APPENDIX UES14-1

NAVIGATION RISK ASSESSMENT

ABLE MARINE ENERGY PARK
(Material Change 2 – TR030006)

MARICO MARINE

ABLE UK

ABLE HUMBER MARINE ENERGY PARK NRA UPDATE

Report Number:	21UK1704
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UK HMA | British Ports Association | International Harbour Masters Association | renewableUK

MARINE AND RISK CONSULTANTS LTD

ABLE UK

ABLE HUMBER MARINE ENERGY PARK NRA UPDATE

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14 June 2021

EXECUTIVE SUMMARY

Able UK has requested Marine and Risk Consultants Ltd (Marico Marine) undertake a Navigation Risk Assessment (NRA) of the Able Marine Energy Park (AMEP) development on the river Humber following an application for a material change to the consented development under Schedule 6 of the Planning Act 2008 and Part 2 of the Infrastructure Planning (Changes to, Revocation of, Development Consent Orders) Regulations 2011.

An NRA was previously completed in 2011 and submitted in support of the DCO application: the Able Marine Energy Park Development Consent Order (DCO) 2014 (Statutory Instrument 2014 No. 2935). The NRA assessed the development as authorised.

This NRA considers the direct impacts resulting from the presence of the proposed amended project and associated construction vessels and dredging activities to commercial, recreational and fishing vessels. The proposed activities associated with the Project have been assessed and it has been concluded that the Project should have a minimal effect on the existing risk profile which should be managed and contained, assuming compliance with embedded mitigation and regulations governing movements, pilotage, towage, VTS and procedures.

A general decrease in risk scores is noted across all hazard categories when compared to the NRA undertaken in 2011 in support of the original DCO application. Factors influencing this decrease in risk score include:

- An overall decline in Humber vessel transits past the Project (>50% reduction in passing transits from AIS) (**Section 3.3**);
- Improvement of the Humber-wide SMS and implementation of embedded mitigations over time;
- The embedding of many originally proposed additional mitigation measures into the project design (**Section 5**);
- The review and associated reduction in construction phase vessel movements associated with dredging activities identified within scoping;
- The simplification of the quay design via the removal of the specialist berth (**Section 2**)**;** and
- The reduction of cumulative projects considered within the 2011 NRA that were not taken forward (**Section 4.1**).

Although all hazards were scored as ALARP or lower, it is recommended that consideration is given to the implementation of the recommended possible additional risk control measures to further reduce the hazards to which they apply, particularly those within the ALARP band which should be reduced unless there is a disproportionate cost relative to the benefits obtained.

CONTENTS

FIGURES

TABLES

ANNEXES

ABBREVIATIONS

Abbreviation	Detail
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
AMEP	Able Marine Energy Park
AHPL	Able Humber Ports Limited
BHD	Backhoe Dredger
CCTV	Closed Circuit Television
CHA	Competent Harbour Authority
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea
COMAH	Control of Major Accident Hazards
DWT	Deadweight Tonnes
EIA	Environmental Impact Assessment
ES	Environmental Statement
FSA	Formal Safety Assessment
HES	Humber Estuary Services
HLV	Heavy Lift Vessel
HW	High Water
ICW	In Collision With
IMO	International Maritime Organisation
INS	Information Service
kt	Knot (unit of speed equal to nautical mile per hour, approximately 1.15 mph)
LOA	Length Over-All
LW	Low Water
m	Metre
Marico Marine	Marine and Risk Consultants Ltd
MSMS	Marine Safety Management System
MCA	Maritime and Coast Guard Agency
ML	Most Likely
MLA	Marine Licence Application
nm	Nautical Mile
NRA	Navigation Risk Assessment

Abbreviation	Detail
PMSC	Port Marine Safety Code
PWC	Personal Watercraft
RHIB	Ridged Hulled Inflatable Boat
SHA	Statutory Harbour Authority
SHB	Split Hopper Barge
TOS	Traffic Organisation Service
TSHD	Trailing Suction Hopper Dredger
VHF	Very High Frequency (radio communication)
VTS	Vessel Traffic Services
WC	Worst Credible
WIV	Wind Installation Vessel

1 INTRODUCTION

Able UK has requested Marine and Risk Consultants Ltd (Marico Marine) undertake a Navigation Risk Assessment (NRA) of the Able Marine Energy Park (AMEP) development on the river Humber following an application for a material change to the consented development under Schedule 6 of the Planning Act 2008 and Part 2 of the Infrastructure Planning (Changes to, Revocation of, Development Consent Orders) Regulations 2011.

An NRA[1] was previously completed in 2011[2] and submitted in support of the DCO application: the Able Marine Energy Park Development Consent Order (DCO) 2014 (Statutory Instrument 2014 No. 2935). The NRA assessed the development as authorised.

This NRA considers the direct impacts resulting from the presence of the proposed amended project and associated construction vessels and dredging activities to commercial, recreational and fishing vessels. However, comments will additionally be made on the impacts to the wider river area and cumulative impacts, where applicable.

Material amendments of significance to shipping and navigation are detailed below:

- Amendments to the quay line including:
  - Removal of the specialist berth at the southern end of the quay; and
  - Creation of a 61 m x 288 m recess in the quay line at the northern end of the quay to accommodate a barge berth of -11m CD to allow for the possibility of end load in and load out of cargo.

It should be noted, the Scoping Opinion and subsequent preliminary environmental information considered an increased number and duration of vessel movements compared to the original EIA and this was associated with an increased usage of deposit sites within the Humber Estuary. This reflected the fact that in the consented scheme, 1.1M tonnes of dredged clay was to be disposed of to terrestrial areas landward of the existing Killingholme Marshes flood defence wall, whereas it is now proposed that this material is disposed of within the Humber Estuary. Subsequent review has determined that vessel movements associated with the construction phase are actually equivalent or slightly reduced

[1] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR030001/TR030001-000402-14.2%20-%20Navigation%20Risk%20Assessment.pdf

2 BMT Isis (2011) TR030001-000402-14.2 – Navigation Risk Assessment

when compared to the consented scenario (**Table 3**). The impact of increased vessel movements associated with an increased usage of deposit sites identified within the scoping study has, therefore, been scoped out of assessment within this NRA. No materially different construction operations are proposed and no increase in the overall dredge tonnage is predicted.

Given that the previous NRA was undertaken over ten years ago, a review of the baseline vessel traffic profile will additionally be undertaken to establish any large-scale changes in vessel activity. The NRA methodology will additionally be reviewed and updated in accordance with current industry best practice in agreement with ABP Humber.

1.1 REFERENCE DOCUMENTS AND GUIDANCE

The NRA has been undertaken drawing on the input data and documents outlined within **Table 1**.

Table 1: Reference Documents

Document Reference	Description
https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR030006/TR030006-000009-TR030006%20-%20Scoping%20Report.pdf	Scoping Report
https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR030006/TR030006-000036-TR030006%20%E2%80%93%20Scoping%20Opinion.pdf	Scoping Opinion
https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR030001/TR030001-000402-14.2%20-%20Navigation%20Risk%20Assessment.pdf	2011 DCO Navigation Risk Assessment
https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR030001/TR030001-000319-14%20-%20Navigation.pdf	Chapter 14 – Navigation, Environmental Statement
21UK1704_AU_PEIR_21_02	Preliminary Environmental Impact Report (PEIR)
210428A – Construction Vessel Movements.pdf	Construction phase vessel movements schedule including dredging programme

Document Reference	Description
AME-029-00000 DCO Boundary Layout.pdf	DCO boundary layout drawing

1.2 GUIDANCE

The NRA has been conducted based on the Formal Safety Assessment (FSA)[3] approach to risk assessment utilising a combination of data analysis and stakeholder/expert judgement to determine risk levels.

Applicable guidance that has informed the assessment of risk is given within **Table 2**.

Table 2: Guidance

Guidance	Description
Harbour Works Consent Procedures	ABP harbour works consents procedures and guidance setting out consents procedures for the carrying out of works below mean high water marks.
IMO (2018) Revised Guidelines for Formal Safety Assessment (FSA) MSC-MEPC.2/Circ.12/Rev.2	Guidelines for undertaking International Maritime Organisation (IMO), Formal Safety Assessment Compliant Navigation Risk Assessments.
International Regulations for Preventing Collisions at Sea 1972 (as amended) (ColRegs)	Guidance to prevent collisions at sea.
Marine Works (Environmental Impact Assessment) Regulations 2007 No.1518	Regulations governing EIA's for marine works licence consent.

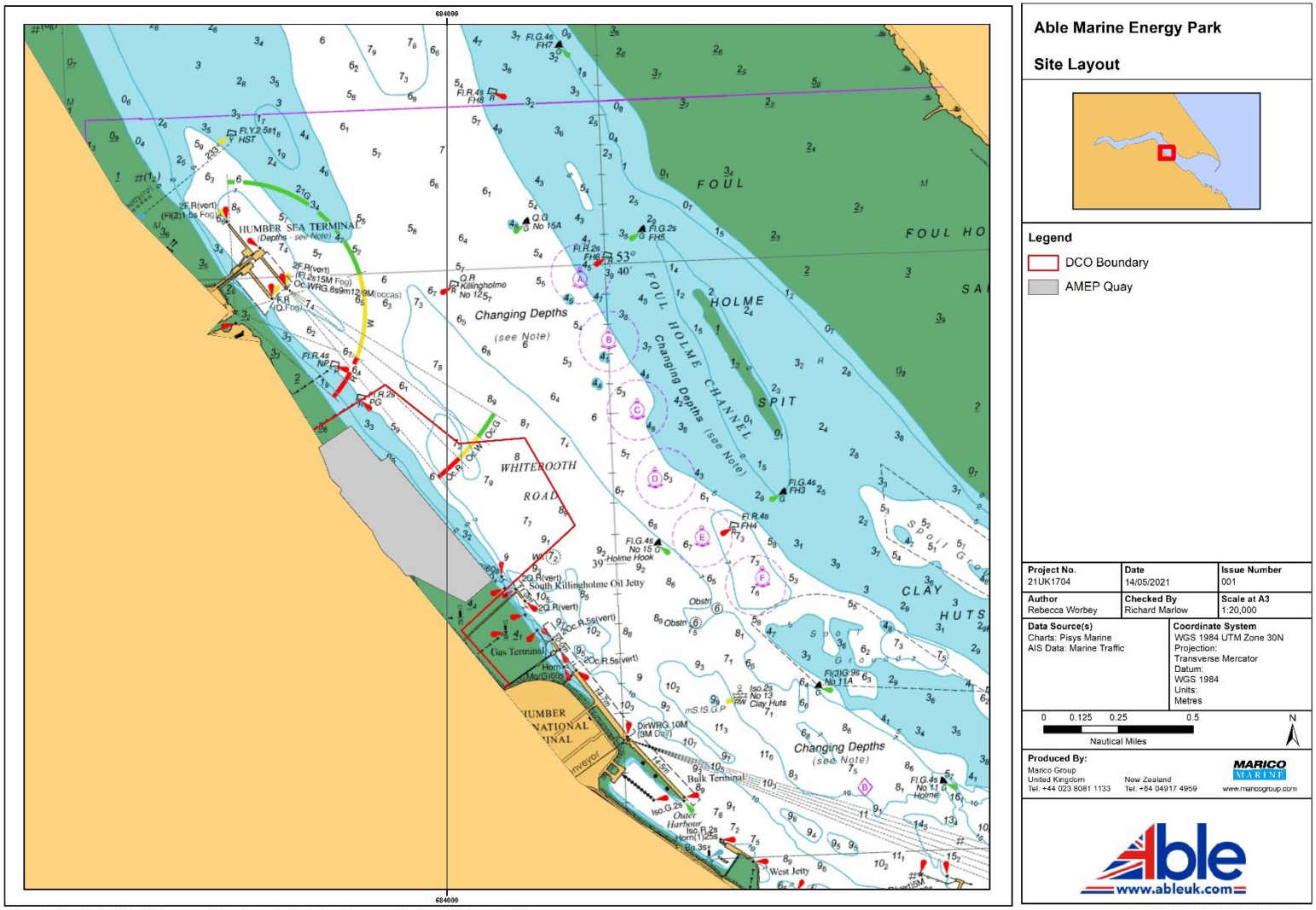
2 PROJECT DESCRIPTION

2.1 STUDY AREA

The proposed material change to the AMEP development layout and associated DCO boundary area are shown within **Figure 1**.

[3] IMO (2018) Revised Guidelines for Formal Safety Assessment (FSA) MSC-MEPC.2/Circ.12/Rev.2

The 2011 NRA considered a study area from Immingham Oil Terminal to King George Dock. The study area for the purposes of the NRA Update and Updated ES has been extended as shown in **Figure 4** to **Figure 14** to incorporate the dredge deposit sites. However, additional comments will be made on the impacts to the wider river area where applicable for consideration of cumulative impacts.



Charts from Pisys Marine 2021. All rights reserved. Not to be used for Navigation; © Crown copyright 2021 UK Hydrographic Office.

Figure Reference: 21UK1704_Site_Layout

Figure 1: Amended Able Marine Energy Park Layout.

2.2 LIFECYCLE AND PHASING

The NRA has considered two distinct development phases:

- The Construction Phase (see **Chapter 2.2.1**), including:
  - Construction of quay; and
  - Dredging.
- The Operation Phase (see **Chapter 2.2.2**), including:
  - Additional vessel movements associated with operational site activities.

2.2.1 Construction Phase

Dredging will be undertaken during the construction phase of the project. For the purposes of this assessment, dredging is assumed to comprise the following operations:

- A small TSHD (1500m3 hopper capacity) removing c.370,000 m3 of soft material, sands and gravels from the berthing pocket and approaches to facilitate access for other construction plant in one campaign disposing at HU080;
- A BHD or CSD with 3 barges excavating and transporting c1.17m m3 clays from the berthing pocket and approaches to HU081 and HU082 in two campaigns to reflect the sectional completion of the quay; and
- A large TSHD (8000m3 hopper capacity) removing c.430,000 m3 of glacial material, sands and gravels from the berthing pocket and approaches to HU080 to enable full operation of the facility.

Alternative scenarios may occur in practice, so the sensitivity of the risk assessment to alternatives that give rise to additional vessel movements is addressed later in this report at **Section 8.1.1**.

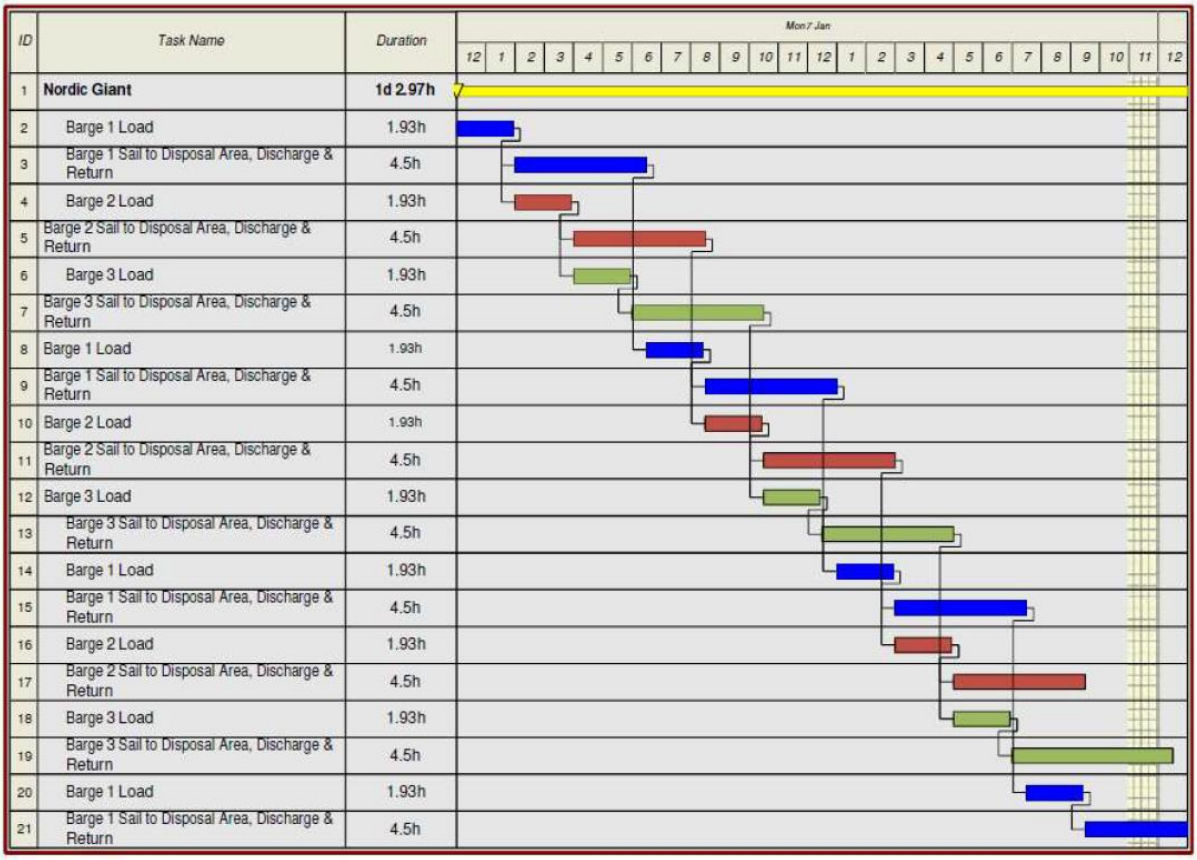
The total volume of dredge arisings is calculated to be approximately 1.6M Tonnes if anchor piles are used and 2M tonnes if flap anchors are used to tie back the quay wall.

Erodible material removed using a TSHD will be deposited at HU080. Inerodible material removed by BHD or CSD will be deposited either at HU081 or HU082 with the available capacity of HU081 and HU082 assessed to be 550,000m^3 and 590,000m^3 respectively.

In addition, aggregate (hydraulic fill) will be imported from offshore dredge areas to provide fill material for the construction site using a medium sized TSHD. These vessels will therefore arrive loaded and depart in ballast.

Anticipated construction phase vessel movements are shown in **Table 3**. Total movements proposed during the construction phase are anticipated to be 5,464 over 28 months equating to an average of

6.5 additional movements per day with a peak of 27 movements per day during peak daily dredging which will occur during back-hoe or cutter-suction dredging operations with barges assumed to operate to the programme shown in **Figure 2.**

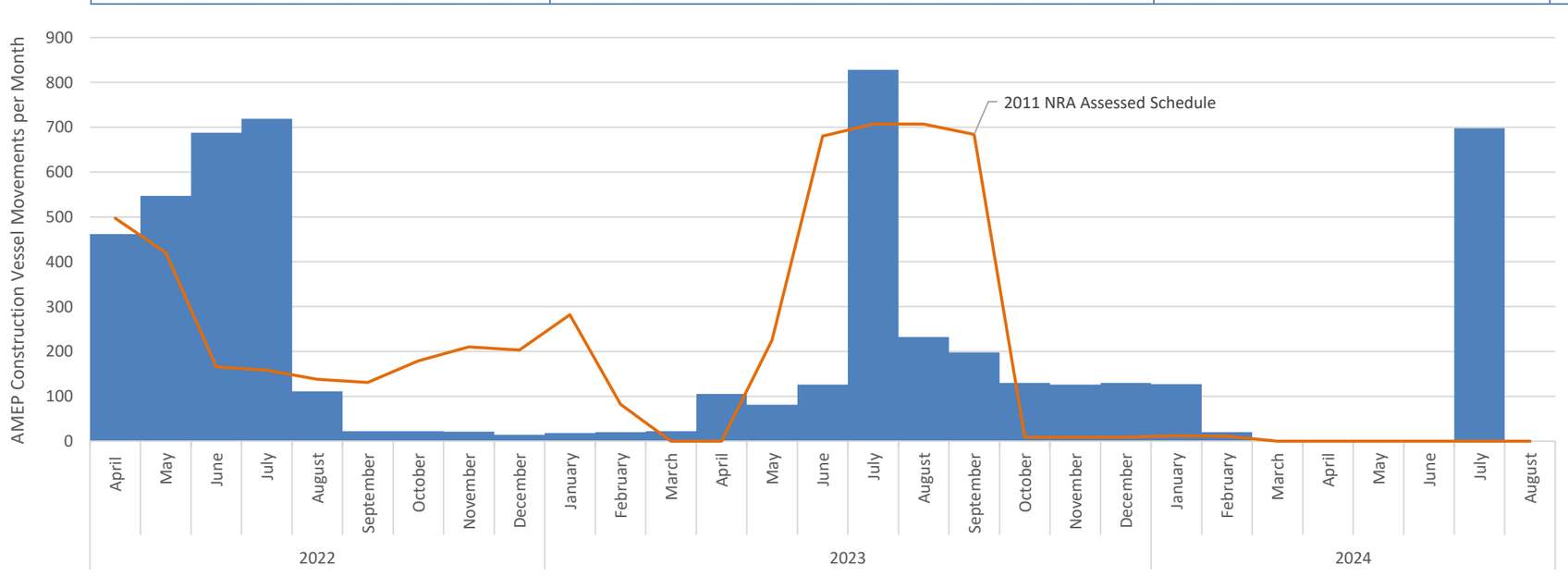


ID	Task Name	Duration
1	**Nordic Giant**	**1d 2.97h**
2	Barge 1 Load	1.93h
3	Barge 1 Sail to Disposal Area, Discharge & Return	4.5h
4	Barge 2 Load	1.93h
5	Barge 2 Sail to Disposal Area, Discharge & Return	4.5h
6	Barge 3 Load	1.93h
7	Barge 3 Sail to Disposal Area, Discharge & Return	4.5h
8	Barge 1 Load	1.93h
9	Barge 1 Sail to Disposal Area, Discharge & Return	4.5h
10	Barge 2 Load	1.93h
11	Barge 2 Sail to Disposal Area, Discharge & Return	4.5h
12	Barge 3 Load	1.93h
13	Barge 3 Sail to Disposal Area, Discharge & Return	4.5h
14	Barge 1 Load	1.93h
15	Barge 1 Sail to Disposal Area, Discharge & Return	4.5h
16	Barge 2 Load	1.93h
17	Barge 2 Sail to Disposal Area, Discharge & Return	4.5h
18	Barge 3 Load	1.93h
19	Barge 3 Sail to Disposal Area, Discharge & Return	4.5h
20	Barge 1 Load	1.93h
21	Barge 1 Sail to Disposal Area, Discharge & Return	4.5h

Figure 2: Back-hoe and Split Barges Daily Programme (Source: Able UK)

Table 3: Construction Phase Vessel Movements

		2022									2023											2024								
Equipment	**Application**	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	**Total**
Vessels Importing Hydraulic Fill																															
TSHD 1	Importing Fill													3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5								
Operating Days/Month														30	23	30	31	31	30	31	30	31	30								
Total Vessel Movements per Month														**105**	**81**	**105**	**109**	**109**	**105**	**109**	**105**	**109**	**105**								**1,040**
Dredging Vessels																															
TSHD 2	Dredging / disposal	15.4	15.4																												
TSHD 3	Dredging / disposal																	6	6												
Operating Days/Month		30	18															17	12												
BH1	Operating Only on Site																0												0		
SB1	Transport to Disposal		7.5	7.5	7.5	7.5											7.5												7.5		
SB2	Transport to Disposal		7.5	7.5	7.5	7.5											7.5												7.5		
SB3	Transport to Disposal		7.5	7.5	7.5												7.5												7.5		
Operating Days/Month			12	30	31	6											31												31		
Total Vessel Movements per Month		**462**	**547**	**675**	**698**	**90**											**698**	**102**	**72**										**698**		**4,041**
Supply Vessels to the Installation Rigs																															
GE1_WR	Operating Only on Site																														
MP1 + Tug	Transporting Material			0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7			0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7							
Operating Days/Month				18	31	30	31	31	30	20	25	28	31			30	31	31	30	31	30	31	31	28							
Total Vessel Movements per Month				**13**	**22**	**21**	**22**	**22**	**21**	**14**	**18**	**20**	**22**			**21**	**22**	**22**	**21**	**22**	**21**	**22**	**22**	**20**							**384**
All Vessels																															
Total Vessel Movements per Month		**462**	**547**	**688**	**719**	**111**	**22**	**22**	**21**	**14**	**18**	**20**	**22**	**105**	**81**	**126**	**828**	**232**	**198**	**130**	**126**	**130**	**127**	**20**					**698**		**5,464**
Assessed 2011 NRA Total Vessel Movements		497	420	166	158	138	131	179	210	203	282	82			225	680	707	707	684	9	9	9	12	11							**5,518**



2.2.2 Operation Phase

The proposed vessel movements during the operational phase are shown in **Table 4.** A slight reduction in vessel movements is noted in comparison to the consented design due to the elimination of specialist vessel berth (**Figure 1**).

Table 4: Operational Phase Vessel Movements

Consented Scenario			New NRA		
Vessel Type	Annual Number of Trips	Annual Number of Movements	Vessel Type	Annual Number of Trips	Annual Number of Movements
Foundation Transfer Vessel	12	24	N/A	0	0
Installation Vessel	100	200	Installation Vessel	100	200
1,500 Tonne Support Vessel	100	200	1,500 Tonne Support Vessel	100	200
6,000 - 10,000 Tonne Cargo Ship	50	100	6,000 - 10,000 Tonne Cargo Ship	50	100
	262	**524**		**250**	**500**

Indicative vessel types anticipated to berth at the AMEP quay during the operational phase are shown in **Figure 3.** The offshore wind Ro-Ro vessels with a carrying capacity of approximately 8888 t DWT, a draft of between 6 and 7 meters, an approximate length overall (LOA) of 141.6 meters and beam of 20.6 meters are proposed.

Figure 3: ROTRA VENTE and ROTRE MARE, Siemens Gamesa

3 BASELINE NAVIGATION SCENARIO

Almost one quarter of the UK's seaborne trade, by tonnage, passes through the Humber; this includes 25 per cent of the country's natural gas and 25 per cent of its refined petroleum products with the port handling in the region of 30,000 international shipping movements each year[4].

Associated British Ports (ABP) operates four ports on the River Humber - Hull, Goole, Grimsby and Immingham of which Grimsby and Immingham are within the assessment study area. ABP is also the Statutory and Competent Harbour Authority (SHA / CHA) overseeing navigation for the whole Humber Estuary.

A wide range of industrial works are situated on or near the estuary including non-ABP ports, oil refineries, chemical plants and power generation facilities. These include the Immingham Oil Terminal (IOT), Associated Petroleum Terminals (APT), South Killingholme Oil Jetty and the C.Ro Port (Killingholme, generally known as Humber Sea Terminals [HST]) within the study area.

The Humber Passage Plan, developed to facilitate the safe movement of large vessels in the Humber, applies to all vessels of over 40,000 DWT or with a draught greater than 11 metres and to gas carriers of over 20,000m³ irrespective of draught.

ABP Humber Estuary Services (HES) monitor navigation safety and provide advice to vessels within the estuary through its Vessel Traffic Services (VTS). HES Is the CHA providing pilotage for all traffic using the Humber Estuary. Additionally, a Marine Safety Management System (MSMS) is operated by HES in accordance with the Port Marine Safety Code (PMSC).

Able Humber Ports Limited will have responsibility as a statutory harbour authority over the AMEP berths and immediate approaches; however, ABP by virtue of the Humber Conservancy Acts (1852-1907) and the Harbour Reorganisation Scheme 1966, will remain the Conservancy and Navigation Competent Harbour Authority for the River Humber (including the Lower Trent to Gainsborough) in addition to the Local Lighthouse Authority (Merchant Shipping Act 1894).

The original assessment of commercial and recreational navigation was produced more than 10 years ago in 2011 requiring a review and update of the baseline to assess any new or different significant effects. Data gathering has been undertaken in order to inform the review of the baseline navigation profile.

[4] ABP Humber Estuary Services Website (2021)

Indicative tidal heights for January 2020, to coincide with the duration of commercially sourced AIS data (**Section 3.1**) is shown in **Table 5**. Spring tides are typically up to 6.9m at Hull while neap tides are typically up to 3.5m. Data from the on-line gauges is transmitted continuously to Vessel Traffic Services (VTS) at Spurn, for the benefit of river users. This is especially useful when a negative surge occurs which may result in a tidal level more than ½ metre below that predicted.

Table 5: Indicative Tidal Heights –Humber Sea Terminals (Admiralty Total Tide) – January 2020

Date	High	Height (m)	Low	Height (m)
16/01/2020	10:00	6.8	04:01	1.1
	22:02	7	16:02	1.6
17/01/2020	10:56	6.5	04:52	1.4
	22:59	6.7	16:53	2
18/01/2020	00:12	6.4	07:02	2
	13:18	6	19:16	2.5
19/01/2020	00:12	6.4	07:02	2
	13:18	6	19:16	2.5
20/01/2020	01:36	6.2	08:15	2
	14:27	6.1	20:38	2.4
21/01/2020	02:49	6.3	09:20	2
	15:28	6.3	21:47	2.1
22/01/2020	03:54	6.4	10:17	1.9
	16:21	6.5	22:45	1.8
23/01/2020	04:50	6.6	11:06	1.7
	17:06	6.8	23:35	1.5
24/01/2020	05:38	6.7	11:50	1.6
	17:48	6.9	-	-
25/01/2020	06:22	6.8	00:20	1.4
	18:27	7.1	12:30	1.6

Date	High	Height (m)	Low	Height (m)
26/01/2020	07:01	6.8	01:02	1.3
	19:04	7.1	13:07	1.6
27/01/2020	07:36	6.7	01:40	1.3
	19:38	7.1	13:41	1.6
28/01/2020	08:09	6.6	02:14	1.4
	20:10	7	14:12	1.7
29/01/2020	08:40	6.5	02:44	1.5
	20:41	6.9	14:42	1.8

3.1 INPUT DATA

The following input data has been utilised for the assessment:

- Stakeholder consultation Feedback;
- Four weeks' AIS Data:
  - Two weeks between 12 to 25 August 2019; and
  - Two weeks between 16 to 29 January 2020;
- DfT port statistics; and
- Historical incident data.

It was noted in consultation with ABP HES that 2020 is considered largely unrepresentative of the typical traffic profile of the port owing to Coronavirus. AIS data was therefore selected from August 2019 and January 2020 (pre-coronavirus) to more accurately reflect the current traffic profile.

3.2 STAKEHOLDER CONSULTATION

Information was gathered through consultation with key local stakeholders, including the Harbour Master, to establish the baseline risk profile and inform impact and hazard identification.

Stakeholders consulted as part of the NRA are listed in **Table 6**. The minutes of the stakeholder meetings are contained within **Annex B**.

Table 6: Stakeholder Consultation Meetings

Date of Meeting	Stakeholder	Comments	Response	Reference
14 April 21	ABP HES	The wind cats transiting to and from Grimsby represent a new activity since the last NRA was undertaken.	Noted.	-
		Wind farm vessels transporting wind turbine equipment heading to Greenport Hull represent a new activity since the last NRA was undertaken.	Change in traffic considered within the baseline analysis.	**Section 3.3**
			Change in baseline considered within updated risk assessment scoring.	**Section 8**
		Greenport Hull has commenced operation since the previous NRA.	Change in traffic considered within the baseline analysis.	**Section 3.3**
			Change in baseline considered within updated risk assessment scoring.	**Section 8**
		Hull Riverside Bulk Terminal was not built; however was in planning at the time of the last NRA and so may have been considered within the cumulative assessment.	Cumulative impacts reviewed.	**Section 4.1**
		Sunk dredge deepening was in the planning during the last NRA assessment but has not been undertaken.	Cumulative impacts reviewed.	**Section 4.1**
		There are no planned future developments within the study area.	Cumulative impacts reviewed.	**Section 4.1**
		Passenger vessels passing the site are likely the Pride of Hull and Pride of Rotterdam, but one of the Hull passenger services has recently ceased (since the last NRA and AIS data obtained).	Change in traffic considered within the baseline analysis.	**Section 3.3**
			Change in baseline considered within updated risk assessment scoring.	**Section 8**
		No significant change to the prevalence of the fishing industry since the last NRA.	Noted.	-
		No significant change in leisure movements since last NRA.	Noted.	-

Date of Meeting	Stakeholder	Comments	Response	Reference
		Overall, there has been approximately a 10% decline in vessel movements across the estuary which has been lower still during 2020 as a result of COVID-19.	Change in traffic considered within the baseline analysis.	**Section 3.3**
			Change in baseline considered within updated risk assessment scoring.	**Section 8**
		Traffic largely passes well clear of the development. Vessels bound for Humber Sea Terminals will be most impacted; however, it is anticipated that the impact should not be dissimilar to that previously assessed.	Construction phase risk assessment reviewed and updated.	**Section 8**
			Operational phase risk assessment reviewed and updated.	**Section 8**
		As far as ABP is aware there have not been any new COMAH developments since the 2011 NRA.	Noted.	-
		Mooring study should be undertaken by the berth operators / new HA to ensure adequate arrangements (Breakout Hazard mitigation).	Mooring Study recommended as a possible additional mitigation measure.	**Section 9**
		Care should be undertaken when disposing of dredge deposits at HU082/HU081 to ensure that the deposits do not encroach the channel.	Dredge Disposal Plan recommended as a possible additional mitigation measure.	**Section 9**
		An agreed plan will need to be established in advance for the disposal of dredge materials.	Schedule 8, paragraph 45 of the DCO already requires a dredge and disposal strategy to be agreed with the MMO before the commencement of disposal activities.	**Section 9**
		HES is particularly concerned to ensure pilot allocation to dredgers is fairly managed to avoid disruption to other customers. (Dredgers may need to have PEC holders on board or wait for pilot availability).	Sufficient availability of pilots recommended as a possible additional mitigation measure, but this will be for HES to manage.	**Section 9**

Date of Meeting	Stakeholder	Comments	Response	Reference
		As the Harbour Authority, AHPL will have to develop their own Marine Safety Management System, and ownership of responsibilities will need to be clear.	Schedule 9, paragraph 20 already requires AHPL to submit a to the Harbourmaster for approval, a written statement of proposed safe operating procedures.	**Section 9**
15 April 21	ABP Immingham	AIS data reflects expected traffic profile.	Noted.	-
		No recent navigational incidents within the study area.	Historical incidents reviewed.	**Section 3.4**
		Likely to be sedimentation issues with the new recessed barge berth becoming a sediment trap and increasing grounding risk of project vessels. Dredge levels will need to be maintained through regular maintenance dredging.	Additional surveys of study area recommended as a possible additional mitigation measure.	**Section 9**
		Tug availability may be an issue.	Noted.	-
		Hazards should be adequately managed / mitigated by HES and passage planning.	Noted.	**Section 5**
		Mooring study should be undertaken by the berth operators / new HA to ensure adequate arrangements (Breakout Hazard mitigation).	Mooring Studies recommended as a possible additional mitigation measure.	**Section 9**
		Can't see a need for additional simulation.	Noted.	-
		No future developments planned for consideration within the cumulative assessment.	Cumulative impacts reviewed.	**Section 4.1**
		There have not been any new COMAH developments since the 2011 NRA that would require inclusion within the NRA update.	Noted.	-
		MC noted that Goole, Hull and Immingham including the Able development have been granted free-port status and therefore the traffic levels may increase in the future.	Cumulative impacts reviewed.	**Section 4.1**

Date of Meeting	Stakeholder	Comments	Response	Reference
15 April 21	Exolum /Associated Petroleum Terminals (APT)	The development is in a very busy part of the Humber. RoRo traffic into HST will be passing very close to the DCO area. Interactions with SKJ, for example, simultaneous berthing, will need to be considered.	Restrict simultaneous movements recommended as a possible additional mitigation measure.	**Section 9**
		Overall, there has been a reduction in vessel traffic in the Humber.	Change in traffic considered within the baseline analysis.	**Section 3.3**
		SKJ – received 173 ships last year: 178 in 2019, 214 in 2018 and 243 in 2017. First quarter berth occupancy figures for 2021 show an increase on 2020.	Change in traffic considered within the baseline analysis.	**Section 3.3**
		Spring line parted on a ship berthed on SKJ in 2019 due to interaction with vessel going up to HST.	Hazard 'Break-out' assessed as part of NRA.	**Section 8**
		Sedimentation levels and the impact that they may have on the dredge pocket off SKJ, and the areas behind the jetties used by mooring boats, is a concern. Currently there is little maintenance dredging required around SKJ which needs to be maintained to -11m. Sedimentation of approach channels may also be an issue.	Additional surveys of study area recommended as a possible additional mitigation measure.	**Section 9**
		Extra siltation would negatively impact access to the mooring dolphins at SKJ. If siltation was such that it prevented access by boat then jetties would need to be fitted.	Additional surveys of study area recommended as a possible additional mitigation measure.	**Section 9**
		The proposed frequency of vessel movements in the operational phase (approximately 1 per day) look to be reasonable.	Noted.	-
		Mooring study should be undertaken by the berth operators / new HA to ensure adequate arrangements.	Mooring Study recommended as a possible additional mitigation measure.	**Section 9**

Date of Meeting	Stakeholder	Comments	Response	Reference
		Mitigation measures proposed within 2011 NRA look reasonable.	Noted.	-
20 April 21	MCA	The development is fully within ABP Humber harbour limits. The MCA expects the proposed assessment methodology for 'Commercial and Recreational Navigation' to be updated for the revised Environmental Statement, and on the understanding Associated British Ports Ltd (ABP) as the Statutory Harbour Authority for the Humber Estuary remains fully consulted, is content with the NRA and that the NRA complies with PMSC requirements, the MCA is unlikely to have any concerns at this time.	Noted.	-
		To address the ongoing safe operation of the marine interface for this project, MCA would point developers in the direction of the Port Marine Safety Code (PMSC) and its Guide to Good Practice. They will need to liaise and consult with the Statutory Harbour Authority and develop a robust Safety Management System (SMS) for the project under this code.	Marine Safety Management System recommended as a possible mitigation measure	**Section 9**
		Final drawings should be submitted to the UKHO. Charts should be updated.	Update Navigation Charts included as an embedded mitigation measure.	**Section 5**
		Appropriate information should be circulated to interested parties.	Promulgation of Information including Notice to Mariners included as an embedded mitigation measure.	**Section 5**
		Trinity House should be consulted regarding changes to Aids to Navigation and any other aspects of relevance identified within the NRA.	Marking and lighting recommended as a possible additional mitigation measure.	**Section 9**
21 April 21	CLdN / C.Ro Ports	Activities (RoRo operations) remain unchanged since previous NRA was undertaken. However, larger vessels (including the "next generation" G9 class vessels at 234m LOA) are now	Change in baseline considered within updated risk assessment scoring.	**Section 8**

Date of Meeting	Stakeholder	Comments	Response	Reference
		being utilised and therefore they require a larger swinging area when turning to berth.		
		There are six berths at Humber Sea Terminals. Although they are not all currently in use at one time, they may be utilised in the future.	Noted. Cumulative impacts reviewed.	**Section 4.1**
		CLdN expressed concern that the increased demand for pilotage from dredging vessels may impact on other customers and their own operations if the dredgers did not have sufficient PEC holders available. CLdN would expect the Pilotage Authority to manage pilot allocation to ensure existing customers and time critical services were not adversely impacted.	Managed by HES as part of routine operations. Availability of pilots recommended as a possible additional mitigation measure.	**Section 5** **Section 9**
		Communication will be essential at all project stages including between AMEP, the Dredging Contractor, C.Ro and other river users. Communication must particularly be maintained during dredging operations. Delays caused by inability to swing to the berth due to obstruction will have considerable commercial and operational impact.	Promulgation of Information including Notice to Mariners included as an embedded mitigation measure.	**Section 5**
			Dedicated project marine manager recommended as a possible additional mitigation measure.	**Section 9**
		A dedicated project marine movement co-ordinator would be an effective mitigation measure during both construction and operational phases.	Dedicated project marine manager recommended as a possible additional mitigation measure.	**Section 9**
		There is a pinch point at Immingham Oil Terminal. Project dredging vessels (especially less manoeuvrable towed barges, should (if possible) use the 'Foul Holme Channel' to keep clear of larger / scheduled river traffic. Priority should be given to C.Ro and other large vessels berthing at Immingham which operate according to strict timetables and which would be more impacted by delays.	Restrict simultaneous movements recommended as a possible mitigation measure.	**Section 9**

Date of Meeting	Stakeholder	Comments	Response	Reference
-	Humber Workboats	Declined to comment.	-	-
-	UK Dredging	Declined to comment.	-	-

3.3 VESSEL TRAFFIC ANALYSIS

AIS data was commercially sourced, as detailed in **Section 3.1**, to enable the assessment of the current baseline traffic profile in the vicinity of the Project and to undertake quantitative analysis to establish any potential impacts the Project and proposed material change may have upon the existing navigation profile.

Vessels were subdivided into categories relevant to vessel operations within the Humber. The assessed vessel categories are identified within **Table 8.** It should be noted that, while recreational activities are rare, recreational vessels are present in small numbers (**Figure 14**). For consistency, recreational vessels have, therefore, been included within the NRA.

Vessel movement data has additionally been provided by ABP Humber as shown in **Table 7** which indicates 21,651 total vessel movements within the Humber Estuary during 2020.

Table 7: Total Vessel Movements (ABP Humber)

Total Vessel Movements				
2016	**2017**	**2018**	**2019**	**2020**
24,876	25,540	25,637	24,625	21,651

Table 8: Vessel Categories

Category	Description
Tankers	Including product tankers, crude oil tankers, gas carriers, bunker barges.
General Cargo Vessels	Including general cargo, containers, non-liquid bulk carriers, ferries, wind farm construction vessels.
Project Cargo Vessels	Including project cargo vessels and abnormal loads including project barges transporting wind farm infrastructure, for example; monopiles and jackets and vessels cold moved to dock.
Construction Vessels	Including project dredgers, tugs, workboats and other construction vessels.
Workboats/Other	Pilot boats, workboats, dredgers, wind farm support vessels and fishing vessels (not engaged in fishing). Sailing yachts, motor yachts, sailing dinghies, Rigid Hull Inflatable Boats (RHIB) etc.

3.3.1 Analysis by Vessel Type

A two-week representative data period from both summer and winter has been assessed (see **Section 3.1)** to ensure any seasonal variations are captured.

Vessels have been analysed according to vessel type and spatial distribution in **Figure 4** to **Figure 14.** While tankers, passenger vessels and fishing vessels are noted passing clear of the Project and DCO boundary, cargo vessels pass within the DCO boundary en route to Humber Sea Terminals. A total of 83 cargo transits, or approximately 6 per day, intersected the DCO boundary in both summer and winter en route to Humber Sea Terminals.

Figure 12 to **Figure 14** illustrate fishing and leisure vessel transits, which are also included in the workboat / other category (**Figure 10** and **Figure 11**).

This category shows intensive tracks throughout the study area, but these are largely accounted for by tug movements (near harbour facilities) and Pilot vessel movements (approaches to the estuary).

Approximately 50 vessels per day were identified from AIS transiting past the AMEP project site in January 2020 and 58 per day in August 2019. The 2011 NRA estimated approximately 115 transits per day from AIS indicating a greater than 50% reduction in transits. It should, however, be noted that only four days of AIS were obtained for assessment within the 2011 NRA which is not considered a large enough dataset from which to derive trends.

The most common vessel types to transit past the site are cargo vessels accounting for 55% and 70% of traffic in summer and winter respectively, followed by workboat/ other category vessels at 27% and 22%. Fishing vessels accounted for <1% of traffic past the site with only 2 vessels recorded from the one month of AIS data and recreational vessels accounted for 2% of all vessel traffic in summer and were absent in winter. Similarly, passenger vessels show distinct seasonality increasing from 6 transits in winter (<1 per day) to 46 in summer or approximately 3 transits per day.

Transits past the Project are shown by vessel length in **Figure 20** with the most common vessel lengths characteristic of cargo and workboat / other type vessels.

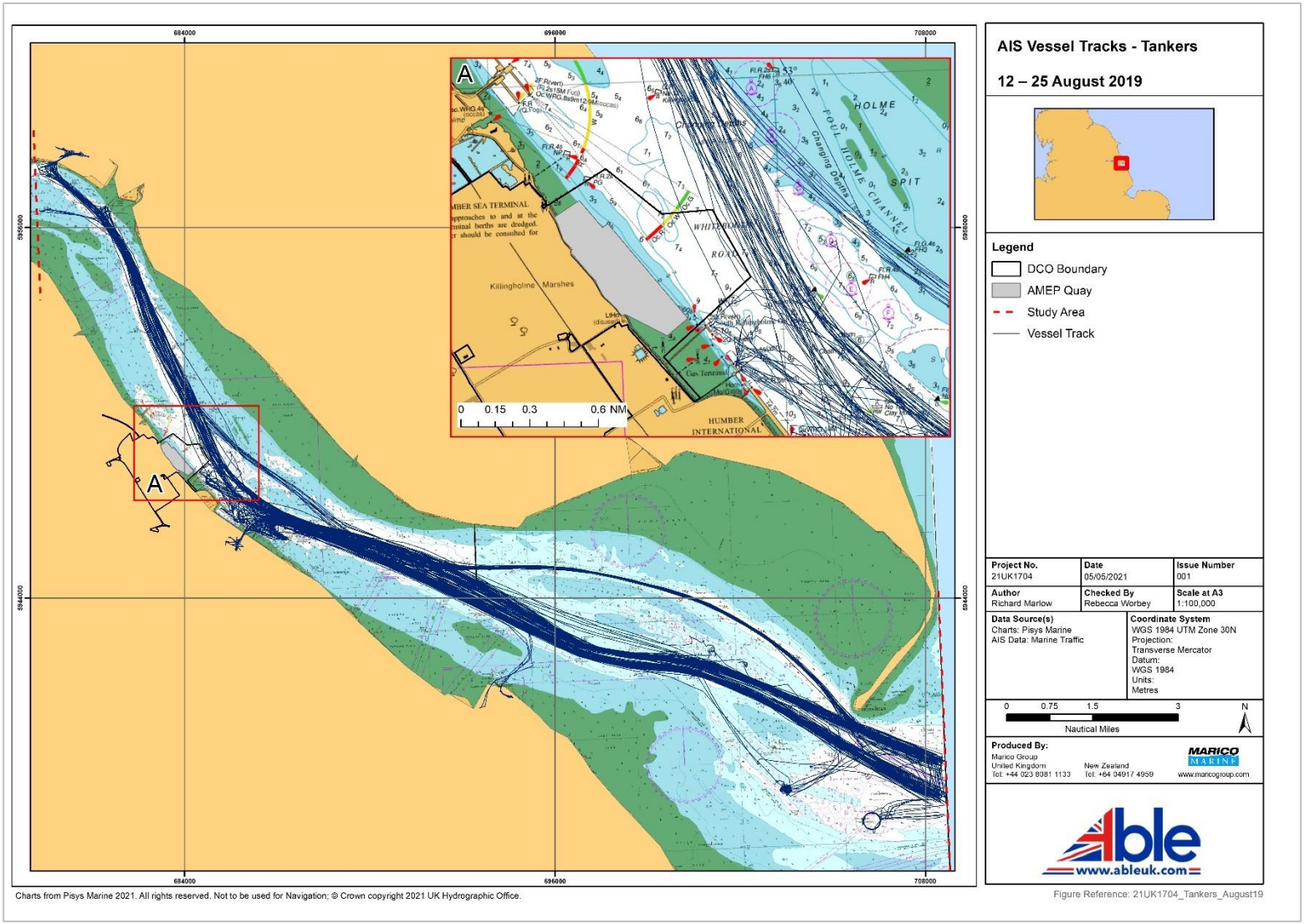


Figure 4: Tanker Vessels (12 – 25 August 2019)

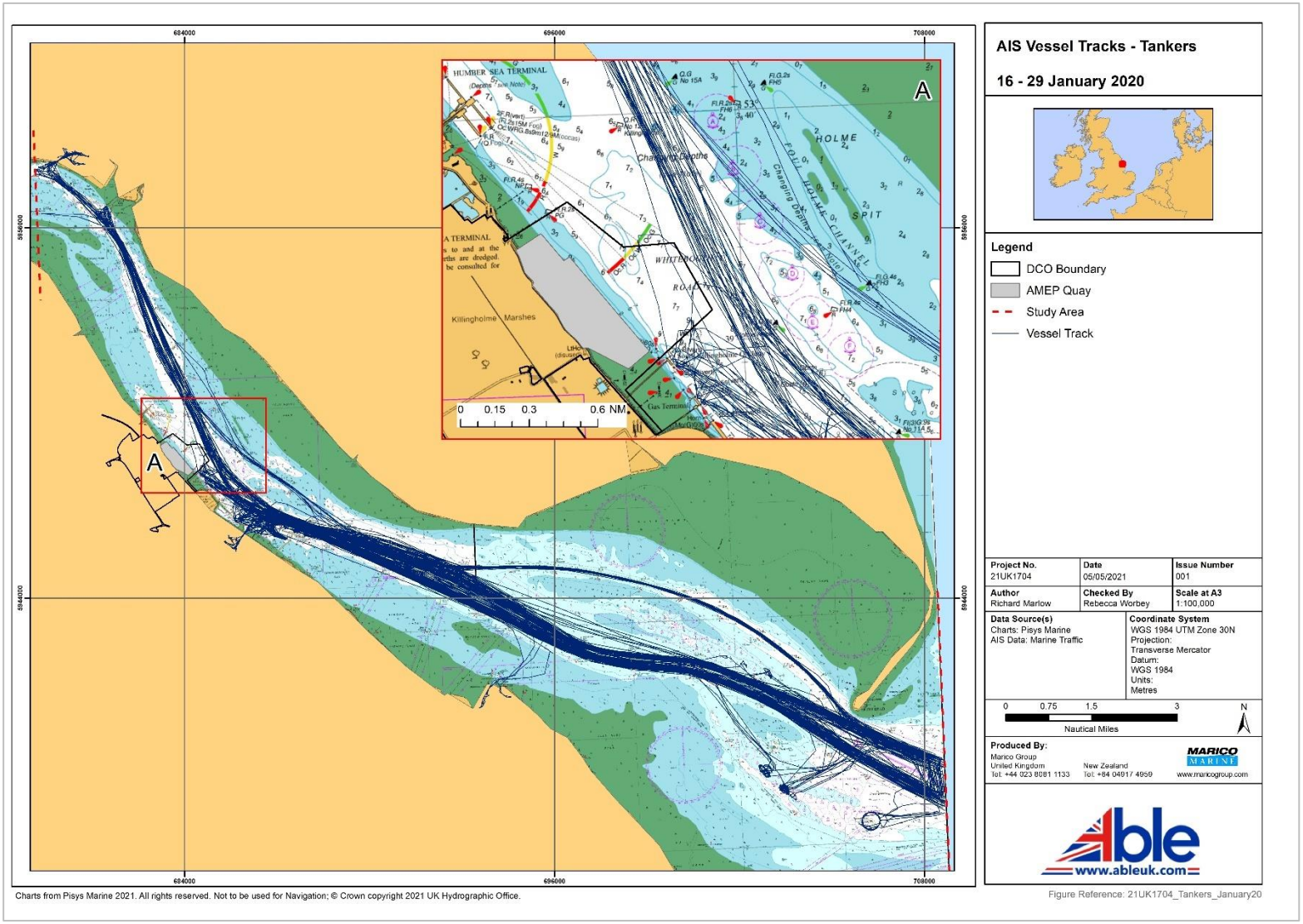


Figure 5: Tanker Vessels (16-29 January 2020)

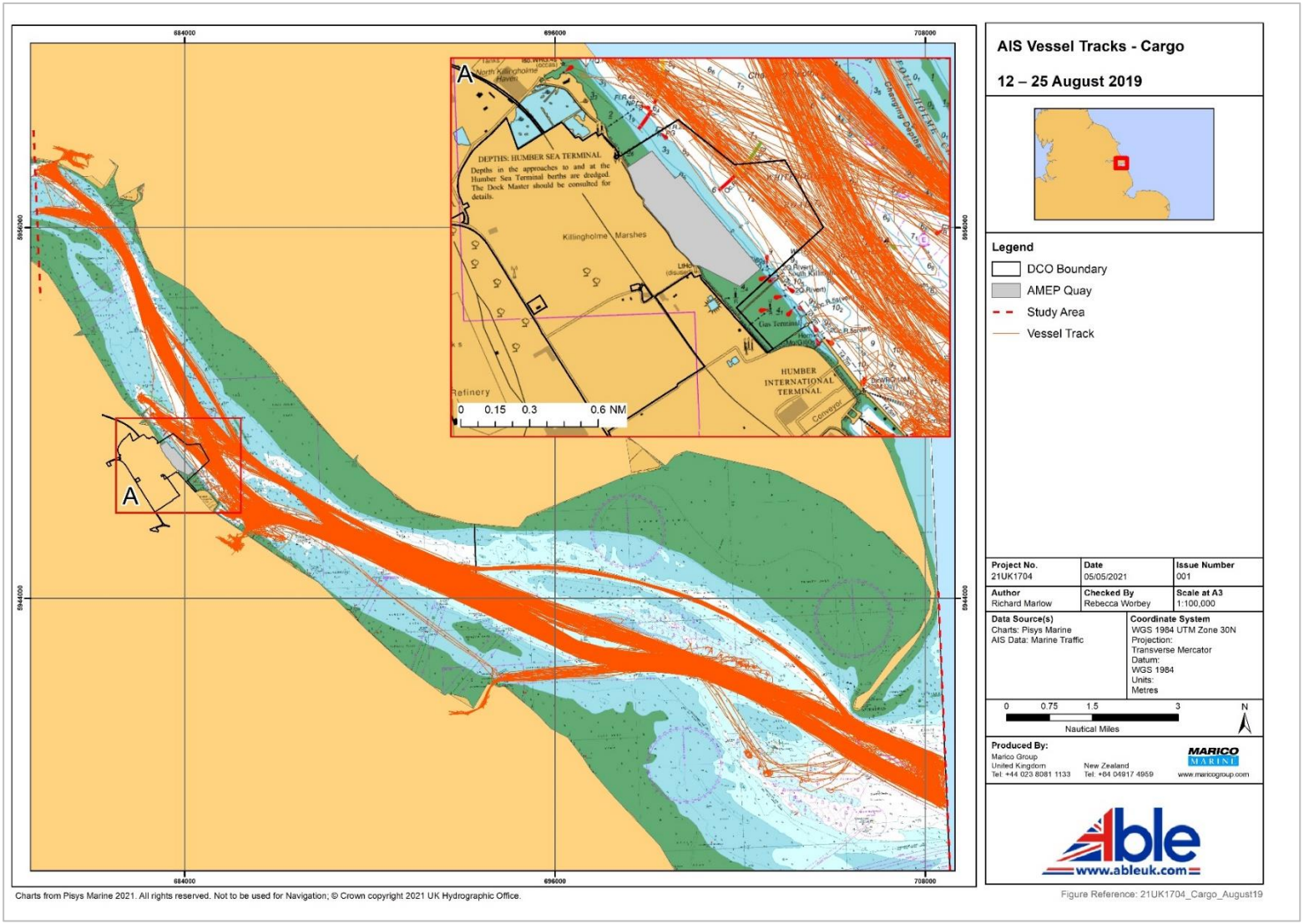


Figure 6: Cargo Vessels (12 – 25 August 2019)

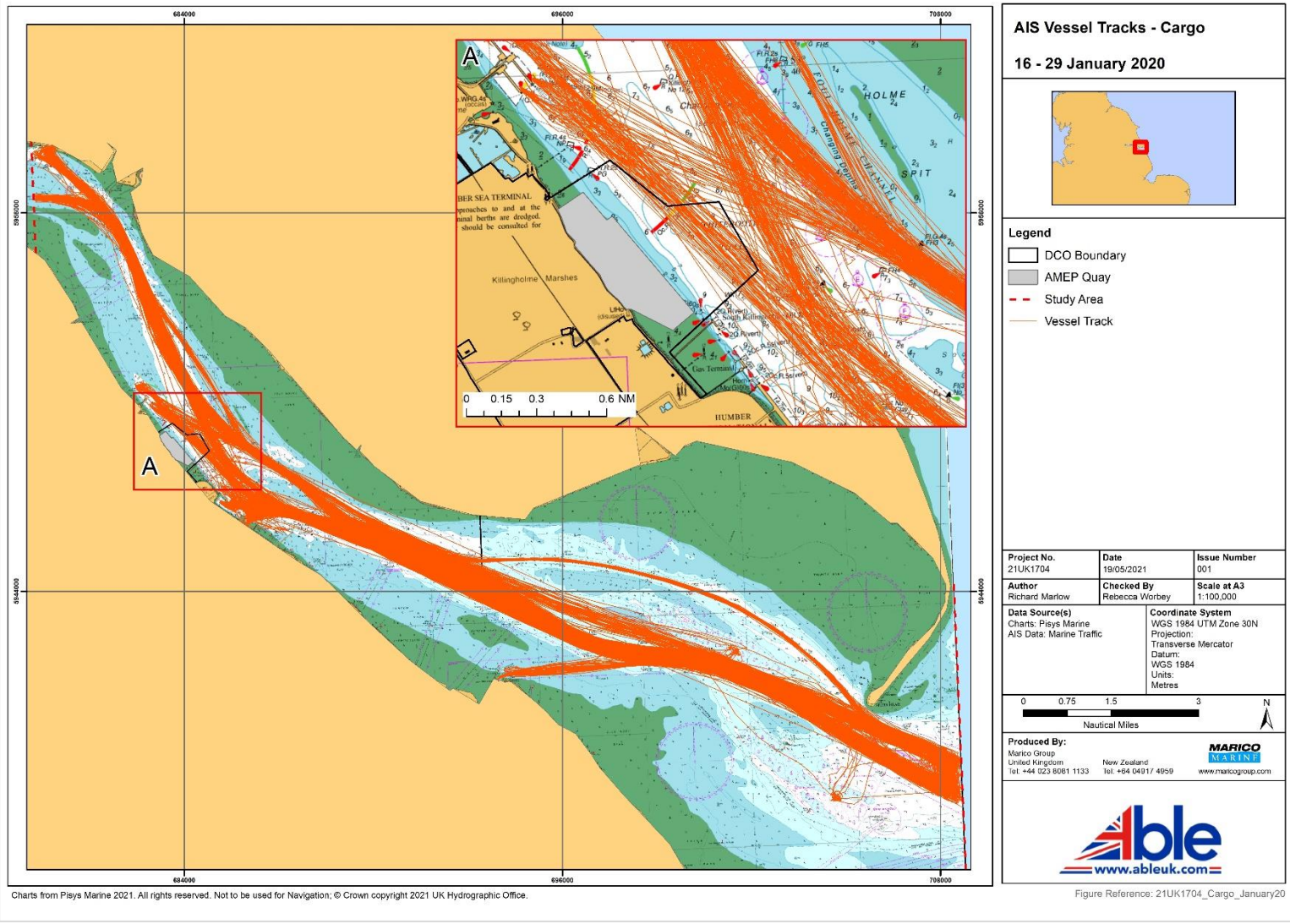


Figure 7: Cargo Vessels (16 – 29 January 2020)

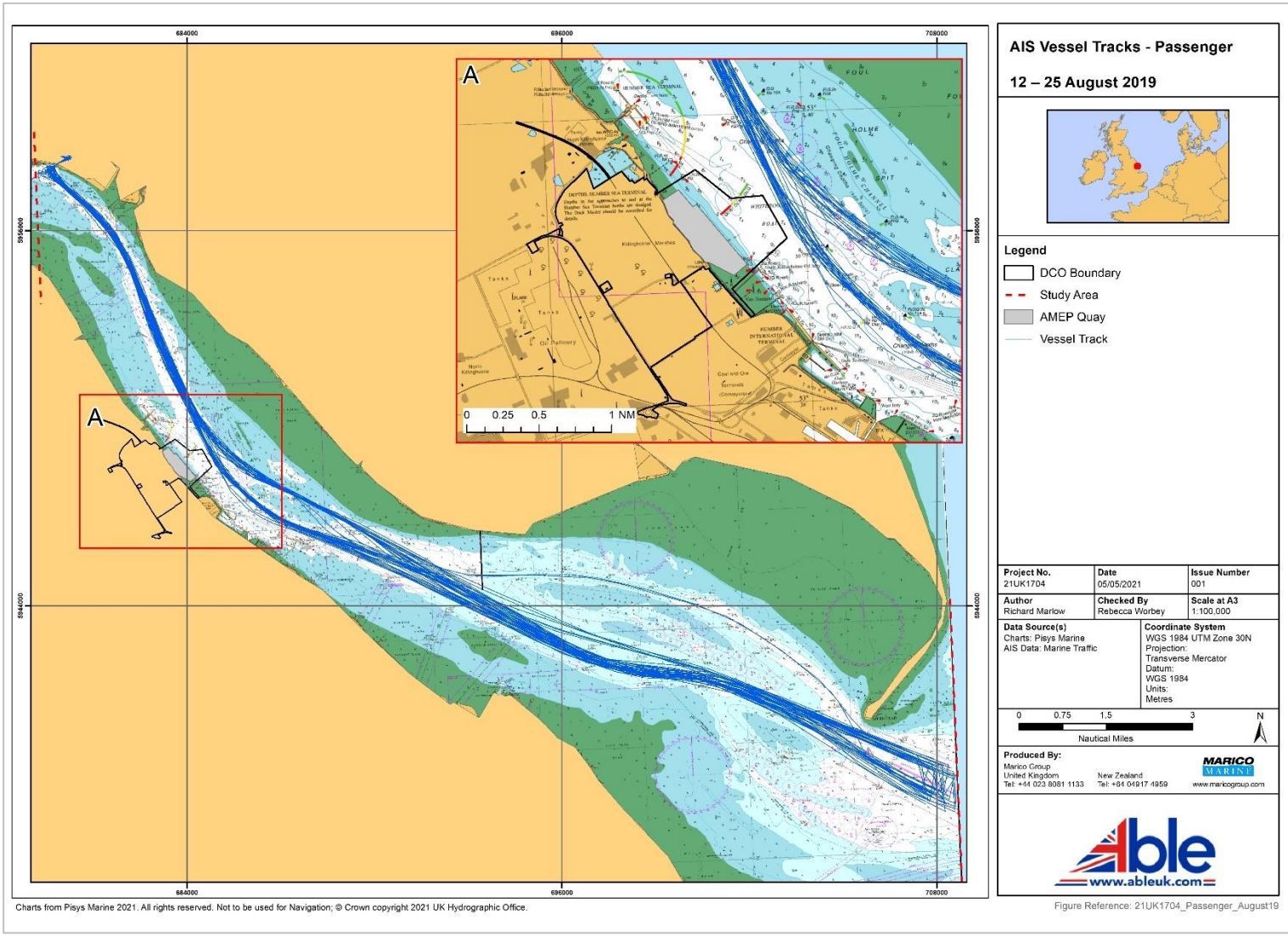


Figure 8: Passenger Vessels (12 – 25 August 2019)

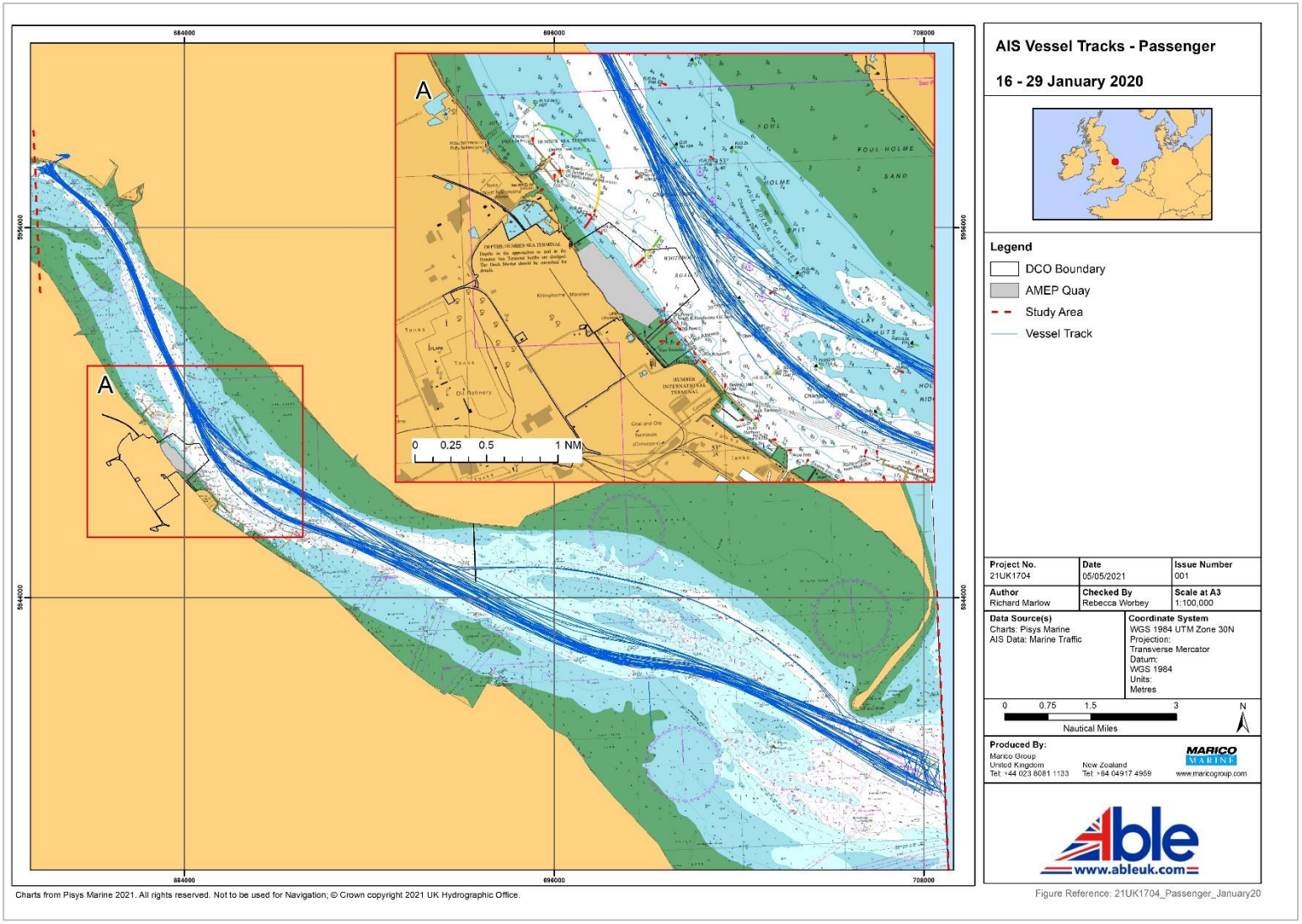


Figure 9: Passenger Vessels (16 – 29 January 2020)

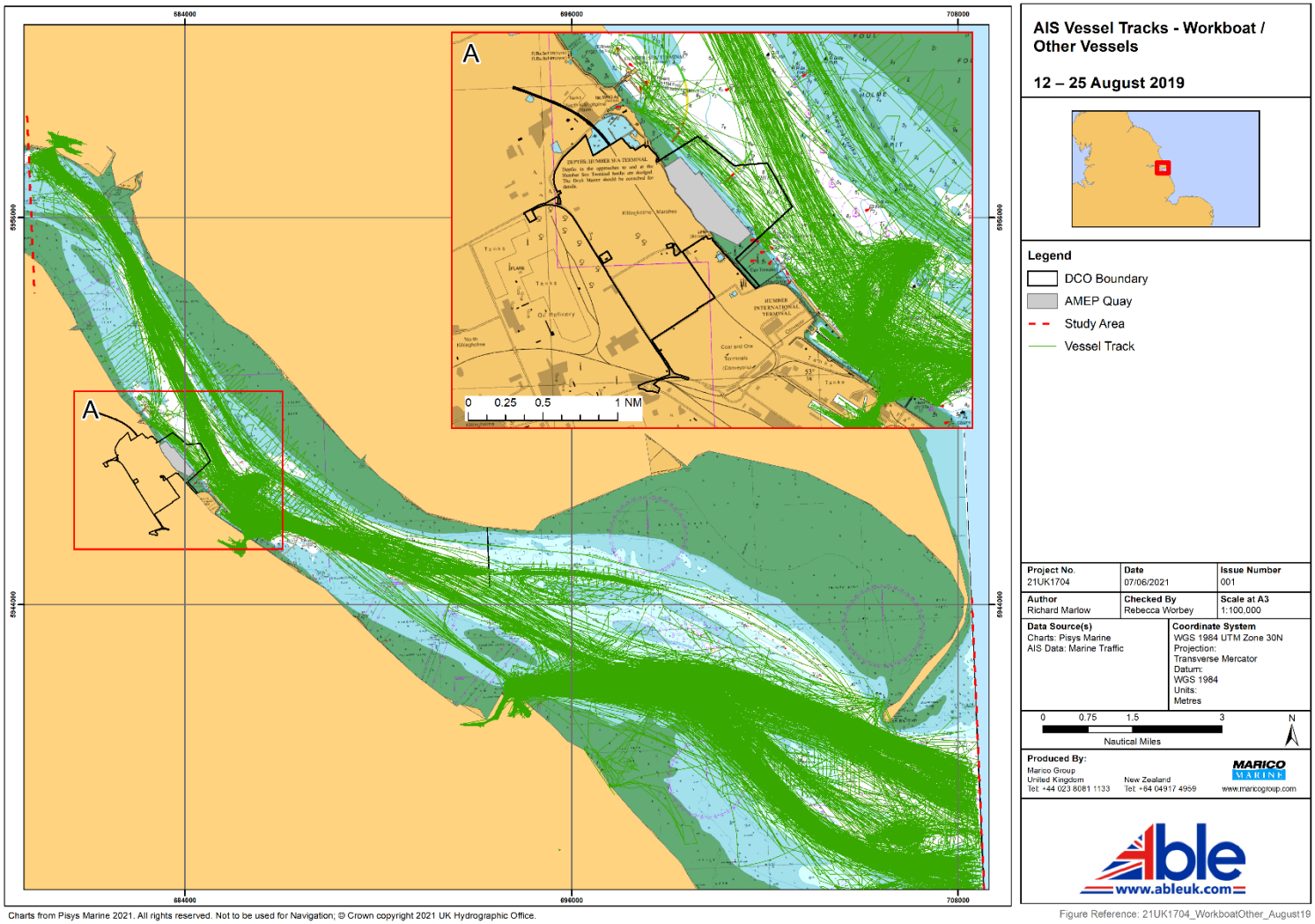


Figure 10:Workboat / Other Vessels (12 – 25 August 2019)

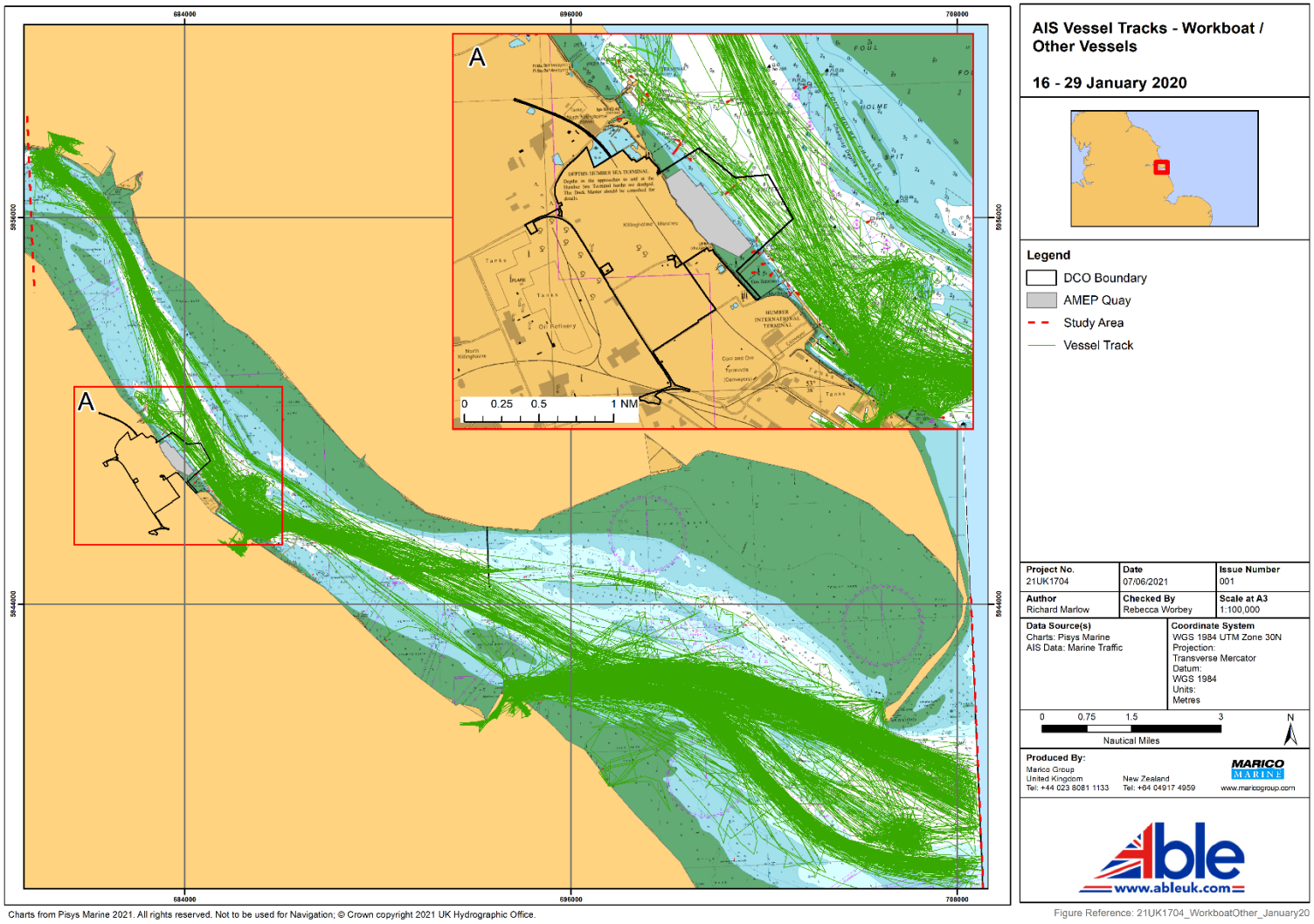


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Figure Reference: 21UK1704_WorkboatOther_January20

Figure 11:Workboat / Other Vessels (16 – 29 January 2020)

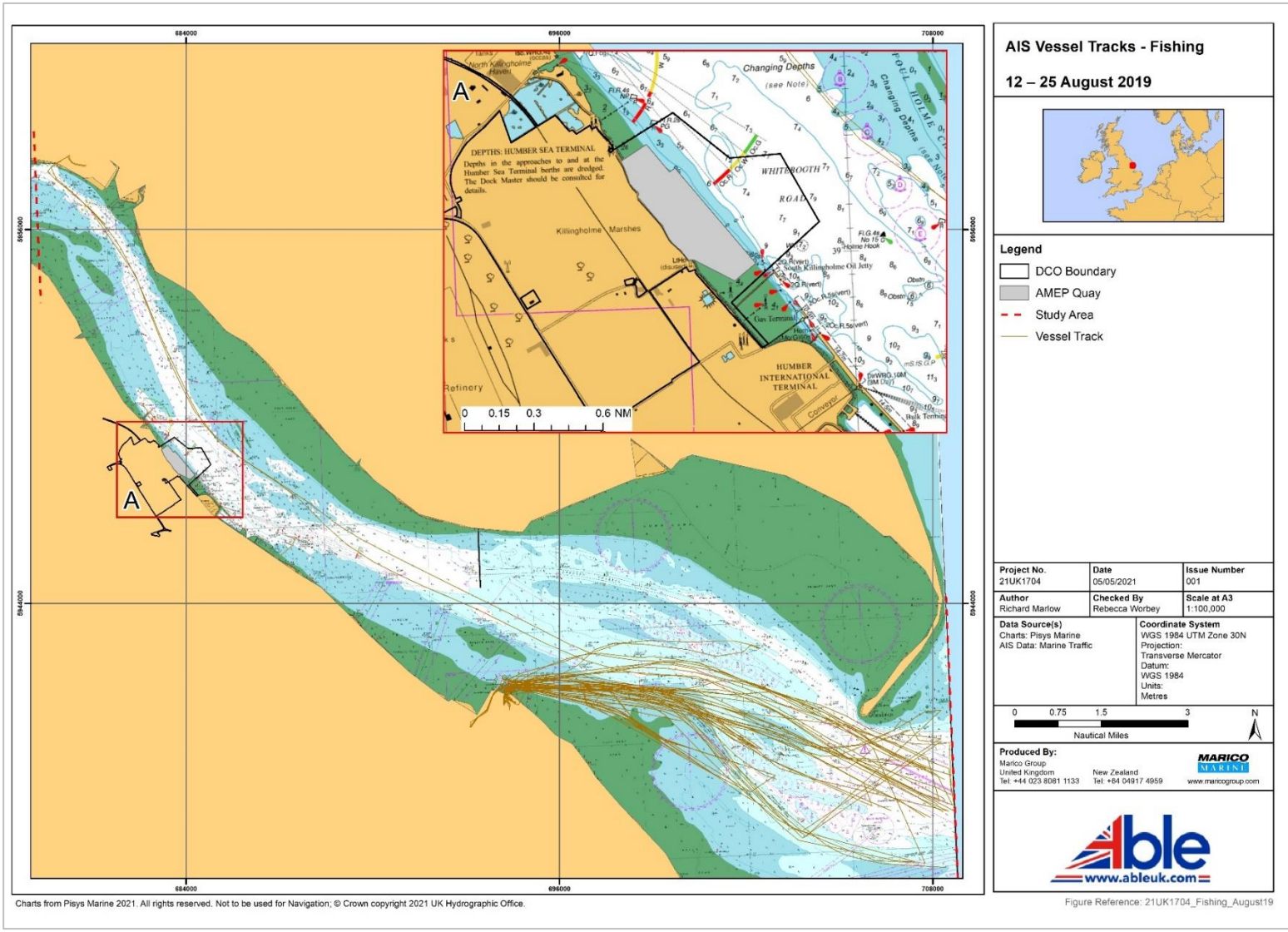


Figure 12: Fishing Vessels (12 – 25 August 2019)

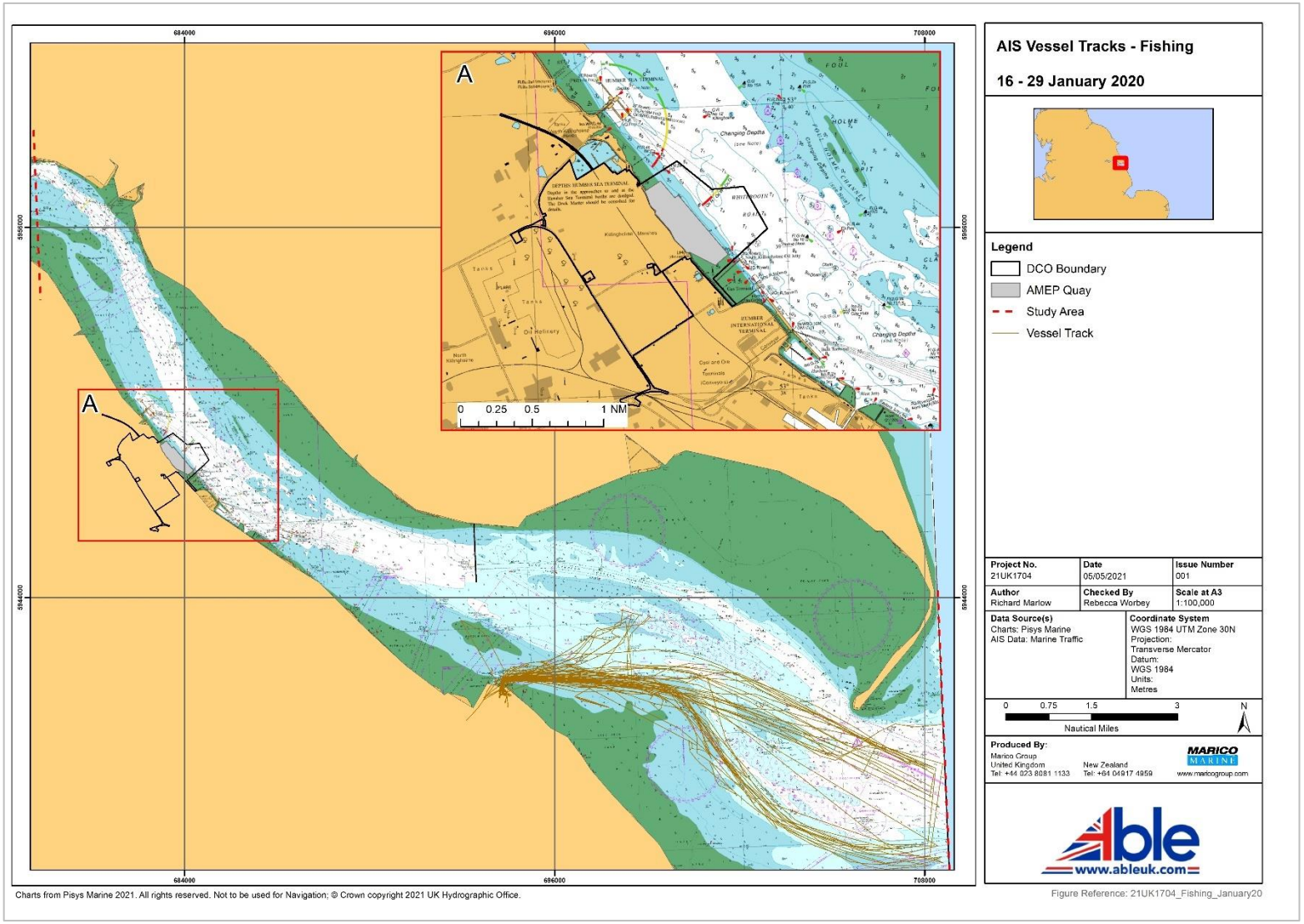


Figure 13: Fishing Vessels (16 – 29 January 2020)

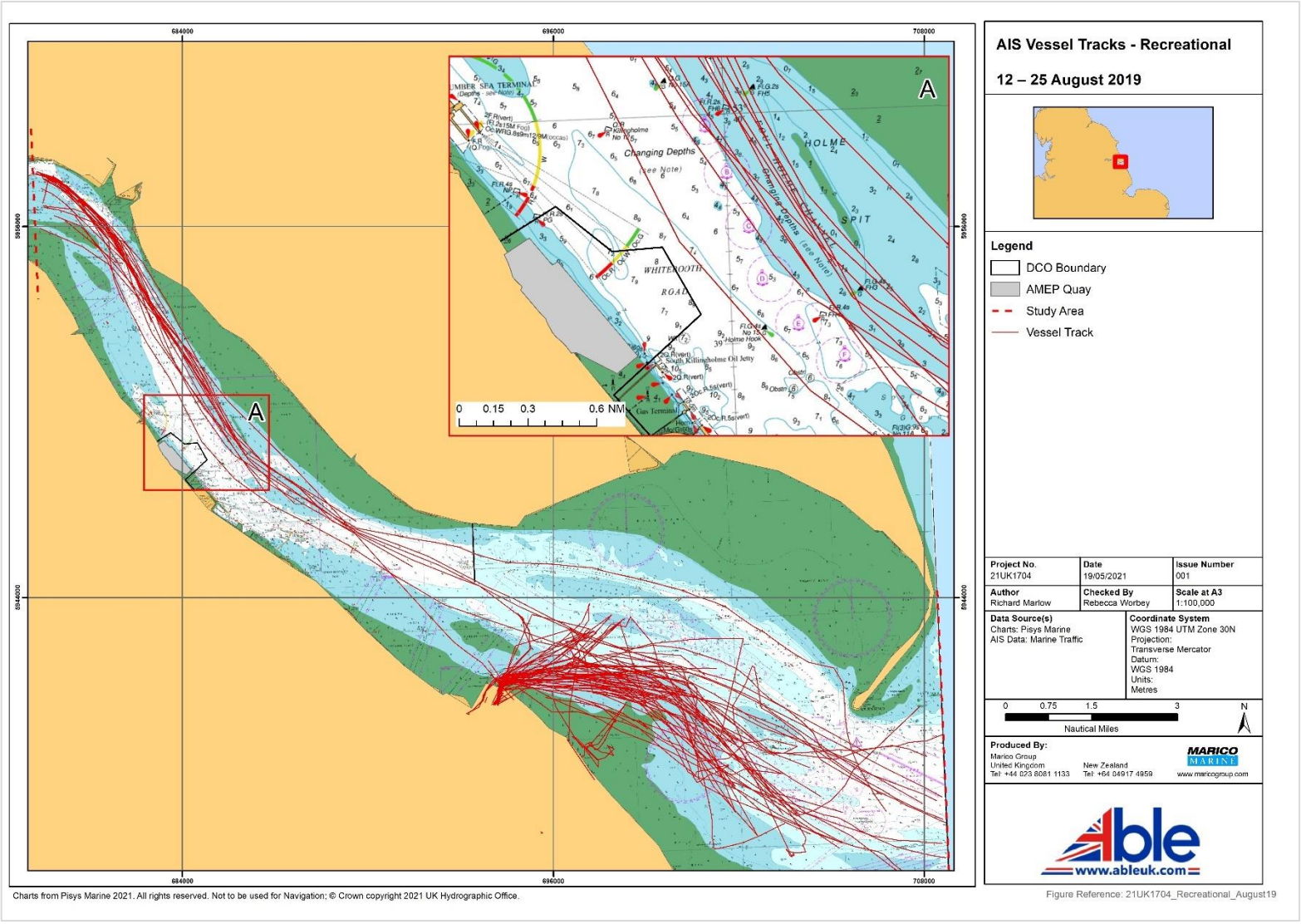


Figure 14: Recreational Vessels (12 – 25 August 2019)

To provide direct comparison to the data obtained from Department for Transport (Dft) and assessed within the 2011 NRA, up to date DfT vessel traffic data was additionally procured. **Figure 15** to **Figure 17** shows the change in Humber Estuary port tonnage, passenger vessel movements and total vessel movements respectively between 2005 and 2019.

With the exception of passenger vessel movements to Grimsby and Immingham which more than doubled between 2005 and 2009, owing to the identification of Wind Cats into Grimsby as passenger vessels, there has been a declining trend in total estuary port tonnage, overall passenger vessel movements and total vessel movements. This analysis is consistent with consultation feedback received from the Statutory Harbour Authority (**Table 6**).

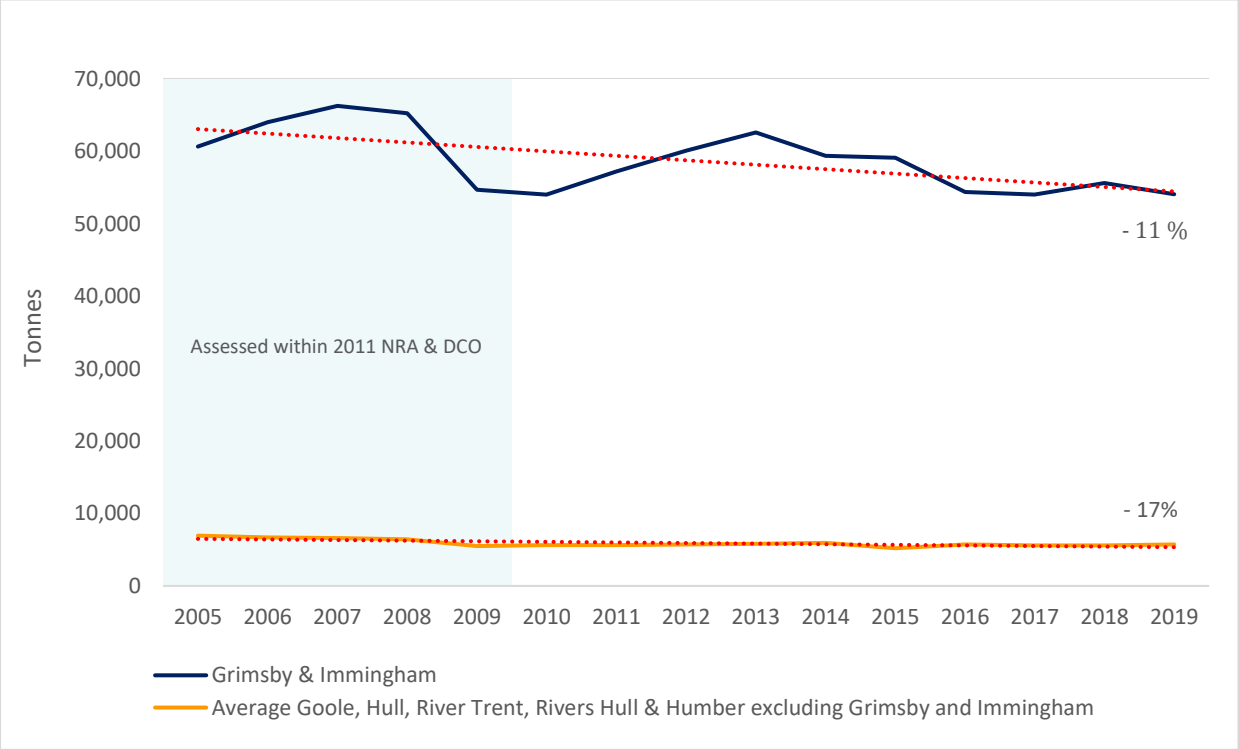


Figure 15: Humber Estuary Port Tonnage 2005 to 2019. Data source: Department for Transport (DfT)

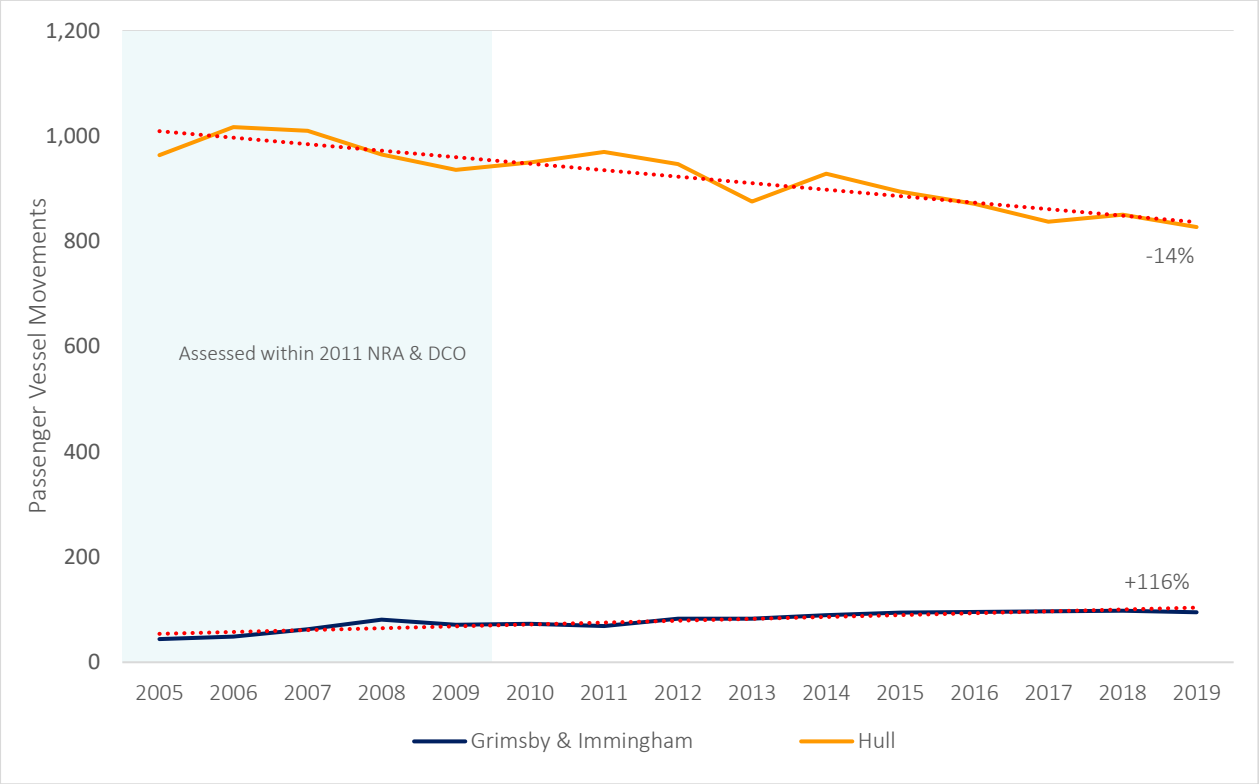


Figure 16: Humber international short sea, long sea and cruise passenger movements 2005 to 2019. Data source: DfT.

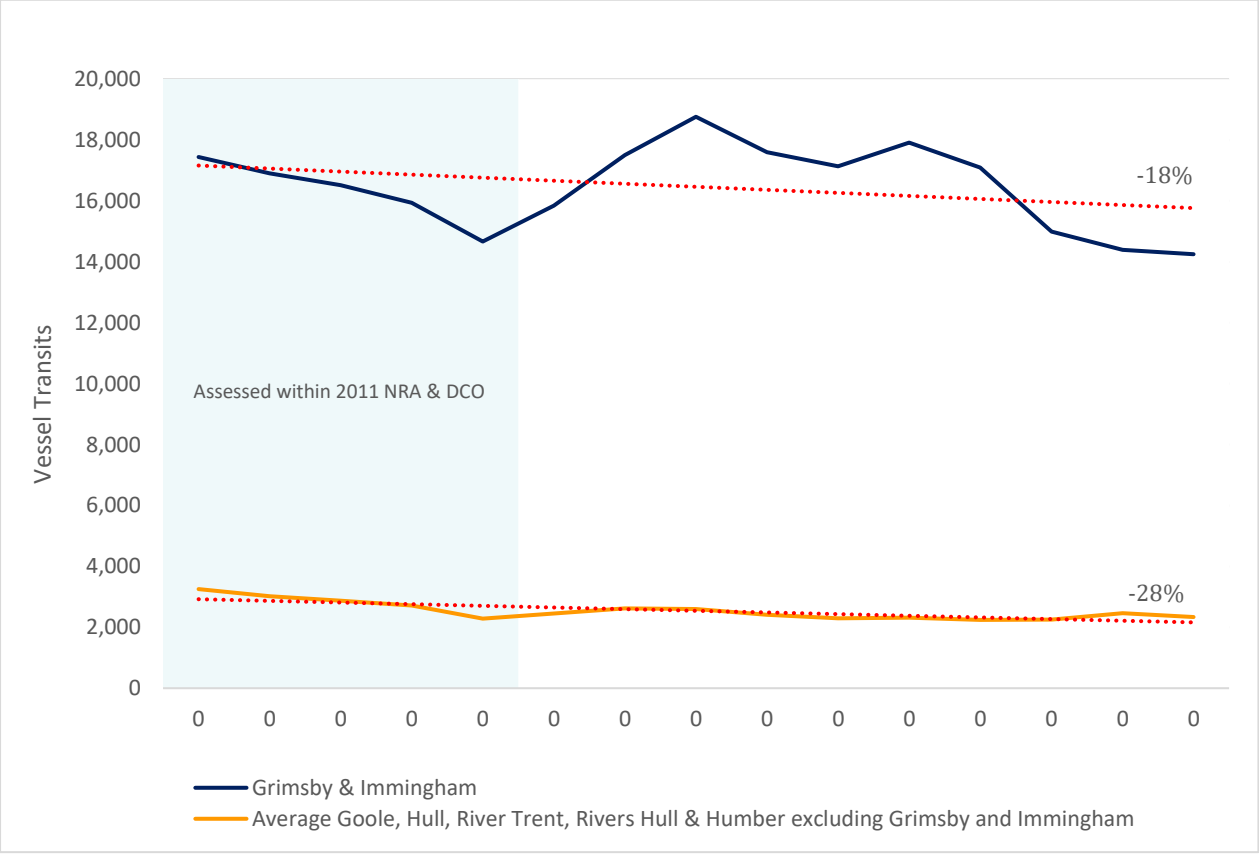


Figure 17: Humber vessel movements 2005 – 2019. Data source: DfT

3.3.2 Gate Analysis

Gate analysis is a tool used by Marico Marine to examine the frequency and direction of vessel traffic through a linear channel. A transect was created perpendicular to the AMEP development site across the channel, through which the frequency of intersecting vessel tracks was assessed.

Transits through the gate have been analysed in **Figure 18** to **Figure 20** to establish the traffic profile in the immediate vicinity of the Project. A total of 563 and 622 transits occurred through the gate during the assessed 2-week winter and summer periods respectively, equating to approximately 40 and 44 transits per day respectively past the Project.

Figure 18 indicates that during winter, peak movements past the Project appear to be driven by schedule, with tidal influence not determined to be a primary contributory factor (See **Table 5**). During summer, the hourly transit pattern is more sporadic reflecting the increase in movements of seasonal industries, primarily passenger vessels.

Over 70% of transits in winter and 55% in summer were by cargo vessels, as shown in **Figure 19,** with Workboat/ Other, accounting for 22% of transits in winter and 27% in summer (**Figure 14**). No recreational vessels were recorded passing the Project in winter with recreational vessels accounting for approximately 2% of all transits in summer.

Vessels have been assessed by Length Over-All (LOA) in **Figure 20.** The most common vessels transiting past the Project are between 10 – 30m LOA and 70 – 89m. These lengths are consistent with the dominant vessel types identified within **Figure 19**.

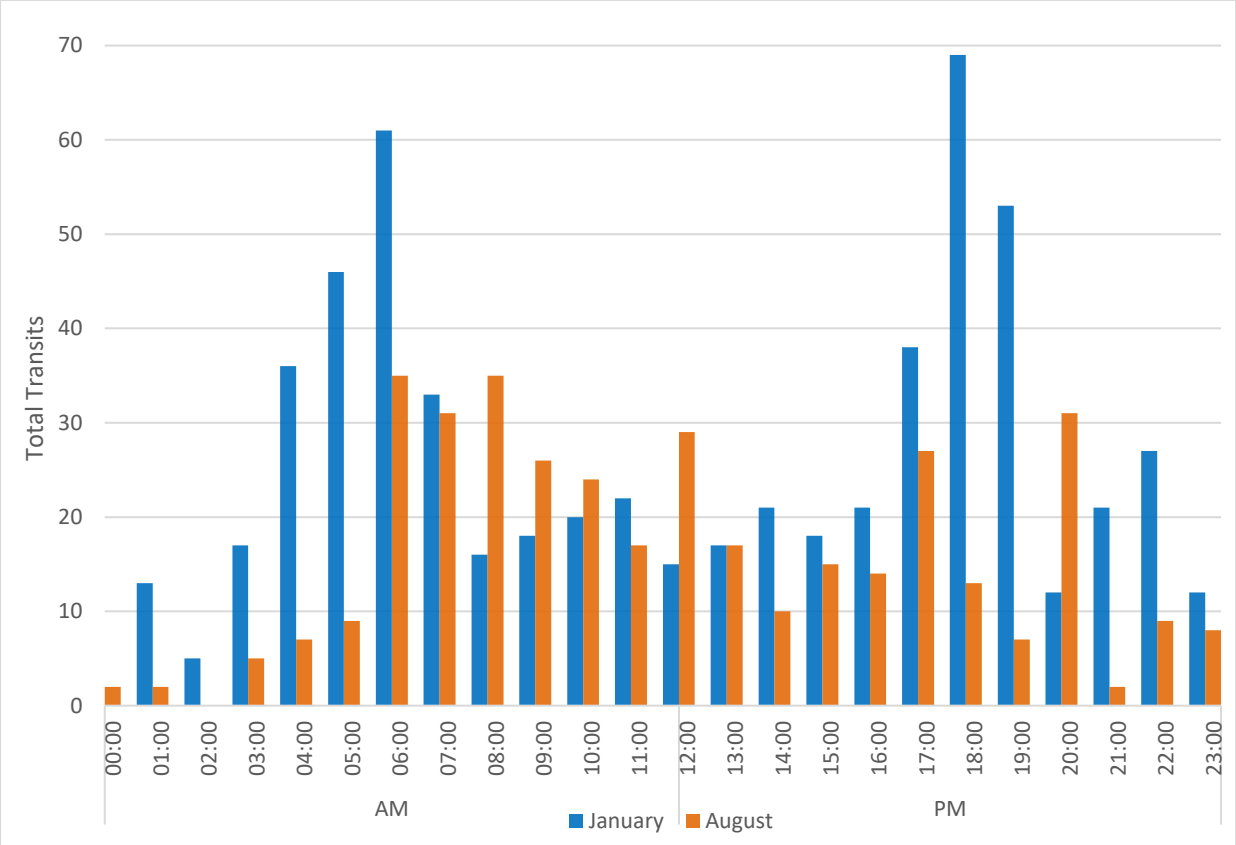


Figure 18: Transits by Time of Day – All Vessel Types – Summer and Winter.

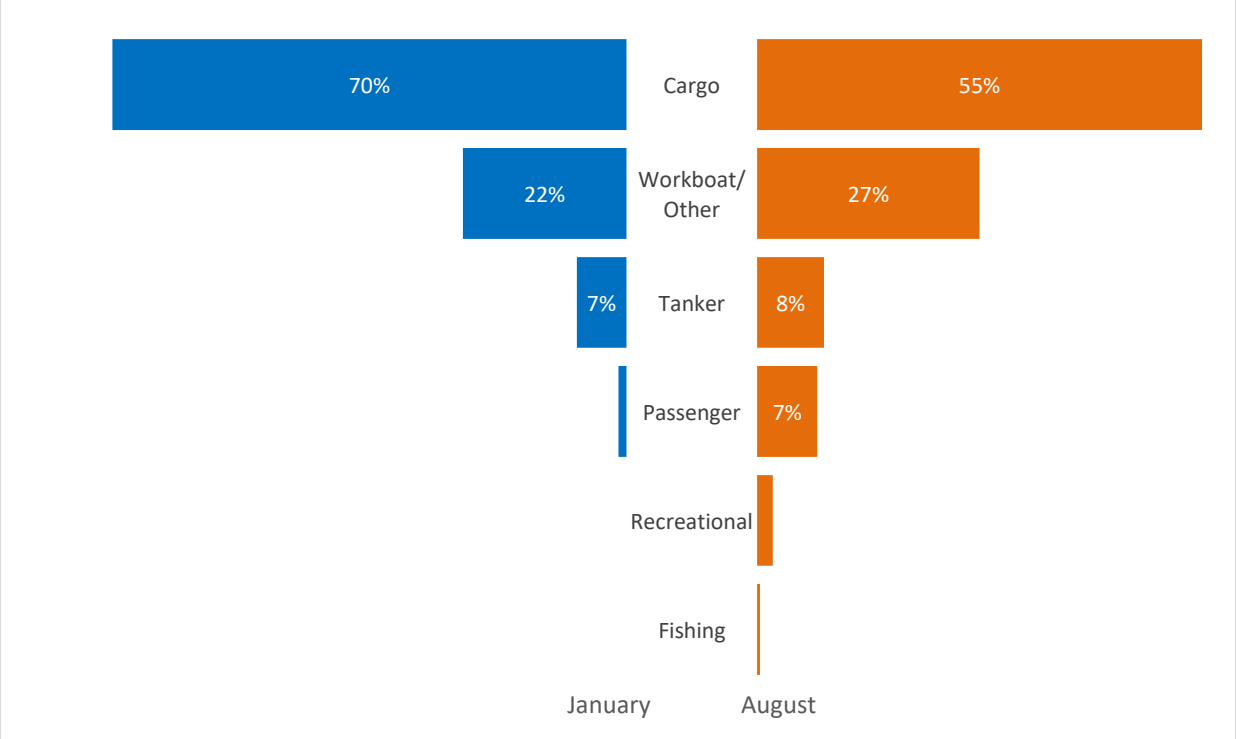


Figure 19:Transits by Vessel Type– Winter and Summer.

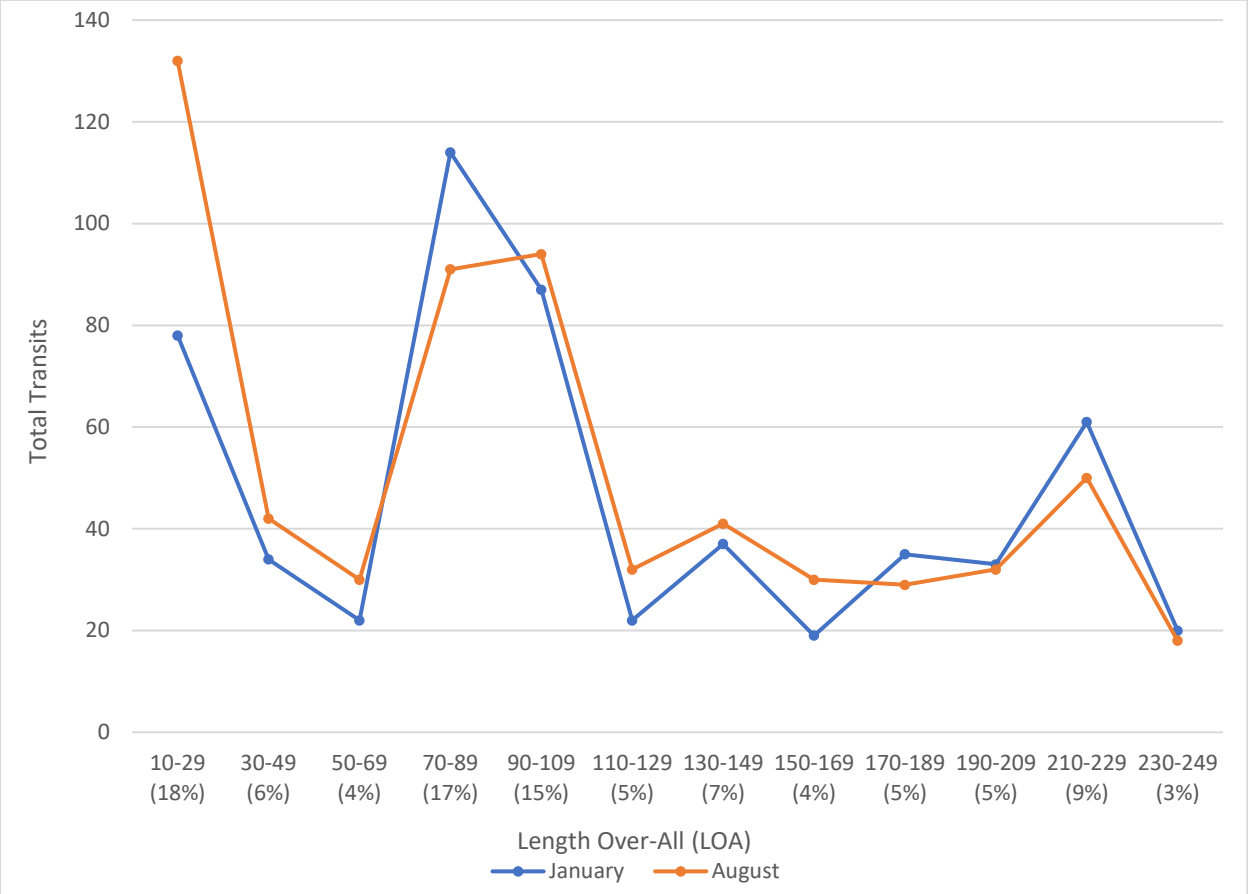


Figure 20:Transits by Length Over-All (LOA) (Summer and Winter)

3.4 HISTORIC INCIDENTS

Historic incident data has been provided by ABP Humber and is shown in **Table 9.** Navigationally significant incident data was filtered according to reported incident location to include incidents that occurred in vicinity of HST, IOH, HIT, and South Killingholme.

Table 9: Historic Incidents. HST, IOH HIT and South Killingholme.

	2016	2017	2018	2019	2020
Contact: Structure	1	7	1	2	1
Temporary Grounding	0	0	1	0	0
Grounding Over Tide	0	0	0	0	0
Collision	0	0	1	1	1
Contact: Floating Mark	0	1	1	2	0

The highest number of navigationally significant incidents occurred in 2017 totalling 8 consisting of seven contacts with structures and one contact with a floating mark (**Figure 21**). The most common incident type is Contact: Structure.

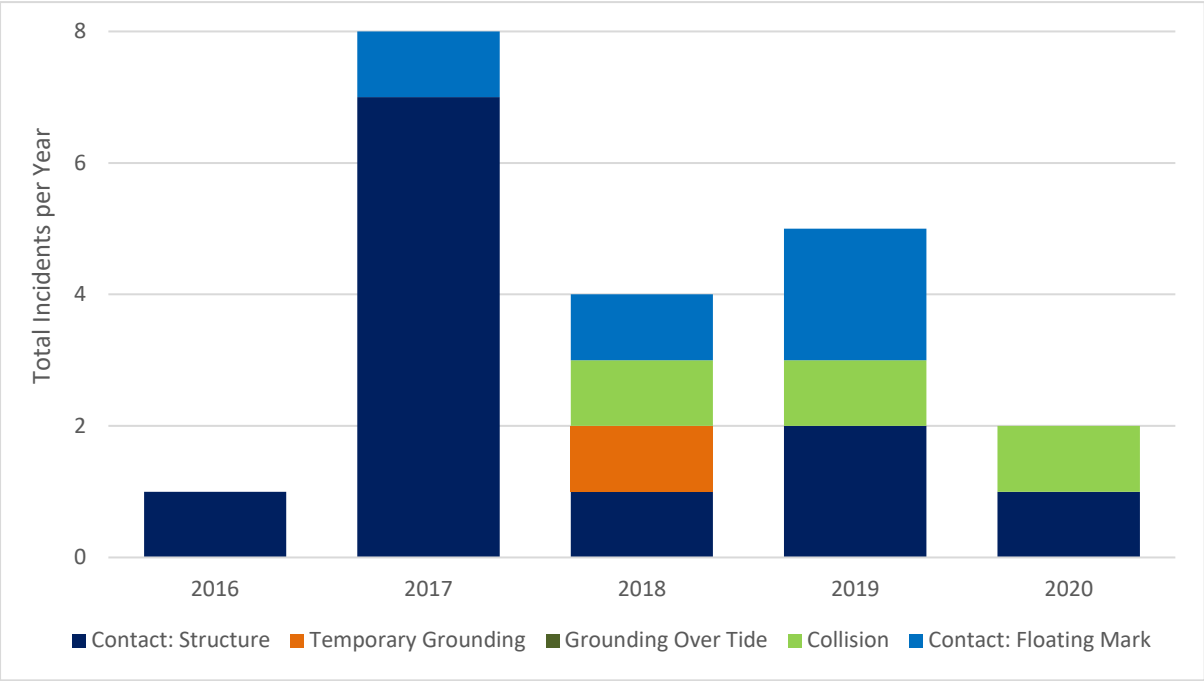


Figure 21: Navigational Incidents – 2016 - 2020

4 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. Hazards relating to navigation were identified through stakeholder consultation meetings and scoping and informed by vessel traffic and incident analysis (**Section 3**). A summary of the key impacts identified during stakeholder consultation are outlined in **Annex B.**

The hazard categories identified for assessment within the NRA are given in **Table 10**. Hazard categories were combined with the vessel categories identified in **Table 8** to establish a list of individual hazards for risk assessment. In total, 16 hazards were identified, as detailed in **Table 10**.

Table 10: Identified Hazard Categories.

Ref	Hazard Category	Hazard Detail	Comments	Individual Assessed Hazards
1	Collision	All Vessel Types	Two or more vessels impact each other whilst manoeuvring.	4
2	Contact	AMEP Infrastructure	One or more vessels makes contact with the AMEP quay or jack-up engaged in construction activities during the construction phase.	2
		Non-AMEP Infrastructure	One or more vessels makes contact with a berth, pier or jetty.	1
		Vessel Alongside Berth	One or more vessels makes contact with a stationary / berthed vessel. Also known as striking.	1
		Navigation Buoy	A project vessel makes contact with a navigation buoy (striking).	1
3	Grounding	All Vessel Types	A vessel unintentionally makes contact with the seabed.	2
4	Foundering / Swamping	Project Vessels	A vessel fills with water for any reason including capsize, and when overwhelmed, sinks.	1
5	Mooring Incident / Breakout	All Vessel Types	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.	2
6	Fire / Explosion	All Vessels	Interaction between a construction vessel and non-project vessel leads to a fire/explosion.	2

4.1 CUMULATIVE IMPACT IDENTIFICATION

Cumulative effects refer to the effects upon receptors arising from the AMEP project when considered alongside other proposed or in-construction projects.

In assessing the potential cumulative impacts, it is important to bear in mind that proposed projects may or may not actually be taken forward. For this reason, all identified relevant projects are considered to be operational for the purpose of risk assessment to represent worst case future development scenario.

Consultation did not establish any cumulative projects of significance to shipping and navigation for consideration within the NRA and, as such, no marine cumulative impacts have been identified.

It was, however, noted that Goole, Hull, Immingham and the AMEP development have been granted Free-Port status and therefore the Humber may see a general increase in overall capacity into the future; however, at this stage, modelling to ascertain any potential impact on river traffic has not been undertaken. It was additionally noted in consultation with C.Ro, that although not currently all in use, Humber Sea Terminals has 6 berths which may be utilised in the future.

It was additionally noted that some of the cumulative projects considered within the 2011 NRA were not taken forward, including the Hull Riverside Bulk Terminal, but the Grimsby Outer Harbour development and Green Port Hull are now in place and included in the current baseline traffic analysis.

5 EMBEDDED MITIGATION

Embedded mitigation measures describe those measures to which adherence is required by regulation / are already enforced by the local SHA. Embedded mitigation measures are assumed to be in place prior to assessment. **Table 11** lists embedded mitigation measures considered within this NRA. Following risk assessment, possible additional risk control measures may be identified with a view to further reducing residual risk (see **Section 9**).

Table 11: Embedded Mitigation measures

ID	Risk Control Measure	Phase	Description
1	VTS Traffic Organisation Service	C/O	Humber VTS is well established and covers the entire project area.
2	Adherence to International regulations	C/O	For example COLREGs, ISM, ISPS etc.
3	Adherence to local regulations/ procedures	C/O	For example byelaws, general directions, Humber Passage Plan etc.
4	Adherence to ABP Humber Emergency Plan	C/O	HESMEP.
5	Training and authorisation of pilots	C/O	Humber Estuary Services provides a pilotage service for the project area. Training and authorisation of Pilots and PEC holders is well documented and compliant with legislation and guidance.
6	Pilotage exemption certificates	C/O	HES issues PEC's to suitably qualified candidates.
4	Passage planning	C/O	Passage planning and scheduling should be undertaken to ensure that existing operations are not impacted by the AMEP arrival and departures. Passage Planning is a HES requirement for all authorised pilots and PEC holders
5	Guidance for small craft	C/O	HES provides and promulgates guidance for small craft (www.humber.com/Yachting_and_Leisure/ Pleasure_Craft_Navigation/).
6	Promulgation of Information including Notice to Mariners	C/O	Promulgation of information and warnings through notices to mariners and other appropriate maritime safety information (MSI) Is achieved by HES through www.humber.com, mailing lists and stakeholder engagement.
7	Update Navigation Charts	O	Final drawings should be submitted to the UKHO and HES, and navigation charts should be updated.
8	Protective Provisions	C/O	Adherence to terms of Protective Provisions, for example, maintaining existing depths of adjacent third-party berths.

6 ASSUMPTIONS

The following assumptions are applicable to this NRA:

- All international, national and local regulations and procedures are adhered to;
- When considering risk control measures, it is assumed that embedded risk controls are in place (see **Section 5**) and they are effective in meeting their intended goal (i.e. the NRA does not take into consideration failure to comply with regulations);
- This NRA is concerned with navigation related hazards and does not consider other non-navigational hazards including those related to a health and safety of marine operations such as slips, trips and falls, or those hazards which are not directly related to navigation, such as fire and explosion, except where they can be a consequence of a navigation hazard.

7 NAVIGATION RISK ASSESSMENT METHODOLOGY

The NRA process is based on Formal Safety Assessment (FSA) methodology as adopted by the International Maritime Organisation (IMO) and follows the guidance set out in International Best Practice. A detailed description of the methodology is provided in **Annex A**.

7.1 OVERVIEW

A standard 5x5 risk matrix is utilised and each hazard is 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 were then combined to give a total risk score for each hazard, weighted towards the most-likely outcome to reflect the reality that comparatively few accidents result in the worst credible outcome.

7.1.1 Assessment of Frequency and Consequence

The assessment of frequency is 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 A.**

The frequency and consequence assessments are largely based on the data/information collected during Stage 1 of this NRA, and in particular:

- Stakeholder consultation meetings;
- Quantitative vessel traffic analysis; and
- Review of the incident database.

This information is 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.

7.1.2 Risk Scores

The frequency and consequence scores are then assessed to give two distinct risk scores;

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

These scores were then combined using a weighted average to produce a single numeric value representing the final risk score for each hazard, between 0 (negligible) and 10 (high) (see **Annex A**), following which, the final risk scores are sorted into a ranked hazard list.

Hazard risk scores are categorised as either negligible, low, As Low as Reasonably Practicable (ALARP), significant or high, as per **Table 12**, where ALARP represents a level of risk that is neither acceptable nor unacceptable and for which further investment of resources for risk reduction may or may not be justifiable – i.e. risks which fall within the ALARP band should be reduced unless there is a disproportionate cost to the benefits obtained.

Navigation hazards with a risk score of significant or high are deemed unacceptable and, as such, additional risk control measures must be implemented to reduce the risk to an acceptable level (see **Section 9**).

Table 12: 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 hazards 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 hazards 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 hazards and associated risk control measures shall be regularly reviewed as part of the Safety Management System.

Each identified baseline hazard log is scored twice, once for the construction phase and again for the operational phase resulting in two separate risk assessments and hazard logs. Each log is then re-assessed applying proposed possible additional mitigation measures (**Section 9**) to assess the residual risk scores and their effectiveness should they be implemented.

8 NAVIGATION RISK ASSESSMENT RESULTS

8.1 CONSTRUCTION PHASE – BASELINE WITH EMBEDDED MITIGATION

A summary of the ranked hazard list for construction phase NRA is shown within **Table 13**. The full hazard log is provided in **Annex C.** The assessment assumes the implementation of all embedded risk control measures identified within **Section 5.**

All hazards were scored as ALARP or lower, with the highest scoring individual hazard assessed to be 'Construction Vessel ICW Construction Vessel' which scored 5.47: ALARP. **Figure 22** provides a summary of the average hazard category scores for the construction phase. The highest scoring overall hazard category was 'Collision' with an average risk score of 4.7: ALARP, closely followed by Fire / Explosion (4.6: ALARP). The lowest scoring overall hazard category in the construction phase was 'Grounding' which scored 2.1: Low driven by a low frequency of occurrence and a most likely outcome of temporary grounding and re-floating resulting in minor damage.

Average hazard category scores assessed within the 2011 NRA are additionally shown in **Figure 22.** A decrease in risk scores is noted across all hazard categories, with Contact and Swamping / Capsize jumping a risk band from ALARP to Low.

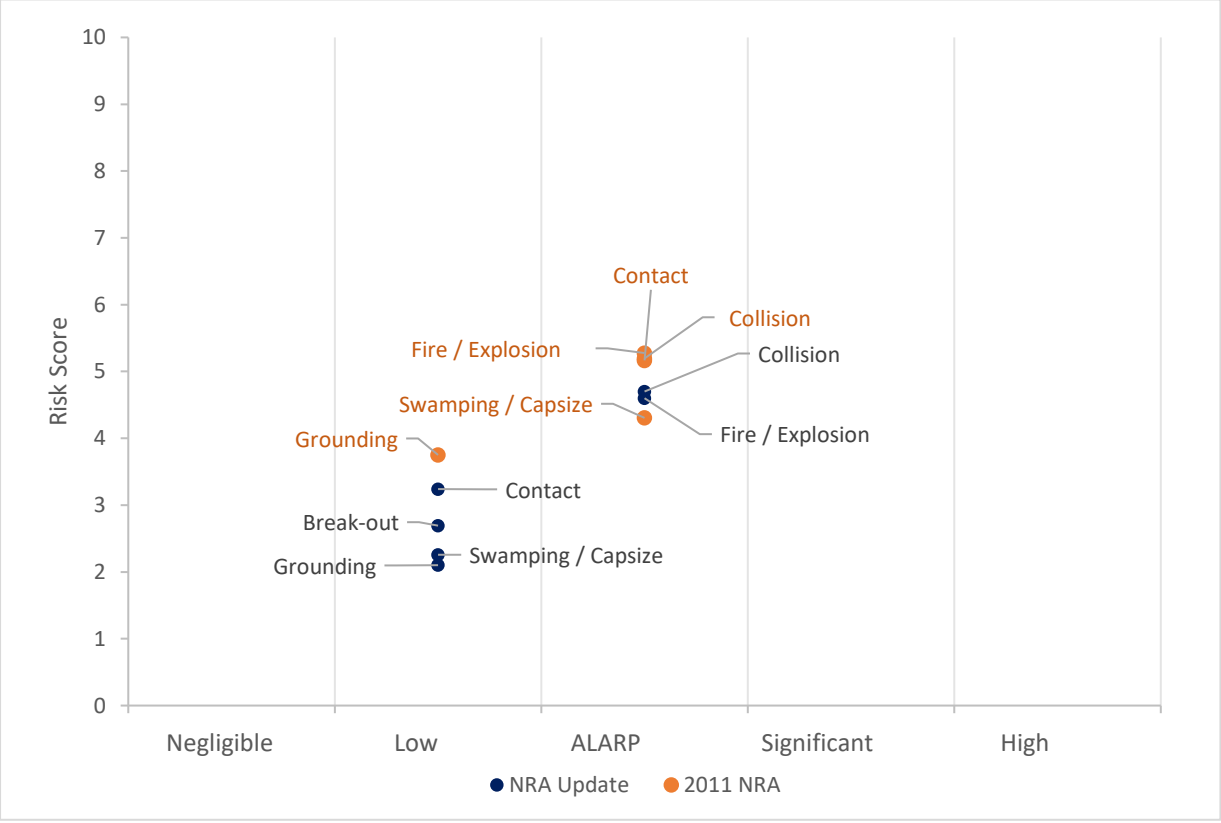


Figure 22: Average Risk Score by Hazard Category – Construction Phase

Table 13: Summary Ranked Hazard List – Construction Phase.

Rank	Hazard Type	Hazard Title	Score
1	Collision	Construction Vessel ICW Construction Vessel	5.47
2	Fire / Explosion	Fire / Explosion: Vessel alongside third party berth	4.72
3	Collision	Construction Vessel ICW Tanker	4.52
4	Fire / Explosion	Fire / Explosion: Construction Vessel alongside	4.45
5	Collision	Construction Vessel ICW Cargo	4.43
6	Collision	Construction Vessel ICW Workboat/Other	4.22
7	Contact	Construction vessel contacts AMEP project infrastructure	4.10
8	Contact	Non-project vessel contacts AMEP project infrastructure	4.10
9	Contact	Construction vessel contacts non-project infrastructure	3.70
10	Contact	Construction vessel contacts vessel alongside third party berth	3.10
11	Break-Out	Construction vessel breaks away from its moorings	2.85
12	Grounding	Non-project vessel runs aground due to construction activities	2.56
13	Break-Out	Third party vessel breaks away from its moorings due to project activities	2.54
14	Sinking / Capsize	Construction vessel sinks / capsizes	2.26
15	Grounding	Construction vessel runs aground	1.65
16	Contact	Construction vessel contacts navigation aid	1.21

8.1.1 Possible Variations During Construction Phase

Although the number and type of vessel movements associated with the construction phase of the project has been predicted based on best available information, it is recognised (**section 2.2.1**) that a number of factors (including contractor appointed, plant type and availability, real world ground conditions) may lead to a variation from predicted movements.

It is anticipated that such a variation is unlikely to be greater than +/- 25% from the description in **section 2.2.1**.

The effect of such variations has been considered in relation to the assessed navigation risks during the construction phase.

Peak vessel movements assessed during this phase are predicted to be 27 per day, therefore a variation of 25% would lead to new peaks of approximately 20 to 34 movements per day.

In the context of total traffic movements (excluding small vessels) on the Humber within the study area of approximately 60 per day **(section 3.3.1**) this is clearly significant and has been assessed within the NRA through consideration of frequency with which hazards may be realised.

However, hazard frequencies are assessed to be low overall due to effective existing mitigations (traffic management) a variation of 25% (7 vessels more or less per day) was not found to be sufficient to increase or reduce the frequency of occurrence of any assessed hazard. That is to say frequency

would not move from the assessed band to the next higher or lower band – see frequency criteria in **Annex A.**

The risk assessment is therefore valid for the construction phase even if actual vessel numbers deviate within realistic margins.

8.2 OPERATION PHASE - BASELINE WITH EMBEDDED MITIGATION

A summary of the ranked hazard list for operational phase is shown within **Table 14**. The full ranked hazard list is provided in **Annex D.** The assessment assumes the implementation of all embedded risk control measures identified within **Section 5.**

All hazards were scored as ALARP or lower, with the highest scoring hazard assessed to be 'AMEP vessel contacts project infrastructure' which scored 4.93: ALARP.

Figure 23 provides a summary of the average hazard category scores for the operational phase. The highest scoring overall hazard category was 'Fire/Explosion with an average risk score of 4.4 driven by the potential for consequences to be high. This was closely followed by 'Collision' which scored 4.3. The lowest scoring overall hazard category in the operational phase was 'Swamping/Capsize' which scored: 2:0: Low, driven by its low likelihood of occurrence.

Average operational phase hazard category scores assessed within the 2011 NRA are additionally shown in **Figure 23.** A decrease in risk scores is noted across all hazard categories, with the exception of 'Fire/ Explosion' which jumped from Low to ALARP.

With the exception of 'Break-Out' and 'Grounding' all hazard categories were assessed to be higher during the construction phase.

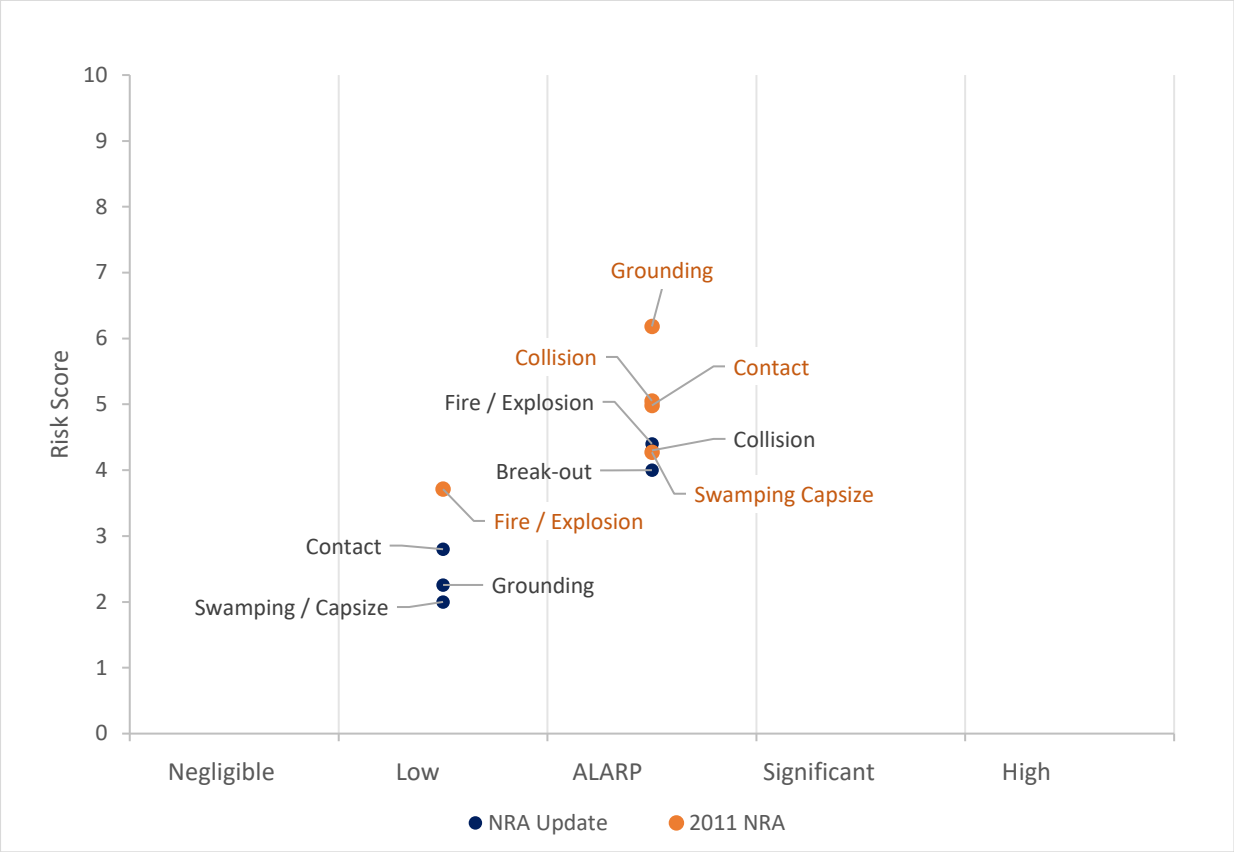


Figure 23: Average Risk Score by Hazard Category – Operation Phase

Table 14: Summary Ranked Hazard List – Operation Phase.

Rank	Hazard Type	Hazard Title	Score
1	Contact	AMEP vessel contacts project infrastructure	4.93
2	Fire / Explosion	Fire / explosion: non-project vessel alongside third party berth	4.72
3	Break-Out	AMEP vessel breaks away from its moorings	4.57
4	Collision	AMEP Vessel ICW tanker	4.52
5	Collision	AMEP Vessel ICW cargo	4.43
6	Collision	AMEP vessel ICW AMEP vessel	4.28
7	Fire / Explosion	Fire / explosion: AMEP vessel alongside	4.17
8	Collision	AMEP vessel ICW workboat / other	3.80
9	Contact	AMEP vessel contacts third party vessel alongside.	2.85
10	Contact	Non-project vessel contacts AMEP project infrastructure	2.74
11	Contact	AMEP vessel contacts non-project infrastructure	2.61
12	Break-Out	Third party vessel breaks away from its moorings due to project activities	2.54
13	Grounding	Non-project vessel runs aground	2.50
14	Grounding	AMEP vessel runs aground	2.04
15	Sinking/ Capsize	AMEP vessel sinks / capsizes	1.96
16	Contact	AMEP vessel contacts navigation aid	0.92

9 POSSIBLE ADDITIONAL RISK CONTROL MEASURES

A number of additional risk control measures have been identified, informed by stakeholder consultation and aimed at further reducing the residual risk during the construction and operation phases of the Project.

Table 15 provides a description of each of the proposed mitigation measures. The individual hazards to which they apply are indicated within the hazard logs in **Annex C** and **Annex D**. While all hazards have been assessed to be ALARP or lower, it is recommended that consideration is given to their implementation with a view to further reducing risk.

It is noted that many of the possible additional risk controls proposed within the 2011 NRA have now been embedded into the project design or HES procedures and as such, the proposed possible additional mitigation measures show a reduced effectiveness on the majority of hazards which are carefully managed and mitigated through the implementation of embedded risk control measures and procedures.

Following the implementation of possible additional risk control measures, the hazard showing the greatest risk reduction in the construction phase was 'Construction Vessel ICW Construction Vessel' with an effectiveness of 22% driven by risk control measures 2 and 4. The hazard showing the greatest risk reduction in the operation phase was 'AMEP vessel contacts project infrastructure' with a reduction of 22%.

Table 15: Possible Additional Risk Control Measures

ID	Risk Control Measure	Phase	Description
1	Suitably qualified marine personnel	C / O	Ensure marine personnel (vessel crew, marine managers) are suitably qualified with local knowledge.
2	Marine Safety Management System	C / O	As the Harbour Authority, AHPL will be required to develop and manage their own marine SMS. Ownership of responsibilities between ABP Humber and AHPL will need to be clear.
3	Emergency procedures	C / O	Development of emergency procedures for AMEP including: - Availability of pollution response equipment; - Availability of shoreside emergency services; - PPE.
4	Dedicated project marine manager	C / O	AHPL should appoint a dedicated marine manager to ensure liaison between project vessel movements and other traffic , both during construction and operational phases. (Liaison with Humber VTS, and neighbouring operators)
5	Mooring studies	O	A mooring study should be undertaken by AHPL as the Harbour Authority to ensure that adequate mooring arrangements and procedures are in place.
6	Additional surveys of study area	C / O	Additional surveys to monitor sedimentation within and in vicinity of the AMEP berths to ensure adequate water depth is maintained.
7	Standard Operation Procedures (SOP)	O	Able should develop standard operating procedures for the facility once operational.
8	Up-to date weather forecasting	C / O	The project marine manager should have access to up-to-date site-specific weather forecasts.
9	Marking and lighting	C / O	Temporary and permanent marking and lighting requirements should be reviewed in agreement with Trinity House.
10	Availability of towage.	O	Review Towage requirements, e.g: ▪ Use of additional towage for high-air draught vessels / vessels carrying large cargoes navigating to and from berthing pocket Guidance to be determined by the Harbour Authority(s).
11	Restrict simultaneous movements	C / O	Consider procedure to prevent simultaneous vessel movements with adjacent facilities.
12	Dredge disposal plan	C	Liaise with HES / Humber VTS to agreed dredge disposal plan and schedule.
13	Availability of pilots	C / O	Pilot allocation should be managed to ensure adequate capacity and avoid disruption to other river users during operational, and especially, construction phases.

10 CONCLUSIONS AND RECOMMENDATIONS

ABP Humber is experienced in the management of large and hazardous cargoes through its Marine Safety Management system (MSMS) and has effectively implemented a suite of embedded mitigation measures ensuring that the risk profile remains at acceptable levels.

The proposed activities associated with the Project have been assessed and it has been concluded that the Project should have a minimal effect on the existing risk profile which should be managed and contained assuming compliance with embedded mitigation and regulations governing; movements, pilotage, towage, VTS and procedures.

A general decrease in risk scores is noted across all hazard categories when compared to the NRA undertaken in 2011 in support of the original DCO application. Factors influencing this decrease in risk score include:

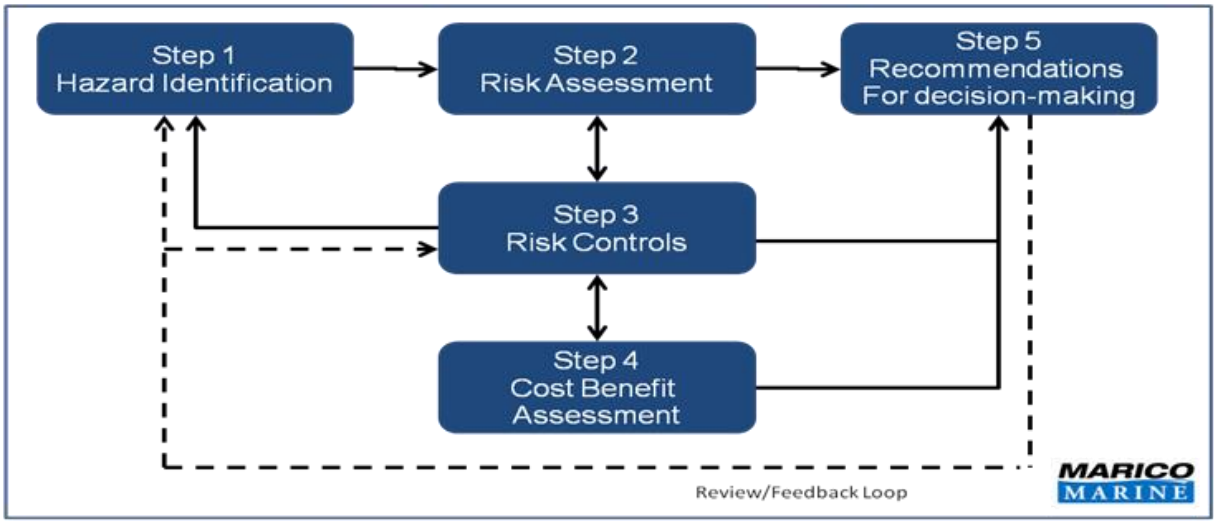
- An overall decline in Humber vessel transits past the Project (>50% reduction in passing transits from AIS) (**Section 3.3**);
- Improvement of the Humber-wide SMS and implementation of embedded mitigations over time;
- The embedding of many originally proposed additional mitigation measures into the project design (**Section 5**);
- The review and associated reduction in construction phase vessel movements associated with dredging activities identified within scoping;
- The simplification of the quay design via the removal of the specialist berth (**Section 2**)**;** and
- The reduction of cumulative projects considered within the 2011 NRA that were not taken forward (**Section 4.1**).

Although all hazards were scored as ALARP or lower, it is recommended that consideration is given to the implementation of the recommended possible additional risk control measures to further reduce the hazards to which they apply, particularly those within the ALARP band which should be reduced unless there is a disproportionate cost to the benefits obtained.

Annex A Navigation Risk Assessment Methodology

RISK ASSESSMENT METHODOLOGY

The Navigation risk assessment methodology is 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.

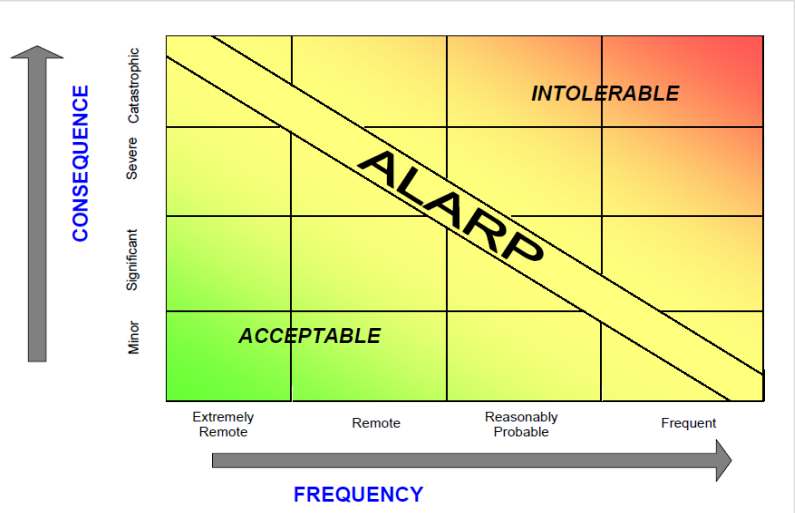


Formal Safety Assessment Risk Assessment Process.

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.

This NRA uses accident categories to organise hazards for assessment. The hazard categories identified as relevant to this study are as follows:

Hazard Categories

Ref	Hazard Category	Hazard Detail	Comments	Individual Assessed Hazards
1	Collision	All Vessel Types	Two or more vessels impact each other whilst manoeuvring.	4
2	Contact	AMEP Infrastructure	One or more vessels makes contact with the AMEP quay or jack-up engaged in construction activities during the construction phase.	2
		Non-AMEP Infrastructure	One or more vessels makes contact with a berth, pier or jetty.	1
		Vessel Alongside Berth	One or more vessels makes contact with a stationary / berthed vessel. Also known as striking.	1
		Navigation Buoy	A project vessel makes contact with a navigation buoy. Also known as striking.	1
3	Grounding	All Vessel Types	A vessel unintentionally makes contact with the seabed.	2
4	Foundering / Swamping	Project Vessels	A vessel fills with water for any reason including capsize, and when overwhelmed, sinks.	1

Ref	Hazard Category	Hazard Detail	Comments	Individual Assessed Hazards
5	Mooring Incident / Breakout	All Vessel Types	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.	2
6	Fire / Explosion	All Vessels	Interaction between a construction vessel and non-project vessel leads to a fire/explosion.	2

Each hazard is reviewed with respect to cause and effect. Frequencies are 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
F1	Remote	An event that could be expected to occur less than once > 1, 000 years.
F2	Unlikely	An event that could be expected to occur once in 1,000 years.
F3	Possible	An event that could be expected to occur once in 100 years.
F4	Likely	An event that could be expected to occur once in 10 years.
F5	Frequent	An event that could be expected to occur yearly.

Assessment of Consequence

Using the assessed notional frequency for the "*most likely*" and "*worst credible*" scenarios for each hazard, an assessment is made for the consequences to people, property, environment and business, using the criteria outlined below.

Consequence Criteria.

Cat	People	Property	Environment	Business
1	Negligible Possible very minor injury (e.g. bruising)	Negligible Costs <2k	Negligible No effect of note. Tier1 may be declared but criteria not necessarily met Costs <2k	Negligible Costs <2k
2	Minor (single minor injury)	Minor Minor damage Costs 2k –20k	Minor Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity CEAS Site warning Costs 2K–20k	Minor Bad local publicity and/or short-term loss of revenue Costs 2k – 20k
3	Moderate Multiple minor or single major injury	Moderate Moderate damage Costs 20k – 200k	Moderate Tier 2 spill criteria reached but capable of being limited to immediate area within site COMAH site evacuation Costs 20k -200k	Moderate Bad widespread publicity Temporary suspension of operations or prolonged restrictions Costs 20k – 200k
4	Major Multiple major injuries or single fatality	Major Major damage Costs 200k -2M	Major Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release COMAH local evacuation Costs 200k - 2M	Major National publicity, Temporary closure Costs 200k - 2M
5	Catastrophic Multiple fatalities	Catastrophic Catastrophic damage Costs >2M	Catastrophic Tier 3 oil spill criteria reached. International support required. Widespread shoreline contamination. Serious chemical or gas release. Significant threat to environmental amenity. COMAH major area evacuation Costs >2M	Catastrophic International media publicity. Operations and revenue seriously disrupted for more than two days. Ensuing loss of revenue. Costs >2M

Note that the Oil Pollution Preparedness, Response Co-operation Convention[5] 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 are 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.

It should be noted that, the approach and terminology of the 2011 NRA, conducted for the DCO ES and DCO application, was undertaken to be cognisant of the existing estuary-wide risk assessment that has been conducted by Associated British Ports (ABP) as the Statutory Harbour Authority. Since 2011, ABP has revised its risk assessment and vessel category bands and terminology. As such the NRA update will be updated accordingly and where possible, phraseology will be adopted that is consistent

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

with that utilised by ABP. However, for consistency and to allow comparison to the 2011 NRA, the same risk assessment matrix and definitions of frequency and consequence have been utilised.

Project Risk Matrix.

Consequences						
	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
	Frequency	**>1,000 years**	**<1,000 years**	**<100 years**	**<10 years**	**Yearly**

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
0 – 1.99	Negligible Risk	A level where operational safety is unaffected.
2 -3.99	Low risk	A level where operational safety is assumed.
4 – 5.99	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.
6 – 7.99	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.
8 - 10	High Risk	A level requiring immediate mitigation.

The frequency and consequence scores are assessed to give two distinct risk scores;

- The average risk score of the categories in the "most likely" set;
- The average risk score of the categories in the "worst credible" set;]

These scores are combined using a weighted average to produce a single numeric value representing the final risk score for each hazard, between 0 (negligible) and 10 (high) following which, the final risk scores are sorted into a ranked hazard list.

Hazard risk scores are categorised as either negligible, low, As Low as Reasonably Practicable (ALARP), significant or high, where ALARP represents a level of risk is neither acceptable nor unacceptable and for which further investment of resources for risk reduction may or may not be justifiable – i.e. risks which fall within the ALARP band should be reduced unless there is a disproportionate cost to the benefits obtained.

Navigation hazards with a risk score of significant or high are deemed unacceptable and, as such, additional risk control measures must be implemented to reduce the risk to an acceptable level.

Annex B Stakeholder Consultation Minutes

Minutes of Meeting held on 14 April 2021 – ABP Humber

Client:	Able UK	
Project:	Able Marine Energy Park (AMEP)	
Venue:	Teleconference	
Date of Meeting:	Tuesday 14 April 2021 , 14:00	
Present:	ABP Humber (ABP)	Andrew Firman (AF) Graham Cudbertson (GC) Ben Brown (BB)
	Marico Marine (MM)	Rebecca Worbey (RW) William Heaps (WH)

Item	Notes for the Record	Actions
1	**Introduction**	
	Introductions. RW introduced the project and proposed material changes.	
2	**Baseline Traffic Profile**	
	Vessel traffic plots and analysis reviewed: • Some vessels incorrectly identifying as passenger vessels, particularly the wind farm support vessels / wind cats going to Grimsby and accompanied RoRo vessels going to Humber Sea Terminal. • The wind cats transiting to and from Grimsby represent a new activity since the last NRA was undertaken. • Wind farm vessels transporting wind turbine equipment heading to Greenport Hull also represent a new activity since the last NRA was undertaken. • Passenger vessels passing the site are likely the Pride of Hull and Pride of Rotterdam, but one of the Hull passenger services has recently ceased (since the last NRA and AIS data obtained). • No significant change to the prevalence of the fishing industry since the last NRA. • No significant change in leisure movements since last NRA. • Overall, there has been approximately a 10% decline in vessel movements across the estuary which has been lower still during 2020 as a result of COVID-19. • Traffic largely passes well clear of the development. Vessels bound for Humber Sea Terminals will be most impacted.	
3	**Hazard Identification**	
	• Humber Sea Terminal will be the most impacted, however, impacts should not be dissimilar to that previously assessed. • COMAH sites are present in the study area. As far as ABP is aware there have not been any new COMAH developments since the 2011 NRA, however, ABP Immingham and APT will be able to comment on this.	

	• Barge Berth may cause local changes in sedimentation which may cause issues for vessels berthing and the project RoRo vessel if it needs to go port side to. • The removal of the specialist berth is considered a positive design change. • It is worth noting that the extension of Immingham frontage will result in another mile of five knot speed restrictions. This is not a result of the material change but rather the presence of the project. • Mooring breakout chief hazard, but similar to previous design.	
4	**Mitigation Measures**	
	• Mooring study should be undertaken by the berth operators / new HA to ensure adequate arrangements (Breakout Hazard mitigation). • Care should be undertaken when disposing of dredge deposits at HU082/HU081 to ensure that the deposits do not encroach the channel. • An agreed plan will need to be established in advance for the disposal of dredge materials. HES is particularly concerned to ensure pilot allocation to dredgers is fairly managed to avoid disruption to other customers. (Dredgers may need to have PEC holders on board, or wait for pilot availability). • As the Harbour Authority, ABLE will have to develop their own marine safety management system, and ownership of responsibilities will need to be clear (Able or HES).	
5	**Cumulative**	
	• North Killingholme Jetty was already present prior to the 2011 NRA and so will have been included within that assessment. • Greenport Hull has commenced operation since the previous NRA. • Hull Riverside Bulk Terminal was not built however was in planning at the time of the last NRA and so may have been considered within the cumulative assessment. • Sunk dredge deepening was in the planning during the last NRA assessment but has not been undertaken. • Immingham Outer Harbour was already constructed during the last NRA. • There are no planned future developments within the study area.	
6	**Actions**	
	ABP requested a copy of the original NRA. ABP requested an updated construction phase vessel movement / dredge programme.	MM MM

Minutes of Meeting held on 15 April 2021 – ABP Immingham

Client:	Able UK	
Project:	Able Marine Energy Park (AMEP)	
Venue:	Teleconference	
Date of Meeting:	Tuesday 15 April 2021 , 11:30	
Present:	ABP Immingham (ABP)	Mark Collier (MC)
	Marico Marine (MM)	Rebecca Worbey (RW)
		William Heaps (WH)

Item	Notes for the Record	Actions
1	**Introduction**	
	Introductions RW introduced the project and proposed material changes.	
2	**Baseline Traffic Profile**	
	Vessel traffic plots and analysis reviewed: • Traffic profile appears as expected. • About 75 Crew Transfer Vessels (CTVs) per week into Grimsby. CTVs will not pass the Able site. Incidents • No recent incidents within the study area. • Most significant incident in recent years out of study area.	
3	**Hazard Identification**	
	• Tug availability may be an issue. • Likely to be sedimentation issues with the new recessed barge berth becoming a sediment trap and increasing grounding risk of project vessels. Dredge levels will need to be maintained through regular maintenance dredging. • Dredging to these levels will return hard clay which is very heavy and does not erode.	
4	**Mitigation Measures**	
	• Hazards should be adequately managed / mitigated by HES and passage planning. • Mooring study should be undertaken by the berth operators / new HA to ensure adequate arrangements (Breakout Hazard mitigation) • Can't see a need for additional simulation.	
5	**Cumulative**	
	• No future developments for consideration within the cumulative assessment as far as MC is aware. • COMAH sites are present in the study area. As far as MC is aware there have not been any new COMAH developments since the 2011 NRA.	

	• There has been some interest in the potential of bringing LNG into the Humber in the future. There is no formal plan at this stage. • MC noted that Goole, Hull and Immingham including the Able development have been granted free-port status and therefore the traffic levels may increase in the future. If available, volume modelling of anticipated future traffic levels in light of freeport designation would be useful.	MM
6	**Other**	
	Will stone beds be installed for jack-ups? MC noted that maintenance costs for stone-beds can be high. MC questioned who has been appointed to undertake the dredging.	MM

Minutes of Meeting held on 21 April 2021 – CLdN / C.Ro Ports

Client:	Able UK	
Project:	Able Marine Energy Park (AMEP)	
Venue:	Teleconference	
Date of Meeting:	Tuesday 21 April 2021, 13:00	
Present:	CLdN	Benjamin Dove-Seymour (BD)
		Phil Pannett (PP)
	C.Ro Ports	Hugh Gates (HG)
	Marico Marine (MM)	Rebecca Worbey (RW)
		William Heaps (WH)

Item	Notes for the Record	Actions
1	**Introduction**	
	Introductions RW introduced the project and proposed material changes.	
2	**C.Ro Operations / Baseline**	
	• Activities (RoRo operations) remain unchanged since previous NRA was undertaken. • However, larger vessels (including the "next generation" G9 class vessels at 234m LOA) are now being utilised and therefore they require a larger swinging area when turning to berth. • There are six berths at Humber Sea Terminals. Although they are not all currently in use at one time, they may be utilised in the future. • It was clearly stressed that this is a significant and busy port with time critical operations.	
3	**Hazard Identification**	
	<u>Alignment</u> • It was clarified that while changes are proposed to the quay line, the alignment of the quay remains unchanged. • It was noted that any changes to the quay alignment may have an impact upon flow and sedimentation dynamics. <u>Construction Phase Vessel Traffic</u> • The prolonged duration of vessel movements depositing material to the HU082 and / or HU081 site was discussed in relation to risk. It was noted that while the risk presented by the vessels themselves would remain similar, the increased duration of the activity may have an impact on assessed risk. <u>Dredge Disposal</u> • CLdN expressed concern that the increased demand for pilotage from dredging vessels may impact on other customers and their own operations if the dredgers did not have sufficient PEC holders available. CLdN would expect the Pilotage	

	Authority to manage pilot allocation to ensure existing customers and time critical services were not adversely impacted.	
4	**Mitigation Measures**	
	Communication • Communication will be essential at all project stages including between AMEP, the Dredging Contractor, C.Ro and other river users. • Communication must particularly be maintained during dredging operations. Delays caused by inability to swing to the berth due to obstruction will have considerable commercial and operational impact. • Contact details of all relevant Able personnel would be required. • A dedicated project marine movement co-ordinator was suggested as an effective mitigation measure during both construction and operational phases. Dredge Licences • ABP should be fully consulted with regard to dredge licences. C.Ro would expect to be included in these discussions to ensure that their activities will not be disrupted or endangered by the dredge disposal operations. Scheduling • There is a pinch point at Immingham Oil Terminal. It was suggested that project dredging vessels (especially less manoeuvrable towed barges, should (if possible) use the 'Foul Holme Channel' to keep clear of larger / scheduled river traffic. • It was suggested that priority should be given to C.Ro and other large vessels berthing at Immingham which operate according to strict timetables and which would be more impacted by delays than AMEP operational or / construction vessels. Protective Provisions • Protective provisions originally negotiated with Able remain in place. It was noted that the proposed changes may have a bearing on risk factors and operations and the negotiated protective provisions. Mooring Planning • Mooring planning was discussed, although it was noted that this will be required within Able's SMS, and WH stated that this has already been identified as a potential mitigation factor.	
5	**Actions**	
	CLdN considers that some of the necessary information required to form a view on navigation risk is missing and requested the following additional information: • A discrepancy was noted between the information presented within the scoping report and information provided by Able with regard to construction methodology. Please confirm whether the construction methodology remains the same as that presented within the DCO. • Additional information required with regards to the types of vessels to utilise the new barge berth. How long will they be there? How manoeuvrable will they be?	MM / Able MM / Able MM / Able

	• Detailed construction phase vessel movement schedule including dredger movements required. • CLdN to send MM vessel movements schedule for HST	CLdN

Minutes of Meeting held on 15 April 2021 – Exolum / APT

Client:	Able UK	
Project:	Able Marine Energy Park (AMEP)	
Venue:	Teleconference	
Date of Meeting:	Tuesday 15 April 2021 , 10:00	
Present:	Exolum (EX)	Kevin Redmile (KR)
		Steve Howard (SH)
		Simone Ingram (SI)
		Lee Wilson (LW)
		Tim Barrow (TB)
	Associated Petroleum Terminals (APT)	Neal Keena (NK)
	Marico Marine (MM)	Rebecca Worbey (RW)
		William Heaps (WH)

Item	Notes for the Record	Actions
1	**Introduction**	
	Introductions RW introduced the project and proposed material changes.	
2	**Description of Activities**	
	Jetty is owned by Exolum who utilize the jetty for their own vessels. Usage is additionally shared by the two adjacent refineries to load / discharge LPG and white oil products. No heavy fuel oils go through the jetty.	
3	**Baseline Traffic Profile**	
	Vessel traffic plots and analysis reviewed: • The development is in a very busy part of the Humber. • RoRo traffic into HST will be passing very close to the DCO area. • Overall, there has been a reduction in vessel traffic in the Humber. ○ SKJ – received 173 ships last year, 178 in 2019, 214 in 2018 and 243 in 2017. First quarter berth occupancy figures for 2021 show an increase on 2020. Incidents • Spring line parted on a ship berthed on SKJ in 2019 due to interaction with vessel going up to HST.	
4	**Hazard Identification**	
	Sedimentation • Sedimentation levels and the impact that they may have on the dredge pocket off SKJ, and the areas behind the jetties used by mooring boats, is a concern.	

	• Currently there is little maintenance dredging required around SKJ which needs to be maintained to -11m. • Extra siltation would negatively impact access to the mooring dolphins at SKJ. If siltation was such that it prevented access by boat then jetties would need to be fitted. • Sedimentation of approach channels may also be an issue. Vessel Traffic • The proposed frequency of vessel movements in the operational phase (approximately 1 per day) look to be reasonable. Proximity to SKJ • The development is very close to SKJ • Interactions with SKJ, for example, simultaneous berthing, will need to be considered. Tugs • APT suffers cancellations due to lack of tug availability and tug availability will be a concern if AMEP is reliant on tugs.	
5	**Mitigation Measures**	
	• Will ABP place any restrictions on simultaneous movements on SKJ and the downstream end of the new berth? • Will ABP impose tidal restrictions on berthing and sailing? • Mooring study should be undertaken by the berth operators / new HA to ensure adequate arrangements (Breakout Hazard mitigation) • Mitigation measures proposed within 2011 NRA look reasonable.	MM MM
6	**Other**	
	• Is a RoRo ramp part of the design? • It was noted that there is also an additional land-based (no marine component) development adjacent to the project. • It was questioned whether or not materials will be brought in by road or by river during the construction phase. If by road, there are concerns about the level of congestion of the main nearby access road.	MM MM
7	**Actions**	
	• SI requested a copy of the DCO.	MM

Additional Comments Received via Email - APT

Client:	Able UK	
Project:	Able Marine Energy Park (AMEP)	
Date of Meeting:	10 May 2021	
From	Associated Petroleum Terminals (APT)	Neal Keena (NK)
To	Marico Marine (MM)	Rebecca Worbey (RW)

1	Notes for the record	
	• The dredging company to be fully aware of all SKJ and IGJ shipping movements. • Slow speed required when passing moored vessels at both SKJ and IGJ. This is in line with the Humber bylaws. • There is a concern that waste material from dredging operations would find its way into the dredged pocket on SKJ and behind the berth, reducing access to the mooring dolphins. This would be an additional concern on top of the general concern we have about the effect of the new jetty of siltation. We currently have very little siltation in the SKJ dredged pocket. Will Able be offering any additional monitoring of water depths off the jetty, to understand if any waste material is being deposited there?	

Minutes of Meeting held on 20 April 2021 – MCA

Client:	Able UK	
Project:	Able Marine Energy Park (AMEP)	
Venue:	Teleconference	
Date of Meeting:	Tuesday 20 April 2021, 10:00	
Present:	Maritime and Coastguard Agency (MCA)	Helen Croxson (HC)
	Marico Marine (MM)	Rebecca Worbey (RW)
		William Heaps (WH)

Item	Notes for the Record	Actions
1	**Introduction**	
	Introductions RW introduced the project and proposed material changes.	
2	**Hazard Identification**	
	• The development is fully within ABP Humber harbour limits. • The MCA expects the proposed assessment methodology for 'Commercial and Recreational Navigation' to be updated for the revised Environmental Statement, and on the understanding Associated British Ports Ltd (ABP) as the Statutory Harbour Authority for the Humber Estuary remains fully consulted, is content with the NRA and that the NRA complies with PMSC requirements, the MCA is unlikely to have any concerns at this time.	
3	**Mitigation Measures**	
	• To address the ongoing safe operation of the marine interface for this project, MCA would point developers in the direction of the Port Marine Safety Code (PMSC) and its Guide to Good Practice. They will need to liaise and consult with the Statutory Harbour Authority and develop a robust Safety Management System (SMS) for the project under this code. • Charts should be updated. • Appropriate information should be circulated to interested parties. • Final drawings should be submitted to the UKHO. • Trinity House should be consulted regarding changes to Aids to Navigation and any other aspects of relevance identified within the NRA.	
4	**Other**	

	• HC questioned whether there would be any change to harbour powers and whether there would be a Harbour Revision Order.
	  ○ WH confirmed that Able will be the Statutory Harbour Authority for the development area, however, ABP Humber will remain the Conservancy Authority. HC questioned when this would come into effect?
	  ○ HC noted that the MCA, through the Ports Team, would expect to be consulted on this and review the Harbour Revision Order.
		MM

	• The NRA process was discussed.
	  ○ MM confirmed that ABP Humber has been consulted and will continue to be consulted throughout the NRA /EIA process.
	  ○ MM clarified that a PEIR has already been undertaken and that the NRA will inform the final ES chapter.	

Annex C Construction Phase Risk Assessment Hazard Log – Baseline with Embedded Mitigation

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
					People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
1	Collision	Construction Vessel ICW Tanker	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - Tug Personnel; Human error/competence/fatigue - VTS Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	3	2	3	3	3.0	4	4	4	4	2.0	4.52	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Availability of towage. Restrict simultaneous movements Availability of pilots
2	Collision	Construction Vessel ICW Cargo	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - Tug Personnel; Human error/competence/fatigue - VTS Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	3	3	2	3	3.0	4	4	3	4	2.0	4.43	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Availability of towage. Restrict simultaneous movements Availability of pilots

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
					People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
3	Collision	Construction Vessel ICW Construction Vessel	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - Tug Personnel; Human error/competence/fatigue - VTS Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	3	2	2	2	4.0	4	4	4	4	3.0	5.47	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Availability of towage Restrict simultaneous movements Availability of pilots
4	Collision	Construction Vessel ICW Workboat/Other	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - Tug Personnel; Human error/competence/fatigue - VTS Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	3	3	2	2	3.0	4	4	3	3	2.0	4.22	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Availability of towage. Restrict simultaneous movements Availability of pilots

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
					People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
5	Contact	Construction vessel contacts AMEP project infrastructure	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	3	2	2	2	3.0	4	4	3	3	2.0	4.10	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Availability of towage. Restrict simultaneous movements Availability of pilots
6	Contact	Non-project vessel contacts AMEP project infrastructure	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	3	2	2	2	3.0	4	4	3	3	2.0	4.10	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Availability of towage. Restrict simultaneous movements Availability of pilots

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
					People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
7	Contact	Construction vessel contacts non-project infrastructure	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	3	2	2	2	2.0	4	4	3	3	2.0	3.70	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Availability of towage. Restrict simultaneous movements Availability of pilots
8	Contact	Construction vessel contacts vessel alongside third party berth	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	2	2	2	2	2.0	4	3	3	3	2.0	3.10	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Availability of towage. Restrict simultaneous movements Availability of pilots

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
					People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
9	Contact	Construction vessel contacts navigation aid	Adverse weather conditions; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - VTS Personnel; Inadequate procedures in place onboard vessel; Malicious action by third party Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	1	1	1	1	5.0	2	2	2	2	3.0	1.21	Marine Safety Management System Emergency procedures Marking and lighting Availability of pilots
10	Grounding	Construction vessel runs aground	Incorrect assessment of height of tide Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Equipment failure; Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - VTS Personnel; Inadequate procedures in place onboard vessel; Loss of water tight integrity; Malicious action by third party Result of avoiding action with 3rd party vessel / dredging operations Unexpected shoaling/ inadequate survey	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	1	1	1	1	4.0	3	3	2	3	2.0	1.65	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Additional surveys of study area Up-to date weather forecasting Marking and lighting Restrict simultaneous movements Dredge disposal plan Availability of pilots

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
					People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
11	Grounding	Non-project vessel runs aground due to construction activities	Incorrect assessment of height of tide Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Equipment failure; Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - VTS Personnel; Inadequate procedures in place onboard vessel; Loss of water tight integrity; Malicious action by third party Result of avoiding action with 3rd party vessel / dredging operations Unexpected shoaling/ inadequate survey	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	1	1	1	1	4.0	3	3	2	4	3.0	2.56	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Additional surveys of study area Up-to date weather forecasting Marking and lighting Restrict simultaneous movements Dredge disposal plan Availability of pilots Protective Provisions
12	Sinking / Capsize	Construction vessel sinks / capsizes	Incorrect assessment of height of tide Adverse weather conditions; Equipment failure; Excessive wash or draw-off. Fire and explosion. Human error/ competence/fatigue - Ship Personnel; Inadequate procedures in place onboard vessel; Loss of vessel stability (due to other than watertight integrity) Loss of water tight integrity; Malicious action by third party Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations Unexpected shoaling/ inadequate survey	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	1	1	1	1	3.0	4	3	3	4	2.0	2.26	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
					People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
13	Break Out	Construction vessel breaks away from its moorings	Incorrect assessment of height of tide Adverse weather conditions; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Fire and explosion. Human error/ competence/fatigue - Ship Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Malicious action by third party	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	2	2	1	1	3.0	4	4	1	2	2.0	2.85	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting
14	Break Out	Third party vessel breaks away from its moorings due to project activities	Incorrect assessment of height of tide Adverse weather conditions; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Fire and explosion. Human error/ competence/fatigue - Ship Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Malicious action by third party	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	2	1	1	1	2.0	4	4	4	3	1.0	2.54	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
					People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
15	Fire / Explosion	Fire / Explosion: Vessel alongside third party berth	Adverse weather conditions; Equipment failure; Excessive wash or draw-off. Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Malicious action by third party Restricted visibility.	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	3	3	4	3	2.0	5	5	5	5	1.0	4.72	Marine Safety Management System Emergency procedures Dedicated project marine manager
16	Fire / Explosion	Fire / Explosion: Construction Vessel alongside	Adverse weather conditions; Equipment failure; Excessive wash or draw-off. Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Malicious action by third party Restricted visibility.	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	3	2	1	2	3.0	5	4	4	4	2.0	4.45	Marine Safety Management System Emergency procedures Dedicated project marine manager

Annex D Operation Phase Risk Assessment Hazard Log – Baseline with Embedded Mitigation

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
					People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
1	Collision	AMEP Vessel ICW Tanker	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - Tug Personnel; Human error/competence/fatigue - VTS Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	3	2	3	3	3.0	4	4	4	4	2.0	4.52	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Standard Operating Procedures Up-to date weather forecasting Marking and lighting Availability of towage Restrict simultaneous movements Availability of pilots
2	Collision	AMEP Vessel ICW Cargo	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - Tug Personnel; Human error/competence/fatigue - VTS Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	3	3	2	3	3.0	4	4	3	4	2.0	4.43	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Standard Operating Procedures Up-to date weather forecasting Marking and lighting Availability of towage Restrict simultaneous movements Availability of pilots

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
					People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
3	Collision	AMEP Vessel ICW AMEP Vessel	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - Tug Personnel; Human error/competence/fatigue - VTS Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	2	1	1	1	5.0	4	4	4	4	2.0	4.28	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Standard Operating Procedures Up-to date weather forecasting Marking and lighting Availability of towage Restrict simultaneous movements Availability of pilots
4	Collision	AMEP Vessel ICW Workboat / Other	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - Tug Personnel; Human error/competence/fatigue - VTS Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	3	3	2	2	2.0	4	4	3	3	2.0	3.80	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Standard Operating Procedures Up-to date weather forecasting Marking and lighting Availability of pilots

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
					People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
5	Contact	AMEP vessel contacts project infrastructure	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	2	2	1	2	5.0	4	4	4	3	2.0	4.93	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Standard Operating Procedures Marking and lighting Availability of towage. Restrict simultaneous movements Availability of pilots
6	Contact	AMEP vessel contacts non-project infrastructure	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	2	2	1	2	2.0	4	4	2	3	1.0	2.61	Suitably qualified marine personnel Marine Safety Management System Standard Operation Procedures (SOP) Availability of pilots

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
					People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
7	Contact	Non-project vessel contacts AMEP project infrastructure	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	2	2	2	2	2.0	3	4	3	3	1.0	2.74	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Restrict simultaneous movements Availability of pilots
8	Contact	AMEP vessel contacts third party vessel alongside.	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	2	2	1	2	2.0	4	4	4	4	1.0	2.85	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Restrict simultaneous movements Availability of pilots

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
					People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
9	Contact	AMEP vessel contacts navigation aid	Adverse weather conditions; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - VTS Personnel; Inadequate procedures in place onboard vessel; Malicious action by third party Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	1	1	1	1	3.0	2	2	2	2	2.0	0.92	Marine Safety Management System Emergency procedures Marking and lighting Availability of pilots
10	Grounding	AMEP vessel runs aground	Incorrect assessment of height of tide Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Equipment failure; Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - VTS Personnel; Inadequate procedures in place onboard vessel; Loss of water tight integrity; Malicious action by third party Result of avoiding action with 3rd party vessel / dredging operations Unexpected shoaling/ inadequate survey	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	1	1	1	1	3.0	3	4	1	4	2.0	2.04	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Additional surveys of study area Up-to date weather forecasting Marking and lighting Restrict simultaneous movements Dredge disposal plan Availability of pilots

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
					People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
11	Grounding	Non-project vessel runs aground	Incorrect assessment of height of tide Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Equipment failure; Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - VTS Personnel; Inadequate procedures in place onboard vessel; Loss of water tight integrity; Malicious action by third party Result of avoiding action with 3rd party vessel / dredging operations Unexpected shoaling/ inadequate survey	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	1	1	1	1	4.0	3	4	1	4	3.0	2.50	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Additional surveys of study area Up-to date weather forecasting Marking and lighting Restrict simultaneous movements Dredge disposal plan Availability of pilots Protective Provisions
12	Sinking / Capsize	AMEP vessel sinks / capsizes	Incorrect assessment of height of tide Adverse weather conditions; Equipment failure; Excessive wash or draw-off. Fire and explosion. Human error/ competence/fatigue - Ship Personnel; Inadequate procedures in place onboard vessel; Loss of vessel stability (due to other than watertight integrity) Loss of water tight integrity; Malicious action by third party Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations Unexpected shoaling/ inadequate survey	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	1	1	1	1	3.0	4	4	3	4	1.0	1.96	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
					People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
13	Break Out	AMEP vessel breaks away from its moorings	Incorrect assessment of height of tide Adverse weather conditions; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Fire and explosion. Human error/ competence/fatigue - Ship Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Malicious action by third party	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	3	2	1	1	4.0	4	4	1	3	3.0	4.57	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Mooring Studies
14	Break Out	Third party vessel breaks away from its moorings due to project activities	Incorrect assessment of height of tide Adverse weather conditions; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Fire and explosion. Human error/ competence/fatigue - Ship Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Malicious action by third party	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	2	1	1	1	2.0	4	4	4	3	1.0	2.54	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting
15	Fire / Explosion	Fire / Explosion: Non-project vessel alongside third party berth	Adverse weather conditions; Equipment failure; Excessive wash or draw-off. Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Malicious action by third party Restricted visibility.	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	3	3	4	3	2.0	5	5	5	5	1.0	4.72	Marine Safety Management System Emergency procedures Dedicated project marine manager

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
					People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
16	Fire / Explosion	Fire / Explosion: AMEP Vessel alongside	Adverse weather conditions; Equipment failure; Excessive wash or draw-off. Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Malicious action by third party Restricted visibility.	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	3	2	1	2	3.0	5	5	4	5	1.0	4.17	Marine Safety Management System Emergency procedures Dedicated project marine manager

Annex E Construction Phase Risk Assessment Hazard Log – Residual with Possible Additional Mitigation

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Possible Additional Risk Controls	Most Likely Consequence					Worst Credible Consequence					Risk Score
						People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
1	Collision	Construction Vessel ICW Tanker	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - Tug Personnel; Human error/competence/fatigue - VTS Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Availability of towage. Restrict simultaneous movements Availability of pilots	3	2	3	3	2.0	4	4	4	4	2.0	4.07
2	Collision	Construction Vessel ICW Cargo	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - Tug Personnel; Human error/competence/fatigue - VTS Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Availability of towage. Restrict simultaneous movements Availability of pilots	3	3	2	3	2.0	4	4	3	4	2.0	4.00

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Possible Additional Risk Controls	Most Likely Consequence					Worst Credible Consequence					Risk Score
						People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
3	Collision	Construction Vessel ICW Construction Vessel	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - Tug Personnel; Human error/competence/fatigue - VTS Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Availability of towage Restrict simultaneous movements Availability of pilots	3	2	2	2	3.0	4	4	4	4	2.0	4.27
4	Collision	Construction Vessel ICW Workboat/Other	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - Tug Personnel; Human error/competence/fatigue - VTS Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Availability of towage. Restrict simultaneous movements Availability of pilots	3	3	2	2	2.0	4	4	3	3	2.0	3.80

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Possible Additional Risk Controls	Most Likely Consequence					Worst Credible Consequence					Risk Score
						People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
5	Contact	Construction vessel contacts AMEP project infrastructure	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Availability of towage. Restrict simultaneous movements Availability of pilots	3	2	2	2	3.0	4	4	3	3	2.0	4.10
6	Contact	Non-project vessel contacts AMEP project infrastructure	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Availability of towage. Restrict simultaneous movements Availability of pilots	3	2	2	2	3.0	4	4	3	3	2.0	4.10

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Possible Additional Risk Controls	Most Likely Consequence					Worst Credible Consequence					Risk Score
						People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
7	Contact	Construction vessel contacts non-project infrastructure	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Availability of towage. Restrict simultaneous movements Availability of pilots	3	2	2	2	2.0	4	4	3	3	2.0	3.70
8	Contact	Construction vessel contacts vessel alongside third party berth	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Availability of towage. Restrict simultaneous movements Availability of pilots	2	2	2	2	2.0	4	3	3	3	1.0	2.74

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Possible Additional Risk Controls	Most Likely Consequence					Worst Credible Consequence					Risk Score
						People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
9	Contact	Construction vessel contacts navigation aid	Adverse weather conditions; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - VTS Personnel; Inadequate procedures in place onboard vessel; Malicious action by third party Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Marine Safety Management System Emergency procedures Marking and lighting Availability of pilots	1	1	1	1	4.0	2	2	2	2	3.0	1.21
10	Grounding	Construction vessel runs aground	Incorrect assessment of height of tide Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Equipment failure; Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - VTS Personnel; Inadequate procedures in place onboard vessel; Loss of water tight integrity; Malicious action by third party Result of avoiding action with 3rd party vessel / dredging operations Unexpected shoaling/ inadequate survey	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Additional surveys of study area Up-to date weather forecasting Marking and lighting Restrict simultaneous movements Dredge disposal plan Availability of pilots	1	1	1	1	3.0	3	3	2	3	2.0	1.65

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Possible Additional Risk Controls	Most Likely Consequence					Worst Credible Consequence					Risk Score
						People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
11	Grounding	Non-project vessel runs aground due to construction activities	Incorrect assessment of height of tide Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Equipment failure; Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - VTS Personnel; Inadequate procedures in place onboard vessel; Loss of water tight integrity; Malicious action by third party Result of avoiding action with 3rd party vessel / dredging operations Unexpected shoaling/ inadequate survey	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Additional surveys of study area Up-to date weather forecasting Marking and lighting Restrict simultaneous movements Dredge disposal plan Availability of pilots Protective Provisions	1	1	1	1	4.0	3	3	2	4	2.0	2.07
12	Sinking / Capsize	Construction vessel sinks / capsizes	Incorrect assessment of height of tide Adverse weather conditions; Equipment failure; Excessive wash or draw-off. Fire and explosion. Human error/ competence/fatigue - Ship Personnel; Inadequate procedures in place onboard vessel; Loss of vessel stability (due to other than watertight integrity) Loss of water tight integrity; Malicious action by third party Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations Unexpected shoaling/ inadequate survey	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting	1	1	1	1	3.0	4	3	3	4	2.0	2.26

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Possible Additional Risk Controls	Most Likely Consequence					Worst Credible Consequence					Risk Score
						People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
13	Break Out	Construction vessel breaks away from its moorings	Incorrect assessment of height of tide Adverse weather conditions; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Fire and explosion. Human error/ competence/fatigue - Ship Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Malicious action by third party	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting	2	1	1	1	2.0	4	4	1	2	2.0	2.51
14	Break Out	Third party vessel breaks away from its moorings due to project activities	Incorrect assessment of height of tide Adverse weather conditions; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Fire and explosion. Human error/ competence/fatigue - Ship Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Malicious action by third party	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting	2	1	1	1	2.0	4	4	4	3	1.0	2.54

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Possible Additional Risk Controls	Most Likely Consequence					Worst Credible Consequence					Risk Score
						People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
15	Fire / Explosion	Fire / Explosion: Vessel alongside third party berth	Adverse weather conditions; Equipment failure; Excessive wash or draw-off. Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Malicious action by third party Restricted visibility.	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Marine Safety Management System Emergency procedures Dedicated project marine manager	3	3	4	3	2.0	5	5	5	5	1.0	4.72
16	Fire / Explosion	Fire / Explosion: Construction Vessel alongside	Adverse weather conditions; Equipment failure; Excessive wash or draw-off. Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Malicious action by third party Restricted visibility.	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Marine Safety Management System Emergency procedures Dedicated project marine manager	3	2	1	2	2.0	4	4	4	4	2.0	3.75

Annex F Operation Phase Risk Assessment Hazard Log – Residual with Possible Additional Mitigation

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Possible Additional Risk Controls	Most Likely Consequence					Worst Credible Consequence					Risk Score
						People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
1	Collision	AMEP Vessel ICW Tanker	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - Tug Personnel; Human error/competence/fatigue - VTS Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Standard Operating Procedures Up-to date weather forecasting Marking and lighting Availability of towage Restrict simultaneous movements Availability of pilots	3	2	3	3	2.0	4	4	4	4	2.0	4.07
2	Collision	AMEP Vessel ICW Cargo	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - Tug Personnel; Human error/competence/fatigue - VTS Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Standard Operating Procedures Up-to date weather forecasting Marking and lighting Availability of towage Restrict simultaneous movements Availability of pilots	3	3	2	3	2.0	4	4	3	4	2.0	4.00

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Possible Additional Risk Controls	Most Likely Consequence					Worst Credible Consequence					Risk Score
						People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
3	Collision	AMEP Vessel ICW AMEP Vessel	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - Tug Personnel; Human error/competence/fatigue - VTS Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Standard Operating Procedures Up-to date weather forecasting Marking and lighting Availability of towage Restrict simultaneous movements Availability of pilots	2	1	1	1	5.0	4	4	4	4	1.0	3.89
4	Collision	AMEP Vessel ICW Workboat / Other	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - Tug Personnel; Human error/competence/fatigue - VTS Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Standard Operating Procedures Up-to date weather forecasting Marking and lighting Availability of pilots	3	3	2	2	2.0	4	4	3	3	2.0	3.80

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Possible Additional Risk Controls	Most Likely Consequence					Worst Credible Consequence					Risk Score
						People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
5	Contact	AMEP vessel contacts project infrastructure	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Standard Operating Procedures Marking and lighting Availability of towage. Restrict simultaneous movements Availability of pilots	2	2	1	2	4.0	4	4	4	3	2.0	3.87
6	Contact	AMEP vessel contacts non-project infrastructure	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Standard Operation Procedures (SOP) Availability of pilots	2	2	1	2	2.0	4	4	2	3	1.0	2.61

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Possible Additional Risk Controls	Most Likely Consequence					Worst Credible Consequence					Risk Score
						People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
7	Contact	Non-project vessel contacts AMEP project infrastructure	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Restrict simultaneous movements Availability of pilots	2	2	2	2	2.0	3	4	3	3	1.0	2.74
8	Contact	AMEP vessel contacts third party vessel alongside.	Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Marking and lighting Restrict simultaneous movements Availability of pilots	2	2	1	2	2.0	4	4	4	3	1.0	2.77

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Possible Additional Risk Controls	Most Likely Consequence					Worst Credible Consequence					Risk Score
						People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
9	Contact	AMEP vessel contacts navigation aid	Adverse weather conditions; Equipment failure; Failure of navigation aid; Failure to comply with International COLREGS; Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - VTS Personnel; Inadequate procedures in place onboard vessel; Malicious action by third party Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Marine Safety Management System Emergency procedures Marking and lighting Availability of pilots	1	1	1	1	3.0	2	2	2	2	2.0	0.92
10	Grounding	AMEP vessel runs aground	Incorrect assessment of height of tide Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Equipment failure; Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - VTS Personnel; Inadequate procedures in place onboard vessel; Loss of water tight integrity; Malicious action by third party Result of avoiding action with 3rd party vessel / dredging operations Unexpected shoaling/ inadequate survey	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Additional surveys of study area Up-to date weather forecasting Marking and lighting Restrict simultaneous movements Dredge disposal plan Availability of pilots	1	1	1	1	3.0	3	4	1	4	1.0	1.71

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Possible Additional Risk Controls	Most Likely Consequence					Worst Credible Consequence					Risk Score
						People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
11	Grounding	Non-project vessel runs aground	Incorrect assessment of height of tide Adverse weather conditions; Communication failure - equipment; Communication failure - operational/ procedural; Equipment failure; Failure of navigation aid; Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Human error/competence/fatigue - Pilot/PEC holder; Human error/competence/fatigue - VTS Personnel; Inadequate procedures in place onboard vessel; Loss of water tight integrity; Malicious action by third party Result of avoiding action with 3rd party vessel / dredging operations Unexpected shoaling/ inadequate survey	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Additional surveys of study area Up-to date weather forecasting Marking and lighting Restrict simultaneous movements Dredge disposal plan Availability of pilots Protective Provisions	1	1	1	1	4.0	3	4	1	4	2.0	2.04
12	Sinking / Capsize	AMEP vessel sinks / capsizes	Incorrect assessment of height of tide Adverse weather conditions; Equipment failure; Excessive wash or draw-off. Fire and explosion. Human error/ competence/fatigue - Ship Personnel; Inadequate procedures in place onboard vessel; Loss of vessel stability (due to other than watertight integrity) Loss of watertight integrity; Malicious action by third party Restricted visibility. Result of avoiding action with 3rd party vessel / dredging operations Unexpected shoaling/ inadequate survey	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting	1	1	1	1	3.0	4	4	3	4	1.0	1.96

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Possible Additional Risk Controls	Most Likely Consequence					Worst Credible Consequence					Risk Score
						People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
13	Break Out	AMEP vessel breaks away from its moorings	Incorrect assessment of height of tide Adverse weather conditions; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Fire and explosion. Human error/ competence/fatigue - Ship Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Malicious action by third party	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting Mooring Studies	3	2	1	1	3.0	4	4	1	3	2.0	3.58
14	Break Out	Third party vessel breaks away from its moorings due to project activities	Incorrect assessment of height of tide Adverse weather conditions; Communication failure - operational/ procedural; Communication failure - personnel; Equipment failure; Excessive wash or draw-off. Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Fire and explosion. Human error/ competence/fatigue - Ship Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Malicious action by third party	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Suitably qualified marine personnel Marine Safety Management System Emergency procedures Dedicated project marine manager Up-to date weather forecasting	2	1	1	1	2.0	4	4	4	3	1.0	2.54

ID	Category	Hazard Title	Possible Causes	Embedded Mitigations	Possible Additional Risk Controls	Most Likely Consequence					Worst Credible Consequence					Risk Score
						People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
15	Fire / Explosion	Fire / Explosion: Non-project vessel alongside third party berth	Adverse weather conditions; Equipment failure; Excessive wash or draw-off. Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Malicious action by third party Restricted visibility.	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Marine Safety Management System Emergency procedures Dedicated project marine manager	3	3	4	3	2.0	5	5	5	5	1.0	4.72
16	Fire / Explosion	Fire / Explosion: AMEP Vessel alongside	Adverse weather conditions; Equipment failure; Excessive wash or draw-off. Failure of ship's mooring gear. Failure to observe Byelaws/local regulations; Human error/ competence/fatigue - Ship Personnel; Inadequate procedures ashore; Inadequate procedures in place onboard vessel; Malicious action by third party Restricted visibility.	VTS Traffic Organisation Service; Adherence to International regulations; Adherence to local regulations/ procedures; Adherence to ABP Humber Emergency Plan; Training and authorisation of pilots; Pilotage exemption certificates; Passage planning; Guidance for small craft; Promulgation of Information including Notice to Mariners; Update Navigation Charts.	Marine Safety Management System Emergency procedures Dedicated project marine manager	3	2	1	2	3.0	4	4	3	4	1.0	3.65