

SANDPIPER PROJECT

Verification Programme Report:
Mining Licence Area No. 170

SECTION A: VERIFICATION PROGRAMME

- A1.0: The Verification Programme
- A.1.1: Contents of the Verification Programme Report
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SECTION A – VERIFICATION PROGRAMME

A1.0 The Verification Programme

A1.1 Contents of the Verification Programme Report

A1.2 Peer Review of the Verification Programme

Verification Programme (2013 – 2014)

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November 2014

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A1.0 THE VERIFICATION PROGRAMME

A1.1 CONTENTS OF THE VERIFICATION PROGRAMME REPORT

Namibian Marine Phosphate (Pty) Ltd (NMP) has applied to recover phosphatic sediments from the seabed on the Namibian continental shelf. Following an extensive exploration programme a mining licence (ML 170) was issued by the Ministry of Mines and Energy (MME) on the 13 July 2011 with the standard conditions requiring the issue of an Environmental Clearance Certificate by Ministry of Environment and Tourism (MET) prior to commencement of operations.

The Sandpiper marine phosphate project (ML 170) is located on the Namibian continental shelf approximately 120 km south southwest of Walvis Bay (see Frontispiece). The eastern boundary of the Mining Licence Area is approximately 60 km off the coast directly west of Conception Bay. The water depths in the licence area range from 180 to 300 m. The Mining Licence Area is 25.2 km wide (greatest width) and 115 km long (longest length) and covers an area of 2233 km².

The phosphate-enriched sediments and the defined mineral resources and reserves, are located throughout the entire Mining Licence Area (ML 170). Within the ML 170 area, three initial target dredging areas have been identified namely SP-1, SP-2 and SP-3 (Figure 1). The primary target dredge site for the 20 year licence period is SP-1 (176 km²) which lies in water depths of 200 to 225 m. A Trailing Suction Hopper Dredger (TSHD) (Figure 2) will be used to recover approximately 5.5 million tons of sediment annually from an area of up to 3 km² in extent. A total area of approximately 60 km² will be dredged over the course of the 20 year mine licence period. The other sites SP-2 and SP-3 also contain phosphate resources and may be considered at a later stage, at which time the requisite additional environmental evaluations will be made in accordance with the Environmental Management Act (Act No. 7) of 2007.

1.1.1 Introduction – the Verification Programme

The Environmental Management Plan (EMP) is an integral component of the Environmental Impact Assessment (EIA) submitted to the Environmental Commissioner in April 2012. The EMP becomes part of the legally binding contract with MET on issue of the Environmental Clearance Certificate. The 2012 EMP included the provision for the completion of an integrated pre-dredging impact verification survey. The survey was designed specifically by the specialists, who determined that the level of *confidence* in their assessment of impacts could be improved with additional *in situ* information. Notwithstanding this, they considered their literature-based work to be robust. The primary reason for the uncertainty related to the relatively short period in which their work was undertaken. The terms and conditions of the licence issued by (MME) required the EIA to be submitted in six months. This requirement did not allow any opportunity for fieldwork (sampling and measurement) to be undertaken.

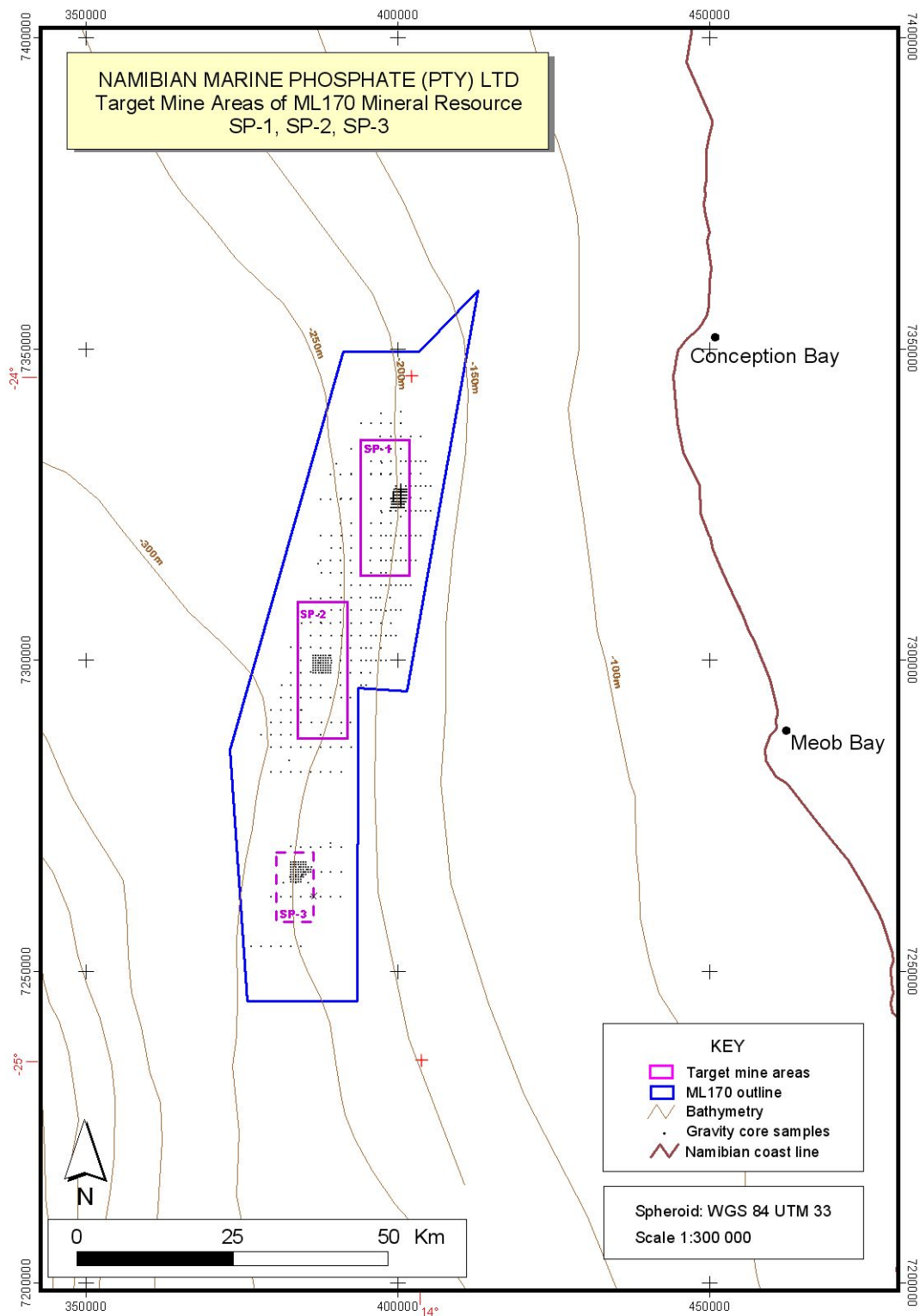


Figure 1: Location of ML 170, showing primary dredge target SP-1

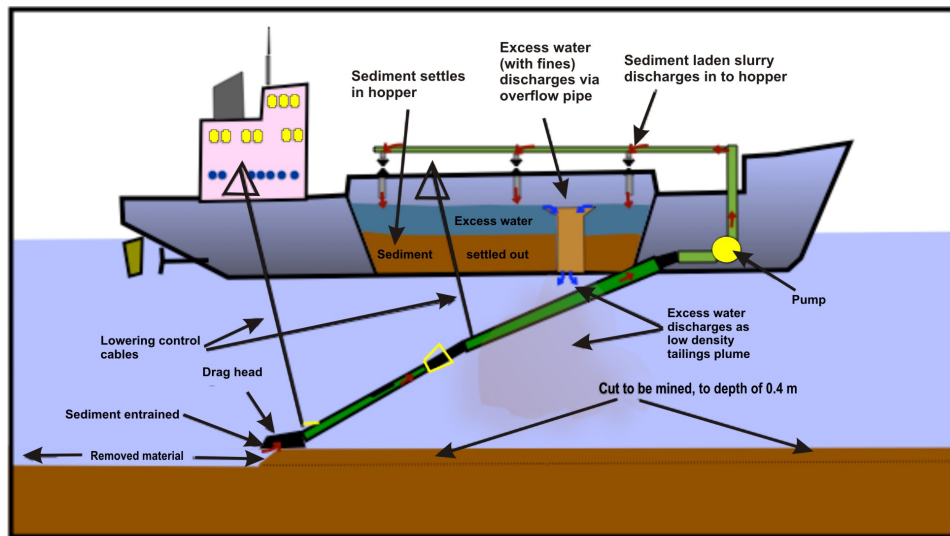


Figure 2: A schematic of a Trailing Hopper Suction Dredger (TSHD).

The 2012 EMP committed NMP to undertake the verification component of the EMP prior to the commencement of dredging, with subsequent adjustments (if required) to the monitoring and management elements of the EMP as a function of the outcomes of the Verification Programme. Given that the impact assessments in the EIA were considered to be suitably robust and had established, to acceptable levels of confidence, that there were no significant risks that would preclude the project from proceeding, the EIA was submitted to the authorities (MET), with the request that an Environmental Clearance Certificate be issued so that the project development could proceed.

During the authorities' process of reviewing the 2012 EIA, MET commissioned independent external reviews of the 2012 EIA. A key conclusion of one of the independent external review parties, the Southern African Institute for Environmental Assessment (SAIEA), was that the proposed Verification Programme was well designed and should be carried out in order to address the residual concerns around the project. The proponent, therefore, elected to follow this advice and appointed an environmental consultant team to undertake the Verification Programme.

The Verification Programme reported herein presents the results of the various specialist studies that were completed during 2013 and 2014, providing the evidence in support of the original impact assessments contained in the 2012 EIA with specific focus of the assessment of the primary target dredge site SP-1. In considering impact assessment, the scale of the proposed dredging project in the context of the mining licence area and the larger ecosystem is of particular importance. ML 170 is 2233 km² in extent, which represents approximately 2% of the Namibian continental shelf area (110 000 km²)¹. Within ML 170, the SP-1 target area is 176 km² or 0.16% of the total shelf area. Within SP-1 only 60 km² representing 0.06% of the total shelf area and 2.7% of the total ML170 area will be dredged during the 20-year mining licence period. The 3 km² annual dredge area represents 0.003% of the total Namibian Continental shelf area and 0.13% of the total ML 170 area. In contrast bottom trawling directly impacts approximately 30% of the Namibian continental shelf annually.

¹ Molloy, F and Reinikainen, T (eds.) 2003. *Namibia's Marine Environment*. Windhoek, Directorate of Environmental Affairs, Ministry of Environment and Tourism. 166pp

As is typical of many mining projects in the Twenty-first Century, the proposed dredging project has attracted a significant amount of environmental resistance. This is a function of several factors, including worldwide and local environmental (state of the environment) sensitivity, public access to social media and general information and the actions of pressure groups. In respect of the interaction during the statutory public engagement process and the additional consultation processes completed in 2013 as required by the Environmental Commissioner, a number of parties have provided written comment on the EIA. This feedback has contributed to an expansion of the original work scope as described in the Verification Programme detailed in the EMP (2012 EIA). This expanded scope of work was adopted by NMP following consultations with, and advice from, a number of authorities, the fishing industry, and I&APs (Section D, Appendix 4.3). These consultations included consideration of:

- The concerns of the Ministry of Fisheries and Marine Resources (MFMR), which are expressed in their communication to the Minister of Environment and Tourism, with the listing of 13 requirements (Section D, Appendix 4.2);
- The concerns of the fishing industry (as represented by their various federation spokespersons in the press and public presentations;
- The concerns of the public and I&APs;
- The matters raised by the three independent reviewers of the 2012 EIA, appointed by the Environmental Commissioner; and,
- Meetings with MFMR, NatMIRC, MET, MME and the Chamber of Mines

The key procedural and operational activities undertaken by the proponent, Namibian Marine Phosphate (Pty) Ltd in the two years from submission of the EIA in April 2012 up to the completion of this Verification Programme report in November 2014 are summarised in Section D, Appendix 4.1.

The Verification Programme focuses on the assessed impacts (2012 EIA) in the primary target dredge site SP-1.

The CSIR and J Midgley and Associates were appointed by the proponent to lead the implementation of the Verification Programme.

The CSIR undertook the overall responsibility for the quality of the Verification Programme and its compliance with the scope of work.

The proponent also commissioned the University of Namibia (UNAM) as an independent external observer to monitor the activities, procedures and quality of the activities conducted on the verification programme.

The CSIR was responsible for identifying and selecting the specialists to conduct the scientific work. This work programme comprises two main groups of studies:

- 1) Water column and sediments: A specialist team led by Dr R. Carter of Lwandle Technologies (Pty) Ltd. This covered: biogeochemistry (water column and sediments), fauna (macro- and meio-fauna) and plankton; and,
- 2) Fish, mammals and birds: A specialist team led by Mr. D. Japp of Capricorn Fisheries Monitoring cc. This covered: a biodiversity survey, a modelling assessment of fisheries biomass and stocks, ecosystem impact assessment, and a recruitment assessment.

The Verification Programme has also been reviewed independently at a number of interrelated levels. These reviews included:

- External Independent Peer review of the final individual specialist studies, undertaken by a panel of internationally acknowledged experts on the Benguela ecosystem and related fields; and,
- The University of Namibia, whose representative assessed the field work (sampling and measurements) and the subsequent chemical and biological analyses.

The reader is referred to the 2012 EIA document which contains the original impact assessment which has now been substantiated, with an overall increase in the levels of confidence in the assessed impacts by means of the Verification Programme. Appropriate content and continuity information has been integrated into the Verification Programme report so that it can be considered as a body of work in its own right. However, it should be read in conjunction with the 2012 EIA which provides valuable supporting material. Of particular relevance is the EMP (Chapter 8 of the 2012 EIA), which can now be updated following the completion of the Verification Programme.

1.1.2 Contents of the Verification Programme report

VOLUME 1: MAIN REPORT

The detail that follows provides information on the structure of the Verification Programme report which is presented in two volumes:

- **Volume 1:**
 - Summary;
 - Introduction and scene setting;
 - Impact assessment: verification of Impacts; and,
 - Specialist studies.
- **Volume 2:**
 - Appendices.

- **Executive Summary**

The executive summary provides a synthesis of the report and also reports on the independent reviews to which the report in its entirety has been subjected.

- **Section A: Verification Programme**

Section A, Chapter 1.1 provides an introduction to the Verification Programme, the reasons and need for undertaking it. The executive summaries of the independent peer reviews of the Verification Programme are presented in this section (Section A, Chapter 1.2).

- **Section B: Impact Assessment**

Section B, Chapters 1.0 to 1.4 provides a comparative assessment of the impacts as presented in the 2012 EIA and as re-evaluated following the completion of the Verification Programme. The cumulative impacts of multiple competing users of the resources in the Namibian Exclusive Economic Zone (EEZ) are discussed in Section B, Chapter 1.5.

- **Section C: Specialist Studies**

Section C comprises three main parts:

- 1.0 Geology and Preliminary Model for the Origin and Age of the Sandpiper Phosphate deposit;
- 2.0 Water Column and Sedimentary Environment; and,
- 3.0 Fisheries and Biodiversity.

Chapter 1.1, Geology and Preliminary Model for the Origin and Age of the Sandpiper Phosphate deposit is of major significance as it serves to establish the nature (origin and age) and characteristics of the deposit.

Chapter 2.1, Water Column and Sedimentary Environment provides a detailed biogeochemical assessment of the water column above, and the sediments in, the Sandpiper deposit. Sediments are evaluated both as surficial sediments (from the seabed) and from cores that penetrated through the phosphate-rich sand horizon to the clay footwall.

Several of the studies in Section C, Chapter 2 have been commissioned through, and in cooperation with, Lwandle Technologies (Pty) Ltd. These included: the dredge plume (Mr. R. van Ballengooyen, Coastal Research Group, CSIR), Thiobacteria (Dr B. Kirby, Next Generation Sequencing Facility Department of Biotechnology University of the Western Cape (UWC)), Meiofauna (Dr S. Forster, Physalia Ltd (UK)), Macrobenthos (Dr N. Steffani, Steffani Environmental Consultant, Cape Town) and a review of Plankton (Ms. L. Weston, Lwandle Technologies (Pty) Ltd).

The plume study (Section C, Chapter 2.2) provides an assessment of the utility of a plume modelling study in reducing any existing residual uncertainties in the specialist assessments of potential water column and related impacts associated with the dredge plume.

Quantitative polymerase chain reaction analysis was used to identify the types of thiobacteria present in the samples collected from the SP-1 target dredge area (Section C, Chapter 2.3). The quality control and standards of compliance are detailed in Section D, Appendix 1.3 and 1.4.

Meiofauna samples were collected during a cruise of the MV *DP Star* (Section D, Appendix 1.1 and 1.2) and sent to the UK for analysis at the Physalia laboratory. The assessment is presented in Section C, Chapter 2.4.

The analysis of the macrobenthos collected on the verification cruise, was undertaken by Dr N. Steffani (Section C, Chapter 2.5). The suite of samples collected augments the earlier baseline collection (Steffani, 2010)².

The epifauna assessment (Section C, Chapter 2.6) was commissioned by CapFish, with the samples being collected during the biodiversity cruise aboard the FV *Zeearend* (June 2014).

A comprehensive literature-based review of plankton in northern Benguela continental shelf waters is presented in Section C, Chapter 2.7.

² Steffani, N, 2010: Biological Baseline Survey of the Benthic Macrofauna Communities in the Phosphate Licence Blocks EPL 3415 and EP 3323 in the Sandpiper / Meob JV Project area. Namibian Marine Phosphate (Pty) Ltd unpublished report.

A comprehensive report on the verification assessment of fish, mammals and seabirds is provided in Section C, Chapters 3.1 to 3.5. The primary component of this section is the findings of the June 2014 biodiversity survey conducted in and around the target dredge site SP-1 (Chapter 3.1). In support of the fish and biodiversity survey four desk-top studies were commissioned by CapFish. These are:

- The fisheries mathematician James Gaylard conducted a modelling review of the monk and hake biomass associated with the ML 170 (Section C, Chapter 3.2).
- The value of ecosystem modelling as an investigative tool for determining ecosystem level impacts likely to be generated from the proposed phosphate dredging project was investigated by Dr K. Cochrane (Section C, Chapter 3.3).
- Dr H. Ndjaula provides an extensive review of the fisheries reproductive dynamics and stock distribution (Section C, Chapter 3.4).
- Ms. M. Smith and Mr D. Japp reviewed the literature (from the 1970s to the present day) regarding the spawning activity, ichthyoplankton drift routes and the recruitment of Namibian marine fauna, for a variety of pelagic and demersal species (Section C, Chapter 3.5).

The key findings of these studies have been incorporated in the Verification Survey Report: Fish, Mammals and Seabirds (Chapter 3.1).

VOLUME 2: APPENDICES

- **Section D: Appendices 1 to 6.**

There are six main appendices, these are:

1. Water Column and Sedimentary Environment;
2. Fisheries and Biodiversity;
3. Geophysics
4. Process documentation related to the verification programme;
5. The curricula vitae and Terms of Reference; and,
6. Dredging project description.

- **Appendix D1.0: Water Column and Sedimentary Environment**

These appendices describe the project execution plans (PEP), cruise reports (CR) for the water column and sediment sampling, the collection of core, and for thiobacteria sampling.

There are two reports by Metocean (Section D, Appendix 1.8 and 1.9), providing the detail of the 90-day deployment of the moored instrument string located in ML 170.

The CSIR's chemical analysis methodology statement provides details of the methods used in subsampling the cores, sample preparation, and the analysis of the samples (Section D Appendix 1.10).

- **Appendix D2.0: Fisheries and Biodiversity**

These appendices (Section D, Appendix 2.1 to 2.5) describe the project execution plans (PEP) and cruise reports (CR) for the biodiversity survey conducted from the FV *Zeearend*, sailing orders are also presented (Section D, Appendix 2.3).

- **Appendix D3.0: Geophysics and Geophysical Habitat Mapping**

The details of the geophysical survey (Section D, Appendix 3.1) and the interpretation of the benthic habitat (Section D, Appendix 3.2) are reported in this appendix.

- **Appendix D4.0: Process Documentation**

A listing of the primary activities of the Verification Programme is provided in Section D, Appendix 4.1. The Ministry of Fisheries and Marine Resources' thirteen requirements for inclusion in the Verification Programme are presented in Section D, Appendix 4.2. The full scope of the Verification Programme (November 2012), as amended (July 2013), is provided in Section D, Appendix 4.3.

- **Appendix D5.0: Reviewing Parties: Terms of reference and Curricula Vitae**

The curricula vitae of the persons undertaking the reviews and specialist assessments and the Terms of Reference of the reviewing parties and the specialist consultants to NMP are presented Section D, Appendix 5.1 and 5.2.

- **Appendix D6.0: Dredging Project Description**

The appendix provides a description of the dredging location, the dredging vessel, the dredging process, the dredging cycle, the positional controls during dredging, safe operating zones and the volumes to be dredged.

A1.2 PEER REVIEW OF THE VERIFICATION PROGRAMME

A 1.2.1 INTRODUCTION

NMP in committing to this extensive and comprehensive Verification Programme recognised the need to have the scientific studies submitted to peer review. Similarly the processes and methods followed during the field acquisition of data were also subject to independent review. The executive summary reports of these reviews are presented below. The independent reviews are presented in full in: *Independent Peer Reviews, Verification Studies, Sandpiper Project: Namibian Marine Phosphate (Pty) Ltd, November 2014*. In addition the entire Verification Programme report, environmental compliance and verification process has been independently reviewed by the CSIR. This report is presented in the cover pages of the Verification Programme report.

The verification assessment reports of the Namibian Marine Phosphate appointed Specialist Consultants, as presented in this report have been independently assessed, via a team of international consultants, the team comprised of:

- ³Dr Andrew Payne
- ⁴Dr Michael O'Toole
- ⁵Dr Barry Clark
- ⁶Professor Alakendra Roychoudhury

In addition to the above parties, Professor John Rogers, formerly (now retired) of the Marine Geoscience unit at the University of Cape Town participated as a guest reviewer (formal report not required) in the independent review workshop with the team as above. Professor John Rogers, along with colleagues Dr Mike Bremner and Dr Gavin Birch first described the diatomaceous mud belt and phosphatic sands of the Southern African West and Southern Coastlines in the 1970s.

The methods and approach to the Verification Programme have been independent assessed by the University of Namibia, represented by ⁷Dr Samuel Mafwila.

The entire verification programme report, environmental compliance and verification process has been independently reviewed by the CSIR, represented by ⁸Mr. Patrick Morant.

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A1.2.2 PEER REVIEW REPORT ON SPECIALIST STUDIES OF THE VERIFICATION PROGRAMME

EXECUTIVE SUMMARY



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EXECUTIVE SUMMARY

Peer Review Assessment of NMP Specialist Reports: Verification Programme.

**Collated and compiled by Dr Andrew I. L. Payne, with input from Dr Barry Clark,
Dr Michael J. O'Toole and Prof. Alakendra N. Roychoudhury**

The review team (the authorship above) was contracted in mid-2014 to evaluate in an unbiased and scientifically robust manner, using their own specific scientific expertise, the various reports provided by local specialists in response to comments made on the original Environmental Impact Assessment 2012 (EIA) of Namibian Marine Phosphate (NMP) by stakeholders and reviewers. Two of the panel are based in South Africa (Clark and Roychoudhury) and two are Europe-based (Payne and O'Toole), but had spent many years working off southern Africa, in both Namibia and South Africa. All four, though, have significant international experience, which they were able to bring to their expert evaluation.

The Terms of Reference for the study required that each of the appointed reviewers thoroughly read and assimilated the contents of the documentation prepared as part of the EIA (i.e. the EIA summary report, supporting specialist studies, comments from various reviewers and stakeholders, and the reports on verification studies undertaken to address comments from those reviewers, to attend a two-day workshop in Cape Town (13th to 14th August 2014) where Namibia Marine Phosphate's (NMP's) appointed specialist consultants were required to present a summary of the work that they had done, to prepare a report or statement on the quality and thoroughness of the various specialist studies, the relevance of datasets, opinions and conclusions of the NMP specialist consultants presented in their EIA assessments and the verification reports, and to identify if further work or assessments were required to quantify some of the risks and impacts associated with the proposed project.

A list of the specialist study topics, the lead authors, and independent experts appointed to review each topic is provided below.

Topic	Lead author	Reviewers
Biomass and stock estimates Recruitment Jellyfish Ecosystem assessment	James Gaylard Dr Hilikka Ndjaula Prof. Mark Gibbons Dr Kevern L. Cochrane	Dr Andrew I. L. Payne (Team leader)
Water column and sediments	Dr Robin Carter (Lwandle Technologies)	Prof. Alakendra N. Roychoudhury
Fish, fishery, marine mammals and birds Jellyfish Ecosystem assessment	David W. Japp Prof. Mark Gibbons Dr Kevern L. Cochrane	Dr Michael J. O'Toole
Macrobenthos Meiofauna	Dr Nina Steffani Physalia, UK	Dr Barry Clark

Up front, it must be said that the client (NMP) and its supporting agencies and consultant specialists were totally open and frank about their aims and their work and were refreshingly receptive at the workshop to criticism and comment, positive and negative, about their overall *modus operandi* and findings. The target extraction area, Mining Licence Area 170, hereafter MLA 170) southwest of Walvis Bay on the Namibian shelf is an extensive one (2230 km²), but the target area for phosphorite extraction (Sandpiper 1, hereafter SP-1) is much smaller (176 km²), from which up to 60 km² will be dredged during the 20-year mine licence period. The extraction area is totally outside the 200 m isobath that limits any bottom-trawling activities on the Namibian shelf. It is also necessary here to stress that the proposed operation about which the reviewers are commenting is one of dredging of the seabed, not mining of the seabed, which by definition will include the onward processing of material extracted, in this case well away from the proposed dredge target area SP-1. Throughout the text that follows, the words “dredge” and “mine” are used alternately, but they all refer to the same activity, which is what we as reviewers were requested to evaluate, namely the dredging activity.

All four reviewers worked and provided their reports independently, though they did collaborate at the workshop and remotely subsequently. Each of the following sections were indeed drafted by each reviewer working independently, with the leader merely formatting the reports for consistency, correcting minor typographic errors throughout. However, all four reflect each named reviewer's own opinions and comments, not necessarily those of the whole team, and should not be amended in any way without their express permission. They are provided not necessarily to influence the result of the formal application, but to provide educated scientific back-up or criticism of the findings to date (August 2014).

The purpose of the Executive Summary is to provide an overview of the findings of the team at the time of writing. Some of the findings are generalities, but for ease of subsequent use and application, a bulleted list of recommendations and important suggestions drawn from each of the peer review reports is also provided. That list is made as the unanimous findings of the whole team, in other words, we support each other's views. To start, there are a few observations, including some proposals that we wish to share with the reader; these are provided below, in no particular order of priority.

- The whole expert evaluation process has, from a scientific perspective, been followed throughout its existence professionally, credibly and appropriately.

- Comments have been made in writing and verbally about the impacts of the more-extensive Namibian inshore marine diamond-extraction effort relative to that proposed in this application for phosphate mining. In our opinion, one needs to be cautious when comparing the two marine extraction exercises.
- It is gratifying to know that the positional accuracy of the dredge head and resolution of the extraction (dredging) process is (technologically) so good; being able to query the technology with the potential dredger operators present at the workshop was valuable.
- The overarching scientific disciplines covered in the specialist inputs and verification procedures are correct and complete.
- One will need to be alert to any cumulative (of mining and of mining plus other operational) impacts in future.
- Future monitoring of all key aspects including an analysis of the potential impacts on the seabed and surrounding areas of the dredging operation needs to be built into any forward-looking management plan, but it will be crucial in doing so to bear in mind potential seasonal effects and the need for consistency in the methodology, gear deployed and even the vessels used.
- Credible analyses of effect or impact cannot really be developed in opposition to or isolated from government scientists' opinions based on their official data (the latter data include the seemingly inaccessible Norwegian data collected for Namibia and stored in the database of the Nansen project). The relationship with state scientific institutions needs to be continually refreshed.
- It is recommended strongly that all specialists contributing data and analyses formally publish the outcome of their analyses as soon as feasible; peer-review adds to the scientific credibility and cannot be countered professionally.
- As with all such comprehensive and multi-disciplinary analyses as those presented to the review team here, regular, though infrequent, independent review will add to international scientific credibility.

Overall, the team finds that the response of the client to issues raised at the earlier review of the EIA through commissioning appropriate verification studies has been appropriate and laudable. The quality of those verification studies is covered elsewhere in this report, but collectively and independently, they have been carried out to the highest scientific and technical standards, using appropriate and up-to-date methodology. The results have almost without fail raised the level of confidence associated with the results in terms of likely impacts, and the team wholeheartedly confirms those analyses. A number of pertinent suggestions did arise through the course of the team's evaluation of the material presented and through discussion at the workshop. Some are mentioned in the observations above. However, for the sake of completeness, the proposals below are taken from the texts of each of the reviewing parties, and where appropriate commented upon, with their order here reflecting generally their mention in text. Some, of course, were mentioned by more than one member of this review team (i.e. appear in more than one review), meaning that suggestions had to be merged, so do not reflect a specific order of priority of either a specific review team member or the team as a whole. The client and his advisors are urged strongly to consider them carefully, either now or during implementation of any management plan established for consideration as part of the application by Namibian national decision-makers.

1. It is recommended that future dredging operations be authorized only within an adaptive management framework (i.e. coupled with intensive monitoring and careful scrutiny of such monitoring data by independent experts and the authorities) and that the authorities retain the

right to require that the scale or scope of dredging be adjusted or that additional mitigation measures be implemented to ameliorate any unforeseen impacts that may arise.

2. Potential cumulative impacts arising from any future expansion in phosphate mining/dredging in the region will need to be considered by the authorities in their own right, or at the minimum a clear body of evidence will need to be presented that can confirm that the probability of there being a cumulative impact of all current plus extra activities is extremely low.
3. Monitoring surveys must be undertaken by NMP after dredging has commenced to confirm that the levels of impact do not exceed those predicted.
4. It is also crucial that, by way of mitigation of potential impact on the macrobenthos and to minimize the possibility of jellyfish polyps establishing in an area, a residual layer of sediment is left on the clay footwall underlying the mineral deposit. Further and if feasible, “lanes” or areas of sediment be left untouched; these two exercises will together facilitate the re-establishment of benthic macrofaunal assemblages on the substratum.
5. Although the current scientific output indicates no such likelihood that it will be a problem, any potential risks arising from ingestion by fish and other fauna of trace heavy metals bound to sediment or organic matter in the water column or on the seafloor should be evaluated by means of laboratory-based sediment toxicity studies.
6. The review team is concerned at the absence of any in-depth analysis of the mesopelagic scattering layer in the MLA. Its presence needs to be confirmed either acoustically using a vessel echosounder or from upward-looking ADCP instrument data moored in the area. It is a phenomenon well known in Namibian waters, and some information needs to be provided in the documentary evidence to be provided in support of the application. The potential impacts of sediment plumes (physical and biogeochemical) on this scattering layer (which could comprise zooplankton, myctophids, other bathypelagic fish, bearded gobies and/or jellyfish) need to be evaluated now given the significant biomass of zooplankton that migrates through the water column and its importance in the ecological functioning of the pelagic environment off Namibia.
7. The water column report needs to include a preliminary model applicable to the SP-1 dredging area using data on current measurements and sediment properties that have already been collected in the vicinity, to demonstrate the distribution, dispersal and sinking rate of plume sediments. Such a model can be developed further as additional data are gathered during environmental monitoring and dredging operations.
8. The collection in future of site-specific sediment dynamics data would support a better understanding of how MLA 170 will be responding to cumulative anthropogenic and natural effects there.
9. Sulphide dynamics will be important, so a better understanding needs to be sought during the operational phase of how oxygen consumption will be affected by the reduced (dredged) sediment reservoir.
10. Attempts should be made to calculate a geo-accumulation index relative to average marine shale, in order to determine whether there is preferential deposition of trace and heavy metals in the target area.
11. In terms of confirming the reproductive dynamics of the commercially important demersal fish species in MLA 170, with focus on the target dredge area SP-1, it will be necessary to monitor on an ongoing basis the reproductive biology of hake and monkfish in the area, collecting appropriate samples as part of a future management plan that includes sample monitoring.
12. Consideration should be given to establishing a zooplankton time-series in and adjacent to SP-1; Such additional information is not crucial to the submission of a dredging application and management plan for SP-1, but would aid the evaluation of future applications in the same or adjacent areas.

13. Two of the review team are concerned at the high value of 7% (of all Namibian monkfish recruits) calculated for MLA 170. That value needs to be checked carefully, but in any case a sampling strategy needs to be devised to seek any evidence of there being a regular influx of young monkfish into the area (they do not appear to be spawning extensively there) to support such a high value calculated for the recent sampling years.
14. The recent CapFish biodiversity verification survey was well designed and fulfilled, but it used a net designed to catch bottom fish and particularly monkfish, so would not have captured many, if any, mesopelagic or bathypelagic fish. The same area in the 1970s was important for mesopelagic fish such as lanternfish, so the biodiversity report needs specifically to state that those fish were not available to the survey because of the selectivity of the monkfish-dedicated trawl sampling gear. Future sampling in the area (to be integrated into the monitoring programmes established for any operational phase) would benefit from at least a few samples being taken of fish scattering layers, deploying if feasible a research midwater trawl (RMT) to prove or disprove their presence in the area. Such information, positive or negative, would supplement the biodiversity baseline dataset compiled from the recent survey.
15. Acoustic monitoring needs to be integrated into future monitoring programmes and undertaken at the proposed extraction site to determine background noise levels and to monitor any local whale or dolphin populations. Ideally, this should be initiated before any dredging takes place, though not necessarily before submission of the revised application. Doing so with passive acoustic monitoring devices (PAMs) is a standard international technique when extraction or abstraction of water on an industrial scale is being considered for the marine environment.
16. Efforts must be redoubled to gain access to the valuable datasets collected off Namibia by the RV “Dr Fridtjof Nansen” programme. Some of those data (especially those collected around MLA 170) could be subjected to rigorous scientific analysis in future to support the current analysis; ideally too, the full Nansen datasets should be made available to the marine science community of the Benguela region and also preferably released into the public domain.
17. In future, effort should be made in the impressively conceived reproductive dynamics work to follow annual cohorts through the samples. This may prove particularly rewarding in terms of pelagic fish, and will certainly enhance confidence in the conclusion currently drawn that marine resources are not being damaged by such industrial-scale activity on part of the Namibian shelf.
18. Although ecosystem modelling is in its relative infancy and in this context currently not able (for reasons of inherent modelling projection uncertainty given the scale of dredging, scarcity of data and their resolution) to evaluate the potential impact of the proposed dredging, its use should not be written off, especially if there is future expansion of phosphorus-mining. Monitoring data collected from this project should be earmarked for future contributions to input data for ecosystem modelling assessments, with the collection of high-resolution data.
19. In terms of the biodiversity survey, regularity and consistency of methodology, gear, vessel and season needs to be maintained and the survey established within the management plan proposed.
20. Effort should be redoubled to coordinate NMP-supported and official Namibian survey effort in future, if the licence to operate is granted.
21. For now, no further meiofaunal surveying is considered necessary, but baseline data have been established, so occasional sampling and comparison with these baseline data during a future operational phase could be revealing.
22. Perhaps in future, given the availability of these new data, the Namibian authorities will be able to commission an exercise to evaluate whether there are any specific lessons that can be learned about the ecosystem effects, including recolonization, plume dispersal and sedimentation rates, of marine industrial mining/dredging as an additional anthropogenic effect on the Namibian shelf.

23. Effort should be escalated in future to try to integrate any impact models from the current extraction proposal exercise with similar assessments undertaken on the fishing industry and the fishery, using industry, government and Nansen data. MFMR and/or the Benguela Current Commission could coordinate such an exercise, to the benefit of understanding water dynamics throughout Namibia.

To conclude, the review team is impressed by the quality of the information provided to it and believes that all avenues and disciplines of concern relating to the proposed operation in SP-1 have been addressed adequately. The policy decision on whether to proceed is a national one, but we can say that the information provided to us has convinced us that everything points to there being a minimal impact of the proposed operation, should a licence be granted, to the Namibian shelf ecosystem.

Finally, we thank the client and his advisors for entrusting us with this important evaluation and for allowing us to meet with the NMP-appointed specialists providing the background scientific information and to quiz them intensively at the two-day workshop in Cape Town.

Dr Andrew I.L Payne
August 2014

A1.2.3 RESPONSES: EIA SPECIALISTS

This section provides a summary of the responses of the NMP EIA Specialists and consultants, to the issues raised by the Peer Review Team, as summarised in the executive summary.



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NMP Specialist Consultants responding to the matters raised by the Peer Review Team

To whom it may concern

Peer Review Assessment of NMP Specialist Reports: Verification Programme

In the peer review report (August 2014) compiled by myself and the peer review team comprising Dr Barry Clark, Dr Michael J. O'Toole, Prof. Alakendra and N. Roychoudhury, we identified a number of matters that we considered required further attention.

These identified concerns have been considered by the NMP Specialist Consultants and an Issues and Response Matrix has been provided which identifies the actions taken to address the concerns raised by the peer review team.

Dr Andrew I.L Payne
October 2014

ISSUES AND RESPONSE MATRIX

<p>1. Peer review comment: The whole expert evaluation process has, from a scientific perspective, been followed throughout its existence professionally, credibly and appropriately.</p> <p>NMP team response: Noted with appreciation</p>
<p>2. Peer review comment: Comments have been made in writing and verbally about the impacts of the more-extensive Namibian inshore marine diamond-extraction effort relative to that proposed in this application for phosphate mining. In our opinion, one needs to be cautious when comparing the two marine extraction exercises.</p> <p>NMP team response: The need for caution is duly noted. In 2013 marine diamonds were recovered from an area of approximately 12 km² in extent and approximately 14 M tonnes of sediment were mined. The maximum water depth within which diamond mining takes place is approximately 125 m, while the sedimentary depositional environments (flat) and ocean processes are similar to those of ML 170. The comprehensive De Beers Marine plume study, which included both modelling and in situ verification, allows it to be applied realistically to the assessment of the dynamics of the fate of the fines discharged by the dredger. We note the statement of caution and primarily intend to use site-based (ML 170) information.</p>
<p>3. Peer review comment: It is gratifying to know that the positional accuracy of the dredge head and resolution of the extraction (dredging) process is (technologically) so good; being able to query the technology with the potential dredger operators present at the workshop was valuable.</p> <p>NMP team response: Noted</p>
<p>4. Peer review comment: The overarching scientific disciplines covered in the specialist inputs and verification procedures are correct and complete.</p> <p>NMP team response: Noted</p>
<p>5. Peer review comment: One will need to be alert to any cumulative (of mining and of mining plus other operational) impacts in future.</p> <p>NMP team response: Data collected by NMP as a baseline, and as acquired during the monitoring programmes (described in the Environmental Management Plan) will be made available to the authorities (or appropriately authorised commissions or organisations) for their utilisation in conducting cumulative and other environmental assessments. Similarly, NMP's data will be evaluated continuously by the Company in respect of site-specific and cumulative impacts arising from dredging in SP-1 and the possible expansion of operations within ML 170. An additional commentary on environmental effects is provided in the verification programme report (Section A).</p>

6. Peer review comment:

Future monitoring of all key aspects including an analysis of the potential impacts on the seabed and surrounding areas of the dredging operation needs to be built into any forward-looking management plan, but it will be crucial in doing so to bear in mind potential seasonal effects and the need for consistency in the methodology, gear deployed and even the vessels used.

NMP team response:

These requirements are built into the NMP Environmental Management Plan at a number of levels, e.g. from, regular site geophysical surveying (real time with active dredging, and recovery profile sediment surveys), annual biodiversity surveys (monk trawls, mesopelagic and epifauna assessments), cooperative surveys with MFMR (their cooperation will need to be sought); project based in-plume gathering of data using various platforms for measurements of dredge plume dimensions and effects on water quality, collection and analysis of water column and sediments; macrofauna recovery surveys in dredged areas; periodic collection of meiofaunal samples and their analysis; Also included are on board (dredger) monitoring and observation of ocean conditions, marine mammals and seabirds.

7. Peer review comment:

Credible analyses of effect or impact cannot really be developed in opposition to or isolated from government scientists' opinions based on their official data (the latter data include the seemingly inaccessible Norwegian data collected for Namibia and stored in the database of the Nansen project). The relationship with state scientific institutions needs to be continually refreshed.

NMP team response:

Relationship building continues to be a priority consideration for NMP in all aspects of the project, with particular emphasis on the authorities, (MFMR – MET and MME) and including I&APs. Effective relationships are based fundamentally on the principle of reciprocity. Efforts by NMP in this regard will be maintained and formal requests for access to the Nansen data will be re-submitted to MFMR. If provided, the received information will be assessed and where recommended by specialists, it will be worked up into the project data sets and used to optimise annual biodiversity and related surveys.

8. Peer review comment:

It is recommended strongly that all specialists contributing data and analyses formally publish the outcome of their analyses as soon as feasible; peer-review adds to scientific credibility and cannot be countered professionally.

NMP team response:

Noted and it is intended that this recommendation will be implemented. The information of a biogeochemical nature gathered during the verification assessment is new to science. Formal publication in the scientific literature is a priority.

9. Peer review comment:

As with all such comprehensive and multi-disciplinary analyses as those presented to the review team here, regular, though infrequent, independent review will add to international scientific credibility.

NMP team response:

Noted and the recommendation is accepted. NMP will institute a process of regular independent review of the environmental monitoring plan.

10. Peer review comment:

It is recommended that future dredging operations be authorized only within an adaptive management framework (i.e. coupled with intensive monitoring and careful scrutiny of such monitoring data by independent experts and the authorities) and that the authorities retain the right to require that the scale or scope of dredging be adjusted or that additional mitigation measures be implemented to ameliorate any unforeseen impacts that may arise.

NMP team response:

This is a regulatory matter and is contained in the requirements of the Minerals Act 1992 and the Environmental Act of 2007. Through this regulatory framework, NMP is committed to comply with the legally binding requirements of the Environmental Management Plan and the annual authority reporting requirements. Furthermore the 3-yearly re-application for environmental clearance from MET provides an opportunity for the EMP to be revised / modified in the light of findings from the monitoring programme. The EMP is a dynamic document with changes in the listed requirements being reflected by the (growing) knowledge base and associated re-assessment of the impacts and risk significance. These standards, compliance and management requirements, (as may be amended from time to time) are incorporated into the Environmental Contract issued by MET.

11. Peer review comment:

Potential cumulative impacts arising from any future expansion in phosphate mining/dredging in the region will need to be considered by the authorities in their own right, or at the minimum a clear body of evidence will need to be presented that can confirm that the probability of there being a cumulative impact of all current plus extra activities is extremely low.

NMP team response:

Noted. This is a matter that has been initiated by the Namibian Government (represented by MFMR): A scoping study, with the intention thereafter of undertaking a strategic environmental Assessment (SEA) on the cumulative effects of marine phosphate mining has been commissioned. Currently the Norwegian group SINTEF is preparing the scoping report. Prior to this the Benguela Current Commission commissioned its own SEA scoping study, formal feed back from this initiative is awaited. All information gathered during the implementation of the Environmental Management Plan will be evaluated in the light of cumulative effects and made available to the authorities for similar local and regional assessments.

12. Peer review comment:

Monitoring surveys must be undertaken by NMP after dredging has commenced to confirm that the levels of impact do not exceed those predicted.

NMP team – Closeout response:

A detailed environmental monitoring programme has been submitted as part of the regulatory requirements of the Environmental Act (No.7) of 2007. This requirement is addressed in the EMP. Management and compliance indicator reports will be generated on a regular basis, with composite reports being submitted to MET in accordance with the requirements of the Environmental Contract (issued by MET).

13. Peer review comment:

It is also crucial that, by way of mitigation of potential impact on the macrobenthos and to minimize the possibility of jellyfish polyps establishing in an area, a residual layer of sediment is left on the clay footwall underlying the mineral deposit. Further and if feasible, “lanes” or areas of sediment be left untouched; these two exercises will together facilitate the re-establishment of benthic macrofaunal assemblages on the substratum.

NMP team response:

Noted. This recommendation is in line with the recommendation submitted in the original EIA and has been included in the EMP with the intention being not to dredge to the clay footwall and to leave approximately 10% of the sediment thickness as a residual layer. This will almost completely eliminate the risk of providing a suitable substrate for the establishment of jellyfish polyps. The clay footwall (from a processing perspective) is an unwanted sediment horizon. The vertical positional accuracy and dredging operational techniques are optimised to extract the upper phosphate-rich horizons and to leave residual phosphate sediments so as not to dredge the clay footwall. The resource extraction plan calls for parallel three metre wide dredge cuts (3 m wide cutter suction head) of up to 4 km long to

dredge the sediment. The horizontal repositioning from cut lane to cut lane will in instances result in undredged sediments being left in areas with the original sediment profile remaining intact. The orientation of these cut lanes is controlled by the dominant swell direction. Hence, depending on swell orientation, there will be occasions where the cuts will not be parallel but at some angle to the usual dredging orientation. This will result in “slivers” of un-dredged ground being left in situ, with the original sediment profile remaining intact. This original material will serve as “seed stock” to enhance benthic faunal recovery. Multibeam geophysical surveys are to be carried out during dredging. Subsequently this will allow for the compilation of composite images of the dredged terrain. These data cross-referenced with independent benthic faunal recovery surveys will optimise the assessment of the post dredging status of the benthic fauna.

14. Peer review comment:

Although the current scientific output indicates no such likelihood that it will be a problem, any potential risks arising from ingestion by fish and other fauna of trace heavy metals bound to sediment or organic matter in the water column or on the seafloor should be evaluated by means of laboratory-based sediment toxicity studies.

NMP team response:

Through the implementation of the Environmental Management Plan samples of the main commercial fish species will be taken on future biodiversity surveys, analysed for heavy metals and compared with the fishing industry standards to check for any deviations from the norm.

Assessments of trophic transfers of heavy metal contaminants now included in the Verification Survey report (section C of the Verification Programme Report) indicate that, in pelagic food webs, these are generally attenuated at the primary consumer level, dominated by copepods, with low transfer efficiencies to fish. In benthic food webs with carnivorous molluscan whelks as top predators appreciable bio-magnification can occur as whelks sequester and store metals derived from their prey. However the proposed mining operations in the survey area are not expected to increase exposures of benthic fauna to heavy metals such as cadmium over and above that which occurs naturally in the region.

15. Peer review comment:

The review team is concerned at the absence of any in-depth analysis of the mesopelagic scattering layer in the MLA. Its presence needs to be confirmed either acoustically using a vessel echosounder or from upward-looking ADCP instrument data moored in the area. It is a phenomenon well known in Namibian waters, and some information needs to be provided in the documentary evidence to be provided in support of the application. The potential impacts of sediment plumes (physical and biogeochemical) on this scattering layer (which could comprise zooplankton, myctophids, other bathypelagic fish, bearded gobies and/or jellyfish) need to be evaluated now given the significant biomass of zooplankton that migrates through the water column and its importance in the ecological functioning of the pelagic environment off Namibia.

NMP team response:

A specialist review of the upward looking ADCP information from the current meter string (90 day site deployment) has been undertaken and is discussed in the verification programme report (Section C of the Verification Programme Report), in order to address the query on the mesopelagic species.

The ADCP data from the proposed dredge area does indeed show acoustic signals indicative of diurnal vertical migrations of zooplankton and ichthyoplankton. It is apparent from published information that light triggers for such migrations occur at very low light intensity and therefore any alteration of the underwater light field such as may occur under a turbidity plume potentially can disrupt migration patterns. The scale of this, if it occurs, should be limited in terms of space and time (turbidity plume dissipation rates and non-continuous plume generation in the proposed dredging cycle). At least it will be possible to show temporal patterns in vertical migrations from the suite of ADCP measurements (downward and upward looking) planned for the initial phases of the proposed dredging programme.

While the EMP can accommodate for future surveys to be designed (a combination of acoustics and satellite imagery) to incorporate the specific sampling of the mesopelagic species and the scattering layers this is a matter for the competent authority as well. There are few surveys of mesopelagic species on record and they are a difficult group of fish species to sample requiring specialized gear and vessels. If the ML 170 area is indeed deemed to be of importance for the mesopelagic fish and other species there is a clear need for MFMR to include the area in its regular sampling programme using the specialised vessel and gear available to it. NMP will engage with the authorities about partnering to meet this recommendation.

16. Peer review comment:

The water column report needs to include a preliminary model applicable to the SP-1 dredging area using data on current measurements and sediment properties that have already been collected in the vicinity, to demonstrate the distribution, dispersal and sinking rate of plume sediments. Such a model can be developed further as additional data are gathered during environmental monitoring and dredging operations.

NMP team response:

In response to this recommendation, NMP has commissioned the CSIR to provide an assessment of the value of undertaking the recommended plume modelling to further constrain the environmental risks associated with the sediment plume (beyond that determined in the EIA (2012) specialist study). The CSIR report is included in the Verification Programme Report (Section C) and determines that, while it is likely that the modelled analysis would provide additional characterisation of the extents, and duration (physical parameters) of the plume using the data already collected from site, it is unlikely to provide any further significant information in evaluating the impact risk associated with dredging. In light of this, the advice to NMP is that plume modelling is not material to the assessment of impacts in the area. However, modelling will be undertaken prior to the commencement of dredging as the first step towards building a comprehensive plume model.

17. Peer review comment:

The collection in future of site-specific sediment dynamics data would support a better understanding of how MLA 170 will be responding to cumulative anthropogenic and natural effects there.

NMP team response:

Post-dredging multibeam surveys coupled with post-dredging interpretation of sediment and water column characteristics will contribute information to the assessment of cumulative anthropogenic and natural effects. These data collection activities are described in the EMP.

18. Peer review comment:

Sulphide dynamics will be important, so a better understanding needs to be sought during the operational phase of how oxygen consumption will be affected by the reduced (dredged) sediment reservoir.

NMP team response:

An assessment of the potential of sulphide derived from iron pyrites dissolution in the water column, i.e. which may be associated with the dredging turbidity plume has been included in the Verification Programme Report. The assessment indicates that a minor proportion of the total iron pyrite pool may contribute reduced sulphide to the water column. This sulphide pool is predicted to be oxidised to sulphur, as opposed to sulphate, therefore no effects on the dissolved oxygen reservoir are predicted to emanate from this. Further details are to be found in Section C of the Verification Programme Report.

19. Peer review comment:

Attempts should be made to calculate a geo-accumulation index relative to average marine shale, in order to determine whether there is preferential deposition of trace and heavy metals in the target area.

NMP team response:

Data presented in the Verification Survey report show that all of the heavy metals with the exception of cadmium covary with aluminium (an indicator of clay minerals). The elevated cadmium concentration has been explained via published analyses indicating scavenging of this metal by the reduced sulphide pool. This is supported by higher cadmium concentrations in mud belt sediments inshore and north of the proposed dredging site (NatMIRC and CSIR). In view of these features the value of calculating of enrichment factors is moot, especially if global values have to be used for this as local Namibian data on shale composition is not readily available. More information on this topic is presented in Section C of the Verification Programme Report.

20. Peer review comment:

In terms of confirming the reproductive dynamics of the commercially important demersal fish species in MLA 170, with focus on the target dredge area SP-1, it will be necessary to monitor on an ongoing basis the reproductive biology of hake and monkfish in the area, collecting appropriate samples as part of a future management plan that includes sample monitoring.

NMP team response:

The recommendation is noted. This is a core component of the EMP and the recommendation is addressed through the annual biodiversity survey sampling programme, where refinements can be made to the work programme to improve data gathering regarding the reproductive biology of the main commercial fish species occurring in SP-1 and immediate surrounds.

21. Peer review comment:

Consideration should be given to establishing a zooplankton time-series in and adjacent to SP-1; Such additional information is not crucial to the submission of a dredging application and management plan for SP-1, but would aid the evaluation of future applications in the same or adjacent areas.

NMP team response:

Cautionary statement: The value of such sampling in a limited area (SP-1) needs to be considered objectively since, if the area is deemed to be too small from a statistical standpoint, then it is questionable and is likely to be of little value to the further understanding of the impacts of dredging. Notwithstanding, the annual surveys provided for in the EMP will incorporate appropriate acoustic surveys for assessment of scattering layers.

22. Peer review comment:

Two of the review team are concerned at the high value of 7% (of all Namibian monkfish recruits) calculated for MLA 170. That value needs to be checked carefully, but in any case a sampling strategy needs to be devised to seek any evidence of there being a regular influx of young monkfish into the area (they do not appear to be spawning extensively there) to support such a high value calculated for the recent sampling years.

NMP team response:

The modelling undertaken was intended to only provide a first order estimate of the abundance of the main commercial species relative to the population of each species as a whole. The reviewers recognized that the area modelled was extremely small and that extrapolations based on typical fisheries approaches would result in high variance, erring on the conservative side of the estimates provided. The data used and variance can only be strengthened by an increased number of samples from the actual dredge area (SP-1 in ML 170), along with the subsequent re-modelling of the acquired data. This can be improved in two ways:

1) Persisting with the current biodiversity sampling programme until a reasonable time series of data can give greater confidence in the model outputs. The sampling regime would focus on the recruitment, meaning the availability and dynamics of juvenile monk in the area. 2) NatMIRC could significantly strengthen these modelled estimates if they undertook biomass trawls in and around the area during

their standard annual hake and monk surveys. NMP will engage with the authorities about partnering to meet this recommendation.

23. Peer review comment:

The recent CAPFISH biodiversity verification survey was well designed and fulfilled, but it used a net designed to catch bottom fish and particularly monkfish, so would not have captured many, if any, mesopelagic or bathypelagic fish. The same area in the 1970s was important for mesopelagic fish such as lanternfish, so the biodiversity report needs specifically to state that those fish were not available to the survey because of the selectivity of the monkfish-dedicated trawl sampling gear. Future sampling in the area (to be integrated into the monitoring programmes established for any operational phase) would benefit from at least a few samples being taken of fish scattering layers, deploying if feasible a research midwater trawl (RMT) to prove or disprove their presence in the area. Such information, positive or negative, would supplement the biodiversity baseline dataset compiled from the recent survey.

NMP team response:

The recommendation is noted. This is of course specialist surveying, requiring specialist equipment and vessels. Again, NatMIRC has the vessels and gear to do this type of sampling and their support and involvement will be encouraged. NMP will engage with the authorities about partnering to meet this recommendation. Notwithstanding this, for future monitoring purposes, provision to utilize a combination of acoustics and satellite imagery to incorporate some measures for sampling of mesopelagic species and the scattering layers has been made in the EMP

24. Peer review comment:

Acoustic monitoring needs to be integrated into future monitoring programmes and undertaken at the proposed extraction site to determine background noise levels and to monitor any local whale or dolphin populations. Ideally, this should be initiated before any dredging takes place, though not necessarily before submission of the revised application. Doing so with passive acoustic monitoring devices (PAMs) is a standard international technique when extraction or abstraction of water on an industrial scale is being considered for the marine environment.

NMP team response:

This recommendation has been considered within the Verification Programme Report (Section C) and in response, site based monitoring of pre-dredging acoustic conditions will be undertaken. Acoustic monitoring will be integrated with fisheries monitoring surveys. Similar monitoring will take place during dredging. This is described in the EMP.

25. Peer review comment:

Efforts must be redoubled to gain access to the valuable datasets collected off Namibia by the RV “Dr Fridtjof Nansen” programme. Some of those data (especially those collected around MLA 170) could be subjected to rigorous scientific analysis in future to support the current analysis; ideally too, the full Nansen datasets should be made available to the marine science community of the Benguela region and also preferably released into the public domain.

NMP team response:

The recommendation is noted. While in broad agreement with the position of the reviewers, the custodianship of the data resides with the countries (and the Benguela Current Commission (BCC)) wherein the surveys are undertaken. The proponent has already requested these data. However, ultimate control over access to the data resides with the competent authority. To address the recommendation, the responsible authorities (MFMR) and the Secretariat of the BCC will again be approached to provide access to this database. The consultants advise, however, that the Nansen data will not necessarily strengthen the EIA as the available data provided by MFMR/NatMIRC is extensive.

26. Peer review comment:

In future, effort should be made in the impressively conceived reproductive dynamics work to follow annual cohorts through the samples. This may prove particularly rewarding in terms of pelagic fish, and will certainly enhance confidence in the conclusion currently drawn that marine resources are not being damaged by such industrial-scale activity on part of the Namibian shelf.

NMP team response:

The recommendation is noted and is taken to refer to the ongoing monitoring activities encompassed in the EMP. As part of the EMP assessment cohort analysis will be undertaken from the results of the annual (year on year) biodiversity surveys.

27. Peer review comment:

Although ecosystem modelling is in its relative infancy and in this context currently not able (for reasons of inherent modelling projection uncertainty given the scale of dredging, scarcity of data and their resolution) to evaluate the potential impact of the proposed dredging, its use should not be written off, especially if there is future expansion of phosphorus-mining. Monitoring data collected from this project should be earmarked for future contributions to input data for ecosystem modelling assessments, with the collection of high-resolution data.

NMP team response:

The recommendation is noted. All data collected and reports generated during the monitoring programmes of the EMP will be made available to competent authorities for input into their ecosystem modelling.

28. Peer review comment:

In terms of the biodiversity survey, regularity and consistency of methodology, gear, vessel and season needs to be maintained and the survey established within the management plan proposed.

NMP team –response:

The recommendation is accepted and addressed in that all planned surveys described in the EMP will be standardised. Modifications to any such surveys will be managed in consultation with the Company's appointed consultants as well as the competent authorities through the terms of the Environmental Contract.

29. Peer review comment:

Effort should be redoubled to coordinate NMP-supported and official Namibian survey effort in future, if the licence to operate is granted.

NMP team response:

NMP will continue to engage with the authorities to establish a reciprocal relationship and to secure their partnering to conduct relevant research and data gathering in the ML 170 area in line with this recommendation.

30. Peer review comment:

For now, no further meiofaunal surveying is considered necessary, but baseline data have been established, so occasional sampling and comparison with these baseline data during a future operational phase could be revealing.

NMP team response:

This recommendation is addressed under the current EMP provisions. Additional samples will be collected and analysed on an infrequent basis. This will be managed through the EMP. Samples will be collected from both the dredged and un-dredged (reference) areas.

31. Peer review comment:

Perhaps in future, given the availability of these new data, the Namibian authorities will be able to commission an exercise to evaluate whether there are any specific lessons that can be learned about the ecosystem effects, including recolonization, plume dispersal and sedimentation rates, of marine industrial mining/dredging as an additional anthropogenic effect on the Namibian shelf.

NMP team response:

The recommendation is noted and the sentiment is shared. NMP will collaborate with the authorities in this regard and provide annual reports and relevant data to the authorities, or managing commission.

32. Peer review comment:

Effort should be escalated in future to try to integrate any impact models from the current extraction proposal exercise with similar assessments undertaken on the fishing industry and the fishery, using industry, government and Nansen data. MFMR and/or the Benguela Current Commission could coordinate such an exercise, to the benefit of understanding water dynamics throughout Namibia.

NMP team response:

The recommendation is noted and the proponent agrees with the sentiments presented.

A1.2.4 INDEPENDENT REVIEW OF THE NMP VERIFICATION PROGRAMME PROCESS

EXECUTIVE SUMMARY

UNIVERSITY OF NAMIBIA



EXECUTIVE SUMMARY

Independent Review of the NMP Verification Programme Process 2013 – 2014

Collated and compiled by Dr Sam Mafwila

Namibian Marine Phosphate (Pty) Ltd. (NMP) is proposing to extract marine pelletal phosphate ore from deposits off the Namibian central coast. The phosphate will be extracted by dredging and the assessment of the environmental impacts associated with the project was conducted during the environmental impact assessment (EIA) stage of the project. However, some stakeholders had raised a number of concerns and issues regarding the then prepared EIA, and recommended some follow up specialist studies to verify the significance of the findings previously presented in the NMP EIA (2012) which was based on both historical and limited recently collected data. NMP in their quest to address the issues and concerns raised by stakeholders, commissioned the verification survey. The purpose of the verification survey was to confirm the sediment properties, water quality, local oceanographic processes of the seafloor and water column, benthic macrofauna and meiofauna within the proposed dredge area. In addition a biodiversity survey was also conducted mainly to address aspects of the demersal fish species, and epifaunal species diversity. All the information was then used, in conjunction with previous scientific investigations of the region, to further inform the assessment of impacts on the marine environment as a result of the proposed dredging operations. Finally the information is synthesized in the Verification Programme Report and Environmental Management Plan for the Mining Licence Area (MLA).

Apart from the various specialist consultants appointed to conduct specific tasks of the verification survey, NMP also entered into three-tier agreement with the University Central Consultancy Bureau (UCCB) of the University of Namibia (UNAM). Part of the agreement was that UNAM provides Specialist Marine Scientists to be independent observers of the field operations of the verification programme, verify and comment on the suitability of equipment and sampling techniques, on-board sample processing and handling of samples (on board processing, storage, marking, transportation, record keeping), completion of the sampling operation and general comments on the overall operation. Furthermore, assess and comment on the laboratory facilities and sample processing in the laboratories, analytical processes, data analysis and interpretation results, biodiversity survey methods, and results, and finally, the peer-review process and workshop.

This independent observer report documents the verification survey and comments on the abovementioned terms of reference. The first verification survey, which dealt with the water column, sediment characteristics, and local oceanographic conditions as well as the benthic macrofauna and meiofauna, was well planned and coordinated. Detailed sampling methods and sample processing were carefully chosen to appropriately address and fulfill the comments and concerns that were raised by the Ministry of Fisheries and Marine Resources (MFMR) and other stakeholders. Although not all the concerns were dealt with, NMP has striven to address the most critical ones to the best of their

ability in a more transparent and practically feasible way. Among the issues, notably the mooring on the seafloor deployed for 90 days, has thus far generated good data for the local oceanographic conditions of the MLA. The use of the Day Grab and the Box-Corer instead of the Van Veen Grab was one of the recommendations, and was implemented during the first verification survey. Reliable data were generated for both benthic macrofauna and meiofauna within the primary dredge target area of SP-1. Verification was done on the sediment characteristics, which have confirmed the area is not within a mudbelt, with very little, or no hydrogen sulphide and organic-rich sediments. In situ measurements of the water column parameters such as oxygen, temperature, pH and salinity were captured using suitable instruments. Issues regarding benthic macrofauna and meiofauna were fully addressed. The sample handling onboard and processing was adequately conducted with care and good workmanship. However, field operations are faced with challenges, the oxidation-reduction potential (ORP) measurements in situ was challenging as the sediment gets exposure to open air. Generally, the whole operation for the first verification survey was successful.

The second verification survey dealt with the demersal fish biomass distribution and diversity, as well as the epibenthic fauna within the MLA and the surrounding nearby areas. Although a hake trawl was not available for use in this survey, a similar but slightly heavier monk directed trawl net was deployed during this survey. This survey generated a wealth of information, the level of which is unique to the area. The sample processing was handled by qualified personnel and data reliability is high. Upon interpretation, the results confirmed and improved our understanding of the potential impacts that dredging may have on the local fish resources and epifauna, as well as mammals and seabirds. Other specialist studies looked at the recruitment dynamics of the fish stocks off Namibia, with emphasis on the MLA; the fish stock dynamics in terms of biomass; and a review of ecosystem models in the northern and southern Benguela. Specialist consultants performed these tasks, and the results have convincingly supported and enhanced the earlier studies in the area.

It is a custom in natural science that scientific work should undergo thorough peer-review in order to have a high quality output. NMP has gone the mile extra to subject all the scientific studies conducted on their behalf by specialist consultants to a peer-review process. A carefully selected panel of internationally profiled experts in biogeochemistry, fisheries, marine ecology, and benthic ecology was appointed to review the specialist work conducted during the verification surveys in conjunction with the earlier EIA and comments there in. The peer-review panel had a chance to review the work at their convenience, and eventually attended a two-day peer-review workshop in Cape Town, where all the work were presented. The whole process was appropriate and efficient. The peer-review workshop was the best thing to do, as it provided a good platform for information sharing and review in a short period of time. A fair and transparent peer-review was the order of the day. Critiques and comments were dealt with immediately, and if not, then the specialist consultants were given the opportunity to re-analyze their data or re-run their analytical process where possible. The final results were incorporated into the final reports.

As a UNAM representative in this whole verification programme, I am of the conviction that NMP has thus far conducted the most comprehensive scientific studies in their MLA. These studies have addressed uncertainties that were raised by the MFMR and beyond. New data sets were generated and new insights about the area have been brought forth, and improved our understanding of the physical, chemical and biological nature and dynamics of the area, and what would be the potential impacts of dredging. It is imperative to continue with monitoring surveys in the MLA, (detailed in the EMP) in order to support the current assumptions and statements. However, in the Regional context, the monitoring of the state of the environment should be a concerted combined effort by government and mining companies.

SECTION A, VERIFICATION PROGRAMME

Overall, the NMP verification programme was a great effort, and has augmented the original EIA, and responded to the queries put forward by the MFMR. The sampling design, sampling methods, sample handling and processing, analytical procedures, data generated and results thereof are reliable, high quality and trustworthy, and were validated by the peer-review process.

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September 2014

