BEFORE THE HEARINGS PANEL

IN THE MATTER of the Resource Management Act 1991 (**RMA**

AND

IN THE MATTER of the Proposed Waikato Regional Coastal Plan, a proposed regional plan under Part 1 of Schedule 1 to the RMA.

STATEMENT OF EVIDENCE OF DR MICHAEL TOWNSEND

ON BEHALF OF WAIKATO REGIONAL COUNCIL

24 JANUARY 2025

INTRODUCTION

1. My full name is Dr Michael Townsend.

2. I hold a Bachelor of Science degree with honours in Oceanography with Marine Biology from the University of Southampton, UK (2001) and a PhD in Environmental Economics and Management from the University of York, UK (2007); which focused on the ecosystem functioning of marine benthic fauna.

3. I have 20 years' experience in marine ecological research. I was a research scientist/senior scientist at NIWA between 2007 and 2018 in the Marine Ecology Group where I specialised in benthic ecology. I joined Waikato Regional Council in July 2018 and am currently the Team Leader for Coastal and Marine Science. I am an honorary lecturer at the University of Waikato where I contribute to several papers. I have lived in the Waikato since 2006 and spent many hundreds of hours in its coastal and marine environment including diving and freediving. I have walked hundreds of kilometres across Coromandel estuaries and observed changes in habitat distributions over the years.

4. My expertise includes ecological monitoring, ecosystem functioning, ecosystem goods and services and biosecurity in marine systems. Much of my research and experience has focused on estuaries and the shallow coastal environment.

5. I have co-authored 36 scientific journal articles, 2 book chapters, and over 40 technical reports. I was an invited plenary speaker at the North Pacific Marine Science Organisation (PICES) conference in Busan, South Korea in 2022. I have been on technical advisory groups associated with the Hauraki Gulf including: MPI Hauraki Gulf Biodiversity Spatial Planning Advisory Group (HG-BSPAG) and the MPI and Sustainable Seas Ecosystem-Based Fisheries Management (EBFM) Indicator development. I am part of the FNZ-DOC-Regional Council kina barrens working group, and the DOC Research Plan working group and the Monitoring and Reporting working group for the Hauraki Gulf. I was a peer reviewer for the State of Our Gulf report in 2020 and 2023 and am currently a peer-reviewer for the MfE National Estuaries Monitoring Protocol (NEMP) update. I led the development of ANZECC Guidance for Estuary Sedimentation for MfE in 2015 and was part of the team that developed the Estuary Health module for Land Air Water Aotearoa (LAWA). Of relevance to my evidence and familiarity with the Waikato coastal and marine environment are:

- Bulmer RH, Stephenson F, Jones HF, Townsend M, Hillman JR, Schwendenmann L, Lundquist CJ 2020. Blue carbon stocks and cross-habitat subsidies. Frontiers in Marine Science 7:380
- Jones HF, Hunt S, Kamke J, Townsend M 2022. Historical data provides context for recent monitoring and demonstrates 100 years of declining estuarine health. New Zealand Journal of Marine and Freshwater Research 56(3): 371-88.
- Needham H, Townsend M, Hewitt J, Hailes S 2013. Intertidal habitat mapping for ecosystem goods and services: Waikato estuaries. Waikato Regional Council Technical Report 2013/52
- Townsend M, Lohrer AM 2019. Empirical validation of an ecosystem service map developed from ecological principles and biophysical parameters. Frontiers in Marine Science 6:21.

6. I confirm that I have read and am familiar with the Code of Conduct for Expert Witnesses as set out in the Environment Court Practice Note 2014. I agree to comply with the Code.

7. Except where I state that I am relying upon the specified evidence or advice of another person, my evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

8. I attended expert conferencing on the Ecosystems and Indigenous Biodiversity on 26 November 2024 as recorded in the Ecosystems and Indigenous Biodiversity joint witness statement (JWS).

SCOPE OF EVIDENCE

9. The purpose of this rebuttal statement of evidence, on behalf of Waikato Regional Council (WRC) as the proponent to the Proposed Waikato Regional Coastal Plan (proposed plan), is to respond to matters raised in submitter evidence in relation to Ecosystems and Indigenous Biodiversity. In doing so I also respond to certain matters raised at expert conferencing.

10. The matters that my rebuttal evidence addresses are:

- Mangrove seedling removal in SIBA-A under ECO-P8 and ECO-R8.
- Amendments to SIBA-A and SIBA-B in Schedule 7:
  - The decline of seagrass in Whitianga Harbour and adjustment of SIBA-A24, including addition of bittern and banded rail habitat.
  - New habitat information for East coast estuaries to provide improved SIBA demarcation.
  - *Galeolaria Hystrix* and the appropriate SIBA status.
- SIBA layer development and consideration of the effects of aquaculture farms or other activities.

11. I support the revised section 42A approach which provides for mangrove seedling removal in SIBA-A where clearance of seedlings or mature mangroves has previously been authorised by a resource consent, or where mature mangroves are not present (ECO-P8 and ECO-R8), as opposed to having 'never been present'.

12. I support the update of SIBA-A and SIBA-B layers in Schedule 7A and 7B, with available contemporary information. This will provide the most accurate, effective and efficient starting point for the regional coastal plan.

13. I support SIBA-B containing *Galeolaria hystrix* reef being reclassified as SIBA-A. This is consistent with the recommendations of Dr Shane Kelly for Moturua (Rabbit Island) but has consequence for other islands on the Coromandel west coast within SIBA B19 (Hautapu group), B17 and B16. The evidence that I have responded to in relation to these matters is from:

a. Helen Anne Kettles (Mangrove Management) on behalf of the Minister of Conservation. 8 November 2024.

b. Simon Andrew West on behalf of Hopper Developments Limited. 8 November 2024.

c. Shane Kelly on behalf of Environmental Defence Society Incorporated. 8 November 2024.

d. David Ian Taylor in support of the submissions of Coromandel Marine Farmers' Association Incorporated and Aquaculture New Zealand. 8 November 2024.

SUMMARY

14. My rebuttal evidence addresses four key areas:

- It is appropriate to remove mangrove seedlings from SIBA-As under ECO-P8 and ECO-R8 as a permitted activity. Mangroves have ecological value and support a range of ecosystem services, but they have expanded significantly in Waikato estuaries. They are now expanding into other important habitats including seagrass and saltmarsh that have high, or in some cases higher, value that underpin SIBA-A designation. The removal of seedlings, in comparison to mature mangroves, has minimal effect on the environment and is appropriate for all estuary types. Consenting pathways come with a significant time and cost burden which is not consistent with this level of effects. Mangrove patches typically extend up the foreshore to the landward edge of the coastal marine area. Seedling management will not be the primary limitation for landward mangrove migration over the ten-year life of the plan.

- Information generated since the development of Schedule 7 has been used to improve the accuracy of SIBA in estuaries. The biggest changes stem from new intertidal seagrass data that affects several SIBA-A. This includes the removal of SIBA A-24 patches from Whitianga Harbour in the Whangamaroro River embayment near Robinson Road following expert conferencing (refer section 3.1.3.2 of the JWS).

- Observations on the biogenic habitat quality of *G. hystrix* in terms of relief, complexity and biodiversity support, in addition to this species being at the the limits of its natural range, trigger SIBA-A status and the updating of SIBA-B areas containing *G. hystrix* to SIBA-A. The extension of the SIBA boundary around Moturua (Rabbit Island) and conversion to SIBA-A is appropriate to safeguard *Galeolaria hystrix* and other ecological features in this location. It is important to consider that *G. hystrix* reef is a recent discovery in the Waikato, circa 2020, and can be considered regionally rare. Prior to this, large colonies had not been found north of the Marlborough Sounds and were only known to occur there and Rakiura/Stewart Island.

- The application of the SIBA methodology and the demarcation of SIBA-A and SIBA-B does not explicitly consider the effects of managed activities. It should not be assumed that the current

existing activities within either SIBA-B or SIBA-A have no impact on those SIBA values. Determination of impacts on the receiving environment and associated values should stem from robust consent surveying / monitoring and knowledge of the possible effects of an activity.

MANGROVE SEEDLING REMOVAL IN SIBA-A AREAS UNDER ECO-P8 AND ECO-R8

15. I support the revised section 42A approach and amended wording of ECO-P8 and ECO-R8 that provides for mangrove seedling removal in SIBA-A, where clearance of seedlings or mature mangroves has previously been authorised by a resource consent or where mature mangroves are not present. To outline why I hold this position I cover: changes in mangrove distribution over the last 80 years in the Waikato with a specific focus on changes between 2013-2023; habitats impacted by mangrove expansion; SIBA-A areas within estuaries; key guidance on mangrove management via seedling removal and its effects; and the appropriateness of a permitted activity status over the 10-year life of the plan.

MANGROVE EXPANSION IN WAIKATO ESTUARIES

16. Mangroves are present in all major Coromandel estuaries on the east coast of the Waikato and in the larger estuaries on the west coast (Whāingaroa, Aotea and Kawhia harbours). Kawhia Harbour (38°05′S) is the current limit of the southern extent of mangroves on the west coast. A lone mangrove was observed in Port Waikato in 2011 (Graeme 2014); it is unclear if this is still present. The west coastal tidal river estuaries of Marokopa, Awakino and Mokau, are the only large estuaries without mangroves in the Waikato.

17. Mangroves have substantially increased in area over the last 80 years in the Waikato[1]. Changes in mangrove extent between 1944 and 2017 were quantified through the digitisation of vegetation coverage from historic, orthorectified aerial photographs and Waikato Regional Aerial Photography Service (WRAPS) in several estuaries in the Waikato (Jones et. al. 2022). Summarised below:

[1] In point 24 of her evidence, Helen Kettles states that "*the main phase of mangrove expansion was in the mid-later 1800's and mangrove forest development was largely complete by the early 1900s (Swales et al. 2020)*". This is not correct for the Waikato region, nor does the cited reference appear to support this statement. Additionally in point 34 she states that "Mangroves are one of the most productive ecosystems in the world", this statement is true but is misapplied in the context of temperate, intertidal mangroves. Statements like this are typically from assessments of tropical mangroves. See the review by Morrisey et al. (2010).

18. In the Firth of Thames, mangrove extent expanded from 298 ha in 1944 to 1,476 ha in 2017. In 1944 mangroves occupied just 20% of the area recorded in 2017. Rapid expansion started in the late 1960s and continued through the 1970s and 1980s. In Coromandel Harbour, mangrove extent was 15 ha in 1944 and expanded to 83 ha by 2017. In 1944 mangroves occupied 18% of the 2017 area, with rapid expansion occurring from the 1970s and 1980s onwards. In Tairua Harbour, mangroves increased in extent from 1.6 ha in 1944 to 29 ha by 2017. In 1944 mangroves occupied just 6% of the 2017 area with rapid expansion occurring mostly from the 1980s to 2000s. The maximum recorded mangrove extent occurred in 2012, reducing subsequently due to consented and unconsented removal. Mangrove extent in Whāingaroa Harbour expanded from 0.05 ha in 1944, consisting of only about a dozen trees, to 36 ha by 2017. Rapid mangrove expansion only occurred from the 1980s and 1990s onwards. Jones et al. (2017) noted that the timing of rapid mangrove expansion in the Waikato coincides with a period of growth and intensification of pastoral farming, particularly in livestock numbers and the introduction and application of chemical fertilisers.

Figure 1: Figure 4 from Jones et al. (2002) shows mangrove habitat expansion in Waikato estuaries between 1944 and 2017.

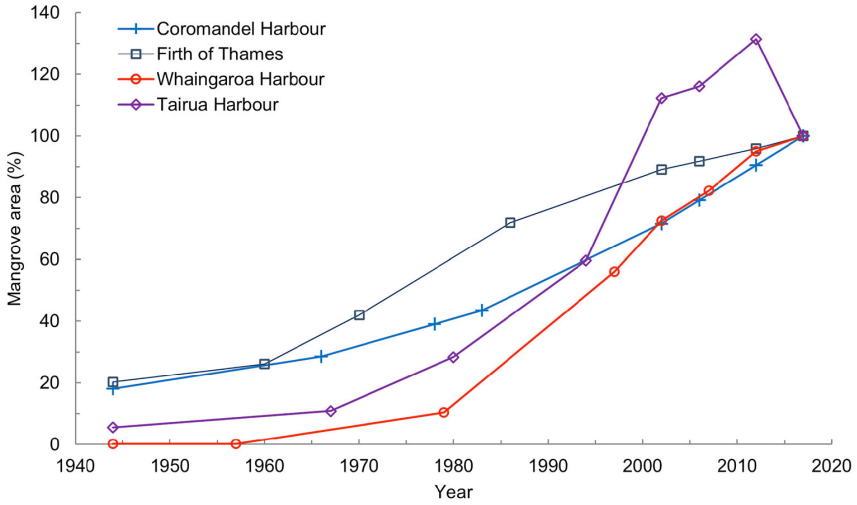


Figure 4. Mangrove area in four Waikato region estuaries between 1944 and 2017 (blue crosses = Coromandel Harbour, dark blue squares = Firth of Thames, red circles = Whāingaroa Harbour, purple diamonds = Tairua Harbour). Note that, for each estuary, mangrove area is calculated as a percentage of total mangrove area in that estuary in 2017.

19. Changes in mangrove extent were documented for Coromandel estuaries between 2013 and 2023 from the habitat mapping efforts of Needham et al. (2013) and Lam-Gordillo et al. (2023). The methodology involved digitisation of mangroves from aerial photos and ground-truthed

demarcation of habitat patch boundaries. In these studies, habitat classification could not always differentiate between mangroves and saltmarsh in certain estuaries.

20. Comparison of results between 2013 and 2023 for estuaries where consented large-scale mangrove removal had not occurred (i.e., excluding Whangamata and Tairua), showed a median increase in mangrove extent of 10%. The largest changes occurred in Whangapoua Estuary, with an increase of 39 ha over ten years. Smaller estuaries in northern Coromandel observed smaller increases in extent by comparison, but these represented large percentage changes. For example, in Waikawau Bay there was a 109% increase (from 1.8 ha to 3.7 ha) and for Kennedy Bay a 56% increase (7.4 ha to 11.5 ha) in mangrove extent over ten years (See Appendix 1 for further details).

21. In summary, mangrove expansion has been substantial over the last century; notably in the last 50 years. Conservatively, mangrove expansion in the 14 Coromandel estuaries studied has equated to approximately 6.6 ha per year (based on 2013 to 2023 data).

HABITAT CHANGES IN COROMANDEL ESTUARIES

22. Mangrove expansion in Coromandel estuaries has predominantly been on the seaward fringe of existing stands, or in natural clearings within or between existing stands, typically in upper estuarine sections. The habitat most often 'replaced' has been 'high densities burrows' i.e., mud crabs. This is not a replacement in a strict sense, rather that mangroves have expanded to become the habitat defining characteristic, with mud crabs co-existing as part of the community of organisms present under the vegetation.

23. However, there are locations where seagrass and saltmarsh habitat have been colonised and replaced (or is in the process of being replaced) by mangroves, notably the western shore[2] of Whangapoua Estuary (See Appendix 2, Figures 5-8). In several Coromandel estuaries, seagrass is immediately adjacent to mangrove habitat (e.g. Whangapoua, Manaia, Coromandel Harbour, Tairua and historically in Whangamata and Wharekawa). In all estuaries in the Coromandel where mangroves are found, there are patches that adjoin saltmarsh.

24. Seagrass (at Risk – Declining) and saltmarsh are both important estuarine habitats providing multiple ecosystem services (Geange et al. 2019). Salt marshes are highly productive biogenic

[2] Despite an overall increase in extent for seagrass in this estuary.

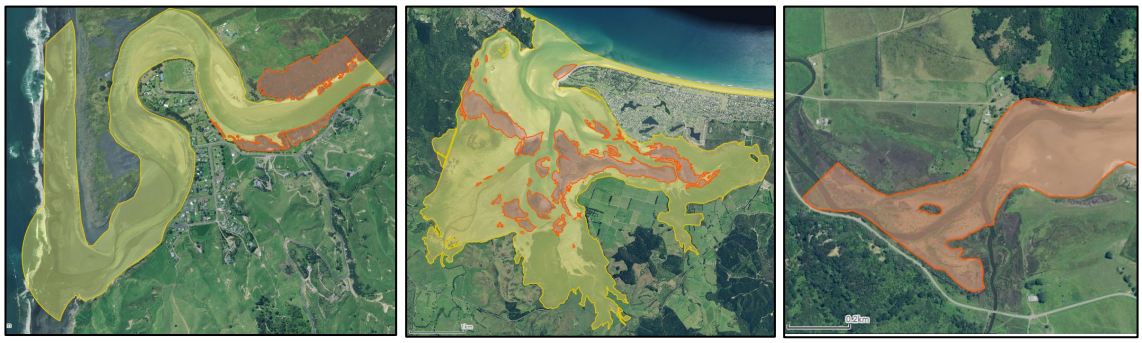
habitats that support biodiverse communities including threatened or at-risk plant and animal species (Berthelsen and Alder, 2024). They provide physical functions including shoreline protection and improving water quality by trapping sediments and pollutants. They contribute to nutrient cycling processes and sequester carbon dioxide, mitigating climate change by storing carbon in plant biomass and sediments. Similarly, seagrass is a key component of shallow coastal ecosystems that provide a range of ecosystem functions, including the cycling and storage of carbon and nutrients (Bulmer et al. 2018).

25. Across Coromandel estuaries there has been a net loss of 89 ha of seagrass in the last 10 years, with the biggest decline occurring in Tairua (loss of 95.5 ha) and Wharekawa (loss of 36.6 ha), but with some growth in west coast Coromandel estuaries (see Appendix 1 for further detail). There are multiple interacting pressures on seagrass, with the major ones being water quality (sediment) and elevated temperature (e.g. heat wave events).

CHARACTERISTICS OF SIBA-A AREAS WITHIN ESTUARIES

26. There are several reasons for the designation of SIBA-A within estuaries: the presence of large areas of intertidal seagrass beds and shellfish beds that provide habitat and a key role in functioning; areas that support threatened and at-risk shore and wetland birds (such as saltmarsh). Additionally, entire estuaries have been designated SIBA-A, where they form part of larger natural ecological sequences or mosaics. These three types of estuarine SIBA-A could be impacted by further mangrove expansion. ECO-P8 and ECO-R8 would allow permitted removal of seedlings from the types of SIBA-A above providing certain rule standards can be met.

Figure 2: Examples of these SIBA-A within estuaries are shown below in Figure 1 for Marokopa (A1, left) that contains nationally significant saltmarsh supporting several threatened and at-risk shorebirds like reef herons, fernbirds and banded rail; Whangapoua Harbour with extensive intertidal seagrass meadows (A21, central) and Waikawau (A15, right) which is part of an extensive SIBA-A sequence on the northern Coromandel coastline. SIBA-A is red, SIBA-B is yellow.



MANGROVE MANAGEMENT – PERMITTED ACTIVITY OF SEEDLING REMOVAL

27. Mangrove expansion is a symptom of excessive nutrients and sediments entering estuaries. Holistic mangrove management must address both the symptom and underlying causes of mangrove expansion. This ultimately links back to the management of catchment activities and water quality. Mangrove expansion to date has likely prevented the onset of nuisance macroalgae that are common in estuaries with nutrient and sediment issues but lacking mangroves.

28. Research on mangrove removal from intertidal environments has investigated options in different types of environments and on different life stages of this vegetation. Consideration has been given to the effects on benthic ecology, sediment chemistry and physical processes, which has guided options for management (Stokes 2009, Lundquist et al. 2012, Bulmer et al. 2017). The Guidelines for Managing Mangroves (Mānawa) Expansion in New Zealand produced by NIWA (Lundquist et al. 2017) are an important resource for considering seedling removal as a permitted activity in SIBA-A and SIBA-B areas.

29. This guideline states that "seedling removal has minimal effect on the environment" and that it is "appropriate for all estuary types". These authors also note that seedling management should be conducted regularly to avoid re-establishment. This level of effects is consistent with a permitted activity and my own experience of removing seedlings in regions where it is a permitted activity. SIBA-A values are protected via the rule standards outlined in ECO-R7 which apply in the context of ECO-R8 (notably, 3. The activity will not disturb or damage areas of saltmarsh or seagrass).

30. In point 38. of her evidence, Helen Kettles notes that "The use of a permitted-activity rule limits the availability of information via consenting processes and monitoring. Having information will enable an informed assessment of the needs for seedling removal, to manage mangrove expansion in the face of uncertainty associated with climate change".

31. A consenting pathway comes with a significant burden in terms of time and cost to applicants. Lundquist et al. (2017) suggest the typical costs could be $12,000 for a non-notified consent. In conversation with WRC consent advisors a "near perfect" non-notified application would be a minimum of $5,000. Based on the level of effects, this seems unreasonable and would likely result in lower levels of uptake.

32. Given the scale of mangrove expansion (refer Appendix 1), there is already evidence to support an informed assessment on the needs for seedling removal. Enabling the control of further advancement of mangroves through seedling removal (sensu 'hold the line') in SIBA-A would support saltmarsh, seagrass and other non-vegetated intertidal habitats and the functions, services and values they provide. This is consistent with Helen Kettles' evidence point 28, where she states that "…mangrove habitat migration into saltmarsh is likely to accelerate (Lundquist & Swales 2024). This creates issues in places where saltmarsh habitats are deemed to hold more value". Mangroves do have significant ecological value, however, in the context of mangrove expansion it is important to consider the impacts on the reduction of other habitats. For example, Bulmer et al. (2020) studied blue carbon stocks in vegetated and unvegetated habitats in Tairua Harbour, measuring carbon in above ground vegetation and in the sediment (to 1m depth). Mangroves contained 46 tonnes of carbon per hectare, and Saltmarsh contained 90 tonnes of carbon per hectare.

33. While knowing where seedling removal activities are occurring would be of benefit, this information could be generated via connections between WRC's catchment management zones staff and community groups (who would likely undertake the activity at scales worth recording). Regular broadscale vegetation habitat mapping and its use under RMA section 35(B) effectiveness and efficiency monitoring and reporting will be the main determinant of the collective efficacy of policies and rules addressing mangrove management. This will inform both future policy and action needs.

34. The management of sea-level rise requires long-term planning and transformative adaptation. There are several instruments preparing for this, e.g. WRC's Climate Action Roadmap and Regional Climate Change Risk Assessment, and locally e.g., Hauraki District Council's Wharekawa Coast 2120 and Thames Coromandel District Council's Shoreline Management Pathways Project. The main impediment to mangrove migration shoreward is an absence of space. Mangrove patches often extend up to embankments separating the CMA from road infrastructure, farmland or native or exotic forest. In flatter, less modified areas, mangroves typically transition into saltmarsh (see Appendix 3). Thus, seedling management is not the primary limitation for landward mangrove migration over the ten-year life of the plan.

35. Despite the inherent context-specificity of estuaries, mangroves have expanded in all areas where they occur in the Waikato. The use of a permitted-activity rule is appropriate to manage seedling

removal within SIBA-A sites or embayments, and more broadly at the estuarine level over both short-term (seasons) and the long-term (the life of the plan).

FURTHER RECOMMENDED CHANGES TO THE SIGNIFICANT INDIGENOUS BIODIVERSITY AREAS A AND B MAP LAYER WHITIANGA SIBA A24

36. In point 2.2 of his evidence, Simon West identifies areas designated as SIBA-A (SIBA A24) in Whitianga Harbour that no longer have intertidal seagrass and recommends their removal from schedule 7A. I support this recommendation as recorded in section 3.1.3.2 of the JWS.

37. SIBA A24 utilised a 2013 composite dataset from the Department of Conservation from the Sea Change spatial planning process[3]. This dataset included vegetation surveys from WRC from 2009. Data from Needham et. al. (2013) found a reduction in the extent of seagrass 4 years later with it diminished to a single small area (See Appendix 4). Recently, Lam-Gordillo (2023) found that seagrass is absent in this part of Whitianga Harbour, which results in some of SIBA A24 no longer being appropriate.

38. The A24 SIBA value description included 'saltmarsh, and adjacent freshwater wetlands support resident populations of Australasian bittern (Threatened – Nationally Critical) and banded rail (At Risk – Declining)'. However, this wasn't reflected in the SIBA A24 demarcation, as information from Dowding (2019) on important bird habitat areas had been mistakenly omitted. This has been included in the recommended changes of A24 and captures a small area in the southern portion of Whitianga Harbour by the Whenuakite River.

AVAILABILITY OF CONTEMPORARY INFORMATION TO UPDATE ESTUARINE SIBAS

39. Information from Lam-Gordillo (2023) on estuarine habitats was unavailable at the time of the development of the coastal plan but has been used to update Schedule 7. This principally affects the size and shape of SIBA-A patches in estuaries from the updated seagrass distribution data and the use of additional shellfish distribution data. Seagrass has changed in the last 10 years (see Appendix 1 for further detail). For example, reductions of 95.6 ha and 36.6 ha in Tairua and

[3] SeaSketch - Better decisions through global participation

Wharekawa Harbour respectively and increases of 28.6 ha and 14.3 ha in Coromandel and Manaia Harbours respectively.

40. There is no comparable data set available to update the west coast estuaries.

SIBA AREAS WITH GALEOLARIA HYSTRIX

41. Following paragraph 7.18 of Dr Shane Kelly's evidence and 3.4.3.1 of the JWS, I support the extension of the SIBA boundary around Moturua (Rabbit Island), including Three Kings Islands, to 800m seaward from the indicative CMA line. This will improve the safeguarding of *Galeolaria hystrix* and other ecological features described in paragraph 7.18 of his evidence.

42. The features observed in the 91 underwater photos provided by Dr Kelly from this location show biogenic habitat with apparent high levels of relief (extending up into the water column) and complexity (different size and shaped spaces) supporting a range of benthic and pelagic taxa. In this regard, the biogenic features are consistent with the highest rank category from my research investigating biogenic habitat provision in the Hauraki Gulf in the vicinity of Great Barrier Island (Townsend and Lohrer 2019). Dr Mark Morrison has indicated these reefs shelter fish including bastard red cod, cusk fish and rockfish and has observed a range of species growing on them such as red algae, sponges, sea squirts, hydroids, bryozoans, and ophiuroids[4]. These features are consistent with Significance Criteria 8 in the Waikato Regional Policy Statement (WRPS) and the provision of breeding and spawning grounds, juvenile nursery areas, and thus being critical in the life cycles of other species.

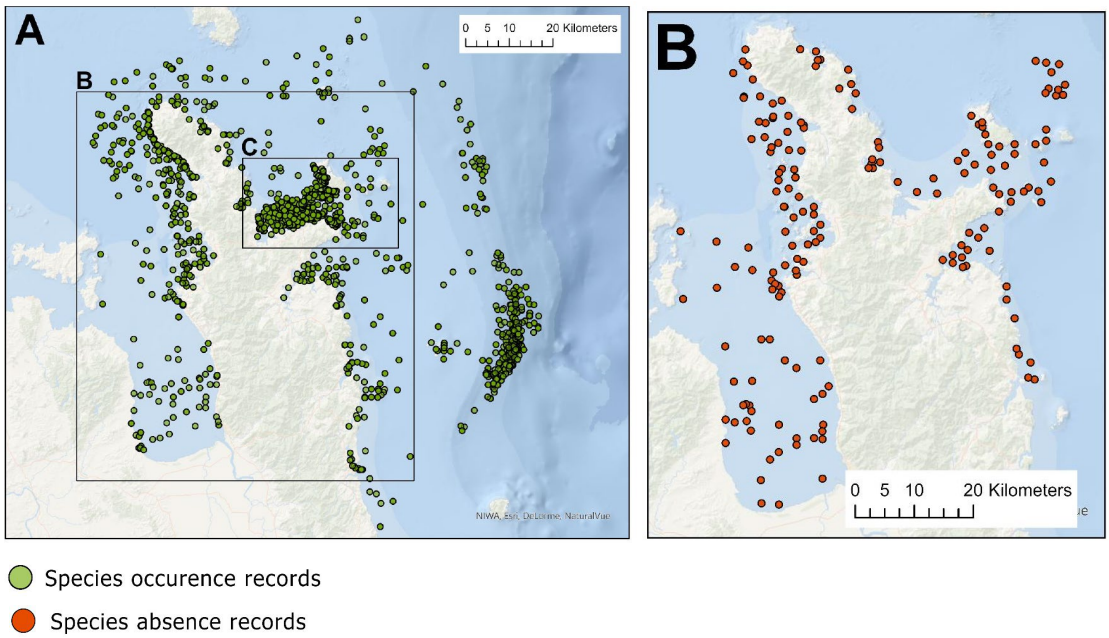
[4] Tubeworm discovery in Hauraki Gulf cause for celebration | NIWA

Figure 3: Photo of G. hystrix reef in the vicinity of Moturua (Rabbit Island), from Shane Kelly



43. In addition to habitat provision, current understanding puts *G. hystrix* reef at the limits of its natural range (WRPS Significance Criteria 3). It is important to consider that *G. hystrix* reef is a recent discovery in the Waikato, circa 2020, and can be considered regionally rare. Prior to this, large colonies had not been found north of the Marlborough Sounds and were only known to occur there and around Rakiura/Stewart Island. While knowledge of species occurrence and distributions can always be improved, there has been lots of data collection in the Hauraki Gulf compared with other locations. This is evident from Figure 4.

Figure 4: Adapted Figure 1 from Bennion and Lundquist (2022)



44. Bennion and Lundquist (2022) compiled biodiversity data for MPI as part of the Revitalising the Gulf Fisheries Corridor Development (ZBD2020-06). This contained a total of 7,625 species occurrence records in the Waikato regional extract and 16,351 species absence records, across 1,783 unique locations. Despite all this data, *G. hystrix* reef is only known to occur in a handful of locations. It is probable that, as with green lipped mussels, *G. hystrix* was previously more abundant across the Waikato CMA and has been impacted by dredging. As such, it is likely that *G. hystrix* has also reduced in extent (WRPS Significance Criteria 2, indigenous vegetation or habitat for indigenous fauna that has reduced in extent or degraded due to historic or present anthropogenic activity to a level where the ecological sustainability of the ecosystem is threatened).

45. As the Waikato *G. hystrix* reefs are currently at the limits of its known range, this should meet NZCPS Policy 11A and WRPS Significance Criteria 3. I consider that *G. hystrix* meets nearly all aspects of the SIBA-A descriptors (*Areas which, due to their physical form, scale or inherent indigenous biodiversity values, are regionally significant because of their rarity, value to Threatened species, provision of critical habitat and/or vulnerable ecosystem types, and/or their*

disproportionate contribution to broader ecological functions and values. They are also considered to be vulnerable to any adverse effects of anthropogenic activities).

46. This results in SIBA B16, B17 and B19 needing to be reclassified as SIBA-As.

Table 1: Summarises my further recommended changes to the to the Significant Indigenous Biodiversity Areas A and B map layers. Maps of these changes are shown in Appendix 4. The Changes to estuarine SIBA result approximately in an increase of SIBA-A by 164 ha with a corresponding reduction in SIBA-B.

SIBA entry	Scope of change	New SIBA number
Coromandel Estuaries[5]:		
A10 & B13	Manaia Harbour: Estuary SIBA updated with seagrass and shellfish habitat data from 2023 (Lam-Gordillo et al. 2023) resulting in an increase in spatial extent of A10 and a decrease in B13 (31 ha).	No change
A11 & B14	Te Kouma Harbour: Estuary SIBA updated with seagrass and shellfish habitat data from 2023 (Lam-Gordillo et al. 2023). This results in a minor increase in spatial extent of A11 (2 ha), including closer proximity to existing marine farm, as well as a corresponding minor decrease in the spatial extent of B14. Seagrass has declined (Appendix 1) with the increase driven by inclusion of shellfish data.	No change
A12 & B15	Coromandel Harbour: Estuary SIBA updated with seagrass and shellfish habitat data from 2023 (Lam-Gordillo et al. 2023). This results in an increase in spatial extent of A12, including closer proximity to existing marine farm, and a decrease in B15 (37 ha).	No change
A14	Change in seagrass Estuary SIBA updated with seagrass and shellfish habitat data from 2023 (Lam-Gordillo et al. 2023), specifically for Shelly Beach/Kikowhakarere, resulting in a minor change to the spatial extent. Addition of SIBA-B shoreward of the seagrass bed, for consistency with intertidal estuarine areas and their values.	BX1
B20	Colville Harbour: Parts of B20 are reclassified as SIBA-A due to the presence of high-density shellfish (habitat data from Lam-Gordillo et al. 2023). Inclusion of shellfish beds is consistent with SIBA classification in other estuaries. This results in a minor decrease in spatial extent of B20 (5 Ha) due to corresponding addition of new SIBA-A area.	AX6
A21 & B22	Whangapoua Harbour: Estuary SIBA updated with seagrass and shellfish habitat data from 2023 (Lam-Gordillo et al. 2023). This results	No change

[5] Where shellfish data was used, a minimum polygon size of 50m^2 to ensure this reflected the larger functionally important beds. There was non minimum size for seagrass patches, given its At Risk – Declining status.

	in an increase in spatial extent of A21 (82 Ha), with a corresponding reduction in B22.	
A24 & B28	Whitianga Harbour: Estuary SIBA updated with seagrass and shellfish habitat data from 2023 (Lam-Gordillo et al. 2023). Inclusion of shellfish beds is consistent with SIBA classification in other estuaries. Areas formerly SIBA-A, due to presence of seagrass, are re-categorised as SIBA-B, consistent with the values described for SIBA B28. Parts of B28 are re-categorised as A24 to include areas supporting populations of Australasian bittern (Threatened – Nationally Critical) and banded rail (At Risk – Declining) as per schedule description. Overall, this results in an increase in spatial extent of A21, with a corresponding reduction in B28.	No change
B31	Purangi Harbour: Parts of B31 are reclassified as SIBA-A due to the presence of high-density shellfish (habitat data from Lam-Gordillo et al. 2023). Inclusion of shellfish beds is consistent with SIBA classification in other estuaries. This results in a decrease in spatial extent of B31 (18 ha) due to corresponding addition of new SIBA-A area.	AX7
A29 & B35	Tairua Harbour: Estuary SIBA updated with seagrass and shellfish habitat data from 2023 (Lam-Gordillo et al. 2023). This results in a decrease in the extent of A39 (-98 ha) and a corresponding increase in the spatial extent of B35.	No change
A37 & B37	Wharekawa Estuary: SIBA updated with seagrass and shellfish habitat data from 2023 (Lam-Gordillo et al. 2023). This results in a decrease in spatial extent of A37 (-34 Ha) and a corresponding increase in the spatial extent of B37.	No change
A38 & B39	Whangamata Harbour and Otahu River: Estuary SIBA updated with seagrass and shellfish habitat data from 2023 (Lam-Gordillo et al. 2023). This results in a minor increase in the extent of A38 (9 ha) and a corresponding minor decrease in the spatial extent of B39.	No change
West Coast Coromandel Islands:		
B19	Reclassification of the majority of SIBA B19 into three new SIBA-As (AX3, AX4, AX5) due to presence or potential for *Galeolaria hystrix*.	AX3, AX4, AX5
B18 & B17	Merge B18 and B17 and reclassify as new SIBA-A due to presence of *Galeolaria hystrix*. Consolidated the 14 known patches of *G. hystrix* into a single SIBA-A boundary (increasing the area covered previously by B17 and B18).	AX2
B16	Reclassification of the majority of SIBA B16 due to the presence of *Galeolaria hystrix*.	AX1

47. Section 3.4.3.1 of the JWS agreed that changing the CMA around Moturua Island to SIBA-A would not apply to areas occupied by the marine farms, as there was evidence to indicate that *G. hystrix* was not present underneath the farms.

48. The absence of *G. hystrix* underneath other farms in B19 and B16 was supported by marine farm benthic assessment reports and was used to apply the same approach. For the farms to the east and west of Motupake Island, this was supported by Clark et al. (2012 A to H), Taylor et al. (2012), Kelly and Sim-Smith (2021), Newcombe et. al. (2019), Kelly and Sim-Smith (2020), Sim-Smith and Kelly (2021), Sim-Smith and Kelly (2022a), Sim-Smith and Jefferson (2023) who did not report the presence of *G. hystrix*.

49. For the farm to the north of Tataweka Island this was supported by Clarke et al. (2012I) and Sim-Smith and Kelly (2022b) who did not report the presence of *G. hystrix*.

50. For the farms to the east of Moturua Island, this was supported by Taylor et al. (2012), Clark et al. (2012 J to L) Sim-Smith and Kelly (2018), Newcombe et. al. (2019) who did not report the presence of *G. hystrix*.

51. For the marine farms to the South of Wekarua Island, this was supported by Clark et al. (2012 M to O), Taylor et al. (2012), Newcombe et al. (2019), Kelly and Sim-Smith (2020), Sim-Smith (2023) who did not report the presence of *G. hystrix*.

52. In these reports, the observed benthic environment under marine farms or under extensions is often described as being typical of the modified benthic habitats found beneath inshore mussel farms throughout the Coromandel characterised by areas of increased mussel shell cover and greater abundances of associated epifauna. There is no indication of regionally significant benthic species or large reefs of *G. hystrix.*

SIBA LAYER DEVELOPMENT AND CONSIDERATION OF THE EFFECTS OF AQUACULTURE FARMS OR OTHER ACTIVITIES.

53. In the production of Schedule 7 and the demarcation of SIBA-A and SIBA-B, I had a minor supporting role to provide some advice, having knowledge of Waikato coastal sites. I did <u>not</u> explicitly consider the effects of managed activities within the demarcation process. Thus, it should not be assumed that current existing activities within either SIBA-B or SIBA-A have <u>no</u> impact on

those SIBA values. Determination of impacts on the receiving environment should come from robust consent surveying, monitoring and knowledge of the possible effects of an activity.

54. Demarcation of SIBA involved the application of spatial data and knowledge at different scales. For example, many estuaries were designated as SIBA-B in their entirety, except for known SIBA-A patches, due to the mosaics of wetlands and the shellfish, worms and crustacea maintaining health and ecosystem functioning.

55. As an example, Aotea and Kawhia Harbours are SIBA-B except for known patches of SIBA-A, this does not explicitly consider the effects of mussel or oyster farming, or the effects of other activities like stormwater or discharges, on the values underpinning the significant indigenous biodiversity status. As another example, the designation of Slipper Island as a SIBA-A, with one of the best remnant subtidal seagrass meadows found in the Hauraki Gulf, but with the presence of moorings here, does not imply that moorings do not have effects on seagrass/SIBA-A values. All activities must be managed appropriately and consideration given to the receiving environment.

CONCLUSION

56. I consider it is appropriate to remove mangrove seedling from SIBA-A under ECO-P8 and ECO-R8 as a permitted activity given the minimal effect on the environment and SIBA-A attributes at risk of further mangrove expansion.

57. Updating Schedule 7 with new data has improved the quality and accuracy of the SIBA layers. This includes identifying *Galeolaria hystrix* as a SIBA-A and updating B19 and the associated consequential amendments for B16 and B17 as a result.

REFERENCES

Bennion M, Lundquist C 2022. Biodiversity data extraction for the Waikato area of the Hauraki Gulf Marine Park. NIWA report 2022192HN prepared for Waikato Regional Council, Hamilton, New Zealand.

Berthelsen A, Alder A 2024. Saltmarsh quality and extent. In: Lohrer, D., et al. Information Stocktakes of fifty-five environmental attributes across air, soil, terrestrial, freshwater, estuaries and coastal waters domains. NIWA report 2024216HN prepared by NIWA, Manaaki Whenua Landare Research, Cawthron Institute, and Environet Limited for the Ministry for the Environment. Wellington, Ministry for the Environment.

Bulmer RH, Lewis M, O'Donnell E, Lundquist CJ 2017. Assessing mangrove clearance methods to minimise adverse impacts and maximise the potential to achieve restoration objectives. New Zealand Journal of Marine and Freshwater Research Vol 51(1): 110-126.

Bulmer RH, Townsend M, Drylie T, Lohrer AM 2018. Elevated turbidity and the nutrient removal capacity of seagrass. Frontiers in Marine Science 5: 462. https://doi.org/10.3389/fmars.2018.00462

Bulmer RH, Stephenson F, Jones HF, Townsend M, Hillman JR, Schwendenmann L, Lundquist CJ 2020. Blue carbon stocks and cross-habitat subsidies. Frontiers in Marine Science 7:380. https://doi.org/10.3389/fmars.2020.00380

Clark D, Taylor D, Goodwin E 2012A. Coromandel mussel farm extension - benthic assessment survey for Li 292. Cawthron report number 2145 prepared for J & A Projects Limited.

Clark D, Taylor D, Goodwin E 2012B. Coromandel mussel farm extension - benthic survey assessment for Li 293. Cawthron report number 2146 prepared for Paddy Bull Limited.

Clark D, Taylor D, Goodwin E 2012C. Coromandel mussel farm extension - benthic survey assessment for Li 333. Cawthron report number 2153 prepared for Paddy Bull Ltd.

Clark D, Taylor D, Goodwin E 2012D. Coromandel mussel farm extension - benthic survey assessment for Li 295. Cawthron report number 2148 prepared for Paddy Bull Limited.

Clark D, Taylor D, Goodwin E 2012E. Coromandel mussel farm extension - benthic survey assessment for Li 333. Cawthron report number 2153 prepared for Paddy Bull Ltd.

Clark D, Taylor D, Goodwin E 2012F. Coromandel mussel farm extension - benthic survey assessment for Li 349. Cawthron report number 2159 prepared for Paddy Bull Limited.

Clark D, Taylor D, Goodwin E 2012H. Coromandel mussel farm extension - benthic survey assessment for Li 350. Cawthron report number 2160 prepared for Paddy Bull Limited.

Clark D, Taylor D, Goodwin E 2012I. Coromandel mussel farm extension - benthic survey assessment for Li 357. Cawthron report number 2161 prepared for Greenshell Mussel Limited.

Clark D, Taylor D, Goodwin E 2012J. Coromandel mussel farm extension - benthic survey assessment for Li 361. Cawthron report number 2162 prepared for Gold Ridge Marine Farm Limited.

Clark D, Taylor D, Goodwin E 2012K. Coromandel mussel farm extension - benthic survey assessment for Li 373. Cawthron report number 2167 prepared for Gold Ridge Marine Farm Limited.

Clark D, Taylor D, Goodwin E 2012L. Coromandel mussel farm extension - benthic survey assessment for Li 396. Cawthron report number 2174 prepared for Paddy Bull Limited.

Clark D, Taylor D, Goodwin E 2012M. Coromandel mussel farm extension - benthic survey assessment for Li 363. Cawthron report number 2164 prepared for Weka Marine Farms Limited.

Clark D, Taylor D, Goodwin E 2012N. Coromandel mussel farm extension - benthic survey assessment for Li 378. Cawthron report number 2170 prepared for Tikapa Moana Enterprises Limited.

Clark D, Taylor D, Goodwin E 2012O. Coromandel mussel farm extension - benthic survey assessment for Li 379. Cawthron report number 2171 prepared for Weka Marine Farms Limited.

Dowding JE 2019. Sites of importance to shorebirds and seabirds in the Waikato region. Waikato Regional Council Technical Report 2019/20. Hamilton, Waikato Regional Council.

Geange S, Townsend M, Clark D, Ellis JI, Lohrer AM 2019. Communicating the value of marine conservation using an ecosystem service matrix approach. Ecosystem Services 35: 150-63.

Graeme M 2014. Estuarine vegetation survey - Port Waikato. Waikato Regional Council Technical Report 2014/25. Hamilton, Waikato Regional Council.

Jones HF, Hunt S, Kamke J, Townsend M 2022. Historical data provides context for recent monitoring and demonstrates 100 years of declining estuarine health. New Zealand Journal of Marine and Freshwater Research 56(3): 371-88.

Kelly S, Sim-Smith C 2020. Ecological assessment of nine Coromandel mussel farms. Coast and Catchment Ltd report number 2020-15.

Kelly S, Sim-Smith C 2021. Ecological assessment of Motukopake marine farms. Coast and Catchment Ltd report number 2021-02.

Lam-Gordillo O, Hailes S, Carter K, Townsend M 2023. Intertidal habitat mapping: Coromandel estuaries 2023. NIWA report prepared for Waikato Regional Council, Hamilton, New Zealand.

Lundquist CJ, Hailes S, Cartner K, Carter K, Gibbs M 2012. Physical and ecological impacts associated with mangrove removals using in situ mechanical mulching in Tauranga Harbour. NIWA Technical Report 137. Auckland, National Institute of Water & Atmospheric Research Ltd.

Lundquist, C., Carter, K., Hailes, S., Bulmer, R 2017. Guidelines for managing mangroves (mānawa) expansion in New Zealand. NIWA Information Series No. 85. Auckland, National Institute of Water & Atmospheric Research Ltd. http://www.niwa.co.nz/managingmangroveguide

Morrisey DJ, Swales A, Dittmann S, Morrison MA, Lovelock CE, Beard CM 2010. The ecology and management of temperate mangroves. Oceanography and Marine Biology: An Annual Review 48: 43-160.

Needham H, Townsend M, Hewitt J, Hailes S 2013. Intertidal habitat mapping for ecosystem goods and services: Waikato estuaries. Waikato Regional Council Technical Report 2013/52. Hamilton, Waikato Regional Council.

Newcombe E, Giles H, Floerl L 2019. Seabed survey and mapping of Coromandel inshore mussel farms, 2018. Cawthron report number 3297 prepared for a collective of inshore mussel farmers.

Sim-Smith C 2023. Ecological Assessment of four Coromandel marine farms. Coast and Catchment Ltd report number 2023-15.

Sim-Smith C & Kelly S 2018. Ecological assessment of Moturua Island and Port Charles mussel farms. Coast and Catchment Ltd report number 2018-06.

Sim-Smith C, Jefferson T 2023. LI 294 and LI 376: Ecological assessment of proposed extensions. Coast and Catchment Ltd report number 2023-01.

Sim-Smith C, Kelly S 2021. Ecological assessment of marine farms LI 294 and LI 376. Coast and Catchment Ltd report number 2021-13.

Sim-Smith C, Kelly S 2022a. Ecological assessment of Li292. Coast and Catchment Ltd report number 2022-05.

Sim-Smith C, Kelly S 2022b. Ecological assessment of LI 357. Coast and Catchment Ltd report number 2022-06.

Stokes D 2009. Assessment of physical changes after mangrove removal: Whangamata Harbour 2008. Waikato Regional Council Technical Report 2009/13. Hamilton, Waikato Regional Council.

Taylor DI, Clark D, Keeley N, Goodwin E 2012. Assessment of benthic and water column effects from inshore Coromandel mussel farms. Cawthron report number 2134 prepared for a collective of Coromandel mussel farmers.

Webb 2023. Waikato Regional Coastal Plan: Significant Indigenous Biodiversity Areas: approach to developing the SIBA overlay. Beca Limited report prepared for Waikato Regional Council, Hamilton, New Zealand.

APPENDIX 1: CHANGES IN MANGROVES AND SEAGRASS COVERAGE IN COROMANDEL ESTUARIES

1. The tables below outline changes in habitat extent between 2013 and 2023 surveys (Needham et al. 2013, Lam-Gordillo et al. 2023). As surveys did not map the exact same area, a standardisation step was used to only compare areas mapped under both surveys. This leads to a slight underestimation of total habitat coverage but is the fairest means of direct comparison.

Mangroves:

Estuary	2013 Area (Ha)	2023 Area (Ha)	Change in Area (Ha)	% Change in Area from 2013
Whangamata Harbour*	94.2	79.4	-14.8	-15.69
Tairua Harbour*	46.5	34.9	-11.6	-24.93
Otahu River	36.2	36.5	0.2	0.66
Port Charles	2.3	2.5	0.2	10.33
Wharekawa Harbour	33.5	34.3	0.8	2.45
Colville Bay	6.5	7.2	0.8	11.93
Purangi River estuary	59.8	60.8	1.0	1.70
Waikawau Bay	1.8	3.7	1.9	108.79
Te Kouma Harbour	16.4	18.3	1.9	11.63
Manaia Harbour	180.5	183.3	2.8	1.57
Whitianga Harbour	512.2	515.1	2.9	0.56
Kennedy Bay	7.4	11.5	4.1	55.50
Coromandel Harbour	97.9	108.6	10.7	10.89
Whangapoua Harbour	411.4	450.5	39.1	9.51

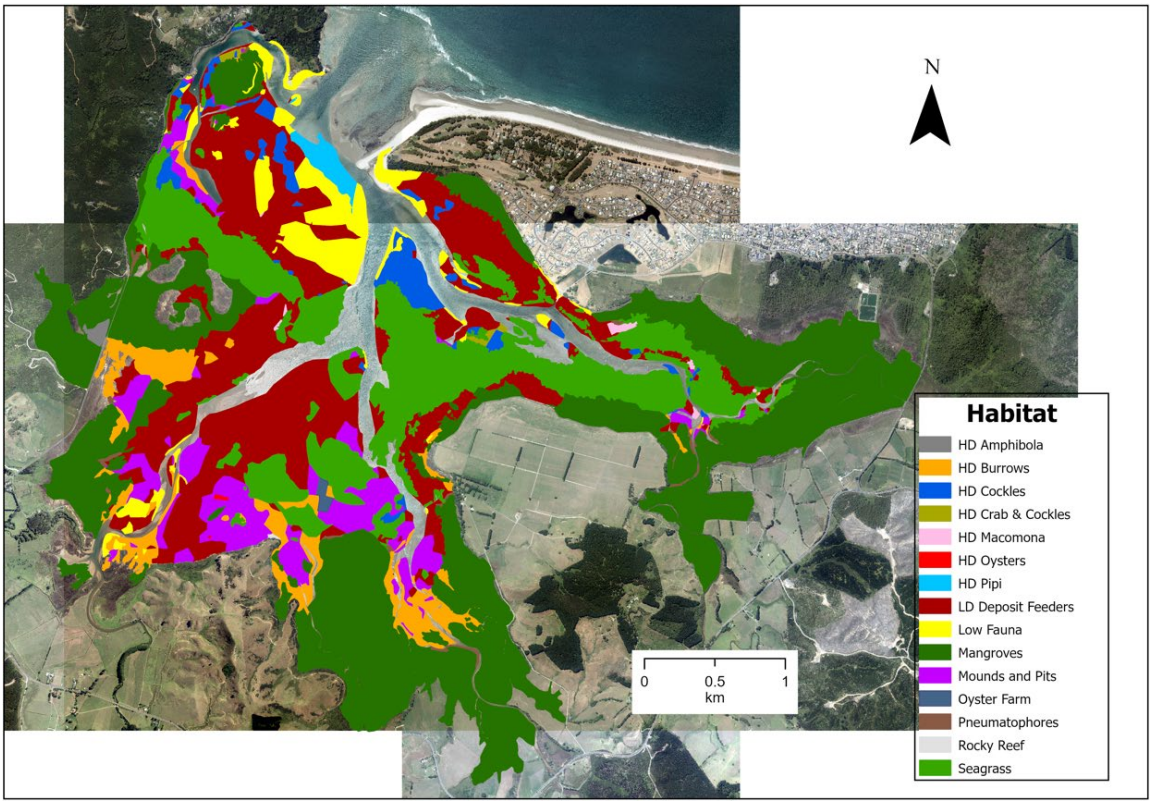
*consented mangrove removal estuaries

Seagrass:

Estuary	2013 Area (Ha)	2023 Area (Ha)	Change in Area (Ha)	% Change in Area from 2023
Tairua Harbour	128.50	32.98	-95.52	-74.33
Wharekawa Harbour	36.80	0.19	-36.61	-99.48
Whangamata Harbour	57.55	47.87	-9.68	-16.82
Te Kouma Harbour	4.70	0.00	-4.70	-100
Otahu River	0.32	0.29	-0.03	-8.69
Whitianga Harbour	0.002	0	0	-
Purangi River estuary	0	0	0	-
Waikawau Bay	0	0	0	-
Port Charles	0	0	0	-
Colville Bay	0	0.002	0.002	-
Kennedy Bay	0	0.01	0.010	-
Manaia Harbour	32.70	46.98	14.27	43.64
Whangapoua Harbour	206.30	221.09	14.79	7.17
Coromandel Harbour	142.24	170.81	28.57	20.09

APPENDIX 2: CHANGES IN HABITAT – EXAMPLES

Figure 5: Habitat maps for Whangapoua estuary from 2013 (top) and 2023 (bottom)



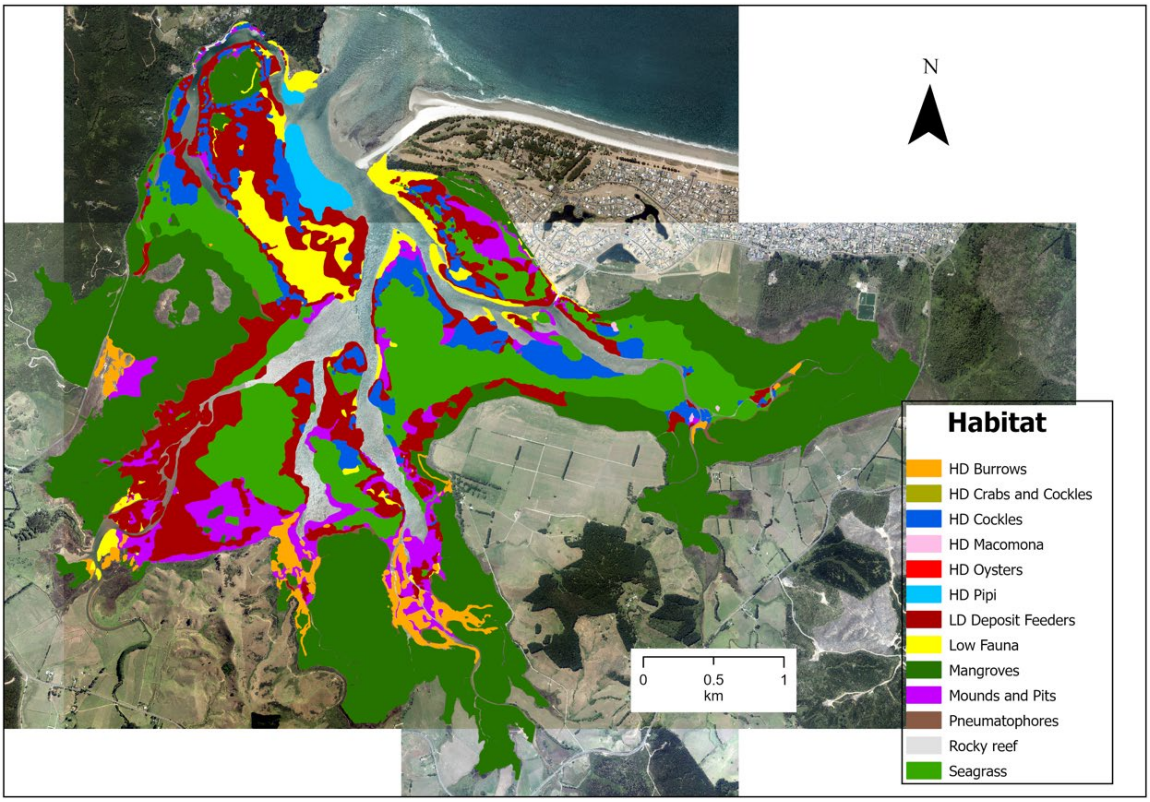


Figure 6: Habitat maps for Whangapoua estuary from 2013 (top) and 2023 (bottom) focused on the western mid-estuary.

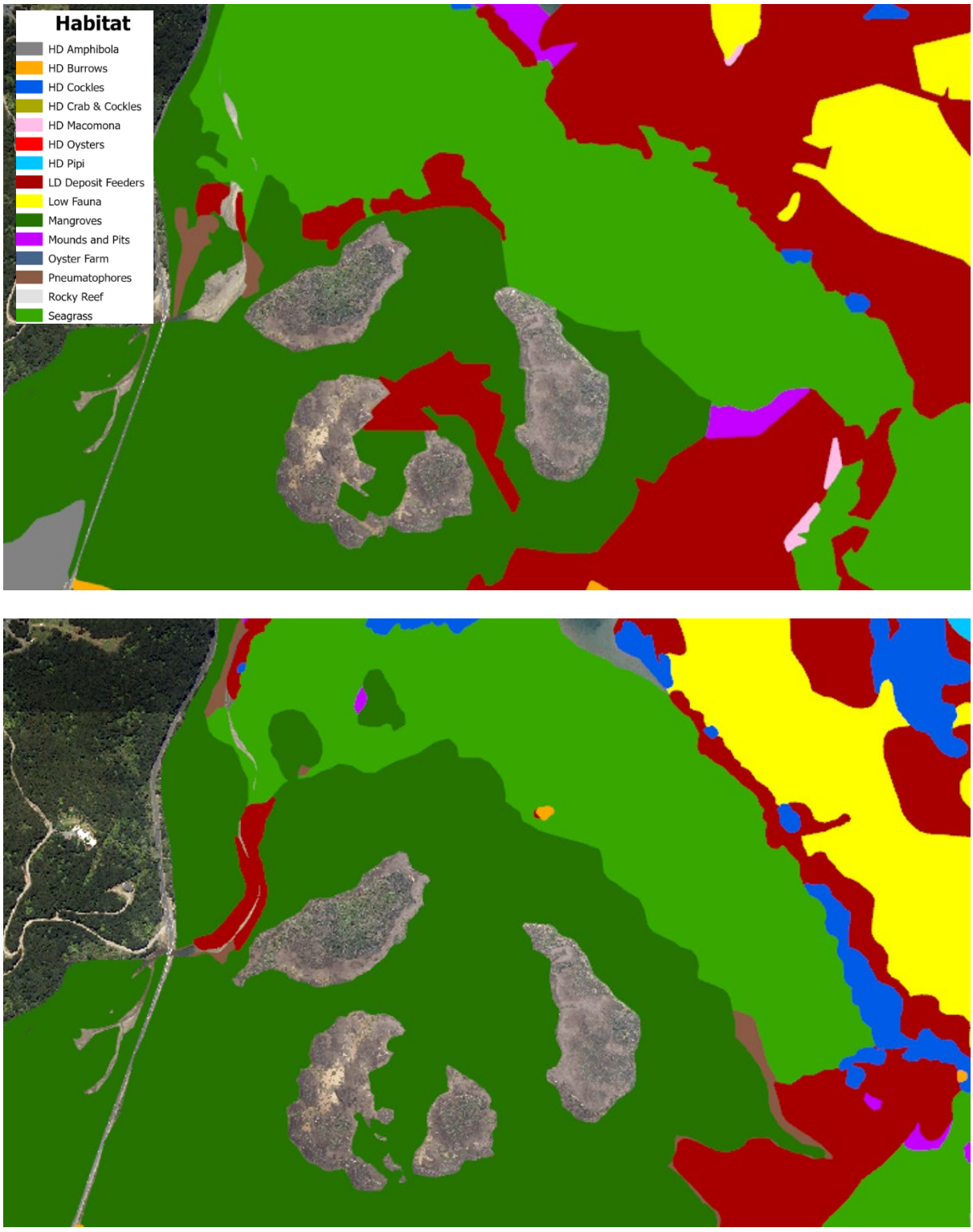
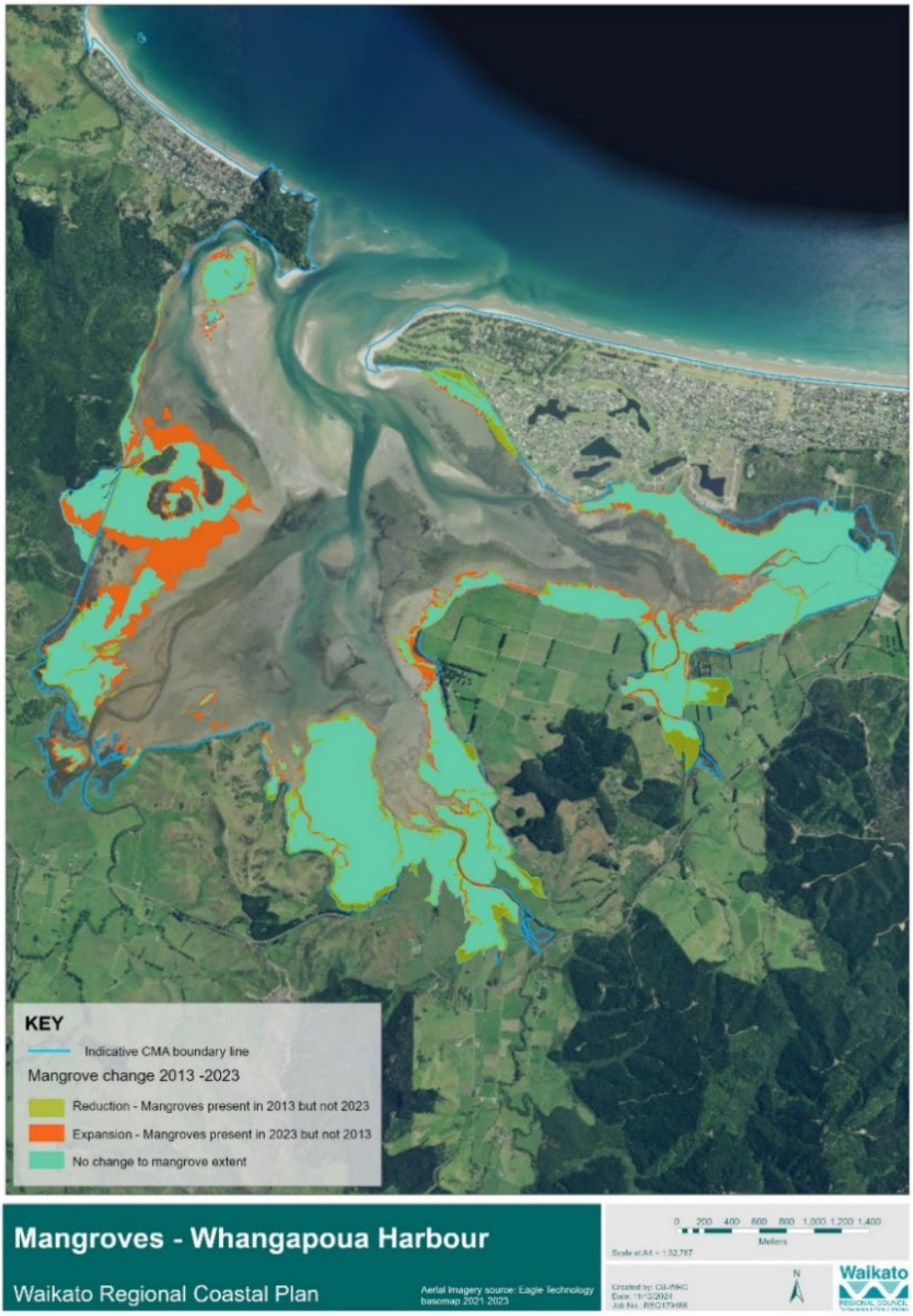


Figure 7: Google Earth images from 2001 (top) and 2024 (bottom), demonstrating the increasing coverage of mangroves near the causeway and islands.





Figure 8: Areas of change in mangrove extent between 2013 and 2023 in Whangapoua Harbour. Orange colour indicates areas of growth, with the largest extent being on the western side of the harbour near the causeway and around the islands. Light green colour indicates areas that were not mapped as mangrove in 2013 which falls into 3 groups: Minor difference along the borders of patches reflecting slight variation in mapping accuracy; some areas in the upper tidal creek areas not mapped in 2023 as they were identified as saltmarsh (this difference is not a genuine difference but an artefact of the method); some unconsented removal on the Matarangi shoreline near the populated area.



APPENDIX 3: EXAMPLES OF SHOREWARD BOUNDARIES OF MANGROVE PATCHES (DARK GREEN) CONSTRAINED BY ROADS, FARMS, EMBANKMENTS OR ADJOINING SALTMARSH FROM LAM-GORDILLO (2013)

Figure 9: Shoreward boundaries of mangrove patches (dark green): Northern end of Colville

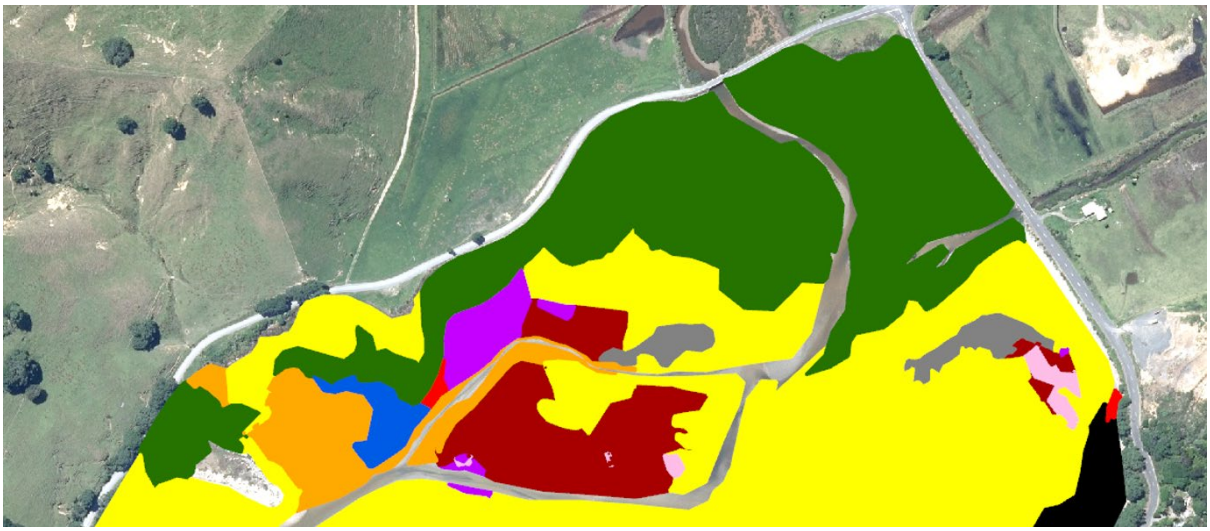


Figure 10: Shoreward boundaries of mangrove patches (dark green): Northern end Port Charles

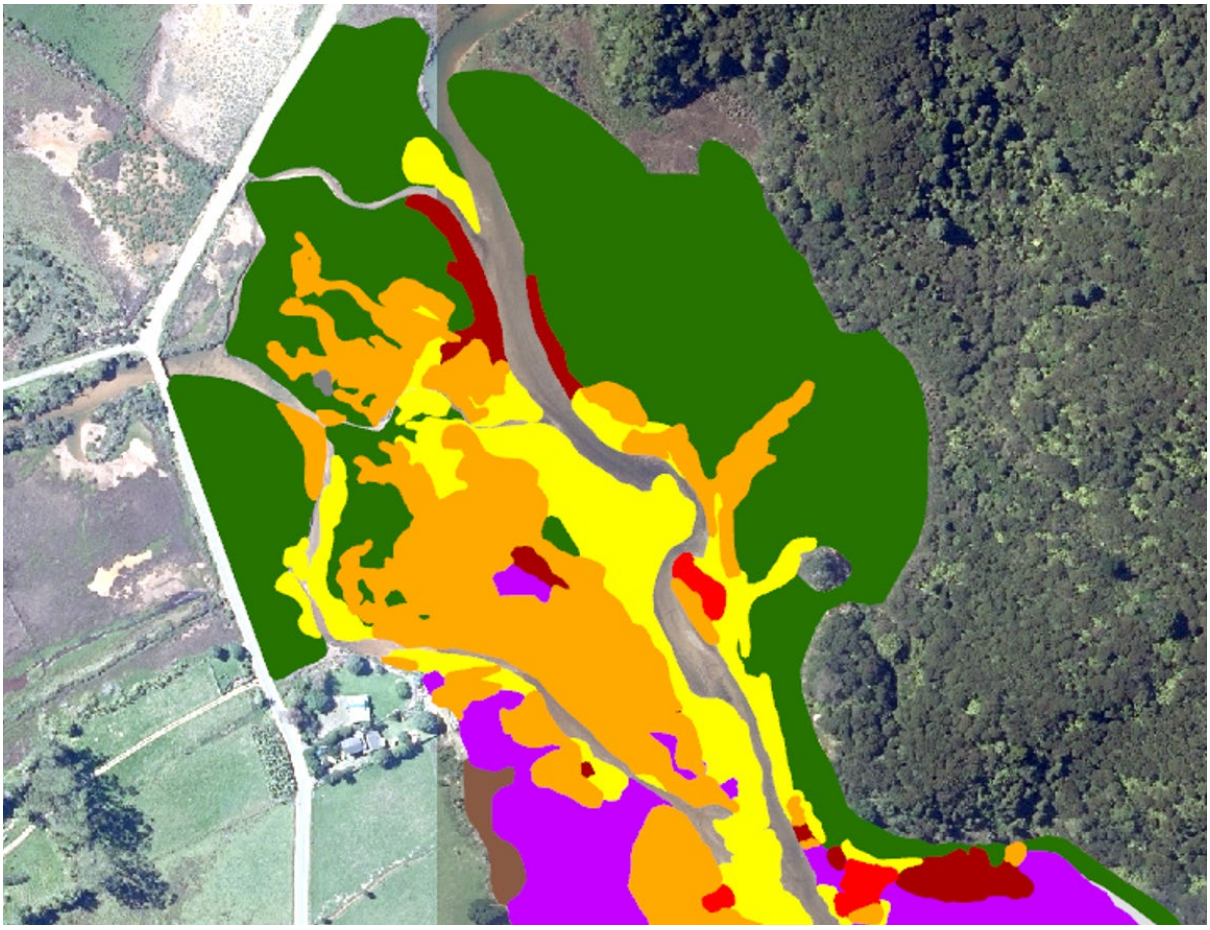


Figure 11: Shoreward boundaries of mangrove patches (dark green): Manaia Harbour

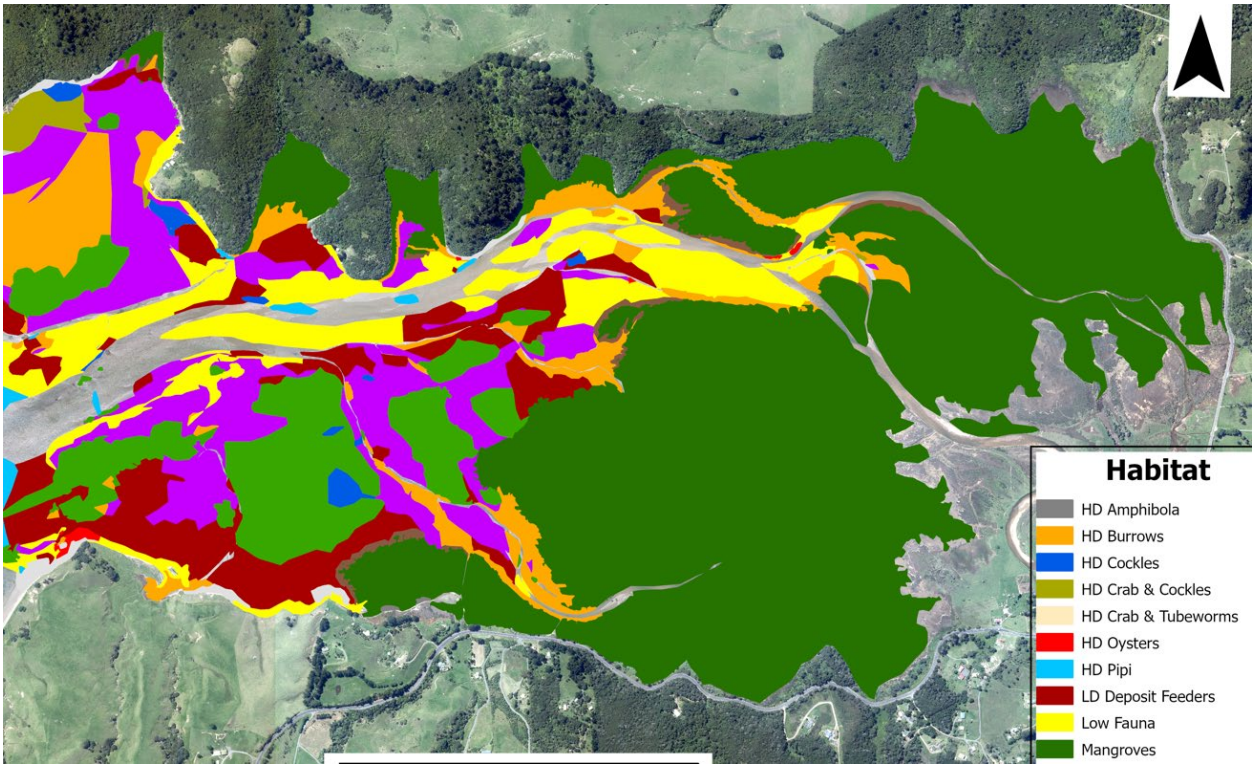
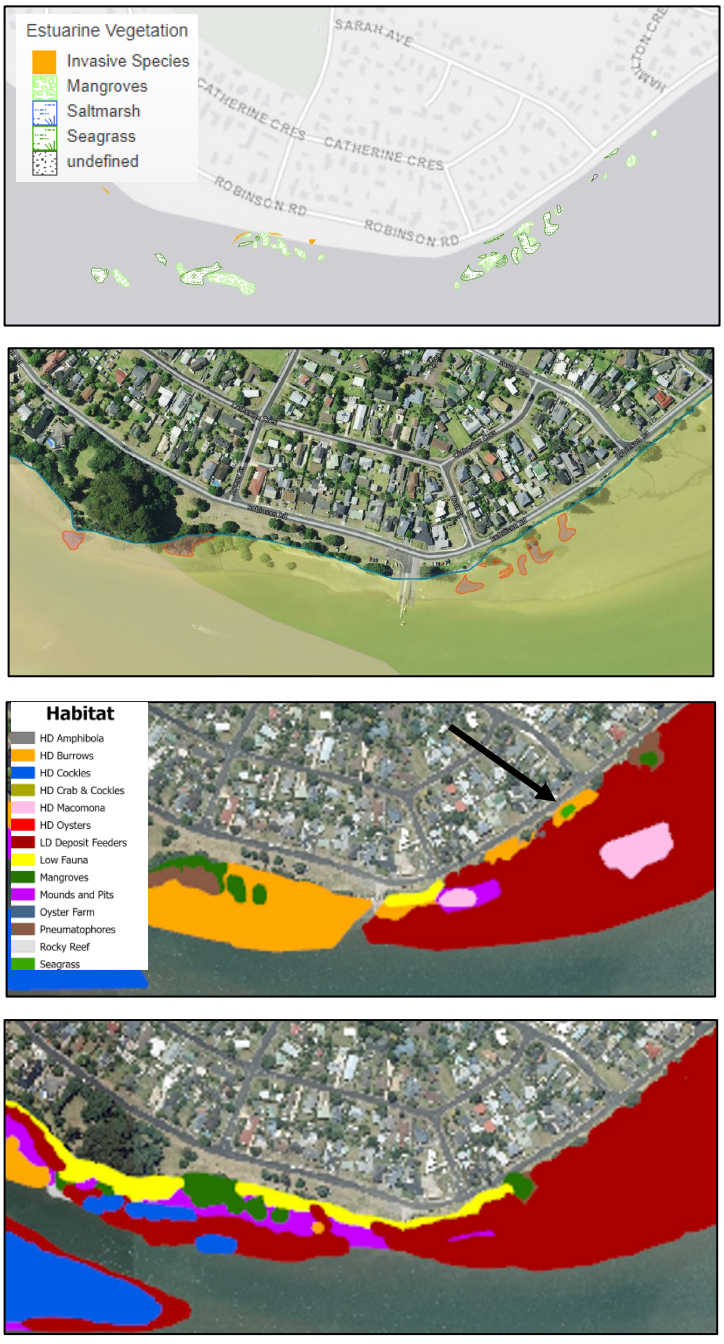


Figure 12: Shoreward boundaries of mangrove patches (dark green): Southern end of Tairua Harbour



APPENDIX 4: AMENDMENTS TO SIBA-A AND SIBA-B IN SCHEDULE 7

1. Habitat changes through time: DOC's composite layer including 2009 vegetation layer from WRC (1st image), which matches Figure 1 from Simon West's evidence (2nd image), by 2013 a solitary patch of seagrass is present (3rd image, indicated by black arrow due to small size) from Needham et al. (2013), with the absence of seagrass in this location by 2023 from Lam-Gordillo (2023) (4th image).



2. Maps of the recommended changes to the to the SIBA map layers compared to the notified maps.

Figure 13: Manaia Harbour (October 2024)

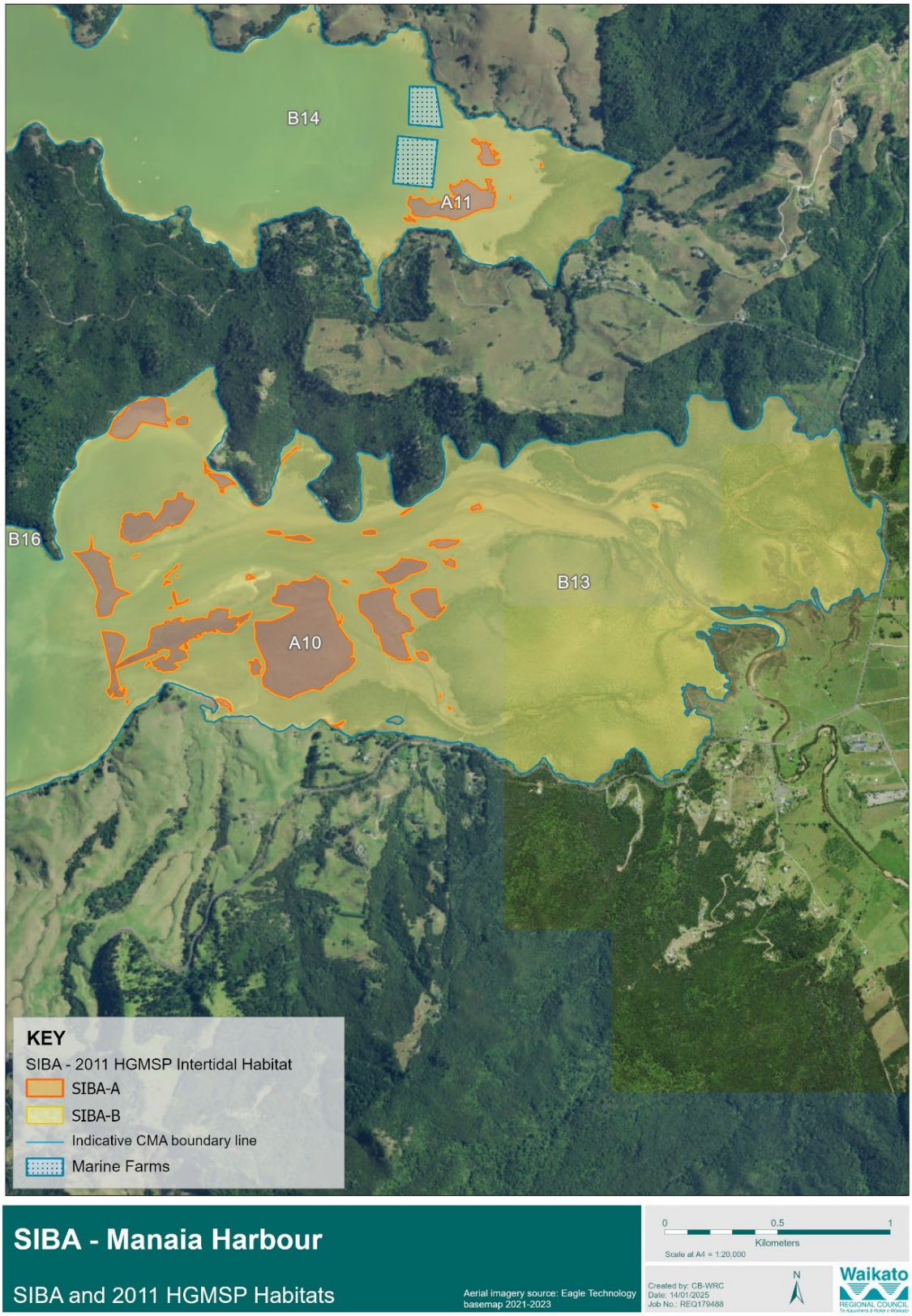


Figure 14: Manaia Harbour - recommended changes (January 2025)

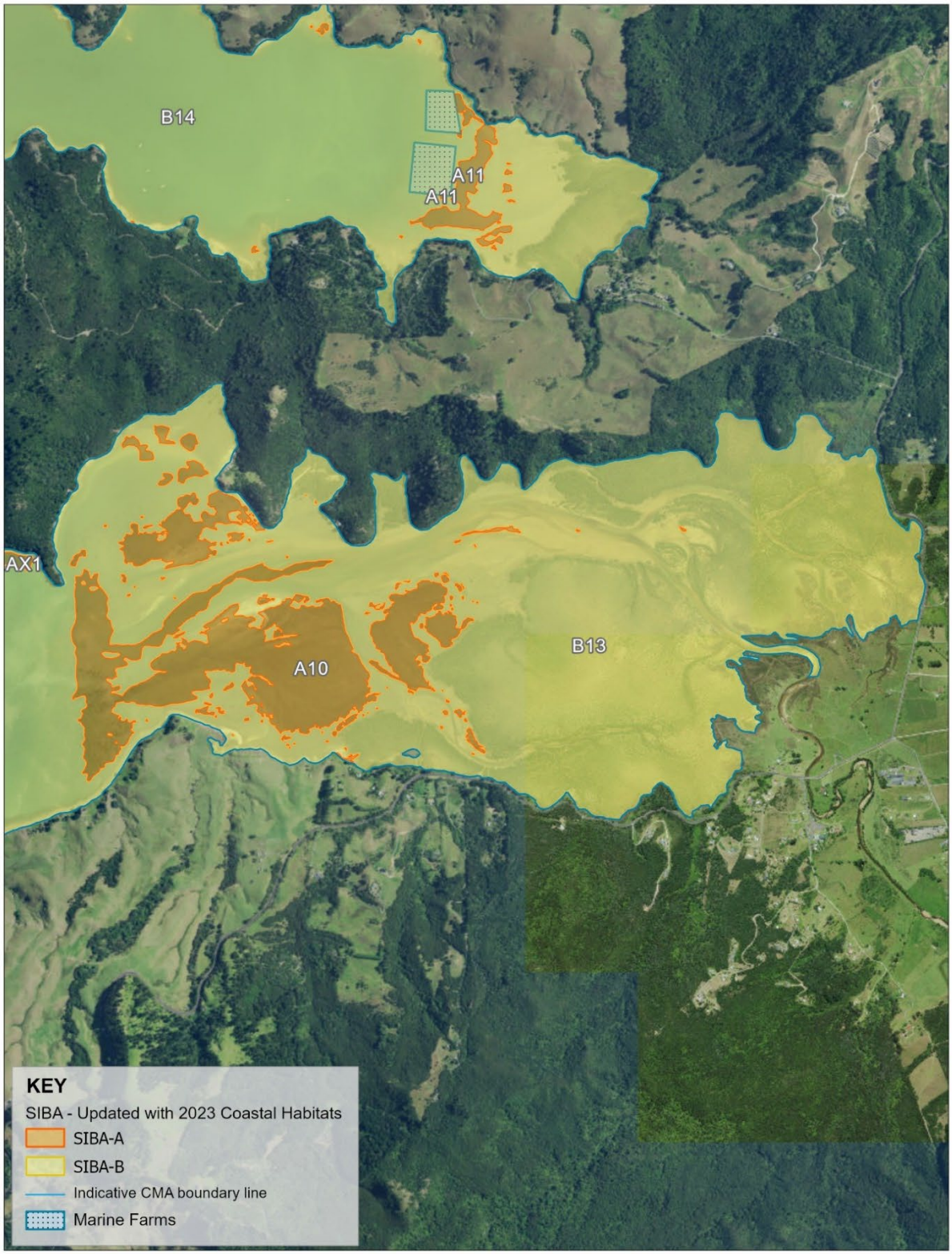


Figure 15: Te Kouma Harbour (October 2024)

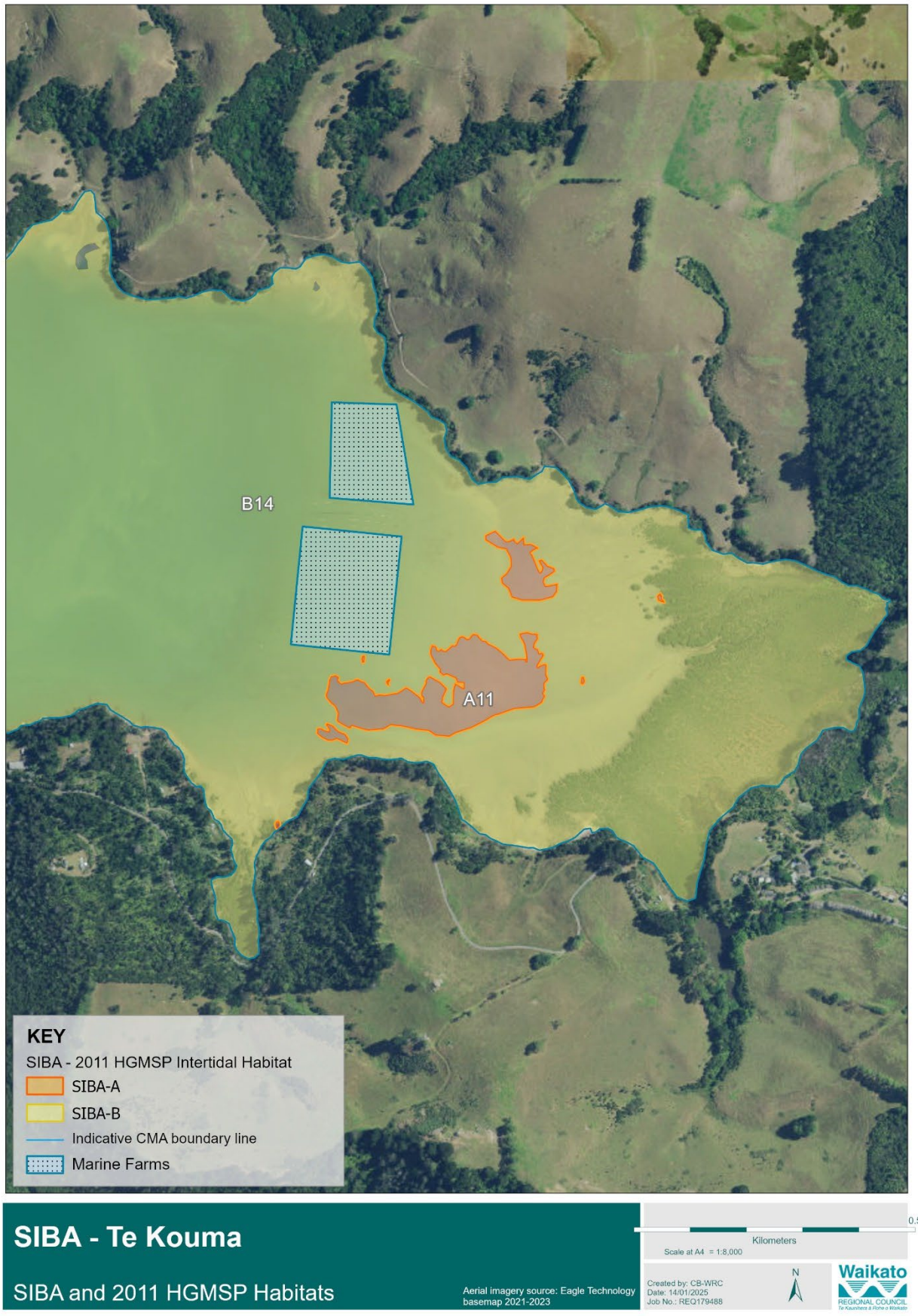


Figure 16: Te Kouma Harbour - recommended changes (January 2025)

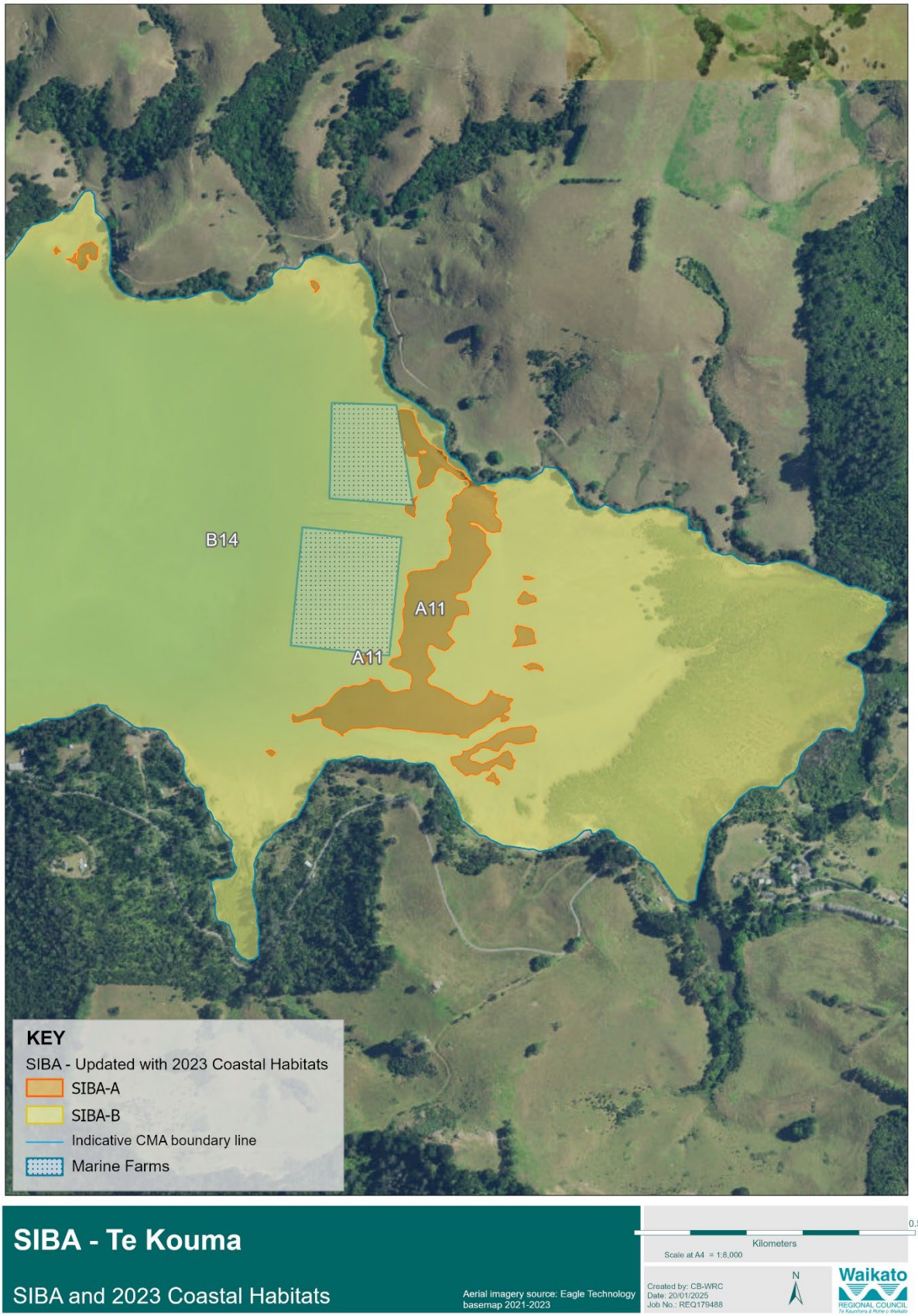


Figure 17: Coromandel Harbour (October 2024)

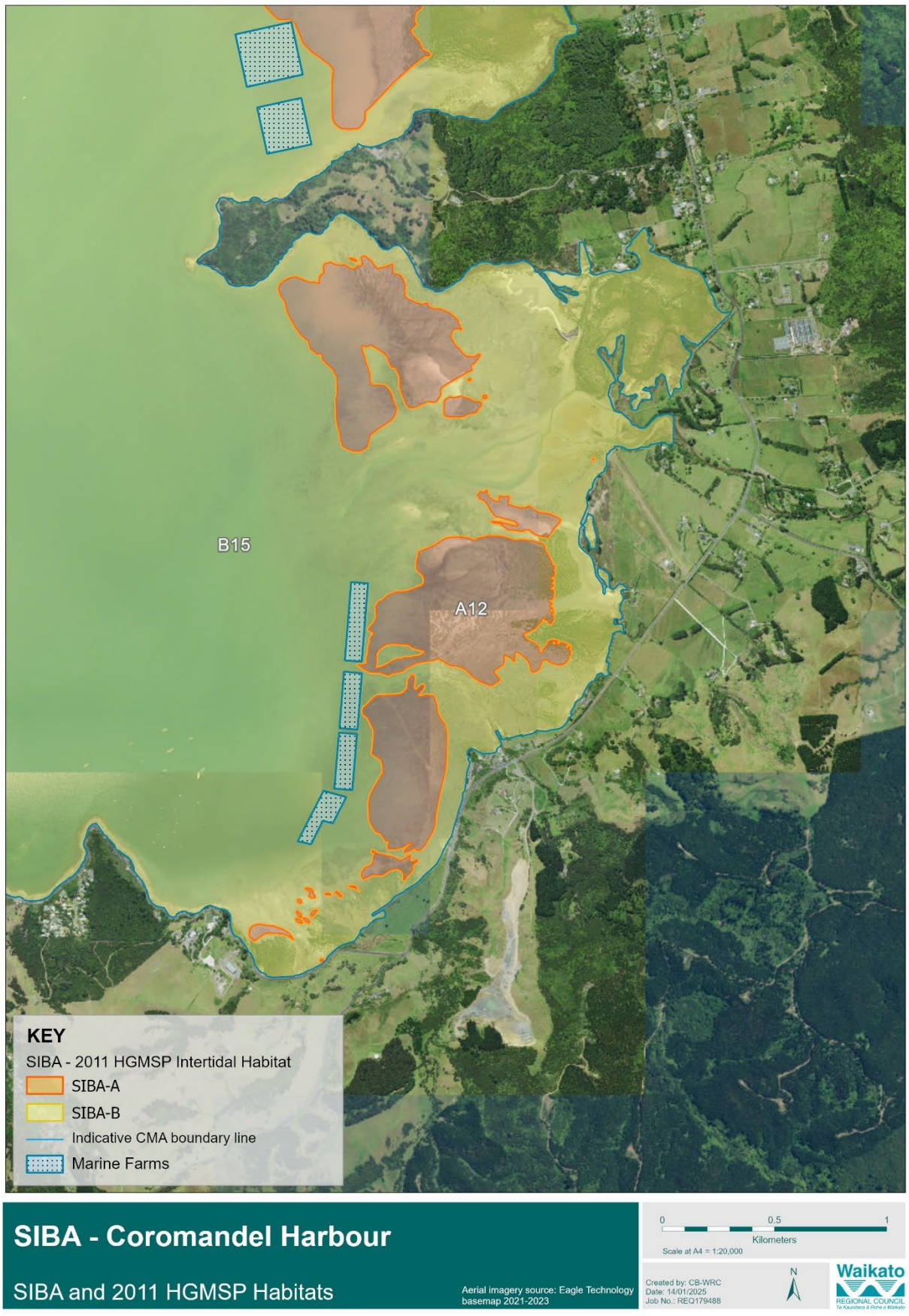


Figure 18: Coromandel Harbour - recommended changes (January 2025)

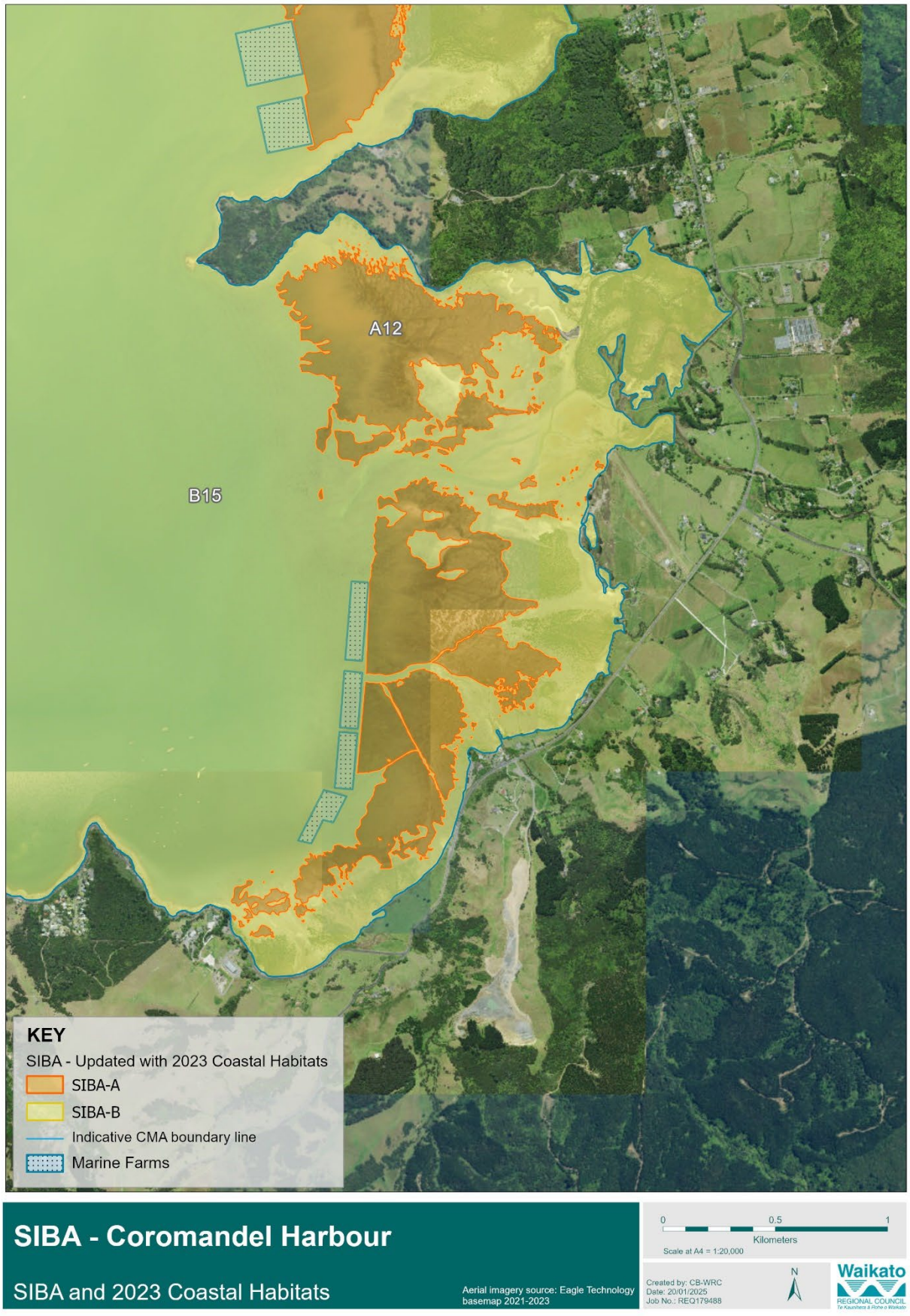


Figure 19: Shelly Beach/Kikowhakarere (October 2024)

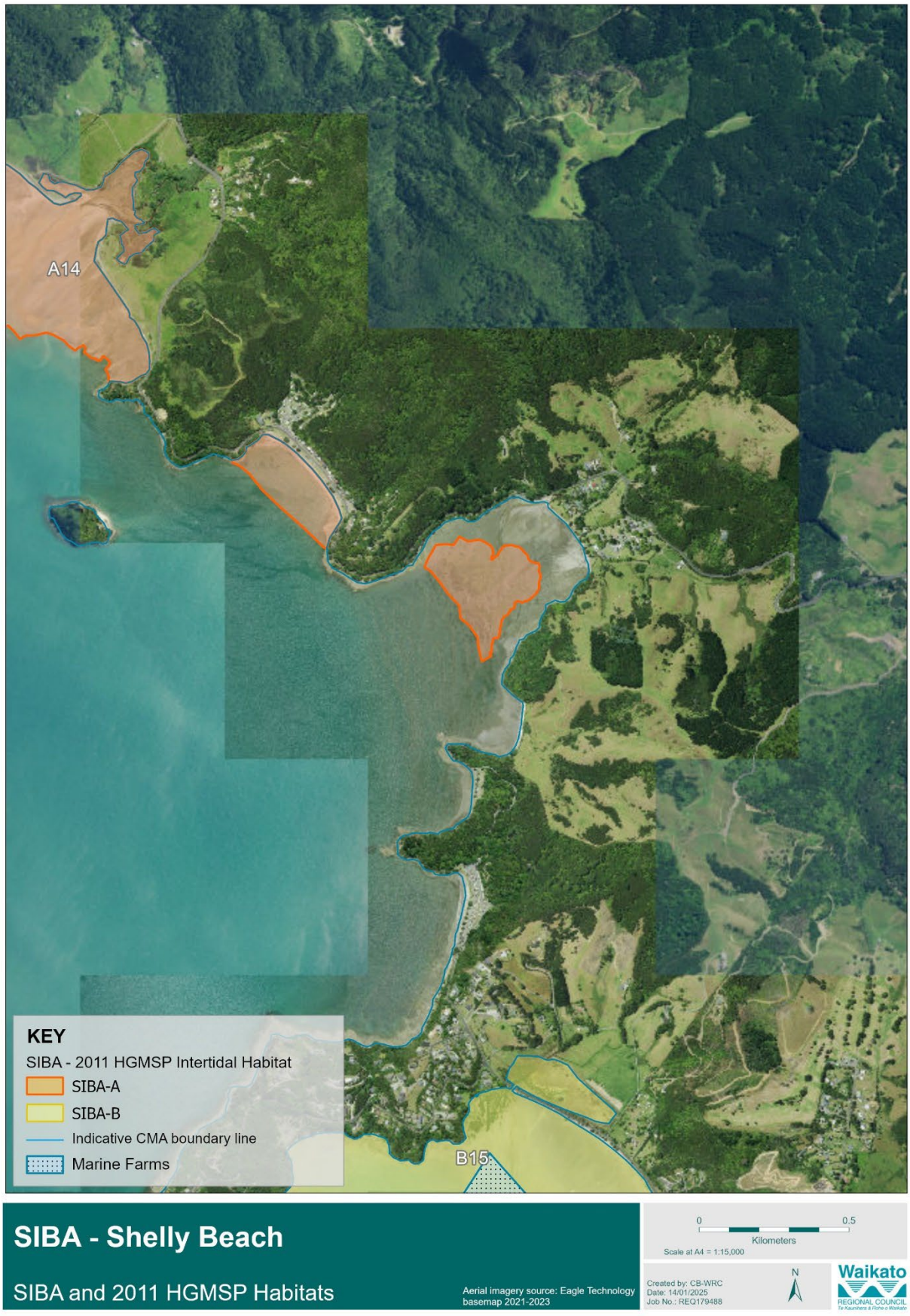


Figure 20: Shelly Beach/Kikowhakarere - recommended changes (January 2025)

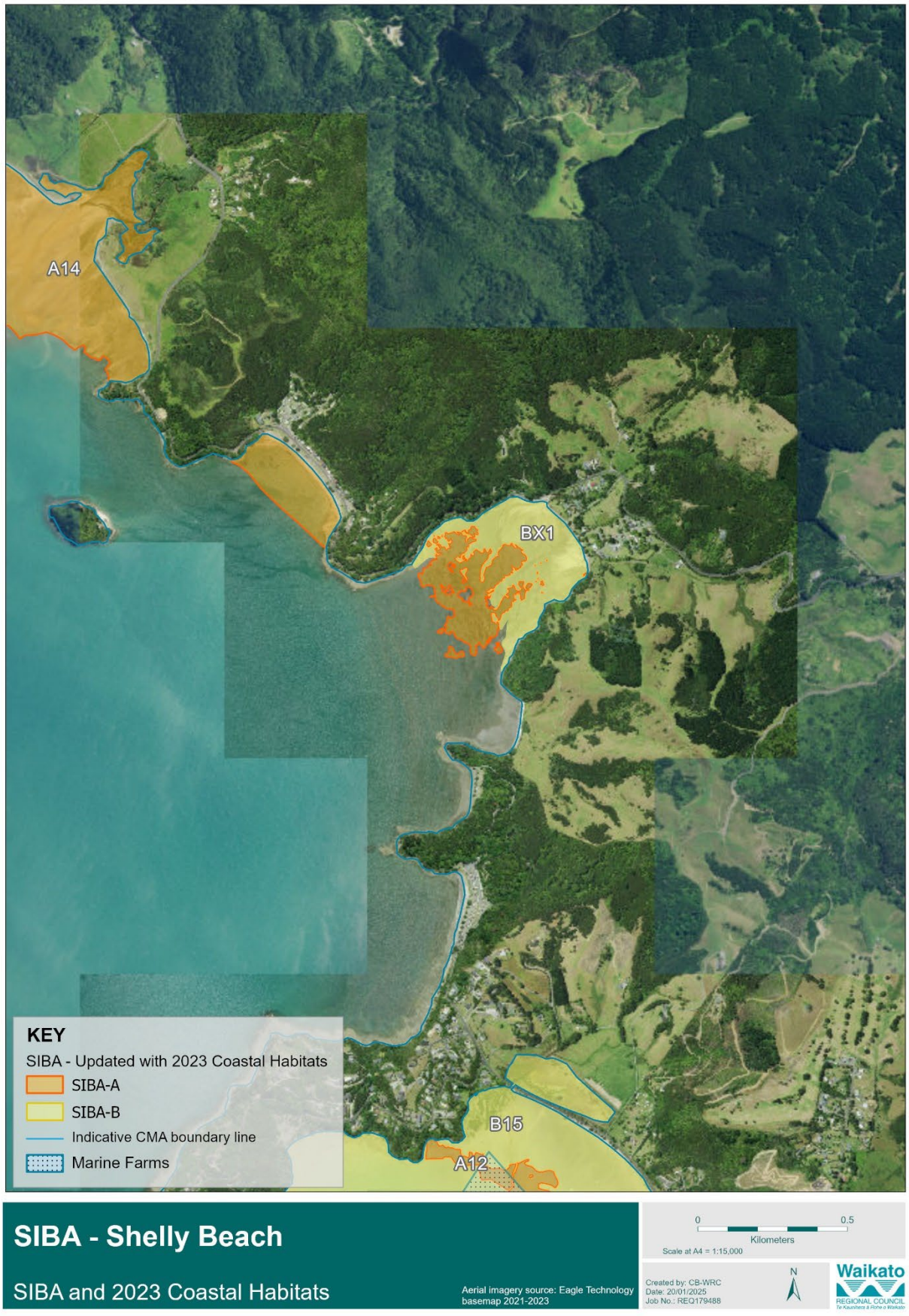


Figure 21: Colville Harbour (October 2024)

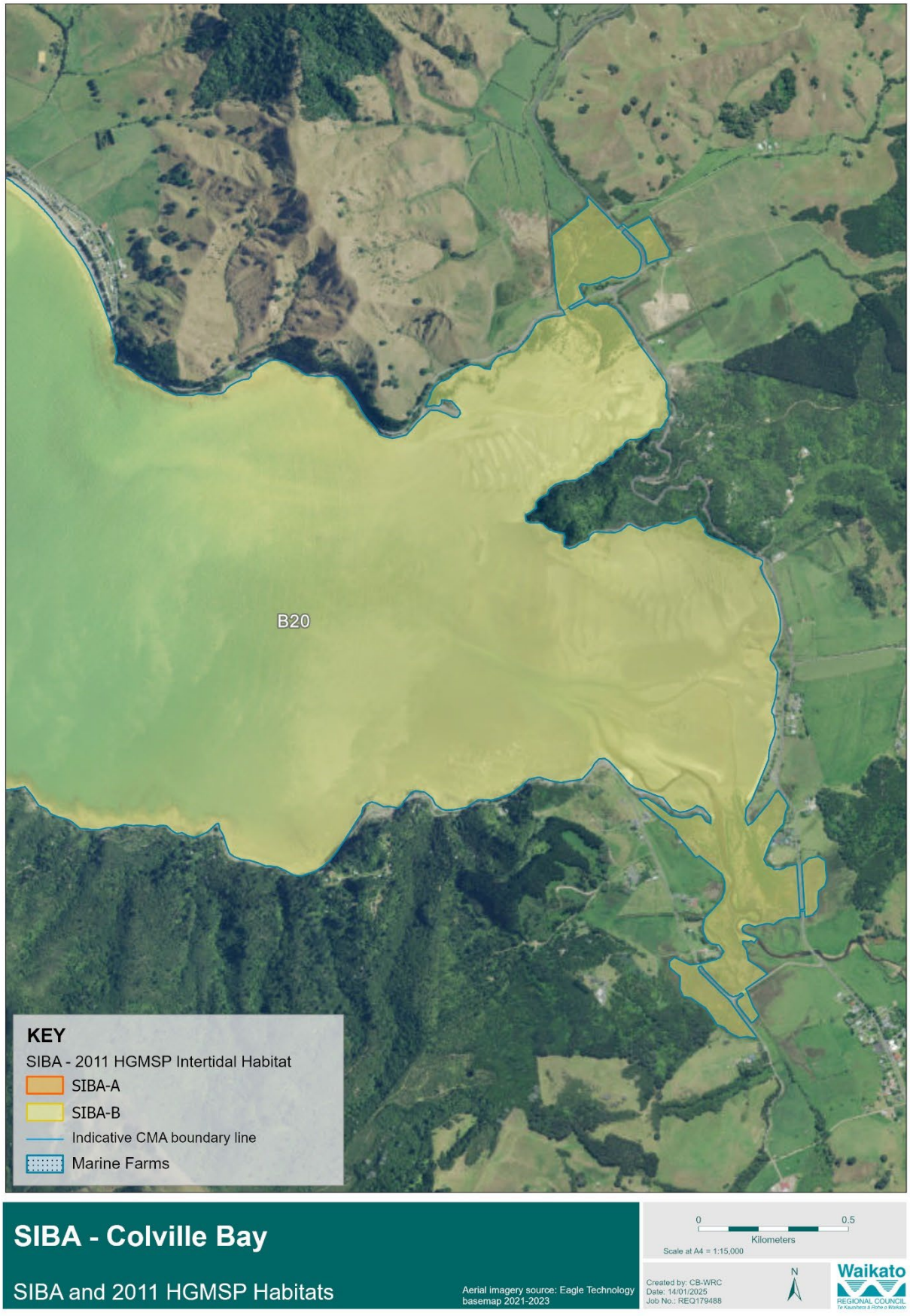


Figure 22: Colville Harbour - recommended changes (January 2025)

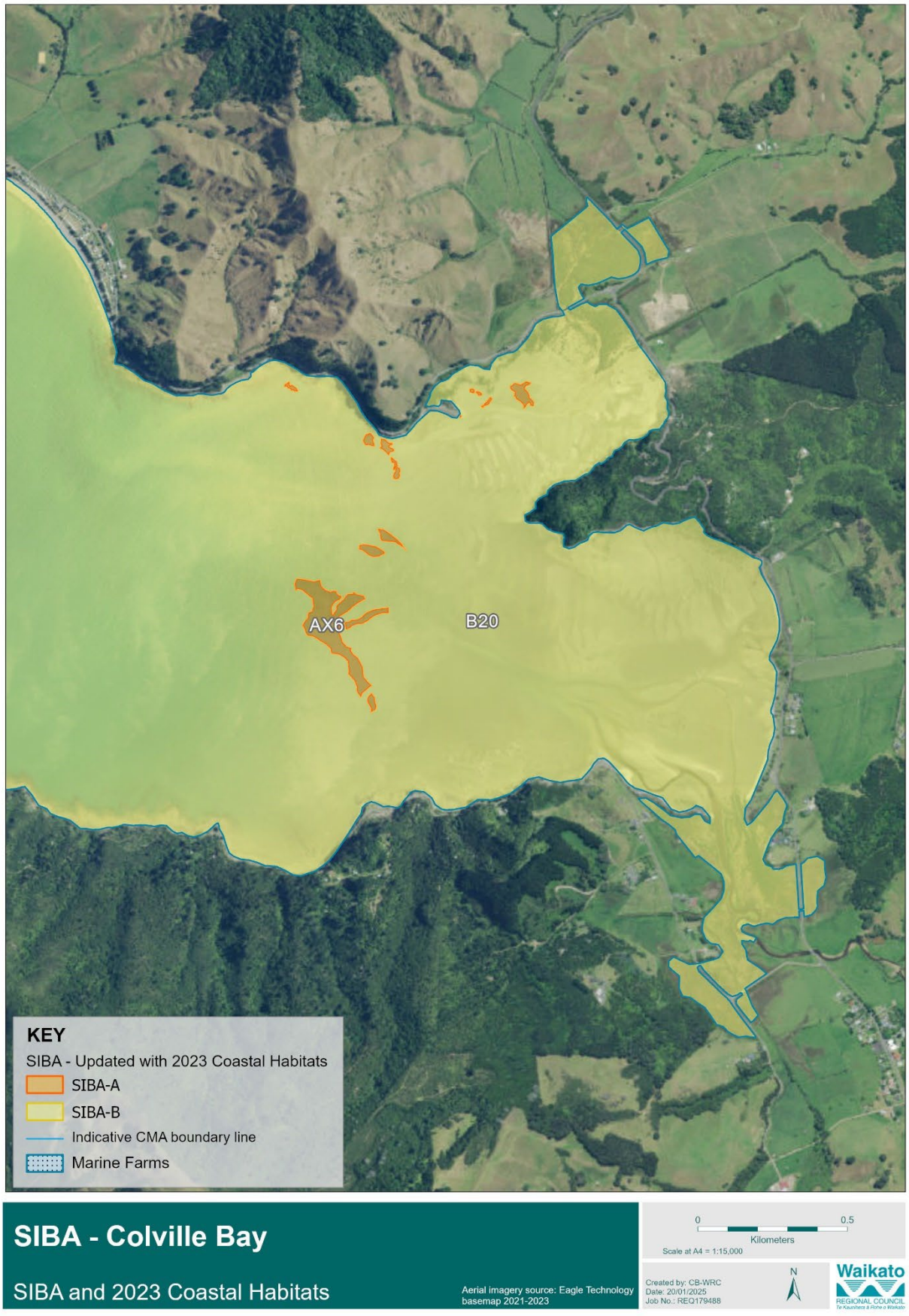


Figure 23: Whangapoua Harbour (October 2024)

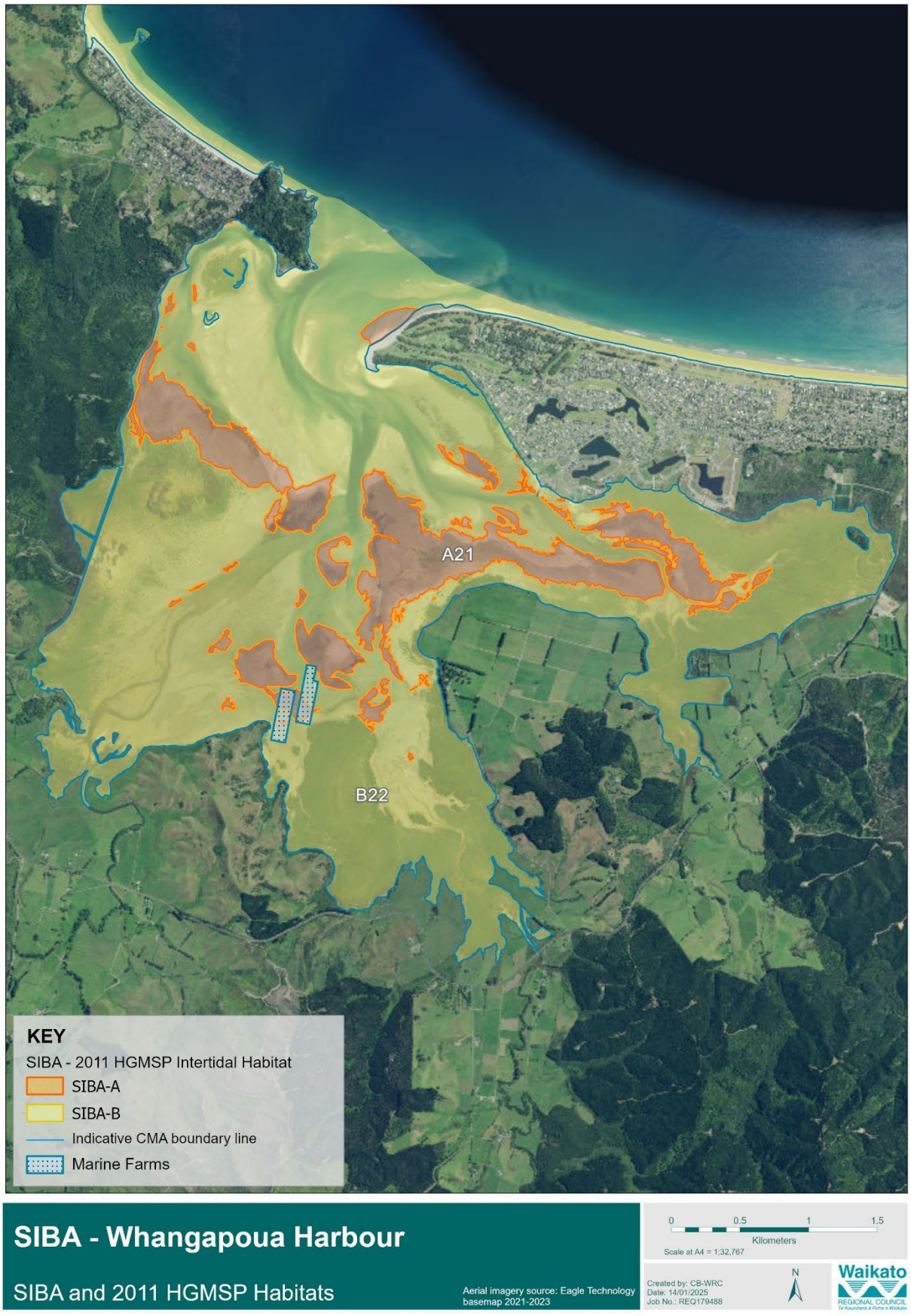


Figure 24: Whangapoua Harbour - recommended changes (January 2025)

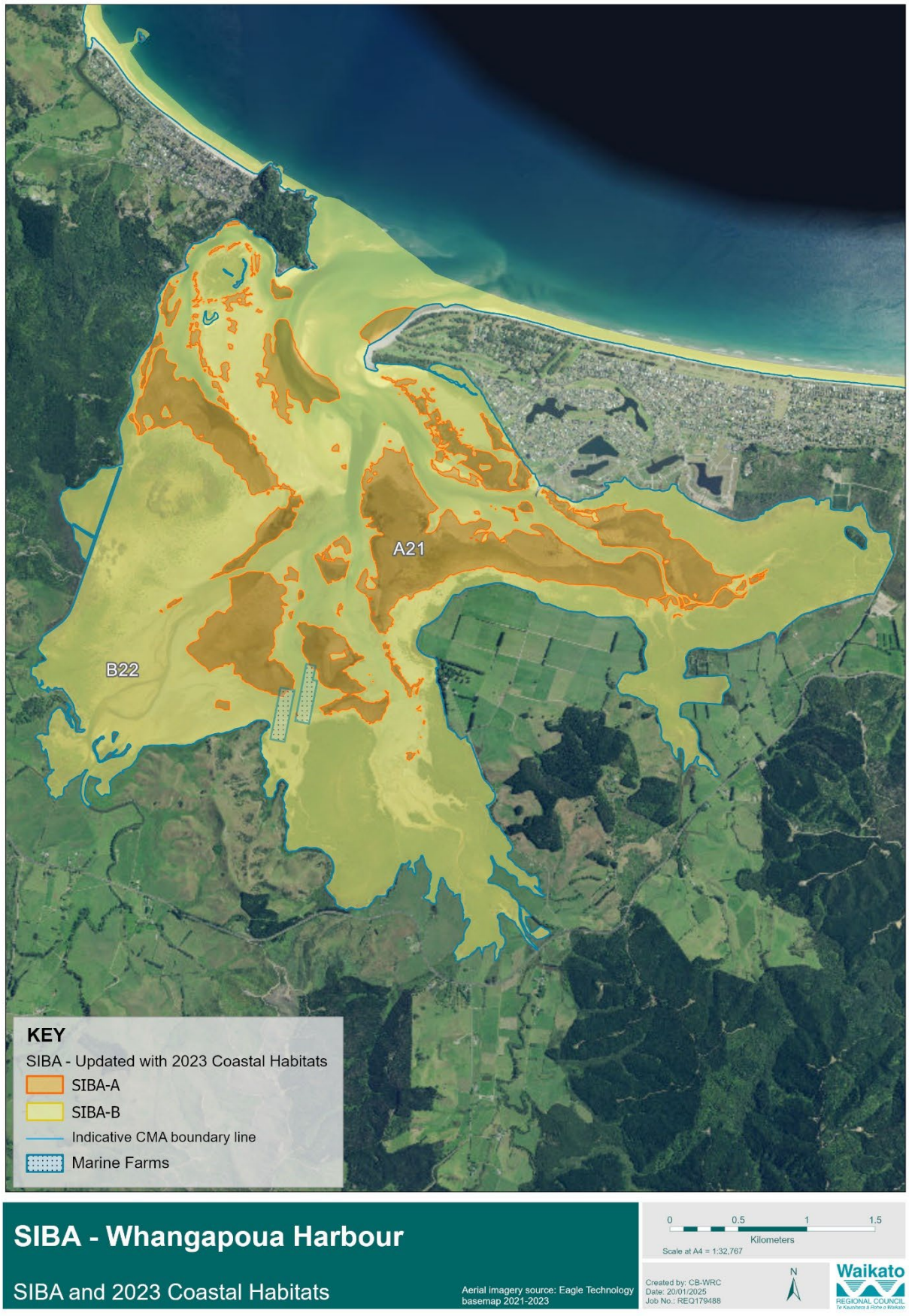


Figure 25: Whitianga Harbour (October 2024)

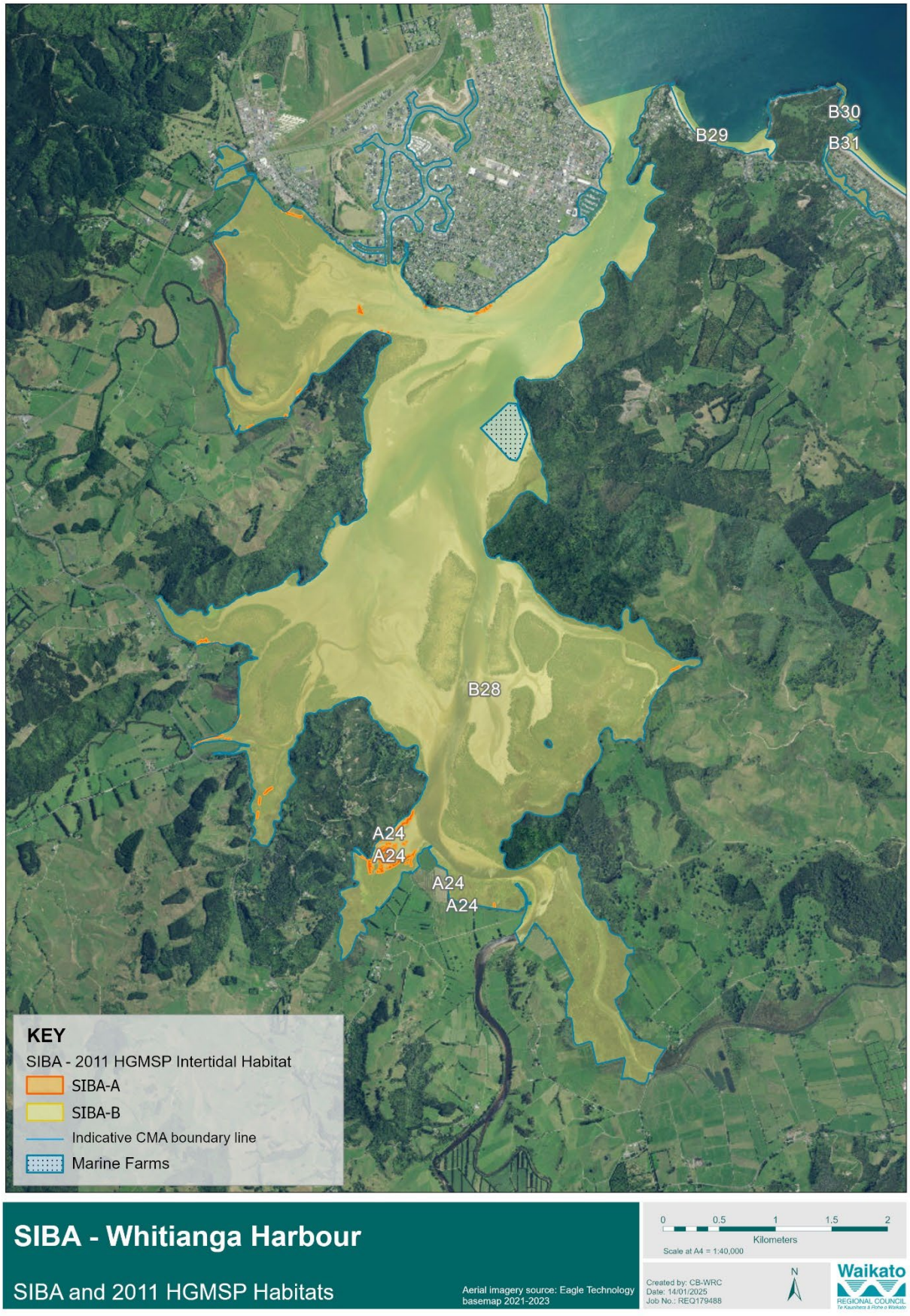


Figure 26: Whitianga Harbour -- recommended changes (January 2025)

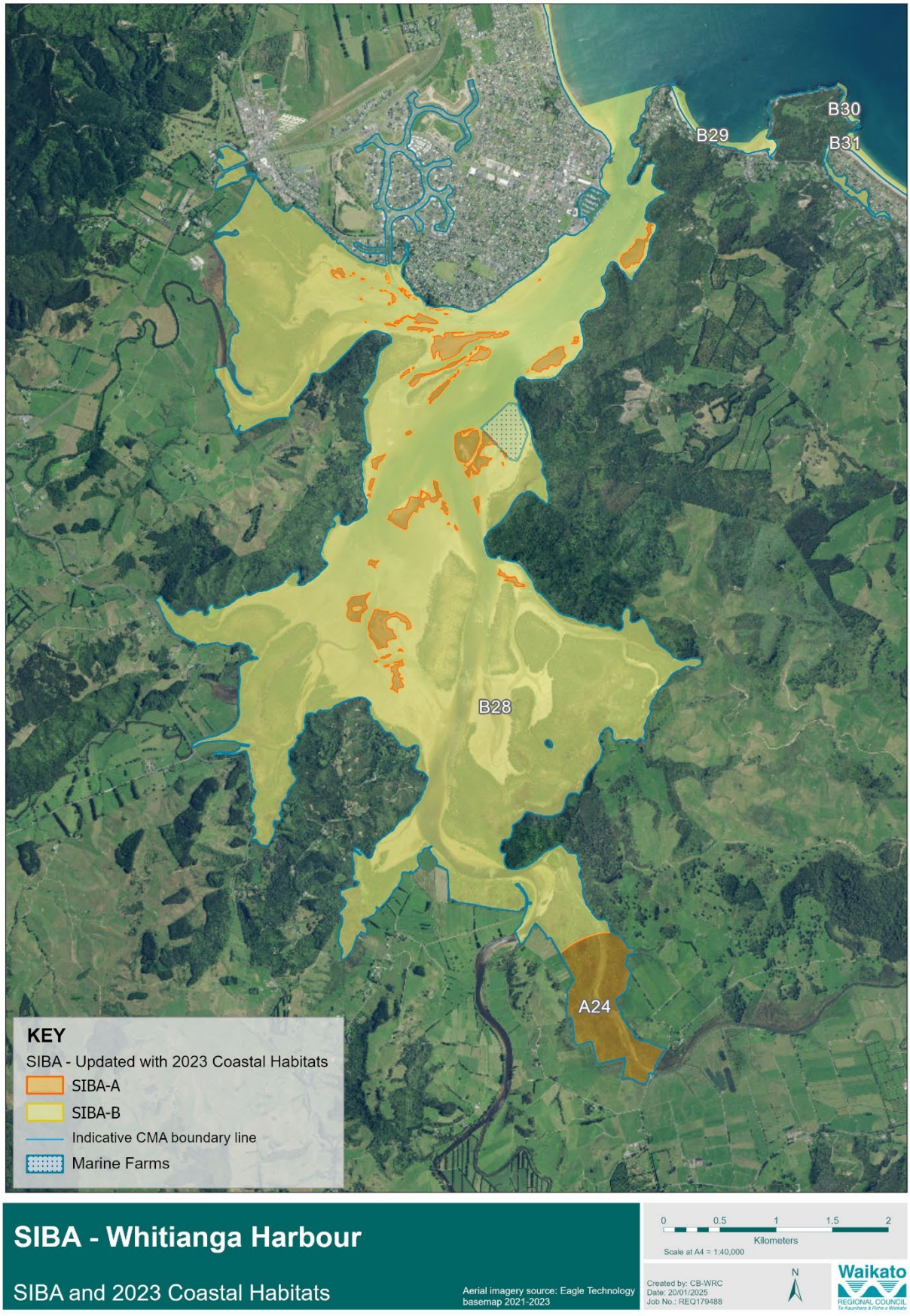


Figure 27: Purangi Harbour (October 2024)

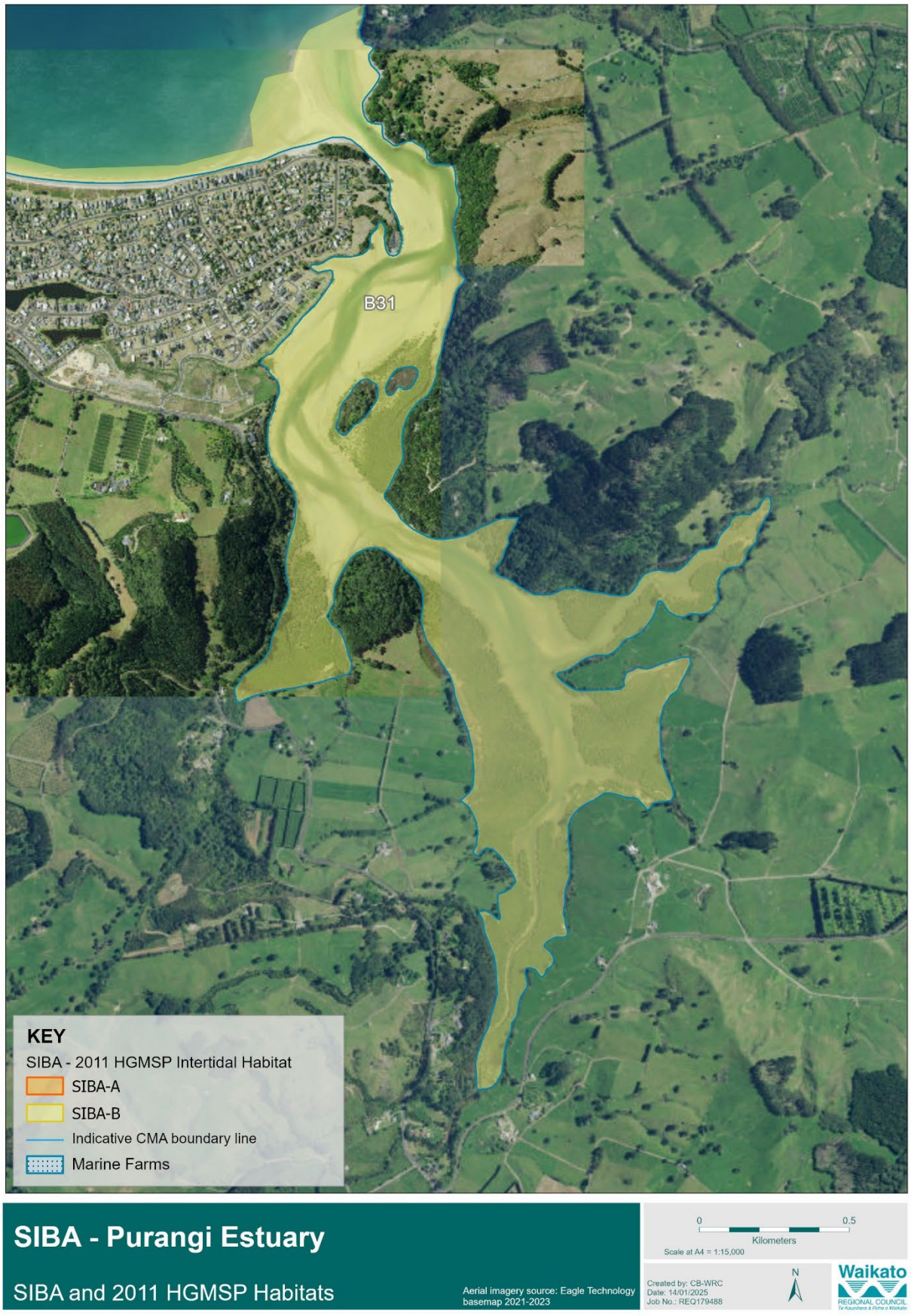


Figure 28: Purangi Harbour - recommended changes (January 2025)

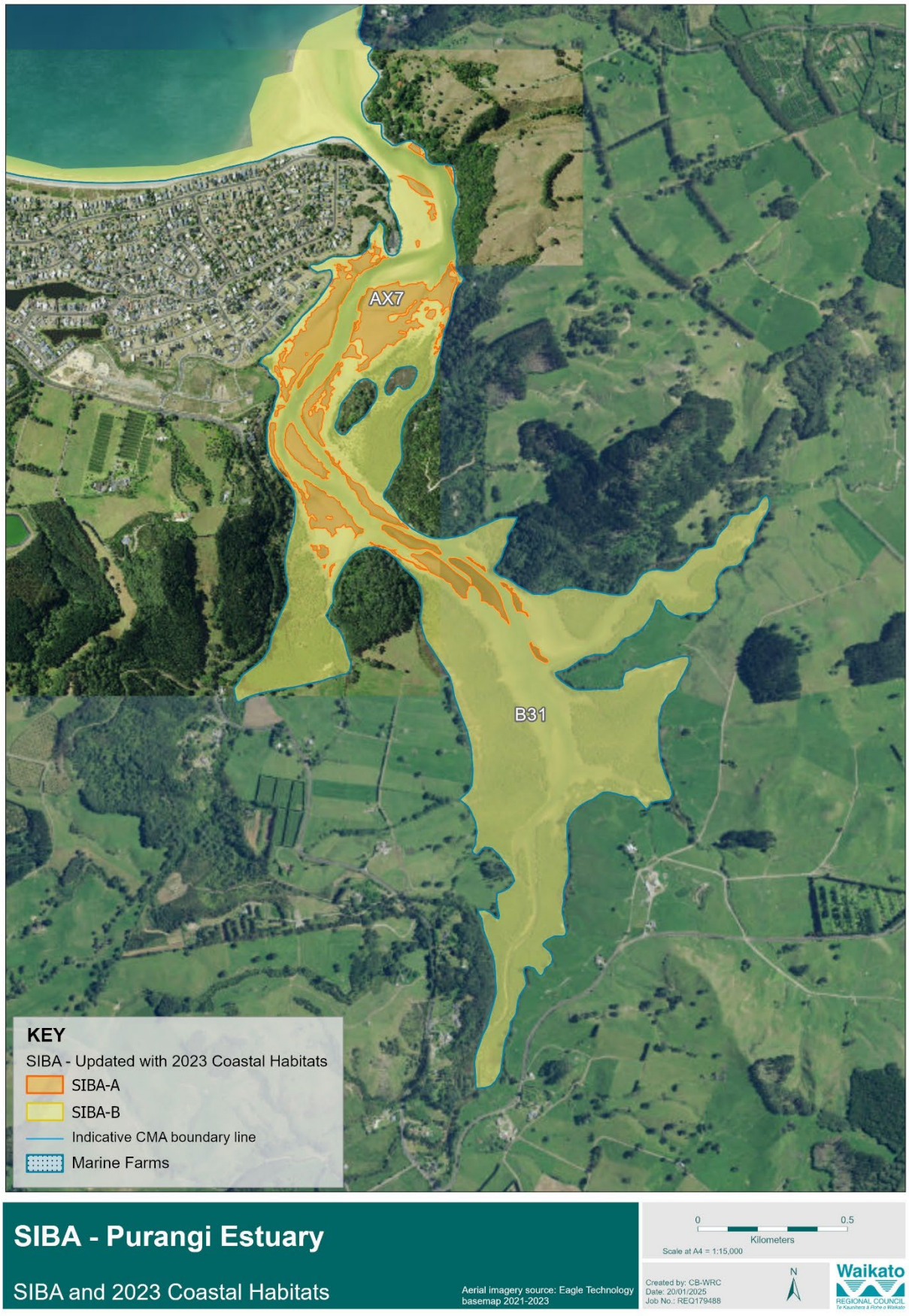


Figure 29: Tairua Harbour (October 2024)

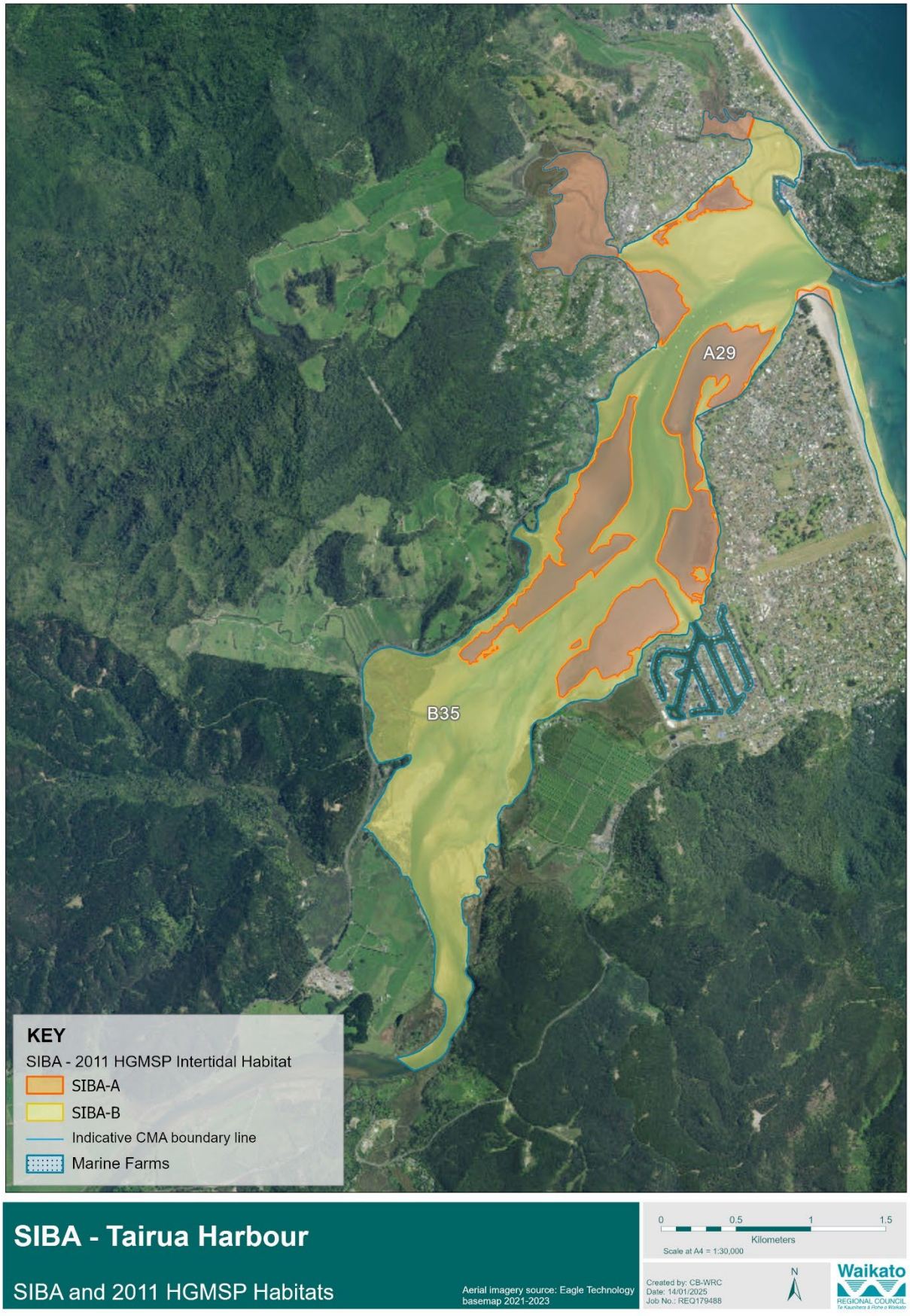


Figure 30: Tairua Harbour - recommended changes (January 2025)

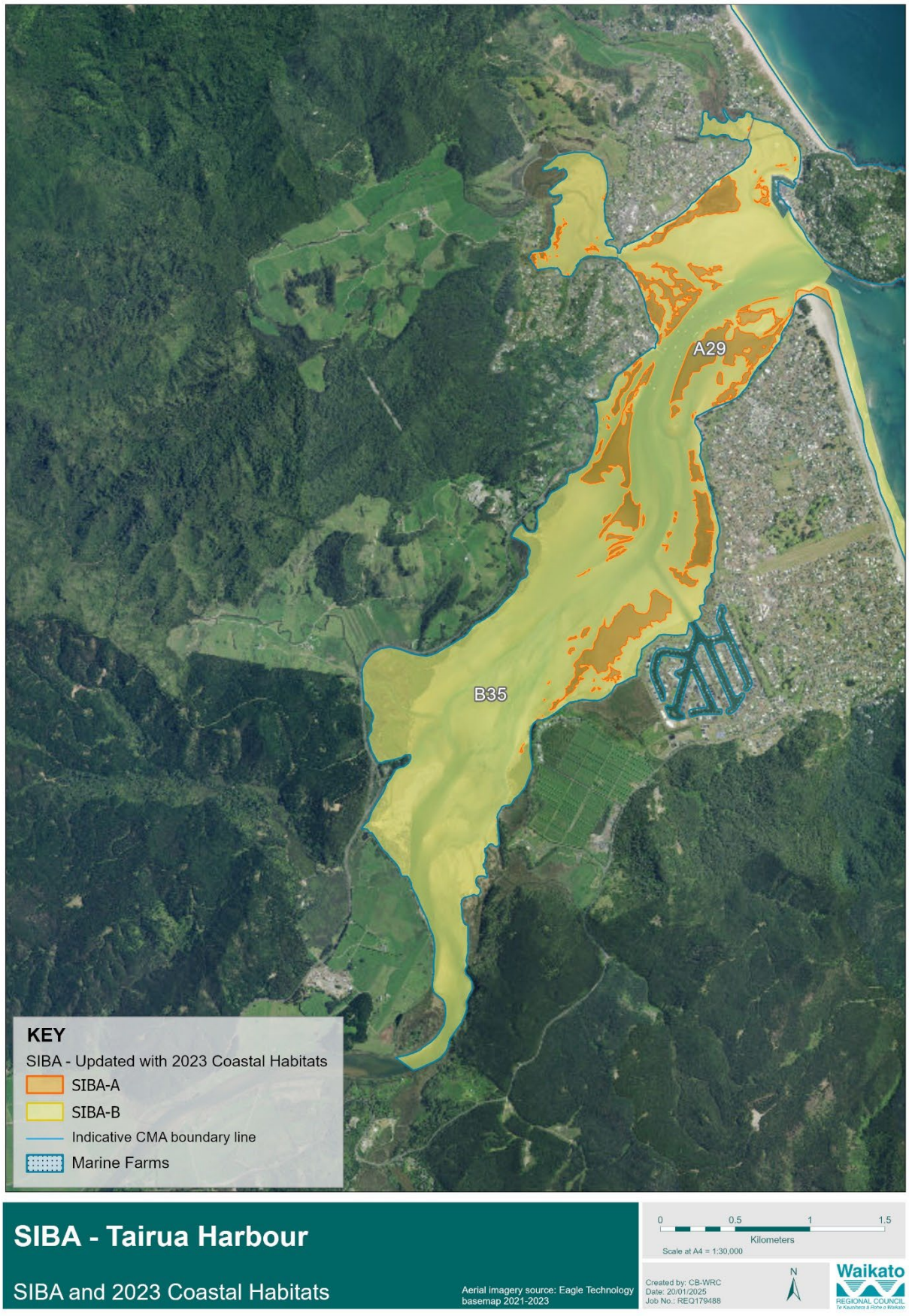


Figure 31: Wharekawa Estuary (October 2024)

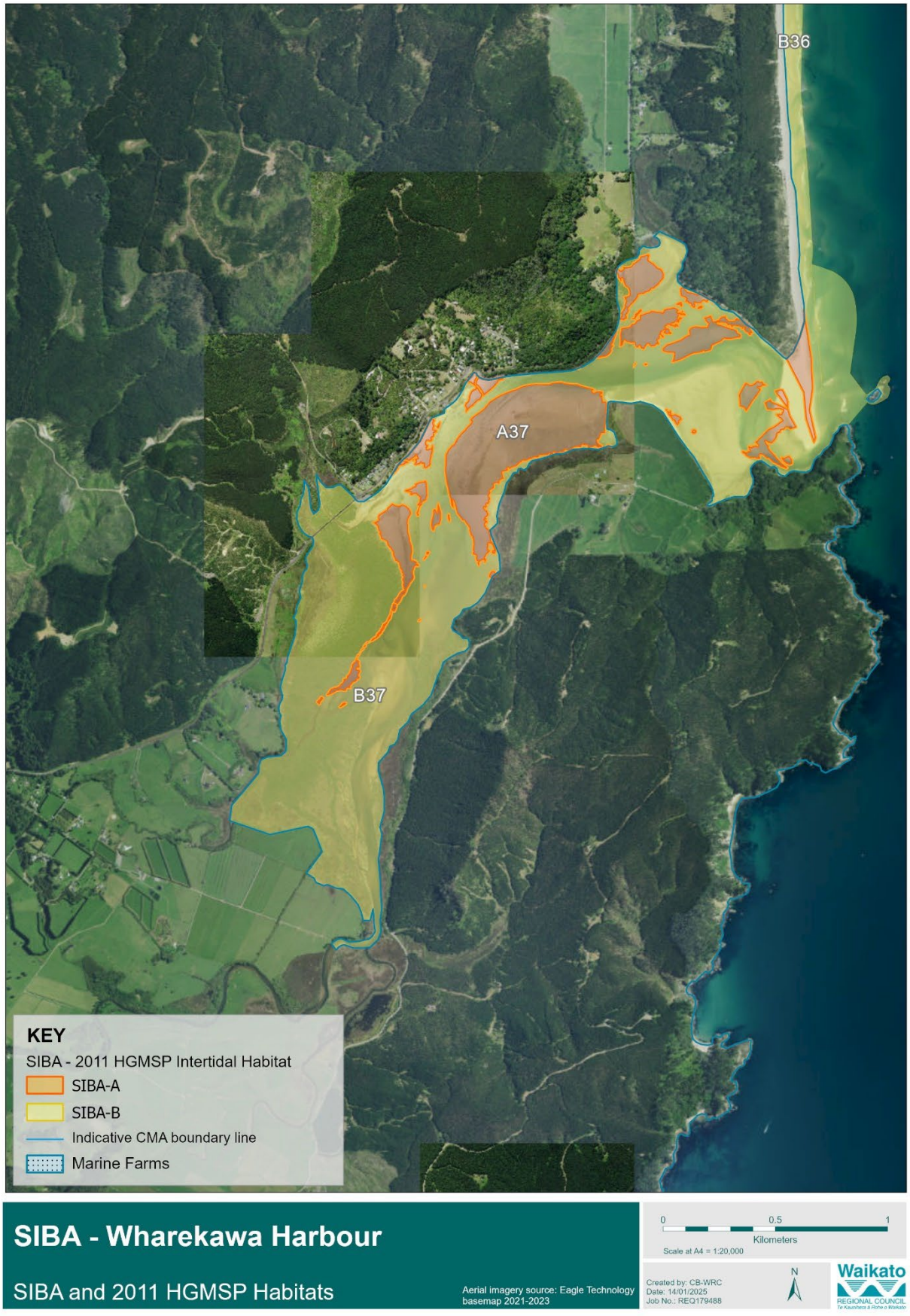


Figure 32: Wharekawa Estuary - recommended changes (January 2025)

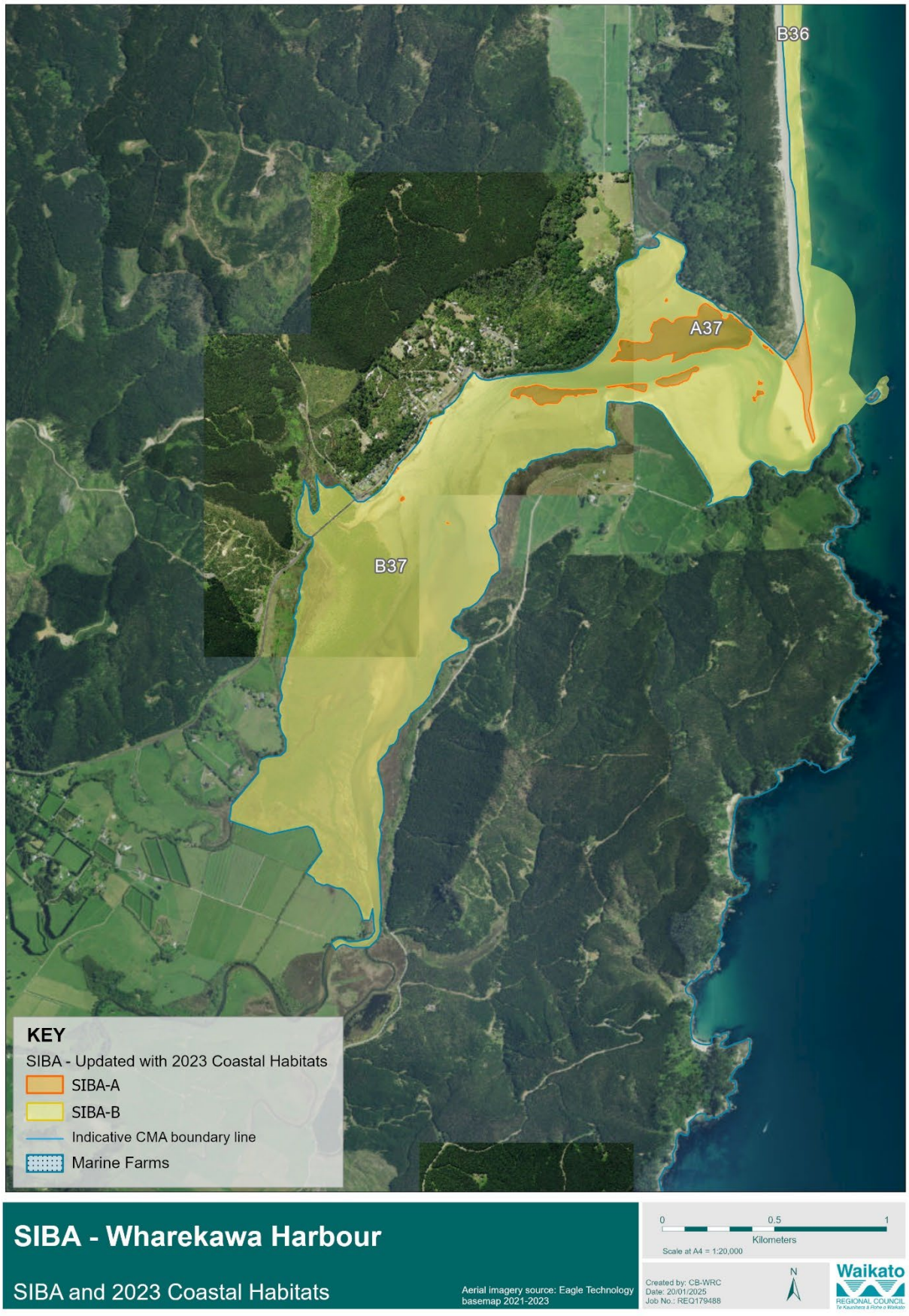


Figure 33: Whangamata Harbour and Otahu River (October 2024)

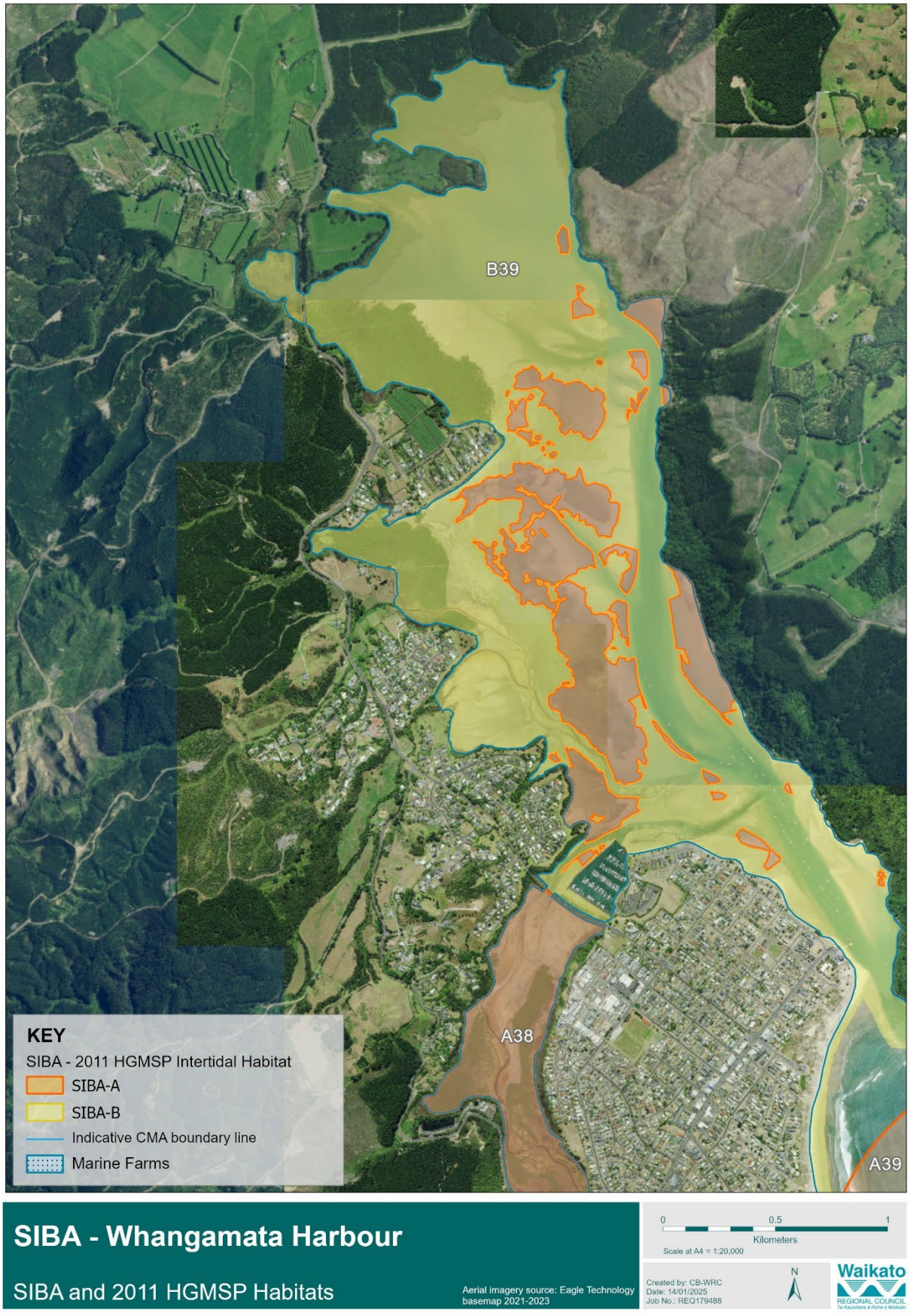


Figure 34: Whangamata Harbour and Otahu River - recommended changes (January 2025)

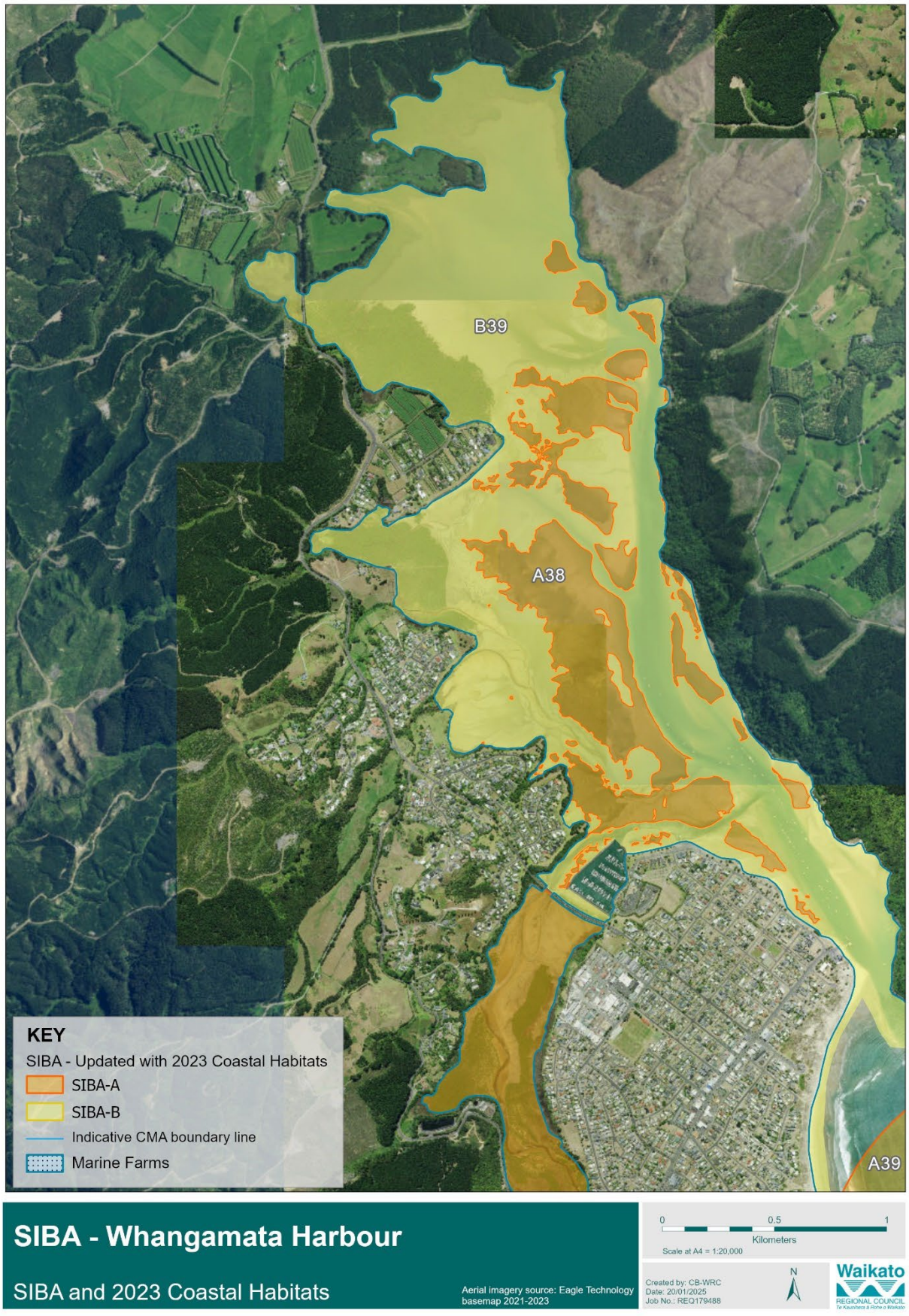


Figure 35: West Coast Coromandel Islands
Wekarua (October 2024)

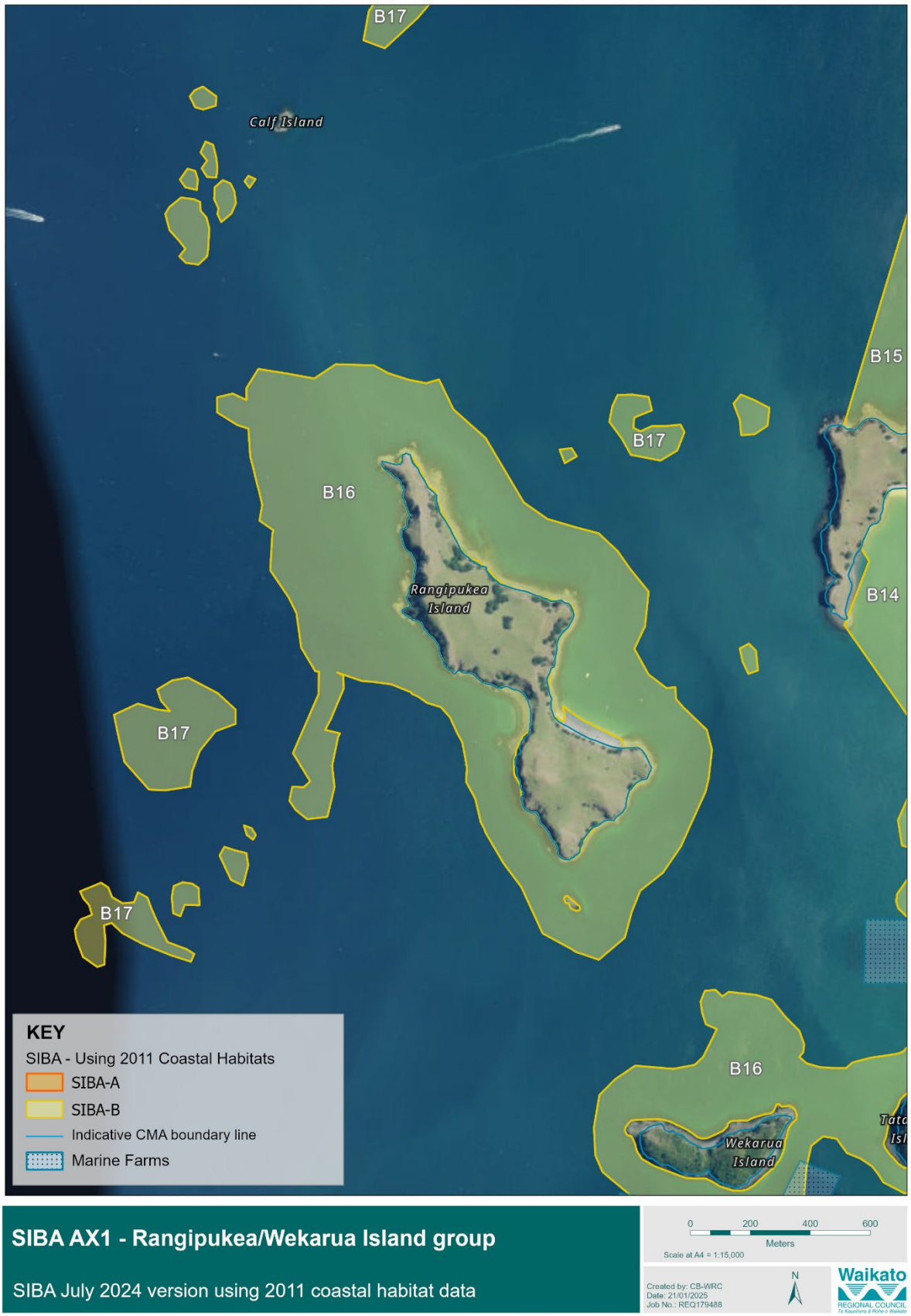


Figure 36: Wekarua - recommended changes (January 2025)

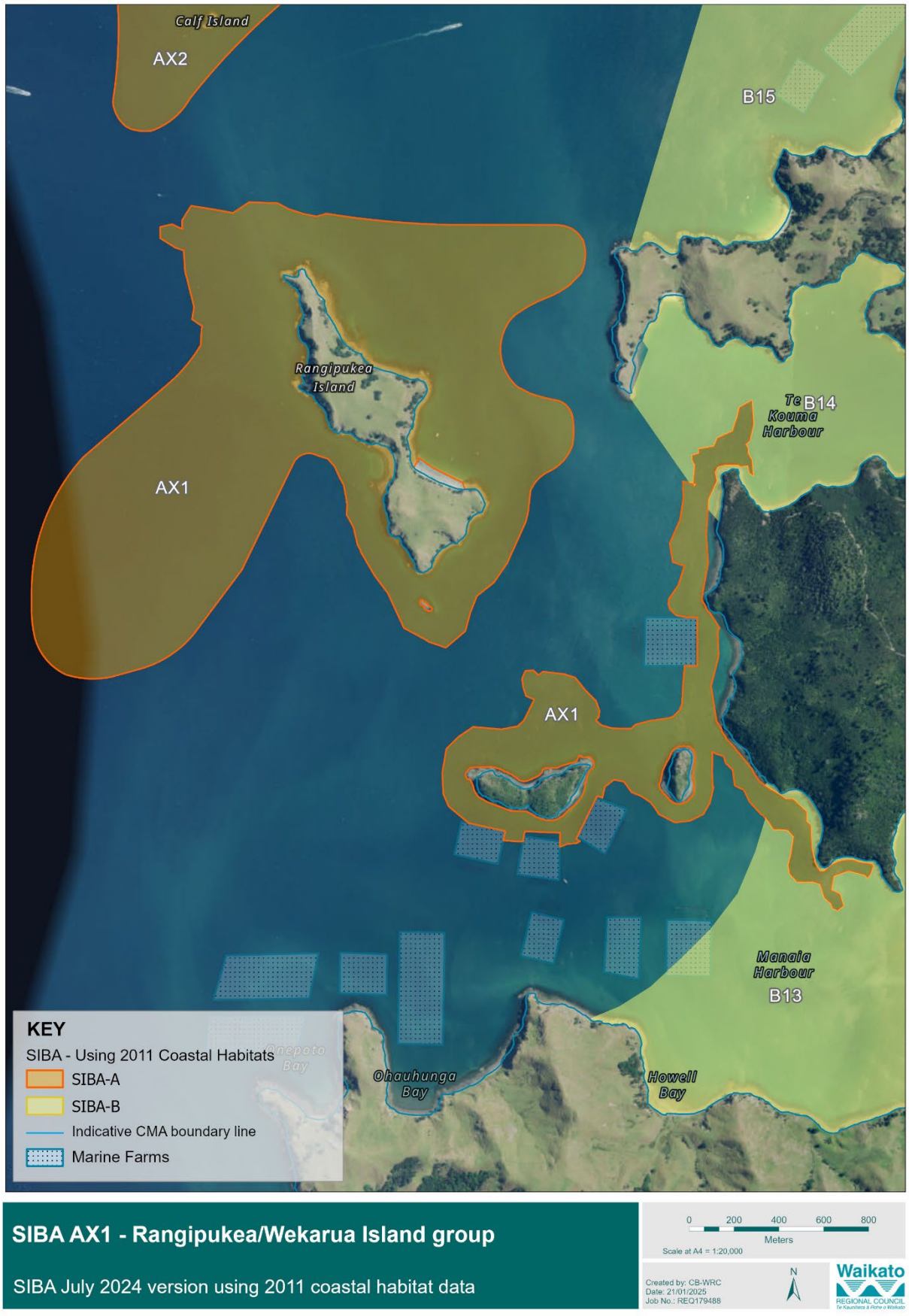


Figure 37: Cow and Calf Island group (October 2024)



Figure 38: Cow and Calf Island group - recommended changes (January 2025)

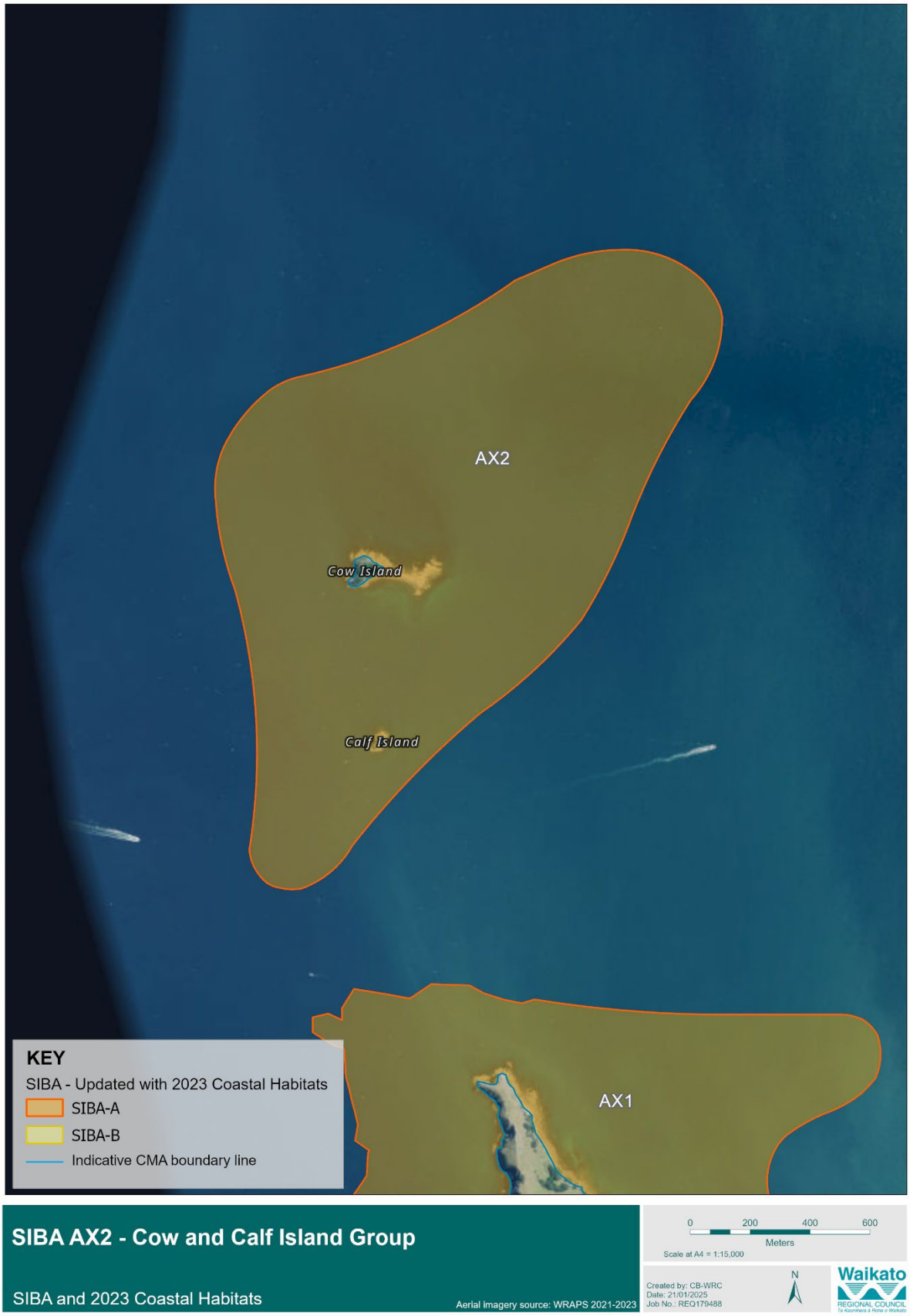


Figure 39: Hautapu Island group (October 2024)



Figure 40: Hautapu Island group - recommended changes (January 2025)



Figure 41: Moturua / Rabbit Island (October 2024)



Figure 42: Moturua / Rabbit Island - recommended changes (January 2025)



Figure 43: Northern Motukawao island group (October 2024)

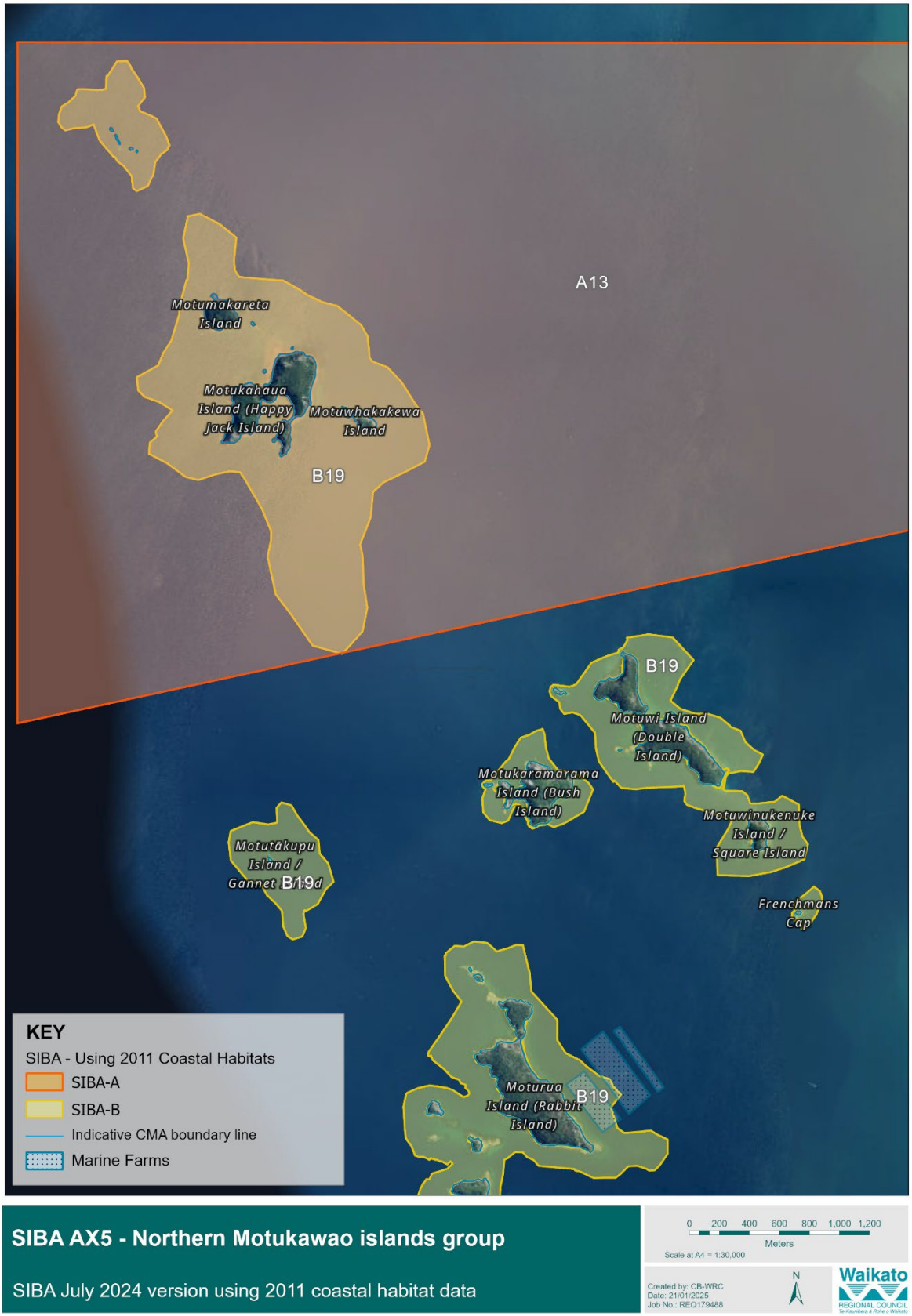


Figure 44: Northern Motukawao island group (January 2025)

