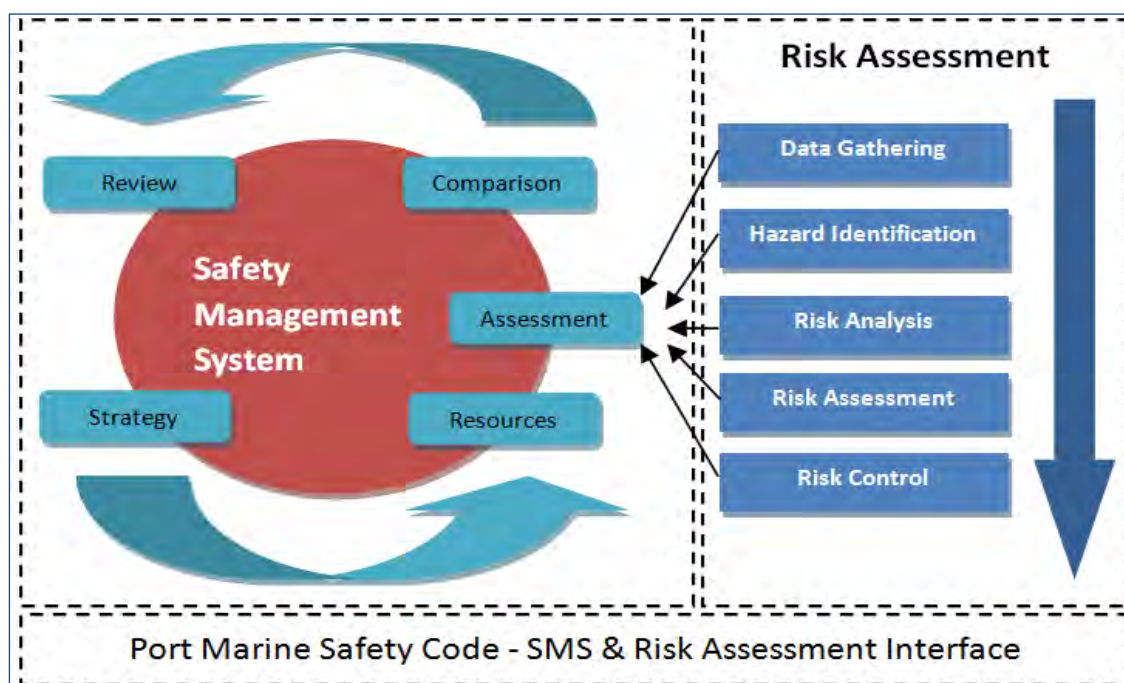
Navigation hazards that may be scored as high or significant risk are termed “intolerable”, and as such additional risk control measures should be implemented. This may range from stopping the activities which

bring about such high-risk hazards or by measures which seek to reduce the likelihood and / or consequence of hazard occurrence.

All the navigation hazards identified and scored for this NRA fell into the negligible, low or ALARP categories of risk, so the current navigation activities are deemed to be largely acceptable.

This does not however mean that mitigation for the ALARP hazards must 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 implement a coherent and clear SMS.

The relationship between the NRA and the OIC SMS is shown in **Figure 26: Relationship between the NRA and the Safety Management System.**



*Figure 26: Relationship between the NRA and the Safety Management System.*

### 5.2.1 High Risks and Significant Risks

No hazards were assessed to be in the High Risk or Significant Risk band for either the construction or operation phase of the project.

## 5.2.2 ALARP Risks

### 5.2.2.1 Construction Phase

Six of the 50 hazards were assessed to be within the ALARP band, with risk scores between 4.3 and 4.56. This is in the lower band of the ALARP region; however efforts should nonetheless be made to reduce this risk further, based on the cost-effectiveness of implementing additional risk control measures. These hazards and their associated control measures should be regularly reviewed as part of the OIC and Project Safety Management System. They are:

- Collision: Construction Vessel - Cruise Ship / Mainland Ferry;
- Collision: Construction Vessel - Inter-Island Ferry;
- Grounding: Grounding - Construction Vessel;
- Contact: Contact - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry;
- Mooring Incident / Breakout: Mooring Breakout - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry; and
- Collision: Inter-Island Ferry - Small Commercial Vessel.

However, it is noted that four of the hazards involve passenger vessels, and while assessed as unlikely to happen in the project vicinity, the relatively high-risk scores are attributable to the severity of outcome in the remote event the hazard is realised (particularly injuries to people).

The three highest scored hazards are directly related to the construction activity, and it is recommended that in addition to the ongoing traffic monitoring and direction provided by the OIC VTS, a navigation management plan is developed and implemented to manage all vessels involved in the construction project.

### 5.2.2.2 Operation Phase

Five of the 38 hazards were assessed to be within the ALARP band, with risk scores between 4.03 and 4.40. This is towards the lower end of the ALARP region; however, efforts should nonetheless be made to reduce this risk further, based on the cost-effectiveness of implementing additional risk control measures. These hazards and their associated control measures should be regularly reviewed as part of the OIC Safety Management System. They are:

- Grounding: Grounding - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry;
- Contact: Contact - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry;
- Mooring Incident / Breakout: Mooring Breakout - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry;
- Collision: Cruise Ship / Mainland Ferry - Small Commercial Vessel; and



- Collision: Inter-Island Ferry - Small Commercial Vessel.

All of these hazards pre-exist the proposed development, and while increased levels of shipping in the area following the commissioning of the pier extension may slightly increase the likelihood (frequency) of these hazards being realised, it is considered that existing risk controls remain effective and appropriate.

### 5.2.3 Negligible and Low Risks

All of the remaining hazards that were identified for both phases fell within the “negligible” or “low risk” regions, therefore no additional risk controls are formally required.

However, the following mitigations, many of which were suggested by consultees are offered for consideration and implementation during the development:

- The project design should ensure sufficient water depth on the inshore face of the new jetty for both commercial vessels and tugs assisting them;
- Impact protection piles / buoys inshore side of construction and operational area should be considered to further reduce the likelihood of groundings;
- Notice to Mariners (NTMs);
- Deconflicting construction traffic movements with others (e.g. Cruise / ferries etc). This would be a normal VTS function, but should be considered during project planning; and
- Seasonal working to avoid the peak summer traffic should be included in project planning.

The following mitigations do not specifically appear in the current list of control measures in the OIC NRA for Kirkwall Bay, but it is assumed that they will be in place during and after construction:

- Lighting / marking of structures and construction plant to the satisfaction of Local Lighthouse Authority / General Lighthouse Authority; and
- Issue of regular Notices to Mariners to inform all users of construction activity, and temporary restrictions or hazards.

## 6 CONCLUSIONS

This assessment has concluded that there is little significant new navigational risk associated with either the construction or operation of the proposed Hatston Pier redevelopment.

The project site is located in an area of relatively low present day traffic density (albeit with significant seasonal variations), and which is already subject to numerous effective risk control measures (VTS, Pilotage, Towage, etc). As a result of both of these factors, incident frequency is also low.

There will be an inevitable increase in navigation risk through the introduction of a new structure, generating an increased volume of traffic. However, the increase in risk is low, on top of an already low baseline.

## 7 RECOMMENDATIONS

While this assessment has found that navigation risk will be low, or in a small number of scenarios, within the ALARP band both during the construction and operational phases, the following recommendations are made:

- The project design should consider additional dredging or other mitigations to prevent vessels grounding inshore of the extended pier (during both construction and operation phases);
- The project design should consider amendments to provide sheltered small vessel moorings inshore of the new pier extension, to replace mooring lost on the current eastern side of the causeway;
- Existing control measures should be kept in place (VTS, Pilotage, Towage) during both construction and operation phases;
- Good communications should be maintained with stakeholders throughout (NTMs, website, meetings etc). There will be a need for close liaison between the OICHA and the contractors during the construction phase and between OICHA and the berth operator during the operational phase.;
- A Navigation Management Plan for the construction phase should be designed and implemented to reduce the chance of ship-to-ship collisions between craft involved in the construction phase;
- Other mitigations, to further reduce low or ALARP risks (see section 5.2.3), should be considered;
- All of the risks should be kept under review as the project is developed, and once the facility is operational, OICs PMSC NRA should be updated and kept under review to reflect the new operations.

## Annex A Stakeholder Meeting Minutes

**Minutes – Hatston Pier Redevelopment – 22UK1893**

Client: OICHA

Project: 22UK1893 **OICHA Stakeholders**

Attendees: William Heaps (WH) Marico Marine  
David Foster Marico Marine  
David Sawkins DHM OICHA  
Peter Bentley Pilot  
Alastair MacDonald VTS

Venue: Orkney

Date of Meeting: 14:00 7 November 2022

Item	Action item / Notes for the record	Action
<b>1</b>	<b>Introductions</b>	
	All present introduced themselves, and indicated that they were already broadly aware of the project proposals.	
<b>2</b>	<b>Overview</b>	
	WH / DS gave a brief project overview using drawings / plans supplied by OICHA. Attendees were reminded that more detail was available in the published Master Plan.	
<b>3</b>	<b>NRA Process</b>	
	A very brief overview was given of the NRA process as all present were familiar with the concept of undertaking NRA's as part of a development consent application.	
<b>4</b>	<b>Existing and Future Shipping and Navigation Activity</b>	
	See commercial users summary – the OICHA stakeholders were in close agreement with the numbers and types of vessels currently using the pier. However, the seasonality / variability of some traffic types was stressed, and this should be analysed using AIS / VTS data. It was noted that all ferries made use of PEC's but less regular callers would often be Piloted in to Hatston Pier (especially those requiring towage). It was noted that vessel berths were allocated by the Kirkwall Pier Master in conjunction with VTS via a basic manual (whiteboard) system. Future traffic – no significant changes were expected with regard to existing users, but it was noted that the new facility should attract additional users. However, it was not considered that the number of extra vessel movements would be great compared with now, nor that vessel types or sizes would change significantly.	
<b>5</b>	<b>Existing and Potential Hazards</b>	
	Existing hazards identified were: Collision –mitigated through VTS reporting requirements but collision hazard currently most significant with leisure / fishing vessels “crossing” approach to pier. Few incidents, but hazard will remain after development. Contact – Pilot highlighted potential for heavy contact with pier during berthing manoeuvres especially during strong northerly winds. New pier not expected to increase risk, and indeed sheet pile construction may lead to reduced risk if effective at reducing swell on inner face.	Marico note future control

	<p>Also noted that fender design should allow for lateral forces during berthing as existing design liable to damage if vessel moves fore and aft alongside.</p> <p>Grounding – considered most likely hazard, especially for vessels using shoreside quay faces. Would be unchanged for existing ferry berth, but it was considered that there would be insufficient water inside pier extension without dredging (including dredging a pocket for tugs to use). Simulation was identified as a mitigation in advance of design finalisation.</p> <p>The location of the fish farm and Scargun Shoal were identified as a potential hazard on approach.</p>	Marico note future control
<b>6</b>	<b>Incidents History</b>	
	<p>See incident history. It was suspected that contacts are under reported, but no significant damage has occurred.</p> <p>Fog was noted as a potential incident cause, but is rare in Orkney.</p> <p>There was little even anecdotal experience of leisure / small vessels impeding commercial users of the pier.</p>	
<b>7</b>	<b>Next Steps (AOB)</b>	
	<p>It was noted that most commercial users / ferries etc are AIS equipped, and can “see each other” / are visible to VTS.</p>	

**Minutes – Hatston Pier Redevelopment – 22UK1893**

Client: OICHA

Project: 22UK1893 **Commercial Stakeholders**

Attendees: William Heaps (WH) Marico Marine  
 David Foster Marico Marine  
 Stuart Pottinger Orkney Ferries  
 Abbie Sinclair Orkney Ferries  
 Dougie Leask Leask Marine  
 John Skuse EMEC  
 Daniel Wise Orbital (renewables)  
 Alan Scott (from 10:10) SERCO NorthLink Ferries  
 Ollie Cameron OIC Kirkwall AHM / Pier Master

Venue: Kiln Corner, Kirkwall

Date of Meeting: 09:30 8 November 2022

Item	Action item / Notes for the record	Action
<b>1</b>	<b>Introductions</b>	
	All present introduced themselves, and indicated that they were already broadly aware of the project proposals, and that all present would be directly affected as current / future pier users.  Alan Scott (SERCO NorthLink) was slightly delayed and joined at 10:10 with a brief recap being given.  All attendees were given the opportunity to view the model of the planned development in the adjacent exhibition space.	
<b>2</b>	<b>Overview</b>	
	WH gave a brief project overview using drawings / plans supplied by OICHA. Attendees were reminded that more detail was available in the published Master Plan and from the exhibition facility.	
<b>3</b>	<b>NRA Process</b>	
	A very brief overview was given of the NRA process as all present were familiar with the concept of undertaking NRA's as part of a development consent application.	
<b>4</b>	<b>Existing and Future Shipping and Navigation Activity</b>	
	Mainland Ferries: One passenger ferry to Aberdeen or Shetland every night (slightly reduced during winter (GMT) period). Vessels currently 20 years old and bespoke to route, but currently no firm plans for replacement ferries, or changes to service. Expect to continue "business as usual" during and after development.  Freight Ferry: variable service on demand – usually 2-3 per week, but can be more e.g. during "cattle season". Not unknown to have two freight and one passenger movement in a 24hr period, but unusual. No expected changes to this pattern, but proposed new RoRo ramp would add flexibility (freight vessel could remain alongside working at same time as passenger, with additional ramp).	

	<p>Cruise: Significant user but seasonal (March to October). This year 157 calls to pier, and expected to be more in future. Pier development an obvious benefit when very large or more than one vessel stemmed on same day.</p> <p>General cargo. Varied and unpredictable. Some seasonal (salt deliveries / fertiliser). Also includes towed barges, offshore support vessels (layby) and other general cargoes. Result is steady usage overall (few / week) and not expected to change greatly in future (aside from new business in offshore support).</p> <p>Others: include regular crew change / storing visits by ETV (up tando 2 /month), renewable device maintenance vessels, including larger work boats (multicats) restricted by draft at Kirkwall, large aquaculture support vessels.</p> <p>None of the above existing uses were expected to significantly change following the pier development, though some would benefit from the extra quay / laydown space.</p> <p>Additionally, the current quay space for small vessels inside the existing pier was noted, and considered to be very useful for smaller work boats and barges. It was noted that these berths would be lost on the East side of the existing causeway, and current users would therefore be displaced to Kirkwall Pier (if sufficient space could be found), resulting in increased traffic / risk in Kirkwall as a result of the development.</p> <p>Suggested mitigation was provision of equivalent quay space to the eastern edge of the new fill area (south of proposed boat lift) by replacing rock revetment with sheet piling and suitable dredging.</p> <p>Stakeholders did not identify any future increases in traffic level (despite the development being promoted to attract additional business).</p>	Marico to suggest
<b>5</b>	<b>Existing and Potential Hazards</b>	
	<p>Existing hazards identified were:</p> <p>Collison – all present felt that this hazard is currently effectively mitigated through VTS reporting requirements, and enlarged pier would have minimal effect.</p> <p>Contact – several stakeholders mentioned potential for heavy contact with pier during berthing manoeuvres especially during strong northerly winds. New pier not expected to increase risk, and indeed sheet pile construction may lead to reduced risk if effective at reducing swell on inner face. Also noted that fender design should allow for lateral forces during berthing as existing design liable to damage if vessel moves fore and aft alongside.</p> <p>Grounding – considered most likely hazard, especially for vessels using shoreside quay faces. Would be unchanged for existing ferry berth, but it was considered that there would be insufficient water inside pier extension without dredging (including dredging a pocket for tugs to use).</p> <p>Entanglement with fishing gear in inshore area was noted as a current hazard in the vicinity of the pier. No effective controls measures suggested beyond current methods.</p>	<p>Marico note future control</p> <p>Marico note future control</p>
<b>6</b>	<b>Incidents History</b>	
	<p>Stakeholders indicated that they thought incidents were routinely reported to OICHA (note – not supported by OICHA records). There was little anecdotal reporting of incidents in the area, except for a few fishing gear foulings, one work boat fouled by steel cable picked up from seabed while alongside, and a small number (2) of shore side incidents.</p>	
<b>7</b>	<b>Next Steps (AOB)</b>	
	<p>Stakeholders were keen to emphasise that they would all need to work as normal during construction of the facility. It was considered that construction would be challenging during the cruise season if all other activities were to be accommodated as well.</p> <p>There was a feeling from the majority present (including OICHA staff) that while they were aware of the planned development, they had not been sufficiently consulted to date.</p>	

	There being no further comments, the meeting was concluded with a visit to the models and exhibition room.	
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**Minutes – Hatston Pier Redevelopment – 22UK1893**

Client:	OICHA	
Project:	22UK1893	<b>Aquaculture Stakeholders</b>
Attendees:	William Heaps (WH)	Marico Marine
	David Foster	Marico Marine
	Steve Kolthammer	Scottish Seafarms
	Maddy Walker	Scottish Seafarms
	Robert Petersen	Cooke Aquaculture
	Naomi Dempsey	Cooke Aquaculture
Venue:	Kiln Corner, Kirkwall	
Date of Meeting:	14:30 8 November 2022	

Item	Action item / Notes for the record	Action
<b>1</b>	<b>Introductions</b>	
	All present introduced themselves and indicated that they were already broadly aware of the project proposals. All attendees were given the opportunity to view the model of the planned development in the adjacent exhibition space.	
<b>2</b>	<b>Overview</b>	
	WH gave a brief project overview using drawings / plans supplied by OICHA. Attendees were reminded that more detail was available in the published Master Plan and from the exhibition facility.	
<b>3</b>	<b>NRA Process</b>	
	A very brief overview was given of the NRA process and then function of the NRA as part of a development consent application.	
<b>4</b>	<b>Existing and Future Shipping and Navigation Activity</b>	
	There is an existing fish farm located to the northwest of Hatston Pier, which is between the shore and Scargun Shoal. The fish farm had been identified as a potential hazard to navigation by other stakeholders; however it was stated that it was likely the infrastructure would be relocated further northwest in the fairly near future, thus deconflicting with any navigation in the vicinity of Hatston Pier. The marine licence applications for the proposed re-location are at an advanced stage, and public consultation has been ongoing since February 2022.  As it is likely the fish farm infrastructure will be removed by the time the Hatston Pier development takes place, the main navigation activity will be limited to passing service vessels (transiting from Kirkwall to the relocated farm at Quanterness Skerry – 1/day), and other farms currently serviced from Kirkwall. Additionally, some of the larger service boats (well boats etc.) will continue to use Hatston Pier as they currently do (few per year).  It was noted that there was a commercial opportunity to develop a feed warehouse at Hatston (relocate from Kirkwall?) which would potentially generate more vessel movements from the new pier, but status unknown at present.	

	A further future commercial opportunity was use of the new laydown areas to construct fish cages, which would also generate occasional vessel / workboat movements from the pier to deliver them to sites around Orkney.	
<b>5</b>	<b>Existing and Potential Hazards</b>	
	Existing hazards identified were: Collision – aquaculture and other fishing vessels crossing the tracks of vessels bound for Hatston Pier. Considered to be low risk at present due to VTS controls, and seamanship. Level of risk not expected to change significantly due to proposed development. Contact – Vessels using Hatston Pier would be subject to the same risk of contact damage, but this may be slightly reduced by the increased shelter provided by the solid pier construction (Reduced wave effects on inner berths). Grounding – See commercial notes. Grounding, especially in adverse weather would be a risk when using inner berths. Fouling fishing gear – considered an ever-present hazard close inshore in all Orkney waters. Future hazards considered similar.	
<b>6</b>	<b>Incidents History</b>	
	No incident history beyond OICHA records	
<b>7</b>	<b>Next Steps (AOB)</b>	
	No other comments. Stakeholders were thanked for their positive and useful engagement. Additional detail regarding the fish farm re-location was provided post-meeting.	

**Minutes – Hatston Pier Redevelopment – 22UK1893**

Client:	OICHA	
Project:	22UK1893	<b>Leisure Stakeholders</b>
Attendees:	William Heaps (WH)	Marico Marine
	David Foster	Marico Marine
	Mike Cooper	Orkney Marinas / RNLI / Cruising Assoc / Ocean Cruising Club
	Ian Hutchison	Orkney Sailing Club
Apologies:	David Flett	Orkney Rowing club – comments received
Venue:	Kiln Corner, Kirkwall	
Date of Meeting:	12:30 8 November 2022	

Item	Action item / Notes for the record	Action
<b>1</b>	<b>Introductions</b>	
	All present introduced themselves and indicated that they were already broadly aware of the project proposals. All attendees were given the opportunity to view the model of the planned development in the adjacent exhibition space.	
<b>2</b>	<b>Overview</b>	
	WH gave a brief project overview using drawings / plans supplied by OICHA. Attendees were reminded that more detail was available in the published Master Plan and from the exhibition facility.	
<b>3</b>	<b>NRA Process</b>	
	A very brief overview was given of the NRA process and then function of the NRA as part of a development consent application.	
<b>4</b>	<b>Existing and Future Shipping and Navigation Activity</b>	
	Attendees described leisure activity in Kirkwall Bay and in the vicinity of the proposed development:  Dinghy racing is mainly confined to the bay from May to October (approx.). Mainly organised racing for dinghies / catamarans one or two evenings a week and Sunday afternoons. Numbers are normally less than 20 per event. Occasional longer races further into bay are well planned and promulgated. Very little dinghy (or kayak / SUP / other leisure) activity in the vicinity of Hatston Pier. Club activity is concentrated from the Hatston Slipway (also used very occasionally by sea cadets, commercial kayaks companies etc.)  Yacht cruising / racing takes place from Kirkwall marina with about 80 local berths and a maximum capacity for 30 to 40 visitors. Total visitors this year is about 400, which is a significant increase on recent years, and likely to be sustained.  Once again, little activity in vicinity of Hatston pier, with racing in Wide Firth, and cruisers heading away from Kirkwall.  From the RNLI perspective, it was stated that there were few "shouts" (17 this year) but incidents tended to be serious – however most are not in the Kirkwall / Hatston vicinity.  Rowing – operate from Hatston slipway. Not a large number of vessels. Early morning / evenings weekends. Typically two boats for an hour.	

<b>5</b>	<b>Existing and Potential Hazards</b>	
	<p>Existing hazards identified were:</p> <p>Collision – all stakeholder recognised the potential for collision with commercial traffic, but did not consider the current risk to be high due to experienced users (leisure and commercial) and relatively low traffic densities. It was not considered that the proposed Hatston development would have any significant impact on current or future leisure activities.</p> <p>No other hazards were considered to be directly relevant to current leisure activities in the project area.</p> <p>A potential additional mitigation was proposed by the Rowing club: inform VTS when leaving and returning to shore (reporting numbers of vessels / people and safe return).</p>	
<b>6</b>	<b>Incidents History</b>	
	<p>Very few leisure incidents known in the study area. Lifeboat has responded to yachts (breakdowns, groundings) but almost always further afield.</p> <p>Fishing gear fouling mentioned as a potential for incidents (hazard).</p>	
<b>7</b>	<b>Next Steps (AOB)</b>	
	<p>No other comments. Stakeholders were thanked for their positive and useful engagement.</p> <p>Additional feedback was received from the rowing club on the following day.</p>	

## **Annex B    Sample Stakeholder Meeting Agenda**

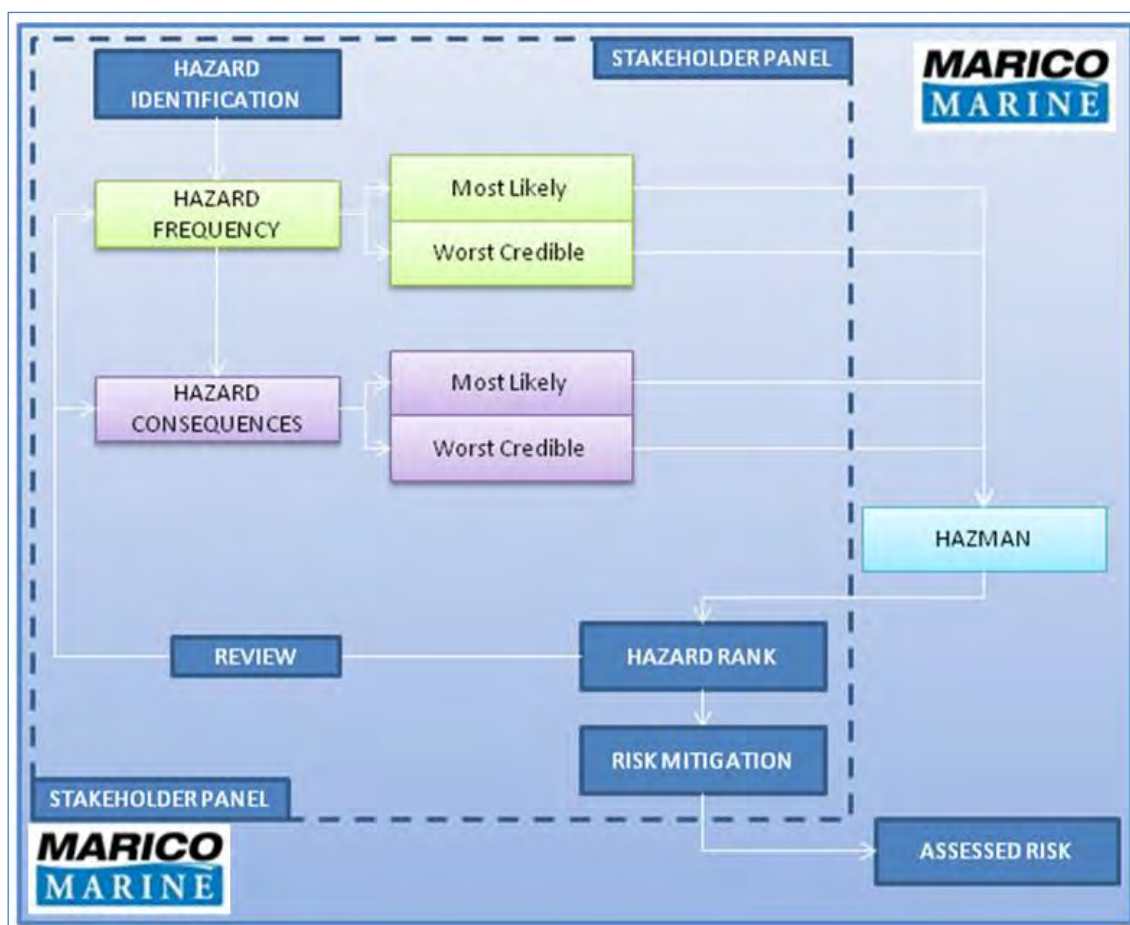
## Stakeholder Meeting Agenda

1. Introductions & Purpose of Workshop
2. Project Overview
3. The NRA / Formal Safety Assessment process
4. Existing Shipping and Navigation Activity
5. Existing & Potential Navigation Hazards
6. Incident History
7. Next Steps

## Annex C NRA Methodology

## RISK ASSESSMENT METHODOLOGY

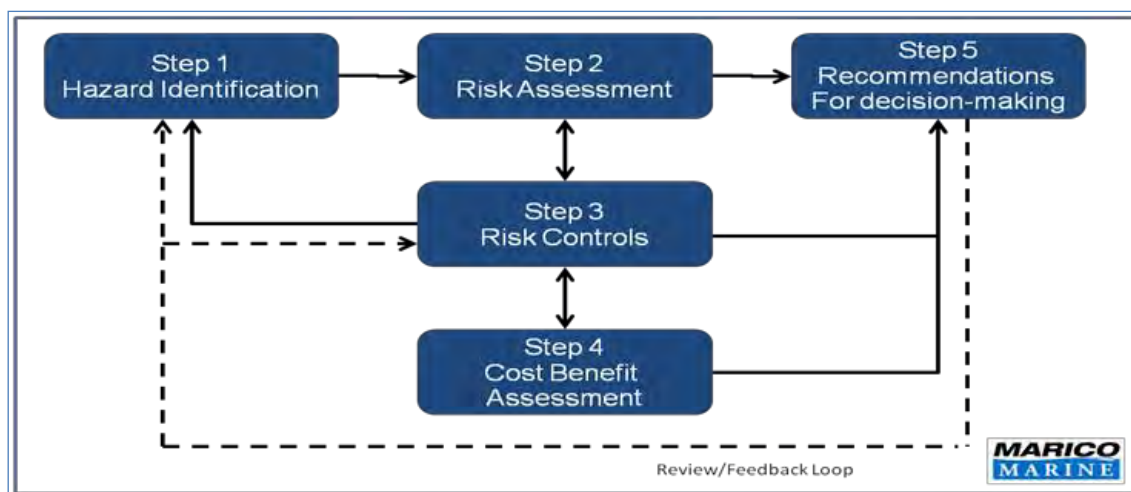
The Navigation risk assessment methodology was based on the Formal Safety Assessment methodology as adopted by IMO. It also follows the guidance set out within the Port Marine Safety Code. Marico Marine uses a form of risk assessment that has been specifically adapted for navigational use. It is unique to Marico and is fundamentally based on concepts of “Most Likely” and “Worst Credible”, which reflect the range of outcomes arising from a shipping accident. This approach matches marine incident data that is customarily available. It is relevant that incident data often shows a high frequency of “Most Likely” events, separated from a much lower frequency of “Worst Credible” events.



*Marico hazard identification and risk assessment process.*

The NRA for the project was carried out using the Marico Marine “HAZMAN II” program to provide ranked hazard reports. The data handled within “HAZMAN II” can subsequently form the basis for an on-going navigational Safety Management System (SMS).

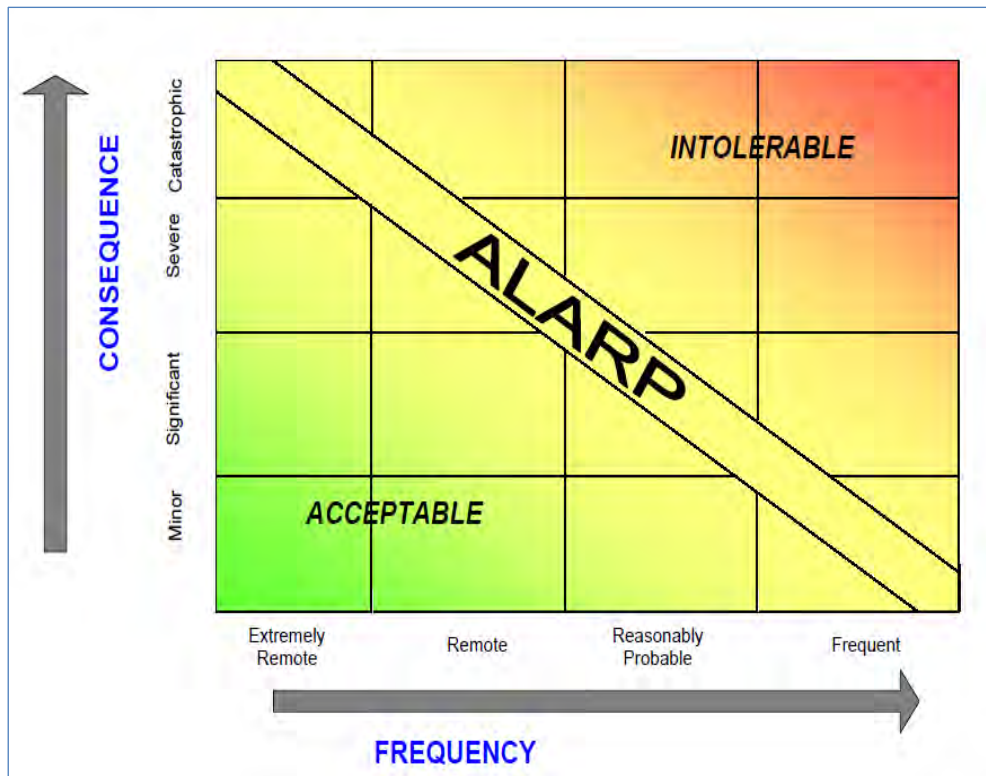




**Formal Safety Assessment Risk Assessment Process.**

IMO Guidelines define a hazard as *"something with the potential to cause harm, loss or injury"*, the realisation of which results in an accident. The potential for a hazard to be realised can be combined with an estimate or known consequence of outcome. This combination is termed "risk". Risk is therefore a measure of the frequency and consequence of a particular hazard. One way to compare risk levels is to use a matrix approach as illustrated below. At the lowest end of the scale, frequency is extremely remote and consequence insignificant such that a risk can be said to be negligible. At the high end, where hazards are defined as frequent and the consequence catastrophic, then risk is termed intolerable. Between the two lies an area known "As Low As Reasonably Practicable" (ALARP).

The IMO guidelines allow the selection of definitions of frequency and consequence to be made by the organisation carrying out the risk assessment. This is important, as it allows risk to be applied in a qualitative and comparative way. To identify high risk levels in a purely mathematically quantitative way would require a large volume of casualty data, which is rarely available in the maritime context. ALARP can be accepted as being "Tolerable", if the further reduction of the risk is impracticable, or if the cost of such reduction would obviously be highly disproportionate to the improvement. It can also be considered "Tolerable", if the cost of reducing the risk is greater than any improvement gained.



*Frequency / Consequence Chart.*

The NRA used accident categories to organise hazards for assessment. The hazard categories identified as relevant to this study are likely to be:

- Anchor dragging;
- Collision;
- Contact;
- Diving incident;
- Girting;
- Grounding; and
- Mooring incident / breakout.

Each hazard was reviewed with respect to cause and effect. Frequencies were then derived for notional “Most Likely” and “Worst Credible” hazard events in each case, using the frequency bands defined below.

**Frequency Criteria.**

Scale	Description	Definition
F5	Frequent	An event that could be expected to occur more than once per year.
F4	Likely	An event that could be expected to occur between 1 to 10 years.
F3	Possible	An event that could be expected to occur between 10 to 100 years.
F2	Unlikely	An event that could be expected to occur between 100 to 1000 years.
F1	Remote	An event that could be expected to occur less than once in 1000 years.

**Assessment of Consequence**

Using the assessed notional frequency for the “most likely” and “worst credible” scenarios for each hazard, an assessment was made for the consequences to people, property, environment and business, using the categories and criteria below.

**Consequence Categories and Criteria.**

Cat.	People	Property	Environment	Business
C1	Negligible			
	Very minor injury (e.g. bruising).	Very minor damage to property.	No effect of note. Tier 1 <u>may</u> be declared but criteria not necessarily met.	Very short-term disruption to services (1-2hrs) with ensuing loss of revenue.
		Costs <£10k	Costs <£10k	Costs <£10k
C2	Minor			
	Single minor injury.	Minor damage to property.	Tier 1 - Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity.	Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities (<1 day).
		Costs £10k -£100k	Costs £10K-£100k	Costs £10k - £100k
C3	Moderate			
	Multiple minor or single major injury.	Moderate damage to property.	Tier 2 spill criteria reached but capable of being limited to immediate area within area.	Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions (1≥7 days).
		Costs£ 100k - £1M	Costs £100k -£1M	Costs £100k - £1M
C4	Major			
	Multiple major injuries or single fatality.	Major damage to property.	Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release.	Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.
		Costs £1M -10M	Costs £1M - £10M	Costs £1M -£10M
C5	Catastrophic			
	Multiple fatalities	Catastrophic damage to property.	Tier 3 oil spill criteria reached. International support required. Widespread shoreline contamination. Serious chemical or gas release. Significant threat to environmental amenity.	Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.
		Costs>£10M	Costs >£10M	Costs >£10M

Note that the Oil Pollution Preparedness, Response Co-operation Convention<sup>5</sup> defines the following response levels for oil spills in the United Kingdom:

- Tier 1 Local (within the capability of the operator on site): A Tier 1 response is the lowest response level and requires resources to be available locally. Depending on the characteristics of the oil this may or may not include the use of dispersants. By definition these resources must be at or near the incident site. It is expected that these resources will be deployed as quickly as operational circumstances allow.
- Tier 2 Regional (beyond the in-house capability of the operator): For larger pollution incidents, local resources may be insufficient to deliver a proper response. In these cases it may be that resources from a regional centre will be required. A key component of UK offshore Tier 2 response is that operators are expected to have this capability mobilised and applied within 2 to 6 hours of an oil pollution incident.
- Tier 3 National (requiring national resources): For very large pollution incidents, resources supplied from national and international sources may be required. A key component of UK offshore Tier 3 response is that operators are expected to have this capability mobilised and applied within 6 to 18 hours of an oil pollution incident.

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 – including third party;
- Environment - Oil pollution etc.; and
- Business - Reputation, financial loss, public relations etc.

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

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<sup>5</sup> The Merchant Shipping (Oil Pollution Preparedness, Response Co-operation Convention) Regulations 1998, Statutory Instrument 1998 No. 1056

**Project Risk Matrix.**

<b>Consequences</b>	Cat 5	5.1	5.9	7.0	8.3	10.0
	Cat 4	4.1	4.9	5.9	7.4	9.4
	Cat 3	2.9	3.5	4.4	5.9	8.3
	Cat 2	1.5	1.8	2.4	3.5	5.9
	Cat 1	0	0	0	0	0
<b>Frequency (years)</b>		<b>&lt;1,000</b>	<b>100-1,000</b>	<b>10-100</b>	<b>1-10</b>	<b>&gt;1</b>

Navigation hazards are identified by the project team, and scored for “frequency” and “consequence” and in terms of a “Most Likely” and “Worst Credible” outcome, with results documented in a “Hazard Log”.

**Risk bands.**

Matrix Outcome	Risk Definition	Action Taken
<b>0 &amp; 1</b>	Negligible Risk	A level where operational safety is unaffected.
<b>2 &amp; 3</b>	Low risk	A level where operational safety is assumed.
<b>4 ,5 and 6</b>	As Low As Reasonably Practicable (ALARP)	A level defined by study at which risk control in place is reviewed. It should be kept under review in the ensuing SMS.
<b>7 &amp; 8</b>	Significant Risk	A level where existing risk control is automatically reviewed and suggestions made where additional risk control could be applied if appropriate. Significant risk can occur in the average case or in individual categories. New risk controls identified should be introduced in a timescale of two years.
<b>9 &amp; 10</b>	High Risk	A level requiring immediate mitigation.

Risk is then calculated for each consequence category (e.g. people, property, environment and business) based on the scores in the hazard log, using a risk matrix. Risk scores are calculated for each hazard under the “Most Likely” and “Worst Credible” scenarios for each of the consequence criteria. This generates eight individual risk scores per hazard. These risk scores are documented in the “Ranked Hazard Lists”. The risk scores are then analysed further to obtain four indices for each hazard as follows:

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

These scores were then combined 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. The ranked hazard list documents the individual category risk scores in more detail.

All risk scores, whether individual per consequence category, or overall for a hazard are scored on a scale of 0 (low risk) to 10 (high risk). Where the resultant risk levels cannot be considered in the low / negligible risk range, possible risk mitigation measures are identified for implementation.

## **Annex D    Ranked Risk Register (Construction)**



Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
1	5	Collision	Construction Vessel - Cruise Ship / Mainland Ferry	A Construction Vessel collides with a Cruise Ship / Mainland Ferry.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and / or prolonged restrictions.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Catastrophic damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area; Adverse international publicity, long-term suspension of operations, prolonged restrictions and / or termination of commercial activities.	0	4	2	4	3	6	6	5	4.56
2	7	Collision	Construction Vessel - Inter-Island Ferry	An Construction Vessel collides with a Inter-Island Ferry.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Major damage to property; Tier 1 to Tier 2 criteria reached; Adverse international publicity, long-term suspension of operations, prolonged restrictions and / or termination of commercial activities.	0	4	2	4	2	6	5	6	4.45
3	45	Grounding	Grounding - Construction Vessel	A Construction Vessel runs aground.	Low speed / energy grounding, vessel able to refloat without assistance. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	High speed / energy grounding, vessel unable to refloat without assistance. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	0	6	0	2	4	6	4	4.41
4	41	Contact	Contact - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry	A Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry contacts a fixed object.	A low speed / energy contact. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	A high speed / energy contact. Resulting in: Multiple minor or single major injury; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	0	6	0	6	2	4	4	4	4.31

Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
5	49	Mooring Incident / Breakout	Mooring Breakout - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry.	A Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry breaks away from her moorings.	Mooring lines in propeller/bow thruster, damage to gangway, lines parted. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Grounding or Contact. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	6	0	0	3	5	5	5	4.19
6	28	Collision	Inter-Island Ferry - Small Commercial Vessel	An Inter-Island Ferry collides with a Small Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	2	0	4	2	6	3	5	4.03
7	14	Collision	Cruise Ship / Mainland Ferry - Inter-Island Ferry	A Cruise Ship / Mainland Ferry collides with an Inter-Island Ferry.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and / or prolonged restrictions.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Catastrophic damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area; Adverse international publicity, long-term suspension of operations, prolonged restrictions and / or termination of commercial activities.	0	0	0	3	3	6	6	6	3.9
8	15	Collision	Cruise Ship / Mainland Ferry - Large Commercial Vessel	A Cruise Ship / Mainland Ferry collides with a Large Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and / or prolonged restrictions.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Catastrophic damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area; Adverse international publicity, long-term suspension of operations, prolonged restrictions and / or termination of commercial activities.	0	0	0	3	3	6	6	6	3.9

Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
9	50	Mooring Incident / Breakout	Mooring Breakout - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	An Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel breaks away from her moorings.	Mooring lines in propeller/bow thruster, damage to gangway, lines parted. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Grounding or Contact. Resulting in: Multiple minor or single major injury; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse local publicity, minor disruption to commercial activities.	0	6	0	0	2	4	4	2	3.82
10	23	Collision	Inshore Fishing Vessel - Small Commercial Vessel	An Inshore Fishing Vessel collides with a Small Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	3	0	3	2	6	3	5	3.8
11	17	Collision	Cruise Ship / Mainland Ferry - Small Commercial Vessel	A Cruise Ship / Mainland Ferry collides with a Small Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and / or prolonged restrictions.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	2	0	3	2	6	3	5	3.7
12	13	Collision	Cruise Ship / Mainland Ferry - Inshore Fishing Vessel	A Cruise Ship / Mainland Ferry collides with an Inshore Fishing Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	2	0	4	2	5	3	5	3.69
13	6	Collision	Construction Vessel - Inshore Fishing Vessel	An Construction Vessel collides with a Fishing Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	0	4	2	2	0	5	3	3	3.64

Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
14	10	Collision	Construction Vessel - Small Commercial Vessel	A Construction Vessel collides with a Small Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	4	2	2	0	5	3	3	3.64
15	25	Collision	Inter-Island Ferry - Inter-Island Ferry	An Inter-Island Ferry collides with another Inter-Island Ferry.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Major damage to property; Tier 1 to Tier 2 criteria reached; Adverse international publicity, long-term suspension of operations, prolonged restrictions and / or termination of commercial activities.	0	2	0	2	2	6	5	6	3.55
16	47	Grounding	Grounding - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	An Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel runs aground.	Low speed / energy grounding, vessel able to refloat without assistance. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	High speed / energy grounding, vessel unable to refloat without assistance. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse local publicity, minor disruption to commercial activities.	0	3	0	0	2	6	4	2	3.52
17	12	Collision	Cruise Ship / Mainland Ferry - Cruise Ship / Mainland Ferry	A Cruise Ship / Mainland Ferry collides with another Cruise Ship / Mainland Ferry.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and / or prolonged restrictions.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Catastrophic damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area; Adverse international publicity, long-term suspension of operations, prolonged restrictions and / or termination of commercial activities.	0	0	0	3	3	5	5	5	3.5

Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
18	37	Collision	Small Commercial Vessel - Small Commercial Vessel	A Small Commercial Vessel collides with another Small Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	2	0	2	2	6	3	5	3.4
19	46	Grounding	Grounding - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry	A Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry runs aground.	Low speed / energy grounding, vessel able to refloat without assistance. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	High speed / energy grounding, vessel unable to refloat without assistance. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	2	2	2	3	5	5	5	3.4
20	29	Collision	Inter-Island Ferry - Towage Vessel	An Inter-Island Ferry collides with a Towage Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Major damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	2	0	2	2	6	5	5	3.27
21	16	Collision	Cruise Ship / Mainland Ferry - Recreational Vessel	A Cruise Ship / Mainland Ferry collides with a Recreational Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and / or prolonged restrictions.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	2	0	3	0	5	3	5	3.25
22	32	Collision	Large Commercial Vessel - Small Commercial Vessel	A Large Commercial Vessel collides with a Small Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	2	0	2	2	6	3	5	3.18

Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
23	30	Collision	Large Commercial Vessel - Large Commercial Vessel	A Large Commercial Vessel collides with another Large Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	0	0	2	5	5	5	5	3
24	26	Collision	Inter-Island Ferry - Large Commercial Vessel	An Inter-Island Ferry collides with a Large Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Major damage to property; Tier 1 to Tier 2 criteria reached; Adverse international publicity, long-term suspension of operations, prolonged restrictions and / or termination of commercial activities.	0	2	0	2	1	5	4	5	2.95
25	38	Collision	Small Commercial Vessel - Towage Vessel	A Small Commercial Vessel collides with a Towage Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	2	0	2	1	5	3	4	2.81
26	9	Collision	Construction Vessel - Recreational Vessel	A Construction Vessel collides with a Recreational Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple minor or single major injury; Minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	0	2	0	2	0	5	2	3	2.76
27	21	Collision	Inshore Fishing Vessel - Large Commercial Vessel	An Inshore Fishing Vessel collides with a Large Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	0	2	0	0	0	5	3	3	2.71

Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
28	27	Collision	Inter-Island Ferry - Recreational Vessel	An Inter-Island Ferry collides with a Recreational Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	0	2	0	0	0	5	3	3	2.71
29	35	Collision	Recreational Vessel - Small Commercial Vessel	A Recreational Vessel collides with a Small Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	0	0	0	2	0	5	3	3	2.71
30	36	Collision	Recreational Vessel - Towage Vessel	A Recreational Vessel collides with a Towage Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	0	0	0	2	0	5	3	3	2.71
31	40	Contact	Contact - Construction Vessel	A Construction Vessel contacts a fixed object including the works.	A low speed / energy contact. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	A high speed / energy contact. Resulting in: Multiple minor or single major injury; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	0	0	0	0	4	6	4	4	2.68
32	31	Collision	Large Commercial Vessel - Recreational Vessel	A Large Commercial Vessel collides with a Recreational Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	0	2	0	2	0	5	3	3	2.65

Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
33	24	Collision	Inshore Fishing Vessel - Towage Vessel	An Inshore Fishing Vessel collides with a Towage Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	0	2	0	0	0	5	3	2	2.61
34	48	Mooring Incident / Breakout	Mooring Breakout - Construction Vessel	A Construction Vessel breaks away from her moorings.	Mooring lines in propeller/bow thruster, damage to gangway, lines parted. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Grounding or Contact. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	0	0	0	0	6	4	4	2.41
35	1	Anchor Dragging	Anchor Dragging - Construction Vessel	A Construction Vessel unintentionally moves from its anchored position because the anchor has failed to hold.	Anchor dragging detected and remedial action taken. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Contact or grounding. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	0	0	0	3	5	5	5	2.34
36	2	Anchor Dragging	Anchor Dragging - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry	A Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry unintentionally moves from its anchored position because the anchor has failed to hold.	Anchor dragging detected and remedial action taken. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Contact or grounding. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	0	0	0	3	5	5	5	2.34
37	19	Collision	Inshore Fishing Vessel - Inshore Fishing Vessel	An Inshore Fishing Vessel collides with another Inshore Fishing Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	0	0	0	0	0	6	4	2	2.28



Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
38	4	Collision	Construction Vessel - Construction Vessel	A Construction Vessel collides with another Construction Vessel	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and / or prolonged restrictions.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Catastrophic damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area; Adverse international publicity, long-term suspension of operations, prolonged restrictions and / or termination of commercial activities.	0	0	0	0	3	5	5	3	2.26
39	8	Collision	Construction Vessel - Large Commercial Vessel	A Construction Vessel collides with a Large Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	0	0	0	3	5	5	3	2.26
40	18	Collision	Cruise Ship / Mainland Ferry - Towage Vessel	A Cruise Ship / Mainland Ferry collides with a Towage Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	0	0	0	2	5	5	5	2.24
41	44	Girting	Girting Incident (including during construction)	A towline under tension exerts a heeling moment which results in excessive heel that causes the tug to capsize.	Tug recovers. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Tug is capsized. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	0	0	0	2	5	5	5	2.24

Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
42	33	Collision	Large Commercial Vessel -Towage Vessel	A Large Commercial Vessel collides with a Towage Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 1 to Tier 2 criteria reached; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	0	0	0	0	2	5	5	3	2.15
43	20	Collision	Inshore Fishing Vessel - Inter-Island Ferry	An Inshore Fishing Vessel collides with an Inter-Island ferry.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	0	0	0	0	2	5	3	3	2.07
44	43	Diving	Diving Incident (including construction works)	A diving incident involving a Recreational and / or Commercial Vessel.	Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Resulting in: Multiple major injuries or single fatality; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	0	0	0	0	0	6	0	2	2
45	22	Collision	Inshore Fishing Vessel - Recreational Vessel	An Inshore Fishing Vessel collides with a Recreational Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	0	0	0	0	0	5	3	2	1.85
46	11	Collision	Construction Vessel - Towage Vessel	A Construction Vessel collides with a ship towage Vessel			0	0	0	0	1	4	4	3	1.8
47	34	Collision	Recreational Vessel - Recreational Vessel	A Recreational Vessel collides with another Recreational Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple minor or single major injury; Minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	0	0	0	0	0	4	2	2	1.69

Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
48	42	Contact	Contact - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	An Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel contacts a fixed object.	A low speed / energy contact. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	A high speed / energy contact. Resulting in: Multiple minor or single major injury; Minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	0	0	0	0	0	4	2	2	1.69
49	3	Anchor Dragging	Anchor dragging - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	An Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel unintentionally moves from its anchored position because the anchor has failed to hold.	Anchor dragging detected and remedial action taken. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Contact or grounding. Resulting in: Multiple minor or single major injury; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse local publicity, minor disruption to commercial activities.	0	0	0	0	2	3	3	2	1.54
50	39	Collision	Towage Vessel - Towage Vessel	A Towage Vessel collides with another Towage Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple minor or single major injury; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse local publicity, minor disruption to commercial activities.	0	0	0	0	1	3	3	1	1.26

## **Annex E    Ranked Risk Register (Operation)**

Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
1	35	Grounding	Grounding - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry	A Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry runs aground.	Low speed / energy grounding, vessel able to refloat without assistance. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	High speed / energy grounding, vessel unable to refloat without assistance. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	3	3	3	4	6	6	6	4.4
2	31	Contact	Contact - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry	A Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry contacts a fixed object.	A low speed / energy contact. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	A high speed / energy contact. Resulting in: Multiple minor or single major injury; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	0	6	0	6	2	4	4	4	4.31
3	37	Mooring Incident / Breakout	Mooring Breakout - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry.	A Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry breaks away from her moorings.	Mooring lines in propeller/bow thruster, damage to gangway, lines parted. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Grounding or Contact. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	6	0	0	3	5	5	5	4.19
4	8	Collision	Cruise Ship / Mainland Ferry - Small Commercial Vessel	A Cruise Ship / Mainland Ferry collides with a Small Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and / or prolonged restrictions.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	2	0	4	2	6	3	5	4.03

Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
5	19	Collision	Inter-Island Ferry - Small Commercial Vessel	An Inter-Island Ferry collides with a Small Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	2	0	4	2	6	3	5	4.03
6	5	Collision	Cruise Ship / Mainland Ferry - Inter-Island Ferry	A Cruise Ship / Mainland Ferry collides with an Inter-Island Ferry.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and / or prolonged restrictions.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Catastrophic damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area; Adverse international publicity, long-term suspension of operations, prolonged restrictions and / or termination of commercial activities.	0	0	0	3	3	6	6	6	3.9
7	6	Collision	Cruise Ship / Mainland Ferry - Large Commercial Vessel	A Cruise Ship / Mainland Ferry collides with a Large Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and / or prolonged restrictions.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Catastrophic damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area; Adverse international publicity, long-term suspension of operations, prolonged restrictions and / or termination of commercial activities.	0	0	0	3	3	6	6	6	3.9
8	38	Mooring Incident / Breakout	Mooring Breakout - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	An Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel breaks away from her moorings.	Mooring lines in propeller/bow thruster, damage to gangway, lines parted. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Grounding or Contact. Resulting in: Multiple minor or single major injury; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse local publicity, minor disruption to commercial activities.	0	6	0	0	2	4	4	2	3.82

Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
9	14	Collision	Inshore Fishing Vessel - Small Commercial Vessel	An Inshore Fishing Vessel collides with a Small Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	3	0	3	2	6	3	5	3.8
10	28	Collision	Small Commercial Vessel - Small Commercial Vessel	A Small Commercial Vessel collides with another Small Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	3	0	3	2	6	3	5	3.8
11	4	Collision	Cruise Ship / Mainland Ferry - Inshore Fishing Vessel	A Cruise Ship / Mainland Ferry collides with an Inshore Fishing Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	2	0	4	2	5	3	5	3.69
12	16	Collision	Inter-Island Ferry - Inter-Island Ferry	An Inter-Island Ferry collides with another Inter-Island Ferry.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Major damage to property; Tier 1 to Tier 2 criteria reached; Adverse international publicity, long-term suspension of operations, prolonged restrictions and / or termination of commercial activities.	0	2	0	2	2	6	5	6	3.55
13	36	Grounding	Grounding - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	An Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel runs aground.	Low speed / energy grounding, vessel able to refloat without assistance. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	High speed / energy grounding, vessel unable to refloat without assistance. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse local publicity, minor disruption to commercial activities.	0	3	0	0	2	6	4	2	3.52

Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
14	3	Collision	Cruise Ship / Mainland Ferry - Cruise Ship / Mainland Ferry	A Cruise Ship / Mainland Ferry collides with another Cruise Ship / Mainland Ferry.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and / or prolonged restrictions.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Catastrophic damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area; Adverse international publicity, long-term suspension of operations, prolonged restrictions and / or termination of commercial activities.	0	0	0	3	3	5	5	5	3.5
15	23	Collision	Large Commercial Vessel - Small Commercial Vessel	A Large Commercial Vessel collides with a Small Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	2	0	2	2	6	3	5	3.4
16	29	Collision	Small Commercial Vessel - Towage Vessel	A Small Commercial Vessel collides with a Towage Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	2	0	2	2	6	3	5	3.4
17	20	Collision	Inter-Island Ferry - Towage Vessel	An Inter-Island Ferry collides with a Towage Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Major damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	2	0	2	2	6	5	5	3.27
18	7	Collision	Cruise Ship / Mainland Ferry - Recreational Vessel	A Cruise Ship / Mainland Ferry collides with a Recreational Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and / or prolonged restrictions.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	2	0	3	0	5	3	5	3.25



Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
19	21	Collision	Large Commercial Vessel - Large Commercial Vessel	A Large Commercial Vessel collides with another Large Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	0	0	2	5	5	5	5	3
20	17	Collision	Inter-Island Ferry - Large Commercial Vessel	An Inter-Island Ferry collides with a Large Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple fatalities; Major damage to property; Tier 1 to Tier 2 criteria reached; Adverse international publicity, long-term suspension of operations, prolonged restrictions and / or termination of commercial activities.	0	2	0	2	1	5	4	5	2.95
21	12	Collision	Inshore Fishing Vessel - Large Commercial Vessel	An Inshore Fishing Vessel collides with a Large Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	0	2	0	0	0	5	3	3	2.71
22	18	Collision	Inter-Island Ferry - Recreational Vessel	An Inter-Island Ferry collides with a Recreational Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	0	2	0	0	0	5	3	3	2.71

Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
23	26	Collision	Recreational Vessel - Small Commercial Vessel	A Recreational Vessel collides with a Small Commercial Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	0	0	0	2	0	5	3	3	2.71
24	27	Collision	Recreational Vessel - Towage Vessel	A Recreational Vessel collides with a Towage Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	0	0	0	2	0	5	3	3	2.71
25	22	Collision	Large Commercial Vessel - Recreational Vessel	A Large Commercial Vessel collides with a Recreational Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	0	2	0	2	0	5	3	3	2.65
26	15	Collision	Inshore Fishing Vessel - Towage Vessel	An Inshore Fishing Vessel collides with a Towage Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Single minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	0	2	0	0	0	5	3	2	2.61
27	10	Collision	Inshore Fishing Vessel - Inshore Fishing Vessel	An Inshore Fishing Vessel collides with another Inshore Fishing Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	0	0	0	0	0	6	4	2	2.28

Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
28	9	Collision	Cruise Ship / Mainland Ferry - Towage Vessel	A Cruise Ship / Mainland Ferry collides with a Towage Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	0	0	0	2	5	5	5	2.24
29	24	Collision	Large Commercial Vessel -Towage Vessel	A Large Commercial Vessel collides with a Towage Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 1 to Tier 2 criteria reached; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	0	0	0	0	2	5	5	3	2.15
30	11	Collision	Inshore Fishing Vessel - Inter-Island Ferry	An Inshore Fishing Vessel collides with an Inter-Island ferry.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse regional publicity, temporary suspension of commercial activities and/or prolonged restrictions.	0	0	0	0	2	5	3	3	2.07
31	1	Anchor Dragging	Anchor Dragging - Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry	A Cruise Ship / Mainland Ferry / Large Commercial Vessel / Inter-Island Ferry unintentionally moves from its anchored position because the anchor has failed to hold.	Anchor dragging detected and remedial action taken. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Contact or grounding. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	0	0	0	3	4	4	4	1.96
32	34	Girting	Girting Incident	A towline under tension exerts a heeling moment which results in excessive heel that causes the tug to capsize.	Tug recovers. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Tug is capsized. Resulting in: Multiple major injuries or single fatality; Major damage to property; Tier 1 to Tier 2 criteria reached; Adverse national publicity, medium-term suspension of operations or prolonged restrictions.	0	0	0	0	1	4	4	4	1.88

Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
33	13	Collision	Inshore Fishing Vessel - Recreational Vessel	An Inshore Fishing Vessel collides with a Recreational Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple major injuries or single fatality; Moderate damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	0	0	0	0	0	5	3	2	1.85
34	25	Collision	Recreational Vessel - Recreational Vessel	A Recreational Vessel collides with another Recreational Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple minor or single major injury; Minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	0	0	0	0	0	4	2	2	1.69
35	32	Contact	Contact - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	An Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel contacts a fixed object.	A low speed / energy contact. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	A high speed / energy contact. Resulting in: Multiple minor or single major injury; Minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	0	0	0	0	0	4	2	2	1.69
36	33	Diving	Diving Incident	A diving incident involving a Recreational and / or Commercial Vessel.	Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Resulting in: Multiple major injuries or single fatality; Very minor damage to property; No environmental effect of note; Adverse local publicity, minor disruption to commercial activities.	0	0	0	0	0	5	0	2	1.63
37	2	Anchor Dragging	Anchor dragging - Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel	An Inshore Fishing Vessel / Recreational Vessel / Small Commercial Vessel / Towage Vessel unintentionally moves from its anchored position because the anchor has failed to hold.	Anchor dragging detected and remedial action taken. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Contact or grounding. Resulting in: Multiple minor or single major injury; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse local publicity, minor disruption to commercial activities.	0	0	0	0	2	3	3	2	1.54

Rank	Hazard Ref.	Accident Category	Hazard Title	Hazard Detail	Consequence Descriptions		Risk By Consequence Category								Risk Overall
							ML				WC				
					Most Likely (ML)	Worst Credible (WC)	Environment	People	Property	Stakeholders	Environment	People	Property	Stakeholders	
38	30	Collision	Towage Vessel - Towage Vessel	A Towage Vessel collides with another Towage Vessel.	One or both vessels take avoiding action resulting in a slow speed / energy collision. Resulting in: Very minor injury; Very minor damage to property; No environmental effect of note; Very short-term disruption to services.	Neither vessel takes avoiding action resulting in a high speed / energy collision. Resulting in: Multiple minor or single major injury; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse local publicity, minor disruption to commercial activities.	0	0	0	0	1	3	3	1	1.26