

EXCLUSIVE ECONOMIC ZONE AND CONTINENTAL SHELF (ENVIRONMENTAL EFFECTS) ACT 2012

Trans-Tasman Resources Ltd Marine Consent Decision

June 2014

Application	<p>To excavate iron sand from the seabed of the exclusive economic zone in the South Taranaki Bight (STB) in area 65.76 square hectares located between 22 and 36 kilometres (12 and 19 nautical miles) offshore. The sand is proposed to be processed onboard vessels to remove iron particles and remaining sand returned to the seabed. More specifically, the application seeks approval for the following activities:</p> <ul style="list-style-type: none">• the construction, placement, alteration, extension, removal or demolition of a structure on or under the seabed (section 20(2)(a));• the removal of non-living natural material from the seabed or subsoil (section 20(2)(d));• the disturbance of the seabed or subsoil in a manner that is likely to have an adverse effect on the seabed or subsoil (section 20(2)(e));• the deposit of anything or organism in, on, or under the seabed (section 20(2)(f));• the destruction, damage, or disturbance of the seabed or subsoil in a manner that is likely to have an adverse effect on marine species of their habitat (section 20(2)(g));• the construction, mooring or anchoring long-term, placement, alteration, extension, removal, or demolition of a structure or part of a structure (section 20(4)(a)); and• the causing of vibrations (other than vibrations caused by the normal operation of a ship) in a manner that is likely to have an adverse effect on marine life (section 20(4)(b)).
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Decision

Pursuant to section 62(1)(b) – Decisions on applications for marine consents – of the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (the EEZ Act), the application for a marine consent by Trans-Tasman Resources Ltd is **REFUSED**.

The reasons for refusing consent are set out below in this decision (pursuant to section 69 – Decision of the Environmental Protection Authority – of the EEZ Act).

Executive summary

1. Trans-Tasman Resources Ltd (TTR) sought a marine consent under the EEZ Act to undertake iron ore extraction and processing operations. The application area was 65.76 square kilometres, located between 22 and 36 kilometres (12 and 19 nautical miles) offshore in the South Taranaki Bight (STB). An Impact Assessment supported the applications for marine consents as required under section 38 of the EEZ Act.
2. TTR proposed the excavation of up to 50 million tonnes per year (up to 27 million cubic metres per year) of seabed material containing iron sand, for processing on a floating processing, storage and offloading Vessel (FPSO). Around 10% of the extracted material would be processed into iron ore concentrate for export, with the residual material (approximately 45 million tonnes per year) returned to the seabed as de-ored sediment via a controlled discharge at depth below the FPSO.
3. The deposition of the de-ored sediment would create a sediment plume with a median extent of approximately 50 kilometres long and up to 20 kilometres wide, predominantly east south-east from the mining site. In addition to the direct effects at the mining site many of the effects of the proposal would result from the plume and accordingly we address them in some detail below. One of the more significant impacts would be on the primary productivity. Modelling of the optical properties and primary production indicated a reduction of total primary production in the 12,570 square kilometres of the STB could be in the order of 10%, and a reduction in energy input into the seabed ecosystem of up to 36%.
4. The application was heard and determined by a Decision-making Committee (DMC) appointed by the Environmental Protection Authority (EPA), which is the consent authority. The procedural history of the application and the hearings process is set out in some in detail in Appendix 1 to this decision.
5. Our decision is to refuse consent. The reasons for this are summarised here and fully set out in the rest of this decision.
6. We have determined that the applications do not satisfy the purpose of the EEZ Act (section 10(1)):

“The purpose of this Act is to promote the sustainable management of the natural resources of the exclusive economic zone and the continental shelf.”

7. 'Sustainable management' is defined in section 10(2) as follows:

"In this Act, sustainable management means managing the use, development, and protection of natural resources in a way, or at a rate, that enables people to provide for their economic well-being while—

- (a) sustaining the potential of natural resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
- (b) safeguarding the life-supporting capacity of the environment; and*
- (c) avoiding, remedying, or mitigating any adverse effects of activities on the environment."*

8. Section 10(3) states:

In order to achieve the purpose, decision-makers must—

- (a) take into account decision-making criteria specified in relation to particular decisions; and*
- (b) apply the information principles to the development of regulations and the consideration of applications for marine consent."*

9. In making our decision, we have taken into account decision-making criteria set out in sections 59 and 60 of the EEZ Act and have applied the information principles in section 61 of that Act. As required, we have addressed the effects of the proposal on the environment and on existing interests, using what we have determined is the best available information. In doing so, we have found that there is considerable uncertainty regarding the scale of those effects based on the information we had before us. In particular, these related to primary productivity and benthic effects and consequent ecosystem effects as well as the impacts on existing interests notably iwi and fishing interests. We have also taken a cautious approach to the impacts on marine mammals given the legislative direction to take into account the importance of protecting rare and vulnerable ecosystems and the habitats of threatened species (section 59(e)).

10. The applicant and most submitters acknowledged that there was uncertainty and accepted that, in this situation, we were to apply sections 61(2) and (3) (and as set out in section 10(3) – Purpose) of the EEZ Act. These are:

"(2) If, in relation to making a decision under this Act, the information available is uncertain or inadequate, the EPA must favour caution and environmental protection.

(3) If favouring caution and environmental protection means that an activity is likely to be refused, the EPA must first consider whether taking an adaptive management approach would allow the activity to be undertaken."

11. We have, as required, favoured caution and environmental protection. In doing so, we have also considered **the extent to which imposing conditions under section 63 might avoid, remedy or mitigate the adverse effects of the activity** (section 59(2)(j)).

12. On 8 May 2014, the last day of actual hearings, the applicant proposed a detailed suite of conditions that included a *“risk-based tiered adaptive management approach”*. As we set out in some detail in this decision, the conditions proposed by the applicant, while extensive, are not sufficient to give us the degree of confidence we needed to be able to grant consent to the proposal.
13. The uncertainties in the scope and significance of the potential adverse environmental effects, the lack of confidence we find in the extent to which existing interests will be appropriately taken into account, the lack of clarity about the extent of economic benefit to New Zealand outside of royalties and taxes and the economic value of the adverse effects, cannot be remedied by the imposition of other lawful conditions that we could require based on the evidence before us.
14. In summary, on the evidence presented, we are not satisfied that the life-supporting capacity of the environment would be safeguarded or that the adverse effects of the proposal could be avoided, remedied or mitigated,¹ nor do we consider that the proposed conditions (including the adaptive management approach) are sufficiently certain or robust for this application to be approved, given the uncertainty and inadequacy of the information presented to us about the potential adverse effects.
15. Overall, we think this application was premature. More time to have better understood the proposed operation and the receiving environment and engage more constructively with existing interests and other parties may have overcome many of the concerns we have set out in this decision. It is conceivable that at least some of these matters could have been addressed contemporaneously with the other investigative work the applicant undertook prior to lodging the application for consents. Ultimately, the information upon which we had to make our decision, while voluminous, was too uncertain and inadequate, and we did not have sufficient confidence in the adaptive management approach proposed to address that uncertainty and inadequacy to enable the activity to be undertaken. For all of these reasons, the application as presented to us does not meet the sustainable management purpose of the EEZ Act.

¹ Section 10(2)(b) and (c) of the EEZ Act.

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1. Structure of the decision

1. This decision is structured in the following way:

- Section 1 sets out the abbreviations and acronyms we have used.
- Section 2 sets out the introduction and background to the proposal, with the procedural history set out in Appendix 1. We also set out a description of the environment summarised from the TTR application information.
- Section 3 sets out the statutory framework and an overview of our decision in terms of that framework.
- Section 4 is concerned with the sediment plume. We do this as the sediment plume is a fundamental component of the proposal and the driver of many of the physical environmental effects.
- Sections 5 and 6 address the effects of the proposal on the environment and on existing interests.
- Section 7 sets out the economic benefits to New Zealand.
- Section 8 sets out the marine management regime for the coastal environment under the Resource Management Act 1991.
- Section 9 addresses uncertainty, conditions proposed by TTR and the proposed adaptive management approach.

2. The appendices are:

- Appendix 1 Procedural history
- Appendix 2 List of submitters who appeared at the hearing
- Appendix 3 List of experts
- Appendix 4 TTR proposed conditions (8 May 2014).

3. Unless stated otherwise, references to the proposed conditions throughout this decision are those set out in Appendix 4 of this decision (as tabled by TTR in their closing submissions and dated 8 May 2014).

1.1. Abbreviations and acronyms used in this decision

4. The abbreviations and acronyms are:

ANZECC	Australian and New Zealand Environment and Conservation Council Water Quality Guidelines 2000
ARMCANZ	Agricultural and Resource Management Council of Australia and New Zealand
MWM-CON	Ballast Water and Sediments 2004 Convention
DMC	Decision-making Committee
EDS	Environmental Defence Society
EEZ Act or the Act	Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012
EEZ	Exclusive economic zone

EMMP	Environmental Management and Monitoring Plan
EPA	Environmental Protection Authority
FMA	Fishing Management Area
FPSO	Floating processing, storage and offloading vessel
FSO	Floating storage and offloading vessel
KASM	Kiwis Against Seabed Mining
MTA	Maritime Transport Act 1994
NIMS	Non-indigenous marine species
NZCPS	New Zealand Coastal Policy Statement
RCP	Taranaki Regional Coastal Plan
RMA	Resource Management Act 1991
RPS	Taranaki Regional Policy Statement
STB	South Taranaki Bight
TTR	Trans-Tasman Resources Ltd (also referred to as 'the applicant')

2. Introduction/background

2.1 The role of the EPA and Decision-making Committee

5. The Environmental Protection Authority (EPA) is the consent authority. One of its functions pursuant to section 13(1) of the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (the EEZ Act or the Act) is to decide applications for marine consents.
6. The EPA has the ability to delegate its power to decide an application for marine consent to a committee appointed under clause 14 of Schedule 5 of the Crown Entities Act 2004 (section 16(a) of the EEZ Act). On 10 May 2013, pursuant to section 73 of the Crown Entities Act, the EPA Board made a general delegation to every committee appointed under clause 14 of Schedule 5 of the Crown Entities Act to decide a marine consent *“all functions and powers of the EPA relating to that matter under the EEZ Act, including, but not limited to those specified in the schedule to this instrument of delegation”*.
7. On 25 October 2013, the EPA Board appointed the Decision-making Committee (DMC) under clause 14 of Schedule 5 of the Crown Entities Act 2004 to hear the Trans-Tasman Resources Ltd consent application. The DMC included Mr Greg Hill (chair), Ms Gillian Wratt (EPA Board Member), Mr William Kapea, Mr Brett Rogers and Mr Stephen Christensen.
8. In hearing and deciding this marine consent application, the DMC has acted independently from the EPA.

2.2 The applicant and the proposal as applied for

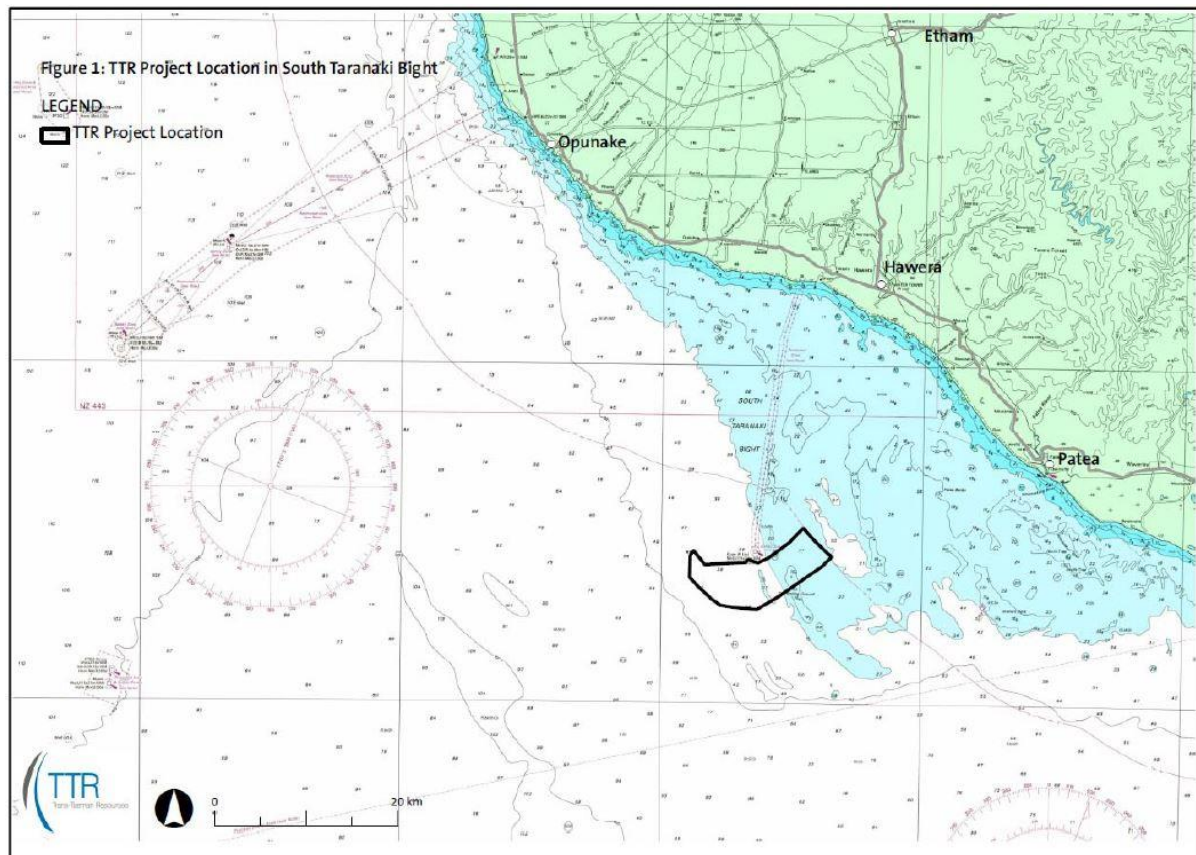
The applicant

9. The applicant is Trans-Tasman Resources Ltd (TTR). TTR is a privately owned New Zealand company, established in September 2007 to explore and develop offshore iron ore deposits off the west coast of the North Island of New Zealand.

The proposal as applied for

10. The proposal as outlined in the TTR application documents (dated 5 November 2013 and as first notified on 21 November 2013) is to undertake iron ore extraction and processing operations in a total extraction area of 65.76 square kilometres, located between 22 and 36 kilometres (12 and 19 nautical miles) offshore in the South Taranaki Bight (STB).

Figure 1: Location of the marine consent application²



11. The project location is offshore from Patea in water depths between 20 and 42 metres. The anticipated project duration (for which consent was sought) was up to 20 years, depending on the final ore concentrate grades encountered during the project. TTR proposed the excavation of up to 50 million tonnes per year (up to 27 million cubic metres per year) of seabed material containing iron sand for processing on a large floating processing, storage and offloading vessel (FPSO).
12. TTR identified four mining blocks within the project boundary that they intended to extract material from first where test work showed iron ore grades were comparatively higher. Four areas of highest grade iron ore sand within the Continental Shelf License Area 50753 was the initial operational focus. These four areas were designated Xantia Extension (X2), Christina, D2 and Dianne. These formed part of the total designated project area where extraction would first occur, after which the remaining in-fill areas within the project boundary would be mined.
13. Around 10% of the extracted material (50 million tonnes) would be processed into iron ore concentrate for export, with residual material (approximately 45 million tonnes per year) returned to the seabed as de-ored sediment via a controlled discharge at a controlled depth below the FPSO.
14. Ahead of mining each area, TTR would undertake grade control drilling to obtain detailed information on the iron sand available.

² Impact Assessment (TTR, 2013)

15. The FPSO would have around 180,000 tonne capacity and be 330 metres in length and 55 metres wide with a 12 metre draught. It would be designed to accommodate the crawlers (subsea sediment extraction devices) at the stern, with operating and utility modules integrated forward of the extraction module, above deck. Seabed material would be excavated using a crawler, which would transfer extracted sediment from the mine face to the FPSO.
16. The crawler would be a self-propelled, seabed-located extraction device, with a submersible pump and slewing boom configuration that would be operated remotely from the FPSO. Two crawlers would be deployed on the FPSO, but only one would be used at a time, being lowered onto the seabed via a retractable deck and lift wire from the stern allowing for rapid deployment and retrieval.
17. A suction head on the crawler would engage the seabed, pumping seawater via nozzles to the extraction face to fluidise the sediment. This would facilitate extraction by pumping into the delivery line and up into the FPSO. The delivery line would consist of a 700–800 millimetre diameter rubber hose at a design delivery rate of 8,000 tonnes per hour of sediment, so that a 300 x 300 metre mining block would typically be depleted in around 5 days.
18. The Crawler would have a design throughput of up to 8,000 tonnes per hour. The crawler would extract the sand in 300 x 300 metre blocks to the base of the mineralisation to no deeper than 11 metres below the seabed, excavating each lane for 300 metres before turning 180° and restarting the operation on the adjacent lane. We note that at times the instantaneous rate of mining may exceed the design throughput of 8,000 tonnes per hour.
19. To mine a 300 x 300 metre area, the FPSO would generally winch itself along its dynamic four-point anchoring system in tandem with the crawler as extraction proceeded, relying on the four anchors and high-tensile steel cables for direction and repositioning.
20. A dedicated anchor-handling tug would move the anchors of the FPSO from one mining area to the next, and the FPSO would use its dynamic positioning for supplementary control. This mooring configuration would be designed to allow a floating storage and offloading vessel (FSO) to engage the FPSO to facilitate the transfer of iron ore without interrupting the extraction or beneficiation (separation of iron ore) process.
21. The FPSO would process the excavated seabed material using screening and magnetic processes. It would be pumped from the crawler into a 'boil box' and then into two intermediate distribution sumps. Recycled water from the hydrocyclone would be added to reduce the slurry density to 31.5% solids by weight before it was passed through rotating drum screens to exclude particles larger than 2 millimetres. Water would be separated from the solid material (de-watering) and the material held ready for discharge. The material that was not excluded in this first stage (particles smaller than 2 millimetres) would be sprayed with water to further reduce the slurry density before being subjected to several stages of magnetic separation.
22. The water required for the concentrate rinsing would be obtained by a process of reverse osmosis using seawater, where salt is separated from water resulting in freshwater and brine (concentrated salt solution). The brine would have a salinity of approximately 54 parts per thousand (ppt) and would be

discharged with the overflow water from the deposition pipe at a combined rate of around 19,608 m³/hour. When adding this concentrated brine to the overflow water discharge, the salinity of the discharge would be changed to 37 ppt.

23. The majority of seabed material would be rejected after the first stage via a chute to the de-ored sediment-handling area to be redeposited on the seabed. The remaining material (approximately 10% of the original volume extracted) would be the targeted iron ore and, after final milling, would then be de-watered to reduce the concentrate moisture to around 10%. It would be stored in two hoppers sized for a buffer capacity of 40 hours or approximately 32,000 tonnes ready for transfer.
24. The FSO would be a self-unloading vessel, with a cargo capacity of 60,000 tonnes, a length of around 230 metres, 32 metres width and a 13 metre draught with hopper-shaped cargo holds being fed by two gravity-fed inclining elevators for loading to the export vessel. To optimise manoeuvrability, it would have a propulsion rudder system aided by bow thrusters with dynamic positioning capabilities to facilitate its loading and unloading requirements.
25. Processed iron ore would be transferred from the FPSO to the FSO for further de-watering, to reduce the moisture content to less than 6.5%, and from the FSO to a 180,000 tonne export vessel. The transfer between the FSO and the export vessel would take place in relatively sheltered conditions (as per Figure 22 of the Applicant's Impact Assessment, and there would be no discharges associated with the transfer operation (other than ballast water).
26. Transfer from the FPSO to the FSO and then to the export vessel would require three round-trips of approximately 3.3 days for each trip (as per Table 7 (FSO shipping cycle) in TTR's marine consent application). This was based on each vessel's operating capacity – FPSO hoppers 32,000 tonnes, FSO 60,000 tonnes and export vessel 180,000 tonnes. The FSO would engage the FPSO and sit in position for the full duration of the loading of the 32,000 tonnes and processing of a further 28,000 tonnes to meet its payload of 60,000 tonnes. It would then disengage and travel to the export vessel and unload. It would need to do this three times in order to fill the export vessel's 180,000 tonne capacity, which could take up to 10–11 days based on the 3.3 days in Table 7 of TTR's marine consent application.
27. The seabed material that would be excluded following processing would consist of sediment particles larger than 2 millimetres from the initial screening, coarse tailings from the first stage of magnetic separation and fine tailings from further magnetic separation and grinding. This material (collectively termed 'tailings') would have been de-watered to approximately 75–80% solids. The tailings would be discharged from the FPSO via a deposition pipe under the bow approximately 4 metres above the seabed. Over most of the mining sequence, the tailings would be redeposited back into the previously mined area. However, at the start of each new mining block (300 x 300 metre area), the tailings may be placed on unmined seabed adjacent and ahead of the cut made by the crawler, creating a mound 8–9 metres high. The last lane and end of each mining block would remain unfilled, creating a pit.
28. The de-watered iron ore concentrate, obtained by processing on the FPSO, would be rinsed with freshwater to reduce its chloride level and to produce slurry of a suitable density that would be pumped to the FSO. A floating slurry line would be connected between the bows of the FPSO and the FSO, and it

is estimated it would take around 53.5 hours to transfer the load. The FPSO would continue to move and extract seabed material using the crawler during the transfer.

29. Refuelling of the FPSO by a tanker would take place in the application area whilst it was in operation with the crawler excavating the seabed. A jackstay wire rope would be fastened to the FPSO vessel above the refuelling point. The fuel hose would be deployed and locked in place to enable fuel to transfer from one vessel to another. This system would only be capable of operating in significant wave heights of up to four metres. The FPSO would be refuelled either within or adjacent to the primary extraction area.

Activities subject to approval

30. TTR sought all the necessary marine consents to undertake the activity under the EEZ Act as set out below:

TTR project element	Consent required	Part of EEZ Act
FPSO anchors, crawler	Construction, mooring or anchoring long-term, placement, alteration, extension, removal, or demolition of a structure or part of a structure on, or under the seabed	S20(4)(a)
FPSO operations, crawler	Causing of vibrations (other than vibrations caused by the normal operation of a ship) in a manner that is likely to have an adverse effect on marine life	S20(4)(b)
Excavation with crawler, grade control drilling	Removal of non-living natural material from seabed or subsoil	S20(2)(d)
Excavation with crawler, grade control drilling	Disturbance of the seabed in a manner that is likely to have an adverse effect on the seabed or subsoil.	S20(2)(e)
Redeposition of de-ored sand, hydrocyclone sediment discharge	Deposit of any thing or organism in, on, or under the seabed	S20(2)(f)
Excavation with crawler, redeposition of de-ored sand, grade control drilling	Destruction, damage, or disturbance of the seabed in a manner that is likely to have an adverse effect on marine species or their habitat	S20(2)(g)

31. In accordance with section 36 of the EEZ Act, TTR's activities are discretionary activities because the activities are not classified in regulations made under the EEZ Act.

Other activities associated with the application

32. Section 59(2)(b)(i) of the EEZ Act requires the EPA to take account of the effects of activities that are not regulated under the Act when considering an application for a marine consent. There are a number of activities associated with the TTR project that are not covered by way of marine consents under the EEZ Act but that need to be considered as part of the overall assessment under Section 59(2). These ancillary activities include:

- ship-to-ship ore transfer
- ship-to-ship fuel transfer
- hydrocyclone overflow
- discharge of freshwater from FSO
- reverse osmosis discharges
- other discharges from ships
- discharge to air and effects on air quality
- navigational safety
- vessel movement
- lighting
- visual effects of boats and plume
- antifouling.

Procedural history

33. The procedural history of the application, including the hearing process, is set out in Appendix 1.

2.3 The hearing and decision process

34. The EEZ Act establishes demanding timeframes for the processing of and decision-making on applications for marine consents. The timeframes are even more stringent than those established under the Resource Management Act 1991 (RMA) in relation to matters that are before a Board of Inquiry. Given the potential scale and significance of a marine consent application – and the present application being a case in point – the timeframe has been a source of considerable challenge for all parties and for this Decision-making Committee.

35. Given the time constraints imposed by the EEZ Act, we have endeavoured at every point to ensure all participants are treated fairly and that the participants have all had a reasonable opportunity to provide and consider material relevant to the matters we need to determine. Much of that material is highly technical and complex in nature, and the task for participants in preparing, reading and responding to that material has been difficult.

36. We are grateful for the efforts of the overwhelming majority of experts, other witnesses and submitters for doing their very best to respond constructively to the challenges presented by the Act's process. We wish to particularly record our appreciation for the work of the experts who met in the various expert conferencing sessions we established early in the hearing sequence. The work that was completed by those experts, including the joint witness statements they produced, has been invaluable.

37. We also need to note the effort that has been put in by some submitters who have spent hours and hours reading and discussing the material produced by the applicant and others so that they were in a position to talk knowledgeably to us about their concerns. In that regard, we wish to single out Mrs Karen Pratt whose extraordinary eye for detail has been of considerable assistance to us in a number of areas.
38. It was brought to our attention by submitters at the hearing that there was no legal or financial assistance available to any members of the public. In this respect, we again acknowledge the effort put in by a number of submitters, including Kiwis Against Seabed Mining (KASM) and the Environmental Defence Society (EDS).
39. The issues caused by the Act's timeframes are amplified by the fact that our consideration of the submissions and evidence represents the one and only opportunity for the facts to be established and the opinions tested. There is no right of appeal other than on questions of law.
40. We have had the ability to establish our own procedure, and unlike ordinary Council hearings under the RMA, we had the benefit of hearing many of the experts answer questions under cross-examination. In that regard, we wish to record our appreciation to counsel representing the various parties (and to Mr Phil McCabe who took on the role in relation to some of the experts questioned on behalf of KASM) for the mostly helpful way they went about the task of questioning the experts.
41. We sat for 2 days of the hearing at Pariroa Marae in Patea. Notwithstanding that this application was challenging to tangata whenua and notwithstanding whatever sense of grievance is still felt towards the Crown as Treaty partner, we were made to feel welcome. We wish to record our appreciation for the welcome we received and for the generosity of the tangata whenua in hosting the hearing.

2.4 Description of the environment

42. The STB is a highly dynamic coastal environment. A prominent band of iron sand occurs in the STB where eroded volcanic material has accumulated in historical river channels, coastal dunes and fault-controlled depressions, and this is the material proposed to be mined.
43. Outlined below is a summary of the existing environment, derived from TTR's application and supporting technical reports. This summary of the environment was the applicant's summary that they presented at the hearing. When we discuss the evidence and findings below, we also address the environment as described by the submitters.

Oceanographic and coastal processes

44. TTR has characterised the physical oceanography by looking at bathymetry, wind, currents and waves at numerous sites in the STB. The prevailing currents in the STB flow to the south-east. Tidal forcing accounts for 40–78% of the measured currents in the STB, but wind forcing is also significant. Large south-west swells from the Southern Ocean and wind generated from the Tasman Sea create waves that are a major driver of sediment transport in the STB.

45. The wave climate on the 50 m isobath has a mean significant wave height of approximately 2 m off Cape Egmont, reducing progressively both northwards and southwards. There is a seasonal variation in wave heights, and in storm conditions, significant wave heights in the order of 8 m can occur.
46. Tidal currents of up to 0.4 ms^{-1} occur on the relatively shallow waters off Patea but are smaller (with peak speeds less than 0.1 ms^{-1}) in nearshore waters between Whanganui and Foxton.
47. Sediment movement along the coast is driven mainly by longshore and onshore transport, fluvial processes and sea cliff erosion. In the northern part of the Bight, from Opunake to south of the Whanganui River, wave-driven processes tend to transport sediment along the coast towards the south-east.
48. Seabed sediment varies from fine to gravelly fine sands, which become finer towards the north and west of the STB. River input contributes the majority of sediment to the coast.
49. Seabed morphology in the STB can generally be characterised by banks, shoals, ridges, dunes and bedforms, which tend to be aligned in a south-east to north-west direction. Dominant structures include:
 - large iron sand and volcanic pebble ridges 4–12 m high, several hundred metres wide and several kilometres long, south-east of the Whanganui River mouth
 - two large areas of 3–12 m high ridges and dunes in the Rolling Grounds
 - smaller active nearshore erosional bedforms made up of rock outcrops and ancient buried river valleys
 - depositional bedforms in water depths greater than 30 m, which include dunes, ridges, sand ribbons, ripples and waves.
50. Particle size distribution of the seabed sediment has been characterised in TTR's application by two sediment cores. These cores indicate that the upper sections of the seabed are moderately sorted sands with less than 4% mud, while lower sections of the seabed are comprised of more than 80% mud.
51. Seabed sediment chemistry is characteristic of a high-energy environment with low levels of organic matter and acid-volatile sulphides. In situ trace metals (chromium, cadmium, copper, lead, nickel and zinc) within the sediment were all below the ANZECC and ARMCANZ guidelines (Australian and New Zealand Environment and Conservation Council Water Quality Guidelines 2000), with nickel and chromium exhibiting increasing concentrations with depth below the seabed.
52. Water quality investigations have found the STB has a generally well mixed water column with only small vertical variations in temperature and salinity, with the exception of decreased salinity near the major rivers. Peaks in fine sediment concentration cannot be solely attributed to seabed resuspension, suggesting high river flow is an important contributor.
53. The background suspended fine sediment concentration is typically less than 10 mg/litre. Suspended sediment concentration decreases significantly with distance offshore and is a reflection of decreased interaction between the waves and the seafloor. Natural sediment plumes are a prominent feature of the STB.

54. Suspended sediment, coloured dissolved organic matter and chlorophyll-a typically decrease away from the shore, and thus an increase in clarity is observed. Surveys undertaken by TTR showed that measured suspended sediment concentrations were greater following high river flows (and sediment loads), and there was considerable temporal variability in the measurements.

Benthic environment

55. Surveys undertaken by TTR in the Patea Shoals region of the STB identified seven major habitat types. Only two of the habitats identified for the wider region were found to occur within the application area – rippled sands and wormfields (worm communities). In the shallower and deeper areas of the Patea Shoals (outside the application area), two biogenic habitats – bivalve rubble and bryozoan rubble – were identified and found to support highly diverse benthic communities.
56. Within the rippled sands habitat of the application area, there were very low abundances of infauna (organisms living in the seabed sediments) and epifauna (organisms living on the seabed). The wormfields were dominated by a tubeworm (*Euchone* sp. A) and supported a higher abundance of infauna.

Marine mammals

57. Using sightings records from 1980 to 2007, 13 different species of whales, dolphins and porpoises (cetaceans) are cited in TTR's application as occurring in the STB. Three of these 13 species are known to be nationally critical or endangered species – the killer whale, Maui's dolphin and southern right whale. The blue whale is listed by the International Union for Conservation of Nature (IUCN) as internationally endangered and in New Zealand as a migratory species. Recent sightings of blue whales in the STB suggest that they may use the area as a foraging ground.
58. Cetacean surveys undertaken by TTR over the period from July 2011 to September 2013 only observed a pod of common dolphins in the area and low densities of fur seals. Seven species have stranded on Taranaki beaches.

Fish and pelagic fauna

59. Thirty-seven species of fish are predicted by TTR to occur on the coastal reefs and rocks in the STB. Reef diversity is predicted to be highest along the coastal fringing reefs south and east of Cape Egmont, but none of the species anticipated to be present are considered to be nationally threatened.
60. There are a number of fish species recorded in the STB including barracouta, red gurnard, leatherjacket, school shark, snapper, spiny dogfish, rig, terakihi and trevally. TTR states that there is evidence for spawning activity by 13 demersal or pelagic fish species in the STB, while larger juveniles of 24 species also occur in the region.
61. TTR's application states that the offshore area of the STB is characterised by intermittent phytoplankton blooms, which vary in size but are often spatially large and cover much of the offshore STB. Zooplankton populations are likely to be dominated by omnivorous copepods.

Birds

62. Although the presence and use of the area by any species has not been determined through surveys, the STB is considered to support a relatively modest assemblage of seabirds, with no large breeding colonies nearby.

Archaeology

63. There are at least 126 documented shipwrecks in the Taranaki region. The remains of the majority are in unconfirmed locations, but 23 vessels are recorded to have been lost on the South Taranaki coast at or near Patea and 28 on the coast at or near Whanganui. No shipwrecks are known to be present within the application area. Multibeam sonar suggests there is no significant wreckage exposed above the seabed in the application area. However, it is possible that wreckage could be buried beneath the seabed.

Existing activities

64. Origin Energy Resources Kupe New Zealand Ltd operates the Kupe platform and pipeline, which is adjacent to the TTR application area.
65. Discharges from land-based operations into the marine environment include:
- Fonterra discharge adjacent to Hawera
 - Hawera sewage scheme via a 2 kilometre outfall pipe into the STB.
66. The two main commercial users in the STB are commercial fishers and the oil and gas industry. In addition, a small number of charter fishing vessels and diving charter vessels operate in the STB.
67. TTR's application shows that shellfish-gathering and/or fishing from beaches, river mouths and boats are all popular activities but occur commonly within 10 kilometres of the shore. There are several boating and fishing clubs along the coast, from which recreational fishers launch their vessels. Recreational divers also use this area.

Maritime and navigation

68. TTR recorded vessel movements over a 12-month period from April 2012 to March 2013 in the STB and found that the majority of vessels transiting through are between 151 metres and 200 metres length overall and have a typical transit speed of between 11 and 20 knots. Most activity is offshore of the proposed mining area.
69. Vessel traffic recorded in the application area comprised tugs and offshore supply vessels servicing the Kupe wellhead platform. Within 5 nautical miles, a general route for commercial shipping from Cape Egmont to Cook Strait was observed for 58 vessel transits.

70. Commercial trawling operations were recorded over 4 nautical miles to the west of the application area.

Social

71. There are eight main coastal communities in the local area – Opunake, Manaia, Ohawe, Hawera, Patea, Waverley, Waitotara and Kai Iwi.

72. At the time of the 2006 Census, there were 531 Taranaki residents employed in the oil, gas and metal ore mining industry. Of these employees, 82.1% worked in New Plymouth District, 12.3% worked in South Taranaki District and 3.9% worked in Stratford District. At the time of the 2006 Census, the Taranaki Region provided 408 jobs in the oil, gas and metal ore mining industry.

3. Statutory framework and overview of the decision in relation to that framework

3.1 Introduction

73. We set out here the statutory framework on which we have heard and made our decision on this marine consent application and an overview of our decision. This section is set out under the following headings:

- Introduction
- Purpose and principles of the EEZ Act
- Section 20 – restrictions on activities in exclusive economic zone and continental shelf
- Decision-making criteria
- Information principles
- Adaptive management and conditions of consent.

74. We are very aware that this is the first application to be ‘decided’ under the EEZ Act. Accordingly, we have set out the statutory framework in some detail. We received extensive submissions from all of the parties represented by counsel as to how we should interpret and apply the provisions of this legislation. That is not surprising given that this is the first application to be decided under the EEZ Act and the significant number of issues the application raised. In this part of our decision, we discuss the important parts of the EEZ Act that we have needed to consider.

75. We do not discuss in this decision the issue as to whether TTR may also require resource consent under the Resource Management Act 1991 (RMA) and what the implications of that would be for the current application. This issue was raised by a number of submitters and in particular the Environmental Defence Society (EDS). We have already given a ruling on that,³ and nothing we have heard subsequent to making that ruling has altered our view. If anything, the view we have taken on this matter was reinforced by subsequent advice from Taranaki Regional Council that it did not consider the activities proposed by TTR required any resource consents.⁴

3.2 Purpose and principles of the EEZ Act

Purpose

76. Section 10(1) states:

“The purpose of this Act is to promote the sustainable management of the natural resources of the exclusive economic zone and the continental shelf.”

77. “Sustainable management” is defined in section 10(2) as follows:

³ Directions from the DMC, 14 April 2014.

⁴ Page 2343 of the transcript, 30 April 2014.

“In this Act, sustainable management means managing the use, development, and protection of natural resources in a way, or at a rate, that enables people to provide for their economic well-being while—

(a) sustaining the potential of natural resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and

(b) safeguarding the life-supporting capacity of the environment; and

(c) avoiding, remedying, or mitigating any adverse effects⁵ of activities on the environment.”

78. Comparisons with the purpose of the RMA, which is also to promote sustainable management, are inevitable. There are many similarities but also significant differences between the definitions. Parliament could have chosen to carry across the RMA definition of sustainable management but has not done so. We note what appear to be the relevant differences below. In considering the evidence and submissions in relation to TTR’s application, we have been careful to do so in light of the EEZ Act’s purpose, not the RMA’s purpose. It is important that we make this point clear, because it needs to be understood that the many differences between the EEZ Act and the RMA – of which the purpose is but one – mean that the large body of case law and understanding that has built up in relation to the interpretation of the RMA’s provisions cannot be applied uncritically to the different environment and statutory context of the exclusive economic zone and continental shelf. Put simply, cases that are decided under the RMA are decided under a statute that has a different statutory purpose than does the EEZ Act.

79. The statutory matters that inform the achievement of sustainable management as that term is defined in the EEZ Act are not the same as those that inform the RMA’s purpose. The physical environment with which the EEZ Act is concerned is not the same as that of the RMA. These differences mean that, while it is important to take on board the understandings that have developed over the years about how to interpret the RMA and indeed what activities do and do not promote that Act’s purpose, we need to be cognisant of the fact that, in the EEZ Act, Parliament has deliberately chosen to depart from the RMA’s approach to a number of matters. It is also noteworthy that the EEZ Act does not provide for the range of subordinate planning documents as does the RMA. There are no national or regional policy statements nor plans that guide how the EEZ Act is to be applied.

80. We have noted the following differences between the sustainable management definitions in the EEZ Act and RMA.

81. The things to be sustainably managed under the EEZ Act are the *“natural resources of the exclusive economic zone and continental shelf”*. Section 4(1) of the EEZ Act defines natural resources as:

“(a) in relation to the exclusive economic zone, includes seabed, subsoil, water, air, minerals, and energy, and all forms of organisms (whether native to New Zealand or introduced); and

(b) in relation to the continental shelf, means the mineral and other non-living resources of the seabed and subsoil and sedentary species.”

⁵ The term ‘effects’ is broadly defined in section 6 of the EEZ Act.

82. In contrast, the things to be sustainably managed under the RMA are “*natural and physical resources*”. Section 2 of the RMA defines these to include “*land, water, air, soil, minerals, and energy, all forms of plants and animals (whether native to New Zealand or introduced), and all structures*”.
83. The subjects of sustainable management under the EEZ are therefore more limited than those under the RMA, and exclude man-made things.
84. The EEZ Act definition of sustainable management in section 10(2) refers to “*managing the use, development, and protection of natural resources in a way, or at a rate, that enables people to provide for their economic well-being*”.
85. The RMA sustainable management definition in section 5(2) talks of “*managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety*”.
86. The EEZ Act’s focus is narrower. There is no mention of communities and no mention of social and cultural wellbeing or of health and safety. However, the field of economics is a broad one, encompassing not just monetary values associated with the activity for which consent is sought but also the direct and indirect values of those resources as used by others or for their intrinsic and ecosystem services values. Not all of these matters can easily be understood in monetary terms, yet they all form part of the picture of total economic value, and it is this broader view of people’s economic wellbeing with which the EEZ Act is concerned.
87. The matters that must be achieved at the same time as economic wellbeing is enabled⁶ include⁷ “*safeguarding the life-supporting capacity of the environment*”. Section 4 of the EEZ Act tells us that ‘environment’ means:
- “the natural environment, including ecosystems and their constituent parts and all natural resources, of—*
- (a) *New Zealand:*
- (b) *the exclusive economic zone:*
- (c) *the continental shelf:*
- (d) *the waters beyond the exclusive economic zone and above and beyond the continental shelf.*”
88. The RMA’s equivalent provision is found in section 5(2)(b), which is “*safeguarding the life-supporting capacity of air, water, soil, and ecosystems*”. It seems to us that both formulations achieve more or less the same end.

⁶ As required by the use of the word ‘while’.

⁷ Section 10(2)(b) of the EEZ Act.

89. Section 10(3) of the EEZ Act is important and has no equivalent provision in the RMA. It states:

“In order to achieve the purpose, decision-makers must—

(a) take into account decision-making criteria specified in relation to particular decisions; and

(b) apply the information principles to the development of regulations and the consideration of applications for marine consent.”

The decision-making criteria referred to in section 10(3)(a) are contained in sections 59 and 60, and the information principles are particularly found in section 61. We discuss these provisions in some detail later.

90. The EEZ Act has no equivalent to sections 6 and 7 of the RMA. That said, the formulation of the decision-making criteria and the application of the information principles do provide guidance about how the purpose of the Act is to be achieved.

International obligations

91. Section 11 of the EEZ Act states:

“This Act continues or enables the implementation of New Zealand’s obligations under various international conventions relating to the marine environment, including—

(a) the United Nations Convention on the Law of the Sea 1982:

(b) the Convention on Biological Diversity 1992.”

92. Several parties made submissions on this section and on New Zealand’s commitments in the marine environment generally, as expressed through various international conventions to which New Zealand is a signatory. These references were brought to our attention in support of the argument that New Zealand’s international obligations require a precautionary approach to be taken in relation to activities that could have adverse effects in the marine environment, particularly on at-risk biodiversity. While we found the references to the various international conventions helpful, in our view, the relevant decision-making criteria and information principles to which we must direct ourselves reflect the nature of New Zealand’s international obligations and embody the appropriate requirements to act with caution and with due regard to uncertainty and the sensitivity of aspects of the marine environment. Indeed, that is what section 11 indicates.

93. We do not agree that New Zealand’s international obligations require additional considerations to be applied in addition to the decision-making criteria and information principles contained in the EEZ Act. In particular, the emphasis in section 59(2)(d) and (e) on the importance of protecting sensitive aspects of the environment and in section 61 on taking into account uncertainty or inadequacy in information, and in the requirement to favour caution and environmental protection where information is inadequate or uncertain form central components of the framework by which the EEZ Act continues or enables the implementation of New Zealand’s obligations under international marine conventions.

Treaty of Waitangi

94. Section 12 of the EEZ Act states:

"In order to recognise and respect the Crown's responsibility to give effect to the principles of the Treaty of Waitangi for the purposes of this Act,—

(a) section 18 (which relates to the function of the Māori Advisory Committee) provides for the Māori Advisory Committee to advise the Environmental Protection Authority so that decisions made under this Act may be informed by a Māori perspective; and

(b) section 32 requires the Minister to establish and use a process that gives iwi adequate time and opportunity to comment on the subject matter of proposed regulations; and

(c) sections 33 and 59, respectively, require the Minister and the EPA to take into account the effects of activities on existing interests; and

(d) section 45 requires the Environmental Protection Authority to notify iwi authorities, customary marine title groups, and protected customary rights groups directly of consent applications that may affect them."

95. This section is more fulsome than the Treaty of Waitangi section in the RMA.⁸ What is immediately apparent from section 12 of the EEZ Act is that the Crown's responsibility to give effect to the principles of the Treaty of Waitangi for the purpose of achieving the sustainable management of the natural resources of the exclusive economic zone and continental shelf has both procedural (i.e. the way decisions are made) and substantive (i.e. the interests of Māori in the outcome of decisions made) dimensions.

96. The RMA makes reference to matters of particular concern or interest to Māori in sections 6 and 7.⁹ In the context of the EEZ Act, particularly in relation to decisions on marine consent applications, those matters of cultural relevance are addressed through the EPA's obligation to notify relevant Māori groups of consent applications, the ability for the DMC to receive specialist advice on matters pertaining to Māori from the Ngā Kaihautū Tikanga Taiao (the Māori Advisory Committee)¹⁰ and the requirement to take into account the effect of activities on existing interests,¹¹ which includes the interests of Māori.

97. We are satisfied that the EEZ Act anticipates that the special relationship of Māori with the moana and with other taonga in the marine environment, the role of Māori as kaitiaki of natural marine resources and the other relationships and interests Māori have with the marine environment and the resources that rely on or are affected by the sea (including such things as coastal stability and fish that rely for part of their life cycle on the marine environment) are intended to form an integral part of the factual matrix within which decisions on natural resource use, development and protection should be made. Further, in arriving at an understanding of the nature of existing interests held by Māori and how they might be

⁸ Section 8 of the RMA.

⁹ Sections 6(e) and 7(a) of the RMA.

¹⁰ Established under section 18 of the Environmental Protection Authority Act 2011.

¹¹ As defined in section 4 of the EEZ Act.

affected by a particular proposal, it is necessary to understand that those existing interests are defined and understood within the paradigm of mātauranga Māori.

3.3 Section 20 – restrictions on activities in exclusive economic zone and continental shelf

98. Section 20 of the EEZ Act specifies that a range of activities in the exclusive economic zone or on the continental shelf can only be undertaken if authorised by a marine consent. Those activities include the removal of non-living natural material from the seabed or subsoil,¹² the disturbance of the seabed or subsoil in a manner that is likely to have an adverse effect on the surface or subsoil¹³ and the deposit of any thing or organism in, on or under the seabed.¹⁴ The applicant's proposed mining involves activities of this nature and accordingly can only proceed if a marine consent is first obtained under the EEZ Act.
99. At this point, we note that there was a matter of interpretation raised in passing by counsel assisting the DMC¹⁵ and advanced vigorously by counsel for EDS concerning the extent to which there might be limits on the range of matters that could be addressed in conditions imposed under section 63 having regard to the nature of activities covered by section 20. The argument was that, because section 20 does not require a marine consent for discharging into the water column, this cannot be an 'activity' authorised by a marine consent and therefore cannot be regulated by conditions we might impose under section 63(1). We disagree.
100. The interpretation contended for by EDS would, with respect, lead to an absurd result. It is clear that the release of some sediment into the water column and the consequential creation of a sediment plume is an unavoidable effect of the mining operation. Sediment would be released to some extent as the seabed material is fluidised and sucked up by the crawler and particularly when the de-ored material is returned to the seabed via the discharge pipe.
101. We are satisfied that the release of material into the water column is an effect of the mining and is entirely capable of being regulated by conditions on a marine consent. The applicant accepted this, and we consider an interpretation of section 63 that arrives at a different conclusion is straining the clear meaning of the words Parliament used and cannot be reconciled with the purpose of the Act.
102. Counsel for EDS referred us to a large amount of materials that, it was argued, established a clear legislative intent to the effect that the EPA should not be able to regulate this aspect of the applicant's proposed operation. We found the material unconvincing and of little assistance given the clear wording of section 63 and the situation that would result if we were to interpret the Act such that the sediment plume, which is a major contributor to the potential adverse effects of the applicant's proposed operation, was unable to be controlled.
103. Counsel for EDS explained to us that regulations were being drafted to 'fix' this problem so that, in the future, discharges could be controlled by the EPA. Whatever interest we may have had in EDS's

¹² Section 20(2)(d) of the EEZ Act.

¹³ Section 20(2)(e) of the EEZ Act.

¹⁴ Section 20(2)(f) of the EEZ Act.

¹⁵ 1 April 2014 Memorandum from EPA legal counsel

argument quickly dissipated when counsel for EDS confirmed what counsel for the applicant had said in opening submissions¹⁶ – that the draft regulations provided that, because the applicant had described the discharge in the application documentation, they would not be required to apply for a further marine consent. In other words, the drafters of the regulations expect that the effects of the plume arising from the applicant’s proposal will be addressed by the EPA now, and this is reinforced by provisions of the 2013 amendment to the EEZ Act, which have yet to come into force.

3.4 Decision-making criteria

EPA’s consideration of application

104. The key sections applying to our decision making are sections 59–61, and we set them out below:

“59 Environmental Protection Authority’s consideration of application

(1) This section and sections 60 and 61 apply when the Environmental Protection Authority is considering an application for a marine consent and submissions on the application.

(2) The EPA must take into account—

(a) any effects on the environment or existing interests of allowing the activity, including—

(i) cumulative effects; and

(ii) effects that may occur in New Zealand or in the waters above or beyond the continental shelf beyond the outer limits of the exclusive economic zone; and

(b) the effects on the environment or existing interests of other activities undertaken in the area covered by the application or in its vicinity, including—

(i) the effects of activities that are not regulated under this Act; and

(ii) effects that may occur in New Zealand or in the waters above or beyond the continental shelf beyond the outer limits of the exclusive economic zone; and

(c) the effects on human health that may arise from effects on the environment; and

(d) the importance of protecting the biological diversity and integrity of marine species, ecosystems, and processes; and

(e) the importance of protecting rare and vulnerable ecosystems and the habitats of threatened species; and

(f) the economic benefit to New Zealand of allowing the application; and

(g) the efficient use and development of natural resources; and

(h) the nature and effect of other marine management regimes; and

(i) best practice in relation to an industry or activity; and

¹⁶ Paragraphs 114 and 115, Opening representations on behalf of Trans-Tasman Resources Limited, 10 March 2014.

(j) the extent to which imposing conditions under section 63 might avoid, remedy, or mitigate the adverse effects of the activity; and

(k) relevant regulations; and

(l) any other applicable law; and

(m) any other matter the EPA considers relevant and reasonably necessary to determine the application.

(3) The EPA must have regard to—

(a) any submissions made and evidence given in relation to the application; and

(b) any advice, reports, or information it has sought and received in relation to the application; and

(c) any advice received from the Māori Advisory Committee.

(4) When considering an application affected by section 74, the EPA must also have regard to the value of the investment in the activity of the existing consent holder.

(5) Despite subsection (3), the EPA must not have regard to—

(a) trade competition or the effects of trade competition; or

(b) the effects on climate change of discharging greenhouse gases into the air; or

(c) any effects on a person's existing interest if the person has given written approval to the proposed activity.

(6) Subsection (5)(c) does not apply if the person has given written approval but the person withdraws the approval by giving written notice to the EPA—

(a) before the date of the hearing, if there is one; or

(b) if there is no hearing, before the EPA decides the application.

60 Matters to be considered in deciding extent of adverse effects on existing interests

In considering the effects of an activity on existing interests under section 59(2)(a), the Environmental Protection Authority must have regard to—

(a) the area that the activity would have in common with the existing interest; and

(b) the degree to which both the activity and the existing interest must be carried out to the exclusion of other activities; and

(c) whether the existing interest can be exercised only in the area to which the application relates; and

(d) any other relevant matter.

61 Information principles

(1) *When considering an application for a marine consent, the Environmental Protection Authority must—*

(a) make full use of its powers to request information from the applicant, obtain advice, and commission a review or a report; and

(b) base decisions on the best available information; and

(c) take into account any uncertainty or inadequacy in the information available.

(2) If, in relation to making a decision under this Act, the information available is uncertain or inadequate, the EPA must favour caution and environmental protection.

(3) If favouring caution and environmental protection means that an activity is likely to be refused, the EPA must first consider whether taking an adaptive management approach would allow the activity to be undertaken.

(4) Subsection (3) does not limit section 63 or 64.

*(5) In this section, **best available information** means the best information that, in the particular circumstances, is available without unreasonable cost, effort, or time.”*

105. We make the following general observations.

106. The extensive list of matters that must be taken into account under section 59(2) contains no explicit internal hierarchy, and the different considerations will vary in their relative importance depending on the factual context of each application, the nature of the environment and the extent and nature of existing interests. That said, we note that there is an apparent emphasis on the protection of the intrinsic value of important biological resources through the use of the qualifying words *“the importance of protecting...”*.¹⁷ This qualifier is not applied to any of the other considerations, and we have proceeded on the basis that Parliament deliberately chose to use these words in relation to biological resources and not in relation to other matters.

107. While the activities for which consents are being sought by the applicant are taking place in the exclusive economic zone, we need to take into account effects of those activities on the environment,¹⁸ which encompasses not just the exclusive economic zone and continental shelf but also the coastal marine area that forms part of the territorial waters of New Zealand.¹⁹ This is particularly important when it comes to assessing the potential effects of the sediment plume, many of which are anticipated to take place within the coastal marine area. This clear requirement to take into account effects that are likely to arise from allowing the activity, including when those effects occur outside the exclusive economic zone, is important. It would be a nonsense were we required to take these effects into account but be unable to regulate them through the setting of appropriate conditions, particularly when consideration of the extent

¹⁷ Section 59(2)(d) and (e) of the EEZ Act.

¹⁸ Section 59(2)(a) of the EEZ Act.

¹⁹ See the definition of ‘environment’ in section 4 of the EEZ Act.

to which the imposition of conditions might avoid, remedy or mitigate the effects of the activity is another matter we must take into account.²⁰

108. The requirement to take into account the extent to which imposing conditions under section 63 might avoid, remedy or mitigate the adverse effects of the activity²¹ means that there is no doubt that we must address the conditions that have been proposed to us by the applicant and also those recommended to us by other participants. This includes conditions proposed by submitters, experts and the EPA in the second staff report. We note that the final version of conditions presented to us by the applicant incorporated a number of conditions or ideas raised by others.
109. In considering conditions for the purpose of section 59(2)(j), we have considered whether the conditions proposed to us give confidence that the uncertainties that have been described in the evidence will be satisfactorily resolved, that the environmental performance standards/objectives that must be met are clear and certain, that the ability to meet those standards has been demonstrated by the applicant and that we have a high degree of confidence that the meeting of those standards/objectives will ensure that adverse effects²² of the proposal are appropriately avoided, remedied or mitigated and that the positive effects of the proposal are realised.
110. As we discuss elsewhere in this decision, the conditions proposed, while extensive, are not sufficient to give us the degree of confidence we needed to be able to grant consent for the applicant's proposal. The uncertainties in the scope and significance of the potential adverse effects, the lack of confidence we find in the extent to which existing interests will be appropriately taken into account and the lack of clarity about the extent of economic benefit to New Zealand outside of royalties and taxes and the economic value of the adverse effects cannot be remedied by the imposition of other lawful conditions that we could require based on the evidence before us.
111. Section 59(2)(m) is a catch-all and requires us to consider any other matter we think is relevant and reasonably necessary to determine the application. The extensive list of matters in section 59(2)(a)–(l) means that there are unlikely to be many matters that fall into this residual category. However, we have noted that the consideration of economic benefit in section 59(2)(f) is in the national context. If the correct interpretation of that requirement is limited to national economic benefit and local or regional benefits (even if they represent transfers from other parts of the economy) cannot be considered, those local and regional economic considerations need to be addressed under section 59(2)(m).
112. Whereas section 59(2) sets out matters we must take into account, section 59(3) lists three sources of information we must have regard to. We record that we have had regard to these sources of information in reaching our decision.
113. We do not attach special significance to the difference in wording between “*must take into account*” in section 59(2) and “*must have regard to*” in section 59(3). The listed matters in both subsections are obligatory considerations that each require our attention to the extent they apply to the application before

²⁰ Section 59(2)(j) of the EEZ Act.

²¹ Section 59(2)(j) of the EEZ Act.

²² As defined in section 6 of the EEZ Act.

us. The importance of or weight to be given to each matter is to be determined by the nature of the proposal and the evidence.

114. For completeness, we note that we have not had regard to either of the matters described in section 59(5)(a) and (b), and section 59(5)(c) is not relevant because we were presented with no written approvals from the holders of existing interests.

115. We have assessed the effects on existing interests²³ having regard to the factors listed in section 60, and we discuss this further when we consider the different types of existing interests.

3.5 Information principles

116. We received extensive submissions from various parties on our obligations under section 61 Information principles. Section 61 is unlike any provision in the RMA. It is directive. We now discuss the requirements of this section and how they have been applied to this application.

Full use of powers

117. Section 61(a) is about ensuring that we have available to us the right amount and quality of information to be able to make a good decision. We understand this provision to be telling us that it may not be sufficient for us to rely only on the information that is presented to us by the participants in the process and that we need to be prepared to obtain additional information should it appear necessary. We have proceeded on that basis.

118. In considering the application, we have had the benefit of:

- (a) the application and its extensive supporting technical documents and impact assessment²⁴
- (b) additional information supplied by the applicant at the request of the EPA²⁵
- (c) independent reviews of aspects of the application prepared by experts engaged by the EPA²⁶
- (d) advice from other agencies with responsibility for other marine management regimes²⁷
- (e) submissions from interested parties, including from parties with existing interests that may be affected by the application²⁸
- (f) advice from Ngā Kaihautū Tikanga Taiao in the form of a written report, supplemented by a presentation at the hearing²⁹
- (g) expert evidence, both written and oral, and supplemented by cross-examination and questioning by us

²³ Section 59(2)(a) of the EEZ Act.

²⁴ Section 39 of the EEZ Act.

²⁵ Section 42 and 43 of the EEZ Act.

²⁶ Section 44 of the EEZ Act.

²⁷ Idem.

²⁸ Section 46 of the EEZ Act.

²⁹ Section 44(1)(c) of the EEZ Act.

- (h) joint witness statements prepared following conferencing of experts – several of these conferences were facilitated by Environment Court Commissioners Sutherland and Edmonds, and we record our appreciation for that work
- (i) non-expert evidence and representations in support of submissions
- (j) additional information supplied by the applicant and other parties at our request during the hearing
- (k) legal representations in both opening and closing the hearing from the applicant, Director-General of Conservation, Origin Energy Resources Kupe NZ Ltd on behalf of the Kupe Joint Venture Parties, KASM, EDS and on behalf of a group of submitters engaged in commercial fishing (the Fisheries Interests)
- (l) reports on the application prepared by EPA staff³⁰
- (m) submissions from counsel assisting the DMC on several matters.

119. Having regard to the above list of material presented to us, some of which arose as a result of our procedural directions and requests, we are satisfied we have met our responsibility under section 61(1)(a) of the EEZ Act.

Best available information

120. Pursuant to section 61(1)(b), we must make our decision on the best available information. ‘Best available information’ is defined in section 61(5). It is not all available information. Neither is it all information that any participant asks us to take into account. Rather, we are required to exercise some judgement about what information is the best available information, having regard to issues of cost, effort and time, and these factors are to be considered within the circumstances that apply to a particular application.

121. In this case, we have determined that we have had regard to the best available information. In reaching that conclusion, we have considered the following.

122. The statutory timeframe. We have extended the 40 working day time limit allowed for the hearing³¹ in order to ensure we had received all the information we needed. That said, the timeframes established in the EEZ Act are a clear indication that there need to be limits around the amount of information adduced.

123. The amount of expert evidence available to us and the advice of those experts as to the areas of uncertainty in the information, the extent to which that was able to be addressed at this time and the extent of disagreement amongst the experts. In a number of areas, the experts were able to agree, although in many instances, that agreement also contained acknowledgements that there were gaps and uncertainties in the information. The existence of gaps and uncertainties has not been a difficulty in terms of our requirement to base our decision on the best available information. The gaps and

³⁰ Section 44(1)(b) of the EEZ Act.

³¹ Sections 52, 159 and 160 of the EEZ Act.

uncertainties arise because the necessary information to remedy these does not exist. It is not a case where important and relevant information is known but has not been shared with us.

124. We do need to make a comment about two situations that arose during the hearing where we chose not to seek or accept information that it was suggested by some parties we should consider. The first related to a marine mammal scientist, Dr Leigh Torres. We declined to ask Dr Torres³² to appear before us or provide further information to us because we determined that we had sufficient relevant information on mammals from other experts. We recorded our reasons for that decision.³³
125. Secondly, the Fisheries Interests and KASM each sought to introduce expert evidence late in the hearing process from witnesses who had not appeared before us. In the case of the Fisheries Interests, the expert was a planner, and in the case of KASM, the expert was a marine scientist. We declined to receive this evidence. We had given a direction under section 57 requiring the provision of briefs of evidence prior to the commencement of the hearing from experts being called by submitters.³⁴ The purpose of that direction was to ensure, within the very short timeframe available under the EEZ Act to complete the hearing, that we, the applicant and all the other participants had as much notice of what experts were saying as possible. In addition, we asked the experts who had provided evidence in accordance with our directions to conference.
126. The Fisheries Interests and KASM did not comply with our direction with regard to the two witnesses described above. We determined that, in all the circumstances and in fairness to all participants, we would not receive or consider this evidence. In relation to the planning expert, we understand he had provided some suggested amendments to proposed consent conditions. We invited counsel for the Fisheries Interests to simply table those suggested conditions so we could all benefit from them. Counsel refused to do so unless we also accepted the accompanying evidence. That was unfortunate, but we understand counsel for the applicant had received a copy of the suggested conditions and was able to address these in the final set of conditions presented to us as part of the applicant's closing.
127. In relation to the evidence of the marine scientist KASM sought to introduce, in closing submissions, counsel for KASM inappropriately presented at least some of this material to us. It was untested and does not form part of the expert evidence properly before us. We have placed very little weight on this aspect of KASM's submissions.
128. The requirement to base our decision on the best available information does not create a 'free for all' whereby participants can expect to be able to produce information whenever they like or where they can demand that we seek additional information. Ultimately, we need to decide how much information (and of what quality) is sufficient for our purposes, and we need to run a process that is fair to all participants and respectful of the EEZ Act's expectations as to the timeframe within which marine consent applications must be processed. That is what we have done.

³² Dr Torres was not called as a witness by any party but was an author of a report that was included in the application and had also authored a journal article on blue whales in the wider area to which we and the expert witnesses had access.

³³ DMC memo in New Plymouth, 30 April 2014.

³⁴ Directions and Hearing Procedures of the Decision-making Committee, February 2014.

Uncertainty or inadequacy of information

129. A feature of this application is the considerable uncertainty as to the nature of the marine environment that might be affected by the proposal and the environmental performance standards necessary to ensure that significant adverse effects are avoided, remedied or mitigated. This includes the application area but also the area of the sediment plume's potential impact – a considerable area within the STB.
130. It was generally agreed by the experts, and accepted by the applicant, that natural temporal variability in the relevant marine environment is not well understood, despite the fact that the applicant has been working on this proposal for over seven years. It was generally agreed that this 'gap' would need to be filled before appropriate trigger values and compliance limits relating to the effects of the applicant's proposed mining operations could be set. The generally accepted view was that this baseline environmental monitoring would take at least two years.
131. We therefore conclude that, while the currently available information on the existing environment is incomplete and inadequate, it is the best available information. This inability to establish more robust quantitative compliance and trigger values was surprising to us based on the applicant's opening submissions³⁵ and having regard to the contents of the joint statement of the planning/mitigation experts.³⁶
132. As things transpired, it seems to us that the applicant had overestimated the extent to which its own and the other experts were in a position to advise us on the nature of the environment and the appropriate environmental performance standards/objectives that should apply to the mining operation. In response, the applicant's emphasis shifted during the hearing to developing a stronger process that would allow an appropriate level of baseline information to be gathered and then quantitative standards developed as a subsequent exercise.
133. While we agree it is reasonable in a proposal such as this that some amount of baseline environmental data-gathering is deferred until after a consent is approved and that some quantitative environmental performance standards that relate to qualitative objectives are not set until that baseline data is sufficiently detailed to ensure quantitative measures are both achievable and meaningful, in this case, we consider that insufficient detail is currently before us for us to be confident in granting a consent. Put simply, we do not know enough about the existing environment (and in particular its temporal variability under existing conditions) and how that environment may be affected by the proposed mining to be confident that the stated qualitative Environmental Performance Objectives will be achieved.
134. We also lack confidence in granting a consent for a 20-year large-scale mining project in this environment when we do not have adequate environmental baseline information and where it is left to a process, in respect to which we have no role, to analyse and interpret that baseline information, to

³⁵ See for example Mr Beatson's comments at page 50 of the transcript, 10 March 2014.

³⁶ Schedule 1 Environmental Objectives and Trigger Levels, Joint Witness Statement of the Mitigation Experts, 25 March 2014.

develop an environmental management and monitoring plan and to set trigger and compliance values for critical environmental parameters.

135. In this regard, we see some comparison with the position the Environment Court found itself in with the Crest Energy application where the Court issued an interim decision and invited the applicant to undertake a considerable amount of work on conditions and a draft management plan that the Court considered before issuing a final decision. A critical difference between the RMA and the EEZ Act is the timeframe within which a decision is expected. Given the advice from various experts that baseline data-gathering is likely to take at least 2 years and the advice of Mr Garry Venus that the experts cannot come up with robust quantitative trigger values at this time,³⁷ we do not consider that it would be a proper exercise of our functions to seek to extend the current process to allow for the necessary work to be completed.
136. We were surprised at the applicant's inability to clearly articulate from the outset how it was going to mine and operate to ensure that it achieved the environmental results – and especially the plume characteristics – that its experts had modelled. We were left with the impression that the applicant had not adequately developed its thinking on this point and was using the hearing process to work this out. Achieving an appropriate particle size distribution and mass flux within the plume is a key environmental performance criteria, but by the end of the hearing, we were left with the impression that the detailed operational thought needed to give us confidence that the applicant would be able to meet the performance criteria it had put forward was lacking.
137. The lack of clarity in the early stages of the hearing in how the applicant proposed to conduct the mining operation having regard to the mud lenses or layers overlying or within the iron-bearing sand layers was surprising. It is concerning that the applicant had not identified at the outset that conditions relating to and controls over particle size distribution and mass flux of released sediment, measured both instantaneously and over some ecologically meaningful averaging period, would be necessary to ensure that the mining operation conformed to that upon which the assessment of the sediment plume was based. While the final version of conditions submitted by the applicant in closing includes relevant conditions, we were also presented with a new condition,³⁸ which gives the applicant the ability to unilaterally change the way it mines provided the Environmental Performance Objectives are met. While at one level this might seem a reasonable condition, in the present circumstances, where there is an acknowledged lack of baseline data, few quantitative environmental performance parameters and we are being asked to trust others to come up with a monitoring regime and appropriate performance parameters, we find the position unacceptably uncertain.
138. Section 61(1)(c) requires us to take into account any uncertainty or inadequacy in the information available. We find that there is considerable uncertainty in the information provided as to both the nature of the environment and the way the mining operation might affect it. We also find the information on how Māori existing interests will be identified and addressed to be inadequate.

³⁷ Addressed later in this decision.

³⁸ Condition 6 in the proposed conditions dated 8 May 2014 and attached as Appendix A to the applicant's closing submissions.

Favouring caution and environmental protection

139. Section 61(2) contains an important direction. We must “*favour caution and environmental protection*” where the information is uncertain or inadequate. This provision is an explicit statement that, within the context of the EEZ Act, the promotion of sustainable management requires a cautious approach. The taking of risks in this environment is not encouraged, and we note that this direction is not to be traded off against the attainment of economic wellbeing. In other words, the requirement to favour caution and environmental protection in the face of uncertain or inadequate information is an absolute one, and we remind ourselves of section 10(3), which makes it clear that applying the information principles in section 61 is one of the ways the purpose of the EEZ Act is achieved.

Adaptive management and conditions of consent

140. Having determined that we are confronted with material uncertainty and inadequacy and that therefore we must favour caution and environmental protection, we next must consider whether that means consent for the proposed activity is likely to be refused and, if so, whether taking an adaptive management approach would allow the activity to be undertaken.³⁹

141. In this case, we have decided on the evidence that favouring caution and environmental protection in light of the uncertainty and inadequacy of the information available means that we have refused consent. We have, later in this decision, discussed the adaptive management approach proposed by the applicant and why we did not find it was appropriate in this case to enable the activity to take place.

142. Section 64(2) provides a definition of adaptive management as follows:

“An adaptive management approach includes—

(a) allowing an activity to commence on a small scale or for a short period so that its effects on the environment and existing interests can be monitored:

(b) any other approach that allows an activity to be undertaken so that its effects can be assessed and the activity discontinued, or continued with or without amendment, on the basis of those effects.”

143. Section 64(3) makes it clear that we have the ability to impose conditions under section 63 to authorise an activity to be undertaken in stages and for there to be monitoring and reporting before the next stage of the activity may be undertaken. Section 64(4) explains that a stage may relate to the duration of the consent, the area over which the consent is granted, the scale or intensity of the activity or the nature of the activity.

144. As explained to us by the applicant, the nature of the activity and the capital-intensive assets required to undertake the mining and processing are such that staging of the activity was not commercially realistic and was not sought. The applicant explained to us that, in order for the operation to be commercially viable, the ability to mine the whole area of the application was required. In this

³⁹ Section 61(3) of the EEZ Act.

respect, the applicant does not have the ability to effectively undertake a staged development.⁴⁰ TTR was explicit about this and sought a full mining consent based on a risk-based tiered approach – an approach it argued was adaptive management based on the definition in section 64(2)(b).

145. It seems to us that what the applicant was able to offer is not adaptive management in the usual sense of a staged development. Rather, the applicant is effectively saying that it accepts it may need to alter its operations in order to ensure it complies with whatever quantitative performance standards are eventually established. The applicant suggests that operational changes (such as altering the production rate or depth of mining⁴¹) can be made before adverse effects become irreversible. While conceptually this makes sense to us, we struggle to understand the extent to which the applicant really does have operational flexibility.
146. The evidence we heard was that, for the project to be commercially viable, it was necessary for the applicant to have consent to mine the whole area and for the full duration sought. We do not know if the applicant will have the flexibility to make the necessary changes. We are concerned that this is not an adequate state of affairs, and in this respect, we find we must favour caution and environmental protection. For this and other reasons set out in the sections that follow, we have refused consent.

⁴⁰ See for example the comments of Mr Crossley at page 29 of the transcript and of Mr Beatson at page 51 of the transcript, 10 March 2014.

⁴¹ Paragraph 435, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014.

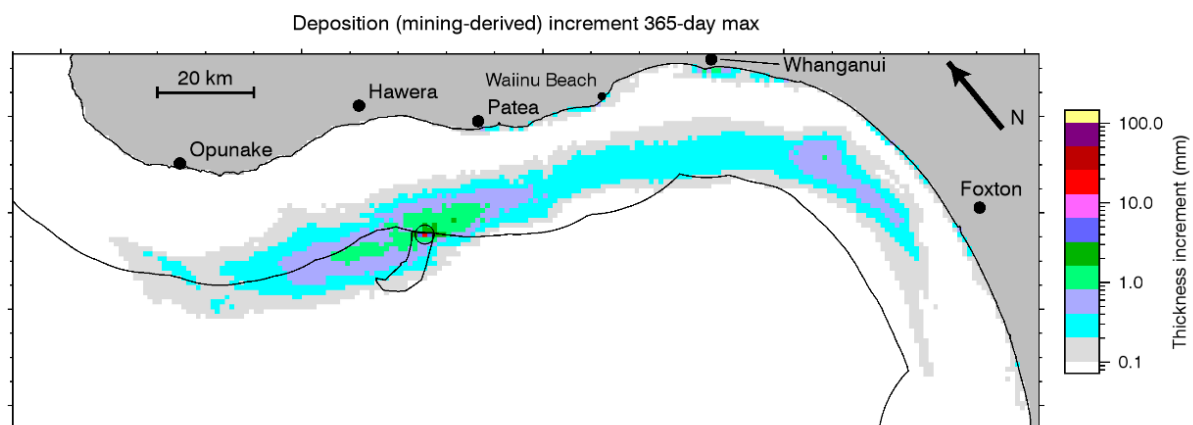
4. The sediment plume

4.1 Overview

147. The sediment plume is a fundamental component of the proposal. Many of the effects of the proposal are due to the plume and are determined by:
- sediment discharge rates from the FPSO
 - discharge sediment particle size distribution, especially with respect to small ($<90\ \mu\text{m}$) particles
 - weather, tides and wave conditions
 - background conditions including bathymetry and position of the FPSO.
148. For sediment plume characterisation, the three classes of sediment we are interested in are:
- coarse grains that deposit quickly
 - medium and fine sediment that deposits widely and can resuspend
 - very fine sediment that remains in suspension.
149. The STB sediment plume model was created by NIWA to take account of:
- the background (non-mining) sediment distribution
 - the mining operation sediment distribution
 - the combined background and mining operation sediment distribution.
150. Two sediment plume models were provided. The first dated October 2013 was provided with TTR's application documents. A revised model dated 19 March was provided by TTR expert witness Dr Mark Hadfield for the joint witness conferencing. It is based on revised discharge data provided by TTR on 4 March with reduced fine sediment from the grinding process and an increase in the run-of-mine fine sediment to allow for increased mud in the seabed material. The comments to follow refer to the 19 March plume modelling.

Figure 2: Modelled sediment plume showing maximum, 365-day increment in equivalent thickness of mining-derived sediment.

Source: South Taranaki Bight Sediment Plume Modelling: the Effect of Revised Source Particle-Size Distributions, Dr Mark Hadfield 19 March 2014



4.2 Background sediment

151. Dr Hadfield's suspended sediment model⁴² was calibrated with baseline measurements including suspended sediment concentrations taken by NIWA scientists. We note the importance of an accurate background model, particularly when mining-derived suspended sediment concentrations are compared to background suspended sediment concentrations.⁴³ However, Dr Hadfield notes that 2 years' model output is not sufficient to define the seasonal cycle to a high degree of accuracy.⁴⁴
152. The experts agreed that all the predictions in the model simulations are subject to uncertainties.⁴⁵ We asked Dr Hadfield about the scale of the uncertainties, and he clarified that the uncertainty factor could be from minus 50% to plus 100%.⁴⁶ He also commented that the mention of uncertainty should not be taken to provide an unlimited licence to dismiss the results.⁴⁷
153. This was echoed by Dr Dougal Greer in his evidence for KASM. He commented that:
- "there will be a degree of error surrounding the modelling of the plume itself but this remains unquantified. Nonetheless Dr Hadfield points out and I would agree with him on this point that error in the order of a factor of two is considered good for sediment transport modelling."*⁴⁸
154. We understand that a model is only as good as the information that is fed into it and asked whether fine sediment released from the mine face had been included in the model. The model does not include mine-face discharges.⁴⁹ We accept that it is expected to only add a small volume and contribution to the plume, unless a significant muddy layer is disturbed.⁵⁰
155. The experts agreed that the model grid size used, while being coarser than ideal to simulate accurately the variability and near-field behaviour, does represent a reasonable balance between the competing demands of spatial-grid resolution and computing power requirements and is fit for purpose. The experts concluded the underlying model structure as used is appropriate for purpose.⁵¹
156. Dr Hadfield noted in his evidence that the coarse grids of the model had limited the accuracy of the nearshore sediment dispersion and that, overall, the model is likely to have underpredicted the maximum nearfield concentrations.⁵²

⁴² Paragraph 25, Statement of Evidence in Chief of Dr Mark Hadfield on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

⁴³ Paragraph 31, Statement of Evidence of Peter Longdill for the Director-General of Conservation, 24 February 2014.

⁴⁴ Paragraph 11, South Taranaki Bight Sediment Plume Modelling: Seasonal Variability of Natural Sediment Suspension, Dr Mark Hadfield, 26 March 2014.

⁴⁵ Paragraph 27, Joint Statement of Experts in the Field of Sediment Plume Modelling, 25 March 2014.

⁴⁶ Page 521 of the transcript, 31 March 2014.

⁴⁷ Page 501 of the transcript, 31 March 2014.

⁴⁸ Page 565 of the transcript, 31 March 2014.

⁴⁹ Paragraph 18, Joint Statement of Experts in the Field of Sediment Plume Modelling, 25 March 2014.

⁵⁰ Paragraph 18 and 20, Joint Statement of Experts in the Field of Sediment Plume Modelling, 25 March 2014.

⁵¹ Paragraph 16, Joint Statement of Experts in the Field of Sediment Plume Modelling, 25 March 2014.

⁵² Page 497 of the transcript, 31 March 2014.

157. The experts involved in joint conferencing regarding the sediment plume modelling all agreed that the process of deposition and subsequent resuspension of sediment is represented in a plausible way in the sediment plume model.⁵³

4.3 Input assumptions

158. The sediment plume inputs are expected to come from a variety of sources, including:
- discharge pipe
 - thrusters
 - qnchoring
 - mine-face spill
 - hyperbaric filter discharge.
159. Overall, the largest plume sources are from the discharge pipes, and that is what we have focussed on.

Mine-face plume source

160. In Dr Longdill's evidence for the Director-General of Conservation,⁵⁴ he raised the potential for mine-face generated sediment to enter the plume. The joint witness statement experts agreed:

*"Although small or incremental and unquantified, under optimal mining conditions, the extra suspended sediment disturbed is expected to only add a small volume and contribution to the plume if a significant mud layer is not disturbed."*⁵⁵

Mined sediment

161. The flow rate (discharge) and particle size distribution of the sediment is a critical factor. The representativeness of the sediment particle size distribution from the mining area does not seem to be particularly robust given it was based on only two drill holes over an area of more than 66 km².
162. The experts involved in the joint conferencing agreed that the particle size used for the mineable resource is appropriate assuming no mud layers are encountered, as presented in the two cores used in the modelling.⁵⁶ The experts agreed with the assumption that the particle size distributions are representative of the mining material resource.⁵⁷
163. Muds, however, form the finest particle size distribution class (<38 µm) and are likely to remain in suspension and travel the furthest within the plume. Methods proposed to control these very fine sediments are discussed later in section 4.6.

⁵³ Paragraph 39, Joint Statement of Experts in the Field of Sediment Plume Modelling, 25 March 2014.

⁵⁴ Paragraph 16, Statement of Evidence of Peter Longdill for the Director-General of Conservation, 24 February 2014.

⁵⁵ Paragraph 18, Joint Statement of Experts in the Field of Sediment Plume Modelling, 25 March 2014.

⁵⁶ Paragraph 11(c), Joint Statement of Experts in the Field of Sediment Plume Modelling, 25 March 2014.

⁵⁷ Paragraph 12, Joint Statement of Experts in the Field of Sediment Plume Modelling, 25 March 2014.

Modelled uptime

164. The Impact Assessment accompanying the application identifies that TTR will develop a seabed mining capacity of 70 million tonnes/annum (8,000 tonnes/hour) with a consent extraction rate of 50 million tonnes/annum, an uptime of 71%. In the plume modelling, a 20-day cycle has been used, with discharges occurring for 16 days followed by 4 days with no discharge, giving an 80% uptime.
165. The modelled source was also turned off when the significant wave height at the site exceeded 4 metres, which occurs approximately 2.5% of the time, based on the wave data used to drive the model.⁵⁸
166. On average, therefore, the plume modelling is expected to be conservative to the actual effects should TTR be constrained to an average mining rate of 50 million tonnes/annum. The uncertainties in the model and the natural variability that can be expected in the actual plume performance means that the plume model would need to be validated against actual plume monitoring data should mining proceed.

Discharge rate

167. In his evidence for TTR, Mr Brown stated that the current mining schedule considers a 7% cut-off grade meaning that material with an in situ magnetic content of less than 7% is not included in the initial mine schedule.⁵⁹ He further advised how the revised particle size distribution used for the expert conferencing plume modelling session was due to increases in the assumed mud content (to take into account the expectation that some mud lenses would be mined) and lower grindings-related fines from a changed milling process.
168. As modelled in the discharge study by MTI, 98% of the discharge sediment released from 4 metres above seabed deposits to the seabed within 100 metres.

"At the output location $x=100$ m, the total deposition rate (without waves) of scenarios 1 and 2 are similar (98 %). Less deposition occurs in scenario 3 (nearly 85%) of the total flux, as described before this has to do with the longer vertical mixing from the release point. The inclusion of waves does not influence significantly the deposition behaviour (scenarios 1 and 2). Sediment in suspension of flux 3 (d_{50} : 196 μ m), however appears to be higher without inclusion of waves."⁶⁰

169. Based on this work, we are satisfied that the NIWA plume modelling should focus on the finer (<90 μ m), sediments as the coarser sediments will drop out relatively quickly.

⁵⁸ Page 32, South Taranaki Bight Iron Sand Extraction Sediment Plume Modelling (Hadfield, 2013).

⁵⁹ Paragraph 65, Statement of Evidence in Chief of Matthew Brown on behalf of Trans-Tasman Resources Ltd, 15 February 2013.

⁶⁰ Page 17, Assessment of Sediment Deposition and Re-suspension Behaviour of Tailings. Phase 2: influence of surface waves, 31 July 2013, A. Ortega/T. de Boer, MTI Holland BV.

170. The sediment size classes used by Dr Hadfield in his model were described in his addendum to the Joint Witness Statement⁶¹ and are shown below:

Size range (μm)	Model discharge (kg.s^{-1})	Model discharge (t.hr^{-1})
38–90	31.1	112
16–38	36.7	132
8–16	14.5	52
<8	14.7	53
TOTAL<38	65.9	237
TOTAL<90	97.0	349

171. To be confident of this, we need to ensure that the actual results are no worse than those modelled.
172. As noted by Counsel for TTR in closing submissions,

“...if the [particle size distribution] inputs into the model are not representative, then this will be TTR’s problem in light of the conditions proposed. Again, the DMC should attach weight to the placement of this risk on TTR to either comply, or be unable to act under a consent.”⁶²

4.4 Plume modelling results

173. We understand that, in general terms, the finer classes of sediment tend to form a mobile plume, whereas the coarsest classes form deposition patches.⁶³ The animations and description presented by Dr Hadfield are as follows for location A (at the inner end of the project area) and B (at the outer end):⁶⁴

“The suspended source at location A generates a plume extending predominantly east-south eastwards towards Whanganui, then along the coast towards Kapiti. Concentrations decrease with distance from the source. Along the plume axis, up to approximately 10–20 kilometres from the source (depending on the particular measure chosen) mining derived [suspended sediment concentrations] exceed background [suspended sediment concentrations].

Within a few kilometres of the shore, mining-derived sediments make a very small contribution to total SSC.

The coarser material from the suspended source – that is the 38–90 micron class – which can be described as very fine sand to very coarse silt – moves predominantly south-eastwards and forms an extensive deposition footprint that follows the inside of the territorial limit. Away from the immediate vicinity of the source deposition rates (over 365 days) are up to one or two millimetres.

⁶¹ Table 2 extract (and reworked), South Taranaki Bight Sediment Plume Modelling: The Effect of Revised Source Particle-Size Distributions (Mark Hadfield, 19 March 2014).

⁶² Paragraph 178, Closing Submissions on Behalf of Trans-Tasman Resources Ltd, 8 May 2014.

⁶³ Paragraph 9, South Taranaki Bight Sediment Plume Modelling: the Effect of Revised Source Particle-Size Distributions (Mark Hadfield, 19 March 2014).

⁶⁴ Page 489 of the transcript, 31 March 2014.

The plume from the suspended source at location B is similar to the plume from source A but shifted off-shore and with lower concentrations. A recovery simulation, in which source A is turned off, indicates that SSCs drop away and the finer mining-derived sediments leave the domain within one or two years, but the deposited coarser (38 to 90 microns) sediment leaves the domain over a time scale of approximately 10 years.

The patch source does not have the potential to produce a plume comparable to the suspended source as the fine sediment concentration in the deposited sediments is low.

The freshwater source forms an extensive plume at low concentrations."

174. We understand from Dr Hadfield's animations that the plume is transported to the east/south-east much of the time, with occasional excursions in the opposite direction or towards Patea.⁶⁵
175. We asked Dr Hadfield how long he estimated it would take to achieve a steady state after mining stopped. He considered it was likely to reach equilibrium in the order of 10 years.⁶⁶
176. The modelling identified the median plume would be approximately 50 kilometres long and up to 20 kilometres wide.⁶⁷

4.5 Uncertainties

177. The experts all agreed that modelling inherently has some form of error.⁶⁸ As Dr Hadfield stated, *"The uncertainty of the uncertainty is uncertain."*⁶⁹
178. The model is critically important because the majority of the environmental effect analysis is dependent on its accuracy.⁷⁰ We accept that the other TTR experts have relied on the model to 'determine' their opinions on the effects of the proposal.
179. Through the course of the hearing, the issue of mud lenses was raised a number of times. We understand this is an important issue, as sediment classed as mud comprises the finest sediment size. The finer-grained mud sediment is likely to remain in suspension for longer and travel further than coarser grained sediment.
180. In terms of uncertainty, we note TTR's Executive and Project Director, Mr Thompson's comments with respects to understanding the plume. He said:

"And I think we understand the sensitivity around the creation of the plume and the work that Dr Hadfield as well as some of the optical work that is being done, we spent an inordinate amount of effort in trying to define what that would look like.

⁶⁵ Page 514 of the transcript, 31 March 2014.

⁶⁶ Page 534 of the transcript, 31 March 2014.

⁶⁷ Paragraph 6, Statement of Evidence in Chief of Dr Matt Pinkerton on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

⁶⁸ Paragraph 27, Joint Statement of Experts in the Field of Sediment Plume Modelling, 25 March 2014.

⁶⁹ Page 508 of the transcript, 31 March 2014.

⁷⁰ Paragraph 16, Closing Submissions of Counsel for Environmental Defence Society Inc (EDS), 7 May 2014.

*It is unknown for us and an unknown for the conditions of New Zealand, so for tried and tested I can honestly [say] that the plume and the tailings deposition off the coast of New Zealand is not tried and tested; it is new.*⁷¹

4.6 Proposed conditions

Grade control drilling

181. To assist TTR to manage its fine particle sediment discharge, Mr Brown considered that grade control drilling was the most appropriate mechanism for managing this.⁷² Grade control drilling is the final step for geologists in defining the ore body boundaries, lithology changes and the grade/tonnage before extraction takes place.⁷³
182. The experts agreed that the uncertainty about the sediment plume could be managed through grade control drilling undertaken in advance of mining activities.⁷⁴ Mr Brown confirmed in his evidence the value of grade control drilling.⁷⁵
183. TTR proposed an initial extraction schedule report to EPA (proposed Conditions 20 and 21). A pre-mining assessment report (proposed Conditions 132 and 133) identifies mud layers in the area to be mined as well as procedures for avoiding identified mud layers to the extent necessary to meet the particle size distribution limits. The specific requirements of grade control drilling are outlined in proposed Conditions 175–178.

Operational plume model

184. Dr Longdill in his evidence recommended that the applicant be required to develop and apply an operational sediment plume model to be forced with actual day-to-day discharges. Dr Hadfield in his evidence agreed that such a model would have value in aiding the interpretation of the results of environmental modelling and could provide useful input into management of the operation.⁷⁶ The experts agreed an operational sediment plume model would be useful as an environmental management tool for the operator and in assessing compliance but also valuable in validating and ground truthing the model.⁷⁷ This was reflected in the conditions proposed by TTR, especially proposed Conditions 179–182, which require an operational plume model to be validated by actual measurements. We agree that, if we were granting consents, a requirement for an operational plume model would be appropriate. The modelled sediment effects are sensitive to changes in sediment inputs, and this is clearly seen in the differences in Dr Hadfield's model predictions when the mud content and grind sizes were changed.

⁷¹ Page 287 of the transcript, 12 March 2014

⁷² Page 461 of the transcript, 31 March 2014.

⁷³ Paragraph 75, Statement of Evidence in Chief of Matthew Brown on behalf of Trans-Tasman Resources Ltd, 15 February 2014.

⁷⁴ Paragraph 14, Joint Statement of Experts in the Field of Sediment Plume Modelling, 25 March 2014.

⁷⁵ Page 461 of the transcript, 31 March 2014.

⁷⁶ Page 498 of the transcript, 31 March 2014.

⁷⁷ Paragraph 32, Joint Statement of Experts in the Field of Sediment Plume Modelling, 25 March 2014.

Discharge management

185. We heard from Dr Longdill that the discharges, not the run-of-mine particle size distribution, determine the suspended sediment concentration plume intensity and extent.⁷⁸ He favoured placing limits on the nature of the discharges, that is, mass flux and particle size distribution, as a more effective mechanism than controlling the suspended sediment concentration plume by proxy, that is, via limiting the run-of-mine sediment and/or processing technology and/or mine throughput.⁷⁹ He also noted the difficulty in measuring compliance of the plume because of the influence of not only the discharge but natural variance to the background.⁸⁰
186. TTR accepted a particle size distribution limit initially at least until the monitoring of the operation demonstrably meets the environmental outcomes specified by the proposed objectives (i.e. the plume effects are far less than predicted). TTR favoured progressive relaxation of that constraint if it is demonstrably unnecessary or at least to have a review opportunity to have the averaging limit extended to better represent the operational variability.⁸¹ The proposed Condition 5(e) sets a limit on the discharge for a maximum fines content (all material finer than 90 µm) and a maximum ultra-fines content (all material finer than 8 µm).
187. TTR proposed a number of conditions to manage both the inputs and outputs of sediment into the process. TTR proposed a maximum level of sediment extraction of 8,000 tonnes per hour on a monthly average and 50 million tonnes during any 12-month period (proposed Condition 5(c)). TTR also wanted to ensure any conditions took into account periods of downtime due to maintenance or adverse weather such that they could 'catch up' on an averaged period.
188. Proposed Condition 5(d) averages the deposition of hydrocyclone underflow over any 12-hour period. Proposed Condition 5(e) set a total average maximum discharge of 7,360 tonnes per hour. In response to the issues raised by Mrs Pratt, Condition 5(g) requires these values to be expressed on a 3-month running average basis. We agree that rolling averages versus instantaneous measurements improve both environmental and operational monitoring.

4.7 Findings

189. Having considered the information available through TTR's marine consent application and associated reports, the expert witness presentations and conferencing reports and concerns expressed by submitters, it is our view that:
- Different sediment sizes will behave differently, with the coarsest sediments dropping out quickly from the plume after discharge from the tailings pipe and the finest particles having the greatest range, either spreading across the STB and depositing in a generally south-eastern pattern from the point of discharge or remaining in suspension.

⁷⁸ Page 539 of the transcript, 31 March 2014.

⁷⁹ Page 541 of the transcript, 31 March 2014.

⁸⁰ Page 550 of the transcript, 31 March 2014.

⁸¹ Paragraph 208, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014.

- We accept the plume model is fit for purpose and, based on field testing, has an accuracy of -50% to +100%.
- There are inherent uncertainties in this type of modelling, which the experts accept, and the model outputs are sensitive to the inputs.
- The other experts have based their assumptions on the model which we address in the subsequent sections.
- The key determinants of the plume can be modelled, calibrated and managed with the TTR proposed conditions.

5. The effects of the proposal

190. Section 59(2)(a) of the EEZ Act requires us to take into account the effects on the environment of allowing the activity. In this section, we discuss the information we received through submissions, evidence, advice and reports and our findings in regard to these effects.

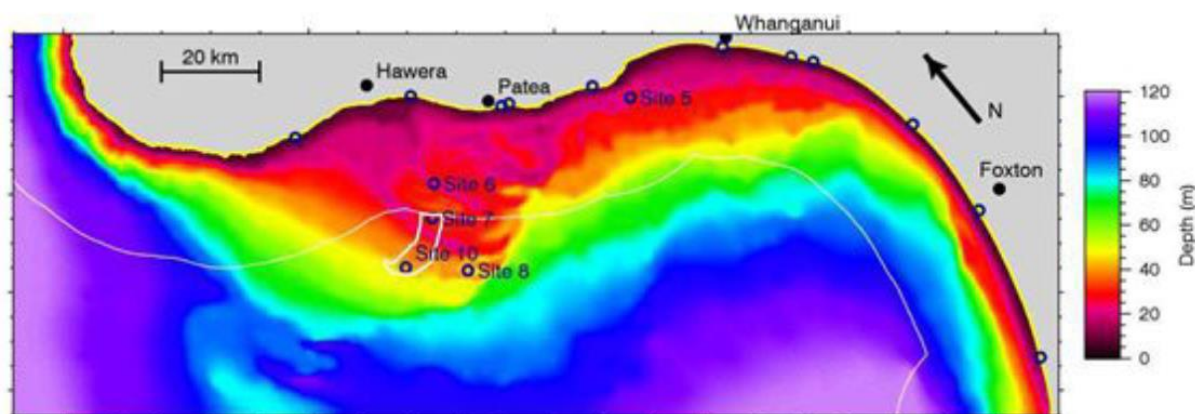
5.1 Primary productivity

The issues

191. Impacts on primary productivity are a potentially significant issue in relation to protecting the biological diversity and integrity of marine species, ecosystems and processes in the STB.

192. We consider the main issues to be addressed in relation to primary productivity are effects on benthic flora and fauna in the area directly affected by the plume, the indirect effects of reduction in primary productivity on the wider ecosystems and food web of the STB (defined by Dr Pinkerton as 12,570 km²⁸² and described as including the South Taranaki Coast from approximately Cape Egmont to just north of Kapiti Island, and to a distance offshore of about 50 km⁸³) and any effects beyond the STB, in particular, the Marlborough Sounds. This section deals particularly with wider productivity and ecosystem/food web issues. Benthic effects are covered in a separate section.

Figure 3: Spatial extent of the South Taranaki Bight for the purposes of this study as originally defined by Dr Hadfield (2013). Also shown are bathymetry (coloured surface), coastline (yellow), 12 nautical mile (22.2 km) territorial limit (thin white line), project area (thick white line), some current meter sampling sites (dark blue), river locations (blue) and towns (black)⁸⁴



193. The three main types of primary producers in the STB are:⁸⁵

⁸² Paragraph 17, Statement of Evidence in Chief of Dr Matt Pinkerton on behalf of Trans-Tasman Resources Ltd, 17 February 2014

⁸³ Paragraph 2, Predicting the effects of ironsand mining on optical properties of the South Taranaki Bight, Dr Matt Pinkerton, 18 March 2014

⁸⁴ Dr Matt Pinkerton Updated Evidence Optical Properties (18 March 2014)

⁸⁵ Joint Statement of Experts in the Field of Optical Effects, 26 March 2014.

- phytoplankton in the water column
- macroalgae (seaweed) on hard substrate (including rocky reefs, cobbles, shell debris)
- benthic microalgae on the seabed.

194. Primary production by these three groups of photosynthetic organisms provides some of the key energy sources for the STB ecosystem.
195. Based on the evidence presented, the sediment plume created by mining would cause shading in the water column affecting primary productivity of phytoplankton and reduce light availability at the seabed affecting benthic primary productivity.

The effects

The application

196. The application identified that *“the principal potential water column effect of the de-ored sand re-deposition process arises from the generation of a “plume” of increased turbidity”*. It was identified that:

“The sediment plume from iron sand mining will impinge on the STB region and shoreline and so may affect light penetration, visibility and colour of the coastal and nearshore waters. However, the changes may be described as ‘fairly subtle’ in the nearshore environment. The impacts on aquatic ecosystems, human observers and recreationalists from optical and visual impacts on coastal and nearshore STB waters are expected to be low.”⁸⁶

197. In respect of cumulative effects, the application identified that *“the TTR project will create elevated suspended sediment levels immediately around the operational area. This effect will not present issues in respect of cumulative physical effects with any other activities, and consequently in respect of ecological effects.”⁸⁷*

Expert conferencing

198. There were four expert joint witness conferencing sessions with relevance to primary production effects of the mining proposal:

- Joint Witness Statement of Experts in the Field of Sediment Plume Modelling, 25 March 2014
- Joint Statement of Experts in the Field of Optical Effects, 18 March 2014. Issues addressed:
 - What changes to optical properties of the water are important/potentially important?
 - Is the methodology used for predicting optical effects appropriate? How robust are the estimates of change in optical properties in the STB that result from the proposed mining?
 - Predicted effects of proposed mining on water clarity.
 - Predicted effects of proposed mining on water colour.
 - Effects on different scales/locations.

⁸⁶ Page 11, TTR Impact Assessment Summary 21 October 2013

⁸⁷ Trans-Tasman Resources Ltd: South Taranaki Bight Offshore Iron Sand Extraction and Processing Project, October 2013. Supporting Information for Marine Consent Application, page 302.

- Conditions: What changes to optical properties would it be important to monitor if mining proceeds? How can optical changes in the STB be appropriately monitored?
- Joint Statement of Experts in the Field of Optical Effects, 26 March 2014. Issues addressed:
 - What changes to primary productivity in the STB may occur as a result of mining affecting optical properties?
 - Are changes to primary production reversible when mining ceases?
 - What are the likely ecological consequences of changes to primary production?
 - What changes related to primary production issues would it be important to monitor if mining proceeds? How could this be carried out?
- Joint Statement of Experts in the Field of Effects on Benthic Ecology – part 2, 26 March 2014.
 - Issue D – Effects of shading on primary productivity.

Modelling results of food web and ecosystem effects in the STB

199. The NIWA report Predicting the Effects of Iron and Mining on Optical Properties of the South Taranaki Bight (19 March 2014, Pinkerton) describes the results of optical modelling and predicts the optical and primary production effects of mining in the STB. The optical modelling is based on NIWA plume modelling reports discussed in the previous section of this decision (Hadfield, 2013).
200. The Joint Witness Statement in the Field of Optical Effects, 18 March 2014, records that the experts agreed that the modelling approach is the best available tool for impact assessment. However, they stated that all models have associated uncertainties, and it should be recognised that the optical model is based on the predictions of the hydrodynamic model, which can increase the level of uncertainty. These uncertainties need to be taken into account by careful interpretation of the results.
201. In relation to the optical properties, the models predict the following:
- At the mining site, there will be a three to four-fold change in optical properties.
 - About 10 kilometres east of the mining site (along the main plume axis), there will be about a two-fold change in optical properties.
 - The mean decrease in water column light over the STB region due to mining at Site A will be 7.6%. The mean decrease in water column light averaged over the STB region due to mining at Site B will be 15%
 - Only small changes in optical properties (underwater visibility, euphotic zone depth, light at the seabed) at the Traps (changes of less than about 10%).
 - Substantial changes in optical properties (underwater visibility, euphotic zone depth, light at the seabed) at the Graham Banks (about 30–65% changes).

Figure 4: Relative average (over two years) light in the water column⁸⁸

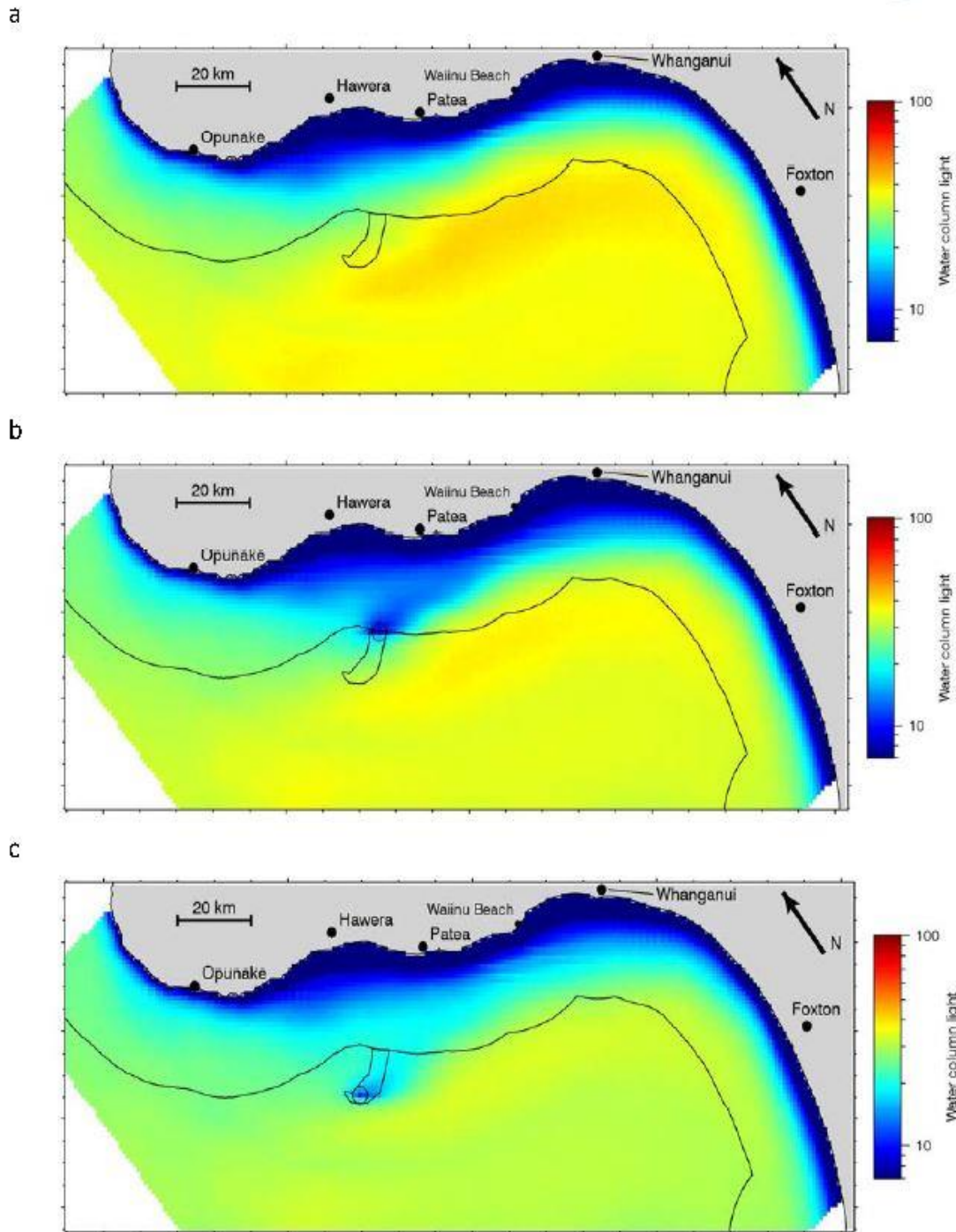


Figure 2. Relative average (over 2 years) light in the water column in the South Taranaki Bight (see Hadfield, 2013 for region limits). Orange/yellow is higher light; blue/purple is lower light. a: Background (no mining). b: With mining at site A. c: With mining at site B. All data processed using new optical processing code (v7) applied to new (lower) sediment discharge rates.

⁸⁸ Predicting the effects of ironsand mining on optical properties of the South Taranaki Bight (Dr Matt Pinkerton, 18 March 2014)

202. The Joint Witness Statement in the Field of Optical Effects, 26 March 2014, records that animals living in/on the seabed of the STB (and forming the faunal part of what is henceforth called the STB benthic ecosystem) depend on energy from one or more of:

- local primary production by benthic microalgae in the sediment
- particulate and dissolved organic matter from phytoplankton primary production in the water column, which sinks to and/or is otherwise incorporated into the sediments (detrital flux)
- detritus (particulate organic matter) from seaweed settling onto the seabed
- organic matter coming from rivers
- animals on/in the seabed taking food from the water column.

203. In relation to benthic effects, the optical model predicts that:

- before mining, approximately 5% of the seabed receives the minimum light requirements for benthic microalgae to grow
- during mining at Site A, approximately 2.5% of the STB seabed will receive more than the minimum light requirements for benthic microalgae to grow
- during mining at Site B, approximately 2.1% of the STB seabed will receive more than the minimum light requirements for benthic microalgae to grow.

204. Dr Pinkerton's expert opinion was that, for the purposes of considering the effects of mining in the STB and acknowledging the considerable uncertainties in the estimates, a reasonable estimate of the amount of primary production by benthic microalgae is 3% (range 1.5–6%) of primary production by phytoplankton in the STB. The other experts did not agree or disagree with this opinion. However, they agreed that the approach used to derive the estimate was a reasonable one.

205. The experts concluded that, for the purposes of considering the effects of mining in the STB, a reasonable or first-order approximation of the reduction in water column (phytoplankton) primary production (averaged across the whole STB and all seasons) due to optical effects of mining, is:

- mining at Site A – 4% reduction in phytoplankton primary production
- mining at Site B – 8% reduction in phytoplankton primary production.

206. The expert opinion of Dr Pinkerton (Pinkerton, 2014) was that, a reasonable estimate of the effect of mining on total primary production averaged across the STB is:

- mine Site A – 5% reduction in total primary production
- mine Site B – 10% reduction in total primary production

and of the effect of mining on energy input to the seabed ecosystem of the STB:

- mine Site A – 12% (range 6–30%) reduction in energy input to the seabed ecosystem
- mine Site B – 16% (range 11–36%) reduction in energy input to the seabed ecosystem.

207. The other experts did not agree or disagree with this opinion. However, they agreed that the approach used to derive the estimate was a reasonable one.

208. The NIWA analysis of 11 years of ocean colour satellite data shows that, at the scale of the whole STB, variability in the annual average chlorophyll-a concentration (indicative of phytoplankton primary production) measured by ocean colour satellites is likely to be of the order of $\pm 37\%$. The other experts did not agree or disagree with this estimate but noted that it was derived using the dataset and analytical approach of Pinkerton et al. (2013), which they agreed is consistent with international practice and robust for the purposes of impact assessment.
209. The experts agreed that the optical effects of mining in rocky reef areas where seaweed is known to occur (predominantly nearshore areas) are likely to be small, based on the outputs of the revised model. They agreed that the effect of mining on primary production by seaweed on the scale of the STB as a whole is hence likely to be small.

Recovery when mining ceases

210. The Joint Witness Statement of Experts in the Field of Optical Effects, 26 March 2014, agreed that concentrations of suspended sediment in the water column of the STB are likely to return to values close to pre-mining levels within a period of a few months after the cessation of mining
211. It was also agreed that, as concentrations of suspended sediment return to values close to pre-mining levels, water clarity and light availability will also return to pre-mining levels. At this stage, primary production by phytoplankton would be expected to return to seasonally adjusted pre-mining levels quickly (within a few weeks). Mining will not influence the oceanographic setting, supply of nutrients to the region, the water column light climate or the magnitudes or patterns of primary production by phytoplankton once suspended sediment from mining is no longer suspending in the water column in the STB.
212. Further, as concentrations of suspended sediment return to pre-mining levels, light at the seabed and primary production by benthic microalgae would be expected to return to pre-mining levels quickly (within a few weeks). Light levels at the seabed in the STB are naturally variable in space and time as a result of different water depths and concentrations of sediment and phytoplankton in the water. Consequently, it is likely that primary production by benthic microalgae is also variable in space and time under background conditions (i.e. benthic microalgal populations will bloom when there is sufficient light then die off or enter resting stages when there is not).
213. As concentrations of suspended sediment return to pre-mining levels, light over areas of hard substrate will return to pre-mining levels. Following this, rates of primary production by benthic macroalgae (seaweed) are likely to return to pre-mining levels after a period of months.

Ecosystem consequences of changes to primary production

214. The Joint Witness Statement of Experts in the Field of Optical Effects, 26 March 2014, agreed that, based on the model predictions of a change in the likely range of 4–8% in phytoplankton primary production and observed interannual variability of 37%, the risk of large-scale ecological regime shift in phytoplankton communities in the STB from the optical changes due to mining is likely to be small. Based upon the best available information, changes to water column primary production and changes to

total primary production due to mining are likely to be less than the background interannual variability in these quantities.

215. The experts agreed that the most significant ecological effect arising in the STB from the optical changes due to mining would likely be on the benthic (seabed) ecosystem in the region where light levels at the seabed are naturally highest. In some parts of the STB, there is likely to be a reduction in the amount of energy available to the benthic ecosystem due to mining. The reduction in energy input to the benthic ecosystem due to mining may reduce the biomass of infauna (animals in the seabed sediments such as worms and small crustaceans). Changes to the benthic ecosystem may affect animals that feed on benthic invertebrates, such as some species of invertebrate-feeding fish.

Marlborough Sounds

216. Aquaculture industry submitters raised concern as to the potential for the mining activity to affect primary productivity in some mussel farm areas in the Marlborough Sounds. The evidence from Mr Johnstone, Aquaculture New Zealand Technical Director, identified that, in La Nina years, there seems to be surface water being pushed into the outer Sounds, and those are years of lower productivity when the industry does not produce as many mussels. He commented that a further 4–8% reduction in the primary productivity potential of the water coming into these mussel areas would represent another potential impact that needs to be carefully monitored.
217. The NIWA report provided information about the plume into the Marlborough Sounds and dilution levels, using a model of plume dispersion for an area encompassing Marlborough Sounds.⁸⁹
218. The report states that STB simulations indicate that the sediment plume often extends down the Manawatu and Horowhenua coasts towards Kapiti. The Cook Strait simulation shows that it continues around the Wellington and Wairarapa coasts at progressively reduced concentrations. Animations from the Cook Strait passive tracer simulations show that, when the plume reaches the Wellington area, it generally hugs the Wellington coast. Wisps of plume material sometimes pass near Marlborough Sounds when a southerly wind pushes surface water northwards, but this is infrequent.

Uncertainty and/or inadequacy of information

219. Dr Pinkerton in his evidence⁹⁰ identified three factors important in estimating the possible changes in primary productivity in the STB resulting from optical effects and noted that none of these is well known:
- *“How much will reductions in light in the STB water column affect primary productivity by phytoplankton?”*
 - *How much primary productivity is there by benthic microalgae in the STB compared to primary productivity by phytoplankton in the water column?*
 - *How much of the primary productivity by phytoplankton in the water column gets to the seabed and is available to the benthic ecosystem?”*

220. He further added:

⁸⁹ South Taranaki Bight Sediment Plume Modelling: Suspended Sediments in Marlborough Sounds (Hadfield, 30 April 2014).

⁹⁰ Page 679 of the transcript, 1 April 2014.

“My sense is that the uncertainty that you get in turning suspended sediment concentrations into optical properties are less than you get from predicting sediment concentrations ... To then to go from an optical effect to a change of primary productivity is much bigger uncertainty ... and then to go from a change of primary productivity to an ecosystem effect, there is a lot more uncertainty on that so the uncertainty kind of steps up as you get into the biological components of the system.”⁹¹

221. The Joint Witness Statement of Experts in the Field of Optical Effects, 26 March 2014, agreed that, while quantitative and in some cases qualitative models are among the best available tools for predicting and assessing potential impacts, all models have associated uncertainties. The predictions of effects on primary production undertaken by the applicant and discussed by the experts are based on model predictions of optical effects of sediment plumes, which in turn are based on hydrodynamic model predictions of suspended sediment plumes. This layering of model predictions may compound the associated uncertainties. The joint statement then identified specific areas of uncertainty as:

- rates of primary production by phytoplankton in the STB
- the abundance, distribution and primary production of benthic microalgae and seaweed in the STB
- the proportion of water column primary production that is transferred as dissolved and particulate organic matter/detritus to the STB seabed ecosystem
- the relative importance of different energy sources for animals living in/on the seabed in the STB
- ecological consequences of changes to primary production in marine ecosystems are difficult to predict as ecosystems are complex systems and may not respond linearly to changes.

222. Dr Roberts, in presenting evidence on behalf of Taranaki Regional Council, raised additional uncertainties in relation to:

- the spatial scale of consideration of impacts on the whole STB compared to the area directly affected by the plume
- the assumptions in relation to the effects of reduced light availability on phytoplankton productivity taking into consideration the degree and seasonal variability of nutrient (nitrogen) limitation of phytoplankton growth.

Proposed conditions

223. Proposed Environmental Performance Objective 10(f)(vi) in relation to primary productivity, presented by TTR in the proposed consent conditions, is that there be no change in water column primary production and total primary production due to mining activity beyond the background natural interannual variability as assessed by baseline and operational monitoring of chlorophyll-a.

⁹¹ Pages 689–690 of the transcript, 1 April 2014.

224. The Pre-operational Baseline Environmental Monitoring Plan proposal in relation to monitoring of primary productivity is proposed Condition 106(c)(i):

“Benthic microalgae (BMA) are too variable in space and time to be a valuable monitoring factor. However baseline monitoring should include measurements of chlorophyll-a from the sediments in a way that discriminates between recent ‘benthic generated microalgae’ and ‘old/degraded phytoplankton’ to determine the relative importance of benthic versus pelagic primary production in this system.”

225. The Environmental Monitoring and Management Plan includes monitoring of chlorophyll-a as described above in the Baseline Environmental Monitoring Plan.
226. The Taranaki Regional Council, in commenting on the second EPA report, noted that including an enforceable condition that attempts to define impact on phytoplankton abundance and distribution arising from TTR’s operations is likely to prove problematic. Separating impacts of mining from natural variability, which can be high, is likely to prove difficult over shorter timescales.⁹²
227. The Taranaki Regional Council further commented that impacts on primary producers and the implications of this for other organisms within the marine food web needs to be dealt with consistently throughout the consent conditions, i.e. potential impacts on primary producers need to be considered in relation to benthic fauna, fish, zooplankton, marine mammals, seabirds, commercial fisheries, recreational fisheries and Māori interests.⁹³

Findings

228. Having considered the information available through TTR’s marine consent application and associated reports, the expert witness presentations and conferencing reports and concerns expressed by submitters, it is our view that:

- The proposed mining would have effects on the primary productivity of the 12,570 km² marine area identified as the STB in the evidence of Dr Pinkerton on optical properties and primary production.
- There would be decreases in both water column (phytoplankton) and benthic primary productivity that, according to the modelling carried out for this project, could result in a reduction of total primary production in the STB in the order of 10% and a reduction in energy input into the seabed ecosystem of up to 36%.
- There are likely to be significant effects on benthic productivity in areas under the sediment plume.
- Based on the outputs of the revised Hadfield model, optical effects of mining in rocky reef areas where seaweed is known to occur (predominantly nearshore areas) are likely to be small.

⁹² Paragraph 16, Taranaki Regional Council: Comment on second EPA staff report and recommended conditions, 6 May 2014

⁹³ Paragraph 120, Taranaki Regional Council: Comment on second EPA staff report and recommended conditions, 6 May 2014.

- There is considerable uncertainty in predicting effects on the wider ecosystem and food web of the STB.

229. We note the expert witness view that the risk of large-scale ecological regime shift in phytoplankton communities in the STB from the optical changes due to mining is likely to be small.
230. We also note from the Joint Witness Statement of Experts in the Field of Optical Effects, 26 March 2014, that, while quantitative and in some cases qualitative models are among the best available tools for predicting and assessing potential impacts, all models have associated uncertainties. The predictions of effects on primary production are based on model predictions of optical effects of sediment plumes, which in turn are based on hydrodynamic model predictions of suspended sediment plumes. This layering of model predictions may compound the associated uncertainties.
231. The applicant has proposed an environmental objective that there be no change in water column primary production and total primary production due to mining activity beyond the background natural interannual variability as assessed by baseline and operational monitoring of chlorophyll-a. This objective was added to the conditions presented by TTR at the last day of the hearing, so there has been no opportunity for it to be given any expert review.
232. We are not convinced that the above objective aligns with a less than minor environmental impact, as the sediment plume will be a constant addition to the water column, and while chlorophyll-a may remain within the baseline limits, there could still be an impact on overall primary productivity and consequent flow-on effects across the ecosystem and food web that are uncertain and difficult to measure. Also, when natural chlorophyll-a levels are at their lowest, **any** additional reduction caused by mining will take levels outside the natural range. We do not see how that circumstance could be avoided in compliance with the proposed condition.
233. Beyond baseline and ongoing monitoring of chlorophyll-a, there is no adaptive management response proposed by TTR if threshold or trigger levels are exceeded.

5.2 Zooplankton

The issues

234. Dr Grieve for TTR stated that zooplankton comprises small invertebrate animals and fish larvae carried by currents in the water column. This forms part of the food web. From the application documents and evidence presented to us, we consider the main issues associated with zooplankton are:
- effects of suspended sediment and sedimentation including reduced light levels in the water column and reduced primary productivity
 - effect of heavy metals released into the water column that would otherwise be in the subsurface seabed sediment.
235. In terms of importance of the STB for zooplankton, we understand from Dr Grieve that the STB may support a generally greater biomass of zooplankton than other parts of the continental shelf. However,

Dr Grieve does not think this in itself makes this region 'sensitive'. From the small amount of data available, she concluded that biomass appears very variable in space and time in the STB.⁹⁴

236. We acknowledge that the levels and health of zooplankton are intrinsically linked to both primary productivity and fisheries (given that some species of fish have a zooplankton phase of their lifecycle). We have addressed these matters in those sections.

The effects

The effects of suspended sediment and sedimentation

237. Dr Grieve in her evidence concluded that, based on the sediment concentration levels predicted for the TTR project, there is likely to be no effect on zooplankton other than what already exists in the natural environment. Zooplankton is already subjected to sediment resuspension and is 'coping' with increased levels of sediment in the water column from natural sources.⁹⁵
238. Dr McClary told us that increased suspended sediment concentrations within the water column are unlikely to cause impacts on zooplankton other than at a localised scale, and the ecological significance of such effects is considered minor.⁹⁶
239. During the expert conferencing session on fish and zooplankton, experts agreed that, in terms of the cumulative effects of increase of suspended solids, the increase in the water column is unlikely to cause sublethal effects or growth effects on zooplankton except at the immediate source of the plume.⁹⁷ The experts further agreed that direct effects of the increase of sediment concentrations on zooplankton are highly unlikely⁹⁸ and that the upwelling around Cape Farewell is unlikely to be affected by mining activities.⁹⁹
240. The experts addressed the effect of sedimentation on the zooplankton stages of rock lobster and fish, as this was raised as a matter requiring further information by the EPA. They agreed that the additional sediment from the mining operations will have no additional level of effect over that which is occurring naturally. The experts also agreed that the effects of mining on rock lobster larvae would be minor, as inshore reefs are located within naturally turbid waters, indicating a tolerance of species to such conditions.¹⁰⁰ This was echoed in Dr MacDiarmid's evidence.¹⁰¹

⁹⁴ Paragraph 16, Statement of Evidence in Chief of Dr Janet Grieve on behalf of Trans-Tasman Resources Ltd, 13 February 2014.

⁹⁵ Paragraph 19, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014.

⁹⁶ Page 822 of the transcript, 2 April 2014.

⁹⁷ Paragraph 17, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014.

⁹⁸ Paragraph 20, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014.

⁹⁹ Paragraph 20, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014.

¹⁰⁰ Paragraph 25, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014.

¹⁰¹ Paragraph 26, Statement of Evidence in Chief of Dr Alison MacDiarmid on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

241. Dr Grieve acknowledged in her evidence to us that the suspended sediment plume has the potential to alter water clarity, with implications for primary production and higher trophic levels. She considered that zooplankton, as abundant mid-level grazers and predators in marine systems, may be affected.¹⁰²

Effect of heavy metals released into the water column

242. The potential for heavy metals to affect zooplankton (for example, copper having the ability to inhibit reproduction of zooplankton) was raised in the EPA report¹⁰³ and highlighted by Dr Slooten in her evidence.¹⁰⁴ Mr Gordon expressed the same concern in his evidence. He expressed concern that no significant analysis has been done on the effects of sedimentation on zooplankton and the possible consequence of the sediments containing a cocktail of heavy metal concentrations.¹⁰⁵ The experts agreed that the application of the ANZECC/ARMCANZ 2000 Guidelines for Water Quality Protection is the appropriate standard for protection of zooplankton.¹⁰⁶

Cumulative effects

243. Section 59(2)(i) of the EEZ Act requires consideration of cumulative effects. We understood from Dr Grieve that near-surface-living zooplankton by their very nature are adapted to an environment that is disturbed. Environmental disturbance occurs naturally through processes such as upwelling of deep water, strong vertical mixing caused by tidal currents in shallow water or strong mixing caused by the grounding of surface waves close to shore.
244. Dr Grieve concluded that it is highly unlikely that one could distinguish between the impact of additional disturbance from any extraction of iron sands and the already existing, multiple sources of natural disturbance occurring in the greater STB region.¹⁰⁷

Uncertainty and/or inadequacy of information

245. Dr Grieve noted in her evidence that there is a paucity of zooplankton data from Class 124 water (water with a mean depth of 8 metres with high orbital velocities) nearshore, which limits conclusions that may be drawn concerning the plankton that live in this zone.¹⁰⁸
246. We note too that TTR did not undertake zooplankton sampling within the STB, and instead, Dr Grieve drew upon existing literature and sampling from the STB that took place in the 1970s and 1980s.¹⁰⁹ Dr Grieve also acknowledged that little is known of the seasonal cycle of interannual variability

¹⁰² Paragraph 8, Statement of Evidence in Chief of Dr Janet Grieve on behalf of Trans-Tasman Resources Ltd, 13 February 2014.

¹⁰³ Paragraph 113, EPA Staff Report, 10 February 2014.

¹⁰⁴ Paragraph 59, Evidence of Associate Professor Elisabeth Slooten on behalf of Kiwis Against Seabed Mining Incorporated.

¹⁰⁵ Paragraph 18, Summary of Douglas Gordon in Support of the Submissions of: The NZ Federation of Commercial Fishermen; Southern Inshore Fisheries Management Co Ltd; Talley's Group Limited; and McDonald and Brown Limited, 24 February 2014.

¹⁰⁶ Paragraph 21, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014.

¹⁰⁷ Paragraphs 18–19, Statement of Evidence in Chief of Dr Janet Grieve on behalf of Trans-Tasman Resources Ltd, 13 February 2014.

¹⁰⁸ Paragraph 7, Statement of Evidence in Chief of Dr Janet Grieve on behalf of Trans-Tasman Resources Ltd, 13 February 2014.

¹⁰⁹ Paragraph 9, Statement of Evidence in Chief of Dr Janet Grieve on behalf of Trans-Tasman Resources Ltd, 13 February 2014.

of plankton, as the existing data was mostly collected in summer.¹¹⁰ The age of the data used was noted by EPA in their gap analysis, and only a limited subset is specific to the waters that are characteristic of the application area.

247. We heard similar concerns expressed by Mr Gordon (Fisheries Interests) that no analysis has been undertaken on the effects of suspended sediments on zooplankton.¹¹¹ We accept the view from the expert witness conferencing that there is likely to be little direct effect from the mining activity. However, any reduction in phytoplankton productivity does have potential flow on effects to zooplankton.

Proposed conditions

248. Although the experts agreed that baseline monitoring for a minimum period of 2 years was necessary, the experts agreed that conditions that require the monitoring of zooplankton are not necessary.¹¹² They agreed that monitoring conditions will be necessary to validate the modelling predictions, and if sediment levels are higher than predicted in the model, an adequate reactive management tool to address the effects on zooplankton can be implemented.¹¹³
249. TTR's latest proposed conditions (dated 8 May 2014) addresses zooplankton as an Environmental Performance Objective in Condition 10. Proposed Condition 106(g) requires pre-operational baseline environmental monitoring for a minimum period of 2 years prior to the commencement of the consented activities to achieve the objectives of the Baseline Environmental Monitoring Plan, including but not limited to consideration of the following matters: *"Direct effects of the increase of sediment concentrations on zooplankton are highly unlikely."*¹¹⁴ Proposed Condition 207 expresses a similar sentiment for the Environmental Management and Monitoring Plan.
250. The experts agreed that testing should be undertaken to ensure that the ANZECC/ARMCANZ 2000 Guidelines for Water Quality Protection are met. The experts noted this would enable validation of the CORMIX modelling. They considered that conditions should specify that the guidelines be adhered to within a specified distance from the source.

Findings

251. We find that, while there was agreement amongst the experts, the information is not based on sampling but existing literature.
252. Effects on zooplankton are in a large part driven by primary production changes. As we have already discussed, there is considerable uncertainty around changes to primary production, and we lack confidence that there will not be a significant consequential effect on zooplankton and other parts of the food web.

¹¹⁰ Paragraph 9, Statement of Evidence in Chief of Dr Janet Grieve on behalf of Trans-Tasman Resources Ltd, 13 February 2014.

¹¹¹ Paragraph 20, Summary of Douglas Gordon in Support of the Submissions of: The NZ Federation of Commercial Fishermen; Southern Inshore Fisheries Management Co Ltd; Talley's Group Limited; and McDonald and Brown Limited, 24 February 2014.

¹¹² Paragraph 37, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014.

¹¹³ Paragraph 31, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014.

¹¹⁴ Appendix A to Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014

5.3 Benthic environment

The issues

253. Impacts on the benthic environment are a potentially significant issue in relation to protecting the biological diversity and integrity of marine species, ecosystems and processes in the STB.
254. We consider the main issues to be addressed in relation to benthic ecosystems to be:
- the physical disturbance from extracting seabed material and deposition of tailings back onto the seabed in the mining area
 - smothering of the biota from sedimentation on the seabed in areas in the sediment plume down current from the application area and in adjacent biogenic habitats
 - the indirect impacts of suspended sediment plumes where reduced light availability and light quality in the water column affects benthic photosynthetic organisms and reduces the input of energy into the benthic environment (see the section on primary productivity).
255. The TTR marine consent application area in the Patea Shoals is described as a high-energy environment resulting in very mobile sediments, sand inundation of reefs, sand scouring of reef habitats and high water turbidity in nearshore areas. Such areas are typically colonised by fast-growing opportunistic species.
256. Surveys conducted by NIWA for TTR (Beaumont et al, 2013; Anderson, 14 Feb 2014) have identified two habitat types within the application area – rippled sands and wormfields. In the deeper areas of the Patea Shoals offshore of the application area, two biogenic habitats – bivalve rubble and bryozoan rubble – were identified and found to support highly diverse benthic communities.
257. Within the rippled sands habitat of the application area, the surveys found very low abundances of infauna (organisms living in the seabed sediments) and epifauna (organisms living on the seabed). The wormfields were dominated by a tubeworm (*Euchone* sp. A) and supported a higher abundance of infauna.
258. No systematic differences were found between the benthic communities in the proposed mine area and communities in similar habitats in adjacent areas. None of the species collected during the benthic surveys are listed as threatened in the New Zealand Threat Classification System lists.
259. Inshore and down current from the proposed mining area is predominantly rippled sands and wormfields. These soft-sediment habitats are described as characteristically low in species abundance and diversity, with mostly small motile epifauna.
260. There are several inshore reef areas outside the application area with a mix of low-growing red and brown macroalgae, native green algae, kelp and sea urchin communities. One of these areas – the North and South Traps – is designated by Taranaki Regional Council and the Department of Conservation as having outstanding coastal value for biodiversity and high ecological significance. Taranaki Regional Council also recognises Four Mile Reef and Waiinu Reef as ecologically significant in the same context as the Traps. Patea Reef is also considered locally significant. The expert witness for

the Director-General of Conservation, Ms Kristina Hillock, noted that there are likely to be other significant rocky reef sites in the STB that have not been mapped.¹¹⁵

261. Another inshore area, the Graham Bank, was described from dives/video in the evidence of Dr McClary as an area of well sorted sand, with no hard substrate observed. Seabed areas examined were not very biodiverse. Dr McClary noted that information from recreational interest groups suggest the Graham Bank is often covered in sediment, while at other times, underlying rocky gutters are exposed for recreational fishing and diving.¹¹⁶
262. Many submissions raised general concerns about the threats to the benthic environment from the physical disturbance of the sand mining, the return of sand/sediment to the seafloor and the indirect effects from the plume. Potential impacts on important inshore reef habitats such as the North and South Traps and Graham Bank were also of concern, in particular to divers and fishers.
263. Submissions from the Director-General of Conservation, KASM, Te Rūnanga o Ngāti Ruanui Trust and Taranaki Regional Council raised specific benthic issues. Te Rūnanga o Ngāti Ruanui Trust and other Māori submitters expressed a concern as to loss of mauri due to de-faunation over the large area of seabed that is proposed to be mined.

The application

264. In relation to the potential effects of the proposed mining on the benthic environment, the application identifies the following:
- It is assumed that all sediment and immobile benthic organisms will be entrained into the intake and pumped to the FPSO. This pumping and screening process is assumed to result in complete de-faunation.
 - The redeposition of de-ored sand will change the nature of the seabed in the deposition area. The de-ored sand is assumed to be de-faunated and, upon redeposition on the seabed, will take time to become recolonised by benthic organisms. The duration of this recolonisation will determine the extent of ecological effects of the redeposition process.
 - The principal potential water column effect of the de-ored sand redeposition process arises from the generation of a 'plume' of increased turbidity.¹¹⁷
265. In assessing ecological risks, three of four moderate to high risks identified by TTR were to the benthic ecology:
- Effects of high environmental risk:
 - Extraction of benthos at extraction site due to sand extraction and smothering and burial from de-ored sand redeposition. (A particular effect was associated with direct impact on the habitat of the tubeworm *Euchone* sp. A.)

¹¹⁵ Paragraph 23, Statement of Evidence of Kristina Anne Hillock for the Director General of Conservation, 24 February 2014.

¹¹⁶ Paragraph 51, Joint Witness Statement of the Experts in the field of effects on benthic ecology – Part 2, 26 March 2014.

¹¹⁷ Page iii, Trans Tasman Resources Ltd South Taranaki Bight Offshore Iron Sand Extraction and Processing Project, October 2013, Supporting Information for Marine Consent Application.

- Effects of moderate environmental risk:
 - Impact on nearfield benthos due to de-ored sand deposition (same effect on *Euchone* sp. A – but at lower deposition rates across a wider area than the direct extraction and deposition zone).
 - Impact on offshore biogenic habitats due to ‘choking’ – potential effect of elevated sediment loads in water column.¹¹⁸

266. The application continued on to state that:

*“In general, after an initial disturbance to seabeds such as in the STB, “pioneering” organisms, such as small, tube-dwelling polychaetes and small bivalves colonise the surficial sediments. These opportunistic taxa occur in relatively high abundances and low diversity and over time are replaced by larger, longer-lived and deeper-burrowing species. TTR’s extraction area is currently dominated by early successional species such as the polychaete *Euchone* sp. This characteristic will facilitate recolonisation over a timeframe of 6 months to 2 years.*

The de-ored sand discharged back to the seabed will have a similar particle size distribution to that present on the seabed prior to extraction. Therefore grain size change should not pose an impediment to recolonisation.”¹¹⁹

267. The application further notes that the anticipated excavation rate means that the extraction and deposition impact at each site will be of very short duration, meaning that there will be ongoing opportunity for recovery on a continuous basis throughout the year. TTR’s operations will affect a relatively small area of the seabed within the STB at any one time. On an annual basis, TTR’s extraction operations will disturb around 5% of the extraction area or 3.3 km² (assuming a 20-year project life).

268. TTR considers that its operation will not present any issues in respect of protection of biological diversity in the broader STB area, notwithstanding localised effects in the extraction and immediate deposition areas.

Expert evidence and joint expert conferencing

269. Expert evidence was presented for a number of parties including the applicant, the Director-General of Conservation and KASM. We address our findings in relation to the evidence below. However, at this point, we need to record that Dr Paavo, a benthic ecologist who gave evidence for KASM, was highly critical of aspects of the work undertaken to characterise the benthic environment in the mining area. We have generally preferred the evidence of the other experts to that of Dr Paavo for a variety of reasons:

- In his written evidence, he attacked the credibility and integrity of other experts in a manner that we found inappropriate, using terms such as “*scientifically and ethically egregious*”, “*disingenuously states*” and “*cognitively dissonant examples*”. When we invited Dr Paavo to reconsider his choice of words, he confirmed that, in his view, his choice of words was

¹¹⁸ Page vi, Trans Tasman Resources Ltd South Taranaki Bight Offshore Iron Sand Extraction and Processing Project, October 2013, Supporting Information for Marine Consent Application.

¹¹⁹ Page vi, Trans Tasman Resources Ltd South Taranaki Bight Offshore Iron Sand Extraction and Processing Project, October 2013, Supporting Information for Marine Consent Application.

appropriate. He sought to explain that the words he used were within the range of words used in scientific discourse. We found his explanation unconvincing.

- His answers to questions put to him in cross-examination were often evasive and unhelpful.
- He refused to sign the joint witness statement on the basis that the editing of it was inappropriate. All the other experts involved were able to agree with the statement.

270. There were three expert joint witness conferencing sessions with relevance to benthic effects of the mining proposal:

- Joint Statement of Experts in the Field of Sediment Plume Modelling, 25 March 2014 –
- Joint Statement of Experts in the Field of Effects on Benthic Ecology – Part 1, 19 March 2014 meeting, statement dated 26 March 2014. Issues addressed:
 - Methodological adequacy to support evidence-based decision making
 - Levels of uncertainty around predicted effects.
- Joint Statement of Experts in the Field of Effects on Benthic Ecology – Part 2, 21 March 2014 meeting, statement dated 26 March 2014. Issues addressed:
 - Acute and chronic effects of the sediment plume and sedimentation on benthic ecology
 - Effects of shading on primary productivity
 - Effects of the sediment plume and sedimentation on offshore biogenic habitats and other potentially sensitive receptors
 - Factors affecting recovery of infauna and epifauna assemblages post mining
 - Benthic habitats and significance of inshore reef areas located down current from mining site (e.g., the North and South Traps and Graham Bank)
 - Sensitivity of *Ecklonia* and other reef assemblages to the predicted reductions in incident light (and relevance of thresholds)
 - Concentration of metals and hypersaline brine in water discharges from the mining plant and dilution required to meet ANZECC/ARMCANZ guidelines
 - Is there any knowledge of freshwater springs in the application area? If so, what is the likely effect on them?
 - Environmental monitoring:
 - Objectives
 - Baseline monitoring – duration pre-activities
 - Relative utility and applicability of trigger level/thresholds-based or other environmental monitoring approaches
 - Parameters, frequency, locations to monitor.

271. The expert witness for KASM, Dr Paavo, was only available for the joint witness conferencing on 19 March and refrained from signing the statement.

The effects

Environmental effects on benthic ecology during mining

272. The benthic expert joint witness statement dated 26 March agreed the following:

- The mining process will alter the chemical and physical structure of the depositional sediments within the mining area.
- Mining activities will result in near total mortality of benthic fauna within the dredged area. Few living organisms will be within the deposited material when returned to the pits.
- Pelagic primary production is likely more important within the area than benthic primary production.
- Monitoring the area will prove difficult for fish and benthic microalgae due to high spatial and temporal variability. However, sediment chlorophyll-a analyses that distinguish between fresh and decaying photosynthetic pigments are straightforward and will indicate the relative importance of benthic and water column microalgal production for benthic fauna.
- Infauna are likely to be the best indicator of any effects (e.g. deposit-feeding species) as they can be measured more reliably. There is sufficient information to understand which species and functional groups could be good indicators of change.
- The primary impact on the biogenic community would be sediment settling out of the water column and settling onto the seabed (smothering).
- Based on model predictions, deposition of mining-derived sediments are unlikely to have an impact on the offshore communities in biogenic habitats.
- The iron content of the sediment is unlikely to have an ecologically significant effect on the community structure.
- Grain size distribution was in some cases associated with particular biota, and this may be an important factor in the recolonisation of the denuded mined areas. Based on the results of Hadfield's modelling report, the sediment returned will be similar in grain size to the sediment extracted.
- Metal content of the deposited sediment is not going to impact recolonisation.
- Recovery of the infauna and epifauna will begin once the sediment is redeposited in each pit. However, this recovery will remain influenced by the high levels of suspended and settling sediment within the immediate area.
- Based on the revised modelling, mining-derived sediment is not expected to have an additional effect on the inshore rocky reef communities located down current from the mining site.
- Concentrations of nickel and copper in the discharged seawater are unlikely to negatively affect the recolonisation of the seafloor, but it was noted that trace metal analysis did not include mercury, which is a highly toxic metal.
- The amounts of suspended and deposited sediments and changes in optical conditions have direct relevance (and potential impacts) on benthic ecological communities.

- Conditions need to be certain and enforceable. This is inherently difficult in ecological systems but is achievable by measuring the physical variable to validate the physical models.

273. Dr Pinkerton noted that, under the revised plume and optical modelling, there were predicted to be substantial changes in optical properties (underwater visibility, euphotic zone depth, light at the seabed) at the Graham Bank due to mining (reductions in water clarity of about 30–65%).¹²⁰

274. The question of increased levels of mercury in the discharged seawater was addressed by TTR expert witness Dr Kay Vopel in his evidence to the hearing. He advised that mercury was not included in the analysis because the volcanic activity that produced the iron resource in the STB will not have resulted in accumulation of mercury in offshore iron sands. In SKM 2014, the reviewer acknowledged that mercury is generally volatilised during eruptions and typically not included in trace metal analysis of volcanic rocks. The reviewers point out, however, that mercury can occur in volcanic rock and that mercury has been detected in sediments in the Taranaki area although at concentrations well below the ANZECC/ARMCANZ 2000 Interim Sediment Quality Guidelines. Dr Vopel agreed with the SKM reviewers in their recommendation to include analysis of mercury in TTR's water quality monitoring programme until the expectation that the mine sediment will not release mercury is confirmed.¹²¹

275. While not specifically noted in the expert joint witness statement, there was general agreement in individual expert witness statements that the area to be mined and the inshore areas likely to be impacted by the sediment plume, other than rocky reef areas, are typical of soft-sediment habitats subject to regular disturbance. They are likely to be characterised by species able to withstand temporary burial by natural sediment movement and are likely to be early successional taxa with short generation time, able to recolonise disturbed habitats rapidly.

276. In their February 2014 report Assessment of Effects on Benthic Ecology from the Trans-Tasman Resources Marine Consent Application, independent reviewers SKM concur with TTR's assessment that the direct impacts of the proposed mining activity on benthic communities located within the mining area will be of low ecological significance and within acceptable limits.

Recovery of benthic environment when mining ceases

277. The experts agreed that the recovery (restoration of the ecological functional roles) of benthic ecosystems within the directly impacted mining area will be in the order of a decade where mining has moved on from an area and in the absence of further anthropogenic-related disturbance.¹²²

Uncertainty and/or adequacy of information

278. Uncertainties noted in the statements of the benthic expert joint witness conferences covered the following:

- Recovery time – the 19 March meeting record states that the experts agreed that there is uncertainty in the rate of recovery of mined areas. Because an in situ recolonisation

¹²⁰ Page 678 of the transcript, 1 April 2014.

¹²¹ Page 734 of the transcript, 2 April 2014.

¹²² Paragraph 39, Joint Statement of Experts in the Field of Effects on Benthic Ecology – Part 2, 26 March 2014.

experiment proved impossible due to rough sea conditions, it is unclear how long the redeposited sediments will take to reconsolidate and how long they will require to return to a pre-mined ecological state within given environmental parameters.

- Recovery times related to oxygen availability – redox (reduction-oxidation potential, a measure of oxygen availability) measurements are not currently available from the benthic sediments within the mining area but are likely to be important to recolonising organisms.
- Infauna deeper in the sediments – the sediment cores used to sample infauna penetrated the sediment to a maximum depth of 23 centimetres. No information is available on the infauna that might occur in sediments deeper than 23 centimetres.
- Temporal variation – while the benthic ecology surveys undertaken by NIWA for TTR were spatially intensive and provide large amounts of information on the types of habitats and epifaunal and infaunal animals and plants present, they do not provide any information on the temporal variability in this system. The experts agreed that temporal sampling would be required to determine seasonal variability as part of a baseline monitoring survey.
- Effects of shading – on benthic ecology (see the section on primary productivity) and on benthic feeding species such as eagle rays.
- Species-specific sensitivity thresholds – for many of the species recorded from the region, very little is known about species-specific sensitivity thresholds. However, we do know a lot about the types of communities present and their functional roles (e.g. suspension vs deposit feeders etc.) so can predict how community function might change.

279. Dr Paavo expressed the view that the core sampling depth, with no sampling below 23 centimetres, meant that there was insufficient evidence presented of the biota deeper than 23 centimetres. His evidence stated:

*“Mature continental shelf sediments are expected to develop a deeply buried infaunal community unless sediment re-suspension is severe and frequent enough to prevent it. These deep-dwelling infauna provide many of the goods and services provided by benthic ecosystems including providing feed for demersal fish stocks.”*¹²³

280. The expert witness conferencing noted that, in the sampling carried out, 89% of infauna collected were found in the top 5 centimetres, with very few animals (<2%) found in 10–15 centimetres.¹²⁴ Dr Anderson elaborated on sampling depth and consideration of likely biota in the deeper sediments during presentation of her expert evidence at the hearing. She advised that some cores went to 32 centimetres depth, and the deeper sections contained very few specimens and the same suite of specimens as found in the surface sediments. She also noted that there was no evidence, based on close inspection of high-resolution still images of the seabed, to indicate deeper assemblages were present, for example, exposed siphons or burrows of deeper-buried species such as the geoduck.¹²⁵

¹²³ Paragraph 21.1(1)(b), Evidence of Brian Paavo on behalf of Kiwis Against Seabed Mining Incorporated, 24 February 2014.

¹²⁴ Paragraph 14, Joint Statement of Experts in the Field of Effects on Benthic Ecology – Part 1, 26 March 2014.

¹²⁵ Page 780 of the transcript, 2 April 2014.

281. Dr Paavo also criticised the lack of temporal sampling, commenting: *“At these latitudes it is reasonable to expect at least a two to three-fold change in macrofaunal abundances (especially polychaetes) across seasons.”*¹²⁶ Dr Anderson acknowledged that the sampling design, although spatially intensive, was not temporally optimal. Her view was that spatial patterns would not change over time and that the timeframe used, although not optimal, was acceptable for the purpose of providing a baseline.

282. A third concern expressed by Dr Paavo was that the taxonomic methodology used was not fine scale and that this weakens the biodiversity data present. For example, in relation to Anderson et al (2013), he comments:

*“The executive summary states that “No records of new species were found.” This is technically true, but scientifically disingenuous as many of identifications did not resolve organisms to species level and the methods employed would only be able to detect such species if they were large and abundant – characteristics of common, well known species.”*¹²⁷

283. In response, Dr Anderson noted that, with the exception of Dr Paavo, all other experts agreed that all infauna and epifauna specimens that were collected in the benthic ecology studies were identified to the lowest taxonomic level practicable and that would enable between-site comparisons. She further commented on the range of taxonomic expertise in NIWA and that she considered this survey to be better than a lot of studies she had worked on around the world.¹²⁸

284. Dr Anderson advised us that she had joined NIWA in 2013 and assessed the reports prepared by other NIWA scientists, not having any prior involvement: *“I went through the data and looked at every single image ... I’ve re-analysed the data ... and in my expert opinion the spatial component of the data is adequate for the intent.”*¹²⁹ We accept Dr Anderson’s opinion. We do not accept that the work is *“scientifically disingenuous”*.

285. The expert witness for the Director-General of Conservation, Ms Hillock, expressed a concern in relation to the risk to the biogenic habitats in the deeper water offshore of the mining area and the uncertainty associated with reliance on the Hadfield plume model:

*“...the biogenic habitats under discussion will be vulnerable if there is an increase in suspended and deposited sediment, and recovery is likely to take a number of years, particularly within the bryozoan habitat. Therefore, if the sediment plume over the biogenic habitats is different in extent than predicted then, depending on the characteristics of the plume, the potential effects of the mining activity on the offshore biogenic habitat could be severe.”*¹³⁰

Proposed conditions

286. Proposed Environmental Performance Objectives 10(f)(i–v) presented by TTR in the proposed consent conditions relate to the benthic environment:

¹²⁶ Paragraph 21.1(1)(a), Evidence of Brian Paavo on behalf of Kiwis Against Seabed Mining Incorporated, 24 February 2014.

¹²⁷ Paragraph 25.4, Evidence of Brian Paavo on behalf of Kiwis Against Seabed Mining Incorporated, 24 February 2014.

¹²⁸ Page 782 of the transcript, 2 April 2014.

¹²⁹ Page 783 of the transcript, 2 April 2014.

¹³⁰ Paragraph 16, Summary Statement of Evidence of Kristina Hillock for the Director-General of Conservation, 30 March 2014.

“(f) Benthic communities, rocky reefs, primary productivity

- (i) Deposition rates of mining-derived sediments indistinguishable from background beyond 10km from point of discharge or deposit with no discernible change in community composition in offshore biogenic habitat within 10km of the consent area.*
- (ii) Recovery of the ecological function of benthic biota communities in operational extraction and deposition area and near-field areas occurs within 10 years of cessation of mining activities.*
- (iii) Moderate impact on near-field benthos (within 10km of operational area) due to deposition of suspended tailing fines, with the exception of offshore biogenic habitat within 10 km of the consent area where there will be no discernible change in community composition different to background variation.*
- (iv) No discernible change in community composition above background variation of benthic assemblages at North and South Traps, Graham Bank, Four Mile Reef, Patea Reefs and Waiinu due to deposition of sediments.*
- (v) No discernible change in community composition above background variation of benthic assemblages at nearshore rocky reefs including the North and South Traps, Patea reefs, Four Mile Reef, Waiinu Reef and Graham Bank due to changes in light availability from mining activity.”*

287. These benthic environment objectives are as proposed in Attachment 3 to the Memorandum of the Director-General of Conservation dated 6 May 2014. The Director-General of Conservation notes that:

“In respect of the benthic environment objectives, the identified objectives set out in Attachment 3 can only be described as preliminary. The benthic ecology identified objectives are therefore presented as an example of the sort of matters the Director-General of Conservation anticipated being included in objectives. They could not be endorsed without further consideration and technical input.”¹³¹

288. We accept this statement as a fair one in relation to the state of development of the benthic environmental objectives. Given that we are required to make a decision based on the information available to us, the position is less than satisfactory, and we have concluded the applicant has failed to demonstrate that these objectives are appropriate, robust, achievable and measurable.

289. The Pre-operational Baseline Environmental Monitoring Plan proposal in relation to benthic monitoring is covered in proposed Condition 106:

“(a) Baseline benthic sampling

- (i) Baseline benthic sampling should capture seasonal variability (relative to recruitment), covering two sampling times per year (e.g. summer and winter or autumn vs spring),*

¹³¹ Attachment 3 to the Memorandum of the Director-General of Conservation dated 6 May 2014.

recognising that the inhospitable nature of this offshore shelf environment probably negates finer temporal sampling.

(ii) Benthic monitoring sites should be sampled along a gradient from the mining area relative to the spatial extent of the projected suspended sediment plume (i.e., gradients along-plume including Graham Bank and across- plume from inshore reef zone to the offshore biogenic zone).

(iii) Benthic monitoring sites should include representative/selected sites with each benthic community type (i.e., wormfields, rippled sands, inshore reefs, offshore biogenic habitats), with sampling of sediment cores to examine infauna greater than 500 µm in size.

(iv) Benthic monitoring sites should include reefs of 'special interest', such as the North and South Traps, Graham Bank, Four Mile Reef, Patea Reefs and Waiinu Reef.

(v) Benthic microalgae (BMA) are too variable in space and time to be a valuable monitoring factor. However monitoring should include measurements of Chlorophyll-a from the sediments in a way that discriminates between recent 'benthic generated microalgae' and old/degraded phytoplankton' to determine the relative importance of benthic versus pelagic primary production in this system

b) Benthic ecology monitoring should be designed/undertaken in a way that provides enough statistical power to detect ecologically significant community change caused by the mining activity.

(i) The same monitoring conditions are proposed for the environmental monitoring and management plan once mining begins, with the additional requirements that;

(ii) Monitoring sites must be in the same locations as those used for baseline monitoring, and the monitoring must be undertaken at the same time of year as baseline monitoring.

(iii) The Consent Holder must continue to monitor benthic habitats and organisms as specified in the EMMP (once mining in the project area has been completed) every two years for 10 years. Monitoring must include but not be limited to representative surficial sediment grain size measurements in the pits and mounds and ecological recolonisation rates."

Findings

290. Having considered the information available through TTR's marine consent application and associated reports, the expert witness presentations and conferencing reports and concerns expressed by submitters, it is our view that:

- The TTR marine consent application area in the Patea Shoals region is a high-energy environment resulting in mobile sediments, sand inundation of reefs, sand scouring of reef habitats and high water turbidity in nearshore areas. The area to be mined and the inshore areas likely to be impacted by the sediment plume, other than rocky reef areas, are typical of soft-sediment habitats subject to regular disturbance, colonised by fast-growing, opportunistic

species able to withstand temporary burial by natural sediment movement and to recolonise disturbed habitats rapidly.

- No systematic differences were found between the benthic communities in the proposed mine area and communities in similar habitats in adjacent areas.
- None of the species collected during the benthic surveys are listed as threatened in the New Zealand Threat Classification System lists.
- The benthic area proposed to be mined will be significantly disturbed with near total mortality of benthic fauna within the dredged area and the deposited material returned to the seafloor. Recovery of the benthic environment in this area post mining is expected to take in the order of 10 years.
- Areas outside the proposed mining area will be subject to sedimentation and reduced light levels as a result of the sediment plume from the mining activity. The modelling provided by Hadfield indicates this will predominantly affect the soft-sediment habitats to the east and south of the mining site.
- The sediment plume will result in reduced energy input to the seafloor with consequent reductions in benthic productivity and flow-on effects through the food web. Dr Pinkerton (2013) identified a potential reduction of up to 36% in energy input to the seabed ecosystem. This is addressed in more detail in the section on primary productivity.
- There are more sensitive biogenic benthic areas to the south and west and rocky reefs inshore of the proposed mining area. According to the Hadfield model, there is unlikely to be any more than minor sedimentation from the plume in these areas, apart from the Graham Bank.
- Assessment of the potential effects of the sediment plume on the benthic environment is based on Dr Hadfield's plume modelling. This modelling is accepted by other experts as being the appropriate and best available methodology. However, it still has uncertainties – Dr Hadfield refers in his evidence to an uncertainty factor of two. This creates uncertainties in relation to the plume effects on the benthic environment and the potential for the plume to impact on the rocky reef environments down current from the mining area and on biogenic habitats adjacent to the mining area, both of which are identified as higher value and likely to be more sensitive to sedimentation. The modelling results provided with the original consent application showed a significantly higher level of sediment likely to reach the North and South Traps than the revised modelling on which the expert witness discussions were based.
- The applicant proposes qualitative objectives as part of the conditions for an adaptive management plan. These revised objectives were presented at the last day of the hearing. They are based on suggested example objectives provided by the Director-General of Conservation with the cautionary note that they should not be endorsed without further consideration and technical input. We address this further in section 9.
- Guidelines for baseline benthic monitoring for 2 years prior to mining and for operational benthic monitoring are provided in the proposed TTR draft conditions. There is no adaptive

management response proposed by TTR if monitoring results do not meet the environmental objectives.

- Te Rūnanga o Ngāti Ruanui Trust and other Māori submitters expressed a concern about the loss of mauri due to de-faunation over the large area of seabed that is proposed to be mined.

5.4 Marine mammals

The issues

291. The potential effects of the proposal on marine mammals, particularly whales and dolphins, were a significant issue before us. Section 59(d) of the EEZ Act requires us to take account of the importance of protecting the biological diversity and integrity of marine species, ecosystems and processes. Section 59(e) also requires us to take account of the importance of protecting rare and vulnerable ecosystems and the habitats of threatened species.
292. The main issues for us related firstly to marine mammal presence and abundance in the STB and secondly to the effects of the proposed activity on them. The presence and abundance is important in understanding any potential impacts and the significance of those effects. We recognise that there are related issues such as primary productivity, noise and the sediment plume (addressed elsewhere in this decision), and these are addressed here only insofar as they relate to the direct effects on marine mammals.

Presence and abundance of marine mammals

The application

293. The application was accompanied by three main sources of information that informed the assessment of effects on marine mammals:
- An evaluation of existing data on observations of marine mammals in the southern and northern Taranaki Bight region (extending out to 100 kilometres offshore from the Patea coastline, 150 kilometres to the south and northwards around the coast past New Plymouth).
 - A survey of cetaceans over an 18-month period in the STB.
 - Habitat modelling analysis of New Zealand-wide data of killer whales, Hector's dolphins and southern right whales.
294. The evaluation of sightings identified 13 species of dolphins and whales observed around Cape Egmont and the STB, with three nationally critical or endangered species.¹³² These are the southern right whale (*Eubalaena australis*), Maui's dolphin (*Cephalorhynchus hectorimau*) and orca or killer whale (*Orcinus orca*).
295. The survey comprised a series of aerial surveys of the offshore project area, extending from approximately Manaia in the north-west to between Patea and Waverley in the south-east. The survey was a presence/absence survey – 12 surveys were undertaken at a quarterly frequency from July 2011

¹³² South Taranaki Bight Factual Baseline Environmental Report (NIWA, 2011).

to February 2013 and then bimonthly or monthly from March 2013 to ensure a spread across all months of the year to address seasonality.¹³³

296. As outlined in the Cetacean Monitoring Report,¹³⁴ the key observations were a pod of common dolphin (6–8) in the October 2012 survey on Transect 11 located inside the application area, and very low densities of fur seals were observed between July 2011 and June 2013 outside of the application area, closer to shore. It was concluded that the abundance of marine cetaceans and mammals within the area surveyed is very low.
297. Because of the very limited sighting data available in the STB in relation to these species, species habitat models for these three species for the area were commissioned by the applicant, covering a distance of 22–40 kilometres offshore in water depths of 25–45 metres, to help understand the suitability of habitat in the STB for each of these endangered species.
298. Low habitat suitability for southern right whales was predicted at and adjacent to the proposed application area. A coastal strip within 5 kilometres of the shoreline had low to moderate suitability for this species, suggesting that individuals may use this area as a migration corridor. The modelling established that habitat suitability for Hector's dolphins in the proposed project area was also low. However, coastal areas inshore of the proposed project area were predicted to have average to above average suitability as habitat for Hector's dolphins. Low habitat suitability for killer whales was predicted in the proposed TTR project area. A band of average to above average habitat suitability for killer whales, corresponding to an area of increased sea surface temperature gradient, begins approximately 8 kilometres seaward of the proposed project area.
299. The habitat modelling undertaken by TTR concluded that the proposed application area in the STB appeared to be of low suitability for all three species of threatened cetaceans. Areas of increased habitat suitability for Hector's dolphins and southern right whales lie close inshore and may be increasingly used as the New Zealand populations of these species recover. An area of average to above average habitat suitability for killer whales begins approximately 8 kilometres seaward of the proposed project area.¹³⁵
300. A recent paper titled Evidence for an Unrecognised Blue Whale Foraging Ground in New Zealand, New Zealand Journal of Marine and Freshwater Research (Torres, 2013) described an apparent blue whale (*Balaenoptera musculus*) foraging ground in the STB. Also a paper titled Documentation of a Blue Whale Foraging Ground in the South Taranaki Bight (NIWA, 2014) was tabled by the Director-General of Conservation. We address these below.

Presence and abundance

301. We agree with the experts that Hector's dolphins, southern right whales, killer whales, Maui's dolphins, blue whales, bottlenose dolphins, common dolphins, dusky dolphins, false killer whales, fin whales, humpback whales, minke whales, pilot whales, sei whales, sperm whales and New Zealand fur

¹³³ Section 5.3.3 of the Impact Assessment (TTR, 2013).

¹³⁴ Cetacean Monitoring Report (Cawthorn & Associates Limited, 2013).

¹³⁵ Executive Summary, Habitat Models of Southern Right Whales, Hector's Dolphins, and Killer Whales in New Zealand (NIWA, 2013).

seals could occur in the proposed project area.¹³⁶ We note that a number of submitters, particularly locals from Taranaki, described having seen dolphins and whales near the coast.¹³⁷

302. Of these, a number have threat classifications at both a national and international scale:¹³⁸

- Maui's dolphin
- Hector's dolphin
- Pygmy blue whale
- Southern/Antarctic blue whale
- Killer whale (orca)
- Southern right whale
- Humpback whale.

Maui's dolphin

303. The vulnerability of Maui's dolphin, given the very low population numbers and the potential for effects from the proposed mining operation, was raised in a number of submissions.

304. There was some debate between the experts as to whether the application area forms part of the Maui's dolphin range (which is listed internationally as 'critically endangered' and nationally as 'nationally critical'). The experts concluded that the South Taranaki coast is considered to be part of the historic natural range for Maui's dolphins and is on the margins of their current range. While most records and sightings of Maui's dolphins are between the Kaipara Harbour and Raglan, Maui's dolphins have been recorded as far south as Whanganui, with their relative density decreasing south of Cape Egmont.¹³⁹

305. We note that the Maui's Dolphin Threat Management Plan developed by the Department of Conservation and the then Ministry of Fisheries does not include the proposed application area. We also note that Mr Mawson (Fishing Interests), who appeared before us, is a regular observer on fishing boats going out from New Plymouth and stated that, in 18 months, he had not seen a Maui's or Hector's dolphin.¹⁴⁰

306. After considering all of the evidence presented, we are of the opinion that the application area is not likely to be a primary habitat for Maui's dolphins. However, we do recognise the importance of a corridor to connect Maui's dolphins to the South Island population of Hector's dolphin's subspecies¹⁴¹ and that, given the threat status of the Maui's dolphin, a very cautious approach needs to be taken to prevent any further loss of habitat or impediment to ensure they are not affected by this proposal.

Blue whales

307. There was debate among the experts with regards to blue whales and whether the proposed project area constituted a key foraging ground.

¹³⁶ Paragraph 13, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

¹³⁷ For example, Ms Douds, Ms Arlidge and Ms de Weyer.

¹³⁸ Table 1, Statement of Evidence of Andrew Baxter for the Director-General of Conservation, 24 February 2014.

¹³⁹ Paragraph 17, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

¹⁴⁰ Page 2510 of the transcript, 1 May 2014.

¹⁴¹ Paragraph 38, Evidence of Associate Professor Elisabeth Slooten on behalf of Kiwis Against Seabed Mining Incorporated.

308. KASM requested that the DMC call Dr Torres as a witness (by summoning her) in relation to marine mammals and in particular blue whales given the work she had undertaken. We did not call Dr Torres, and our determination on this, setting out our reasons, was given at the hearing on 30 April 2014 in New Plymouth.¹⁴²

309. The experts attending the marine mammal expert conferencing addressed the issue of whether there was a need to call Dr Torres in relation to blue whales. The response was:

*"Most members of the expert group agreed there was no need to call Dr Torres to provide further information on blue whales as her information has already been provided to them and is not contested."*¹⁴³

310. We note the findings of Dr Torres that blue whales are feeding in the STB and the agreement of the experts in conferencing on this point.¹⁴⁴ The Department of Conservation recorded sightings combined with studies and reports indicates that the greater STB (including offshore waters) is a blue whale feeding area. However, the full extent of the blue whale foraging habitat is unknown.¹⁴⁵ It is also unknown whether blue whales habitually or occasionally occur in the project area.¹⁴⁶

311. The NIWA report Documentation of a Blue Whale Foraging Ground in the South Taranaki Bight (2014) concludes that the data strongly supports the hypothesis that the western STB is a blue whale foraging ground but notes that more data collection and analyses are needed to determine the significance and extent of this foraging ground. Exploration of this area as a blue whale habitat is driven by the upwelling off Farewell Spit, which is south of the proposed mining site. It also notes that these results are a snapshot and more extensive survey and research effort is needed to more fully understand blue whale ecology in the STB.¹⁴⁷

¹⁴² Pages 2330–2331 of the transcript, 30 April 2014.

¹⁴³ Paragraph 80, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

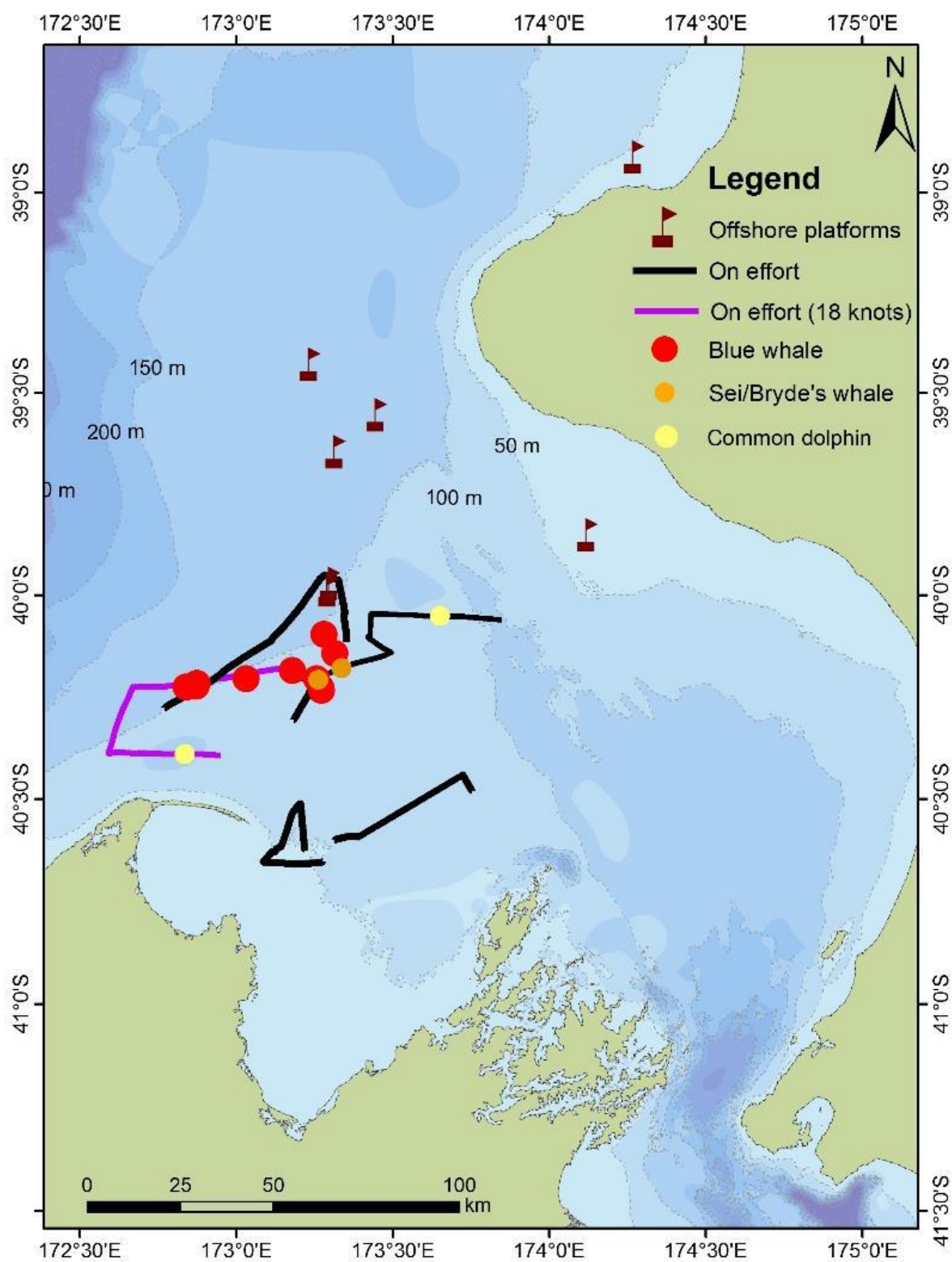
¹⁴⁴ Paragraph 27, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

¹⁴⁵ Paragraph 79, Statement of Evidence of Andrew Baxter for the Director-General of Conservation, 24 February 2014.

¹⁴⁶ Paragraph 15, Statement of Evidence of Bernd Wursig for the Director-General of Conservation, 24 February 2014.

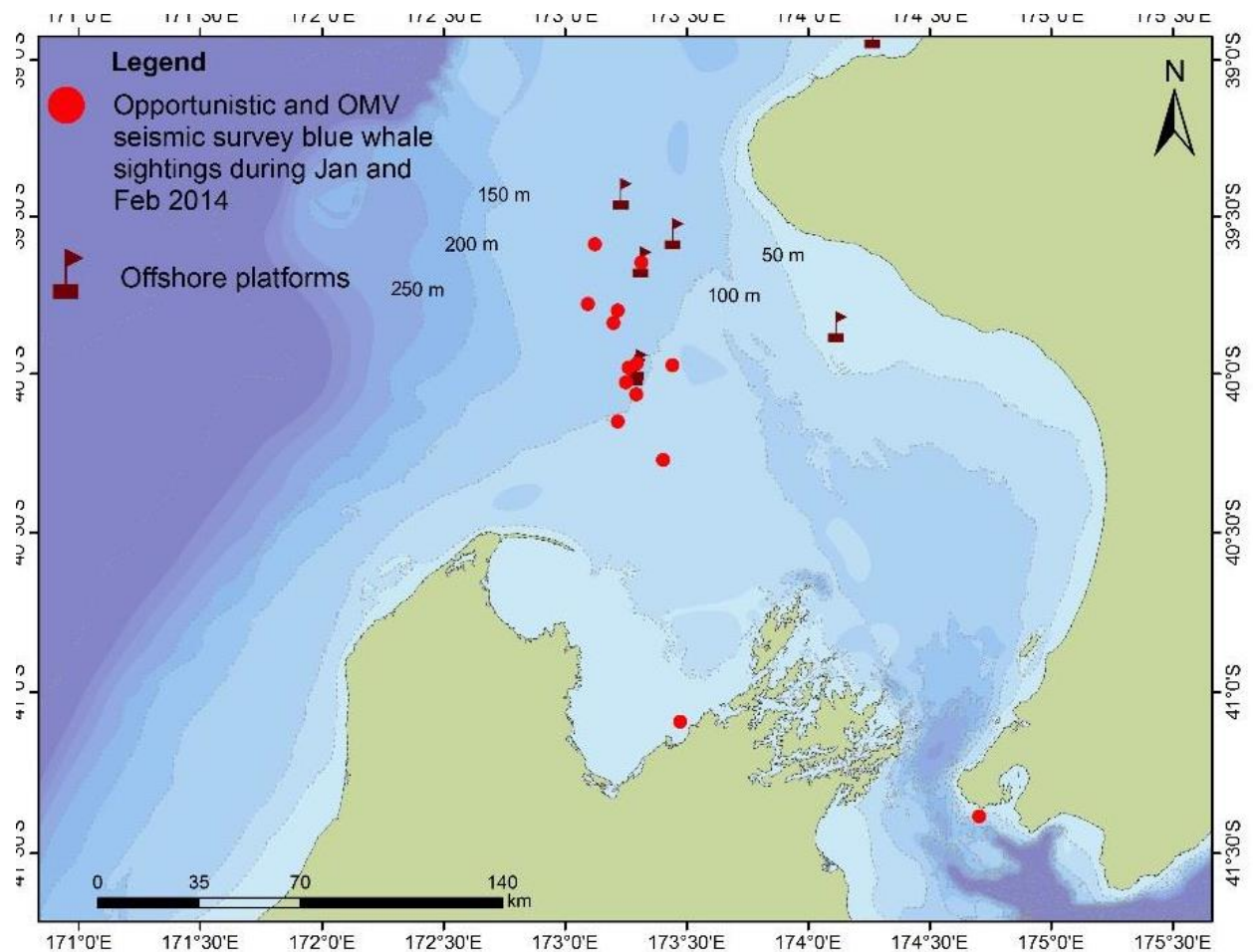
¹⁴⁷ Documentation of a Blue Whale Foraging Ground in the South Taranaki Bight (NIWA, 2014).

Figure 5: Survey effort and cetaceans sightings in the South Taranaki Bight between 21 January and 4 February 2014¹⁴⁸



¹⁴⁸ Documentation of a blue whale foraging ground in the South Taranki Bight (NIWA, 2013)

Figure 6: Reported sightings of blue whales in the South Taranaki Bight between 15 January 2014 and 16 February 2014 by other observers¹⁴⁹



312. Our findings in relation to blue whales is the same as for Maui's dolphins – a cautious approach is required.

Dolphins

313. Common dolphins were the only cetacean species recorded by the TTR aerial survey.¹⁵⁰ The experts agreed that the range of bottlenose and dusky dolphins includes the STB area although they note insufficient data to determine whether these species are resident in the STB.¹⁵¹ We accept this.

Other whale species

314. Mr Cawthorn addressed the potential occurrence of beaked whales and the humpback whale migration routes in his evidence. He stated that, although beaked whales pass through Cook Strait during the summer and autumn months, very little is known of the seasonal movements and feeding behaviour of them.¹⁵² The experts agreed that beaked whales are unlikely to be found in the TTR mining area or in waters less than 200 metres deep.¹⁵³

¹⁴⁹ Documentation of a blue whale foraging ground in the South Taranaki Bight (NIWA, 2013)

¹⁵⁰ Paragraph 38, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

¹⁵¹ Paragraph 40, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

¹⁵² Paragraphs 55 and 56, Statement of Evidence in Chief of Martin Cawthorn on behalf of Trans-Tasman Resources Ltd,

315. The experts also agreed that sperm whales are generally found in deep water like beaked whales, although they have been recorded in the STB.¹⁵⁴ They also agreed that southern right whales are likely to be present in the STB area seasonally and travel through in low numbers¹⁵⁵ and that pilot whales and false killer whales may use the STB area, particularly over the summer months (based upon stranding information).¹⁵⁶
316. Although the TTR aerial surveys did not record any orca, the experts agreed that the STB area is part of their range. It was agreed that some killer whale groups are likely to be transitory through the STB area, but there was no agreement about whether there could also be resident groups in the area due to a lack of data.¹⁵⁷ Again, we accept the evidence.

The effects

317. Having established that there may be marine mammals in the project area, the potential key effects in terms of marine mammals are:
- loss of benthic habitat and fisheries/food resources
 - displacement of marine mammals¹⁵⁸
 - noise effects¹⁵⁹
 - risk of collision and entanglement with TTR vessels.

318. We address each of these in turn below.

Loss of benthic habitat and fisheries/food resources

319. Mr Cawthorn stated that, in regard to loss of benthic habitat and fisheries, the risk of potential adverse effects of TTR's operations on marine mammals is low. He attributed this to the relatively small proportion of the habitat of the STB that will be disturbed in the application area during any one year of operations and the low abundance of cetaceans present in the STB area.¹⁶⁰
320. The experts agreed that any impacts (including from heavy metals) on other organisms, including fish, benthic species and plankton, have the potential to have flow-on effects through the ecosystem, including for marine mammals that are at the top of the food chain. The experts agreed that not only does the sediment plume have potential effects on marine mammals through the food chain but also potentially for a direct impact upon marine mammals. Marine mammals are visual predators (toothed

10 February 2014.

¹⁵³ Paragraph 30, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

¹⁵⁴ Paragraph 33, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

¹⁵⁵ Paragraph 35, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

¹⁵⁶ Paragraph 37, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

¹⁵⁷ Paragraphs 20 and 21, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

¹⁵⁸ Paragraph 15, Evidence of Associate Professor Elisabeth Slooten on behalf of Kiwis Against Seabed Mining Incorporated.

¹⁵⁹ Paragraph 44, Statement of Evidence in Chief of Martin Cawthorn on behalf of Trans-Tasman Resources Ltd, 10 February 2014.

¹⁶⁰ Paragraph 48, Statement of Evidence in Chief of Martin Cawthorn on behalf of Trans-Tasman Resources Ltd, 10 February 2014.

whales and dolphins also echolocate), and therefore increased sediment in the water column has the potential to impact upon their ability to feed.¹⁶¹

321. The experts did not form a collective opinion on how likely this impact was or what magnitude it may have, and we did not hear any further evidence quantifying this.

322. The importance of the STB as a foraging ground has been addressed above.

Displacement of marine mammals

323. We heard that a potential effect of the proposed operation is displacement from an area, due to the presence of mining equipment and vessels or the noise generated by them.¹⁶² This was agreed by the experts in their joint witness statement that animals hearing noise or being disturbed by the TTR operation may be displaced from the immediate area. The experts agreed that it is possible that moving into other areas may reduce their fitness (e.g. ability to feed, increased risk of bycatch or predation).¹⁶³

324. Again Mr Cawthorn considered the likelihood of the migration routes of any of the mammal species being significantly altered to the detriment of the animals is very low. Historically, blue whales, humpbacks and southern right whales have migrated north and south outside the 100 metre isobaths. He explained that this assessment was based on their seasonal movements not appearing to have been significantly altered by the installation of seven oil/gas production platforms and the attendant ship movements to and from New Plymouth over the last three decades.¹⁶⁴

Noise effects

325. A number of submitters expressed concern at the potential impacts of noise generated by the proposed activities on marine mammals. The applicant acknowledges that underwater noise generated by the proposed project has the potential to affect the underwater environment for marine mammals such as dolphins, porpoises and whales.¹⁶⁵ Dr Childerhouse presented evidence for the applicant and concluded that, given that the moderate levels of noise likely generated from the proposed operation fall below proposed international standards for marine mammals, little impact from noise is anticipated.¹⁶⁶ This evaluation was based on the acoustic predictions undertaken by Mr Hegley, which were amended in his evidence.

¹⁶¹ Paragraphs 44 and 45, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

¹⁶² Paragraph 86, Evidence of Associate Professor Elisabeth Slooten on behalf of Kiwis Against Seabed Mining Incorporated.

¹⁶³ Paragraph 53, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

¹⁶⁴ Paragraph 93, Statement of Evidence in Chief of Martin Cawthorn on behalf of Trans-Tasman Resources Ltd, 10 February 2014.

¹⁶⁵ Section 11.8.1 of the impact assessment (TTR, 2012).

¹⁶⁶ Paragraph 1, Statement of Evidence in Chief of Dr Simon Childerhouse on behalf of Trans-Tasman Resources Ltd, 16 February 2014.

326. Dr Childerhouse identified potential effects associated with noise to be:¹⁶⁷

- masking of marine mammal communication systems, echolocation signals and passive listening capabilities
- disturbance of normal behaviour resulting in displacement from habitat areas.

327. From Dr Childerhouse, we understand the three types of impact from noise to be:¹⁶⁸

- permanent threshold shifts that result from unrecoverable tissue damage
- temporary threshold shifts that result in a temporary reduction of hearing sensitivity
- behavioural response threshold shifts.

328. He considered that, while permanent or temporary hearing loss arising from increased noise from the proposed activity seems unlikely, the slow movement of the dredge and the long duration of the operation (i.e. 20 years) warrant careful consideration of behavioural effects, especially for 'species of concern'.¹⁶⁹

329. During the expert conferencing, there was considerable discussion of what the magnitude and character of the noise was likely to mean for marine mammals and whether there were any conditions that might adequately address potential impacts. The experts agreed that blue whales are particularly sensitive to low-frequency sounds within their communication/hearing range.¹⁷⁰ Beaked whales are recognised to be more sensitive to high-power mid-frequency sonar than other species, and therefore sound emissions of this or a similar type may have an impact on them. The TTR sonar may be audible to beaked whales depending on its power and distance of whales from the operation, but is unlikely to cause the same level of disturbance as observed in the case of high-power sonars.¹⁷¹

330. The experts did not initially agree on any specific noise conditions, but further conferencing led to an agreed condition (apart from Dr Slooten) tabled by Director-General for Conservation in a memoranda (dated 1 May 2014). We found Professor Wursig's responses to questioning most helpful. He stated:

"It is my opinion that realistic decibel levels for average effects at greater than level 4 of disturbance as we just discussed be used at the threshold to not be exceeded. This is a 130 decibel level within the frequency bands of the four species types and needs to be verified at a certain distance and by four species types, I meant the low frequency creatures, approximately 10 to 100 Hertz, the mid-frequency ones, 100 to 10,000 Hertz and the higher frequency ones, the higher indeed than 10 kilohertz or higher and the pinnipeds. And I suggest that 500 metres – and that is a difference from the original 1000 metres that I wrote from the source at such a reasonable distance as whales, dolphins and fur seals are not likely to approach the activity at closer than 500

¹⁶⁷ Paragraph 41, Statement of Evidence in Chief of Dr Simon Childerhouse on behalf of Trans-Tasman Resources Ltd, 16 February 2014.

¹⁶⁸ Paragraph 49, Statement of Evidence in Chief of Dr Simon Childerhouse on behalf of Trans-Tasman Resources Ltd, 16 February 2014.

¹⁶⁹ Paragraph 61, Statement of Evidence in Chief of Dr Simon Childerhouse on behalf of Trans-Tasman Resources Ltd, 16 February 2014.

¹⁷⁰ Paragraph 29, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

¹⁷¹ Paragraph 31, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

metres if it is bothersome and that a 500 metre “bubble” around the activity does not take away appreciable space from the habitats of the animals.”¹⁷²

331. This contrasted with Dr Slooten’s concern with the 130 decibel level proposed. She considered that the risk of severe behavioural responses is higher above 120–130 decibels, and the scientific literature indicates that any signal audible to the animal can cause a behavioural response at any severity level between 0 and 7.¹⁷³

Risk of collision and entanglement with TTR vessels

332. We heard from expert and non-experts/submitters alike that increased vessels in the area increases the risk of collisions between marine mammals and vessels associated with the mining activities. We understand collision with any marine mammals is highly undesirable given the level of investment in all of the vessels involved in the operation. The experts involved in conferencing all agreed that the risk of ship strike is relatively low. Speeds from vessels directly involved in the mining operation are assumed to be generally slow.¹⁷⁴
333. Mr Cawthorn provided more detail on the risk, and we accept that it is low due to the low vessel speeds during excavation and the relatively low number of operational vessels proposed (approximately four including an anchor-handling tug) in comparison to those already using the STB. His evidence went on to state that observers stationed on the vessels will identify any cetaceans that are present during vessel movement and extraction activities.¹⁷⁵
334. There was also concern expressed in the submissions that there was a risk of entanglement. Mr Cawthorn considered that, in terms of the effects of ship strikes and entanglements, the potential for any entanglement is infinitesimal based on the proposed project anchoring methodology and site location. He considered the only remote possibility for entanglement is if anchors or any other structures are buoyed using light (e.g. 10 millimetre diameter) floating lines to an inflatable buoy at the surface. Whales such as humpbacks are known to become entangled in crayfish buoy lines. Overall, he considered the possibility of cetaceans getting close enough to be compromised is insignificant.¹⁷⁶ The experts agreed in the joint witness statement that the potential for entanglement is low.¹⁷⁷

Uncertainty and/or inadequacy of information

335. We find that there is a level of uncertainty with respect to the potential effects on marine mammals.

¹⁷² Page 1026 of the transcript, 3 April 2014.

¹⁷³ Statement on Noise Conditions, Dr Slooten, 11 April 2014.

¹⁷⁴ Paragraph 49, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

¹⁷⁵ Paragraph 46, Statement of Evidence in Chief of Martin Cawthorn on behalf of Trans-Tasman Resources Ltd, 10 February 2014.

¹⁷⁶ Paragraph 67, Statement of Evidence in Chief of Martin Cawthorn on behalf of Trans-Tasman Resources Ltd, 10 February 2014.

¹⁷⁷ Paragraph 48, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

336. The application acknowledges that the marine mammal survey was not continuous and may have missed some mammals present at times when surveys were not being undertaken. Furthermore, the aerial surveys were conducted in calm weather (below Beaufort 4) in order for mammals to be detected. It is possible that marine mammals could be present in poorer weather conditions (i.e. greater wind and swell).¹⁷⁸
337. The experts in their conference concluded that there is insufficient data available for most marine mammal species that use the STB to determine their status (e.g. abundance) or the significance of the location for them.¹⁷⁹ On the evidence presented, there was agreement that marine mammals frequent this project area, but there was uncertainty as to the extent of their presence, the importance of the area for them and therefore what the effects on marine mammals may be.
338. We agree with Dr Childerhouse's evidence, that impacts are extremely difficult to quantify without direct experimental studies including monitoring before, during and after the introduction of an activity.¹⁸⁰
339. With respect to mammal displacement, very little information on this was presented to us regarding the possibility or effect of displacement particularly due to the plume, and consequently we do not consider we adequately understand the effect or significance of this.
340. In terms of noise effects, Dr Childerhouse acknowledged that, despite the increasing number and sophistication of studies of the effects of underwater noise, there are still large gaps in knowledge.
341. These knowledge gaps he said arise from the diversity in the physiology and behaviour of different species of marine mammals, the myriad of different types of anthropogenic noise sources, the relatively complex nature of sound propagation through the marine environment and geographic and spatial variability among all of these factors. He noted that many assessments of the effects of noise on marine mammals rely upon extrapolation of results from localised studies to draw conclusions for different populations in different areas, noise sources, environments and even species.¹⁸¹
342. We note, too, that a number of assumptions have been made in determining the appropriate noise levels for mammals. Dr Childerhouse told us that noise source characteristics from other dredges were used, however these vessels differ from those proposed to be used by TTR.¹⁸² He went on to say that noise levels could be better estimated through a more complex propagation model that includes specific information about the dredge site and environmental conditions and the spectra of the noise.

¹⁷⁸ Section 5.3.3 of the Impact Assessment (TTR, 2013).

¹⁷⁹ Paragraph 43, Joint Statement of Experts in the Field of Effects on Marine Mammals Including Noise, 26 March 2014.

¹⁸⁰ Paragraph 17, Statement of Evidence in Chief of Dr Simon Childerhouse on behalf of Trans-Tasman Resources Ltd, 16 February 2014.

¹⁸¹ Paragraph 23, Statement of Evidence in Chief of Dr Simon Childerhouse on behalf of Trans-Tasman Resources Ltd, 16 February 2014.

¹⁸² Paragraph 43, Statement of Evidence in Chief of Dr Simon Childerhouse on behalf of Trans-Tasman Resources Ltd, 16 February 2014.

343. Mr Baxter on behalf of the Director-General of Conservation summarised this for us by saying uncertainties remain regarding the noise of the TTR operation (levels and frequencies) and its transmission away from the source. This information would not be known until empirical noise monitoring was undertaken after operations were up and running at full production.¹⁸³
344. Notwithstanding this, the noise experts agreed what they considered to be an appropriate noise condition. This was included in the suite of conditions proposed by the applicant.

Proposed conditions

345. We note that a number of conditions were proposed by the Director-General of Conservation and adopted by TTR to address effects on marine mammals. Proposed Environmental Performance Objective Condition 10(i) establishes that there will be no adverse effect at a population level on blue whales or Maui's dolphins.
346. Proposed Condition 60 requires development of a Marine Mammal Monitoring and Management Plan. Proposed Condition 68(e)(vi) requires the Operational Manual and Safety Contingency Plan to include controls relating to avoidance of potential collisions with marine mammals. Conditions 161–172 address various effects on marine mammals. Proposed Condition 204 requires the Environmental Monitoring and Management Plan to include monitoring of marine mammals, and the details of this plan are set out in proposed Condition 207.

Other relevant regulations/legislation

347. For completeness, we have addressed this matter. We understand marine mammals are managed in New Zealand waters across a range of statutes and legislative tools. The Marine Mammals Protection Act 1978 (MMPA) is the key statutory instrument.¹⁸⁴ A permit is required under the MMPA for any activity that will directly disturb, harass, injure, harm or kill a marine mammal. The MMPA allows for accidental or incidental injury or death as a defence (e.g. while fishing or undertaking any other lawful activity such as seabed mining) provided the incident is reported to the Department of Conservation or Ministry for Primary Industries. Of particular relevance is Part III of the MMP Regulations, which sets out conditions governing operating behaviour for anyone around marine mammals including approach and departure speeds, number of vessels, orientation of approach and other vessel activities. The applicant vessels would be required to adhere to Part III of the MMP Regulations.¹⁸⁵
348. The Wildlife Act 1953 deals with the protection and control of wild animals and birds and the management of game. Most species of wildlife including mammals are given absolute protection under this Act. The definition of animals includes marine mammals.
349. We note that proposed Condition 118 acknowledges the responsibilities of their obligations under the Marine Mammals Protection Act 1978 and Marine Mammals Protection Regulations 1992. Proposed Condition 161 requires employees and contractors undertaking airborne, sea-going and watch-keeping

¹⁸³ Paragraph 86, Statement of Evidence of Andrew Baxter for the Director-General of Conservation, 24 February 2014.

¹⁸⁴ Paragraph D, Statement of Evidence of Andrew Baxter for the Director-General of Conservation, 24 February 2014.

¹⁸⁵ Paragraph 38, Statement of Evidence of Andrew Baxter for the Director-General of Conservation, 24 February 2014.

duties to be informed of their obligations under the Marine Mammals Protection Act 1978 and Marine Mammals Protection Regulations 1992.¹⁸⁶

Findings

350. Dr Childerhouse considered there is no evidence from the TTR reports or other material that the operational area is of particular biological importance to any marine mammal species, although they are likely to be present in the broader area at certain times of year. We agree with this, but because of the importance of the marine mammals, it is appropriate to take a cautious approach.
351. We acknowledge the proposed consent conditions but consider that more baseline work should have been undertaken prior to the application being lodged. We consider comprehensive and longer-term baseline studies of the presence of marine mammals in the STB would have assisted us to understand the importance of the STB to various species and what they use this area for (e.g foraging, breeding, calving, migrating etc.). The absence of this information leaves us uncertain as to the significance of the proposed mining area and the wider area of the STB affected by the mining operation to cetaceans. However, we find that the final conditions proposed by TTR are comprehensive and may have addressed our concerns.

5.5 Fish

The issues

352. We are required to take into account the importance of protecting the biological diversity and integrity of marine species, ecosystems and processes (section 59(2)(d) of the Act). Fish are clearly part of this. Although linked to the biological effects on fish addressed below, the effects on fisheries and fishing are addressed later in the section on existing interests.
353. Aside from the fisheries catch information, the distribution and abundance of reef fish, pelagic fish and demersal (seabed) fish in the STB was determined by predictive models based on survey information conducted around New Zealand together with a set of environmental predictor variables.¹⁸⁷
354. We heard from Dr MacDiarmid on behalf of TTR that the species richness of the reef fish, demersal fish and pelagic fish assemblages in the STB is moderate on a national scale. She stated: *“None of the strictly marine species reviewed are nationally rare or threatened, although several diadromous species (species with a phase in both marine and fresh waters) occurring in the region are listed as ‘at risk – declining’.”*¹⁸⁸
355. Submitters such as Mrs Pratt questioned the validity of the model. However, Dr MacDiarmid told us she considered the data (although dated) used to underpin the model was still relevant to describing broad-scale distributions and abundances. Dr MacDiarmid explained that they are based on such a large data set (comprising 21,000 research trawls in the New Zealand territorial sea and EEZ, with 666 from

¹⁸⁶ Appendix A, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014.

¹⁸⁷ Section 2.2 South Taranaki Bight Fish and Fisheries (NIWA, 2013).

¹⁸⁸ Paragraph 12, Statement of Evidence in Chief of Dr Alison MacDiarmid on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

the region of interest). This provides much greater spatial and temporal coverage than could be reasonably expected from a modern one-off survey.¹⁸⁹

356. Demersal and pelagic fish species with predicted distributions in the STB that particularly coincide with areas potentially affected by iron sand extraction operations (i.e. those species with % occurrence >50%) include barracouta, blue cod, carpet shark, eagle rays, John dory, golden mackerel, kahawai, leather jacket, lemon sole, red cod, red gurnard, rig, school shark, snapper, spiny dogfish, tarakihi, trevally, common warehou and witch. Species that are predicted to be particularly abundant (>50 kilogram per hour standard trawling) in the TTR proposed project area include barracouta, red gurnard, leather jacket, school shark, snapper, spiny dogfish, rig, tarakihi and trevally.¹⁹⁰

The effects

357. From the application documents and evidence presented to us, the main potential issues on fish are:

- effects of suspended sediment and sedimentation
- effect of heavy metals released into the water column that would otherwise be in the subsurface seabed sediment
- loss of benthic food sources
- displacement of fish and loss of habitat
- loss of spawning nurseries
- noise
- entrainment of fish in mining apparatus
- light spill from mining operations.

Effects of suspended sediment and sedimentation

358. A number of submitters commented on the potential impact of increased suspended sediments on fish wellbeing. Dr MacDiarmid said that *“high [suspended sediment concentrations] can alter fish foraging patterns and success by reducing visual acuity, cause non-lethal damage to gill lamellae, and increase gill ventilation rates”*.¹⁹¹

359. In the joint expert conferencing, the experts agreed that the increase of sediment in the water column is unlikely to cause sublethal effects or growth effects except at the immediate source of the plume.¹⁹² Dr MacDiarmid expanded on this in her evidence, stating that, based on Dr Hadfield’s modelling, *“at the source of the plume [suspended sediment concentrations] may reach 287 g per m³ which is sufficiently high to cause adverse growth and developmental effects from physiological stress in juvenile snapper and perhaps in other coastal species, but will probably not cause fish mortalities”*.¹⁹³

¹⁸⁹ Paragraph 32 Statement of Evidence in Chief of Dr Alison MacDiarmid on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

¹⁹⁰ Paragraph 16, Statement of Evidence in Chief of Dr Alison MacDiarmid on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

¹⁹¹ Paragraph 28, Statement of Evidence in Chief of Dr Alison MacDiarmid on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

¹⁹² Paragraph 17, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014.

¹⁹³ Paragraph 29, Statement of Evidence in Chief of Dr Alison MacDiarmid on behalf of Trans-Tasman Resources Ltd,

360. Dr McClary considered the potential effects of sediment choking fish. He concluded that *“in the mid-shore to nearshore areas the risk of fish choking is low-moderate risk with high confidence as the midshore and nearshore habitats already characterised by turbid conditions and the modelling suggests that this will not be significantly worsened”*.¹⁹⁴
361. He acknowledged that nothing is known of the use of the STB by diadromous (freshwater migratory) fish such as lamprey, eels and whitebait. He considered these fish are adapted to living in turbid freshwater systems and it is unlikely that the suspended sediment concentration elevations arising from TTR’s operations would adversely affect such fish – either in the adult form or the larval form.¹⁹⁵
362. Dr McClary commented that *“being fully motile, fish have the ability to select their preferred habitat and thus there is a possibility that some species (those which prefer waters of high clarity) will avoid areas with high loads of suspended sediment (e.g., nearest the site of mining activities)”*.¹⁹⁶ We accept this.
363. In terms of the effects on visual predators, Dr McClary said in cross-examination that there was discussion at the fish and zooplankton joint conferencing around visual predators and prey. Overall, the feeling from the experts was that there was not going to be a significant effect on these or an effect that could be relatively easily detected.¹⁹⁷
364. The experts in the joint conferencing agreed that detectable direct effects of decreases in water clarity on fish population are highly unlikely.¹⁹⁸

Effect of heavy metals released into the water column that would otherwise be in the subsurface sediment

365. The Fishing Interests in particular expressed concern about the potential for heavy metals to affect fish.¹⁹⁹ We have addressed heavy metals in the context of fisheries and human health.
366. Dr Huber (appearing for the EPA) explained under cross-examination that the most likely mode of impact of dissolved metals in the discharge upon fish would be through the food web. Dr Huber explained that fish can take up metals by eating things that have metals in them, or they can absorb it, typically through the gills. He considered that fish accumulating metals to levels of concern directly from the water in this instance would be highly unlikely because significant numbers of fish are unlikely to remain around the discharge for long enough periods to accumulate significant levels of metals. The most likely route for some metals would be through the food web.²⁰⁰ Dr Vopel in his evidence for TTR

14 February 2014.

¹⁹⁴ Paragraph 179, Statement of Evidence in Chief of Dr Dan McClary on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

¹⁹⁵ Paragraph 181, Statement of Evidence in Chief of Dr Dan McClary on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

¹⁹⁶ Paragraph 215, Statement of Evidence in Chief of Dr Dan McClary on behalf of Trans-Tasman Resources Ltd 17 February 2014

¹⁹⁷ Page 705 of the Transcript, 1 April 2014

¹⁹⁸ Paragraph 24, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014

¹⁹⁹ E.g. Mr Doug Gordon who gave evidence on 14 April 2014

²⁰⁰ Page 628 of the Transcript, 1 April 2014

similarly considered that it was unlikely that a fish would stay behind the discharge pipe in a stationary position long enough to be exposed to the elevated concentrations of heavy metals to be affected.²⁰¹

367. The experts in joint conferencing considered that, while some individuals might be attracted to the mining plant/structures and be exposed to higher levels of heavy metals, the effects of this were low.²⁰²

368. The experts agreed that the application of the ANZECC/ARMCANZ 2000 Guidelines for Water Quality Protection are the appropriate standards for protection of fish.²⁰³

Loss of benthic food sources

369. Dr McClary told us that, in his opinion, *“the loss of benthic feeding area is in my opinion not likely to be significant as the extraction process operates in a sequential harvesting manner with recolonisation over time ... given there are no endangered species in the region and that the region does not support fish nursery or extensive feeding grounds”*.²⁰⁴ On this basis, he considered the effects are likely to be negligible.

370. The effects on the benthic ecology are discussed in more detail in the section on benthic effects.

Displacement of fish and loss of habitat

371. There was a concern expressed by the Fishing Interests that fish species would be displaced by the proposed mining operation. Dr McClary concluded (based on Dr Hadfield’s sediment plume modelling) fish in the region 2–3 kilometres from the immediate deposition area will be subject to elevated levels of suspended sediments and thus potentially be displaced (or remove themselves) from the affected areas if not capable of tolerating these higher levels of sediment concentrations.²⁰⁵

Loss of spawning and nurseries

372. We asked Dr MacDiarmid about the potential for spawning areas in the STB, as this was raised by Mr Gordon and Dr Gibbs (reviewer for the EPA). Dr MacDiarmid outlined the potential effects of increased sediment on spawning sites. She noted that the most vulnerable stages would be eggs and larvae.²⁰⁶ Dr MacDiarmid stated that there is some evidence for spawning activity by 13 demersal or pelagic fish species in the STB, while larger juveniles of 24 species also occur in the region.²⁰⁷ However, she commented that no evidence had been found for well defined spawning sites or juvenile nurse areas in the STB.²⁰⁸

²⁰¹ Page 754 of the Transcript, 2 April 2014

²⁰² Paragraph 23, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014

²⁰³ Paragraph 21, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014

²⁰⁴ Paragraph 174, Statement of Evidence in Chief of Dr Dan McClary on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

²⁰⁵ Paragraph 177, Statement of Evidence in Chief of Dr Dan McClary on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

²⁰⁶ Page 922 of the transcript, 2 April 2014.

²⁰⁷ Paragraph 14, Statement of Evidence in Chief of Dr Alison MacDiarmid on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

²⁰⁸ Page 924 and 925 of the transcript, 2 April 2014.

373. Dr McClary considered in his evidence that any effects on spawning would be likely to be minor, given the relatively small scale of TTR's activities in the context of the broader area of the STB.²⁰⁹

Noise

374. The experts agreed in the joint witness statement that adult fish have lower sensitivity to noise than marine mammals. The experts considered that the measures to mitigate the potential noise effects on marine mammals will also reduce the effects of noise on fish.²¹⁰

Entrainment of fish in mining apparatus

375. Dr McClary presented evidence that, although fish at the periphery of the intake zone may be able to avoid entrainment into the intake pump, the intake water velocity of the crawler pump (up to 6 m/sec) exceeds the likely burst swimming velocity of smaller coastal fish, and the entrainment of the occasional fish would be expected. Dr McClary told us that, given the observed low abundance of fish in the direct project area, any such losses would not be ecologically significant.²¹¹

376. The experts agreed that there would be no great opportunity for fish to gain entry into the mining apparatus, and based on the evidence, we agree that this would not be a significant effect.²¹²

Light spill from mining operations

377. Dr Thompson in his evidence on behalf of TTR considered that, for fish and squid, any effects of the vessel as a source of artificial nocturnal light would be likely to be very localised and centred on the vessel itself. Due to the small number of squid and fish groups that could aggregate in the water column close to the vessel, there would be no measurable effect at a population level.²¹³

378. The experts agreed that the effects of light spill would be minor given the appropriate applications of industry guidelines. The experts recommended these were imposed as a condition.²¹⁴

Proposed conditions

379. The experts involved in joint conferencing agreed that baseline monitoring should occur for a minimum period of 1 year.²¹⁵ They considered that, although specific monitoring of species abundance around the mining site was not warranted, reef fish should be monitored at the North and South Traps, Graham Banks and the biogenic shell and bryozoans areas to the south of the mining areas.²¹⁶ This is reflected in proposed Condition 106(f)(ii).

²⁰⁹ Paragraph 180, Statement of Evidence in Chief of Dr Dan McClary on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

²¹⁰ Paragraph 16, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014.

²¹¹ Paragraphs 171 and 172, Statement of Evidence in Chief of Dr Dan McClary on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

²¹² Paragraph 26, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014.

²¹³ Paragraph 18, Statement of Evidence in Chief of Dr David Thompson on behalf of Trans-Tasman Resources Ltd 15 February 2014.

²¹⁴ Paragraph 27, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014.

²¹⁵ Paragraph 33, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014.

²¹⁶ Paragraph 34, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014.

380. The experts agreed that testing should be undertaken to ensure that the ANZECC/ARMCANZ 2000 Guidelines for Water Quality Protection are met.²¹⁷ This is reflected in proposed Condition 183 and as a performance objective in 10(g).
381. Noise effects on fish are addressed by performance objective 10(d)(i) and lighting is addressed in 10(h). Proposed Condition 106 requires fish to be part of the Pre-operational Baseline Environmental Monitoring Plan. This includes monitoring of reef species and a focus on measurement of environmental physical determinants such as suspended sediment concentrations and optical properties as indicators of potential biological effects. Proposed Condition 207(c) contains similar requirements for the Environmental Management and Monitoring Plan.
382. Proposed Condition 110(l) identifies fish biology, movement and behaviour as a key environmental component of baseline environmental monitoring. Likewise, proposed Condition 204 requires these factors be included in the Environmental Management and Monitoring Plan.

Findings

383. The modelling indicates that the fish species richness and abundance is moderate on a national scale, and there do not appear to be any nationally rare or threatened species. We accept that this is a model and that the actual results of a fish survey may vary from the model.
384. Areas of uncertainty are that the distribution of the marine life stages of diadromous fish in the STB is unknown as is the importance of this area for spawning and pupping. We accept that fish are highly mobile and those not tolerant of high suspended sediment concentrations will likely move to more suitable habitats. Overall, we accept the conclusions of the experts on fish and zooplankton that the effects on fish, while there is some uncertainty in the information, are unlikely to be significant. We note, however, that this conclusion assumes that no significant food web effects arise due to primary production changes. As we have stated previously, there is significant uncertainty around this aspect.
385. We address the effects on the Fishing Interests in the section on Existing Interests.

5.6 Seabirds

The issues

386. We are required to take account of the importance of protecting the biological diversity and integrity of marine species, ecosystems and processes and the importance of protecting rare and vulnerable ecosystems and the habitats of threatened species (section 59(d) and (e) of the EEZ Act). There are a number of protected bird species that are thought to be in the area and that can be expected to be in the project area from time to time.
387. In order to understand the effects on birds, we first needed to understand the importance of the STB for both seabirds and migratory birds.

²¹⁷ Paragraphs 28–30, Joint Statement of Experts in the Field of Effects on Fish and Zooplankton, 20 March 2014.

Importance of the STB for birds

388. The application was accompanied by a report on seabirds (Seabirds of the South Taranaki Bight, NIWA, 2013), which reviewed and summarised information from published and unpublished sources and drew upon expert opinion to determine the species of seabirds that are likely to be associated with the STB at some point during the year. The report states that *“no attempt has been made to quantify the use of the area by any species, nor have numbers of any particular species that use the area been reported”*.²¹⁸
389. Dr Thompson, the expert witness for TTR, considered that three species listed as nationally critical are likely to occur in the STB area: *“Salvin’s albatross, black-billed gull and fairy tern. It is possible that two further species may occur in the area – Antipodean albatross and Gibson’s albatross.”*²¹⁹
390. Ornithological Society of New Zealand records indicate that six additional endangered species have been seen, including Snares penguin, Fiordland penguin, Antarctic fulmar, grey-backed tern, black noddy and greater frigate bird.²²⁰ Evidence presented on behalf of the Director-General of Conservation by Dr Scofield considered grey-headed albatross, Antipodes wandering albatross and Gibson’s wandering albatross have been shown to occur in the STB. All are classed as nationally critical.²²¹ We accept that the South Taranaki coast does not support major bird colonies.²²²
391. We also heard from Ms Hammond (2 May 2014), who expressed concern about the impacts on birds that have not been investigated. She drew our attention to the Hutton’s shearwater, a nationally endangered species, as part of the STB is one of two known feeding grounds. She expressed concern that this species is already being severely compromised by impacts on its breeding grounds from human activity. She drew our attention to the Ministry for Primary Industries NABIS database, which illustrated their spring range, and commented that there are only 40 birds present in New Zealand in the breeding season from September to March. They feed on small fish and crustaceans, especially krill. Outside the breeding season, they are migratory and most are absent from New Zealand waters.
392. The paragraphs above are particularly relevant in terms of section 59(2)(e) of the EEZ Act, which requires us to take into account the importance of protecting rare and vulnerable ecosystems and the habitats of threatened species.
393. The ‘bird experts’ (via the expert conferencing) agreed that the STB could be on the migratory route of several New Zealand seabird species such as the sooty shearwater and Hutton’s shearwater. They acknowledged that the amount of time these species spend in the area is unknown, as is the ability of

²¹⁸ Section 1, Seabirds of the South Taranaki Bight (NIWA, 2013).

²¹⁹ Paragraph 14, Statement of Evidence in Chief of Dr David Thompson on behalf of Trans-Tasman Resources Ltd, 15 February 2014.

²²⁰ Paragraph 28, Statement of Evidence in Chief of Dr David Thompson on behalf of Trans-Tasman Resources Ltd, 15 February 2014.

²²¹ Paragraph 12, Statement of Evidence of Richard Paul Scofield for the Director-General of Conservation, 24 February 2014.

²²² Paragraph 29, Statement of Evidence in Chief of Dr David Thompson on behalf of Trans-Tasman Resources Ltd, 15 February 2014.

these species to move from their migration route.²²³ The experts also agreed that the STB does not support significant penguin, gannet and shag populations and colonies.²²⁴

394. The applicant accepted that they had not done any bird field surveys. There was considerable discussion about the absence of surveys and reliable data regarding the presence and abundance of birds in the STB. The review of the application commissioned by the EPA expressed 'surprise' that no field surveys were undertaken as part of the NIWA assessment.²²⁵ The EPA noted that there was limited field information provided with the application as surveys of seabirds were not undertaken to inform the proposal and no attempt was made to quantify the use of the area by any bird species.²²⁶

395. The experts agreed that there is not enough evidence to conclude that the area is of importance or not of importance to seabirds.²²⁷ The experts acknowledged that the level of uncertainty is high and there are knowledge gaps.²²⁸ This was echoed by Dr Thompson who stated *"that detailed, systematic and quantitative information on the at-sea distribution of virtually all species is currently lacking for the STB"*.²²⁹

396. When questioned by Ms Jamieson, Counsel for the Director-General of Conservation, Dr Thompson stated that acquiring enough information to provide a thorough and detailed understanding of all seabird use at the STB would be a major undertaking and not practical in the context of this application.²³⁰ Dr Thompson accepted that an additional year of bird surveys would improve the information on the occurrence of birds. However, he concludes that the effects on birds are unlikely to be significant.²³¹

397. We agree with Dr Scofield that, given the lack of information, it is not possible to conclude at this stage that the STB supports a relatively modest seabird assemblage, as there is simply insufficient information to draw that conclusion.²³²

The effects

398. Having established that there may be seabirds and migratory birds in the project area, based on the evidence provided, we consider that the potential key effects in terms of birds are:

- direct effects of vessel lighting and noise
- effects of sediment on visual foragers
- effects on the food web, including habitat loss and specifically the loss of foraging areas.²³³

²²³ Paragraph 12, Joint Statement of Experts in the Field of Effects on Seabirds, 20 March 2014.

²²⁴ Paragraph 22, Joint Statement of Experts in the Field of Effects on Seabirds, 20 March 2014.

²²⁵ Paragraph 11, Review of Technical Reports Relating to Seabirds Submitted as Part of the Trans-Tasman Resources Limited Application to Mine Iron Sand in the South Taranaki Bight (Mitchell Partnerships Ltd, 2013).

²²⁶ Paragraph 23, Statement of Evidence in Chief of Dr David Thompson on behalf of Trans-Tasman Resources Ltd, 15 February 2014.

²²⁷ Paragraph 11, Joint Statement of Experts in the Field of Effects on Seabirds, 20 March 2014.

²²⁸ Paragraph 14, Joint Statement of Experts in the Field of Effects on Seabirds, 20 March 2014.

²²⁹ Paragraph 9, Statement of Evidence in Chief of Dr David Thompson on behalf of Trans-Tasman Resources Ltd, 15 February 2014.

²³⁰ Page 1093 of the transcript, 3 April 2014.

²³¹ Paragraph 25, Statement of Evidence in Chief of Dr David Thompson on behalf of Trans-Tasman Resources Ltd, 15 February 2014.

²³² Paragraph 19, Statement of Evidence of Richard Paul Scofield for the Director-General of Conservation, 24 February 2014.

399. We address each effect below.

Effects from vessel lighting and noise

400. The experts agreed that lighting is potentially the most significant effect on seabirds.²³⁴ Dr Thompson expanded on this, stating that the most likely direct effects of the proposed activity would be collision of seabirds with the vessel, most likely at night-time, and artificial nocturnal lighting conditions.²³⁵ Deck lights combined with standard navigation lights will increase the presence of artificial nocturnal lighting.²³⁶ This was illustrated by Dr Scofield's experience onboard MV *Aurora Australis* in calm and foggy conditions, which necessitated the use of deck lighting and led to a high number of bird strikes.²³⁷

401. The experts agreed that vessel design, including the number of portholes and light bollards, and best-practice upper deck management practices will greatly minimise the scale and significance of potential adverse light effects on birds.²³⁸

402. In terms of effects, we understand collision of birds with vessels due to lighting would be a localised effect and would be centred on the vessel itself.²³⁹ We also accept in most cases that this is unlikely to have any measurable population level impact because the number of individuals affected is small compared to the size of the population overall and the fact that there are no major seabird breeding colonies nearby.²⁴⁰

403. The experts accepted that there is uncertainty surrounding the scale and significance of effects of lighting on seabirds.²⁴¹

404. The experts agreed that they do not consider noise an issue for seabirds, and we have no reason to dispute this having heard no evidence on this issue.²⁴²

Effects of sediment on visual foragers

405. Dr Thompson stated that the sediment plume has the potential to affect seabirds through an increase in water turbidity and a corresponding reduction in foraging efficiency in visual predators such as shag species. We accept that this may lead to seabirds being displaced from the areas affected by the sediment plume.²⁴³

²³³ Paragraph 20, Review of Technical Reports Relating to Seabirds Submitted as Part of the Trans-Tasman Resources Limited Application to Mine Iron Sand in the South Taranaki Bight (Mitchell Partnerships Ltd, 2013).

²³⁴ Paragraph 16, Joint Statement of Experts in the Field of Effects on Seabirds, 20 March 2014.

²³⁵ Page 1096 of the transcript, 3 April 2014.

²³⁶ Paragraph 15, Statement of Evidence in Chief of Dr David Thompson on behalf of Trans-Tasman Resources Ltd, 15 February 2014.

²³⁷ Paragraph 27, Statement of Evidence of Richard Paul Scofield for the Director-General of Conservation, 24 February 2014.

²³⁸ Paragraph 26, Joint Statement of Experts in the Field of Effects on Seabirds, 20 March 2014.

²³⁹ Paragraph 18, Dr Thompson, Evidence in Chief.

²⁴⁰ Paragraphs 18 and 19, Statement of Evidence in Chief of Dr David Thompson on behalf of Trans-Tasman Resources Ltd, 15 February 2014.

²⁴¹ Paragraph 16, Joint Statement of Experts in the Field of Effects on Seabirds, 20 March 2014.

²⁴² Paragraph 15, Joint Statement of Experts in the Field of Effects on Seabirds, 20 March 2014.

²⁴³ Paragraph 13, Statement of Evidence in Chief of Dr David Thompson on behalf of Trans-Tasman Resources Ltd, 15 February 2014.

406. The experts agreed that the sediment plume that actually occurs, rather than the sediment plume as modelled, will determine the scale of the effects.²⁴⁴ Given that the model is predictive and based on a series of assumptions, we consider that this introduces uncertainty in terms of the effects of sediment on visual foragers and therefore what the potential consequences may be.

Effects on the food web

407. Dr Thompson noted that seabirds are important high-level predators in marine systems and may potentially be indirectly impacted by the deposition of tailings and the sediment plume.²⁴⁵ The experts noted that trophic modelling for seabirds in the STB was not used as part of the TTR application, and due to the lack of baseline information, it would be of limited use in the assessment of effects on seabirds.²⁴⁶

408. We did not hear any evidence on this, and it appears from the experts that it would be difficult to undertake due to the lack of baseline information. Consequently, we do not have an understanding of what the effects on birds might be through effects on the lower levels of the food web.

Proposed conditions

409. An Environmental Performance Objective requiring no more than minor effect on seabirds attributable to lighting of TTR's operations was set out in proposed Condition 10(h). Proposed Condition 10(k), another Environmental Performance Objective, also sought no adverse effects at a population level of seabirds classified as nationally endangered, nationally critical or nationally vulnerable or classified endangered or vulnerable in the International Union for the Conservation of Nature Red List. This level of detail was specified by the Director-General of Conservation, and we set out in more detail our concerns about the Environmental Performance Objectives later in this decision.

410. Seabirds are also identified as a key environmental component to be subjected to baseline monitoring (proposed Condition 110). The conditions also require the development of a Seabirds Effects Lighting Mitigation and Management Plan, with proposed Conditions 86–99 establishing the requirements of that plan. Seabirds are also identified as a key component of the Environmental Monitoring and Management Plan.

411. Dr Scofield and Dr Bramley recommended that an observer be employed to undertake compliance monitoring in terms of activities likely to have an effect on birds and corpse and capture/release monitoring.²⁴⁷ However, Dr Thompson considers it would not be necessary to have a dedicated observer and favours good-quality multiple photographs of the birds before they are released to identify them.²⁴⁸

²⁴⁴ Paragraph 22, Joint Statement of Experts in the Field of Effects on Seabirds, 20 March 2014.

²⁴⁵ Paragraph 8, Statement of Evidence in Chief of Dr David Thompson on behalf of Trans-Tasman Resources Ltd, 15 February 2014.

²⁴⁶ Paragraph 31, Joint Statement of Experts in the Field of Effects on Seabirds, 20 March 2014.

²⁴⁷ Paragraph 30, Joint Statement of Experts in the Field of Effects on Seabirds, 20 March 2014.

²⁴⁸ Page 1092 of the transcript, 3 April 2014.

Findings

412. It is evident from the proposed conditions that TTR has recognised the importance of minimising and mitigating the risk to and effects on birds. However, the extent of the proposed conditions is a reflection of the lack of any field surveys undertaken and an understanding of the potential significance or not of birds in the STB. Given this, we find that we are still lacking an understanding of how important the STB is for seabirds and therefore the significance of the potential effects.

5.7 Biosecurity

The issues

413. There is a risk of spreading non-indigenous species that will affect the biological diversity and integrity of native marine species, ecosystems and processes in the STB and affect existing interests.
414. Vessels associated with the mining activity transiting in and out of New Zealand may carry non-indigenous species in their ballast water or on their hulls (biofouling). There is a particular concern from marine farming operators in the coastal marine area, in particular Admiralty Bay and other areas of the Marlborough Sounds, if ore transfer or refuelling activities are carried out in these areas when sea conditions in the STB are unsuitable.

The effects

The application

415. The application identifies that 'biosecurity' refers to the protection of native or indigenous biological resources from non-native, invasive species. In the context of this proposal, marine biosecurity refers to the prevention, detection and management of non-indigenous marine species (NIMS) that may be harboured on or within project-associated vessels. These include the FPSO, FSO, refuelling vessels, anchor-handling tug and export vessels.
416. Potential marine biosecurity issues for the project are associated with the use and management of ballast waters and also vessel biofouling.
417. The project ecological risk assessment carried out by Dr McClary identified biosecurity as one of three potential moderate environmental risks:

"The potential for effects arising from Unplanned Events – including biofouling effects on native biodiversity through the incidental translocation of non-indigenous marine species to the project site and around New Zealand..." ²⁴⁹

418. TTR proposed to prepare and implement a project-specific Biosecurity Management Plan that would include reference to the relevant vectors of NIMS into and around New Zealand and provide mechanisms for the detection, mitigation and response to biosecurity threats for all project activities.
419. New Zealand manages ballast waters through declaring that ballast water is a 'risk good' and is subject to the import health standard for ships' ballast water from all countries issued under section 22 of

²⁴⁹ Page 260, TTR Supporting Information for Marine Consent Application, October 2013.

the Biosecurity Act 1993. All vessels arriving in New Zealand are required to make a ballast water declaration and comply with this import health standard.

420. The vessels employed for the TTR project would arrive in New Zealand from an overseas port and would be fully compliant with the requirements of the International Convention for the Control and Management of Ships' Ballast Water and Sediments 2004 (BWM-CON) with 'clean' water ballast and 'clean' tanks. Under the requirements of the Convention, ballast water on board is exchanged with oceanic water while at sea in order to reduce the potential for the survival and release of organisms entrained at the source port.
421. There would be operational ballasting and de-ballasting undertaken by project vessels working within the EEZ and in the New Zealand territorial sea. This would, in effect be exchanging either oceanic or locally derived ballast water for ballast water abstracted within New Zealand and thus pose reduced risk of translocating NIMS into and around the country.
422. Ballast water would be pumped out of the export vessel when cargo is loaded as a normal operational discharge as is the case for most vessels loading cargoes in New Zealand waters.
423. Export vessels would arrive in New Zealand with BWM-CON and import health standard-compliant water ballast and 'clean' tanks.
424. Vessel biofouling refers to the organisms carried by vessels on both the external surfaces of their hull(s) and also within their internal seawater systems. The colonisation and growth of such organisms is typically controlled through both the application of fouling control or release coatings (antifouling paints) to the external surfaces of the vessel as well as a variety of 'approved' active and passive systems for controlling fouling of internal systems.
425. TTR vessels arriving in New Zealand would be required to comply with a project-specific Biosecurity Management Plan to be developed by TTR as well as the International Maritime Organization Biofouling Guidelines 2011 (Resolution MEPC.207(62) – 2011 Guidelines for the Control and Management of Ships' Biofouling to Minimize the Transfer of Invasive Aquatic Species).
426. The guidelines include advice on preparing and implementing the vessel's biofouling management plan, biofouling record book, choosing, installing and maintaining appropriate antifouling systems, in-water inspection, cleaning and maintenance.
427. All TTR project-related vessels would be subject to a vessel biosecurity risk assessment prior to travelling to the EEZ and territorial sea.
428. Only those vessels considered to pose a low risk of translocating NIMS to and around New Zealand waters will be considered compliant with the Biosecurity Management Plan. All TTR project vessels will be required to meet the Craft Risk Management Standard: Biofouling on Vessels arriving to New Zealand (CRMS) issued under section 24G of the Biosecurity Act 1993/Biosecurity Law Reform Act 2012.

429. Biosecurity concerns were particularly raised by aquaculture industry submitters. Mr Johnstone, Technical Director of Aquaculture New Zealand, and Mr Culley of Sanford Ltd both identified biosecurity as a significant concern in relation to marine farms in the Marlborough Sounds and risks from international vessels transiting into the sheltered waters of Admiralty Bay or other areas of the Sounds for refuelling of the FPSO or FSO or transfer of iron sand. They noted that the aquaculture industry generates over \$360 million annually and 3,000 jobs for New Zealand and that 69% of New Zealand's Greenshell™ mussel and 64% of New Zealand's salmon farming production occurs in the Sounds. They also noted that aquaculture industry has already been subject to marine pest incursion at considerable cost.²⁵⁰
430. Aquaculture submitters proposed full requirements for 'long-stay vessels' (as specified in the CRMS) are made a consent condition for the operation to ensure that the bulk carriers are only bearing a slime layer and/or goose barnacles on all hull surfaces (as defined in the CRMS) at all times, for every entry.
431. The Ministry for Primary Industries noted in its submission that, in addition to risks from ballast water and vessel biofouling, non-indigenous species could also be introduced via other equipment such as anchors and chains and associated storage lockers and the two crawlers plus umbilicals. They identified that this should be explicitly addressed in the TTR Biosecurity Management Plan.
432. In regard to the submissions, we note that the potential biosecurity risks are as described by TTR – biofouling effects on native biodiversity through the incidental translocation of non-indigenous marine species to the project site and around New Zealand.
433. A biosecurity incident has potential to have more than a minor environmental effect. Biosecurity risks are managed in New Zealand under the Biosecurity Act 1993 administered by the Ministry for Primary Industries. The UN Convention on the Law of the Sea (UNCLOS) and the International Maritime Organisation provide international frameworks and requirements for biosecurity management. Biosecurity concerns were raised by the Ministry for Primary Industries and the aquaculture industry, with recommendations in relation to biosecurity management.

Proposed conditions

434. To address the concerns raised, TTR proposed potential conditions. These included:

"Condition 10 – Environmental performance objectives f(vii) and (l) relating to the benthic environment

(f) Benthic communities, rocky reefs, primary productivity

(vii) No more than minor adverse effect on native biodiversity through the incidental translocation of non-indigenous marine species and/or spills

(l) Biosecurity

No translocation of marine species not naturally already present in the coastal marine environment as a result of vessels entering operational areas both in the mine site and transfer areas."

²⁵⁰ Page 2543 of the transcript, 1 May 2014.

435. Proposed Condition 60(h) requires the development of a Biosecurity Management Plan, which is then detailed in Conditions 100–102.
436. The aquaculture industry proposed that TTR vessels meet the ‘long-stay vessel’ requirements as specified in the CRMS. In cross-examining the Aquaculture New Zealand witness, Mr Johnstone suggested that the long-stay requirements should be fine-tuned to meet the real situation that is being managed, and this concept was included in the proposed conditions.²⁵¹

Other relevant regulations/legislation

437. The Biosecurity Act is administered by the Ministry for Primary Industries and governs the exclusion, eradication and effective management of pests and unwanted organisms. This Act provides a range of functions, powers and options for the management of risk organisms.
438. The reform of the Biosecurity Act in 2012 extended its application to include the EEZ. This was in response to increased economic activity in the EEZ. This 2012 reform added Part 8A to the Act, which extends the existing provisions of the Act to the EEZ.
439. The project would be legally required to comply with the provisions of the Biosecurity Act and any regulations made under that Act.
440. In summary, all vessels arriving in New Zealand are required to make a ballast water declaration and comply with the import health standard for ships’ ballast water from all countries issued under section 22 of the Biosecurity Act 1993. With respect to hull biofouling, all arriving vessels will be required to meet the Craft Risk Management Standard: Biofouling on Vessels arriving to New Zealand issued under section 24G of the Biosecurity Act 1993, as well as other provisions.
441. The UN Convention on the Law of the Sea provides the global framework for invasive species or biosecurity management by requiring States (Article 196) to work together *“to prevent, reduce and control human caused pollution of the marine environment, including the intentional or accidental introduction of harmful or alien species to a particular part of the marine environment”*.
442. The International Maritime Organization International Convention for the Control and Management of Ships’ Ballast Water and Sediments 2004 (BWM-CON) was adopted by consensus in London on 13 February 2004. New Zealand is a Party to the Convention, which requires all ships to implement a ballast water and sediments management plan. Compliant ships will carry a ballast water record book and will be required to carry out ballast water management procedures to the standard set out in the BWM-CON. Parties to the Convention are also given the option to take additional nation-specific measures that are subject to criteria set out in the Convention and to International Maritime Organization guidelines.
443. The International Maritime Organization International Convention on the Control of Harmful Anti-Fouling Systems on Ships 2001 came into force on 17 September 2008. It prohibits the use of harmful organotin compounds in antifouling paints and provides a mechanism for preventing the future use of

²⁵¹ Page 2550 of the transcript, 1 May 2014.

harmful substances in antifouling systems. All parties to the Convention (of which New Zealand is a member) are required to prohibit use of harmful antifouling substances on flagged vessels, as well as all vessels that enter a port, shipyard or offshore terminal of a party. As the FPSO-FSO is, in effect, a mobile offshore terminal, all vessels working at the project site must be compliant with the convention.

444. Any entry of TTR vessels into the coastal marine area, for example, to Admiralty Bay and other parts of the Marlborough Sounds for shelter and/or refuelling or ore transfer, would come under the jurisdiction of the relevant regional council and the RMA.

Findings

445. Having considered the information available through TTR's marine consent application and associated reports and concerns expressed by submitters, should consent have been granted, it is our view that:

- Non-indigenous organisms could be introduced into New Zealand by ships transiting into New Zealand to support the proposed TTR activities and hence create biosecurity risks.
- Effects of a biosecurity incident could be more than minor.
- The only risks associated with this activity that could be considered outside the normal biosecurity risks associated with international shipping in New Zealand waters would be if regular refuelling and/or iron ore transfer occurred in the STB, Admiralty Bay or other parts of the Marlborough Sounds.
- Biosecurity risks are managed by the Ministry for Primary Industries under the Biosecurity Act (1993).

446. If consent had been granted, we would have recommended that the Ministry for Primary Industries give additional consideration to the biosecurity risks in the Marlborough Sounds in signing off a TTR Biosecurity Management Plan.

5.8 Human health

The issues

447. We are required to take into account the effects on human health that may arise from effects on the environment (section 59(2)(c) of the EEZ Act). From TTR's application, the evidence presented to us, submissions and submitters we heard, we consider the four main issues associated with effects on human health are:

- air discharges from the combustion of heavy fuel oil in the engines on the vessels
- contamination to seafood from the proposed operation
- risk to other users of the STB including recreational users
- health and safety for workers.

448. Origin Energy Resources Kupe NZ Ltd on behalf of the Kupe Joint Venture Parties raised concerns in their submission and evidence relating to how their operations and employees might be affected. The effects on air quality in relation to the Kupe platform are addressed in this section. We have, however,

addressed the other concerns raised in their submission in the section on existing interests so that they could be addressed as a package.

The effects

Discharges to air from the combustion of heavy fuel oil

449. TTR undertook an air dispersion modelling study predicting the air concentrations of contaminants that would arise from discharges to air from the proposed electricity turbines on the FPSO. In terms of air quality and human health, we consider the main issues to be addressed are

- the nature and amount of contaminants to be discharges
- the potential breach of the National Environmental Standards for Air Quality within the territorial limit and how this relates to the EEZ Act
- application of Workplace Exposure Standards
- exposure of recreational users to emissions.

450. We understand from the application that the FPSO would require powering by four modular gas turbines, which will be fuelled by heavy oil. Each gas turbine will have its own stack, which will discharge the products of combustion to atmosphere. The air pollutants emitted as a result of combustion are fine particulate matter (PM10), sulphur dioxide, nitrogen dioxide and carbon monoxide.²⁵² The maximum ground level concentrations of contaminants on land were predicted using air dispersion modelling, and the results of the modelling were compared to appropriate air quality assessment criteria, including the National Environmental Standards for Air Quality.

451. We heard from Ms Simpson, an air quality scientist who appeared on behalf of TTR, who summarised the main findings of the air dispersion modelling assessments. Ms Simpson's evidence was that two options were considered – gas turbines and reciprocating engines. For the gas turbines option, the predicted ground level concentrations of all contaminants would be below the relevant New Zealand air quality standards and guidelines over both land and water.²⁵³ For the reciprocating engines option, the ground level concentrations predicted to occur on land are well within the relevant New Zealand air quality standards for all contaminants considered. She stated that the highest 24-hour average sulphur dioxide concentrations are predicted to exceed the World Health Organization 24-hour guideline. The maximum predicted ground level concentrations of nitrogen dioxide and sulphur dioxide (1-hour and 24-hour averages) that occur over water exceed the relevant New Zealand air quality standards and guidelines.²⁵⁴

452. Ms Simpson considered that the combined effects were assessed and the predicted air concentrations on land were still well within the relevant New Zealand ambient air quality standards and

²⁵² Section 2.2, Offshore Ironsands Project Air Dispersion Modelling Study (Tonkin & Taylor, 2013).

²⁵³ Paragraph 17, Statement of Evidence in Chief of Jenny Simpson on behalf of Trans-Tasman Resources Ltd, 16 February 2014.

²⁵⁴ Paragraph 18, Statement of Evidence in Chief of Jenny Simpson on behalf of Trans-Tasman Resources Ltd, 16 February 2014.

guidelines and well below the relevant workplace exposure standard.²⁵⁵ We accept this and consider any effect would be no more than minor and could be addressed by conditions of consent.

National Environmental Standards for Air Quality

453. Ms Simpson advised us the maximum predicted air concentration of sulphur dioxide, which occurs offshore within 1–2 kilometres of the vessels, would exceed the air quality standard of 350 micrograms per cubic metre as set out in the National Environmental Standards for Air Quality, which allow nine exceedances of this level per year.²⁵⁶

454. The experts involved in the joint conferencing all agreed that the air dispersion modelling predicts air concentrations will breach the ambient air quality standards for nitrogen dioxide (1-hour average) and sulphur dioxide (1-hour average) set out in the National Environmental Standards for Air Quality within the territorial limit.²⁵⁷

455. The applicability of the National Environmental Standards for Air Quality was raised in the hearing and addressed in TTR's closing submissions. TTR contended that the National Environmental Standards for Air Quality do not apply to TTR's proposed operation. We agree.²⁵⁸

Workplace Exposure Standards

456. Ms Simpson also advised that the effects of air emissions from the FPSO turbines were considered in terms of both people working on the TTR vessels and the Kupe platform. We understand that the Workplace Exposure Standards are intended to protect the health of individuals exposed to air contaminants in their work environment and that these standards were used rather than the ambient air quality guidelines.²⁵⁹

457. Ms Simpson concluded that, for the worst-case option considered (emissions from reciprocating engines burning heavy fuel oil at 4.5% w/w sulphur), the maximum predicted ground-level concentrations are well below the Workplace Exposure Standards.²⁶⁰

458. In response to Mrs Pratt's submission, Ms Simpson concluded that the effects of the exhaust emissions on air quality on the TTR vessels are low because of the tall exhaust stacks. Ms Simpson considered that predicted air concentrations on the deck of the FPSO vessel are less than 1% of the Workplace Exposure Standards.²⁶¹ Dr Kelly, a public health expert for TTR, explained that the highest modelled exposures of sulphur dioxide over a 1-hour averaging period would be at levels where it is very unlikely for a person to notice a problem.²⁶² Dr Kelly considered that people present on the Kupe platform

²⁵⁵ Page 1112 of the transcript, 4 April 2014.

²⁵⁶ Paragraph 18, Joint Statement of Experts in the Field of Air Quality and Health Effects, 26 March 2014.

²⁵⁷ Paragraph 10, Joint Statement of Experts in the Field of Air Quality and Health Effects, 26 March 2014.

²⁵⁸ Paragraphs 312–316, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014.

²⁵⁹ Paragraph 26, Statement of Evidence in Chief of Jenny Simpson on behalf of Trans-Tasman Resources Ltd, 16 February 2014.

²⁶⁰ Paragraph 31, Statement of Evidence in Chief of Jenny Simpson on behalf of Trans-Tasman Resources Ltd, 16 February 2014.

²⁶¹ Paragraph 5, Executive Summary Statement of Evidence of Jenny Simpson on behalf of Trans-Tasman Resources Ltd.

²⁶² Page 1122 of the transcript, 4 April 2014.

or TTR vessel for work purposes will be adequately protected from cardio-respiratory health effects even if they are predisposed to asthma.²⁶³

459. The experts involved in the joint conferencing agreed that, so long as air quality at the Kupe platform complies with the Workplace Exposure Standards, the source of the air emissions is not important in relation to air quality or health effects.²⁶⁴ We accept the expert evidence and find that any effects would be no more than minor.

Risk to other users of the STB including recreational users

460. The most likely risk to human health for other users of the STB is from the air emissions from the vessels. We have addressed this in detail above. Dr Kelly concluded in her evidence that exposure to contaminants through contact recreation is not an issue because of the distance from shore and water depth.²⁶⁵ She clarified for us that coastal water and beach recreational users, including fishers, boaters, surfboarders and swimmers whose activity involves presence at one location for an hour or more, are likely to be in locations where the National Environmental Standards are met. Although we heard that the emissions will not comply with the National Environmental Standards, Dr Kelly considered offshore recreational users, for example, fishers, are unlikely to remain for an hour or more in locations within 1–2 kilometres of the TTR operating vessels.²⁶⁶
461. We asked Dr Kelly what the risks were to fishers staying near the proposed operation for 3 or 4 hours. Dr Kelly concluded that, if somebody chose to linger fishing in that zone, they would be unlikely to experience an asthma attack or anything of risk to themselves.²⁶⁷
462. Given the evidence presented and the conclusions of the experts involved in the joint witness statement, we accept that the risk to recreational users will be low, as any fishers in close proximity to the TTR vessels are likely to be transiently present and in a moving vessel, which further reduces the exposure.

Contaminants to food and water

463. We heard from a number of submitters expressing concern about the potential human health effects through the food web (the harvesting of seafood). This was in terms of heavy metals already in the seabed sediment that may be released in the sediment plume.
464. Dr Vopel on behalf of TTR had undertaken analysis of heavy metals in the sediment. He compared the results of the elutriate tests against ANZECC/ARMCANZ water quality guidelines for toxicants. These guidelines were mainly derived from laboratory tests in clean water and calculated at four different protection levels: 99%, 95%, 90% and 80%.²⁶⁸

²⁶³ Paragraph 38, Statement of Evidence in Chief of Dr Francesca Kelly on behalf of Trans-Tasman Resources Ltd, 15 February 2014.

²⁶⁴ Paragraph 17, Joint Statement of Experts in the Field of Air Quality and Health Effects, 26 March 2014.

²⁶⁵ Paragraph 23, Statement of Evidence in Chief of Dr Francesca Kelly on behalf of Trans-Tasman Resources Ltd, 15 February 2014.

²⁶⁶ Page 1118 of the transcript, 8 May 2014.

²⁶⁷ Page 1122 of the transcript, 8 May 2014.

²⁶⁸ Paragraph 39, Statement of Evidence in Chief of Dr Kay C. Vopel on behalf of Trans-Tasman Resources Ltd,

465. Dr Vopel's analysis showed that the concentrations of cadmium, chromium, copper, lead, nickel and zinc in the water column outside the plume of TTR's wastewater discharge are unlikely to be elevated to concentrations that adversely affect biota. He stated that the concentrations of dilute acid-soluble cadmium, copper, lead and zinc in deep iron sand were of the same order of magnitude as their maximum concentrations in iron sand for the surface of the seafloor.²⁶⁹ He also clarified that, somewhere in the plume, a dilution will be reached that is required to get the concentration below guidelines. Dr Vopel concluded, based on Dr Hadfield's model, he would not expect adverse effects beyond a distance of 24 metres from the discharge point.²⁷⁰
466. During cross-examination, Mr Makgill, legal counsel for the Fishing Interests, asked Dr Vopel whether there was a risk of heavy metals entering the food web. Dr Vopel's opinion was that, because the heavy metal concentrations will be below guideline values, he must assume that there is no adverse effect and there is no effect on the food web.²⁷¹ Dr Vopel also opined that any elevated concentrations would not persist once the discharge stopped.²⁷²
467. Dr Huber provided more information on this topic through cross-examination. His view was that metals can enter the food web but considered the risk of fish accumulating metals to levels of concern directly from the water to be highly unlikely.²⁷³
468. Dr Kelly on behalf of TTR considered the potential health effects of the proposal. She identified copper and nickel as potential health hazards warranting specific consideration for risk of adverse effects on human health. We considered this is an important effect to consider given the potential for marine life to be harvested for food.
469. Dr Kelly stated that the relevant guidelines were the World Health Organization's Guidelines for Drinking-Water Quality, Ministry for Primary Industries Food Standards and European Food Safety Authority.²⁷⁴ In respect of these, Dr Kelly concluded that any elevations of copper or nickel in seafood, if they were to arise, would be well below amounts of any consequence for human health through consumption of the food.
470. Given the concern of the fisheries submitters, Dr Kelly was asked by us about the standards required of New Zealand food exports, particularly seafood exports. Dr Kelly explained that she did not look specifically at the export criteria, but her assessment was in terms of fitness of food for consumption against international best practice. She explained that, in her experience, the approach that she used tends to be more conservative or stringent than regulatory standards.²⁷⁵

13 February 2014.

²⁶⁹ Paragraph 9, Statement of Summary Evidence of Dr Kay C. Vopel on behalf of Trans-Tasman Resources Ltd.

²⁷⁰ Page 746 of the transcript, 2 April 2014.

²⁷¹ Page 745 of the transcript, 2 April 2014.

²⁷² Page 757 of the transcript, 2 April 2014.

²⁷³ Page 628 of the transcript, 1 April 2014.

²⁷⁴ Paragraphs 19–21, Statement of Evidence in Chief of Dr Francesca Kelly on behalf of Trans-Tasman Resources Ltd, 15 February 2014.

²⁷⁵ Page 1121 of the transcript, 8 May 2014.

471. As outlined in Dr Vopel's evidence, his assessment is based on analyses of iron sand collected at five sites in TTR's mining area to a maximum depth below the seafloor of 5 metres. Although he believed that the results of these analyses are suitable to assess orders of magnitude of trace metal concentrations from mining areas Dianne and Christina, he acknowledges that uncertainty remains in regard to variations in iron sand properties across the entire TTR mining area and any changes in these properties at depth below seafloor greater than 5 metres.²⁷⁶
472. Dr Vopel acknowledged the potential for variations in the mass and water balances of TTR's proposed mining operation and the possibility of spatial variations in the quality of the target iron sand. He recommended implementation of monitoring of trace metal concentrations in both the wastewater stream on both the processing vessel and the wastewater discharge plume in STB water column.²⁷⁷
473. He also acknowledged uncertainties remain regarding the effects of the elevated dilute acid-soluble concentrations of nickel and chromium in deep iron sand and the observed trends with depth below the seafloor.²⁷⁸
474. The SKM peer review on behalf of the EPA noted that the levels of mercury had not been assessed. Dr Vopel agreed with the reviewers that analysis of mercury in TTR's water quality monitoring programme should be included until the expectation that the mine sediment will not release mercury is confirmed.²⁷⁹ When asked by us, Dr Vopel suggested that mercury be analysed with all the other metals at three points – on board the vessel, after discharge in the plume and then one point outside the affected area as a control.²⁸⁰

Health and safety in employment

475. Section 4.9 of TTR's Impact Assessment accompanying the application addressed health and safety in employment and sets out TTR's initiatives in various areas including:
- management responsibilities
 - vessel operations (FPSO, anchor-handling tug, FSO)
 - process areas
 - subsea sediment extraction device (crawler)
 - power generation
 - HFO fuel handing and transfer
 - personnel
 - helicopter operations.
476. The Impact Assessment stated that all of the vessels involved in TTR's extraction operations will follow the International Safety Management Code (SOLAS) for vessel operations, Maritime Transport Act 1994 and Maritime New Zealand Marine Protection Rules.²⁸¹ Section 4.10.4 of the Impact Assessment

²⁷⁶ Paragraph 36, Statement of Evidence in Chief of Dr Kay C. Vopel on behalf of Trans-Tasman Resources Ltd.

²⁷⁷ Paragraph 8, Statement of Summary Evidence of Dr Kay C. Vopel on behalf of Trans-Tasman Resources Ltd.

²⁷⁸ Paragraph 10, Statement of Summary Evidence of Dr Kay C. Vopel on behalf of Trans-Tasman Resources Ltd.

²⁷⁹ Paragraph 13, Statement of Summary Evidence of Dr Kay C. Vopel on behalf of Trans-Tasman Resources Ltd.

²⁸⁰ Page 751 of the transcript, 2 April 2014.

²⁸¹ Section 4.9.3 of the impact assessment (TTR, 2013).

addresses the EEZ Act requirement expressed in section 59(2)(i) for best practice with regards to health and safety management.

477. Mr Thomas, on behalf of TTR, explained that TTR had developed its health and safety manual and guidelines in accordance with current legislation – the Health and Safety in Employment Act 1992. He also explained that TTR has looked to other health and safety systems with the aim of implementing systems that prove to be effective at providing the safest and healthiest work environment.²⁸² He outlined the main areas covered in TTR's health and safety manual and how they are implemented.

478. Mr Cosman on behalf of TTR outlined that the health and safety regime in New Zealand is governed by two principal Acts – the Health and Safety in Employment Act 1992 (as amended) and the Hazardous Substances and New Organisms Act 1996. We understand from his evidence that each Act has subordinate regulations covering specific aspects that in turn are supported by approved codes of practice, standards and guidelines. Mr Cosman alerted us to national and international safety regimes applied by the Ministry of Transport, Civil Aviation Authority and Maritime New Zealand, which are designed to protect workers and others. These include the Maritime Transport Act 1994, the Civil Aviation Act 1990 and the requirements of the International Civil Aviation Organisation and the International Maritime Organisation. The application of these international requirements is determined by vessel or aircraft size or type, flag status and the area of operation.

Proposed conditions

479. A condition limiting the sulphur content of fuel to 3.5% w/w was proposed by the applicant (proposed Condition 174) to address the issue of air quality.²⁸³

480. We note that an Environmental Performance Objective was included in proposed Condition 10(g) to manage the discharge of heavy metals. The objective would require receiving water quality to comply with ANZECC guidelines after reasonable mixing (in relation to discharged dissolved metals). Proposed Condition 10(m) also requires no more than minor elevation of metal levels within seafloor surficial sediments. Proposed Condition 183 provided more detailed requirements, requiring the concentration of dissolved nickel, mercury and copper in seawater beyond a radius of 50 metres from the hydrocyclone outlet discharge point to meet the respective ANZECC 99% species protection guideline trigger values. Receiving water quality (discharged dissolved metals) inside the 50 metre mixing zone is required to comply with respective ANZECC 80% species protection guideline trigger values.

481. In terms of health and safety, we note that proposed Conditions 184–192 would have required TTR to undertake management of navigational and maritime safety during project operations. This would include preparation of operational manuals and safety contingency plans around a comprehensive Project Safety Case concept and that are consistent with the Collision (Loss of Position) Contingency Management Plan. The conditions set out the information to be included in the Project Safety Case.

²⁸² Paragraph 9, Statement of Evidence in Chief of Rhys Thomas on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

²⁸³ Appendix A, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014.

482. Had consent been granted, we find that these conditions would have been acceptable.

Findings

483. We agree that the National Environmental Standards for Air Quality do not apply to the EEZ, and we agree with the experts' conclusions that the effects on air quality will be no more than minor.

484. Overall, our findings are that the effects on human health are manageable and could have been appropriately addressed by conditions had consent been granted.

5.9 Physical environment

The issues

485. The physical marine environment is a series of complex and interrelated processes, and the proposed mining operation would have some effects on the physical environment, as set out below. From TTR's application, the evidence presented to us, submissions and submitters we heard, we consider the four main areas associated with effects on the physical coastal environment are:

- seabed bathymetry
- waves and surf
- coastal stability and the sediment budget
- freshwater springs.

The effects

Effects on seabed bathymetry

486. There are two stages to seabed bathymetry changes – during mining operations, and longer term bathymetry after mining has ceased. TTR's application outlined that mining activity would take place in three extraction blocks, each of which is divided into a set of corridors or lanes in which extraction will take place. At the commencement of mining a new area, with no pre-existing cut or fill, sediment would need to be deposited in a mound on the seabed. Similarly, a pit would be left unfilled on completion of mining operations at the opposite end of a lane. As a result, at various stages of the mining operation, certain pits would have been partly refilled (to approximately 1 metre below their initial level), some deeper pits (of approximately 9–10 metres depth) would remain unfilled and some mounds of de-ored sediment of height 8–9 metres would remain above the original seabed level.²⁸⁴ Dr Green in his evidence stated that the mounds and pits would be less than 10 metres at different ends of the lanes.²⁸⁵

487. During the course of the hearing, there was some discussion about the maximum heights of the pits and mounds. Different dimensions were raised in evidence and questions. Dr Gorman stated that the mounds are likely to be a different height from that used in his modelling (5–6 metres as opposed to 9–

²⁸⁴ Paragraph 38, Statement of Evidence in Chief of Dr Richard Gorman on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

²⁸⁵ Paragraph 1, Statement of Evidence in Chief of Dr Malcolm Green on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

10 metres).²⁸⁶ Mr Brown, when asked by us about the mounds, stated in relation to potential conditions: *"But we would have a degree of confidence in ensuring that a mound, the mining depth on the periphery is not at 11 metres, it is more likely to be at the most probably five to six metres on the periphery"*.²⁸⁷ In answer to the question from us, *"So you wouldn't have a difficult if you were required in consent condition to ensure that residual mounds weren't higher than six metres at the periphery or in fact six metres at any point?"* he replied, *"Yes, well, I think we would [be] fairly comfortable with a condition like that."*²⁸⁸ We note that Condition 139 proposed by TTR on 8 May sought that the mound be no higher than 9 metres above pre-mined seabed.

488. The most detail about the location and heights of the pits and mounds was tabled by TTR at the hearing on 16 April 2014. Pits are shown in green and the mounds are shown in red in Figure 7.

489. We questioned whether the height of the mounds would allow the draught of the FPSO vessel to move over the top of the highest mounds, especially if they were in the shallower water depths. TTR responded by saying the FPSO vessel has been designed with a design draught of 12 metres. Each end of the vessel, both fore and aft, has a vertical raised hull section of seven metres. At 20 metres depth, at the location of the tailings deposition pipe, the clearance between the seabed and hull is therefore 15 metres. The indicated depth of boundary resource at 20 metres depth is five metres maximum, and considering that these shallow areas would only be mined in the most benign weather conditions, the distance between the hull and re-deposited end mounds (on unmined seabed) would therefore be 10 metres using a lateral progressing extraction path and three metres using a longitudinal progressing extraction path. TTR submitted a sketch to us illustrating this scenario.

490. In terms of longer term bathymetric changes, we heard from Dr Green that the pits and mounds can persist for a considerable length of time after mining has ceased.²⁸⁹

491. Dr Green discussed the behaviour of pits and mounds over time and noted that mounds deflate faster than pits infill partially because they sit above the seabed and are subjected to stronger wave-orbital motions. He noted that pits infill and mounds deflate faster in shallower water.²⁹⁰ The experts involved in joint conferencing agreed that the methods used to assess the fate of pits and mounds presented by Dr Green are consistent with international practice and suitable for the purposes of impact assessment.²⁹¹

²⁸⁶ Page 647 of the transcript, 1 April 2014.

²⁸⁷ Page 480 of the transcript, 31 March 2014.

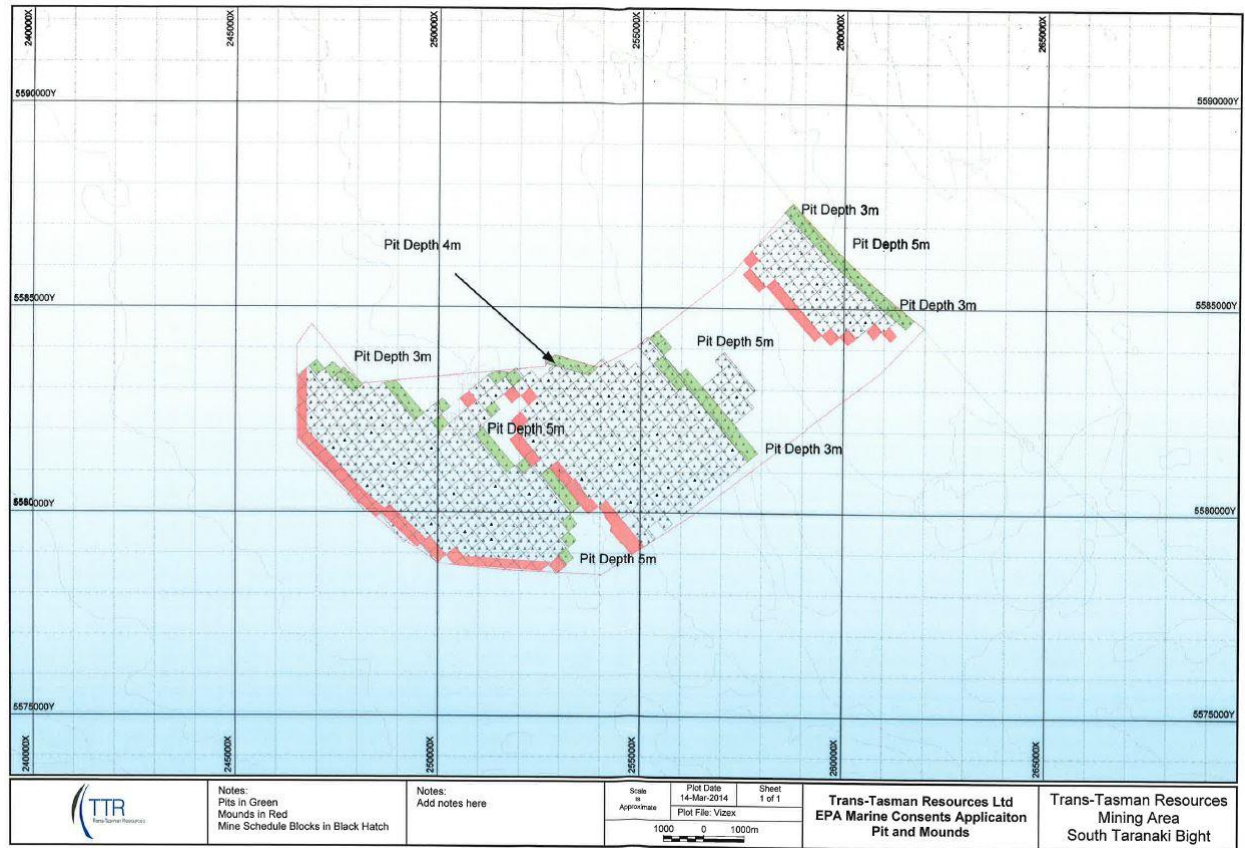
²⁸⁸ Page 481 of the transcript, 31 March 2014.

²⁸⁹ Tables 1 and 2, Statement of Evidence in Chief of Dr Malcolm Green on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

²⁹⁰ Paragraphs 54 and 55, Statement of Evidence in Chief of Dr Malcolm Green on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

²⁹¹ Paragraph 11, Joint Statement of Experts in the Field of Effects on Bathymetry and Oceanographic Processes, 20 March 2014.

Figure 7: Location and heights of the pits and mounds tabled by TTR (16 April 2014)



492. In his evidence, Dr Green discussed the migration of pits and that his best estimate for pit migration rate is 10 metres per year, which equates to 1 kilometre over 100 years.²⁹²

493. Concern was expressed by those in the commercial fishing industry that mounds represent a safety hazard to trawlers. Mr Smith (Fishing Interests) told us:

*"I have trawled for years and I can assure you that if there were pits and mounds of two to four or even ten metres, a small coastal trawler will get stuck. It's trawl doors will get bogged down, its net will get stuck or damaged. Even worse, if these boats get stuck and they have got, say thirty knots of southerly, or forty knots of northerly behind them, and they are stuck on the bottom, that can cause a serious safety issue and you know we have had boats stuck before, for various reasons, one not so long ago off Fiordland and the boat sank, with the loss of the crew. So to say that the pits and mounds can be trawled over is totally wrong, [in] my view."*²⁹³

494. This conflicted with the evidence given by Ms Gibbs on behalf of TTR, who considered the pits and mounds are unlikely to have a negative impact on the physical activity of trawling.

²⁹² Page 654 of the transcript, 1 April 2014.

²⁹³ Page 2479 of the transcript, 1 May 2014.

495. Ms Gibbs acknowledged that she has no direct experience in trawling herself and this conclusion was based on her understanding of the likely profile, site and distribution of the pits and mounds, the absence of protrusions that could snag trawl gear and the abilities of experienced trawl operators to control their fishing gear when trawling over uneven ground.²⁹⁴ We accept the evidence of the fishers that there is a risk to the safety and gear of small trawlers posed by the presence of the pits and mounds. However, we also accept the view by them that it is likely trawlers would avoid this area to minimise the risk if mining is being undertaken.

496. Mr Boffa addressed the effect of the pits and mounds in terms of natural character in his evidence.²⁹⁵ We address this further in the section on visual, natural features, natural features / seascapes and natural character.

Waves and surf

497. Dr Gorman on behalf of TTR presented evidence on waves and the potential for the activity to alter wave conditions in the vicinity and shoreward of the proposed operation. We heard that pits and mounds on the seabed have the potential to alter the direction of wave approach and wave height.²⁹⁶ Dr Gorman also described how the FPSO vessel was factored into the effect on nearshore wave conditions.²⁹⁷

498. We understand from Dr Gorman that the changes in nearshore wave parameters associated with seabed pits and mounds formed during mining operations as proposed in the mining plan developed in June 2013 are expected to be minor in comparison with the natural level of variability in those values. Corresponding effects from the presence of a large moored vessel during mining operations are expected to be comparable to or smaller than the effects of the pits and mounds as presently envisioned.²⁹⁸

499. Dr Gorman found that the simulated changes in significant wave height at the 10 metre isobath were all less than 12 centimetres for Case 1 and less than five centimetres for all other cases. We understand Case 1 represents a worst-case final pattern of completion of all mining operations in all blocks for the purposes of modelling, and other cases were lesser levels of disturbance.²⁹⁹ Changes in mean period were all less than 0.5 seconds for Case 1 and less than 0.25 seconds for all other cases. This relates to a percentage change in wave height and mean period of less than 8.6% for Case 1 and less than 4.5% for all other cases.

500. The maximum effects on wave characteristics considered would occur in the immediate vicinity of the dredged pits and mounds. Most of the cases tested produced local changes in wave height of up to

²⁹⁴ Page 1723 of the transcript, 14 April 2014.

²⁹⁵ Paragraph 41, Statement of Evidence in Chief of Frank Boffa on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

²⁹⁶ Paragraph 12, Statement of Evidence in Chief of Dr Richard Gorman on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

²⁹⁷ Paragraph 53, Statement of Evidence in Chief of Dr Richard Gorman on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

²⁹⁸ Paragraph 78, Statement of Evidence in Chief of Dr Richard Gorman on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

²⁹⁹ Paragraph 40, Statement of Evidence in Chief of Dr Richard Gorman on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

0.436 metres or 12.6% of baseline values. Taking a time average of differences induced by the bathymetry change, it was found that wave heights at 10 metres water depth generally tend to be decreased (by less than five centimetres) along the coast east of Patea and increased (by less than 2.5 centimetres) further west. Mean wave period in 10 metre water depth shows a similar spatial pattern of change, decreasing (by less than 0.1 seconds) in the vicinity of Patea and increasing (by less than 0.05 seconds) to the west. Mean wave direction is slightly decreased (i.e. changes in an anticlockwise sense) on average along the majority of the coast by less than 1°. ³⁰⁰

501. Origin Energy Resources Kupe NZ Ltd on behalf of the Kupe Joint Venture Parties raised concern about the effects of changed currents and wave reflections from TTR's operations and infrastructure. Dr Gorman found from his assessment that the largest change in significant wave height at the Kupe platform associated with wave shadowing and/or reflections due to the presence of the FPSO in the two positions simulated was 8.1 centimetres, while the largest percentage change relative to the baseline value was 3.2%. However, the two FPSO positions simulated to date were approximately 5–6 kilometres from the Kupe platform, whereas, at its closest, the FPSO could be moored some 1.5 kilometres from the Kupe platform. While that situation has not been explicitly tested to date, the maximum absolute change in significant wave height seen in simulations at that distance from the FPSO was approximately 25 centimetres and the maximum relative change around 6%. Dr Gorman considered these effects minor relative to the natural variability in wave conditions affecting the Kupe platform. It should be noted that these results arise from a conservative assumption of complete reflection from the vessel. ³⁰¹
502. With respect to surf, a number of submitters expressed concern that the proposed activity would potentially affect the quality of surfing and surf breaks, both intermittently and permanently. The mining proposal, as set out in the above section, has the potential to change the seabed (both local deepening and raising of the seabed), which could potentially affect waves by refraction (bending the wave path) and diffraction (lateral dispersion of wave energy) and locally by shoaling (changing the wave height) as they pass over the modified seabed. This in turn could then potentially impact on surfing breaks on the coast. ³⁰² Dr Mead stated that the two main parameters that could potentially be impacted are the wave height and direction – these in turn can impact on wave peel angles and breaking intensity. ³⁰³
503. Dr Mead considered the effects on specific wave breaks. The application notes there are 10 surf breaks between Patea and Whanganui that could potentially be affected and listed in the New Zealand Surfing Guide. None of these surf breaks seem to be rated particularly highly in their own right by surfers, but they do form part of the overall West Coast surfing opportunity. Dr Mead's investigation indicated that impacts on the 10 surf breaks are likely to be insignificant. In even the best surfing

³⁰⁰ Executive Summary, South Taranaki Bight Iron Sand Mining Nearshore Wave Modelling (NIWA, 2013).

³⁰¹ Paragraph 84, Statement of Evidence in Chief of Dr Richard Gorman on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

³⁰² Section 1, Potential Effects of Trans-Tasman Resources Mining Operations on Surfing Breaks in the Southern Taranaki Bight, (S. Mead, 2013).

³⁰³ Paragraph 13, Statement of Evidence in Chief of Dr Shaw Mead on behalf of Trans-Tasman Resources Ltd, 24 January 2014.

conditions (i.e. during swells with a higher directional spread and less favourable wind conditions), there would likely be:

“(a) no measureable impact at the Waverley surf break, the only site at which the SWAN model returned an effect; and

(b) no impacts on the other breaks in the area.”³⁰⁴

504. The results of the modelling showed that, of the 216 cases investigated, only four indicated changes in wave height and direction at the second-most northern break (Waverley). However, these changes were very small (<1% difference in height) and mostly localised to the area of seabed modifications with respect to direction (<2° change). The experts agreed that the magnitude of predicted reductions in wave size (in the order of 0.1 metres for a 3 metre significant wave height) were proportional to the wave size. Thus, in smaller surfing conditions (0.5–1.0 metre waves), the reduction in wave size would be smaller than 0.1 metres and thus not affect wave quality for surfers.³⁰⁵

505. Submissions from the Taranaki Regional Council, Mrs Pratt and Origin Energy Resources Kupe NZ Ltd on behalf of the Kupe Joint Venture Parties raised questions about the modelling. We note that Dr Mead used extreme worst-case scenarios of proposed seabed modification in his models, and we are satisfied with this approach.³⁰⁶ The experts in joint conferencing agreed that the results of modelling are soundly based.³⁰⁷ They also agreed that the modelling methods used, the spatial resolutions selected and the choice of outputs reported from those simulations were appropriate for the study.³⁰⁸ Having heard no contrary evidence, we agree.

506. Overall, we accept that any effects on waves and surf breaks would likely be no more than minor.

Coastal stability and the sediment budget

507. We understand from the evidence presented by Dr Hume that extracting sand from the seabed has the potential to alter the wave climate at the shore and reduce the supply of sand to the shore. This in turn can cause coastal erosion affecting natural landforms and geomorphic character and public access to the marine environment.³⁰⁹

508. Dr Hume advised that sand is transported through and into the nearshore primarily by waves. Changes in sand volumes measured by beach profile surveys at the eight sites between Ohawe and Kai Iwi over the period June 2011 to April 2012 show that the net change in beach volume and sand storage over the year varies from erosion at some sites to accretion at others. The total volume of sand moving on and off the beach over the year ranged from 67,000 m³ at Hawera Beach to 247,000 m³ at

³⁰⁴ Paragraph 39, Statement of Evidence in Chief of Dr Shaw Mead on behalf of Trans-Tasman Resources Ltd, 24 January 2014.

³⁰⁵ Paragraph 11, Joint Statement of Experts in the Field of Effects on Waves and Surfing, 25 March 2014.

³⁰⁶ Paragraph 22, Statement of Evidence in Chief of Dr Shaw Mead on behalf of Trans-Tasman Resources Ltd, 24 January 2014.

³⁰⁷ Paragraph 11, Joint Statement of Experts in the Field of Effects on Waves and Surfing, 25 March 2014.

³⁰⁸ Paragraph 14, Joint Statement of Experts in the Field of Effects on Waves and Surfing, 25 March 2014.

³⁰⁹ Paragraph 16, Statement of Evidence in Chief of Dr Terry Hume on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

Manawapou Beach. This indicated that beaches are continually changing as large volumes of sand enter, leave and are redistributed in the beach system.³¹⁰

509. The stability of the coastline was raised as an issue of concern by Ngā Kaihautū Tikanga Taiao. Their report states that it was well known that the Taranaki coastline is prone to erosion. This is particularly an issue for iwi as there are many wāhi tapu and wāhi tūpuna on the coastal strip. All iwi express concern at the potential impact of offshore activity on the coastline generally including such sites. Any activity that has the potential to exacerbate this situation was of major concern to iwi.³¹¹

510. The experts involved in conferencing agreed:

“(a) Sediment supply from the mining area to beaches south east from the mining area is likely to be small.

(b) Changes to nearshore wave characteristics due to mining operations would be much smaller than natural variability in wave conditions.

(c) Changes in wave energy incident on the coast line are unlikely to induce measurable changes in erosion and accretion patterns on the beaches in the lee of the mining area.”³¹²

511. Dr Hume concluded that the beaches and the cliffs are subject to a large degree of temporal and spatial variation in wave characteristics under natural conditions. For this reason, he opined that wave climate at the shore will only be marginally modified by sand extraction operations, and there will be no significant changes in erosion and accretion processes.³¹³ He also concluded that the natural landforms and overall geomorphic character of the beaches and cliffs is unlikely to change due to sand extraction.³¹⁴

Sediment budgets

512. The sediment budget is a consideration of the rate at which sand is brought into the system versus the rate at which sand leaves the system and the balance of inputs and outputs. It is noted that some submitters were concerned that changes to beach sediment supply and potential erosion caused by the proposed seabed mining would have negative impacts on surfing breaks.

513. Dr Hume considered sand extraction would be largely disconnected from the littoral system because of the distance offshore. Therefore, the cross shore flux of sand from the seabed in the extraction site to the shore will be a relatively small (albeit unquantified) term in the overall sediment budget.³¹⁵

³¹⁰ Paragraph 48, Statement of Evidence in Chief of Dr Terry Hume on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

³¹¹ Paragraph 16, Ngā Kaihautū Tikanga Taiao Report.

³¹² Paragraph 19, Joint Statement of Experts in the Field of Effects on Coastal Stability, 25 March 2014.

³¹³ Page 661 of the transcript, 1 April 2014.

³¹⁴ Page 660 of the transcript, 1 April 2014.

³¹⁵ Paragraph 57, Statement of Evidence in Chief of Dr Terry Hume on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

514. It was agreed by the experts that sand from offshore within the proposed mining location was considered to be a minor source for beaches. The evidence for this is that:

"1) the mining area is 22–35 km distant from the closest beaches,

2) the modelling and field measurements of currents that drive sand transport across the shelf show the principal currents run NW-SE and shore parallel, with only a weak component towards the shore,

3) the grain size of material on the seabed in the extraction area is largely fine sand whereas the beaches contain coarser material, and

*4) modelling of sand transport away from the extraction area by Dr Hadfield, who used near-bed currents and took into account combined wave and current forcing over two years, showed little transport of beach sized sand away from the extraction site and toward the shore, and transport slightly to the SE."*³¹⁶

515. The experts agreed that the methods used to assess potential effects of the proposed activities on physical drivers and shoreline processes by Dr Hume et al. (2013) are consistent with international practice and appropriate for the purpose of assessing potential effects of the proposed activities on shoreline processes.³¹⁷ They also agreed that, due to the distance offshore and the water depths, cross-shelf transport of sediment from the mining area to beaches in the STB is expected to be a small but unquantified component of sediment supply to the coast.³¹⁸

516. We find that any effects in terms of coastal stability and sediment budgets are likely to be no more than minor.

Freshwater springs

517. Three submitters have made reference to freshwater springs. Mr Mikoz (Wellington Recreational Marine Fishers Association) noted that: *"Marine charts clearly identify that the waters off Patea and Wanganui contain a number of submarine fresh water springs."* Ms Hart (New Zealand Recreational Fishing Council) noted that: *"this area contains numerous submarine fresh water springs"*. The submission from Sanford made the inference that freshwater springs exist on the shelf. When asked, Mr Malthus (a local Taranaki fisher and diver) confirmed he had not heard or seen anything of freshwater springs in his experience.³¹⁹

518. This topic was addressed by the joint conferencing of the experts in the area of coastal stability. Dr Orpin showed multibeam images of the seabed (bathymetry and slope) from the mine site. This gave no indication of the 'pot-hole' like feature indicative of freshwater springs but accepted that the image scale is still quite coarse.³²⁰

³¹⁶ Paragraph 13, Joint Statement of Experts in the Field of Effects on Coastal Stability, 25 March 2014.

³¹⁷ Paragraph 14 Joint Statement of Experts in the Field of Effects on Coastal Stability, 25 March 2014.

³¹⁸ Paragraph 15, Joint Statement of Experts in the Field of Effects on Coastal Stability, 25 March 2014.

³¹⁹ Page 2246 of the transcript, 29 April 2014.

³²⁰ Paragraph 22, Joint Statement of Experts in the Field of Effects on Coastal Stability, 25 March 2014.

519. With regards to freshwater springs, the experts agreed that no evidence for the existence of freshwater springs in the mining area had been presented. However, they accepted that, given the environment, it was conceivable that they might exist on the continental shelf. They also opined that, if there were springs, they would not be permanently blocked by a blanket of unconsolidated de-ored sand but would likely resurge to the surface if buried. Springs would not be affected by fine sediment from the plume because such fine sediments would be displaced by the emerging springwater. Although we asked several submitters about the springs, none could identify where the springs might be located.³²¹ When asked, Mr Mikoz was unable to substantiate his claim that freshwater springs were identified on marine charts.

520. In the absence of any factual information about the location of freshwater springs, we can not conclude with any certainty that there are freshwater springs located in the proposed mining site. However, based on the evidence, if there were springs, they would unlikely to be significantly affected by the mining operation.

Uncertainty or inadequacy of information

521. In terms of seabed bathymetry, Dr Green told us that it is difficult to assess the uncertainty of his predictions. However, he considered that, due to some of the assumptions made, he will have overestimated the time it takes for mounds to deflate. The predictions of pit infilling and mound deflation cannot be reliably verified short of monitoring the evolution of prototype-scale features in the region of interest. He notes that the predictions of pit infilling are nevertheless consistent with international experience as reported by others.³²²

522. Mrs Pratt noted in her submission that Dr Green used a different particle size from that representative of the mining area. Dr Green stated in his evidence that this will have led to an overestimation of time it takes for the mounds to deflate.³²³

523. We note the agreement of the experts that making no allowances for slumping of vertical sides most likely results in the worst-case estimate of infilling time.³²⁴ While we understand the experts agreed that the uncertainty was relatively low and that the estimates are conservative,³²⁵ the lack of clarity throughout the hearing as to the heights and depths of mound and pits was concerning, and this added to our overall concern about certainty and adequacy of the information before us.

524. Dr Green acknowledged that his estimation of pit migration is based only on the literature and is not a result of any specific analysis that he had done for the STB.³²⁶ We note that the experts agreed with Dr

³²¹ For example, Ms Undorf-Lay appearing for fisheries, Mr Croker and Mr Mikoz.

³²² Paragraphs 8 and 9, Statement of Evidence in Chief of Dr Malcolm Green on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

³²³ Paragraph 58, Statement of Evidence in Chief of Dr Malcolm Green on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

³²⁴ Paragraph 12, Joint Statement of Experts in the Field of Effects on Bathymetry and Oceanographic Processes, 20 March 2014.

³²⁵ Paragraph 14, Joint Statement of Experts in the Field of Effects on Bathymetry and Oceanographic Processes, 20 March 2014.

³²⁶ Page 654 of the transcript, 1 April 2014.

Green's approach to estimating the net pit migration rate of 10 metres per year to the south-east.³²⁷ We asked whether the pits are likely to move towards the biogenic habitats to the south of the mining area, but Dr Green responded by saying this was unlikely.³²⁸

Proposed conditions

525. We note that a number of conditions are proposed by TTR in the 8 May version (Appendix 4) regarding mounds. Environmental Performance Objective 10(c) restricts long-term effects on seabed topography to residual pits and mounds at the ends of extraction lanes and also allows minor variation in bathymetry in operational areas following re-deposition. Environmental performance objective 10(j) requires no more than minor adverse effect on commercial fishing via the creation of pits and mounds in respect of changes in bathymetry. Proposed Condition 139 requires that the mounds be no higher than 9 metres above pre-mined seabed. The pits and mounds are also required to be addressed in the Environmental Monitoring and Management Plan (proposed Condition 204(m)).

526. In terms of waves, proposed Condition 10(a) establishes an Environmental Performance Objective relating to waves and seeks:

- no more than moderate change in wave height in the immediate vicinity of the TTR operations, attributable to dredging and deposition activities
- no more than minor change in wave height at the shoreline
- no adverse effects on PML 38146 interests caused by local increases in wave or current loading.

527. Proposed Condition 106(e) requires pre-operational baseline environmental monitoring, and proposed Condition 110 identifies waves as a key environmental component subject to baseline monitoring.

528. In terms of coastal geomorphology, Environmental Performance Objective 10(a) seeks:

- no more than minor influence on beach state, geomorphic character and coastal erosion
- no more than minor residual TTR-derived fine sands and muds on beaches
- no more than minor effect on sand supply to beaches
- no more than minor effect on natural processes of erosion and accretion.

529. Proposed Condition 106(e) requires pre-operational baseline monitoring for a minimum period of 2 years and must include shore profiling to provide a basis for future comparison and modelling/analysis to quantify the magnitude and patterns of cross-shore sediment transport on the inner shelf. Proposed Condition 110(f) identifies that coastal processes including shoreline morphological changes are to be part of the Baseline Environmental Monitoring Plan. Proposed Condition 204(j) requires coastal processes and shoreline morphological changes to be part of the Environmental Management and Monitoring Plan.

³²⁷ Paragraph 13, Joint Statement of Experts in the Field of Effects on Bathymetry and Oceanographic Processes, 20 March 2014.

³²⁸ Page 565 of the transcript, 1 April 2014.

Findings

530. We do not think there would be significant adverse effects on the physical environment. We agree that seabed bathymetry would change around the mining site, and the extent of this is unclear to us given the lack of clarity about the pits and mounds. Notwithstanding this, there was no evidence that suggested that there would be more than minor effects on waves and surf or adverse effects on coastal stability or the sediment budget.
531. Some of the fisheries witnesses considered that the change in seabed would have a potentially significant effect on trawling. However, they also advised they would likely avoid this area if the mining was occurring.
532. There will be little or no effect on any freshwater springs if any are present.

5.10 Operational risks in the marine environment

The issues

533. The TTR project would introduce new activities within the STB. Up to five vessels including FPSO, FSO, export vessels, fuel transfer vessels and anchor-handling vessels ranging in length from 60 to 330 metres may be in the operations area at any one time. This raises potential maritime safety effects and risk management issues associated with the operation. This is within the scope of the DMC consideration, as section 59(2) requires us to take into account any effects on the environment or existing interests (section 59(2)(a)), the effects of activities that are not regulated by the EEZ Act (section 59(b)(i)), the nature and effect of other marine management regimes (section 59(2)(h)) and any other matters (section 59(2)(m)).
534. We note that many of these issues are addressed by other marine management regimes.

The effects

Fuel transfer operations

535. Fuel transfers would be stationary ship to ship of heavy fuel oil. All vessels contracted or employed for bunkering and the associated engineered systems would be of relatively recent design and will comply with internationally recognised standards and codes.³²⁹
536. The maritime experts concluded that system design of the inter-operating vessels should be informed by international best practice in bunker fuel handling, formal risk analysis and assessment and incorporate all reasonably practical measures to enable safe bunkering and fuel transfer operations of high integrity.
537. The operating procedures for fuel transfers should be incorporated in the Project Safety Case and be approved by Maritime New Zealand.

³²⁹ Paragraphs 16–19, Joint Witness Statement of Experts in the Field of Navigational Safety, 26 March 2014.

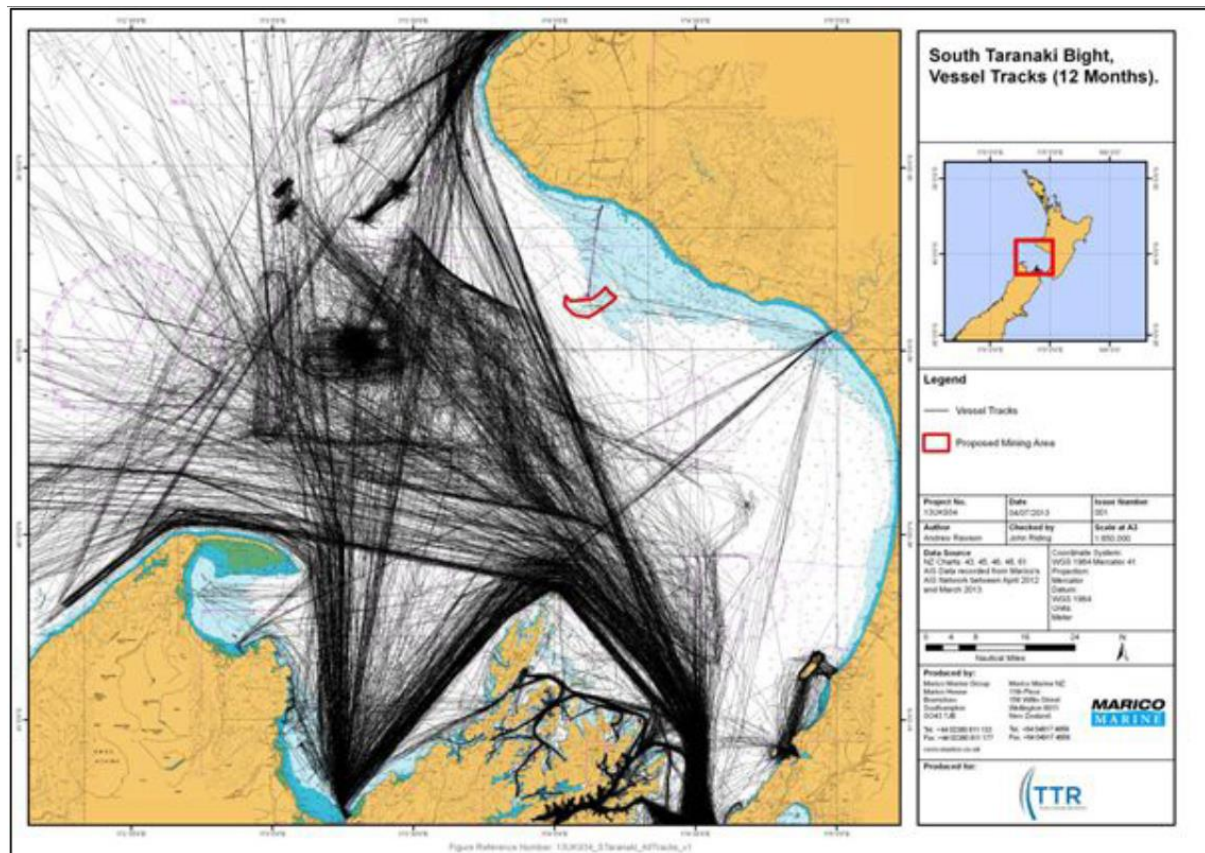
538. Hydrodynamic studies should be undertaken for the FPSO and FSO transfer operations to ensure the operating procedures and upper operating limits are properly determined during the risk analysis and hazard and operability studies.
539. Proposed consent conditions that would have satisfied these concerns are detailed in the section Navigation and Maritime Safety Management conditions 184-192:

Impact on shipping from transfer operations away from the site

540. TTR has stated its intention to carry out product transfer operations in a sheltered part of the STB or in the Admiralty Bay region at the master's discretion (based on weather conditions) and away from established shipping lanes.
541. A number of uncertainties arise over which marine management system is responsible for overseeing product transfer operations. Maritime New Zealand is clearly responsible for bunkering transfers. However, a number of responsibilities are being transferred to the Environmental Protection Authority. We find that the best way to have resolved this would have been to ensure consent conditions (had consent been granted) included mechanisms for ensuring safe operation and minimising risk to other shipping and the environment.³³⁰
542. Product transfers of non-hazardous materials (iron ore concentrate) are not regulated under the Maritime Transport Act 1994.
543. In addition to prevailing and forecast meteorological conditions (prevailing winds in these latitudes are westerly with a succession of high and low pressure systems dominating the meteorological conditions), transfer operations carried out away from the mining site would need to be undertaken in a manner that does not create a navigation hazard to shipping and occurs out of recognised shipping routes.
544. The prevailing westerly weather patterns and vessel traffic patterns as outlined in Figure 8 suggest that transfer operations would have needed to occur at nearshore locations at the north-east or south of the STB. Insufficient evidence was presented to assess the specifics of these operations, and further work would have been required, as recommended within the Project Safety Case. If additional approvals under the Maritime Transport Act or Resource Management Act had been required for managing the safe operation and environmental protection of these activities, TTR would have been required to gain these prior to export operations.

³³⁰ Paragraphs 20–24, Joint Witness Statement of Experts in the Field of Navigational Safety, 26 March 2014.

Figure 8: South Taranaki Bight vessel tracks (12 months)³³¹



Assessment methodology for safe operations

545. As advised by Maritime New Zealand, regulation of ships within the EEZ applies only in respect of marine protection matters, unless those ships are New Zealand flagged.³³² TTR offered this for the FPSO but not the other vessels.³³³ We consider that the project vessels (FPSO and FSO) should be New Zealand flagged to ensure the appropriate New Zealand marine management authority with the relevant maritime safety expertise is able to oversee these operations.

546. Marine operations would have involved seabed crawlers, FPSO vessel, FSO vessel, ocean-going vessels and supply vessels in challenging metocean conditions in the STB (as shown by the annual wind rose for the STB in Figure 9). In light of this, we agree with the recommendation by Mr Cosman³³⁴ of the adoption of the International Risk Management Standard ISO 31000 with a safety case approach as outlined by WorkSafe Australia entitled Guide for Major Hazard Facilities – Developing a Safety Case Outline.

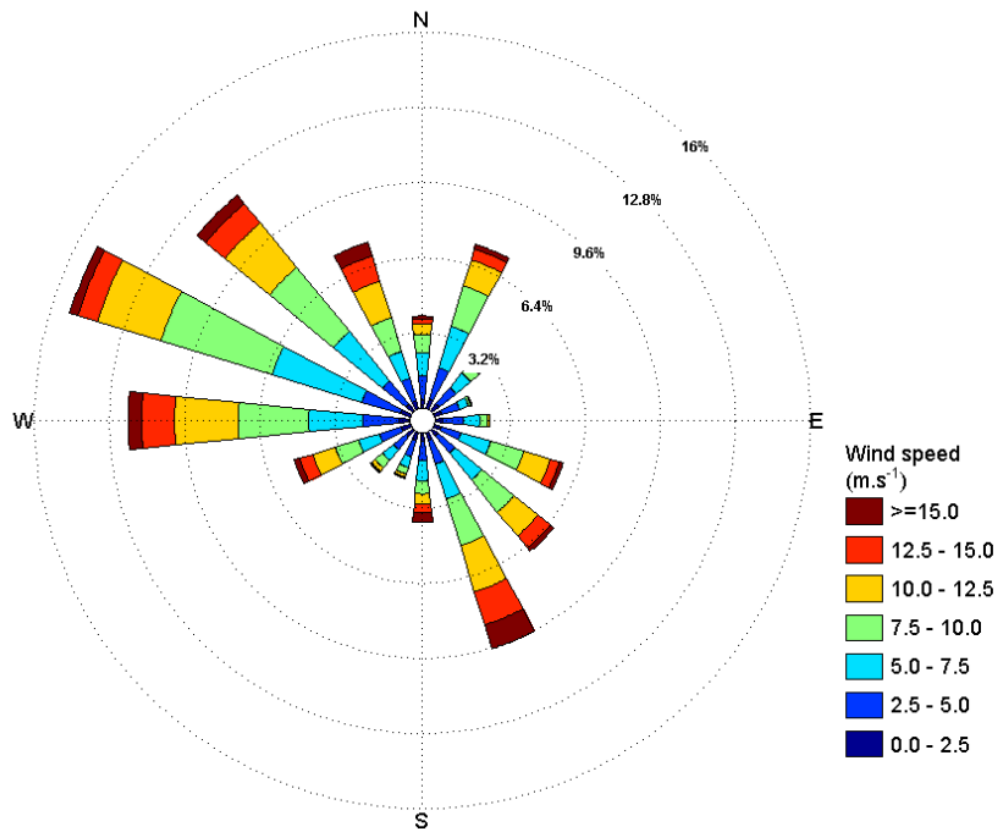
³³¹ Figure 7, Page 15, Marico Marine, Trans-Tasman Resources Limited South Taranaki Bight Marine Traffic Study, 18 July 2013, Mr Rawson and Mr Riding.

³³² Part 4, Page 2, Maritime New Zealand, Section 44 Request regarding TTR application Letter to EPA, 6 March 2014.

³³³ Paragraph 52, Statement of Evidence in Chief of Shawn Thompson on behalf of Trans-Tasman Resources Ltd, 16 February 2014, and Paragraph 302, Statement of Evidence in Chief of Ray Barlow on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

³³⁴ Paragraphs 23 and 27–29, Statement of Evidence in Chief of Michael Cosman on behalf of Trans-Tasman Resources Ltd, 12 February 2014.

Figure 9: Annual wind rose for the approximate centre of the permit area – sectors indicate the direction from which wind is coming³³⁵



Basis for ocean-going vessel operating procedures

547. The maritime experts concluded that the ocean-going vessel operating procedures form part of the Project Safety Case and require approval of Maritime New Zealand. They also concluded this should be a condition should the consent be granted.

Meteorological data

548. It was noted that the meteorological data from wave rider buoys provided by Dr MacDonald was for less than one year and did not include a period during winter. Dr MacDonald also stated that no wave cumulative frequency distribution studies had been carried out.³³⁶

549. It is the intention of the applicant to use meteorological forecasting for the adjacent Kupe platform and pipeline route included in the Kupe Metocean Design Criteria Report from ASR Limited to supplement the NIWA studies. This does include buoy data and hindcasting for the period missing from Dr MacDonald's report.

³³⁵ Figure 5.1, Page 11, Oil Spill Trajectory Modelling Report, MetOcean Solutions, 13 February 2014.

³³⁶ [Paragraph 26, Joint Witness Statement of Experts in the Field of Navigational Safety, 26 March 2014.

550. An accurate picture of the sea state will help ascertain how often transfer operations in the vicinity of the FPSO will be possible. From a navigational safety angle, however, the important factor is ensuring operations cease when conditions reach the safe upper limit rather than how often that occurs.³³⁷

Other relevant legislation³³⁸

551. Maritime aspects of the operation are covered by the Maritime Transport Act 1994 (MTA), and Maritime New Zealand oversees the safety of marine activities – including within the exclusive economic zone. The MTA ensures that participants in the maritime transport system are responsible for their actions, protecting the marine environment and regulating maritime activities and the marine environment in the EEZ and on the continental shelf as permitted under international law. Part 20 of the MTA gives the Director of Maritime New Zealand powers regarding hazardous ships, structures and offshore operations. The definition of a hazardous marine operation is *“marine operations in New Zealand continental waters that are discharging, or are likely to discharge, a harmful substance into New Zealand continental waters to the seabed below them”*.

552. Under the MTA, New Zealand’s marine protection rules set out the detailed technical requirements for ships’ construction, pollution prevention equipment and operation, and restriction on the deliberate disposal of waste into the sea. Much of the substance of these rules is derived from international conventions and good practice. The overarching goal of the rules is to limit the input of harmful substances into the sea, for example, from:

- oil (cargo and fuel for ships’ engines)
- chemicals from the cargo tanks of tankers carrying industrial bulk liquids
- sewage from passengers and crew
- garbage, such as food scraps from ships’ galleys.

553. The management of New Zealand’s rules to regulate discharge of harmful substances (Marine Protection Rules) is undertaken by Maritime New Zealand on behalf of the Minister of Transport. Part 180 (Dumping of Waste and Other Matter) and Part 200 (Offshore Installations – Discharges) of the Marine Protection Rules are discussed in the appendices of the impact assessment. In summary, Maritime New Zealand’s advice is that TTR would require a Discharge Management Plan under Part 200 of the Marine Protection Rules. However, we note that this would not cover processed sediment/tailings, overflow water from the hydrocyclone system, brine for the reverse osmosis plant or water from the hyperbaric filter as these are not considered to be harmful substances for the purpose of the Marine Protection Rules.³³⁹

³³⁷ Paragraphs 26–28, Joint Witness Statement of Experts in the Field of Navigational Safety, 26 March 2014.

³³⁸ Section 12, Other Marine Management Regimes Assessment (Boffa Miskell, 7 October 2013).

³³⁹ Question 4, Page 3–4, Letter ‘Section 44 Request regarding TTR application’, Maritime New Zealand, Sharyn Forsyth, General Manager Maritime Standards, 6 March 2014.

Findings

554. While the MTA requirements do cover matters relating to spills, they do not cover the principal sources of the sediment plume, and accordingly, we conclude these aspects can be controlled through the marine consent process.
555. Our decision to refuse consent is not affected by our findings in relation to the applicability of the Marine Protection Rules.

5.11 Visual, natural features, natural landscapes/seascapes and natural character

The issues

556. The mining activity and the creation of the plume may have adverse visual effects and impact on the natural features and landscapes/seascapes of the STB. Mr Boffa, a landscape architect/planner presented evidence on behalf of TTR, which was uncontested.

The effects

557. Mr Boffa considered that, in the context of the project, the effects on seascapes, natural character and visual amenity, while interrelated, could be categorised as follows:

“(a) Visual effects from specific viewpoints and viewing audiences.

(b) Effects on natural features and natural landscapes (being defined and/or special or significant landscapes/seascapes and features).

(c) Effects on natural elements, natural patterns and natural processes (the natural character of the coastal environment).³⁴⁰

558. We address these below.

Visual effects

559. It was Mr Boffa’s opinion that the visual effects of the offshore above-water activity (the vessels) were likely to be minor given the distance between the viewing points on the coast and the vessels and the contextual nature of the surface-water activities.³⁴¹ We requested further information about this, and Mr Boffa provided photo ‘mock-ups’ of how the vessels would appear from the shore.³⁴² Having reviewed that information, we agree any adverse visual effects would be no more than minor.
560. In addressing the visual effect of the sediment plume, he accepted that there would be increased visual effects in terms of the offshore and distant offshore marine areas where currently there are no visible sediment plumes under most conditions. He stated that the key visual effects from increases in suspended sediment concentration would be on the following basis:

³⁴⁰ Paragraph 25, Statement of Evidence in Chief of Frank Boffa on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

³⁴¹ Paragraph 3, Summary Statement of Evidence of Frank Boffa on behalf of Trans-Tasman Resources Ltd.

³⁴² Received 1 May 2014 in New Plymouth.

- There will be effects in terms of plume patterns and sea colour change in the immediate vicinity and to the east of the mining activity.
- These effects will be observable to some recreational boats, depending on weather conditions and the boats' offshore location.
- These effects will be observable from commercial aircraft particularly those flying above the plume.³⁴³

561. In his evidence in chief, Mr Boffa opined: *"Given the variability of the plumes and the restricted transient nature of experiencing them, the overall significance of the visual effect is assessed to be moderate."*³⁴⁴ We accept this in relation to offshore and distant offshore effects.

Natural features and natural landscapes

562. In undertaking his assessment of the significance of natural features and landscapes, Mr Boffa cited the New Zealand Coastal Policy Statement (NZCPS) Policy 15(a),³⁴⁵ which seeks the avoidance of adverse effects on outstanding natural features and landscapes/seascapes in the coastal environment.

563. Mr Boffa set out in his evidence that:

*"...the Project by its remote offshore location effectively avoids direct adverse effects on the identified outstanding natural features, landscapes and seascapes in the South Taranaki Bight. In addition, and with respect to NZCPS 15(b) which seeks to "avoid significant adverse effects and avoid, remedy or mitigate other adverse effects in the coastal environment", the Project achieves these objectives."*³⁴⁶

564. He considered that the project has sought to avoid or minimise adverse effects by confining the seabed mining footprint, reducing operational sediment discharges and minimising the redeposition of de-ored sands to previously disturbed seabed area. He concludes by stating:

*"Based on the identified amenity and recreational activities that occur on the coast and within the inshore/nearshore areas of the CMA [coastal marine area], the overall significance of the effect on natural features and landscapes is judged to be low."*³⁴⁷

565. The actual application area is not identified as an outstanding natural feature or landscape, and it would not be possible to mine as proposed by TTR without directly impacting that area and without having some effects that extend beyond the actual mining area. We accept that, had consent been granted, the landscapes/seascapes would have been significantly altered, and this would be unavoidable. We have found (and set out in sections 6.3 and 6.4) that the amenity and recreational activities that occur on the coast and within the inshore/nearshore areas of the coastal marine area, as

³⁴³ Summarised from paragraphs 7 and 9 of the Statement of Summary Evidence of Frank Boffa on behalf of Trans-Tasman Resources Ltd.

³⁴⁴ Paragraph 35, Statement of Evidence in Chief of Frank Boffa on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

³⁴⁵ National Policy Statement under the Resource Management Act 1991.

³⁴⁶ Paragraph 36, Statement of Evidence in Chief of Frank Boffa on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

³⁴⁷ Paragraph 37, Statement of Evidence in Chief of Frank Boffa on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

well as in the area of the mining area and plume, are more significant than was suggested by the applicant's impact assessment and evidence.

Natural character

566. Mr Boffa in his evidence in chief states: *"Natural character in its RMA context is a term used to describe the "naturalness" of the coastal environment in terms of its natural elements, natural patterns, and natural processes."*³⁴⁸ Given his evidence (as set out above), it was his opinion that, due to the location and position of the mine and its associated deposition area, *"the overall effects on natural character can be considered to be in the moderate to minor significance category"*.³⁴⁹ We accept this.

Proposed conditions

567. Proposed Environmental Performance Objective 10(c) addresses effects on visual and natural character:

- Surface marine activities not visually intrusive as seen from coastal recreation and amenity areas.
- Visual extent of the sediment plume restricted to within 10 kilometres of the outside edge of the operational area

568. Visual effects are identified as key components of the Baseline Environmental Monitoring Plan (proposed Condition 110) and the Environmental Management and Monitoring Plan (Condition 204).

Uncertainty or inadequacy of information

569. We do not find that the information relating to this matter is uncertain or inadequate.

Findings

570. Our findings are that we agree with Mr Boffa. Any visual effects from the offshore vessels will be minor. The visual effects of the plume, given its variability and the transient nature of those experiencing it, will be moderate (more than minor but less than significant).

571. The impact on natural features and the landscapes/seascapes, other than the mined area itself, would most likely be minor.

572. In terms of natural character, the effects would be moderate to minor significance in the vicinity of the mining site as a result of the mining activity. However, there would be only minor effects on the inshore and nearshore coastal waters or the coastline as a result of the offshore mining activity.

³⁴⁸ Paragraph 38, Statement of Evidence in Chief of Frank Boffa on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

³⁴⁹ Paragraph 42, Statement of Evidence in Chief of Frank Boffa on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

5.12 Archaeology

The issues

573. There is the potential for shipwrecks or archaeological artefacts to be present in the proposed mining site. Due to the non-selective operation of the crawler and the deposition of sediment, there is the potential for archaeological artefacts to be uncovered, covered and/or destroyed.

The effects

574. TTR commissioned Clough & Associates Ltd to provide archaeological advice on the potential for the discovery of historic shipwreck sites within the area of operations as part of the assessment of effects for the project.³⁵⁰ The assessments undertaken consisted of a review of previous research, including a multibeam bathymetry survey of the proposed area of operations commissioned from NIWA by TTR. A desk-based review of the literature relevant to shipwrecks on the South Taranaki coast was also carried out to provide background historical detail and supplement the results of that survey.

575. We understand the results of this study indicate there are at least 126 documented shipwrecks in the Taranaki region, of which 64 pre-date 1900. The remains of the majority are in unconfirmed locations, and only 11 of these wrecks have been successfully relocated in recent times. Twenty-three vessels are recorded to have been lost on the South Taranaki coast at or near Patea and 28 on the coast at or near Whanganui. These include 14 near Patea and 20 near Whanganui that were wrecked before 1900.

576. We understand no shipwrecks are known to be present within the project area. A review of NIWA's multibeam sonar data suggests that there is no significant wreckage exposed above the seabed in the project area. However, it is still possible that wreckage could be encountered buried beneath the seabed.³⁵¹

577. The report written by Dr Clough concluded that there should be no constraints on the proposed iron sand mining project on archaeological grounds, as no shipwrecks are known to be present within the project area and the potential for previously unrecorded shipwrecks is low.³⁵² As no evidence was presented to the contrary, we have no reason to dispute this. In questioning Dr Clough, he confirmed this and said he was not surprised that there were no known shipwrecks and the chances of finding one were low.³⁵³

578. As stated by Dr Clough, the potential for encountering shipwrecks in the STB economic exclusion zone is low but cannot be discounted entirely. We do not think this information is uncertain or inadequate.

³⁵⁰ TTR South Taranaki Bight Offshore Iron Sand Project: Archaeological Assessment (Clough and Associates, 2013).

³⁵¹ Executive Summary, TTR South Taranaki Bight Offshore Iron Sand Project: Archaeological Assessment (Clough and Associates, 2013).

³⁵² Recommendations, TTR South Taranaki Bight Offshore Iron Sand Project: Archaeological Assessment (Clough and Associates, 2013).

³⁵³ Page 343 of the transcript, 12 March 2014.

Uncertainty or inadequacy of information

579. We do not find that the information relating to this matter is uncertain or inadequate.

Proposed conditions

580. To provide for the possibility that a shipwreck may be encountered, a Discovery Protocol for Shipwreck Finds was proposed to ensure that statutory requirements and processes are followed in the event that 19th century wreckage is encountered.

581. We note that proposed Condition 135 (had consent been granted) would require the ceasing of mining activities on the discovery of steel, brass, other metals in a solid state, manufactured or worked timbers or other material not naturally found in the mining area. In addition, proposed Condition 136 would require the Consent Holder to notify the EPA of the find and consult with Heritage New Zealand and iwi representatives on confirming the origin of the find. Mining in the area of the discovery must not restart until the EPA is satisfied that the discovery does not qualify as a pre-1900 shipwreck as described under the Historic Places Act 1993.³⁵⁴ It is unclear how the EPA would have done this.

Findings

582. We are satisfied that these conditions would have appropriately addressed any archaeological remains that may have been discovered if consent had been granted.

³⁵⁴ Appendix A, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014.

6. The effects of the proposal on existing interests

6.1 Identifying existing interests

583. Section 59(2)(a) of the Act requires us to take account of any effects on the environment or existing interests of allowing the activity. Section 60 of the Act provides more guidance on matters to be considered in deciding the extent of adverse effects on existing interests. The details of these sections of the Act are set out in Statutory framework and overview of the decision in relation to that framework.

584. TTR identified the following groups as existing interests by virtue of them having a lawfully established activity in the territorial sea and/or exclusive economic zone including rights of navigation, access and fishing, which may be adversely affected by TTR's activity. Groups and organisations have been identified based on pre-existing relationships, discussions with representative bodies and regulators and the South Taranaki District Council's database of recreational clubs.³⁵⁵ From the application, submissions and evidence, we agree the following to be existing interests and address the effects on them in this decision:³⁵⁶

- Iwi, including customary fishing
- Recreational fishing groups (and operators)
- Diving and boating clubs (and operators)
- Charter operators
- Surf clubs
- Commercial fishing operators/representative bodies
- Origin Energy (Kupe platform and pipeline operator)
- Marine traffic.

585. There are currently no activities authorised by existing marine consents granted under section 62 of the Act. The only existing resource consent we are aware of is the Fonterra discharge. However, that is 20 kilometres away.³⁵⁷

Settlement of historical claims under the Treaty of Waitangi Act

586. TTR has interpreted the settlement of a historical claim under the Treaty of Waitangi Act 1975 provision to include potential future settlement of historical claims, in addition to settlements that have been enacted by legislation. The application states that, to date, no historical settlements have included provisions covering the EEZ within the STB. TTR considers that the plume modelling indicates potential for the sediment plume to migrate into the coastal and marine area, over which iwi may have a Treaty interest through a statutory acknowledgement. The application lists the following iwi organisations as having existing interests:³⁵⁸

- Te Rūnanga o Ngāti Ruanui

³⁵⁵ Section 7.2.1 of TTR's impact assessment, 2013.

³⁵⁶ Section 7.2.1 of TTR's impact assessment, 2013.

³⁵⁷ Sections 7.2.2 and 7.2.3 of TTR's impact assessment, 2013.

³⁵⁸ Section 7.2.4 of TTR's impact assessment, 2013.

- Te Kaahui o Rauru
- Whanganui River Māori Trust Board
- Te Rūnanga o Ngāti Apa Trust
- Ngāti Raukawa ki te Tonga Trust
- Te Ohu Tiaki o Rangitāne Te Ika a Māui Trust
- Ngā Hapū o Ngāruahine Iwi Inc
- Taranaki Iwi Trust.

Settlement of contemporary claims under the Treaty of Waitangi Act

587. TTR's application considers that all the above iwi organisations are mandated iwi organisations under the Māori Fisheries Act 2004, which implemented the agreements made under the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992. In addition, Te Ohu Kaimoana has an existing interest in the project based on their statutory role as defined in the Māori Fisheries Act 2004. This Act implements the agreement made in the Deed of Settlement dated 23 September 1992 and the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992.

588. TTR's application considers there are no customary right or customary marine titles that have been recognised under the Marine and Coastal Area (Takutai Moana) Act 2011. TTR notes that Ngāruahine has lodged an application for customary title for the coastal marine area between the Taungatara and Waihi Rivers.³⁵⁹

589. Mr Young and Ms Ngarewa gave evidence for Ngāti Ruanui and told us that iwi have a role defined under the Treaty of Waitangi and their own Deed of Settlement 2003 to apply kaitiakitanga or guardianship to the whole of their takiwā. Ms Ngarewa explained that the Patea Awa, because of its cultural significance, is recognised as an area of interest under the Ngāti Ruanui Deed of Settlement.³⁶⁰ We have considered this in terms of Ngāti Ruanui's issues as set out later in this decision.

590. Section 59(2) of the EEZ Act requires us to take into account the effects on existing interests. A number of iwi submitters considered that they were an 'existing interest' and had submitted in opposition to the proposal by TTR. Those who submitted, and particularly Ngāti Ruanui as the tangata whenua, considered that the proposal would have significant adverse effects on them, physically as well as spiritually. The concerns raised by iwi were in many respects the same as those of most other submitters – the lack of certainty about what the physical environmental effects may be (as we have already addressed) and how this then affects iwi's physical, cultural and spiritual relationship with Tangaroa.

6.2 Iwi

The issues

591. TTR in the South Taranaki Bight Iron Sands Project Impact Assessment Summary stated in the section on existing interests the following:

“Effect on Iwi

³⁵⁹ Section 7.2.5 of TTR's impact assessment, 2013.

³⁶⁰ Page 2145 of the transcript, 28 April 2014.

The Project will not have any adverse effects on coastal wāhi tapu sites or customary fisheries. TTR has met with, and provided draft environmental reports, to iwi along the South Taranaki Bight coastline. The Te Tai Hauāuru Iwi Fisheries Forum is working with the iwi to coordinate research into the Project and make recommendations on the Project.”³⁶¹

592. Iwi submitters did not agree with this and strongly raised their concerns with us at the hearing. They set out that, while the applicant had sought to engage with them (addressed below), it was not sufficient from a ‘building a relationship’ perspective. Iwi submitters explained to us why they considered the proposal was inappropriate. Te Tai Hauāuru Iwi Fisheries Forum and Ngā Kaihautū also presented to us and raised concerns from their perspectives. We address this below.

Consultation

593. We set out in some detail the consultation issue as this is an important matter for iwi in respect of the relationship with TTR and forms part of the context as to why the iwi submitters hold the views they do. It is also important as, in their final set of revised conditions (8 May version), TTR proposes a significant role for iwi and in particular Ngāti Ruanui.

594. As a preliminary comment, we note that the EEZ Act does not expressly require applicants to consult with iwi (or with anyone else) in relation to their proposals. That said, in understanding and addressing existing interests, some level of consultation appears to us to be not just good practice but an important element in compiling a robust proposal. Further, a failure to consult adequately with tangata whenua/tangata moana may be seen as culturally offensive and disrespectful. Finally, by way of introduction, we note consultation is a ‘two-way street’. Parties who fail to respond or behave poorly when consulted cannot later complain that their interests have not been properly considered.

595. We were informed throughout the hearing from the applicant and from the iwi submitters, in particular Ngāti Ruanui, that some consultation/engagement had occurred but no ‘true’ relationship has been formed between TTR and the tangata whenua. We find iwi are a significant and important ‘existing interest’.

The applicant

596. Mr Bisset, co-founder and former Executive Chairman of TTR stated, “TTR’s early consultation is well documented in the attached copies of letters to the various stakeholders ... commencing in 2007”.³⁶² We note that the letters were sent to a wide range of iwi groups, and it appears that the letters were more about the pursuit of willing investors than a consultative engagement process.

597. In July 2010, Mr Sommerville joined TTR as a member of the executive management team tasked with managing the consultants engaged by TTR to carry out reporting and modelling works. He stated in his evidence in chief, “I carried out a significant amount of consultation around the community. This included discussions with various parties including iwi, specifically Ngāti Ruanui, who we understand to

³⁶¹ Page 13, South Taranaki Bight Iron Sands Project Impact Assessment Summary, 21 October 2013

³⁶² Paragraph 60, Statement of Evidence in Chief of Bill Bisset on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

*be the tangata whenua for the proposed mining area, Ngati Rauru and Ngati Apa.*³⁶³ We found his approach to be more meaningful and engaging, and to that end, we acknowledge Mr Sommerville's role in the TTR consultative process.

598. In June 2013, Ms Austen-Falloon was employed as TTR's Iwi and Community Relations Manager. In her evidence in chief, she stated, *"One of the first tasks in undertaking our consultation was identifying groups who had existing interests under the [EEZ Act]."*³⁶⁴ We considered her approach to be very thorough and well thought out given the time constraints she had. We also note that a number of submitters commented that she had done as well as she could have, given no cultural impact assessment was prepared by Māori as initially envisaged by TTR.

599. Ms Austen-Falloon stated in her evidence, *"Robust consultation requires all parties to engage and contribute constructively and in good faith."*³⁶⁵ She set out in paragraphs 60 through 67 her account of the consultation process as it unfolded. A 'telling point' for us on consultation was highlighted in the following statement: *"Ngati Ruanui told me that although we had been good with providing information, the information that we had provided them still did not answer their key questions, or provided enough information to draft [a] cultural impact assessment."*³⁶⁶ We return to this matter later.

600. We were advised by Ms Austen-Falloon that, as TTR had decided to lodge the application in early November 2013, TTR had no alternative other than to submit their application without a recognised iwi cultural impact assessment but one that was an internal desktop study model.³⁶⁷ We were advised by iwi submitters that they considered this 'an about turn' and had had a major impact on how iwi viewed the application, its process and TTR.

601. The applicant's consultation and engagement faltered on the basis that iwi had reservations about the uncertainty of the effects from TTR's proposed activities and this not being addressed in an appropriate cultural impact assessment. Also, they advised that they became frustrated that their request for answers to questions were not provided once the application had been lodged with the EPA.

Submissions from Māori

602. The first opportunity to hear Māori submitters took place in the week after the expert conferencing had concluded in which Māori took no part. This matter was raised with us by Māori submitters, and the conferencing went ahead on the basis that it would not prejudice Māori interests. We considered and accept that Māori have their own expertise in mātauranga Māori and other areas, and they would

³⁶³ Paragraph 38, Statement of Evidence in Chief of Andy Sommerville on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

³⁶⁴ Paragraph 2, Statement of Evidence in Chief of Rose Austen-Falloon on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

³⁶⁵ Paragraph 47, Statement of Evidence in Chief of Rose Austen-Falloon on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

³⁶⁶ Paragraph 68, Statement of Evidence in Chief of Rose Austen-Falloon on behalf of Trans-Tasman Resources Ltd, 17 February 2014.

³⁶⁷ TTR was clear to us that the cultural impact assessment was a desktop approach and did not purport that it was any more than this.

present that to us during this phase of our hearings. This made the absence of a cultural impact assessment even more important to iwi as the hearing was the only opportunity to present to us.

Hamilton submitters

603. We heard from a number of Māori submitters in Hamilton. While the applicant may have seen these submitters as physically separated from the mining area, these submitters based their claim through their whakapapa connections to Taranaki and the moana. Ms Angeline Greensill explained:

*“While Nga Hapu o Te Uru is north of the consent area, our whanaungatanga relationships to the Taranaki area and the iwi are widespread. Many coastal fauna in the Tainui area trace relationships to Ngati Ruanui to Ruaputahanga and married Whatihua who lived in Raglan.”*³⁶⁸

604. Mr Hamilton closed his evidence with the following whakataukī (proverb) in a similar vein:³⁶⁹

*“Kote moana i te wai kau (The sea is not any water)
No Tangaroa keteneimarae (It is the Marae of Tangaroa)
He maha onahua e ora ai (It yields life for many things)
Nga manu o te rangi (The birds in the sky)
Te iwi ki te whenua (The people on the land).”*

605. Mr Te Rawhitiroa Bosch and Mr Te Kahu Rolleston, as a ‘duet’, left their youthful messages firmly implanted with us and, as it turned out, represented the view of many of the iwi submitters. Mr Bosch stated:

*“So we stand here today, as young men, as young Māori, as brothers, as sons, as grandsons as descendants of our home lands and sea ... We stand here as ones whose whole lives have been sustained by our coasts with kai, with energy ... It’s a very real, very personal and very deep relationship with our moana. It’s a relationship that’s been put at risk, an unknown risk, as has been mentioned for what, for offshore profits.”*³⁷⁰

606. Mr Rolleston’s rap lyrics related to the Rena grounding but gave insight into the depth of relationship that Māori have with the moana:

“Kia ora and so it began as theft, itself crept from the monster depths into sand impacting all creatures from the air, sea and land, she was stuck. Stuck between a reef and a hard place jammed like boiled fruit in a jar case, her knife like features with a sharp blade base pierced moana oozing and bleeding the stark pace, she was stuck. No anchor, nothing but a dark taste of volatility spread, churning my once bright pantry and sanctuary into a dark place.

I saw them, there was an army of taniwha surfing the waves in the shape of a shipping containers though nothing within them could be contained, armored in steel, stealing and taking the life of the moana away. Unless you were raised to be one with the sea you could never sea, believe,

³⁶⁸ Page 1429 of the transcript, 9 April 2014.

³⁶⁹ Closing whakataukī in the Te Ngaru Roa ā Maui submission to “Trans-Tasman Resources Application” prepared by Malibu Hamilton 9.12.2013.

³⁷⁰ Page 1334 of the transcript 8, April 2014.

*understand or feel this sort of pain and while it was happening there was a culture clash. Money verses mana.*³⁷¹

607. Mr Bosch stated:

*“So I hope you got the message that we have come here to bring and we’re standing here as mangai.³⁷² I know definitely we’re standing here as mangai for at least hundreds, most probably thousands that don’t know how to participate in a hearing like this ... and don’t have the means of getting here to be able to share the message.”*³⁷³

Wellington submitters

608. We heard one submission from Māori in Wellington – Ms Jean Kahui accompanied by Mrs Parker who had spent most of her life in Patea. Mrs Parker’s recollections of growing up and harvesting traditional kaimoana along the shores of Patea was helpful for us in understanding the changes that have taken place over the last 50–60 years.

Taranaki submitters – Pariroa Marae

609. Two days of the hearing was held at Pariroa Marae (28 and 29 April 2014). The wero and karakia laid the foundation for what was to follow, and while ‘colourful and descriptive’ rhetoric was not spared, it was given and received without prejudice. This is the pōwhiri tūturu Māori, and once said, arohanui prevails amongst all those who have gathered on this important occasion. This is the traditional and customary welcome, and we acknowledge that along with the ‘cup of tea’ that followed.

610. Ms Ngarewa-Packer (Te Rūnanga o Ngāti Ruanui) stated in her opening, *“Our Chair is correct, we are experts in this field, we were born into this legacy through situations given to us by the Crown kia ora ... Today we are here proclaiming our expertise in this field.”*³⁷⁴ She explained that their backyard had 46 oil wells, the largest earth-based dam and the largest waste outfall and that they are then expected to ‘tolerate’ the TTR proposal.

611. With respect to consultation with TTR, Ms Ngarewa-Packer stated:

“When the kaupapa came to us we were really concerned at the size of [the TTR proposal], we as tangata whenua are naturally green, we naturally lean that way. As kaitiaki ... with the unemployment issues we are constantly challenged with the tension of reconciling and balancing opportunities economically and environmentally, we constantly live like that...

*So we have been able to put together a map and plot out who are the best practicing and who are the worst ... What does great consultation look like and what does poor ... and it would be remiss of me not to state that TTR have had poor consultation.”*³⁷⁵

³⁷¹ Page 1335 of the transcript, 8 April 2014.

³⁷² Mangai, simply meaning advocate for the people.

³⁷³ Page 1336 of the transcript, 8 April 2014.

³⁷⁴ Page 2128 of the transcript, 28 April 2014.

³⁷⁵ Page 2130 of the transcript 28 April 2014.

612. Ms Ngarewa-Packer continued:

*"Now there is a difference between consultation and engagement ... if it is being done really well, we go to the next stage. We will qualify that they are able to satisfy us that they have the quality of environmental management practices that we will then decide to go to the hapu and say " they are ready to consult with you. Every time we would get to that point with TTR there would be another press release about 6000 jobs ... a whole lot of other press releases and spin doctors."*³⁷⁶

613. Ms Ngarewa-Packer highlighted where consultation with TTR had failed to deliver the outcomes that allowed them to make a considered and informed response to the proposal. It also prevented them from completing their draft iwi cultural impact assessment report and also meant that Ngāti Ruanui opposed the proposal outright rather than being able to take a more considered response.

614. We also heard from the confederation Ngā Marae o Ngā Rauru Kītahi. Turama Hawira in his opening stated, *"My submission today is therefore, to define the line in the sand according to the Kawa and Tikanga of the Aotea peoples and secondly highlight how the intended activities of TTR transgress the customary [lores] of the gathered iwi."*³⁷⁷

615. He and the others who presented shared with us their Māori world view, crafting together a compelling relationship that they have with their ancestral lands, waters and other taonga. This included a key message: *"Our tupuna embraced business in a way that used, respected and conserved natural resources. They opposed business that takes and destroys natural resources. They firmly believed in and practiced sustainable business. So do we."*³⁷⁸

616. What was articulated to us was nothing more than their taonga, their traditional knowledge containing their very existence (it being told to us that Ngā Marae o Ngā Rauru Kītahi had "spilled its guts"). This contrasted with TTR, which was seen by Ngā Rauru as an exploitative company with little regard to protecting the environment.

617. Ngā Marae o Ngā Rauru Kītahi tabled statements from Mr Erueti, a senior lecturer at Waikato University, and from Ms Jacinta Ruru, Associate Professor at the Faculty of Law, University of Otago. Mr Erueti stated, *"But it is clear that hapu and iwi do not consider that this process has been sufficiently robust. The Ngā Kaihautū Tikanga Taiao Report considered "there to be gaps and that a wider set of interested and/or effected iwi could have been consulted". According to the report, these gaps include, "the lack of sufficient information relating to the potential effects on: Maori fishing activity (commercial and customary); cultural association; impacts to Maori and ultimately the exercising of kaitiakitanga."*³⁷⁹

³⁷⁶ Page 2131 of the Transcript 28 April 2014.

³⁷⁷ Ngā Marae o Ngā Rauru Kītahi Trans-Tasman Resources Application, page 1 of the Oral Submission of Turama Hawira, Pariroa Pa, Patea, 28 April 2014.

³⁷⁸ Ngā Marae o Ngā Rauru Kītahi Trans-Tasman Resources Application, page 2 of the Oral Submission of Turama Hawira, Pariroa Pa, Patea, 28 April 2014.

³⁷⁹ Page 4, Ngā Marae o Ngā Rauru Kītahi Trans-Tasman Resources Application, written statement of Andrew Erueti, Pariroa Pa. Patea. 28 April 2014.

618. Ms Ruru said in her written statement, *“When the DMC decides what weight to give the concerns expressed by Maori submitters and reiterated by Nga Kaihautu it must remember that the statutory authority under which it is operating cannot be divorced from the Treaty principles themselves.”*³⁸⁰
619. Counsel for TTR in their closing, with respect to the Treaty, stated, *“that so long as the effects of TTR’s activities on existing iwi interests have been taken into account ... then section 12 [Treaty of Waitangi] has been satisfied”*. Mr Rennie noted that the written statement from Associate Professor Ruru *“reached a different view that the DMC is to directly apply the Treaty”*.³⁸¹

Ngā Kaihautū Tikanga Taiao

620. Ngā Kaihautū Tikanga Taiao (Ngā Kaihautū) is the EPA Māori Advisory Committee established under section 18 of the Environmental Protection Authority Act 2011. It is an independent committee set up to provide advice and assistance from a Māori perspective to the EPA on policy, process and decision-making.
621. Section 59(3)(c) of the EEZ Act requires us to have regard to any advice received from the Māori Advisory Committee.
622. Ngā Kaihautū considered the TTR application under section 44(1)(c) of the EEZ Act. In their report, Ngā Kaihautū expressed the following concerns with the application:³⁸²

“Executive Summary

- *The consultation undertaken is acknowledged, however we consider there to be gaps and that a wider set of interested and/or affected iwi could have been consulted.*
- *The impacts on kaitiakitanga in particular, and cultural activities which uphold mana for iwi, is a common theme identified by iwi submissions.*
- *The Taranaki coastline is significant culturally for its waahi tapu and waahi tupuna. It is already highly vulnerable to coastal erosion and there is potential for additional unacceptable impacts arising from the proposed activity.*
- *Information provided on social and economic impacts of specific relevance to Māori is limited and it would appear that the cost / benefit assessment does not favour iwi and / or Māori generally.*
- *The potential for impact to customary and commercial fisheries is of particular concern. Issues raised include the access to fisheries / spatial exclusion; a detrimental impact to the mauri of the moana and kaimoana; the provision of inadequate information for Māori submitters to assess impacts; and the quantity and nature of any real economic benefit for Māori.*

³⁸⁰ Page 14, Nga Marae o Nga Rauru Trans-Tasman Resources Application, written statement of Jacinta Ruru, Pariroa Pa, Patea, April 2014.

³⁸¹ Paragraphs 54 and 55, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014.

³⁸² Executive Summary, Ngā Kaihautū Tikanga Taiao Report Application for a Marine Consent to undertake discretionary activity, 2014.

- *It is the collective responsibility of all descendants of Taranaki maunga to protect their whakapapa for future generations, thus all Taranaki iwi have an interest in this particular application. This applies across all levels of kaitiakitanga and activates with communal interests such as commercial and recreational fishing.”*

623. The three authors – Dr Roskruge, Ms Paine and Dr Ataria – appeared at Pariroa Marae on 28 April 2014 and spoke to their report. In addition to the points outlined above, Dr Ataria spoke about toxicity and considered that ecological-based testing (using native species to test the toxicity) on the sediments or sediment extracts would provide integrated biological response data that, when combined with the residue information, will give a much clearer indication of toxicity related to the mining activity. He considered that biological testing, particularly of the processed wastewater, is warranted.³⁸³

624. Dr Roskruge explained that significant gaps were evident, particularly the lack of consideration of effects on Māori customary and commercial fishing, wāāhi tapu, social and economic implications and exercising of kaitiakitanga. He acknowledged that, while consultation is not required by the legislation, it was the most efficient way to get this information, and consultation, according to Ngā Kaihautū, had been inadequate.³⁸⁴

625. We asked whether Ngā Kaihautū opposed or supported the application based on the application and evidence heard to date. Dr Roskruge stated:

*“But as Nga Kaihautu we don’t make the yes or no, but we – clearly the recommendations here show that we have some reservations about the application as a whole and at least until those reservations are addressed we wouldn’t suggest it should go forward”.*³⁸⁵

626. We were aware that time (and information) had moved on since Ngā Kaihautū had written its report. Dr Roskruge in answering a question said the authors had been reviewing the material since they wrote their report and that *“we have constantly had new information come back to us”*,³⁸⁶ and he described the impact of this:

*“But one thing it has done [reviewing the information and evidence] is reinforced what we’ve said, so if anything it’s added that reinforcement from a wider sort of set of submitters. So haven’t needed to review because if anything that’s added some weight to those statements.”*³⁸⁷

627. In closing submissions by TTR, Mr Rennie reflected on our question to Ngā Kaihautū if they had subsequently reviewed material and Dr Roskruge’s response. Mr Rennie contended that that comment was said without identification of what had been reviewed. He stated:

“It appeared to be a claim that Ngā Kaihautu had reviewed the executive summary evidence and transcript for TTR’s experts, in particular, Dr MacDiarmid, Dr Vopel, Dr Hume and Nikki Gibbs. It also related to a period during which the joint expert statements were created and filed. Now, if

³⁸³ Page 2207 of the transcript, 28 April 2014.

³⁸⁴ Page 2204 of the transcript, 28 April 2014.

³⁸⁵ Page 2213 of the transcript, 28 April 2014.

³⁸⁶ Page 2209 of the transcript, 28 April 2014.

³⁸⁷ Page 2209 of the transcript, 28 April 2014.

*they did review this information, we fail to see how they could have reasonably continued to hold the opinions they expressed, or could justify not reviewing or changing their views. Regrettably, Ngā Kaihautu does not provide either current, detailed or expert advice of assistance for your committee.*³⁸⁸

628. We find no reason to doubt what Dr Roskrige said and accept that Ngā Kaihautū had kept itself informed of the evidence presented to us.

Te Tai Hauāuru Iwi Fisheries Forum and Te Ohu Kaimoana Trustee Ltd

629. We have addressed these submitters in the Section on Fishing Interests.

Whanganui submitters

630. The hearings in Whanganui took place at the local Council offices, and there we heard Ms Bullock and Ms Tangaroa giving their account of a very different and contemporary Māori world view. These were two very passionate tangata whenua submitters who, like others, had put a lot of time and effort into their submissions, which we acknowledge.

Proposed conditions

631. We are required to take into account the effects on ‘existing interests’ and accept that the effects on iwi and in particular Ngāti Ruanui could be significant for the reasons already set out (section 59(2)(a) of the EEZ Act). The applicant accepted the need to involve iwi in the management of its consent (had it been granted) and stated in closing submissions:

*“TTR recognises Ngāti Ruanui is tangata whenua of the project area, and that all iwi and many submitters have a special relationship with the ocean and Tangaroa. TTR has listened to the submitters who spoke at the hearing and appreciates they are particularly concerned to ensure that there will not be significant effects on the marine environment as a result of this activity. TTR acknowledges and shares these concerns and is committed to adopting international best practice in its operations and to continue to engage and listen to Ngāti Ruanui’s and other iwi concerns and work with them as TTR progresses down the pathway to commercial production.”*³⁸⁹

632. This is laudable. However, from the evidence and hearing from iwi, it is uncertain or unknown if iwi want/could be involved to the extent provided for. In this respect, the conditions offered by the applicant propose a significant role for iwi in the Kaitiakitanga Komiti, Ngāti Ruanui and other iwi representatives.
633. A number of iwi would be invited to be on the Komiti, with Ngāti Ruanui as tangata whenua being invited to chair it (proposed Conditions 41 and 42). The objectives of the Komiti are set out (proposed Condition 44(a)–(e)) and propose a significant role for the Komiti including liaison and consultation and to make recommendations to the Consent Holder, the Technical Peer Review Group (TPRG) and the EPA as well as reviewing all of the required management plans (Condition 45).³⁹⁰ Condition 52 sets out

³⁸⁸ Page 2858 of the transcript, 8 May 2014.

³⁸⁹ Paragraph 5, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014

³⁹⁰ Ten management plans were proposed (set out in Condition 60) including the Pre-operational Baseline Monitoring Plan (which has a specific section on mātauranga Māori) and the Environmental Monitoring and Management Plan.

that the Consent Holder will invite “one kaitiaki representative appointed by Ngati Ruanui” to be on the (TPRG) (proposed Condition 50).

634. Also in proposed Condition 27, the Consent Holder would set up a Project Consultative Group. Three iwi representatives are to be invited on this group.
635. While we accept the applicant’s intent (via the conditions) to address iwi existing interests, we also accept from a legal perspective we cannot force iwi (or anyone) to be involved in the various groups/processes set out above. We were surprised and concerned that agreements with iwi on the appropriateness of these process conditions (on the assumption that consents were granted) were not presented to us.
636. We do not know if iwi wish to participate to the extent proposed by the applicant and whether what is proposed by the applicant is acceptable to iwi.
637. Without understanding or knowing the views of iwi in relation to the suggested conditions of consent, we are not able to determine if the effects on iwi as an existing interest have been appropriately ‘taken into account’.

Findings

638. In TTR’s closing submissions,³⁹¹ Counsel stated, “We note that while we heard forceful presentations about iwi concerns, we heard little about how they perceive the effects of the proposal would interfere with their activities and interests. There was virtually no engagement with the proposed conditions of consent.” In the following paragraph, he went on to say, “This leads us to question whether the forcefulness of their position was informed by what is actually proposed, or by other information or concerns which are not reflective of the proposal.”
639. We were somewhat surprised by these two closing statements in light of the evidence we heard from iwi submitters and particularly Ngāti Ruanui. These comments appeared to support iwi’s concerns regarding their ability to reach a position where they could make an informed response and even potentially support aspects of the proposal.
640. TTR provided a revised set of conditions when they presented their closing submissions. The iwi consultation conditions had been ‘beefed up’ and, as outlined earlier in this section, iwi could, if they chose, have a significant role in the consent had it been granted.
641. While we acknowledge that TTR is seeking to involve iwi in a substantive way via the consent conditions, it was apparent to us, and not contradicted by TTR, that iwi were not engaged in the drafting of the latest suite of consent conditions nor have they agreed to them.
642. Given the above, we find that iwi’s existing interest would potentially be adversely affected in more than a minor way.

6.3 Fishing interests

³⁹¹ Paragraph 139, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014.

The issues

643. A large number of groups and individuals have an existing interest in fishing in the STB that we must take into account. We heard evidence from experts, iwi, commercial and recreational fishers and organisations about the potential impacts of the proposal on fishing. We have decided to address all of the fishing issues under the one heading as they all share one thing in common – they fish and dive in the same stretch of ocean. We address:

- commercial fishing
- recreational fishing
- customary fishing.

The effects

644. The joint witness statements from the experts stated:

“We agreed that this level of spatial exclusion may cause changes in catch and catch rates at a local scale. Whether these changes are positive or negative will depend on how fish react to the sediment plume and how fishers respond, or are allowed to respond, to local changes in fish abundance and distribution.

We consider that the exclusion is unlikely to result in more than minor additional costs for fishermen (due to the small amount of displaced catch) and is unlikely to have a more than minor adverse effect on fishing operations, profitability, fishstock sustainability or quota value averaged across the whole relevant quota management areas.”³⁹²

“We agreed that pits and mounds may result in local changes to the aggregation of fish which may effect fish productivity. There is uncertainty around whether local productivity effects would be positive or negative.”³⁹³

“We did not reach agreement on the impacts of the pits and mounds on the physical activities of trawlers ... However, it was highlighted that none of the experts were active commercial fishers and hence have limited capability in this area.”³⁹⁴

“We identified a material area of uncertainty regarding the impacts of elevated levels of heavy metals near the mining site and the potential for bioaccumulation in the food web, particularly in relation to species of importance for commercial, customary and recreational fishing.”³⁹⁵

645. The experts also agreed that past and future spatial closures will also have an impact, including a cumulative impact, on fisheries in the STB:

- Set net prohibitions out to seven nautical miles around Cape Egmont south to Hawera.

³⁹² Paragraphs 15–16, Joint Statement of the Experts in the Field of Effects on Commercial Fisheries and Fishing, 26 March 2014.

³⁹³ Paragraph 20, Joint Statement of the Experts in the Field of Effects on Commercial Fisheries and Fishing, 26 March 2014.

³⁹⁴ Paragraph 21 Joint Statement of the Experts in the Field of Effects on Commercial Fisheries and Fishing, 26 March 2014.

³⁹⁵ Paragraph 10 Joint Statement of the Experts in the Field of Effects on Commercial Fisheries and Fishing, 26 March 2014.

- Submarine cable and pipeline protection zone for the Tui area, Oaonui, Kupe project and Maari development.
- Vessel and gear restrictions such as the prohibition on vessels greater than 46 metres in length fishing within the territorial sea.³⁹⁶

646. The experts agreed that *“there will be some cumulative impact with respect to the existing closed areas listed above, particularly relating to set net fisheries targeting rig and school shark”*.³⁹⁷

647. In addition to the expert evidence, we had the benefit of a considerable amount of non-expert evidence from people associated with commercial, recreational and customary fishing. We found that many of these witnesses and submitters did possess considerable expertise and provided useful information and insights.

Commercial fisheries

648. Section 6.14 of TTR’s Impact Assessment acknowledged that the STB supports a productive and diverse range of inshore fisheries. Moreover, that quota ownership was dominated by Talley’s and Sanford, with Te Ohu Kaimoana listed in the top 10 quota owners for stock in this area.

649. We were advised by Dr Helson, the Chief Executive of Fisheries Inshore New Zealand, that *“The New Zealand seafood industry directly employs about 8,000 New Zealanders and an estimated 17,000 additional New Zealanders in related industries that provide infrastructure and services. Many of these jobs are in small coastal centres where fisheries are an important component of the social fabric.”*³⁹⁸

650. He also stated, *“Export earnings from wild capture fisheries were \$1.52 billion in 2013, with the addition of approximately \$300 million from aquaculture. The seafood industry is an important contributor to the New Zealand economy.”*³⁹⁹

651. We accept that an industry that employs a significant number of people and has export earnings as stated above has genuine reasons to be concerned with the potential effects of TTR’s proposal. Given the significance of this industry to the New Zealand economy, Dr Helson explained some of the concerns he had about the proposal:

*“Many inshore fishers hold quota or source ACE for a relatively small number of species. The consequence of a limited quota portfolio is that changes to relative fish abundance have a more significant effect on small operators as they are not able to source difference combinations of ACE. For small-scale fishing operations, this could be critical and represents a serious risk to the viability of their businesses. It is simplistic to assert that fishers can simply move elsewhere.”*⁴⁰⁰

³⁹⁶ Paragraph 22, Joint Statement of the Experts in the Field of Effects on Commercial Fisheries and Fishing, 26 March 2014

³⁹⁷ Paragraph 23, Joint Statement of the Experts in the Field of Effects on Commercial Fisheries and Fishing, 26 March 2014.

³⁹⁸ Paragraph 5, Statement of Evidence of Dr Jeremy Helson on Behalf of Fisheries Submitters, 4 April 2014.

³⁹⁹ Paragraph 6, Statement of Evidence of Dr Jeremy Helson on Behalf of Fisheries Submitters, 4 April 2014.

⁴⁰⁰ Paragraph 38, Statement of Evidence of Dr Jeremy Helson on Behalf of Fisheries Submitters, 4 April 2014.

652. In relation to this, under the heading “Compounding Uncertainty”, he stated:

*“The aforementioned example is one illustration of the uncertainty faced by fishers. TTR’s evidence contains numerous qualified statements. There is very little by way of quantitative analysis based on empirical evidence. TTR’s own experts concede that the uncertainty associated with the modelling of the sediment plume could be greater than anticipated.”*⁴⁰¹

*“Furthermore, the Joint Statement of Experts in the Field of Optical Effects (26 March 2014) states that their analysis of optical effects is uncertain but also that it is based on similarly uncertain modelling of the sediment plume. These are assumptions based on assumptions which the Experts refer to as layering of uncertainty [at 17]. Of even more concern is the concession that from the Experts that they have no understanding of the ecological consequences of changes in primary productivity [at 38]. Given that primary production is the foundation of the marine ecosystem, it is precisely these effects on the marine ecosystem that deserve close analysis and a measure of certainty.”*⁴⁰²

653. Mr Smith, the operations manager for Talley’s, has extensive experience and gave evidence on the potential effects of the proposal on fishing in the STB:

*“So, we have eight or nine large vessels that operate in this area from April, May, June, July and then October, November, December, January. They take around about 30 thousand [ton] of Mackeral, Jack Mackeral in this area, which is worth somewhat around \$70 to \$80 million dollars.”*⁴⁰³

654. His main concern was the uncertainty of the plume dispersion and spatial effects based on the unpredictable nature of the strong currents that could potentially push a plume 50–80 nautical miles in any given direction. He stated:

*“In my experience as a skipper, many pelagic species are very sensitive to water quality and clarity changes and noise ... I recall in my earlier years of fishing on the rolling grounds that if the water was discolored through a storm event, there was little prospect of catching good quantities of snapper or trevally in this area.”*⁴⁰⁴

655. Sanford Ltd is a significant quota owner in Fishing Management Area 8 (FMA 8) with a long-established catching presence in an area that is considered to be particularly productive known as the Rolling Grounds. Their concerns related to the potential or both immediate and cumulative adverse effects from the mining activity, including the effects from the plume (suspended sediment).

656. We were advised that Sanford owns 35% of New Zealand’s aquaculture production, which was also an issue of significant concern for them. Mr Culley, Aquaculture Manager for Sanford Ltd, expressed concerns relating to these investments with consultation high on their list of issues as explained:

⁴⁰¹ Paragraph 40, Statement of Evidence of Dr Jeremy Helson on Behalf of Fisheries Submitters, 4 April 2014.

⁴⁰² Paragraph 41, Statement of Evidence of Dr Jeremy Helson on Behalf of Fisheries Submitters, 4 April 2014.

⁴⁰³ Page 2474 of the transcript, 1 May 2014.

⁴⁰⁴ Page 2476 of the transcript, 1 May 2014.

*"As a result of lodging our submission with EPA, TTR contacted Sanford and offered to meet. Sanford has met with TTR once. At that meeting Sanford set out its concerns in respect of aquaculture. Sanford identified an increased risk from biosecurity, marine pest invasion, increased sediment loadings in the water column."*⁴⁰⁵

657. We also heard from Mr Piper, the pioneer of the clam fisheries who (with his eldest son) owns Cloudy Bay Clams. He told us Cloudy Bay Clams produced over a thousand tonnes of clams for the New Zealand market in 2013 and have a substantial investment in Quota Management Area 8. Mr Piper stated:

*"The biomass survey estimated the current combined biomass of the four main species of surf clam at 18,384 tonnes, for a sample area of approximately 40 kilometres. If this sample is extrapolated over the whole area of FMA 8, this would most likely result in a total biomass exceeding 60,000 tonnes."*⁴⁰⁶

658. Mr Johnstone, Aquaculture New Zealand's Technical Director, also spoke briefly about the aquaculture sector that he represented covering the salmon, mussel and oyster industry, which employs around 3,000 New Zealanders. His concerns were also around the plume effects on productivity and biosecurity risks to their globally recognised export brand if the TTR application went ahead.

659. Mr Mawson of Egmont Seafoods, based in New Plymouth, explained how dependent they are on the wet fish West Coast fisheries and that the company employed approximately 50 people from the local community. He stated:

*"It is vital to the future economic viability of Egmont that local fishers are able to access the initial shallow coastal waters in South Taranaki". Our business is dependent on fishers being able to choose the location and timing to of their catch, and to be able to secure a supply of quality fish."*⁴⁰⁷

660. He went on to outline the geographical constraints this fishery has faced in recent years:

*"The cumulative effects of these closures has brought the industry to tipping point. The FMA 8 set-net industry cannot shoulder the cost of more spatial closures."*⁴⁰⁸

661. This phase of commercial fisheries submissions was concluded by Ms Undorf-Lay, who discussed the conditions of consent that the fisheries submitters sought. Unfortunately, her answers to questions put to her were neither constructive nor helpful to us, and it was clear she had not read the applicant's expert evidence or the joint witness statements.

662. We have addressed the issue of the potential impact of trawling in the mining area due to the pits and mounds from the mining operation in the section on the Physical Environment.

663. The applicant in closing submissions addressed in some detail the commercial fishing interests⁴⁰⁹ and set out the areas of agreement and disagreement. It is our finding that there are likely to be some

⁴⁰⁵ Page 2561 of the transcript, 1 May 2014.

⁴⁰⁶ Page 2519 of the transcript, 1 May 2014.

⁴⁰⁷ Page 2503 of the transcript, 1 May 2014.

⁴⁰⁸ Page 2504 of the transcript, 1 May 2014.

adverse effects on the fishing industry, but based on the evidence, we cannot determine the magnitude. There would likely be some economic disbenefit to the New Zealand economy, and this has been raised in the section on the Economic benefit to New Zealand. We are also mindful here of our findings in respect of the sediment plume and primary productivity, which may also impact on the commercial fishing interests.

664. The applicant offered a suite of conditions to address the concerns of the commercial fishers. This was despite the experts' agreement in the joint witness statement that there would only be localised and transient changes in the distribution and abundance of commercially important fish species that could result in changes to catch rates (either positive or negative) in the vicinity of the mining operation.⁴¹⁰
665. In summary, these conditions included (but were not limited to) an Environmental Performance Objective with respect to commercial and non-commercial fishing (Condition 10(j)) and a Commercial Fisheries Communication and Management Plan (Conditions 60 and 82–85). The objective of that plan is to “avoid, remedy or mitigate the effects of the consented works on the commercial fishing industry”⁴¹¹ and the plan “shall be developed in consultation with the fishing industry”.⁴¹² The Baseline Environmental Monitoring Plan and Environmental Management and Monitoring Plan also have specific reference to issues that may affect fish and their distribution.
666. We are not critical of the applicant for including these, and they are highly likely to be very important. What we do not understand is why these conditions (or the details of them) had not been discussed and agreed as far as may have been possible with the commercial parties prior to the hearing.
667. We contrast the approach taken to the fisheries conditions with the more specific conditions relating to the Kupe platform and pipeline on behalf of the Kupe Joint Venture Parties (Kupe JVP). As submitted by Kupe JVP and TTR, specific discussions had occurred in an attempt to develop a ‘cooperation agreement’. While this had not been agreed prior to the end of the hearing, it had enabled more detailed conditions to be proposed by the applicant.
668. The impact on the commercial fishers is uncertain. We address this further in section 9.4.

Aquaculture

669. In closing submissions, TTR stated:

*“The fisheries’ submitters also raised concerns about the potential impacts on aquaculture at the top of the South Island as a result of biosecurity risks or increased levels of sediments and contaminants. We have addressed management of biosecurity risks above. Dr Hadfield confirmed that the plume would never reach Tasman and Golden Bay, and the model predicts that the presence of fine sediment from the mining operation at the entrance to Marlborough Sounds will be low, and well below background levels.”*⁴¹³

⁴⁰⁹ Paragraphs 322–362, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014.

⁴¹⁰ Paragraph 12, Joint Statement of Experts in the Field of Effects on Commercial Fisheries and Fishing, 26 March 2014.

⁴¹¹ Proposed Condition 83.

⁴¹² Proposed Condition 84.

⁴¹³ Paragraph 359, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014.

670. We have addressed the impact of the application on aquaculture earlier in this decision. We agree with the applicant in terms of the evidence presented that any adverse effects on aquaculture from increased levels of sedimentation from the mining operation are likely to be nil to very minor. We accept there could be some biosecurity effects from the vessels. We consider that the conditions proposed by TTR, including monitoring, could have ensured that any biosecurity or primary production effects could be avoided or mitigated.

Recreational fishers

671. We heard from a number of submitters about the recreational fishing and diving interests in the STB. We find recreational fishing and diving interests are significantly greater than presented to us by the applicant.

672. In the Joint Statement of Experts in the Field of Social, Recreational and Tourism Impacts, we note recreational fishers are not mentioned. As set out in section 6.4, Mr Greenaway stated, *“the mining site is infrequently visited by recreational anglers due to its distance offshore and the limited fishing resource at the mining site.”*⁴¹⁴ It was also pointed out by Ms Greensill (a submitter in Hamilton) that:

*“There is no economic analysis of the loss to the recreational fishing sector. The potential loss to people’s economic well-being and impacts to the local and regional area will create adverse effects to those communities.”*⁴¹⁵

673. Mr Purser, Commodore of the Patea and District Boating Club, which operates out of the Patea River mouth, questioned the accuracy of TTR’s information about recreational fishing on the STB. He set out from his research (over a 12-month period) there were up to 2,000 radio calls made to the South Taranaki Coast Guard. He stated:

*“Now on one specific day alone, there was ... 33 boats on an average day were heading out in the summer time. This is quite common, okay.”*⁴¹⁶

674. Mr Saunders representing the New Plymouth Sport Fishing and Underwater Club had this to say:

*“Some of them now as you would be aware, of the big boats that are capable of being towed by four wheel drive utilities and getting bigger and bigger ... So these boats are now capable of ... going down ... and fishing off Patea and Ohawe as well.”*⁴¹⁷

675. We also heard from Mr Boyd, another member of the Patea Boating Club:

*“Both myself and many fellow boating and underwater club members have invested considerable time and money to enable us the opportunity to fish and dive in this area ... As you heard earlier from the guys that were here, it is through the purchase and servicing of boats, fishing and diving gear, fuel and food and we will continue to do this while the fishery remains healthy.”*⁴¹⁸

⁴¹⁴ Paragraph 5, Statement of Summary Evidence of Rob Greenaway on behalf of Trans-Tasman Resources Ltd.

⁴¹⁵ Page 1433 of the transcript, 9 April 2014.

⁴¹⁶ Page 2594 of the transcript, 2 May 2014.

⁴¹⁷ Page 2654 of the transcript, 2 May 2014.

⁴¹⁸ Page 2622 of the transcript, 2 May 2014.

676. Mr Purser stated:

*"I suppose over a year and I worked it out roughly if everyone spent around even at \$160 a boat which more than likely would be realistic - it comes in at around \$320,000 to \$340,000 spent in that community."*⁴¹⁹

677. Mr Gane, a past Commodore, also pointed out how the Council had spent over a \$1 million fixing and maintaining the river entrance sea walls:

*"...because it is vital to the town, you know, the town suffered a lot from the freezing works closures and there is no real industry around for the people to be involved in and every community wants to see its community kept alive."*⁴²⁰

678. A number of other recreational fishing submitters added to the extensive picture, with Ms Arlidge stating:

*"TTR claim, that as they are working over sand seabed, as opposed to reefs, the fish numbers there are insignificant. I know this to be an untruth from my personal scuba experience in the South Taranaki seas. All levels of our seas are rich feeding grounds for many varieties of fish. These must not be jeopardized by ignorance of convenience."*⁴²¹

679. A visit by some members of the DMC to the Patea and Egmont boat ramps provided a good understanding of the physical environment and the real challenge for any fishers – but they still choose to fish and dive here.

680. As we have heard throughout the hearing, weather conditions on these waters are constantly changing and the 'window of opportunity' for recreational fishers to fish is limited. The main fishing months of September through to May tie in with the spawning and fish movement cycles.

681. After hearing from recreational fishers and divers as well as the site visit, we have gained a picture of local Taranaki recreational fishing and diving that is more significant than put forward by the applicant. This raises issues about the impact of the proposal on recreational fishers and divers.

682. We conclude that the area to be mined has more value to recreational fishers than the applicant has assumed. While usage of this area is modest, it is growing. The wider area of the STB where fishing may be affected by the plume also appeared to be more important for recreational fishing than the applicant assumed. There is considerable uncertainty as to how the recreational fishing may be affected. The same conclusion applies to customary fishing in the wider area.

⁴¹⁹ Page 2600 of the transcript, 2 May 2014.

⁴²⁰ Page 2601 of the transcript, 2 May 2014 .

⁴²¹ Page 2228 of the transcript, 29 April 2014.

Recreational diving

683. We now turn to diving at the traps and banks. Mr Cummerfield told us:

*"Being distant from the shore, the reefs are substantially free from sediment damage". "The clear water and shallow reefs provide enjoyable diving. The water visibility has always been adequate for diving on my visits."*⁴²²

684. We understand that diving conditions, as stated by a number of recreational divers, are quite variable and that different people will have different tolerances, but the clearer the water, the better. TTR's expert Mr Greenaway in his evidence in chief stated:

*"The mining operations will not preclude any of this current diving activity, although it may, from time to time and depending on the sedimentation effects from mining operations, effect the quality of the experience for some divers."*⁴²³

685. We heard evidence as to the strong tidal currents and the risk this presents to the diver. Mr Boyd, a local diver from Patea, stated in his evidence:

*"I limit my diving to the turn of the tide because you can run into all sorts of difficulties because there is a huge current flow out there."*⁴²⁴

686. We have heard how diving on these reefs may be impacted by any increased sediment loading that may result from the proposed activities of the applicant, and submitters are understandably concerned. Mr Cummerfield explained:

"The remote location of the reefs and banks on this exposed coast has provided some protection from over-fishing. The reefs and banks have been marvelous for recreational fishers and divers who have a passion for that unspoilt sea and a hunger for fresh seafood, such as myself.

*These experiences are in marked contrast to the inshore reefs that have been damaged over the decades by sediment from the land. The spoiling of once pleasant inshore reef systems seems to be worse every year. My considered opinion, (as an amateur diver and fisher) is that the sediment from 20 years of seabed mining would significantly damage the diving reefs and fishing banks."*⁴²⁵

687. We also note that these reefs are regionally significant as stated by the Taranaki Regional Council (identified as such in the Taranaki Regional Coastal Plan).

Customary fisheries

688. Customary fisheries (which include consideration of issues such as catch, quota entitlement, mahinga kai, tangata kaitiaki and kaitiakitanga) are matters to which we must have regard. Customary fisheries are a subset of iwi and fishing existing interests and were addressed by iwi, Te Ohu Kaimoana and Te Tai Hauāuru Fisheries Forum.

⁴²² Page 2255 of the transcript, 29 April 2014.

⁴²³ Paragraph 56, Statement of Evidence in Chief of Rob Greenaway on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

⁴²⁴ Page 2602 of the transcript, 2 May 2014.

⁴²⁵ Page 2255 of the transcript, 29 April 2014.

689. Te Ohu Kaimoana's purpose under the Māori Fisheries Act 2004 is to advance the interests of iwi individually and collectively in regard to fisheries activities, and they also hold quota on behalf of iwi. Ms Woods pointed out in the written submission:

"Given our broad purpose, we have an interest in ensuring that the overall value of the fisheries settlements is protected and enhanced, and that the value of the settlement quota and ACE that could be affected by the application is not undermined by the effects of new activities.

*In addition, we wish to clarify that as part of the settlement, the Crown also retains obligations in respect of customary non-commercial fishing. Iwi and hapu have rights and interests under various regulations to manage fisheries for customary purposes."*⁴²⁶

690. The submission then cited the various regulations that may be affected by TTR's proposed activities and pointed out that iwi have interests in all commercial quota species fished in the area along with potential interests in the clam fisheries. Te Ohu Kaimoana set out that it opposed the application based on the information provided and stated:

"While TTR has clearly presented a wealth of scientific information to support their application, the assessment of effects that are of concern to us-particularly predicted levels and effects of sedimentation, is based on modeling. It can't be certain at this stage whether the actual effects will match or even exceed what has been predicted.

*The company has designed their operation around these predicted effects. This raises questions about the ability of the company to adjust their operations to address effects that turn out to be greater than predicted ... TTR states that they have "only a limited ability to vary the project scope and retain a commercial viable operation". This suggests that there isn't a great deal of room to move if the effects of their activities turn out to be greater than those that have been predicted."*⁴²⁷

691. The Te Ohu Kaimoana submission (and evidence) raised and commented on a number of other issues consistent with those raised by other submitters. It also reminded us that:

"Under the Fisheries Act assessment, it is noted that there are no taiapuri or mataitai. However that does not mean iwi and hapu may not wish to establish such an area. Under the Fisheries (Kaimoana Customary Fishing) Regulations 1998 (which are regulations made under fisheries legislation), iwi and hapu can apply to establish such an area.

*Please note that these regulations within which mataitai can be established, are still to be fully implemented in this area. Iwi - through the Te Taihauauru Fisheries Forum - wish to work together to implement the regulations."*⁴²⁸

692. Dr Proctor⁴²⁹ spoke on behalf of the Te Tai Hauāuru Fisheries Forum (TTF), which was established through the development of the Fisheries Management Area 8 (FMA 8) in response to the Treaty of

⁴²⁶ Te Ohu Kaimoana Trustee Ltd submission, 28 January 2014.

⁴²⁷ Te Ohu Kaimoana Trustee Ltd submission, 28 January 2014.

⁴²⁸ Te Ohu Kaimoana Trustee Ltd submission, 28 January 2014.

⁴²⁹ Dr Proctor was accompanied by Mr Takarangi, President of Tanenuiarangi Manawatu Incorporated, a member of TTF, who assisted Dr Proctor with the preparation of his report.

Waitangi fisheries settlement and Māori Fisheries Act. He explained that TTF included all iwi from Taranaki to Porirua and its role was to:

“... provide a mechanism for iwi to engage with each other and the Ministry of Primary Industries in regard to commercial and customary fisheries issues.”⁴³⁰

693. As we understand it, TTR had engaged TTF to undertake a further cultural analysis of their activity in a manner that was more consistent with Māori decision-making principles and understanding of the marine and nearshore environment and the values tangata whenua hold to that area. In this regard, Dr Proctor stated:

“TTR and TTF have agreed that there is a distinct gap between the scientific understanding of the environment and the Māori values and understanding of that same environment. The western based scientific and environmental impact study will seek to determine individual effects in isolation of the environment as a whole, whereas from a Māori perspective the interactions, relationships and balance of the individual constituents can be more important to comprehend.”⁴³¹

694. He also stated that TTR’s approach to consultation differed from how TTF undertook consultation. Dr Proctor considered it did not allow TTF to gain a better understanding of the scientific data and how that dovetailed into mātauranga Māori, thus preventing them from making a fully informed decision and a suitable recommendation as to the activity proposed. We had also heard these same sentiments expressed by iwi on the marae earlier in the week.

695. Dr Proctor went on to state:

“Recognising that there is a gap between western science and matauranga Māori, the collective iwi within Te Tai Hauauru have attempted to bridge this gap ... This approach has involved hui with tangata tiaki and iwi based Māori scientists to compile iwi concerns and ask pertinent questions based on the cultural values from the impacted wider iwi community.”⁴³²

“Other common issues are related to the ability of iwi to exercise their customary rights and practices within the coastal environment and their role as kaitiaki or tangata tiaki ... Iwi expressed the desire to ensure that there was adequate resourcing and capability building within iwi to undertake this kaitiaki role.”⁴³³

“As part of our project, it is evident that naturally, the Te Tai Hauauru Fisheries Forum will be the kaitiaki committee in their preferred consent conditions.”⁴³⁴

696. In summary, the iwi of TTF are aware of the application and have undertaken a process and partnership with TTR to better understand mātauranga Māori and the cultural values associated with the coastline. It was envisaged from this process that well informed decisions could be made by iwi to

⁴³⁰ Page 2627 of the transcript, 2 May 2014.

⁴³¹ Page 2628 of the transcript, 2 May 2014.

⁴³² Page 2628 of the transcript, 2 May 2014.

⁴³³ Page 2631 of the transcript, 2 May 2014.

⁴³⁴ Page 2633 of the transcript, 2 May 2014.

ensure their connections to the area are not compromised. We commend the efforts of TTR and TTF to work together to assist iwi in better understanding the impact of the TTR project on iwi.

697. However, of significant concern to us was that the study being undertaken in relation to TTR's mining proposal was to be part of the assessment of its effects. As set out by Dr Proctor, the results of that study will not be available until well after our decision would have been released, stating "*Today we are only approximately 50 per cent away through this process.*"⁴³⁵ Accordingly, we are unable to give any weight to any possible findings, outcome or agreements reached (or not) between the parties. We are not able to determine what TTF's position may have been on the application if the report was completed or what response TTR may have taken to its results or outcome, for example, whether TTR would have offered any particular conditions of consent.

Findings

698. Overall, our findings are that there is more fishing activity in the STB than identified by TTR – commercially, recreationally and from a customary fisheries perspective. We do not find that there had been good communication between the parties. While we acknowledge the opinions of the experts in this field, we heard a lot of evidence from commercial and recreational fishers and their concerns about the impact mining may have. We cannot ignore what they have consistently told us, and we find that effects are at best uncertain. In this respect, we note the conditions proposed by the applicant to address the fisheries concerns (Environmental Performance Objectives and the Commercial Fisheries Communication and Management Plan.).
699. With respect to aquaculture, there are some potential risks from biosecurity issues, but we do not think there is a significant risk from the plume or to primary productivity. Had we granted consent, appropriate conditions could have been imposed.
700. We find there is considerable uncertainty with respect to customary fishing and the impact on iwi as the TTF report is not completed.

6.4 Recreation and tourism

The issues

701. The proposal has the potential to adversely affect the recreational and tourism opportunities in the STB. Recreation in terms of fishing and diving is addressed in the section on Fishing Interests.

The effects

702. Mr Greenaway, a recreational expert, was called by the applicant. His opinion was that the key recreation and tourism activities potentially affected by the proposal were:

"in offshore settings where there are likely to be changes to turbidity and water clarity levels and sediment deposition rates, resulting from the mining sediment plume. Inshore recreation settings

⁴³⁵ Page 2629 of the transcript, 2 May 2014 .

*are unlikely to be affected due to their distance from the mining site and naturally high background sediment levels. There are no effects on inshore surfing settings. Visual amenity effects from the shore are minimal.*⁴³⁶

703. He also stated that *“the mining site is infrequently visited by recreational anglers due to its distance offshore and the limited fishing resource at the mining site”*.⁴³⁷ This was disputed by a number of the recreational fishers and divers that appeared before us.

704. Mr Greenaway considered that the main recreation effect is on diving at the North and South Traps. He highlighted that adverse turbidity events will be limited to the periods when mining occurs in the eastern part of the mining area (so it is not a persistent effect) and may influence recreation satisfaction when water clarity would normally be extreme and when diving is marginal for crayfishing. Again, we address this in section 6.3.

705. Dr Fairgray for the EPA did not question the assessment of these effects but did raise concerns as to whether or not there is a sufficient recreation and tourism baseline information to assess the significance of such effects.⁴³⁸ We note that this matter was addressed at expert conferencing, and the experts provided further data to us. However, it was agreed that it is not sufficiently detailed to be used as a baseline against which effects of the proposal can be measured.⁴³⁹

706. The experts did agree a major oil spill or other disaster would have the potential to have significant adverse effects on coastal recreation and tourism and that direct effects specific to businesses and recreation groups could be identified at the time of the disaster.⁴⁴⁰

Potential effect on New Zealand international tourism reputation

707. Considerable concern was raised by a number of submitters, and particularly those submitters heard in Hamilton, about the impact of the TTR proposal on New Zealand’s international tourism reputation. As an example, Mr Citizen, a lecturer in Visual Arts at Wintec in Hamilton, provided evidence⁴⁴¹ that the proposed activity would affect New Zealand’s existing tourism interests as represented by the 100% Pure branding strategy and New Zealand’s ‘clean green’ image as a destination strategy.

708. Both Mr Greenaway and Ms Buchan for TTR considered that the proposal was unlikely to have any adverse effect on international tourism activity and brand value.⁴⁴² As set out in the applicant’s closing,⁴⁴³ this was for a number of reasons including the lack of any apparent international concern about seabed mining as an adverse effect on tourism, and the scale of effect of the seabed mining proposal was of insufficient status compared to other extractive industries, as well as significant international reputational values of New Zealand.

⁴³⁶ Paragraph 2, Statement of Evidence in Chief of Rob Greenaway on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

⁴³⁷ Paragraph 5, Statement of Summary Evidence of Rob Greenaway on behalf of Trans-Tasman Resources Ltd, 11 April 2014..

⁴³⁸ Page 2, Assessment of effects on recreation and tourism from the Trans-Tasman Resources marine consent application.

⁴³⁹ Paragraph 7, Joint Statement of Experts in the Field of Social, Recreation and Tourism Impacts.

⁴⁴⁰ Paragraph 8, Joint Statement of Experts in the Field of Social, Recreation and Tourism Impacts.

⁴⁴¹ Day 11 of the hearing – 8 April 2014 in Hamilton.

⁴⁴² Paragraphs 13 and 14, Joint Statement of Experts in the Field of Social, Recreation and Tourism Impacts.

⁴⁴³ Paragraph 371, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014.

709. Dr Fairgray's view was that Mr Greenaway's reports and statement did not offer sufficient evidence to support that claim and was based on opinion rather than assessment. It was his opinion that, in order to establish that there is "very limited potential for adverse effects on [New Zealand's] international tourism reputation",⁴⁴⁴ it would be necessary to identify the main components of that brand, identify what contributes to those components and establish that enabling seabed mining would not detract from that brand.⁴⁴⁵

710. Dr Fairgray, in questioning from TTR's legal counsel, stated:

"I have researched and identified that the 100% brand is extremely important to New Zealand. It's, I think, widely accepted and established. I have identified that there are various components to that brand as with any brand.

*I have identified that there is potential for an activity, such as seabed mining, to have an impact on that brand. I haven't taken the next step to say what that impact would be but certainly it's within my area of expertise to say there is potential for that activity to have an impact on that brand. I don't know what it is."*⁴⁴⁶

Findings

711. While we agree with the experts that the potential for the proposal to affect New Zealand's international tourism reputation is an unresolved issue, we think it unlikely that New Zealand's international reputation would be harmed provided the effects were as described by the applicant. As was agreed by all experts at expert conferencing, any effects of the proposal on New Zealand's tourism brand would be difficult to measure.⁴⁴⁷

6.5 Origin Energy Resources – Kupe Joint Venture Parties NZ (Kupe JVP)

The issue

712. Kupe JVP is an 'existing interest' and potentially affected by the proposal. Kupe JVP holds a Petroleum Mining Licence 38146 (PML 38146) and the rights and interests it gives Kupe JVP, together with the existing infrastructure established and operated under PML 38146. We understand from Mr Gardner-Hopkins, counsel for Kupe JVP, that about half of TTR's 66 km² marine consent application overlaps PML 38146. The marine consent area extends close (1.14 kilometres) to the existing Kupe platform and overlays an existing (capped) Kupe wellhead.⁴⁴⁸

⁴⁴⁴ Paragraph 23, Statement of Summary Evidence of Rob Greenaway on behalf of Trans-Tasman Resources Ltd, 11 April 2014.

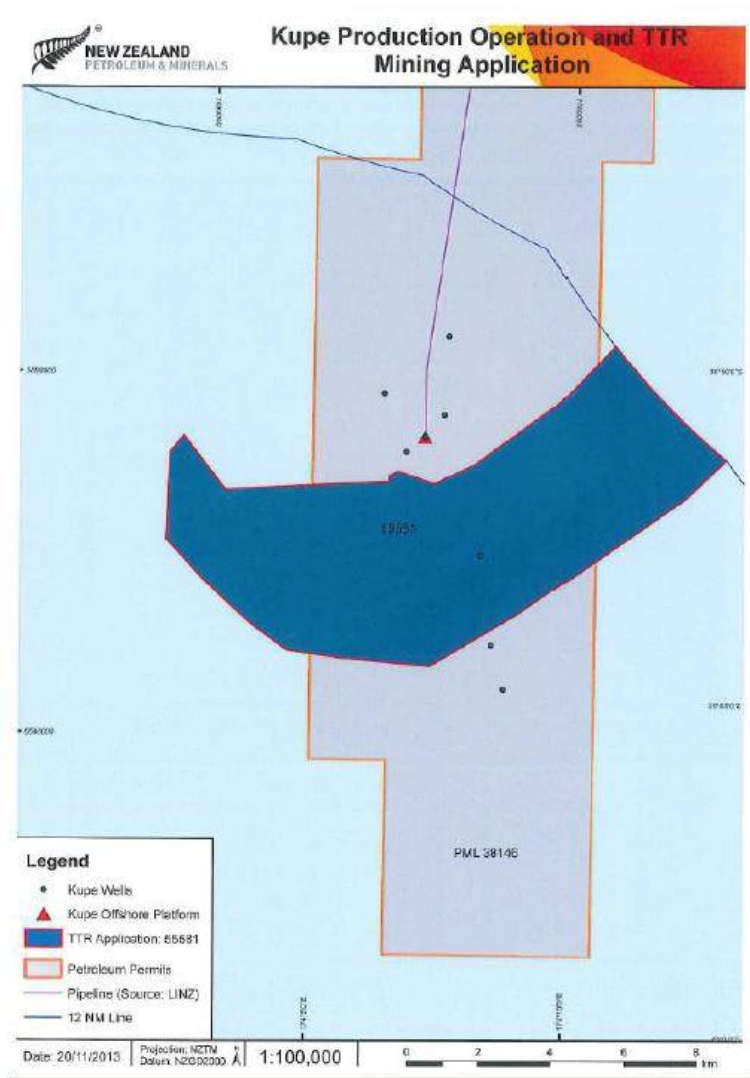
⁴⁴⁵ Paragraph 15, Joint Statement of Experts in the Field of Social, Recreation and Tourism Impacts.

⁴⁴⁶ Page 1686 of the transcript, 14 April 2014.

⁴⁴⁷ Paragraph 23, Joint Statement of Experts in the Field of Social, Recreation and Tourism Impacts.

⁴⁴⁸ Paragraph 1.4, Legal representations for Origin Energy Resources Kupe NZ Ltd on Behalf of the Kupe Joint Venture Parties, 16 April 2014.

Figure 10: Map showing the location of Kupe production operation and TTR's proposed mining area⁴⁴⁹



713. The Kupe platform, pipeline and umbilicals are 1.2 kilometres north-west of the TTR mining permit. This is high-value infrastructure supplying petroleum gas and liquids to processing facilities onshore.

714. Origin Energy Resources Kupe NZ on behalf of the Kupe Joint Venture Parties (JVP) advised the key risk areas⁴⁵⁰ where TTR's planned activities could have a significant adverse impact on the Kupe JVP are:

- heightened risk of a vessel colliding with the Kupe JVP assets
- risk of damage to the Kupe JVP infrastructure arising from altered seabed currents or seabed processes

⁴⁴⁹Appendix A, Representations for Origin Energy Resources Kupe NZ Ltd on behalf of the Kupe Venture Parties (16 April 2014)

⁴⁵⁰ Paragraph 6.2, Evidence of Anthony Bissell for Origin Energy Resources Kupe NZ Ltd on behalf of the Kupe Joint Venture Parties, 2 April 2014.

- impact on Kupe operations resulting from visibility issues associated with TTR sediment plumes
- encumbrances on future activities that the Kupe JVP will undertake within the area of its existing licence.

The effects

715. Mr Gardner-Hopkins outlined Kupe JVP's main concerns with the TTR proposal:⁴⁵¹

"(a) collision by TTR's vessels or crawler with the platform, umbilical or other infrastructure (potentially a low risk but a high -catastrophic - potential impact);

(b) loss of integrity of the existing infrastructure due to changes in the oceanographic environment resulting from the mining activities (there is a high risk that the undersea currents and wave velocities will be changed by TTR's mining);

(c) loss of visibility at the platform, umbilical and other existing infrastructure making it difficult to monitor or repair the infrastructure (visibility will inevitably be affected, and significantly - the issue is for how long/over what periods, and whether TTR can manage those effects so the Kupe JVPs can undertake their inspections and works as needed); and

(d) inability to develop and utilise the petroleum resource in the remainder of its permit area due to conflict with TTR activities (anew wellhead or platform cannot be drilled or developed in the same place that mining is occurring, and pipelines/umbilical cannot be laid where mining may yet occur (without preventing recovery of iron sands); there will also be significant additional costs associated with developing infrastructure on or in the seabed that has already been mined including in respect of the yet unknown consequences and effects of the mining and backfill operations)."

716. It was clear that TTR and Kupe JVP had discussed the proposal and attempted to reach an agreement (a cooperation plan). However, any agreement had not been finalised during the hearing. Due to this, Kupe JVP proposed a number of consent conditions to address its concerns.

717. Some of the conditions that had been proposed by Kupe JVP were acceptable to TTR (albeit TTR considered they were unnecessary), and these were included in the updated TTR proposed conditions. TTR's legal counsel in closing set out the terms and conditions of TTR's mining permit (MMP 55581) stating that the mining permit had been granted and contained obligations relevant to our consideration of this matter.

718. TTR received Minerals Mining Permit 55587⁴⁵² to mine for iron sand for 20 years on 2 May 2014,. Clauses 11–17 deal with interfaces between TTR and the Kupe permit holders in PML 38146:

"11. While conducting activities under the permit, the permit holder must not:

⁴⁵¹ Paragraph 3.1, Legal representations for Origin Energy Resources Kupe NZ Ltd on Behalf of the Kupe Joint Venture Parties, 16 April 2014.

⁴⁵² Conduct of Activities in the Permit Area, Minerals Mining Permit 55581, New Zealand Petroleum and Minerals, 2 May 2014

- (a) unreasonably interfere with or endanger operations under any existing licence or permit issued or maintained under the Continental Shelf Act 1964, Petroleum Act 1937 or Crown Minerals Act 1991;*
- (b) cause serious damage to any mineral, which is the subject of a licence or permit held by another person in the permit area;*
- (c) claim any mineral that the permit holder may discover while conducting operations under the permit, other than the minerals covered by the permit.*
12. *While conducting activities under the permit, the permit holder must consult and coordinate its activities with other users of the area for navigation and safety purposes.*
13. *Where the area of the permit overlaps with petroleum mining licence 38146 (PML 38146), the permit holder shall conduct its operations (including timing and location) in a manner that will reasonably enable the licensee of PML 38146 to undertake any activities authorised under PML 38146.*
14. *If given reasonable notice by the licensee of PML 38146, the permit holder shall conduct its operations (including timing and location) in a manner that will reasonably avoid, or minimise, any impact on visual clarity within the waters close to any infrastructure associated with PML 38146 so as to enable visual inspection of that infrastructure by the licensee of PML 38146.*
15. *The permit holder shall undertake regular monitoring, as appropriate, after the commencement of mining operations, to enable assessment of any adverse effect of mining on the infrastructure associated with PML 38146.*
16. *The permit holder shall, to the satisfaction of the Chief Executive, report annually on the monitoring undertaken in accordance with clause 15. The permit holder shall, if requested by the licensee of PML 38146, provide the licensee with copies of any monitoring report within a reasonable timeframe.*
17. *If a dispute arises in respect of conditions 11-16 then either the permit holder or the licensee of PML 38146 may refer the dispute to arbitration, as follows:*
- (a) The arbitrator shall be appointed by the permit holder and the licensee of PML 38146. If the permit holder and the licensee of PML 38146 are unable to agree on the appointment of an arbitrator within 5 working days of the referral of the dispute either party may request that an arbitrator be appointed by the President of the New Zealand Law Society (or his or her nominee);*
- (b) The arbitration shall be conducted in accordance with the Arbitration Act 1996. The decision of the arbitrator shall be final and binding on both parties to the arbitration.*
- (c) The place of arbitration shall be in Wellington, New Zealand."*

719. Mr Rennie stated that, *“The upshot of this is that you can be satisfied that the Kupe JVP’s interests are also being recognised and provided for in the Crown Minerals context by the terms of TTR’s permit.”*⁴⁵³

Findings

720. We generally agree with Mr Rennie’s conclusion, and had we granted consent, we would have amended the conditions having regard to the fact that the inter-relationship between the mining permit and the marine consent is largely dealt with via the Crown Minerals Permit conditions.

6.6 Marine traffic

The issues

721. The mining activity and its associated activities may impact on other marine traffic in the area.

The effects

722. Mr Barlow for TTR outlined in his evidence that the project area is removed from regular marine traffic routes, and the activities associated with the proposal should not be in conflict with other marine traffic in the area. He considered the project vessels will keep lookout, as required of any vessel, and alert any approaching vessels of the existence of the operations and request they keep clear. He did not anticipate there will be any effects on navigation.⁴⁵⁴

723. TTR had proposed to seek approval from Maritime New Zealand to establish an exclusion zone (or an equivalent) around the FPSO when anchored on the mine site to safeguard other ocean users, members of the public and project vessels from harm. We understand this was not possible. An alternative solution was a ‘safety zone’ around the FPSO to warn other ocean users of the hazards that may be present and requesting them to keep clear. This will be by means of a Notice to Mariners and Navigation Warning, which will be updated by TTR as the FPSO changes position.⁴⁵⁵

724. Mr Barlow considered that an exclusion or safety zone around the FPSO would be unlikely to affect recreational opportunities in the mining area. The Marine Traffic Study indicated that the area is very lightly used by any vessels.⁴⁵⁶

Proposed conditions

725. Proposed Condition 67 required the preparation of an Operational Manual and Safety Contingency Plan with the objective of ensuring navigational and maritime safety during project operations, minimising any interference with other non-mining-related vessels in the area and avoiding unplanned events. Moreover, proposed Condition 85 would have required the Commercial Fisheries Communication and Management to include a protocol for communication with local commercial fishers to keep fishers informed on a regularly updated basis of exclusion zones and vessel movements. These conditions

⁴⁵³ Paragraph 417, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014.

⁴⁵⁴ Paragraph 15, Statement of Evidence in Chief of Ray Barlow on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

⁴⁵⁵ Paragraph 16, Statement of Evidence in Chief of Ray Barlow on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

⁴⁵⁶ Paragraph 17, Statement of Evidence in Chief of Ray Barlow on behalf of Trans-Tasman Resources Ltd, 14 February 2014.

would have likely addressed any marine traffic existing interests. We also note that this issue is dealt with in more detail in section 5.10.

Finding

726. Our finding is that any effects are likely to no more than minor, and appropriate conditions had been proposed by TTR.

7. Economic benefits to New Zealand

7.1 The issue

727. We are required to take into account the economic benefit to New Zealand from this application (section 59(2)(f) of the EEZ Act). The applicant stated that *“The Project will create tangible economic benefits to NZ, including the creating of more than 250 jobs.”*⁴⁵⁷

7.2 The economic benefit

728. The applicant produced expert economic evidence from Dr Kaye-Blake from the New Zealand Institute of Economic Research (NZIER). His evidence was that NZIER had conducted an analysis of the economic impacts of the iron sands extraction project using a computable general equilibrium (CGE) model of the New Zealand economy.

729. He stated that CGE modelling is a well accepted method for analysing the impacts of specific projects or policies and reiterated the value of this model when he presented his evidence at the hearing. Accordingly, the positive economic benefits of the proposal had been determined based on the CGE model.

730. However, we note that the EPA’s expert Dr Denne (Covec) and KASM’s experts Mr Walter and Mr Ljubownlkow did not agree. We also note here that Mrs Pratt had strongly questioned the economic modelling and analysis of Dr Kaye-Blake, and her criticisms were fully addressed in the applicant’s closing statement.⁴⁵⁸

731. Dr Denne’s opinion was that a cost-benefit model was more appropriate in assessing the economic benefit of this proposal. In his review of the proposal,⁴⁵⁹ he raised areas of significant uncertainty, the main one being (at paragraph 27):

“the use of their [NZIER] own in-house CGE model for the analysis but without any verification of it. While we appreciate the theoretical reasons for using such a model, it provides little basis for certainty in the results. As noted previously, we are asked to take on trust that the model provides robust results, but this report provides no basis for drawing such a conclusion - it is a black-box.”

732. It was Dr Denne’s opinion that the only economic ‘factors’ that could reasonably be considered (as all the other factors were too uncertain) were tax and royalty payments to the New Zealand Government. These he opined would be in the range of \$50 million per year.

733. KASM’s experts agreed with this, but their concerns also included that the economic impact assessment did not consider potential negative effects on other interests such as tourism and fisheries. They argued that, to assess the true economic impact of the project, potential negative effects as well as

⁴⁵⁷ Page 15, Overall Evaluation – TTR Impact Assessment Summary, 21 October 2013.

⁴⁵⁸ Paragraphs 113–117, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014.

⁴⁵⁹ Review of report(s) by Covec for the Environmental Protection Authority, 16 December 2013.

input assumptions such as iron ore prices need to be included into the specifications of the model. They opined that, as this had not been done, the real effect on GDP might have been overestimated.

734. We return to this matter below as, based on the models discussed, the experts disagreed on the extent of the economic benefits that would be derived from this project should it eventuate but noting all the experts accepted there would be a net economic benefit to New Zealand.

735. Dr Kaye-Blake's analysis found that the TTR proposal would grow the New Zealand economy as follows:⁴⁶⁰

“(a) The Project would raise the level of exports by \$134m per year;

(b) Greater exports would increase Gross Domestic Product (GDP) by \$290m per year during the project;

(c) Included in this increased GDP are taxes and royalties to the New Zealand government from TTR, estimated at \$49m annually;

(d) Overall, government expenditure is estimated to be \$68m greater per year as a result of the project; and

(e) Household consumption – a measure of the welfare impacts of the project – would increase by \$111m per year.”

736. Dr Kaye-Blake also considered the regional impacts on Taranaki and stated that these were:

“(a) An increase in regional GDP of \$220m or 3% per year, including impacts on related sectors and the service sector; and

(b) An increase of employment of 200 jobs within TTR and an additional 160 jobs in the rest of the economy.”⁴⁶¹

737. With respect to the number of jobs that may be created, we note that the expert evidence of Ms Buchan who was commissioned by TTR to undertake an assessment of the social impacts (positive and negative) of the proposed project on local communities:

“As a result of the proposed roster system which will facilitate a fly-in fly-out/ drive in/drive out workforce, the estimated 258 workers are likely to reside across a large geographical area with the majority being based somewhere between Taranaki and Wellington.

Based on the workforce survey of one shift on the FPSO operating in Taranaki, we estimated that between 35 and 58 new jobs could be filled by people residing between Opunake and Whanganui City.

Since submitting my Evidence in Chief, I have been able to gain access to the data on the residential location of the full crew on the FPSO Umuroa. This data has caused me to reduce my

⁴⁶⁰ Statement of Evidence in Chief of Dr William Henry Kaye-Blake on behalf of Trans-Tasman Resources Ltd, 15 February 2014 (including the executive summary) and in his supplementary statement of evidence.

⁴⁶¹ Statement of Evidence in Chief of Dr William Henry Kaye-Blake on behalf of Trans-Tasman Resources Ltd, 15 February 2014 (including the executive summary) and in his supplementary statement of evidence.

*estimate for jobs potentially accruing to local residents to 23-57 workers with about 8 additional jobs filled by people living locally. If New Plymouth is included, the number of total jobs (on-shore and off-shore) potentially filled by people living in the local area is likely to be between 120 and 170. The proportion of local residents gaining employment could be increased by funding and other forms of pro-active support to facilitate access to relevant training and work experience prior to the commencement of the project.*⁴⁶²

738. While we accept that there will be jobs created by this proposal, it is not entirely clear how many there will be, how many will be based locally and what the spin off will be to the local, regional and national economy. We accept it will not be possible to precisely determine the number of jobs and where those taking up jobs will reside. The evidence of Ms Buchan highlights the uncertainties of the job creation benefits.

739. With respect to ecosystem services, Dr Kaye-Blake in his evidence stated that:

*"The area for the Project contributes few ecosystem services, using the Ecosystem Services framework. The services are mainly cultural ecosystem services such as tourism and recreation, sense of place, and aesthetic values. Total tourism represents around \$83m of the annual Taranaki economy; the minor effects of the Project would have minor (if any) effects on that value. The existence value of the beaches and coastal areas to Taranaki residents has not been measured, but the existence value of rivers to Cantabrians has been estimated at \$53 per household, and national spending on the environment has been estimated at about \$200 per person."*⁴⁶³

740. These values can be roughly compared by converting them all into dollars per person per year:⁴⁶⁴

Project GDP gain	\$2,727
Impact on tourism, some fraction of	\$755
Impact on environment	\$200
Impact on existence value	\$22

741. These figures and the approach, especially the relevance of the existence value of rivers to Cantabrians as a comparator, were questioned by the other economic experts. The KASM experts strongly disagreed and again stated that there was insufficient information on the adverse environmental effects to be able to state with any certainty what the costs would be. Dr Denne considered the approach 'acceptable' but did not agree with the dollar figures.

⁴⁶² Summary Statement of Evidence of Dianne Buchan on behalf of Trans-Tasman Resources Ltd, 11 April 2014.

⁴⁶³ Paragraph 5, Statement of Summary Evidence of Dr William Henry Kaye-Blake on behalf of Trans-Tasman Resources Ltd– 11 April 2014.

⁴⁶⁴ Paragraph 6, Statement of Summary Evidence of Dr William Henry Kaye-Blake on behalf of Trans-Tasman Resources Ltd– 11 April 2014.

Expert witness conferencing

742. As part of the hearings process, expert witnesses were requested to conference. The expert economic conference produced a joint witness statement on 25 March 2014. We found the joint witness statement particularly helpful in terms of determining what the economic benefits may be from an expert and lay-person perspective.

Commodity prices

743. It was agreed by the experts that there are three fundamental factors to consider for forward pricing of iron ore, being:

- hedging market
- cost of production
- consensus pricing.

744. They also agreed that:

- using a standard 8% New Zealand Treasury discount rate, uncertainty past 10 years will have a small impact on economic calculations
- there is a strong correlation between the price of iron ore and oil – therefore, as the price of oil goes up, so does the value of the iron sands commodity
- the estimates of costs of shipping and oil are realistic in that they have been obtained from the hedge markets and can be locked in for periods of up to 10 years.

745. The experts also agreed that the project will lead to taxes and royalty payments, which will be a minimum baseline estimate of welfare benefits to New Zealand, and that, in general, wider economic benefits result from higher wages, increased employment and spending and increased returns to capital.

746. We accept there will be additional economic benefits generated from the project including employment. The questions are what level are those benefits, how certain are they and what adverse economic effects may arise? The applicant's expert considered that the benefits to New Zealand could be significant. The EPA and KASM experts considered that the wider economic benefits from this project were too uncertain to be "*taken into account*". Also, there was no agreement about the adverse economic effects on other interests such as fisheries, tourism and recreational activities. While these have been addressed elsewhere in this decision, their 'economic value' has not been determined and therefore it is difficult to accurately determine the net economic benefit.

747. Dr Kaye-Blake and Dr Denne agreed that the economic value of the environmental impacts "*is at least an order of magnitude less as estimated by Dr Kaye-Blake*".⁴⁶⁵ The KASM experts disagreed on the basis that they believed there is insufficient information on environmental costs to support this statement.

748. Notwithstanding that the experts did not agree on all matters, they did agree there would overall be a net economic impact. They agreed that a "*cost benefit analysis was the best way to estimate the net*

⁴⁶⁵ Paragraph 41, Economic Statement of Experts in the Field of Economic Benefit to New Zealand, 25 March 2014.

*economic impacts*⁴⁶⁶ and “Under the baseline assumption the economic benefits of the project are estimated to be approximately \$50 million based on royalty and tax payments per annum”.⁴⁶⁷

749. We have not made a finding on this aspect, but even if we had agreed with Dr Kaye-Blake on all points, we still would not have granted consent because of the uncertainty of the environmental effects and those on existing interests.

7.3 Regional economy

750. We heard from a number of people, including the South Taranaki and Whanganui District Councils, Ngāti Ruanui and local commercial/recreational tourist operators. These submitters sought that, if the application was approved, there should be some regional economic benefit accruing to them as the activity was “in their back yard” and they were “taking the risks” of the proposal. The evidence was that this community actively seeks to make better use of its facilities, tackle unemployment and encourage new industry.

751. The economic analysis undertaken did not consider the benefits in the South Taranaki area. Given Ms Buchan’s evidence and the lack of analysis, it is not clear what level of benefits may have accrued. However, the applicant in response to this matter offered (as a condition of consent based on the Augier principle) the establishment of a community trust (TTR South Taranaki Community Trust), funded annually by TTR.⁴⁶⁸ The purpose of this Trust, as set out in the condition, would have been to provide benefit to the South Taranaki coastal communities between Opunake and Whanganui by financially supporting initiatives within the community. TTR considered this would recognise and provide assistance to these communities and of itself may also generate its own economic momentum and benefits.

752. Had consent been granted, we would have ‘accepted’ the concept of the Trust (given it was offered on an Augier basis) and also accept it would have gone some way to providing for the economic and social wellbeing for the local community.

7.4 Findings

753. Having considered the economic analysis provided and the potential adverse environmental effects and those on existing interests (set out elsewhere in this decision), we accept the findings of the expert economists that,

- under the baseline assumption, the economic benefits of the project to New Zealand are estimated to be approximately \$50 million based on royalty and tax payments per annum,
- other economic benefits may accrue from the project but they are less certain,
- the value of the potential adverse effects is difficult to quantify, and
- the project is likely to have a positive net economic benefit.

⁴⁶⁶ Paragraph 38, Economic Statement of Experts in the Field of Economic Benefit to New Zealand, 25 March 2014.

⁴⁶⁷ Paragraph 39, Economic Statement of Experts in the Field of Economic Benefit to New Zealand, 25 March 2014.

⁴⁶⁸ Proposed Conditions 32–40 of the 8 May 2014 version.

8. Coastal marine area management regime – the Resource Management Act 1991.

754. We are required to take into account the nature and effect of other marine management regimes (section 59(2)(h) of the EEZ Act). We have addressed these in other sections of this decision, but the RMA is a significant ‘other marine management regime’ as it is the predominant legislation governing the use, development and protection of the coastal marine area.⁴⁶⁹ Relevant subordinate statutory planning documents created under the RMA include the New Zealand Coastal Policy Statement (NZCPS), the Taranaki Regional Policy Statement (RPS) and the Taranaki Regional Coastal Plan (RCP). The RMA and its subordinate documents do not apply directly to the EEZ, and there is no requirement in the EEZ Act that we give effect to these documents when deciding marine consent applications. However, we make the following observations:

- (a) The proposed activity is to take place immediately adjacent to the coastal marine area, and many of the proposed activity’s effects will occur here; effects from the sediment plume being the most obvious example, and
- (b) The NZCPS, RPS and RCP give guidance as to the important values within the coastal marine area and how sustainable management (in the RMA sense of that term) is to be achieved and therefore it is appropriate for us to consider those documents.

755. We heard submissions from the applicant, EDS and KASM on the relevance of these RMA documents to our consideration of TTR’s proposal for consents to undertake activities within the EEZ. We also heard evidence on this topic, particularly from Ms Clarke, a planner for TTR,⁴⁷⁰ and Mr McLay, Director of Resource Management at the Taranaki Regional Council. We have not set out the provisions here, noting that they were quoted in the application documents, the evidence of Ms Clarke, legal submissions of EDS and in the Taranaki Regional Council’s submission.

756. The Taranaki Regional Council had lodged a submission to the application and had identified and assessed the policies relevant to the proposal. As set out in Mr McLay’s evidence, *“As outlined in the submission, it was determined that the application, at that point in time, was inconsistent with the majority of policies set out in the Regional Coastal Plan for Taranaki (RCP) and [the] New Zealand Coastal Policy Statement (NZCPS).”*⁴⁷¹

757. Mr McLay went on to say that *“TTR has provided further information that addresses most of the Council’s concerns, and therefore the policy matters, raised in the submissions ... The Council considers that the application of an adaptive management approach, provided it is robust, will ensure that unacceptable or irreversible adverse effects do not arise and therefore ensure consistency with the policies of the RCP and NZCPS.”*⁴⁷²

⁴⁶⁹ Section 7(2)(1) of the EEZ Act.

⁴⁷⁰ This largely related to activities that may occur in the coastal marine area.

⁴⁷¹ Paragraph 22, Statement of Evidence of Alan Douglas McLay on Behalf of Taranaki Regional Council, 2 April 2014.

⁴⁷² Paragraph 23, Statement of Evidence of Alan Douglas McLay on Behalf of Taranaki Regional Council, 2 April 2014.

758. In relation to Mr McLay's evidence, we asked him about the adaptive management approach, the question being, *"Is the corollary of that, is if an appropriate adaptive management system cannot be established, is it then your view that this application will be inconsistent with those documents?"* to which Mr McLay replied, "Yes".⁴⁷³
759. As we set out in the following section, we are not convinced that the adaptive management approach proposed by the applicant is appropriate or robust enough to ensure that the adverse effects of the proposal within the coastal marine area are avoided, remedied or mitigated. We also find that the extent of any adverse effects within the coastal marine area are uncertain due to the uncertainty of the information we have.
760. Given our findings summarised above and *"taking in account"* the RMA policy documents, we are not convinced that the proposal would satisfy the relevant policies of the New Zealand Coastal Policy Statement, the Regional Policy Statement or the Regional Coastal Plan so far as those documents apply to activities occurring in the coastal marine area. While that finding does not preclude us granting marine consents under the EEZ Act (since the RMA documents are not ones we need to give effect to under the EEZ Act), they provide important guidance as to whether the potential effects of the proposal, as mitigated, are acceptable in the marine environment.

⁴⁷³ Page 2342 of the transcript, 30 April 2014.

9. Uncertainty, conditions proposed by TTR and adaptive management

761. In this section, we address uncertainty, the conditions of consent proposed by the applicant and the adaptive management approach proposed by the applicant embodied in the conditions of consent.

9.1 Uncertainty

762. We have addressed all of the effects of the proposal above. It is clear to us, the applicant many of the submitters, and as addressed in the EPA second staff report there is considerable uncertainty as to the information we have received and as a consequence uncertainly as to the effects of the proposal.

763. In closing submissions, EDS stated:

*"It is unarguable that the information before the DMC is uncertain and inadequate. As a result 61(2) of the EEZ Act is triggered and the DMC must favour caution and environmental protection."*⁴⁷⁴

764. In this respect, Mr Enwright for EDS stated:

"...I think it is a remarkable feature of this case that you do not just have one area in which you do not have adequate information, it is a whole raft. And the proposed condition put forward by the EPA, I think, has a list from the A to R which is something like 19 if my maths is right, different areas where baseline monitoring is still required. We are not just talking about one issue. We are talking about, essentially, the whole shooting box. And even the draft consent conditions put forward by the applicant, Condition 9, have a very lengthy list of, 'well, we still have to do the baseline research for all of these different areas.'

*My submission: That is just not good enough, with the greatest of respect, and does mean you are faced an inadequate information scenario."*⁴⁷⁵

765. KASM in its closing submissions stated under the heading of 'Uncertainties in the Evidence':

*"The DMC will have to make a decision based on the inadequate information they have before them on the impacts of the proposed mining. This comes through most strongly in the evidence on the plume, on benthic effects and effects on marine mammals ... We agree with the advice in the 2nd Staff Report in paragraph 11 concerning uncertainties in the evidence"*⁴⁷⁶

766. The second EPA staff report stated at paragraph 11 the following:

"The EPA staff agree with submitters to the application that, notwithstanding the further information provided in response to the EPA's requests, the application continues to leave uncertainty about the effects the proposed activities might have on the environment. Many of the effects of the proposed activities cannot be accurately evaluated until after baseline monitoring proposed by TTR has occurred. Particular comments of submitters are discussed in detail in section 3 of this report.

⁴⁷⁴ Paragraph 34, Closing Submissions of Counsel for Environmental Defence Society Inc (EDS), 7 May 2014

⁴⁷⁵ Page 2811 of the transcript, 7 May 2014.

⁴⁷⁶ Paragraph 26 Closing Submissions by KASM, 6 May 2014.

*If the DMC agrees that there remains uncertainty about the effects of the proposed activities, the DMC is required under s 61(2) of the Act to favour caution and environmental protection.*⁴⁷⁷

767. Mr Venus, TTR's expert planning witness stated in his summary to his evidence in chief that:

*"Most submitters, the Joint Witness Statements, TTR's witnesses and the application supporting material agree that there is uncertainty associated with the information provided by TTR in relation to the Project."*⁴⁷⁸

768. TTR in its closing submissions also accepts there is uncertainty and stated:

*"TTR acknowledges the reality that with a predicative exercise such as this, in a dynamic environment subject to an array of natural processes, uncertainty is inevitable ... It must not, however, be confused with an acceptance that the level of uncertainty is material to the extent it calls into question whether or not consent should be granted."*⁴⁷⁹

769. However, in this respect. TTR's closing also stated:

*"An applicant needs to present an application which is sufficient to persuade the consenting authority; not an application which achieves scientific certainty on every issue ... You must be careful to not to set information expectations unrealistically high, particularly when dealing with what are anticipated to be relatively minor and reversible effects."*⁴⁸⁰

*"...We submit this because the evidence is clear that apart from effects at the mining site and within 10 kms of the operational area, the effects of the project are no more than minor. This is reflected in TTR's proposed environmental objectives."*⁴⁸¹

770. As has been well canvassed and accepted by the parties and by us, there is uncertainty with the information (including the evidence). Some parties also consider that the information was inadequate, particularly in terms of the lack of baseline monitoring on which to base the assessment of effects (by the various experts).

771. We address below the degree of uncertainty, the potential (and in particular the unknown) scale of the potential effects, whether they will be (or can be) appropriately avoided, remedied or mitigated by the conditions proposed by TTR and whether an appropriate adaptive management regime has been proposed.

772. We also record that there was a lack of clarity, about some aspects of the mining operation itself. We accept an operation such as this, and in the environment it in which it would operate, will not have all the operational requirements 'locked down' at the planning stage. However, it would have assisted us and given us greater confidence had the applicant been able to provide us with greater operational detail.

⁴⁷⁷ Paragraph 11, Second EPA staff report, 4 May 2014

⁴⁷⁸ Paragraph 3, Summary Statement of Evidence of Garry Venus on behalf of Trans-Tasman Resources Ltd.

⁴⁷⁹ Paragraph 16, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014.

⁴⁸⁰ Paragraph 12, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014.

⁴⁸¹ Paragraph 15, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014.

773. Overall, it is our finding that the information we have to make our decision on is, at various levels, both uncertain and inadequate. This is one of the main reasons why consent has been refused. We set this out below.

9.2 Section 61 – Information principles

774. As set out in section 3 of our decision, section 61(2) states: *“If, in relation to making a decision under this Act, the information is uncertain or inadequate, the EPA must favour caution and environmental protection.”* Given our findings above, we accept we must favour caution and environmental protection.

775. Section 61(2) is an important section of the EEZ Act and a significant difference from the RMA. Caution and environmental protection are specifically stated and is a ‘lens’ through which we must view the proposal to determine if it meets the purpose of the Act (section 10).

776. If we were to otherwise refuse consent due to favouring caution and environmental protection, we must first consider *“whether taking an adaptive management approach would allow the activity to be undertaken”* (section 61(3)).

9.3 Proposed conditions of consent

777. Before specifically turning to the issue of adaptive management, we have addressed the proposed conditions of consent from an ‘overview’ perspective as well as addressing our concerns about a number of the specific conditions, particularly in relation to existing interests, and if they might avoid, remedy or mitigate the adverse effects.

Overview

778. Section 63 – Conditions of marine consents of the Act states at subsection (1):

“The Environmental Protection Authority may grant a marine consent on any condition that it considers appropriate to deal with adverse effects of the activity authorised by the consent on the environment or existing interests.”

779. Also, section 59(2)(j) requires us to take into account:

“The extent to which imposing conditions under section 63 might avoid, remedy, or mitigate the adverse effects of the activity.”

780. We accept we have wide discretion in terms of imposing conditions on marine consents and have carefully considered those proposed by the applicant, as well as those from a number of submitters and the EPA officers. However, we record here that, in favouring caution and environmental protection, we are not convinced that the conditions proposed by TTR would overall avoid, remedy or mitigate the potential adverse effects of the proposal, recognising that the number and scale of adverse effects is uncertain because of the level of uncertainty in the information provided by the applicant.

781. As part of the application, TTR offered conditions of consent that it considered would appropriately ‘manage’ any adverse effects of the proposal and provide for adaptive management. ‘Updated’ and more comprehensive conditions were progressively offered throughout the hearing, including those in the

application itself (Section 16 – Consent Condition Framework – page 311 of the application), at the opening of the hearing (Conditions dated February 2014), those attached to the Joint Witness Statement of the Mitigation Experts (March 2014), when Mr Venus presented his evidence to the hearing (Conditions dated 15 April 2014), and finally a revised set was provided with the closing submissions on 8 May 2014 (Conditions dated 8 May 2014). All of the versions, other than those provided with the closing submissions, were commented on by a number of the submitters and the EPA staff.

782. There was much criticism from a number of submitters about the way in which they ‘perceived’ the hearing was being used by the application to ‘develop’ the TTR case as evidenced by the ongoing updating of the proposed consent conditions. This was probably best summed up by Ms Jamieson, Counsel for the Director-General of Conservation (DOC), in her cross-examination of Mr Venus:⁴⁸²

“Ms Jamieson: Now, looking back over the evolution of conditions that we have just outlined. I put it to you that without a clear indication of what has been proposed by TTR, discussion about conditions during the course of this hearing has proceeded in somewhat of a vacuum.

Mr Venus: Well, discussion has proceeded leading on from the Joint Witness Statement. A draft has been worked on. And I have been talking to Mr Witte in terms of the wording of those conditions.

Ms Jamieson: But the first statement that the decision making committee and submitters collectively have got about the TTR proposed conditions and any form that TTR was prepared to put its name too, without a qualifier, came yesterday. Didn’t it?

Ms Jamieson: I guess my point ... is that we have started from an incredibly low base in terms of the submission that were submitted as part of the impact assessment.”⁴⁸³

783. We agree that the proposed conditions have significantly ‘developed’ over the course of the hearing. Some degree of development and refinement of conditions is not unusual and is to be expected as an applicant responds to matters raised by submitters. However, we were surprised by the extent of the changes made throughout the hearing and particularly with the ‘final’ set provided with the closing submissions on 8 May 2014. We were concerned about their evidential base and if they could actually and reasonably be achieved and monitored.

784. With respect to the final set of proposed conditions, we note that the applicant’s legal counsel suggested that we may wish not to close the hearing but adjourn so that we could better understand the conditions proposed and seek any clarification or other information if we needed to. We note here that no party was able to comment on the final set of draft conditions. The comments in the second EPA staff report and the comments from submitters on that report were all based on the 15 April 2014 set of conditions attached to Mr Venus’s evidence.

⁴⁸² Page 1904 of the transcript, 15 April 2014.

⁴⁸³ Pages 1902–1904 of the transcript, 15 April 2014.

785. Having adjourned the hearing, we took some time (closing the hearing on 19 May 2014) to carefully consider the proposed conditions (and all of the information we received in the final week of the hearing) and whether we needed any further information from the applicant. We also considered whether, if we sought further advice or clarification from the applicant, we would need to invite comments from other parties.

786. It was our view that we would have needed to seek a significant amount of further information and that we would have required the opportunity for all other parties to be able to respond and provide further information (and potentially evidence). We determined that this was not appropriate given the timeframes set out in the EEZ Act for the processing of applications. Further, we have accepted the applicant's submissions that we have before us all the information we need to make a decision. In this regard, we note the following comments from the applicant's closing submissions:

"The DMC has had the benefit of hearings conducted over a period of 28 days, at Wellington, Hamilton, Pariroa Marae, Whanganui, and New Plymouth. From these and the information filed in writing, the DMC is fully informed. [emphasis added]

The application and impact assessment comprise some 450 pages and are accompanied by 40 technical reports. TTR spent in the order of \$8m preparing this application and the accompanying studies (excluding the costs of this hearing). This represents a very high level of research and investigation into the use of known and proven technologies in this project. In many ways the fact that TTR is committed to proceed, is able to obtain funding, accepts the risks of the venture, and has applied for this consent is the plainest evidence of the maturity of the project and the validity of its design.

The EPA has commissioned technical and peer reviews of the applicant's materials from experts in the fields of the physical environment, noise, air emissions, benthic ecology, marine mammals and fish, birds, commercial fisheries, economic impacts, recreation, and navigation. These provide independent validation of the key design elements in TTR's application.

*You can and should be satisfied that you have had the benefit of both the best available and more than sufficient information to assist you with your decision."*⁴⁸⁴

787. Moreover, as opined by many of the submitters, TTR was in control of when it lodged their application. Many submitters considered that the application was premature and that more baseline monitoring and consultation/engagement (particularly with iwi and the Fishing Interests) should have been done to better 'inform' the likely or potential effects that might arise from the proposal.

788. We accept the applicant has been working on its proposal for over seven years and has spent in the order of eight million dollars (excluding the cost of this hearing) on this consent application. Given that level of investment and the timeframe over which the project has developed, we can only speculate as to why the applicant did not think it necessary, or at least prudent, to undertake the two years of baseline monitoring so that it could be more certain of the baseline environment, be better informed to understand

⁴⁸⁴ Paragraphs 8, 9, 10 and 12 respectively, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014.

the potential effects of the project and be better able to propose robust, quantitative environmental performance standards.

789. Given all of the above, we determined that we needed to make a decision based on the information we had received up to and including the applicant's closing.
790. We have addressed in the section on the effects, where appropriate, the conditions proposed by TTR and whether they might avoid, remedy or mitigate any adverse effects. We also address the conditions below in setting out our finding on whether the applicant's proposed adaptive management regime is appropriate.

9.4 Adaptive management

791. As required by section 61(3) of the EEZ Act, if we were to otherwise refuse consent due to favouring caution and environmental protection, we must first consider "*whether taking an adaptive management approach would allow the activity to be undertaken*". We address this below.
792. The EEZ Act 'defines' what adaptive management may include. Section 64 states:
- "Adaptive management approach*
- (1) The Environmental Protection Authority may incorporate an adaptive management approach into a marine consent granted for an activity.*
- (2) An adaptive management approach includes—*
- (a) allowing an activity to commence on a small scale or for a short period so that its effects on the environment and existing interests can be monitored;*
- (b) any other approach that allows an activity to be undertaken so that its effects can be assessed and the activity discontinued, or continued with or without amendment, on the basis of those effects."*

793. We note in opening submissions by the applicant it was stated that:⁴⁸⁵

"The key requirements for an adaptive management plan approach are:

- (a) Setting clear, reasonably certain and enforceable objectives;*
- (b) Conditions containing quantifiable standards and performance criteria against which proposed management plans can be assessed and subsequent operation of the management plans measured (with others aspects of management plans potentially elevated to conditions including for transparency reasons and ease of enforcement);*
- (c) Providing for the collection of baseline knowledge/detailed pre-construction monitoring to establish the existing state of the environment upon which management plans can build in an on-going and cyclical process;*

⁴⁸⁵ Paragraph 107, Opening Representations on behalf of Trans-Tasman Resources Ltd, 10 March 2014.

(d) Transparent disclosure of any effects so that the consent authority can ensure steps are taken before significant adverse effects eventuate;

(e) Detailed implementation plans and monitoring regime contained within an EMP (provided the general content and objectives of these are specified in conditions of consent); and

(f) Mechanisms to review and update the EMP if this is required, as the monitoring feedback is available.” [emphasis added]

794. The applicant advised us that the ‘package’ of proposed consent conditions provided for an appropriate adaptive management approach (a risk-based tiered approach) such that the mining activity should be enabled. TTR was very clear that it was not proposing an approach that would enable the activity *“to commence on a small scale or for a short period so that its effects on the environment and existing interests can be monitored”*. They said a condition or an imposed approach such as this would be tantamount to either refusing consent or imposing conditions that would essentially frustrate any consent.

795. We understand TTR’s reasoning for this. TTR considers that they have ‘done enough’ to obtain a full consent based on the ‘adaptive management’ approach it has proposed and that TTR requires ‘investment certainty’ due to the large capital investment required to undertake the activity. TTR says that its project is not feasible if they are required to develop it in stages with no certainty that the overall project (i.e. the full project area for the full term of the consent) will be approved. We accept this is the position. We have therefore not considered *“a small scale or for a short period”* approach but note that this may have been able to ‘overcome’ many of the uncertainties associated with the proposed activity.

796. The approach TTR sought was set out in proposed Condition 9 (8 May 2014 version):

“Management of Environmental Effects

The consent holder shall manage the environmental effects of activities authorised under this consent using a risk-based, tiered approach, based on the following:

a) Specification of qualitative environmental performance objectives associated with the consented activities (as set out in Condition 10);

b) Pre-operational Baseline monitoring to establish a statistically robust description of the natural variability of key potential receptors (as set out in Condition 110);

c) Develop quantitative measures for relevant physical and biological indicators, as “trigger indicators or values” to inform compliance with environmental performance objectives, relative to the baseline environment (as set out in Conditions 11 and 12);

d) Operational monitoring to establish whether or not trigger indicators and values are being met (as set out in Condition 200);

e) Adaptively managing operations to ensure that the identified environmental performance objectives are achieved; and

f) Review of the trigger indicators and values to ensure that trigger indicators and values are appropriate in relation to achieving environmental performance objectives (as set out in Condition 215).

797. Conceptually we agree that this could be an appropriate adaptive management framework and one envisaged by section 64(2)(b) of the EEZ Act. However, its applicability will be fact specific. It is a departure from the approach TTR proposed at the commencement of the hearing. At that stage, the expectation was that considerably more quantitative detail would be added to the consent conditions. In this case, we do not find that what the applicant has finally put forward would provide an appropriate adaptive management regime to ensure that the potential adverse effects are avoided, remedied or mitigated.

798. During the hearing, the Supreme Court released its decision on *Sustain our Sounds v King Salmon* (SOS v King Salmon), a case decided under the RMA.⁴⁸⁶ Amongst other things SOS v King Salmon addressed the requirements for 'adaptive management'. A number of parties, including the applicant, KASM, DOC and EDS cited this decision and suggested we apply it given that it was decision of the Supreme Court, was recent, was 'on point' and was a case involving the application of the NZCPS precautionary policy. We agree and have set out our findings in relation to TTR's application and the adaptive management regime proposed.

799. The Supreme Court set out the tests to be applied in determining whether an adaptive management approach is appropriate. The Court found that it depended on an assessment of the following four factors:

- The extent of the environmental risk (including the gravity of the consequences if the risk is realised).
- The importance of the activity (which could in some circumstances be an activity it is hoped will protect the environment).
- The degree of uncertainty.
- The extent to which an adaptive management approach will sufficiently diminish the risk and the uncertainty.

800. In relation to the first bullet point we have set out the effects and the risks earlier in this decision. Without repeating them here, we have found there is considerable uncertainty and that some of the effects from the proposal have the potential to be more than minor. This is largely due to the lack of baseline monitoring and 'real data' as opposed to modelled information – that is, 'we do not know'. Given this and the range of effects that may be created, it is not possible to determine the environmental risk, especially over a 20-year timescale. We accept that if the mining stopped the plume would dissipate within a short timeframe. Experts opined that mined areas would recover within a decade. However, we are not confident if the effects that have already occurred will have been significant and/or irreversible.

801. With respect to the importance of the activity, we accept that the activity is important to TTR, but that is not what the Supreme Court is getting at. The mining proposal will provide economic benefit to New

⁴⁸⁶ *Sustain our Sounds Incorporated v New Zealand King Salmon Company Ltd* [2014] NZSC 40.

Zealand, although we have noted there are some uncertainties as to the size of that benefit. There are also likely to be some local/regional benefits of a smaller scale. Overall, we have concluded that while the proposal will have economic benefits these are not 'must have' benefits that make it a truly important activity.

802. In terms of the degree of uncertainty, we have already addressed this at some length and do not repeat that here. Accordingly, we find the most significant issue to address further here is the extent to which an adaptive management approach will sufficiently diminish the risk and the uncertainty.

803. Of relevance to this is what the Supreme Court stated at [133] being that, before endorsing an adaptive management approach in that case, it would have to be satisfied that:

- (a) there will be good baseline information about the receiving environment*
- (b) the conditions provide for effective monitoring of adverse effects using appropriate indicators*
- (c) thresholds are set to trigger remedial action before the effects become overly damaging*
- (d) effects that might arise can be remedied before they become irreversible.*

804. We find that the criteria set out by the Supreme Court are applicable to this proposal.

805. The Court also said at [125]:

"As to the threshold question of whether an adaptive management regime can even be considered, there must be an adequate evidential foundation to have reasonable assurance that the adaptive management approach will achieve its goals of sufficiently reducing uncertainty and adequately managing any remaining risk. The threshold question is an important step and must always be considered. As Preston CJ said in Newcastle, adaptive management is not a "suck it and see" approach." [emphasis added]

806. Before addressing the questions posed above, we set out below our concern about the process, robustness and certainty with respect to the conditions of consent proposed by the applicant.

807. As part of the Joint Witness Statement of Experts in the Field of Mitigation, the experts agreed and attached Schedule 1 Environmental Objectives and Trigger Levels, and stated:

"The mitigation of effects expert conference endorses the following table approach as promoted by Mr Venus, and suggests that when the relevant technical experts are presenting, the DMC requests those experts to focus on this table and advise on appropriate compliance and threshold trigger technical values." [emphasis added]

808. The heading of Schedule 1 stated:

"Schedule 1: The following trigger levels will be assessed according to methodology defined in the EMMP. Exceedance of specified management trigger values as specified will initiate a management response as defined in the EMMP....TO BE COMPLETED"

809. It was clearly envisaged that the other experts would be able to establish (for the most part) quantitative triggers that would be specified in the Schedule. This would form part of the 'adaptive management' regime and provide specificity enabling the identification of exceedance of the

management trigger values and the ability to initiate a management response as defined in the Environmental Management and Monitoring Plan.

810. This Schedule was not carried over in the draft set of conditions proposed by Mr Venus when he presented his evidence (the 15 April 2014 version).

811. Mr Venus stated in his Summary Statement of Evidence (14 April 2014):

*"The attached recommended conditions set out a range of qualitative environmental performance objectives in Condition 9. These objectives are generally framed in terms of whether effects shall be "no more than minor", "minor", "moderate" or "significant", with associated spatial limits. Use of qualitative objectives in this way is consistent with the RMA consenting approach followed for other marine development projects with which I have been involved, particularly the Crest Energy Marine Turbine project in the Kaipara Harbour."*⁴⁸⁷

812. He then set out that the recommended conditions provided for the development of environmental performance triggers as follows:

"10. The Consent Holder shall use data from baseline monitoring to establish trigger indicators and values which if exceeded will require an adaptive management response to ensure that the environmental performance objectives referred to in Condition 9 are achieved. These trigger indicators and values shall be prepared in accordance with Conditions 11, 44(b) and 85(d) of this consent, and shall be subject to approval by the EPA.

*11. Trigger indicators and values established pursuant to Condition 10 shall be developed in terms of two tiers comprising an "alert" level which triggers increased management attention, and a maximum "compliance" level which indicates potential enforcement action."*⁴⁸⁸

813. Mr Venus then opined that:

*"the development of trigger values based on baseline monitoring in this manner is commonly used in large scale marine projects. For example it was an underpinning basis for the adaptive management approach adopted in consents granted by the Environment Court for the Crest Energy Kaipara Harbour marine turbine project noted above, it was an integral part of consenting for the Australian Wheatstone project and it is one of the approaches advocated by the US EPA in relation to developing suspended sediment water quality criteria."*⁴⁸⁹

814. In questioning Mr Venus, Mr Christensen asked: "Were you surprised, given where you and your planning colleagues got to in the joint witness statement, were you surprised at the lack of quantitative information that came out of the other conferences to inform the table [schedule 1] that you had proposed?"

"Mr Venus: Yes I was. I was anticipating in the joint witness statements that we'd be able to come up with some quantitative units. But actually, I guess, having sat through the all the other witness

487 Paragraph 29, Summary Statement of Evidence of Garry Venus on behalf of Trans-Tasman Resources Ltd.

488 Paragraph 30, Summary Statement of Evidence of Garry Venus on behalf of Trans-Tasman Resources Ltd.

489 Paragraph 31, Summary Statement of Evidence of Garry Venus on behalf of Trans-Tasman Resources Ltd.

*statements, the realisation that whilst the experts could make a conclusion about a level of likely effect, to actually there was a need to collect specific seasonal baseline information if you like, to actually come up with a quantitative number.*⁴⁹⁰

Mr Christensen: And that means that the position that we're in now is less than ideal

*Mr Venus: I think in terms of your situation, firstly in terms of the objectives I think you can do that because that's setting the objective in terms of the values that you are perceiving for the environment, in terms of setting the numerical numbers, I think that if you are setting those specific objectives you are at a slight disadvantage in respect of handing off the definition of the quantitative triggers to another party, but I think and that is really what comes back to the importance of that technical peer review group and the involvement of the EPA and the other parties in developing those quantitative triggers.*⁴⁹¹

815. Ms Wratt posed a similar line of questioning regarding the extent of specificity that may be able to be obtained with respect to the triggers.

"Ms Wratt: You are saying you do not think that would be helped at this stage by trying to give some more specific qualitative measures?"

*Mr Venus: No, I think the guidance would come from the environmental objectives and then in terms of the benthic sampling, then there is a list of issues here that need to be addressed, that should be addressed for the benthic sampling. That is condition 79A in the conditions.*⁴⁹²

"Ms Wratt: I am certainly not saying you should not be doing that, I guess I am saying in addition to that it would be good to have some more specific qualitative measures.

Mr Venus: Yes.

Ms Wratt: You are saying yes?

*Mr Venus: I'm saying it would be good.*⁴⁹³

816. The reason for setting out the above in some detail is that, at this point, the adaptive management approach changed from one of having quantitative triggers specified to one where a 'process' was prescribed to enable the establishment of those triggers (as set out in proposed condition 9 above). This also meant the Environmental Performance Objectives (proposed Condition 10 – 8 May version) 'took on' a greater significance as they become the 'cornerstone pillars' of the adaptive management approach. That is Condition 9 (8 May version) requires:

"Develop quantitative measures for relevant physical and biological indicators, as "trigger indicators or values" to inform compliance with environmental performance objectives, relative to the baseline environment (as set out in Conditions 11 and 12)." [emphasis added]

⁴⁹⁰ Page 1940 of the transcript, 15 April 2014.

⁴⁹¹ Page 1941 of the transcript, 15 April 2014.

⁴⁹² Page 1945 of the transcript, 15 April 2014.

⁴⁹³ Page 1947 of the transcript, 15 April 2014.

817. We now turn to whether the package of conditions proposed is an appropriate 'adaptive management' approach that in this case would allow the activity to be undertaken given the requirement to favour caution and environmental protection and the extent to which these conditions might avoid, remedy or mitigate the adverse effects of the activity. We firstly address the Environmental Performance Objectives and then the questions posed earlier to the extent they are relevant.

Environmental Performance Objectives

818. The Environmental Performance Objectives are critical in our view to determining if the 'package of controls' are appropriate for the application to meet the purpose of the EEZ Act.

819. This is because they are the foundation pillars of the entire proposal given that quantitative trigger values have not been established and that they would ultimately need to 'comply' (or meet) Environmental Performance Objectives.

820. We were concerned that the Environmental Performance Objectives proposed in the 15 April version of the conditions were very 'general' and 'non-specific'. Our view at that time accords with that reflected in the second EPA report, where it was stated:

"In some Resource Management Act 1991 circumstances, where compliance thresholds for a proposal have been unable to be identified due to ecological or technological uncertainty, it has been held appropriate to consent an activity by setting qualitative objectives in conditions to be supplemented by quantitative compliance thresholds developed out of baseline monitoring after the consent has been granted. Compliance with the quantitative limits (once they have been set) indicates that the objectives have been attained. The quantitative thresholds may be further refined on the basis of additional information obtained by monitoring once the activity has commenced. Such an approach is evident in the King Salmon consents.

TTR's proposed approach broadly resembles the above description, but in at least two critical respects, significant uncertainty remains:

- *A comparatively large number of effects of the proposal cannot have quantitative environmental standards prescribed at this time. This breadth is evident from the range of matters described in qualitative terms in TTR's proposed Condition 9 (as proposed on 15 April). The extent of uncertainty represented by the number and variety of effects that have had to be described in qualitative terms appears unlike other situations in which an adaptive management approach has been used.*
- *There are no prescribed processes to be followed in the event of a quantitative threshold being exceeded. Rather, it is left for the proposed EMMP to determine TTR's approach to adaptively manage activities at that stage.*

The EPA staff are concerned that these matters lead to an inappropriate level of reliance being placed upon the EPA's certification or approval of the EMMP to 'fill the gaps' to enable consent to

*be granted. We believe the degree of uncertainty is too great to be satisfactorily addressed through the EPA certifying the EMMP at a later date.*⁴⁹⁴

821. We accept that Environmental Performance Objectives have changed and improved as reflected in the 8 May 2014 version of the conditions. However, our concerns about the specificity of some of those objectives remain. While we accept that the term ‘no more than minor’ may in some cases be acceptable and may reasonably be ‘judged’ by the chief executive officer of the EPA, the terms ‘no more than moderate’, ‘moderate impacts’ or ‘no more than moderate and temporary adverse effects’ are too vague or not able to be consistently interpreted. In this respect, we are concerned how these could be reasonably translated into trigger values by a third party. We are also conscious that little baseline monitoring has been done to assist in ‘giving some confidence’ that the objectives are in fact realistic and achievable.⁴⁹⁵ We needed to have evidence on these matters at this stage of the process.

822. The objectives relating to benthic communities, marine mammals and seabirds have been substantially redrafted (Condition 10(f), (i) and (k) respectively). We note that these were the objectives that were of particular concern to the Director-General of Conservation (as well as the sediment plume). Ms Jamieson in her closing statement on 7 May 2014 considered that the “*extensive reliance on terms such as no more than minor, is problematic*”.⁴⁹⁶ In an attempt to provide ‘better’ examples of objectives that may be appropriate, Ms Jamieson on behalf of the Director-General of Conservation provided more detailed objectives relating to benthic communities, marine mammals and sea birds.⁴⁹⁷

823. These were largely adopted by TTR in their final set of conditions provided to us (8 May 2014). These were cited as examples where the objectives were now more ‘specific and certain’. However, as we have noted earlier, Ms Jamieson on behalf of the Director-General of Conservation stated:

*“In respect of the benthic environment objectives, the identified objectives set out in Attachment 3 can only be described as preliminary. The benthic ecology identified objectives are therefore presented as an example of the sort of matters the Director-General anticipated being included in objectives. They could not be endorsed without further consideration and technical input.”*⁴⁹⁸
[emphasis added]

824. We also note Ms Jamieson’s comments on this matter when the applicant was presenting their closing submissions. Mr Beatson said, “*So if you look at [condition] 10(f)(6) and that is picking up it is one of the Department of Conservation’s recommendations.*”

825. Ms Jamieson stated at this point, “*We recommend that the objectives and changes here, I am sorry but it is important that you understand that, we put them forward to you as examples of what might be*

⁴⁹⁴ Paragraphs 21, 22 and 23 of the Second EPA Staff Report, 4 May 2014,

⁴⁹⁵ TTR proposes that baseline monitoring is undertaken for at least 2 years in advance of any mining activity to determine variability, both spatially and temporally, of the background environment. During this time, TTR proposes to develop the threshold and response mechanisms to be included in the Environmental Monitoring and Management Plan.

⁴⁹⁶ Paragraph 27, Closing Submissions on Behalf of the Director-General Of Conservation, 7 May 2014.

⁴⁹⁷ Attachment 3 to the Memorandum on Behalf of the Director-General of Conservation dated 6 May 2014.

⁴⁹⁸ Ibid,

*possible, but we did not recommend the change. So just in case there was any misunderstanding about that.”*⁴⁹⁹

826. As an example of the changes made to the Environmental Performance Objectives, we set the one relating to primary productivity. Proposed Condition 10 – Environmental Performance Objective (f)(vi) in relation to primary productivity (8 May version) is *“that there be no change in water column primary production and total primary production due to mining activity beyond the background natural interannual variability as assessed by baseline and operational monitoring of chlorophyll-a”*.
827. As set out in the section on primary productivity, we are not convinced that this objective aligns with a less than minor environmental impact as the sediment plume will be a constant addition to the water column, and while chlorophyll-a may remain within the baseline limits, there could still be an impact on overall primary productivity and consequent flow-on effects across the ecosystem and food web that are uncertain and difficult to measure. In addition, the presentation of this objective as part of the applicant’s closing submission did not allow time for expert review.
828. Beyond baseline and ongoing monitoring of chlorophyll-a, there is no adaptive management response proposed by TTR if threshold or trigger levels are exceeded.
829. Overall, we have serious misgivings about several of the Environmental Performance Objectives, especially as they are the foundation of the entire adaptive management approach.
830. We go on to consider the questions posed by the Supreme Court.

Is there good baseline information about the receiving environment?

831. As already set out, the applicant accepts that there is currently an inadequate understanding of the baseline. A least 2 years’ baseline monitoring is proposed (proposed Condition 4). A Pre-Operational Baseline Environmental Monitoring Plan was proposed by the applicant (Condition 103).
832. The condition is to *“describe the baseline monitoring in accordance with the objectives set out in Condition 10 [the Environmental Performance Objectives]”*. The details of what would need to be in that plan, as prescribed by the condition, are extensive.
833. TTR in closing submissions stated:
- “TTR’s conditions are largely to ensure there are only minor effects. Further, for the TTR proposal there is a relatively good understanding of the nature of the receiving environment and a reasonable degree of confidence (amongst the majority of experts) about the anticipated effects and confirmation that we have sufficient information upon which to move forward.”*⁵⁰⁰
834. Firstly, we are not convinced about the ‘minor’ potential effects on the environment and hence we do not agree with the comment that *“TTR’s conditions are largely to ensure there are only minor effects”*. This is partly due to there not being a good baseline understanding of the receiving environment and therefore better understanding the potential effects and clearly the need for such an extensive Baseline

⁴⁹⁹ Page 2946 of the Transcript, 8 May 2014

⁵⁰⁰ Paragraph 426, Closing Submissions on behalf of Trans-Tasman Resources Ltd, 8 May 2014

Environmental Monitoring Plan. The purpose of that plan is to obtain good baseline information about the receiving environment.

835. We note that in the case of *King Salmon*, the Board of Inquiry had noted there was “*considerable uncertainty as to the nature of the receiving environment, [an] astonishing gap in the prediction of effects on the environment, ... a fundamental failing in the assessment of effects that we would not expect to see in a project of this magnitude and importance*”.⁵⁰¹ Notwithstanding this, we accept that the Supreme Court concluded, despite the uncertainty in that case, that an adaptive management approach was appropriate.⁵⁰²

836. As outlined earlier the overall application of an adaptive management approach and the need for good baseline information will be fact specific. It also needs to be considered in light of the EEZ Act. In this respect, we note that the *King Salmon* decision was where the adaptive management package for the water column involved staged development (development restricted to initial feed limits with incremental increases dependent on results of operational monitoring). TTR’s proposal is not a staged development but one where the full-scale mining would be commenced with the ‘full effects’ of it being generated from the beginning of the mining operation. The other key factor of course, as we have set out, is the need under the EEZ Act for caution and environmental protection where information is uncertain.

837. In our view, once the baseline monitoring is completed, there will be significantly more information about the receiving environment. However, while we accept it is not necessary to have all information available on which to base conditions of consent and an adaptive management regime, we are not convinced in this case there is sufficient ‘baseline’ understanding on which to base the Environmental Performance Objectives as the basis of the overall adaptive management approach and to be able to meet the purpose of the Act.

The conditions provide for effective monitoring of adverse effects using appropriate indicators

838. The indicators would have been the quantitative trigger values once they had been developed – based on the baseline monitoring and established against the Environmental Performance Objectives (which we have addressed above).

839. The triggers would be established in the Environmental Management and Monitoring Plan, and therefore this would have been the key plan regarding monitoring and management. While a draft of this was provided in the application documents, due to the lack of quantitative triggers being able to be developed, there was no Environmental Management and Monitoring Plan in the proposed conditions (193) that in fact set out the requirements of the EMMP.

840. The proposal put forward by the applicant was that, once the baseline monitoring was completed, TTR would develop the Environmental Management and Monitoring Plan (including the quantitative

⁵⁰¹ *Environmental Defence Society v New Zealand King Salmon Company Ltd* [2013] NZHC 1992, paragraph 52.

⁵⁰² *Environmental Defence Society v New Zealand King Salmon Company Ltd* [2013] NZHC 1992, paragraph 140.

triggers values in consultation with the Project Consultative Group (Condition 27) and the Komiti (Condition 41).

841. Given our concerns about the Environmental Performance Objectives, we find that the applicant's proposal to leave reviewing the baseline data, reviewing and approving the Environmental Management and Monitoring Plan and setting or agreeing the necessary environmental triggers or compliance values to the EPA is inappropriate and unreasonable.
842. Given this, we are unable to determine that there would be effective monitoring of any adverse effects using appropriate indicators.

Thresholds are set to trigger remedial action before the effects become overly damaging

843. As already identified, no 'thresholds' (or triggers) have been set but rather a process by which to establish them. We have already set out why we did not find this acceptable.
844. It was clearly the intention of TTR to establish thresholds (in terms of the suggested 'alert' levels) in the Environmental Management and Monitoring Plan. However, for the reasons set out above, we do not find that they can be established with any certainty based on the Environmental Performance Objectives.

Effects that might arise can be remedied before they become irreversible

845. We find we are unable to answer this question as we do not know with any certainty what the significance of any effects will be.
846. We accept that, if the mining ceased, the plume and changes to the seafloor bathymetry would stop. However, we do not know if the effects on the receiving environment that would have already been created would be irreversible, i.e. they may have already caused irreversible damage such as to biogenic areas, permanently affected commercial and recreational fishing interests, affected iwi's existing interests and relationship to Tangaroa and affected marine mammals.

1.2. Overall findings – adaptive management

847. At paragraph 432 of the applicant's closing, it is stated:

"We note that you are specifically directed to consider whether taking an adaptive management approach would allow the activity to be undertaken (s61(3)). We submit that the detailed monitoring and management regime that is proposed is a cautious approach, where TTR cannot commence its activities until detailed management plans are prepared (including review by the Technical Peer Review Group) and which will only be approved by the EPA when it is satisfied that through them the stated environmental objectives will be achieved. Again, if TTR has committed to too stringent environmental objectives this will be its problem and does not create a risk for the DMC, existing interests, or submitters."

848. In considering this statement, we come back to the Supreme Court's statement at [125]:

"As to the threshold question of whether an adaptive management regime can even be considered, there must be an adequate evidential foundation to have reasonable assurance that the adaptive

management approach will achieve its goals of sufficiently reducing uncertainty and adequately managing any remaining risk. The threshold question is an important step and must always be considered. As Preston CJ said in Newcastle, adaptive management is not a “suck it and see” approach.”

849. We find that the ‘evidential foundation’ for establishing the (final version of) the Environmental Performance Objectives and the basis for many of the other conditions that form the ‘adaptive management package’ is lacking for the reasons set out above.
850. While we accept that qualitative objectives can appropriately be part of an adaptive management regime, in this case, we find they are not sufficient. We find that the proposed Environmental Performance Objectives do not provide sufficient certainty, clarity or robustness on which to form the foundation of an appropriate adaptive management approach – one that would “*achieve its goals of sufficiently reducing uncertainty and adequately managing any remaining risk*” (of which we cannot be certain).
851. We are also concerned that, without the option of a scaled or staged implementation, the applicant has not provided any compelling adaptive management alternatives should the environmental objectives not be met.
852. On the evidence presented, we are not satisfied that the life-supporting capacity of the environment would be safeguarded or that the adverse effects of the proposal could be avoided, remedied or mitigated,⁵⁰³ nor do we consider that the proposed conditions (including the adaptive management approach) are sufficiently certain or robust for this application to be approved, given the uncertainty and inadequacy of the information presented about the potential adverse effects.
853. Overall, we think this application was premature. More time to have better understood the proposed operation and the receiving environment and engage more constructively with existing interests and other parties may have overcome many of the concerns we have set out in this decision. It is conceivable that at least some of these matters could have been addressed contemporaneously with the other investigative work the applicant undertook prior to lodging the application for consents. Ultimately, the information we had to make our decision, while voluminous, was too uncertain and inadequate, and we did not have sufficient confidence in the adaptive management approach proposed to address that uncertainty to enable the activity to be undertaken. For all of these reasons, the application as presented to us does not meet the sustainable management purpose of the EEZ Act.

⁵⁰³ Section 10(2)(b) and (c) of the EEZ Act.

Mr Greg Hill (Chair)



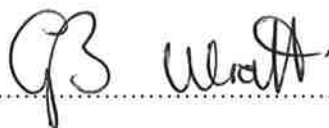
Handwritten signature of Greg Hill, written in cursive script above a dotted line.

Mr Stephen Christensen



Handwritten signature of Stephen Christensen, written in cursive script above a dotted line.

Ms Gillian Wratt



Handwritten signature of Gillian Wratt, written in cursive script above a dotted line.

Mr Brett Rogers



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Mr William Kapea



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17 June 2014

APPENDIX 1- PROCEDURAL HISTORY

TTR lodged an application with the EPA for a marine consent on 21 October 2013.

The EPA, independently of the DMC, engaged independent consultants to prepare reports to assess what it considered may be the main effects of TTR's marine consent application on the environment and existing interests as follows:

- Report on the effects of TTR's activity on recreational activities and tourism
- Report assessing the effects of noise
- Report assessing the effects on commercial interests
- Report assessing the effects on whales, dolphins and fish
- Report assessing the effects on life in and on the seabed (benthic ecology)
- Report assessing the effects on oceanographic processes and the physical environment
- Preliminary report assessing the validity of the sediment plume model (the EPA received an updated version of this report on 4 March 2014).

The EPA sought advice from Maritime New Zealand on the marine management regime it is responsible for and how it might apply to the TTR application. A response from Maritime New Zealand was dated 6 March 2014.

The EPA commissioned its Māori Advisory Committee, Ngā Kaihautū Tikanga Taiao, to prepare a report on the TTR application from a Māori perspective.

The EPA obtained independent reviews of the information provided in TTR's marine consent application. The reviews analyse the information that TTR used to determine the effects of the proposed project on the following topic areas:

- Oceanographic processes and the physical environment – this includes waves, tides, ocean currents, water quality and changes to the coastline
- Noise emitted into the water
- Air quality and emissions
- Life in and on the seabed (benthic ecology)
- Whales, dolphins, seals and fish
- Birdlife
- Commercial fisheries and aquaculture
- Local and national economy
- Recreational activities including fishing, surfing and diving
- Navigation and navigational safety risk.

The application was publicly notified on 21 November 2013, and the first submission period closed on 19 December 2013. The application was renotified on 20 December 2013 as some of the documents accompanying the application were not made available on the EPA website for the entire first submission period. The second submission period closed on 28 January 2014.

The effective consequence of having two notification periods was that would-be submitters had additional time to consider the application documentation. Given the very short timeframe (20 working days) the EEZ Act allows for submissions, we consider the renotification period has enabled greater participation in the process by the public and has likely assisted in the quality and depth of information that has come before us.

There were 4,702 complete submissions received. Of these:

- 11 submitters supported the proposal either in full or in part
- 4,680 submitters opposed the proposal either in full or in part
- two submitters were neutral
- nine submitters had a range of views.

A wide range of issues were raised in the submissions, with the majority relating to effects on marine and coastal ecology, erosion and waves and consequential effects on local communities, recreation, businesses, Māori interests and economy. The majority of the submissions were on a 'standard form' that had been prepared by KASM. These standard submissions raised a wide range of issues. Many of these submitters had useful knowledge and perspectives that they shared with us, and we appreciated their contribution.

Two incomplete submissions were received, and there were 137 'late submissions' received outside of the official submission period. Section 159 of the EEZ Act enables the EPA to extend a time period in order to accept submissions received outside the time period provided for in section 47 of the EEZ Act, and this power was exercised so that these late submissions were taken into account by us.

The hearing began on 10 March 2014 and was closed on 19 May 2014. During that period, there were 25 hearing days as well as 2 weeks for expert conferencing to take place. The hearing was mostly held at the Marist St Pats Club Rooms, Hataitai, Wellington. On the week of 7–11 April 2014, the hearing was held at the Waikato Stadium in Hamilton to enable submitters from the Waikato and Auckland regions to be heard. The hearing moved to the Taranaki region on the week of 28 April–2 May 2014 and was held at Pariroa Marae in Patea, Whanganui District Council and Devon Hotel in New Plymouth. The closing week of the hearing was held in Wellington.

A list of the experts and submitters that appeared before us is contained in Appendices 2 and 3.

After closing submissions from the applicant on 8 May 2014, the DMC at the suggestion of the applicant adjourned the hearing so that it could more fully consider the information provided during the hearing in the week of 5 May 2014. This included the second EPA staff report, the comments from submitters on that report, closing statements from submitters and the applicant and the revised sets of proposed conditions provided by submitters and the applicant.

The Decision-making Committee subsequently determined it had sufficient information to begin deliberations and formally closed the hearing on Monday 19 May 2014. Adjourning the hearing required an extension of the time period for the hearing, and the DMC issued a direction closing the hearing and extending the timeframe.

APPENDIX 2 - LIST OF SUBMITTERS, EXPERTS AND REPRESENTATIVES WHO APPEARED AT THE HEARING

Day 01 - 10 March 2014

Marist St Pats Rugby Club, Wellington

June and Peter Jackson - Te Ati Awa

Hugh Rennie QC on behalf of Trans-Tasman Resources Ltd (TTR)

Doug Gordon on behalf of Inshore Fisheries Management Company Ltd, New Zealand Federation of Commercial Fishermen Inc, Talley's Group Ltd and McDonald and Brown Limited

Duncan Currie on behalf of Kiwis Against Seabed Mining (KASM)

Tim Crossley appearing for TTR

Andrew Beatson on behalf of TTR

Eleanor Jamieson on behalf of the Director-General of Conservation

Day 02 - 11 March 2014

Marist St Pats Rugby Club, Wellington

Rob Enright on behalf of Environmental Defence Society (EDS)

Vivienne Holm on behalf of the EDS

Peter Dawson on behalf of the NZ Federation of Commercial Fishermen, Southern Inshore Fisheries Management Co Ltd, Talley's Group Ltd, McDonald and Brown Ltd, Sandford Ltd and Fisheries Inshore NZ Ltd (Inshore Fisheries and Others)

Duncan Currie on behalf of KASM

Hugh Rennie QC on behalf of TTR

Tim Crossley appearing for TTR

Bill Bisset appearing for TTR

Andy Somerville appearing for TTR

Rose Austen-Falloon appearing for TTR

Day 03 - 12 March 2014

Marist St Pats Rugby Club, Wellington

Shaun Thompson appearing for TTR

Kevin Richardson appearing for TTR

Bruce Souter appearing for TTR

Sander Bot appearing for TTR

Frank Boffa appearing for TTR

Rhys Thomas appearing for TTR

Dr Brett Beamsley appearing for TTR

Dr Rod Clough appearing for TTR

Andrew Beatson on behalf of TTR

Doug Gordon on behalf of Inshore Fisheries and Others

Day 04 - 13 March 2014

Marist St Pats Rugby Club, Wellington

Gary Teeear appearing for TTR

Catherine Clarke appearing for TTR

Day 05 - 31 March 2014

Marist St Pats Rugby Club, Wellington

Iain MacDonald appearing for TTR

Alan Orpin appearing for TTR

Robert Enright on of the EDS

Phil McCabe on behalf of KASM

Matt Brown appearing for TTR

Eleanor Jamieson on behalf of the Director-General of Conservation

James Gardner-Hopkins on behalf of Origin Energy Resources Kupe NZ Ltd (OERKL)

Hugh Rennie QC on behalf of TTR

Dr Mark Hadfield appearing for TTR

Robert Makgill on behalf of the Fisheries Group

Dr Peter Longdill appearing for the Director-General of Conservation

Dougal Greer on behalf of KASM

Day 06 - 1 April 2014**Marist St Pats Rugby Club, Wellington**

Morgan Slyfield appearing for the Environmental Protection Authority (EPA)

Dr Michael Huber and Miles Yeates appearing for the EPA

Eleanor Jamieson on behalf of the Director-General of Conservation

Robert Enright on of EDS

Robert Makgill on behalf of the Fisheries Group

Andrew Beatson on behalf of TTR

Hugh Rennie QC on behalf of TTR

Dr Richard Gorman appearing for TTR

Dr Shaw Mead appearing for TTR

Dr Malcolm Green appearing for TTR

Dr Terry Hume appearing for TTR

Phil McCabe on behalf of KASM

Dr Matt Pinkerton appearing for TTR

Emma Matheson on behalf of Origin Energy Resources Kupe NZ Ltd (OERKL)

Dr Dan McClary appearing for TTR

Dr Alison MacDiarmid appearing for TTR

Day 07 - 2 April 2014**Marist St Pats Rugby Club, Wellington**

Dr Kay Vopel appearing for TTR

Robert Makgill on behalf of the Fisheries Group

Robert Enright on of EDS

Andrew Beatson on behalf of TTR

Dr Tara Anderson appearing for TTR

Phil McCabe on behalf of Kiwis Against Seabed Mining (KASM)

Dr Dan McClary appearing for TTR

Eleanor Jamieson on behalf of the Director-General of Conservation

Dr Brian Paavo appearing for KASM

Kristina Hillock appearing for the Director-General of Conservation

Dr Janet Grieve appearing for TTR

Dr Alison MacDiarmid appearing for TTR

Day 08 - 3 April 2014

Marist St Pats Rugby Club, Wellington

Dr Dan McClary appearing for TTR

Phil McCabe on behalf of KASM

Nevil Hegley appearing for TTR

Eleanor Jamieson on behalf of the Director-General of Conservation

Dr Simon Childerhouse appearing for TTR

Robert Enright on of the EDS

Morgan Slyfield appearing for EDS

Darran Humpheson on behalf of EPA

Professor Bernd Wursig appearing for the Director-General of Conservation

Martin Cawthorn on behalf of TTR

Andrew Beatson on behalf of TTR

Andrew Baxter appearing for the Director-General of Conservation

Associate Professor Elisabeth Slooten appearing for KASM

Dr David Thompson appearing for TTR

Dr Garry Bramley appearing for the EPA

Dr Richard Paul Scofield appearing for the Director-General of Conservation

Day 09 - 4 April 2014

Marist St Pats Rugby Club, Wellington

Jenny Simpson appearing for TTR

Dr Francesca Kelly appearing for TTR

Lance Furniss appearing for the EPA

Morgan Slyfield on behalf of EPA

Ray Barlow appearing for the TTR

Andrew Beatson on behalf of TTR

Hugh Rennie QC on behalf of TTR

David Shennan appearing for the EPA

Phil McCabe on behalf of KASM

Ian Ives appearing for TTR

Grant Bermingham appearing for TTR

Dr Marie Brown appearing for EDS

Natasha Garvan on behalf of TTR

Robert Enright on behalf of the EDS

Day 10 - 7 April

Waikato Stadium, Hamilton

Tui Allen representing herself

Wanda Baker representing herself

Tracey Brown representing Sea Shepherd

Carolyna Hart-Meade representing herself

Xavier Meade representing himself

Ron Hepworth representing himself

Paul Havemann representing himself

Joan Havemann representing herself

Heather Cunningham representing herself

Mark Murdoch appearing for Heather Cunningham

Bob MacLeod representing himself

Christine Rose representing herself

John Lawson representing himself

Danelle Hart representing herself

Vera van der Voorden representing herself

Day 11 - 8 April 2014**Waikato Stadium, Hamilton**

Ben Lenzner representing himself

Te Rawhitiroa Bosch representing himself

Te Kahu Rolleston representing himself

Debra Te Manawa representing herself

Hinemaria Ward-Holmes representing herself

Stephanie Philip representing herself

Mark Dobson representing himself

Dr Heidi Douglass representing herself

Jack Douglass-Dobson representing himself

Evey Douglass-Dobson representing herself

Anna Cunningham representing herself

Joe Citizen representing himself

Niall Darwin representing himself

Sarah Edwards representing herself

Vic Albon representing himself

Day 12 - 9 April 2014**Waikato Stadium, Hamilton**

Lynne Wilkins representing herself

Paul Judge representing himself

Madelin Watson representing herself

Angeline Greensill on representing Nga Hapu o te Uru o Tainui Customary Fisheries Forum and Tainui Hapu ki Whaingaroa

Mailbu Hamilton representing Te Ngaru Roa Maui

Evelien Gilbert representing herself

Lorraine Dilon representing herself

Donna Crosby representing herself

Andrew Swinton representing himself

Nora van der Voorden representing herself

Felipe Bonfanti de Barros representing Tui Ward-Holmes

Day 13 – 10 April 2014

Waikato Stadium, Hamilton

Duncan Currie on behalf of KASM

Bernadette Gavin representing herself

Sequoia Gavin-McCabe representing herself

Phil McCabe representing KASM

David March and Anna March representing themselves

Linda Silvester representing herself

Susan Hall representing herself

Day 14 - 11 April 2014

Waikato Stadium, Hamilton

Andrew Beatson on behalf of TTR

Day 15 - 14 April 2014

Marist St Pats Rugby Club, Wellington

Vivienne Holm on behalf of EDS

Robert Magkill on behalf of fishing interests

Andrew Beatson on behalf of TTR

Duncan Currie on behalf of KASM

Hugh Rennie QC on behalf of TTR

Morgan Slyfield on behalf of EPA

Dianne Buchan appearing for TTR

Dr Bill Kaye-Blake appearing for TTR

Michael Cosman appearing for TTR

Nici Gibbs appearing for TTR

Rob Greenaway appearing for TTR

Douglas Gordon appearing for the Fisheries Group

Dr Douglas Fairgray appearing for the EPA

Nicola de Wit on behalf of EDS

Dr Mark Gibbs appearing for EPA

Day 16 - 15 April 2014

Marist St Pats Rugby Club, Wellington

Hugh Rennie QC on behalf of TTR

Andrew Beatson on behalf of TTR

Martijn Schouten appearing for TTR

Mike Patrick appearing for TTR

Dennis Karp appearing for TTR

Duncan Currie on behalf of KASM

Tim Denne appearing for TTR

Nicola de Wit on behalf of EDS

Sebatian Walter and Grigorij Lubownikow appearing for KASM

Rodney Wiite appearing for the Director-General of Conservation

Eleanor Jamieson on behalf of the Director-General of Conservation

Garry Venus appearing for TTR

Day 17 - 16 April 2014

Marist St Pats Rugby Club, Wellington

Martijn Schouten appearing for TTR

Andrew Beatson on behalf of TTR

Jim Mikoz representing the Wellington Recreational Marine Fishers' Association

Jean Kahui representing herself

Piki o te Rauamo Parker appearing for Jean Kahui

Joeseeph Hassell representing himself

James Gardner-Hopkins on behalf of Origin Energy Resources Kupe NZ Ltd

Day 18 - 17 April 2014**Marist St Pats Rugby Club, Wellington**

Tony Bissell appearing for Origin Energy Resources Kupe NZ Ltd

Hugh Rennie QC on behalf of Trans-Tasman Resources Ltd

James Gardner-Hopkins on behalf of Origin Energy Resources Kupe NZ Ltd

Iain Currill appearing for Origin Energy Resources Kupe NZ Ltd

Reneke van Soest appearing for Origin Energy Resources Kupe NZ Ltd

Day 19 - 28 April 2014**Pariroa Marae, Patea**

Haimona Maruera Jnr representing Te Runanga o Ngati Ruanui Trust

Debbie Ngarewa-Packer representing Te Runanga o Ngati Ruanui Trust

Graham Young appearing for Te Runanga o Ngati Ruanui Trust

Shi-han Ngarewa appearing for Te Runanga o Ngati Ruanui Trust

Te Pahunga Martin William Davis, Anne-Marie Broughton, Turama Hawira, Raukurawaihoea Waitai

Karanga J Morgan, Leaara-Jade Kauika-Stevens, Ngahiraka Hamilton and Julian Broughton representing
Nga Marae o Nga Rauru Kiihahi

Dr Nick Roskrige and Jamie Ataria on behalf of Nga Kaihautu Tikanga Taiao

Kirsty Woods representing Te Ohu Kaimoana Trustee Ltd

Day 20 - 29 April 2014**Pariroa Marae, Patea**

Cynthia Douds representing herself

Sharon Arlidge representing herself

Roger Malthus representing himself

Jacquelin Cran representing herself

Hugh Rennie QC on behalf of TTR

Gavin Cummerfield representing himself

Patrick Gemmel appearing on behalf of the EPA

Whanganui District Council, Whanganui

Graham and Lyn Pearson representing Castlecliff Coast Care

Lyn Pearson representing herself

Marion de Weyer representing the Whanganui Manawatu Sea Fishing Club

Nelson Lebo representing Helen Marie O'Connell

Phil McCabe representing Rachel Rose

Rochelle Bullock representing herself

Dr Athol Steward representing himself

Tanea Tangaroa representing herself

Michaela Stoneman representing herself

Day 21 - 30 April 2014

Devon Hotel, New Plymouth

Fred McLay representing the Taranaki Regional Council

Dr Emily Roberts appearing for the Taranaki Regional Council

Andrew Beatson on behalf of TTR

Ross Dunlop representing the South Taranaki District Council

Allan MacGibbon and James Witham representing the Wanganui District Council

Andrew Woodger representing himself

Gareth Hughes representing the Green Party of Aotearoa NZ

Anthea Poulton making her representation

James Croker making his representation

Jack Cran making his representation

Mark Donald representing himself

Dr Stuart Bramhall representing himself

Emily Bailey representing herself

Urs Signer representing himself

Day 22 - 1 May 2014**Devon Hotel, New Plymouth**

Robert Makgill appearing on behalf of the Fisheries submitters

Alison Undorf-Lay appearing for the Fisheries submitters

Andrew Smith appearing for the Fisheries submitters

Anthony Piper appearing for the Fisheries submitters

Colin Johnstone appearing for the Fisheries submitters

Douglas Loader appearing for the Fisheries submitters

Edward Culley appearing for the Fisheries submitters

Jeremy Helson appearing for the Fisheries submitters

Keith Mawson appearing for the Fisheries submitters

Steve Pivac making his representation

Hugh Rennie QC on behalf of TTR

Andrew Beatson on behalf of TTR

Day 23 - 2 May 2014**Devon Hotel, New Plymouth**

Andrew Purser representing Patea District Boating Club

Ted Gane representing Patea District Boating Club

Anne Scott and Elise Smith representing Nga Motu Marine Reserve Society

Barbara Hammonds representing herself

Bruce Boyd making his representation

Dr Jonathan Proctor and Maurice Takarangi representing Te Tai Hau-a-uru Fisheries Forum

Alessandra Keighley representing herself

Rex Hendry representing the Taranaki/Whanganui Conservation Board

Kerry Riley representing himself

Pete Sauunders representing New Plymouth Sport Fishing and Underwater Club

Karen Pratt representing herself

Chris Wilkes representing himself

Day 24 - 7 May 2014***Marist St Pats Rugby Club, Wellington***

Duncan Currie on behalf of KASM

Emma Matheson on behalf of Origin Energy Resources Kupe NZ Ltd

Robert Magkill on behalf of Fisheries submitters

Eleanor Jamieson on behalf of the Director-General of Conservation

Robert Enwright on behalf of EDS

Vivienne Holm on behalf of EDS

Nicola de Wit on behalf of EDS

Day 25 - 8 May 2014***Marist St Pats Rugby Club, Wellington***

Hugh Rennie QC on behalf of TTR

Andrew Beatson on behalf of TTR

June and Peter Jackson - Te Ati Awa

APPENDIX 3 - LIST OF EXPERTS WHO APPEARED AT THE HEARING

Trans-Tasman Resources Ltd

Mr Matt Brown - Resource and exploration process

Mr Shawn Thompson - Operational Issues

Mr Bruce Souter - Processing Methodology

Mr Sander Bot - Vessel dynamics

Mr Ian Ives - Vessel dynamics

Mr Martijn Schouten - Crawler technology

Mr Kevin Richardson - Crawler operational history

Mr Dennis Karp - Iron Ore and Freight Prices

Dr Bill Kaye-Blake - Economics

Ms Rose Austen-Falloon - Consultation

Dr Alan Orpin - Geology

Dr Iain MacDonald - Oceanographic

Dr Malcolm Green - Pits and mounds

Dr Richard Gorman - Offshore wave climate modelling

Dr Shaw Mead - Surf break effects

Dr Terry Hume - Shoreline/coastal stability

Dr Mark Hadfield - Sediment plume modelling

Dr Matt Pinkerton - Satellite imagery / optical effects

Mr Gary Teear - Geotechnical

Mr Ray Barlow - Navigation

Dr Dan McClary - Ecology

Mr Martin Cawthorn - Marine mammals

Dr Tara Anderson - Benthic Ecology

Dr Alison MacDiarmid - Fish and benthic colonisation

Dr David Thompson - Birds

Dr Janet Grieve - Zooplankton

Mr Nevil Hegley - Noise

Dr Simon Childerhouse - Noise effects on marine mammals

Mr Frank Boffa - Landscape and visual assessment

Mr Rob Greenaway - Recreational and tourism

Ms Dianne Buchan - Social impact

Dr Francesca Kelly - Health effects

Mr Mike Cosman - Health and safety

Mr Rhys Thomas - Details of TTR's health and safety

Ms Jenny Simpson - Air discharges

Ms Nici Gibbs - Commercial fishing

Dr Rod Clough - Archaeology

Dr Mike Patrick - Risk assessment/management

Dr Kay Vopel - Sediment toxicology/pore chemistry

Mr Geraint Bermingham - Risk of oil spill

Dr Brett Beamsley - Oil spill trajectory

Ms Catherine Clarke - Planning

Mr Garry Venus - Environmental Management & Monitoring Plan

Environmental Protection Authority

Mr Darran Humpheson - Effects on Marine Mammals including Noise

Mr David Shennan - Navigation

Dr Gary Bramley - Seabirds

Mr Doug Fairgray - Social, Recreation and Tourism

Mr Lance Furniss - Air Quality and Health Effects

Mr Mark Gibbs - Commercial Fisheries

Dr Michael Huber - Physical Environment, Marine Mammals and Fish, and Benthic Ecology

Mr Miles Yeates - Physical Environment, Marine Mammals and Fish, and Benthic Ecology

Mr Tim Denne - Economics

Director-General of Conservation

Mr Andrew Baxter – Management of marine mammals

Professor Bernd Gerhad Wursig – Marine mammal welfare

Ms Kristina Hillock – Benthic habitats

Dr Peter Longdill - hydrodynamics, sediment plume generation and dispersal, coastal oceanography aspects, and associated environmental management

Dr Paul Scofield - Seabirds

Mr Rodney Witte - Planning

Environmental Defence Society

Dr Marie Brown - Biodiversity offsetting and mitigation principles

Kiwis Against Seabed Mining (KASM) Incorporated

Mr Dougal Greer - Plume modelling and natural sediment transport mechanisms

Dr Brian Paavo – Benthic ecology

Associate Professor Elisabeth Slooten – Abundance and distribution of marine mammals

Mr Sebastian Walter and Mr Grigorij Ljubownikow - Economics

McDonald And Brown Limited, New Zealand Federation of Commercial Fishermen, Southern Inshore Fisheries Management, Talley's Group Limited

Mr Douglas Gordon – Marine biology and management

APPENDIX 4 - TTR PROPOSED CONDITIONS (8 MAY 2014)

APPENDIX A

PROPOSED CONDITIONS

8 MAY 2014

Details of consent

Name of Consent Holder:

Consent Granted Date:

Purpose of Consent Granted:

Expiry Date:

Review Date(s):

Site Location:

Legal Description:

A. GENERAL

Reference to Chief Executive

1. All references herein to the Chief Executive refer to the Chief Executive of the Environmental Protection Authority (or his or her designate appointed in writing)¹.

Lapse

2. This consent shall lapse five years from the date of commencement of this consent. The consent shall not lapse if the pre-operational Baseline Environmental Monitoring Plan required under Condition 103 is approved² by the Chief Executive in accordance with Condition 105 and the monitoring required by the pre-operational Baseline Environmental Monitoring Plan has commenced.

Operations in accordance with application

3. Subject to compliance with the conditions of this consent, the activities authorised by this consent must be undertaken in general accordance with the application and documents submitted as part of the application. Where information contained in the application documents is contrary to the conditions of these consents or where information contained in the application documents is contrary within itself, the conditions will prevail³.
4. Prior to the commencement of any activities authorised by this marine consent, baseline monitoring comprising a minimum of two years monitoring and evaluation must be undertaken in accordance with the procedures set out for the pre-operational Baseline Environmental Monitoring Plan required under Condition 103 of this consent.
5. At least 3 months prior to the exercise of this consent the consent holder shall provide, to the Chief Executive, detailed plans of the activity for the Chief Executive to certify that the proposal is in accordance with the application and supporting documentation and will comply with relevant conditions of this consent. In particular the Consent Holder shall comply with the following:

¹ Chief Executive identified as individual within EPA delegated for approvals as appropriate. Consequential changes included conditions below.

² Standardise wording to reflect approval role of Chief Executive.

³ Condition 01 from EPA Staff Report

- a) The “mining area” shall occupy no more than 65.76 square kilometres contained within the following co-ordinates⁴:

Point	Longitude	Latitude
1	174° 10' 51" E	39° 49' 39" S
2	174° 13' 03" E	39° 51' 21" S
3	174° 12' 16" E	39° 51' 56" S
4	174° 09' 02" E	39° 53' 42" S
5	174° 07' 21" E	39° 54' 29" S
6	174° 05' 37" E	39° 54' 23" S
7	174° 04' 33" E	39° 54' 16" S
8	174° 03' 49" E	39° 53' 52" S
9	174° 02' 52" E	39° 53' 12" S
10	174° 02' 09" E	39° 52' 38" S
11	174° 02' 12" E	39° 51' 20" S
12	174° 02' 28" E	39° 51' 04" S
13	174° 03' 18" E	39° 51' 53" S
14	174° 06' 30" E	39° 51' 43" S
15	174° 06' 30" E	39° 51' 39" S
16	174° 06' 40" E	39° 51' 34" S
17	174° 07' 23" E	39° 51' 45" S
18	174° 08' 10" E	39° 51' 28" S
19	174° 09' 46" E	39° 50' 33" S

Datum: NZGD2000

- b) Seabed sediment extraction shall be undertaken by a remotely controlled, submerged crawler device.
- c) Seabed sediment extraction shall not exceed a monthly average rate of 8,000 tonnes per hour of seabed material extracted, and 50 million tonnes of seabed material during any 12-month period for the term of this marine consent⁵.
- d) Deposition of hydro cyclone underflow onto the seabed shall take place by means of a dedicated tailings disposal pipe which discharges from the mining vessel at a depth of 4 metres above the seabed, averaged over any 12 hour period.
- e) Discharge of a total combined mass flux of solids not exceeding an average of 7360 tonnes per hour, with a maximum fines content (all material finer than 90 µm) not exceeding an average of 300⁶ tonnes per hour, and with a maximum ultra-fines content (all material finer than 8 µm) not exceeding an average of 42 tonnes per hour^{7, 8}.
- f) Direct deposition of post-processing tailings onto the seabed shall not be undertaken closer than 200 metres from the seaward boundary of the Coastal Marine Area.

⁴ Coordinates have been corrected – those in EPA Staff Report contained errors.

⁵ Total mass per year from EPA Staff Condition 37 in part; K Pratt

⁶ Both values are contingent on being able to assess as long-term average value – consistent with Dr Hadfield plume modelling

⁷ Format based on Witte Supplementary Evidence suggested alternative condition 3(d) with revised figures

⁸ Revision related to Witte Evidence

- g) Average values cited in Condition 5(e) shall be expressed on a three month running average basis, derived from analysis of one representative daily composite sample made up from eight sub-samples taken at three hour intervals for days of operation.

Advice Note:

It is expected that the Chief Executive will provide certification within 20 working days of receipt of the detailed plans.

6. The consent holder may vary operational methods from those set out in Condition 5, subject to certification from the Chief Executive that such varied methodology will not result in potential adverse environmental effects which are inconsistent with attainment of the environmental objectives set out in Condition 10

Operations in Accordance with Consent Conditions

7. The consent holder shall require all staff and contractors engaged to undertake work authorised by this consent to do so in accordance with these conditions and shall develop and implement training and staff awareness programmes. A copy of the training programme shall be made available to the Chief Executive if requested.
8. A copy of this consent, the Environmental Monitoring and Management Plan (EMMP) required under Condition 193, and any variations to these documents shall be present at the consent holder's office and on all vessels carrying out the works at all times while the work is being undertaken.

Management of Environmental Effects

9. The consent holder shall manage the environmental effects of activities authorised under this consent using a risk-based, tiered approach, based on the following:
- a) Specification of qualitative environmental performance objectives associated with the consented activities (as set out in Condition 10);
 - b) Pre-operational Baseline monitoring to establish a statistically robust description of the natural variability of key potential receptors (as set out in Condition 110);
 - c) Develop quantitative measures for relevant physical and biological indicators, as "trigger indicators or values" to inform compliance with environmental performance objectives, relative to the baseline environment (as set out in Conditions 11 and 12);
 - d) Operational monitoring to establish whether or not trigger indicators and values are being met (as set out in Condition 200);
 - e) Adaptively managing operations to ensure that the identified environmental performance objectives are achieved; and
 - f) Review of the trigger indicators and values to ensure that trigger indicators and values are appropriate⁹ in relation to achieving environmental performance objectives (as set out in Condition 215).

Environmental Performance Objectives

10. The Consent Holder shall undertake activities authorised under this consent to achieve the following environmental performance objectives:
- (a) Waves and Coastal Processes

⁹ K Pratt

- i. No more than moderate change in wave height in the immediate vicinity of the TTR operations, attributable to dredging and deposition activities;
 - ii. No more than minor change in wave height at the shoreline,
 - iii. No more than minor influence on beach state, geomorphic character and coastal erosion.
 - iv. No more than minor residual TTR-derived fine sands and muds on beaches.
 - v. No more than minor effect on sand supply to beaches.
 - vi. No more than minor effect on natural processes of erosion and accretion.
 - vii. No adverse effects on PML 38146 interests caused by local increases in wave or current loading.
 - viii. Sediments deposited onto and around PML 38146 shall not cause substantial interference with PML 38146 infrastructure existing at the date of grant of this consent.
- (b) Plume derived suspended sediments and deposited sediments
 - i. Significant elevation in sediment plume total Suspended Sediment Concentration (SSC) limited to within 10 kilometres of the source (subject to avoiding more than minor SSC elevation in identified biogenic areas to the southwest of the mining area).
 - ii. Minor¹⁰ elevations in sediment plume SSC from 10km of source to a line 5 kilometres from the coast (subject to avoiding more than minor SSC elevation at North and South Traps, Four Mile Reef, Patea Reefs and Waiinu Reef)¹¹.
 - iii. Sediment plume SSC indistinguishable from¹² natural SSCs within 5 kilometres of the coast.
 - iv. Deposition rates of mining-derived sediments indistinguishable from natural background beyond 10 km from point of discharge or deposit.
 - v. No material adverse effects on the interests of PML 38146 in the immediate vicinity of PML 38146 infrastructure existing at the date of grant of this consent.
- (c) Visual effects and effects on natural character
 - i. Surface marine activities not visually intrusive as seen from coastal recreation and amenity areas.
 - ii. Visual extent of the sediment plume restricted to within 10 km of the outside edge of the operational area.
 - iii. Long term effects on seabed topography restricted to residual pits and mounds at ends of extraction lanes
 - iv. Minor variation in bathymetry in operational area following re-deposition.
 - v. Visual impacts shall not prevent reasonable and efficient inspection of PML 38146 infrastructure.

Note: TTR will seek to co-ordinate with PML38146 interests to enable infrastructure inspections to occur. If an agreement cannot be reached dispute resolution ~~shall~~^a be undertaken in accordance with the provisions of TTR's mining permit.

^a[Wording change advised to DMC in TTR closing submission.](#)
- (d) Noise effects
 - i. No more than temporary and minor adverse effect on behaviour of marine mammals and fish attributable to noise.

¹⁰ To make consistent with Joint Witness agreed conditions

¹¹ K Pratt

¹² To make consistent with Joint Witness agreed conditions

- (e) Effects on Air quality
 - i. Ground level concentrations on land of all contaminants arising from emissions to air from the combustion of Heavy Fuel Oil below relevant New Zealand Ambient Air Quality Guidelines (2002) and relevant parts of the Resource Management (National Environmental Standards for Air Quality) Regulations 2004, and updates.
- (f) Benthic communities, rocky reefs, primary productivity
 - i. Deposition rates of mining-derived sediments indistinguishable from background beyond 10km from point of discharge or deposit with no discernible change in community composition in offshore biogenic habitat within 10km of the consent area.¹³
 - ii. Recovery of the ecological function of benthic biota communities in operational extraction and deposition area and near-field areas¹⁴ occurs¹⁵ within 10 years of cessation of mining activities.
 - iii. Moderate impact on near-field benthos (within 10km of operational area) due to deposition of suspended tailing fines, with the exception of offshore biogenic habitat within 10 km of the consent area where there will be no discernible change in community composition different to background variation.¹⁶
 - iv. ¹⁷No discernible change in community composition above background variation of benthic assemblages at North and South Traps, Graham Bank, Four Mile Reef, Patea Reefs and Waiinu Reef¹⁸ due to deposition of sediments.
 - v. No discernible change in community composition above background variation of benthic assemblages at near shore rocky reefs including the North and South Traps, Patea reefs, Four Mile Reef, Waiinu Reef and Graham Bank due to changes in light availability from mining activity.²⁰
 - vi. No change in water column primary production and total primary production due to mining activity beyond the background natural inter-annual variability as assessed by baseline and operational monitoring of chlorophyll-a²¹.
 - vii. No more than minor adverse effect on native biodiversity through the incidental translocation of non-indigenous marine species and/or spills
- (g) Water Quality
 - i. Receiving water quality to comply with ANZECC Guidelines after reasonable mixing (in relation to discharged dissolved metals).
- (h) Lighting
 - i. No more than minor effect on seabirds, fish and marine mammals attributable to lighting of TTR's operations
- (i) Effects on Marine mammals ²²
 - ii. No adverse effect at a population level on blue whales or Maui's dolphins.

¹³ DG Submission 6 May 2014 Attachment 3

¹⁴ D Serjeant suggestion

¹⁵ DG Submission 6 May 2014 Attachment 3

¹⁶ DG Submission 6 May 2014 Attachment 3

¹⁷ DG Submission 6 May 2014 Attachment 3

¹⁸ Identify explicit reefs for certainty

¹⁹ DG Submission 6 May 2014 Attachment 3

²⁰ DG Submission 6 May 2014 Attachment 3 - with modification to link to light effects.

²¹ DG Submission 6 May 2014 Attachment 3

²² DG Submission 6 May 2014 Attachment 3

- iii. Adverse effects on marine mammals including but not limited to effects arising from the following are effectively and practicably avoided;
 - a. vessel strikes,
 - b. noise,
 - c. lighting, and
 - d. entanglement
- iv. "All practicable steps" shall include, but not be limited to:
 - 1. Within the wider EMMP required under Condition 193, preparation of a Marine Mammal Monitoring and Management section the objectives of which shall be to:
 - a. Minimise the adverse effects on marine mammals from the mining operations and associated vessel and aircraft movements; Determine how the operation of the mining operations and associated activities will be managed adaptively to avoid, remedy and mitigate adverse effects on marine mammals;
 - b. Ensure a comprehensive understanding of the presence, distribution, abundance and density of cetaceans in the South Taranaki Bight pre-operation and during operation to assist to determine whether and to what extent mining operations and associated activities may be impacting on cetaceans, including but not limited to blue whales and Maui's dolphins; and
 - c. Establish a monitoring programme to assess the effectiveness of the Marine Mammals Monitoring and Management section of the EMMP.
 - 2. Operational responses to marine mammals approaching mining operations;
 - 3. Visual observation for the presence of cetaceans and recording and reporting their presence; and
 - 4. Ongoing acoustic monitoring to determine the presence of cetaceans, including but not limited to blue whales and Maui's dolphins;
 - a. Procedures and methods to ensure avoidance of vessel strike and adverse effects due to aircraft operations associated with the consented activities.
- (j) Commercial and non-commercial fisheries²³
 - i. No more than minor and temporary spatial displacement of commercial fishing.²⁴
 - ii. No more than minor adverse effect on commercial fishing via the creation of pits and mounds in respect of changes in bathymetry,
 - iii. No more than minor and temporary adverse effect on non-commercial fishing in the South Taranaki Bight.
 - iv. No more than moderate and temporary adverse effect on recreational diving in the South Taranaki Bight outside 10 kilometre radius from TTR's operational area.
 - v. No adverse environmental effect on existing commercial aquaculture activities in the South Island.²⁵

²³ Recreational fishing is "non-commercial" fishing - revise to aid clarity.

²⁴ Remove explicit fishing methods to broaden out scope.

- (k) Seabirds**
 - i. No adverse effect at a population level of seabirds of the species classified under the New Zealand Conservation Status as “Nationally Endangered”, “Nationally Critical” or “Nationally Vulnerable” or classified “Endangered” or “Vulnerable” in the International Union for the Conservation of Nature “Red List”.
 - ii. Adverse effects on seabirds including but not limited to effects arising from;
 - a. lighting,
 - b. spills, and
 - iii. the effect of sediment in the water column on diving birds that forage visually are effectively and practicably avoided.
- (l) Biosecurity**
 - i. No translocation of marine species not naturally already present in the coastal marine environment as a result of vessels entering operational areas both in the mine site and transfer areas.
- (m) Sediment quality for accumulated metals²⁶**
 - i. No more than minor elevation in metal levels within seafloor surficial sediments.
- (n) Anchor movement and mooring stability**
 - i. The mooring system will be designed in accordance with the relevant ABS Rules (the selected Classification Society) “Guide for Building and Classing Floating Production Installations” 2014, which refers to API RP2SK “Recommended Practice for Design and Analysis of Station Keeping Systems for Floating Structures”, October 2005.

Environmental Performance Triggers

- 11. The Consent Holder shall use data from baseline monitoring to establish trigger indicators and values which if exceeded will require an adaptive management response to ensure that the environmental performance objectives referred to in Condition 10 are achieved. These trigger indicators and values shall be prepared in accordance with Conditions 12, 51(b) and 112(d) of this consent, and shall be subject to approval by the Chief Executive.
- 12. Trigger indicators and values established pursuant to Condition 11 shall be developed in terms of two tiers comprising an “alert” level which triggers increased specific operational responses set out in the EMMP, with all exceedances of trigger levels and the operational response reported to the EPA as soon as practicable, and advised to the TPRG²⁷; and a maximum “compliance” level which indicates potential enforcement action.

Standard for Information Collection

- 13. Investigations required under this consent shall be designed to obtain the best available information in accordance with Section 61(5) of the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012.

Risk Management

²⁵ Insert reference to location of aquaculture interests.

²⁶ K Pratt

²⁷ DG 6 May 2014 Attachment 1

14. The consent holder shall develop a **Spill Contingency Management Plan (the SCMP)** in accordance with Condition 73 and a **Collision (Loss of Position) Contingency Management Plan (the CCMP)** in accordance with Condition 76.
15. The Consent Holder must ensure that it maintains insurance including, but not limited to public liability insurance, for a sum not less than NZ\$100,000,000 (2014 dollar value) for any one claim or series of claims arising from undertaking activities authorised by this marine consent.
16. The Consent Holder must submit a certificate demonstrating that it holds the insurance required by Condition 15 prior to giving effect to this consent and an updated certificate annually by 1 July of each year for the term of this marine consent to the EPA.²⁸
17. The Consent Holder shall ensure that appropriate procedures are put in place and that machinery is maintained at all times to avoid spillage and leakage of fuel or oil. The consent holder shall conduct annual audits of standard operating procedures and evidence of scheduled maintenance work being undertaken.²⁹
18. The Consent Holder shall comply with MARPOL requirements in respect of discharge of fuel or oils into the marine environment as a result of activities authorised under this consent.
19. The Consent Holder shall ensure that at least one senior employee or suitably qualified or experienced contractor is formally allocated responsibility for collating information on compliance management in relation to this consent and for reporting information in accordance with the requirements of this consent. The name and contact details of this person(s) shall be provided to the EPA and updated as necessary.

B. PRE-OPERATIONAL

Initial Extraction Schedule Reported to EPA

20. Prior to removing seabed material from any part of the approved extraction area, other than by grade control drilling required under Condition 175, the Consent Holder must complete a pre-mining assessment report of the area from which it proposes to extract material. The pre-mining assessment report must be provided to the EPA for approval at least three months prior to removal of the seabed with the SSED in the previously unmined area.
21. The consent holder shall, at least three months prior to commencing mining, provide the EPA with a pre-mining assessment report of the area it proposes to extract from detailing:
 - (a) the areas in which extraction and deposition is intended to occur over the next 12 months;
 - (b) The depths proposed for extraction³⁰; and
 - (c) the periods during which extraction and deposition is scheduled to occur in each specified area;

Annual Report to EPA

22. The consent holder shall provide the EPA with a report providing information relating to the twelve month period following commencement of mining operations authorised

²⁸ EPA Staff Conditions 103 104

²⁹ K Pratt

³⁰ K Pratt

under this consent, and subsequently with an Annual Report relating to the twelve month period following the anniversary of commencement of mining. This report shall include the following information:

- (a) An Extraction Schedule detailing:
 - i. the areas in which extraction and deposition is proposed to occur over the next 12 month period;
 - ii. the timing of proposed extraction and deposition activities in areas identified in Condition 22 (a)i;
 - iii. the volume and mass³¹ of materials extracted and deposited during the previous 12 month period;
 - iv. GPS locations or chart references detailing the location of extraction and deposition in the previous 12 month period;
 - v. Depths of extraction that are scheduled to occur and
 - vi. All updates of the extraction schedule that were notified to the EPA³².
 - (b) A summary report on all monitoring undertaken in the previous 12 months;
 - (c) A copy of the minutes taken at any Project Consultative Group (PCG) and Kaitiakitangi Komiti (the Komiti) meetings during the previous 12 months;
 - (d) Details of monitoring proposed for the next 12 months.
 - (e) Details of any exceedances of the trigger indicators and values, or failures to achieve outcomes sought³³ and the management response implemented in response;
 - (f) An evaluation of monitoring results against Environmental Performance Objectives referred to in Condition 10.
23. The Annual Report required in Condition 22 shall be provided to the EPA within two months of the end of the period reported on, at which time it shall also be made available on the consent holder's website and sent in hard copy to members of the Public Consultative Group³⁴.
24. The Consent Holder shall, advise the EPA of any modified operational extraction and deposition areas or periods which differ from those identified in the Annual Report required in Condition 22. This advice shall be provided to the EPA at least five working days³⁵ prior to undertaking such works.
25. The Consent Holder shall, on receipt of any request in writing for information from the EPA, within the time specified in the requirement or conditions, supply the information required or provide a written explanation to the EPA setting out why the requested information is not able to be provided.
26. The Consent Holder shall advise the EPA at any time when an indicator level or value defined and specified in accordance with Conditions 11 and 12 of this consent is triggered. This advice shall also set out the management response is proposed to be or has been undertaken and the measures to be adopted to assess and report on the outcome of that management response.

Community Liaison

27. The consent holder shall, no later than twelve months prior to the commencement of mining authorised under this consent, establish a "Project Consultative Group"

³¹ DG Submission 6 May 2014 Attachment 1

³² K Pratt

³³ Consultation with Origin - inserted assuming DMC agrees with relief sought by Origin

³⁴ Relating to TRC submission (F McClay) and D Serjeant suggestions (in part)

³⁵ K Pratt

- (PCG). The objective of the PCG is to facilitate ongoing consultation between the community and the consent holder.
28. The consent holder shall invite the following to be members of the PCG:
- a) Three iwi representatives including representatives from Ngati Ruanui;
 - b) A local community representative from the South Taranaki Area;
 - c) A representative of the South Taranaki recreational fishing/diving community;
 - d) A representative of the commercial fishing/charter boat operator community;
 - e) A representative of the regional business development community;
 - f) A representative of the Taranaki Regional Council;
 - g) A representative of the South Taranaki District Council³⁶;
 - h) A representative of the Department of Conservation; and
 - i) A representative of the EPA.
29. The consent holder shall hold meetings of the PCG at half yearly intervals for the purpose of discussing the activities authorised by this consent which have been undertaken over the previous six month period and those activities projected to be undertaken over the following six month period. The PCG may, three years after mining³⁷ operations commence, change the frequency of the meetings and the Consent Holder shall advise the Chief Executive accordingly.
30. The Consent Holder shall hold an annual meeting of the PCG for the purpose of providing a forum for discussion in relation to the monitoring undertaken by the Consent Holder in the previous 12 months. This may also be part of one of the half yearly meetings required under Condition 29 of this consent. The Consent Holder shall circulate a report on all monitoring undertaken in the previous 12 months to all members of the PCG no less than two weeks prior to the annual meeting.
31. The consent holder shall keep minutes of the meetings held and shall make these available to all members of the PCG and the EPA, and they shall be made available on the consent holder's and the EPA's websites. .

TTR South Taranaki Community Trust

32. The Consent Holder shall establish a South Taranaki Community Trust (the Trust). The Trust must be established no later than twelve months prior to the commencement of mining authorised under this consent, and be maintained for the full duration of this consent. The objective of the Trust will be to provide benefit to South Taranaki coastal communities between Opunake and Whanganui³⁸ by financially supporting initiatives within that community including :
- a) The granting of at least one significant scholarship annually, which promotes excellence in a field related to TTR's operations, for example engineering, earth sciences or marine sciences.
 - b) The granting of discretionary payments to contribute to the environmental, social, recreational and/or economic success of the South Taranaki community. The Trust shall include a discretionary fund of NZ \$100,000 over each two-year period to enable the Trust to contribute to small requests of up to \$15,000 on an ad hoc basis.

³⁶ To provide relevant local authority liaison

³⁷ K Pratt

³⁸ To clarify that the scope relates to coastal communities including those potentially outside the STDC local authority boundary.

- Applicants for Discretionary grants will need to demonstrate that they meet the criteria and objectives of the Trust;
- c) The provision of sponsorship to community events or organisations. The Trust will be used to manage TTR's sponsorship, and it is proposed the Trust include at least one medium term significant sub-regional sponsorship agreement. The community will be invited to assist in identifying targets for this significant sponsorship.
33. The Consent Holder shall establish the Trust with a setup payment of \$80,000 which will cover setting up the Trust and its administration, appointing trustees and soliciting for the initial proposals.
34. The Consent Holder shall fund the activities of the Trust by contribution of no less than 0.3% of the Consent Holder's pre-tax profit resulting from the activities of this consent. The pre-tax profit shall be determined on a 3 year rolling average basis. The first payment to the Trust shall be made three years following commencement of operations.
35. The shall invite representatives as described in (a) – (e) below to become Trustees of the Trust:
- a) Three Iwi representatives including representatives from Ngati ruanui;
 - b) A local community representative from the South Taranaki Area nominated by the South Taranaki District Council;
 - c) A representative of the South Taranaki recreational fishing/diving community;
 - d) A specific representative of the South Taranaki commercial fishing/charter boat operator community;
 - e) A representative of the regional business development community³⁹; and
 - f) Two representatives of the Consent Holder;
36. The Trust shall solicit applications, and allocate grants on a biennial basis, with the exception of scholarships which will be awarded on an annual basis. Discretionary grants may be made on an ad hoc basis.
37. The Community Trust will award 4 scholarships per year for the three years from the date of commencement of mining authorised under this consent. At least one scholarship per year must be awarded to a descendant of Ngāti Ruanui. These scholarships will be awarded to residents of the coastal communities between Opunake to Whanganui for university or trades training in marine sciences, ecology, engineering and maritime trades to cover one year's tuition fees up to \$7,000 per scholarship per year.
38. The Consent Holder shall convene meetings of the Trust and provide administrative support at meetings of the Trust.
39. The Trust may review and if desired, change the composition and procedures of the Trust, but only by unanimous agreement.
40. The Consent Holder shall provide an annual report to the Chief Executive by 30 June each year including the following information:
- a) Details of the activities undertaken by the Trust in the preceding year; and
 - b) The actual expenditure by the Trust in the preceding year and a comparison with planned expenditure; and

³⁹ To provide clarification of invited representation

- c) The planned activities for the following year including the planned expenditure for each of these activities.

Iwi Consultation

- 41. The consent holder shall within three months of commencement of this consent, invite representatives from the iwi listed in (a) – (h) below, to join a “Kaitiakitanga Komiti” (the Komiti):
 - a) Ngāti Ruanui
 - b) Ngaa Rauru
 - c) Ngāruahine
 - d) Te Atihaunui a Pāpārangi (Whanganui Iwi)
 - e) Ngāti Apa
 - f) Taranaki Iwi
 - g) Rangitaane o Manawatu
 - h) Ngāti Raukawa ki te Tonga
- 42. The consent holder shall invite a representative of Ngāti Ruanui, as tangata whenua, to chair the Komiti.
- 43. A representative of the consent holder shall attend meetings of the Komiti, and the consent holder shall⁴⁰ invite a representative of the EPA to all meetings of the Komiti.
- 44. The objectives of the Komiti shall be to:
 - a) Facilitate ongoing consultation between iwi⁴¹ and the consent holder and in particular to facilitate better understanding of matauranga Maori and the cultural values associated with the coastline;
 - b) Enable consultation in relation to the BEMP⁴² and EMMP, including consultation in relation to the cultural health indicators for key species of importance to iwi;
 - c) Provide a forum for discussion with iwi in relation to monitoring undertaken and proposed by the consent holder;
 - d) Make recommendations to the consent holder, the TPRG and the EPA under Condition 45⁴³, in relation to methods to avoid, remedy or mitigate any adverse effects of the consented activities on the cultural values and interests of iwi in the South Taranaki Bight area; and
 - e) Recognise the different cultural associations and interests iwi have in the project.

Mātauranga Māori Issues

- 45. The Komiti shall review all management plans required in Condition 60 of this consent to ensure that investigations identified in these plans address Mātauranga Māori matters including those matters set out in Condition 106(i) to the satisfaction of the Komiti. If the Komiti identifies that matters are not being satisfactorily addressed, then the Komiti may make recommendations to the consent holder, TPRG and EPA in regard to investigations which should be undertaken to address those matters.

⁴⁰ To clarify involvement of the consent holder

⁴¹ To clarify that the objective of the Komiti is to address broader iwi issues that might arise.

⁴² Include Baseline Monitoring Plan

⁴³ To provide for Komiti to raise iwi issues directly with the consent holder, TPRG and the EPA.

Meetings of the Komiti

46. The consent holder shall, at least once per calendar year, invite representatives of the EPA and the Komiti to a meeting to discuss any matter relating to the exercise and monitoring of this consent. At this time the consent holder shall, in addition to any matters relating to the exercise and monitoring of this consent, use its best endeavours to inform the Komiti of the likely dredging to be undertaken in the following year.

Annual Report to Komiti

47. The consent holder shall prior to providing the EPA with the Annual Report as set out in Condition 22, provide a draft version of the report to the Komiti for comment. . If requested by the Komiti, appropriate technical expertise shall be made available by the consent holder to assist⁴⁴ the Komiti in interpreting monitoring data provided by the Consent Holder to the Komiti. The consent holder shall keep minutes of Komiti meetings and shall make them available to all members of the Komiti.
48. The Consent Holder shall provide to the Komiti final copies of the Annual Report required by Condition 22, concurrently with submission to the EPA.
49. The Consent Holder shall keep minutes of Komiti meetings and make them available to all members of the Komiti.

Technical Peer Review Group

50. The Consent Holder shall establish a Technical Peer Review Group (TPRG) prior to the formulation of the pre-operational Baseline Environmental⁴⁵ Monitoring Plan (BEMP) referred to in Condition 103.
51. The objectives of the TPRG shall be:
- a) to make recommendations to the consent holder and the EPA on the draft BEMP that is required in Condition 103;
 - b) to make recommendations to the consent holder and the EPA on quantitative trigger indicators and values for relevant physical and biological indicators directed at achieving the environmental performance objectives referred to in Condition 10 including in respect of existing interests⁴⁶;
 - c) to make recommendations to the consent holder and the EPA on the final content of all management plans⁴⁷ including operational monitoring and associated adaptive management protocols;
 - d) to review the methodology and procedure for establishing and subsequent application of the operational sediment plume model along with its calibration and validation including risks to existing interests⁴⁸;
 - e) to consider and make recommendations to the consent holder and the EPA in respect of monitoring data and reports from the monitoring undertaken in accordance with the EMMP required in Condition 193;
 - f) to make recommendations to the Consent Holder and the Chief Executive on actions to improve the monitoring and management;

⁴⁴ Clarify wording

⁴⁵ To align wording

⁴⁶ From consultation with Origin - inserted assuming DMC agrees with relief sought by Origin

⁴⁷ To clarify broader relationship with all management plans (R Witte evidence; D Serjeant suggestions)

⁴⁸ From consultation with Origin- inserted assuming DMC agrees with relief sought by Origin

- g) to receive and consider the EMMP annually after operational monitoring has commenced, and make recommendations to the Consent Holder and the Chief Executive on amendments to the EMMP; and
 - h) to make recommendations to the Consent Holder and the Chief Executive in respect of the review of conditions of this consent pursuant to section 76(1)(e) of the Act and Conditions 214 and 215 of this consent.
52. The consent holder shall invite parties to nominate representatives to sit on the TPRG as follows⁴⁹:
- a) one kaitiaki representative appointed by Ngati Ruanui⁵⁰;
 - b) one senior management representative (or equivalent) of the Consent Holder;
 - c) one suitably qualified specialist in the field of marine ecology appointed in consultation with the Department of Conservation; and
 - d) one suitably qualified specialist in the field of marine plume modelling appointed in consultation with Taranaki Regional Council and the EPA⁵¹;
 - e) one suitably qualified specialist in the field of marine science appointed in consultation with the EPA;
 - f) one suitably qualified specialist in the field of marine primary productivity appointed in consultation with the EPA⁵².
 - g) one specialist in regulatory processes appointed in consultation with the Taranaki Regional Council⁵³.
53. The TPRG may invite up to three additional members from time to time to ensure that it has the requisite skills to meet its objectives, including marine mammal or seabird experts appointed in consultation with the Department of Conservation; and a fisheries scientist appointed in consultation with the commercial fisheries sector⁵⁴.

Advice Note

The Commercial Fisheries sector includes commercial aquaculture operators.

54. The consent holder shall obtain written confirmation from the EPA that the Chief Executive approves the membership and any changes in membership of the TPRG (other than the Ngati Ruanui representative)⁵⁵ prior to the nominated member(s) commencing their function.
55. Following approval of the pre-operational baseline monitoring plan the TPRG shall meet at six monthly intervals for a period of two years to review baseline monitoring reports and develop the operational components of the EMMP. After this initial two year period, the TPRG shall arrange its schedule to meet as frequently as necessary, but in no case less than annually to achieve its objectives (including consideration of the annual monitoring report).
56. Copies of all reports from the TPRG shall be provided to the EPA, the consent holder, the Project Consultative Group and the Komiti. These reports shall be public

⁴⁹ Clarify process for invitation to nominate.

⁵⁰ To recognise the kaitiaki status of Ngati Ruanui.

⁵¹ Include provision for EPA involvement in process to nominate plume specialist given the pre-eminence of the plume in relation to effects.

⁵² Recognition of relevance of need to specifically address primary productivity issues.

⁵³ Recognise TRC expertise in regulatory process and monitoring.

⁵⁴ Include fisheries scientist expertise.

⁵⁵ Clarify independence of Ngati Ruanui appointee.

- documents and shall be published on the ⁵⁶consent holder's website within four weeks of receipt by the EPA and the consent holder.
57. The consent holder shall, in relation to the TPRG:
- a. develop protocols regarding appointment processes, including resignations, replacements and reappointments; the holding of meetings; provision of information and technical advice; administrative support; dispute resolution in the event of disagreement amongst members of the TPRG⁵⁷; and other necessary and related procedures.
 - b. ensure such protocols are developed in consultation with and approved by the Chief Executive;
 - c. maintain and support the ongoing objectives and work of the TPRG, as required by the conditions of this consent;
 - d. meet the reasonable costs of undertaking its functions in accordance with the conditions of this consent.
58. The TPRG shall determine its own processes and procedures for conducting its meetings as it sees fit.
59. Notwithstanding the above procedures, the Ngati Ruanui representative on the TPRG shall be entitled to make recommendations directly to the consent holder and the EPA in respect of methods to avoid, remedy or mitigate any adverse effects of the consented activities on the cultural values and interests of Ngati Ruanui in the South Taranaki Bight area⁵⁸.

Management Plans

60. The consent holder shall prepare for the approval of the Chief Executive such management plans as are required to give effect to the conditions of this consent. The following management plans shall be prepared and submitted to the Chief Executive for approval:
- a) Operational Manual and Safety Contingency Plan.
 - b) The Spill Contingency Management Plan.
 - c) The Collision (Loss of Position) Contingency Management Plan⁵⁹
 - d) The Recreational Fishing and Diving Monitoring and Management Plan.
 - e) The Commercial Fisheries Communication and Management Plan.
 - f) The Seabird Effects Mitigation and Management Plan.
 - g) The Marine Mammals Management Plan⁶⁰.
 - h) The Biosecurity Management Plan.
 - i) The Pre-operational Baseline Monitoring Plan
 - j) The Environmental Monitoring and Management Plan.
61. The likely timing of the delivery of these management plans shall be identified by the consent holder and advised to the Chief Executive within six months of the commencement of this consent. The Consent Holder shall work collaboratively with the EPA to ensure that ample notice of the delivery date for each plan is provided to assist the EPA with planning the allocation of resources to assess each of the plans.

⁵⁶ Consent cannot impose obligation on another party.

⁵⁷ Provides a mechanism for dispute resolution - raised by TRC.

⁵⁸ To recognise the kaitiaki status of Ngati Ruanui.

⁵⁹ Consultation with Origin - insertion subject to DMC agreeing with relief sought by Origin

⁶⁰ From Joint Witness suggestion

62. The Management Plans required in Condition 60 shall be made available on the consent holder's website within 10 working days of approval by the Chief Executive⁶¹.
63. The Consent Holder shall ensure that the management plans are given effect to following approval by the Chief Executive.
64. The Consent Holder may at any time after receiving approval, in addition to review provisions specified elsewhere in this consent, review and revise any management plan at any time on the following terms:
- a) Amendments shall be submitted in writing to the Chief Executive for approval. Minor amendments to take into account unforeseen circumstances on site, or circumstances that require immediate action do not need to be submitted in advance of the work being undertaken, but shall be submitted as soon as practicably possible;
 - b) The Consent Holder shall, in relation to any change to any management plan, consult with the same parties it is required to consult in relation to the preparation of the original management plan under these conditions of consent and in any case, with the TPRG in respect of the relationship of such changes to the Environmental Performance Objectives set out in Condition 10, The Consent Holder shall provide a statement to the EPA on the outcome of such consultation; and
 - c) Any change(s) to management plan(s) shall be approved by the Chief Executive as meeting the respective purpose(s) and objective(s) of the management plan(s) in accordance with these conditions.
65. All Management Plans shall clearly state the methods and provide such other detail as required to demonstrate how the purpose and the objective(s) of such Plans as set out in the relevant condition(s) will be achieved.
66. The consent holder shall pay all actual and reasonable costs of the EPA in connection with the review of all management plans prior to their approval.

Advice Note:

Chief Executive approval is expected to be provided within 20 working days of receipt of each plan or plans.

Operational Manual and Safety Contingency Plan

67. The Consent Holder must prepare an Operational Manual and Safety Contingency Plan with the objectives of ensuring navigational and maritime safety during project operations, minimising any interference with other non-mining related vessels in the area and avoiding unplanned events.
68. Subject to Condition 60, the Operational Manual and Safety Contingency Plan must be developed with information including but not limited to the following:
- a) An assessment of compliance with all environmental limits imposed by this marine consent.
 - b) Determination of operating limits that will ensure compliance with this marine consent and in particular Condition 145.
 - c) A formal risk analysis, hazard and operability studies and vessel assessment to be used to develop vessel design to ensure compliance with this marine consent including but not limited to:

⁶¹ K Pratt submission

- i) depth of water
 - ii) range of sea states in the South Taranaki Bight
 - iii) range of weather conditions in the South Taranaki Bight.
 - d) Preparation of standard and emergency operating procedures for use by the vessel crews and company management.
 - e) Detail of all key operations including but not limited to:
 - i) positioning, anchoring and mining operations for the FPSO
 - ii) product transfer between FPSO and FSO
 - iii) product transfer between FSO and export vessel
 - iv) fuel and other liquids transfers
 - v) transfer of provisions and stores
 - vi) controls relating to avoidance of potential collisions with marine mammals.
 - f) Operating procedures for export vessels.
 - g) Procedures for recovery and placement of anchors associated with the FPSO.
 - h) Metocean data including operational limits with respect to sea state during anchor handling activities.
 - i) Emergency procedures in the event of an unplanned occasion including storm events, equipment failure, loss of the FPSO anchor(s) and vessel collision.
 - j) Contractor name and contact details of the operator of the anchor handling tug.
69. Subject to Condition 68(a), environmental limits will cover wind speed and direction, sea and swell height including combined waves and directions for:
- a) mining operations
 - b) product transfer operations (FPSO to FSO)
 - c) product transfer operations (FSO to export vessel)
 - d) fuel transfer operations
 - e) other provisioning operations.
- Advice note: The Operational Manual and Safety Contingency Plan must also provide the basis for applications to Maritime New Zealand for fuel and product transfer operations at sea as required under the Marine Protection Rules Part 103.*
70. The Consent Holder must review and if necessary update the Operational Manual and Safety Contingency Plan and provide it to the EPA:
- a) one month after the first anniversary of the commencement of activities authorised by this marine consent
 - b) one month after any incident of non-compliance identified by the EPA
 - c) in the event of any emergency requiring notification of emergency management agencies including but not limited to Police, Maritime NZ and the Coastguard
 - d) one month prior to any change in the operation that may result in non-compliance with the conditions of this marine consent.
71. The Consent Holder must undertake operational audits of key operations listed in Condition 68(e) one year after the first anniversary of the commencement of activities

authorised by this marine consent and every three years thereafter. These must be provided to the EPA electronically within one month of completion.

72. The Consent Holder must maintain a log of operational accidents or incidents, which must be recorded and provided electronically to the EPA on request.

Spill Contingency Management Plan

73. At least 3 months prior to commencement of mining authorised by this consent the consent holder shall provide a Spill Contingency Management Plan (SCMP) to the Chief Executive for approval and certification that the plan demonstrates how the environmental performance objectives set out in Condition 10 will be achieved.
74. The objective of the SCMP is to outline the process, methods and responses to be implemented after any unplanned event that potentially results in a spill to the environment, including the measures which will be taken to avoid, remedy or mitigate to the greatest extent practicable any adverse environmental effects.
75. The provisions of the SCMP shall be integrated with spill contingency requirements set out in any Discharge Management Plan or equivalent, prepared pursuant to requirements of the Maritime Transport Act 1994, or equivalent.

Collision (Loss of Position) Contingency Management Plan⁶²

76. At least 3 months prior to commencement of mining authorised by this consent the consent holder shall provide a CCMP to the Chief Executive for certification that the plan demonstrates how the environmental performance objectives set out in Condition 10 will be achieved.
77. The objective of the CCMP is to outline the processes, methods and responses to be implemented after any unplanned event that potentially results in mooring failure or loss of position, including the measures which will be taken to avoid, remedy or mitigate any adverse environmental effects or effects on existing interests such as the infrastructure and operations of the licensee of PML 38146.

Recreational Fishing and Diving Monitoring and Management Plan

78. At least 3 months prior to the commencement of mining authorised by this consent, the Consent Holder shall prepare a Recreational Fishing and Diving Monitoring and Management Plan (RFDMMMP) and provide it to the Chief Executive for approval and certification that the plan is in accordance with the environmental performance objectives set out in Condition 10 of this consent.
79. The objective of the RFDMMMP is to avoid, remedy or mitigate the effects of the consented works on recreational fishing and diving locations recognised in the Taranaki Regional Coastal Plan and the Inventory of Coastal Areas of Local or Regional Significance in the Taranaki Region (Taranaki Regional Council, 2004).
80. The Consent Holder shall consult with the recreational fishing and diving community in preparation of the RFDMMMP.
81. The RFDMMMP shall include, but not be limited to, the following:
- a) A communication protocol with the local recreational fishing and diving industry, the primary aim of which is to keep recreational fisher and divers informed on a regular basis of effects of the project on popular fishing and diving locations;

⁶² Consultation with Origin - inserted assuming DMC agrees with relief sought by Origin

- b) Identification of measures to mitigate effects of sediment plumes on popular fishing and diving locations and how these effects will be monitored; and
- c) Identification of the location of areas in which monitoring will occur.

*Commercial Fisheries Communication and Management Plan*⁶³

- 82. Subject to Condition 60 of this consent, the Consent Holder must prepare a Commercial Fisheries Communication and Management Plan (CFCMP)
- 83. The objective of the CFCMP is to avoid, remedy or mitigate the effects of the consented works on the commercial fishing industry.
- 84. The CFCMP shall be developed in consultation with the commercial fishing industry, and the reasonable costs of preparing and implementing this plan shall be met by the consent holder⁶⁴.
- 85. The CFCMP shall include but not be limited to:
 - a) evidence of consultation on the plan undertaken with:
 - i) all commercial operators that hold and fish for quota allocations for fisheries inside an area 2 km² from the boundaries of the Project area shown on Plan A
 - b) a protocol for communication with local commercial fishers including those identified in (a) above, the primary aim of which would be to keep fishers informed on a regularly updated basis of exclusion zones, vessel movements, bathymetry and other mining activities that will result in compliance with this marine consent and in particular Condition 83.
 - c) a contact list of companies operating in the area to whom the above information will be provided
 - d) a protocol for consultation with the Ministry for Primary Industries (MPI) Northern Inshore Science Working Group in respect of fishing effort data and environmental effects as appropriate.
 - e) A protocol for the commercial fishing industry to advise the consent holder of implications / problems / areas of concern in relation to effects arising from activities authorised under this consent, including twice yearly meetings (December and August each year)⁶⁵.

*Seabirds Effects Mitigation and Management Plan*⁶⁶

- 86. At least 3 months prior to the commencement of mining authorised by this consent, the consent holder shall, in consultation with the Department of Conservation, develop a Seabird Effects (Lighting) Mitigation Plan and provide it to the EPA for approval that the plan is in accordance with this marine consent. The Seabird Effects (Lighting) Mitigation Plan shall be prepared in accordance with Condition 60. The Consent Holder shall also provide a statement to the EPA on the outcome of consultation with the Department of Conservation within that same 3 month time frame.
- 87. The consent holder shall record all deck strike of seabirds including photographs, date, time, weather conditions, species, threat status, migratory or not, was the bird dead or released alive. Dead birds should be bagged, labelled, frozen and provided to the Department of Conservation.

⁶³ EPA Staff Condition 96

⁶⁴ D Serjeant suggestion in part

⁶⁵ D Serjeant suggestion in part

⁶⁶ DG Submission 6 May 2014 Attachment 1

88. The consent holder shall commission an annual review of the recorded bird strike information by the Technical Peer Review Group (TPRG) for the first 3 years of operation. Subsequent reviews will be at an interval to be recommended by the TPRG and approved by the EPA. When undertaking these reviews one or more seabird experts must be invited to join the group for this purpose, as provided in Condition 53 of this consent.
89. The TPRG's reviews should assess if the bird strike data obtained is sufficient to determine trigger levels that require mitigation. Such triggers should be considered separately for threatened or endangered seabirds, migratory seabirds and non-threatened seabirds. If required, mitigation measures could include but not be limited to:
 - a) Trials of using alternative types of light – particularly red and green;
 - b) Consideration of environmental conditions when operations should be suspended; and
 - c) Consideration of environmental conditions when some or all deck lights should be turned off.
90. The consent holder shall maintain a list of all seabirds known to occur in the South Taranaki Bight, updating it as new sightings occur, i.e. as a result of Condition 91.
91. In the event the consent holder undertakes any vessel-based baseline monitoring for other issues, such as marine mammal or plankton abundance, both before operations begin or during operations, a trained seabird observer should be placed aboard this research vessel to make rigorous and replicable observation of seabird abundance.
92. At least 3 months prior to the commencement of mining authorised by this consent, the consent holder shall, in consultation with the Department of Conservation, develop a Seabird Effects (Lighting) Mitigation Plan and provide it to the Chief Executive for approval that the plan is in accordance with this marine consent – in accordance with Condition 10(k).
93. The objectives of the Seabird Effects (Lighting) Mitigation and Management Plan are:
 - a) To mitigate and where possible avoid adverse effects on seabirds from vessel lighting including the FPSO, FSO and other support vessels;
 - b) To establish thresholds of adverse effects due to mortality or injury of seabirds of the species classified under the New Zealand Conservation Status as “Nationally Endangered, Nationally Critical” or “Nationally Vulnerable” or classified “Endangered” or “Vulnerable” in the International Union for the Conservation of Nature “Red List”. Such thresholds shall trigger responses specified in the Seabird Effects (Lighting) Mitigation and Management Plan. Such responses may include but not be limited to matters set out in Condition 89 above.
 - c) To monitor bird strike due to vessel lighting and adaptively manage vessel lighting and vessel operations to reduce the incidence of bird strike.
94. The Seabird Effects (Lighting) Mitigation and Management Plan shall address seabird collision risk mitigation features in design and operation of the FPSO, with particular attention to the following measures:
 - a) External lighting to be limited to the minimum required for safe navigation and operation of vessels;
 - b) Use of shades on deck lights, and black-out blinds on portholes and windows to prevent unnecessary light escaping;

- c) Deck lights wherever practicable shall be directed downwards and shielded to reduce horizontal or vertical light shining out from the vessel;
 - d) Use of non-reflective paints on vessels to minimise reflected light; and
 - e) Minimise the use of vertical wires and objects on the deck of all vessels and, in particular, the FPSO.
95. The consent holder shall record all deck strikes of seabirds, including the following:
- a) Photographs – close-up digital images including: a whole body shot; at least two shots of the head – from the side and the front; and an under-wing shot;
 - b) Date and time;
 - c) Weather conditions;
 - d) Whether the bird is released alive or is dead;
 - e) if a bird need to be euthanized or cared for in any other way (see Condition 96 below);
 - f) The threat status of the bird using the most up to date NZ Conservation status and the IUCN “Red list”
 - g) Whether the bird is a migratory species.
96. The consent holder shall ensure that shipboard personnel are aware and trained as appropriate to deal safely and humanely with any birds that collide with the vessel, including but not limited to the following:
- a) If a bird has a broken wing or broken bill it should be euthanized;
 - b) If a bird is stunned it should be placed in a dark cool place for several hours and then re-checked for release. A stunned seabird should not be put in warm place to recover; and
 - c) A basin of clean water should be made available so birds have the option to self-clean.
97. In the event one of the following seabirds is injured in a deck strike, the Department of Conservation should be contacted as soon as practicable immediately for advice on what to do with it:
- a) Chatham Islands Taiko (magenta Petrel) (*Pterodroma magentae*);
 - b) Parkinson’s petrel (*Procellaria parkinsoni*); and
 - c) Fairy tern (*Sternula nereis davisae*).
98. If any of the species in Condition 97 are found on a consent holder vessel, it shall be bagged, labelled including the information required in Condition 95 above, frozen and provided to the Department of Conservation.
99. The Technical Peer Review Group should periodically assess if the bird strike data obtained is sufficient to potentially require mitigation. If so then trigger levels for mitigation should be established. Such triggers should be considered separately for threatened or endangered seabirds, migratory seabirds and non-threatened seabirds.”

Biosecurity Management Plan

100. At least 3 months prior to the commencement of mining authorised by this consent, the consent holder shall develop a Biosecurity Management Plan and provide it to the Chief Executive for approval and certification that the plan is in accordance with

achieving the environmental performance objectives set out in Condition 10 of this consent.

101. The Biosecurity Management Plan shall detail measures to avoid the introduction of unwanted or risk species identified as such by Biosecurity New Zealand and minimise any impacts through propagation if such species are introduced.
102. In particular the consent holder shall ensure that all vessels used to export product shall operate a biofouling management plan developed around the requirements of the "Craft Risk Management Standard (CRMS) for Bio-fouling on Vessels arriving to New Zealand" issued under section 24G of the Biosecurity Act 1993. Particular attention shall be given to those taxa on the MPI unwanted species list, relevant taxa that are on Australian target species lists and other taxa that have 'demonstrably invasive characteristics'⁶⁷.

Pre-operational Baseline Environmental Monitoring Plan

103. The Consent Holder must prepare a Baseline Environmental Monitoring Plan (BEMP) to describe the baseline monitoring in accordance with the objectives set out in Condition 10, including the following, as a minimum:
 - a) The sampling methodology, including parameters and techniques for each environmental component listed in Condition 110.
 - b) Monitoring locations that will provide a statistically robust representation of the area affected by mining activities area.
 - c) Frequency and replicates of samples.
 - d) Describing the environmental baseline, including in respect of existing interests⁶⁸; and
 - e) Providing data to inform subsequent operational monitoring, including but not limited to matters set out in Condition 110.
104. The objectives of the BEMP shall be ⁶⁹:
 - a. to establish the range of background variability in the key environmental components, including in respect of existing interests⁷⁰, (listed below) ;
 - a. to inform the setting of quantitative limits on effects of the mining activities, or outcomes, authorised by this marine consent that give effect to the qualitative limits referred to in Condition 10;and
 - b. providing data for comparison with post operational monitoring data
105. The Consent Holder shall submit the proposed BEMP to the Chief Executive for approval and certification that it is consistent with and will enable measurements to demonstrate the environmental performance objectives set out in Condition 10 are being met. The proposed BEMP shall be submitted to the Chief Executive no less than 24 months prior to the commencement of the mining activities authorised by this consent.

Advice Note:

Chief Executive certification is expected to be provided within 20 working days of receipt of the proposed BEMP.

⁶⁷ Provides explicit reference to nominated taxa set out under international guidelines.

⁶⁸ Consultation with Origin - inserted assuming DMC agrees with relief sought by Origin

⁶⁹ From EPA Staff Conditions 05

⁷⁰ Consultation with Origin - inserted assuming DMC agrees with relief sought by Origin

106. The consent holder shall undertake pre-operational baseline environmental monitoring⁷¹ for a minimum period of 2 years prior to the commencement of the consented activities. Pre-operational baseline environmental monitoring shall cover the full range of matters necessary to achieve the objectives of the BEMP including but not limited to consideration of the following matters:
- a) Baseline benthic sampling
 - i. Baseline benthic sampling should capture seasonal variability (relative to recruitment), covering two sampling times per year (e.g. summer and winter or autumn vs spring), recognising that the inhospitable nature of this offshore shelf environment probably negates finer temporal sampling.
 - ii. Benthic monitoring sites should be sampled along a gradient from the mining area relative to the spatial extent of the projected suspended sediment plume (i.e., gradients along-plume including Graham Bank and across- plume from inshore reef zone to the offshore biogenic zone).
 - iii. Benthic monitoring sites should include representative/selected sites with each benthic community type (i.e., wormfields, rippled sands, inshore reefs, offshore biogenic habitats), with sampling of sediment cores to examine infauna greater than 500 µm in size.
 - iv. Benthic monitoring sites should include reefs of 'special interest', such as the North and South Traps, Graham Bank, Four Mile Reef, Patea Reefs and Waiinu Reef.
 - b) Benthic ecology monitoring should be designed/undertaken in a way that provides enough statistical power to detect ecologically significant community change caused by the mining activity. Marine mammals⁷²
 - i. The Consent Holder shall undertake baseline surveys for cetaceans (whales and dolphins) in the consent area and sufficient parts of the wider South Taranaki Bight, and these shall be of sufficient duration, frequency and seasonality, to be able to achieve the marine mammal objectives set out in Condition 10 of this consent⁷³;
 - ii. The purpose of the baseline survey surveys shall be to monitor and assess scientifically cetacean presence, distribution density and, where possible, total abundance with a purpose of informing decision making including the development, ongoing implementation and review of marine mammal section of the EMMP;
 - iii. The marine mammal baseline survey protocols shall be endorsed by the TPRG and approved by the Chief Executive and designed by independent, qualified and experienced marine mammal scientists, who are endorsed by the TPRG and approved by the EPA;
 - iv. The marine mammal baseline survey shall include the consent area and sufficient parts of the wider South Taranaki Bight, and shall be of sufficient duration, frequency and seasonality to ensure the identification of the presence, abundance and distribution of marine mammals in the study area; and

⁷¹ Revised to clarify wording

⁷² All inserted based on wording of final marine mammals group suggestions - variations noted as separate footnotes below.

⁷³ Slight re-wording to reflect structure on conditions.

- v. The marine mammal baseline survey shall adopt scientifically appropriate and best-practice marine mammal survey methodologies.
- vi. The marine mammal baseline survey shall be designed to assess any impacts of the mining operation on cetacean species with sufficient statistical power.
- c) Primary Productivity⁷⁴
 - i. Benthic microalgae (BMA) are too variable in space and time to be a valuable monitoring factor. However baseline monitoring should include measurements of Chlorophyll-a from the sediments in a way that discriminates between recent 'benthic generated microalgae' and 'old/degraded phytoplankton' to determine the relative importance of benthic versus pelagic primary production in this system.⁷⁵
- d) Bathymetry and Oceanographic Processes
 - i. The Consent Holder shall undertake multi-beam surveys to determine the bathymetry of the entire area within a 300 meter boundary line drawn around the operational extraction and deposition area, at such a scale as to allow comparison with post-operational bathymetric changes of the order of 500 mm⁷⁶.
 - ii. Baseline measurement of oceanographic characteristics shall be undertaken in accordance with recognised international standards.⁷⁷
- e) Coastal Processes and Waves⁷⁸
 - i. Shore profiling to be undertaken to a similar standard as that undertaken for application studies to provide a basis for future comparison.
 - ii. Predicted changes in wave characteristics and coastal processes occurring closer to shore would be too small to detect given the large natural variation in wave characteristics (height, period and direction) over time and space – no monitoring of wave characteristics close to shore.
 - iii. Modelling/analysis to be undertaken to quantify the magnitude and patterns of cross-shore sediment transport on inner shelf.
- f) Fish and Fisheries⁷⁹
 - i. Specific monitoring of fish species that are abundant around the mining site is not warranted.
 - ii. It would be appropriate to monitor reef fish these species at the North and South Traps, at the Graham Banks if reefs actually do occur at this site, and in the biogenic shell and bryozoans areas to the south of the mining area.
 - iii. The method used to monitor demersal species (bottom trawling) is likely to cause a larger effect on the demersal fish and benthos than the effects that are being assessed.
 - iv. In lieu of direct monitoring of fish species, monitoring should focus on measurement of environmental physical determinands such as SSC and optical properties as indicators of potential biological effects⁸⁰.

⁷⁴ Relates to issues raised by TRC, Pinkerton

⁷⁵ Moved from benthic category above - more appropriate in primary productivity category.

⁷⁶ Multibeam survey indicated in Joint Witness statement Coastal and Oceanographic Processes; Predicted residual change in deposition area of around 1m - 500 mm selected here to provide precision for future comparisons.

⁷⁷ Joint Witness Statement Coastal and Oceanographic Processes.

⁷⁸ Joint Witness statements Coastal and Oceanographic Processes & Effects on Waves and Surfing.

⁷⁹ Joint Witness Statement Fish and Zooplankton - unless otherwise noted.

- g) Zooplankton⁸¹
 - i. Direct effects of the increase of sediment concentrations on zooplankton are highly unlikely.
- h) Sediment Plume⁸²
 - i. An operational plume model would be useful as an environmental management tool for the operator, and in assessing compliance (see Condition 179). The plume results for the revised model provide a basis for developing an operational plume model to be used for operational management processes.
 - ii. Monitoring is a necessity for any operational model in order to validate and ground truth that model. The operational model might then be appropriate as a forecasting management tool to undertake operational decisions and experiment with changes to sensitivity parameters.
- i) Mātauranga Māori⁸³
 - i. Changes attributable to activities authorised under this consent in relation to grainsize, aesthetics and morphology of coastal features such as sand bars, reefs, and river bars that are significant customary fishing or significant cultural sites.
 - ii. Evaluation of the ability to discriminate geochemically between coastal sediments and sediments derived from activities authorised under this consents.
 - iii. is the sediment being discharged geochemically distinct to act as a tracer so it can be differentiated from other sediment sources along the entire coastline impacted.
 - iv. potential impacts on feeding, breeding and habitat areas by sediment discharge customary species such as kahawai, snapper, shark, sea cucumber and gurnard.
 - v. The holistic relationship between these species and their habitat, feeding and breeding areas in regards to sites and species in the sense that if one element is impacted, even in a minor manner what are the potential flow on effects or compounding flow on effects to other species or the wider ecosystem.
 - vi. Potential effects on migratory patterns of glass eels, lamprey and flounder
 - vii. Potential changes of activities authorized under this consent in relation to changes in the grainsize of sand and the increased deposition of a particular grainsize on habitats, numbers and health of a range of shellfish species including toheroa, tuatua, pipi.
 - viii. Consideration of potential flow-on effects to related species if one species or one geomorphic feature or process is altered or impacted.
 - ix. If shellfish in the sediment depositional zone were affected, what effects would this then have of the fisheries species and migratory patterns of those fish that feed on these.

⁸⁰ Follows from consideration of conclusions of Fish Joint Witness Statement.

⁸¹ Joint Witness Statement Fish and Zooplankton.

⁸² From Joint Witness Statement Sediment Plume Modelling.

⁸³ From submission by Te Taihauauru Fisheries Forum - these matters are additional to those specified elsewhere in this condition.

- x. Regular monitoring of sites of significance and of their species of significance in the coastal environment.
 - xi. Further exploration of suitable satellite sensors and hyperspectral sensors to develop a long term monitoring program of the area and the ability to detect and track sediment plumes from TTR's operations.
 - xii. Potential effects of activities authorized under this consent in relation to coastal geomorphology around the Whanganui/Rangitikei/Manawatu coastline and consideration of applicability of regular surveys of coastal areas by both sonar and lidar to map out geomorphic features and any areas of change that may relate to TTR's operation.
 - xiii. Additional grainsize and geochemical monitoring of beaches and depositional zones should also occur.
 - xiv. Investigations into the migratory patterns of glass eels and the potential effects of suspended sediment on glass eels be conducted.
 - xv. Consideration of whether it would be appropriate to limit operations or sediment discharge during periods of glass eel migrations through the coast areas and into the freshwater areas.
- j) Existing interests⁸⁴
- i. The Consent holder shall undertake baseline monitoring to the extent practicable to establish the baseline physical and environmental conditions affecting the interests associated with PML 38146.
 - ii. The baseline monitoring programme shall be developed using all reasonably available relevant data and after undertaking appropriate modeling.
 - iii. The purpose of the baseline monitoring is to enable assessment of any adverse effects on the interests associated with PML 38146 that might arise from the exercise of this consent.
107. The BEMP shall be prepared by the consent holder in consultation the following:
- a) Project Consultative Group (Condition 27)
 - b) Komiti (Condition 41)
108. The Consent Holder shall provide the draft components of the BEMP to the TPRG for their consideration and recommendations for inclusion in the final content of those components of the BEMP. Those recommendations and any subsequent recommendations of the TPRG to further drafts of the BEMP shall be provided to the Consent Holder and to the EPA.
109. The Consent Holder shall finalise the relevant components of the BEMP having regard to the recommendations of the TPRG. Where TPRG recommendations have not been incorporated, these shall be clearly outlined in the report to the EPA (Condition 108)⁸⁵.

Content of BEMP

110. The key environmental components to be subject to baseline monitoring are⁸⁶:
- (a) Seabed bathymetry;
 - (b) Water quality throughout the water column;
 - (c) Air quality;

⁸⁴ Consultation with Origin - inserted assuming DMC agrees with relief sought by Origin

⁸⁵ K Pratt

⁸⁶ EPA Staff Conditions 05

- (d) Seabed sediment dynamics;
 - (e) Sedimentation;
 - (f) Coastal processes including shoreline morphological changes, waves;
 - (g) Visual effects;
 - (h) Underwater noise;
 - (i) Primary productivity;
 - (j) Benthic habitat and benthic organisms;
 - (k) Marine mammals;
 - (l) Fish biology, movement, behaviour;
 - (m) Seabirds;
 - (n) Recreational fishing and diving;
 - (o) Commercial fishing including aquaculture;
 - (p) redox levels of pre-mined sediments (if reasonably practicable); and
 - (q) The interests of or under PML 38146⁸⁷.
111. The BEMP shall encompass monitoring in the project area authorised for activities in this consent, and in sufficient parts of the wider South Taranaki Bight to be able to achieve the objectives of this consent⁸⁸..
112. The BEMP shall contain the following elements:
- a) The monitoring strategy designed to meet the objectives of the BEMP.
 - b) Detailed methodology for pre-operational investigations including:
 - (i) Verification of available information for use as baseline data; and
 - (ii) Detailed sample design for baseline data collection, including parameters to be measured; detection limits; monitoring locations; frequency; sampling methods.
 - c) The level of reporting required during the pre-operational monitoring phase;
 - d) Specification of process to develop trigger indicators and values (Condition 11).
113. Within three months of the completion of the baseline environmental monitoring, the Consent Holder must provide a report to the EPA setting out the results of all monitoring undertaken under the BEMP including the results of the Marine Mammal Baseline Survey and Benthic Baseline Survey⁸⁹.

C. OPERATIONAL

Sediment extraction, deposition and discharge monitoring

114. The consent holder shall operate, maintain and regularly calibrate to manufacturers specifications, equipment and systems capable of accurately measuring and electronically recording the following matters relating to those specified in Condition 5 of this consent:
- (a) The total run of mine material extracted hourly, on an ongoing basis;
 - (b) The total mass of sediment discharged via the hydro-cyclone underflow hourly, on an ongoing basis;
 - (c) The total mass of sediment discharged via the hydro-cyclone overflow hourly, on an ongoing basis;

⁸⁷ Consultation with Origin - inserted assuming DMC agrees with relief sought by Origin

⁸⁸ To define the area of baseline monitoring relative to environmental objectives set out in this consent.

⁸⁹ EPA Staff Conditions 07

- (d) Discharge water flow rates (hourly); and
 - (e) The particle size distribution (i.e. size range from ≤ 0.4 to ≥ 2000 micron across ≥ 92 discrete size classes) of sediment being discharged via the hydro cyclone underflow and overflow (from samples collected and combined in accordance with the requirements of Condition 5(e) ⁹⁰.
115. The information recorded under Condition 114 (a) to (c) of this consent shall be certified as correct by the person nominated by the consent holder under Condition 19 with responsibility for collating information on consent compliance management, and shall be reported to the EPA in accordance with the compliance reporting elements of the Operational Environmental Management Plan required under Condition 196(b) of this consent.
116. The consent holder shall operate the sediment extraction equipment (crawler) in a manner which minimises the loss or spillage of sediment (i.e. sediment which is agitated or disturbed and which is not subsequently extracted via the suction pipe). The consent holder shall ensure that sensors are present and operational on the extraction equipment to allow the operator to monitor this in real time and in an ongoing continuous manner.

Operations and Maintenance⁹¹

117. The Consent Holder must make a hard copy of these conditions (including all management plans and other documentation required in these conditions) available for the EPA to inspect at any time:
- (a) at the Consent Holder's head office
 - (b) on board all vessels undertaking activities provided for by this marine consent.
118. The Consent Holder must ensure that all personnel on board project vessels receive the training required below prior to taking part in any employment duties related to giving effect to this consent. Training must be to a standard that ensures compliance with consent conditions when giving effect to this consent, including training on but not limited to:
- (a) the Consent Holder's obligations under the marine consent, conditions and associated management plans
 - (b) their responsibilities under any condition or management plan and how to meet those responsibilities
 - (c) their obligations under the Marine Mammals Protection Act 1978 and Marine Mammals Protection Regulations 1992.
119. A record of all training carried out in accordance with this condition must be maintained and made available to the EPA on request.
120. The Consent Holder must ensure that, in respect of all project vessels, a valid International Oil Pollution Prevention (IOPP) certificate is held.
121. The IOPP certificate must be:
- (a) in place prior to the vessel operating under this consent
 - (b) provided to the EPA within 10 working days of receipt by the Consent Holder
 - (c) kept on board all vessels used to give effect to this consent at all times.
122. Whilst giving effect to this marine consent, the Consent Holder must maintain a permanent register of any complaints received by any person or company alleging adverse effects from, or related to this marine consent.

⁹⁰ Linkage with revised Condition 4. and DG Submission 6 may 2014 Attachment 1

⁹¹ EPA Staff Conditions 24-27

123. The register shall include:

- (a) the name and address of the complainant (if provided to the consent holder)
- (b) the nature of the complaint
- (c) the location, date and time of the complaint and of the alleged event
- (d) weather conditions at the time of the complaint, including wind direction and approximate wind speed, the real-time New Zealand MetService forecast for the mining area and any forecast warning for the area and the presence of precipitation, fog or any other weather related impact on visibility
- (e) the outcome of any investigation into the complaint
- (f) any measures taken to respond to the complaint.

124. This information should be provided in writing to the EPA in the monthly report and shall be held in a log on both the FPSO and at the TTR head office for inspection by the EPA on request.

Long-term anchoring or mooring of the Floating Processing, Storage and Offloading (FPSO) vessel ⁹²

125. Subject to Conditions 126 and 127, long term anchoring or mooring of a single FPSO under this marine consent must be restricted to the area contained within the co-ordinates set out below⁹³. Long term anchoring or mooring of the FPSO on or under the seabed outside of this area is not authorised by this marine consent:

Point	Longitude	Latitude
1	174° 10' 51" E	39° 49' 39" S
2	174° 13' 03" E	39° 51' 21" S
3	174° 12' 16" E	39° 51' 56" S
4	174° 09' 02" E	39° 53' 42" S
5	174° 07' 21" E	39° 54' 29" S
6	174° 05' 37" E	39° 54' 23" S
7	174° 04' 33" E	39° 54' 16" S
8	174° 03' 49" E	39° 53' 52" S
9	174° 02' 52" E	39° 53' 12" S
10	174° 02' 09" E	39° 52' 38" S
11	174° 02' 12" E	39° 51' 20" S
12	174° 02' 28" E	39° 51' 04" S
13	174° 03' 18" E	39° 51' 53" S
14	174° 06' 30" E	39° 51' 43" S
15	174° 06' 30" E	39° 51' 39" S
16	174° 06' 40" E	39° 51' 34" S
17	174° 07' 23" E	39° 51' 45" S
18	174° 08' 10" E	39° 51' 28" S
19	174° 09' 46" E	39° 50' 33" S

Datum: NZGD2000

126. The Consent Holder must ensure that no mining activities are undertaken within 1.14 km in any direction from operational infrastructure associated with PML 38146.

⁹² EPA Staff Condition 28

⁹³ Coordinates have been corrected - those in EPA Staff Report contained errors.

127. The Consent Holder must ensure it will mine safely around non-operational infrastructure associated with PML 38146 so as not to adversely affect the integrity of it.
128. The Consent Holder must ensure that up to a maximum of four anchors are placed on or under the seabed from the FPSO when anchoring in the Project area.
129. The Consent Holder must not anchor more than one FPSO in the Project area.
130. This marine consent requires the FPSO to be attached to the seabed, subject to Conditions 125 to 129, at all times when the SSED is operating on the seabed.
131. The Consent Holder must ensure pits remaining at the end of mining lanes, as described in the application documents, are no deeper than a maximum of 10 m and 5 m on average below the pre-mined seabed level. The average depth and GPS position of any unfilled pits remaining after completion of a mining lane must be recorded and reported in the monthly mining report under Condition 134.

Pre-mining assessment report⁹⁴

132. A pre-mining assessment report must be prepared and provided to the EPA at least three months prior to removal of the seabed with the SSED in each proposed mining area.
133. The purpose of this report is to identify within a proposed mining area the presence and extent of any mud layers beneath the seabed so that those areas can be avoided when mining in order to achieve the PSD Limits imposed by these conditions. The report must include but is not limited to:
 - a) an outline of the area where removal of seabed material will take place indicating mining lanes
 - b) bathymetry of the seabed in the area where removal of seabed material is planned
 - c) mineral grade projections and mine plan schedules
 - d) definition of mud layers in the area to be mined
 - e) procedure for avoiding identified mud layers to the extent necessary to meet the PSD Limits
 - f) the timing of proposed extraction and deposition activities in areas identified in a).

Monthly Mining Report⁹⁵

134. The Consent Holder must prepare a mining report at the end of each month of operation and provide this to the EPA electronically before the first Wednesday of the first week of each month during the mining activity. The mining report must include the following for the prior month of operation:
 - a) GPS positions of anchor placements on the seabed and coordinates illustrated on a map with the mining area as shown in Plan A clearly marked.
 - b) GPS positions of the SSED placement and tracks during operation and coordinates illustrated on a map with the mining area as shown in Plan A clearly marked.
 - c) Any bathymetry measurements of the seabed measured in the reporting period for in the area where removal of seabed material has taken place. (Note: Bathymetry will be assessed on six-monthly basis)

⁹⁴ EPA Staff Condition 84

⁹⁵ EPA Staff Condition 85

- d) Quantity and rate of removed and deposited seabed material.
- e) Maximum and average depth of seabed removed by the SSED throughout each mining lane. (from bathymetry)
- f) Average depth and GPS position of any unfilled pits remaining after completion of a mining lane. (from bathymetry)
- g) Average height and GPS position of any mounds created during the deposition of seabed material. (from bathymetry)
- h) Location and height above the seabed of discharge pipes whilst discharging seabed material.
- i) Any other components required by conditions of this marine consent.

Archaeological Remains (Shipwrecks)⁹⁶

135. On the discovery of any of the following or other material not naturally found in the mining area the Consent Holder, must immediately stop mining activities authorised by this marine consent.
- a) Steel.
 - b) Brass.
 - c) Other metals in solid state.
 - d) Manufactured or worked timbers.
136. The Consent Holder must notify the EPA of the find and consult with Heritage New Zealand and iwi representatives on confirming the origin of the find. Mining in the area of the discovery must not restart until the EPA is satisfied that the discovery does not qualify as a pre-1900 shipwreck as described under the Historic Places Act 1993.

Deposition of material on the seabed⁹⁷

137. Pits, other than those at the ends of each lane, as described in the application, created by the removal of seabed material must be backfilled as described in the application. The deposition of coarse tailings on the seabed in the area shown in the project area must be continuously recorded and monitored including but not limited to monitoring and recording PSD. The information collected during recording and monitoring must be reported on as part of the monthly mining report under Condition 134.
138. The Consent Holder must use all reasonable endeavours to ensure that coarse tailings are discharged no more than 4 metres above the deposited sediment or seabed level immediately below the discharge pipe. The Consent Holder must continuously record the depth at which tailings are released and report on this in the monthly mining report under Condition 134.
139. The Consent Holder must ensure mounds as described in the application documents are no higher than 9 m above the pre-mined seabed level and occur only at the start of a mining lane. The height and GPS position of any such mounds created during the deposition of seabed material must be recorded and reported in the monthly mining report under Condition 134.
140. The Consent Holder must not use or place more than one SSED on the seabed at any one time.

⁹⁶ EPA Staff Condition 43

⁹⁷ EPA Staff Conditions 44-46, 57

Vessels⁹⁸

141. The Consent Holder must ensure all vessels associated with the exercise of this marine consent are equipped with AIS (Automated Identification System), which must be turned on at all times.
142. The Consent Holder must notify the EPA, Maritime New Zealand, local fishing operators that hold quota allocations for fisheries inside an area 2 km² from the boundaries of the Project Area shown on Plan A, Ports of Wellington, Taranaki, Wanganui and Nelson and Land Information New Zealand at the beginning of each month prior to undertaking anchor placement and removal of seabed material of:
 - a) coordinates of the area where seabed removal and anchor placement will occur
 - b) VHF channel for communications
 - c) dates of effect.
143. The Consent Holder must comply with the Requirements for Vessels Arriving in New Zealand 2010 administered by the Ministry for Primary Industries.
144. The Consent Holder must comply with the Import Health Standard 2005 administered by the Ministry for Primary Industries.
145. The Consent Holder must not operate in sea states above the maximum identified for safe deployment of the SSSED. This upper limit will form part of the Operational Manual and Safety Contingency Plan required under in Condition 67.
146. The Consent Holder must notify the EPA in writing 24 hours prior to undertaking any fuel transfer operations.
147. The Consent Holder must notify the EPA, Maritime New Zealand and the relevant regional council and harbourmaster in writing of the location for each transfer of iron ore between the export vessel and FPSO at least 24 hours prior to the transfer taking place.
148. The Consent Holder must ensure that transfer operations are undertaken only when the receiving vessel is at anchor or under dynamic positioning or making steerageway.
149. The Consent Holder must take all reasonable measures to avoid spillage of material, other than that described as discharges provided for in the application, into the marine environment. This includes but is not limited to the loss of heavy fuel oil and iron ore concentrate.
150. The Consent Holder must ensure that the lifting equipment required for the SSSED is independently certified every year and certification is maintained until the expiry of this consent. Certification and maintenance records must be kept by TTR at their head office and on the FPSO and made available to the EPA on request.
151. The Consent Holder must prepare a stability book before conducting any ore transfer operations that, at a minimum, will include but not be limited to processes for loading each export vessel (which includes contingencies for interruption due to weather). This must be provided to the EPA one month prior to the first transfer operations performed as a consequence of giving effect to this consent.
152. The Consent Holder must ensure vessels comply with the Convention on the International Regulations for Preventing Collisions At Sea 1972 (COLREGS).

⁹⁸ EPA Staff Condition 65-80

153. The Consent Holder must ensure that all vessels maintain registration with Flag State and Class. Statutory obligations of the Flag State, Class and Coastal State must be maintained at all times, and documents should be made available to the EPA on request.

Discharges to air⁹⁹

154. This marine consent authorises the use of:
- a) gas turbines; or
 - b) reciprocating engines; or
 - c) similar, to ensure exhaust emissions are as predicted.
155. The Consent Holder must ensure that ground level air quality at the Kupe platform is compliant with the Workplace Exposure Standards under the Hazardous Substances and New Organisms (HSNO) Act 1996.

Discharges into the water column¹⁰⁰

156. The Consent Holder must not discharge water from the hydrocyclone at a height greater than 6 metres above the deposited sediment or seabed level immediately below the discharge pipe.
157. The Consent Holder must not dispose of chemicals or harmful substances at sea. All hazardous and oily waste must be stored on board for transport in suitable containers or packaging to an approved shoreside reception facility.
158. The Consent Holder must take all practicable measures to avoid the loss or spillage of sediment (i.e. sediment that is agitated or disturbed and is not subsequently extracted via the suction pipe) when operating the SSED.
159. The Consent Holder must ensure that sensors are present and operational on the extraction equipment to allow the operator to monitor compliance with Condition 158 in real time and in an ongoing continuous manner.
160. The results of continuous monitoring must be provided to the EPA in the monthly mining report with analysis of compliance with Condition 134.

Marine Mammals General

161. The consent holder shall ensure that at all times its employees and contractors undertaking airborne, seagoing and watch-keeping duties are informed of their obligations under the Marine Mammals Protection Act 1978 and Marine Mammals Protection Regulations 1992.
162. The Consent Holder shall require all of its employees and contractors to record any sightings of whales or dolphins including the date, time and GPS position of the marine mammals where possible. To assist in species identification, the consent holder shall provide all relevant employees and contractors with a marine mammals species identification guide and shall prepare and implement a training package and programme (including assessment and certification) for staff and contractors to help ensure accurate species identification and assessment of behaviour.
163. The consent holder shall ensure:
- a) Sufficient personnel on board its vessels all its vessels (including the FPSO) are, in addition to their regular duties, trained as Cetacean Observers (COs)

⁹⁹ EPA Staff Condition 81

¹⁰⁰ EPA Staff Condition 47, 55

- in terms of marine mammal identification, behaviour observation, operational procedures and reporting, to standards agreed to by the Chief Executive;
- b) that at least one assigned CO is on active duty on every vessel engaged in works during daylight hours (including the FPSO and vessels travelling to and from the extraction area);
 - c) COs maintain regular checks for marine mammals around the operational area and report on all marine mammal sightings (Note: COs may have other duties on board vessels but sufficient time shall be allotted for regularly scanning for and reporting on marine mammal presence and behaviour; and
 - d) COs maintain a daily log in a format agreed by the Chief Executive of all marine mammal sightings and interactions including:
 - i. Date, time and location (where practicable in latitude/longitude) of all marine mammal sightings relative to the consented operation;
 - ii. number of marine mammal individuals associated with each sighting, including the number of cetacean calves if present;
 - iii. behaviour of marine mammals including travelling, feeding, milling, avoidance, attraction and changes in behaviour;
 - iv. any marine mammal injuries or mortalities (including those attributable to the consented operation);
 - v. any management responses in relation to disturbed, distressed or injured marine mammals; and
 - vi. time spent on a daily basis by COs actively on watch for marine mammals.

Note: CO training, procedures and reporting (including the daily log) may be audited by the EPA at any time

164. The consent holder shall prepare a report annually on all marine mammal sightings in a format agreed to by the Chief Executive. This report shall include as a minimum:
- a. date and location of all marine mammal sightings relative to the consented operation;
 - b. number of individuals (including cetacean calves) associated with each sighting;
 - c. behaviour of marine mammals including travelling, feeding, milling, avoidance, attraction and changes in behaviour;
 - d. any marine mammal injuries or mortalities (including those attributable to the consented operation); and
 - e. an assessment of the sightings data by a suitably qualified marine mammal biologist; in particular assessing the effect, if any, of the consented operation on the occurrence and behaviour of marine mammals in the vicinity of the operation.
 - f. The consent holder shall report any sightings of a Maui or Hector's dolphin, to the Department of Conservation (DOC) as soon as practicable. The consent holder shall report any marine mammal strikes, entanglements, injuries or deaths to DOC as soon as practicable. If a, strike, entanglement, injury or death involves a Maui's or Hector's dolphin, the consent holder shall, subject to the consent holder's obligations under the Marine Mammals Protection Act 1978, recover the carcass, notify DOC of that recovery immediately and return it to shore as soon

- as possible for collection by DOC. The animal carcass shall be put on ice to preserve the specimen as much as possible.
165. Should a Maui's dolphin, Hector's dolphin or any whale or whales be detected in the general vicinity of the FPSO at the time of the initial start-up (or future re-start) of the crawler and production equipment on the FPSO, the consent holder shall ensure the initial start-up is delayed until the cetaceans have moved to a minimum distance of 500 metres from the FPSO.
166. Should any whale or whales be observed to approach closer than 500 metres to the FPSO while the crawler and FPSO plant equipment are operational, the consent holder shall as far as practicable minimise the amount of noise and sediment entering the water in accordance with the EMMP, including the following possible options:
- a) shutting down the crawler and production equipment on the FPSO if this is operationally feasible;
 - b) reducing the combined power of the crawler and the production equipment on the FPSO as far as practicable; and
 - c) minimising ancillary vessel activity to the extent practicable.
167. The consent holder shall develop procedures to minimise as far as practicable possible the risk of whale entanglement including ensuring:
- a) all ropes and floats associated with the operation are of sufficient size and maintained under sufficient tension so as to minimise the risk;
 - b) there are no floating ropes or lines on the surface
168. The consent holder shall undertake baseline surveys and subsequent operational monitoring surveys for cetaceans (whales and dolphins) in the consent area and sufficient parts of the wider South Taranaki Bight, and be of sufficient duration, frequency and seasonality, to be able to achieve the marine mammal objectives set out in Condition 10 of this consent. These surveys shall monitor and assess scientifically cetacean presence, distribution, density and where possible, total abundance with a purpose of informing decision making including the development, ongoing implementation and review of the marine mammal section of the EMMP. With respect to blue whales the purpose of the surveys shall be to
- a) assess the significance of the consent area for blue whales
 - b) assess the potential (baseline) and actual (operational) effects of the consented operations on the distribution and abundance of blue whales.
169. The baseline survey and ongoing monitoring survey protocols shall:
- a) be endorsed by the TPRG and approved by the EPA;
 - b) be designed and undertaken by independent, qualified and experienced marine mammal scientists who are endorsed by the TPRG and approved by the Chief Executive;
 - c) adopt scientifically appropriate and best-practice marine mammal survey methodologies, consistent with obtaining best available information as defined in Section 34(4) of the EEZ Act;
 - d) include the consent area and sufficient parts of the South Taranaki Bight, and be of sufficient duration, frequency and seasonality, to be able to achieve the purpose of this condition;
 - e) be designed to assess any impacts of the mining operation on cetacean species with sufficient statistical power.

170. The consent holder shall undertake Passive Acoustic Monitoring (PAM) using a stationary acoustic monitoring array. The purpose of PAM shall be to monitor cetacean presence and distribution within the South Taranaki Bight within and outside the consent area, in order to inform decision making including the development, ongoing implementation and review of the marine mammal section of the EMMP. PAM protocols shall:
- a) be endorsed by the TPRG and approved by the EPA;
 - b) be designed and undertaken by independent, qualified and experienced marine mammal scientists who are endorsed by the TPRG and approved by the EPA;
 - c) adopt scientifically appropriate and best-practice marine mammal survey methodologies, consistent with obtaining best available information as defined in Section 34(4) of the EEZ Act;
 - d) include the consent area and sufficient parts of the wider South Taranaki Bight, and be of sufficient capacity (e.g. number and distribution of PAM devices) and duration, to be able to achieve the purpose of this consent in relation to marine mammals. The number of devices and their deployment shall ensure cetaceans are able to be detected and their positions determined relative to the consent area.
171. The consent holder shall engage an independent and suitably qualified and experienced marine mammal expert (endorsed by the TPRG and approved by the Chief Executive) to prepare and provide to the EPA reports on all marine mammal baseline and ongoing monitoring surveys (including PAM) according to a schedule and in a format or formats agreed to by the EPA. As a minimum reports shall be provided after the baseline surveys have been completed, annually for the next five years, and then as required by the EPA. The EPA shall refer such reports to the TPRG for consideration. The TPRG shall invite a marine mammal expert or experts to join the TPRG for such consideration. The TPRG may make recommendations for additional monitoring, amendments to the EMMP or changes to operational practices to mitigate adverse effects on marine mammals.
172. The consent holder shall develop procedures to minimise the risk of vessel interaction with marine mammals which shall be set out in the marine mammal section of the EMMP, and in particular those procedures shall include methods to ensure:
- a) masters of all vessels (excluding the FPSO) reduce speed to a safe minimum within 500 metres of, and take all practical steps to avoid any large whales which may be seen.
 - b) the masters of the large bulk carrier ship/s take all practical steps to avoid any blue whale feeding aggregations in the wider South Taranaki Bight region (where these are known to be present at the time).
 - c) helicopters servicing the operation shall (subject to compliance with safety and Civil Aviation Authority requirements) maintain to a minimum altitude of 600 meters (2000 feet) except when landing and taking off.

Underwater Noise

173. The consent holder shall comply with the following requirements in relation to underwater noise:
- (a) The combined noise from the FPSO and Crawler operating under representative full production conditions shall be measured nominally 10m below the sea surface at 300m, 500m, 750m and 1000m from the

- port or starboard side of the FPSO. The combined noise level at 500m shall not exceed 130dB re 1µPa RMS linear in any of the following frequency ranges: low frequency 10-100 Hz, mid-frequency 100-10,000 Hz, and high frequency >10,000 Hz; and the overall combined noise level at 500m across all frequencies shall not exceed a sound pressure level of 135 dB re 1µPa RMS linear;
- (b) Measurements shall be undertaken in calm sea conditions (e.g. Beaufort sea state less than 3 (beginning of white-capping)), with no precipitation and no external noise sources (e.g. passing ships);
 - (c) The monitoring equipment shall be calibrated before and after measurements;
 - (d) The combined noise shall be monitored:
 - i. Within one month of commencement of mining operations and if less than 80% of full production, a further measurement will be made within one month of mining operations reaching 90% of full production;
 - ii. An additional two times in the first 12 months of the commencement of 90% of full production. Each measurement being separated by a period of at least 6 months;
 - iii. Annually for the following four years;
 - iv. Every 5 years thereafter; and
 - v. At any time reasonably requested by the EPA.
 - (e) Should the operation of the FPSO and crawler be altered in any way which may change the magnitude or character of the underwater noise production, the noise shall be monitored within one month of the change to demonstrate compliance with Condition 173 (a) has been maintained;
 - (f) In the event weather or sea conditions prevent monitoring within the specified time frame, the monitoring shall be undertaken as soon as practical after the specified time;
 - (g) Within two weeks of the monitoring, a detailed report on the monitoring and results shall be provided to the EPA. As a minimum, this report shall include details on the equipment used, calibration methods used, measurement conditions and location, and a summary of the noise levels measured, including broadband and one third octave band frequency data and compliance of the operation with respect to the noise standards specified in Condition 173 (a).
 - (h) Any startup of the mining operation shall be undertaken as a “soft start” whereby equipment shall be gradually increased in power over a minimum of 20 minutes. For clarity, a “soft start” includes noise from the FSO, Crawler and associated plant.

Advice Notes:

1. 300m, 750m & 1000m are to be used to check the level at 500m;
2. The minimum distance of 300m has been adopted to ensure all site safety requirements are complied with;
3. Measurements of the combined noise of the crawler and FPSO are to be made for a minimum period of 2 minutes and once the sound pressure level has stabilised.

Air Quality

174. Heavy Fuel Oil combusted by the consent holder to power the mining vessel shall have a sulphur content of not more than 3.5% by weight.

Grade Control Drilling¹⁰¹

175. The Consent Holder must undertake grade control drilling in the areas where removal of seabed material is planned.
176. The Consent Holder must not sell any non-living natural material removed from the seabed or subsoil during or for the purpose of undertaking the grade control drilling
177. The Consent Holder may only remove material from the seabed or subsoil that is reasonably necessary to undertake the grade control drilling.
178. The results of grade control drilling must be provided to the EPA as part of the pre-mining assessment report in Condition 132.

Operational Plume Model

179. The consent holder shall develop, maintain, and use for operational management an "operational sediment plume model".
180. The objectives of the operational plume model are to provide an effective mechanism to assist in:
- (a) the development of adaptive management methodologies applied with respect to SSC and sediment deposition and subsequent effects;
 - (b) predicting both background and mining derived SSC and deposition under various scenarios to inform the management of the operation; and
 - (c) distinguishing operationally derived contributions to SSC and deposition from background processes.
181. The methodology for the development of the operational plume model, its calibration and validation of the various components (hydrodynamics, background SSC and deposition, mining derived SSC and deposition) both initially and in on ongoing fashion, shall be subject to the review of the TPRG.
182. The operational sediment plume model shall be developed is to satisfactorily resolve in a 4-dimensional setting (x, y, z, time) over the South Taranaki Bight the following aspects:
- (a) water currents caused by winds, tides, waves;
 - (b) water column physical properties (salinity, temperature, density);
 - (c) background SSC; and
 - (d) mining derived SSC ; and
 - (e) sediment deposition (separated by size fraction)¹⁰²
 - (f) Mining derived deposition – the following particle size classes shall be used as to basis for presentation of data on SSC and mining derived deposition
 - 500-1000 microns
 - 125-500 microns
 - 90-125 microns

¹⁰¹ Deleted by TTR - replaced with stringent PSD controls over output fines other conditions from EPA Staff Report suggested Condition 40.

¹⁰² From R Witte evidence

38-90 microns
16-38 microns
125-500 microns
90-125 microns
38-90 microns
16-38 microns
8-16 microns
<8 microns

Discharges of Contaminants (metals)

183. The concentration of dissolved nickel, mercury and copper in seawater beyond a radius of 50 metres from the hydro-cyclone outlet discharge point shall meet the respective ANZECC 99% species protection guideline trigger values. Receiving water quality (discharged dissolved metals) inside the 50 metre mixing zone shall comply with respective ANZECC 80% species protection guideline trigger values.

Navigation and Maritime Safety Management

184. The Consent Holder shall undertake management of navigational and maritime safety during project operations; and preparation of operational manuals and safety contingency plans around a comprehensive 'Project Safety Case' concept and which are consistent with the CCMP¹⁰³. The "Project Safety Case" shall be provided to the Chief Executive prior to commencement of mining activities authorised under this consent, for certification that aspects of the Safety Case that relate to potential environmental effects are consistent with the environmental performance objectives set out in this consent and in the CCMP¹⁰⁴.
185. The "Project Safety Case" shall be developed with information including but not limited to the following:
- (a) An assessment of safe upper environmental limits for all operations based around the designers' hydrodynamic models and motion studies as well as meteorological data for the mining site area;
 - (b) A formal risk analysis, hazard and operability studies and vessel assessment to develop the vessel design to ensure it is suitable for the proposed operation at the intended mining site taking due account of:
 - i. Depth of water;
 - ii. Range of sea states in the South Taranaki Bight; and
 - iii. Range of weather conditions in the South Taranaki Bight
 - (c) Determination of the operational and environmental limits of the design and operational states and ensure these operating limits are reflected in the operational policies and procedures
 - (d) Preparation of standard and emergency operating procedures for use by the vessel crews and company management.
 - (e) Rigorous application of the above matters to all key operations including but not limited to:
 - i. positioning, anchoring and mining operations for the FPSO;

¹⁰³ Consultation with Origin - inserted assuming DMC agrees with relief sought by Origin

¹⁰⁴ Consultation with Origin - inserted assuming DMC agrees with relief sought by Origin

- ii. product transfer between FPSO and FSO;
 - iii. product transfer between FSO and export vessel;
 - iv. fuel and other liquids transfers;
 - v. transfer of provisions and stores; and
 - vi. controls relating to avoidance of potential collisions with marine mammals.
186. 'Upper Environmental Limits' assessed in Condition 185 (a) will cover wind speed and direction, sea and swell height including combined waves and directions, for:
- (a) Mining operations;
 - (b) Product transfer operations (FPSO to FSO);
 - (c) Product transfer operations (FSO to Export vessel);
 - (d) Fuel transfer operations; and
 - (e) Other provisioning operations
187. The Project Safety Case' shall also provide the basis for applications to Maritime New Zealand for fuel and product transfer operations at sea as required under the Marine Protection Rules Part 103.
188. The Consent Holder shall initiate a review and if necessary update of the 'Project Safety Case' after the first year of operations and prior to any significant proposed change in the operation to ensure 'fitness for purpose' and that risks are being appropriately managed.
189. The Consent Holder shall initiate operational audits on a three-yearly basis.
190. The Consent Holder shall maintain a log of 'operational Incidents', which shall be recorded and regular reviews undertaken to inform required improvements and changes to operating limits and procedures.
191. Oil Spill Contingency Plans approved by Maritime New Zealand shall be reviewed by the Consent Holder annually.
192. Operating procedures of Export Vessels shall form part of the 'Project Safety Case'.

Environmental Monitoring and Management Plan (EMMP)

Preparation of EMMP

193. The Consent Holder shall prepare an Environmental Monitoring and Management Plan (EMMP) that includes but is not limited to¹⁰⁵:
- a) Environmental performance criteria for each of the environmental components listed in Condition 204 of this marine consent informed by baseline monitoring results for those criteria.
 - b) Ongoing operational monitoring schedules including but not limited to the location duration, frequency, timing and reporting of monitoring proposed for each environmental component listed in Condition 204.
 - c) Details of trigger values for each environmental component that will result in actions to reduce environmental effects and details of those actions, their duration, location and timing and proposed monitoring of the results of such actions.

¹⁰⁵ EPA Staff Conditions 14

- d) The methodology to be used for gathering data generated during monitoring for each environmental component, including but not limited to details on data format and technologies proposed for use (e.g. telemetry).
- e) Proposals to enable provision of data from monitoring to the public including details on how the Consent Holder will manage the reliability, accuracy and veracity of information drawn from data should it be used for independent public analysis and reporting.

194. The objectives of the EMMP shall be to:

- (a) Ensure the adverse effects existing interests, arising as a result of activities authorised under this consent are appropriately avoided, remedied or mitigated and the environmental performance objectives referred to in Condition 10 are met.
- (b) Determine the Consent Holder's approach to adaptively managing activities authorised under this consent in order to remedy or mitigate adverse effects on the environment and existing interests.

195. The EMMP shall be prepared by the consent holder in consultation with the following:

- (a) Project Consultative Group (Condition 27)
- (b) Komiti (Condition 41)

Content of EMMP

196. The EMMP shall set out protocols for operational environmental monitoring, and operational environmental management, The EMMP shall comprise the following documents:

- (a) An Operational Environmental Monitoring Plan informed by the outputs of pre-operational baseline environmental monitoring, including but not limited to matters set out in Conditions 200 and 201.
- (b) An Operational Environmental Management Plan specifying compliance management and reporting measures and operational responses to be initiated in the event that indicators set in conditions are triggered or values are exceeded. This Plan shall include but not be limited to matters set out in Condition 203.

EMMP Process

197. The Consent Holder shall provide the draft components of the EMMP to the TPRG for their consideration and to enable the TPRG to make recommendations for inclusion in the final content of those components of the EMMP. Those recommendations and any subsequent recommendations of the TPRG in relation to further drafts of the EMMP shall be provided to the Consent Holder and to the Chief Executive.
198. The Consent Holder shall finalise the relevant components of the EMMP having regard to the recommendations of the TPRG.
199. The Consent Holder shall, no less than three months prior to the commencement of the activities authorised by this consent¹⁰⁶, submit the operational environmental monitoring plan and the operational management plan components of the EMMP to the Chief Executive for approval.

Advice Note:

¹⁰⁶106 Clarify intent of wording

Chief Executive approval is expected to be provided within 20 working days of receipt of the EMMP.

Monitoring and Management

200. All operational environmental monitoring provided for in the final EMMP must be undertaken for the duration of the mining activity and for at least 12 months following the cessation of the mining activity, with the exception of ongoing benthic sampling¹⁰⁷. The EMMP shall cover the full range of matters necessary to achieve the objectives of the EMMP including but not limited to the following matters:
- (a) Sediment grain size in the pits and mounds and the ecological recolonisation rates (within the mining areas).
 - (b) Sampling should be undertaken within the two habitat types present within the Mining Project area: rippled sands in depths less than 30m and the wormfields in depth greater than 30m.
 - (c) Sampling should include sediment cores to examine infauna greater than 500 µm in size.
 - (d) To establish whether or not trigger indicators and values are being met or exceeded.
201. The operational monitoring regime shall be more intensive, and associated data reviews shall be initiated more frequently, during the first two years of operation than in subsequent years of operation.
202. Sampling protocols developed for the EMMP shall provide for refinements in methodology and reduction in sampling frequency and intensity if initial monitoring identifies predictable trends which can allow such refinements whilst not unreasonably reducing the statistical power of data collected¹⁰⁸.
203. Operational environmental management shall address¹⁰⁹ to the following matters:
- (a) methodology and timing of compliance assessments;
 - (b) frequency of compliance reporting;
 - (c) the retention of compliance assessments;
 - (d) the method of reporting of potential non-compliances and corrective actions taken;
 - (e) public availability of compliance assessment reports; and
 - (f) management response to exceedance of trigger indicators and values
204. The EMMP shall must include but not be limited to monitoring of:
- (a) benthic habitat and benthic organisms
 - (b) water quality including optical effects, dissolved oxygen, turbidity and concentrations of trace metal concentrations in both the wastewater stream on board the FPSO and in the plume
 - (c) underwater noise
 - (d) marine mammals
 - (e) meteorological conditions (waves, wind)
 - (f) fish biology, movement and behaviour
 - (g) commercial fishing including aquaculture

¹⁰⁷ EPA Staff Condition 15

¹⁰⁸ TTR suggestion to provide for efficiency of monitoring in accordance with obtaining best available information.

¹⁰⁹ K Pratt

- (h) recreational fishing
 - (i) recreational diving
 - (j) coastal processes and shoreline morphological changes
 - (k) sedimentation (in particular, sediment deposition thickness in the extraction areas and outside the application area)
 - (l) seabed sediment dynamics
 - (m) seabed bathymetry (in particular, the height of pits and depth of mounds)
 - (n) air quality
 - (o) visual effects
 - (p) seabirds
 - (q) primary productivity
 - (r) suspended sediment concentrations at offshore biogenic habitats, including the North and South Traps, and Graham Bank, Four Mile Reef, Patea Reefs and Waiinu Reef.
 - (s) salinity of hydrocyclone water
 - (t) redox levels of post-mined sediments (if reasonably practicable)
 - (u) The interests of or under PML 38146¹¹⁰.
205. The EMMP shall encompass monitoring within the project area authorised for activities in this consent, and in sufficient parts of the wider South Taranaki Bight to be able to achieve the objectives of this consent.
206. The EMMP shall contain the following elements:
- (a) The monitoring strategy designed to meet the objectives of the EMMP.
 - (b) The location of monitoring locations consistent with “gradient of effect” monitoring
 - (c) Methods for matching the physical and biological characteristics of monitoring locations sites so that valid comparisons may be made, taking account of levels of natural environmental variability and potential confounding factors between sites where ever possible)
 - (d) Evaluation criteria whereby changes attributable to the subject development can be identified and assessed against pre-determined trigger indicators and values defined pursuant to Conditions 11 and 12 of this consent.
 - (e) Detailed methodology for operational monitoring:
 - (i) to describe the characteristics of discharges associated with the deposition of de-ored sediment (tailings), the hydro-cyclone and the hyperbaric filter, and combustion of HFO for power generation;
 - (ii) to enable evaluation against monitoring trigger indicator levels and values defined pursuant to Conditions 11 and 12 of this consent;
 - (iii) to enable the consent holder to adaptively manage activities authorised under the consent with the objective of achieving the environmental performance objectives in Condition 10; and

¹¹⁰ Consultation with Origin - inserted assuming DMC agrees with relief sought by Origin

- (iv) to identify detailed sample design for operational monitoring, including parameters to be measured; detection limits; monitoring locations; frequency; sampling methods.
 - (f) The adaptive management actions to be followed by the Consent Holder if monitoring results indicate that activities authorised under this consent have caused exceedance of trigger indicators and values defined under Condition 12 of this consent, and may include amendments to the location, intensity or duration of the activities¹¹¹; and
 - (g) The level of reporting required during the operational phase.
207. The EMMP shall cover the full range of matters necessary to achieve the objectives of the EMMP including but not limited to the following matters¹¹²:
- a) Benthic sampling
 - i. Benthic sampling should capture seasonal variability (relative to recruitment), covering two sampling times per year (e.g. summer and winter or autumn vs spring), recognising that the inhospitable nature of this offshore shelf environment probably negates finer temporal sampling.
 - ii. Benthic monitoring sites should be sampled along a gradient from the mining area relative to the spatial extent of the projected suspended sediment plume (i.e., gradients along-plume including Graham Bank and across-plume from inshore reef zone to the offshore biogenic zone). Sampling should address suspended sediment levels at the North and South Traps, Graham Bank, Four Mile Reef, Patea Reefs and Waiinu Reef.
 - iii. Benthic monitoring sites should include representative/selected sites with each benthic community type (i.e., wormfields, rippled sands, inshore reefs, offshore biogenic habitats).
 - iv. Benthic monitoring sites should include reefs of 'special interest', such as the North and South Traps, Graham Bank, Four Mile Reef, Patea Reefs and Waiinu Reef.
 - v. Benthic ecology monitoring should be undertaken in a way that provides enough statistical power to detect ecologically significant community change caused by the mining activity.
 - vi. Benthic microalgae (BMA) are too variable in space and time to be a valuable monitoring factor. However monitoring should include measurements of Chlorophyll-a from the sediments in a way that discriminates between recent 'benthic generated microalgae' and 'old/degraded phytoplankton' to determine the relative importance of benthic versus pelagic primary production in this system.
 - vii. Monitoring sites must be in the same locations as those used for baseline monitoring, and the monitoring must be undertaken at the same time of year as baseline monitoring.
 - viii. The Consent Holder must continue to monitor benthic habitats and organisms as specified in the EMMP (once mining in the project area has been completed) every two years for 10 years. Monitoring must include but not be limited to representative surficial sediment grain size measurements in the pits and mounds and ecological recolonisation rates

¹¹¹ K Pratt

¹¹² Wording provided to mirror relevant elements cited in relation to BEMP.

b) Marine mammals

- i. The Consent Holder shall undertake ongoing surveys for cetaceans (whales and dolphins) in the consent area and sufficient parts of the wider South Taranaki Bight, and be of sufficient duration, frequency and seasonality, to be able to achieve the objectives set out in Condition 194 of 113 this consent;
- ii. The purpose of the surveys shall be to monitor and assess scientifically cetacean presence, distribution density and, where possible, total abundance with a purpose of informing decision making including the development, ongoing implementation and review of marine mammal section of the EMMP;
- iii. The ongoing marine mammal monitoring survey protocols shall be endorsed by the TPRG and approved by the Chief Executive and designed by independent, qualified and experienced marine mammal scientists, who are endorsed by the TPRG and approved by the EPA;
- iv. The ongoing marine mammal monitoring survey shall include the consent area and sufficient parts of the wider South Taranaki Bight, and shall be of sufficient duration, frequency and seasonality to ensure the identification of the presence, abundance and distribution of marine mammals in the study area; and
- v. The ongoing marine mammal monitoring survey shall adopt scientifically appropriate and best-practice marine mammal survey methodologies.
- vi. The ongoing marine mammal monitoring survey shall be designed to assess any impacts of the mining operation on cetacean species with sufficient statistical power.

c) Fish and Fisheries¹¹⁴

- v. Specific monitoring of fish species that are abundant around the mining site is not warranted.
- vi. It would be appropriate to monitor reef fish these species at the North and South Traps, at the Graham Banks if reefs actually do occur at this site, and in the biogenic shell and bryozoans areas to the south of the mining area.
- vii. The method used to monitor demersal species (bottom trawling) is likely to cause a larger effect on the demersal fish and benthos than the effects that are being assessed.
- viii. In lieu of direct monitoring of fish species, monitoring should focus on measurement of environmental physical determinands such as SSC and optical properties as indicators of potential biological effects¹¹⁵.

d) Zooplankton¹¹⁶

- ii. Direct effects of the increase of sediment concentrations on zooplankton are highly unlikely.

e) Sediment Plume¹¹⁷

¹¹³ Slight re-wording to reflect structure of conditions.

¹¹⁴ Joint Witness Statement Fish and Zooplankton – unless otherwise noted.

¹¹⁵ Follows from consideration of conclusions of Fish Joint Witness Statement.

¹¹⁶ Joint Witness Statement Fish and Zooplankton.

¹¹⁷ From Joint Witness Statement Sediment Plume Modelling.

- iii. An operational plume model would be useful as an environmental management tool for the operator, and in assessing compliance (see Condition 179). The plume results for the revised model provide a basis for developing an operational plume model to be used for operational management processes.
 - vii. Monitoring is a necessity for any operational model in order to validate and ground truth that model. The operational model might then be appropriate as a forecasting management tool to undertake operational decisions and experiment with changes to sensitivity parameters.
- f) Mātauranga Māori¹¹⁸
- i. Changes attributable to activities authorised under this consent in relation to grain size, aesthetics and morphology of coastal features such as sand bars, reefs, and river bars that are significant customary fishing or significant cultural sites.
 - ii. Evaluation of the ability to discriminate geochemically between coastal sediments and sediments derived from activities authorised under this consents.
 - iii. is the sediment being discharged geochemically distinct to act as a tracer so it can be differentiated from other sediment sources along the entire coastline impacted.
 - iv. potential impacts on feeding, breeding and habitat areas by sediment discharge customary species such as kahawai, snapper, shark, sea cucumber and gurnard.
 - v. The holistic relationship between these species and their habitat, feeding and breeding areas in regards to sites and species in the sense that if one element is impacted, even in a minor manner what are the potential flow on effects or compounding flow on effects to other species or the wider ecosystem.
 - vi. Potential effects on migratory patterns of glass eels, lamprey and flounder
 - vii. Potential changes of activities authorized under this consent in relation to changes in the grain size of sand and the increased deposition of a particular grain size on habitats, numbers and health of a range of shellfish species including toheroa, tuatua, pipi.
 - viii. Consideration of potential flow-on effects to related species if one species or one geomorphic feature or process is altered or impacted.
 - ix. If shellfish in the sediment depositional zone were affected what effects would this then have of the fisheries species and migratory patterns of those fish that feed on these.
 - x. Regular monitoring of sites of significance and of their species of significance in the coastal environment.
 - xi. Further exploration of suitable satellite sensors and hyperspectral sensors to develop a long term monitoring program of the area and the ability to detect and track sediment plumes from TTR's operations.
 - xii. Potential effects of activities authorized under this consent in relation to coastal geomorphology around the Whanganui/Rangitikei/Manawatu coastline

¹¹⁸ From submission by Te Taihauāuru Fisheries Forum – these matters are additional to those specified elsewhere in this condition.

and consideration of applicability of regular surveys of coastal areas by both sonar and lidar to map out geomorphic features and any areas of change that may relate to TTR's operation.

- xiii. Additional grainsize and geochemical monitoring of beaches and depositional zones should also occur.
- xiv. Investigations into the migratory patterns of glass eels and the potential effects of suspended sediment on glass eels be conducted.
- xv. Consideration of whether it would be appropriate to limit operations or sediment discharge during periods of glass eel migrations through the coast areas and into the freshwater areas.

Review of Monitoring Data by TPRG

208. Data collected under the EMMP shall be reviewed by the Technical Peer Review Group at six monthly intervals for an initial period of two years following the date of approval of the EMMP in accordance with Condition 199, and thereafter at a frequency determined by the TPRG but not less than annually (Condition 55).

EMMP Reporting

209. Reports on the findings of the environmental monitoring under the EMMP must be submitted to the EPA in accordance with the reporting protocol set out in the EMMP. In addition, a summary of all monitoring results for each year of this consent after it is given effect to must be provided to the EPA annually for the term of this marine consent.¹¹⁹

EXISTING PETROLEUM OR MINERAL LICENCE HOLDERS

210. While conducting activities authorised under this consent, the consent holder shall not unreasonably interfere with or endanger operations under any existing licence or permit issued or maintained under the Continental Shelf Act 1964, Petroleum Act 1937 or Crown Minerals Act 1991;
211. Where the area of activities authorised under this consent overlaps with petroleum mining licence 38146 (**PML 38146**), the consent holder shall conduct its operations (including timing and location) in a manner that will reasonably enable the licensee of PML 38146 to undertake any activities authorised under PML 38146.
212. Without derogating from the general requirements in conditions 210 and 211 above, but in particular to assist in achieving them, the consent holder shall¹²⁰:
- (a) ¹²¹Ensure, in respect of interests associated with PML 38146, that the pre-operational monitoring contained in its EMMP will be sufficient to establish the baseline physical and environmental conditions affecting the interests associated with PML 38146. That pre-operation monitoring programme is to be developed using all reasonably available relevant data and after undertaking appropriate modeling. The purpose of this baseline monitoring is to enable assessment of any material adverse effect on the interests associated with PML 38146 that might arise from the exercise of this marine consent.
 - (b) Undertake regular monitoring after the commencement of mining operations to enable assessment of any adverse effect of mining on the interests associated with PML 38146. This operational monitoring shall be detailed in

¹¹⁹ EPA Staff Condition 16

¹²⁰ Consultation with Origin - inserted assuming DMC agrees with relief sought by Origin

¹²¹ Consultation with Origin - inserted assuming DMC agrees with relief sought by Origin

the operational monitoring plan contained in the EMMP, which shall detail the responses necessary to avoid, remedy, or mitigate any material adverse effects on the PML 38146 interests existing as at the date of grant of consent.

- (c) Provide the results of any monitoring created or obtained in connection with this condition to the EPA and/or the licensee of PML 38146 upon request and in any event shall supply the results of and any report on the monitoring annually.
- (d) Not undertake mining within an area of 1.14km in any direction from operational infrastructure associated with PML 38146.
- (e) TTR will mine safely around non operational infrastructure associated with PML 38146 so as not to adversely affect the integrity of it.
- (f) Shall if given reasonable notice by the licensee of PML 38146, conduct its operations (including timing and location) in a manner that will reasonably avoid, or minimise, any impact on visual clarity within the waters close to any infrastructure associated with PML 38146 so as to enable visual inspection of that infrastructure by the licensee of PML 38146.
- (g) Shall use reasonable endeavours to enter into a co-ordination agreement with the licensee of PML 38146 setting out how the consent holder and the licensee shall co-ordinate their activities reasonably, and to ensure that the consent holder meets its obligations to the licensee of PML 38146 under this consent

Laboratories

213. All sampling and analyses undertaken in connection with this permit shall be performed by an IANZ registered laboratory or otherwise as specifically approved by the EPA.

Review

214. The EPA may, in accordance with Section 76 of the EEZ Act, serve notice on the Consent Holder of its intention to review the conditions of this consent. Such notice may be served at the following times:
- (a) Annually within one month commencing after each anniversary of the date of commencement of consent; or
 - (b) Within one month commencing after the receipt of any report or estimate required from the Consent Holder by the conditions of this consent.
 - (c) Immediately upon being made aware of a significant breach of non-compliance or unexpected environmental effects¹²².
215. The review may be initiated for any one or more of the purposes specified in Section 76 of the Act, and the following matters:
- a) To review the adequacy of and the necessity for monitoring undertaken by the Consent Holder.
 - b) To review the Environmental Objectives and trigger indicators and values defined pursuant to Conditions 11 and 12 of this consent to ensure they

¹²² Based on D Serjeant suggestion

remain appropriate in respect of the Consent Holder's requirement of avoid remedy or mitigate adverse effects on the environment and existing interests.

216. In the event that the EPA determines that the proposal is having unacceptable adverse effects, the Consent Holder, after consultation with the EPA, shall adapt the proposal to the extent necessary to avoid those identified adverse effects. The adaptation of the proposal shall include, as necessary, but not be limited to limitations on the location, intensity or duration of the activity.¹²³

¹²³ Based around D Serjeant suggestion - modified to reflect this application and EEZ process.

Schedule 1

Index of all TTR submitted reports and evidence

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