BEFORE THE ENVIRONMENT COURT
AT AUCKLAND
I MUA I TE KŌTI TAIAO O AOTEAROA
TĀMAKI MAKAURAU ROHE

UNDER	the Resource Management Act 1991
IN THE MATTER	of appeals under Clause 14 of Schedule 1 of the Act
BETWEEN	**BAY OF ISLANDS MARITIME PARK INCORPORATED**
	(ENV-2019-AKL-000117)
	ROYAL FOREST AND BIRD PROTECTION SOCIETY OF NEW ZEALAND INCORPORATED
	(ENV-2019-AKL-000127)
	Appellants
AND	**NORTHLAND REGIONAL COUNCIL**
	Respondent

STATEMENT OF EVIDENCE of VICTORIA ANN FROUDE (NATURAL CHARACTER AND MARINE ECOLOGY)

TOPIC 14 – MARINE PROTECTED AREAS

19 March 2021

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1. My name is Victoria Ann Froude. I am a Director and Principal of Pacific Eco-Logic Ltd which is an environmental consultancy based in the Bay of Islands (and previously Porirua City). I am providing this evidence on behalf of the Royal Forest and Bird Protection Society of New Zealand Inc ("Forest & Bird"), Bay of Islands Maritime Park Inc ("BOIMP") and Ngāti Kuta Hapū ki te Rawhiti ("Ngāti Kuta").

2. My evidence addresses natural character and ecological significance for all the areas of interest where Ngāti Kuta, BOIMP and Forest & Bird are seeking additional marine protection measures. It also covers existing area-based controls on fishing activities within these areas.

SUMMARY OF EVIDENCE

3. Natural character incorporates ecological naturalness; hydrological, hydraulic and geomorphological naturalness; freedom from structures, sound and light regime naturalness. Perceptions and experiences of natural character depend on a person's sensory acuity, personal and cultural filters. It varies between individuals. Aspects that contribute to perceptions include visual [for the unit (water surface and underwater) and the wider environmental context], anthropogenic light, anthropogenic sounds, touch, odours and taste. The reference condition for natural character is *present-potential natural state*.

4. Natural character was assessed in 2011-12 for all the inner Bay of Islands, most of the outer Bay of Islands and the area around Cape Brett as part of the natural character overlay mapping for the Northland RPS. It has since been assessed for the remainder of the marine environment where additional marine protection is sought.

5. Policy 13 of the New Zealand Coastal Policy Statement (NZCPS) requires that within the coastal environment, areas of at least high natural character are mapped; adverse effects on outstanding natural character are avoided; and elsewhere significant adverse effects on natural character are avoided, remedied or mitigated. Policy 14 promotes the restoration and rehabilitation of coastal natural character.

6. Current levels of natural character are outstanding in Maunganui Bay where fishing has been excluded for the last ten years and there has been partial recovery in ecological naturalness and therefore natural character. The continuation of the harvest prohibition (excluding kina) is necessary to avoid adverse effects on natural character in this area, and should facilitate ongoing restoration of natural character. Natural character for the area extending from Maunganui Bay to and around the Twins, Bird Rock and Cape Brett is also outstanding.

7. For the remainder of the proposed Maunganui Bay to Oke Bay Rahui Tapu and Buffer Strip, current natural character levels are high. The absence of structures

and relatively low hydrological/ hydraulic and geomorphological modification means natural character is high. However, it is not outstanding, because some reef areas such as those in and around Oke Bay contain a relatively high level of urchin barrens because of the removal of larger predators of kina (by fishers) has allowed kina to flourish.

8. Natural character of the proposed Mimiwhangata Rahui Tapu and its buffers is currently high, as is the remainder of the areas where additional marine protections are sought. Contributing factors include very high water quality compared to the natural state, no human-mediated hydrological or geomorphological changes or human structures, and indigenous benthic cover with very few alien species. While the commercial fishing controls in Mimiwhangata have been strict, the small size and heavy recreational pressure means that these controls have been insufficient to improve ecological naturalness, and as a result Mimiwhangata does not have outstanding natural character.

9. The most effective way to avoid adverse effects or significant adverse effects on natural character in the areas that the appeals relate to is to cease fishing, or at least significantly reduce fishing pressure, in the areas that are the focus of the appeals. Over time, areas protected from fishing will also return to a more natural state. This includes the return of more and larger individuals of harvested fish and invertebrate species, especially if protected areas are sufficiently large. As urchin predator numbers and size increase, urchin numbers should reduce and kelp forest should expand onto areas that in the recent past had been urchin barrens. This again is returning to a more natural state. Overall fish and invertebrate populations continue to return to a more natural abundance, size distribution and behaviour.

10. Prohibiting fishing in the proposed extension of the Rahui from Maunganui Bay to Oke Bay Rahui Tapu is necessary to avoid significant adverse effects. It should allow predators of the urchin kina to gradually recover. As demonstrated in the Leigh and Tawharanui no-take marine reserves, the recovery of the predators of the urchins reduces urchin abundance. This facilitates the recovery of the natural kelp forests. More natural fish abundance, size, distribution and behaviour would also result from the prohibition of fishing. All of these ecological changes would improve ecological naturalness and thereby natural character.

11. The proposed Mimiwhangata Rahui Tapu would also experience similar types of improvements in ecological naturalness and thereby natural character. This proposed Rahui Tapu is larger than the existing Mimiwhangata Marine Park and this increased size should reduce the proportion of the area subject to the boundary or edge effect.

12. The use of buffer areas where fishing methods are more tightly prescribed could help to reduce the boundary or edge effect. This is where heavy fishing on the

boundary reduces the benefits of the reserve, especially in areas closer to the boundary[1]. An alternative would be to include the buffer within the no-take area which would provide an even greater protection from the fishing edge effect observed in no-take areas.

13. The majority of Area B, where a prohibition on scallop dredging is proposed in the outer eastern Bay of Islands, is currently of high natural character. Recreational scallop dredging is currently infrequent (and commercial dredging is prohibited under Fisheries Act regulations). Scallops themselves are very sparse compared to recent earlier years. Preventing further dredging would help to avoid further significant adverse effects on this area, and allow benthic communities to recover from the physical effects of dredging. This would improve ecological and geomorphological naturalness, and therefore natural character.

14. For Cape Wiwiki- Taupiri (Area C) and Te Au o Morunga collectively- the open coast between the western Bay of Islands and just south of Mimiwhangata - prohibitions on bottom trawling will avoid significant adverse effects on natural character and should help to restore the natural character of the benthic habitats in those areas where trawling occurs (primarily north of the Bay of Islands and Cape Brett).

15. Two of the features of the Cape Brett area are the schools of pelagic and demersal fish and the presence of tropical vagrants such as vulnerable turtles. There seems to be an intensive purse seine skipjack tuna (and to a lesser extent mackerel) fishery to the east of Cape Brett Peninsula. It is possible that the prohibition of purse seining in the area of interest would help to restore more natural levels of schooling fish for a variety of species and improve the survival chances for some tropical vagrants. This would again improve natural character in this area.

Urchin barren and kelp cover assessment

16. Additional field assessment work relating to the local extent of urchin barrens and kelp cover was not able to be completed prior to the closing date for submitting this evidence. The results of this work will be included in supplementary evidence and will help elaborate the attributes and values of the inshore reefs in the area of interest.

Ecological significance

17. Both the proposed Maunganui Bay- Oke Bay and the Mimiwhangata Rahui Tapu areas (Areas A) and their proposed buffers are ecologically significant using the criteria in Appendix V of the Northland Regional Policy Statement and are identified as parts of Significant Ecological Marine Areas in the

[1] Willis TJ, Millar RB, Babcock RC (2000) Detection of spatial variability in relative density of fishes: comparison of visual census, angling, and baited underwater video. Marine Ecology Progress Series 198: 249-260

Proposed Regional Plan for Northland. Most of Area B is ecologically significant with the main exception being the deeper Rawhiti Basin where much of the sediment transported by the Kawakawa River is deposited. A more complex pattern of ecological significance applies to the larger areas identified by Ngāti Kuta (Area C) and Te Uri o Hikihiki (Te Au o Mounga Protection Area. For the open coast the reefs and reef-edge habitat are widespread and ecologically significant.

Existing fishing controls

18. There are a range of existing fishing controls in place in the areas that the appeals relate to, which I describe in Part 4 of my evidence.

QUALIFICATIONS AND EXPERIENCE

19. I have a PhD in environmental science and policy. My PhD thesis was completed in 2011 and is titled *Quantitative methodology for measuring natural character in New Zealand's coastal environments*[2] While the field work focused on Northland, the methodology was designed to be applicable throughout New Zealand. Terrestrial, freshwater and marine coastal environments were addressed.

20. I also have a BSc in botany and an MSc in resource management with supplementary postgraduate papers in Planning Law and the Treaty of Waitangi in New Zealand Society.

21. In 1989 I was I was admitted as a full member of the New Zealand Planning Institute, although I am not currently a financial member.

22. I have a PADI Divemaster (professional scuba diving) qualification and until recently was a certified scientific scuba diver.

23. I am a member of New Zealand Ecological Society and the New Zealand Marine Sciences Society.

24. I have manged Pacific Eco-Logic since 1997. It became a limited liability company in 2001. Since 1997 I have completed a broad range of work including terrestrial, marine and lake environmental assessments and monitoring; developing biodiversity and marine monitoring indicators, habitat and natural character mapping, developing and implementing ecological restoration plans; and undertaking major national reviews (e.g. biocontrol for protected areas; and wilding conifers in New Zealand).

25. I assessed and mapped coastal environment natural character for the Northland Regional Policy Statement in 2011-12. At that time Council decided that there was insufficient information to assess most of the open coast marine environment and so it is generally unassessed in the Proposed Northland

[2] https://researchcommons.waikato.ac.nz/handle/10289/5919

Regional Plan ("pNRP"). I have subsequently undertaken more detailed natural character assessments for various parts of the Northland Region.

26. In addition to Northland I have worked on natural character projects in Tasman District, the Waikato Region and Southland Region (Fiordland).

27. I worked with a multiagency team to develop a national monitoring project for the New Zealand marine environment[3]. Currently I am preparing a two book environmental history for New Zealand's marine environments. This latter work assists with developing appropriate natural character baselines for assessing marine natural character.

28. I have considerable scuba and snorkel/ free diving experience in the wide Bay of Islands as well as many other New Zealand and international locations. Over the last ten years I have over 200 hours of logged dive and snorkel/ free dive assessment time within the the Maunganui Bay rahui area.

29. In 2016 I researched algae cover and urchin barrens in the outer Bay of Islands using more than 560 5x5m quadrats. Since then, I have undertaken a series of rapid assessments of algal cover and urchin barrens in a number of eastern Northland locations[4].

30. I have considerable experience with the biodiversity-related provisions in the Resource Management Act. This has included a 1997 review of New Zealand council implementation of the biodiversity protection provisions in the Resource Management Act[5]; analyses of options for biodiversity protection using tools available to local government; preparation of the MFE Quality Planning Website Guidance Note on biodiversity[6]; and carrying out ecological assessments including analyses of ecological significance (e.g. using the criteria in Appendix 5 of the Northland RPS for Northland assessments).

CODE OF CONDUCT

31. I have read the Code of Conduct for Expert Witnesses in Part 7 of the Environment Court's Practice Note 2014. I agree to comply with the Code of Conduct. In particular, except where I state that I am relying upon the evidence of another person as the basis for any opinion I have formed, the evidence in this statement is my expert opinion within my area of expertise. I have not

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[3] Hewitt et al (2014) Developing a national marine environment monitoring programme (MEMP) for New Zealand. *New Zealand Aquatic Environment and Biodiversity Report* No. 141. 128p

[4] Froude, V. A. (2016). Kelp cover and urchin barrens in the Bay of Islands: a 2016 baseline. A report prepared for Bay of Islands Maritime Park. 72p. https://www.fishforever.org.nz/images/ff/documents/reports/Kelp_cover_and_urchin_barrens_in_the_Bay_of_Islands_FINAL_Dec_2016.pdf

[5] Froude, V.A. (1997) Implementing the biodiversity protection provisions of the Resource Management Act: A review of council progress to date. Pacific Ecologic Resource Management Associates: Wellington: N.Z.116 pp.

[6] Quality Planning 2013 Plan topics-indigenous biodiversity. https://www.qualityplanning.org.nz/sites/default/files/2018-11/Indigenous%20Biodiversity_0.pdf

omitted to consider material facts known to me that might alter or detract from the opinions I express.

EVIDENCE

AREAS PROPOSED FOR ADDITIONAL MARINE PROTECTION

Ngati Kuta Proposed Te Hā o Tangaroa Protection Areas - Rakaumangamanga-Ipipiri

32. Figure 1 shows the geographical extent of the Te Hā o Tangaroa protection areas A, B and C for Rakaumangamanga-Ipipiri. The evidence of Peter Reaburn describes the details for each of the areas which in summary are:

    a. A- Maunganui Bay-Oke Bay eastern Bay of Islands Rahui Tapu (no-take, except for kina) plus a 1km wide buffer along the western boundary.

    b. B- Eastern Bay of Islands prohibition on scallop dredging (in effect, this applies to recreational scallop dredging as commercial dredging is already prohibited).

    c. C- Western Bay of Islands -Cape Brett- south to Taupiri including both the outer coast and the inner Bay of Islands (excluding the existing Te Puna Mataitai and the Waikare Taiapure) prohibition on damaging bulk fishing methods –particularly trawling and purse seining.

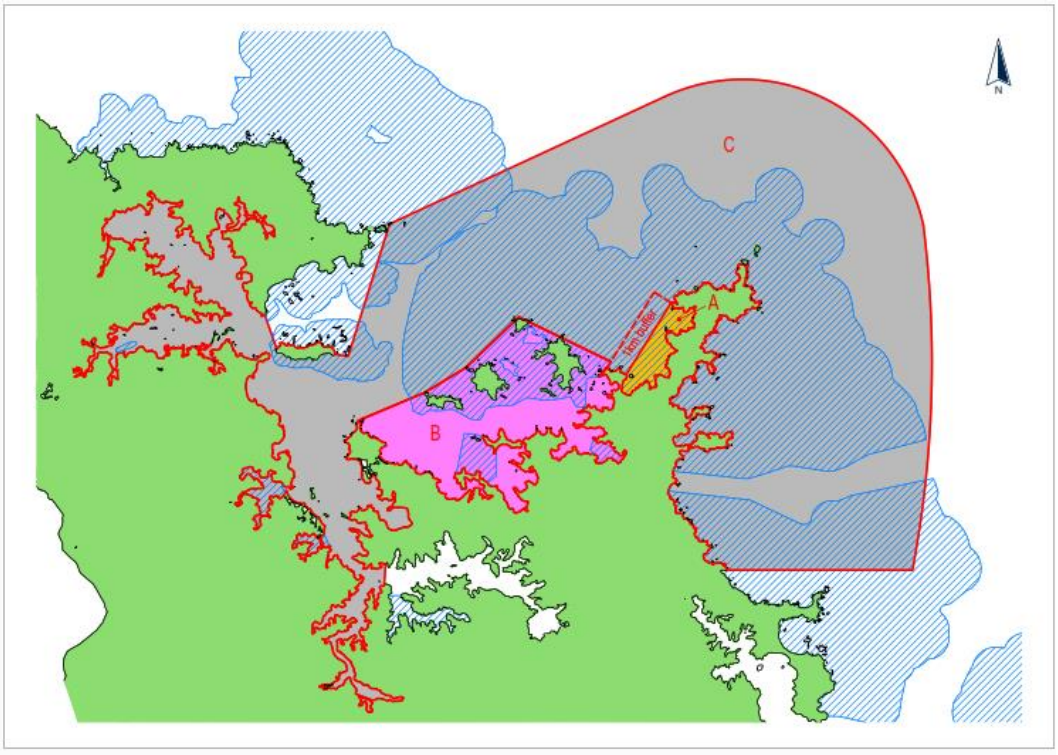

Figure 1: Ngati Kuta proposed marine protection and fishing restrictions

Te Uri o Hikihiki Te Mana o Tangaroa Protection Areas

33. Figure 2 shows the geographical extent of the Te Mana o Tangaroa Protection Areas centred on Mimiwhangata. It also includes the Ipipiri- Rakaumangmanga areas.

34. The provisions sought for this areas were circulated by Te Uri o Hikihiki on 11 December 2020 and in summary are:

    a. Mimiwhangata Rahui Tapu and its buffers: no take except for kina and in the buffers, activities provided for in a management plan may occur.

    b. Te Au o Morunga Protection Area from Cape Brett to Mimiwhangata excluding Whangaruru Harbour and the nearshore from Whangaruru to Mimiwhangata. In this area prohibitions are sought on damaging bulk fishing methods –particularly trawling and purse seining.

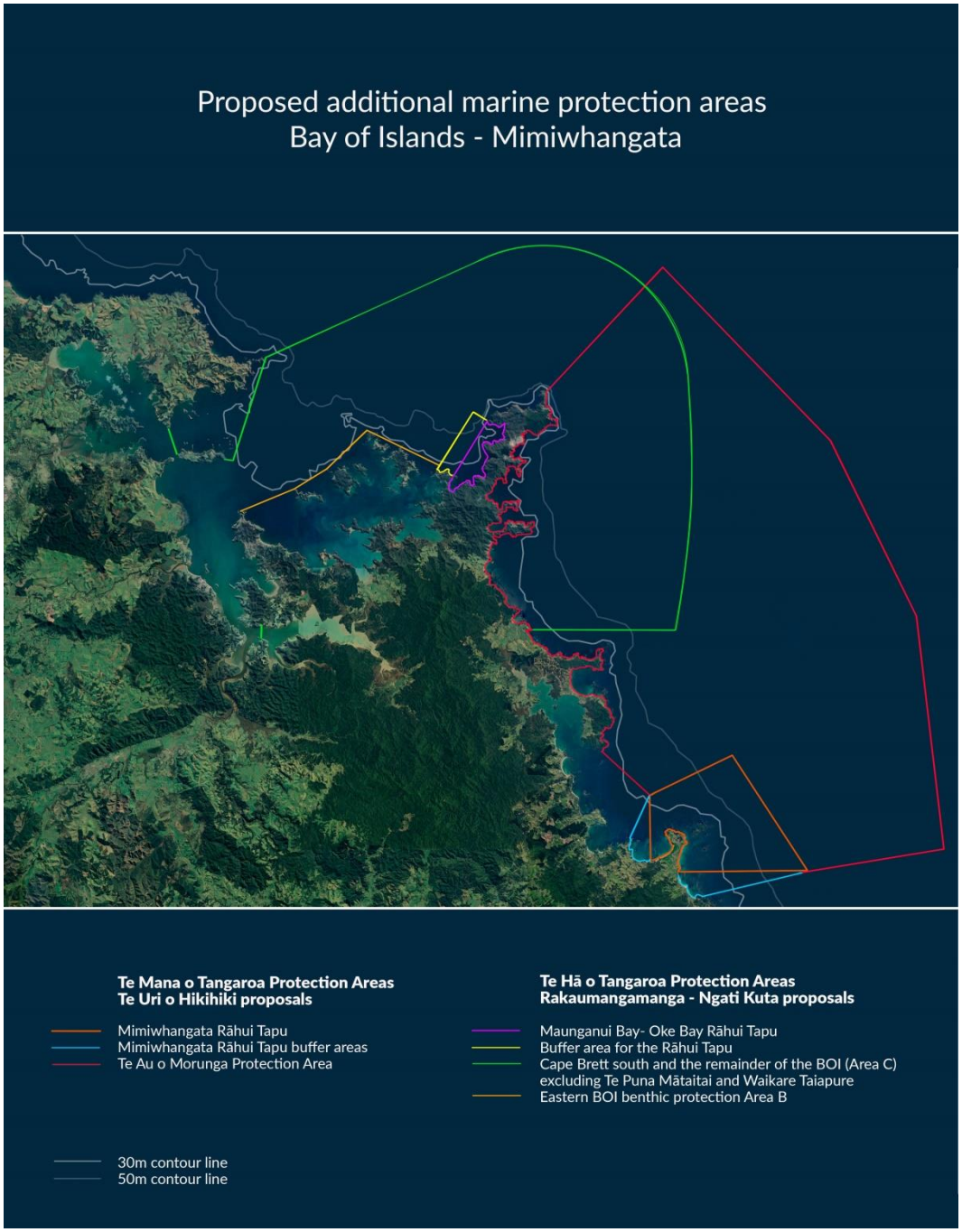

Figure 2: Boundaries of areas where different types of additional control sought by Ngati Kuta, Te Uri o Hikihiki, BOIMP and Forest & Bird

PART 1: NATURAL CHARACTER

Defining Natural Character

35. In 2007, I set out to develop a robust methodology for measuring natural character change. The first step was to develop a definition of natural character.

I produced the following definition, which was published in a peer-reviewed journal in 2010:[7]

> Natural character occurs along a continuum. The natural character of a "site" at any scale is the degree to which it:
>
> (a) is part of nature, particularly indigenous nature
>
> (b) is free from the effects of human constructions and non-indigenous "biological artefacts"[8]
>
> (c) exhibits fidelity to the geomorphology, hydrology[9] and biological structure, composition and pattern of the reference conditions chosen
>
> (d) exhibits ecological and physical processes comparable with reference conditions
>
> Human perceptions and experiences of a "site's" natural character are a product of the "site's" biophysical attributes, each individual's sensory acuity and a wide variety of personal and cultural filters.

36. I compared this definition with an analysis of the collective interpretations of natural character distilled from 100 pre-2010 relevant[10] Court decisions. This comparison found that the definition was generally consistent with the various Court interpretations of natural character[11]. A subsequent analysis of a later set of 100 relevant Court decisions[12] confirmed that natural character is of nature and includes natural elements, patterns and processes across a continuum from outstanding to very low. This analysis also confirmed that natural character is independent of viewer perception and it is different to beauty, wilderness and aesthetic preference.

37. The 2010 New Zealand Coastal Policy Statement (**NZCPS**)[13] Policy 13(2) states that:

> "…natural character is not the same as natural features and landscapes or amenity values and may include matters such as:
>
> a. natural elements, processes and patterns;
>
> b. biophysical, ecological, geological and geomorphological aspects;
>
> c. natural landforms such as headlands, peninsulas, cliffs, dunes, wetlands, reefs, freshwater springs and surf breaks;
>
> d. the natural movement of air, water and sediment;

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[7] Froude VA, Rennie HG, Bornman JF 2010 The nature of natural: defining natural character for the New Zealand context. *New Zealand Journal of Ecology 34(3)*.
[8] The term biological artefact is used in international scientific literature to represent human constructed and managed biological systems such as pasture for grazing, lawns, gardens, plantations and orchards. In the application of the methodology for measuring natural character such a distinction is not necessary
[9] In aquatic systems this includes water quality including nutrient levels
[10] "Relevant" decisions were those that discussed natural character
[11] Froude VA 2011. Quantitative methodology for measuring natural character in New Zealand's coastal environments. PhD Thesis. University of Waikato. 341 p. https://researchcommons.waikato.ac.nz/handle/10289/5919
[12] Froude, V A 2015 Preserving coastal natural character: Court interpretations of a long-standing New Zealand policy goal. *New Zealand Geographer* 71, 45-55
[13] Department of Conservation 2010. New Zealand Coastal Policy Statement 2010. Wellington, Department of Conservation. 28 p.

e. the natural darkness of the night sky;

f. places or areas that are wild or scenic;

g. a range of natural character from pristine to modified; and

h. experiential attributes, including the sounds and smell of the sea; and their context or setting.

38. These matters are a mixture of biophysical attributes including those that contribute to "experiential attributes". Some of the listed attributes provide guidance about what constitutes natural character (e.g. a, b, d, and e). Others identify particular components of the coastal environment which are likely to possess natural character (e.g. c and f). Item (h) gives examples of biophysical attributes that contribute sensory information to human experiences, while item (g) contains the observation that natural character occurs along a continuum. Policy 13(2) in its current form is a non-exclusive list of matters to consider rather than a definition.

39. The 2010 NZCPS introduced thresholds for management of effects on coastal natural character for the first time. Policy 13(1)(a) requires any adverse effects of activities on the natural character of the coastal environment be avoided in areas of outstanding natural character. For all other areas in the coastal environment policy 13(1)(b) requires that significant adverse effects on natural character are avoided and that other adverse effects of activities are avoided, remedied or mitigated. The threshold of high was introduced in policy 13(1)(c). This policy requires that natural character be assessed by mapping or otherwise identifying at least areas of "**high** natural character" These thresholds have not been formally defined in legislation or national policy.

Assessing Natural Character, especially in Northland

40. The initial rationale for developing a quantitative methodology for measuring natural character change in New Zealand's coastal environments ("QINCEE methodology"[14])[15] was that the lack of monitoring of natural character change was one of the key deficiencies identified by Joanna Rosier in her review of the implementation of 1994 NZCPS[16] . An important feature of the methodology I developed was that it could be applied at different levels of detail depending on the purpose and scale of assessment. Quantitative scoring systems were developed for key components. By using common assessment systems in different coastal environments, the methodology allows users to compare

[14] Where QINCEE means "Quantitative Indices for measuring the Natural Character of the Coastal Environment"

[15] Froude VA 2011. Quantitative methodology for measuring natural character in New Zealand's coastal environments. PhD Thesis. University of Waikato. 341 p.

[16] Rosier, J 2004. Independent review of the New Zealand Coastal Policy Statement. Massey University. https://ref.coastalrestorationtrust.org.nz/site/assets/files/6610/nzcps-rosier_review-2004_-_docdm-484624.pdf

natural character levels for different types of terrestrial and aquatic coastal environment.

41. The original methodology was adapted to map and assess areas of high and outstanding natural character at the regional scale in Northland[17]. In summary, a set of criteria were used as an initial triage to identify areas that definitely were not of at least high natural character. For all other areas, relatively homogeneous units (from the perspective of natural character) were defined, and specific variables were measured. Scores from the different variables were combined multiplicatively[18] into sub-indices to give an overall Natural Character Index (NCI).

42. For each unit, natural character was measured using the modified QINCCE methodology[19]. The following indices and their component parameters were assessed::

    a. Ecological Naturalness Index (ENI) (the naturalness of benthic cover and mobile fauna, the lack of alien invasive species, and level of protection[20] from human harvesting and/or levels of different types of fishing activity and benthic disturbance);

    b. Hydrological, hydraulic and Geomorphological Naturalness Index (HGNI) (including naturalness of sedimentation regimes and water quality, impacts of bottom disturbance including benthic contact fishing methods, dumping, dredging, causeways and reclamations);

    c. Freedom from the impacts of Building and Structures Index (FBSI);

43. These indices were combined multiplicatively into an overall natural character index (NCI). This is a multi-metric index, equivalent to the various Macroinvertebrate Community Indices (MCIs) used in freshwater standards.

44. In addition, the naturalness of the sound and light regimes was assessed qualitatively at the regional scale as this can vary significantly across a larger unit depending on local topography and other local features[21].

45. Units that had been allocated an overall NCI score could then be assessed against minimum numerical thresholds for high and outstanding natural

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[17] Froude, V A 2014 Northland Regional Council Mapping Project. Natural character methodology report – including amendments following Council decisions. Pacific Eco-Logic Ltd; Bay of Islands. 31p.
[18] The reason for combining these variables multiplicatively was to make sure that if there were any linkages between the variables, this did not affect the overall score. A more common approach is to add scores from variables and then find the average. This assumes that the variables are not linked which is not necessarily an appropriate assumption with natural environment variables.
[19] Froude, V A 2014 Northland Regional Council Mapping Project. Natural character methodology report – including amendments following Council decisions. Pacific Eco-Logic Ltd; Bay of Islands. 31p
[20] The level of protection is used as a proxy for logistically complex and costly direct assessments of mobile biota population structure and abundance. Levels of different types fishing were also evaluated using aggregated data obtained from Fisheries New Zealand.
[21] Even a low ridge can provide a significant lateral barrier to sound while elevation with a clear line of sight does not

character. Based on trials and consultation I made initial recommendations as to where those thresholds should be. The thresholds I had recommended were shifted upwards in small increments several times by Council staff and the high threshold was also shifted up one small increment for terrestrial environments by the Council's RPS hearings commissioners. This had the effect of reducing the number of units and the total area ranked as possessing high or outstanding natural character.

46. Each unit which scored close to the numerical threshold for either high or outstanding natural character was reviewed individually, considering additional factors that could not be effectively quantified at the scale needed for a regional assessment where the coastline is 3,200km long. Following this review, a unit's status of less-than-high, high or outstanding for natural character was confirmed.

47. I developed the following working definitions to assist the Council and public to better understand the differences between areas of outstanding or high natural character or where the natural character is less than high.

    a. Areas of outstanding natural character:

        i. Consist entirely or almost entirely, of indigenous nature[22]

        ii. Relative to other Northland coastal sites, there is a very high level of matching to reference conditions[23] for all or most of:

            1. Biological structure & composition and ecological processes[24]

            2. Geomorphology, hydrology, hydraulics, water quality and physical processes

            3. Sound and odour environment, darkness regimes

        iii. Exhibit minimal or no impacts from buildings, structures, paved surfaces, roading or vehicle tracks

    b. Areas with high natural character:

        iv. Almost entirely consist of nature, especially indigenous nature

[22] This can include surfaces with minimal or no obvious biological cover

[23] Reference conditions are compiled using a variety of information sources to represent a particular time or target. In the New Zealand context the reference conditions used is that of present-potential natural state. This is what would be expected if humans and their tools had not impacted an area but natural processes (e.g. earthquakes, tsunamis, storms, coastal erosion and accretion) had still occurred. High levels of natural disturbance characterise many coastal environments.

[24] For the regional and district scale these are assessed based on various attributes of the biological cover and/or natural surface; and the level of animal pest control or freedom from animal pests or human harvest (depending on the environment type). Attributes relating to cover/ natural surface have greater impact on the scoring.

v. Relative to other Northland coastal sites, there is a moderate to a high level of matching to reference conditions for:

1. Biological structures & composition and ecological processes
2. Geomorphology or landform, hydrology, hydraulics, water quality and physical processes
3. Sound and odour environment, darkness regimes

vi. Exhibit minimal impacts from buildings, human-built structures, paved surfaces, roading or vehicle tracks

c. Areas where the natural character is less-than-high:

vii. May have low levels of nature (versus human-constructed environments)

viii. Typically have low-moderate to low levels of indigenous nature

ix. May be dominated by human-constructed and managed biological systems such as pasture for grazing, lawns, gardens, plantations and orchards which are typically dominated by introduced species

x. May include moderate to high levels of invasive species

xi. Relative to other Northland coastal sites, there is usually a low level of matching to reference conditions for one or more of:

1. Biological structures & composition and ecological processes
2. Geomorphology or landform, hydrology, hydraulics, water quality and physical processes
3. Sound and odour environment, darkness regimes

xii. May exhibit a variety of impacts from buildings, human built structures, paved surfaces, roading or vehicle tracks

48. The reference condition used for assessing natural character is **present-potential natural state (PPNS)**. This is the state that would be present today, if humans and the introduced species they brought with them had not arrived in New Zealand and natural processes had continued. These natural processes can be large scale and major (e.g. earthquakes, volcanism and major storms); or more local (such as landslides and a mobile river mouth). PPNS is useful for areas where there are high rates of natural disturbance (as for example it avoids the need to specify the exact position of a river mouth at a particular historical date). While 1840 is often used in New Zealand as a date against which change is compared, 1840 is less relevant in much of Northland as there was relatively

intensive Maori settlement in locations such as the Bay of Islands, and noticeable European settler activity prior to 1840.

Assessing and mapping the natural character of the Northland coastal environment

49. In 2011-2012 Pacific Eco-Logic assessed and mapped coastal natural character for part of the Northland coastal environment as part of the process for preparing the Regional Policy Statement for Northland. Northland's long coastline of 3200km made this a time-consuming task, especially given the poor quality of much of the available imagery at the time of mapping. Much of the available satellite imagery was of poor quality with large areas obscured by cloud or only addressed with low resolution imagery. As a consequence many of the areas needed to be physically inspected (by vehicle, on foot and/or by boat) as part of this assessment. Mapping was relatively slow and resource intensive.

50. Natural character assessment in subtidal marine environments is more complex than for terrestrial and intertidal environments. This is because satellite and aerial imagery which can be so useful in terrestrial environments is of little use in most temperate subtidal environments. Personal inspection is complex in most locations and there is generally much less spatially bounded data available. Some proxy indicators can be used because of the difficulty in obtaining accurate spatially bound biological condition data in a cost effective manner, especially in deeper locations.

51. In 2011-12 the terrestrial, freshwater and estuarine and sheltered waters mapping used up the available resources and time. Council decided that the readily available information was not sufficient to map most of the open coast marine environment below mean high water springs. These areas have remained unmapped.

52. The 2011-2012 mapped areas are in the operative Northland RPS maps with the marine units only included in the maps for the Proposed Regional Plan for Northland. The hard copy proposed RPS maps stated that the unmapped open coast was unassessed. However, the online RPS maps currently make no distinction between the areas that were specifically identified as being of less than high natural character and those areas that were not assessed. This is also the case for the online maps for the proposed RP for Northland. The current online maps provide an inaccurate impression that most of the Northland marine environment outside of harbours, estuaries and other sheltered waters, is of less than high natural character. This should be remedied. It would be preferable that these previously excluded areas be mapped and added to both the RPS and Regional Plan maps. As a minimum the online maps and any associated screen shots or screen snips should be annotated to make it clear that the unmapped open coast marine environment has not been mapped for natural character.

53. Approximately 25% of the area included within the marine environment where marine protection provisions are sought was assessed and mapped for natural character in 2011-12. I assessed and mapped the remainder of the area (approximately 75%) in 2021 as part of the process of preparing this evidence. Appendix 1 contains my natural character assessment report[25] addressing both the marine units assessed in 2011-12 and the units newly assessed in 2021.

54. The process for mapping the additional areas included information collation, a field inspection for parts of the shallow reefs to assess urchin barren levels, and the naturalness of the benthic cover. Information collected included maps of the broad habitat types; Northland Regional Council marine SEA maps and assessments, sediment and nutrient delivery from land and freshwater; extent of any offshore sediment plumes, discharges, maps of the location and intensity of different types of fishing effort, the location of any existing protection and fishing methods restrictions tools, and any other relevant papers and reports.

Summary of 2011-2012 mapped natural character attributes and values in Northland's coastal marine area for locations where protection/fishing controls are proposed

55. Figure 3 shows the 2011-2012 mapped areas of high and outstanding natural character in the marine environment of the Bay of Islands[26]. These areas are shown on the Council's online GIS maps for the operative RPS and the proposed regional plan. Areas of outstanding natural character (ONC) are orange; areas of high natural character (HNC) are green[27]. Some of the mapped areas inshore or upstream of the orange and green mapping are shown as dark grey. These did not make the threshold for high natural character. The grey area seaward of the green and orange mapping was not assessed and mapped for natural character in 2011-12.

[25] Froude, V A 2021. Natural character assessment for the Bay of Islands to Mimiwhangata Report prepared for the Royal Forest and Bird Protection Society, Bay of Islands Maritime Park Incorporated, Ngati Kuta and Te Uri o Hikihiki. Pacific Eco-Logic, Bay of Islands.
[26] From the PRP for Northland with colours unchanged and place names added.
[27] The yellow shading shows areas that have been assessed as being an outstanding natural feature

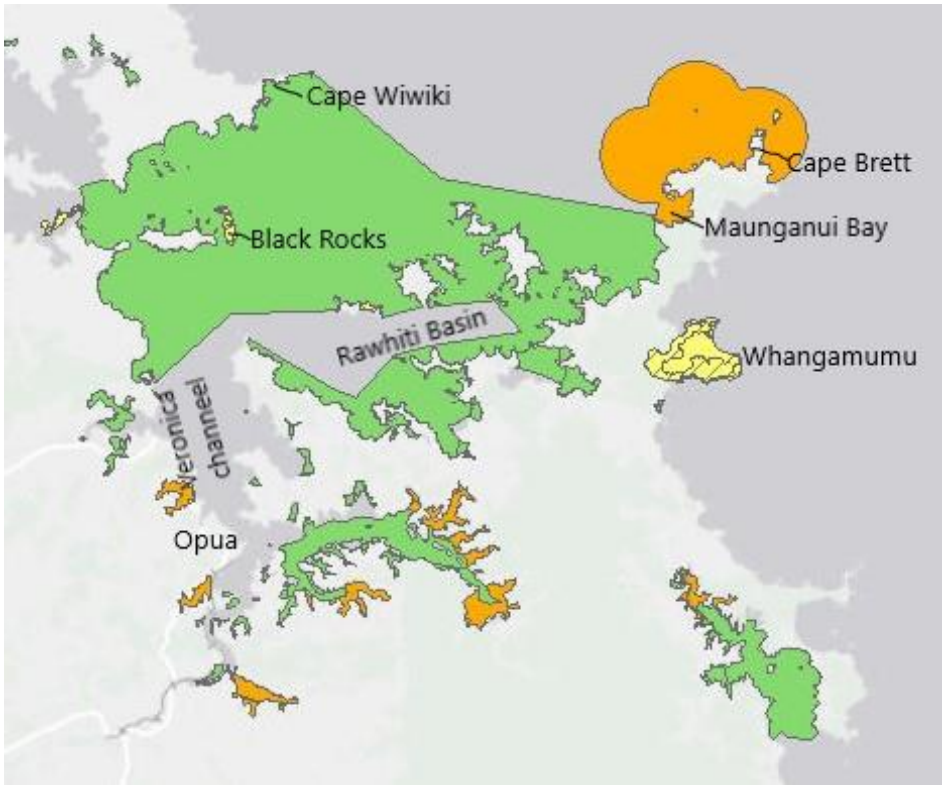

Figure 3 Areas of high (green) and outstanding (orange) natural character marine environment mapped in 2011-2012 for the Bay of Islands.[28] Areas that were either unmapped (offshore) or did not meet the threshold of high natural character (inshore) are shown in grey.

56. Maunganui Bay is part of a unit of ONC extending to and around The Twins, Bird Rock and Cape Brett. The remainder of the area in the proposed Maunganui Bay to Oke Bay Rahui Tapu and the associated Buffer Zone (Area A) has been mapped as being of HNC.

57. Most of the Ipipiri Area B is mapped as HNC. The main exclusion is the deep sheltered basin in Rawhiti Channel/Inlet where much of the sediment from the Kawakawa River's 339,000 tonnes/annum of suspended sediment settles[29][30]. The main HNC unit is 00/11 which wraps around the deep Rawhiti Basin. There are also other HNC units covering the Paroa Bay Estuary, Manawaora Bay and Parekura Bay.

58. Area C is more complex. There is an area of mapped ONC that extends from Maunganui Bay to an area immediately around Cape Brett. Adjoining this to the west is a larger area of HNC extending to Cape Wiwiki and south to an area north of Tapeka Point. The marine environment north of this HNC and ONC mapping had not been assessed and mapped for natural character when the RPS

[28] From Northland Regional Policy Statement maps
[29] MacDiarmid A. et al Ocean Survey 20/20 Bay of Islands Coastal Project- Phase 1-Desktop Study, NIWA Client Report WLG 2009
[30] The boundary for this excluded area is the 10m bathymetry line. At this location sediment deposited below 10m depth is unlikely to be re-suspended

maps were prepared. Most of the major Bay of Islands inner inlets (including Kerikeri, Te Puna, Veronica Channel-Kawakawa have been assessed for natural character and in 2012 did not meet the criteria for HNC. The Waikare Inlet met the criteria for HNC and a number of the smaller upper estuaries were mapped as ONC. As this area is within a taiapure managed by another hapu it is not included in the Area C proposed by Ngati Kuta. Several smaller estuaries not within the Waikare Inlet (Te Haumi, Whangae and Karetu) have been assessed as being of ONC. Parts of the Waitangi, Kawakawa and Uruti Bay Estuaries have been assessed as being of HNC. There are also small areas of HNC in the upper reaches of the Kerikeri and Te Haumi Inlets.

59. More detailed maps showing the 2011-2012 existing mapping is in Figures 3-6 in-Appendix 1. Table 1 in the same Appendix includes for each mapped unit within the area of interest: a summary description, a summary of contributing values, the NCI, and location. Table 2 summaries the main factors contributing to the varying experiences of natural character for the main subtidal units.

60. Neither the area encompassed by the proposed Mimiwhangata Rahui Tapu and its buffers, nor the **Te Au o Morunga Protection Area** was assessed for natural character in 2011-2012.

Summary of my 2021 mapping of natural character attributes and values in Northland's coastal marine area for locations where protection/fishing controls are proposed

61. Figure 4 below shows the main subtidal marine natural character units within the areas proposed for marine protection. Natural character units 00/02, 00/11 were assessed in 2011-2012. The other natural character units were assessed in 2021.

62. The second part of Appendix 1 contains the 2021 natural character assessments. Figure 7 shows the boundaries of the new units plus the larger marine subtidal units 00/02 and 00/11 that were mapped in 2011-12. Table 3 in Appendix 1 includes for each new mapped unit within the area of interest: a summary description, a summary of contributing values, the NCI, and a summary of factors affecting human experience. The factors affecting experience are: visual attributes within the unit (water surface and underwater); visual attributes in the wider environment context; anthropogenic light; risk and resilience to anthropogenic sound; odour, taste and touch or feel.

63. In summary the 2021 natural character mapping covered the outer Bay of Islands (only areas not previously mapped) down to Mimiwhangata. This covers the Mimiwhangata Rahui Tapu and its buffers plus all of the Te Au o Morunga Protection Area and much of Area C (Ipiripiri- Rakaumangamanga). Table 3 in Appendix 1 provides a summary of this assessment.

64. There are two new areas that are mapped as ONC. The first is the marine environment one nautical mile around Cape Wiwiki and Ninepin Rock in the

western Bay of Islands (00/12 and 00/25). This is mostly exposed coast with a high level of restriction of bulk fishing methods, habitat protected from some fishing impacts; and a lesser level of recreational fishing activity compared to other outer Bay of Islands locations. The second new ONC unit joins the Maunganui Bay to Cape Brett ONC unit. This unit encompasses the highly exposed eastern steep shoreline along the Brett Peninsula. There is a high degree of resilience to, and generally very low levels of non-natural sounds, and minimal anthropogenic light.

65. The rest of the area assessed is ranked HNC. This includes the existing Mimiwhangata Marine Park which, as described later in this evidence and in more detail in the evidence of Nick Shears has not shown benefits from its controls in such a small area. There has not been recovery of the predators of urchins nor the urchin barrens.

66. It should also be noted that marine mammals are affected by human-created sounds and disturbance. Within the Bay of Islands there has been a massive 91% decline in bottlenose dolphin numbers since 1999 from 278 to 26 individuals of which only 16 frequently visited the Bay in 2020. A 75% calf mortality rate is the highest in New Zealand[31]. Research so far indicates that this is primarily due to disturbance[32] and so the proposed Marine Mammal Sanctuary controls aim to reduce disturbance.

[31] Department of Conservation 2021 Consultation opens on proposed Bay of Islands' marine mammal sanctuary. https://www.doc.govt.nz/news/media-releases/2021-media-releases/consultation-opens-on-proposed-bay-of-islands-marine-mammal-sanctuary/

[32] Peters, C H; Stocklin, K A 2016. Responses of bottlenose dolphin (Tursiops truncates) to vessel activity in Northland, New Zealand. Final progress report to the Department of Conservation, Northland. Massey University Coastal Marine Research Group https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/bottlenose-responses-dolphin-vessel-activity-northland.pdf

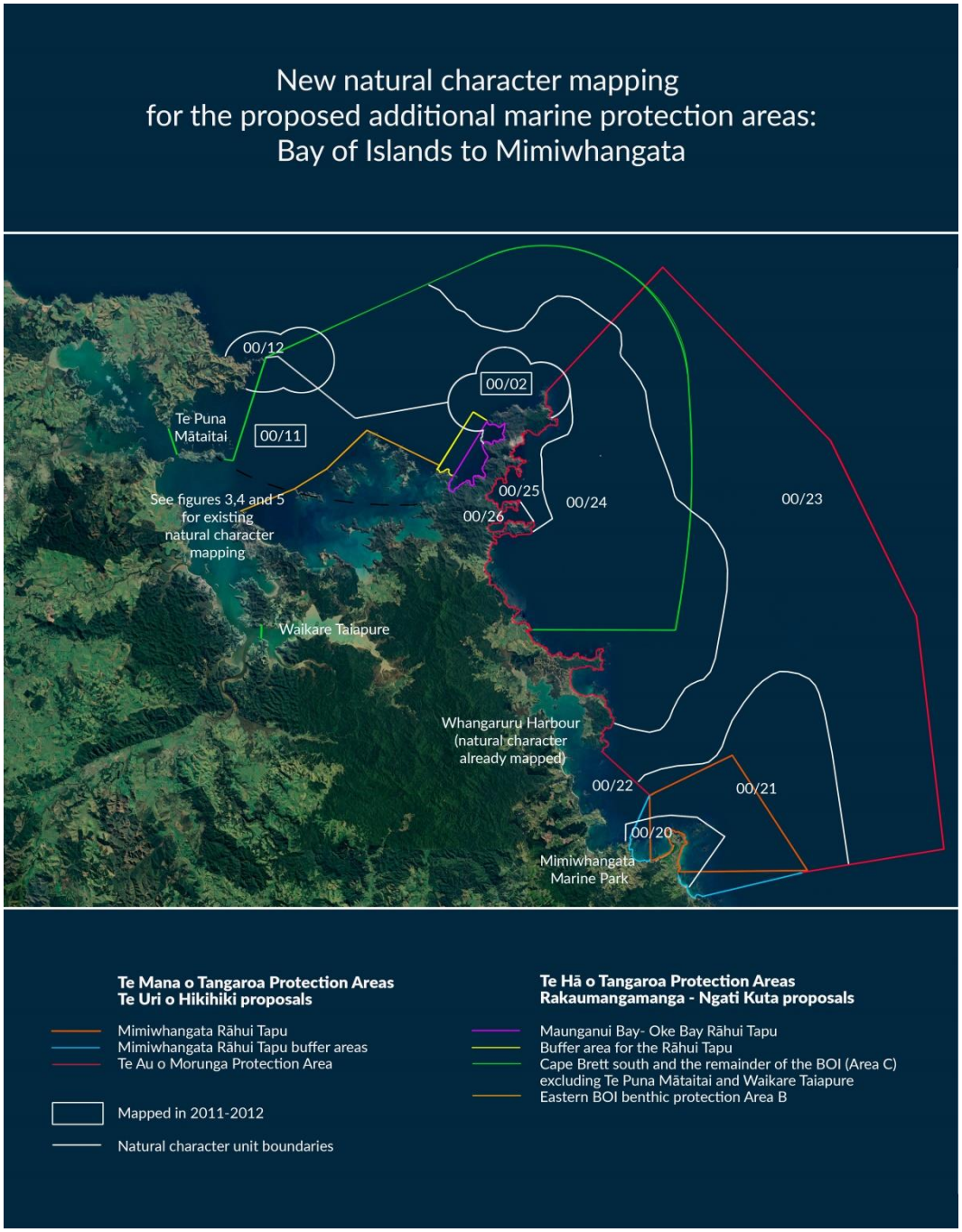

Figure 4 Numbered marine natural character units within the areas proposed for protection

Proposed Schedule

67. I have reviewed the draft Schedule of characteristics, qualities and values for the proposed Te Hā o Tangaroa Protection Area Rakaumangamanga-Ipipiri. I consider that it appropriately describes those characteristics, qualities and values from a natural character and ecology perspective.

New Zealand Coastal Policy Statement

68. Policy 13 of the New Zealand Coastal Policy Statement (NZCPS) requires that within the coastal environment areas of at least high natural character be mapped; adverse effects on outstanding natural character be avoided; and elsewhere significant adverse effects on natural character be avoided, remedied or mitigated.

69. NZCPS Policy 14 promotes the restoration and rehabilitation of the natural character of the coastal environment. This policy has not had the level of attention given to NZCPS Policy 13.

70. Removing pressures or processes that cause degradation of natural character is an important way to restore and rehabilitate marine environments. This includes pressures such as:

    a. accelerated sedimentation arising from catchment land use activities and management;

    b. increased nutrients and contaminants from catchment land use activities and discharges to waterways;

    c. commercial and recreational extraction/harvest of marine life;

    d. dredging, and trawling damage to the seabed; and

    e. dumping, reclamation and infilling, causeways and other structural barriers to natural marine processes.

71. Addressing pressures **a** and **b** above requires appropriate controls on discharges and land management as well as a comprehensive programme of catchment retirement of wetland seeps and eroding land, fencing and appropriate planting of riparian margins, and restoring flood plain functioning to trap sediment. This is especially important for restoring natural character in estuaries and many near-shore habitats. Regulation is needed to prevent exacerbation from pressure **e** while active programmes are needed to remove particularly problematic structures.

72. For much of the open coast, however, the most significant pressure adversely affecting natural character is primarily **c** and in some locations **d**.

The impacts of fishing on natural character attributes and values

73. Harvesting of marine fish and invertebrates, as occurs in the marine waters associated with the Bay of Islands and in the adjoining coast to areas south of Mimiwhangata, reduces ecological naturalness and therefore natural character. The systematic selective removal of particular species of marine biota reduces the naturalness of ecosystem structure, composition and processes. For all of this section of coast the steady removal of the main predators (large snapper and rock lobster) of the sea urchin kina (*Evechinus chloroticus*) has allowed kina

populations to increase[33]. This has resulted in the loss of considerable areas of kelp forest, particularly in the shallow subtidal zone (2-14m). These kelp forests have in many areas been typically been replaced by algal felts, turfs and coralline paints- collectively known as "urchin barrens". My 2016 assessment of 561 subtidal 5m x5m plots in the eastern outer Bay of Islands found considerable variation in the proportion of urchin barrens in this high-risk depth range, with the highest amount being found on the reefs around Tapeka Point (80%)[34]. In Oke Bay-Opourua Bay (north of Rawhiti) 54% of the quadrat area was urchin barrens.

74. A 2017 Kerr & Grace project[35] found that there were 5528ha of urchin barrens across 32, 515ha of mapped shallow rocky reef from Ahipara to Tawharanui. This represented 17% of the shallow reef which they defined as less than 30m in depth. In areas of high exposure urchin barrens covered 19.02% of the reef area (and 16.8% overall). For medium exposure sites urchin barrens covered 4.1% of those reef areas and 0.6% overall. Urchin barrens covered 33.8% of low exposure reefs and 0.16% overall.

75. In contrast the area of urchin barrens within two northern mainland no-take marine reserves was about 1% (Leigh 0.87%; Tawharanui 1.69%). The virtually complete recovery of kelp forests in these two no-take reserves is well documented and represents a 30 plus year observation period over which this recovery took place.[36]

76. Mimiwhangata Marine Park (part of the Mimiwhangata Rahui Tapu) has been partially protected since the late 1980s. Regulations under the Fisheries Act prohibit commercial fishing and restrict recreational fish to non-weighted line fishing. Long-term monitoring studies over several decades for reef fish[37] and rock lobster[38] show that there has been no recovery of the key predators of urchins since the Marine Park was established. Kerr & Grace[39] calculated the extent of urchin barrens as being 21.23% of the shallow reef area less than 30m in depth. This is more than the 17% figure estimated for the average of the

[33] There is currently a temporary section186A Fisheries Act closure in Maunganui Bay which has not been in place for long enough to reverse the effects of predator removal

[34] : Froude, V A 2016. Kelp cover and urchin barrens in the Bay of Islands: a 2016 baseline. A report prepared for the Bay of Islands Maritime Park Fish Forever Working Group. Russell, Pacific Eco-Logic Ltd. 71p. https://fishforever.org.nz/images/ff/documents/reports/Kelp_cover_and_urchin_barrens_in_the_Bay_of_Islands_FINAL_Dec_2016.pdf

[35] Kerr & Grace 2017 Estimated extent of urchin barrens on the east coast of Northland, New Zealand. A report prepared for the Motiti Rohe Moana Trust. Kerr & Associates, Whangarei. file:///C:/Users/Public/Documents/Reports%20by%20others/NZ%20env%20change%20marine/Kerr%20&%20Grace%202017%20Extent%20urchin%20barrens%20east%20Northland.pdf

[36] Leleu, K; Remy-Zephir, B; Grace, R; Costello, M. J; 2012. Mapping habitats in a marine reserve showed how a 30 year trophic cascade altered ecosystem structure. *Biological Conservation* 155: 193-201

[37] Denny, C. M; Babcock, R C. 2004. Do partial marine reserves protect reef fish assemblages? *Biological Conservation* 116: 1190129

[38] Shears, N; T; Grace, R.V; Usmar, N.R.; Kerr, V.C; Babcock, R.C. 2006. Long term trends in lobster populations in a partially protected vs. no-take Marine Park. *Biological Conservation* 132: 221-231

[39] Kerr & Grace 2017 As before

coast between Ahipara and Tawharanui where no special restrictions apply. It also contrasts significantly with the results from fully protected marine reserves at Leigh and Tawharanui where the algal forests have fully recovered[40] over much the same time period that Mimiwhangata was partly protected. Leleu et al.[41] compared the historic 1981 habitat map for the Leigh Marine Reserve [42] where there was 44ha of urchin barrens with the situation in 2006 where all but 4.5ha of the barrens had been restored to healthy *Ecklonia* forest. They also found that boundary areas outside the reserve continued to have large areas of urchin barrens.

77. In addition to the urchin barrens (resulting from ongoing fishing/ extraction of the main predators of sea urchins), commercial and recreational fishing in eastern Northland has resulted in a variety of changes in the abundance and size distribution of fish and some invertebrate populations. These changes have reduced ecological naturalness and therefore natural character. The nearest present-day approximation of present-potential state for fish abundance and size distribution is that which is found in long-term marine reserves of sufficient size to minimise the boundary fishing edge effect.

78. Snapper populations rebound when fishing pressure is removed. While small, the Leigh Marine Reserve has seen significant increases in snapper. The same has occurred at the Poor Knights once it became a fully protected marine reserve after 1998. In the four years following the establishment of the Poor Knights Marine Reserve there was an 818% increase in snapper biomass[43]. This was probably helped by commercial finfish extraction prohibitions and controls in areas around the reserve [44] and the long distance from the mainland deterring recreational fishers.

79. Provided there is good recruitment, rock lobsters also increase to more natural levels in the absence of harvest pressure. Where there is heavy harvest pressure on the margins of smaller reserves there is only partial recovery as the lobsters tend to seasonally migrate beyond the reserve boundaries, especially where there are reefs beyond the reserve boundaries.

80. Reef fish species targeted by some spear-fishers also recover in the absence of such fishing. Novice spear-fishers and those just wanting "a quick feed" can

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[40] E.g. Shears, N. T; Babcock R. 2002. As above

[17]Leleu, K; Remy-Zephir, B; Grace, R, Costello, M. J; 2012. Mapping habitats in a marine reserve showed how a 30 year trophic cascade altered ecosystem structure. *Biological Conservation* 155: 193-201.

[41] Leleu, K; Remy-Zephir, B; Grace, R, Costello, M. J; 2012. Mapping habitats in a marine reserve showed how a 30 year trophic cascade altered ecosystem structure. *Biological Conservation* 155: 193-201.

[42] Ayling, A.M., Cumming, A., Ballantine, W.J., 1981. Map of shore and subtidal habitats of the Cape Rodney to Okakari Point Marine Reserve, North Island, New Zealand in 3 sheets, scale 1:2,000. Department of Lands and Survey, Wellington.

[43] Denny, C Mangroves; Willis, T J; Babcock, R C. 2004. Rapid recolonisation of snapper *Pagrus auratus* Sparidae within an offshore island marine reserve after implementation of no-take status. *Marine Ecology Progress Series* 272; 183-190

[44] See Froude, V A 2004. Area-based restrictions in the marine environment. Department of Conservation MCU Report. 156p & appendices

target easy to spear fish such as red moki and butterfish. I have observed increases when this pressure is removed. A lack of netting also helps butterfish numbers to recover to more natural levels[45].

81. Fish behaviour also changes with harvesting pressure. The COVID 19 level 4 lockdown saw a return of more fish aggregations and the associated seabird action in the Hauraki Gulf. I personally observed a significant change[46] in fish behaviour when I returned to the sea (using shore access at Tapeka Point) immediately following the transition from COVID level 4 to COVID level 3. With the return of the spear-fishers, and then power-boats with fishers (with COVID level 2) this change quickly disappeared.

82. In addition to the direct removal of "fisheries resources", some fishing methods reduce naturalness by directly contacting and damaging the benthic cover and the seabed itself. Dredging for scallops damages soft bottom habitats and at its extreme removes and/or severely damages the natural ecosystem structure. At its worst it is like a plough destroying rhodolith beds, horse mussel beds, deeper subtidal seagrass patches and other soft bottom communities. This adversely affects natural composition and processes, and therefore ecological naturalness. It can also adversely affect geomorphological naturalness by re-contouring a soft-bottom seabed at the local scale. The declines in geomorphological and ecological naturalness adversely affect natural character. Scallop harvesting in channels associated with the islands of Ipipiri (eastern outer Bay of Islands) has reduced in recent years as scallop populations have declined (and especially since about 2014). So there has been less harvesting activity and less recent scallop dredge damage. Longer term dredge damage is represented by the very low abundance of natural horse mussel reefs as these are highly vulnerable to dredge damage and recovery is slow.

83. Trawling can also cause significant benthic ecosystem damage[47]. The risk is probably greatest where there are scattered low reefs, including biogenic reefs (e.g. green-lipped or horse mussels), in a predominantly soft sediment habitat.

84. Within the east- coast Northland CMA trawling primarily takes place on soft bottom habitats. Fisheries New Zealand commercial trawl fishing intensity maps[48] show that between October 2007 and September 2018 there was relatively low level of trawling activity in the area of interest. This is probably because of the extensive reef coverage along the open coast in the area of interest. Reefs can snag and damage nets and so tend to be avoided.

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[45] Increases in red moki following the establishment of the Leigh Marine Reserve were noted in the early years by Dr Bill Ballantyne from the Leigh Marine Laboratory. I have observed increases in butterfish in the no-take rahui in Maunganui Bay.

[46] This change included more visible, calm and non-flighty snapper

[47] Langley, A D 2019 Characterisation of the New Zealand skipjack tuna fishery. New Zealand Fisheries Assessment Report 2019/34

[48] Information obtained under the Official Information Act 1982

85. Areas already closed to all trawl fishing include all of the Bay of Islands from Cape Brett to Whale Rock to Cape Wiwiki. There are additional 1NM exclusions around Cape Brett, Bird Rock, The Twins, Ninepin and Cape Wiwiki. There is low intensity trawling affecting the area north of Cape Brett and the Bay of Islands.

86. Set nets can catch a large amount of bycatch. This includes non-target fish species including sharks and rays, as well as seals and dolphins. Depending on how frequently the net is checked, there can be large amounts of fish that have deteriorated and so are no longer suitable for human consumption. In exposed locations, set nets can become detached in storms/ during high seas and can continue to drift catching fish and other creatures for many months or even years. So netting can reduce ecological naturalness and therefore natural character. MPI/ Fisheries New Zealand data aggregates commercial set-net use and so it is hard to get an accurate assessment of activity in the area of interest. Recreational/amateur set-netting effort data is not collected.

87. Skip-jack tuna purse-seining occurs to the east of Cape Brett[49]. This has the effect of harvesting large amounts of fish at a time and can include non-targeted species. This has a negative effect on natural character. Rebecca Stirnemann's evidence examines the protected species bycatch data for the purse seine fishery for the area between Cape Brett and Mimiwhangata from 2009-2019. The bycatch includes 21 spine tailed devil rays[50] and 1 manta ray. The rays are primarily tropical and warm temperate sea species. Tropical visitors are part of what gives the Cape Brett area its special natural character and ecological distinctiveness. Three seabirds and 8 black corals are other protected species caught in this fishery. The quantities and species of non-protected fish and invertebrates that are harvested/ discarded are unknown.

Restoration of natural character through addressing the adverse effects of fishing

88. The most effective approach for reducing the impact of fishing on the natural character of marine ecosystems is for there to be no fishing. Over time, areas protected from fishing return to a more natural state. This includes the return of more and larger individuals of typically harvested fish and invertebrate species. As urchin predator numbers and size increase sufficiently, kelp forest should expand onto areas that in the recent past had been urchin barrens. This again is returning to a more natural state. Overall fish and invertebrate populations will continue to return to a more natural abundance, size

[49] Skipjack tuna purse seine fishery. FAR 2019-34

[50] While many spine-tailed devil rays taken in the skipjack tuna purse seine fishery are released alive, their survival is unknown. Spine-tailed devil rays and manta rays are protected species in New Zealand under the Wildlife Act. The IUCN Red List classifies manta rays as endangered and spine-tailed devil rays as near-threatened globally and vulnerable in SE Asia. https://www.doc.govt.nz/nature/native-animals/marine-fish-and-reptiles/sharks-mango/spine-tailed-devil-ray/ ; https://www.doc.govt.nz/nature/native-animals/marine-fish-and-reptiles/sharks-mango/giant-manta-ray/

distribution and behaviour. The proposed rahui tapu areas (where there is to be no fishing) should, over time, become increasing natural, thereby implementing NZCPS Policy 14. The use of buffer areas where fishing methods are more tightly prescribed could help to reduce the well-known boundary or edge effect. This is where heavy fishing on the boundary reduces the benefits of the reserve, especially in areas closer to the boundary[51]. An alternative would be to include the buffer within the no-take area which would provide an even greater protection from the fishing edge effect observed in no-take areas. Where the no-take area is large the edge effect is prevalent for only a small proportion of the no-take area. Where the no-take area is smaller the fishing edge effect affects a much greater proportion of the no-take area, especially if there is intense fishing pressure along the margins.

89. For other areas, prohibiting fishing methods that damage benthic ecosystems should help those ecosystems to recover and so become increasingly natural over time. The time frame for this improvement can be lengthy, depending on the extent of damage. In the Bay of Islands dredging for scallops has been infrequent in recent years and so a prohibition on this activity would help protect existing gains and allow more recovery over time.

90. For the open coast between the Bay of Islands and just south of Mimiwhangata, prohibitions on bottom trawling should help to restore the natural character of the benthic habitats in those areas where trawling occurs (primarily north of the Bay of Islands and Cape Brett) There are quite considerable areas of reef in this area and these areas do not seem to receive much trawling pressure compared to, for example, the west coast of Northland where soft sediment areas are widespread and reefs are few.

91. Two of the features of the Cape Brett area are the schools of pelagic and demersal fish and the presence of tropical vagrants such as vulnerable turtles. There seems to be an intensive purse seine skipjack tuna (and to a lesser extent mackerel) fishery to the east of Cape Brett Peninsula. It is possible that the prohibition of purse seining in the area of interest would help to restore more natural levels of schooling fish for a variety of species and improve the survival chances for some tropical visitors.

PART TWO: URCHIN BARRENS AND KELP COVER LOCAL SURVEY RESULTS

92. Additional field assessment work relating to the local extent of urchin barrens and kelp cover was not able to be completed prior to the closing date for submitting this evidence. The results of this work will be included in supplementary evidence and will help elaborate the attributes and values of the inshore reefs in the area of interest.

[51] Willis TJ, Millar RB, Babcock RC (2000) Detection of spatial variability in relative density of fishes: comparison of visual census, angling, and baited underwater video. Marine Ecology Progress Series 198: 249-260

PART THREE: ECOLOGICAL SIGNIFICANCE ASSESSMENTS

93. Assessments of ecological significance in Northland's coastal environment derive from s 6(c) RMA, Policy 11 of the New Zealand Coastal Policy Statement and Northland Regional Policy Statement Policy 4.4.1 and Appendix V.

94. Appendix V in the operative RPS contains a set of criteria for evaluating "Areas of significant indigenous vegetation and significant habitats of indigenous fauna in terrestrial, freshwater and marine environments. An area is ecologically significant if it meets one or more of the following criteria:

    a. representativeness,

    b. rarity/ distinctiveness,

    c. diversity and pattern and

    d. ecological context.

95. While these criteria work best in terrestrial and freshwater environments, Vince Kerr made some minor modifications to enable their effective use in the marine environment of Northland[52]. These changes were to substitute the term "flora" for vegetation and to omit all of criterion 2(a) except for the size guideline for saltmarsh. The modified criteria, annotated to discuss their application in the Northland marine environment, are the primary component in this report.

96. The Kerr 2016[53] methodology report describes the process that was used for mapping significant marine ecological areas in Northland for the Northland Regional Plan. It identifies that describes the process that was used to map estuaries and estuarine areas, reef habitat down to 100m, and reef edge habitats (300-1000m soft sediment transition areas to rocky reefs including areas below 100m) The earlier 2015 report states: *"We are only at the beginning of understanding the full ecological significance of the wide diversity of marine communities and ecosystems that are found in Northland. As a result this mapping process should be viewed as a starting point of our understanding and appreciation of marine ecosystems, rather than a final view."*[54]

Ecological attributes and values summary for Maunganui Bay and surrounding marine environments

97. Areas of coast to the north and south of Maunganui Bay, plus Maunganui Bay itself, are part of a much larger highly ranked marine "significant ecological area" or SEA entitled "Eastern Bay of Islands and Cape Brett Coast"[55]. This

[52] Kerr V 2015. The identification and mapping of significant ecological marine areas in Northland- project brief and guide to assessment. 24p.
[53] Kerr, V 2016 Methodology report: mapping of significant ecological areas in Northland. https://www.nrc.govt.nz/media/xouckneq/methodologyreportmappingofsignificantecologicalareasnorthland.pdf
[54] Kerr V 2015. The identification and mapping of significant ecological marine areas in Northland- project brief and guide to assessment. (p5)
[55] This area is included in the proposed Regional Plan for Northland.

larger area includes an extensive and complex shallow reef system connected to a deep offshore reef system to the east of Cape Brett. It also includes islands as far west as Motuarohia) and various soft bottom habitats. The site assessment sheet states that this ecological area is "exceptionally diverse and has some of the best examples of coastal rocky reef communities in Northland"[56]. There is a great diversity in the algal (kelp) communities of the shallow reef habitats, reflecting the diversity of the substrate and exposure.

98. Reef fish diversity of Cape Brett is the second highest in Northland, with 93 species recorded in 2002[57]. This is exceeded only by the unique offshore Poor Knights Islands with 98 species. Reef fish diversity in the wider Bay of Islands (excluding the Cape Brett area) is recorded at 63 species. The waters around Cape Brett have the second highest percentage of subtropical and tropical species at 34% (behind only the Poor Knights Islands). The percentage of tropical and subtropical reef fish in the wider Bay of Islands is 14.3%.

99. Tropical green turtles are regularly found during the summer months around the Cape Brett-Maunganui Bay area, while New Zealand fur seals (a cooler water species) are also found. A variety of dolphin and whale species also use this area. The most regularly observed cetaceans within the Bay of Islands are orca, bottlenose dolphins, common dolphins and Bryde's whales[58]. Other species occasional reported are: humpback whales, pilot whales and false killer whales. Subtropical invertebrates include banded coral shrimp and Spanish lobster.

Ecological attributes and values summary for the Mimiwhangata Rahui Tapu

100. The reef systems of Mimiwhangata and the adjoining reef edges and soft bottom habitat are a high ranking significant ecological area[59] titled "Mimiwhangata Coast". There are large areas of shallow reef connected to a large deep reef system extending offshore more than 13km in places. The complex reef, islands and coastline create an ecological sequence that includes shellfish beds, sea grass meadows, shallow and deep water kelp forests, and deep reefs dominated by a diverse filter-feeding encrusting invertebrate community. There is a great diversity of algal communities reflecting the variety of conditions.

101. The extensive and complex reef systems also provide valuable habitat for snapper (*Pagrus auratus*), koura (crayfish *Jasus edwardsii*) and paua (*Haliotis iris*),

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[56] Significant Ecological Marine Area Assessment Sheet- Eastern Bay of Islands and Cape Brett Coast https://www.nrc.govt.nz/media/9434/easternboiandcapebrettcoastsignificantecologicalmarineareaassessmentsheet.pdf

[57] Brook, F J 2002. Biogeography of near-shore reef fishes in northern New Zealand. *Journal of Royal Society* 32: 243-274

[58] Baker, A N 2005 Sensitivity of marine mammals found in Northland waters to aquaculture activities. Report to Department of Conservation, Northland Conservancy. 18p.

[59] https://www.nrc.govt.nz/media/9440/mimiwhangatasignificantecologicalmarineareaassessmentsheet.pdf

which were once abundant in the area. Part of the proposed Rahui Tapu is currently a Marine Park with no commercial fishing and some restrictions on recreational fishing.

Ecological attributes and values for the combined Area C (Ipipiri-Rakaumangamanga Protection Area) and Te Au o Morunga Protection Area

102. This section addresses the coastal reefs and reef-edge habitats offshore from Mimiwhangata, Bland Bay, Cape Brett- Brett Peninsula, Ipipiri Islands and Wiwiki coasts. It excludes the lower significance inshore soft sediments within Whangaruru Bay, Te Puna Inlet, Kerikeri Inlet, Veronica Channel and the Kawakawa basin. The higher ecological value mangrove and saltmarsh dominated habitats associated with these inner Bay of Islands inlets are addressed as part of the ecological significance assessments below.

103. The extent of the rocky reef is depicted in the habitat mapping undertaken for DOC by Vince Kerr in 2009[60]. The ecological attributes and values of the reef habitats have been described in detail by Kerr and Grace in 2015 (Brett Peninsula-Ipipiri)[61] and Kerr and Grace in 2005 (Mimiwhangata)[62] and were summarised in the SEA worksheets for the Mimiwhangata Coast, Bland Bay Coast, Eastern Bay of Islands and Cape Brett Coast and Takou Bay Coast (to Cape Wiwiki).

104. The SEA worksheets[63] show that there is a high diversity in the shallow algal communities of the rocky reefs. This ranges from semi sheltered shores with mixed red algae and *Carpophyllum* sp. In the shallow mixed algae zones with *Ecklonia radiata* forests below; to exposed shores where wave energy is high and the associated exposed algal communities including *Carpophyllum maschalocarpum* and *Lessonia variegata* make up the shallow mixed algae zone with *Ecklonia radiata* forest below and extending down to 30m.

105. For Eastern Bay of Islands-Cape Brett Coast marine SEA at distances of 100 to 500m off shore the reefs drop to depths beyond 30 m. Further south at Mimiwhangata the distance offshore to these deeper reefs is 1500-1700m. For the deeper reefs light is insufficient for algal forests and so:[64]

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[60] Kerr, V 2009 Marine habitat map of Northland: Mangawhai to Ahipara. Northland Conservancy, Department of Conservation, Whangarei. 33p.

[61] Kerr, V C; Grace, R V 2015. Marine habitats of the proposed Waewaetorea Marine Reserve. A report prepared for Fish Forever, BOIMP Inc

[62] Kerr, V; Grace R 2005. Intertidal and subtidal habitats of Mimiwhangata Marine Park and the adjacent shelf. Department of Conservation Research and Development Series 201. Department of Conservation, Wellington. 55p.

[63] E.g. SEA worksheets for Eastern Bay of Islands and Cape Brett coast, and Mimiwhangata coast https://www.nrc.govt.nz/media/vwpcw5i0/mimiwhangatasignificantecologicalmarineareaassessmentsheet.pdf ; https://www.nrc.govt.nz/media/rutcglle/easternboiandcapebrettcoastsignificantecologicalmarineareaassessmentsheet.pdf

[64] See previous footnote

"*reef communities become dominated by diverse filter-feeding encrusting invertebrate communities. Sponges play a key role in these communities. This invertebrate community provides protection and food sources for a complex community of marine species and trophic food webs culminating in the top order predators which frequent these biodiversity hotspots and at times become resident*".

106. The SEA worksheets report that:[65]

"*A special aspect of these reef systems is that they have extensive areas of soft bottom habitats surrounding them to the north and south. Recent ecological studies of rock lobster Jasus edwardsii demonstrate that important ecological connections exist between deep reef habitats, patch reefs, shallow reefs and surrounding soft sediment areas. In these studies, crayfish were found to regularly migrate up to several kilometres out onto sand and gravel areas from their reef habitats to feed on bivalves and other benthic organisms.*"

107. Reef fish diversity around Cape Brett is the second highest in Northland, with 93 species recorded in 2002[66]. This is exceeded only by the unique offshore Poor Knights Islands with 98 species. The waters around Cape Brett have the second highest percentage of subtropical and tropical species at 34% (behind only the Poor Knights Islands).

108. There are 35 species of marine mammals recorded with 12 NM of the Northland coast[67]. Some are resident or semi-resident and breed along the Northland coast. Others are transients. Three threatened species are amongst the species most often encountered in inshore waters: Bryde's whales *Balaenoptera edni*, bottlenose dolphins *Tursiops truncatus*, and Orca *Orcinus orca*[68]. The common dolphin *Delphinus delphis*, which is not threatened, is also commonly seen in the Eastern Bay of Islands with the dolphins having resident population[69]. There has been considerable research about the bottlenose dolphin population of the Bay of Islands which has decreased significantly since 1998. This has led to the current proposal to establish a marine mammal sanctuary[70]. Less common, but occasionally encountered in the Eastern Bay of Islands are

[65] See previous footnote
[66] Brook, F J 2002. Biogeography of near-shore reef fishes in northern New Zealand. *Journal of Royal Society* 32: 243-274
[67] Baker, A. N., 2005. Sensitivity of marine mammals found in northland waters to aquaculture activities. Report to the Department of Conservation, Northland Conservancy. A. N. Baker Cetacean Biology Consultant, Kerikeri.
[68] SEA marine assessment sheet: Northland coastal management area – general values for highly mobile and dispersed species https://www.nrc.govt.nz/media/i3glg3vc/northlandcoastalmanagementareageneralmarinevaluesforhighlymobileanddispersedspeciesmarinemammals.pdf
[69] SEA marine assessment sheet for Eastern Bay of Islands and Cape Brett Coast https://www.nrc.govt.nz/media/rutcglle/easternboiandcapebrettcoastsignificantecologicalmarineareaassessmentsheet.pdf
[70] Department of Conservation 2021 Consultation opens on proposed Bay of Islands' marine mammal sanctuary. https://www.doc.govt.nz/news/media-releases/2021-media-releases/consultation-opens-on-proposed-bay-of-islands-marine-mammal-sanctuary/

pilot whales *Globicephala spp*., false killer whales *Pseudorca crassidens*, and some of the large baleen whales[71]. New Zealand fur seals are present in small numbers in the Eastern Bay of Islands and Cape Brett area, and the Mimiwhangata area as transient visitors[72].

109. The ecological values and attributes relating to seabirds are addressed in the evidence of Rebecca Stirnemann.

Ecological significance of the Proposed Rahui Tapu and their buffers

110. Both of the Rahui Tapu areas sought (Mimiwhangata and Maunganui Bay- Oke Bay) lie within SEAs shown on online PRPN mediation changes map[73]. My assessment of the ecological significance of each of these areas supports the wider SEA decision. In addition, I have assessed the ecological significance of the proposed Rahui Tapu and their buffers independently of the wider SEAs in which they reside.

111. Table 1 summarises how proposed Maunganui Bay- Oke Bay Rahui Tapu and its buffers meet the RPS Appendix 5 criteria as modified by Kerr 2015. Table 2 summarises how proposed Mimiwhangata Rahui Tapu and its buffers meet the RPS Appendix 5 criteria as modified by Kerr 2015.

Table 1: Ecological significance criteria summary for the proposed Maunganui Bay-Oke Bay Rahui Tapu and its buffers

Significance Criterion	How addressed
1 Representativeness	1-a The proposed Maunganui Bay-Oke Bay Rahui Tapu and its buffers are a good representative example of largely indigenous flora and benthic fauna that is representative of the area's natural diversity. It includes most of the faunal assemblages in most of the guilds expected for the various habitat types. This has been enhanced by more than ten years of no-take status for Maunganui Bay.
2. Rarity/ distinctiveness	2-c-ii The proposed Rahui Tapu contains at different times a variety of tropical and subtropical species that are at their southern distributional limits including green turtles, Indo-Pacific sergeant, striated frogfish, banded coral shrimp, gold- ribbon groper[74], oblong sunfish

[71] SEA marine assessment sheet for Eastern Bay of Islands and Cape Brett Coast https://www.nrc.govt.nz/media/rutcglle/easternboiandcapebrettcoastsignificantecologicalmarineareaassessmentsheet.pdf

[72] SEA marine assessment sheet for Eastern Bay of Islands and Cape Brett Coast and Mimiwhangata Coast https://www.nrc.govt.nz/media/rutcglle/easternboiandcapebrettcoastsignificantecologicalmarineareaassessmentsheet.pdf https://www.nrc.govt.nz/media/vwpcw5i0/mimiwhangatasignificantecologicalmarineareaassessmentsheet.pdf ;

[73] https://nrcgis.maps.arcgis.com/apps/webappviewer/index.html?id=21b4117f24eb4e0395f7f8fd6afd9392

[74] Mainly found in the waters around the Kermadec Islands

	2-d-iii There is naturally rare ecosystems including a high quality arch with diverse encrusting fauna[75]. In addition the frigate Canterbury (sunk in 2007) is now covered in a variety of encrusting organisms and habitat to a variety of fish species
3.Diversity and pattern	3-a-i The proposed Rahui Tapu with its arches[76], caves, islands, mainland coast, many new habitats created with the November 2007 sinking of the frigate Canterbury, and deeper subtidal habitats, has a high diversity of indigenous ecosystems and habitat types 3-b There are a variety of taxon assemblages reflecting the existence of diverse natural features and ecological gradients 3-c There is intact ecological sequences along the entire mainland shoreline. This sequence includes: continuous native forest from the ridge crest to the rocky supratidal herbfield, flax and shrubland to shallow rocky reef or gravel or sand shallow subtidal, to deep reef or deep soft sediment.
4. Ecological context	4-a Feeding area for seabirds that nest and roost on Bird Rock and the Twins

Table 2: Ecological significance criteria summary for the proposed Mimiwhangata Rahui Tapu and its buffers

Significance Criterion	How addressed
1 Representativeness	1-a The proposed Mimiwhangata Rahui Tapu and its buffers are a good representative example of diverse East Coast Northland marine open coast shore to deeper water indigenous vegetation and habitats for indigenous fauna. There is a high diversity of habitats and species[77] resulting from a complex shoreline and variations in exposure resulting from the positions of the islands and the peninsula; relative proximity to the East Auckland current, and a good depth range. There are extensive areas of deep reefs (30-100m depth range) inside and especially beyond the proposed Rahui Tapu. These deeper reefs include areas of high relief around the 50m depth mark 1-b The proposed Rahui Tapu is a good example of a combination of different marine "landforms" and indigenous flora and fauna
2. Rarity/ distinctiveness	2-d-I and iv Sea grass meadows are present[78]. This is an important habitat that is of restricted occurrence; and is a regionally rare biogenic habitat

[75] Froude, V A 2016 Rare and special marine and estuarine sites of the Bay of Islands, New Zealand. https://www.fishforever.org.nz/images/ff/documents/reports/Rare-special-marine-sites-BOI-with-photoappend-24-December-2016-No-EN.pdf

[76] Froude, V A 2016 Rare and special marine and estuarine sites of the Bay of Islands, New Zealand. https://www.fishforever.org.nz/images/ff/documents/reports/Rare-special-marine-sites-BOI-with-photoappend-24-December-2016-No-EN.pdf

[77] See Kerr 2015

[78] Significant Ecological Marine Area Assessment Sheet: Mimiwhangata Coast

3.Diversity and pattern	3-a The proposed Mimiwhangata Rahui Tapu contains a high diversity of habitats resulting from a complex shoreline and variations in exposure resulting from the positions of the islands and the peninsula; relative proximity to the East Auckland current, and a good depth range. There are extensive areas of deep reefs (30-100m depth range) inside and especially beyond the proposed Rahui Tapu. These deeper reefs include areas of high relief around the 50m depth mark
4. Ecological context	4-c The site's seagrass meadows habitat is important nursery for certain fish species, especially snapper

112. Both Rahui Tapu and their buffers are ecologically significant using the criteria in Appendix 5 of the RPS (and as fine-tuned for the marine environment by Kerr 2015).

Ecological significance of Area B (Ipipiri Benthic Protection Area)

113. Figures 1 and 2 show the boundaries of the proposed benthic protection area termed Area B. In summary it extends from Tapeka to Whale Rock to the south- west edge of the Maunganui –Oke Bays Rahui Tapu buffer. Not all of this area falls within the Eastern Bay of Islands and Cape Brett Coast SEA. It also includes the eastern Bay of Islands biogenic habitats marine SEA and the Parekura Bay, Bay of Islands marine SEA. Much of the mainland coast has been excluded from the listed SEAs. The main exceptions to this exclusion are the inner Parekura Bay estuaries (Tangatapu and Wairoa River Estuaries) which form the Parekura Bay SEA and an area of biogenic reefs (rhodolith beds) between Orokawa Bay Peninsula and Paroa Bay Peninsula (eastern Bay of Islands biogenic habitats marine SEA).

114. Much of the area excluded from the SEAs (covering Area B) is part of the Rawhiti Basin below 10m where much of the sediment from the Kawakawa River is finally deposited[79]. Some of the bays with intertidal and subtidal seagrass close to Rawhiti (Kaingahoa and Hauai Bays) have been excluded from any SEA. The intertidal mangroves and saltmarshes in the sheltered areas of Paroa Bay are also excluded. The seagrass meadows in Kaingahoa and Hauai Bays meet at least ecological significance criteria 2 and 4 of Appendix V and so are ecologically significant.

115. Area B contains about 15% of the Eastern Bay of Islands and Cape Brett Significant Ecological Marine Area in the PRPN. The part of this SEA that is in Area B is dominated by biogenic habitats with some shallow reef and reef edge habitat.

116. Table 3 below assesses the ecological significance of Area B in terms of the Appendix 5 criteria.

[79] MacDiarrmid et al 2009 OS2020 BOI Coastal Project Phase 1- Desktop Study. NIWA Client Report WLG2009-3, p63

Table 3: Ecological significance criteria summary for the proposed Area B that is within the Eastern Bay of Islands and Cape Brett Coast SEA, the Parekura marine SEA, the Eastern Bay of Islands biogenic habitats SEA, plus identified additional biogenic habitats[80]

Significance Criterion	How addressed
1 Representativeness	1-a Consists of largely indigenous benthic flora and fauna; and faunal assemblages of most of guilds expected as represented by faunal assemblages
2. Rarity/ distinctiveness	2-d-i Contains extensive biogenic habitats including rhodolith beds which are of restricted occurrence[81]
3.Diversity and pattern	3-c Intact ecological sequences are present- e.g. Parekura Bay indigenous forest to freshwater wetland and/or saltmarsh to mangroves to subtidal flats. Much of the islands have an indigenous vegetation cover. This forms part of a sequence to a variety of soft and hard shore marine habitats.
4. Ecological context	4-c Some habitats- especially seagrass meadows are important nursery habitat for various juvenile fish species including snapper

117. Table 3 shows that much of Area B (excluding the Rawhiti Basin and non-biogenic habitats close to the mainland) is ecologically significant. The extent of SEAs applying to Area B should, however, be expanded to at a minimum include the Rawhiti subtidal and intertidal seagrass meadows. These seagrass meadows meet criteria 2 and 4 in the Appendix V of the RPS and so are ecologically significant. As the extent of seagrass can vary over time in response to a range of factors[82] the mapped boundaries should include a soft sediment buffer extending beyond the current boundaries.

Ecological significance of Area C (Ipipiri-Rakaumangamanga Protection Area) and Te Au o Morunga Protection Area (proposed by Te Uri o Hikihiki)

118. The area termed Area C and the area termed Te Au o Morunga by Te Uri o Hikihiki have a considerable overlap affecting the area east of the Rakaumangamanga (Brett) Peninsula. Accordingly, I have combined them for the purpose of this assessment of ecological significance.

119. The two areas collectively include virtually all of the following mapped marine SEAs in the PRP for Northland:

e. Eastern Bay of Islands –Cape Brett Coast;

f. Bland Bay Coast

[80] These additional areas include: intertidal and subtidal seagrass close to Rawhiti (Kaingahoa and Hauai Bays); and
intertidal mangroves and saltmarshes in the sheltered areas of Paroa Bay

[81] Anderson T et al 2019. Review of New Zealand's key biogenic habitats. Prepared for the Ministry for the Environment. NIWA Client report 2018139WN

[82] Booth J

g. Mimiwhangata Coast.

120. Only part of the mapped marine SEA Takou to Ninepin Reef falls within Area C

121. All these mapped SEAs are each ecologically significant using the criteria in Appendix V of the operative Northland RPS. Collectively they definitely meet the criteria for ecological significance. A high proportion of the two areas (Area C and Te Au o Morunga) are included within these four SEAs.

122. The main locations within the combined area which are not part of already mapped SEAs are:

h. Inner Bay of Islands (apart from some primarily saltmarsh and mangrove habitats in the Waitangi, Te Haumi and Waikino Estuaries that have been identified as marine SEAs);

i. an area with few reefs heading east from an area immediately south of the entrance to Whangaruru Harbour;

j. an area with few reefs heading east from the open coast in the vicinity of Elliot's and Te Pahi Beaches (south of Whangamumu harbour); and

k. open coast beyond the outer reefs and their associated reef edge habitats.

123. The last area does not seem to have been assessed by Kerr as part of the process to delineate marine areas of ecological significance. However, the evidence of Rebecca Stirnemann does include a comprehensive assessment of the ecological significance of this area.

124. There are additional mangrove, saltmarsh and associated intertidal flats elsewhere in the inner Bay of Islands that would meet the criteria for ecological significance. Such areas include:

l. Various locations in the Waikare Inlet. As these are located within the Waikare Taiapure they will not be discussed further as they are not part of the area under consideration;

m. Karetu wetlands. The summary natural character description for this ONC (09/27) area is ´ "*Outstanding area of mangroves and saltmarsh with small brackish areas (e.g. oioi, raupo & marsh ribbonwood) and then limited areas of freshwater wetland (raupo, flax, mixed native shrubs (manuka, mapou), cabbage trees, Baumea sp) in some upper reaches. The saltmarsh areas are particularly extensive and there are a variety of ecological transitions. Abundant fernbirds. The unit includes a road causeway and the intact saltmarsh on the western side of this road. Damaged saltmarsh & freshwater wetland are excluded from this unit. Contributing Values Large area of indigenous vegetation without pest plants, close to present potential cover for site conditions. Part of a continuum of marine to terrestrial ecosystems. Few obvious human structures except well bridged causeway*" This wetland complex meet Appendix 5

ecological significance criteria 1b (representativeness), 2a(rarity/ distinctiveness), and 4b & c (ecological context)

n. Whangae River wetlands. The summary description for ONC Unit 09/45 is "*Whangae River Estuary. Tall mangrove forest grading to saltmarsh up river. Railway causeway & bridge across Whangae River entrance is not included. Causeway has been in place for nearly 150 years. Excludes small estuary arms cut off by road (SH10); Contributing Values Indigenous vegetation without pest plants, close to present potential cover for site conditions. Part of a continuum of marine to terrestrial ecosystems."* This wetland complex meets at least Appendix V criteria 2a and 4b and c.

PART 4: EXISTING FISHING CONTROLS

125. In 2003-04 I was contracted by the then Ministry of Fisheries and the Department of Conservation to prepare an analysis of all area-based restrictive provisions providing some potential protection to indigenous species, habitats and ecosystems in the New Zealand EEZ. For this I reviewed fisheries regulations and associated legislative instruments, areas managed under legislation administered by the Department of Conservation (Wildlife Act, Reserves Act, and the Conservation Act) and areas that were restricted under the Submarine Cables and Pipelines Act. Products included a public report published by the Department of Conservation – "[83]Area-based restrictions in the New Zealand marine environment" and a data layer for the online NABIS database administered by the Ministry of Fisheries.

126. **Appendix 2** contains extracts from the area-based 2004 report and contains the maps and the associated provision tables applying to the areas being proposed for further protections. In the area proposed for further protections there have been few significant changes to the provisions since 2004. The main changes are the addition of the Te Puna Mataitai and the Maunganui Bay temporary s186A Fisheries Act closure. Since the gazettal of the Te Puna Mataitai, bylaws have been instituted prohibiting the harvest of three species of mussel.

127. The 2020 Temporary Closure Notice for Maunganui Bay[84] states that:

> 4. Maunganui Bay is closed in respect of any species of fish, aquatic life or seaweed (except kina).
>
> (1) A person must not take any species of fish, aquatic life or seaweed (except kina) from Maunganui Bay while this notice is in force
>
> (2) In this clause: kina :
>
> a. means a shellfish of the species *Evechinus chloroticus* (also known as sea egg); and
>
> b. includes the shellfish of the species *Centrostephanus rodgersii* (also known as purple urchin).

[83] Froude, V A ; Smith, R 2004. Area-based restrictions in the New Zealand marine environment. Department of Conservation MCU report. 155p + appendices

[84] Fisheries (Maunganui Bay Temporary Closure) Notice 2020 (MPI 1245)

128. Total allowable catch figures for individual fish stocks and Quota Management Areas (QMA) are not part of the Fisheries regulations reported in Table 4. In the context of fisheries restrictions, Table 4 provisions address typically longer-term, location-specific rules about methods and some species-specific restrictions. The Total Allowable Catch (TAC), Total Allowable Commercial Catch (TACC), and the allowance for recreational and customary takes for different fishery stocks are typically set via a stock assessment process.

129. Te Puna Mataitai is specifically excluded from the area proposed as Area C by Ngāti Kuta and so is not included in Table 4. The same applies to the Waikare Taiapure.

130. Table 4 summarises the main restrictive provisions for each of the areas where additional protections are sought. This does not include a variety of detailed controls relating to permit requirements, mesh sizes etc. This extra detail is included in **Appendix 2** (excluding the most recent provisions referred to above).

Table 4: Summary of the area-based restrictions affecting the areas covered by the appeals

Location	Summary of provisions currently in place[85]
Maunganui Bay- Oke Bay Rahui Tapu & buffers	• Temporary closure to fishing except kina in Maunganui Bay only • No commercial fisher shall use any trawl or Danish seine net • No commercial fisher shall take any scallops • No commercial fisher shall use any set net (NW corner only) • No person shall use any set net (amateur) (NW corner only) • No commercial fisher shall take green-lipped mussels or their spat, banded wrasse, cockles, pipi, black angelfish, butterfly perch, giant boarfish, green wrasse, kelpfish, long-finned boarfish, marble fish, painted moki, red moki, red mullet, red pigfish, rock cod, Sandager's wrasse, scarlet wrasse, silver drummer, splendid perch or toadstool grouper, spotted black grouper, shortbill spearfish or sailfish
Area B Ipipiri	• No commercial fisher shall use any trawl or Danish seine net • No commercial fisher shall take any scallops • No commercial fisher shall take fish 1 October-30 April. Rock lobster can be taken by potting under permit

[85] Refer to Appendix for further detail noting that the Maunganui Bay s186A temporary closure and the Te Puna Mataitai are not included in the maps and tables

Location	Summary of provisions currently in place[85]
	• No commercial fisher shall use for taking fish: a box or teichi net, purse seine, Dutch seine, trawl net, lampara net, or set nets >1000m in length • No commercial fisher shall take green-lipped mussels or their spat, cockles, pipi, banded wrasse, black angelfish, butterfly perch, giant boarfish, green wrasse, kelpfish, long-finned boarfish, marble fish, painted moki, red moki, red mullet, red pigfish, rock cod, Sandager's wrasse, scarlet wrasse, silver drummer, splendid perch or toadstool grouper, spotted black grouper, shortbill spearfish or sailfish • No person shall use or possess a set net between 1 October to 30 April except when targeting flatfish or mullet (amateur)
Area C Inner Bay of Islands (south of Tapeka Point)	• No commercial fisher shall use any trawl or Danish seine net • No commercial fisher shall take any scallops • No commercial fisher shall use for taking fish: a box or teichi net, purse seine, Dutch seine, trawl net, lampara net, or set nets >1000m in length • No commercial fisher shall take green-lipped mussels or their spat, cockles, pipi, banded wrasse, black angelfish, butterfly perch, giant boarfish, green wrasse, kelpfish, long-finned boarfish, marble fish, painted moki, red moki, red mullet, red pigfish, rock cod, Sandager's wrasse, scarlet wrasse, silver drummer, splendid perch or toadstool grouper, spotted black grouper, shortbill spearfish or sailfish

Area C outer BOI	• No commercial fisher shall use any trawl or Danish seine net (south of a line Wiwiki-Whale Rock-Cape Brett)
	• No commercial fisher shall take any scallops (south of a line Wiwiki-Whale Rock-Cape Brett)
	• No commercial fisher shall use any set net (1NM around Cape Wiwiki and Whale Rock)
	• No commercial fisher shall use any net (1NM around Ninepin, Cape Brett, Bird Rock)
	• No person shall use any set net (1NM around Cape Wiwiki or Ninepin or Whale Rock or Twins Rock)
	• No person shall use any net (amateur)(1NM around Cape Brett)
	• For the area south of a line from Cape Wiwiki-Whale Rock
	  ○ No commercial fisher shall use any trawl or Danish seine net
	  ○ No commercial fisher shall take any scallops
	  ○ No commercial fisher shall use for taking fish: a box or teichi net, purse seine, Dutch seine, trawl net, lampara net, or set nets >1000m in

Location	Summary of provisions currently in place[85]
	length • For the area south of a line from Cape Brett to Whale Rock o No commercial fisher shall use any trawl or Danish seine net o No commercial fisher shall take any scallops • No commercial fisher shall take green-lipped mussels or their spat, cockles, pipi, banded wrasse, black angelfish, butterfly perch, giant boarfish, green wrasse, kelpfish, long-finned boarfish, marble fish, painted moki, red moki, red mullet, red pigfish, rock cod, Sandager's wrasse, scarlet wrasse, silver drummer, splendid perch or toadstool grouper, spotted black grouper, shortbill spearfish or sailfish
Area C excluding the Outer Bay of Islands included above (I.e. seaward of a line from Cape Wiwiki- Whale Rock- Cape Brett and the various net prohibitions above)	• No commercial fisher shall take green-lipped mussels or their spat, cockles, pipi, banded wrasse, black angelfish, butterfly perch, giant boarfish, green wrasse, kelpfish, long-finned boarfish, marble fish, painted moki, red moki, red mullet, red pigfish, rock cod, Sandager's wrasse, scarlet wrasse, silver drummer, splendid perch or toadstool grouper, spotted black grouper, shortbill spearfish or sailfish • No commercial fisher shall use any New Zealand vessel > 46m long
Mimiwhangata Rahui Tapu & buffers	• Part of this area is within the Mimiwhangata Marine Park where: • No commercial fisher shall take or possess fish or seaweed by any method. • Amateur fishers using lines with a maximum of 1 hook, trolling, spears, hand gathering or pots (max 1/ vessel) may harvest: barracouta, billfish, blue maomao, flounder, garfish, green-lipped mussel, gurnard, kahawai, kina, lingfish, mackerel, rock lobster, scallops, shark, snapper, terakihi, trevally, tuatua, tuna, yellow-eyed mullet
Te Au o Morunga Protection Area (Mimiwhangata to Cape Brett excluding near shore Bland Bay and Whangaruru	• No commercial fisher shall take green-lipped mussels or their spat, cockles, pipi, banded wrasse, black angelfish, butterfly perch, giant boarfish, green wrasse, kelpfish, long-finned boarfish, marble fish, painted moki, red moki, red mullet, red pigfish, rock cod, Sandager's wrasse, scarlet wrasse, silver drummer, splendid perch or toadstool grouper, spotted black grouper, shortbill spearfish or sailfish • No commercial fisher shall use any New Zealand vessel > 46m long

131. In addition to the area-specific provisions, the Driftnet Prohibition Act 1991 prohibits driftnet fishing in New Zealand fisheries waters (EEZ). It also prohibits the transportation and transhipment of any fish or marine life taken using a driftnet and prohibits driftnets on vessels.

Victoria Froude

19 March 2021

List of Appendices

Appendix 1	**Natural character assessment for the Bay of Islands to Mimiwhangata**
Appendix 2	**Area Based Restrictions in the New Zealand Marine Environment (excerpt)**

Pacific Eco-Logic Ltd

Bay of Islands

Natural character assessment for the Bay of Islands to Mimiwhangata

Prepared for the Royal Forest and Bird Protection Society, Bay of Islands Maritime Park Incorporated, Ngati Kuta and Te Uri o Hikihiki

Prepared by Victoria Froude

March 2021

Executive summary

Bay of Islands Maritime Park Inc. and the Royal Forest and Bird Protection Society appealed the Council decisions on the Proposed Regional Plan for Northland (PRPN) on a range of matters including the inadequacy of marine biodiversity and natural character protection provisions. Ngati Kuta and Te Uri o Hikihiki hapu lodged Resource Management Act section 274 notices in support. Each hapu has proposed several areas for different types of protection which the appellants have also adopted.

In 2011-2012 Pacific Eco-Logic classified and mapped natural character for the Northland coastal environment as part of the process for preparing the Regional Policy Statement for Northland. Northland's long coastline of 3200km made this a time-consuming task given the poor quality of much of the available imagery at the time of mapping.

The methodology used is described in the RPS natural character mapping methodology report[1]. In summary, a set of criteria were used as an initial triage to identify areas that definitely were not of at least high natural character. For all other areas, relatively homogeneous units from the perspective of natural character were defined, and specific variables were measured. Data was entered into an Excel spreadsheet and algorithms calculated an Ecological Naturalness Index (ENI), a Hydrological and Geomorphological Naturalness Index (HGNI), a Freedom from Buildings and Structures Index and a Sound and Light Naturalness Index (SLNI). These indices were combined into Natural Character Index (NCI). Thresholds were used to identify areas of high natural character (HNC) and outstanding natural character (ONC). All units close to thresholds were reassessed qualitatively using additional factors.

There are many already mapped areas of HNC and ONC within the areas where Ngati Kuta is seeking additional protection. The report includes summary information for each of the already mapped marine high and outstanding natural character units.

Perception or experiential values were not included in the NCI in 2011-12, although some were referenced in the descriptions. This was because people's perception of naturalness varies considerably and there is not a single "perception" or "experience" of naturalness. This report provides a summary of key variables contributing to human perceptions of natural character for the main Bay of Islands subtidal units assessed as having high or outstanding natural character in 2011-12.

Creatures other than humans experience changes in naturalness from their perspective. For marine mammals, human-actions other than those that physically damage their habitat or remove food, a major impact is that of human generated or anthropogenic sounds and general disturbance. This has had such an impact in the Bay of Islands that dolphin numbers are 91% of those present in 1999.

About 40% of the area identified by Ngati Kuta was not assessed for natural character in 2011-2012. None of the areas identified by Te Uri o Hikihiki were assessed for natural character in 2011-2012. This report defines the boundaries and describes new natural character units for areas not previously assessed. All the new areas have been assessed as having at least HNC.

[1] Froude, V A 2014 Northland Regional Council Mapping Project. Natural character methodology report – including amendments following Council decisions. Pacific Eco-Logic Ltd; Bay of Islands. 31p

Contents

EXECUTIVE SUMMARY **2**

INTRODUCTION **4**

EXISTING NATURAL CHARACTER MAPPING 4

APPEALS ON THE PRPN RELATING TO THE INADEQUACY OF MARINE PROTECTION PROVISIONS (TOPIC 14) 4

DEFINING NATURAL CHARACTER **6**

ASSESSING NATURAL CHARACTER IN THE NORTHLAND COASTAL ENVIRONMENT **9**

2011-2012 MAPPING 9

MARINE NATURAL CHARACTER UNITS DESCRIBED IN 2011-2012- MAPS AND DESCRIPTIONS **11**

PERCEPTION AND EXPERIENCE OF NATURAL CHARACTER **25**

IMPACTS ON NATURAL CHARACTER EXPERIENCES OF MARINE MAMMALS AND FISH 27

NEW NATURAL CHARACTER MAPPING **31**

Introduction

Existing natural character mapping

In 2011-2012 Pacific Eco-Logic assessed, classified and mapped natural character for the Northland coastal environment as part of the process for preparing the Regional Policy Statement for Northland. Northland's long coastline of 3200km made this a time-consuming task given the poor quality of much of the available imagery at the time of mapping. Much of the available satellite imagery was of poor quality with large areas obscured by cloud or only addressed with low resolution imagery. As a consequence many of the areas needed to be physically inspected (by vehicle, on foot and/or by boat) as part of this assessment. Mapping was relatively slow and more resource intensive than had been envisaged at the outset.

Natural character assessment in subtidal marine environments is more complex than for terrestrial and intertidal environments. This is because satellite and aerial imagery which can be so useful in terrestrial environments is of little use in most temperate subtidal environments. Personal inspection is complex in most locations and there is generally much less spatially-bounded relevant data available. Some proxy indicators can be used because of the difficulty in obtaining accurate spatially bound biological condition data in a cost effective manner, especially in deeper locations.

In 2011-12 the coastal terrestrial, freshwater and estuarine and sheltered waters mapping used up the available resources and time. Council decided that the readily available information was not adequate to identify boundaries of distinctively different units and thereby map most of the open coast marine environment below mean high water springs. These areas have remained unmapped.

The 2011-2012 mapped areas are in the operative Northland RPS 2014 maps with only the marine units included in the Proposed Regional Plan for Northland (PRPN). In the former the hard copy proposed RPS maps stated that the unmapped open coast was unassessed. However, the online RPS maps make no distinction between the areas that were specifically identified as being of less than high natural character and those areas that were not assessed. This is also the case for the online maps for the PRP for Northland. The current online maps therefore provide an inaccurate impression that most of the Northland marine environment outside of harbours, estuaries and other sheltered waters, is of less than high natural character.

Appeals on the PRPN relating to the inadequacy of marine protection provisions (Topic 14)

Bay of Islands Maritime Park Inc. and the Royal Forest and Bird Protection Society appealed the Council decisions on the PRPN on a range of matters including the inadequacy of marine biodiversity and natural character protection provisions. Ngati Kuta and Te Uri o Hikihiki hapu lodged s274 notices in support. The two appellants also lodged section 274 notices supporting the relevant provisions in the other's appeals. Each hapu has proposed several areas for different types of protection. These areas are shown in Figure 1 and are what the appellants have chosen to promote.

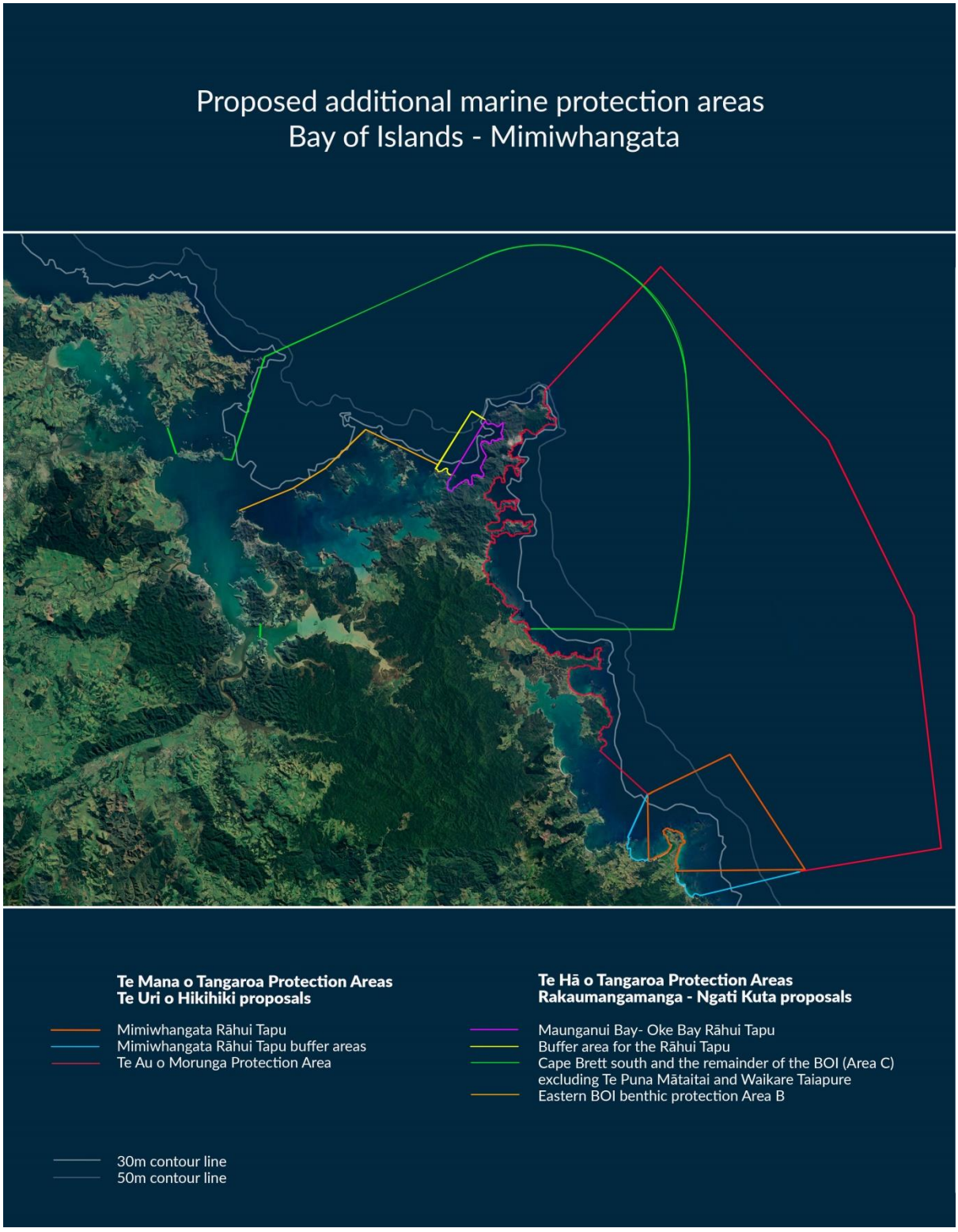


Figure 1: Marine areas proposed for additional protection by Ngati Kuta and Te Uri o Hikihiki[2]

[2] Image prepared by Dean Wright of Dean Wright Photography

Defining natural character

"*Natural character occurs along a continuum. The natural character of a "site" at any scale is the degree to which it:*

- *is part of nature, particularly indigenous nature*
- *is free from the effects of human constructions and non-indigenous "biological artefacts"*[3]
- *exhibits fidelity to the geomorphology, hydrology*[4] *and biological structure, composition and pattern of the reference conditions chosen*
- *exhibits ecological and physical processes comparable with reference conditions*

Human perceptions and experiences of a "site's" natural character are a product of the "site's" biophysical attributes, each individual's sensory acuity and a wide variety of personal and cultural filters."

I compared this definition with an analysis of the collective interpretations of natural character distilled from 100 pre-2010 relevant[5] Court decisions. This comparison found that the definition was generally consistent with the various Court interpretations of natural character[6]. A subsequent analysis of a later set of 100 relevant Court decisions[7] confirmed that natural character is of nature and includes natural elements, patterns and processes across a continuum from outstanding to very low. This analysis also confirmed that natural character is independent of viewer perception and it is different to beauty, wilderness and aesthetic preference.

The 2010 New Zealand Coastal Policy Statement (**NZCPS**)[8] Policy 13(2) states that "…*natural character is not the same as natural features and landscapes or amenity values and may include matters such as*:

- natural elements, processes and patterns;
- biophysical, ecological, geological and geomorphological aspects;
- natural landforms such as headlands, peninsulas, cliffs, dunes, wetlands, reefs, freshwater springs and surf breaks;
- the natural movement of air, water and sediment;
- the natural darkness of the night sky;
- places or areas that are wild or scenic;
- a range of natural character from pristine to modified; and

[3] The term biological artefact is used in international scientific literature to represent human constructed and managed biological systems such as pasture for grazing, lawns, gardens, plantations and orchards. In the application of the methodology for measuring natural character at the regional scale such a distinction is not necessary

[4] In aquatic systems this includes water quality including nutrient levels

[5] "Relevant" decisions were those that discussed natural character

[6] Froude VA 2011. Quantitative methodology for measuring natural character in New Zealand's coastal environments. PhD Thesis. University of Waikato. 341 p. https://researchcommons.waikato.ac.nz/handle/10289/5919

[7] Froude, V A 2015 Preserving coastal natural character: Court interpretations of a long-standing New Zealand policy goal. *New Zealand Geographer* 71, 45-55

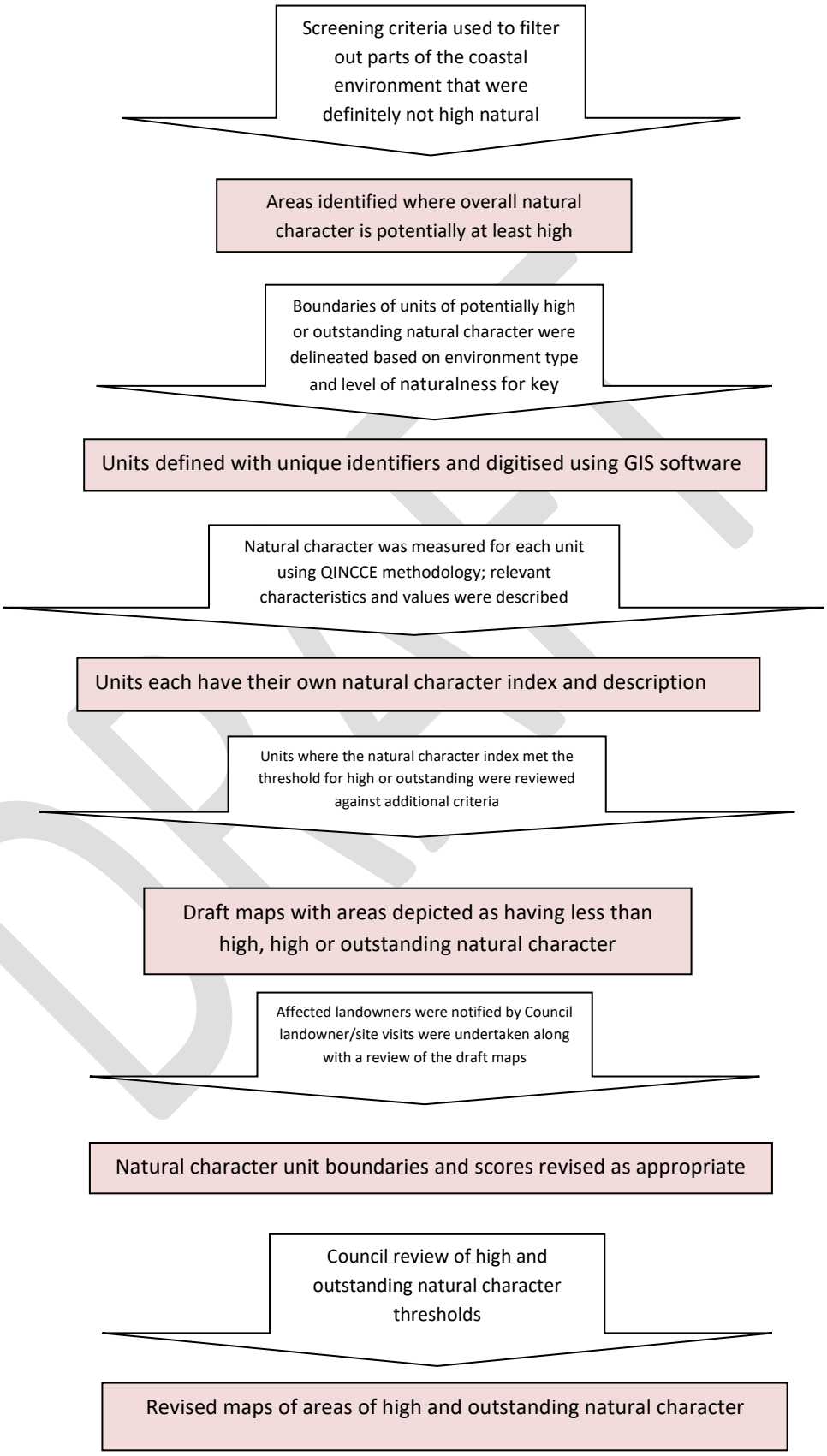
[8] Department of Conservation 2010. New Zealand Coastal Policy Statement 2010. Wellington, Department of Conservation. 28 p.

- experiential attributes, including the sounds and smell of the sea; and their context or setting.

These matters are a mixture of biophysical attributes including those that contribute to "experiential attributes". Some of the listed attributes provide guidance about what constitutes natural character (e.g. a, b, d, and e). Others identify particular components of the coastal environment which are likely to possess natural character (e.g. c and f). Item (h) gives examples of biophysical attributes that contribute sensory information to human experiences, while item (g) contains the observation that natural character occurs along a continuum. Policy 13(2) in its current form is not a definition.

The 2010 NZCPS introduced thresholds for policy and management of coastal natural character for the first time. Policy 13(1)(a) requires any adverse effects of activities on the natural character of the coastal environment be **avoided** in areas of "**outstanding** natural character". For all other areas in the coastal environment policy 13(1)(b) requires that **significant** adverse effects on natural character be avoided and that **other** adverse effects of activities be avoided, remedied or mitigated. The threshold of high was introduced in policy 13(1)(c). This policy requires that natural character be assessed by mapping or otherwise identifying at least areas of "**high** natural character" These thresholds have not been formally defined in legislation or national policy.

Figure 2: Process used to assess the natural character of the Northland coastal environment in the proposed RPS



Assessing natural character in the Northland coastal environment

2011-2012 mapping

The methodology for classifying and mapping natural character in 2011-2012 is described in the RPS natural character mapping methodology report[9]. In summary, a set of criteria were used as an initial triage to identify areas that definitely were not of at least high natural character. For all other areas, relatively homogeneous units from the perspective of natural character were defined, and specific variables were measured. Scores from the different variables were combined multiplicatively[10] into sub-indices to give an overall Natural Character Index (NCI) which was assessed against minimum numerical thresholds for high and outstanding.

For each unit, natural character was measured using the modified QINCCE (Quantitative Indices for measuring the Natural Character of the Coastal Environment) methodology[11]. The following indices and their component parameters are assessed and combined multiplicatively into an overall natural character index (NCI):

a. Ecological Naturalness Index (ENI) (the naturalness of benthic cover and mobile fauna, the lack of alien invasive species, and level of protection[12] from human harvesting and benthic disturbance);

b. Hydrological, hydraulic and Geomorphological Naturalness Index (HGNI) (including naturalness of sedimentation regimes and water quality, impacts of bottom disturbance including benthic contact fishing methods, dumping, dredging, causeways and reclamations);

c. Freedom from the impacts of Building and Structures Index (FBSI); and

The naturalness of the sound and light regimes was assessed qualitatively at the regional scale as this can vary significantly across a larger unit depending on local topography and other local features

The data from the variables assessed for each index were entered into an Excel spreadsheet and an algorithm then calculated the various indices. A summary description was added along with some other data. Most units that scored close to a threshold for high or outstanding were then assessed qualitatively using additional non-quantified factors in the final assessment. From this the final rank or classification was determined for each unit. The location, summary description and NCI can be found for each unit by clicking on that unit in the online Northland Regional Council GIS maps for the RPS.

[9] Froude, V A 2014 Northland Regional Council Mapping Project. Natural character methodology report – including amendments following Council decisions. Pacific Eco-Logic Ltd; Bay of Islands. 31p

[10] The reason for combining these variables multiplicatively was to make sure that if there were any linkages between the variables, this did not affect the overall score. A more common approach is to add scores from variables and then find the average. This assumes that the variables are not linked which is not necessarily an appropriate assumption with natural environment variables.

[11] Froude, V A 2014 Northland Regional Council Mapping Project. Natural character methodology report – including amendments following Council decisions. Pacific Eco-Logic Ltd; Bay of Islands. 31p

[12] The level of protection is used as a proxy for logistically complex and costly direct assessments of mobile biota population structure and abundance

Figure 2 provides a graphical representation of the natural character assessment and mapping process, including visits with landowners.

Figures 3-6 are annotated screen snips from the Northland Regional Council online RPS maps with the coastal environment boundary (in blue), and natural character layers turned on. Mapped areas of high natural character areas are shown in green and mapped areas of outstanding natural character are shown in orange. The underlying unit boundaries are shown in in a faint grey. The shoreline or mean high water springs boundary is not specifically marked and relies on unit boundaries to provide guidance as to where the boundary between land and the marine environment lies for the purpose of Resource Management Act planning and the spatial scope of the Regional Coastal Plan. Ecologically the boundary between land and marine ecosystems can be less discrete, especially along soft sediment shores. The marine natural character unit numbers and some additional place names have been added to screen snips. These maps also show the location of the high and outstanding terrestrial and freshwater natural character within this section of the coastal environment. The terrestrial and freshwater units are not numbered.

The following Table 1 provides for each of the existing numbered marine units in Figures 3-6: a summary description, contributing values, location, and the natural character index. Some additional information is included in the right hand column. Ngati Kuta has excluded the Te Puna mataitai (in the outer western part of the Bay of Islands) and the Waikare Inlet Taipure (inner Bay of Islands east of Opua) from their larger area of interest (Area C). Accordingly those marine high and outstanding natural character units that fall within the mataitai or taipure are not included in Table 1 or numbered in Figures 3-6. The reason for the exclusion is that the units are within the rohe moana of other hapu. This means that Waikare Inlet high and outstanding natural character units have not been included as they lie within the Waikare Taiapure. The high natural character unit that applies to the Te Puna mataitai (00/11) covers a much wider area beyond the mataitai and so the unit is still included in Table 1.

Marine natural character units described in 2011-2012- maps and descriptions

Figure 3: Marine units mapped in 2011-12 as having high or outstanding natural character in the eastern outer Bay of Islands

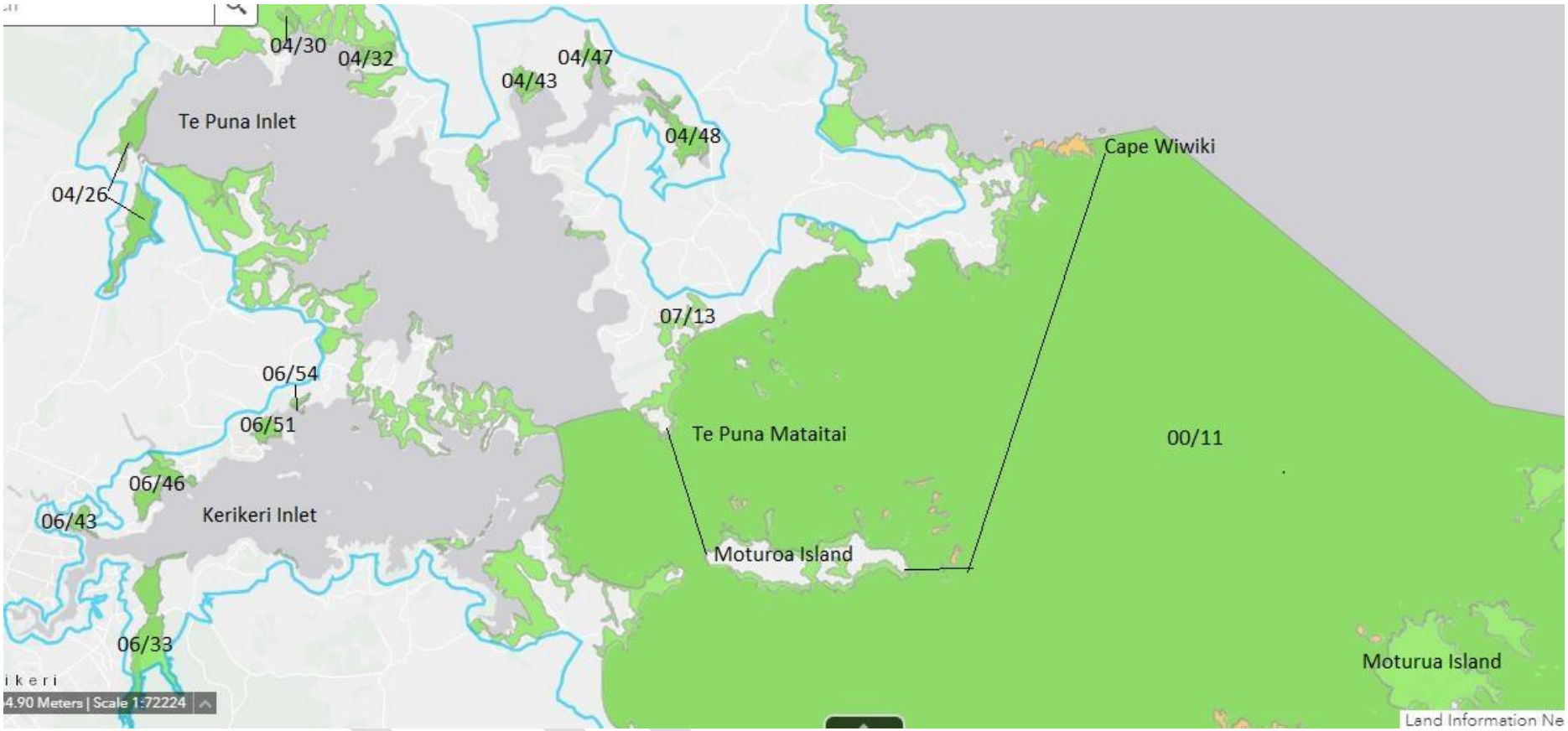


Figure 4: Marine units mapped in 2011-12 as having high or outstanding natural character in the western outer Bay of Islands

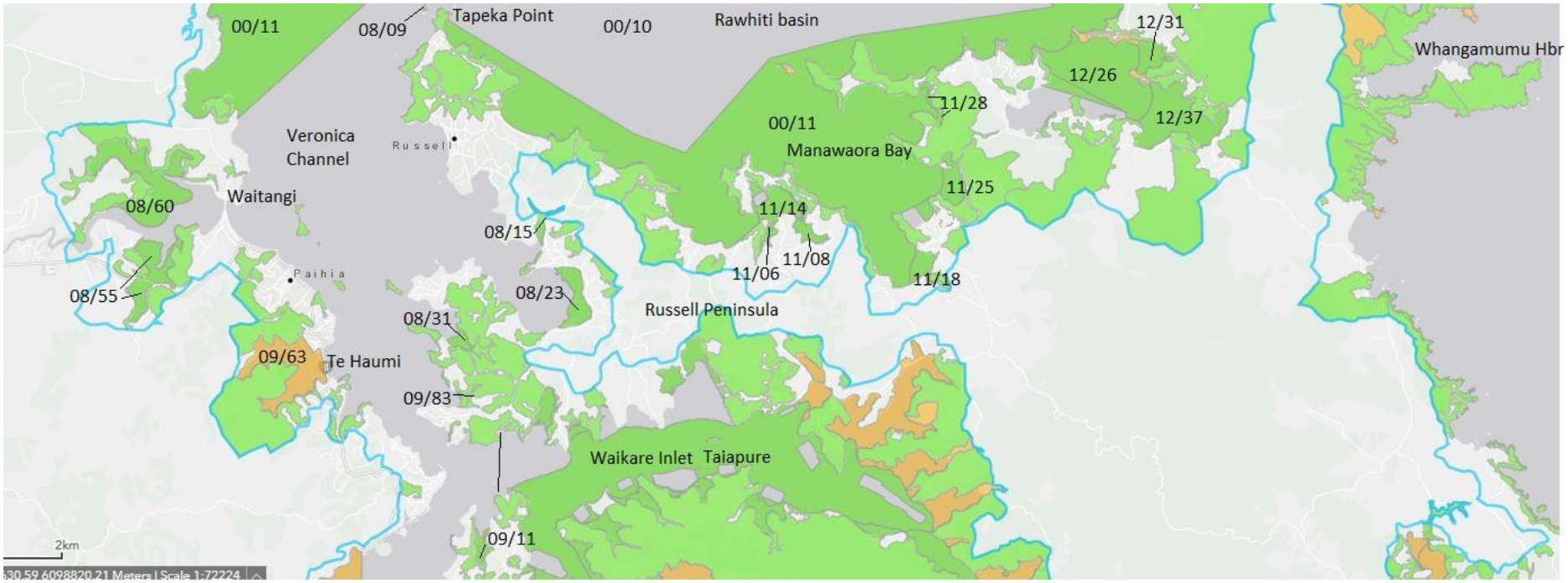


Figure 5: Marine units mapped in 2011-12 as having high or outstanding natural character in the central Bay of Islands

(The marine units in the Waikare Inlet have not been numbered as this area is not part of the proposals from either Ngati Kuta or Te Uri o Hikihiki)

Figure 6: Marine units mapped in 2011-12 as having high or outstanding natural character in the south-west Bay of Islands

(The marine units in the Waikare Inlet have not been numbered as this area is not part of the proposals from either Ngati Kuta or Te Uri o Hikihiki)

Table 1: High and Outstanding natural character units mapped in 2011-2012 with their summary description and contributing values

Unit identifier & rank	NCI	Location	Summary description and contributing values	Additional notes
00/11; HNC	0.51	Outer Bay of Islands	Subtidal reefs, channels & flats and intertidal flats in the outer Bay of Islands. There is good flushing by oceanic waters and wind mixing. Some water quality impacts from the Bay of Islands catchment, but there is a relatively low level of deposition of sediment in this unit as most of the sediment drops out in the more sheltered and deeper waters of the Rawhiti Basin (which is ranked as less than high below the 10m contour as deposited sediment is unlikely to be re-suspended and moved elsewhere.) Contributing Values Relatively high level of restriction of fishing activity and impacts, but offset in part by accessibility and shelter. Water quality relatively high compared to natural state, and to inner waters. Relatively large area of indigenous benthic biota, including subtidal seagrass in sheltered shallows. Relatively few pest species. Few obvious human structures within boundary. Zoned for highest level of habitat protection MM1 in Regional Coastal Plan.	Massive 91% decline in bottlenose dolphin numbers in the Bay of Islands since 1999 from 278 to 26 individuals of which only 16 frequently visited the Bay in 2020. A 75% calf mortality rate is the highest in New Zealand[13]. The primary cause of this decline is attributed to human disturbance and a Marine Mammal Sanctuary is being proposed[14]. There are prohibitions on commercial fishers taking scallops or using any box or teichi net, purse seiene, Dutch seine, trawl net, lampara net, or set nets > 1000m in length. Around the islands of Ipipiri no commercial fisher shall fish from 1 October-to 30 April

[13] Department of Conservation 2021 Consultation opens on proposed Bay of Islands' marine mammal sanctuary. https://www.doc.govt.nz/news/media-releases/2021-media-releases/consultation-opens-on-proposed-bay-of-islands-marine-mammal-sanctuary/

[14] See the above footnote

Unit identifier & rank	NCI	Location	Summary description and contributing values	Additional notes
				and rock lobster can be taken by pots under permit.
00/02; ONC	0.68	Cape Brett- Maunganui Bay, outer Bay of Islands	Marine subtidal unit with little intertidal zone. Extreme level of exposure and natural disturbance regime. Only part of mainland New Zealand swept by the subtropical East Auckland current on a regular basis. Creates very high level of diversity of marine life, including rare tropical vagrants. Strong tidal currents generated by the Cape Brett peninsular concentrate marine plankton, planktivorous fish and predatory fish and birds in high abundance. Fishing pressure can be high for relatively short periods of calmer conditions, but the pelagic basis of the fishery facilitates relatively quick recovery. Contributing Values Water quality very high compared to natural state. No human-mediated hydrological or geomorphological changes or human structures. Relatively large area of indigenous benthic cover with very few alien species. Boundary reflects very high level of restriction of bulk fishing methods and the protection of habitat from fishing impacts, including a no fishing regulation for Maunganui Bay[15]. Zoned for highest level of habitat protection MM1 in Regional Coastal Plan.	Massive 91% decline in bottlenose dolphin numbers in the Bay of Islands since 1999 from 278 to 26 individuals of which only 16 frequently visited the Bay in 2020. A 75% calf mortality rate is the highest in New Zealand [16] The natural character of the no-take Maunganui Bay has continued to increase since the establishment of a no-take (excluding kina) temporary rahui under s186(A) of the Fisheries Act 1996.
00/03[17] HNC in 2021		Maunganui Bay, sunken frigate (The Canterbury)	This unit primarily includes the sunken ex-Navy frigate Canterbury which was sunk in 2009 after thorough cleaning to prevent alien species being introduced into the Bay. It sits on a sand substrate at about 35m[18].	Twelve years on from the sinking of the Canterbury, the natural character of the wreck and the adjoining sandy flats has increased. The hull and superstructure are generally

[15] Fishing (apart from kina) has been prohibited since 2010 under a series of temporary closures under s186A of the Fisheries Act 1996.
[16] Department of Conservation 2021 Consultation opens on proposed Bay of Islands' marine mammal sanctuary. https://www.doc.govt.nz/news/media-releases/2021-media-releases/consultation-opens-on-proposed-bay-of-islands-marine-mammal-sanctuary/
[17] This unit was not ranked as HNC in 2011-12 as the wreck of the Canterbury had only been sunk in the Bay for a couple of years.
[18] As this area was not ranked as being of high or outstanding natural character

Unit identifier & rank	NCI	Location	Summary description and contributing values	Additional notes
				covered by a variety of indigenous encrusting organisms and indigenous marine algae. The wreck is part of the no-take area in Maunganui Bay[19] (since 2010) and so fish life is flourishing.
04/26 HNC	0.49	Te Puna Inlet, western Bay of Islands	Saltmarsh & mangrove shrubland & forest. Contributing Values Indigenous vegetation without pest plants (mangroves & saltmarsh). Few obvious human structures.	
04/30 HNC	0.54	Te Puna Inlet, western Bay of Islands	Small embayment primarily with mangroves. Limited saltmarsh & intertidal flats Contributing Values Indigenous vegetation without pest plants (mangroves & saltmarsh). Few obvious human structures.	
04/32 HNC	0.57	Te Puna Inlet, western Bay of Islands	Mangrove forest and shrubland along stream margin, saltmarsh and intertidal flats Contributing Values Indigenous vegetation without pest plants (mangroves & saltmarsh). Few obvious human structures.	
04/43 HNC	0.55	Te Puna Inlet, western Bay of Islands	Mangrove forest & shrubland with channel. Contributing Values Indigenous vegetation without pest plants (mangroves). No obvious human structures.	
04/43 HNC	0.55	Te Puna Inlet, western Bay of Islands	Mangrove forest & shrubland with channel. Contributing Values Indigenous vegetation without pest plants (mangroves). No obvious human structures.	
04/48 HNC	0.58	Te Puna Inlet, western Bay of Islands	Mangrove forest and shrubland, saltmarsh and some intertidal flats. Surrounded mostly by farmland Contributing Values Indigenous vegetation without pest plants (mangroves & saltmarsh). Few obvious human structures in unit	
06/33	0.49	Okura River Estuary	Okura River Estuary. Primarily mangroves. Also intertidal flats and river channels;	

[19] The taking of marine life other than kina is prohibited

Unit identifier & rank	NCI	Location	Summary description and contributing values	Additional notes
HNC		Kerikeri Inlet, Bay of Islands	and inland limited area of saltmarsh and freshwater wetland. The freshwater wetland contains native shrubs, flax & raupo and seems to have a relatively low level of weed invasion. Much catchment is in plantation forestry and agricultural land uses Contributing Values Intertidal flats and channels with mangroves, saltmarsh and freshwater wetland sequence. Largely indigenous vegetation with few pest plants (mangroves). No obvious human structures	
06/43 HNC	0.49	Kerikeri Inlet, Bay of Islands	Small embayment with a limited catchment with mangroves, and a limited area of saltmarsh and channel Contributing Values Indigenous vegetation without pest plants (mangroves). No obvious human structures within unit. Part of a continuum of indigenous ecosystems from marine to terrestrial. Part of community pest control area.	
06/46 HNC	0.54	Rangitane Estuary, Kerikeri Inlet, Bay of Islands	Rangitane Estuary mangroves with limited saltmarsh & freshwater wetland (raupo with flax, pampas, gorse) in upper reaches Contributing Values Indigenous vegetation without pest plants (mangroves). Sequence of mangroves, saltmarsh & freshwater wetland. Part of community pest control area. No obvious human structures.	
06/51 HNC	0.57	Kerikeri Inlet, Bay of Islands	Inlet with mangroves and a limited area of channel & intertidal flats Contributing Values Indigenous vegetation without pest plants (mangroves). Surrounded by largely indigenous vegetation. Small direct catchment. No obvious human structures.	
06/54 HNC	0.53	Kerikeri Inlet, Bay of Islands	Mangroves on intertidal flats surrounded by predominantly native vegetation Contributing Values Indigenous vegetation without pest plants (mangroves). Surrounded by largely indigenous vegetation. Small direct catchment. No obvious human structures.	
07/13 HNC	0.44	Wairoa Bay, outer Bay of Islands	Freshwater wetland with stream flowing into inlet with kanuka-manuka dominant shrubland on the margins. Beyond the defined coastal environment is kanuka dominant shrubland on hillslopes. Sand spit at stream mouth is used by breeding shorebirds. Contributing Values Largely indigenous vegetation with relatively few pest	

Unit identifier & rank	NCI	Location	Summary description and contributing values	Additional notes
			plants. Part of a continuum of indigenous ecosystems. No obvious human structures. Part of community pest control area	
08/09 HNC	0.61	Fraser Rock, Tapeka, outer Bay of Islands	Low rock stacks with Tapeka light. Small areas with mixed prostrate mixed native broadleaved shrubland, and herbfield with some grasses. Much boat traffic rounding Tapeka Point Contributing Values Rock & relatively mature indigenous vegetation for site conditions and natural disturbance regime/history. Minimal human-mediated hydrological or landform change. Not outstanding because of size, navigation structure & proximity to fast boat traffic	
08/15 HNC	0.56	Uruti Bay,Russell, Bay of Islands	Uruti Bay bay-head mangroves with a road causeway (Russell Road). Upstream of mangroves there a limited area of oioi saltmarsh and a two armed freshwater wetland dominated by raupo with some native shrubs. Boardwalk across 1 arm of freshwater wetland Contributing Values Largely indigenous vegetation with few pest plants. Continuum mangroves, saltmarsh to freshwater wetland. Part of a continuum of marine to terrestrial ecosystems. Part of community pest control area	
08/23 HNC	0.58	Orongo Bay, Bay of Islands	Intertidal flats with mangroves and limited saltmarsh inland. Includes a boardwalk on the margins in south & through centre in north. Contributing Values Indigenous vegetation without pest plants (mangroves). Few obvious human structures, except narrow boardwalk	
08/31 HNC	0.59	Te Wahapu, inner Bay of Islands	Bay head mangroves. Intact small catchment Contributing Values Indigenous vegetation (mangroves) that is part of a continuum through freshwater wetland to regenerating (and small area relatively mature) forest. Water quality protected by upstream wetland and forest.	
08/55 HNC	0.55	Waitangi Inlet, Bay of Islands	Extensive area of mainly mangroves and saltmarsh upstream & downstream of the road bridge in the Kapatiki Creek. Also includes the channel & small amount of road bridge and small areas freshwater wetland Contributing Values Relatively extensive area of mangrove, saltmarsh & freshwater wetland continuum mostly adjoining indigenous vegetation that is part of a larger area of indigenous vegetation. Few obvious human structures,	

Unit identifier & rank	NCI	Location	Summary description and contributing values	Additional notes
			except for causeway.	
08/60 HNC	0.56	Waitangi inlet, Bay of Islands	Upper Waitangi River extensive area of intact mangroves & saltmarsh. Mostly adjoins indigenous vegetation - riparian indigenous forest, freshwater wetland areas Contributing Values Large intact area of mangroves & saltmarsh. Largely joins native forest and freshwater wetland so unit is part of a larger continuum	
09/11 HNC	0.47	Lower Waikare, inner Bay of Islands (downstream of taiapure)	Small bay head with mangroves and a small amount of saltmarsh inland Contributing Values Indigenous vegetation without pest plants (mangroves & saltmarsh). Part of a continuum of marine to terrestrial ecosystems. Some human-mediated water quality changes and few obvious human structures.	
09/20 HNC	0.60	Lower Kawakawa catchment, inner Bay of Islands	Mangroves in lower reaches of a tributary stream, Mangroves are in good condition. Small amount of saltmarsh in upper reaches plus some alluvial freshwater wetland (swamp) Contributing Values Indigenous vegetation without pest plants, close to present potential cover for site conditions (mangroves & saltmarsh). Part of a continuum of marine to terrestrial ecosystems. Few obvious human structures.	
09/23 HNC	0.52	Lower Kawakawa catchment, inner Bay of Islands	Mangrove forest on an inside-bend of the Kawakawa River. Likely to be a relatively recent stand resulting from increased sedimentation on this inside bend. Mangroves extend into a small bay which is identified as a brown teal reserve Contributing Values Indigenous vegetation without pest plants mangroves). Part of a continuum of marine to terrestrial ecosystems. Few obvious human structures.	
09/27 ONC	0.7	Karetu River, inner Bay of Islands	Outstanding area of mangroves and saltmarsh with small areas brackish (e.g. oioi, raupo & marsh ribbonwood) and then limited areas of freshwater wetland (raupo, flax, mixed native shrubs (manuka, mapou), cabbage trees, Baumea sp) in some upper reaches. The saltmarsh areas are particularly extensive and there are a variety of ecological transitions. Abundant fernbirds. The unit includes a road causeway and the intact saltmarsh on the western side of this road. Damaged saltmarsh & freshwater wetland are excluded from this unit	

Unit identifier & rank	NCI	Location	Summary description and contributing values	Additional notes
			Contributing Values Large area of indigenous vegetation without pest plants, close to present potential cover for site conditions. Part of a continuum of marine to terrestrial ecosystems. Few obvious human structures except well bridged causeway.	
09/34 HNC	0.48	Lower Kawakawa catchment, inner Bay of Islands	Fringing mangroves & primarily inland saltmarsh on true right bank of Kawakawa River. Mangroves are primarily along river margin Contributing Values Indigenous vegetation without pest plants (mangroves & saltmarsh). Few obvious human structures.	
09/35 HNC	0.56	Lower Kawakawa catchment, inner Bay of Islands	Mangroves (primarily downstream) and saltmarsh (primarily upstream) on true left bank on an inside bend of the Kawakawa River Contributing Values Indigenous vegetation without pest plants (mangroves). Part of a continuum of marine to terrestrial ecosystems. Few obvious human structures.	
09/40 HNC	0.47	Lower Kawakawa catchment, inner Bay of Islands	Mangroves behind a rail causeway (unit should not include causeway, part of river unit) Contributing Values Indigenous vegetation without pest plants Mangroves).	
09/42 HNC	0.58	Lower Kawakawa catchment, inner Bay of Islands	Mangroves on the true left bank on the Kawakawa River on an inside bend with some intertidal flats & saltmarsh inland Contributing Values Indigenous vegetation without pest plants (mangroves) and relatively close to present potential cover for site conditions. Part of a continuum of marine to terrestrial ecosystems. Few obvious human structures	
09/43 HNC	0.54	Lower Kawakawa catchment, inner Bay of Islands	Mangroves with some saltmarsh & intertidal flats inland Contributing Values Indigenous vegetation without pest plants (mangroves & saltmarsh). Part of a continuum of marine to terrestrial ecosystems. Few obvious human structures	
09/45 ONC	0.65	Whangae catchment, inner Bay of Islands	Whangae River Estuary. Tall mangrove forest grading to saltmarsh up river. Railway causeway & bridge across Whangae River entrance is not included. Causeway has been in place for nearly 150 years. Excludes small estuary arms cut off by road (SH10) Contributing Values Indigenous vegetation without pest plants, close to	

Unit identifier & rank	NCI	Location	Summary description and contributing values	Additional notes
			present potential cover for site conditions. Part of a continuum of marine to terrestrial ecosystems. Few obvious human structures	
09/63 ONC	0.66	Te Haumi, Bay of Islands	Haumi River Estuary with mangroves, intertidal flats, saltmarsh (inland) & channels. Excludes causeway & bridge. Catchment (apart from urban settlement in lower reaches and a farm in NW) is mainly woody indigenous vegetation Contributing Values Indigenous vegetation without pest plants, close to present potential cover for site conditions. Part of a continuum of marine to terrestrial ecosystems. Catchment largely clad with indigenous vegetation. Few obvious human structures.	
09/83 HNC	0.59	Pipiroa Bay, Okiato inner Bay of Islands	Pipiroa Bay head mangroves, saltmarsh and freshwater wetlands (dominated by raupo). Catchment largely woody vegetation. Contributing Values Indigenous vegetation with relatively few pest plants, making progress towards present potential cover for site conditions, but only retired from drainage and grazing 40 years ago. Part of community pest control area. Relatively low level of human-mediated hydrological or landform change, now that floodgate has been removed and catchment largely reforested.	
11/06 HNC	0.59	Paroa Bay, outer Bay of Islands	Small inlet dominated by mangroves. At entrance where more sand & shell there is a salt herbfield with coastal tussocks and marsh ribbonwood- manuka shrubland on true left. Catchment is mostly introduced vegetation Contributing Values Indigenous vegetation without pest plants. Minimal human-mediated hydrological or geomorphological changes. Few obvious human structures.	
11/08 HNC	0.61	Paroa Bay, outer Bay of Islands	Mangroves and channel. Clear open coast water on sand sediment in outer section. Saltmarsh inland Contributing Values Indigenous vegetation without pest plants. Minimal human-mediated hydrological or geomorphological changes. Few obvious human structures.	
11/14 HNC	0.49	Paroa Bay, outer Bay of Islands	Inner sheltered bay with intertidal flats and subtidal channels. High water quality from small catchment. Abundant fish life. Contributing Values Largely indigenous vegetation/cover with few pest	Excludes oyster farm area

Unit identifier & rank	NCI	Location	Summary description and contributing values	Additional notes
			plants. Minimal human-mediated hydrological or geomorphological changes. Few obvious human structures except excluded oyster farm.	
11/18 HNC	0.50	Manawaora Bay, outer Bay of Islands	Clendon Cove two stream delta with intertidal flats & channel, patches of mangroves in the bay and the creek grading into saltmarsh upstream Contributing Values Indigenous vegetation without pest plants, close to present potential cover for site conditions. Minimal human-mediated hydrological or geomorphological changes. Few obvious human structures.	
11/25 HNC	0.54	Dicks Bay, outer Bay of Islands	Intertidal flats & mangroves. Contributing Values Largely indigenous vegetation/cover with few pest plants. Minimal human-mediated hydrological or geomorphological changes. Few obvious human structures except moored yachts.	
11/28 HNC	0.49	Te Hue Bay, outer Bay of Islands	Mangroves at stream mouth, intertidal flats and some shallow subtidal flats. Old wharf with water supply line Contributing Values Largely indigenous vegetation/cover with relatively few pest plants. Only significant structure is old jetty. Part of a community pest control area.	
12/07 HNC	0.58	Hauai Bay intertidal, Rawhiti, outer eastern Bay of Islands	Intertidal flats and shallow subtidal flats with seagrass Contributing Values Water quality relatively high compared to natural state. Recovering seagrass vegetation. Minimal human-mediated hydrological or geomorphological changes. Few obvious human structures.	
12/11 HNC	0.58	Kaingahoa Bay intertidal, Rawhiti, outer eastern Bay of Islands	Intertidal and subtidal flats with sea grass Contributing Values Water quality relatively high compared to the natural state. Recovering seagrass vegetation. Minimal human-mediated hydrological or geomorphological changes. Few obvious human structures.	
12/26 HNC	0.51	Parekura Bay, eastern outer Bay of Islands	Subtidal flats of Parekura Bay with limited areas of fringing intertidal flats (rest in separate units). Less than 10m deep. Contributing Values Water quality relatively high compared to natural state. Minimal human-mediated hydrological or geomorphological changes. Few obvious human structures.	Excludes Waipiro and Te Uenga Bay mooring areas Massive 91% decline in bottlenose dolphin numbers in the Bay of Islands since 1999 from 278 to 26 individuals of

Unit identifier & rank	NCI	Location	Summary description and contributing values	Additional notes
				which only 16 frequently visited the Bay in 2020. A 75% calf mortality rate is the highest in New Zealand [20]
12/31 HNC	0.51	Parekura Bay eastern outer Bay of Islands	Intertidal mudflats and low fringing mangrove forest. Old small Pacific oyster farm remnants Contributing Values Largely indigenous cover and infauna, although some Pacific oysters are present. Unit is part of a continuum of marine to terrestrial natural ecosystems. Few obvious human structures (apart from remnants of old marine farm). Adjoins a community pest control area.	
12/37 HNC	0.52	Parekura Bay eastern outer Bay of Islands	Intertidal flats with mangrove forest & saltmarsh at the head of the bay Contributing Values Part of a continuum of marine to terrestrial ecosystems, with good condition indigenous mangroves and saltmarsh. Relatively high level of sedimentation, but few obvious human structures. Adjoins a community pest control area.	

[20] Department of Conservation 2021 Consultation opens on proposed Bay of Islands marine mammal sanctuary. https://www.doc.govt.nz/news/media-releases/2021-media-releases/consultation-opens-on-proposed-bay-of-islands-marine-mammal-sanctuary/

Perception and experience of natural character

My PhD thesis devoted a large chapter to the human perception of natural character. This included a study involving 119 "informed" participants to help determine the appropriate weighting for different components of natural character in an overall index. There was insufficient consistency between participants to determine whether different components should have the same or different but consistent weightings. In recognition of this I went with a multiplicative index where the sub-indices are multiplied to give an overall natural character index (NCI). A multiplicative index is appropriate when it is uncertain that the contributing variables are independent.

As part of my PhD research I reviewed the literature relating to perception of environmental naturalness. The following extract from my thesis summarises the literature as at the end of 2011. This extract makes it clear that people's perception of naturalness varies and that there is not a single "perception" or "experience" of naturalness.

> "*Human perceptions of natural character/environmental naturalness are influenced by the distribution, structure, composition, spatial pattern, and functioning of biophysical elements in the environment concerned. These biophysical elements include geomorphology, hydrology, hydraulics, soil/substrate, water, air, biota (native and introduced), biological associations, physical and ecological processes, human structures and sounds, and the patterns in which the various elements are arranged. While various biophysical elements can be measured, people vary in how they perceive the naturalness of individual elements as well as overall environmental naturalness/natural character. This is because an individual's perception of natural character/environmental naturalness depends on the interaction of the actual biophysical elements, with that individual's sensory acuity, knowledge and experience, and a variety of personal and cultural factors affecting that individual (Froude et al. 2010)*
>
> *The literature on human perception of environmental naturalness mostly addresses the perception of the general population rather than those who are "informed" or have a good understanding of what makes an environment/area more natural. As members of the general population have not normally spent time considering what makes an area natural they can find it difficult to identify the attributes of environmental naturalness. For example, Hull et al. (2001) found local residents had difficulties defining what made their nearby forest natural and viewed people and the history of the human use of the forest to be part of the "natural forest".*
>
> *A number of studies have addressed differences between various sub-groups in their perception of environmental naturalness. Habron (1998) found considerable variation in perceived naturalness between rural inhabitants and recreational users in Scotland. Distinct cultural differences were found in a ten country survey of student perceptions of riverscapes, and in particular the role of large in-channel wood (Le Lay et al. 2008). Students from China, India and Russia perceived riverscapes with large amounts of in-channel wood as not natural and considered that those rivers needed management to reduce their danger levels. In contrast students from Germany, Oregon State (USA) and Sweden considered that human regulated channels needed improvement to increase their naturalness and aesthetic qualities. Le Lay et al. (2008) suggested an explanation for this difference could be that the*

first set of countries had a "development strategy" that focused on controlling nature while the second group focused more on living and working with nature.

Several studies have used factor analysis techniques to identify "naturalness perception sub-groups" based on participant scoring or sorting of photographs. In their assessment of public perceptions of natural character in Coromandel (New Zealand), Fairweather & Swaffield (1999) identified two perception sub-groups. The first group ("Factor 1") perceived "natural" to be an absence of human construction and artefacts. For this group, the most unnatural landscapes were those with buildings while treeless pasture was assessed as neutral in terms of its naturalness. The second group ("Factor 2") attributed naturalness to native vegetation. For them, large scale commercial plantation forestry was perceived to be least natural, because of its potential impacts. Treeless pasture was also considered relatively unnatural and limited environmentally sensitive development in natural settings may be acceptable.

In a similar type of study in the tourism locations of Kaikoura and Rotorua, Newton et al (2002b) also identified two perception sub-groups. They called the first "pure nature". This emphasised nature's wild attributes or natural character without humans. The second group they called the "cultured nature" view. This is a perception that nature is primarily a resource for human enjoyment and activity, and naturalness is defined in terms of personal experience of the natural environment (Fairweather & Swaffield 2003).

Some studies have compared perception with biophysical measures of naturalness (e.g.Lamb & Purcell 1990; Wagner & Gobster 2007). Most of these studies have not specifically sought participants that were "informed" about what is natural in the context of what is being assessed. In a study of perception of Australian vegetation types and disturbance regimes, Lamb & Purcell (1990) found that while ecological naturalness and perceived naturalness were related there were some important differences. For example:

- *Heath vegetation was perceived as less natural than forests and even severely weed-infested forests were seen as natural*

- *Where foliage cover was sparse, all levels of human interference were perceived as equally unnatural. As the density of foliage cover increased, participants were increasingly unable to discriminate between levels of interference*

- *As vegetation height increased people became less able to discriminate between natural and altered vegetation. Extensively altered structure in the tallest forest was perceived to be more natural than low stature vegetation with minor modification*

In a very different study by Taylor et al.(2011 in prep) to establish naturalness baselines, long-term divers were asked to use only their memory and dive logs to recollect changes in particular species and ecological communities found in the waters of the now Poor Knights Marine Reserve (New Zealand). The divers were asked to record relative abundance for each of the species and communities in each of four time periods beginning with "pre-1971". When diver recollections were compared with the far more limited (in terms of the span of time covered) monitoring data, Taylor et al. (2011 in prep) found that the divers were not inconsistent with the monitoring data and were conservative in their assessments of change.

The authors observed that most of these participating long-term divers had a good knowledge of marine life. They could, therefore, be considered to be "informed" from the perspective of assessing naturalness.

Other authors have considered perceptions of environmental change, but in terrestrial environments. Several authors have found that those who experience rural natural riparian areas more frequently tend to observe more of the changes that occur (Zube et al. 1989; Wagner & Gobster 2007). Zube et al. (1989) found that when people do not understand the linkages between parts of a natural system they may not appreciate the effect of environmental changes on attributes they value. Wagner & Gobster (2007) found differences between traditional biophysical landscape change assessments and how residents experienced and interpreted environmental change."[21]

For my work on natural character I have focused on the many environmental components that contribute to perceptions of naturalness. Several components were not addressed quantitatively at the regional scale of natural character assessment for 3200km of coastline. This was for practical reasons. Those factors were addressed qualitatively for each unit close to a numerical threshold and for more detailed assessments.

Table 2 provides a summary of key contributing variables to human perceptions of natural character for the main Bay of Islands subtidal units assessed as having high or outstanding natural character in 2011-12[22]. There are a large number of mostly smaller units covering primarily intertidal flats, mangroves and/or saltmarsh. An assessment of attributes affecting perception and/or experience for each of these units has not been included as this would be too consuming and not necessary at this stage.

Impacts on natural character experiences of marine mammals and fish

Excluding human actions that physically damage habitat or remove food, one of the major human impacts on marine mammals and many other marine animals is that of human generated or anthropogenic sounds. Particular problems arise when vessel (e.g. motor, prop cavitation) and other human generated sounds (e.g. seismic air-guns) are at the same frequencies as that used by marine mammals and fish. There is an increasing literature around the impacts on marine mammals and fish about adverse effects on communication and on their behaviour[23].

In the Bay of Islands human disturbance has adversely affected bottlenose dolphin populations. Research has shown that there has been a massive 91% decline in bottlenose dolphin numbers in the Bay of Islands since 1999 from 278 to 26 individuals of which only 16 frequently visited the Bay in 2020. A 75% calf mortality rate is the highest in New Zealand [24]. The Department of

[21] Froude VA 2011. Quantitative methodology for measuring natural character in New Zealand's coastal environments. PhD Thesis. University of Waikato. 341 p. https://researchcommons.waikato.ac.nz/handle/10289/5919

[22] This excludes the Waikare Inlet

[23] E.g. Warren, V E; McPherson, C; Giorli, G; Goetz, K T; Radford, C A. 2021 Marine soundscape variation reveals insights into baleen whales and their environment: a case study in central New Zealand. Royal Society Open Science Vol 8 (3)

[24] Department of Conservation 2021 Consultation opens on proposed Bay of Islands marine mammal sanctuary. https://www.doc.govt.nz/news/media-releases/2021-media-releases/consultation-opens-on-proposed-bay-of-islands-marine-mammal-sanctuary/

Conservation is shortly to begin consultation about a marine mammal sanctuary for the Bay of Islands. The proposed provisions include:

"For the Bay of Islands:

- *No swimming with marine mammals;*
- *Vessels to maintain a 400m distance from marine mammals; and*

Within the Bay of Islands:

- *Vessel speed to be restricted to 5 knots within two "marine mammal safe zones"*[25].

[25] https://www.doc.govt.nz/news/media-releases/2021-media-releases/consultation-opens-on-proposed-bay-of-islands-marine-mammal-sanctuary/

Table 2: Summary of human experiences of natural character for the main Bay of Islands subtidal units mapped as having high or outstanding natural character in 2011-2012

Unit or unit cluster and location	Human visual for only the unit	Human visual wider environment experienced from inside the unit	Human sound	Absence of anthropogenic light	Taste & odours
00/11	High But this can vary at certain times depending on the level and type of boat traffic within the unit. During the New Zealand summer holidays and summer weekends, typically there are more boats, including larger commercial motorised vessels involving in tourism.	Generally high In this context there are only a few areas of intensive building (Tapeka, Long Beach-Oneroa Beach). These are more prominent when close. Otherwise the wider terrestrial environment is generally native vegetation (especially in the east), limited pine plantation (and diminishing), and some pasture (primarily in the west)	Moderate –very high This varies depending on location within the unit and the level of motorised boat traffic within that part of the unit. Locations in the eastern and western extremities of the unit generally have low levels of motorised boat traffic. Motorised boat traffic is most prevalent during the New Zealand summer and late spring to autumn weekends. Actual impact of anthropogenic noise depends on the proximity to moving boat traffic; and to level to which this is offset by natural sounds generated by natural processes (e.g. waves breaking).	High- very high Low levels of anthropogenic light away from the few small settlements and major anchorages during the summer	High- very high Within the unit the dominant smell is of the sea, especially in rough conditions. Diesel fumes from cruise ships moving through and anchoring for the day just south of the unit (out from Waitangi) can locally reduce air quality as can smaller vessels with poorly tuned motors
00/02	Generally outstanding This may reduce for short periods when sea conditions are relatively	Outstanding In this context the adjoining land is generally ranked as being of outstanding natural character	Generally outstanding This is due to the high degree of resilience to non-natural sounds provided by this	Outstanding Minimal levels of anthropogenic light and none away from	Outstanding apart from the occasional local diesel odour Within the unit the

Unit or unit cluster and location	Human visual for only the unit	Human visual wider environment experienced from inside the unit	Human sound	Absence of anthropogenic light	Taste & odours
	calm and many vessels can be travelling to or through the Cape Brett-Motukokako area and/or Deep Water Cove.	(relatively mature indigenous vegetation, with minimal change to the landform and hydrology and no buildings)	rugged and exposed coast. When sea conditions are calm there may be more boat noise because of more boats and lower levels of natural ambient sound.	the only overnight anchorage in Deep Water Cove (then only night anchor lights)	sea feels and tastes like the sea
12/26	High	Generally high	Generally high	Low levels of anthropogenic light	Generally high apart from occasional localised diesel odours

New 2021 natural character mapping

Some of the marine areas for which Ngati Kuta is seeking additional marine protection were covered by the 2011-2012 natural character mapping. Those areas which met the criteria for high or outstanding natural character are documented in Table 1. About 40% of the area identified by Ngati Kuta was not assessed for natural character in 2011-2012. None of the areas identified by Te Uri o Hikihiki were assessed for natural character in 2011-2012.

This part of the report documents the new natural character mapping that assesses those areas identified by the two hapu and not mapped in 2011-2012. Figure 7 shows the boundaries of these new units and their unique identifier numbers. It also includes several units previously mapped in the outer Bay of Islands.

Drawing accurate natural character unit boundaries in deeper subtidal marine environments is much more difficult than for shallow subtidal and intertidal units where satellite or aerial imagery can provide considerable assistance in distinguishing discontinuities. Boundaries can be drawn around areas subject to legal restrictions (e.g. no harvesting or significant method restrictions). Where boundaries relate to habitat discontinuities then reasonably accurate habitat mapping is required. Such mapping is unavailable in much of the deeper subtidal. Habitat type can determine what types of benthic contact fishing methods are used. Other human influences on marine environments include increased sedimentation and nutrients from larger “developed” catchments, the presence of alien species, dredging and dumping, and the large-scale-removal of marine fauna and sometimes flora.

This new mapping largely uses the same methodology used for the largely subtidal marine units in 2011-2012. It makes use of new information becoming available since the initial assessment work, including marine habitat mapping and the more recent generalised fishing activity level and type maps. It also more explicitly addresses factors affecting perception and experience in the unit descriptions.

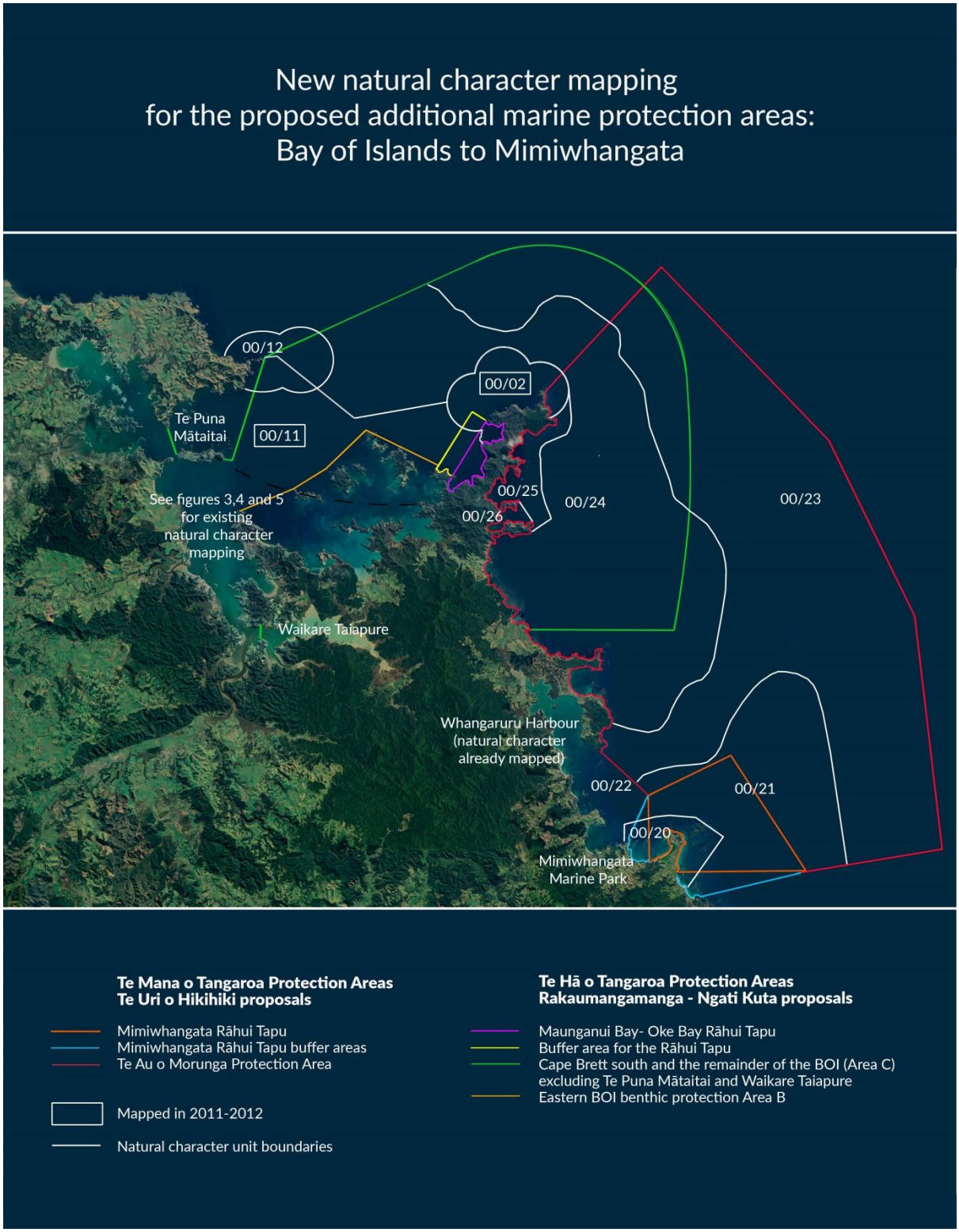


Figure 7: Numbered marine natural character marine units in relation to the boundaries of protection areas sought by Ngati Kuta and Te Uri o Hikihiki[26]

[26] Figure 7 image prepared by Dean Wright of Dean Wright Photography

Table 3: Assessment of marine natural character units depicted in Figure 7

Unit identifier & rank	Location	NCI	Summary description Contributing values	Experience[27]: Visual- within unit- on the surface and underwater/ Visual – wider environmental context/ Anthropogenic light	Experience Sound/ Odour, Taste, Feel
00/12 ONC or HNC	Cape Wiwiki-Ninepin	0.64	Largely shallow to deeper reef habitat surrounding Cape Wiwiki, Harakeke Island and Ninepin Rock. This area has a set net prohibition for a 1NM radius around Cape Wiwiki and a complete net prohibition in a 1NM radius around Ninepin. The latter effectively extends the ban of a variety of fishing methods applying to the Bay of Islands inshore of a line from Cape Wiwiki- Whale Rock – Cape Brett. A small part of this unit is within the Te Puna mataitai which prohibits commercial fishing and the taking of mussels (temporary bylaw to address significant overharvesting of green-lipped mussels). There are urchin barrens resulting from a reduction of natural predators of the native urchin kina (*Evechinus chloroticus*), although these are generally less than for more sheltered Bay of Islands locations. Kelp forest is present, especially in more exposed locations. The area is part of The Eastern Bay of Islands and Cape Brett Coast (SEA) Contributing Values Water quality very	Very high-high/ Very high/Outstanding Within the unit the water surface visual experience is generally one of at least high natural character. There is not much boat traffic in this area, especially when compared to other parts of the Bay of Islands. Underwater, the visual experience compared to the natural state, is: a lesser extent of kelp forest on rocky reefs, more urchin barrens, fewer larger predatory fish (e.g. snapper) and rock lobster. The wider visual context includes (1) the adjoining rocky Harakeke Island (ONC 0.81 intact native mixed broadleaved low forest and shrubland with flax); (2) Ninepin (ONC 0.76 steep rock island gannet roosting and nesting area with scattered low native vegetation); (3) the headland and dramatic rock cliffs (HNC 0.56 with mixed native-alien shrubland and pohutukawa trees & shrubs) No anthropogenic light nearby.	High- very high Very high As much of the area is open exposed coast the area has high levels of resilience to non-natural sounds. There is some anthropogenic boat noise although this is less than for much of the Bay of Islands. The area smells, tastes and feels like a natural sea environment

[27] The first line gives qualitative perception scoring for each of visual within unit (surface, underwater)/ Visual – wider environmental context/ Anthropogenic light

Unit identifier & rank	Location	NCI	Summary description Contributing values	Experience[27]: Visual- within unit- on the surface and underwater/ Visual – wider environmental context/ Anthropogenic light	Experience Sound/ Odour, Taste, Feel
			high compared to the natural state. No human-mediated hydrological or geomorphological changes or human structures. Indigenous benthic cover with very few alien species. Boundary reflects high level of restriction of bulk fishing methods and the protection of habitat from some fishing impacts; and a lesser level of recreational fishing activity compared to elsewhere in the Bay of Islands.		
00/20 HNC	Mimiwhangata Marine Park	0.55	Mimiwhangata Marine Park covers 1890 ha and was established in 1984. It has a complex boundary and does not include entire reef systems and adjacent sand areas. Commercial fishing is prohibited. Recreational fishers are able to harvest a variety of species including snapper, shark and rock lobster using lines with a maximum of 1 hook, trolling, spears, hand gathering or pots (maximum of 1 per vessel). Densities of legal rock lobster have decreased in the Park since the 1970s and are at very low levels both inside and outside the park[28]. Urchin barrens (resulting from low numbers of kina predators- snapper and rock lobster) have increased over the time of the	High/high-very high/ very high Within the unit the water surface visual experience is of high natural character. Underwater, the visual experience compared to the natural state, is: a lesser extent of kelp forest on rocky reefs, more urchin barrens, fewer larger predatory fish (e.g. snapper) and rock lobster. The wider visual context includes (1) Series of outer islands (ONC 0.63, 16/33) with steep NE cliffs with a cover including pohutukawa forest, mixed broadleaved shrubland and coastal tussocks and astelia; (2)centre of north facing bay (ONC 0.68, 16/38) are headlands, hill-faces and slopes with mixed broadleaved forest, and kanuka forest and shrubland and a small wetland;	High- very high/ very high As much of the area is open exposed coast the area has high levels of resilience to non-natural sounds. There is some anthropogenic boat noise although this less from some nearby areas closer to boat ramps. When anchored in

[28] Shears et al 2006

Unit identifier & rank	Location	NCI	Summary description Contributing values	Experience[27]: Visual- within unit- on the surface and underwater/ Visual – wider environmental context/ Anthropogenic light	Experience Sound/ Odour, Taste, Feel
			Park. Historical imagery shows kelp forest dominating at Mimiwhangata in the 1950s[29]. The extent of urchin barrens increased from 11-36% of the Park from 1973-2019[30] Contributing Values Water quality very high compared to the natural state. No human-mediated hydrological or geomorphological changes or human structures. Indigenous benthic cover with very few alien species. Boundary reflects the prohibition of commercial fishing and restrictions on recreational fishing methods. However, the small size and boundary location means that the effects of these restrictions on benthic cover and fish abundance has been limited	(3) (HNC 0.59 16/35) coastal cliffs with native forest and shrubland; (4) HNC 0.5 unit 16/17) sand beach and low dune with native sand binders on fore dune, introduced grasses and pohutukawa and small swales with native rushes behind; 5) (HNC, 0.44, 16/18) shallow ponds with mixed native and introduced sedges etc. and a diversity of waterfowl; (6) and a broader area of pasture with livestock. No anthropogenic light nearby.	Mimiwhangata Bay cattle sounds can be dominant. The area smells, tastes and feels like a natural sea environment
00/21 HNC	Open Coast Reefs	0.53	Shallow and deeper reef to the north and east of the existing Mimiwhangata Marine Park along with reef margin habitat. The outer boundary is that of the mapped Mimiwhangata SEA. A significant part of this unit is in the proposed Mimiwhangata Rahui Tapu and earlier marine reserve proposals. Vessels >46m prohibited.	High/high/very high Within the unit the water surface visual experience is of high natural character. Underwater, the visual experience compared to the natural state, is: a lesser extent of kelp forest on rocky reefs, more urchin barrens, fewer larger predatory fish (e.g. snapper) and rock lobster and no alien species.	High- very high/ very high As much of the area is exposed open coast, the area has high levels of resilience to non-natural sounds.

[29] Kerr & Grace 2005
[30] Kerr & Grace 2005
Lawrence 2020

Unit identifier & rank	Location	NCI	Summary description Contributing values	Experience[27]: Visual- within unit- on the surface and underwater/ Visual – wider environmental context/ Anthropogenic light	Experience Sound/ Odour, Taste, Feel
			Contributing Values Water quality very high compared to the natural state. No human-mediated hydrological or geomorphological changes or human structures. Indigenous benthic cover with very few alien species.	The wider environmental context will be as above but from a greater distance. Some of the small coastal settlements will be visible from a distance along with headlands and coastal faces dominated by native forest and shrubland No nearby anthropogenic light although there will be some light visible from small coastal settlements, especially Oakura Bay	There is some anthropogenic boat noise although this less from some nearby areas closer to boat ramps. Cattle noise may be heard on calm days. The area smells, tastes and feels like a natural sea environment
00/22 HNC	Whangaruru Bay[31]		Not part of area of interest		
00/23 HNC	Brett-Mimiwhangata offshore	0.49	Department of Conservation marine habitat[32] mapping shows this area as primarily soft sediment beyond the main reefs and the reef margin transitional habitat. It also falls outside of the Significant Marine Ecological Areas identified for the Proposed Regional Plan. The 2007-2018 Fisheries NZ Northland Commercial Trawl fishing intensity data shows activity towards the low end for the area immediately north of the Bay of Islands and	High- very high/very high-outstanding/ very high-outstanding Within the unit the water surface visual experience is of high-very high natural character. Underwater, the practical visual experience compared to the natural state would be a lesser extent of kelp forest on rocky reefs, more urchin barrens, fewer larger predatory fish (e.g. snapper) and rock lobster and no alien species. The wider visual context includes further	Very high-outstanding/ very high There can be some vessel motor noise north of Cape Brett otherwise anthropogenic sound is minimal The area smells,

[31] Not part of the area where either hapu is seeking additional protection provisions

[32] https://www.doc.govt.nz/about-us/science-publications/conservation-publications/marine-and-coastal/reserves-species-monitoring/marine-habitat-map-of-northland-mangawhai-to-ahipara/

Unit identifier & rank	Location	NCI	Summary description Contributing values	Experience[27]: Visual- within unit- on the surface and underwater/ Visual – wider environmental context/ Anthropogenic light	Experience Sound/ Odour, Taste, Feel
			Cape Brett. A related data set shows an area with a high level of all fishing methods to the east of the Brett Peninsula. This is most likely from the skipjack tuna purse seine fishery[33]. Amateur and charter fishing vessel activity is shown by Fisheries New Zealand to be high north of Cape Brett[34]. Contributing Values Water quality very high compared to the natural state. No human-mediated hydrological or geomorphological changes apart from some possible interference with the substrate from trawl nets. There are no known human structures. There is indigenous benthic cover with very few alien species.	offshore, the HNC and ONC areas of native vegetation Cape Brett and the Brett Peninsula; and the largely undeveloped/ minimally developed coastline and hinterland south to Home Point at Whangaruru Harbour entrance. The wider visual context along the Brett Peninsula includes ONC unit 13/06 (0.62). Further south are a number of HNC units of coastal faces and cliffs and steep hill slopes with native vegetation (15/09- 0.62; 14/21- 0.47; 14/18-0.47; 14/01- 0.44; 14/04-0.45; 13.15- 0.49; 13/13- 0.5; 13/05- 0.59) but these units are not close. The ONC unit at the entrance (North Head) to Whangaruru Harbour is a steep rocky headland with mixed broadleaved forest. For most of this unit anthropogenic light is minimal (vessel navigation and anchoring lights). Closer to the southern coastal settlements such lighting is more obvious in the west but not immediate.	tastes and feels like a natural sea environment
00/24 HNC-	Whangaruru-Brett-Wiwiki reefs	0.56	Department of Conservation marine habitat[35] mapping shows this area as primarily deep and shallow reef habitat and reef margin	Very high/outstanding-very high/ very high-outstanding Within the unit the water surface visual	Very high-outstanding/ Very high -

[33] Langley, A D 2019 Characterisation of the New Zealand skipjack tuna fishery. New Zealand Fisheries Assessment Report 2019/34

[34]Fisheries New Zealand aerial flight and boat ramp surveys 2005-2012 and catch and activity from charter vessels from 2011-2014

[35] https://www.doc.govt.nz/about-us/science-publications/conservation-publications/marine-and-coastal/reserves-species-monitoring/marine-habitat-map-of-northland-mangawhai-to-ahipara/

Unit identifier & rank	Location	NCI	Summary description Contributing values	Experience[27]: Visual- within unit- on the surface and underwater/ Visual – wider environmental context/ Anthropogenic light	Experience Sound/ Odour, Taste, Feel
			transitional habitat. The boundary largely follows several of the Significant Marine Ecological Areas identified for the Proposed Regional Plan. The 2007-2018 Fisheries NZ Northland Commercial Trawl fishing intensity data shows activity towards the low end for the area immediately north of the Bay of Islands and Cape Brett which is probably outside/ to the north of this unit. A related data set shows an area with a high level of all fishing methods to the east of the Brett Peninsula affecting this and the adjoining unit 00/23. This is most likely from the skipjack tuna purse seine fishery[36]. Amateur and charter fishing vessel activity is shown by Fisheries New Zealand to be high in the Bay of Islands and north of Cape Brett[37]. Contributing Values Water quality is very high compared to the natural state. No human-mediated hydrological or geomorphological changes. There are no known human structures. There is indigenous benthic cover with very few alien species.	experience is of very high natural character. Underwater, the practical visual experience would be of the water column compared to the natural state, is: a lesser extent of kelp forest on rocky reefs, more urchin barrens, fewer larger predatory fish (e.g. snapper) and rock lobster. The wider visual context includes further offshore and the HNC and ONC areas of native vegetation at Cape Brett and the Brett Peninsula; and the largely undeveloped/ minimally developed coastline and hinterland south to Home Point at Whangaruru Harbour entrance. The wider visual context along the Brett Peninsula includes ONC unit 13/06 (0.62). Further south are a number of HNC units of coastal faces and cliffs and steep hill slopes with native vegetation (15/09- 0.62; 14/21- 0.47; 14/18-0.47; 14/01- 0.44; 14/04-0.45; 13.15- 0.49; 13/13- 0.5; 13/05- 0.59). The ONC unit at the entrance (North Head) to Whangaruru Harbour is a steep rocky headland with mixed broadleaved forest. For most of this unit anthropogenic light is minimal (vessel navigation and anchoring lights).	
00/25 ONC	Eastern Brett Peninsula reef	0.64	Steep bathymetry close inshore and high levels of exposure increase the resilience of	Very high- outstanding/ outstanding/ outstanding Within the unit the water surface visual	Outstanding/ outstanding

[36] Langley, A D 2019 Characterisation of the New Zealand skipjack tuna fishery. New Zealand Fisheries Assessment Report 2019/34
[37]Fisheries New Zealand aerial flight and boat ramp surveys 2005-2012 and catch and activity from charter vessels from 2011-2014

Unit identifier & rank	Location	NCI	Summary description Contributing values	Experience[27]: Visual- within unit- on the surface and underwater/ Visual – wider environmental context/ Anthropogenic light	Experience Sound/ Odour, Taste, Feel
	and reef edge habitats		this area's reefs to urchin browsing effects. Minimal vessel traffic and no anchoring. The boundary largely follows the 50m depth contour except for the very steep bathymetry around Cape Brett itself where a deeper contour is used Contributing Values Water quality is very high compared to the natural state. No human-mediated hydrological or geomorphological changes. There are no known human structures. There is indigenous benthic cover with very few alien species. There is a high degree of resilience to, and generally very low levels of non-natural sounds	experience is of outstanding natural character. Underwater, the practical visual experience compared to the natural state would be a slightly reduced extent of kelp forest on rocky reefs, a higher level of urchin barrens, fewer larger predatory fish (e.g. snapper) and rock lobster and no alien species. The wider visual context includes further offshore, the HNC unit around the Brett lighthouse area and ONC areas of native vegetation of Cape Brett, Motukokako and the Brett Peninsula Virtually no anthropogenic light apart from passing vessels.	
00/26 HNC	Whangamumu Harbour	0.49	The Harbour is exposed to the east and the large easterly swells. It is part of the Eastern Bay of Islands and Cape Brett south Significant Ecological Area. Habitat mapping[38] shows a largely fringing reef and broad reef edge habitat. During times without a strong easterly swell, from several to up to 60 recreational vessels can be anchored in the Harbour Contributing Values Water quality very high compared to the natural state. No	High/ high- very high/ Very high- outstanding Within the unit the water surface visual experience is of generally high natural character, there can be many vessels anchored during summer peak periods. Underwater, the visual experience compared to the natural state, is: a lesser extent of kelp forest on rocky reefs, more urchin barrens, fewer larger predatory fish (e.g. snapper) and rock lobster and no alien species. The wider visual context includes close fringing	High- very high/ very high The outer parts of the harbour area moderately exposed and so this area has high levels of resilience to non-natural sounds. Inshore, the unit has less resilience

38

Unit identifier & rank	Location	NCI	Summary description Contributing values	Experience[27]: Visual- within unit- on the surface and underwater/ Visual – wider environmental context/ Anthropogenic light	Experience Sound/ Odour, Taste, Feel
			human-mediated hydrological or geomorphological changes. The few human structures are associated with the old whaling station and in this unit primarily include the old slipway. Indigenous benthic cover with very few alien species.	coastal faces, steep rocky cliffs and hill-slopes with a mosaic of kanuka and mixed broadleaved native forest, and native shrubland with flax and grasses. This includes units 14/04 (HNC, 0.45); 14/05 (HNC, 0.60), 14/01 (HNC, 0.44), 13/19 (HNC, 0.54) and 13/18 (HNC, 0.48), 13/15 (HNC, 0.49). At the entrance are two ONC units based on rocky islands (13/16, ONC, 0.66; 13/17, ONC, 0.80). There is no or a very low level of anthropogenic light related to the use of boat cabin and anchor lights at night. There are no shore based sources of anthropogenic light	to non-natural sounds with primarily vessel/ dinghy motor noise being the non-natural sounds. Occasional local diesel odour is possible.

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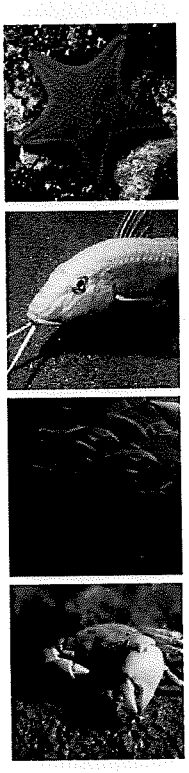
Area-based restrictions in the New Zealand marine environment



Department of Conservation

This report was prepared by Victoria A. Froude with maps by Roger Smith

December 2004

Department of Conservation
Te Papa Atawhai

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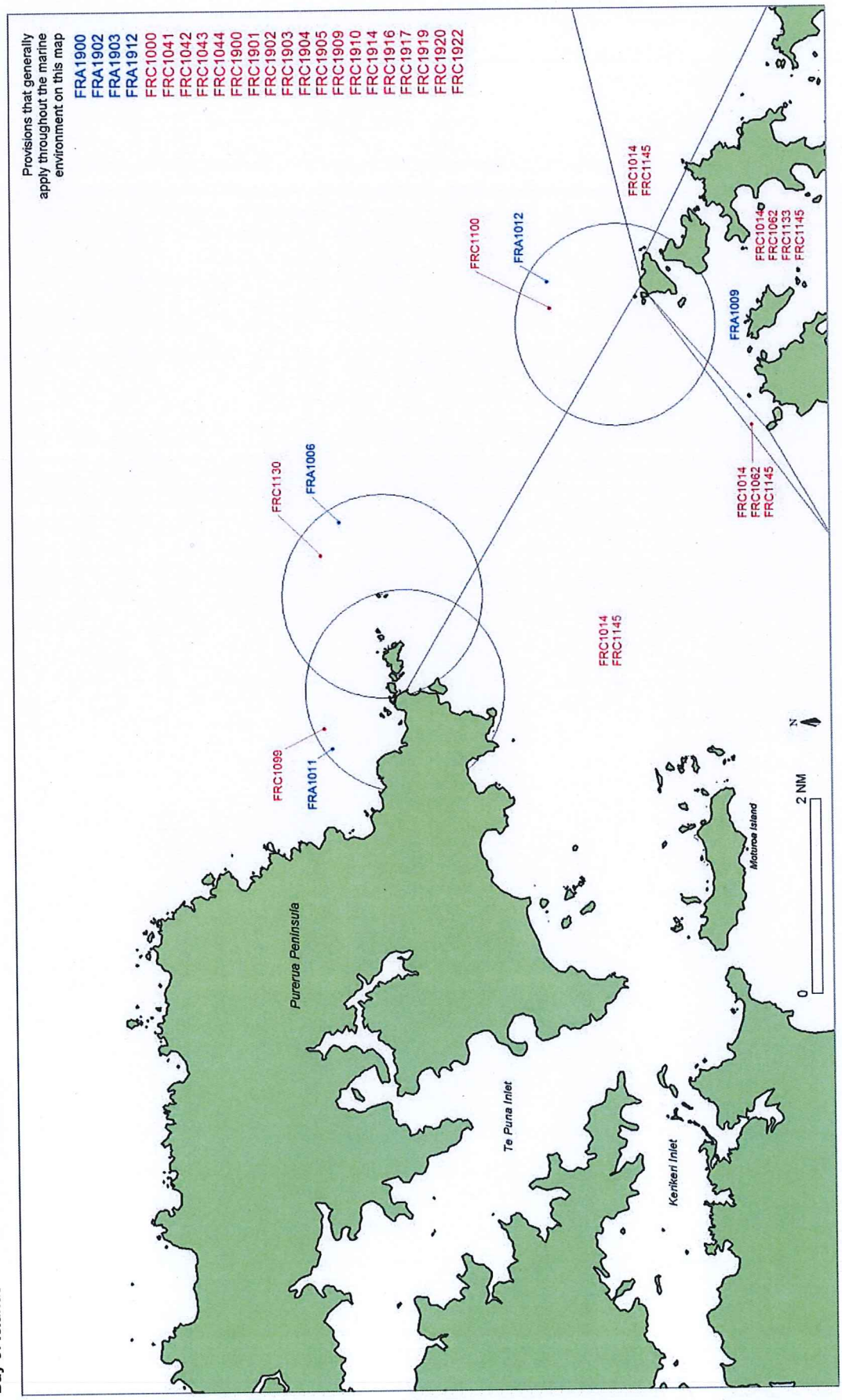
Bay of Islands – nothern outer headlands



These maps are a guide only and should not be relied upon for determining actual boundaries.

Bay of Islands northern outer headlands

Explanatory table for restrictive provisions as at February 2004

*Provisions that apply to part of the map**

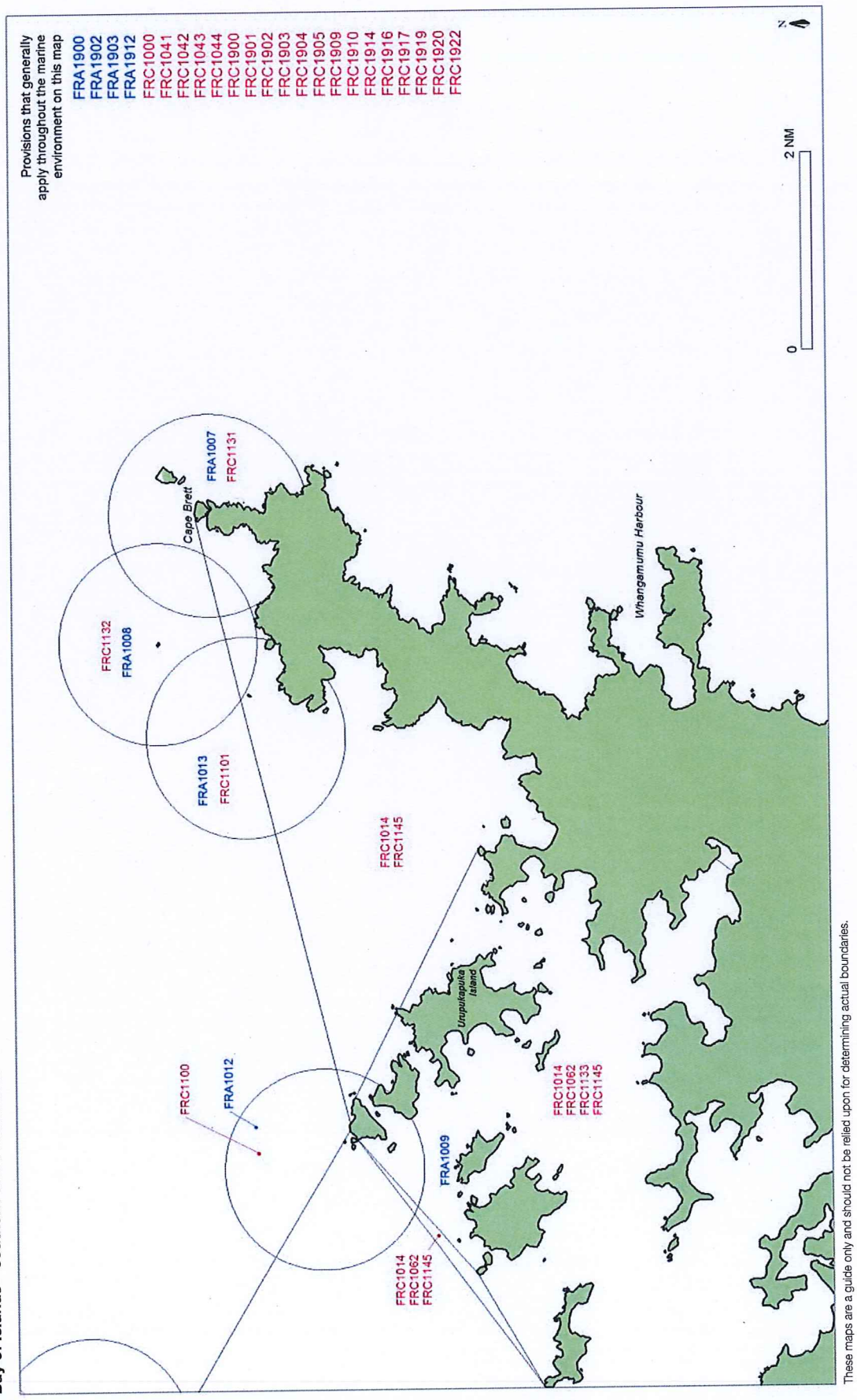
Code/category	Location or name	Description of restriction
FRA1006	Ninepin	No person shall use any net (amateur)
FRA1009	Bay of Islands	No person shall use or possess a set net or set line 1 October to 30 April inclusive except when nets are targeting grey mullet or flatfish
FRA1011	Bay of Islands – Cape Wiwiki	No person shall use any net (amateur)
FRA1012	Bay of Islands – Whale Rock	No person shall use any net (amateur)
FRC1014	Bay of Islands	No commercial fisher shall use any trawl or Danish seine net
FRC1062	Bay of Islands	No commercial fisher shall use for taking fish: a box or teichi net, purse seine, Dutch seine, trawl net, lampara net, or set nets >1000m total length
FRC1099	Bay of Islands – Cape Wiwiki	No commercial fisher shall use any set net
FRC1100	Bay of Islands – Whale Rock	No commercial fisher shall use any set net
FRC1130	Ninepin	No commercial fisher shall use any net
FRC1133	Bay of Islands	No commercial fisher shall take fish 1 October to 30 April. Rock lobster can be taken by pot under permit
FRC1145	Bay of Islands	No commercial fisher shall take any scallops

* There may be protected areas administered under the Reserves or Conservation Acts, where small portions lie within the intertidal.

Provisions that generally apply throughout the mapped area

FRA1900	Amateur maximum daily number of fish by species that can be taken or possessed by one person in any day
FRA1902	Amateur minimum mesh size for catching different species of fish
FRA1903	No person can take or possess snapper <27cm length (amateur)
FRA1912	No person shall take or possess spotted black grouper (amateur)
FRC1000	No commercial fisher shall use any New Zealand vessel >46m in length for trawling
FRC1041	No commercial fisher shall take any tuatua
FRC1042	No commercial fisher shall take any green lipped mussels
FRC1043	No commercial fisher shall take any cockles
FRC1044	No commercial fisher shall take any pipis
FRC1900	No commercial fisher shall use a trawl net <125mm in the cod end for taking fish, unless authorised to do so by a fishing permit
FRC1901	No commercial fisher shall use any set, trawl, Danish seine, purse, lampara or drag net or dredge to take fish or aquatic life unless authorised in a fishing permit
FRC1902	No commercial fisher shall take paddle crabs, octopus or hagfish other than by a pot unless the method is authorised by a fishing permit. If authorised to take paddle crabs by set net the mesh is to be at least 200mm
FRC1903	A commercial fisher may take anchovies, pilchards, or saury by a net with a mesh at least 25mm. No lampara or seine nets may be used
FRC1904	No commercial fisher may take green lipped mussel spat
FRC1905	Commercial fishing minimum mesh size by species fished
FRC1909	No commercial fisher shall use a drag net with a mesh <125mm to take snapper
FRC1910	No commercial fisher shall use a set net with a mesh <125mm to take snapper, trevally or rig
FRC1914	No commercial fisher shall take or possess any spotted black grouper
FRC1916	No commercial fisher shall take any shortbill spearfish or sailfish
FRC1917	No person shall sell or possess the following fish species taken from the Auckland FMA: banded wrasse; black angelfish; butterfly perch; giant boarfish; green wrasse; kelpfish; long finned boarfish; marble fish; notch headed marble fish; painted moki; red moki; red mullet; red pigfish; rock cod; Sandaggers wrasse; scarlet wrasse; silver drummer; splendid perch; toadstool grouper
FRC1919	Scallops can only be harvested 6am-6pm (commercial)
FRC1920	Maximum daily weight limits for a commercial fisher for tuatua, cockles, pipi, and mussels
FRC1922	No commercial fisher shall take kina for sale except by hand harvest

Bay of Islands – southern outer headlands



These maps are a guide only and should not be relied upon for determining actual boundaries.

Bay of Islands southern outer headlands

Explanatory table for restrictive provisions as at February 2004

*Provisions that apply to part of the map**

Code/category	Location or name	Description of restriction
FRA1007	Cape Brett	No person shall use any net (amateur)
FRA1008	Bird Rock	No person shall use any net (amateur)
FRA1009	Bay of Islands	No person shall use or possess a set net or set line between 1 October to 30 April inclusive except when nets are targeting grey mullet or flatfish
FRA1012	Bay of Islands – Whale Rock	No person shall use any set net (amateur)
FRA1013	Bay of Islands – Twins Rock	No person shall use any set net (amateur)
FRC1014	Bay of Islands	No commercial fisher shall use any trawl or Danish seine net
FRC1062	Bay of Islands	No commercial fisher shall use for taking fish: a box or teichi net, purse seine, Dutch seine, trawl net, lampara net, or set nets >1000m total length
FRC1100	Bay of Islands-Whale Rock	No commercial fisher shall use any set net
FRC1101	Bay of Islands – Twins Rock	No commercial fisher shall use any set net
FRC1131	Bay of Islands – Cape Brett	No commercial fisher shall use any net
FRC1132	Bay of Islands – Bird Rock	No commercial fisher shall use any net
FRC1133	Bay of Islands	No commercial fisher shall take fish 1 October to 30 April. Rock lobster can be taken by potting under permit
FRC1145	Bay of Islands	No commercial fisher shall take any scallops

* There may be protected areas administered under the Reserves or Conservation Acts, where small portions lie within the intertidal.

Provisions that generally apply throughout the mapped area

FRA1900	Amateur maximum daily number of fish by species that can be taken or possessed by one person in any day
FRA1902	Amateur minimum mesh size for catching different species of fish
FRA1903	No person can take or possess snapper <27cm length (amateur)
FRA1912	No person shall take or possess spotted black grouper (amateur)
FRC1000	No commercial fisher shall use any New Zealand vessel >46m in length for trawling
FRC1041	No commercial fisher shall take any tuatua
FRC1042	No commercial fisher shall take any green lipped mussels
FRC1043	No commercial fisher shall take any cockles
FRC1044	No commercial fisher shall take any pipis
FRC1900	No commercial fisher shall use any trawl net <125mm in the cod end for taking fish, unless authorised to do so by a fishing permit
FRC1901	No commercial fisher shall use any set, trawl, Danish seine, purse, lampara or drag net or dredge to take fish or aquatic life unless authorised in a fishing permit
FRC1902	No commercial fisher shall take paddle crabs, octopus or hagfish other than by a pot unless the method is authorised by a fishing permit. If authorised to take paddle crabs by set net the mesh is to be at least 200mm
FRC1903	A commercial fisher may take anchovies, pilchards, or saury by a net with a mesh at least 25mm. No lampara or seine nets may be used
FRC1904	No commercial fisher may take green lipped mussel spat
FRC1905	Commercial fishing minimum mesh size by species fished
FRC1909	No commercial fisher shall use a drag net with a mesh <125mm to take snapper
FRC1910	No commercial fisher shall use a set net with a mesh <125mm to take snapper, trevally or rig
FRC1914	No commercial fisher shall take or possess any spotted black grouper
FRC1916	No commercial fisher shall take any shortbill spearfish or sailfish
FRC1917	No person shall sell or possess the following fish species taken from the Auckland FMA: banded wrasse; black angelfish; butterfly perch; giant boarfish; green wrasse; kelpfish; long finned boarfish; marble fish; notch headed marble fish; painted moki; red moki; red mullet; red pigfish; rock cod; Sandaggers wrasse; scarlet wrasse; silver drummer; splendid perch; toadstool grouper
FRC1919	Scallops can only be harvested 6am-6pm (commercial)
FRC1920	Maximum daily weight limits for a commercial fisher for tuatua, cockles, pipi, and mussels
FRC1922	No commercial fisher shall take kina for sale except by hand harvest

Whangaruru Harbour

These maps are a guide only and should not be relied upon for determining actual boundaries.

Whangaruru Harbour

Explanatory table for restrictive provisions as at February 2004

*Provisions that apply to part of the map**

Code/category	Location or name	Description of restriction
FRA1909	Part Whangaruru Harbour	No person who is not a Maori shall take oysters
FRC1015	Whangaruru Harbour	No commercial fisher shall use any trawl or Danish seine net
FRC1064	Whangaruru Harbour	No commercial fisher shall use for taking fish: a box or teichi net, purse seine, Dutch seine, trawl net, lampara net, or set nets >1000m total length
FRC1146	Whangaruru Harbour	No commercial fisher shall take any scallops

* There may be protected areas administered under the Reserves or Conservation Acts, where small portions lie within the intertidal.

Provisions that generally apply throughout the mapped area

FRA1900	Amateur maximum daily number of fish by species that can be taken or possessed by one person in any day
FRA1902	Amateur minimum mesh size for catching different species of fish
FRA1903	No person can take or possess snapper <27cm length (amateur)
FRA1912	No person shall take or possess spotted black grouper (amateur)
FRC1000	No commercial fisher shall use any New Zealand vessel >46m in length for trawling
FRC1041	No commercial fisher shall take any tuatua
FRC1042	No commercial fisher shall take any green lipped mussels
FRC1043	No commercial fisher shall take any cockles
FRC1044	No commercial fisher shall take any pipis
FRC1901	No commercial fisher shall use any set, trawl, Danish seine, purse, lampara or drag net or dredge to take fish or aquatic life unless authorised in a fishing permit
FRC1902	No commercial fisher shall take paddle crabs, octopus or hagfish other than by a pot unless the method is authorised by a fishing permit. If authorised to take paddle crabs by set net, the mesh is to be at least 200mm
FRC1903	A commercial fisher may take anchovies, pilchards, or saury by a net with a mesh at least 25mm. No lampara or seine nets may be used
FRC1904	No commercial fisher may take green lipped mussel spat
FRC1905	Commercial fishing minimum mesh size by species fished
FRC1909	No commercial fisher shall use a drag net with a mesh <125mm to take snapper
FRC1910	No commercial fisher shall use a set net with a mesh <125mm to take snapper, trevally or rig
FRC1914	No commercial fisher shall take or possess any spotted black grouper
FRC1916	No commercial fisher shall take any shortbill spearfish or sailfish
FRC1917	No person shall sell or possess the following fish species taken from the Auckland FMA: banded wrasse; black angelfish; butterfly perch; giant boarfish; green wrasse; kelpfish; long finned boarfish; marble fish; notch headed marble fish; painted moki; red moki; red mullet; red pigfish; rock cod; Sandaggers wrasse; scarlet wrasse; silver drummer; splendid perch; toadstool grouper
FRC1919	Scallops can only be harvested 6am-6pm (commercial)
FRC1920	Maximum daily weight limits for a commercial fisher for tuatua, cockles, pipi, and mussels
FRC1922	No commercial fisher shall take kina for sale except by hand harvest

Mimiwhangata

These maps are a guide only and should not be relied upon for determining actual boundaries.

Mimiwhangata

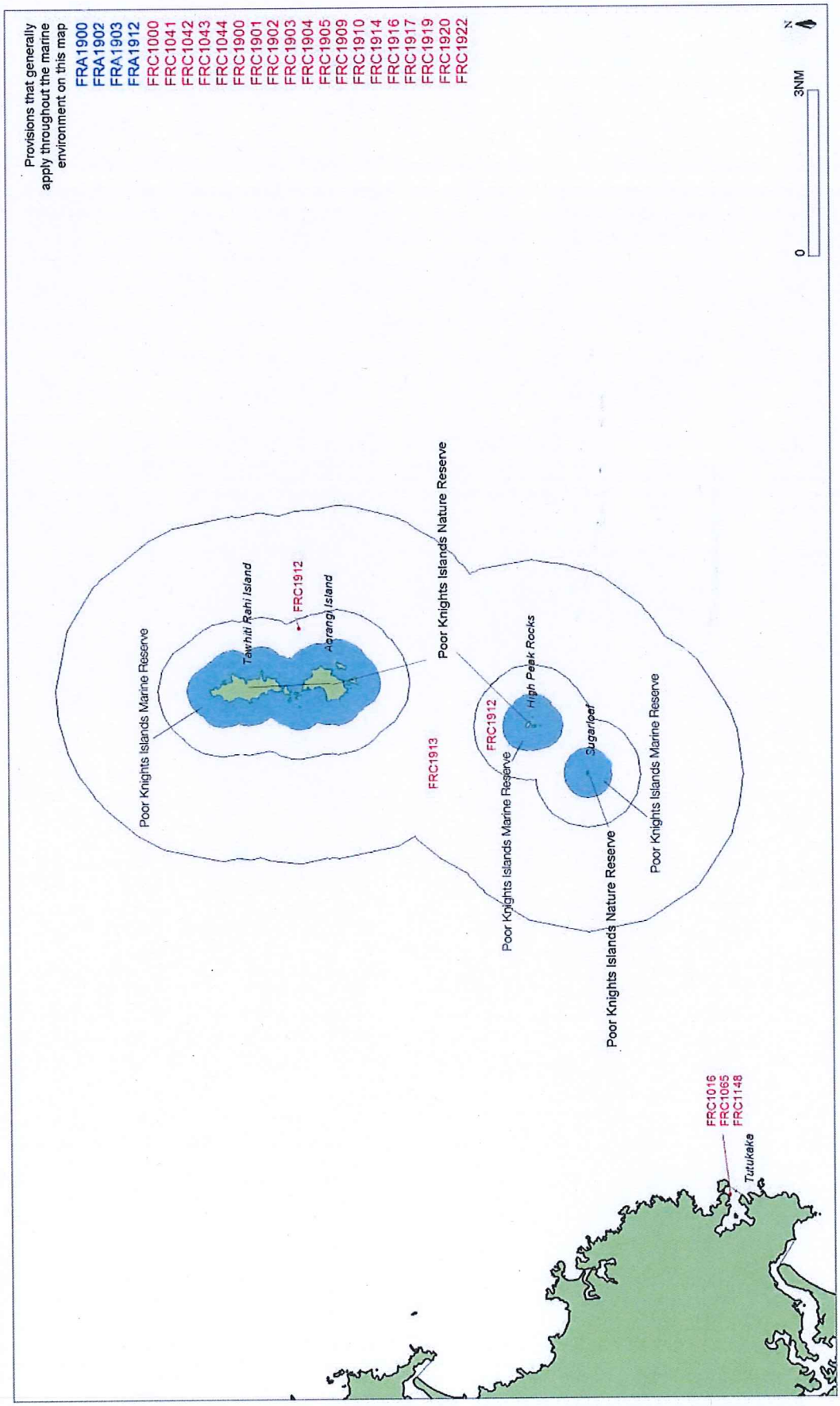
*Provisions that apply to part of the map**

Code/category	Location or name	Description of restriction
FRA1002	Mimiwhangata	Barracouta, billfish, blue maomao, flounder, garfish, green mussel, gurnard,kahawai, kina. kingfish,,mackerel, rock lobster, scallops, shark, snapper, tarakihi, trevally, tuatua, tuna, and yellow-eyed mullet may be harvested using lines with a maximum of 1 hook; trolling, spears, hand gathering or pots (max 1 per vessel) (amateur)
FRC1175	Mimiwhangata	No commercial fisher shall take or possess fish or seaweed by any method
Marine park	Mimiwhangata Peninsula	See FRA1002, FRC1175

* There may be protected areas administered under the Reserves or Conservation Acts, where small portions lie within the intertidal.

Provisions that generally apply throughout the mapped area

FRA1900	Amateur maximum daily number of fish by species that can be taken or possessed by one person in any day
FRA1902	Amateur minimum mesh size for catching different species of fish
FRA1903	No person can take or possess snapper <27cm length (amateur)
FRA1912	No person shall take or possess spotted black grouper (amateur)
FRC1000	No commercial fisher shall use any New Zealand vessel >46m in length for trawling
FRC1041	No commercial fisher shall take any tuatua
FRC1042	No commercial fisher shall take any green lipped mussels
FRC1043	No commercial fisher shall take any cockles
FRC1044	No commercial fisher shall take any pipis
FRC1900	No commercial fisher shall use any trawl net <125mm in the cod end for taking fish, unless authorised to do so by a fishing permit
FRC1901	No commercial fisher shall use any set, trawl, Danish seine, purse, lampara or drag net or dredge to take fish or aquatic life unless authorised in a fishing permit
FRC1902	No commercial fisher shall take paddle crabs, octopus or hagfish other than by a pot unless the method is authorised by a fishing permit. If authorised to take paddle crabs by set net the mesh is to be at least 200mm
FRC1903	A commercial fisher may take anchovies, pilchards, or saury by a net with a mesh at least 25mm. No lampara or seine nets may be used
FRC1904	No commercial fisher may take green lipped mussel spat
FRC1905	Commercial fishing minimum mesh size by species fished
FRC1909	No commercial fisher shall use a drag net with a mesh <125mm to take snapper
FRC1910	No commercial fisher shall use a set net with a mesh <125mm to take snapper, trevally or rig
FRC1914	No commercial fisher shall take or possess any spotted black grouper
FRC1916	No commercial fisher shall take any shortbill spearfish or sailfish
FRC1917	No person shall sell or possess the following fish species taken from the Auckland FMA: banded wrasse; black angelfish; butterfly perch; giant boarfish; green wrasse; kelpfish; long finned boarfish; marble fish; notch headed marble fish; painted moki; red moki; red mullet; red pigfish; rock cod; Sandaggers wrasse; scarlet wrasse; silver drummer; splendid perch; toadstool grouper
FRC1919	Scallops can only be harvested 6am-6pm (commercial)
FRC1920	Maximum daily weight limits for a commercial fisher for tuatua, cockles, pipi, and mussels
FRC1922	No commercial fisher shall take kina for sale except by hand harvest



Poor Knights Islands

Poor Knights Islands

Explanatory table for restrictive provisions as at February 2004

Provisions that apply to part of the map

Code/category	Location or name	Description of restriction
FRC1016	Tutukaka Harbour	No commercial fisher shall use any trawl or Danish seine net
FRC1065	Tutukaka Harbour	No commercial fisher shall use for taking fish: a box or teichi net, purse seine, Dutch seine, trawl net, lampara net, or set nets >1000m total length
FRC1148	Tutukaka Harbour	No commercial fisher shall take any scallops
FRC1912	Edge marine reserve to 1NM around Poor Knights Islands	No commercial fisher shall take or possess finfish
FRC1913	1NM-3NM around Poor Knights Islands	No commercial fisher shall take or possess finfish except by longlines
Marine reserve	Poor Knights Islands	See Table 1
Nature reserve	Poor Knights Islands – intertidal #	See Table 1

Map shows general location of this provision rather than exact boundaries because the areas concerned are small relative to the scale of the completed map. This provision may straddle MHW (mean high water) and so may only partly lie in the marine environment.

Provisions that generally apply throughout the mapped area

FRA1900	Amateur maximum daily number of fish by species that can be taken or possessed by one person in any day
FRA1902	Amateur minimum mesh size for catching different species of fish
FRA1903	No person can take or possess snapper <27cm length (amateur)
FRA1912	No person shall take or possess spotted black grouper (amateur)
FRC1000	No commercial fisher shall use any New Zealand vessel >46m in length for trawling
FRC1041	No commercial fisher shall take any tuatua
FRC1042	No commercial fisher shall take any green lipped mussels
FRC1043	No commercial fisher shall take any cockles
FRC1044	No commercial fisher shall take any pipis
FRC1900	No commercial fisher shall use any trawl net <125mm in the cod end for taking fish, unless authorised to do so by a fishing permit
FRC1901	No commercial fisher shall use any set, trawl, Danish seine, purse, lampara or drag net or dredge to take fish or aquatic life unless authorised in a fishing permit
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FRC1903	A commercial fisher may take anchovies, pilchards, or saury by a net with a mesh at least 25mm. No lampara or seine nets may be used
FRC1904	No commercial fisher may take green lipped mussel spat
FRC1905	Commercial fishing minimum mesh size by species fished
FRC1909	No commercial fisher shall use a drag net with a mesh <125mm to take snapper
FRC1910	No commercial fisher shall use a set net with a mesh <125mm to take snapper, trevally or rig
FRC1914	No commercial fisher shall take or possess any spotted black grouper
FRC1916	No commercial fisher shall take any shortbill spearfish or sailfish
FRC1917	No person shall sell or possess the following fish species taken from the Auckland FMA: banded wrasse; black angelfish; butterfly perch; giant boarfish; green wrasse; kelpfish; long finned boarfish; marble fish; notch headed marble fish; painted moki; red moki; red mullet; red pigfish; rock cod; Sandaggers wrasse; scarlet wrasse; silver drummer; splendid perch; toadstool grouper
FRC1919	Scallops can only be harvested 6am-6pm (commercial)
FRC1920	Maximum daily weight limits for a commercial fisher for tuatua, cockles, pipi, and mussels
FRC1922	No commercial fisher shall take kina for sale except by hand harvest