MCIB
Marine Casualty Investigation Board
Bord Imscrúdú Taismí Muirí

REPORT OF AN INVESTIGATION INTO A MARINE CASUALTY INVOLVING THE MERCHANT VESSEL ARKLOW RAIDER IN THE BRISTOL CHANNEL, 25 NOVEMBER 2022

REPORT NO. MCIB/324
(No.7 OF 2023)

The Marine Casualty Investigation Board (MCIB) examines and investigates all types of marine casualties to, or onboard, Irish registered vessels worldwide and other vessels in Irish territorial waters and inland waterways.

The MCIB objective in investigating a marine casualty is to determine its circumstances and its causes with a view to making recommendations to the Minister of Transport - for the avoidance of similar marine casualties in the future, thereby improving the safety of life at sea and inland waterways.

The MCIB is a non-prosecutorial body. We do not enforce laws or carry out prosecutions. It is not the purpose of an investigation carried out by the MCIB to apportion blame or fault.

The legislative framework for the operation of the MCIB, the reporting and investigating of marine casualties and the powers of MCIB investigators is set out in the Merchant Shipping (Investigation of Marine Casualties) Act, 2000.

In carrying out its functions the MCIB complies with the provisions of the International Maritime Organisation's Casualty Investigation Code and EU Directive 2009/18/EC governing the investigation of accidents in the maritime transport sector.

Leeson Lane, Dublin 2.
Telephone: 01-678 3485/86.
email: info@mcib.ie
www.mcib.ie

REPORT OF AN INVESTIGATION INTO A MARINE CASUALTY INVOLVING THE MERCHANT VESSEL ARKLOW RAIDER IN THE BRISTOL CHANNEL, 25 NOVEMBER 2022

The Marine Casualty Investigation Board was established on the 25th March 2003 under the Merchant Shipping (Investigation of Marine Casualties) Act, 2000.

REPORT NO. MCIB/324
(No.7 OF 2023)

Glossary of Abbreviations and Acronyms

AB	Able Bodied Seaman
AIS	Automatic Identification System
ARPA	Automatic Radar Plotting Aid
BBC	British Broadcasting Corporation
CHA	Competent Harbour Authority
CPP	Controllable Pitch Propellor
ECDIS	Electronic Chart Display and Information System
GHT	Gloucester Harbour Trustees
HW	High Water
IMO	International Maritime Organisation
LLP	Limited Liability Partnership
LOA	Length Overall
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MCIB	Marine Casualty Investigation Board
MMSI	Maritime Mobile Service Identity
PPU	Portable Pilot Unit
PSC	Port State Control
ROT	Rate of Turn
S.I.	Statutory Instrument
SOG	Speed Over the Ground
SOLAS	Convention for the Safety of Life at Sea (SOLAS Convention)
SMS	Safety Management System
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
UK	United Kingdom
UKC	Under Keel Clearance
UTC	Co-ordinated Universal Time
VDR	Voyage Data Recorder
VHF	Very High Frequency
VRM	Variable Range Marker
VTS	Vessel Traffic Service

Centimetre	cm
Hour	hr
Kilowatt	kW
Knot	kt
Metre	m
Metres per second	m/s
Nautical mile	NM
Tonne	t

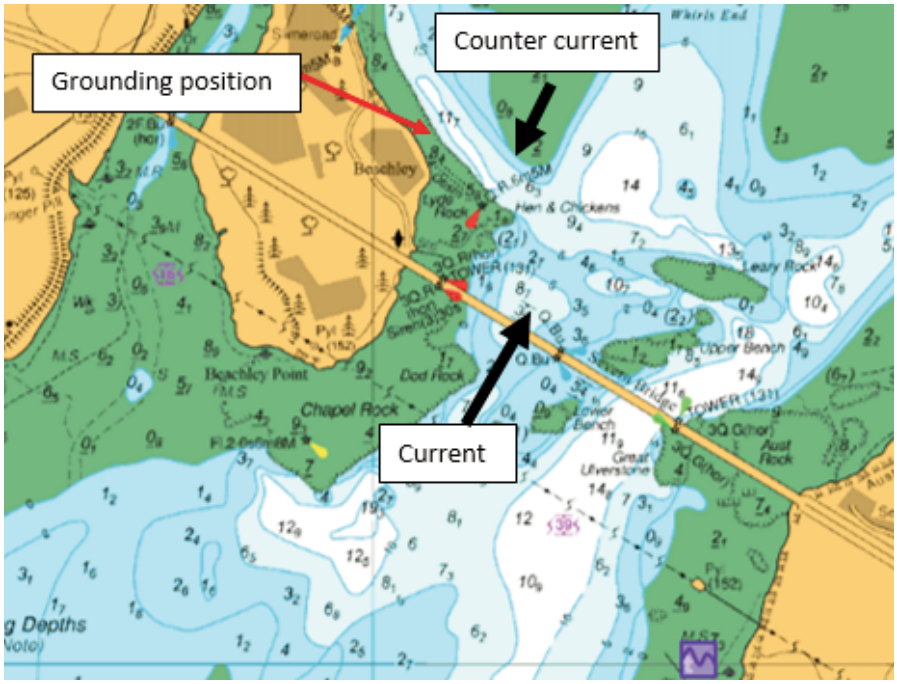
CONTENTS

Report MCIB/324 published by the Marine Casualty Investigation Board.
4th September 2023.

1. SUMMARY

1.1 On the evening of 25 November 2022, the general cargo vessel Arklow Raider, proceeded on a laden passage up the Bristol Channel towards her destination port of Sharpness, United Kingdom (UK). At around 19.19 hours (hrs) the vessel passed under the Severn Bridge and the Pilot commenced a planned turn to port to round Lyde Rock. Despite the Pilot applying starboard helm to counter the anticipated currents and counter currents, the vessel rapidly sheered to port, leaving the channel, before grounding heavily by the bow on a mud and rock bottom at approximately 19.21 hrs. After sounding all compartments and determining no apparent water ingress, the vessel was re-floated under its own power on the still rising tide. The passage was aborted and successfully completed on the following tide with the same Pilot. The vessel sustained damage to the shell plating and framing in the forepeak ballast tank, with water ingress subsequently detected in the forepeak. The vessel was dry-docked for repairs. No persons were injured and no pollution occurred.

Note: Times are local time = UTC + 1 (Co-ordinated Universal Time + 1 hour).



Annotated Extract from Admiralty Chart 1166: River Severn Avonmouth to Sharpness and Hook Cliff

2. FACTUAL INFORMATION

2.1 The Vessel

The vessel is a general cargo ship constructed with a single hold and with a capacity to carry containers. The accommodation and machinery spaces are located abaft (behind) the hold. Weather deck protection is provided by pontoon type steel hatch covers.

Arklow Raider.

2.1.1 Vessel Details

Vessel Name:	Arklow Raider.
Vessel Type:	General Cargo Ship.
Year:	2007, Barkmeijer, Netherlands.
Flag:	Irish.
Port of Registry:	Arklow.
Official Number:	404061.
Maritime Mobile Service Identity (MMSI) Number:	250001268.

International Maritime Organisation (IMO) Number:	9344540.
Length Overall (LOA):	89.990 metres (m).
Breadth Moulded:	14.00 m.
Summer Draught:	5.679 m.
Summer Deadweight:	4,458 tonnes (t).
Gross Tonnage:	2,999 t.
Net Tonnage:	1,639 t.
Main Engine:	MAK 6M25 rated at 1,499 Kilowatts (kW).
Propulsion:	A single variable pitch propeller.
Service Speed:	11.5 knots (kt).
Classification:	Bureau Veritas.
Entry No:	07983E.
Number of Crew:	7.
Owner/Operator:	Invermore Shipping Ltd/Arklow Shipping Limited.

2.1.2 Equipment

The vessel is a modern cargo ship and as such, it is well equipped with navigational aids and equipment. The bridge layout is comprised of a central control console, with two seats towards the centreline at the front. The bridge has enclosed bridge wings. The chart table is to port of the main console and at the front of the bridge.

See Appendix 7.1 – Annotated Photographs taken of the Bridge lay-out in Three Places on the Arklow Raider.

2.1.3 The bridge equipment included:

- Sperry Marine Bridgemaster Radar with Automatic Radar Plotting Aid (ARPA) to port
- Sperry Marine Bridgemaster Radar to starboard
- Sperry Marine Electronic Chart Display and Information System (ECDIS) chart plotter displays, type VMS.NAVIECDIS-BE Sperry Marine ES 5100
- Sperry Marine Doppler speed log

- ICS NAV 5 Navtex receiver
- ICOM M401E Very High Frequency (VHF) transceiver to port
- Sperry Marine Navpilot 4000 automatic steering
- Rudder angle indicator
- Joystick type steering control lever
- Bow thruster control lever
- Remote engine control lever (bridge control system)
- Sperry Marine Gyro Compass, with wing repeaters
- Sperry Marine VHF transceiver, RT4822
- Engine gauges and manual override controls
- MX Marine FMX 420 GPS at chart table.

2.1.4 The vessel is fitted with a hydraulic steering system, two rams and motors, coupled to the rudderstock by a 'Clampax' coupling manufactured by KTR, Germany. The rudder is a Becker Marine design with a maximum rudder angle of 45 degrees. When engaged in manual steering mode, the rudder is operated by a tiller located in the centre of the main bridge console. The vessel is not legally required to be fitted with a Voyage Data Recorder (VDR) and a VDR is not carried onboard. The ECDIS system does not have the facility to enable track download.

2.1.5 The vessel is fitted with a right hand turning controllable pitch propellor (CPP). This means when the CPP is operating astern, the bow should turn to port.

2.1.6 According to Gloucester Harbour Trustees (GHT) records, Arklow "R" class vessels have visited Sharpness a minimum of 36 times since 2011, in both laden and ballast conditions. There have been no reported issues. This was the Arklow Raider's fifth visit:

Date	Vessel Draught m	Laden/Ballast	Predicted tide height Sharpness m
17/08/2013	3.50	Ballast	6.10
06/01/2018	6.10	Laden	9.10
15/12/2020	6.20	Laden	9.70
29/04/2022	6.27	Laden	8.50
25/11/2022	6.10	Laden	8.90

2.2 Crew and Pilot Details

The Master

2.2.1 The Master, a 59 year old Polish National, has worked for Arklow Shipping for nine years, with all but his first contract with Arklow in the position of Master. He has seven years of service onboard Arklow Raider working typical contract lengths of 2.5 months duration. In total he has 15 years' experience as a Master and 37 years of seagoing experience. The Master has considerable experience of navigation in the Bristol Channel and River Severn. He joined the vessel on 10 October 2022 in Avonmouth.

2.2.2 The Master was well rested at the time of the grounding. During 25 November he had 14.50 hrs of rest and during the preceding day 15.00 hrs of rest.

See Appendix 7.2 – International Convention on Standards of Training, Certification and Watchkeeping for Seafarers Hours of Rest for the Master and Crew of the Arklow Raider.

The Pilot

2.2.3 The Pilot, a 34 year old British National, holds an International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) II/2 Certificate of Competency (Master Mariner Unlimited) and he has varied background of seagoing experience. He first served as a Humber Pilot in 2018, gaining three and a half years' experience, before starting as a Gloucester Pilot in July 2021. He was granted authorisation as a Class Three Pilot on 1 October 2021, with authorisation as a Class Two Pilot in October 2022. In total the Pilot undertook 77 trips as a Class Three Pilot, of which 35 were inbound.

2.2.4 The Pilot was well rested at the time of the incident, his previous outbound passage was conducted on 17 November 2022, over a week before.

2.3 Relevant Legislation

2.3.1 The body known as Gloucester Harbour Trustees was originally constituted as a Trust Port in 1890, with powers to improve, regulate and manage the Harbour, which would include the provision of tide gauges and aids to navigation.

2.3.2 The Gloucester Harbour Revision (Constitution) Order 2002 Statutory Instrument (S.I.) No.3268 sets out the Harbour limits.

2.3.3 The Pilotage Act 1987. Section 7 provides competent harbour authority (CHA) with powers to make pilotage directions.

2.4 Voyage Particulars

The incident occurred whilst the vessel undertook a passage laden with cement in bulk from Santander, Spain, to the port of Sharpness, UK.

2.5. Marine Incident Information

2.5.1 Type of Casualty: The incident is classed as a marine casualty due to the vessel grounding and sustaining material damage.

Date: 25 November 2022.

Time: 19.21 hrs.

Position: Latitude 51°37.023' North, Longitude 002° 38.782' West.

Wind Speed: Beaufort Force 4 - Moderate breeze - kt (11-16) metres per second (m/s) (6-8).

Wind Direction: Westerly.

Sea State: 3 - Slight (0.5 - 1.25 m).

Visibility: Good - 5.0 <= Vis < 25.0 nautical mile (NM) (hours of darkness).

Tide information: High water (HW) Sharpness 20.54 hrs (8.9 m).

2.6 Emergency Response and Shore Authority Involvement

2.6.1 An initial report was made by the Pilot to the GHT Harbour Master, who in turn contacted HM Coastguard, the Maritime and Coastguard Agency (MCA), Bristol Vessel Traffic Service (VTS) and local tugs; however, tug assistance was subsequently not required. A Marine Accident Investigation Branch (MAIB) accident report was submitted both by GHT and Arklow Shipping and a preliminary assessment carried out by the MAIB. This included cotemporaneous taped interviews of the Master and Pilot which were reviewed in this investigation. A comprehensive incident investigation was completed by GHT Harbour Master.

2.7 Vessel Inspections

2.7.1 The last flag state inspection was conducted on 2 September 2022 in Dublin, Ireland. Eight deficiencies were recorded, with one deficiency to be rectified prior to departure and seven to be rectified within 14 days. None of the deficiencies had any effect on the vessel's ability to be safely navigated and manoeuvred; the deficiencies are not material to the grounding.

See Appendix 7.3 – Flag State Inspection Report 2 September 2022.

2.7.2 The most recent Port State Control (PSC) inspection conducted prior to the grounding was undertaken by the MCA at Teignmouth, UK, on 17 November 2020. No non-compliances were identified. The MCA conducted a PSC inspection post grounding, at Swansea, UK, on 11 December 2022. Three minor non-compliances were identified, all of which were not material to the grounding; International Convention for the Safety of Life at Sea (SOLAS) Training Manual not available onboard, one heaving line was found with inappropriate weight attached and one gas monitor calibration certificate expired.

See Appendix 7.4 – Port State Inspection Report 11 December 2022.

2.8 Information Available for Passage Planning

2.8.1 The lower part of the Severn River has a tidal atlas, detailing the direction and strength of currents. No such written information exists for the area between the bridges and above the Severn Bridge. Knowledge of the currents is instead passed between pilots and learnt through training and experience. Pilots keep a record of currents in their pilot books which must be produced prior to examination for authorisation.

2.8.2 Gloucester Pilots are contracted by GHT to undertake visual inspections of Slimeroad Sands sandbanks located to the north of the Severn Bridge, each month. No regular hydrograph surveys are conducted at this area.

See Appendix 7.5 – Example Survey Report of Slimeroad Sands.

2.8.3 The GHT Safety Management Plan (Marine), Annex B, Pilotage Directions, can be accessed via the GHT website. Section 8 covers passage planning. Other than detailing the charts and publications which mariners should consider, the section states *"upon boarding, the pilot will discuss the passage plan with the bridge team"*. There is no reference to the potentially hazardous currents and their locations; the currents are not illustrated by the provision of 'chartlets'.

2.8.4 NP37 - Admiralty Sailing Directions: West Coasts of England and Wales Pilot was carried onboard Arklow Raider and was available for the crew to consider. Section 4.217 refers to tidal streams, *"Between Severn Bridge and Sharpness the tidal streams set directly inwards and outwards across the shoals and rocks when they are covered, but in the direction of the channel when they are dry. Maximum spring flood rate 5-6 knots; ebb 4-5 knots"*. There is no reference to strong counter currents.

3. NARRATIVE

3.1 The timeline for the following narrative is based on various evidence, including witness interviews, logbook entries, incident reports and vessel Automatic Identification System (AIS) data.

Passage Planning

3.2 Prior to joining Arklow Raider the Pilot completed a detailed passage plan using a GHT standardised passage plan form, for the planned voyage from the pilot station at Barry Roads to Sharpness. The details are considered further in Section 4 of this report.

See Appendix 7.6 – Completed Gloucester Harbour Trustees Passage Plan Form as used on 25 November 2022.

3.3 In addition to the GHT passage plan form, the Pilot had his own passage planning proforma. He had developed the form based on his previous experience as a Humber Pilot and used the proforma as a tool to reduce the likelihood of any human error in his calculations.

See Appendix 7.7 – Pilot's Passage Plan Proforma and Calculations for 25 November 2022.

3.4 The Second Officer onboard Arklow Raider had also completed a berth-to-berth passage plan, using the ECDIS and 'Chart Track' software package. The Master had checked the passage plan and confirmed it was correct. The passage plan did not contain supplemental information such as wheel over positions, Variable Range Marker (VRM) ranges, etc.

See Appendix 7.8 – Waypoint List and Passage Plan - Arklow Raider.

Execution of the Passage

3.5 The Pilot travelled by road for around two hours from Gloucester to the Barry Lodge Pilot Station, arriving at 15.00 hrs. Pilot boarding time was scheduled for 16.45 hrs, however, as all the pilot boat crew were present and waiting, boarding time was brought forward to 16.35 hrs. The Pilot boarded Arklow Raider at position C, Barry Roads. The Master and Chief Officer were waiting on the bridge. After greetings were exchanged, the Pilot gathered situational awareness and then ordered the vessel's speed be increased to full ahead. There was a general discussion as part of the Master/Pilot exchange. This included the number of times the Master had visited Sharpness. The Pilot set up his Portable Pilot Unit (PPU), which works independently of the vessel's navigation systems, to provide real-time data to the Pilot such as vessel position, heading and rate of turn (ROT) etc. Whilst setting up the PPU the Pilot maintained a radar watch.

3.6 The Master/Pilot exchange also considered the time of HW at Sharpness, critical waypoints and timings and time of arrival at Sharpness. The vessel's handling characteristics and absence of any defects were discussed. The propellor pitch had been adjusted in dry-dock in October 2022 and the Master thought that at zero pitch there may be some astern power. The Master also referenced that the vessel had difficulty in maintaining a course at reduced speed with the tide astern. This was not considered unusual by either the Master or Pilot given the strength of current. Both anchors were cleared away and ready to be let go if required, with an Able Bodied Seaman (AB) on standby in the messroom.

3.7 The exchange took around 15 minutes at which point the Master left the bridge to take some rest in his cabin. The Master confirmed that he would not be asleep and immediately available if required. The Chief Officer and Pilot remained on the bridge. The vessel was in autopilot, but at various points in the passage the Pilot planned to go into hand steering (via the tiller). The Pilot tested how the vessel handled and it responded as he expected. The Pilot contacted Bristol VTS via VHF channel 12 at 16.57 hrs to confirm the vessel's position and he noted the call in the side column of his proforma as it assisted him in adjusting the vessel's speed. Bristol VTS confirmed the tide gauge reading was 6.2 m as predicted.

3.8 The vessel transited past Flat Holm Island and into Bristol Deep. At the English and Welsh Buoy a further VTS report was made at 17.35 hrs and Bristol VTS confirmed the tide gauge was reading 0.2 m above the predicted tidal height. When turning into Bristol Deep the vessel began to yaw, which is not uncommon, and the Pilot engaged hand steering. The Pilot favoured the starboard side of the channel, as going across the tide acted as a brake and kept the vessel to the planned time.

3.9 The vessel reached the Welsh Buoy at 18.01 hrs and a call to Bristol VTS confirmed the tide gauge was now reading 0.4 m above the predicted tidal height. The Pilot noted that the tide was following the trend of the previous two tides. The area of King Road off Avonmouth is a narrow area and the Pilot once again engaged manual steering as he wanted to avoid any yawing on the autopilot. There was no outbound vessel traffic to consider.

3.10 At 18.33 hrs the vessel passed Portishead Point. The Pilot's passage plan had a scheduled arrival time of 18.35 hrs and so the Pilot was satisfied with the vessel's progress. The vessel passed the Cockburn Buoy, just North of Avonmouth and the Pilot set a course of 013° towards the Shoots Channel. Manual steering was engaged to execute some large turns and the Pilot made a final VHF call to Bristol VTS.

3.11 At 19.00 hrs the Master returned to the bridge and relieved the Chief Officer, who then left the bridge. Hand steering was engaged for the passage between the bridges. The Pilot stood to the right of the console with the tiller control in his left hand, the Master stood to the left of the console. At 19.04 hrs the vessel passed under the Prince of Wales Bridge. The current was trying to set the vessel

in a north easterly direction towards the East Bridge Tower. This was not an uncommon situation and the Pilot altered course to port to compensate. Using a combination of visual references, vectors and VRM on the radar, the Pilot navigated the vessel towards the Severn Bridge. Water funnels through the shoots, with the Pilot describing the area as *"akin to navigating in a pinball machine"*, with back eddies, cross currents and large variations in water depth e.g. from 17 m, to a hole of 27 m, then back to 17 m.

The Grounding

3.12 The Pilot discussed the planned turn around Lyde Rock with the Master. He explained that the currents would turn the vessel to port; the main northerly current would act on the vessel's port quarter, turning the stern to starboard, and at Whirls End a counter current, moving in an anticlockwise circulation would act on the starboard bow, turning the bow to port. Both currents would cause the vessel to naturally turn to port. The Pilot's intention was to navigate the vessel over the edge of Slimeroad Sands, close to the narrow channel which lies to the west of the Sands. Bristol VTS had confirmed the tidal height was 0.4 m above prediction and therefore there was sufficient water to cut more directly across the Sands had the Pilot so chosen. The vessel passed under the Severn Bridge at 19.18 hrs, with AIS data evidencing a speed over the ground (SOG) of 14.0 kt, with pitch set at 85%. The Pilot was comfortable with this speed as the strength of current typically took vessels up to speeds of 14.0 kt at this section of the passage. The Pilot had no means available of anticipating the strength of the approaching Whirls End back eddy (other than past experience) until the vessel was in the eddy.

See Appendix 7.9 - Extract from Admiralty Chart 1166: River Severn Avonmouth to Sharpness and Hook Cliff.

3.13 Watching for visual bearings of the Severn Bridge West Tower and Lyde Rock Beacon, once the bearings started to open, the Pilot commenced the port turn, ensuring via a VRM to maintain a distance of 0.25 NM off Chapel Rock. The vector showed the vessel would set away from Lyde Rock. The Pilot used starboard helm orders of 5° to 10° rudder to check the port turn and the vessel edged around to port, with the Pilot attempting to ensure that he didn't offer the beam of the vessel to the counter current. In clear visibility the Pilot used the foremast light, tree line at Sedbury and instruments to judge the vessel's ROT in degrees per minute. All navigation aids were in good working order.

3.14 Without warning the ROT to port rapidly increased. AIS data evidences the ROT increased from 2.2° at 19.18.57 hrs to 67.9° by 19.19.23 hrs i.e. an increase of 65.7° per minute in only 26 seconds. The Pilot described the effect as *"like putting tugs at the stern and bow of the vessel"*. During this period the Pilot applied full starboard helm of 45° rudder in an attempt to check the turn. Concerned that the rudder may have stalled, on two

occasions he returned the rudder to starboard 10°, but with no discernible effect. The Master and Pilot have different recollections on main engine settings at this time; the Master recalls a propellor pitch of 85% set throughout, whilst the Pilot believes the pitch was increased to 100% to power through the turn.

3.15 The Master commented on the speed of the turn and the Pilot reassured him that the turn would slow as the vessel entered deeper water and the rudder started to bite. Notwithstanding, the vessel continued to turn rapidly to port and through the trees the Pilot could observe the Slimeroad leading lights. At this point he understood that the vessel was not going to turn sufficiently to starboard and that full astern was required on the main engine. The SOG had fallen to 10.0 kt in the turn. Application of full astern further slowed the vessel's speed. The vessel grounded at approximately 5.6 kt, as evidenced by a subsequent rapid deacceleration of speed recorded on AIS data. Crew present forward had been ordered to prepare the anchors for letting go, however, the vessel grounded with both anchors still in the hawsepipes.

Actions Post-Grounding

3.16 Grounding via the bow at 19.21 hrs to the north of the Lyde Rock Beacon, the vessel didn't stop dead, but rather it rode up the bank. Four loud thuds were heard and the forward motion stopped. The main engine was still operating astern. The Master stopped the engine and the Pilot telephoned his manager to report the grounding, who in turn telephoned the GHT Harbour Master. Crew were summoned to muster stations and by 19.30 hrs the crew had commenced sounding all tanks and the Master informed Arklow Shipping of the grounding. During this period aground the vessel was slowly setting down in the current and so the Pilot applied hard to port on the rudder and dead slow ahead to keep the stern up into the current and vessel in deep water i.e. at a 90° angle to the shore.

3.17 All ballast and fuel tanks were reported intact. Approximately 30 centimetres (cm) of water was found in the forepeak tank, but as this could constitute unstripped ballast water, the Master and Pilot agreed to attempt to re-float the vessel under its own power. HW Beachly occurs around 30 minutes before HW Sharpness and so the Pilot calculated they had until 20.25 hrs to free the vessel on the rising tide, with around 1.3 m more tide predicted. The intention was to back the vessel off using astern population. No vibration was experienced when setting full astern pitch. Nothing initially happened and then at 20.00 hrs the vessel started slowly moving astern, backing in a straight line towards Slimeroad Sands.

3.18 Once the vessel was safely afloat, after a discussion with the Harbour Master, at around 20.08 hrs the Master and Pilot agreed to abort the inbound passage and instead head back out to the two designated anchorages at English and Welsh Grounds. The vessel proceeded slowly at reduced speed and crew continuously sounded tanks with no reported ingress. The vessel was duly anchored, but as the

anchor would not hold, the Master decided to steam the vessel up and down at the pilot station until a further inbound passage could be attempted the following morning.

Inbound Passage on 26 November 2022

3.19 The Pilot stayed onboard the vessel overnight and the inbound passage was resumed at 04.30 hrs the following morning, 26 November 2022. The tidal parameters were very similar to those experienced on the aborted passage the night before. When passing under the Severn Bridge, the Pilot set a heading approximately 15° different to the heading set the day before which was 015° as opposed to 000°. The Pilot's intention was to offer less of the vessel's port quarter and starboard bow to the currents and take a more direct route across the Sands. The vessel passed Lyde Rock and Slimeroad Sands without incident.

See Appendix 7.10 - Annotated Automatic Identification System Tracks for Arklow Raider on 25 and 26 November 2022.

See Appendix 7.11 – Pilot's Portable Pilot Unit Display of Previous Vessel Tracks under the Severn Bridge and Display on 25 November 2022.

Vessel Damage

3.20 After arrival in Sharpness it was identified that the bottom plating of the forepeak tank was breached and dry-dock would be required to effect repairs.

See Appendix 7.12 – Photographs of the Vessel Damage.

4. ANALYSIS

Fatigue

4.1 The Master and Pilot were both well rested and during interview neither expressed concern at each other's apparent state of alertness. Fatigue is therefore not considered to be a contributing factor to the grounding.

Environmental Conditions

4.2 It was a night passage, in good visibility, with westerly winds at Beaufort Force 4. Strong winds were therefore not causative. The tide had a predicted height of 8.9 m, with an actual tide 0.4 m higher than predicted which was 9.3 m. Whilst at the higher end of the tidal range for Sharpness, the height of tide was not in any way unprecedented. Generally, high tides generate strong currents; however, there is no means of evidencing the strength of current in the Lyde Rock area on 25 November, and therefore it not possible to opine whether the strength of current constituted an abnormal occurrence. It can be surmised, by the sudden and rapid increase in the vessel's ROT to port, that the currents must have been at the higher end of those typically experienced in the area. A review of historical metrological data collected by local weather stations, provides no evidence of extreme rainfall which could have contributed to stronger than anticipated currents i.e. through high volumes of fresh water flow coming downstream from the River Severn catchment area.

4.3 The tidal conditions on the following morning, 26 November, had very similar parameters to those experienced during the grounding. It is logical to assume that in the absence of any heavy rainfall, that the currents would have been of a similar strength and direction to those experienced on 25 November. On 26 November the passage was executed without incident, with no stronger than anticipated currents experienced. Both the Pilot and GHT Harbour Master advise that currents of up to six knots on spring tides are regularly experienced in the Lyde Rock area and that strong, but variable, counter-currents run in the area. This information was known to the Pilot through his training and prior experience. Clearly a root cause of the grounding was the strength and direction of the current, however, it is not possible to quantify the effects of whether the currents were in excess of those typically experienced.

Hydrographical Information

4.4 As per Admiralty Chart 1166 (Edition 10, 12 November 2020) a full hydrographic survey of the channel used by commercial shipping through the Gloucester Harbour area was carried out in 2015, and a further survey specifically of the Slimeroad area was carried out in 2019. A survey of the Slimeroad area was completed in 2023, post the grounding of Arklow Raider. The narrow channel which runs to the east of Lyde Rock, was last surveyed in 2015. Gloucester Pilots are contracted by GHT to undertake monthly visual surveys of Slimeroad Sands and an example survey report is included at Appendix 7.5. Visual surveys have inherent inaccuracies, as to some extent, visual interpretation has a degree of

subjectivity to the surveyor. Regular water-based surveys, using a high resolution multibeam echo sounder combined with a specialist hydrographic software package, offer a more accurate and objective alternative. A new package can cost in the region of €150,000, and so for a small trust port, the costs may be prohibitive. A single echo sounder combined with software can be purchased for circa €30,000 and still provides accurate empirical data. Both systems require a vessel and trained operator which have further cost implications. The fact that the sandbanks may be subject to regular change does not negate the requirement for surveying, to the contrary, it highlights the requirement for accurate surveying. Completing a monthly water borne survey is not an onerous task, providing the correct equipment and staff are available. This is certainly an improvement which should be given due consideration, although it is recognised that the cost benefit analysis and proportionality of any additional costs will be a factor in any changes to the present system of visual inspections.

4.5 In addition to the absence of any recent bathometric data for Slimeroad Sands, there is also no tide gauge or flow meter in the area. Pilots must therefore exercise caution when opting to adopt a direct track over the Sands. Other than from experience of navigating in different tidal states, there is no way of gauging the strength of the counter-current until the vessel is already to some extent committed to the manoeuvre. Consideration should be given to sitting a tide gauge in the area of Lyde Rock/Whirls End with telemetry capability i.e. automatic measurement and wireless transmission of tidal data to pilots. If combined with a flow meter to measure the current, such data would assist pilots in decision making as to whether there is sufficient water to pass more directly over Slimeroad Sands. The absence of any natural or manmade features in the area on which to site a flow meter may make such an improvement prohibitively expensive.

4.6 The GHT Harbour Master advised that in 2009, the vessel Balticdiep had grounded close to Lyde Rock slightly further along the bank in similar circumstances i.e. the vessel sheered to port during a port turn. That vessel had slightly less draught than Arklow Raider at 5.6 m, but was longer at 107 m LOA. The tide was similar at 8.4 m predicted. The grounding of Arklow Raider is therefore not an isolated incident and it is foreseeable that without an improvement in the current system of an analysing water depths and flows, that another similar incident will occur.

The Vessel

4.7 The passage was conducted in darkness; all navigation equipment carried onboard and used to monitor the vessel's position was effective i.e. radar and ECDIS. In addition the Pilot carried a PPU which is independent of the vessel's navigation systems and which he consulted throughout. Both steering pumps were running throughout the passage. There were no recorded defects at the time of the grounding. The subsequent PSC inspection conducted in dry-dock post incident identified three minor deficiencies which were not material to the grounding.

4.8 During the turn, the Pilot considered that the rudder may have stalled. Depending upon the drag, viscosity, blade shape and flow characteristic of the fluid, the critical angle of rudder effectiveness varies for different rudder and fluid combinations. The Becker rudder on Arklow Raider has a maximum angle of 45°, which is common on this rudder type; standard rudders typically have a maximum rudder angle of 35°. It is theoretically possible that the rudder had stalled during the port turn, however, the Pilot's actions moving the rudder back to starboard 15° on two occasions should have corrected any stall i.e. by altering the rudder angle relative to the flow of fluid. It is also possible that an initial stall may have contributed to the rapid port swing, with any subsequent corrective action insufficient to slow the turn in the time available. There are too many unknows to reach a definitive conclusion on this point.

4.9 The Master had reported difficulties maintaining the vessel's course with the tide astern whilst approaching the pilot station at Barry Roads. Both the Pilot and Master were unconcerned by this fact, such handling is experienced on many vessels in similar environmental conditions. The vessel successfully executed the passage on the 26 November 2022 in very similar tidal conditions to those experienced on 25 November, notwithstanding the fact that the forepeak tank was now breached. On the face of it, the successful passage the following morning (albeit more directly across Slimeroad Sands), is evidence that the vessel was capable of successfully undertaking the passage.

Pilot Training and Authorisation

4.10 Gloucester Pilots is a Limited Liability Partnership (LLP) consisting of four pilots, with a history dating back to 1894. Three pilots have class one authorisation, one pilot has class two authorisation. Under the provisions of the Pilotage Act 1987, the CHA for Sharpness is the GHT. GHT contract with Gloucester Pilots for pilotage and survey services. The pilots organise their own work rotas, with a minimum of two pilots always available. On average each month the pilots typically work 20 days on and ten days off, although this is flexible.

4.11 GHT have issued Pilotage Directions for the Gloucester Harbour CHA area (see below) and the Directions and other pertinent documentation can be considered in full via the GHT website www.gloucesterharbourtrustees.org.uk. Pilotage within the CHA area is compulsory on vessels of over 30 m or carrying over 12 passengers (CHA area shown below). Annex C of the Safety Management Plan (SMS) (Marine) dated 24 September 2018, details the regulations for the training, authorisation, and exemption of pilots.

Limits of Gloucester Harbour CHA

4.12 The regulations state that *"A trainee pilot must accompany an authorised pilot on a minimum of 40 acts of pilotage, of which 25 acts are to be inbound and 15 acts to be during the hours of darkness. This initial training period will last not less than three months. Assessment before the issue of a Class 3 Authorisation will be by a senior pilot and will include submission of the logbook and take*

account of the range of tides and weather conditions that have been encountered. Assessment will include theoretical and practical examination and submission of a training record and passage plans. The National Occupational Standards for Marine Pilots will be taken into account. Additional training will be required within each category of authorisation in order to gain appropriate experience of vessels having unusual configurations or equipment." Progression to a class two authorisation requires a minimum 75 acts under the class three authorisation, with 30 of these acts to be inbound, of which 15 should be during the hours of darkness. The table below summarises the Gloucester pilot authorisation classes. There are additional restrictions regarding minimum under keel clearances:

	CLASS 3	CLASS 2	CLASS 1
Max LOA	90 m	100 m	-
Max beam	14.5 m	15.5 m	-
Max draught	6.0 m	-	-

4.13 During the examination process for class three authorisation, the trainee pilot must conduct an inbound passage under the supervision of a class one pilot and produce a dossier detailing the local knowledge gained during training including tidal streams, datums etc. There are written examination which test knowledge on buoy and light characteristics, together with scenario-based questions e.g., actions on a main engine failure. The final examination is an oral examination undertaken before two pilots and the GHT Harbour Master. No assessments or training are undertaken in a simulator, although not every pilotage district in the UK offers this type of training.

4.14 If all training trips are included, the Pilot had experienced the inbound turn around Lyde Rock 72 times, of which 35 of those passages were undertaken at night. The Pilot had successfully executed the turn in similar tidal conditions, and the tide was slightly higher on the successful passage completed the morning following the grounding. The Pilot also had experience piloting other similarly sized Arklow vessels including the Arklow Faith, Arklow Clipper and Arklow Coat.

4.15 In summary, there is no evidence that the training or experience of the Pilot was causative to the grounding, although the addition of simulator training in the authorisation of GHT pilots would constitute a potential improvement to the status quo.

Passage Planning

Pilot

4.16 Gloucester Pilots maintain a database called 'Leading Lights' into which they

input basic vessel details such as port of departure, deadweight, length, maximum beam, service speed, draught etc. as supplied by agents, managers, owners or vessels directly. The Pilot noted a maximum calculated draught of 6.03 m for Arklow Raider, and as was his normal practice, he rounded the figure to 6.10 m in his passage planning calculation to allow for a margin of error. However, prior to boarding, the Pilot observed an aft draught of 6.12 m and therefore he used a revised maximum draught of 6.15 m in his calculations, allowing an amended safety margin. The forward draught was not recorded, and the vessel was marginally trimmed by the stern. In his planning the Pilot allowed a minimum Under Keel Clearance (UKC) of 1.5 m, which was over and above the minimum 1.0 m required by the GHT Pilotage Directions.

4.17 Timings for the passage are worked back from the necessary arrival time at Sharpness. Thirty minutes before HW Sharpness is allowed to manoeuvre the vessel from the wooden pier into the lock. Based on the difference between the actual and predicted time of HW on the previous two tides, the Pilot estimated HW would be reached approximately four minutes earlier than the predicted time of 20.54 hrs. He also estimated the tide would be higher than the predicted height of tide of 8.9 m. The Pilot therefore used a HW time of 20.50 hrs in his calculations, giving a required time of arrival at Sharpness at 20.20 hrs.

4.18 Along the passage the vessel must reach certain waypoints, or 'gates', at set times to ensure sufficient UKC and compliance with the planned arrival time. Working backwards from Sharpness, the Bull Channel was the first waypoint, with a calculated arrival time of 20.05 hrs, at which point the Pilot would provide 15 minutes notice of mooring stations to the Master. Shepperdine (a village on the eastern bank of the river) is located approximately 4.5 NM from Sharpness and at this point the Pilot would provide 30 minutes notice to the Master for arrival and crew standby. From this point it is crucial not to run ahead of the flooding tide and potentially run aground. From the Severn Bridge to Sharpness, the river has an increase of height elevation of 4.27 m, in effect the river 'goes up hill', and the effect of tide and current is considered in the planning stage.

4.19 The Pilot allowed 15 minutes for the passage between Severn Bridge, with a planned arrival of 19.20 hrs, meaning a planned arrival at the Prince of Wales Bridge (Second Severn Crossing) of 19.05 hrs. Portishead Point had a calculated arrival time of 18.35 hrs; it is located approximately 21 NM from the pilot station at Barry. The vessel's speed could be adjusted to ensure the correct arrival time if necessary, by rounding Cockburn Buoy and stemming the tide. In his passage planning the Pilot used a British Broadcasting Corporation (BBC) tidal application for the River Severn, which has been cross referenced with Admiralty calculations. His passage planning process took him around 20 minutes.

4.20 Post incident the passage plan was analysed by the GHT Harbour Master and senior pilot. Both concluded that the timings calculated in the passage plan were correct and indeed during the execution of the passage, the Pilot adhered

very closely to his calculated timings. One factor of significance, is the decision to plan the passage with a turn to port around Lyde Rock, as opposed to taking a more direct track across Slimeroad Sands. GHT pilots use a drying height of 3.0 m for Slimeroad Sands in their planning. Based on predications, there would have been 11.76 m of tide over the Sands at the time of the grounding. If a draught of 6.15 m is used in UKC calculations, then this still provided an UKC of 2.61 m. Even with a minimum UKC of 1.5 m, the vessel still had ample UKC to safely cross the Sands on a more direct heading. Such a track would arguably have exposed less of the vessel's beam to the currents and possibly avoided the rapid swing to port which followed. To some extent, the passage planning process was therefore causative to the grounding.

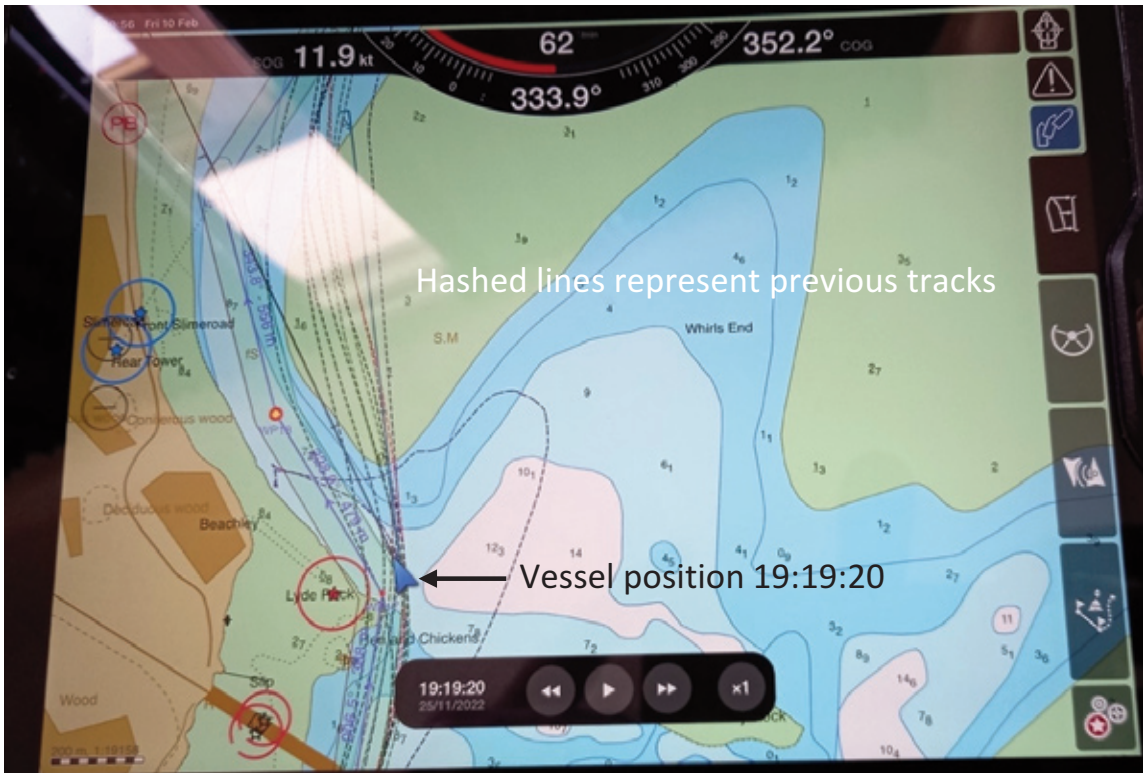
Crew

4.21 The Second Officer had completed a berth-to-berth passage plan. Only limited information was available to the crew through the Admiralty Sailing Directions and GHT website. Certainly the dangers posed by the counter-current at Whirls End were not apparent. Had the GHT Pilotage Directions referenced that a direct passage over Slimeroad Sands was the preferred route, and included the 3.0 m drying height for use in UKC calculations, then it is likely the Master would have had reason to question the decision to turn to port around Lyde Rock. As matters stand, ship's crews are almost entirely reliant upon the local knowledge of the pilot and as such their own passage planning has limited effectiveness. The crew were limited in the actions they could have taken to prevent the grounding.

4.22 The Guide to Good Practice on Port Marine Operations recommends improvements to the passage plan proformas by the addition of annotated 'chartlets' (Section 8 and Annex G). These would illustrate particular areas of caution such as the Lyde Rock turn, plus abort/hold points and would be a helpful addition to the Pilot/Master exchange. The 'chartlets' should be available to all mariners in advance via the GHT website.

Execution of the Manoeuvre

4.23 During interviews there was no evidence that either the Pilot or Master lost situational awareness at any point. The helm orders applied appear reasonable. The Master and Pilot have differing recollections on whether the pitch was increased from 85% to 100%, but ultimately given the speed with which the vessel turned to port, this engine command is unlikely to have made any difference to the eventual outcome. A review of previous tracks on the Pilot's PPU evidences that on 25 November 2022, the Pilot was following a very similar track to ones that he had used to successfully execute the turn around Lyde Rock on multiple previous occasions. See Appendix 7.9 - Extract from Admiralty Chart 1166: River Severn Avonmouth to Sharpness and Hook Cliff and following screenshot:



Screenshot of Portable Pilot Unit.

4.24 The track successfully executed on 26 November had a marginally different heading and followed a more direct route across the Sands. As the tidal conditions were very similar, this supports the findings already outlined, that passage plans should always prefer a more direct route across the Sands when it is safe to do so.

5. CONCLUSIONS

5.1 At 19.20 hrs on 25 November 2022, whilst the Arklow Raider was underway and under pilotage up the Bristol Channel, whilst executing a port turn after passing under the Severn Bridge, the vessel took a sudden and rapid sheer to port, causing it to ground heavily and suffer bottom damage. A similar incident had occurred at the same location in 2009.

5.2 The environmental conditions, including wind speed/direction and height of tide, were not unusual, and the vessel had successfully undertaken a similar manoeuvre in laden condition on three other occasions. The following morning the vessel successfully transited the area during similar tidal conditions with the same Pilot, by passing more directly over Slimeroad Sands. This is persuasive evidence that the track adopted and the angle of the hull presented to the current during the previous passage was causative in causing a rapid swing to port.

5.3 The potential presence of a strong counter-current at the Lyde Rock area is well known local knowledge. However, this information is unavailable in Admiralty Sailing Directions or via GHT pilotage information to mariners. There is no means of accurately measuring the height of tide or current flow at Lyde Rock, in addition Slimeroad Sands are only visually surveyed.

5.4 The rapid sheer to port was not caused by any defect on the vessel, but rather the effect of strong current and counter-currents acting on the port quarter and starboard bow of the vessel respectively. It is not possible to evidence whether the strength of current constituted an abnormal occurrence or whether the vessel's rudder had stalled. The effect of the currents may have been minimised if a track been planned to maintain a perpendicular aspect of the hull to the turning effects of the current i.e. by heading more directly over Slimeroad Sands. There was sufficient UKC to do so.

5.4 Providing there is sufficient UKC, a more direct passage over Slimeroad Sands is preferable, rather than execution of a port turn passing close to Lyde Rock. The limited availability of real-time accurate tidal data, current data and the absence of regular hydrographic surveys in the area of Slimeroad Sands is a factor in this grounding.

6. SAFETY RECOMMENDATIONS

Premable

The following safety recommendations are made pursuant to the findings of this investigation. As part of the investigative process the findings of a report prepared by the Glouchester Harbour Trustees were considered. Many of the recommendations identified as necessary in this investigation were also identified in the Gloucester Harbour Trustees incident report; however, there are some minor differences. The Marine Casualty Investigation Board recommends that regular bathometric surveys are conducted at Slimeroad Sands, whereas Gloucester Harbour Trustees are satisfied that the present regime of visual surveys is adequate. Objectively a bathometric survey will be more accurate than a visual survey, but there is a significant cost implication to the former. It is appreciated that there is always a cost benefit analysis required when evaluating 'as low as reasonably practicable' decisions to reduce risks. Accordingly, it is for Gloucester Harbour Trustees to evaluate the reasonable practicality of implementing the Marine Casualty Investigation Board recommendation.

A Marine Casualty Investigation Board recommendation is that consideration is provided for simulator training for the Gloucester Pilots. This point was not identified in the Gloucester Harbour Trustees report. Again, this is a question of resources, as preparation of simulation models, followed by time in a simulator, is a costly process. Provision of realistic simulator training is accepted as good industry practice, as it allows for pilots to be trained in a more controlled environment, practicing difficult manoeuvring strategies that replicate real local conditions. The Marine Casualty Investigation Board recommendation is therefore made with an understanding that cost constraints may make implementation unfeasible in the context of a small harbour trust, but nevertheless such training would improve safety.

See Appendix 7.13 – Gloucester Harbour Trustees Harbour Master's Investigation Report.

6.1 Recommendations to Gloucester Harbour Trustees:

6.1.1 Location of a tide gauge in the area of Lyde Rock/Whirls End with telemetry capability i.e. automatic measurement and wireless transmission of tidal data to pilots. Such data would assist pilots in decision making i.e. to whether there is sufficient water to pass over Slimeroad Sands. The addition of a flow meter would greatly improve knowledge of current flows in the area.

6.1.2 Conduct regular bathometric surveys of the Slimeroad Sands area to provide pilots with greater certainty as to whether it is safe to pass over the Sands.

6.1.3 Revise the Gloucester Harbour Trustees passage planning documents to recommend that due consideration is given to following a track directly across

Slimeroad Sands when it is safe and practicable to do so. This is the general practice of the pilots, however, there is no reference in Gloucester Harbour Trustees's passage planning documentation. Any revision of the documents should also include a calculation of predicted tidal height and Under Keel Clearance at Slimeroad Sands, so pilots have readily available definitive information. The forward draught of the vessel should also be recorded and the resulting potential effect on trim/handling characteristics considered.

6.1.4 Consider the addition of simulator training to the pilot authorisation program and continued use thereafter as part of continuing professional development. Realistic simulation would require the modelling of the complex currents in the Lyde Rock area and that such modelling may be technically challenging and therefore have a significant cost implication.

6.1.5 Improve the passage plan proforma by adding annotated 'chartlets' (as suggested in the Guide to Good Practice on Port Marine Operations Section 8 and Annex G). These would illustrate particular areas of caution such as the Lyde Rock turn, plus abort/hold points and would be a helpful addition to the Pilot/Master exchange. The 'chartlets' should be available to all mariners in advance via the Gloucester Harbour Trustees website.

6.1.6 The most important information required for a passage plan is the actual intended route to be taken and this should be clearly discussed during the Master/Pilot exchange. The effects of the currents should be clearly stated to the Master, including the option of an alternative route across the Sands (when possible) to avoid exposing the vessel to the maximum effect of the currents.

6.1.7 Review the Gloucester Harbour Trustees navigational risk assessments and create a specific risk assessment for the Lyde Rock area on inbound passages.

6.2 Recommendations to UK Hydrographic Office

6.2.1 NP37 - Admiralty Sailing Directions: West Coasts of England and Wales Pilot, to be updated with a warning relating to potentially strong counter-currents in the Lyde Rock area.

7. APPENDICES

Appendix 7.1 Annotated Photographs taken of the Bridge lay-out in Three Places on the Arklow Raider.

Appendix 7.2 International Convention on Standards of Training, Certification and Watchkeeping for Seafarers Hours of Rest for the Master and Crew of the Arklow Raider

RECORD OF HOURS OF REST
Nov 2022
IMO STCW 2010 +Manila

Vessel: Arklow Raider
IMO No: 9344540
Flag: Ireland

Seafarer (Full Name): [redacted]
Position (Rank): AB/Cook
Watchkeeper: YES

November 2022	Periods of work are shaded	Hours of work in 24h period	Hours of rest in 24h period	Comments	NOT TO BE COMPLETED BY THE SEAFARER: Hours of rest in any 24h period	Hours of rest in any 7d period
Date	00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24					
01/11/2022		9.0	15.0	Swansea Dry Dock	15.0	103.0
02/11/2022		9.0	15.0	Swansea Dry Dock	15.0	104.0
03/11/2022		9.0	15.0		15.0	105.0
04/11/2022		2.5	21.5		15.0	106.0
	00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	29.5	66.5			

The following national laws, regulations and/or collective agreements governing limitations on working hours or minimum rest periods apply to this ship:

Irish Department of Communications, MArine and Natural REsources, European Union Labour LAws

I AGREE THAT THIS RECORD IS AN ACCURATE REFLECTION OF THE HOURS OF WORK OR REST OF THE SEAFARER CONCERNED.

Name of master or person authorized by master to sign this record: [redacted]

Signature of master or authorized person:

Signature of seafarer:

A copy of this record is to be given to the seafarer. This form is subject to examination and endorsement under procedures established by:

Ireland
(name of competent authority)

Appendix 7.3 Flag State Inspection Report 2 September 2022

(v0.2)

Dept. of Transport
Marine Survey Office
Leeson Lane
Dublin 2

Phone: +353 (0)1 6783400
Email: FirstNameLastName@transport.gov.ie
Web: www.gov.ie/transport

Report of Survey/ Inspection

TMS No:

Name of Vessel:	Arklow Raider	ON/IMO:	404061/9344540
Type of Vessel:	Cargo Ship	Port of Registry:	Arklow
Date of Survey:	02/09/2022	Place of Inspection:	Dublin Port
Surveyor:	[redacted]	Activity:	Cargo Ship Safety Equipment Certificate
Office:	Dublin	Deficiencies:	Yes

Hull Modifications	☐	Exemptions / Equivalencies	☐

Inspection Operations

(Please tick the relevant areas inspected)

Hull Out of Water Survey	☐	Sea Valves & Skin Fitting	☐	Internal Void Space & Ballast Tank(s) Opened & Inspected	☒
Decks	☒	Steering / Engine Room	☒	Cargo Hold(s) / Tank(s)	☒
Accommodation	☒	Passenger Spaces	☐	Propeller Shaft & Rudder Removal	☐
Shell Plating U/T Inspection	☐	Safety Equipment	☒	Emergency Steering	☒
Sea Trials & Crew Drills	☒	Navigational Equipment	☒	MLC	☒
Radio Equipment	☒				

Other: Radio survey 02/09/2022
Crew drills carried out but no sea trials
Aft peak tank inspected.

Comments

Signature

Appendix 7.3 Flag State Inspection Report 2 September 2022

SUR 2500 Rev 2.1 (05/19)

Dept. of Transport
Marine Survey Office
Leeson Lane
Dublin 2

Phone: +353 (0)1 6783400
Email: FirstNameLastName@transport.gov.ie
Web: www.gov.ie/transport

Deficiencies

Item No.	Nature of Deficiency	Legislation Reference (if detained)	Action Taken
1	Main engine exhaust uptake, drain hat insulation to be repaired/replaced (opposite boiler fuel tank)		17
2	Sludging valve on settling tank dripping.		16
3	SW Cooling water for aircon condenser line (in front of E/R alarm panel) section of pipe to replace with two repairs		16
4	Watermist release panel (top of stairs from M/E) damaged at side and requires replacement.		16
5	CO2 room - bottle connections aft Port side are rusted and require replacing in drydock. All connections physically checked by hand and all ok.		16
6	Full service and pressure test/blow through of CO2 fixed fire fighting system to be carried out by authorised service company in drydock		16
7	Load test of Gangway to be carried out in drydock		16
8	Fire extinguishers portable to be serviced in drydock		16

00	No Action Taken	18	ISM Non Conformities: rectify before departure
10	Deficiency Rectified	19	ISM Non-Conformities: rectify within 3 months
12	All Deficiencies Rectified	30	Grounds for Detention
15	Rectify Deficiency at Next Port	35	Ship allowed to sail after detention
16	Rectify Deficiency within 14 days	70	Classification Society informed
17	Master instructed to rectify deficiency before departure	99	Other (Specify in Clear Text)

This report must be retained on board for a period of two years and must be available for consultation by a Department of Transport, Tourism & Sport Surveyor at all times. This inspection is based on random samples and therefore deficiencies may exist which may not have been identified.

Appendix 7.3 Flag State Inspection Report 2 September 2022

SUR 2500 Rev 2.1 (05/19)

Page 3 of 4

Dept. of Transport Marine Survey Office Leeson Lane Dublin 2		Phone: +353 (0)1 6783400 Email: FirstNameLastName@transport.gov.ie Web: www.gov.ie/transport

Deficiencies

Item No.	Nature of Deficiency	Legislation Reference (if detained)	Action Taken

00	No Action Taken	18	ISM Non Conformities: rectify before departure
10	Deficiency Rectified	19	ISM Non-Conformities: rectify within 3 months
12	All Deficiencies Rectified	30	Grounds for Detention
15	Rectify Deficiency at Next Port	35	Ship allowed to sail after detention
16	Rectify Deficiency within 14 days	70	Classification Society informed
17	Master instructed to rectify deficiency before departure	99	Other (Specify in Clear Text)

This report must be retained on board for a period of two years and must be available for consultation by a Department of Transport, Tourism & Sport Surveyor at all times. This inspection is based on random samples and therefore deficiencies may exist which may not have been identified.

Appendix 7.3 Flag State Inspection Report 2 September 2022

SUR 2500 Rev 2.1 (05/19)

Page 4 of 4

Dept. of Transport
Marine Survey Office
Leeson Lane
Dublin 2

Phone: +353 (0)1 6783400
Email: FirstNameLastName@transport.gov.ie
Web: www.gov.ie/transport

Item No.	Nature of Deficiency	Legislation Reference (if detained)	Action Taken

00	No Action Taken	18	ISM Non Conformities: rectify before departure
10	Deficiency Rectified	19	ISM Non-Conformities: rectify within 3 months
12	All Deficiencies Rectified	30	Grounds for Detention
15	Rectify Deficiency at Next Port	35	Ship allowed to sail after detention
16	Rectify Deficiency within 14 days	70	Classification Society informed
17	Master instructed to rectify deficiency before departure	99	Other (Specify in Clear Text)

This report must be retained on board for a period of two years and must be available for consultation by a Department of Transport, Tourism & Sport Surveyor at all times. This inspection is based on random samples and therefore deficiencies may exist which may not have been identified.

Appendix 7.4 Port State Inspection Report 11 December 2022

Paris MoU on Port State Control

REPORT OF INSPECTION IN ACCORDANCE WITH THE PARIS MEMORANDUM OF UNDERSTANDING ON PORT STATE CONTROL*

FORM A

- Reporting Authority: Cardiff Marine Office
- Address: Anchor Court, Ocean Way, Cardiff CF24 5JW
- Telephone: +44 (0)203 9085222
- Email: Cardiff_MO@mcga.gov.uk
- Website:

SHIP PARTICULARS					
Name	ARKLOW RAIDER	IMO Number	9344540	Gross Tonnage	2999
Flag	Ireland	MMSI Number	250001268	Old Tonnage	
Type	General cargo/multipurpose	Date Keel Laid/Major Conv.	01/12/2004	Main Engine (KW)	1800
Call Sign	EIXS	Deadweight		Emission Abatement Method	

ISM COMPANY					
Name	Arklow Shipping ULC			IMO Company Number	0036202
Address	North Quay	City	Arklow	Country	Ireland

MLC SHIPOWNER					
Name	Arklow Shipping ULC				
Address	North Beach	City	Arklow	Country	Ireland

CHARTERER (only ships carrying liquid or solid cargoes in bulk, pref. 1st charterer record)					
Name	Dragon Alfa Cement				
Address		City		Country	United Kingdom

☐ Demise Charter ☐ Time Charter ☒ Voyage Charter

Name and signature of master to confirm the receipt of the inspection report and to certify that the information on charterer is correct:

Name	Signature

*) This inspection report has been issued solely for the purpose of informing the master and other port States that an inspection by the port State, mentioned in the heading, has taken place. This inspection report cannot be construed as a seaworthiness certificate in excess of the certificates the ship is required to carry.

**) Masters, Shipowners and/or Operators are advised that detailed information on the inspection will be reported to the appropriate authorities and organisations and is subject to publication.

***) "Outstanding deficiencies" are listed for information only and will not be taken into account for the calculation of the Ship Risk Profile and Company performance.

Page 1 of 6

Paris MoU on Port State Control

REPORT OF INSPECTION IN ACCORDANCE WITH THE PARIS MEMORANDUM OF UNDERSTANDING ON PORT STATE CONTROL*

FORM A

Name Of Ship	ARKLOW RAIDER	IMO Number	9344540	Date Of Report	11/12/2022	Place Of Inspection	Swansea

Classification Society(ies) responsible for issuance of class certificates					
Issuing Entity	Bureau Veritas	Date Of Issue	07/11/2022	Date Of Expiry	03/10/2027

Recognised Organization(s) responsible for issuance of certificates on behalf of the flag State	
Issuing Entity	Bureau Veritas

INSPECTION PARTICULARS **			
Date Of First Visit	11/12/2022	Place Of Inspection	Swansea
Date Of Report	11/12/2022	If detained: Date Of Issue Of Detention No	

Type Of Inspection

☐ Initial Inspection ☒ More Detailed Inspection ☐ Expanded Inspection ☐ CIC

Checked	Operational Control (if any)	Additional Comment
☒	Other	Bilge alarm, OWS 15PPM, Emergency Steering, Quick closing Valves, Rescue Boat engine, Fire Dampers, emergency fire pump.
☐	Abandon ship drill	
☐	Damage Control drill	
☐	Enclosed space entry drill	
☐	Emergency steering drill	
☐	Fire drill	
☐	Man Over Board drill	
☐	Rescue Boat drill	

*) This inspection report has been issued solely for the purpose of informing the master and other port States that an inspection by the port State, mentioned in the heading, has taken place. This inspection report cannot be construed as a seaworthiness certificate in excess of the certificates the ship is required to carry.

**) Masters, Shipowners and/or Operators are advised that detailed information on the inspection will be reported to the appropriate authorities and organisations and is subject to publication.

***) "Outstanding deficiencies" are listed for information only and will not be taken into account for the calculation of the Ship Risk Profile and Company performance.

Page 2 of 6

Appendix 7.4 Port State Inspection Report 11 December 2022

Paris MoU on Port State Control

REPORT OF INSPECTION IN ACCORDANCE WITH THE PARIS MEMORANDUM OF UNDERSTANDING ON PORT STATE CONTROL*

FORM A

Name Of Ship	ARKLOW RAIDER	IMO Number	9344540	Date Of Report	11/12/2022	Place Of Inspection	Swansea

☐	SMPEP drill	
☐	SOPEP drill	

Checked	Areas Inspected	Additional Comment
☒	Accommodation and galley	
☐	Ballast tank(s) - internal	
☐	Ballast tank(s) - from manhole	
☐	Vehicle deck	
☒	Cargo area	
☒	Engine room	
☒	Navigation bridge	
☒	Decks and forecastle	
☐	Passenger spaces	
☒	Steering-room	

RELEVANT CERTIFICATES

				Information on last intermediate, periodical or annual		
Title Certificate	Issuing Authority	Date Of Issue	Date Of Expiry	Date Of Survey	Surveying Authority	Country
Bunker Oil Pollution Damage	Ireland	11/02/2022	20/02/2023			
Cargo Ship Safety Construction	BV	07/11/2022	03/10/2027			
Cargo Ship Safety Equipment	Ireland	07/11/2022	08/02/2023			

*) This inspection report has been issued solely for the purpose of informing the master and other port States that an inspection by the port State, mentioned in the heading, has taken place. This inspection report cannot be construed as a seaworthiness certificate in excess of the certificates the ship is required to carry.

**) Masters, Shipowners and/or Operators are advised that detailed information on the inspection will be reported to the appropriate authorities and organisations and is subject to publication.

***) "Outstanding deficiencies" are listed for information only and will not be taken into account for the calculation of the Ship Risk Profile and Company performance.

Page 3 of 6

Paris MoU on Port State Control

REPORT OF INSPECTION IN ACCORDANCE WITH THE PARIS MEMORANDUM OF UNDERSTANDING ON PORT STATE CONTROL*

FORM A

Name Of Ship	ARKLOW RAIDER	IMO Number	9344540	Date Of Report	11/12/2022	Place Of Inspection	Swansea
Cargo Ship Safety Radio		BV	07/11/2022	03/10/2027			
Continuous Synopsis Record[2]		Ireland	14/01/2011				
Document of Compliance		BV	06/11/2019	27/11/2024	11/11/2022	BV	Ireland
Document of Compliance Dangerous Goods		BV	07/11/2022	03/10/2027			
Engine International Air Pollution Prevention(ME & 2 DG)		BV	28/08/2012				
International Air Pollution Prevention		BV	07/11/2022	03/10/2027			
International Anti-Fouling System		BV	07/11/2022				
International Energy Efficiency Certificate		BV	27/10/2017				
International Oil Pollution Prevention (IOPP)		BV	07/11/2022	03/10/2027			
International Sewage Pollution Prevention		BV	07/11/2022	03/10/2027			
International Ship Security		BV	05/01/2021	26/01/2026			
Load Line		BV	07/11/2022	03/10/2027			
Maritime Labour Certificate		BV	30/01/2018	29/01/2023	17/06/2020	BV	United Kingdom
Minimum Safe Manning Document		Ireland	27/01/2022				
Nairobi International Convention on the Removal of Wrecks		United Kingdom	12/02/2022	20/02/2023			
Safety Management Certificate		BV	31/01/2018	16/03/2023	17/06/2020	BV	United Kingdom
Tonnage		Ireland	17/04/2014				

INSPECTION ACTIONS

Checked	Ship related inspection action taken (if any)	Additional Comment
☐	Inspection suspended	

*) This inspection report has been issued solely for the purpose of informing the master and other port States that an inspection by the port State, mentioned in the heading, has taken place. This inspection report cannot be construed as a seaworthiness certificate in excess of the certificates the ship is required to carry.

**) Masters, Shipowners and/or Operators are advised that detailed information on the inspection will be reported to the appropriate authorities and organisations and is subject to publication.

***) "Outstanding deficiencies" are listed for information only and will not be taken into account for the calculation of the Ship Risk Profile and Company performance.

Page 4 of 6

Appendix 7.4 Port State Inspection Report 11 December 2022

Paris MoU on Port State Control

REPORT OF INSPECTION IN ACCORDANCE WITH THE PARIS MEMORANDUM OF UNDERSTANDING ON PORT STATE CONTROL*

FORM A

Name Of Ship	ARKLOW RAIDER	IMO Number	9344540	Date Of Report	11/12/2022	Place Of Inspection	Swansea

☐	Dismissed on AFS grounds	
☐	Excluded on AFS grounds	
☐	Vessel expelled on other grounds	
☐	Vessel expelled on security grounds	
☐	Marpol investigation of contravention of discharge provision	

Checked	Ship related reporting action taken (if any)	Additional Comment
☐	Coastal State informed	
☐	ILO informed	
☐	Other authority informed	
☐	Observations to inspection	
☐	Shipowners' and seafarers' organizations informed	
☐	Overriding Factor	
☐	The flag State has been requested to provide an action plan within a deadline	
☐	Union representative informed	
☐	Ship owner organisation informed	
☐	Inspection done at sea	
☐	Next port of call informed	
☐	Flag State Administration informed	
☐	Recognised organisation informed	

*) This inspection report has been issued solely for the purpose of informing the master and other port States that an inspection by the port State, mentioned in the heading, has taken place. This inspection report cannot be construed as a seaworthiness certificate in excess of the certificates the ship is required to carry.

**) Masters, Shipowners and/or Operators are advised that detailed information on the inspection will be reported to the appropriate authorities and organisations and is subject to publication.

***) "Outstanding deficiencies" are listed for information only and will not be taken into account for the calculation of the Ship Risk Profile and Company performance.

Page 5 of 6

Paris MoU on Port State Control

REPORT OF INSPECTION IN ACCORDANCE WITH THE PARIS MEMORANDUM OF UNDERSTANDING ON PORT STATE CONTROL*

FORM A

Name Of Ship	ARKLOW RAIDER	IMO Number	9344540	Date Of Report	11/12/2022	Place Of Inspection	Swansea

DEFICIENCIES	☐ no	☒ yes (see attached FORM B)
OUTSTANDING DEFICIENCIES***	☒ no	☐ yes (see attached FORM B)
SUPPORTING DOCUMENTATION	☒ no	☐ yes (see annex)

PORT STATE PARTICULARS			
Head Office/District Office	Cardiff Marine Office	Telephone	+44 (0)203 9085222
Address	Anchor Court, Ocean Way, Cardiff CF24 5JW	Email	Cardiff_MO@mcga.gov.uk
		Website	

Name(s) of duly authorized PSCO(s) of reporting authority	Signature	Visit Date
[redacted]		11/12/2022
		11/12/2022

This report must be retained on board for a period of at least three years and must be readily available for consultation by Port State Control Officers at all times.

*) This inspection report has been issued solely for the purpose of informing the master and other port States that an inspection by the port State, mentioned in the heading, has taken place. This inspection report cannot be construed as a seaworthiness certificate in excess of the certificates the ship is required to carry.

**) Masters, Shipowners and/or Operators are advised that detailed information on the inspection will be reported to the appropriate authorities and organisations and is subject to publication.

***) "Outstanding deficiencies" are listed for information only and will not be taken into account for the calculation of the Ship Risk Profile and Company performance.

Page 6 of 6

Appendix 7.4 Port State Inspection Report 11 December 2022

Paris MoU on Port State Control

REPORT OF INSPECTION IN ACCORDANCE WITH THE PARIS MEMORANDUM OF UNDERSTANDING ON PORT STATE CONTROL

FORM B

Name Of Ship	ARKLOW RAIDER	IMO Number	9344540	Date Of Report	11/12/2022	Place Of Inspection	Swansea

DEFICIENCIES FOUND AND FOLLOW UP ACTIONS

Nr.	Code	Defective Item	Nature Of Defect*	Convention Reference	Action Taken	Due Date	Ground For Detention	Accidental Damage**	RO resp.	ISM Related	Additional Comments
1	11131	On board training and instructions	Not as required	SOLAS ch. III - SOLAS 2006 Amend / Chapter III / Reg. 35	16 - To be rectified within 14 days	25/12/2022	☐	☐	☐	☐	SOLAS Training manual not available onboard.
2	18427	Ship's occupational safety and health policies and programmes	Not as required	MLC 2006 Title 4 - MLC 2006 / The Regulations and the Code / Standard A4.3	17 - To be rectified before departure	11/12/2022	☐	☐	☐	☐	1 x heaving line found with inappropriate weight attached.
3	18410	Gas instruments	Not as required	MLC 2006 Title 4 - MLC 2006 / The Regulations and the Code / Standard A4.3	16 - To be rectified within 14 days	25/12/2022	☐	☐	☐	☐	1 x gas monitor calibration certificate expired.

Name(s) of duly authorized PSCO(s) of reporting authority	Signature	Visit Date
[redacted]		11/12/2022
		11/12/2022

*) This inspection was not a full survey and deficiencies listed may not be exhaustive. In the event of a detention, it is recommended that a full survey is carried out. All deficiencies should be rectified before an application for re-inspection is made.

**) Deficiencies marked as Accidental Damage are not taken into account for calculating the company performance and Ship Risk Profile.

Page 1 of 1

Paris MoU on Port State Control

REPORT OF INSPECTION IN ACCORDANCE WITH THE PARIS MEMORANDUM OF UNDERSTANDING ON PORT STATE CONTROL

FORM A

Name Of Ship	ARKLOW RAIDER	IMO Number	9344540	Date Of Report	11/12/2022	Place Of Inspection	Swansea
Cargo Ship Safety Radio		BV	07/11/2022	03/10/2027			
Continuous Synopsis Record[2]		Ireland	14/01/2011				
Document of Compliance		BV	06/11/2019	27/11/2024	11/11/2022	BV	Ireland
Document of Compliance Dangerous Goods		BV	07/11/2022	03/10/2027			
Engine International Air Pollution Prevention(ME & 2 DG)		BV	28/08/2012				
International Air Pollution Prevention		BV	07/11/2022	03/10/2027			
International Anti-Fouling System		BV	07/11/2022				
International Energy Efficiency Certificate		BV	27/10/2017				
International Oil Pollution Prevention (IOPP)		BV	07/11/2022	03/10/2027			
International Sewage Pollution Prevention		BV	07/11/2022	03/10/2027			
International Ship Security		BV	05/01/2021	26/01/2026			
Load Line		BV	07/11/2022	03/10/2027			
Maritime Labour Certificate		BV	30/01/2018	29/01/2023	17/06/2020	BV	United Kingdom
Minimum Safe Manning Document		Ireland	27/01/2022				
Nairobi International Convention on the Removal of Wrecks		United Kingdom	12/02/2022	20/02/2023			
Safety Management Certificate		BV	31/01/2018	16/03/2023	17/06/2020	BV	United Kingdom
Tonnage		Ireland	17/04/2014				

INSPECTION ACTIONS

Checked	Ship related inspection action taken (if any)	Additional Comment
☐	Inspection suspended	

*) This inspection report has been issued solely for the purpose of informing the master and other port States that an inspection by the port State, mentioned in the heading, has taken place. This inspection report cannot be construed as a seaworthiness certificate in excess of the certificates the ship is required to carry.

**) Masters, Shipowners and/or Operators are advised that detailed information on the inspection will be reported to the appropriate authorities and organisations and is subject to publication.

***) "Outstanding deficiencies" are listed for information only and will not be taken into account for the calculation of the Ship Risk Profile and Company performance.

Page 4 of 6

Appendix 7.5 Example Survey Report of Slimeroad Sands

GLOUCESTER HARBOUR TRUSTEES

Report on Status of Navigation Aids Date 13/09/2022

Please indicate any navaids observed to be defective, together with a note of the defect.

- Shoots Beacons (Lower Shoots, Mixoms, Old Man's Head, Lady Bench) ✓
- Prince of Wales Bridge (Towers, centre-span lighting, Lady Bench back light) – GMT TOWER SOUTH FRONT LOWER GREEN LIGHT UNLIT (11/09/22)
- Prince of Wales Bridge (Fog Signal) – NOT TESTED
- Charston (Lighthouse) ✓
- Redcliffe (Leading Lights) ✓
- Wye Road Bridge (Centre-span lights) ✓
- Chapel Rock (Lighthouse) ✓
- Severn Bridge (Tower, gantry and centre-span lighting) ✓
- Severn Bridge (Fog Signal) – NOT TESTED
- Lyde (Light Beacon) ✓
- Slimeroad (Leading Lights) ✓
- Sedbury (Light) ✓
- Inward Rocks (Leading Lights) ✓
- Counts (Light Beacon) ✓
- Narlwood (Leading Lights) ✓
- Ledges (Buoy) ✓
- Hills Flats (Light Beacon) ✓
- Sheperdine (Leading Lights) ✓
- Haywards Rock (Light Beacon) ✓
- Fishinghouse (Leading and sector lights) – RED SECTOR MARKS TO BE CHECKED (11/09/22)
- Conigre (Leading Lights) ✓
- Bull Rock (Light Beacon) ✓
- Berkeley Pill (Leading Lights) ✓
- Panthurst (Light) ✓
- Lydney Dock (Light) ✓

Note of observed defects:

AS STATED ABOVE

HARBOUR MASTER ENGINEER 13/09/22

Appendix 7.5 Example Survey Report of Slimeroad Sands

GLOUCESTER HARBOUR TRUSTEES

River, Channel and Port Approach inspection Date..... 09/09/2022 To 13/09/22

Shoots to Chapel Rock:

APPEARS CLEAR - OFFSET OBSERVATION POSITION FROM S. BARROW DUE TO BARROW LEADS

Chapel Rock to Inward Rocks:

APPEARS CLEAR

Inward Rocks to Hills Flats:

APPEARS CLEAR

Hills Flats to Bull Rock:

APPEARS CLEAR

Bull Rock to Sharpness:

APPEARS CLEAR

Port Approaches:

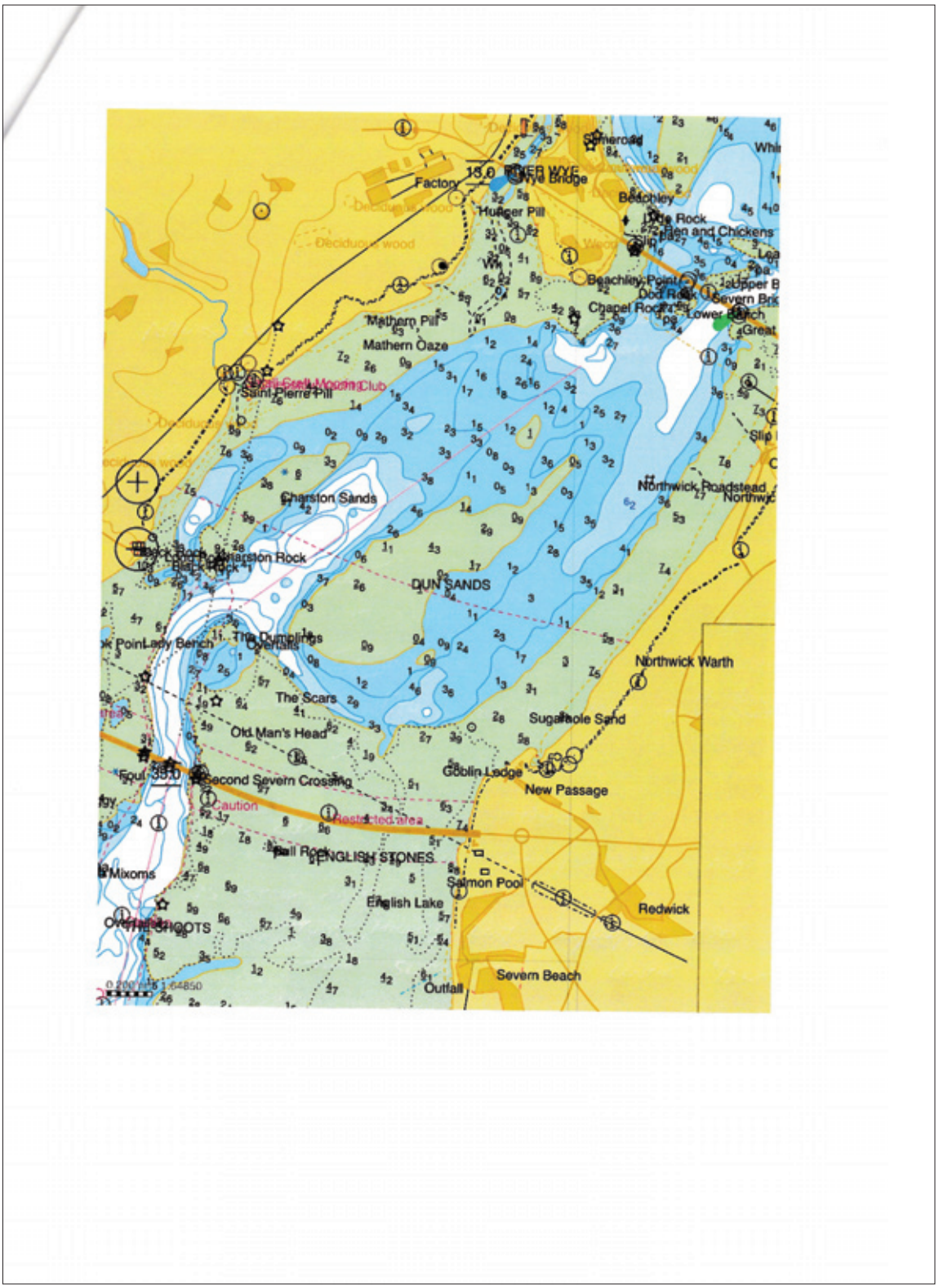
CLEAR – TUMP HIGHEST POINT CHARTED AT 1.5D

TUMP SLOPES TOWARDS CENTRE 1/3 WAY ACROSS

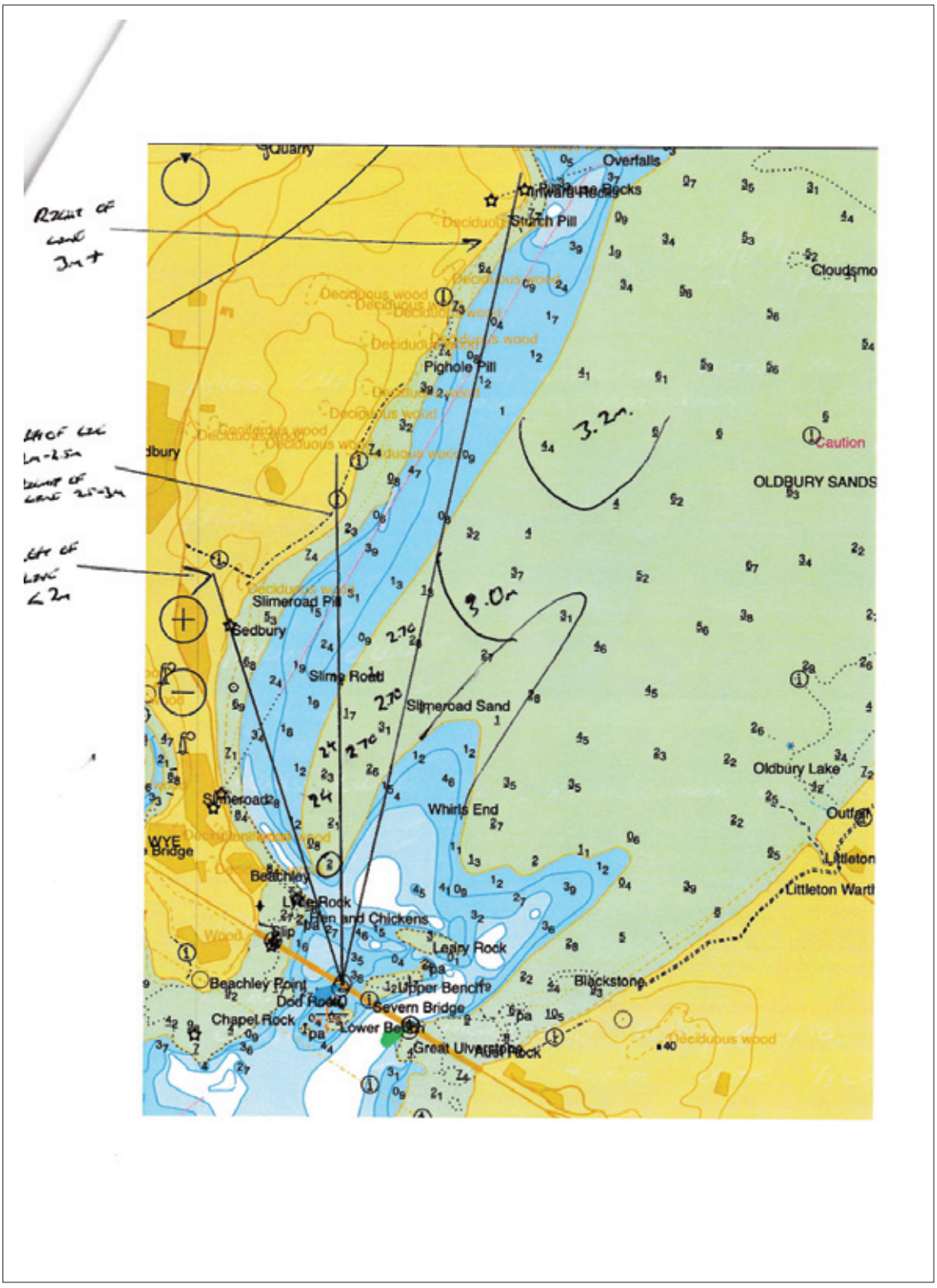
Summary:

Inspection carried out by:..... [redacted] .....

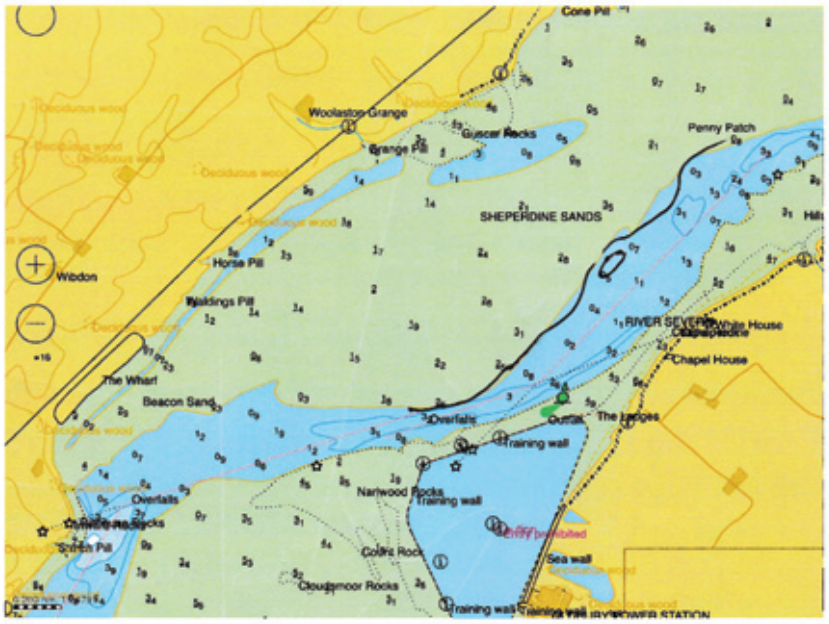
Appendix 7.5 Example Survey Report of Slimeroad Sands

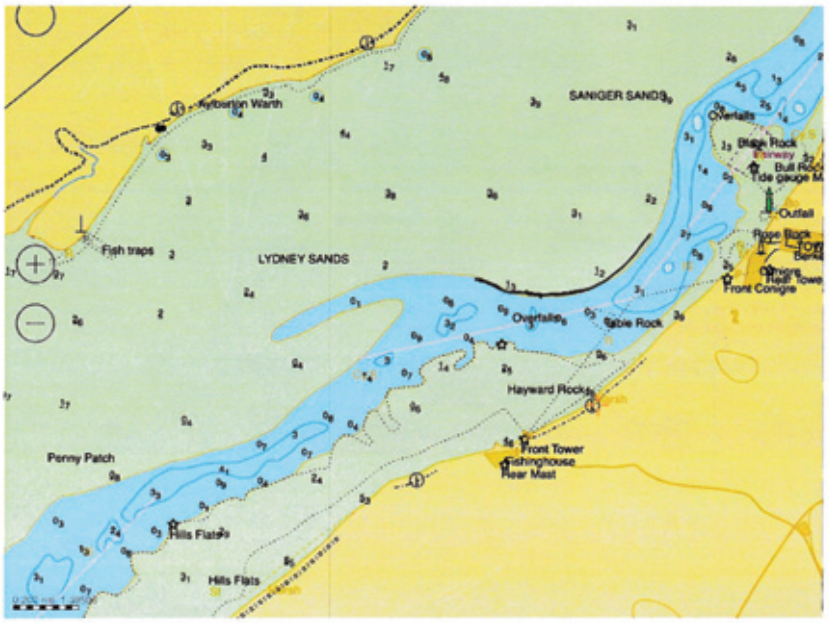


Appendix 7.5 Example Survey Report of Slimeroad Sands

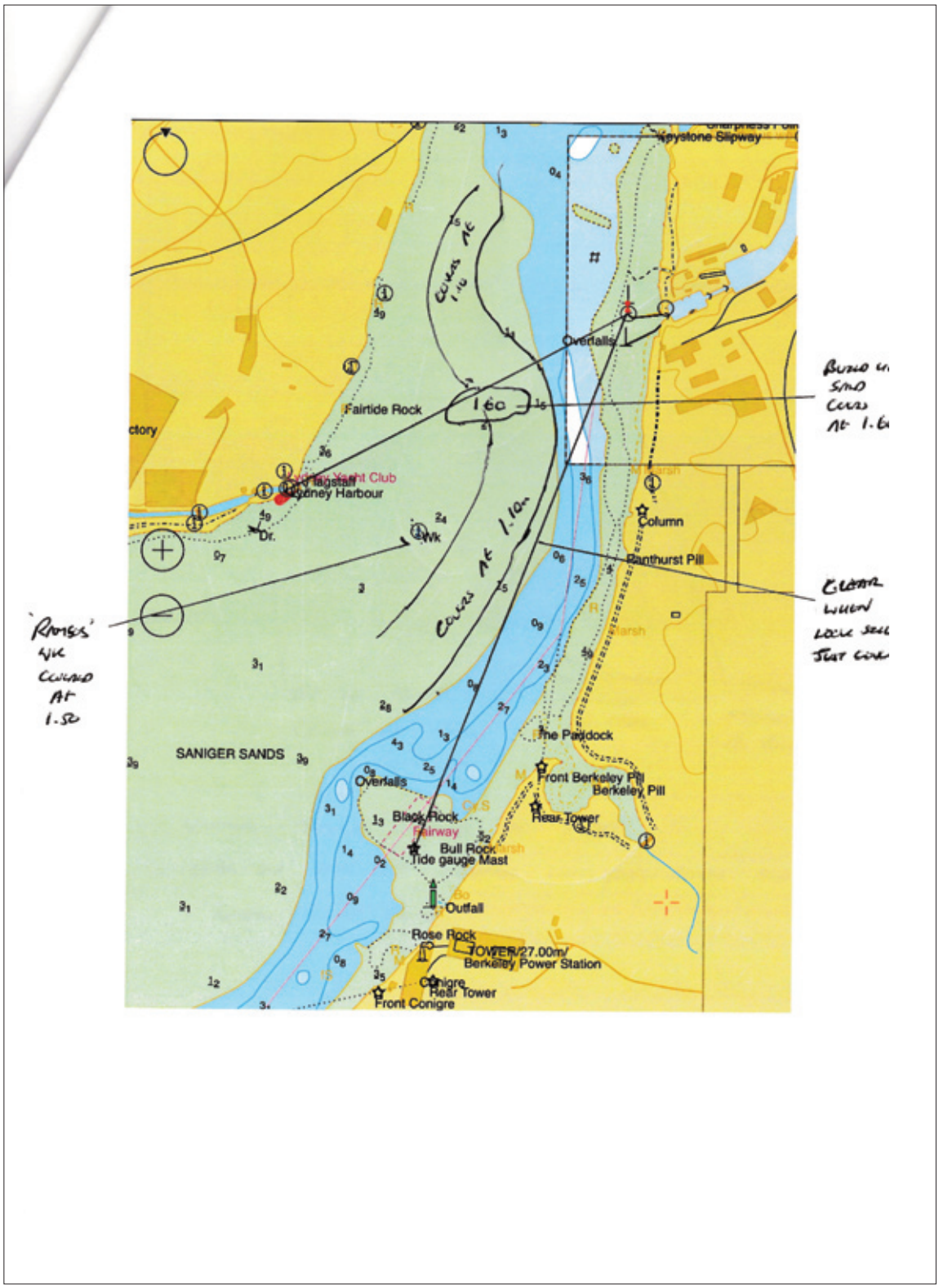


Appendix 7.5 Example Survey Report of Slimeroad Sands

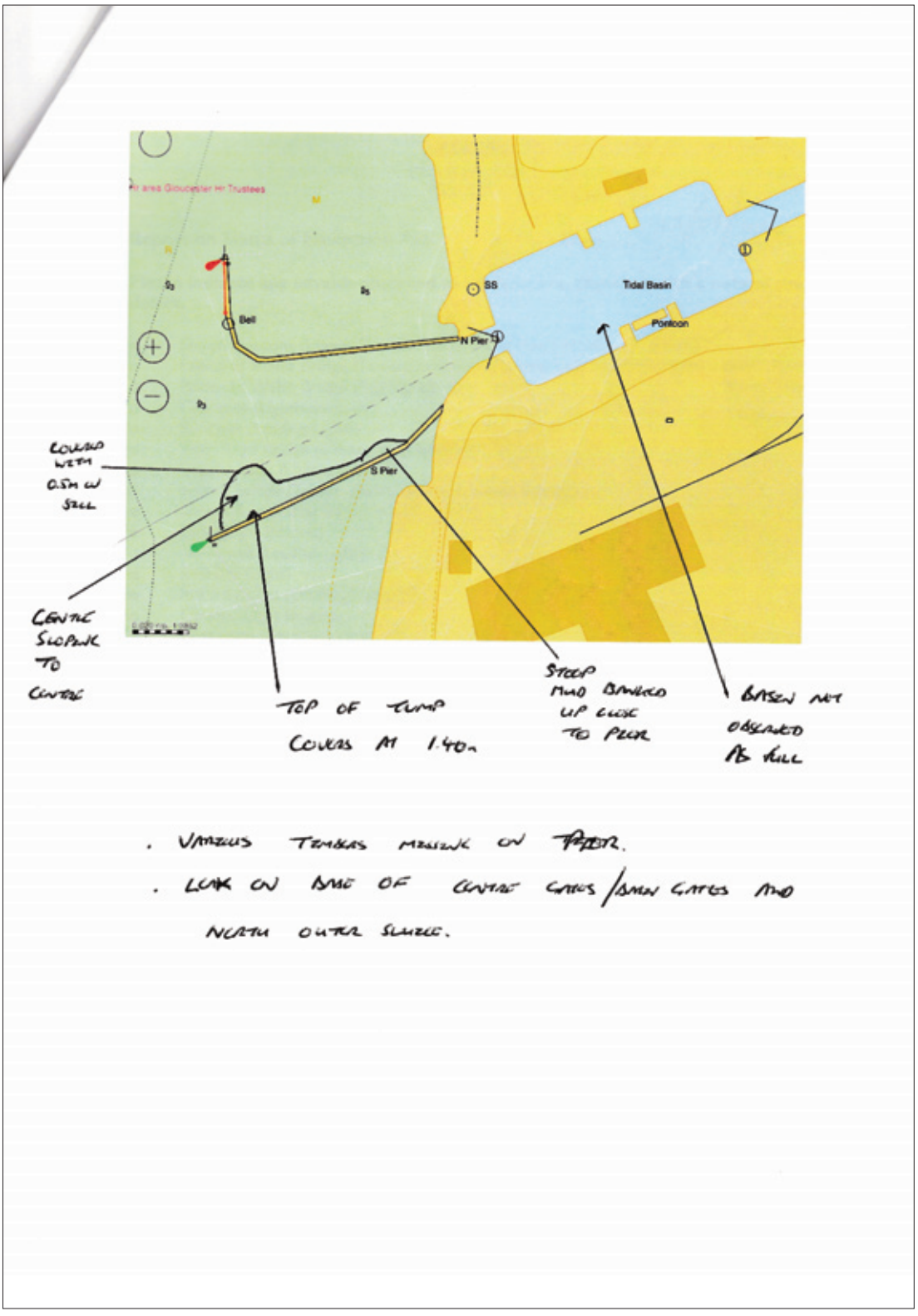




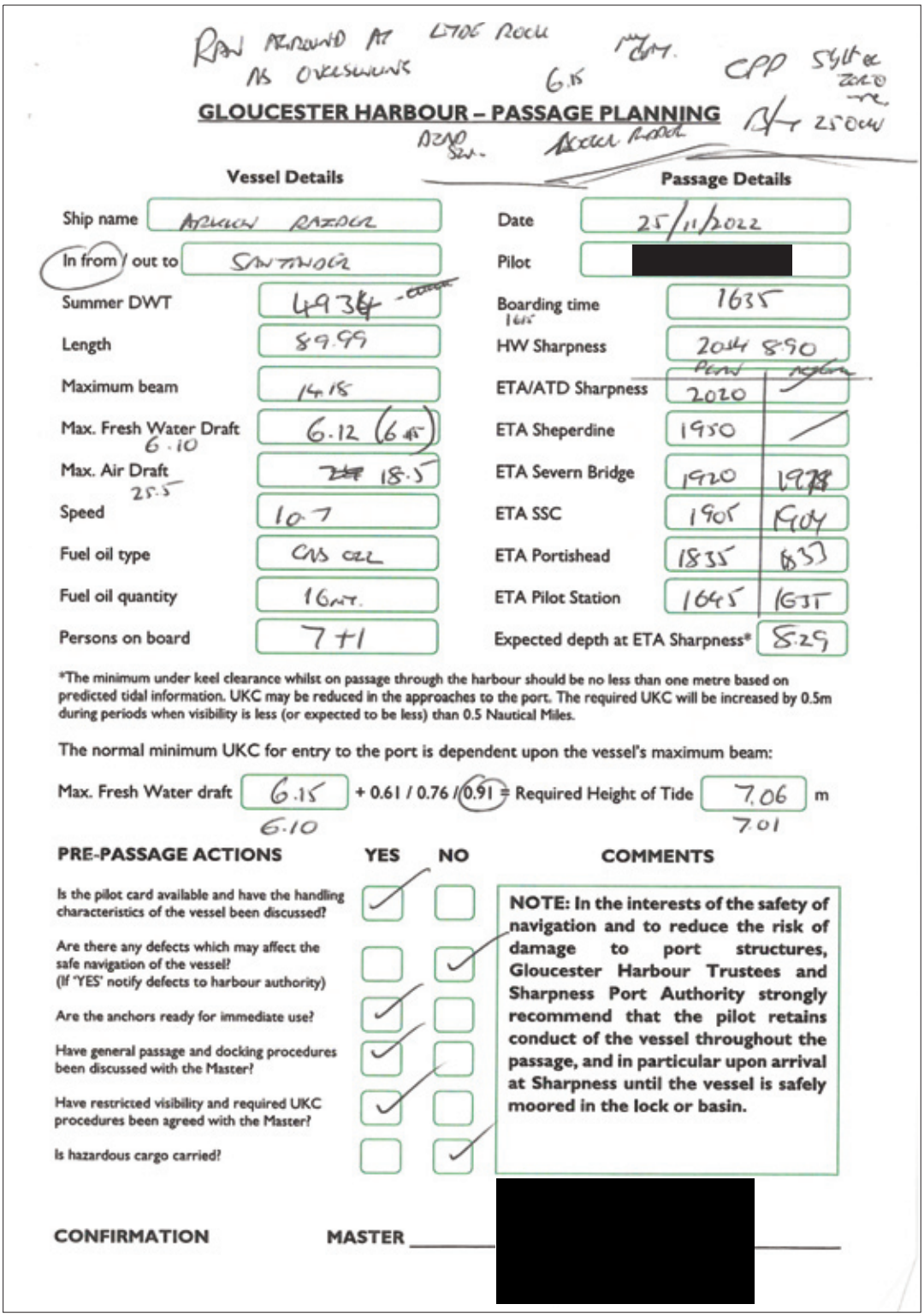
Appendix 7.5 Example Survey Report of Slimeroad Sands



Appendix 7.5 Example Survey Report of Slimeroad Sands



Appendix 7.6 Completed Gloucester Harbour Trustees Passage Plan Form as used on 25 November 2022



RAN AGROUND AT LYDE ROCK
AS OVERSHOOT 6.15 CPP SLIGHT

GLOUCESTER HARBOUR – PASSAGE PLANNING

Vessel Details		Passage Details	
Ship name	ARKLOW RAZOR	Date	25/11/2022
In from / out to	SANTANDER	Pilot	[redacted]
Summer DWT	4938	Boarding time	1635
Length	89.99	HW Sharpness	2014 8.90
Maximum beam	14.18	ETA/ATD Sharpness	2020
Max. Fresh Water Draft	6.12 (6.15) 6.10	ETA Sheperdine	1950
Max. Air Draft	18.5 25.5	ETA Severn Bridge	1920 1928
Speed	10.7	ETA SSC	1905 1904
Fuel oil type	CNS GAS	ETA Portishead	1835 1837
Fuel oil quantity	16MT.	ETA Pilot Station	1645 1637
Persons on board	7+1	Expected depth at ETA Sharpness*	8.29

*The minimum under keel clearance whilst on passage through the harbour should be no less than one metre based on predicted tidal information. UKC may be reduced in the approaches to the port. The required UKC will be increased by 0.5m during periods when visibility is less (or expected to be less) than 0.5 Nautical Miles.

The normal minimum UKC for entry to the port is dependent upon the vessel's maximum beam:

Max. Fresh Water draft 6.15 (6.10) + 0.61 / 0.76 / (0.91) = Required Height of Tide 7.06 (7.01) m

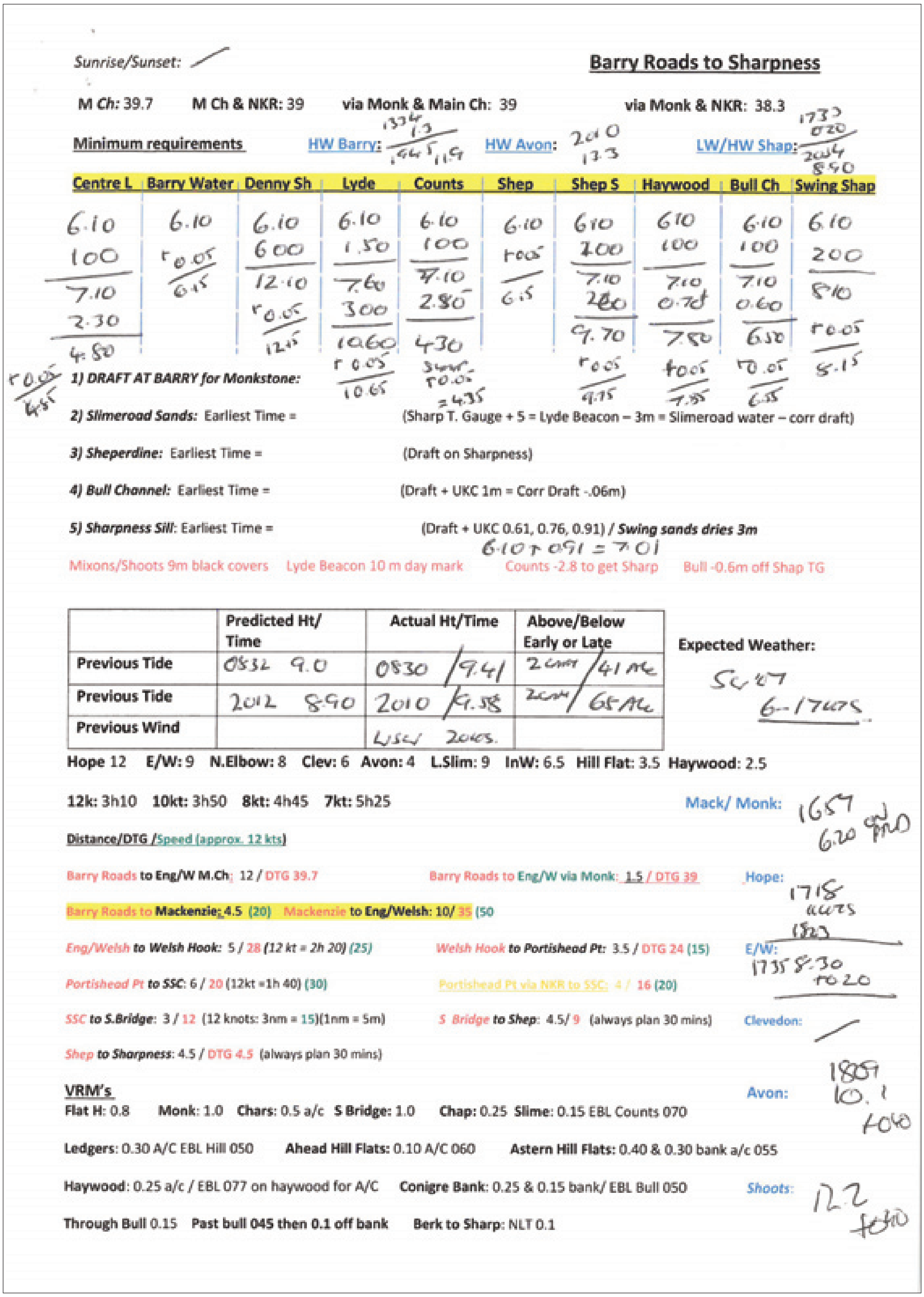
PRE-PASSAGE ACTIONS	YES	NO
Is the pilot card available and have the handling characteristics of the vessel been discussed?	✓	
Are there any defects which may affect the safe navigation of the vessel? (If 'YES' notify defects to harbour authority)		✓
Are the anchors ready for immediate use?	✓	
Have general passage and docking procedures been discussed with the Master?	✓	
Have restricted visibility and required UKC procedures been agreed with the Master?	✓	
Is hazardous cargo carried?		✓

COMMENTS

NOTE: In the interests of the safety of navigation and to reduce the risk of damage to port structures, Gloucester Harbour Trustees and Sharpness Port Authority strongly recommend that the pilot retains conduct of the vessel throughout the passage, and in particular upon arrival at Sharpness until the vessel is safely moored in the lock or basin.

CONFIRMATION MASTER [redacted]

Appendix 7.7 Pilot's Passage Plan Proforma and Calculations for 25 November 2022



Sunrise/Sunset: /

Barry Roads to Sharpness

M Ch: 39.7 **M Ch & NKR:** 39 **via Monk & Main Ch:** 39 **via Monk & NKR:** 38.3

Minimum requirements HW Barry: 1334 / 1.3 / 1445 / 11.9 HW Avon: 2010 / 13.3 LW/HW Shap: 1733 / 020 / 2034 / 850

Centre L	Barry Water	Denny Sh	Lyde	Counts	Shep	Shep S	Haywood	Bull Ch	Swing Shap
6.10	6.10	6.10	6.10	6.10	6.10	6.10	6.10	6.10	6.10
100	+0.05	6.00	1.50	100	+0.05	100	100	100	200
7.10	6.15	12.10	7.60	7.10	6.15	7.10	7.10	7.10	8.10
2.30		+0.05	3.00	2.80		2.60	0.70	0.60	+0.05
4.80		12.15	10.60	4.30		9.70	7.80	6.50	8.15
+0.05			+0.05	Sharp +0.05		+0.05	+0.05	+0.05	
4.85			10.65	= 4.35		9.75	7.85	6.55	

1) DRAFT AT BARRY for Monkstone:

2) Slimeroad Sands: Earliest Time = (Sharp T. Gauge + 5 = Lyde Beacon – 3m = Slimeroad water – corr draft)

3) Sheperdine: Earliest Time = (Draft on Sharpness)

4) Bull Channel: Earliest Time = (Draft + UKC 1m = Corr Draft -.06m)

5) Sharpness Sill: Earliest Time = (Draft + UKC 0.61, 0.76, 0.91) / ***Swing sands dries 3m***

6.10 + 0.91 = 7.01

Mixons/Shoots 9m black covers Lyde Beacon 10 m day mark Counts -2.8 to get Sharp Bull -0.6m off Shap TG

	Predicted Ht/ Time	Actual Ht/Time	Above/Below Early or Late
Previous Tide	0832 9.0	0830 / 9.41	2 early / 41 ...
Previous Tide	2012 8.90	2010 / 9.58	2 early / 68 ...
Previous Wind		WSW 20kts	

Expected Weather: SW 7 / 6 - 17kts

Hope 12 **E/W:** 9 **N.Elbow:** 8 **Clev:** 6 **Avon:** 4 **L.Slim:** 9 **InW:** 6.5 **Hill Flat:** 3.5 **Haywood:** 2.5

12k: 3h10 **10kt:** 3h50 **8kt:** 4h45 **7kt:** 5h25

Mack/ Monk: 1657 / 6.20 ...

Distance/DTG /Speed (approx. 12 kts)

Barry Roads to Eng/W M.Ch: 12 / DTG 39.7 Barry Roads to Eng/W via Monk: 1.5 / DTG 39

Hope: 1718 / ... / 1823

Barry Roads to **Mackenzie: 4.5** (20) Mackenzie to **Eng/Welsh: 10/** 35 (50

Eng/Welsh to Welsh Hook: 5 / 28 ***(12 kt = 2h 20)*** (25) ***Welsh Hook to Portishead Pt:*** 3.5 / DTG 24 (15)

E/W: 1735 8.30 / +0.20

Portishead Pt to SSC: 6 / 20 (12kt =1h 40) (30) Portishead Pt via NKR to SSC: 4 / 16 (20)

SSC to S.Bridge: 3 / 12 (12 knots: 3nm = 15)(1nm = 5m) ***S Bridge to Shep:*** 4.5/ 9 (always plan 30 mins)

Clevedon: /

Shep to Sharpness: 4.5 / DTG 4.5 (always plan 30 mins)

VRM's

Flat H: 0.8 **Monk:** 1.0 **Chars:** 0.5 a/c **S Bridge:** 1.0 **Chap:** 0.25 **Slime:** 0.15 EBL Counts 070

Avon: 1859 / 10.1 / +0.40

Ledgers: 0.30 A/C EBL Hill 050 **Ahead Hill Flats:** 0.10 A/C 060 **Astern Hill Flats:** 0.40 & 0.30 bank a/c 055

Haywood: 0.25 a/c / EBL 077 on haywood for A/C **Conigre Bank:** 0.25 & 0.15 bank/ EBL Bull 050

Shoots: 12.2 / +0.30

Through Bull 0.15 **Past bull 045 then 0.1 off bank** **Berk to Sharp:** NLT 0.1

Appendix 7.7 Pilot's Passage Plan Proforma and Calculations for 25 November 2022

1645 - 1835 = 1450 = 110 ÷ 21 = 11.5 kts.

140 ÷ 21 = 9 kts

Tidal predictions, earliest times and draft plan times INBOUND

HW SHARPNESS: 2034 8.90

Waypoint	Earliest Water At Given Point	Earliest Plan Time	Draft Planned Time	Draft Plan Tide Ht	NOTES
POB:	Monk 1645		1615 / 1645	4.80 / 6.20	RoD 6.10 CHART DATUM
P. PT (21)	Denny 1910	1815	1835	10.85	RD 12.10 → 12.15
SSC (6) (30 m)		1845	1905	12.00	
S. Brid (3) (15)	Slim Sands 1855	1900	1920	11.76	RD 10.60
Sheperdine (4.5) (30)	1930	1930	1950	7.39	RD 6.10
Bull Channel	1940	1945	2005	7.93	RD 6.50
Arr Sharpness (0)	Sill 1945 / Swing 2015	2000	2020	8.29	RD 7.01 / RD 8.10

6.15 LEAVE LINE TO RoD UP.

10.65 — 6.15 — 6.55 — 7.06 — 8.15

Earliest Time Speed Required to P.Pt:

Earliest Speed Required for complete passage approx.:

Planned Time speed required:

Planned complete voyage speed required:

TIDAL PREDICTIONS

DIFF	2hrs	1.5 hrs	1 hr	0.5 hr	HW	Diff
			1.90	0.70	8.90	
	3.50	5.50	7.70	8.40	8.80	
ACTUAL						ACTUAL

At the shoots, obtaining King Road T.Gauge. Then -1.1m will give approx. water S.Bridge. You should have this water approx. time you reach S.Bridge

Calculations Section

2hrs to 1.5 hrs 10/5 mins diff:

1.5 hrs to 1 hrs 10/5 mins diff:

1 hr to 30 mins 10/5 mins diff

30 mins to HW 10/5 mins diff:

2020 = 35 A4 = 8.29

50 A4 = 7.93

1950 = 1405 = 7.39

Stop RoD : 6.10

1.90 ÷ 3 = 0.63 /hr = 031 /6m

= 14.25 = 1930

14.15 A4 = 1940

1410 A4 = 1945 SILL

SILL : 40B4 = 2015

Appendix 7.8 Waypoint List and Passage Plan – Arklow Raider

CHAR TRAC

Santander Berth - Santander P/S — Passage Plan

CHAR TRAC

FINAL WAYPOINTS TO BE SET NO CLOSER THAN 1NM FROM ANY INSTALLATION AND NEVER HEAD DIRECTLY TOWARD AN INSTALLATION

Voyage Number		Departure Location	Santander Berth
Departure Date / Time	22/11/2022 17:20	Weather Conditions trends for the transit	
Air Draft		Departure Draft (Fore / Aft / Mean / G'M)	6.1 m
Arrival Destination	Santander P/S	Estimated Arrival Date / Time	
Security Conditions for the transit		POB	17:55

WPT	Latitude	Longitude	Waypoint Remarks	Course	Next WPT (NM)	To End (NM)	Charts	Publications	Closest Security hub / Contacts	Additional Info (VHFchannel, Port information etc)
1	43° 26' 32" N	3° 48' 56" W	Santander Berth	25	0.5	4.3	ES201080, ES30040A, ES400401, ES504011	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 14 Santander Practicos/VHF 11 Santander Port control
2	43° 26' 58" N	3° 48' 39" W		13	0.2	3.8	ES201080, ES30040A, ES400401, ES504011	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 14 Santander Practicos/VHF 11 Santander Port control
3	43° 27' 10" N	3° 48' 35" W		55	0.4	3.6	ES201080, ES30040A, ES400401, ES504011	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 14 Santander Practicos/VHF 11 Santander Port control
4	43° 27' 24" N	3° 48' 6" W		80	1.5	3.2	ES201080, ES30040A, ES400401, ES504011	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 14 Santander Practicos/VHF 11 Santander Port control
5	43° 27' 40" N	3° 46' 6" W		56	1.0	1.7	ES201080, ES30040A, ES400401, ES504011	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 14 Santander Practicos/VHF 11 Santander Port control

Printed by: Master

Page 1 of 6

Appendix 7.8 Waypoint List and Passage Plan – Arklow Raider

WPT	Latitude	Longitude	Waypoint Remarks	Course	Next WPT (NM)	To End (NM)	Charts	Publications	Closest Security hub / Contacts	Additional Info (VHFchannel, Port Information etc)
6	43° 28' 15" N	3° 44' 56" W		359	0.7	0.7	ES201080, ES30040A, ES400401, ES504011	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 14 Santander PracticosVHF 11 Santander Port control
7	43° 28' 57" N	3° 44' 57" W	Santander P/S		0.0	0.0	ES201080, ES30040A, ES400401, ES504011	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 14 Santander PracticosVHF 11 Santander Port control

Printed by: Master

Page 2 of 6

Appendix 7.8 Waypoint List and Passage Plan – Arklow Raider

CHAR TRAC

Santander P/S - Breaksea

Passage Plan

FINAL WAYPOINTS TO BE SET NO CLOSER THAN 1NM FROM ANY INSTALLATION AND NEVER HEAD DIRECTLY TOWARD AN INSTALLATION

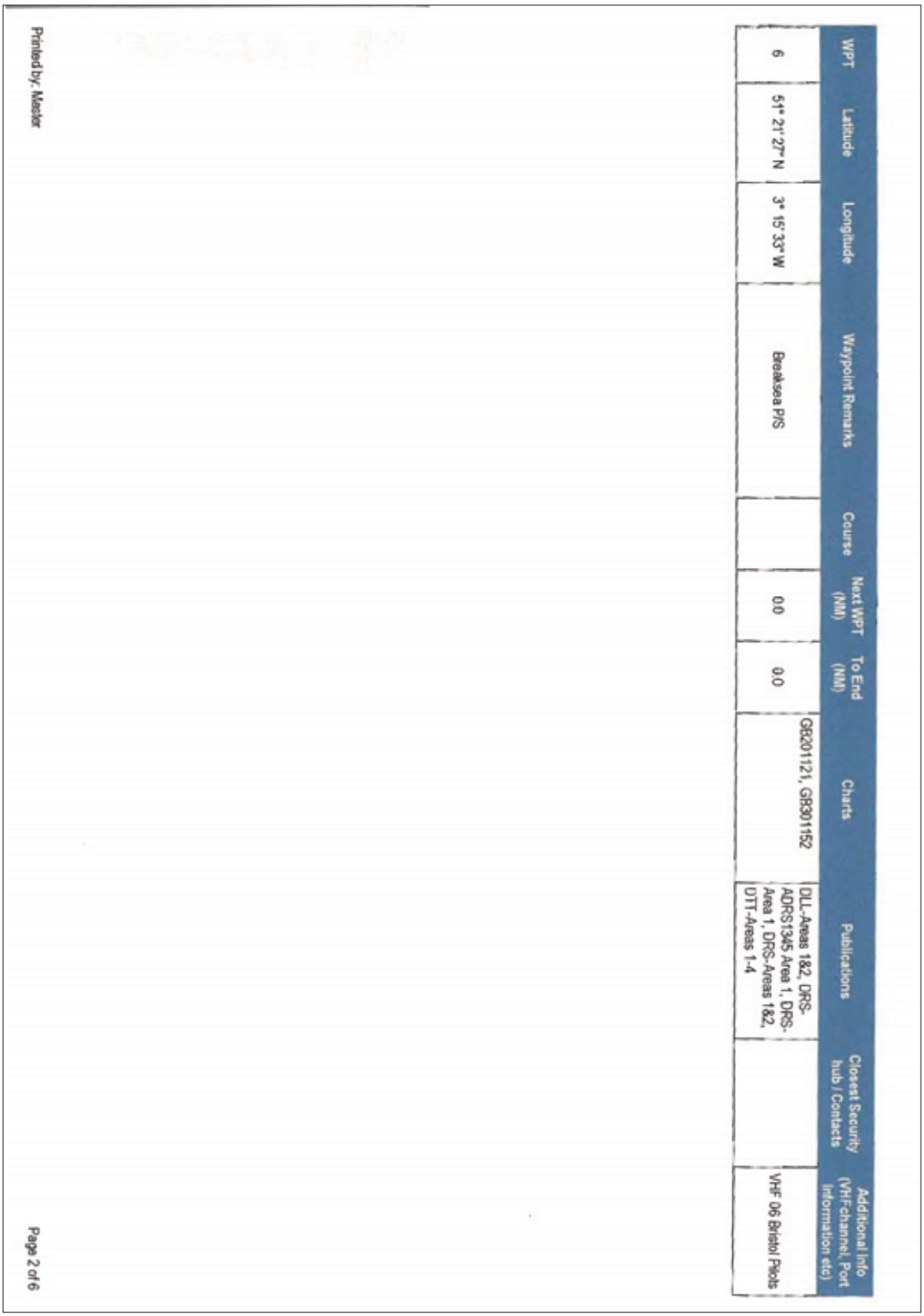
Voyage Number		Departure Location	Santander P/S
Departure Date / Time	22/11/2022 18:25	Weather Conditions trends for the transit	
Air Draft		Departure Draft (Fore / Aft / Mean / G'M)	6.1m
Arrival Destination	Sharpness Breaksea P/S	Estimated Arrival Date / Time	
Security Conditions for the transit		POB	

WPT	Latitude	Longitude	Waypoint Remarks	Course	Next WPT (NM)	To End (NM)	Charts	Publications	Closest Security hub / Contacts	Additional Info (VHFchannel, Port Information etc)
1	43° 28' 59" N	3° 44' 59" W	Santander P/S	342	314.6	552.9	ES201060, ES30040A, ES400401, ES504011, FR272110, FR273110, FR370660	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 11 Santander Port Control/VHF 14 Santader Practicos
2	48° 27' 37" N	6° 6' 57" W	Ushant	5	90.7	238.3	FR273110, FR370660, GB202649, GB301148, GB302565	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		
3	49° 57' 50" N	5° 54' 1" W	Land's end IN	3	22.2	147.6	GB202649, GB301148	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 16 Falmouth C/G
4	50° 19' 59" N	5° 52' 10" W	Land's end OUT	39	69.7	125.4	GB201121, GB202649, GB301148, GB301149, GB301178	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 16 Falmouth C/G
5	51° 14' 19" N	4° 43' 34" W	Lundy	83	55.7	55.7	GB201121, GB301152	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		

Printed by: Master

Page 1 of 6

Appendix 7.8 Waypoint List and Passage Plan – Arklow Raider



WPT	Latitude	Longitude	Waypoint Remarks	Course	Next WPT (NM)	To End (NM)	Charts	Publications	Closest Security hub / Contacts	Additional Info (VHF channel, Port information etc)
6	51° 21' 27" N	3° 15' 33" W	Breaksea PIS		0.0	0.0	GB201121, GB301152	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, OTT-Areas 1-4		VHF 06 Bristol Pilots

Printed by: Master

Page 2 of 6

Appendix 7.8 Waypoint List and Passage Plan – Arklow Raider

CHAR TRAC

Breaksea P/S - Sharpness Berth

Passage Plan

FINAL WAYPOINTS TO BE SET NO CLOSER THAN 1NM FROM ANY INSTALLATION AND NEVER HEAD DIRECTLY TOWARD AN INSTALLATION

Voyage Number		Departure Location	Breaksea P/S
Departure Date / Time		Weather Conditions trends for the transit	
Air Draft		Departure Draft (Fore / Aft / Mean / G'M)	6.1 m
Arrival Destination	Sharpness Dock	Estimated Arrival Date / Time	
Security Conditions for the transit		POB	

WPT	Latitude	Longitude	Waypoint Remarks	Course	Next WPT (NM)	To End (NM)	Charts	Publications	Closest Security hub / Contacts	Additional Info (VHFchannel, Port Information etc)
1	51° 21' 29" N	3° 15' 24" W	Breaksea P/S"C"	90	4.5	40.7	GB201121, GB301152	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 06 Bristol Pilots
2	51° 21' 28" N	3° 8' 11" W	Mackenzie buoy	63	2.0	36.2	GB201121, GB301152	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS
3	51° 22' 22" N	3° 5' 23" W	Weston buoy	38	5.4	34.2	GB201121, GB301152, GB40864B, GB6H1176	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS
4	51° 26' 38" N	3° 0' 7" W	NW Elbow	61	1.2	28.8	GB201121, GB40864B, GB6H1176	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS
5	51° 27' 15" N	2° 58' 24" W	N Elbow	82	2.4	27.6	GB201121, GB40864B	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS

Printed by: Master

Page 1 of 7

Appendix 7.8 Waypoint List and Passage Plan – Arklow Raider

WPT	Latitude	Longitude	Waypoint Remarks	Course	Next WPT (NM)	To End (NM)	Charts	Publications	Closest Security hub / Contacts	Additional Info (VHFchannel, Port Information etc)
6	51° 27' 34" N	2° 54' 36" W	Clevedor	70	1.9	25.2	GB201121, GB40864B	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS
7	51° 28' 13" N	2° 51' 42" W	Avon buoy	56	2.1	23.2	GB201121, GB40864B	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS
8	51° 29' 25" N	2° 48' 53" W	Bristol Deep	73	3.5	21.1	GB201121, GB40864B, GB501859	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS
9	51° 30' 25" N	2° 43' 29" W		13	4.1	17.6	GB201121, GB40863A, GB501859	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS
10	51° 34' 22" N	2° 42' 2" W	Old Mans Head	2	0.7	13.5	GB201121, GB40863A	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS
11	51° 35' 2" N	2° 41' 0" W	Lady Bench	54	2.8	12.9	GB201121, GB40863A	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS
12	51° 36' 40" N	2° 38' 20" W	Severn Bridge	331	0.8	10.1	GB201121, GB40863A	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS
13	51° 37' 22" N	2° 38' 57" W	Slime road	30	2.3	9.3	GB201121, GB40863A	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS
14	51° 39' 23" N	2° 37' 4" W	Inward Rocks	75	1.8	6.9	GB201121, GB40863A	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS

Printed by: Master

Page 2 of 7

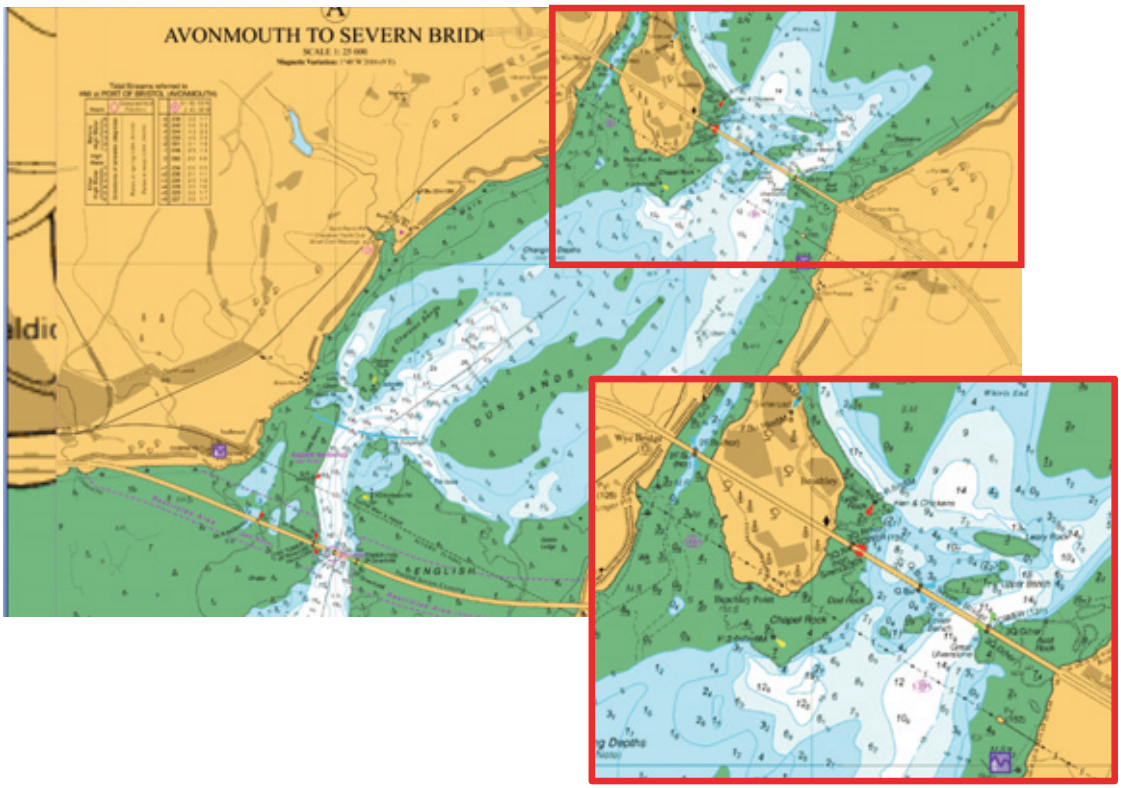
Appendix 7.8 Waypoint List and Passage Plan – Arklow Raider

WPT	Latitude	Longitude	Waypoint Remarks	Course	Next WPT (NM)	To End (NM)	Charts	Publications	Closest Security hub / Contacts	Additional Info (VHFchannel, Port information etc)
15	51° 39' 50" N	2° 34' 18" W	Ledges	45	1.4	5.1	GB201121, GB40863A	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS
16	51° 40' 47" N	2° 32' 45" W	Hills Flats	59	0.9	3.8	GB201121, GB40863A	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS
17	51° 41' 15" N	2° 31' 30" W		77	0.7	2.9	GB40863A	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS
18	51° 41' 24" N	2° 30' 28" W		38	1.1	2.2	GB40863A	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS
19	51° 42' 17" N	2° 29' 21" W		5	0.7	1.1	GB40863A, GB50863A	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS
20	51° 42' 57" N	2° 29' 16" W	Approach to Lock	65	0.4	0.4	GB50863A	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 12 Bristol VTS
21	51° 43' 8" N	2° 28' 39" W	Sharpness Berth		0.0	0.0	GB50863A	DLL-Areas 1&2, DRS-ADRS1345 Area 1, DRS-Area 1, DRS-Areas 1&2, DTT-Areas 1-4		VHF 13 Sharpness dock Radio

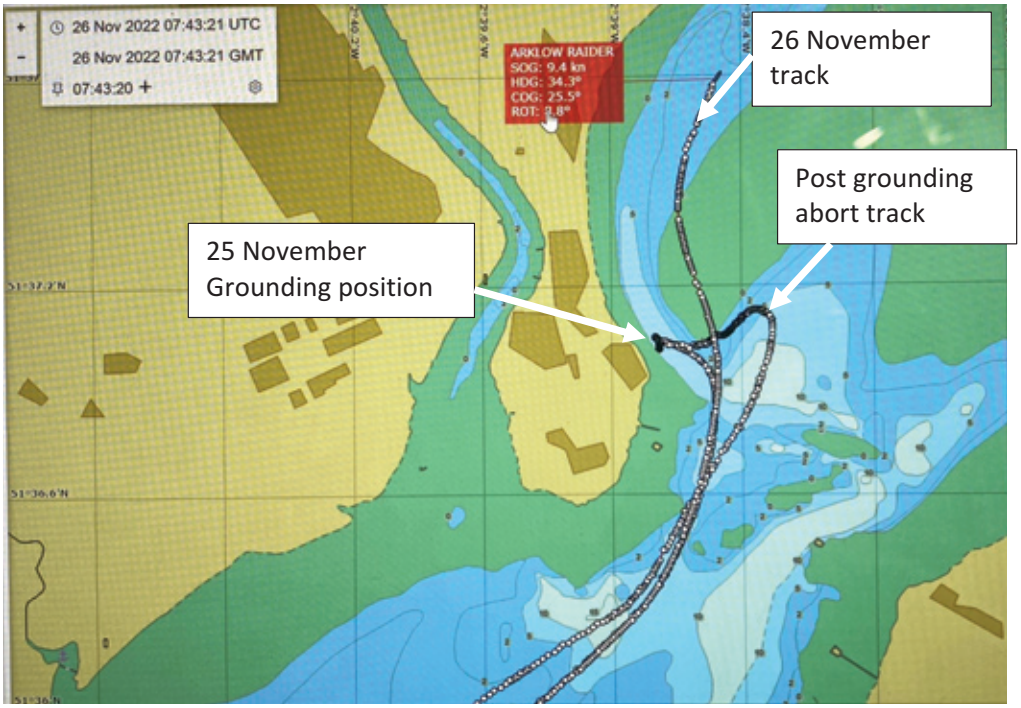
Printed by: Master

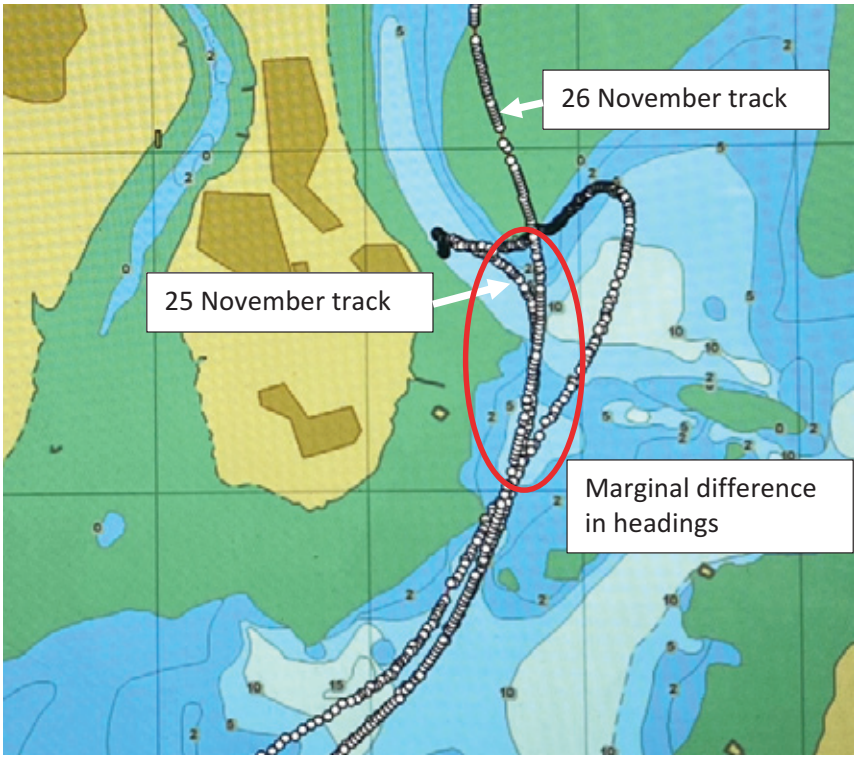
Page 3 of 7

Appendix 7.9 Extract from Admiralty Chart 1166: River Severn Avonmouth to Sharpness and Hook Cliff

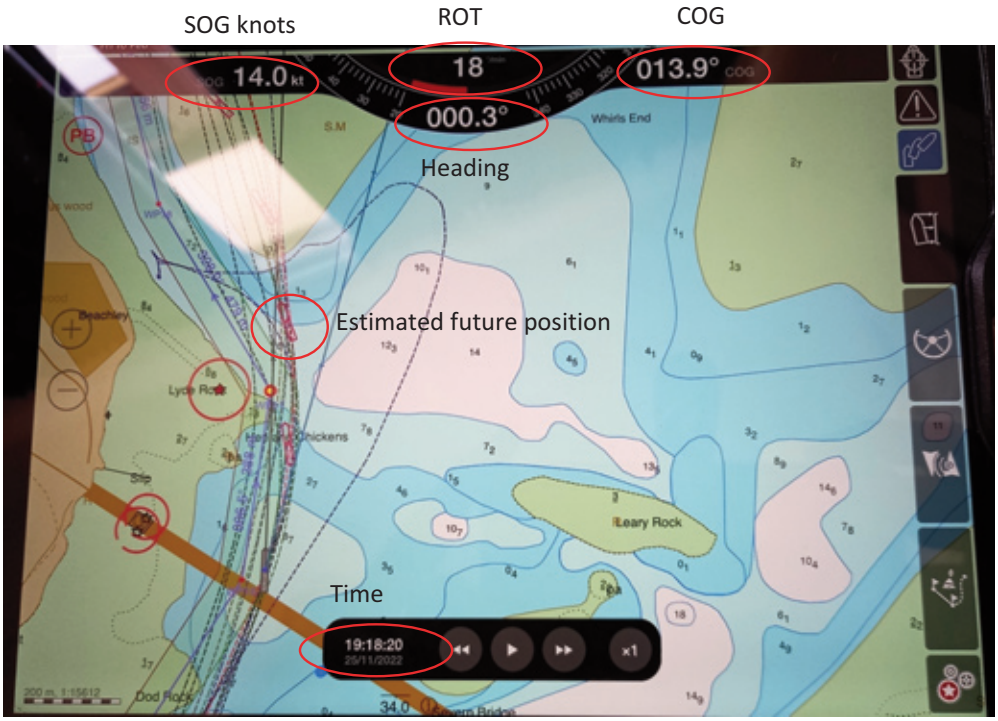


Appendix 7.10 Annotated Automatic Identification System Tracks for Arklow Raider on 25 and 26 November 2022





Appendix 7.11 Pilot's Portable Pilot Unit Display of Previous Vessel Tracks under the Severn Bridge and Display on 25 November 2022



PPU – 19:18:20

PPU – 19:19:20

Appendix 7.11 Pilot's Portable Pilot Unit Display of Previous Vessel Tracks under the Severn Bridge and Display on 25 November 2022

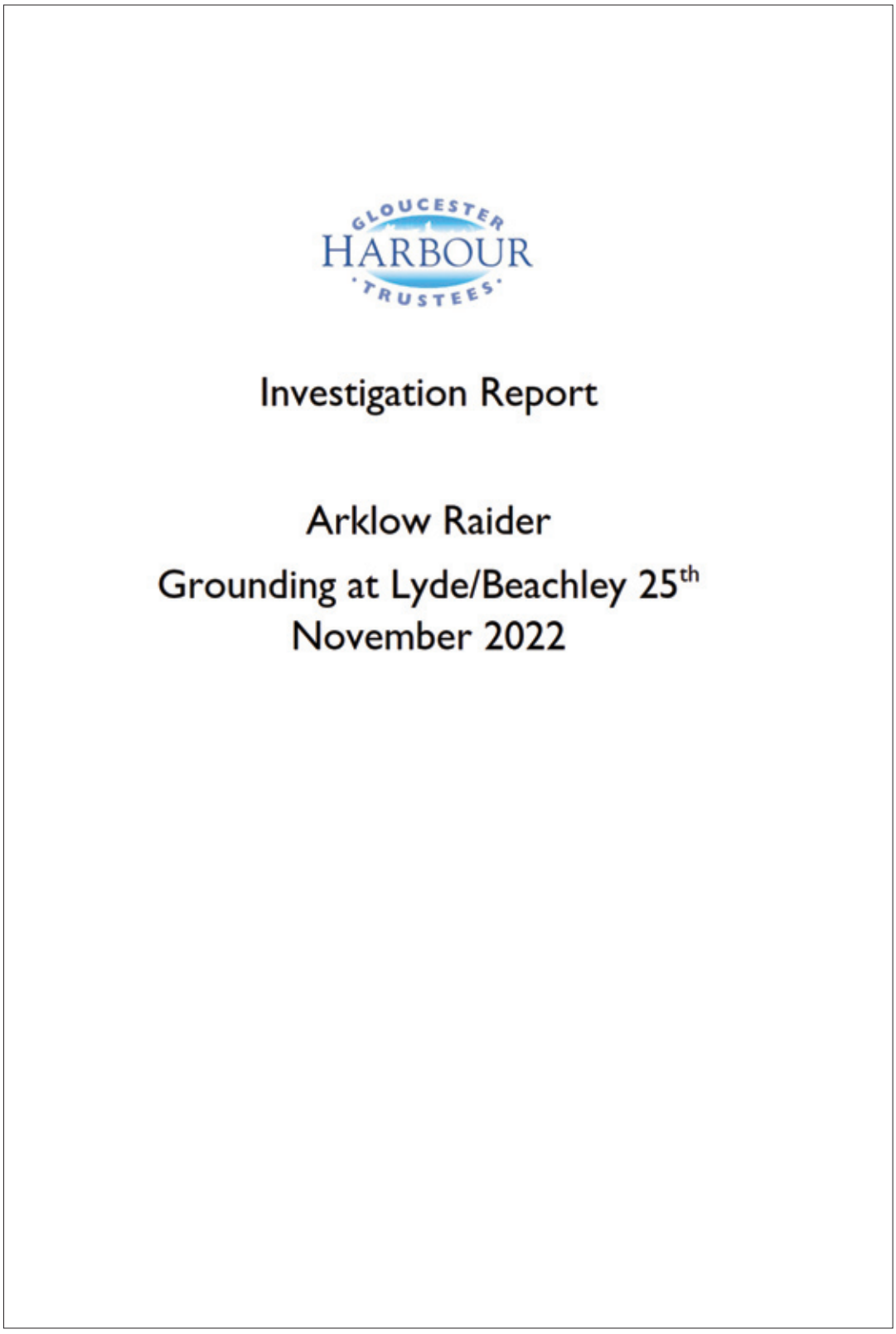
PPU – 19:20:20

PPU – 19:21:20

Appendix 7.12 Photographs of the Vessel Damage

Forepeak bottom damage to Arklow Raider

Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report



Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report

Contents

Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report

Introduction

During inward passage under pilotage through the Gloucester Harbour area to Sharpness on 25th November 2022, the vessel Arklow Raider suffered an uncontrolled turn to port whilst rounding the Lyde beacon and grounded by the bow on the bank of the estuary just North of the Lyde beacon at Beachley.

There were no injuries or pollution, and the vessel self-recovered on a rising tide. There was subsequently discovered to be steelwork damage to the forepeak area of the vessel.

As Statutory and Competent Harbour Authority, Gloucester Harbour Trustees have investigated and reviewed the incident with a view to determining cause and thereby deriving any learnings in order to inform mitigation measures for future Further details of the incident follow, along with analysis, conclusions and subsequent actions.

Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report

Incident Details

Vessel Arklow Raider was due at Sharpness with a cargo of bulk cement from Santander in Spain. In order to make Sharpness the vessel was subject to compulsory pilotage for the estuary passage through the Gloucester Harbour area. Pre-arrival information had been submitted via the agent, and vessel details added by the agent to the web-based vessel database "Leading Lights", amended as required by the duty Pilot.

Based on vessel ETA, Pilot boarding was set as 1645hrs 25th November in order to enter Sharpness on the pm high tide, which was predicted at 2045hrs.

- HW Sharpness 2054hrs (8.9m – adjusted 0.5m for Sharpness sill).
- HW Beachley 2020hrs (13.1m).
- Weather: Fair (Wind SSE F3)
- Visibility: Good (hours of darkness)

Vessel details:

- Loa: 89.99m
- Bm: 14.18m
- Max draft 6.10m
- GT 2999 / DWT 4936
- Single screw, bowthrust, Becker rudder.

Timeline:

1635hrs Pilot boarded Barry Roads. Master/Pilot exchange was performed, and the passage plan was outlined to the Master by the Pilot, including the various critical points, of which the turn around Lyde is one.

No particular issues outlined, though Master did advise that vessel had been having difficulty maintaining a course at reduced speed with tide astern whilst approaching the Pilot station. This was not considered out of the ordinary by either Master or Pilot given the tidal conditions. Also, Master advised that zero pitch on the propellor was now actually slightly negative astern after adjustment during a recent drydocking.

1904hrs Passed under PoW Bridge (vessel changed to hand steering prior to entering Shoots Channel). Pilot on the helm.

1910hrs (approx.) the Pilot discussed the turn around Lyde rock, the intended courses and expected counter current once the bow started to pass the Lyde and re-iterated the information from the Master/Pilot exchange that the intention was to pass over the tail of Slimeroad Sands. The Master had been requested, as is usual given the nature of the turn, to have both steering pumps in use for the turn.

1918hrs Passed under Severn Crossing

Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report

1919hrs Bow passing Lyde Rock. Speed 13.7kts. Vessel was reported by the Pilot as slowly turning to port as planned with starboard helm applied for the expected counter current. As is usual and expected, the vessel started to turn port once the counter current began acting on her and starboard helm was increased. Propellor pitch was 85% ahead at this stage. The vessel did not answer to the starboard helm. Further helm was applied hard to starboard and propellor pitch increased to 100% to counter the port swing. The vessel then experienced a further very strong sheer to port despite, the continued corrective starboard helm, and the bow was now headed towards the Western riverbank to port.

1920hrs Due to the vessel's position, the attempted turn was aborted, starboard helm taken off and full astern pitch selected to take the way off the vessel as it approached the bank. Vessel crew, who were forward preparing for arrival at Sharpness, were instructed to prepare to drop an anchor, but there was insufficient time for that to happen and to have any useful effect.

1921hrs The vessel made contact with the bank at a speed of 5.6kts, still going astern on the engine, and was then apparently fast by the bow. See Fig 1&2 below. Various relevant parties/ authorities were contacted by the Pilot and Master. Tidal window assessed for vessel removal. There was approximately 1.3m of further rise in tide predicted before high water.

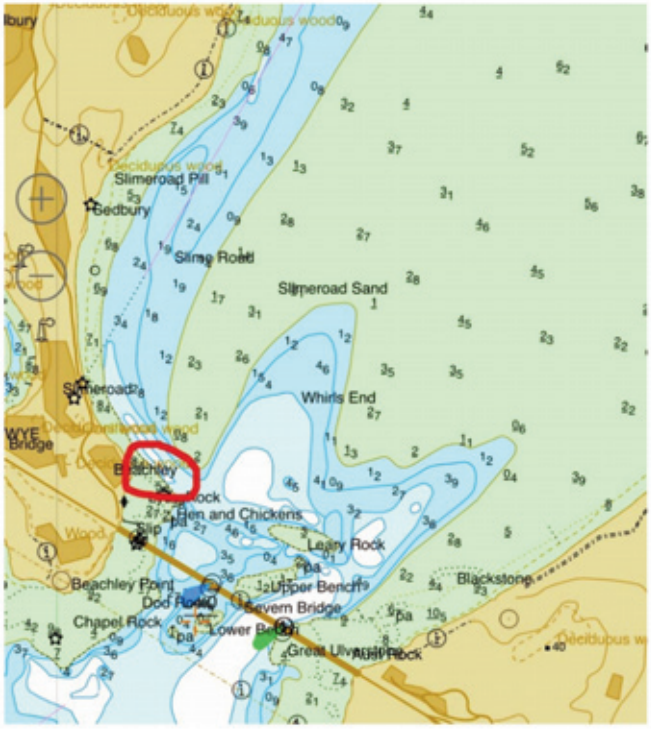


Fig.1: Chartlet indicating area of grounding

Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report

Fig.2: Satellite image of grounding site with AIS overlay of vessel

1930hrs Tanks and spaces sounded for water ingress and potential pollution assessed. No pollution evident and reportedly no ingress at that time. No injuries. Pilot and Master agreed to continue to attempt to free vessel under own power given the rising tide. There was approximately 1.3m predicted rise of tide remaining after grounding time according to the admiralty tide tables.

The vessel was manoeuvred with main engine astern and ahead into position more perpendicular to the bank to take advantage of tide, and the engine was run astern.

Harbour Master contacted HM Coastguard operations by phone and advised them of the situation. Also started process of contacting local towage operators to seek tug availability.

2000hrs Vessel floated from the bank and manoeuvred into deeper water of the main channel. Harbour Master advised HM Coastguard of the updated situation.

2008hrs After discussion with Harbour Master the decision was taken to abort the inward passage to Sharpness completely due to lack of available time on tide and in order to perform further damage assessment. Vessel proceeded outward towards a suitable anchorage or waiting area, whilst a more detailed assessment of damage took place as far as was possible by the vessel crew.

2023hrs Outward at PoW Bridge, planning to proceed to English/Welsh Grounds anchorage to wait and resume inward passage on next tide. During this time a report was received from Master, via the Pilot, that vessel appeared fit for passage to Sharpness on next tide, with no confirmed water ingress or definite damage identified at that time. HM Coastguard were in touch with the vessel via VHF radio to update on the situation.

Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report

The vessel subsequently made passage and berthed at Sharpness on the am tide of 26th November (0913hrs HW) with no further issues.

During and after discharge of the cargo at Sharpness the vessel reported that inspections had revealed steelwork damage to the forepeak area of the vessel, including some water ingress. Vessel was fit to sail for repairs and sailed from Sharpness on 28th November to Swansea for drydocking and repair.

Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report

Investigation - factors considered:

Weather and environmental conditions

The weather was fair with light winds and good visibility, and therefore not considered to be a factor.

It was dark, but all navaids, both externally and on board, were in good working order and the Pilot appears to have had good perception of position. The Portable Pilotage Unit (PPU) was in use, and the vessel had good working radar and electronic charts. Pilot also reported that the foremast floodlights were used whilst making the turn to give a better visual appreciation of vessel's head.

Tidal conditions

It was a reasonably large spring tide, but not exceptional for the area, and in no way outwith the conditions experienced previously by the pilot or by other vessels and pilots in the past.

Currents of up to 6kts on spring tides are experienced inwards past the Lyde.

The pilot was aware of the potential counter current and was applying starboard helm in readiness, as per previous passages (see Pilot Training below).

Vessel

The Arklow Raider's Master had reported during the Master-Pilot Exchange (MPX) that he had experienced difficulty maintain a course whilst at low speed with tide astern on approaching the Pilot Station. However, this was not considered unusual – more a handling issue that can affect many vessels. There were no reported actual defects with the vessel steering or otherwise and there were no unusual issues during the first part of the passage, where both autopilot and hand steering were used at times. Both steering pumps were apparently working and in use for the turn around Lyde.

Arklow "R" class vessels have visited Sharpness at least 36 times since 2011, both laden and in ballast. This was the Arklow Raider's 5th visit, all laden with cargo and similar draft except one, which was in ballast (see table Fig.3 below). No previous issues have been reported with this class of vessel.

Date	Vessel Draft (mtrs)	Laden/Ballast	Predicted tide height Sharpness (mtrs)
17/08/13	3.50	Ballast	6.10
06/01/18	6.10	Laden	9.10
15/12/20	6.20	Laden	9.70
29/04/22	6.27	Laden	8.50
25/11/22	6.10	Laden	8.90

Fig. 3: Arklow Raider list of inward passages to Sharpness

Subsequent to the grounding, Arklow Raider made the inwards passage on the following tide, which was same predicted height, without any issues, though the Pilot made the

Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report

conscious decision to cut over more of the tail of Slimeroad sands, given the issue on the previous tide.

Rudder effectiveness at speed and "rudder stall" is an issue that can affect vessels at maximum rudder angles, but without detailed information on speed, current and exact rudder angle at the various aspects of the turn it cannot be determined if lack of rudder effectiveness was a factor.

Similar sized and type vessels have also regularly made the passage on all states of tide many times, often with a significant angle of starboard rudder applied, so it is considered unlikely that the vessel's manoeuvring characteristics, though obviously a factor, were a particular causal issue.

Position/Course/Speed

Based on a review of her track, the past tracks of other vessels and the usual course taken the vessel appears to have followed expected "normal" track and headings. Speed under the Severn Bridge and past the Lyde beacon was as expected to maintain steerage through the water with a following tide. Past measurements have shown that up to 6kts inward tidal flow on spring tides can be experienced under the bridge and past the Lyde, and the Admiralty Sailing Directions (NP37) also reference currents of 5-6kts on flood tides in the area. Therefore, the usual practice is that vessel speeds over the ground approaching the turn to port need to be relatively high to ensure steerage. It was 13.7kts passing the Lyde beacon in this case.

Tracks saved on the Pilot's PPU for the vessels under his pilotage previous to Arklow Raider demonstrate that the track this particular vessel was following was very similar. AIS replays from other vessels also indicate the same (see Fig.4 & 5). The vessel's Master had made this passage and turn on several previous occasions and did not report any perceived irregularity in the execution of the turn.

The vessel's heading throughout the turn is as expected initially and not out of the ordinary but can be seen heading too far to port once into the bend past the Lyde beacon, even with starboard rudder applied (see Fig.6 AIS track). The same vessel called in April 2022 (per Fig.3), and Fig.7 illustrates the inward track from AIS on that occasion, which is very similar on approach to the Lyde, but demonstrates continued successful passage past it and passing over the tail of Slimeroad Sands.

There is nothing unusual that has been able to be determined from the vessel's approach track, heading and speed that would indicate an obvious cause of the loss of control.

Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report

Fig.4: Screenshot of PPU showing inwards track to grounding, plus subsequent outwards track. Also tracks of prior vessels with same Pilot.

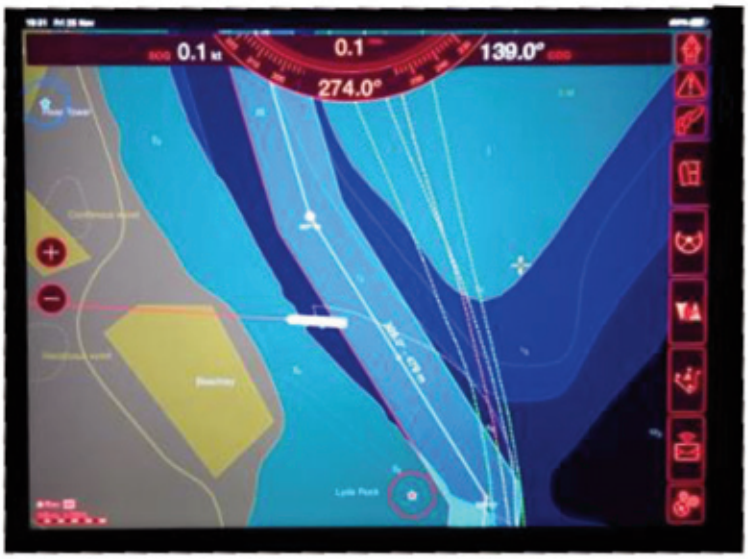


Fig.5: Screenshot of PPU with vessel in grounded position, plus Pilot's previous vessel tracks.

GHT investigation report – Arklow Raider – S.H. - 09th February 23 10

Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report

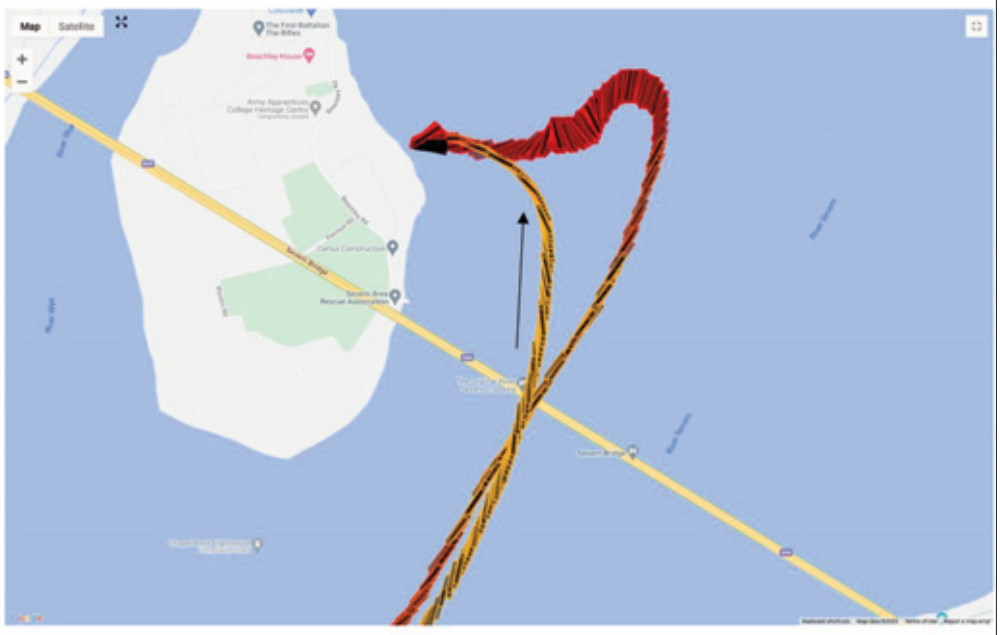


Fig.6: Screenshot of AIS positions/track showing approach to grounding (indicated by arrow) and subsequent refloating and outwards passage on date of incident.

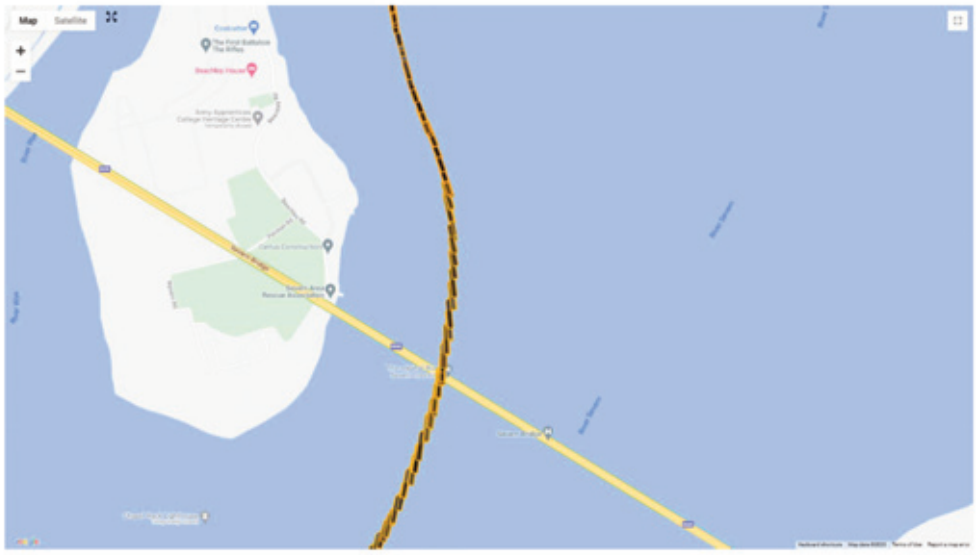


Fig.7: Screenshot of AIS track of Arklow Raider previous inward passage 29th April 2022.

Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report

Pilot Training & Experience

There are three levels / class of Pilot authorisation under the GHT regime, rising from Class 3 to Class 2 and Class 1. The Pilot in this case was authorised as Class 2, and the Arklow Raider fell in Class 2 parameters. Previous to joining Gloucester Pilots, he had been an authorised Pilot on the Humber, handling many similar sized and larger vessels in tidal estuary conditions, for three years, during which he undertook 460 acts of pilotage.

In order to obtain Class 3 authorisation for GHT, a Pilot is required to perform 40 acts of pilotage under supervision of an existing Pilot, of which 25 should be inwards and 15 in darkness – plus 10 additional vessels outside Class 3 parameters or in unusual conditions (e.g. poor vis). The training period should be not less than 3 months and is followed by examination as well as the assessed trips. In practice, as the guidelines for training trips are a minimum, they are sometimes exceeded, and the training period can be extended beyond the minimum three months if required.

The Pilot completed 46 trips (including a laden Arklow R class on an 8.3m tide inwards, albeit in daylight) plus assessment trips over three months without any issues, plus 9 leisure vessels not counted in training, and was authorised as a Class 3 Pilot in September 2021 following very successful examination.

To reach Class 2 authorisation, 75 acts of pilotage as a Class 3 must be performed, of which 30 should be inwards and 15 in darkness. An additional 10 trips outside of Class 3 parameters should be completed, assessed by existing pilots.

The Pilot had completed 77 trips as a Class 3 Pilot, plus 16 additional trips including vessels similar in size to Arklow Raider – all without any issues – and was duly authorised as a Class 2 Pilot in October 2022.

Given that the Pilot had performed his training and time as a Class 3 Pilot in exemplary fashion, had taken similar sized vessels in similar states of tide around the same bend and had three years of similar experience as a Pilot in similar estuarial conditions elsewhere, it is not considered that lack of familiarity or experience is an issue in this case.

Passage planning

The Pilot had prepared a passage plan in advance of boarding the vessel based in on pre-arrival information supplied via the agent. The pre-arrival drafts supplied were 5.9m fwd and 6.03m aft. These are required to be advised as drafts in fresh water for passage in the upper estuary and entry into Sharpness. However, it transpired that actual max draft on boarding was advised as 6.12m. Pilot therefore used 6.15m for calculations to give a margin of safety. In the event max draft of Arklow Raider was in fact 6.10m, and though assumed, despite the slight changes in draft, she remained trimmed very slightly by the stern, it is/was not recorded what the exact forward draft actually was.

Vessel trim can be significant in handling when making turns, as the pivot point may change. There was no obvious aspect of trim by the head on Arklow Raider, but it should possibly have been noted given that the maximum fresh water draft had changed to what was reported pre-arrival.

Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report

In terms of maximum draft, as 6.15m was used there was always a safety factor for all parts of the passage. It should also be noted that the Pilot was using 1.5m minimum Under Keel Clearance (UKC) in calculations to give an additional safety factor above the min 1m UKC required by GHT.

During the Master/Pilot exchange, and again on approach to the Severn Bridge, the pilot explained how it was planned to make the turn after the bridge and then cut across the tail of Slimeroad Sands. This is common practice, as evidenced by previous vessel tracks because, due to the expected counter current, attempting a sharp turn to port around the Lyde to stay in the deepest water is difficult or impossible to achieve and attempting to do so increases the risk of loss of control. Arklow Raider's Master had been to Sharpness on several previous occasions and was reportedly aware of, or remembered when briefed at MPX, the turn and possible counter current in the Lyde area.

Each Pilot authorised by GHT (of which there are four), makes their own calculations to provide the information required to be inserted on the GHT passage plan in terms of ETAs at various points and drafts. See Appendix 1 – passage plan proforma.

The Pilot in this case uses his own detailed spreadsheet. When analysed by the Harbour Master and Senior Pilot, it appeared entirely correct and as expected for that tide and vessel. Also taken into account was the fact that the two preceding tides were above predicted height and slightly early, so the tide in question was expected to be also, given the conditions. That transpired to be correct. The tide height when passing King Road (Avonmouth) was 0.4m above prediction.

The passage plan produced stated ETA 1905hrs at the Severn Bridge, and the vessel was passing there at 1904hrs, which is insignificant, and in any case the tide was slightly early.

All other timings prior to that point had also been as per passage plan. See Appendix 2 – completed passage plan.

A course of action taken by Pilots on regular occasions is to steer a course continuing North past the Lyde beacon and take vessels over the top of Slimeroad Sands – i.e heading for Sedbury cliffs, passing over the sands and back into the main channel before proceeding onwards up the deep-water channel. This can have the effect of stemming the counter current more than placing it on the starboard bow and reducing the required starboard helm. Obviously forward planning to calculate the predicted depth of water over the sands is required.

In this case, using a drying height of 3m on Slimeroad Sands, a vessel draft of 6.15m, then 10.65m height of tide at the Lyde (using the local chart datum) was required to pass over the sands using the Pilots minimum 1.5m UKC. Based on predictions, there would have been 11.76m at the time of the incident, giving 2.66m UKC crossing the sands. Therefore, it would have been possible to safely pass over the sands even with an extra margin to allow for slight accretion of the sand bank.

However, the individual choice of exact route is left to the Pilot, and there was no apparent reason to suppose that the Arklow Raider would be any different to any other of the many vessels that had followed the same track around the bend in the channel and over the tail of the sands. It is therefore not considered that the decision was in any way wrong.

Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report

On smaller tides, there is not always sufficient water to proceed over the sands, so the turn must be made even if cutting the tail of the sands. In such cases, however, the risk from the adverse counter current is sometimes reduced because the tide is smaller.

The Pilot was aware from his training and passages made since that it was possible to go over the sands and, again erring on the side of caution, used 3m drying height for the whole area of the Slimeroad sands in passage planning, even if only passing over the tail.

Surveys/Hydrographic Information

Frequent formal hydrographic surveys in the area have always been considered unnecessary, and potentially constantly out of date, due to the fact that the main channel remains scoured to bedrock and the surrounding sandbanks are subject to continuous slight changes in height and shape due to the tidal flows and levels of suspended sediments in the water. Past experience has shown that there is little change in the main channel There is in place a system of monthly visual low water inspections, carried out under contract to GHT by the Pilots, from the Shoots Channel inwards to Sharpness. This provides a visual check on drying areas, particularly with reference to any excursions into the main channel and any excessive topographical changes affecting drying heights where vessels may be required to pass over those areas. As these are visual inspections only, any drying heights or change in shape of banks are best professional estimates based on surrounding references and observation on either an ebbing or flooding tide. Results are recorded on standard forms and chartlets. At Slimeroad Sands the drying height of the sands is referenced to known fixed areas of drying height, such as nearby Leary Rock at 3m drying height. This process has always been seen as satisfactory to suitably identify any major changes in height of Slimeroad sands or change in shape of the tail e.g. encroachment into the channel. Periodic hydrographic surveys are used as confirmation, and to verify the visual observations.

The margins used for UKC if passing over the sands are sufficient to allow for slight accretions of sand. Even if there were a very large accretion in a short space of time, and a Pilot elected to track over the sands rather than attempt to make the turn to port (to lessen the risk of an incident such as the one being analysed here), the potential consequences of touching on the sands are likely less than that of grounding on the bank experienced in this case.

Previous incidents

The vessel "Balticdiep" experienced what appears to be an almost identical incident in the same location in 2009, where the vessel failed to answer starboard helm on making the turn. That vessel was slightly less draft at 5.6m but was longer at 107m loa. The tide was similar at 8.4m predicted. This was not an exceptional vessel for the port and the pilot was very experienced. Fortunately, in that case the grounding was very slightly further along the bank on mud, so no damage was sustained, and the vessel was able to self-recover and proceed inwards to Sharpness.

Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report

Conclusions

The Arklow Raider grounded on the western shore of the Severn Estuary just upstream of the Lyde Rock during inbound passage to Sharpness at 1921 GMT on 25 November 2022. She was under pilotage of a Pilot under contract to Gloucester Harbour Trustees (GHT), the Competent Harbour Authority. The ship was subsequently refloated on the same tide, proceeded to anchor and made passage to Sharpness on the next tide. Minor damage to steelwork in the forepeak was sustained. There were no injuries and no pollution.

At this point in the passage the deep-water channel is narrow and after passing under the M48 bridge it swings sharply to port and then back to starboard, between the western shore of the estuary and sands to the east. There is a counter-current (reverse eddy) that is well known to the Pilots, which can make execution of this turn challenging.

In this incident it appears that the counter-current acting on the starboard bow of the ship caused the vessel to lose control during the turn as she passed around the Lyde beacon and despite increasing amount of starboard helm being applied it was not possible to overcome this force and the vessel continued swinging to port and grounded on the bank.

The passage plan was correct for the vessel and tide, and the passage was performed to the plan up until the point of grounding. There were no known mechanical defects with the vessel. There is no evidence that the intended track around the Lyde turn was out of the ordinary and the turn has been and continues to be achieved by numerous other vessels in various tidal conditions. That said, a very similar grounding incident occurred in the same circumstances in 2009.

The Upper Severn Estuary experiences a highly dynamic tidal regime, particularly in the area of the incident. Whilst the existence of the counter-current just past the Lyde beacon is well known, the strength and exact direction of it is not so predictable, and therefore the exact track, helm and speed settings for the manoeuvre must be judged on a case-by-case basis.

It is possible, if there is sufficient depth of water, for the Pilot to elect to proceed further to the north past Lyde and make a course over Slimeroad Sands. This can avoid the need for the sharp turns required to stay in the deep-water channel and thus the risk of the counter-current preventing the ship from being able to make the turn to starboard. Such a course of action must be pre-planned based on predicted under keel clearance and allowing margin for slight changes in sand accretion. When there is insufficient water to take this action due to smaller tides the tidal counter-current poses less risk to the manoeuvre.

GHT are satisfied with the current regime relating to hydrographic survey and regular visual checks that are made by the Pilots from ashore. The sands are known to continuously vary in their precise contours and heights, as they always have done, but the overall channel is relatively stable, so there would be nothing gained by more frequent surveys.

GHT are satisfied that the Pilot training and experience requirements are suitably rigorous and that the particular Pilot involved in this incident was suitably qualified and experienced.

A number of recommendations have been made to clarify the risk of loss of control whilst executing this turn and the potential mitigation by proceeding over Slimeroads sands when

Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report

the tides are big enough to provide the necessary depth of water. These include improvements to GHT's passage planning documentation, and recommended notes for the Admiralty chart and Sailing Directions.

Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report

Recommendations and Lessons Learned

As a result of this investigation, including an analysis meeting held on 5th January 2023 chaired by the Harbour Master and attended by all four Pilots and the Port Marine Safety Code "Designated Person", the following recommendations and actions were agreed upon and are in the process of being implemented.

1. Include wording in GHT passage planning documents to recommend that due consideration is given to taking a track over Slimeroad sands where safe to do so, at Pilot discretion. At present that course of action is practised but is not specifically mentioned in GHT's passage planning documentation.
2. Amend the passage plan proforma to include formal recording of predicted heights above Slimeroad sands in order to inform planning of which track to take. Also add a tick box to confirm formally if there is sufficient water to pass over the sands, allowing for minimum stipulated UKC and margin, should that option be planned.
3. Improve the passage plan proforma by adding annotated "chartlets" (as suggested in the Guide to Good Practice on Port Marine Operations Section 8 and Annex G). These would illustrate particular areas of caution such as the Lyde turn – plus abort/hold points and would be a helpful addition to the Pilot/Master Exchange.
4. Amend the passage planning documents to require the consideration of vessel fore/aft trim; i.e. record forward and aft drafts, not just maximum, as this may inform vessel handling characteristics.
5. Request UK Hydrographic Office to include information about the counter-current around the Lyde Rock area on the chart and in publications (e.g. NP37 Sailing Directions. There is currently mention of tidal flows in the Shoots Channel and various other points in NP37, but not of the counter-current in the Lyde Rock area).
6. Review the risk assessments for grounding and in particular whether there should be a specific risk assessment relating to the Lyde Rock area on inbound passages.
7. Specify and obtain quotes for a new hydrographic survey of Slimeroad sands to validate the current data and vessel track decision-making.
8. Investigate the feasibility of a reliable real-time tide gauge at Lyde Beacon or Severn Bridge pier able to transmit readings to Pilots on vessels. This may also assist with estimates of Slime Road sands heights during the monthly visual surveys.

Other lessons learned and potential points for review:

- The MAIB were not called by phone immediately. The report with details was submitted quickly but the duty officer should have been called at the time of the incident.
- Be clear who is taking what actions at time of incident (e.g. calling HMC, tugs etc) – though noting that this may depend on the exact nature of the incident.

Appendix 7.13 Gloucester Harbour Trustees Harbour Master's Investigation Report

- Review whether detailed information relating to post-incident vessel damage assessment in Sharpness was made available to GHT before the ship sailed from Sharpness.
- Check with vessel Master that VDR data is saved following the incident.
- Review how any relevant PPU data in such situations is downloaded and able to be processed ashore.

Action Table:

Action	Who	Due	Status
Agree new wording regarding passage over Slimeroad Sands to be inserted in passage planning documentation.	HM, Pilots, DPA	12/01/23	Wording agreed following meeting 05/01/23.
Agree revised passage plan documentation including chartlet(s)	HM, Pilots, DPA	12/01/23	Changes agreed at meeting 05/01/23 and subsequent discussions.
Review grounding risk assessments	HM, Pilots, DPA	28/02/23	To be reviewed
Prepare and publish revised passage planning info	HM	28/02/23	As of 02/02/23 HM to produce draft layouts for approval or further revision.
Additional info to UKHO for Chart 1166 and NP37	HM	01/03/23	HM to send once passage plan documents agreed,
Hydrographic survey of Slimeroad sands	HM	End Feb 2023	As of 02/02/23 quote obtained & contractor instructed. May be March 23 to perform depending availability.
Investigate feasibility of electronic tide gauge installed in the area of Lyde/Beachley.	HM	End Mar 2023	Ongoing.

SECTION 36 PROCESS

Section 36 of the Merchant Shipping (Investigation of Marine Casualties) Act, 2000

It is a requirement under Section 36 that:

(1) Before publishing a report, the Board shall send a draft of the report or sections of the draft report to any person who, in its opinion, is likely to be adversely affected by the publishing of the report or sections or, if that person be deceased, then such person as appears to the Board best to represent that person's interest.

(2) A person to whom the Board sends a draft in accordance with subsection (1) may, within a period of 28 days commencing on the date on which the draft is sent to the person, or such further period not exceeding 28 days, as the Board in its absolute discretion thinks fit, submit to the Board in writing his or her observations on the draft.

(3) A person to whom a draft has been sent in accordance with subsection (1) may apply to the Board for an extension, in accordance with subsection (2), of the period in which to submit his or her observations on the draft.

(4) Observations submitted to the Board in accordance with subsection (2) shall be included in an appendix to the published report, unless the person submitting the observations requests in writing that the observations be not published.

(5) Where observations are submitted to the Board in accordance with subsection (2), the Board may, at its discretion -

(a) alter the draft before publication or decide not to do so, or

(b) include in the published report such comments on the observations as it thinks fit.'

The Board reviews and considers all observations received whether published or not published in the final report. When the Board considers an observation requires amendments to the report, those amendments are made. When the Board is satisfied that the report has adequately addressed the issue in the observation, then no amendment is made to the report. The Board may also make comments on observations in the report.

Response(s) received following circulation of the draft report (excluding those where the Board has agreed to a request not to publish) are included in the following section.

The Board has noted the contents of all observations, and amendments have been made to the report where required.

8. MSA 2000 SECTION 36 - CORRESPONDENCE RECEIVED

Note: The names and contact details of the individual respondents have been obscured for privacy reasons.

8.1 Correspondence from UK Hydrographic Office and MCIB response

UK Hydrographic Office

T [redacted]
E- [redacted]

From: [redacted]
Chief Executive

UKHO Reference: 0026-22/CE
Date: 29 June 2023

Marine Casualty Investigation Board
Leeson Lane
D02 TR60

info@mcib.ie

Your Ref: MCIB/12/324

Dear Sir/Madam,

In response to the "Draft Report of an investigation into a marine casualty involving the merchant vessel Arklow Raider in or around the Bristol Channel, on or about 25 November 2022", and your covering letter (your reference: MCIB/12/324) dated 14 June 2023, UKHO would like to respond.

UKHO accepts the recommendation in Paragraph 6.7 of the report, we are already in the process of issuing an amendment to NP37 to include wording recommended by the report. This will be issued via Admiralty Notice to Mariners to all holders of the publication by the end of August 2023.

Yours faithfully,

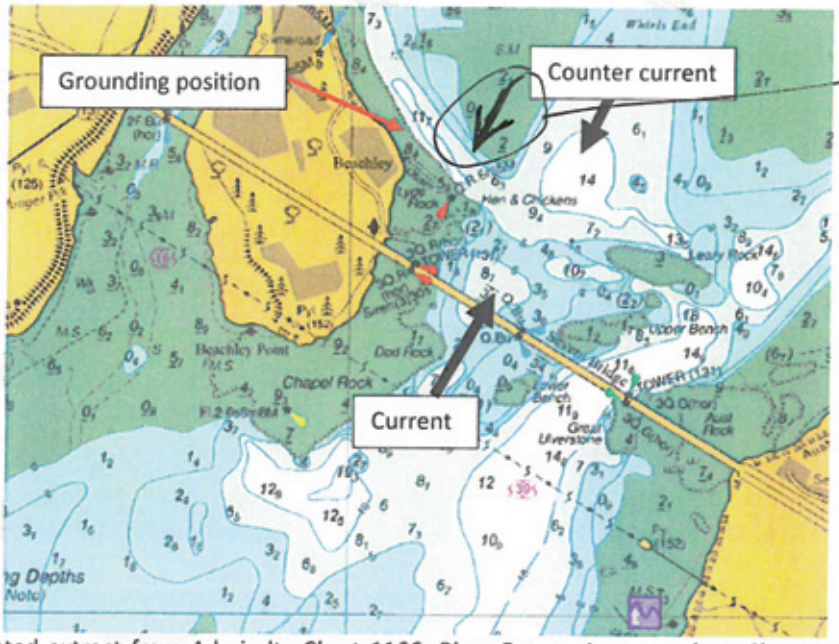
[redacted]

8.1 Correspondence from UK Hydrographic Office and MCIB response

1. SUMMARY

1.1 During the evening of 25 November 2022, the general cargo vessel Arklow Raider, proceeded on a laden passage up the Bristol Channel towards her destination port of Sharpness, United Kingdom (UK). At around 19.19 hours (hrs) the vessel passed under the Severn Bridge and the Pilot commenced a planned turn to port to round Lyde Rock. Despite the Pilot applying starboard helm to counter the anticipated currents and counter currents, the vessel rapidly sheered to port before grounding heavily by the bow on a mud and rock bottom at approximately 19.21 hrs. After sounding all compartments and determining no apparent water ingress, the vessel was re-floated under its own power on the still rising tide. The passage was aborted and successfully completed on the following tide with the same Pilot. The vessel sustained damage to the shell plating and framing in the forepeak ballast tank, with water ingress subsequently detected in the forepeak. The vessel was dry-docked for repairs. No persons were injured and no pollution occurred.

Note: All times are local time = Co-ordinated Universal Time (UTC) unless specified.



Annotated extract from Admiralty Chart 1166: River Severn Avonmouth to Sharpness and Hook Cliff

MCIB RESPONSE: The MCIB notes the contents of this observation.

8.2 Correspondence from MAIB and MCIB response

Good afternoon

I have reviewed the draft investigation report on behalf of the UK Marine Accident Investigation Branch and while we do not offer any comment of the reports findings would request that the following amendment is made to more accurately align with our procedures:

> Paragraph 2.6.1 … A Marine Accident Investigation Branch (MAIB) accident report was submitted by Arklow Shipping and ~~an initial~~ preliminary assessment carried out by the MAIB

Yours ever,

[redacted]

[redacted] Inspector of Marine Accidents | Marine Accident Investigation Branch | **He/Him/His**
First Floor | Spring Place | 105 Commercial Road | Southampton | SO15 1GH | 24hr Accident Reporting Line: +44(0)23 8023 2527 [redacted]
[redacted] www.gov.uk/maib
MAIB Fair Treatment Volunteer

MCIB RESPONSE: The MCIB notes the contents of this observation.

8.3 Correspondence from Harbour Master and MCIB response

04th July 2023

Marine Casualty Investigation Board
Leeson Lane
Dublin
D02 TR60
Eire

Dear [redacted]

Re: MCIB/12/234 - Draft Report of Investigation into Arklow Raider grounding in the Bristol Channel – November 2022

On behalf of Gloucester Harbour Trustees, I thank you for sending us a draft copy of your report on the investigation into the grounding of the Arklow Raider in our harbour area. We thank the MCIB for their time and input, and we are grateful to receive a thorough and professionally written report.

It is pleasing that, in general, the conclusions and recommendations contained in the report are aligned to those we had already reached as a result of our own investigation. Therefore, in fact, most of the recommendations are already being acted upon.

I very much welcome the opportunity to provide observations and comments on the draft report, and therefore attached with this letter is a document with our observations for you to consider for final publication, which are intended as being constructive and reflective of our general specialist knowledge of navigational safety on the Severn estuary.

Please do not hesitate to contact me if you require further clarification.

Yours sincerely

[redacted]

Harbourmaster

Gloucester Harbour Trustees
Navigation House · The Docks · Sharpness · Berkeley · Gloucestershire · GL13 9UD
Telephone · 01453 811913 Fax · 01453 810381 Mobile · 07774 725270
www.gloucesterharbourtrustees.org.uk

8.3 Correspondence from Harbour Master and MCIB response

Section Ref.	Observation/Comment
1.1	The annotated extract from Admiralty chart 1166 shows the arrow indicating "counter current" in the wrong position (directly opposing the inward tidal current). The arrow for counter current should be further West, over the tail of Slimeroad Sands, otherwise it doesn't represent the forces exerted on the vessel as described in sect. 5.4 for example. Annotated/amended version of the chartlet is attached to illustrate.
1.1	Request insertion in line 6 of the wording "leaving the channel" as follows - "*Despite the pilot applying starboard helm to counter the anticipated currents and counter currents, the vessel rapidly sheered to port,* ***leaving the channel*** *before grounding heavily by the bow."* We believe this is important in the context of the focus on hydrographic information later in the report.
2.1.5	It is understood that, as a right-handed CPP propellor will continue to rotate in the same direction when blades operated astern, then the effect is usually to turn the bow to port, not starboard as stated (which would be correct for a fixed pitch prop). We acknowledge, however, that it is only a technicality in this case as the full astern manoeuvre was necessary to reduce speed, so the type of propellor had no influence on the outcome.
2.3.1	Although a technicality in terms of the incident, it should be noted that GHT's powers to "improve, regulate and manage the harbour" result from an act of 1890. The 1994 HRO does confer powers in terms of aids to navigation to which 2.3.1 refers.
2.6.1	It should be noted, for sake of good order, that GHT also submitted a report to the MAIB, prior to that submitted by Arklow Shipping.
2.8.2	Correctly the wording should refer to "inspections" rather than "surveys".
4.3	The comment regarding currents is true in as much as 6kts can be experienced running past the Lyde on a flooding spring tide, but the counter currents should more accurately be described as "variable". Even if there is no counter current, the effect of the vessel's bow entering still water and the port quarter continuing to be pushed by the flood tide will have the same effect of turning the vessel to port.
4.4	The statement regarding the last survey of the Slimeroad Sands as being in the year 2000 is incorrect. As per Admiralty chart 1166 (Edition 10, 12th November 2020) a full hydrographic survey of the channel used by commercial shipping through the Gloucester Harbour area, therefore including Slimeroad, was carried out in 2015. A further survey specifically of the Slimeroad area was carried out in 2019. Therefore, the reference to the last survey having been "some 22 years prior to the grounding" should refer to it having been "3 years prior to the grounding" and we request that this be corrected. Furthermore, it should be noted that a further full hydrographic survey of the Slimeroad area (expanded area from the 2019 survey area) has recently been carried out during May 2023.
4.4	Given that safe navigation is our prime concern, GHT has considered over many years the merits, or otherwise, of the regularity of hydrographic surveys of the channel, especially in the Slimeroad area. In

8.3 Correspondence from Harbour Master and MCIB response

	order to have up-to-date, accurate data, surveys would need to be almost continuous, and the level of accuracy obtained would in fact be of little benefit proportionate to the cost of equipment, software, vessel, and staff involved – or cost of outside contractor. The general principal in terms of the tail of Slimeroad sands is to work on the maximum drying height being 3mtrs, and all UKC calculations are based on this, as in fact years of observations and surveys have shown that the sands are very rarely higher. The current system of monthly inspections uses a known rock (Leary rock) with a drying height of 3mtrs next to the sands to provide an estimate of the sands height, with particular emphasis on checking they are below 3 mtrs. GHT is studying the feasibility of installing a local reliable electronic tide gauge, as per one of the report recommendations, and once this is in place it will allow accurate validation of the estimates of the height of the sands obtained from the monthly inspections. Because the topography of the sands change continuously, albeit within small parameters, a regular survey could be out of date almost as soon as processed and published and is of little practical use unless the height is observed to be unusually building above 3 mtrs, whereupon a full survey can be carried out. This was the case for the 2019 survey, and the resulting charted heights in fact lowered very rapidly and have been observed to be lower ever since – which is reflected in the recent May 2023 survey – max height 2.7mtrs. GHT therefore believes that the current regime of periodic hydrographic surveys and monthly shore-based inspections is appropriate to the conditions prevailing whilst also remaining affordable.
4.5	GHT agrees with the idea of looking at the feasibility of an electronic tide gauge in the area, per our own report, which would assist with vessel passages and assessing drying heights of the sands. However, for a flow meter to be of any benefit it would need to be sited in an area where it is physically impossible to do so and would also require data from more than one location to make an accurate, useful assessment of what the current does on any particular tide, as it is not predictable.
4.16	A technicality – Gloucester Pilots do not use the Leading Lights software to obtain vessel details. Leading Lights is an operating database maintained by the Pilots, into which they input vessel information supplied by agents, managers, owners or vessels direct.
5.4	Whilst in agreement that there are changes that can be made to aid future decision making, it should be noted that the vessel grounded outside of the main channel, and the Pilot was aware that there was sufficient UKC to pass over Slimeroad sands. Additionally, tide gauge readings were available from Bristol VTS and Sharpness Radio, allowing accurate estimates of the tidal heights at any point in between. Therefore, we would challenge how much of a factor lack of real time data and regular hydrographic surveys were in the grounding.
6.1	Agreed, and the feasibility of an electronic tide gauge mounted locally on either the Severn Bridge Western pier or the Lyde beacon is being

8.3 Correspondence from Harbour Master and MCIB response

	investigated, as this would also give additional accuracy to the monthly low water inspections.
6.2	See comment under 4.4
6.3	Agreed. A revision of the passage plan is being made.
6.4	GHT acknowledges the undoubted benefits of simulator training in many situations, though discussions would indicate a perception that simulator training would be of limited use for a situation such as investigated here. Realistic simulation is only useful if the input data is valid. We cannot accurately model the strengths and directions of the complex currents in the Lyde Rock region and how they vary with tide height or time. We could hypothesise many different scenarios, but the data would be so error-prone that it is questionable whether the simulations would have much value in relation to the related effort and costs. Therefore, in this particular application, we do not believe that simulator training would be helpful. However, it is a subject that will certainly be further discussed and reviewed along with ongoing reviews of Pilot training requirements overall.
6.5	Agreed – per 6.3 a revision of the passage plan is being made, which will also include chartlets.
6.6	Agreed, a specific risk assessment for the area.
6.7	GHT have already written to the UKHO with suggested wording for NP37, and chart annotations. Additionally we have supplied the data from our recent May 2023 hydrographic survey in order to update Chart 1166.

MCIB RESPONSE: The MCIB notes the contents of this observation.

NOTES

Leeson Lane, Dublin 2.
Telephone: 01-678 3485/86.
email: info@mcib.ie
www.mcib.ie