A Non-Technical Summary of the CIC Exploration Programme

25 October 2021

Contents

Appendix A – Tools and Technology is attached to the end of this document.

Abbreviations Key

AUV – Autonomous Underwater Vehicle
CBG – Contiguous Block Group
CCD - Carbonate Compensation Depth
CCZ – Clarion-Clipperton Zone
CIC - CIC Limited
CIM - Canadian Institute of Mining, Metallurgy and Petroleum
EEZ – Exclusive Economic Zone
EIA – Environmental Impact Assessment
HSE – Health Safety and Environment
IMMS - International Marine Minerals Society
ISA – International Seabed Authority
JORC - Australasian Joint Ore Reserves Committee
Li-Ion – Lithium-ion
REE – Rare Earth Elements
ROV – Remotely Operated Vehicle
SBMA – Cook Islands Seabed Minerals Authority
TAB – Technical Advisory Board

Note: Currency conversion rates used throughout this document are calculated as of 1 October 2021, $1.00 US = $1.4424 NZD, source: Bank of England, www.bankofengland.co.uk.

An Overview of the CIC Exploration Programme

- As society is seeking a path to help reduce its carbon footprint demand is growing exponentially for critical base metals and rare earth elements (REE) to support global manufacturing, electric transportation, and clean-energy production.

- An abundant supply of polymetallic nodules that could potentially provide a source of these base metals and REE lies in the Cook Islands' EEZ (the area of the ocean controlled by the Cook Islands).

- CIC Limited (CIC) is applying for exploration rights in a defined area of the Cook Islands' EEZ. This Exploration Licence would only allow for exploration work (CIC Exploration Programme) such as scientific research, environmental studies, and resource analyses. Commercial seabed nodule harvesting will not be permitted at this stage.

- Environmental and social responsibility will remain at the forefront of each step of the strategic and tactical decision-making processes of the programme.

- CIC has assembled a Consortium of experienced partners as well as a Technical Advisory Board of world-class scientists and experts to help develop, observe, guide, and advise on the Exploration Programme.

- CIC's approach to ocean exploration is backed by sound research managed by independent scientists whose mission is to produce objective peer-reviewed studies in cooperation with some of the world's leading academic institutions and research facilities.

- The CIC Exploration Programme will deliver extensive scientific data that will contribute to the overall understanding of ocean resources in the Cook Islands, offering a benefit to the islands above and beyond the economic potential of the mineral resource alone.

- All operational tasks and business functions will be evaluated to provide opportunities to engage both Cook Islanders and local businesses wherever possible.

- The CIC Exploration Programme will lead to employment, training, and capacity-building opportunities for Cook Islanders in a variety of technical, educational and professional fields.

- CIC is committed to fulfilling the terms of an Exploration Licence and is financially and technically capable of carrying out all proposed exploration work.

Common Questions About the CIC Exploration Programme

Who is CIC Limited?

CIC Limited (CIC), a private Cook Islands company focused on responsible seafloor exploration, has applied for an Exploration Licence in accordance with the 2020 Cook Islands Seabed Minerals Tender. The CIC Consortium consists of individuals, companies, organisations, and investors that will support the project with their collective experience in marine and terrestrial mineral exploration, marine scientific research, and resource management.

How will CIC assure no harm is done to the marine environment during exploration?

CIC's priority is environmental stewardship. The methods and equipment that will be used during exploration have been employed worldwide by scientists from academia, government, and industry for decades without significant environmental impacts. CIC will first perform baseline environmental studies in the licence area to understand the marine environment. Next, the science team will assess any potential risks to the environment and determine proper mitigation strategies to that there will be no serious harm to the environment if a nodule harvesting programme is approved.

Where will operations take place?

Exploration operations will take place in the Cook Islands' EEZ and will be conducted 50 or more nautical miles away from any coastlines or lagoons. Most of the work will be take place much further offshore. Research activities in the proposed licence area will take place on the abyssal seafloor at an approximate water depth of 4,500 to 5,400 metres. No individual exploration activity will impact more than 10,000 m^2 of the seafloor (a bit larger than a rugby pitch). Special precautions will also be taken to avoid areas such as seamounts that are known to promote increased biodiversity in the open ocean via upwelling.

Why is CIC involved in this programme?

At this stage, CIC would only be a contractor to the government, leading a science-based exploration programme to determine if polymetallic nodule harvesting can be conducted in a socially and environmentally responsible manner with no serious harm to the environment. There is high demand for copper, nickel and cobalt and other metals to help society transition to renewable energy. Over the course of 15 research cruises, conducted by global independent scientists from multiple nations, data has been generated which indicates that there is a large quantity of polymetallic nodules, enriched in many of these critical base metals, located in the Cook Islands' EEZ. If it is proven to be environmentally feasible, the country could play a significant role in supplying the global economy with a sustainable source of these much-needed metals.

What benefits will this have for Cook Islanders?

The CIC Exploration Programme will deliver new scientific and environmental data to present a better understanding of the ocean in the Cook Islands' EEZ. This information will benefit sea users and provide an enormous amount of data to support the sustainable management of Cook Islands' marine resources for future generations. Additionally, training and career opportunities will be offered to Cook Islanders interested in learning more about ocean exploration and taking on careers in the field. Local businesses which supply materials and logistics services will be utilised to support the project both onshore and offshore.

When will operations begin?

CIC will conduct multiple campaigns during the five-year licence period. The first offshore operation would likely commence 90 to 120 days after a licence is granted (subject to any constraints created by the current COVID-19 pandemic).

Introduction

Global climate change has reached a tipping point and is a grave concern worldwide and is predicted to have a profound effect especially on island nations of the Pacific. The Cook Islands, a nation with a strong system of governance, is taking the lead in ocean mineral resource legislation, management, and regulations. These potential ocean resources could offer a new, plentiful, and sustainable source of critical energy metals in dire demand to assist the world's transition to a cleaner, carbon-neutral future less dependent on fossil fuels and more reliant on renewable energy.

Far offshore in the depths of the Cook Islands' EEZ, in an area known as the abyssal plain, billions of small mineral concretions are lying unattached on the surface of the seafloor. Though these 'rocks' lack much character on the outside, polymetallic nodules (sometimes called manganese nodules, ferromanganese nodules or *toka moana* in Cook Islands Māori) contain cobalt, manganese, iron, nickel, copper, titanium, and rare earth elements (REE) which are all needed to create Lithium-ion (Li-ion) batteries and the other electrical components needed for alternative energy sources.

It is important to recognise that currently CIC is only proposing to perform exploration activities. The programme's scientists and the Government and other stakeholders will use the exploration data to determine whether a commercial nodule harvesting programme can be sustainably developed that is also environmentally and socially responsible.

The results of the programme will be transparently shared with the Cook Islands' Government, citizens, and other stakeholders to help obtain a better understanding of the environmental and oceanographic data in the in the setting of the licence area.

The programme will also provide prospective social, economic, and employment opportunities and benefits for Cook Islanders now and in the future.

A representation of polymetallic nodules recovered from the Cook Islands EEZ.

CIC's Assurances to the People of the Cook Islands

Four guiding principles are incorporated into every aspect of the CIC Exploration Programme and each will be described in the individual sections of this Non-Technical Summary**.**

Collaboration: CIC will work with the people of the Cook Islands, the Government of the Cook Islands, local stakeholders, accredited academics, and scientists to identify opportunities to involve Cook Islanders.

Transparency: The collected scientific data becomes property of the Cook Islands Government and, in accordance with the government's policies, will be accessible to any qualified institution or organisation with an interest in contributing to marine scientific research now and in the future. Findings will also be made available to the public and all stakeholders through general publications and reporting.

Environmental Responsibility: Ahead of any strategic or tactical decision in the project, CIC will employ the Precautionary Principle and only proceed with activities that are within the boundaries of the Government's environmental rules and regulations and CIC's Consortium and Technical Advisory Board's own environmental and operational policies.

Science: Independent scientists with a track record of publishing peer-reviewed materials are collaborating on the CIC Exploration Programme with the goal of delivering extensive data to the Cook Islands that will benefit the nation now and in the future. The scientific studies will cover many disciplines relevant to both the seafloor and the overlying water column.

Contributions to Ocean Science Research

The primary goal of the CIC Exploration Programme is to obtain baseline environmental data for the area - essentially providing a biological and oceanographic snapshot.

During the exploration phase, the research programme will concentrate on modelling oceanographic currents, collecting data regarding sedimentation rates, ambient turbidity, sound propagation, water current velocity, dissolved oxygen, and molecular identification/sequencing, as well as predicting sediment plumes that could occur in any future nodule harvesting operations. This will provide a better understanding of the defined area for future research and planning initiatives while also enhancing what is already known about the Cook Islands' EEZ.

Leading academic and scientific institutions will be involved with independently collecting, analysing, and reporting on data so that objective, academically sound marine scientific research is assured. The scientists supervising and conducting the research are doing so with their interest focused on scientific objectivity and will have the freedom to publish their peer-reviewed results.

Academic researchers and scientists involved with the project through the Consortium, the Technical Advisory Board, and other project partners have extensive combined experience in oceanographic data collection, geological and environmental research, and modelling. CIC also will be partnering with local, regional, and international academic institutions that either have already performed or have an interest in marine scientific research and ocean mineral research within the Cook Islands. CIC is open to establishing a dialogue and collaborating with any institution that has an interest in the future of the Cook Islands' marine scientific research.

Some of the institutions that are partnering in the project, providing scientists, or contributing research resources include:

- The University of South Florida - College of Marine Science (USF-CMS) (USA)
- The University of North Carolina - Chapel Hill (UNC-CH) (USA)
- Eckerd College (USA)
- The University of Hawai'i (Manoa)
- Kochi University (Japan)
- The International Marine Minerals Society (IMMS)
- The United States Geological Survey (USGS)
- The Natural History Museum of London (United Kingdom)
- The National Oceanography Centre at the University of Southampton (United Kingdom)

An Environmentally Responsible Project

Independent marine science institutions and academics from around the world have collected over 50 years of general research on the mineralogy and environment of polymetallic nodule deposits in the Pacific Ocean. In that time 15 research cruises have been specifically dedicated to the study of nodules in the abyssal zone of the Cook Islands' EEZ. All human-led activities can naturally cause impacts on the environment, and even more research is needed to determine the extent of those potential impacts if commercial nodule harvesting were to be conducted in the Cook Islands.

CIC's integrated approach to programme development means that exploration activities and environmental studies will remain transparent for the duration of the project.

CIC's baseline environmental studies of the seafloor, water column, and surface waters at various locations will provide a detailed picture of the marine environment. This will allow CIC and the project scientists to develop an Environmental Impact Assessment (EIA). World-class scientists, environmental professionals, various Cook Islands Government ministries, and local stakeholders will be able to use the EIA to decide whether commercial nodule harvesting should go forward, and if so, to devise precautionary measures and techniques with mitigation strategies to both minimise and avoid serious harm to the environment if a harvesting programme is approved.

Marae Moana

Although the Exploration Programme will remain outside the defined 50-nautical-mile (>90 km) Marae Moana exclusion zones, CIC recognises that all activities will be taking place within the legislated boundaries of Marae Moana multiple-use marine park that covers the entire 1.9 million square kilimetres of the Cook Islands EEZ and will carefully and responsibly adhere to the nine principles of ecologic sustainability outlined in the Marae Moana Act 2017. Representatives from Marae Moana will be engaged in the project and research. This programme is expected to deliver a greater understanding of the entire surrounding ocean system, which will in turn contribute to long-term marine spatial and resource management planning.

An In Depth Look at Polymetallic Nodules

A group of Swedish explorers first discovered polymetallic nodules in the 19th century in the Kara Sea located in the Arctic Ocean off Siberia. Later, scientific expeditions were conducted aboard H.M.S. *Challenger* between 1872 and 1876 proved they could be found in most oceans of the world (Cronan & Verlaan, 2021), though their quantity and chemistry differ based on geographical and environmental factors. Nodules vary in size and shape, but most are 2 to 10 centimetres in diameter (typically around the size of a golf ball). A nodule of three centimetres diameter may weigh approximately 25 grams.

Deep-sea polymetallic nodule formation is influenced by the interplay between marine chemistry, biology, physics, and geology. They form by one of two processes or a combination of both, but both require a nucleus around which mineral layers can precipitate. The two processes result in precipitation of metal oxides, and either depend on dissolved metals in seawater (this formative process is called the 'hydrogenetic process') or dissolved metals in pore water - found within seafloor sediments near the seafloor surface (this formative process is called the 'diagenetic process'). In a sense, it is similar to how pearls form, with layers building up around a nucleus over time.

A look inside a polymetallic nodules recovered from the Cook Islands' EEZ.

The amount of sediment reaching the seafloor over time in a given location influences nodule abundance on the seafloor, as do the currents flowing over the ocean floor. Seafloor age and water depth also impact nodule formation and chemistry. A low sedimentation rate, older seafloor and water depths near or deeper than the Carbonate Compensation Depth (CCD) (~4500 metre water depth) favour nodule formation. (Note: CCD refers to a water depth at which carbonate is no longer preserved in recently deposited marine sediments).

The World Needs More of the Metals Found in The Cook Islands

The world is moving towards a cleaner future that is less dependent on the fossil fuels that pump carbon dioxide into the atmosphere and in the future will rely more on renewable energy. By developing solar energy and wind energy technologies, both of which are enabled through battery storage systems, and by driving battery-powered electric vehicles, global carbon output can be significantly reduced.

A barrier to making this clean-energy transition is access to the raw metals needed to produce batteries, which largely power renewable energy technologies. At the present time, there are not enough energy metals in circulation to meet the growing demand. Current terrestrial sources are dwindling and producing lower grades. Furthermore, continuing to rely on the terrestrial sources of these metals also means that more land will be used for extraction, making it impossible to avoid the inherent significant impact on the environment and communities both directly and indirectly from land mining.

Countries are eagerly investigating new supply sources and alternative ways to secure these base metals. The harvesting of deep-sea polymetallic nodules could provide an environmentally friendly, socially responsible and truly sustainable solution to this problem. Many base metals are required to produce these batteries and technologies, but nickel, cobalt, and REE are some of the most critical and difficult to source dependably and sustainably. All of these metals are present in deep-sea polymetallic nodules.

Of all the metals needed to aid in the production of batteries necessary for the conversion to alternative energy sources, cobalt is the most difficult to sustainably source at this time. Currently, it is produced as byproduct of nickel mining primarily in the Democratic Republic of Congo under circumstances that have both significant human rights issues and severe environmental impacts.

The areas in the Cook Islands' EEZ that CIC has identified are believed to contain at least seven million tonnes of cobalt, which is approximately equal to the cobalt resources of the entire rest of the world combined. (NS Energy Staff Writer , 2021; U.S. Geological Survey, 2021; Hein et al, 2015).

Nearly 100% of the minerals found in polymetallic nodules are usable compared to land-based metal ores, which often contain less than 2% of the targeted minerals and rarely see above 20% (Conca, 2021). Since the nodules lie unattached on the ocean floor, no drilling, excavating, digging or blasting is required to harvest them, and there is no overburden to remove. In essence, this method of harvesting can be done in a way that generates no solid waste, emits up to 90% less carbon emissions, and does not produce toxic tailings or waste products (Paulikas, 2020).

The ultimate goal is the creation of a circular economy wherein metal recycling supplants mineral extraction, but recycling cannot be a complete solution until much larger quantities of these metals are available which is estimated to take from 20 to 40 years into the future.

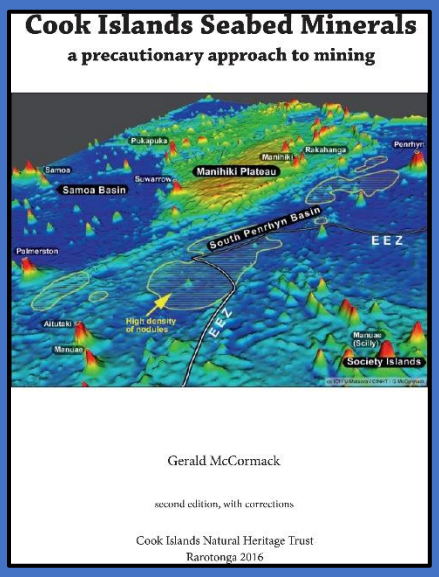
Through the development of a socially and environmentally responsible exploration programme, the Cook Islands will have the data necessary to determine whether it can potentially supply the world with some of these critical energy metals and speed up the transition to a fully circular and sustainable economy in which society does not continue to demand raw material production from mines on land or the sea.

The Proposed CIC Exploration Programme

CIC has applied for seabed mineral exploration rights within 10 Contiguous Block Groups (CBGs) on the abyssal seabed (roughly 4,500 to 5,400 metres of water depth) within the Cook Islands' EEZ. The offshore activities will occur at greater than 50 nautical miles (>90 km) from any coastline, with most of the work being conducted much further offshore beyond the sight of land. Special precautions will also be taken to avoid areas such as seamounts that are known to promote increased biodiversity in the open ocean via upwelling and providing structure for sea life. Current plans provide that no single exploration activity will impact an area of the seafloor greater than 10,000 m^2 (approximately the size of a rugby pitch and less than 0.000001% of the total Cook Islands' EEZ).

During the five-year exploration licence period, CIC will conduct multiple campaigns using at least two different ships with the first targeted campaign beginning 90 to 120 days after an exploration licence is granted (subject to any constraints created by the current COVID-19 pandemic). The Exploration Programme will deliver data to produce a resource statement, Environmental Impact Assessment, economic feasibility study, and details for engineering requirements within 36 months of the grant of the exploration licence.

CIC's Exploration Programme is developed to take into consideration the critical environmental points articulated in Gerald McCormack's *Cook Islands Seabed Minerals: A Precautionary Approach to Mining* (2016).



These principles include:

- Applying the precautionary approach at every stage of exploration.
- Determining sedimentation rate at the seafloor and estimating the amount of carbon from the overlying waters reaching the seafloor.
- Examining the pre-operational extent and makeup of seafloor ecosystems.
- Comparing the seafloor environment within the license area, EEZ, South Pacific region, and other regions of the world such as the CCZ.
- Developing models for managing plumes, including determination of relevant sediment properties, long-term measurement of benthic current velocities, modelling of plume dispersion, and monitoring of trial harvesting operations.
- Minimising both the dispersion of sediments into the water column and the transfer of seawater from one depth to another.

Map showing the areas that CIC applied for during the 2020 Cook Islands Seabed Minerals Tender.

Survey and Map the Licence Area

The CIC exploration team will use advanced industry-accepted methodologies to survey and map the licenced area to develop extensive baseline environmental models. This will allow the team to capture a starting "picture" of what the area looks like before any other activities commence. The multibeam data collected will show deep-water seafloor features in greater detail than can be determined through satellite-based study. In addition to data on water depth and seafloor bathymetry, the equipment used for this survey can provide information on seafloor habitats as well as the presence of biota in the water column.

Conduct Environmental Baseline Studies

CIC will carry out thorough and extensive environmental baseline studies to determine the characteristics of the seafloor, the underlying sediment, and the overlying water column. The areas of focus for these baseline environmental studies include physical oceanography, geology, chemical oceanography, sediment characterisation, ecology/biological community study, bioturbation, DNA/RNA sequencing, plume modelling, acoustic impact studies, and fluxes of sediment and carbon to the seafloor.

Acquire Representative Samples in the Resource Area

Recovering samples of polymetallic nodules and sediment will help support metallurgical processing development, conceptual design of a nodule harvesting system and provide environmental baseline information to facilitate an extensive assessment of the biodiversity in the area. The limited sample recovery during exploration is predicted to have no significant adverse impact on the marine environment.

Execute a Resource Assessment Programme

The activities conducted during exploration will characterise mineral resources in the licence area. Industry-accepted sampling and chemical analysis will provide information to determine the abundance of nodules present on the seafloor, the areas which contain nodules, and the proportions of the various minerals contained in the nodules. Independent laboratories will use the best possible techniques for determining metal concentrations in the nodules and the sediment. Analysis will provide confidence in spatial continuity of the resources so that a degree of certainty can be given to calculated resources. For this purpose, CIC will use the protocols and general guidelines of either the Australasian Joint Ore Reserves Committee (JORC) or the Canadian Institute of Mining, Metallurgy and Petroleum (CIM).

Complete an Environmental Impact Assessment (EIA)

Once CIC has sufficient data from the exploration cruises, the science team led by the project's Environmental Chief Scientist will develop an extensive EIA. This report will define any potential environmental impacts as well as mitigation measures that will counter those impacts that might result from nodule harvesting operations. The purpose of this research is to determine whether nodule harvesting can be accomplished without serious harm to the marine environment. If at any point the results indicate that serious harm will occur, the project will be suspended until advice is received from the SBMA.

Exploration Methodologies

Two vessels with ocean survey capabilities that can work in remote oceans will be used to conduct offshore exploration operations. Both vessels will accommodate a technical and environmental crew allowing for multi-faceted operations across many disciplines as well as accommodating a combination of both Cook Islands' trainees, employees, and Government observers/regulators during offshore exploration campaigns.

A larger vessel will be one of several ships currently under consideration and will be an 80 to 90 metre dynamically positioned ship mobilised with a full-ocean depth multibeam sonar system. The ship will incorporate different technologies as dictated in the project plans, which may include box corers, bulk-sampling equipment, a 6,000-metre remotely operated vehicle (ROV), and geotechnical and oceanographic/environmental sampling tools. This ship will likely be used for five cruises lasting 30 to 45 days each.

A second vessel (the CAT research vessel) will be smaller catamaran, approximately 40 metres in length that will be stationed in the Cook Islands and used for multiple shorter (5 to15 day) research cruises to monitor sensors, deploy equipment, and maintain and manage scientific research and data acquisition technology.

The vessels, ship management agency, ship company, and crew staffed through a crewing agency will be required to be in good standing with applicable national, international and trade association codes and compliant with standards for safeguarding health, safety, and the environment (HSE) including those set by the International Organization for Standardization (ISO). All companies in the CIC Consortium involved with offshore operations have impeccable records related to health, safety, and environmental performance.

Cook Islanders will be employed as either crew members or technicians and will be given an opportunity to participate in offshore training and science programs where possible.

The following table describes much of the equipment to be used in deep ocean exploration. Images of the equipment that would likely be used for the various Exploration Techniques can be found in Appendix A:

Exploration Technique	Purpose
Hull-Mounted Multibeam Survey	Uses sound waves to calculate the seafloor depth so a detailed map can be created.
Towed Multibeam Survey	Creates high-resolution bathymetry map to allow imaging of bottom features; also provides acoustic backscatter intensity which can be used to identify nodule presence and abundance.
Autonomous Underwater Vehicle (AUV)	Provides for high resolution mapping and photography that can be accomplished between completed box core sampling stations; the ship is free to conduct other simultaneous operations since the AUV is untethered.
Remotely Operated Vehicle (ROV) Survey and Sampling Tools	Visual surveys and sampling conducted at the direction of the on-board technical team. The ROV's tools include manipulator arms for collecting samples, video and still cameras, and a range of specialised, close-proximity sensing tools for both seafloor and water column survey.
Gravity / Box Coring Equipment	Collects samples for mineral resource estimation, extracts pore water samples to determine the basic chemistry of the sediments and collects biological samples for environmental baseline measurement and geotechnical data.
Bulk Sampling Equipment	Gathers sufficient nodule sample material to complete metallurgical studies.
Vane Shear and Cone Penetration Testing Equipment	Measures seabed and sediment properties in various locations over the licenced area to verify that the seabed has sufficient bearing capacity for a nodule collector.
Water Sampling Carousel/Rosette, CTD (Conductivity, Temperature and Density)	Assesses baseline water chemistry conditions in the water column overlying the exploration licence area - CTD data can be acquired by casting equipment from the ship or deploying it on a stationary mooring line; data from at least two summer/winter seasons (i.e., seasonal studies) at mooring locations in potential harvesting areas will be captured.

Deep-Ocean Moorings	Will provide data that gives a detailed understanding of the currents around designated areas of interest - also enables long-term modelling of the extent and duration of plumes that may be formed as a result of nodule harvesting. Particle traps will be included in the moorings to measure the actual sedimentation rates delivered to the seafloor.
Plankton Nets, Fishing Instruments	Provides baseline plankton assessments within the water column, including baseline metal concentrations and fish populations.
Marine Biota Observers	Records sightings of marine mammals, other near-surface large biota (such as turtles, fish schools and whales) and bird aggregations, identifying the relevant species and behaviours where possible.
Moored Hydrophones	Provides acoustic data - incorporated into the moorings or landers used for physical oceanography studies, or as stand-alone moorings.
Moored (and some Baited) Time Lapse Cameras	Provides visual information to help analyse baseline biological conditions at and immediately above the seafloor and predict the impact of harvesting activities on biological communities.
Benthic Mini-Landers	Monitors physical transport and biogeochemical processes that combine to control distributions of both suspended particulates and dissolved chemical parameters within the benthic boundary layer (BBL).
Genetic Metabarcoding	With the advent of modern, ultra-high throughput sequencing platforms, conducting deep sequencing metabarcoding surveys with multiple DNA markers will enhance the breadth of biodiversity coverage, enabling comprehensive, rapid bioassessment of all the organisms in a sample.

Marine Life

In the abyssal plain, water pressure is immense, food is scarce and marine life is significantly less abundant than in shallower water closer to the coast. Current knowledge of the area, based on 15 research cruises previously conducted by multiple institutions from the Cook Islands, New Zealand, Australia, the United States of America, the United Kingdom, Japan, France, and Germany, suggests that the seafloor in the proposed licence area has very low densities of benthic life especially compared to shallow and coastal waters but also even compared to the abyssal zone in other parts of the Pacific Ocean. It is also likely that most species found on the deep seabed within the licence area will be found throughout large areas of the Cook Islands' EEZ. Additionally, primary productivity (one of the best indicators for biological activity in the ocean) within the Cook Islands' EEZ is extremely low relative to the rest of the Pacific Ocean, indicating lower levels of biomass on the deep seafloor. Nonetheless, CIC will enact avoidance and mitigation strategies to protect and minimise any impact to living species that might be affected.

CIC recognises that the entire Cook Islands' EEZ is a designated whale sanctuary and will enact whale detection and avoidance strategies to avert interference or contact. A variety of different species of whales including humpback, sperm, and beaked whales have annually been observed migrating north up to Rarotonga and Aitutaki during early July, then departing via a route west/northwest by late October toward Samoa, Tonga, and Fiji. While some of the proposed licenced areas may overlap with known whale migration routes during different parts of the year, the research that will be undertaken in these areas during the exploration licence term will be standard marine scientific studies that are practised routinely around the world with no reported harmful impact on whales.

In particular, planned exploration activities will not cause significant harmful acoustic energy emissions within the Deep Sound Channel (~700 to 1,500 metre water depths), which is known to be important for whales and other marine mammals. The multibeam echosounder equipment used to map the seabed is operated at both a frequency and intensity that is considered safe for marine mammals. CIC's initial exploration plans include the use of low-frequency sonar utilised at a low intensity only to be used near-seabed via towed or AUV systems. These sonar systems do not pose a threat to marine mammals.

Sea turtles have also been known to inhabit the open seas and lagoons and to nest throughout the Cook Islands. CIC is confident that its exploration activities will not cause any disturbance to their marine environment, but the company is still planning to engage with the Cook Islands' Government and relevant stakeholders to develop turtle protection measures and programmes.

Offshore exploration activities are not expected to interfere with seabird migratory routes or feeding grounds as the vessel is generally well offshore and in motion during operations. Observations of seabirds will be logged as part of standard operating procedures during exploration, and bird studies will be conducted as part of the EIA for the project.

In addition to the precautions geared towards avoiding interference with whales, sea turtles, and seabirds, CIC will collaborate with Cook Islanders, NGOs, scientists, and other technical experts to avoid interference with seasonal migratory patterns of any other marine species. The data collected in the Exploration Programme will enhance the understanding of marine life and identify measures to protect it.

CIC's Plan to Work Collaboratively with Other Sea Users

- Focus exploration on areas furthest from the most productive commercial fishing zones and whale migration routes.
- Collaborate with the Cook Islands government, local communities, NGOs and other stakeholders while formulating exploration cruises to minimise potential interference.
- Stay outside 50 nautical miles exclusion zones to ensure that the islands, fisheries, tourism, shipping traffic, and marine life surrounding them will not be affected by exploration work.
- Share the collected scientific data that will contribute toward a better understanding of the ocean environment within Cook Islands' EEZ. CIC will communicate with local academic institutions to ensure proposed exploration work does not interfere with, but rather complements and extends scientific research.
- Cooperate with authorities to monitor and report international fishing vessels that may be conducting unauthorised and unlicenced activities within the Cook Islands' EEZ, if requested by the Cook Islands authorities.
- Engage with the Cook Islands' Government and submarine cable contractors to ensure exploration work does not interfere with the submarine cable maintenance and upkeep. CIC's ships and equipment can be utilized for cable maintenance and monitoring if needed.
- Proactive communication with any academic institutions that wish to conduct marine scientific research to ensure exploration work proposed does not interfere with, and where possible complements and extends scientific research.
- Maintain an open line of communications with all stakeholders throughout the islands.

Investment in Local Business, Arts and Projects

CIC understands that it is important that the Exploration Programme deliver world-class research and science as well as social and economic programmes that will directly benefit the people of the Cook Islands. CIC Consortium members began travelling to the Cook Islands in 2012 at the invitation of the Government to discuss assisting the nation with research related to the development of ocean mineral resources. CIC Consortium members have now made 10 trips to the Cook Islands and Greg Stemm, the founder of CIC, and his wife, Laurie Stemm, have been living in the Cook Islands since March 2020, engaging closely with the community and cultural activities as well as building a local team to advise on and support the project.

A Future in Exploration

The CIC Exploration Programme will create opportunities for current and future generations of Cook Islanders interested in pursuing career paths related to ocean exploration or to those just interested in learning more about the marine environment and mineral resources. Through the development of robust technical and educational programmes, it is anticipated that in the near future a crew of qualified Cook Islands' ship's officers and crew will primarily lead operations with logistical assistance from CIC and their contracted marine service providers.

Here are some of the ways CIC envisions Cook Islanders will work alongside its technical and science teams:

- Employment, training, and capacity-building programmes that complement the Exploration Programme in the fields of offshore research operations, laboratory research, marine science, and environmental studies.
- Hiring Cook Islanders who have exceptional knowledge relating to the waters and sea life around the Cook Islands to assist the planned environmental monitoring and support programmes.
- Establishing a training programme and programs with university partners to train people for the technical and scientific positions that will be needed to support onshore logistics and/or testing facilities for biological, geological, oceanographic, and other sampling analysis.
- Creating an on-shore and at-sea development, apprenticeship, and educational programmes to build local competencies so Cook Islanders can learn the skills for the future roles in the seabed minerals sector, ranging from shipboard operations to graduate degrees in geological and environmental research in cooperation with collaborating academic institutions.

During early-stage exploration and evaluation, CIC's marine operations team will require progressively greater levels of ship-to-shore support, utilisation of local expertise and logistics services. Examples of potential local support in the exploration phase include sourcing fuel and provisioning of the ship's operations and crew, emergency and standby support vessels and calling on islands in the event of an emergency. Local air and vessel chartering services, port facilities and operators could also benefit from the development of the programme.

Community and Stakeholder Engagement

The company is committed to involving Cook Islanders in all stages of development so that citizens and other sea users are comfortable with the project and have sufficient knowledge about the Cook Islands' ocean minerals and deep-ocean environment to make informed decisions about the possible commercialisation of these resources. CIC will collaborate with representatives from various governmental departments, as well as local communities including meetings with traditional leaders, environmental organisations, Pa Enua leaders/communities, schools, churches, Parliament, the various Ministries and all political parties, businesses and other stakeholders to understand their concerns and ideas about maximising the benefits of the Exploration Programme. A combination of meetings, technical workshops, town halls, web-based communications, ship visits and seminars are being planned and will be conducted in cooperation with the proper government agencies.

The Cook Islands Traditional Arts Trust (CITAT)

CIC is committed to the community and is already providing funding for arts and cultural programmes in the Cook Islands, which members of CIC have come to appreciate during their time spent in the Cook Islands. The Cook Islands Traditional Arts Trust is an example of CIC's commitment to participate in various local non-profit cultural and educational projects. The Trust has already begun making contributions in a variety of local traditional, cultural and educational programmes.

CIC investments and CITAT activities to date include:

- Sourcing, transporting and donating medical equipment for COVID-19 preparation in cooperation with *Te Marae Ora*, the Ministry of Health.
- Creating a dialogue with the Arts Department of the Ministry of Education to encourage the Arts curriculum within the schools. Working on this initiative with the Advisor for the Ministry of Education and coordinating these activities with The Cook Islands Traditional Arts Trust.
- Supporting Autism Cook Islands and contributing to its fundraising efforts for the Kara Run 2020.
- Securing sponsorship funds with the local BSP bank to construct bathroom facilities and to open a teaching cafe to support the Tavioni Arts program & Vananga.
- Support for classes in traditional arts skills and assisting author Michael Tavioni to distribute his educational motif book to several schools in Rarotonga and Aitutaki.
- Participating in World Clean-Up Day on the beaches and roadways.
- Providing a mental wellness workshop for the community.
- Contributing support and funds to the Cook Islands 2021 Olympic kayak team.

World-Class Expertise is Leading the Exploration Programme

Through CIC's Consortium, scientists, affiliated academic institutions and Technical Advisory Board, the project will be guided by leading accredited academics and experts in the fields of marine geology, marine sciences, environmental studies, and deep-ocean exploration. The CIC Exploration Programme will operate in a responsible and sustainable manner in accordance with ESG (Environmental, Social and Governance) principles and best practises.

The CIC Consortium

Searock Resources, LLC

CIC was founded by Greg Stemm, who is the company's CEO and Chairman. He is a pioneer and widely recognised leader in the field of deep-ocean exploration. He has played an important role in the development of new advanced technologies and private sector standards for ocean mineral exploration, shipwreck archaeology and underwater resource management for over 30 years. Mr. Stemm is also the Past President of the International Marine Minerals Society (IMMS), the oldest and largest international organisation with the mission to promote the field of ocean mineral science, research and commerce.

Odyssey Marine Exploration, Inc.

Odyssey is engaged in subsea mineral resource research, exploration, validation and development. The company uses innovative methods and state-of-the-art technology to provide access to critical resources in an environmentally and socially responsible manner. Odyssey's global team consists of leading academic researchers, project managers, offshore professionals, geophysicists, subsea engineers, geologists and environmental scientists. Their track record includes high-profile projects that have resulted in many deep-ocean record-setting accomplishments and results unmatched by any other deep-ocean exploration company. The company also holds an impeccable record of sharing the knowledge obtained from its work with the broader public through self-publication and other media. Odyssey has committed a total of $6,500,000 (NZD $9,375,600) in funding to the project.

Royal Boskalis Westminster N.V.

Boskalis is a leading global maritime services company operating in the market segments: Dredging, Offshore Energy, Inland infrastructure, Towage & Salvage services. As a partner Boskalis is able to realise complex infrastructural works for clients within the chain of design, project management and execution, on time and within budget, even at vulnerable or remote locations around the world. The company strives for sustainable design and realisation of solutions. Boskalis is active in projects in the energy, ports and infra markets. Boskalis has committed a total of $5,000,000 (NZD $7,212,000) to the project.

Cobalt Capital Partners, LLC

A private investment firm led by Mark Justh, a former Managing Director of J.P. Morgan/Hong Kong. It will provide a total of USD $2,000,000 (NZD $2,884,000) of capital funding and will act as a senior advisor in financing exploration operations.

DYNE Capital Pty Ltd

A merchant bank focused on funding programs benefiting the Five Eyes countries on Clean Path Initiatives that encourage stronger ties between member countries and ultimately reduce security concerns of essential assets for governments. Dyne has committed resources to fund the CIC Exploration Programme. Dyne has provided USD $3,500,000 (NZD $ 4,984,000) in pre-exploration funding and has committed USD $40,000,000 in (NZD $57,696,000) in funding if CIC is granted an exploration licence.

The CIC Technical Advisory Board

In addition to the broad access of the Consortium's technical capabilities and resources, CIC is supported by a Technical Advisory Board that provides guidance, detailed reviews, and approves all the project's technical and scientific aspects.

Mr. Tom Albanese

The former Chief Executive Officer of Vedanta Resources plc and Rio Tinto - two of the world's leading mining and natural resource companies. Mr. Albanese brings 40 years of global experience in the mining industry with a career focused on developing innovative modern mining systems, supply chain, corporate management and government relations. He has a history of best practise with stakeholders and environmental management groups. Mr. Albanese is also a recipient of the SW Mining Hall of Fame award in the United States.

Mr. Jean-Noel Calon

Founding Member of Blue Fish and Project Manager for Boulogne Seafood Cluster (Boulogne sur Mer, France), Europe's most important seafood cluster and leading logistics hub, focused on identifying drivers for consistent promotion and monitoring of safe sustainable fishing practices.

Mr. Jonathan Gardner

A Professor of Marine Biology at Victoria University of Wellington. Much of his work is focussed on using molecular tools to better understand connectivity in marine species. This research is multi-disciplinary and involves ecologists and physical oceanographers and has a very applied focus to deliver management outcomes in conservation (i.e., coastal and deep-sea marine protected areas), in biodiversity studies and phylogeography, management of bioinvasions, and in aquaculture and fisheries.

Mr. Robert Goodden

A deep-sea drilling pioneer and subsea mining consultant with 30+ years at the forefront of new technologies in seabed excavation and drilling with an eye for what works in that environment both practically and commercially.

Dr. James Hein

48 years of experience as a marine geologist at USGS, author/co-author of 560+ papers, abstracts and books; associate editor of *Marine Geology* and *Marine Georesources and Geotechnology.* Past scientific advisor to the Department of State and was part of their delegation to the International Seabed Authority.

Dr. Mark Luther

Associate Professor of Physical Oceanography, USF-CM and Director of the Ocean Monitoring and Prediction Lab at USF-CM. Dr. Luther's research involves the combination of real-time ocean observations with numerical models of ocean currents and processes and their application to various problems ranging from maritime safety and security to water quality in estuaries to variability in large-scale ocean circulation and its relation to climate change.

Dr. Charles Morgan

20 years as an Environmental Planner in Hawaii with a focus on permitting and environmental impact assessments for renewable energy projects and Chairman of the Underwater Mining Institute.

Dr. Akira Usui

40 years at the Geological Survey of Japan focused on the field of geology, geochemistry, and mineralogy of marine ferromanganese deposits. Published more than 100 scientific papers and maps jointly with domestic and international colleagues, based on numerous shipboard investigations.

Mr. David Weight

Past President of the Cobalt Institute with involvement in the metals mining industry for 40+ years with 20 years focused on providing technical and commercial services to one of the world's largest refined copper and cobalt producers, Zambia Consolidated Copper Mines Ltd.

Dr. John Wiltshire

Exploration geologist for Noranda Mines, Chevron and Petro-Canada. Ocean Resources Manager for the State of Hawaii in the Department of Business, Economic Development and Tourism and Director of Hawaii Undersea Research Laboratory (HURL).

Meitaki Ma'ata

CIC looks forward to working with Cook Islanders to better understand their marine minerals and deep-ocean environment in a manner that will allow all stakeholders to evaluate whether it makes sense to move toward commercial harvesting of subsea nodules. If the country decides to move forward, these marine resources have the capacity to boost both the nation's economy and the scientific understanding of these ocean resources. They can also potentially provide the metals needed to move away from fossil fuels and toward a carbon neutral economy.

CIC is pleased to have submitted an application for exclusive mineral exploration rights in the 2020 Cook Islands Seabed Minerals Tender. As proven by the relationships already developed with key stakeholders and the mitigation measures incorporated into the Exploration Programme, CIC will endeavour to make every effort to fulfil its responsibilities as an appointed steward of mineral resources which it is licenced to explore in an environmentally sensitive manner.

Greg, Laurie and Adam Stemm with the team behind the Gallery Tavioni and Vananga cultural and language initiatives that have been sponsored by the Cook Islands Traditional Arts Trust.

Please contact the Cook Islands Seabed Minerals Authority for additional information on this project.

References

Conca, J. (2021, March 2). Is Mining The Ocean Bottom For Metals Really Better Than Mining On Land? *Forbes*. https://www.forbes.com/sites/jamesconca/2021/02/24/is-mining-the-ocean-bottom-for-metals-really-better-than-mining-on-land/

Cronan, D., Verlaan, P. (2021, February 2). Origin and variability of resource-grade marine ferromanganese nodules and crusts in the Pacific Ocean: A review of biogeochemical and physical controls. *Science Direct.* https://www.sciencedirect.com/science/article/pii/S0009281921000039

Hein, J., Spinardi, F., Okamoto, N., Mizell, K., Thorburn, D., Tawake, A. (2015, July). Critical metals in manganese nodules from the Cook Islands EEZ, abundances and distributions, Ore Geology Reviews, https://www.sciencedirect.com/science/article/pii/S0169136814003679

McCormack, G. (2016). Cook Islands Seabed Minerals: A Precautionary Approach to Mining. Rarotonga. *Cook Islands National Heritage Trust.* Print.

NS Energy Staff Writer (2021, February 22). Profiling the world's eight largest cobalt-producing countries. *NS Energy. https://www.nsenergybusiness.com/features/top-cobalt-producing-countries/*

Paulikas, D., Katona, S., Ilves, Saleem, H. (2020, December 1). Life cycle climate change impacts of producing battery metals from land ores versus deep-sea polymetallic nodules. *Journal of Cleaner Production (Volume 275)*. ScienceDirect.com. https://www.sciencedirect.com/science/article/pii/S0959652620338671?via%3Dihub

U.S. Geological Survey. (2021). Mineral commodity summaries 2021: U.S. Geological Survey. https://doi.org/10.3133/mcs2021

A Non-Technical Summary of the CIC Exploration Programme

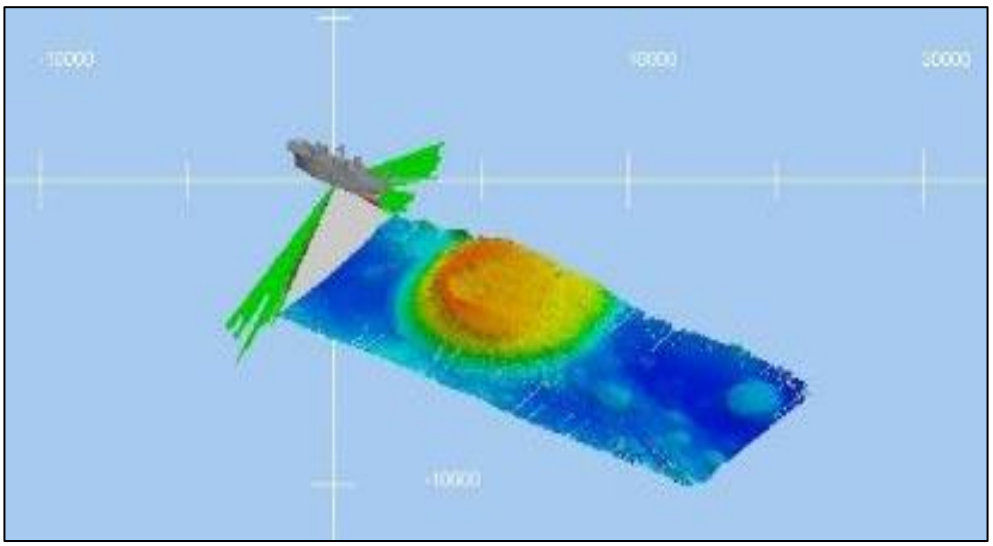
Appendix A
Tools and Technology

25 October 2021

Hull-Mounted Multibeam Survey

Uses sound waves to calculate the seafloor depth so a detailed map can be created.

RESON 7150F Seabat



Multibeam data example

Images courtesy of Odyssey Marine Exploration, Inc.

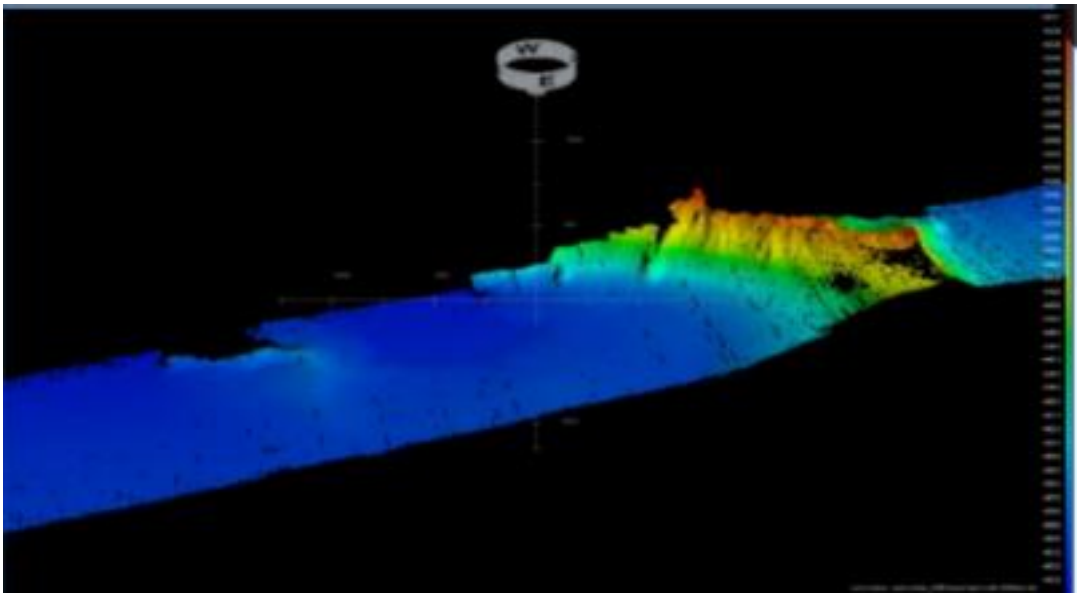
Towed Multibeam Survey

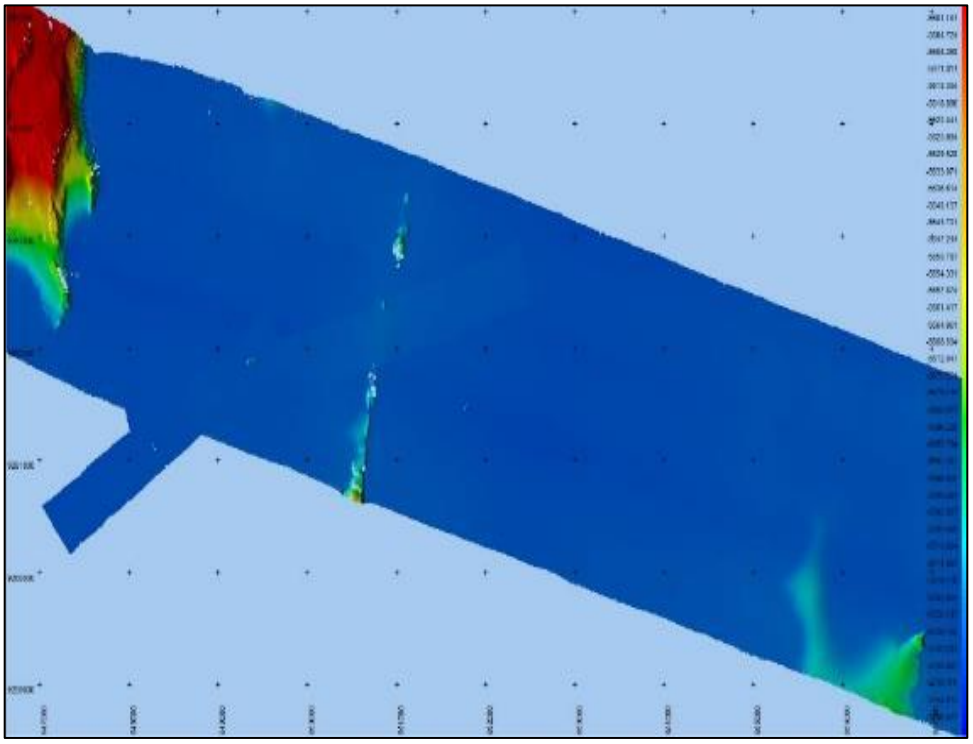
Creates high-resolution bathymetry map to allow imaging of bottom features; also provides acoustic backscatter intensity which can be used to identify nodule presence and abundance.

ARES - A 6,000m deep tow survey system.

Images courtesy of Odyssey Marine Exploration, Inc.

Examples of data collected by ARES

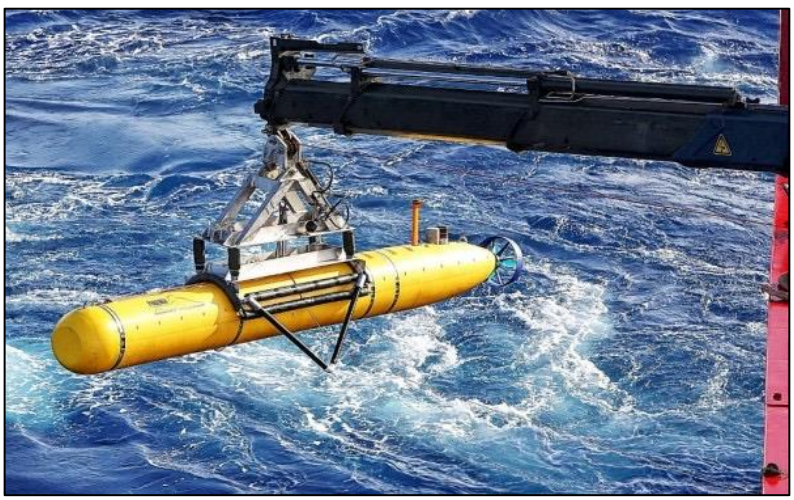




Images courtesy of Odyssey Marine Exploration, Inc.

Autonomous Underwater Vehicle (AUV)

Provides for high resolution mapping and photography that can be accomplished between completed box core sampling stations; the ship is free to conduct other simultaneous operations since the AUV is untethered.

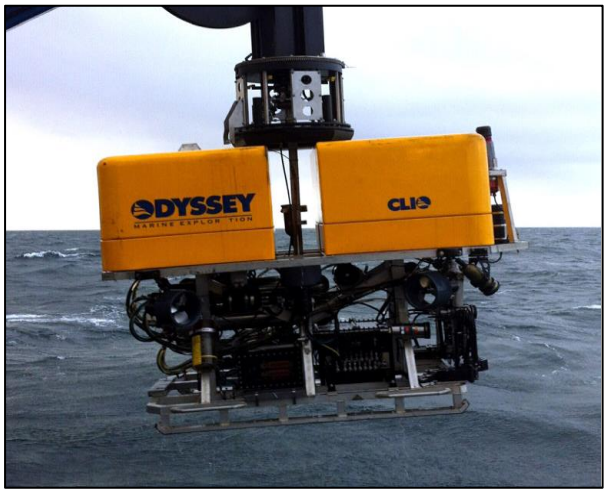


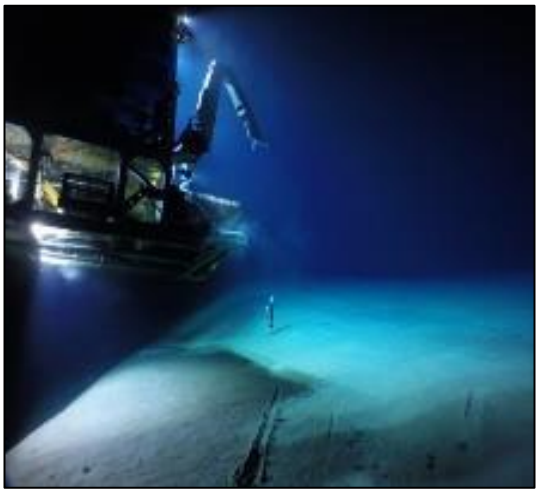
Artemis - A 5,000 Meter rated autonomous underwater vehicle

Images courtesy of Phoenix.

Remotely Operated Vehicle (ROV) Survey and Sampling Tools

Visual surveys and sampling conducted at the direction of the on-board technical team. The ROV's tools include manipulator arms for collecting samples, video and still cameras, and a range of specialised, close-proximity sensing tools for both seafloor and water column survey.



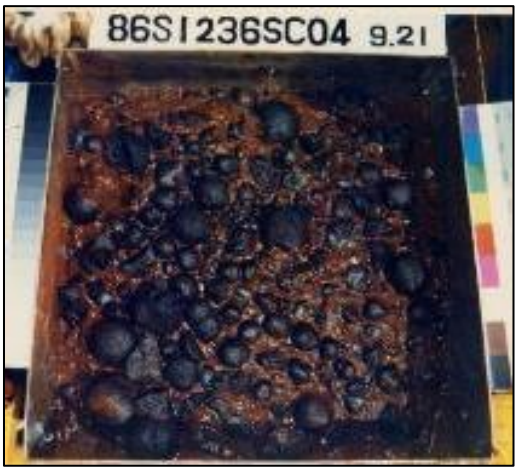


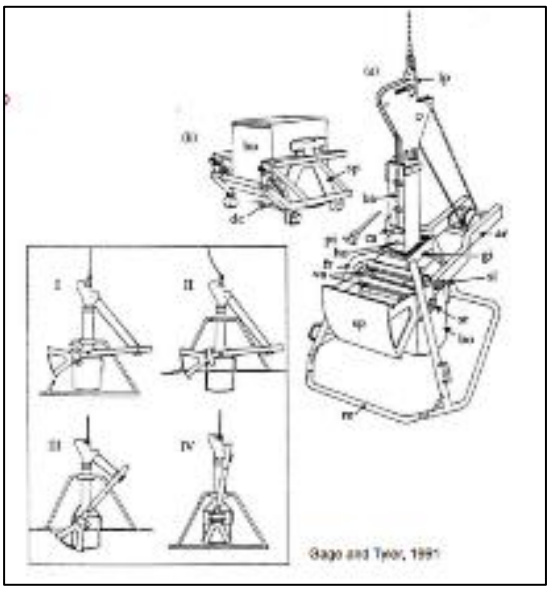
CLIO is a 6,000-meter rated ROV that is configured to perform precision survey work or light work-class ROV intervention tasks

Images courtesy of Odyssey Marine Exploration, Inc.

Gravity / Box Coring Equipment

Collects samples for mineral resource estimation, extracts pore water samples to determine the basic chemistry of the sediments and collects biological samples for environmental baseline measurement and geotechnical data.

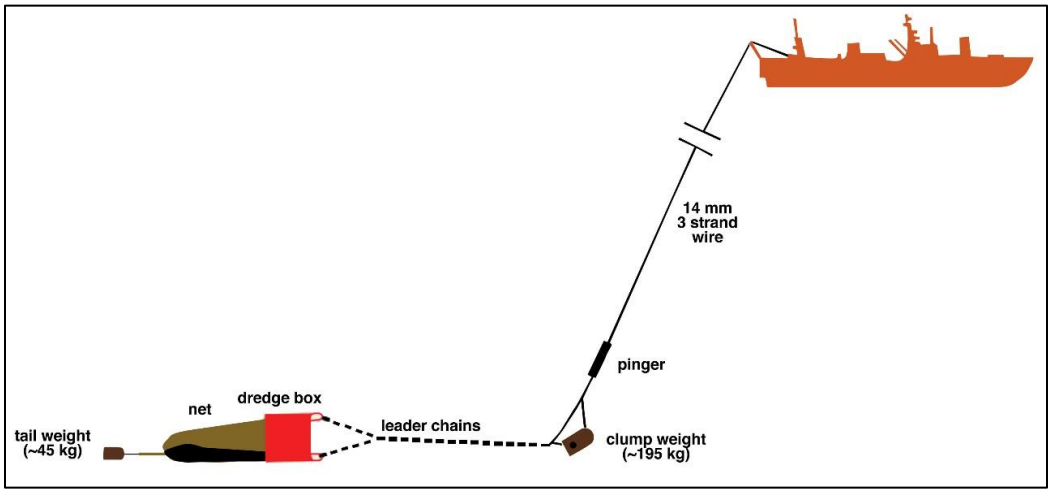




Images courtesy of Ocean Instruments.

Bulk Sampling Equipment

Gathers sufficient nodule sample material to complete metallurgical studies.



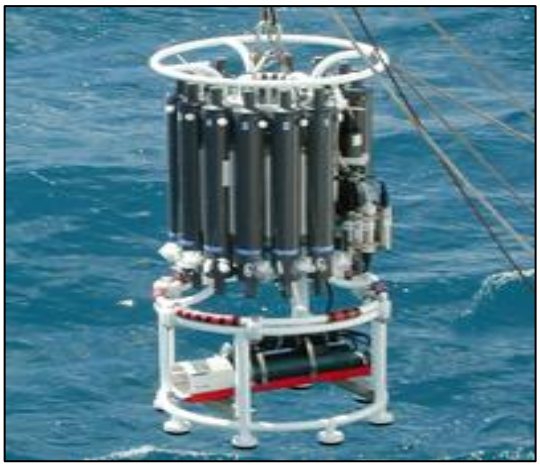
Images courtesy of Yuzhmorgeologiya.

Cone Penetration Test (CPT)

Measures seabed and sediment properties in various locations over the licenced area to verify that the seabed has sufficient bearing capacity for a nodule collector.

Water Sampling Carousel/Rosette, CTD (Conductivity, Temperature and Density)

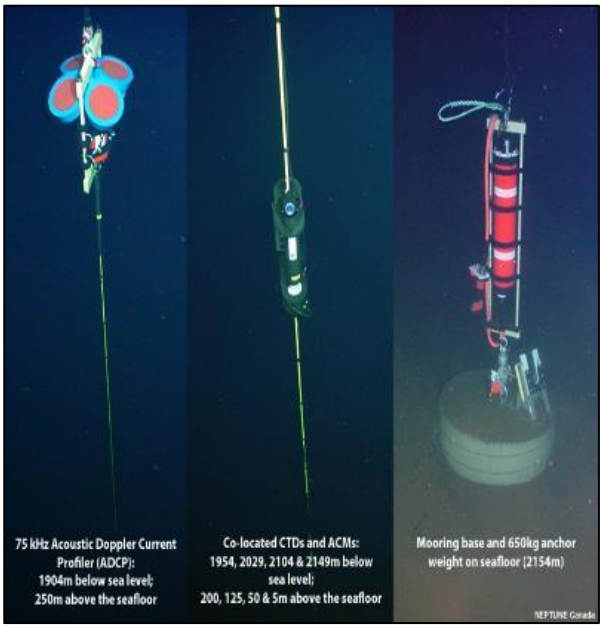
Assesses baseline water chemistry conditions in the water column overlying the exploration licence area - CTD data can be acquired by casting equipment from the ship or deploying it on a stationary mooring line; data from at least two summer/winter seasons (i.e., seasonal studies) at mooring locations in potential harvesting areas will be captured.



Images courtesy of Yuzhmorgeologiya**.**

Deep-Ocean Moorings

Will provide data that gives a detailed understanding of the currents around designated areas of interest - also enables long-term modelling of the extent and duration of plumes that may be formed as a result of nodule harvesting. Particle traps will be included in the moorings to measure the actual sedimentation rates delivered to the seafloor.



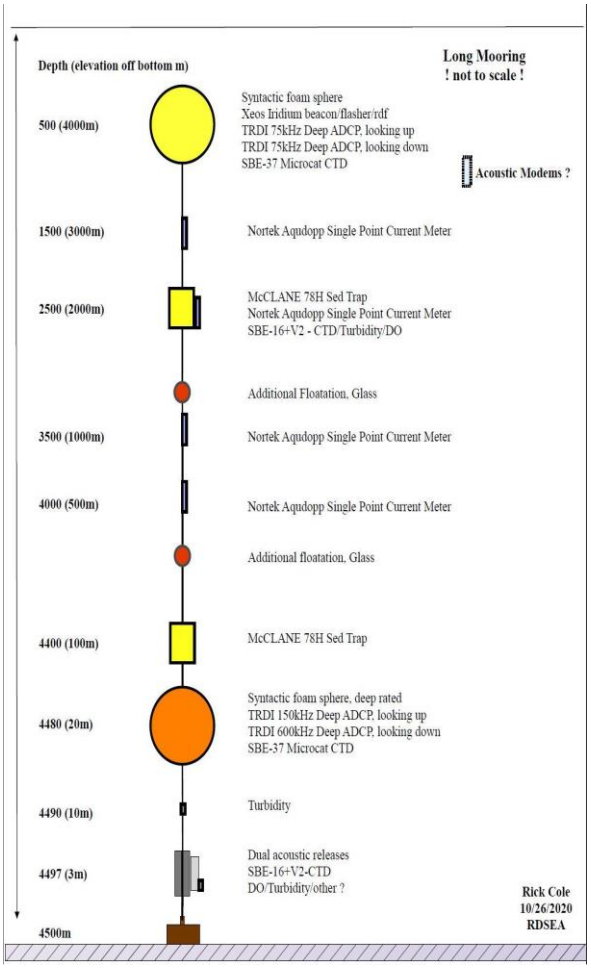
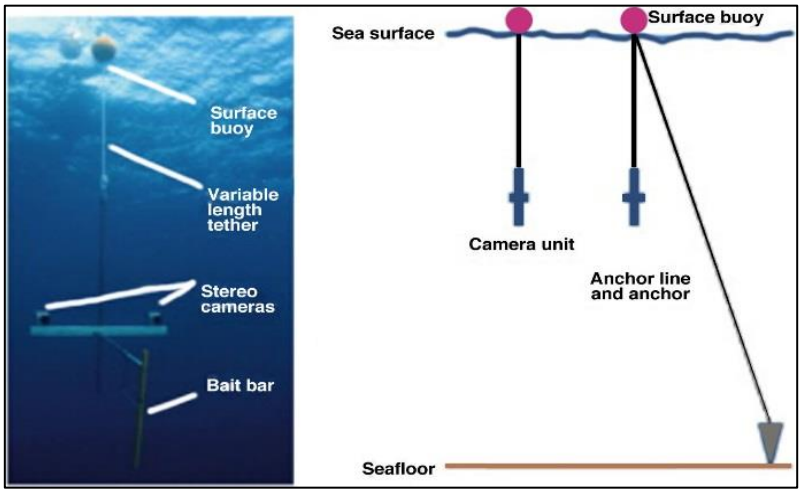


Illustration from RDSea.

Plankton Nets, Fishing Instruments

Provides baseline plankton assessments within the water column, including baseline metal concentrations and fish populations.



Plankton net with flow meter / © Peter Verhoog

Moored Hydrophone

Provides acoustic data - incorporated into the moorings or landers used for physical oceanography studies, or as stand-alone moorings.

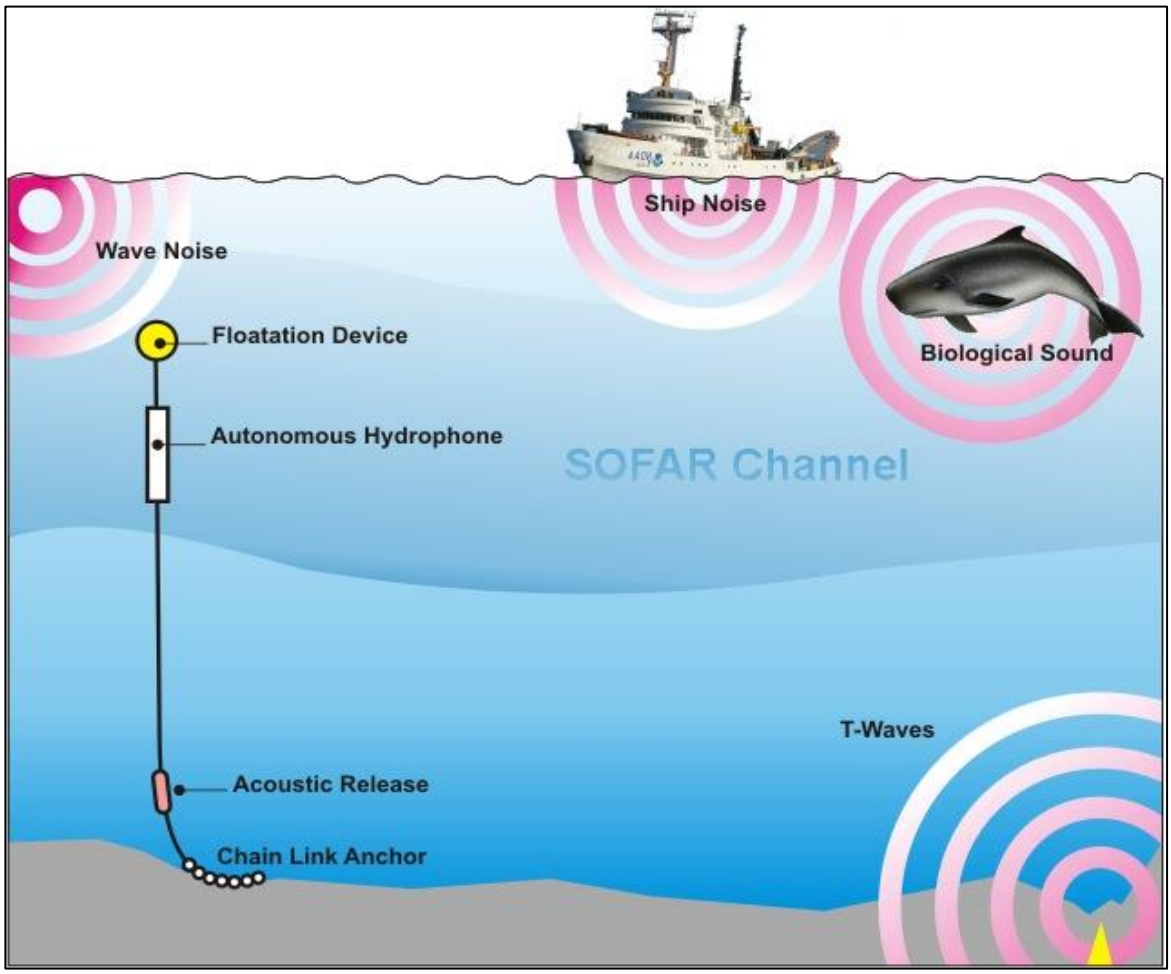


Image courtesy of Kompasiana

Moored (and some Baited) Time Lapse Cameras

Provides visual information to help analyse baseline biological conditions at and immediately above the seafloor and predict the impact of harvesting activities on biological communities.

Photo courtesy of Hellovenus

Benthic Mini-Landers

Monitors physical transport and biogeochemical processes that combine to control distributions of both suspended particulates and dissolved chemical parameters within the benthic boundary layer (BBL).

Images courtesy of UNC-CH.