



Draft Guidelines for the preparation of environmental management and monitoring plans

Developed by the Legal and Technical Commission

**DRAFT FOR STAKEHOLDER CONSULTATION
(DO NOT QUOTE OR CITE)**

Background

1. During the continuation of the twenty-sixth session, the Commission considered draft guidelines for the preparation of environmental management and monitoring plans pursuant to regulation 48 and annex VII of the draft regulations on exploitation of mineral resources in the Area (ISBA/25/C/WP.1) as prepared by a technical working group of the Commission.
2. The purpose of an Environmental Monitoring and Management Plan is to manage and confirm that Environmental Effects meet the environmental quality objectives and standards for the mining operation.
3. Draft regulation 48 requires an applicant or contractor, as the case may be, to prepare an Environmental Monitoring and Management Plan in accordance with annex VII that is:
(i) based on the environmental impact assessment and the Environmental Impact Statement;
(ii) in accordance with the relevant environmental management plan; and (iii) prepared in accordance with the applicable Guidelines, Good Industry Practice, Best Available Scientific Evidence and Best Available Techniques, and consistent with other plans in the draft regulations, including the Closure Plan and the Emergency Response and Contingency Plan.
4. To give effect to the requirements contained in draft regulation 48, including annex VII, the Commission considered that it was necessary to prepare: (i) Guidelines (Appendix I) for the preparation of environmental management and monitoring plans.

Appendix I
Draft Guidelines for the preparation of environmental management and monitoring plans

CONTENTS

I. Introduction

- A. Scope and Purpose
- B. Terminology
- C. Use of this Guideline in Context of Regulations and Other Standards or Guidelines

II. General Principles for Environmental Management and Monitoring Plans

III. Preparing an EMMP for submission with a plan of work

- A. Preparation of EMMP for submission of Plan of Work application
- B. Project Area Description
- C. Environmental Management System
- D. Environmental Impact Assessment and Predicted Environmental Effects
- E. Monitoring and Management Program
- F. Planning Performance Assessments
- G. Preservation Reference Zones and Impact Reference Zones
- H. Mining Discharges and Waste Assessment and Prevention Audit
- I. Training Program
- J. Report of Competent Person
- K. Additional considerations

IV. Cost of preparing the EMMP

V. Performance Assessment, Review and Reporting

VI. Information Sources

- A. References
- B. Useful Links

VII. Appendices

List of Abbreviations and Acronyms

APEIs	Areas of Particular Environmental Interest
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMMP	Environmental Management and Monitoring Plan
EITI	Extractive Industries Transparency Initiative
EI	Environmental Indicator
EMS	Environmental Management Systems
ERA	Environmental Risk Assessment
ERCP	Emergency Response and Contingency Plan
IRZs	Impact Reference Zones
ISBA	International Seabed Authority
ISO	International Organization for Standardization
MARPOL	International Convention for the Prevention of Pollution from Ships
MSHA	Mine Safety and Health Administration
PRZs	Preservation Reference Zones
REMP	Regional Environmental Management Plan
SMS	Safety Management System
UNCLOS	United Nations Convention on the Law of the Sea

I. INTRODUCTION

1. The EMMP to be prepared and submitted by an Applicant for a Plan of Work under the Regulations on exploitation of Mineral Resources in the Area (**Exploitation Regulations**) must set out commitments and procedures on how mitigation measures will be implemented, how the effectiveness of such measures will be monitored, what the management responses will be to the monitoring results and what reporting systems will be adopted and followed in accordance with Regulation 48.

2. This guideline has been developed to provide practical and technical guidance on the implementation of an EMMP associated with Exploitation of mineral resources in the Area, as specified in regulations 13(3)(b), 31, 38, 42, 48, 49, 50, 51, and Annex VII of the Exploitation Regulations.

3. The guidance below is not intended to be prescriptive, the aim is to provide sufficient direction to enable Applicants/Contractors to formulate an approach for environmental management and monitoring. These Guidelines should be read in conjunction with the Exploitation Regulations, the relevant Exploration Regulations, other relevant International Seabed Authority (the **ISA** or the **Authority**) rules, regulations, recommendations and procedures, as well as other relevant Standards and Guidelines.

A. Scope and Purpose

4. The scope and purpose of an EMMP as prescribed by the Exploitation Regulations is to “*manage and confirm that Environmental Effects meet the environmental quality objectives and standards for the mining operation*” (Regulation 48(1)).

5. “*Environmental Effects*” as defined by the Exploitation Regulations means any consequences in the Marine Environment arising from the conduct of Exploitation activities, whether positive, negative, direct, indirect, temporary or permanent, or cumulative effect arising over time or in combination with other mining impacts.

6. The EMMP outlines commitments and procedures on how the mitigation measures will be implemented, how the effectiveness of such measures will be monitored, what the management responses will be to the monitoring results and what reporting systems will be adopted and followed. The EMMP shall cover the main aspects prescribed by the Authority in Annex VII to the Exploitation Regulations in accordance with these Guidelines, Good Industry Practice, Best Available Scientific Evidence and Best Available Techniques.

B. Terminology

7. Unless otherwise stated, terms defined in the Exploitation Regulations and UNCLOS have the same meaning when used in this Guidelines.

- Areas of Particular Environmental Interest (APEIs) refers to areas that are “set aside” by the Authority as a part of a regional environmental management plan. APEIs are large areas with self-sustaining populations as well as a wide range of habitat variability.

- The Precautionary Approach—is the approach reflected in Principle 15 of the Rio Declaration, which states that: “*In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.*”¹ Principle 15 of the Rio Declaration

C. Use of this Guideline in Context of Regulations and Other Standards or Guidelines

8. Users of this Guideline should take steps to check with the Authority whether further Standards or Guidelines have been issued at the time they prepare their EMMP.

9. **In conjunction with the Exploitation Regulations:** The Exploitation Regulations should be strictly followed, and applicable terms used as reference. The Applicant/Contractor should also conduct a search for guidelines published by governing bodies that could be of relevance for the project, including national laws and other industry codes that could be developed from time to time. This guideline does not specify any national, state or provincial legislation to retain relevance given laws and regulations are amended or updated from time to time. This guideline promotes best practices when it is used in conjunction with relevant legislation, regulations, and procedural guidelines.

10. **In consultation with other EMMP guidance documents and examples:** Additional resources can be found in Section 5 of this guideline. There are numerous guidance documents from related industries that can provide valuable, relevant approaches to establishing management and monitoring actions.

II. GENERAL PRINCIPLES FOR ENVIRONMENTAL MANAGEMENT AND MONITORING PLANS

11. Environmental management is critical, particularly for the conservation and sustainable use of the oceans, seas, and marine resources for sustainable development consistent with the UN Sustainable Development Goal 14.

12. One of the fundamental policies and principles set out in Regulation 2 is to provide “*pursuant to article 145 of the Convention, for the effective protection of the Marine Environment from the harmful effects which may arise from Exploitation*” based on the principle of “*a fundamental consideration for the development of environmental objectives shall be the effective protection of the marine environment, including biological diversity and ecological integrity*” and “*the application of an ecosystem approach.*”

13. The EIA, EIS, and EMMP are important instruments for adherence to these principles. In accordance with Regulation 52 the EMMP remains as a 'living document' to be used as a management tool to ensure that the commitments made in the EIS are implemented throughout the project life.

¹ United Nations Conference on the Human Environment, “Rio Declaration on Environment and Development,” November 13, 2006, <https://www.cbd.int/doc/ref/rio-declaration.html>.² Eva Ramirez-Llodra et al., “Strategic Environmental Goals and Objectives for Seabed Mining” (Deep-Ocean Stewardship Initiative, 2018).

14. An EMMP should:
- Be balanced and objective through independent verification;
 - State any limitations that apply to the use of the information;
 - Identify scientific uncertainties and include adaptive management strategies for managing uncertainty, where appropriate;
 - Where practical, appropriate and proportionate, establish specific commitments to auditable and measurable outcomes and clear timeframes;
 - Clearly explain technical terms and acronyms used;
 - Clearly define responsibilities and roles; and
 - Be reviewed and updated in accordance with Regulation 52.

15. In accordance with Regulation 48 the EMMP must be consistent with other plans including the Closure Plan and Emergency Response and Contingency Plan. Regulation 48 further provides that the EMMP shall cover aspects prescribed in Annex VII and shall be:

- Based on the environmental impact assessment and the Environmental Impact Statement;
- In accordance with the relevant regional environmental management plan; and
- Prepared in accordance with the applicable guidelines, Good Industry Practice, Best Available Scientific Evidence and Best Available Techniques, and consistent with other plans in these regulations, including the Closure Plan and the Emergency Response and Contingency Plan.

III. PREPARING AN EMMP FOR SUBMISSION WITH A PLAN OF WORK

A. Preparation of EMMP for submission of Plan of Work application

16. The EMMP must be submitted by the Applicant as part of the Approval of a Plan of Work for Exploitation in the form of a contract with the Authority.

17. This Section 3 provides guidance to Applicants on the requirements for preparing an EMMP for an application for a Plan of Work.

18. An EMMP Checklist has been provided in Appendix C of this guideline to assist Applicants/Contractors in determining if all relevant and necessary elements are contained within the EMMP.

B. Project Area Description

19. In accordance with Annex VII(2)(b), the EMMP must contain a description of the the area likely to be affected by the proposed activities.

20. This description should be consistent with Section 3.1 "*Project area definition*" included in Annex IV (Environmental Impact Statement template).

C. Environmental Management System

21. Annex VII (2)(d) of the Exploitation Regulations requires that an EMMP provide details of the Applicants EMS and environmental policy. Detailed guidance regarding preparation of the EMS can be found in the EMS Guideline.

D. Environmental Impact Assessment and Predicted Environmental Effects

22. Annex VII(2)(e) and (f) requires that:

- An assessment of the potential Environmental Effects of the proposed activities on the Marine Environment, and any significant changes likely to result.
- An assessment of the significance of the potential Environmental Effects, and proposed mitigation measures and management control procedures and responses to minimize the harm from Environmental Effects consistent with the environmental impact assessment and the Environmental Impact Statement.

23. The EIA, ERA, and mitigation measures are used to prepare the detailed monitoring plans within the EMMP. Detailed guidance regarding an EIA, ERA, and EIS can be found in their respective guidelines. The Applicant should develop mitigation measures and control procedures for each Environmental Effect identified in the EIA process and described in the EIS. The mitigation measures identified for each potentially significant Environmental Effect identified in the EIA (refer to Guideline 2) should then be used to design the monitoring program(s) (see below).

E. Monitoring and Management Program

24. Annex VII(2)(g) requires that an EMMP must include a description of:

- the planned monitoring program; and
- the overall approach, standards, protocols, methodologies, procedures and performance assessment of the Environmental Management and Monitoring Plan, including the necessary risk assessment and management techniques, including adaptive management techniques (process, procedure, response), if appropriate, needed to achieve the desired outcomes.

25. Section 3.5.1 below provides guidance on management techniques and Section 0 below on the monitoring program.

1. Adaptive Management

26. Adaptive environmental management:

- is an iterative process of decision-making in which management actions are modified as needed as information accumulates or conditions change in the managed system;
- allows for feedback between monitoring and decision-making, mitigates risk, and can integrate environmental change (natural or as a result of the activities being managed) in the EMMP²;

² Eva Ramirez-Llodra et al., “Strategic Environmental Goals and Objectives for Seabed Mining” (Deep-Ocean Stewardship Initiative, 2018).

- modest and reversible management interventions, to generate further knowledge about the resource being studied.³ Adaptive management is often portrayed as a multi-step cyclical process involving problem identification, design, implementation, monitoring, and assessment⁴; and
 - is important to ensure the linking of on-going science to decision-making;⁵
27. Inherent uncertainties will take time and gained knowledge and experience to resolve.⁶
28. Review of management objectives and evaluation of monitoring plans are key components of adaptive management in the context of Mineral Exploitation in the Area.
29. This adaptive management process will aid in the advancement of scientific understanding of sites where Mineral Exploitation will occur, mining technologies, impacts and the environment's response, thereby providing critical feedback to inform future decision-making.⁷
30. A useful way to describe the implementation of adaptive management is in terms of a setup or deliberative phase during which key components are put in place, and an iterative phase in which the components are linked together in a sequential decision process.⁸
31. The setup phase involves a framing of the resource problem in terms of objectives, management alternatives, models, and monitoring protocols. The iterative phase utilizes these elements in an ongoing cycle of learning about system structures and functions and managing based on what is learned (Figure 1).

³ Aline Jaeckel, "Deep Seabed Mining and Adaptive Management: The Procedural Challenges for the International Seabed Authority," *Marine Policy* 70 (2016): 205–11, <https://doi.org/10.1016/j.marpol.2016.03.008>.

⁴ Ibid.

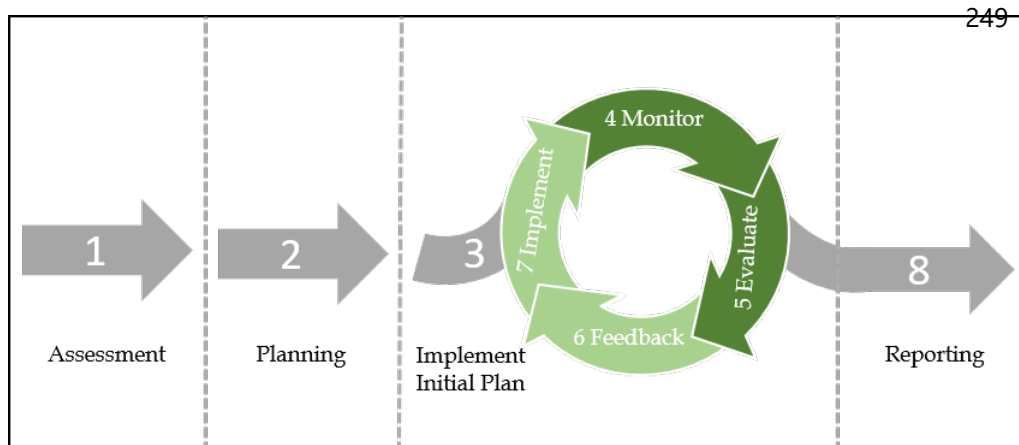
⁵ Swaddling, "Pacific-ACP States Regional Environmental Management Framework For Deep Sea Minerals Exploration and Exploitation."

⁶ Ramirez-Llodra et al., "Strategic Environmental Goals and Objectives for Seabed Mining." ⁷ Swaddling, "Pacific-ACP States Regional Environmental Management Framework For Deep Sea Minerals Exploration and Exploitation"

⁷ Swaddling, "Pacific-ACP States Regional Environmental Management Framework For Deep Sea Minerals Exploration and Exploitation"

⁸ B K Williams, Robert C. Szaro, and Carl D. Shapiro, *Adaptive Management The U.S. Department of the Interior Technical Guide* (Washington, D.C.: U.S. Department of the Interior, 2009), <http://pubs.er.usgs.gov/publication/70194537>.

Figure 1: Adaptive Management Feedback Loop (adapted from Williams et al., 2011⁹)
Additional links to resources to assist with developing appropriate component monitoring plans are provided in Section VI.B.



2. Monitoring Program Overview

32. As set out above, the EMMP will include an assessment of the significance of the potential Environmental Effects and the proposed mitigation measures, management control procedures to minimise harm from Environmental Effects, and proposed mitigation measures to reduce residual impacts to acceptable levels.

33. The implementation of these assessments, procedures and measures requires monitoring to confirm environmental performance and the effectiveness of the implementation strategy (**Monitoring Program**).

34. The Monitoring Program should detail the following:

- The parameters identified to be monitored and/or sampled during an EIA/EIS to evaluate Environmental Effect and the associated monitoring actions to be taken;
- Proposed environmental monitoring/sampling methodology, including standards, protocols, methodologies, and procedures for collecting, analysing, and interpreting data, and the details of the proposed monitoring stations across the project area;
- Performance standards;
- Necessary risk assessment and management techniques, including adaptive management techniques (process, procedure, response), if appropriate, needed to achieve the desired outcomes; and
- Review and reporting requirements and quality control standards.

3. Parameters to be monitored

35. The types of environmental parameters that should be monitored as part of Exploitation applications in the Area are those studied during the baseline study, EIA and EIS phase, including:

- Physiochemical Environment;

⁹ Byron K. Williams, "Adaptive Management of Natural Resources—Framework and Issues," *Journal of Environmental Management*, Adaptive management for Natural Resources, 92, no. 5 (May 1, 2011): 1346–53, <https://doi.org/10.1016/j.jenvman.2010.10.041>.

- Biological Environment;
- Socioeconomic Environment.

a) Monitoring Methodology

36. Non-significant environmental effects identified in the EIS will be monitored in accordance with Best Environmental Practices, consistent with Annex VII (2) (k) and regulation 48 (3) (c) of the Exploitation Regulations.

37. The specific details relating to each potential significant Environmental Effect will vary based on the planned activities, management objectives, character and magnitude of potential Environmental Effects, site characteristics, the techniques to be used, and available equipment and resources (including financial and human).¹⁰

38. The EMMP should describe the types of monitoring to be used through the various phases of Exploitation. Types of monitoring includes:

- Validation Monitoring: This monitoring should take place at the commencement of the project or activity and involves intensive, real time, and comprehensive monitoring to validate assumptions made in the baseline/EIA/EIS phase of the project. Upon the completion of the validation monitoring period, it is expected that uncertainty will be reduced, and the operation may enter into a 'steady state' compliance monitoring period, which may be less intense.¹¹
- Compliance Monitoring: This monitoring should be implemented throughout the project's operations to ensure that the prescribed mitigation measures are effective in reducing the residual impacts to acceptable levels. This monitoring should be conducted periodically, the timing of which will vary from project to project (but which will be agreed with the Authority and set out in the EMMP). It must be used to check that the levels of specific environmental parameters are compliant with applicable regulations, Standards or guidelines, and contractual obligations. This type of monitoring will assist Applicants/Contractors carrying out performance assessments (see Section "*Planning Performance Assessments*" below).
- Long-term Monitoring: Monitoring of Environmental Effects must continue after completion of operations. This monitoring will be a continuation of some aspects of the compliance monitoring components, but likely with adjusted frequency and timescale. The details of long-term monitoring will be developed in accordance with the Closure Plan. Applicants and Contractors should refer to Standard and Guidelines on Closure Plans for further guidance.

39. The effort and resources allocated to monitoring different parameters should be proportionate to the importance of the predicted environmental impacts and effects (subject to complying with the overall objectives and requirements in the Exploitation Regulations), the level of residual uncertainty from the EIA, and the areas of main focus for adaptive

¹⁰ Alison Swaddling et al., "Pacific-ACP States Regional Scientific Research Guidelines for Deep Sea Minerals" (Pacific Community (SPC), 2016), https://www.researchgate.net/publication/311104561_Pacific-ACP_states_regional_scientific_research_guidelines_for_deep_sea_minerals.

¹¹ Leonardus J. Gerber and Renée L. Grogan, "Challenges of Operationalising Good Industry Practice and Best Environmental Practice in Deep Seabed Mining Regulation," *Marine Policy*, September 2018, S0308597X18304639, <https://doi.org/10.1016/j.marpol.2018.09.002>.

management strategies. The monitoring should reflect the sum total of predicted impacts and management strategies, with the aim of determining if the environmental objectives are being achieved.

40. It is expected that data collected during Exploration to support the baseline definition of the project will be used in conjunction with data collected in subsequent monitoring activities. The EMMP may need to be modified following the collection of additional data and throughout the monitoring program.

41. The Applicant should provide a detailed description of the proposed methods and procedures for collecting, analysing, and interpreting data.¹² Specifically, for each activity, the Applicant should provide the following information in accordance with Best Environmental Practices:

- Parameter to be evaluated and a description of what information that particular variable will provide pertinent to a potential significant Environmental Effect;
- Detailed monitoring/sample collection procedures, including quality assurance/quality control samples;
- List of monitoring/sampling equipment and supplies;
- Specifications of monitoring/sampling equipment (including calibration procedures);
- Laboratory methods and detection limits, if applicable;
- Monitoring/sampling timing and frequency;
- Cleaning/decontamination procedures;
- Record keeping procedures;
- An estimate of the anticipated annual cost of monitoring;
- Data organization, analysis, and interpretation procedures;
- Proposed methods of presenting the data (e.g., maps, photographs, data tables, graphs, live data feeds) and including transferability to external databases (e.g., DeepData); etc. If the Applicant/Contractor possesses the capability, they can use real time electrical compliance monitor technology; and
- A monitoring checklist specifying when the monitoring needs to be carried out, who is responsible, what methods will be used to measure effectiveness, and if follow-up action is required.¹³

42. The adoption of consistent data collection methodology by Applicants/Contractors will enable the Authority to effectively manage the data and combine it to gain a ‘big picture’ understanding of mineral resources and the environments of the Area¹⁴ in the EMMP review and approval process. Applicants/Contractors may identify different/new Best Available Techniques for monitoring, if sufficient justification is provided. Not all sampling methodology is applicable to all resource types and should be evaluated by the Applicant/Contractor.

¹² Clark, Durden, and Christiansen, “Environmental Impact Assessments for Deep-Sea Mining.”

¹³ New South Wales Department of Infrastructure Planning & Natural Resources and Planning & Natural Resources Department of Infrastructure, *Guideline for the Preparation of Environmental Management Plans* (Sydney, NSW, Australia 2000: Department of Infrastructure, Planning and Natural Resources, 2004).¹⁴ Saddling et al., “Pacific-ACP States Regional Scientific Research Guidelines for Deep Sea Minerals.”

¹⁴ Saddling et al., “Pacific-ACP States Regional Scientific Research Guidelines for Deep Sea Minerals.”

4. Monitoring Stations

43. Annex VII(2)(h) of the Exploitation Regulations provides that an EMMP must provide a detailed description of the proposed monitoring stations across the project area, including the frequency of monitoring and data collection, the spatial and temporal for such monitoring, and justification for such arrangements.

44. Monitoring associated with Exploitation in the Area should take place in multiple locations in the project area; including but not limited to:

- Monitoring to evaluate the characteristics of the operational plume;
- Monitoring to evaluate the characteristics of the ‘returned water’ plume;
- Permanent Monitoring in locations to assess physical oceanography characteristics such as current speed and direction to inform operational decision-making;
- Monitoring in locations to meet specific monitoring objectives relative to the Environmental Effects identified in the EIS;
- IRZ Monitoring; and
- PRZ Monitoring.

F. Planning Performance Assessments

1. Overview

45. Annex VII requires that an EMMP include details of the planned performance assessment of the EMMP (Annex VII, 2(g)) and the details of the quality control and management standards, including the frequency of the review of the performance of the EMMP (Annex VII, 2(l)).

46. The applicants description and plan of the performance assessment must be consistent with Regulation 52. Therefore, the below guidance links the EMMP description of the planned performance assessment with the requirements in Regulation 52.

2. Format

47. Regulation 52 requires that the Contractor shall conduct performance assessments in accordance with the format in Appendix A to this Guideline.

3. Description of the performance assessment

48. In accordance with Regulation 52, the planned performance assessment must consider:

- the compliance of the mining operation with the EMMP; and
- the continued appropriateness and adequacy of the EMMP, including the management conditions and actions attaching thereto.

49. Each performance assessment should also assess:

- whether the EMMP is (continuing to) achieving its objectives and the requirements of any relevant approval conditions, the contract, and the rules, regulations and procedures of the Authority;
- environmental monitoring records and the results of any prior assessments;
- include examination of updated external information (academic literature, workshop and technical reports from the Authority or other relevant groups, environmental data from other sources (e.g. published by the Authority on DeepData);
- document any reasons for varying the EMMP;
- the performance assessment criteria (this is detailed further below);
- whether corrective action is required (this is detailed further below); and
- whether identified corrective actions have been undertaken and then assess the effectiveness of such actions. Results should be used to inform future stages of the project.

50. Contractors should be aware that these specifications may be revised by the Authority during the implementation of the EMMP, in the spirit of promoting continuous improvement.¹⁵

4. Description of performance assessment criteria

51. Performance assessment criteria should take the form of environmental objectives and standards that are:

- Quantitative and measurable, to the extent practicable;
- Qualitative, where appropriate and where applicable qualitative goals and standards are available; and
- Able to achieve the environmental outcomes when implemented.

5. Description of plan for corrective action

52. Performance criteria should include trigger values or conditions under which corrective actions are taken.

53. Subject to section "*Description of plan in respect of Notifiable Events*" below, the EMMP should specify:

- monitoring results which exceed the trigger values for corrective action;
- how monitoring records will be maintained;¹⁶
- when follow up action is required;
- potential corrective actions; and
- procedures and timelines for reporting non-compliance to the Commission/Authority.¹⁷

54. Contractors should make sure their corrective action plan is in accordance with Regulation 51(b), which requires Contractors to implement all applicable Mitigation and management measures to protect the Marine Environment, as set out in the Standards referred to in Regulation 45.

¹⁵ CSIR Environmental, "Guideline for Environmental Management Plans" (Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town: Department of Environmental Affairs & Development Planning, Cape Town, 2005).

¹⁶ Australian Government, Department of Environment, "Environmental Management Plan Guidelines."

¹⁷ Ibid.

471 **6. Description of plan in respect of Notifiable Events**

472
473 55. Applicants should ensure that their EMMP complies with the Exploitation Regulations
474 requirements in respect of a "*Notifiable event*", as defined in Appendix I of the Exploitation
475 Regulations and detailed in Regulation 34.

476
477 56. In particular, Applicants/Contractors should note in the EMMP that if a "*Notifiable*
478 *event*" is identified during a performance assessment:

- 479
- 480 • the Contractor shall immediately notify its sponsoring State or States and the Secretary-
481 General of the happening of any of the Notifiable Event;
 - 482 • the Contractor shall, as soon as reasonably practicable, but no later than 24 hours after
483 the Contractor becomes aware of any such event, provide written notification to the
484 Secretary-General of the event, including a description of the event, the immediate
485 response action taken (including, if appropriate, a statement regarding the
486 implementation of an Emergency Response and Contingency Plan) and any planned
487 action to be taken; and
 - 488 • the Contractor shall ensure that all regulatory authorities are notified and consulted, as
489 appropriate.
- 490

491 **7. Description of the frequency of scheduled performance assessments**

492
493 57. In accordance with Regulation 52, the frequency of a performance assessment shall be
494 in accordance with the period specified in the EMMP.

495
496 58. The frequency of the performance assessment should be appropriate to the nature and
497 scale of the impacts and risks of the of the impacts and risks of the activity, with consideration
498 given to the level of confidence in the cause-effect relationship for each risk/impact. Where
499 there is less confidence in the effectiveness of a control measure, it would be appropriate to
500 implement more regular performance assessments. In the context of deep seabed mining,
501 Contractors should plan to carry out performance assessments more regularly as control
502 measures.

503
504 **8. Description of the non-scheduled and triggered performance assessments**

505
506 59. The EMMP should include non-scheduled triggers for carrying out performance
507 assessments. For example:

- 508
- 509 1. Following a Notifiable Event (see above);
 - 510
 - 511 2. When there is a substantive adjustment to the relevant REMP; and
 - 512
 - 513 3. When relevant new or revised rules, regulations, procedures or Standards and
514 Guidelines are issued by the Authority.
- 515

516 **9. Description of who carries out the performance assessment**

517
518 60. Applicants should plan for performance assessments to be carried out internally or
519 by independent competent persons. If they are carried out internally, they should be done by
520 Competent Persons

521
522 **G. Preservation Reference Zones and Impact Reference Zones**

523
524 61. Annex VII requires that each EMMP include the location and planned monitoring and
525 management of preservation reference zones and impact reference zones, or other spatial
526 management planning tools. These zones and tools assist Contractors in monitoring and
527 evaluating the impacts of deep seabed mining on the Marine Environment.

528
529 62. Appendix B contains checklists established to assist the Applicant/Contractor in
530 monitoring of IRZs and PRZs.

531
532 **H. Mining Discharges and Waste Assessment and Prevention Audit**

533
534 **1. Overview**

535
536 63. Regulation 50 provides:

- 537
538 1. Subject to (2) below, a Contractor shall not dispose, dump or discharge into the Marine
539 Environment any Mining Discharge, except where such disposal, dumping or discharge
540 is permitted in accordance with:

- 541
542
 - The assessment framework for Mining Discharges as set out in the Guidelines
 - (**Mining Discharge Guideline**); and
 - The Environmental Management and Monitoring Plan.

- 543
544
545
546 2. Paragraph 1 above shall not apply if such disposal, dumping or discharge into the
547 Marine Environment is carried out for the safety of the vessel or Installation or the
548 safety of human life, provided that all reasonable measures are taken to minimize the
549 likelihood of Serious Harm to the Marine Environment, and such disposal, dumping or
550 discharge shall be reported forthwith to the Authority.

551
552 64. Annex VII 2(o) of the Exploitation Regulations provides that the EMMP must include
553 details of Mining Discharges, including a waste assessment and prevention audit.

554
555 65. “*Mining Discharge*” means any sediment, waste or other effluent directly resulting
556 from Exploitation, including shipboard or Installation processing immediately above a mine
557 site of Minerals recovered from that mine site.

558
559 **2. Planned management of Mining Discharge and waste**

560
561 66. Contractors planned management of Mining Discharge and waste under an EMMP
562 should be consistent with the Exploitation Regulations, the Mining Discharge Guideline, the
563 EIA, the EIS, and any relevant conventions, standards, legislation or instruments.

67. Generally, waste generated by and/or discharged from ships and other seacraft are managed in accordance with the International Convention for the Prevention of Pollution from Ships (MARPOL) and the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter. Onshore waste is managed in accordance with applicable local directives.

3. Waste assessment and prevention audit

68. The waste assessment and prevention audit should:

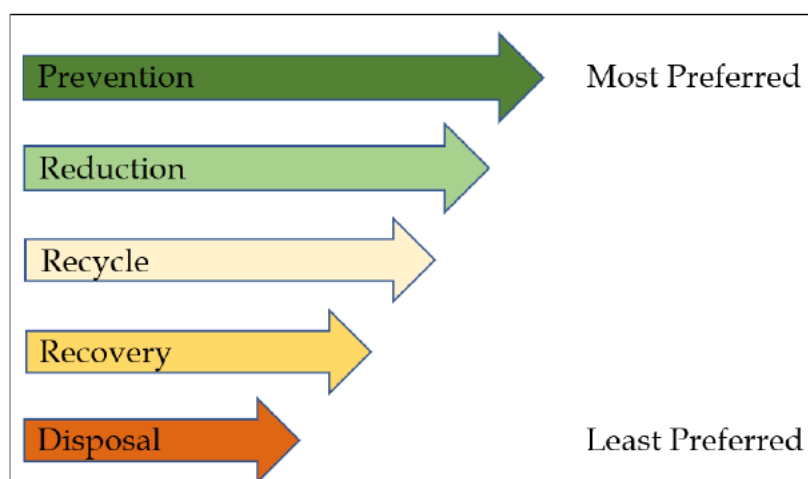
1. assess the Contractors compliance with its planned management of Mining Discharge and waste under its EMMP; and
2. assess Mining Discharge and waste prevention. To do so, the waste assessment and prevention audit should evaluate:
 - The amount, type, and hazard of the waste [in accordance with Guideline 5];
 - The source of the waste; and
 - The feasibility of waste prevention or reduction techniques. Waste prevention or reduction techniques may include input substitution, process modification, clean production technology, or a combination thereof.

69. If the waste assessment and prevention audit identifies opportunities for waste prevention at the source, the Contractor should create a waste prevention strategy that prioritizes the waste stream or pollutant that is the most hazardous to the Marine Environment and includes specific waste reduction targets, with stipulations to ensure that targets are being met.¹⁸

70. Following a waste assessment and prevention audit, a Contractor should update its planned management of Mining Discharge and waste under its EMMP. As part of this update, the Contractor should demonstrate that appropriate consideration has been given to the following hierarchy of waste management options, which implies an order of increasing environmental impact illustrated in Figure 2.

¹⁸ International Maritime Organization, “1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972, as Amended in 2006,” 2006.¹⁹ UNEP, UN DESA, and FAO, “SIDS-FOCUSED Green Economy: An Analysis of Challenges and Opportunities” (www.unep.org/greeneconomy and www.unep.org/regionalseas, 2012).

Figure 2. – Waste management hierarchy. (adapted from UNEP, et al., 2014¹⁹)



71. The examination of each alternative should include an assessment of the potential effects on the Marine Environment in accordance with the Contractors obligations under the Exploitation Regulations (including 2(e)(ii) and 32).

I. Training Program

72. Successful completion of monitoring activities requires the proper training of personnel and therefore there should be clearly described training protocols in the EMMP. This can be included in overall training for the site which is summarized below. Refer to [Guidelines 6 and 12 for additional guidance on training].

73. Regulation 37 of Exploitation Regulations is relevant to the extent that personnel of the Authority and development states are *"engaged or to be engaged in activities in the project area"*.

74. Training programs should be developed and implemented prior to the start of Exploration. Training should continue through the Exploitation as engineering design and project execution methods are developed. All training should be documented. The training should be tailored to the role of the individual in the project with a preference for in-person training whenever possible. When in-person training is not possible, formal, in-class training should be conducted. The EMMP should describe the training to be implemented and could include relevant components of Table 3:

Table 1: Example Curriculum for Training Program (not limited to EMMP)

Program Name	Training Program Overview	Personnel Involvement
Site Inductions/ Project Orientation	Training on site activities, operations and rules, and sensitive environmental areas	All personnel interacting with project site

¹⁹ UNEP, UN DESA, and FAO, "SIDS-FOCUSED Green Economy: An Analysis of Challenges and Opportunities" (www.unep.org/greeneconomy and www.unep.org/regionalseas, 2012).

Program Name	Training Program Overview	Personnel Involvement
Health and Safety Protocols	Training on health and safety protocols pertaining to general site activities, operations, and monitoring activities	All personnel interacting with project site; Designated personnel for more in-depth training
Explaining Requirements of EMMP and Employee Roles	Clearly stating requirements of EMMP to specific personnel roles and consequences of not meeting those requirements; identifying and communicating areas of environmental value and significance	All personnel interacting with project site
Spill Response Procedures	Protocols on how to respond to fuel and hazardous materials spills to stop the release, eliminated potential for ignition, evacuate, conduct remediation	Designated personnel
Emergency Response Procedures	Staff emergency scenario training and practice drills	Designated personnel
Monitoring Training	Training must be administered pertaining to monitoring protocols, sampling methodology, and data handling procedures	Designated personnel
Operations Training	Training must be administered to personnel involved in the physical extraction of minerals, and associated sea-based processing and transportation activities Marine Support Vessels Safety is discussed in further detail in Guideline 6.	Designated personnel

75. Records of all training conducted should be maintained and include²⁰:

- The person receiving the training;
- The date the training was received;
- The name and qualifications of the person conducting the training; and
- Any records of competency reports or assessments carried out at the conclusion of the training.

J. Report of Competent Person

76. Annex VII of the Exploitation Regulations requires that the EMMP is verified by the report of an independent competent person (**Competent Person Report**).

77. The term "competent person" is utilized in several industries and is generally regarded as a person with ability, training, knowledge, or experience to provide review, training, and/or

²⁰ Ibid.

take corrective actions in his or her area of expertise.²¹ It is recommended that the “*competent person*” who verifies the EMMP (**Competent Person**):

- a) has practical experience with the preparation of EMMPs;
- b) has ability, training, knowledge, and/or experience with offshore mining operations and environmental monitoring programs;
- c) has the ability to evaluate whether deficiencies are present within an EMMP with specific regard to the monitoring program and performance standards; and
- d) is not directly employed by the Applicant (i.e. should be a contracted third-party) or any subsidiaries of the applicant; and should not have been directly involved in the development of an EMMP that is subject to the review or verification of the Competent Person.

78. The Competent Person Report should include:

- a) a statement of the Competent Person's qualifications and experience;
- b) a statement of the Competent Person's independence vis-à-vis the Applicant;
- c) concise explanations of the method used by Applicant under the EMMP; and
- d) confirmation that the Applicant's EMMP and methodology contained therein is sensitive to the economic, geological, environmental and geographic features of the project.

79. Pursuant to Annex VII, an applicant must include the Competent Person Report in their final EMMP submitted with their Plan of Work application.

K. Additional considerations

80. Environmental data collected under an EMMP is generally information that the Authority is entitled to request.

81. In this context, in addition to the mandatory reporting requirements, applicants/Contractors are encouraged to agree additional requirements on an individual basis in the EMMP above on performance assessments. For example, Contractors may consider providing certain environmental data on a continuous basis to the Authority in real time.

82. On a regular basis (monthly or quarterly), Contractors could provide monitoring reports including monitoring data, statistical analysis, test results and model validation, assessment of trends, and identification of areas for improvement. Contractors should also discuss with the Authority the provision of periodic reports on longer-term Environmental Effects (e.g. annually or post-survey, and every 5-year substantive review).

²¹ Examples of “competent persons” definition from the mining industry are provided below. The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (‘the JORC Code’), a professional code of practice that sets minimum standards for Public Reporting of minerals Exploration Results, Mineral Resources and Ore Reserves, defines “competent person” as a Member or Fellow of The Australasian Institute of Mining and Metallurgy, or of the Australian Institute of Geoscientists, or of a ‘Recognized Professional Organization’ and as having a minimum of five years’ experience working with the style of mineralization or type of deposit under consideration and relevant to the activity which that person is undertaking. The United States Mine Safety and Health Administration (MSHA), a “competent person” means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them (30 Code of Federal Regulations 46.2(d)).

IV. COST OF PREPARING THE EMMP

83. Applicants should note that for the purposes of the Financing Plan in Annex III, they should detail and record the cost of preparing the EMMP. Further guidance in this regard is provided in the Guideline on the Financing Plan.

V. PERFORMANCE ASSESSMENT, REVIEW AND REPORTING

84. Contractors should familiarize themselves with the requirements in Regulations 38(1), 38(2), 51(1)(a) and 52 in respect of on-going reporting, performance assessments, and consultations with the Commission.

VI. INFORMATION SOURCES

A. References

- Australian Government, Department of Environment. "Environmental Management Plan Guidelines," 2014.
- Australian Government, NOPSEMA. "Environment plan content requirement," September 2020.
- Canada-Newfoundland and Labrador Offshore Petroleum Board. "Offshore Waste Treatment Guidelines," December 15, 2010.
- Clark, M.R., Jennifer M. Durden, and Sabine Christiansen. "Environmental Impact Assessments for Deep-Sea Mining: Can We Improve Their Future Effectiveness?" *Marine Policy*. Accessed December 18, 2019. <https://doi.org/10.1016/j.marpol.2018.11.026>.
- Clark, M.R., H.L. Rouse, G. Lamarche, J.I. Ellis, Christopher Wayne Hickey, and National Institute of Water and Atmospheric Research (N.Z.). "Preparation of Environmental Impact Assessments: General Guidelines for Offshore Mining and Drilling with Particular Reference to New Zealand." (New Zealand) National Institute of Water and Atmospheric Research, 2017.
- CSIR Environmentek. "Guideline for Environmental Management Plans." Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town: Department of Environmental Affairs & Development Planning, Cape Town, 2005.
- Department of Planning, Transport, and Infrastructure. "Underwater Piling Noise Guidelines." Government of South Australia, November 2012.
- Durden, Jennifer M., Kevin Murphy, Aline Jaeckel, Cindy Lee Van Dover, Sabine Christiansen, Kristina M. Gjerde, Aleyda Ortega, and Daniel O. B. Jones. "A Procedural Framework for Robust Environmental Management of Deep-Sea Mining projects Using a Conceptual Model." *Marine Policy* 84 (2017): 193–201.
- Fjukmoen, Øyvind, Amund Ulfesnes, Tor Jensen, Jon Kristian Haugland, and Lars Ulvestad. "Handbook - Species and Habitats of Concern, Mapping Assessment, Mitigation, and Monitoring. - In Relation to Oil and Gas Activities.," June 17, 2019.
- Gedamke, Jason, Jolie Harrison, Leila Hatch, Robyn Angliss, Jay Barlow, Catherine Berchok, Chris Caldow, et al. "Ocean Noise Strategy Roadmap." National Oceanic and Atmospheric Administration, 2016.
- Gerber, Leonardus J., and Grogan, Renée L.. "Challenges of Operationalising Good Industry Practice and Best Environmental Practice in Deep Seabed Mining Regulation." *Marine Policy*, September 2018, S0308597X18304639. <https://doi.org/10.1016/j.marpol.2018.09.002>.
- International Maritime Organization. "1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972, as Amended in 2006," 2006.
- . "International Convention for the Control and Management of Ships Ballast Water and Sediments," 2004.
- International Organization for Standardization. "ISO 14001:2015 Environmental Management Systems - Requirements with Guidance for Use," 2015.
- International Seabed Authority. "Briefing Paper - Design of IRZs and PRZs in Deep-Sea Mining Contract Areas," 2018. <https://ran-s3.s3.amazonaws.com/isa.org.jm/s3fs-public/files/documents/bp02-2018irz-final-18jul.pdf>.
- . "ISBA/25/C/WP.1 - Draft Regulations on Exploitation of Mineral Resources in the Area." ISA, 2019.
- International Seabed Authority, Legal and Technical Commission. "ISBA/16/LTC/2 The International Marine Minerals Society's Code of Environmental Management of Marine Mining." The Mining Code, 2010. <https://www.isa.org.jm/mining-code>.
- . "ISBA/17/LTC/7 - Environmental Management Plan for the Clarion-Clipperton Zone," 2011.

- International Seabed Authority, Legal and Technical Commission, and Legal and Technical Commission. "ISBA/25/LTC/6 - Recommendations for the Guidance of Contractors for the Assessment of Possible Environmental Impacts Arising from Exploration for Marine Minerals in the Area," April 18, 2019.
- ISA Draft Regulations (n.d.).
- Jaekel, Aline. "Deep Seabed Mining and Adaptive Management: The Procedural Challenges for the International Seabed Authority." *Marine Policy* 70 (2016): 205–11. <https://doi.org/10.1016/j.marpol.2016.03.008>.
- New South Wales Department of Infrastructure Planning & Natural Resources, and Planning & Natural Resources Department of Infrastructure. *Guideline for the Preparation of Environmental Management Plans*. Sydney, NSW, Australia 2000: Department of Infrastructure, Planning and Natural Resources, 2004.
- Orr, Terry, Stephen Wood, Michael Drunsic, and Gordon Perkins. "Development of Guidance for Lighting of Offshore Wind Turbines Beyond 12 Nautical Miles." Sterling, VA: US Dept. of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, 2016.
- Ramirez-Llodra, Eva, Lisa A. Levin, Anna Metaxas, Kristina Gjerde, Amber Cobley, and Maria C. Baker. "Strategic Environmental Goals and Objectives for Seabed Mining." Deep-Ocean Stewardship Initiative, 2018.
- Swaddling, Alison. "Pacific-ACP States Regional Environmental Management Framework For Deep Sea Minerals Exploration and Exploitation." Pacific Community (SPC), 2016.
- Swaddling, Alison, Malcolm R Clark, Marie Bourrel, Hannah Lily, Geoffroy Lamarche, Christopher Wayne Hickey, Helen L Rouse, Scott Nodder, Graham Rickard, and Philip Sutton. "Pacific-ACP States Regional Scientific Research Guidelines for Deep Sea Minerals." Pacific Community (SPC), 2016. https://www.researchgate.net/publication/311104561_Pacific-ACP_states_regional_scientific_research_guidelines_for_deep_sea_minerals.
- The PEW Charitable Trusts. "Regional Environmental Management Plans Are Key to Deep-Sea Conservation," July 2019. <https://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2019/07/regional-environmental-management-plans-are-key-to-deep-sea-conservation>.
- "UN Sustainable Development Goals." Accessed January 7, 2020. <https://sustainabledevelopment.un.org/>.
- UNEP, UN DESA, and FAO. "SIDS-FOCUSED Green Economy: An Analysis of Challenges and Opportunities." www.unep.org/greeneconomy and www.unep.org/regionalseas, 2012.
- United Nations Conference on the Human Environment. "Rio Declaration on Environment and Development," November 13, 2006. <https://www.cbd.int/doc/ref/rio-declaration.shtml>.
- Williams, B K, Robert C. Szaro, and Carl D. Shapiro. *Adaptive Management: The U.S. Department of the Interior Technical Guide*. Washington, D.C.: U.S. Department of the Interior, 2009. <http://pubs.er.usgs.gov/publication/70194537>.
- Williams, Byron K. "Adaptive Management of Natural Resources—Framework and Issues." *Journal of Environmental Management*, Adaptive management for Natural Resources, 92, no. 5 (May 1, 2011): 1346–53. <https://doi.org/10.1016/j.jenvman.2010.10.041>.

B. Useful Links

Topic	URL	Comments
EMMP General Resources		
ISA International Seabed Authority	https://www.isa.org.jm/documents-and-publications https://www.isa.org.jm/central-data-repository	Authority documents, including publications, legal documents, patents, and DeepData repository
SPC-EU Deep Sea Minerals Project	http://dsm.gsd.spc.int/index.php/publications-and-reports	Publications and reports on deep sea minerals, regional environmental management framework, and regional scientific research guidelines
Rules, Regulations, and Procedures		
International Seabed Authority	https://www.isa.org.jm/mining-code/Regulations	The mining code
International Marine Minerals Society	https://www.immsoc.org/IMMS_downloads/2011_SEPT_16_IMMS_Code.pdf	Code for Environmental Management of Marine Mining
International Marine Minerals Society	https://www.immsoc.org/IMMS_code.htm	Code for Environmental Management
Det Norske Veritas (DNV)-GL	https://www.dnvgl.com/maritime/index.html	Shipping Compliance and pollution reduction
International Maritime Organization (IMO)	http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/Default.aspx	International shipping and safety law obligations
Standards and Guidelines		
Equator Principals	https://equator-principles.com/best-practice-resources/	Equator Principals and Association Governance Rules
International Organization for Standardization	https://www.iso.org/iso-14001-environmental-management.html	ISO Environmental Management Standards
International Finance Corporation	https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_handbook_pps	IFC Performance Standards on Environmental and Social Sustainability
Extractive Industries Transparency Initiative	https://eiti.org/document/eiti-standard-2019#download	EITI Standard

Topic	URL	Comments
Activity-Specific Component Plan Development Resources		
Ecological Monitoring	https://www.researchgate.net/publication/311104561_Pacific-ACP_states_regional_scientific_research_guidelines_for_deep_sea_minerals	Provides information about targets, indicators, and thresholds for sustaining marine ecosystem integrity
Monitoring Techniques and Methods	https://www.researchgate.net/publication/311104561_Pacific-ACP_states_regional_scientific_research_guidelines_for_deep_sea_minerals	Provides aspects to be included, and parameters to be measured, in monitoring plans, including geology, sediment, seafloor communities, etc.
Methods for Resource Mapping and Monitoring	https://www.norskoljeoggass.no/contentassets/13d5d06ec9464156b2272551f0740db0/handbook-shec-mapping-assessment-and-monitoring-v0-final-signed.pdf	Provides methods for mapping and monitoring of seabed communities
Noise Management	https://cetsound.noaa.gov/Assets/cetsound/documents/Roadmap/ONS_Roadmap_Final_Complete.pdf	Provides strategies for assessing ocean noise impacts
Noise and Vibration Management	https://www.dpti.sa.gov.au/__data/assets/pdf_file/0004/88591/DOCS_AND_FILES-7139711-v2-Environment_-_Noise_-_DPTI_Final_word_editing_version_Underwater_Piling_Noise_Guide.pdf	Guidelines for management and mitigation of underwater piling noise
Lighting Management	https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Renewable-Energy/Offshore-Lighting-Guidance.pdf	Guidance of off-shore lighting management
Ballast Water Management	http://library.arcticportal.org/1913/1/International%20Convention%20for%20the%20Control%20and%20Management%20of%20Ships%27%20Ballast%20Water%20and%20Sediments.pdf	International Convention for the Control and Management of Ships' Ballast Water and Sediments

VII. APPENDICES

Appendix A – Example EMMP TOC

Appendix B – Considerations for Monitoring Criteria for IRZs and PRZs

Appendix C – EMMP Review Form

Appendix A
Environmental Monitoring and Management Plan (EMMP)
[Example Table of Contents/Form of Performance Assessment]

Appendix B
Checklist of Monitoring Criteria for
Impact Reference Zones (IRZs) and Preservation Reference Zone (PRZs):
Polymetallic Nodules Area

Item	Criteria	Description of how the plan addresses the criteria, or rationale for alternate criteria
MONITORING		
1.	It is recommended that experiences from other sectors be leveraged in the development of monitoring approaches and designs.	
2.	It is recommended that collected biological samples need to be appropriately archived in a reputable museum or research institute, if possible.	
3.	Data standards should be backward compatible.	

Item	Criteria	Description of how the plan addresses the criteria, or rationale for alternate criteria
4.	<p>Impacts predicted in the EIA should be monitored at sites using stratified sampling design within IRZs to assess impact across all habitat types, direct and indirect impacts, and spatial scales. The contractor shall consider, <i>inter alia</i> , the following key impacts to be monitored:</p> <ul style="list-style-type: none"> • physical removal / direct alteration of substrate, sediment and biota • change in geochemistry of the seabed substrate • changes to seafloor integrity • release of heavy metals and other contaminants as well as potential accumulation through the food chain • effects on the organisms and communities by plumes (e.g. smothering, effects on suspension feeders) • potential effects on plankton or nekton and mesopelagic fishes from the seafloor or discharge plumes • turbidity reducing visibility in the water column for predatory fish • potential impacts on commercial fish, fisheries, marine mammals, and migratory vertebrates such as turtles and sharks • noise and light • changes in water column properties 	

Item	Criteria	Description of how the plan addresses the criteria, or rationale for alternate criteria
5.	<p>The contractor shall consider, inter alia, assessing changes in:</p> <ul style="list-style-type: none"> • physical removal / direct alteration of substrate, sediment and biota • change in geochemistry of the seabed substrate • changes to seafloor integrity • release of heavy metals and other contaminants as well as potential accumulation through the food chain • effects on the organisms and communities by plumes (e.g. smothering, effects on suspension feeders); • potential effects on plankton or nekton and mesopelagic fishes from the seafloor or discharge plumes • turbidity reducing visibility in the water column for predatory fish • potential impacts on commercial fish, fisheries, marine mammals, and migratory vertebrates such as turtles and sharks • noise and light • changes in water column properties 	
6.	Further refinement is needed for monitoring variables to be measured in keeping with the spatial and temporal nature of the Project.	
7.	Contractors should consider variance and statistical power in PRZ and IRZ monitoring.	
8.	The contractor shall monitor IRZs and PRZs for, at least, the duration of any mining activity. In the context of the closure plan, there should then be a review to assess the relative importance of mining impacts and evaluate if any longer term effects (residual Environmental Effects) need to be monitored for a reasonable period after the activities in	

Item	Criteria	Description of how the plan addresses the criteria, or rationale for alternate criteria
	mining area.	

Acronyms

PRZ Preservation Reference Zone

IRZ Impact Reference Zone

**Checklist of Monitoring Criteria for
Impact Reference Zones (IRZs) and Preservation Reference Zone (PRZs):
Polymetallic Sulphides (PMS) Areas**

Item	Criteria	Description of how the plan addresses the criteria, or rationale for alternate criteria
MONITORING		
1.	Experiences from other sectors should be leveraged in the development of monitoring approaches and designs.	
2.	It is recommended that collected biological samples need to be appropriately archived in a reputable museum or research institute, if possible.	
3.	Data standards should be backward compatible.	
4.	Stratified sampling design to monitor within IRZs and PRZs should be used to assess impact across all habitat and impact types.	
5.	IRZs should be designated and monitored to assess all impacts from mining activities within and outside the contract area.	
6.	<p>Impacts predicted in the EIA should be monitored at sites using stratified sampling design within IRZs to assess impacts across all habitat types, direct and indirect impacts, and spatial scales. It is recommended that contractors consider monitoring, <i>inter alia</i>, the following:</p> <ul style="list-style-type: none"> • Sediment alteration/removal • Smothering • Marine mammal populations • Noise and light • Plume – operational and discharge • Changes in fluid flux • Faunal removal • Trophic ecology • Habitat loss or change 	

Item	Criteria	Description of how the plan addresses the criteria, or rationale for alternate criteria
	<ul style="list-style-type: none"> • Homogenization of habitat • Taxonomic composition change • Ecotoxicology • Sediment restructuring • Community Structure • Community Function • Productivity 	
7.	Further refinement is needed for monitoring variables to be measured in keeping with the spatial and temporal nature of the monitoring.	
8.	Contractors should consider variance and statistical power in PRZ and IRZ monitoring.	
9.	The contractor shall monitor IRZs and PRZs for, at least, the duration of any mining activity. In the context of the closure plan, there should then be a review to assess the relative importance of mining impacts and evaluate if any longer term effects (residual Environmental Effects) need to be monitored for a reasonable period after the activities in mining area.	

Acronyms

PRZ Preservation Reference Zone

IRZ Impact Reference Zone

**Checklist of Monitoring Criteria for
Impact Reference Zones (IRZs) and Preservation Reference Zone (PRZs):
Cobalt Rich Crust Areas**

Item	Criteria	Description of how the plan addresses the criteria, or rationale for alternate criteria
MONITORING		
1.	Experiences from other sectors be leveraged in the development of monitoring approaches and designs.	
2.	It is recommended that collected biological samples need to be appropriately archived in a reputable museum or research institute, if possible.	
3.	Data standards should be backward compatible.	
4.	<p>Impacts predicted in the EIA/EIS should be monitored at sites using stratified sampling design within IRZs to assess impact across all habitat types, direct and indirect impacts, and spatial scales. The contractor shall consider the following key impacts, <i>inter alia</i> , to be monitored:</p> <ul style="list-style-type: none"> • Physical removal of crusts, sediment and animals • Change in texture and geochemistry of the seabed substrate • release of heavy metals and other contaminants as well as potential accumulation through the food chain • Smothering or other effects on the biology of benthic animals by sediment from the plume • Potential effects on plankton, nekton, and mesopelagic fishes from the seafloor or discharge plumes • Turbidity reducing visibility in the water column for predatory fish • Potential impacts on commercial fish, 	

Item	Criteria	Description of how the plan addresses the criteria, or rationale for alternate criteria
	<p>fisheries, marine mammals, and migratory vertebrates such as turtles and sharks</p> <ul style="list-style-type: none"> • Noise and light • Changes in water column properties 	

Item	Criteria	Description of how the plan addresses the criteria, or rationale for alternate criteria
5.	<p>The contractor shall consider, <i>inter alia</i>, assessing changes in the following key metrics:</p> <ul style="list-style-type: none"> • Composition, abundance and condition of epibenthic species, sediment properties such as physical (e.g., sediment thickness, particle size) and geochemical characteristics. • Water column characteristics such as turbidity and dissolved oxygen measured by sensors on CTDs or moorings (landers) with a variety of sensors (such as turbidity sensors, dissolved oxygen, temperature, salinity, current meter or ADCP, sediment traps and hydrophone for acoustic monitoring of a change in behavior or distribution of marine mammals). Furthermore, the Contractor should undertake regular CTD casts in both IRZs and PRZs throughout the water column. • The concentrations of heavy metals and contaminants in the sediment and the water column. • Composition and abundance of plankton if there are oceanographic retention situations such as closed- circulation cells (Taylor columns) which may also lead to increased bioaccumulation in sessile filter-feeders, plankton and predatory fish. 	
6.	Further refinement is needed for monitoring variables to be measured in keeping with the spatial and temporal nature of the monitoring.	
7.	Contractors must consider variance and statistical power in PRZ and IRZ monitoring.	
8.	The contractor shall monitor IRZs and PRZs for,	

Item	Criteria	Description of how the plan addresses the criteria, or rationale for alternate criteria
	at least, the duration of any mining activity. In the context of the closure plan, there should then be a review to assess the relative importance of mining impacts and evaluate possible need for longer term effects to be monitored for a reasonable period after the closure of the activities in a mining area.	

Acronyms

PRZ Preservation Reference Zone

IRZ Impact Reference Zone

Appendix C

Environmental Monitoring and Management Plan (EMMP) Review Form

EMMP Component	Does the EMMP Contain?	DR Requirement	Do the Components of the EMMP Meet These Requirements?	EMMP Reference
Project Description	Project Goals and Objectives	regulation 48 (1); regulation 50; Annex VII (2) (b), (m), (o), and (q)	Does the Environmental Management and Monitoring Plan (EMMP) identify clear project goals and objectives?	
	Project Stakeholders		Is there a list of the stakeholders containing: <ul style="list-style-type: none"> • each stakeholder's role on the project; and, • how/ when they will be consulted during the Project? 	
	Contractor Project Design Brief		Does the project design brief summarize the dialogue between the Contractor with persons affected by, or interested the in activity? Does it take into account their input and reference them directly?	
	Organizational Structure and Responsible Parties		Does the EMMP describe how the Contractor's environmental team fits into the organizational structure? Does it outline the responsibilities of key personnel?	

EMMP Component	Does the EMMP Contain?	DR Requirement	Do the Components of the EMMP Meet These Requirements?	EMMP Reference
	Mining Technology and Methods		Are mining technology and methods explained step-by-step?	
			Does the EMMP include a discussion regarding best available techniques?	
	Waste Assessment and Prevention Audit		Does the EMMP describe every potential waste generated, waste characteristics, and the way that the waste will be disposed?	
			Is it clear that the Contractor has implemented recycling and waste reduction techniques whenever possible?	
Environmental Management System	Organizational Structure and Responsibilities	regulation 46 (1) and Annex IV (11.1)	Are the roles of key personnel outlined? For every person defined as being key personnel, is it clear how they support site-specific environmental objectives?	

EMMP Component	Does the EMMP Contain?	DR Requirement	Do the Components of the EMMP Meet These Requirements?	EMMP Reference
	Environmental Management System and Contractor Environmental Policy	regulation 46 (2) and Annex (2) (d)	Does the EMMP include a discussion of the Contractor's environmental policy? Does the Contractor describe their over-arching environmental management system and how the EMMP fits into that system?	
Environmental Impact Assessment, Risk Assessment, and Mitigation Hierarchy Monitoring Program	Environmental Impact Assessment and Potential Environmental Effects	regulation 48 (3) (a) and Annex VII (2) (e)	Are all potential Environmental Effects identified in the EIA discussed in the EMMP?	
			If a potential Environmental Effect results in a significant change in the Project Site, does the EMMP assess the Effect, the severity of the change, and explain further mitigation measures?	
			Does the EMMP describe mitigation measures for all potential significant environmental effects identified in the Environmental Impact Assessment (EIA)?	

EMMP Component	Does the EMMP Contain?	DR Requirement	Do the Components of the EMMP Meet These Requirements?	EMMP Reference
			Does the EMMP cite reputable sources confirming that the mitigations measures proposed represent good industry practices?	
	Risk Assessment	Annex VII (2) (g)	Does the EMMP describe the environmental risk assessment techniques used to assess each potential Environmental Effect?	
	Mitigation Hierarchy	Annex VII (2) (f) and regulation 47(1) (d)	Does the EMMP identify how the mitigation hierarchy was employed for the identification of mitigation strategies for each Environmental Effect?	
	Monitoring Program and Component Plans Summary	regulation 48 (1)	Does the Monitoring Plan identify each significant environmental effect documented in the EIS?	
			For each Environmental Effect deemed significant is there a component plan and/or mitigation strategy?	
			Is each component plan a detailed, stand alone document?	

EMMP Component	Does the EMMP Contain?	DR Requirement	Do the Components of the EMMP Meet These Requirements?	EMMP Reference
	Component Management and Monitoring Plan Development	Annex VII (2) (g)	Is each component plan specific to the planned activities, management objectives, characteristics, project area, equipment, and resources of the Project?	
	Monitoring Methodology	Annex VII (2) (g)	<p>Does each Component Plan provide a detailed description of the proposed methods and procedures for collecting, analyzing, and interpreting data?</p> <p>Is it documented that the proposed monitoring/sampling methods are appropriate for the parameter?</p> <p>Are the proposed monitoring/sampling methods approved by pertinent regulatory agencies/bodies or agreed upon in reputable literature?</p>	
	Monitoring Stations	Annex VII (2) (h) and (2) (i)	<p>Does each Component Plan provide a detailed description of the proposed sampling/monitoring locations, the spatial arrangement of proposed sampling locations?</p> <p>Is justification for the proposed</p>	

EMMP Component	Does the EMMP Contain?	DR Requirement	Do the Components of the EMMP Meet These Requirements?	EMMP Reference
			sampling arrangement provided?	
			Are Impact Reference Zones (IRZs) and Preservation Reference Zones (PRZs) clearly defined and justified?	
	Performance Standards	Annex VII (2) (c) and (2) (j)	Have performance standards been developed for each monitored parameter that will be used to assess whether the mitigation actions have been effective? Are performance criteria quantitative and measurable, to the extent practicable? If not, are qualitative goals and standards applicable? Are these performance standards based on reputable literature and/or on work by pertinent regulatory agencies/bodies?	
			Are trigger values or conditions under which corrective actions are necessary provided for each monitored parameter?	

EMMP Component	Does the EMMP Contain?	DR Requirement	Do the Components of the EMMP Meet These Requirements?	EMMP Reference
			Does each Component Plan include procedures for identifying the need for corrective action and procedures for reporting non- compliance?	
			Are proposed corrective actions supported by reputable literature or pertinent regulatory agencies/ bodies?	
	Adaptive Management	Annex VII (2) (g)	Are the basic principles of adaptive management defined, allowing the Reviewer to confirm that the Contractor understands its principles?	
			Is an adaptive management plan provided that identifies the key iterative phases of the plan (i.e. decision making, monitoring, assessment)?	
			Does the adaptive management plan include a phase to evaluate monitoring results with respect to stakeholder input, project objectives, management alternatives, updated models, and/or monitoring protocols?	

EMMP Component	Does the EMMP Contain?	DR Requirement	Do the Components of the EMMP Meet These Requirements?	EMMP Reference
Best Practices	Best Practices Evaluation	annex (2) (k) and (m)	Does the EMMP include a description of a system for ensuring that the Plan adheres to Good Industry Practice, Best Available Techniques and Best Available Scientific Evidence?	
			Does the system provide detail for how the Contractor will effectively engage stakeholders and independent experts to continuously review monitoring, data collection, and data evaluation techniques?	
			Does the EMMP detail a system for consideration of cumulative impacts of the proposed activities?	
			Does the EMMP detail a system for consideration of other marine users?	
			Does the EMMP include a description of how these practices are reflected in the proposed Exploitation activities?	

EMMP Component	Does the EMMP Contain?	DR Requirement	Do the Components of the EMMP Meet These Requirements?	EMMP Reference
Consultation and Research	On-going Consultation and Research	Annex VII (2) (p) and (2) (r)	Does the EMMP provide a description of relevant stakeholders and parties identified to have interests in the proposed project area?	
			Does the EMMP detail the protocol for on-going review and modification of the description of stakeholders and interested persons?	
			Does the EMMP provide a schedule and detailed protocol for consultation and cooperation activities?	
			Does the EMMP provide a method of analyzing and identifying on- going opportunities to collaborate with other stakeholders or interested persons on environmental studies?	
Emergency Preparedness	Emergency Response Team & Emergency Response Procedures	regulation 48 (3) (c)	Does the EMMP include a stand-alone Emergency Response Plan? Is the Plan tailored to the specific potential hazards identified during the EIA and risk assessment process?	

EMMP Component	Does the EMMP Contain?	DR Requirement	Do the Components of the EMMP Meet These Requirements?	EMMP Reference
			Does the Plan provide detailed procedures for managing environmental emergencies in the context of exploitation of mineral resources in the Area?	
			Does the Plan state the important emergency contacts that handle environmental emergencies related to the mining activities and the contact details?	
			Does the Plan provide detailed procedures for contacting the Authority when environmental emergencies related to the mining activities occur and the contact details?	
Training Program	Types of training required, personnel requiring training and record keeping requirements	Annex VII (2) (n)	Does the training program include training requirements for each proposed operational and monitoring activity?	
			Is training tailored to the roles and responsibilities of personnel?	
			Is it clearly stated which key personnel	

EMMP Component	Does the EMMP Contain?	DR Requirement	Do the Components of the EMMP Meet These Requirements?	EMMP Reference
			roles will undergo which training and when?	
			Does the structure of the training program allow for training programs to be added as the Project evolves?	
			Is it clearly stated how training records will be maintained?	
Reporting	Report Submittal to the ISA and Data Sharing for Regional Environmental Management	regulation 48 (3) (b)	Has the EMMP been reviewed and verified by an independent competent person with applicable experience? Are the competent person's qualifications provided in the document?	
			Does the EMMP document the Contractor's understanding of annual reporting requirements? Are there details regarding the timing of each reporting requirement?	
			Are provisions included for uploading data to the ISA DeepData database?	