EXECUTIVE SUMMARY

Introduction

Nauru Ocean Resources Inc. (NORI) plans to carry out testing of a polymetallic nodule collector system (the Collector Test) in the NORI-D lease area (NORI-D) of the eastern Clarion Clipperton Zone (CCZ), Central Pacific Ocean. NORI has commenced an Environmental and Social Impact Assessment (ESIA) in support of an application to the International Seabed Authority (ISA) for a contract to commercially collect deep-sea polymetallic nodules. Testing of a prototype collector vehicle (PCV) and riser system is a mandatory sub-task of the overarching operational ESIA. The ISA requires a dedicated assessment of the technical and environmental performance of the prototype system, which is one fifth of the proposed commercial scale.

The Collector Test Environmental Impact Statement (EIS) must be submitted to the Secretary-General of the ISA no later than one year in advance of the activity taking place. The current schedule has the NORI-D Collector Test EIS being submitted Q3/2021 and the test being conducted in Q3/2022, with the overarching operational EIS to be submitted Q2/Q3 2023.

The collector test will take place in international waters and will adhere to the latest recommendations of the ISA (paragraph 38 and Annex III in ISBA/25/LTC/6/Rev.1; 30 March 2020), the governing body that organises, regulates, and controls all mineral-related activities in international waters beyond the limits of national jurisdiction (referred to as “the Area”). This recommendation defines the activities that require an EIA, the form and content of the EIS, and guidance on expectations for baseline studies, monitoring and reporting.

Approach

Annex III of ISA Recommendations (ISBA/25/LTC/6/Rev.1) states that the assessment of impacts from activities on the seafloor should be appropriate to the nature and extent of the activity being considered and should also ensure that no significant harm is caused by the activities conducted during exploration. The proposed work program is underpinned by a detailed risk-based assessment that considers the representativeness of the study area, its dimensions, the duration and sequencing of system testing, and the environmental performance data to be gathered at each stage of the test. The collector test will take place over a period of approximately 60 days with all seafloor trials conducted within an 8km^2 test area.

Current Environmental Status

In 2012, NORI commenced a program of research campaigns to develop the environmental baseline for the NORI-D operational ESIA. As of July 2021, fourteen research campaigns to the NORI leases have been completed. These have provided samples from box and multi cores for biological, geochemical, geotechnical and mineral assays; and installed and serviced three oceanographic moorings to monitor current and water quality throughout the water column. During 2020, 25K+ benthic images were collected using ROV mounted cameras, 8,000+ sediment samples and biological specimens were collected using benthic cores from 47 seabed sites. Pelagic biology studies were initiated in Q1 2021. The forward work plan over the next 2 years will complete the scope of environmental baseline studies developed by NORI (2020) which address the current ISA recommendations.

Many of the specimens and samples collected are still in the process of being identified and analysed. Once the environmental program is complete the data set will be the most comprehensive single body of information on the biology of the seabed, sampling procedures, and environmental impacts of collecting nodules from the seafloor of the CCZ.

The collector test forms an important component of the baseline data collection program, which is in progress and will be completed prior to any disturbance from any activities.

Selection of Collector Test Area & Test Field

The collector test will be conducted within an 8 km^2 Test Field (TF) in a designated 150 km^2 Collector Test Area (CTA). The CTA has been selected to be representative of the target mining areas represented within NORI-D, based on bathymetry, slope (max. 4°), water depth, nodule type, nodule distribution, and a geoform classification.

Nine potentially suitable TF sites were initially identified for comparison within the CTA. The TF best meeting the criteria is located in a Level 2 geoform ("Flatter area"), which is well represented throughout NORI-D and the wider CCZ. This geoform covers 8,535 km^2, approximately 35% of NORI-D. This provides a high level of confidence that any biological communities disrupted by the collector test will be well represented throughout other parts of NORI-D as well as the wider CCZ.

Once the proposed collector test activities have been completed the TF and other impacted areas of the CTA will be designated as Impact Reference Zones (IRZs). A post-test monitoring program for the IRZ will be included in the operational Environmental Management and Monitoring Plan (EMMP) developed for submission with the application for a commercial contract. Monitoring will continue for the duration of the contract and closure plan period.

The 8 km^2 TF is the only area that will be directly disrupted by testing and represents 0.09% of the geoform/habitat represented on NORI-D and does not include any potentially sensitive geoforms or habitat types, such as seamounts. Of the 8km^2 TF only 0.5km^2 will be directly disturbed by the tracks of the PCV, although it is anticipated that the total area that will be subjected to increased levels (>0.5 mm) of sedimentation after the completion of the collector test will be approximately 6 km^2.

Recently completed modelling of both mid-water and benthic plumes indicates that the total suspended solids (TSS) concentrations will return to background levels within 500 - 1000m from the point of plume generation. This provides a high degree of confidence that indirect impacts, such as deterioration in water quality and sedimentation within the water column and benthos, are unlikely to extend beyond the CTA and will be mostly contained to the TF.

Collector Test Components

The main components to be tested include the Surface Support Vessel (SSV), a dynamically positioned ship that will accommodate, launch, and recover the PCV and provide all other associated support equipment. The PCV will be constructed at one-fifth of the scale of the proposed commercial size, but otherwise, is a similar tracked vehicle that uses suction technology to collect nodules from the seafloor and will be controlled via an umbilical from the SSV. A riser and return system will transport the collected nodules from the seabed to the surface and discharge water separated from nodules via a return pipe at a trial depth of 1,200m (the outlet to be positioned below the mesopelagic zone). Assistance to the PCV for monitoring, attaching the riser system, visual and sonar surveys etc. will be provided by a Remotely Operated Vehicle (ROV). Umbilicals on both the PCV and the ROV will provide the power and control of all the subsea equipment from the SSV to the seafloor.

A second research vessel will also be on hand as a platform for scientific monitoring during the collector test.

Collector Test Program

The surface vessel will transit from the port of San Diego, USA. to NORI-D for an estimated 60 days on location. Once initial field inspection and preparation are complete, the PCV will be lowered to the seafloor and the testing sequence will commence with manoeuvrability and pick-up tests. These will involve straight line and turning tests, obstacle avoidance tests and line tracking tests, taking an estimated 97 hours to complete. This will be followed by pick-up efficiency tests, requiring an estimated 127 hours. During these trials the PCV will still not be connected to the riser system and any nodules collected will be discharged behind the PCV.

The next stage involves the riser installation, commissioning and integration testing (210 hours), followed by system line and manoeuvring test runs, initially without nodule production at slow speeds (0.1 to 0.5 m/s), then with nodule production ramp-up to full capacity (319 hours). Testing will progress to performance test runs to determine nodule production rates and efficiencies under straight line, 180° turning, and contour mining; this will be followed by advanced capacity and slope ability test runs. The trials will end with an emergency shutdown test prior to de-commissioning and site closure.

The estimated overall total time requirement for system testing is 860 hours, during which the PCV will travel approximately 82 linear kilometres and collect approximately 3600 wet tonnes of nodules.

Physicochemical Environment

The CCZ is a 4.5-million-km^2 region in the northern part of the Central Pacific Ocean, approximately 1,700 km to the northwest of Mexico. Water depths within NORI-D range from approximately 3,000 to 4,600 m, with isolated seamounts of volcanic origin occurring in the southern half, becoming larger and more prominent towards the southeast. Bathymetric data for NORI-D was collected in 2012 (Campaign 1) from full-ocean depth multibeam system, with 25,720 km^2 of seafloor mapped.

The climate is dominated by north-easterly trade winds from April to November. Precipitation and cloud cover are sporadic but higher in the northern winter. Hurricane season starts in May, subsiding generally by October or November.

Three oceanographic moorings have been deployed in NORI-D since October 2019, to collect baseline metocean data throughout the water column in proximity to the CTA and PRZ. These are equipped with a range of instrumentation to measure currents, physical water quality parameters, sedimentation, acoustics and a seafloor camera system. Five water quality sampling stations were established in 2019 to collect samples from 16 depths within the water column for analyses of alkalinity, chlorophyll-*a* (for water depths <1,150m), nutrients, trace metals, metalloids, carbon and TSS.

Seafloor sediment chemistry samples have been collected from 235 locations within NORI-D to determine horizontal and vertical variability within the 0 to 1 cm, 1 to 5 cm and 5 to 10 cm sections of cores, for sediment particle size, total metals, carbon and nutrients. Preliminary comparisons of the geochemistry of sediments in the CTA and the PRZ have been conducted to compare nodule types, geoforms, microbial respiration, alkalinity and nutrients. Preliminary results have found no evidence to suggest differences in key geochemical parameters between sites.

Three types of nodule distribution have been characterised, based on nodule size, density, or abundance, benthic mapping by multivariate cluster analysis has identified an 8-cluster geoform classification. Biological communities are expected to be organised in response to these abiotic geoform substrate types and mapping of geoforms and substrates provide a hypothesis of the typology and distribution of ecologically relevant habitats. This information has been used to inform the selection of the CTA, TF, PRZ and benthic sample sites for Before-After-Control-Impact (BACI) monitoring studies.

Biological Environment

Studies are currently underway to characterize the various biological communities represented in the CTA and PRZ as part of the operational ESIA. This involves a comprehensive program of benthic and pelagic sampling, including: box coring, multi coring, video transects from robotic and autonomous vehicles, MOCNESS nets, benthic landers and free-floating pelagic samplers. Results will provide a baseline for the BACI monitoring studies that will be ongoing through the operational monitoring phase of the project.

The collector test is considered essential to fully understand the magnitude of environmental impacts from polymetallic nodule collection and the sensitivities of the impacted biota. This information will be available to inform the operational ESIA.

The NORI environmental campaign schedule is summarised below.

#	Campaign ID	Start Date	End Date	Focus
1	Campaign 4A	2/10/19	23/10/19	Deployment of three oceanographic moorings within NORI-D to collect continuous metocean data. Water sampling and oceanographic profiling also conducted.
2	Ocean Infinity	23/05/20	30/05/20	Over 25K seabed images collected from PRZ and TMA used for megafauna identification and quantification.
3	Campaign 4D	16/6/20	15/7/20	Serviced the oceanographic moorings deployed at NORI-D during Campaign 4A. Conducted additional oceanographic profiling.
4	Campaign 5A	16/10/20	30/11/20	Collected data on the benthic biology, sediment geochemistry and surface biology of NORI-D using box-core, multicore and floating hydrophones.
5	Campaign 5B	5/3/21	14/4/21	Pelagic biology studies of NORI-D supported by ROV, CTDs, MOCNESS nets and rosette water quality samplers for trace metals.
6	Campaign 5D	27/4/21	12/6/21	Collected seasonal data on the benthic biology, sediment geochemistry and surface biology of NORI-D using box-core, multicore and floating hydrophones.
7	Campaign 4E	6/7/21	29/7/21	Serviced the oceanographic moorings deployed at NORI-D during Campaign 4A. Conducted additional oceanographic profiling.
8	Campaign 5C	21/9/21	2/11/21	Seasonal pelagic biology studies of NORI-D supported by CTDs, MOCNESS nets and rosette water quality samplers for trace metals.

#	Campaign ID	Start Date	End Date	Focus
9	Campaign 5E	12/11/21	22/12/21	ROV pelagic and benthic transects and sample collection. Collection of seasonal seabed images collected from PRZ and TMA used for megafauna identification and quantification.
10	Pre/Mid- Collector Test	Q2/2022	TBA	Studies before and during the Collector Test will be conducted during this campaign.
11	Campaign 4F	Q2/2022	TBA	Serviced the oceanographic moorings deployed at NORI-D during Campaign 4A. Conducted additional oceanographic profiling.
12	Post - Collector Test	Q3/2022	TBA	Disturbance studies during and after the Collector Test will be conducted.
13	Campaign 4G	Q2/2023	TBA	Serviced the oceanographic moorings deployed at NORI-D during Campaign 4A. Conducted additional oceanographic profiling.

As studies are currently in progress no published data is yet available. An overview of preliminary findings is provided below, with additional detail in the main report.

Benthic habitat

The nodule provinces found in the CCZ typically provide hard substrates in the form of the nodules and soft substrates in the red clays that surround them. Thus, there are organisms that live in the sediment, on the sediment, attached to the nodules and those that are free swimming.

The benthic habitat represented by the CTA and TF is classified as an abyssal plain geoform on which sediments are overlain with medium-sized (1 to 10 cm) and densely packed nodules (termed Type 1 nodules). Many nodules are in contact with their neighbours and cover over 50% of the seafloor.

Benthic fauna

Over 25K images of the seafloor have been collected from NORI-D and detailed analysis of the images for benthic megafauna is currently in progress. Preliminary results include representatives of the following megafauna groups: anemones, sponges, corals, shrimp, holothurians, brittle stars, barnacles and nudibranchs.

Preliminary analysis of macrofaunal communities from the CTA suggests dominance by deposit feeding annelids and crustaceans is as expected for the CCZ; and when meiofaunal taxa are excluded, the most abundant macrofaunal component is annelids (polychaete worms).

Analysis of a preliminary data of 0-1cm meiofauna samples from the CTA suggest densities of at least 40 individuals per 10 cm^2 in the surface 1 cm, comparable in magnitude to data from meiofauna baseline studies in other eastern CCZ contract areas.

Preliminary eDNA analysis was used to complement the traditional morph-taxonomy-based methods of describing biodiversity, which focusses on selected morphologically identifiable biological quality elements (mega-, macro-, and meio- fauna). Eukaryotic operational taxonomic units (OTUs) were classified into 6 different categories (Alveolata, Excavata, Metazoa, Rhizaria, Stramenopiles and others).

Metazoa were classified into 5 categories (Annelida, Arthropoda, Nematoda, Nemertea and other). The taxonomic composition as depicted by the two markers presented a significance dominance of nematodes and annelids.

Pelagic fauna

Data from moorings located close to the CTA and PRZ indicate that diel vertical migration of zooplankton was readily observable on the upward-and downward-looking 75 kHz ADCPs mounted at 500 m depth. The majority of daytime backscatter fell between 300 m to 550 m depth, with weaker scattering signal extending as deep as 850 m.

Migration corridors appear to extend between 100 m to 300 m depth with a steep vertical orientation. There appeared to be a strengthening of the overnight signal in the upper 100 m of the water column likely a function of scatterers concentrating into surface waters.

Overall, this pattern is in general agreement with previous studies in the Eastern Pacific with migrators correlating to oxygen at low oxygen levels.

Impacts

The main sources of impact to biota from the collector test will be from the removal of hard substrate in the form of nodules, disturbance of sediment and the creation of plumes. Nodule collection will not only remove habitat but will also cause physical trauma to sessile organisms living on the nodules and in the sediments. As the PCV moves across the seabed a benthic plume will be generated behind the vehicle which will disperse and settle on organisms and habitat outside of areas of direct physical disturbance. Settling sediments can clog respiratory apparatus and filter feeding structures of sessile benthic organisms as well as coating nodules making hard surfaces unavailable for larval settlement.

Surface processing water will be released from the SSV via a return pipe, for the collector test the outlet depth will be set at 1,200m. This mid-water plume will disperse through the water column and may interfere with feeding efficiency and respiratory capacity of pelagic organisms inhabiting the bathypelagic zone.

Impact Assessment

Impacts have been categorised as those resulting from planned activities (e.g., operation of the collector system) where the ‘significance’ (i.e., magnitude*sensitivity) is the primary consideration; and those that are a result of an unplanned activity (or hazard), where ‘risk’ (i.e., likelihood*consequence) is the primary consideration. Effective impact assessment requires both an understanding of the significance of the impact from planned activities and the risk of impacts from unplanned events.

An analysis of the Environmental Effects of the collector test identified 34 project related activities and events as potential sources of impact, and 25 Valued Ecosystem Components (VECs), distributed through the atmospheric, euphotic, mesopelagic, bathypelagic, and abyssal zones of the water column and benthic environment. A Leopold Matrix is used to evaluate the 850 (34x25) potential interaction points between project activities and VECs; 103 are identified as interactions with potential to cause impact. Where zero interaction was anticipated no further assessment is applied.

The highest number of vulnerable VECs are in the bathypelagic and abyssal zones and most of the potential impacts are associated with nodule production (specifically system test runs). This information is used to focus the EIA on potentially high-risk activities, vulnerable VECs, and areas that may be exposed to multiple and/or cumulative impacts.

The impacts of nodule production to biophysical VECs in the bathypelagic and abyssal zones are primarily associated with the mid-water column discharge plume, the benthic plume, nodule removal, and sediment disturbance by the PCV.

The findings of the impact assessment highlight that there is still a degree of uncertainty around sensitivity of many of the biological VECs. Data collected during the collector test and the operational ESIA will contribute to reducing levels of uncertainty prior to the commencement of commercial operations.

Application of a precautionary approach requires that measures be implemented to minimize impacts resulting from, or exacerbated by, any paucity of information on how VECs may respond to pressures resulting from activities associated with the collector test. NORI has addressed this by incorporating the following features into the design of the collector system and test program which reduce the magnitude of impacts to both physicochemical and biological VECs to as low as reasonably practicable (ALARP), while still achieving the objectives of the collector test.

Measures to minimize impacts to physicochemical VECs:

1. All collector test operation will be conducted within an 8 km^2 TF.
2. The area of direct physical disturbance within the test field is limited to approximately 0.5 km^2.
3. Sedimentation modeling indicates that the total area of the seabed that will be subjected to increased levels (>0.5 mm) of sedimentation after the completion of the collector test will be limited to approximately 6 km^2.
4. Modelling of the benthic plume indicates that the area impacted by sedimentation (>0.5 mm) outside the TF, but still primarily within the CTA, is limited to approximately 2 km^2.
5. The PCV is 20% of the scale of the full-size collector, considered sufficient to meet the testing objectives while minimizing the disturbance footprint.
6. The CTA is in the abyssal plain geoform, which is the most common geoform in NORI-D and the wider CCZ. Mapping and geophysical sampling confirms a predominance of Type I nodule facies in this geoform which is the most common nodule facies across NORI-D. Therefore, it is likely that the physicochemical VECs on the CTA are well represented regionally.
7. The TF selected is not close to any potentially sensitive, or poorly represented, habitat features.
8. The duration of the entire collector test is limited to 860 hours, and the duration of system testing (period of maximum plume generation) is limited to 259 hours. Most impacts associated with the collector test will be temporary, of short duration and spatially constrained.
9. The depth of the outlet of the mid-water return pipe has been increased from 1,000 m to 1,200 m to avoid the biologically richer mesopelagic/bathypelagic transition zone.
10. The TF and impacted parts of the CTA will be designated as IRZs following the collector test and used as a reference site for ongoing long-term environmental studies.
11. A precautionary approach has been applied to significance analysis by assigning a maximum sensitivity score (that is, most conservative) to VECs for which there is currently uncertainty around how they might respond to an impact.
12. All relevant international standards and best practices (for example, MARPOL) will be adopted regarding the vessels commissioned to conduct the collector test.
13. The results of monitoring during and after the collector test will inform and validate plume modelling and impact prediction for the operational ESIA.

Additional measures to minimize impacts to biological VECs:

14. The wet weight of nodules collected during the collector test will be limited to approximately 3,600 tonnes, limiting the impacts of the test due to loss of nodule habitat and direct impacts to benthic biota.

15. Nodules >80 mm in diameter will not be collected. Larger nodules will be left in the TF where they may continue to provide habitat value for nodule obligate biota, if not buried by sediment.
16. Modelling of the mid-water plume predicts that all exceedances of ≥0.1 mg/l will be spatially confined to a small area around the actual discharge points over the 259 hours of operations. The modelling does not show a strong lateral trajectory in any direction. Impacts associated with the mid-water plume are characterized as temporary, of short duration and confined to a small footprint.

Significance analysis demonstrates that with the implementation of measures to minimize the magnitude of impacts, and the application of a precautionary approach to account for uncertainty, no significant inherent impacts are anticipated from activities associated with any aspect of the collector test.

Major Hazards, Mitigations & Emergency Response Plans

The specialised oceanographic vessels that will be commissioned for the collector test and environmental monitoring studies are fully equipped for purpose, complete with all documentation of crew qualifications, health and safety procedures, emergency response plans, international maritime and navigational certification, MARPOL compliance, oil spill prevention and response plans, organisational responsibility charts and current records of audits, inductions, training, and drills etc. The existence of, and adherence to, these systems and processes will be confirmed by NORI as part of vessel contractual arrangements, as has been the case for all previous campaigns.

Once the vessel is selected, job-specific operating procedures will be prepared to address the hazards, environmental risks, and mitigations specific to the activities of the contracted scientific staff and points of integration with the vessel's overarching health, safety and emergency response procedures.

The Hazard Identification Risk Assessment (HIRA) used conforms to international principles of risk management, where criteria have been developed in a 5-step matrix to rank the likelihood (from rare to almost certain) and consequence of potential impacts (none to severe), respectively. The consequence of potential project impacts due to major hazards is defined in terms of four aspects – environment, health and safety, business reputation and financial loss.

Risk Prioritisation

The risks posed by predictable impacts and unpredictable events (hazards) have been assessed, based on the current understanding of the activities associated with the Collector Test and receiving environment, no impacts have been assessed as being of 'high' risk. This is primarily due to the routine nature of many of the activities (e.g., operation of surface vessels) and/or the small scale of the Collector Test. Therefore, it is not considered necessary to develop additional mitigation measures to supplement the management measures described.

Activities and hazards ranked posing 'medium' risk will be prioritised for resourcing and monitoring in the EMMP.

Cumulative Impacts

Cumulative impacts have been considered at three levels:

1. project scale;
2. the project and third-party impacts from other anthropogenic activities (e.g., fishing); and
3. the project and other environmental changes such as climate change and rising sea temperature.

There is potential for cumulative impacts at the project scale (level 1); for example, the 0.5km^2 of the TF that is disturbed by the PCV tracks will also be impacted by sedimentation from both the benthic and mid-water plumes. The cumulative impact of successive sedimentation events resulting from the Collector Test has been modelled, as has the cumulative impact of an extended period of mid-water plume release. In both cases the impacting activity is temporary and of short duration and considered unlikely to result in significant cumulative impacts.

Cumulative impacts with third-party activities (level 2) and environmental change (level 3) are unlikely to be significant due to the low levels of other anthropogenic activities (e.g., fishing and shipping) in the area and the small scale of the Collector Test.

Environmental Monitoring & Reporting

Monitoring of the collector system performance will be conducted over two campaigns currently scheduled for Q3/2022. The monitoring program will follow a pre-, during, and post-test sequence and will focus on the technical performance of the collection system and short-term environmental impacts. The collector test provides an opportunity to challenge assumptions made during the development of plume models and collector system design.

The performance of the collector system will be monitored in real-time in the near-field (that is, <200m from the collector system) and far-field (≥200m to the limit of measurable change in an environmental parameter). It is acknowledged that this is a broad definition and that far-field limits will vary depending on the metrics being measured. However, real time measurements of dynamic parameters such as total suspended sediment (TSS) will provide indications of the likely extent of other ecological changes.

For the purpose of monitoring collector system performance, the receiving environment has been divided into the following impact zones based on the expected nature of the impacts and the monitoring methods that will be applied:

- Impact Zone 1 – Atmosphere, Surface Waters and Euphotic zone (0 m - 200 m)
- Impact Zone 2 – Mesopelagic (200-1,000 m) and Bathypelagic zone (1,000 m - 4,000 m)
- Impact Zone 3 – Abyssal (4,000 m - 6,000 m) and Benthic (seabed) zones

Long-term environmental studies will monitor how benthic communities recover following disturbance and will be conducted over years to decades. Details of monitoring methods will be included in the operational EMMP and results will be benchmarked against the pre-test baseline of the CTA and PRZ. Parts of the CTA designated as IRZs will not be mined any further following the test, and along with the PRZ and other control sites, the areas will be preserved as reference sites for the duration of mining operations.

A collector test specific EMMP will also be developed prior to the start of activities, this will include commitments to the requirements for monitoring and validating the main predicted impacts from the collector test.

Limitations, Assumptions & Uncertainty

Limitations

- This EIA is only applicable to the Collector Test.
- The plume modelling results only applicable to the Collector Test.
- The findings of this EIA are applicable to the Collector Test activities only and not the operational phase.

Assumptions

The findings of this EIA are based on the following assumptions:

- All activities associated with the collector test are confined to the CTA (150 km^2) and the over lying water column.
- All direct disturbance of the seabed by the PCV is confined to the TF (8 km^2).
- The overall area of seabed that will be directly disturbed by the PCV is limited to 0.5 km^2.
- Collector test activities will be conducted in accordance with the test plan described.
- All onsite activities associated with the Collector Test will be completed within a 3-month period. The duration of the entire collector test is limited to approximately 36 days, and the duration of system testing (period of maximum plume generation) is limited to approximately 12 days. Most impacts associated with the collector test will be temporary, of short duration, and spatially constrained.
- The benthic and mid-water plume exceedance models are an accurate representation of plume dynamics.
- Seasonal variations in physical oceanography (e.g., current direction; water temperature etc.) will not cause a material change in the magnitude of TSS exceedances described by the plume models. Any seasonal change in direction of plume drift is inconsequential to the findings of this EIA.
- The biota impacted by activities associated with the Collector Test are well represented in similar abyssal plain and pelagic habitat abundant throughout NORI-D and the wider CCZ.

Uncertainty

Uncertainty is almost unavoidable in EIAs as they typically involve situations in which the full range of possible options and their impacts cannot be known. Assumptions then have to be made to address knowledge gaps, which introduce uncertainty into the EIA process. It is important for informed decision making that the sources of uncertainty are identified and treatments proposed.

The main sources of uncertainty in the Collector Test EIA are associated with the plume models which are in the early stages of development and need to be verified by field observations and the preliminary nature of the biological baseline. An uncertainty profile has been developed for the collector test which demonstrates that small scale of the Collector Test minimises the potential magnitude of key impacts for which there is high unresolved uncertainty (i.e., plume size, area of sedimentation, area of seabed disturbance).

Consultation & Review

NORI conducted a global stakeholder consultation workshop Q1/2020 to inform both the collector test EIA and operational ESIA. ISA recommendations (ISBA/25/LTC/6/Rev.1/E41(d)) encourage sponsoring states to also conduct stakeholder consultations as part of the collector test EIA. This EIS will be made available by Nauru for stakeholder comment.

The EIS document has also been subjected to expert review, comments and suggestions were provided and addressed.

This document has been reviewed by a Certified Environmental Impact Assessor (EIANZ) who confirms that the EIS methodology and processes are consistent with international good industry practice.

Conclusion & Recommendation

A robust precautionary approach has been applied to this EIA with a conservative position adopted when there is uncertainty or ambiguity around the sensitivity of VECs. The information presented supports a finding that the design features incorporated into the collector system and the small scale of the test program sufficiently minimise all impacts to non-significant levels without the need for additional focused mitigation measures. In the absence of significant impacts, the risk of the collector test resulting in 'serious harm' to the marine environment at a regional scale, is assessed to be negligible.

The collector test should proceed under the conditions described in this EIS. The learnings from the information gathered during the testing should be reflected in the findings of the operational EIS and applied to the design and operations of the full-scale system to reduce uncertainty and minimise environmental impacts during commercial operations.