# Damage to the Waiwhakaiho Reef Caused by the Grounding of the MV Lake Triview

## Introduction

1. I am employed by the Taranaki Regional Council (**TRC**) as Scientific Officer – Marine Ecology. Details of my experience and qualifications are set out in Appendix I.

2. In this report I discuss the following:

   (a) Location of the grounding of the MV Lake Triview on the Waiwhakaiho Reef;

   (b) Nature of the Waiwhakaiho Reef environment with reference to its protection as a surf break of national significance and an important ecosystem and habitat; and

   (c) Damage to the Waiwhakaiho Reef taking into account i) damage to the MV Lake Triview, ii) physical disturbance to the Reef and Surf Break, iii) destruction, damage and disturbance to the Reef ecosystem and habitat and iv) deposition of antifouling paint on the Reef.

3. I have read and agree to comply with the Code of Conduct for Expert Witnesses (Environment Court Consolidated Practice Note 2011). My report is within my area of expertise, except where I state otherwise. I have not omitted to consider material facts known to me that alter or detract from the opinions that I express.

## Location of the Grounding

4. The MV Lake Triview ran aground on the Waiwhakaiho Reef at approximately 9.38 p.m. on 24 May 2014, becoming stuck fast on the Reef. The Ship's Captain ordered the engines full-ahead (full power) and after approximately five minutes the Ship started to move off the Reef.

5. Figure 1 shows the position logs of the MV Lake Triview for 24 May 2014 (yellow circles). It appears that the Vessel grounded on the eastern flank of the Reef structure (Figure 1).

6. Also shown on Figure 1 is the location of the dive survey, undertaken on 28 July 2014

to assess damage to the Reef resulting from grounding of the MV Lake Triview. Unsuitable weather conditions prevented the survey from being undertaken on an earlier date. The survey was carried out by New Plymouth Underwater as instructed by the TRC. During the survey, divers zigzagged from the 'dive start' towards the 'planned finish' (red circles). When the divers came across a concentrated area of damaged reef, the remainder of the dive focussed on that location ('focus area', orange circles).

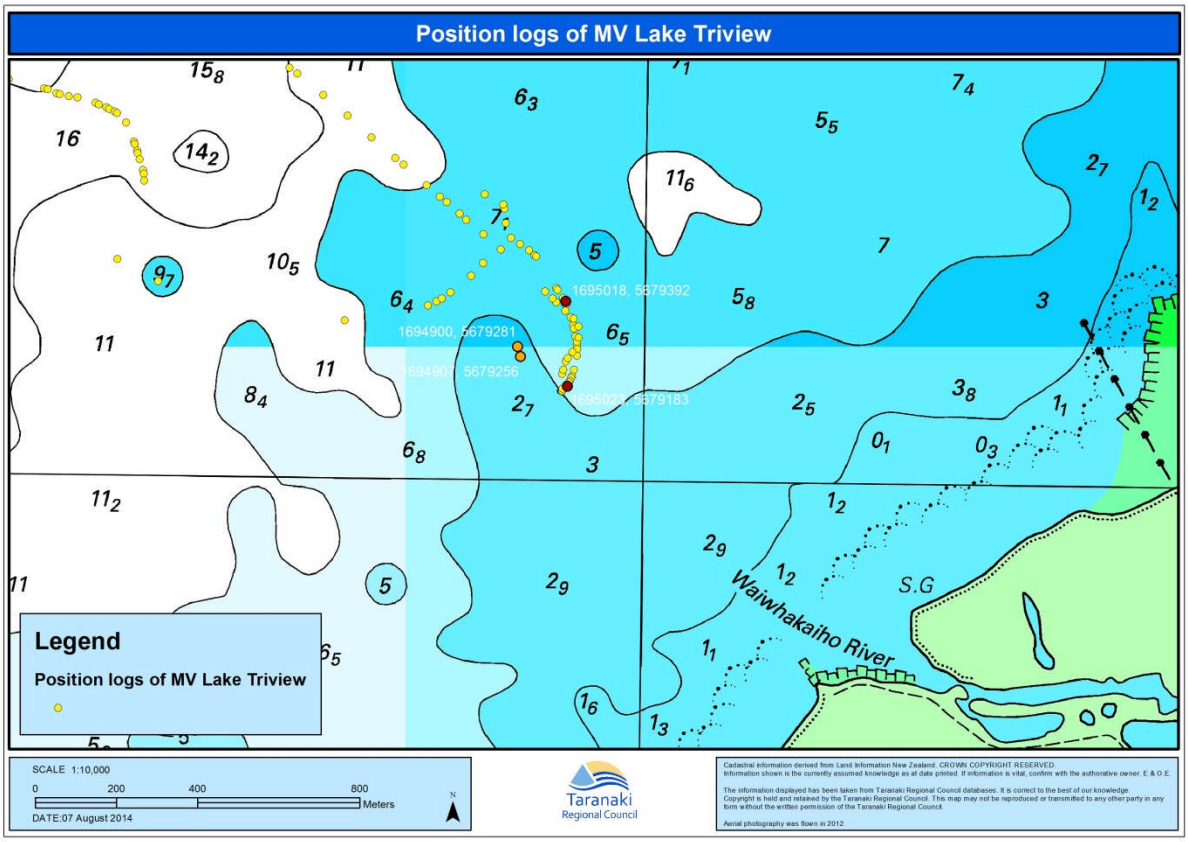


**Figure 1** The Waiwhakaiho Reef showing the position logs of the MV Lake Triview 24 May 2014 (yellow circles) and the location of the dive survey on 28 July 2014 (red circles = dive start and planned finish, orange circles = focus area, see paragraph 6 for further explanation)

## Nature of the Environment: Waiwhakaiho Reef Surf Break

7. The Waiwhakaiho Reef is included in Schedule 1 of the New Zealand Coastal Policy Statement 2010 (**NZCPS**) as a surf break of national significance. In total, 17 surf breaks of national significance are identified in Schedule 1 of the NZCPS.

8. In relation to surf breaks of national significance, Policy 16 of the NZCPS states:

*Protect the surf breaks of national significance for surfing listed in Schedule 1, by:*

*(a) ensuring activities in the coastal environment do not adversely affect the surf breaks; and*

*(b) avoiding adverse effects of other activities on access to, and use and enjoyment of the surf breaks.*

9. The NZCPS includes the following glossary definition for a 'surf break':

> *A natural feature that is comprised of swell, currents, water levels, seabed morphology, and wind. The hydrodynamic character of the ocean (swell, currents and water levels) combines with seabed morphology and winds to give rise to a 'surfable wave'. A surf break includes the 'swell corridor' through which the swell travels, and the morphology of the seabed of that wave corridor, through to the point where waves created by the swell dissipate and become non-surfable.*
>
> *'Swell corridor' means the region offshore of a surf break where ocean swell travels and transforms to a 'surfable wave'.*
>
> *'Surfable wave' means a wave that can be caught and ridden by a surfer.*

10. The surfable wave at Waiwhakaiho forms inshore and to the south east of where the MV Lake Triview ran aground (Photo 1).


**Photo 1** Surfable wave at the Waiwhakaiho Surf Break March 2011

11. Dr Peter McComb (Managing Director, MetOcean Solution Limited) was consulted

to provide expert opinion on the grounding of the MV Lake Triview in relation to the Waiwhakaiho Surf Break (email provided in Appendix II).

12. In his email, Dr McComb explains that the reason for the surf break at Waiwhakaiho is due to the shape of the inshore reef system. The Reef concentrates wave energy through refraction and that energy is subsequently directed toward the break point just east of the river mouth. The protrusion of the 5 metre isobath (shown as a black line on Figure 1, coinciding with the most shoreward position of the Vessel) is directed into the swell direction, which enhances the refraction process. Without this reef shape there would not be the surf quality adjacent to the river mouth.

13. In Dr McComb's opinion the grounding location coincides with the swell corridor for the Waiwhakaiho Surf Break.

## Nature of the Environment: Protection of Rocky Reef Habitats

14. Rocky reefs are recognised as important ecosystems and habitats in both the NZCPS and the Regional Coastal Plan for Taranaki (**RCP**).

15. Policy 11 of the NZCPS states:

*To protect indigenous biological diversity in the coastal environment:*

*…*

*(b) avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on:*

*…*

*(iii) indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh;*

*…*

16. Policy 1.1 of the RCP states:

*Management of the coastal marine area will be carried out in a way that recognises that:*

*…*

*(d) The open coastline:*

…

*(iii) includes reef systems that provide habitat to marine life, and are valued by Maori for kaimoana gathering;*

…

17. The RCP recognises a number of locations in Taranaki as areas of outstanding coastal value.

## Nature of the Environment: the Waiwhakaiho Reef Ecosystem

18. The Waiwhakaiho Reef is protected by the general policies outlined in paragraphs 16 and 17 above but it is not specifically listed as an area of outstanding coastal value in the RCP.

19. The Waiwhakaiho Reef (also referred to as the Rewarewa Reef by tangata whenua) is included as a kaimoana reef in the '*Inventory of Coastal Areas of Local or Regional Significance in the Taranaki Region*' (TRC, 2004).

20. The Waiwhakaiho Reef is known to be a popular site for recreational collection of crayfish. Although other kaimoana species are present on the Reef, including mussels, paua and kina, the close proximity to the New Plymouth Wastewater Treatment Plant Marine Outfall can act as a deterrent to shellfish gathering.

21. Key macroalgae (seaweed) and animal species that comprise the subtidal community of the Waiwhakaiho Reef are listed in Table 1. The species list was generated using information from surveys (including the 28 July 2014 dive survey) and published reports (TCC, 1982; Haggit and McComb, 2005; Miller *et al*., 2013). Table 1 provides an indication of subtidal species typically present on the Waiwhakaiho Reef. Table 1 is not a complete species list, as certain groups of organisms have not been included e.g. bryozoans, hydroids and worms.

22. Marine organisms which are known to occur on subtidal areas of the Waiwhakaiho Reef include various species of sponges (Appendix III Slides 3 to 11), habitat forming macroalgae (kelp *Ecklonia radiata* and sea wrack *Carpophyllum* sp., Appendix III Slides 13 to 15) and species collected for recreational purposes (in particular crayfish).

**Table 1 Key subtidal species of the Waiwhakaiho Reef**

| | Species | | Source of information | | | | |
|---|---|---|---|---|---|---|---|
| | **Latin name** | **Common name** | **[1]Dive survey July 2014** | **[2]TCC (1982)** | **[3]Haggit and McComb (2005)** | **[4]Miller *et al.* (2013)** | **[5]TRC intertidal survey 2014** |
| Macroalgae | *Carpophyllum* sp. | Sea wrack | ✓ | ✓ | | | |
| | *Ecklonia radiata* | Common kelp | ✓ | ✓ | ✓ | ✓ | |
| | *Corallina officinalis* | Coralline turf | | ✓ | | | |
| | *Corallina* sp. | Coralline paint | ✓ | | | ✓ | ✓ |
| | *Ulva* sp. | Sea lettuce | | ✓ | | | ✓ |
| | *Stenogramma interrupta* | - | | ✓ | | | |
| | *Symphyocladia marchantioides* | - | | ✓ | | | |
| | *Scinaia firma* | - | | ✓ | | | |
| Sponges | *Ancorina alata* | Massive grey sponge | ✓ | ✓ | | | |
| | *Iophon minor* | - | | ✓ | | | |
| | *Polymastia* sp. | - | ✓ | ✓ | | | |
| | *Aaptos aaptos* | - | | ✓ | | | |
| | *Tethya aurantium* | Orange golf-ball sponge | ✓ | ✓ | | | |
| | *Tethya ingalli* | Pink golf-ball sponge | ✓ | ✓ | | | |
| | *Cliona celata* | - | [6]? | ✓ | | | |
| | *Haliclona sabulosa* | - | | ✓ | | | |
| | *Microciona coccinea* | - | | ✓ | | | |
| Anemones | *Actinothoe albocincta* | - | | ✓ | | | |
| | *Phlyctenactis tuberculosa* | Wandering anemone | ✓ | | | | |
| Crustaceans | *Jasus edwardsii* | Crayfish | | ✓ | | ✓ | |
| Chitons | *Eudoxochiton nobilis* | Noble chiton | ✓ | ✓ | | | |
| Snails | *Cookia sulcata* | Cook's turban shell | ✓ | ✓ | | ✓ | |
| | *Maurea tigris* | Tiger maurea | | ✓ | | | |
| | *Trochus viridis* | Green top shell | | ✓ | | ✓ | |
| Paua | *Haliotis iris* | Black-foot paua | | | | | ✓ |
| Mussel | *Perna canaliculus* | Green-lipped mussel | | | | | ✓ |
| Urchin | *Evechinus chloroticus* | Kina | ✓ | ✓ | ✓ | ✓ | ✓ |
| Starfish | *Coscinasterias* | Eleven-armed | | ✓ | | | ✓ |

| | Species | | Source of information | | | | |
|---|---|---|---|---|---|---|---|
| | **Latin name** | **Common name** | **[1]Dive survey July 2014** | **[2]TCC (1982)** | **[3]Haggit and McComb (2005)** | **[4]Miller *et al.* (2013)** | **[5]TRC intertidal survey 2014** |
| | *calamaria* | sea star | | | | | |
| | *Stegnaster inflatus* | New Zealand cushion star | ✓ | ✓ | | | ✓ |
| | *Patiriella regularis* | Common cushion star | ✓ | ✓ | | | ✓ |
| | *Stichaster australis* | Reef star | ✓ | ✓ | | | ✓ |
| Brittle star | *Ophionereis fasciata* | - | | ✓ | | | |
| Sea squirts | *Aplidium phortax* | - | | ✓ | | | |
| | *Didemnum candidum* | | | ✓ | | | |

*[1]Dive survey conducted as part of the MV Lake Triview investigation July 2014.*

*[2]Taranaki Catchment Commission report (TCC, 1982) which includes results from a subtidal survey of the Waiwhakaiho Reef undertaken by divers along five transects in 1982.*

*[3]Report prepared by ASR Limited for Shell Todd Oil Services Limited (Haggit and McComb, 2005) which documents the presence of kelp (Ecklonia radiata) and kina (Evechinus chloroticus) on subtidal areas of the Waiwhakaiho Reef between 2003 and 2005.*

*[4]Department of Conservation report (Miller et al., 2013) includes species abundance data on crayfish (Jasus edwardsii), kina (Evechinus chloroticus), Cook's turban shell (Cookia sulcata) and kelp (Ecklonia radiata) at site NPII on the Waiwhakaiho Reef between 2001 and 2003.*

*[5]Observations made by TRC staff, including myself, on the lower intertidal zone of the Waiwhakaiho Reef January 2014 (photographs available).*

*[6]A number of unidentified encrusting sponge species were observed during the dive survey (Appendix III).*

## Disturbance and Damage: Evidence from the MV Lake Triview

23. Damage to the hull of the vessel resulting from grounding on the Waiwhakaiho Reef is shown in Slides 16 to 18 of Appendix III (photos obtained from New Zealand Diving and Salvage Limited). Additional photos showing further damage and scraping of the hull are at Tab 1 of the Summary of Facts.

24. In Slides 17 and 18 of Appendix III it can be seen that macroalgae (*Carpophyllum* sp.) was scoured off the Reef and lodged in the damaged vessel. Slide 19 shows that macroalgae (*Carpophyllum* sp.) and rocks with associated tube worms and encrusting algae became displaced, ending up inside the vessel as a result of the grounding (see also Appendix III, Slides 20 and 21). In my opinion, Slides 17 to 21 of Appendix III are evidence of disturbance and damage to the Waiwhakaiho Reef and associated

communities in contravention of sections 12(1)(c) and 12(1)(e) of the Resource Management Act 1991 (**RMA**).

## Physical Disturbance to the Reef: Evidence from the Dive Survey

25. I have used the words "disturb" and "disturbance" in paragraphs 26 to 29 because the verb in section 12(1)(c) of the RMA is "disturb".

26. Photos taken during the dive survey of the Waiwhakaiho Reef on 28 July 2014 provide evidence of the physical disturbance to the Reef resulting from the grounding of the MV Lake Triview (Appendix III Slides 22 to 31). Numerous boulders and rocks were damaged, smashed and, in some cases, destroyed. These photos provide evidence of disturbance to the Waiwhakaiho Reef in contravention of section 12(1)(c) of the RMA.

27. The full extent/area of the disturbance was not assessed during the dive survey. However, disturbance was documented along a 25 metre long section of the Reef, the location of which is shown in Figure 1 (orange circles) and Appendix III Slides 1 and 2.

28. The location of the disturbance coincides with the protrusion of the inshore reef system (Figure 1) described by Dr McComb as the structure responsible for producing the surf quality at the Waiwhakaiho Surf Break (Appendix II). This location also occurs within the swell corridor for the Surf Break (Appendix II).

29. It is not known if changes to seabed morphology resulting from the grounding of the MV Lake Triview have affected surf quality at the Waiwhakaiho Surf Break.

## Damage to the Reef Ecosystem: Evidence from the Dive Survey

30. The verbs in section 12(1)(e) of the RMA are " destroy, damage, or disturb". The photos I refer to below provide evidence of destruction, damage and disturbance to the Waiwhakaiho Reef ecosystem in contravention of section 12(1)(e) of the RMA.

31. Photos taken during the dive survey of the Reef on 28 July 2014 (Appendix III Slides

32 to 48) show that the boulders damaged by the MV Lake Triview provided habitat for a range of different encrusting animals (including sponges, hydroids, bryozoans, chitons and tubeworms), motile animals (including kina, starfish and snails), encrusting algae (including coralline algae) and habitat-forming macroalgae (including kelp and sea wrack). The photos provide evidence that the seabed was destroyed, damaged and disturbed by the grounding of the Vessel in a manner that had an adverse effect on the organisms and their habitat in contravention of section 12(1)(e) of the RMA.

32. Damaged sections of the Reef might be recolonised relatively quickly (within a year) by certain animals e.g. motile species and tube worms. However, other species will be slow to recover with implications for reef biodiversity. Sponges, in particular, are slow growing and long-lived (Morton, 2004). The Waiwhakaiho Reef provides habitat for a diverse range of sponges including massive, globular and encrusting species (Table 1, Appendix III Slides 3 to 11). During the dive survey many sponges were observed close to and on damaged boulders (Slides 32 to 37).

33. Photos of the Waiwhakaiho Reef (Appendix III Slides 38 to 48) provide evidence that macroalgal communities, mainly sea wrack *Carpophyllum* sp., were damaged and disturbed by the grounding of the Vessel. Reef macroalgae, including sea wrack *Carpophyllum* sp. and kelp *Ecklonia radiata*, provide both food and habitat for other organisms living on the Reef (Haggit and McComb, 2005; Shiel and Lilley, 2011). Removal of the dominant habitat-forming species of macroalgae from a reef can result in pronounced negative changes in diversity and community structure (Lilley and Shiel, 2006; Shiel and Lilley, 2011).

## Deposition of Antifouling Paint: Evidence from the Dive Survey

34. Scouring of the MV Lake Triview on the Reef resulted in deposition of antifouling paint on boulders in contravention of section 12(1)(d) of the RMA. During the dive survey antifouling paint was observed on damaged boulders (Appendix III Slides 49 to 56) and numerous paint chips were collected (Appendix III Slides 51 to 53). Although the presence of antifouling paint on the Reef may impede the growth of encrusting animals and algae, any toxic effects of the paint are likely to be highly localised.

## Oil Spill: Near Miss

35. Given the damage sustained to the hull of the MV Lake Triview and boulders of the Waiwhakaiho Reef, it is apparent that the grounding was a near miss event in terms of damage to the heavy fuel oil tanks with potential for a significant oil spill.

36. If an oil spill had occurred as a result of the grounding of the MV Lake Triview it is likely that, due to the predominant currents in the area (Weppe *et al*., 2012), the majority of oil would have been transported in a northeast direction along the coast, potentially impacting the Mangati/Te Whioa Reef (3 kilometres to the northeast). This reef is recognised as a popular site for recreational shellfish collection and to tangata whenua for kaimoana harvesting (TRC, 2004).

37. Other coastal areas of significance (TRC, 2004) which could have been potentially impacted by an oil spill include Fitzroy and East End Beaches (popular beaches for recreation less than 2 kilometres to the southwest), Kaweroa Reef (diverse rocky reef and significant kaimoana harvesting area approximately 4 kilometres to the southwest) and the Sugar Loaf Islands Marine Protected Area and Marine Park (recognised in the RCP as an area of outstanding coastal value approximately 7 kilometres to the west/southwest).

38. A number of threatened species, some of which are considered nationally critical e.g. Maui's dolphin *Cephalorhynchus hectori maui* and killer whale *Orcinus orca*, have been reported to occur in the area (Taranaki Biodiversity Forum Accord, 2012). Northern little blue penguins, considered at risk declining, are known to nest nearby (Taranaki Biodiversity Forum Accord, 2012).

## Summary of Damage

39. Photos of the MV Lake Triview, which show macroalgae lodged in the side of the damaged hull and reef boulders with attached macroalgae and animals inside the Vessel, provide evidence of disturbance and damage to the Waiwhakaiho Reef and associated communities in contravention of sections 12(1)(c) and 12(1)(e) of the RMA.

40. Photos taken during a dive survey of the Waiwhakaiho Reef on 28 July 2014 provide

evidence of the physical disturbance to the Reef in contravention of section 12(1)(c) of the RMA. The Waiwhakaiho Reef is included in Schedule 1 of the NZCPS as a surf break of national significance. The area disturbed by the grounding of the MV Lake Triview occurs within the swell corridor for the Surf Break. The location of the disturbance also coincides with the protrusion of the inshore reef system described by Dr McComb as the structure responsible for producing the surf quality at the Waiwhakaiho Surf Break. It is not known if changes to seabed morphology resulting from the grounding of the MV Lake Triview have affected surf quality at the Surf Break.

41. Rocky reefs are recognised as important ecosystems and habitats in both the NZCPS and the RCP. Photos taken during the dive survey of the Waiwhakaiho Reef on 28 July 2014 provide evidence that the boulders damaged by the MV Lake Triview provided habitat for a range of different encrusting animals, motile animals, encrusting algae and habitat-forming macroalgae. These organisms will have been destroyed, damaged and disturbed by the grounding of the Vessel, in contravention of section 12(1)(e) of the RMA.

42. The Waiwhakaiho Reef provides habitat for a diverse range of sponge species. As sponges are slow-growing and long-lived, sponge communities will be slow to recover following the damage resulting from the grounding of the MV Lake Triview, with implications for Reef biodiversity.

43. Photos of the MV Lake Triview and the Reef provide evidence that macroalgae, mainly sea wrack *Carpophyllum* sp., was damaged and disturbed by the grounding of the Vessel. Removal of the dominant habitat-forming species of macroalgae from sections of the Reef could potentially affect Reef diversity and community structure.

44. Photos taken during the dive survey of the Reef on 28 July 2014 provide evidence that scouring of the MV Lake Triview on the Reef resulted in deposition of antifouling paint on boulders in contravention of section 12(1)(d) of the RMA. Although the presence of antifouling paint on the Reef may impede the growth of encrusting animals and algae, any toxic effects of the paint are likely to be highly localised.

45. A number of threatened species, some of which are considered nationally critical e.g.

Maui's dolphin and killer whale have been reported to occur in the area and could have been significantly impacted if an oil spill had occurred as a result of damage sustained to the hull and heavy fuel oil tanks of the MV Lake Triview. Coastal areas of significance could have been affected by a spill including reefs valued for the collection of kaimoana (Mangati and Kaweroa Reefs), popular beaches for recreation (Fitzroy and East End Beaches) and an area of outstanding coastal value (the Sugar Loaf Islands Marine Protected Area).

Dr Emily Clare Roberts
Scientific Officer – Marine Ecology
21 October 2014

# References


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Taranaki Catchment Commission (1982) Waiwakaiho Water Resource Investigations.

Taranaki Regional Council (2004) Inventory of coastal areas of local or regional significance in the Taranaki Region.

Weppe, S., Oldman, J. and McComb, P. (2012) New Plymouth wastewater outfall virus dispersal modelling. Report prepared by Met Ocean Solutions Limited for New Plymouth District Council

# Appendix I

Experience & Qualifications

My full name is Emily Clare Roberts. I hold a doctorate in Aquatic Microbiology from the University of Nottingham (1999) and a BSc with First Class Honours in Marine Biology from the University of Wales Bangor (1995). My current position is Scientific Officer-Marine Ecologist at the Taranaki Regional Council (2 years). Prior to this I was employed as a Marine Biology Lecturer at Swansea University (10 years). I have published more than 30 peer-reviewed papers in scientific journals on the subject of marine and freshwater biology. I have previously been a member of the Peer Review College for the Natural Environment Research Council UK (3 years) providing assessment, advice and guidance for grant review panels.

# Appendix II

**Emily Roberts**

**From:** Peter McComb <p.mccomb@metocean.co.nz>
**Sent:** Tuesday, 17 June 2014 8:15 PM
**To:** Emily Roberts
**Subject:** Waiwhakaiho Reef vessel grounding
**Attachments:** Grounding_log.kml

Dear Emily,

I have processed the position logs of the Lake Triview and attach them here as a Google Earth file, plus as an image below. The trajectory of the drifting vessel takes it directly over the Waiwakaiho Reef, and the location where the vessel grounded appears to be on the eastern flank of the reef structure. The surf break at Waiwakaiho lies inshore and to the SE of this location.

The reason there is a surf break at Waiwakaiho is due to the shape of this offshore reef system. The reef concentrates wave energy through refraction and that energy is subsequently directed toward the break point just east of the river mouth. Note the protrusion of the 5 m isobath (circled in red) is directed into the swell direction, which enhances the refraction process. Without this reef shape there would not be the surf quality adjacent to the river mouth. In my opinion the grounding location coincides with the swell corridor for the surf break.

We have undertaken several research projects in this area, including sidescan sonar, camera images, benthic ecology experiments and multi-beam survey. These can be made available to the council if required.

Kind regards

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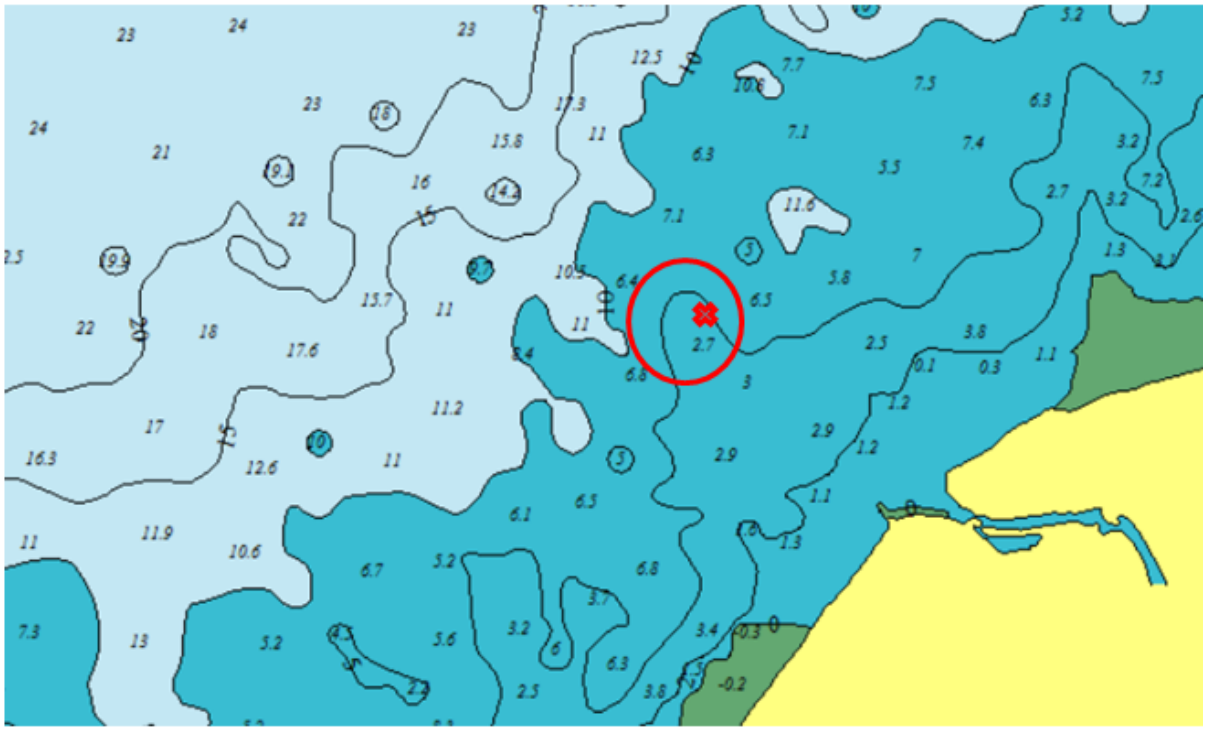
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