FIRST ADDENDUM

EIA for Proposed Coastal Protection Works in

Dh. Maaenboodhoo

Addendum Proposal: Changing Burrow Sites

December 2015

Prepared for: SAS e Senok JV Pvt. Ltd.

Prepared by: Mohamed Zuhair (EIA01/15)

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CONSULTANT DECLARATION

I, Mohamed Zuhair, Registered EIA Consultant at the Ministry of Environment and Energy of Maldives with the Registration Number EIA 01/15, hereby declare that the statements in this First Addendum to the EIA Report for Proposed Coastal Protection Works in Dh. Maaenboodhoo, which involves changing of the approved burrow sites to a new site are true, complete and correct to the best of my knowledge and abilities.

Name: Mohamed Zuhair (EIA01/15)

Signature: 

Date: 6 December 2015

ސާދާ ހުލާސާ

މި ރިޕޯޓަކީ ދ. މާއެނބޫދޫގެ އިރުއުތުރުންނާއި، އިރުދެކުނުންނާއި އަދި ހުޅަނގުދެކުނުން ރަށްގިރާ ސަރަހައްދުތަކަށް ހިމާޔަތް ކުރުމަށް ބޭރިއަރ ގްރޮއިން އަދި ޖިއޯބޭގު ރިވެޓްމަންޓް ހިމާޔަތްކުރުމުގެ މަޝްރޫޢުގެ އީއައިއޭގެ ފުރަތަމަ އެޑެންޑަމެވެ. މި އެޑެންޑަމް ތައްޔާރުކޮށްފައިވަނީ މަޝްރޫޢުގައި ގެނެވުނު ބަދަލުތަކާއި ކުރިން ހުށަހެޅުނު ބަދަލުތަކުގެ އަސަރު ދިރާސާކޮށް ހުށަހެޅުމަށެވެ. މި މަޝްރޫޢު ހިނގަމުންދަނީ ދިވެހިރާއްޖޭގެ ސަރަހައްދީ ހިޔާވަހިކަމުގެ ސިޔާސަތުގެ ދަށުން ދިވެހިސަރުކާރު ހިންގަމުން ގެންދާ ޕްރޮޖެކްޓެއްގެ ގޮތުގައި އިންވަޔަރަމަންޓް މިނިސްޓްރީ ދަށުން ހިންގުމަށް ނިންމާފައިވާ މަޝްރޫޢެއްގެ ގޮތުގައެވެ.

މި އެޑެންޑަމް ރިޕޯޓަކީ ދިވެހިރާއްޖޭގެ ތިމާވެށި ރައްކާތެރިކުރުމާއި ދެމެހެއްޓުމުގެ ޤާނޫނު (ޤާނޫނު ނަންބަރު 4/93) އަދި މި ޤާނޫނުގެ ދަށުން ހެދިފައިވާ އީ.އައި.އޭ ގެ ގަވާއިދުގެ ދަށުން ހެދިފައިވާ އީ.އައި.އޭ ގަވާއިދު 2012 އަށް ރިއާޔަތްކޮށް ހެދިފައިވާ ރިޕޯޓެކެވެ. އަދި އިޞްލާހުން އެޑެންޑަމް ތައްޔާރުކުރަނީ ގޮތް ބާވަތް އެޕް ތަފާސްކޮށް ފާސްކޮށްފައިވަނީ 3 ޑިސެމްބަރ 2015 ގައެވެ.

މި އެޑެންޑަމުގައި ހިމެނޭނީ މައިގަނޑު ބަދަލުތަކުގެތެރޭގައި އަލަށް ފާހަގަކުރެވުނު ހިމާޔަތްކުރާ ސަރަހައްދުގެ ފިރި ވަކިންކުރުމާއި މިކަމުގެ ސަބަބުން އެ ސަރަހައްދުގެ ވެއްޓުން ރީބިލްޑިން ގެއްލުންތަކަށް އެންމެބޮޑަށް ކުރެވޭ އަސަރުތަކާއި ފަރާތްތަކުން ދެކޭގޮތާއި އަދި ތިމާވެށީގެ ބައިތަކަށް ކުރާނެ އަސަރު ތަފާތުކުރުމާއި ކުރެވޭނެ ފިޔަވަޅުތައް ހުށަހަޅާފައިވެއެވެ.

އަޑީގެ ވެލިޖަމާކުރުން ހުރަހަކާ ސަރަހައްދު އެންމެގިނަ ބަދަލުގެ ދަށުން ވަކިކުރާނެ ފަރާތްތަކެއްގައެވެ. އަދި މި ސަރަހައްދު ފުރަތަމަ ތަރުތީބުކޮށްފައިވާ ރާއްޖޭގެ ބެލެނިވެރިން ކޮންޓްރެކްޓު ޕޮން ހިއްސާކުރުމަށް ގަވާއިދު 2013 އަދި އިޞްލާހުން ކަނޑައަޅާފައިވާ ގައިޑްލައިން ކަރުދާހާ ގުޅޭގޮތުން 50މ އާއި ބޮޑުތަނުގެ 100މ ހުރަހަކާ ގޮތުގެ މަޝްރޫޢެވެ.

ދ. މާއެނބޫދޫގައި ހިނގުމަށް ހުށަހަޅާފައިވާ ގުޅުމަކަށް ހިމާޔަތްކުރުމުގެ މަޝްރޫޢުގެ އީއައިއޭ ރިޕޯޓުގައި ބަޔާން ގުޅުމަކަށް ބޭނުން ވާހަކަ ވަކިން ތަފްސީލުކޮށް ހިމަނާފައިވެއެވެ. އަދި މި އެޑެންޑަމުގައި އެ ބައިތައް ވަކިކޮށް އަލަށް ހުރަހަކާ ސަރަހައްދުގެ ބައިތައް ހިމަނާފައިވެއެވެ.

ވަކިކޮށްފައި އަލަށް ފާހަގަކޮށްފައިވާ ސަރަހައްދު ކަނޑުގެ ސަބަބުން ތިމާވެށްޓަށް ކުރާނެއަސަރު ފާހަގަކުރެވޭ މައިގަނޑު އަސަރުތަކަކީ މަޝްރޫޢު ހިނގާ ސަރަހައްދުގައި ހިފެހެއްޓުމުގެ ސަބަބުން ފަރާތް ދިރުން ހަމަޖެހުމާއި، ދުވަސްވަރު

ތޮށުގަނޑު ބަޔައްޓަރުވުމާއި އަދި މާހައުލަށް އިތުރުގެއްލުން ލިބުނަކަސް ފާހަގަ ކުރެވޭއެވެ. މިގޮތުގެމަތިން ތިމާވެށި ހިމާޔަތްކުރުމަށް އެކަށީގެންވާ ފިޔަވަޅުތަކެއް އެޅުއްޖެނަމަ މިމަޝްރޫއުގެ އަސަރު ވަރަށްބޮޑަށް ކުޑަކުރެވޭނެއެވެ. އަދި މިގޮތުގެމަތިން އެޅިދާނެ ފިޔަވަޅުތަކެއް ރިޕޯޓުގައި ފާހަގަކޮށްފައިވާނެއެވެ. މިސަރަހައްދުގެ ވެލިގެ މިންވަރު ރާޅުގެ ދުރުމިނަށް މި މަޝްރޫއުގެ ސަބަބުން ތިމާވެށްޓަށް ކޮށްފާނެ ނުރައްކާ އަސަރުތަކާއި އަދި އެއަސަރުތަކަށް ފިޔަވަޅު ކުޑަކުރެވޭނެ ގޮތްތައް ހުށައި އަދި މި މަޝްރޫއުގެ ދަށުން ކުރަން ހަމަޖެހިފައިވާ ބައެއް ކަންތައްތައް ކުރިއަށްގެންދާނެ އަހަން ގޮތްތަކާއިވެސް މި ރިޕޯޓުގައި ހިމަނާފައި ވާނެއެވެ.

ތިމާވެށްޓަށް އަންނަމުންދާ ބަދަލުތަކަށްބަލާ މޮނިޓަރކުރުން ޕްލޭނެއް މިރިޕޯޓުގައި ހިމަނާފައިވާނެއެވެ. މިފަދަ މޮނިޓަރިން ޕްލޭނުގެ ބޭނުމަކީ ތިމާވެށްޓަށް ކުރާއަސަރުތަކަށް ދުރާލާ ދެނެގަނެ ފިޔަވަޅު އަވަހަށް އެކަންކަން ކަންހިނގުމުގެ ފުރުސަތު އަތުވުމެވެ.

މި މަޝްރޫއުގެ ސަބަބުން ތިމާވެށްޓަށް ކޮންސްޓްރަކްޝަނުގެ ނުރައްކާ އަސަރުތައްކުޑަކުރުމަށްޓަކައި މި މަޝްރޫއަކީ ދެ: މާއެނބޫދޫގެ ގިރަމުންދާ ސަރަހައްދުތަކަށް ހިމާޔަތްކޮށް އިތުރު ގެއްލުމެއްނުވާނެގޮތަށް ކުރަން ހަމަޖެހިފައިވާ ގޮތްތަކެއް ކުރުމަށް ބޭނުންވާ ވެލި ހޯދުމަށް ހިނގާ މަޝްރޫޢުތަކަށްބަލާއިރު މި ކުރިއަށްގެންދާނެ ގޮތްތަކާއި އެންމެ ރަނގަޅު ކަމުގައި ފާހަގަކޮށްފައިވާނެއެވެ.

1. NON TECHNICAL SUMMARY

This is the First Addendum to the project's approved main EIA, which has been prepared for obtaining permit and environmental clearance for a new burrow site that will be used for obtaining all required fill material for the proposed revetments to be developed in Dh. Maaenboodhoo. The Proponent of the project is Ministry of Environment and Energy and the contractor of the project is SAS e Senok JV Pvt. Ltd.

It is a legal requirement under the Amended EIA Regulation 2012 EIAs/Addendums for projects that are believed to generate negative environmental impacts. This Addendum has been prepared as per the approved Terms of Reference (TOR) on 3 December 2015.

The scope of this Addendum is to assess the existing environmental condition of the proposed project areas and surrounding environment, identify potential environmental impacts, propose environmental management and mitigation measures to minimize environmental impacts as well as propose an environmental monitoring plan with appropriate environmental parameters to monitor changes on a regular basis.

The proposed new burrow site is located on the southern side of the island within the EPA guideline buffer boundary of 50m from the shoreline and 100m from the outer reef line as implemented under the Dredging and Reclamation Regulation 2013.

A detailed environmental assessment was undertaken as part of the main EIA and marine and coastal environmental assessments relevant for the proposed project have been used as the baseline environmental condition in this Addendum.

Main environmental impacts from the proposed project will be from sedimentation including water quality deterioration, reef damage as well as direct destruction of lagoon habitats within the new burrow site boundary. Although, these impacts are inevitable, it is effects can be reduced by implementing various environmental management and mitigation measures such as undertaking dredging operations coinciding with low tide and on calm days as well as undertaking the operations in the quickest possible timeframe to reduce impact exposure period.

Environmental monitoring has been planned to undertaken in conjunction with the main EIA environmental monitoring plan.

Although there are a number of environmental impacts from the proposed development, some of these can bring permanent changes to the environment of the island, other impacts can be reduced and mitigated by use of appropriate methodology. The effectiveness of these methodologies can be documented by implementing a comprehensive monitoring programme. Also, with positive social outlook of the project and considering the overall need for the project, it is concluded that the project should go ahead as planned.

2. INTRODUCTION

2.1 BACKGROUND

The proposed project involves protection of areas affected by beach erosion on the NE, SE, NW and SW of Dh. Maaenboodhoo Island by means of rock boulder revetment breakwater and geo-bag revetment. In this regard, it is proposed to build a 220m long rock boulder revetment breakwater along the NE side, 550m long rock boulder revetment breakwater along the SE side, 225m long geo-bag revetment along the NW shoreline and 190m long geo-bag revetment along the SW shoreline of the island.

The required material for filling, beach profiling and core material for the geo-bag revetment and rock boulder revetments is proposed to be obtained from two burrow sites (western side and southern side) initially approved by EPA on 26 August 2015. This Dredging and Reclamation Permit has been attached in **Appendix 1 (Dredging and Reclamation Permit).**

With regards to undertaking the above-mentioned project, the Environment Impact Assessment (EIA) was prepared by Mohamed Zuhair (EIA01/15) and Ibrahim Shakir and approved by Environment Protection Agency (EPA) in November 2015.

The main EIA for the project was prepared based on the Terms of Reference (TOR) approved by the EPA on 16 September 2015. **(Appendix 2: EIA Terms of Reference).**

Since the burrow sites for obtaining necessary fill and core material for the proposed revetment works has already been approved by EPA on 26 August 2015, extensive consultation with Maaenboodhoo Island Council and other relevant parties with regards to the approved locations of burrow sites for the proposed project was not undertaken. However, based on further consultations among the Island Council, Project Proponent, Project Contractor as well as Member of Parliament of the Constituency with regards to proposing a new burrow site has been undertaken and agreed, which forms the basis for this First Addendum to the main EIA for proposed coastal protection works to be carried out in Dh. Maaenboodhoo Island.

As all dredging and reclamation works require a permit from EPA under the Dredging and Reclamation Regulation 2013, a new dredging permit for the new site will be issued by EPA,

which was agreed by the concerned parties. **(EIA Attachment: Application for New Dredging and Reclamation Permit).**

This is the First Addendum to the project's approved EIA, which has been prepared for approval due to the change in location of the approved burrow sites to a new burrow site. The proposed new burrow site will be located slightly southwards of the island having 222m in length, 31m in width and 1m in depth

This addendum document was prepared upon approval of a Terms of Reference for the Addendum by EPA on 3 December 2015**. (Appendix 3: EIA Addendum Terms of Reference).**

This Addendum is part of the approved main EIA for the project, hence it shall be read in conjunction with the approved EIA for Proposed Coastal Protection Works in Dh. Maaenboodhoo, which contains detailed information on the project and site conditions.

2.2 PROPONENT AND CONTRACTOR

The proponent of the proposed project is Ministry of Environment and Energy, Government of Maldives.

The contractor of the proposed project is SAS e Senok JV Pvt. Ltd., a private company registered in the Maldives having the following contact details;

SAS E Senok JV Pvt. Ltd.
M. Ibage, 1st Floor
Iramaa Magu
Male'
Maldives
Tel: 333 1682
Fax: 330 1682
Email: saud@saseconstruction.com

2.3 RATIONALE

Although 3 burrow sites around the island lagoon for the project were initially identified to be approved, only 2 sites were approved by EPA, which are the located and on the western and southern sides of the island.

Based on extensive discussions and consultations among Maaenboodhoo Island Council, Ministry of Environment and Energy, SAS e Senok JV Pvt. Ltd as well as Member of Parliament for Dh. Kudahuvadhoo Constituency, only one site was agreed to be used as a burrow site for the project, which is now located further south from the approved burrow site located on the south.

The main reason for changing the location of the burrow sites are that the western side of the island is a potential tourism development area, hence obtaining fill material from the lagoon may negatively impact the activities proposed for the area, and the approved burrow site located on the southern side of the island is located close to the island, which is placed on an anticipated future land reclamation project, hence relocating the burrow site further south will avoid any anticipated future land reclamation boundary. Also, an important consideration has been given to combine the two approved burrow sites to obtain fill material to a designated one location. Thus, there will be no need to obtain fill material from different locations of the island, which may have more negative environmental impacts to the island.

Hence, this Addendum to the approved main EIA has been prepared in order to obtain approval and environmental clearance for the proposed new burrow site located on the southern side of the island.

2.4 SCOPE AND APPROACH

The main scope of this Addendum is to assess the existing environmental conditions of the proposed new burrow site, predict and evaluate environmental impacts, propose environmental management and mitigation measures to minimize environmental impacts as well as propose an environmental monitoring plan with appropriate environmental parameters to monitor changes on a regular basis as a result of obtaining fill material from the proposed new burrow site.

This Addendum has been prepared based on information collected from the baseline environmental assessments undertaken to prepare the project's EIA as well as information obtained from key stakeholders such as Maaenboodhoo Island Council and the Member of Parliament for Dh. Kudahuvadhoo Constituency.

2.4.1 Review of Relevant EIAs

Additionally the Consultant's previous experience in preparing EIAs in similar environmental settings and similar projects has been used in this report.

- Environmental Impact Assessment Report for Proposed Coastal Protection Works in AA Ukulhas, prepared by Mohamed Zuhair and Ibrahim Shakir in 2015.
- Environmental Impact Assessment Report for Coastal Protection Measures in Veymandoo, Thaa Atoll, prepared by Mohamed Zuhair and Ibrahim Shakir in 2015

These EIAs prepared for the above mentioned projects outlines obtaining fill material by means of sand excavation. The environmental impacts identified from these projects are similar, however, their extent and magnitude have been identified to be different due to the scale of the development. Major environmental impacts discussed in the studies as a result of sand excavation, include sedimentation and direct destruction of lagoon and reef habitats.

2.5 ADDENDUM STRUCTURE

A summary of the main contents of this EIA Addendum is presented below;

- **Project Description:** A description of the overall project proposal including justification, main project inputs and outputs, project schedule;
- **Legal Considerations:** An assessment of the most relevant laws and regulations that the proposal has to comply with;
- **Existing Environment:** An assessment of the existing environmental status of the proposed burrow site and surrounding environment;
- **Potential Environmental Impacts:** Prediction of potential environmental impacts and evaluation of the magnitudes of environmental implications that will be associated with the proposed new burrow site;
- **Mitigation Measures:** Identification and assessment of the ways in which the environment of the project site be appropriately managed and minimized;

- **Alternatives:** Assessment of alternatives sites and no development option,
- **Stakeholder Consultation:** Presentation of views of important stakeholders with regards to the proposed change of burrow site of the project; and
- **Environmental Monitoring:** Development of an environmental monitoring plan with regards to long-term monitoring of various environmental aspects related to the project.

2.6 IMPACT PREDICTION AND EVALUATION

The key environmental impacts from the proposed new burrow site have been identified by means of simple descriptive check list and evaluated by using comparative matrices. These methods are widely used for identifying and evaluating environmental impacts and their magnitudes, and based on these assessments, environmental management and mitigation measures have been proposed. Additionally, Expert judgment and professional opinion have also been widely used throughout the impact assessment and evaluation process.

2.7 CONSULTANT

This EIA Addendum was prepared by Mr. Mohamed Zuhair, a registered EIA Consultant.

Mr. Mohamed Zuhair, EIA Consultant (EIA01/15) is a freelance Environment Consultant who has many years of experience in the field of environmental management, assessment and monitoring, implementation of environmental laws and regulations and has involved as lead consultant and a team member in preparing several EIAs in the Maldives.

3. STUDY AREA

The main focus of this Addendum is to present existing environmental status of the proposed new burrow site located on the southern side of the island.

The location of the new burrow site and extent of the study area can be found in the following figure.

Figure 1: Location of the proposed new burrow site and outline of the study area

4. PROJECT DESCRIPTION

4.1 PROJECT LOCATION

The proposed new burrow site has been located on the southern lagoon of the island, which has been located having 50m buffer boundary from the shoreline and 100m buffer boundary from the outer reef **(Figure 1).** The location of the new site has taken into consideration the requirements of the Regulation on Dredging and Land Reclamation implemented by EPA.

4.2 PROJECT OUTLINE

Dredging and obtaining required fill and core material for the proposed revetments on the island will be the main project activity that will be outlined in this Addendum.

4.2.1 Mobilization

Mobilization of the project in terms of required machinery and equipment has already been done at the site. However, the project is waiting for the approval and environment clearance for the new burrow site from EPA.

4.2.2 Dredging Works

It is proposed to dredge by means of excavation of all the required fill and core material for the project from the new site. The estimated total material requirement is 6,882cbm of sand and rubble, which will be excavated from the new burrow site. As the area is shallow, a 330 excavator will be used to carry out the work. In order to access the new burrow site, a temporary sand bed will be laid from the island to the site, which will be used for transferring the required material to the island. The excavation works will start from the outside of the lagoon and move inwards along the shallow lagoon until the desired length, width and depth, which is 222m, 31m and 1m respectively, is obtained.

It is planned to complete the excavation works soon in order to reduce environmental impacts exposure to the surrounding environment.

4.2.3 Project Duration

As part of this Addendum, the project contractor proposes to complete obtaining the required fill and core material in 2 – 4 weeks period.

4.3 PROJECT JUSTIFICATION

The primary purpose with regards to proposing this EIA Addendum is to change the already approved burrow sites to a one particular location for a number of reasons.

1. Extensive consultation with Maaenboodhoo Island Council and other concerned parties were not undertaken as part of preparing main EIA for the project.
2. Changing the approved burrow sites to a new burrow site as per the future plan requirements of Maaenboodhoo Island Council.
3. The reason for changing the approved burrow site on the western side to the new site is due to allocated future tourism development on the western part of the island where some of the planned activities may be impacted due to the location of the burrow site.
4. The reason for changing the approved burrow site on the southern side to the new site is due to its location being close to island, which is within a future prospective land reclamation area identified by the Island Council.

The above key points form the key justification for this EIA Addendum.

4.4 MATERIAL INPUT AND OUTPUT

Following are the key project inputs and outputs.

4.4.1 Main Project Inputs

Project Input	Type	Source
Labor	Foreign and local	Contractor (3-5 persons)
Technical personnel	Foreign and local	Contractor (2 persons)
Machinery	Excavator 330 and dump truck,	Contractor's machinery
Spare parts	Spare parts for all machineries	Contractor and local suppliers
Water supply	During construction	From the island
Fuel supply	Diesel, petrol, lubricants	Contractor and locally

		purchased
Food and accommodation	During construction	Locally arranged from the island
Health and safety	Fire extinguishers, first aid, safety equipment	Contractor

Table 1: Key project inputs

4.4.2 Main Project Outputs

Project Output	Quantity	Disposal Method
Excavated material	6,882 cbm	Used as fill material and core material for the revetments
Oil and lubricant waste	Small	Stocked to transfer for final disposal in Thilafushi
Air and Noise Pollution	Small	Fixed working hours

Table 2: Key project outputs

4.5 KEY IMPACTS AND IMPACT BOUNDARY

A notable environmental impact from the proposed activities of dredging and excavation works will be from sedimentation and subsequent impacts from it. However, it is believed that sedimentation will be mainly distributed within the lagoon found on the southern side of the island, which some of its effects may be felt on the adjacent reef itself.

Figure 2: Impact boundaries of the new burrow site (yellow = activity area; red = anticipated impact boundary)

The above figure shows key project activity areas and anticipated impact areas, mainly areas that will be affected by sedimentation, which may be distributed within the neashore lagoon and to parts of the southern side reef.

5. LEGAL CONSIDERATIONS

A detailed legal, administrative and policy framework relevant for the proposed project have been outlined in the main EIA; **Environmental Impact Assessment Report for Proposed Coastal Protection Works in Dh. Maaenboodhoo.** All major activities of the proposed project including development of geo-bag revetments and rock boulder revetments, beach profiling works have been approved by Environment Protection Agency (EPA) in November 2015.

The approval was granted by the **EIA Regulation 2012.** The Dredging and Reclamation Permit was granted under the **Dredging and Reclamation Regulation 2013.** These regulations are developed under the main **Environmental Protection and Preservation Act of Maldives (Law No. 4/93).** The Environment Act and regulations developed under the Act are regulated and implemented by **EPA** on behalf of **Ministry of Environment and Energy**.

An Amendment to the EIA Regulation 2012 is now under enforcement since November 2015. As part of this Amendment, application for permit of dredging and reclamation works can now be submitted together with EIAs/Addendums to the Environment Protection Agency.

Hence, this Addendum to the main EIA falls under this Amendment to the EIA Regulation 2012 and therefore, the required dredging and reclamation permit of the new burrow site has been attached with this EIA Addendum.

6. EXISTING ENVIRONMENT

This section outlines the key existing environmental conditions of the project area, ie, the proposed new burrow site location and the surrounding environment where the project is believed to impact the environment.

A detailed assessment on the various components of the environment was undertaken in the main EIA prepared for undertaking coastal protection works in Dh. Maaenboodhoo Island.

6.1 METHODOLOGY

The main EIA discussed in detail the types of the methods used to gather data from the existing environment of the island. For the purpose of this EIA Addendum, only relevant information for the proposed dredging works in the new burrow site has been used.

Beach Profiles - Beach profiles around the island were undertaken by using a standard leveler and profile locations were geo-referenced. Information on two beach profiles can be used as part of this Addendum.

Currents – current speed and direction was collected by drogue technique from the southern side of the island.

Bathymetry – echo sounder was used to collect depth information from around the island, hence from the proposed new burrow site.

Seawater Quality – a seawater sample was collected from the southern side of the island and analysed from the laboratory of MWSC.

Marine Environment - coral reefs and lagoon environments that may be impacted from the proposed activities were assessed visually and by use of 1x1 several and random photo quadrats on the northern and southern side of the lagoon. Information obtained from the southern side of the lagoon is used in this Addendum.

6.1.1 Uncertainty on Data Collection Methods

Limited time spent on site has been the key limiting factor to get a more detailed assessment on all environmental aspects surrounding the project area. Some of the methods used are quite rapid, such as those undertaken on the marine and lagoon environment. Nonetheless, most of the assessments, including seawater, beach profiles, reef health, bathymetry and drogue were done in accordance with the TOR and reflect the general existing environment of the island at the time of these assessments.

6.2 BEACHES

Beach dynamics of the project area was studied by taking beach profiles, transacts, comparison of aerial photographs in 2010 and 2013 from Google Earth and that of the shoreline survey undertaken in 2015. It was found that no major changes have occurred since 2010, however, development of the harbor on the north may have triggered some erosion on the north as well as placement of the fill material from the harbor may have affected the NW and SW beach areas, which now requires coastal protection.

Also, beach profiles taken from the immediate area on the southern side relating to the proposed new burrow site indicate heavy scouring of beach material from the areas. As can be seen from the profiles, P3 and P4 have drastic drops in the beach slope which indicates heavy scouring in the area.

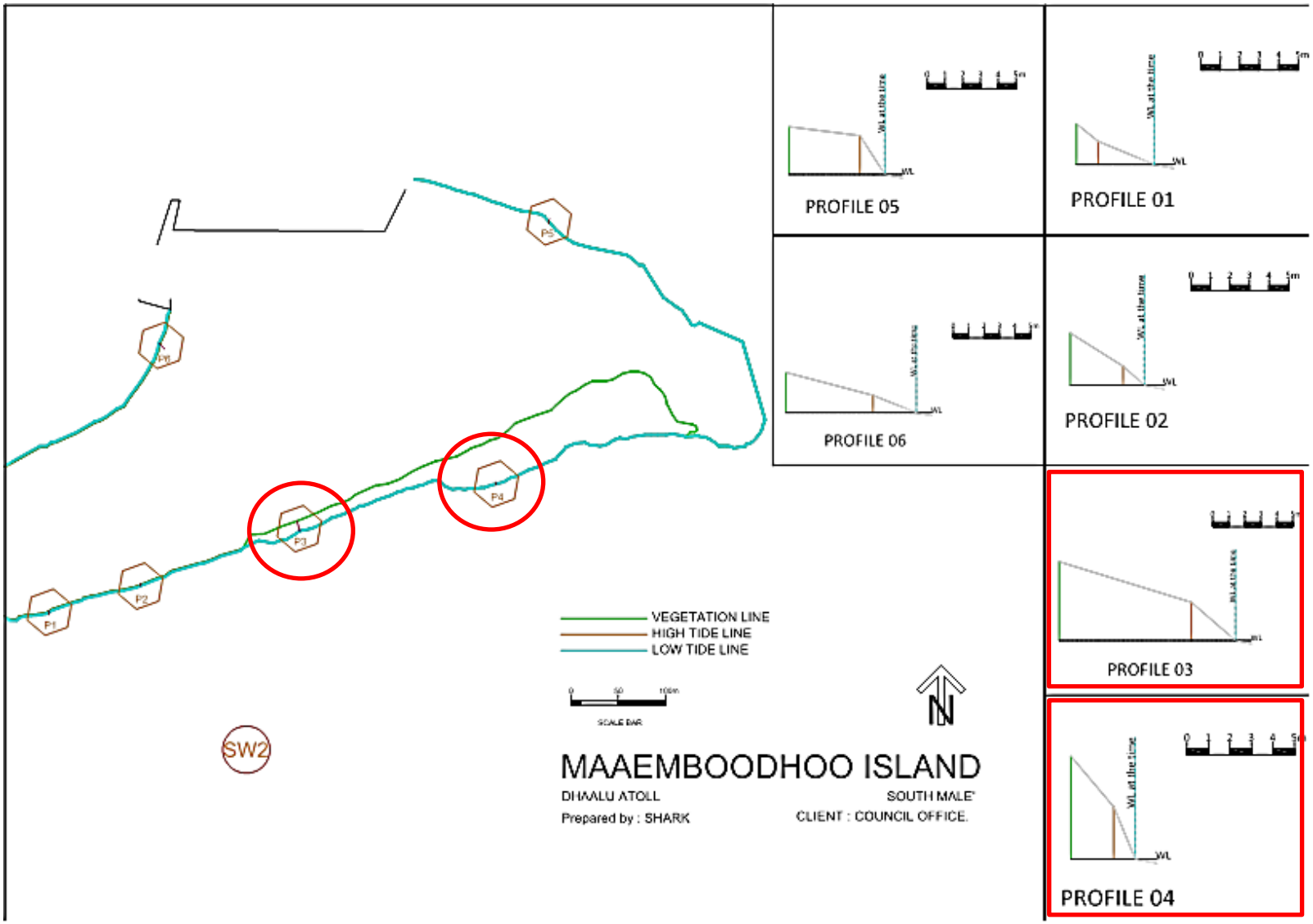


Figure 3: Beach profiles taken around the island (encircled relevant areas)

6.3 CURRENTS

Current measurements have been taken from three locations; north, south and eastern lagoon of the island. Currents on the south had a northerly flow at a speed of 0.07m/s.

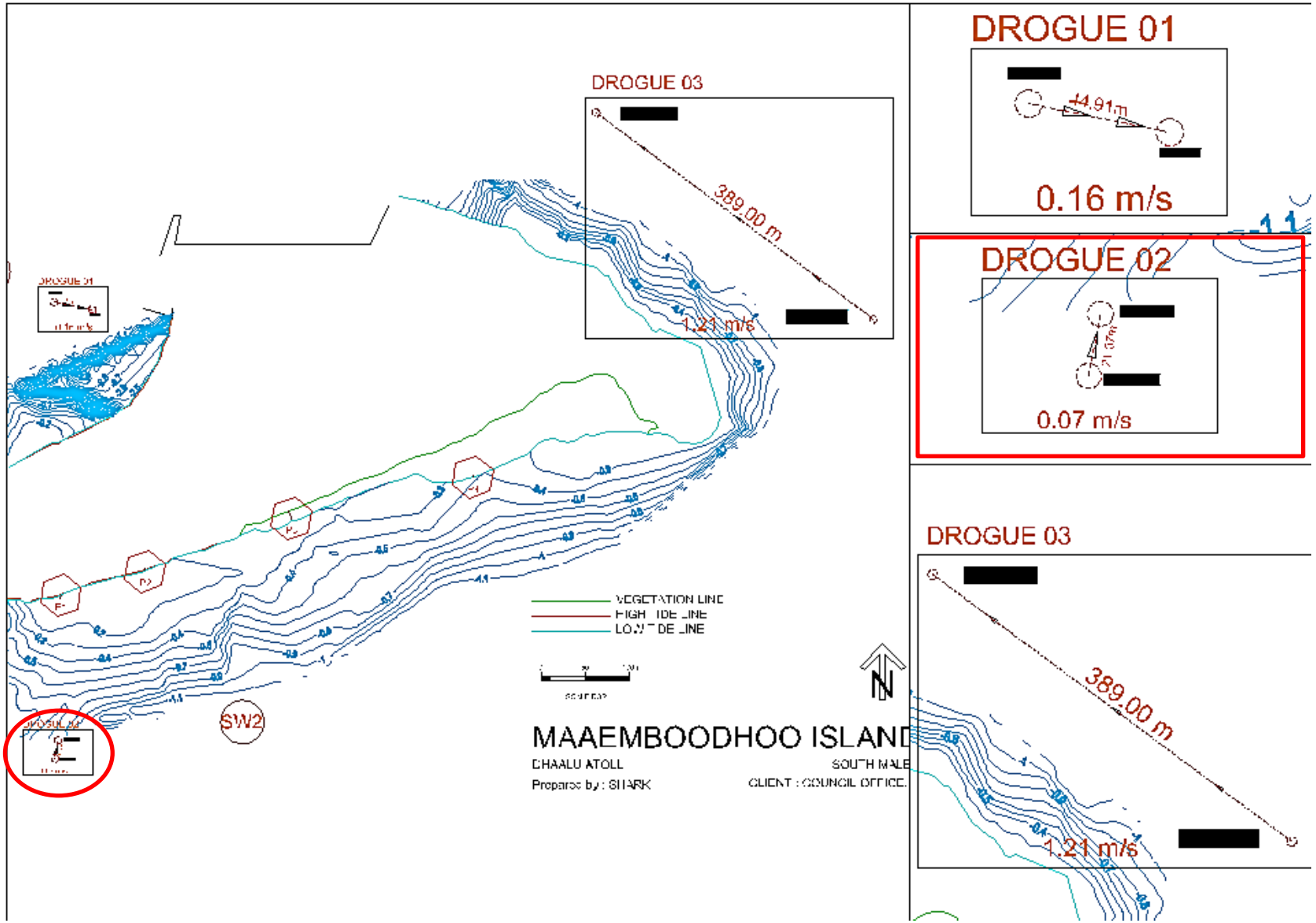


Figure 4: Current measurements around the island (encircled relevant areas)

6.4 BATHYMETRY

Bathymetry taken around the proposed new burrow site indicates that the near shore depths are between 0.5m – 0.7m where dredging will take place from the new burrow site.

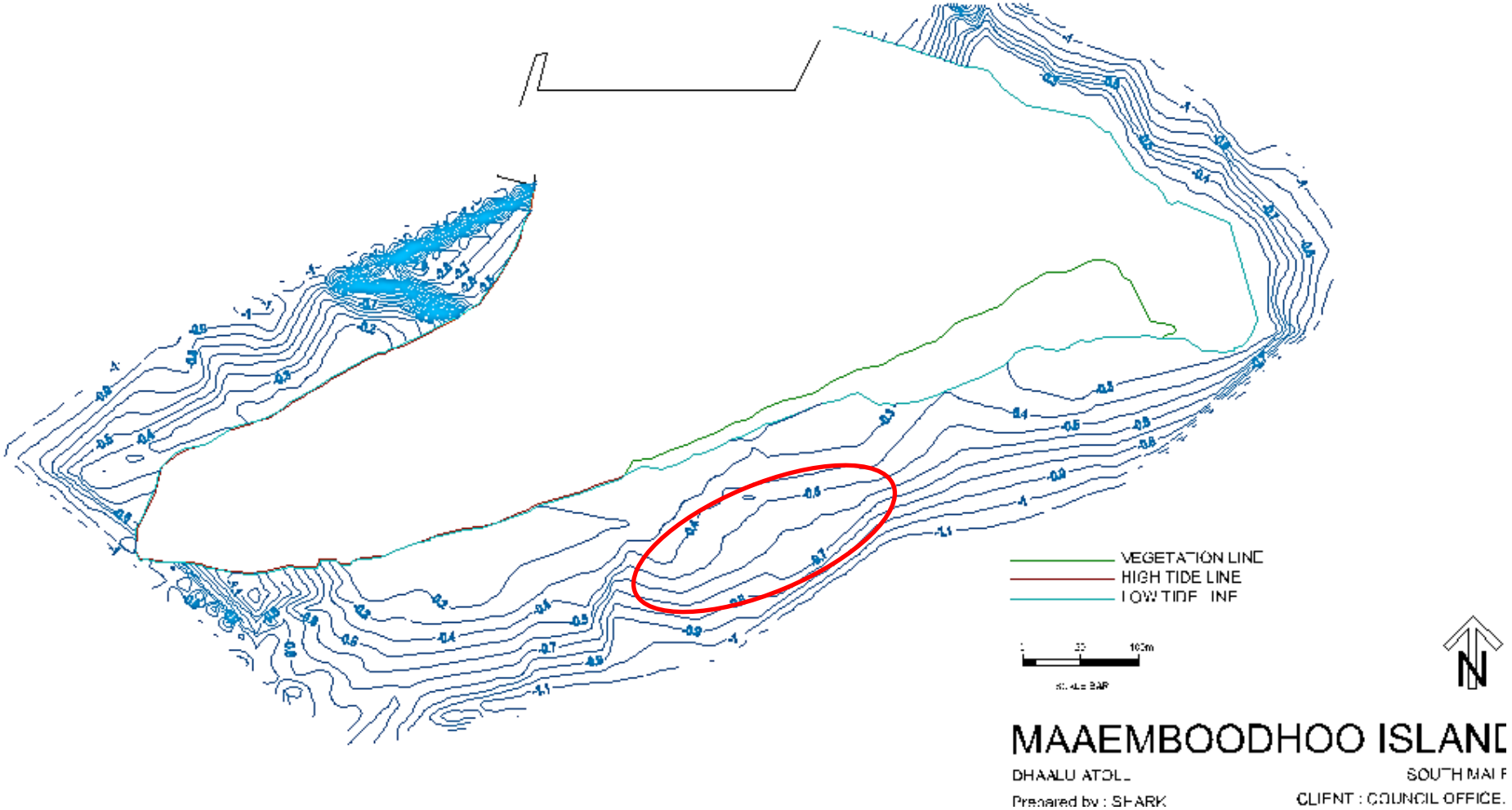


Figure 5: Lagoon bathymetry taken around the island (encircled relevant area)

6.5 MARINE ENVIRONMENT

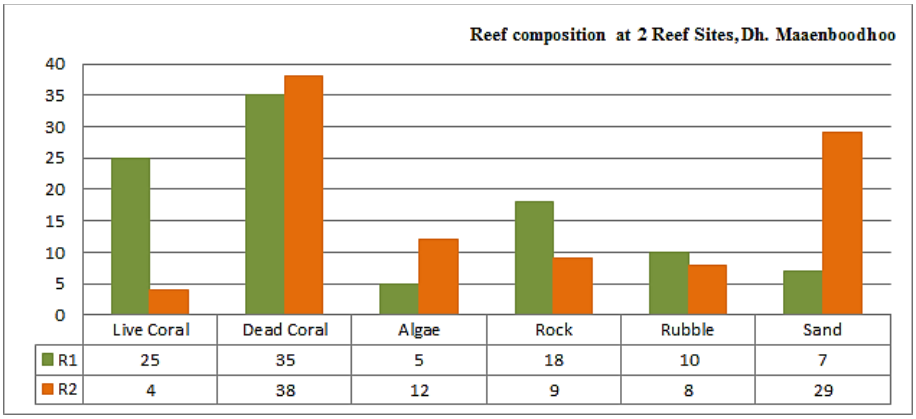
The following areas of the marine environment have been assessed both qualitatively and quantitatively in order to understand the current status.

Figure 6: Marine survey locations; R=reef assessment, S=seawater sample collection points (encircled relevant areas)

Coral reef assessments were carried out on two locations, one on the reef crest of north and one on the reef flats of south as indicated in the above figure. The reef extent on the south was observed to large having around 220m with wide reef flat areas. On the north the reef extent is around 88m and there are limited lagoon areas. However, reef flat area are observed to be quite defined and wide.

Both these area fall within the direct impact zone of the proposed project, hence, long-term monitoring will show how the project has impacted the natural environment found in these areas.

The following figure summarizes the main findings of the reef assessment carried out on the two locations of the reef of Maaenboodhoo Island.



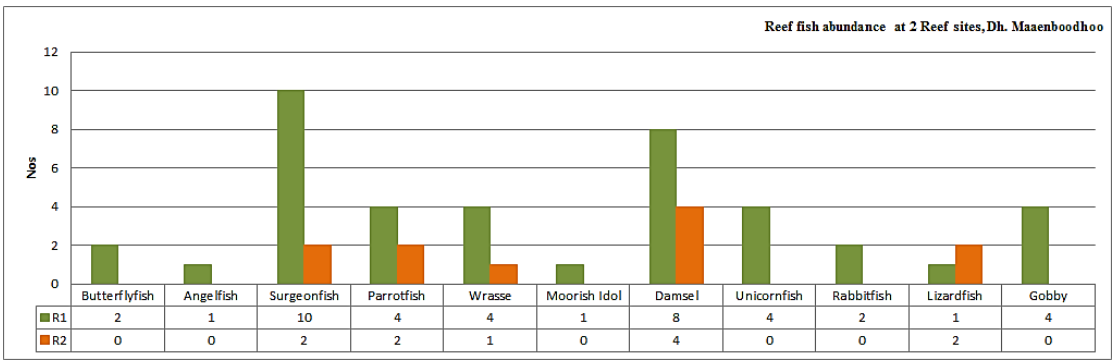
	Live Coral	Dead Coral	Algae	Rock	Rubble	Sand
R1	25	35	5	18	10	7
R2	4	38	12	9	8	29

Figure 7: Reef composition at surveyed sites from the reef of Maaenboodhoo (R2 is relevant area)

The two sites surveyed have different characteristics. More live coral was found at R1 located on the north with around 25% live coral, with corals of Acropora and Porites. In the contrary, R2 located on the southern side of the island had very high sand content with around 29% cover. This area is located quite close to the proposed burrow site, hence it is expected that the burrow site will have similar environmental conditions. Only 4% of live coral was observed and most of which were isolated coral colonies mostly belong to Acropora family. Over 30% dead corals and rubble were observed at both sites.

Figure 8: Reef composition distinction between the two sites (R2 is on right)

Reef fish abundance and diversity was also assessed during the coral reef assessments. Visual fish censuses were carried out on all reef sites along an approximately 20m belt transects. The reef fish assessments were only done at family level. The findings of the reef fish assessments are presented in the following figure.



	Butterflyfish	Angelfish	Surgeonfish	Parrotfish	Wrasse	Moorish Idol	Damsel	Unicornfish	Rabbitfish	Lizardfish	Gobby
R1	2	1	10	4	4	1	8	4	2	1	4
R2	0	0	2	2	1	0	4	0	0	2	0

Figure 9: Reef fish assessment results at two locations (R2 is relevant area)

Only 11 fish belonging to 5 families were recoded from R2, of which most were damesels and no groupers, angelfish, Moorish idol, unicornfish, rabbitfish were found from R2.

6.6 SEAWATER QUALITY

A seawater sample from the island lagoon on the southern side was tested by the laboratories at MWSC for the parameters in the following table to establish the baseline status of seawater around the island.

Seawater test results are attached in **Appendix 4.**

Perimeter	**Unit**	**SW 1**
Physical Appearance		Clear
Conductivity		52300
pH		8.10
Nitrate	mg/L	0.4
Sulphate	mg/L	2980
Salinity	mg/L	34.20
TSS	mg/L	26500
Turbidity	NTU	0.635

Table 3: Seawater analysis results

The seawater quality around the island had no excessive contents of nitrate or sulphates. These data will be used as baseline data for the monitoring purpose.

7. ENVIRONMENTAL IMPACTS

The following section predicts potential environmental impacts from dredging and excavation works to be carried out in the proposed burrow site as part of Maaenboodhoo coastal protection project. Once the potential environmental impacts are identified, the impacts are evaluated to identify their significance. In order to identify and analyze environmental impacts, the following methods have been used.

7.1 METHODOLOGIES

7.1.1 Impact Prediction

First of all, most of the environmental impacts that may be generated as a result of the project is predicted and is distinguished from construction and operation phases of the project. The impacts have been predicted by using simple matrix method. The prediction of environmental impacts also to a great extent incorporated expert judgment and professional opinions of the EIA consultant involved in the preparation of the report as well as statements addressed in the EIA reports reviewed in this Addendum.

7.1.2 Assessing Impact Significance

The environmental impacts are assessed in terms of significance. Significance is the function of magnitude of the impact and the likelihood of the impact occurring and the impact magnitude is a function of the extent, duration and intensity of the impact. The criteria used to determine impact significance are summarized in the following table (adapted from Environmental Resource Management, 2008).

IMPACT MAGNITUDE		
Extent	On-Site	Impacts that are limited to the boundaries of the development site
	Local	Impacts that affect an area in a radius of 1km around the development site
	Regional	Impacts that affect regionally important environmental resources, administrative boundaries determined by bregional scale
	National	Impacts that affect nationally important environmental resources or have macro-economic consequences
Duration	Temporary	Impacts are predicted to be of short duration and intermittent / occassional
	Short-term	Impacts that are predicted to last only for the duration of the construction period
	Long-term	Impacts that will continue for the life of the project, but stops when the project ceases operation
	Permanent	Impacs that cause a permanent change in the affected receptor or resource
Intensity		*BIOPHYSICAL ENVIRONMENT*
	Negligible	Impact on the environment is not detectable
	Low	Impact affects the environment in such a way that the natural funclions and processes are not affected
	Medium	Where the affected environment is altered but natural functions and processes continue
	High	Where natural functions or processes are altered to the extent that they will temporarily or permanently cease
		SOCIOECONOMIC ENVIRONMENT
	Negligible	There is no perceptible change to people's livelihood
	Low	People/communities are able to adapt with relative ease and maintaine pre-impact case
	Medium	People/communities are able to adapt with some difficulty and maintain pre-impact case but only with a degree of support
	High	People/communities will not be able to adapt to changes or continue to maintain pre-impact case
Likelihood	Unlikely	The impact is unlikely to occur
	Likely	The impact is likely to occur in most consitions
	Definite	The impact will occur

Table 4: Impact significance criteria

Once a rating has been determined for magnitude and likelihood, the following matrix has been used to determine the impact significance.

SIGNIFICANCE				
		LIKELIHOOD		
		Unlikely	**Likely**	**Definite**
MAGNITUDE	**Negligible**	Negligible	Negligible	Minor
	Low	Negligile	Minor	Minor
	Medium	Minor	Moderate	Moderate
	High	Moderate	Major	Major

Table 5: Significance rating matrix

The different ratings of impact significance are then given a colour scale for easily understanding the overall magnitude of the impact. The following colour scale has been used.

Negative Ratings	Positive Ratings
Negligible	Negligible
Minor	Minor
Moderate	Moderate
Major	Major

Table 6: Significance colour scale

7.1.3 Limitations and Uncertainties

The potential environmental impacts from the proposed project are all predicted and assumed, hence there may be variables affecting the accuracy of these impacts due to natural variations and uncertainties.

EIA studies undertaken in similar environmental settings and technical experience as well as professional judgment of the EIA team have been used as support while predicting and evaluating these environmental impacts.

Since the environmental, geomorphological and physical oceanography of the islands of the Maldives are unique, the degree and accuracy of the predicted impacts when applied even in other islands of the Maldives in similar project settings, may differ in accuracy, magnitude and significance.

7.1.4 Justification of the Method Used

There are many ways and a number of methods in which environmental impacts that arise from development projects can be assessed and evaluated. The methods used for the purpose of predicting and evaluating the significance of environmental impacts is an accepted and internationally recognized as well as widely used methods throughout the world in a number of development projects. Although it is adapted for the condition of the project by the EIA consultant from Environmental Resource Management, 2008 literature, the approach as well as intended outcomes still remain same. The method used are quite easy to be understood by non-technical personnel.

7.2 IMPACT PREDICTION

The environmental impacts that may be associated with dredging of the proposed burrow site are predicted in this section by using a simple descriptive matrix. The following matrix distinguishes the types of environmental impacts that may be associated with various project actions on key environmental components and distinguishes whether these impacts occur during construction period or during post-construction period.

PROJECT ACTIONS	ENVIRONMENTAL COMPONENTS AND ENVIRONMENTAL IMPACTS			IMPLICATION PERIOD
	Beach Shoreline	**Lagoon Habitat Oceanography**	**Reef Habitat Seawater**	
Dredging and excavation from proposed burrow site	May affect shoreline due to sudden changes in the oceanography of the lagoon	Direct destruction of lagoon habitats, changes in seawater quality from sedimentation and changes in oceanography	Direct and indirect mpacts to reef habitats and organisms due to sedimentation, turbid seawater	During construction
Operation of construction vehicles	Due to the operation of excavator and dump trucks on the beaches, the area may have some negative implications			During construction
Site after dredging	Long-term changes in the shoreline	Filling of sand naturally due to currents		Post construction
Benefits	No major impacts to designated tourism area on the NW	Avoiding potential land reclamation boundary by changing burrow site from the south		Post construction

Table 7: Impact prediction table

The above table shows the main project activities and the environmental components upon which the environmental impacts will occur. As the Addendum only deals with dredging and excavation works from the new burrow site, impacts arising only from this activity has been predicted.

7.3 DESCRIPTION OF IMPACTS

7.3.1 Construction Phase Environmental Impacts

7.3.1.1 Impacts from Dredging

With this new burrow site, all required fill and core material will be obtained from the proposed site located on the southern side lagoon. It is estimated that around 6,882cbm of material will need to be obtained from the site.

The most significant direct cause of dredging is sedimentation and consequential turbidity, benthic destruction and changes in reef communities, dredge spoil as well as its impacts on the environment such as water quality deterioration, changes in light intensity, habitat destruction as well as species loss and reef damage. Some impacts to the shoreline are also anticipated.

Shoreline

The proposed dredging area is located within the southern lagoon and will be dredged to a length of 222m and a width of 31m. The dredging in the area is believed to alter the oceanography of the lagoon, hence may have some implications on the existing shoreline on the southern side of the island. The sudden increased depths in the area may be forced to vary the hydrodynamics of the area, which may lead to further loss of already affected beaches on the southern side.

Sedimentation

This is the most significant contributing factor to reef damage from dredging as it releases large amounts of sediments into the environment. Large volumes of sediment released into ambient environment including to the lagoon and reef, as a result of activities such as dredging is harmful to establishment, development and survival of many corals both in the lagoon and reef.

The ecological effects of sedimentation on coral reefs range from a temporary slow-down in coral growth to gradual dying and permanent changes in community structure and species diversity. This indicates that corals itself as well as coral communities are highly susceptible to changes that will occur from sedimentation. Concerning the settlement of sediment particles, a big quantity of different sized corals will bury them as well as will fill in all crevices and cavities together with numerous species and organisms that live there and which are indispensable to the structure and functioning of the whole ecosystem.

The capacity of corals to remove fine sediments falling on them depends on the type of coral. The ability of corals to reject sediments is limited by several factors such as excessive sediments and complete burial for more than several hours is lethal to most corals and coral colonies. Ciliary movements cause the rejection of sediment in corals. Branching species are more advantageous than other flat and massive growth forms in remaining viable in situations of prolonged sediment deposition.

Turbidity and Changes in Light Intensity

Light for organisms in seawater is a very complex problem as coral reefs are very sensitive to changes that occur within the environment in which they are found. Fine particles in suspension in the water column will contribute to a decrease in light intensity. Visibility in normal conditions in the Maldives range between 10-15m, however, it may drop to 2m during the operation of dredging, hence, drastically cuts down the light intensity, which will affect the growth of autotrophic organisms such as corals which depend on sunlight for its growth, reproduction and survival.

Seawater Quality Deterioration

As it is clear that abiotic and biotic reef conditions are modified by sedimentation, it also alters certain parameters of water. For instance, suspension of sediments, in addition to problems of turbidity and siltation, will produce dirtier water, noxious odours and significantly decrease the dissolved oxygen in water and the results can be severe for fish and other very active organisms. However, this will depend on the site itself and will reduce such problems in open areas where there is an adequate current flow. The proposed dredging site is quite open, hence, the impact on water quality is envisaged to be on an average scale.

Habitat Destruction and Changes in Reef Community Structure

As sedimentation causes adverse impacts on the general reef ecosystems, it is apprehensible that all levels of physical and biological content of a reef system will undergo drastic changes. In the vicinity of the dredged site, the main damage is caused by sand loading, sedimentation, silt deposition on coral colonies, other organisms, crevices and cavities, and such drastic modifications lead to very important changes in the biotic composition and sometimes lead to the death of the reef. Within the coral reef ecosystem, corals and coralline algae are first to suffer from sedimentation. Some corals and algae will immediately die because they cannot reject mass sedimentation episodes while molluscs and crustaceans as well as fish leave the damaged reef or die, resulting total decrease in species richness and diversity as well as loses its renewable high productivity.

7.3.1.2 Operation of Construction Vehicles

As part of the proposed burrow site dredging works in Maaenboodhoo, some construction vehicles such as an excavator and a dump truck will be used in the operations. During the

operation of these vehicles, impacts from noise and dust may be generated. Also, operation of these vehicles on the beach may affect the area, however, will be of short-term in nature. No Major environmental impacts are anticipated.

However, these impacts will be restricted to vehicle operation periods and specific project locations only.

7.3.2 Post Construction Environmental Impacts

7.3.2.1 Site after Dredging

After the dredging has taken place, the substrate becomes lifeless, and rock surfaces will be covered by sessile organisms only if larvae can settle and survive. Some areas may be non colonisable as the lagoon bottom may be completely covered with sand. However, it is believed that some sort of coral recolonisation will start even though not immediately after dredging but several years after the operation has taken place and when the condition becomes favourable for corals to restart establishment.

7.3.2.2 Beneficial Impacts

The benefits arising from dredging of the proposed new locations is avoiding environmental impacts from dredging of approved burrow site on the NW where the location has been designated for tourism development by the Island Council. If dredging occurs on the NW site, activities planned for tourism development may be affected.

Similarly, the proposed new site is located further south from the approved burrow site, hence dredging in the proposed new site will avoid any implication to the future anticipated land reclamation boundary on the southern side. The above has been identified as beneficial impacts from the proposed dredging of new burrow site.

7.4 IMPACT ANALYSIS AND EVALUATION

The following section analyses and evaluates the previously described environmental impacts in order to identify their significance.

	IMPACT MAGNITUDE					
ACTIVITY/IMPACT	**EXTENT**	**DURATION**	**INTENSITY**	**LIKELIHOOD**	**MAGNITUDE**	**COLOUR SCALE**
Dredging	Local	Permanent	High	Definite	Major	
Operation of contruction vehicles on beaches	Onsite	Short-term	Low	Likely	Minor	
Beneficial impacts	Local	Long-term	Medium	Likely	Moderate	

Table 8: Impact analysis table

It is clear dredging related impacts are felt within 1km radius having permanent changes and having high intensity. Thus, the impact significant has been scaled as having major implications.

Also, operation of construction vehicles in the adjacent beach areas have been identified have site-specific impacts which are of short-term in nature and have a low intensity. Thus, it has been scaled as having minor implications.

In terms of avoiding dredging in approved burrow sites, beneficial social impacts have been identified having long-term benefits that have moderate implications.

8. MITIGATION MEASURES

The main purpose of the following section is to outline environmental management and mitigation measures that will be undertaken and followed with regards to minimizing and reducing environmental impacts from dredging in the proposed burrow site in the lagoon of Maaenboodhoo Island . Mitigation measures have been addressed for all environmental impacts identified in the previous section.

8.1 CONSTRUCTION PHASE

8.1.1 Mitigation Measures to Reduce Sedimentation

As can be seen from the previous section on environmental impacts from the proposed activity, sedimentation as a result of excavation to obtain necessary material has been identified as the major cause of environmental impacts from the project including seawater quality deterioration, impacts to corals and reef fish and other organisms as well as habitat destruction.

The following measures will be used to reduce impacts from sedimentation and reducing spread of sedimentation within and around the surrounding environment.

- In order to reduce effects of sedimentation, consideration has been given to undertake the dredging activity in the shortest possible time, thus sedimentation will be exposed only for a short period of time.
- It is proposed to undertake the activity mostly at low tide and on calm days, to ensure that the sedimentation does not reach far distances as well as for easy operation of the activity. It is believed that during low tides and calm days, transport of sedimentation will not reach far distances, hence its effects on the environment can be minimized.
- The turbid waters will be directed into the bottom in order to reduce the spread since bottom waters are less disturbed by winds; this combined with a shorter distance for sediments to settle may help to minimize the turbidity effects around the area. The burrow site itself can be made into the sedimentation sink location.

Key considerations;

Consideration	Detail
Reduce spread of sedimentation	Project implementation plan
Cost	0
Expected benefits	Reduced spread of sedimentation within the surrounding environment
Expertise	Sediment control
Required Manpower	3 - 5
Equipment/Technology	Excavator
Timing	During dredging operation

8.1.2 Mitigation Measures to Reduce Construction Vehicle Impacts

Vehicles such as excavator and dump trucks will be used during dredging and transport of dredged material to the island. Noise and dust are expected during the operations of these vehicles. However, these impacts will be minimal and is not expected to disturb the island community as the operations will be undertaken in the project area only.

Also, as an important measure, the operations will be undertaken during day time and in the designated area only.

Key considerations;

Consideration	Detail
Reduce impacts from construction vehicle operation	Mark and locate desired areas
Cost	0
Expected benefits	Reduced noise dust and shoreline impacts from vehicle operations
Expertise	Project management
Required Manpower	2
Equipment/Technology	Well maintained and serviced vehicles
Timing	During project implementation

8.2 POST CONSTRUCTION PHASE

8.2.1 Mitigation Measures for Post Construction Phase

It is believed that the site after dredging will be completely dead covered with sand, hence it will be difficult for recolonisation of corals. Once dredging from the site is completed, the area can be filled with rocks and rubble brought from nearby areas. This will help in establishing and colonizing new corals in a relatively short period of time.

8.3 COMMITMENT

The proponent fully recognizes the importance of protecting the environment and ensures that the proposed mitigation measures will be implemented throughout the project implementation.

Commitment letter from the proponent is attached in **Appendix 5.**

9. ALTERNATIVES

The following section outlines some alternative means to the project in terms of some alternative burrow sites that can otherwise be used as an alternative to the project. Also, a "No Development Option" has been considered as an alternative.

9.1 NO DEVELOPMENT OPTION

If the proposed dredging is not undertaken on the new burrow site, there is no doubt that the anticipated environmental impacts will not generate. However, obtaining fill and core material for the revetments is an important component of the proposed coastal protection project to be carried out in Maaenboodhoo.

Also, if no development option is taken for the proposed burrow site, then the required material will need to be obtained from the approved two burrow sites located on the NW and on the south close to the island. Although these two sites are approved for dredging, further consideration was given for future development plans of the island, hence the key purpose of this Addendum is to propose a new burrow site that is acceptable to the island community.

Although there are severe environmental impacts from dredging of the new burrow site, the overall benefit to the proposed project as well as for the island community seemed quite important for the dredging to go ahead. It will also ensure that the project can be completed in a timely manner without affecting material requirements.

Thus, the no development option has not been considered as an alternative for the project, considering the importance of the dredging component for the project for obtaining necessary fill and core material for the revetments, which has been proposed for an urgent coastal protection need of the island.

9.2 ALTERNATIVE BURROW SITES

The following alternative burrow sites have already been outlined in the main EIA Report, however, for the purpose of this Addendum, they are once again identified as alternative burrow sites.

As alternative burrow sites, the seagrass areas found on northern and southern sides can be removed, which will obtain more material than the approved sites. However, as the current areas with seagrass are quite spread out, the operation will take time and may affect the overall budget and schedule of the project. Also, obtaining fill material from a large area will increase sedimentation within the reef system, also has the potential to alter regional currents that may in the long-term affect the proposed revetments.

Also, if these sites are used for obtaining required fill material for the proposed project, there is potential for further erosion of the beaches as these seagrasses act as protective layers of the beaches found in the areas. Furthermore, dredging in these areas may impact the future island development plans.

Figure 10: Alternative burrow sites

10. STAKEHOLDER CONSULTATION

With regards to identifying a new burrow site to obtain all required fill and core material for the proposed revetments, extensive stakeholder consultations have been undertaken among all concerned parties, as there were some major issues with the previously identified two burrow sites as outlined in the main EIA.

10.1 MODE OF CONSULTATIONS

In order to reach to a new burrow site for the project, some extensive consultations among relevant parties have been undertaken through formal and informal meetings, telephone calls as well as conference calls.

The new burrow site has been proposed by Maaenboodhoo Island Council, hence, this Addendum has been prepared for approval and environmental clearance for undertaking dredging from this new site.

10.2 KEY STAKEHOLDERS

Following are the key stakeholders that have been widely engaged throughout the process of stakeholder consultation for the purpose of this Addendum.

1. Dh. Maaenboodhoo Island Council
2. Dh. Kudahuvadhoo Constituency Member of Parliament
3. Ministry of Environment and Energy
4. Environment Protection Agency
5. Sas e Senok JV Private Limited
6. EIA Consultant

10.3 SUMMARY OF MAJOR DISCUSSIONS

1. A major concern of Maaenboodhoo Island Council and Dh. Kudahuvadhoo MP has been that adequate stakeholder consultations has not been undertaken while addressing the already approved burrow sites located on the NW and southern side of the island that have been outlined in the main EIA.
2. Island Council to prepare a letter indicating their consent on the new burrow.
3. The approved burrow sites requires to be changed to a new site as these sites are within the boundaries of future development plans including a tourism development location on the NW side as well as a prospective future land reclamation site on the southern side of the island, hence a new site that can obtain all required fill and core material for the project needs to be identified.
4. As there were some issues with the previous two sites, the new burrow site located further south of the island has been identified by Maaenboodhoo Island Council and Dh. Kudahuvadhoo MP.
5. As the proponent of the project, Ministry of Environment and Energy generally accepts the new location to be identified as burrow site for the project and agrees to accommodate the changing of the burrow site as per the requirements of the Island Council and Dh. Kudahuvadhoo MP. The Ministry requires the project go ahead without further delays due to difficulty in obtaining additional financial resources for the project.
6. As the regulator of the EIA process implementation, EPA informs that any new burrow site has obtain dredging and reclamation permit as well as preparation of an Addendum to accommodate the changing in the burrow sites for the project.
7. As the contractor of the project, Sas e Senok JV Pvt Ltd informs that they are also in agreement with the new burrow site as identified by the Island Council provided that the project propoenent shall take into consideration any change in the scope of the project as well as any implications relating to finance.
8. The EIA consultant confirms that the new burrow site has adequate baseline environmental information to prepare an Addendum to the main EIA in terms of getting approval and environment clearance.

10.4 LIST OF STAKEHOLDERS CONSULTED

NAME	DESIGNATION	CONTACT
Mohamed Naseem	President, Maaenboodhoo Island Council	7912787
Abdul Rasheed	VP, Maaenboodhoo Island Council	7758070
Ahmed Shahid	Maaenboodhoo Island Council	7502089
Afrah Adam	Maaenboodhoo Island Council	7766687
Yousuf Saeed	Maaenboodhoo Island Council	9910201
Ahmed Amir	Dh. Kudahuvadhoo Constituency MP	7782131
Abdulla Ziyad	Minister of State, Ministry of Environment and Energy	7781502
Yazeed Ahmed	Director, EPA	7903373
Mohamed Hamdhan Zuhair	Asst. Director, EPA	7633166
Saudulla Ahmed	SAS e Senok JV Pvt. Ltd.	7771682
Mohamed Zuhair	EIA Consultant	7776800

Table 9: List of stakeholders consulted

11. MONITORING PLAN

11.1 BACKGROUND

Environmental monitoring is important part of the whole EIA. It ensures that how the project has or is impacting the baseline environmental conditions that have been assessed as part of the EIA. It identifies the degrees and magnitudes of the predicted environmental impacts for the project are felt on the environment as a result of project implementation. Thus, it will help in implementing the mitigation measures that are already identified in this report or implement further measures if the impacts are identified to be bigger than anticipated.

The main EIA for the proposed project has already identified an environmental monitoring plan and following monitoring plan for the Addendum will be as part of the approved EIA monitoring programme.

11.1.1 Aim

The primary aim of the monitoring is to provide information that will aid impact management, and secondarily to achieve a better understanding of cause-effect relationship and to improve impact prediction and mitigation methods.

11.1.2 Objective

The following monitoring plan is used to measure impacts that occur during the proposed project activities and determine the accuracy of impacts that are predicted and the effectiveness of mitigation measures that are relevant for the proposed project. The objectives of the monitoring plan are to measure:

- Coral reef health (main EIA baseline)
- Seawater quality (main EIA baseline)
- Beach Profiles (main EIA baseline)
- Currents (main EIA baseline)
- Bathymetry (main EIA baseline)

The monitoring will also ensure that these measurements are kept within the baseline limits and predicted impacts are accurate and mitigation measures taken are effective.

11.2 MONITORING REPORT

A detailed environmental monitoring report will be compiled and submitted to all concerned agencies during construction and post-construction periods of the project based on the data collected for monitoring the parameters included in the monitoring plan outlined for the project. An Addendum Monitoring Report and an EIA Monitoring Report will be done simultaneously.

11.2.1 Report Format

The Environment Monitoring Report will be developed in accordance with the following format;

i) Introduction
ii) Aims and Objectives
iii) Environmental Conditions
    a. Coastal environment including shoreline, bathymetry, beach profiles, currents
    b. Marine environment including coral reef assessments, reef fish assessments and other benthos
iv) Comparison of data over different time periods
v) Conclusion and Recommendations

11.2.2 Reporting Frequency

It is important to ensure that monitoring of the environmental parameters mentioned above will be initiated during construction periods, which will be continued throughout the operation life cycle of the project. In this regard, the following measures will be followed.

- During Construction Phase – For 2 months
- During Operation Phase – Every 6 months for every operation year for 2 years

11.3 MONITORING PLAN AND COSTS

The following Addendum Monitoring Plan will be followed during and after the required dredging on the southern side of Maaenboodhoo.

Monitoring Requirements	Indicators	Baseline Reference Values	Technique	Frequency	Approx Cost (US$)
Coral cover	% live coral cover	EIA Baseline	Qualitative & Quantitative	Construction 1 and operation 4	100.00
Reef fish populations	Population structure	EIA Baseline	Qualitative & quantitative methods Fish census	Construction 1 and operation 4	100.00
Marine water quality	Turbidity, TSS, Salinity	EIA Baseline	Laboratory Analysis	Construction1 and operation 4	200.00
Current patterns	Seasonal directions and changes	EIA Baseline	Drought technique	Construction1 and operation 4	100.00
Bathymetry	Changes in depths	EIA Baseline	Echo sounder	Construction 1 And operation 4	500.00
			TOTAL COST PER MONITORING TRIP		**1,000.00**

Table 10: *Environmental monitoring and costs*

11.4 COMMITMENT

The proponent recognizes the important of environmental monitoring and commits to undertake the monitoring programme during construction and operation periods.

Commitment letter from the Project Proponent is attached in **Appendix 5.**

12. CONCLUSIONS

Following are the main conclusions of the proposed new burrow site based on the EIA Addendum undertaken for the project.

1. This is the First Addendum to the EIA undertaken for coastal protection works to be carried out in Dh. Maaenboodhoo, etc, hence it shall be read in conjunction with the main EIA.

2. The Addendum is submitted to EPA as per the Amended EIA Regulation 2012. Thus, it has to comply with the above Regulation.

3. This Addendum only looks at dredging works that will be carried out in the proposed new site for obtaining fill and core material for the proposed revetments. The overall benefits of the proposed activity include obtaining required fill and core material from one location as well as accommodate needs and future plans of the community.

4. The major environmental impacts from the proposed dredging works in the new burrow site is effects of sedimentation within the surrounding environment, direct destruction of some of the lagoon and reef habitats as well as increased turbidity in seawater due to sedimentation.

5. Careful planning and scheduling of the proposed activities to coincide with calm days and low tide operations has been proposed as the main mitigation measures in addition to regular monitoring of the various aspects of the environment.

6. Although alternative burrow sites have been outlined in this Addendum, preference has been given to the proposed new burrow site as it is generally accepted by all concerned stakeholders of the project .

7. Environmental monitoring has been planned to undertaken in conjunction with the main EIA environmental monitoring plan.

8. Although there are a number of environmental impacts from the proposed development, some of these can bring permanent changes to the environment of the island, other impacts can be reduced and mitigated by use of appropriate methodology. The effectiveness of these methodologies can be documented by implementing a comprehensive monitoring programme. Also, with positive social outlook of the project and considering the overall need for the project, it is concluded that the project should go ahead as planned.

13. REFERENCES

Regulations on Environmental Impact Assessment, 2012, MEE
Dredging and Reclamation Regulation, 2013, EPA

Environmental Resource Management, 2008, Solaire Direct Drennan Deir, Rev 2

EIA Regulation (Amended), 2015, EPA

Environmental Impact Assessment Report for Proposed Coastal Protection Works in Th. Veymandoo by Mohamed Zuhair in 2015.

Environmental Impact Assessment Report for Proposed Coastal Protection Works in Th, Kandoodhoo Island by Mohamed Zuhair, EIA01/15.

Handbook on Compilation of Laws and Regulations on Protecting the Environment of Maldives, 2006, MEEW

14. APPENDICES

APPENDIX 1: **Dredging and Reclamation Permit**

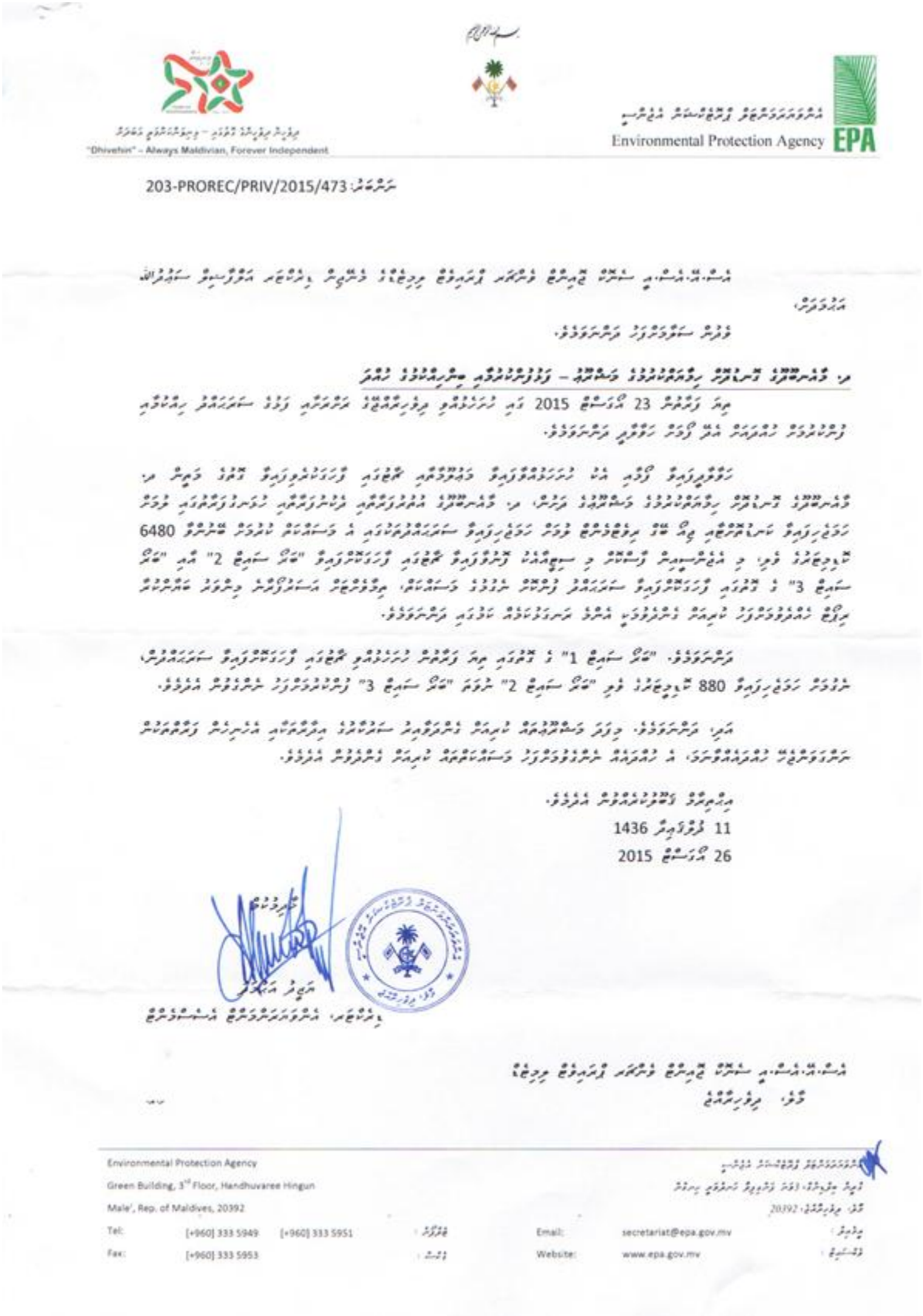
APPENDIX 2: **EIA TOR**

APPENDIX 3: **EIA Addendum TOR**

APPENDIX 4: **Water Test Results**

APPENDIX 5: **Commitment Letter**

APPENDIX 1: Dredging and Reclamation Permit



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Environmental Protection Agency
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"Dhivehin" – Always Maldivian, Forever Independent

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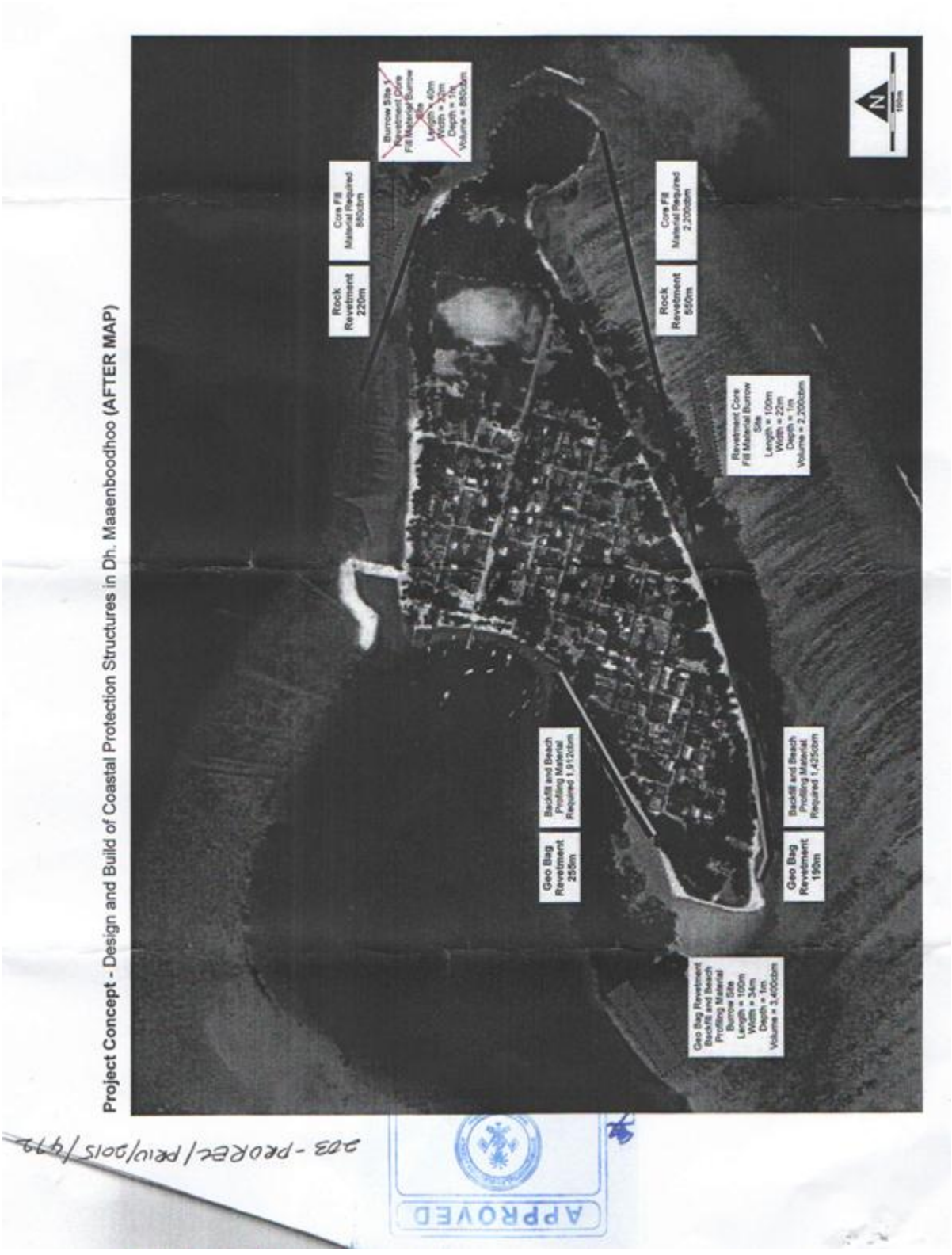
Project Concept - Design and Build of Coastal Protection Structures in Dh. Maaenboodhoo (AFTER MAP)
Rock Revetment 220m
Core Fill Material Required 880cbm
Burrow Site 1 Revetment Core Fill Material Burrow Site Length = 40m Width = 22m Depth = 1m Volume = 880cbm
Rock Revetment 550m
Core Fill Material Required 2,200cbm
Revetment Core Fill Material Burrow Site Length = 100m Width = 22m Depth = 1m Volume = 2,200cbm
Backfill and Beach Profiling Material Required 1,912cbm
Geo Bag Revetment 255m
Backfill and Beach Profiling Material Required 1,425cbm
Geo Bag Revetment 190m
Geo Bag Revetment Backfill and Beach Profiling Material Burrow Site Length = 100m Width = 34m Depth = 1m Volume = 3,400cbm
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APPENDIX 2: EIA TOR

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Environmental Protection Agency EPA

EPA/ToR/2015/135

Terms of Reference for Environmental Impact Assessment for Coastal Protection Works in Dh. Maenboodhoo

The following is the Terms of Reference (ToR) following the scoping meeting held on *15/09/2015* for undertaking the EIA for Coastal Protection Works in Dh. Maenboodhoo.

While every attempt has been made to ensure that this TOR addresses all of the major issues associated with development proposal, they are not necessarily exhaustive. They should not be interpreted as excluding from consideration matters deemed to be significant but not incorporated in them, or matters currently unforeseen, that emerge as important or significant from environmental studies, or otherwise, during the course of preparation of the EIA report.

1. **Introduction and rationale** –Describe the purpose of the project and, if applicable, the background information of the project/activity and the tasks already completed..Objectives of the development activities should be specific and if possible quantified. Define the arrangements required for the environmental assessment including how work carried out under this contract is linked to other activities that are carried out or that is being carried out within the project boundary. Identify the donors and the institutional arrangements relevant to this project. .

2. **Study area** – Submit a minimumA3 size scaled plan with indications of all the proposed infrastructures. Specify the agreed boundaries of the study area for the environmental impact assessment highlighting the proposed development location and size. The study area should include adjacent or remote areas, such as relevant developments and nearby environmentally sensitive sites (e.g. coral reef, sea grass, mangroves, marine protected areas, special birds site, sensitive species nursery and feeding grounds).Relevant developments in the areas must also be addressed including residential areas, all economic ventures and cultural sites.

3. **Scope of work**– The report should be categorised into the following components:

Task 1. Description of the proposed project – Provide a full description and justification of the relevant parts of the coastal protection works, using maps at appropriate scales where necessary. The following should be provided (all inputs and outputs related to the proposed activities shall be justified):

- Coastal defence construction and justification;
- Excavation methods, if required for construction purposes including machinery, man power, expertise and scheduling;
- Emergency plan during spillages;
- Environmental monitoring during construction activities;
- Measures to protect environmental values during construction and operation phase i.e. sedimentation control;
- Project management (include scheduling and duration of the project and life span of facilities; communication of construction details, progress, target dates, construction/operation/closure of labour camps, access to site, safety, equipment and material storage, fuel management and emergency plan in case of spills).

Coastal structure construction

- Details and justification of location, number, size and materials of coastal protection structures e.g. groins, seawall or breakwaters;
- Construction methods, materials, equipment, man power, expertise and scheduling.

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Website: www.epa.gov.mv

Dredging (if included as part of the project):

- Location and size of sand burrow areas (s) on a map;
- Justification for the selection of this location;
- Quantity, quality and characteristics of fill material;
- Indication of guarantees for sufficient availability of fill material;
- Method and equipment used for dredging, including description of positioning system, depth control system and operational control procedures;
- Justification for selecting the methods and equipment;
- Duration of dredging activity;
- Labour requirements and (local) labour availability;
- Housing of temporary labour, and
- Emergency plan in case of spills (diesel, grease, oil).

Task 2.Description of the environment – Assemble, evaluate and present the environmental baseline study/data regarding the study area and timing of the project(e.g. monsoon season). Identify baseline data gaps and identify studies and the level of detail to be carried out by consultant. Consideration of likely monitoring requirements should be borne in mind during survey planning, so that data collected is suitable for use as a baseline. As such all baseline data must be presented in such a way that they will be usefully applied to future monitoring. The report should outline detailed methodology of data collection utilized.

The baseline data will be collected before construction and from at least two benchmarks.All survey locations shall be referenced with Geographic Positioning System (GPS) including water sampling points, reef transects, vegetation transects and manta tows sites for posterior data comparison. Information should be divided into the categories shown below:

Climate

- Temperature, rainfall, wind, waves, evaporation rates (including extreme conditions)
- Risk of hurricanes and storm surges;

Geology and geomorphology

- Offshore/coastal geology and geomorphology (use maps);
- Bathymetry (bottom morphology) (use maps) of all dredging and reclamation locations;
- (Seasonal) patterns of coastal erosion and accretion (see appendix for monitoring details). Identify areas of erosion, this can be used to justify the project; and
- Characteristics of seabed sediments to assess direct habitat destruction and turbidity impacts during construction;

Hydrography/hydrodynamics (use maps)

- Tidal ranges and tidal currents;
- Wave climate and wave induced currents;
- Wind induced (seasonal) currents;
- Sea water quality measuring these parameters: temperature, pH, salinity, turbidity and Total Suspended Solids (TSS).

Sea water quality should be tested from at least one control site.

Ecology

- Identify marine protected areas (MPAs) and sensitive sites such as breeding or nursery grounds for protected or endangered species (e.g. coral reefs, spawning fish sites, nurseries for crustaceans or specific sites for marine mammals, sharks and turtles). Include description of commercial species, species with potential to become nuisances or vector.

Socio-economic environment

- Demography: total population, sex ratio, density, growth and pressure on land and marine resources;

- Income situation and distribution
- Economic activities of both men and women (e.g. fisheries, home gardening, fish processing, employment in industry, government);
- Seasonal changes in activities;
- Land use planning, natural resource use and zoning of activities at sea;
- Accessibility and (public) transport to other island;
- Services quality and accessibility (water supply, waste/water disposal, energy supply, social services like health and education);
- Community needs;

Hazard vulnerability:

- Vulnerability of area to flooding and storm surge.

Absence of facilities in the country to carry out the water quality tests will not exempt the proponent from the obligation to provide the necessary data. The report should outline the detailed methodology of data collection utilized to describe the existing environment.

Task 3. Legislative and regulatory considerations – Identify the pertinent legislation, regulations and standards, and environmental policies that are relevant and applicable to the proposed project, and identify the appropriate authority jurisdictions that will specifically apply to the project. The report should clearly identify the different articles and clauses that apply to the said project and should state how the project meets these requirements.

Task 4. Potential impacts (environmental and socio-cultural) of proposed project, incl. all stages – The EIA report should identify all the impacts, direct and indirect, during and after construction, and evaluate the magnitude and significance of each. Particular attention shall be given to impacts associated with the following:

Impacts on the natural environment

- Changes in flow velocities/directions, resulting in changes in erosion/sedimentation patterns, which may impact shore zone configuration/coastal morphology;
- Loss of marine bottom habitat, both in the borrow area as well as due to enlargement of the islands, resulting in (temporary) loss of bottom life, which may impact fish stocks and species diversity and density of crabs, shellfish etc.;
- Sediment dispersal in water column (turbidity at the dredging site (overflow) and related to shore protection activities), possibly resulting in changes in visibility, smothering of coral reefs and benthic communities and affecting fish and shellfish etc.;
- Impacts of noise, vibration and disturbance;
- Impacts on ground water table and quality as a result of reclamation areas (leaching of salts in the deposited sediments and change in ground water quantity);
- Impacts on unique or threatened habitats or species (coral reefs, sea turtles etc.), and
- Impacts on landscape integrity/scenery.

Impacts on the socio-economic environment

- Impacts of the dredging and construction works on the public, stakeholders and tourism ventures (nearby resorts and dive sites);
- Impacts on employment and income, potential for local people to have (temporary) job opportunities (and what kind) in the execution of the works;
- Level of protection against hazards like sea level rise, storm surges, etc.
- Social destabilization of the island community, and
- Monitoring of socioeconomic and demographic development.

The methods used to identify the significance of the impacts shall be outlined. One or more of the following methods must be utilized in determining impacts; checklists, matrices, overlays, networks, expert systems and professional judgment. Justification must be provided to the selected methodologies. The report should outline the uncertainties in impact prediction and also outline all positive and negative/short and long-term impacts. Identify impacts that are cumulative and unavoidable.

Task 5. Alternatives to proposed project – Describe alternatives including the *"no action option"* should be presented. Determine the best practical environmental options. Alternatives examined for the proposed project that would achieve the same objective including the "no action alternative". This should include alternative coastal protection measures, alternative designs, alternative materials; alternative locations and alternative borrow sites. The report should highlight how the best location was determined. All alternatives must be compared according to international standards and commonly accepted standards as much as possible. The comparison should yield the preferred alternative for implementation. Mitigation options should be specified for each component of the proposed project.

Task 6.Mitigation and management of negative impacts – Identify possible measures to prevent or reduce significant negative impacts to acceptable levels. These will include both environmental and socio-economic mitigation measures with particular attention paid to sedimentation control, future changes in coastal processes and prevention of flooding. Mitigation measures to avoid or compensate habitat destruction caused by dredging will have to be considered, e.g. temporal sediment control structures, coral reconstruction and MPA replacement areas. Measures for both construction and operation phase shall be identified. Cost the mitigation measures, equipment and resources required to implement those measures. The confirmation of commitment of the developer to implement the proposed mitigation measures shall also be included. An Environmental management plan for the proposed project, identifying responsible persons, their duties and commitments shall also be given. In cases where impacts are unavoidable arrangements to compensate for the environmental effect shall be given.

Task 7. Development of monitoring plan (see appendix)– Identify the critical issues requiring monitoring to ensure compliance to mitigation measures and present impact management and monitoring plan for coastal modification, beach morphology, sediment movement around the island. Ecological monitoring will be submitted to the EPA to evaluate the damages during construction during project implementation and after project completion. The EIA report should include a realistic schedule of implementation of the monitoring program. The baseline study described in task 2 of section 2 of this document is required for data comparison. Detail of the monitoring program including the physical and biological parameters for monitoring, cost commitment from responsible person to conduct monitoring in the form of a commitment letter, detailed reporting scheduling, costs and methods of undertaking the monitoring program must be provided. Some important aspects to monitor include the following:

- Coastal erosion and accretion changes around the island;
- Water quality, especially turbidity and TSS;
- Impacts from sedimentation on nearby coral reefs, benthic system, seagrass beds and fish and invertebrates communities;
- Condition of the sensitive ecosystems and marine resources;
- Re-colonization of the benthic organisms in the borrow areas;
- Environmentally sound site clearance; and
- Effectiveness of the mitigation measures.

Task 8. Stakeholder consultation, Inter-Agency coordination and public/NGO participation) – Identify appropriate mechanisms for providing information on the development proposal and its progress to all stakeholders. Consultation shall be undertaken with Dh. Maenboodhoo council and the general public of Maenboodhoo. The EIA report should include evidence of consultation, including names of those consulted and their contact details. The EIA report should include the methodology of consultation with

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justification, details of the date, time and place of the consultation and the summary outcomes. The report should include evidence that EIA report has been submitted to atoll council prior to submission to EPA.

Presentation- The environmental impact assessment report, presented in digital format, shall be concise and focus on significant environmental issues. It shall contain the findings, conclusions and recommended actions supported by summaries of the data collected and citations of or any references used in interpreting those data. The environmental assessment report will be organized according to, but not necessarily limited by, the outline given in the Environmental Impact Assessment Regulations, 2012.

Timeframe for submitting the EIA report – The developer must submit the completed EIA report within 6 months from the date of this Term of Reference.

16 September 2015

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APPENDIX 3: EIA Addendum TOR

203-EIARES/438/2015/135

Terms of Reference for First Addendum to the Environmental Impact Assessment for Coastal Protection Works in Dh. Maaenboodhoo

The following is the Terms of Reference (ToR) for First Addendum to the EIA for Coastal Protection Works in Dh. Maaendoodhoo Island. The First Addendum deals with changing the previously approved burrow sites to a new burrow site.

While every attempt has been made to ensure that this TOR addresses all of the major issues associated with development proposal, they are not necessarily exhaustive. They should not be interpreted as excluding from consideration matters deemed to be significant but not incorporated in them, or matters currently unforeseen, that emerge as important or significant from environmental studies, or otherwise, during the course of preparation of the EIA report.

1. **Introduction and rationale** – Describe the purpose of the project and, if applicable, the background of the site and the tasks already completed. Clearly identify the objectives to enable the formulation of alternatives and to furnish criteria for monitoring and evaluation.

2. **Study area** – Submit a minimum A3 size scaled plan with indications of all the proposed infrastructures. Specify the boundaries of the study area for the environmental impact assessment highlighting the proposed development location and size. The study area should include environmentally sensitive sites in close proximity (e.g. coral reef, mangroves, marine protected areas, special birds site, sensitive species nursery and feeding grounds).

3. **Scope of work**– Identify and number tasks of the project including preparation, construction and decommissioning phases.

   Task 1. Description of the proposed project – Provide a full description and justification of the relevant changes to the proposed coastal protection works, using maps at appropriate scales where necessary. The following should be provided (all inputs and outputs related to the proposed activities shall be justified):

Dredging:

- Location and size of sand burrow areas on a map;
- Justification for the selection of this location;
- Quantity, quality and characteristics of fill material;
- Indication of guarantees for sufficient availability of fill material;

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- Method and equipment used for dredging, including description of positioning system, depth control system and operational control procedures;
- Justification for selecting the methods and equipment;
- Duration of dredging activity;
- Labour requirements and (local) labour availability;
- Emergency plan in case of spills (diesel, grease, oil).

Task 2.Description of the environment – Assemble, evaluate and present the environmental baseline study/data regarding the study area and timing of the project(e.g. monsoon season). Identify baseline data gaps and identify studies and the level of detail to be carried out by consultant. Consideration of likely monitoring requirements should be borne in mind during survey planning, so that data collected is suitable for use as a baseline. As such all baseline data must be presented in such a way that they will be usefully applied to future monitoring. The report should outline detailed methodology of data collection utilized.

The baseline data will be collected before construction and from at least two benchmarks.All survey locations shall be referenced with Geographic Positioning System (GPS) including water sampling points, reef transects, vegetation transects and manta tows sites for posterior data comparison. Information should be divided into the categories shown below:

Baseline Environmental Condition

- Marine environment including coral reef health
- Seawater quality
- Bathymetry
- Currents
- Other relevant data

Hazard vulnerability:

- Vulnerability of area to flooding and storm surge.

If the newly proposed borrow site is covered in survey of the original EIA report reference can be made to this information and the relevant sections included in this chapter of the EIA report.

Task 3. Legislative and regulatory considerations – Identify the pertinent legislation, regulations and standards, and environmental policies that are relevant and applicable to the proposed changes, and identify the appropriate authority jurisdictions that will specifically apply to the project.

Task 4. Potential impacts– The EIA addendum report should identify all the impacts, direct and indirect, during and after construction, and evaluate the magnitude and significance of each. The impacts should be discussed in relation to the proposed changes and if applicable relevant sections of the original EIA report can be referred to. Particular attention shall be given to impacts associated with the following:

Impacts on the natural environment

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- Changes in flow velocities/directions, resulting in changes in erosion/sedimentation patterns, which may impact shore zone configuration/coastal morphology;
- Loss of marine bottom habitat, both in the borrow area as well as due to enlargement of the islands, resulting in (temporary) loss of bottom life, which may impact fish stocks and species diversity and density of crabs, shellfish etc.;
- Sediment dispersal in water column (turbidity at the dredging site (overflow) and related to shore protection activities), possibly resulting in changes in visibility, smothering of coral reefs and benthic communities and affecting fish and shellfish etc.;
- Impacts of noise, vibration and disturbance;
- Impacts on unique or threatened habitats or species (coral reefs, sea turtles etc.), and

Impacts on the socio-economic environment

- Impacts of the dredging and construction works on the public, stakeholders and tourism ventures (nearby resorts and dive sites);
- Impacts on employment and income, potential for local people to have (temporary) job opportunities (and what kind) in the execution of the works;
- Level of protection against hazards like sea level rise, storm surges, etc.
- Social destabilization of the island community,
- Social acceptability of the dredge location, and
- Monitoring of socioeconomic and demographic development.

The methods used to identify the significance of the impacts shall be outlined. One or more of the following methods must be utilized in determining impacts; checklists, matrices, overlays, networks, expert systems and professional judgment. Justification must be provided to the selected methodologies. The report should outline the uncertainties in impact prediction and also outline all positive and negative/short and long-term impacts. Identify impacts that are cumulative and unavoidable.

Task 5. Alternatives to proposed project – Describe alternative borrow sites and the methodology used to select the preferred site.

Task 6.Mitigation and management of negative impacts – Identify possible measures to prevent or reduce significant negative impacts to acceptable levels. These will include both environmental and socio-economic mitigation measures with particular attention paid to sedimentation control and future changes in coastal processes. Mitigation measures to avoid or compensate habitat destruction caused by dredging will have to be considered, e.g. temporal sediment control structures, coral reconstruction and MPA replacement areas. Measures for both construction and operation phase shall be identified. Cost the mitigation measures, equipment and resources required to implement those measures. The confirmation of commitment of the developer to implement the proposed mitigation measures shall also be included. An Environmental management plan for the proposed project, identifying responsible persons, their duties and commitments shall also be given.
Reference can be made to relevant sections of the original EIA report where applicable.

Task 7.Development of monitoring plan – Identify the critical issues requiring monitoring to ensure compliance to mitigation measures and present impact management and monitoring plan relevant for marine environment. Any changes to the monitoring program due to the proposed changes need to be specifically identified.

Task 8. Stakeholder consultation – Identify appropriate mechanisms for providing information of the project to relevant stakeholders, government authorities. In this respect consultation shall be undertaken with the following parties. Consultation needs to be undertaken specifically with regards to the proposed borrow site as the work was stopped due to the communities dissatisfaction for the proposed borrow site:

1. Maenboodhoo Council
2. The general public of Maenboodhoo

Details of the consultative meetings including summary outcomes, participants, date, time and location should be described. Photographic evidence of consultation needs to be included in the EIA report. The EIA report should include a list of people/groups consulted, their contact details and summary of the major outcomes. The EIA report should be submitted to the atoll council and evidence of which included in the EIA report.

Presentation- The environmental impact assessment report, to be presented in digital format, will be concise and focus on significant environmental issues. It will contain the findings, conclusions and recommended actions supported by summaries of the data collected and citations f or any references used in interpreting those data. The environmental assessment report will be organized according to, but not necessarily limited by, the outline given in the Environmental Impact Assessment Regulations, 2012 and relevant amendments.

Timeframe for submitting the First Addendum to EIA report – The developer must submit the completed EIA report within 03 months from the date of this Term of Reference.

03rd December 2015

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MWSC

WATER QUALITY TEST REPORT

Test Report No: 301220/2015/01

Customer Informations : *Mr. Mohamed Zuhair*
H. Eforniumge,
Moonlight Hingun,
Male'
Rep.of Maldives

Date: 15/10/2015

Sample Description / Location~	Dh. Maaenboodhoo	TEST METHOD	UNIT
	SW1		
Sample Type~	Sea water		
Sampled Date~	06/10/2015		
Sample Received Date	07/10/2015		
Test Requisition Form No.	900161290		
Sample No.	818622		
Date of Analysis	7/10/2015 - 12/10/2015		
PARAMETER	ANALYSIS RESULT		
Physical Appearance	Clear	Visual	-
Conductivity	52300	Method 2510 B. (adapted from Standard methods for the examintation of water and waste water, 21st edition)	µS/cm
Nitrate	0.4	Method 8171 (Adapted from HACH DR5000 Spectrophotometer procedure Manual)	mg/L
pH	8.10	Method 4500-H+ B. (adapted from Standard methods for the examintation of water and waste water, 21st edition)	-
Sulphate	2980	Method 8048 (Adapted from HACH DR5000 Spectrophotometer procedure Manual)	mg/L
Salinity	34.20	Method 2520 B. (adapted from Standard methods for the examintation of water and waste water, 21st edition)	‰
Total Suspended Solids (TSS)	26500	Method 8006 (Adapted from HACH DR5000 Spectrophotometer procedure Manual)	mg/L
Turbidity	0.635	HACH Nephelometric Method (adapted from HACH 2100N Turbidimeter User Manual)	NTU

Keys:
mg/L: Milligram Per Liter, **µS/cm:** Micro Siemens per centimeter, **‰:** Parts Per Thousand, **NTU:** Nephelometric Turbidity Unit
LoQ: Limit of Quantification

Checked by:	Approved by:
Afnan Farooq Laboratory Executive	Mohamed Eyman Senior Technical Officer

Notes:
Sampling Authority: Sampling was not done by MWSC Laboratory
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~ Information Supplied by the customer

**********END OF THE REPORT**********

APPENDIX 5: Commitment Letter

Ministry of Environment and Energy
Male', Republic of Maldives.

438-ECAS/203/2015/73

06 ڈسمبر 2015ء

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