THE PEW CHARITABLE TRUSTS

2005 Market Street, Suite 2800, Philadelphia, PA 19103-7077 P +1.215.575.9050 F +1.215.575.4939
901 E Street NW, 10th Floor, Washington, DC 20004 P +1.202.552.2000 F +1.202.552.2299
Avenue des Arts 40, 1040 Brussels, Belgium P +32.2.274.1620 F +32.2.274.1630
The Grove, 248A Marylebone Road, London, NW1 6JZ P +44 (0) 20.7535.4000

Kane Amandus
First Secretary, Permanent Mission of Nauru to the UN
EISconsultation@nauruun.org

CC:
Michael Lodge, Secretary-General
Harald Brekke, Chair, Legal and Technical Commission
International Seabed Authority

The Pew Charitable Trusts is an independent non-profit, non-governmental organization dedicated to serving the public interest by improving public policy, informing the citizenry and stimulating civic life. In 2017, Pew assembled the Code Project, an international collection of scientists and legal scholars, to review and comment on aspects of the evolving governance regime for mining in the Area. At Pew's request, members of the Code Project reviewed the Environmental Impact Statement (EIS) recently circulated by Nauru Ocean Resources Incorporated (NORI) to conduct technical trials of a prototype nodule collector in the Clarion-Clipperton Zone in the Pacific Ocean in 2022. On behalf of the Code Project, we respectfully submit the attached comments.

In summary, the absence of any biological baseline data in the EIS is a critical deficiency and disregards the International Seabed Authority's recommendation to provide such data prior to testing.[1] This statement is intended to assess environmental impacts from a test mine, but says virtually nothing about what marine life the test may put at risk or how such risks will be monitored and controlled. NORI's assurances that it will provide baseline data in the future are not meaningful without an opportunity to review such data prior to the test's approval. In lieu of an adequate baseline, it seems that NORI has offered a research plan to develop one – this is no substitute.

On 31 August 2021, the Secretariat of the International Seabed Authority (ISA) noted the Secretary-General's request that NORI provide additional information to supplement this EIS, including the status of its environmental baseline studies (ISBA/26/LTC/10). It is unclear, but seems unlikely, that the EIS circulated by NORI in October and dated "July 2021" is responsive to this request. It also appears that the ISA's Legal and Technical Commission has commenced its review of the EIS concurrently with this stakeholder consultation. We therefore respectfully submit to the Republic of Nauru, the ISA's Secretary-General and the members of the LTC together: incorporating this EIS into the programme of activities under NORI's contract will result in a test mining operation with impacts that are poorly understood and monitored while inviting future deficient submissions to the ISA. We urge you not to do this.

Yours sincerely,

Andrew Friedman
Project Lead, Seabed Mining
The Pew Charitable Trusts

[1] Recommendations for the guidance of contractors for the assessment of the possible environmental impacts arising from exploration for marine minerals in the Area (ISBA/25/LTC/6/Rev.1 and Corr.1)

Republic of Nauru & Nauru Ocean Resources Incorporated (NORI)

NORI Collector Test Environmental Impact Statement (EIS)

OFFICIAL PUBLIC COMMENT FORM

The Republic of Nauru, as a Sponsoring State to the Nauru Ocean Resources Incorporated (NORI) is requesting stakeholder feedback on the NORI Collector Test Environmental Impact Statement (EIS) by **November 8, 2021.** More information about the stakeholder consultationprocess, and an electronic version of this form, are available at www.eisconsultationnauruun.org.

Please email completed forms to EISconsultation@nauruun.org with 'NORI EIS Official Comment Form' in the subject of the email.

Thank you for your interest in reviewing the NORI Collector Test EIS. We appreciate your time and input. Contact EISconsultation@nauruun.org with questions or concerns.

CONTACT INFORMATION

First Name/Given Name: Andrew

Last Name/Surname: Friedman

Government (if applicable): N/A

Organization/Affiliation (if applicable): The Pew Charitable Trusts

General Comments
Lack of baseline biological data: The EIS does not contain any biological data from the NORI contract area. This is a clear and significant deficiency and is contrary to the ISA's Recommendations[2] and the Regulations for Exploration. NORI's assertions that baseline data will be ready in months or years to come cannot be taken as a substitute for the data it is required to provide. Moreover, significant gaps persist in scientific knowledge regarding the CCZ's biological communities. The EIS reflects unrealistic expectations as to how quickly scientific results can be generated. NORI's deferral of its baseline obligations also undercuts the value of stakeholder review, as it prevents stakeholders from assessing NORI's proffered conclusions about the potential severity of impacts from the proposed test. Finally, the absence of baseline prevents adequate monitoring. Without an adequate point of comparison, the environmental data collected after the test will be of little value. There are some positive elements. Qualified experts have been engaged to support future work. The EIS is also well structured, and the cruise programming in the last 3 years is impressive. However, the lack of any biological data renders the EIS incomplete, and thus in non-conformity with the ISA's stated requirement for an EIS. If the ISA is to maintain its credibility as a regulator, it cannot accept an EIS where key elements are missing and the timing, amount suitability and statistical rigour of the data still to be presented.
Lack of a robust monitoring plan The EIS also provides very little explanation of the monitoring activities that will be use to assess impacts and gather future relevant data. Without more, it is impossible to determine whether the impacts generated by the test will results in useful information, or whether they meet the standard set by the ISA's guidance that a monitoring plan "should be able to detect impacts in time and space and to provide statistically defensible data."
Questions regarding process: This EIS raises several questions and concerns about the process for its review. NORI's EIS is dated "July 2021". On 31 August, 2021, the Secretary General provided initial comments to the EIS (ISBA/26/LTC/10)[3] asking NORI to provide an updated status of environmental baseline studies before the start of its planned activities. This would seem to indicate that the EIS was not "complete" according to section 38 (b) of ISBA/25/LTC/6/Rev.1[4]. It is now unclear if the version of the EIS provided for stakeholder comment has been submitted after the SG's

[2] Particularly ISBA/25/LTC/6/Rev.1, Recommendations for the guidance of contractors for the assessment of the possible environmental impacts arising from exploration for marine minerals in the Area.

[3] ISBA/26/LTC/10 Review of the environmental impact assessment statement submitted by Nauru Ocean Resources Inc. (31 August 2021)

[4] (b) The Secretary-General will acknowledge the receipt of the environmental impact statement within 30 days and check for completeness against the template as contained in annex III to the present recommendations. If the submission is incomplete, the Secretary-General will contact the contractor to seek additional information. The contractor is to respond within 30 days.

review or is the same version the SG reviewed; if an updated EIS is still forthcoming based on the SG's assessment; if the LTC has already begun its review of the EIS, or will it wait until an updated EIS is submitted; if there will be further stakeholder consultation once future data is submitted; and finally if stakeholders will have the time and capacity to review multiple iterations of this document. In the face of these outstanding questions, it would be premature to incorporate this EIS into the programme of activities under NORI's contract.

	Specific Comments
	Must include the page number from the EIS report for reference
Page and Section	**Comment**
1.5.1 Page 1-4	Clarification needed as to whether NORI published an EIA for benthic sled surveys and where the data from such surveys was made available.
Page 2-4	In its summary of relevant legislation of the Republic of Nauru that govern its engagement with seabed mineral activities, no reference is made to EIA or other environmental management laws. EIAs and environmental permitting are usually managed by dedicated national environmental laws, rather than mining laws which the International Seabed Minerals Act 2015 refers to. It is also unclear what, if any, feedback NORI has received from the Government of Nauru on this EIS – that is, if the government of Nauru has conducted a national consultation, posed any amendments to the EIA/EIS and/or issued a permit for the proposed activity.
Page 2-6 and 2-7	Regarding the list of conventions, treaties, and standards that might be relevant to this EIS, NORI should clarify – (1) Which of these international agreements, NORI or Nauru as a State Party, considers itself bound to; (2) What the legal requirements of these treaties are, and how NORI will maintain compliance with the listed treaties/conventions as part of this collector test, and (3) If this list is exhaustive. Various conventions concerning maritime safety, crewing, and training are missing from this list – an explanation of their absence is needed. (4) The State or State(s) in which the vessel(s) to be used will be registered. This information would be helpful for due diligence and transparency purposes, and particularly to enable stakeholders to verify that the flag state(s) are signatory to relevant shipping conventions pertaining to environmental matters, as well as human health and safety.
Page 3-8 3.3.1, 3.3.4	There is no biological data from the NORI contract area. While this section refers to data in section 6.3.2, what is contained in section 6.3.2 is a scope of work for studies that will be undertaken later - no data from studies undertaken is presented. Moreover, there is no data given to support the conclusory assertions that habitats in the test mine area (and reference sites) are representative of the contract area.
Page 3-1 3.2	The choice of 1,200m for the release of entrained seawater and sediment from the return pipe needs to be justified in view of the data presented on differences of the returned and ambient water temperature presented in Fig 3.13 and the Dissolved Oxygen profile presented in Fig 5-13 (described in greater detail below). This will have ramifications for the focus of baseline studies on pelagic organisms.

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Page 3-2 3.3.2 and Figure 3-1 Pages 3-2	It is unclear from the text and figure whether the test mine site is representative of the NORI D area, and of the environmental values present within the test site (including habitats). Since there is no biological data in this EIS, and therefore no habitat data, it is unclear how an appropriate PRZ could have been selected. Indeed, from the bathymetry data presented in Figure 3-3, alone, there appear to be some differences in the terrain around the test mine area and the Preservation Reference Zone. An example of this is the relative high topography that surrounds the dotted area in the PRZ. There is also a significant and unjustified distance (100 kilometers) between the PRZ and test site that makes it less likely to be representative. Does NORI expect impacts from the test to travel that far and, if so, is it prepared to monitor them over these distances? It might also be worth noting here that another contractor, in identifying a test mining area and a Preservation Reference Zone, identified originally two similar areas based on seafloor characteristics (as in Section 3.3.1), but the biological communities were found to be different owing possibly to the effect of nearby seamounts and/or the degree of nodule cover. The choice of PRZ was subsequently revised. Fig 3-3 shows a potentially similar situation (effects of geomorphology on biological communities) between the Collector Test Area (CTA) and the Preservation Reference Area (PRZ)Site specific biological data should therefore be urgently assessed.
Page 3-6 3.3.4	The Spearman et al. (2020) reference relates to the top of a seamount. Reference should be made to modelling of plume behaviour on an abyssal plain (e.g. Muñoz-Royo et al. (2021) https://doi.org/10.1038/s43247-021-00213-8).
Page 3-12 3.4.3.	The text indicates that the largest nodules will be rejected – it is not immediately apparent why. This effectively means that if there is a large nodule (8cm) it is going to be sucked up, any life on it destroyed, and then discarded to the seafloor - sterilising the resource and impacting the habitat at the same time. It is also questionable whether a laminar flow is achievable with track movement.
Page 3-12 3.4.3.6	Ten days is a lengthy test of a discharge plume at 1,200 metres, particularly without a more robust impact assessment. Further, the selection of 1200m for the discharge of the returned water and sediment needs to be justified as this depth is where the greatest temperature differential is expected between the returned water and ambient sea temperatures. Deep-sea organisms are known to be particularly sensitive to temperature change. The contractors should consider discharge at a greater depth with a smaller temperature differential(e.g. 1800m) (see also comments on Dissolved Oxygen - Section 5.7.5.3)
Page 3-12 3.4.3.6	Assumptions around nodules <3mm are unclear – the report estimates that 2% of nodules lifted will be discharged in the return water, without knowing the percentage of nodules that are <3mm. More explanation is needed, as returned nodules will be effectively sterilised.
Page 3-12 3.4.3.6	Assumptions/parameters included in this model should be further explained. For example, it seems that water temperature at surface was assumed to be 6.3 degrees, but whether this is based on the residence times, and the temperature of the water as it

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	moves both up and down the pipe is critical to the plume modelling of return discharge.
Page 3-12 3.4.3.10	The EIS should specify whether biodegradable hydraulic oils are going to be used
Page 3-13	There appears to be no design features to minimize the impact of the collector. It may be important to consider these at the collector test stage to assess if such mitigation approaches are possible or beneficial.
Page 3-30	Section 3.6 notes that the workforce might potentially include ISA or Nauru observers.. From a regulatory standpoint, it would be beneficial to have either the ISA or Nauru government representatives on the vessel to monitor the test independently. From a process standpoint, it should be made clear when this decision will be made.
Page 4-1 4.2	When determining what is adverse significant harm, the EIS refers to the Canadian Environmental Agency's 1992 guidance, instead of the ISA's guidance in the draft Guideline on EIA which uses an example from Dong Energy. This presents a larger issue for the ISA regarding a contractor's responsibility to adhere to Guidelines which offer limited instruction on certain issues, including in this instance about the nature of significant harm.
Page 4-2 4.4	Should temperature be added to the physical Valuable Ecosystem Components (VECs)? Should the risks from intentional and accidental leakage of the riser pipe and the discharge pipe on water quality be included in the chemical VECs to match water quality VEC concerns highlighted in Table 4-5 for all water depths? Gelatinous zooplankton should be treated as a separate VEC to other zooplankton taxa - these might be sampled by nets and acoustic methods.
Page 4-3 4.5	Table 4-5 does not specifically refer to the destruction of habitat in the top sediment layers, nor to the removal of nodules, as an impact for assessment. The emergency testing does not list dumping of the riser contents as an impact.
Page 4-9 4.5.1	The methodology quoted as being used for significance assessment is Percival et. al. 1999 – different from the Canadian Environmental Agency standard cited above. Also, there is no discussion as to the extent to which this methodology aligns with any of the guidance provided by the ISA.
Page 4-9 4.5.1.1 – Table 4-8	This table talks about significance scores allocated to impacts. The Negligible definition indicates "Very high probability that the impacted VEC is well represented throughout the CCZ". Here again, the absence of biological data means that any statement about representative probabilities is completely unsupported, given there is no evidence in the EIS of any of the biological VECs in the NORI area. If the "level of detail [required to characterize key environmental attributes] is not available for the collector test as the baseline studies are not yet complete, and there remains a degree of uncertainty around the sensitivity of many of the VECs" then potential impacts cannot be properly assessed.

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	The Dissolved Oxygen data presented in Section 5.7.5.3 indicates that a discharge depth at 1200m is not sufficiently below the lower interface of the Oxygen Minimum Zone (see comments below).
Page 4-11	The EIS states that "Any contribution of the collector test to future cumulative impacts on NORI-D will be considered as part of the operational ESIA." But it does not attempt to evaluate potential cumulative impacts. This appears to be an omission. Some impacts in combination may lead to cumulative effects
Page 5-3 5.5.1.1	There is almost no information in this section at all. Noise is likely to be particularly disruptive in the SOFAR (Sound Fixing and Ranging) channel, where it travels particularly long distances. Yet baseline noise levels at different depths is essential to determine the noise impacts . If this work has been done, a summary of findings should be included in this section. As it reads currently, it is not possible to determine the levels of baseline noise, and as a result not possible to determine the impacts likely to occur because of the project.
Page 5-8 5.6.4	The table does not indicate how much data was obtained from the various moorings referenced. It indicates that no instrumentation was placed in the pelagic zone, however there are statements as to the current speed in that zone. Is this because the ADCPs were upwards facing? It is hard for the reader to assess validity. There is also no supporting data presented in appendices.
Page 5-14 5.7.4 Table 5-6	Detection limits are provided but not any kind of water quality criteria. The detection limit is relative for each laboratory. Stating the detection limit is useful in terms of giving context to the data, but is not an indication of environmental impact. Also, this section does not indicate how many samples were taken - it is not therefore possible to tell whether the average values are statistically reasonable.
Page 5-18 5.7.5.3	Fig 5-13 shows variability in dissolved oxygen levels extending 100km from the Collector Test Site, which may also reflect a temporal component in dissolved oxygen at any one site (the variability noted in Fig 5-13 may occur in both time and space). While the boundaries of an OMZ are not static and will shift over time, no time series data are presented for the TCA at the intended discharge depth of 1200m. In other Oxygen Minimum Zones (OMZ), such as in the Arabian Sea, there is distinct zonation of organisms at the base of the OMZ, at least in the benthic environment, where small changes in oxygen lead to significant changes in benthic fauna. This may also be important at midwater depths too. Based on the paucity of data it is impossible to determine whether the proposed discharge depth is appropriate.
Page 5-18 5.7.5.5	0.1NTU wouldn't normally correlate with a TSS of 2-5 as reported in 5.7.3. A relationship curve to show the relationship between NTU and TSS would normally be required to give meaning to the two.
Page 5-18 5.7.5.8	The wording in this section fluctuates between "x was done" and "y will be done" making it very difficult to understand what data has been used to inform this impact assessment, and what has not. In addition, the data already collected is not presented. This section and the following 5.7.5.9 indicates that samples have been taken but "data is not available" with no explanation as to why it is not.
Page 5-31 5.8.1	This section indicates that an extremely large volume of sampling has been undertaken but that very limited analysis has been conducted. Why have these samples not been analysed in detail and the results used to inform this EIS?

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Page 5-33 5.8.2	For two of the cruises the ISA guidelines for sediment sampling were not followed (i.e. the full 10cm profile was mixed), but they were followed for the third cruise (which means the samples from the third cruise are the only samples for which the assessment of vertical variability of sediment structure could be useful). However, the EIS shows mixed samples from the three cruises, so that none of the data presented meet the ISA recommendations of showing vertical variability of sediment quality.
Page 5-33 5.8.2.1	The data has been interpreted and presented as average "heat source" point data, rather than presenting the actual point source data. This is confusing at best. Also, the test sites are not overlain on the accompanying map so it is not possible to determine whether the test site is representative of the sediment geochemistry across the contract area.
Page 5-39 5.8.5	This section, entitled "Comparison of CTA and PRZ" includes vague graphs, and a conclusory statement that says "Preliminary results found no evidence to suggest differences in key geochemical parameters across test sites (pers comm)" But with no supporting data to support or assess this assertion.
Page 5-42 5.9	Bathymetry data is coarse, with no overlay between the test and reference sites. It is therefore not possible to see whether the test site and reference site bathymetry is indicative of the rest of the bathymetry. Fig 3-3 shows the positions of the CTA and PRZ in relation to the seabed bathymetry data and should have been cross-referenced in this Section. High resolution multibeam bathymetry was collected by AUV in Campaign 3 (2018), but presumably not in the Collector Test Area. Detailed AUV bathymetry of the CTA might have been generated during the Ocean Infinity Campaign in 2020, but is not provided here.
Page 5-44 5.10	Because the sediment quality samples were mixed, it's not possible to determine the sediment characteristics of the two zones (dark brown clay and mottled light brown). So no conclusion can be drawn about the quality of these sediment zones. And again, no data is provided.
Page 5-45 5.11	This section indicates that more than half the nodules are >8cm, but the description of the collector indicates it excludes everything 8cm and larger. The test is unlikely to be representative of a full scale mining machine if it cannot collect more than half of the nodule resource.
Page 5-45 5.11	There is no map of the collector test area showing nodule density, so it is not possible to determine whether the nodule density in either the test or the reference area is indicative of nodule density across the contract area.
Page 5-50 5.12.1	This section acknowledges that mapping of habitats requires both geoform and substrate mapping as well as biological classification, but then indicates that the biological data is not yet available. Consequently, habitat mapping cannot inform the baseline (or the impact assessment for the collector test). There are no useful conclusions drawn in relation to the biological values of each of the geoform types. As noted, the lack of biological data to provide any context on habitats and ecosystems is fatal to the utility of this (or any) EIS. The section on geoform mapping is well conducted, presented and referenced, but highlights the need to look at a finer scale to understand biological communities, and to use stratified random sampling to relate biological distributions to geoform. The EIS notes "the influence of geoform and substrate type on macro-, meio- and microfauna community composition and sediment biochemistry is not yet confirmed

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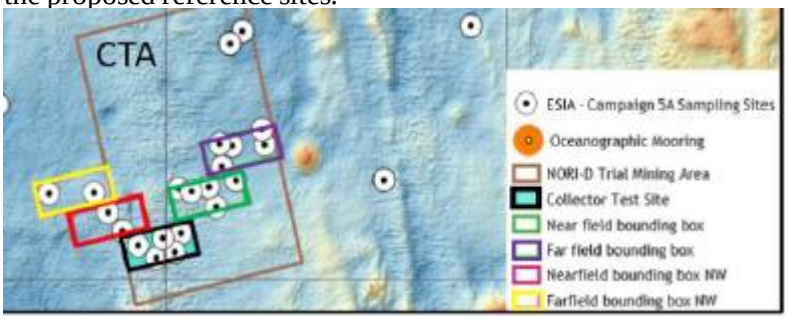
	from previous sampling, due in part to the fact that this kind of a-priori stratification of sampling into habitat strata has not been prioritised until now". The EIS therefore is incomplete with the omission of one of the most important data streams. The assertion "Preliminary results from the NORI-D ESIA baseline studies suggests that macro- and meiofauna communities may be more ubiquitous and that sediment biochemistry may vary on larger spatial scales" needs data to be presented to justify this conclusion in an EIS.
Page 6-1 6.2	This section includes only a summary of scientists who are doing the work, and a statement that "At the time of writing no published biological findings from the baseline campaigns are available". It does not seem logical to develop and publish an EIS for a collector test without the baseline biological studies having been completed. An overview of existing studies is also inappropriate, where delivered in lieu of a proponent analysing its own biological samples.
Page 6-4 6.3	Given there are no data specific to the NORI area, let alone the test site, no comments can be provided on this section.
Page 6-10 6.3.2.1	This section (entitled "Baseline investigations") provides a preliminary scope of work – which cannot be a substitute for the baseline it is intended to produce. The section goes on to report that 47 box cores are available for quantitative analysis from previous surveys, but that none have been analysed prior to the submission of this EIS.
Page 6-10 6.3.2.1 Figure 6-3	This figure shows biological sampling locations relative to the collector test site and the proposed reference sites:  If these samples were analysed, they would potentially show that the test site, and the reference site, were either representative, or not representative, of biological values in the context of the contract area. Without this analysis there is no justification of the location of the collector test site, or any of the reference sites.
Page 6-10 6.3.2.1	There is a table in this section that lists the macrofauna observed in boxcores. However, it presents a list of pooled data only. Such a dataset (preliminary as it is) is meaningless without describing which fauna came from what box core/location.
Page 6-10 6.3.2.1 Figure 6-8	The limited data provided in this section is pooled – so there is no way to show the data for the test site or the reference sites. However, Figure 6-8 asserts that the test sites and reference sites are similar in biological values, but the supporting data is not provided in any form. The preliminary data presented in Figs 6-8 and 6-9 appear to relate to one or two 15cm by 15cm sub-sample(s) taken in each of the provinces sampled (as described in the text

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	above Fig 6-3). It is noted that samples are limited and variance in the data is high, calling into question the stated conclusion that "at present these differences between the sites are not significant".
Page 6-16 6.3.3.1	This section (meiofauna) indicates that there are 732 samples available for analysis, and that 66 have been analysed. Here again, the EIS was submitted with less than 10% of collected data analyzed.
Page 6-19 6.3.5.1	This section (eDNA eukaryotes) indicates that 288 samples are awaiting analysis, 66 samples have been analysed, and have been compared with samples from the UK exploration area. The relevance of the UK exploration area is unclear, particularly when NORI's area has not been analysed. Moreover, any similarities between the areas are meaningless if neither area will be protected from mining. The team of experts engaged is the same for two different contractors, NORI and UK Seabed Resources, who are seeking to exploit polymetallic nodules in adjacent contract areas. Environmental DNA (eDNA) may eventually be shown to be a useful monitoring tool and comparison between contractor areas is encouraged by the ISA. However, in the context of this EIS, the results show that there are significant differences in biodiversity between the two contract areas, indicating significant spatial variation in benthic communities, which has not been resolved in the NORI contract area in this EIS.
Page 6-4 General comment for Section 6.3	The lack of data also prevents any meaningful mitigation or monitoring plans or an adequate risk assessment.
Page 6-24 6.4	This section (pelagic baseline) indicates that samples have been collected (even provides photos to show samples) but does not provide any data regarding those samples, and acknowledges that samples have not been analysed. As such, this section should be considered incomplete, and the conclusions drawn from this "impact assessment" viewed accordingly. The EIS recognizes the importance of monitoring vertical migration in midwater zooplankton in the context of the discharge plume, but the details provided are very vague. Table 5-1 provides details of mooring depths and equipment, including ADCPs of various frequencies, but offers no details of the specific depths of the ADCPs and the distances over which they measured currents and zooplankton activity, except at 500m. It is not clear, therefore, what data have been collected specifically at the proposed depth of the discharge plume (1200m, but see above re. the lower boundary of the OMZ). Reliance on ADCP data alone for zooplankton that scatter sound may not be appropriate for gelatinous zooplankton, which may be important at the depth of the discharge plume. Better correlation of pelagic studies to the expected depth of discharge would be expected. Additionally, the discharge plume should be deeper from the base of the OMZ and evident structure in dissolved oxygen evident in Fig 5.13. The differences in oxygen at this depth may appear small but small changes in oxygen at the base of the OMZ, especially at the interface where oxygen levels are very low, are likely to lead to significant faunal changes, as described above.

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	The importance of characterising the pelagic community in the Benthic Boundary Layer is noted in the text, but no data are presented.
Page 6-28 6.5	Pelagic fauna observations are not provided –data from previous cruises are referenced, but not presented. Also, the numbers of sightings reported are extremely low (e.g. 43 observations over 39 days).Various potential causes for low sightings are listed, but observational capacity is not considered among them. Greater efforts to generate statistically significant results and to apply impact mitigation measures are needed.
Page 7-1 Section 7.1	This section says that "The collector test EIA is a sub-component of a comprehensive operational ESIA that is currently in progress". Treating this document as a part of a larger exploitation EIS is contrary to both the Recommendations and the Regulations of the ISA. Section 4.4 and Table 4-2 lack a monitoring plan for the integrity of the riser and discharge pipes for leaks during the system test. Leaks may have significant effects on the euphotic zone, mesopelagic and bathypelagic communities through temperature and nutrient loading changes.
Page 7-3 7.3.2	This section refers to voluntary IMO guidelines on noise but does not contain a commitment – it simply states that there is a set of guidelines available to assist with minimising noise, and they may (or may not) be used, depending on practicality.
Page 7-3 7.3.2	No noise modelling has been done, so the statements made in relation to noise are not supported. For example, the statement that "some noise will be generated by dynamic positioning thrusters" is misleading, given experience with noise modelling for other projects indicates that dynamic positioning is the single largest noise source.
Page 7-4 7.3.4	While the claim to adhere to MARPOL to manage water quality is reasonable, there is no commitment to any kind of monitoring or auditing, or to publishing those monitoring/auditing results to show compliance.
Page 7-4 7.4.2	This section quotes a statement from 1998 indicating that submersible lights "might present a hazard to deep sea fauna, but the potential volume of impacts is miniscule relative to the habitat volume". A plethora of literature available from the last 25 years is likely to support a counter argument in relation to minimising light. The EIS does not describe a plan to minimize light.
Page 7-5 7.4.3.2	This section says discharge water could be "several degrees above ambient seawater" but provides no justification to this assumption. Some form of modelling should be provided to support this prediction. Deep-sea fauna are sensitive to small changes in temperature. Greater consideration of temperature effects in the discharge plume should be made.
Page 7-5 7.4.3.3	Despite having taken hundreds of sediment samples in previous cruise campaigns, the plume model predictions are based on a series of regional studies, including data from the BGR contract area. This does not comply with ISA recommendations or exploration regulations.
Page 7-5 7.4.3.3	More detailed review of the plume model will be provided in the review of the Model Report (Appendix 2). However a few comments here: This section claims that the model has been preliminarily validated. While the actual report referenced is not available, this applies only to oceanographic conditions, and does not refer in any way to the prediction of either plumes or sedimentation.
Page 7-5	The preamble for the sedimentation model indicates that model results are presented in

	Specific Comments
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7.4.3.3	terms of incremental (above background) sedimentation and suspended sediment. However, the EIS presents no baseline/background data on sedimentation rates, so there is no foundation to the sedimentation model. This is evidenced by the cutoff values - measurement cannot be cut off at 0.5mm sediment thickness in an environment where the upper estimate of annual sedimentation rates (according to BGR and others) is 0.009mm/yr. This means that measurement will stop at levels 50 times the most conservative estimates of the area's potential sedimentation rates.
Page 7-5 7.4.3.3	The plume model uses a timestep of 300 seconds (5 minutes). A robust plume model would use *at most* 60 seconds. If the first timestep is a full five minutes after the disturbance, the plume is going to have settled somewhat - leaving the model trailing behind the disturbance event by 5 minutes.
Page 7-5 7.4.3.3	The plume model runs for 11 days. 11 days is unlikely to be sufficient to show the persistence of a fine plume - and whether the cutoff value was meaningful. This cutoff must also be evaluated in the context of how long the disturbance will last - if the disturbance event itself goes for 11 days, then modelling the impacts for 11 days is going to under-report the prevailing impacts as it will not capture any impacts from settling sediment after the disturbance.
Page 7-5 7.4.3.3	Best practice would be to model different discharge depths to determine whether there are any differences in plume characteristics, rather than just assuming based on current data that there will not be be (as has been assumed here).
Appendix 2 2.2.1	The 50m mesh would normally extend beyond the impact - going to 500m immediately outside the test area could lead to artificial smoothing of outputs.
Appendix 2 2.3.1	It is unusual for a plume model to use settling velocities from laboratory experiments. Best practice involves using sediment characteristics as inputs to the model, and letting the model determine the settlement velocities in the oceanographic setting. If laboratory velocities have been used as inputs to the model then the model would potentially under-estimate the settling velocities of sediment under oceanographic conditions. The further statement stressing the high level of agreement between the modelled outputs and the measured outputs is also confusing - the 'measured' results are those observed in the lab. If those measurements were used as inputs to the model, then it makes sense that the model would be aligned. However, the model should be predicting movement under oceanographic conditions, which should be different to lab conditions.
Appendix 2 2.3.2	Noting potential inaccuracies in the model due to the presence of nodules means that the model cannot account for nodules on the seafloor. This is a red flag - the model should provide a fine enough resolution to reflect the true nature of the seafloor.
Page 7-5 7.4.3.3 Figure 7-9	These figures show very small sedimentation footprints, which is not surprising if the lowest cutoff used is 0.5mm. In an environment where the annual sedimentation rate is ~0.0009mm, using a cutoff of 0.5mm for a test that has a duration of several hours significantly distorts the impact of the sedimentation footprint.
Page 7-5 7.4.3.3 Figure 7-10	These figures show a much larger plume footprint than sedimentation footprint, which is further evidence that the sedimentation footprint is likely to be under-estimated. If the size of the plume decreases rapidly between 24-48 hours, it can be assumed that the suspended sediment is settling in that time period, and therefore is creating a sediment footprint of the size somewhere between the two figures.
Page 7-5	The problem with this kind of figure is that it assumes that the footprint of sediment associated with the settlement of the mid-water plume will align with the footprint of

	Specific Comments
	Must include the page number from the EIS report for reference
Page and Section	**Comment**
7.4.3.3 Figure 7-12	the seabed plume/sedimentation. In fact, that is not the case, so while the plume has been modelled, any sedimentation associated with it has not (and would occur potentially a long way from the test site, given the depth of discharge and current velocities). While the impact may not be large, it still has not been assessed.
Page 7-5 7.4.3.3 Figure 7-13	Again, as discussed above, using a cutoff limit of 0.5mm for a 5 day project in an environment where annual baseline sedimentation is in the order of 0.0009mm is significantly underestimating the footprint size.
Page 7-44 7.5.1	Claiming that the test site is not close to any sensitive or poorly represented habitats when no habitat data has been presented in the EIS is misleading.
Page 7-45 7.5.2	It is not possible to assess this section without any of its underlying data. The principles of the ISO risk management standard (to which the EIS commits) require a consideration of these values, as well as the impacts, and this has not been achieved. To undertake a risk assessment based only on physicochemical values is contrary to the Recommendations and the Exploration Regulations.
Page 8-3 8.2.2	This section notes: "The feasibility of assessing survival rates for megafauna passing through the onboard nodule processing system and ejected with the benthic plume will be investigated as part of the collector test. It is proposed to add a basket to the rear of the PCV to collect ejected biota. Any captured specimens will be brought to the surface when the PCV is recovered and examined for signs of trauma and the likelihood they would have survived the passage through the nodule processing system will be assessed." The approach suggested might provide some information but it is likely to be difficult to sample the organisms and differentiate trauma from the machine from sampling-induced trauma. Any technical solutions to this problem should be elaborated.
Page 8-2 8.2	This section, entitled "Environmental Effects" provides a cursory look at numerous generally-described impacts. For example, it notes, in relation to the impacts of smothering from plumes: "It is anticipated that benthic, benthopelagic and mid-water organisms within the TF (test site) will experience some of these impacts". This statement, like virtually all others in this section, is unsupported by data or specifics. This section does not meet the requirements of the Recommendations (nor could it due to the lack of baseline biological data). Impacts of the discharge plume and its sediment load will be different for gelatinous zooplankton and for other zooplankton taxa. Separate consideration of these groups is required. Benthic Boundary Layer pelagic taxa should be listed explicitly and separately from mesopelagic and bathypelagic communities. They will be impacted by different plumes. Effects on the benthic habitat quality in Table 8-1 might make explicit mention of changes in chemical and physical characteristics of surface sediments (as described in Section 8.2.2.2). This will be important in relation to subsequent resuspension and

	Specific Comments
	Must include the page number from the EIS report for reference
Page and Section	**Comment**
	resedimentation over a wider area of the unconsolidated sediment surface. It is likely to have major impacts on sediment fauna of all size classes. In Section 8.2.2.2 greater detail is needed regarding the monitoring of the test mining activity using sensors on static and AUV platforms. In all sections, including monitoring of pelagic organisms in relation to the discharge depth, there is no detail. Without actual data and specific details of how monitoring will be achieved, it is impossible to assess the adequacy of the EIS, the impacts of proposed test, and information that will be collected from it.
Page 8-8 Section 8.3.3 Table 8-2	It is not possible to assess this section in the absence of baseline biological data.
Page 9-2 9.2.1	It is worth noting that there is no commitment to using biodegradable hydraulic fluid, a commitment made by other contractors , and is one of the most effective ways to minimise the impact of spills.
Page 9-3 Section 9.2.3	Best practice would be to list the organisations that are being notified of the test.
Page 9-4 Section 9.3	Best practice for the emergency response plan would be to append this document
Page 12-2 Section 12	Without an assessment of the baseline, it is impossible to determine whether the monitoring program described will adequately capture changes in the marine environment resulting from the test.
Page 12-3 12.2.1.3 Table 12-3	It is not clear where the monitoring of biological parameters will take place, or how (i.e. during or after the campaign). Normally a set of figures/maps would show the monitoring locations – not only of biological samples, but also of mooring locations, AUV transects relative to the impact location, and other parameters so that the design of the monitoring regime can be defended. It is not possible to determine from this table whether the proposed monitoring strategy aligns with the proposed disturbance design.
Page 12-3 12.2.1.1 Table 12-1	Issues relating to monitoring potential leakages from the riser pipe and discharge pipe, and during processing on the surface vessel, should be included.
Page 12-12 Section 12.3.2	This section only distills a scope of work for further baseline studies, While this shows intent to collect data, there is no apparent connection between what NORI is proposing to collect and what has already been collected. Section 12.3.2.4 states "seafloor sediments will be collected using a multicore and boxcore" – but what does this mean in the context of the hundreds of box core samples that have already been collected?
Page 12-28 Section 12.5.2	Notably, there is no commitment to make monitoring reports available to the public.
Page 14-5	The section notes that there is no legal obligation for sponsoring states to conduct stakeholder participation. While it might be true that the current ISA rules do not prescribe or obligate stakeholder participation in an EIA, many relevant legal

	Specific Comments
	Must include the page number from the EIS report for reference
Page and Section	**Comment**
	instruments make public participation and stakeholder consultation in environmental decision making a requirement.
Page 15-1 Section 15.1	The conclusion states "The collector test is an essential component of the operational ESIA" and that there are no projected significant impacts from it. There seems to be a fundamental disconnect in understanding the aim and purpose of an EIS for a collector test –an EIS for a collector test should be complete in and of itself and at the very least no assumptions to impacts can be made in the absence of critical baseline data.