

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of an application by Kaipara Ltd for coastal permits to extract sand from the coastal marine area offshore at Pakiri (CST60343373)

**STATEMENT OF EVIDENCE OF DR SHAW MEAD ON BEHALF OF DAMON CLAPSHAW
(COASTAL OCEANOGRAPHY)**

21 February 2021

1. EXECUTIVE SUMMARY

- 1.1** My evidence presents the findings of investigations into the operation and regulation of the current offshore dredging consents and the sea floor impacts of repeatedly dredging the same shore-parallel dredge lines.
- 1.2** A large number of on-water consent breaches have been identified (i.e., dredging outside of the consented areas), as well as reporting type breaches of consent conditions; the exact extent of them is unknown, they are thought to be significant in number.
- 1.3** Repeatedly dredging the same shore-parallel dredge lines has been identified as the cause and persistence of multiple lines of trenches over 1 m deep, with some parts of the features surveyed >2.5 m deep. These features have been found to be persistent for at least 18 months, and have very likely resulted in negative environmental impacts to the sediment transport processes within the Mangawhai-Pakiri embayment.
- 1.4** It is very likely that these deep trenches capture shoreward moving sediment during large storm events and during any period when wave orbitals have sufficient velocity to lift sediment off the seabed for even very short periods of time (i.e. seabed creep). However, this material is then dredged from the trenches/sediment traps and the process of diabathic sediment transport is interrupted and/or stopped altogether.
- 1.5** Based on the applicant's evidence and missing reports, the extent of the consent breaches and impacts on the sea floor during the dredging practice of repeatedly dredging the same line presented in this evidence were not known by the consenting authority. This is in part due to the inadequacy of the existing conditions pertaining to physical monitoring and effects and how the conditions of the consents have been regulated.
- 1.6** As a result, very little has been learnt with respect to the impacts and sustainable management of the offshore dredging activity in the past 2 decades. As a consequence, the proposed conditions for the application do not address the issues identified with respect to consent breaches and dredging practices (since they were unknown), and seem to be less robust than the previous conditions (e.g. no sea floor imaging, single sites for the collection of monitoring).

2. QUALIFICATIONS AND EXPERIENCE

- 2.1** My name is Dr Shaw Trevor Mead. I am an Environmental Scientist and the Managing Director of eCoast based at Raglan, which is a marine consulting and research organisation.
- 2.2** I hold BSc (School of Biological Sciences) and MSc (Hons) (School of Environmental and Marine Sciences) degrees from the University of Auckland, and a PhD degree from the University of Waikato (Earth Sciences).
- 2.3** I have over 25 years' experience in marine research and consulting, have authored/co-authored 60 peer-reviewed scientific papers and two chapters in a practitioner's textbook on beach management¹ and surf science/coastal protection², and have solely or jointly produced over 500 technical reports pertaining to coastal oceanography, coastal engineering (design and impact assessments), marine ecology and aquaculture. I have also prepared over 70 expert witness statements and reports to support expert evidence for Resource Consent Hearings, Environment Court, High Court and the EPA. I have undertaken over two thousand research and consulting SCUBA dives around the coast of New Zealand and overseas, and have led many comprehensive field investigations that have addressed metocean, biological and chemical components of the coastal environment. I am also a part-time lecturer (environmental change and coastal engineering) and research provider at Unitec. I am a member of the New Zealand Coastal Society (ENZ), the New Zealand Association of Impact Assessment, and am on the editorial board of the Journal of Coastal Conservation, Planning and Management. In addition, I am a technical advisor for the Surfbreak Protection Society (NZ) and Save the Waves Coalition, which mostly entails consideration of marine structures and developments and the impacts they will have or have had on surfing breaks; I am co-author of the New Zealand Management Guidelines for Surfing Resources³, which were first released in beta version in October 2018 and finalised in

¹ Mead S. T., 2017. *Chapter 6 - Beach Management*. In: *Marine and Coastal Resource Management: Principles and Practices*. Eds D. Green and J. Payne. Routledge, 328 pg.

² Mead S. T., and J. C. Borrero, 2017. *Chapter 16 - Surf Science and Multi-Purpose Reefs*. In: *Marine and Coastal Resource Management: Principles and Practise*. Eds D. Green and J. Payne. Routledge, 328 pg.

³ Atkin, E., Bryan, K., Hume, T., Mead, S. T., and Waiti, J., 2019. *Management Guidelines for Surfing Resources*. Raglan, Aotearoa New Zealand: Aotearoa New Zealand Association for Surfing Research. ISBN: 978-0-473-49540-4. https://surfbreakresearch.org/wp-content/uploads/Management_Guidelines_for_Surfing_Resources.pdf

September 2019 (<https://surfbreakresearch.org/downloads/>), and also and board member of the Aotearoa New Zealand Association for Surfing Research (ANZASR) and the International Association of Surfing Research (IASR)

- 2.4** I have a background in coastal oceanography, numerical modelling, marine ecology and aquaculture. I studied for my MSc degree at the University of Auckland's Leigh Marine Laboratory, undertaking subtidal research there from 1994 to 1996 directed at the fertilisation success of sea urchins as a basis for the sustainable management and development of the commercial market. My MSc in Environmental Science, Marine Ecology and Aquaculture included 4th year Environmental Law and a dissertation on the Quota Management System (QMS) legislative review. My PhD was primarily in coastal oceanography and surf science, with the marine ecological components of my Doctorate directed towards subtidal habitat enhancement of marine structures. The physical oceanography component was focussed on understanding the effects of coastal bathymetry on surfing wave breaking characteristics using field measurements (bathymetry surveys, aerial photography and GPS positioning of in situ data collection) and hydrodynamic numerical modelling. My PhD thesis is comprised of 6 peer-reviewed Journal Papers that describe the meso-scale components that combine to create high-quality surfing breaks and empirical methods of determining wave breaking intensity of high-quality surfing waves.
- 2.5** My professional career has included involvement in a wide range of coastal consulting and research projects that have included the design of coastal structures and developments, and assessments and monitoring of physical and ecological effects of marine construction, MPR design and surf break impact assessment, design of inland surf pools and wave generators, coastal erosion control, marine reserves, dredging, outfalls, oil industry, aquaculture ventures and various other coastal and estuarine projects that have included hydrodynamic (waves and currents), sediment transport and dispersion modelling (including contaminants, suspended sediments, freshwater, hypersaline water, nutrients and petro-chemicals).
- 2.6** Further to this, with direct relevance to the present case, I am familiar with the science and research undertaken by NIWA in the mid to late 1990's for the existing resource consent, during which time I was undertaking my PhD at NIWA/the University of Waikato and was also involved with the assessment of ecological impacts of the

proposed activity at the time. I am also very familiar with the area of interest, having spent a great deal of time at the beaches and surf breaks within the Mangawhai-Pakiri embayment between the mid-1970's and late 1990's; the latter period when I was based at the Goat Island marine laboratory. With respect to the impacts of dredging, collection of oceanographic data and sediment transport, my following experience is of relevance:

- I have been involved with consideration of the impacts of dredging (physical and ecological) for the Northport channel deepening and disposal application, Lyttleton Port channel deepening and disposal application, Chatham Rise deepsea phosphate mining, South Taranaki Bight iron ore mining, Centerport channel deepening, Port Otago channel deepening and disposal, Tauranga Harbour channel deepening, large scale dredging and disposal in Vietnam and several other dredging related studies/applications in Austrasia and the South Pacific Islands.
- I have undertaken a large number of seabed surveys (>150) up to 200 m deep and incorporating intertidal areas (latterly with the application of RTK-GPS enabled drones), underwater mapping surveys over 10's to 100's of square kilometres using remote techniques (e.g. drop-cameras, grab-samplers video-sleds underwater drones, side-scan sonar, bathymetry, physical and chemical properties, etc.) to consider existing biological and physical environments for consideration of dredging (e.g. Tawara lagoon climate change resilience programme in Kiribati; Nasese Waters dredging in Suva Harbour) the selection of marine protected areas, for numerical modelling purposes and a range environmental impact assessments.
- I have undertaken and led a large number of sediment transport modelling studies that have considered bay/harbour wide processes and impacts (e.g. Mahurangi and Puhio estuaries and sediment impacts due to the construction of the Puhio-Warkworth highway of national significance; Savusavu Bay (Fiji) super-yacht marina design and impact modelling; morphological modelling of the Motueka spit/harbour/island system) down to the impacts of small structures on sediment transport due to wave/current/structure interactions.

2.7 I confirm that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2014 and to the extent that I am giving expert evidence, have complied with it in preparing this evidence. I confirm that the issues addressed in this evidence are within my area of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in my evidence.

3. SCOPE OF EVIDENCE

3.1 I was retained by Friends of Pakiri Beach (“**FoPB**”) to investigate the current dredging practices in offshore and near-shore areas in the Mangawhai-Pakiri Embayment, to ascertain whether there has been compliance with the conditions of existing resource consents for dredging, to consider the implications of any breaches and to report on any adverse effects of the dredging practices.

3.2 For that purpose, I worked closely with Mr Damon Clapshaw who was assisting Friends of Pakiri Beach (“**FoPB**”) and me with this analysis. I have been asked by Mr Clapshaw to present the findings of my work in this statement of evidence for the hearing of Kaipara Ltd’s application to renew its consents for the offshore areas within the Embayment.

3.3 I undertook my analysis and investigations in three areas:

- a) Dredging Activities vs Consent Conditions: Mangawhai-Pakiri Embayment, with Rhys McIntosh and Jai Davies-Campbell
- b) Pakiri Sand Extraction Review: Dredge Trench Assessment, with Edward Atkin.
- c) Review of the Mangawhai-Pakiri Dredging Consents and Supporting Science and Data, with Mr Davies-Campbell.

3.4 I have summarised below the key points from this work, including the methods used, the results of the assessments and my conclusions and findings. Reports a and b are attached as Annex 1 and 2.

3.5 While my main focus for this evidence is on the current Kaipara consent and the dredging practices in the offshore area, and the implications arising from that for consideration of the new Kaipara application, there are areas of inevitable overlap with the dredging of the nearshore area not least because both areas are dredged by the same operator and there are aspects that need to be considered more broadly. Throughout Annex 1 and 2 I have focussed on the offshore consent and have endeavoured to avoid any confusion between the nearshore consents and the offshore consent when reference to both is required

3.6 My evidence will cover the following matters:

- a) Summary of my investigations and analysis;
- b) Comments on the applicant's evidence;
- c) Comments on the Section 42A Report;
- d) Conclusions.

For completeness, I note that after I was retained by FoPB and began working with Mr Clapshaw on the work described above, I was approached by Kaipara Limited as applicant and requested to provide advice on any implications of the offshore dredging on the surf breaks at Pakiri. I consulted Kaipara Ltd, FoPB, and the Surfbreak Protection Society on that matter and it was agreed that as this was not an effect of concern to them in relation to dredging in the offshore area, I could provide that separate advice to the applicant. Of note, I undertook the surfbreak impact assessment for offshore dredging in August 2020, while the investigations for FOPB were only very recently completed. Even so, the recent findings do not result in any changes to the surfbreak assessment. In the assessment and my evidence addressing surfbreak impacts, I note that the effects of reflection/refraction/diffraction of waves due to the creation of >1.0 m shore-parallel channels within the Mangawhai-Pakiri embayment have not been investigated in detail. However, my assessment of these features with sole respect to surfbreak impacts concludes that due to the depth of the channels (i.e., >1.0 m) and the relative depth that the channel(s) could occur (i.e. 25 to 40 m deep), means that the reflective impacts are likely to be relatively small.

4. SUMMARY OF MY INVESTIGATIONS AND ANALYSES

4.1 As stated above, I have undertaken 3 investigations into the science, dredging practices, conditions of dredging and physical impacts of dredging in the Mangawhai-Pakiri embayment. From these investigations, I have several concerns with respect to how the offshore dredging license has been operated with respect to both the physical practise of dredging and compliance with the conditions of the offshore consents, as well as how these 2 aspects have been managed by the consenting authority. These issues are of concern in terms of environmental impacts, and cast uncertainty onto how future extraction will be operated and managed to prevent negative impacts to the beaches of the Mangawhai-Pakiri embayment.

4.2 The conditions of consents were developed to minimise, mitigate and adaptively manage any adverse environmental impacts, which requires the consenting authority to be engaged in the review and management of the various monitoring protocols (e.g. the automatic identification system (AIS)) and reports in order to ensure that the conditions are being met and/or to determine whether or not other aspects of conditions need to come into play in order to protect the environment (e.g. second tier monitoring if dredging results in deepening that exceeds 1.5 m)). My investigations have found that there have been multiple breaches to conditions, the monitoring conditions that were put in place were ineffective and should have been modified well in advance of the expiry of the existing consent, and that the consenting authority has not managed these critical components of environmental management effectively. It would be expected that after exercising these consents over the past two decades that a great deal of information would have been gathered and all parties (the applicant, the Council, FOPB and others) would be in a better position for future decision-making and the impacts of offshore dredging. However, it is my opinion that at present that is not the case.

Breaches of Conditions of Consent

4.3 The Friends of Pakiri Beach (FoPB) and Mr Clapshaw were concerned that the manner in which the dredging is being conducted has not only been breaching consent conditions, but also is creating damaging environmental effects for the medium to long term future of Pakiri Beach. A significant amount of information is available to consider

consent breaches in terms of where dredging is undertaken, such as the AIS data and monitoring reports. As part of our investigations, best efforts were made to compile this information, and these data were reviewed in relation to the conditions of consent. The conditions of consent with respect to environmental monitoring are appended below as Annex 1 for easy reference (see Annex 1, Section 2, pages 5-13). Please note when reviewing Annex 1 (and Annex 2) that our investigations included review of both offshore and nearshore dredging consents, but for this hearing I focus on the offshore consent.

4.4 FOPB had made multiple observations of the dredging practices of dredging vessels working in the Mangawhai-Pakiri embayment, and concluded that there were numerous poor dredging practices, such as dredging single-line trenches instead of utilising more of the available dredge areas, dredging multiple times in quick succession or for multiple consecutive weeks. I, with the assistance of my associates, independently reviewed AIS data and monitoring reports to determine the extent of FOPB's concerns and whether their conclusions were valid. Breaches of both offshore (OS) and nearshore (NS) consent conditions were identified by FoPB and confirmed by our investigations, being both on-water breaches (i.e. dredging outside of permitted zones) and reporting breaches (detailed in Annex 1). In order to consider on-water breaches, it was assumed that when the vessel is moving at less than 3 knots (determined from the AIS), dredging is underway – as described in Mr Riddell's evidence in his Paragraph 46. With respect to breaches concerning reporting for Consent Conditions and the EMMP's, this can only be based on the reports that have been located by FOPB and from the Auckland Council.

4.5 Upon analysis of the manner of dredging by McCallum Bros Limited (MBL) vessels, under both the Kaipara Limited OS consent and their NS consent (Annex 1), we concluded that there have been numerous breaches of both consents' conditions. These dredging practices and breaches of consent conditions have resulted in negative environmental impacts, which I discuss further below in relation to Annex 2 of my evidence.

4.6 The repeat side sonar scan (SSS) surveys of 20 February 2019 and 31 August 2020 of the approximately 2.6 km long a shore-parallel dredge run (some 2.5 km offshore) identified by the AIS data (see Annex 2, Figure 3.2 page 4 and Figure 6.1 page 32)

found that these dredging trench features collocate over an 18-month period. The persistence of these features is clearly demonstrated in Figure 4.3 (Annex 2, page 8), which is contrary to the commonly held belief that they are filled during large storms and the effect of sand extraction on bathymetry will be minor. It is very likely that these deep trenches capture shoreward moving sediment during large storm events and during any period when wave orbitals have sufficient velocity to lift sediment off the seabed for even very short periods of time (i.e. seabed creep). However, this material is then dredged from the trenches/sediment traps and the process of diabathic sediment transport is interrupted and/or stopped altogether.

4.7 The most obvious on-water breaches of consent identified in the analysis are the regular dredges outside of the permitted OS areas (Annex 1, Special Condition 2 (page 5) and EMMP Area 2 Restriction on Sand Extraction Area 1 (page 11)). There were 50 OS breaches in 2020, which equates to 1 breach every week on average. The analysis of the random months of OS dredging show that on average MBL vessels breach the OS consent once every voyage. The AIS vessel tracks displayed in the Figures in Section 4 of Annex 1 show that in the example month of June 2020 several OS dredges within 2 km of the mean high water spring level, as well as dredging incursions over the Auckland/Northland boundary (Figure 1). Other examples of dredging ~1.8 km offshore are also presented in Section 4 of Annex 1.



Figure 1. Example of area boundary and territorial boundary breaches.

- 4.8** The other aspect of breaches of conditions are related to the nature of monitoring reports and surveys required by the OS consent, including the second tier monitoring which should have been triggered based on the depth of the dredge trenches that are present (Annex 2). As noted above, unlike the AIS data that can be analysed for exact locations and positions, there is some uncertainty as to what reports have and have not been produced for the conditions of consent and the EMMPs due to obtaining these reports, although it is acknowledged by the Auckland Council that some reports are missing. Our review of the reports that we were able to obtain found that some required reports were missing, others were uninterpretable or incomplete and some of the monitoring was flawed from the outset, which should have been remedied (e.g. the repeat bathymetry surveys), while information that would have led to changes to environmentally damaging dredging practices was not present (i.e. sea floor imaging). This data collection and monitoring is vital to (1) inform key stakeholders on the environmental changes happening within the Mangawhai-Pakiri Embayment, (2) to ensure dredging is being undertaken in an environmentally and legally responsible manner, and (3) allow for adaptive management in order to modify dredging practices if the operation is causing negative environmental effect (e.g. Annex 2). Without this information documenting environmental effects of the activity, there are implications for the management of the embayment due to cumulative impacts in terms of safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and avoiding, remedying, or mitigating any adverse effects of the activities on the environment.
- 4.9** An example of how monitoring has been ineffective, which has been enhanced by reporting failures, and has likely been resulting in adverse effects that as yet remain undetected, is the repeat bathymetric surveys and analysis for monitoring purposes. These have been carried out by 4 different hydrographic surveyors using different equipment, which have resulted in inherent errors both within and between consecutive surveys. As a result, up until recent years, surveys and survey comparisons have been subject to large volumetric errors and are not considered appropriate for providing quantitative comparison for the interpretation of quantities extracted and/or environmental impacts in the OS area. This is compounded by the absence of 'seafloor imaging,' which is also specified to be collected in the conditions and EMMP's; seafloor imagery such as the side-scan sonar as reported in Annex 2 would have identified the persistent shore-parallel trenches and led to further investigations,

which in turn would have identified these features as being >1.5 m deep. This in turn should have resulted in modifications to dredging practice to prevent the formation of multiple shore-parallel sand traps along some 18 km of the embayment greatly reducing or prevent diabathic sediment transport.

Offshore Dredging Practices

- 4.10** FOPB commissioned 2 seabed surveys in Area 1 (in 2019 and 2020) to investigate the impacts of dredging the same lines on multiple occasions, which was initially observed from land and confirmed in AIS data. The methodology, equipment used and the results of repeat side-scan sonar (**SSS**) surveys and bathymetry survey transects across dredge trenches identified by the SSS are attached as Annex 2. These investigations focus on Area 1 (see Annex 2, Figure 3.2 page 4) These investigations have led to the conclusion that it cannot be said that “*best endeavours*” have been applied to extract sand “*no deeper than the thickness of the active sand layer*” (Condition 3 in Annex 1 page 5) when the dredging vessels are repeatedly dredging the same shore-normal lines to depths of 1 to >2.5 m (i.e., well beyond the thickness of the active layer). However, it is noted that Condition 3 also states “*The consent to holder shall use its best endeavours to extract sand by means of smaller deeper extractions rather than large shallow extractions*”, which is somewhat contrary to extracting “*no deeper than the thickness of the active sand layer*”, and makes little sense from the perspective of maintaining active diabathic sediment transport; wide shallow extractions would better serve this purpose. The presence of these features is of concern with respect to the environmental management of the Mangawhai-Pakiri embayment’s sediment system and the supply of offshore sediment to the nearshore.
- 4.11** A combination of SSS and Single Beam Echo Sounder (**SBES**) data was used to identify and characterise dredge trenches made by the operators of the dredging carried out under the existing Kaipara Limited resource consent; these features are in line with AIS data showing repeated shore-parallel dredge runs (see Annex 2, Figure 6.1. page 32). The dredge trenches were identified as distinct shadow zones and areas of sharp contrast (see Annex 2, Figures 4.3 to 4.6, pages 9-18)
- 4.12** The features were also found to collocate with abrupt changes in SBES depths where transects crossed the trenches (see Annex 2, Figures 4.4 to 4.6, pages 9-18). As can

be seen in the Figures, the dredge trenches are in excess of 1.5 m deep in areas that had not been dredged recently. In areas of more recent activity, the dredge trenches were found to be in excess of 2.5 m deep; 8 out of 13 SBES transects were found to be deeper than 1.5 m (see Annex 2, Figures 4.7 to 4.19, pages 19-25). Figure 2 provides some examples of the SSS and SBES surveys in Annex 2. These data confirm that the methodology of offshore dredging the same lines repeatedly results in dredge trenches that are shore parallel and persistent. According to the EMMP (Annex 1, pages 11), these types of seabed effects should have triggered Tier 2 monitoring under the terms of the existing Kaipara Limited resource consent, although to my knowledge Tier 2 monitoring has never occurred since the consent was granted.

- 4.13** The resource consent conditions also require repeat bathymetric surveys and analysis for monitoring purposes of the offshore area. However, these surveys were carried out by different hydrographic surveyors, which have resulted in inherent errors both within and between consecutive surveys. As a result, up until recent years, surveys and survey comparisons have been subject to large volumetric errors and are not considered appropriate for providing quantitative comparison for the interpretation of quantities extracted and/or environmental impacts in the OS area.
- 4.14** In addition to hydrographic surveys (e.g. bathymetric surveys), the EMMP for Area 1 states “*The first tier comprised hydrographic surveys and multi-beam sea floor imaging to determine any significant physical change to the seafloor condition at fixed intervals during dredging in Area 1” (i.e. at the conclusion of the extraction of every 250,000 m³ of sand). However, to the best of my knowledge, other than very coarse interpretation of the seabed conditions, sea floor imaging has not been undertaken, or at least not presented in the specified monitoring or EIA reports. This conclusion is supported by the fact that if sea floor imaging had been carried out, the seabed feature identified in our investigations by both SSS and SBES would have been identified and further investigations would have been initiated to determine the extent of these significant physical changes to the seafloor condition. As was undertaken in 2019 and repeated in 2020, the AIS provides precise locations of where dredging has occurred, and so where sea floor imaging should focus.*

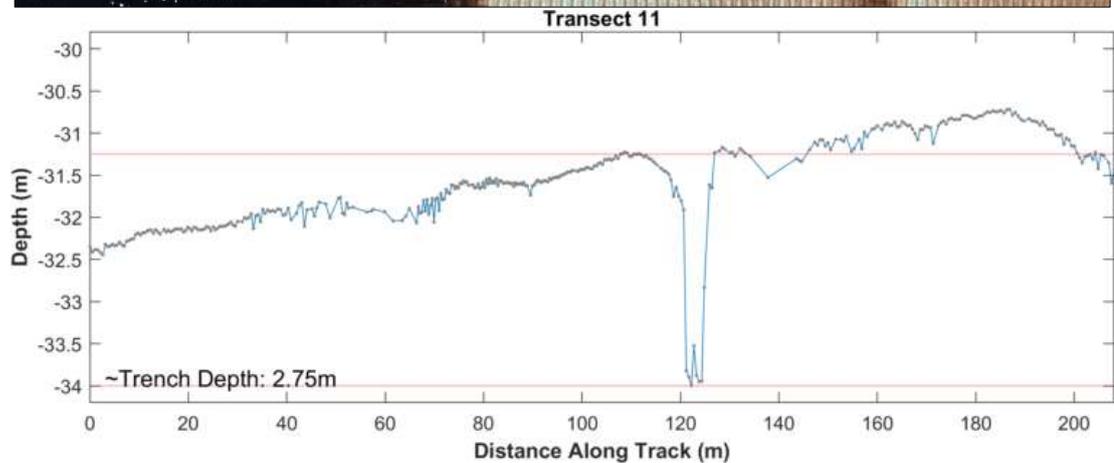
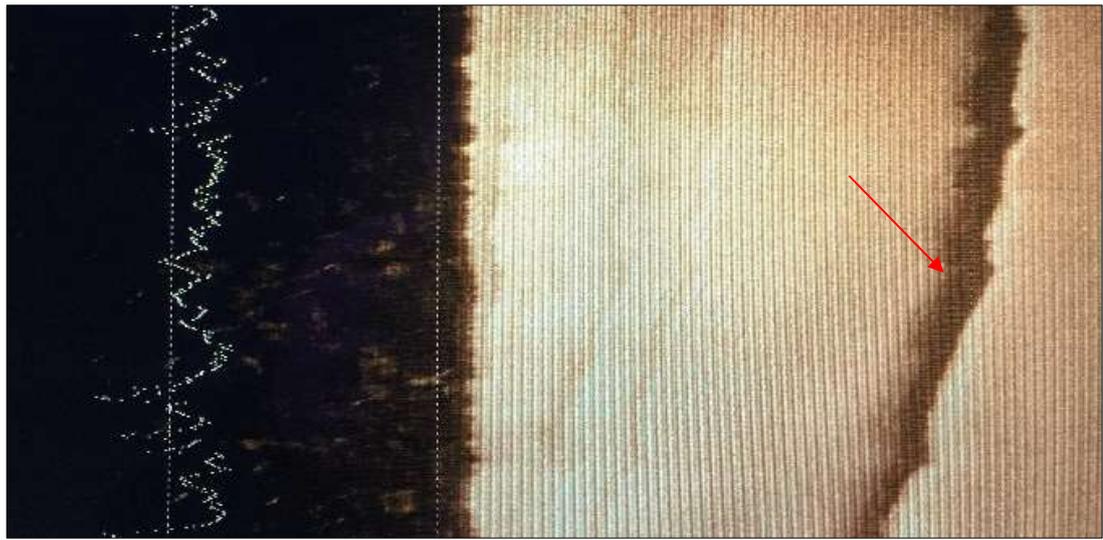
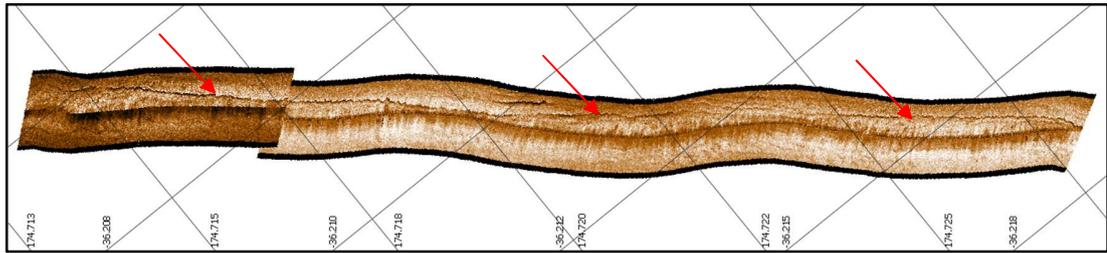


Figure 2. Side scan sonar imaging in Area 1 (top and middle), and bathymetry survey transect across a trench (bottom).

4.15 In addition to not being identified by the monitoring regime, the presence of persistent trenches also very likely interferes with diabathic sediment transport. When sand is mobilised and moving shoreward, these shore-parallel trenches will capture sand and

there are no natural physical mechanisms to resuspend this material until the trenches are almost full and seabed wave orbitals and currents can interact with it.

- 4.16** These findings cast serious doubts on the likelihood that diabathic sediment transport is occurring. The Sand Study concluded that an average of 12,000 m³/yr of offshore sediment moves shoreward past the closure depth 25 m contour (this has been increased in the current nearshore dredging consent application to 76,500 m³/yr). It is very likely that trenches in the offshore area of 1 to >2.5 m depth running shore-parallel for some 18 km along the Mangawhai-Pakiri embayment (~70% of the beach length), is greatly reducing and/or preventing transport of sediment to the beaches. Depending on the source of information, this represents an average yearly deficit to the nearshore of 8,600 m³ (Sand Study) to 57,375 m³ (technical reports supporting the current nearshore dredging consent) resulting in the increasing risk of negative effects to the embayment's beaches over time; capture/loss of between 172,000 and 1,147,500 m³ of sand being transported shoreward in the 20 year duration of the existing consent, and that will double with the new consent.

5. ADEQUACY OF CONDITIONS OF NEW CONSENT

- 5.1** I refer to the conditions set out on Mr Hay's evidence, and the draft EMMP in his Attachment D. An important aspect of the conditions that is unclear, and is also unclear and contradictory in the existing conditions (i.e., Annex 1, condition 3 page 5), is with respect to the physical effects of the dredge head of the William Fraser. I earlier noted in my surfbreak impact assessment that I consider the proposed extraction methodology an improved management regime where dredging is undertaken in thin 'skims' (e.g. <10 cm, rather than repeated dredging of the same area creating deep channels) and there is progressive movement through the proposed extraction area cell by cell (management cells of 1,000 m x 200 m). In addition, a maximum of 40,000 m³/yr can be extracted from any 1,000 m x 200 m cell, giving a maximum extraction depth of 200 mm, averaged over the cell, and the cell must remain un-dredged for the following year if this extraction volume is reached. This methodology should in theory prevent the formation of deep channels/pits/strips and allow for the seabed to recover, which also mitigates the potential negative impacts on diabathic sediment transport due to the creation of deep shore-parallel dredge trenches (i.e. sediment traps). However, there is some uncertainty with respect to what the actual depth of dredge trenches will

be, and in addition, there is not enough detail in the proposed conditions to ensure that dredging of deep trenches (Annex 2) will not occur in the future.

5.2 For example, in Table 5.1. of Annex 2 (page 26) the dredging characteristics of the William Fraser are presented, which it is planned will undertake offshore sand extraction under the new consent (paragraph 46 of Mr Riddell's evidence). In this table, the depth of the extraction trench is 65 cm, which is a lot deeper and not comparable to <10 cm – note, table 5.1 also indicates that the William Fraser depth of extraction trench will be >4x that of the Coastal Carrier. Ms Hart states in her evidence in paragraph 46 that “The extraction is undertaken by a trailing suction hopper dredger. The dredger removes seabed material while sailing, via a trailing suction draghead. As stated in Mr Riddell's evidence, the dredge track is approximately 0.1m deep and 1.6m wide to minimise any effects on the beach and nearshore”, which was also my understanding of the operation. However, as described above, this is at odds with the dredging characteristics of the William Fraser (presented Table 5.1. of Annex 2, page 26).

5.3 The new conditions for the consent currently being applied for do not consider extraction depths with respect to actual impacts of the dredge tracks. Ms Hart states in her evidence in paragraph 49 that “Based on the proposed volume of extraction and extraction limits (refer to paragraph 45), the dredge track depth (refer to paragraph 46), and the results of monitoring to date outlined above, the proposed extraction is expected to result in a small distributed lowering of the seabed, approximately equivalent to the volume extracted and expected to average less than 100mm.” This is the type of dredging ‘impact’ that should be sought by the conditions in order to avoid negative environmental impacts associated with across shore sediment transport. However, it is not clear how the proposed conditions will ensure this is the case.

5.4 Similarly, any requirements for sea floor imaging have been reduced (in comparison to the existing consent conditions) to a single drop-camera record in cells where extraction has occurred and the control area. As clearly demonstrated by the shore-parallel trenches identified in the SSS and SBES surveys described in Annex 2, multiple sediment traps are present in the offshore area of the Mangawhai-Pakiri embayment reducing or completely preventing diabathic sediment transport to the nearshore and beaches. This was not detected because sea floor imagery was not

produced as part of the existing consent conditions and the consenting authority did not enforce these requirements.

5.5 I have similar concerns with respect to benthic ecological monitoring with respect to the level of detail in the conditions, since one sample and/or one location in the cells means very little in inherently randomly dispersed benthic communities; it is unclear from the conditions how many samples will be collected at the single location. A sampling design that shows that the number of samples taken at control and impact sites will be adequate to statistically determine any impacts is required.

5.6 I support Mr Mitchell's statements concerning monitoring, reporting and adaptive management, which incorporate Dr Single's recommendations (paragraphs 31 to 36 of his evidence), should the consent be granted (paragraphs 45 to 48 in Mr Mitchell's evidence). More detail is required, more frequent monitoring, clarification of aspects such as depth of dredge trenches is needed, monitoring connected with the beach system and measures to ensure that the formation of deep shore-parallel trenches also need to be incorporated (e.g. sea floor imaging directed by AIS/DGPS records). Given the presence of the trenches and depending on which science regarding diabathic sediment transport is considered, it is likely that the trenches will have prevented between 172,000 and 1,147,500 m³ of sand being transported shoreward in the past 20 years, and if not well managed, that will double with the new consent.

6. COMMENTS ON THE APPLICANT'S EVIDENCE

6.1 My comments are in reference to the statements that have been made regarding the conditions of the existing consent and effects of the OS dredging that has been undertaken under this consent. I acknowledge that issues with the current consents and associated monitoring have been identified by the applicant and that measures have been put forwards to address these issues. For example, Mr Riddell's evidence paragraphs 92-99, and Mr Hay's statement regarding how the proposed EMMP "builds on the lessons learnt from the implementation of the current consent" (paragraph 29 of his evidence). However, the proposed conditions associated statements in the applicant's evidence lack an awareness of the dredging practices and associated consent breaches, and impacts on the sea floor that have occurred during the past 17 years.

6.2 Due to an assumption that the conditions have been followed and regulated, there is an overall perception that the activity has been undertaken within the consented area, and that there have been no discernible environmental effects (e.g. Mr Riddell's evidence paragraph 10), or that the dredging has been undertaken in a manner resulting in general minimal deepening over the whole or the allowed consenting area and only short term effect (e.g. Ms Hart's evidence paragraph 47 and 53, respectively). This would be the desirable effects of the activity. However, as has been demonstrated by the investigations into the AIS data and monitoring reports (Annex 1) and surveys presented in Annex 2, there have been regular breaches of conditions in terms of where sand has been extracted, and the effects of dredging the same lines over and over again have resulted in significant effect to the seabed and consequently diabathic sediment transport.

6.3 Similarly, Mr West states in his paragraph 4.9 that "It is not currently planned to operate more than one dredge vessel in the sand extraction area at the same time, thus cumulative effects from more than one vessel will not occur, the short duration and small size of the plume means cumulative effects of repeated dredge passages on consecutive days or even within the same day, will not occur." This is clearly not the case at present (Annex 1), and so there is a concern that the current practices will simply be continued if they are implemented as they have been with the current consent, should the current consent application be granted, and the proposed conditions do not address this; with the removal of the requirement for sea floor imaging the effects of repeated dredge passages are also likely to be missed. The same is also the case with Mr Hay's statement in his evidence in paragraph 225; he is not aware of any non-compliance issues, our investigations into operations and the sea floor in Area 1 show this not to be the case.

7. COMMENTS ON THE SECTION 42A REPORT

7.1 The Section 42a report also has statements that are incorrect due to the Council's lack an awareness of the dredging practices and associated breaches, and impacts on the sea floor that have occurred during the past 17 years. For example, "with the monitoring records and survey from the exercise of this consent of particular relevance to establishing the receiving environment and the basis for assessments of the potential effects of the proposal (page 22); Bathymetry surveys beyond the 25m

isobaths DoC carried out by the applicant as part of the monitoring of their existing permit show no significant variance in the seabed levels outside the immediate extraction area, with extraction to date showing results in short term localised depressions, with the longer term effect being reflected in the lowering of the seabed over a large area equal to the volume of sand extracted. (page 24); the compliance records for both the existing permit held by the applicant, and the existing permit held by MBL were checked, and I have been advised that there have been no compliance issues with either consent (page 40)". These statements are not supported by the evidence in Annexes 1 and 2."

8. CONCLUSION

- 8.1** Investigations into the exercise of the current consent for offshore sand extraction indicate that the consent breaches and dredging practices that have occurred have likely negatively impacted in the sediment transport processes within the Mangawhai-Pakiri embayment.
- 8.2** The concern that I presently have is that it will just be 'business as usual' without correctly addressing the management of dredging practices, the adequacy of conditions and the regulation of the activity if they are implemented as they have been with the current consent.
- 8.3** Being involved in the original studies considering the sustainability of offshore dredging in the Mangawhai-Pakiri embayment in the 1990's, and also being involved in the development of parts of the conditions of consent (i.e. marine ecology), as well as in my role as an environmental scientist, I am personally disappointed with how the offshore sand extraction has been practiced and managed since 2003, which has also been a lost opportunity with respect to gaining a better understanding of the potential and actual impacts of the activity so that this learning could be applied to sustainable management of our marine resources.

Dr Shaw T Mead

19 February 2021