14. COMMERCIAL & RECREATIONAL NAVIGATION

14.1 INTRODUCTION

14.1.1 This chapter details commercial and recreational navigation activities on the Humber Estuary and an assessment of navigational risk associated with marine operations at AMEP.

14.1.2 The risk assessment was conducted using a mixture of quantitative data (accident/incident data) and professional judgement following consultation with stakeholders.

14.1.3 This chapter considers the impact of the Project as a whole on navigation and shipping, rather than the separate impacts of the AMEP site and the Compensation Site.

14.2 REVIEW OF RISK ASSESSMENT - NOVEMBER 2011

14.2.1 The risk assessment has been reviewed following changes to the design of the AMEP quay. The review has been based on the latest available AMEP Masterplan (AME - 1010, Revision B, dated 31/10/2011) and predictions of vessel movements during the construction phase. Potential changes to navigational risk (both increases and decreases) have been summarised in *Table 14.1*. The hazard numbers shown in *Table 14.1* refer to the hazard reference numbers in the hazard logs appended to *Annex 14.2*.

Table 14.1 Changes to Navigational Risk Associated with the Revised AMEP Masterplan.

Hazard	Hazard Number(s)	Change in Risk
AMEP construction vessel impacts South Killingholme Jetty structure	1-9	Slight Increase
AMEP construction vessel runs aground	1-15	Slight Increase
AMEP operational vessel collides with other vessels	2-1, 2-2, 2-3, 2-4, 2-5	Slight Reduction
AMEP operational vessel impacts South Killingholme Jetty structure	2-9	Slight Increase
AMEP operational vessel runs aground	2-15	Slight Increase
AMEP abnormal load collides with other vessels	3-1, 3-2, 3-3, 3-4, 3-5	Slight Reduction

14.2.2 The risk of vessels associated with AMEP operation and AMEP abnormal loads colliding with other vessels on the Humber is slightly reduced since the quay has been set back further from the main navigational channel. A similar reduction in risk of collision between AMEP construction vessels and other vessels might be expected; however this is balanced against the increase in construction vessel movements for the updated quay design.

14.2.3 A slightly increased risk has been identified for vessels associated with AMEP construction and operation impacting South Killingholme Jetty structures. This is due to the increase in vessel movements and the reduced clearance between the proposed approach channel & turning area and South Killingholme Oil Jetty.

14.2.4 The risk to vessels associated with AMEP construction and operation phases and AMEP abnormal loads running aground is slightly increased due to the fact that if vessels inadvertently stray from the dredged approach channel and turning area or berthing pocket, they will find themselves in shallower water, further from the main navigational channel.

14.2.5 There is an increase in construction vessel movements associated with the updated quay design (5,518 vessel movements compared with 3,561 for the earlier design). It is expected that the appointment of a Berth Manager to liaise with Humber VTS will mitigate against the additional vessel movements. Continued dialogue with the Statutory Harbour Authority should allow Temporary Notices to Mariners and VHF Navigation Warning Broadcasts to be issued as required at times of peak construction vessel traffic.

14.2.6 No major changes to navigational risk have been identified and the previously identified mitigations (particularly the use of simulator based studies and a Safety Management System) are considered appropriate and capable of reducing risks to a level that can be considered As Low As Reasonably Practicable (ALARP).

14.3 LEGISLATION, POLICY AND GUIDANCE

British Transport Docks Act 1972

14.3.1 The British Transport Docks Act 1972 gives General Directions to vessels navigating in the Humber. Berthing procedures for the proposed development will take due consideration of the General Directions.

The Port Marine Safety Code (PMSC)

14.3.2 The Port Marine Safety Code (PMSC) (Department of Transport, 2009a) and associated Guide to Good Practice on Port Marine Operations (Department of Transport, 2009b), amongst other things, requires ports to '*ensure all risks are formally assessed and as low as reasonably practicable in accordance with good practice*'. The methodology to assess navigational risk, described below, will comply with this requirement.

Humber Passage Plan

14.3.3 The Humber Passage Plan has been prepared to '*facilitate the safe movement of large vessels in the Humber*'. The Plan applies to all Passage Plan Vessels (see *paragraph 14.6.2* below for the definition of a Passage Plan Vessel) navigating to or from a specified berth. The impact of the proposed development on procedures for berthing at other developments on the Humber will be assessed. This will be achieved via consultation with port operators and the Harbour Authority as required.

Humber Navigation Byelaws 1990

14.3.4 These byelaws include requirements for vessels navigating in the Humber that will need to be factored into berthing procedures at the proposed development.

Other

ABP Marine Policy

14.3.5 As the Statutory and Competent Harbour Authority for the Humber, ABP fulfils several navigational safety functions. The methodology described below involves comprehensive consultation with stakeholders including ABP.

14.4 ASSESSMENT METHODOLOGY AND CRITERIA

Methodology

14.4.1 Analysis of Automatic Identification System (AIS) data for the Humber Estuary area has been used to identify the baseline of vessel routes. Predictions of vessel types and numbers of vessel movements expected to access the new facilities have been used in order to assess future traffic growth.

14.4.2 These data sets have been used to assess the impact of additional vessel movements on existing river/estuary users, particularly on facilities adjacent to the proposed development. In order to manage and identify all potential navigation hazards for this project, a risk assessment workshop was conducted on 25 January 2011 at North Killingholme. Details of attendees are contained in *Table* 14.6. A record of the meeting is included in *Annex 14.1*.

14.4.3 Hazards, their consequences and their probability of occurrence have been assigned, based on the results of a desktop exercise and the risk assessment workshop. Hazards have been assessed in terms of damage or injury to: life (personal injury, fatality, etc), property, environment (oil pollution, etc) and port business (reputation, financial loss, etc). At the risk assessment workshop it was agreed that the scope of the risk assessment should be limited to a stretch of the Humber from Immingham Oil Terminal to King George Dock, a distance of approximately 14.5 km.

14.4.4 It is noted that ABP, as the Statutory Harbour Authority, have conducted a full risk assessment for the Humber Estuary. The risk assessment detailed in this report is cognisant of the risk assessment that has been conducted by ABP. Where possible, phraseology has been used that is consistent with the ABP risk assessment so that the assessments are comparable and may be used to complement each other.

14.4.5 A simulation workshop has also taken place in order to assess the feasibility of berthing and departure from the AMEP (see *Annex 14.1*). The workshop involved the use of a full mission bridge simulator and a model of the proposed development. Simulations were carried out for a range of vessel types, weather conditions and tidal states at a number of berths (at the AMEP and adjacent port facilities). The simulation study team noted that the hydrodynamic current model was not based on the most up-to-date information and this may have affected the outcome of the simulations. The simulation workshop resulted in recommendations being made regarding potential improvements to the AMEP (see *Annex 14.1*).

Significance Criteria

14.4.6 For the purposes of this process, the following definitions have been applied:

- Hazard - the potential for an adverse consequence, and may be associated with ”conflict of interest”, ”effect on environment” or ”a

situation with the potential to cause harm to people or damage to property".

- Consequence - a particular scenario that results from a hazardous situation.

- Risk - a quantitative estimate of harm (in units "per unit time"), derived during subsequent analysis from the combination of postulated harm with a likelihood of the consequence occurring. Likelihoods can be expressed as probabilities (e.g. "one in a thousand"), frequencies (e.g. "1000 cases per year") or in a qualitative way (e.g. "negligible", "significant", etc).

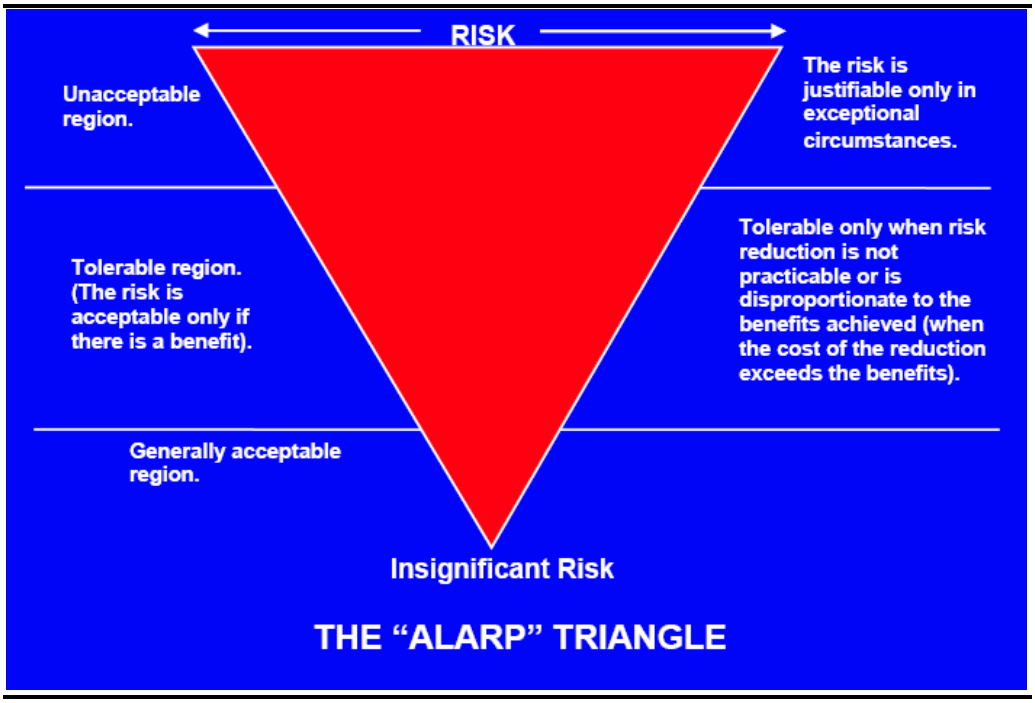
- Harm - death, physical injury or damage to the health of people, or damage to material or the environment.

- As Low As Reasonably Practicable (ALARP) - this term is a key part of the Health and Safety at Work etc Act 1974 and involves weighing a risk against the difficulty, time and expense needed to control it.

- Open - the status given to hazards that are deemed credible and are actively being managed towards a level that is deemed tolerable and ALARP.

14.4.7 The assessment has used the principle of reducing navigational risks to a level that is ALARP. The ALARP concept is illustrated below:

Figure 14.1 The ALARP Concept



14.4.8 The probable consequences associated with each event have been assessed in terms of damage or injury to:

- life (personal injury, fatality, etc);
- property;
- environment (oil pollution etc); and
- port business (reputation, financial loss, etc).

14.4.9 For each credible accident scenario the effect on each of these areas of concern was assessed. The assessments are, of course, subjective as many factors can influence and affect the eventual outcome of accident scenarios. A hazardous event may, in some circumstances, lead to death and, in others, only to a minor injury. The probability of each consequence is usually different for death and minor injury. The concept of risk assessment takes account of both the level of severity and the probability of the event. It is important that the risks of different consequences are individually assessed for each hazard.

14.4.10 *Table 14.2* defines the likelihood of an event occurring and *Table* 14.3 the severity of accident scenarios utilised for the risk assessment. The ratings applied to the accident severity categories are such that the consequences are of broadly equivalent value for a given category.

Table 14.2 Risk Assessment Likelihood Criteria.

Category	Likelihood of Consequence	Likelihood
1	Frequent	Yearly
2	Reasonably Probable	1 - 9 years
3	Remote	10 - 99 years
4	Extremely Unlikely	100 - 999 years
5	None	>1,000 years

14.4.11 Categories 1 to 3 are self-explanatory. Category 4 represents a frequency suggesting an event which is unlikely to happen, but has been identified as a possibility. Category 5 is an event which is currently considered scarcely credible, but where the consequential outcome is catastrophic, the hazard needs to be included to take account of possible future changes in risk.

Table 14.3 Risk Assessment Severity Criteria.

Category	Port Business	Environment	Personnel	Property - Able	Property - Others
0	Negligible (< £2,000)	Negligible (< £2,000)	None	Negligible (< £2,000)	Negligible (< £2,000)

Category	Port Business	Environment	Personnel	Property - Able	Property - Others
1	Minor (> £2,000)	Minor Tier 1 (>£2,000)	Minor (Single slight injury)	Minor (> £2,000)	Minor (> £2,000)
2	Moderate Negative local publicity or short-term loss of dues, revenue, etc. (> £20,000)	Moderate Tier 2 (limited outside assistance) oil spill or environmental amenity impaired	Slight (Multiple moderate or single major injury)	Moderate (> £20,000)	Moderate (> £20,000)
3	Serious Negative widespread publicity, temporary Port closure or prolonged restriction of navigation (> £200,000)	Serious Tier 2 (regional assistance) oil spill, localised flooding or multiple amenities impaired	Serious (Multiple major injuries or single fatality)	Serious (> £200,000)	Serious (> £200,000)
4	Major Port closes, navigation seriously disrupted for more than 1-2 days. Long-term loss of trade (> £2,000,000)	Major Tier 3 (national assistance) oil spill, widespread flooding or extensive damage to amenities	Major (More than one fatality)	Major (> £2,000,000)	Major (> £2,000,000)

14.4.12 The navigation risk assessment has combined assessment of probability (frequency) with accident severity categories to produce a risk assessment "score", as shown in *Table* 14.4.

Table 14.4 Risk Classification Matrix.

Severity	Cat 4	5	6	7	8	10
	Cat 3	4	5	6	7	9
	Cat 2	3	3	4	6	8
	Cat 1	1	2	2	3	6
	Cat 0	0	0	0	0	0
	Frequency	**>1,000 years**	**100 - 999 years**	**10 - 99 years**	**1 - 9 years**	**Annually**

14.4.13 The risk assessment scores, taken from the risk classification matrix are categorised as shown in *Table 14.5*.

Table 14.5 Risk Assessment Scores.

Score	Definition
0 - 1 Negligible Risk	A level where operational safety is unaffected.
2 - 3 Low Risk	A level where operational safety is assumed
4 - 6 Medium Risk (ALARP Region)	A level at which specific risk control should be in place and regularly reviewed.
7 - 9 Significant Risk	A level where existing risk control is reviewed and suggestions made where additional risk control could be applied if appropriate (some activities are inherently significant risk irrespective of safeguards).
10 High Risk	An area where rapid and effective action is needed to reduce risk.

14.4.14 Tolerability of risk uses the principle of reducing risks to ALARP. International Maritime Organisation (IMO) guidelines recognise the existence of ALARP, but do not set any bounds as to how this should be applied and/or demonstrated in the marine industry. This approach is also incorporated into the PMSC and UK shipping policy. This is important as risks need to be managed in a qualitative and comparative way in situations where the actual levels of risk are difficult to determine. Part of the reason for this difficulty is that, whilst a Port Authority will aim to reduce risk to ALARP, not all contributory factors and circumstances are under their control. A Port Authority can only set comprehensive requirements as a regulator that, as far as is foreseeable, would reduce the risk of a range of incidents to ALARP. The use of ALARP in this study is therefore practical in nature, reflecting the practical problems that a Port regulator has in influencing the navigation of a vessel and for meeting Health and Safety Executive guidelines.

14.4.15 Accident scenario consequences were considered for the Most Likely (ML) event and Worst Credible (WC) event. The approach taken for the risk assessment process was pragmatic, realising that value would be gained by considering what would be the most likely outcome of an accident when all relevant considerations were taken into account. It is acknowledged that escalation of an incident to a major or catastrophic

scale is always possible but, given the mitigating circumstances and expected responses from individuals and organisations that are trained and equipped to deal with such incidents, it was believed that the pragmatic approach is the correct one to adopt.

14.5 CONSULTATION

14.5.1 Several responses relevant to commercial and recreational navigation were received as part of the Scoping Opinion Report and the Section 42 Statutory Consultation. The issues raised are summarised in ***Error! Reference source not found.***.

14.5.2 Following the identification of navigational risks and the initial development of risk management actions, a workshop was held with local stakeholders where the findings of the initial risk assessment were presented and reviewed, along with draft measures to minimise the risk to navigation.

14.5.3 Consideration was also given to recreational craft that use the area. Accordingly, representatives from local sailing clubs were notified of the workshop and requested to attend in order to provide input. Unfortunately, no recreational craft representatives were able to attend the workshop. Risk assessment workshop attendees are shown in *Table* 14.6.

Table 14.6 Risk Assessment Workshop Attendees.

Name	Organisation	Position
Phil Cowing	Associated British Ports	Harbour Master
Phil Pannett	Associated British Ports	Pilot Operations Manager
Martin Gough	Associated British Ports	Dock Master, Immingham
Adrian Gray	The Oil and Pipelines Agency	System Control and Logistics Manager
Andrew Bridge	The Oil and Pipelines Agency	Partner and Contractor Representative
Chris Davis	GreyStar	Terminal Manager, South Killingholme Oil Jetty
Hugh Gates	Simon Ports	Port Manager
Colin Harrison	Able UK	Port Director
Richard Cram	Able UK	Design Manager
Chris Bordas	BMT	Consultant
Lee Rhodes	BMT	Senior Consultant
Edward Horabin	BMT	Engineer

14.5.4 Prior to the risk assessment workshop, a briefing pack was produced for all attendees. The briefing pack contained an outline of the safety

methodology to be used and a Preliminary Hazard Log (PHL). The purpose of the briefing pack and the PHL was to provide stakeholders with the opportunity to familiarise themselves with the proposed development and identify any potential hazards that had not been captured in the PHL.

14.5.5 The intention had been to assess the risk of each hazard identified in the PHL, in addition to any new hazards identified by the workshop attendees. However, following initial consultation with the workshop attendees, it was agreed that the focus would be on identifying key concerns and issues relating to navigational risk. It was agreed that these issues would be factored into the draft hazard log. The draft hazard log was distributed to the risk assessment workshop attendees for further comments. These comments were reviewed and, where appropriate, were incorporated into the final hazard log.

14.5.6 A technical report has been produced documenting the above tasks and providing results and recommendations and is included in *Annex 14.2*. The report includes an assessment of the navigational risk both for operational traffic and for construction traffic. Where the additional traffic is likely to increase the risk to navigation on the Humber, initial measures are proposed to manage that risk. The hazard logs are appended to *Annex 14.2*.

14.6 BASELINE

Navigation Authority

14.6.1 ABP, by virtue of the Humber Conservancy Acts 1852-1907 and the Humber Harbour Reorganisation Scheme 1966 (Confirmation Order 1967), is the Conservancy and Navigation Authority for the River Humber (including the Lower Trent up to Gainsborough) and also the Local Lighthouse Authority - within the meaning of the Merchant Shipping Act 1894, (ABP, 2011).

14.6.2 The Humber Passage Plan applies to

> '*any vessel of over 40,000 DWT capacity, whether laden, part laden, or light, or with a draught of 11 metres or over, and Gas Carriers of over 20,000 cubic metres capacity irrespective of draught*' (ABP, 2008).

14.6.3 ABP, as the Competent Harbour Authority, issues pilotage directions (ABP, 2010).

Commercial Shipping Movements

14.6.4 High levels of shipping activity are present within the Humber Estuary; statistics produced by the Department for Transport (DfT) show that 15 percent of total UK port freight handling took place within the Humber Estuary area in 2010 (DfT, 2011).

14.6.5 *Table 14.7* below summarises the DfT statistics for the last five years (2006 - 2010 inclusive). All figures are expressed in thousands of tonnes. Grimsby & Immingham was the leading UK port area by tonnage for all five years considered.

Table 14.7 Humber Estuary Port Tonnage Statistics 2006 – 2010 ('000 tonnes).

Reporting Area	**2006**	**2007**	**2008**	**2009**	**2010**
Goole	2,215	2,281	2,159	1,635	1,936
Grimsby & Immingham	64,033	66,279	65,267	54,708	54,029
Hull	12,785	12,497	12,249	9,771	9,236
River Ouse	234	282	226	196	241
Rivers Hull and Humber	9,774	9,370	9,351	9,466	10,034
River Trent	2,062	2,207	1,984	1,096	1,361
Humber Total	91,103	92,916	91,236	76,872	76,837

14.6.6 *Table 14.7* shows that tonnage increased slightly from 2006 to 2007, decreased slightly in 2008 and decreased sharply in 2009. Tonnage stabilised in 2010. This effect is probably linked to the current recession and recovery to the underlying upward trend is expected as the world economy recovers. Provisional DfT statistics for the first two quarters of 2011 show a slight increase (approximately 3 %) in tonnage for Humber ports compared to the same period in 2010.

14.6.7 In addition to freight vessels, a number of ferries operate on the Humber Estuary, primarily on the Hull-Rotterdam and Hull-Zeebrugge routes. DfT statistics (summarised below in *Table 14.8*) show an average of over one million passengers per year for the ports of Hull, Grimsby and Immingham over the last five years. All figures are expressed in thousands of passengers.

Table 14.8 Summary of DfT Passenger Statistics 2006 – 2010 ('000 passengers).

Reporting Area	**2006**	**2007**	**2008**	**2009**	**2010**
Hull	1,017	1,010	966	936	950
Grimsby & Immingham	49	63	81	71	73
Total	1,066	1,073	1,047	1,007	1,023

14.6.8 DfT also produces statistics for vessel arrivals at Humber ports. The number of vessel arrivals can be doubled to give an estimated number of vessel movements.

14.6.9 *Table 14.9* summarises the estimated number of vessel movements for the last five years of available data (2010 vessel arrival data has not been published by DfT).

Table 14.9 Estimated Number of Vessel Movements 2005 - 2009.

Reporting Area	**2005**	**2006**	**2007**	**2008**	**2009**
Hull	7,264	6,540	6,054	5,718	4,598
Goole	2,564	2,290	2,068	2,010	1,658
Rivers Hull and Humber	992	866	868	990	1,056
Grimsby & Immingham	17,440	16,912	16,520	15,940	14,638
River Trent	2,200	2,380	2,522	2,146	1,308
River Ouse	294	358	376	262	286
Humber Total	30,754	29,346	28,408	27,066	23,554

14.6.10 *Table 14.9* shows a declining trend in the number of vessel movements in the Humber Estuary from 2005 to 2009. The number of vessel movements declined even in years when the tonnage and passenger values increased. This may indicate a trend towards the use of larger vessels, resulting in fewer vessel movements for a given cargo / passenger load. It is possible that the trend of increasing vessel size may counteract a recovery in port tonnage to keep vessel movements on the Humber approximately constant over the next few years.

14.6.11 It is likely that the figures shown in *Table 14.9* underestimate the actual number of vessel movements since, according to the Humber Passage Plan (ABP, 2008), vessels may make more than one movement within the estuary before arriving at a port or after departing. Examples include moving to an anchorage to await favourable tide conditions or the boarding of a pilot. Humber Estuary Services estimates that there are approximately 40,000 individual shipping movements per year on the estuary (Humber Estuary Services, 2010).

Navigation Routes

14.6.12 There are three main channels leading to/from the Humber Estuary area; New Sand Hole, Sea Reach and Rosse Reach. All three are governed by a Traffic Separation Scheme, as is the single channel leading into / out of the estuary. Large vessels tend not to use Rosse Reach owing to draught restrictions. Channels within the Humber Estuary are marked by floats, buoys and shore marks.

14.6.13 Typically, vessels entering the estuary will slowly converge as they pass by Burcom Sands. The traffic pattern is around 1.2 km wide travelling down the approximate centre of the estuary. This pattern continues until the approach to Immingham Docks; at this point traffic splits with the majority of traffic proceeding to the docks and the rest continuing up the estuary. This accounts for the very high concentration of traffic in this area.

14.6.14 The majority of vessels navigating the Humber estuary to locations more inland than the proposed development maintain a course close to the north bank. In general, these vessels pass just south of the Foul Holme Spit in order to be on course to pass north of the Halton Flat.

14.6.15 A few vessels travelling upstream of Immingham currently follow closer to the south bank of the estuary and then proceed to cross the estuary to avoid the Halton Flat. Encouraging these vessels to reroute along a more northerly course will increase the available space for vessels departing from both the proposed development and adjacent port facilities.

Navigation Route Usage

14.6.16 Analysis of AIS data for the Humber Estuary area has been used to identify the baseline of vessel routes used by Humber shipping traffic. For the purpose of this assessment, four days of AIS data, obtained from the Vessel Traffic Services Manager, Humber Estuary Services, covering the period 27 February 2010 to 2 March 2010 inclusive, providing a representation of Humber traffic levels was used. The data cover an area of the Humber Estuary bounded by the following co-ordinates:

- 53 45N;
- 53 27N;
- 000 09E; and
- 000 17W.

14.6.17 The total number of vessels recorded in the Humber Estuary and the number of vessels upriver of Immingham Dock for each day of AIS data are shown in *Table 14.10* below.

Table 14.10 Number of Vessels from AIS Data.

Date	Vessels on the Humber Estuary	Vessels Upriver of Immingham Dock
27 February 2010	110	41
28 February 2010	114	47

Date	Vessels on the Humber Estuary	Vessels Upriver of Immingham Dock
1 March 2010	115	48
2 March 2010	121	51
Average (Mean)	115	47

14.6.18 It should be noted that, in total, the four days worth of data represent only 288 unique vessels. This means that a significant proportion of vessels transit the area regularly (i.e. may work locally), as follows:

- 57 of the 288 vessels transit the area every day;
- 47 of the 288 vessels transit the area for 3 out of the 4 days;
- 84 of the 288 vessels transit the area for 2 out of the 4 days; and
- 99 of the 288 vessels only appeared to transit the area for a single day.

14.6.19 Density grids were created to allow analysis of traffic levels in different sections of the estuary. From the density grids it is clear that the highest densities of traffic are en route to Immingham Dock; past this point the concentrations of traffic are significantly less.

14.6.20 Due to the relatively light traffic levels directly outside of the proposed development, integration of vessels into the Humber Estuary traffic should not be challenging. However, it may be prudent for traffic accessing the proposed south bank development to avoid the areas of high traffic density (shown in orange and red in *Figure 14.2* and *Figure* 14.3 below). Consideration will need to be taken of the traffic associated with Immingham Dock and Immingham Oil Terminal.

Figure 14.2 Humber Estuary Vessel Traffic Density Grid.

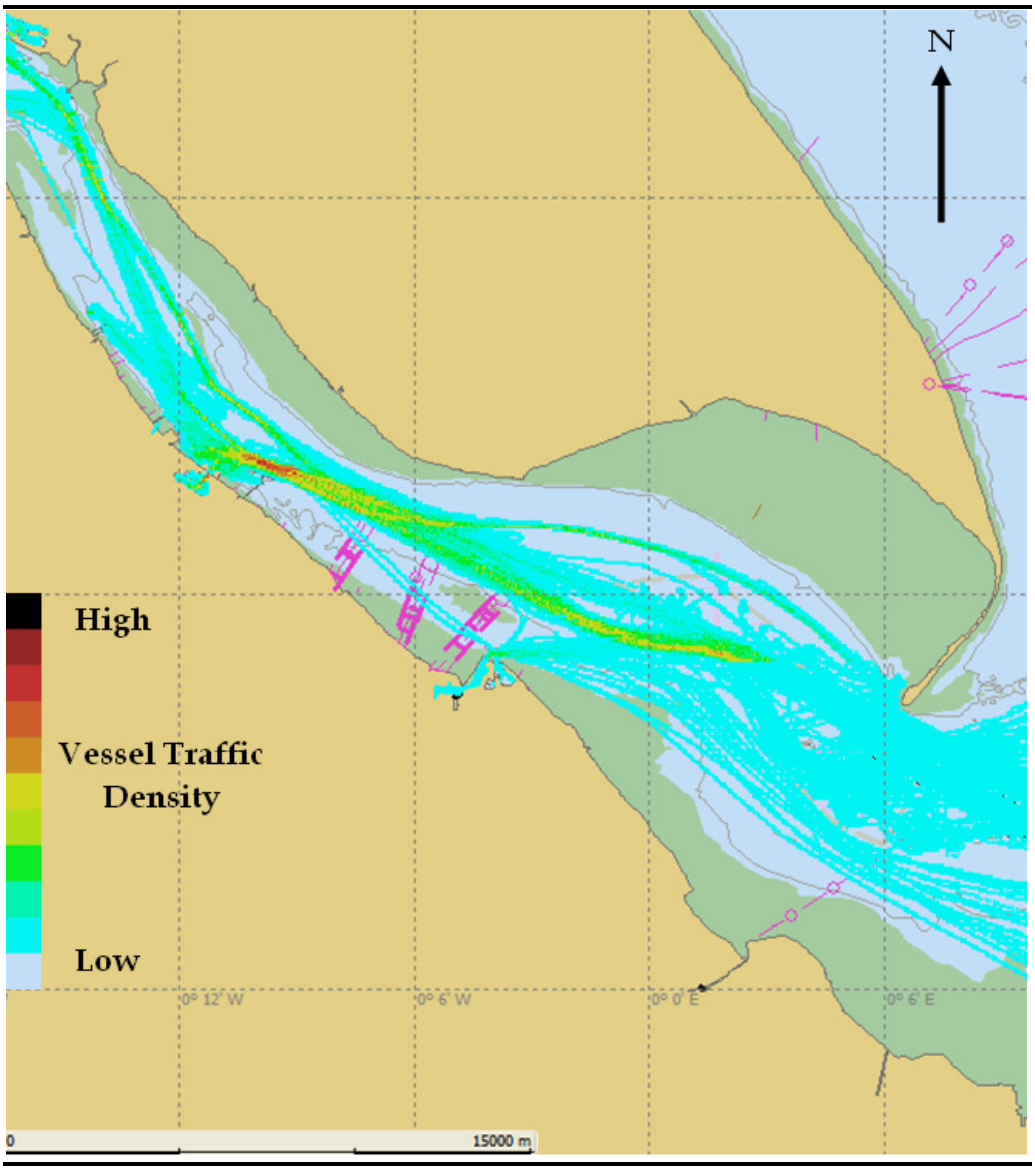
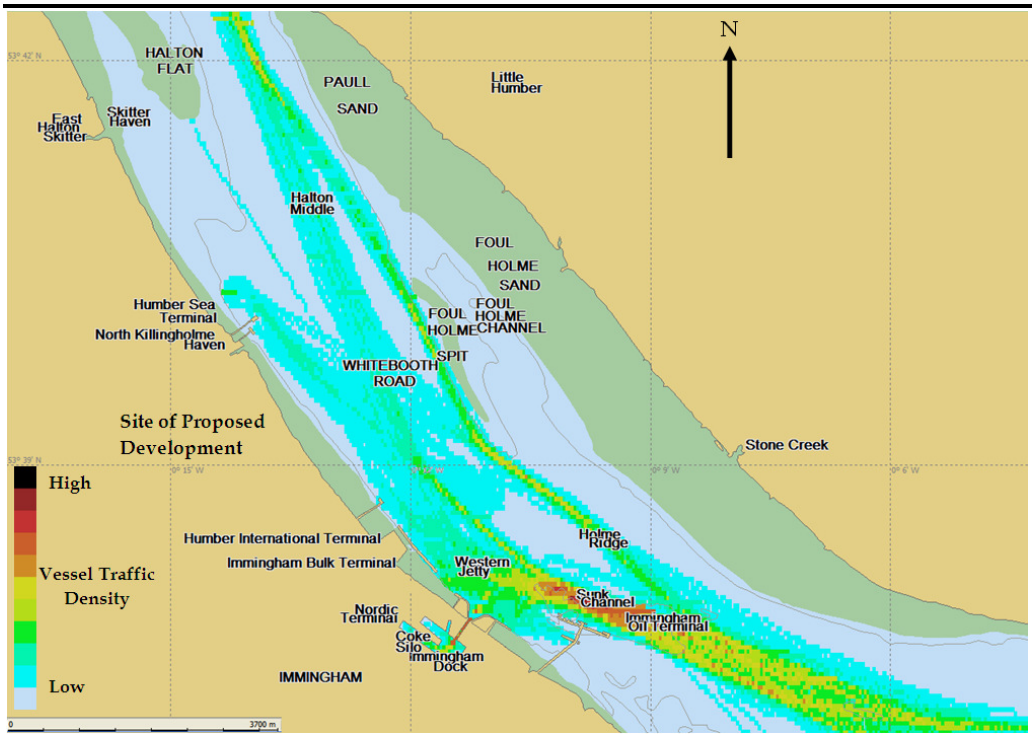


Figure 14.3 Vessel Traffic Density Grid in the Vicinity of the Proposed Development.



Recreational Navigation

14.6.21 A large number of boat and yacht clubs are situated on the Humber Estuary, with over 900 permanent berths in addition to those for visiting craft. A summary of some of the marinas is shown below in *Table 14.11* (information on berths / moorings was not available for all marinas / clubs).

Table 14.11 Selected Marinas and Clubs on the Humber Estuary.

Marina / Club	Number of Berths / Moorings (Permanent + Visitor)
Grimsby & Cleethorpes Yacht Club	175 (150 + 25)
Hull Marina	330 (310 + 20)
Goole Boathouse	140
South Ferriby Marina	120 (100 + 20)
Humber Cruising Association	230 (200 + 30)
Humber Yawl Club	126
Humber Mouth Yacht Club	-
Stone Creek	-
Barrow	-
Hessle Haven	-

14.6.22 Activities such as races and festivals taking place within the navigable areas of the Humber Estuary are regulated under the Humber Navigation Byelaws 1990 and General and Special Directions issued under the British Transport Docks Act 1972. It is worthy of note that yacht racing currently takes place in areas upriver of the Humber Bridge, thus having no impact on the proposed site.

14.6.23 It should be noted that adjacent to the proposed Compensation Site on the north bank of the Humber is Stone Creek, an inlet with banks consisting of inter-tidal mudflats. The potential for the compensation development to affect the flow of water in this area and impact on recreational use of Stone Creek is assessed separately in *Volume 2* of the ES.

Shipping Safety

14.6.24 A series of safety plans and schemes govern and regulate shipping in the Humber. The Humber Port and Vessel Information System (PAVIS) is maintained by ABP Humber Estuary Services (HES) for monitoring and controlling navigational safety within the Humber Estuary. Vessel Traffic Service (VTS) Humber is operated by ABP HES to monitor and advise vessels as they transit the Humber Estuary.

14.6.25 Emergency plans exist for dealing with major shipping incidents on the estuary. A Safety Management System (SMS) is operated in accordance with the PMSC and its associated Guide to Good Practice. Minimum towage guidelines exist for all vessels to which the Humber Passage Plan applies.

Additional vessel traffic

Construction Traffic

14.6.26 The construction phase is proposed to last approximately two years and materials will be delivered by road, rail and sea. Dredging will increase the available depth to 9 m below CD in the approach channel and turning area and 11 m below CD in the berthing pocket. The intention is to remove as little dredged spoil from the wider Humber Estuary system as possible. Two types of dredger are expected to be used: trailing suction hopper dredgers and backhoe dredgers, depending on the type of material to be dredged. Some construction materials are anticipated to be delivered directly to the site, whilst others will arrive at other ports on the Humber Estuary for onward delivery.

14.6.27 Estimated construction vessel movements during this phase have been based on *Annex 14.3*. Construction vessel movements number approximately 5,500 in total over an 18 month period. Peak activity is expected to require approximately 700 construction vessel movements per month (in the second year of construction). Dredging vessels account for the majority of the total number of vessel movements (approximately 4,000). Vessel movements are based on the assumption that all fill material is imported by sea and that all dredge material is transported to an existing licensed disposal site within the estuary. Vessel sizes and capacity vary greatly depending on a number of factors, therefore these numbers are provided as an approximation. The use of larger vessels than those used for the assessment would reduce the overall movements to/from the proposed site.

14.6.28 Vessels involved with construction of the proposed facility may be limited in their ability to manoeuvre and, in the case of dredgers and barges, may be static for varying periods of time. These vessels could potentially increase the risk of a collision in the area of proposed development. In addition, there may be an increased risk of groundings as vessels manoeuvre around the construction traffic. However it is noted that, as shown by *Figure 14.3*, the existing vessel traffic density in the immediate vicinity of the proposed development is relatively low when compared to, for example, Immingham Dock.

14.6.29 When compared to the average number of vessel movements on the Humber Estuary from 2005 to 2009, the construction traffic will represent an increase of approximately 10 percent over a two year period.

Operational Traffic

14.6.30 *Table 14.12* shows an estimate of the additional vessel movements associated with the operational phase of AMEP, based on information provided by Able.

Table 14.12 AMEP Operational Phase Vessel Movements.

Vessel Type	Annual Number of Trips	Annual Number of Movements
Installation Vessel	100	200
Foundation transfer vessels	12	24
1,500 Tonne Support Vessel	100	200
6,000 - 10,000 Tonne Cargo Ship	50	100
Total	262	524

14.6.31 The estimated 524 additional vessel movements per year represent an increase of approximately 1.9 percent over the average number of vessel movements from 2005 to 2009.

14.6.32 Based on the AIS data in *Table 14.10* (which is limited in the number of days for which information was collected), the additional vessel movements associated with the operational phase of AMEP represent an increase of approximately 1.2 percent in the number of vessels on the Humber per day and an increase of approximately 3 percent in the number of vessels that travel upriver of Immingham Dock.

14.7 IMPACTS

General

14.7.1 A total of 45 hazards have been identified, split into three categories:

- vessel traffic associated with the construction of AMEP (18 hazards);
- vessel traffic associated with the operation of AMEP (18 hazards); and
- abnormal loads transported in association with construction and/or operation of AMEP (9 hazards).

14.7.2 A summary of the risk assessment results is shown in *Table 14.13* (most likely events) and

14.7.3 *Table 14.14* (worst credible events) below.

Table 14.13 Number of Risks By Class (Most Likely Events).

Risk Class	Personnel	Property - Able	Property - Others	Environment	Business
Negligible Risk	6	12	5	19	9
Low Risk	26	29	28	20	33
Medium Risk	13	2	10	4	1
Significant Risk	-	-	-	-	-
High Risk	-	-	-	-	-

Table 14.14 Number of Risks By Class (Worst Credible Events).

Risk Class	Personnel	Property - Able	Property - Others	Environment	Business
Negligible Risk	-	-	-	-	-
Low Risk	3	12	4	17	9

Risk Class	Personnel	Property - Able	Property - Others	Environment	Business
Medium Risk	42	31	39	26	34
Significant Risk	-	-	-	-	-
High Risk	-	-	-	-	-

14.7.4 *Table 14.13* shows that, for the most likely event, 51 risks are classed as "Negligible Risk", 136 risks are classed as "Low Risk" and 30 risks are classed as "Medium Risk". No risks are classed as "Significant Risk" or "High Risk".

14.7.5 *Table 14.14* shows that, for the worst credible event, 45 risks are classed as "Low Risk" and 172 risks are classed as "Medium Risk". No risks are classed as "Negligible Risk", "Significant Risk" or "High Risk".

14.7.6 278 Hazard Management Actions (HMAs) have been identified that relate to the identified hazards. The HMAs serve to reduce risk either by reducing the severity or the frequency of an accident (or a combination of both). Many of the HMAs are already in place (such as pilotage requirements on the Humber Estuary) but others will need to be implemented as the project advances (including the provision of a dedicated dockside marine manager). Where HMAs are not yet in place these are highlighted in this report.

Construction Phase

14.7.7 It is estimated that AMEP construction traffic will, on average, increase the annual number of vessel movements on the Humber Estuary by approximately 10 percent over a period of 24 months.

Operational Phase

14.7.8 Vessel traffic associated with the operational phase of AMEP is estimated to represent an increase of 1.9 percent over the 2005 to 2009 average.

14.7.9 The increased number of berths on the Humber Estuary provided by the proposed quay could potentially add resilience to estuary-wide emergency plans.

14.8 MITIGATION MEASURES

General

14.8.1 To reduce the risk of vessels colliding with AMEP structures during the construction and operational phases, the upstream and downstream

extents of the quay and the upstream extent of the swinging area will be identified with navigation marks and lights.

14.8.2 Traffic management procedures will be required to ensure that large vessels operating to/from the proposed AMEP development do not adversely impact on the passage of other vessels on the Humber. This will be achieved via consultation with the Harbour Authority when required.

14.8.3 Able will consult with fire tug providers to establish the requirement and practicalities of providing fire tug assistance at the AMEP. Provision of a fire tug provider will help to mitigate the effects of a fire on a vessel whilst it is in the vicinity of the proposed AMEP development.

14.8.4 To reduce the severity of pollution incidents, Able will arrange for pollution response equipment to be available.

14.8.5 Able will maintain the hazard log to ensure that it reflects any changes to the likelihood and severity of risk. If any additional hazards are identified then these will be assessed and included in the hazard log. The hazard log will also be updated if there are any changes to the assumptions that have been made in the navigational risk assessment. The risk may change due to changes in the way that other port operators on the Humber conduct their operations. Continued dialogue between Able and other port operators will enable these changes to be identified and included in the hazard log.

14.8.6 Due to the effects that port lighting can have on the night vision of mariners operating in the vicinity, Able will consider the AMEP lighting requirements with regard to the guidance on port lighting levels that has been produced by the ports industry with assistance from the Health and Safety Executive (Health and Safety in Ports SIP009 - Guidance on Lighting, Issue 1, October 2010).

14.8.7 To manage the overall risks associated with marine operations, Able will establish a Safety Management System that aims to meet the requirements of the PMSC.

14.8.8 Although out of direct control of Able, encouraging vessels to reroute along a more northerly course will increase the available space for vessels departing from both the proposed development and adjacent port facilities.

Construction Phase

14.8.9 During the construction phase, Able will investigate the viability of establishing a "Berth Manager" or Marine Control Centre. The Berth Manager will have responsibility for managing construction vessel movements and liaising with Humber VTS.

14.8.10 In order to minimise the disruption to traffic on the Humber Estuary, any temporary moorings required for construction of the quay will not extend any further out from the shore than the footprint of an operational vessel berthed at the completed quay. In addition, any pilings or mooring dolphins associated with construction of AMEP will be fully extracted once the construction phase is complete.

14.8.11 VTS Humber provides a general information broadcast giving weather reports, tidal information and navigational warnings on Channel 12, 14 and 15 every 2 hours. Consideration is to be given to include in this broadcast times of high vessel activity associated with AMEP construction work.

Operational Phase

14.8.12 Able will investigate the requirement for a Marine Control Centre to be established at AMEP, with a dedicated dockside marine manager and Very High Frequency (VHF) radio channel to manage incoming and departing vessels.

14.8.13 Should Humber Passage Plan vessels (as defined in *paragraph 14.6.2*) berth at AMEP in future, a full review of the Humber Passage Plan will be conducted, in conjunction with Harbour Authority, to include passage abort procedures.

14.8.14 Emergency procedures will be developed to cover situations such as fires and mooring line failures. Involvement in the Humber Serious Incident Emergency Plan will commence.

14.9 RESIDUAL IMPACTS

14.9.1 Details of the residual navigational risk are contained in the hazard logs appended to the technical report in *Annex 14.2*.

14.9.2 Since the existing vessel traffic levels in the immediate vicinity of the proposed development are relatively low, it is expected that additional traffic and associated local risk can be managed as part of a Safety Management System in accordance with the Port Marine Safety Code.

14.10 CUMULATIVE IMPACTS

14.10.1 In addition to AMEP, the following projects on the Humber may result in additional operational traffic; potential cumulative effects are detailed in *Table 14.15*:

- Maintenance dredging;
- Immingham Oil Terminal Approach Channel;
- Grimsby Ro–Ro;
- Quay 2005, Port of Hull; and
- Hull Bulk Terminal.

Table 14.15 Potential Cumulative Impacts.

Project	Description	Potential Cumulative Impacts
Maintenance Dredging	Channels in the Humber Estuary are regularly dredged to maintain the required depth of water.	Additional vessel movements associated with dredging operations in the Humber Estuary.
Immingham Oil Terminal Approach Channel	Accommodates vessels of up to 290,000 DWT which handle oils and spirits for local refineries. Identified for major development between 2010 and 2030 as part of the Port of Immingham Master Plan, which predicts a 62 percent increase in crude oil imports during that period.	Further development may increase the number of vessels navigating the Humber in the close vicinity of the proposed AMEP development.
Grimsby Ro-Ro	Handles approximately 400,000 vehicles per year. Possible expansion of ro-ro operations will increase the size and number of vessels using the facility.	Further development will increase construction traffic and lead to longer term increases in operational vessel traffic around Grimsby.
Quay 2005, Port of Hull	Provides direct access to the deep water channel and may be developed further for vessels supplying the offshore renewables sector.	Further development will increase construction traffic and lead to longer term increases in operational vessel traffic around the Port of Hull.
Hull Bulk Terminal	Currently accommodates vessels of up to 34,000 DWT. Proposed development will increase the amount of bulk products handled by five million tonnes	Further development will increase construction traffic and lead to longer term increases in operational vessel traffic

Project	Description	Potential Cumulative Impacts
	per year.	around the Port of Hull.