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REPORT ON THE

NAVIGATION SAFETY ASSESSMENT

MV "RENA", WRECKED ON ASTROLABE REEF

Date: 18 August 2014 **Our Ref: 5750/LOCS/NEH/R005**

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EXECUTIVE SUMMARY

This report has been commissioned by MNZ to provide expert salvage advice in respect to issues raised in the report “Navigation Safety Assessment – Proposal to Leave the Remains of the Wreck of the MV “RENA” on Astrolabe Reef” authored by Nigel Drake and issued as a draft report for peer review.

In summary, LOC are of the opinion that based on this report (and the other provided documents) the remains of the wreck of MV “RENA” pose a minimal risk to navigation for larger sea-going ships and the larger commercial fishing vessels that may use the Bay of Plenty. However, at this time we believe that the wreck and debris may have the potential to cause damage to the smaller commercial craft and private pleasure craft that use the Bay of Plenty/Astrolabe Reef. The potential risks to the smaller craft may be diminished by the mitigation measures proposed in the Drake Report, but are unlikely to be negated by those alone. Conversely, the times when the risk is highest, namely during bad weather, it is highly unlikely that the at-risk users would be navigating at or near Astrolabe Reef.

The author of the Navigation Safety Assessment Report has made a number of assumptions about the current state of the wreck which are aligned to the other data available to LOC and would appear to reflect the known condition of the wreck at this time. The assumptions made by the author in respect of how the wreck and debris will behave and/or deteriorate are as would be expected for a wreck that has undergone the level of wreck diminution works seen on MV “RENA”. The wreck and ferrous debris will continue to diminish over time and the minimal risks to navigation posed will, as a consequence, diminish accordingly. However, this assumes that the scope of work proposed in the Drake Report is completed as advised.

1. INTRODUCTION

1.1 Instructions Received

1.1.1 We are instructed by Sid Wellik, Manager Legal services, Maritime New Zealand (MNZ) to provide expert opinion on a report prepared for the owners of M.V. "RENA" entitled "Navigation Safety Assessment – Proposal to Leave the Remains of the Wreck of the MV Rena on Astrolabe Reef" (Drake Report)[1].

1.1.2 In particular we have been asked to specifically consider and comment on the following aspects of the report:

1. *The assumptions the author has made about the current state of the wreck, and whether they are valid based on the information available to LOC?*

2. *The assumptions the author has made about how the wreck and debris will behave and/or deteriorate?*

    a) *Are those assumptions valid, and/or within the reasonable parameters of what might be expected?*

    b) *Would LOC make other assumptions about the behaviour? And if so, on what basis?*

3. *What are LOC's views about the likely or possible behaviour of any remains of the wreck and debris?*

Out of scope of what MNZ requires are any views about the other matters covered in the Drake Report, for example:

1. *The assessment of Tauranga Port Operations;*

2. *The comments about designated shipping routes;*

3. *Any matters that are unique from a New Zealand perspective (for example, any cultural considerations); and,*

[1] Copy of Drake Report attached as Appendix "A".

4. *Any comment about whether the current situation might not have existed if previous actions had been different.*

1.1.3 To allow us to make a fuller assessment we have been provided with the following documents:

i. Report “Navigation Safety Assessment” by Nigel Drake (dated May 2014); and

ii. An email from Reece Golding summarising some of the recent matters. Attached to that email are:

a. MNZ report compiled for the Governance Meeting held in Tauranga 05 March 2014.

b. TMC Report providing detail of the scattered items.

c. Email from William Boyd regarding search areas.

1.2 Background

1.2.1 The “RENA” ran aground, at a speed of 17 knots, on the Astrolabe Reef at approximately 02:20 hours on 5th October 2011. Preliminary calculations carried out by LOC, and based on the draught of the vessel before and after the grounding, indicated a ground reaction in excess of 9,000 tonnes and therefore it was deemed to be extremely unlikely that the ship could be re-floated without the removal of a significant amount of weight. The vessel also developed a list of approximately 11° to port.

1.2.2 On 11th October a period of bad weather and large seas caused the vessel to move from the original grounded condition with a change of heading of approximately 20°. It is thought that the bow of the vessel remained pinned to the reef during this period with the more buoyant aft section being moved by the heavy swell and rotating about the bow. This resulted in significant damage to the bulbous bow. The list of the vessel also changed from port to approximately 22° to starboard.

1.2.3 During the period of heavy weather a crack developed in way of No. 3 Hold in both the port and starboard side shells. The stern of the vessel rotated an additional 1-2° meaning that the crack on the starboard side opened to approximately 1.7 metres at its widest point. On the port side the crack was overlapping above the waterline and then opened to around 0.15 metres below the waterline.

1.2.4 On 21st October 2011 the vessel was officially declared a constructive total loss and became a wreck, which term is used hereafter.

1.2.5 The wreck was located at a position of 37° 32'.4S, 176° 25’.7E with a heading of 276° True. (The position was provided by Discovery Marine Ltd (DML) who had undertaken single and multi-beam surveys of the reef in the area surrounding the wreck.)

1.2.6 During the initial salvage operation containers were removed from both above deck and partially below deck. However, during the early hours of 8th January 2012 during a period of bad weather, the hull severed in way of the damage in Hold 3. Over the next two days the stern section commenced listing further to starboard until eventually the stern section sank on 10th January 2012, although part of it was visible above the sea surface.

1.2.7 Further bad weather causing movement of the wreck sections occurred in March and April 2012. On the 4th April 2012, the aft section wholly sank beneath the sea surface.

1.2.8 Subsequent to the bad weather it was established that the stern section had sunk on the reef and slid downwards to starboard and aft until coming to rest on the stern at a depth of 74 metres. The section was lying on its starboard side against the reef. The forward end of the aft section was 3.5 metres below the surface. The port bridge wing was some 10 metres below the surface. The fore section remained in place on the Astrolabe Reef. A debris field was created between the fore and aft sections on the Reef from the contents of the cargo holds.

1.2.9 Removal of containers from the forward section continued under the existing Lloyds’ Open Form contract until 8th June 2012 when owners terminated the contract. The contractors Smit & Svitzer departed the site on 13th June 2012.

1.2.10 Owners prepared an invitation to tender for the partial removal of the bow section and on 8th August 2012 Resolve Salvage and Fire (RSF) commenced work on the wreck reduction of the above water forward section. The contract was for the removal of the forward section to -1 metre LAT (Lowest Astronomical Tide).

1.2.11 Surveys undertaken by owners’ contractors revealed that the wreck itself was beginning to disintegrate. An ROV survey undertaken in August 2012 showed that the port side of the upper accommodation area (in way of the chief engineer’s cabin) had begun to collapse.

1.2.12 RSF were subsequently contracted to remove part of the debris from around the wreck and to recover specific cargo that had dispersed around and remained within the wreck itself. In addition, the owners and their P&I Club also contracted RSF to remove the accommodation block from the wreck, and debris from the debris field.

1.2.13 On the 25th July 2013, it was announced that the bow section had been removed to depths greater than -1m LAT, leaving two main pieces on the Reef. In October 2013, the bow section was found to have broken into several smaller sections.

1.2.14 The removal of the upper section of the accommodation block was completed in March 2014. Prior to the removal of the lower decks of the accommodation block, during the week 14-21 March 2014, a tropical cyclone (LUSI) passed close to New Zealand which resulted in a protracted period of unsettled weather and high seas. The resulting high seas caused the remaining wreck sections to move, the aft section rolling further to starboard and bodily slipping down the reef with parts of the wreck section now beyond safe commercial air diving depth, the remnants of the bow section also moving, as did the contents of the debris field.

1.2.15 As a result, it was decided by the owners to abort the further removal of the accommodation block, the contractors, RSF, instructed to target removal of hazards associated with the debris field.

1.2.16 Whilst the work by RSF was ongoing, the owners submitted an application for resource consent on 27th May 2014.

1.3 Scope of Report

Review and comment where appropriate on the report; “Navigation Safety Assessment – Proposal to Leave the Remains of the Wreck of the MV “RENA” on Astrolabe Reef” prepared by Nigel Drake on behalf of the owners of MV “RENA”.

1.4 Disclaimer

This report is based on our understanding of the documents itemised in para 1.1.3 and the weekly salvage updates issued by MNZ; such evidence is contemporaneous in its nature. However, our opinions are based on the information available from these documents and not through our own attendances on site. Consequently, if there are any inaccuracies in these reports provided, they may be reflected in this report.

2. GENERAL PARTICULARS

2.1 The Vessel “RENA”

2.1.1 Motor Vessel “RENA” (ex- “ANDAMAN SEA”, ex – “ZIM AMERICA”) was a fully cellular 7-hold, gearless container carrier which was owned at the material time by Daina Shipping Co of Liberia and operated and managed by Ciel Shipmanagement SA of Greece. The vessel’s keel was laid in October 1989 and she was completed in January 1990. The vessel was built at Howaldtswerke-Deutsche Werft AG (HDW) of Kiel. She was registered in Liberia and classed by the American Bureau of Shipping (ABS) with the following Hull Notation, AB*A1.

2.1.2 The vessel had the following principal dimensions:

Length Overall	:	236 metres
Breadth Moulded	:	32.2 metres
Depth Moulded	:	18.8 metres
Summer Loaded Draft	:	12.001 metres
GT	:	37,209
NT	:	16,454
Summer Deadweight	:	47,230 tonnes

2.1.3 The vessel’s propulsion was provided by a Zaklady Przemyslu Metalowego 'H Cegielski' SA - Poznan SULZER 8RTA76 Diesel Engine, developing 29,476 BHP at 98 RPM, driving a fixed pitch propeller. The vessel had a service speed of 21 knots.

2.1.4 The vessel was fitted with seven cargo holds. The vessel had a total capacity of 3,352 twenty foot equivalent units (TEU), split as 1,384 TEU within the holds and 1,968 on deck. In addition, the vessel was originally designed to carry 121 refrigerated units.

2.1.5 Prior to grounding the vessel had onboard 1,368 containers loaded as mixed TEU and FEU (forty-foot equivalent units). Of the containers said to have been onboard, 821 were loaded below deck and 547 were stowed on deck.

2.2 Astrolabe Reef

2.2.1 A brief reference to Astrolabe Reef is made in the New Zealand Pilot (NP51 – 2010 Edition)[2]. The reference is given below:

"***9.95*** *From a position ENE of "A" Light Beacon (E Cardinal) (37° 36.1'S 176° 10.7'E), at the seaward end of No.1 Reach to Tauranga Harbour, the coastal route leads initially ENE passing clear of Pudney Rock (37° 31'S 176° 19'E), depending on draught. Thence the track either continues ENE to pass N of Volkner Rocks (37° 29'S 177° 08'E) and thence to a position N of Cape Runaway, 41 miles E, or it leads E. The E track passes (with positions from Motiti Island Light (white metal column, 4m in height) (37° 36.4'S 176° 25.1'E)):*

N of Okaparu Reef (3 miles WNW), where the sea breaks in all swell conditions and particularly during NE or N gales, and:

N of Brewis Shoal ($2^{3}/_{4}$ miles NW), which breaks in a moderate to heavy swell from the NE, thence:

Either side of Astrolabe Reef (4 miles N), which breaks in all swell conditions and in fair weather appears like a boat, thence:……."

[2] New Zealand Pilot NP51 Eighteenth Edition 2010, para 9.95.2, page 264

3. CONSIDERATIONS

3.1 Executive Summary of the Assessment

3.1.1 The author advises, within the Executive Summary of the assessment, that the report provides an overview of the issues regarding the safety of navigation within the Bay of Plenty, specifically relating to the impact, if any, of the wreck of the "RENA". He advises that the issues covered relate ***"to the Proposal to leave the remains of the wreck, including its equipment and remnant cargo"***[3]**.** However, he also states that ***"The report, apart from a brief comment on the existence of debris and restricted areas, does not look into wreckage or cargo that has become separated from the wreck site and lost to the sea."***

3.1.2 The report was commissioned by the owners of "RENA" to determine what, if any, impact there may be on the various types of vessels that navigate within the Bay of Plenty. In determining this, the following sizes of vessels were considered in the four categories below:

1. Large ships trading to and from New Zealand using the port of Tauranga to conduct their business;

2. Commercial fishing vessels engaged in fishing operations;

3. Small commercial vessels such as charter fishing operators;

4. Privately owned pleasure craft.

3.1.3 Midway through the Executive Summary the author summarises by stating:

"In summary, there is currently no danger to navigation to any vessels operating in the Bay of Plenty as a result of the wreck on Astrolabe Reef. Floating debris from the wreck has reduced to the point that only minor amounts have been released since September 2012, even despite significant storms and movements that have occurred of the wreck (such as occurred as a result of Tropical Storm Lusi in March 2014)."

[3] Drake Report, Page 1, Executive Summary.

Whilst there have been no major releases of debris there have been a number of releases recorded of debris from the wreck since September 2012.

3.1.4 In the MNZ Sitrep of 26th April 2013, there is the following report:-

"Weather forced a pause to Rena wreck site work on the 14 April 13. Up until that point cargo debris and containers had been removed from the targeted bead container in tier 02 of Bay 28, Cargo Hold 4. One of the bead containers was found to be damaged and containment was attempted / made until RSF could get back on site.

As it transpires, it is now obvious that the severe nature of the storm not only impacted on the container containment, but in RSF's view, may have had a wider impact on the aft section itself. 6 meter seas were registered at the mooring buoy (nearest land) which suggests seas could have been greater at the reef with surge, current playing its part at the wreck site.

On Saturday 20 April the MNZ rep on the ground in Tauranga walking his dog at Papamoa triggered a response to what turned out to be a significant uncontrolled release of beads for the wreck site, and other aspects of debris such as tyres, chemical pool cleaning containers and couch cushions. It was reported earlier that a container in CH4 had furniture, so potentially other debris is likely to have been released during the storm event."[4]

Consequently, even in April 2013, debris was still being released and not dealt with until it landed on the beach.

[4] MNZ Salvage SITREP dated 26 April 2013. Attached at Appendix "B".

3.1.5 In the MNZ Sitrep of 24th May 2013, we are advised as follows:

"*The bay plan shown below reflects container loading in the ships manifest however due to the Rena's hull now at an estimated 54° to starboard, many of the containers remaining have been destroyed and are now found in layers of wreckage adjacent to or remaining inside the hull.*"

It is evident from this extract that that the potential for such a release existed as of 24 May 2013 and is likely to remain whilst the wreck remains in its present condition.

3.1.6 The minor releases of debris are likely to have resulted from either wreck removal operations or bad weather activity. Either could result in minor releases of entrapped, buoyant material remaining within the wreck or within the debris field adjacent to the wreck. Such risk will inevitably continue as long as loose debris remains trapped within the wreck and/or the adjacent debris field.

3.1.7 With the known deterioration of the wreck witnessed over time due in large to the diminution programme and in part to the frequent bad weather periods it is likely that the risk of debris release will continue until the port side of the wreck has deteriorated or collapsed and entrapped internal debris (crushed and layered containers/cargo) has dispersed.

3.2 <u>The Proposal to Leave the Remains of the Wreck on the Astrolabe Reef</u>

3.2.1 On page 3 of the Drake Report[5] it states; ***"Resource consent is sought to leave the remains of the Rena and of its equipment and cargo on the Astrolabe Reef in the Bay of Plenty. The following is a summary description of the intended state of the wreck to which the consent will apply:***

Bow Section

[5] Drake Report, Page 3, Background.

Following the grounding and break up of the ship and work done to reduce the bow section to below LAT -1m, what remains of the bow is now in several sections. The proposal is to leave these sections on the Reef.

Aft Section, including any remaining cargo

Parts of the hull structure of the aft section have broken off and part of the accommodation block has been removed. The proposal is to leave what remains of the aft section including structural material, equipment and cargo still within it, the engine room and the accommodation block to the level of D Deck.

Debris Field

The proposal is to leave the structural hull parts, equipment, containers and cargo in the debris field surrounding the wreck, following further clearance to remove (where practicable):

- ***plastic beads***
- ***TCCA canisters***
- ***aluminium ingots***
- ***inorganic material***
- ***entanglement and other hazards to a depth of LAT -30m."***

3.2.2 It is clear from the above that the owners of "RENA" intend to make an application under the RMA to leave behind the remaining forward section(s) and the bulk of the aft section upon completion of the stated works in *para* 3.2.1 above. My only concern with the stated works is the addition of the phrase "***remove (where practicable):…***" in respect of the debris field. This term is somewhat subjective in respect to the scope of works being contemplated for the debris field, what is "*practicable*" and who decides?

3.2.3 The strict meaning of this term provides that the actions are "*capable of being put into practice or of being done or accomplished*"[6]. I note that the report does not define this term with "*reasonably practicable*" which would imply that "*the imposition of an absolute duty or obligation is impracticable*".[7] Therefore, it indicates that the owner intends to complete the stated scope of work, however it is not defined who determines the practicability of the works.

3.3 Status of the Wreck

3.3.1 On page 4 of the Drake Report[8] there is a brief description of the present status of the wreck, the following is extracted text:

"***The Proposal is to leave the wreck in as benign a state as is practicable***.

The aft section is lying to the north of the bow section on the lower part of the reef. This section originally included the accommodation block but the top decks have been removed down to D deck. The shallowest part of the aft section is approximately LAT -24m. The forward bow section was originally wedged firmly between two elevated peaks of the reef. Late in 2013 the bow section separated into several pieces. Several of these pieces have moved to lower energy locations on the Reef. The breaking up and movement of the bow section in late 2013 does not alter the findings of this assessment as all pieces of the bow remain at or below LAT -1m."

3.3.2 Earlier this year (February 2014) owners' technical advisors TMC, issued a report entitled "RENA" – Bow Section Survey November 2013"[9]. This report summarises the findings of a joint survey undertaken by Solis Marine Consultants Pte Ltd on behalf of Resolve Salvage & Fire (RSF) and TMC undertaken in November 2013.

[6] http://www.merriam-webster.com/dictionary/practicable
[7] http://www.ntc.gov.au/filemedia/reports/nationalguidelinesfairpmar07.pdf
[8] Drake Report, Page 5, Status of the Wreck.
[9] TMC report "RENA-Bow Section Survey November 2013", attached as Appendix "C".

3.3.3 This report comments on the seven sections of the original cut-down forward section. The report advises at *para* 2.5.2 (page 18 of 22) that the starboard side structure (the highest point on the section after cut-down) was now at 3 metres below the waterline. It should be noted that the report advises 3 metres below the waterline and not at -3 metres LAT, no reference is made as to the state of tide at the time the assessment was made. In assessing the potential depth of water above the wreck the height of tide should be considered.

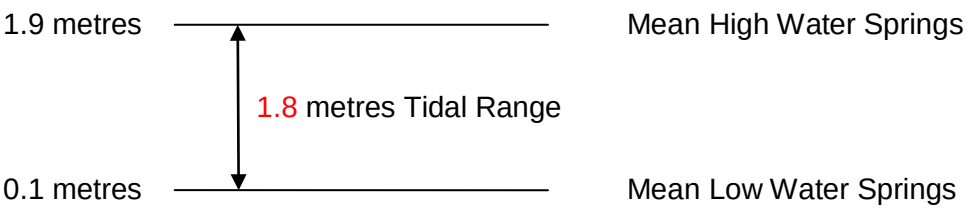
3.3.4 Admiralty Total Tide program[10] provides the following data for the port of Tauranga:

Highest Astronomical Tide	2.1 metres
Mean High Water Springs	1.9 metres
Mean Low Water Springs	0.1 metres
Lowest Astronomical Tide	-0.1 metres

From the above it can be seen that the mean spring tidal range is 1.8 metres. Therefore, the 3.0 metres referred to in the RSF/TMC report discussed at *para* 3.3.3 above could result in either:

If reading taken at High Water; 3.0-1.8 = 1.2 metres (minimum at low tide)

If reading taken at Low Water; 3.0+1.8 = 4.8 metres (maximum at high tide)



[10] http://www.ukho.gov.uk/ProductsandServices/DigitalPublications/Pages/ATT.aspx

Therefore, the RSF/TMC report is a little unclear as to what actual depth is available above the wreck. If the reading referred to in the RSF/TMC report was taken at High Water then the water level could be as low 1.2 metres at low tide (with a maximum of 3 metres at high tide). If however, the reading was taken at Low Water then there could be as much as 4.8 metres of water above the wreck at high tide (with a maximum of 3 metres available at low tide).

3.3.5 According to the RSF/TMC report, the section referred to above at *para* 3.3.3 was showing structural degradation due to movement down the slope of the reef as it detaches from the double-bottom section due to cyclic loading. Any additional movement down the reef will increase the depth above the section and as a consequence reduce the risk of damage to any craft.

3.3.6 However, nowhere in the report is there a detailed sounding of the Reef showing the location of the bow sections confirming that they are actually at a depth deeper than -1m LAT, and how they have subsequently moved during tropical storm LUSI or other previous weather events. In the “MV RENA: IMPLICATIONS OR RECREATIONAL DIVING AFTER CYCLONE LUSI – SUPPLEMENTARY REPORT”, submitted as part of the resource consent application, the authors, Gorman & Mitchell, discovered when diving on the wreck after tropical storm LUSI that, at the bow section, the ***“very shallow section of wreck with the long corridor which we commented on in our first report has actually shifted shallow (to about -6m) making it a greater surge hazard….”.*** In their first report, this corridor is described as being 30m long and having an entry at 2m and 8m depth. If the corridor location at 8m depth has moved 2m shallower, then it begs the question as to what depth is the 2m depth entry or other shallower parts of this section? Consequently, the above not only shows that the bow sections moved significantly after tropical storm LUSI and other earlier storms, but one large section in particular has apparently moved upwards on the Reef to a shallower depth.

3.3.7 Also, in the MNZ report of 2nd May 2014, it states:- ***"Reef Dive: Cushla Loomb (Beca) plus one other (female without proper gear) conducted a snorkel survey on top of the reef; it was reported that Ms Loomb was standing on a piece of wreck with her head out of the water; arguably this piece of wreckage in no longer at LAT -1."*** As such, the historic depth readings taken of the Reef in way of the bow section and to date are essential for any proper assessment of this resource consent application.

3.3.8 Under the heading, **Debris Field,** It explains how the debris field covers about 1 Ha, extending between the two sections of the wreck; bow and stern. It then states that ***"The shallowest part of the debris field is at approximately 8 metres depth. This depth has remained relatively constant since the wreck split in January 2012."*** Firstly, in the drawing of the debris field included in the BECA report (**APPLICATION FOR RESOURCE CONSENT (MV RENA) – Background and Consideration of Alternatives – Volume Three" prepared on behalf of the owner of M.V. "RENA" by Beca Carter Hollings & Ferner Ltd (BECA) dated 27th May 2014**), see Fig. 1 below, the debris field is shown to extend from the bow double bottom through the areas bounded by the 2m depth contour.

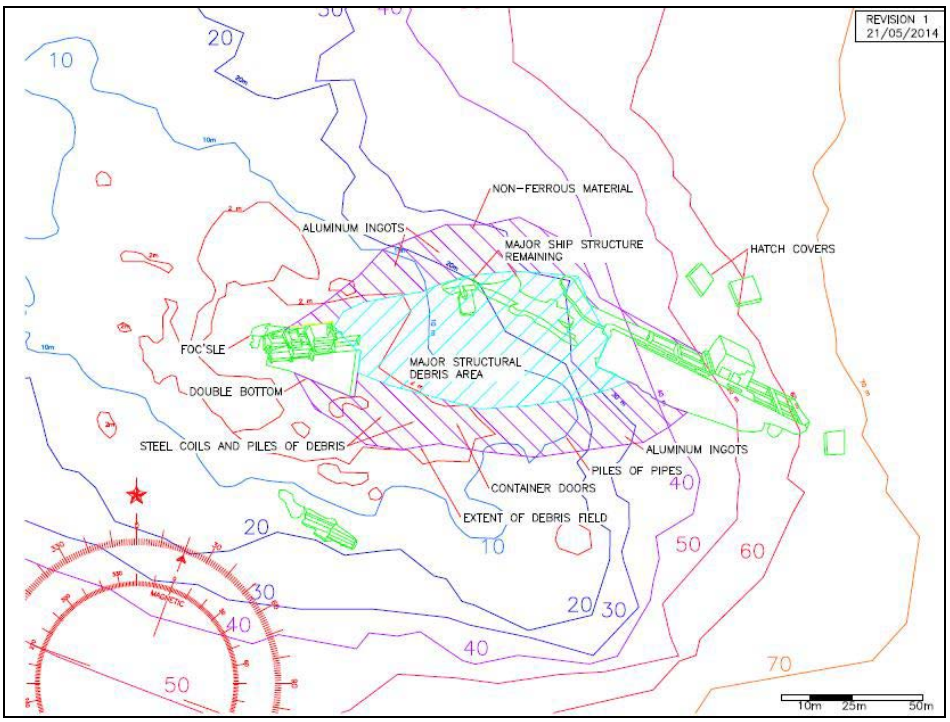


Figure 1. RSF Debris Field Survey April 2014.

This drawing is dated 21st May 2014, which shows that the debris is less than the 8m stated in this report.

3.3.8 Secondly, it is noted that in the **"MV RENA: IMPLICATIONS OR RECREATIONAL DIVING AFTER CYCLONE LUSI – SUPPLEMENTARY REPORT",** submitted as part of the resource consent application, by the authors, Gorman & Mitchell, they state that, after the passage of tropical storm LUSI, ***"In the shallower reaches of the wreck, the wire hazard in the debris field has become worse, with partial uncoiling of many of the previous coils. We remain of the opinion that these need to be removed"*** This example illustrates the movement experienced in the debris field after a major storm, and the potential for the reduction in the depth of water in the shallow areas of the Reef.

Under the heading, **Debris Distribution,** it states ***"In addition to the above, shoreline debris monitoring has been occurring since shortly after the Rena grounded in October 2011. Since the ship broke apart in January 2012 the amount of debris washing ashore has significantly reduced (see Figure below). The only debris being recorded on shorelines is plastic beads, which are not a navigation hazard."*** Included is a figure showing the amount of debris recovered since November 2011, implying that nothing has been recovered since September 2012. However, this is misleading as there has been debris being released from the wreck since that time, although it has been reduced.

3.4 Effects on Large Overseas and Coastal Ships

3.4.1 The Drake report details the potential effects of the remaining RENA wreck on large overseas and coastal ships at pages 8-11[11]. The report advises that ships proceeding to Tauranga would set courses to clear the reef by a wide margin. The presence of the "RENA" does not alter the need to clear the reef in the normal practice of good seamanship.

3.4.2 The report does not comment on the fact that despite the long term exclusion zone surrounding the Astrolabe Reef and the wreck mitigation operation there

[11] Drake Report, Page 6-9, Effects on Large Overseas and Coastal Ships.

has been a number of exclusion zone infringements. These are too numerous to detail here but a number of these have involved larger ships on route to the port of Tauranga. Whilst it may be unreasonable to liken exclusion zone infringements with the "*normal practice of good seamanship*" they should not be ignored. After all, the "RENA" ran aground during normal operations.

3.4.3 This section also discusses debris emanating from the wreck and the lack of any complaints from shipping lines that frequent the port. However, once again this summary ignores the fact that there has been an active exclusion zone established and that contingency planning has been in place throughout for recovery of any free-floating debris observed. This issue is covered in *paras* 3.1.3-3.1.5 above.

3.5 Commercial Fishing Vessels

3.5.1 The Drake Report advises at Page 12[12] a number of commercial fishing vessels that have fishing grounds around Astrolabe Reef could be subjected to navigational dangers resulting from the presence of the "RENA" wreck. The report also explains that due to the exclusion zone surrounding the wreck that fishing operations are not allowed at this time but the operators have expressed that the area around Astrolabe Reef is a desirable area to undertake trawling activities, however they note that there are existing seabed obstructions close to the Reef, which means that fishing is hazardous closer than 1.5 miles, or in depths of less than 95m.

3.5.2 The report also advises that normal operations are in place outside of the exclusion zone for the larger vessels. The report details an earlier issue of a fishing vessels snagging seabed debris in early 2012 however, it also advises that since known debris locations are now promulgated via Notices to Mariners there have been no reported incidents since September 2012.

3.5.3 The report summarises in respect to fishing activity as follows: ***"The wreck of the Rena is expected to continue to degrade and move into lower energy environments further down the Reef towards the seabed. Given***

[12] Drake Report, Page 12, Commercial Fishing Vessels.

that fishing trawlers (whose nets are positioned at the seabed and therefore at greatest potential navigational safety risk) already maintain some distance between their operations and the Reef due to existing known hazards presented by rocks, it is not considered that any debris of significant size from the wreck would present a snagging hazard to fishing trawlers. Commercial fishing operators will be aware of the presence of the wreck on Astrolabe Reef and are therefore expected to be cautious when operating in the vicinity.

The probability of a trawler snagging on debris from the wreckage of sufficient size to cause a navigational safety issue is considered very low.

Small commercial fishing vessels presently cannot approach close to the reef. Once the exclusion zone is removed they will be able to do so. The danger to their navigation will be in the need to understand where the wreck is situated. The accurate updating and marking of charts will be necessary to assist in their navigation and operation. The Bay of Plenty Regional Harbourmaster initiates this as a standard procedure."

And, "The wreck has essentially become part of the reef. The reef area as a whole, while being an attraction for small commercial fishing vessels, charter vessels and pleasure craft, is a navigational hazard. The reef does not have a navigational mark warning vessels of its presence but is well marked on local charts."

3.6 Small Commercial Charter Vessels

3.6.1 In respect to the smaller commercial craft that use Astrolabe Reef, the Drake Report advises at Page 15[13] that this fleet of vessels undertake a range of activities from big game fishing, snapper fishing, dolphin watching, parasailing and scenic cruises.

3.6.2 The Drake Report further advises as follows:

[13] Drake Report, Page 15, Small Commercial/Charter Vessels.

"As time has passed, no debris which would cause a danger to navigation for these vessels has been reported. With work completed on preparing the wreck to its proposed state the 2 mile radius exclusion zone around the wreck is not considered necessary (Notice to Mariners New Zealand 158(T)/12 issued on 24 September 2012 detailed this zone.)"

As discussed in *paras* 3.1.4-3.1.7 above, this statement is not strictly correct. Debris has been released from the wreck and the potential for further such releases remains with the wreck and debris field in the present condition. The debris commented on at *para* 3.1.4 above, is the type of debris which has the potential to cause damage to smaller commercial craft.

3.6.3 The Drake Report summarises the lack of risk for smaller commercial craft as follows:

"The completion of the work carried out by salvors in cutting down the forward section of the hull to one metre below LAT and the upgrading of local charts identifying the wreck, ensures there is no danger to navigation for charter vessels in carrying out their normal activities in the Bay of Plenty provided normal precautions for navigating in such an environment are followed. No ongoing requirement for an exclusion zone for navigational safety is considered necessary."

3.6.4 The argument being made within the Drake Report is that the cut-down wreck, even at -1 metre LAT is unlikely to pose any greater a threat to the smaller commercial craft than the existing Astrolabe Reef. However, it is incorrect to state that the wreck at -1 metre LAT poses no danger to navigation for this class of craft. Furthermore, it is unreasonable to compare the reef infrastructure with the remains of a wreck, an immovable rock that has been in this location for millennia cannot be likened to numerous very mobile wreck sections. The recent movement of a large section of the bow, discussed in 3.3.6 above, and debris field, mentioned in 3.3.9 above show how the depths can change which can catch out the unsuspecting boat owner.

3.6.5 It is likely that any possible debris release would occur during bad weather, with the resulting high swells, it is very unlikely that any of the smaller commercial craft that use this area would contemplate leaving harbour let alone traverse the Astrolabe Reef is such conditions.

3.6.6 During the summer months, experience has shown that the swell is rarely below 0.5 metre around the Astrolabe Reef. If the water depth, discussed in *para* 3.3.4 above, is in fact 1.2 metres (at low water), then in combination with a low swell of 0.5 metres there is a risk of smaller commercial craft contacting the wreck sections.

3.6.7 However, it is agreed that the updating of the relevant charts and the promulgation of Notices to Mariners should mitigate the existing low risk.

3.7 Privately Owned Pleasure Craft

3.7.1 The Drake Report discusses at page 17[14], the numerous private pleasure craft that use the Bay of Plenty. The following information is provided:

"The Bay of Plenty attracts a wide range of nautical activity with marinas, boat ramps, boating, yachting, fishing and dive clubs spread along its coast. In Tauranga Harbour alone there are reported to be 25 boat ramps plus two marinas with a combined total of 1,050 berths as well as numerous moored craft."

3.7.2 It is evident from the above that the Bay of Plenty is very popular and widely used by privately owned pleasure craft. Astrolabe Reef, located 14 nautical miles East North East of Tauranga is readily accessible to the majority of these users. Fishing and diving at the reef area have been common pastimes for many years.

3.7.3 The Drake report goes on to advise:

"The Coastguard reports that there have been no calls for assistance or reports from any of their members of any debris from the wreck of the "Rena" causing a concern to navigation safety since at least January

[14] Drake Report, Page 15, Private Pleasure Craft.

2013. Boating and fishing clubs contacted have also reported that their members have raised no issues relating to safety of navigation."

As discussed in *paras* 3.1.4-3.1.7 of this report the above statement is not strictly correct. The debris discussed in these paragraphs is the exact type of debris that would have the potential to cause catastrophic damage to high speed privately owned craft.

3.7.4 Of note is the fact that the Drake Report does not advise whether contact has been made with all fishing/boating clubs or simply a random sample. Also the report fails to advise what questions were asked, if the question was simply regarding whether any of their members had called for emergency assistance, then the answer may well be no. However, if the clubs were asked whether there had been any near-miss incidents then the answers may have been different.

3.7.5 The typical private boat owner is not as likely to be carrying the latest navigation charts and publications and may not have such ready access to the latest Notices to Mariners. Therefore, the mitigation processes discussed in the Drake Report and at para 3.6.7 of this report, may not be as effective as for the other three classes of users of the Bay of Plenty.

3.7.6 The Drake Report summarises the effects on private pleasure craft as follows:

"The completion of the work carried out by salvors in cutting down the forward section of the hull to one metre below LAT and the upgrading of local charts identifying the wreck, ensures there is no danger to navigation to private pleasure craft in carrying out their normal activities in the Bay of Plenty provided normal precautions for navigating in such an environment are followed. No ongoing requirement for an exclusion zone for navigational safety is considered necessary."

I am not in agreement with this summary paragraph. This statement assumes that private pleasure craft owners will have access to both the latest navigation charts and to Notices to Mariners. Of all four of the groups of vessels considered in the Drake Report, this group is the one most likely not to have such access. Furthermore, this class of vessel is the one most likely

to suffer serious damage from impacting floating debris, which may still emanate from the wreck.

3.7.7 As discussed at *para* 3.3.4 and *para* 3.6.6 of this report, it is still unclear to LOC what depth of water exists above the forward wreck sections. This class of vessel is likely to suffer serious damage from potentially impacting the forward wreck sections in any low swell at low tide.

4. CONCLUSIONS

4.1 The assumptions made by the author in respect to the “Navigation Safety Assessment” report in respect to the current state of the wreck reflect the findings of the TMC/RSF report issued in February 2014. The information available to LOC would indicate that that the assumptions made reflect that as contained in the information provided and available.

4.2 The wreck continues to disintegrate and diminish as the activities of the wreck removal contractor are boosted by the actions of the prevailing weather. The TMC/RSF report (February 2014) advises that the highest point of the forward wreck sections is now 3 metres below sea level, however it should be noted that the derivation of this depth is not clearly defined and after the passage of tropical storm LUSI, it was observed that at least one of the bow sections moved upwards and the entanglement hazard of the wire in the debris field had worsened. This indicates that there is movement, potentially creating shallower depths, in times of weather events.

4.3 The actual remaining wreck and known debris field continue to deteriorate. Such deterioration is aligned to what LOC has been advising would happen and with what would be expected of a wreck that has been cut-down to the extent of the RENA.

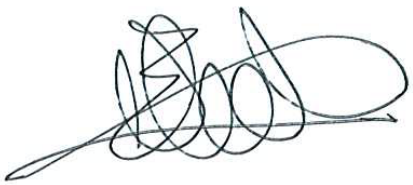
4.4 Upon completion of the existing scope of work proposed by the owners of RENA, the reduced wreck sections will continue to deteriorate. Given time and sea action the forward sections are likely to reduce further and ultimately wash off the reef and move into deeper water. The stern section is likely to continue to deteriorate and reduce beyond the proposed -30 metres level.

4.5 A risk remains at this time from the possibility of the entrapped buoyant material coming loose from the wreck/debris field, due to weather action; however this risk may be at least, partially mitigated by the updating of charts and the promulgation of suitable Notices to Mariners.

4.6 We are of the opinion that upon completion of the scope of work identified within the “Navigation Safety Assessment” the risk to class 1 and 2 vessels as identified in *para* 3.1.2 of this report is minimal and capable of being easily managed.

4.7 However, a small risk remains to both the class 3 and 4 vessels. In particular, the class 4 vessels are the least likely to receive updated charts and Notices to Mariners and the most likely to be damaged by either the wreck or debris.

4.8 Whilst a small risk exists for the smaller craft that are likely to use Astrolabe Reef should the exclusion zone be lifted, it should be stressed that the risk is low. The mitigation measures proposed in the Drake Report will diminish that risk but not negate it in its entirety for the most vulnerable of the four classes of vessels considered in the report, namely the privately owned pleasure craft. However, potential debris release and reduced water depth over the forward wreck sections are likely to occur during bad weather periods, at which time it is unlikely that this class of vessel would consider navigating within the vicinity of Astrolabe Reef.



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Appendix A

Drake Report “Navigation Safety Assessment”

Appendix B

MNZ Salvage SITREP dated 26 April 2013

Appendix C

TMC Report “RENA – Bow Section Survey November 2013”