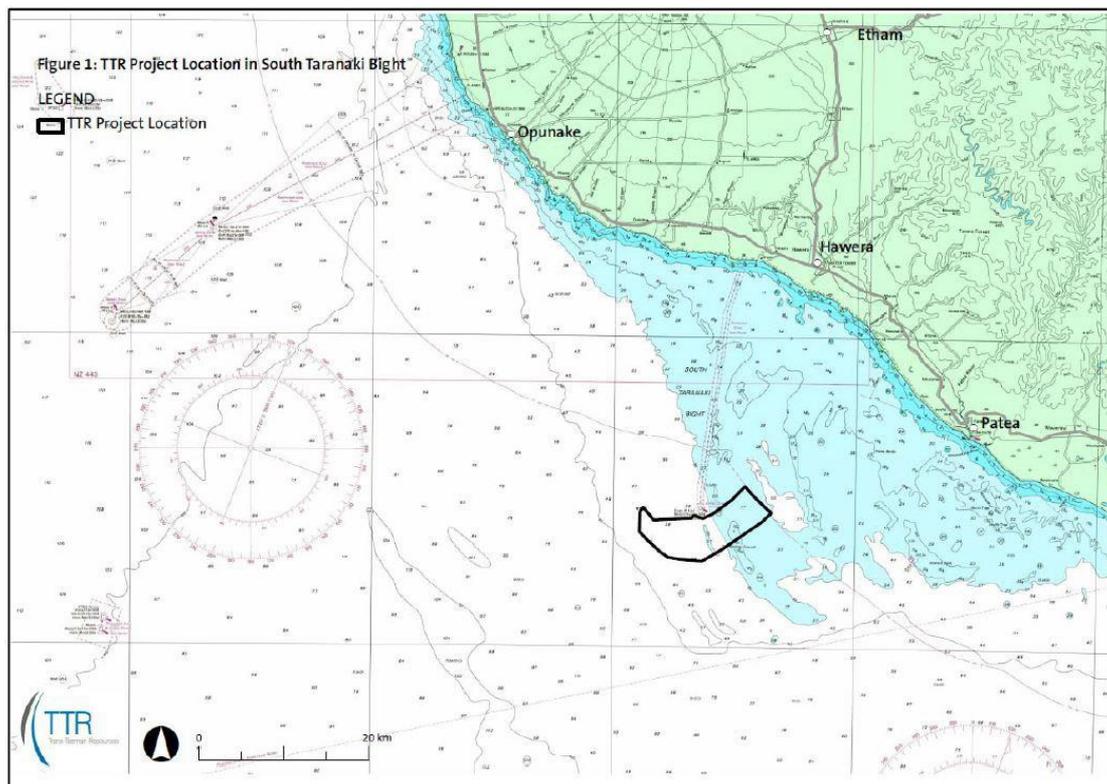


Summary of the New Zealand Protection Authority (EPA's) Decision on the Trans-Tasman Resources Ltd Marine Deep Sea Mining Application

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The following represents a summary of a 248 page decision document, where possible using the words of the decision. It is aimed at an international audience interested in the decision. The following extract comprises quotations from the decision, of the Decision Making Committee (DMC), except where in italics. Quotations are used to make clear where text is quoted from the decision, but where non-italic text appears, it is taken verbatim from the decision. The process took place under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act) which requires a marine consent for seabed mining and associated activities (section 20). The Environmental Protection Authority (EPA) EPA Board appointed a decision-making committee to consider the application by CRP for a marine consent. The five-member committee comprised of experienced decision-makers with collective expertise in ecology, engineering and tikanga Maori.

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The Proposal

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). 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). 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. 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. 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. 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%.

Our decision is to refuse consent. We have determined that the applications do not satisfy the purpose of the EEZ Act. 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)). 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)). 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. 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.

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, nor do we consider that the proposed conditions (including

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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. 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. 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.

The Process

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. 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. The application was publicly notified on 21 November 2013, and the first submission period closed on 19 December 2013. The application was re-notified 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 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. 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.

Statutory Context

The Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012

We are very aware that this is the first application to be 'decided' under the EEZ Act. 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.

International Law

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)

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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

This section (*section 12 of the EEZ Act*) is more fulsome than the Treaty of Waitangi section in the *Resource Management Act 1991*. 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.

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

Section 20 – Restrictions on Activities in Exclusive Economic Zone and Continental Shelf

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. 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). 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. 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.

Description of the Environment

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.

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. Sediment movement along the coast

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is driven mainly by longshore and onshore transport, fluvial processes and sea cliff erosion. 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. 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 southeast. 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.

Surveys undertaken by TTR in the Patea Shoals region of the STB identified seven major habitat types of *Benthic*. 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. 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. 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. 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. 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. 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.

The Sediment Plume

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 µm) particles
- weather, tides and wave conditions
- background conditions including bathymetry and position of the FPSO.

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

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- very fine sediment that remains in suspension.

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.

Dr Hadfield's suspended sediment model 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. However, Dr Hadfield notes that 2 years' model output is not sufficient to define the seasonal cycle to a high degree of accuracy. The experts agreed that all the predictions in the model simulations are subject to uncertainties. 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%. He also commented that the mention of uncertainty should not be taken to provide an unlimited licence to dismiss the results. 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. We accept that it is expected to only add a small volume and contribution to the plume, unless a significant muddy layer is disturbed.

Plume Model Results

We understand that, in general terms, the finer classes of sediment tend to form a mobile plume, whereas the coarsest classes form deposition patches. 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. 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. The modelling identified the median plume would be approximately 50 kilometres long and up to 20 kilometres wide.

The experts all agreed that modelling inherently has some form of error. As Dr Hadfield stated, "The uncertainty of the uncertainty is uncertain. The model is critically important because the majority of the environmental effect analysis is dependent on its accuracy. We accept that the other TTR experts have relied on the model to 'determine' their opinions on the effects of the proposal. 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 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."

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.

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Findings on Plume

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.
- 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

Effects of the Proposal

Primary Productivity

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.

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 km² 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 km³) and any effects beyond the STB, in particular, the Marlborough Sounds.

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

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

Primary production by these three groups of photosynthetic organisms provides some of the key energy sources for the STB ecosystem. 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.

Dr Pinkerton's expert opinion was that, for the purposes of considering the effects of mining

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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. It was also agreed that, as concentrations of suspended sediment return to values close to premining 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. 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.

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.

Findings

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

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

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small. 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.

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. 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.

Beyond baseline and ongoing monitoring of chlorophyll-a, there is no adaptive management response proposed by TTR if threshold or trigger levels are exceeded.

Zooplankton

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. 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. 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).

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. 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. The potential for heavy metals to affect zooplankton (for example, copper having the ability to inhibit reproduction of zooplankton) was raised in the EPA report and highlighted by Dr Slooten in her evidence. 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.

The experts agreed that the application of the ANZECC/ARMCANZ 2000 Guidelines for Water Quality Protection is the appropriate standard for protection of zooplankton. We find that, while there was agreement amongst the experts, the information is not based on sampling but existing literature. Effects on zooplankton are in a large part driven by primary

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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.

Benthic Environment

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. 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).

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.

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. 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.

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.

Findings

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. No systematic differences were found between the benthic communities in the

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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.
- 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.

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Marine Mammals

The potential effects of the proposal on marine mammals, particularly whales and dolphins, were a significant issue before us. 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. 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 seals could occur in the proposed project area. We note that a number of submitters, particularly locals from Taranaki, described having seen dolphins and whales near the coast. Of these, a number have threat classifications at both a national and international scale.

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. 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. 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 subspecies 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.

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

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 mammals
- noise effects
- risk of collision and entanglement with TTR vessels.

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 whales and dolphins also echolocate), and therefore increased sediment in the water column has the potential to impact

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upon their ability to feed.

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. This evaluation was based on the acoustic predictions undertaken by Mr Hegley, which were amended in his evidence. From Dr Childerhouse, we understand the three types of impact from noise to be:

- 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.

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

Findings

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.

Fish

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. 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’.”

A number of submitters commented on the potential impact of increased suspended sediments on fish wellbeing. Dr MacDiarmid said that “high [suspended sediment

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concentrations] can alter fish foraging patterns and success by reducing visual acuity, cause non-lethal damage to gill lamellae, and increase gill ventilation rates”. 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. The Fishing Interests in particular expressed concern about the potential for heavy metals to affect Fish. 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.

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

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. 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.

Seabirds

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.” 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. 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. We accept that the South Taranaki coast does not support major bird colonies.

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. 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.

The experts agreed that lighting is potentially the most significant effect on seabirds. Dr

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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. In terms of effects, we understand collision of birds with vessels due to lighting would be a localized effect and would be centred on the vessel itself.

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. The experts agreed that the sediment plume that actually occurs, rather than the sediment plume as modelled, will determine the scale of the effects. 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. 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.

Biosecurity

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. Vessels associated with the mining activity transiting in and out of New Zealand may carry nonindigenous species in their ballast water or on their hulls. 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.

Human Health

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. 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. 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. The most likely risk to human health for other users of the STB is from the air emissions from the vessels. 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. She clarified for us that coastal water and beach recreational users, including fishers, boaters, surfboarders and swimmers whose activity involves presence at

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one location for an hour or more, are likely to be in locations where the National Environmental Standards are met.

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

Physical Environment

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.

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. 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. There will be little or no effect on any freshwater springs if any are present.

Operational Risks in the Marine Environment

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. We note that many of these issues are addressed by other marine management regimes. 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

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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.

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. TTR offered this for the FPSO but not the other vessels. 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. 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 Cosman 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.

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. 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.

Visual, Natural Features, Natural Landscapes/Seascapes and Natural Character

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. 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. 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. We accept that, had consent been granted, the landscapes/seascapes would have been significantly altered, and this would be unavoidable. 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). The impact on natural features and the landscapes/seascapes, other than the mined area itself, would most likely be minor. 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.

Archaeology

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 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. We do not think this information is uncertain or inadequate.

The Effects of the Proposal on Existing Interests

We agree the following to be existing interests and address the effects on them in this decision:

- 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.

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 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**. 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.

Iwi

Iwi 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. 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. 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'. 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. Given the above, we find that iwi's existing interest would potentially be adversely affected in more than a minor way.

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

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associated with the 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. 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.

Fishing Interests

A large number of groups and individuals have an existing interest in fishing in the STB that we must take into account. It is our finding that there are likely to be some adverse effects on the fishing industry, but based on the evidence, we cannot determine the magnitude. 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. 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. 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.

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.). 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.

Recreation and Tourism

The proposal has the potential to adversely affect the recreational and tourism opportunities in the STB. 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. 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. 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. 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

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agreed by all experts at expert conferencing, any effects of the proposal on New Zealand's tourism brand would be difficult to measure.

Origin Energy Resources Kupe Joint Venture Parties NZ (Kupe JVP)

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. 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.

Marine Traffic

The mining activity and its associated activities may impact on other marine traffic in the area. 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. Our finding is that any effects are likely to no more than minor, and appropriate conditions had been proposed by TTR.

Economic Benefits to New Zealand

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.

Accordingly, the positive economic benefits of the proposal had been determined based on the CGE model. However, we note that the EPA's expert Dr Denne (Covec) and KASM's experts Mr Walter and Mr Ljubownlkow did not agree. 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. 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 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.

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." 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

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the dollar figures.

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. 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. 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.

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. 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.

Coastal Marine Area Management Regime – The Resource Management Act 1991

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. 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:

- 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
- 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. Given our findings summarised above and "taking in account" the RMA policy documents, we are not convinced that the proposal would satisfy the relevant

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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.

Uncertainty, Proposed Conditions and Adaptive Management

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. 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. 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.

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. 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). 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)).

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. 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. 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’ evidence. 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.

We accept the applicant has been working on its proposal for over seven years and has spent

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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 the potential effects of the project and be better able to propose robust, quantitative environmental performance standards. 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. 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.

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. 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.

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. 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). 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. On the evidence presented, we are not satisfied that the life-supporting capacity of the environment would be safeguarded or

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that the adverse effects of the proposal could be avoided, remedied or mitigated, 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.