Draft regional environmental management plan for the Area of the North-west Pacific Ocean: with a focus on cobalt-rich ferromanganese crust and polymetallic nodule resources and habitats

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Table of Contents

Table of Figures

Table of Tables

Abbreviations

ABMT	Area-based management tool
APEI	Area of particular environmental interest
CFC	Cobalt-rich ferromanganese crust
CCZ	Clarion Clipperton Zone
COMRA	China Ocean Mineral Resources Research and Development Association
EBSAs	Ecologically or Biologically Significant Areas
JOGMEC	Japan Organization for Metals and Energy Security
EEZ	Exclusive Economic Zone
ECS	Extended Continental Shelf
PMN	Polymetallic nodule
POC	Particulate organic carbon
REMP	Regional environmental management plan
SPEI	Site of particular environmental interest
WCPFC	Western and Central Pacific Fisheries Commission
NPFC	North Pacific Fisheries Commission
VME	Vulnerable Marine Ecosystem

I. Introduction and background

1. In accordance with the United Nations Convention on the Law of the Sea (the "Convention") and the 1994 Agreement relating to the implementation of part XI of the Convention, the International Seabed Authority (the "Authority") is the organization through which the States parties to the Convention administer the mineral resources of the International Seabed Area (the "Area") and promote, control and organize current exploration and future mining activities for the benefit of humankind as a whole. At the core of the mandate of the Authority lies also its duty to take all necessary measures to ensure effective protection of the marine environment from harmful effects that may arise from activities in the Area. Pursuant to article 145 of the Convention, the Authority is required to adopt appropriate rules, regulations and procedures for, inter alia, the prevention, reduction and control of pollution and other hazards to the marine environment, the protection and conservation of the natural resources of the Area and the prevention of damage to the flora and fauna of the marine environment.

2. To that end, pursuant to article 165 of the Convention, the Legal and Technical Commission (the "Commission") of the Authority is responsible for making recommendations to the Council on the protection of the marine environment, with respect to relevant rules, regulations and procedures, as well as a monitoring programme on the risks and impacts on the marine environment resulting from activities in the Area. In addition, the Commission is responsible for keeping under review the rules, regulations and procedures on activities in the Area.

3. Three sets of exploration regulations have been adopted by the Authority on prospecting and exploration for polymetallic nodules, polymetallic sulphides and cobalt-rich ferromanganese crusts,[1] which are supplemented by a series of recommendations issued by the Commission.[2] Draft regulations on exploitation of mineral resources in the Area are presently under consideration by the Council and will be supplemented by a set of standards and guidelines to support their implementation. [3]

4. In pursuance of the mandate under article 145 of the Convention, the Council, at its seventeenth session held in 2012, approved, in its decision ISBA/18/C/22, an environmental management plan for the Clarion-Clipperton Zone (CCZ), on the basis of the recommendation of the Commission. Among other elements, the environmental management plan established objectives and priority actions at various levels, as well as a mechanism for review. In line with those provisions, the Commission reviewed progress in the implementation of the environmental management plan in 2016 and 2021 and identified further actions to advance the goals and objectives of the plan (see ISBA/26/C/43). On the basis of the recommendation of the Commission, the Council adopted in 2021 a decision relating to the review of the environmental management plan for the CCZ, as contained in document ISBA/26/C/58.

5. In 2020, the Assembly adopted the action plan of the Authority in support of the United Nations Decade of Ocean Science for Sustainable Development (ISBA/26/A/4), which identifies a number of expected outputs that highlight the role of scientific approaches to developing regional environmental management plans.

6. Through continued discussions, at its thirtieth session, the Council adopted the standardized procedure for the development, establishment and review of regional environmental management plans, on recommendation from the Commission, including a template for all regional environmental management plans (ISBA/30/C/20, hereafter, "the standardized procedure"). In this decision, the Council requested the Commission to implement the standardized procedure and advance its work, with a view to recommending new regional environmental management plans for priority areas where

[1] See ISBA/16/A/12/Rev.1, ISBA/18/A/11 and ISBA/19/C/17.
[2] See https://www.isa.org.jm/mining-code/recommendations.
[3] See https://www.isa.org.jm/mining-code/standards-and-guidelines.

there are currently exploration contracts, taking into account exploration or exploitation activities and the best available scientific information.

7. The development and implementation of regional environmental management plans have become an integral part of the work of the Authority on the protection of the marine environment and have the potential to contribute to the effective conservation and management of marine biodiversity in areas beyond national jurisdiction. Regional environmental management plans also have the potential to contribute to the achievement of Sustainable Development Goal 14 (Life below water) of the 2030 Agenda for Sustainable Development, namely, to conserve and sustainably use the oceans, seas and marine resources for sustainable development.

8. The development of the regional environmental management plan for the North-west Pacific Ocean was initiated in 2018. In March 2018, the Council took note of a strategy proposed by the Secretary-General for the development of regional environmental management plans (ISBA/24/C/3). The Council agreed with the priority areas that had been identified, including the North-west Pacific Ocean for seamounts. Subsequently, in October 2019, a new contract for exploration for polymetallic nodules in the North-west Pacific Ocean was granted by the Authority, adding a new resource category and associated habitats for consideration in developing a regional environmental management plan.

9. Since 2018, the Authority has organized four expert workshops in support of the development of the regional environmental management plan for the North-west Pacific by the Commission. Three of these workshops focussed on compiling available data and information and to progress scientific discussions of the environmental data and its implications for potential area based-management tools. These science-focused workshops were held in Qingdao, China, in 2018, remotely in 2020, and in Tokyo, Japan in 2024. For these workshops, a data report and regional environmental characterisation were prepared and updated for each workshop.[4] A further management-focussed workshop was held in Busan, Republic of Korea in 2026, which evaluated the outputs from the scientific workshops and further developed the draft regional environmental management plan from a management and operational perspective. The process for developing the regional environmental management plan for the North-west Pacific Ocean is consistent with the steps as outlined in the standardized procedure.

10. In developing the regional environmental management plan, the Commission considered the outcomes of the above-mentioned workshops, as the main scientific foundation. The Commission also considered the practical feasibility of implementing the proposed management measures and took a balanced approach in addressing the concerns of different stakeholders from the workshops.

11. The present plan contains references to measures that are applicable to the exploitation phase for which the draft regulations on exploitation of mineral resources in the Area are still under negotiation; those measures may therefore need to be aligned once the regulations have been finalised.

12. The development and implementation of regional environmental management plans are guided by the following overarching principles with respect to activities in the Area:

a) Common heritage of mankind. The Area and its resources are the common heritage of humankind. All rights to the resources of the Area are vested in humankind as a whole, on whose behalf the Authority shall act;

b) Precautionary approach. In principle 15 of the Rio Declaration on Environment and Development, it is specified that where there are threats of serious or irreversible damage to the environment, lack of full scientific certainty

[4] For workshop reports, the data report and regional environmental characterization, please see https://isa.org.jm/protection-of-the-marine-environment/regional-environmental-management-plans/other-regions/

shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation;

c) Transparency. The Authority shall enable public participation in environmental decision-making procedures;

d) Application of an ecosystem approach; and

e) Incorporation of the best available scientific evidence into decision-making processes.

13. As set out in the standardized procedure, regional environmental management plans are designed, among other things, to:

a) Provide the relevant organs of the Authority, as well as contractors and their sponsoring States, with environmental management measures and tools, including area-based management tools, to support informed decision-making for environmental protection at a regional scale from mineral resource exploration and exploitation activities;

b) Provide the Authority with a clear and consistent mechanism to identify particular areas considered to be: (i) representative of the full range of habitats, biodiversity, sensitive ecosystems and biological communities within the management area; and/or (ii) important for the maintenance of the ecosystem structure and function;

c) Provide those areas with the necessary levels of environmental protection from mineral resource exploration and exploitation activities; and

d) Provide the Authority, contractors, their sponsoring States and other member States, with information at a regional scale on the environment and on the levels of protection set out by the regional environmental management plan.

14. The structure of this regional environmental management plan follows the template as laid out in the standardized procedure.

II. Goals and objectives

15. Environmental goals and objectives underlie the development, establishment and review of regional environmental management plans in contributing to the mandate of the Authority to ensure the effective protection of the marine environment from harmful effects that may arise from activities in the Area, in accordance with article 145 of the Convention.

16. As set out in the standardized procedure, the goal of regional environmental management plans is to protect and conserve biodiversity and ecosystem integrity at a regional scale.

17. Environmental objectives that aid the achievement of the goal are, at a regional scale, to:

a) Maintain biodiversity;

b) Maintain ecosystem structure, function and services (including the structure and integrity of food webs, and elemental cycling and trophic relationships);

c) Maintain the representativity of habitats, communities and populations;

d) Maintain the ability of populations to replace themselves, including ensuring connectivity among populations;

e) Maintain areas of temporal, including seasonal, use (such as migratory routes and feeding grounds);

f) Preserve vulnerable and/or unique ecosystems;

g) Preserve endemic, endangered or threatened species; and

h) Maintain benthic and pelagic ecosystems, including mid-water fauna.

18. A regional-specific objective is identified as to maintain environmental elements with significant cultural characteristics, values and human uses.

19. In implementing the above goal and objectives, efforts should be made to promote collaboration with other competent international, regional and subregional organizations, as well as neighbouring States, including for addressing knowledge gaps related to regional patterns of biodiversity and ecosystem integrity.

III. Geographical scope

A. Development of the regional definition

20. The regional environmental management plan applies to a geographical space within the Area, extending from approximately 10.4°N to 27.0°N latitude and from 146.8°E to 165.7°E longitude (see Figure 1).

21. The North-west Pacific has a complex geography that includes three major seamount chains: Marcus-Wake, Magellan, and Marshall Island chains) and several deep ocean basins, such as the Northwest Pacific, Pigafetta, and East Mariana basins (Figure 1). The regional environmental management plan is bounded by the Federated States of Micronesia, Republic of Marshall Islands, United States of America and Japan.

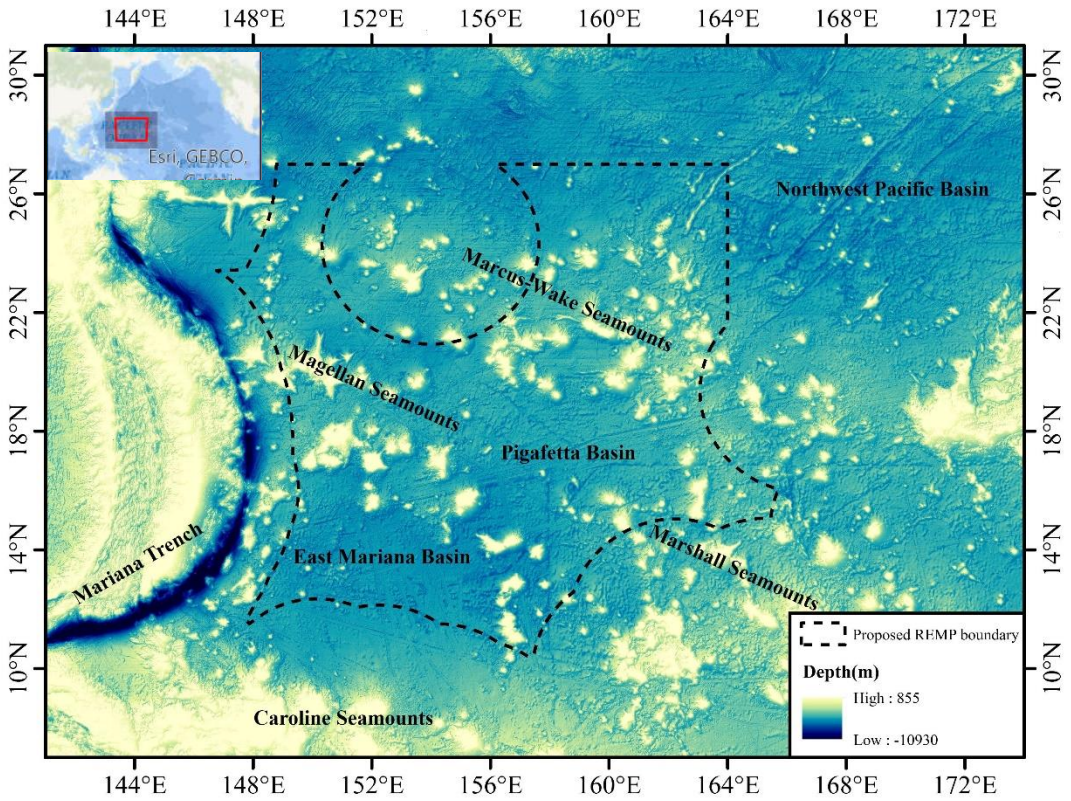

Figure 1: Overview of geology and bathymetry of the area covered under the regional environmental management plan and surrounding areas.
Data source: General Bathymetric Chart of the Oceans (GEBCO, 2020).

22. This area includes contract areas and reserved areas for the exploration for polymetallic nodules and cobalt-rich ferromanganese crusts in the Area. The details of the exploration contracts grated by the Authority are provided under Section IV. B1.

23. The geographical limits of the area covered under the regional environmental management plan, and the contract areas and reserved areas, are shown in Figure 2. The total area covered under the regional environmental management plan is around 2.1 million km2, and extends up to the limits of adjacent countries' jurisdiction.

B. Geographical coordinates and water depths of the regional environmental management plan region

24. The northernmost boundary of the draft regional environmental management plan lies in the Northwest Pacific Basin, near approximately 27°N latitude, and between about 146.8°E and 165.7°E longitude. To the west, the northern boundary turns southwards around the maritime boundaries of Japan and United States. From the northeast corner, the boundary of the plan area turns southwards along longitude 165.7°E to the maritime zone of the Wake Island, which it follows to the south and then eastwards following the maritime boundaries of the Republic of Marshall Islands and that of the Federated States of Micronesia (Figure 2).

25. The region has large and variable topographic relief. The depth of basement of the Marshall seamounts is around 4,000m and that of the Marcus-Wake and Magellan seamounts are between 5,000 and 6,000m. The peaks of Marcus-Wake and Magellan seamounts are generally deeper than 1,000m. The depth of abyssal plain in the basins varies from 4,000m to 6,000m.

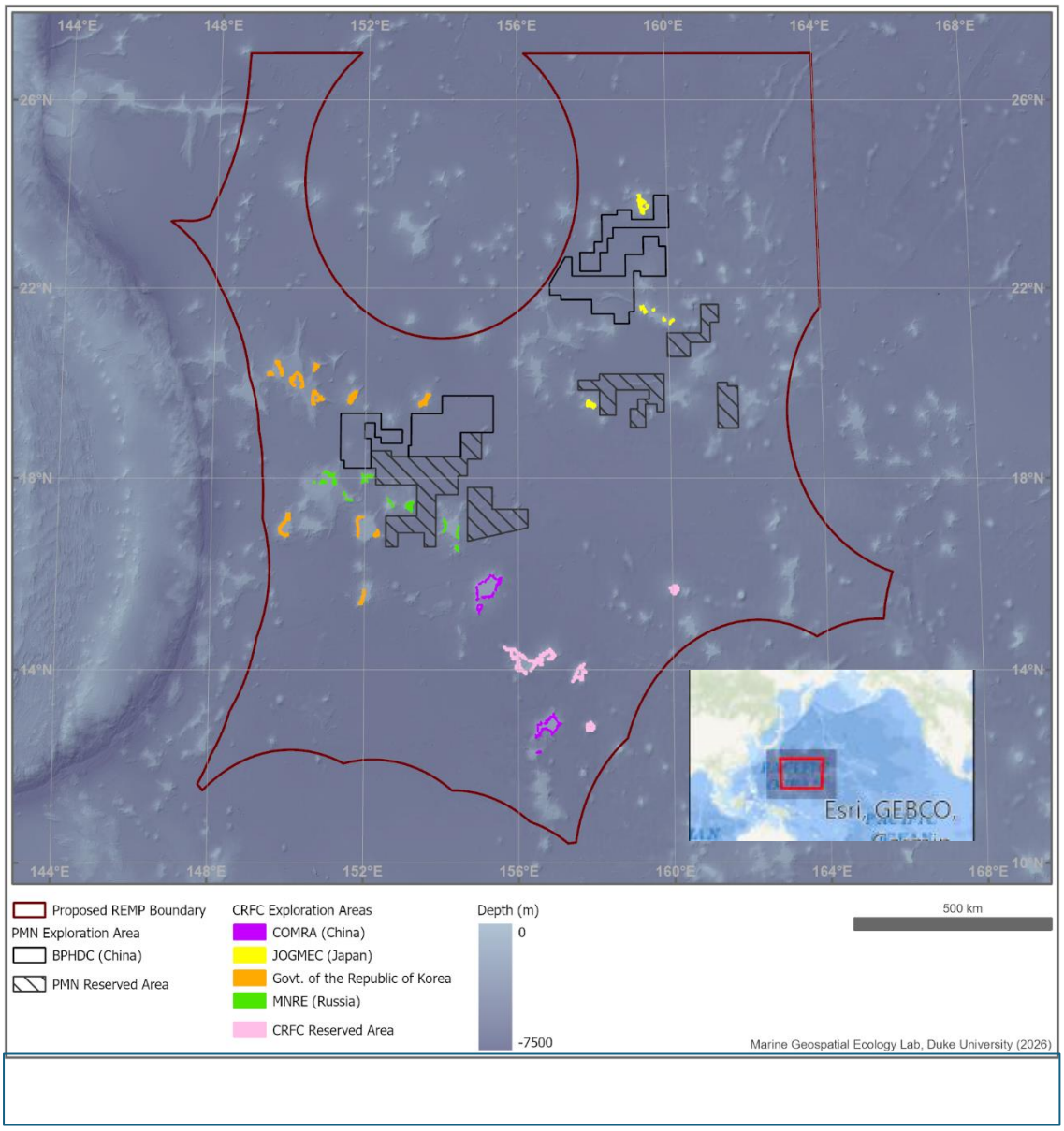

Figure 2: Overview of geology and bathymetry of the area covered under the regional environmental management plan and surrounding areas. BPHDC: Beijing Pioneer Hi-Tech Development Corporation; COMRA: China Ocean Mineral Resources Research and Development Association; JOGMEC: Japan Organization for Metals and Energy Security; MNRE: Ministry of Natural Resources and Environment of the Russian Federation.

Data source: for bathymetry, the General Bathymetric Chart of the Oceans (GEBCO, 2020); for contract areas and reserved areas, ISA website (updated to 30 April. 2026).

IV. Regional setting

26. Existing sets of scientific data and information on the geology, oceanography and biological communities of the North-west Pacific Ocean have been compiled and synthesized in the data report and regional environmental characterisation as inputs to the preparation of the regional environmental management plan. Drawing on those scientific

compilations, the environmental characteristics of the North-west Pacific are summarized below.

A. Environmental characteristics

27. The sections below summarise the key environmental characteristics of the region. They are based on an extensive collation of information compiled by scientific experts, and produced as a regional environmental characterisation report (see footnote 4).

1. Physicochemical characteristics

28. The area covered under this regional environmental management plan (defined in section III) is characterized by a tropical oceanic climate with consistently high temperatures and humidity, with minimal seasonal variation. Prevailing trade winds drive westward surface currents, while summer typhoons contribute strong winds, heavy rainfall, and enhanced ocean mixing. The region is strongly influenced by components of the North Pacific Subtropical Gyre. Surface circulation is dominated by the North Equatorial Current and the North Equatorial Counter Current, whereas deeper layers are influenced by thermohaline circulation and the northward transport of the Antarctic Bottom Water. Deepwater circulation is affected by a number of ridge systems associated with offshore islands, with an eastern branch flowing northwards near Wake Island, and a western branch through the East Marianas basin. The convergence of water masses formed at mid- and high-latitudes produces a complex vertical structure that includes North Pacific Tropical Water, North Pacific Intermediate Water, and Subtropical Mode Water.

29. Surface waters remain warm year-round, ranging between 26-29 °C, and are highly saline at 34.5–35 PSU due to strong evaporation and limited rainfall. A pronounced thermocline develops at depths of 100–200 m, below which temperature decreases steadily to about 5 °C near 1,000 m. The region is oligotrophic, with low concentrations of nitrate, phosphate, and silicate that limit primary productivity. However, seamounts generate internal tides and turbulence that promote localized upwelling, supplying nutrients to the upper layers and supporting deep chlorophyll maxima around 100–150 m below the ocean surface. Oxygen is abundant in surface waters but decreases sharply between 500 and 1,000 m, forming an oxygen minimum zone typical of subtropical gyres. Chemically, the waters are supersaturated with respect to aragonite and calcite, favoring coral reef growth and carbonate sedimentation. Collectively, these features define a distinctive oceanographic environment that sustains ecologically diverse systems.

2. Geological characteristics

30. The Northwest Pacific Ocean is a geologically diverse region shaped by tectonic and magmatic activity, which contains three major seamount chains (Marcus–Wake, Magellan, and Marshall) and several deep basins, including Northeast Pacific, Pigafetta, and East Mariana. The topographic relief ranges widely across its submarine landscape. The Marshall and Caroline seamount features rise from basement depths of roughly 4,000 m, while the Marcus–Wake and Magellan chains are deeper, at 5,000–6,000 m at their base. Many of the Marcus–Wake and Magellan seamount peaks ascend to within just over 1,000 m of the ocean surface, underscoring the dramatic vertical scale of the region's seafloor features. Seamounts in the region are classified as either guyots, ridge-like seamounts, or conical seamounts based on summit flatness, shape and height. The top platform of guyots is usually smooth, whereas conical and ridge seamounts are more steep-sided. This geomorphic complexity defines different environmental habitat types.

31. The Magellan seamount chain consists of single seamounts and volcanotectonic massifs with complex morphologies. Guyots in the chain have bases at depths of 5,100-5,600 m. Summit plateaus occur at depths of 1,300-2,600 m. Upper parts of slopes are convex, characterised by slopes from 15˚ to 20˚ or more. Further down the flanks (2,600–4,000 m), the steepness decreases and is between 10˚ and 12˚. At the base of the guyots, the slopes are gentle, between 2˚ and 8˚. The tops of guyots are covered with loose carbonate sediments, while the bases have argillaceous sediments, and the slopes feature

limestone, breccias, and basalts. Spurs and satellite volcanic structures complicate the slopes. Conical and ridge seamount features are smaller than the guyots, with isometric or elongated bases less than 2,000 km² and heights of 2,500–3,500 m.

32. The Marcus-Wake seamount chain consists of numerous seamount and volcanotectonic edifices. Summit plateaus can be table-like or irregular with domed uplifts, and vary in size. Many of the conical and ridge seamounts have spurs and additional domes with plateau-like tops. Seamount slopes are generally convex at the upper parts (steepness of 15˚–20˚ or more) and concave at the lower parts (steepness of 6˚–9˚), decreasing to 3˚–6˚ at the base.

33. The abyssal basins in the region span depths of 4000 to almost 6000m. They are composed of pelagic clay, calcareous ooze, siliceous ooze, and volcaniclastic sediments, with slow accumulation rates.

3. Biological characteristics

34. The pelagic environment exhibits large gradients in light, heat and availability of surface-derived food, all of which are, in general, negatively correlated with depth. The central and southern parts of the region experience highly oligotrophic conditions (waters low in nutrients with reduced biological productivity) throughout the year, whilst the northern parts have seasonal phytoplankton blooms in winter and spring. Animals living in oligotrophic waters often exhibit slow growth, and resting stages to cope with limited nutrient supply for extended periods.

35. The midwater mesopelagic and bathypelagic environment hosts many different species and communities. The presence of seamounts and strong diurnal vertical migration of plankton and nekton play an important role in connecting epipelagic and deeper pelagic as well as benthic ecosystems.

36. The benthic environment of the North-west Pacific is a complex patchwork of habitats spanning a depth range of thousands of meters and encompassing varied seabed geomorphological types. These deep-sea habitats are dynamically connected over a range of spatial scales through dispersal processes and interactions with the pelagic ecosystem. The diverse range of benthic habitats can be broadly grouped into four types: (a) seamount and guyot hard substrates; (b) seamount and guyot soft substrates; (c) soft abyssal plain sediment; and (d) the water column 50 m above the seafloor (benthopelagic, including the benthic boundary layer).

37. Hard substrates on seamounts and guyots enable sessile benthic invertebrates to attach, and sponges and corals can be abundant. These biogenic habitat-formers in turn support a diversity of other fauna, including a variety of crustacean, seastar and urchin species. The crust composition appears to have limited effect on benthic faunal composition but may influence patterns of species dominance and abundance. Soft sediment communities, whether on seamounts or abyssal plains, are dominated by infaunal macro- and meio-fauna (e.g., polychaetes, nematode worms). Large epifauna (e.g., holothurians, octocorals, xenophyophores, sponges, polychaetes, seastars, urchins) are less common and occur in low densities. On seamount features the distribution of benthic fauna is influenced by depth as well as substrate, acting as a proxy for environmental and biological factors such as temperature, dissolved oxygen, and labile organic matter.

38. An important factor in the ecology of the region is that the composition and abundance of benthic communities can be highly variable within and between geomorphological types over a range of spatial scales. The fine-scale variability in habitat (see Section IV. A2) means that it is difficult to stratify within a seamount. The diverse geomorphology, wide depth range, and dynamic processes associated with seamount features are particularly important in contributing often to a greater biomass, abundance and diversity of plankton, nekton, and benthic biota on and around seamounts, compared to the pelagic and benthic habitats of the surrounding ocean.

39. Biogeographic studies show potential patterns in the region. While global province-level classifications like GOODs indicate a general uniformity in the region, more detailed seamount geomorphic and biological data can potentially identify 4 seamount benthic groups in the REMP area: Northwest, Northeast, East, and Southwest-South.

4. Natural stressors

40. Existing general large-scale stressors to the marine environment in the North-west Pacific include climate-related changes, such as ocean warming, deoxygenation, and ocean acidification.

41. The North Pacific is undergoing a rapid and significant change in its oceanographic characteristics. Sea surface temperatures are rising faster than in many other ocean basins, with more frequent and severe heat waves, and a northwards shift of the North Pacific jet stream. There are predicted to be ongoing increases in temperature, reductions in pH (ocean acidification) and reduced oxygen levels. These affect deep sea habitats particularly through changes in food supply for biological communities resulting from a lower flux of particulate organic carbon, and changes in the chemical environment affecting presence or abundance of certain taxa. These changes are predicted to affect seamounts in the North-west Pacific, with reductions in benthic biomass, especially cold-water corals which are affected by acidification. Impacts on abyssal plain biological communities are potentially less, but uncertain.

42. Such natural changes may occur over longer time scales than short-term human-induced impacts, but still need to be considered in evaluating conservation and management measures under the regional environmental management plan.

B. Information on human activities in the region

1. Mineral resource-related activities

43. As of December 2025, five contracts have been granted by the Authority for exploration in the Area of the North-west Pacific.

44. The contractors with contracts granted for exploration for cobalt-rich ferromanganese crusts are:

a) Japan Organization for Metals and Energy Security (JOGMEC). The contract started on 27 January 2014 and will expire on 26 January 2029.

b) China Ocean Mineral Resources Research and Development Association (COMRA). The contract started on 29 April 2014, and will expire on 28 April 2029.

c) Ministry of Natural Resources and Environment of the Russian Federation. The contract started on 10 March 2015 and will expire on 09 March 2030.

d) Government of the Republic of Korea. The contract started on 27 March 2018 and will expire on 26 March 2033.

45. The contractor with contract granted for exploration for polymetallic nodules is:

e) Beijing Pioneer Hi-Tech Development Corporation. The contract started on 18 October 2019 and will expire on 17 October 2034.

2. Other human activities

Fisheries

46. The broader North-west Pacific is a large region of high fisheries production, generally around 20 million tonnes annually, accounting for 25% of the global fisheries catch in 2017. Historically, Japanese sardine and Alaska cod were the main species caught, but their numbers have declined over the past 25 years. In contrast, catches of squid, cuttlefish, octopus, and shrimp have increased significantly since the 1990s. The area covered under the regional environmental management plan is managed by two regional

fisheries management bodies under the auspices of FAO: the Western and Central Pacific Fisheries Commission (WCPFC) and the North Pacific Fisheries Commission (NPFC).

47. The WCPFC manages fisheries targeting highly migratory species like tuna (bigeye, yellowfin, skipjack, Pacific bluefin), billfish (swordfish, marlin), and sharks (e.g., oceanic whitetip, silky, blue, shortfin mako). The WCPFC manages 19 fish stocks, of which 14 overlap with the area covered under the regional environmental management plan. The majority of these are not regarded as overfished, and catches of almost all species have decreased in recent years. The fisheries are largely longline. None of the current CFC contract areas or potential ABMTs are sites of major fishing effort. The NPFC oversees bottom fish stocks on the Emperor seamounts (e.g., North Pacific armorhead, splendid alfonsino) and other pelagic fish stocks (e.g., Pacific saury, chub mackerel, Japanese sardine, neon flying squid) not managed by WCPFC. Bottom trawl fisheries are not being carried out in the area covered under the regional environmental management plan.

Cables

48. The North-west Pacific Ocean is the site of a number of major submarine telecommunications cable corridors providing connectivity across and within the Pacific Ocen, as well as between Asia and Oceania. Major cables running from Japan to Australia and trans-Pacific east-west cables run through the Guam interconnection hub.

49. There are two main cable routes that run in an east-west direction through the area covered under the regional environmental management plan.

Shipping

50. The amount of shipping is relatively limited in the area covered under the regional environmental management plan, compared with other areas in the wider Western Pacific Ocean. The area is south of the main Trans-Pacific shipping route, which links East Asia with North America and is to the east of the main routes heading to the south.

Potential future activity

51. The North-west Pacific Ocean contains significant seabed deposits of Rare Earth Elements and yttrium, with some deep-sea sediments exceeding 2000 ppm. These deposits, often found in hydrogenetic Fe-Mn crusts on seamounts and in deep-sea muds, are considered a major potential future resource for high-technology applications.

3. Other anthropogenic stressors

52. Climate change stressors include ocean warming, acidification, deoxygenation, and changes in Particulate Organic Carbon (POC) flux. These have the potential, both individually and cumulatively, to impact deep-sea biodiversity and ecosystem structure and function. Warming will affect surface layers most strongly, although will still propagate to deeper waters and affect the upper parts of shallower seamounts. Ocean acidification and the shoaling of calcite and aragonite saturation horizons will alter the deep structure of animals that rely on these chemicals to build and maintain their skeletons (e.g., cold-water corals). Warmer waters reduce oxygen solubility, and waters down to several hundred meters can become deoxygenated, and again affect seamount environments. Associated with these factors can be a more strongly stratified water column, a reduction in phytoplankton production, and lower POC fluxes to the deep ocean. These changes may occur on decadal time scales. The northern Pacific is already showing some of these changes. However, protection of seamounts could offer some mitigation of these effects, as they allow connectivity and adaptation of biological organisms over a continuous benthic depth range. For example, if animals can disperse and settle in shallower parts of seamounts they may be more resilient to shoaling chemical horizons.

53. The level of potential plastic pollution in the area covered under the regional environmental management plan is unknown. However, it is southeast of the main accumulation of rubbish and pollution known as the “North Pacific Garbage Patch”.

4. Cultural heritage and interests

54. Indigenous connections: For the indigenous peoples of the North-west Pacific, the ocean is an integral part of their identity, foundational stories, and a source of sustenance and trade. The deep sea is also linked to origin stories and traditional knowledge systems that guide interactions with marine life.

55. Many migratory species are culturally and economically important to Indigenous Peoples and Local Communities (IPLCs). Globally, these include sea turtles, whales and other cetaceans, sharks, commercially n important fish such as salmon and tunas, seals and other pinnipeds, and seabirds. Leatherback sea turtles are recognised as an important species to IPLCs, and these are known to migrate through the central part of the regional environmental management plan, although more commonly to the south of it.

56. Maritime History and Trade Routes: The wider region has been an active maritime "highway" for an extended period, with traces of human existence spanning centuries. This includes voyages by Ice Age mariners and later Pacific peoples who utilized catamaran and outrigger canoes for expansive travel. The area under the regional environmental management plan remains important for indigenous navigation. Shipwrecks, especially from World War II where the Pacific was a major theatre of conflict resulting in a large number of sunken ships and aircraft that are now historical and memorial sites. These sites often serve as war graves.

57. Several shipwrecks are recorded from the area covered under the regional environmental management plan, but high densities are to the west and south of this area.

C. Description of knowledge gaps

58. Following compilation of the data report and regional environmental characterisation, a number of issues were identified in the scientific workshops where gaps exist related to the regional environmental baseline, and its spatial and temporal variations:

(a) Bathymetry, geology and regional-scale high-resolution mapping

59. These components are well described in the contractors' exploration areas, but throughout much of the area covered under the regional environmental management plan, bathymetry is not well quantified. This is particularly the case for seamounts where their elevation and size based only on global bathymetric databases may be unreliable. Bathymetric data collected by the contractors have been used to spot check the bathymetry data form publicly available datasets, however, efforts should continue to collate data and information from different sources, including the DeepData database. This would improve regional-scale knowledge of bathymetry, morphology and geology, especially with regard to seamount characteristics and the classification of seamounts into conical, ridge, and guyots where possible, and to guide future sampling efforts.

(b) Oceanography

60. Current flows around seamounts are important for both understanding biological connectivity between seamounts, and also for evaluating potential impacts from mining operations on nearby areas of interest. Upwelling of bottom currents can take abyssal plain sediments to lesser depths, leading to an influence on habitats on the flanks of seamounts. Similarly, sediment plumes generated by crust mining could disperse in bathyal depths and settle on the seabed at those depths.

61. There is a need for a regional-scale current circulation model to be developed, which could utilise detailed information and data from individual contractors.

(c) Regional patterns of biodiversity

62. There are limited comparable biological data across the area covered under the regional environmental management plan. Several abiotic environmental proxies have been used to stratify habitats in the region. Species distribution models at the regional scale should be developed for a range of taxa for which there is adequate information on

distribution or abundance/biomass. This would inform the understanding of broad distributional ranges of taxa across the region and to check on what is likely present in the various APEIs.

63. Biodiversity studies have tended to focus on benthic communities, and there is a strong need for more emphasis on pelagic studies, especially given the importance of benthic-pelagic interactions over seamounts, and for understanding connectivity through larval dispersal in the water column (see below).

(d) Population connectivity

64. Larval dispersal and faunal connectivity studies have occurred at localised contractor-area scale. Such studies need to be broadened to understand patterns at a regional scale, in particular potential source-sink dynamics along seamount chains. This could involve validating existing connectivity models, and then establishing a standardized approach using suitable indicator species for regional analyses of connectivity to provide regional baselines against which changes can be monitored;

(e) Migratory corridors of seabirds, marine mammals, sea turtles, fishes or other megafauna

65. There are few data on whether areas covered under the regional environmental management plan act as migratory corridors. However, seamounts are often associated with being navigational cues, or as sites of feeding. Monitoring and research may focus initially on mapping key habitats that serve as feeding and breeding grounds.

(f) Ecosystem function

66. Efforts will be needed to develop an ecosystem model at the scale of the North-west Pacific. Studies on community structure would be the standard first step for better understanding relationships within the ecosystem, followed by experimental and modelling studies on ecosystem linkages and function.

D. Designations and management systems

67. As covered in section 4.2.2, the area covered under the regional environmental management plan is within the regional fisheries management organisation regions administered by the WCPFC and the NPFC.

68. Benthic megafauna at seamounts includes indicator species for vulnerable marine ecosystems (VME) for bottom contact fisheries, typically because of their slow growth rates, high longevity, and slow recovery. Sections of 4 seamounts have been closed in the North-west Pacific by the North Pacific Fisheries Commission, due to presence of VMEs, but these are east of the regional environmental management plan, on the Hawaiian-Emperor-Seamount Chain.

69. Seabirds in the Northwest Pacific Ocean have strong migratory habits, with some species undertaking long distance migrations in ‘flyways’. The regional environmental management plan sits within the East Asia – Australasia flyway, however, no site designated by national partners through the East Asian – Australasian Flyway Partnership is within the area covered under the regional environmental management plan.

70. There are no Ecologically or Biologically Significant Areas (EBSAs), Key Biodiversity Areas or Important Bird and Biodiversity Areas within the area covered under this regional environmental management plan. The regional environmental management plan is situated south of the North Pacific Transition Zone EBSA, which sits between the Subtropical and Subarctic Frontal Zones, and is a highly productive water mass and important habitat for bluefin tuna and juvenile loggerhead sea turtles. The seamounts of the Magellan, Marcus-Wake and Marshall chains have also been identified as meeting a number of EBSA criteria.

V. Management measures

71. Management measures proposed in this regional environmental management plan were developed during three science-focussed workshops, and one management-focussed workshop. This development followed the process as outlined in the standardised procedure (ISBA/30/C/21). The workshop participants considered that the most effective way to achieve the goal and objectives as per the standardised procedure was to develop a network of area-based management tools based on conservation design criteria that **collectively** address key elements to ensure adequate protection of ecological structure and function in the region, and thereby address ecosystem integrity. A conservation network is defined following IUCN as a collection of managed areas that operate cooperatively and synergistically at various spatial scales to achieve long-term conservation objectives that a single isolated reserve could not accomplish.

A. Area-based management

72. The development of area-based management tools followed a structured and scientifically objective expert process based on a set of underlying network design criteria. These criteria were evaluated using appropriate available data sets and information, documented in the data report and regional environmental characterisation, and then combined in a qualitative approach with other factors described below to guide decisions about the location, size and configuration of ABMTs.

1. Ecological network design criteria

73. The application of network criteria is a widely used and accepted approach to generate a balanced and scientifically objective set of area-based management tools that can meet the specific goal and objectives of a management strategy or plan (ISBA/29/LTC/8). The use of such criteria is consistent with other global and regional processes, such as the description for EBSAs under the Convention on Biological Diversity, VMEs under FAO, and those listed in Annex 1 of the Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction. The ecological criteria used for identifying area-based management tools under this regional environmental management plan are detailed in Table 1.

Table 1: Ecological criteria for consideration in a network approach to area-based management tools (based on CBD 2008[5]).

Network properties	Definition	Examples of factors to consider
Ecological importance	These are geographically or oceanographically discrete areas that important services to species/population in an ecosystem.	Uniqueness/rarity Biological diversity Life history stage importance Threatened or endangered species/habitats High vulnerability Biological productivity Naturalness
Representativity	This consists of areas representing the full range and diversity of ecosystems, both biological communities and habitats	Geomorphic types Depth ranges Productivity gradients Faunal community type
Connectivity	Connectivity allows for linkages that enable larval/species exchanges, both within and between network sites	Oceanographic flows Migration routes Species dispersal distances

[5] Convention on Biological Diversity. Decision IX/20.

Replication	Replication of ecological features means that more than one site contains such features. These include species, habitats and ecological processes	Range of natural variation Multiple habitat types included
Viability	All sites within a network have size and protection sufficient to ensure the ecological viability and integrity of the features for which they were selected	Size for self-sustainability Connectivity links Shape of area Resilience from impact

74. The main data requirements that support these criteria for this regional environmental management plan were:

a) Ecological importance: Specific biodiversity data, rare habitat(s), depth zones, geomorphic types, biogeographic studies.

b) Representativity: Habitat types/classes and environmental proxies (geomorphological features, depth, POC).

c) Connectivity: larval dispersal distances, current flow directions, depth appropriate for settlement of taxa.

d) Replicated ecological factors: Habitat types/classes and environmental proxies in each ABMT (geomorphology, depth, POC).

e) Viability: Abyssal plain box size (as per information used in the environmental management plan for the CCZ), source-sink dynamics between seamounts for a self-sustaining population.

75. Environmental aspects were identified during the workshops and in the regional environmental characterisation as being important for defining habitats and biodiversity patterns within the Northwest Pacific. These aspects were primarily considered through habitat proxies such as geomorphological feature type and depth.

76. In the area covered under the regional environmental management plan, the types and total number of geomorphological features relevant to the network design comprised the following:

a) Guyots (25)

b) Conical seamounts (135)

c) Ridge seamounts (45)

d) Abyssal plain areas, which are relatively flat areas on the seabed with no notable elevation and a depth greater than 3500m.

e) Inter-seamount basins, which are areas of deep seabed in between seamount features of each of the three seamount chains. They comprise areas encompassed by the geographical distribution of the chains, but exclude the seamounts themselves.

77. Depth factors:

a) Key to classification was the depth of seamount summits. The summit and upper flank areas of a seamount have a high ecological significance in terms of availability of hard substrate for sessile fauna, leading to high biodiversity, abundance and wide distribution. These areas are subject to dynamic oceanographic conditions.

b) A uniform approach to depth groupings was adopted based on workshop discussions. The seamounts were divided into groups based on the depth of their summits. Seamounts with summits shallower than 3000 m were grouped into 6 depth zones, each at a 500-meter interval. Seamounts with summits deeper than

3000 m were grouped into 4 depth zones, each at a 1000-meter interval. This resulted in a total of 10 depth bands.

78. Other environmental proxy data used:

a) POC gradient. This gradient was considered to be relatively weak, but with higher levels in the north, decreasing to the south

b) Distribution of PMN. Nodules are known to occur close to seamount features, on their lower flanks towards the base, as well as on the abyssal plains. An attempt to model their likelihood during previous workshops was felt uncertain, but potential co-occurrence was borne in mind when designing ABMTs. ABMT boundaries were at times extended around seamount features, and efforts were made to ensure inclusion of inter-seamount basins within the main seamount chain systems.

79. Given the proximity to several Pacific Island States and several significant geomorphological features (e.g., Marianas Trench being the deepest site in the oceans), societal/cultural significance was also considered. This included information on culturally significant taxa which migrate through the area, and proximity of potential impact to islands and adjacent seas.

2. Factors considered in the application of network criteria for development of the ABMT network

i. Ecological importance

80. Seamount features can host high biodiversity and abundance of benthic fauna. While there were data from only limited survey work on several seamounts, these were felt sufficient to guide regional-scale considerations. Studies indicated that there was a high likelihood of occurrence of cold-water corals on seamount features, with low probability on abyssal plains. This confirmed using geomorphic feature type as a key factor. There are indications that corals are more distributed on seamounts in the northern part of the area, with sponges more in the south, associated with changing POC. A benthic species cluster analysis identified potentially 4 seamount biogeographic regions (Hao et al, 2023) [6]. These supported the view that ABMTs should be distributed across the area covered under the regional environmental management plan.

ii. Representativity

81. Given the limited knowledge of the main environmental drivers of biodiversity in the region, there should be a geographical spread of ABMTs across the Area covered under the regional environmental management plan, ABMTs should include multiple habitat types where possible, which can also reflect multiple resource types. Where possible, ABMTs developed for protection of seamounts should extend beyond their base to incorporate overlap with abyssal plain habitat.

iii. Connectivity

82. Multiple features in a seamount chain should be included in an ABMT. A mean dispersal distance of 30-40km for several types of deep-sea taxa was noted.

83. Isolated seamounts can be important for having ecologically distinct communities. Conversely, closer seamounts in chains/clusters can act as “stepping stones” for connectivity.

84. For abyssal plain ABMTs, separation of less than 1000km can improve connectivity potential between them.

- [6] H. Hao *et al.* Using habitat classification and large-scale spatial planning model to identify environmental areas: a case study in the area of the Northwest Pacific Ocean Mar. Pol. 147. (2023)

iv. Replication

85. ABMTs should include multiple habitats where practical. ABMTs focussed on seamounts should also include multiple seamount features (guyot, conical and ridge seamounts) where practical to provide an "internal" form of replication. This allows the network to not be entirely reliant on replication of individual ABMTs, although this latter form still applies to abyssal plain and polymetallic nodule habitats.

v. Viability

86. The whole seamount (defined as the area from the summit down to the base where the seafloor flattens out to the abyssal plain) is the preferred ecological unit to be included in seamount ABMTs. Given that a seamount feature is a complex mix of geological, oceanographic and ecological characteristics affecting elements of an integrated seamount "ecosystem", seamounts, guyots and ridges are not subdivided without good ecological reason. No standard size can be defined for this unit, as individual seamounts vary in size and shape.

87. A minimum size of 200km x 200km for abyssal plain ABMTs is considered as adequate, based on information used for defining a self-sustaining population area under CCZ environmental management plan (ISBA/17/LTC/7), which is consistent with findings from recent dispersal distance studies.

vi. Distance separation

88. While not part of the above network criteria, distance of the ABMTs from the Exclusive Economic Zones (EEZs) and extended continental shelf (ECS) is also an important factor considered in the design of the network, as distance from regions outside of the Area may affect ability to undertake successful management.

89. The North-west Pacific Ocean has its own environmental and resource characteristics, as such some aspects applied in other regions (such as the CCZ) are modified here to suit this particular regional setting. In terms of distance separation, the following guidelines were applied to maintain distances between the ABMTs and national jurisdictions, and between ABMTs and nearest contract areas and reserved areas:

a) A 50 km distance is maintained between the ABMTs and national maritime boundaries, except when the maintaining such a distance led to a major loss in conservation features and/or loss of network viability. Although the Area and the REMP boundary extend up to national maritime boundaries, it is a precautionary measure to protect APEIs from any "overspill" of impacts from activities inside national maritime boundaries.

b) A 25 km distance is maintained between ABMTs and the nearest CFC contract areas. A 10 km distance is maintained between ABMTs and the nearest PMN contract area and reserved area boundaries. These were applied except when maintaining such a distance led to a major loss in conservation features and/or loss of network viability. For PMN areas, good data from recent CCZ collector tests show that the dispersal distance of sediment plumes are in the order of <10km before turbidity levels return to ambient levels. In contrast, a more conservative approach is applied for CFC mining, as there is very little information available on the nature and extent of sediment effects.

vii. Wider considerations

90. Straight lines to define ABMT boundaries should be used to reduce ambiguity and facilitate compliance and enforcement.

91. Consideration is given to possible future applications for plans of work for exploration within the area covered under the regional environmental management plan, and to the effective protection of spaces where such activities could cause a major loss in conservation features and/or loss of network viability. This ensures the effectiveness of the plan while recognizing the legal basis of the role of the Authority under UNCLOS and

its mandate for organizing and controlling all mineral-resources-related activities in the Area for the benefit of humankind as a whole.

92. As the selection of the ABMTs is based on scientific network criteria, no pre-defined target number or area is included in the calculations and conclusions of area covered by the ABMTs, or percentage of features included. Nevertheless, note was taken of the protection targets of other processes (such as those of the CBD) when evaluating the effectiveness of the overall network.

3. Area-based management tools

93. Two types of area-based management tools are considered under the regional environmental management planning process: Areas of Particular Environmental Interest (APEIs), and Sites of Particular Environmental Interest (SPEIs). These differ in their spatial scale and in the dominant criteria used in their identification and specification (see ISBA/29/LTC/8). However, in this region, only APEIs are proposed. Some smaller-scale features within the APEIs can meet the characteristics of SPEIs, but their management is covered under an APEI.

94. APEIs are large-scale areas of ecological importance. They capture representativity and protect regional-scale ecosystem features, which are important in terms of basin-scale water mass exchange, biogeographical zonation and transitions, connectivity and ecosystem function.

95. The identification of the APEIs was undertaken through interactive mapping exercises during the expert workshops, as well as further deliberations within the Commission, applying the network design criteria and guided by the factors considered in the application of such criteria as outlined in Section V.A.2.

96. The proposed APEI network comprises 12 APEIs (Figure 3). Most include multiple habitats and resource types. The 12 proposed APEIs cover 29.4% of the total area under the regional environmental management plan.

97. Ensuring representativity of a range of the design criteria for seamount features with a focus on CFC habitat was complex, because of the range of geomorphic types (conical seamount, guyot, ridge) and the 500 meter depth band intervals used in the depth groupings. This was especially the case for depths less than 1000m, as there are only a few features of this depth in the region, and many of the guyots in those depth bands are located in contract areas. APEI discussions in the workshops targeted these shallower features, and especially guyots.

98. Details on network statistics and network coverage by geomorphic type and depth is given in Annex A. The characteristics of individual APEIs are described, with maps, in Annex B.

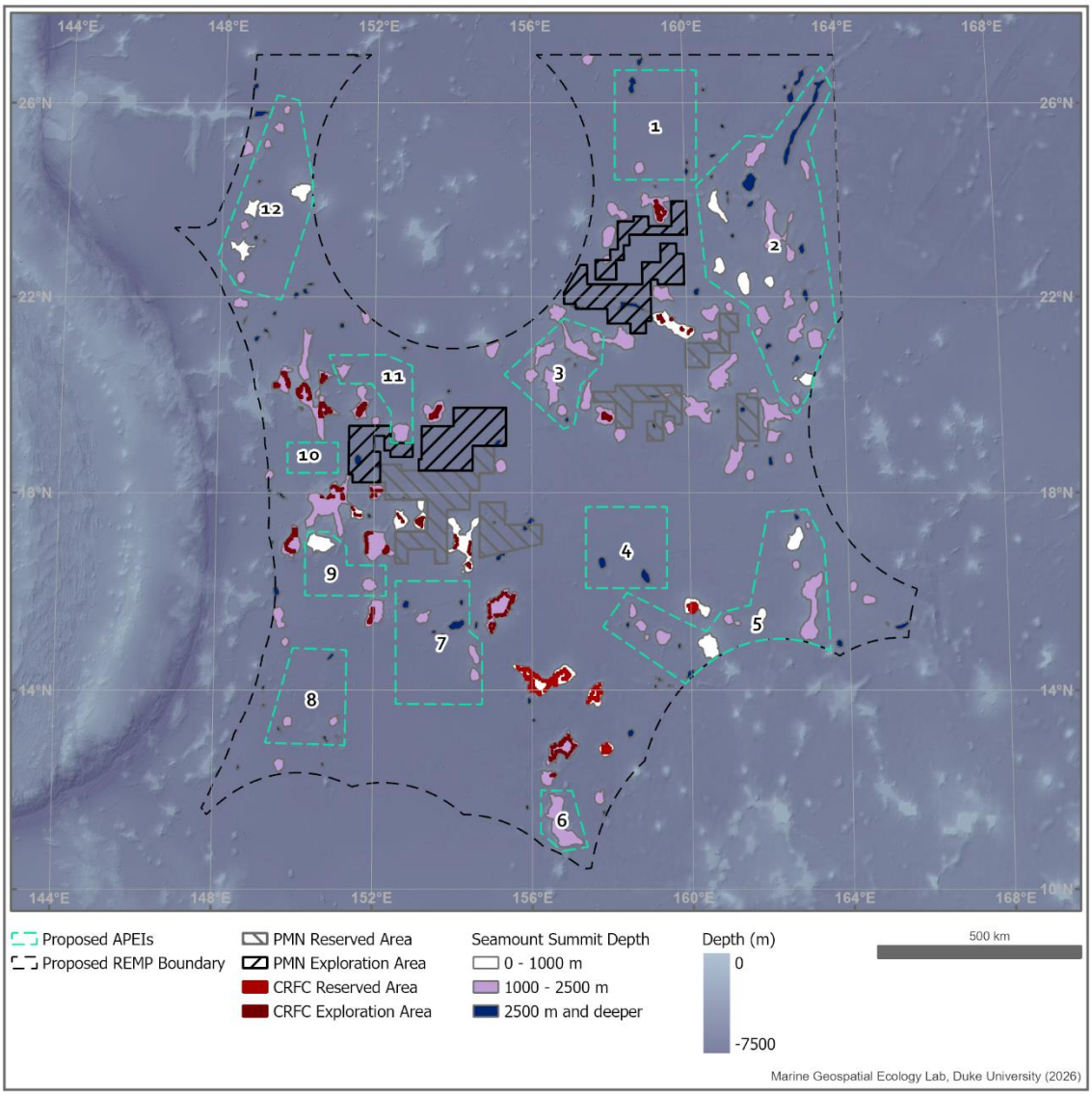

Figure 3: The regional environmental North-west Pacific area, showing overall boundaries of the region, contract areas and reserved areas, seamounts (colour coded by summit depth), and the 12 proposed APEIs.

Note: depths are summarised into three bands here to improve readability, but the analyses were based on the 10 depth bands. The map combines seamounts, guyots and ridge features to make it easier to visualize, but these were examined separately (see text below and details in Annex A).

i. Location, coordinates and size of APEIs

99. Location, coordinates and size of each APEI, and maps, are found in Annex B.

100. The size of individual APEIs ranges from just over 9,000 km^2 to over 161,000 km^2 (Table 2).

732 **Table 2: Size of the proposed APEIs.**

Number	Principal habitat(s)	Area (km^2)
1	Abyssal Plain	54,000
2	Seamounts and inter-seamount basin	161,727
3	Seamounts	35,886
4	Abyssal plain	40,000
5	Seamounts and inter-seamount basin	93,895
6	Seamounts	13,107
7	Abyssal plain and inter-seamount basin	60,491
8	Abyssal plain and seamounts	38,711
9	Seamounts	22,457
10	Abyssal plain	9,375
11	Seamounts (and inter-seamount basin)	22,171
12	Seamounts and abyssal plain	70,755
Total		622,575

733

734 ii. Reasons for the designation of APEIs

735 101. Characteristics of each APEI are given in the descriptions in Annex B.

736 102. Individual APEIs form part of a cohesive network, and should not be evaluated on
737 an individual basis, even though details and designation criteria are provided for each
738 APEI. Table 3 below demonstrates how the key aspects of each APEI are related to the
739 ecological network criteria.

740 **Table 3. Summary of how each APEI meets the ecological network design criteria. More detailed descriptions are provided under Annex B.**

741 PMN: polymetallic nodule; CFC: cobalt-rich ferromanganese crust; POC: Particulate Organic Carbon. REMP: regional environmental management plan.

742

APEI	Primary habitat/ resource	Ecological importance	Representativity			Connectivity	Replication	Viability
			Similarity to contract areas	Multiple habitats	Location			
1	Predominantly abyssal plain (?PMN)	No information	Similar environmental characteristics and depth range as in PMN contract areas. Contains one large conical seamount of similar depth range and geomorphic type as those in CFC contract areas	Includes plain habitat, 2 deep ridge seamounts, 1 deep- and 1 medium- depth conical seamount.	Northern part of the REMP area. Covers an area of relatively high levels of POC.	No information	Abyssal plain habitats replicated in other APEIs	Larger than 200 x 200 km, which is considered the minimum size for maintaining viability in abyssal plain areas.
2	Seamount (CFC) with inter-seamount basin (PMN)	Includes seamounts with shallow and medium depth ranges, which are considered important for biodiversity. Sample data from a seamount shows occurrence of common gorgonian octocorals.	Includes guyots and conical seamounts with shallow and medium depth ranges, which are mostly occupied by CFC contract areas and reserved areas in this region. Possible similarity to PMN contract areas based on occurrence of PMN reported.	Includes 27 seamount features with all geomorphic types and varied depth ranges, and extensive inter-seamount basin habitat	Located in the Marcus-Wake seamount chain. and northeast seamount biogeographic area.	Considered important for connectivity between Marcus-Wake seamounts.	Internal replication by including multiple seamounts of the same geomorphic type and depth range. Seamount types and depth ranges, and inter-basin habitat replicated in other APEIs.	The APEI covers mostly whole seamounts. One guyot extends partially into an adjacent maritime boundary

3	Seamount (CFC) and inter-seamount basin (PMN)	Includes relatively rare seamount depth ranges. One seamount has a high sponge diversity and abundance. Occurrence of PMN was reported, so likely nodule-associated fauna.	Includes seamounts with depth ranges similar to those in CFC contract areas. Possible similarity to PMN contract areas based on occurrence of PMN reported.	Includes 9 seamount features, with multiple depth ranges of different seamount geomorphic types. This APEI also includes inter-seamount basin and abyssal plain habitats.	Located in the Marcus-Wake seamount chain and Northeast biogeographic region. Covers an area of medium POC levels.	Includes the Arnold guyot (ID # 46892, see Annex B) reported as important for connectivity across seamounts in this area.	Internal replication by including multiple seamounts of the same geomorphic type and depth range. Seamount types and depth ranges replicated in other APEIs.	All seamount features in this APEI are whole seamounts, except for Arnold Guyot where a discrete feature is included in the APEI.
4	Abyssal plain and inter-seamount basin (?PMN)	No information specific to this APEI.	Similar depth to deeper PMN contract areas, but no PMN occurrence had been recorded	Predominately abyssal plain and inter-seamount basin habitats, and 2 deep seamounts.	Covers an area of medium POC levels.	No information	Similar habitats replicated in other APEIs.	Maintains the minimum size for viability for abyssal plain areas (200 x 200 km)
5	Seamount (CFC) and inter-seamount basin (PMN)	Includes relatively rare seamounts at shallow and medium depth ranges.	Southern shallow guyot very similar to those in CFC contract areas.	Includes 16 conical and ridge seamounts, and guyots.	Located in the Marshall Island seamount chain. Eastern biogeographic class. Covers an area of medium to low POC levels.	Thought important for connectivity of Marshall Islands seamount chain.	Internal replication of medium-depth conical and ridge seamounts. Seamount types and depth ranges replicated in other APEIs.	All seamount features in this APEI are whole seamounts. Includes large areas of inter-seamount basin.
6	Seamount (CFC)	Includes a medium-depth ridge seamount with sponges common on its northern side	Depth and size of the seamount is similar to those of seamounts in CFC contract areas.	Include a single seamount feature.	Located in the Magellan seamount chain. Covers an area of low POC levels. Southern	Potentially important connectivity with southern seamounts of	Medium-depth ridge seamount replicated in other APEIs.	Includes a whole seamount.

					biogeographic class.	Magellan seamount chain.		
7	Abyssal plain and inter-seamount basin (PMN)	Likely nodule-associated fauna	Includes inter-seamount basin habitat. PMN occurrence reported.	Includes multiple habitat types - abyssal plain, inter-seamount basin, and 8 seamounts.	Located in the Magellan seamount chain. Southern biogeographic class. Covers an area of low POC levels.	May provide for connectivity between multiple deep habitat types	Abyssal plain habitat replicated in other APEIs.	Larger than the minimum size for viability in abyssal plain areas.
8	Abyssal plai (PMN), and seamounts (CFC)	Includes 6 seamounts. Coral and sponge communities known from a seamount within this APEI	Similar depth to PMN contract areas (around 5000m). PMN occurrence reported.	Includes 6 seamounts and abyssal plain habitats.	Southern Magellan seamount chain. Southern seamount biogeographic class. Covers an area of low POC levels.	No information specific for this APEI. Possible connectivity with nearby Mariana Trench.	Internal replication by including several seamounts of similar types. Seamount types and depth ranges replicated in other APEIs.	Larger than minimum size for maintaining viability in abyssal plain areas. All seamount features are whole seamounts.
9	Seamount (CFC) and abyssal plain (PMN)	Includes a shallow depth guyot, which is relatively rare	Close to CFC contract areas and reserve areas on guyots.	Includes multiple habitats - abyssal plain, inter-seamount basin, and 2 seamounts	Located in the Magellan seamount chain. Southern seamount biogeographic class. Covers an area of medium POC levels.	Possible connectivity with guyots to the north of this APEI	Seamount types and depth ranges replicated in other APEIs	All seamount features are whole seamounts.
10	Abyssal plain (?PMN)	No information	Similar depth to PMN contract areas, includes inter-basin habitat	Largely abyssal plain	Located in the western part of the REMP. Covers an area of medium POC levels.	No information. Possible links with the Marianas Trench to the west.	Abyssal plain habitat replicated in other APEIs.	Size of the APEI constrained by contract areas and slightly smaller than the minimum size for viability in

								abyssal plain areas.
11	Seamount (CFC) with inter-seamount basin (PMN)	Includes 2 seamounts at rare summit depth (around 1300 m).	Two conical seamounts with summits at 1300 m depth, which is very similar to the depth of CFC contract areas	Includes multiple habitats - 3 seamounts, inter-seamount basin, and abyssal plain habitats.	Located in the Magellan seamount chain. Northwestern seamount biogeographic class. Covers an area of higher POC levels.	Possible connectivity with adjacent seamounts in contract areas.	Habitat types replicated in other APEIs.	All seamount features are whole seamounts.
12	Seamount (CFC) and abyssal plain	Sponges and corals known from a seamount. Includes shallow seamounts, which are relatively rare for this region.	Shallow seamounts in this APEI are of similar depth to CFC contract areas.	Includes multiple habitats - 11 seamounts, inter-seamount basin and abyssal habitats.	Covers the Northern parts of the Magellan and Marcus-Wake seamount chains. Northwestern seamount biogeographic class. Covers an area of medium POC levels	Possible importance for connectivity along and between seamount chains.	Seamount types and depth ranges replicated in other APEIs	All seamount features are whole seamounts. Includes large deep basin area.

743

103. In terms of fulfilling representativity, distribution of geomorphic type (conical seamounts, guyots, ridges) by depth (Table 4) was an important consideration.

104. Numbers of seamount features within contract and APEI areas, as well as the numbers that remain available for further exploration, are given in Table 4. This shows the level of consistency with the network design factor to include areas still available for exploration

105. Most APEIs were relatively close to one another. Distances ranged from 10 km to 260 km, although direction, habitat type, and direction are important to evaluate potential for connectivity between APEIs. Distance between geomorphic features within APEIs are given in Annex B.

Table 4: Numbers of seamounts by geomorphic type and general depth band for each APEI. CS: conical seamount; GY: guyot; RG: ridge; s: shallow; 0-1000m; m:medium depth, 1000-2500m; d: deep >2500m.

APEI	CS_s	CS_m	CS_d	GY_s	GY_m	GY_d	RG_s	RG_m	RG_d	Total
1		1	1						2	4
2	4	6	8		2		1	3	3	27
3			2		3			4		9
4			1						1	2
5	1	4	5	1	1		1	3		16
6								1		1
7		1	5					2		8
8		2	4							6
9		1		1						2
10										0
11		2	1							3
12	1	5	3	1			1			11

106. The level of protection overall of the different habitats varies from about 25% for the area covered in APEIs for abyssal plains, to 39% for seamounts (Table 5).

107. Reconsideration of the network factor to keep 50km distance from national maritime boundaries was sometimes necessary to increase representation of the most critical depth bands across seamount types, particularly for guyots. Ingress into this distance was deemed necessary for APEIs #3, #6, #7, #13 and #14.

108. The "Proximity to contract areas" factor was largely observed, but APEI #12 and the need to include a large conical seamount in the network meant that this one APEI effectively abuts the nearest contract area.

Table 5: **Habitat types within the area covered under the regional environmental management plan and APEIs.**

Habitat Type	Total Area in REMP (km^2)	Total Area in APEIs (km^2)	Percentage in APEIs (%)
Seamount	183,154	72,120	39.4
Inter-seamount basin	983,476	315,507	32.1
Abyssal plain	952,444	234,949	24.7
REMP area	**2,119,074**	**622,575**	**29.4**

iii. Management measures imposed on mineral resource-related activities by the Authority for each specific ABMT

109. In the APEIs, the following management measures will be applied: direct or indirect impacts in the APEIs from any exploration or exploitation of mineral resources in the area covered under the regional environmental management plan should not be allowed.

110. The integrity of the seamount ecosystem and its connectivity through the water column is essential to ensure the efficacy of the APEIs. In this regard, collaboration with other competent global, regional and subregional organisations is strongly encouraged. This is to understand and manage the impacts of other activities near the seamounts and in the water column.

B. Non-spatial management

111. Other non-spatial management actions may be necessary to complement the area-based management tools, and to ensure sound environmental management of exploration and exploitation activities in a way that is consistent with the goal and objectives of the regional environmental management plan.

a) There may need to be consideration of temporal and / or spatial adjustments to mining operations during biological events, for example, major spawning aggregations, migration periods of both marine mammals and sea turtles.

b) Operators within the area covered under the regional environmental management plan (e.g., ISA contractors, scientific research vessels, fishing operations) should be encouraged to minimise the generation of underwater noise from surface vessels and underwater equipment, to avoid disturbance to sensitive animals, especially marine mammals. Noise generation in the sound fixing and ranging channel should be minimised.

c) Operators within the area covered under the regional environmental management plan (e.g., ISA contractors, scientific research vessels, fishing operations) should be encouraged to control surface and underwater light from vessels as much as reasonably possible to avoid attraction of birds and fishes, thus potentially disrupting their behaviour.

d) Operators within the area covered under the regional environmental management plan (e.g., ISA contractors, scientific research vessels, fishing operations) should be encouraged to prevent the introduction and spread of invasive species from vessels and infrastructure.

112. In implementing these measures, efforts should be invested to strengthen collaboration with other competent international and regional, subregional organizations, including those with responsibilities for managing pollution, particularly with regard to data sharing in addressing critical data gaps, and understanding and management of cumulative impacts of different activities.

VI. Regional monitoring

A. Knowledge gaps and research priorities

113. To ensure effective implementation of the management measures in achieving the goal and objectives of this regional environmental management plan, the following priorities are identified:

a) Cumulative risk and impact assessment at the regional scale should be carried out, in order to identify and confirm risks as plans for exploitation develop.

b) The spatial distribution of habitats, including nodule-rich abyssal plain habitats relative to cobalt-rich crust habitats, should be investigated to ensure management measures are appropriate for both habitat and resource types, particularly where the two are closed associated.

c) The APEI network uses a combination of sources to inform decisions about connectivity and the spatial scale of protection (either large self-sustaining areas or links between seamounts). Connectivity at the population level needs to be better determined based on further studies in this region to validate the design rules applied. Standardized regional hydrodynamic data collection and modelling methods are needed.

d) Biogeographic studies and habitat/species mapping using empirical environmental and biodiversity data are needed to validate the assumptions made in the network design based on environmental "proxies" and to inform future review of the APEI network. Improved habitat suitability modelling, informed by additional biological and environmental data is a priority, and incorporating fine-scale habitat features. Further validation of bathymetry datasets will also be needed.

e) Technology will play an important role in future environmental management and monitoring. The Authority should monitor technology development to understand the impacts of new technologies, and how this might either affect the APEI design, or improve the ability to monitor the marine environment.

B. Strategy for regional environmental monitoring

1. Monitoring objectives

114. The starting point for the definition of spatial and temporal monitoring effort is agreeing the objectives for the regional environmental monitoring plan. These should be aligned with the overall goals and objectives for the regional environmental management plan, and need to inform any required modifications to the management measures to improve its performance.

115. Objectives and initial design of a monitoring plan can be undertaken by the Authority, led by the Commission with support of the Secretariat, and consulting with regional experts with expertise in different disciplines, where appropriate.

116. Key objectives for the development of a monitoring plan are:

a) To encourage collection of new information and data and integration of existing data that will address identified knowledge gaps in either regional baseline data, or information needed for the effective implementation of, or modifications to, the regional environmental management plan.

b) To pursue efforts related to understanding of changes in environmental conditions and structure of ecosystems that support a regional-level environmental assessment;

c) To provide improved information on the extent of environmental impacts that arise from exploitation activities at a regional scale and in the designated APEIs.

2. Future research activities

117. The scope of any regional environmental monitoring plan is highly dependent upon the level of resources available to carry out a regional scale survey and sampling programme. There are several steps that should be followed in developing such a plan for the area covered under this regional environmental management plan. These are considered below.

a) Integration of information from appropriate monitoring efforts, such as those conducted by contractors at the level of individual contract areas, from scientific literature, existing global databases, relevant activities such as those from national programmes and regional fisheries bodies, and international ocean observation systems. This would provide an initial analysis of existing research and monitoring efforts, which could contribute to specific objectives identified under the regional environmental management plan.

b) Development of indicators. In the early stages of operationalisation of the regional environmental management plan, data may be limited for defining indicators. Their development, however, should start during exploration, with analysis of qualitative ecosystem models that use a Driver-Pressure-State-Impact-Response (DPSIR) approach to identify components of the ecosystem that denote a high risk, uncertainty or importance in terms of change. These indicators are important to monitor to assess success of potential management options and measures.

c) Development of a sampling design that accounts for spatial and temporal scales necessary to detect and monitor change. Spatially balanced designs are a form of random sampling that have a spatial structure that maximises spatial independence between samples and improve efficiency in methods to survey and monitor the potential impact of deep-sea mining on biodiversity. The level of sampling needed for a regional environmental management plan will be driven by a combination of the amount of sampling required to monitor potential changes in variables across habitat and faunal community types, and the level of resources available. Designing a network of fixed stations containing multiple types of sampling (e.g., CTD, seafloor camera, box/multicores) is an approach that can be applied to monitor changes over time.

d) Monitoring to evaluate characteristics of, and potential change in, the APEI network. Given that that APEIs are located outside contract areas and cover large geographical areas, Member States, contractors and other parties are encouraged to collaborate with the Authority, as well as national and international scientific organizations to conduct joint monitoring surveys. Additional resources will be needed to ensure the adequate and effective implementation of the regional environmental management plan.

118. The monitoring plan developed for the regional environmental management plan should complement baseline data collection and any monitoring programmes developed within contract areas. It should also utilise Global Observing Programmes like Global Ocean Observing System (GOOS) and Deep-Ocean Observation Strategy (DOOS) and regional ARGO float deployments, among others.

119. A collaborative approach will be essential for monitoring and research at the regional scale. To that end, the Secretariat could facilitate collaboration among contractors, sponsoring States, scientific communities and programmes, and competent international and regional organizations in the implementation of the priorities. Member States, funding agencies and other interested parties are encouraged to align their planning with the priorities identified in the monitoring plan.

C. Other aspects

120. The implementation of the monitoring plan and associated research and other activities should create opportunities for capacity-building for developing member States, including through collaboration with member States, Joint Training and Research Centres of the Authority, and other competent international, regional and subregional organizations. The Secretariat

should facilitate effective participation of developing members States in the activities of implementing the regional environmental management plan, subject to the availability of financial and other resources.

121. After the adoption of the regional environmental management plan, the following information should be disseminated through the website of the Authority:

a) The maps and GIS coordinates of the boundaries of the APEIs established under the plan;

b) The latest data report and regional environmental characterisation;

c) Information on activities related to the implementation of the plan, as relevant and appropriate; and

d) Information related to future review of the regional environmental management plan (see section V).

VII. Review of progress in the implementation of the regional environmental management plan

122. The regional environmental management plan will be subject to periodic review by the Commission at least every 5 years, or sooner as specified in the standardized procedure (ISBA/20/C21).

123. This review will be based, *inter alia,* on newly available data and scientific information and an evaluation of the effectiveness of the measures established to achieve the goals and objectives of the plan. The data report and regional environmental characterisation will be updated, as appropriate, as part of the review process. As part of the review process, the Commission will provide to the Council a report that summarizes how new data and information have been considered by the Commission for this region.

124. There are currently no SPEIs in this regional environmental management plan. However, information on newly discovered sensitive ecosystems and communities will be compiled and used for any future process of identifying sites of particular environmental interest. The Commission will consider such information during its review of the regional environmental management plan.

125. Prior to the commencement of the review process, the Commission will decide the scope of the review and the steps to be undertaken, as specified in the standardized procedure (ISBA/20/C21).

Annex A. Network statistics

1. This Annex contains further details on the depth coverage, geomorphic feature type and area within the overall REMP area.

Depth coverage

2. A high proportion of depths shallower than 3000m are already in CFC contract areas (Table A.1).

3. PMN contract areas occupy much less of the area covered under the regional environmental management plan (Table A.1).

Table A.1. Size of each depth zones within the area covered under the regional environmental management plan, and ISA contract areas for CFC and PMN. The CFC area is of the entire seamount on which there are contract area blocks, not just the size of the contract area blocks. Na; not applicable.

Depth Zone	Depth Zone in REMP area (km^2)	Depth Zone on CFC seamounts (km^2)	Percentage on CFC seamounts	Depth Zone in PMN contract areas (km^2)	Percentage in PMN contract areas
0-500	774.6	316.9	40.9	na	na
500-1000	1295.1	734.1	56.7	na	na
1000-1500	17518.5	11111.3	63.4	na	na
1500-2000	22208.5	11726.7	52.8	na	na
2000-2500	21374.6	8509.6	39.8	na	na
2500-3000	27029.6	9191.0	34.0	1.2	0.0
3000-4000	88725.7	16547.8	18.7	639.6	0.7
4000-5000	216845.0	3913.9	1.8	14201.0	6.2
5000-6000	1517521.1	39.5	0.0	142946.0	8.9
6000-7000	204303.4	na	na	51.6	0.0

4. Area coverage within the APEIs varies by depth (Table A.2).

Table A.2. Size of each depth zone within the area covered in the APEIs. These are the total areas in the proposed APEIs for seamounts, inter-seamount basin and abyssal plain habitats combined.

Depth Zone	Depth Zone in REMP area (km^2)	Depth Zone in APEIs (km^2)	Percentage in APEIs
0-500	774.6	457.7	59.1
500-1000	1295.1	561.0	43.3
1000-1500	17518.5	4514.1	25.8
1500-2000	22208.5	6569.5	29.6
2000-2500	21374.6	8105.3	37.9
2500-3000	27029.6	9043.5	33.5
3000-4000	88725.7	33590.8	37.9
4000-5000	216845.0	88185.1	40.7
5000-6000	1517521.1	427529.2	28.2
6000-7000	204303.4	43825.4	21.5

5. Areas of seamount features in contract areas and proposed APEIs by depth are shown in Table A.3.

Table A.3 Table of depth zones (km^2) for just seamount habitat within CFC contract areas and proposed APEIs. Na; not applicable.

Depth Zone	Depth Zone in REMP area (km^2)	Depth Zone on CFC Seamounts (km^2)	Percentage on CFC Seamounts	Depth Zone in APEI Seamounts (km^2)	Percentage on APEI Seamounts
0-500	774.6	316.9	40.9	457.7	59.1
500-1000	1295.1	734.1	56.7	561.0	43.3
1000-1500	17518.5	11111.3	63.4	4495.8	25.7
1500-2000	22208.5	11726.7	52.8	6547.8	29.5
2000-2500	21374.6	8509.6	39.8	8053.1	37.7
2500-3000	27029.6	9191.0	34.0	8844.9	32.7
3000-4000	88725.7	16547.8	18.7	22489.7	25.3
4000-5000	216845.0	3913.9	1.8	17617.5	8.1
5000-6000	1517521.1	39.5	0.0	3037.4	0.2
6000-7000	204303.4	na	na	na	na

Geomorphic type

6. Analyses were also carried out to understand the area coverage of features by geomorphic type within contract areas and APEI areas, as well as those that remain available for further exploration. Geomorphic type by depth for the full range of depth categories is provided in the three tables below (Table A.4, Table A.5 and Table A.6).

970 971 **Table A.4: Depth zones and area of conical seamounts in APEIs, contract areas for CFC (CFC) and PMN (PMN), and remaining "available" (outside any managed area). Na; not applicable.**

Depth Zone	Depth Zone in CFC Seamounts (km^2)	Depth Zone in APEI Seamounts (km^2)	Depth Zone in PMN Seamounts (km^2)	Depth Zone in Remaining Seamounts (km^2)	Depth Zone Area for Seamount Type	Percent CFC	Percent APEI Seamount	Percent PMN	Percent Remaining Seamount
0-500	83.0	439.6	na	na	522.6	15.9	84.1	na	na
500-1000	187.1	303.1	na	na	490.2	38.2	61.8	na	na
1000-1500	1596.5	495.0	622.3	388.4	3102.2	51.5	16.0	20.1	12.5
1500-2000	2280.6	850.8	407.3	1804.4	5343.1	42.7	15.9	7.6	33.8
2000-2500	1328.6	1518.6	406.8	1956.3	5210.3	25.5	29.1	7.8	37.5
2500-3000	1628.0	2569.8	568.3	2629.4	7395.5	22.0	34.7	7.7	35.6
3000-4000	3125.3	9259.8	1652.4	7741.3	21778.8	14.4	42.5	7.6	35.5
4000-5000	972.8	11114.5	2230.1	8244.7	22562.2	4.3	49.3	9.9	36.5

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973 974 **Table A.5: Depth zones and area of guyots in APEIs, contract areas for CFC (CFC) and PMN (PMN), and remaining "available" (outside any managed area). Na; not applicable.**

Depth Zone	Depth Zone in CFC Seamounts (km^2)	Depth Zone in APEI Seamounts (km^2)	Depth Zone in PMN Seamounts (km^2)	Depth Zone in Remaining Seamounts (km^2)	Depth Zone Area for Seamount Type	Percent CFC	Percent APEI Seamount	Percent PMN	Percent Remaining Seamount
0-500	229.8	na	na	na	229.8	100.0	na	na	na
500-1000	217.0	31.5	na	na	248.5	87.3	12.7	na	na
1000-1500	8125.9	2484.9	na	140.7	10751.5	75.6	23.1	na	1.3
1500-2000	8086.9	2704.9	na	272.5	11064.3	73.1	24.4	na	2.5
2000-2500	6344.1	2070.1	na	168.0	8582.2	73.9	24.1	na	2.0
2500-3000	6588.6	2523.0	na	298.3	9409.8	70.0	26.8	na	3.2
3000-4000	10740.7	3924.8	na	773.4	15438.9	69.6	25.4	na	5.0
4000-5000	2117.0	559.2	na	105.6	2781.9	76.1	20.1	na	3.8
5000-6000	17.6	na	na	na	17.6	100.0	na	na	na

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977 **Table A.4: Depth zones and area of ridge seamounts in APEIs, contract areas for CFC (CFC) and PMN (PMN), and remaining "available"**
978 **(outside any managed area). Na; not applicable.**

Depth Zone	Depth Zone in CFC Seamounts (km^2)	Depth Zone in APEI Seamounts (km^2)	Depth Zone in PMN Seamounts (km^2)	Depth Zone in Remaining Seamounts (km^2)	Depth Zone Area for Seamount Type	Percent CFC	Percent APEI Seamount	Percent PMN	Percent Remaining Seamount
0-500	4.2	18.1	na	na	22.3	18.9	81.1	na	na
500-1000	330.0	226.4	na	na	556.4	59.3	40.7	na	na
1000-1500	1389.0	1515.8	na	739.3	3644.1	38.1	41.6	na	20.3
1500-2000	1359.2	2992.2	na	1070.5	5421.9	25.1	55.2	na	19.7
2000-2500	836.8	4464.4	245.7	1080.7	6627.7	12.6	67.4	3.7	16.3
2500-3000	974.4	3752.1	508.7	2409.5	7644.8	12.7	49.1	6.7	31.5
3000-4000	2681.7	9305.1	1629.6	4046.6	17663.0	15.2	52.7	9.2	22.9
4000-5000	824.0	5943.8	1275.4	2514.9	10558.2	7.8	56.3	12.1	23.8

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Annex B. Descriptions of individual APEIs[7]

APEI 1

Description: The APEI is situated in the Area of the North-west Pacific, in the north-eastern sector of the regional environmental management plan area. The APEI is predominantly abyssal plain in the 5000–5500 m depth band. It contains four seamounts, as well as abyssal plain habitats. Seamount summit depths are provided in Table B.1.
The APEI is important for representativity, containing a wide range of habitats representative of those seen at similar depths in contract areas.
A map of the APEI is provided in Figure B.1.

Area: 54,000 km^2 (abyssal plain 51,394 km^2, inter-seamount basin 1,043 km^2, seamounts 1,563-km^2).

Network criteria

- **Ecological importance**

Seamount species typically are vulnerable to impact, with slow growth rates and long generation times leading to very slow and episodic recovery following human impact.

- **Representativity**

The APEI is representative of 5000–5500 m depth abyssal plain. This is comparable to the depths seen in PMN contract and reserved areas. Nodule similarity analyses indicate varying likelihoods of nodule occurrence, though moderate nodule density is expected. While the APEI is primarily created for abyssal plain areas, one large, medium-depth conical seamount is also present that is an important target habitat for inclusion in the REMP network (Table B.1). The APEI provides representation of higher POC flux in the REMP area.

- **Connectivity**

Assessment of the contribution of the APEI to connectivity was not possible given the available evidence.

- **Replication**

Abyssal plain habitats are replicated in other APEIs in the REMP.

- **Viability**

This APEI is larger than the minimum recommended size for viability of abyssal plains.

Site-specific data availability
No site-specific data are known.

Boundary: See Appendix.

Distance to nearest APEI
APEI 1 is located 10.7 km from APEI 2.

[7] Descriptions of the individual APEIs in this Annex build on the information compiled through the data report and regional environmental characterization, and the analyses conducted during the scientific workshops held to develop the regional environmental management plan for this region. Among these, information on records of PMN occurrence and nodule similarity analyses, as referred to in this Annex, is summarized in the report of the workshop held in Tokyo, Japan in 2024 (pages 37-40).[7]

Distance to contract areas

APEI 1 is over 25 km from any contract area.

Distance to national maritime boundaries

APEI 1 is over 50 km from the distance separation zone to national maritime boundaries.

Table B.1: Type, depth and area of seamount features in APEI 1

(ID refers to a Duke University identifier)

ID	Seamount Type	Summit Depth (m)	Area (sq km)	Nearest Seamount ID	Distance to Nearest Seamount (km)
745	Conical Seamount	3,155	668.1	1735	167.0
1614	Ridge	4,785	117.2	1762	3.7
1735	Conical Seamount	1,319	588.9	1762	96.4
1762	Ridge	3,877	188.4	1614	3.7

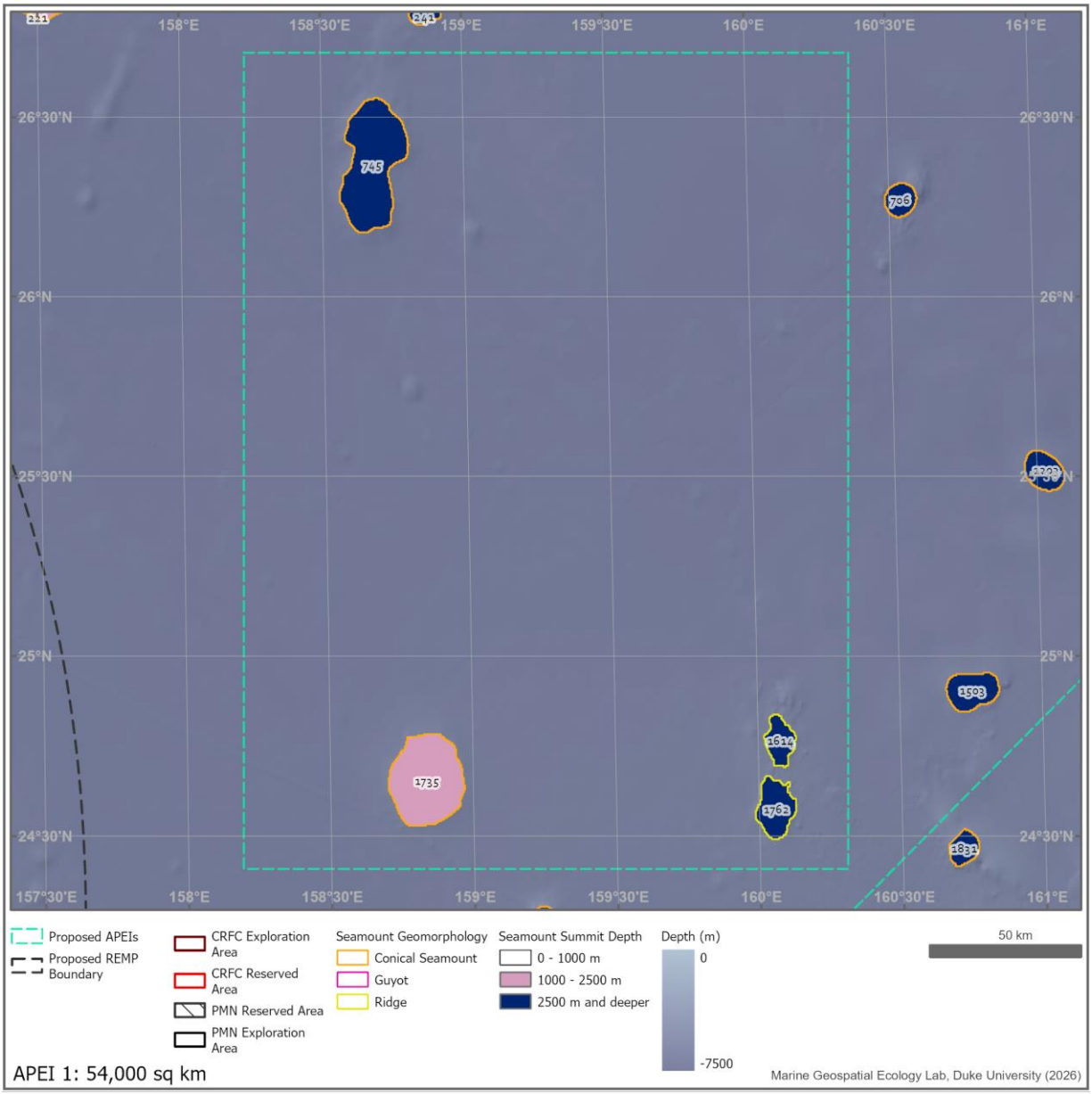

Figure B.1: Map of APEI 1

APEI 2

Description: The APEI is situated in the Area of the North-west Pacific, in the eastern sector of the regional environmental management plan area. Its eastern boundary lies close to a national maritime boundary. It contains 27 seamounts of the Marcus-Wake seamount chain, as well as large areas of inter-seamount and abyssal plain habitats. Seamount summit depths are provided in Table B.2. Data are available from COMRA related to a seamount in this APEI ("RE" seamount). Inter-seamount basin depths are in the range of 4000-6000 m.
Scientific information indicates that the APEI has ecological importance and potential importance for connectivity relative to the surrounding deep seabed. It contains a wide range of habitats representative of those seen at similar depths in exploration or reserved areas.
A map of the APEI is provided in Figure B.2.

Area: 161,728 km^2 (abyssal plain 17,301 km^2, inter-seamount basin 120,009 km^2, seamount 24,418 km^2).

Network criteria

- **Ecological importance**

The APEI contains conical seamounts and guyots within the ecologically important shallow and medium depth ranges that are mostly occupied by CFC exploration and reserved areas. The western flank of "RE" seamount is known to contain high abundance of corals, particularly gorgonian octocorals as well as precious corals, primnoid fan corals, bamboo corals and golden corals. Such taxa typically are vulnerable to impact, with slow growth rates and long generation times leading to very slow and episodic recovery following human impact.
Inter-seamount basin habitat is present in the APEI. PMN have been reported on several seamounts.

- **Representativity**

The APEI contains multiple large-scale habitats (Table B.2): seamounts in the Marcus-Wake seamount chain, inter-seamount habitat and known nodule presence on seamounts. The majority of seamount types and major depth bands are represented in the APEI, i.e. conical seamounts (shallow, medium and deep), guyots (medium) and ridge seamounts (shallow, medium and deep). The shallow and medium-depth seamounts in the APEI are likely to be representative of nearby seamounts that are CFC exploration areas. The APEI sits in the northeastern biogeographic region identified by Hao et al. (2023).

- **Connectivity**

The APEI is thought to be important for connectivity in the eastern REMP area, due to the inclusion of multiple seamounts of the Marcus Wake seamount chain. Seamounts in the APEI are widely distributed and unevenly clustered (see Table B.2). The location also is expected to provide connectivity with contract area seamounts.

- **Replication**

Internal replication occurs in the APEI, with multiple seamounts in all seamount types and depth bands (except for the shallow ridge category). Seamount types and depth bands are all replicated in other APEIs.

- **Viability**

The APEI is the largest in the area covered by the regional environmental management plan. The combined inter-seamount area is considerably larger than the minimum recommended size for viability of abyssal plains. Seamounts are included as whole units, except for the southernmost seamount that extends into a national maritime boundary.

Site-specific data availability

One seamount (COMRA "RE") in this APEI has data collected during an ROV transect in 2020. The western flank of the seamount, close to the summit at 1100m, revealed high abundance of deep-sea corals. Gorgonian octocorals were the dominant type (termed "yellow-green sea fan") together with precious coral *Hemicorallium* sp., primnoid fan corals, bamboo corals and golden corals and has significant biological data on coral density. CAPSTONE surveys on seamounts to the east on the Marcus-Wake chain report diverse coral and sponge fauna.

Boundary: See Appendix.

Distance to nearest APEI

APEI 2 is 10.7 km from APEI 1.

Distance to contract areas

APEI 2 is over 25 km from any contract area.

Distance to national maritime boundaries

The APEI abuts national maritime boundaries. It thus includes the whole 50 km distance separation zone. Given that conical seamounts and guyots within the shallow and intermediate depth range not occupied by CFC exploration areas and reserved areas are scarce within the REMP area, it is considered important to include the guyot and shallow conical seamount which occur in the maritime boundary distance separation zone. One guyot extends into the adjacent maritime boundary.

Table B.2: Type, depth and area of seamount features in APEI 2

(ID refers to a Duke University identifier)

ID	Seamount Type	Summit Depth (m)	Area (sq km)	Nearest Seamount ID	Distance to Nearest Seamount (km)
1619	Ridge	2,792	3,017.9	1848	28.7
1633	Conical Seamount	2,062	1,753.9	2016	13.6
1831	Conical Seamount	3,801	85.4	2526	26.5
1848	Conical Seamount	1,940	739.8	1619	28.7
2016	Conical Seamount	2,565	1,197.0	1633	13.6
2192	Ridge	3,599	202.0	2526	19.6
2272	Conical Seamount	3,415	257.1	2016	19.9
2526	Ridge	868	1,549.0	2192	19.6
2809	Conical Seamount	4,527	126.5	2526	27.7
2980	Ridge	1,096	3,092.9	3151	5.1
3051	Conical Seamount	2,906	351.4	3151	7.9
3151	Ridge	2,048	726.3	2980	5.1
3280	Conical Seamount	4,710	58.4	3674	37.2
3284	Conical Seamount	Uncertain (<100m)	931.1	3565	34.6
3468	Conical Seamount	-517	573.0	3833	31.1
3565	Conical Seamount	Uncertain (<100m)	1,452.7	3468	34.2
3674	Ridge	3,658	394.3	3951	6.8
3833	Conical Seamount	2,246	898.6	3674	22.9
3951	Ridge	1,980	595.9	3674	6.8
4391	Conical Seamount	2,014	270.8	4135	10.7

4532	Conical Seamount	1,840	1,483.7	4650	11.2
4683	Conical Seamount	3,497	221.4	4391	25.8
5173	Conical Seamount	2,559	303.9	5886	24.1
6243	Conical Seamount	1,991	470.4	5886	27.5
4135	Guyot	1,170	1,222.0	4391	10.7
4650	Guyot	1,185	1,491.0	4532	11.2
5886	Conical Seamount	Uncertain (<100m)	951.6	5173	24.1

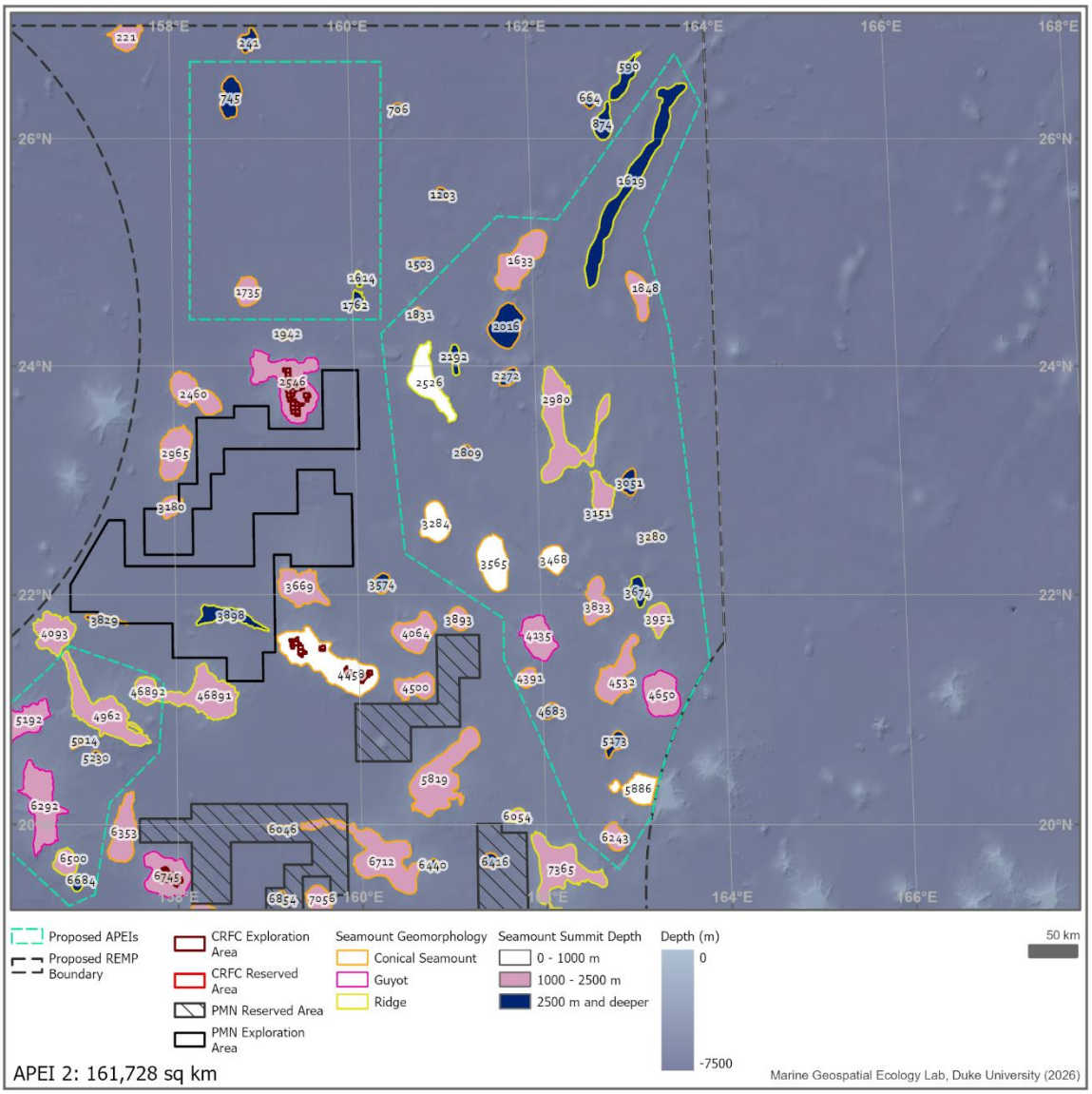

Figure B.2: Map of APEI 2

APEI 3

Description: The APEI is situated in the Area of the North-west Pacific, in the eastern sector of the regional environmental management plan area. Its eastern boundary lies close to a national maritime boundary. It contains nine seamounts of the south-west section of the Marcus-Wake seamount chain, as well as inter-seamount basin habitats. Seamount summit depths are provided in Table B.3. Inter-seamount basin depth is generally in the depth band of 4000 - 4900 m.

Scientific information indicates that the APEI has ecological importance and importance for connectivity relative to the surrounding deep seafloor. It contains a wide range of habitats representative of those seen at similar depths in contract areas.

A map of the APEI is provided in Figure B.3.

Area: 35,886 km^2 (abyssal plain 159 km^2, inter-seamount basin 27,058 km^2, seamount 8,669 km^2).

Network criteria

- **Ecological importance**

The north-east of the APEI includes two of the seamounts relinquished by JOGMEC in 2024 (Maloney Guyot, and part of Arnold Guyot). These contain known high sponge abundance and diversity (Saito et al., 2025). The medium-depth range of the seamounts is relatively rare in the APEI network. Seamount species typically are vulnerable to impact, with slow growth rates and long generation times leading to very slow and episodic recovery following human impact.

Polymetallic nodules have been reported from on and near the base of several seamounts.

- **Representativity**

The APEI contains multiple large-scale habitats (Table B.3): seamounts in the Marcus-Wake seamount chain, inter-seamount habitat and known nodule habitats. A number of seamount types and major depth bands are represented in the APEI, i.e. conical seamounts (deep), guyots (medium-depth) and ridge seamounts (medium-depth). The medium-depth seamounts in the APEI are likely to be representative of seamounts that contain CFC exploration or reserved areas. The APEI sits in the northeastern biogeographic region identified by Hao et al. (2023). The APEI provides representation of the region of medium POC conditions.

- **Connectivity**

Larval dispersal studies on amphipods and subsequent modelling indicate that Arnold Guyot may be an important feature in enabling dispersal between seamounts in the JOGMEC region (Saito et al., 2025). Seamounts are distributed widely in the APEI (see Table B.3).

- **Replication**

Internal replication occurs in the APEI, with multiple seamounts in all seamount types and depth bands (except deep ridges). The seamount types and depth bands are all replicated in other APEIs.

- **Viability**

Seamounts are included as full units, except for Arnold Guyot, where only the western part is included. This western part of the seamount is a topological discrete feature from the eastern peak (joined by a deep ridge). The APEI is larger than the minimum recommended size for viability of abyssal plains.

Site-specific data availability

Biological sampling and benthic camera data show high abundance of sponges on Maloney Guyot. Larval dispersal work on amphipods and subsequent modelling indicate that Arnold

Guyot may be an important feature in enabling dispersal between seamounts in the JOGMEC region (Saito et al, 2025).

Boundary: See Appendix.

Distance to nearest APEI

APEI 3 is 199.9 km from APEI 4.

Distance to contract areas

APEI 3 is over 25 km from any contract area.

The APEI is still close to seamounts in the JOGMEC contract area, and includes one of the seamounts relinquished by the contractor in 2024 (Maloney Guyot, and part of Arnold Guyot). The western part of Arnold Guyot that is included in the APEI is further away from the adjacent PMN contract area than the eastern part of the seamount.

Distance to national maritime boundaries

APEI 3 is 49.7 km distant from the nearest maritime boundary.

Table B.3: Type, depth and area of seamount features in APEI 3

(ID refers to a Duke University identifier; ** signifies a feature that substantially crosses the APEI boundary.)

ID	Seamount Type	Summit Depth (m)	Area (sq km)	Nearest Seamount ID	Distance to Nearest Seamount (km)
4962	Ridge	1,742	2655.5	5014	14.2
5014	Conical Seamount	3,091	73.9	5230	13.2
5192	Guyot	1,896	1476.6	5613	3.9
5230	Conical Seamount	2,993	67.9	5014	13.2
6500	Ridge	1,582	531.4	6684	4.1
6684	Ridge	3,571	136.5	6500	4.1
5613	Guyot	1,591	814.3	5192	3.9
6292	Guyot	1,492	2298.5	6500	9.6
46892	Ridge	1,336	614.1	4962	14.9

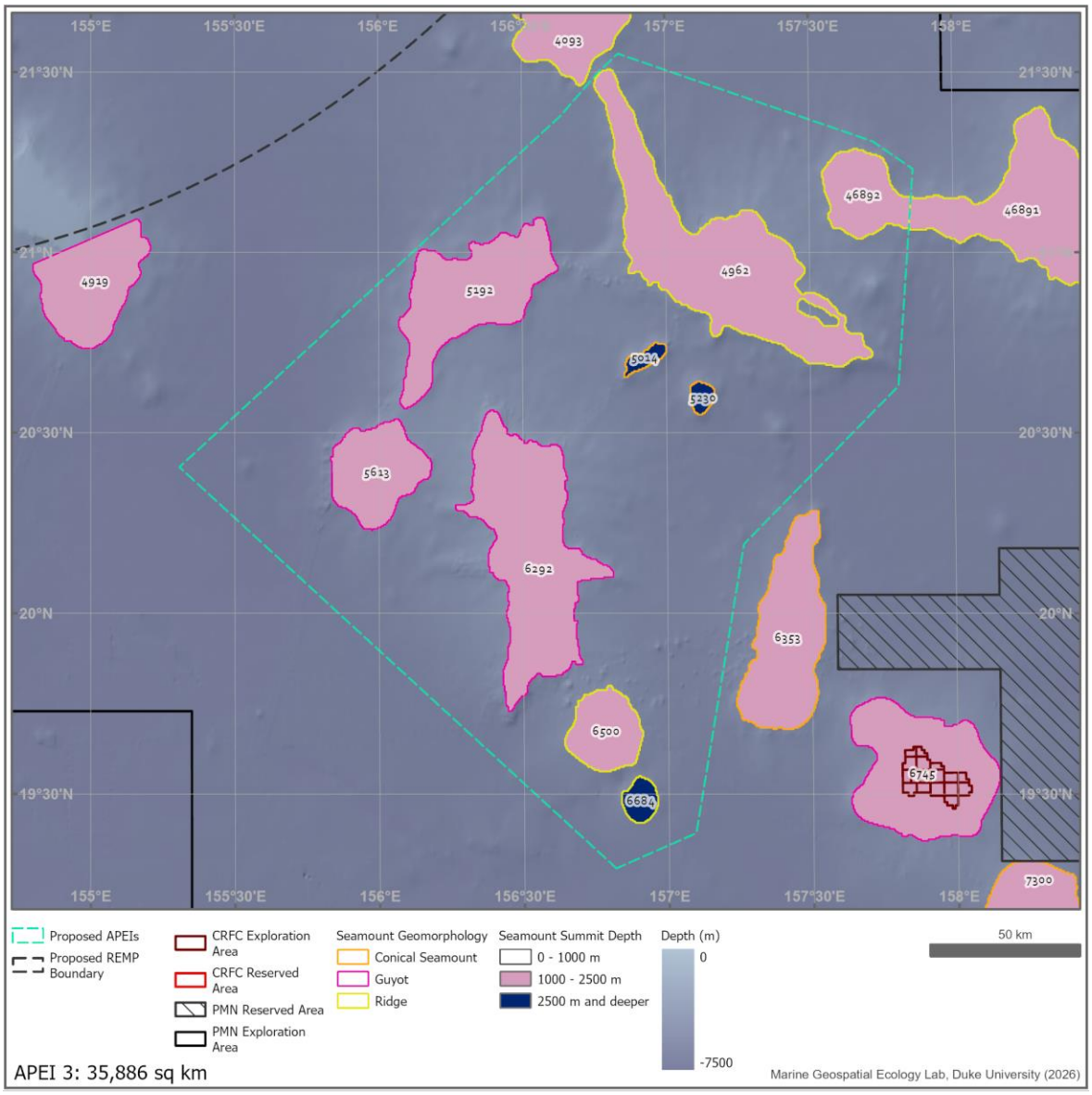

Figure B.3: Map of APEI 3

APEI 4

Description: The APEI is situated in the Area of the North-west Pacific, in the central-eastern sector of the regional environmental management plan area. The APEI contains large areas of inter-seamount and abyssal plain habitats, as well as two deep seamounts of the Marcus-Wake seamount chain. Seamount summit depths are provided in Table B.4. Inter-seamount basin depth is in the depth band of 5500–5700 m.

Scientific information indicates that the APEI has ecological importance and potential importance for connectivity. It contains a wide range of habitats representative of those seen at similar depths in contract areas.

A map of the APEI is provided in Figure B.4.

Area: 40,000 km^2 (abyssal plain 26,633 km^2, inter-seamount basin 12,194 km^2, seamount 1,173 km^2).

Network criteria:

- **Ecological importance**

The APEI contains both abyssal plain habitat and inter-seamount basin habitat, situated between the Marcus-Wake and Magellan seamount chains. Seamount species typically are vulnerable to impact, with slow growth rates and long generation times leading to very slow and episodic recovery following human impact.

- **Representativity**

The APEI contains inter-seamount basin and abyssal plain habitats. Depths are similar to deeper PMN contract and reserved areas. There is relatively low nodule similarity potential, and no nodule records. The APEI provides representation of the region of medium POC conditions.

- **Connectivity**

The APEI may be important for connectivity through the Pigafetta Basin.

- **Replication**

Abyssal plain and inter-seamount basin habitats are replicated in other APEIs. The two deep seamounts (1 conical, 1 ridge) in the APEI are replicated in type and depth band in other APEIs.

- **Viability**

The APEI is the minimum recommended size for viability of abyssal plains.

Site-specific data availability

Site-specific data are not known.

Boundary: See Appendix.

Distance to nearest APEI

APEI 4 is 10.9 km from APEI 5.

Distance to contract areas

APEI 4 is over 25 km from any contract area.

Distance to national maritime boundaries

APEI 4 is over 50 km from the distance separation zone to national maritime boundaries.

Table B.4: Type, depth and area of seamount features in APEI 4
(ID refers to a Duke University identifier.)

ID	Seamount Type	Summit Depth (m)	Area (sq km)	Nearest Seamount ID	Distance to Nearest Seamount (km)
10183	Ridge	3,266	522.1	10597	85.4
10597	Conical Seamount	3,467	651.2	10183	85.4

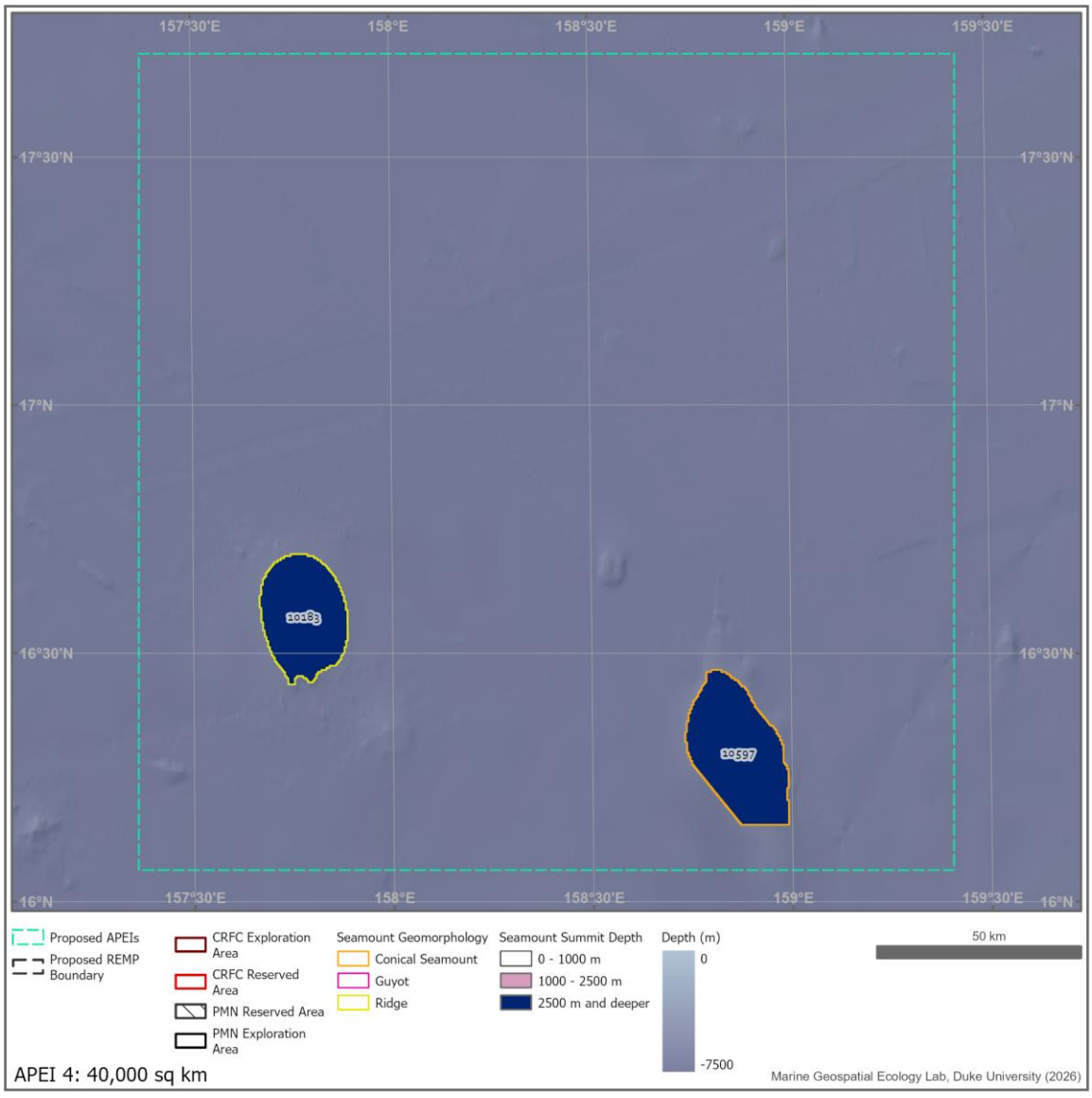

Figure B.4: Map of APEI 4

APEI 5

Description: The APEI is situated in the Area of the North-west Pacific, in the south-eastern sector of the regional environmental management plan area. Its southern boundary lies close to a national maritime boundary. It contains 16 seamounts of the Marshall Islands seamount chain, as well as large areas of inter-seamount and abyssal plain habitats. Seamount summit depths are provided in Table B.5. Inter-seamount basin depth is in the range of 4200-5200 m.

Scientific information indicates that the APEI has ecological importance and potential importance for connectivity relative to the surrounding deep seafloor. It contains a wide range of habitats representative of those seen at similar depths in contract areas.

A map of the APEI is provided in Figure B.5.

Area: 93,895 km^2 (abyssal plain 10,943 km^2, inter-seamount basin 69,051 km^2, seamount 13,900 km^2).

Network criteria

- **Ecological importance**

The summit depths of two guyots (956 and 1146 m) are rare outside contract areas. The southernmost guyot is of particular ecological significance as it is one of the few shallower guyots in the region that does not have a mining exploration contract, and which sits in the same depth band as the nearby guyot beyond the APEI boundary that contains CFC reserve areas. Seamount species typically are vulnerable to impact, with slow growth rates and long generation times leading to very slow and episodic recovery following human impact.

- **Representativity**

The APEI contains multiple large-scale habitats (Table B.5): seamounts in the northwest of the Marshall Islands seamount chain, inter-seamount habitat and abyssal plain habitats. A number of seamount types and major depth bands are represented in the APEI, i.e. conical seamounts (shallow, medium-depth and deep), guyots (shallow, medium-depth) and ridges (shallow, medium-depth).

The shallower seamounts in the APEI are similar to nearby seamounts that contain CFC exploration areas. The abyssal plain and inter-seamount basin habitats are of similar depth to PMN contract areas. The APEI sits in the northeastern biogeographic region identified by Hao et al. (2023). The APEI provides representation of the region of lower POC conditions in the REMP.

- **Connectivity**

The APEI is thought to be important for connectivity in the Marshall Islands seamount chain (both in the Area and in the nearby EEZ). Seamounts in the APEI are widely distributed and unevenly clustered (see Table B.5).

- **Replication**

Some internal replication occurs in the APEI, with multiple deep and medium depth conical seamount and medium depth ridge seamounts. Seamount types and depth bands are all replicated in other APEIs.

- **Viability**

Seamounts are included as full units. This APEI is larger than the minimum recommended size for viability of abyssal plains.

Site-specific data availability

No site-specific data are known.

Boundary: See Appendix.

Distance to nearest APEI

APEI 5 is 10.9 km from APEI 4.

Distance to contract areas

APEI 5 is over 25 km from any contract area.

Distance to national maritime boundaries

The APEI abuts a national maritime boundary. It thus includes the whole 50 km distance separation zone. Given that guyots within the medium-depth range not occupied by CFC exploration areas and reserved areas are scarce within the REMP area, it is considered important for the APEI network to include the guyot and shallow conical seamount which occur within the distance separation zone to a national maritime boundary.

Table B.5: Type, depth and area of seamount features in APEI 5

(ID refers to a Duke University identifier.)

ID	Seamount Type	Summit Depth (m)	Area (sq km)	Nearest Seamount ID	Distance to Nearest Seamount (km)
9148	Conical Seamount	3,062	200.9	9722	13.7
9329	Conical Seamount	2,469	182.2	9722	11.1
10184	Conical Seamount	1,163	366.1	9722	23.2
11623	Conical Seamount	2,050	542.7	12049	11.3
11702	Conical Seamount	Uncertain (<100m)	576.9	11929	5.8
11854	Conical Seamount	2,095	652.3	11929	26.6
11927	Conical Seamount	4,066	145.2	12049	10.2
11929	Conical Seamount	3,549	414.6	11702	5.8
12049	Ridge	1,277	596.0	12304	3.7
12304	Ridge	2,487	174.3	12049	3.7
12520	Conical Seamount	3,637	106.7	12417	22.8
13129	Conical Seamount	2,944	305.3	12740	40.8
9722	Ridge	393	1607.3	9329	11.1
12289	Ridge	1,101	4758.8	10184	34.3
12417	Guyot	1,146	1058.4	12304	14.7
12740	Guyot	956	2212.7	12520	40.1

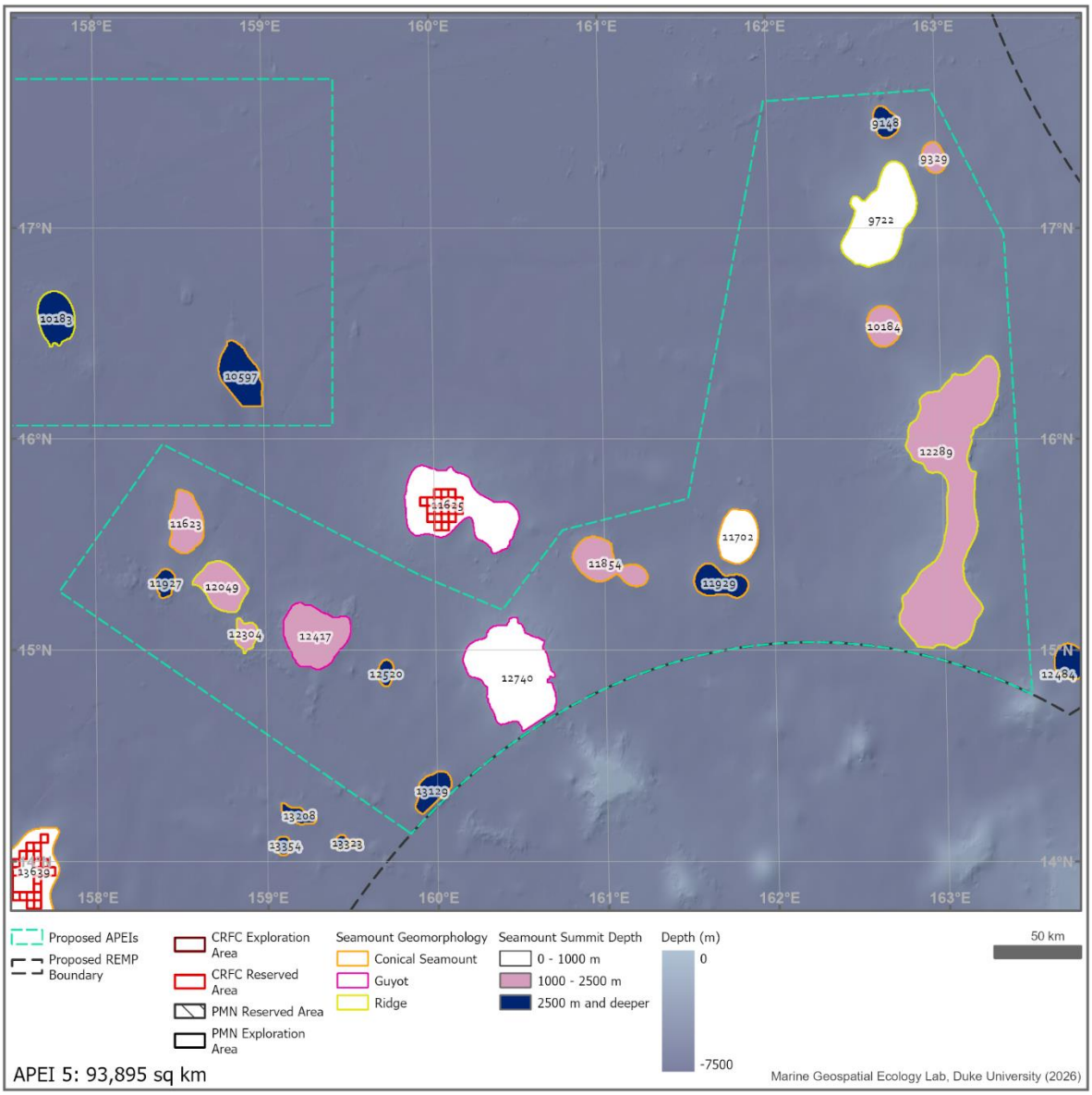

Figure B.5: Map of APEI 5

APEI 6

Description: The APEI is situated in the Area of the North-west Pacific, in the southern sector of the regional environmental management plan area. Its southern boundary lies close to a national maritime boundary. It contains one large ridge seamount of the Magellan seamount chain. Summit depth is 1408m (Table B.6), with the base of the seamount and surrounding inter-seamount basin depth at around 4700 m.

Scientific information indicates that the APEI has ecological importance and potential importance for connectivity relative to the surrounding deep seafloor.

A map of the APEI is provided in Figure B.6.

Area: 13,107 km^2 (inter-seamount basin 8,084 km^2, seamount 5,023 km^2).

Network criteria

- **Ecological importance**

The APEI contains a large ridge seamount within the ecologically important depth band of 1000-2000 m. Sponges are known to be common on the north side of the seamount. Seamount species typically are vulnerable to impact, with slow growth rates and long generation times leading to very slow and episodic recovery following human impact.

- **Representativity**

The large medium-depth ridge seamount is important for capturing representativity as it is similar to depth and size of some of the contract area seamounts. The APEI sits in the south-western biogeographic region identified by Hao et al. (2023). The APEI provides representation of the region of low POC conditions in the REMP.

- **Connectivity**

The APEI may be important for connectivity to neighboring features of the Magellan seamount chain within EEZs to the south of the REMP.

- **Replication**

The medium-depth ridge feature is replicated in other APEIs.

- **Viability**

Seamounts are included as full units.

Site-specific data availability

Sponges are common from samples on the northern section of this seamount (Hao et al, 2023).

Boundary: See Appendix.

Distance to nearest APEI

APEI 6 is 256.8 km from APEI 7.

Distance to contract areas

APEI 6 is over 25 km from any contract area.

Distance to national maritime boundaries

The APEI abuts a national maritime boundary. There is a 8.4 km distance separation zone between the national maritime boundary and the nearest ridge feature. Incursion into the 50 km distance separation zone is necessary to contain the entire ridge seamount unit in the APEI.

Table B.6: Type, depth and area of seamount features in APEI 6. Na: not applicable.
(ID refers to a Duke University identifier.)

ID	Seamount Type	Summit Depth (m)	Area (sq km)	Nearest Seamount ID	Distance to Nearest Seamount (km)
15793	Ridge	1,408	5022.5	na	na

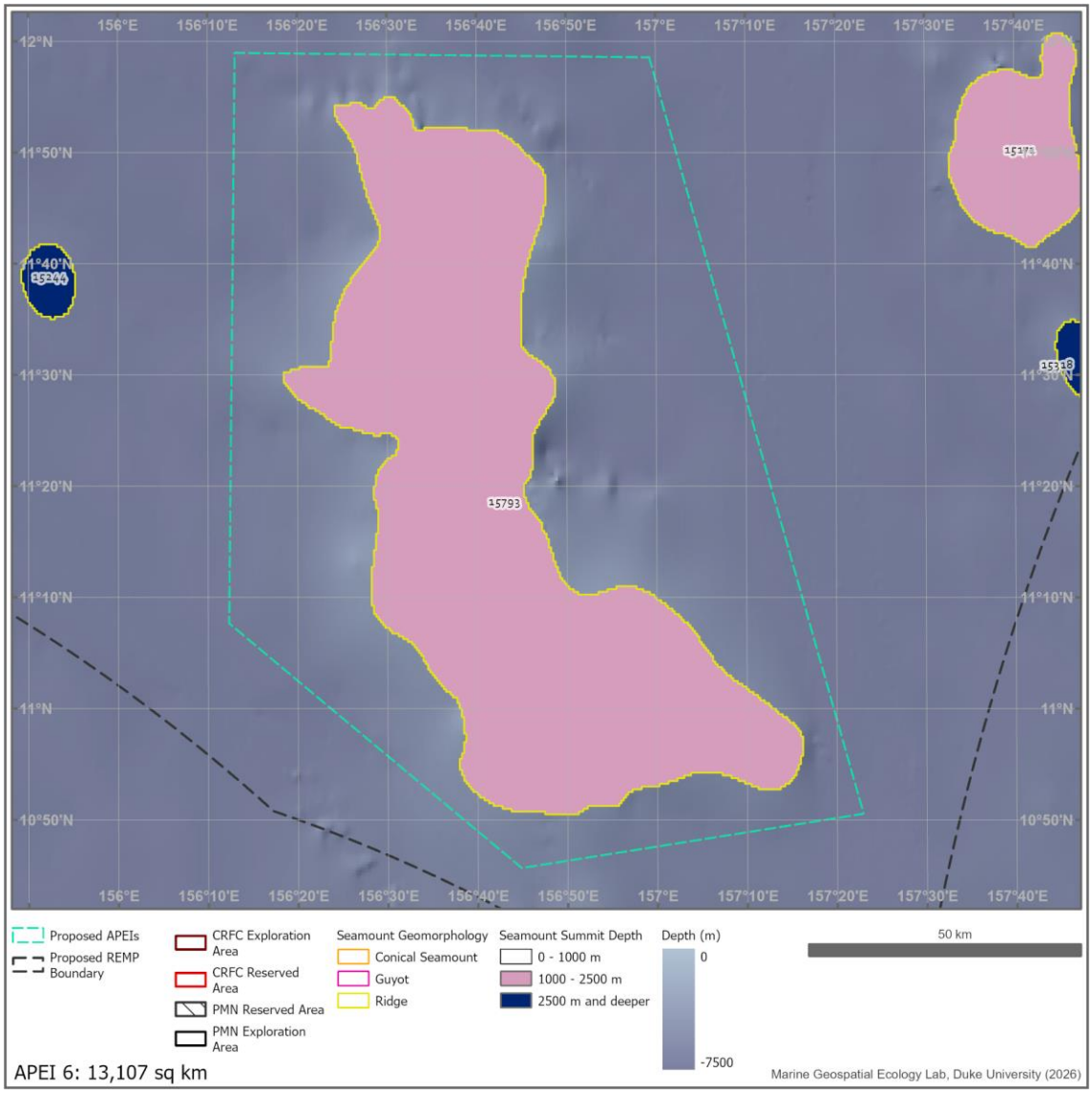

Figure B.6: Map of APEI 6

APEI 7

Description: The APEI is situated in the Area of the North-west Pacific, in the central-southern sector of the regional environmental management plan area. It contains large areas of inter-seamount and abyssal plain habitats, as well as eight seamounts of the Magellan seamount chain. Summit depths are provided in Table B.7. Abyssal plain and inter-seamount basin depth is 5000-5400m.

Scientific information indicates that the APEI has ecological importance and is representative of PMN habitat. It contains a wide range of both abyssal and seamount habitats.

A map of the APEI is provided in Figure B.7.

Area: 60,491 km^2 (abyssal plain 33,741 km^2, inter-seamount basin 22,921 km^2, seamount 3,829 km^2).

Network criteria

- **Ecological importance**

The APEI contains both deep inter-seamount basin habitat and deep abyssal plain habitat in the East Marianas Basin. There are multiple nodule records in the northern part of this APEI, and so nodule-associated faunal communities are likely to also occur in the APEI. Seamount species typically are vulnerable to impact, with slow growth rates and long generation times leading to very slow and episodic recovery following human impact.

- **Representativity**

The APEI has multiple types of habitats: abyssal plain, inter-seamount basin, and both medium-depth and deep conical and ridge seamounts. It sits in the southern biogeographic region identified by Hao et al. (2023). The APEI provides representation of the region of low POC conditions in the REMP.

- **Connectivity**

There is no specific information on connectivity in this APEI, but the range of deep habitats may provide for connecting abyssal plain, inter-seamount basin and dee seamount faunal communities.

- **Replication**

Some internal replication occurs in the APEI. Medium-depth ridge features are replicated in other APEIs in the REMP. Abyssal plain and inter-seamount basin features are replicated in other APEIs.

- **Viability**

This APEI is larger than the minimum recommended size for viability of abyssal plains. Seamounts are included as full units.

Site-specific data availability

Site-specific data are not known.

Boundary: See Appendix.

Distance to nearest APEI

APEI 7 is 24.3 km from APEI 9.

Distance to contract areas

APEI 7 is over 25 km from any contract area.

Distance to national maritime boundaries

APEI 7 is over 50 km from the distance separation zone to national maritime boundaries.

Table B.7: Type, depth and area of seamount features in APEI 7
(ID refers to a Duke University identifier.)

ID	Seamount Type	Summit Depth (m)	Area (sq km)	Nearest Seamount ID	Distance to Nearest Seamount (km)
11151	Conical Seamount	3,999	164.6	12013	32.5
11254	Conical Seamount	3,007	349.8	11816	28.1
11816	Conical Seamount	2,113	775.7	12112	23.3
12013	Conical Seamount	3,851	823.1	12227	15.0
12112	Conical Seamount	4,451	125.6	12227	6.8
12227	Conical Seamount	4,351	136.5	12112	6.8
12841	Ridge	2,029	849.2	13192	9.4
13192	Ridge	1,853	604.6	12841	9.4

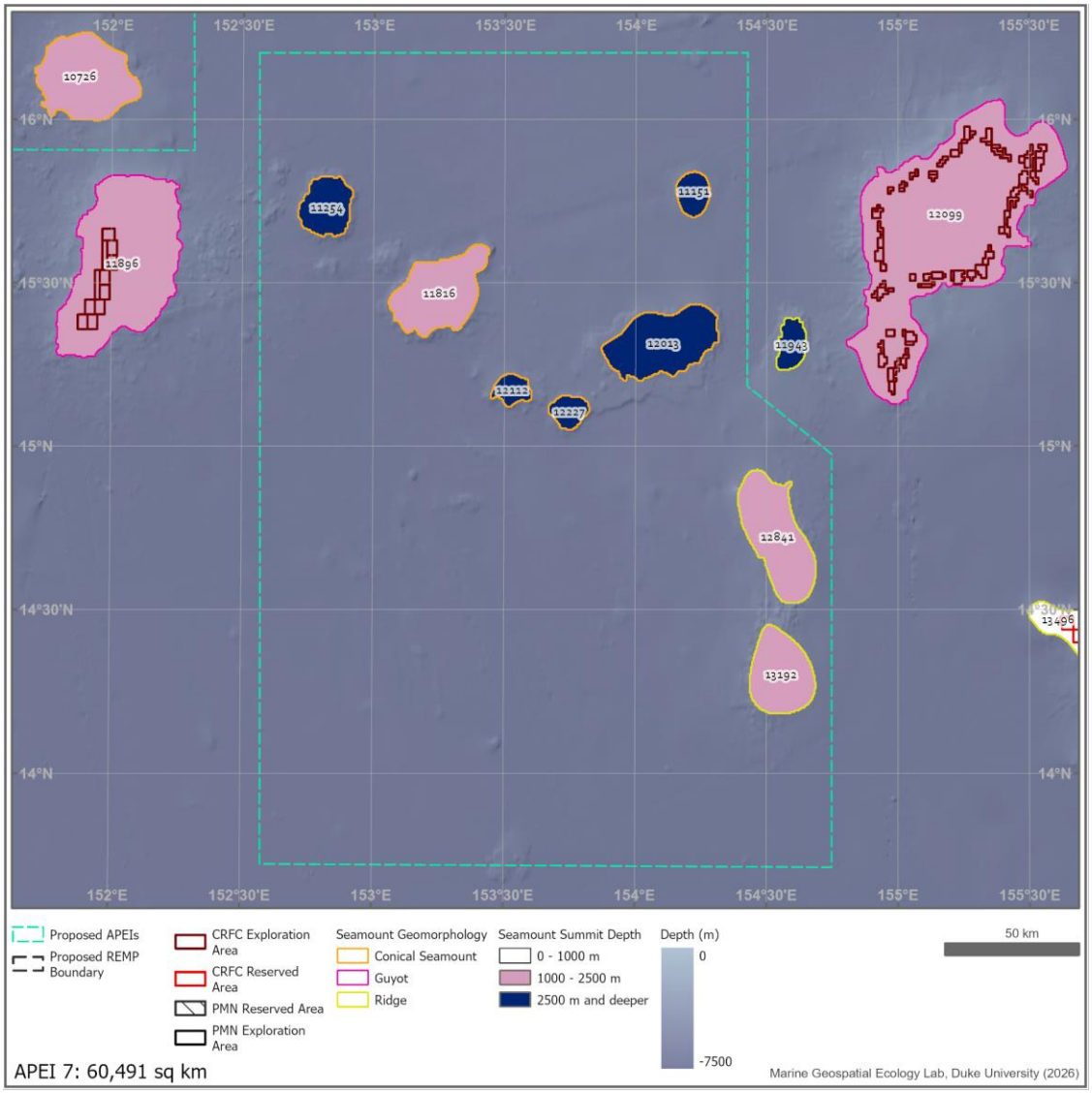

Figure B.7: Map of APEI 7.

APEI 8

Description: The APEI is situated in the Area of the North-west Pacific, in the southwestern sector of the regional environmental management plan area. Its southern boundary lies close to a national maritime boundary. It contains six seamounts of the Magellan seamount chain, as well as areas of abyssal plain habitats of the East Marianas Basin. Summit depths are provided in Table B.8. Abyssal plain depth is around 5500 m.

Scientific information indicates that the APEI has ecological importance and potential importance for connectivity. It contains a wide range of habitats representative of those seen at similar depths in contract areas.

A map of the APEI is provided in Figure B.8.

Area: 38,711 km^2 (abyssal plain 37,264 km^2, seamount 1,447 km^2).

Network criteria

- **Ecological importance**

COMRA "RD" seamount data shows the presence of prominent primnoid and chrysogorgiid coral and sponge communities, with associated crinoids and ophiuroids. Seamount species typically are vulnerable to impact, with slow growth rates and long generation times leading to very slow and episodic recovery following human impact. Polymetallic nodules have been reported on one seamount.

- **Representativity**

There is moderate to high nodule similarity potential. The APEI sits in the southern biogeographic region according to Hao et al. (2023). The APEI provides representation of the region of low POC conditions in the REMP.

- **Connectivity**

The area may also protect connectivity from the area of the Marianas Trench as it shallows to abyssal plain depths on its eastern side.

- **Replication**

Some internal replication occurs in the APEI, with multiple seamounts in medium-depth and deep ridge features. Seamount types and depth bands are all replicated in other APEIs.

- **Viability**

This APEI is larger than the minimum recommended size for viability of abyssal plains. Seamounts are included as full units.

Site-specific data availability

Data are available from COMRA for the "RD" seamount, which was one of the seamounts surveyed in 2019. The photographic transect mapped an area of corals (*Primnoidae, Chrysogorgiidae*) and sponges over about 300m. Crinoids and ophiuroids were associated with the sessile fauna**.**

Boundary: see Appendix.

Distance to nearest APEI

APEI 8 is 121.6 km from APEI 7.

Distance to contract areas

APEI 8 is over 25 km from any contract area.

Distance to national maritime boundaries

APEI 8 is over 50 km from the distance separation zone to national maritime boundaries.

Table B.8: Type, depth and area of seamount features in APEI 8
(ID refers to a Duke University identifier.)

ID	Seamount Type	Summit Depth (m)	Area (sq km)	Nearest Seamount ID	Distance to Nearest Seamount (km)
12745	Conical Seamount	5,109	209.2	13912	133.5
13912	Conical Seamount	2,418	412.7	14126	21.5
13927	Conical Seamount	1,967	501.5	14008	9.2
14008	Conical Seamount	4,720	112.9	13927	9.2
14126	Conical Seamount	5,012	58.1	14214	17.4
14214	Conical Seamount	4,691	152.8	14126	17.4

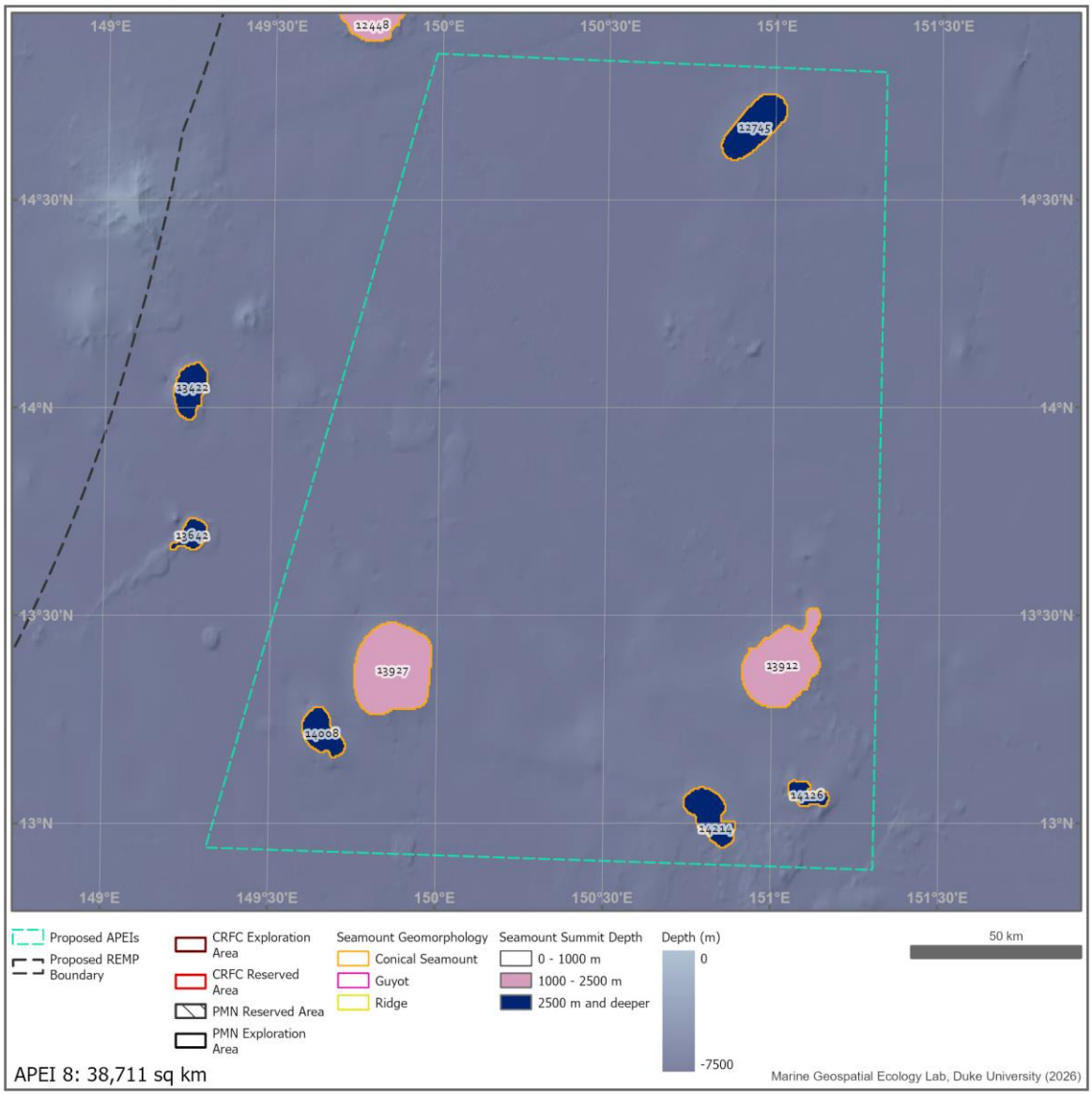

Figure B.8: Map of APEI 8

APEI 9

Description: This seamount area includes a shallow guyot and a small conical seamount at priority depths in the central region of the Magellan seamount chain.

The APEI is situated in the Area of the North-west Pacific, in the central-western sector of the regional environmental management plan area. It contains two seamounts of the Magellan seamount chain, as well as abyssal plain habitats. Summit depths are provided in Table B.9. Inter-seamount basin depth is in the depth band of 4300 - 5000 m.

Scientific information indicates that the APEI has ecological importance. It contains habitats representative of those seen at similar depths in contract areas.

A map of the APEI is provided in Figure B.9.

Area: 22,457 km^2 (abyssal plain 11,136 km^2, inter-seamount basin 8,234 km^2, seamount 3,087 km^2).

Network criteria

- **Ecological importance**

This seamount area includes a shallow guyot and a small conical seamount at priority depths in the central region of the Magellan seamount chain. Seamount species typically are vulnerable to impact, with slow growth rates and long generation times leading to very slow and episodic recovery following human impact. A nodule record exists on a seamount.

- **Representativity**

The APEI contains multiple large-scale habitats (Table B.9): seamounts in the Magellan seamount chain, abyssal plain habitat and known nodule habitat. The shallower seamounts in the APEI are likely to be representative of nearby seamounts that contain CFC exploration or reserved areas. The APEI sits in the southern biogeographic region identified by Hao et al. (2023).

The APEI provides representation of the region of medium POC conditions in the REMP.

- **Connectivity**

The APEI may provide a connectivity pathway to the cluster of guyots to its north.

- **Replication**

Seamount types and depth bands are all replicated in other APEIs.

- **Viability**

Seamounts are included as full units.

Site-specific data availability

No site-specific data are known.

Boundary: See Appendix.

Distance to nearest APEI

APEI 9 is 24.3 km from APEI 7.

Distance to contract areas

APEI 9 is 24.0 km from the nearest PMN reserved area.

Distance to national maritime boundaries

APEI 9 is over 50 km from the distance separation zone to national maritime boundaries.

Table B.9: Type, depth and area of seamount features in APEI 9
(ID refers to a Duke University identifier.)

ID	Seamount Type	Summit Depth (m)	Area (sq km)	Nearest Seamount ID	Distance to Nearest Seamount (km)
9774	Guyot	914	2165.4	10726	109.9
10726	Conical Seamount	1,415	921.4	9774	109.9

.

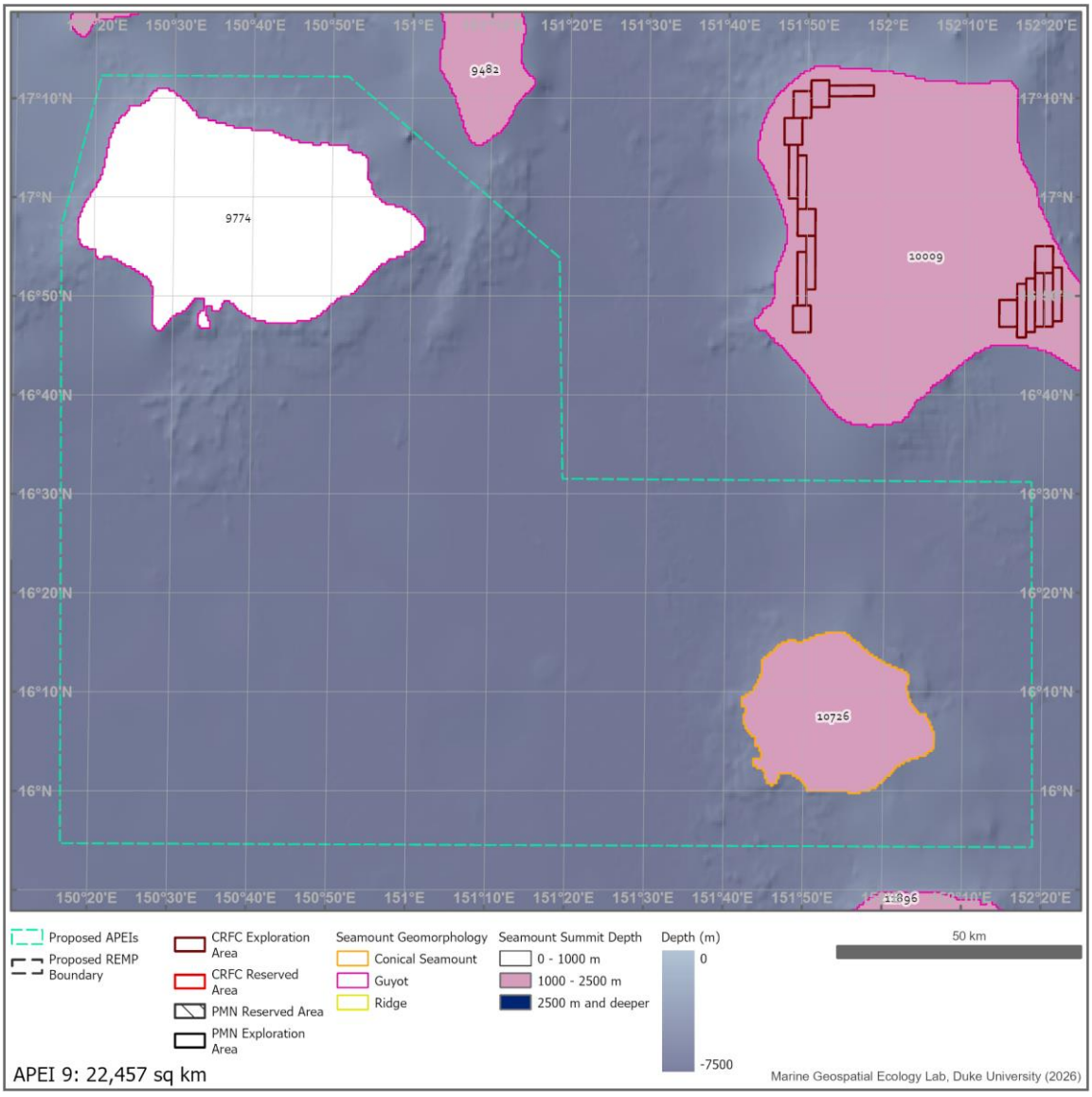

Figure B.9: Map of APEI 9

APEI 10

Description: The APEI is situated in the Area of the North-west Pacific, in the central-western sector of the regional environmental management plan. Inter-seamount basin depth is in the depth band of 5000-5500 m. There are no seamounts in the APEI, though two large seamounts flank it to the north and south of the area, which might modify bottom current flows.
The APEI contains habitats representative of those seen at similar depths in contract areas.
A map of the APEI is provided in Figure B.10.

Area: 9,375 km^2 (abyssal plain 6,244 km^2, inter-seamount basin 3,132 km^2)

Network criteria

- **Ecological importance**

No information

- **Representativity**

The APEI contains abyssal plain habitats. Depths are similar to the PMN contract and reserved areas to its east. Nodule model similarity indicates nodule-specific fauna likely. The APEI has high nodule similarity to contract area characteristic for abyssal plain depths. The APEI provides representation of the region of medium POC conditions in the REMP.

- **Connectivity**

No information

- **Replication**

Abyssal plain habitats are replicated in other APEIs in the REMP.

- **Viability**

This APEI is slightly smaller than the minimum recommended size for viability of abyssal plains.

Site-specific data availability
No site-specific data are known.

Boundary: See Appendix.

Distance to nearest APEI
APEI 10 is 129.5 km from APEI 11.

Distance to contract areas
APEI 10 is over 25 km from any contract area.

Distance to national maritime boundaries
APEI 10 is 47.3 km distant from the nearest national maritime boundary.

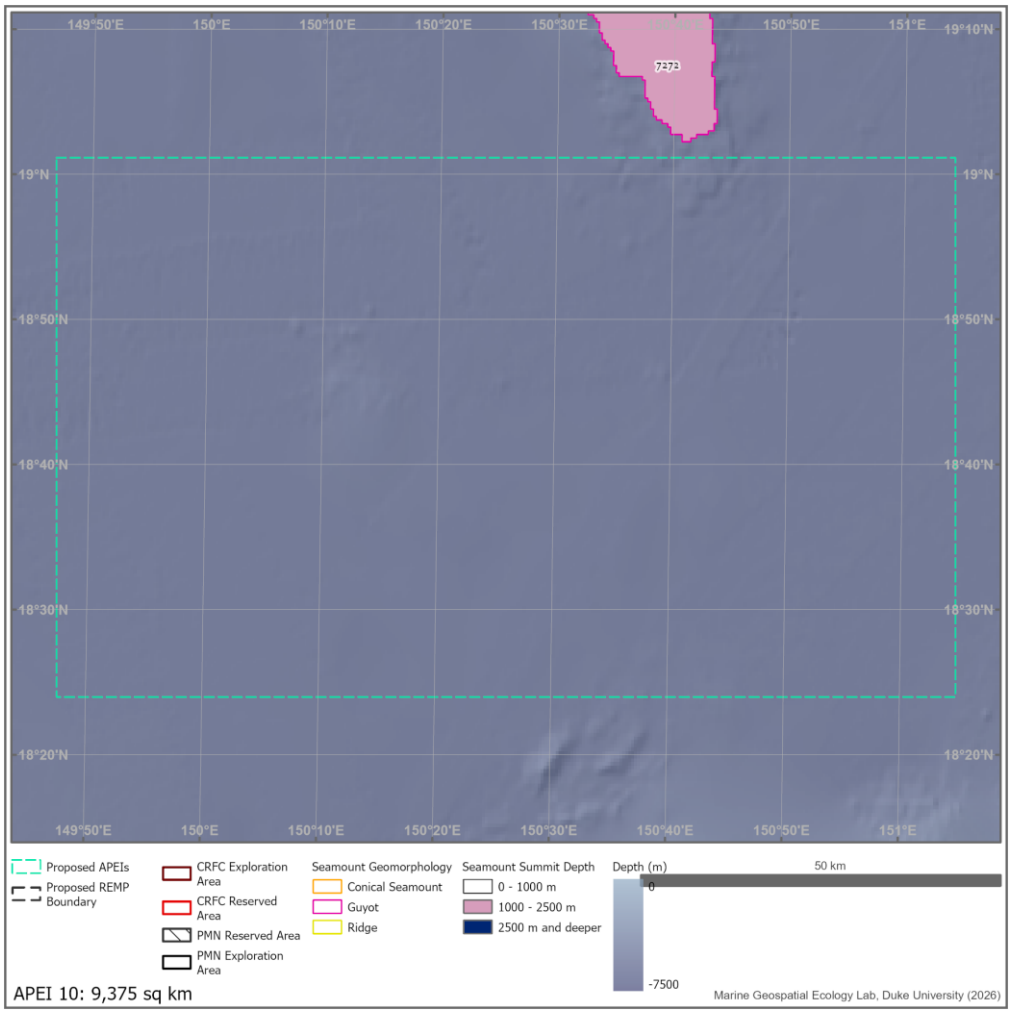

Figure B.10: Map of APEI 10

APEI 11

Description: The APEI is situated in the Area of the North-west Pacific, in the central-western sector of the regional environmental management plan area. It contains three seamounts of the Magellan seamount chain, as well as areas of inter-seamount and abyssal plain habitats. Summit depths are provided in Table B.11. Inter-seamount basin depth is in the depth band of 4500 - 5500 m.

Scientific information indicates that the APEI has ecological importance and potential importance for connectivity relative to the surrounding deep seafloor. It contains a range of habitats representative of those seen at similar depths in contract areas.

A map of the APEI is provided in Figure B.11.

Area: 22,172 km^2 (abyssal plain 9,949 km^2, inter-seamount basin 9,735 km^2, seamount 2,487 km^2).

Network criteria

- **Ecological importance**

The APEI contains Magellan seamount chain conical seamounts and guyots within the ecologically important medium-depth range. Seamount species typically are vulnerable to impact, with slow growth rates and long generation times leading to very slow and episodic recovery following human impact. Inter-seamount basin is included.

- **Representativity**

The APEI contains multiple large-scale habitats (Table B.11): seamounts in the Magellan seamount chain, inter-seamount basin habitat and abyssal plain habitat. The shallower seamounts in the APEI are similar to nearby seamounts that contain CFC exploration areas. The area has a high nodule similarity and so the abyssal plains in between the seamounts may be important for representativity with the PMN contract area to its south.

The APEI sits in the north-western biogeographic region identified by Hao et al. (2023).

The APEI provides representation of the region of higher POC conditions in the REMP.

- **Connectivity**

The three conical seamounts could be ecologically significant for east-west connectivity if adjacent areas to both the west and east are exploited.

- **Replication**

Seamount types and depth bands are all replicated in other APEIs.

- **Viability**

Seamounts are included as full units.

Site-specific data availability

No site-specific data are known.

Boundary: See Appendix.

Distance to nearest APEI

APEI 11 is 129.5 km from APEI 10.

Distance to contract areas

APEI 11 is 0 km from a PMN contract area to its south. the inclusion of the large conical seamount in the southern part of the APEI was important to ensure the representativity of the seamounts in this region and function as refugia for species that might be impacted by future CFC activities on the surrounding seamounts. More study on upwelling is needed to ensure no impact to this seamount from the PMN contract area to the south.

Distance to national maritime boundaries

APEI 11 is over 50 km from the distance separation zone to national maritime boundaries.

Table B.11: Type, depth and area of seamount features in APEI 11

(ID refers to a Duke University identifier.)

ID	Seamount Type	Summit Depth (m)	Area (km^2)	Nearest Seamount ID	Distance to Nearest Seamount (km)
5338	Conical Seamount	4,764	66.5	5573	90.1
5573	Conical Seamount	1,300	856.3	5338	90.1
7363	Conical Seamount	1,260	1564.3	5338	125.1

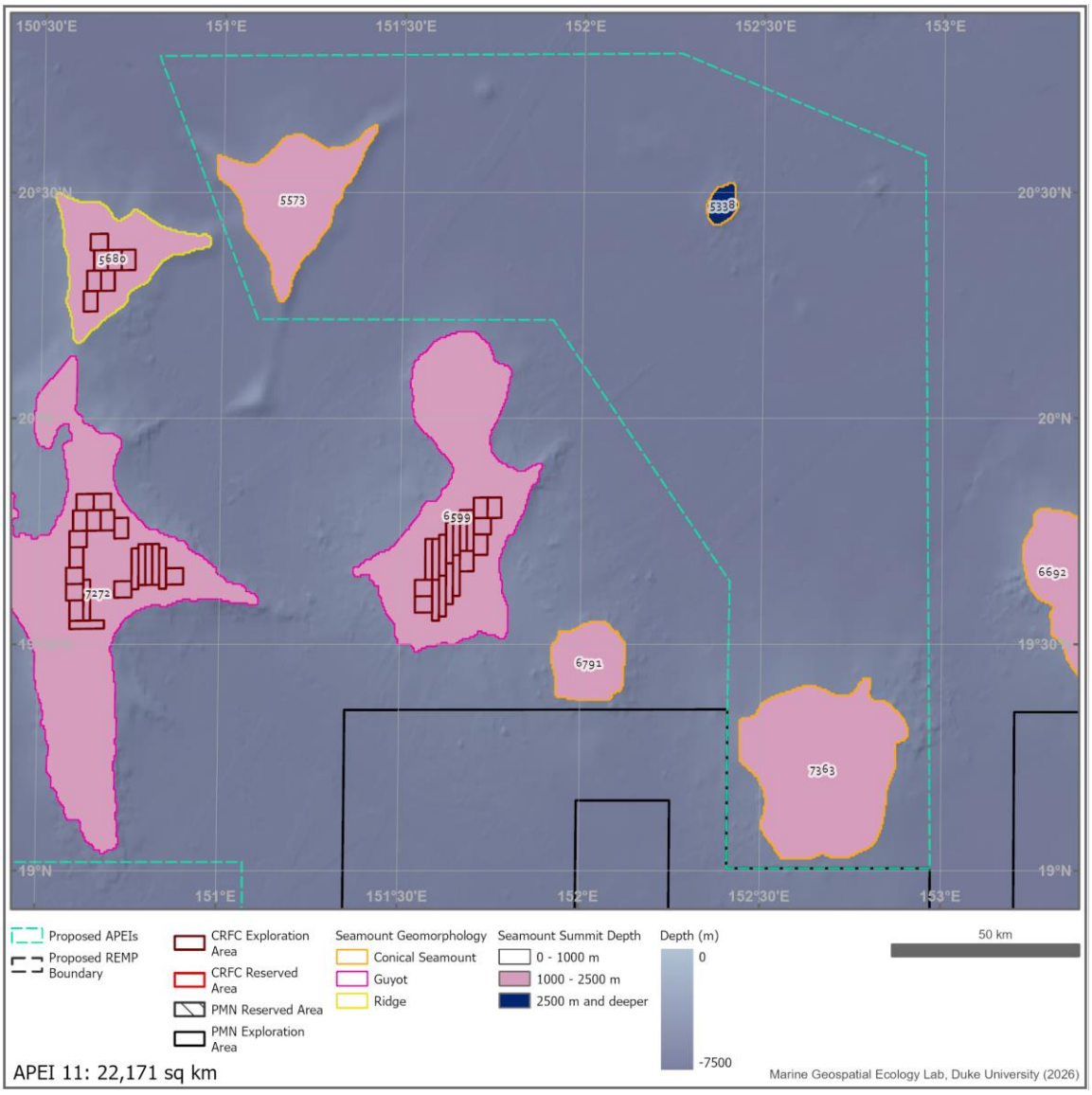

Figure B.11: Map of APEI 11

APEI 12

Description: The APEI is situated in the Area of the North-west Pacific, in the north-western sector of the regional environmental management plan area. Its eastern boundary lies close to national maritime boundaries. It contains 11 seamounts of the Magellan seamount chain, as well as large areas of inter-seamount and abyssal plain habitats. Summit depths are provided in Table B.12. Inter-seamount basin depth is around 5000 m.
Scientific information indicates that the APEI has ecological importance and importance for connectivity relative to the surrounding deep sea floor. It contains a wide range of habitats representative of those seen at similar depths in contract areas.
A map of the APEI is provided in Figure B.12.

Area: 70,756 km^2 (abyssal plain 30,185 km^2, inter-seamount basin 34,046 km^2, seamount 6,525 km^2).

Network criteria

- **Ecological importance**

Three seamount features are reported to be shallower than 1000m, which is significant for protecting seamount fauna representative of the depth of features in exploration contract areas. Information is available for "RB" seamount, which was surveyed by COMRA and known to contain frequent sponges and corals, principally primnoids. Data indicate diverse and abundant benthic megafauna on "RB" seamount.
The abyssal plain habitat on the east side allows the inclusion of a considerable portion of >5000m depths.

- **Representativity**

The APEI contains multiple large-scale habitats (Table B.12): seamounts in the Magellan and Northern Wake seamount chains, inter-seamount basin habitat and abyssal plain habitats. A number of seamount types and major depth bands are represented in the APEI, i.e. conical seamounts (shallow, medium-depth and deep), guyots (shallow) and ridges (shallow). The shallower seamounts in the APEI are similar to nearby seamounts that contain CFC exploration areas. Nodule model similarity indicates nodule-specific fauna likely. The APEI sits in the north-western biogeographic region identified by Hao et al. (2023). The APEI provides representation of the region of medium POC conditions in the REMP.

- **Connectivity**

The APEI could be important for both north-south and east-west connectivity in the REMP area. Seamounts in the APEI are widely distributed and unevenly clustered (see Table B.12).

- **Replication**

Some internal replication occurs in the APEI, with multiple medium-depth and deep conical seamounts. Seamount types and depth bands are all replicated in other APEIs.

- **Viability**

The combined inter-seamount area is considerably larger than the minimum recommended size for viability of abyssal plains. Seamounts are included as whole units.

Site-specific data availability

A COMRA photographic transect on "RB" seamount recorded frequent sponges (*Saccocalyx* sp and *Pheronematidae*) and corals, principally of the family *Primnoidae*. COMRA "RB" seamount data indicate diverse and abundant benthic megafauna.

Boundary: See Appendix.

Distance to nearest APEI

APEI 12 is 180.2 km from APEI 11.

Distance to contract areas

APEI 10 is over 25 km from any contract area.

Distance to national maritime boundaries

The APEI extends through the whole of the 50 km distance separation zone from the nearest national maritime boundaries. Given that shallow guyots not occupied by CFC exploration areas and reserved areas are scarce within the REMP area, it is considered important to include the shallow guyot on the eastern side of the APEI.

Table B.12: Type, depth and area of seamount features in this APEI 12

(ID refers to a Duke University identifier.)

ID	Seamount Type	Summit Depth (m)	Area (sq km)	Nearest Seamount ID	Distance to Nearest Seamount (km)
988	Conical Seamount	2,466	313.8	1258	23.2
1258	Conical Seamount	2,355	498.7	988	23.2
1414	Conical Seamount	2,016	329.1	1258	26.1
1892	Conical Seamount	4,395	85.6	2430	37.3
2430	Conical Seamount	965	1101.5	2680	13.1
2841	Conical Seamount	2,690	136.4	3144	9.0
2870	Conical Seamount	4,140	52.2	2841	11.5
3401	Conical Seamount	1,869	548.4	3144	21.7
2180	Guyot	805	1559.3	1892	74.1
2680	Conical Seamount	2,179	424.5	2430	13.1
3144	Ridge	993	1475.4	2841	9.0

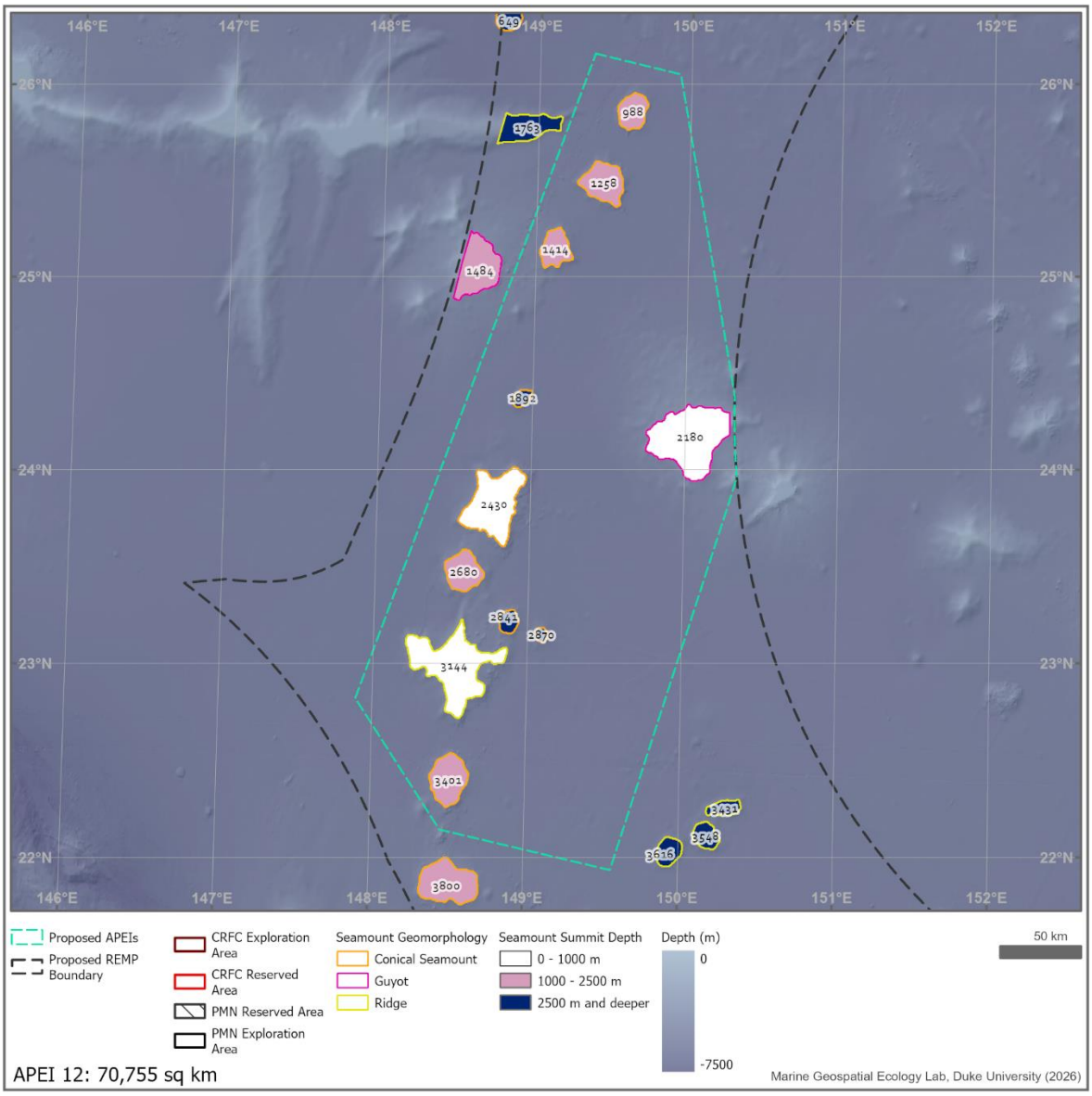

Figure B.12: Map of APEI 12

References

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Saito, N., Kise, H., Washburn, T. W., Ikeuchi, E., Iguchi, A., Kamoshida, H., & Suzuki, A. (2025). Seamount larval dispersal networks: A potential strategy for conserving ecological connectivity from deep-sea mining. Ecological Applications, 35(7), e70086.

Appendix. GIS coordinates for the turning points of the APEIs.

APEI 1

Point Identifier	Latitude	Longitude
APEI1_1	26° 40' 48.9" N	158° 13' 45.94" E
APEI1_2	26° 40' 48.9" N	160° 22' 8.23" E
APEI1_3	24° 24' 32.92" N	160° 18' 22.37" E
APEI1_4	24° 24' 32.92" N	158° 11' 30.09" E
APEI1_5	26° 40' 48.9" N	158° 13' 45.94" E

APEI 2

Point Identifier	Latitude	Longitude
APEI2_1	21° 32' 20.69" N	163° 49' 7.53" E
APEI2_2	21° 24' 36.32" N	163° 49' 51.78" E
APEI2_3	21° 24' 9.09" N	163° 49' 28.83" E
APEI2_4	21° 23' 25.8" N	163° 48' 52.69" E
APEI2_5	21° 22' 42.36" N	163° 48' 16.77" E
APEI2_6	21° 21' 58.77" N	163° 47' 41.06" E
APEI2_7	21° 21' 15.02" N	163° 47' 5.58" E
APEI2_8	21° 20' 31.11" N	163° 46' 30.31" E
APEI2_9	21° 19' 47.05" N	163° 45' 55.27" E
APEI2_10	21° 19' 2.85" N	163° 45' 20.44" E
APEI2_11	21° 18' 18.49" N	163° 44' 45.84" E
APEI2_12	21° 17' 33.98" N	163° 44' 11.45" E
APEI2_13	21° 16' 49.32" N	163° 43' 37.3" E
APEI2_14	21° 16' 4.52" N	163° 43' 3.36" E
APEI2_15	21° 15' 19.57" N	163° 42' 29.65" E
APEI2_16	21° 14' 34.48" N	163° 41' 56.16" E
APEI2_17	21° 13' 49.4" N	163° 41' 22.98" E
APEI2_18	21° 13' 4.18" N	163° 40' 50.04" E
APEI2_19	21° 12' 18.81" N	163° 40' 17.31" E
APEI2_20	21° 11' 33.31" N	163° 39' 44.82" E
APEI2_21	21° 10' 47.67" N	163° 39' 12.55" E
APEI2_22	21° 10' 1.88" N	163° 38' 40.5" E
APEI2_23	21° 09' 15.96" N	163° 38' 8.69" E
APEI2_24	21° 08' 29.9" N	163° 37' 37.1" E
APEI2_25	21° 07' 43.71" N	163° 37' 5.74" E
APEI2_26	21° 06' 57.38" N	163° 36' 34.61" E
APEI2_27	21° 06' 10.92" N	163° 36' 3.71" E
APEI2_28	21° 05' 24.32" N	163° 35' 33.04" E
APEI2_29	21° 04' 37.6" N	163° 35' 2.6" E
APEI2_30	21° 03' 50.74" N	163° 34' 32.39" E
APEI2_31	21° 03' 3.75" N	163° 34' 2.42" E
APEI2_32	21° 02' 16.63" N	163° 33' 32.68" E
APEI2_33	21° 01' 29.39" N	163° 33' 3.17" E
APEI2_34	21° 00' 42.02" N	163° 32' 33.89" E
APEI2_35	20° 59' 54.52" N	163° 32' 4.86" E
APEI2_36	20° 59' 6.9" N	163° 31' 36.05" E
APEI2_37	20° 58' 19.15" N	163° 31' 7.48" E
APEI2_38	20° 57' 31.28" N	163° 30' 39.15" E
APEI2_39	20° 56' 43.3" N	163° 30' 11.05" E
APEI2_40	20° 55' 55.18" N	163° 29' 43.19" E

APEI2_41	20° 55' 6.95" N	163° 29' 15.57" E
APEI2_42	20° 54' 18.6" N	163° 28' 48.19" E
APEI2_43	20° 53' 30.14" N	163° 28' 21.05" E
APEI2_44	20° 52' 41.55" N	163° 27' 54.14" E
APEI2_45	20° 51' 52.86" N	163° 27' 27.48" E
APEI2_46	20° 51' 4.04" N	163° 27' 1.05" E
APEI2_47	20° 50' 15.11" N	163° 26' 34.87" E
APEI2_48	20° 49' 25.65" N	163° 26' 8.68" E
APEI2_49	20° 48' 36.07" N	163° 25' 42.74" E
APEI2_50	20° 47' 46.38" N	163° 25' 17.04" E
APEI2_51	20° 46' 56.58" N	163° 24' 51.59" E
APEI2_52	20° 46' 6.67" N	163° 24' 26.39" E
APEI2_53	20° 45' 16.65" N	163° 24' 1.44" E
APEI2_54	20° 44' 26.52" N	163° 23' 36.73" E
APEI2_55	20° 43' 36.29" N	163° 23' 12.27" E
APEI2_56	20° 42' 45.95" N	163° 22' 48.07" E
APEI2_57	20° 41' 55.5" N	163° 22' 24.11" E
APEI2_58	20° 41' 4.95" N	163° 22' 0.4" E
APEI2_59	20° 40' 14.3" N	163° 21' 36.95" E
APEI2_60	20° 39' 23.55" N	163° 21' 13.74" E
APEI2_61	20° 38' 32.69" N	163° 20' 50.79" E
APEI2_62	20° 37' 41.74" N	163° 20' 28.09" E
APEI2_63	20° 36' 50.69" N	163° 20' 5.64" E
APEI2_64	20° 35' 59.54" N	163° 19' 43.44" E
APEI2_65	20° 35' 8.29" N	163° 19' 21.5" E
APEI2_66	20° 34' 16.95" N	163° 18' 59.81" E
APEI2_67	20° 33' 25.52" N	163° 18' 38.37" E
APEI2_68	20° 32' 33.99" N	163° 18' 17.19" E
APEI2_69	20° 31' 42.37" N	163° 17' 56.27" E
APEI2_70	20° 30' 50.66" N	163° 17' 35.6" E
APEI2_71	20° 29' 58.87" N	163° 17' 15.18" E
APEI2_72	20° 29' 6.98" N	163° 16' 55.02" E
APEI2_73	20° 28' 15.0" N	163° 16' 35.12" E
APEI2_74	20° 27' 22.94" N	163° 16' 15.47" E
APEI2_75	20° 26' 30.8" N	163° 15' 56.08" E
APEI2_76	20° 25' 38.57" N	163° 15' 36.95" E
APEI2_77	20° 24' 46.26" N	163° 15' 18.08" E
APEI2_78	20° 23' 53.86" N	163° 14' 59.46" E
APEI2_79	20° 23' 1.39" N	163° 14' 41.1" E
APEI2_80	20° 22' 8.84" N	163° 14' 23.0" E
APEI2_81	20° 21' 16.2" N	163° 14' 5.16" E
APEI2_82	20° 20' 23.5" N	163° 13' 47.58" E
APEI2_83	20° 19' 30.71" N	163° 13' 30.26" E
APEI2_84	20° 18' 37.85" N	163° 13' 13.2" E
APEI2_85	20° 17' 44.92" N	163° 12' 56.39" E
APEI2_86	20° 16' 51.91" N	163° 12' 39.85" E
APEI2_87	20° 15' 58.83" N	163° 12' 23.57" E
APEI2_88	20° 15' 5.68" N	163° 12' 7.55" E
APEI2_89	20° 14' 12.47" N	163° 11' 51.8" E
APEI2_90	20° 13' 19.18" N	163° 11' 36.3" E
APEI2_91	20° 12' 25.83" N	163° 11' 21.06" E
APEI2_92	20° 11' 32.41" N	163° 11' 6.09" E
APEI2_93	20° 10' 38.93" N	163° 10' 51.38" E
APEI2_94	20° 09' 45.39" N	163° 10' 36.93" E
APEI2_95	20° 08' 51.78" N	163° 10' 22.74" E

APEI2_96	20° 07' 58.11" N	163° 10' 8.82" E
APEI2_97	20° 07' 4.38" N	163° 09' 55.16" E
APEI2_98	20° 06' 10.59" N	163° 09' 41.76" E
APEI2_99	20° 05' 16.74" N	163° 09' 28.63" E
APEI2_100	20° 04' 42.2" N	163° 09' 20.38" E
APEI2_101	19° 36' 49.9" N	162° 47' 11.6" E
APEI2_102	19° 53' 35.56" N	162° 22' 46.82" E
APEI2_103	20° 47' 11.9" N	161° 56' 37.47" E
APEI2_104	21° 26' 35.04" N	161° 34' 45.66" E
APEI2_105	21° 47' 29.94" N	161° 35' 21.35" E
APEI2_106	22° 21' 30.46" N	160° 31' 30.04" E
APEI2_107	24° 17' 11.63" N	160° 18' 34.6" E
APEI2_108	25° 19' 4.31" N	161° 37' 36.77" E
APEI2_109	25° 17' 16.56" N	162° 17' 32.45" E
APEI2_110	26° 45' 8.46" N	163° 39' 52.67" E
APEI2_111	26° 18' 50.56" N	163° 56' 2.82" E
APEI2_112	25° 10' 51.17" N	163° 15' 3.61" E
APEI2_113	24° 18' 20.61" N	163° 30' 18.42" E
APEI2_114	21° 32' 20.69" N	163° 49' 7.53" E

APEI 3

Point Identifier	Latitude	Longitude
APEI3_1	19° 17' 40.86" N	156° 48' 59.45" E
APEI3_2	20° 24' 16.5" N	155° 18' 27.33" E
APEI3_3	21° 22' 41.31" N	156° 38' 9.06" E
APEI3_4	21° 30' 3.81" N	156° 46' 12.45" E
APEI3_5	21° 33' 4.35" N	156° 50' 14.09" E
APEI3_6	21° 18' 27.65" N	157° 43' 23.28" E
APEI3_7	21° 13' 52.86" N	157° 51' 41.14" E
APEI3_8	20° 37' 45.07" N	157° 48' 20.21" E
APEI3_9	20° 11' 29.85" N	157° 15' 54.2" E
APEI3_10	19° 23' 31.29" N	157° 05' 36.63" E
APEI3_11	19° 17' 40.86" N	156° 48' 59.45" E

APEI 4

Point Identifier	Latitude	Longitude
APEI4_1	17° 42' 31.36" N	157° 22' 16.62" E
APEI4_2	17° 42' 31.36" N	159° 25' 39.29" E
APEI4_3	16° 03' 49.18" N	159° 24' 13.61" E
APEI4_4	16° 03' 49.18" N	157° 21' 30.73" E
APEI4_5	17° 42' 31.36" N	157° 22' 16.62" E

APEI 5 Coordinates

Point Identifier	Latitude	Longitude
APEI5_1	14° 08' 51.11" N	159° 48' 49.48" E
APEI5_2	15° 16' 34.29" N	157° 47' 9.38" E
APEI5_3	15° 58' 28.18" N	158° 23' 54.97" E
APEI5_4	15° 21' 8.46" N	159° 54' 51.63" E
APEI5_5	15° 11' 23.55" N	160° 23' 39.21" E
APEI5_6	15° 34' 3.85" N	160° 45' 21.43" E

APEI5_7	15° 43' 2.05" N	161° 29' 50.07" E
APEI5_8	17° 36' 9.93" N	161° 58' 50.96" E
APEI5_9	17° 39' 27.93" N	162° 58' 20.63" E
APEI5_10	16° 58' 14.86" N	163° 23' 29.45" E
APEI5_11	14° 57' 45.14" N	163° 29' 43.7" E
APEI5_12	14° 47' 23.7" N	163° 30' 20.69" E
APEI5_13	14° 47' 29.51" N	163° 30' 6.11" E
APEI5_14	14° 47' 49.68" N	163° 29' 14.87" E
APEI5_15	14° 48' 9.63" N	163° 28' 23.54" E
APEI5_16	14° 48' 29.35" N	163° 27' 32.11" E
APEI5_17	14° 48' 48.85" N	163° 26' 40.59" E
APEI5_18	14° 49' 8.12" N	163° 25' 48.98" E
APEI5_19	14° 49' 27.16" N	163° 24' 57.28" E
APEI5_20	14° 49' 45.98" N	163° 24' 5.48" E
APEI5_21	14° 50' 4.56" N	163° 23' 13.6" E
APEI5_22	14° 50' 22.92" N	163° 22' 21.64" E
APEI5_23	14° 50' 41.05" N	163° 21' 29.58" E
APEI5_24	14° 50' 58.95" N	163° 20' 37.45" E
APEI5_25	14° 51' 16.62" N	163° 19' 45.22" E
APEI5_26	14° 51' 34.06" N	163° 18' 52.92" E
APEI5_27	14° 51' 51.27" N	163° 18' 0.53" E
APEI5_28	14° 52' 8.25" N	163° 17' 8.07" E
APEI5_29	14° 52' 25.22" N	163° 16' 15.02" E
APEI5_30	14° 52' 41.94" N	163° 15' 21.89" E
APEI5_31	14° 52' 58.44" N	163° 14' 28.69" E
APEI5_32	14° 53' 14.69" N	163° 13' 35.4" E
APEI5_33	14° 53' 30.71" N	163° 12' 42.04" E
APEI5_34	14° 53' 46.5" N	163° 11' 48.61" E
APEI5_35	14° 54' 2.04" N	163° 10' 55.09" E
APEI5_36	14° 54' 17.34" N	163° 10' 1.51" E
APEI5_37	14° 54' 32.41" N	163° 09' 7.85" E
APEI5_38	14° 54' 47.25" N	163° 08' 14.12" E
APEI5_39	14° 55' 1.84" N	163° 07' 20.32" E
APEI5_40	14° 55' 16.19" N	163° 06' 26.46" E
APEI5_41	14° 55' 30.3" N	163° 05' 32.52" E
APEI5_42	14° 55' 44.17" N	163° 04' 38.52" E
APEI5_43	14° 55' 57.81" N	163° 03' 44.45" E
APEI5_44	14° 56' 11.2" N	163° 02' 50.32" E
APEI5_45	14° 56' 24.35" N	163° 01' 56.12" E
APEI5_46	14° 56' 37.26" N	163° 01' 1.87" E
APEI5_47	14° 56' 49.93" N	163° 00' 7.55" E
APEI5_48	14° 57' 2.36" N	162° 59' 13.17" E
APEI5_49	14° 57' 14.55" N	162° 58' 18.73" E
APEI5_50	14° 57' 26.49" N	162° 57' 24.24" E
APEI5_51	14° 57' 38.19" N	162° 56' 29.68" E
APEI5_52	14° 57' 49.96" N	162° 55' 33.73" E
APEI5_53	14° 58' 1.48" N	162° 54' 37.72" E
APEI5_54	14° 58' 12.75" N	162° 53' 41.66" E
APEI5_55	14° 58' 23.75" N	162° 52' 45.54" E
APEI5_56	14° 58' 34.5" N	162° 51' 49.37" E
APEI5_57	14° 58' 45.0" N	162° 50' 53.14" E
APEI5_58	14° 58' 55.24" N	162° 49' 56.87" E
APEI5_59	14° 59' 5.22" N	162° 49' 0.54" E
APEI5_60	14° 59' 14.95" N	162° 48' 4.17" E
APEI5_61	14° 59' 24.42" N	162° 47' 7.75" E

APEI5_62	14° 59' 33.63" N	162° 46' 11.28" E
APEI5_63	14° 59' 42.58" N	162° 45' 14.77" E
APEI5_64	14° 59' 51.28" N	162° 44' 18.22" E
APEI5_65	14° 59' 59.72" N	162° 43' 21.63" E
APEI5_66	15° 00' 7.91" N	162° 42' 24.99" E
APEI5_67	15° 00' 15.83" N	162° 41' 28.31" E
APEI5_68	15° 00' 23.5" N	162° 40' 31.6" E
APEI5_69	15° 00' 30.91" N	162° 39' 34.85" E
APEI5_70	15° 00' 38.06" N	162° 38' 38.07" E
APEI5_71	15° 00' 44.95" N	162° 37' 41.25" E
APEI5_72	15° 00' 51.58" N	162° 36' 44.39" E
APEI5_73	15° 00' 57.95" N	162° 35' 47.51" E
APEI5_74	15° 01' 4.07" N	162° 34' 50.59" E
APEI5_75	15° 01' 9.92" N	162° 33' 53.65" E
APEI5_76	15° 01' 15.52" N	162° 32' 56.67" E
APEI5_77	15° 01' 20.86" N	162° 31' 59.67" E
APEI5_78	15° 01' 25.93" N	162° 31' 2.65" E
APEI5_79	15° 01' 30.75" N	162° 30' 5.6" E
APEI5_80	15° 01' 35.31" N	162° 29' 8.53" E
APEI5_81	15° 01' 39.6" N	162° 28' 11.43" E
APEI5_82	15° 01' 43.64" N	162° 27' 14.32" E
APEI5_83	15° 01' 47.42" N	162° 26' 17.19" E
APEI5_84	15° 01' 50.94" N	162° 25' 20.04" E
APEI5_85	15° 01' 54.2" N	162° 24' 22.87" E
APEI5_86	15° 01' 57.19" N	162° 23' 25.68" E
APEI5_87	15° 01' 59.93" N	162° 22' 28.48" E
APEI5_88	15° 02' 2.4" N	162° 21' 31.28" E
APEI5_89	15° 02' 4.62" N	162° 20' 34.05" E
APEI5_90	15° 02' 6.58" N	162° 19' 36.82" E
APEI5_91	15° 02' 8.27" N	162° 18' 39.58" E
APEI5_92	15° 02' 9.7" N	162° 17' 42.33" E
APEI5_93	15° 02' 10.87" N	162° 16' 45.08" E
APEI5_94	15° 02' 11.79" N	162° 15' 47.82" E
APEI5_95	15° 02' 12.44" N	162° 14' 50.56" E
APEI5_96	15° 02' 12.83" N	162° 13' 53.29" E
APEI5_97	15° 02' 12.96" N	162° 12' 56.02" E
APEI5_98	15° 02' 12.83" N	162° 11' 58.75" E
APEI5_99	15° 02' 12.44" N	162° 11' 1.49" E
APEI5_100	15° 02' 11.79" N	162° 10' 4.23" E
APEI5_101	15° 02' 10.87" N	162° 09' 6.97" E
APEI5_102	15° 02' 9.7" N	162° 08' 9.71" E
APEI5_103	15° 02' 8.26" N	162° 07' 12.46" E
APEI5_104	15° 02' 6.57" N	162° 06' 15.22" E
APEI5_105	15° 02' 4.61" N	162° 05' 17.99" E
APEI5_106	15° 02' 2.4" N	162° 04' 20.77" E
APEI5_107	15° 01' 59.92" N	162° 03' 23.56" E
APEI5_108	15° 01' 57.19" N	162° 02' 26.36" E
APEI5_109	15° 01' 54.19" N	162° 01' 29.18" E
APEI5_110	15° 01' 50.93" N	162° 00' 32.01" E
APEI5_111	15° 01' 47.41" N	161° 59' 34.86" E
APEI5_112	15° 01' 43.64" N	161° 58' 37.73" E
APEI5_113	15° 01' 39.6" N	161° 57' 40.61" E
APEI5_114	15° 01' 35.3" N	161° 56' 43.52" E
APEI5_115	15° 01' 30.74" N	161° 55' 46.45" E
APEI5_116	15° 01' 25.92" N	161° 54' 49.4" E

APEI5_117	15° 01' 20.85" N	161° 53' 52.37" E
APEI5_118	15° 01' 15.51" N	161° 52' 55.37" E
APEI5_119	15° 01' 9.91" N	161° 51' 58.4" E
APEI5_120	15° 01' 4.05" N	161° 51' 1.45" E
APEI5_121	15° 00' 57.94" N	161° 50' 4.54" E
APEI5_122	15° 00' 51.57" N	161° 49' 7.65" E
APEI5_123	15° 00' 44.95" N	161° 48' 10.58" E
APEI5_124	15° 00' 38.07" N	161° 47' 13.54" E
APEI5_125	15° 00' 30.93" N	161° 46' 16.54" E
APEI5_126	15° 00' 23.54" N	161° 45' 19.57" E
APEI5_127	15° 00' 15.88" N	161° 44' 22.64" E
APEI5_128	15° 00' 7.96" N	161° 43' 25.74" E
APEI5_129	14° 59' 59.78" N	161° 42' 28.89" E
APEI5_130	14° 59' 51.35" N	161° 41' 32.07" E
APEI5_131	14° 59' 42.65" N	161° 40' 35.31" E
APEI5_132	14° 59' 33.69" N	161° 39' 38.58" E
APEI5_133	14° 59' 24.48" N	161° 38' 41.89" E
APEI5_134	14° 59' 15.0" N	161° 37' 45.26" E
APEI5_135	14° 59' 5.27" N	161° 36' 48.66" E
APEI5_136	14° 58' 55.28" N	161° 35' 52.12" E
APEI5_137	14° 58' 45.03" N	161° 34' 55.63" E
APEI5_138	14° 58' 34.52" N	161° 33' 59.19" E
APEI5_139	14° 58' 23.75" N	161° 33' 2.8" E
APEI5_140	14° 58' 12.73" N	161° 32' 6.46" E
APEI5_141	14° 58' 1.44" N	161° 31' 10.19" E
APEI5_142	14° 57' 49.91" N	161° 30' 13.96" E
APEI5_143	14° 57' 38.11" N	161° 29' 17.79" E
APEI5_144	14° 57' 26.06" N	161° 28' 21.68" E
APEI5_145	14° 57' 13.75" N	161° 27' 25.64" E
APEI5_146	14° 57' 1.19" N	161° 26' 29.64" E
APEI5_147	14° 56' 48.37" N	161° 25' 33.72" E
APEI5_148	14° 56' 35.29" N	161° 24' 37.86" E
APEI5_149	14° 56' 21.96" N	161° 23' 42.06" E
APEI5_150	14° 56' 8.38" N	161° 22' 46.33" E
APEI5_151	14° 55' 54.54" N	161° 21' 50.66" E
APEI5_152	14° 55' 40.85" N	161° 20' 56.25" E
APEI5_153	14° 55' 26.92" N	161° 20' 1.9" E
APEI5_154	14° 55' 12.75" N	161° 19' 7.62" E
APEI5_155	14° 54' 58.33" N	161° 18' 13.41" E
APEI5_156	14° 54' 43.68" N	161° 17' 19.27" E
APEI5_157	14° 54' 28.78" N	161° 16' 25.19" E
APEI5_158	14° 54' 13.64" N	161° 15' 31.2" E
APEI5_159	14° 53' 58.26" N	161° 14' 37.27" E
APEI5_160	14° 53' 42.63" N	161° 13' 43.42" E
APEI5_161	14° 53' 26.77" N	161° 12' 49.64" E
APEI5_162	14° 53' 10.67" N	161° 11' 55.94" E
APEI5_163	14° 52' 54.32" N	161° 11' 2.32" E
APEI5_164	14° 52' 37.74" N	161° 10' 8.78" E
APEI5_165	14° 52' 20.92" N	161° 09' 15.31" E
APEI5_166	14° 52' 3.86" N	161° 08' 21.93" E
APEI5_167	14° 51' 46.56" N	161° 07' 28.64" E
APEI5_168	14° 51' 29.02" N	161° 06' 35.42" E
APEI5_169	14° 51' 11.25" N	161° 05' 42.29" E
APEI5_170	14° 50' 53.23" N	161° 04' 49.24" E
APEI5_171	14° 50' 34.98" N	161° 03' 56.28" E

APEI5_172	14° 50' 16.5" N	161° 03' 3.41" E
APEI5_173	14° 49' 57.77" N	161° 02' 10.63" E
APEI5_174	14° 49' 38.82" N	161° 01' 17.94" E
APEI5_175	14° 49' 20.0" N	161° 00' 26.07" E
APEI5_176	14° 49' 0.94" N	160° 59' 34.29" E
APEI5_177	14° 48' 41.67" N	160° 58' 42.6" E
APEI5_178	14° 48' 22.16" N	160° 57' 51.0" E
APEI5_179	14° 48' 2.43" N	160° 56' 59.5" E
APEI5_180	14° 47' 42.46" N	160° 56' 8.08" E
APEI5_181	14° 47' 22.28" N	160° 55' 16.77" E
APEI5_182	14° 47' 1.87" N	160° 54' 25.55" E
APEI5_183	14° 46' 41.23" N	160° 53' 34.42" E
APEI5_184	14° 46' 20.37" N	160° 52' 43.4" E
APEI5_185	14° 45' 59.28" N	160° 51' 52.47" E
APEI5_186	14° 45' 37.97" N	160° 51' 1.64" E
APEI5_187	14° 45' 16.44" N	160° 50' 10.91" E
APEI5_188	14° 44' 54.68" N	160° 49' 20.29" E
APEI5_189	14° 44' 32.7" N	160° 48' 29.77" E
APEI5_190	14° 44' 10.5" N	160° 47' 39.35" E
APEI5_191	14° 43' 48.07" N	160° 46' 49.04" E
APEI5_192	14° 43' 25.42" N	160° 45' 58.83" E
APEI5_193	14° 43' 2.56" N	160° 45' 8.73" E
APEI5_194	14° 42' 40.47" N	160° 44' 20.74" E
APEI5_195	14° 42' 18.19" N	160° 43' 32.84" E
APEI5_196	14° 41' 55.7" N	160° 42' 45.05" E
APEI5_197	14° 41' 33.01" N	160° 41' 57.36" E
APEI5_198	14° 41' 10.11" N	160° 41' 9.77" E
APEI5_199	14° 40' 47.02" N	160° 40' 22.29" E
APEI5_200	14° 40' 23.73" N	160° 39' 34.91" E
APEI5_201	14° 40' 0.24" N	160° 38' 47.64" E
APEI5_202	14° 39' 36.54" N	160° 38' 0.47" E
APEI5_203	14° 39' 12.65" N	160° 37' 13.41" E
APEI5_204	14° 38' 48.56" N	160° 36' 26.46" E
APEI5_205	14° 38' 24.27" N	160° 35' 39.62" E
APEI5_206	14° 37' 58.9" N	160° 34' 49.8" E
APEI5_207	14° 37' 33.3" N	160° 34' 0.11" E
APEI5_208	14° 37' 7.49" N	160° 33' 10.53" E
APEI5_209	14° 36' 41.44" N	160° 32' 21.08" E
APEI5_210	14° 36' 15.18" N	160° 31' 31.76" E
APEI5_211	14° 35' 48.7" N	160° 30' 42.56" E
APEI5_212	14° 35' 22.0" N	160° 29' 53.49" E
APEI5_213	14° 34' 55.08" N	160° 29' 4.55" E
APEI5_214	14° 34' 27.94" N	160° 28' 15.73" E
APEI5_215	14° 34' 0.58" N	160° 27' 27.05" E
APEI5_216	14° 33' 33.68" N	160° 26' 39.19" E
APEI5_217	14° 33' 6.57" N	160° 25' 51.46" E
APEI5_218	14° 32' 39.25" N	160° 25' 3.85" E
APEI5_219	14° 32' 11.72" N	160° 24' 16.38" E
APEI5_220	14° 31' 43.98" N	160° 23' 29.03" E
APEI5_221	14° 31' 16.03" N	160° 22' 41.82" E
APEI5_222	14° 30' 47.87" N	160° 21' 54.73" E
APEI5_223	14° 30' 19.51" N	160° 21' 7.78" E
APEI5_224	14° 29' 51.05" N	160° 20' 20.73" E
APEI5_225	14° 29' 22.38" N	160° 19' 33.81" E
APEI5_226	14° 28' 53.51" N	160° 18' 47.03" E

APEI5_227	14° 28' 24.43" N	160° 18' 0.39" E
APEI5_228	14° 27' 55.14" N	160° 17' 13.88" E
APEI5_229	14° 27' 25.65" N	160° 16' 27.51" E
APEI5_230	14° 26' 55.96" N	160° 15' 41.27" E
APEI5_231	14° 26' 26.06" N	160° 14' 55.18" E
APEI5_232	14° 25' 55.96" N	160° 14' 9.24" E
APEI5_233	14° 25' 25.65" N	160° 13' 23.43" E
APEI5_234	14° 24' 55.15" N	160° 12' 37.76" E
APEI5_235	14° 24' 24.44" N	160° 11' 52.24" E
APEI5_236	14° 23' 53.53" N	160° 11' 6.87" E
APEI5_237	14° 23' 22.43" N	160° 10' 21.64" E
APEI5_238	14° 22' 51.12" N	160° 09' 36.55" E
APEI5_239	14° 22' 19.62" N	160° 08' 51.62" E
APEI5_240	14° 21' 47.91" N	160° 08' 6.83" E
APEI5_241	14° 21' 16.01" N	160° 07' 22.2" E
APEI5_242	14° 20' 43.92" N	160° 06' 37.71" E
APEI5_243	14° 20' 11.62" N	160° 05' 53.37" E
APEI5_244	14° 19' 39.13" N	160° 05' 9.19" E
APEI5_245	14° 19' 6.45" N	160° 04' 25.15" E
APEI5_246	14° 18' 33.27" N	160° 03' 40.65" E
APEI5_247	14° 17' 59.9" N	160° 02' 56.3" E
APEI5_248	14° 17' 26.33" N	160° 02' 12.1" E
APEI5_249	14° 16' 52.56" N	160° 01' 28.07" E
APEI5_250	14° 16' 18.59" N	160° 00' 44.2" E
APEI5_251	14° 15' 44.43" N	160° 00' 0.49" E
APEI5_252	14° 15' 10.08" N	159° 59' 16.94" E
APEI5_253	14° 14' 35.52" N	159° 58' 33.55" E
APEI5_254	14° 14' 0.78" N	159° 57' 50.34" E
APEI5_255	14° 13' 25.85" N	159° 57' 7.28" E
APEI5_256	14° 12' 50.72" N	159° 56' 24.39" E
APEI5_257	14° 12' 15.4" N	159° 55' 41.67" E
APEI5_258	14° 11' 39.89" N	159° 54' 59.12" E
APEI5_259	14° 11' 4.19" N	159° 54' 16.74" E
APEI5_260	14° 10' 28.3" N	159° 53' 34.52" E
APEI5_261	14° 09' 54.64" N	159° 52' 55.04" E
APEI5_262	14° 09' 20.83" N	159° 52' 15.7" E
APEI5_263	14° 08' 46.85" N	159° 51' 36.51" E
APEI5_264	14° 08' 12.7" N	159° 50' 57.48" E
APEI5_265	14° 07' 49.83" N	159° 50' 31.56" E
APEI5_266	14° 08' 51.11" N	159° 48' 49.48" E

1816

1817 APEI 6

Point Identifier	Latitude	Longitude
APEI6_1	11° 58' 33.91" N	156° 59' 19.38" E
APEI6_2	10° 50' 32.88" N	157° 22' 55.16" E
APEI6_3	10° 45' 40.32" N	156° 44' 50.98" E
APEI6_4	11° 07' 38.85" N	156° 12' 19.84" E
APEI6_5	11° 58' 58.22" N	156° 13' 3.47" E
APEI6_6	11° 58' 33.91" N	156° 59' 19.38" E

1818

1819 APEI 7

Point Identifier	Latitude	Longitude

APEI7_1	16° 12' 14.94" N	152° 33' 40.49" E
APEI7_2	16° 12' 14.94" N	154° 25' 35.82" E
APEI7_3	15° 10' 59.63" N	154° 25' 33.68" E
APEI7_4	14° 58' 31.88" N	154° 44' 49.73" E
APEI7_5	13° 42' 47.3" N	154° 44' 52.89" E
APEI7_6	13° 43' 24.15" N	152° 34' 37.12" E
APEI7_7	14° 33' 49.88" N	152° 34' 23.13" E
APEI7_8	16° 12' 14.94" N	152° 33' 40.49" E

1820

1821 APEI 8

Point Identifier	Latitude	Longitude
APEI8_1	14° 51' 7.4" N	149° 59' 0.54" E
APEI8_2	14° 48' 27.01" N	151° 19' 58.71" E
APEI8_3	12° 53' 16.71" N	151° 18' 22.51" E
APEI8_4	12° 56' 30.05" N	149° 18' 51.36" E
APEI8_5	14° 51' 7.4" N	149° 59' 0.54" E

1822

1823 APEI 9

Point Identifier	Latitude	Longitude
APEI9_1	17° 12' 18.5" N	150° 20' 42.89" E
APEI9_2	17° 12' 11.41" N	150° 51' 56.65" E
APEI9_3	16° 53' 52.05" N	151° 18' 47.12" E
APEI9_4	16° 31' 30.67" N	151° 19' 23.63" E
APEI9_5	16° 31' 11.07" N	152° 18' 31.43" E
APEI9_6	15° 54' 17.94" N	152° 18' 54.89" E
APEI9_7	15° 54' 42.06" N	150° 16' 34.98" E
APEI9_8	16° 57' 0.71" N	150° 15' 49.91" E
APEI9_9	17° 12' 18.5" N	150° 20' 42.89" E

1824

1825 APEI 10

Point Identifier	Latitude	Longitude
APEI10_1	19° 01' 8.39" N	149° 46' 49.13" E
APEI10_2	19° 01' 8.39" N	151° 04' 17.58" E
APEI10_3	18° 23' 58.92" N	151° 04' 49.57" E
APEI10_4	18° 23' 58.92" N	149° 47' 31.64" E
APEI10_5	19° 01' 8.39" N	149° 46' 49.13" E

1826

1827 APEI 11

Point Identifier	Latitude	Longitude
APEI11_1	19° 00' 18.0" N	152° 58' 15.6" E
APEI11_2	19° 00' 18.0" N	152° 24' 32.4" E
APEI11_3	19° 21' 21.6" N	152° 24' 32.4" E
APEI11_4	19° 38' 21.64" N	152° 24' 46.16" E
APEI11_5	20° 13' 3.14" N	151° 55' 4.11" E
APEI11_6	20° 13' 10.37" N	151° 05' 55.03" E
APEI11_7	20° 48' 10.07" N	150° 49' 5.6" E
APEI11_8	20° 48' 27.97" N	152° 16' 15.22" E
APEI11_9	20° 34' 52.7" N	152° 56' 53.72" E
APEI11_10	19° 00' 18.0" N	152° 58' 15.6" E

1828

1829 APEI 12

Point Identifier	Latitude	Longitude
APEI12_1	26° 09' 34.09" N	149° 21' 42.01" E
APEI12_2	26° 03' 4.46" N	149° 55' 31.03" E
APEI12_3	24° 22' 47.15" N	150° 19' 13.05" E
APEI12_4	24° 22' 40.59" N	150° 19' 12.94" E
APEI12_5	24° 22' 27.46" N	150° 19' 12.73" E
APEI12_6	24° 22' 20.89" N	150° 19' 12.63" E
APEI12_7	24° 21' 54.62" N	150° 19' 12.29" E
APEI12_8	24° 21' 48.06" N	150° 19' 12.21" E
APEI12_9	24° 21' 34.93" N	150° 19' 12.08" E
APEI12_10	24° 21' 28.37" N	150° 19' 12.02" E
APEI12_11	24° 20' 35.82" N	150° 19' 11.65" E
APEI12_12	24° 20' 29.26" N	150° 19' 11.62" E
APEI12_13	24° 20' 16.13" N	150° 19' 11.56" E
APEI12_14	24° 20' 9.56" N	150° 19' 11.55" E
APEI12_15	24° 19' 43.29" N	150° 19' 11.52" E
APEI12_16	24° 19' 36.73" N	150° 19' 11.52" E
APEI12_17	24° 19' 23.59" N	150° 19' 11.54" E
APEI12_18	24° 19' 17.03" N	150° 19' 11.56" E
APEI12_19	24° 18' 24.48" N	150° 19' 11.82" E
APEI12_20	24° 18' 22.47" N	150° 19' 11.83" E
APEI12_21	24° 18' 17.92" N	150° 19' 11.86" E
APEI12_22	24° 18' 4.79" N	150° 19' 11.96" E
APEI12_23	24° 17' 58.2" N	150° 19' 12.02" E
APEI12_24	24° 17' 31.17" N	150° 19' 12.31" E
APEI12_25	24° 17' 24.27" N	150° 19' 12.4" E
APEI12_26	24° 17' 11.9" N	150° 19' 12.57" E
APEI12_27	24° 17' 5.69" N	150° 19' 12.67" E
APEI12_28	24° 16' 11.73" N	150° 19' 13.57" E
APEI12_29	24° 16' 6.28" N	150° 19' 13.66" E
APEI12_30	24° 15' 58.26" N	150° 19' 13.81" E
APEI12_31	24° 15' 53.5" N	150° 19' 13.9" E
APEI12_32	24° 15' 39.06" N	150° 19' 14.18" E
APEI12_33	24° 15' 32.5" N	150° 19' 14.32" E
APEI12_34	24° 15' 19.36" N	150° 19' 14.62" E
APEI12_35	24° 15' 12.8" N	150° 19' 14.78" E
APEI12_36	24° 14' 46.53" N	150° 19' 15.46" E
APEI12_37	24° 14' 39.97" N	150° 19' 15.64" E
APEI12_38	24° 14' 26.84" N	150° 19' 16.01" E
APEI12_39	24° 14' 20.27" N	150° 19' 16.21" E
APEI12_40	24° 13' 41.39" N	150° 19' 17.44" E
APEI12_41	24° 13' 36.54" N	150° 19' 17.6" E
APEI12_42	24° 13' 26.82" N	150° 19' 17.93" E
APEI12_43	24° 13' 21.96" N	150° 19' 18.1" E
APEI12_44	24° 13' 2.53" N	150° 19' 18.8" E
APEI12_45	24° 12' 57.67" N	150° 19' 18.98" E
APEI12_46	24° 12' 47.96" N	150° 19' 19.35" E
APEI12_47	24° 12' 43.11" N	150° 19' 19.54" E
APEI12_48	24° 11' 50.59" N	150° 19' 21.66" E
APEI12_49	24° 11' 44.03" N	150° 19' 21.94" E
APEI12_50	24° 11' 30.91" N	150° 19' 22.51" E
APEI12_51	24° 11' 24.35" N	150° 19' 22.8" E

APEI12_52	24° 10' 58.11" N	150° 19' 24.02" E
APEI12_53	24° 10' 51.55" N	150° 19' 24.33" E
APEI12_54	24° 10' 38.43" N	150° 19' 24.98" E
APEI12_55	24° 10' 31.87" N	150° 19' 25.31" E
APEI12_56	24° 09' 39.39" N	150° 19' 28.06" E
APEI12_57	24° 09' 32.83" N	150° 19' 28.41" E
APEI12_58	24° 09' 19.72" N	150° 19' 29.14" E
APEI12_59	24° 09' 13.16" N	150° 19' 29.51" E
APEI12_60	24° 08' 46.93" N	150° 19' 31.04" E
APEI12_61	24° 08' 40.37" N	150° 19' 31.43" E
APEI12_62	24° 08' 27.26" N	150° 19' 32.23" E
APEI12_63	24° 08' 20.71" N	150° 19' 32.64" E
APEI12_64	24° 07' 28.25" N	150° 19' 36.01" E
APEI12_65	24° 07' 21.7" N	150° 19' 36.44" E
APEI12_66	24° 07' 8.59" N	150° 19' 37.32" E
APEI12_67	24° 07' 2.04" N	150° 19' 37.77" E
APEI12_68	24° 06' 35.82" N	150° 19' 39.6" E
APEI12_69	24° 06' 29.27" N	150° 19' 40.07" E
APEI12_70	24° 06' 16.17" N	150° 19' 41.03" E
APEI12_71	24° 06' 9.62" N	150° 19' 41.52" E
APEI12_72	24° 05' 17.2" N	150° 19' 45.5" E
APEI12_73	24° 05' 10.65" N	150° 19' 46.01" E
APEI12_74	24° 04' 57.56" N	150° 19' 47.05" E
APEI12_75	24° 04' 51.01" N	150° 19' 47.57" E
APEI12_76	24° 04' 24.81" N	150° 19' 49.72" E
APEI12_77	24° 04' 18.27" N	150° 19' 50.27" E
APEI12_78	24° 04' 5.17" N	150° 19' 51.38" E
APEI12_79	24° 03' 58.63" N	150° 19' 51.95" E
APEI12_80	24° 03' 6.25" N	150° 19' 56.55" E
APEI12_81	24° 02' 59.71" N	150° 19' 57.14" E
APEI12_82	24° 02' 46.62" N	150° 19' 58.33" E
APEI12_83	24° 02' 40.08" N	150° 19' 58.93" E
APEI12_84	24° 02' 13.91" N	150° 20' 1.39" E
APEI12_85	24° 02' 7.37" N	150° 20' 2.01" E
APEI12_86	24° 01' 54.29" N	150° 20' 3.28" E
APEI12_87	24° 01' 47.75" N	150° 20' 3.92" E
APEI12_88	24° 00' 55.42" N	150° 20' 9.14" E
APEI12_89	24° 00' 48.89" N	150° 20' 9.8" E
APEI12_90	24° 00' 35.81" N	150° 20' 11.15" E
APEI12_91	24° 00' 29.28" N	150° 20' 11.83" E
APEI12_92	24° 00' 3.13" N	150° 20' 14.6" E
APEI12_93	23° 59' 56.6" N	150° 20' 15.3" E
APEI12_94	23° 59' 43.53" N	150° 20' 16.72" E
APEI12_95	23° 59' 37.0" N	150° 20' 17.44" E
APEI12_96	23° 58' 44.72" N	150° 20' 23.28" E
APEI12_97	23° 58' 38.2" N	150° 20' 24.02" E
APEI12_98	23° 58' 25.14" N	150° 20' 25.51" E
APEI12_99	23° 58' 18.61" N	150° 20' 26.27" E
APEI12_100	23° 57' 52.49" N	150° 20' 29.35" E
APEI12_101	23° 57' 45.96" N	150° 20' 30.12" E
APEI12_102	23° 57' 32.91" N	150° 20' 31.7" E
APEI12_103	23° 57' 28.22" N	150° 20' 32.27" E
APEI12_104	23° 52' 12.5" N	150° 18' 34.57" E
APEI12_105	21° 56' 5.75" N	149° 33' 53.06" E
APEI12_106	22° 08' 35.01" N	148° 27' 26.39" E

APEI12_107	22° 49' 12.5" N	147° 53' 30.32" E
APEI12_108	26° 09' 34.09" N	149° 21' 42.01" E