



Dr. Kane Amandus  
First Secretary  
Permanent Mission of Nauru to the UN  
New York  
(submitted via email to [EISconsultation@nauruun.org](mailto:EISconsultation@nauruun.org))

CC:  
Mr. Michael Lodge, Secretary-General  
Chapi Mwangi, Chief, Contract Management Unit  
International Seabed Authority  
14-20 Port Royal Street  
Kingston, Jamaica  
(submitted via email to [mlodge@isa.org.jm](mailto:mlodge@isa.org.jm) and [cmwango@isa.org.jm](mailto:cmwango@isa.org.jm))

November 18, 2021

**Re: NORI EIS Official Comment Form**

Dear Kane Amandus, First Secretary of Permanent Mission of Nauru to the UN in New York,

Dear Michael Lodge, Secretary-General of the International Seabed Authority,

We thank you for the opportunity to provide commentary on the Environmental Impact Statement for NORI's plans to test a polymetallic nodule collector system in the NORI-D lease area of the eastern Clarion Clipperton Zone of the Pacific Ocean, between Hawaii and Mexico. Below, please find our commentary. We used the information and format for commentary as provided on <https://www.eisconsultationnauruun.org/>.

As Group Leads, we (Drs. Diva Amon, Patricia Esquete, Sabine Gollner, Jesse van der Grient) submit on behalf of the Deep-Sea Minerals Working Group of the Deep-Ocean Stewardship Initiative (DOSI). We hereby express our concern that the baseline data needed for an adequate EIS are not yet analysed, making the EIS in its current form incomplete in accordance with the International Seabed Authority's Recommendations. To this end, we kindly ask that the DOSI commentary is made available to the LTC as the LTC is considering the EIS simultaneously to the public commentary period.

DOSI integrates science, technology, policy, law, and economics to advise on ecosystem-based management of resource use in the deep ocean and strategies to maintain the integrity of deep-ocean ecosystems within and beyond national jurisdictions. DOSI gathers expertise across disciplines, jurisdictions, and industrial sectors to foster discussion, provide guidance, and facilitate communication. As a distributed network, DOSI has over 2200 members from 103 countries and was granted Observer Status at the 22nd Session of the International Seabed Authority in Jamaica in 2016. The list of contributors to this document is presented hereafter. Express Consent for sharing is granted.

Sincerely,



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## NORI EIS Official Comment Form

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### General comments

1. When compared with the ISA's "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), this Environmental Impact Statement (EIS) is incomplete as it completely lacks biological baseline information on species or genus level from the relevant areas of the NORI contract area. The very few data on phylum (or higher taxon) level presented in this EIS are not appropriate for the scope of an EIS. For example, as stated in 38 (o) (ISBA/25/LTC/6/Rev.1), "Preservation reference zones will be important in identifying natural variations in environmental conditions against which impacts of the mining tests will be assessed. Their species composition should be comparable to that of the impacted areas." Without biological baseline data, the PRZ cannot be appropriately identified. This is a significant deficiency of the EIS. Therefore, despite significant efforts and resources that have been allocated to collecting environmental and biological data, an adequate baseline (especially biological) has not yet materialised and therefore neither the baseline nor the EIA is currently fit for purpose.
2. Samples have been collected over a short and recent timeframe (2019-2021). It is therefore unsurprising that samples have not yet been analysed. The EIS itself acknowledges that it will take several more months (at least) until important baseline information will be available from such analysis. Yet this information is required for meaningful impact assessment. As such the EIS should be withdrawn, revised and re-submitted for re-evaluation once the collected data have been analyzed.
3. This EIS also has very limited information on the plan for the environmental impact assessment and the monitoring of the proposed activity. A robust monitoring plan is of critical importance and should be described in sufficient detail to understand whether it will effectively assess impacts. The LTC Recommendations make it clear that a test of a nodule collector 'must be based on a properly designed monitoring programme that should be able to detect impacts in time and space and to provide statistically defensible data'. The EIS does not meet this standard.
4. This EIS repeatedly assumes that the biota is the same throughout the CCZ. This statement is inaccurate, as shown by recent peer-reviewed scientific research that indicates high

environmental and therefore biological heterogeneity, species with variable distributions and ranges, as well as high hidden species diversity (ISBA, 2020; Amon et al., 2016; Christodoulou et al., 2019; Simon Lledo et al., 2019; 2020; Vanreusel et al. 2016; Tilot et al. 2018; Pape et al. 2021; Leitner et al. 2017, 2021; Drazen et al. 2021; Bonifácio et al. 2021; Jones et al. 2021). The statement would, in any event, be currently impossible to verify given the incompleteness of the biological baseline.

5. Both the observational data and model assumptions determining the suspended sediment plumes (from the seafloor and from the discharge) in this EIS are potentially questionable and should be revised. See specific comments in the next section. Concerns include for example measurements (and calibration) of total suspended sediment solids (TSS) which are much higher than expected (e.g. Gardner et al. 2018, as well as comparisons with NTU values). Several parameters in the model assumptions are insufficiently addressed, such as for example (1) differences in temperature between discharge plume and ocean water, (2) flocculation of the discharge plume, (3) speed of discharge plume and movement of vessel, (4) eddies, (5) particle size distribution in plumes and associated settling velocity. As several Valued Ecosystem Components (VEC) impacts are based on the plume simulations, these issues are a grave concern.
6. Throughout the document, the EIS states that there will be “no significant residual impacts” on various aspects of the environment from deep-seabed mining. As the environmental baseline is incomplete, these are currently assumptions that need to be modeled, forecast and verified. Instead, we suggest that the EIS should state that there is a high level of uncertainty and provide this value or remove the statements completely.
7. There are several instances within the EIS where the language insinuates that the findings from this collector trial can be extrapolated to commercial mining. This is inaccurate and should be avoided, especially in the light that almost no biological baseline data are presented in the EIS.
8. The EIS does not adequately address the possibility of transboundary impacts occurring outside of the NORI contract area, in another contract area, or in a State’s national jurisdiction. Even if the likelihood of transboundary harm is minimal given the size of the test, it is good practice to assess it, especially as this EIS is one of the first to test all components of a polymetallic nodule collector (including nodule transport to the vessel and discharge plume), so should set the precedent and establish a high standard of inclusivity of scope. Where the scope is limited or certain impacts are omitted, this needs to be explained and supported with data.
9. NORI performed a general risk and significant rating (see e.g. Table 7-7; Table 8-2). However, information about the methods for how conclusions of ratings were reached is very limited. Whilst the exercise itself is very relevant, we suggest that such general ratings (which would potentially apply also to other contractors’ EIS for test-mining in the CCZ with similar mining equipment) should be based on knowledge and consensus of the wider community (including e.g. scientists from various disciplines, contractors from various countries). We suggest that as an alternative or addition to the risk ratings for deep-sea mining activities using the ‘probability of incident’ approach (used in well-tested industries), the ‘likelihood of consequence’ approach which factors in knowledge, uncertainty and the extent of the evidence base should be applied. This approach may be more relevant for fields without decades of practice from which to draw.
10. This collector plans to use airlifting from near seafloor environments to the surface. This will likely supersaturate the seawater with oxygen. This will then be discharged into the sub-Oxygen Minimum Zone (OMZ) but still a very low oxygen region at 1200 m depth. The resulting increase

- in oxygen levels is another potentially adverse impact on the midwater fauna. Many of these animals are finely adapted to low oxygen (see Childress and Seibel 1998, Seibel et al 2016) and midwater zooplankton communities are finely structured around ambient oxygen levels (e.g. Wishner et al 2013, 2018, Maas et al 2014). A consideration of oxygen pollution is needed and the effects of how climate change may expand the OMZ in the region
11. The ecotoxicological impacts from both the return water and benthic plume are not adequately addressed in this EIS. Sampling to assess the metal concentrations in tissues for species in both the pelagic and benthos is planned to occur during the test and post-test. However, by the point at which an increase in metal accumulation can be detected in organisms, metal exposure is likely to have already caused physiological or biochemical harm e.g., impairing the metabolic activity or potentially affecting survival and reproductive capacity, which may affect the populations and ecosystems. It is thus important to collect baseline and post-test data on the early-warning signs of organism damage as solely the accumulation of metals is insufficient to assess the impacts on fauna (Andersen, 1997). This applies to Sections 6, 8, 12.
  12. The references cited in this EIS do not match the reference lists. For example, in some cases references in the document have a letter added to the year, but this is not present in the reference list. References in the reference list are also presented twice in several cases. At least one reference (Block et al. 2011) is mentioned in the text, but does not occur in the reference list, while it is used to argue (potentially inaccurate because of the difficulty of obtaining tracking data, see specific comment below) that no apex predators are present in NORI D.
  13. DOSI is concerned that the level of detail provided by the ISA for EIS guidance is not sufficient as has been indicated by this document being incomplete and not fit for purpose. As such, we would like to reiterate the importance of standardized minimum requirements, both for exploration and exploitation phases. Standardized minimum requirements for EISs shall ensure that potential effects on the environment can be addressed and should include standards for (1) the collection of baseline data from the IRZ and PRZ, and (2) a local monitoring plan that allows the detection of any impact arising from a collector trial/test-mining/full-scale mining. Such an approach, using best available science, would allow for transparency, an equal level playing field, and focused (and thus cost-efficient) sampling strategy, which is key given the typically scarce baseline knowledge on deep-sea biodiversity and ecosystem function.

Specific comments	
<i>Must include the page number from the EIS report for reference</i>	
Page	Comment
iii	Over 25,000 benthic images were collected in 2020 but have not yet been analyzed. While this data collection is admirable, the results from these analyses should be included in the EIS to enable proper assessment of the proposed activity and its predicted impacts on the existing environment. Additionally, it would be useful for the expected timeline for completion of data analysis and presentation to be indicated.

iv	<p><i>“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”</i></p> <p>Please provide data and references for this assumption. Recent scientific studies have shown this statement to be incorrect. Instead there has been shown to be high environmental and therefore biological heterogeneity, species with variable distributions and ranges, as well as high hidden species diversity (ISBA, 2020; Amon et al., 2016; Christodoulou et al., 2019; Simon Lledo et al., 2019; 2020; Vanreusel et al. 2016; Tilot et al. 2018; Pape et al. 2021; Leitner et al. 2017, 2021; Drazen et al. 2021; Bonifácio et al. 2021; Jones et al. 2021)</p>
iv	<p><i>“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.”</i></p> <p>A monitoring plan for test-mining should be included in the EIS. However, given the insufficient biological baseline data, developing a robust monitoring program is very difficult. We propose that baseline data are analyzed, and the EIS updated accordingly, and re-submitted to the ISA and to public consultation.</p>
iv	<p><i>“Recently completed modelling of both mid-water and benthic plumes indicates that the total suspended solids (TSS) concentrations will return to background level within 500-1000 m from the point of plume generation.”</i></p> <p>We note that the modelling suggested a limit of the plume to 500-1000 m. We suggest that any uncertainty with regard to plume behaviour and local current regimes, including eddies, should be described and taken into account when monitoring the plume during impact. DEME-GSR, BGR and MiningImpact2 partners could be asked to share their experience and knowledge gained during test-mining in the Belgian and German exploration area, to reduce uncertainty and to plan the monitoring set-up.</p>
iv	<p>The spread of the plume is based on total suspended solid (TSS) concentrations in the water column compared with baseline conditions. However, the estimates of TSS in this EIS are much higher than what is expected and known from this area (see Gardner et al. 2018). In addition, the TSS values seem at odds with the turbidity measures presented (which are more similar to those from an open ocean system). Further, the lack of a trend in the TSS concentrations with depth also suggests there are major issues with these measurements. It is unclear how TSS concentrations were measured and whether large organics were included in the measurement. As such, the TSS are questionable. Information on methodology, including equipment calibration should be added to the EIS. Incorrect measurement of TSS leads to false TSS thresholds against which impact can be measured (i.e., underestimating the impact).</p>
v	<p><i>“...8-cluster geofom classifications. Biological communities are expected to be organised in response to these abiotic geofom substrate types”</i></p> <p>It will be important to link biological results (that do not yet exist) to this observation and then relate to the implications this has on choosing the test-mining location and PRZ. PRZ has different nodule sizes/coverage than IRZ - how is this taken into account?</p>
vii	<p><i>“no data yet available”</i></p> <p>Without data, no assessment of EIS robustness is possible. See expanded General Comment (1) on this.</p>

1-3	Key objectives listed in the EIS include: "Develop sound procedures to assess environmental risks associated with polymetallic nodule collection" and "Study the environmental impacts of polymetallic nodule collection to inform monitoring and mitigation measures and the development of management plans for full-scale operations". This suggests that this is the first of many studies to begin the development of procedures to assess risks, plan development, and inform future monitoring and mitigation. Please clarify if this is the case and whether there will be further EISs.
1-3	The Metals Company (TMC) is listed as a private Canadian company. However, it appears that The Metals Company, Inc. is a public company, traded on the United States stock exchange as TMC. Please clarify.
1-4	It is unclear whether there is data available from campaign 3 and other previous studies and whether this is presented in the EIS or elsewhere.
1-4	While it is stated that multiple cruises have been conducted to NORI contract areas A, B, C and D, the campaigns to NORI A, B and C seem to have only focused on the exploration of nodule resources, and not on the environment and biology. How will the results from this collector test be extrapolated to these understudied areas as it is not known how similar these areas are to NORI D? This reiterates that there is not an adequate baseline.
1-5	Collecting data at two points during a year does not give adequate information on the temporal baseline. Changes, if any, may be seasonal, intra-annual, or inter-annual. Referring to Campaign 5C, or any other campaign, as seasonal is therefore misleading. Data instead should be collected over several years to accurately capture these baseline characteristics.
1-5	It is unclear how 250,000 offshore hours were accrued. This would represent 28.5 years (250000/8760 hours in a year). How was this calculated?
1-6	It is stated that " <i>environmental impacts will be temporary, or short duration....</i> ". However, the duration and severity of the impacts cannot be assessed before the Project has taken place, and before the baseline study has been completed, which is not the case here.
2-3	The EIS refers to "Recommendations for the Guidance of Contractors for the Assessment of the Possible Environmental Impacts Arising from Exploration for Polymetallic Nodules in the Area (ISBA/16/LTC/7; 2 November 2020)". This is incorrectly dated. The document was in fact issued by the LTC in 2010. This document was replaced by the ISA in 2013 ( <a href="https://undocs.org/en/ISBA/19/LTC/8">https://undocs.org/en/ISBA/19/LTC/8</a> ) and superseded again in 2020 (ISBA/26/LTC/6/rev1) - subject to a correction later the same year (ISBA/26/LTC/6/rev1/corr). The LTC Recommendations themselves acknowledge a need for the ISA's rules to keep pace with advancements in scientific knowledge " <i>given that the recommendations contained herein are based on the current scientific knowledge of the marine environment and the technology to be used at the time at which they were prepared, they may require revision at a later date, taking into account the progress of science and technology</i> ". In our opinion, NORI should ensure it follows the correct and most up-to-date guidance document, and not an obsolete one from over a decade ago.
2-3	No monitoring program, which is a requirement, has been included.

<p>2-4</p>	<p><i>"Draft regulations on exploitation of mineral resources in the Area (March 2019; ISBA/25/C/WP.1) [...] are expected to be finalised in 2021"</i>. This is inaccurate. Council negotiations on the Regulations are not even due to (re)commence until 2022.</p> <p>The EIS states that it is consistent with the requirements of the draft regulations on exploitation of mineral resources in the Area (March 2019; ISBA/25/C/WP.1), and draft Standards and Guidelines issued by the ISA for consultation. However the draft regulations contain detailed EIS requirements for e.g. biological data, which would not appear to be met by the incomplete analyses of biological data in this EIS .</p> <p>Reference is made to Nauru’s International Seabed Minerals Act 2015. However, no reference is made to EIA or environmental management legislation in Nauru. Usually dedicated national environmental laws deal with EIAs and environmental permitting, rather than mining laws.</p> <p>It is also not clear from the EIS whether the Government of Nauru has reviewed the EIS, conducted national consultation, required any amendments to the EIA/EIS and/or issued a permit for the proposed activity.</p> <p>The legal section notes that Nauru’s own laws obligate it to follow international principles and norms. However, there is no analysis of the actual text or scope of those laws nor their applicability to this project.</p>
<p>2-6</p>	<p>Table 2-1: In our opinion, the column “description/implications” does not actually address the implications. We also suggest calling the current Column 2 “Description” and including a Column 3: “Relevant governing provisions”; and Column 4: “Mechanism to ensure compliance”.</p>
<p>2-6 to 2- 7</p>	<p>Various international treaties are listed. It is unclear from the EIS which of these NORI considers itself bound by (for example, either through Nauru being a state party, or through NORI’s vessels’ flag state(s) being a state party). It would be helpful for this to be clarified.</p> <p>There is no explanation in this section as to what the relevant requirements are of each legal instrument in relation to the proposed activity, nor how NORI has designed the collector test to ensure its compliance. Without such explanation, the list of legal instruments is not very informative. Therefore, we suggest adding an explanation.</p> <p>Also, it is unclear whether NORI considers the list complete and exhaustive. There appear to be relevant instruments missing, for example:</p> <ul style="list-style-type: none"> <li>- International Convention on the Control of Harmful Anti-fouling Systems on Ships;</li> <li>- International Convention for the Safety of Life at Sea;</li> <li>- International Convention on Load Lines;</li> <li>- Convention on the International Regulations for Preventing Collisions at Sea; or</li> <li>- Various conventions concerning maritime safety, crewing, and training.</li> </ul> <p>If NORI does not consider that the requirements of those Conventions are relevant to the planned activities that are the subject of the EIS, it would be useful to have this stated, along with a rationale.</p>



	NORI does not disclose in the EIS 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.
3-2	What are the other types of nodule distribution? If different nodule classes appear in different NORI areas, in what proportions? How does this affect potential environmental impacts? There is no reference to habitat definition data in the EIA so it is unclear the extent to which the habitats in the test mine area (and reference sites) are representative of the contract area. There are statements made to that effect, but no supporting evidence/data.
3-2	<i>“Areas of the CTA outside of the TF may be indirectly impacted by sedimentation or deterioration of water quality”.</i> Why are these the only impacts listed? Noise pollution, for example, may also occur outside of the TF.
3-3	It is unclear how the considerations for lowest potential environmental impacts were considered for the TFs selections. What factors were considered and how did that result in the different TF candidates? Why was Site 6 selected?
3-4	It is unclear from the text and Figure 3.1 how representative the test mine site is of the NORI D area, and of the environmental values present within the test site (including habitats). This is due to the complete lack of biological data.  Also, type 1 nodules are not shown, while it is stated this is the preferred type of nodule distribution. Additionally, the figure is illegible, which makes interpretation difficult.
3-6	It is not clear how the PRZ was selected without knowledge of the biological baseline, and it is not possible to verify that the PRZ has been appropriately selected.
3-6	<i>“Recent autonomous underwater vehicle (AUV) measurements of artificial benthic plume generation found that suspended sediment concentrations reduced to a level similar to the background concentrations (order of 10 µg/l) at a distance of around 1 km from the source (Spearman et al., 2020).”</i> It would be useful to see consideration of the Spearman et al. (2020) study results as this may not be representative of the activities proposed here. For example, the plume generation is very different (pump vs. collector vehicle), the timing of the plume generation is different, the rate of sediment release is different (the Spearman et al. study mentions their rate was not constant), the sediment is different (coarse grained in the Spearman et al. study, while fine grained sediments are present in NORI D - smaller particles will disperse further), and the Spearman et al. study state the importance of local currents on a seamount - which will be different in NORI D. Fine grained sediments in the abyssal ocean will disperse farther as modeling studies suggest (Muñoz-Royo et al 2021; Aleynik et al 2017). These claims need to be verified.
3-7	The CLARA analysis has not been verified, and thus cannot be used as an argument that the CTA and PRZ communities are the same based on habitat classification. It is unclear

	<p>what the different geoforms are or what their coverage is. It is not clear how the geoforms are represented in the CTA or NORI D area.</p> <p>The definition of nodule type 2 and 3 are not given. This makes understanding and validating statements concerning nodule type 2 and 3 impossible.</p> <p><i>“The PRZ should be large enough to include representative biota, habitats, biodiversity, and ecological function potentially impacted by mining”</i></p> <p>Given the biological baseline analyses are not complete yet, what has been used to determine if 750 km<sup>2</sup> is large enough and that the PRZ indeed contains the representative biota, habitats, biodiversity and ecological function? Also, what ecological functions are included here?</p>
3-12	<p>Most life within the sediments occurs in the upper 0-20 cm, as well as on top of the sediment, so stating that the disturbance of the surface sediments is minimized, does not mean that impacts will be prevented. This includes impacts to the sediment water interface, which was not included in this section. This should be made clear.</p>
3-13	<p>It is unclear how larger nodules that are not collected will remain intact as the mining vehicle will move across them. Additionally, these will likely still be impacted by disturbance and sedimentation resulting in loss of habitat and biodiversity.</p>
3-14	<p><i>“Seawater, sediment, and nodules are sucked into the PCV and pass through an 80 mm screen mesh. Any material that cannot pass through the screen mesh will be rejected and will remain on the seafloor”.</i></p> <p>The reason for rejecting nodules larger than 80 mm should be clarified, as well as the process to select the nodules. It seems from this text that they will be pulled into the machine, before being returned to the seabed, with a consequent impact on the epifauna and infauna. Please clarify this point.</p>
3-15	<p><i>“Test operations generating a return-water discharge will be of short duration (approx. 259 hours).”</i></p> <p>Since this is one of the most controversial aspects from an environmental standpoint, more detail on how this time allocation was decided would be appreciated.</p>
3-15	<p>Tests will start at 1200 m, but <i>“the optimal discharge depth and design will ultimately be decided based on an assessment of the engineering requirements and environmental impacts of the options under consideration”</i>. Since the depth of the discharge is critical for potential environmental impacts, we strongly suggest adding more detail on how the decision will be made, what the priorities would be, and what factors/parameters would be taken into account.</p>
3-15	<p>The potential changes in the environment associated to the presence of an OMZ upon the release of the discharge plume should be described.</p>
3-16	<p>There is no such thing as the mesopelagic-bathypelagic interface, stated here to be at 950 m. The convention is 1000 m as given in Section 5.7.1. However, some are now placing this transition even deeper or suggesting a great connection between the mesopelagic and bathypelagic (see Sutton 2013).</p>

3-17	It is not clear what assumptions/parameters were included in this model. Why was it assumed that the water temperature at the surface would be 6.3 degrees? Is this based on the residence times, and the temperature of the water as it moves both up and down the pipe? This is critical to the plume modelling. What assumptions are used in the return water discharge plume model? How will the differing water temperatures between the discharge plume and background ocean influence dispersal of the plume, as well as the biota? These aspects should be clarified.
3-18	Figure 3.15: Dotted red circles are missing.
3-30	The EIS states that the workforce will " <i>potentially</i> " contain " <i>ISA or Nauru observers</i> ". It would certainly be beneficial if a regulatory body (either from the ISA or Nauru Government, or both) is on the vessel in order to monitor the test independently, but more detail on how the selection would be made may be added. Additionally it would be positive if this test could be used as part of a longer-term capacity-building opportunity for either Nauru nationals or ISA staff. Transparency should be regarded as a priority.
4-3	It is unclear why some important fauna, such as sharks and large rays which have been spotted in the area, are not mentioned here. It is unclear if micronekton and gelatinous animals are included in the biological VEC definition, as these are different from nekton. If they were grouped together, provide a justification for this. Micronekton and gelatinous animals are important components in the food web. Further, besides the presence of these groups, behaviour and related changes may be just as important in determining mining effects on ecological functioning. No mention of this is made.
4-4	<p>Table 4-2: There are several important interactions, as well as impacts to one depth zone not included in this table. For example -</p> <p>There are birds present in the area, including vulnerable and endangered species, and it is known that the presence of ships can impact birds.</p> <p>Atmospheric (all VECs listed): It should not be assumed that there will only be effects from noise/vibration/light/air quality/GHG emissions during transit, leak testing and locking of hose, riser installation and system integration tests and transit. The ship will be using dynamic positioning, which will make noise and burn fuel. The ship operations will continue 24/7, so there will be light pollution during the night. At any point of the process, it seems that one or more of these effects will be present. Additionally, cetaceans present in the mesopelagic can still hear ships in transit and may avoid the area. This should be noted.</p> <p>The mesopelagic should be checked for the effect of the ROV deployment, when other zones are identified as having an interaction? Also, ROVs are noisy, why is this box not checked for all pelagic habitats?</p> <p>Subsea lowering of PCV: the mesopelagic should be included, both cetacean interaction as well as water quality. Noise/vibration impacts should be expected from the lowering in all the marine zones</p> <p>Interaction for noise/vibration/light in the abyssal zone should be included.</p> <p>The jumper hose and riser deployment: water quality impacts in bathypelagic as it is lowered should be expected, as well as noise interactions. Why are there no interactions assumed for mesopelagic cetaceans?</p> <p>Why are there no interactions assumed for mesopelagic cetaceans during the leak test and locking of pressure hose? Why are there no interactions assumed for noise/vibration/light in the abyssal zone for this task?</p>

	<p>Why are there no interactions assumed for mesopelagic noise/vibration during task 20 (ROV attaches pull-in wire) while there are for other pelagic zones?</p> <p>There can be interactions between nekton and zooplankton during the manoeuvrability test for those that are benthopelagic. This interaction needs to be included.</p> <p>Why is there no interaction included for cetaceans and turtles in the epipelagic and mesopelagic for the riser installation and commissioning test (task 27)? Zooplankton and bathypelagic nekton, too, may be impacted during this task.</p> <p>Noise/vibration interaction between the euphotic zone and system integration test (task 28) is also possible. Why was it not included? Why is it assumed that abyssal microbes would not have an interaction during this task?</p> <p>Noise/vibration interaction between the euphotic environment and system test runs (task 29) is also possible. Why was it not included?</p>
4-5	Tables 4-3, 4-4: As with Table 4-2, there are key interactions missing.
4-9	It may be an overstatement to say that significance can be assessed with high confidence because one of the two components is within control and known, especially since the second component is unknown or poorly known and not in your control. This language needs to be tempered.
4-7	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. Please amend.
4-9, 4-10	Table 4-6: What is the justification for determining that effects on the order of weeks to months are small? In actuality, these may not be small, especially if they, for example, occur during the breeding season or during the migration for large megafauna. Medium effects lasting years do not seem medium, but instead large. There really ought to be a fifth class: (extreme) covers several years - permanent. It is important to recognise that the recovery potential of deep-sea animals is poorly understood and thus duration of impacts may be significant.
4-10	Table 4-7: what does “ <i>well represented</i> ” mean? Also, while fauna may be well represented, that does not indicate their recovery potential in impacted areas. The connectivity between areas and reproductive potential need to be known, as well as the spatial structuring.
4-10	Tables 4-7 and 4-8: Half of the significance score for VECs is based on sensitivity. “High” sensitivity is used only for species/resources that are found in the test field or if there is high uncertainty, however, species/resources outside the test field should be taken into account. Furthermore, 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”. What data is provided by the contractor to support such a claim? It is not clear by this point in the EIS what the environmental values (called VECs by the contractor) are in the test area, and whether they are present elsewhere. In fact, there is no biological data from the NORI area at all in this EIS, which means that the statement above in relation to probabilities is completely unsupported, given there is no evidence in the EIS of any of the biological VECs in the NORI area.
4-10	Not all effects will be additive. How will you identify non-additive effects and manage those? Some effects will likely act in synergy.

4-10	Section 4.7 states major hazards, but the description is for hazards. Major hazards are hopefully rare, but hazards can occur. Please clarify this terminology.
4-12	Table 4-9: What rating will be given for something that occurs more than ten times in a year? If you think such a situation would not arise, please justify this.
4-12	Table 4-10: Why are cultural impacts not separated from environmental impacts? This should have its own column. It is unclear what is meant by minimal, minor, significant, etc. impacts for the environment. How are these defined? Similarly, the business reputation impacts classification seems vague.
4-13	Table 4-11: It is unclear how the different consequence categories play a role in this table. What if the consequence ratings differ for an impact for different categories? How is this reflected in the table?
5-1	It is important to consider how storms would influence mining operations given that they occur approximately once per month from May through October? Likewise, how would eddies that are present in the area affect operations and the spread of impacts (especially for sediment plumes and the proposed plans to monitor those plumes).
5-3	More information is needed in this section. What are the baseline noise levels at different depths? This is essential information if the EIA is to determine the impacts of noise. 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 as a result of the project.
5-5	There seems to be a mismatch between what is shown in Figure 5-5 and the text in terms of what month has the largest amplitude. Please clarify.
5-9	How will the data be compared between the different mooring sites as different depths are targeted for different measurements should be clarified.  Table 5-1 shows that the epipelagic was not sampled at either of the three mooring sites, and that the mesopelagic was only sampled in the long mooring site (not in the two reference sites). This disagrees with the statement below the table, which states the mooring instruments were positioned such that they captured data from the upper water column, midwater, and near the seafloor zone. Please clarify.
5-10	Stations ND001 and ND005 are not identified in Figure 5-3. Please clarify where these samples were taken.
5-13, 5-14	Table 5-5. The values presented for TSS and the lack of pattern for TSS with depth is concerning. There are no clear details of how TSS was measured. Given this, as well as the fact that chlorophyll-a concentrations were below laboratory limits, it seems that the wrong equipment may have been used. What protocols were followed for the measurement of oceanic data where these values are known to be extremely low? Equipment calibrated for coastal areas for open-ocean systems cannot be used. This will not give accurate measurements. TSS values (1-4.5 mg/l) are markedly high compared to NTU (turbidity) sensor values of ~0.1 (page 5-26) in the EIS and other research (Gardner et al., 2018) showing concentrations of inorganic particles of ~20 ug/l. The EIS then uses

	these values to choose a threshold for suspended sediments of 0.1mg/l. This is too high. Values of only 0.02 mg/l will exceed background values.
5-15	<p>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 without any kind of water quality standard being referenced all one can tell is the level of rigour applied by the laboratory, not the actual quality of the water relative to a standard.</p> <p>Additionally, the water column metal and metalloid concentrations provided were often below the limits of detection because trace metal clean CTD water sampling and processing haven't been completed and because open ocean values are often low. In any event, the data presented is not sufficient. Additional accurate measurements are required prior to the collector test so that precise measures of important metals, including those from the nodules, can be made and thus departures from background conditions will be robust. It will be necessary to have the analytical power to detect small changes in metals concentrations which might be evident from the discharge plume.</p> <p>Also, this section does not indicate how many samples were taken - it is not therefore possible to tell whether the average values are reasonable or not (from a statistical perspective).</p>
5-32	This section indicates that an extremely large volume of sampling has been undertaken but that very limited analysis has been conducted (yet). However, the results of such analyses should be used to inform this EIS.
5-39	<p><i>“Preliminary results found no evidence to suggest differences in key geochemical parameters across test sites (pers comm)”</i></p> <p>This section includes graphs with an unacceptable level of detail. There is no data provided in the report, not even reference to a report. References should be provided as well as statistical tests results with data</p>
5-43	Figure 5-32: The bathymetry is shown at a very coarse level, and the test sites and reference sites are not overlain. It is not possible to see whether the bathymetry of the test site and reference site is indicative of the rest of the bathymetry.
5-45	There is no map of the collector test area showing the nodule density, so it is not possible to determine whether the nodule density in either the test area or the reference area is indicative of nodule density across the contract area.
5-50	This section indicates that mapping of habitats requires both geofom and substrate mapping as well as biological classification, but then indicates that the biological data is not yet available. This means that habitat mapping has not been achieved and 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 geofom types. The lack of biological data to provide any context on habitats and ecosystems is a fundamental weakness of the EIS.
5-51	Table 5-37: From this table, and Page 3-7, I cannot see what the eight geofoms are that should occur in NORI D according to this EIS. Neither does it inform which geofoms are present in the CTA or PRZ respectively. This is confusing. As the geofoms are used

	as an argument that similar communities are present (already a huge assumption that lacks verification), it is extremely important to show these model outputs.
6-1	This section includes only a summary of scientists who are doing the work and a statement that says <i>“At the time of writing no published biological findings from the baseline campaigns are available”</i> . It does not seem logical to develop and publish an EIS for a collector test without the baseline biological studies having been completed. The section also says <i>“the following sections provide a brief overview of relevant studies from the wider CCZ region with descriptions of preliminary NORI data where available”</i> . It is inappropriate to deliver an EIS without having analysed biological samples. Additional clarifications will be necessary.
6-1	Table 6-1 and text: As this is the chapter on the biological environment, why has physical oceanography been included here? Thirteen campaigns were not used to collect biological environmental data, but instead included physical oceanography cruises. Please provide more clarity.  What is “surface biology”? Please clarify the use of this term.  Note that this table talks about micronekton, while earlier in the report (e.g., Table 4-2) refers to nekton. These two groups are not the same or interchangeable. Please clarify.
6-2	There seems to be only two sampling occasions planned for macro- and meiofauna, i.e., Oct-Nov 2020 and May-June 2021 (Campaigns 5A, 5D). How can natural temporal variability of these benthic communities be assessed when only two time points are available? The ISA’s Recommendations (ISBA/25/LTC/6/Rev1) state that temporal variability should be addressed <i>“with a minimum of annual sampling over at least three years”</i> .  Similar comments apply to pelagic communities - two data points will not inform on seasonal variability (Campaigns 5B, 5C). This also applies to the mention of seasonal data for seabed images (Campaigns Ocean Infinity and 5E) and lander deployments for scavengers, respiration and ecosystem function (Campaigns 5D, 5E).
6-2	<i>“At the time of writing, no published biological findings are available”...“requiring 12 month to conduct analyses”</i> As per above, this EIS is incomplete and should be withdrawn because of the absence of biological information. Please provide a more detailed plan on how this will be achieved within the next 12 months.
6-2	Table 6-2 lists data status, showing that the majority of data still needs to be analysed. Awaiting the results of these collected samples and incorporating these results into a revised EIS would significantly reduce current uncertainty and be more in line with the ISA’s current recommendations.
6-5	<i>“Nodule shape and density may play an important role for community composition of mobile and sessile fauna”</i> The PRZ seems to have different nodule shape and abundance compared to the test-mining area. Where are the data that would compare community composition prior to test-mining and the PRZ?

6-6 - 6-10	In Section 6.3.1.2, the experiments performed were certainly opportunistic and do not adequately evaluate the scavenger community. Only the presence of fish is presented and this is apparently from a huge amount of bait over 2+ months. It is no surprise that fish were present. Baited camera studies are done to inventory the diversity and relative abundance of fishes in the immediate area and should use standard methodology that includes images or video every few minutes for ~18-24 hrs and a smaller 1-2 kg bait so as to ensure animals are attracted from a small radius, representative of the deployment location (Leitner et al., 2017; Drazen et al., 2021). Further study is needed.
6-11	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. As it stands there is absolutely no justification of the location of the collector test site, or any of the reference sites.
6-12	Data on phylum level gives very little information and is inadequate.
6-14	Table 6-5: This table lists the macrofauna observed in boxcores. However, it presents a list of pooled data only. Such a dataset is meaningless as there is no way to show what fauna came from what box core/location.
6-14	Metazoa are not a phylum; are these all metazoans that could not be identified to lower taxonomic levels? Please clarify.
6-14	It is correct to state this is a coarse level of resolution. Comparisons made based on this resolution are not useful. For reference: all vertebrates, including humans, belong to one phylum. Here, you show 14 (metazoa is not a phylum). It will be important to use finer resolution before making any statements about the similarity or dissimilarity between the two sites.
6-15	Figure 6-8: This figure is misleading. The very 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. Figure 6-8 claims to show that the test sites and reference sites are similar in terms of biological values but the supporting data is not provided.
6-16	Why was an upper sieve size of 300 $\mu\text{m}$ used for meiofauna? This is not mentioned in the ISA recommendations (ISBA/25/LTC/6), nor is this common practice by deep-sea meiobenthologists (e.g. Pape et al. 2017, 2021, Hauquier et al. 2019, Lins et al. 2021).
6-16	Figure 6-9: Without the sample size present, it is difficult to interpret the error bars and high variance. High variance is often present when few samples are taken; this is not an appropriate argument for stating something is similar (or not). It is also possible that the low taxonomic resolution influences the variance. Doing similar analyses on finer taxonomic scales will be more informative and appropriate.
6-16	Data on phylum level is insufficient and therefore inadequate.
6-19 to 6- 22	Details are missing on the methodology (i. e., bioinformatic pipeline). Also, statements are made on significant differences, without mentioning the statistical tests used and test results, which makes this unverifiable.



6-18	Please provide information on how analyses of >90% of samples can be achieved within the next year.
6-22	Figure B shows that the UKSRL and NORI contract areas are different. How does this result compare to statements throughout this EIS that the CCZ is homogenous?
6-28	Marine mammals were identified as being exposed to medium risk during test-mining. However, baseline data for mammals is insufficient and was done in a non-standardized way, so it will be very difficult (if not impossible) to detect impact (or non-impact) arising from test-mining.
6-29	<p>The collection of opportunistic data could explain the low numbers.</p> <p>The mention of observation does not clarify the number of individuals observed per observation.</p> <p>Section 6.5.1: there is no mention of the numbers observed. The text only refers to what is most common. No list of species observed is presented with the number of individuals.</p> <p>Why show only data from a few campaigns when the PelagOS system was used on more campaigns? There should be more data. This misrepresents what was seen.</p> <p>Is there a chance that the brown booby has been confused with the brown morph of the red-footed booby? The latter is more common in the area than the former. What did you do to ensure birds were properly identified? Please clarify training.</p> <p>Other cruises spotted sharks and pilot whales in NORI D. Why was this not included? Why is there no data collected on the number of birds that may be stranded on the ship at night? This would have been useful for the EIS.</p>
7-1	<p><i>"The collector test EIA is a sub-component of a comprehensive operational ESIA that is currently in progress"</i>.</p> <p>Treating this document as a part of a larger exploitation EIS is contrary to both the Recommendations and the Regulations of the ISA.</p>
7-3	No noise modelling has been done for this EIA 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.
7-3	Climate change considerations seem poorly addressed. Under the heading 'Air Quality & GHG Emissions' (Page 7.3), there is just a brief mention that all vessels used will be registered in a state that has ratified shipping convention MARPOL. However, MARPOL parties have only recently begun to agree measures relating to emissions, and how such measures may or may not affect NORI's shipping emissions for the three vessels engaged in this project is not explained in the EIS. It would be helpful for the EIS to be more precise about what mandatory requirements with regards GHG NORI considers itself bound by, or plans to adhere to (for example, which protocols or measures from MARPOL). Also the EIS should set out the energy requirements, fuel consumption, and emissions predicted for the test project, and describe any measures taken to minimise these.

<p>7-5</p>	<p>The preamble for the sedimentation model indicates that model results are presented in 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 at all. This is evidenced by the cutoff values - selecting a lowest cutoff value of 0-0.5mm sediment thickness is inappropriate in an environment where the upper estimate of annual sedimentation rates (according to BGR and others) are 0.009 mm/yr. BGR modelled down to 0.0001 mm/yr, but certainly having a cutoff of 0.5 mm/yr is well in excess of even what the EIS (Appendix 4) acknowledges is reasonable.</p> <p>There is a disparity between the statement that the discharge plume could be several degrees above ambient seawater while on Page 3-17 this is confirmed. Since temperature can affect the plume dispersal, this is important to know and understand (Rzeznik et al. 2019). Please amend.</p>
<p>7-6</p>	<p>A near-field plume model is important especially because of the assumption that flocculation will occur. However, this has been shown to be untrue for the discharge plume (see Muñoz-Royo et al. 2021). With the temperature increase compared to ambient for the discharge plume, buoyancy may be very important. Also note the stated high discharge speed, so movement may also play a role.</p>
<p>7-7</p>	<p>Has the difference in temperature of plume and seawater been included in the model? Please clarify.</p>
<p>7-9</p>	<p>Note that the convention is that natural background concentrations may be around 10-20 ug/l (Gardner et al. 2018), which is higher than the thresholds or background values used here. This means that, based on the Gardner et al. data, the sediment concentrations are raised between 5-10 and 500-1000 higher. That can have significant impacts on the biota.</p>
<p>7-9</p>	<p>Why model only 50 m below the discharge for sediment concentrations? The plume may extend well beyond that (see Rzeznick et al. 2019, Muñoz-Royo et al. 2021).</p>
<p>7-10</p>	<p>It is unclear how Figure 7-4 supports the temporal assumption presented in vi that at 11 days plume concentrations fall to background levels. It is hard to believe that the plume will dilute to background conditions within 11 days (see Muñoz-Royo et al. 2021). Many would argue that 11 days is not sufficient to show the persistence of a fine plume. Regardless, the figure of 11 days is meaningful unless referred to in the context of how long the disturbance will last - if the disturbance event goes for one day, then 11 days might be a reasonable length of time to model. If the disturbance event goes for 11 days, then modelling the impacts for 11 days is going to under-report the prevailing impacts. Note however in the later figures, 11 days is reduced to 24 or 48 hours. Please clarify.</p>
<p>7-11</p>	<p>The assumptions of flocculation are in contrast with Rzeznik et al. 2019 which showed that flocculation is unlikely to occur for the discharge plume because of momentum and turbulence. As flocculation influences the fall out and reduces the spread of the plume, this needs to be more precise than what is presented.</p>
<p>7-12</p>	<p>Table 7-3: These characteristics are different from what was presented in earlier sections. The temperature is much higher (7.5 instead of 6.13), the discharge speed is lower (3.12 instead of 3.9), the sediment load is lower (11.7 g/l instead of 21.3 g/l), the diameter is</p>

	different (0.2 instead of 0.16). How is it that the design specifications are different from the model specifications? This does not allow for proper evaluations of this EIS.
7-17	Searching through the document, it is not possible to get an idea of what the likely speed is for the stable production rate which is referred to. Simulations with different speeds are shown, but which is the most likely? This is important to understand the generation of benthic plumes.
7-18	The natural level of sedimentation in the Central Pacific is 1-6 mm in 1000 years (Halbach & Fellerer 1980; Mewes et al. 2014). Those levels are reached within a few days according to the model. A finer resolution would be more appropriate to determine the range of impact from sedimentation as the EIS is missing that even very small additions are a lot on these timescales.
7-18	The vehicle would remove 10-15 cm of sediment. How is this uncertainty included in the model? Which scenario was chosen for the model and how would the results change?
7-19	Figure 7-9: This shows very small sedimentation footprints, which is not surprising given the lowest cutoff used is 0.5 mm. In an environment where the annual sedimentation rate is ~0.0009 mm using a cutoff of 0.5 mm for a test that has a duration of several hours is significantly (and misleadingly) underestimating the impact of the sedimentation footprint.
7-31	Why is it assumed the buoyancy of the plume will not result in the plume migrating upward at the point of release? See Muñoz-Royo et al. 2021 and Rzeznik et al. 2019 for information. Both temperature (and crossflow) and fall out have an influence on the plume rebound, but none of that can be seen here, while that will have an influence on plume development.
7-31	It is surprising that the plumes are this small given the model results from Rzeznik et al. 2010 and Muñoz-Royo et al. 2021. These outputs are hard to evaluate given the limited information on the model assumptions. It may be related to the assumption of flocculation (which is unlikely to occur), and did not take into account the buoyancy effect - it was instead assumed the plume would drop to 1050m. Rzeznik et al. (2019) showed why the near-field plume should be modelled appropriately (which this EIS does not) in determining plume development and scale on the timescale included here.
7-31	Given snapshots of 24-48 hours for something that will take 11 days (verification needed) is like showing the beginning of a crash but not the whole scenario. Why focus on these small temporal scales? The same applies for sediment deposition.
7-31	Is 50-m mesh resolution appropriate? Figure 3-23 shows the schematic for the tests, with the track length in one direction up to 3 km, which would give 60 cells in one direction - that seems reasonable. But this is not how it was modelled. The model seems to show a stationary release. If the plume is 100 m wide, for example, then it will only show to grid cells? Was 300 s the correct trade off for spatial resolution to follow this plume? Please clarify.
7-31	Is it assumed that the discharge will only happen once at the end of the test? Or is it continuously? The model results indicate only one point of release resulting in a lateral length not exceeding 100 m. But the mining track at the seafloor is 3.1 km in length with

	the ship and discharge pipe following this. If there are multiple discharges, then that will change the suspended plume spread. Please clarify.
7-31	Given the short duration of the model simulation, it is not appropriate to ignore the near-field dynamics of the sediment plume. Temperature differences (3-4° C) between ambient and the discharge will affect buoyancy, as well as crossflow, and sediment fall out. Rzeznik et al. 2019 clearly shows how this can impact plume height. It is unclear why these results are so different from Muñoz-Royo et al. 2021 which predict a much larger plume height and area. Looking at your Appendix 2, is the settling modelled appropriately? The sizes of the particles used are very high compared to median particle sizes found in the CCZ sediments.
7-38	As discussed above, using a cutoff limit of 0.5 mm for a 5-day project in an environment where annual baseline sedimentation is in the order of 0.0009mm or 1-6 mm of sediment in 1000 years is significantly underestimating the footprint size. We suggest amending.
7-42	<p>It is hard to believe that the TSS are this high in this area, especially since the NTU are so low. What was measured as TSS? NTU values of less than 0.5 often are associated with waters containing &lt;1 mg/l TSS. There is likely an issue with the definition of TSS, which is very serious given the assumptions of the threshold values used in the plume models.</p> <p><i>“a working hypothesis that temporary exceedances of ≤ 1mg/l are not expected to be significant in the context of the scale of the collector test, would appear to be reasonable. This hypothesis will be tested as part of the operational ESIA studies.”</i></p> <p>It is very likely that 1mg/l will cause harmful effects on the biota as its 5x higher than natural background conditions in a habitat with very low variability in suspended sediment concentrations. Thus the fauna are unlikely adapted to cope with such a large excursion from natural conditions</p>
7-44	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 very misleading.
7-45	The statement <i>“no significant residual impacts”</i> cannot be verified without knowing the biological baseline.
8-1	<p><i>“Key-objective of collector test to reduce uncertainty in the operational phase of the project”</i></p> <p>Please explain how this would be possible for the biological impacts, which are inherently linked to baseline biological data of the mined areas (that are not available yet).</p>
8-2	The “Environmental Effects” section contains statements such as (in relation to the impacts of smothering from plumes) <i>“It is anticipated that benthic, benthopelagic and mid-water organisms within the TF (test site) will experience some of these impacts”</i> . This is a general statement, supported solely by references to general existing literature rather than data on the environment in the areas that will be impacted. This entire section does not meet the requirements of the Recommendations due to the lack of baseline biological data.

8-3	Why are the observations restricted to cetaceans and turtles for the ongoing PelagOS system? Other animals, such as sharks and birds, may be affected in their migration by the presence of ships. Birds may get confused by the lights of the boats at night and strand. What is the plan for dealing with birds that land on the ship to ensure they do not get injured or worse, and are able to leave appropriately?
8-3	<p><i>“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.”</i></p> <p>Results on specimen-survival of specimens that passed through the nodule processing system and are ejected will be interesting, although based on expert knowledge these rates would be (very) low. It is not clear, how transport through 4000 meters of water-column, or different conditions on board of the vessel will be taken into account in the survival rate study (i. e., are pressurized tanks on board of the vessel used?). For how long will the animals be observed? Injury may not lead to direct mortality, but to death after a certain time period.</p>
8-3, Figure 8-1	Block et al. (2011) never made the claim that their list of species and species migration was exhaustive. Tracking studies are incredibly difficult in terms of attaching the trackers and retrieving the trackers. I would not take these data as an argument that no migration occurs in the NORID area simply because there is no data available. Absence of evidence is not evidence of absence. It is very likely that as more species and individuals are tagged, this gap will be filled.
8-5	Will the discharge be continuous over 259 hours? If not, what would be the time period where discharge occurs and where it does not? How does the mining vehicle and ship movement affect the discharge? Was this considered in the model simulations? Please clarify.
8-9	Table 8-2: This table does not consider baseline biological data, so determining the residual impacts of an activity on an undefined environment/value is nonsensical. Additionally, impact assessments are usually much more comprehensive than this table and include specific, measurable, time bound and auditable commitments that relate to specific predicted impacts.
Section 11	All cumulative impacts related to the test activities are assumed to be additive, but this is not necessarily true. What is done to determine whether the effects are additive, and if not, what additional precautions would be taken?
11-1	There seems to be a focus on plume effects, but no consideration of sediment compaction, habitat destruction, and noise pollution. The presence of a ship will likely change behaviours as observed with birds following the ship for example. None of these are considered.

12-6	Table 12-2: Why have the bacteria and micronekton not been investigated for impact? 10-m MOCNESS net tows should have been used and water sampled for the bacterial communities.
12-8	<p>Table 12-3: It is not clear where or how the monitoring of biological parameters will take place. Normally there would be a set of figures/maps showing the monitoring locations - of biological samples, but also of mooring locations, AUV transects relative to the impact location, etc. so that the design of the monitoring regime can be defended. From this table, it is not possible to determine whether the proposed monitoring strategy is at all aligned with the proposed disturbance design.</p> <p>Why were the micronekton not investigated for impact?</p> <p>Please clarify how the bioluminescent community was measured. The table suggests the use of a transmissometer, which is not appropriate.</p>
13-1, 13-2	<p><i>"Biota are well represented throughout NORI-D and CCZ"</i></p> <p>Please provide data and references for this assumption. As mentioned above, recent scientific studies have shown this statement to be incorrect. Instead there has been shown to be high environmental and therefore biological heterogeneity, species with variable distributions and ranges, as well as high hidden species diversity (ISBA, 2020; Amon et al., 2016; Christodoulou et al., 2019; Simon Lledo et al., 2019; 2020; Vanreusel et al. 2016; Tilot et al. 2018; Pape et al. 2021; Leitner et al. 2017, 2021; Drazen et al. 2021; Bonifácio et al. 2021; Jones et al. 2021). In addition, there is no baseline within the EIS to confirm this (as stated in this document: <i>"At the time of writing, the physical baseline is well progressed but the biological baseline data is considered preliminary. The current work program will collect baseline biological data as required for statistical impact assessment prior to the commencement of the collector test"</i>). If the biological baseline data is preliminary, the assumption cannot be made that the biota impacted by the collector test represents habitat through NORI-D and/or the wider CCZ. Please amend.</p>
14-5	<p><i>"Although sponsoring states are encouraged to conduct stakeholder consultation there is currently no legal obligation to do so and a preferred process is not prescribed."</i></p> <p>This statement is not correct. While it may be accurate to say that UNCLOS and current ISA rules do not prescribe specific obligations with regards to stakeholder consultation in an EIA, these are not the only relevant legal instruments. Public participation in State decision-making is an important obligation in the context of environmental law, natural resources law, and human rights law, all of which apply to the Government of Nauru (and other sponsoring States at the ISA). Nauru (along with other sponsoring States) has also committed to consultative decision-making via political agreements, such as the Rio Declaration and the sustainable development goals. Any State's decision to permit an activity that will lead to a significant degree of environmental harm to the common heritage of [hu]mankind should be taken via responsive, inclusive, and participatory decision-making.</p>
14-5, 14-6	The schedule and procedure set out makes no allowance for the Council of the ISA to review the EIS, the LTC's recommendations on the EIS, and stakeholder comments received. The Council is the executive organ of the ISA, and has the legal mandate to <i>"exercise control over activities in the Area"</i> and to take steps to prevent serious harm to

	the environment. Failure to factor the Council into the EIS process and decision-making might be problematic.
15-1	The conclusion indicates that there are no significant impacts, despite there being a complete absence of baseline biological data. It might be a reasonable assumption for a small test, but it is contrary to all the ISA guidance and it is inappropriate to draw that conclusion with no supporting biological data.
App endi xes 1,2  Pg 11	Are the diameters of the particle size given the average or median? It is 1-2 orders higher than median values from the CCZ (Muñoz-Royo et al. 2021). That will have impacts on the settling speed.
App endi xes 1,2  Pg 11	Stating flocculation will occur based on the lab conditions that do not seem to include the effects of discharge effects is inappropriate. There are significant issues with this model assumption.
App endi xes 1,2  Pg 11	The main document states that the discharge concentration will be 11.7 or 21.3 g/l (not clear) - both those concentrations are above the hindered settling limit. Is this why the plume starts at 50 m below the discharge point and ignores the initial plume development? Please clarify.
App endi xes 1,2  Pg 11	The assumption of flocculation occurring may be invalid (Rzeznik et al. 2019), which therefore also affects your settling estimates and thus plume dispersal.
App endi xes 1,2 Pg 13	Are model outputs being evaluated against the data used to parametrize it? Please clarify
App	Please include how compaction will influence burrowing animals.

<p>endi xes 1,2 Pg 15</p>	
<p>App endi xes 1,2 Pg 16</p>	<p>How typical is 2017? It was a very warm year without it being an El-Nino year. January 2017, for example, was the 3rd warmest January in 137 years.</p>
<p>App endi xes 1,2 Pg. 24</p>	<p>Section 3: Midwater plume results are only shown for 50 m below the discharge. This does not represent the plume. What is the 3D shape and extent of the plume? Please clarify.</p>
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