

BEFORE THE ENVIRONMENTAL PROTECTION AUTHORITY

IN THE MATTER of the Exclusive Economic Zone and
Continental Shelf (Environmental Effects)
Act 2012

AND

IN THE MATTER of an Application for Marine Dumping
Consent by Coastal Resources Limited

JOINT STATEMENT OF EXPERTS IN ECOLOGY/MONITORING

Dated 20 November 2018

INTRODUCTION

1. A facilitated conference of the ecology/monitoring experts took place on Friday 16 November 2018 and was conducted in Auckland and Wellington by way of telephone conferencing.
2. The meeting was attended by:
 - a) Simon West, on behalf of Applicant
 - b) Dr Daniel Leduc, on behalf of the Decision Making Committee
 - c) Clinton Duffy, on behalf of the Director-General of Conservation
 - d) Dr. Rich Ford, on behalf of Fisheries New Zealand;
 - e) Dr Daniel Kluza, on behalf of the Ministry for Primary Industries;
 - f) Jason Welsh, ChanceryGreen, facilitator

CODE OF CONDUCT

3. We confirm that we have read the Environment Court's Code of Conduct as set out in its Practice Note 2014 and agree to comply with it. We confirm that the issues addressed in this Joint Statement are within our area of expertise.

SCOPE OF STATEMENT

4. In the meeting we discussed the issues relevant to the Applications which arise within our field of expertise. Prior to attending the meeting we each read the relevant parts of the application, the evidence and independent reports prepared by the other expert(s) and circulated. Given the limited time available to conduct the conference (the conference concluded at 2pm as Rich Ford had a pre-existing commitment outside of Wellington), we focussed on responding to the series of questions posed to us by the Decision Making Committee.
5. The questions were:
 - a) How typical of the area off-shore east coast Great Barrier is the Northern Disposal Area (NDA) and what is the likelihood of rare and vulnerable ecosystems/threatened species – benthic biota, fish, marine mammals being found in the NDA that are not found elsewhere in the vicinity?
 - b) What is the spread of ecologically significant impact of the disposal at the NDA to date – e.g. a benthic mortality zone within a 500m radius of the centre?
 - c) At what distance from the centre of the NDA is there no ecologically significant impact?
 - d) What thickness of sediment and rate of sedimentation causes significant mortality to the benthic ecosystems of the NDA?
 - e) What is the fish population of the NDA?
 - f) What risks are there to threatened fish species from the disposal of sediment in the NDA?

- g) What risks are there to customary or commercial fishing interests from the disposal of sediment in the NDA?
 - h) What are the risks from invasive organisms within the dredged material:
 - i. At the NDA;
 - ii. At coastal sites in eastern Great Barrier and the Coromandel;
and
 - iii. En route to the NDA.
 - i) What is the likelihood of reproductive stages of invasive species reaching coastal sites?
 - j) Recommended monitoring/conditions to measure the spread of the impacted benthic area and prevent impact beyond the NDA boundary?
6. In relation to each issue we discussed points of agreement and disagreement in relation to:
- a) Facts;
 - b) Assumptions
 - c) Areas of uncertainty
 - d) Expert opinions
7. In this Joint Statement we report the outcome of our discussions in relation to each issue by reference to points of agreement and disagreement relating to facts, assumptions, uncertainties and expert opinions. We have noted where each of us is relying on the opinion or advice of other experts. Where we are not agreed in relation to any issue we have set out the nature and basis of that disagreement or where a question related to an area outside of our expertise.
8. In course of discussing the questions of the Decision Making Committee, we considered the draft marine consent conditions proposed by the Applicant and have considered whether they are appropriate having regard to our opinions, should the Environmental Protection Authority grant the consents sought by the Applicant. Given time constraints, we note that the discussion of the conditions centred around responding to the questions of the Decision Making Committee, rather than a wider discussion on the proposed conditions more generally.

LIST OF ISSUES/QUESTIONS OF THE DECISION MAKING COMMITTEE

How typical of the area off-shore east coast Great Barrier is the Northern Disposal Area (NDA) and what is the likelihood of rare and vulnerable ecosystems/threatened species – benthic biota, fish, marine mammals being found in the NDA that are not found elsewhere in the vicinity?

9. Our response to this question is divided into the two parts;
- a) The NDA is considered to be typical of the wider east coast of Great Barrier inner continental shelf habitat, based on the information each of the experts is aware of.
 - b) The likelihood of rare and vulnerable ecosystems/threatened species being present in the NDA
 - i. It is considered that the benthic habitat is largely homogeneous. While there is the possibility that small isolated patches of boulder habitats harbouring diverse epifaunal assemblages of organisms such as Stony corals may be present within the NDA, it was agreed that the likelihood of these occurring in the NDA when not occurring in adjacent areas was none to very low.
 - ii. With regard to fish, Clinton Duffy reported that the only threatened fish species likely to be present within the NDA are Basking Shark and Great White Shark. Both of these species are pelagic and have wide ranges of which the NDA is only a very small part. Clinton Duffy also reported that the protected Sand Tiger Shark may also be present within the NDA from time to time, and similarly Manta Rays and Devil Rays may also pass through the NDA. All of these species have wide ranges of which the NDA is only a very small part.
 - iii. While the experts at this conference were not mammal experts, we generally agreed that like the larger fish, marine mammals occupy relatively large ranges of which the NDA is only a small part. The marine mammal experts should supply further detail.

What is the spread of ecologically significant impact of the disposal at the NDA to date – e.g. a benthic mortality zone within a 500m radius of the centre?

What is Ecological Significance?

10. In order to answer the question, a discussion regarding what constitutes an “ecologically significant impact” took place both during the conference and as a

matter which the experts corresponded on after the conference. Although the disappearance of all individuals in a natural community would clearly represent an ecologically significant change, defining precisely at what point a shift in abundance, diversity or composition of a community (irrespective of cause) is sufficient to be considered ecologically significant requires some consideration. Important ecological thresholds can include the loss of key habitat-forming or keystone species (e.g., coral, sponges or large burrowing urchins), the disappearance of a species from a certain location, or loss of an entire functional groups (e.g., filter feeders or sediment bioturbators). A degree of variability will always be present in biological communities, however when pushed beyond a certain point (tipping point) due to stressors, they will shift to an alternate state which will not perform the same ecological functions and services as the original community. Impacts should therefore be limited to avoid reaching these tipping points through loss of species and/or functional groups. Determining what an ecologically significant impact is not formulaic and should be a scientific judgement call, preferably by more than one scientist, based on knowledge of the species involved and the role they play in undisturbed ecosystem.

11. Based on the benthic biota and seabed core monitoring data provided by CRL to date from sample sites at the disposal centre, 500 m and 1500 m from the disposal centre and a control site, there is a gradient of effects as follows:
 - the disposal centre site is ecologically significantly impacted;
 - the 500m sample sites show potential limited impacts but the data are not clear if this is ecologically significant or not;
 - data from the 1500m sample sites suggest no statistically significant differences from the Control site, suggesting no ecologically significant impact.
12. The point was raised by Daniel Leduc and agreed by all that if boulder habitats occur within the NDA then impacts to the sensitive epibiota of these habitats are likely to have occurred, but no monitoring information is available to support this judgement.

At what distance from the centre of the NDA is there no ecologically significant impact?

13. Based on the post 150,000 m³ disposal monitoring report, all experts agreed that no ecologically significant impacts occurred at the 1500m boundary sites. It was also considered possible that impacts occurred at the 500m sites, however, the

data were not conclusive as to whether the impacts occurred and whether they were ecologically significant or not.

What thickness of sediment and rate of sedimentation causes significant mortality to the benthic ecosystems of the NDA?

14. There was general agreement that there were no direct scientific studies to evaluate what sedimentation thickness or rate causes significant mortality in this environment. There have been studies in estuarine environments which suggest that rates of greater than 2 cm per year are likely to result in adverse effects to more sensitive biota. Since the NDA environment is expected to naturally have lower rates of sedimentation than occur in estuarine environments it was theorized that NDA biota would be more sensitive to sedimentation rate changes than estuarine biota, but to what extent, it is not possible to define.

What is the fish population of the NDA?

15. Fish populations are naturally low in density in the NDA as a result of the low abundance and diversity of benthic habitats. Those fish are most likely to be transient and mobile.
16. Commercial fish such as snapper, school shark and tarakihi were the most caught. All three species are highly mobile. The lack of seabed structure will result in these species not taking up residence within the NDA. Other fish likely to be present in low numbers will be part of a species assemblage common to the north-eastern New Zealand coast.

What risks are there to threatened fish species from the disposal of sediment in the NDA?

17. The risks to threatened fish species are considered negligible. The only threatened species are Basking and Great White Sharks, with the addition of the protected fish species Manta and Devil Rays, Whale and Sand Tiger Sharks. All of these species are pelagic, wide ranging, and none are expected to be resident in the NDA. None of these species feed on benthic biota so a reduction in benthic biota within the NDA is not likely to affect these species.

What risks are there to customary or commercial fishing interests from the

disposal of sediment in the NDA?

18. The impact to commercial catch is expected to be negligible. Rich Ford provided information on reported commercial catches of snapper, with an estimated 74 kg/year taken from the NDA which was contrasted with 4500 tonnes /year taken from the SNA1 area (North Cape to East Cape). This is the largest quantity of any species commercially reported as caught.
19. No information on customary catch is available, recreational catch is known to be at relatively low levels in the NDA from aerial boat surveys.

What are the risks from invasive organisms within the dredged material:

i. At the NDA;

20. Simon West and Daniel Kluza were the principal participants in responding to this question. Both agreed that there was negligible risk of invasive macrofauna or macroflora surviving on the seabed in the NDA as it was too deep. It is possible cysts could survive but this was beyond the expertise of both Simon West and Daniel Kluza.

ii. At coastal sites in eastern Great Barrier and the Coromandel;

21. The risk to coastal areas was considered negligible. This is the result of the low chance of entrainment in the disposal barge, survival of burial in the disposal barge, chance of spawning, survival of transport to shore, and availability of suitable habitat to settle on.

iii. En route to the NDA.

22. While this potentially presents a greater risk, the rarity of the event and varying locations, provide difficulties to define an overall risk. It was considered that the overall risk is likely to be low. The risk from hull fouling would present a greater risk.

23. Rich Ford, Clinton Duffy and Daniel Leduc presented no opinion

What is the likelihood of reproductive stages of invasive species reaching coastal sites?

24. Larval stages of the species identified to date are unlikely to reach shore alive based on the trajectory model presented. Of the species identified to date only

Undaria could be transported as fragments with reproductive stages present. However, it was considered the low likelihood of entrainment in the barge, low likelihood of transport to shore and low likelihood of establishment would provide an overall negligible risk.

25. Rich Ford, Clinton Duffy, and Daniel Leduc presented no opinion.

Recommended monitoring/conditions to measure the spread of the impacted benthic area and prevent impact beyond the NDA boundary?

26. It was suggested that four aspects of monitoring should be considered.

a) Mound formation and spread

A combination of multibeam surveys and direct sediment core samples was considered appropriate.

- Multibeam surveys to be conducted annually in spring, and a resulting bathymetric map of the NDA should be provided to allow comparisons with previous surveys.
- Sediment cores for sediment thickness should be conducted annually in spring at 100 m intervals along the eight axes. The use of a colour reference chart is to be added to the current methodology to ensure objective colour determination.
- Sediment cores for sediment chemistry should be conducted at annual intervals in spring at the 500m, 1000m, 1500m and control sites, with the 0-5cm and 5-10cm layers tested for grain size, total recoverable metals and TPH. The inclusion of 5-10cm layer samples was recommended as a method to potentially provide background levels with which to compare surface layer effects in early stages of mound spread. This is unlikely to be effective in all samples, because if the disposal layer increases in thickness then the 5-10cm layer will not be representative of a background.

b) Benthic biota

It was considered the current 0, 500, 1000, 1500m sites were suitable, but the control sites should be expanded to at least 2 sites (1 south as currently sampled, and a second 3.5 km north of the NDA centre). Having more than one control site is important, as even un-impacted sites will vary due to past events or factors that are not monitored or accounted for. Therefore comparing potentially impacted sites to more than one control allows any potential impact to be appropriately

contextualized within the range of the natural variability seen in those control sites.

- A continuation of the current sampling was suggested, however rather than combining the 2 individual cores per replicate they should be handled as separate samples, increasing the replication to 6 individual cores per site. In order to compare with previous sampling the 3 pairs of cores could be randomly added together post enumeration.
- Some discussion was held on methods of staining samples as a technique to determine if Foraminifera were alive at the time of sampling. The discussion did not reach a clear conclusion as to the effectiveness of staining. Further advice on that was required by experts in that field. Daniel Leduc has reservations about the quality and reliability of foraminifera count data obtained to date without staining.
- The group recommended video or still photo transects should be added to the sampling methodology at each of the biota sampling sites. Preference would be for scaled video transects approx. 200 m long perpendicular to the sampling axis, and centred on the biota site. Video sampling would provide visual evidence of the presence of larger epifauna, seabed topography, possible vulnerable habitats and species, invasive species, and fish.
- It was suggested that grab or box corer samples should be collected to provide information on larger biota not covered by the video transects and cores. Daniel Leduc suggested a grab or box corer of approximately 0.5x0.5m area sieved through a 2 mm mesh. However Simon West expressed concern this was too big a grab to be practical from many vessels.

c) Vulnerable species and habitats

- The use of video transects would provide visual evidence of the presence or absence of any boulder habitats harbouring vulnerable species such as Stony corals, and a way to assess any potential impacts from sedimentation.

d) Biosecurity

- The sampling outlined above will provide sufficient information to determine if invasive species have established on the seabed in the Northern Disposal Area.

27. Some discussion was conducted on whether the coring methods used to date

were providing undisturbed samples. Daniel Leduc was of the opinion that the gravity corer would cause a bow wave that disturbs the sediment surface layer prior to impact. Simon West was not convinced that the bow wave disturbance, if it occurs, was sufficient to alter the results. Testing the adequacy of a gravity corer by doing a pilot study using both gravity corer and a multicorer (the latter is considered best practice) was highly recommended by Daniel Leduc. If there is no significant difference between the two methods, then a gravity corer can be used for future surveys. If they differ, then a multicorer should be used.

Regardless of what method ends up being used, it is best practice to record sign of disturbance (e.g., water clarity, surface topography, presence of surface biota) to the core sample to enable interpretation of the core fauna data. The issue remains outstanding.

28. Discussion was held on the statistical power of the sampling planned with regard to detecting a change of a specific amount. Because of the natural variability in biological communities in both space and time, statistics must be employed to establish whether a given change in community parameter(s) is greater than what would be expected given this background variability. The ability of statistical tests to detect a given change (i.e., its power) depends on 1) the magnitude of the change, 2) the background variability, 3) the threshold of statistical significance (p , most commonly 0.05) and 4) the number of replicate samples obtained. Normally, a power of 0.8 is judged sufficient; i.e., a given change can be detected 80% of the time. Designs with low statistical power may result in not detecting ecological impacts until biological communities have been more affected than desired.
29. Once the natural variability of a biological community has been determined through sampling, and that the magnitude of the change to be detected has been determined, then it is possible to quantify the power of a statistical test to detect this change given a defined sampling effort. If the power of a test turns out to be too low, one can either increase sampling effort, choose another, less variable community parameter to measure (e.g., abundance, taxon richness, diversity index), lower the threshold for statistical significance (e.g., from 0.05 to 0.10), or increase the magnitude of change to be detected (however there may be good reasons not to change this, to detect ecologically significant differences). A different sampling device may also help address statistical power issues if it helps lower variability among the samples by obtaining physically larger samples.
30. Designs with low statistical power may result in not detecting ecological impacts until biological communities have been more affected than desired. Simon West reported

that based on the current sampling plan of 6 control replicates compared with a hypothetical 24 test replicates, the power was not sufficient and would require significantly greater sampling effort to achieve a power of 0.8. There was agreement on the difficulty posed in that regard, but that the univariate power of any sampling plan should be explicitly stated.

31. It is Daniel Leduc and Rich Ford's opinion that all practical means should be used to resolve the issue of statistical power, because designs with low statistical power may result in not detecting impacts until biological communities have been more severely affected than intended. Whatever the means used to achieve satisfactory statistical power (usually 0.8 or greater), the reasoning for modifying the design needs to be explained and justified.

32. Another potential solution is to simply test for statistically significant differences in community structure between NDA sites and the control sites by using statistical routines such as PERMANOVA in the PRIMER 6 software package. Multivariate community data are typically more sensitive to impacts than univariate measures such as abundance and diversity. A statistically significant difference between boundary sites and control sites, for example, would suggest that sediment dumping is impacting NDA boundary sites.

DATE: 20 NOVEMBER 2018




Simon West



Dr Daniel Leduc



Clinton Duffy



Rich Ford



Dr Daniel Kluza