ENVIRONMENTAL IMPACT ASSESSMENT

For the Proposed Police Academy Development Project

Addu City, Maldives

Proponent: Maldives Police Service

Sandcays

September 2016

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List of Abbreviations

DO	Dissolved Oxygen
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
ESA	Environmentally Sensitive Area
GPS	Global Positioning System
IPCC	Intergovernmental Panel on Climate Change
ISLES	Institute for Security and Law Enforcement Services
IUCN	International Union for Conservation of Nature
l/p/d	litres per person per day
MEA	Maldives Energy Authority
MEE	Ministry of Environment and Energy
MHI	Ministry of Housing and Infrastructure
MNDF	Maldives National Defence Force
MOT	Ministry of Tourism
MPS	Maldives Police Services
MSL	Mean Sea Level
NBSAP	National Biodiversity Strategy and Action Plan
NE	North East
NEAP	National Environment Action Plan
NSSD	National Strategy for Sustainable Development
NW	North West
PPE	Personal Protective Equipment
RO	Reverse Osmosis
SE	South East
SW	South West
TOR	Terms of Reference
UNFCCC	United Nations Framework Convention on Climate Change

Consultants Declaration

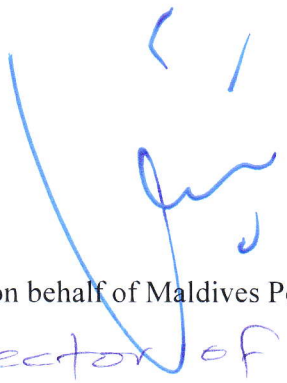
This EIA has been prepared according to the EIA Regulations 2012. I certify that the statements in this Environmental Impact Assessment study are true, complete and correct to the best of my knowledge and abilities.

Ahmed Zahid

Consultation Registration No. EIA 08/07

Proponent's Declaration

As the proponent of the proposed development I guarantee that I have read the report thoroughly and that to the best of my knowledge all information provided here is accurate and complete.



For and on behalf of Maldives Police Service

Inspector of police Abdulla Naseer.

Executive Summary

This report provides the finding of an Environmental Impact Assessment carried out for the proposed Police Academy in Addu City. The project is proposed by Maldives Police Service.

The proposed project involves the development of a Police Academy/Institute for Security and Law Enforcement in Addu City. An 83,680m^2 area in Rujjehere on the south of Hithadhoo Regional Port has been allocated for the proposed development. This includes a 35,000m^2 area proposed to be reclaimed since the area is narrow and does not provide sufficient space. The reclamation is on the shallow reef flat on the west of the plot facing the rim reef of Addu Atoll. The reclamation will be undertaken by borrowing sand from the lagoon on the western side where the lagoon depth is about 1.5 to 2m on average. A 15 to 20m wide channel will be dredged for dredger entry and for use as entrance channel by vessels used by the proposed Police Academy. The area (approximately 46,000m^2) will be dredged to a depth of no more than 4m from MSL. The dredged sand will be directly pumped to the site, as recommended by relevant stakeholders.

The proposed project will have several support facilities including power, water, sewerage, jetty, staff, students and visitor accommodation and storage facilities developed on the project site since the area is remotely located away from Hithadhoo. These will be established on the project site during the construction phase. Under the project, the building footprint areas would be cleared of vegetation and the coconut palms and some trees removed from the cleared areas would be transplanted in the reclaimed area. The bush areas in proposed building sites has already been cleared. An area is designated for waste management and waste will be collected, managed and sent to landfill according to the requirements of the Waste Regulation. A 10-ton desalination plant will be installed initially until water supply is made available to the project area by the service provider, FENAKA. This plant will become a back-up plant once FENAKA provides the services. The sewerage system established at the project site will comprise of a gravity system that will collect sewage and wastewater from all areas into an 85kl/day treatment plant and a pumping station from where treated wastewater effluent will be disposed of at the eastern reef by an ocean outfall. The powerhouse at the facility will cater for the energy needs of the facility. A 500kVA genset will be installed to meet the needs. Fuel for powerhouse and other requirements such as vehicles will be stored in

underground tanks at site. The fuel system will be developed according to the requirements of the Fuel Regulations enforced by the Maldives National Defense Force.

The baseline environmental conditions were assessed using standard methods. The project areas including clearance areas and dredge and fill areas have been studied. In addition, the project site's vegetation, vegetation line and shorelines have been mapped. It has been estimated from the vegetation surveys that a total of 88 coconut palms and 33 other mature trees would need to be cleared, but some of it can be preserved if the buildings are appropriately designed/setout. The proposed jetty area has adequate depths for jetty installation and leads to the proposed borrow area, which will be used for mooring vessels.

Environmental impacts were identified and assessed for both construction phase and operational phase of the project. Some of the environmental impacts of the project have been identified as positive resulting mainly from improved security and law enforcement services in the country, increased economic activities in Addu City, direct and indirect employment opportunities, and increased business opportunities. The main negative environmental impacts of the project are identified to be the changes to the terrestrial ecosystem from clearance of vegetation, impacts on longshore sediment transport on the western side due to reclamation and shore protection and impact on the marine environment from dredging and jetty installation works. Given the large degree of impacts on longshore transport due to the projecting reclamation area with the long jetty at the Hithadhoo Regional Port, the proposed jetty would not have impacts on longshore sediment transport. However, it shall be designed for minimal impact. Since the dredge area proposed with the EIA application was at over 300m from the shore, the dredge area has been later revised to suit a shorter jetty while minimizing on a wider borrow area. The jetty has been kept at about 100m so that the dredged basin is at necessary distance from beach as recommended in the Dredging and Reclamation Regulation. As an important mitigation measure to minimize sedimentation during filling, it is recommended to enclose the fill areas with jumbo bags or the rock boulder revetment prior to filling the area or as filling progresses.

Other mitigation measures for the proposed project would be that clearance take place only where necessary and coconut palms are transplanted on the reclaimed area and other available spaces. It is also required to plant two trees for every mature tree or coconut tree cut down. Septic tank systems have been proposed for disposing human waste during the construction phase and pose no long-term negative environmental impact considering the small number of

people expected to be based on the site. These will be decommissioned once the sewerage system is built and operational.

The activities proposed in the project comply with environmental laws and regulations of the Maldives. These have been outlined in the report.

Alternatives have been identified in the project document. These include alternative reclamation location on the eastern side, thereby minimizing largely on the shore protection on the western side and providing more space at less overall cost of dredging, reclamation and shore protection. This alternative is recommended, however, shall be considered in light of potential issues. The other option is to modify the shape of the proposed fill area so as to minimize any negative impact on longshore sediment transport. Also, changes to the fill area shape based on recommendations of EPA during the Scoping Meeting, changes to reclamation area and filling methodologies based on suggestions from stakeholders. The "no-development" option was also analyzed in light of alternative uses of the project site, no reclamation option and other potential options for the development of the proposed facility. Considering the other potential alternative uses of the area, the closeness to the port does not make it most-suited for tourism development or other recreational development. The area is also quite narrow for residential development but may be more suited for industrial developments. The proposed project has several merits in terms of location and suitability, therefore, the no project option may not be as favourable as the proposed option.

Alternatives to water supply, wastewater disposal and electricity have also been considered. The use of groundwater for water supply such as flushing may be appropriate if water skimming technologies or infiltration galleries can be introduced. Wastewater treatment would have negative impacts for the proposed project in terms of use of fuel-based electricity for the treatment process. Therefore, the proposed disposal to sea/ocean is considered appropriate for such a small scale operation. Alternative sources of power have also been looked at and recommend the use of solar (photo-voltaic) technology to the greatest possible extent.

It is inevitable that there would be some negative environmental impacts. However, most of the impacts of the proposed project are minor compared to the positive socio-economic benefits of the project. Yet, monitoring for about 3 years from the end of construction phase to ensure the effectiveness of the proposed project would be necessary. Therefore, a

monitoring component has been suggested. This monitoring component will be adhered to and will allow the assessment of changes due to construction and implementation of the proposed project. Monitoring is specifically focussed on ground and marine water quality, changes to coastal hydrodynamics, as well as impacts on the reef or marine ecological area of importance. Project performance indices can be added too.

In conclusion, it appears justified from a technical and environmental point of view, to carry out the proposed project to develop the proposed Police Academy in Addu City. The recommended alternatives may be considered in the light of improving environmental performance of the proposed project.

ސާރާ ޚުލާސާ

މި ރިޕޯޓަކީ އައްޑޫ ސިޓީގެ ހުޅުދޫހުޅު ސަރަހައްދުގައި ހިންގުމަށް ހަމަޖެހިފައިވާ ޕޮލިސް އެކަޑަމީ މަޝްރޫޢުގެ ސަބަބުން ތިމާވެށްޓަށް އަސަރުކޮށްފާނެ މިންވަރު ބަޔާންކުރުމުގެ ގޮތުން ތައްޔާރުކުރެވިފައިވާ ރިޕޯޓެކެވެ. މި މަޝްރޫޢުގެ އިދިޔާރާކުރަނީ މޯލްޑިވްސް ޕޮލިސް ސަރވިސް އެވެ.

މި މަޝްރޫޢުގައި ހިމެނެނީ އައްޑޫ ސިޓީގައި ޕޮލިސް އެކަޑަމީ ނުވަތަ އިންސްޓިޓިއުޓް ފޮރ ސެކިއުރިޓީ އެންޑް ލޯ އެންފޯސްމަންޓް ހިންގުމަށް ބޭނުންވާ އެންމެހާ ވަސީލަތްތައް ޤާއިމުކުރުމެވެ. މިގޮތުން ހިތަދޫގެ ދެކުނުން އޮންނަ ހުޅުދޫހުޅު ސަރަހައްދުގެ 83،680 އަކަމީޓަރުގެ ބިމެއް ވަނީ މި މަޝްރޫޢު ކުރިއަށް ގެންދިއުމަށް ދޫކުރެވިފައެވެ. މީގެ ތެރޭގައި 35،000 އަކަމީޓަރުގެ ސަރަހައްދެއް ހިއްކައި މި މަޝްރޫޢުގެ ބައެއްގެ ގޮތުގައި އިމާރާތްކުރެވޭނެއެވެ. އޭގެ، އިދާރީ ހަރަކާތުން މަޝްރޫޢުގައި ހިމެނޭ ވަސީލަތްތައް ޤާއިމުކުރުމަށް އިމާރާތް ފުރާޅުތަކަށް ބޭނުންވާނެއެވެ. ހިއްކާނީ ފުރުޖަހާ ނުވަތަ އިތުރުކޮށް ފާހާމަކުރަނީ. ހިއްކުމަށް ބޭނުންވާ ވެލި ނަގާނީ އަތޮޅުގެ އުތުރުފަރާތުން ވަގުތީ ހުޅަނގު ފަރާތުގެ ދޫނުކުރާނެ. މި ސަރަހައްދުގެ ފެންމިނުގައި ގޮތެއްގެކަން 1.5 ނުވަތަ 2 މީޓަރު ހުރެއެވެ. ގޮނޑުބޭރު ފެއްދުމަށާއި މުސްތަޤްބަލުގައި ބޭނުންކުރުމަށް ނަގައި ހިމެނޭގޮތަށް ޖުމްލަ 46،000 އަކަމީޓަރުގެ ސަރަހައްދެއް 4 މީޓަރަށް ފުރުނުވާ ވަރަށް ކޮންމެ ނަގާ ފަސް ސިޓީ ހިއްކާތަނަށް، ކާމިޕޯ ބަރު ފަރާތްތަކުގެ ތަފާތު މަދުން، އަސަރެއްގަނޑު ވަނީ ހަމަޖެހިފައެވެ.

މީގެ އިތުރުން ބޭނުންވާ ތަފާތު ހުރިހާތަކެއް ވަސީލަތްތައް ޤާއިމުކުރެވޭނެއެވެ. އޭގެ ތެރޭގައި ފާހާއި، ކަރަންޓާއި ނަރުދަމާ، ޖެޓީ، މިސްކިތް، ތަންތަނާއި، ގުދަން ކާރު ތަންތަން ހިމެނެއެވެ. އަދި މީގެ އިތުރުން އިމާރާތްކުރާ ނުވަތަ މަޝްރޫޢުގެ ބޭނުމަށް ސާފުކުރާ ހިސާބުތަކުގައި ހުރި ގަސްތައް ކަނޑައިން މަދުކުރުމައި ކަނޑާ ގިނަ ބަދަލު ހިއްކާ ސަރަހައްދުގައި އިންދުމާއި އިތުރުގަސް އެ ސަރަހައްދާއި އެހެނިހެން ތަންތާނގައި އިންދާނެއެވެ. 10 ބަނޑުގެ ފެން ފުރާނބައް މަސައްކަތް ކުރާއިރަށް ތަރީބު ޤާއިމުކުރުމަކީ މަސައްކަތް ނިމުމުން ފެނަކައިން ފެން ތިބެނެން ފެނުމުން މި ފުރާނބޭ ހުންނާނީ ބަކަރު ގެންދާބަރުގެ ގޮތުގައެވެ. ނަޖިސްފެން ސާފު ކުރާ ދުވަހަކަށް 85 ހަސް ލީޓަރުގެ ނަޖިސްފެން ސާފުކުރާނެ ނިޒާމުކަން ނަޖިސްފެން ސާފުކުރުމަށްފަހު ހެޔޮނުގެ ފުއްޓަރު ފަރާތުން ފާހާގު ސްޓެޝަނެއް ގުދުފިނިކަން ބޭރުކުރާނީއެވެ. އަދި ހަކަތަ އުފެއްދުނީ ޖެނަރޭޓަރ ބޭނުންކޮށްގެން ކަމުން ބިމުއެޖަގައި ތާނގީ ބަހައްޓާނެއެވެ. އަދި 500 ކިލޯވޮޓްގެ ޖެނެރޭޓަރކާއި ބަކަޕް ޖެނެރޭޓަރެއް ހުންނާނެއެވެ.

މަޝްރޫޢާއި ގުޅުންހުރި ތިމާވެށީގެ ބައެއް އާއްމު ކަންތައް ސްޓޭންޑަރޑް ތަކެއް ބޭނުންކޮށްގެން އެސެސްމަންޓްކުރެވިފައިވާނެއެވެ. މިގޮތުން މަޝްރޫޢު ހިނގާ ސަރަހައްދުގެ އާބި ހިސާބުގައި ހުރި ގަސްތަކާ، ފެނުގެ ކޮލިޓީ، އަދި ރަށުގެ ހެޔޮގޮތުގައި، ދެ ދިއުމަށްޓަކައި ޓެސްޓްކުރެވޭ އެއް ހިސާބު ހޯދާކަށް ކުރެވިފައިވާނެއެވެ. މި ދިރާސާތަކުގެ އަޑިގައި ކަނޑެއް ޖެހޭ ރުއްގަސްގެ އަދަދާއި ޖެހި ސަރަހައްދު ފެންކުރަން ޖެހިލުންތަކާ ވަސް ފާރަކުރެވިފައިވެއެވެ. މިގޮތުން ގޮތަށް ޖުމުލަ 88 ރުކާއި 33 ގަސް ކަނޑަން ޖެހިދާނެ ކަމަށް އަންދާޒާ ކުރެވިފައިވާ އިމާރާތްތައް ރަގަޅަށް ފަރުމާކުރުމަށް ސަޖެސްޓް ކުރެވިފައިވާތީ ގިނަ އަދަދެއްގެ ރުއްގަސް ސަލާމަތްވާނެއެވެ.

މި މަޝްރޫޢުގެ ކޮންސްޓްރަކްޝަން އަދި އޮޕަރޭޝަން ފިޔަވަޅުގައި ތިމާވެށީގެ ގޮތުން އިޖްތިމާޢީ އަދި އިޤްތިޞާދީ ގޮތުން އަންނަނިވި ބަދަލުތަކާއި ކުރާނެ ހެޔޮ އަދި ނޭދެވޭ އަސަރުތަކަކީ ބަޔާންވެފައިވާނެއެވެ. އަދި މި މަޝްރޫޢުގެ ސަބަބުން ތިމާވެށްޓަށް ބައެއް ކުޑަ ކުޑަ ގެއްލުން ކުރި ނަމަވެސް އިޤްތިޞާދީ އަދި އިޖްތިމާޢީ ގޮތުން ގިނަ ފައިދާއެއް ކުރާނެކަން ފާހަގަކޮށްފައިވެއެވެ. އެގޮތުން ފައިދާގެ ތެރޭގައި ސަރުކާރުގެ ފުލުހުންގެ ގިނަ ސަބަބުން ލިބޭނެ އިޖްތިމާޢީ ފައިދާތަކުގެ އިތުރުން މަޝްރޫޢުގެ ސަބަބުން ލިބޭ ވަޒީފާއާ ވިޔަފާރީގެ ފުރުޞަތުތަކުގެ ސަބަބުން ލިބޭނެ ފައިދާތައް ހިމެނެއެވެ. ނަމަވެސް، ތިމާވެށްޓަށް ނޭދެވޭ އަސަރުތަކެއް ކުރާނެއެވެ. އެގޮތުން ކުރާނެ އަސަރު ތަކުގެ ތެރޭގައި ގަސް ކަނޑާލުމާއި، ކޮންމެ ބިން ހިއްލުމުގެ ސަބަބުން ވަށައި ކަސްކަރިތައް އެއްސުމުން ނޭދެވޭ އަސަރުތައް ކުރާނެއެވެ. އަދި ބިން ހިއްލުމާއި ތޮށިގެ ސަބަބުން ހިނގާނެ ކަންކަމުގެ ގައިގައި ދާދި ގާތުގައި އޮތް ބަހުގެ ކަނޑު ކަމަށް އަންނަ ކުޑަ މިންވަރުގެ ބަދަލުތައް ސަބަބުން ރަށުގެ ބައެއް ދިމާއަކަށް ގިރުމާ އަސަރުކުރުންވަރަކަށް ކަންކަން ހިފެހެއްޓޭނެއެވެ. ޖެހި އެހެރުގެ ސަބަބުން ބަދަލު އަސަރުކުރާނެއެވެ. މިގޮތުން ހިމަނާ ރިޢާޔަތް ޕްރޮޖެކްޓް ގުޅިގެންވާ ގުޅިގެންވާ ހިއްސާދާރުން ފަރުމާ ކުރެވިފައިވާ ގޮތުން މިހާރުވެސް މި ރިސޯޓުގައި އޮތް ދަށުދަނޑުގެ ގޮތަށް ބަޔާންކޮށްފައިވާ ބަދަލު އައިސްފައެވެ. މިފަދަ ޖެހި އެހެރުގެ ގޮތަށް ބަދަލު ގޮތަށް އަދި އެއް ދަށުދަނޑު ގޮތަށް ފަރުމާކުރުމަށް ބަލާލެވިފައިވެއެވެ. އަދި ޖެހި ހުރިހާ ކަންކަމުގެ ހިސާބު ހަރަކާތް ކަމުގެ ކަންކަން ސަރަހައްދުގެ އީ.އައި.އޭ އެޕްލިކޭޝަން ފޯމާއި ގުޅިގެން ބަޔާންކޮށް އެއްގަމު ކުރެވިފައިވާނެއެވެ. އޭގެ މިގޮތުން އެންމެ 300 މ ގެ ޖެހިއްޖެ ބެއްލުމުގެ ބަދަލުގައި 100 މ އަށްވުރެ ކުރު ބާރު ވަރަކު ކަނޑަން ސަރަހައްދު އެއްގަމުކުރުން މަޖިލީހެވެ. މިގެ އިތުރުން ހިމާ ސަރަހައްދުން ވެލި އަދި ހިލަތަކާއި އަސަރު ނުފޯރުވާނެ ގޮތަށް ޖެހި ސަރަހައްދު ވިސްނާލެވޭ ކަމަކަށެވެ.

މަޝްރޫޢުގެ ސަބަބުން ތިމާވެށްޓަށް އަސަރުކުރާނެ ކަންކަން ހުއްޓުވުމަށް ކޮށްދީފައިވާ މިންވަރު ކުރާނެ ފުރުޞަތުގައި ޖެހި ރަށުގެ ކަނޑު މިންވަރު ކުޑަކުރެވޭ އިމާރާތްތަކުގެ ސަޕޯޓް ކުރުމުގައި އަހަރުދުވަހެއްގެ ތެރޭގައި، ގިނަ ރުއްގަސް ހިމާ

ސަރަހައްދުގައި އިންދުމާއި ކަނޑާ ކޮށުން ރުކަކަށް ބޮޑު ގަހަކަށް ދީ ހުރި ނުވަތަ ގަސް އެހެން ތަނެއްގައި އިންދުން ހިމެނެއެވެ. މަސައްކަތް ކުރައިރު، ރަށުގައި އުޅޭ މީހުންގެ މަދުކަމުން ނަޖިހާއި ނަޖިސްވުން ހިންގާނީ ރަނގަޅަށް ފަރުމާކުރެވިފައިވާ ސެޕްޓިކް ޓޭންކް ގެ ނިޒާމަކުންނެވެ. މިގޮތުން މަސައްކަތް ފަރާތުންވެސް މިފަދަ ނިޒާމެއް ޤާއިމުކުރުމަށް އެކަށީގެންވާ ގޮތަކަށް ނަޖިހާއި ނަޖިސްފެން ނައްތާލުމުގެ އުސޫލުތަކާއި ބެހޭ ސަރުކާރުގެ އަސަރުކުރާނެ ސަލާމަތްކުރެވޭނެއެވެ.

މި މަސްރޫޢުގައި ކުރަން ކަނޑައެޅިފައިވާ ކަންކަން ކުރާނީ ދިވެހިރާއްޖޭގައި ހުރިފައިވާ ތިމާވެށީގެ ޤަވާޢިދުތަކާއި އެއްގޮތަށް ފަރުމާކުރެވިގެންނެވެ. ސަރުކާރުގެ އުސޫލުން ދާއިރާތަކުން ތަންފީޒުކުރާ ތިމާވެށީގެ ގަވާއިދުތަކާއިވެސް އެއްގޮތަށެވެ.

މަސްރޫޢުގެ ތަފާތު އޮޕަރޭޝަނުގެ ތަކެތި ވެސް ވަނީ އެކުލަވާލެވިފައެވެ. މިގޮތުން މި ސަރަހައްދުގެ އިރު މަތީ ފަރާތުން ބޮޑުބައެއް ހިއްކައިގެން ކުރާނަމަ، ހުޅަނގު ފަރާތު ހިއްކުމަށްފަހު ހުންނާނީ ދެ ބައިގެ ނުވައި ކުރެވޭ ޤާއިމުކުރެވިފައިވާ ގޮތަށް ބޮޑު ތަރުތީބު ދޫކޮށްފައި ހިނގާނެއެވެ. މިކަމަށް ހުރި ބިމުގެ މައްޗަށް ނުރައްކާތެރި ސަރަހައްދެއް ފަދަ ބޮޑު ބިމެއް ހުސްކުރެވޭނެ ކަމުގެ ޢަމަލުތަކެއް ވަނީ ތަރުތީބުކޮށްފައެވެ. އަދި އީ.ޕީ.އޭ އިންވެސް ފަރުމާކުރެވިފައިވާ ގޮތަށް ހިނގާ ސަރަހައްދު ބަލައި ބޮޑުތަކުގެ އެއްގޮތަށް ހިއްކުން ފަދަ ކަންކަން ހިމެނެއެވެ. މީގެ އިތުރުން ހިނގާ ތަފާތު ސަރަހައްދުގައި ހިނގާނެ ތަފާތު ގޮތްގޮތަށް ބަލާލުމަށްފަހު ކުރިއަރައިގެން ދާނެ އޭގެ އެޕްރޯޗެއް ކުރަން ބަލާފައިވާ މަސްރޫޢު ނިޔަމުގެ ކޮށް ބޮލާވާ ޕާކިން ތަފާތު އެކި ސިފަތަކާއި ކުރިއަށް ގެންދެވޭނެ އަދި ހިނގަމުން ދާ މަސްރޫޢު ހިނގާތަނާއި މަސްރޫޢު އެނބުރި ގޮތަކަށް ތަފާތު ހިނގުމުގެ ބަލައިލެވިފައިވާ ގޮތުން ބަލައިލެވެ. މަސްރޫޢު ހިނގާ ސަރަހައްދުގެ ހިސާބު ސަރަހައްދުގެ ބަދަލުވި ހަމަ ސަރަހައްދުގެ އިންވެސް ބޮޑު ބިމަކަށްވާތީ، މި ތަނަކީ ސިނާއީ މަސައްކަތް އެކަށީގެންވާ ތަނެއް ނޫނެވެ. އަދި ސަރަހައްދުގެ ހަނިކަމާއިއެކު މީހުން ދިރިއުޅެން އެންމެ އެކަށޭނަ ތަނަކަށްވެސް ނުވެއެވެ. ހަރަކާތްތެރިވާ ސަރަހައްދު ކުރެވޭ އެކަށީގެންވާ ތަނެއް ނޫން ސިފަތަކެއް ހުރި ބިމަކަށްވުމާއި، ބޮޑެތި އެކަށީގެން އެތައް ބަދަލެއް އޭގެއިން ދޭތެރޭ ތަފާތުކުރުމުގެ ފާހަގަކުރެވިފައެވެ.

މަސްރޫޢުގެ ދަށުން ފޭން ބޭނުންކުރުމާއި، ނަޖިސްފެން ނައްތާލުމާއި ހަކަތަ އުފެއްދުމުގައި ހުރި ތަފާތު ގޮތްތަކަށް ތަރުތީބުކޮށްފައިވާނެއެވެ. އެގޮތުން ބިމުގެ ފެނަށް މިފަދަ ކުޅޭ މަސްރޫޢަކުން ދަތުރުއުޅިނާ ގޮތަކަށް ބޭނުންކުރުމުގެ ފެނަކީ ބިމުގެ ފެން ވެސް ފެނުގެ ސާފުކުރުމުގެ ދަތުރުއުޅިނާ ގޮތަކަށް ބޭނުންކުރާ އެކަށީގެންވާ

ގޮތެއް ކަމުގައި ފާހަގަކޮށްފައިވާނެއެވެ. އަދި ނަރުދީސްފެން ސާފު (ބީރީޗް) ކުރުމަކީ އާއި ސަހަރަދުން ނުރަފާ އަސަރުކުރާނެކަމެއް ކަމަށް ވެފައި ބީރީޗް ނުކުތް ކަނޑަށް ދޫކުރުމަށް އެންމެ ރަގަޅުކަމަށް ފެންނާތީ، އެގޮތަށް އެކަށަޅުކުރުން އެއީ އެންމެ ރަގަޅު ގޮތްކަމުގައި ވަނީ ފާހަގަކުރެވިފައެވެ. މީގެ އިތުރުން ހަކަތަ އުފެއްދުމުގައި ޑީޒަލް ބޭނުންކުރުން ކުޑަކޮށް އިރުގެ ހަކަތަ ބޭނުންކުރާ ނިޒާމްތަކަށް އިސްކަން ދިނުމަށް ވަނީ ހުށަހަޅާފައެވެ.

މި މަޝްރޫޢަކީ އިޤްތިޞާދީ ގިނަގުނަ ފައިދާތަކެއް އެކުލެވޭ އަދި ތިމާވެށްޓަށް އާއި ނުރައްކާ އަސަރު ފޯރާނޭކަމުގައި ކުރި މަޝްރޫޢުގެ ނަތީޖާތަކުން، މަޝްރޫޢުގެ ސަރަޙައްދު ކޮންމެ ނުރައްކާ އަސަރުތައް ދުރުކުރުމަށް މަދުވެގެން ތިން އަހަރު ވަންދެން ދިރާސާކުރެވި ކުރަމުން ގެންދިއުމަކީ މުހިންމު ކަމެކެވެ. މިގޮތުން މަސައްކަތް ހިނގަމުންދާއިރު ކަނޑުގެ ކުރިއާލާ ރަށުގެ އަޑިއާއި، ޑައިވްސައިޓް ފަދަ ދާއިރާތައް އަދި ބަލަހަށްޓާނެ (ޑްރެޖިންގ ފެންވަރު) ކުރިމަތިވާ އަސަރު ކުރާވަރު އަދި މަސައްކަތް ނިމުމުން ބިމުގެ ފެނުގެ ކޮލިޓީއާއި، އައި އަދި ވެސް ފައިދާވާވަރު (ފެނުގެ އަޑި ބަލަހައްޓާ ދިރާސާކުރުމުގެ މަޝްރޫޢުގެ ސަރަޙައްދު ބެލޭ އިތުރުގެ އެންމެ ފަހުގެ ބައެއް ދިރާސާކުރުން ހިމެނެއެވެ.

މި މަޝްރޫޢުގެ ސަރަޙައްދު ތިމާވެށްޓަށް ކުރާ ނުރައްކާ އަސަރުތަކުން ވެސް އާއި ސަރަޙައްދު މައިގެ ގޮތެއްގައި ބޯ ދިރުމާއި އަދި އެހެނިހެން ފަރުދާ ބޮޑުކަމަށް ފެންނާތީ، މި މަޝްރޫޢު ހުރަހަށްފައިވާ ގޮތަށް ކުރިއަށް ގެންދިއުން އެންމެ ރަގަޅު ކަމަށް ފެނެއެވެ. އެހެންނަމަވެސް ހުރަހަށްފައިވާ އަލްޓަނޭޓިވް ތަކަށް ރިޢާޔަތް ކުރުމަކީ މުހިއްމު ކަމެއްކަމުގައި ފާހަގަކުރަމެވެ.

1 Introduction

1.1 Introduction

This Environmental Impact Assessment (EIA) report has been prepared in order to meet the requirements of Clause 5 of the Environmental Protection and Preservation Act of the Maldives (Law No. 4/93) to assess the impacts of proposed Police Academy or Institute for Security and Law Enforcement (ISLES) in Addu City. Environment Impact Assessment Regulations 2012 provides a list of proposals requiring an EIA. As per the list, EIAs are mandatory for all developmental projects involving dredging and reclamation. As such the EIA Application was made for the dredging and reclamation component. However, during the Scoping Meeting, EPA informed the Proponent that the EIA has to be done for the whole project including all relevant environmental infrastructure. This report will identify the potential impacts (both positive and negative) of the proposed project, which includes reclamation of land on the western side by dredging from the eastern lagoon, shore protection on the reclaimed area, clearing vegetation for buildings and infrastructure, construction of jetty, water supply, powerhouse, solid waste management facilities, staff, student and visitor accommodation, recreational services/facilities and administrative facilities.

This report will look at the justifications for undertaking the proposed project components. Alternatives to proposed components or activities in terms of location, design and environmental considerations would be suggested. A mitigation plan and monitoring programme before, during and after the works would also be included. Monitoring would ensure that the proposed activities are undertaken with caution and appropriate care so as to protect and preserve the built environment of the areas in proximity to the site or those areas and environmental aspects affected by the development.

The findings of this report are based on qualitative and quantitative assessments undertaken during site visits in July and August 2016 as well as professional judgment. Data and information presented in the project concept documents have been relied upon in order to understand and present the project. Very little detail was made available to the consultants regarding the project. Therefore, the consultants had to understand and present the project components by discussions and stakeholder consultations as well. The impact assessment methodology has been restricted to field data collected, professional judgement and

experience of similar settings and projects across the Maldives and elsewhere. Long term data relevant to this report on specific aspects such as meteorology and climate were gathered from secondary sources and published reports on the Maldives. Since projects of this sort have been undertaken in the past, documents and experiences from these projects such as small scale agriculture projects, small resort projects, reclamation projects and shore protection projects have been reviewed. There had not been any EIA for a Police Academy done in the past.

Personnel experiences of the EIA Consultants, especially experiences with dredging, reclamation, shore protection and resort or agricultural facility development undertaken recently have been taken into consideration.

1.2 Background to the EIA

This EIA is prepared in accordance with the Terms of Reference (TOR) approved by the Environmental Protection Agency (EPA) on 7 August 2016. It is a legal requirement that new projects having potential for environmental impacts gain environmental clearance or approval prior to construction and operation of such projects.

The principal environmental institution that implements EIA process in the country is Environmental Protection Agency. Additionally, the Ministry of Environment and Energy provides policy guidance and directions while Atoll Councils and Island Councils also provide approvals before projects are implemented.

1.3 Scope of the EIA and Approach

The main scope of this EIA report as per the approved ToR is to broadly assess, identify, predict and document potential environmental impacts from the proposed Police Academy in Addu City. Importance is given to document the whole project proposal in detail, identify the main environmental impacts that are associated with the proposed development and address the legal requirements that need to be taken into consideration while implementing this project. This document also addresses the existing environmental condition of the project site and foresees the ways in which potential environmental impacts will be managed, mitigated and reduced.

Hence the key aims of the report are to;

- Describe in detail the proposed project;
- Identify the need and justification for the proposed development;
- Describe the biophysical status of the existing environmental condition of the project sites based on the findings undertaken during the site visits;
- Assess, identify and predict potential environmental impacts of the proposed development;
- Evaluate the significance and magnitude of impacts that will be generated; and identify and predict ways in which these environmental impacts will be prevented and removed through appropriate environmental management and mitigation measures;
- Develop a mechanism to closely monitor and understand the long-term effects and changes of the proposed development on the environment with respect to the available baseline information, mostly collected from field assessments and site visits;
- Provide legal protection with regards to the proposed development activities; and
- Review the predictions and assessments made on environmental impacts that are associated with the proposed development activities.

In general, the EIA report has been based upon the following sources of information:

- Review of available project documentation;
- Discussions with involved key personnel;
- Site visits to the project site;
- Baseline environmental assessments;
- Maldives Environmental Protection and Preservation Act No. 4/93;
- Regulation on Environmental Impact Assessment of 2012
- Other Environmental Regulations
- Maldives National Development Framework
- Sandcays' previous experience of undertaking EIAs for projects in the Maldives;
- Other EIAs for similar development projects that have been carried out in the Maldives; and
- EIAs undertaken for projects in Addu Atoll recently.

1.4 Relevant Studies

In order to prepare this EIA, relevant EIA reports prepared by Sandcays for dredging/reclamation projects, small scale agricultural projects and small resort development projects have been taken into consideration. EIAs undertaken for different projects in Addu City have also been studied.

- EIA for agriculture project at Linboakandhoo, Raa Atoll (Sandcays 2016a)
- EIA for the proposed multi-storey building at H. Naadhee (Sandcays 2016b)
- EIA for Malé Southwest Harbour Redevelopment Project (Sandcays 2015a)
- EIA for the proposed resort development on K. Kuda Villingili (Sandcays 2015b)
- EIA for sewerage system in Hithadhoo, Addu City (CDE 2015)
- EIA for proposed runway extension at Gan Airport, Addu City (Sandcays 2013)
- EIA for proposed tourist resort at Hankende, Addu City (CDE 2012)
- EIA for reclamation of 167hectares of land at Thilafushi (Sandcays 2011)

1.5 EIA Implementation and Methodologies

This study was based mainly on data collected during field investigation missions during June and August 2016 by a team from Sandcays Pvt. Ltd. and published literature on similar settings and projects. The EIA report was compiled by Ahmed Zahid. Zahid is a registered EIA consultant with 20 years of experience and has been involved in numerous development projects in the Maldives. Trained environmental surveyors at Sandcays namely Mohamed Riyaz and Hassan Jameel have been involved in the field investigations. The field data analysis was done by Riyaz and other field data was provided by Hassan.

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 of this report.

The methods used to identify, predict and assess impacts are based on matrices that have been established by the Consultants over a long period. In the matrix, the consultants assign a likert-scale number to represent the magnitude, significance, duration and spatial extent of the potential impact for each project activity against the key environmental and socio-economic components that the specific project activity may have an impact on. The product of the

magnitude, significance, duration and spatial extent for each activity and component is summed up to measure the exact nature of the impacts by each activity and the overall impact of the proposed project is the sum of all activities.

The Terms of Reference (TOR) for this EIA has been attached as Appendix 1. This EIA has been prepared based on this term of reference.

2 Project Description

2.1 Introduction

The purpose of this section is to describe the project in terms of the need and justification of the project, location and boundaries of the project, project schedule, main inputs, project mobilization as well as project construction activities. In addition, this section presents materials and resources that will be used as well as the main output of the project.

2.2 Project Overview

The Institute for Security and Law Enforcement Studies (ISLES) is currently located in the congested Malé while several training programmes are undertaken in Addu City. Addu City has been used for training by Police for a number of years. The land allocated for the development of ISLES in Addu City has been handed over to Maldives Police Service in October 2014. Since then plans have been built to accommodate the required infrastructure such as buildings and sports facilities including a football field. Since the area is narrow, it was considered necessary to reclaim land and based on the design proposed initially, the western side was considered for reclamation.

On completion, the project will provide adequate space and necessary facilities for the training of police officers for the purpose of improving policing, security and law enforcement services in the Maldives.

2.3 The Proponent

The project is proposed by Maldives Police Service (MPS). MPS is the government agency responsible for the provision of security and law enforcement services in the Maldives. It is mandated with enforcing laws, specifically criminal and traffic law; maintaining peace and order; and minimizing crime and enhancing public safety. The organization and its functions fall within the mandate of the Ministry of Home Affairs.

2.4 Project Location and Boundaries

The project site is located at -0.633648° Latitude and 73.100307° Longitude on Rujjehera area south of Hithadhoo, Addu City. On the north of the site is the Hithadhoo Regional Port and on the south is the waste management site near Gaukendi. Further south is Hankende, where a City Hotel has been proposed. Rujjehere, Gaukendi and Hankende are currently uninhabited areas with vegetation and the Addu Link Road running through the three areas on the eastern side. These areas are narrow and remains as a connection between Hithadhoo and Maradhoo.

The project site is the area of Rujjehere between the Link Road and the western coast. Part of the western coast is proposed to be reclaimed to create sufficient width to place the proposed structures.

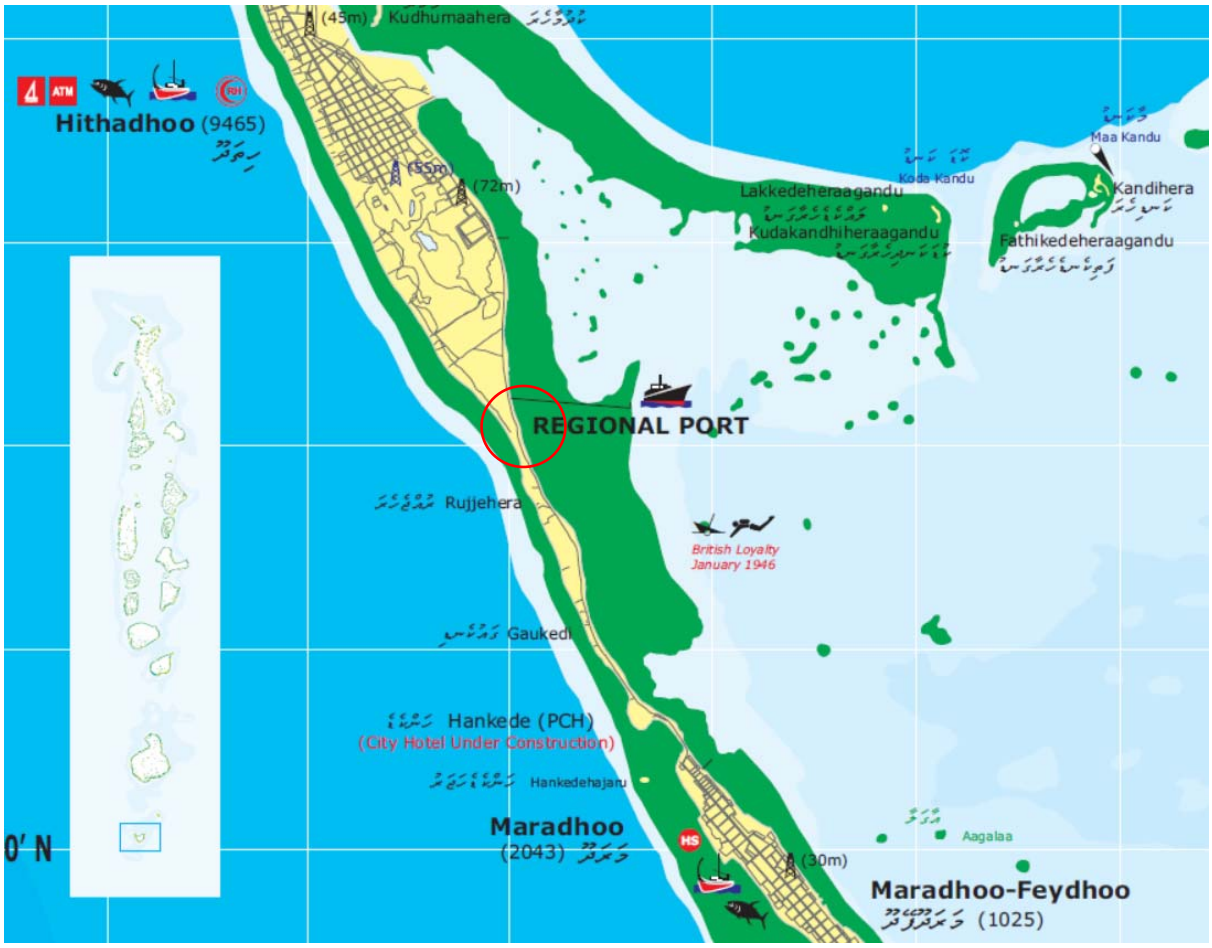


Figure 2-1: Project location

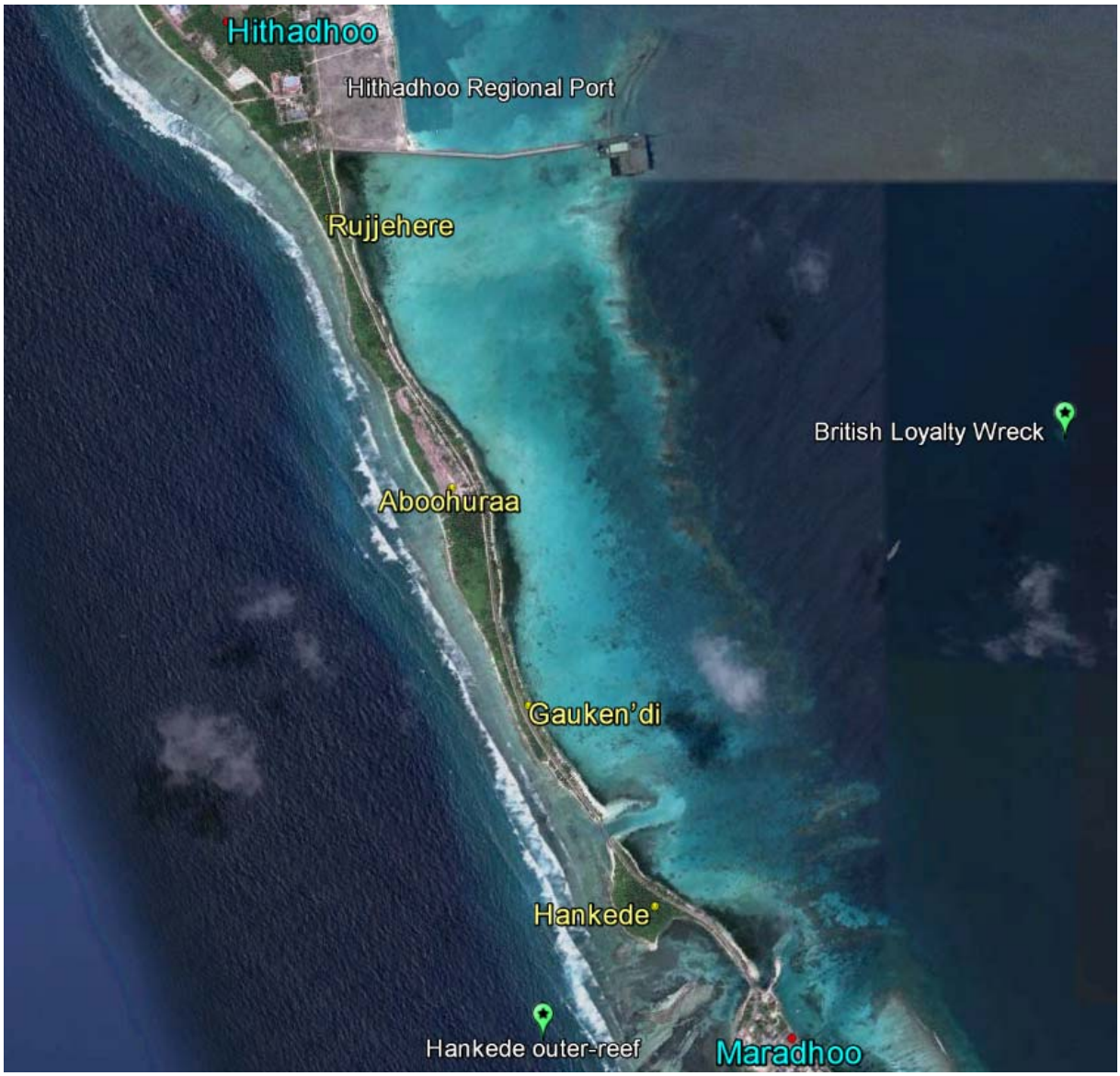


Figure 2-2: Aerial view of the project area

2.5 The Project

The proposed project involves the development of a Police Academy or The Institute for Security and Law Enforcement Studies (ISLES), as it is referred to. ISLES is currently operational in the congested city of Malé, with several difficulties in undertaking appropriate training programmes. Also, the different faculties of the Institute are dispersed in different areas of Malé. Therefore, it has been decided to provide the necessary infrastructure in Addu City at the Rujjehere area. The project is funded by the Government of India.

The proposed project is developed on a narrow strip of land at Rujjehere area of Addu City on the south of Hithadhoo Regional Port. An 83,680m^2 area has been allocated including a

35,000m^2 area that is proposed to be reclaimed. The reclaimed land is on the western side of the plot while the material can be borrowed from the eastern side lagoon. Therefore, the pipeline would have to be laid over the existing Addu Link Road on the eastern coast.

The proposed ISLES infrastructure comprises of academic buildings, auditoriums, admin building, visitor accommodation, staff accommodation, separate male and female student accommodation, mosque, sports facilities, gym, swimming pool, training areas and shooting range. In addition, support facilities including power, water, sewerage, waste management, and storage facilities will be developed as the area is remotely located.

2.5.1 Physical Infrastructure

The following infrastructure to support the proposed ISLES activities will be developed.

- Admin building
- Staff accommodation
- Student accommodation
- Visitor accommodation
- sports facilities
- gym, swimming pool
- training areas
- shooting range
- Power and RO Plant building
- Roads
- Fuel tank
- Water tank
- Waste management area
- Workshop/garage
- Fire-fighting equipment

2.5.2 Reclamation

It is proposed to reclaim about 35,000m^2 (3.5hectares) land on the western rim reef side. The reclamation will be undertaken by putting bunds at the periphery and separating discharge areas into cells to minimize sediment outflow. The borrow area is the shallow lagoon on the eastern side at about 300m from the shore. There will be a narrow (about 20m) channel that

will be dredged to allow dredger access. This channel would be used by MPS for access to the ISLES facility.

Two options were discussed with relevant stakeholders regarding the sand fill including pipeline installation for the fill. These are as follows.

Option 1: Pump to the eastern shore and move the material to the proposed fill location on the west using trucks.

Option 2: Lay the pipeline across the Link Road and lay a sandbed over the pipeline to allow vehicles to pass.

According to MPS personnel in Addu, Option 2 would be the most suitable since barricades and traffic control would be difficult due to lack of manpower and increased risk of safety when truck movements coincide with traffic flow on the highway. A sand bed allowing traffic flow temporarily is, therefore, considered most appropriate. The sand bed will be removed without any damage to roads, at the end of the reclamation works. Rock boulders and other materials can be moved site using existing roads and roads cleared as per proposed development plan.

The reclaimed land will be compacted and buildings or other infrastructure proposed for the area will be constructed immediately after reclamation and compaction.

2.5.3 Shore protection

Shore protection is proposed for the reclaimed area on the west. It is proposed to place a rock revetment all along the length of the reclaimed land. Imported rock boulders will be used. The design of the structure will be based on waves in the area including oceanic swells, bathymetry of the area, wave setup and other relevant data. The structure would be designed to absorb wave energy thus minimizing impact on downdrift locations. The scour behind the structure will be minimized using geotextile and/or other suitable material.

2.5.4 Machinery and equipment

During the construction stage, the following equipment and machineries will be used.

- Cutter suction dredger
- Excavator

- Loader
- Truck
- Crane

2.5.5 Revegetation and landscaping

Revegetation will be minimized. In fact, only those trees in the footprint of buildings will be removed. However, the reclaimed area would be landscaped using branches of trees that need to be removed/felled and by transplanting coconut trees that would be removed. If additional palms are required, they are proposed to be imported from India after approvals from relevant authorities.

2.5.6 Project management and environmental protection

The project will be managed by Maldives Police Service in corporation with the design and project management firm from India. A few temporary labour facilities including shelter with a small genset, water and fuel tanks (HDPE) with temporary septic tanks for sewage disposal. These structures will be removed as soon as the proposed accommodation facilities and utilities have been established.

There are no major environmental hazards with reference to the proposed project. However, the project will be undertaken with due care to the environment and with minimal disturbance to the natural environment. The labour force would be made aware of the fragile nature of the environment and the need to preserve the natural value of the project site. The project will also be designed to minimize the negative effects of the development on the environment.

Trees will be cleared only at the footprint of proposed buildings and other structures. Major vegetation would be preserved by planning buildings around them and any trees, especially coconut palms, that require removal would be transplanted in the reclaimed area. A small nursery area will be developed at the onset of the project for landscaping purposes.

To compensate for the removal of vegetation and for the purpose of landscaping the site including reclaimed area, coconut palms are proposed to be imported from India after obtaining necessary approvals from Indian authorities and the Ministry of Fisheries and Agriculture of the Maldives.

2.6 Environmentally Significant Activities

The main activities of the development that may have impacts on the environment are:

- Land clearance;
- Temporary facilities
- Equipment, machinery and tools
- Utilities including power, water, wastewater, waste and fuel;
- Fuel tanks
- Construction and operation of accommodation and public and recreational facilities;
- Reclamation
- Landscaping
- Emergency response

The following subsections looks at the details of these environmentally sensitive elements of the proposed project.

2.6.1 Land clearance

Site clearance will be one of the first activities during the construction stage. Vegetation clearing is required for about 36000m^2 (nearly 42% of the plot area); most of which will be existing clearance. Clearance of undergrowth in several areas has been undertaken recently but mature trees have been preserved. About 88 coconut trees and 33 other mature trees are estimated to be removed with a possibility of preserving most trees. Most of the palms would be transplanted to proposed reclamation area.

The undergrowth and grasses that were pulled out was sent to landfill. The number of mature plants that will be cut down will be monitored and recorded. This will guide the proponent to organize the activity of planting trees that was cut. Laws and regulations with regard to vegetation clearance will be strictly followed in this process.

The vegetation clearance will be undertaken with care to minimize removal of mature trees to the greatest possible extent. As has been in the past, areas will not be cleared during stakeout of the buildings and pathways to get the line of sight for stakeout. Instead, state of the art real-time GPS technology will be used to stakeout footprint areas of buildings and pathways. Furthermore, mature trees within the development footprint will be carefully replanted elsewhere, especially the proposed reclaimed area.

2.6.2 Temporary facilities

Temporary housing of labour will be considered at the onset of the project. Labour camps will be developed in the proposed staff areas. Temporary labour camps will be developed only on actual development footprint areas and other areas would not be cleared for temporary facilities. They would be located close to the western coast since reclamation on the western coast would be one of the first activities that would be undertaken.

Temporary facilities will be developed on areas where similar permanent structures such as powerhouse will be located. Therefore, utilities such as powerhouse, fuel tanks, desalination plant and waste management center will be developed at the early stages of construction. Septic tanks will be constructed at the onset in order to avoid possible health hazards. These septic tanks will be decommissioned and the material pumped to proposed sewerage system once the sewerage system is in place.

All constructional waste will be taken to specified area, segregated and sent to waste disposal site nearby. Constructional waste management procedures will be in place. Green waste may be mulched or composted on site and used to condition soil. Waste that cannot be used for composting will also be sent to landfill/waste disposal site.

2.6.3 Equipment, Machinery and Tools

In the construction phase key activities based on the proposed concept include site preparation, mobilization of materials and equipment, temporary accommodation and services for labour force, development of water supply, sewerage and power generation facilities, construction of buildings and other infrastructure, landscaping and demobilisation. Machinery and tools used for these activities would be in good condition and used under strict supervision. Heavy vehicles such as excavators, bulldozers and trucks would be kept in designated areas and existing or project specific paths would be used. No additional paths would be created for their movements.

The operational phase would not involve the use of heavy equipment greatly. However, the machinery and equipment used during operational phase such as desalination plants and generator sets would be energy efficient. Refrigerants would be to the requirements of the Montreal protocol (and circulars issued by the Ministry of Environment regarding the Montreal protocol from time to time).

2.6.4 Power and fuel

The facility will house 500kVA prime fuel oil generation sets. The generators will be installed early in the development according to the requirements of Maldives Electricity Regulation. The powerhouse will be an elevated building which will be constructed following proper building codes. The power will be distributed throughout the project site by well-established network.

Fuel will be stored on site about 10m from the power house and in appropriately bunded underground storage tanks to avoid any spill leaking into the ground. Fuel will be supplied by using a pipeline at the road. The tank will have a capacity of 25,000 litres. The entire fuel system will be built according to the requirements of the fuel handling and management regulation recently enforced by the Maldives National Defence Force.

Although diesel power generation will be considered, the facility will slowly invest in alternative energy, especially solar energy. To reduce the consumption of fossil fuel, LED lights will be used as much as possible in the facility.

2.6.5 Water supply

Since there is would be no proper groundwater lens formed in the plot due to the narrowness of the island, groundwater use is proposed to be restricted to the temporary facilities during the construction phase and groundwater use during the operational phase restricted to toilet flushing only. Therefore, a Reverse Osmosis (RO) desalination plant of $10m^3$/day will be installed and commissioned at very early stages of the development works. The 10ton plant may be installed at the onset of the project to meet construction phase water needs. It is proposed that intake for the RO Plants will be from a borehole. The brine will be discharged to a nearshore location on the western reef flat.

RO plant product water will be stored in two 10,000litre tanks installed close to the RO facility. RO production will only be done when required. Rainwater is not dependable due to weather-related scarcity issues, therefore, rainwater collection may not be given importance. However, rainwater tanks would be installed at the accommodation blocks to collect rainwater as backup or for emergency supplies. Rainwater and/or desalinated water would also be used for irrigation.

Desalination plants will be installed according to the requirements of the Maldives Desalination Regulation and all plants will be registered with the EPA once the EIA Decision Statement is received. Personnel working inside the RO plant premise will only be subjected to noise levels exceeding 85dB(A) at intermittent periods not exceeding half of an hour. This is acceptable by all international standards, yet ear muffs would be provided on site for personnel to use. Water quality will be tested using onsite water test meters for pH, Conductivity, free and residual chlorine regularly and samples sent to laboratory for analysis as required by EPA following the desalination plant registration, which will be done soon after the desalination plants are installed.

Waste mud arising from borehole drilling will be disposed by on-site burial, which is considered to be more appropriate than off-shore disposal.

2.6.6 Waste management

The proposed facility would produce a significant amount of green waste that may need to be appropriately managed. Waste such as stems, leaves and discarded fruit make up a huge component of waste generated. Most of this waste has already been taken to landfill. The mature trees that may be required to be removed would be cut down and branches planted in reclaimed area. Coconut trees would be transplanted from their location to the reclaimed area.

During the operational phase, most of the waste would be domestic in nature, while there would be institutional waste including paper and cardboard. These waste would be collected at the waste management area and sent to nearby landfill site. Waste management will be given priority and the policy will be to reduce, re-use and to recycle the waste as much as possible.

2.6.7 Sewerage system

At the construction phase, sewage will be discharged to septic tanks. These septic tanks would have a minimum of two tanks/chambers to achieve adequate clarification before discharging to ground. This will be a temporary setup used only during the construction phase. These tanks will be decommissioned with the contents pumped to the sewerage system that will be installed.

The proposed sewerage system will have gravity lines to deliver sewage and wastewater from all areas into a sewage treatment plant of capacity 85kl/day. Treated wastewater will be

pumped outside the reef using pumps in a pumping station. The pumping station will have two pumps of adequate capacity with one as a standby pump for operation when the primary pump fails. The wastewater will be pumped beyond the outer reef at over 7m depth, as per current guidelines.

Dewatering may be required during the installation of the pumping station, during which time any neighbouring trees that may be affected due to dewatering would be watered regularly. Dewatering is not expected to have any other impacts as there are no groundwater users in the vicinity of the project site.

2.6.8 Jetty

The major access facility for the project site would be from the jetty for the Regional Port. However, this jetty is expected to get busier day by day, therefore, a new jetty would be considered for the proposed ISLES facility. The jetty would reach to the proposed borrow area. The jetty will be constructed on concrete piles standing on concrete footings. Concrete slabs may be used on the top to allow vehicular movement for the transport of goods. Wood may also be used on the jetty deck.

The potential requirement for a harbour and harbour protection have not been considered at this stage. They will be considered separately. However, the borrow area would become the harbour basin or mooring area for the boats that will use this jetty. The jetty use would be limited since the project site is connected to the stretch of land from Gan International Airport to Hithadhoo by road. In fact, the need for the jetty may not arise until later.

2.6.9 Emergency Response Plan

As a means of addressing potential fire hazards, firefighting equipment that meets the requirements of National Fire Code will be developed with all necessary equipment including fire hydrants and fire extinguishers. Services of rescue with all necessary equipment will be made available. An emergency response plan will be developed with details of equipment, human resource and procedures. The following will be considered in the emergency response plan:

- Level of protection to be provided;

- Equipment - firefighting equipment (fire hydrants, fire extinguishers, etc.), rescue equipment (land and water), communication and alerting systems, oil spill containment
- Response time;
- Emergency access and evacuation procedures;
- Personnel and training requirements.

2.7 Project Duration

The first stage will concentrate on establishing a site office and power generation and water. Then temporary accommodation units and storage facilities will be set up. The site office and the temporary power house, accommodation units and storage facilities will all be erected in areas where the impact on vegetation would be the least. The development of the project facilities will then concentrate on installing the essential service plants and utilities and buildings.

The second stage of construction of the site will focus on constructing the accommodation blocks and other administrative infrastructure and the construction of the training facilities. The clearing of the areas would be done as per design and changes to the design may be brought in order to minimize the cutting down of trees.

The project is estimated to take 12 months to complete. Work is expected to start by late October after the EIA has been approved. A tentative work schedule is given in the Appendix.

2.8 Project Inputs and Outputs

The types of materials that will go into the development of the project is provided in the following tables.

Table 2-1: Major inputs during construction

Input resource(s)	Source/Type	How to obtain resources
Construction workers	Local and foreign	Mainly nearby islands/contractor's workforce
Engineers and site supervisors	Mainly Maldivians and Indian personnel	Advertise in local papers, social networks, etc.
Construction material	Electrical cables and wires, PVC pipes, light weight concrete blocks, reinforcement steel bars, sand, cement, aggregates etc.	Import and purchase where locally available at competitive prices - Contractor's

Input resource(s)	Source/Type	How to obtain resources
		responsibility.
Water supply	Rainwater, desalinated water, groundwater and bottled drinking water	Facilities at site except for bottled water, which will be purchased locally
Electricity/Energy (during construction)	Diesel	500kVA generators
Machinery	Excavators, trucks, concrete mixers, farming machinery, road levelling machinery	Import or hire locally where available
Food and beverage	Locally or imported	Mainly locally purchased
Firefighting equipment	Fire pumps, fire protection system, smoke detectors, carbon dioxide and foam fire extinguishers, etc.	Local suppliers
Fuel, kerosene and LPG	Light diesel, LPG gas, petrol, lubricants	Local suppliers

Table 2-2: Outputs during construction stage

Products and waste materials	Anticipated quantities	Method of disposal
Green waste from site clearance	Large quantity	Use to make compost or mulched on site and used for nursery and landscaping needs. Some of the appropriate-sized palms may be transplanted to other sites, such as reclaimed areas.
Construction waste (general)	Small quantities	Send to designated landfill nearby
Waste oil	Small quantities	Reused or sent to designated waste management site nearby
Hazardous waste (diesel)	Small quantities	Barrelled and sent to designated landfill as part of overall hazardous waste management programme of the facility

Table 2-3: Major inputs during operational stage

Input resource(s)	Source/Type	How to obtain resources
Personnel (staff and students)	Local and foreign, mainly local	Recruiting agencies, advertise in local papers for courses, select from current recruits, etc.
Maintenance material	Electrical cables and wires, PVC pipes, light weight concrete blocks, sand, cement, aggregates, machinery spare parts, farm	Import or purchase locally where available
Water supply	Rainwater, ground water and bottled drinking water	Purchase locally
Electricity/energy	Diesel	20kVA generators
Machinery	Vehicles used for transport and drills	Imported
Refrigeration and air conditioning	Air conditioners	Local suppliers
Food and beverage	Mainly imported sources except a few locally available products	Import and purchase locally
Firefighting equipment	Fire pumps, fire protection system, smoke detectors, carbon dioxide and foam fire extinguishers, etc.	Local suppliers
Fuel, Kerosene and LPG	Light diesel, LPG gas, petrol, lubricants	Local suppliers

Table 2-4: Major Outputs during operational stage

Output(s)	Source/Type	Disposal Method
Potable water	RO Plant product water; Recyclable glass bottles will be used; PET bottle sold from staff shop (very small quantity)	RO water supplied to showers and other areas; Plastic Bottles – designated landfill; Glass - Reused
Non-potable water (Irrigation, gardening/ landscaping, flushing)	2,000 litres per day during dry season and 1200 litres per day during rainy season	Ground water, recharging the aquifer and rainwater collection
Sewage and wastewater Grey water/laundry wastewater	Not more than 150 litres/person/day	Secondary treatment using a treatment plant and clarified effluent disposed to ocean outfall
General/domestic waste	Small amount	Sent to waste management site nearby
Food and kitchen waste	Small amount	Sent to waste management site nearby
Waste oil and grease	Small quantity	Incinerated or reused by local people or sent to waste management site for appropriate disposal
Scrap metal/cans/plastics	Small amount (<1kg per day)	Sent to waste management site nearby or sold to locals
Paper and cardboard	Moderate quantity	Sent to waste management site nearby
Green wastes	<30 kg per day	Composted on site and used as fertilizer or sent to waste management site nearby

2.9 Need and Justification

Maldives Police Service has been playing an important role in the development of the Maldives. It has been focusing on its development to improve operational standards. With that objective, the Institute for Security and Law Enforcement Studies (ISLES) had been formed with several ambitious programmes targeted at development of the Police Service. The Institute targets to achieve international best practices through training people in the law enforcement sector. ISLES has been providing several courses that is geared at continuing to educate law enforcement officers while developing and enhancing their skills and knowledge and establishing best practices and leadership.

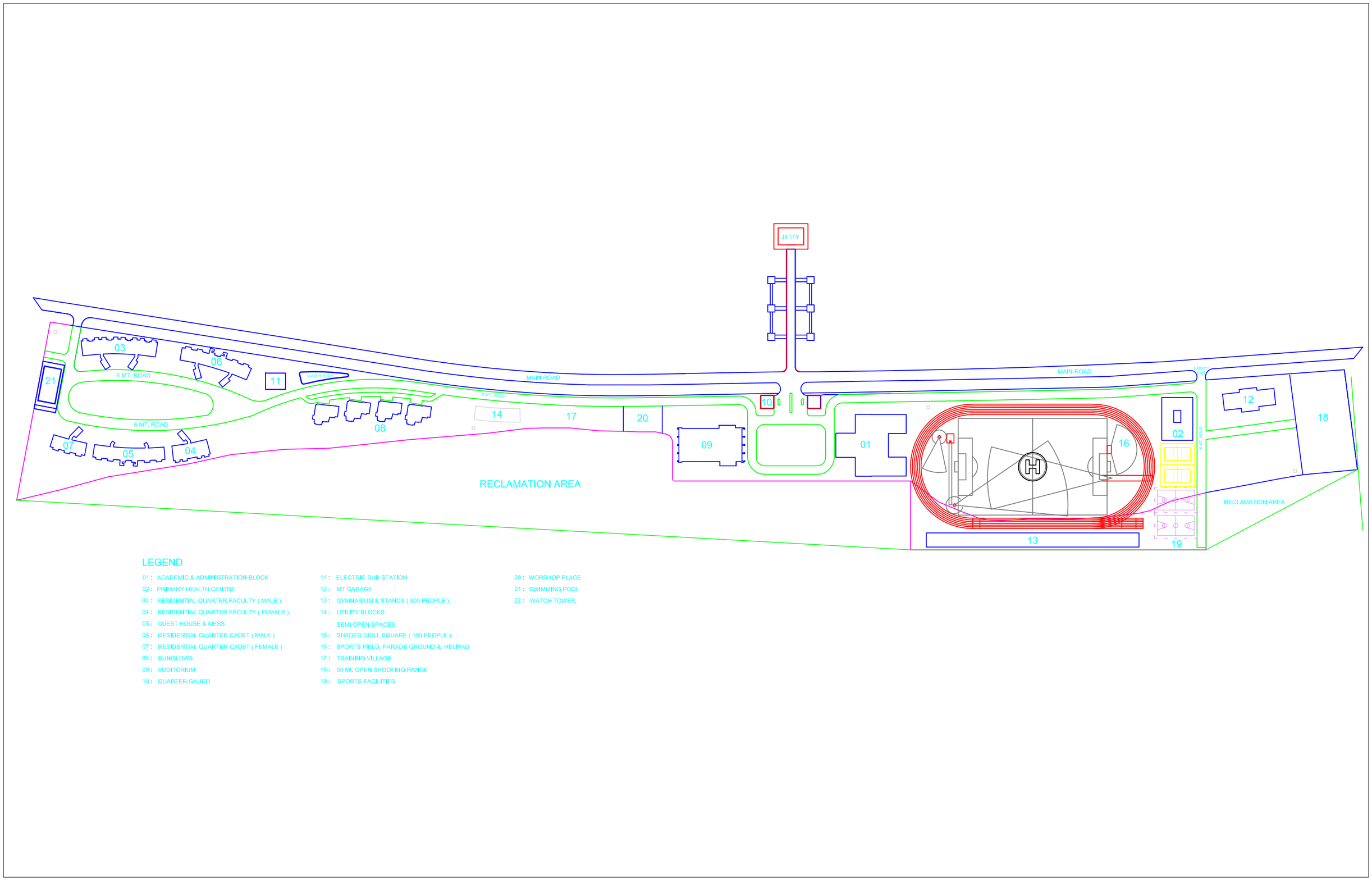
After the separation of Maldives Police Service and Maldives National Defense Force, Law Enforcement Training Center, later Police Academy, which has changed to Institute for Security and Law Enforcement Studies was established to train Maldives police officers.

Institute for Security and Law Enforcement Studies (ISLES) is responsible for the operational and tactical training for Maldives police officers.

With limited resources the recruit training was started in K. Maafushi and Lh. Madivaru. For the further development of training, Addu Training School was established in 2008. In the incident of 8th February 2012 Addu Training School was burnt and beyond repair. After this incident, with a very limited resources, recruit training was started in Lh. Madivaru, which is one of MNDF bases, but they had some obligations to let MPS use their facility on long term basis. So, MPS had to leave Madivaru after training just 2 batches of officers and move to Dh. Vaanee which was abandoned by its inhabitants and moved to nearby islands due to difficulties at this Island. However, ISLES have been conducting their trainings on Vaanee with limited facilities and under harsh conditions. Therefore, it is important that the facility is established at an appropriate location. Addu City, which is the second largest population of the Maldives with rapidly improving infrastructure and services provides such a venue and has been used for previous training programmes.

ISLES is currently affiliated with relevant parties locally and internationally. The Indian government has been an important party in the development of the law enforcement sector of the Maldives. As such, the proposed Addu Police Academy or Institute for Security and Law Enforcement Studies will be developed by a grant aid from the Indian Government and with the support of an Indian project management team.

Figure 2-3: Proposed development concept



LEGEND

01 : ACADEMIC & ADMINISTRATION BLOCK
02 : PRIMARY HEALTH CENTRE
03 : RESIDENTIAL QUARTER FACULTY (MALE)
04 : RESIDENTIAL QUARTER FACULTY (FEMALE)
05 : GUEST HOUSE & MESS
06 : RESIDENTIAL QUARTER CADET (MALE)
07 : RESIDENTIAL QUARTER CADET (FEMALE)
08 : BUNGLOWS
09 : AUDITORIUM
10 : QUARTER GAURD
11 : ELECTRIC SUB STATION
12 : MT GARAGE
13 : GYMNASIUM & STANDS (800 PEOPLE)
14 : UTILITY BLOCKS
SEMI OPEN SPACES
15 : SHADED DRILL SQUARE (100 PEOPLE)
16 : SPORTS FIELD, PARADE GROUND & HELIPAD
17 : TRAINING VILLAGE
18 : 50 Mt. OPEN SHOOTING RANGE
19 : SPORTS FACILITIES
20 : WORSHOP PLACE
21 : SWIMMING POOL
22 : WATCH TOWER

3 Legislative and Regulatory Considerations

The development of the proposed ISLES or Police Academy at Addu City is governed by national legislative frameworks, administrative frameworks and mandates. This section will identify the pertinent legislation, regulations and standards, administrative considerations 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 proposed project is expected to conform to all of the policy and regulatory aspects outlined here. This section outlines and summarizes key policies, applicable laws and regulations and regulatory bodies regarding environmental protection. Also, it outlines some international and regional obligations that the country has to meet in terms of sustainable development, environmental management and protection as well as safety.

The proposed project will be subject to the key regulations including Environmental Protection and Preservation Act (No. 4/93) of Maldives and EIA Regulations. Thus, it must satisfy the EIA process and get approval before the project can be implemented. The legal framework pertaining to the proposed Project is also aimed at sustainable development, impact mitigation and conservation of the country's natural resources. The main national legislative frameworks relevant to this proposed project and proposed compliance arrangements are summarized below.

According to Environmental Impact Assessment Regulations, an Environmental Impact Assessment is required for all development projects, especially those involving dredging and reclamation. Hence, this report has been prepared.

3.1 Policy Guidance

The policy guidance on the development of the proposed project is taken from a number of policy documents prepared by the Government of Maldives on sectoral developments. Key documents outlined in this EIA are currently being implemented towards sustainable development of the country.

3.1.1 Third National Environment Action Plan

NEAP 3 sets out the agenda for environmental protection and management in the Maldives for the five-year period 2009-2013. This plan is targeted to achieve measurable environmental results that matter to the people of the Maldives.

The aim of developing NEAP 3 is to protect and preserve country's environment and properly manage natural resources for sustainable development of the country and encompasses ten principles, six strategic results with targeted goals to be achieved under each result.

The key principles of the NEAP 3 are:

Principle 1: Environmental protection is the responsibility of every individual

Principle 2: Achieve results

Principle 3: Promote and practice sustainable development

Principle 4: Ensure local democracy

Principle 5: Inter-sectoral co-ordination and co-operation

Principle 6: Informed decision making

Principle 7: Precaution first

Principle 8: Continuous learning and improvement

Principle 9: Right to information and participation

Principle 10: Environmental protection complements development

The six strategic results of NEAP3 are: resilient islands; rich ecosystems; healthy communities; safe water; environmental stewardship; and a carbon neutral nation with 30 result oriented environmental goals that will be achieved in the span of the NEAP 3.

3.1.2 Maldives National Strategy for Sustainable Development

The Maldives National Strategy for Sustainable Development (NSSD) outlines the key objectives, principles and goals that the country will embark toward achieving sustainable

development. Hence, the overall direction of the NSSD is to build a nation which appreciates the true value of the natural environment, utilizes its natural resources in a sustainable manner for national development, conserves its limited natural resources, has built the capacity to learn about its natural environment and leaves a healthy natural environment for future generations.

The guiding principles outlined in the NSSD are:

Principle 1: Promotion and protection of fundamental human rights

Principle 2: Equity within and between generations

Principle 3: Democratic and open society

Principle 4: Full participation of businesses and civil society

Principle 5: Policy coherence and coordination

Principle 6: Use best available knowledge

Principle 7: Precaution first

Principle 8: Make polluters pay

While the country will be steered in accordance with the underlying principles of NSSD, the country aims to achieve very important environmental goals, including; adapting to climate change, protecting coral reefs, achieving carbon-neutrality in energy, ensuring food security, establishing a carbon neutral transport system, protecting public health and achieving full employment and ensuring social security.

3.1.3 Waste Management Policy

As waste management has been identified as a key environmental issue in the Maldives, a National Solid Waste Management for the Republic of Maldives was developed in 2007 and amended in 2015 as an important step towards mainstreaming waste management in the country. The key strategic principles outlined in the document include; establishing polluter pay principles, integrated solid waste management, best practice environmental option (BPEO), best available technology not entailing excessive costs (BATNEEC), proximity principle and private sector participation. It is an important priority of the Government of

Maldives as identified in the policy document to setup regional waste management facilities and island waste management centres and decentralizing waste management administration.

Establishing a proper mechanism of waste management and disposal will be vital for the overall operation of the project and the waste management practices both during construction and operation of the project will closely adhere to the policies and principles taken as a priority of the government.

3.2 Regulatory Bodies

3.2.1 Ministry of Environment and Energy

The primary environmental institution in the Maldives is Ministry of Environment and Energy (MEE). It is mandated with formulating policies, strategies, laws and regulations concerning environmental management, protection, conservation and sustainable development. The Minister of Environment or a designate (currently EPA) gives the environmental approval or clearance to EIA by an Environmental Decision Statement. Additionally, MEE is responsible for formulating relevant laws and regulations, policies and strategies concerning environment, energy, water and sanitation, waste and infrastructure.

3.2.2 Environmental Protection Agency (EPA)

EPA is the key regulatory body on environment, which is an autonomous body formed under the umbrella of MEE. It is mandated with implementing the EIA process in the Maldives, implementing the Environment Act and subsequent regulations on behalf of MEE, regulating water and sanitation, biodiversity conservation, waste management and coastal zone management. Also, it is responsible for developing environmental standards and guidelines in the country.

3.2.3 Ministry of Defence and National Security

The Ministry of Defence and National Security (MNDF) is responsible for the regulation of import and use of hazardous materials and substances into the country including ammunition, fireworks and gunpowder as well as laboratory and other hazardous chemicals. The Ministry also regulates the supply, storage and management of fuel in the country. The National Fire Code is also developed and implemented by the Ministry.

3.2.4 Atoll/City Councils and Island Councils

Under the Maldives Decentralization Law, elected Atoll Councils, City Councils and Island Councils have been formed as regulatory bodies dealing directly with atoll, cities and island issues. In this regard, some of the development projects are subject to approval of these councils through a public consultation process. For the proposed project, EPA requires that a copy of the final draft of the EIA Report be submitted to City Council and receipt provided to EPA or attached to the EIA report. In the case of Malé and Addu City, these roles of the Councils have been taken over by the Ministry of Housing and Infrastructure and a copy shall be sent to the Ministry.

3.3 Laws and Regulations

There are a number of laws and regulations relating to environment in the country. Only relevant laws and regulations have been outlined in this section.

3.3.1 Environmental Protection and Preservation Act

The Environmental Protection and Preservation Act of the Maldives, EPPA (Law No. 4/93) provides the basic framework for environmental management including Environmental Impact Assessment (EIA) process in the Maldives, which is currently being implemented by EPA on behalf of MEE.

Clause 3 of the EPPA mandates the Ministry of Environment to formulate policies, rules and regulations regarding the environment.

Clause 5 of this Act specifically provides for environmental impact assessment (EIA), a tool implemented to attempt to integrate environmental issues into development decisions. According to the Clause, environmental impact assessments are a mandatory requirement for all economic development projects.

Clause 6 of the EPPA gives the Ministry of Environment the authority to terminate any project that has an undesirable impact on the environment.

Clause 7 of the EPPA refers to the disposal of oil, wastes and poisonous substances in to the Maldivian territory. According to this clause, any type of waste, oil, toxic gas or any substance that may have harmful effects on the environment should not be disposed within the

Maldivian territory. If, however, the disposals of such substances become absolutely necessary, the clause states that they should be disposed only within the areas designated for that purpose and if incinerated, appropriate precautions should be taken to avoid harm to the health of the population.

Furthermore, clause 9 sets a fine between five and five hundred Rufiyaa for minor offenses in breach of this law and a fine of not more than one hundred million Rufiyaa for major offenses. The fine shall be levied by the Ministry of Environment or by other government authorities designated by that Ministry in case of minor offenses.

Finally, Clause 10 of EPPA gives the government of the Maldives the right to claim compensation for all damages caused by activities that are detrimental to the environment.

The Environmental Act or Law 4/93 is the single most important legal instrument with regards to environmental management and it gives very high prominence towards safeguarding the environment with regard to all the development activities. Under this Act, the Ministry of Environment have developed regulations and guidelines concerning the environmental protection through implementation of EIA procedures.

3.3.2 Environmental Impact Assessment Regulation 2012

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 EIA is subjected to the EIA Regulations 2012.

The EIA Regulation 2012 is currently only in Dhivehi and an official translation is awaited. 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 and reclamation is among those.

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.

3.3.3 Land Act

The land Act of the Maldives (Law No. 1/02), formulated in 2002, makes legal provisions for releasing of lands for different needs, releasing of public land for housing and the conditions that govern the owning, selling, renting and transfer of ownership of public and private land. T has been leased according to the requirements of the Land Act.

3.3.4 Regulation on Uprooting, Cutting and Transportation of Palms and Trees

The Regulation on cutting down, uprooting, digging out and export of trees and palms from one island to another was issued by the Ministry of Environment in 2006. The primary purpose of the Regulation is to control and regulate large-scale uprooting, removal, cutting and transportation of palms and trees from one island to another. According to the regulation, certain types of trees and plants that have unique attributes are prohibited to be removed from its natural environment. Also, uprooting and removal of 50 or more mature trees and palms are subject to environmental impact assessment (EIA), which is required to be submitted to the Environmental Protection Agency and written approval is required prior to implementation of the project.

Clause 5 (a) of the Regulation states that prior to the commencement of any project(s) that would require the indiscriminate removal and transplanting of trees/palms from one island to another for the purpose of agriculture, development/redevelopment, construction or any other purpose, it is mandatory under the Regulation to prepare an Environmental Impact Assessment report.

Article 8 (a) requires permission be obtained from Ministry of Environment, if more than 10 coconut palms that are of a six of 15 ft (from base of the palm to the tip of the palm frond) are cut, uprooted or relocated to another island. The regulation also ensures the replacement of the vegetation that is lost by imposing the planting of two palms for every palm tree that is cut or uprooted (Article 2 (d)). Logging on inhabited islands must be done under supervision of the islands chief or an official appointed by the island chief (now Island Council) (Article 8 (c)).

This regulation also provides particular protection to the following:

- coastal vegetation extending 15 meters into the island;

- all trees and palms growing in and within 15m around mangrove and wetland areas;
- all trees and palms growing in protected areas; and
- trees and palms that are unique in shape, structure or character

The proposed project does not involve large scale removal of mature trees although a large area covering vegetation would have to be cleared. The sports field and other areas will undergo indiscrete removal or 100% clearance while most of the other areas will have the matures trees preserved. Of those trees that require removal, some may have to be cut while most of the coconut palms will be transplanted at the reclaimed land. There are no protected trees in the project area.

3.3.5 Hazardous Substances Act

Under the Hazardous Substances Act, prior written consent is required from the Ministry of Defense and National Security for import of chemicals to the country. The following information has to be submitted to the Ministry for approval of the chemical to be imported to the country:

- Name of the chemical (in English),
- Common name and principal trade name of the chemical,
- Use (as insecticide/fungicide/rodenticide),
- Country where it is being imported from,
- Amount that needs to be imported,
- Reason for the import, and
- If the chemical is retailed, name of the retailer.

Import of Class A chemicals into the country is banned and are listed in Table 3-1

The Proponent shall obtain prior written consent of the Ministry for the import of chemicals, if the proponent decides to use any in future expansions (at present proponent does not plan to use any imported chemicals under this project). In addition, the Proponent shall not import chemicals listed in Table 3-1.

Table 3-1: Import-Banned Class-A Chemicals

Common Name	Trade Name
Insecticides/Acaricides	
Aldrin	Aldrex, Aldrite
Chlrodane	Chlorotox, Octachlor, Pentichlor
Endvin	Hexadrin
Dieldrin	Dieldrex, Dieldrite, Octalox
DDT (dichloro diphenyl trichloroethane)	Neocide, Pentachlorin, Chlorophenothate
Heptachlore	Dromex, Heptamol, Heptox
Mirex	
HCH (<99% gamma isomer)	Hexachlorohexane
Hexachlorobenzene	
Camphechlor	Toxaphene, Polychloro camphene
Nitrofew	
1,2 Dibromoethane	
1,2 Dichlorothane	
Monocrotophos	
Bromocholoromethane (CH2BrCl)	
Methylbromide (CH2Br)	
Fungicides	
Mercury Compound (Hg)	
Selenium Compound (Si)	
Rodenticides	
Talium Compounds	
Herbicides	
2,4,5T	Brochfox, Decamine Veon

3.3.6 Desalination Regulation

Desalination Regulation (2002) states that all sea water desalination plants installed and intended to supply water to 200 or more people or large scale agricultural needs or tourism related activity need to be registered prior to the operation of the plant. Therefore, it would be necessary to consider the impacts of desalination plant in this EIA so that registration can be done without further environmental scrutiny. Desalination plant registration is required to be renewed every five years. Therefore, regular monitoring shall be ensured in order to carry out and efficient renewal process.

3.3.7 Dewatering Regulation

Dewatering regulation (2013/R-1697) was published on 31 December 2013 and became effective from 1 February 2014. The Regulation covers the following:

- Exceptions under the Regulation including dewatering for cleaning household wells and extraction for agricultural purposes.
- Application for dewatering permits including application form, information required such as size, water quality, work schedule, method of dewatering and disposal location.
- Fees for dewatering permits including MVR500.00 for administrative fees, MVR500 per day for the first 28 days, MVR1000 per day for first extension, MVR1500 per day for second extension and MVR 2000 per day for third extension.
- Water quality testing requirements including parameters that has to be tested.
- Provision of information (in writing) regarding dewatering to entities within 30m from the dewatering location and ensuring that in case of difficulty in getting water from neighbouring wells, providing 250litres or RF30 as compensation for each household.
- Provisions for disposal of dewatering effluent.
- Reporting requirements.
- Procedures for termination of work and fines levied.

This regulation is of relevance since dewatering would be required. Hence this regulation will be strictly adhered to and dewatering would be undertaken in a planned manner to avoid impacts as well as cost minimization.

3.3.8 Borehole Specifications and Guidelines

Borehole Drilling Technical Specifications and Guidelines were issued by EPA dated 25 September 2011. The Guidelines covers drilling of boreholes and installation of electric pumps for source water extraction for various water supply development projects. The Guidelines state that boreholes shall be drilled at the location(s) designated by the client in consultation with Environmental Consultant and Environmental Protection Agency (EPA). It is also stated that care must be taken in handling and storage of all drilling fluids, oils, greases and fuel on site, to avoid any environmental pollution, damage and degradation. Any toxic materials, drilling fluids and other additives, cuttings and discharged water shall be disposed in a manner that do not cause damage to the environment, public and private property.

According to the Guidelines, the in-land borehole depth shall be more than 30m even if the electrical conductivity of discharge water has reached 50-60mS/cm before reaching 30m depth. If electrical conductivity of discharge water at 30m depth is measured less than 50-60mS/cm, drilling shall continue until electrical conductivity reaches to 50-60mS/cm. This aspect of the Guidelines has raised concerns especially with reference to boreholes at the periphery of the island where, according to renowned hydro-geologists, the freshwater lens may not exist and therefore shallower depths may be considered. Further studies are proposed under the scope of the proposed project in order to determine the exact nature of this.

The Guidelines also provide guidelines for the different records that ought to be made during the drilling process. For monitoring purpose, boreholes drilled shall provide water sampling tubes at the interval of 5m from top to bottom. Water quality testing that may be necessary to be performed upon completion of the borehole has also been indicated in the Guidelines.

3.3.9 Regulation on provision of Electricity to Male and outer islands

The regulation details all the aspects of electricity services provision which includes the registration of the service provider, agreement between service provider and customer, sub-contracting the service provision, breaches to the agreement, discontinuation of electricity services, fines with regard to any breach of regulation, tariff formulation, technical specification for power house construction, control room, switch board, distribution feeder, distribution network, house connections and wiring standards. Relative to the proposed project, it is mentioned in the Article 8.6 that the ventilation of the powerhouse must be such that when all the engines are operational, the difference in temperature inside and outside the powerhouse must be less than 10C compared to ambient temperature. To achieve this, the proposed project aims to regulate the temperature by establishing a sea water cooling system which will circulate water around the generator sets. All the articles of the regulations are understood and will be abided by throughout the project cycle.

3.3.10 Powerhouse Registration Guidelines

Guidelines for the registration of powerhouses have been issued by the Maldives Energy Authority recently. According to these Guidelines, all power plants need to be registered and environmental clearance is required prior to registration. Therefore, this EIA will look at the

environmental aspects of power generation proposed for ISLES in order to assist the powerhouse registration process.

3.3.11 Regulation on Environmental Damage Liabilities

Under the Environmental Protection and Preservation Act (No. 4/93), the Ministry of Environment formulated the Environmental Damage Liabilities Regulation in February 2011, which encompasses the basis to avoid environmental deterioration, extinction of biological resources, environmental degradation and avoid wastage of natural resources. The main purpose of this regulation is to stop unlawful activities on environment and adequately implement a fining procedure for violations as well as implement a compensation mechanism on environmental damages. Its Schedules form the basis for levying fines on various environmental components and activities. Hence, the proposed project will be subject to this Regulation for any activity outside of the EIA scope and Environmental Decision Statement.

3.3.12 Dredging and Reclamation Regulations

The Dredging and Reclamation Regulations was gazetted on 2 April 2013 as Regulation No. 2013/R-15. This regulation is currently in Dhivehi and an English translation is awaited. 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. Under the current practice EPA will accept the EIA application with the EIA report or during or prior to EIA application.

Clause 7 provides the conditions for dredging, clause 8 for reclamation and clause 9 for beach nourishment or beach enhancement. Clause 9 is of specific relevance to beach nourishment projects. Clause 9(a) states that beach nourishment shall be done up to 10m from the registered shoreline. Clause 9(b) identifies that sand for beach nourishment shall be taken from an area (borrow area) that is not prohibited under clause 13 of the Dredging and Reclamation Regulation. 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 EPA. Clause 13(f) gives the EPA the authority to restrict borrowing sand from those locations from which dredging or borrowing sand has been approved earlier, if the EPA 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 to the EPA. Clause 18 gives the EPA 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.

This regulation is of relevance to the proposed dredging and reclamation component of the proposed project. The borrow and fill areas indicated meet the requirements of the Regulation.

3.3.13 Regulation on Fuel Storage, Handling and Usage

The Regulation on Fuel Storage, Handling and Usage (2015/R-160) came into effect recently on 12 August 2015. The following clauses of the regulation may be of relevance to the proposed project.

Clause 4 deals with installation, registration and inspection of fuel storage facilities. The following sub-clauses in this clause are of relevance.

a. Fuel storage facilities shall be established according to the Regulations and shall have appropriate fire safety and protection systems.
b. All fuel storage facilities shall be registered with the Ministry of Defense and National Security as per the Regulations

c. The Ministry reserves the right to inspect the facilities prior to registration and every six months thereafter in the presence of the Developer or Developer's designate. In case of rectification

Clause 6 considers the requirements of petrol storage facilities. This may not be of relevance to the proposed project.

Clause 11 states the design requirements for fuel/petrol storage tanks/containers. The maximum capacity allowed for underground tanks is given as 40,000litres. The containers/tanks should be separate from other buildings such as convenience stores. Requirements for overhead tanks are also provided.

Clause 12 discusses about the requirements for petrol dispensers and filling points and Clause 13 prohibits keeping wet cells, acids and pressurized containers in petrol sheds or petrol storage areas.

Clause 14 to Clause 17 states the requirements for the installation of diesel and kerosene storage and handling facilities. These are similar to those for petrol sheds and handling facilities.

Clause 18 discusses the requirements for fuel delivery line. Fuel delivery lines are required to be kept underground and the pipes are required to conform to BS EN10025 and BS EN10296 or similar international standards. The delivery line is required to be buried at safe depth from ground within a trench that can contain the entire volume of the pipeline in case of breakage.

Clause 19 provides definitions and clause 20 penalties. The penalties vary from fines of MVR5000 to MVR25000 and withdrawal or cancellation of permits depending on the severity of the offense.

3.3.14 Design Criteria and Specifications for Sewerage

Design criteria and specifications for sewerage systems have been recently updated and adopted. These include design standards, testing requirements, submittals and drawing standards, impact analysis procedures and service fee requirements. Some important considerations are that:

- All buildings shall be connected to sewer lines
- Storm water drainage can be deviated to sewers with special permission

- Sewerage system design shall allow for sewage resulting from future landuse and new reclamation, the design period being 35 years.
- Sewerage systems shall be designed with a single outfall. If multiple outfalls are required, pumping stations shall be provided
- All systems shall have a bypass sea outfall
- An operation and maintenance manual shall be furnished for all sewerage projects

Since its implementation, the Design Criteria has been used by engineers in designing sewerage systems for the islands of the Maldives. There has been an increase in awareness about the Design Criteria and discussions with or reviews from engineers and other technical personnel working in the sector has been helping to address current concerns and improve the specifications.

This document has been recently updated and is called the Design Criteria and Final Technical Specifications for Sewerage Systems (Gravity System). The document can be downloaded from the EPA website. This document provides specifications for the design of the sewerage system including material specifications, depth of excavation, pipe laying and quality control requirements.

3.3.15 National wastewater guidelines

The Maldives adheres to WHO guidelines for its drinking water standards. However, due to the small size of the islands and the time water remains within the waterworks, free chlorine levels have been set below WHO guideline values. This adjustment has been made mainly due to public complaints of chlorine levels in their drinking water but has not been technically justified. Therefore, this has been recently revised.

Currently, there are no surface water quality standards for the Maldives, but this issue has been addressed in the "Guidelines for Domestic Wastewater Disposal" in the Maldives. The pristine nature of the Maldivian waters requires high standards to be met. Given the existing concerns of raw sewage disposal and wastewater disposal within the coastal zone, there should be surface water quality standards that ensure that the pristine state of the coastal waters of the country as a whole is not affected.

Effluent quality standards have not been fully developed in the Maldives. Some standards were recently drafted by a South African consultants' team. These were disclosed for internal

use and comments in January 2007 as National Wastewater Quality Guidelines. These guidelines were publicized on MEEW website in 2008 along with a Water and Sanitation Policy Statement but were later removed and never used and made public. Later in May 2010, EPA discussed with stakeholders draft documents developed with technical assistance from JICA in which some effluent quality standards were laid down. However, none of these documents have been finalized and made available to the public until recently when EPA published the National Wastewater Guidelines of 2007 on their website. In this guideline it is stated that "deep sea discharge in context of the Maldives means discharge of waste water beyond the shallow reef and at a depth which will ensure proper dispersion and rapid dilution. Deep sea discharge does not imply discharge of waste water inside the atoll". Therefore, for reference, the maximum allowable concentrations given in Table 6.1 of the Guidelines are suggested, especially for any potential future treatment involving sea outfalls.

3.4 International and Regional Context

3.4.1 Environment Sector

The major global issue facing the Maldives is climate change, global warming and subsequent sea-level rise. The small size of the islands and their low elevation above MSL makes possible impacts of it very seriously. Consequently, the country plays a prominent role in fore-fronting environmental issues faced by many other small islands developing states including the Maldives in the international arena. The Maldives is therefore, a party and signatory to various international conventions and declarations. These include;

- UN Convention on the Law of the Sea – UNCLOS (1982)
- International Convention for the Prevention of Pollution of the Sea by Oil (1982)
- Vienna Convention for the Protection of the Ozone Layer (1985)
- Montreal Protocol on Substances that Deplete the Ozone Layer (1987)
- Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal (1989)
- The London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (1990)
- Agenda 21 and the Rio Declaration of the United Nations Conference on Environment and Development (1992)

- Convention on Biological Diversity (1992)
- United Nations Framework Convention on Climate Change (1992)
- The Copenhagen Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (1992)
- The Montreal Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (1997)
- The Beijing Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (1999)
- Washington Declaration on Protection of the Marine Environment from Land-Based Activities
- Kyoto Protocol to the UN Framework Convention on Climate Change (1998)
- Cartagena Protocol on Biosafety (Maldives acceded on 2 September 2002)
- United Nation Convention to Combat Desertification (2002)

The Maldives is also a key player in formulating and adopting various regional plans and programmes to protect the environment by continuously participating in various activities organized by regional bodies such as SACEP, ESCAP and SAARC. As a result, the Maldives is committed to the following;

- SAARC Environment Action Plan adopted in 1997 in Male'
- SAARC Study on Greenhouse Effect and its Impact on the Region
- South Asian Regional Seas Action Plan and Resolutions concerning its implementation (1994)
- SAARC Study on Causes and Consequences of Natural Disasters, and
- South Asian Seas Programme initiated by SACEP
- Malé Declaration on Control and Prevention of Air Pollution and its likely Transboundary Effects for South Asia (1998)

4 Existing Environment

4.1 Introduction

Conditions of the existing environment of the study area were analysed by using appropriate scientific methods. Field surveys were undertaken to get further understanding of the existing environment of the project site. These surveys were carried out during field visit to the project site in June and August 2016 to collect baseline data. Before the trip was undertaken all existing information regarding the site was gathered including concept plan.

The following components of the existing environment were assessed;

- Existing landuse
- Coastal environment including longshore and offshore currents using drogue, and beach profiles
- Marine environment at affected locations
- Marine water quality
- Terrestrial environment including ground water, flora and fauna.
- Socio-economic aspects

4.2 Methodologies

The environmental components of the study area were divided into marine, coastal and terrestrial resources. The marine environment of the site is affected by the proposed dredging component only while the impacts of sewage disposal would be almost negligble. The coastal environment covered the beaches, the beach rock formations and coastal processes including longshore sediment transport, nearshore currents, tides and wave climate. The terrestrial environment covers the existing vegetation of the project site and related fauna.

The different methods used in assessing and reporting the conditions of the existing environment of the project site are given in the following subsections.

4.2.1 Location identification

The location of data collection sites has been marked using handheld GPS. Figure 4-20 shows the data collection and sampling locations.

4.2.2 Water Quality

One of the main environmental components that would be affected by implementing the project would be water quality. Water quality was assessed in-situ for most of the parameters using an YSI handheld water quality logger and Hach portable turbidity and TSS meter. Water quality was assessed at different locations within the impact zone. Water testing was also undertaken for ground and marine location identified as control survey locations.

All water samples were taken at a depth of 1m from the mean sea level or mid water depth for shallow areas marine locations and practical depths for groundwater. GPS coordinates of each water sampling location was taken. The samples were analysed for the following parameters as indicated in the environmental monitoring manual issued by the EPA recently.

Table 4-1: Water quality parameter optimum conditions

PARAMETER	OPTIMAL RANGE	REFERENCE
TEMPERATURE	18ºC and 32ºC Changes should not surpass 10C above the average long term maximum	GBRMPA, 2009
SALINITY	3.2% - 4.2%	GBRMPA, 2009
PH	8.0-8.3 Levels below 7.4 pH cause stress	
TURBIDITY	3-5 NTU >5 NTU causes stress	Cooper et al. 2008
SEDIMENTATION	Maximum mean annual rate 3mg/cm2/day. Daily maximum of 15mg/cm2/day	GBRMPA, 2009
NITRATES	<5 mg l-1 NO3-N	UNESCO/WHO/UNEP, 1996
AMMONIA	Max. 2-3 mg l-1 N	UNESCO/WHO/UNEP, 1996
PHOSPHATE	0.005 - 0.020 mg l-1 PO4-P	UNESCO/WHO/UNEP, 1996
SULPHATE	2 mg l-1 and 80 mg l-1	UNESCO/WHO/UNEP, 1996
BOD	< 2 mg l-1 O3	UNESCO/WHO/UNEP, 1996
COD	< 20 mg l-1 O2	UNESCO/WHO/UNEP, 1996

Samples that were brought for laboratory testing were taken to the MWSC laboratory.

4.2.3 Currents and Waves

A purpose built drogue integrated with Trimble Juno GPS was released at selected locations, especially the main impact areas to understand general longshore currents around the project site including those areas outside the project site that was identified by EPA in the Scoping Meeting. Several drogues were done. Repetitive long term measurements at the same locations would help to understand the general current patterns that will be used in assessing impacts as well as designing long-term shore protection measures.

Wave data was based on secondary sources and tide data on long term tide data available with the Gan Meteorological Center.

Long-term monitoring of the coastal processes such as currents, wind and waves could be undertaken at regular intervals in order to understand shore protection needs especially the erosion on the southern end where the erosion may affect the proposed structures.

4.2.4 Bathymetry

Bathymetry of relevant areas of the project site was carried out by Sandcays during the field visit using a GPS integrated Sonarmite. This was done for the purpose of the EIA, as detailed bathymetry has not been made available.

4.2.5 Terrestrial Ecology

The other main environmental component that would be affected by implementing the proposed project would be terrestrial flora and fauna. These were assessed for the entirety of the project site by positioning each and every tree using differential GPS. This was possible because the project site was cleared of low bush and the mature trees were easily accessible.

The assessment of the fauna was largely qualitative as protected or unique terrestrial fauna were not observed during the field visits. The types of fauna seen at the project site would be often identified and classified into categories based on their abundance; rare, common or very common. However, no significant fauna was observed, therefore, a faunal survey was not undertaken.

4.3 General meteorological conditions

The Maldives, in general, has a warm and humid tropical climate with average temperatures ranging between 25°C to 30°C (MHAHE, 2001) and relative humidity ranging from 73 per cent to 85 per cent. The country receives an annual average rainfall of 1,948.4mm. Table 4-2 provides a summary of key meteorological findings recorded for Maldives.

Monsoons of Indian Ocean govern the climatology of the Maldives. Monsoon wind reversal plays a significant role in weather patterns. Two monsoon seasons are observed: the Northeast (*Iruvai*) and the Southwest (*Hulhangu*) monsoon. Monsoons can be best characterized by wind and rainfall patterns. These are discussed in more detail in the following subsections.

The southwest monsoon is the rainy season which lasts from May to September and the northeast monsoon is the dry season that occurs from December to February. The transition period of southwest monsoon occurs between March and April while that of northeast monsoon occurs from October to November. However, according to Elliot *et al,* 2003 due to proximity to the equator, the monsoon seasons in Maldives are not as well defined as they are in Sri Lanka. The monsoons in Maldives are best defined in the northern part of the country where a distinct monsoon seasons including the strong southwest monsoon from June through September and a noticeable northeast monsoon from December through February occurs.

Table 4-2: Key meteorological information

Parameter	Data
Average Rainfall	9.1mm/day in May, November 1.1mm/day in February 1900mm annual average
Maximum Rainfall	184.5 mm/day in October 1994
Average air temperature	30.0 ^{0}C in November 1973 31.7 ^{0}C in April
Extreme Air Temperature	34.1 ^{0}C in April 1973 17.2 ^{0}C in April 1978
Average wind speed	3.7 m/s in March 5.7 m/s in January, June
Maximum wind speed	W 31.9 m/s in November 1978
Average air pressure	1012 mb in December 1010 mb in April

The climate of the Maldives varies slightly from South to North of the country. As pointed out by Elliot *et al,* 2003 the monsoon in north region is more pronounced and distinct. In Maldives, meteorological data are not recorded in all islands across Maldives. It has been recorded regional airports. General meteorological conditions prevailing in the region based on meteorological data for Gan has been used to understand climatic factors affecting the project site. Table below shows summary of four seasons in Maldives.

Table 4-3: Summary of Seasons in the Maldives

Season	Months
North East-Monsoon (Iruvai)	December to February
Transition Period - 1 (HulhanguHalha)	March to April
South West Monsoon (Hulhangu)	May to September
Transition Period - 2 (IruvaiHalha)	October to November

4.3.1 Temperature

The temperature of Maldives varies little throughout the year with a mean daily maximum temperature of about 32°C and mean low of 26°C and are rarely below 25°C or above 33°C.

The highest temperature ever recorded in the Maldives was 36.8°C, recorded on 19 May 1991 at Kadhdhoo Meteorological Office. Likewise, the minimum temperature ever recorded in the Maldives was 17.2°C, recorded at the National Meteorological Centre on 11th April 1978. The highest recorded temperature for Male' was 34.1°C on 16th and 28th of April 1973. The hottest month of the year is usually April reaching a peak around 24 April.

The figure below represents daily average low (blue) and high (red) temperature with percentile bands: inner band from 25th to 75th percentile and outer band from 10th to 90th percentile (source: weatherspark.com) based on the historical records from 1998 to 2012 at Hulhulé weather station.

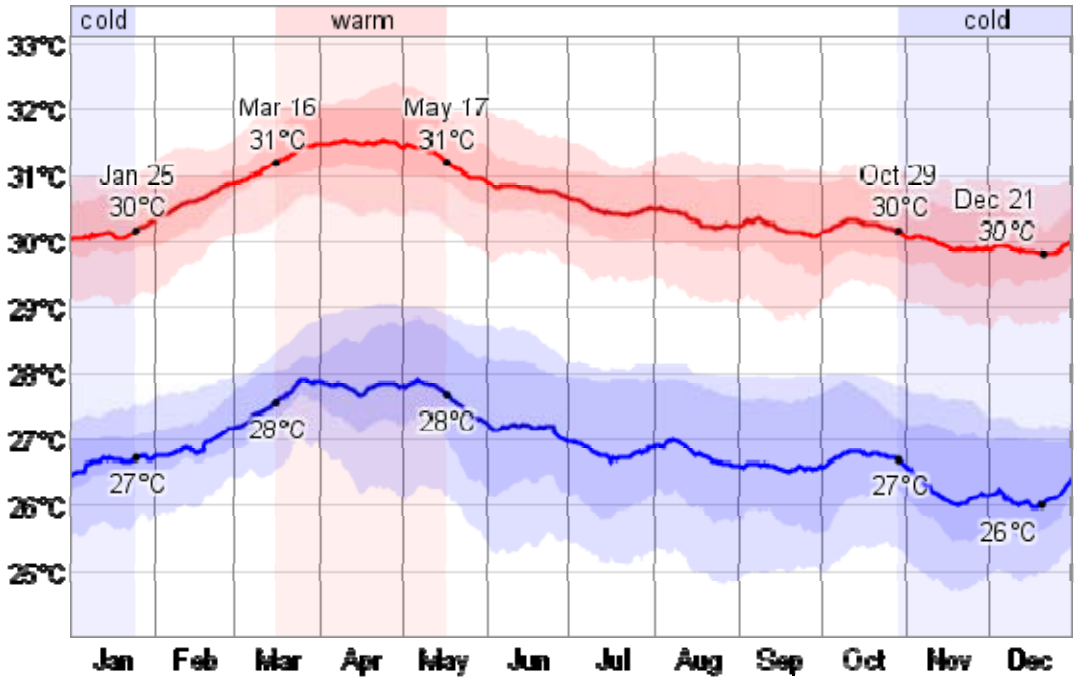


Figure 4-1: Daily average temperature for Central Maldives with percentile bands

The hottest day of the last 12 months was January 5, with a high temperature of 38°C. For reference, on that day the average high temperature is 30°C and the high temperature exceeds 31°C only one day in ten. The hottest month of the last 12 months was April with an average daily high temperature of 32°C.

The longest warm spell was from January 9 to January 30, constituting 22 consecutive days with warmer than average high temperatures. The month of June had the largest fraction of warmer than average days with 93% days with higher than average high temperatures.

The coldest day of the last 12 months was July 9, with a low temperature of 24°C. For reference, on that day the average low temperature is 27°C and the low temperature drops below 25°C only one day in ten. The coldest month of the last 12 months was November with an average daily low temperature of 27°C.

The longest cold spell was from February 24 to March 5, constituting 10 consecutive days with cooler than average low temperatures. The month of December had the largest fraction of cooler than average days with 48% days with lower than average low temperatures.

4.3.2 Rainfall

Annual average rainfall in the Maldives is about 1900mm. There is a marked variation in rainfall across Maldives with an increasing trend towards south. The annual average rainfall in north is 1977mm and for south is 2470mm. The southwest monsoon is known as the wet season with monthly average rainfall ranging from 125-250mm. The northeast monsoon is known as the dry season with average monthly rainfall of 50-75mm.

The following figure illustrates the likelihood that precipitation may occur at some point in the day on a given day, based on the historical records from 1981 to 2012 at Hulhulé weather station (weatherspark.com).

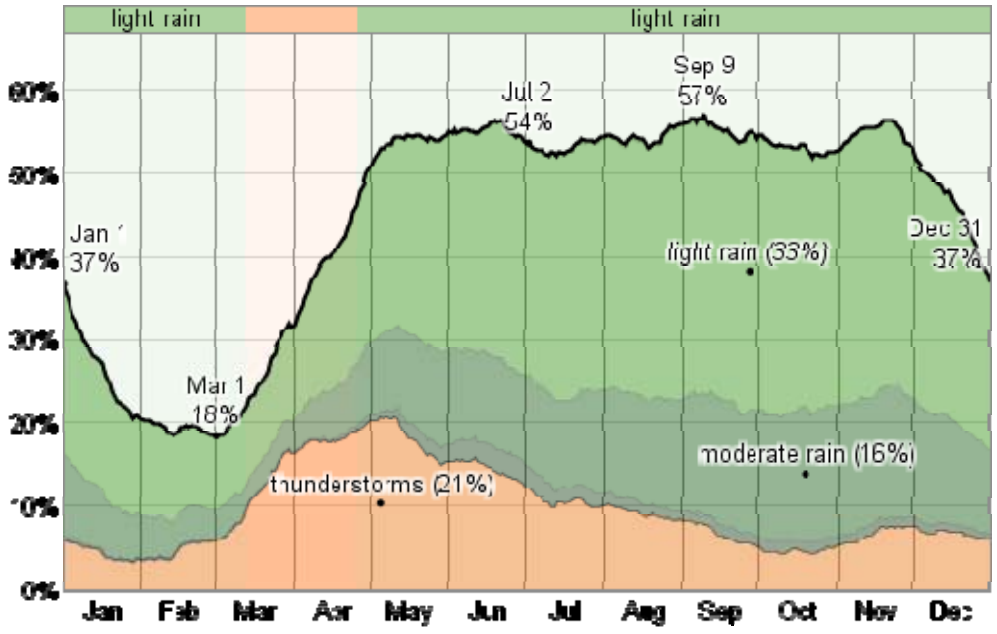


Figure 4-2: Probability of precipitation at some point in the day for Hulhulé, Maldives

4.3.3 Wind

Wind has been shown to be an important indirect process affecting formation development and seasonal dynamics of the islands in the Maldives. Winds often help to regenerate waves that have been weakened by travelling across the reef and they also cause locally generated waves in lagoons. Therefore, winds are important here, as being the dominant influence on the sediment transportation process (waves and currents). With the reversal of winds in the Maldives, NE monsoon period from December to March and a SW monsoon from April to November, over the year, the accompanying wave and current processes respond accordingly too. These aspects have ramification on the seasonal sediment movement pattern on the islands and also the delivery/removal of sediments from the reef platform/island.

The two monsoon seasons have a dominant influence on winds experienced across the Maldives. These monsoons are relatively mild due to the country's location close to the equator and strong winds and gales are infrequent. However, storms and line squalls can occur, usually in the period May to July; gusts of up to 60 knots have been recorded at Male' during such storms.

Wind was uniform in speed and direction over the past twenty-plus monsoon seasons in the Maldives (Naseer 2003). Wind speed is usually higher in central region of the Maldives during both monsoons, with a maximum wind speed recorded at 18 m/s for the period 1975 to 2001. Maximum wind speed recorded in the south was 17.5 m/s during the period 1978 to 2001. Mean wind speed was highest during the months January and June in the central region, while wind speed was in general lower and more uniform throughout the year in the southern region. Wind analysis indicated that the monsoon was considerably weaker in the south (Naseer, 2003). During the peak months of the SW monsoon, southern regions have a weak wind blowing from the south and south-eastern sectors.

Figure 4-3 summarizes the wind conditions in the region throughout the year and Figure 4-4 provides the wind-rose diagram typical to Addu City (windfinder.com). This analysis represents wind data from Gan International Airport taken between 07/2002 and 04/2016 from 0700 to 1900hrs local time.

Month of year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
	01	02	03	04	05	06	07	08	09	10	11	12	1-12
Dominant wind direction													
Wind probability >= 4 Beaufort (%)	2	2	5	17	23	9	10	10	12	20	29	13	12
Average Wind speed (kts)	5	5	5	8	8	7	7	7	8	8	8	8	7
Average air temp. (°C)	29	29	30	30	30	30	30	29	29	29	29	29	29

Figure 4-3: Summary of general wind conditions in Addu City

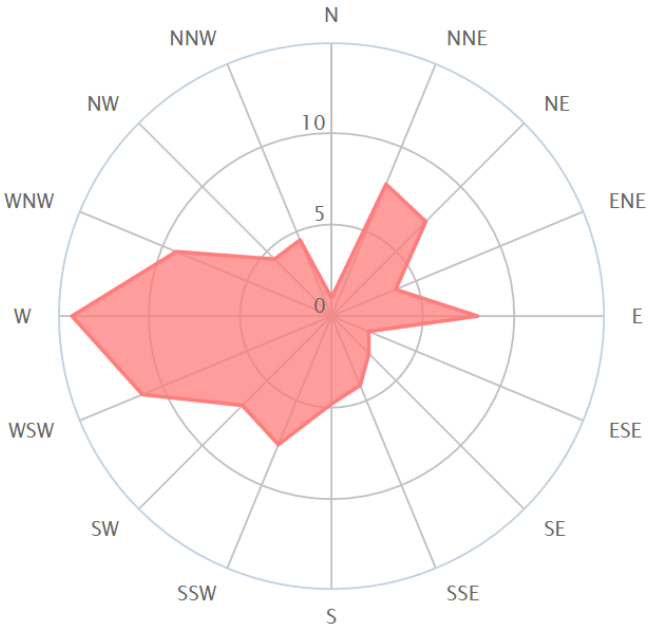


Figure 4-4: Windrose diagram based on data from Gan International Airport

Figure 4-5: Maximum monthly wind speeds (in mph) for the South in 2015

4.3.4 Humidity and Evaporation Rates

Based on data obtained from Hulhulé weather station over a period of 14 years from 1998 to 2012 given in Figure 4-6 (weatherspark.com), the relative humidity typically ranges from 68% (mildly humid) to 93% (very humid) over the course of a year, rarely dropping below 61% (mildly humid) and reaching as high as 100% (very humid).

The air is *driest* around February 26, at which time the relative humidity drops below 71% (humid) three days out of four; it is *most humid* around November 30, exceeding 89% (very humid) three days out of four.

Over the course of a year, the dew point typically varies from 23°C to 27°C and is rarely below 21°C or above 28°C.

Open water evaporation and transpiration from vegetation are very high. The high rates of evaporation and transpiration, especially owing to global warming, may be considered to add further to the evaporation rate and cause sea levels to fall in the future (Morner *et al* 2004). Evaporation rates are influence by wind, temperature and humidity and level of particulates in the air, studies of pan evaporation rates may yield misleading results as pan evaporation rates are influenced by the amount of sunlight hitting the pan, rather than other meteorological factors (Dawson and Spannagle 2009).

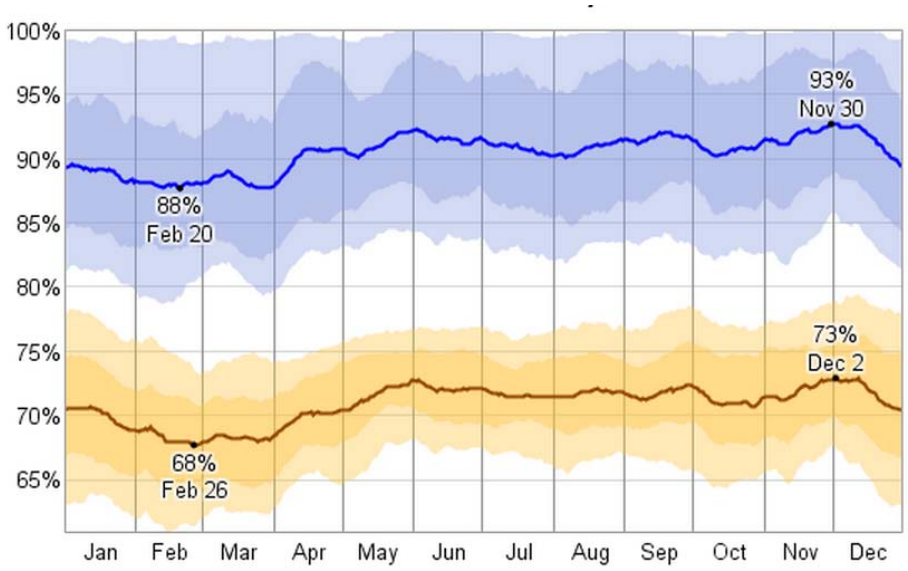
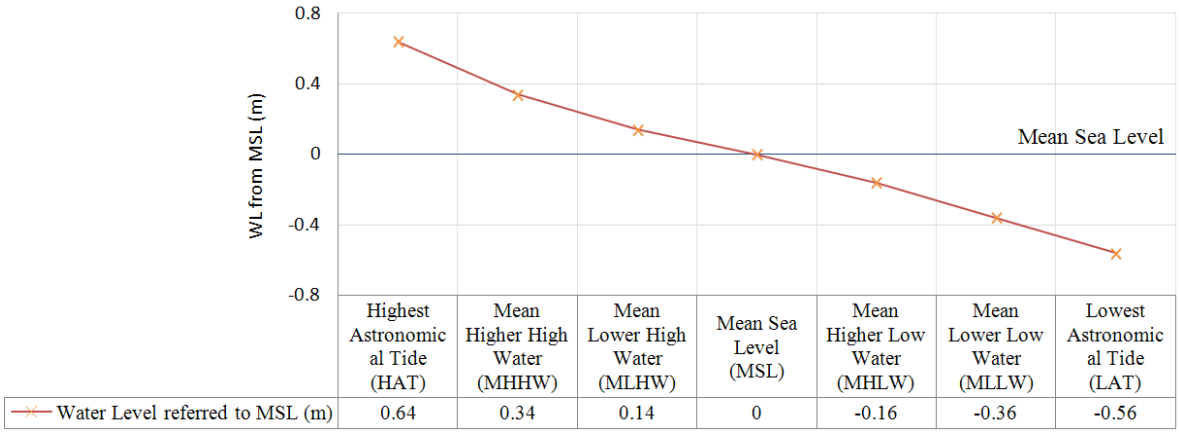


Figure 4-6: Relative humidity over a period of 1 year

4.3.5 Tides

The Maldives experiences mixed semi-diurnal/diurnal type of tides which on two extreme ends of the country (North to South) found varying tidal range. The tide at Hanimaadhoo, HDh. Atoll is about 20cm lower than that recorded in Gan, Seen Atoll (MHAHE 2001). Tides affect wave conditions, wave-generated and other reef-top currents. Tide levels are believed to be significant in controlling amount of wave energy reaching an island, as no wave energy crosses the edge of the reef at low tide under normal conditions. In the Maldives, where the tidal range is small (1m), tides may still have significantly important influence on the formation, development, and sediment movement process around the islands. Tides would play an important role in lagoon flushing, water circulation within the reef and water residence time within enclosed areas.



	Highest Astronomical Tide (HAT)	Mean Higher High Water (MHHW)	Mean Lower High Water (MLHW)	Mean Sea Level (MSL)	Mean Higher Low Water (MHLW)	Mean Lower Low Water (MLLW)	Lowest Astronomical Tide (LAT)
Water Level referred to MSL (m)	0.64	0.34	0.14	0	-0.16	-0.36	-0.56

Figure 4-7: Astronomical tidal variation in the Maldives

Based on the above tide table, the proposed western side where the fill takes place would be generally flushed at all tides except low tide when the reef flat at the area is dry. Therefore, good flushing occurs at mean and high tides. Hence, it is best to undertake the filling of the periphery at low tide.

4.3.6 Currents

Studies on current flow within a reef flat in Malé Atoll suggests that wave over-wash and tides generate currents across the reef platforms, which are also capable of transporting sediments (Binnie Black & Veatch 2000). However, available information suggests that tidal currents are not strong due to small tidal range.

Generally current flow through the Maldives is driven by the dominating two-monsoon season winds. Westwardly flowing currents are dominated from January to March and eastwardly from May to November. The change in currents flow pattern occurs in April and December. In April, the westward currents flow are weak and eastward currents flow will slowly take place. Similarly, in December eastward currents flows are weak and westward currents will take over slowly.

Studies on current flow process within a coral atoll have shown that waves and tides generate currents across the reef platforms, which are capable of transporting sediments on them. Currents, like waves are also modified by reef morphology. Under low-input wave conditions (0.5m heights) strong lagoon ward surge currents (>60cm/sec) are created by waves breaking at the crest. Studies on current flow across reef platforms have shown that long-period oscillations in water level cause transportation of fine-grained sediments out of the reef-lagoon system, while strong, short duration surge currents (<5sec.) transport coarse sediments from the breaker zone to seaward margin of the back reef lagoon. Always sediment accumulates at the lee of high-speed current zones. Generally, zones of high current speed (jets or rips, 50-80cm/sec) are systematically located around islands.

Drogue studies were undertaken at site and the results are shown in Figure 4-20. Aspects relating to currents have a direct impact on the project, especially in understanding the movement of sediment plumes and the design of coastal protection measures and future changes to shore protection measures, if required. Therefore, long term monitoring of currents is important.

4.3.7 Bathymetry

Bathymetry of relevant areas of the site is given in Figure 4-21.

4.4 Geology and geomorphology

Island formation theories suggest that the Maldives was formed around prehistoric volcanoes in Indian Ocean which has gone extinct. As the ocean floor subsided with the volcano, corals began to populate and grow around it forming a fringed reef. As ages passed the reef slowly became a barrier reef enclosing a shallow lagoon inside. The volcanoes disappeared and the coral continued to grow. Slowly as material eroded from the reefs they got collected on the shallower reefs and the sand banks became tiny islands.

According to geological formation, the stretch of islands from Hithadhoo to Gan have been formed over time due to strong swells from the western side causing large coral shingles or boulders to be moved ashore, creating the necessary conditions for the formation of several islands. The gaps between the islands have been connected in the recent years by constructing causeways. The causeways also help to create the inter-tidal flow between the inner and outer atoll waters, which is necessary for a closed atoll like Addu Atoll.

The western side is also raised by over 1m from the height of the eastern side. The topographic surveys undertaken by Sandcays indicate that the average elevation on the western side is about 2.2m above MSL while that on the eastern side is about 1.2m. Surveys undertaken by Shaig (2012) for the north end of Hithadhoo indicated a western rim of about 3m while the eastern rim is about 1m above MSL. The soil profile of the western side comprised of a thin humus layer formed from decaying leaves and plant matter, followed by about half a metre of dark soil with the soil getting coarser and whiter until it reaches the water table at about 2.6m below the ground surface. On the eastern side, the water table is at about 1m from the surface with thinner layers of coralline sand (Shaig 2012).

While the large landmass of Hithadhoo has two low lying areas or wetlands, known locally as *kilhi*. The kilhi on the North is a protected area. There are no such inundations or large variations in the topography of the Rujjehere area where the proposed ISLES or Police Academy will be developed.

In recent centuries, Maldives may have slightly suffered from the increase in global sea levels, which has been averaging about 1mm to 1.5mm/year. This is because all islands of the Maldives are about a metre or two above mean sea level. As sea level rises relative to a beach, there is an inevitable tendency for the shoreline to move inland. In future, according to most climate scientists, the consequences of atmospheric pollution, and hence global warming, may cause an acceleration of the increase in mean sea levels around the world. As a consequence, large parts of the coast of Maldives may begin to experience a net increase in sea levels. However, there are also theories (Mörner *et al* 2004) that support that a reduction in sea level may occur around equatorial zones as a result of global warming and subsequent increases in sea surface evaporation.

4.4.1 Beach Environment

There is no beach on the western side, where the proposed reclamation would occur. This area has rocky reef flat and beach rock on the coastline. The coast has been severely eroded and largely hit by incoming swells. On the other hand, the eastern side has a large beach formed in the lee of the reclaimed section of the Regional Port. The condition of the coastline of the project site is shown in Figure 4-24.

The coastal vegetation belt is dominated by Dhiggaa (*Hibiscus tiliaceus*), ruh (*Cocos nucifera*), Kuredhi (*Pemphis acidula*), Magoo (*Scaevola taccada*) and Boakashikeyo (*Pandanus tectorus*) on all areas on the eastern side. On the western side, Ruh (*Cocos nucifera*), iron wood (Pemphis acidula) and Magoo (*Scaevola taccada*) dominates the coastal vegetation. These plants are typical of a Maldivian island; most of these trees are very tolerant to saline water and serve as protection against erosion by retaining sand within its root system.

4.5 Water quality

4.5.1 Marine water quality

Marine water quality has been measured from the location of the channel or reef survey location and the shallow lagoon on the east of the site. The water quality testing was done using handheld water quality meters.

Table 4-4: Marine water quality results

	Units	Site 1	Site 2
Coordinates	UTM	336111m E 580444m N	335558m E 579944m N
Temperature	°C	30.01	29.90
Electrical conductivity	µS/cm	54320	53960
TDS	mg/l	33940	33900
Salinity	ppt	34.86	34.88
DO	mg/l	5.7	4.6
pH		8.03	8.12
Turbidity	NTU	1.61	2.21
TSS	mg/l	0	0

These indicate the coastal waters of the project area are in pristine condition as far as the tested parameters are concerned.

4.5.2 Ground Water Quality

Ground water quality has been measured from two locations inside the project site, including the proposed powerhouse area and a control point away. The water quality results (in-situ as well as laboratory testing) are given in Table 4-5.

Table 4-5: Ground water quality results

	Units	Site 1	Site 2
Coordinates	UTM		
Temperature	oC	28.62	28.32
Electrical conductivity	µS/cm	1120	987
TDS	mg/l	734	605
DO	mg/l	2.10	2.65
pH		7.82	7.35
Turbidity	NTU	0.32	1.97
TSS	mg/l	0	0
Nitrates	mg/l		
Phosphates	mg/l		
BOD	mg/l		
Faecal Coliform	MPN/100mL		
Total Coliform	MPN/100mL		

The ground water lens has not been properly formed at this narrow area of the long stretch, however, the groundwater is not very saline, as can be seen from the table above.

4.6 Ecology

4.6.1 Marine Protected Areas and sensitive sites

There are 2 Environmentally Sensitive Areas (marine) on the south and east of the site at about a distance of 2km and a landbased ESA on the north of the site. The British Loyalty Wreck on the east of the site and Hankede outer reef on the west of Hankede have been considered as ESAs. They are shown below.

Figure 4-8: ESAs or MPAs within the vicinity of the project site

4.6.2 Marine Survey

The house reef of Hithadhoo can be regarded as significantly low with few live coral patches. The existing live corals are under stress due to high sedimentation. There were signs of abundant life, especially at the transect areas 2 and 3 that had been surveyed. Five locations were surveyed altogether. Two transection from proposed reclaim area, one trnasect from proposed borrow area and two transect from reef edge.

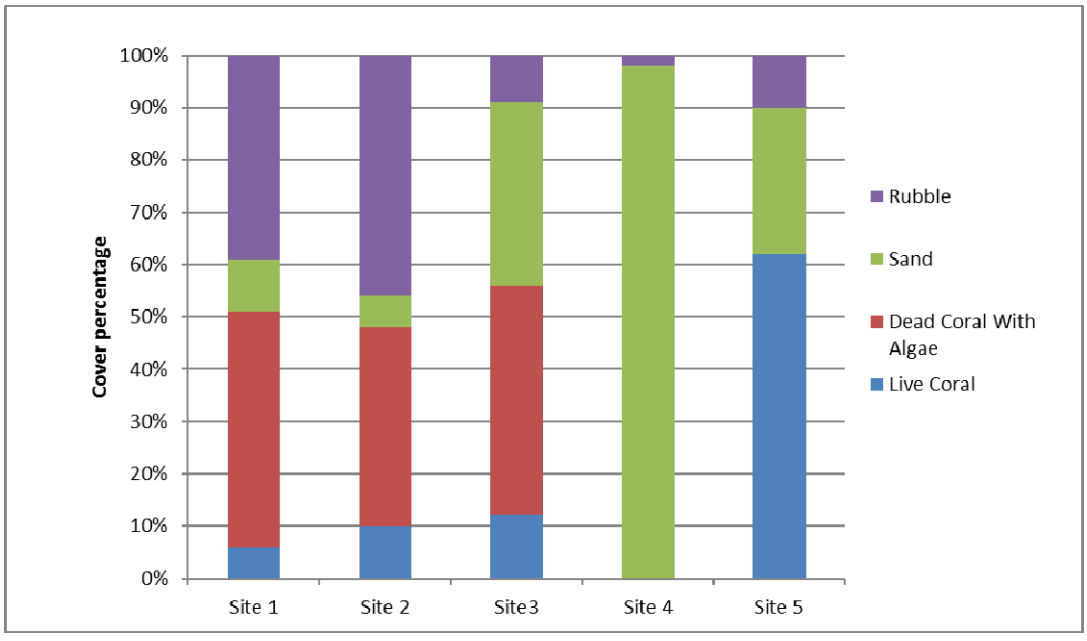


Figure 4-9: Benthic cover around the housereef near proposed project area

Below are the findings of the reef transects undertaken during the survey.

4.6.2.1 Site 1

Transect 1 was placed about 100m east side on the reef flat. Majority of the live corals found at this site were that of *Acropora* genus and *Porites* spp (Figure 4-10). A fair amount of fish was also seen at this location during the time of this survey (Table 4-6).

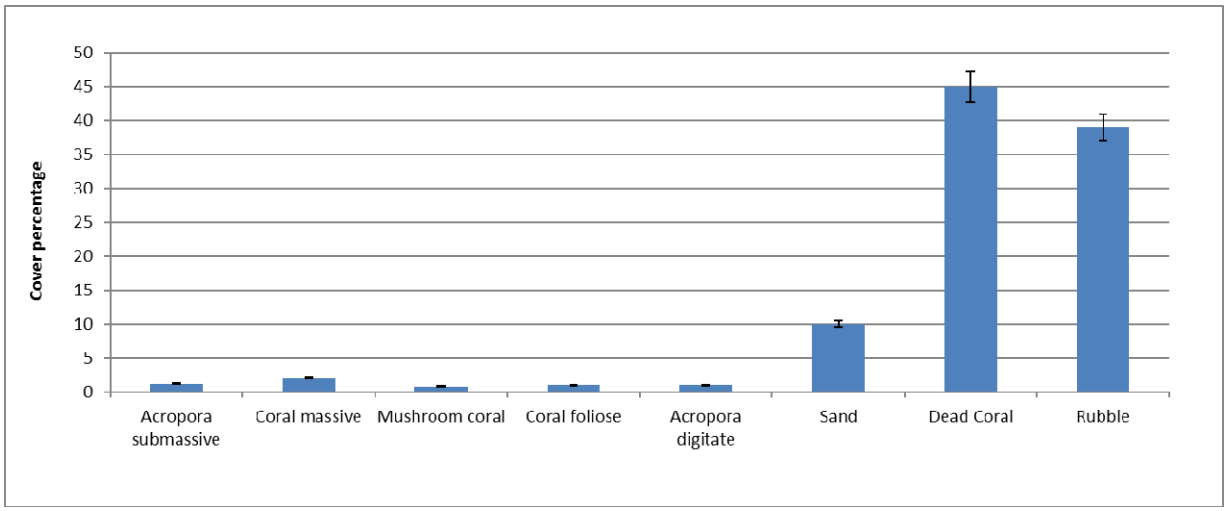


Figure 4-10: Coral cover at Site 1

Fish count in this site is high given the localized nature of the colony. Juvenile fishes were common as this site is relatively calm and close to shallow lagoon.

Table 4-6: Fish survey results at Site 1

Common Name	Scientific Name	Abundance
Mimic Surgeonfish	*Acanthurus tristis*	8
Powder-blue Surgeonfish	*Acanthurus leucosternon*	6
Double-saddled Butterfulyfish	*Chaetodon falcula*	2
Bloch's Surgeonfish	*Acanthurus blochii*	50+
Bullehead Parrotfish	*Chlorurus sordidus*	4
Lined Surgeonfish	*Acanthurus lineatus*	2
Barred Thicklip Wrasse	*Hemigymnus fasciatus*	2
Six-barred Wrasse	*Thalassoma hardwicke*	4
Convict Surgeonfish	*Acanthurus triostegus*	6
Sergeant Major	*Abudefduf vaigiensis*	4

4.6.2.2 Site 2

Figure 4-11: Photographs depicting benthic cover at site 2

Transect 2 was placed near the proposed borrow area on east side reef flat. few live corals were found at this site and less fish was observed compare to site 1.

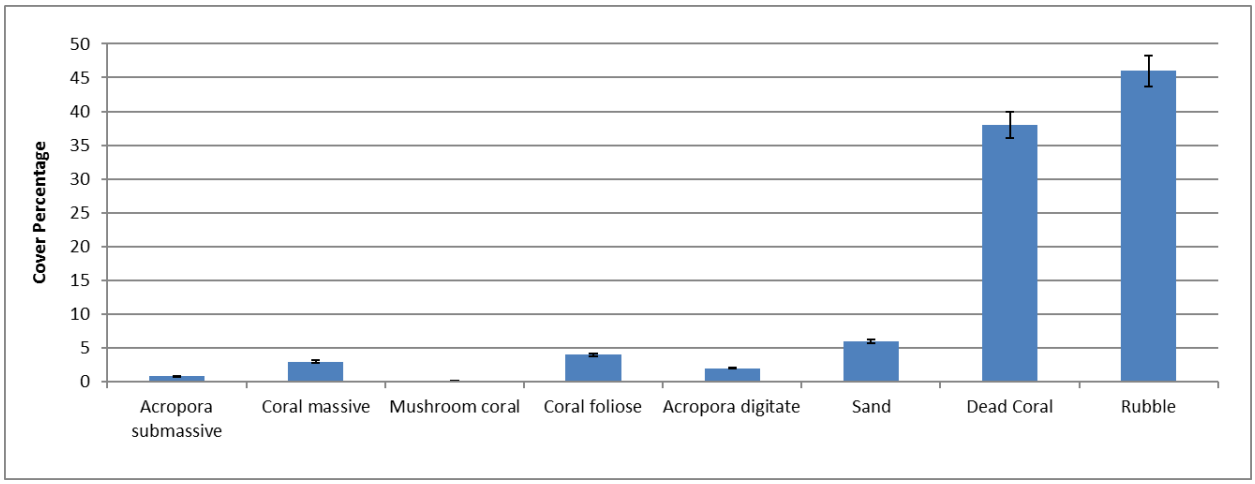


Figure 4-12: Photographs depicting benthic cover at site 2

Table 4-7: Fish survey results at Site 2

Common Name	Scientific Name	Abundance
Mimic Surgeonfish	*Acanthurus tristis*	8
Bloch's Surgeonfish	*Acanthurus blochii*	4
Bullehead Parrotfish	*Chlorurus sordidus*	4
Barred Thicklip Wrasse	*Hemigymnus fasciatus*	2
Convict Surgeonfish	*Acanthurus triostegus*	6

4.6.2.3 Site 3

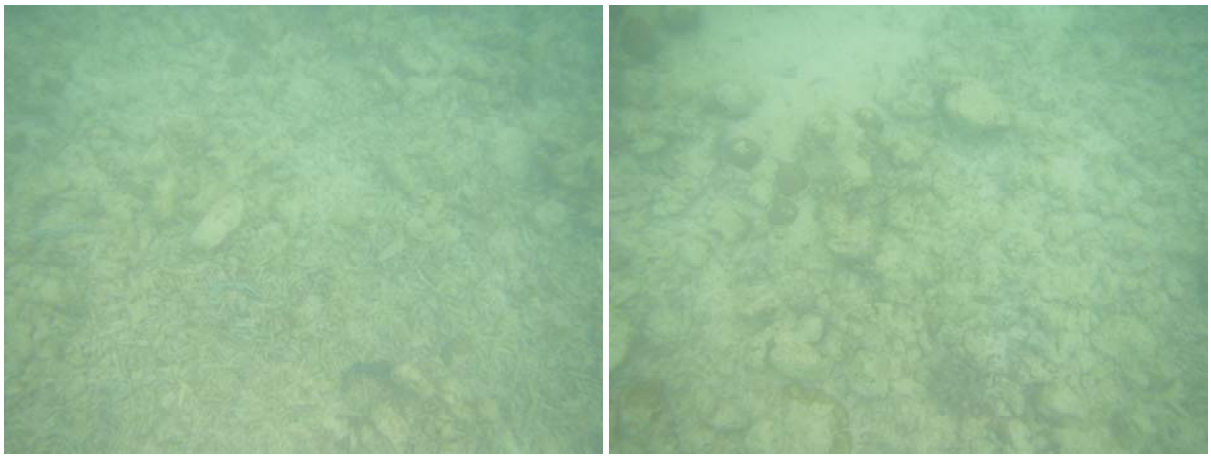


Figure 4-13: Photographs depicting benthic cover at site 3

Transect 3 was placed south of the lagoon near proposed borrow site 2. The site is sandy with few filamentous algae patches. No fish species were observed along this site.

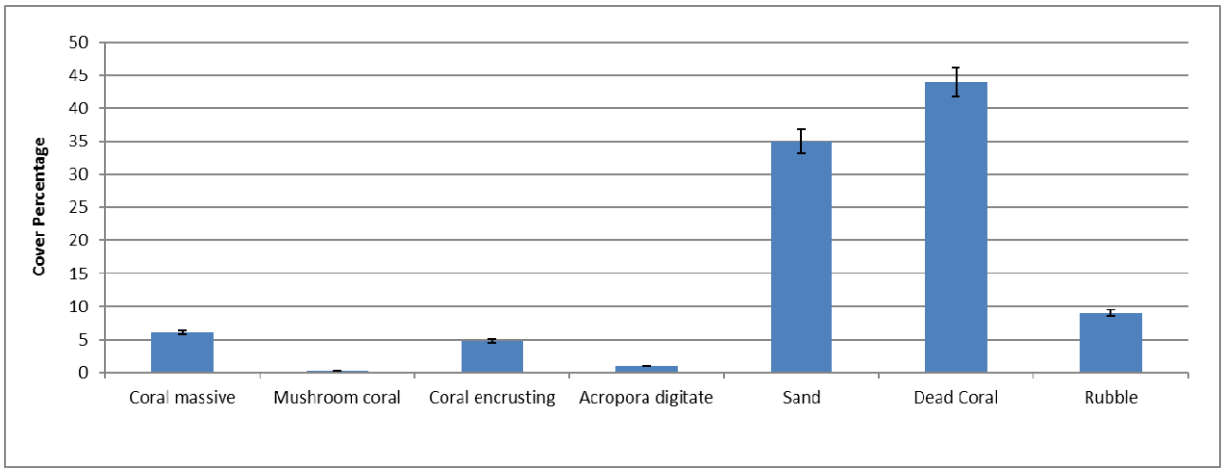


Figure 4-14: Coral cover at Site 3

The fish population at this site was moderately high compared to other sites (Table 4-8) most fish species observed were juveniles.

Table 4-8: Fish survey results for Site 3

Common name	Scientific name	Abundance
Humpback Red Snapper	*Lutjanus gibbus*	1
Convict Surgeonfish	*Acanthurus triostegus*	6
Citron Butterflyfish	*Chaetodon citrinellus*	2
Bloch's Surgeonfish	*Acanthurus blochii*	2

4.6.2.4 Site 4

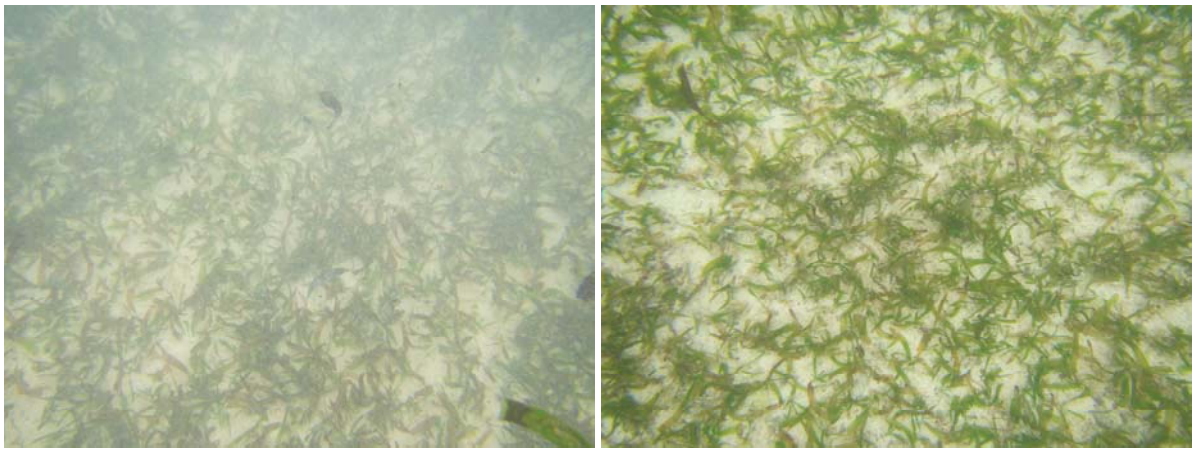


Figure 4-15: Photographs depicting benthic cover at site 4

Site 4 was placed slightly west of the proposed borrow site 2. This site had mainly seagrass with some encrusting corals in the rubble and mainly sandy floor.

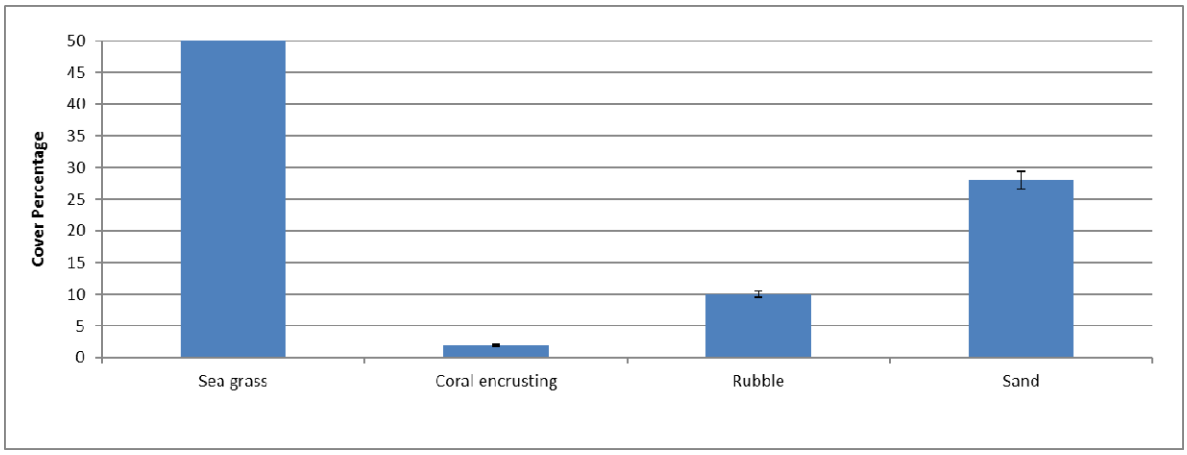


Figure 4-16: Coral cover at Site 4

No fish species were observed during survey.

4.6.2.5 Site 5

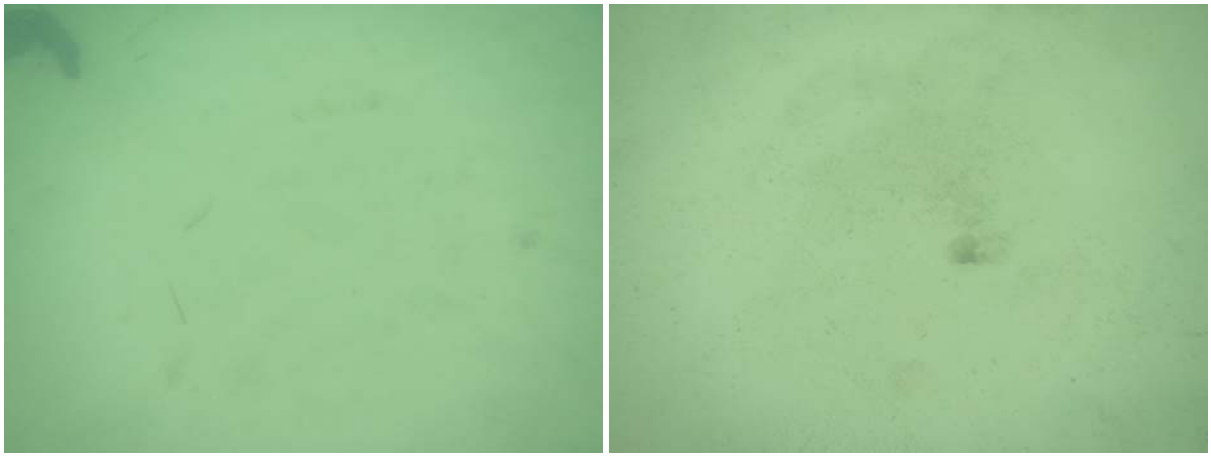


Figure 4-17: Photographs depicting benthic cover at site 2

Transect 5 was placed in proposed borrow area. No live corals were found at this site no fish was observed. The site has a sandy sea floor.

4.6.3 Floral Landscape

A detailed floral survey of the mature vegetation was done and the results tabulated below.

Table 4-9: Census of mature vegetation at the project site

DHIVEHI NAME	COMMON NAME	SCIENTIFIC NAME	Count	%
Dhivehi ruh	Coconut palm (mature)	*Cocos nucifera*	238	43.4
Dhivehi ruh	Coconut palm (young)	*Cocos nucifera*	200	36.5
Nika / kiri gas	Banyan tree	*Ficus benghalensis*	2	0.4
Funa	Alexander Laurelwood tree	*Calophyllum inophyllum*	37	6.8
Kaani	Sea trumpet	*Cordia subcordata*	2	0.4
Dhunburi	Crokwood	*Ochrosia borbonica*	9	1.6
Fithroanu	Beef wood	*Casaurina equisetifolia*	2	0.4
Maskandhu	Jack in the hox	*Hernandia peltata*	1	0.2
Midhili	Country almond	*Terminalia catappa*	8	1.5
Uni	Nit pitcha (s)	*Guettarda speciosa*	2	0.4
Dhiggaa	Sea hibiscus	*Hibiscus tiliaceus*	28	5
Kinbi	Sea putat	*Barringtonia asiatica*	4	0.7
Boakashikeyo	Wild screw pine	*Pandanus tectorus*	15	2.7

4.6.4 Terrestrial Fauna

No significant fauna was observed including birds. Terrestrial fauna at project site is low in both diversity and abundance. The only avian fauna observed during the survey within the project site were Maldivian water hen (*Dhivehi kambili*), grey heron (*maakanaa*) and Maldivian little heron (*raabondhi*). The banyan trees are frequented by flying fox (fruit bats). Common white tern (Dhondheeni) is quite common in Addu although none has been sighted at the project site during the surveys. The Common Sandpiper (*Actitis hypoleucos*, locally known as *Findhana*) was observed on the western coast.

Insects are also rare, dominated by ants and mosquitoes. Common garden lizards have been encountered occassionally. However, various species of crabs, mainly ghost and fiddler crabs were observed on the coast.

4.7 Natural hazard vulnerability

As described earlier, the proposed site has adequate elevations that keeps the land quite safe with reference to tidal surges. The western side, which is subjected to oceanic swells, is raised over 1m above the eastern side. The project site does not have inundations or wetland areas and is quite uniform in topography.

The western shoreline is prone to strong wave attack. The stretch of islands is observed to be stable over the years from 1969, when some of the first aerial photos of the Maldives were taken. However, there has been observed changes following the Regional Port project at this location and other changes further south due to Feydhoo reclamation project and runway extension project. The impact of the long terminal groyne under the jetty at the Regional Port is mainly the accumulation or accretion of sand in its lee on the east of the project site. This is sand that is supplied from an updrift location, therefore, causing erosion at that or those locations. This would probably have been considered in the EIA for the Regional Port and mitigation measures discussed. Since the Port EIA could not be found, it was not possible to comment.

The eastern side of the project site is also less vulnerable to erosion compared to western side, which is prone to oceanic swells with large potential for cross-shore sand movement. Therefore, the proposed reclamation on the west will require a strong revetment all along the area, as proposed. The revetment would have to be designed higher than a similar structure on the east.

The height of the island is at an average of 1.3m above MSL, which is the average height of small islands in the Maldives. Therefore, the existing height is sufficient to render the island safe from tidal inundation under normal tidal surge conditions. Apart from that there are no natural hazard concerns. The following paragraphs provide a general account of the vulnerability of the islands of Maldives to natural hazards (UNDP 2006).

The disaster risk scenario for Maldives can be described as moderate in general. Despite this, Maldives is among the most severely affected countries hit by the Asian tsunami on December 26th, 2004. Maldives experiences moderate risk conditions due to a low probability of hazard occurrence and high vulnerability from exposure due to geographical, topographical and socio-economic factors.

An island's natural vulnerability depends on geographic and geomorphologic characteristics of the island. These include geographic features of the island and location of the island with respect to the country, the formation of the island, location of the island respect to the atoll, orientation of the island, region of the country where island is located, level of protection to the island from the reefs and other islands; area of the inland lake found on the island, width of the island's house reef, coastal defence structures on the island, shape of the island and the

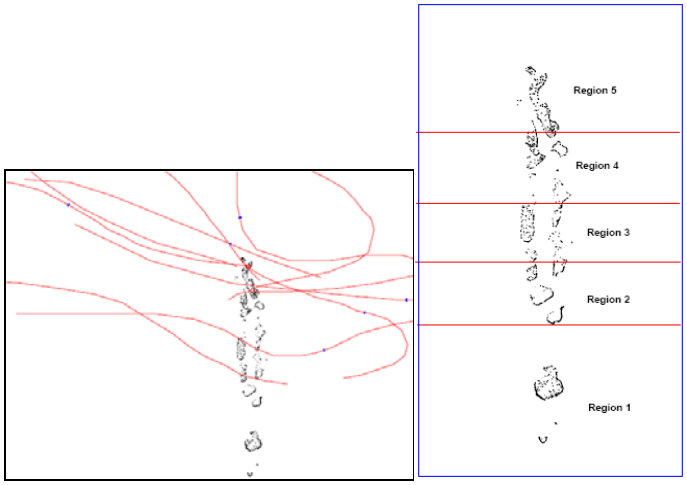
area of the island. Although Maldives is generally considered to have moderate risk to natural hazards or disasters, islands across Maldives experience varying degree and magnitude of natural disasters.

The stormy weathers around the world are affecting coral reef systems directly and indirectly due to global climatic changes. Intense storms can wipe out the natural coral "recruitment" process (Daily Science, April 29, 2008) as a direct effect of climatic change. Healthy coral reef systems are vital assets to many economies around the world on which large numbers of island communities, including the Maldives, depend on a range of fisheries activities. In the Maldives, for instance, according to NAPA (2006), local demand on reef fishery has increased in recent years. Therefore, the concerns due to natural hazard vulnerability of coral reefs in the Maldives are very high, which needs a solution through local and global effort.

Besides heavy rains and strong winds during monsoons, hazardous weather events which regularly affect Maldives are tropical storms or 'tropical cyclones', and severe local storms. At times, tropical cyclones hitting Maldives are destructive due to associated strong winds that exceed a speed of 150 kilometres per hour, rainfall of above 30 to 40cm in 24 hours and storm tides that often exceed four to five meters (UNDP 2006).

Cyclonic winds sometimes can cause a sudden rise in sea-level along the coast, leading to a storm surge. The combined effect of surge and tide is known as 'storm tide'. Storm tides can cause catastrophe in low-lying areas, flat coasts and islands such as Maldives.

Referring to Suffir-Simpson Scale given in Figure 4-18, ISLES site is considered to be in a fairly safe zone when cyclonic winds and storm surges over the Maldives are concerned. The island falls under hazard zone 1 at Suffir-Simpson Scale 1, the maximum probable wind speed expected to be at 96.8knots as shown in the following figure.



Hazard Zone	Probable Maximum Wind Speed (knots)	Saffir-Simpson Scale
1	0.0	0
2	55.9	0
3	69.6	1
4	84.2	2
5	96.8	3

Figure 4-18: Cyclonic wind hazard zones (adapted from RMSI/UNDP 2006)

Figure 4-19 show that Maldives faces tsunami threat largely from the east and relatively low threat from the north and south.

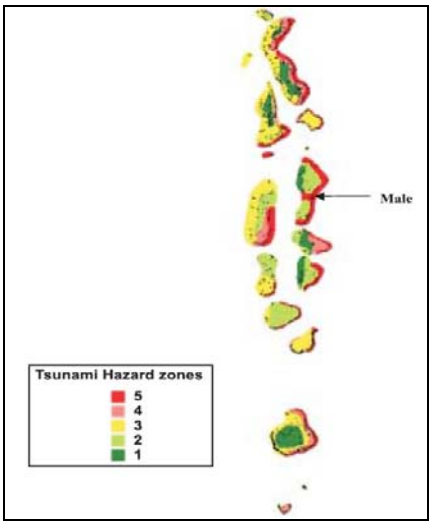


Figure 4-19: Tsunami hazard zones

So, islands along the eastern fringe are more prone to tsunami hazard than those along the northern and southern fringes. Islands along the western fringe experience a relatively low tsunami hazard. This map is produced based on the experience of the tsunami in 2004 and also occurrence of historic tsunami events in the greater region where most of the events have identified to have occurred from the Sumatra Region (UNDP 2006).

Maldives is also affected by severe local storms- thunder storms/ thunder squalls. Hazards associated with thunder storms are strong winds, often exceeding a speed of 100 kilometres per hour, heavy rainfall, lightning and hail; they also give rise to tornadoes in some regions.

In general, thunderstorms are more frequent in the equatorial region than elsewhere, and land areas are more frequently hit by thunderstorms as compared to open oceans. However, thunder storms close to the equator are less violent when compared with those in the tropical regions and beyond. Maldives being close to the equator; thunder storms are quite frequent but less violent here. Strong winds generated by severe local storms generate large wind-driven waves which are hazardous for Maldives (UNDP 2006).

Vulnerability of the islands of the Maldives to flooding and storm surges and possibly complete inundation is considered to be high due to increasing vulnerability to the effects of global warming such as melting of polar ice caps. As a result, sea level rise due to climate change has uniform hazard throughout the country (RMSI/UNDP 2006). However, there are theories that support that high rates of evaporation in the tropical Indian Ocean may cause water levels to go down although pan evaporation studies may indicate of only evaporation due to sunlight falling on the pan excluding other meteorological factors.

Rainfall in the Maldives is such that regular flooding caused by heavy rainfall is a somewhat annual occurrence especially for those islands with low lying areas towards the middle of the island. For the proposed site, such flooding is not considered to be a cause for concern as the are is narrow and does not cup towards the middle of the island. As discussed earlier, there are no inundations or wetlands at any area.

4.8 Socio economic conditions

According to the latest census data (2014), the total resident population in Addu city is 21,275. Out of which 10975 are males while 10300 are females. This is inclusive of Foreigners. The exclusive Maldivian population in Addu City is 19319. Furthermore, a total of 7315 citizens were enumerated in Male whose place of birth is Addu city. Looking back at the the data of census 2006, the population in the year 2006 was 17862. The growth rate of Addu city is at 1.23. Therefore, with reference to the aforementioned demographic data, Addu city is currently experiencing a population increase and is expected to increase further with the better development of facilities. The total employed population of Addu City is 4325. The main occupations are government jobs, private business, resort jobs and fisheries. There are a number of shops, mosques, educational centres, banks and health facilities available throughout the City. Furthermore, the Addu City is one of the most developed areas in the country after taking the capital of Malé.

There are some large scale projects already taking place at Addu City, which includes the supply of water supply project for all the islands of Addu City and Hithadhoo central area sewerage project contracted to FENAKA Corporation by the Ministry of Environment and Energy. Reclamation of land in Feydhoo Island has only been completed recently. The sewerage services for the rest of the islands are in the tendering process.

4.8.1 Traffic flow at Link Road

A simple survey of traffic flow was undertaken on the day of the field from 1200hrs to 1300hrs. The results are tabulated below.

Table 4-10: Traffic flow on Link Road

Type of vehicle	Count
Bus	6
Van	12
Pickup/lorry	25
Car	70
Cycle	65
Crane	1
Oil bowser	2

Figure 4-20: Survey locations

Figure 4-21: Bathymetry

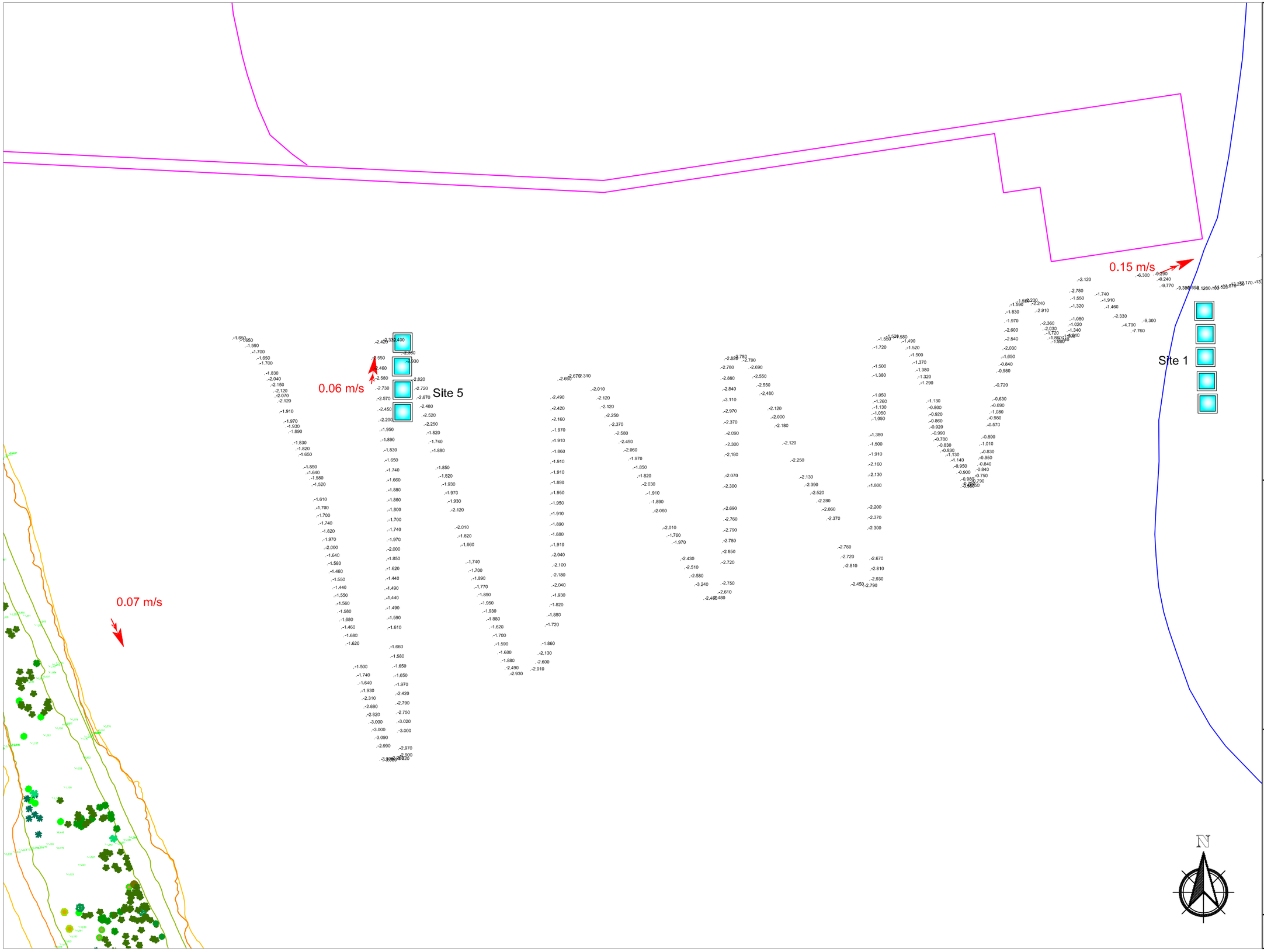


Figure 4-22: Beach profiles

Figure 4-23: Vegetation survey map

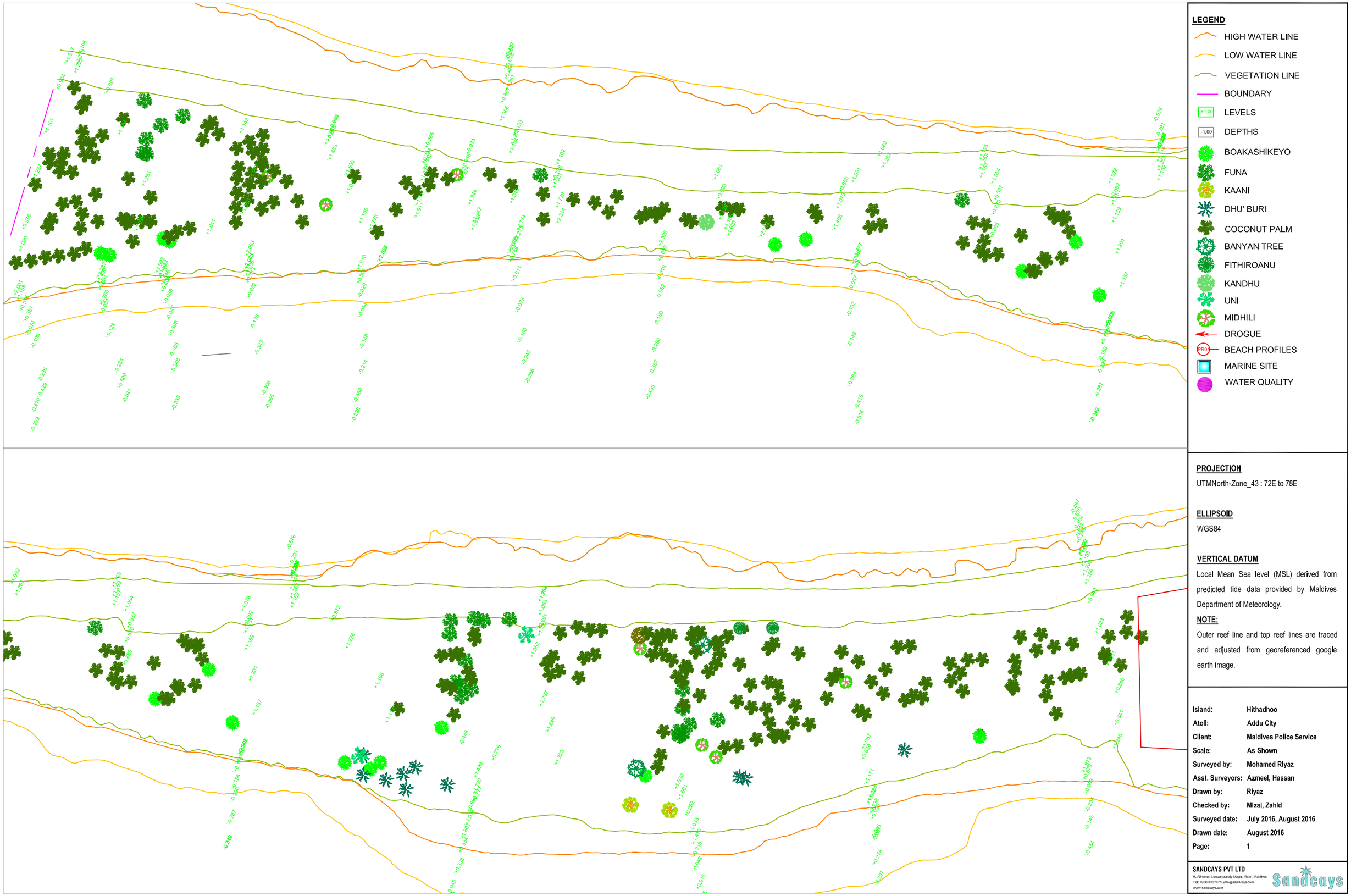


Figure 4-24: Photographic summary of coastal environment

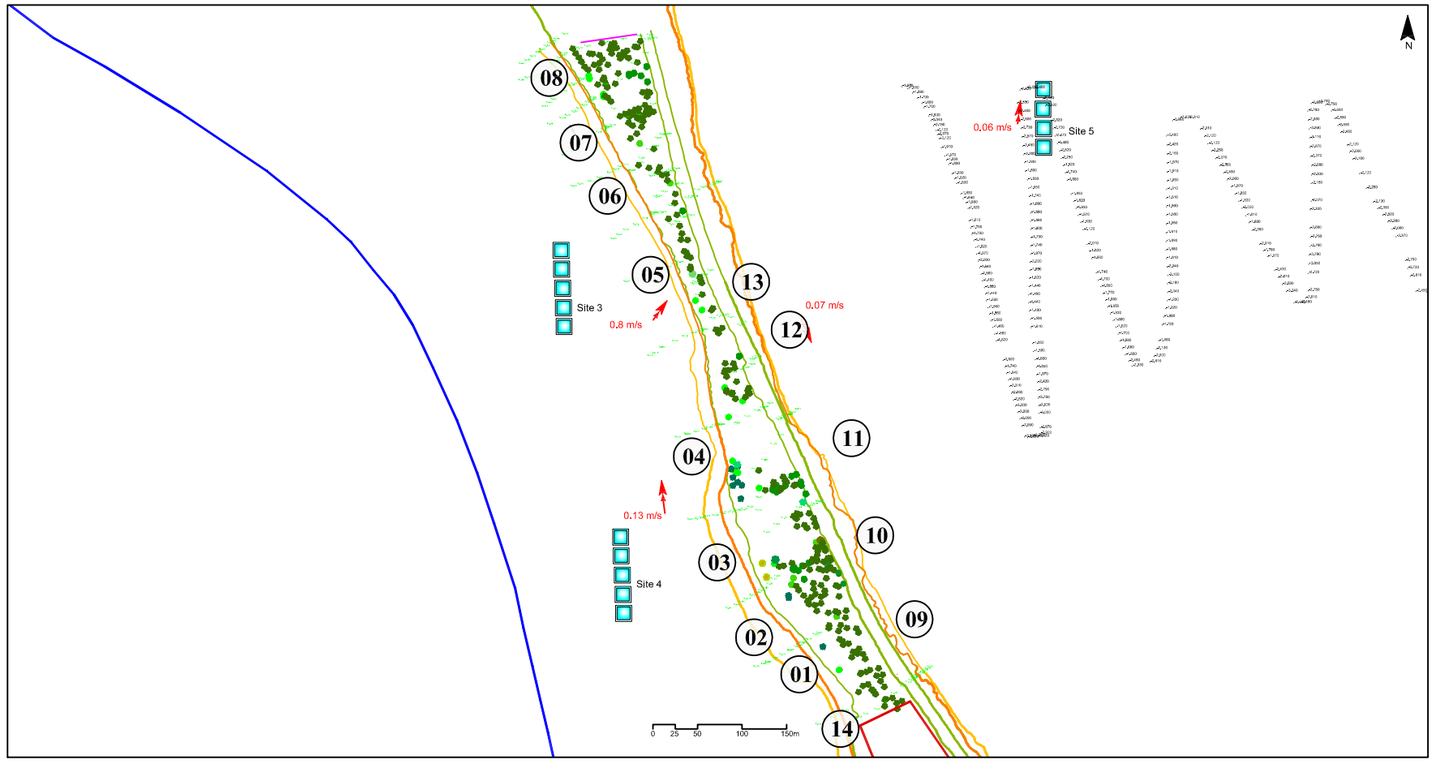


Figure 4-25: Photographic summary of terrestrial environment

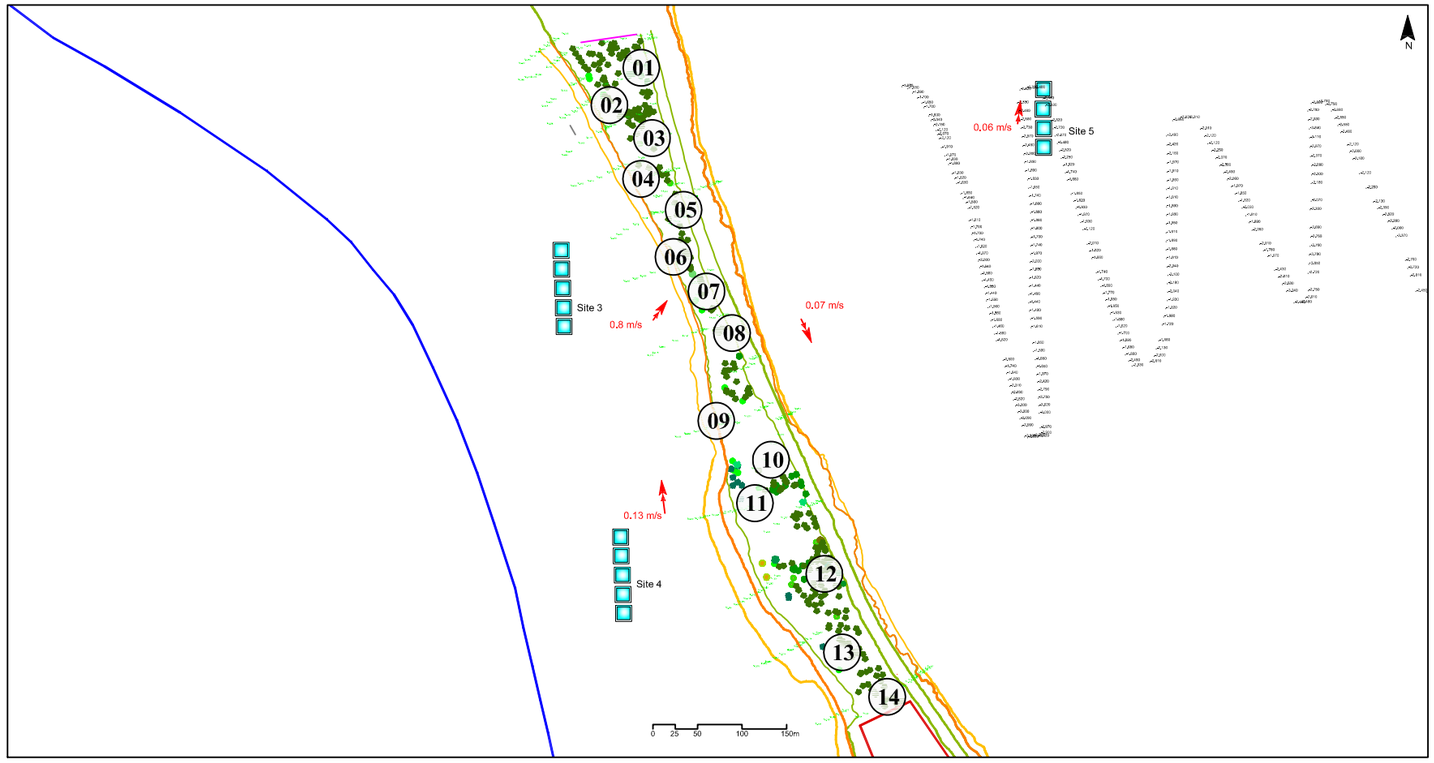


Figure 4-26: Photographic summary of marine environment (Sites 1 and 2)

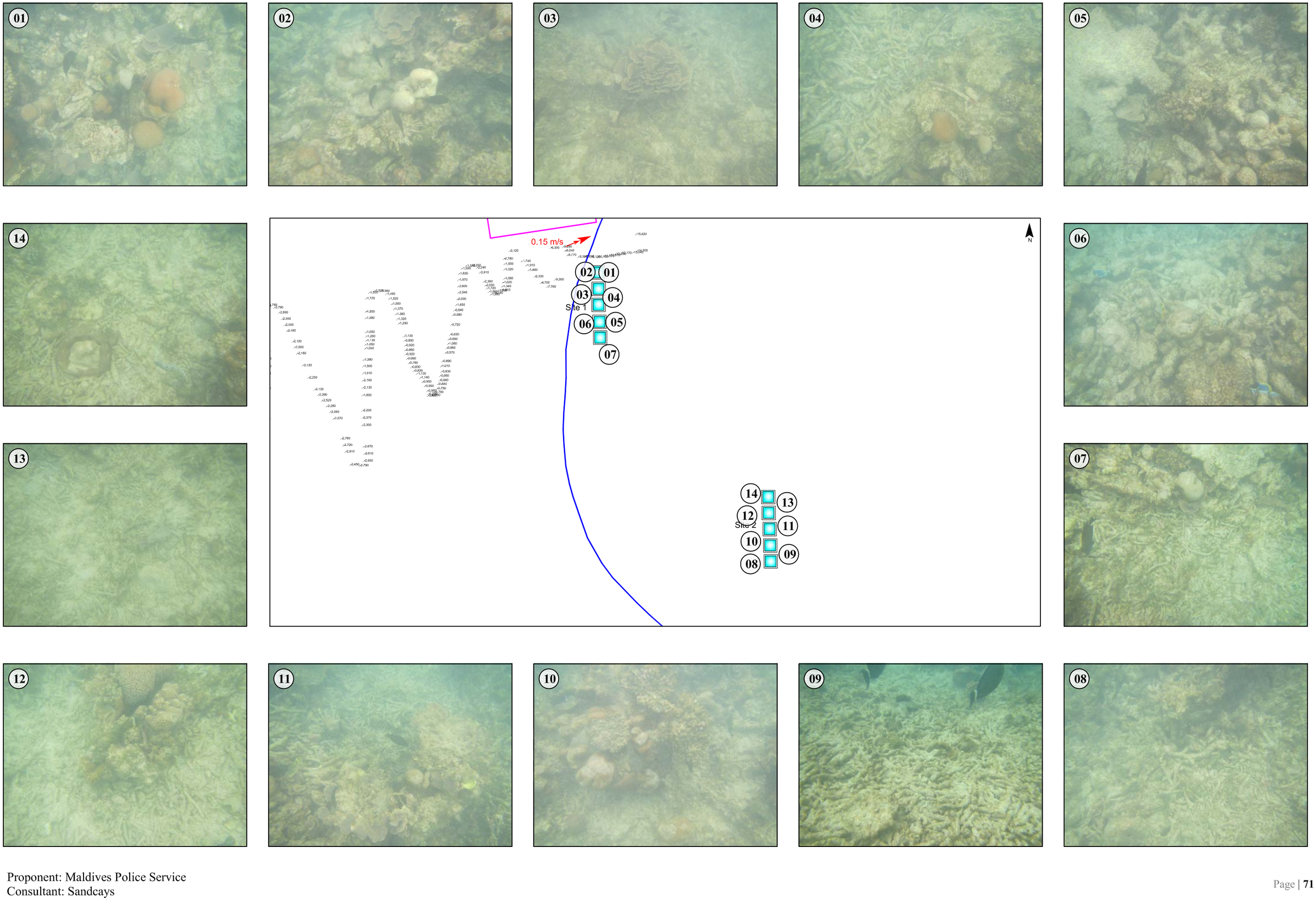
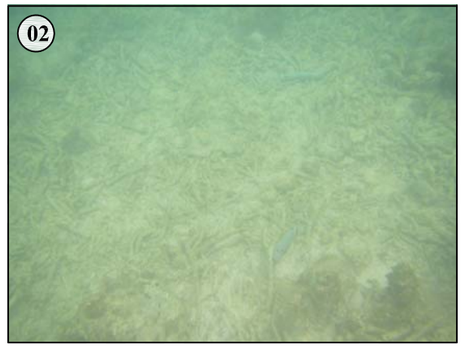
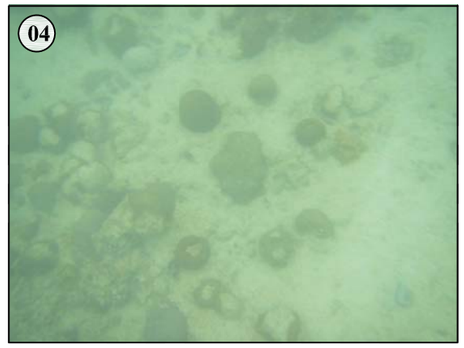
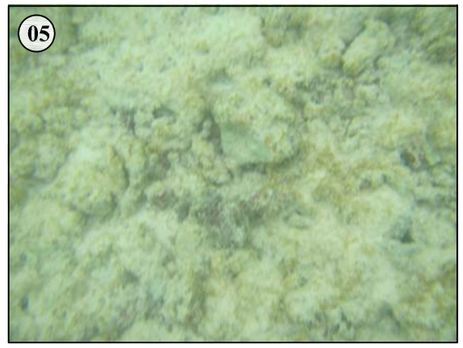
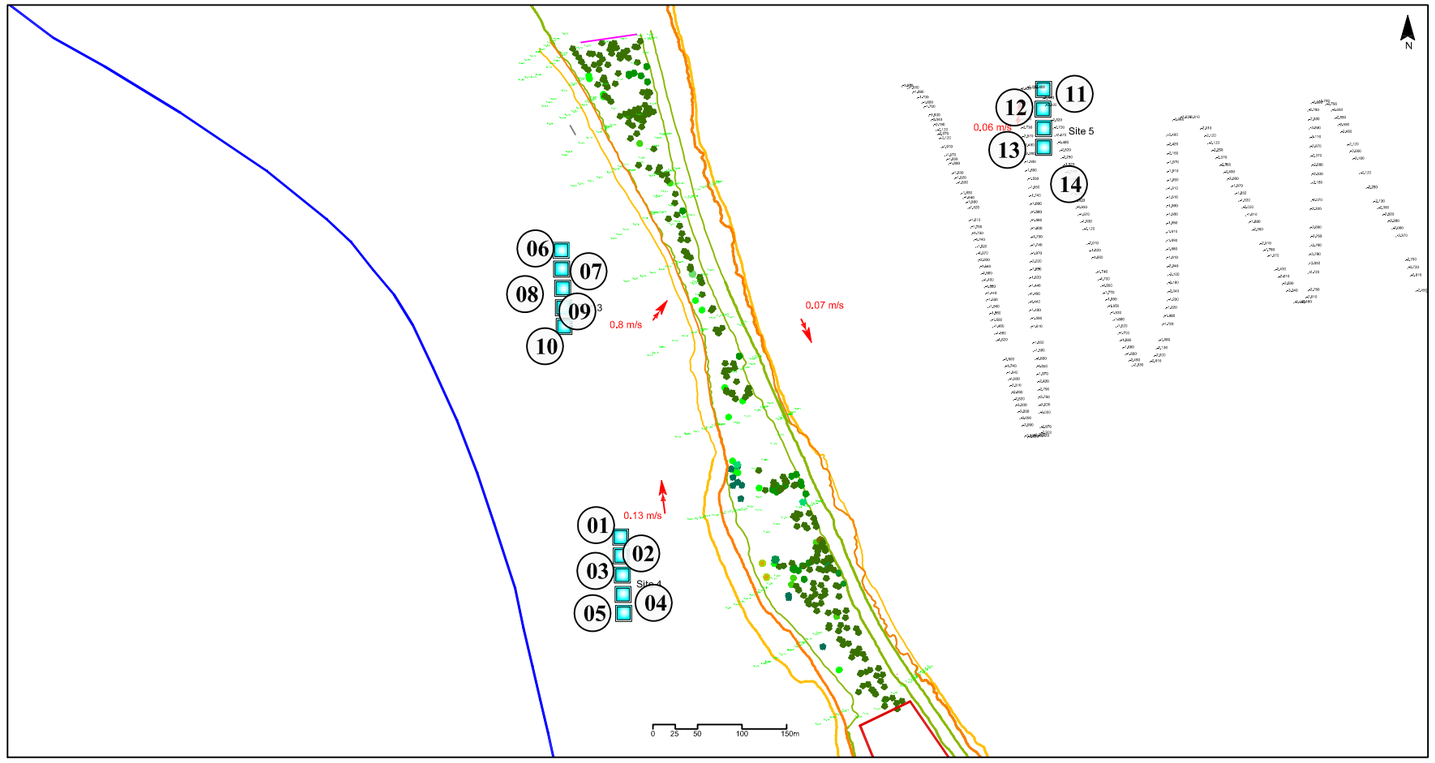


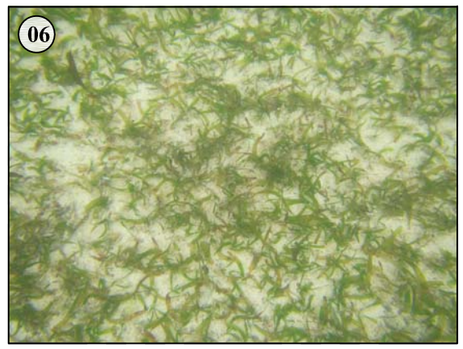
Figure 4-27: Photographic summary of marine environment (Sites 3 to 5)

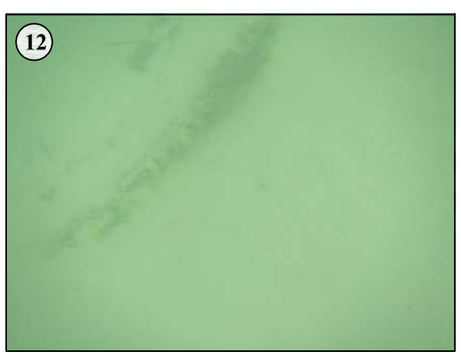


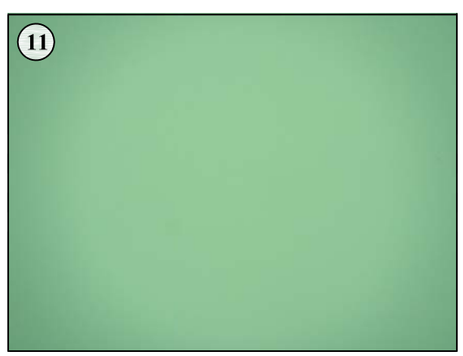


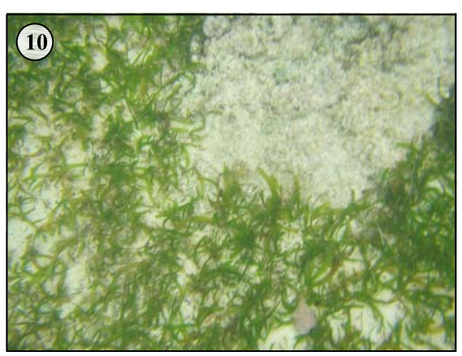


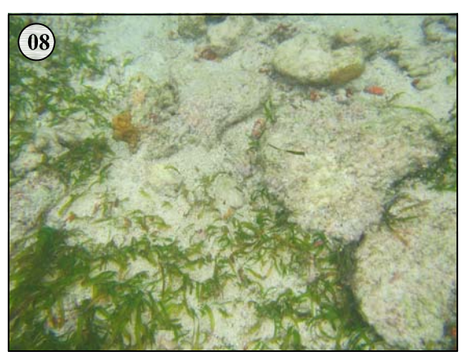












5 Stakeholder Consultations

The key stakeholders of the project identified in the Scoping Meeting include the City Council, Ministry of Housing and Environment, Ministry of Fisheries and Agriculture, Maldives Road Development Corporation (MRDC), Maldives Transport and Contracting Company (MTCC) and FENAKA. Other stakeholders include Environmental Protection Agency, Traffic Police of Addu City, Proponent, Contractor and Project Engineers, Consultants and general public.

5.1 Scoping Meeting

The scoping meeting to set the scope for the project was held on 2 August 2016 at 1000hrs at the Environmental Protection Agency. This meeting was attended by Ministry of Housing and Infrastructure, Environmental Protection Agency, the Proponent and the EIA Consultant. A formal list of participants was provided by EPA, which is given in the Appendix. The stakeholders that participated in the Scoping Meeting have extensively discussed on the issues relating to the project.

After a brief description of the relevant components for the EIA, EPA identified that the EIA application has been made for the entire development although the attached brief and the tasks identified in the application clearly states that the EIA is to be done for the reclamation component. This aspect was identified by the Proponent and Consultant. However, EPA insisted that EIA shall be done for the entire project and cannot be done just for reclamation component only. After discussions, the Proponent and Consultant agreed to cover all relevant aspects of the project in the EIA report. Therefore, all environmental infrastructure and services including water supply, sewerage, waste management and electricity was considered and added to the scope.

The following aspects of the project were discussed.

- Total population after development and the facilities - estimated total population of 200 persons with all facilities including running tracks, own/backup gensets, own wastewater services but no RO plant. EPA said that water supply shall be done by licensed party.

- The shape of dredging – to shape according to natural shoreline to the greatest possible extent. MPS agreed to consider that as well as shore protection at possible areas that may be affected.
- Waste management during construction and operation – Construction waste would be managed at the existing waste management site nearby. EPA said that a separate waste management plan shall be developed for the operational phase and licensed parties shall manage the waste
- Land approvals – Already given by MHI
- Land clearance – area already cleared except for major trees
- Dredging location and shape and size of borrow area – Dredging location is identified based on dredging and reclamation regulation and shaped given is an indication of the overall area but may differ depending on dredger movements, etc.
- Importation of trees – there may be plans by the Indian contractor to bring trees, however, it may not be necessary. EPA requested to consult with MoFA regarding importation of trees, if required.
- If dewatering is required, dewatering permits would have to be taken, said EPA

EPA also required to consult with the following.

- Road Corporation – roads and waste
- Housing Ministry's unit at Addu – roads, waste, municipal services
- City Council, if the consultant sees relevant
- Traffic Police
- MPL/MTCC re bus service
- FENAKA
- Fisheries - tree importation
- HPA – health aspects of workforce and personnel
- MFDA – food services during operation

Furthermore, the scope was identified to include the following.

- Ocean currents in the project area
- Tree survey
- GW quality
- Other areas that may need to be protected

- Shorelines, veg line from the nearest road after Hithadhoo port to the causeway between Rujjehere and Hankende
- Reef surveys at relevant locations

5.2 Consultations in the field

5.2.1 Ministry of Housing and Infrastructure (Addu Unit)

Deputy Director, Ahmed Haleem was consulted. He indicated that there has not been any official communication from Ministry of Housing nor Maldives Police Service or any other government authority regarding the project. He said that he came to know about a jetty on the western side when he visited field with Indian High Commissioner, Indian architect and officials from the government.

He highly recommended to mention in the EIA report about the erosion and other concerns at the project area. He said that there had been noticeable erosion of the area after the Regional Port had been developed.

He also mentioned that if the whole of the western coast is taken for the purpose of the project, there would be access restrictions to locals, which may have to be considered.

5.2.2 Addu Police Station (Hithadhoo)

Personnel at the Addu Police Station was met and the following points have been highlighted.

- There are currently no plans for traffic control regarding the project.
- If reclamation were to be done using dredger, the best option to lay the pipes will be to pump to the fill area by crossing the Link Road with a sand bed laid over the pipeline, this enabling traffic flow and less disruptions to the project activities.
- Barricades would not be very effective.
- Get help from MRDC to clean the road after reclamation works are completed.
- There is a lack of manpower to keep a traffic police near closed area, if road blockage or traffic control were to be considered during the project. However, it may be possible to keep traffic police during peak hours.

5.2.3 Addu City Council

Addu City Council was consulted during the June visit. According to Council members, the Council had not been informed of the project officially and that they have no major role in the decisions regarding the project. However, they expressed concern about the lack of their involvement regarding decisions about the land. Had they known that reclamation is considered within the scope of the project, they would have requested that the entire Police Academy facility be built on reclaimed land on the eastern side keeping the existing land intact.

5.3 Other Consultations

5.3.1 Ministry of Fisheries and Agriculture

Conversation with Mr. Hamid Ibrahim from the Ministry was held. He noted the following points.

- Permit should be taken for any kind of trees that are imported from outside the country.
- Permit will not be given to any endangered species of trees.
- Should submit a list of trees that are being important beforehand and the Ministry will review the list and provide the permission in writing indicating the trees which can be imported from the list.
- Should submit relevant documents regarding the trees including where they were planted or grown. If the trees are nursery-bread that should be mentioned too.

5.3.2 FENAKA

According to FENAKA, they shall be able to provide the necessary utilities to the project site. In order to proceed with the works, the relevant forms shall be submitted. Once the forms are submitted the technical team will evaluate the project site and provide a material list. Although there has been no official request made to FENAKA so far, they shall proceed with any request as soon as a request is made.

5.3.3 Ministry of Housing and Infrastructure

According to Ms. Nafha Aujaz at the Ministry, the Ministry will provide the land approvals. It would be the Proponent's responsibility to address other issues with the relevant government agencies and other stakeholders.

5.3.4 Southern Transport

As per the phone conversation with Mr. Mohamed Azhar (supervisor), the bus services will not be facing any difficulties if the link road is not closed. But if the link road has to be closed in that area for any reason it would be good to keep them informed beforehand so that they can make announcements about the bus transportation to the public since they would not have any alternative road to take if link road is closed.

5.3.5 List of Informants/Participants

List of participants in consultations in and outside the field are provided in the table below.

Table 5-1: List of participants in Scoping Meeting and different consultations

Name	Designation/Office	Contact
Yazeed Ahmed	Director, EPA	yazeed.ahmed@epa.gov.mv
Mariyam Rifga	Asst. Director/EPA	mariyam.rifga@epa.gov.mv
Adam Mubeen	Asst. Engineer/EPA	adam.mubeen@epa.gov.mv
Hashim Nabeel	Asst. Oceanographic Observer/EPA	hashim.nabeel@epa.gov.mv
Ahmed Shan	Senior Surveyor/EPA	ahmed.shan@epa.gov.mv
Nafha Aujaz	Environment Analyst/MHI	nafha.aujaz@epa.gov.mv
Ibrahim Rashid Adam	Environment Analyst/MHI	ibrahim.rashif@housing.gov.mv
Ibrahim Hameed	Ministry of Agriculture	3339208
Ibrahim Naeem	In-charge/Addu Police Station	9795077
Mohamed Azhar	Supervisor/Southern Transport	9971835
Haleem	Deputy Director/MHI Addu Unit	
Abdulla Sodiq	Mayor/Addu City Council	7924030
Hussain Hilmy	Addu City Council	7772969
Mohamed Yasrif	Addu City Council	7781342
Abdulla Thoib	Addu City Council	7774310
Ali Fahmee	Addu City Council	
Ahmed Hameed	FENAKA	9652808
Ahmed Moosa	Asst. Superindent of Police/MPS	7784119
Mohamed Falah	MPS	7566882
Ahmed Zahid	EIA Consultant/Sandcays	zahid@sandcays.com; 7781535

6 Environmental Impacts

6.1 Introduction

Development projects in island environments are believed to generate a series of environmental impacts, of which some can be felt immediately on the surrounding environment while others can be felt continually and can be far reaching. By far and large the most significant environmental impacts are those that are felt on the immediate environment. Terrestrial environment is directly affected from removal of vegetation resulting in loss of habits. Also coral reef environments are sensitive and highly susceptible to immediate changes that will be incurred from most of the development activities. Therefore, all the development activities must take into consideration the understanding of the environment and changes as well as implications that it will bring about to the environment and surrounding.

The following account describes potential environmental impacts that will be associated with the proposed development of the proposed Police Academy (ISLES) at Rujjehere area in Addu City; both during the construction phase as well as the operational phase.

6.2 Methods and Limitations

The methods used to predict and evaluate the environmental impacts that may be associated with the proposed development and its related components may not be the most comprehensive methods as they are quite simple prescriptive methods. The main shortcoming of these methods is that only assumptions have been made to predict the impacts which may or may not be accurate. Also, the degrees at which these impacts are either accurate or inaccurate as well as uncertainties and natural variability are the key factors that affect the accuracy of these methods. Nonetheless, the methods used are concise and provide a general overview as well as the range of impacts that can affect the environment. Also, the EIA report has taken into consideration similar studies undertaken in the Maldives as well as expert judgment in identifying the main environmental impacts that may be associated with the proposed development.

6.3 Impact Identification

Impacts on the environment from various activities of the proposed development have been identified through:

- A consultative process within the EIA team and the Proponent
- A purpose built impact identification matrix
- Existing literature and reports on similar developments in small island environments and other research data specific to the context of the Maldives
- Baseline environmental conditions described in Chapter 4
- Consultant's experience of projects of similar nature and similar settings

A purpose built matrix has been used to evaluate the overall impacts of the proposed project. The impacts of the project have been evaluated according to the following criteria:

1. Magnitude (or severity): the amount or scale of change that will result from the impact
2. Significance: importance of the impact. Reversibility is considered part of its significance
3. Duration: the time over which the impact would be felt
4. Extent/spatial distribution: the spatial extent over which the impact would be felt

The scales associated with the above criteria are given in the table below.

Table 6-1: Impact evaluation scale

Criteria	Scale	Attribute
Magnitude *Change caused by impact*	-3	Major adverse
	-2	Moderate adverse
	-1	Minor adverse
	0	Negligible
	1	Minor positive
	2	Moderate positive
	3	Major positive
Significance/Reversibility *Impact implications / Reversibility of impact's effects*	0	Insignificant
	1	Limited implications / easily reversible
	2	Broad implications / reversible with costly intervention
	3	Nationwide or global implications / irreversible
Duration *Duration / Frequency of Impact*	0	Immediate
	1	Short term/construction period only
	2	Medium term (five years of operation)
	3	Longterm/continuous
Extent/Spatial Distribution *Distribution of impact*	0	None/within 1m from point of discharge/no affected party
	1	Immediate vicinity/household level/developer/consumer
	2	Specific areas within the island/atoll/specific parties
	3	Entire island/atoll/nation/all stakeholders

Based on the above scale, an impact matrix was developed for the proposed development to determine the overall impact of the proposed project. This matrix is given in Table 6-2.

An impact potential index was then developed from Table 6-2. The impact potential index table represents a product of the magnitude (M), significance (S), duration (D) and extent/spatial distribution (E) given in the above table. The sum of all key component specific indexes for one activity (i.e. sum by rows) provides the Activity Potential Impact Index (API) and the sum of all activity specific indexes for one key component (i.e. sum by column) provides the Component Potential Vulnerability Index (CPVI) which gives an indication of the vulnerability of each key component to activity related impacts. Table 6-3 represent the impact potential indices for the proposed project.

6.4 Overall Impacts of the Proposed Project

The overall impact of the proposed project is slightly positive due to its socio-economic benefits. Some of the environmental impacts of the project have been identified as positive resulting mainly from improved security and law enforcement services in the country, increased economic activities in Addu City, direct and indirect employment opportunities, and increased business opportunities. The main negative environmental impacts of the project are identified to be the changes to the terrestrial ecosystem from clearance of vegetation (minor

negative), impacts on longshore sediment transport on the western side due to reclamation and shore protection (minor negative), restrictions on landuse at the western periphery by locals (minor negative) and impact on the marine environment from dredging and jetty installation works (minor to moderate negative). These negative environmental impacts are of little significance and occurs in the short-term. In fact, the proposed revetment using rock boulders would help to minimize the longshore drag, thereby minimizing erosion in downdrift locations.

The jetty is proposed to be built on concrete piles, therefore, the impact on longshore sediment transport regime would be minimal or negligible. Given the large degree of impacts on longshore transport due to the reclaimed area and terminal groyne at the Hithadhoo Regional Port, a jetty at the eastern side of the project site would not have significant impacts.

There are also operational impacts which include fuel handling and management, solid waste management and sewage disposal. Fuel is proposed to be in underground tanks, which would be built according to the current regulations, therefore, there will be concrete bunds around the tanks and concrete gutters to contain fuel in the unlikely event of a spill. Therefore, the risks of groundwater contamination would be low due to appropriate hazard controls. Waste will be managed at site and taken to the neighbouring waste management area. However, it is important to monitor leaks. The waste management is expected to have minimal impacts and every effort is expected to be made to minimize waste generated at the facility. Sewage and wastewater would be treated, therefore, no impacts from effluent disposal via ocean outfall. Even if the sewage was disposed without treatment, the effluent will be well diluted and mixed minimizing impacts. The operations will involve high per capita energy use, therefore, treatment plant is best avoided to minimize energy demand. Furthermore, energy conservation technology is expected to be used, thereby minimizing the impact of greenhouse gas emissions from burning of diesel fuel. Climate-related impacts of carbon and other emissions are becoming worrisome and hence the project shall contribute well to the country’s goal of carbon neutrality.

Table 6-2: Impact matrix for the proposed project

	KEY COMPONENTS									
	Environment					Socio-Economic				
PROJECT ACTIVITIES	Terrestrial Flora and Fauna	Soil and groundwater	Lagoon/seawater	Reefs incl. live bait	Air/Noise/land or seascape	Services and Infrastructure	Health and Safety	Employment	Property Value	Costs to consumer/tax payer
Construction										
Temporary facilities, machinery and workforce	-1 2 1 2	-1 1 1 2	-1 0 1 1	-1 0 1 1	-1 0 1 1	1 1 1 2	-1 1 1 1	1 2 1 3	-1 0 1 2	-1 1 1 1
Transport of materials to the site	-1 2 1 2	0	0 1 1 2	-1 0 1 1	-1 0 1 1	1 1 1 2	-1 0 1 1	1 2 1 3	0	-1 2 1 1
Vegetation Clearence	-2 2 3 2	-1 0 3 2	0	0	-1 0 1 1	1 2 1 2	-1 0 1 1	2 2 1 3	-1 0 1 2	1 1 1 1
Construction of buildings and other utility facilities	-1 0 1 2	-1 1 3 1	-1 1 1 2	-1 1 1 2	-1 0 1 1	1 2 1 2	-1 0 1 1	1 2 1 3	1 1 1 1	-1 1 1 1
Dredging and reclamation	-1 0 1 2	-1 0 1 2	-1 0 1 1	-1 0 1 2	-1 0 1 2	1 1 1 2	1 1 1 2	1 2 1 3	1 1 1 2	-1 1 1 1
Jetty Construction	-1 0 1 1	0	-1 1 1 1	-1 0 1 1	-1 0 1 1	1 1 3 2	-1 0 1 1	1 2 1 3	1 2 3 2	-1 1 1 1
Operation										
Use of the proposed infrastructure	-1 1 3 2	-1 1 3 2	-1 1 3 1	-1 1 3 2	-1 1 3 3	2 2 3 3	-1 0 3 2	3 3 3 3	2 2 3 3	2 1 3 1
Solid waste management	-1 1 3 1	-1 1 3 1	-1 0 3 2	-1 0 3 2	-1 0 3 2	1 1 3 2	1 1 3 2	1 1 3 3	1 1 3 2	-1 0 3 1
Sewerage system	-1 0 1 2	-1 1 3 2	-1 1 3 1	-1 0 3 2	-1 1 3 2	1 3 3 1	1 1 3 2	1 1 3 2	1 2 3 2	-1 0 3 1
Electricity and fuel use	-1 0 3 3	-1 0 3 2	-1 0 3 2	0	-1 1 3 3	2 2 3 3	-1 0 3 2	2 3 3 3	2 3 3 3	-2 1 3 1

KEY: M S Magnitude Significance
D E Duration Extent (spatial)

Table 6-3: Impact potential indices for the proposed project

	KEY COMPONENTS										
	Environment					Socio-economic					
PROJECT ACTIVITIES	Terrestrial Flora and Fauna	Soil and groundwater	Lagoon/seawater	Reefs incl. live bait	Air/Noise/land or seascape	Services and Infrastructure	Health and Safety	Employment	Property Value	Costs to consumer/tax payer	**TOTAL API**
Construction											
Temporary facilities, machinery and workforce	-0.05	-0.02	0	0	0	0.02	-0.01	0.07	0	-0.01	0
Transport of materials to the site	-0.05	0	0	0	0	0.02	0	0.07	0	-0.02	0.02
Vegetation Clearence	-0.3	0	0	0	0	0.05	0	0.15	0	0.01	-0.09
Construction of buildings and other utility facilities	0	-0.04	-0.02	-0.02	0	0.05	0	0.07	0.01	-0.01	0.04
Dredging and reclamation	0	0	0	0	0	0.02	0.01	0.07	0.01	-0.01	0.1
Jetty Construction	0	0	0	0	0	0.07	0.01	0.07	0.07	-0.01	0.21
Operation											
Use of the proposed infrastructure	-0.07	-0.07	-0.04	-0.07	-0.11	0.44	0	1	0.44	0.07	1.59
Solid waste management	-0.04	-0.04	0	0	0	0.07	0.07	0.11	0.07	0	0.24
Sewerage system	0	-0.07	-0.04	0	-0.07	0.11	0.07	0.07	0.15	0	0.22
Electricity and fuel use	0	0	0	0	-0.11	0.44	0	0.67	0.67	-0.07	1.6
TOTAL CPVI	-0.51	-0.24	-0.1	-0.09	-0.29	1.29	0.15	2.35	1.42	-0.05	3.93

API = Activity Potential Impact Index
CPVI = Component Potential Vulnerability Index

The table above indicates that the project has low negative environmental impacts during and after the proposed works, however, the socio-economic benefits of the project are considerably high, as a result of which the total potential impact index for the project is fairly positive. Therefore, the project can be allowed to proceed as proposed or with further modifications, if required.

6.5 Project Specific Impacts – Construction Phase

The construction phase of the proposed project involves operation of machinery, vehicles, clearance of vegetation, dredging and minor excavations. This would be carried out by a workforce of over 100 people. Hence there will be a considerable amount of social and environmental impacts; both negative and positive. For instance, amongst the negative environmental impacts include obvious loss of vegetation, increased air and noise pollution, accidental spillage of pollutants to the sea and ground in addition to increased turbidity in the area from dredging work. However, there will be an increase in job opportunities as well as training opportunities for the locals of the area. The following subsections include a detailed assessment of impacts from all the components of the construction phase of the project.

6.5.1 Temporary facilities, machinery and workforce

Based on experiences of similar development projects including resort projects, temporary facilities would remain for quite a reasonable period of time from the onset of the project. There would be temporary shelters, temporary sewage disposal arrangements, temporary water facilities (including a groundwater well) and temporary jetty or sand bed for material mobilization to site. Since the proposed project is small, these temporary arrangements would be small too.

For small projects, it is expected to have minor impacts of noise and pollution. The use of machinery for transplanting or uprooting of trees and other works are not expected to have adverse impacts. Since there are no sensitive receptors, the impacts would be negligible. As the project site is away from inhabited areas, human influence on the environment could be regarded as negligible in the past. The sudden increase in noise and pollutant levels from the construction phase may have a minor impact on the fauna of the island. However, the field investigations show there are no significant terrestrial fauna on the island except for the sea birds which use only the beach and coastal vegetation. Therefore, the impacts of the use of machinery would be low and insignificant.

The use of diesel as well as petrol in vehicular engines and operation of machines such as trucks and excavators cause emissions of carbon dioxide, sulphur dioxide and nitrogen oxides with fine particulate matter. For the proposed project, carbon emissions are considered to be negligible. However, carbon dioxide being the primary greenhouse gas and the main

contributor to global warming, likely future carbon emissions would be a cause for concern, as the impact cumulatively adds to the global burden of carbon emissions.

There is an unlikely risk of major pollution given that the hazards are well controlled. Usually, in projects involving heavy machinery, fuelling of excavators and other machinery is undertaken manually and it carries the risk of spills. Such spills are not a cause for concern in the case of the construction equipment as fuel prevention measures are in place. The impact on the quality of soil and groundwater is not going to be significant as proper storage facilities will be maintained for construction materials, construction waste and oil and grease.

Waste from the construction and work force will be sorted and separated on site and sent to the waste management site closely located to the project site. Liquid waste can be of concern during the construction phase at times. However, the proponent wishes to keep 50 workers permanent during the construction phase and the rest of the workforce will be made up of locals from nearby islands and sheltered in rented accommodation in Hithadhoo. Temporary arrangement for sewage disposal in the proposed project is a septic tank at the location of the temporary shelters/toilets. Often, the temporary septic tank would be a simple arrangement with no settlement and sewage and wastewater will be directly disposed to ground, it would affect groundwater. If the groundwater well which would be constructed in the area were close to the septic tank, the septic tank may cause pollution of well water.

There could be an impact on the groundwater quality during the construction phase if groundwater is used for construction uses. However, the impact would be that of salinization, which is temporary and the proposed project may utilize a temporary RO plant to provide water to the workforce during construction.

The project would not affect social values, norms and beliefs due to the workforce significantly as majority of the workforce will comprise of locals from the project area and also due to the segregated nature of the workforce from local populace. Besides, the construction phase being short, any such impacts would be negligible.

There may also be a number of risks related construction activities including cutting down or uprooting of plants and carpentry works. Key impacts predicted for the construction workforce is related to health and safety issues. Often in such construction environments, workers are prone to injuries and diseases. Also, if precautionary measures on health and

safety are not taken into serious consideration, the entire operation may be affected as a result of incidents and injuries.

6.5.2 Impacts from dredging and reclamation

A 15 to 20m wide channel will be dredged for dredger entry and for use as entrance channel by vessels used by the proposed Police Academy. An area of approximately 60,000m^2 including the channel will be dredged to a depth of no more than 4m from MSL. The dredged sand will be directly pumped to the area identified for reclamation on the western shoreline. The reclamation is on the shallow reef flat on the west of the plot facing the rim reef of Addu Atoll. The dredging will be done by a cutter suction dredger, therefore, the impact of sedimentation at the borrow area would be almost negligible.

The laying of the pipeline across the Link Road had been discussed during the initial stages of the project. It was identified at that time that there will be an impact on traffic flow and cutting the asphalt road would not be suitable. Therefore, it was identified to place a sand bed over the section of the pipeline that crosses the road and allow normal traffic flow.

The project would be undertaken during the northeast monsoon, therefore, any sediment plume during dredging is expected to move towards the shore and minimize any impact on the reef. The possible use of excavator to cut the channel for dredger entry would, however, cause sedimentation on the reef, which would also be minimal if undertaken during the northeast monsoon. Therefore, the overall impact on the reef would be small. However, there would be sedimentation on the immediate dredge areas and on the reef during excavation. The extent of sediment plume would not be significant.

Since the reclamation is likely to be undertaken during the northeast monsoon, the west side would be calmer during this time, therefore, sedimentation will be low. However, since there is constant wave activity on the rim reef at all times, the movement of sediment towards the rim reef would be restricted. Yet, it would be necessary to take measures to minimize loss as well as sedimentation on the reef flat.

The fill area will have sediment resuspension for quite some time as there will be a reasonable degree of fines in the excavated material. The fines would move longshore and settle in downdrift locations.

6.5.3 Jetty

As discussed earlier, a jetty of no more than 100m may be considered under the proposed project The dredging of the mooring area or harbour basin will happen as a result of the dredging for the proposed fill/reclamation. Therefore, there would be no additional impacts. The jetty location is also appropriate and does not constitute impacts on longshore transport regime.

6.5.4 Vegetation clearance

The proposed project aims to utilize about 25% of the project site for project-related facilities. The bush vegetation has been cleared and the mature trees will be preserved to the greatest possible extent. However, there will be indiscriminate removal of all trees at some locations such as sports field. Therefore, this may be considered as a potential negative impact. The proposed location for clearance has mainly mature coconut palms but sparsely distributed. It is estimated a total of 88 coconut palms and 33 mature trees may be uprooted to make way for the proposed facilities. Most of the palms would be transplanted on the reclaimed area.

6.5.5 Feed water intake

Feed water for desalination plant is proposed to be drawn from a borehole. Borehole drilling does not have adverse environmental impacts. However, the boring methodology is important. Details of the borehole(s) will be provided to EPA when applying for the registration of desalination plant as they are not available at this stage.

There are two options for disposal of mud arising from the borehole installation. They are on-site burial (proposed) or offshore disposal. When disposed to soil or buried on-site, the bentonite mud may affect soil pH and plant growth in the vicinity. However, this impact is low. Offshore disposal in the deep sea, on the other hand, involves a cost and may not be suitable due to the cost involved and having to move the mud, thereby causing aesthetic and other nuisances. Offshore disposal also can have impacts on marine fauna.

6.6 Project Specific Impacts – Operational Phase

6.6.1 Shore protection structures

During the operational phase, the shore protection structures will have two impacts: (1) protect the reclaimed land from erosion and damage to structures behind it and (2) absorb wave energy and reduce the drag forces on the shoreline thereby minimizing erosion at the downdrift locations. To achieve these positive impacts, it would be necessary to construct the structure in such a way that the structure has voids or cavities that help absorb wave energy. Solid structures such as seawalls or geotextile tubes would cause the wave energy to be reflected and cause downdrift erosion as well as scour at the structure.

6.6.2 Water Pollution

Groundwater will be used for toilet flushing and gardening/landscaping and will not cause a significant impact on the aquifer of the island/project site. However, the water lens will become saline if the drawdown exceeds.

The proposed sewerage system for operational phase of the project involves construction of a comprehensive sewerage network with gravity pipes, sewage treatment plant, pump station and ocean outfall. As the number of users is very small, the amount of sewage produced will be very limited; hence low impact on the marine water from the disposal of clarified effluent into the marine environment at designated depths of over 7m. This is also in line with the provisions of the wastewater guidelines issued by EPA.

6.6.3 Brine discharge

Brine is discharged in the lagoon on the west, where there is good flow except during low tide. Even during the northeast monsoon, there will be good tidal mixing and dilution. The impact is negligible because the volume of discharge is very small and good dilution and mixing takes place at the discharge location. Almost all audits and EIA reports carried out in the past indicate that there is no impact of hyper-salinization from brine discharge in the lagoon for such small scale operations.

Effects, if any, would be evaluated as part of the proposed monitoring programme under this project.

6.6.4 Waste management

The waste generated during operational phase of the proposed project can be classified into two categories: biodegradable organic waste and non-biodegradable waste. All waste will be taken to the neighbouring waste management site. The biodegradable waste is expected to be appropriately dealt with in the waste management site. The non-biodegradable waste such as plastic bags, glass and cans however, could have a significant impact on the environment. Therefore, it would be necessary to reduce waste to the greatest possible extent.

Inappropriate handling of waste and its disposal into the surrounding environment can have impacts on the marine environment including pollution of coastal waters and consequential effects on coral reefs and associated reef organisms. The types of non-biodegradable solid waste generated during the operation will mainly consist of plastic bags, glass and plastic bottles, cans, tins, wrappings and other discarded litter. Such items can have adverse impacts on the marine environment ranging from reduced aesthetic beauty of the surrounding area to potential ecological disturbances. Ecological impacts associated with solid waste disposal into the marine environment include killing corals and other marine organisms from smothering by certain items such as plastic bags.

The impacts on the environment of poor solid waste management can be far reaching and more damaging than proposed dredging and reclamation activities. Therefore, a waste management plan shall be in place.

6.6.5 Transport Related Impacts

The use of diesel as well as petrol in vehicular engines and operation of machines cause emissions of carbon dioxide, sulphur dioxide and nitrogen oxides with fine particular matter. Carbon dioxide being the primary greenhouse gas and the main contributor to global warming, likely future carbon emissions would be a cause for concern, as the impact cumulatively adds to the global burden of carbon emissions.

6.6.6 Socio-Economic Impacts

The socio-economic impacts from the proposed project are positive, in terms of job opportunities and other income generating opportunities for the community. The student and staff population would become an important part of the community contributing to the

community in improving social and economic well-being. The small community of ISLES would make purchases from local shops and use local bus service and other facilities.

6.6.7 Noise, Light and Air Pollution

There will be minor air and noise pollution from the proposed development. Operation of the facility will involve 500kV diesel generator sets. The per capita energy use within the facility would be quite high, close to that of a tourist resort given the different facilities. The greenhouse gas emissions from the burning of diesel fuel is often related to the increasing global surface temperatures and changes in climate with increasing floods and sea level rise scenarios. Therefore, it would be important to minimize on energy use and implement conservation measures.

There will be no noisy operations at site apart from arms training activities. However, there are no residential areas in the vicinity of the site, therefore, disturbances are not expected. The lighting within the facility would be minimal, thereby minimizing light pollution. However, some areas such as the sports fields may be often lighted with high degree of pollution. Since there are no significant terrestrial flora in the area, the disturbance to habitats would be small. Yet, it would be important to minimize light and noise pollution.

6.7 Uncertainties in Impact Prediction

Environmental impact assessment involves a certain degree of uncertainty as the natural and anthropogenic impacts can vary from place to place due to even slight differences in ecological, geomorphological or social conditions in a particular place. The level of uncertainty, in the case of the proposed development, may be expected to be low due to the experience of similar projects in similar settings in the Maldives. The know-how to minimize the impacts of vegetation clearance and dredging and reclamation exists with most of the contractors. Nevertheless, it is important to consider that there are elements that are new and that there will be uncertainties and to undertake voluntary monitoring as described in the monitoring programme given in the EIA report.

7 Mitigation Measures

7.1 Introduction

It is evident that island and coral reef environments are fairly susceptible to changes and implications that will bring about from the development of the proposed project. As described earlier, some impacts are felt largely while others are localized. However, most of the environmental impacts associated with the development cannot be either reduced or minimized unless effective environmental management and mitigation as well remediation process is in place.

The following section describes key environmental mitigation measures that will be undertaken during the construction and operation of the proposed development.

7.2 Mitigation Measures – Construction Phase

7.2.1 Waste Management

The recommended waste management plan is aimed at reducing the amount of waste for disposal through the development of outline plans for waste avoidance, material re-use and recycling. Mitigation measures are proposed to alleviate the impacts caused by the excavated materials and residual wastes during their handling, temporary storage on site, transportation and final disposal. Waste management procedures will be implemented to minimize potential impacts to the environment. This may be achieved by consideration and application of the following:

- Avoid and/or minimize waste generation wherever practical by altering the site procedures
- Maximize the opportunity for reusing/ recycling/ recovering materials and thereby negate/minimize the disposal requirements (e.g. by waste segregation according to type, separation of recyclable materials such as metal, maximize reuse of timber framework wherever possible, utilization of excavated material for filling or landscaping); and
- Ensure that all treatment and disposal options comply with all relevant guidelines and standards.

The following practices will be followed to minimize waste generated from construction activities;

- Segregate waste materials according to types to facilitate re-use;
- Segregate different materials at source as far as practical;
- Co-ordinate material deliveries to minimize storage times on site to avoid damage and
- Provide training to site staff in waste minimization practices
- It will be ensured that construction debris will be reused on site to the maximum extent possible.

The following measures will be implemented to mitigate the likely adverse impacts to the environment.

- Stockpile material and sites will be covered to prevent washout and erosion during heavy rainfall.
- Dust suppression techniques will be adopted;
- Designated areas for stockpiling will be fenced.

A temporary refuse collection facility will be set-up by the contractor and wastes will be stored in appropriate containers prior to collection and disposal.

The waste management plan for construction phase has been summarized in Table 7-1.

Table 7-1: Waste management plan – construction phase

• minimization of waste generation for disposal (via reduction/ re-use onsite); • segregating waste materials according to type to facilitate re-use; • separation of inert construction materials; • co-ordinate material deliveries to site; • training site staff in waste minimization practices; • transport of wastes off site as soon as possible; • maintenance of comprehensive accurate waste records; • use of re-useable metal boarding / signboards; • no on-site burning will be permitted

7.2.2 Human Environment

Considering the nature of work, proper equipment and safety gears will be provided to the workers. To minimise the risks associated with health and safety issues, the project proponent

will be responsible to ensure that adequate health care arrangements will be available at the site throughout the construction period.

The World Bank Group Environmental, Health and Safety Guidelines have often been referred to in EIAs in the Maldives as a set of useful guidelines. According to the EHS Guidelines, the applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project on the basis of the results of an environmental assessment in which site-specific variables, such as host country context, assimilative capacity of the environment, and other project factors, are taken into account.

For the project, General EHS Guidelines have been adopted since the EHS risks are low for these projects. The following table presents the specific areas of focus when the EHS Guidelines are considered.

Table 7-2: Project specific aspects under the EHS Guidelines

Areas identified in the Guideline	Project specific considerations	Responsible party
1. Environmental • Dust and air emissions • Energy conservation • Waste management • Noise	• Energy conservation (good lighting and ventilation) in the design • Constructional waste management • Air and noise emissions minimized	Designer/ Engineer Contractor
2. Occupational Health and Safety • General facility design and operation • Communication and training • Physical hazards • Chemical hazards • Biological hazards • Personal Protective Equipment (PPE) • Special hazard environments • Monitoring	• Contractors and supervisors shall be obliged to implement all reasonable precautions to protect the health and safety of workers • Workers should be made of special hazard environments including confined spaces and lone/isolated events • Use appropriate signs and PPE during construction works as well as maintenance works during operational phase	Designer /Engineer Contractor School authorities
3. Community Health and Safety • Water quality and availability • Structural safety of infrastructure • Life and fire safety • Traffic safety • Disease prevention • Emergency preparedness and response	• Ensure healthy and safe use of the buildings during the design • Ensure structural integrity and use safe and appropriate chemicals and other materials in the construction • Promote health and safety in the use of buildings by appropriate signage • Use appropriate signs and PPE during construction works as well as maintenance works during operational phase	Designer /Engineer Contractor School authorities
4. Construction and decommissioning • Environment • Occupational Health and Safety • Community Health and Safety	• Project engineers shall outline health and safety measures in the design and incorporate those in the BoQ • Contractors shall follow good engineering principles and health and safety measures such as leaving the work area clean and levelled prior to demobilisation	Designer /Engineer Contractor

7.2.3 Air

Mitigation measures to minimize emissions from machinery and vehicles related to the project including mobilisation and operational phase include:

- Use light fuel (with low sulphur content) as much as possible.
- Avoid unnecessary operation of vehicles, machines and boats.
- Keep in place appropriate transport management system.
- Minimize mobilisation by planning the mobilisation. In most of the projects undertaken near cities, several mobilisations happen to not only increase the cost of the project but also the environmental impact. Appropriate planning is the key.
- Keep in place appropriate logistic management system during construction and operation phase.

7.2.4 Vegetation Clearance

Avoid removal of coastal vegetation belt. Additionally, larger trees such as mature coconut palms of appropriate size, which were removed during land clearance should be re-planted on the reclaimed area or elsewhere on the project site where tree planting is required.

Furthermore, it would be necessary to minimize cutting down trees by designing and setting out around trees to the greatest possible extent.

7.2.5 Jetty

Jetty construction does not have adverse impacts, therefore, no mitigation measures have to be considered. However, it is important to ensure that the design is that of a piled jetty minimizing impacts on longshore transport. No solid structures shall be considered, in order to minimize impacts on longshore transport regime.

7.2.6 Reclamation and Shore protection

The following mitigation measures are proposed.

- The pipeline crossing the Link Road shall be anchored on either side of the road and filled with fine sand on top and compacted to allow free vehicle movement.
- Appropriate signs shall be kept informing drivers of potential hazards

- Undertake extensive oceanographic data throughout the design and construction phase to improve the shore protection design based on regular site-specific data. This is important since the western side shore protection would be quite challenging.
- Shore protection shall be done using rock boulders or similar structures with maximum voids to enhance structural performance in wave energy absorption. No solid structures including geotextile containers are advisable for use on the western side.
- Design for performance and aesthetics with performance given priority for the western side.
- Undertake shore protection works during the northeast monsoon, as it will be less risky during this time of the year to work on the western side.
- Filling is best done at low tide to minimize sedimentation and loss. Also shore protection works is best done at low tide as working at high tide would not be safe.
- To minimize the potential impact of sedimentation during beach fill, sand bunds and bunds made of jumbo bags can be used or the shore protection structures put in place as reclamation progresses.

7.3 Mitigation Measures – Operational Phase

7.3.1 Changes and Loss of Habitat

Coastal zone should be examined using shorelines, vegetation lines and beach profiles to identify abnormal erosion activities. Cause for these should be identified and addressed as soon as possible.

7.3.2 Groundwater

To reduce salinization of the groundwater lens, skimming wells or infiltration galleries are recommended. Rainwater collection and discharge is encouraged.

7.3.3 Operational stage waste management

Operational stage waste management plans will be developed in consultation with EPA for EPAs approval and/or certification.

7.3.4 General considerations

All building construction and renovation will adhere to the existing building and other applicable codes of practice in the Maldives and any other standard construction specifications approved by the country. In addition, the contractor is required to pay attention to and address the following.

- Air and noise pollution during construction activities
- Preservation of ecological features of the sites
- Good planning in terms of transport and access to site
- Overshadowing and access to daylight and sunlight, with possible options for passive solar design and its effect on site layouts
- Structural integrity of buildings
- External appearance (aesthetics)
- Floodwater management provisions
- Designing appropriate landscaping
- Energy conservation and efficiency
- Waste disposal, salvage, re-use and recycling of materials
- Avoidance of hazardous materials
- Health, safety, security and fire
- Minimize potential for sick building syndrome

8 Alternatives

8.1 Introduction

This section looks at alternative ways of undertaking the proposed project. There are two basic options: (1) leave the problem as it is (no project option), or (2) take measures to resolve the problem (undertake the project options). If the project were to continue, it would be necessary to take economic, ecological and social aspects of the project into consideration and ensure that these concerns exist within a delicate balance. Neither the economic benefits nor the social and ecological concerns can be avoided. Therefore, it is important to consider all options and ensure that the best available option(s) is/are chosen to solve the issues/problems.

Not all the impacts of a project can be completely prevented, however, with the use of appropriate technology and management measures; the magnitude of most of these impacts can be either reduced or minimized. Nevertheless, the effectiveness of these technology and mitigation measures highly depends on the environmental condition and procedures in which they are applied in the field. On the other hand, there are complex and sophisticated procedures of minimizing environmental impacts by means of alternative methods to some of the activities. Often, alternate means are not economically competent with the extent of the project itself. However, to some of the activities where predicted impacts and its magnitudes on the environment are very adverse, alternate means must be applied considering long-term benefits from use of alternatives, as short-term environmental restorations can become very costly.

The following section describes and evaluates some alternatives in terms of locations and various project activities and methods of construction for the proposed project.

8.2 No project option

The ‘no project’ option, in cases such as this proposed project where a potentially pristine environment with minimal anthropogenic influences in the past would be exposed to a development, cannot be disregarded without proper evaluation. This section compares the ‘no project’ option to the project option from a social, economic and environmental perspective and described the preferred alternative. The table below describes the main advantages of each option from an environmental, social and economic perspective.

Table 8-1: Comparison of project option with no project option

Option	Advantages	Disadvantages
Project	• Employment and training opportunities. • Revenue to local shops and service providers will increase. • Improved security, law enforcement and policing services • Direct and indirect economic expansion and diversification due to project-related migration and increased peace and stability • Potential migration to Addu and related relief to the population congestion in Malé.	• Environmental impacts related to dredging and reclamation. • People living in Malé may have to move away from their families for job-related activities. • Potential alternative uses of the project site would be affected. • Access to the area by locals for recreational and other uses may be affected. • Costs related to the project and possible taxpayer dissatisfaction.
No project	• No change to the existing condition, the pristine environmental condition of the project site is maintained • Costs related to the project components can be avoided. • The access to the area remains intact to locals. The area can be used for recreational activities like picnic. • Environmental impact footprint minimized.	• Project-related revenue (local shops and service providers) would not be generated. • Employment opportunities due to the project would not arise.

The proposed project will have negative environmental impacts, however, the project is linked to several social and developmental issues country-wide. Therefore, the project has several justifications. The project site has remained as it is for a number of years and has little value to add to the recreational needs of the people of Hithadhoo. Provided that the impacts of the project are properly mitigated, it is likely to have very limited impact on the environment and is likely to preserve most of the ecosystem values of the site. Thus, overall it promotes the sustainable development principle of ensuring development is undertaken in an environmentally and socially responsible manner. Hence, it is preferred to go with the project option rather than the 'no project' option.

8.3 Alternative project options

8.3.1 Alternative project sites

As mentioned earlier, police had undertaken several training programmes in Addu prior to 2012. After the incident of 8 February 2012, the training programmes have been conducted in the MNDF Base in Lh. Madivaru and later in Dh. Vaanee.

The Island of Dh.Vaanee has been a logistical nightmare. Vaanee is 110 miles from Malé, so it takes a 9-hour boat ride from Malé to reach Vaanee. Boat rent is between MVR45,000-

50,000. There is no any airport nearby but the construction of Kudahuvadhoo is in progress. Nearest hospital is a 40-minute-long ride by sea to Kudahuvadhoo.

- Chronic power failures
- Low telephone signal reception
- No internet connection
- No proper class rooms
- Limited accommodation facilities for instructors
- Frequent visits by previous occupants and people from other island is a security concern
- There is not a suitable route to conduct PT and BFT due to which many trainees get unnecessary injuries.
- Due to the limitation of facilities and the logistical problems it is impossible to conduct short term refreshers and on the job training.

8.3.2 Alternative location at Addu

Considering the other potential alternative uses of the site, the area is suitable for tourism development but the lack of beach and closeness to Port and waste management sites make it less suited for tourism development. Considering this, the area seems to be appropriate for the proposed ISLES/Police Academy development. However, considering the difficulties in reclamation by placing the dredge pipes over the highway and the high costs of shore protection on the western side, it may be worthwhile considering the reclamation of an appropriate area on the eastern side for the development of the proposed Police Academy. This arrangement is illustrated below.

It is important to note that the high cost of protecting about 1km of the western shoreline (in the proposed option) would increase the cost of the project by several folds than the preferred alternative where more than double the proposed area can be reclaimed according to natural contours of the island while planning the area with beach and other aesthetic and easier site access by the jetty on the eastern side.

However, it is important to note here that although the eastern side reclamation, inclusive of low cost protection, may be more acceptable to Maldives Police Service too, the preparations has gone very far now that it would be almost impossible to relocate this site or reconsider alternative design of site.

Figure 8-1: The preferred alternative site

8.3.3 Alternative project design

The area that protrudes out as a rectangle on the southwest of the proposed site is believed to cause erosion in the downdrift areas. For this reason, EPA also suggested to redesign the area according to natural contours of the western side. If this were to be done, the reclaimed area moves too close to the western rim reef crest, which further increases the shore protection need, thereby increasing the cost. Since boulders have been proposed to be used for the shore protection, it is considered better to keep the design as it is and only curve the corners of the rectangular shape, thereby minimizing the impact on longshore sediment transport as a result of this.

At present, the low tide line moves outwards at this area in the proposed shape. Therefore, the proposed shape makes it suitable to move it closer to the reef according to existing contours. The required contours to blend with the island contours would increase the cost of the project slightly at it will increase by about 7,500m^2 area. However, this cost is not comparably high.

8.4 Alternative Energy generation options

The proposed method of generating energy from diesel generators is considered to be the most reliable means at present. However, given the unstable nature of the world economy, it is important to find sustainable energy sources such as photovoltaic, OTEC, wave or wind energy systems. These systems, however, have reliability and feasibility issues at the present time. Further research into improved large scale applications is required.

It is better to avoid diesel based systems given their negative impact on the global environment. Diesel generators produce carbon dioxide, sulphur dioxide and nitrogen oxides which, based on current knowledge, contributes to global warming that is seemingly affecting global weather or climate system with potential sea level rise due to melting of polar ice caps. However, it shall be noted that from a global scale, the emissions produced from the diesel generators used for the proposed project will be minute. Despite this, cumulative impacts need to be taken into account when taking the best option from a sustainable development perspective.

Thus, from a sustainable development perspective, taking into account the reliability of issues of the existing renewable energy technologies available, it is preferred option to slowly phase out the use of diesel power for energy generation for this project. Solar energy and OTEC systems may be quite suitable for the proposed project given its location. However, this requires a lot of research and development and may not be suitable at this stage. Solar energy is becoming increasingly popular and it is, therefore, recommended to design the proposed containers incorporating maximum use of day light/solar energy.

8.5 Alternative for water supply

Desalination has been proposed for this project only as a backup. Since a diesel based system is proposed, the alternative to would be a solar desalination plant. There are currently several systems available for solar desalination; however, these are small scale plants that could be used as backup. Even though globally not significant, the diesel or fuel-based systems have negative environmental impacts while the solar desalination systems have zero to none environmental impacts. Solar desalination technology may also have high setup costs compared with fuel-based. Solar desalination was proposed for Lh. Vavvaru marine research facility.

For desalination, there are two options for raw water: seawater or groundwater. Seawater is taken from a location offshore or from an intake well in the lagoon. Groundwater is not usually taken for desalination. However, since the groundwater aquifer is easily recharged, groundwater is certainly a cheaper source of intake water as the salinity is low and the energy requirement, therefore, is less. This is a recommended means where groundwater is not used for any other purpose. However, groundwater is necessary for transpiration by vegetation. Therefore, the small, superficial groundwater lens must be preserved. Hence, groundwater is best avoided. However, an infiltration gallery at the area cleared for proposed hydroponic systems shall be able to provide adequate supply of water without causing salinization of the groundwater lens. This is recommended if the water quality can be appropriately controlled according to the requirements of the proposed systems.

The use of boreholes that draw seawater from a depth much far below the groundwater lens has the advantage that water is well filtered, therefore, membrane life is longer and the need for large sedimentation tanks is avoided. However, it may be necessary to watch for anaerobic conditions at such depths giving rise to ammonia in the water which could lead to the formation of chloramines after treatment with hypochlorite. Yet, in the Maldives, reports of ammonia smell in raw water in systems where boreholes have been used are rare. Hence, this method is acceptable and has gained interest. The other minor disadvantage is that in case of failure of the borehole within the groundwater lens, there is a tendency that groundwater is drawn into the system. The same applies to ocean intake pipelines, the failure of which could cause salinization of the aquifer. In ocean intakes, impingement and entrainment are also causes for concern. In many resorts, for example, fishes get drawn into the pipeline (entrained) and can be found in sedimentation tanks. However, this can be avoided by using footvalves or filters. Therefore, both boreholes and ocean intakes (including lagoon intake wells) are recommended equally.

Therefore, for the proposed project, the water intake for the desalination plant can be either boreholes or beach well as both options are equally recommended. Lagoon intake may not be suitable.

For brine discharge the alternative location is the eastern side where the jetty is proposed. However, this would require the pipe to pass over the Link Road and may not be feasible or less favourable. The proposed western side is most suited for brine discharge as it would not be used for recreational purposes like swimming due to depth limitation while it would

provide adequate mixing and dilution of the discharge. If the preferred alternative site given above were to be considered for the project, the discharge location would be on the east side under the jetty at this location.

8.5.1 Waste mud disposal alternatives

There are two options for mud disposal, i.e. on-site burial (proposed) or offshore disposal. When disposed to soil or buried on-site, the bentonite mud may affect soil pH and plant growth in the vicinity. However, this impact is low. Offshore disposal in the deep sea, on the other hand, involves a cost and may not be suitable due to the cost involved and having to move the mud, thereby causing aesthetic and other nuisances. Offshore disposal also can have impacts on marine fauna.

8.5.1.1 On-site burial

When disposed to soil or buried on-site, the bentonite mud may affect soil pH and plant growth in the vicinity. However, this impact is low.

8.5.1.2 Disposal offshore

Offshore disposal in the deep sea involves a cost and may not be suitable due to the cost-involved and having to move the mud in trucks on roads, thereby causing aesthetic and other nuisances.

8.6 Alternatives for Sewage Disposal

The volume of wastewater generated on the proposed facility would be extremely small (below 30m^3/day). The current design involves installation of a comprehensive sewerage network with a treatment plant and ocean outfall. There are two practicable options given the small volume of wastewater. One is to dispose untreated sewage off the ocean outfall where there would be over 500-fold dilution and good mixing due to ever-present wave activity on the rim reef. The alternative outfall location would be the inner atoll lagoon side given that the wastewater would be treated. If not, this alternative discharge location would not be suitable. The third option would be a series of multi-chambered septic tanks at appropriate locations discharging to ground, which would be quite suitable and may be more cost-effective. A multi-chambered septic tank will retain solids, provide adequate retention/sedimentation and let the bacteria decompose the organic wastes.

8.7 Preferred alternatives

The preferred alternatives from the alternatives discussed above are as follows.

1. For reclamation and shore protection, the preferred alternative is the reclamation of a large area of land with less shore protection structures on the eastern side which will minimize the cost of these components of the project and provide adequate space. This option is favourable in environmental and socio-economic terms, however, may not be so for other reasons, which needs to be considered before finalizing on this option.

2. For raw water, the preferred alternative would be beach well.

3. The preferable option is disposal of raw sewage to ocean at appropriate depth on the rim reef side. This is because treatment is a fuel dependent process while the disposal of raw sewage at the given location does not cause pollution due to the small volume. For small wastewater volumes, it is also preferable to use a series of septic tanks given the difficulties of installing and maintaining a pipeline on the rim reef.

4. For energy, the use of solar energy has been recommended to the greatest possible extent that it be able to completely phase out fuel-based electricity.

8.8 Impacts and mitigation measures for alternatives

The impacts and mitigation measures for the alternatives discussed above have been considered when discussing each alternative.

9 Environmental Monitoring

9.1 Introduction

Environmental monitoring is a vital component of the EIA process, of which the primary objective is to assess the effects of the project on natural and cultural environment. It also aims to provide information to assist in impact management and achieve a better understanding of cause-effect relationship. The most significant aspects of this tool are its capacity to discern the accuracy of the predicted impacts and its potential to identify unforeseen impacts. Hence, environmental monitoring is essential to safeguard the environment from impacts that have not been identified and mitigated during the EIA stage.

Inclusion of a monitoring plan can significantly enhance the potency of the EIA, since it can provide a mechanism for ensuring whether the proposed mitigation measures have been undertaken, and whether the predicted impacts were accurate. Effective monitoring also needs collection of reliable data and information that can be utilised during post-project auditing. Taking the forgoing into account, the proposed monitoring plan for this project addresses parameters that are most relevant for monitoring the impacts that may arise from the project. These include water quality, sedimentation, shore dynamics, live coral cover and nektonic fauna.

The environmental monitoring plan communicates a cautious approach towards undertaking all the activities proposed under this project, which ensures that the environment of the areas in the immediate vicinity of the project site, as well as distant environments, are adequately protected from direct and indirect impacts arising from the proposed development. Furthermore, monitoring presents the opportunity to learn from experience. It can highlight flaws in the methods being used for impact prediction and mitigation, which can subsequently be used to refine procedures for future projects, leading to the improvement of the overall quality of the impact assessment process. In addition to this, monitoring provides regulatory agencies with a framework for checking compliance with, and the performance of the environmental management plan.

The monitoring plan shall target to measure:

- Ground water quality changes;
- Changes to the marine environment;

- Marine water quality changes;
- Beach profile and hydrodynamic changes;
- Accuracy of impacts and effectiveness of mitigation measures; and
- Whether thresholds are kept within the baseline limits predicted.

9.2 Recommended Monitoring Programme

The annual monitoring programme proposed for monitoring the terrestrial, coastal and marine environment of the project site is given in Table 9-1. This programme commences from the onset of the project. If the project were to be delayed by more than six months from the approval of the EIA report, the proponent needs to undertake further assessment of all baseline components covered in this EIA report. The proponent's commitment to undertake this monitoring programme for at least three years forms part of this report.

9.3 Monitoring Report

A detailed environmental monitoring report is required to be compiled and submitted to the Environment Protection Agency annually, based on the data collected for monitoring the parameters included in the monitoring programme given in this report. EPA may submit the report to the relevant Government agencies in order to demonstrate compliance of the Proponent.

The report will 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 will also include fuel, chemicals and water consumption data and greenhouse gas emission calculations.

In addition to this, more frequent reporting of environmental monitoring will be communicated among the environmental consultant, project proponent, the contractors and supervisors to ensure possible negative impacts are mitigated appropriately during and after the project works

Table 9-1: Proposed monitoring schedule for construction 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 (MVR)	Total (MVR)
1	Marine water quality (100m within the sedimentation impact zone)	Water quality: Turbidity, TSS	Every 2 months for 6 months	10		10		10								30	200.00	**6,000.00**
2	Coral and benthic cover at baseline locations	Live coral cover and fish survey - Photo quadrates/LIT and fish survey	At beginning and every 4 months for 12 months	4				4				4				12	500.00	**6,000.00**
3	Currents/hydrodynamics (baseline locations)	Drogue tracks/current meter	Every 4 months for 12 months	8				8				8				24	350.00	**8,400.00**
4	Shoreline changes (baseline locations)	High tide line and low tide line using differential GPS	Every 4 months for 12 months	2				2				2				6	500.00	**3,000.00**
5	Groundwater quality	For TDS/salinity, nitrates and photophates	Every 4 months for 12 months	2				2				2				6	300.00	**1,800.00**
6	Tree removal	No. of trees removed	Site records													0	-	**-**
7	Reclamation progress and no. and location of trees transplanted	Reclamation area outer line and GPS location of trees	Every 4 months for 12 months	2				2				2				6	500.00	**3,000.00**
8	Job opportunities	No. and type of jobs	Site records	1				1				1				3	-	**-**
9	End of construction stage monitoring report		Construction phase only												1	1	5,000.00	**5,000.00**
TOTAL																		**33,200.00**

Note:

M indicates Month

The costs given does not cover travel, food and accommodation as well as other site logistics during field investigations

Table 9-2: Proposed annual monitoring schedule for 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 (MVR)	Total (MVR)
1	Marine water quality (baseline locations)	Water quality: temperature, conductivity/salinity, DO, pH, Turbidity, TSS	Every four months	3						3						6	250.00	**1,500.00**
2	Coral and benthic cover at baseline locations	Live coral cover and fish survey - Photo quadrates/LIT and fish survey	Every six months	4						4						8	500.00	**4,000.00**
3	Currents/hydrodynamics (baseline locations)	Drogue tracks/current meter	Every three months	8			8			8			8			32	350.00	**11,200.00**
4	Shoreline changes (baseline locations)	High tide line and low tide line using differential GPS	Every 3 months	2			2									4	500.00	**2,000.00**
5	Groundwater quality	For TDS/salinity, nitrates and photophates	Every 3 months	2			2									4	300.00	**1,200.00**
6	Desalinated water quality	Toal and faecal coliforms, pH, E-conductivity, free chlorine	Every 3 months	2			2									4	400.00	**1,600.00**
7	Job opportunities	No. and type of jobs	Site records	1			2			2			2			7	-	**-**
8	Annual Monitoring Report		Once a year												1	1	1,000.00	**1,000.00**
TOTAL																		**22,500.00**

Note:

M indicates Month

The costs given does not cover travel, food and accommodation as well as other site logistics during field investigations

10 Conclusions

In conclusion, it appears justified from a technical and environmental point of view, to carry out the proposed project to develop the Police Academy or ISLES in Rujjhehere, Addu City. The main negative impacts of the project caused during construction phase are loss of habitat from vegetation clearance and potential sedimentation on the reef from dredging and reclamation. However, these two components would not offset the socio-economic benefit of the project including positive migration patterns away from Malé City and improved services and revenue generation in the host city. Proposed clearing has mature trees that can be transplanted, therefore, the impact can be reduced.

Since the overall negative impact is low and of little significance, few mitigation measures have been proposed for the proposed project. These include reducing vegetation clearance by design and proper stakeout, transplanting as many trees as possible, employing rigorous health and safety plans, dust control plans, monitoring and employing efficient waste management strategies.

The project alternatives that have been considered for the project include the reclamation of the eastern side, which makes it possible to reclaim a large area and provide beaches and add other aesthetic value to the project while minimizing largely on the shore protection component. Therefore, this alternative is not only preferable but also the more feasible option than the proposed. However, the option shall be considered in the light of other potential reasons for doing or not doing so.

Since there would be uncertainties of some degree, monitoring of key environmental parameters such as water quality of the marine environment, marine biota surveys and hydrodynamic changes as well as changes in groundwater quality would be necessary. This would help identify impacts which have not been predicted for the project and help mitigate them in time before significant environmental loss.

11 Acknowledgements

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13 Appendices

Appendix 1: Terms of Reference

Appendix 2: Commitment letter

Appendix 3: Communication of final draft with Atoll Council

Appendix 4: Approved concept plan/land approval

Appendix 5: Scoping Meeting participant list

Appendix 6: Tentative work schedule

203-EIARES/171/2016/26

Terms of Reference for Environmental Impact Assessment for the proposed Development of a Police Academy, Addu City

The following ToR is based on the application form and the scoping meeting held on 2nd August 2016 for undertaking the Environmental Impact Assessment for the proposed Development of a Police Academy in Addu City

While every attempt has been made to ensure that this TOR addresses major issues associated with the proposed development but 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\t or significant from environmental studies, or otherwise, during the course of preparation of the EIA report. ***In-text referencing needs to be provided in the report where information is obtained from any published or unpublished source.***

1. **Introduction to the project** – 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.

a) **Study area** – Submit a minimumA3 size scaled plan with indications of all the proposed infrastructures. Include Main master plan concept used for the project, description of residential building designs including the type of accommodation and facilities offered, layout of various building floors,
parking capacity and building access. 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.

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

Task 1. Description of the proposed project – Provide a description and justification of the relevant parts of the proposed project, using maps at appropriate scales where necessary.

The following should be provided (all inputs and outputs related to the proposed activities shall be justified and sources of inputs and means of managing all outputs must be provided):

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 land;
- Shore protection at the reclaimed area;
- Utilities during construction and operational phase
- Landscaping
- Measures to protect environmental values during construction and operational phase;
- Project management (Describe temporary site set up location, construction methods 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)

<u>Dredging</u>

- Location and size of borrow areas (s) on a map;
- Justification for the selection of the location(s);
- 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;

<u>Reclamation</u>

- Design of the fill area, including a justification (from a social and environmental point of view) for the choice of the shape;
- Planning and timing of sub-activities (order of the works, clearance, dredging and reclamation);
- Method and equipment of transport of fill material and hydraulic filling;
- Distance of transport;
- Need for and location of temporary stockpile(s);
- Location and design of the external bunds for the containment of the sand together with a description of their stability against waves and currents;
- Location(s) and methods of discharging water from the fill area;

<u>Shore protection</u>

- Coastal defence structures and justification for their selection;
- Details and justification of location, number, size and materials of coastal protection structures e.g. groynes, seawall or breakwaters;
- Construction methods, materials, equipment, manpower, expertise and scheduling.
- Excavation methods, if required

- Emergency plan during spillages;

Revegetation

a) Details of the source of trees that will be used for revegetation
b) If vegetation is to be supplied from inhabited islands, approvals from those island councils are required and the details of the number of trees should be provided

Utilities

a) Power for construction phase and operational phase
b) Details of any new Generators, its location and details
c) Fuel storage location
d) Fuel transport methodology and route
e) Water during operation and construction stage
f) RO plant details and intake methodology and details
g) If borehole to be used, information on how waste from drilling will be managed
h) Sewerage management during operation and construction stage
i) Waste Management during operation and construction stage

Task 2. Descriptions 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 data must be collected as per the requirements of the EPA Data Collection Guidelines (published on www.epa.gov.mv). The report should outline detailed methodology of data collection utilized.

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:

Physical environment including wind, wave and currents based on available secondary data and primary data collected at the site (Reference to available data from other reports may be used as reference material).

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/spot depths/profile (bottom morphology) (use maps) of borrow areas and proposed reclamation area;
- (Seasonal) patterns of coastal erosion and accretion, and
- Shoreline and vegetation line of the project area (About 3.4km North, starting from the causeway at the end of Hithadhoo)

Hydrography/hydrodynamics (use maps)

- Tidal ranges and tidal currents;
- Wave climate and wave induced currents;
- Wind induced (seasonal) currents;
- Sea water quality measuring temperature, pH, salinity, turbidity and total suspended solids.

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
- General land use patterns on the island,
- 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 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. Legal requirements:

- Land approval from Ministry of Housing and Infrastructure

Task 4. Potential impacts (environmental and socio-cultural) 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 due to power generation, water production and sewerage
- Impacts due to waste

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. Measures for both construction and operation phase shall be identified. Cost the mitigation measures, equipment and resources required to implement these measures shall be provided. The confirmation of commitment of the developer to implement the proposed mitigation measures shall also be included.

Task 6. 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

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Email: secretariat@epa.gov.mv
Website: www.epa.gov.mv

achieve the same objective including the "no action alternative". This should include alternative coastal protection measures, alternative designs and alternative materials. 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. Alternatives need to be provided for the shape of reclamation and coastal protection measures and its length.

Task 7.Development of monitoring plan – Identify the critical issues requiring monitoring to ensure compliance to mitigation measures and present impact management. The report should provide a monitoring report submission schedule. 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.

Task 8.Stakeholder consultation – Identify appropriate mechanisms for providing information on the development proposal and its progress to all stakeholders, government authorities. The report should state the outcomes of these consultations. Consultations should be made regarding the overall project as well as crossing the link road to move dredged material.

a) MRDC
b) Traffic Police
c) MTCC
d) City Council
e) Ministry of Housing and Infrastructure
f) Ministry of Fisheries and Agriculture
g) FENAKA

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 the relevant amendments.

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.

7thAugust 2016

بسم الله الرحمن الرحيم

VISIT MALDIVES YEAR 2016

Maldives Police Service

Malé

Republic of Maldives

ދިވެހިރާއްޖެ ޕޮލިސް ސަރވިސް

ގއ

ދިވެހިރާއްޖެ

Reff: 171-H3/203/2016/25

Ibrahim Naeem

Director General,

Environmental Protection Agency,

Maldives.

27 September 2016

Dear Sir,

This is in reference to the Environmental Impact Assessment (EIA) for the Proposed Police Academy in Addu City.

As the Proponent of the project, we assure you our commitment to undertake the proposed mitigation measures and monitoring program given in the EIA Report.

Sincerely yours,

Inspector of police Abdulla Naseer

Head of Finance Department

بسم الله الرحمن الرحيم

Land Building and Municipal Services Department

ގޯތްތި ހިއްސާކުރާ ދާއިރާ ތަރައްގީ ސަރވިސަސް ޔުނިޓް

Addu City, Maldives

Ministry of Housing and Infrastructure

LAND REGISTRY

ހުއްދަ ނަންބަރު

Reg No:/ ނަންބަރު

138-LS/S2/2016/04

Purposes of Land: /ބޭނުންކުރާ ގޮތް

Police Acedemy

Size of Land: / ހުއްދަ ދެއްވި

400,000 sqft

Land Owner: / ހުއްދަ ދީފަރާތް

Ministry of Housing and Infrastructure

Land Issued to: /ބޭނުންކުރާ ފަރާތް

Maldives Police Services

Block No: / ބްލޮކް ނަންބަރު

485

Location: / ބޭނުންކުރާ ތަން

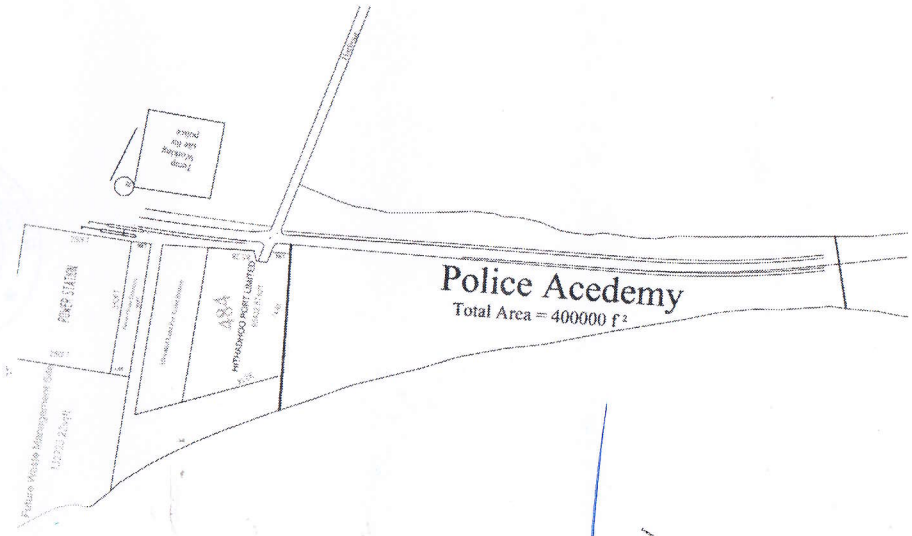
Hithadhoo/ Addu City

Registered Date: / ހުއްދަ ނަންބަރު ދީފައި

20th July 2016

The Land specified is reserved for the state use.

ބަޔާންކުރެވިފައިވާ ތަން ރާއްޖޭގެ ގާތްގަނޑުގެ ގޮތުގައި ކަނޑައެޅިފައި.



Registrar of Land

Land Building and Municipal Services

Addu City, Hithadhoo

Ministry Of Housing and Infrastructure

Environmental Protection Agency
Male', Rep of Maldives

Meeting: Scoping Meeting for the Proposed Development of a Police Academy in Addu City.
Date: 02/08/16' - Tuesday
Time: 10:00 a.m - 11:00 a.m.

MEETING ATTENDANCE

	Name	Designation	Office	Email	Phone No.	Signature
01	Yaseed Ahmed	Director	EPA	yaseed.ahmed@epa.gov.mv	7905573	
02	Ahmed Zahid	Consultant	Sandcays	zahid@sandcays.com	7781535	
03	Ahmed Maoon	client -	Police	ammu2002@gmail	7784119	
04	mohamed faleh	client	police		7566882	
05	Nafha Anjaz	~~MHH~~ Environment Analyst	MHH	nafha.anjaz@housing.gov.mv	7721554	
06	Ibrahim Rashid Adam	Env. Analyst	MHI	ibrahim.rashid@housing.gov.mv	7785434	
07	Adam Nubeen	Asst. Engineer	EPA	adam.nubeen@epa.gov.mv	7588930	
08	Hashim Naleel	Asst. Oceanographic observer	EPA	hashim.naleel@epa.gov.mv	7687188	
09	Ahmed Shan	Senior Surveyor	EPA	ahmed.shan@epa.gov.mv	7905899	
10	Mariyam Rifga	Asst. Director	EPA	mariyam.rifga@epa.gov.mv	3335871	

		Schedule of completion - ISLES Project at Addu City, Republic of Maldives																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
SL.No.	Name of the Block	Dec'2016	Jan'2017	Feb'2017	March'20	April'201	May'2017	June'201	July'2017	Aug'2017	Sept'2017	Oct'2017	Nov'2017	Dec'2017	Jan'2018	Feb'2018	March'2018	April'2018	May'2018	June'2018	July'2018
1	Academic & Administration Block																				
2	Quarter Guard																				
3	Public Health Care																				
4	Auditorium Block - 340 seater																				
5	M T Garage																				
6	Male Faculty -Residential Quarter																				
7	Guest House																				
8	Female Barracks																				
9	Male Barracks																				
10	Bunglow - 3BHK																				
11	Bunglow - 4BHK																				
12	Utility Block																				
13	Gymnasium & stand (800 people)																				
14	Electrical Sub Station																				
15	Sports field, Parade Gr & Helipad																				
16	Swimming pool																				
17	Watch towers																				
18	Worship place																				
19	Sports facilities																				
20	Training Village																				
21	Shooting range																				
22	compound wall																				
23	Road																				
24	Jetty																				
25	Reclaimation & boulder filling																				

Addu Police academy EIA

azmeel@sandcays.com [azmeel@sandcays.com]

Sent: 10/4/2016 10:16 AM

To: emu@housing.gov.mv

Cc: zahid@sandcays.com

Dear Sir/Madam

Please find the attached EIA report of the Addu Police Academy.

Thank you

Mohamed Azmeel
Admin Director
Sandcays Pvt. Ltd.
H. Alihuras
Lonuziyaaraiy Magu
Malé, Maldives
Mobile: (960)7793351
Fax: (960)3009799

Environment specialists
www.sandcays.com

Attachments: Addu Police Academy EIA_final draft.pdf