BEFORE THE NORTHLAND REGIONAL COUNCIL

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of a resource consent application by The New Zealand Refining Company Limited under section 88 of the RMA to deepen and realign of the Whangarei Harbour entrance and its approaches

APPLICATION APP-037197.01.01

ADDENDUM TO 42A REPORT

GLENN NEIL MORTIMER
NRC REPORTING OFFICER

1.0 Introduction

1.1 This s42A Report addendum is in response to the Hearing Panel's Minute No. 7 issued after the adjournment of the hearing on 14 March 2018. The minute lists eleven separate items for Refining NZ and its expert advisors to provide further information on. These are as follows:

(i) Written comment from Dr Clement on the applicability of the ANZECC Interim Sediment Quality Guidelines - Low (ISQG-Low) as a trigger for the protection of marine mammals from contaminants (proposed Condition (26));

(ii) A plan showing the proposed dredged berth pocket bathymetry (together with existing bathymetry) with a moored Suezmax vessel moored to the existing jetty and dolphins;

(iii) Written comment from Mr Coffin on proposed Conditions (44) to (55) on their practicability and likely effectiveness in achieving successful environmental outcomes;

(iv) A draft replenishment management plan for disposal at Site 1.2 linked to coastal processes and sediment transport monitoring conditions;

(v) Conditions addressing monitoring the morphology of Mair Bank over the term of the consent;

(vi) Statistical analyses of the existing NRC water quality data and the Refining NZ sonde data showing the 50, 80, and 95 percentiles for each dataset;

(vii) Comment on the applicability of Cawthron Report No.2648 to the application;

(viii) Response to the commentary from Mr Griffiths on turbidity monitoring;

(ix) Proposed consent conditions in respect of turbidity and/or suspended sediment concentrations. These conditions should also address the issue of exposure frequency and duration which were raised by us through questions during the hearing;

(x) A copy of the thesis work by Teaioro (1999) reference by Dr Coffey in his supplementary statement of the evidence (dated 8 March 2018); and

(xi) A revised set of proposed conditions of consent.

1.2 The Refining NZ response was received by NRC on 13 April 2018 and, at the direction of the Panel, circulated to submitters for written comment by 30 April 2018. Responses were subsequently received from the following submitters:

- Bream Head Conservation Trust
- W Bruce-Kingi
- M Kepa
- D Milner
- Patuharakeke Te Iwi Trust Board
- B Pyle
- Te Parawhau[1]

The majority of these submitters focused solely or primarily on the proposed consent conditions for the Kaitiaki Group and associated funding (RNZ proposed conditions 44 – 55).

Addendum Structure

1.3 For clarity, this addendum follows the order of the items as listed in Minute No. 7. For each item, the RNZ response is briefly summarised along with any submitter comments on the further information provided. I then provide my opinion on the implications of the further information and/or submitter comments in relation to (a) the possible grant of consents and (b) the revised RNZ proposed consent conditions.

1.4 In forming the opinions reported here, I have sought expert advice from:

(a) Mr Abe Witana (NRC Programme Manager Maori Policy Specialist) - in respect of proposed conditions 44 - 55;

(b) Dr Rob Bell (NIWA Principal Scientist Coastal and Estuarine Physical Processes) - in respect of the draft replenishment management plan for Disposal Site 1.2; and

(c) Richard Griffiths (NRC Marine Research Specialist) – in respect of the turbidity monitoring consent provisions.

Unless stated otherwise, I have adopted the advice as received. Copies of the written advice from Dr Bell and Mr Griffiths are attached for completeness. Mr Witana provided verbal comment on those elements within Conditions 44 – 55 which have been contested by the submitters.

1.5 This addendum concludes with a recommendation on the application having reviewed the above information, comments and responses.

2.0 Applicability of ANZECC Interim Sediment Guidelines

RNZ Response

2.1 This issue relates to RNZ proposed condition 26 which requires testing of marine sediments to be dredged to see if they contain contaminants that could present a risk to marine mammal health. The Interim ANZECC Guidelines for Sediment are proposed to be used. The guidelines are not targeted toward marine mammal health but rather are used as an indicator of risk of bioavailable contaminants to benthic biota and of the potential for remobilisation of contaminants into the water column and/or aquatic food chains.

2.2 Dr Clement has stated, at paragraph 5, that the most effective and standardised manner for monitoring any contaminant uptake by marine mammals to ensure that sediment contaminant levels are below the best available guidelines; which are the Interim ANZECC 2000 guidelines.

Submitter Responses

2.3 No submitter commented on the further information provided.

[1] An initial response was received on 26 April 2018. A replacement response was then received on 3 May 2018

Reporting Officer Response

2.4 I have previously stated in evidence that I do not see such a condition as necessary given the RNZ analysis of sediments to be dredged has not shown any contaminant levels above the relevant guidelines. However, I have no issue with the inclusion of the condition as this will act as a safeguard not just for marine mammals but also for any marine biota in vicinity of the dredging and spoil disposal operations. There are no guidelines that I am aware that are specific to marine mammals.

3.0 Proposed dredged berth pocket bathymetry

RNZ Response

3.1 The detailed plan has been provided as requested, with an outline of a Suezmax vessel superimposed.

Submitter Responses

3.2 Dr Mead for the Patuharakeke Trust Board commented on this matter, noting that the plan did not appear to him to be anything new or different from that previously presented. He remains of the view that the berthing pocket is a major distribution site for maturing pipi and asks what modifications might be made to the dredging if the new (deepened and widened) berth pocket is found to have an impact on (Mair Bank) ecology, principally the pipi beds. He appears to suggest including a condition to requiring the relocation of the new berthing pocket if ecological effects on Mair Bank can't otherwise be addressed through modification of the dredging methodology.

Reporting Officer Response

3.5 The issue Dr Mead raises goes to the adaptive management steps that may be required should adverse effects on Mair Bank, including ecological effects, occur. From the information presented at the Hearing and as I have previously stated, I am of the opinion that such potential effects are of low probability but high potential impact. The principal method for addressing/avoiding this potential effect is the Replenishment Management Plan which is discussed later in this addendum.

I note that Dr Coffey, in paragraphs 2 – 8 of his supplementary evidence, disagrees with Dr Mead about the effect of the berthing pocket dredging on pipi recruitment stating that as pipi are broadcast spawners (gametes are released into the water column). However, I do agree with Dr Mead that the physical/ecological processes on Mair Bank are not well understood. Notwithstanding this, I consider the matter better initially dealt with through further investigation of those relationships and the implementation of any preventative or remedial measures arising out of those investigations including pipi reseeding.

4.0 Mr Coffin's Comments on Conditions 44 - 55

RNZ Response

4.1 Proposed conditions 44 -55 have been referred to by RNZ as the Kaitiaki Group (KG) conditions. Mr Coffin's comments were sought, based on his considerable resource management-related experience in this area, on the practicality and likely effectiveness of those conditions in achieving successful environmental outcomes.

4.2 Mr Coffin in his comments hones in on three conditions only; conditions 44 (KG membership), 46 (KG Charter) and 54 (proposed Te Patuharakeke control of the Poupouwhenua fund). It is therefore assumed that the other conditions are considered by Mr Coffin to be practical and effective in achieving the environmental outcomes being sought.

4.3 In regard to appropriate representation on the KG, Mr Coffin notes in paragraph 6 that condition 44 reflects a desire to be inclusive of tangata whenua groups who have been identified in the CVA/CEA while acknowledging that such a large group could be challenging and time consuming to establish and maintain. However, My Coffin is aware of large groups that have been operating successfully over long periods of time. Furthermore, RNZ does not wish to determine which groups are tangata whenua or kaitiaki - and so should be represented.

4.4 Notwithstanding this, Mr Coffin puts forward three alternate options should the hearings panel wish to restrict KG membership. These are:

(a) naming just those hapu/iwi with a close association to the affected area on the KG (1 or 2 members each) with provision for three further members from other groups.

(b) identifying a fixed number of representatives to be on the KG and having the hapu/iwi sort out for themselves who should be included (as per the NorthPort Kaitiaki Roopu).

(c) refer the matter to the Maori Land Court for a ruling as to who has mana whenua mana moana over the affected area(s).

4.5 In regard to the proposed charter for the KG, Mr Coffin recommends inclusion of an alternate dispute resolution clause within condition 46 to cover the possibility that matters of group establishment or operation are not able to be resolved by the KG in a timely fashion.

4.6 In regard to the Te Patuharakeke being proposed as the sole determining body for use of the Poupouwhenua Fund, Mr Coffin states that, while acknowledging the shared interests of other groups in Poupouwhenua, the weight of Patuharakeke's evidence and existing MoU with RNZ gives more substance to their primary interest. However, Mr Coffin does note that he does not know the extent to which shared and other types of traditional interest may exist at Poupouwhenua. He suggests a possible alternative of having the KG manage the fund but restricting its use to projects and activities at Poupouwhenua.

Submitter Responses

4.7 These issues drew the majority of responses from submitters.

4.8 In regard to the KG membership:

(a) Dr M Kepa considers the different views of Patuharakeke, Te Parawhau, and maybe Ngati Kahu o Tongongare should be clarified at a hui at Takahiwai Marae.

(b) Patuharakeke Te Iwi Trust Board (Chetham) states, at paragraph 4.6, that several of the currently listed groups shouldn't be expected to be included; namely

- Te Kumutu, Ngai Tahuhu and Ngati Manaia as ancient tribes now subsumed into other iwi/hapu groups.
- Ngapuhi, Ngati Whatua and Ngati Hine having deferred to hau kainga during the consultation process, i.e. agreed that the matter be dealt with at hapu/marae level.
- Ngati Manuhiri included in apparent error in response to CVA references to Manuhiri.
- Terenga Paraoa Marae as this represents all hapu of Whangarei (and not just those associated with the harbour).
- Toetoe Marae, Te Taumata Kaumatua o Te Parawhau and Hauauru Trust as all fall under the umbrella of Te Parawhau (which is listed).

In paragraph 8.2, it is suggested that Ngatiwai should also be excluded as the iwi authority provided its written approval for the project prior to this mitigation option (the KG) being proposed.

The PTB agrees with Mr Coffin that the option of using the Maori Land Court as adjudicator over representation issues should be avoided.

(c) Mr D Milner endorses the Patuharakeke Trust Board comments.

(d) Te Parawhau does not support any of the three alternate membership options put forward by Mr Coffin and appears to suggest that the NorthPort Kaitiaki Roopu be used as the basis for the KG. Further, a two-tiered structure is suggested with Tier 1 being all hapu who are rightly responsible for the harbour and surrounds and Tier 2 being other interested parties.

(e) Waimarie Bruce-Kingi appears to support the condition as it stands and also highlights that the Kaitiaki Roopu has been operating for the last 15 years – in her view, successfully and well. She also considers that the Maori Land Court could be used to resolve issues around KG representation.

4.9 In regard to Mr Coffin's suggestion of a dispute resolution provision within the proposed charter for the KG, the PTB, Mr David Milner and Waimarie Bruce-Kingi all support including provision for this measure. Dr Kepa also appears to support the provision and suggests some guidelines for the dispute resolution process.

4.10 In regard to the management of the Poupouwhenua Fund and Mr Coffin's comments on Patuharakeke having primary interest in the area, PTB and Mr Milner understandably agree but Te Parawhau and Waimarie Bruce-Kingi strongly disagree.

Reporting Officer Response

4.11 Having taken guidance from the NRC Programme Manager Maori Policy Specialist, I recommend that condition 44 be amended as follows:

> *Within three months of the commencement of these resource consents, the Consent Holder shall provide an offer in writing to the relevant representative entities of tangata whenua groups of Whangārei Te Rerenga Paraoa; namely Patuharakeke, Te Parawhau, Te Parawhau/Toetoe, Ngati Kahu o Torongare me Te Parawhau, Te Waiariki, Ngati Korora, Ngati Tu, Te Uriroroi, ~~Te Kumutu~~, Ngatiwai, Ngapuhi, Ngati Whatua, ~~Ngai Tahuhu, Ngati Manaia, Ngati Manuhiri~~ to establish and maintain a KRG. These representatives entities will include:*
>
> *(a) Patuharakeke Te Iwi Trust Board;*
>
> *~~(b) Ngatiwai Trust Board;~~*
>
> *(c) ~~Te Taumata Kaumatua o~~ Te Parawhau;*
>
> *(d) Ngati Kahu o Torongare Hapu Trust;*
>
> *(e) Pehiaweri Resource Management Group;*
>
> *(f) Ringa Atawhai Charitable Trust;*
>
> *(g) Te Pouwhenua o Tiakiriri Kukupa Trust;*
>
> *(h) Whatitiri Resource Management Unit;*
>
> *~~(i) Terenga Paraoa Marae;~~*
>
> *~~(j) Toetoe Marae;~~*
>
> *(k) Te Waiariki Ngati Korora Ngati Taka Hapu Trust;*
>
> *~~(l) Te Runanga o Ngati Whatua;~~*
>
> *~~(m) Hauauru Trust;~~*
>
> *~~(n) Te Runanga A Iwi O Ngapuhi;~~*
>
> *(o) And other appropriate entities or representatives <u>subsequently</u> advised <u>by the Kaitiaki Group and endorsed</u> by Northland Regional Council.*

4.12 The deletion of the specified iwi authorities in the header paragraph is for the reasons set out in the PTB comment. For clarification, there is an iwi/hapu group called Ngati Manuhiri in the

south Bream Bay/Mangawhai area but their defined 'area of interest' does not extend to Marsden Point.

4.13 Listing of Ngatiwai, Ngapuhi and Ngati Whatua in the header paragraph has been retained but representation on the KG is considered more appropriately delegated to hapu/marae level. The relevant groups are already included within the list (a) to (n). It is assumed that these groups will have established mechanisms for reporting back to the relevant iwi authority and will use this to inform the authorities of KG projects and actions as and when required (should consent be granted).

4.14 I recommend that Te Parawhau be expressly listed rather than being included by reference to the specific organisation Te Taumata Kaumatua o Te Parawhau.

4.15 I am unclear about the relationship of the Whatitiri Resource Management Unit (an inland group) with the Marsden Point/harbour entrance area but am comfortable leaving them as included as no comment was made by the submitters to the contrary.

4.16 The amendment to (o) is to allow the KG to first discuss and determine who else should be represented on the group and for any recommendations in regard to this to be put to NRC for endorsement.

4.17 I do not support the use of the existing Kaitiaki Roopu based on NRC advice around the continued difficulties with decision-making within this group, deriving from the way it was set up by condition and not caused by the parties themselves. Accordingly, a fresh approach is needed but one which can draw on that experience as the same groups would be represented on the KG.

4.18 In regard to the proposed inclusion of the dispute resolution clause in condition 46, I agree with both Mr Coffin and the responding submitters that this is an important measure for the effective functioning of the KG.

4.18 In regard to the management of the Poupouwhenua Fund, I am advised that while PTB is most active in the area, there is some weight to the arguments put forward by Te Parawhau and others regarding their close traditional association with Poupouwhenua. It is understood that these matters will be traversed through the Waitangi Tribunal consideration of the Te Paparahi o Te Raki (Northland) Wai 1040 claims – this is an inquiry into some 420 bundled claims. In the interim, condition 5 as worded is highly likely to become divisive and so potentially affect the effectiveness of the KG overall. It is therefore recommended that Mr Coffin's alternative suggestion of having the KG manage the fund but (still) restricting its use to projects and activities at Poupouwhenua, be generally adopted. In acknowledgement of the continued proactive involvement of PTB 'on the ground' in developments within or adjacent to Poupouwhenua, the implementation of agreed projects could, in my view, be appropriately delegated to the PTB.

4.19 Based on the above advice and reasoning, I recommend that condition 54 be amended as follows:

> *The Poupouwhenua Fund in condition 52(c) above is to be utilised towards restoration or enhancement projects at Poupouwhenua, including (without limitation) the examples set out in condition 59 below. The Poupouwhenua Fund shall be held and administered separately to the Initial Kaitiaki Fund and Ongoing Kaitiaki Fund, and the use of the Poupouwhenua Fund shall be determined by the <u>KG at their discretion. Implementation of individual projects shall be managed by the</u> Patuharakeke Te Iwi Trust Board representative<u>, with appropriate resourcing, unless the representative declines or the KG determines that it is more consistent with tikanga Maori to do otherwise.</u> ~~to the KG at their discretion~~.*

5.0 Draft Replenishment Management Plan

<u>RNZ Response</u>

5.1 Mr Reinen-Hamill has provided a detailed Draft Replenishment Management Plan (RMP) for Disposal at Site 1.2. The RMP is a requirement of proposed condition 122, as numbered in the latest RNZ set of conditions. In addition, Mr Reinen-Hamill has provided a disposal plan for Site 3.2.

5.2 The RMP includes stated objectives, outcomes and performance indicators. The desired outcomes of the RMP are:

(i) Sand dredged from the active part of the ebb tide delta is retained on the ebb tide delta.

(ii) Sand placed within Site 1.2 migrates landward at a rate that does not adversely affect the morphology of Mair Bank.

(iii) Any additional sand placed at Site 1.2 provides increased resilience of the ebb tide delta from natural shocks and stresses provided this sand does not have an adverse effect on the morphology of Mair Bank.

An adaptive management approach, represented in flow diagram form, is the key component of the plan. This is based around close monitoring, through bathymetric surveys, of changes in the morphology of Mair Bank and the ebb tide delta.

5.3 The disposal plan for Site 3.2 is essentially a mechanism for limiting seabed disturbance within the defined area post capital dredging - that is during maintenance dredging disposal operations.

Submitter Responses

5.4 Both the PTB and Mr D Milner appear to support the RMP, although Dr Mead on behalf of PTB considers it "somewhat experimental". Dr Mead also endorses the Site 3.2 disposal plan as being feasible and achievable. Dr Mead's primary concern is the lack of recognition of the physical/ecological process linkages that are an important part of the structure and function of the Mair Bank and the ETD.

Reporting Officer Response

5.5 The RMP was provide to Dr Bell (NIWA) for peer review. His comments are attached to this addendum. Overall, he states, the adaptive-management approach taken in the RMP is the best way to manage the disposal in Area 1.2 and align it with the variable fluctuations in the morphology of Mair Bank. I agree.

5.6 However, Dr Bell does suggest several amendments to the RMP. His suggestions and my opinion on those are as follows:

(a) That a proportion of the initial capital dredging sand be placed in the top NW corner, where it is shallower (7-8 m) and the time for migration onshore would be earlier than for deeper parts of the disposal area. This will allow a more-timely emergence of (information around) the direction and influence of migrating sand and any potential downstream effects before too many maintenance dredging cycles are completed. If deeper areas are used, it could be some years before dredged sand is detected on Mair Bank or in the nearshore.

I recommend the inclusion of this provision into the RMP.

(b) The monitoring methodology included a requirement that the area of placement shall be surveyed at least annually from the capital dredge completion survey for a period of at least two years. Dr Bell suggests that the surveys should be undertaken for up to 5 years (subject to triggers mentioned in the next point).

Dr Bell's suggestion would be consistent with proposed condition 84 which requires annual surveys for a period of five years after capital dredging. Accordingly, I recommend the change of period specified under the heading '*Monitoring extents within Site 1.2*' in the RMP from two years (second sentence) to five years.

(c) Under the same heading (last sentence) is states: "*Depending on the results of the assessment, surveys may be stopped or continued*.". Dr Bell points out that this is quite open ended, both in terms of the continuance of the monitoring and what the criterion is (for discontinuance). Therefore, a trigger(s) should be specified in the RMP which indicate when consideration might be given to discontinuing the annual surveys might be discontinued. Dr Bell suggests that there might also be a need to develop a re-trigger, as part of the routine Mair Bank monitoring, if the morphological parameters for the RMP are exceeded in future years.

There is no current consent condition requiring surveys beyond the five year period. That for maintenance dredging, condition 87, only requires (implicitly and not explicitly) surveying of the channel areas only in order to identify where maintenance dredging is required and what sediment volume is involved. Putting the issue of triggers to one side, the general inference is for the RMP content is that the stated outcomes can be achieved within the five year period. This is uncertain and the absence of any survey information beyond that period would preclude the application of the adaptive management approach or indeed provide any base knowledge of how the bank is changing over time.

I recommend the RMP be amended to either specify a set period for resurveys, e.g. every five years, or that resurveys be carried out whenever maintenance dredging is proposed, i.e. once every 2 to 5 years. The RMP should also include one or more criteria for determining when surveys might be discontinued. To provide surety for all concerned, the criteria/criterion should be agreed with NRC before any consent is granted. RNZ may wish to respond to these issues in its final right off reply. The alternative is to ensure those matters are addressed through certification of the RMP by the NRC Compliance Manager in accordance with proposed condition 122.

5.7 In regard to Dr Mead's comments about the lack of recognition of the physical/ecological process linkages in the RMP, I have expressed my opinion in paragraph 3.5 above. I don't consider that any change to the RMP need be made in relation to ecological aspects.

6.0 Conditions for Mair Bank Morphology Monitoring

RNZ Response

6.1 No separate response has been provided. The RNZ Memorandum of Counsel indicates that this issue is addressed within the RMP discussed above.

Submitter Responses

6.2 No submissions were made on this separate point.

Reporting Officer Response

6.3 My response has been provided in paragraph 5.6(c) above. Neither the consent conditions nor RMP provisions cover monitoring over the requested term of consent (35 years). My recommendations in 5.6(c) refer as they are directly related to this issue.

7.0 Turbidity Monitoring and Management

RNZ Response

7.1 RNZ has appropriately bundled items (vi) to (ix) of Minute No. 7 under the general heading of turbidity as these matters are all interrelated. These are:

(vi) Statistical analyses of the existing NRC water quality data and the Refining NZ sonde data showing the 50, 80, and 95 percentiles for each dataset;

(vii) Comment on the applicability of Cawthron Report No.2648 to the application (i.e. closed dredging season);

(viii) Response to the commentary from Mr Griffiths on turbidity monitoring;

(ix) Proposed consent conditions in respect of turbidity and/or suspended sediment concentrations.

The further information provided by Dr Stewart is comprehensive so I will not endeavour to repeat that here. A brief summary related to the items requested by the Commissioners follows.

7.2 In his Tables 6 and 7, Dr Stewart has provided his statistical analysis of NRC and RNZ water quality data respectively showing the 50th, 80th, and 95th percentiles for each dataset.

7.3 Dr Stewart, in paragraphs 56 – 62 considers the applicability of the Cawthron Report and concludes that a closed dredging season from January to October (inclusive) is unnecessary as shellfish beds will be protected through:

- the anticipated level of sedimentation due to dredging;
- the view that the effects on soft bottom fauna will be minor and/or transitory;
- the proposed monitoring and operational responses; and
- the expected confining of the dredge plumes to the channel and resultant low 'fallout' on beds.

7.4 Dr Stewart has addressed Mr Griffith's comments on turbidity monitoring at paragraphs 63 to 70. Rather than summarise the responses, in my comments below I focus on those issues (and related consent conditions) that remain in contention based on further feedback from Mr Griffiths on Dr Stewarts responses. These generally cover each of the other three items in the minute.

7.5 Revised conditions have been provided which notably now include provision for more accurately establishing background turbidity levels over a minimum of one year prior to any capital dredging commencing (condition 103). Conditions can be considered agreed with by me unless otherwise noted in my comments below.

Submitter Responses

7.6 PTB supports the position of Mr Griffith's in respect of turbidity monitoring as his recommendations are more stringent and would impose a closed dredging season to take into account shellfish spawning, etc.

Reporting Officer Response

7.7 Following advice from Mr Griffiths (attached), the matters that should be addressed in final consent conditions (if consents are granted) are:

(a) The need for correct calibration and collection of adequate quality assurance data for the real time continuous turbidity meters to ensure that results are accurate.

(b) The appropriate operational response, e.g. cessation of dredging in that location, should one or more continuous turbidity meter(s) be lost or malfunction meaning turbidity levels were not known in and around the two sensitive rocky reef sites.

(c) The default turbidity levels specified within condition 104 (being higher than those indicated in either the NRC or RNZ monitoring results to date).

(d) The proposed use of 80th, 95th and 99th percentiles under conditions 104 and 105.

(e) The lack of clarity, and therefore enforceability, around operational responses to exceedances of Level 1 and Level 2 thresholds under condition 109.

(f) The lack of NRC notification requirements for Level 1 exceedances and the one week notification timeframe for Level 2 exceedances.

(g) Possible alternative to conditions 103 (establishing background turbidity levels) and 104 of using a background reference site and specifying exceedance levels as percentage change.

(h) The lack of ability to deal with excessive turbidity plumes in the main channel away from the specified M1MA areas if turbidity/suspended solids measures are not included in condition 112.

(i) The need for a closed season based on Cawthron Institute advice and for consistency with all other recent dredging consents.

7.8 In regard to meter calibration, this matter should in my opinion be specified and is appropriate to include at the end of Section 1 of Schedule 3 Turbidity Monitoring Programme:

> *The Consent Holder shall carry out calibration and field verification of each turbidity meter at least once per month to ensure that the readings are accurate. The calibration and field verification methodologies used and the results of these shall be provided to the council's assigned monitoring officer within one week of completion.*

7.9 In regard to the potential for a continuous meter outage or loss, I recommend adding the following to condition 108:

> *Should one or more of the required continuous turbidity meters malfunction or be lost, dredging in that location shall case until the meter(s) is repaired or replaced.*

7.10 In regard to the default limits in condition 104, the condition as it currently reads allows the set levels to be retained even if NTU/SS measurement taken under condition 103 show that background levels are below these. This is based on the reported sensitivities of benthic organisms to elevated sediment loads and data on ambient suspended concentrations (paragraph 21 in Dr Stewart's response). However, emphasis does appear to have been placed more on the former which, based on the NRC and RNZ turbidity information to hand, would allow the dredging operation far greater latitude than if ambient water quality was factored in more strongly. However, the central issue is that that robust water quality information is currently lacking.

7.11 Dr Stewart, at paragraph 32, contends that the levels of SS (NTU) RNZ has specified fall well within the range experienced by local benthic communities under ambient conditions. This may be so terms of range but the issue raised at the hearing (and in Minute 7) was also about the exposure frequency and duration of SS (NTU) elevations. The monitoring proposed in condition 103 will clarify those matters and I agree with Mr Griffith's that the results should ultimately be reflected in, or supplant, those currently specified in condition 104.

7.11 Related to this is Mr Griffith's suggestion that the 80th, 90th and 95th percentiles be used to set management threshold levels rather than the 80th, 95th and 99th percentiles as proposed. The RNZ proposal will skew the need for definitive management action (Levels 2 and 3) toward the upper bound of ambient NTU/SS conditions and are therefore more likely to stress resident benthic organisms.

7.12 The present difficulty for NRC is that the tabulated threshold value in condition 104 may be higher than ambient water quality when the results are known but the present wording of the condition does not allow for any adjustment downwards. If the intention is to maintain ambient turbidity levels at the boundary of the Motukaroro Marine Reserve and Rocky Point reefs (100m set out) then the tabled value should, in my opinion, reflect this, i.e. be based on the results of condition 103.

7.13 For the actual dredge and spoil disposal operations (Calliope Bank, Mair Bank and the two disposal sites), a different approach may be justified if the approach is to be that receiving water quality standards are met outside of the specified mixing zone (300m downstream or edge of disposal site). This is standard practice for discharges to natural water bodies. Even so, the water quality standards in the operative Regional Coastal Plan for Northland, in Appendix 4, specify that visual clarity 'shall not be altered' for class CN waters. All of the affected area excluding the defined NZRC wastewater discharge mixing zone around the jetties is classed as CN.

7.14 Accordingly, it is recommended that condition 104 be amended as follows:

(a) The introductory paragraph be amended to read:

The 80th, 90th and 95th percentiles shall be determined for each location from TSS monitoring data obtained under Condition 103. ~~Should the 80th, 95th and 99th percentile values for ambient TSS concentrations be found to be less than the proposed Level 1, Level 2 and Level 3 values respectively (detailed in the table immediately below which is based on an NTU/TSS ratio of 1:1), the following default thresholds will apply.~~ These percentiles shall constitute Level 1, 2 and 3 turbidity management threshold values respectively for each location. For the purpose of turbidity management during dredging and spoil disposal operations, turbidity levels shall be monitored in accordance with the following table:

(b) Delete rows from table which specify values, i.e. confine table to location and NTU calculation methodology only. An alternate would be to include a review clause to amend the table after the results of the 12 months NTU/SS monitoring are known.

7.15 If this recommendation is accepted then proposed conditions 105 – 107 can be deleted as these are based on the values within condition 104 being included prior to ambient NTU/SS levels becoming known.

7.16 In regard to the actions specified in condition 109 in response to Level 1, 2 or 3 exceedances, each requires an assessment to be done before any action is taken. The details of the assessment are not currently made clear and neither is a time period specified for this to be completed. Mr Griffith's recommends that the condition be amended to reflect an approach more closely aligned to the Port of Otago consents (see Table 2 in Dr Stewart's response) where the actions required are made more specific and enforceable. The condition would read:

If a management threshold specified pursuant to condition 104 above ~~(including as modified by condition 107, if relevant)~~ is exceeded, then the following operational responses shall be immediately undertaken:

(a) Level 1 exceedance: ~~An assessment shall be carried by a suitably qualified person of the likely cause or causes of the elevated turbidity.~~

(i) Notify the council within 24 hours of exceedance

(ii) Check monitoring equipment and data accuracy to verify exceedance

(iii) Review natural events and areas of dredging activity with expert advisor

(iv) Assess the likely effect of continuing dredging operations

(v) Assess the need for additional monitoring and implement if required.

(b) Level 2 exceedance: ~~An assessment shall be carried by a suitably qualified person of the likely cause or causes of the elevated turbidity. If investigation reveals the cause is due to dredging or disposal activity, operational controls shall be implemented, the objective of which shall be to reduce the turbidity level that is being caused by dredging or disposal.~~

(i) Undertake all actions specified for Level 1 exceedance

(ii) Undertake appropriate management action of dredging or spoil disposal operations which may include:

- relocating the dredge or spoil disposal

- reducing dredging or disposal frequency

- operating in dredge hopper in non-overflow mode

(c) Level 3 exceedance: ~~An assessment shall be carried by a suitably qualified person of the likely cause or causes of the elevated turbidity. If investigation reveals the cause is due to dredging or disposal activity, that~~

(i) Notify the council immediately of the exceedance

(ii) Activity in that location shall cease until levels fall below Level 3 threshold at any monitoring station within 300m of the activity.

7.17 This amendment will also mean that proposed condition 110 is redundant in respect of NRC notification of exceedances.

7.18 Mr Griffiths has suggested an alternative to using baseline NTU/SS information to set thresholds and determine compliance based on the advice from the Cawthron Institute (Report 2648). This is to express turbidity management controls in terms of percentage change relative to a reference site. The sites suggested are either in the southern Bream Bay area (near Waipu Cove) or within the harbour in the main channel adjacent to Snake Bank. Exceedance levels of 20 or 33% are suggested to as threshold depending on the sensitivity of the site. In this case, the 20% would be used for the two rocky reef sites and the 33% change for the remaining sites.

7.19 I have no firm view on this alternate but note that this may be more easily implemented for single, short duration dredging sites rather than for the present proposal for multiple dredging sites over a lengthy initial period (6 months). This would be particularly so for sites where hand held turbidity measurements are proposed. The readings from the remote reference site would need to compared with readings from all dredge sites on a continuous basis – during daylight hours at least. Presently a daily mean based on three NTU measurements is proposed for non-rocky reef M1MA sites.

7.20 Mr Griffiths has raised the issue of managing turbidity in the main channel away from the M1MA areas and accordingly has recommended that turbidity measures be inserted into Schedule 4, referenced in condition 112. This would apply only to the turning basin dredge area as all others are covered under the condition 104 table.

7.21 On reflection, I believe this matter is better addressed via amendment of the way the location details in the condition 104 table are phrased. Other than for the two rocky reef M1MAs, rather than specify the MIMA areas at or near the dredge locations, I recommend the wording be amended to simply reference the dredge sites proposed. For example, the wording would become 'Calliope Bank dredge site' and 'Mair Bank (or Ebb Tide Delta) dredge site'. Separate express provision would need to be made for the berth pocket and turning basin dredge areas. I consider the same values derived from the baseline monitoring under condition 103 from the proposed site 300m from the refinery jetty (103 (iii)) could be used for both as the dredge areas are close to this site.

7.22 Following the same line of reasoning, for clarity mention of the outer harbour channel should be included in the current reference to Bream Bay, i.e.

Bream Bay including the outer harbour channel, Three Mile Reef, and Disposal Site 3.2.

7.23 Lastly, Mr Griffiths advocates that the closed season for dredging as recommended in the Cawthron Institute review of NRC dredging conditions, be applied to these consents, if granted. Mr Griffiths advises that omitting such a condition would be inconsistent with other consent granted by NRC post the review. Accordingly, this would create a precedent that may give rise to legal challenges to the NRC imposing this for other future dredging consents.

7.24 The clear implication of this for RNZ is that no dredging activity between the months of October and January inclusive.

7.25 I have no fixed view on this matter other than to note that inclusion of such a condition would ensure consistency with other consents issued by NRC, it would and additional safeguard, and would still leave eight months within which the RNZ could undertake its expected 6-month capital dredging programme.

8.0 OTHER CONSENT CONDITIONS

8.1 The applicant has provided a full suite of amended conditions in it response. Conditions not covered in the main body of this addendum that were queried by submitters, i.e. not otherwise supported, are:

(a) The definition of Suitably Qualified and Experienced person (condition 8) by Mr D Milner

(b) Marsden Point Liaison Committee conditions 38 – 43 by the Bream Head Conservation Trust

(c) Harbour Restoration and Enhancement conditions 56 – 58 by PTB and Mr B Pyle

(d) Inclusion of Mair Bank and Marsden Bank in baseline monitoring condition 103 by PTB

8.2 Addressing each in turn, Mr Milner's suggestion is that proposed definition of Suitably Qualified and Experienced person be expanded to allow inclusion of tangata whenua with expertise in matauranga Maori. With respect, the term is used in a defined context within the proposed consent conditions where it is sheeted to requirements for very specialised technical assessments and/or management plan preparation. I therefore do not support Mr Milner's suggestion.

8.3 Mr Gates for the Bream Head Conservation Trust seeks inclusion of conditions to clarify the powers and procedures for the MPLC and also to expand its scope to deal with broader environmental management of the harbour entrance/Bream Head area. Mr Gates appears to suggest that the listed MPLG roles in condition 39 do not constitute powers of the MPLC. I understand the intended powers, such as they are, to be purposely limited to influencing RNZ dredging and disposal decisions via comments on technical reports received and no more. For this reason, and obvious legal constraints, I do not believe that the conditions should enable or require the MPLC to have greater scope than that required to ensure that the dredging project, if approved, is properly managed.

8.4 I do not favour inclusion of administrative procedures in the consent conditions but recommend that a side note be added to Commissioners decision, if in favour, that the development of such is advised within the first few meeting of the MPLC to ensures its smooth functioning.

8.5 The PTB and Mr Pyle both challenge the priority given to the Te Rauri (Blacksmiths Creek) for proposed harbour restoration and enhancement works. As I have previously stated in evidence, I too agree that this is not directly associated with the affected area and that the project should simply be included in the list of possible projects in condition 59. In short, I recommend that conditions 56 and 57 be deleted (or replaced – see next paragraph) and 59(g) be amended by adding the words "*including possible management of Te Rauri (Blacksmiths Creek) outlfows*.".

8.6 In preference to focusing on Te Rauri I remain of the view that the physical/ecological interactions at Mair Bank be the most appropriate priority focus for any enhancement or remediation works. This is both within the affected area and, as extensively discussed at the hearing, a pivotal element (in my opinion) to protected through the proposed adaptive management approach to the project. I therefore recommend that conditions 56 ad 57 be reoriented to focus on understanding the physical/ecological dynamics and interrelationships of Mair Bank as a matter of first priority.

8.6 Finally, the PTB seeks the specific inclusion of the Mair Bank and Marsden Bank mahinga mataitai among the sites to be used for baseline monitoring under condition 103. I consider that the site 300m from the RNZ will be within sufficient proximity to both to provide an accurate assessment of turbidity/SS levels within those two areas.

9.0 CONCLUSION

9.1 Having carefully reviewed the further information provided by the applicant and the responses of the submitters as set out in this s42 report addendum, I my opinion there is nothing to suggest that consents for the RNZ harbour entrance dredging project cannot be granted. I have made recommendations to refine those conditions to, in my view, make these more workable and, in cases, enforceable for all concerned. I am happy to provided further clarification if required but trust that this addendum provides sufficient detail to assist the Commissioners to make their ultimate decision.

Glenn Mortimer
BSc, MSc, MNZPI, MMScSoc

8th May 2018

RNZ Further Information in Response to Minute No. 7

Comments of Mr R Griffiths (NRC Marine Research Specialist)

Introduction

Firstly it should be noted that the proposed activity is of a significant scale for Northland and is in an area where the Council and the applicant have identified high value and sensitive ecosystems. The scale and the risk profile of the proposed activity are significant in the context of Northland Coastal Marine Area. From an environmental perspective, the conditions associated with water clarity are in my opinion of primary importance. It is imperative that these conditions are robust and enforceable. In its current form the proposed consent conditions are more lenient than other resource consents for dredging issued by Council.

Real time continuous turbidity monitoring

While I see the value in the deployment of continuous real time turbidity monitoring for the proposed activity. However, the shortcomings and pitfalls of this method need to be fully understood.

Council has significant experience deploying real time continuous water quality monitoring equipment including turbidity sensors in the marine environment and it is a complex and difficult task. The obvious error in the turbidity data supplied by RNZ for the third deployment (between 10/08/2017 and 9/09/2017), illustrates the difficulty in this task. The difference in turbidity values provided by RNZ for the first deployment (between 10/05/2017 and 7/06/2017) and the second deployment (between 07/06/2017 and 11/07/2017) also suggests that there was an error when calibrating one of the sensors. Correct calibration and collection of adequate QA and validation samples is a crucial and needs to be done correctly if robust monitoring data is to be collected. The marine environment in the vicinity of the proposed activity is exposed and dynamic, which adds further complexity to the task of deploying buoys and sensors. It should be noted that RNZ have already lost one continuous monitoring SONDE. It is not clear if the consent holder would be required to cease dredging in the event of a sensor failure or equipment loss.

Dredge operators in Northland currently collect secchi depth data on a daily basis and provide this to Council. It has the advantage that it is easy to collect and can be instantly understood and interpreted by the dredge operator. Consideration should be given to inclusion of secchi depth within the consent, in case of equipment failure, calibration error or sensor drift.

Condition 104

As it is currently worded the principal mechanism for monitoring water clarity appears to be Conditions 104 and 109. Notwithstanding my significant concerns with the default thresholds values in the Condition 104 (addressed below), we have concerns about our ability to monitor and enforce these conditions.

The responsibility for monitoring and responding to breaches of the various ‘Levels’ appears to lie solely with the applicant. There are currently no data reporting requirements except for exceedances of Level 2 (within one week) or Level 3 (within 24 hours).

If this condition is retained, it is imperative that there is a condition requiring ongoing reporting of continuous monitoring data, so that Council can assess whether the applicant is complying with these Conditions.

Condition 109

As it is currently written Condition 109 will be very difficult to monitor and enforce

What constitutes an 'assessment' under 'Condition 109 a)' is open to interpretation. An assessment may merely be someone looking at the data. Even if an assessment identifies that dredging was the cause of the exceedance there is no requirement for the consent holder to take any further action. Furthermore, there is no requirement under Condition 110 for the consent holder to notify Council that a Level 1 exceedance has even occurred. Unless notification and some action is required by the consent holder, a Level 1 threshold appears to be redundant. I note from Dr Brian Stewart's statement, that Port Otago were required to report a Level 1 exceedance within 24 hours and management actions were prescribed in the consent (Table 2 of Dr Brian Stewart's statement).

Condition 109 b) is also problematic. Firstly Condition 110, only requires the consent holder to notify Council one week after a Level 2 exceedance. The consent holder can simply notify Council one week after the event that an exceedance occurred and state that 'no cause' was identified to satisfy this Condition. With such a long reporting framework it would be difficult for Council to dispute this position.

In the event that the consent holder identifies that dredging is the cause of a Level 2 exceedance, the condition only requires that they implement 'operational controls' with the 'objective' that turbidity be reduced. There is no detail as to what 'operational controls' might entail and there is no requirement for these 'operational controls' to be successful in reducing turbidity.

Again I note from Dr Brain Stewarts evidence that Port Otago were required to report a Level 2 exceedance within 24 hours and management actions were prescribed in the consent (Table 2 of Dr Brian Stewart's statement).

The management actions documented in the consent for Port Otago Ltd (Table 2 in the Dr Brian Stewarts statement), are much more appropriate than Condition 109 as the management actions are more prescriptive. It is also noticeable that both Port Otago Ltd. and Port of Tauranga had two response levels (Level 1 and Level 2) and then an Environmental Limit, whereas Condition 109 of the proposed consent has three response levels and no Environmental Limit.

If this approach is adopted for this consent, I recommend that Condition 109 be altered to mimic the management actions outlined in Table 2 of Brian Stewart's statement. I recommend that Condition 109 should read:

If a management threshold in Condition 104 is exceeded, then the following operational response shall be immediately undertaken:

a) *Level 1 exceedance:*
   Notify Council within 24 hours of exceedance.
   Check equipment/data accuracy to verify exceedance
   Review natural events and areas of dredging activity with expert advisor.
   Assess impact of ongoing dredging operation.
   Assess need for additional monitoring.

b) *Level 3 exceedance*
Undertake all actions as set out when Level 1 Response limit is reached.
Undertake management of dredging process to reduce turbidity. This could include:
• Relocation of dredge
• Reduced dredging frequency
• Suspend dredging
• Operate dredge in non overflow mode

c) *Level 3 exceedance:*
All dredging activity shall cease in the current dredging area (Plan number 4782/1). Dredging may only continue in a different dredging area, with the permission of the Council's Compliance Manager.

Response thresholds

I strongly disagree with the statement of Dr Brian Stewart that the proposed default thresholds in Condition 104 are robust and will provide adequate protection. I also dispute that the levels proposed in Table 4 fall within the range experienced by local benthic communities under ambient conditions. Both NRC and RNZ data suggest that ambient turbidity values are significantly lower.

Using Sonde data provided by RNZ, the 6 hour average only exceeded the Level 1 threshold for Mair Bank of 15 NTU on 4 days (out of a total of 88 days). The rolling 6 hour average only breached the Level 3 threshold (35 NTU) on 1 day out of 88 days. On the final deployment between 15 September and 19 October the highest 6 hour rolling average was 8 NTU. This indicates that the default thresholds proposed in Condition 104 are in fact very rare.

The principle argument for the inclusion of the default thresholds in Condition 104 appears to be that these thresholds have been used successfully in consents issued to Port Otago and Port of Tauranga. However, without knowing how frequently these thresholds were breached and what management responses were adopted following a breach it is not possible to attribute the success of these activities to the threshold values. From the limited data provided in Dr Stewart's report (Figures 1 and 2), it appears that the thresholds were rarely breached (possibly because the thresholds were set to high). The success of these operations may instead have been due to the local hydrodynamics, the sediment characteristics and good operational practices by the dredge operators, or a combination of these factors.

Notwithstanding my concerns that the response levels are too high from an ecological perspective, there are also the aesthetic considerations of members of the public and the local community to consider. The public and local community are used to very good water clarity in the area of the proposed activity. The Ministry of the Environment (MfE 1994) noted that people can generally detect changes in the visual clarity of water larger than 10-15%. A change from ambient turbidity levels of approximately 1 NTU to 15 NTU will represent an increase in turbidity of 1400%. A sediment plume that creates a turbidity value of 15 NTU, at a distance of 300m from the dredge, in an environment where turbidity is close to zero, is going to be highly visible to members of the public and generate a large number of enquiries and complaints to both RNZ and Council.

If the consent is to include response levels, I recommend that all thresholds be set using the 80th, 90th and 95th percentiles, determined for each location from monitoring data as outlined in Condition 103 and 104. Note I recommend that the 80th, 90th and 95th percentiles be used, not the 80th, 95th, and 99th percentiles. I also recommend that this approach be used even if the 80th, 90th and 95th percentiles are less than the default Level 1, Level 2 and Level 3 thresholds. For clarity, I recommend that the turbidity default thresholds in Condition 104 be removed from the consent. Instead I recommend that Condition 104 should read:

The Level 1, Level 2 and Level 3 thresholds should be determined for each location using data collected as per Condition 103.

As per my previous evidence, another approach would be to install a turbidity sensor at a control/reference site and base an exceedance value on a percentage change. This is the approach recommended by Morrisey and Barter (2015) in their review of review of Northland Regional Council's consent conditions for dredging. I personally favour this approach as it has worked well for other dredging consents in Northland and would be simpler to implement, monitor and enforce.

If this approach was adopted, I recommended utilising the exceedance values listed in Table 1 below:

Table 1. Recommended exceedance values based on relative change from a reference site.

Location	**Exceedance level**
Motukaroro Island Marine Reserve M1MA**	20% change from background
Calliope Bank M1MA*	33% change from background
Mair Bank M1MA*	
Home Point M1MA**	
Bream Bay including Three Mile Reef*	
Disposal Site 1.2*	

A suitable reference site could be located in the southern portion of Bream Bay towards Waipu Cove or within the Whangārei Harbour at Snake Bank.

In response to paragraph 44 e) of Dr Brian Stewart statement, I will clarify that my proposed reference site at Snake Bank was intended to be in the channel adjacent to Snake Bank. Snake Bank is an intertidal bank that is exposed at low tide so it would not be possible to locate a buoy with a turbidity sensor on an intertidal flat (most turbidity sensors need to be kept moist).

Condition 112

As discussed above, the responsibility for monitoring, reporting and implementing management responses, all appear to lie with the applicant.

It is imperative that there is some mechanism for Council to independently monitor the proposed activity, as it does with all other dredging consents in Northland. Because of the complex nature of the proposed monitoring and management responses, there is an even greater need for Council to have the capability to undertake its own monitoring independent of the applicant.

In the event of a calibration error, equipment loss or failure, sensor drift or a failure by the consent holder to report an exceedance or implement an appropriate response there is no adequate mechanism for Council to undertake its own monitoring.

The only condition that currently gives any scope for Council to independently monitor and enforce the consent is Condition 112. However, the standards associated with the Condition are in a Schedule (Schedule 4) and significantly the Schedule does not include any standards for water clarity, turbidity or total suspended solids (TSS). As stated earlier, the primary concern with the proposed activity is water clarity (turbidity, TSS or secchi depth) so it imperative that Condition 112 include a standard for water clarity. The standards should also be included in the consent condition, rather than a schedule.

I recommend that Condition 112 be rewritten as follows:

112 The exercise of these consents shall not result in any of the following effects on coastal water quality, as measured at or beyond a 300 metre radius from the dredger or dredge disposal site:

(a) The visual clarity, as measured using a Secchi disk, shall not be reduced by more than 33% of the background visual clarity at the time of measurement; and

(b) The turbidity of the water (Nephelometric Turbidity Units (NTU)) to be increased by more than 33% of the background turbidity at the time of measurement;

(c) The Total Suspended Solids shall not exceed 40 grams per cubic metre above the background measurement; and

(d) The natural water temperature shall not be changed by more than 3 degrees Celsius; and

(e) The natural pH of the waters shall not be changed by more than 0.2 units; and

(f) The dissolved oxygen content in solution in the waters shall not be reduced below 5 grams per cubic metre; and

(g) The production of any conspicuous oil or grease film, scums or foams, or floatable or suspended materials, or emissions of objectionable odour; and

(h) There shall be no destruction of natural aquatic life by reason of a concentration of toxic substances

This is a standard consent condition included in all recent consents for dredging in Northland.

Closed seasons.

As stated in my previous evidence, closed seasons for dredging have been included in all recent dredging consents issued by Council. They were a key recommendation of Morrisey and Barter's (2015) report to Council into consent conditions for dredging. I strongly favour the inclusion of closed seasons in dredging consents as they provide protection to key species at the most vulnerable stages of their life cycle.

It is incredulous that closed seasons be omitted from this consent but included in all other consents issued by Council for dredging activities that are of a much smaller scale and lower risk than the proposed activity. The closed season recommended by Morrisey and Barter (2009) of October to January for the area around the proposed activity, is in my professional opinion appropriate and represents just a quarter of the year. The proposed activity will require significant planning and lead time. With such a timeframe to prepare for the activity, it should be possible to organise the dredging to occur outside of this closed season. Dr Stewart provides limited evidence to reject the inclusion of a closed season in the current consent.

Peer-review of:

COMMENT BY RICHARD REINEN-HAMILL IN RESPONSE TO MINUTE #7 OF HEARING COMMISSIONERS
(REPLENISHMENT MANAGEMENT PLAN, MORPHOLOGY OF MAIR BANK, AND DISPOSAL PLAN FOR SITE 3.2)

Dr Rob Bell, NIWA

7-May-2018

Context:

Northland Regional Council – NRC (Paul Maxwell) and Mortimer Consulting (Glenn Mortimer) requested a peer review via email on 18-April-2018 of the tabled Comment by Richard Reinen-Hamill (Tonkin + Taylor) in Response to Minute #7 of the Hearing Commissioners.

I previously provided NRC with my comments on the pre-lodgement technical reports prepared by Tonkin + Taylor and MetOcean Solutions Ltd I n2016, but I had not seen the final lodged versions.

Back in the 1980's, I assisted Northland Catchment Board with field and analytical studies for the NZ Refinery hydrocracker upgrade and outfall discharge consent hearings – so I am familiar with the oceanographic processes that operate in the Harbour Entrance and its associated ebb-tide delta (Mair Bank).

As requested in the 18-April-2018 email and a subsequent email of 4 May (Glenn Mortimer), my review was to focus on whether the methodology underlying the adaptive Replenishment Management Plan (RMP) is likely to be responsive enough to mitigate any erosion trend detected at Mair Bank – should this occur. Therefore, I only reviewed relevant sections of the Comment on Minute #7 relating to Disposal Area 1-2 and the RMP for that area. I did not review the material in relation to Disposal Area 3-2 and minimizing seabed disturbance.

Mair Bank area morphology:

As I mentioned in my review of the pre-lodgement report, Dredging and Disposal Options – Synthesis Report by T + T, the analysis of the historical fluctuations was sound and based on extensive monitoring and bathymetric surveys that were available to inform the assessments. This analysis shows the following relevant aspects:

- the Mair Bank geomorphic structure is quite stable overall in the long term, but experiences shorter term (periods of years) fluctuations of around ±1 m in the vertical and ±2 m in the horizontal dimension;
- net sediment transport along northern Bream Bay is to the north of 20,000 m^3 per year, which translates into the same net loss from Mair Bank as overwash into the main tidal channel;
- the secondary flood-tide channel between the main beach at Marsden Point and the inner side of Mair Bank, tends to fluctuate over periods of months to years. Ongoing morphological change with this near-shore system has been associated over past decades with an erosion hotspot on the foreshore at Marsden Point (previously assessed by my former colleague – Dr Terry Hume in past decades).

Disposal Area 1.2:

The location of Disposal Area 1.2 is located to the SE of Mair Bank straddling water depths from 7 metres (Chart Datum) in the NW corner on the flanks of Mair Bank out to 10-11 metres or more as the inner shelf flattens out – as shown on p3 of the T + T technical report. The average depths are somewhat higher, taking into account the extra 1.6 m to mean sea level (MSL) above Chart Datum.

Also to note that the NW corner is just over 1 km to the SW point of the shallower 5 m seabed depth contour (Chart Datum) and around 3.4 km due west to the nearshore of the Bream Bay shoreline.

Review Comments:

Overall, the adaptive-management approach taken in the RMP (and attached flow diagram) is the best way to manage the disposal in Area 1.2 and align it with the variable fluctuations in the morphology of Mair Bank.

I also agree with Mr Renein-Hamill that it could take several years for sand deposited in Disposal Area 1.2 to migrate to the top of Mair Bank or to the nearshore area. Given the depths of Area 1.2, which are mostly in the range 9-10 m + adding 1.6 m MSL, it would require substantial wave or swell energy from the sporadic storm events – combined with the weaker tidal and wind-generated currents, to migrate sand onshore. Also the net sediment transport pathways shown in Figure 4-6 (T + T report) indicate a rather circuitous route to the south-west before turning onshore for sand sourced from the Disposal Area 1.2, which will add to the onshore migration period.

One of the underlying governing factors for the RMP, is that the net sediment drift along the coast and across Mair Bank is to the north. So essentially, the dredging of Areas A and C and to a lesser extent Area B from the main tidal channel, are recovering that net sand volume and re-depositing it on the seabed to the SE of Mair Bank. Therefore, the main control on morphological fluctuations in the nearshore areas comes from wave and wind-generated processes from the south or refracted from the east. This implies that dredging in the main channel on the northern and north-eastern flanks of Mair Bank is unlikely to exacerbate erosion or accretion in the long-term (years) on Mair Bank, or in particular the secondary flood-tide channel in the nearshore area at Marsden Point (leaving aside any steep-slope erosion on the flank of the new channel).

Taking both these factors (the slow migration onshore from Disposal Area 1.2 over years and the net northerly sediment drift) means that the disposal of sand in Area 1.2 is unlikely to feature as a causal factor in erosion of the secondary flood-tide channel at Marsden Point- rather the interconnections between seasonal and inter-annual sediment and oceanographic processes will continue to play the dominant role in governing the degree of erosion or accretion and lateral movement of this subsidiary channel.

However, in managing the sand deposits in Area 1.2, there will be a tension between not enough sand reaching nearshore areas (and possibly contributing in a minor way to erosion of the foreshore) versus the potential for exceeding historic sand accretion rates over Mair Bank (affecting the benthic habitat).

My suggested changes to the RMP would be:

a) A proportion of the initial capital dredging sand, destined for Disposal Area 1.2, should be placed in the top NW corner, where it is shallower (7-8 m) and the time for migration onshore would be earlier than for deeper parts of the disposal area. The deposited mound could be up to the proposed upper limit thickness of 0.6 m to enhance the ability to detect transport pathways and rates from the bathymetric surveys. This procedure will allow a more-timely emergence of the direction and influence of migrating sand and any potential downstream effects before too many maintenance dredging cycles are completed. Otherwise, it could be some years before dredged sand is detected on Mair Bank or in the nearshore, if mainly the deeper parts of Area 1.2 are used to place dredged material.
b) The monitoring methodology included a requirement that the area of placement shall be surveyed at least annually from the capital dredge completion survey for a period of at least two years. In my view - arising from the slow emergence time for migrating sand to reach the top of Mair Bank (<5 m) or the nearshore area – that the surveys should be undertaken for up to 5 years (subject to triggers mentioned in the next point);
c) The RMP (under heading of *Monitoring extents within Site 1.2*) states that: "Depending on the results of the assessment, surveys may be stopped or continued." This is quite open ended, both in terms of the continuance of the monitoring and what the criterion is. Therefore, this section of the RMP could do with setting a trigger(s) which indicate when that point might be considered for discontinuing the surveys that provides some surety up front to resource managers for that part of the monitoring. There might also be a need to develop a re-trigger, as part of the routine Mair Bank monitoring, if the morphological parameters for the RMP are exceeded in future years.

I'm available to field any further queries on this matter.

Dr Rob Bell, PhD (Civil Engineering), MEngNZ, CPEng (Environmental)

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