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Assessment of ETV Provision for North and North West Scotland

for
Maritime and Coastguard Agency

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ACRONYMS & ABBREVIATIONS

AHTS	Anchor Handling Tug Supply
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practical
ARPA	Automatic Radar Plotting Aid
ATBA	Areas To Be Avoided
BA	British Admiralty
BHP	Brake Horse Power
BP	British Petroleum
BTA	British Tugowners Association
CAST	Coastguard Agreement for Salvage and Towage
CCTV	Closed Circuit Television
CMID	Common Marine Inspection Document
CP	Controllable Pitch
DfT	Department for Transport (UK)
Dia	Diameter
DWR	Deep Water Route
E	East
ECDIS	Electronic chart display and information system

ACRONYMS & ABBREVIATIONS

EMSA	European Maritime Safety Agency
ETV	Emergency Towing Vessel
GPS	Global Positioning System
GT	Gross Tonnage
HIAL	Highlands and Islands Airports Limited
IACS	International Association of Clarification Societies
IMCA	International Marine Contractors Association
IACS	International Association of Classification Societies
IMO	International Maritime Organisation
ISM	International Safety Management
JNCC	Joint Nature Conservation Committee
Kt	Knots
LNG	Liquefied Natural Gas
LOA	Length Overall
LOC	London Offshore Consultants
LPG	Liquid Petroleum Gas
LRS	Lloyds Register of Shipping
M	Metres
MAIB	Marine Accident Investigation Branch
MARPOL	Marine Pollution – The International Convention for the Prevention of Pollution from Ships
MCA	Maritime and Coastguard Agency
MEHRA	Marine Environmental High Risk Areas
Mm	Millimetres
MMSI	Maritime Mobile Service Identity
MPA	Marine Protected Areas
MPM	Mixing Parameter Method
m/s	Metres per Second
N	North
NE	North East
Nm	Nautical Miles
NMPI	Marine Scotland's National Marine Planning Initiative
NSA	National Scenic Areas
NW	North West
OIC	Orkney Islands Council
OCIMF	Oil Companies International Marine Forum
RPM	Revolutions Per Minute
SAC	Special Areas of Conservation
SAR	Search and Rescue
SE	South East
SNH	Scottish National Heritage
SOLAS	Safety of Life at Sea
SOTEAG	Sullum Voe Oil Terminal Environmental Advisory Group
SPA	Special Protection Areas
SSSI	Sites of Special Scientific Interest
STCW	Standards of Training, Certification and Watchkeeping
SVHA	Sullum Voe Harbour Area
SVT	Sullum Voe Terminal

ACRONYMS & ABBREVIATIONS

T	Tonnes
Tbp	Tonnes Bollard Pull
Tdwt	Tonnes Deadweight
TSS	Traffic Separation Scheme
UK	United Kingdom
UK EEZ	United Kingdom Exclusive Economic Zone
ULCS	Ultra Large Container Ship
VLCC	Very Large Crude Carrier
VTS	Vessel Traffic Services
W	West
24/7	24 hours a day, 7 days a week

EXECUTIVE SUMMARY

There is currently one emergency towing vessel (ETV) on the coast of the United Kingdom and this is stationed in Kirkwall to serve an area covering North and North West Scotland. The contract for this vessel, AHT “HERAKLES”, has been extended until September 2016 subject to an assessment on the requirement and type of ETV that might be deemed necessary going forward.

London Offshore Consultants Ltd (LOC) was contracted by the Maritime and Coastguard Agency (MCA) to conduct an independent assessment for ETV provision taking into account traffic density and type, specific hazards, prevailing weather and environmental sensitivities in the area in which the current ETV operates. These factors are fundamental in determining the requirements and specification for an ETV should the decision be taken to continue with such provision. Crewing and training requirements to perform on a 24/7 basis, outfit requirements and the suitability of the vessel to perform non-emergency work were also to be considered.

The assessment was to be completed as a matter of urgency and within a tight deadline. Certain data was made available, some obtained from in-house resources and some obtained from the public domain. A detailed risk assessment was not required under the present scope of work. Rather, risk assessments undertaken in previous studies and their findings are still relevant in many respects. Where possible, the data related to vessel traffic in the area under review has been used to identify areas where the shipping risk profile may have changed. The implications of future trends in the global shipping industry and in the local shipping traffic have been commented on.

The assessment found the following:

1. Presently there are tugs up to 55tbp in the area under review but these are harbour tugs, none are reliably available and none are suitable for emergency towage in gale force conditions and/or can proceed at an appropriate speed and/or are manned by sufficient crew experienced in emergency towage operations. The harbour tugs can, and have been, used effectively for emergency towing in circumstances within their operational capability and subject to availability. They can and should be considered in future emergency towing plans in this respect.

2. Pentland Firth remains the most frequently navigated channel in the area and traffic can also be busy around Cape Wrath and through the Minches. The areas to be avoided (ATBA) and traffic separation lanes seem to be having their desired effects. The deep water route (DWR) west of Hebrides has a lower traffic density. The most frequent types of vessels other than fishing vessels are dry cargo ships; Aframax tankers are a common feature. Scapa Flow has had several recent visits from VLCCs and Suezmax tankers. Cruise liner visits continue to increase throughout the area. This activity had not been considered in previous studies and overall, traffic density was found to be higher than before.

3. Although positive measures have been implemented to improve the safety of navigation within the area and pollution prevention regulations have also been enhanced through MARPOL, specific hazards remain which present potential risks to shipping. Loss of control through machinery break down is the highest cause of incidents which lead to groundings, and human error is by far the prime cause of shipping incidents as a whole. Neither can be ignored. Given the features of the coastlines in the area being considered, the risk of breaching the hull of a grounded vessel is high and the impact of consequential marine pollution would be potentially devastating.

4. Weather statistics show no discernible change in trends. It is a hostile area for weather and in particular Shetland and Hebrides which are fully exposed to the north Atlantic and strong westerly winds are a high probability. Shetland and Orkney, including Fair Isle Channel and Pentland Firth, experience more frequent gales followed by Hebrides. Wave heights of 4m or more feature in these areas during adverse weather and 3m - 4m in Orkney. The Minches is sheltered by the Hebrides, hence the favoured route for shipping traffic and wave heights are usually less than 2m. There are exceptionally strong tidal flows through the Pentland Firth with currents up to 11 knots or so, and generally unpredictable and extreme weather conditions along with strong currents around the Shetland Islands.

5. The area remains the most environmentally sensitive area in the UK by a wide margin. It contains 6 Marine Environmental High Risk Areas (MEHRA) including north and south St. Kilda. There are numerous species of birds, marine mammals, fish, aquaculture and a fragile and precious ecology. The area is also famous for its scenic value, spectacular in many places. There has been a significant increase in identified marine protection areas since the Belton Study in 1995. The impact from marine pollution could have a catastrophic effect on wide stretches of coastline and also the livelihood of communities, both socially and economically.

6. A review of previous risk assessments in connection with ETVs was carried out and many of the risks concerning the area under review are the same. In particular these include environmental sensitivity to a marine pollution incident. This assessment identified a higher traffic density than previous assessments with a risk of an increasing trend of larger vessels visiting or transiting the area. The increasing cruise liner activity had not been considered previously either. Marine pollution from a laden oil tanker remains the worse-case scenario as would be expected.

7. An analysis performed for this assessment looked at the likely proportion of vessels which visit the area and might be assisted by an ETV over a range of bollard pull capacities. This was found to be a useful and simplistic way of assessing risk reduction against the range of bollard pull capacities. When associated with other risk factors, the conclusion was that an ETV with a bollard pull of about 120t would be likely to provide for a reduction in risk posed by drifting or disabled vessels into the ALARP (As Low as Reasonably Practical) range.

The main recommendations from the Study Team's assessment are summarised below:

1. The suitable ETV service can be provided by an AHTS vessel with a bollard pull of about 120t, comprehensively fitted and equipped for ocean and emergency towage operations in all weather conditions. This type of vessel also provides flexibility in usage for non-emergency work.

2. The ETV should not be confined to one particular base but have a patrolling function and be more centrally based within the area if practicable. Dedicated weather forecasting services will be an essential tool for determining patrol strategy as will close liaison with Vessel Traffic Services (VTS).

3. The ETV should be manned with master(s) and crew(s) with relevant sound experience in coastal, ocean and emergency towing. The crew complement should be at least 10.

4. Training of the ETV master and crew should be robust. Prior to joining the ETV, all personnel should attend an approved specific emergency towing course. Exercises and drills should be undertaken on a regular basis and training should be a continuous activity for ongoing improvement addressing all elements of the operations of the ETV and its functions. "*Live"* drills using voluntary vessels should take place at least annually, managed and coordinated by the MCA.

5. Should the ETV be tasked with non-emergency work, operational restrictions should be borne in mind and contingency plans prepared ready for implementation in the event a casualty vessel requires assistance.

1 INTRODUCTION

1.1 Engagement

1.1.1 On 5th April 2016, LOC was contracted by the MCA to undertake an independent *'Assessment of ETV Provision for North and North West Scotland'* including the size, type and suitability to meet the MCA's requirement in that area.

1.1.2 A Study Team was formed comprising individuals with relevant first-hand practical experience and knowledge in ETVs, both in their management and operation, marine emergency response and casualty management. The team was further strengthened with particular expertise relating to navigation in the subject area under review, marine transportation analysis, risk assessment and ship performance modelling.

1.1.3 The work was to be completed as a matter of urgency and outcomes to be presented to MCA/DfT and the Tug Working Group prior to the next scheduled Scottish ETV Meeting on 4th May 2016. The study has relied on data provided by the MCA, available in-house data (LOC) and published data together with the knowledge and experience of the Study Team.

1.2 Scope of Work

1.2.1 The Scope of Work is set out below and reflects the points which the Tug Working Group[1] determined need to be taken into consideration:

1.2.2 Assessment of the size, type and suitability for an ETV to meet the MCA's requirements in North and North West Scotland with particular attention afforded to the following:

- The type and density of shipping traffic in the specified area of ETV coverage, both historical (no further back than 2010) and a projection going forward;
- Specific hazards identified in this area of the UK EEZ to be highlighted, including recognition of tidal variances, making particular note of the areas around the Pentland Firth, Fair Isle and the Minches;
- The prevailing weather with due reference to data provided by the Meteorological Office: report on trends, i.e. weather generally improving, deteriorating or generally remaining fairly constant in the specified area;
- The environmental sensitivity of the coastlines in the specified area;
- For the recommended size of vessel, the suitability to perform other non-emergency work, crewing and training requirements and the on-board equipment necessary.

1.3 Structure of Study

1.3.1 It is inevitable that with the excellent Study Reports prepared on emergency towing by Captain C.Belton, RN (retired), 1995 (Belton Study), '*The Review of Emergency Towing Provision Around the Coast of the UK in 2000'* (MCA Report) and Marico Marine Group's *'ETV Assessment of Requirements Report of 2008'* (Marico Report), there will be repetition in this study where circumstances remain unchanged. Along with other notable sources, the study uses these publications as important references.

[1] Working Group set up to consider optimum emergency towing arrangements in N and NW Scotland

1.3.2 This study adopts a *"back to the future"* approach from the outset and re-visits the background which resulted in the introduction of ETVs. **Section 2** is dedicated to the history, purpose and development of ETVs, particularly around the UK coast and the depletion from four in 2010 to the single ETV in North and North West Scotland which exists today. General particulars of the current ETV "HERAKLES" are provided, the specification requirements to fulfil its function are summarised and the area of coverage illustrated. Statistics of ETV intervention from October 2011 to February 2016 are reviewed and summarised. Tugs in the CAST (Coastguard Agreement for Salvage and Towage) agreement and finally tug availability generally are considered, both within the area under consideration and beyond. Section 2 therefore, sets the scene – 'what has been?' and 'what is available today?' Against this background the study moves forward to consider other key factors leading to recommendations for ETV requirements.

1.3.3 There are some key criteria which warrant careful consideration in ETV requirement and selection. The first of these is traffic density and type affecting the area under review. **Section 3** performs an analysis of data which has been provided by the MCA and additional data which has been obtained. Particular attention is afforded to the main waterways as well as routes to ports and terminals in the Shetland Islands and Orkney Islands. Projections are made with due regard to developments in the subject area and how these may impact on shipping density and type.

1.3.4 **Section 4** considers special hazards which exist in the subject area. These were looked at in the Belton Study (chapter 3) but are re-visited here given improvement measures taken, changes to navigation routes, traffic type, and vessel size. The considerations include, but are not limited to, tidal regimes, particularly in the Pentland Firth, Fair Isle and the Minches, navigational risks associated with the length and features of coastlines and inland waters, including restricting water depths, underwater obstructions and outlying dangers. Future developments are considered and assessed.

1.3.5 Prevailing weather is a prime consideration not only from a risk aspect when casualty vessels have broken down, and/or are disabled and free drifting, but also when selecting the optimum ETV for size, bollard pull and from a dimensional and seakeeping quality standpoint. **Section 5** assesses representative weather statistics and considers possible trends which might impact on ETV selection.

1.3.6 Environmental sensitivity is another critical factor demanding close examination and this is considered in **Section 6.** The Belton Study addressed this and the current study updates the findings thereof given the increase in designated marine conservation areas since 1995. Risk to the marine environment from pollution has prompted annexes to MARPOL, far greater political and public awareness and particular concern from local interests in the subject area under review to provide measures to protect coastlines from the impact of casualty vessels and potential pollution. Authoritative data has been used in identifying environmental sensitivities in the subject area under review. Projections are considered for the subject area.

1.3.7 In **Section 7** the findings of risk assessments performed previously are reviewed and comments made as to the relevance and merit of the risks identified in today's context. With the findings from the analyses of shipping traffic discussed in Section 3, updates to the risk profile of the area under review are suggested.

1.3.8 Following the risk review undertaken in Section 7, the results of towage resistance calculations for various ship types are presented in **Section 8** which addresses bollard pull requirement and reduction in risk considerations. The towage resistance of various ship types is calculated and an indication provided of the proportion of the fleet operating in the area that would be serviced by ETVs with different bollard pull capacities. Ultimately this informs the selection of an ETV that is considered most appropriate to provide emergency towing services in the area and reduces the risk of a marine pollution incident.

1.3.9 **Section 9** addresses the selection of a suitable ETV. Factors considered are summarised, selection criteria discussed with particular attention afforded to type and design, seakeeping characteristics and ability to perform to requirements and type & dimension. Given the need to consider suitability for non-emergency work, this is discussed accordingly. Crewing and training warrants special attention as does the particular outfitting of the tug to meet its role as an ETV.

1.3.10 The assessment draws conclusions from the analyses and findings therein in the final section, **Section 10,** and makes recommendations on the selection of an ETV summarising the qualified reasons resulting from the study.

1.4 Study Team

1.4.1 The Study Team comprised:

David A Pockett, BSc (Hons), FNI, Master Mariner
Seagoing career in general cargo ships and chemical tankers up to and including command. Marine warranty surveyor and then consultant specialising in marine casualty management and investigations for 35 years. Member of the Special Casualty Representative Panel at Lloyd's.

Lucy Aldous, PhD, MEng, AMRINA, Mechanical Engineer
Specialises in advanced engineering analysis associated with shipping and offshore projects. Experience in marine transportation analysis, structural analysis and finite element analysis. Studied for a PhD in Energy and Engineering at the Energy Institute (UCL) which focused on statistical and theoretical ship performance models. Graduated from University College London with first class honours in Mechanical Engineering (MEng).

Drew Shannon, Master Mariner
Seagoing career on bulk carriers, container ships, tankers and AHTSs up to and including command. Salvage Master and later in-country (Australia) general manager of International Salvage Contractor. Managing and support role for ETV and towage operations including drills and training, emergency response plans and risk assessments. Member of the Special Casualty Representative Panel at Lloyd's.

Paul Whyte MBE, AFNI, Master Mariner
Seagoing career in general cargo ships and bulk carriers followed by a long career with the Royal Fleet Auxiliary with 12 years command experience in a variety of vessel types. Specialist navigator in both traditional and electronic "paperless" navigation systems. Investigates and advises on groundings, collisions and a wide variety of navigation disputes in a consulting and expert capacity.

Guy Dewdney, MEng, CEng, MRINA, Naval Architect
Specialises in technical analyses and investigations of a wide range of aspects including stability, strength and fatigue. Undertakes forensic engineering of complex issues and risk assessments.

1.5 Acknowledgements

1.5.1 Special thanks are given to the MCA for providing certain data essential for this Assessment and also those who provided helpful information about the regions under consideration and other relevant factors. In particular:

Caledonian Towage	Clarkson Platou Offshore
Comhairle nan Eilean Siar	Highland Region Council
Orkney Islands Council	Shetland Islands Council

2 EMERGENCY TOWING VESSELS, CURRENT ETV STATUS, CAST & TUG AVAILABILITY IN AREA

2.1 The Advent of ETVs

2.1.1 While the term Emergency Towing Vessels was not used, it could be argued that the first dedicated vessels to protect the coastline of a maritime state were the South African tugs "***JOHN ROSS"*** and "***WOLRAAD WOLTEMADE"***, both with bollard pulls exceeding 200t. With increased shipping plying the Cape of Good Hope following the closure of the Suez Canal in 1967 caused by the Six-day War, there was a significant increase in risk to the South African coastline. These tugs were delivered in the mid-1970s and provided much comfort and far less dependence on foreign salvage contractors who had salvage tugs on station, at least in those days. The track record of the two tugs was impressive to say the least, and both had been involved in many major casualties off the South African coast including several which were tanker related.

2.1.2 The French government was prompted to take action following the "***AMOCO CADIZ"***, the stricken tanker off Brittany in 1978, which resulted in widespread pollution. It was not long after this incident that two very large *"supertugs"* from the Les Abeilles fleet were stationed at Le Havre and Brest under contract to the French government and where a presence continues to be maintained.

2.1.3 ETVs were established in the UK in 1994 as a result of an in-depth inquiry ('*Safer Ships, Cleaner Seas'*) carried out by the late Lord Donaldson in 1994 and prompted by the tanker ***"BRAER"*** casualty off Shetland, north of Scotland (January 1993) and ***"SEA EMPRESS"*** in Milford Haven (February 1996). Germany, Spain and others soon followed.

2.1.4 Today, there are ETVs operating in Algeria, Finland, France, Germany, Iceland, the Netherlands, Norway, Poland, South Africa, Spain, Sweden, Turkey and the UK. Australia also operates emergency response vessels and other maritime nation states, Japan for example, have specific arrangements which are a variation on an ETV theme.

2.2 Prime Purpose of ETVs

2.2.1 The prime purpose of an ETV is to go to the assistance of vessels in difficulties, distressed or disabled, in order to take them under tow, and in so doing, save human lives or risk of danger thereto, and protect the marine environment by preventing, or reducing, the risk of drifting ashore and grounding, with a release of bunkers or cargo. The ETV can also be used to standby a disabled vessel in case the problem on board cannot be rectified and towage intervention might be required and also to act as a guard vessel and warn other shipping if the incident is in a shipping lane. The key here is having a proactive rather than a reactive approach to maritime incidents and protection of the marine environment.

2.2.2 The role of an ETV will vary according to prevailing circumstances. For example, it may be used to prevent a vessel from running aground or as a support vessel to a salvage operation if a vessel has taken the ground. In either case, the ETV should be stationed to have the optimum chance of useful intervention in a timely manner having in mind that a vessel drifting towards the shore in adverse weather conditions and a strong current, will have a shorter period of time before grounding than one in calm conditions.

2.2.3 Traditionally, ETVs are multi-purpose tugs which can provide towing services, anchor-handling, carry oil pollution prevention equipment and also have deck space for supplies and sufficient accommodation for their first responder task. ETVs are operated by the State Maritime Authority, although, how they are financed differs from state to state. It can be said that the ETV provides "*first response"* and *"first aid"* in many cases until, if it is deemed necessary, a professional salvage contractor takes over under a specific form of salvage contract.

2.3 Brief History of ETVs in UK Territorial Waters

2.3.1 Initially there were two ETVs, "***BRODOSPAS SUN***" and "***BRODOSPAS MOON"*** in the SW Approaches and Dover Strait respectively and operating only in the winter season. Following a review in 2000, two additional ETVs joined the fleet and station locations became Dover Straits, SW Approaches, The Minches and Fair Isle Channel. The ETVs were on sea patrol and only came into port for crew change, stores or bunkering. The above arrangement continued until the end of September 2011. The ETVs were:

- ***"ANGLIAN PRINCE*"**, 162tbp ; (now "AHT HERAKLES" the current sole ETV)
- ***"ANGLIAN PRINCESS"***, 200tbp;
- ***"ANGLIAN SOVEREIGN"***, 200tbp;
- ***"ANGLIAN MONARCH"***, 149tbp.

"ANGLIAN PRINCESS" is shown in Figure 1.

Figure 1 – "ANGLIAN PRINCESS" – ETV until 2011
(Source: channelimages.com)

2.3.2 The working criteria for the ETV fleet was that each tug would be operational 24 hours a day, 365 days a year and maintained at 30-minutes readiness to sail. One tug was allocated to each of the four operating areas on a rotational basis, worked around maintenance schedules. The Dover-stationed ETV was funded jointly by the UK and French Maritime Authorities. The four operating areas are shown in Figure 2.

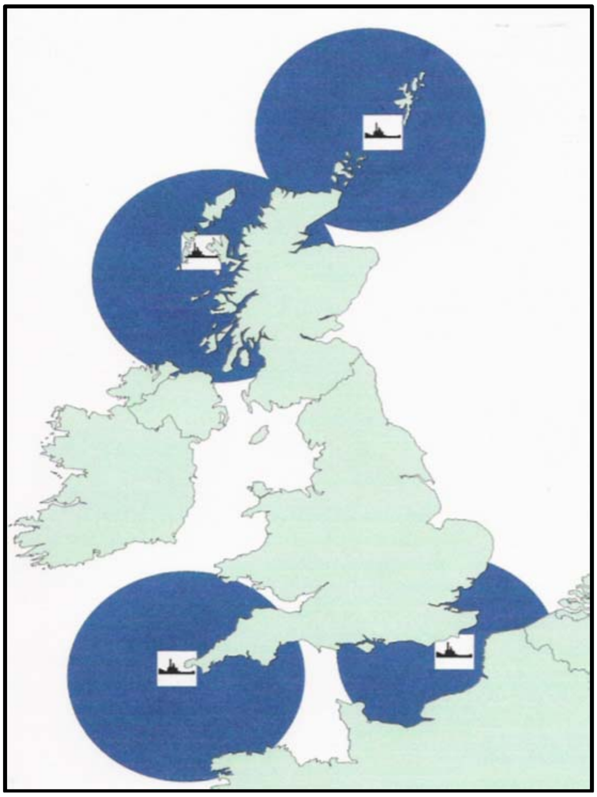

Figure 2 – Location of the Four Permanent UK ETVs until 2011 (Source: MCA)

2.3.3 In 2010, it was decided by the UK Government that as part of a spending review, the contract of two of the ETVs should not be continued after September 2011 with a reprieve for the other two for a short term. One was stationed in Shetland covering the Northern Isles and the other in Stornoway to serve the Western Isles. This arrangement continued until March 2012. Following recommendations of a working group established by the Scottish office, the Government agreed to reintroduce a single government funded ETV, to be based in Kirkwall until March 2016. This was to be the current ETV, "AHT HERAKLES". The agreement has been extended for a further 6 months.

2.4 The Present ETV "AHT HERAKLES"

Figure 3 – "Current ETV "HERAKLES" (Source: Marine Group Web Site)

2.4.1 “AHT HERAKLES” is an anchor handling tug built in 1980 for the then salvage and towing contractor United Towing of Hull when it was named “SALVAGEMAN”. The overall length is 69.07m, extreme breadth 14.86m, gross tonnage 1,641 and deadweight 1479t. The tug has 4 Ruston diesel engines developing 11,280 BHP, driving two controllable pitch (CP) propellers[2] in a fixed Kort nozzle[3] and producing service speeds ranging from 7.0kts (one engine at low RPM) to 17.5kts (4 engines at high RPM). The bollard pull is reported to be about 170t.

2.4.2 There are two towing winches with 1,200m of 70mm dia wire rope and a line pull of 200t on each layer. The tug is also fitted with an anchor handling winch. A data sheet of the tug as provided by Marine Group is included in Appendix A of this study.

2.4.3 The tug was sold by United Towing and after other ownerships, was purchased by Klyne Tugs in 1996 and re-named “ANGLIAN PRINCE” (Klyne Tugs was taken over by JP Knight Group in December 2007). It joined UK’s ETV fleet in 1998. In 2011, the tug was sold to the present owner, Rederi AB Nestor of Pitea, Sweden and is managed by Marine Carriers AB. It flies the Maltese flag and is registered with LRS.

2.5 ETV Specification Requirements

2.5.1 There is a Specification for Current ETV Provision which is entitled ‘*Provision of an Emergency Towing Vessel - Statement of User Requirements’*. This is included in Appendix B to this study and the main points are summarised below:

- To be on immediate standby to render emergency towing services from a designated station on the UK coastline;
- Maintain station instructions with the designated area of coverage;
- MCA tasking unless the tug is aware of immediate lifesaving when it can go directly without a tasking in accordance with SOLAS;
- Operational, maintenance and manning standards to comply with flag state, ISM compliant and in class with an IACS member;
- Inspection confirmation to IMCA’s published CMID on delivery;
- Capability requirements with respect to bollard pull, cruise speed of minimum 15 knots, safe operational & manoeuvrability for towage connection in anticipated weather conditions, continuous operation for not less than 10 days;
- Fitted for emergency towage and provided (by MCA) with lightweight floating tow system;
- Reliability & availability to be able to achieve 98% availability within 30 minutes of being tasked;
- Training – demonstration of professional competency.

[2] Propellers where the blades can be rotated about the long axis to change the pitch
[3] Propeller fitted with non-rotating nozzle to improve the efficiency

2.6 Specified Area of Coverage for ETV

2.6.1 The specified area of coverage for the ETV is illustrated in the Map of Specified Area (Figure 4 below).

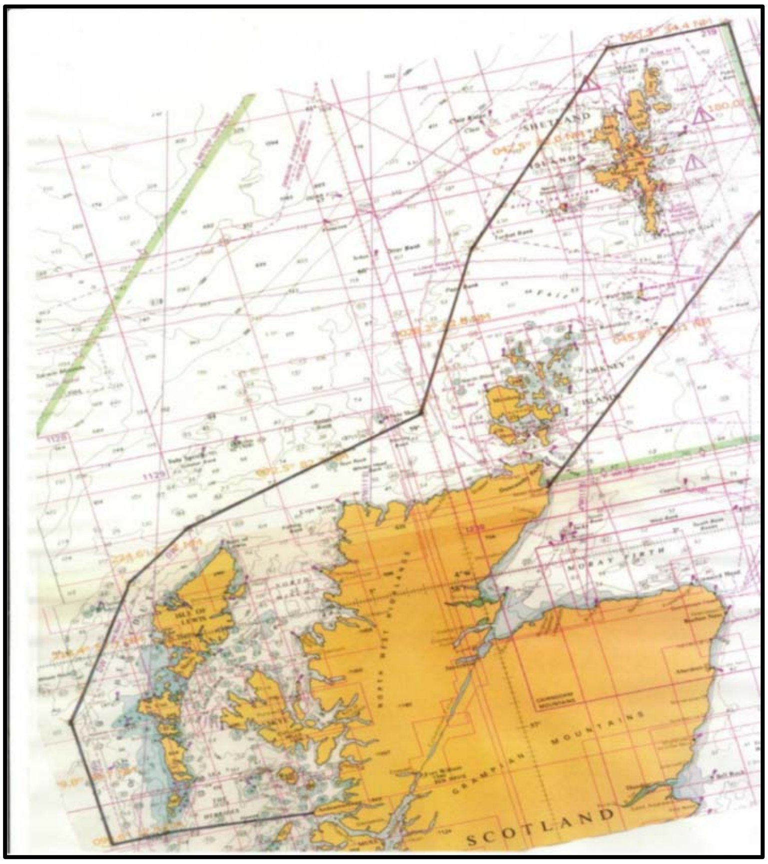

Figure 4 – Map of Specified Area for ETV

2.6.2 The station area boundaries for the ETV are defined as:

Latitude	Longitude
58 37.4N	003 33.0W
59 15.0N	003 33.0W
59 00.0N	002 27.0W
58 39.5N	003 01.5W

2.6.3 The operating area of the ETV is bound by the following coordinates and the ETV will be available to reach anywhere in the bounded area within 13 hours.

Latitude	Longitude
58 29.0N	003 03.0W
60 00.0N	000 00.0W
61 00.0N	000 00.0W
61 00.0N	001 10.0W
60 00.0N	003 00.0W
59 05.0N	004 00.0W
58 41.0N	006 31.0W
58 24.0N	007 14.0W
57 38.0N	008 10.0W
56 47.0N	008 10.0W
56 43.5N	006 14.0W

2.7 ETV Intervention from October 2011 to February 2016

2.7.1 Statistics provided by the MCA are tabulated in Table 1 below. In summary:

- 63 vessels had the potential to require assistance during the period;
- The ETV was tasked on 14 occasions;
- 24 vessels required towing assistance;
- 4 vessels were towed by the ETV and 20 by other means;
- The remaining vessels rectified their problems and resumed on passage.

Location	No of Casualty Vessels	Taskings	Towed / Intervened	Decisive	Directed (by SOSREP)
2011 (from 1 Oct 11)					
N & W Isles Region	1	1			
2012					
N & W Isles Region	7	2			
2013					
N & W Isles Region	10				
2014					
N & W Isles Region	18	5	2		
2015					
N & W Isles Region	25	6	2	1	
2016					
N & W Isles Region	2	1			
TOTAL	**63**	**14**	**4**	**1**	

Table 1 – MCA Casualty Statistics October 2011 – February 2016 (Source: MCA)

2.7.2 More detailed information has been provided by the MCA in ‘*Towage Provided in the Vicinity of the Northern and Western Isles*’ (see Appendix C). This provides information about the casualty vessels, location of casualty, nature and extent of casualty and ETV intervention. ETV towage intervention incidents are summarised below:

MV "NICOLA"

Figure 5 – MV "NICOLA" - (Source: MarineTraffic.com)

Incident: 19th October 2014 – casualty vessel (general cargo, GT 2,999, LOA 95.04m) broke down 25nm ENE of Cape Wrath. No commercial tug available. ETV "HERAKLES" deployed given location, timeframe and prevailing weather. Vessel towed to Scapa Flow.

MV "NORHOLM"

Figure 6 – MV "NORHOLM (Source: Vesselfinder.com)

Incident: 7th December 2014 - casualty vessel (fish carrier, GT 296, LOA 32.2m) broke down 2.5nm SW of Cape Wrath. ETV "HERAKLES" deployed and took tow over from lifeboat from Lochinver and towed vessel to Stromness.

MV "INDUSTRIAL KENNEDY"

Figure 7 – MV "INDUSTRIAL KENNEDY" (Source: FleetMon.com)

Incident: 7th May 2015 - casualty vessel (general cargo, GT 7,138, LOA 130m) broke down 94nm NW Shetland and drifting with potential to come close to two offshore installations within 24 hours. Commercial tugs not available within time frame – nearest 29 hours passage. ETV deployed and arrived in 13-14 hours and undertook tow. Casualty vessel towed to Lerwick.

MV "SKOG"

Figure 8 – MV "SKOG"- (Source: www.sjofartstidningen.se)

Incident: 24th November 2015 – casualty vessel (cargo/container, GT 4,462, LOA 99m) disabled and taking on water 8.7nm west of Westray, Orkney. ETV deployed in parallel with seeking commercial tug which was found to be too far away and ETV tasked as towing vessel. MCA had considered running vessel ashore if ETV could not arrive in time.

2.7.3 Deployment tasks for the ETV when not used for towage included standing by casualty vessels until commercial tugs arrived, acting as guard ship on a casualty scene to warn vessels from standing into danger, standing by a grounded vessel in case a commercial tug was unable to handle towage alone, search assistance for the cargo vessel ***"CJEMFJORD"*** which foundered in the Pentland Firth in January 2015, guard ship for vessel on fire and escorting the commercial tow by tug ***"EINAR"*** of a disabled vessel ***"SCHOKLAND"*** through Pentland Firth at the request of the tug master (2016). Miscellaneous activities involving the ETV have included being deployed to act as guard ship for a ditched helicopter in the Fair Isle Channel, being deployed to attach a line to helicopter wreckage awaiting the arrival of a salvage vessel and fire-fighting operations involving a dive support vessel in Kirkwall.

2.8 The Coastguard Agreement on Salvage and Towage (CAST)

2.8.1 Quoting directly from the Agreement in force, *"The Coastguard Agreement on Salvage and Towage (CAST) is a Maritime and Coastguard Agency sponsored framework agreement with the British Tugowners Association (BTA) detailing emergency chartering arrangements for towing services. The Agreement acknowledges that there may be occasions when a casualty vessel needs these services but the most appropriate salvage and towage solution is not readily available. In these instances the services of a less capable towing vessel may prove invaluable in either full replacement of the anticipated requirement, or as a means of reducing further risk to the casualty, until the most appropriate capability can be engaged".*

2.8.2 Within the area under review, signatory members to CAST had 7 tugs – 3 in the Orkney and 4 in the Shetland Islands with bollard pulls ranging from 45t to 55t. In the wider area, including Clyde and Leith, there were 2 signatory members to CAST with 3 tugs from 34t to 75tbp. There are other tugs in CAST stationed in Scotland but smaller and not deemed relevant.

2.9 Available Tugs in Area under Review

2.9.1 Including tugs connected with CAST, the study has considered available tugs in the subject area to assess if there might be suitable towage services which could be immediately available as a first responder facility in the event of a casualty. In doing so, enquiries have been made of salvage & towage brokers and also towing contractors in the area under review and beyond, as well as published information.

Orkney Islands

2.9.2 Orkney Council Harbour Authority (The Orkney Towage) owns 3 azimuth stern drive[4] harbour tugs, **"EINAR", "ERLEND"** and **"HARALD"** and operates a 24 hour towage service. The tugs each have a maximum bollard pull of 55t. Enquiries made confirmed that Flotta Terminal imports have ramped up and there is a higher frequency of export tankers. Also, at the Hatson Terminal, there has been an increase in cruise liners from last year. Tug duties are therefore mainly confined to harbour towage rendering assistance in berthing and un-berthing of tankers and gas tankers from the terminal jetty, also ship-to-ship operations for LNG, LPG and up to VLCC size. They provide towage assistance in the berthing and un-berthing of ship-to-ship operations and escort duties for oil tankers arriving and departing from Scapa Flow. Also, the tugs are required to assist berthing/sailing of cruise liners in the event of high winds. The tug **"EINAR"** was used to tow a disabled vessel MV **"SCHOKLAND"** at the western end of Pentland Firth in February 2016 but the ETV "HERAKLES" attended for monitoring purposes during the tow through the Pentland Firth with the fast flowing tide[5] (see also 2.7.3).

[4] Propellers installed in pods that can be rotated to provide 360° all direction propulsion force
[5] Towage provided in the vicinity of the Northern and Western Isles – source MCA – see also Appendix "C"

2.9.3 The Orkney Towage is a signatory to the CAST agreement with the MCA. In this respect, subject to availability, tugs can be made available to assist in emergency towing services in the N.Scotland region. However, given the primary duties of the tugs, their availability will be very much subject to shipping movements in Scapa Flow. As confirmed, the tugs are essentially harbour tugs.

2.9.4 There is a potential for the requirement of a fourth and larger tug in Orkney due to the growth in tanker and cruise liner activity and the need for cover for refits and the change in tug design/technology. This might provide a more capable tug to support emergency response as well as greater flexibility to release a tug for emergency response. In extremis, harbour operations would be suspended if harbour tugs were able to respond to an emergency call.

Shetland

2.9.5 Sullum Voe Port Authority owns and operates a fleet of 4 Voith-Schneider[6] propulsion tugs, ***"TYSTIE"*** and ***"DUNTER"*** having 53tbp and ***"TIRRICK"*** and ***"SHALDER"*** rated at 43tbp. The two smaller tugs have tow hooks and no towing winches. The tugs are stationed in Sella Ness. These tugs are also included in CAST.

2.9.6 The tugs' primary duties are to render harbour towage and towing services to tankers visiting SVT (Sullum Voe Terminal). As such, their availability and readiness to be a first responder towing facility much depends on shipping movements in Sullum Voe, but also on the prevailing circumstances, including weather and distance offshore for certification purposes.

Others within Area under Review

2.9.7 There are other owners and operators in the region with smaller tugs up to 45tbp range and also multicats[7] and shoalbusters[8] which are best suited to inland, shallow and coastal waters. There can be no guarantee they will always be stationed in home waters. Certainly these vessels would be no substitute for a dedicated emergency towing vessel.

Beyond Area under Review

2.9.8 Beyond the subject region there are a large number of anchor handling tugs in Aberdeen serving the offshore industry. Some will transit the area or in close vicinity from or to operations in the North Sea, perhaps north and west of Shetland and occasionally in the Irish Sea. However, there are none stationed in the subject area which can be relied or called upon for immediate mobilisation for emergency towage intervention duties.

2.9.9 There are tugs further afield in the Glasgow area and on the River Clyde in the 55-60tbp range and also Navy tugs. There is one tug in the Clyde, ***"KINGDOM OF FIFE"*** owned by Briggs Marine, having a bollard pull of 75t, but sometimes working with the Navy and also quite often outside the area. However, these tugs are well beyond a range whereby they could be mobilised in a reasonable period of time to provide emergency towage intervention within the area under review. Moreover, they are mainly harbour tugs and are not usually seen operating outside the river or its estuary.

2.9.10 On the east coast there are 2 tugs in Invergordon, ***"STRATHDON"*** and ***"STRATHDEE",*** owned by Caledonian Towage Limited, having bollard pulls of 65t. Enquiries confirmed that ***"STRATHDEE"*** is currently engaged in port towage duties and ***"STRATHDON"*** is on ad hoc charters which can take the tug outside of the area. These tugs could respond to an incident if available at the material time.

[6] Propulsion that converts shaft power into the acceleration of a fluid using a rotating axis perpendicular to the direction of fluid motion
[7] Shallow draught vessels used for a variety of support tasks usually coastal or inshore including towing and anchor handling
[8] Originally designed for contractor support in shallow waters, inland & coastal including towage and anchor handling; later design developments have expanded area of operational capabilities

2.10 Summary of Findings

2.10.1 Events and status can be summarised as follows and will be reflected in Risk Assessment (Section 7) and Recommendations for an ETV (Section 9):

- ETVs have been in existence, albeit under different names, since the mid-1970s;
- They were first introduced in the UK in 1994 following Lord Donaldson's '*Safer Ships Cleaner Seas*' Report;
- By 2010, there were 4 ETVs covering the UK coastline;
- From 2012, there was only 1 ETV covering N and NW Scotland and this has a reprieve until September 2016 subject to further recommendations;
- There were 63 identified casualty vessels within the area under review between October 2011 and February 2016 and ETV intervention on 14 occasions including 4 towage incidents;
- There were 7 tugs on CAST up to 55tbp within the area under review. Their availability is very much subject to harbour duties and prevailing circumstances. As harbour tugs, there are limitations in their operational capabilities;
- There are a few tugs beyond the subject area under review on the east coast and Clyde up to 75tbp. Aberdeen is not considered a reliable source;
- There are **no** tugs in the region which can be considered reliable first responders should emergency towage intervention be required;
- Harbour tugs have rendered emergency towing services on occasion and can be used subject to the prevailing circumstances and their operational capabilities.

3 TYPE & DENSITY OF SHIPPING TRAFFIC IN NORTH & NORTHWEST SCOTLAND

3.1 Preamble

3.1.1 The aim of this section is to establish the type and density of shipping traffic in the area. First, the vessel types operating in the area are identified using the AIS (Automatic Identification System) data provided by the MCA. Following that, for each area separately, the shipping routes, traffic density and vessel sizes are highlighted in further detail. An AIS brief is provided in Appendix D.

3.1.2 The dataset comprised the number of vessel entries into a pre-defined area between the years 2010 and 2015 and disaggregated by vessel type. The areas are shown in Figure 9. It is clear that two of the areas relevant to this study, Fair Isle North and Fair Isle South, including the most commonly used route - the Pentland Firth, are assumed to be merged in the AIS dataset (green area in Figure 9). The purple area represents the Hebrides and Minches.

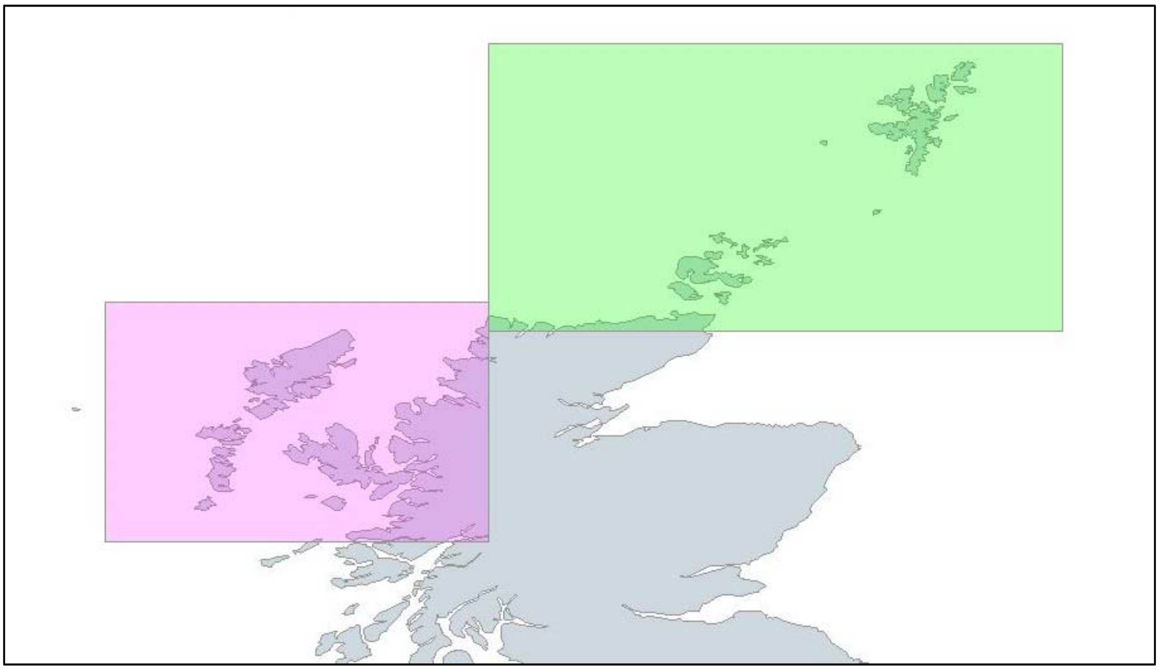

Figure 9: Areas into which vessel movements are recorded

3.1.3 The AIS data received is summarised graphically for all of the years (2010 to 2015) in Figure 10. It can be seen that there is a greater volume of vessel traffic in the Fair Isles relative to the traffic in the Hebrides and Minches. There is a one month gap in the AIS data in 2015, which will affect the observed trend in this final period.

3.1.4 The relevant vessel types considered in further detail in this section and for this study are fishing vessels, passenger ships, dry cargo vessels (including bulk carriers and container ships) and tankers. Although there are significant movements of pilot vessels, search and rescue vessels and tugs, these are not considered in further detail as they are deemed less likely to prompt ETV intervention. "*Other"* vessels comprise a significant number of movements, particularly in the Fair Isles area. However, in the absence of conclusive information these cannot be analysed in further detail.

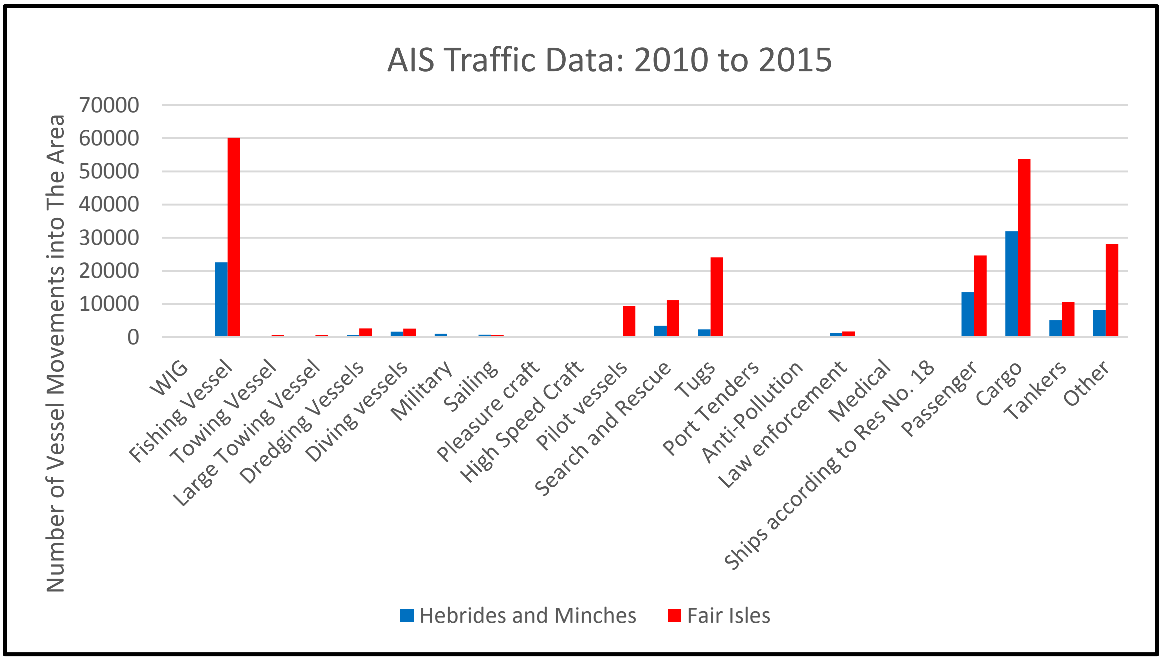

Figure 10: AIS data showing the number of vessel movements into the Hebrides and Minches and the Fair Isles areas between 2010 and 2015

3.1.5 The AIS data provided by the MCA was vessel specific. The MMSI (Maritime Mobile Service Identity) numbers of this dataset were matched to an in-house database of vessel characteristics (length, deadweight, beam, draught, etc.) using the MMSI numbers. This allowed for the frequency distribution of the vessels by size to be interrogated.

3.1.6 It is worth noting that not all of the MMSI numbers in the AIS dataset were found in the in-house dataset. For tanker movements in the Fair Isles area for example, 22% of the observations were matched. It is believed that the in-house dataset is a random sample of the global fleet and therefore the MMSI matches represent an unbiased sample that accurately represents the composition of the tankers operating in the area. However, unknown bias's affecting the sample can never be completely ruled out.

3.1.7 The use of this matching method is simply to observe the range of sizes of vessels that may be transiting into each of the areas. It is not a comprehensive review of all the vessels that have entered the area between 2010 and 2015.

3.2 Fair Isles

3.2.1 In 2012, as part of a shipping study for Marine Scotland, Anatec Limited and Halcrow performed a detailed commercial shipping analysis in the Pentland Firth and Orkney waters as part of a wider study (Marine Scotland Report), and which stands on its own merit and continues to be representative in many aspects[9]. The current study has not been able to analyse traffic densities to the same extent and detail. However, findings from the data provided by the MCA analysed here, do show many similarities and trends as the Marine Scotland Report.

3.2.2 The AIS data received from the MCA is summarised graphically in Figure 11. This is separated by year and the general increasing trend in fishing vessel movements to 2014 is evident. This peak however, is affected by the missing data in 2015. Dry cargo vessel movements follow a similar trend. However, they peak slightly earlier in 2013. The movement of passenger ferries has remained more or less constant while the tanker movements have decreased slightly year on year, probably reflecting the reduction in oil price over the period. See also Figure 12. However, tanker movements within the area have increased sevenfold to and from Orkney/Scapa Flow.[10]

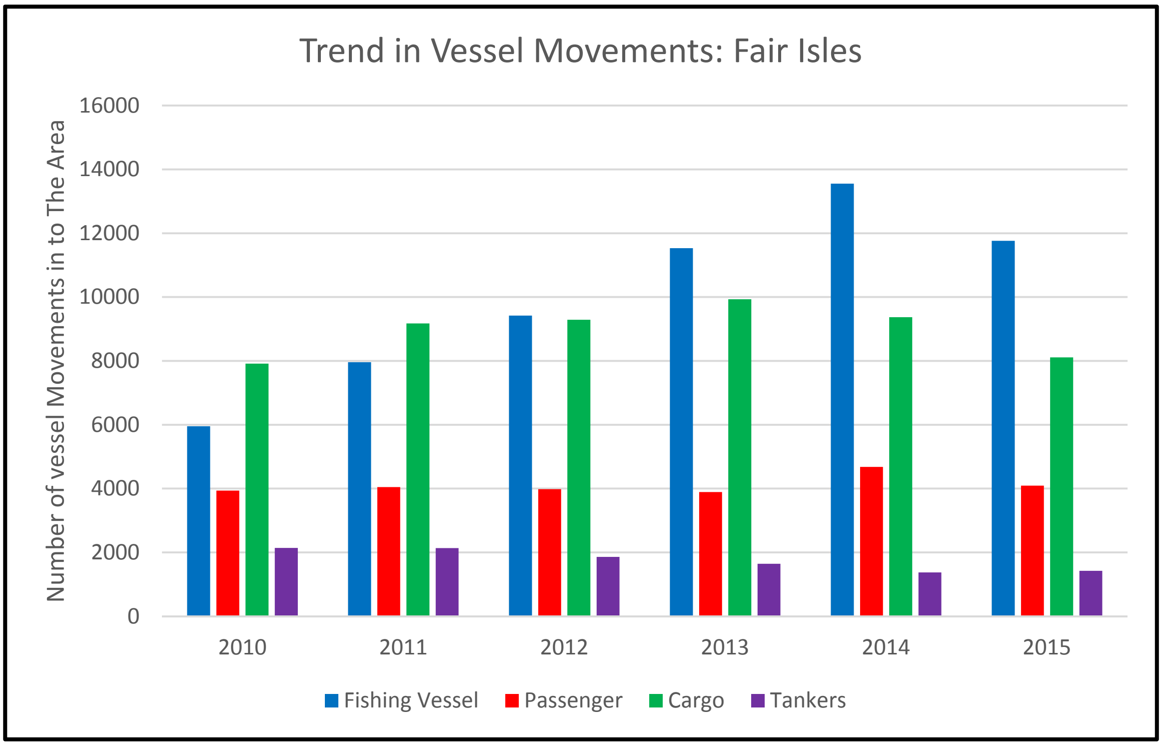

Figure 11: Trend in vessel movements in to the Fair Isles between 2010 and 2015 (2015 dataset incomplete)

[9] Shipping Study of the Pentland Firth and Orkney Waters by Anatec and Halcrow dated 9th November 2012 – Section 7
[10] Orkney Islands Council Marine Services, 2016

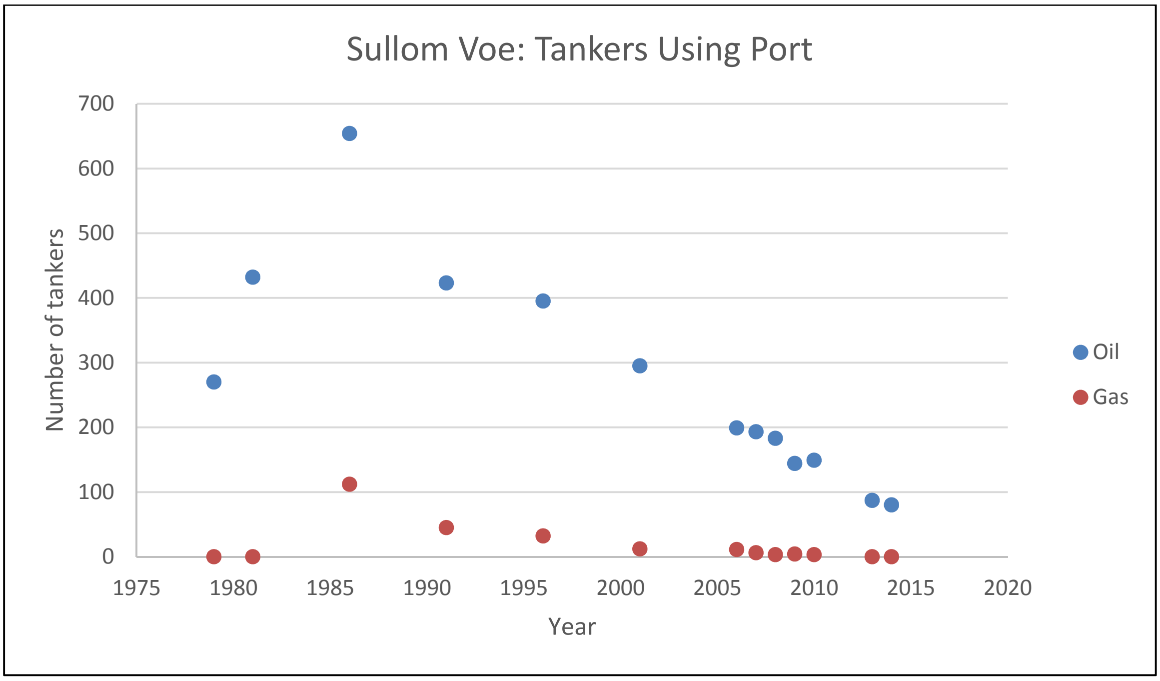

Figure 12: Trend in tankers using the Sullom Voe Port (Source: Shetland in Statistics)

3.2.3 The Pentland Firth has the highest density of traffic in the area under review. The Marine Scotland Report found a daily average of 76 vessels pass through the Firth during the winter months although this includes fishing vessels which pose little or no threat.

3.2.4 The Marine Scotland Report highlights seasonal variations in vessel types operating in the Pentland Firth and Orkney water areas that has shown an increase in the volume of passenger and offshore vessels operating in summer relative to winter. The trend of increase in passenger liner traffic is expected to continue (see also Projections – 3.5 below).

Passenger Vessels

3.2.5 At Haston Terminal the frequency of cruise liners has increased from last year. The Orkney Island Council publishes the schedule of cruise vessels due to arrive at the island and this is used to indicate the general sizes of vessels that are likely to be in the area. There are other vessels operating in and around the area. The increase in cruise vessels warrants growing attention in terms of the vessel size and type that might suffer a break down and need towage intervention. It is reported that there were 85 cruise vessels visiting in 2014, 95 in 2015, 117 are expected in 2016 and 128 in 2017.

3.2.6 A histogram of vessel draughts, overall lengths and maximum capacities of cruise ships arriving in Orkney in 2016 is shown in Figure 13. There is no definitive standard shape to the distributions.[11] The draught exhibits a more uniform distribution with a noticeable reduction in the number of port arrivals of vessels with a draught between 6.5 and 7.0m.

[11] Orkney Islands Council Harbour Authority

3.2.7 The range and average size of cruise ships arriving in Orkney is also shown in Table 2.

	Max Capacity, persons	Length Overall, m	Draught, m
Smallest vessel	12	56	3.7
Average vessel	600	175.3	5.8
Largest vessel	3300	333.3	8.65

Table 2: Range and Average Size of Cruise Ship Arriving in Orkney, 2016

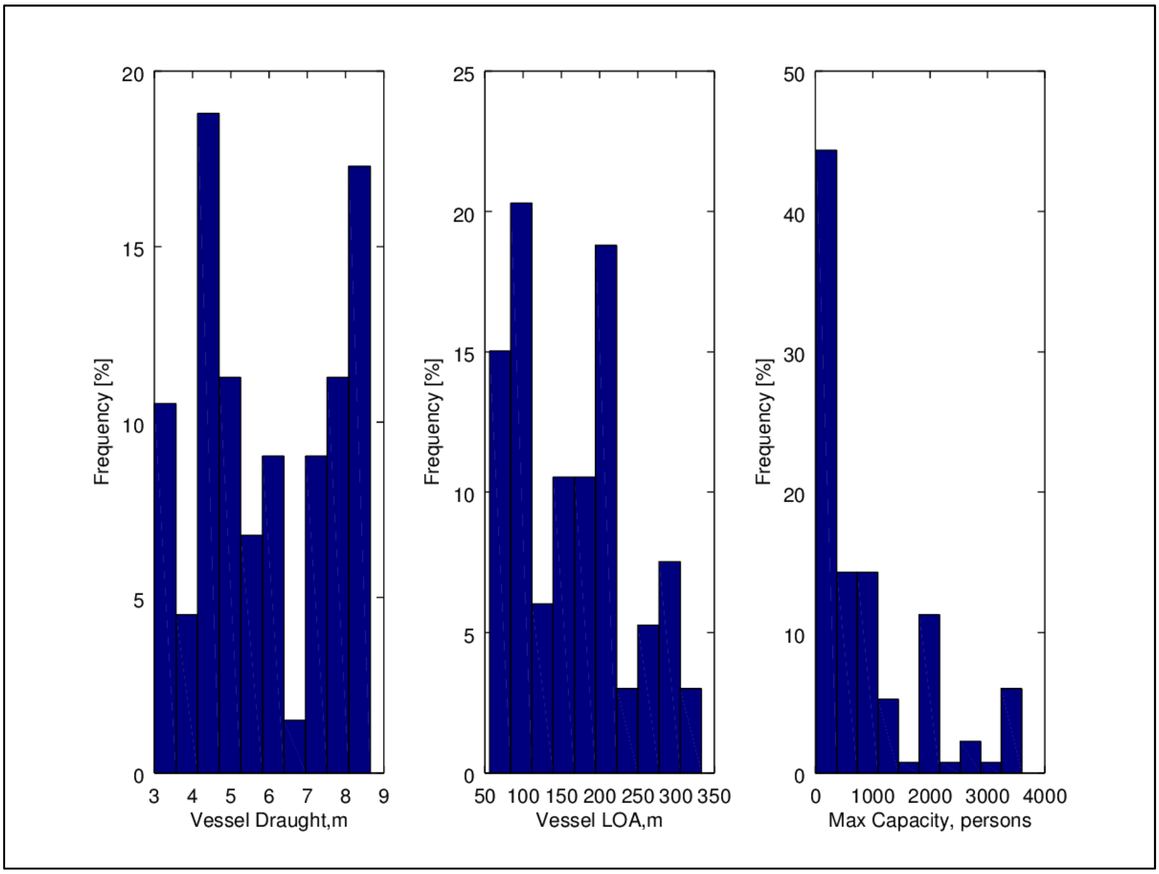

Figure 13: Vessel draught, overall length and maximum capacity for cruise ships visiting Orkney in 2016

3.2.8 Statistics for cruise ships arriving in Shetland were not obtained. However, data from the Lerwick Port Authority demonstrates the general increasing trend in cruise liner arrivals over the past few years as shown in Figure 14.

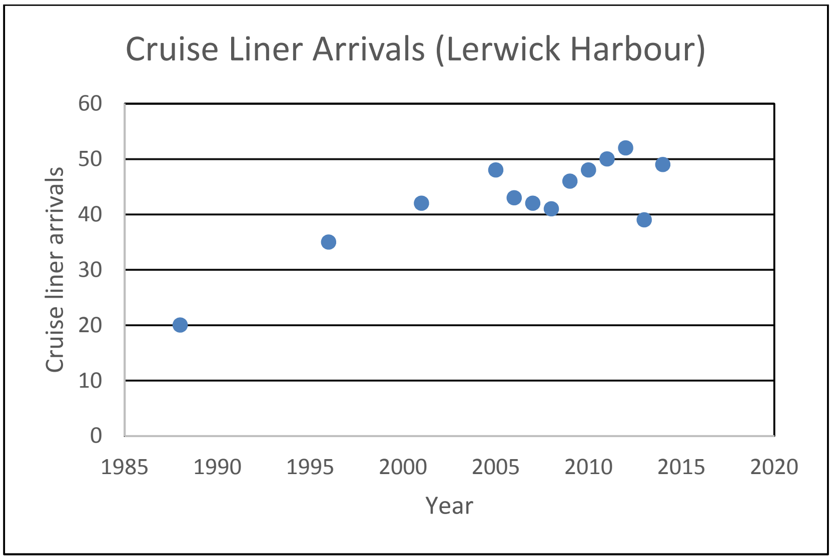

Figure 14: Trend in cruise liner arrivals at Lerwick Harbour (Source: Lerwick Port Authority)

There is busy ferry traffic between Orkney and mainland Scotland with up to 8 visits per day.

Tankers

3.2.9 The MMSI match showed the frequency distribution of the vessel lengths for the tankers transiting into the Fair Isles area and this is presented in Figure 15. As mentioned previously, the observations in the AIS dataset on which the below plot is based are not vessel specific but reflect movements of vessels into the areas that are defined in Figure 9.

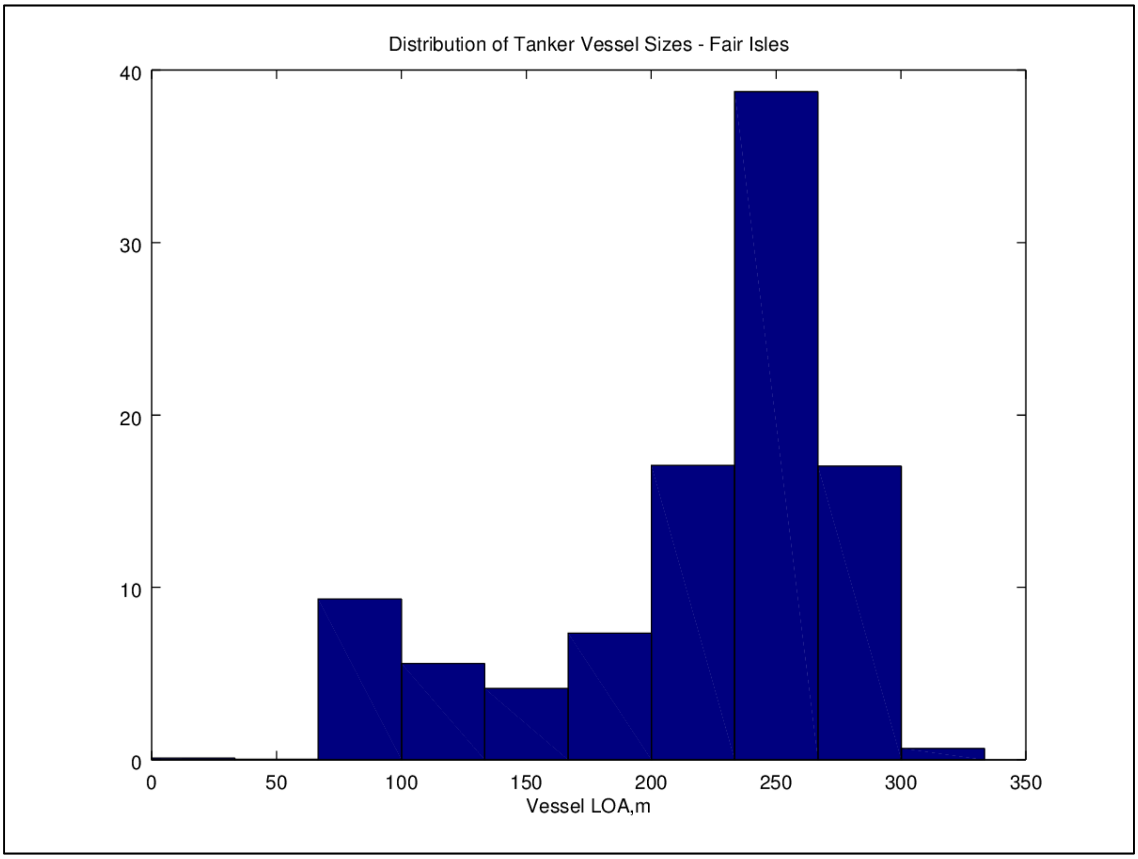

Figure 15 – Distribution of Tanker Vessel Sizes – Fair Isles

3.2.10 Over the time period 2010 to 2015, the tanker sizes most frequently observed entering the Fair Isles area are of Panamax[12] and Aframax size[13], there are also larger Suezmax[14] tankers operating in the area. There are also 48 observations of VLCCs (vessels 330m in length), some of which were bound for Scapa Flow for STS operations. The data includes LNG tankers of around 100 000t and approximately 300m in length which are also known to operate in the area including STS operations in Scapa Flow. There are also LPG tankers of 35,000t bound for that location.

Dry Cargo Vessels

3.2.11 The MMSI match showed the frequency distribution of the vessel deadweights for dry cargo vessels transiting into the Fair Isles area. This is presented in the left hand graph of Figure 16. This includes bulk carriers, general cargo vessels as well as container ships. Most of the dry cargo vessels are Handysize[15] or Handymax[16], although post-Panamax[17] size vessels are also observed along with a few Capesize[18] ships.

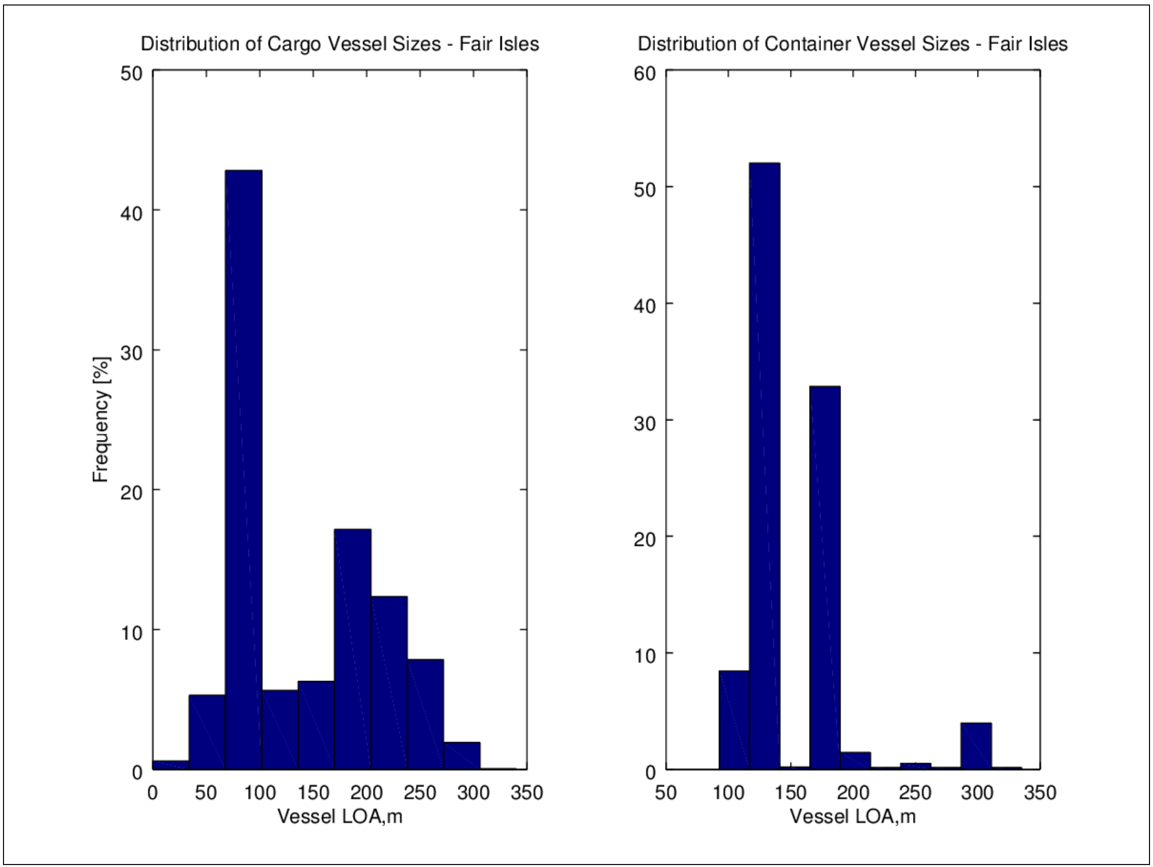

Figure 16: Vessel lengths for the cargo carriers and container vessels transiting into the Fair Isles area

3.2.12 Included in dry cargo vessels are container vessels and the distribution of the sizes of these vessels transiting into the Fair Isles are summarised in Figure 16 (right hand side). Again, the majority of these ships are at the smaller end of the spectrum although post- Panamax vessels are also observed.

[12] Maximum length 294.13m; 65,000t DWT average
[13] Average Freight Rate Assessment – medium size oil tankers – 80,00 – 119,999t DWT - circa 245m
[14] Mid-size cargo vessel 120,000 - 200,000t DWT
[15] Small sized cargo ships less than 60,000tDWT
[16] Small sized ships 15,000-35,000t DWT
[17] Larger than Panamax – supertankers, container and passenger ships for example
[18] > 150,000t DWT

Other

3.2.13 This category does not increase our knowledge of the vessel types in the area as this field is unidentifiable. However, it is reassuring to see that there are not larger vessels in this category that have been omitted causing us to have a skewed perception of the traffic in the area

3.2.14 There were 2,392 observations of ships that were categorised as "*other*". This category includes bulk carriers, general cargo vessels, chip carriers and unidentified types. Of these, 2,334 could be identified by their MMSI number and the vessel lengths identified. Most of these vessels are relatively small - approximately 50m in length (Figure 17). They do not have a significant influence on this study.

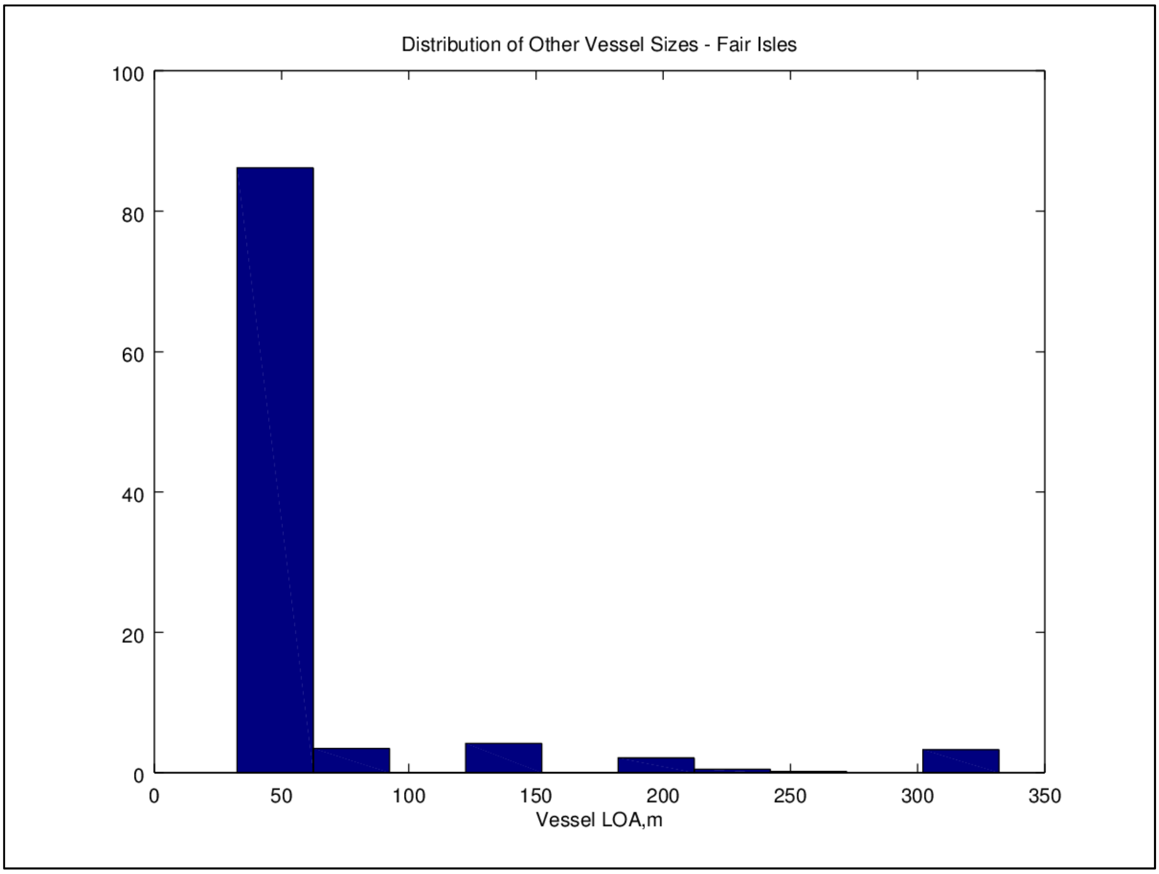

Figure 17: Distribution of vessel lengths for the "other" category – Fair Isles

3.3 Hebrides and Minches

3.3.1 In a similar way to the previous section, the AIS data is presented to show the trend in vessel movements into the Hebrides and Minches area between 2010 and 2015. This is shown in Figure 18. The trends are very similar to the data for the Fair Isles; the volume of fishing vessel traffic increases over the time period, as does dry cargo vessels which peak at around 2014, volumes of passenger vessels remain more or less constant while tanker volumes reduce slightly between 2011 and 2015. Again, the missing data in 2015 will affect the observed trend in this final period.

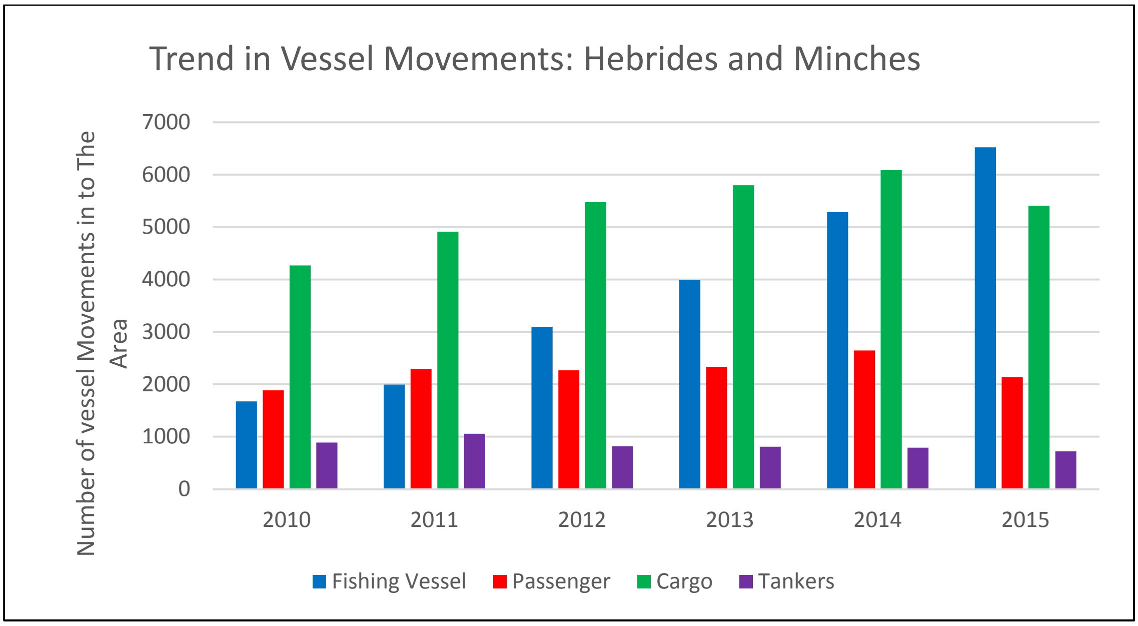

Figure 18: Trend in vessel movements in to the Hebrides and Minches area between 2010 and 2015 (2015 dataset incomplete)

3.3.2 The Hebrides area may be split into the Outer Hebrides/Deep Water Route (DWR) to the north west of the Hebrides and the Inner Hebrides/ Minches - the channel between the Hebrides and the Highlands. As described in a study of the traffic routing in the area[19] virtually every type of marine traffic can pass through the Minches as well as the DWR. The Hebrides area may be utilised by vessels travelling from Scandinavia, East Scotland and northern North Sea oil fields to Ireland, west coast UK and the Atlantic. This is often more economical and less busy than passing through the English Channel and south of the UK. Concerned about the potential for oil pollution incidents, the IMO recommends[20] that laden tankers of over 10,000gt use the DWR route rather than going through the Minches. This has reduced the volume of traffic through the Minches.

Passenger Vessels

3.3.3 There is busy ferry traffic throughout the year between Stornoway and Ullapool and also between ports within the western Isles and mainland Highlands. The frequency is affected by season but nevertheless, is a continuous service.

3.3.4 Current scheduled cruise ship visits to the Highlands Isles in 2016 have been obtained and it is noted that these include Fort William, Inverie, Kyle, in the Highlands, Portree and Loch Scavaig on the Isle of Skye and the islands of Raasay and Rum.

3.3.5 82 visits are scheduled and 21 liners are involved, the smallest being the motor yacht **"LORD OF THE GLEN"**, 45m LOA and passenger carrying capacity of about 54. This vessel makes a scheduled 34 of the total visits. The largest is **"ZUIDERDAM"** 291m LOA, draught 7.8m and passenger carrying capacity of over 2,000. The frequency of visits has increased since 2014.

3.3.6 It is noted from the Stornaway Port Authority website that cruise liners visit the port and anchorage. There are 68 planned visits in 2016. In 2014 there were 37 cruise liner visits which demonstrates an increasing trend in the Western Isles.[21]

[19] Comhairle Nan Eilean Siar and Highlands Council, "*Traffic Routing in the Minches and West of Hebrides*" project nr ELP – J55188, SaS CEMT01, 2005
[20] Adopted November 1993
[21] Stornowayportauthority.com - Cruise

Tankers

3.3.7 The pattern of tanker vessels transiting into the Minches and Hebrides area is very similar to that of the Fair Isles. Most of the vessels are Aframax size with a few Suezmax sizes also operating in the area. A handful of VLCC observations are also represented in the data.

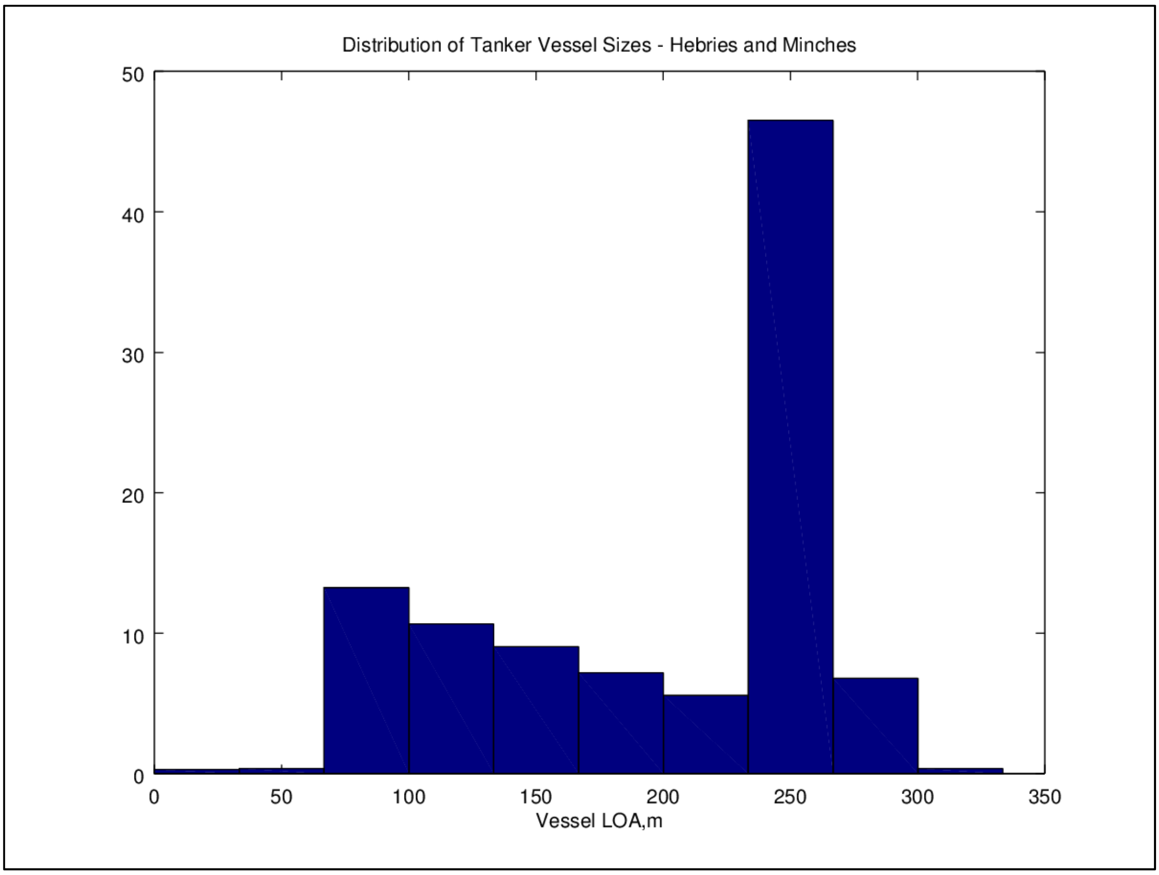

Figure 19 – Distribution of Tankers – Hebrides and Minches

Dry Cargo Vessels

3.3.8 The size distribution of dry cargo carriers operating in the area (Figure 20) is again very similar to the pattern of the vessels into the Fair Isles, although there are a fewer number of ships in this area. The container vessel pattern is different in the Hebrides and Minches area in that the most frequent vessel size is post-Panamax rather than a much smaller 125m length vessel which was seen to frequent the Fair Isles.

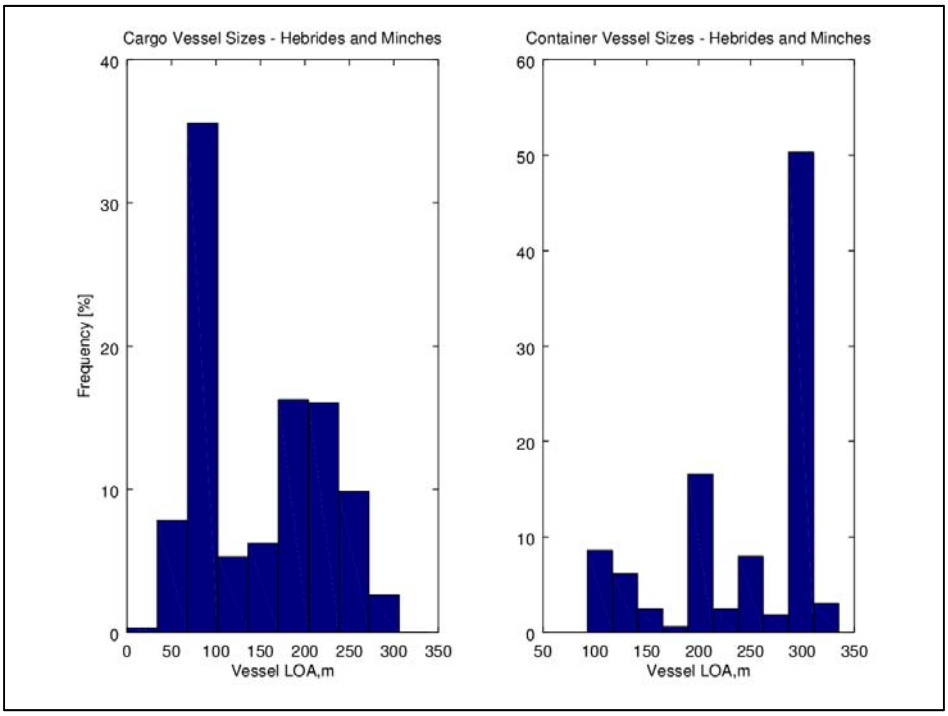

Figure 20: Vessel lengths for the dry cargo carriers and container vessels transiting into the Minches and Hebrides area

Other

3.3.9 Of the vessel observations in the AIS data that were categorised as “other”, only 35 of the MMSI numbers could be matched to the MMSI numbers in the in-house database in order to extract the vessel sizes. The distribution is shown in Figure 21 below and these vessel lengths are between 65m and 244m. It is recognised that in reality there may be a wider ranging vessel size transiting the area categorised as *“other”*.

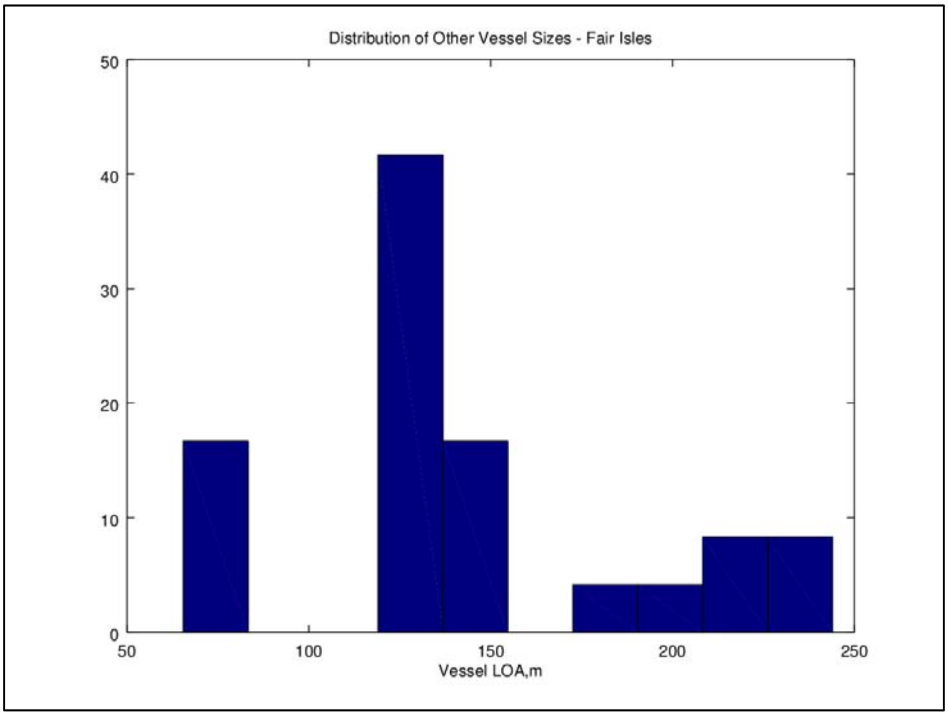

Figure 21 – Distribution of “Other” Vessel Sizes – Minches and Hebrides

3.4 Observations from 2012 AIS Data

3.4.1 Whilst the MCA data provides vessel types that enter a *"box",* the route *"from", "to"* and *"via"* are key in making a judgement of the risk to the coastline. From shipmap.org using AIS data for 2012, the images below in Figures 22 to 24 have particular interest and relevance and it is considered that traffic density and type will not have changed significantly since that time.

3.4.2 Figure 22 below provides the data for the whole of 2012. The traffic pattern is clearly seen around the UK coast. Observations from the area under review are:

- The ATBA around Shetland seems to have been observed;
- There is a high density of traffic passing through the Pentland Firth;
- Approach to Sullum Voe is mainly from the north;
- High density of traffic around Cape Wrath;
- High density of traffic through the Minches;
- Light density of traffic through the DWR off the Hebrides.

Figure 22 – AIS Data for 2012 (Source: shipmap.org)

3.4.3 Figure 23 below shows all vessel types apparently using all routes. The concentration along shipping lanes, as well as the scatter in all waters tell a story. The most important observation is the 'path of least resistance', i.e. the propensity to use the shortest route through the Pentland Firth.

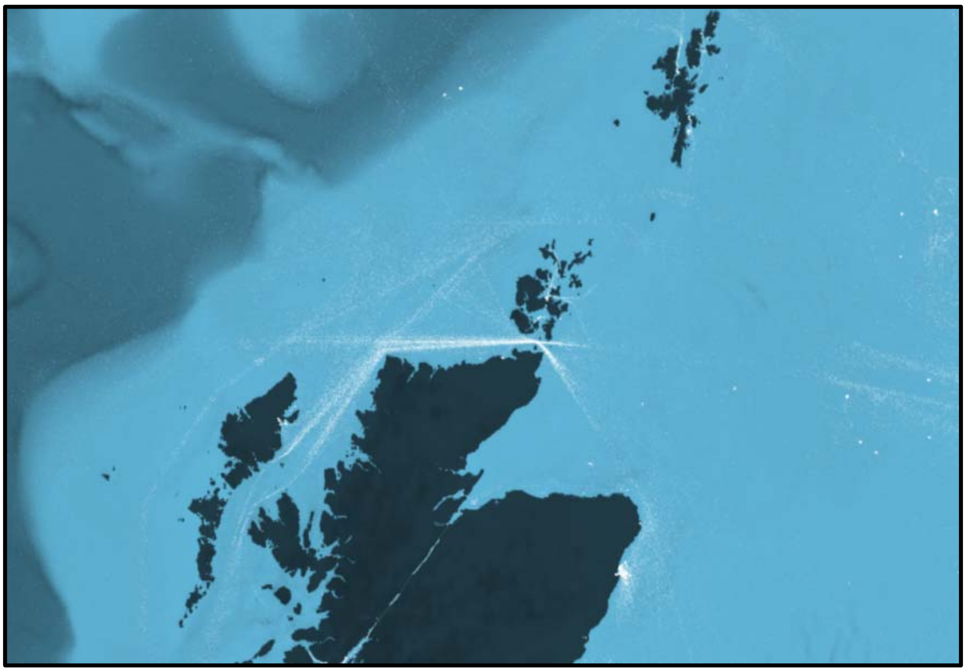

Figure 23 – All Vessel Types Using all Routes (Source: shipmag.org)

3.4.4 The image below in Figure 24 only shows tankers and gas carriers. It shows concentrations around oil fields and ports, and shipping routes that are both inside (more) and outside (less) the Hebrides, and through each island gap. The Minches routing system appears to be working thereby reducing risk of collision encounters.

Figure 24 – Tankers and Gas Carriers 2012 (Source shipmag.org)

3.5 Projections

3.5.1 Enquiries have been made to various organisations regarding projections on traffic density going forward. Research has also been made of information in the public domain. Findings are summarised below.

Shetland

- The Sullum Voe Terminal receives about 85 tankers per annum and this is predicted to increase up to 120 tankers by 2019. The tanker size, however, is not expected to increase to greater than Aframax. As far as other energy projects go, there are no renewable energy projects forecast. Occasional smaller cargo vessels visit and this will continue.
- The number of cruise liners visiting Lerwick is anticipated to be steady at approximately 50 this year with a slight increases going forward.
- Ferry traffic is expected to remain constant.

Orkney

- Flotta Terminal has about 50 tanker visits per year (Aframax and Suezmax) which is forecast to be fairly static in future years. With regards to ship-to-ship oil transfer activities, these are increasing for vessels at anchor. Up to 16 operations per year are anticipated which may be one-to-one or one-to-multiple tankers and hence are expected to generate a further 40 plus tanker moves per year. They will include VLCC to Aframax transfers, VLCC to VLCC transfers and LNG transfers for LNG vessel sizes in the range of 85,000t to 100,000t deadweight. Shale gas tankers in the size range of 30,000t to 40,000t also operate in the area and the frequency of visits may increase if the oil price climbs.
- The cruise liner business is expected to increase by about 10% year on year with nearly 130 visits booked for 2017.
- Ferry traffic, already up to 8 per day to mainland Scotland and 30-40 internal return trips a day is anticipated to remain at least at that level.
- A tidal energy project is under way in the Inner Sound and there may be development of another tidal project south of the Island of Hoy. This is unlikely to have any impact on traffic density but the turbine field will constrain traffic movement to a narrower section of the Pentland Firth in adverse weather conditions.

Western Isles and Highlands

- Cruise ship visits to the Highlands are predicted to increase year on year.
- Cruise liner visits the port of Stornoway are expected to increase year on year.
- The port can berth up to 156m in length and a maximum draught of 6.5m. Larger cruise ships anchor in the outer anchorage and there are 68 planned visits in 2016. In 2014 there were 37 cruise liner visits which demonstrates an increasing trend in the Western Isles[22].
- There remains a high number of ferry trips between Stornoway and Ullapool which is expected to continue.

[22] Stornowayportauthority.com - Cruise

Offshore Industry

- There may be an increase in oil and gas support vessels around the west of Shetland with the Clair and Clair Ridge Oil Fields, Foinhaven Field and the Schiehallion Field in the next 2 or 3 years. BP has a 7 year drilling programme. Future developments include Chevron's Rosebank development and there has been drilling activity for Shell west of Hebrides. Drilling activities are anticipated for other operators west of Shetland.

3.6 Summary of Findings

3.6.1 Data from various sources has been collated and presented in this section. As well as establishing an overview of the ship types operating in the areas, it has attempted to disaggregate this by vessel size by matching MMSI numbers to an in-house database. It was not possible to match all AIS vessel observations to known vessels and ultimately to size them. However, the data that has been analysed is still based on a large number of observations (see Table 3 below) and there is no reason to suspect a biased sample. The local knowledge of key parties including councillors, harbour masters and port authorities were consulted and who also corroborate the broad trends and conclusions made herein.

3.6.2 Generally, it is clear that fishing and dry cargo vessel types are the most prevalent in both areas, followed by passenger ships and finally tanker vessels. Traffic volume is greater in the Fair Isles relative to the Hebrides and Minches and in particular the Pentland Firth remains a point of concentration in the area under review. The most prevalent vessel sizes are Aframax to Suezmax for tankers, Panamax for container vessel transiting the Hebrides and Minches and feeder container ship size for those transiting the Fair Isles. The most frequent dry cargo size is Panamax. The vessel lengths are summarised in Table 3. Cruise vessels that are planned to visit Orkney Island in 2016 are between 56m and 333m in length.

	Fair Isles				Hebrides and Minches			
	Tanker	Dry Cargo	Passenger	Container	Tanker	Dry Cargo	Passenger	Container
Mean	218	142	163	149	200	149	161	245
Maximum	333	340	333	335	333	340	298	335
Number of matched observations	7513	9604	133 vessels	2334	3042	9104	21	163

Table 3: Summary of Vessel Lengths (m) operating in the Areas under Review

3.6.3 This data is corroborated by the Marine Scotland Report which found the longest vessel was the tanker, ***"FIDA"***, at 333m, tracked to the north of the Strategic Area and en route to Hound Point marine terminal in the Firth of Forth during the summer period. The Report also found that the longest vessel during the winter survey was the fully cellular containership, ***MSC "ELENI"***, at 294m. This was tracked transiting through the Outer Sound of the Pentland Firth, en route to Bremerhaven.

3.6.4 Estimates of bollard pull appropriate for towing vessels of all types identified are presented in Section 8 when considering the required size and type of an ETV going forward.

3.6.5 With regards to future developments, enquiries found there was no information to suggest there are any new developments anticipated in the foreseeable future which might have a significant impact on traffic density affecting the area under review. Cruise liner activity is the only area where increases are anticipated. Falling oil price and its impact on the global economy is an influencing factor coupled with slower global growth generally. For the purpose of this study, it is considered appropriate to consider the present traffic density and type as reasonably representative for the next 3-5 years.

4 SPECIFIC HAZARDS

4.1 Preamble

4.1.1 Lord Donaldson's, *'Safer Ships, Cleaner Seas'* Report addressed vulnerable coastal areas as 'areas with particular routeing problems', a sentiment echoed by various authorities concerned with any adverse impact of a maritime casualty to the local environment and economy[23].

4.1.2 This section considers the 'specific hazards' to the North and North West Scotland sub-divided into the following coastal areas (see Figure 25):

- Minches and Hebrides;
- Fair Isle North;
- Fair Isle South.

4.1.3 The islands of the British Isles have been shaped by numerous glaciations with the west coast of Scotland weathered by the Atlantic Ocean, resulting in a coastline generally characterised by long peninsulas, headlands and bays.

4.1.4 A characteristic of these coastal areas are designated *"special areas"* based on their ecological and environmental sensitivity. These isolated special areas are also exposed to harsh weather, and are vulnerable to concentrations of marine traffic following sea lanes that experience strong tidal currents, and vessels hampered by topography and isolated dangers.

4.2 Environmentally Sensitive Areas

4.2.1 Under IMO, MARPOL regulations have defined and identified "*Particularly Sensitive Sea Area"* that need special protection because of significant ecological or socio-economic or scientific reasons, and might be vulnerable to damage by maritime activities. In 1999, the waters of the North West European continental shelf were identified as a particularly sensitive sea area.

4.2.2 Additionally, environmentally sensitive areas known as Marine Protection Areas (MPAs) are safeguarded by ATBA annotated on nautical charts as a caution to shipping. The North and North West of Scotland have numerous such environmentally sensitive areas on exposed coastal areas, which are managed by both passive and active measures to reduce the likelihood of maritime casualties. There are also pending Special Protection Areas (SPAs), two of which cover much of Orkney. Figure 25 identifies the ATBA and the ETV operating area.

[23] *Safer Ships, Cleaner Seas*, section 14.21

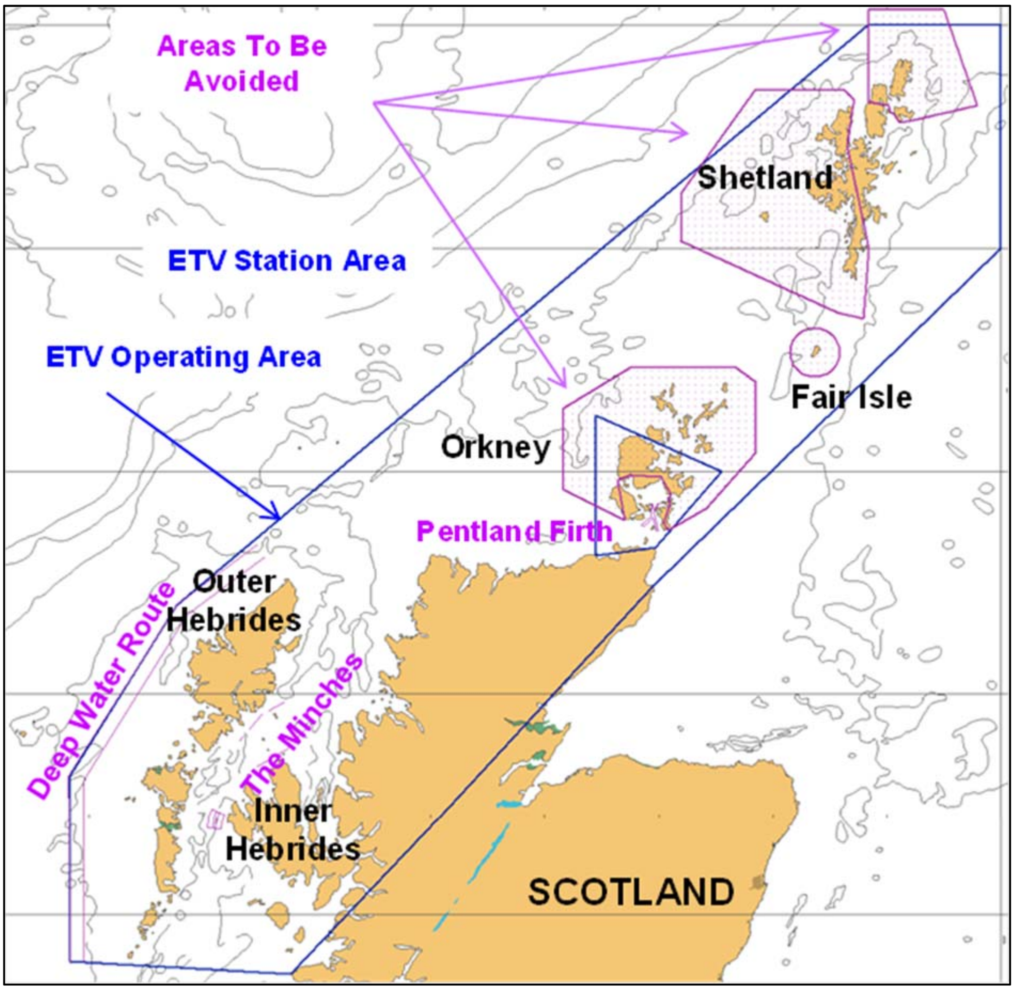

Figure 25 - Operating Area and Areas to Be Avoided

4.2.3 The Belton Study in-depth analysis of 'danger areas' took account of risk and environmental assessments, including the effect of potential oil spills on the fishing industry, agriculture and tourism. The risk factors took account of traffic density, navigational hazards, weather, and the availability of harbour and coastal tugs, and suitable offshore vessels. (See also Section 3.)

4.2.4 For the purpose of this Study, 'specific hazards' are defined as those that can be a source for, and impact on, a marine casualty, and can also be a source of potential damage to the marine environment. Examples are traffic type and density, traffic management, routing measures, navigation aids, coastline features including outlying dangers and water depths, local weather, currents and tides, tug availability and the omnipresent propensity for human error.

4.2.5 The provisions of the United Nations Convention on the Law of the Sea 1982, allows places that have been given the status of a particularly sensitive sea area, to have specific measures to control maritime activities, such as routeing measures, strict application of MARPOL and the installation of Vessel Traffic Services.

4.3 General Climate

4.3.1 The effects of the Gulf Stream converging on the continental shelf give the British Isles a temperate marine climate, which brings significant moisture and raises temperatures about 11°C above the global average for this latitude. See Figure 26 below.

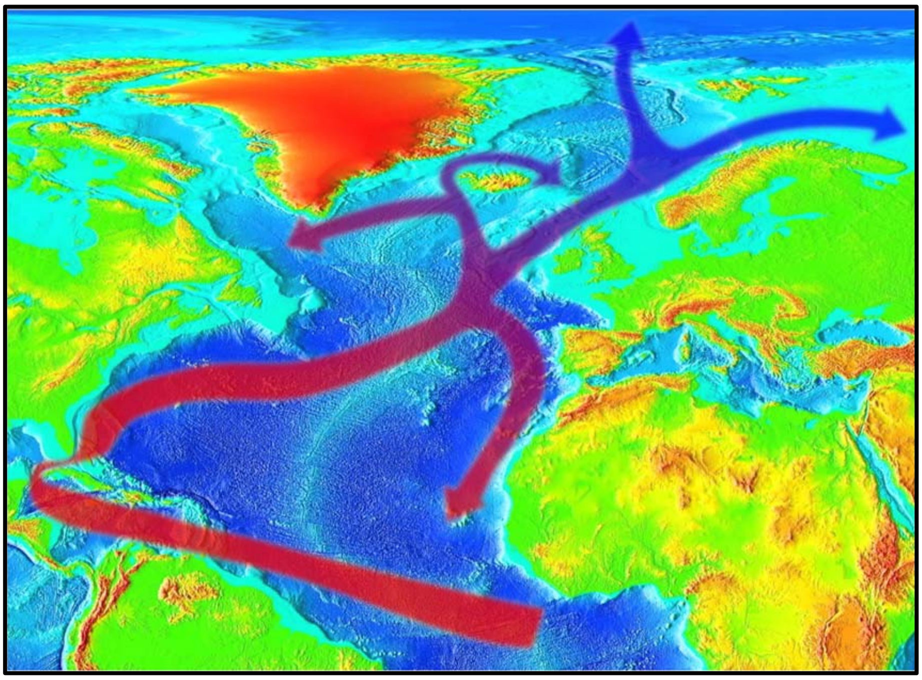

Figure 26 - Gulf Stream and North Atlantic Equatorial Drift (Source: Wikipedia)

4.3.2 As a consequence, winters are relatively cool and wet, and summers are relatively mild and also wet. Most Atlantic depressions pass to the north of the islands, and when combined with the general westerly circulation and interaction with the landmass, create an east-west variation in climate.

4.3.3 The study coastal areas border the merger of the Gulf Stream at the nearby continental shelf, and air masses that originate from the Atlantic, Polar and Continental regions that give rise to the temperate and changeable climate.

4.4 Sea Lanes

4.4.1 The coastal areas of the Study have recognised sea lanes essential to transatlantic, intercontinental and coastal shipping, which are:

- The Minches passage between the Inner and Outer Hebrides where restrictions apply to the passage of loaded tankers over 10,000GT;
- The Deep Water Route (DWR) to the west of the Outer Hebrides;
- The Pentland Firth between Orkney and the Scottish mainland;
- The Fair Isle passages between Orkney and the Shetland Islands.

4.4.2 Improvements to these sea lanes include:

- A DWR west of the Outer Hebrides to encourage large vessels to transit further offshore;
- The introduction of the Neist Point Traffic Separation Scheme (TSS);
- A new BA Chart 1757 of the Little Minch that overlaps the existing BA Charts 1794 and 1795 to improve situational awareness for vessels negotiating these difficult waters;
- Routeing measures through the Minches for north and southbound traffic;
- Guidance for vessels using the Pentland Firth for avoiding special areas and more importantly guidance with regards to tidal windows and avoiding the tide race.

4.5 Minches and Hebrides

4.5.1 The Hebrides is a chain of islands that lie off the mainland, known as the Outer and Inner Hebrides. See Figure 27.

4.5.2 The coast presents an almost uninterrupted succession of deep indentations, fronted by bold rocky cliffs and headlands forming islands, narrows and sea lochs. Drying rocks and reefs are plentiful, quite often with deep navigable waters immediately adjacent. Strong tidal streams and eddies can be experienced in narrows and inshore.

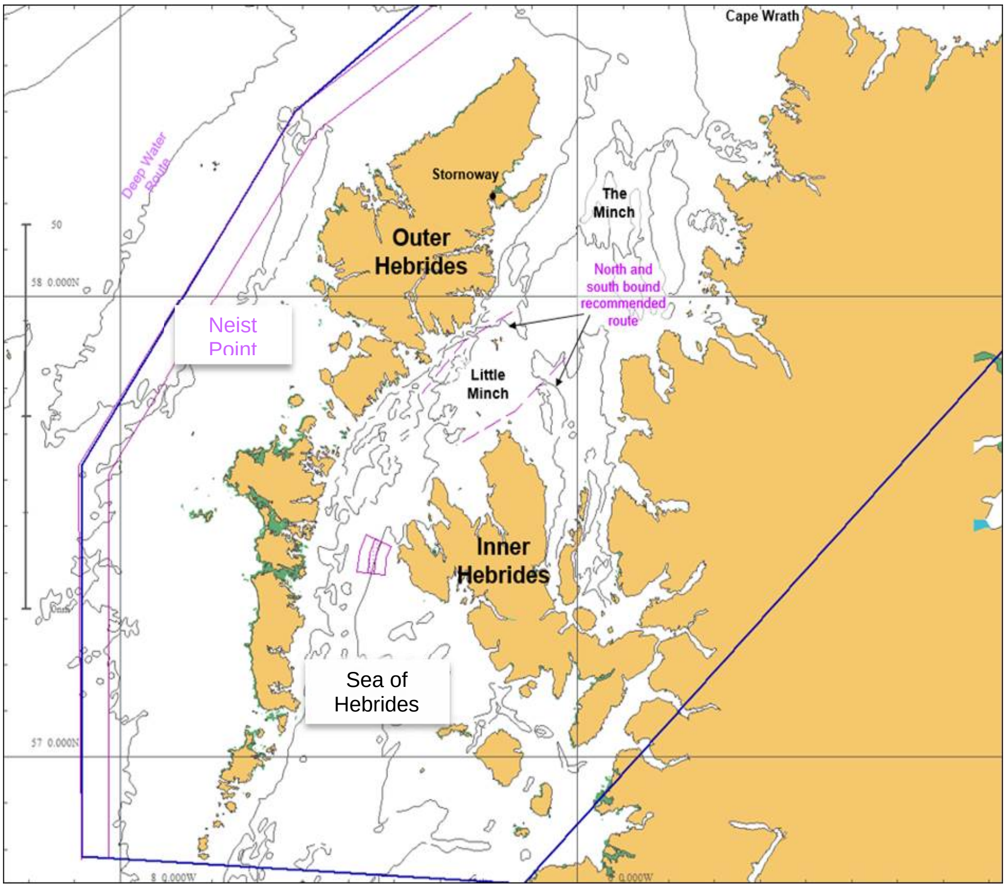

Figure 27 - The Minches (Source: Euronav)

4.5.3 The Outer Hebrides is exposed to the full force and swell of the Atlantic Ocean. The west coast is generally low lying, and the coastal bank extends up to 15 miles offshore with isolated rock pinnacles extending beyond the bank. Surveys are incomplete outside of the Deep Water Route toward the abyss of the continental shelf.

4.5.4 The passage between the Inner and Outer Hebrides affords some shelter from the Atlantic but depths within the Little Minch are very irregular and several banks lie across the northeast entrance. Consequently, traffic routeing and voluntary reporting is in place. In bad weather, the Little Minch can become a dangerous sea area due to the clash of wind, tidal streams and uneven nature of the bottom producing high and turbulent seas.

4.5.5 Throughout the area there are numerous small ports and harbours supporting the local economy that create significant levels of sea trade in addition to seasonal cruise traffic. Through traffic consists of crude oil and product tankers, transiting to and from the North Sea and Flotta, Scapa and the Forth, and oilfield support vessels repositioning to and from the North Sea, as well as seasonal cruise ship traffic, and the constant coaster trade to/from Orkney, Shetland and Scandinavia.

4.6 Fair Isle South (including Pentland Firth and North Scotland)

4.6.1 The north coast of Scotland from Cape Wrath to Dunnet Head is mainly heavily indented cliffs with a few inshore off lying dangers.

4.6.2 The Orkney (also known as Orkney Islands) is an archipelago off the north coast of Scotland, which lie about 59°N, 03°W some 10 miles north of the mainland (see Figure 28). Their coasts are much indented and generally rocky but there are also extensive sandy beaches especially on the NE side of the group.

4.6.3 The principal port of Flotta is situated in Scapa Flow, which is almost fully enclosed and hence a swell and tidal stream free anchorage and sheltered bay. It is bound by the islands of Hoy and the South Isles of Orkney mainland with entrances to the south and west from the Pentland Firth.

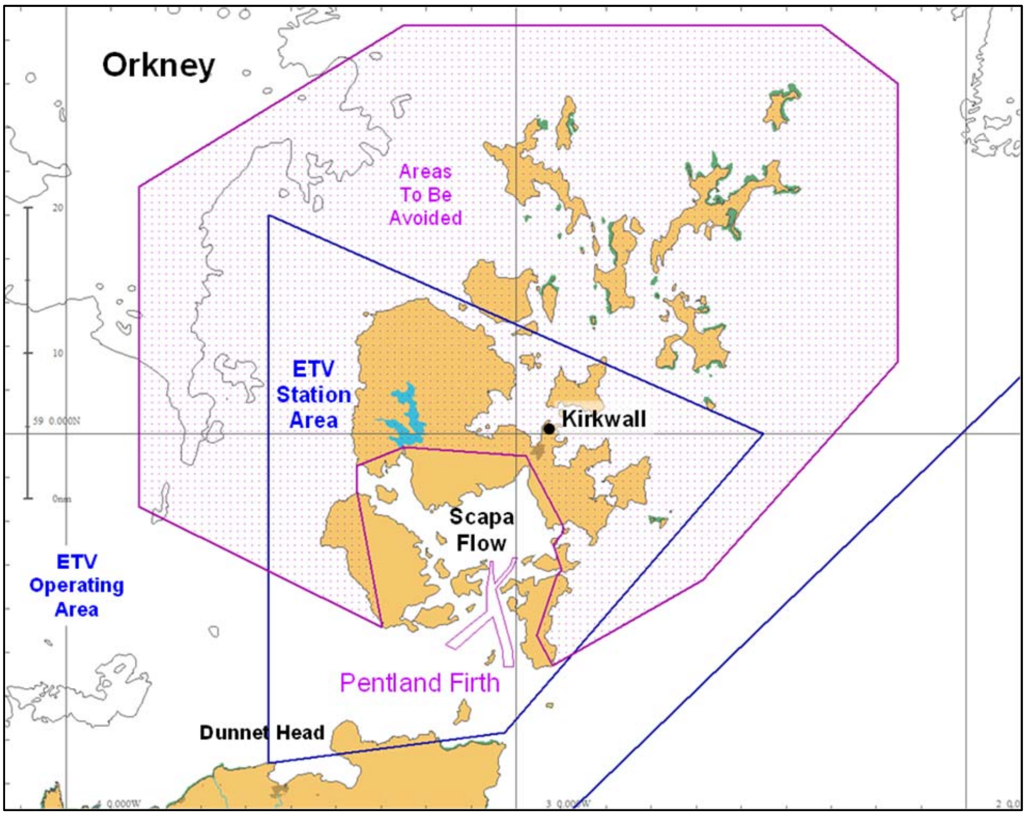

Figure 28 - Fair Isle South (Source: Euronav)

4.6.4 Notwithstanding the Pentland Firth tides, the easily accessible deep and sheltered water of Scapa Flow makes it one of the principal locations in Europe for ship-to-ship transfer of crude and fuel oils. Up until January 2012 there was an average of 33 crude oil export shipments per year amounting to approximately 2.5 billion barrels of oil, although declining each year until 2015 when traffic increased markedly to about 70 per year amounting to about 4.5 billion barrels. There are three tugs for berthing operations that also escort tankers using indirect towing for transit in and out of Scapa Flow, whether laden or in ballast.

4.6.5 The other main ports are Kirkwall and Stromness, but throughout Orkney there are numerous small mixed use ports and harbours supporting the general local economy and the large number of inter-island ferry routes or specific operations. Traffic patterns have not substantially changed over the past decade, other than a significant increase in cruise vessels visiting the area.

4.6.6 The Pentland Firth is bordered by the rocky mainland coast to the south from Dunnet Head to Duncansby head which is indented by numerous bays and coves. Within the Firth its deep waters are interspersed with the islands of Stroma, Swona and Pentland Skerries. The latter with an associated 10 mile long and narrow bank substantially reducing depths and creating a funnelling effect.

4.6.7 Tidal streams within the Firth are renowned and can reach up to 12kts, and rates up to 16kts have been reported close to Pentland Skerries. The strong tidal streams create tidal races and eddies which can be dangerous particularly in combination with adverse weather. Substantial seas occur (wind against tide) in circumstances of strong westerly or SE winds and consequently, reporting measures are in place.

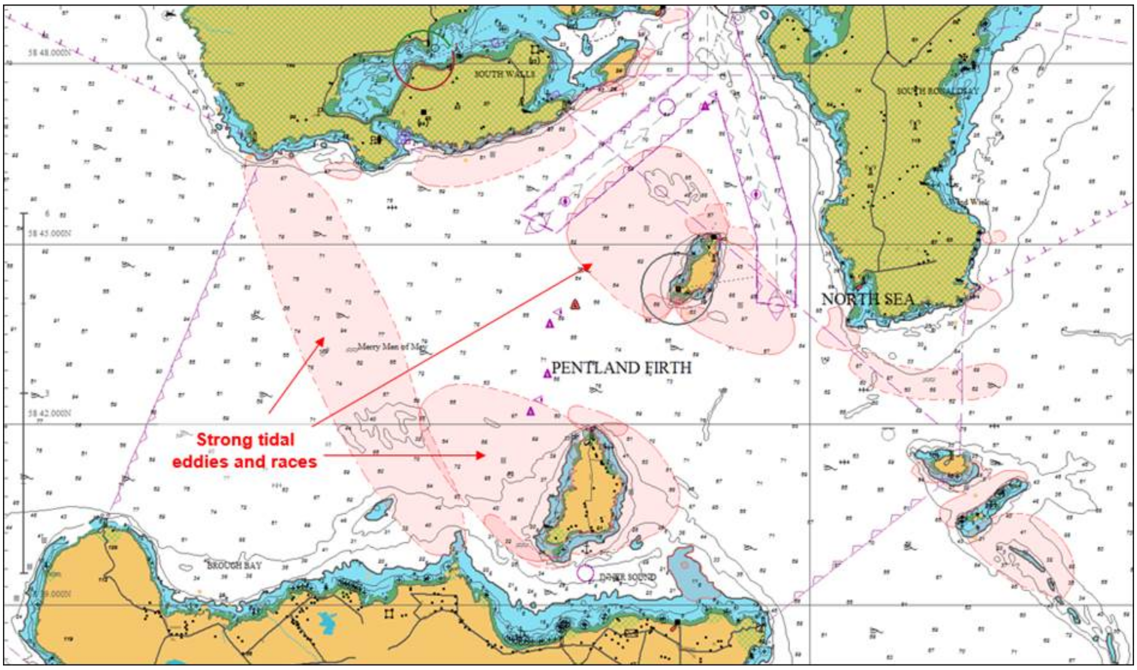

Figure 29 - Pentland Firth (Source: Euronav)

4.6.8 The wind is perhaps the most notable factor of Orkney weather. In summer there is an almost constant breeze (average Beaufort force 4). Because of the low lying land mass, strong winds are common and winter gales are frequent when the average wind speed increases to around Beaufort force 6, and often force 7 to 8. There have been occasions for winds in excess of 100 knots which, when combined with strong tides, can set a distressed vessel down on to the western shores at an alarming rate.

4.6.9 Due to the Gulf Stream, winter temperatures rarely drop below freezing, so snow is uncommon and usually restricted to a few days at a time. However, fog and sea-haze are perhaps the most frustrating aspect of Orkney weather, which is a damp sea fog common all year round, but generally more so in the warmer summer months when there is a lack of wind and turbulence to clear the air. The east coast is more prone to fog than the west, and it is possible for the West mainland to be basking in sunshine while the East is blanketed in fog.

4.6.10 The main environmental risks identified in the Oil Transfer Licence application to the MCA was from the following activities:

- Movement and presence of ships;
- Accidental oil spill;
- Discharge of ballast water during transfer process.

4.6.11 The VTS is manned 24 hours a day to monitor and communicate with traffic using Scapa Flow and approaches, Kirkwall and its approaches and the adjacent areas. The VTS system incorporates automatic vessel detection and tracking as well as the use of electronic navigation charts in addition to radar coverage from 6 radar heads plus CCTV coverage of the entire area.

4.7 Fair Isle North

4.7.1 Shetland (also known as Shetland Islands) is a subarctic archipelago north of Scotland comprising some 100 islands with over 900 miles of coastline, and has several ports and many piers (see Figure 30 below). The islands lie about 60°N, 01°W between Orkney and the Faroe Islands and form part of the division between the Atlantic Ocean to the west and the North Sea to the east. The archipelago has an oceanic climate, a complex geology, a rugged coastline and many low rolling hills. The islands are for the most part relatively high, undulating, fringed by bold cliffs and separated by narrow sounds.

4.7.2 Following the discovery of crude oil in 1972 in the East Shetland Basin, the Port of Sullom Voe was built as a major deep water harbour, which is owned and operated by the Shetland Islands Council, formerly the Zetland County Council, and acts as the statutory Harbour Authority.

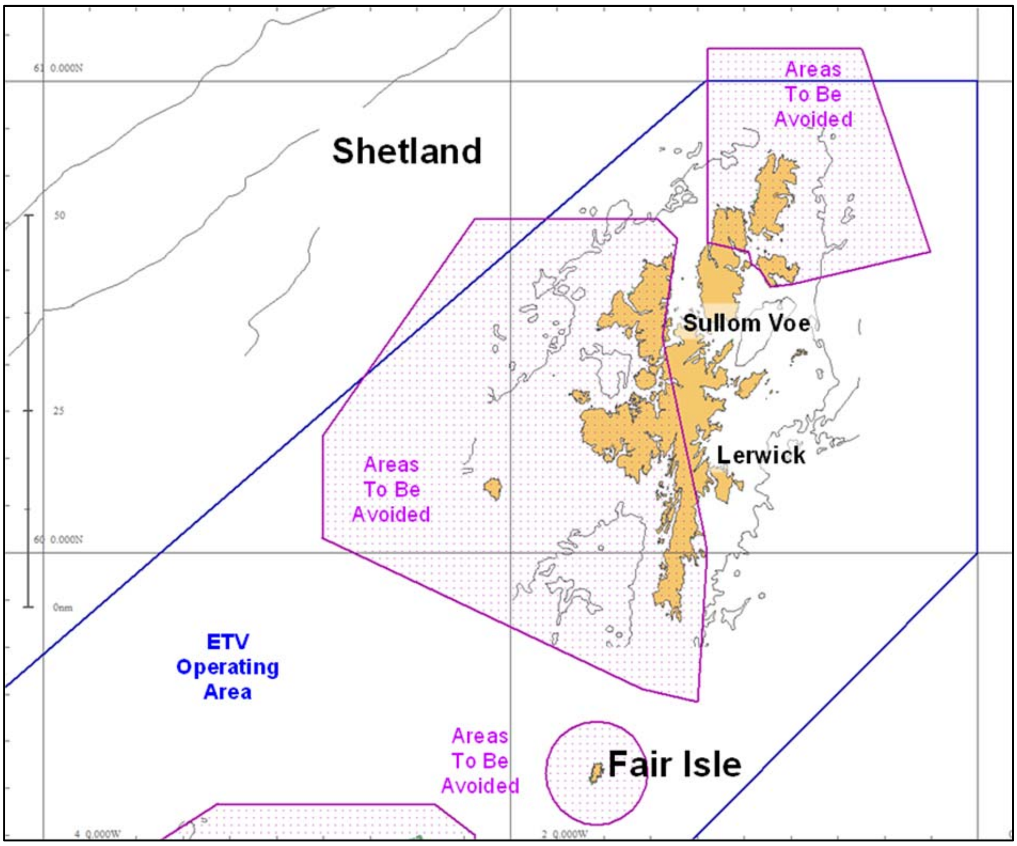

Figure 30 - Fair Isle North (Source: Euronav)

4.7.3 The Sullom Voe Terminal (SVT) became operational in 1978 and is operated by BP Exploration Operating Company Ltd on behalf of a consortium of oil companies. See Figure 31. SVT is one of the largest and cleanest oil terminals in the world with no discernible impact on the abundant marine life.

4.7.4 The main purpose of the SVT is to receive crude oil and gas from more than two dozen North Sea offshore fields in the East Shetland Basin and the Atlantic Margin, as well as from the Brent and Ninian pipeline systems. The oil and gas is stored, processed and exported via tankers.

4.7.5 Situated within sheltered waters, Sullom Voe benefits from considerable protection from the weather. The approaches to Sullom Voe have several areas of high environmental sensitivity. As a consequence of the dangers to navigation posed by offshore obstructions, strong tides, rapid weather changes and the presence of fishing vessels, navigation near the Shetland coastline is vigorously discouraged. The IMO has ratified ATBA which are applicable to all tankers whether loaded or in ballast calling at Sullom Voe, or in transit around or near the coastline of Shetland.

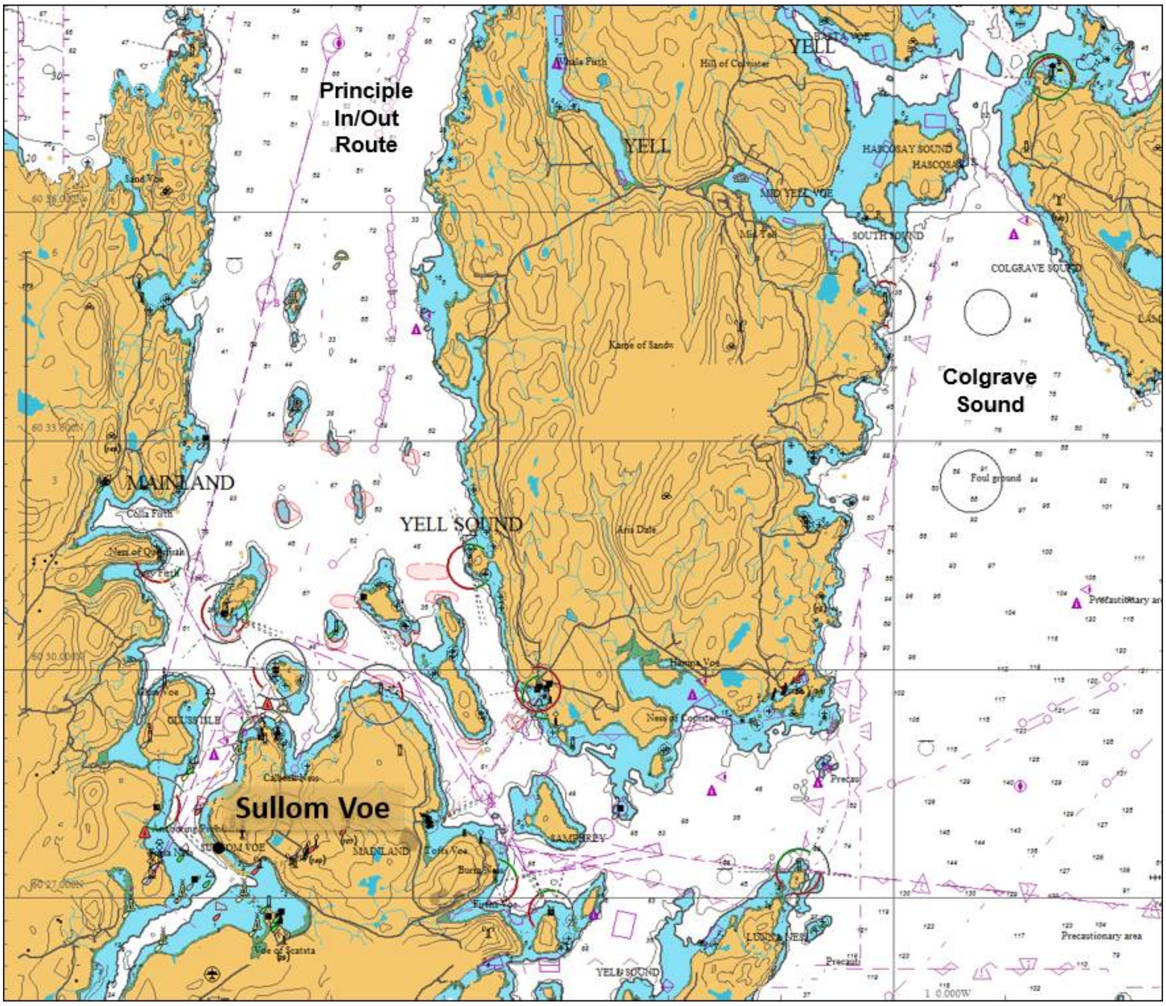

Figure 31 - Approaches to Sullom Voe (Source: Euronav)

4.7.6 Pilotage is compulsory for all ships navigating within the Sullom Voe Harbour Area (SVHA). AIS tracking shows that most tankers enter/exit from the northerly entrance to Yell Sound. In the summer months, tankers in ballast can anchor in Colgrave Sound that lies to the east of Yell Sound. Vessels often wait for a berth or break in adverse weather conditions and therefore drift outside the ATBA *"within VHF range"*. However, SVHA expects vessels to keep main engines at a high state of readiness to comply with the International Regulations for Preventing Collisions at Sea, 1972.

4.7.7 The Sullom Voe VTS is available around the clock providing a traffic organisation service for the safe and efficient movement of vessel traffic and an information service to ensure that essential navigation information is promulgated. VTS monitors and records the passage of each vessel, including the ATBA.

4.7.8 Lerwick is the UK's second most important fishing harbour landing some 66,500t in 2008. The port handles around 5,500 vessels per annum including cruise, ferry, coastal tankers, feeder container fish farm and oil industry support as well as leisure users. Throughout the Shetland Islands there are numerous small harbours supporting the general local economy and the large number of inter-island ferry routes, fishing, leisure or specific operations.

4.7.9 Traffic patterns have not substantially changed in the past decade, other than a significant increase in cruise vessels visiting the area. There is significant oil industry traffic to the west of Shetland as well as the North Sea with vessels transiting through Shetland and using its ports.

4.7.10 The Fair Isle Channel remains an important route for Scandinavian and Baltic trade bound for the Atlantic, and for tankers loaded and in ballast for Sullom Voe or in transit to/from the west.

4.7.11 Shetland lies in the track of North Atlantic depressions and is influenced by the relatively warm waters of the Slope Current (originally Gulf Stream), flowing north along the edge of the continental shelf. Consequently, the islands have a mild humid temperate maritime climate with warm summers and no dry season.

4.7.12 Like Orkney, the wind and sea fog are the most notable aspects of Shetland weather. The average wind speed over the year is about Beaufort force 4. In winter, gale force winds of over 30kts are more prevalent. Similarly, sea fog occurs mainly in summer, which is often confined to the east coast of the islands while the west coast basks in sunshine.

4.8 Summary of Findings

4.8.1 To assess whether the specific hazards of the subject area have been reduced to as low as reasonably practicable (ALARP) would be to measure the compliance of shipping to the various routeing measures.

4.8.2 Despite the limitations of AIS information, using the annual data for 2012 overlaid onto a nautical chart provides a baseline measurement of compliance - see Figure 32. Some noticeable patterns emerge with the most significant being the high concentration of traffic through the Minches rounding Cape Wrath and using Pentland Firth, as well as the number of crossing sea lanes to the north of Cape Wrath and West of Shetland. Apart from some contraventions of the ABTA to the west of Shetland, most traffic appears compliant with special areas. Noticeably, the Deep Water Route has a low concentration of traffic.

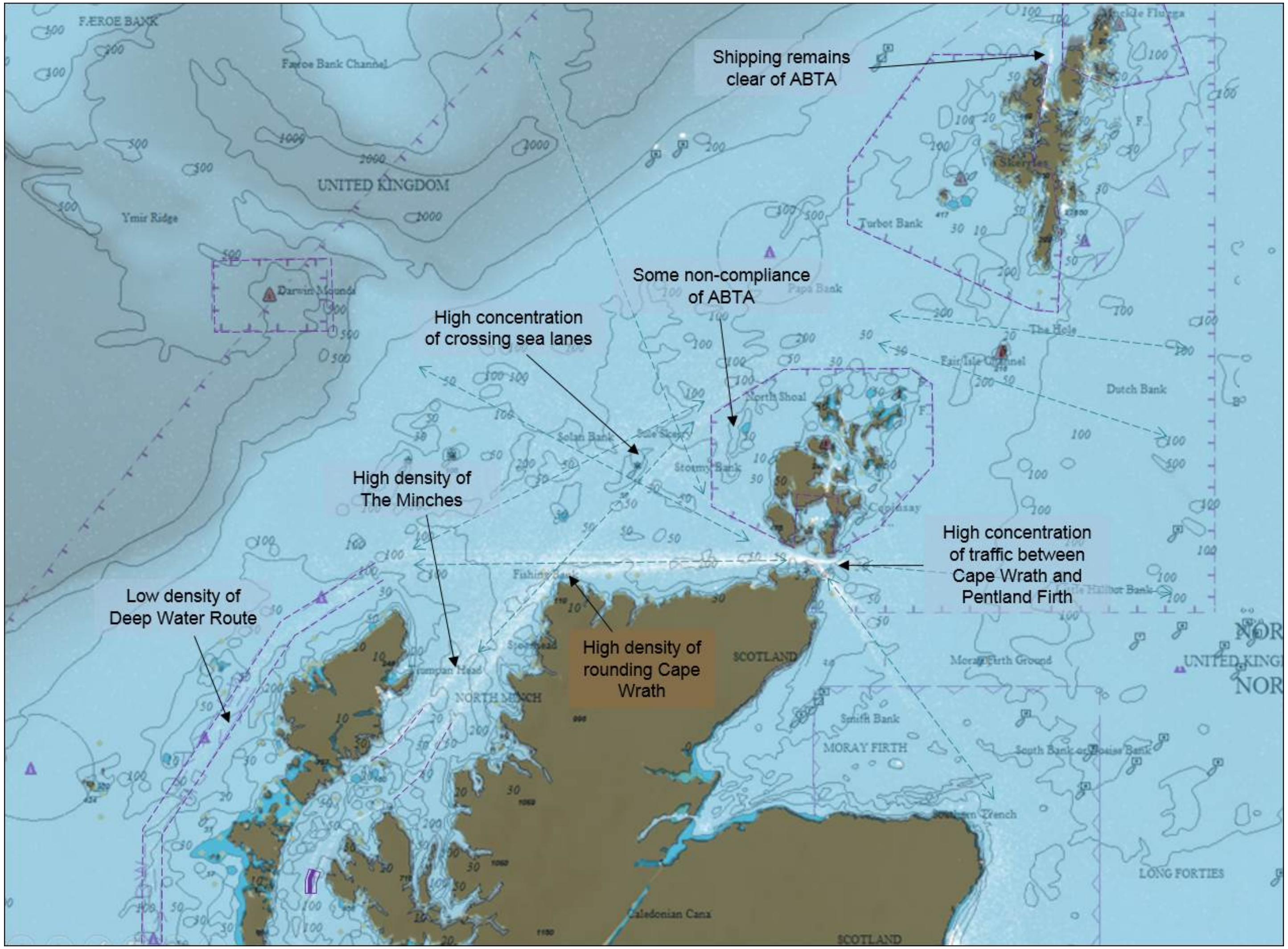

Figure 32 – Chart Overlay of AIS Track for 2012 (Source: shipmap.org and Euronav)

4.8.3 The overall assessment shows a general compliance with the routeing measures. However, whilst modern navigation systems have reduced the uncertainty of knowing a vessel's position, course and speed, and the proximity of hazards, lessons from MAIB reports indicate that mariners are exploiting the new technology to improve operational performance, by reducing safe passing distances, and using common waypoints that tend to funnel vessels into sea lanes that can cause mutual interference and increase the risk of collision.

4.8.4 The specific hazards of the North and North West of Scotland, including the Hebrides, Orkney and Shetland Islands, have not significantly changed in the past decade, and are:

- Exposure to the rigours of the north Atlantic with above average wind speeds and with a commensurate swell that continues to be the enemy of concentration and good decision-making by Masters under commercial pressure, and vessels that occasionally succumb to the persistent heavy weather;
- The entire coastline is a hazard to navigation and characterised by an almost uninterrupted succession of deep indentations, fronted by bold rocky cliffs and headlands forming islands, narrows and sea lochs. The approach and coastal routes are deep but close offshore there are plentiful drying rocks and reefs between the navigable waters;
- Strong tidal streams and eddies can be experienced in narrows and inshore waters, and around open headlands such as Cape Wrath, and particularly through the Pentland Firth, which have caused vessels to flounder;
- The weather, sea state and swell strongly influence decision-making that shows the Minches and Pentland Firth as routes of choice. However, rounding exposed headlands such as Cape Wrath and entering the Pentland Firth with strong tides and adverse weather can cause vessels difficulties;
- The management of shipping and sea lanes will have reduced vessel encounters with routeing measures and the environmental risks mitigated by special areas to be avoided. However, concentrations of traffic through choke points in bad weather with difficult transits such as the Minches, in sometimes poor visibility, will increase the risk of a maritime casualty.

5 THE PREVAILING WEATHER

5.1 Preamble

5.1.1 Several previous studies have addressed the prevailing weather conditions in the area under review. The aim of this section is to summarise the previous findings and to introduce supplementary data in order to understand the weather driven risks in each of the areas and ultimately how the ETV selection may be influenced by these conditions.

5.1.2 The pre-existing data was largely taken from the Marico Report and the Belton Study. For the navigation section of the Belton Study, the study team used a combination of its own members' experience at sea (totalling some 65 years) along with consultation with a cross section of stakeholders in the maritime industry.[24]

5.1.3 This summary is also supplemented by additional data which includes gale data based on ship observations and provided by the MCA and SafeTrans output which are based on an 18 year hindcast weather dataset.[25] SafeTrans is primarily a voyage simulation software which outputs environmental conditions, vessel motions and voyage durations along a specific route or at a stationary location for the planning of offshore operations. Here it has been used solely to extract wind and wave data for various locations within the area of interest. Further details of SafeTrans and the method of extracting the 10-year return period can be found in a paper by the software developers and working group.[26] Due to computational limitations, only 8 years of hindcast data could be extracted using this method. This was deemed sufficient for our purposes of gaining a greater general understanding of the prevailing conditions. The locations at which the wind and wave data was extracted, are shown in Figure 33 and described in Table 4.

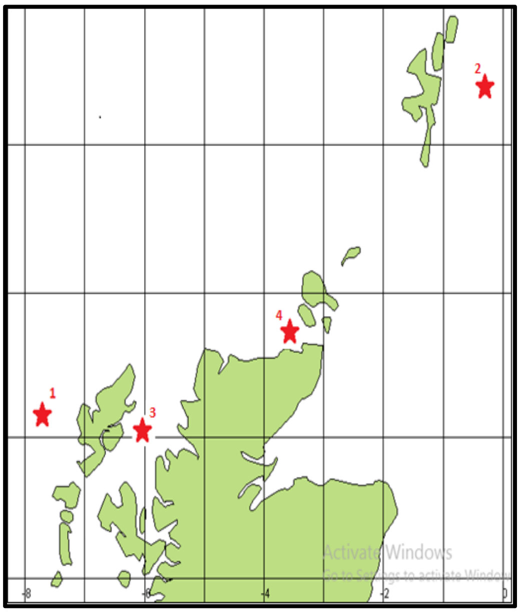

Figure 33 - Locations of Wind and Wave Condition Measurements in SafeTrans

1.	West Hebrides
2.	East Shetland
3.	North Minch
4.	South West Orkney

Table 4 – Areas of Wind & Wave Data

[24] *Belton Study,* section 2.1.3
[25] Ref: http://www.marin.nl/web/JIPs-Networks/JIPs-public/Safetrans.htm
[26] "Case Studies Of Ocean Transports Using The Safetrans Simulator", Cooper Et Al, 2008

5.2 The Prevailing Weather

Wind and Tidal Effects

5.2.1 The MCA has provided data relating to the number of gale days between 2010 and 2015. The data is based on ship observations; a day of gales was counted if there was at least one observation of wind speeds reaching 34kts or more. It is not known how many ships took part in the observations.

5.2.2 The gale data was presented in the form of the number of days on which a gale was observed for each month of each year between 2010 and 2015. The data was then averaged for each month across the time period, resulting in a summary of the average number of gale days in each month between 2010 and 2015. This meant seasonal variations could be established and areas compared. The areas studied were Malin, Hebrides, Fair Isle and Cromarty. Malin barely intrudes upon the area under review and Cromarty is outside the area in this study. However, they are included for completeness and comparison purposes. The data is presented in Figure 34 and a discussion of the trends is covered in the next section.

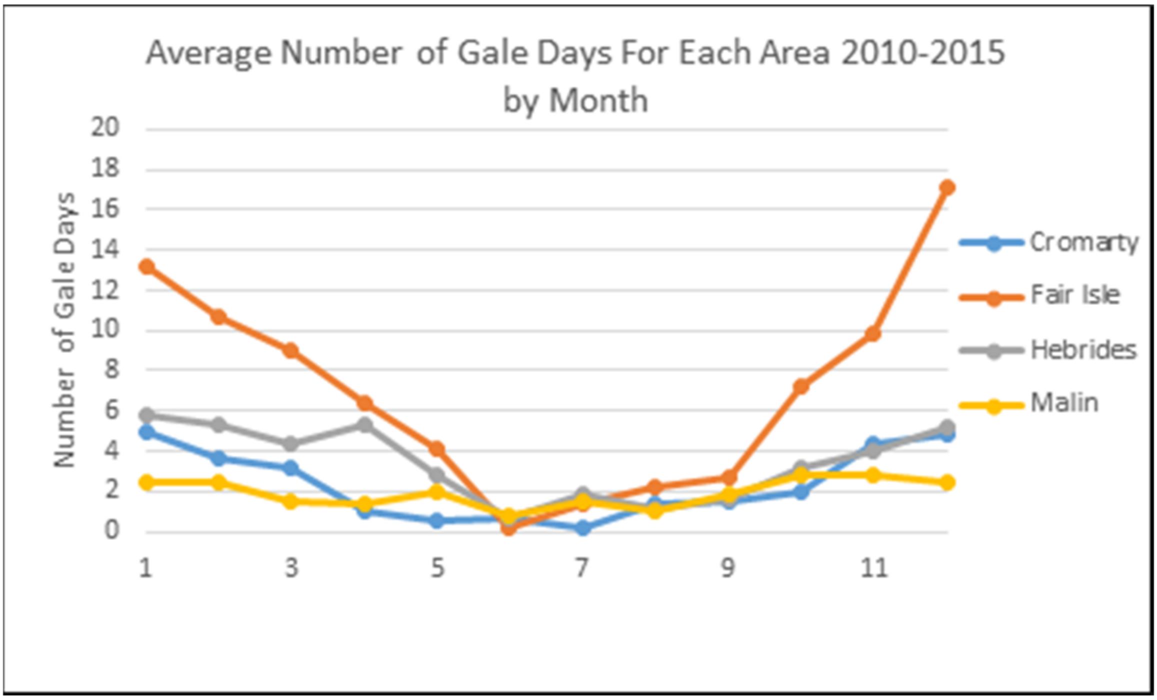

Figure 34: Average Number of Gale Days by Month

5.2.3 Clearly, some obvious conclusions can be drawn; Fair Isles area is most susceptible to gales, followed by the Hebrides and then by Cromarty and Malin which exhibit similar conditions in terms of gale days experienced. Malin has slightly fewer gale days in the winter months. June is generally the calmest month with conditions becoming progressively worse as the year goes on; post December the conditions then improve through to June again.

5.2.4 The Marico Report addressed the weather effects in the risk assessment section by categorising both wave and wind/tidal effects according to the frequency of significant wave heights and westerly wind speeds/tidal currents in winter months.[27]

[27] *Marico Report,* Section 6.5.2-6.5.3

5.2.5 For tide and wind effects, the category thresholds and results presented by Marico are reproduced in Table 5 below. This corroborates the gale data presented in Figure 34 above to a certain extent. However, the Marico Report concluded that the conditions in Cromarty are more benign than the gale data might suggest.

Area	Tide/wind effect	Score
North Fair Isles, South Fair Isles, Hebrides, Minch, Malin	Area frequently exposed (>20%) to westerly winds / strong tidal currents	High
Cromarty	Area infrequently exposed (5%-10%) to westerly winds / moderate tidal currents	Low

Table 5 - Category Thresholds & Results (Source: Marico Report, table 8 and annex A)

5.2.6 The Belton Study describes the strong tidal flows through the Pentland Firth and generally unpredictable and extreme weather conditions along with strong currents around the Shetland Islands.[28]

5.2.7 The average wind speeds of the 3 hour time period over an 8 year period (1995 to 2003) are summarised in Table 6. These results indicate the lower wind speeds in areas shielded by the Shetland Islands and Hebrides (locations 3 and 2). Wind speeds may be up to 47.6kts on the west side of Orkney which is exposed to the Atlantic. All areas exhibit high wind speeds; all of the maximum wind speeds are between 41.8kts and 47.6kts. The most probable maximum is defined as the 90% non-exceedance value and these range between 26kts and 28kts.

Area	1	2	3	4
Wind speed mean, knots	17.59	16.63	17.55	17.95
Wind speed max, knots	43.74	41.79	43.74	47.62
Wind speed, MPM	28.19	26.24	28.19	28.19

Table 6 - Wind Speeds for the Areas defined in Figure 33

Wave Effects

5.2.8 The method adopted in the Marico Report involved categorising the wave exposure as low, medium or high according to the exposure of the area to significant wave heights according to specific thresholds, as presented in the Table 7 below. The significant wave height was based on the 10% frequency during the winter months. The Hebrides and the North Fair Isles were both allocated a high score, while Cromarty and South Fair Isles were categorised as medium, Malin low and Minch very low.[29]

Area	Significant wave height	Score
Hebrides and North Fair Isles	Area fully exposed to open sea, >4m	High
Cromarty and South Fair Isles	Area largely exposed to open sea, 3m to 4m	Medium
Malin	Area partially exposed to open sea, 2m to 3m	Low
Minch	Area largely sheltered, <2m	Very Low

Table 7 - Wave Height Categories(Source: Marico Report table 9 and annex A)

5.2.9 The Belton Study details significant wave heights in excess of 2.5m to 3.0m for 10% of the year in the outer regions of the Moray Firth and the sea areas to the east of Orkney. The western approaches of Orkney are subject to significant wave heights in the range of 3.0m to 4.0m over the equivalent timescale. The south and east of the Shetland Islands experience significant wave heights in excess of 4.0m for 10% of the year.[30] To the north and west of the Islands, significant wave heights of 5.0m are encountered.[31]

[28] Belton Study, section 2.73 and 2.81
[29] Marico Report, Table 9 and Annex A
[30] Belton Study, section 2.81
[31] Belton Study, section 2.81

5.2.10 The DWR to the west of the Hebrides is more exposed than the channel through the Minches as the predominant weather prevails from the west. The wave statistics indicate the 1.5m to 2.0m wave heights in the Minches, the 3.0m to 4.0m experienced to the west of the Hebrides is found close inshore and, in parts of the DWR, 4.0m to 5.0m waves are exceeded for 10% of the year.

5.2.11 The histograms of wave heights for each of the 4 areas defined in Figure 33 over an 8 year period (1995 to 2003) are presented below in Figures 35 to 38 and summarised in Table 8.

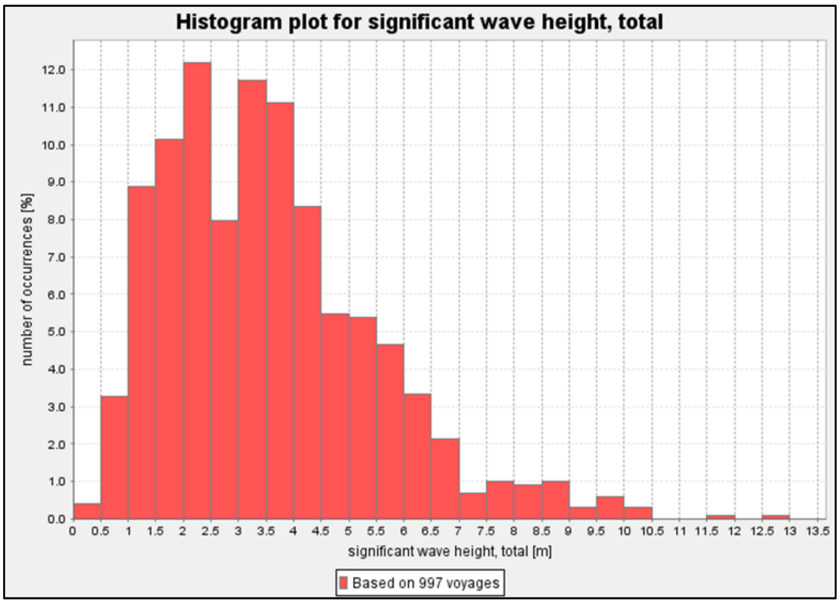

Figure 35: Histogram of Wave Heights for Area 1, (W.Hebrides) 1995-2003

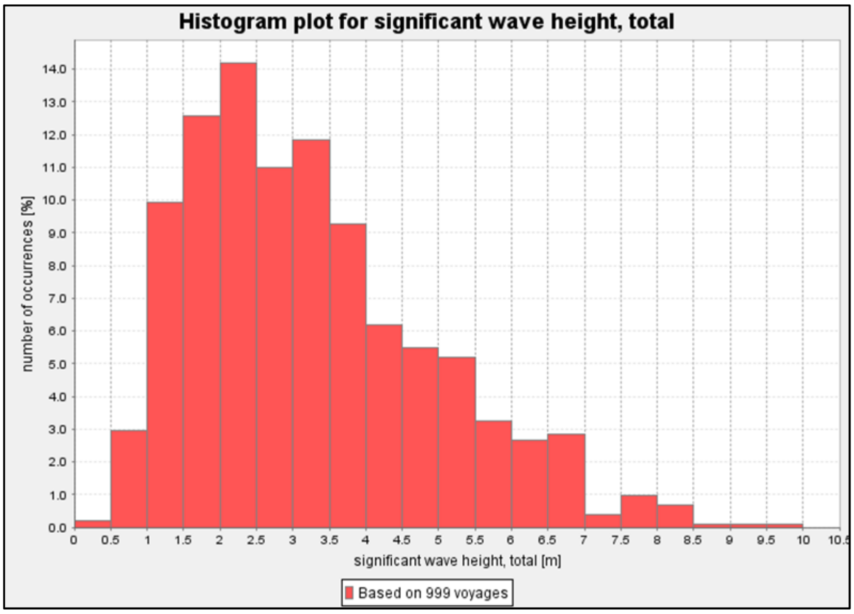

Figure 36: Histogram of Wave Heights for Area 2,(E.Shetland) 1995-2003

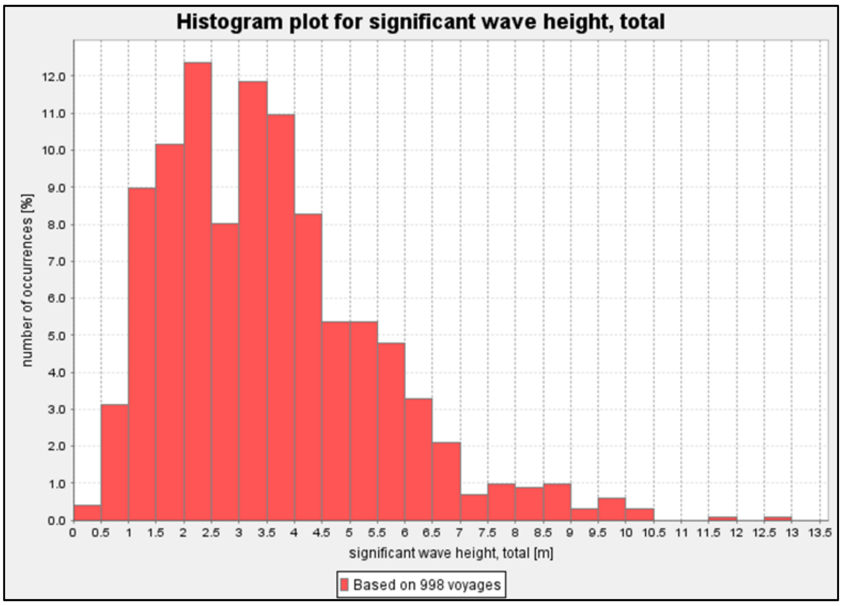

Figure 37: Histogram of Wave Heights for Area 3, (N.Minch) 1995-2003

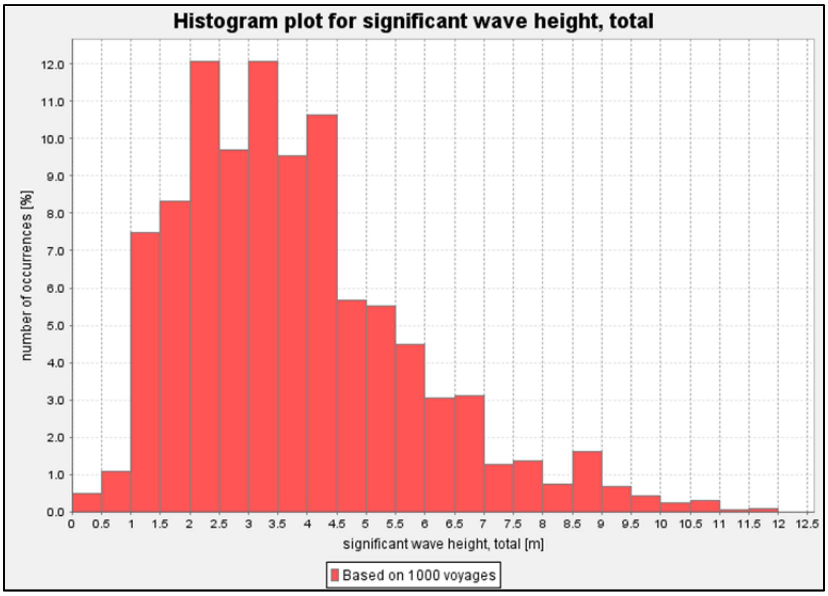

Figure 38: Histogram of Wave Heights for Area 4 (SW Orkney) 1995-2003

Area	1	2	3	4
Significant wave height (m), mean	3.75	2.46	2.16	4.4
Significant wave height (m), MPM	5.24	4.09	4.11	7.52

Table 8 – Wave Heights in All Areas

5.2.12 The table above is approximately in agreement with the data previously presented. The data in the table represents results from all year round rather than winter only as in the Marico Report and therefore the overall statistics will be slightly lower. Generally, Minch has the lowest wave height of around 2m or less (area 3) and South Fair Isles and Hebrides areas are exposed to 3m to 4m significant wave heights (areas 1 and 4). Area 2 is also in the North Fair Isles. However, the effect on the wave heights of being sheltered from the Shetland is seen in the SafeTrans results.

5.3 Statistics since 2010 and Trends

5.3.1 The total number of gales observed each year in four different areas are summarised in Figure 39.

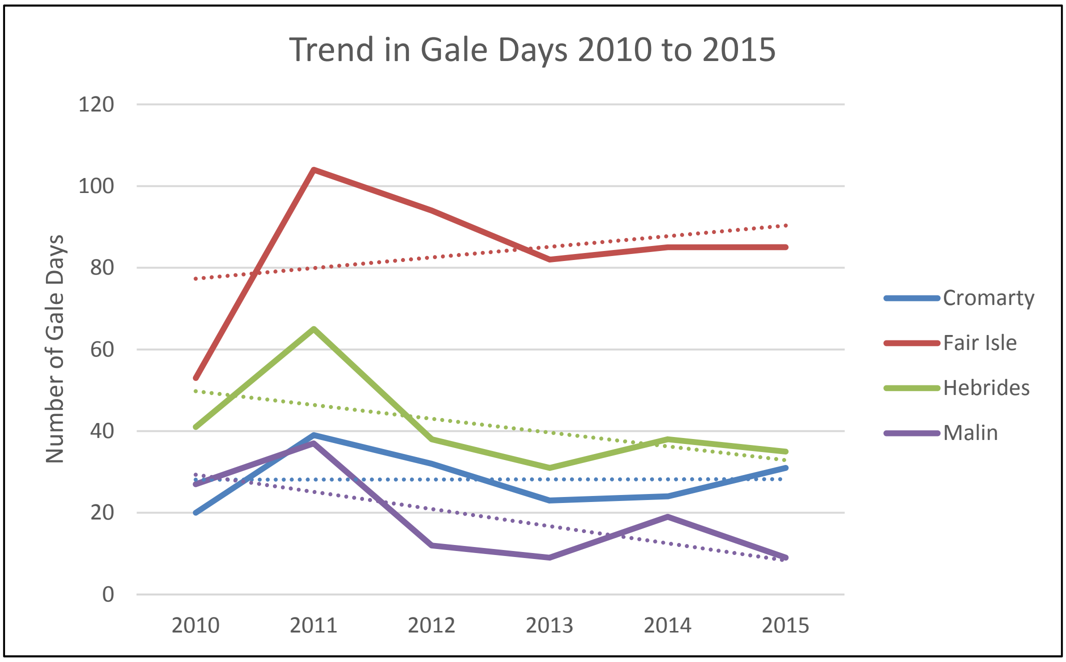

Figure 39: Trend in Gale Days between 2010 and 2015

5.3.2 The data collection period is insufficient to determine conclusively if any long term trends exist and it would be erroneous to attempt to extrapolate future trends from this dataset either locally in each of the areas, or across all areas. Given that the number of ships participating in the observations is unknown, the statistical significance of any trend within an area cannot be ascertained.

5.3.3 Establishing evidence of an overall trend could be done by comparing the trend across each and looking for similarities. The coefficient of the year parameter from the linear trend line (overlaid in Figure 39), shows that the gradient of the line, representing the rate of change in number of gale days since 2010, ranges from 4.2 gales/year to 2.6 gales/year. Clearly, no convincing similarity in trend exists.

5.3.4 Further, the SafeTrans data which is based on a 10-year period between 1994 and 2004 generally supports the values reported in the Belton Study which is based on data from the UK Meteorological Office. This provides further evidence that the short term environmental trend is relatively constant.

5.4 Summary of Findings

5.4.1 In summary, the Hebrides, the North Fair Isles and the South Fair Isles are fully exposed to the Atlantic and therefore have a high probability of strong westerly winds. The Minches has a high probability of westerly winds although it is sheltered by the Hebrides and therefore the significant wave height is much reduced. There are extremely strong tidal flows through the Pentland Firth and generally unpredictable and extreme weather conditions along with strong currents around the Shetland Islands.

No evidence has been found that the environmental conditions are likely to change in the foreseeable future.

6 ENVIRONMENTAL SENSITIVITIES OF COASTLINES

6.1 Preamble

Figure 40 – Puffins on the Trennish Isles
(Source: www.southernhebrides.com)

6.1.1 In considering the selection of ETVs and areas of coverage, one of the recommendations made by the late Lord Donaldson was that the sensitivity of the coasts should be taken into account. In his Report *'Safer Ships, Cleaner Seas'*, Lord Donaldson emphasised the importance of MEHRAs being seen as both an environmental and shipping concept (ref: Para 2.1) and "*... even the most sensitive areas should only become classified as MEHRAs if there is a realistic risk of pollution from merchant shipping".* On 13th February 2006, Alistair Darling, Secretary of State for Scotland, the Secretary of State for Transport announced: *"I am today announcing 32 locations around the UK coast that have been identified as Marine Environmental High Risk Areas (MEHRAs). The locations of these areas have been identified after taking into account shipping risk, environmental sensitivity and other environmental protection measures already in place at each location and follow recommendations made by the late Lord Donaldson in his report 'Safer Ships, Cleaner Seas'*[32]*.*

6.1.2 32 areas identified in the MEHRAs list of which 4 lie within the area under review, these being Fethaland, mainland Shetland, Gallan Head, Isle of Lewis, Muckle Flugga in the Shetland Islands and Tor Ness, Hoy, Orkney. Nearby North and South Kilda are also MEHRAs and identified as well. See Figure 41.

[32] Hansard Source Citation: HC Deb 13 February 2006 c58WS

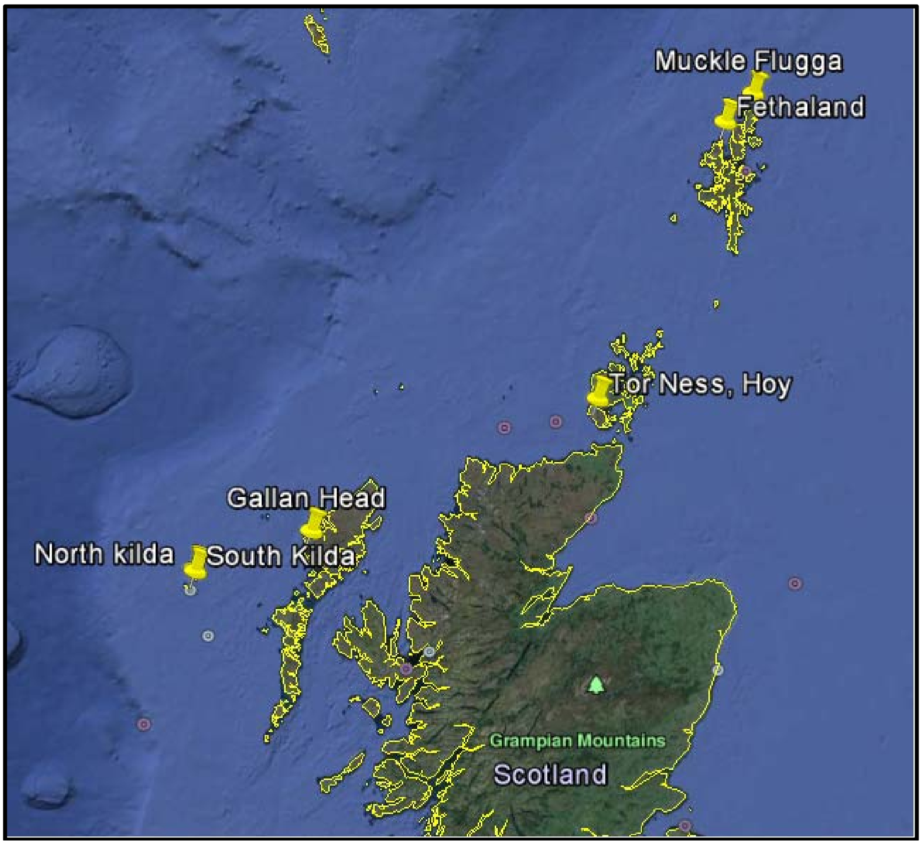

Figure 41 – 4 MEHRAs within Area under Review + St.Kilda N&S
(Source: Google Earth)

6.1.3 In addition to the MEHRAs, there are numerous marine conservation areas around the UK coast (and which were taken into account when identifying MEHRAs) and many of these lie within the area under review and are addressed in this section. Although widely published, for the purpose of this study, it is helpful to define marine conversation areas and the definitions provided by the Scottish National Heritage (SNH) are considered highly appropriate and quoted for this purpose.

Marine Protected Areas (MPAs)

6.1.4 MPAs are recognised globally as one way to support our marine environment. A well-managed network of MPAs will protect important marine habitats and species, deliver benefits for our marine environments, support coastal communities, help sustain marine industries, and provide for recreational uses. Developing a network of MPAs in Scotland is part of a wider strategy to achieve the Government's commitment to a *"clean, healthy, safe, productive and biologically diverse marine and coastal environment that meets the long term needs of people and nature"*.

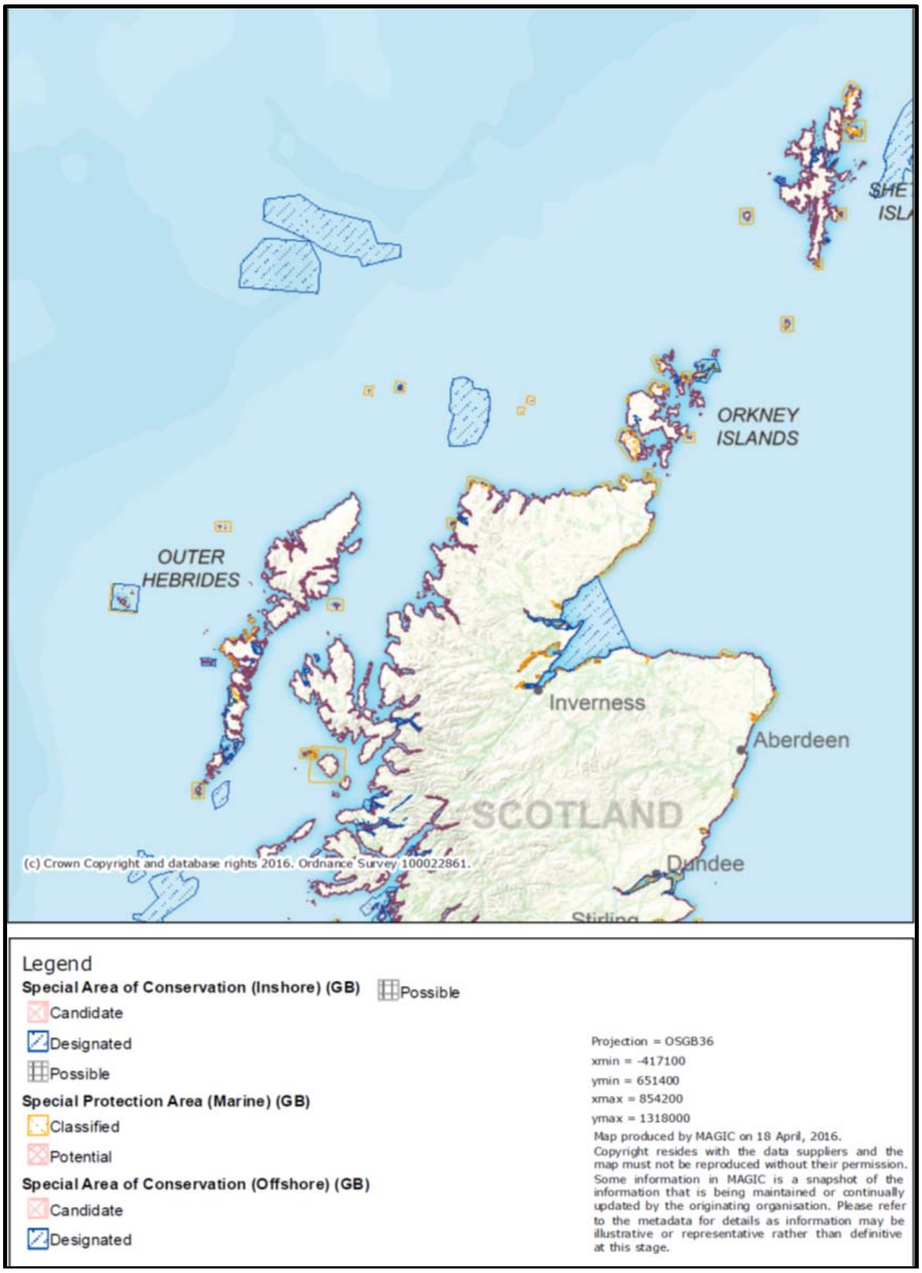

Figure 42 – Marine Designated Areas (Source:* http://magic.defra.gov.uk*)

6.1.5 Scotland's existing MPA network consists of over 180 designated areas. The network includes Nature Conservation MPAs, Special Areas of Conservation (SACs), Special Protection Areas (SPAs), and Sites of Special Scientific Interest (SSSIs). This network of MPAs make a significant contribution to the protection of Scotland's nationally important marine wildlife, habitats, geology and undersea landforms.

Special Areas of Conservation (SACs)

6.1.6 A Special Area of Conservation (or SAC) is a site designated under the ‘Habitats Directive’. These sites, together with Special Protection Areas (or SPAs), are called Natura sites and they are internationally important for threatened habitats and species. Natura sites form a unique network of protected areas which stretches across Europe from the rocky coasts of Ireland in the west, to the marshes of eastern Poland, taking in the northern forests of Sweden and the volcanic lava fields of Tenerife.

SACs are selected for a number of habitats and species, both terrestrial and marine, which are listed in the Habitats Directive.

(Of the 626 SACs in the UK, 236 are in Scotland and this study has identified more than 50 which lie within the area under consideration).

Special Protection Areas (SPAs)

6.1.7 A Special Protection Area (or SPA) is a site designated under the Birds Directive. These sites, together with Special Areas of Conservation (or SACs), are called Natura sites and they are internationally important for threatened habitats and species. Natura sites form a unique network of protected areas which stretches across Europe from the rocky coasts of Ireland in the west, to the marshes of eastern Poland, taking in the northern forests of Sweden and the volcanic lava fields of Tenerife.

SPAs are selected for a number of rare, threatened or vulnerable bird species listed in Annex I of the Birds Directive, and also for regularly occurring migratory species.

Sites of Special Scientific Interest (SSSIs)

6.1.8 Sites of Special Scientific Interest (SSSI) are those areas of land and water (to the seaward limits of local authority areas) that Scottish Natural Heritage (SNH) considers to best represent our natural heritage - its diversity of plants, animals and habitats, rocks and landforms, or a combination of such natural features.

They are the essential building blocks of Scotland's protected areas for nature conservation. Many are also designated as Natura sites (Special Protection Areas or Special Areas of Conservation). The national network of SSSIs in Scotland forms part of the wider GB series.

SNH designates SSSIs under the Nature Conservation (Scotland) Act 2004. SSSIs are protected by law. It is an offence for any person to intentionally or recklessly damage the protected natural features of an SSSI.

Ramsar Sites

6.1.9 Ramsar sites are named after a town in Iran where the Convention on Wetlands of International Importance was adopted in 1971. The UK Government signed up to the Convention in 1976.

6.1.10 The mission of the Convention is *"the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world".*

6.1.11 All Ramsar sites in Scotland are also either SPAs or SACs (Natura sites), and many are also SSSIs, although the boundaries of the different designations are not always exactly the same.

Marine Consultation Areas

6.1.12 Marine Consultation Areas are identified by SNH as deserving particular distinction in respect of the quality and sensitivity of the marine environment within them. Their selection encourages coastal communities and management bodies to be aware of marine conservation issues in the area.

National Scenic Areas

6.1.13 The 40 National Scenic Areas (NSAs) in Scotland, with their outstanding scenery, represent Scotland's finest landscapes. They include spectacular mountain areas such as the Skye Cuillins, Ben Nevis and Glencoe, and dramatic island landscapes within the Hebrides and the Northern Isles. But they also include some of the more gentle and picturesque landscapes that can be found in Perthshire, the Borders and in Dumfries & Galloway.

World Heritage Sites

6.1.14 World Heritage Sites are recognised by UNESCO (The United Nations Educational, Scientific and Cultural Organisation) as places of internationally significant cultural or natural heritage, whose Outstanding Universal Value is considered to transcend national boundaries and to be of importance for future generations. Being placed on the World Heritage List is a high accolade and demonstrates international recognition of the site's significance. Countries with World Heritage Sites have to manage them to ensure that their Outstanding Universal Value is sustained into the future. Scotland currently has six World Heritage Sites[33].

6.1.15 This section considers the environmental sensitivity of the coasts included in the area under review. In so doing, it makes particular reference to the detailed examination carried out in the Belton Study[34] which remains highly relevant. There will be some inevitable repetition with this study. It also uses data obtained from other sources where noted.

6.1.16 For the purpose of the environmental sensitivity review, the area under review is conveniently divided into the following three areas:

Fair Isle (North) -
Shetland Islands including Fair Isle;

Fair Isle (South) -
North Scotland from Noss Head to Cape Wrath and including Orkney Islands;

Hebrides and Minches -
North West Scotland from Cape Wrath to south of Barra Island including Minches and Hebrides.

6.1.17 Given that the primary risk of damage to the marine environment along the coastline will arise from oil pollution and/or other pollution sources, the environmental factors considered are the same as those examined in the Belton Study, namely environment, fishing industry, agriculture and tourism. Data for these factors has been obtained from available published sources.

6.1.18 The section is structured such that key conservation sites in each area are identified and categorised according to published status. Thereafter just a few random examples of specific interest are provided given the extensive number of conservation areas identified. The Belton Study observations are still highly relevant today. A brief summary of fishing activities is given followed by a snapshot of agricultural and tourist information. The section concludes with a summary of findings, an opinion on the environmental sensitivity of the coastlines within the area under review and the risks faced from a marine pollution incident occurring along the significant stretches of coastlines which are marine conservation areas.

[33] Historic Scotland Website
[34] Belton Study, Chapter 2

6.2 Fair Isle (North) - Shetland Islands (including Fair Isle)

Environment

6.2.1 The study has identified the following MPA areas of note. These include 2 MEHRAs, 12 SAC sites, 6 SPA sites 4 SSSI sites, 4 MCA sites and 5 NSA sites:

1. Bradister Voe and the Vadills (MCA);
2. Esha Ness (NSA);
3. East Mires & Lumbister (SAC);
4. Fair Isle (SAC & SPA);
5. Fetlar to Haroldswick (MPA);
6. Fethaland (MEHRA, NSA);
7. Foula (SPA);
8. Hascosay (SAC);
9. Hernaness (NSA);
10. Ham Ness (SSSI);
11. Keen of Hamar (SAC);
12. Mousa (SAC);
13. Mousa to Boddam (MPA);
14. Muckle Flugga (MEHRA);
15. Muckle Roe (NSA);
16. North Fetlar (SAC & SPA);
17. Norwick (SSSI);
18. Noss (SPA);
19. Papa Stour (SAC, SPA & SSSI);
20. South West Mainland (NSA);
21. Sullum Voe (SAC);
22. Sumburgh Head (SPA);
23. Swinister Voe and the Houb of Fora Ness (MCA);
24. The Houb, Fuglar Ness (MCA);
25. The Vadills (SAC);
26. Tingon (SAC);
27. Villians of Hamnavoe (SSSI);
28. Whiteness Voe (MCA);
29. Yell Sound Coast (SAC).

6.2.2 There is an abundance of seabirds in the Shetland Islands but also grey seals, common seals and otters. Horse mussel beds, kelp forests and maerl beds exist in the marine environment and onshore there is machair in some locations The island of Mousa is famous for the breeding of storm petrels. The island of Noss is a National Nature Reserve (NNR) for birds. The island has steep cliffs which are home to a wide variety of bird species including gannets, guillemots, fulmars and kittiwakes. Great skuas also feature. Porpoises can be observed in the coastal waters off the island[35]. Fetla, also known as the "*Garden of Shetland*"[36] because of its diverse flora, fauna and wildlife. It is the prime breeding site for the red necked phalarope and a seasonal home for a host of other bird species. Whale and dolphin species, albeit few in number, are observed on an annual basis. Papa Stour is well known for frequent observations of otters, grey seals, killer whales and harbour porpoises. The bird population includes Atlantic puffin, Arctic and common tern, bonxie and Arctic skua, northern fulmar, common guillemot, razorbill, curlew, wheatear,

[35] Scottish Natural Heritage; Scotlands National Nature Reserves
[36] Haswell-Smith (2004); Nature & Wildlife of Fetlar

ringed plover and great black-backed gull which all breed on the island[37]. Fair Isle has a permanent bird observatory and is reported to be the best location in the UK to observe rare species of birds.

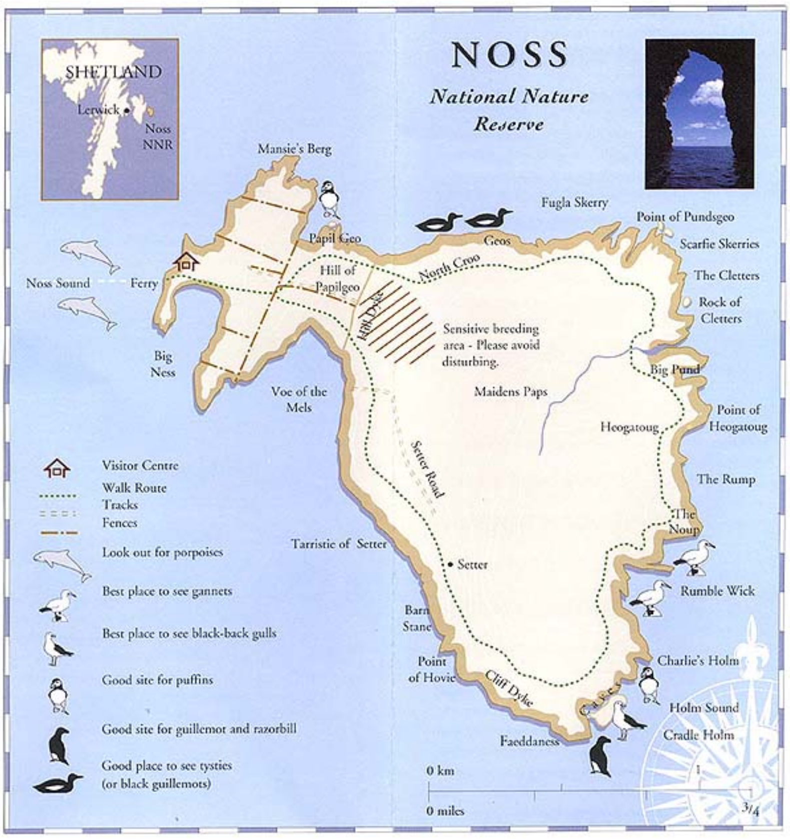

Figure 43 – Noss NNR (Source: SNH Website)

6.2.3 Sullum Voe (SAC) warrants a special mention on account of the presence and activity of the Sullum Voe Oil Terminal operated by BP Exploration Operating Company Limited on behalf of a consortium of oil companies. There are two entrances to Yell Sound that merge at the entrance of Sullom Voe. The primary north route for all vessels and the south east route, which is suitable for vessels of up to 200m in length and maximum draught of 11.6m.

6.2.4 It is said that the coastline of Shetland Islands is the best known and well mapped in the UK. The approaches to Sullom Voe have several areas of high environmental sensitivity with sea inlets, tidal rivers estuaries, mudflats, sandflats and lagoons. There is a diverse faunal community colonised in the lagoons including bivalves, polychaetes and the sea cucumber. Muddy sediments are colonised by horse mussels, sea-pens and diverse burrowing communities. The marine life in this area is in abundance hence why the Shetland Oil Terminal Environmental Advisory Group (SOTEAG) has been so proactive on environmental issues and with very notable success.

[37] Papa Stour Magazine September 2007; Papa Stour Natural History-Kevin King

Fishing Industry

6.2.4 Fishing grounds in Shetland waters continue to be the richest in the UK. The latest Shetland fisheries statistics are for 2014 and the official government data has been usefully summarised by Ian R.Napier of NAFC Marine Centre, University of the Highlands and Islands (dated September 2015) and to which this study refers.

6.2.5 The following is noted from the above statistics:

- More than 78,000t of fish worth some £76 million were landed in Shetland in 2014;
- More fish and shellfish were landed in Shetland in 2014 than in any other port in the UK, except Peterhead;
- The total weight and value of fish landed in 2014 was slightly higher than in 2013;
- Pelagic species (mackerel, herring, etc.) accounted for most of the fish landed in Shetland (77% by weight, 59% by value), but had the smallest unit-value. Whitefish (cod, haddock, monks, etc.) accounted for 21% of the weight of landings but 36% of their value. Shellfish (crabs, scallops, etc.) accounted for the smallest proportion of landings (2% by weight, 5% by value) but had the highest unit-value of just over £2 million.

Aquaculture is a major industry in the Shetland Islands. Salmon farms are plentiful, there are about 25,000t of salmon farmed each year and the shell fish market continues to increase. Employment in these sectors has increased accordingly.

Agriculture

6.2.6 The Shetland Islands continues to be a very significant crofting area and supports about 25% of the UK sheep. There were 2,976 crofts in Shetland in 2014/2015 according to the Crofting Commission Facts and Figures which was over 15% of the total of crofts in Scotland. The total estimated production value of agriculture in 2013 was £9.23 million.[38]

Tourism

6.2.7 In 2013, the number of visitors to the Shetland Islands, excluding cruise ship passengers, amounted to 64,655 spending nearly £16.25 million. Cruise ship passengers in 2014 totalled 43,723, an increase from 26,684 in 2013 and the number of arrivals at Lerwick was 49 in 2014 compared with 39 in 2013 (source: Lerwick Port Authority). The population of the Islands in 2013 was 23,200.[39]

6.3 Fair Isle (South) – Orkney Islands and North Scotland

Environment

6.3.1 The study has identified the following MPAs which include 1 MEHRA, 11 SACs, 9 SPAs, 9 SSSIs, 3MPAs and 1 NSA. There are currently 36 SSSIs in Orkney alone and some SSSIs are identified with SACs and SPAs below; 2, perhaps 3 pending SPAs are scheduled to cover Orkney:

1. Calf of Eday (SPA & SSSI);
2. Cape Wrath (SAC & SPA);
3. Copinsay (SPA & SSSI);
4. Durness (SAC);
5. Faray and Holm of Faray (SAC & SSSI);

[38] Shetland in Statistics 2014
[39] Shetland in Statistics 2014

6. Hoy (SAC, SPA & SSSI);
7. Hoy and West Mainland – Orkney (NSA);
8. Invernaver (SAC);
9. Loch of Stennes (European Special Site- saline lagoon connected to the sea)
10. Marwick Head (SPA & SSSI);
11. Noss Head – Off Coast of Wick (MPA);
12. Papa Westray – Orkney (MPA);
13. River Borgie (SAC);
14. River Naver (SAC);
15. River Thurso (SAC);
16. Rousay (SPA & SSSI);
17. Sanday (SAC & SSSI);
18. Strathy Point (SAC);
19. Stromness Heaths and Coast (SAC);
20. Sule Skerry and Sule Stack (SPA & SSSI);
21. Tor Ness Hoy (MEHRA);
22. West Westray (SPA & SSSI);
23. Wyre and Rousay Sounds – Orkney (MPA).

6.3.2 The Orkney Islands are 70 in number and are home to a significant number of species including corncrake, red-throated divers, hen harrier, merlin, peregrine, whimbrel and pintail. Breeding birds include the short-eared owl, golden plover and dunlin. In the early summer, the sea cliff reserves on the islands of Westray, Copinsay and Marwick Head on Orkney Mainland are colonised by fulmar, guillemots, kittiwakes and razorbills. Great skuas can be seen on the cliff tops and moors and gannets are in abundance too. Ducks, swans and geese of various species feature during the autumn and winter months. Grey seals can be seen throughout the year and are in abundance with about 25,000 in Orkney waters. They mate and females have their pups ashore on the small islands. There are about 7,000 common seals which can be seen mainly in the nearby coastal water. Dolphins, porpoises and whales have been observed in Orkney waters in increasing numbers.[40]

6.3.3 River Borgie boasts an abundance of wild life including otters, badgers and voles; marine life includes salmon, sea and brown trout and the grey and harbour seal[41] .

6.3.4 Cape Wrath has a wide diversity of wildlife, including red deer, fulmar, hooded crow, rock pipit, golden eagle, cormorant and gannet. The surrounding cliffs are an internationally important nesting site for over 50,000 seabirds, including colonies of puffin, razorbill, guillemot, kittiwake and fulmar. The SPA extends 2km out to sea and includes the sea bed and marine environment which is a source of food for the bird population of the area[42]. Marine species in the area include harbour porpoise, common seal and bottle nosed dolphin and also species including sea squirts and sponges.[43]

[40] Official Tourism Offices Orkney
[41] NBN Gateway
[42] JNCC/SNH
[43] Coasts & Seas/JNCC

Figure 44 – Old Man of Hoy
(source: www.gofurtherscotland.co.uk)

Fishing Industry

6.3.5 Salmon farms in Orkney are many and the output increased significantly over the 10 year period between 2002 and 2012. 11,694t were produced in 2012[44] . Shellfish species in Orkney include crabs, lobsters, periwinkles, scallops, whelks and other. Landed in 2012 were 3,440t with a value of £6,481,000. There were 142 fishing vessels in Orkney in 2012, a reduction of 10 on the previous year.[45] Pelagic/Demersal landings in 2012 were 5,280t with a value of £7,220,000.[46] The Orkney waters remain one of the richest fishing grounds in the UK. Scrabster in Thurso Bay is also a key fishing port in the area.

Agriculture

6.3.6 Agriculture is the largest sector in Orkney with arable farming and more importantly cattle are a key feature. Orkney has the most active farming sector of all the areas. Crofting activity continues in the Highlands and Orkney. In the 2014/2015 Facts and Figures published by the Crofting Commission, there were 19,422 crofts recorded and over 45% were in the Highlands and over 2% in Orkney.

Tourism

6.3.7 Tourism remains Orkney's prime industry. The latest published statistics from Orkney Island Council is the Economic Review of 2012/2013. It is recorded therein that in 2012, there were 138,546 passengers from sea ferries[47] and 164,228 passengers arriving at Kirkwall airport.[48] There were 77 liners visiting in 2012 with a total of 41,563 passengers. In 2016, 117 liners are scheduled with a total of about 85,000 passengers expected. Internal ferry routes within the Islands in 2012 was similar to previous years carrying well over 300,000 passengers. The population of Orkney in 2012 was 21,530.[49]

[44] Marine Scottish Science
[45] Marine Scottish Science
[46] Scottish Sea Fisheries Statistics
[47] OIC Marine Services
[48] HIAL Annual Reports
[49] General Register Office for Scotland

6.4 Hebrides & Minches

Environment

6.4.1 The following marine conservation areas have been identified (including St.Kilda) which include 3 MEHRAs, 22 SACs, 10 SPAs, 5 SSSIs, 4 MPAs, 8 NSAs, 4 Ramsars:

1. Abhainn Clais an Eas and Allt a' Mhuilinn (SAC);
2. Airds Moss (SAC);
3. Ascrib, Isay and Dunvegan (SAC);
4. Assynt Coigach (NSA);
5. Berneray (SSSI);
6. Canna and Sanday (SPA);
7. Eoligarry Barra (SPA);
8. Flannan Isles (SPA, SSSI);
9. Gallan Head (MEHRA);
10. Glen Beasdale (SAC);
11. Gribun Shore and Crags (SSSI);
12. Handa (SPA);
13. Isle of Lewis (Ramsar);
14. Knoydart (NSA);
15. Langavat (SAC);
16. Little Gruinard River (SAC);
17. Loch an Duin (SSSI, Ramsar);
18. Loch Laxford (SAC);
19. Loch Moidart and Loch Shiel Woods (SAC);
20. Loch nam Madadh (SAC);
21. Loch Roag Lagoons (SAC);
22. Lochs Duich, Long and Alsh Reefs (SAC, MPA);
23. Monach Islands (SAC, SPA, MPA);
24. Morar, Moidart and Ardamurchan (NSA);
25. North Rona (SAC & SPA);
26. North Uist Machair & Islands (SAC,SPA, Ramsar);
27. Obain Loch Euphoirt (SAC);
28. Oldshoremore and Sandwood (SAC);
29. Onich to North Ballachulish Woods (SAC);
30. Priest island (SPA);
31. Rigg – Bile (SAC);
32. Rum (SAC & SPA);
33. Shiant Isles (SPA);
34. Small Isles (MPA & NSA);
35. Sound of Arisaig (Loch Ailort to Loch Ceann Traigh) (SAC);
36. South Lewis, Harris & North Uist (NSA);
37. South Lewis Machair (NSA, Ramsar);
38. St Kilda (MEHRA North & South, SAC, SPA, SSSI, NSA, World Heritage Site);
39. Sunnart (SAC);
40. Traigh na Berrie (SAC);
41. Wester Ross (MPA & NSA).

6.4.2 The Western Isles are home to well over 300 species of birds and are a breeding ground for at least one third of these. Examples of birdlife include the Shiant Isles which are famous for the population of seabirds and in particular Atlantic puffins, common guillemots, razorbills, northern fulmars, black-legged kittiwakes, common shags, gulls and great skuas. Other species here and on other islands such as Handa Island and Rum Island, include shag, gannets, fulmars, kittiwakes and guillemots. Golden and white-tailed eagles have been spotted in Lewis. Wild fowl are diverse on the islands with the eider duck being found around Lewis and geese on North Uist. Marine life is in abundance in the area. Seals are common in North Uist and can be seen in Stornoway harbour and dolphin, porpoises, turtles and basking sharks have been observed in coastal waters. Monach Islands (Figure 45) are a refuge for the second largest grey seal colony in the world. Pilot whales can be seen off Flannan Isles. There are various nature reserves and SSSIs in the Western Isles, some of these being: Isle of Lewis, Balranald RSPB Reserve, South Uist Nature Reserve, Monach Islands Nature Reserve, Mingulay and Berneray, Flannan Isles and St.Kilda.

Figure 45 – Monach Islands (Source: www.hebridescruises.co.uk)

Fishing Industry

6.4.3 Aquaculture remains a mainstay of the Western Isles with salmon farms a key feature in the Minch. Sea fishing is also highly active with Lochinver having the highest landings of Dermesal fish in 2014 and Stornoway with the highest landings of shellfish. Together with landings in Kinlochbervie, Ullapool, Portree and Mallaig, the combined catch weight was 42,757,000 with a value of £94,692,000[50].

[50] Scottish Sea Fisheries Statistics 2014

Agriculture

6.4.4 Crofting continues to be a strong tradition in the Western Isles and also along the coastal regions of the Western Highlands. The Machair habitat has been preserved, particularly on Uist, Barra and Tiree in the Outer Hebrides. The rearing of cattle and growing of small areas of crops remains a primary feature in the region.[51]

Tourism

6.4.5 Research figures carried out by the Islands visitor survey for Highlands & Islands, found that more than 218,000 people visited the Outer Hebrides between October 2012 and September 2013, an increase of 27% since 2006. The total spend was £53 million. 78% of visitors arrived and departed by ferry. The activities of 74% of visitors' activities was in connection with beaches and coastal scenery.[52]

6.5 Summary of Findings

6.5.1 The extensive list of MPAs within the area under review provides testament to the nature and extent of the environmental sensitivity in terms of ecology, birds and mammals, outstanding scenery, spectacular in many instances, and the extraordinary measures being taken to provide environmental protection for the immediate and long term. Certainly, since 1995 when the Belton Study was published, the MCAs have increased quite substantially in number within the Western Isles and Hebrides covering a far greater area along the coastlines and further sites are being considered. Moreover, both political and public awareness has increased in its intensity, nationally and globally, recognising the need to take yet further legislative action to protect the marine environment and prevent pollution.

6.5.2 The Belton Study performed a risk analysis which included weighting and scoring of environmental factors[53]. The method of assessment is explained in considerable detail and is considered highly relevant today. It is noted that the four highest raw and weighted scores of environmental factors in 1995 from the 16 areas considered were:

- 1st NW Scotland (Hebrides and Minches in this study);
- 2nd Shetland (Fair Isle North in this study);
- 3rd SW Scotland;
- 4th N Scotland (Fair Isle North in this study).

6.5.3 It is further noted that other than W & N Wales which scored 10% below N.Scotland, the above scores were higher than the next group of areas by a significant margin – almost by a factor of 2 with the exception of the West Country.

6.5.4 Whilst this study does not consider the other areas included in the Belton Study, there is no evidence in any published information to suggest that the ranking of the top four would be any different today than in 1995. There is no doubt that the environmental sensitivity of the coastlines within the area under review has the highest environmental impact risk by a wide margin from other coastal areas from pollution incidents and more so given the additional MPAs which have been designated since 1995, and that more are under consultation. This is the most relevant factor from the environmental aspect in so far as ETV requirement and selection is concerned.

6.5.5 With the greater number of MPAs identified because of their environmental importance and sensitivity, comes a longer stretch of coastline affected in each of the three areas considered. Notwithstanding the additional safety and preventative measures which have been introduced to improve the safety of navigation and reduce the risk of pollution, there will still be vessels

[51] Scottish National Heritage
[52] Islands Visitor Survey 2012/2013
[53] Belton Study, section 2.148 to 2.156

becoming disabled due to breakdowns and loss of control. It remains one of the highest causes of incidents and human error too. A vessel losing power in any of the coastal and inland routes under consideration, will pose a grave risk of pollution should it be caused to ground and breach the hull. Marine bunkers, oil and chemical cargoes and hazardous cargoes can have a serious impact on shorelines and can be devastating to the marine habitat and birdlife as well as the local communities, from a health, social and economic standpoint. The global examples are too many to mention. Harbour tugs are confined to Fair Isle North and South, there are lifeboat stations with the wider area under review which perform exemplary services time and again. However, these craft cannot substitute for a dedicated emergency towing service should prevailing circumstances exceed their operational limits.

7 RISK REVIEW

7.1 Preamble

7.1.1 Several reports exist which contain detailed analyses and assessment of the risks posed by shipping in the areas of interest in this study. In particular, the Belton Study and Marico Report both provide extensive analysis of the risks and consequences associated with a shipping incident in the areas in question.

7.1.2 The risk assessment methodology adopted in these studies, which, in the case of the Marico Report, includes extensive analysis of AIS data, is considered to be rigorous and stands on its own merit. Many of the findings of these studies have been found to be still relevant. As a result, a further risk assessment of the type presented in the Marico Report has not been attempted under the scope of this study. Rather, a review of the findings of these risk assessments has been conducted, followed by an examination of the changing factors affecting the areas which could impact on risk levels. This has allowed conclusions to be drawn as to the relative risks posed by various types of shipping in each area under review.

7.1.3 Following this review, the results of towage resistance calculations for various ship types are presented in Section 8 together with an indication of the proportion of the fleet operating in the area that would be serviced by ETVs with different bollard pull capacities.

7.2 Review of the Belton Study Risk Assessment

7.2.1 The Belton Study (1995) states that "*the rationale for Emergency Towing Vessels centres around protecting the environment from ship-borne pollution.*" The risk assessment that is presented therefore focuses on identifying those regions around the UK coast most at risk of marine pollution. The methodology adopted was one of scoring sixteen coastal regions based on a number of weighted environmental and risk factors. The larger the total score for a region, the greater the likelihood of a ship-borne pollution incident with major environmental consequences. The division of the UK coast into regions as adopted in the Belton Study is shown in Figure 46.

7.2.2 Scoring of environmental factors was based on the prevalence of significant or rare species of birds, marine mammals and other ecology in the area. The reliance on the coastal environment for fishing, tourism and agriculture was also considered.

7.2.3 The risk factors considered included traffic density, navigational hazards, wave heights, the extent of lee shores along the areas' coast which are rocky and the availability of tugs. Risk factors were weighted more heavily than environmental factors for the reason that "*environmental sensitivity becomes relevant to a decision on tugs only to the extent that there is a risk of pollution damage. The environmental benefits of tug provision occur as a consequence of reduction in risk*."

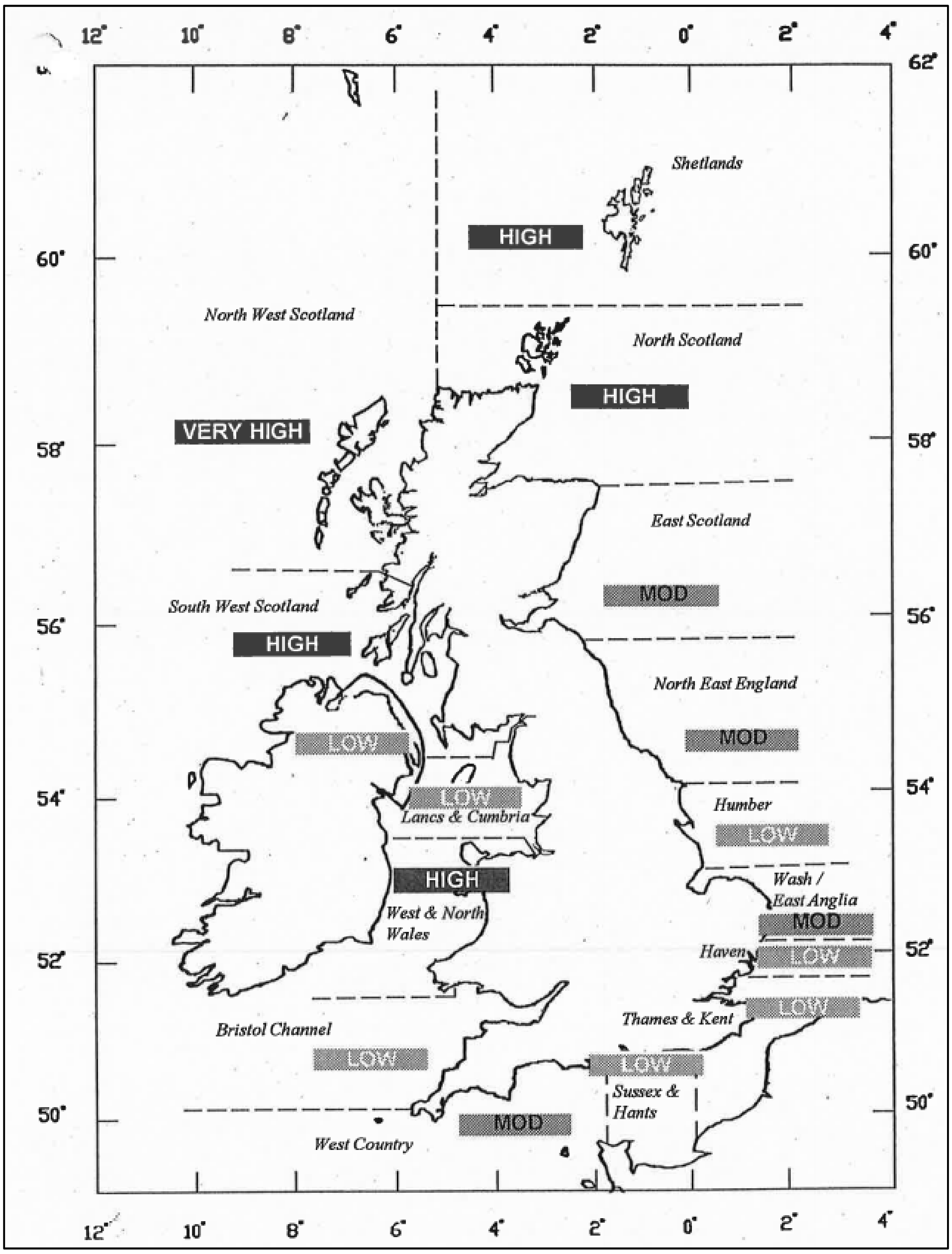

Figure 46 – UK coastal regions as defined in the Belton Study, in this case showing environmental priority (graded low to very high)

North West Scotland

7.2.4 Environmentally, North West Scotland was rated 1st in importance by a substantial margin. The report states that "*even a relatively minor pollution incident in this area would have catastrophic effect in both human and economic terms*." Such sensitivity is largely due to the number of marine conservation sites covering the majority of the coastline and the reliance of the area on the fishing industry.

7.2.5 Risk scoring ranked North West Scotland in 3rd place, largely attributed to the severe weather conditions, the nature of the coast and the lack of tug availability in the area. The report makes particular reference to the risks posed by the number of tankers transiting the Minches which, at the time of the report, was thought to be between two and three vessels per day, and to the unnecessary proximity of the Deep Water Channel to the west coast of the Hebrides.

7.2.6 North West Scotland was ranked highest of all 16 regions in terms of combined environmental and risk score. The Belton Study concluded that the Hebrides operating area should have year round ETV cover.

North Scotland and the Shetland Islands

7.2.7 The Shetland Islands were ranked 14th on the basis of risk and 2nd on an environmental basis. North Scotland, including the Orkney Islands, was ranked 16th in terms of risk and 5th in terms of environmental sensitivity. In both cases the low risk ranking was attributed to low traffic densities, despite the Pentland Firth and Fair Isle channel influencing traffic densities in these areas. The Belton Study comments that transit traffic in this area is likely to be high and that no statistics were available to establish the density of transit traffic at the time of the study.

7.2.8 The Fair Isle operating area, which encompasses the regions of North Scotland and Shetland, was ranked 6th most at risk overall in the UK. The Fair Isle operating area was concluded to be a secondary danger area requiring ETV cover during the winter months October to March.

7.3 Review of the Marico Report Risk Assessment

7.3.1 Whilst applying similar principles to the Belton Study, a key difference of the risk assessment presented in the Marico Report (2008) is the utilisation of AIS data to assess the likelihood of a shipping incident requiring ETV intervention. This data is considered to give a more reliable picture of vessel traffic density around UK waters compared to the Department of Transport port statistics used to compile the Belton Study.

7.3.2 The Marico risk assessment methodology is to define risk as the product of probability of occurrence and consequence. Here, probability of occurrence is the likelihood of a particular vessel type suffering a mechanical failure, resulting in loss of propulsion, whilst in the area in question. Consequence is determined by scoring a number of environmental, commercial and situational factors.

7.3.3 In order to determine the probability of a vessel suffering a propulsion failure whilst in a particular area, the total mileage of several vessel types through each region was determined from AIS records. The total mileage within each region for each vessel type was multiplied by a probability of mechanical failure per ship mile, this latter value having been determined in a study concerning tankers conducted in the United States. It is assumed in the study that the probability of mechanical failure per mile is the same for both cargo ships and tankers, by virtue of the fact that both vessel types commonly have single engine, single screw propulsion systems.

7.3.4 The consequence of an incident are divided into two types in the Marico Report; those associated with ship drift and those associated with extreme motion. The rationale for this approach is that a ship propulsion failure may escalate into a pollution incident involving loss of the cargo or vessel due to either grounding following vessel drift, or through foundering or structural failure due to excessive motion.

7.3.5 Criteria in the ship drift scenario include the following:

- Proximity to land, where a distance of less than 12 miles denotes high risk and greater than 48 miles very low risk;
- Prevailing wind/tide conditions, where areas subject to frequent strong westerly winds and strong currents are rated high risk;
- The nature of the coastline most likely to be struck by a disabled vessel, where hard ground (rock) or man-made structures denote high risk, soft ground low risk;

- The potential quantity of oil that could be spilt, where tiers range from >10,000t (high), 1,000 to 10,000t (medium) and 10 to 1,000t (low);
- The environmental impact of any pollution to the coast in the vicinity;
- The potential economic impact should a waterway be blocked or should a disabled ship be struck by another vessel;
- The ability of the crew to stop the drift through anchoring.

7.3.6 In the case of the extreme motion scenario, criteria relate to the wave environment in the area of the disabled vessel, the type of cargo or stability condition of the vessel and the pollution potential of the cargo.

7.3.7 The risk assessment was performed considering only tankers and cargo vessels with length greater than 100m. This includes container ships, bulk carriers, product tankers, general cargo vessels and RO-RO container/cargo vessels, but excluded passenger vessels. It was assumed in the study that passenger vessels are more reliable than cargo vessels or tankers such that the available data relating to probability of mechanical failure is not applicable.

7.3.8 It is important to note that the AIS data on which the analysis was based covered a duration of only 2 weeks. Furthermore, no recorded visits of vessels greater than 290m in length to any of the areas of interest were included in the data.

Ship Disablement Risk Results

7.3.9 The Marico Report risk assessment indicates that the risks associated with ship disablement are small in the regions of interest to this study compared to other areas. Fair Isle North is ranked 9th overall (out of fifteen areas), with Fair Isle South, Minch and Hebrides ranked 13th, 14th and 15th respectively.

7.3.10 These results are a reflection of the fact that these areas have the lowest concentration of vessel movements, according to the AIS data used to perform the study, and are therefore less likely to witness a vessel disablement. The authors of the report acknowledge that the risk level may not be representative given the short period for which AIS data applies.

7.3.11 The Marico Report places equal weighting on the consequences of a ship drift scenario and excessive motion scenario. However, only the first of these appears to account for the sensitivity of the coastal environment to a pollution incident. Furthermore, the weighting attributed to the coastal 'quality' or environmental impact is considered low; a weighting of only 2 points being given to this category out of a maximum of 5 points.

7.3.12 These factors could explain why the areas in question appear to be amongst the least at risk in the UK, a conclusion which the Marico Report states as potentially misleading.

7.3.13 The Marico Report addresses this by posing a worse-case scenario in the form of a "high risk" laden tanker transiting the Pentland Firth or Fair Isle Strait and becoming disabled (ref: p92). The Report goes on to say, "*As long as there remains the potential for a 'high risk' ship (e.g. a laden tanker) to be disabled in the area, it will happen…..*". Table 15 in the Report provides the Ranked Area Weighted Consequence Scores from such event. Hebrides scores the highest of all areas considered, Fair Isle North and Fair Isle South are third and fourth respectively.

7.4 Relevance of the Conclusions of Previous Risk Assessments Today

7.4.1 Both the Belton Study and Marico Report attempt to quantify the level of risk associated with a shipping incident in the areas north and north west of Scotland through assessment of probability and consequence of such an event. Both analyses rank the environmental consequences of a pollution incident in these areas as amongst the greatest, if not *the* greatest, of any area in the UK.

7.4.2 The area under review remains the most environmentally sensitive area in the UK by a wide margin. It contains 6 MEHRAs including North and South St.Kilda. There has been a significant increase in identified marine protection areas since the Belton Study in 1995. The impact from marine pollution would have a devastating impact on wide stretches of coastline and also the livelihood of communities within these areas. For these reasons the emphasis on environmental sensitivity placed by both risk assessments on these area is considered entirely appropriate.

7.4.3 Following an analysis of AIS data, the Marico Report assesses the risk of a ship becoming disabled in the region to be low due to low volumes of shipping traffic in these areas. The Belton Study considers the risk to be greater and the areas under review are ranked higher overall as a result.

7.4.4 In light of AIS data collected for these areas between 2010 and 2015, discussed in Section 3, the rankings given by the Marico Report are considered misleading. This data shows an increasing number of cargo and passenger vessels transiting the area in the years since 2010, and instances of vessels with length greater than 290m transiting the regions; an occurrence that was not recorded in the Marico Report. The Pentland Firth remains the busiest waterway in the region, with an average of 76 vessels passing through the Firth per day in winter[54]. Cruise liner visits show an increasing trend throughout the area under review; a category of vessel that was not considered in the Marico Report.

7.4.5 It is important to note that the bunker capacity of many of the larger vessels visiting the area, including cruise vessels, containerships and bulk carriers, can be in excess of 3,000t. The pollution threat due to a spillage of heavy fuel oil bunkers alone is therefore comparable to the cargo of a small coastal tanker. Consequently the pollution risk associated with vessels whose cargo may not itself be hazardous to the environment should not be underestimated.

7.4.6 Although numerous legislative measures have been implemented to improve the safety of navigation within the area under review and pollution prevention regulations have also been enhanced, specific hazards still exist which present potential risks to shipping. These have been discussed in Section 4.

7.4.7 Human error remains one of the prime causes of shipping incidents and cannot be ignored. It can impact on navigation and vessel breakdown. Human error is not considered explicitly in either of the previous studies, but can be considered a random variable affecting shipping in all coastal regions equally.

[54] Shipping Study of the Pentland Firth and Orkney Waters, Marine Scotland, 9th November 2012

7.5 Future Trends

7.5.1 Globally, numbers of major shipping casualties have been reducing over the past decade, and annual casualty numbers have been below 100 for the past two years. Large shipping losses have declined globally by 45% over the past decade, seemingly driven by an increasingly robust safety environment and self-regulation. The British Isles, North Sea, English Channel and Bay of Biscay area remains a global hotspot for shipping casualties, accounting for 91 losses over the past decade[55].

7.5.2 Statistics obtained from the most recent Annual Review of Marine Casualties and Incidents 2015 by EMSA (European Maritime Safety Agency) show that loss of control was the highest percentage cause of casualty events which classified as marine incidents between 2011 and 2014. Loss of control is defined as "*a total or temporary loss of the ability to operate or manoeuvre the ship, failure of electric power, or to contain on board cargo or other substances*". Increasing pressure on the cost of shipping, and in turn shipboard maintenance, suggests that incidence of loss of control due to machinery damage could increase.[56]

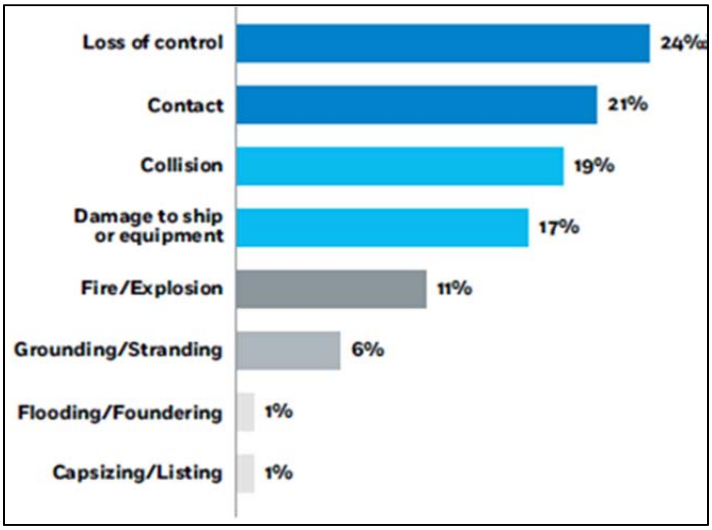

Figure 47 - Distribution of Casualty Events Classified as Marine Incidents 2011 – 2014 (Source: EMSA)

7.5.3 A similar issue faced by the global shipping industry relates to seafarer shortage, fatigue and training issues[57]. The shortage of qualified and experienced staff on board vessels could give rise to a greater number of human error and fatigue related incidence in future years.

7.5.4 The trend for ever-increasing sizes of containerships could present a risk to the area under review. The AIS data reviewed in Section 3 indicates that containerships of lengths in excess of 300m are already visiting the area, and the grounding of a vessel of this size, or larger *"mega-ships"*, could result in significant pollution and environmental damage from oil, hazardous and non-hazardous cargoes, significant damage interruption to fishing and aquaculture activities, severe impact on the local economy and a devastating effect on the local communities. A salvage or wreck removal operation of such a vessel could be very lengthy indeed. As discussed at 7.4.5 above, in larger vessels the quantities of heavy fuel oil bunkers alone may be comparable to the cargo of a small coastal tanker.

[55] Safety and Shipping Review 2016, Allianz Global Corporate & Speciality
[56] Safety and Shipping Review 2016, Allianz Global Corporate & Speciality
[57] Safety and Shipping Review 2016, Allianz Global Corporate & Speciality

7.5.5 As has been stated elsewhere in this report, the increasing number of cruise vessels visiting the area poses a unique risk to the region which should be considered for future ETV planning. In particular, the growing size and passenger capacity of these vessels, together with the nature of their operations, which may involve entering potentially hazardous or restricted waterways for the benefit of passenger experience, give rise to previously unseen risks.

7.6 Conclusions

7.6.1 A review of previous risk assessments undertaken in the Belton Study and Marico Report has been conducted. These assessments both placed the North and North West Scotland amongst the most environmentally sensitive areas in the UK. Low densities of shipping traffic were identified in the Marico Report, based on analysis of AIS data, resulting in the area under review being classed as at low overall risk. The Belton Study ranked the overall risk more highly.

7.6.2 The environmental risks associated with the area identified in both reports remain present today. The area is considered the most environmentally sensitive to a pollution incident of any in the UK, owing predominantly to the number of marine protection areas and reliance on the fishing industry. AIS data analysed for this study would suggest an increased traffic density than is suggested by the Marico Report. There is an increasing trend for large cargo and passenger vessels to visit the area, the latter including cruise ships of up to 300 metres length. The operations of large cruise vessels may pose risks to this area which have not previously been considered in the context of ETVs. However, from an environmental perspective, the pollution risks associated with laden oil tankers are considered to remain the worst case scenario for the region.

8 BOLLARD PULL ANALYSIS AND RISK REDUCTION CONSIDERATIONS

8.1 Preamble

8.1.1 As discussed in Section 2.2, the primary function of an ETV is to take vessels that are distressed or disabled under tow, so as to control the rate and direction of drift, in order to prevent or reduce risk to human life and the environment. The bollard pull capacity of an ETV is therefore an important parameter which influences its ability to be of assistance in an emergency and key to ETV selection.

8.1.2 In order to help gauge the appropriate bollard pull capacity for an ETV based in the North and North West Scotland, an analysis is carried out to examine the likely proportion of vessels which visit the area which could be assisted by ETVs of various bollard pull capacities.

8.1.3 It is important to note that such a study will never be definitive, and that certain situations will always exist in which no ETV can be completely effective. Nevertheless, an ETV with an appropriate bollard pull should have the capability of having a real influence on mitigating risk through controlling drift.

8.1.4 The methodology used for the analysis involves two stages. First, calculations are performed on the basis of industry standard guidelines to determine bollard pull required for a tug to tow different vessel types on unrestricted ocean tows. The criteria on which the calculations are based assume a bollard pull necessary to arrest drift of a tow in gale force conditions. The sensitivity of the bollard pull calculated to changes in the environment is discussed. The towed vessel types for which bollard pull requirements are calculated have been selected so as to encompass the majority of the vessel types and sizes found to be visiting the area, based on the data presented at Section 3.

8.1.5 The second stage of the analysis is to determine the proportion of the vessels in the area whose drift could be arrested by tugs of various bollard pull capacities. For the purposes of the calculations, each tug's bollard pull capacity is reported as either sufficient to tow the vessel and by inference to be effective as an ETV in mitigating risk, or it was not. It is recognised that the distinction is unlikely to be so clear cut in reality, and that tugs which may not, on paper, be sufficiently powerful for an ocean tow will still provide a degree of assistance to a disabled vessel. The calculations are simply intended to provide information regarding risk levels to help inform the decision of appropriate ETV size.

8.1.6 Each stage is discussed in more detail in the following sections.

8.2 Calculation of Bollard Pull

8.2.1 AIS and other data presented in Section 3 indicates that several types of large vessel are common to the area, including tankers, cargo vessels (including bulk carriers and containerships) and passenger vessels (including cruise ships). Bollard pull calculations were therefore focused on these vessels. The data indicated that tankers of length 250 to 300m are common in the region, and that container vessels and passenger ships with lengths of the order of 300m are also seen. The breadth, depth and draught of these vessels are chosen accordingly based on common vessel types and are summarised in Table 9.

8.2.2 Larger vessels in excess of 300m length are also considered, such as VLCCs and post-Panamax container vessels, despite the fact that these types of vessels are rarely seen in the area although 5 VLCCs visited Scapa Flow in the past 15 months.

8.2.3 The bollard pull calculations are based on the philosophy recommended by DNV Offshore Standard H202 and by IMO MSC Circular 884 – '*Guidelines for Safe Ocean Towing*'. In these guidelines, the bollard pull of the towing vessel is calculated as that necessary to hold the towed vessel at zero forward speed in a fully developed gale, defined as:

Significant wave height:	5m
Wind speed:	20m/s (approx.40 knots)
Current:	0.5m/s (approx.1 knot)

8.2.4 The above environmental criteria, associated with gale force conditions, are normally applied in the design of unrestricted (i.e. ocean going) towing operations. The analysis of weather data, presented in Section 5, indicates that average wind and wave conditions for the areas in question are less than gale force. In order to understand the effect of the assumed environmental conditions on bollard pull requirements, a sensitivity study has been performed. This considers the effect of increasing or decreasing the environmental parameters from the values above on bollard pull for a Suezmax tanker. The results of the study are shown in Table 10. However, for the purposes of this study, the ocean tow conditions are considered to be representative criteria against which to judge the potential effectiveness of an ETV in arresting drift in all of the areas being considered.

8.2.5 It is recognised that there are many areas within the region where current velocities are commonly much greater than 1 knot, for example the Pentland Firth. As shown in Table 11, the effect of an increase in current velocity from 1 knot to 3 knots (in combination with the wind and wave conditions above) is to increase the bollard pull required by about 10t. These figures are based on the tow of a large tanker but are considered applicable to the tow of all large casualties. It is considered very unlikely that an ETV would be required to tow a casualty vessel directly against wind, wave and high currents all from the same direction. Currents typically flow parallel to the coastline and would not necessarily be the primary cause of a vessel's drift towards the shore. Against this background, the standard industry criteria for calculating the towage resistance and hence bollard pull for an ocean towage is deemed appropriate for the whole area under consideration.

8.2.6 In the calculation of bollard pull, the forces due to wind, wave and current are assumed to act coincidently on the bow of the towed vessel. This is the direction from which the environmental forces on the towed vessel will be minimal. Several studies have shown that tankers naturally adopt a beam-on attitude to wind, waves and current when freely drifting (footnotes [58] and [59] for example). The ability of the ETV to turn the vessel into the prevailing weather is therefore an important consideration. In this regard the results of model testing conducted by Oil Companies International Marine Forum (OCIMF)[60] have been referenced, in which the towing force required to turn a VLCC from beam-on conditions to face into the prevailing weather (either head-on or stern-on) was investigated in wind and wave conditions corresponding to Beaufort 7. From a total of 50 runs the turn was completed by applying forces ranging from 80 to 135t in all but 3 cases.

8.2.7 The towing force available to any tug will reduce in wind, waves and current as some of the thrust is used to overcome the environmental forces on the tug itself. The same is also true when the tug has forward speed. Losses in pulling capacity associated with tug efficiency in waves have been included in the calculations. Tug efficiency has been taken as follows (reference DNV-OS-H202, Sea Transport Operations, October 2015, Section 4.3.3, Bollard Pull):

$$\boldsymbol{Tug\ Efficiency} = \left[\mathbf{80} - (\mathbf{18} - \mathbf{0.0417}\ \times \boldsymbol{LOA}\ \times \sqrt{\boldsymbol{BP} - \mathbf{20}}) \times (\boldsymbol{H_s} - \mathbf{1})\right]/\mathbf{100}$$

[58] "Stopping and Anchoring Large Ships – A Feasibility Study" A. Morton, B. Baines & K. Ridgway, Transactions of the Institute of Marine Engineers, Vol. 99, Paper 26.
[59] "Disabled Tankers, Report of Studies on Ship Drift and Towage", OCIMF, 1st Edition, 1981
[60] "Disabled Tankers, Report of Studies on Ship Drift and Towage", OCIMF, 1st Edition, 1981

8.2.8 The results of the bollard pull calculations for several vessel types are presented in Table 9. Their sensitivity to environmental conditions is shown in Table 10.

	Tanker			Bulk Carrier			Passenger Vessel	Containership	
Vessel Type	Aframax	Suezmax	VLCC	Handymax	Panamax	Post Panamax		Panamax	Post Panamax
Length OA (m)	245	290	330	190	230	280	302	294	330
Breadth (m)	34	47	53	32	32	45	33	32	40
Depth (m)	18.7	28	32.0	17.5	20	26	44.0	21.0	25
Draught (Ballast) (m)	6.0	8.5	9.6	5.0	5.0	7.0	7.6	5.0	12.0
BP Required (tonnes)	107	124	138	95	100	128	80	87	105

Table 9 – Summary of Bollard Pull Requirements for Various Vessel Types

	Change	Effect on Bollard Pull
Change in Wind Speed	+/- 5 knots	+/- 6 tonnes
Change in Significant Wave Height	+/- 1 metre	+/- 20 tonnes
Change in Current Velocity	+/- 2 knots	+/- 10 tonnes

Table 10 – Sensitivity of Bollard Pull to Changes in Environmental Conditions, relative to Industry Standard Criteria, for a Suezmax Tanker

8.3 Calculation of Vessel Coverage

8.3.1 In this step, the results of the bollard pull calculations are reconciled with the number of vessels of each size and type that are operating in the area in order to provide an indication of the proportion of all vessels that could be towed by tugs of various bollard pull capacities.

8.3.2 The AIS data provided to LOC only identified the vessel type and not the vessel size. Vessel size is interrogated by comparing the vessel's MMSI number to an in-house dataset of vessels. This is particularly useful to gauge an indication of the range of vessel sizes operating in the area. The data is extrapolated to establish an understanding of the composition of all vessels operating in the area by vessel size. However, it is important to highlight that of 291,151 vessel movements recorded in the Fair Isles area, the ship types could be determined for 80% of cases and, of these, 9.5% could be allocated to a vessel size. Where the size could not be determined, most of the vessel types were known to be fishing vessels, pilot vessels, search and rescue vessels and tugs (see Figure 2 of Section 3) and it was assumed that they could be handled by the smallest size ETV. The numbers were similar for the Hebrides and Minches area.

8.3.3 Passenger vessel size statistics are not obtained from MMSI information, but in the case of the Fair Isles are based on records of passenger vessel arrivals to the Orkney Islands. This dataset showed that almost all cruise ships (97%) visiting the area were under 300m length. The passenger vessel sizes entering the Hebrides and Minches area are based on the cruise ship visit schedules from the Western Isles, which showed that all cruise ships are under 300m length. These datasets are described in more detail in Section 3.

8.3.4 It is worth noting that a small sample size is being used to extrapolate the proportion of vessels under 303m length to the entire passenger fleet operating in the area as identified by AIS. Consequently, the exact proportion of cruise ships less than 300m length that is estimated for each area has a lower precision associated with it. This is somewhat mitigated by the knowledge that many of the passenger ships identified by AIS will be ferries less than 300m length and therefore although the precision is low, the bias is conservative from the perspective of this study.

8.3.5 There is no data associated with the category of miscellaneous ships included in the AIS data. It is therefore assumed that miscellaneous ships with a length of less than 190m can be towed by all tugs with a bollard pull of at least 105t. It might be the case that a lower bollard pull would be sufficient for many of the ships included in this category, such that this approach is considered conservative.

8.3.6 Of the total number of observed vessel movements into each area between 2010 and 2015 which could be attributed to a particular vessel type and size, the percentage of the total observations is determined. For example, in the Fair Isle area it was found that there were 7,080 observations of Handymax bulk carriers, which was 10.3% of the total number of observations (21,983) that could be allocated to a size range.

8.3.7 Finally, using the results of the bollard pull calculations conducted previously, the proportion of vessels which could be towed by a range of ETVs with different bollard pulls (90t to 140t) is investigated. This is achieved by comparing the type and size of each vessel to the bollard pull requirements presented in Table 9. Where it is found that the bollard pull capacity is sufficient for a particular size and type of vessel, it could be said that a tug with that capacity could tow the corresponding proportion of the total fleet. This enabled an approximate indication to be made of the proportion of all vessels which could be towed by a particular size of tug in the environmental conditions described above.

Results - Fair Isles

8.3.8 The results for the Fair Isles area are presented in Table 11. In the table the cells outlined in green define whether or not the selected bollard pull capacity would be capable of towing the vessel type and size as calculated in the preceding part of this section. As previously mentioned, for the purposes of the calculation a binary *"yes"* or *"no"* decision is stated as to the tug's ability to tow each vessel. However, it is important to note that the reality is not so straight forward. Even if a tug capacity is less than the required bollard pull, it does not mean it is ineffectual in controlling drift and a casualty can be brought round into the prevailing weather and the rate of drift arrested.

8.3.9 The row at the bottom of Table 11 represents the sum (as a percentage) of all the vessel types and sizes that are covered by each of the bollard pulls (a summation of the % total observations against which a 'yes' is recorded). This a percentage of all vessels, (including the biggest population by far of others), and not just the larger vessels.

8.3.10 As an example, Table 11 indicates that about 95% of all vessels operating in the area could be towed by an ETV with bollard pull of 110t and that 98% could be towed by an ETV with bollard pull of 125t.

Ship Type	Ship Length Range, L (m)	Ship Type Category+	No. of Observations		% of Total Obs.	90	105	110	125	130	140
			Sample	Population							
Total, unknown type & small vessels*				174052	59.8	✓	✓	✓	✓	✓	✓
Bulk Carrier	L <=190	Handymax	7080	29961	10.3	✗	✓	✓	✓	✓	✓
	190 < L <= 230	Panamax	1567	6631	2.3	✗	✗	✓	✓	✓	✓
	230 < L <= 280	Post-Panamax	765	3237	1.1	✗	✗	✗	✗	✓	✓
	L > 280m	Capesize	192	812	0.3	✗	✗	✗	✗	✗	?
Tanker	L <= 210	Coastal	1988	8413	2.9	?	?	✓	✓	✓	✓
	210 < L <= 250	Aframax	3638	15395	5.3	✗	✗	✓	✓	✓	✓
	250 < L <= 290	Suezmax	1836	7769	2.7	✗	✗	✗	✓	✓	✓
	L >290	VLCC	51	216	0.1	✗	✗	✗	✗	✗	✓
Miscellaneous	L <= 190		2286	9674	3.3	✗	✓	✓	✓	✓	✓
	L > 190		113	478	0.2	✗	✗	✗	✗	✗	✗
Containership	L <= 295	Panamax	2302	9741	3.3	✓	✓	✓	✓	✓	✓
	295 < L <= 330	Panamax Plus	29	123	0.0	✗	✓	✓	✓	✓	✓
	L >330	New Panamax	3	13	0.0	?	?	?	?	?	?
Passenger ship	L <= 302		129	23895	8.2	✓	✓	✓	✓	✓	✓
	> 302		4	741	0.3	?	?	?	?	?	?
TOTALS			21983	291151	100	71	85	95	98	99	99

Table 11: ETV Bollard Pull Coverage for the Traffic Size and Type operating in the Fair Isles

*** Fishing vessels, search and rescue craft, dredging vessels, diving vessels, pilot vessels and tugs**
+ These definitions are used in this report, they may vary across the industry for some vessel types
? Calculations not critical to the conclusions

Results - Minches and Hebrides

8.3.11 The results for the Minches and Hebrides area are presented in Table 12. This shows the number of vessel movements in to the area observed between 2010 and 2015. It should be borne in mind that conditions in the Minches are sheltered and therefore the results below are representative for the Outer Hebrides and lower bollard pulls would apply in the Minches in most cases.

Ship Type	Ship Length Range, L (m)	Ship Type Category+	No. of Observations		%of Total Observations	90	105	110	125	130	140
			Sample	Population							
Total, unknown type & small vessels*				56721	49.1	✓	✓	✓	✓	✓	✓
Bulk Carrier	L <=190	Handymax	6187	22591	19.6	✗	✓	✓	✓	✓	✓
	190 < L <= 230	Panamax	1764	6441	5.6	✗	✗	✓	✓	✓	✓
	230 < L <= 280	Post-Panamax	912	3330	2.9	✗	✗	✗	✗	✓	✓
	L > 280m	Capesize	241	880	0.8	✗	✗	✗	✗	✗	?
Tanker	L <= 210	Coastal	1235	4509	3.9	?	?	✓	✓	✓	✓
	210 < L <= 250	Aframax	1295	4728	4.1	✗	✗	✓	✓	✓	✓
	250 < L <= 290	Suezmax	501	1829	1.6	✗	✗	✗	✓	✓	✓
	L >290	VLCC	11	40	0.0	✗	✗	✗	✗	✗	✓
Miscellaneous	L <= 190		25	91	0.1	✗	✓	✓	✓	✓	✓
	L > 190		58	212	0.2	✗	✗	✗	✗	✗	✗
Containership	L <= 295	Post-Panamax	135	493	0.4	✓	✓	✓	✓	✓	✓
	295 < L <= 330	Panamax Plus	24	88	0.1	✗	✓	✓	✓	✓	✓
	L >330	New Panamax	4	15	0.0	?	?	?	?	?	?
Passenger	L <= 302	S <= 302	82	13556	11.7	✓	✓	✓	✓	✓	✓
TOTALS			12474	115524	100	61	81	95	96	99	99

Table 12: ETV Bollard Pull Coverage for the Traffic Size and Type operating in the Minches and Hebrides Area

*** Fishing vessels, search and rescue craft, dredging vessels, diving vessels, pilot vessels and tugs**
+ These definitions are used in this report, they may vary across the industry for some vessel types
? Calculations not critical to the conclusions

8.3.12 The results are similar to the Fair Isle area and suggest that a tug of 110tbp would be capable of covering around 95% of the vessel sizes and types operating in the area in the environmental conditions assumed.

8.4 Discussion

8.4.1 The results of bollard pull calculations in combination with the analysis of the type and density of traffic in the area indicates that the majority of vessel types (about 90%) entering the area could be towed by an ETV with bollard pull of 110t in fully developed gale conditions and less in the Minches. Such a bollard pull capacity would also be sufficient to turn a disabled tanker from a beam-on condition into the prevailing weather, based on the results of the OCIMF study discussed previously (see under 8.2.6).

8.4.2 In the early part of Section 7, the high sensitivity of the coastlines, their vulnerability to pollution and the dire consequences of an oil spill in the areas studied was highlighted. It was also shown however, that the risk was deemed low because of the ship traffic density in the areas. This section has provided a means by which the ETV bollard pull can be put into context given the traffic operating in the area. It is important to note several points about the results before conclusions can be drawn, which are discussed below.

8.4.3 The calculations are not intended to imply a cut-off point at which a tug is ineffective in a towing situation. Even if a tug's capacity is calculated to be less than the required bollard pull, it does not mean it is ineffectual in controlling drift. A lower capacity tug will have the potential to alter the direction and/or speed of drift which may be sufficient to overt an environmental catastrophe in the short term while waiting for additional assistance to arrive. Likewise, even if the tug is shown to have the theoretical capacity to pull a stricken vessel, it may not be able to do so in reality due to a combination of high currents and heavy swell greater than assumed in the calculations.

8.4.4 It is important to bear in mind that these results are specific to the standard environmental criteria for establishing bollard pull requirements for ocean towage (40 knot wind speed, 5 m significant wave height and 1 knot current speed). The sensitivity of the bollard pull to changes in these environmental parameters has been considered and the results shown in Table 10 above. The bollard pull is most sensitive to changes in wave loads, followed by wind and current loads. Given the weather statistics for the area and the variable nature of the conditions experienced, the standard criteria used is considered most appropriate.

8.4.5 Differences in the percentage coverage of vessels operating in the Fair Isles and in the Hebrides and Minches are attributed to variations in traffic density and vessel sizes between these areas, rather than environmental conditions. For example, traffic density is greater in the Minches than in the DWR and consequently there may be some distortion in the results.

8.4.6 Considering the above factors and the results of the analysis conducted here, together with the foregoing analyses of vessel types and sizes in the area under review, it is considered that an ETV with bollard pull in the region of 120t would provide a level of capability that would be likely to provide for a reduction of risk posed by drifting or disabled vessels into the ALARP range.

9 RECOMMENDED TYPE, SIZE AND SUITABILITY OF VESSEL FOR ETV

9.1 Summary of Key Factors Considered

9.1.1 The key factors considered have been addressed in the preceding sections, namely the following:

Present tug availability - towage assets in the area are confined to harbour tugs with maximum bollard pulls of 55t, unreliable availability and restricted operational capabilities.

Traffic type & density - statistics and enquiries show that the tanker traffic features more Aframax size although larger tankers may transit the area on occasion as will ULCS passing north of the Shetland and in the DWR. Panamax size dry cargo vessels are common. Cruise liner traffic is experiencing steady increase.

Specific hazards – these have been considered and exist throughout. Breakdowns will occur despite measures which are in place to reduce incidents and vessels will be caused to free drift and require towage intervention.

Weather - conditions and trends do not suggest any changes and the frequency of gales can be expected to follow previous years, fluctuating between good and bad years. Fair Isle suffers the highest number of gales followed by Hebrides. The risk of break down has been shown to be higher in exposed open water and with significant wave heights greater than 4m as found in the Marico Report[61] and ETV selection must be commensurate with heavy weather operations. The exceptionally strong tidal streams also need to be borne in mind.

Environmental sensitivity – this impacts upon a significantly greater stretch of coastlines than ever before which increases the need for a dedicated first responder which is designed to reach all areas within the shortest possible time period. A patrolling function will be an important consideration.

9.1.2 Previous **risk assessments** have considered all the above factors and their consequences and the results would not be significantly different today. The risk review made by the Study Team has reached similar conclusions.

9.1.3 The Fair Isles area generally receives a larger volume of traffic than the Minches and Hebrides, with the greatest density being concentrated in the Pentland Firth. The Minches and Hebrides on the other hand are subject to smaller overall volumes. However, particularly busy areas are found around Cape Wrath and through the Minches. The traffic separation lanes in the Minches appear to be observed and the ATBA also seem to be having their desired effect within the Fair Isles area.

9.1.4 In both areas fishing and dry cargo vessels are the most prevalent type. The size of vessels are quite wide ranging; coastal tankers to VLCCs and Handymax to Post-Panamax dry cargo carriers have all been recorded in the area between 2010 and 2015. Panamax size container ships are most commonly observed transiting through the Minches along with feeder vessels and other smaller cargo ships. VLCCs are observed passing north of Shetland and the Hebrides Deep Water Route. However, tanker traffic in the Minches has been confined to a maximum of 10,000 gross tonnes for laden tankers and it appears that this restriction is adhered to. Aframax and Suez max are the most frequent vessels to call at the Sullum Voe and Flotta oil terminal. Cruise liner traffic is present throughout the area although influenced by season, the maximum size cruise liner reported is 333m length.

[61] P111 and table 25

9.1.5 There are other factors key to ETV selection and these include the following:

The size of the area to be covered by the ETV

9.1.6 From Kirkwall to the southern boundary of the current ETV area is 225nm via the Minches or 265nm via the Deep Water Route. To the northern boundary from Kirkwall it is 150nm. From the northern to southern boundary the distance is 410nm from north east of Shetland to the south west of the Outer Hebrides. Whichever ETV location is taken, distances, and hence time to reach a casualty vessel in need towage assistance, is significant and may be critical. ETV selection affords particular attention to speed, seakeeping qualities and also the need to have a patrolling function covering the entire area.

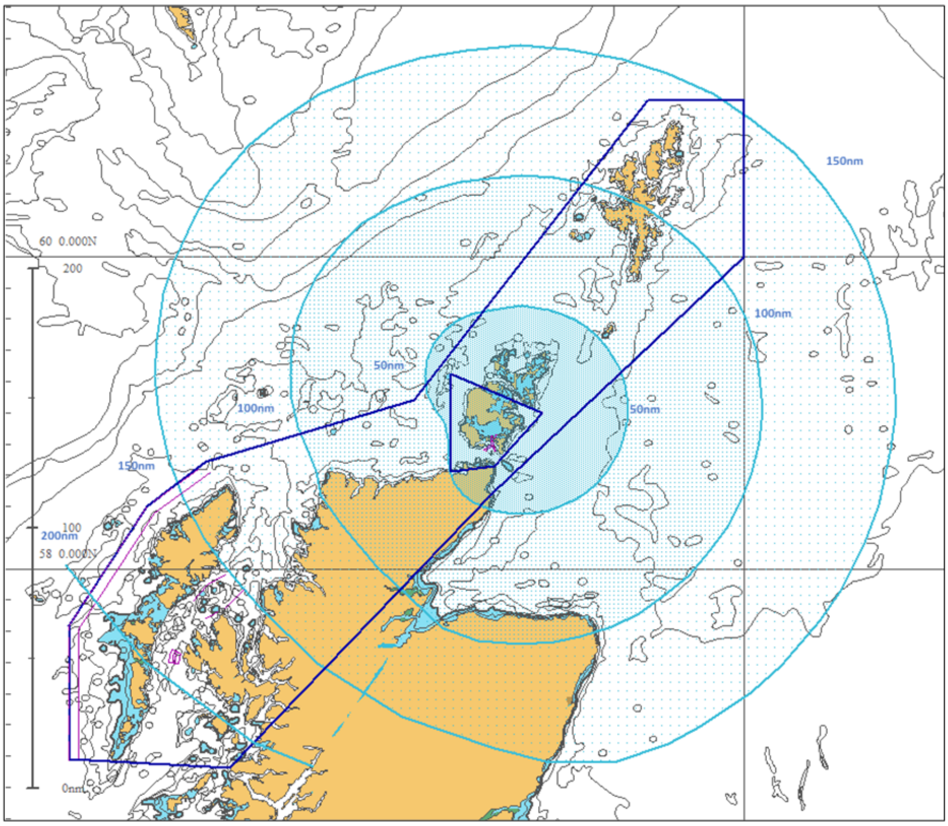

***Figure 48 –Distances from Kirkwall within the area under review*[62]**

Manning

9.1.7 This is addressed under Crewing Requirements in Section 9.5 below but ETV selection must consider accommodation facilities allowing for an adequate crew complement to handle emergency towing in heavy weather conditions and also rescued personnel and supernumeraries as circumstances dictate.

Design

9.1.8 North and North West Scotland are known for hostile weather and ETV selection must have this in mind when considering tug design features, not only related to seakeeping qualities with propulsion and steering systems, but open deck area astern and non-emergency operations.

[62] Circles centred on the current ETV's berth is considered too simplistic as the vessel has different routes to open water. Routes are used to the W from Pentland Firth, to the E from Stronsay Firth and to the NW from Westray Firth. When joining the dots of the different 'follow on circles' the result is out of shape circles.

Outfit

9.1.9 The outfit of the tug will be all important to facilitate emergency towing operations in deep water, shallow water and heavy weather and ETV selection places great importance on this. Section 9.7 below covers typical on-board equipment, importantly towing outfit, and also navigation and ancillary equipment.

9.2 Recommended Type and Size of ETV

9.2.1 It is clear from the assessment carried out, and as with previous assessments, that there should be a dedicated ETV to serve the North and North West Scotland area. The assessment conducted has concluded that the most suitable ETV would be an appropriately dimensioned anchor handler supply vessel (AHTS) with a bollard pull in the order of 120t. This size of tug should, in the majority of circumstances, be able to bring even the largest vessel plying the area and which becomes disabled, into the prevailing weather and assist in arresting the rate of drift.

9.2.2 In addition to bollard pull, other important factors are length, draught and deadweight. ETVs should have a longer length and deeper draught than harbour tugs to provide the necessary lateral resistance to maintain steerage and tow control.[63] Tug efficiency (the ratio of the actual towline pull to the static continuous bollard pull in a given environment and at a particular towing speed) is also improved with increased length. DNV Offshore Standard H202 recommends that tugs with length less than 35m are not used for ocean towing, and that tug length should be at least 40m for towage in harsh environments.[64] Greater displacement will assist in improving the seakeeping qualities of an ETV.

9.2.3 The dimensions of an ETV with the bollard pull identified as appropriate vary quite significantly depending on the particular features and characteristics of the vessel. However, with seakeeping and overall efficiency and effectiveness in mind, it is expected that the LOA might be in the region of 60m - 70m, breadth, 15m - 16m and draught +/-6m. Propulsion and steering systems, including a DP system, should provide for highly manoeuvrable capabilities and the running speed should ideally be 15kts or more.

The suitability of AHTS vessels is discussed in more detail in the following section.

9.3 Suitability of ETV

9.3.1 Given the long standing offshore industry in the North Sea, tug design has advanced to meet the many challenges involved with wide ranging marine operations. These include, but are not limited to, manoeuvring in close quarters to offshore platforms for supply purposes, rig location moves[65] and anchor handling[66] in a range of water depths. The most suitable vessels to handle these operations are AHTS. They are used extensively and their design and performance has advanced and is well proven over the years. Importantly too, AHTS vessels are multipurpose vessels and have flexible usage.

9.3.2 AHTS vessels which operate in the North Sea are designed for harsh weather conditions. Important features of AHTS vessels which benefit ETV operations and potential non-emergency work are:

- Their duties demand good seakeeping qualities, with propulsion and steering systems which provide for highest manoeuvring and station keeping abilities. Many are fitted with DP systems improving station keeping in close quarters of a vessel casualty;

[63] OCIMF Recommendation on Equipment for the Towing of Disable Tankers, 1st edition, July 1981
[64] DNV-OS-H202, Sea Transport Operations, Section 4.3 – Towing Vessels, October 2015
[65] Mobile offshore drilling units, jack-up rigs and semi-submersible rigs are required to be towed from one location to another
[66] Running anchors from a semi-submersible rig to a pre-determined position

- They have a full hull form, good length, breadth and draught ratios and a larger displacement to improve seakeeping capabilities;
- The design is suited to handling heavy weather and shipping seas on deck both forward and aft;
- High quality towing equipment proportional to bollard pull and with a configuration for ease of operation by the crew;
- High bollard pull/horse power to provide adequate towing capability at sea;
- Raised forecastle assisting in improving seakeeping behaviour;
- Good free running speed (but see also 9.3.3 below);
- Long range/endurance for both bunkers and fresh water;
- Open stern and deck space to accommodate stores, additional equipment if required and the versatility to perform a variety of non-emergency work;
- Storage capacity for essential equipment;
- Adequate accommodation space for both crew and additional personnel.

9.3.3 AHTS vessels with running speeds of 15kts or more are generally confined to vessels with much higher bollard pulls than 120t given their propulsion characteristics. Running speeds of 12 - 13kts are more common for the AHTS vessels with 100 – 120tbp. Examples of these can be found with a number of ETVs being used in other maritime states. However, there are some examples which satisfy a 15kt criteria – the ETV vessel ***"BALTIC"*** (Figure 49) operating in Germany has 127tbp and a running speed of 17kts[67]; the Spanish rescue tug ***"ALONSO DE CHAVES"*** (Figure 50) has a bollard pull of 105t and a speed of 15kts[68]. There are AHTS vessels in design with 120tbp and speed of 14.4kts such as the Damen ***"AHTS120"*** (Figure 51).[69]

Figure 49 - ETV "BALTIC" (Source: maritimejournal.com)

[67] www.fairplay-towage.com/en/fleetlist/etv/baltic.html
[68] Shipspotting.com & grosstonnage.com
[69] *products.damen.com/en/ranges/anchor-handling-tug-supplier/ahts-120*

Figure 50 - "ALONSO DE CHAVES" (Source: shipspotting.com)

Figure 51 - Damen "AHTS120" (Damen Shipyard Group)

9.4 Flexibility in Usage

9.4.1 The scope of work for this study does not call for what other tasks the ETV might undertake to support funding. However, it does require comment on the suitability of the recommended ETV to perform non-emergency work. By so doing, it is inevitable that the recommended type of vessel can be related to operations which it can perform. It is also necessary to point out the obvious need to ensure that any such work can be suspended immediately to allow the ETV to respond to an emergency situation. Contingency arrangements are discussed in this connection.

Restrictions

9.4.2 Non-emergency performance work will have to recognise the following restrictions:

- ETV's dimensions and draught for any port work;
- Non-emergency work should be within the study area unless there are ETV contingency arrangements in place;
- Non-emergency work should be such that the ETV can terminate immediately and mobilise to a casualty vessel unless there are contingency measures in place;
- Non-emergency work should be such that the ETV's towing system is not compromised and can be used without any obstructions on deck or to associated machinery and deck fittings;
- ETV crew complement will be required to be maintained at all times;
- There should always be sufficient reserve bunkers, fresh water and stores to mobilise to a vessel casualty to anywhere within the study area from the location of non-emergency work;
- Close monitoring of dedicated weather forecasts will be necessary at all times;
- Close liaison will need to be maintained with VTS.

ETV Non-Emergency Towage Tasks

9.4.3 In the course of an ETV's duties, the following tasks have either been carried out or are foreseen as part of potential tasking:

- Oil spill response operations;
- On-scene command posts;
- Search and rescue operations;
- Guardship duties;
- Escort duties – through Pentland Firth for example;
- Communications conduit between the on-scene commander and shore-based facilities;
- Surveillance such as policing traffic separation lanes;
- A "first-aid" salvage service in advance of the arrival of a salvage contractor;
- Salvage support;
- Fire-fighting operations;
- Deployment of a remote-operated vehicle (ROV) for underwater search and/or recovery operations;
- General support for underwater recovery operations;
- Emergency accommodation for evacuated crews and passengers;
- First-aid and medical services.

9.4.4 Given the design of the proposed ETV type, dimensions, open deck space and likely deck machinery such as crane facilities, there is good potential for flexible usage provided that such usage does not compromise the prime function of the vessel, namely to respond to an emergency for towage purposes.

9.5 Crewing Requirements

Regulations

9.5.1 The STCW Code sets the qualification standards for masters, officers and watch personnel and this will apply for an ETV. The principal requirement for the manning of an ETV will be the Minimum Safe Manning Scale required by the flag state and this will vary according to the gross tonnage of the tug and its operational category – harbour, coastal, deep sea. It is assumed that the current ETV "HERAKLES" is manned to these minimum requirements.

9.5.2 It is accepted that the standards laid down in Section 2 of MCA's '*Provision of an Emergency Towing Vessel Statement of User Requirements'*, will be a minimum requirement for any ETV arrangement going forward. In accepting these standards, the masters and crews of an ETV will be duly qualified in accordance with their rank and rating. This assumes that the certificates of competency shall be in accordance with MGN 495 Certificate of Competency Tug Deck 500 GT to 3,000 GT – near coastal, as a minimum.

Factors to Consider

9.5.3 Crewing for emergency towing operations must consider the following key factors:

- The emergency situation (including worse case scenarios);
- The location;
- Health & Safety;
- Division of responsibilities - watchkeeping (deck & engine), towing deck supervision and crew, catering;
- Prevailing weather (including heavy weather);
- Period of emergency towing engagement;
- Towline control, care and attention;
- Maintenance.

Recommended Minimum Manning

9.5.4 Minimum manning for the ETV is considered to be:

- Bridge - Master and minimum 2 bridge watchkeepers including chief officer (3);
- Engine room (bridge controlled) - Chief Engineer and minimum 1 watchkeeper (2);
- Deck – minimum 4 deck crew including bosun/supervisor (4);
- Catering - 1 (1);
- Total minimum complement 10 (ten).

It is understood that many ETVs of similar size to that recommended are crewed by up to 12 persons.

9.5.5 The above recommended minimum crew complement might be questioned given the very few occasions the ETV is tasked for emergency towing or other intervention. However, the risks in manning with a lesser complement are deemed too great to contemplate. For example:

- Planning must assume worse case scenarios in terms of casualty type and weather conditions;
- Crew members cannot be mobilised on a case by case basis;
- The duties on board for emergency towing can be arduous and long lasting;
- A lesser crew complement will increase risk and compromise safe working practices, the ETV and the casualty vessel.

Tour of Duty

9.5.6 It is suggested that subject to ETV arrangements decided, given it is not required to act in an emergency mode for much of the time and non-emergency tasks may not be regular, crew efficiency and motivation can only be maintained by reasonable periods of duty on board. In this respect, whilst it will be for owners/operators to determine periods of duty, it is recommended that serious consideration be given to requesting a maximum tour of duty for masters and crew members of no more than 3 months.

9.6 Training Requirements

General

9.6.1 Crewing a tug to proceed to sea is not simply a matter of putting people on board to staff positions. Crew, who take a tug to sea, must be adequately qualified, trained and exercised to maintain the vitally important level of competence that enables them to perform the towage operations at sea. Ocean towing in anticipated poor weather is far removed from harbour towage operations. Open sea conditions are similar to conditions that oil field operations experience when working on the aft deck of an AHTS vessel. Tug crews must not only hold the necessary qualifications to perform the duties according to their rank or rating but also have the requisite experience in their respective roles to perform towage operations efficiently and safely. Given the emergency towing role of the ETV, training and experience must comply with the highest of standards.

9.6.2 The Marico Report (2008) refers to the incident involving ***"BOURBON DOLPHIN",*** a 180tbp AHTS that foundered during operations off the north west Scottish Coast with the loss of eight lives. The Norwegian Inquiry report into this tragedy acknowledges the power of the vessel to perform in the weather conditions of the area. However, the inquiry deemed the vessel not fit for purpose. Crews not sufficiently trained with proper procedures for the work undertaken attributed to the accident[70]. The report articulates the need to maintain focus by an operator for their duty of care to ensure safety standards are met with no relaxation of either duty or standards for the operation of an ETV[71].

Emergency Towing Procedures

9.6.3 Since 2008, emergency towing procedures have been a requirement on board vessels of a certain type and as of 1st January 2012, SOLAS Regulation 11-1/3-4 of 2008, the requirements for emergency towing were amended to apply to all vessels and require all vessels, including tankers, to be provided with an emergency towing procedure.[72] By this it is meant that all vessels must be provided with ship-specific towing procedures for implementation in emergency situations. An emergency towing procedures booklet is to be on board and also maintained by owners/operators. The emergency towing procedures form part of the International Safety Management code (ISM) and are part of the ship's Safety Management System (SMS). This will include an ETV.

Emergency Towing Procedures Experience and Training

9.6.4 It is left to owners/operators to implement and police procedures to ensure that masters and crews are familiar with the emergency towing procedures, including any training and drill exercises on board vessels. The degree of training in emergency towing procedures on board ships will vary according to shore-side and shipboard management, master and crew experience and attention paid to the SMS. The master and crew of an ETV cannot expect a casualty vessel to have a master and crew proficient in emergency towing procedures which, by their very nature, would be implemented rarely if at all. Moreover, if there is an emergency situation which has been on-going for a period, fatigue will also be a factor.

9.6.5 In emergency situations, making the best towing connection at the most suitable station on board the casualty ship is the key consideration but not always possible. Alternative stations have to be considered and ships' bollards and other deck fittings are not always strong enough to withstand towing forces applied. With larger ships and increased difficulty in making a towing connection, emergency towing procedures become all the more important.

[70] Marico Report, p.74
[71] ibid
[72] SOLAS Chapter II-I Regulation 3-4 & IMO Circular MSC.1/Circ.1255

9.6.6 Harbour tug crews are not often exposed to emergency towing operations and many not at all. This can be a disadvantage of using harbour tugs in emergency towing situations and a factor to be seriously considered in ETV selection going forward.

Importance of Robust Training for ETV Crews

9.6.7 Against the above background, training of the ETV master and crew becomes even more important with these factors in mind. An effective ETV system demands robust training requirements. The prime purpose of the ETV is for emergency towing intervention but conversely, given the few occasions where this is required, the tug will be in standby mode or idle, unless tasked with non-emergency work. There are, therefore, three main scenarios which demand particular attention in so far as training is concerned:

i) Emergency towing operations;
ii) Non-emergency work operations;
iii) Idle time.

Emergency Towing Operations

9.6.8 Given the specific task of emergency towing and the range of emergency situations the master and crew of an ETV might encounter, it is recommended that the following training requirements are adopted going forward with any ETV arrangement which might be decided:

i) Masters and officers undergo an MCA approved training course in emergency towing training before being eligible to join the ETV. (There are courses in emergency towing run by commercial organizations and the MCA should be familiar with these and be in a position to give approval of the courses for ETV training purposes.) Such a course will include an induction specific to emergency towage and form a base level of understanding, appreciation and knowledge of the role of an ETV.

ii) Deck crew (if not included in above) to attend an MCA approved emergency tow specific training course before being eligible to join an ETV.

iii) High levels of navigation and self-pilotage competence given the potential for being multi-port based and be expected to operate in an emergency on the limits of navigation safety in restricted waters.

iv) On board training procedures should include weekly instruction sessions on topics such as:

a) Emergency towing arrangements of different ship types;
b) Towing connection and disconnection procedures;
c) Emergency/contingency arrangements – e.g. parting of towline;
d) Understanding and use of towing equipment and machinery including its limitations;
e) Risks and dangers – girting, machinery failures, working in heavy weather;
f) Safe working practices;
g) ETV emergency towing booklet and its implementation;
h) Planning and execution of emergency towing operations;
i) Divisions of responsibilities;
j) Teamwork;
k) Communications on board and with other parties to an emergency – casualty vessel, MCA, helicopters, shore stations, VTS etc;
l) Man overboard procedures;
m) Crew/passenger rescue operations;
n) First aid and medical assistance;
o) Oil spill response;
p) Handling hazardous cargoes/goods.

v) Exercise drills should be performed on a monthly basis assuming a variety of simulated scenarios.

vi) Actual "*real life"* drills involving a volunteer ship should be undertaken on a minimum annual basis which will have MCA participation and direction. The drills should be run to ensure all crew members actively participate to simulate an emergency towage operation. The drills must exercise the full management of an ETV on-board, to test and simulate a full scale operation. Developing various scenarios involving different vessels will ensure the crew is tested and better equipped to deal with a live emergency operation.

Non-emergency work operations

9.6.9 ETV masters and crews may be expected to undertake a variety of non-emergency roles during the period they are on board. Such roles are not yet clearly defined but there will be a need to ensure that masters and crews are provided with adequate training to undertake the range of work which the MCA may have in mind. Weekly on-board training sessions and monthly drills should include this potential work.

Idle Periods

9.6.10 It is a well-known fact that human error remains by far and above the primary cause of accidents at sea. Long periods of idleness can lead to complacency which in turn can result in inefficiency, human error and a safety risk. Idle time needs to be managed and addressed on board the ETV and masters and crews organised and trained in using these slack periods to maximum benefit. Of course, continuous maintenance of the ETV and its equipment will always be paramount but continuous improvement of masters and crew has to be a prime objective too and can be achieved with optimum use of idle time.

9.6.11 It is recommended that a schedule of proposed activities is drawn up to cover idle time which should include, but not be limited to relevant training courses for on board use, practical towing procedures, use of towing equipment, simulated emergency scenarios, tug manoeuvring exercises, specified ETV coverage area familiarization including navigation skills and self-pilotage.

ETV Patrols

9.6.12 Given the expanse of the area under review, it stands to reason that if the ETV is stationed at Kirkwall and a casualty vessel is at the southern limits of the Minch, by the time the ETV arrives at the initially reported location of distress, it could be too late to intervene and effect a towing connection. It can be seen from AIS records that the current ETV has not ventured beyond the Kirkwall area for quite long periods. It is recommended that not only for good practice and wider coverage, but also to enhance training and sea-going experience in the area, a patrol schedule is developed which will include visits to all parts of the area at reasonable intervals. Training exercises should also be developed and integrated with patrolling manoeuvres.

9.7 On-board Equipment Necessary

9.7.1 The ETV should be equipped as an ocean going tug, also for escort duties, fire fighting and salvage. It should have a comprehensive on-board outfit commensurate with ocean towing and emergency operations. Typical on-board equipment would be expected to include:

Towing equipment

- Waterfall towing winch with main and spare towing wire 1000m - 1500m;
- Synthetic rope stretcher and spares;
- Fore runner wire towing pennants;
- Dyneema pennants;
- Tow chain bridle with ancillary equipment;
- Connecting shackles with adequate SWL against bollard pull;
- Light and wide bodied “D” type shackles;
- All towing wires, stretchers and pennants to be fitted with hard eye thimbles;
- Adequate spares;
- Tugger winches, capstans and recovery drum above waterfall winch for rapid towline recovery and storage;
- Towing pins, stern roller and anchor winches;
- Line throwing equipment, light and heavy messengers.

Bridge equipment and passage planning

- Compliance with SOLAS V Safety of Navigation;
- ECDIS type approved with duplicate back-up system and TotalTide overlays;
- 3cm and 10cm ARPA radars;
- Automatic pilot;
- Log speed indicator;
- CCTV monitoring of hazardous areas.

Communications equipment

- Compliance with SOLAS IV radio communications;
- Satellite communications for telephone and internet access;
- Suitable communications equipment to act as On Scene Commander;
- Intrinsically safe portable VHF handsets for deck and boat operations;
- Mobile phone;
- Upper tannoy covering all decks audible in bad weather.

Personnel Protective Equipment

- Suitable for working on deck in extreme cold and warm weather;
- Suitable lifejackets for hazardous working.

Rescue and sea survival equipment

- Compliance with SOLAS III Life-saving appliances and arrangements;
- Type approved davit launched rescue boat protected from heavy weather;
- Jason’s Cradle;
- Rescue Strop and stretchers;
- Safe means of access for emergency rescue with suitable illumination;
- Additional lifejackets, immersion suits and thermal protective aids;
- Emergency clothing;
- Additional food and potable water;
- Medical facilities suitable for rescued personnel.

Firefighting equipment

- Compliance with SOLAS II-2 Fire protection, fire detection and fire extinction;
- Two high capacity monitors and pumps.

Salvage and damage control equipment
- Patching equipment, wooden plugs, rubber for sealing, assorted hand and electrical tools for patching;
- Submersible pumps (50 m^3- 200 m^3/hr);
- Suction and discharge hoses;
- Extension lead/cables and diesel pumps.

Pollution Prevention
- Oil containment boom;
- Weir type skimmer plus ancillary equipment;
- Absorbent materials and clean up equipment;
- Disposable coveralls, boots and masks.

Deck Equipment
- Deck crane of suitable reach and SWL;
- Container fittings;
- Heavy weather safety lines and guard rails for crew protection.

9.7.2 Subject to any foreseen non-emergency work which the ETV might undertake, there may be a need to require additional equipment and facilities on board.

10 CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

Tug Availability in Area

10.1.1 Other than the current ETV, there are no tugs in the North and North West Scotland area that can be relied upon to be effectively capable of performing emergency towing operations of the largest vessels identified visiting the area, in gale force conditions and in open water. Whilst harbour tugs in Shetland and Orkney can, and have on few occasions, responded to tow casualty vessels, this is highly dependent on availability and also operational limitations. Such conditions render the present harbour tugs an unreliable towage asset for emergency purposes unless additional capacity/larger tugs is created.

ETV Intervention

10.1.2 Actual ETV intervention for emergency towage has been implemented on very few occasions over the last 4½ years and has involved fairly small dry cargo vessels and a small fish carrier. However, larger vessels have been disabled and required towage intervention provided by other means, namely tugs of opportunity. This alternative type of intervention cannot and should not be relied upon. Loss of control is the highest cause of casualties which can lead to grounding and this can happen to any vessel which plies the area under review. ETV considerations must have this in mind.

Traffic Density

10.1.3 The Fair Isles area generally receives a larger volume of traffic than the Minches and Hebrides, with the greatest density being concentrated in the Pentland Firth. The Minches and Hebrides on the other hand are subject to smaller overall volumes. However, particularly busy areas are found around Cape Wrath and through the Minches. The traffic separation lanes in the Minches appear to be observed and the ATBA also seem to be having their desired effect within the Fair Isles area.

Traffic Type

10.1.4 In both areas, fishing and dry cargo vessels are the most prevalent type. The size of vessels are quite wide ranging; coastal tankers to VLCCs and Handymax to post-Panamax dry cargo carriers have all been recorded in the area between 2010 and 2015. Panamax size container ships are most commonly observed transiting through the Minches along with feeder vessels and other smaller cargo ships. VLCCs are observed passing north of the Shetland and the Hebrides Deep Water Route and to and from Scapa Flow. However, tanker traffic in the Minches has been confined to a maximum of 10,000 gross tonnes for laden tankers and it appears that this restriction is adhered to. Aframax and Suezmax are the most frequent vessels to call at the Sullum Voe and Flotta oil terminal. Cruise liner traffic is present throughout the area although influenced by season. The maximum size cruise liner reported is 333m length.

Projections

10.1.5 Enquiries have indicated that tanker activities are predicted to increase at the Sullum Voe Terminal to about 120 tankers annually by 2019. The prevalent size will be Aframax. Tanker traffic at Flotta Terminal is expected to be fairly constant at 50 visits per year from Aframax/Suezmax size although STS operations are increasing. The price of oil has been and will remain a governing factor. Cruise liner traffic is increasing throughout the area with sizes varying from 45m LOA motor yacht to large liners up to about 333m LOA. Ferry traffic is expected to remain busy and fishing is still the mainstay of the area with high fishing vessel activity throughout the year.

10.1.6 Offshore developments involve drilling programmes and some field developments west of Shetland which may see an increase in offshore support vessel traffic. Renewable projects including tidal energy are presently not impacting upon navigation channels and presently there are no indications which suggest there might be spatial problems in the foreseeable future.

Specific Hazards

10.1.7 Despite the various measures which have been taken to improve safety of navigation with better management of shipping and sea lanes, specific hazards remain the same in the subject area. It is dominated by exposure to the North Atlantic; the full extent of the mainly rugged coastline is a hazard to navigation with numerous outlying dangers such as drying rocks and reefs intermingling with navigable waters. Pentland Firth is notorious for strong tidal stream and eddies and these are found elsewhere in narrows and inshore waters and around open headlands such as Cape Wrath.

10.1.8 Prevailing weather prompts passage planning to opt for Pentland Firth and Minches as preferred routes which are causes of the concentration of traffic in these areas and therefore their proximity to the wider stretches of environmentally sensitive coastlines.

10.1.9 The limited number and suitability of tugs for emergency intervention is an obvious specific hazard throughout the area.

Prevailing Weather

10.1.10 Exposed to the North Atlantic, strong westerly winds are a common feature which affect the Fair Isles and Hebrides more so in the winter months. Gales are more frequent in the Fair Isles followed by Hebrides, with significant wave heights of 4m or higher, 3m-4m in South Fair Isles. The Minches are sheltered by the Hebrides with significant wave heights usually less than 2m. Unpredictable and extreme weather can affect the Shetland. The weather data studied showed no trend of decreasing or increasing weather conditions for the area.

Environmental Sensitivity of Coastlines

10.1.11 There has been a significant increase in the number of MPAs over the past two decades in North and North West Scotland over a correspondingly longer expanse of coastline. The abundance and diversity of birdlife, mammals, fish, aquaculture, flora, fauna, stunning scenery, nature reserves and a multitude of other natural and physical features make the Hebrides and Minches the highest environmental impact risk in the UK with Shetland and North Scotland very close behind. Marine pollution could have devastating and long lasting consequences to the environment and the livelihood of the local communities. Testament to the splendour and environmental interest in the area is the increase in cruise liners and tourist industry generally and also the particular measures being taken to protect MPAs and other areas of natural beauty and interest.

Risk Review

10.1.12 Risk assessments performed in the Belton Study and Marico Report have been reviewed and many of the risks identified therein remain valid today and in particular in connection with environmental sensitivity. AIS data obtained for this study suggests higher traffic density than the data used in the above two reports, with higher risks given the greater presence of large cargo and passenger liners found in the area. The worse-case scenario remains a drifting and grounding laden tanker with consequential pollution. Bunker quantities on large vessels can exceed the cargo capacity of coastal tankers.

Bollard Pull Considerations

10.1.13 A statistical analysis has been performed which examines the likely proportion of vessels which visit the area which could be assisted by ETVs of various bollard pull capacities. The results of the analysis, whilst simplistic, provide a useful means of assessing the risk reduction associated with various ETV bollard pull capacities. The results of this analysis, when taken into account along with other risk factors, indicate that an ETV with bollard pull in the region of 120t would be likely to provide for a reduction in risk to ALARP levels.

ETV Requirements and Type

10.1.14 The Study Team has concluded there are compelling reasons for maintaining a dedicated ETV to cover the North and North West Scotland area. The most suitable vessel is considered to be an AHTS with about 120tbp, the appropriate dimensions and deadweight, propulsion and steering systems, speed, range, towage outfit and accommodation. Such a vessel should be capable of fulfilling the ETV role and, as a multipurpose vessel, will have flexible usage for non-emergency work.

10.1.15 A disadvantage recognised is that there are few AHTS vessels in the 120t + bollard pull range with running speeds of 15kts. 12kts - 13kts is more common. Higher speeds are associated with AHTS vessels with greater bollard pulls. This needs to be factored into ETV selection and the operational model, including where the ETV will be stationed and how it will be patrolled within the area.

10.2 Recommendations

The Study Team makes the following recommendations regarding the selection of the ETV, its crew, training and on-board equipment necessary:

10.2.1 The dimensions and displacement of the AHTS should be such as to provide good seakeeping behaviour in all weathers.

10.2.2 The steering and propulsion systems of the ETV should be such as to provide for the highest manoeuvring capabilities in close quarter situations for emergency towing in all weathers.

10.2.3 The AHTS vessel should be able to make a free running speed of about 15kts

10.2.4 The manning complement should be a minimum of 10 persons.

10.2.5 There should be accommodation for at least 20 persons including the crew.

10.2.6 The ETV should be provided with a comprehensive outfit of towing equipment fit for ocean towing and emergency towing operations.

10.2.7 Master(s) and crew(s) should have proven towage experience, at least involving ocean towage.

10.2.8 Prior to joining the ETV for on station, master(s) and crew members should attend an approved (by the MCA) training course in emergency towing procedures.

10.2.9 There should be a robust, on-going training programme on board which shall include weekly training sessions specifically addressing the functions of the ETV and its operations in all respects.

10.2.10 There should be regular drills and exercises performed by the ETV crew simulating potential emergency towing scenarios and at least annual *"live"* exercises managed and controlled by the MCA involving a voluntary vessel.

10.2.11 Training should be closely integrated with a patrolling function of the ETV which should make visits to all parts of the area to be covered at planned intervals having due regard to weather forecasts and VTS. High level navigation and self-pilotage competency will also warrant particular attention.

10.2.12 It is recommended that the tour of duty for ETV personnel should not exceed 3 months to ensure a more alert, efficient and effective crew.

10.2.13 Should the ETV be used for non-emergency work, this should be carefully planned such that emergency response to towage intervention is not compromised in any way. Work should be such that it can be immediately terminated to release the ETV. Contingency arrangements should always be in place.

APPENDIX "A"

Data sheet of AHT "HERAKLES"
(Source: Marine Group)

PROPULSION

MAIN ENGINES:	4XRUSTON 12 RK 3A
B.H.P	11280 BHP 2 X CPP
PROPELLERS:	PROPELLERS IN FIXED KORT NOZZLE

THRUSTERS

2 X BOW THRUSTERS	TOTAL 18 TONNES

SPEED – FUEL CONSUMPTION

MAXIMUM 4 ENGINES:	17.5 KTS @ 35 TONNES HIGHT RPM
MAXIMUM 4 ENGINES:	15.5 KTS @ 20 TONNES LOW RPM
MAXIMUM 2 ENGINES:	13.2 KTS @ 12 TONNES HIGHT RPM
MAXIMUM 2 ENGINES:	12.0 KTS @ 10 TONNES LOW RPM
MAXIMUM 1 ENGINE:	8.0 KTS @ 6 TONNES HIGHT RPM
MAXIMUM 1 ENGINE:	7.0 KTS @ 5 TONNES LOW RPM

TANK CAPACITIES

FUEL	1250 TONNES
FRESH WATER	106 TONNES

DECK EQUIPMENT

TUGGER WINCH	1 X 17 TONNE
PENNANT WINCH	1 X 70 TONNE
DECK CRANE AFT	SWL 5 TON@5M
DECK CRANE AFT CAN BE INSTALLED IF REQ	SWL 60 TONNE
DECK CRANE FOREDECK	2 X 1 TONNE

TOWING AND AHCHOR HANDLING EQUIPMENT

DONKIN SIDE BY SIDE TOWING WINCHES WITH 200 TONNES LINE PULL ON ALL LAYERS EACH FITTED WITH 1200 METERS X 70 MM WIRE

ONE ACHOR HANDLING WINCH WITH 150 TONNE LINE PULL AND 300 TONNES BRAKE

ANCHOR HANDLING ROLL 1.5X4.0 M. MAX LOAD 250T.

1 SET SHARK JAWS 400T. SWL 1 SET HYD. GUIDE PINS

FULLY EQUIPPED WITH SEVERAL PENNANTS WIRES, CHAINS BRIDLE PICK-UP WIRES ETC.

ANCHOR

ANCHORING SYSTEM:	2 PLUS 1 SPARE ANCHOR

FIRE FIGHTING

2 X 600M3 REMOTE CONTR. FIRE MONITORS

AUXILIARIES

1 X CATERPILLAR D398TA 860BHP @ 1200RPM
1 X CATERPILLAR D3406 345BHP @ 1800RPM

BRIDGE & COMMUNICATION EQUIPMENT

AUTO PILOT ANSCHUTZ NP60
AP ECHO SOUNDER - SIMRAD
2182 RX-TX KODEN
3 X HH VHF ICOM
6 X HH UHF ICOM
GMDSS SAT-C SAILOR
GMDSS SAT-C JRC
SAT PHONE SAILOR
SAT BB SAILOR FLEET 150
GYRO SIMRAD GC85
RADAR FURUNO 3 CM
RADAR FURUNO 10 CM RASTAR
CHART PLOTTER FURUNO

SAFETY & SALVAGE

4 X 16 MAN LIFERAFT VIKING
1 X DOT LIFEBOAT
1 X RESCUE/SALVAGE BOAT
3 X DIESEL DRIVEN PUMPS
3 X SUBMERSIBLE PUMPS 40 – 500 M3/H
1 X 50 KVA PORTABLE GENERATOR
PORTABLE PUMPS, OXI CUTTING GEAR
DIVING GEAR, 300 BAR COMPRESSOR
(FULL INVENTORY LIST AVAILABLE)

ACCOMMODATION

OFFICER	6 SINGLE CABIN
RATINGS	3 SINGLE CABIN
	5 DOUBLE CABINS
ADITIONAL	10 CABINS
HOSPITAL	1 FULLY EQUIPPED

CLASS

LLOYDS 100A1

APPENDIX B

"Provision of an Emergency Towing Vessel - Statement of User Requirements" (Source: MCA)

Provision of an Emergency Towing Vessel
Statement of User Requirements

1. Introduction

1.1. This statement of user requirements (SUR) details the performance and service specification for one Emergency Towing Vessel (ETV). The requirement is based upon a provision of a salvage tug or anchor handling tug supply vessel (AHTS) that meets this requirement to be on immediate standby to render emergency towage services.

1.2. Emergency towing cover will be provided from a designated station on the coast of the United Kingdom as required by the charterer.

1.3. Unless otherwise directed by the charterer the vessel will maintain station within the area delineated in section 1 of Annex A and be able to respond to an incident anywhere within the area delineated in section 2 of Annex A.

1.4. Tasking authority will rest with the Maritime & Coastguard Agency (MCA)

2. Standard

2.1. The vessel will be operated, maintained and manned in accordance with the requirements of it's Flag State, be ISM compliant and maintained in Class with an IACS member classification society.

2.2. It is a condition of delivery that the vessel must achieve a satisfactory inspection in accordance with the Common Marine Inspection Document (CMID) as published by the International Marine Contractors Association (IMCA).

3. Capability

3.1. The vessel will be designed, constructed, equipped, manned, supplied and provisioned to enable it to:

- 3.1.1. Exert a bollard pull of no less than 150 Tonnes;
- 3.1.2. Continuously cruise (when free running) at a speed of no less than 15 knots;
- 3.1.3. Be safely operated and manoeuvred to connect and effect towage in the sea and weather conditions that may reasonably be foreseen in UK waters;
- 3.1.4. Operate continuously at sea for no fewer than 10 days at the maximum rate of consumption.

4. Functional Requirements

4.1. Emergency towage as directed using suitable towing equipment to be provided by the vessel operator;

4.2. The MCA will, in addition provide a lightweight floating tow system for use at the discretion of the vessel operator. This will be on a user replacement basis for breakage, subject to allowance for fair wear and tear.

5. Reliability and availability

5.1. The vessel will be maintained in a fully serviceable condition and operated to achieve 98% availability for mobilisation within 30 minutes of being tasked;

6. Training

6.1. The operator must produce evidence of the professional competency and experience of the vessel crew to the charterer upon request.

APPENDIX C

Towage Provided in the Vicinity of the Northern and Western Isles
(Source: MCA)

TOWAGE PROVIDED IN THE VICINITY OF THE NORTHERN AND WESTERN ISLES

DATE	LOCATION	CASUALTY VESSEL	TOWING VESSEL	REMARKS
2011 (from 1 Oct 2011)				
26/11/2011	58 20.0N 008 50.0W 32nm NW of St Kilda	FV DASU Broken down	FV KEILA K 121	• Peer-to-Peer Tow to Stromness
2012				
19/03/2012	57-30N 007-09W SE corner of N. UIST (Isle of Floddy Mor)	MV FLINTERSPIRIT Ran Aground	Nil	• Vessel ran itself aground whilst on passage at c2300 19 Mar. • **ETV deployed from Orkney.** • Vessel successfully self-refloated at 1pprox..0204 UTC 20 Mar. • No pollution confirmed by Barra Lifeboat. • Vessel proceed to Stornoway under own power (accompanied by Bara then Stornoway Lifeboats) for Class and underwater inspection and subsequent PSC. • **Once vessel at anchor Stornoway (20 Mar), ETV returned to normal station off Kirkwall**.
11/04/2012	59-30.0N 004-37.0W 50nm NW Orkney	FV ONWARD on fire	Nil	• **ETV deployed** • Crew rescued by SAR helo. • FV subsequently sank before ETV arrival. • **ETV returned to anchorage.** • No Pollution
09/07/2012	58 53.1N 000 54.6W 41 nm SE of Fair Isle	FV DENARIUS On fire	FV DISCOVERY	• Peer-to-Peer tow to Macduff Harbour • Crew evacuated to life raft and subsequently airlifted by HMCG helo to Shetland. • No Pollution.
2013				
29/05/13	5932N 00102E 82 nm East of Fair Isle	F/V ASTRID MARIE	Norwegian tug – no name	• Commercial tow to Bergen

Updated 06 February 2016

DATE	LOCATION	CASUALTY VESSEL	TOWING VESSEL	REMARKS
06/06/13	5706.3N 00723.0W West coast, South Uist	F/V BOY ANDREW	Barra RNLI Lifeboat	• RNLI tow
09/07/13	5816.1N 00617.6W Brevig harbour – Lewis	F/V KELLY	Stornoway RNLI Lifeboat	• RNLI Tow to Stornoway.
2014				
02/04/14	5748.5N 01115.0W 85 nm West St Kilda.	MV ELEANOR D	Tug PACIFIC CHAMPION	• Commercial tow to Newcastle
12/04/14	5617N 00736W 24 nm SSW Tiree	MV WILSON GDYNIA	Tug BALDER VIKING	• Commercial tow to Belfast
03/05/14	5850N 00436W 25nm NNE Cape Wrath	MV WILSON FEDJE	Tug ODYSSEY	• Commercial tow to Kirkwall
14/05/14	Scrabster Harbour	F/V SHALIMAR	Tug VOE VIKING	• Commercial tow • F/V having sunk in Scrabster Hbr was re-floated and subsequently towed to Macduff post incident.
24/05/14	5641.2N 00610.9W Ardnamurchan Peninsula	F/V DIAMOND D	Tobermory Llifeboat	• RNLI tow to Tobermory Bay.
27/05/14	5853.7N 00043.1E 105 nm East Orkney Isles	MV VITIN	MV VESTBORG	• Peer-to-Peer commercial tow by other cargo vessel to Skagen.
07/10/14	5813.6N 00230.0W 22 nm SE Wick	MV PARIDA	Tug PACIFIC CHAMPION	• Commercial tow to Cromarty. • **ETV deployed as Standby until tow established – not used and returned to Orkney station**
18/10/14	5806.2N 00007.8E 70 nm East Peterhead	F/V ROCKALL	Tug TOISA ELAN – commercial tow	• Commercial tow to Peterhead • **ETV deployed but not used and retuned to Orkney station**
19/10/14	58-41N 004-12W 25 nm ENE Cape Wrath	MV NICOLA Broken down	ETV HERAKLES	• No commercial tow available in timeframe given prevailing weather • **ETV deployed and towed casualty vessel to Scapa Flow**
21/10/14	5917.2N 00123.3E East of Fair Isle Channel	MV MYRTE Broken down	Tug TYSTIE	• Commercial tow to Lerwick. • OLYMPIC OCTOPUS then **ETV HERAKLES stood by until arrival of tug TYSTIE.**
07/12/14	5835.8N 00504.9W 2.5nm SW Cape Wrath	MV NORHOLM Broken down	Lochinver Lifeboat and ETV HERAKLES	• Initial tow by RNLI to hold casualty vessel off shoreline by until clear of Cape Wrath. • **Tow transferred to ETV – towed to Stromness**

DATE	LOCATION	CASUALTY VESSEL	TOWING VESSEL	REMARKS
2015				
03/01/2015	58-29.9N 002-31.1W 15 nm East of the Pentland Firth	MV CEMFJORD Capsized	Nil	• Capsized vessels spotted by the ferry HROSSEY. Vessels bows only out of the water. • SAR ops for missing crew. • **ETV HERAKLES deployed to scene to act as Guardship to warn approaching vessel of the danger.** • CEMFJORD sank prior to ETV on-scene. • **ETV remained on task for 3 days until the site could be survey by NLB vessel, then resumed station at Orkney.** • No pollution observed**.**
10/01/2015	56-24.6N 005-30W E Side Kerrera Is, Oban Bay	FV CRIMSON AROW Aground	RNLI - Oban Lifeboat	• RNLI Tow to Oban. • No pollution
18/02/2015	56-41.2N 006-05.6W Southern side Ardnamurchan Peninsula at Kilchoan	MV LYSBLINK SEAWAYS Ran Aground	Tug KINGDOM of FIFE (and multicat FORTH JOUSTER)	• Commercial Tow. • **ETV deploy but held at Cape Wrath as tugs from Clyde due to arrive at scene pm 19th . On their arrival ETV returned to Orkney** • Casualty vessel self re-floated on the 19 Feb but still required considerable salvage work. KINGDOM of FIFE (KoF) and FORTH JOUSTER (FJ) remained on-scene. • Minor pollution seen, subject to response by on-scene OSR contractors. • Due to impending bad weather and doubt on KoF Master that they would be able to handle the casualty single handed in bad weather**, the ETV was redeployed to the scene on 23 Feb, arriving pm on the 24 th. ETV returned to station pm 25 Feb once weather and forecast improved.** • **The incident location was well outside the ETV's operational area.**
07/03/2015	Corpach, Fort William	MV FRI SEA Ran Aground	Tug SD KYLE of LOCHALSH	• Commercial Tow to berth at Corpach • No pollution occurred during the incident.

DATE	LOCATION	CASUALTY VESSEL	TOWING VESSEL	REMARKS
07/05/2015	61-17.6N 004-20.2W 94 nm NW Shetland	MV INDUSTRIAL KENNEDY Broken down	ETV HERAKLES	• Casualty vessel drift had potential to come close to either the PETROJARL FOINAVEN or CLAIRE offshore installations in 18 to 24 hr. • **ETV deployed, initially to stage to NW edge of Operation area whilst commercial option for towage investigated.** • No commercial towage available to be on scene within response timeframe available – nearest was 29 hrs passage • **ETV passage time to casualty vessel c.13-14 hrs, thus approved to proceed to scene and undertake the tow.** • Casualty vessel towed to Lerwick.
17/09/2015	56-30.063N 005-41.773W Eilean Rubha an Ridre, South end Sound of Mull	FV St APOLLO	MV HEADCORN	• Following salvage operation to refloat FV St APOLLO casualty vessel towed to Oban for further stabilisation and repair. • No Pollution
28/08/2015	59-37.1N 002-08.8W 15 nm WNW Fair Isle.	FV RESOLUTE Broken down	FV GITTE HENNING then FV EVER GRATEFUL	• Towed to Lerwick • No pollution
4/10/2015	58- 02N 001-47W 24 nm NNE Fraserburgh	FV KARINYA On fire	Nil	• Crew rescued by FV PLEIADES and Fraserburgh lifeboat. • Neither FV or Lifeboat could establish a tow and following drft modelling, casualty vessel deemed a hazard to shipping and offshore installations. • **ETV HERAKLES was tasked to make best speed to the area to act as Guardship vessel.** • FV burnt through and sank prior to arrival of ETV on scene and **ETV returned to Orkney**. • No pollution reported by attending vessels.
24/11/2015	59-25.2N 003-16.9W 8.7 nm west of Westray Orkneys)	MV SKOG Disabled and taking on water	ETV HERAKLES	• **On receipt of SKOG Mayday and potential for vessel to drift onto Westray ETV deployed initially as a precautionary measure, whilst in parallel seeking a commercial tug option.** • Nearby Offshore safety/supply vessel unable to provide tow.

				• **ETV tasked as towing vessel as other tug to far away to be viable in circumstances.** • No pollution
05/02/2016	58-44.4N 003-17.17W West end Pentland Firth	MV SCHOKLAND	EINAR	• Vessel disabled unable to repair – NUC • Western end of Pentland Firth drifting NW • **ETV Deployed (ETA 5-6 hrs passage time).** • Tug EINAR contracted (Orkney Is Towage Co) and deployed. • Tow line secure approx. 1820 • **ETV remained in vicinity as precaution during passage thru the Pentland Firth on a fast following tide.** • No pollution

ETV MISCELLANEOUS ACTIVITIES

Table below highlights ETV activities outwith assistance to casualty vessels at sea:

DATE	LOCATION	CASUALTY VESSEL	TOWING VESSEL	REMARKS
22/10/2012	5930.9N 002 06W Fair Isle Channel	Ditched Puma Helo	Nil	• ETV deployed to act as Guardship to transiting surface vessels. • ETV attached a line to the helo until the recovery vessel OLYMPIC ZEUS arrived on-scene
23/08/13	5952.9N 00120.2W 2' west Sumburgh Head	Helicopter – HELIBUS 23R	Nil	• ETV deployed and attached line to helicopter wreckage to keep contact and enable recovery until salvage vessel arrived on scene
31/07/2015	59-00.1N 002-58.5W	Dive support vessel SUBSEA VIKING On fire in harbour	Nil	• At Hatston Pier Kirkwall suffered a fire on the afterdeck when an acetylene welding bottle ignited. • The MCA ETV HERAKLES, moored next to the casualty, used its fire monitors to extinguish the fire very quickly and provide cooling for several hours until risk of re-ignition had passed. • No Pollution

APPENDIX D

AIS Brief
(P.Whyte MBE, AFNI, Master Mariner)

Introduction to Automatic Identification System (AIS)

Executive Summary

AIS is a public broadcast VHF transponder device mandated for the majority of vessels, but not for recording, although it is recorded on VDR/S-VDR and is widely available from open sources. It is fitted for the primary purpose of improving ship-to-ship situational awareness and the management of controlled water space.

Who can use the Data?

Everyone can collect and store open source AIS transmissions.

Carriage Requirements

All ships of 300 gross tonnage and upwards engaged on international voyages and cargo ships of 500 gross tonnage and upwards not engaged on international voyages and passenger ships irrespective of size shall be fitted with an automatic identification system.

What is AIS?

AIS was first introduced in July 2002 by the International Maritime Organisation (IMO) under the International Convention for the Safety of Life at Sea (SOLAS) Chapter V/20 and automatically transmits data at set intervals covering Dynamic, Static and Voyage Related Information as an aid to navigation for the primary purpose of improving ship-to-ship situational awareness for collision avoidance, and the management of controlled water space of busy international straits, harbours and inland waterways.

Ownership of AIS Information

By design, AIS is an unencrypted open source data transmission. However, since inception the availability of AIS data has concerned IMO in terms of maritime security as AIS data is freely available on the world-wide-web. Contrary to IMO wishes, there are numerous vendors offering free or pay to view live tracking of AIS fitted vessels. By their very nature, open source AIS providers rely upon an unspecified number of shore-based receivers from around the globe that are privately owned with centralized collection and sharing of data.

Data Storage and Retrieval

The AIS Performance Standard does not require storage or retrieval of AIS data. However, AIS data is stored on VDR for passenger ships and cargo ships of 3,000 gross tons and over, constructed on or after 01 July 2002 and VDR or S-VDR to existing cargo ships of 3,000 gross tons and over from 01 July 2006, phasing in the requirement for cargo ships of 20,000 gross tonnage and upwards first, to be followed by cargo ships of 3,000 gross tonnage and upwards.

Recovery of AIS Data

Since inception the availability of AIS data has concerned IMO in terms of maritime security with AIS data freely available on the world-wide-web. Contrary to IMO wishes, there are numerous vendors offering free or pay to view live tracking of AIS fitted vessels. By their very nature, open source AIS providers rely upon an unspecified number of shore-based receivers from around the globe that are privately owned with centralized collection and sharing of data.

Types and Class of AIS

There are two classes of AIS, Class A (Vessels ≥300 GT engaged on international voyages, Vessels ≥500 GT not engaged on international voyages, all passenger ships) and Class B, as well as shore AIS Base Stations, Aids to Navigation (AIS AtoN), AIS on Search and Rescue (SAR) aircraft and AIS Search and Rescue Transmitters (AIS SART).

Each AIS Class A station consists of one VHF transmitter, two VHF receivers (AIS 1 and AIS 2), one VHF DSC receiver (Ch. 70), a standard marine electronic communications link and sensor input from different onboard systems. Timing and positional information comes from a GNSS (global navigation satellite system – such as GPS).

How it Works

AIS uses the technology of Self-Organized Time Division Multiple Access (SOTDMA) transmitted on two common channels in the Very High Frequency (VHF) spectrum, namely AIS 1 (161.975 MHz) and AIS 2 (162.025 MHz), which enables AIS equipped vessels and shore-based stations to send and receive identification and movement information that can be displayed on a standalone device, computer or electronic chart plotter. Each of the frequencies are divided into 2250 time slots repeated every 60 seconds with packets of information transmitted in these 'slots'. All AIS units within VHF range listen and schedule transmissions within these time slots.

AIS Message Formats

The IMO Performance Standard for AIS requires that the system should be capable of operating:

- In the ship-to-ship mode, to assist in collision avoidance.
- As a means for littoral States to obtain information about a ship and its cargo.
- As a VTS tool, i.e. ship-to-shore (traffic management).

AIS employs the principle of using a ship's speed and manoeuvring status as a means of governing information update rates and ensuring the appropriate levels of positional accuracy for ship tracking. This is shown in Table 2. A similar process is applied to the content of ship information messages to ensure that the data being transferred is not encumbered with static or low priority information.

The different information types, identified as "static", "dynamic" or "voyage related" are valid for different time periods and thus require a different update rate.

AIS messages include the following three basic types of data:

- Static information: Every 6 minutes and on request
  - MMSI
  - IMO number (where available)
  - Call sign and name
  - Length and beam
  - Type of ship
  - Co-ordinates of position-fixing antenna on the ship.

- Dynamic information: Dependant on speed and course alteration (see Table)
  - Ship's position with accuracy indication and integrity status
  - Position time stamp (in UTC)
  - Course over ground (COG)
  - Speed over ground (SOG)
  - Heading
  - Navigational status (e.g. at anchor, underway, aground etc. - manual input)
  - Rate of turn (where available).

- Voyage related information: Every 6 minutes, when is data amended, or on request
  - Ship's draught
  - Hazardous cargo (type)
  - Destination and ETA (at Master's discretion)
  - Route plan (waypoints).

- Short safety-related messages:
  - Free format text message - sent as required.

Ship's Manoeuvring Condition	Nominal Reporting Interval
• Ships at anchor or moored and not moving faster than 3 knots	3 minutes
• Ships at anchor or moored and moving faster than 3 knots	10 seconds
• Ship 0-14 knots	10 seconds
• Ship 0-14 knots and changing course	3 ⅓ seconds
• Ship 14-23 knots	6 seconds
• Ship 14-23 knots and changing course	2 seconds
• Ship >23 knots	2 seconds
• Ship >23 knots changing course	2 seconds

Display Requirements

If there is navigational equipment capable of processing and displaying AIS information such as ECDIS, radar or an integrated system, then the AIS Class A mobile system may be connected to that system via the AIS Presentation Interface (PI). The PI (input/output) needs to meet the requirements of relevant IEC standards (latest edition of IEC 61162). At present, there are a number of AIS units that use the Minimum Keyboard Display (MKD) (Shown above) which provides text based or basic graphic display elements.

The revised IMO radar performance standards (IMO Resolution MSC.192(79) 2004) states that all new radars fitted to ships after July 2008 must be able to display AIS contacts. As AIS will be displayed on Radar, and may also be displayed on ECDIS, it is unlikely that the MKD will evolve, and it is more likely that radar and ECDIS will be used to display AIS data.

For AIS Class B, depending on the unit purchased, software is available to display AIS or it may be able to feed into an existing navigation display system.

Shore authorities have an option of a number of purpose built, off the shelf AIS display systems, as well as the ability to fuse with radar contacts to provide better tracking and overall situational awareness aspects.

AIS Limitations

Dynamic reports are broadcasted very frequently (between 2-10 seconds depending on the vessel speed or every 3 minutes if at anchor), while static and voyage related reports are sent every 6 minutes. An idiosyncrasy of this technology is that it is common and likely that an AIS user will receive numerous position reports from a vessel prior to receipt of the vessel's name and type.

The range of AIS normally depends on the height of the antenna and atmospheric conditions, as VHF is usually uninterrupted just beyond 'line of sight' to the horizon, which is similar to other electromagnetic transmissions. Therefore, vessels and shore-based receivers will normally receive AIS data at a range of about 15-25 nautical miles. All VHF transmissions do suffer from interference, terrain masking or blind sectors. Equally, VHF can benefit from increased range through ducting caused by atmospheric super-refraction. The main limitations of AIS are:

- Data received is only as good as the data entered into the AIS;
- Not all ships carry AIS;
- AIS might be switched off for denial of information in high risk areas;
- AIS is subject to the vagaries and limitations of VHF propagation;
- AIS data can only be received/exchanged by vessels/stations within VHF range.

Satellite AIS tracking is in its infancy with coverage improving with the new constellations that will vastly increase the satellite footprint with more frequent over flights reducing data latency to offer virtual real-time monitoring both inshore and deep sea, and improved detection in high traffic density areas such as the US Gulf, South China Sea and Mediterranean. This AIS data is not available open source and is not yet reliable.

Cautionary Advice to Users of AIS on Board Ships

Mariners on craft fitted with AIS should be aware that the AIS will be transmitting own-ship data to other vessels and shore stations. To this end they are advised to:

- initiate action to correct improper installation;
- ensure the correct information on the vessel's identity, position, and movements (including voyage-specific) is transmitted; and
- ensure that the AIS is turned on, at least within 100 nautical miles of the coastline of the United Kingdom.

The simplest means of checking whether own-ship is transmitting correct information on identity, position and movements is by contacting other vessels or shore stations. Increasingly, UK Coastguard and port authorities are being equipped as AIS shore base stations. As more shore base stations are established, AIS will be used to provide a monitoring system in conjunction with VTS.

The MCA has already identified the dangers of using VHF to discuss action to take between approaching ships. (See MGN 167 – Dangers in the use of VHF in collision avoidance). Correct identification of targets by AIS does not eliminate such danger.

The above advice does not obviate the need to use AIS for the purposes indicated in Rule 5 of the International Regulations for Preventing Collisions at Sea, 1972. However, it is unlikely that current targets detected through AIS would not be also detected through efficient marine radar. Note: No specific reference is given to AIS in those Regulations, including Rule 19. AIS on radar is now approved and there are strict parameters for association and display of targets.

AIS operates primarily on two dedicated VHF channels (AIS1 - 161,975 MHz and AIS2 - 162,025 MHz). Where these channels are not available regionally, the AIS is capable of automatically switching to alternate designated channels.

AIS Issues

Many ship owners have opted for the least cost AIS installation to meet the mandatory carriage requirement. By doing so, many of the benefits offered by graphic display (especially AIS on radar) are not realised with the 3-line 'Minimum Keyboard Display' (MKD).

The Pilot Connector Socket and suitable power outlet should be located somewhere of practical use to a marine pilot who may carry compatible AIS equipment. This should be somewhere close to the wheelhouse main conning position. Less accessible locations in chart rooms, at the after end of the wheelhouse are not recommended.

The routine updating of data into the AIS should be included in the navigating officer's checklist.

The quality and reliability of position data obtained from targets will vary depending on the accuracy of the transmitting vessel's GNSS equipment. It should be noted that older GNSS equipment may not produce Course Over Ground and Speed Over Ground (COG/SOG) data to the same accuracy as newer equipment.

Current guidance given on AIS in the MCA Guidance Safety of Navigation – Implementing SOLAS Chapter V (accessible from the MCA website), is reproduced as follows:

For more information

Additional information is available from IMO and the International Association of Lighthouse Authorities (http://www.iala-aism.org).