FIRST ADDENDUM

ENVIRONMENTAL IMPACT ASSESSMENT

For the Proposed Harbour Project

Nilandhoo, Faafu Atoll, Maldives

Proponent: Ministry of Housing and Infrastructure

Sandcays

July 2016

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List of Abbreviations

EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
F.	Faafu (Atoll)
GDP	Gross Domestic Product
GRM	Grievance Redress Mechanism
KLD	kilo litres daily or kilo litres per day
MEE	Ministry of Environment and Energy
mg/l	milligrams per litre
MHI	Ministry of Housing and Infrastructure
NBSAP	National Biodiversity Strategy and Action Plan
NEAP	National Environment Action Plan
NSSD	National Strategy for Sustainable Development
NTU	Natural Turbidity Units
Ppt	parts per thousand
RCC	Reinforced Concrete
TDS	Total Dissolved Solids
TOR	Terms of Reference

Consultant's Declaration

This EIA has been prepared according to the EIA Regulations 2012. I certify that the statements in this Environmental Impact Assessment study are true, complete and correct to the best of my knowledge and abilities.

Ahmed Zahid (EIA 08/07)

Proponent's Declaration

Re: EIA Addendum for F.Nilandhoo Harbor

As the proponent of the proposed project we guarantee that we have read the report and to the best of our knowledge, all information relevant to this project in terms of project description, project construction works and operational aspects provided here are accurate and complete.

Signature:

Name: Fathimath Shaana Farooq
Designation: Director General
On behalf of: Ministry of Housing and Infrastructure

Executive Summary

This is the first Addendum to the EIA for the harbour project being undertaken in Nilandhoo, Faafu Atoll. The project is proposed by Ministry of Housing and Infrastructure.

The project constitutes dredging of a large harbour for the people of Nilandhoo while at the same time creating land using dredged sand including additional dredging for proposed reclamation of 10hectares of land for housing and infrastructure development including semi-industrial activities. An environmental assessment was undertaken for this project in Nov 2015, which has been subsequently approved. According to the EIA report, the objective of the harbour project is to provide a sizeable harbour to accommodate the increasing number of vessels in the island and to restore the usability of the harbour that has been filled over time with the breakwater being damaged, especially following the tsunami of 2004. The harbour on the northeast side is too small given that Nilandhoo has a lot of large fishing vessels and has been serving as the regional hub with fuelling services established on the old (tsunami-damaged) harbour on the northwest.

This addendum addresses the modification to the location of the borrow area. One of the main concerns is that the performance of the dredger is affected due to having to pump up to 1km from the borrow to the fill area. Therefore, it has been considered important to move the dredge (borrow) area closer to the fill area in order to enhance dredging performance and achieve cost-effectiveness.

During the first Scoping Meeting, which was cancelled by EPA stating that the project justifications were not clear, EPA identified that the borrow area needs to be moved as far as possible from the proposed quaywall as there may be stability issues. Taking this concern into consideration, further alternatives to the borrow area were also considered by the Proponent in consultation with the Contractor and the representatives of Nilandhoo people.

During discussions with the Council and people of Nilandhoo, they have raised concern regarding the need to protect the proposed harbour, which would involve huge costs if the proposed option were adopted although it had been mentioned in the original EIA that harbour protection will be considered in the future. Therefore, in order to reduce the overall cost of the proposed project and to increase the usability of the proposed harbour even during rough southwest monsoon, appropriate alternatives were considered to the harbour design as well although it is beyond the scope of this EIA. A number of alternatives to the proposed harbour design was considered in the original EIA report. Of these, the option of upgrading the existing harbour on the northwest has been given due consideration in the light of improving on social concerns related to limitations in land reclamation. An alternative analysis that have been done in the original EIA and during the current Addendum indicated that the preferred alternative to redesign the existing harbour would have several advantages over the proposed especially the ease of use during rough southwest monsoon while leaving the possibility of an external quaywall if it becomes necessary at a later stage. However, some stakeholders believe that the proposed option has advantages over the preferred alternative as it has better opportunities for future expansion and growth of the economic potential of the island. Some of the other alternatives considered in the original EIA report including the expansion of existing harbour on the northeast to the northwest has cost advantages while it has restrictions over future expansion that the recommended alternative in this Addendum provides.

Environmental impacts were assessed for both the construction and operational phases of the project. Most of the direct, negative environmental impacts identified for the construction phase of the project were minor negative; the main impact being the impact on sedimentation from the proposed borrow area to the coral colonies in the vicinity and more importantly sedimentation during the filling of the proposed fill areas, which have already been covered in the original EIA report. Therefore, the impact of dredging has been considered in this Addendum. The main impact arising from the proposed new dredge area is the damage to the inner reef as a result of the dredging. There was a concern relating to the closeness of the dredge area to the proposed quaywall and the potential failure of the structure due to a collapse of the sides of the dredged basin. However, since the dredged basin would need to be dredged to less than 4m from the existing seabed, which is less than 6m in depth at present, there should not be such a problem. Only a few berths or quaywalls just adjacent to the reef edge dropping to 30m suddenly have failed whereas the proposed structure is over 110m from the dredge area, which will be dredged to only about 10m and not more than 13m under the current proposal. Furthermore, most of the naturally deep lagoon areas in similar islands would be about 10m in the middle areas with some areas having 15m depths. Therefore, the direct removal of some of the corals due to proposed option can be avoided by not dredging from the inner reef flat areas but the deep lagoon only, as in the proposed alternative.

Reclamation of land considering current and future potential use is a favoured development activity in many islands today. However, based on the experience of most of the land reclaimed in many islands, the cost recovery of the project is low and taxpayers have reason to question the outcome of the project. Yet, if the project objectives were achieved by renting the reclaimed land for semi-industrial activities and housing developments, it may be a justifiable cost. It is sad to note that the proposed reclaimed land has yet to find itself a landuse plan and development scenario after several months of EIA approval that had passed by. This is a cause for concern in terms of the afore-mentioned socio-economic impact of the project, although it is beyond the scope of the EIA. If the land is appropriately managed, the project is considered to have several socio-economic benefits that will certainly outweigh the negative environmental impacts, which are of low significance.

Although the impacts are not significant due to the absence of sensitive ecological elements that would be directly impacted, some project-specific mitigation measures have been discussed. These include consideration of the preferred alternative (which is also the or one of the alternatives discussed in the original EIA report) to mitigate the impacts of wave activity at the proposed quaywall, to consider shore protection as the reclamation progresses to minimize erosion and to move any live corals that may be directly affected into safer locations. General mitigation measures, involving appropriate construction management such as working during low-tide as much as possible and rigorous supervision during project implementation are also recommended.

It is recommended to carry out regular monitoring as proposed in this Addendum, which replaces the monitoring programme given and approved in the original EIA report. It would be important to assess the movement of the sediment plume regularly and to ensure that sediment plume does not severely affect the reef areas. Turbidity levels are expected to be measured within the sedimentation zone on a regular basis up to 6 months after the project.

In conclusion, it appears justified, from a technical and environmental point of view, to carry out the proposed project. Since alternatives have not been considered or discussed with the relevant stakeholders including the Council, it is recommended to consider all potential alternatives, including those identified by the EIA Consultants, before proceeding with the project. The preferred alternative borrow areas including the existing harbour on the northwest is recommended.

ސާރާ ޚުލާސާ

މި ރިޕޯޓަކީ ފ. ނިލަންދޫގައި ހިންގާ ބަނދަރު ހެދުމުގެ މަޝްރޫޢަށް ގެންނަން ހުށަހަޅާފައިވާ ބަދަލުތަކުގެ ސަބަބުން ތިމާވެށްޓަށް އަސަރު ފޯރާނެ މިންވަރު ބަޔާންކުރުމަށް ތައްޔާރުކުރެވިފައިވާ ރިޕޯޓެކެވެ. މި މަޝްރޫޢުގެ އެދޭފަރާތަކީ މިނިސްޓްރީ އޮފް ހައުސިންގ އެންޑް އިންފްރާސްޓްރަކްޗަރއެވެ.

މި މަޝްރޫޢުގައި އެކުލެވިގެންވަނީ މައިގަނޑު ގޮތެއްގައި ރަށުގެ ހުޅަނގު އުތުރުގައި އޮތް ވިލު ފުންކުރުމާ ބަނދަރުގެ ގޮތުގައި ބޭނުންކުރެވޭނެހެން ހުޅަނގު ބައިގެ 10 ހެކްޓަރުގެ ބިން ހިއްކުމެވެ. މިކަމަށްޓަކައި 2015 ވަނަ އަހަރުގެ ނޮވެމްބަރުގައި ވަނީ އީ.އައި.އޭ ރިޕޯޓް ތައްޔާރުކުރެވި މަޝްރޫޢު ކުރިއަށް ގެންދިއުމުގެ ހުއްދަ ލިބިފައެވެ. އެ ރިޕޯޓުގައިވާ ގޮތުން ނިލަންދޫއަށް ގިނަ ޖަހާފަހަރަށް ބޭނުންވާ ދޯނި ފަހަރު ގެންގުޅޭ އަދި އެހެން ދޯނިފަހަރުވެސް ބޭރު އެއްލުމާއި އަދި ބަނދަރު ކުރުމަން ގިނަ ގިނައިން ބޭނުންކުރާ ބަނދަރުތަކެވެ. ވީމާ، މިރަށުގެ ތަރައްޤީއަށް ބޭކަލަ މި ބަނދަރު ހެދުމަކީ މުހިއްމު ކަމެކެވެ. އަދި ބަނދަރާ ގުޅޭ ހިދުމަތްތަކާއި ސަރަހައްދު އަދި މަސައްކަތްތެރިންގެ ބަދަލާ ކައިރިން ބިން ދިނުން ހެދުމަކީ މުހިއްމު ކަމެކެވެ.

މި މަޝްރޫޢު ކުރިއަށް ގެންދިއުމުގައި ހަރަދު ކުރާ ކުރުމުގެ ޖުމްލަ މަސައްކަތް ހެދުން ކުރުމުގެ ގޮތުން މިހާރު ކޮންސަން ހުށަހަޅާފައިވާ ސަރަހައްދަކީ ގޮތަކަށް ދަކުން ހިއްކާ ސަރަހައްދުން ފުރިގެން 1 ކިލޯމީޓަރު ދުރުގައިވާ ތަނަކަށްވާތީ ޑްރެޖިންގެ ޕްލޫމްސް އެއް އަސަރުކުރާނެއެވެ. ވީމާ، ހިއްކާ ތަނާއި ކައިރިން ވިލުތެރޭގެ އޮތް މި އާބާދީގެ ގައި ހިލޭ މަޖައްލުގެ ބަދަލެވެ. އެގޮތުން ވަރަށް ނުބައި ކައިރިން ފަޅުގެ ބޭރު ގޮސް ތަނާ ގޮތަށް ވަނީ ހުށަހަޅާފައެވެ.

މި މަޝްރޫޢުގެ ގޮތުން މި ބަނދަރުގެ ސަރަހައްދު ތިމާވެށްޓާ އަސަރު ފޯރާނެ ގޮތްތަކަށް މިންވަރު ދެނެގަތުމަށް ހަދާ ރިޕޯޓުގެ ފުރަތަމަ މިންވަރުކުރުމުގެ ބައްޓަންކުރުމުގައި މަޝްރޫޢުގެ ބޭނުން ފުރިހަމަ އަދި ބާރާކުރެވިފައިވާ ނަތީޖާއި ހުރިހާ ތަފުސީލު ލިޔުނު ކުރިމަތިކުރެވެން އެ ތަނި ފައިބުން ފަރު ކައިރި ދިރާވެތިކަންތައް ބަލައި ވެލި ނަގާ ސަރަހައްދު އަލުން މުރާޖަޢާ ކުރުމަށް އީ.އައި.އޭ އިން ހުށަހަޅައެވެ. މިކަމަށް ވިސްނުމަށްފަހު އަލުން ވެލި ނަގާ ސަރަހައްދު ކަނޑައަޅާ މިޓިގޭޝަން ފިޔަވަޅު ކަރުދާސްއެވެ.

ނިލަންދޫއަށް ކޮންސަލްޓަންޓުން ކުރި ދަތުރުގައި ކައުންސިލާ އެކު ބޭއްވި ބައްދަލުވުމުގައި ރަށުގެ އޮޑިދޯނި ފަހަރު ގެންގުޅޭ ބައެއް ފަރާތްތަކާއި ދުއްވުން ވަރަކަތުގެ ތަޅައިން އެ ފަރާތްތަކުން ވަނީ ބޭރުތޮށިތައް ނުތި މި ބަނދަރަށް އުކަރިގެންވާ ނިވާ ނުލިބޭނެ ކަމާއި ހުޅަނގު މޫސުމުގައި ބަނދަރު ބޭނުންކުރުމުގައި ދަތިތަކެއް ދިމާވެދާނެ ކަން ފާހަގަކޮށްދެއްވެ. އަދި މިގޮތުން ބަނދަރު ބޭނުންކުރުމަށް ވާން ޖެހޭ ތޮށިގެ ހަރަދު ބޮޑުވެގެން ކަމަށް ފާހަގަކުރެވުނެވެ. ނަމަވެސް، ފުރަތަމަ ހެދި އީ.އައި.އޭ ރިޕޯޓުގައިވެސް ފާހަގަކޮށްފައިވާ ގޮތަށް މި ސަރަހައްދުގައި ބަނދަރަށް ނިވާ ލިބޭނެހެން ތޮށިއެއް ޖަހަންކަން ފާހަގަކޮށްފައެވެ. ވީމާ، މިކަމަށް ބޮޑު ހަރަދުތަކެއް ހިނގާނެ ކަމަށް ފެނޭ އަދި އުކަރިގެންވާ ރައްކާތެރިކަމާއި އެވަރުންވެސް ނުލިބިގެން ކަމަށް ބަލައި ހަތަރު އޯލްޓަރނޭޓިވް ތަކެއް ވަނީ ބަލާލެވިފައެވެ. މިގޮތުން ކުރިން ހަދާފައިވާ ތިމާވެށީގެ ރިޕޯޓުގައިވެސް ފާހަގަކޮށްފައިވާ ގޮތަށް މިހާރު އޮތް ބަނދަރު ފަޅާ ގޮތްތަކާ ބަނދަރުފުޅާކުރާ އެ ބަނދަރު ބޭނުންކުރެވޭ ގޮތަށް ފަރުމާކުރެވިއްޖެނަމަ، ދުރު މުސްތަޤްބަލުގައިވެސް ނިވާ ލިބި ރައްކާތެރި ބަނދަރެއް މިހާރުން މިހާރަށްވެސް ލިބޭނެއެވެ. އަދި މުސްތަޤްބަލުގައި ވަގުތު ފުޅާކުރުމަށްވެސް ގޮތް މިހާރު ބަނދަރު ފަރުމާކުރެވޭނެކަން ފާހަގަކުރަން ޖެހެއެވެ. ނަމަވެސް، ބައެއް ފަރާތްތަކުން ދެކޭ ގޮތުގައި މިހާރު ހުށަހަޅާފައިވާ ގޮތަށް ހަދަން އިތުރު ތަރައްޤީ ގެނައުމަށް ފަސޭހަ ވާނެއެވެ.

މި މަޝްރޫޢުގައި ހުށަހަޅާފައިވާ ކޮނޑުގެ ސަބަބުން މާބޮޑު ނެގެޓިވް އަސަރެއް ނުކުރާނެއެވެ. މިގޮތުން ކޮނޑުގެ ސަބަބުން އުފެދޭ ކިލަނބުގެ މިންވަރު ހިއްކުމުގެ ސަބަބުން އުފެދޭ ކިލަނބުން ފަރު ކައި ވެއް މި މަޝްރޫޢުގެ ސަބަބުން އަސަރުކޮށްފާނެ ދުރުކަމުގެ ބެލެހެއްޓުން މި ހިމެނުމުގެ އަސަރު ކުޑަވާ ފަރު ކުޑަވާނެއެވެ. ކުރިން ހުށަހަޅާފައިވާ ގޮތަށް ފެށި ނެގުމުގެ ސަބަބުން ކުރާނެ ކަމަށް ފާހަގަކޮށްފައިވާ އަސަރު ދެކޭގެ އިތުރުން މިހާރު ހުށަހަޅާފައިވާ ގޮތް ކުރިން ފަރުގެ ބައެއް ހިސާބުތަކަށް ސީދާ ގެއްލުން ވާނެއެވެ. މީގެ އިތުރުން ހުށަހަޅާފައިވާ ފަރު ގޮތުން ސަރަހައްދު ތެރެއަށް މާ ބޮޑުން ކައިރިވެއްޖެނަމަ ބްރޭކްވޯޓަރު ދުރުން ފެނުން ކަމަށް ވެސް ބަލާލެވިފައެވެ. ނަމަވެސް، 10 ހެކްޓަރުގެ ބިން ހިއްކުމަށް ބޭނުންވާ ވެލި ނަގަން ހުށަހަޅާފައިވާ ސަރަހައްދަކީ ބޭރު ސަރަހައްދުގައިކަމުން އެ ސަރަހައްދު 4 މީޓަރު އިތުރަށް ކޮނޑުން ބޭނުންވާ މިންވަރަށް ވެލި ލިބިގަތުމަށް އަނގަރާ ކުރެވޭނެއެވެ. ވީމާ، މިގޮތުން ކުރިމަތިން ފުން 6 މީޓަރު ހުރި ސަރަހައްދު ގޮވަދަރުކަން 10 މީޓަރަށް ފުންމިނުގައި މީގެ ސަބަބުން ކަނޑުން ހިސާބުގެ ކައިރިން ފަލީގެ ފެހި ގިނަވާ ފެއްޓުމުގެ ސަބަބުން ހުށަހަޅާފައިވާ ފަޅުން 75މ ދުރުގައިވާ ފަނޑުވެ ގެއްލިގެން ބިހުރީސްމުގެ ކޮނޑުގައި ކަލަކާ ނުފެނެއެވެ. މިގޮތުން ވީ ހިސާބަށް ފަރުންޖެހިފައިވާ މިންވަރަކަށްވެސް ބަރުމަޖު ސީދާ ފަރުން ބޭރުން ކައިރިވުމުގެ ހިސާބުގައި ހުރި އަދި އުކާލާގޮތުގެ ތަރުކާ ކޮންސްޓްރަކްޝަނުގެ މަރުޙަލާގައި ހިނގާނެ ވިންވިންކަން ގަބޫލުކުރެވެއެވެ. އަދި މީގެ އިތުރުން ގިނަ ފިޔަވަޅުތަކުގައި ދާއިރާގައި

ގޮނޑުދޮށް 10 ނުވަތަ 15 މ ގެ ފުޅާމިން ހުރެއެވެ. މީގާ، ހުރަހަގާފައިވާ ގޮތަށް ވިލުން އަދި ބާރުބަލާކަމް ފަރުމާތީގައި ހުރި މުރަކައަށް ގެއްލުން ނުވާނެހެން ސީދާ ވިލުން ކޮނުމަކީ އެންމެ ރަގަޅު އޮޕްޝަނެވެ. މީގާ، މިކަން ކުޑަކުރުމަށްޓަކައި އެ ސަރަޙައްދުގެ ބަދަލުގައި އެ މުރަކަތަކާއި ދުރުގައި ކޮންނަ ތަން ވަނީ ފާހަގަ ކުރެވިފައެވެ. އަދި ހުރަހަގާފައިވާ ގޮތަށް ގެންދާނަމަ، މަރުވާދާނެ ކަމަށް ފެންނަ މުރަކައިގެ ބާވަތްތައް އާބާދީ ތަނަށް ބަދަލުކުރަން ފެނެއެވެ.

މި މަޝްރޫޢުގައި ހިމެނޭ ހިއްކާ ބަނދަރު މި އެޅޭނެ ސަރަހައްދުގެ ތެރޭގައި ހިމެނޭ ބައެއް ނޫނެވެ. އެހެން ނަމަވެސް، ގިނަ ރަށްރަށުގައި މިފަދަ ހިސާބަށް ހިއްކާފައިވާ ބިން ހިއްކުމުގެ މަޝްރޫޢުތަކުން އެހެން ނަތީޖާ ފެނިފައި ނެތުމަކީ ދަތުރުފަތުރު ބޮޑުވެފައި ދަނޑު ކަރަންޓު ގަދަކަމުގެ ސަބަބުން އުދަގޫތައް ކަމަށްވެއެވެ. މި މަޝްރޫޢުގެ އީ.އައި.އޭ ރިޕޯޓް ނިމުނު ފަހުން އެތައް މަހެއް ފާއިތުވެފައިވާތީ ބަދަލުތަކެއް ގެނެސް މަސައްކަތް ހިނގަމުންދާ ގޮތުގެ ވާހަކަ ދަންނަވާލަމެވެ. ނަމަވެސް، ހިއްކާ ބިން ތަރައްގީ ކުރުމާއި ގުޅޭ ގޮތުން ބަލާކަމަކީ، މަޝްރޫޢުގެ ފިނިޝިންގ އަދި އިންޖިނިއަރިންގ ފައިނަލް ޑިޒައިން މަޝްރޫޢުގެ ފަރާތުން ރިޕޯޓް ކުރެވިފައެވެ. އަދި މިގޮތުން މަޝްރޫޢުގެ ސަރަހައްދު ތިލަ ފަޅުވެރިން ކުޅި ނަގާ އަސަރުކޮށްފައިވާ ހިސާބު ފެނިގެން ކުރެވޭ ބަޔަކު ފެނެއެވެ.

މި މަޝްރޫޢުގެ ދަށުން ފެނި ނަގާ ސަރަހައްދުތަކާ ގުޅުވުން ބަދަލުގެ ސަރަހައްދު އަސަރުކުރާނެ މުހިއްމު ތިމާވެށީގެ ބައިތަކާއި ނޭވާލާ ދިރުމަތަކުގައި ފިޔަވަޅު މަޝްރޫޢު ހިންގާއިރު ތިމާވެށީގެ ކޮންޓްރޯލް ނުވާ އަސަރު ކުރެވެނިވި އެއްވެސް ބޮޑު މިގިނަ ފަސޭހަތައް ގެނައުމާ ކުރިމަތިވެދާނެ ކަމަށް ބެލެވޭއެވެ. މިގޮތުން، މި މަޝްރޫޢުގެ އީ.އައި.އޭ ރިޕޯޓްގައިވެސް ފާހަގަކޮށްފައިވާ ފަދައިން މިހާރު އެކި ބަޔަކު އެސްޓޭ ހުރި ގޮތުން ބަނދަރުކުރެވިދާނެ ގޮތަށް މަޝްރޫޢު ފަހުމްކުރެވިފައިވާ ބަޔަކު ބަނދަރުގައި (ހާބަރ ގޮތުގައި ހުރެގެ ގޯސްވުމުގައި) ދިމާވެދާނެ އުދަގޫ ތަކެއް ސަމާލުކަމަށް ގެނައުމާ އެ ކަމުގެ ސަބަބުން ވާނީ ޖެހޭ ތަރުތީބަށް ހިންގާނެ ހަރަކާތް ކުރެވިފައެވެ. އެގޮތުގެ ތިމާވެށި މިހާރު ހުރަހަގާފައިވާ ގޮތަށް ކަނޑަ އިތުރު ފަރުގެ އެތެރެ ކައިރިން ކަނޑަ ހިސާބުގައި ހުރި ދިރު ދިމާ މުރަކަ އެހެން ތަރަކާތަށް ބަޔަކާއި ރަސްމީ ގަނޑުއްވާއި، ދިރުމަށް ހިފުމުން ގެނައުމާ މަސައްކަތަށްވުރެ މަޝްރޫޢު ދިރާސާކުރާ ރަށްރަށު އިދާރީ ޖަޒީރާ ސަރަހައްދު ކުރުމުން ކަނޑު ފެނުގެ އަސަރުތަކާ ކުރެވޭނެއެވެ.

މި މަޝްރޫޢުގެ ދަށުން ހުރަހަގާފައިވާ މާލިޔަތުގެ ފިޔަވަޅު އެޅުމާ ގޮތުގައި ކުރީގެ ގޮތްތަކާ މުޅިން ކަމެއް ކަމުގައި ފާހަގަކުރެވެއެވެ. މި ގޮތުން މަސައްކަތް ހިންގުން ދާއިރު ކުރިންވެސް ދަތުރުކުރާ ގޮތް

ދެންގަތުމާއި މޫދުގެ ފެނުގެ ކޮލިޓީއަށް އަންނަ ބަދަލުތައް، މަޝްރޫޢު ނިމޭ ފަހުން ގާތްގަނޑަކަށް 6 މަސްދުވަސް ވަންދެން ދިރާސާކުރަމުން ގެންދިއުން ހިމެނެއެވެ.

މި ރިޕޯޓުގައި ހިމަނާފައިވާ ކަންކަމަކީ އޭގެ ސަބަބުން ތިމާވެށްޓަށް ކުރާ ނޭދެވޭ އަސަރު ކުޑަ ނުވަތަ ނޭދެވޭ އަސަރުތައް ކަމަށް ކަނޑަނާގާ ދޫކޮށްލެވިދާނެ ކަންކަމަށްވުމާއި މަޝްރޫޢުގެ ސަބަބުން މައިގަނޑުގޮތެއްގައި ލިބޭ އިޖްތިމާޢީ އަދި އިގްތިސާދީ ފައިދާ ބޮޑުކަމަށް ފެންނާތީ، މި މަޝްރޫޢު ހުށަހަޅާފައިވާ ގޮތަށް ކުރިއަށް ގެންދިއުން އެންމެ ރަގަޅު ކަމަށް ފެނެއެވެ. ނަމަވެސް، މި ރިޕޯޓުގައި ފާހަގަކޮށްފައިވާ ފަދައިން މަޝްރޫޢުގެ އޮޕަރޭޝަނަލް ފޭސްގައި ފުރިހަމައަށް ރިއާޢަތްކުރުމަކީ ބޭނުންތެރި ކަމެކެވެ. އަދި އެ އޮޕަރޭޝަނަލް ކަމާއި ބެހޭ އެންމެ ފަރާތްތަކާއި މަޝްވަރާކޮށްގެން ގޮތެއް ނިންމުމަކީ މުހިއްމު ކަމެއް ކަމުގައި ފާހަގަކުރަމެވެ.

1 Introduction

This is the First addendum to EIA report for the proposed harbour project in F. Nilandhoo. This Addendum covers the changes to the proposed borrow area due to the difficulties in dredging as a result of poor performance of the dredger at site owing to the long pumping distances of over 1km. Therefore, a new borrow area has been identified closer to the proposed and approved reclamation area behind the proposed quaywall. The proposed borrow area is over 110m from the proposed quaywall.

The findings of this report are based on the EIA for the proposed harbour project and recent surveys undertaken for the project at relevant project locations including locations included in the EIA report. No works under the approved project have been carried out so far except bunding works on the south of the proposed reclamation area, which has been eroded away due to delays in dredging and reclamation.

The impact matrices that have been done for the EIA report had considered the impacts of the dredging and reclamation, however, the impacts vary slightly for the proposed new borrow area and these have been considered in this report separately.

This report has been compiled in accordance with the EIA Regulations 2012 and Amendments to it, which is enforced by Environmental Protection Agency (EPA) of the Maldives.

1.1 EIA Implementation and Methodologies

This study was based mainly on data presented in the original EIA report prepared by Water Solutions and data collected during a field investigation mission in early July 2016 by a team from Sandcays. This EIA Addendum report was compiled by Ahmed Zahid, who is a registered EIA consultant with over 19 years of experience and has been involved in numerous harbour, reclamation and shore protection projects in the Maldives. He was assisted by Hussain Fizah, a registered EIA consultant with experience of numerous similar projects in the Maldives. Trained environmental surveyor at Sandcays, Ibrahim Mizal, was involved in the baseline surveys.

Established and widely accepted methods have been applied in this EIA study. Field studies have been undertaken using methods generally employed for EIA studies in the Maldives. The field assessment methodologies are briefly described in Section 4.2 of this report.

2 Project Description

2.1 The Proponent

The Proponent is the same as that given in the EIA report, i.e. Ministry of Housing and Infrastructure (MHI). MHI is the government agency responsible for the harbours and related infrastructure in addition to addressing the housing needs.

2.2 Project Location and Study Area

The details of project location have been provided in the EIA report. The new borrow area has moved to a location between the proposed quaywall and the entrance channel north of the quaywall, as shown in Figure 2-1. This would be the project boundary as well as the impact boundary. There may be only a few indirect impact areas of dredging given that dredging in the dredge area does not cause much sedimentation in comparison with filling.

The proposed study area is the new borrow area including the harbour basin and the reef flat area forming part of the borrow area on the north of the proposed borrow area. The areas previously studied for the purpose of the harbour project EIA can be considered relevant for the purpose of the proposed project as these areas have been studied under the same EIA report. However, additional surveys to provide existing conditions have been under the scope of the current study. Some of the changes to the island's natural coastline has occurred in the past few months, which have also been studied. These characteristics of the study area would be discussed in the Existing Environment section of this report.

2.3 The Project

The project, as described in the EIA report, involves development of a harbour that is suitable for the increasing fleet of large fishing and other vessels in the island as well as the Atoll and the region. In doing so, the lagoon and existing harbour behind the proposed quaywall is filled and additional reclamation is proposed within the scope of the harbour project. Therefore, a large area had been identified as area from which fill material will be obtained. This borrow area was initially at about 1km away from the fill area which had been found difficult to be undertaken using the dredger currently mobilized for the project as the long distance decreases the efficiency of the dredger dramatically. Hence, the borrow area was revised to a closer location, as shown in Figure 2-1. This Addendum, therefore, covers only the new borrow area.

This location is considered appropriately located at over 110m from the proposed quaywall and would require to be dredged to about 4m below the existing seabed. Therefore, there are no major concerns surrounding the borrow area. However, part of the northern periphery of the new borrow area falls on the inner reef flat at the northern edge of the deep lagoon, which is considered to be the only concern.

The machinery required for the project are currently on site to start the project once the new borrow area has been finalized and approved by EPA. The dredging will be undertaken using the cutter suction dredger at site, which is capable of dredging to 13m depths and can pump to about 1km depending on the depth. However, as pumping distance increases the performance decreases and therefore, decreased pumping distances will help to complete the project earlier. The project will also use excavators, trucks, loaders and cranes for the reclamation component, as discussed in the original EIA report.

The project timeline remains the same as that proposed in the EIA report, however, may be speeded up due to the shorter pumping distances.

The following measures will be taken to protect environmental values during pumping sand from the new borrow site.

- Live corals in the affected borrow area would be moved to safer locations to the greatest possible extent.
- Sand bunds will be created in fill areas, as proposed earlier. The sand bunds would be made wide enough to ensure that the bund is not easily washed by waves and tides.
- Dredging will be undertaken from the deeper lagoon areas and move towards the reef section of the borrow area in order to ensure that the reef areas are spared if not required.

2.3.1 Site setup, mobilization and services

Machinery and personnel have been mobilized to site. Staff facilities and services are in place, as has been covered in the original EIA report.

2.3.2 Dredging

Dredging will be undertaken from the proposed new borrow area. The depth of dredging would be a maximum of 6m from the existing seabed, i.e. a total of 12m from Mean Sea Level. The dredge depth would be kept as low as possible, an average depth of 4m has been considered sufficient to provide the required amount of sand to fill an area of 10hectares to a height of 1.5m above Mean Sea Level.

2.4 Project Inputs and Outputs

The project inputs and outputs remain the same as that discussed in the EIA report. Only the source or the location of the fill material has changed. The quantity required also remains the same.

2.5 Project duration

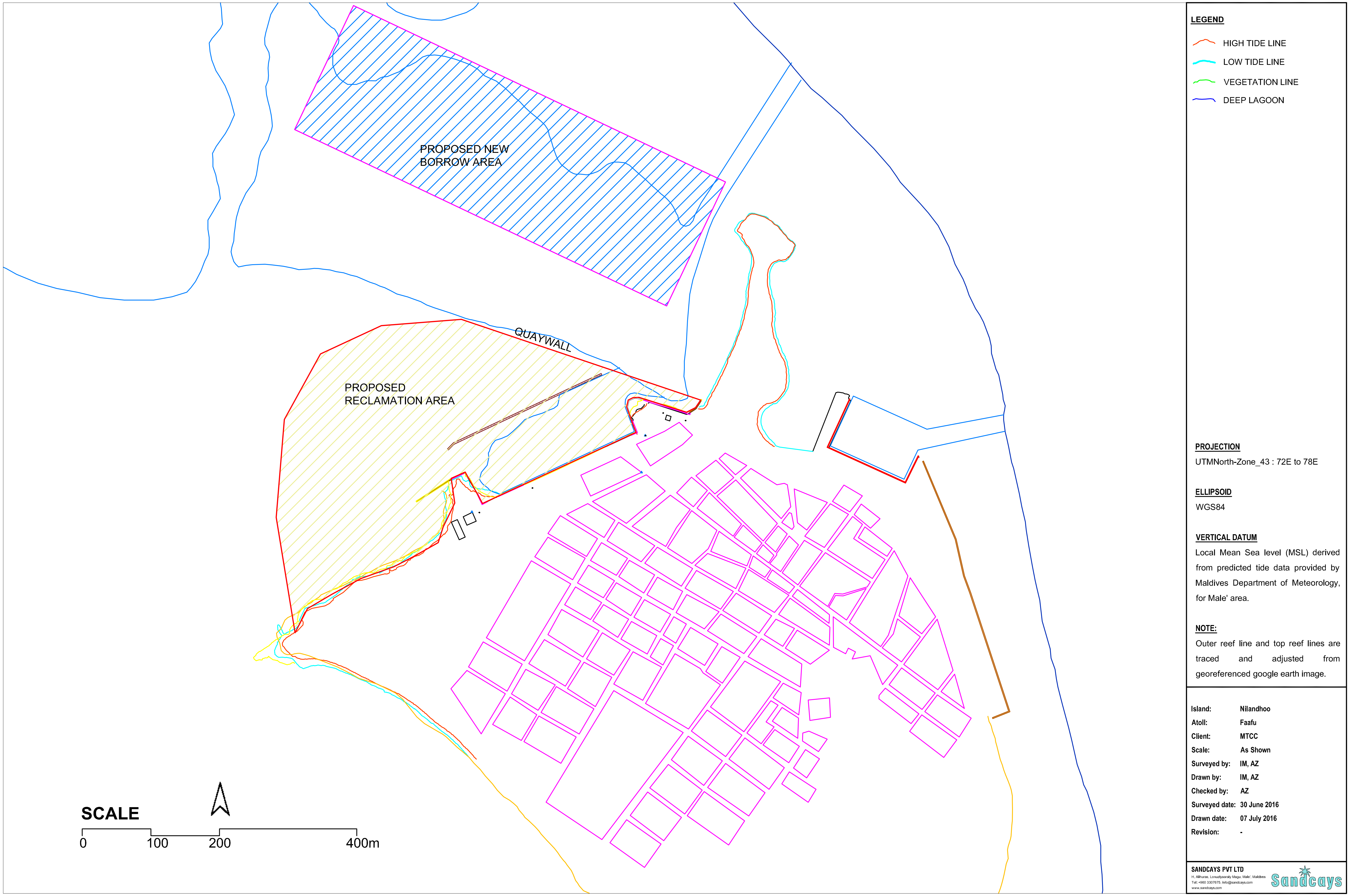
The project is planned to start soon after approval of this EIA report. The estimated duration of the project is the same as that given in the EIA report.

2.6 Need and Justification

The proposed project, as has been discussed in the EIA report, provides an adequately sized harbour for the increasing number of large vessels in Nilandhoo. The harbour, however, may have difficulties during the southwest monsoon, where there would be a large percentage of wind waves that will cause a high degree of turbulence within the harbour area and may pose difficulties in using the proposed harbour and quaywall during rough southwest monsoon. Therefore, the project may not be justified in terms of costs until the cost benefit analysis inclusive all possible options have been done.

Justifications for the harbour, its location as well as design have been discussed in detail in the original EIA report. Therefore, this report looks at justifications for the new borrow area. As has been discussed earlier, the proposed borrow area is too far from the fill or reclamation area, which reduces the performance of the dredger and the new area wich is only a few hundred km away will help to address the concern.

Figure 2-1: Proposed project concept



PROJECTION

UTMNorth-Zone_43 : 72E to 78E

ELLIPSOID

WGS84

VERTICAL DATUM

Local Mean Sea level (MSL) derived from predicted tide data provided by Maldives Department of Meteorology, for Male' area.

NOTE:

Outer reef line and top reef lines are traced and adjusted from georeferenced google earth image.

Island:	Nilandhoo
Atoll:	Faafu
Client:	MTCC
Scale:	As Shown
Surveyed by:	IM, AZ
Drawn by:	IM, AZ
Checked by:	AZ
Surveyed date:	30 June 2016
Drawn date:	07 July 2016
Revision:	-

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3 Legislative and Regulatory Considerations

The proposed project is mainly subjected to the EIA Regulations and Dredging and Reclamation Regulation of the Maldives. There may be other less applicable regulations, all of which have been discussed in the original EIA report.

3.1.1 Environmental Impact Assessment Regulation

The EIA Regulation, which came into force in 2007, has been recently revised and the revised EIA Regulation 2012 is currently in force since May 2012. This project is subjected to the EIA Regulations 2012 and Amendments.

The Regulation sets out the criteria to determine whether a development proposal is likely to significantly affect the environment and is therefore subject to an EIA. Schedule D of the EIA Regulations defines the type of projects that would be subject to Environmental Impact Assessment. Dredging, reclamation and shore protection projects are amongst these.

The main purpose of this Regulation is to provide step-by-step guidance for proponents, consultants, government agencies and general public on how to obtain approval in the form of an Environmental Decision Statement.

3.1.2 Dredging and Reclamation Regulation

The Dredging and Reclamation Regulations was gazetted on 2 April 2013 as Regulation No. 2013/R-15. Clause 6 of the Regulation requires applying for approval under this Regulation by submitting the project details, land use plan, project justification and scaled maps of existing site plan and site plan with proposed project components. According to Section 6 of the original EIA report, the dredging and reclamation had been approved by EPA. However, a new application needs to be submitted for the approval of the new dredge/borrow area.

Clause 13(c) states that borrowing material from the following areas are prohibited.

1. 100m shore-wards from the reef line
2. 500m seawards from the reef line
3. 50m from the vegetation line

4. Protected Area or Environmentally Sensitive Areas (ESA) identified under Law No. 4/93 (Environmental Protection and Preservation Act of the Maldives).

Clause 13(d) restricts to borrow material or dredge or reclaim within 200m of a Protected Area or ESA identified in 4 of Clause 13(c). Clause 13(e) states that those areas or islands where the reef extent (distance from shore to reef edge) is less than 300m, dredging and reclamation may be done in consultation with the designated authority. Clause 13(f) gives the relevant government body the authority to restrict borrowing sand from those locations from which dredging or borrowing sand has been approved earlier, if the relevant government body finds that the area is environmentally significant or worthy of protection or preservation. Clause 14 identifies the options for disposal of dredge material which include land reclamation, construction, levelling of land, shore protection and other activities approved under the EIA process or EIA Regulations. Clause 14 also states that land levelling shall be done with minimal disturbance to wetland areas. Clauses 15 and 16 provide the details of area (size) that can be dredged and reclaimed respectively. Clause 17 requires that a scaled as-built drawing indicating the new shape and size of the island upon completion of reclamation shall be submitted.

Clause 18 gives the relevant government body the right to terminate a project that has been seen to cause significant environmental damage and to claim compensation under the Regulation on Environmental Liability (2011/R-9). Clause 19 further reinstates the compensation claims under the Regulation on Environmental Liability.

The proposed project is in line with this Regulation. It, however, requires approval for the new borrow area even though it conforms to the requirements. It is also necessary to provide EPA or other relevant government institution with the as-built drawing of the reclaimed area upon completion of the project.

4 Existing Environment

4.1 Introduction

Conditions of the existing environment of the study area were analysed using appropriate scientific methods. Field surveys were undertaken to get further understanding of the existing environment of the island. These surveys were carried out during field visit to the island on July 2016 to collect baseline data. Before the trip was undertaken all existing information regarding the site was gathered.

The following components of the existing environment were assessed;

- Recent shoreline configuration of the project area
- Currents at the proposed borrow and fill areas
- Beach profiles
- Marine water quality at borrow and fill area (updrift and downdrift at both locations)
- Characteristics of seabed sediments at borrow and fill areas
- Bathymetry of the proposed borrow areas

4.2 Methodologies

Conditions of the existing environment of the study area were analyzed by using appropriate scientific methods. The different methods used in assessing and reporting the conditions of the existing environment of the island are given in the following subsections.

4.2.1 Location identification

The location of data collection sites have been marked using handheld GPS. Figure 4-7 shows the data collection and sampling locations.

4.2.2 Marine Water Quality

Marine water quality was assessed for most of the parameters using a YSI handheld water quality logger and Hach portable turbidity and TSS meter. Water quality was assessed at different locations within the impact zone, especially updrift and downdrift locations of the proposed borrow and fill areas.

In-situ water testing was undertaken at a depth of 1m from the mean sea level or mid water depth for shallow areas, as required. GPS coordinates of each water sampling location was taken. The samples were analyzed for relevant parameters in-situ.

4.2.3 Currents

Purpose built drogue with a GPS (Trimble Juno) was used to measure ocean currents. On selected locations around the island, drogue tests were conducted to assess currents. Currents (magnitude and direction of flow) at the time of measurement is illustrated in Figure 4-7.

4.2.4 Bathymetry

Bathymetry of the proposed and alternative borrow sites was carried out by the Contractor, MTCC and this has been included in the Appendix. Spot depths were taken from the proposed new borrow area by Sandcays.

4.2.5 Marine Ecology

Marine environmental surveys were conducted to gather data on key environmental components (i.e. the coral reef) that will be impacted due to the development. Purposes of the surveys are to define and establish marine environmental baseline conditions for impact evaluation during and after the proposed project implementation. Surveys were based on standard marine environmental survey techniques (English, *et al* 2007) so that they can be repeatedly carried out to monitor and record changes and assess possible impacts on the marine environment from the proposed work activities as well as operation of the facility. These surveys should be continually repeated to assess the short-term and long-term impacts on the marine environment.

4.2.5.1 Coral Reef Surveys

Quantitative surveys were conducted to establish the status of the affected reef areas of Nilandhoo. A qualitative assessment of the seagrass beds was also undertaken. Signs of use of seagrass beds by turtles were observed. Methodologies adopted for these surveys are internationally accepted and widely used to assess the status of coral reefs in the country as well.

For the benthic cover, a 20m line transect was laid using a measuring tape of 50m, a set of random photos were taken along the line transect and later analyzed using Coral Point Count with excel extension (CPCe) created and maintained by National Coral Reef Institute, Nova Southeastern University Oceanographic Centre.

Photo transects were conducted at 2 locations of the reef as shown in Figure 4-7. These sites are representative areas within the reef system that can be monitored on long-term basis for assessing magnitude of possible impacts. Since there are no areas that may have significant impacts from the project, detailed assessment, establishing permanent monitoring sites is not considered necessary.

4.2.6 *Sea bed characteristics*

A sample was taken from the proposed alternative borrow area and a sieve analysis undertaken at Sandcays' lab. The sieve analysis can be used as baseline data or to understand the type of material available at site. It is observed by the survey team that the proposed borrow area, especially in the deep lagoon has a large proportion of fine to coarse sand with very little rubble within a meter on the surface. The areas below the 1m could not be sampled, however, there is an indication of sufficient availability of fill material.

4.3 Field findings

4.3.1 *Currents at the proposed borrow area.*

The currents at the southwest corner of the island is quite strong whereas the currents in the proposed fill area are not as strong as that at the corner. The current is strongest in the entrance channel on the north of the proposed quaywall. This channel moves a large proportion of the flow from the south and southwester rim reef.

4.3.2 *Beach profiles*

Beach profiles were done at two locations although it was unnecessary to do beach profiles given that the baseline beach profiles shall be taken after the reclamation. The recent profiles undertaken indicate that there is no large beach in any of the project areas. There is a sizeable beach of about 5-7m on average at MSL on the southern side of the island, which is considered as the beach for tourists in the few guesthouses in the island.

4.3.3 Marine water quality

Marine water quality was tested at 3 locations considered as updrift and downdrift locations of the proposed dredge and fill areas. The results are given in the table below.

	Units	WQ1	WQ2	WQ3
Coordinates	UTM	264723.26m E 338249.50m N	265008.45m E 338608.71m N	265593.82m E 338902.61m N
Temperature	ºC	29.47	29.01	29.15
pH		8.02	8.13	8.16
Electrical conductivity	µS/cm	57580	57620	57350
Total dissolved solids	mg/l	35210	35340	35120
Dissolved oxygen	mg/l	5.69	6.20	6.52
Turbidity	NTU	0.95	0.64	0.53
Total suspended solids	mg/l	0	0	0

The water quality results indicate that the marine waters at the tested locations are in pristine conditions with low turbidity and no suspended solids.

4.3.4 Seabed characteristics

The seabed characteristics at the borrow area were done by taking a single sample from the proposed borrow area just off the inner reef flat areas at the location. The results of the sieve analysis are given below.

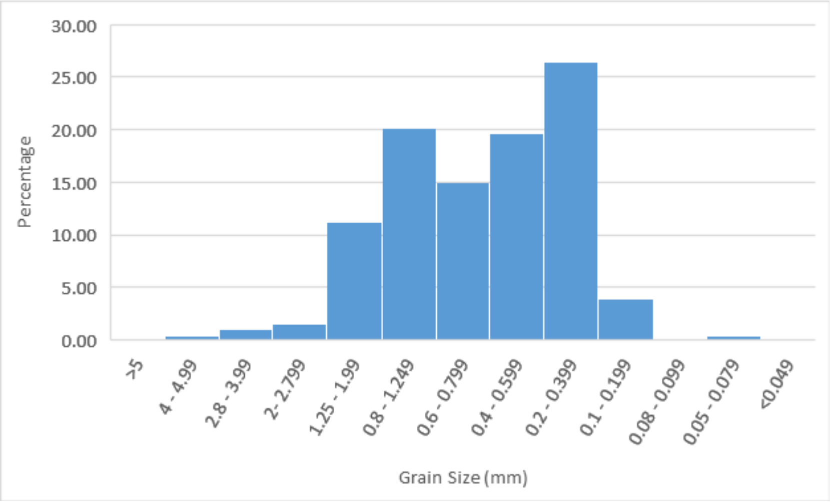


Figure 4-1: Sediment distribution at the proposed new borrow area

4.3.5 Recent shoreline configuration

High tide line and low tide line of the project area was mapped using differential GPS. The findings are given in Figure 4-7. The survey undertaken by MTCC of the shorelines have also been included for comparison.

The two locations at which beach profiles were taken are typical of the only areas where beach exists on the western side of the island where the proposed project takes place. The profiles are shown below. The locations of the profiles are shown in Figure 4-7.

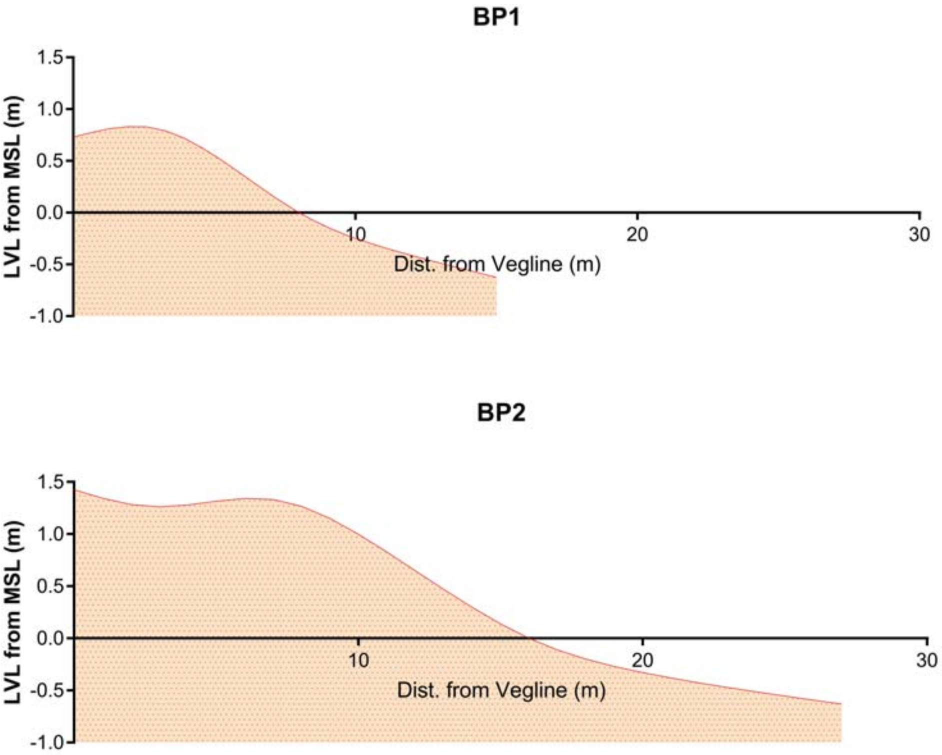


Figure 4-2: Beach profiles on the western side

4.3.6 Bathymetry

Bathymetry of relevant areas is given in Figure 4-8.

4.3.7 Ecology

Live coral cover at both sites were low. Natural sedimentation was seen at two of the surveyed locations. Live coral cover was low at the surveyed locations.

Site 1 close to the entrance channel had mainly porites followed by acropora. The area is primarily composed of bed rock and rubble with most of the acropora sp. sedimented, dead and partly bleached.

Table 4-1: Benthic cover at the 3 surveyed sites

Major Category	Percentage Cover of the Transect		
	Site 01	**Site 02**	**Site 03**
Live Coral	4.51	1.49	0.15
Zoanthids		0.21	
Dead coral with algae	69.12	47.60	0.29
Diseased/sedimented coral	0.17		
Sand and rubble	26.21	50.69	99.56

Figure 4-3: Benthic cover at site 1

Site 2 is located at the northwest corner of the proposed borrow area where the reef flat protrudes into the deep lagoon with a sandy floor.

Figure 4-4: Benthic cover at Site 2

Site 3 is located on the rim reef flat area southwest of the proposed reclamation area, part of the transect falling just into the proposed reclamation. This area has mainly sand and rubble; mainly sand. There are sparse corals and one sea cucumber on the transect.

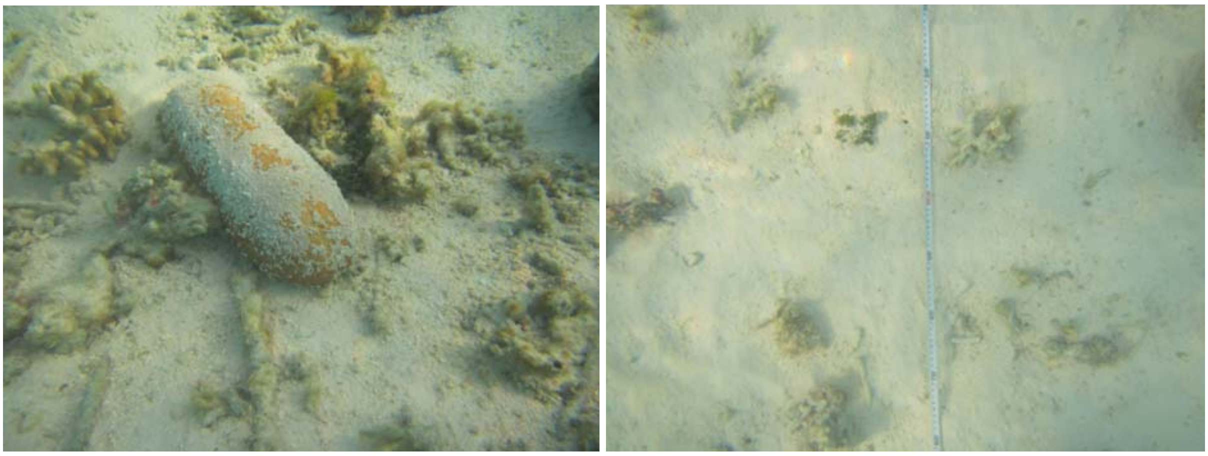


Figure 4-5: Benthic cover at Site 3

Site 4 is a recently formed seagrass bed at the reclamation area. The seagrass bed, according to some locals would be around 6 years old and visited by turtles occasionally. Turtles have been seen to have fed on these seagrass beds, as can be seen in the picture on the right below.

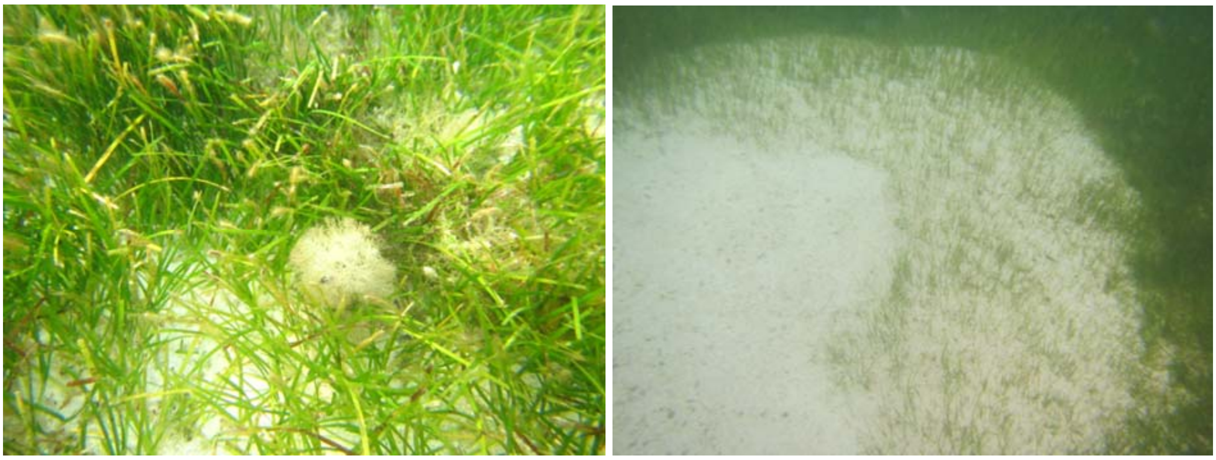
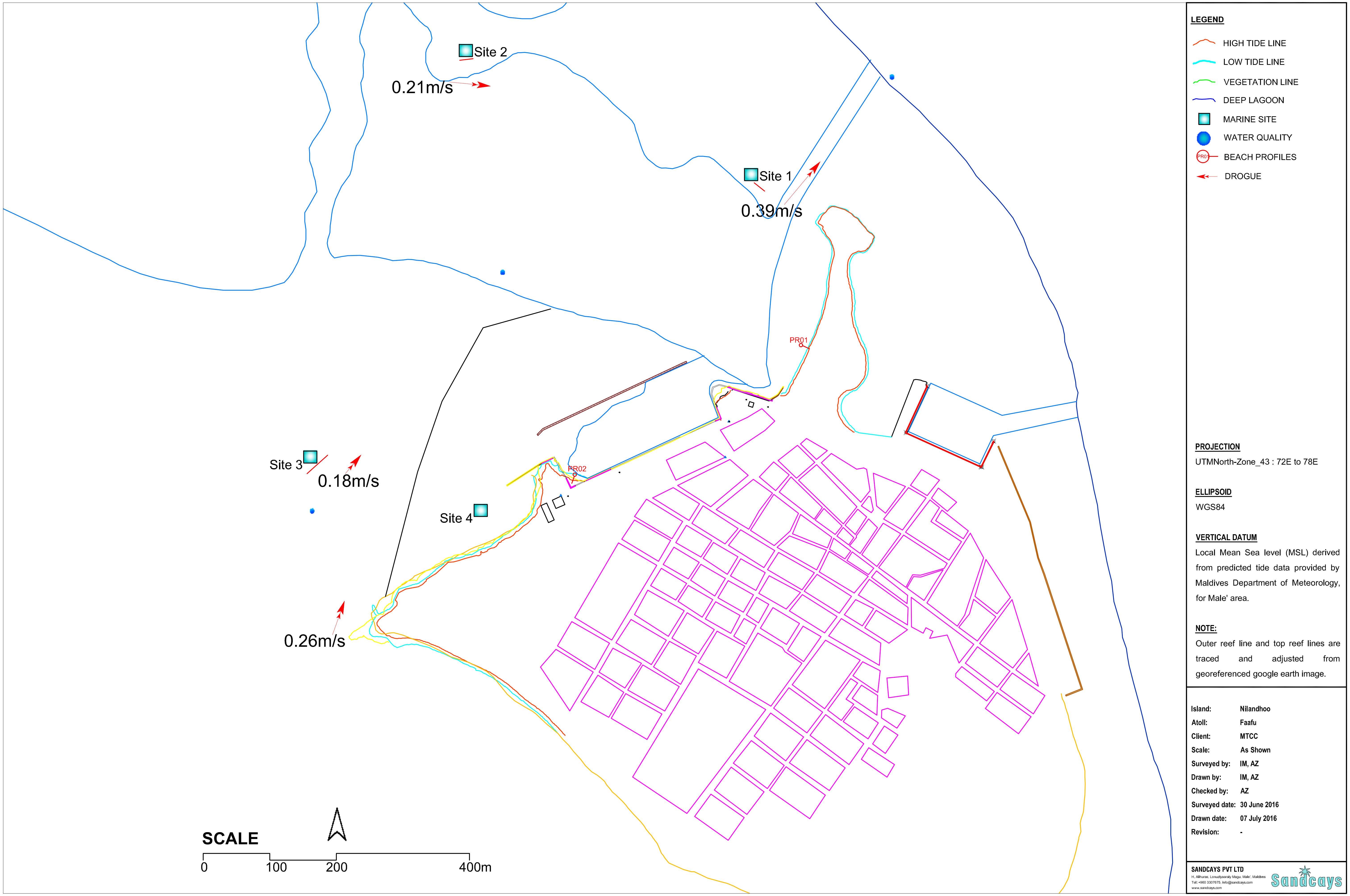


Figure 4-6: Seagrass bed at part of the proposed reclamation area

Figure 4-7: Survey locations



PROJECTION

UTMNorth-Zone_43 : 72E to 78E

ELLIPSOID

WGS84

VERTICAL DATUM

Local Mean Sea level (MSL) derived from predicted tide data provided by Maldives Department of Meteorology, for Male' area.

NOTE:

Outer reef line and top reef lines are traced and adjusted from georeferenced google earth image.

Island: Nilandhoo
Atoll: Faafu
Client: MTCC
Scale: As Shown
Surveyed by: IM, AZ
Drawn by: IM, AZ
Checked by: AZ
Surveyed date: 30 June 2016
Drawn date: 07 July 2016
Revision: -

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www.sandcays.com

Figure 4-8: Bathymetry of relevant areas

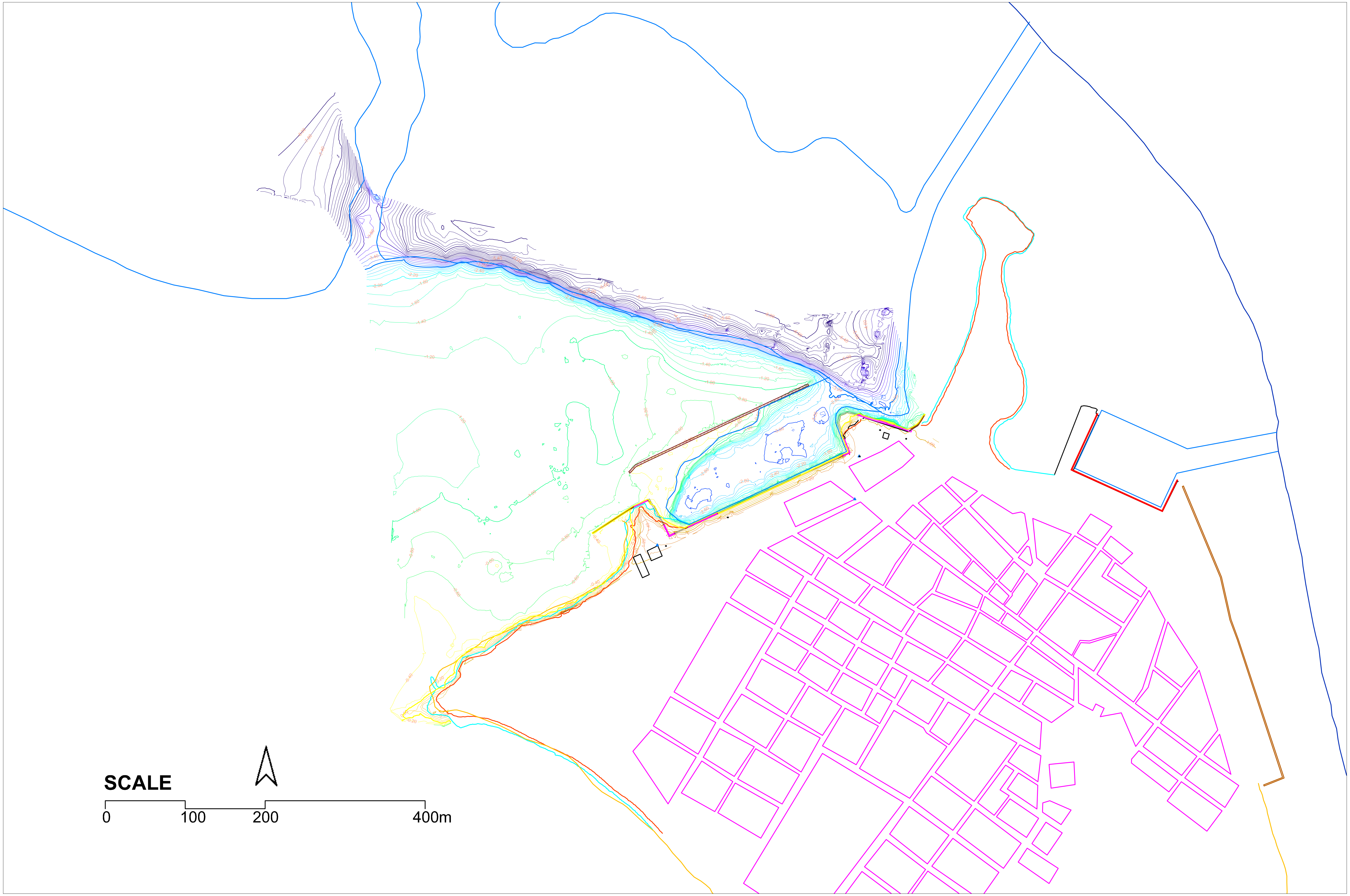
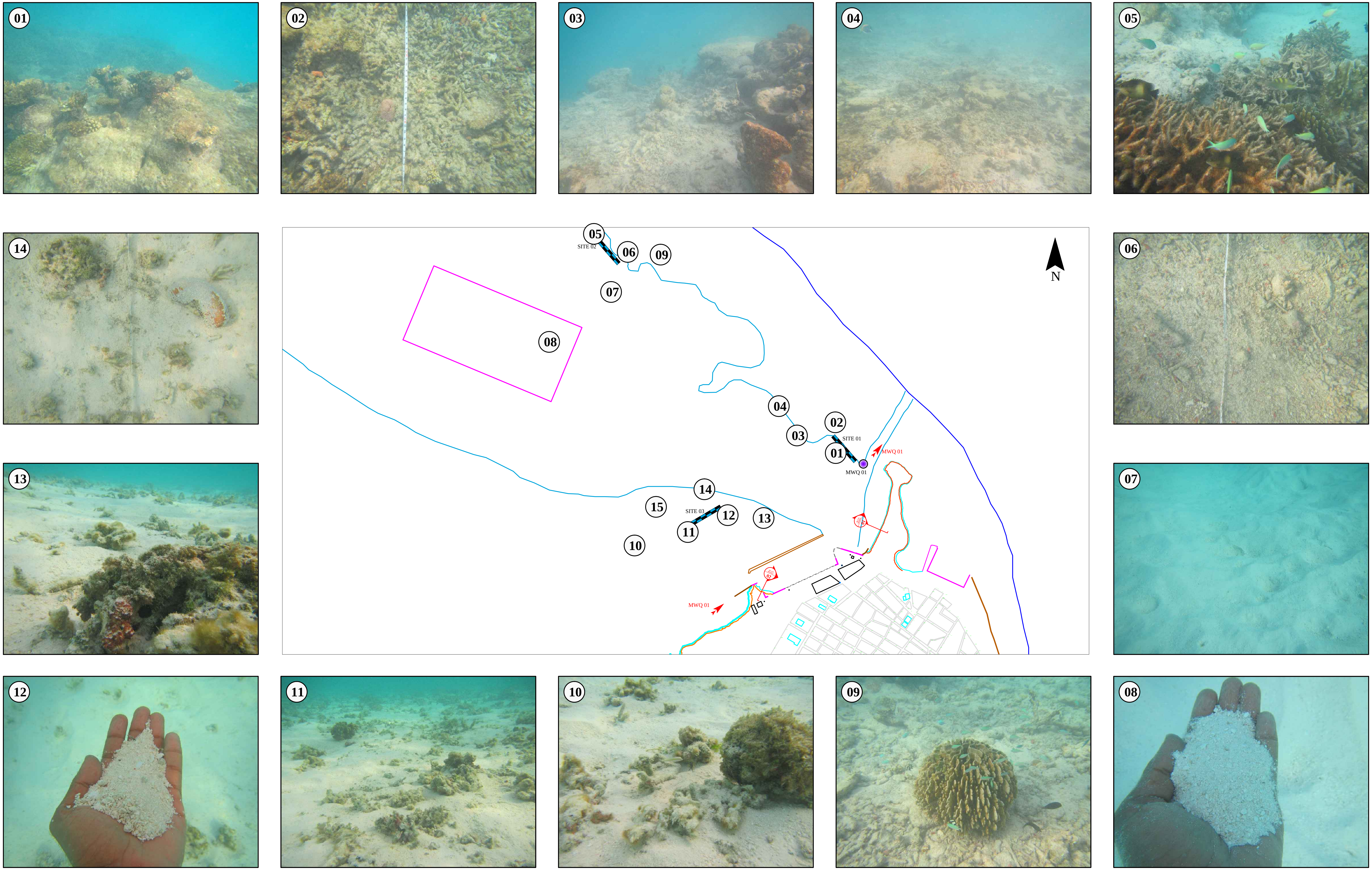


Figure 4-9: Illustrated summary of coastal environment

Figure 4-10: Illustrated summary of marine environment



5 Stakeholder consultations

A Scoping Meeting for the EIA was first held on 13 July at EPA. In this meeting EPA identified two main issues: (1) the objectives of the proposed additional reclamation was not clear and (2) the new borrow area appears to be too close to the proposed quaywall, which may cause the structure to fail eventually due to dredging. The meeting was adjourned requesting the Proponent to provide sufficient justification for the additional dredging proposed and to review and revise the proposed borrow area. In the second Scoping Meeting held on 20 July, the additional reclamation had been removed and the only change was the change to the borrow area, which was revised by the Proponent based on two alternatives that was shared with the consultant based on consultations with the Council and some community members.

Consultations have been done under the main project EIA process. Additional consultations have also been done with the Nilandhoo Council on 30 June 2016. In addition, some residents of Nilandhoo and MP for Nilandhoo constituency were consulted. The primary concern of the Council was the safety of vessels during rough southwest monsoon without a breakwater to provide protection. The also mentioned that they have not been appropriately consulted or informed. The Council identified that the communication with them was mainly with the dredging contractor who mobilized to site 6 months ago. They also said that the community’s main concern is that the existing harbour is too small and shallow. The Council had also requested to include a breakwater type T-jetty (120x75ft) on the west of the proposed quaywall to provide protection during the southwest monsoon. The current design will also require the existing ice plant and fuel supply services to be relocated.

Therefore, possible alternatives were discussed with the Council and Council was in favour of the option of changing the existing harbour design to provide a safe harbour for the large vessels. The same was also discussed with the Parliament member for the Constituency who believed that the proposed harbour caters for better future plans for the island although the proposed alternative may be more suitable at this stage. Therefore, the Consultants agreed to discuss the alternative option as an alternative or a mitigation measure to address the existing concerns of safety. The Proponent had also said that the alternative dredge areas and any changes to the design of the harbour cannot be entertained at this stage and that “the

Nilandhoo community has bigger plans for the harbour, and for this, they need us to proceed with the harbour layout as previously proposed".

A few local residents were also asked about the proposed design even though it is beyond the scope of this Addendum and they believe that the proposed design had only one major concern that that would be the lack of protection to the proposed harbour during the southwest monsoon. If that could be considered in the design even as a second phase, the proposed design would be quite suitable. The alternative design was not discussed with them. However, they have identified by themselves that the option of re-designing the existing harbour in a suitable manner may be a more appropriate option considering the cost of protection of the proposed harbour.

Table 5-1: List of people consulted

#	Name	Designation	Office/Address
1	Amir Musthafa	Engineer	MHI
2	Abdulla Khaleel	MP	Nilandhoo constituency
3	Mohamed Khaleel	President	Nilandhoo Council
4	Ali Rasheed	Member	Nilandhoo Council
5	Abdul Majeed Ali	Member	Nilandhoo Council
7	Abdul Azeez	Boat captain	Nilandhoo
8	Abdul Hameed Moosa	Private sector coastal works	Nilandhoo

6 Environmental Impacts and Mitigation Measures

The following account describes potential environmental impacts that will be associated with the proposed new borrow area, both during construction and operation phases. The impact matrices that have been given in the original EIA report are still relevant. The following section discusses the direct, indirect and cumulative impacts related to the project with their magnitude, significance, duration and spatial extent.

6.1 Impacts related to the proposed components

The proposed project has a net negative impact due to dredging from the new borrow area, resulting from sedimentation and direct habitat destruction, which is considered to be small compared to the sedimentation as well as habitat destruction of the reclamation component under the proposed project. These impacts are summarized in the table below and discussed in some detail in the following sections.

Table 6-1: Simple impact matrix for the proposed components

Impact	Direct/ indirect/ cumulative	Magnitude	Significance	Duration	Spatial extent
Removal of coral habitat at the north end of proposed dredge area	Direct	Minor negative	Low	Long term	Site specific
Altered bathymetry	Direct	Minor negative	Low	Long term	Site specific
Loss of habitat for fauna	Direct	Minor negative	Low	Short term	Site specific
Possible reduction in wave impact and erosion due to depth variation closer to shore	Cumulative	Positive	Low	Long term	Site specific
Sedimentation at the impact area	Direct	Minor negative	Low	Short term	Site specific
Sedimentation at the areas close to borrow area	Indirect	Minor negative	Low	Short term	Site specific
No protection from waves in the harbor during berthing along quaywall during the southwest monsoon	Direct	Moderate negative	Significant	Medium/long term	Island and atoll

6.1.1 *Dredging (and filling)*

Construction phase will have direct short-term impacts and some secondary long-term impacts on the environment from dredging and filling.

Since the impact area at the new borrow area is mainly dead, direct damaged to live corals is negligible. Dredging from the borrow area on the north of the proposed quaywall would have little impact on reef as there are very few live corals in the area and sedimentation from the dredging is low while sedimentation would be mainly from the fill area. As the fill area is at a considerable distance from the reef, there will be very low impacts of sedimentation on the reef. Sediment movement is expected to be towards the north past the dredge area and the channel. Sediment on the reef, if any, is expected to settle on the reef flat.

Since the percent of live corals in the dredge/borrow area is very low and mainly porites, this impact is considered insignificant. Also, due to strong longshore and onshore currents in the area, the water quality would be affected for a short duration and sediment plumes would be diluted to a great extent. The effects of suspended sediments and turbidity are generally short term (<1 week after activity) and near-field (<1km from activity). There generally only needs to be concern if sensitive coral species are located in the vicinity of the project sites (ABP 1999).

One of the effects of dredging will be creation of an area deeper than the existing lagoon, thus helping to reduce the energy of the incoming waves reaching the shore. This will help reduce the erosion or accumulation of sediments on the shore zone at that particular location. This may affect the overall sediment transport process. However, since there is no specific accumulation of sediment in the area and accumulation to some degree is desirable to the beach on the northwest of the island.

6.1.2 Harbour use during operational phase

There is the concern of safe use of the proposed quaywall due to the area being subjected to wave action during the rough southwest monsoon. The deep lagoon stretch is also large, which makes it difficult to create a safe harbour by a breakwater due to the large fetch. Therefore, this impact would have to be addressed as soon as possible to make the project more feasible. If a breakwater were to be considered a vegetated breakwater will be necessary to create appropriate harbour conditions.

6.1.3 Socio-economic impacts

There are no major negative socio-economic impacts. The only negative socio-economic would be the potential disappointment during the northwest monsoon without adequate protection of the proposed quaywall area. However, it is quite possible that such concerns could be addressed in the near future.

Noise is not of significance due to the intermittent nature of works and the short duration. There have been no major concerns related to dust and noise during the installation of dredge pipeline and bunding works so far, and the community is pleased that the project is happening.

6.2 Uncertainties

There are no uncertainties in the data, however, there are some degree of discrepancies in the live coral cover percentage in the two sites that have been surveyed under the previous EIA and the current surveys. Although the location has been indicated to be similar, it may be quite possible that two different locations in the same area have been surveyed during the two times. It may also be possible that there had been death of several corals over the few months. There definitely are several uncertainties and it may be helpful to undertake further studies under the monitoring programme to understand these uncertainties. There is also some degree of uncertainty that surrounds the impact of the usability of the proposed harbour/quaywall under harsh weather during the southwest monsoon. This is also something that needs to be studied carefully during the monitoring period.

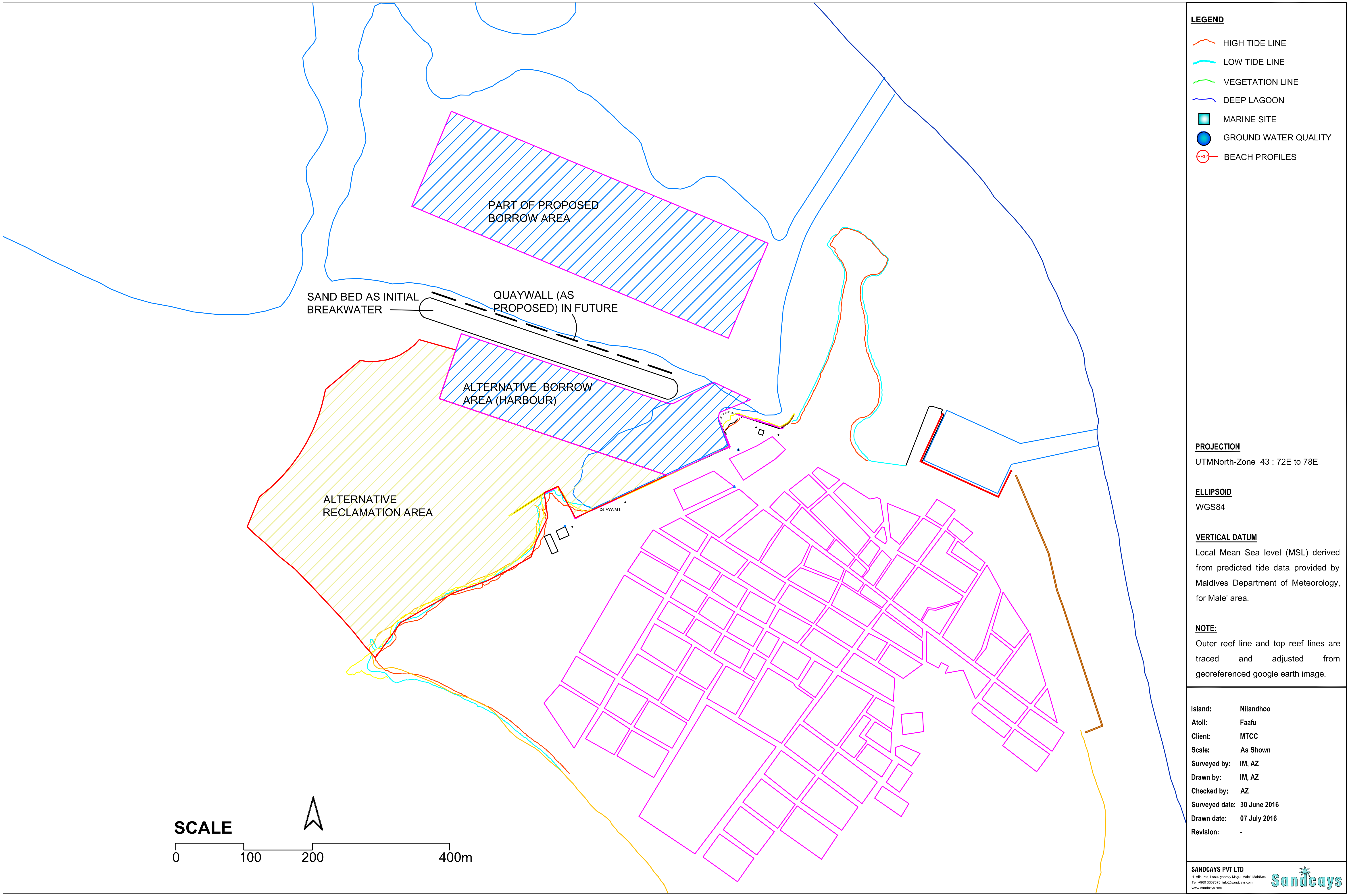
6.3 Mitigation Measures

There are very few mitigation measures that apply specifically to the proposed change of the borrow area. These measures, listed below, would not incur additional project costs. In fact, some of the components may involve a cost saving and shall be considered carefully.

1. Undertake the dredging or excavation of sand at low tide and at a considerable distance from the beach.
2. The dredge area should not be deeper than 12m. This would allow the area to come to equilibrium quickly and without significantly affecting the nearshore sediment regime and potential threat to the proposed quaywall.
3. Spare the reef flat areas shown in the proposed borrow area. Start dredging from the deep lagoon end and move towards the reef flat area of the proposed borrow area. If dredging of reef area becomes really necessary, transplant live coral colonies within impact zone at a safer location.

4. Ensure appropriate supervision and monitoring.
5. Complete the work as soon as possible.
6. Avoid washing tools, equipment etc. into lagoon.
7. Reconsider the re-designing of the existing harbour basin in such a way that it would complement the future growth of the island while providing protection from waves inside the harbour. Such a supplementary design has been given in Figure 6-1. Alternatively, if the option is not considered appropriate in the detailed design stage, it is recommended to consider appropriate protection of the harbour as a second phase to be implemented in the near future.

Figure 6-1: Supplementary design to mitigate potential impacts



7 Environmental Monitoring

The monitoring programme given in the EIA report is considered sufficient to cover the data needed to assess impacts from the proposed component as there were no additional major components to the project. However, there are a few elements that needs to be incorporated taking into consideration the potential mitigation measures proposed in this Addendum. Therefore, the monitoring programme given in the original EIA report has been revised accordingly and revised programme included in this report.

It is also recommended to undertake monitoring as proposed during the construction phase as well as the operational phase, however, it is recommended to report only at the end of construction phase and annually during the operational phase.

As proposed in the original EIA report, the monitoring programme is recommended to be undertaken for 2 years after project implementation, which should provide adequate data to understand the impacts of the project. As suggested in the original EIA report, the monitoring programme shall be undertaken by an independent environmental consultant or consulting firm. The recommended monitoring programme is a guide and includes important parameters. The consultant may, at his/her discretion provide any additional information that may be considered relevant.

The monitoring report that shall be submitted to EPA as proposed should include details of the site, strategy of data collection and analysis, quality control measures, sampling frequency and monitoring analysis and details of methodologies and protocols followed. The report may also include fuel, chemicals and water consumption data and greenhouse gas emission calculations relevant to the project.

Table 7-1: Proposed construction phase monitoring

No.	Indicator/locations	Parameters to be monitored	Frequency and duration	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	Total	Rate (USD)	Total (USD)
1	Marine water quality (100m within the sedimentation impact zone incl. sites 1, 2 and 3 in Addendum)	Water quality: temperature, conductivity/salinity, pH, Turbidity, TSS	Every month initially and then every 3 months	10	10	10	10			10			10			60	10.00	**600.00**
2	Marine life/biodiversity (Sites 1 and 2 given in Addendum plus one more on the outer reef, if sediment plume reaches that)	Live coral cover and fish survey - Photo quadrates/LIT and fish survey	Every 3 months	3			3			3			3			12	30.00	**360.00**
3	Sedimentation rate at 3 selected locations (Sites 1 to 3 in Addendum) and one on the outer reef	Sedimentation rate using sediment traps	Every month initially and then every 3 months	4	4	4	4			4			4			24	75.00	**1,800.00**
4	Currents/hydrodynamics (baseline and 2 additional)	Drogue tracks	Every month initially and then every 3 months	5	5	5	5			5			5			30	20.00	**600.00**
5	Shoreline changes (baseline and additional)	High tide line, low tide line	Every three months	3			3			3			3			12	25.00	**300.00**
6	End of construction stage monitoring report		Construction phase only												1	1	500.00	**500.00**
TOTAL																		**4,160.00**

Note:

M indicates Month

The above costs do not include travel, food and accommodation during field visits

Table 9-2: Proposed annual monitoring programme (operational phase)

No.	Indicator/locations	Parameters to be monitored	Frequency and duration	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	Total	Rate (USD)	Total (USD)
1	Marine water quality (locations in the EIA Addendum)	Water quality: temperature, conductivity/salinity, DO, pH, Turbidity, TSS	Every six months	4						4						8	25.00	**200.00**
2	Marine life/biodiversity (locations in Addendum)	Live coral cover and fish survey - Photo quadrates/LIT and fish survey	Every six months	3						3						6	30.00	**180.00**
3	Currents/hydrodynamics (baseline and additional)	Drogue tracks	Every three months	5			5			5			5			20	25.00	**500.00**
4	Shoreline changes	High tide line and low tide line	Every three months	2			2			2			2			8	25.00	**200.00**
5	Marine water quality at fuel supply area	Total hydrocarbon	Every six months				2						2			4	50.00	**200.00**
6	Service quality at harbour	Services available, operation and maintenance issues, care	Every six months				2						2			4	-	**-**
7	Financial sustainability	Income generation from harbour	Once a year										1			1	-	**-**
8	Safety of harbour	User complaints/survey (site records)	Every six months				1						1			2	-	**-**
9	Traffic analysis	Vessel types and nos. that use the harbour & new vessels in island	Once a year										1			1	-	**-**
10	Employment	Employment for harbour management	Once a year										1			1	-	**-**
11	Demography	Population changes	Once a year										1			1	-	**-**
12	Annual Monitoring Report		Once a year												1	1	1,000.00	**1,000.00**
TOTAL																		**2,280.00**

Note:

M indicates Month

The above costs do not include travel, food and accommodation during field visits

8 Conclusions

The proposed change of borrow area was considered necessary as the dredger mobilized to project would have performance issues due to the long pumping distance. Therefore, it would be useful to find an appropriate dredge/borrow area closer to the fill area. The proposed borrow area is over 110m from the proposed borrow area and is sufficient distance for a maximum borrow depth of 12m. However, since EPA had raised an important concern relating to the possible failure of the proposed quaywall in case of a potential collapse of the banks/sides of the dredged basin, it was considered important to move the borrow area about 75m from the proposed quaywall. It is observed that the proposed area will still provide sufficient quantities without having to move the dredge area over the inner reef flat on the north of the borrow area.

The consultant identified that the original EIA report has taken into consideration several alternatives and the preferred or recommended alternative has been further studied by the consultant. The consultant, therefore, recommended to re-consider the option of improving the design of the existing harbour so that the proposed quaywall can be considered in future. While this option has several advantages, the Proponent and the MP for the Constituency stresses that the proposed design is in line with even greater plans for the development of the island. Therefore, it is recommended by the Consultants as a mitigation measure to improve the usability of the harbour by providing adequate protection to the proposed design even as a second phase to be undertaken at the earliest possible or to consider the preferred/recommended alternative given in the EIA report as well as this Addendum. It is to be noted that the cost of future protection of the proposed is expected to be higher than the cost of the recommended re-design of the existing harbour.

Environmental monitoring during the construction and operational phase is not often treated with the same importance as the initial impact assessment, whereas it would be an important tool to help improve the environmental performance of future projects of similar nature. Hence, the revised monitoring programme is recommended to be followed in order to understand the overall benefits and impacts of the proposed project.

9 Acknowledgements

The author wishes to acknowledge the work of several people who have contributed to this report. The following people have been mentioned due to their specific contributions. Thanks are also due to those who participated in the different meetings, interviews, discussions although their names have not been specifically mentioned here.

- Technical team at MTCC, especially Firdous Hussain and Hamdhoon Khaleel for taking part in meetings and timely delivery of requested information.

Thanks to Hussain Fizah for assisting in the field work and participating in the Scoping Meeting and Council meeting during the field visit. Ibrahim Mizal also participated in the field work and assisted in presenting the necessary field results. Thanks to Hassan Jameel and Mohamed Azmeel for assisting in the administrative procedures.

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11 Appendices

Appendix 1: Terms of Reference

Appendix 2: Proponent’ commitment letter

Appendix 3: Receipt of Document Communication with Atoll Council

بسم الله الرحمن الرحيم

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Environmental Protection Agency

203-EIARES/138/2016/153

Terms of Reference for 1st Addendum to the Environmental Impact Assessment for the Proposed Land Reclamation at Nilandhoo,Faafu Atoll

The following is the Terms of Reference (ToR) for undertaking the **First Addendum to the EIA for the proposed land reclamation project at Nilandhoo, Faafu Atoll**, followed by the scoping meeting held on 20/7/2016. Proponent of the Project is Ministry of Housing and Infrastructure.

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 of 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 institutional arrangements relevant to this project. Please provide justification for the proposed changes to the borrow area and reclamation site and size.

2. **Study area** – Submit a minimum A3-size scaled plan with indications of all the proposed infrastructures including reclamation site and borrow areas. 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).

3. **Scope of work**

Task 1. Description of the proposed project – Provide a full description and justification of the relevant parts of the project, using maps at appropriate scales where necessary. The following project activities shall be considered.

- Dredge (borrow) areas;
- Reclamation of additional land;
- Measures to protect environmental values during construction and operational phase;
- 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)

Dredging

- Location and size of borrow areas (s) and its alternatives on a map;
- Justification for the selection of these locations;

- 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;

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.

In addition to the baseline data provided in the EIA report, the following data/information shall be provided.

Geology and geomorphology
- Bathymetry of the project areas (use maps);
- Characteristics of seabed sediments at borrow and fill areas to assess direct habitat destruction and turbidity impacts during construction;

Hydrography/hydrodynamics
- Currents at the proposed borrow and fill areas;
- Recent shoreline configuration of the project area
- Sea water quality at updrift locations of the borrow and fill areas for temperature, pH, electrical conductivity, salinity, dissolved oxygen, turbidity and total suspended solids.

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 components, and identify the appropriate authority jurisdictions that will specifically apply to the project. Include permits and approvals in the EIA document including a copy of the dredging application.

Task 4. Potential impacts of proposed project – 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
- Impacts on marine habitats including damages to coral reefs and seagrass communities, fish stocks, protected areas and protected species;
- Changes in erosion/sedimentation patterns, which may impact shore zone configuration/coastal morphology;
- Temporary sediment dispersal in water column (turbidity at the dredging site, reclamation areas 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 on landscape integrity/scenery.

Impacts on the socio-economic environment

- Impacts on employment and income, potential for local people to have (temporary or long term) job opportunities (and what kind) in the execution of the works;
- Disturbance to local natural resource users such as fishing areas, other tourism ventures;

Construction related hazards and risks

- Pollution of the natural environment (e.g. oil spills, discharge of solid waste, including construction waste);
- Risk of accidents and pollution on workers and local population, where applicable.

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. 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. Mitigation measures to avoid or compensate habitat destruction, e.g. temporal sediment control structures, coastal protection structures to reduce erosion, 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. In cases where impacts are unavoidable arrangements to compensate for the environmental effect shall be given.

Task 6. Stakeholder consultation, Inter-Agency coordination and public/NGO participation) – Identify appropriate mechanisms for providing information on the project to all stakeholders and consultations need to be made with the Island Council and the general public of Nilandhoo. The EIA report should include evidence of consultation including a list of people/groups consulted, their contact details and summary of the major outcomes. The report shall also include the methodology of the consultation with justification, date, time and place of consultation. The report should also include evidence that EIA has been submitted to Faafu Atoll council prior to submission to EPA.

Task 7. Development of monitoring plan – If there are additional monitoring requirements for the proposed components of the projects, identify the critical issues requiring monitoring and present a monitoring plan. The baseline study described in task 2 of section 2 of this document is required for data comparison. Detail of the monitoring programme 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 programme must be provided.

Presentation- The Environmental Impact Assessment report 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 for 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 EIA report – The developer must submit the completed report within 6 months from the date of this Term of Reference.

24 July 2016

بسم الله الرحمن الرحيم

Ministry of Housing and Infrastructure
Male', Republic of Maldives.

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މާލެ، ދިވެހިރާއްޖެ.

Date: 25 July 2016

No: 138-PIS1/203/2016/188

Mr. Ibrahim Naeem
Director General
Environmental Protection Agency,
Ministry of Environment and Energy,
Green Building, Male',
Maldives.

Dear Sir,

This is in reference to the EIA Addendum report for the proposed harbor at F.Nilandhoo. As the Proponent of the project, we assure you our commitment to undertake the proposed mitigation measures and monitoring programme as given in the report.

Thanking you

Sincerely,

Fathimath Shaana Farooq,
Director General

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Subject: **Faafu Nilandhoo Harbor project EIA - first Addendum**
From: **rameez@sandcays.com**
Date: **Mon, Jul 25, 2016 10:09 am**
To: **Secretariat@faaf.gov.mv**
Attach: **First Addendum to Nilandhoo Harbour EIA_final draft.pdf**

Dear Abdul Hameed Mohamed,
Attached herewith please find Faafu Atoll Nilandhoo Harbor project EIA first addendum for your kind perusal. Please acknowledge the receipt of this E-mail.

Warm Regards
Rameez
Sandcays