Environmental Impact Assessment

for the proposed 10 storey building construction at Ma. Maavelavaru, Malé

Proponent:

Mohamed Rasheed

Ma. Maavelavaru, Malé

Consultant:

Development Advisory Services Pvt Ltd

January 2018

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Consultants Declaration

As the lead consultant of this EIA, I certify that the content in this Environmental Impact Assessment study is complete, true and correct to the best of my knowledge and abilities. This EIA has been prepared according to the EIA regulation 2012.

Name: Ali Shareef (EIA P19/11)

Signature:

Signed on: 25 January 2018

Proponents Declaration

I, Mohamed Rasheed, the proponent of the proposed project guarantee that all the non-technical information provided in this study are accurate and complete.

Mohamed Rasheed

Ma. Maavelavaru

Non-Technical Summary

This report discusses the findings of Environmental Impact Assessment (EIA) carried out for the proposed 10 storey building at Ma. Maavelavaru, Kudhirayimaa goalhi, Malé. The objective of undertaking the project is to provide a residence to the proponent and family. The proponent also aims to rent out apartments in the building for residential use.

The report has looked at the justifications for undertaking the proposed project components. Alternatives to proposed components or activities in terms of, design and environmental considerations were suggested. A mitigation plan and monitoring programme before, during and after the works has also been proposed.

It is inevitable that there would be some negative environmental impacts, especially during excavation, dewatering and construction work is carried out. The potential environmental and social impacts from the overall project includes water contamination, shortage of groundwater, generation of waste, air pollution, noise pollution, disruption to traffic and interruption to commercial activities around the project location. After a survey and the study undertaken, these negative impacts identified are not severe enough to not allow the project. In light of possible impacts assessed, a comprehensive monitoring component has been suggested to monitor environmental (natural and social) impact during the course of this project. This monitoring component will be adhered and will allow the assessment of long term changes, despite the limited nature of the impact. In addition, the socioeconomic impacts that have been assessed have been identified as mostly positive impacts, not just in short term but also in long term.

Therefore, from an environmental and technical point of view and in light of the existing socio-economic developments it appears justifiable to carry out the proposed project.

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ތިމާވެށްޓަށް އަސަރުކުރާ މިންވަރު ބަޔާންކުރާ (އީ.އައި.އޭ) މި ރިޕޯޓަކީ މައްޗަންގޮޅި މާވެލަވަރު ގޯތީގައި 10 ބުރީގެ އިމާރާތެއް ހެދުމުގެ މަޝްރޫއު ކުރިއަށް ގެންދިއުމުގައި ތިމާވެށްޓަށް ދިމާވެދާނެ އަސަރުތަކާއި ދެނެގަނެ އޭގެ މިންވަރު ބަޔާންކުރުމަށްޓަކައި ތައްޔާރުކޮށްފައިވާ ރިޕޯޓެކެވެ. މި މަޝްރޫއުގައި، މިގޯތީގައި 10 ބުރީގެ އިމާރާތެއް ހެދުމުގެ މަގްސަދަކީ ގޭގެ ވެރިފަރާތާއި ވެރިފަރާތުގެ އާއިލާއިން ދިރިއުޅޭނެ ރަނގަޅު ތަނެއް ބިނާކުރުމެވެ. އަދި މީގެ އިތުރުން އިމާރާތުގެ ބައެއް ފްލެޓްފިހާރަތައް ކުއްޔަށް ދިނުމަށްވެސް ގޭގެ ވެރިފަރާތުން ގަސްދުކުރައްވައެވެ.

މި މަޝްރޫއަށް އީ.އައި.އޭ ރިޕޯޓް ހަދަން ޖެހުނީ މައިގަނޑު މި މަޝްރޫއަކީ ތިމާވެށީގެ ޤާނޫނު ބެހެއްޓުމާ ބެހޭ ގަވާއިދު 2012 ގެ ޖަދުވަލު 'ނ' ގައި ހިމެނޭ ލިސްޓުގައި މިމަޝްރޫއުގައި ހިމެނޭ މަސައްކަތްތައް އެކުލެވިގެންވާތީއެވެ.

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މިހާރު އަސަރުތަކަކީ ވަގުތީ އަސަރުތަކެއް ކަމަށާއި މި އަސަރުތައް ކުޑަކުރުމަށް ޚާއްސަ ފިޔަވަޅުތައް އަޅަންޖެހޭނެ ކަމަށެވެ. އަދި އަސަރުކުރާ ފިޔަވަޅުތަކުގެ ތެރޭގައި އިމާރާތްކުރާ މަސައްކަތުގެ ނަތީޖާއަށް ލޭބަރ ކޮލިޓީ އަސަރުތަކެވެ. މި އަސަރުތައް ކުޑަކުރުމަށް އަޅާނެ ފިޔަވަޅުތަކުގެ ތެރޭގައި ކަރަންޓާއި ފެނާއި ސީވޭޖު ބަންދުކުރުމުގެ ކުރިން ފީލްޑް ވިޒިޓަކުން ހޯދާނެ ފިޔަވަޅުތަކާއި، ކޮންސްޓްރަކްޝަން އާލާތް މަދުކޮށް ބޭނުންކުރުމާއި ކޮންސްޓްރަކްޝަން ކާބަރޭޖު ކަނޑައެޅި ނަގާ ޖާގައިގައި ބެހެއްޓުމާއި، ކައިރި އިމާރާތްތަކަށް ގެއްލުން ނުވާގޮތަށް މުރާޖަޔާއި އިތުރު ފޯރުކޮށްދިނުމާއި، ދުވާލުގެ ގަޑިއަކަށް ހަމައަށް ކޮންސްޓްރަކްޝަން ދުވަހު ސޭފްޓީ ގެއަރ ބޭނުންކުރުމާއި، މަސައްކަތު ވަގުތު ހަނިކުރުމާއި، ކޮންސްޓްރަކްޝަން ސައިޓް ބަރިކޭޑް ކުރުމާއި މޭޓީރިއަލް ރައްކާކުރުމާއި ކޮންސްޓްރަކްޝަން މަސައްކަތު ވަގުތު ހަނިކުރުމެވެ. މިމަޝްރޫއުގެ ސަބަބުން ކުރާ އަސަރުތަކާއި ދިމާވާނެ އަސަރުތައް ކުޑަކުރުމަށް އަޅާނެ ފިޔަވަޅުތައް ހިމެނޭ ސަބަބުން ފެނުގެ އިންސައިޑް ކޮންޓްރޯލް ކުރުމާއި، ހިތަދޫސް ހުރި މިންވަރު، ޖަނަރޭޓަރު ކޮންޓްރޯލް ކުރުމާއި، ކައިރި އިމާރާތްތަކުގެ ހާލަތު ފަދަ ކަންތައްތަކާއި މޮނިޓަރކުރާނެ ގޮތް މި ރިޕޯޓުގައި ހިމަނާފައިވެއެވެ. މިރިޕޯޓަކީ އެންވަޔަރަންމަންޓަލް މެނޭޖްމަންޓް ޕްލޭން އެކުލެވޭ ފުރިހަމަ ރިޕޯޓެކެވެ.

މި މަޝްރޫއުގެ ސަބަބުން ދިމާވާނެ ވަގުތީ އަދި ދިގުމުއްދަތުގެ ގޮތުން ކުރާ އަސަރުތައް ކުރިމަތިލާނެ މި ރިޕޯޓުގައި ހުށަހަޅާފައިވާ އިސްލާހީ ފިޔަވަޅުތައް އަޅައި މޮނިޓަރިންގ ޕްރޮގްރާމް ތަންފީޒުކުރުމާއި ކުރިމަތިލާ އަސަރުތައް ގެންދިއުމުގެ ޒިންމާ ބަލައިގަތުމުން މިމަޝްރޫއުގެ ސަބަބުން ތިމާވެށްޓަށް މާބޮޑު ނޭދެވޭ އަސަރެއް ކުރާނެކަމަށް ނުދެކެމެވެ.

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1. Introduction

This report addresses the social and environmental impacts associated with the construction of 10 storey building at Ma. Maavelavaru. The Environmental Impact Assessment (EIA) has been carried out to meet the requirement of Clause 5 of the Environmental Protection Preservation Act of the Maldives. This EIA report is an evaluation of the potential environmental impacts of the proposed 10 storey building construction at Ma. Maavelavaru.

This report looks at the justifications for undertaking the proposed project components. Alternatives to proposed components or activities in terms of location, design and environmental considerations are suggested along with mitigation measures where necessary. A building monitoring and management plan is also included in the report.

1.1 Scope of the EIA

The Terms of Reference (TOR) for this project was approved by the Environmental Protection Agency on 12th December 2017. As per the approved TOR this EIA report broadly identifies, asses and predict the environmental impacts from the construction of 10 storey building at Ma. Maavelavaru. The main focus of the report therefore, as per the TOR is to:

- Provide background information on the project
- Provide a description of the relevant parts of the project including inputs and outputs of the project
- Provide a description of the environment characteristics associated with the project including groundwater quality prior to the beginning of construction activities, noise level before construction activities, traffic flow around the project site, possible social impact arising from construction activities
- Identify the legislations, regulations, policies, standards, and international conventions relevant to the project
- Identify potential impacts of proposed project with impacts on the physical and human environment, distinguishing between significant positive and negative impacts, short term and long-term impacts during construction and identifying impacts that are cumulative, unavoidable or irreversible
- Describe alternatives examined for the proposed project including the “no project alternative”
- Identify possible measures to prevent or reduce significant negative impacts to acceptable levels during construction
- Provide monitoring details for water quality monitoring, noise and traffic monitoring during construction.
- Provide stakeholder consultations undertaken with a summary of the outcome of the consultations including the main concerns identified.

1.2 Aims and Objectives of the Project

As per the Environmental Protection Preservation Act of the Maldives, this report aims at looking at the environmental and social concerns that may arise due to the construction of the proposed 10 storey building. Therefore, this report attempts to achieve the following objectives;

- To identify and describe environmental and social elements likely to be affected by the proposed developments
- To identify and quantify any potential losses or damages to flora, fauna and natural habitats,
- To identify, assess any negative impacts during the construction and operational stage and to propose measures to mitigate these impacts to acceptable levels,
- To identify, predict and evaluate the cumulative effects expected to arise during the construction and operation of the proposed developments in relation to the sensitive receivers
- To promote informed and environmentally sound decision making
- To provide commitment from the proponent to minimize the social and environmental impacts that may arise due to the implementation of this project.

1.3 Need and justification

Malé being the capital and a small island has become over crowded with more than one-third of the population living in the capital. Due to overcrowding, there is not space for horizontal expansion of the infrastructure. To cater the high population density, the only means is to develop vertically. With growing families, the old structures of a single storey is not enough for families for a quality and decent life. The proponent also decides to construct a vertical development to cater the needs of a growing family.

This project also aims to provide quality and decent life for expanding families and provide extra and quality space. With completion of this project, it will increase the housing and floor area available for Malé.

1.4 References to similar studies

As mentioned earlier, under the EIA regulation Schedule Raa requires undertaking EIAs for the construction of high-rise buildings. Therefore, with several multi-story building projects undertaken recently in Malé by public and private sector, lots of EIAs have been undertaken in the country. Thus, several such EIAs were studied including:

- EIA for 10 storey building at Feryuvaadhee
- EIA for 10 storey building at Andhalus
- EIA for 11 storey Residential Building at Ma. Shamna
- EIA for the development of a 14-storey building at G. Hudhukokaa
- EIA for the construction of a 10-storey building with basement at G. Javaahiru Asseyri
- EIA for the construction of 11-storey building at Ma. Jambugasdhoshuge
- EIA for construction of a 14 storey building at G. Noomaraaage aage, Malé.

2. Project Description

2.1 Background

Ma. Maavelavaru is an existing house, however now demolished and the project proponent decided to construct a 10-storey building due to need of more housing space. Due to need of more space and for better living conditions, it was decided to build a new home for residential purposes. The location is sited in a narrow road (Kudhiraiymaa golhi) situated between Dhibahaaru magu and Chaandhanee magu.

2.2 Project Location

The project location as shown in Figure 1 is in Kudhiraiymaa golhi, in Machangolhi district in Malé the capital city of Maldives. The project has a plot area of 77.80 m^2. It also shows the possible project impact boundary mostly related to traffic and noise.

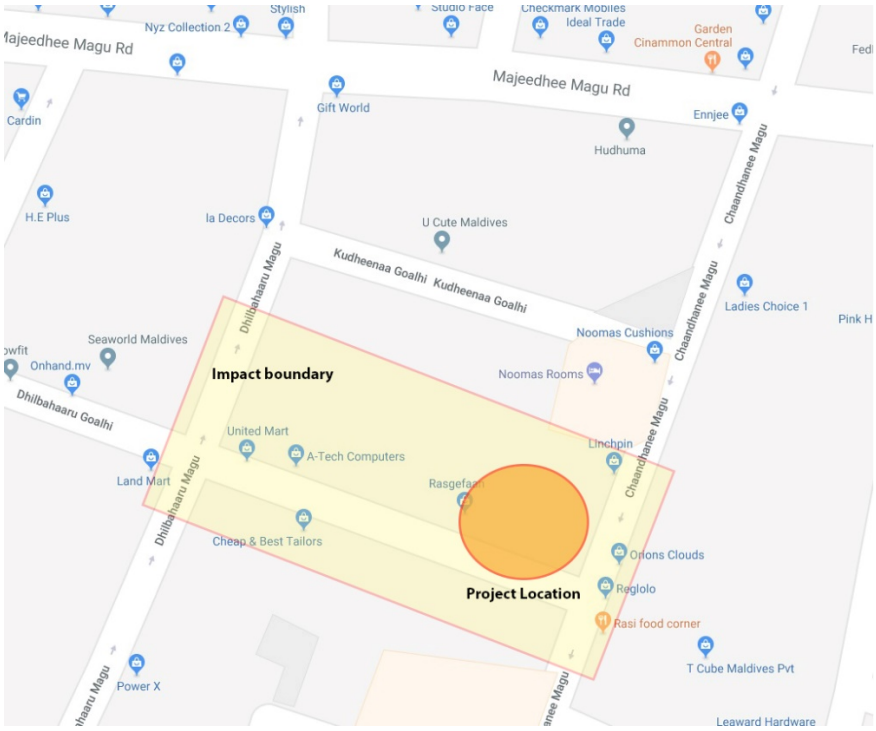

Figure 1: Location of the project and possible impact project boundary

The area is, like any other place of Male congested with some high-rise buildings. There is a 5-storey building to the west of the land plot and to the east a 1 storey building. The place has been vacated for construction and currently used as a temporary garage as shown in Figure 2.

Figure 2: Current status of the land plot

2.3 Proposed works

Like any other project of this nature, the following activities will be carried out under this project.

- Excavation
- De-watering
- Mixing and application of concrete
- Storage and handling of cement and other raw materials
- Use of heavy machinery and equipment
- Roofing part of the terrace
- Plumbing
- Tiling and railing
- Plastering, painting and finishing

2.4 Key design details

Key design features of the project are as follows:

- Development footprint: 77.80 m^2

- Foundation depth: 1.5 m below ground level
- Foundation type: Raft foundation
- Foundation thickness: 750 mm
- Floor use: For residential purposes
- Lift installed
- Designated area for waste collection

Following is simple schematic of the site plan, ground floor, a typical floor and an elevation plan of the building. Detailed large drawings are given in the appendix of the report.

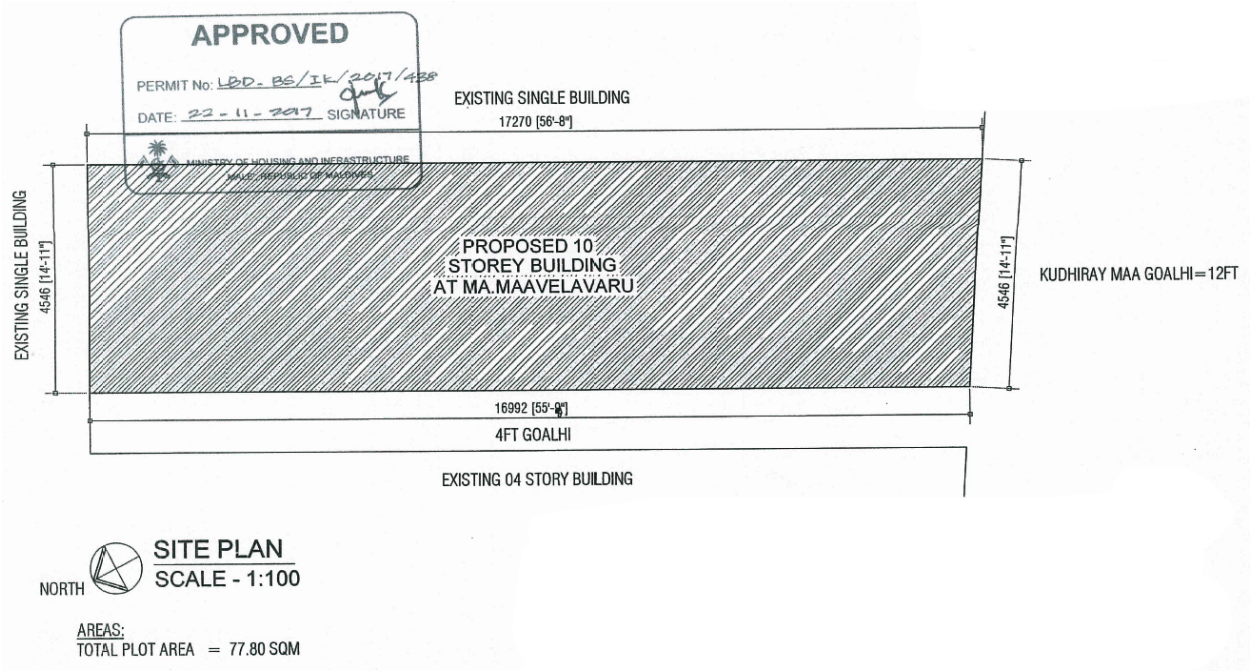

Figure 3: Site plan

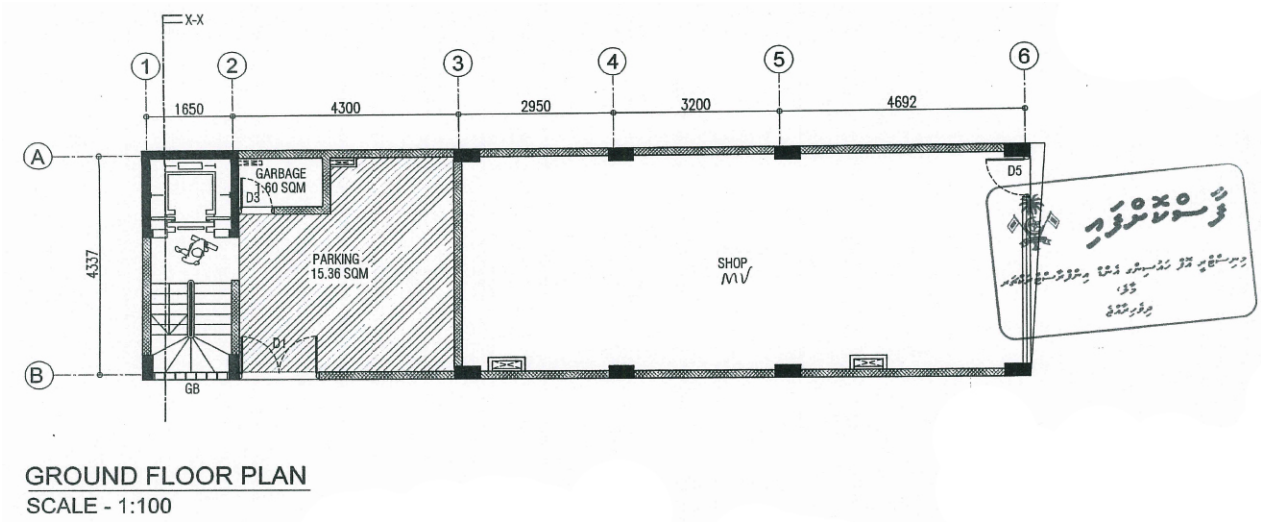

Figure 4: Ground floor plan

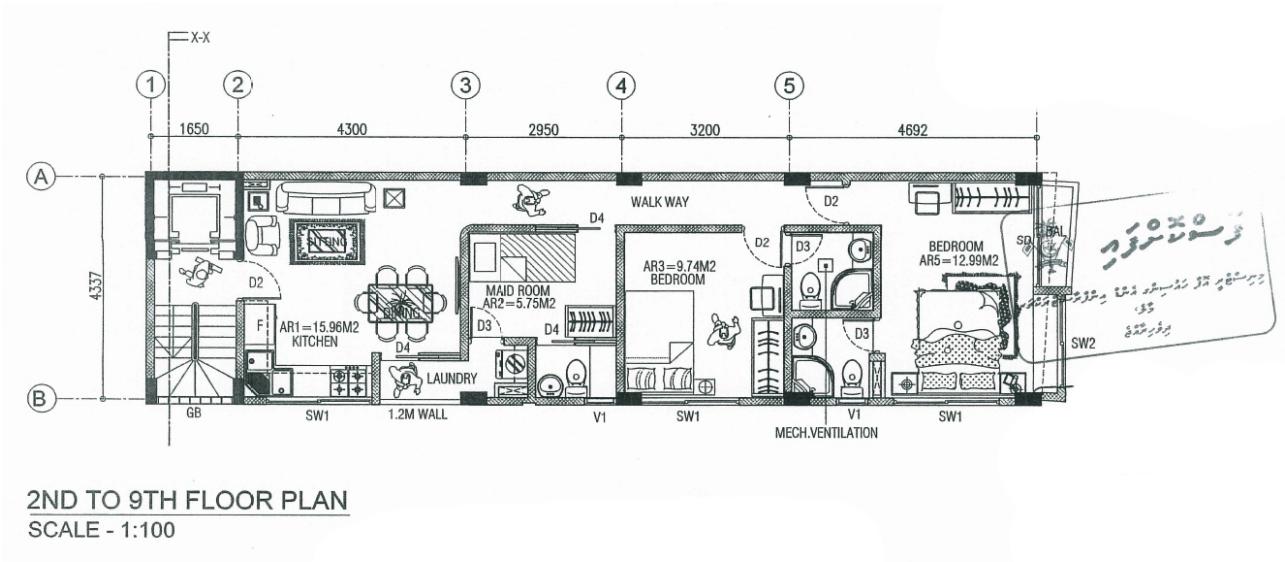

Figure 5: Typical floor plan

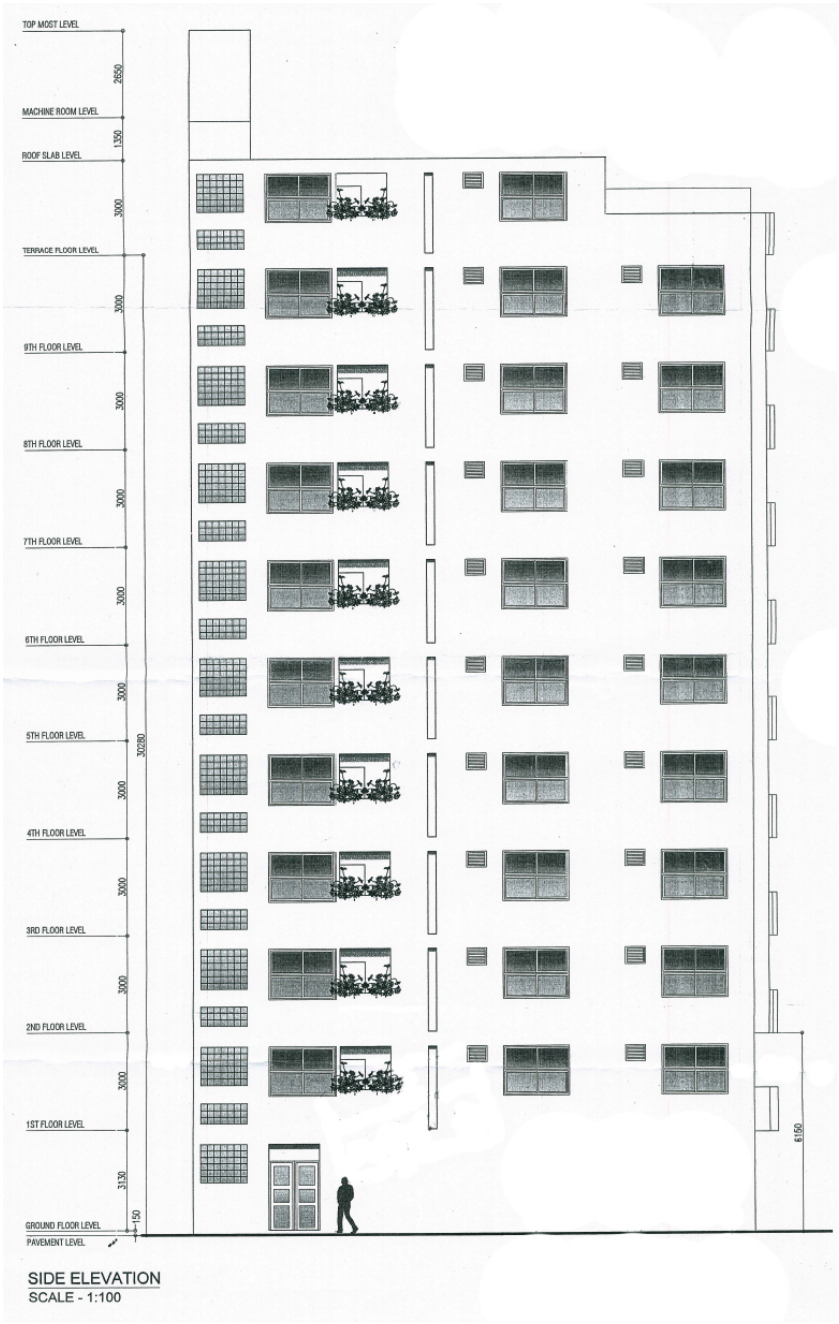

Figure 6: Elevation view

2.5 Project components

The following major components will be carried out under this project.

2.5.1 Demolition of existing structure

Currently the land plot allocation for the construction is being vacated and temporarily used as a garage. Existing infrastructure at the site will be demolished and cleared for excavation. In order to lay the raft foundation site will be excavated to 1.5m depth from the ground level.

Since there are number of buildings adjacent to the project site, proper measures will be taken to avoid any adverse effect during excavation. Therefore, retention structure to prevent collapse of soil is required. In addition to this precautionary notices and adequate lighting will be in place to minimize any likely incidences. Adequate site security will also be in place to prevent unauthorized access. Demolition will be taken with demolition hammer and excavators.

2.5.2 Excavation and protection to adjacent structures

In order to lay the raft foundation site will be excavated to 1.5m depth below the ground level. The estimated depth of water table in the areas is 1.1m from the ground level. The excavation will be done using an excavator.

Since there are number of buildings adjacent to the project site, proper measures will be taken to avoid any adverse effect to nearby structures. All necessary precautions will be taken into account to protect the freshly cut surface of the natural ground to prevent it from fall due to the action of weather or any other action that may cause such a fall. It is proposed to drive angles vertically at 1.2m, along the periphery of the building where adjacent existing foundations remain. 6mm thick metal sheets will be driven in simultaneously with vertical angels. A second set of vertical angels will be driven in at a distance of 1.2m to be used for shoring and bracing the initial set of vertical angles. The sheets will be placed during excavations and hence there is no hammering for driving the sheets. Precautionary notices and adequate lighting will be in place to minimize any likely incidences. Adequate site security will also be in place to prevent unauthorized access.

2.5.3 Dewatering

Dewatering will be simultaneously ongoing with the excavation works until the casting of the foundation has been completed. This is an important process for establishing the building structures. Dewatering will remove ground water from construction site allowing construction to be conducted in dry environment. It is necessary to do dewatering before substructure works are started.

Dewatering in Malé is usually done by pumping the water to a temporary junction provided by Malé Water and Sewerage Company (MWSC) or dispose to sea through a pipeline provided by the Maldives Road Development Corporation (MRDC). However, this service has been temporarily being shutoff and pipes has to be laid on road and flushed into sea. For any dewatering to be carried an approval has to be taken from the Environmental Protection Agency. Therefore, dewatering process will be undertaken as per the approved method by the EPA. The details of the methods will be submitted to EPA with the dewatering application.

Possible impacts which might occur due to the process of dewatering are:

- Increased noise level due to the continuous operation of generators to operate dewatering pumps.

- Partial loss of stability and subsequent settlement due to loss of fines from the soil medium.
- Water shortage due to dewatering at nearby wells

Therefore, the contractor will be made responsible for ensuring the safety and stability of all adjacent structures and services above or below ground level. If there are trees in the vicinity of the project site, it would be watered daily to prevent water shortages. If there are any complaints regarding water quality and availability from the neighbouring households and buildings it will be taken care of by the proponent through negotiation or compensation.

2.5.4 Foundation

The raft foundation is the most commonly adopted method of laying foundation in the Maldives and this method will be used in the proposed project. This type of foundation helps spread the load from the structure over a large area and minimize the pressure applied on the base.

After the excavation work is complete, a 50mm thick lean concrete will be laid to provide a level surface to assemble the reinforcement of foundation raft slab and beams. The concrete works for the raft foundation will be done using Grade concrete. Thickness of the raft is 750mm. Figure 7 shows the foundation plan of the project.

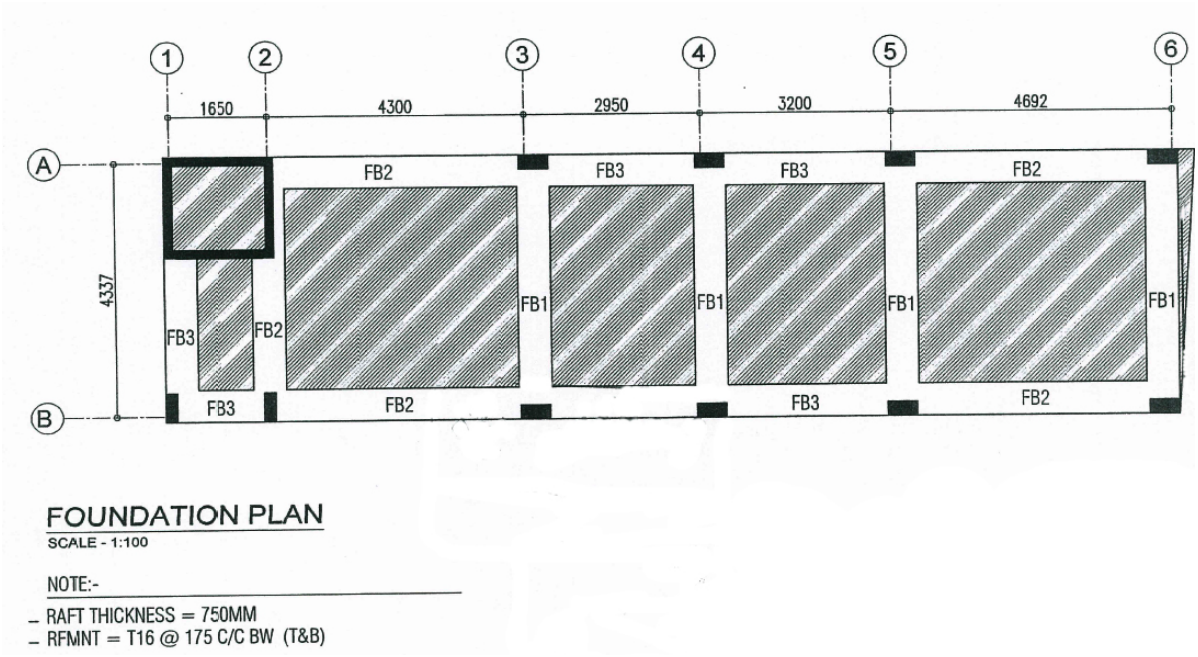

Figure 7: Foundation plan

For a raft foundation, as is designed for this structure, no unappreciable settlement is anticipated. Should any event of a physical soil disturbance leads to settlement; it will be of uniform settlement that will have the least impact on the structural stability.

2.5.5 Mobilization of equipment and materials

All the materials such as cement, aggregate and sand will be delivered to the site based on consumption. Steel and plywood will be stored at the warehouse. Necessary measures will be taken to avoid spillage of materials while transporting. Furthermore, the relative width of roads leading to site would accommodate movement of large vehicles at all times of day. If any road closure is required, proper sign boards will be placed and measures will be taken to avoid congestion.

2.5.6 Traffic re-routing and road blocks

The two roads to the west and east of the project location is Dhilbahaaru magu and Chaandhanee magu respectively. These two roads are one-way road where Chaandhanee magu traffic goes from north to south while Dhilbahaaru magu traffic goes from south to north. The traffic where the house is located is also a one-way street where it goes from east to west. Therefore, traffic which comes from Chaandhanee magu only can enter the project location site. Since Kudhiraiymaa golhi is a one-way and the only point for traffic to enter is at the junction of Chaandhanee magu and Kudhiraiymaa golhi, a possible road block could be placed at this junction should heavy work to be carried. Possible re-routing and road block which could be used is shown in Figure 8. However, none wide vehicles such as bicycles and motor bikes could be allowed if the contractor feels it could be allowed. This will ease the traffic nuisance to a certain degree. All the necessary permits from the Ministry of Housing and Infrastructure will be taken for any road blocks.

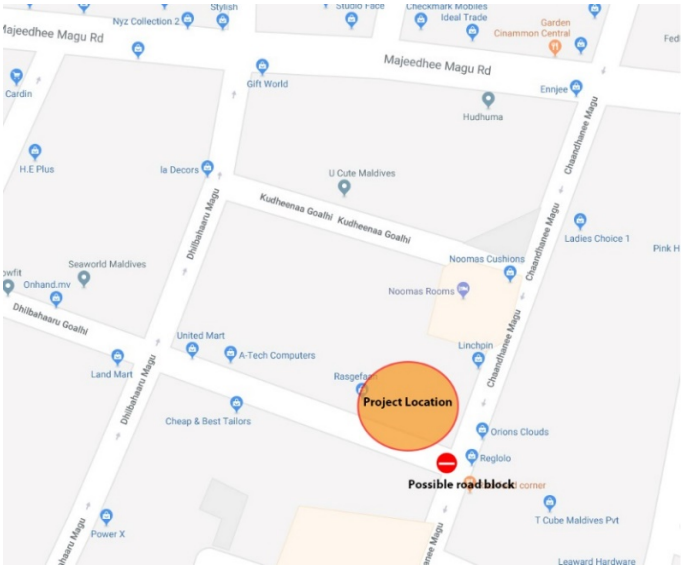

Figure 8: Possible traffic re-routing and road block during construction

2.5.7 Utilities

Water and sewerage services for the building will be provided by the Maldives Water and Sewerage Company (MWSC). MWSC will provide desalinated water supply and sewerage connections upto the building and all the internal plumbing need to be carried out by the proponent. It is estimated that 25 m^3 per day of desalinated water will be required during the

construction phase. Wastewater generated will be relatively low during the construction phase compared to the operational phase.

Electricity will be provided by State Electric Company (STELCO). They will provide temporary electricity during construction of the building and permanent electric connections to the entire building during the operational phase. It is estimated that the project site will require approximately 30 kW of power during the construction phase.

2.5.8 Waste management

Wastes created during construction would include mostly construction material (mainly steel and wood), empty cement bags, excavated earth and general packaging waste. Small amounts of waste oil may be generated from the operation and maintenance of vehicles. The developer will be responsible for regular collection of the waste created during construction, and transfer of the waste. Waste generated will be transported in vehicles approved for waste transportation under waste regulation.

Excess sand excavated during foundation works will be transported at appropriated intervals and waste generated during concrete works and finishing works will be collected at the end of the day and stored in closed containers at designated locations temporarily. Waste generated due to any activity and component of the project will not be placed outside the project location/boundary. Extra care will be taken to dispose Hazardous waste as per the required standards. All necessary regulations and standards will be followed to avoid any impact on environment and nearby households and pedestrians.

2.5.9 Health and safety measures

All reasonable precautions will be taken for the safety of employees and equipment will be operated by competent persons. Construction activities would be carried out under the supervision of a suitably experienced person. Sign boards to indicate ongoing construction activities will be installed as a precautionary measure to avoid any potential harm that might be caused otherwise to the general public. Necessary safety gear will be provided to all employees and proper supervision will ensure that the gears are worn at all times. Some safety signboards which would be used are given below in Figure 9.

Figure 9: Signboards

2.5.10 Project input and output

The types of materials that will go into the development and from where and how this will be obtained are given below. Table 1 provides major inputs while of the project while Table 2 highlights the major outputs of the project.

Table 1: Project Inputs

Input resources (s)	Source/Type	How to obtain resources
Construction workers	Local and foreign	Contractor's employees or by announcement
Engineers and site supervisors	Local and foreign	Contractor's employees or by announcement
Water supply (during construction)	Desalinated water	MWSC
Electricity/Energy (during construction)	Diesel	STELCO
Machinery	Concrete Mixer, barge, excavators, trucks, Dump Truck and general construction tool	Contractor's machinery or hire locally where available
Construction materials	Aggregate, sand, cement, wood, steel	Import or local purchase where available
Maintenance materials	Maintenance parts and fluids required for the machinery and piping	Import or local purchase where available
Telecommunication	Mobile phones, fax machines and internet	Dhiraagu

Table 2: Major outputs

Products and waste Materials	Anticipated quantities	Method of disposal
Construction waste	2-3 tons per day	Sorted and transferred to Malé waste collection area
Waste oil	Small quantities	Contained and transferred to Malé waste collection area
Hazardous waste (diesel)	Small quantities	Contained and transferred to Malé waste yard
Waste water (dewatering)	30 litres/second	Water flow to junction provided by MWSC and to the lagoon via water drainage pipes
Noise pollution	Only localised	Work hours will be determined to avoid nuisance to the nearby residents, especially during night
Air pollution	Debris in minute	Minimized by site demarcation

	quantities	temporary boundary walls
Waste generated during operation phase (Kitchen and other domestic waste)	Small to moderate	Collected by WAMCO
Sewage effluent	small	Disposed through existing sewerage network

2.5.11 Project management

Once the necessary clearances for construction would be sorted out, a contractor will be chosen for construction. The contractor would work with close collaboration with the project proponent. All the expat staffs involved in the project would be brought in by the contractor and they would be housed in labour quarters of the contactor. All the planning operations would be done at the contractors' office. Any machinery and equipment not owned by the company will be rented.

2.5.12 Fire emergency and evacuation plan

Fire emergency and evacuation is an important process which should be given due consideration in construction of houses. The proponent has made sure that the building comes with staircases at every floor which could be used as an escape should there be an emergency. Additionally, it is proposed to have fire extinguishers at the apartments.

2.6 Work schedule

It is envisaged to finish the project in 2.7 years and Table 3 shows the proposed work schedule.

Table 3: Work schedule

No	Details	Days	Start date	Completion date
1	Preliminary works, ground works	25	1-Feb-18	26-Feb-18
2	Foundation	30	26-Feb-18	28-Mar-18
3	Ground floor concrete	25	28-Mar-18	22-Apr-18
4	1st - 10 floor concrete	280	22-Apr-18	27-Jan-19
5	Terrace concrete	20	27-Jan-19	16-Feb-19
6	1st - 10 masonry and plastering	196	16-Feb-19	31-Aug-19
7	Ground floor finishing	20	31-Aug-19	20-Sep-19
8	1st - 10 floor finishing	350	20-Sep-19	4-Sep-20
9	Panel installation	20	4-Sep-20	24-Sep-20
10	Lift and pumps installation	20	24-Sep-20	14-Oct-20
11	Clean up	7	14-Oct-20	21-Oct-20

2.7 Survey methods

The methodology used for the analysis of the field environment and assessment of the impacts are based on established scientific methods, professional judgment and guidance from the TOR for the EIA.

2.7.1 Noise level

Noise level was measured using a sound meter at designated points and monitored for 1-minute. Noise levels of maximum, average and minimum was measured.

2.7.2 Water quality

Water samples were collected from a groundwater tap collected in a plastic bottle and tested at MWSC laboratory.

2.7.3 Soil data

Soil information was obtained from a well dug and was assessed visually.

2.7.4 Traffic data

Traffic data was obtained by counting the type and number of vehicles for a fixed time period.

2.8 Uncertainties in the data collection methods

Some of the methods used are based on visual assessment, there will be uncertainties associated with it. Furthermore, surveys such as noise and traffic are time bound and very specific to the time of the survey and might not represent the long-term average conditions.

3. Existing Environment

This section includes the compilation and evaluation of baseline data of the relevant environmental characteristics of the study area, including the following components.

- Hazard vulnerability
- Water quality
- Traffic flow
- Noise level
- Buildings in the vicinity

3.1 Climatology

The Indian Ocean Monsoons governs the climatology of the Maldives hence monsoonal reversal plays a significant role in weather patterns. Two very distinct monsoon are observed: the Northeast (*Iruvai*) and the Southwest (*Hulhangu*) monsoon. Monsoons can be best characterized by direction of wind and the amount of rainfall. The southwest (SW) monsoon is the rainy season which lasts from May to September and the northeast (NE) monsoon is the dry season that occurs from December to February. The transition period of SW monsoon occurs from March and April while that of NE monsoon occurs from October to November. The results are summarized in Table 4.

Table 4: Summary of the seasons.

Season	NE-Monsoon	Transition Period 1	SW-Monsoon	Transition Period 2
Month	Dec, Jan, Feb	Mar, Apr	May, Jun, Jul, Aug, Sep	Oct, Nov

Since there were no site-specific wind data, wind regime around the island was assumed to be that similar to the closest meteorological stations. The closest station is the meteorological station at the Male' international airport from 2002 to 2006. Figure 10 below represents mean daily wind speeds and direction. It was determined that the winds from WSW to WNW is the dominant wind direction in the Southwest Monsoon, where wind from ENE and E was dominant during the North-East Monsoon. Wind determines the direction of the sediment movement and have an influence on the alongshore current patterns.

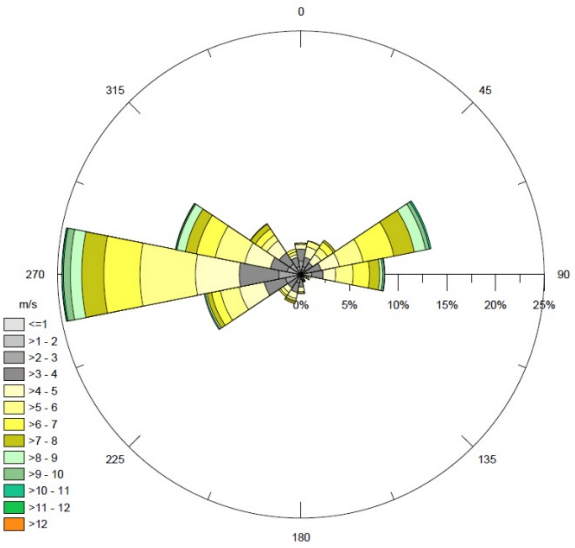

Figure 10: Wind speed and direction at Male' international airport (adapted from EIA Lamer 2008).

3.2 Temperature variability

The average temperature ranges from 25 to 31-degree Celsius with seasonal fluctuations due to monsoon. The warmest periods are observed during north-east monsoon (Figure 11).

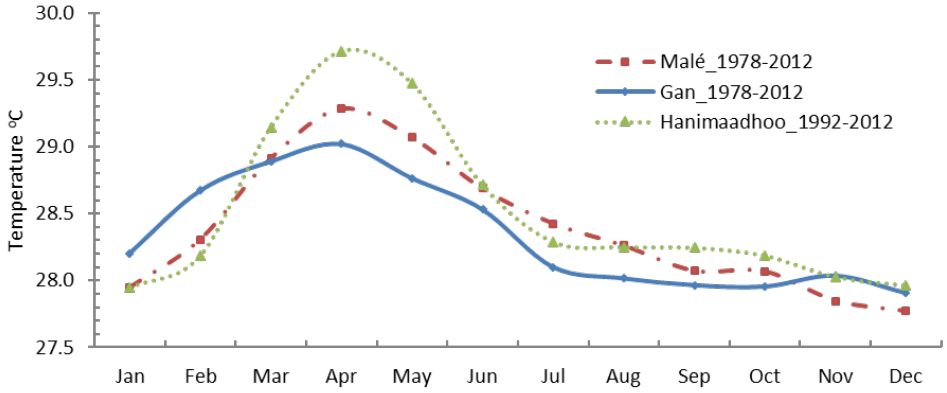

Figure 11: Temperature climatology (MEE 2016).

3.3 Rainfall variability

Total average rainfall received in Maldives varies spatially as shown in Figure 12.

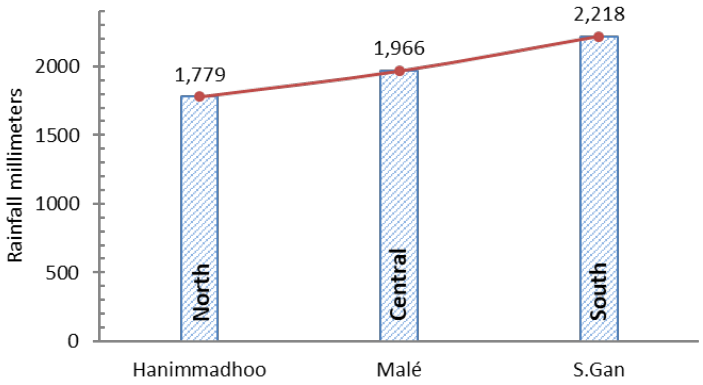

Figure 12: Total average rainfall variation across Maldives (MEE2016).

3.4 Hazard Vulnerability

Natural disasters and hazards are not experienced on a frequent basis. The worst natural disaster that was faced and experienced by throughout the country was the tsunami on December 26, 2004. Several islands were badly damaged. Malé experienced little damaged due to the protection by the breakwater and revetments around the island constructed after the tidal wave in 1987 in Malé. The tidal wave in April 1987 affected about a third of Malé.

The Disaster Risk Assessment Report of Maldives (2006) as shown in Figure 13 describes moderate disaster risk scenario for Maldives and Malé in the low risk hazard zone. However, natural hazard vulnerability risks related to global warming and sea level rise due to climate change will have a huge impact throughout the country including Malé as well.

Extreme weather events such as heavy rains and strong winds during monsoons regularly affect Maldives. However, as the project site is located at the centre of the island and that Malé is protected by the breakwaters and revetments, the impact will be minimal to the project site. With the heavy rainfall, Male experiences severe flooding. However, the project site has not experienced flooding due to heavy rain fall.

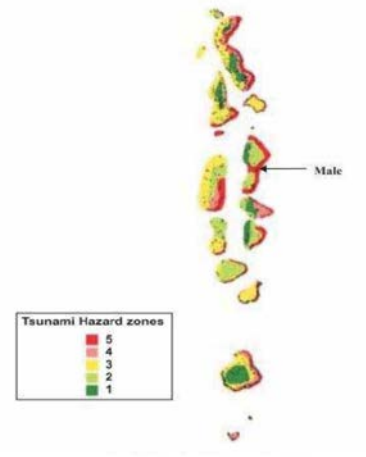

Figure 13: Disaster Risk Profile of Maldives (UNDP, 2006)

3.5 Groundwater

Groundwater quality of Malé has deteriorated due to extraction of groundwater for several development activities. Ground water samples from the site were collected and sent for testing to MWSC. The water quality test results provided by the laboratory are presented in Table 5. The full report is attached in Appendix of the report.

Table 5 : Water quality test result

Parameter	Result
Physical Appearance	Pale yellow
Temperature	21.6 ^{o}C
pH	7.29
Electrical Conductivity	7100 µS/cm
Total Dissolved Solids	3550 mg/L
Salinity	3.90 ‰

As expected, the above results show poor water quality at the project site. Based on the above results it is concluded that the ground water condition is slightly alkaline and conductivity is higher than drinking quality. Hence, may not be suitable for human consumption. The general practice in Malé with regards to management of access water at the location of foundation laying is to pump directly into the sea as to avoid flooding of streets in the vicinity. Furthermore, there is little or no value in trying to pump the water back in the ground due to the poor quality of the ground water.

3.6 Traffic flow

The traffic condition in Malé could be described as very worse. With the growing population of Malé, the number of vehicles has been increasing. Driving at certain points during certain times has made it virtually impossible. In addition to this, the small space available for parking of vehicles leaves less space for driving due to parked vehicles. If a vehicle stops for embarking and disembarking of passengers or goods, traffic gets easily congested. Sometimes at some points traffic police has to take over the management of traffic, especially during school hours near the schools.

The project location is not very near to a school. However, it is to be noted that Chaandhanee magu hosts 3 schools, Arabiyya School, Iskandar School and Aminiyya School. Suring school hours Chaandhanee magu is extremely congested and even during non school hours it is quite a busy road. Traffic flow was surveyed at junction of Chaandhanee magu and Kudhiraiymaa golhi as shown in Figure 14.

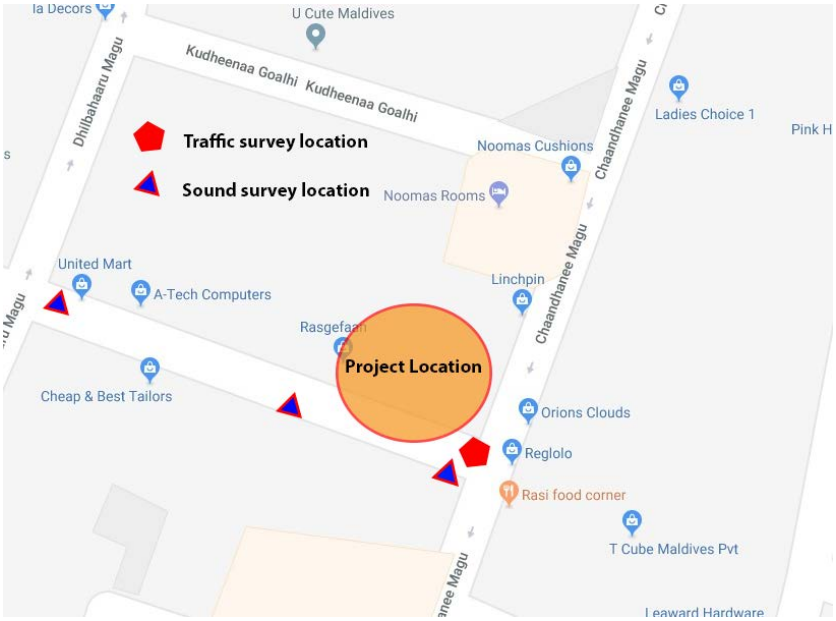

Figure 14: Location of the traffic count analysis and sound

A traffic count analysis was carried at this junction on 23rd December 2017 after 1330 hrs. It is to be noted that this time of the year is a non-school time and the analysis here would not represent school time traffic. Traffic was observed for a 15 minutes block.

The most important would be to consider the normal traffic should there be a road block or detour of traffic needed during the construction phase. Count of the number and types of vehicles was considered and a simple analysis was made to determine the traffic condition. Traffic cannot enter from the Dhilbahaaru magu, but it can enter only from Chaandhanee magu to pass through the project location. Therefore, traffic survey was not carried at the junction of Kudhiraiymaa golhi and Dhilbahaaru magu.

The traffic passing through the junction can pass only in two directions, to the south and into the Kudhiraiymaa golhi to the west and they are both one-way roads. The traffic through the Kudhiraiymaa golhi will be passing in front of the project location. The following Table 6 shows the traffic count, including pedestrians, which was passing through the junction.

Table 6: Traffic count through junction

	To South	To Goalhi	Total
Cycle	113	18	131
Car	8	-	8
Pickup	3	-	3
Lorry	5	-	5
Mini bus	6	-	6
Pedestrians	46	10	56
Subtotal	181	28	209

It was noted that none of the vehicle category of car, pickup, lorry and minibus were entering into the golhi during the survey time. For further investigation it was cleared from people about this situation and was told that vary sometimes cars and pickups does enter. It is usually low due to the narrow width of the goalhi and if cycles are parked it gets difficult for cars for manoeuvring.

Analysis below in Figure 15 shows that the more than 60% of the vehicle which passes through the junction either south or into the goalhi are motor cycles and 27% are padestrains while 4% of them are cars.

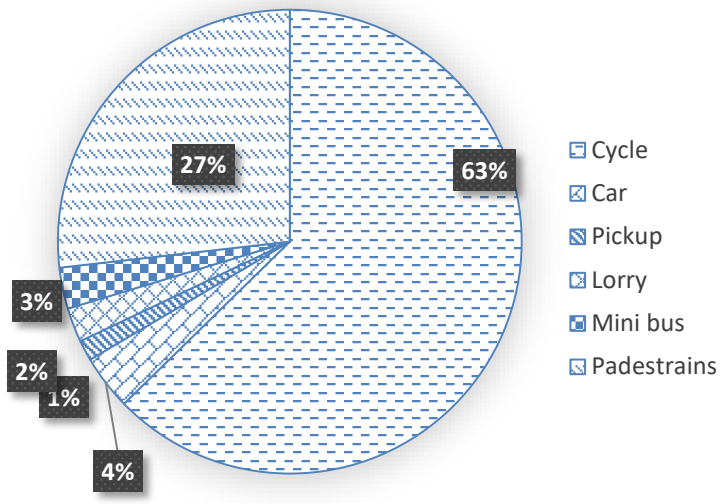

Figure 15: Summary of total vehicles through the junction by category

Figure 16 shows the traffic condition by category and the direction of travel. It is inferred that bulk of the traffic movement is towards the south on Chaandhanee magu through this junction which will not be passing through in front of the project location. It's only a few cycles and pedestrians which passes into the goalhi. It is envisaged that these numbers would be considerably higher during peak hours of office and schools. Since most of the traffic flow is south on the main Chaandhanee magu and comparatively less into the goalhi, placing a temporary block not to allow or allow limited traffic into the goalhi would not cause much inconvenient traffic jams. However, this might cause some inconvenience during the construction period for the residents who lives along the goalhi. Additionally, heavy works could be carried during low peak hours at night and during weekends to avoid school and office hours.

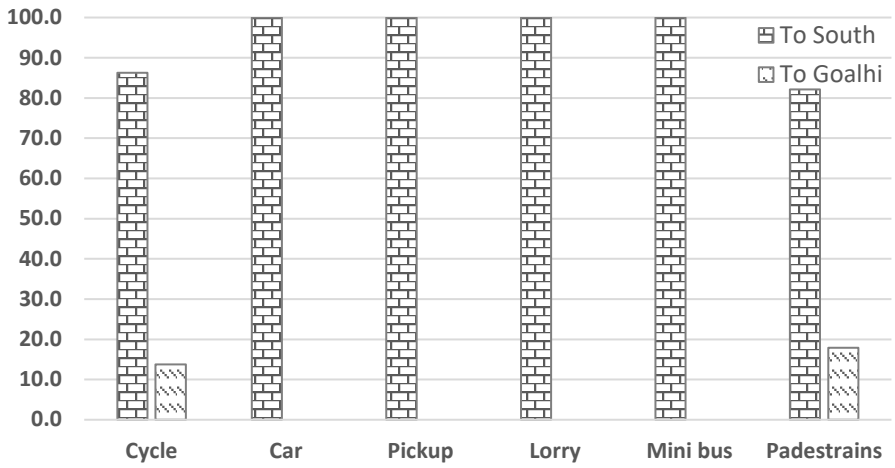

Figure 16: Summary of the traffic going towards north and into the goalhi

3.7 Noise level

The level of noise was also measured during the day at the following locations as in Figure 14. The sound levels were recorded for a period of 30 seconds. On average, the noise levels recorded were 67-78 decibels. As expected these levels are high due to the background noise and with the traffic during the day time. The maximum levels vary between 75-86 decibels. Figure 17 shows the noise level at three locations starting from the east of project location and towards west.

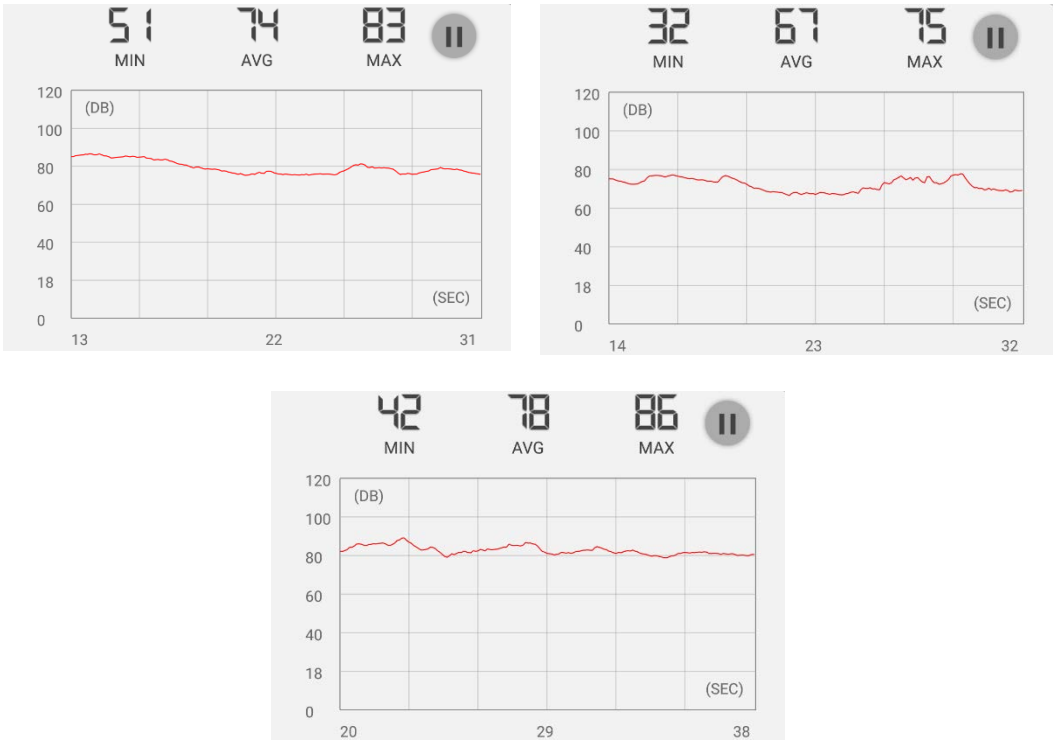

Figure 17: Noise levels at the locations east, middle and west respectively, starting from the east of project site.

3.8 Buildings in the vicinity

Buildings within the close vicinity of the project site were observed. Figure 18 to Figure 20 shows the buildings within the vicinity. The house to the west of the project location is a fairly recently built structure. Only minor cracks are seen on the wall of this building as seen in Figure 18.

The building to the east is a fairly weak and old structure with a one storey building. Major cracks are seen on the wall on the outside Figure 20. Discussion with the owner of the structure says it's a very old home and similar damage is seen inside and is considering a construction and is in dialogue with the owner of Maavelavaru while this place would be built.

Figure 18: Building to the west of the project site

Figure 19: Houses adjacent to the project site (left) and in front of site (right)

Figure 20: House to the east of the project location, with a fairly weak structure

3.9 Vegetation

There are no trees or vegetation as this land plot is used as a temporary garage.

3.10 Soil condition

As part of the engineering assessment, the soil condition was assessed. A trail pit was dug and it revealed that a 600mm thick black sandy soil layer exists at the top. Slightly white sandy soil exists below this layer with a thickness of 1100mm. Water table was found approximately below 800mm from the ground level.

3.11 Socio-economic Environment

3.11.1 Population of Malé

According to the census conducted by National Bureau of Statistics on 2014, the population of the Malé is 153,379 divided into 83,429 males and 69,950 females. A large population of foreigners are also living in Malé and included in the total population, a total of 20,360 persons divided into 17,274 males and 3,086 females currently reside in Malé. According to the Census 2014, 38.98% of the country's population now reside in Malé (NBS 2014).

The population has rapidly grown in Malé. In 2006 Census, the total population of Malé was 103,693 persons divided into 51,992 males and 51,701 females. Hence, over the last 9 years, the population of Malé has grown by 32%. The rapid growth of population in Malé is believed.

3.11.2 Education in Malé

There are 36 school operational in Malé which consist of 13 government schools and 4 community schools and 19 private schools (Ministry of Education 2013). The student population as of 2013 was 27,204 which is highest anywhere in the Maldives. The total number of teachers as of 2013 was 1,878 which give rise to a student teacher ratio of 14.48 students per teacher in Malé (Ministry of Education 2013).

3.11.3 Health

There are four major hospitals in Malé namely Indhira Gandhi Memorial Hospital (IGMH), Sena Hiya Hospital ADK Hospital and Medica Hospital. IGMH and Sena Hiya Hospital are government owned hospitals. IGMH is the biggest hospital in the Maldives. ADK and Medica Hospital are private hospitals. These hospitals provide medical health services for the residents of Malé and those who travel to Malé for medical services. In addition to the aforementioned hospitals there are specialist clinics which provide specialist health care service to the residents of Malé. Also, Dhamana Veshi (Malé Health Centre) provides health monitoring, vaccination and family planning services.

3.11.4 Utilities

Utility services are supplied by the existing utility service providers in Malé, namely State Electric Company (STECLO), who provide electricity services and Malé Water and Sewerage Company (MWSC), who engage in providing water and sanitation services in Malé.

3.11.5 Transport

There are no existing public transport system for land transport in Malé. However, there are existing ferry system which connects between Velana International Airport and Malé. Regular ferries operate between other residential islands close to Malé including HulhuMalé and Villingili which are considered as districts of Malé city.

The most common mode of land transport are motorcycles and cars. In 2013, over 61,413 vehicles were registered including motorcycles, cars, pickups, lorries, vans, trucks, etc, out of which motorcycles are amongst the highest having 50,777 cycles registered (NBS 2014). This large number of vehicle in a small island such as Malé has given rise to many congestion issues and road safety issues in the Malé.

3.11.6 Waste Management

Over 211,579 tonnes of solid waste including industrial and domestic waste from Malé were transported to Thilafushi Island in 2013 (NBS 2014). Waste Management Corporation (WAMCO) has is the state-owned enterprise responsible for waste management in Malé. They became operational from 2017 and provide waste collection services for residential as well as commercial premises in Malé.

3.11.7 Economic Activities

Malé is the main economic and commercial centre of the Maldives, hence a number of economic activities are undertaken in Malé which contributes to the local economy. The construction industry in Malé is believed to be the largest economic activity. Real estate development and management also plays a key role in the economy. Public sector and private sector employment is an essential economic activity for the residents of Malé as most of the government agencies and institutions are based in Malé. In addition, local tourism activities such as operation of travel agencies, guesthouses, souvenir shops are undertaken in Malé.

Furthermore, operation of supermarkets, departmental stores, garment shops, pharmacies and restaurants and cafes are common economic activity in the Malé.

3.11.8 Economic Activities in the Surrounding Area of the project site

There are commercial activities such as small shops on either side of the road. In addition there are some construction sites in the far west side of the project site.

4. Applicable Policies, Laws and Regulations

This project will be carried out in the context of the Maldivian laws and regulations. This chapter identifies the legislations and regulations that are relevant and applicable to the proposed project. The project is expected to conform to all these existing plans, policies, guidelines, regulations and laws of the Maldives and therefore all the activities during both development and implementation stage of the proposed project will be carried out in accordance to the legislations, policies and laws outlined below. All of these laws and regulations will be complied by the project proponent and the contractor.

4.1 Environmental Protection and Preservation Act (Law No. 4/93)

The Article 22 of the Constitution of Maldives provides guidance on the protection of the environment and sustainable development. According to this Article no development project will go ahead if its impacts are detrimental to the environment.

The Articles of the Environmental Protection and Preservation Act (Law No, 4/93) of the Maldives enacted in April 1993 is the umbrella law to protect and preserve the environment of the country. This umbrella law covers all the environmental issues such as pollution prevention, protection and management of biodiversity, environmental impact assessment, etc.

The following Articles of the Environmental Protection and Preservation Act are relevant to the proposed project.

- 5(a): An Environmental Impact Assessment shall be submitted to Environmental Protection Agency before implementing any development project that may have a potential impact to the environment.
- 6: The Ministry has the authority to terminate any project that has any undesirable impact on the environment and can be terminated without compensation

The Act also provides penalty for breaking the Law.

4.2 Environmental Impact Assessment Regulation

The EIA regulations issued by the Ministry of Housing and Environment on May 2007 has been amended and re-published in May 2012. The EIA regulation guides the process of undertaking the Environmental Impact Assessment in the Maldives.

This guideline outlines every step of the EIA process including the roles and responsibilities of the consultants and the proponents. This report adheres to the guidance provided in this Regulation. Schedule D of the EIA regulation defines the types of projects which require carrying out Environmental Impact Assessments. Schedule D includes:

- Buildings that are higher than 31m or over 10 storeys
- Buildings with foundations that can support over 10 storeys
- Buildings with basements
- Buildings that have footprint of over 4000square feet

4.3 Dewatering regulation

The dewatering regulation which came into effect on 1 February 2014 is to protect groundwater resources from impacts of dewatering. For all the developmental projects, a dewatering permit should be obtained from EPA prior to any dewatering activity starts. The regulation covers the following:

- Dewatering process can be carried out after gaining approval from EPA. The dewatering approval form shall be submitted with the required fees.
- Fees for dewatering permits include MVR 500 as administrative fee, MVR 500 per day for the first 28 days, MVR 1000 per day for the first extension, MVR 1500 per day for the second extension and MVR 2000 per day for the third extension.
- Water quality testing requirements
- Exceptions under the regulation such as dewatering for cleaning household wells and extractions for agricultural purposes
- 30 m radium boundary shall be considered as impact area from all dewatering operations and any entity within the boundary shall be informed 24hrs before the dewatering starts and in case of any water shortage experienced in the neighbouring wells, 250 litres or MVR 30 as a compensation for each household should be provided.
- Guidance on where and how the extracted water should be disposed of
- Reporting requirements

4.4 Waste management regulation

The Waste management regulation came into effect in February 2016. The regulation aims to protect the environment and human health by minimizing the impacts of waste and establishing an integrated waste management framework managing the waste in a sustainable manner. The regulation prohibits dumping of waste on to public areas and protected areas. The areas relevant to this project include the clause for construction waste. Under this chapter it states that building construction shall be planned and organized in a manner where minimal waste is generated.

The construction was should not be kept anywhere else but at the demolition site until the demolition is complete. The regulation also highlights minimizing the disturbance due to the demolition of buildings to the environment and people.

4.5 Regulation on the Construction of buildings in Malé

This regulation deals with building heights, design guidelines and requirements for building permits for constructions in Malé. According to this regulation a permit is required by the local authority for the construction on site, which has to be displayed at the site at all times during the construction. The proposed project has been approved in line with this regulation.

4.6 The Land Act

The Land Law of the Maldives which was passed in 2002 deals with issues of land in the Maldives. The Land Law concerned with identifying the lands of Maldives for different purposes and uses, allocating such land, allocating government owned land for living, government land allocated for living, owning and using private land, selling, conveyance, leasing lands and other related matters. The law stipulates that except for trees and coconut palms owned by person, all other natural resources in the ground, gold, silver, jewellery, money, artefacts found during excavation of the Maldivian soil, and all metal found in the Maldivian soil are government property. The law also states that soil excavated from the plot can been distributed or sold with the approval of the Malé Municipality, and in accordance with the regulations made under this Act.

4.7 The Building Act and Building Code

This act sets out the importance of adhering to the Building Code, application procedures, building consents and performance standards. It also defines roles and responsibilities of different parties involved in the building process. This is one of the most relevant legislations for the construction of buildings and some of the important Clauses of this include;

- Clause 46 states that a registered building practitioner and design checkers shall be responsible for the design
- Clause 53 states that the permit to use the building would be issued based on the Building Inspector's report
- Clause 60 and 61 refer to Building Code
- Clause 64 states that the building works should be supervised by a Building Inspector appointed by the Developer who is not associated with the Client

4.8 Environmental Guidelines for Concrete Batch Plants (2014)

The aim objective for formulation of this guideline by EPA was to guide operations of concrete batch plants in an environmentally friendly manner and to mitigate and nullify the adverse impacts of operating a concrete batch plant.

Some key environmental considerations outlined in the regulation include the following:

- The Concrete batch plant should be located in an area where contaminated storm water and process wastewater can be retained on-site;
- Consideration should be given to the location of the plant to minimize spread of dust by natural means such as prevailing winds and artificial means fences and landforms;
- A 100 metre buffer zone should be left between the plant and sensitive land uses;

Minimize wastewater and measures should be taken to re-use wastewater so that impacts on the groundwater due to potential contamination.

4.9 Land Use Plan and Implementation Regulation

This regulation is under the Maldivian Land Act of 2002. According to this regulation, all lands in the islands of the Maldives requires a land use plan to be developed and approved from Ministry of Housing and Infrastructure prior to use of the land. Furthermore, the regulation outlines key aspects that need to be considered during the preparation of land use plans as well as describes guidelines on developing and allocating lands for various purposed. In this regard, various categories of lands are identified under which a government agency shall implement the land use plan.

4.10 Malé Planning Regulation (2015)

This regulation was first developed in 2008 and realigned to the Maldives Land Act (2002) in 2015. This regulation is implemented by Ministry of Housing and Infrastructure.

The regulation includes the following aspects;

- The construction permit shall be displayed at the project site;
- A foundation protection method shall be approved and all foundation work shall be undertaken in accordance to the approved foundation protection plan.
- Any demolition work of existing buildings shall be carried out after consulting with utility service providers namely water and sanitation and electricity.
- All construction activities shall be only carried out by taking appropriate measure to protect the surrounding buildings;
- The height of the building shall be determined by taking into consideration the size of the plot, length and width of the plot as well as the width of the road/street in which the plot is found;
- Extending the building to the roadside (for sun shading, balcony, etc) is only allowed from 9ft above to a limit of 1.49ft.
- Also, the height of the building can be determined by taking into consideration its area In this regard, if the area of the plot exceeds 9.291 sqm, a building can be developed and if the width of the road/street exceeds 3.048m, a building having a height of 30.48m can be developed.
- If the area of the plot is less than 4,000 sqft (371.612 sqm), than the maximum height allowed under the regulation can be developed.
- The maximum allowable height of a building in Malé is 45m, which is only allowed for plots having an area exceeding 6,000 sqft.
- A 10% area from each floor shall be left as opening space for ventilation
- The balconies of the building shall be at 1m height
- A parking area of 15% of the plot shall be allocated if the area of the plot is between 1,000 – 2,000 sqft.
- A fine between 1,000 MVR to 75,000 MVR will be imposed under the regulation depending on the magnitude of an illegal activity.

4.11 Permits required for the project

Description of some important permits required for undertaking the project activities is given below.

4.11.1 Dewatering Permit

A dewatering permit shall be obtained from Environment Protection Agency (EPA) prior to undertaking any dewatering activities.

4.11.2 EIA decision statement

Before the construction work commences a Decision Statement regarding this EIA need to be obtained from the Environmental Protection Agency (EPA). Decision Statement will be given to the Proponent after reviewing this document to check the existing environment and potentials impacts of the project along with the mitigation and measures associated with it.

4.11.3 Design Approval

An approval from the Ministry of Housing and Infrastructure (MHI) is required for the design and floor plan.

5. Environmental Impacts and significance

This Chapter deals with the anticipated positive as well as negative impacts of the proposed project. As most of the building construction projects are similar in nature, the negative impacts due to the implementation of such projects are very similar. However, all infrastructure development projects have their own set of potential positive and negative impacts.

5.1 Impacts identification

Impact identification is based on literature reviews, professional judgment and past experience from similar projects, consultative process within the EIA team and the proponent and existing environmental conditions of the site. Anticipated potential environmental impacts associated with this project is likely to be arising from demolition, excavation, dewatering, waste generation, foundation work, Material storage and transport, establishment of utilities and masonry works. The magnitude and severity of impacts associated with these components differ based on the nature of impact. These impacts may be either short term reversible or long term irreversible damage or alterations. The impacts of this project have been evaluated according to the following criteria:

- Magnitude: the amount or scale of change that will result from the impact
- Significance: Reversibility/ Impact implications /Reversibility of impact's effects
- Duration: frequency of impact/the time over which the impact would be felt
- Spatial distribution: the spatial extent over which the impact would be felt

The magnitude or severity of the impacts is further grouped into negligible, minor, moderate and major. This will help in identifying and carrying out mitigation measures. A description of the impact categories are presented below.

- Negligible: no significant impact on environment
- Minor: the impact is short term and cause little damage to the environment which may be reversible on the long run.
- Moderate: Impacts are significant, may cause long term environmental concerns but are likely to be short termed, acceptable and justifiable
- Major: long term impact, large scale environmental alterations

5.2 Impact Assessment Methodology

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

- Consultative process within the EIA team, proponent and resort development consultants.
- Purpose built checklist
- Existing literature and reports on similar developments in Maldives
- Existing environmental conditions of the site
- Consultants experience of similar projects

A purpose-built matrix method (a Leopold matrix) is used to assess the impacts. The scale of impacts assessment used in described in Table 7.

Table 7: 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	Long-term/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

The above scale is used to develop and potential impact matrix based on the literature and expert judgment. Results of the potential impact is shown in Table 8. The impact potential index is based on magnitude (M), significance (S), duration (D) and extent or spatial distribution (D). An Activity Potential Index (API) is derived using the sum of all key component specific indices for an activity (sum row wise). In addition, Component Potential Vulnerability Potential Index (CPVI) (sum column wise) gives an indication of the vulnerability of each key component to activity related impacts. These indices are shown in Table 9.

Based on the above matrix the proposed activities of the project are analysed against suspected impacts to assess the overall impact of the project. As seen in table the project is predicted to have an overall positive impact on economy and country.

Table 8: Potential impact matrix

	Environment						Socio-economic											
	Soil and groundwater		Road conditions		Air/Noise/land or seascape		Services and Infrastructure		Health and Safety		Employment		Property Value		Costs to consumer/tax payer	
Construction Phase																
Demolition of existing structure	-1	1	-1	0	-1	1	1	1	-1	1	1	2	0	0	-1	1
	1	1	0	0	1	1	1	1	1	1	1	3	0	0	1	1
Excavation and dewatering	-2	1	0	0	-1	1	-1	1	0	0	1	2	0	0	-1	1
	1	0	0	0	1	1	1	1	0	0	1	3	0	0	1	1
Construction activities	0	0	-1	1	-1	1	-1	1	-1	-1	1	2	0	0	1	1
	0	0	1	1	1	1	1	1	1	1	1	3	0	0	1	1
Traffic distortion	0	0	-2	1	-1	1	0	0	-1	1	0	0	0	0	0	0
	0	0	1	1	1	1	0	0	1	1	0	0	0	0	0	0
Operation of construction machinery and vehicles	-1	1	-1	1	-1	1	1	1	-1	1	1	2	0	0	-1	1
	1	1	1	1	1	1	1	1	1	1	1	3	0	0	1	1
Operational Phase																
Solid waste management and disposal	-1	1	0	0	0	0	3	1	3	0	3	1	0	0	3	0
	1	1	0	0	0	0	3	3	3	3	3	3	0	0	3	3
Economic and social activities	0	0	-1	1	-1	1	3	3	3	3	3	3	3	3	3	3
	0	0	1	1	1	1	3	3	3	3	3	3	3	3	3	3
Increase of traffic	0	0	-1	1	-2	3	-1	1	-1	1	0	0	0	0	0	0
	0	0	1	1	3	3	1	1	1	1	0	0	0	0	0	0
Key	**M**	**S**		**Magnitude**					**Significance**							
	D	**E**		**Duration**					**Extent**							

Table 9: Impact potential indices.

	Environment			Socio-economic					
	Soil and groundwater	Road conditions	Air/Noise/land or seascape	Services and Infrastructure	Health and Safety	Employment	Property Value	Costs to consumer/tax payer	**Total API**
Construction Phase									
Demolition of existing structure	-0.01	0.00	-0.01	0.01	-0.01	0.07	0.00	-0.01	**0.04**
Excavation and dewatering	0.00	0.00	-0.01	-0.01	0.00	0.07	0.00	-0.01	**0.04**
Construction activities	0.00	-0.01	-0.01	-0.01	0.01	0.07	0.00	0.01	**0.06**
Traffic distortion	0.00	-0.02	-0.01	0.00	-0.01	0.00	0.00	0.00	**-0.05**
Operation of construction machinery and vehicles	-0.01	-0.01	-0.01	0.01	-0.01	0.07	0.00	-0.01	**0.02**
Operational Phase									
Solid waste management and disposal	-0.01	0.00	0.00	0.33	0.00	0.33	0.00	0.00	**0.65**
Economic and social activities	0.00	-0.01	-0.01	1.00	1.00	1.00	1.00	1.00	**4.98**
Increase of traffic	0.00	-0.01	-0.67	-0.01	-0.01	0.00	0.00	0.00	**-0.70**
Total CPVI	**-0.04**	**-0.07**	**-0.74**	**1.32**	**0.96**	**1.63**	**1.00**	**0.98**	**5.04**

5.3 Justification for the Methodology used

There are many various methodologies used for impact assessment in environmental context. One of the most commonly used methodologies include check lists and matrices such as Leopold Matrix (Lohani et al., 1997) The Leopold matrix was conceived by geologist Luna B. Leopold and his colleagues in 1971, as a response to the US Environmental Policy Act of 1969, which didn't give clear instructions to the Federal Government agencies for preparing an impact report or for examining the environmental effects of the projects that an agency plans. The Leopold matrix addressed this challenge by 'providing a system for the analysis and numerical weighting of probable impacts' (Josimovic et al., 2014).

According to the Leopold matrix method, EIA should consist of three basic elements:

- a listing of the effects on the environment that the proposed development may induce, including the estimate of the magnitude of each of the effects;
- an evaluation of the importance of each of listed effects (e.g., regional vs. local); and
- a summary evaluation, which is a combination of magnitude and importance estimates.

This method has been adapted from the Environmental Resource Management (2008). This is a widely used method for impact assessments. Leopold Matrix is an effective impact assessment methodology which has been extensively used by EIA practitioners across the world. Since EIA is a technical report which are read by both technical experts of different field as well as the general public, understanding the significance level will enhance the report in a manner which would be easily comprehended by general public and people with no technical expertise in this field.

5.4 Limitations and the uncertainties of the impact assessment methodology

The following aspects are considered as limitation and the uncertainties which may be involved in the impact assessment process;

- All the potential environmental aspects have been predicted and assumed for the proposed project development hence they may differ in the natural context such as site conditions and uncertainties in scales and magnitude.
- The baseline data for the existing environmental conditions were taken in a very short period of time hence may affect the accuracy in prediction of the environmental impacts.
- The aforementioned baseline data for the existing environmental condition were collected for one monsoonal season (*Iruvai* season) and inferred based on that seasonal data hence the predicted environmental impacts may vary on the other (*Hulhangu*) season.
- Expert judgement and professional opinion of the EIA consultant were enhanced using the existing EIA reports of similar nature, however due to the unique nature of coastal processes, lagoons and reef system in the Maldives each island is unique. Hence the predicted environmental impacts may vary from island to island.

5.5 Description of Impacts

5.5.1 Construction Phase Impacts

5.5.1.1 Demolition of existing structure

Any existing structure in the plot which will be demolished for site clearance prior to commencement of the construction. Hence, the impacts on the physical and the socio-economic environment is considered to be highly significant. The demolition will be carried out by the contractor using heavy duty machineries used for demolition of concrete buildings in Malé.

The main impacts envisaged include the following;

- Unsettling of dust and other particulate matter will decline the air quality in the vicinity of the project site for a short period of time;
- Noise pollution and disturbance for nearby residents of the project site.
- Potential threat to nearby buildings and roads in terms of cracking and physical damages;
- Damage may occur to electricity or telephone cables which are close to the project site;
- Potential fall of debris and other accidents may occur;
- Dust and particulate matter may trigger upper respiratory tract infection and affect asthma patients living in close vicinity to the project site.

5.5.1.2 Excavation and dewatering

It is estimated that approximately 700 m^3 of sand will be excavated for laying foundation. Although there are no major environmental impacts from sand excavation very low-level impacts on the soil environment is believed to take place. This includes displacement of some soil organisms.

There will be no impacts on terrestrial flora or fauna due to absence of any terrestrial flora or fauna.. The following impacts have been identified as potential impacts due to the proposed development;

- Potential impacts on the soil environment;
- Unsettling of dust and other particulate matter will decline the air quality in the vicinity of the project site.
- Damage may occur to electricity or telephone cables or water and sanitation pipes which are close to the project site.
- Potential threat to nearby buildings and roads.
- Road blockage
- Without proper signage, there may be potential accidents of falling into the trenches excavated.
- Dust and particulate matter may trigger upper respiratory tract infection and affect asthma patients living in close vicinity to the project site.

It is estimated that more than 1000 m^3 of groundwater will be required to be dewatered from the proposed project area. The environmental impacts associated with dewatering is expected to be short-term in nature. The following impacts are predicted

- Short-term loss of groundwater from the project boundary and vicinity of the project site.
- Decline in groundwater quality including increase in turbidity and dissolved solids.
- Short term decline in groundwater quality for the close by plots;
- Road blockage due to installation of dewatering pipes;
- Potential breeding site for mosquitos.

5.5.1.3 Construction Activities

A number of construction activities will occur including cladding, concrete mixing, safety framework development, site preparation, transport of construction material, welding and woodworks etc. Construction will involve packaging waste such as cement bags and cardboards, concrete waste, iron, timber, aluminium, nets, wastewater, etc that are generated from construction activities if inappropriately disposed have the potential to degrade environmental conditions in disposed areas.

The following impacts are predicted;

- Groundwater may be affected due to disposal of wastewater at the construction site;
- Short-term exposure to dust due to usage of cement on the construction site.
- Noise pollution and disturbance for nearby residents of the project site.
- Exposure to noise levels for residents close to the project site;
- Traffic congestion;
- Potential fall of objects and other accidents may occur;
- Possible respiratory diseases due to dust;
- Exposure dust from cement and offensive smell from paints and other chemicals.
- Additional burden to existing commercial waste management system in Malé
- Potential public health impacts and nuisance.

5.5.1.4 Traffic distortion

Given the small and narrow roads and increased number vehicles in Malé, traffic congestion is a very common problem. Should a taxi or a heavy vehicle stops for loading and off-loading traffic congestion would happen. Construction sites are another congestion factor during some of the stages of construction. Especially during construction of sheets with the use of heavy vehicles such as cranes. Following impacts are envisaged;

- Road blocks due to laying of dewatering pipes
- Traffic would have to be re-routed should it be needed
- Traffic congestion can increase noise pollution due to honking

5.5.1.5 Operation of construction machineries and vehicles

Large construction machinery such as concrete batching plant, trucks and other vehicles such as excavators will be used in the operations. The following impacts are expected;

- Potential contamination of groundwater from oil-spill from machineries;
- Noise disturbances due to operation of heavy machineries
- Damage to roads due to transport of heavy machineries;
- Road blockage during transport of heavy machineries;
- Potential accidents during the operation of the heavy machineries and vehicles.

5.5.2 Operational phase Impacts

5.5.2.1 Solid waste management and disposal

Once the building is complete and in operation it is envisaged that it will generate large quantity of solid waste. Since the building will be used for residential purposes, a significant amount of household and food waste will be generated. Household waste mostly includes food waste and other household items. Piling of household waste by the project area is believed to generate serious environmental implications including decreased aesthetics and higher risks of disease outbreaks. Solid waste need to be properly managed and disposed daily in order to prevent public health issues and foul odour. The following are some of the adverse impacts which will be encountered.

- Aesthetic impacts and potential groundwater pollution
- The most important socio-economic impacts include the following;
- Additional burden to existing residential waste management system in Malé
- Potential public health impacts and nuisance.

5.5.2.2 Economic and social activities

With the completion of the building it will be used for residential purposes. Some of the apartment will be on lease basis. Therefore, it is envisaged that there will be increase in the population around and within the premises. Due to this there will be increase in social activities. Some of the impacts that could arise include;

- Damage to the premises due to use for personal use by the residents
- Increased traffic due to limited parking space with increase in number of people using the premises
- Increase in economic income due lease of apartments
- Increase job opportunities due to operation and maintenance of building services

5.5.2.3 Increase of Traffic

With the increased number of people using the building, it will increase the demand for increased parking spaces and increase road traffic. Following are some of the impacts that could arise;

- Exposure to air pollutants such as carbon monoxide, SOx, NOx, particulate matter
- Additional burden on roads and contribute to congestion of Malé

5.5.3 Overall Positive Impacts

With the completion of the building and once in operation, it is envisaged that the overall impact would be highly positive. This is also shown in the impact analysis. This will partially solve the issue of demand for housing problem. In addition, this will also increase the economic income to individuals and country as a whole.

5.5.4 Impact on adjacent structures

After the impact caused to the adjacent building due to the construction of Holiday Inn (now hotel Jen) some past years back, various measures have been taken at many levels to avoid such damages during the construction of such buildings. With the structures side by side in Malé careful considerations have to be given not to cause any damage to the adjacent buildings. The project site also has numerous structures all around. Therefore, there is a probability of impacting these structures during the dewatering and foundation works. The impact will not be high and could be mitigated. The foundation works and excavation will use the best methods to ensure that the adjacent buildings will not be affected during construction.

6. Mitigating the Impacts

The following section provides mitigation measures for all the environmental impacts identified in the previous section. These measures need to be adopted in order to minimize the potential negative impacts. The focus of impact management and mitigation is on the construction phase of the project.

6.1 Justification for the proposed mitigation measures

The following factors were considered in order to evaluate the appropriateness of the proposed mitigation measures;

- costs;
- benefits;
- required manpower;
- equipment;
- expertise;
- timing and technology

The proposed mitigation measures will be the most cost-effective, have the maximum benefits and requires minimum utilization of manpower and equipment. Furthermore, the practicality of the proposed mitigation measures will be given a high priority. The technical aspects of the different project components were considered when evaluating the proposed mitigation measures.

6.2 Limitations of the proposed mitigation measures

The main limitation of the proposed mitigation measures is that these mitigation measures are proposed for an impact which is predicted. Since the impact has been predicted, there is an uncertainty regarding how the impact will affect the natural environment when the actual project is implemented. The nature of impacts even from similar project activities undertaken in a different location in the country could generate in a totally different manner.

6.3 Mitigation measures for construction phase impacts

6.3.1 Mitigation measures for demolition impacts

The demolition activities are expected to have significant impact on the air quality and the structural environment near the project site. The following are the mitigation measures which will be taken in order to minimize the impacts of demolition;

- Demolition will be done by experienced contractors who will take all the precautionary measures to avoid damage to adjacent buildings due to vibrations.
- Ensure no material gets deposited outside project boundary
- Safety nets will be deployed in order to avoid falling of debris on the pedestrians and users of adjacent road.
- If too much dust appears, water will be sprayed to reduce dust

The following are key consideration which need to be taken for the most significant mitigation measures listed above;

Mitigation Measure	Installation of Safety nets used to prevent falling of debris
Cost	Approximately 5000 USD
Benefits	Protection of pedestrians and workers
Expertise	Structural Engineering
Required Manpower	2 - 5
Responsibility	Contractor
Equipment and Technology	Safety nets and iron beams
Timing	Prior to demolition works

6.3.2 Mitigation measures for excavation and dewatering impacts

Impacts due to excavation and dewatering impacts can be short-term in most of the cases, however it occurs very rapidly. The following mitigation measures will be taken in order to reduce the impacts from dewatering;

- The dewatering activities will be commenced only after obtaining the required dewatering permit from the EPA and will be conducted according to the prescribed schedule;
- A signage indicating that dewatering is in progress will be placed in order to inform the general public about dewatering activities.
- The dewatering operations will be undertaken quickly in order to reduce the prolonged environmental impacts on the areas close to the project site.
- Dewatering pipeline will be regularly monitored for physical damage and immediately rectify the issue. This will be done if dewatering will be undertaken by contractor's equipment and machinery.
- Laying of pipes so that minimal disturbance will be caused

The following are key consideration which need to be taken for the most significant mitigation measures listed above;

Mitigation Measure	Monitoring and management of the dewatering pipelines
Cost	Approximately 7000 USD
Benefits	Avoid potential flooding of the roads
Expertise	Environmental protection & plumbing
Required Manpower	2 - 5
Responsibility	Contractor
Equipment and Technology	Pipelines, machineries, management
Timing	Prior to construction

6.3.3 Mitigation measures for Construction Activities

The following are mitigation measures which will be taken in order to reduce the impacts of construction activities.

- Construction work sign boards and fencing will be placed prior to construction phase;

- Placement of safety and dust protection nets all around the building plot;
- Enforcement of the mandatory use of safety equipment and gear at all times during the construction phase;
- Excessive noise at night time will be avoided as all the construction activities are time bound.
- All the construction activities will be conducted within the project boundary hence nuisance related to construction activities will be reduced to the residents living close by.
- All road blocking will be released at shortest possible time upon completion of the work;
- All construction activities will be halted for prayer times in order to avoid noise disturbance to the close by mosque;
- First Aid kits will be maintained at the site at all times.

The following are key consideration which need to be taken for the most significant mitigation measures listed above;

Mitigation Measure	**Use of safety equipment and gear**
Cost	Approximately 16,000 USD
Benefits	Avoid accident and increase safety of the workers
Expertise	Procurement and Project management
Required Manpower	2 - 5
Responsibility	Contractor
Equipment and Technology	Safety equipment
Timing	During construction phase

6.3.4 Traffic distortion

Traffic congestion is unavoidable during any construction project within Malé. Following are some of the mitigation activities which could be carried to mitigate the impacts.

- Carry out major works which needs significant road blocks during late hours of the night
- If road blocks are needed, plan it to weekends or on holidays so that people going to work and schools will be less disrupted
- Use proper signs at junctions away from the project site

The following are key consideration which need to be taken for the most significant mitigation measures listed above;

Mitigation Measure	**Carry out during late hours and use of sign boards**
Cost	Approximately 100 USD
Benefits	Avoid traffic congestion
Expertise	-
Required Manpower	2
Responsibility	Contractor
Equipment and Technology	Sign boards
Timing	During construction phase

6.3.5 Mitigation Measures for impacts from construction machineries & vehicles

Machineries and vehicles used for construction purpose such as batching plant, excavators and truck will be widely used during the construction phase of the proposed project. The following mitigation measures are proposed;

- EPA guidelines will be followed during the operation of the concrete batch plant;
- The transport of materials using the vehicles will be done during the off-peak traffic hours;
- The materials will be transport in bulk in order to reduce the need of frequent transportation of the materials and reducing the impacts of noise and dust/
- The vehicles will be operated only within the project plot and areas designated by the Ministry of Housing and Infrastructure in order to avoid frequent road blockage.

The following are key consideration which need to be taken for the most significant mitigation measures listed above;

Mitigation Measure	Employment of an experienced site supervisor
Cost	Site supervisor salary
Benefits	Reduce dust and emission
Expertise	Project management
Required Manpower	1
Responsibility	Contractor
Equipment and Technology	Site supervisor
Timing	During construction phase

6.3.6 Mitigation Measures for impacts from Construction Waste

As outlined in the impacts section, large amounts of construction waste will be generated from the proposed project. In order to reduce impacts from solid waste disposal on the construction site, the following measures will be undertaken;

- All the construction waste will be piled and segregated in an allocated location within the project site;
- Re-use construction waste where ever possible in order to reduce waste required for disposal;
- Regularly transport unusable construction waste to the waste collection site in Malé with assistance from WAMCO.
- Avoid transport of construction waste during rainy weather conditions;
- Arrange transportation of construction waste such that peak traffic hours will be avoided.
- Outsourcing will be done to WAMCO or any other licensed party for waste handling and comply with the waste management regulation all the times;
- Waste disposal on-site and within the boundary of the project area will be avoided at all times.

The following are key consideration which need to be taken for the most significant mitigation measures listed above;

Mitigation Measure	Transport waste regularly to the designated construction waste collection site
Cost	WAMCO charges
Benefits	Reduce waste accumulated in the project site
Expertise	Logistic and transport
Required Manpower	1
Responsibility	Contractor
Equipment and Technology	Dump trucks, lorries and pick-ups
Timing	During construction phase

6.4 Mitigation measures for operational phase impacts

6.4.1 Solid waste management disposal

It is highly important to manage household waste during the operational phase of the project. The following measure will be implemented in order to mitigate the impacts from household waste accumulation in the building;

- Piling of solid waste in the floors and by the building will not be allowed;
- The building and adjacent areas will be kept clean at all times and free from waste;
- WAMCO will be outsourced for waste management and handling.
- Waste disposal will be avoided at the project site at all the time.

The following are key consideration which need to be taken for the most significant mitigation measures listed above;

Mitigation Measure	**Subscription to the WAMCO waste collection service**
Cost	WAMCO charges (MRV 100 per apartment)
Benefits	Reduce waste accumulated in the project site
Expertise	Logistic and transport
Required Manpower	1
Responsibility	Contractor
Equipment and Technology	Dump trucks, lorries and pick-ups
Timing	During operational phase

6.4.2 Mitigation measures for increased traffic

As a result of the newly constructed building large amounts of traffic will be diverted to the project area during the operation phase of the project. The following mitigation measures will be undertaken in order to avoid impacts due to increased traffic;

- Prohibition of parking of vehicles by the building;

- Residents will be encouraged to park in the parking space available within the building and basement area if this space is available.

The following are key consideration which need to be taken for the most significant mitigation measures listed above;

Mitigation Measure	**Prohibition of parking of vehicles by the building**
Cost	0
Benefits	Good traffic flow
Expertise	Traffic Management
Required Manpower	Nil
Responsibility	Building owner & Transport authority
Equipment and Technology	Signage
Timing	During operational phase

7. Socioeconomic and Stakeholder Consultations

Stakeholder consultation is one of the most important aspects of the EIA process.

7.1 Consultation with the proponent

The consultation with the proponent was done throughout during the preparation of this report. The proponent outlined his purpose for the building after completion of the project. His need for the building and the urgency to start the project was expressed in the discussions.

There were no formal means of interviews. A meeting was requested with the respective stakeholders and met with whatever means they preferred whether in person or over the phone with a set of questions and concerns or advice if any.

7.2 Consultation with the engineer

The design engineer Arsid (7977274) was consulted on 6 January 2018. He explained about the design aspects and specially about the structure. It was informed that there isn't anything specifically special compared to usual buildings in Malé. There is no sheet piling or heavy driven activities. However, since the land plot is long and narrow, the foundation depth had to be a bit deeper for structural strength purposes.

7.3 Consultation with neighbours

Neighbours were consulted and were informed about the development that would be coming up. They too were informed that should there be any concerns, the owners or the contractor could be approached and the issues would be addressed accordingly. They were informed about the possible or usual damages that occur in Malé although these are not very common these days as contractors are more careful and the technology today allows for less risks. Mariyam Waheeda, 7774808 from Kurinbeege and Shifaz 7778536 from Fehenfaru was consulted and informed on 2 January 2018 and 6 January 2018 respectively.

7.4 Consultation with STELCO

Consultations with STELCO was carried on January 2018 at 1300 hrs at the STELCO premises. The following personnel participated in the meeting.

- Mr Mohamed Shakeeb, Senior Engineer, 7772691
- Mr. Mohamed Niyaz, Senior Engineer, 7787021

Following is the summary of the outcomes of the discussions.

- They informed that if the building to be used for commercial purposes, STELCO should be notified as the metering would be different.
- They also recommended to leave enough space for the panel doors to be opened. In some of the houses they have experienced that the space in front of the panel boards is very limited that they can sometime barely walk in to take readings and for any

maintenance. There have been cases where they have to remove the front door of the panel board to access the board.

- They also recommended to raise the floor if the panel is raised above the floor. It is good and they recommend to keep the panel raised above the floor so as to keep it safe from any flood. But if its raised they recommend to have a small raised floor in front of the panel so that they can use it while checking the panel.
- One of the critical recommendations they have for the developer is to leave a pipe through the raft when the foundation is laid. In their experience what they have found is, when the foundation is done and when it is time to place an earth, there is no room within the foundation to place a rod for earthing. In such cases earth rod might have to be driven somewhere on the road near the premises. So, to avoid this, they recommend to leave a pipe when the foundation is laid so that they can use this to drive the earth rod. This pipe could be placed somewhere near where the panel would be sited.
- They also recommend to the follow the Maldives Energy Authority (MEA) guidelines on wiring.

7.5 Meeting with Malé Water and Sewerage Company (MWSC)

MWSC responsible for the water and sanitation systems of Malé. Assistant Manager, Technical Operations of MWSC, Mohamed Hameed (7784479) was met on 21 January 2018. Following is the outcome of the discussions.

- It was mentioned that dewatering permit now has to be obtained from the Ministry of Housing and Infrastructure. The dewatering pipes have to be connected all the way into sea.
- He mentioned that currently they have stopped connections to the sewer system for dewatering due to some technical problem of the system.
- He said the usual practice is that before demolition, a demolition permit has to be taken usually by the contractor to change the metered connections to commercial meters and usually contractors are aware of this.
- He also mentioned that usually contractors would have a meeting with them before construction to obtain information about where to put the sewer junction, water inlets and booster pumps and advised to do so.

8. Alternatives

For all the EIAs alternate options or best alternatives need to be considered including design and location. The option of not undertaking the project also needs to be considered.

8.1 No Project Option

One of the alternatives considered is the 'no project' option. Advantages and disadvantages of this option are discussed below.

Table 10: Advantage and disadvantages of no project scenario

Advantages	Disadvantages
Will not contribute to groundwater degradation	Will be a missed opportunity for the developers to develop their land and increase the value of their land
Will not lead to health and safety concerns at project site	Will not be able to alleviate the issue of people living in small crowded places in Malé
Will not contribute to structural issues of neighboring buildings.	Will lead to residents of the existing structure to continue living in an old structure prone to accidents
Will not cause any noise and air pollution at project location	Will decrease economic opportunities for construction companies and their employees
Will not cause any traffic disruptions	
Will not have any contribution to the increasing population in Malé	Competition for communities looking for spaces

If the project is not implemented it will reduce the impact on the physical environment. However, this will have negative implications such as negative impacts on the economic income and will not alleviate the living condition of the developer. Therefore, not having the project is not an option for the developer.

8.2 Foundation

An alternative to raft foundation is deep pilling.

Deep foundation is used when the soil near the ground surface is weak. Deep foundations are sufficiently below the finished ground surface for their base bearing capacity to be affected by surface conditions, this is usually at depths >3 m below finished ground level. Deep foundations can be used to transfer the loading to deeper, more competent strata at depth if unsuitable soils are present near the surface.

Pile foundations are the part of a structure used to carry and transfer the load of the structure to the bearing ground located at some depth below ground surface. The main components of the foundation are the pile cap and the piles. Piles are long and slender members which transfer the load to deeper soil or rock of high bearing capacity avoiding shallow soil of low bearing capacity. The main types of materials used for piles are wood, steel and concrete.

Although deep pile foundation may be suitable for the soil conditions found in Malé, in terms of noise pollution and cost, deep pile foundation is not a favourable option. Driving the piles deep into the ground will cause excessive noise that will inconvenience neighbouring residents. Deep pile foundation was commenced for the project Holiday Inn at Athireege Aage. This project was the first to try deep piling in Malé. The deep piling that was started in October 2007 using hammer technology was halted by the Government in December 2007 due to complaints from neighbours of tremors and cracks on their walls. Furthermore, the noise pollution caused by deep piling activity will also disrupt the commercial atmosphere of the project area. Therefore, deep piling technology may not be socially acceptable to Malé.

Until recently construction of buildings does not adhere to any recognized building standards and hence, there is high degree of uncertainty over the magnitude of vibration that such buildings can withstand. Therefore, unnecessary delays maybe unavoidable such as government intervention, public outcry etc.

Henceforth, this method of construction is too risky without an intensive assessment of the surrounding built environment and therefore not recommended.

8.3 Location

Alternative location is not important for this type of construction of building projects by individuals. Under any circumstances individual owned land cannot be changed by the individual.

9. Monitoring

This Chapter outlines the monitoring plan for the project. Adoption of appropriate mitigation measures can significantly reduce the environmental damage caused by a development project. However, occurrence of unforeseen impacts is still possible, even with proper implementation of mitigation measures. Moreover, some of the predicted impacts may turn out to be greater than predicted, necessitating different or more rigorous mitigation measures. Therefore, regular and frequent monitoring of the environment is vital, in order to avoid or reduce the chances of such events, and to minimize the impact and cost of unforeseen events by taking prompt remedial action if such events occur.

The primary objective of including a monitoring plan is to check whether the proposed mitigation measures have been adequately undertaken as recommended. It is also to identify whether the predicted impacts re accurate and mitigation measures taken are effective, to taken mitigation measures at the earliest when an unforeseen impact arises and eliminate or reduce environmental costs.

9.1 Aspects of the Monitoring Plan

The monitoring plan would be assessed and take necessary action to safeguard the both natural and social environment around the project site. Following activities will be undertaken as part of the monitoring plan:

- Groundwater quality
- A log of waste generated and disposed at the project site
- Maintain a log of the volume of water pumped out and the velocity/ speed during dewatering process
- Noise and air quality during construction
- Traffic congestion
- Defects in neighbouring structures

9.2 Responsibilities

Monitoring of the above activities has to be undertaken by the proponent and contractor.

9.3 Specific monitoring requirements

Proposed environmental monitoring programme is outlined in the below Table 11.

Table 11: Proposed environmental monitoring programme

Parameters to be monitored	Indicator	Method	Frequency	Resp. person	Cost MVR
Ground water	pH/Salinity	Laboratory methods	Daily during dewatering	Proponent/ contractor	20,000
Waste disposal	Quantity and type	Waste audit	Every 3 months	Proponent/ contractor	3000
Noise pollution	Sound level	Sound meter	Once a month Noise readings during peak and off-peak hours	Proponent/ contractor	5,000
Safety of workers	Health	Site observation and records	Monthly	Proponent/ contractor	1000
Traffic congestion	Traffic count	Visual timed count	Daily during construction	Proponent/ contractor	2000

9.4 Monitoring Report

A detailed environmental monitoring report should be compiled based on the baseline data collected and submitted to EPA annually. This report structure may include but not limited to

- Introduction
- Details of the site at the time of investigation
- Data collection and analysis
- Quality control measures
- Details of methodologies
- Sampling frequency and monitoring analysis
- Conclusion and recommendations

10. Conclusions

The proposed project involves construction of 10 storey residential building at Ma. Maavelavaru, Malé. The project will provide residential apartments for the proponent and rental residential space too.

The negative impacts envisioned for the project are likely to occur during construction phase and all the impacts as highlighted in the project can be mitigated. In light of possible impacts assessed, a comprehensive monitoring component has been suggested to monitor environmental impacts during the course of this project. This monitoring component will be adhered and will allow the assessment of long term changes, despite the limited nature of the impact.

In addition, the socioeconomic impacts that have been assessed have been identified as mostly positive impacts, not just in short term but also in long term. The socio-economic benefits to the developer are reasonably high. The project construction phase would involve employment opportunities to some and housing opportunities to people after the construction of the building. Therefore, in conclusion the proposed project is justified both technically and environmentally in light of the existing socio-economic developments.

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Appendix A – Terms of Reference

بسم الله الرحمن الرحيم

No: 203-EIARES/INDIV/2017/229

Terms of Reference for Environmental Impact Assessment Report for the Proposed 10-Storey Building at Ma. Maavelavaru, Male'

The following is the Terms of Reference (ToR) following the scoping meeting held on *3rd December 2017* for undertaking the EIA of the proposed 10 Storey Building at Ma. Maavelavaru, Male'. The Proponent of the Project is Mr. Mohamed Rasheed.

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

1. **Introduction and rationale** –Describe the purpose of the project and, if applicable, the background of the project and the tasks already completed. Clearly identify the rationale and objectives to enable the formulation of alternatives. Define the arrangements required for the environmental assessment and if relevant, including how work carried out under this contract is linked and sequenced with projects executed by other consultants, and how coordination between other consultants, contractors, government institutions will be carried out. List the donors, and the institutions the consultant will be coordinating with and the methodologies used. This should include (but should not be limited to) the following;

    - Name and contact details of the Proponent
    - Rationale and background to the project
    - Aims and objectives of the project

2. **Study area** – Submit a minimum A3-size scaled plan with indications of all the proposed infrastructures. Specify the agreed boundaries of the study area for the environmental impact assessment highlighting the proposed development location and size of the facility. The study area should include adjacent buildings and related infrastructure,, nearby environmentally sensitive sites (e.g. mosque). Relevant developments in the areas must also be considered including residential areas, all economic ventures and cultural sites.

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

Task 1. Description of the proposed project – Provide a full description and justification of the relevant parts of the project, using maps at appropriate scales where necessary. All inputs and outputs related to the proposed activities shall be justified. Provide the following details'

Master plan design concept

a) Approved design of the building including architerural and engineering drawings (A3 sized)
b) Master plan concepts in A3 formatAccomodation and housing component of the building
c) Parking capacity and access
d) Fire emergency evacuation plan

Project development

Provide a schedule outlining the proposed phasing, sequencing and duration of components, including;

a) Pre-construction, construction, operation and decommissioning
b) The activities to date, including baseline assessments, modelling and geotechnical investigations
c) Key factors controlling the schedule and uncertainties relating to the project

Excavation and dewatering

a) Area, depth, volume required for excavation
b) Excavated earth disposal method and location
c) Estimated number of days required for dewatering
d) Dewatered water disposal method and location(s)
e) Shoring methods for particularly on sides with adjacent buildings

Foundation and Concrete Works

a) Type of foundation and foundation depth
b) Structural compliance requirement to National Building Code
c) Constructiion process including concrete misxing at site or transportation method

Construction Management

a) Construction waste management
b) Traffic flow and management
c) Project site office and temporary storage area details

Utilities

a) Description of the utility providers during construction and operation stage (Water, Electricity, Power)
b) Sewerage connection plan to Male' main network
c) Water connection plan and water storage tank(s) details
d) Waste management plan during operational phase

Project management: Include communication of construction details, progress, target dates, and duration of works, construction/operation/closure of labour camps, access to site, safety, equipment and material storage, water supply, waste management from construction operations (mainly dredged material), power and fuel supply temporary site setup.

Task 2. Description of the environment – Assemble, evaluate and present the environmental baseline study/data regarding the study area and timing of the project (eg: monsoon season). Identify baseline data gaps, and identify studies and level of detail to be carried out by the 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.

All data must be collected as per the requirements of the EPA Data Collection Guideline (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, vegetation and noise levels for posterior data comparison. Information should be divided into the categories shown below:

Climate

- Temperature, rainfall, wind and waves
- Risk of hurricanes and storm surges and vulnerability to flooding

Physical parameters

- Groundwater quality assessment of the site including physical parameters, Salinity, pH, TDS and EC.
- Ground condition assessment.
- Noise levels in the vicinity of the site including any noise sensitive locations
- Traffic count

Structural environment

- State of adjacent buildings including photographic records of existing conditions of the buildings, Condition of the adjacent roads associated with the building;
- Existing structures/uses of the proposed site

Biological assessment

- Description of the terrestrial environment such as soil. Description of the status of the ground to include the condition of the soil and vegetation (if any is significant) shall be provided.

Socio-economic environment

- Demographic data for Malé and population of adjacent buildings;
- Brief description of social environment of Malé in general and adjacent residential units in particular;
- Identify types of vehicles and peak traffic hours in or near the project site.
- Possible social impact arising from construction activities.

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 (but not limited to)

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

Impacts on natural environment

- Impacts of noise, vibration and disturbance
- Impacts on terrestrial flora and fauna and from land preparation works, if any
- Impacts on groundwater table and quality as a result of dewatering and groundwater use
- Impacts on soil
- Impacts on landscape integrity/scenery
- Contamination due fuel leakage

Impacts on the socio-economic environment

- Impacts on employment and income such as job opportunities in the constructional and operational phase;
- Disturbances to residents and cultural facilities/activities;
- Impacts on transportation/traffic.
- Impacts of increased demands on utility services especially water and energy and waste management
- Impacts on nearby buildings

Construction related hazards and risks

- Pollution of natural environment (e.g. oil spills, discharge of untreated waste water and solid waste including construction waster)
- Risk of accidents and pollution on workers and local populations, and
- Impacts on social values, norms and belief due to construction workers on local population
- Dust and emission
- Impacts due to foundation works
- General public health and safety issues

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

Task 5. Alternatives to Proposed Project – Describe alternatives including "*no action option*" should be presented. Determine the best practical environmental option. Alternatives examined for the proposed project that would achieve the same objectives including the "no action alternative". This should include alternative location, construction technologies, taking into account environmental, social and economic factors. The report should highlight how the location was determined. All alternatives must be compared according to international standards and commonly accepted standards as much as possible. The comparison should yield the preferred alternative for implementation. Mitigation options should be specified for each component of the proposed project.

Task 6 Mitigation and management of negative impacts – Identify possible measures to prevent or reduce significant negative impacts to acceptable levels. These will include both environmental and socio-economic mitigation measures. Measures for both construction and operation phases shall be identified. Cost the mitigation measures, equipment and resources required to implement those measures. The confirmation of the commitment of the developer to implement the proposed mitigation measures shall also be included. An environmental management plan for the proposed project, identifying responsible persons, their duties, and commitments shall also be given. In case where impacts are unavoidable arrangements to compensate for the environmental effect shall be given.

Task 7. Development of monitoring plan – Identify the critical issues requiring monitoring to ensure compliance to mitigation measures and present impact management and monitoring plan during and after completion of the proposed project. Reporting requirements shall be outlined. 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, Inter-Agency coordination and public/NGO participation – Identify appropriate mechanisms for providing information on the development proposal and its progress to stakeholders, government authorities, NGOS, engineers/designers, development managers, staff and members of the general public. The EIA report should include a list of people/groups consulted and summary of major outcomes. The following parties should be consulted;

a) STELCO
b) MWSC
c) Residents of adjacent buildings
d) Nearby Schools (if any)

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 subsequent 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.

12th December 2017

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Appendix B – Technical Layout Drawings

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- ސިވިލް އިންޖިނިއަރ: އަޙްމަދު ސަޢީދު • ހުއްދަ ނަންބަރު: BDR2017170E
- ވެރިފަރާތް: ނަޒީމާ އަލީ، ނަދީރާ އަލީ.
- ހުއްދަ ދިން ގޮތް: މި ހުއްދައިގެ ދަށުން އިމާރާތްކުރުމުގެ މަސައްކަތް ކުރަންވާނީ، މާލޭ ޒޯނިންގ ގަވާއިދާއި، ބިލްޑިންގ ކޯޑާއި ފެން ބޭނުންކުރުމުގެ ގަވާއިދާއި، ދިވެހިރާއްޖޭގެ ބިލްޑިންގ ކޯޑާއި، ދަށުގައިވާ ގޮތާއި، ހ. ފާސްކުރުމުގެ ކުރެހުން ހަދާފައިވާ ގޮތާއި އެއްގޮތަށް އިމާރާތްކުރުމުގެ އުޞޫލުން ގަވާއިދުތަކާ އެއްގޮތަށެވެ.
- ހުއްދައިގެ މުއްދަތު ހަމަވާ ތާރީޚް: 21 ނޮވެމްބަރ 2023

މަތީގައި މައުލޫމާތު ދީފައިވާ އިމާރާތް، މަތީގައި ބަޔާންކޮށްފައިވާ ގޮތުގެ މަތިން އިމާރާތްކުރުމުގެ ހުއްދަ ދީފީމެވެ.

04 ރަބީޢުލްއައްވަލް 1439

22 ނޮވެމްބަރ 2017

މުޢާޛު އަސްލަމް	ޢަބްދުﷲ ސަޢީދު
އެސިސްޓަންޓް އިންޖިނިއަރ	ޑިރެކްޓަރ

ނޯޓް:

- މި ހުއްދައާއި އެކުގައި ކުރެހުން ހުރުން ލާޒިމްވާނެއެވެ. މި ހުއްދަ ބާޠިލުވާނެއެވެ.
- މާލޭ ޒޯނިންގ ގަވާއިދުގެ 1.16 ވަނަ މާއްދާގައި ބަޔާންކޮށްފައިވާ ގޮތުގެ މަތިން އިމާރާތުގެ މަސައްކަތް ނިމުމުން "އިމާރާތް ބޭނުންކުރުމުގެ ހުއްދަ" ހޯދަންވާނެއެވެ. އަދި އެހުއްދަ ހޯދުމަށް ކުރިން "އިމާރާތް ބޭނުންކުރުމުގެ ހުއްދަ" ހޯދާފައި ނުވާނަމަ، އިމާރާތް ބޭނުންކުރުމުގެ ހުއްދަ ނުދެވޭނެއެވެ. ވީމާ، އިމާރާތް ނިމުމުގެ ކުރިން މި ހުއްދައާ ގުޅުންހުރި ކަންކަން ފުރިހަމަކުރަންވާނެއެވެ.

بسم الله الرحمن الرحيم

Ministry of Housing and Infrastructure
Male' Republic of Maldives.

މިނިސްޓްރީ އޮފް ހައުސިންގ އެންޑް އިންފްރާސްޓްރަކްޗަރ
މާލެ، ދިވެހިރާއްޖެ.

ބިލްޑިންގްސް ރެގިއުލޭޝަން - ސަބްމިޝަން ރިވިއުސް

ނަންބަރު: LBD-BS/KF/2017/454

<u>އިމާރާތުގެ ކުރެހުން ފާސްކުރެވުމުގެ ލިޔުން</u>

- ގޯތި ނުވަތަ ބިމުގެ ނަން: މއ. މާވެލަވަރު
- ފަންގިފިލާގެ އަދަދު: 10 (ދިހައެއް) ފަންގިފިލާ، 2/3 ބޭސްމަންޓް ފްލޯރ
- ސްޓްރަކްޗަރގެ ބާވަތް: ކޮންކްރީޓް
- އިމާރާތުގެ އުސްމިން: 30·280 މީޓަރ
- ފަންގިފިލާގެ ބާވަތް: ކޮންކްރީޓް
- މި ލިޔުމުގެ މުއްދަތު: 6 (ހައެއް) އަހަރު
- މުއްދަތު ހަމަވާ ތާރީޚު: 21 ނޮވެމްބަރ 2023
- ވެރިފަރާތް: ރަޝީދާ އަޙްމަދު، ނާދިރާ އަޙްމަދު.

1. މި ލިޔުން، (އިމާރާތުގެ ކުރެހުން ފާސްކުރެވުމުގެ ލިޔުން) ކޮށްދެވުނީ، މި ލިޔުން ދޫކުރާ ތާރީޚުން ފެށިގެން 6 (ހައެއް) އަހަރުދުވަހުގެ މުއްދަތުގައި، "އިމާރާތްކުރުމުގެ ހުއްދަ" ނަގައިދިނުމަށް. މި ލިޔުން އާކުރަން ޖެހޭނެއެވެ. މި ލިޔުން އާކުރެވޭނީ، މި ލިޔުން ދޫކުރާތާ 6 (ހައެއް) އަހަރުދުވަހުގެ މުއްދަތުގައި، "މާލޭ ޕްލޭނިންގ ގަވާއިދު" އާއި އިމާރާތް ކުރުމާބެހޭ އުސޫލުން ގަވާއިދުތަކަށް އެއްގޮތްވާ ބަދަލެއް އައިސްފައި ވާނަމަ، އެއިރެއްގައި ހިނގާ ގަވާއިދުތަކާ އެއްގޮތްވާގޮތަށް މެނުވީ، ކުރެހުންތަކަށް ބަދަލުނުގެނެސް އިސްލާހުކޮށް ގަބޫލުކުރެވޭނެއެވެ.
2. "އިމާރާތްކުރުމުގެ ހުއްދަ" ކޮށްދެވުނީ، އެ ހުއްދަ ދޫކުރާތާ ފެށިގެން 6 (ހައެއް) އަހަރު ދުވަހުގެ މުއްދަތުގައި، އިމާރާތްކުރަން ނިންމައިދީ ނަމަ، އެ ހުއްދަ (އިމާރާތްކުރުމުގެ ހުއްދަ) ބާޠިލުވާނެއެވެ. އެ ހުއްދަ ބާޠިލުވެގެން ދާނަމަ އިމާރާތްކުރުމުގެ މަސައްކަތް ކުރެވޭނީ، އެ ހުއްދަ އާކޮށްގެންނެވެ. އެ ހުއްދަ އާކުރާނަމަ، "އިމާރާތުގެ ކުރެހުން ފާސްކުރެވުމުގެ ލިޔުން" ދޫކުރާތާ ފެށިގެން 6 (ހައެއް) އަހަރު ދުވަސް ފާއިތުވެފައި ނުވާ ނަމައެވެ.

04 ރަބީޢުލްއައްވަލް 1439
22 ނޮވެމްބަރ 2017

ޢަފްޝާނާ ސަޢީދު
ކޯޑިނޭޓަރ

މާޒިޔާ ހުސައިން
އެސިސްޓަންޓް އިންޖިނިއަރ

454_ma. maavelavaru

Ameenee Magu, Maafannu, Male', 20392, Republic of Maldives.
އަމީނީމަގު، މާފަންނު، މާލެ، 20392، ދިވެހިރާއްޖެ.
+(960) 300 4 300
+(960) 300 4 301
secretariat@housing.gov.mv
www.housing.gov.mv
www.facebook.com/housing.gov.mv
www.twitter.com/HousingGovMv

PROJECT : MA. MAAVELAVARU

FOUNDATION PROTECTION METHOD

IT IS PROPOSED TO EXCAVATE THE GROUND TO 1.5M. (ASSUMING EXISTING FOUNDATIONS ARE AT A DEPTH OF 1.75M.) HOWEVER EXCAVATION WILL DEPEND ON DEPTH OF ADJACENT FOOTINGS . IT IS PROPOSED TO EXCAVATE NO GREATER THAN ITS FORMATION LEVEL MINUS 0.1 M.

IT IS THEN PROPOSED TO DRIVE ANGLES (SEE SIZES) VERTICALLY AT 1.2M. C/C ALONG THE PERIPHERY OF THE BUILDING WHERE ADJACENT EXISTING FOUNDATIONS (FOOTINGS/STRIPS)REMAIN. 6MM THK. METAL SHEETS MAY BE DRIVEN IN SIMULTANEOUSLY WITH VERTICAL ANGLES.

A SECOND SET OF VERTICAL MEMBERS (ANGLES, SEE SIZES) MAY ALSO BE DRIVEN IN AT A DISTANCE 1.2M. (THIS IS TO BE USED FOR SHORING AND BRACING THE INITIAL SET OF VERTICAL MEMBERS) SEE ILLUSTRATION BELOW .

BRACING AND SHORING IS DONE BY WELDING HORIZONTAL AND DIAGONAL MEMBERS (SEE SIZES)ON TO VERTICALS.

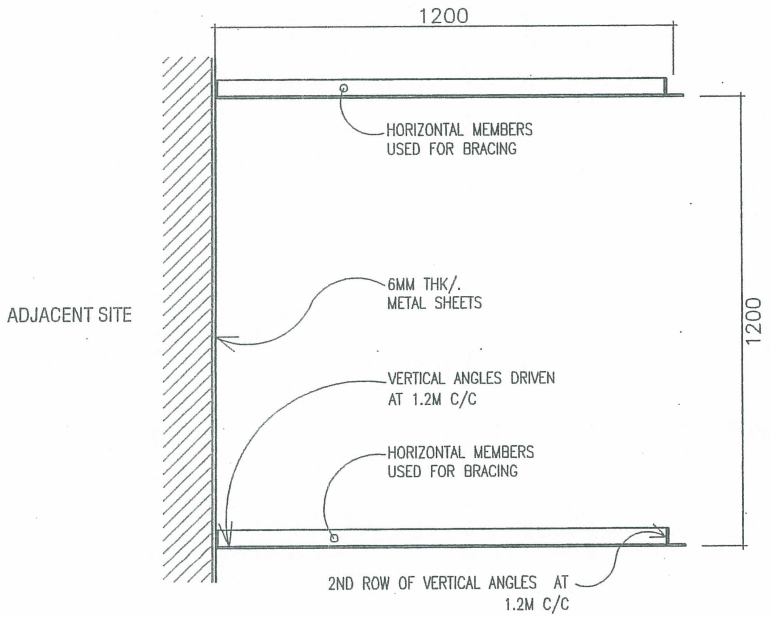
Ministry of Housing & Infrastructure

ACCREDITED CHECKER

STRUCTURAL CHECKER A1

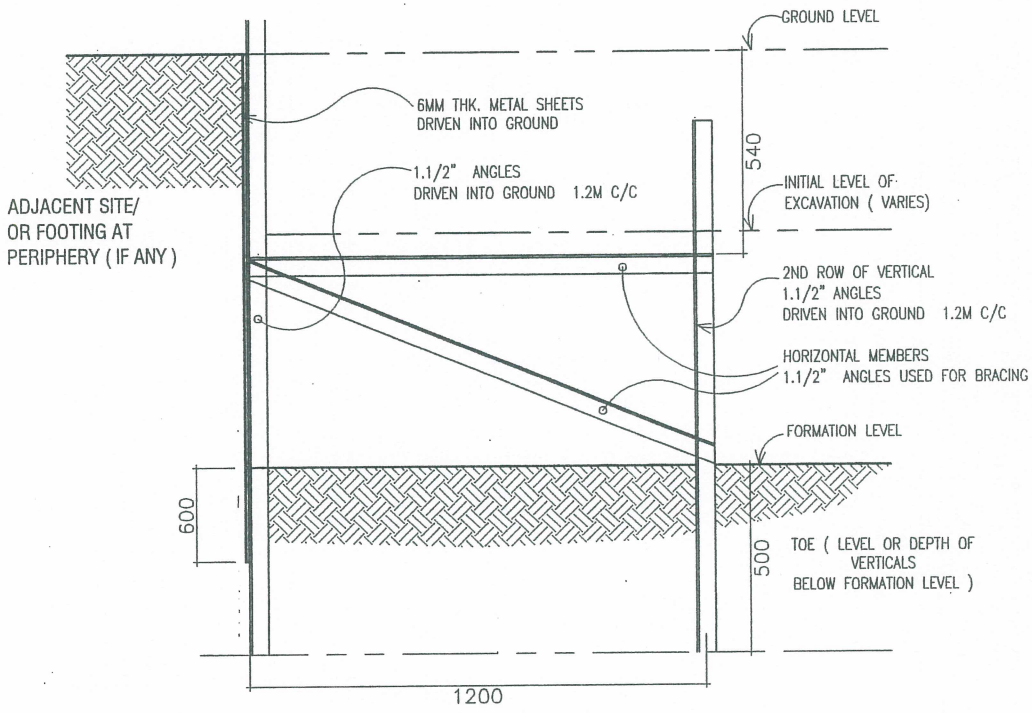
Name: Hussain Shihan VALIDITY: 10.01.17 - 09.01.18

Accredited No: BPR2017024A1 A1-2017-024-001



PLAN

SCALE : 1 :20



SECTION

SCALE : 1 :20

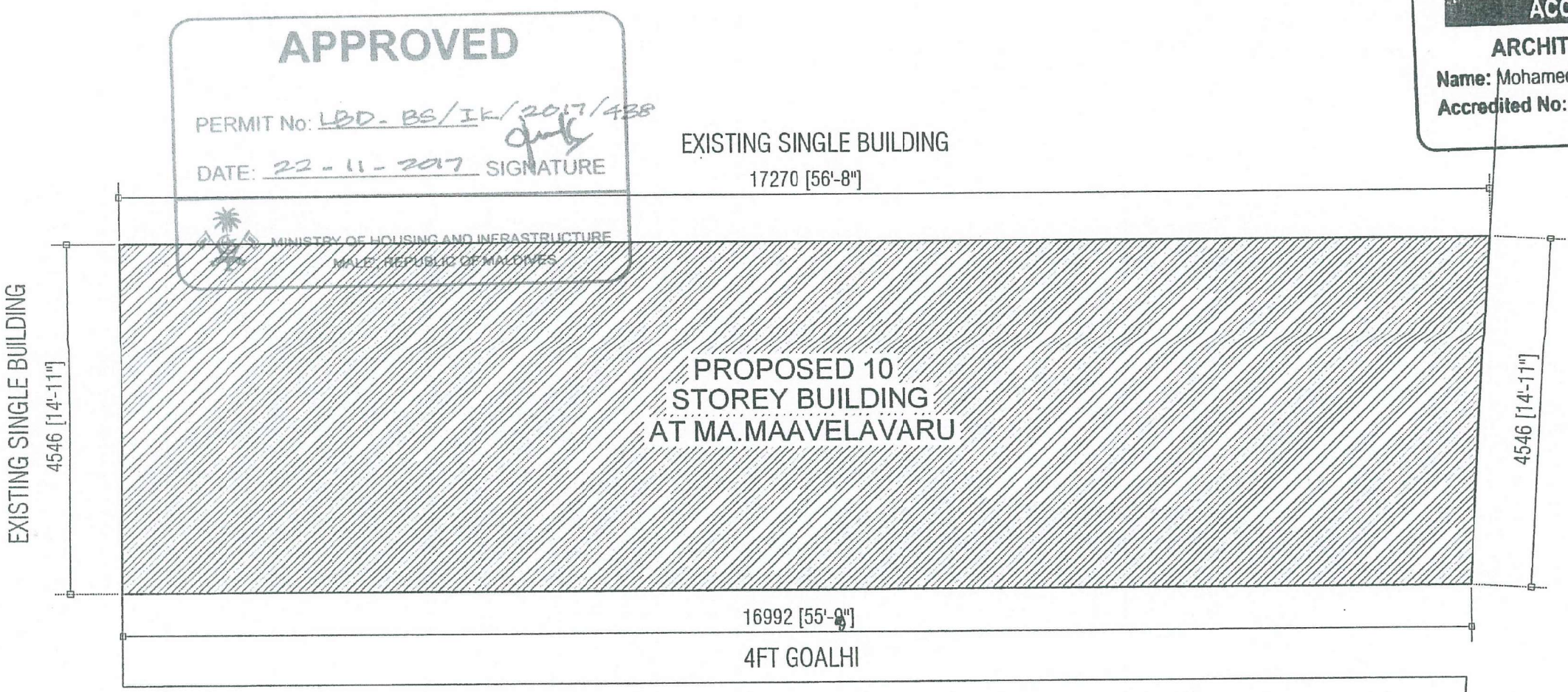
APPROVED

PERMIT No: LBD-BS/IK/2017/438

DATE: 22-11-2017 SIGNATURE

MINISTRY OF HOUSING AND INFRASTRUCTURE
MALE', REPUBLIC OF MALDIVES

Ministry of Housing & Infrastructure
ACCREDITED CHECKER
ARCHITECTURAL CHECKER B1
Name: Mohamed Shamin VALIDITY: 19.10.17 - 18.10.18
Accredited No: BPR2017013B1 B1-2017-013-001



NORTH

SITE PLAN
SCALE - 1:100

AREAS:
TOTAL PLOT AREA = 77.80 SQM

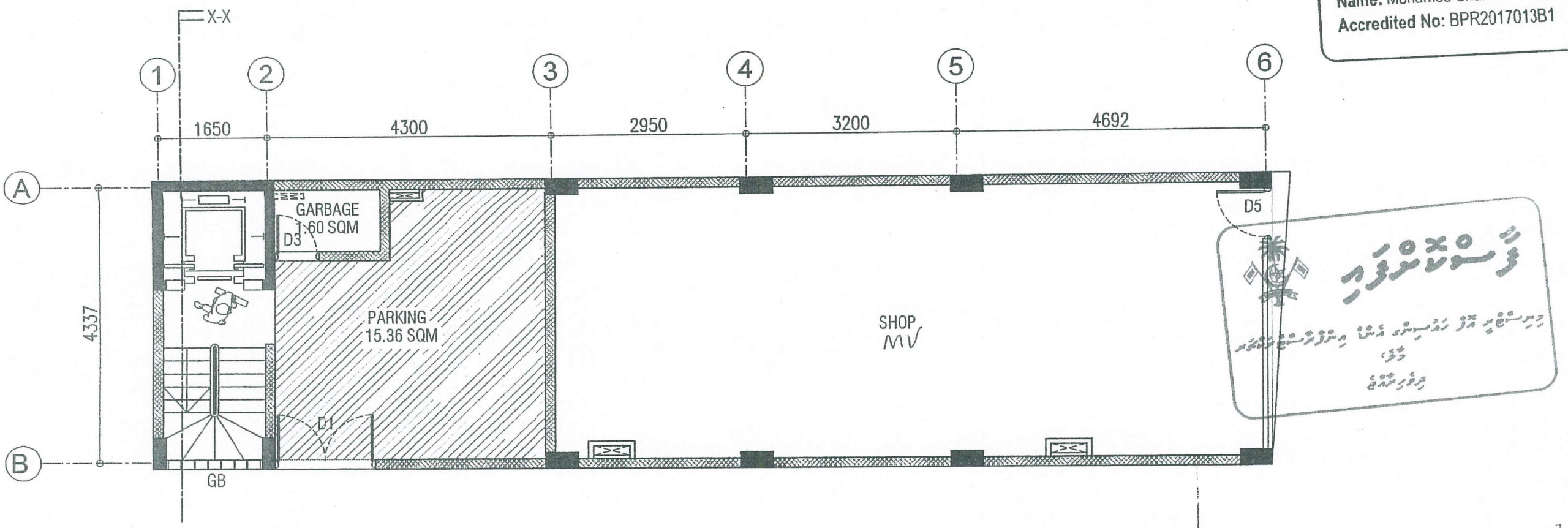
Ministry of Housing & Infrastructure
ACCREDITED CHECKER
ARCHITECTURAL CHECKER B1
Name: Mohamed Shamin VALIDITY: 19.10.16 - 18.10.17
Registration No: BPR2016013B1 B1-2016-013-001

Ministry of Housing & Infrastructure
STRUCTURAL CHECKER A1
Name: Hussain Shihan VALIDITY: 10.01.17 - 09.01.18
Accredited No: BPR2017024A1 A1-2017-024-001

PROJECT: PROPOSED 10 STOREY BUILDING AT MA.MAAVELAVARU	DRAWN BY: RINGUD PRIVATE LIMITED	ARCHITECT: CYTTE	ARCH. CHEKER: SHAMIN	SCALE: AS GIVEN DATE: SEP 2017
		STR. ENGINEER: -	STR. CHECKER: SHIHAN	DRAWING NUMBER: A2

REVISION: 01 02 03 04

MOBILE NO. 7977274 NOTE: ALL DIMENSIONS TO BECHECKED ON SITE BEFORE CONSTRUCTION



Ministry of Housing & Infrastructure
ACCREDITED CHECKER
ARCHITECTURAL CHECKER B1
Name: Mohamed Shamin VALIDITY: 19.10.17 - 18.10.18
Accredited No: BPR2017013B1 B1-2017-013-001

ACCREDITED CHECKER A1
Name: Hussain Shihan VALIDITY: 10.01.17 - 09.01.18
Accredited No: BPR2017024A1 A1-2017-024-001

GROUND FLOOR PLAN

SCALE - 1:100

Ministry of Housing & Infrastructure
ACCREDITED CHECKER
ARCHITECTURAL CHECKER B1
Name: Mohamed Shamin VALIDITY: 19.10.16 - 18.10.17
Registration No: BPR2016013B1 B1-2016-013-001

GENERAL NOTE:

FLOOR FINISHES

SITTING ROOM AND BEDROOMS TO HAVE 600 x 600 FLOOR TILES.

ALL TOILETS, SHOWERS,SLUICE ROOMS AND THEIR RESPECTIVE LOBBIES TO HAVE NON-SLIP CERAMIC FLOOR TILES.

TOILETS SHOWER 25MM LOWER THAN THE FFL OF RESPECTIVE FLOORS.

ALL THE TILES SHOULD BE SPECIFIED BY THE CONTRACTOR AND APPROVED BY THECLIENT.

CHEMICALS

"MATERSEAL 550" CHEMICAL SHOULD BE APPLIED IN ALL THE TOILETS AND BALCONY FLOORS UP TO 1 FEET HIGH ON THEWALLS AFTER SCREEDING

ALL THE WALLS EXPOSED TO RAIN INCLUDING OPEN VOIDS SHOULD BE PLASTERED WITH "REOMIX 720" OR EQUIVALENT CHEMICAL.

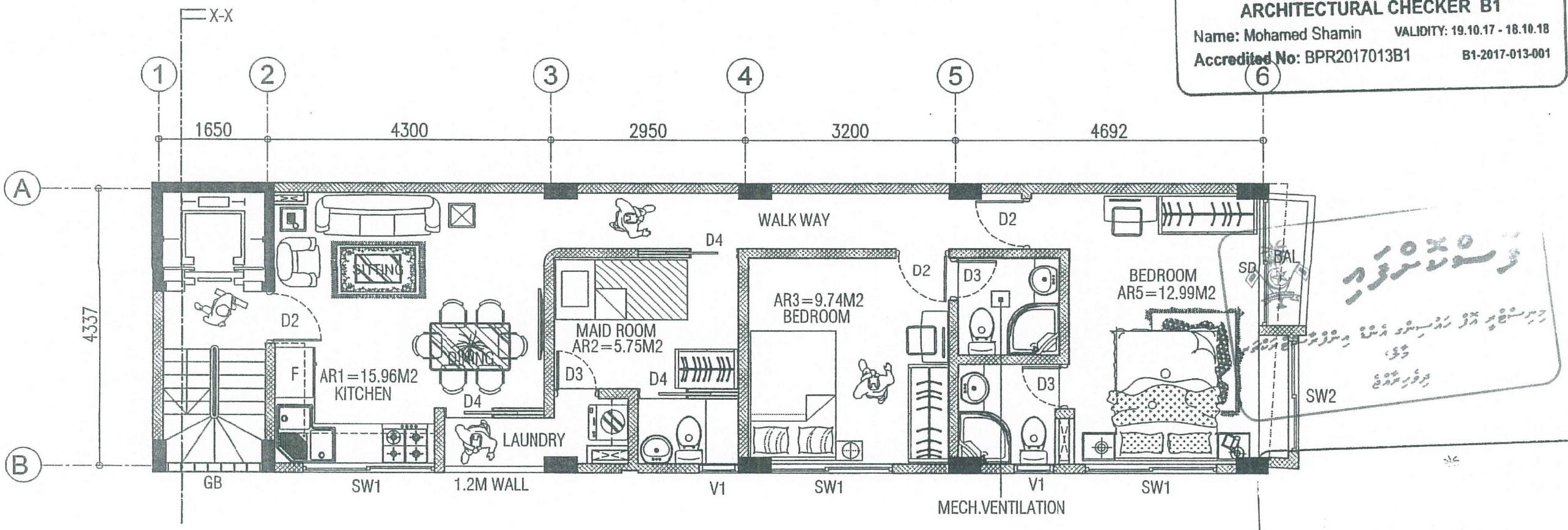
"MASTERTILE 30" OR EQUIVALENT CHEMICAL CEMENT SHOULD BE USED FOR ALL THE TILING.
"MASTERTILE 530lm" OR EQUIVALENT SHOULD BE USED FOR GROUT

ALL THE WORK SHOULD BE CARRIED OUT ACCORDING TO THE CONSULTANT

PROJECT: PROPOSED 10 STOREY BUILDING AT MA.MAAVELAVARU	DRAWN BY: RINGUM PRIVATE LIMITED	ARCHITECT: CYTTE	ARCH. CHEKER: SHAMIN	SCALE: AS GIVEN
				DATE: SEP 2017
		STR. ENGINEER: -	STR. CHECKER: SHIHAN	DRAWING NUMBER: A3

REVISION: 01 02 03 04

MOBILE NO. 7977274 NOTE: ALL DIMENSIONS TO BECHECKED ON SITE BEFORE CONSTRUCTION



Ministry of Housing & Infrastructure
ACCREDITED CHECKER
ARCHITECTURAL CHECKER B1
Name: Mohamed Shamin VALIDITY: 19.10.17 - 18.10.18
Accredited No: BPR2017013B1 B1-2017-013-001

2ND TO 9TH FLOOR PLAN

SCALE - 1:100

Ministry of Housing & Infrastructure
ACCREDITED CHECKER
ARCHITECTURAL CHECKER B1
Name: Mohamed Shamin VALIDITY: 19.10.16 - 18.10.17
Registration No: BPR2016013B1 B1-2016-013-001

STRUCTURAL CHECKER A1
Name: Hussain Shihan VALIDITY: 10.01.17 - 09.01.18
Accredited No: BPR2017024A1 A1-2017-024-001

GENERAL NOTE:

FLOOR FINISHES

SITTING ROOM AND BEDROOMS TO HAVE 600 x 600 FLOOR TILES.

ALL TOILETS, SHOWERS,SLUICE ROOMS AND THEIR RESPECTIVE LOBBIES TO HAVE NON-SLIP CERAMIC FLOOR TILES.

TOILETS SHOWER 25MM LOWER THAN THE FFL OF RESPECTIVE FLOORS.

ALL THE TILES SHOULD BE SPECIFIED BY THE CONTRACTOR AND APPROVED BY THECLIENT.

CHEMICALS

"MATERSEAL 550" CHEMICAL SHOULD BE APPLIED IN ALL THE TOILETS AND BALCONY FLOORS UP TO 1 FEET HIGH ON THEWALLS AFTER SCREEDING

ALL THE WALLS EXPOSED TO RAIN INCLUDING OPEN VOIDS SHOULD BE PLASTERED WITH "REOMIX 720" OR EQUIVALENT CHEMICAL.

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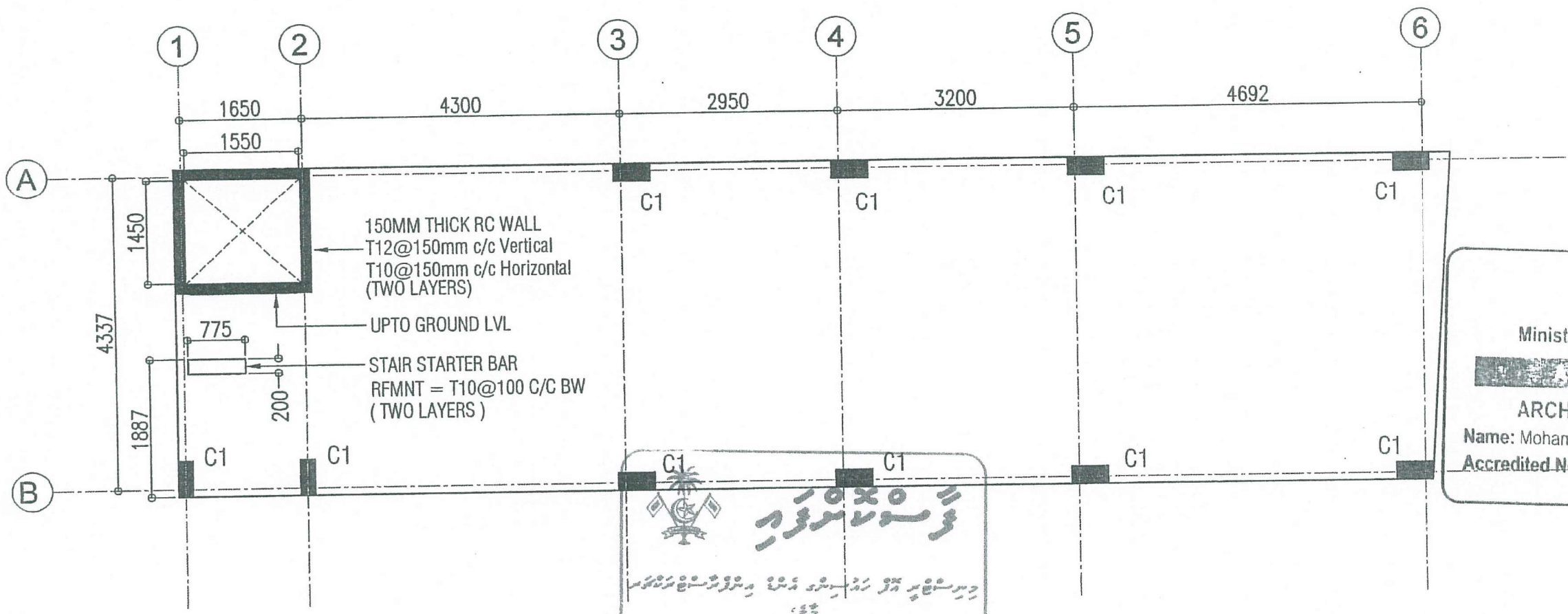
"MASTERTILE 530lm" OR EQUIVALENT SHOULD BE USED FOR GROUT

ALL THE WORK SHOULD BE CARRIED OUT ACCORDING TO THE CONSULTANT

PROJECT: PROPOSED 10 STOREY BUILDING AT MA.MAAVELAVARU	DRAWN BY: RAINBOW PRIVATE LIMITED	ARCHITECT: CYTTE	ARCH. CHEKER: SHAMIN	SCALE: AS GIVEN	REVISION:
				DATE: SEP 2017	01
		STR. ENGINEER: -	STR. CHECKER: SHIHAN	DRAWING NUMBER: A5	02
					03
					04

MOBILE NO. 7977274 NOTE: ALL DIMENSIONS TO BECHECKED ON SITE BEFORE CONSTRUCTION



COLUMN SETTING OUT PLAN

SCALE - 1:100

Ministry of Housing & Infrastructure
ACCREDITED CHECKER
ARCHITECTURAL CHECKER B1
Name: Mohamed Shamin VALIDITY: 19.10.17 - 18.10.18
Accredited No: BPR2017013B1 B1-2017-013-001

Ministry of Housing & Infrastructure
STRUCTURAL CHECKER A1
Name: Hussain Shihan VALIDITY: 10.01.17 - 09.01.18
Accredited No: BPR2017024A1 A1-2017-024-001

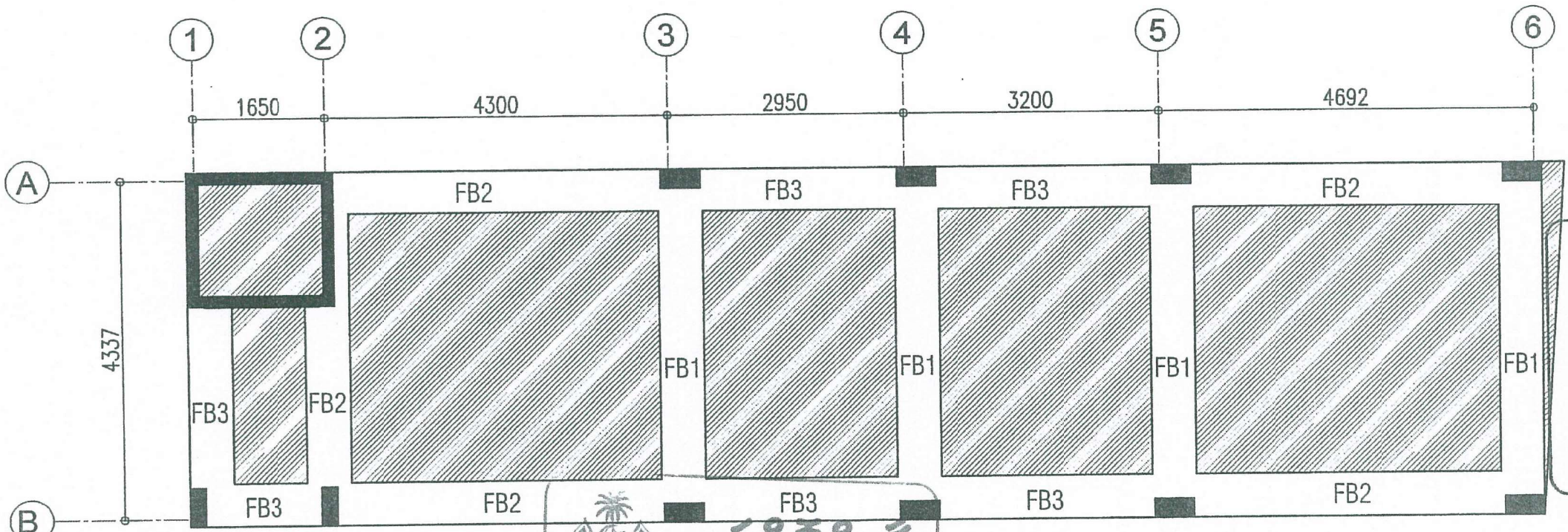
Ministry of Housing & Infrastructure
ACCREDITED CHECKER
ARCHITECTURAL CHECKER B1
Name: Mohamed Shamin VALIDITY: 19.10.16 - 18.10.17
Registration No: BPR2016013B1 B1-2016-013-001

PROJECT:
PROPOSED 10 STOREY BUILDING AT
MA.MAAVELAVARU

DRAWN BY: RINGUK PRIVATE LIMITED

ARCHITECT: CYTTE	ARCH. CHEKER: SHAMIN	SCALE: AS GIVEN	REVISION:
		DATE: SEP 2017	01
STR. ENGINEER: -	STR. CHECKER: SHIHAN	DRAWING NUMBER: S1	02
			03
			04

MOBILE NO. 7977274 NOTE: ALL DIMENSIONS TO BECHECKED ON SITE BEFORE CONSTRUCTION



FOUNDATION PLAN

SCALE - 1:100

NOTE:-

- RAFT THICKNESS = 750MM
- RFMNT = T16 @ 175 C/C BW (T&B)

Ministry of Housing & Infrastructure
ACCREDITED CHECKER
ARCHITECTURAL CHECKER B1
Name: Mohamed Shamin VALIDITY: 19.10.17 - 18.10.18
Accredited No: BPR2017013B1 B1-2017-013-001

Ministry of Housing & Infrastructure
STRUCTURAL CHECKER A1
Name: Hussain Shihan VALIDITY: 10.01.17 - 09.01.18
Accredited No: BPR2017024A1 A1-2017-024-001

Ministry of Housing & Infrastructure
ACCREDITED CHECKER
ARCHITECTURAL CHECKER B1
Name: Mohamed Shamin VALIDITY: 19.10.16 - 18.10.17
Registration No: BPR2016013B1 B1-2016-013-001

PROJECT: PROPOSED 10 STOREY BUILDING AT MA.MAAVELAVARU	DRAWN BY:	ARCHITECT: CYTTE	ARCH. CHEKER: SHAMIN	SCALE: AS GIVEN	REVISION:
				DATE: SEP 2017	01
		STR. ENGINEER: -	STR. CHECKER: SHIHAN	DRAWING NUMBER: S2	02
					03
					04

MOBILE NO. 7977274 NOTE: ALL DIMENSIONS TO BECHECKED ON SITE BEFORE CONSTRUCTION

Appendix C – Water Quality Reports

Male' Water & Sewerage Company Pvt Ltd
Water Quality Assurance Laboratory
FEN Building 5th Floor, Machangoalhi, Ameenee Magu, Male', Maldives
Tel: +9603323209, Fax: +9603324306, Email: wqa@mwsc.com.mv

WATER QUALITY TEST REPORT

Report No: 500178076

Customer Information:
DAS Pvt. Ltd
G. Heylhi

20077

Report date: **27/12/2017**
Test Requisition Form No: **900182732**
Sample(s) Recieved Date: **24/12/2017**
Date of Analysis: **24/12/2017 - 26/12/2017**

Sample Description	Maavelavaru Ground Water	**TEST METHOD**	**UNIT**
Sample Type	Ground Water		
Sample No	83195648		
Sampled Date	24/12/2017		
PARAMETER	**ANALYSIS RESULT**		
Physical Appearance	Clear		
Conductivity	930	Method 2510 B. (adapted from Standard methods for the examintation of water and waste water, 21st edition)	µS/cm
pH	7.59	Method 4500-H+ B. (adapted from Standard methods for the examintation of water and waste water, 21st edition)	-
Salinity	0.46	Method 2520 B. (adapted from Standard methods for the examintation of water and waste water, 21st edition)	‰
Temperature	21.6	Electrometry	°C
Total Dissolved Solids	465	Electrometry	mg/L
Total Suspended Solids	<5 (LoQ 5 mg/L)	Method 8006 (Adapted from HACH DR5000 Spectrophotometer procedure Manual)	mg/L
Hardness, Total	212	HACH Method 8213	mg/L

Keys: µS/cm : Micro Seimen per Centimeter, **‰** : Parts Per Thousand, **°C** : Degree Celcius, **mg/L** : Milligram Per Liter

Checked by

Aminath Sofa
Assistant Laboratory Executive

Approved by

Adam Rasheed
Manager, Quality

Notes: Sampling Authority: Sampling was not done by MWSC Laboratory
This report shall not be reproduced except in full, without written approval of MWSC
This test report is ONLY FOR THE SAMPLES TESTED.
~ Information provided by the customer

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

Appendix E – Letter of Commitment

Mr. Ibrahim Naeem,
Director General,
Environmental Protection Agency,
Green Building, Roashaneemagu
Male', Republic of Maldives.

5th January 2018

Dear Sir,

Commitment for monitoring and mitigation actions for Environmental Impact Assessment for a 10-storey building at Ma. Maavelavaru

As the developer of the above mentioned project, I hereby confirm that I have read the report to best of my knowledge and commit to carry out and bear costs of environmental mitigation measures and monitoring outlined in the report.

Yours sincerely

Mohamed Rasheed

Curriculum Vitae

Name: Ali Shareef
Date of Birth: 10 June 1978
Contact: Mob: +960 796 5626, Work: +960 301 8346
Email: shareef.ali@gmail.com

EDUCATION

Masters of Science – Geography in Atmospheric Science and Numerical modelling (2009), Department of Geography, University of Canterbury, Christchurch, New Zealand. Thesis title: "*Numerical Analysis of Convective Storm Development over Maldives*".

Bachelor of Science (Honours) in Meteorology and Oceanography (2003), Flinders University of South Australia. Thesis title: "*Evaluation of Rainfall from satellite and rain gauge observations over selected islands in the Indian Ocean*".

General Certificate of Education Advanced Level (1997).

General Certificate of Education Ordinary Level (1995).

PROFESSIONAL MEMEBERSHIP

Licensed Environmental Impact Assessment consultant (License No. EIA 19/11) 2011 – date

Member to the Adaptation Committee under the United Nations Framework Convention on Climate Change (UNFCCC) 2015 - date

As part of the Cancun Adaptation Framework, Parties established the Adaptation Committee (AC) to promote the implementation of enhanced action on adaptation in a coherent manner under the Convention, inter alia, through the following functions:

Providing technical support and guidance to the Parties;

Sharing of relevant information, knowledge, experience and good practices;

Promoting synergy and strengthening engagement with national, regional and international organizations, centers and networks;

Providing information and recommendations, drawing on adaptation good practices, for consideration by the COP when providing guidance on means to incentivize the implementation of adaptation actions, including finance, technology and capacity-building;

Considering information communicated by Parties on their monitoring and review of adaptation actions, support provided and received.

Member of the Faculty Advisory Committee of the Faculty of Science at the Maldives National University 2015 - date

Board Member of the South Asian Association for Regional Cooperation (SAARC) Coastal Zone Management Centre 2011 - 2015

Member to the Least Developed Countries Expert Group (LEG) of the United Nations Framework Convention on Climate Change (UNFCCC) 2010- 2011

Least Developed Countries Expert Group (LEG) is a group of experts formed under a decision from the Conference of the Parties (COP) where members are nominated by the parties. The objective of the LEG is supporting the preparation and implementation strategy of National Adaptation Programs of Action (NAPAs) and support the national adaptation plans process within the UNFCCC. As a member my expertise was provided in the formulation of the guidelines for the development NAPAs for the UNFCCC and other several countries and reviewing

several NAPAs submitted to the UNFCCC to ensure if they are within the NAPA guidelines.

SCHOLARSHIPS & AWARDS

Scholarship for postgraduate studies by New Zealand Development Aid (NZAID, open category).	2007
Golden Key Award, by the Golden Key International Honour Society (Flinders University of South Australia, Adelaide).	2001
Undergraduate Scholarship awarded under the Human Resource development project by WMO to the Maldives government.	2000

INFORMATION TECHNOLOGY AND DATA ANALYSIS

	Level
Microsoft Windows and Office packages	Excellent
UNIX and LINUX operating systems (FEDORA, openSuSE, UBUNTU, SunOS)	Basic to intermediate
Experience with programming languages: FORTRAN, C, C++, JAVA, PHP	Basic to intermediate
Experience with Data analysis packages: MATLAB, SPSS, GrADS, Surfer, Grapher, ArcGIS, RBR	Basic to intermediate
Geographic Information Systems (ESRI ArcGIS)	Intermediate

EMPLOYMENT HISTORY

Director, Climatology, Climate Change Department, Ministry of Environment and Energy — Sep 2014 - date

Responsibilities: Oversee of formulation of climate change and energy strategies; Guide in preparation and evaluation of project briefs and proposals for climate change adaptation and climate mitigation; Oversee and facilitate climate change adaptation and mitigation projects; Provide professional technical assistance to various stakeholders as to mainstream climate change; Advocate at local and international forums regarding the climate change status of Maldives and to secure finance to address the issues; Fulfil the requirements of the conventions on climate change such as UNFCCC and other bodies such as IPCC; Oversee and establishment of market mechanisms under the convention; Oversee and advice on the preparations of the Nationally Appropriate Mitigation Actions; Provision of professional expertise in climate change negotiation forums both local and international climate negotiations; Provision of advice on the new climate agreement; Negotiate and liaise with various donors and funding agencies and other international partners; Lead the department in the absence of the superiors; Contribute to various other projects and office works.

Assistant Director, Climatology, Climate Change and Energy Department, Ministry of Environment and Energy — 19 Jul 2009- Sep 2014

Responsibilities: Formulation of climate change and energy strategies; Preparation and evaluation of project briefs and proposals for climate change adaptation and climate mitigation; Facilitate climate change adaptation and mitigation projects; Provide professional technical assistance to various stakeholders as to mainstream climate change; Advocate at local and international forums regarding the climate change status of Maldives and to secure finance to address the issues; Fulfil the requirements of the conventions on climate change such as UNFCCC and other bodies such as IPCC; Establishment of Clean Development Mechanism (CDM) unit under the guidance of UNEP RISO; Provision of professional expertise in climate change negotiation forums both local and international climate negotiations, participating several climate negotiations since 2009; Negotiate and liaise with various donors and

funding agencies and other international partners; Lead the department in the absence of the superiors; Contribute to various other projects and office works.

Project Officer, Water and Sewerage Department, Ministry of Environment Energy and Water — 07 Jul 2007-25 Jan 2008

Responsibilities: Preparation of water and sanitation project briefs and proposals; Middle management of water and sanitation projects ensuring that the projects are delivered according to schedule and project implementation; Assist in provision of technical information regarding water and sanitation. Some of the key projects worked on was sanitation projects on Tha. Guraidhoo, AA. Rasdhoo, V. Felidhoo, HA. Dhidhoo, L. Isdhoo, Lh. Hinnavaru and Th. Thimarafushi.

Assistant Oceanographer, Department of Meteorology, National Meteorological Center — 17 Jan 2005-07 Jul 2007

Responsibilities: Collect information on daily weather status; Collect and analyses local and neighboring international weather data to prepare daily weather forecasts; Prepare daily, weekly and monthly weather reports; Research and analysis of meteorological and oceanographic data; Pioneering the use of numerical weather prediction in Maldives by use of meso-scale numerical weather forecasting models such as MM5 and WRF; Provision of training to the new recruit staffs on use of meteorological and oceanographic data and instruments.

Switching Technician, Dhivehi RaajjeygeGulhun (DHIRAAGU) Pvt Ltd — Jan 1998-Jan 2000

Responsibilities: Work at the mainframe telephone and mobile phone exchange units; Daily system checks of the mainframe units; Daily assistance in connections and disconnections of the telephones and mobile phones; Assist the telephone networks maintenance teams in trouble shooting and fixing of telephone, mobile phones and pagers; Routine checks of the local and international carrier trunks; Programing of mobile phones and pagers; Minor repair of mobile phones and pagers; Liaise with international partners ensuring smooth operation of the telephone and the mobile networks.

KEY PROJECT CONTRIBUTIONS

Coordinator of the Second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC), Vulnerability needs assessments coordinator. — Ongoing

In accordance with the principle of "common but differentiated responsibilities", parties to the UNFCCC have to report on the steps taken by the parties in implementing the convention. This report should include information about the vulnerability status, the impacts and the adaptive measures taken and planned to be taken by the party. It should also report on the Greenhouse Gas inventory and the climate change mitigation measures undertaken and planned to mitigate the emission of greenhouse gases.

I was involved in coordination of vulnerability needs assessment where I have to assist the consultants who are working on the respective thematic areas in arranging the field trips, meetings, data analysis, results interpretation and compilation of the final report.

National Coordinator of Quantifying projected impacts under 2°C warming - IMPACT2C. — Completed

United Nations Climate Change Conference in Cancun recognized that global warming beyond 2°C above pre-industrial levels will be a major threat to human welfare and to ecosystems and the goal to limit the global warming demands that discussions are informed by the best available science on projected impacts and possible benefits. IMPACT2C project enhances knowledge, quantifies climate change impacts, and adopts a clear and logical structure, with climate and impacts modelling, vulnerabilities, risks and economic costs, as well as potential

responses, within a pan-European and in some of the world's most vulnerable regions. The project is a research collaboration among some of the countries within the European Union and some countries from the world's most vulnerable regions.

I was involved in coordinating with various stakeholders to collect the data via field expeditions and by other sources, coordination of the meetings, analysis and interpretation of results and contributing to the reports of the research findings.

Lead coordinator and co-Author of Maldives Energy Supply and Demand 2010-2012. 2014

Energy supply and demand is an accounting framework for the compilation and reconciliation of data on all energy entering, exiting and used within the national territory of a given country during a reference period.

I was involved in the data analysis needed for the compilation of the energy balance and was a co-author of the Energy supply and demand.

Lead coordinator and Lead Author of Baseline analysis of Adaptation Capacity and Climate Change Vulnerability Impacts in the Tourism Sector, Tourism Adaptation Project. 2013

To address the climate change issues, the Tourism Adaptation Project (TAP) facilitate and provide support to bring about the required amendments to the existing laws and regulations that govern the tourism sector, so as to incentivize private sector investments in climate change adaptation in the tourism sector. The baseline assessment carried out was to determine the existing vulnerabilities in resorts, tour operators, safari owners and the associated communities. It also assessed the impacts and the adaptive and mal-adaptive measures within the tourism sector. A social survey was carried out to determine this.

My role was to lead the entire project, involved in the field data collection surveys, results interpretation and compiling the final report as a lead author.

National Coordinator of the project on Mapping of the Maldives and Climate Change. 2011

The Mapping of the Maldives and Climate Change (MMCC) project with an overall objective of development of a large scale mapping of the Maldives. It included national capacity building in terms of information management and monitoring of climate change issues, acquiring and processing environmental data, research and development of monitoring methods for and actions to adjust to climate change, creation of a Maldives Environment and Climate Change GIS Geo-portal.

My role was to coordinate the various meetings with stakeholders and coordinate research field trips.

PUBLICATIONS AND CONTRIBUTIONS

Maldives National Climate Change Policy framework, as a co-author, 2015, Ministry of Environment and Energy.

Shifting perspectives on coastal impacts and adaptation, Sally. et. al., vol 4, 752–755, Nature Climate Change, 2014.

Maldives Energy Supply and Demand 2010 – 2012, Ministry of Environment and Energy 2014.

Baseline Analysis: Adaptation Capacity and Climate Change Vulnerability Impacts in the Tourism Sector, Tourism Adaptation Project, 2013 participated as the lead author.

Scaling-up of Renewable Energy Program Investment Plan Maldives 2012, Ministry of Housing and Environment.

Co-Author of the project proposals for the European Union Climate Change Trust Fund on Climate Change Adaptation and Mitigation 2009.

Co-Author in formulation of Maldives National Energy Policy and Strategies 2010.

Numerical Analysis of Convective Storm Development over Maldives, 2009, Masters thesis.

KunioYoneyama, Yukio Masumoto, Yoshifumi Kuroda, Masaki Katsumata, Keisuke Mizuno, Yukari N. Takayabu, Masanori Yoshizaki, Ali Shareef, Yasushi Fujiyoshi, Michael J. McPhaden,V. S. N. Murty, RyuichiShirooka, Kazuaki Yasunaga, Hiroyuki Yamada, Naoki Sato, Tomoki Ushiyama, QoosakuMoteki, Ayako Seiki, Mikiko Fujita, Kentaro Ando, Hideaki Hase, Iwao Ueki, Takanori Horii, Chie Yokoyama, and Tomoki Miyakawa., 2008. *MISMO Field Experiment in the Equatorial Indian Ocean 2007*. Bull. Amer. Met. Soc

Shareef, 2007. *Introducing numerical weather forecasting in Maldives using MM5 meso-scale model*. Rain O Shine, Department of Meteorology, Maldives.

Shareef, 2006. *Overview of the Maldives Sea Level and the risk involved*. Rain O Shine, Department of Meteorology, Maldives.

Tomczak, M., A. Shareef, A. Henry-Edwards and J. Bennett (2004) *Determination of the fresh water flux at the air/sea interface for climate modelling*. Proceedings of the First International Conference on Physics (ICP) January 6-9, 2004 Ð Tehran, Iran. Faculty of Physics and Nuclear Sciences, Amirkabir University of Technology, Tehran, 127 Ð 136.

Evaluation of rainfall from satellite and rain gauge observations over selected islands in the Indian Ocean. 2003. Honours thesis.

WORKSHOPS AND TRAININGS

Economics of Climate Change Adaptation and Cost Benefit Analysis, Bangkok, Thailand.	11-14 Mar 2013
GIS and Remote Sensing, Male', Maldives.	6-17 Jan 2013
Intermediate course on use of GIS, Male', Maldives.	18-29 Nov 2012
Hands-on training workshop for the Asia-Pacific region on vulnerability and adaptation assessment, Vientiane, Lao Peoples Democratic Republic.	8-12 Oct 2012
Introduction to GIS and GIS tools, Male', Maldives.	26 Aug-6 Sep 2012
Regional workshop for Eastern European and Asia-Pacific regions to share experiences and lessons learned in the preparation and implementation of nationally appropriate mitigation actions (NAMAs), Yerevan, Armenia.	2-4 July 2012
Hands-on Training Workshop on Greenhouse Gas (GHG) Inventory for the Asian Region, Colombo, Sri Lanka.	30 Jan-3 Feb 2012
Climate extreme analysis and Geo-Climate Information System – a visualization tool for displaying climate change scenarios for Maldives, Maldives.	22-26 Jan 2012
GIS basic training on use of the products from the Mapping of the Maldives and Climate Change, Male', Maldives.	22-26 May 2011
Workshop for Climate Risk Management Technical Assistance Support Project (CRM-TASP), Pondicherry, India.	5-7 Jul 2010
National Workshop of Climate Change and Human Health, Bandos Island Resort, Maldives.	5-7 Oct 2009

National Sustainable Development Strategy final workshop, Bangkok, Thailand.	10-12 Sep 2009
UNESCO-IOC Training Course on Tsunami Numerical Modelling Course II, Bangkok, Thailand.	29 Jun- 6 Jul 2007
Training workshop on seismology and Tsunami, Male, Maldives, organised by UNESCO International Oceanographic Commission (IOC), U.S Agency for International Development (USAID) and United States Geological Survey (USGS).	27- 31 Aug 2006
SAARC Training Workshop on MM-5 (Numerical Weather Prediction) Model held in New Delhi, India by the SAARC Meteorological Research Center (SMRC), Dahaka, Bangladesh and the Indian Meteorological Department (IMD), New Delhi, India.	27 Feb-10 Mar 2006
Workshop on Preparation and Interpretation of a Climate Risk Profile for the Maldives, Male', Maldives.	20-21 Feb 2006
IMO National OPRC Level 3 Training Course, Male', Maldives.	23-25 Jan 2005
Renewable energy technologies, Male', Maldives.	25-29 Dec 2005
Workshop on post-tsunami review, Male', Maldives.	24-29 May 2005
Science Demonstrators Training, staff development and training unit, Faculty of science and Engineering, Flinders University of South Australia.	25-26 Feb 2003

SEMINARS AND CONFERENCES

19th Conference of the parties (COP 19) to the United Nations Convention on Climate Change (UNFCCC) serving as the meeting of the Parities to the Kyoto Protocol, Warsaw, Poland	3 Nov- 25 Nov 2013
36th Session of the Intergovernmental Panel on Climate Change (IPCC), approval and acceptance of the report of the working group I.	23 Sep-26 Sep 2013
18th Conference of the parties (COP 18) to the United Nations Convention on Climate Change (UNFCCC) serving as the meeting of the Parities to the Kyoto Protocol, Doha, Qatar	28 Nov- 9 Dec 2012
Second General Assembly on Quantifying projected impacts under 2°C warming - IMPACT2C, Vienna, Austria	14-16 Nov 2012
Capacity Building Programme on the Economics of Climate Change Adaptation, Bangkok, Thailand	24- 26 Oct 2012
Cartegena Dialogue on Climate Change negotiations, Nairobi, Kenya	2-3 Apr 2012
17th Conference of the parties (COP 17) to the United Nations Convention on Climate Change (UNFCCC) serving as the meeting of the Parities to the Kyoto Protocol, Durban, South Africa	28 Nov-9 Dec 2011
Quantifying projected impacts under 2°C warming - IMPACT2C, Hamburg, Germany	4-5 Oct 2011
5th Preparatory Commission for International Renewable Energy Agency (IRENA) and the First Assembly of IRENA, Abu Dhabi, United Arab Emirates	3-5 Apr 2011
Sessions of the Intergovernmental Panel on Climate Change (IPCC), on various occasions.	

Sessions of the Intergovernmental Panel on Climate Change (IPCC) meeting of the Bureau, on various occasions	
Asia Pacific Climate Change Finance and Development Effectiveness Dialogue, Bangkok, Thailand	12-13 Sep 2011
East Asia Low Carbon Green Growth (LCGG) Roadmap Policy Forum , Busan, Republic of Korea	7-8 Jul 2011
Executive Exchange to the "European Wind Energy Conference and Exhibition", Brussels, Belgium	14-18 Mar2011
Carbon Forum Asia, Singapore	27-28 Oct 2010
18th meeting of the Least Developed Countries Expert Group (LEG) to the UNFCCC, Kathmandu, Nepal	12-15 Oct 2010
17th meeting of the Least Developed Countries Expert Group (LEG) to the UNFCCC, Bonn, Germany	12-14 Apr 2010
UN Climate Change Negotiations (AWG-LCA and KP) preparatory meetings (LDC, SIDS, G77China), Bonn, Germany	4-11 Apr 2010

ENVIRONMENT IMPACT ASSESMENTS

Reviewed more than 30 EIAs as part of the independent professional review process of the Maldives Environment Protection Agency and the Ministry of Tourism.

Environmental Impact Assessment for the Proposed Aquaculture Project at Maroshi, Shaviyani Atoll 2016. Involved as a consultant in report compilation.

Environmental Impact Assessment for the harbour reconstruction at M. Madduvari and Dhiggaru 2015. Field data collection, analysis and report compilation.

Environmental Impact Assessment for the proposed land reclamation and coastal protection in Gdh. Thinadhoo 2015. Involved in data analysis and report compilation.

Environmental Impact Assessment for the proposed land reclamation for south of Addu City Feydhoo 2015. Report write up and compilation.

Environmental Impact Assessment for the proposed resort development at N. Medhufaru 2015. Involved in, data analysis and compilation of the report on wave, tidal, meteorological, beach dynamics and satellite imagery data.

Environmental Impact Assessment for sand burrow site for road development at southern reef area of Thilafushi 2015. Involved as a principle consultant in analysis and report compilation.

Environmental Impact Assessment for construction of an 11 storey building at MA. Himaaliya 2015. Involved as a primary consultant.

Environmental Impact Assessment for the upgrading of the sewerage system in Fihaalohi 2015. Involved as a primary consultant.

Environmental Impact Assessment for the proposed development of a Resort at Kuredhivaru 2014. Involved in, data analysis and compilation of the report on wave, tidal, meteorological, beach dynamics and satellite imagery data.

Environment Impact Assessment for the Expansion of Nursery Beds and Land Clearing for the Existing Mariculture Facility at Sh. Nalandhoo 2013. Involved in report completion.

Environmental Impact Assessment for the proposed development of a Resort at Gdh. Havodda 2013. Involved in, data analysis and compilation of the report on wave, tidal and beach dynamics.

Environmental Impact Assessment for the proposed development of a Slipway at Raa. Innamaadhoo, 2013. Involved in field data collection, analysis and compilation of the entire EIA report.

Environmental Impact Assessment for the proposed development of a resort at Gdh. Havodda, 2013. Involved in data analysis and compilation of the waves, current and geomorphological changes to the island.

Environmental Impact Assessment for the proposed development of a Slipway at Thaa. Dhiyamigili, 2012. Involved in field data collection, analysis and compilation of the entire EIA report.

Initial Environment Examination for development of an 11 storey building at H. Feyruvaadhee, 2011. Involved in field data collection, analysis and compilation of the entire EIA report.

Environmental Impact Assessment construction of 80 housing units at Baa. Goidhoo, 2011. Responsible for compilation of entire EIA.

Environmental Impact Assessment for the proposed development of a Slipway at Raa. Vandhoo, 2011. Involved in data analysis on physical environment and compilation of entire EIA.

Environmental Impact Assessment for the proposed development of a Resort at K. Kudavillingili, 2011. Involved in data analysis on physical environment and compilation of final report.

Environmental Impact Assessment for the proposed development of Hospitality Institute and City Hotel at L. Gan and resort development at L. Gasfinolhu and L. Bodufinolhu, 2011. Involved in data analysis on physical environment and compilation of final report.

Initial Environment Evaluation for registration of power generation facility of 9 storey building at IskandarKoshi, Male, 2011. Responsible for field data collection and compilation of entire IEE.

EIA on proposed Harbour reconstruction project at B. Goidhoo, 2010. Involved in data analysis on physical environment and compilation of final report.

EIA on proposed Harbour reconstruction project at K. Kaashidhoo, 2010. Involved in data analysis on physical environment and compilation of final report.

EIA Report for proposed harbour construction at H.A Thuraakunu, Thuraakunu Island Development Committee, 2008. Involved in field data collection, analysis and compilation of the final report.

EIA on proposed resort development at H. A Berimadhoo, 2008. Involved in field data collection, analysis and compilation of the final report.

REFREES

Amjad Abdulla
Director General, Climate Change Department
+960 300 4300, abdulla.amjad@gmail.com
Ministry of Environment and Energy

Dr. Peyman-zawar Reza
Department of Geography
University of Canterbury Atmospheric Research unit
peyman.zawar-reza@canterbury.ac.nz
University of Canterbury, New Zealand

I hereby declare that the information given here is true to the best of my knowledge.

Ali Shareef

Curriculum Vitae

- **Name:** Hamdhoon Mohamed
- **Date of Birth:** 26th August 1987
- **Contact:** Mobile: +960 7845332,
- **Email:** hamdhoon.mohamed@gmail.com

2. Key Qualifications

- **2014:** Master of Environment with specialization in Environmental Studies, Macquarie University, Australia
- **2010:** Bachelor of Science in Microbiology, Chemistry, Botany, Bangalore University, India
- **2006:** General Certificate of Education (Advanced Level), University of London, (Studied at Centre for Higher Secondary Education)
- **2003:** General Certificate of Education (Ordinary Level), Cambridge University, (Studied at Dharumavantha School).

3. Other Trainings

- Attended a training on Energy Efficiency: Practice and Management: Policies, Preferences and Practices organized by Singapore Cooperation Programme held from 18th to 22nd July in Singapore.
- Attended Regional Training Workshop for Asia and Eastern Europe on preparations of Biannual Update Reports (BURs) for Non-Annex One Parties organized by UNFCCC held from 4th to 6th April 2016 in Colombo, Sri Lanka.
- Attended the UNFCCC Regional Training Workshop on National Adaptation Plans (NAPs) for Asian Countries organized by UNFCCC held from 10th August to 14th August 2015 in Yangon, Myanmar.
- Completed a training on Nationally Appropriate Mitigation Actions (NAMAs) organized by UNEP Danish Technological University Partnership held from 19th to 24th April 2015 in Copenhagen, Denmark.
- Completed training on Climate Change Adaptation Strategies for Small Island Developing Island States organized by Environment Institute of Singapore from 24th to 28th November 2014 in Singapore.
- Completed a training on Nationally Appropriate Mitigation Actions (NAMAs) organized by GIZ Maldives held from 18th to 20th November 2014 in Male', Maldives.
- Completed training on Project Management Essentials conducted by University of Sydney from 20th to 21st February 2014 in Sydney, Australia.

- Completed training on Microsoft Project: Managing projects conducted by University of Sydney from 28th to 29th November 2013 in Sydney, Australia.
- Completed training on Project Management conducted by Civil Service Training Institute held from 12th to 16th February 2012 in Male', Maldives.

4. Fellowships

- Australian Leadership Award Scholarship, awarded by Australian Government to study Master of Environment at Macquarie University, 2013.
- Indian Council for Cultural Relations Scholarship, awarded by Indian Government to study Bachelor of Science at Bangalore University, 2007.

5. Professional Memberships

- Member of Technical Committee for Tourism Adaptation Project (TAP) implemented by Ministry of Tourism (2015 to 2016).
- Licensed Environmental Impact Assessment Temporary Consultant (2015 – 2016)
- Certified Environmental Impact Assessment (EIA) Reviewer for Environmnetal Protection Agency (July 2016 to Present)
- Certified Environmental Impact Assessment (EIA) Reviewer for Ministry of Tourism (
- Licensed Environmental Impact Assessment Permanent Consultant - License number EIA P03/2017 (2017 to Present)

6. Achievements and Awards

- Australian Leadership Program Award (given to top 5 awardees of Australian Development Scholarship in the Maldives), 2013.
- Achieved tenth best result in General Certificate of Education (Advanced level) Examination in the Maldives, 2006.

7. Professional Experience

From September 2014 to Present: **Assistant Director, Climate Change Department, Ministry of Environment and Energy.**

Responsibilities:

- Providing technical assistance for promotion of Market Mechanisms under United Nations Framework Convention on Climate Change (UNFCCC) in Maldives.
- Provide technical assistance for operator in Maldives regarding International programs dealing with Low Carbon Investment.
- Coordination with private and public sector regarding the Clean Development Mechanism (CDM) and Joint Credit Mechanism (JCM).
- Provide technical inputs regarding procedures in accordance to international regulations for CDM.
- Conduct and coordinate stakeholder consultation for evaluation of proposed carbon market projects in Maldives.
- Conduct and coordinate awareness programmes, stakeholder consultations and workshops regarding development of a carbon market in Maldives.
- Represent international meetings, conferences regarding market mechanisms especially CDM and JCM.
- Coordination of CDM's Designated National Authority (DNA) administrative work and meetings.
- Provide technical assistance in development of Green House Gas (GHG) inventory of Maldives.
- Participate in International Climate Negotiations.
- Coordinate climate change adaptation projects in the Maldives.
- Focal point from Ministry of Environment and Energy for Tourism Adaptation Project implemented by Ministry of Tourism.

From July 2017 to Present: Part-time Lecturer, Faculty of Science, Maldives National University.

Responsibilities:

- Prepare lecture material and tutorial material for the subject *Pollution prevention & control (ENV303)* unit under the Bachelor of Environmental Management course.
- Prepare, conduct and invigilate assessments for CHE107 subject.
- Coordinate the subject with the course coordinator and the students.
- Marking of the assessments including exams paper, presentations and written assignments.

From January 2016 to July 2016: Part-time Lecturer, Faculty of Engineering Technology, Maldives National University.

Responsibilities:

- Prepare lecture material and tutorial material for the subject *Material science and Chemistry (CHE107)* unit under the Bachelor of Civil Engineering course.
- Prepare, conduct and invigilate assessments for CHE107 subject.

- Coordinate the subject with the course coordinator and the students.
- Marking of the assessments including exams paper, presentations and written assignments.

From May 2010 to January 2013: **Environment Analyst, Water and Sanitation Department, Ministry of Environment and Energy.**

Responsibilities:

- Focal point for the Adaptation Fund Project "Increasing Climate Resilience through Integrated Water Resource Management".
- Coordinate with the contractor and project consultant for Design and Build of Sewerage Systems in ADH. Mahibadhoo and L. Fonadhoo.
- Representing Water and Sanitation Department in Provincial Workshops for Environmental Awareness.
- Organize and conduct awareness programmes on water safety and water conservation issues in the Maldives.
- Development of Terms of References for procurement of consultants for Water and Sanitation Department.
- Evaluation of tenders for design and build of sewerage systems in various islands of the Maldives.

From September 2006 to June 2007: **Data Processing Officer (Trainee), Economic Research and Statistical Services, Ministry of Fisheries and Agriculture.**

Responsibilities:

- Collection of Agricultural Data.
- Entry of Agricultural Data.
- Data Analysis of Agricultural Data.
- Writing reports based on Surveys.

8. Research, Consultancy Assignments and Project Management

1. Development of inventory for polychlorinated biphenyls (PCBs) of the Maldives.
    - **Overview:** This inventory is a part of National Implementation Plan (NIP) under the obligations of the Stockholm Convention on Persistent Organic Pollutants (POPS).
    - **Client:** Ministry of Environment and Energy
    - **Timeline:** October 2014 to January 2015.

2. Environmental Impact Assessment Study for Rehabilitation and Repair of GA. Kanduhulhudhoo Harbour.
    - **Overview:** Conduct field data collection and the analysis including describing the existing environment and proposing of mitigation options.
    - **Client:** Maldives Energy and Environmental Company (MEECO)
    - **Proponent:** Ministry of Housing and Infrastructure (MHI)
    - **Timeline:** March 2015 to May 2015.

3. Development of the content for promoting investment in climate change adaptation in the Maldivian Tourism Sector.
    - **Overview:** Conduct a literature review to determine the ways to encourage investment for climate change adaptation in the Maldivian Tourism Sector.
    - **Client:** United Nations Development Programme
    - **Timeline:** April 2015 to May 2015

4. Environmental Impact Assessment Study for development of a tourist resort in N.Huivani.
    - **Overview:** Conduct field data collection and the analysis including describing the existing environment and proposing of mitigation options.
    - **Client:** Maldives Energy and Environmental Company (MEECO)
    - **Proponent:** RHD Maldives Pvt Ltd
    - **Timeline:** June 2015 to December 2015

5. National Project Manager for the project "Preparation of Intended Nationally Determined Contribution (INDC) for 2015 climate agreement under the UNFCCC"
    - **Overview:** National Project Manager responsible for the preparation of the Maldivian INDC.
    - **Donor agency:** Global Environment Facility (GEF) via United Nations Environment Programme (UNEP).
    - **Timeline:** July 2015 to July 2016

6. Mitigation analysis for determination of the Intended Nationally Determined Contribution (INDC) to the 2015 Paris Agreement in collaboration with UNEP Danish Technical University partnership.
    - **Overview**: Modelling of fuel consumptions and emission of the greenhouse gases (GHG) inorder to determine the Business As Usual (BAU) scenario for the Maldives by 2030. Exploration of potential mitigation opportunities for the Maldives.
    - **Donor Agency:** Global Environment Facility (GEF) via United Nations Environment Programme (UNEP)
    - **Timeline:** July 2015 to September 2015
    - **Research focal point from UNEP Danish Technical University partnership:** Mr. Jorgen Fenhann, Senior Scientist, UNEP DTU.
7. Environmental Impact Assessment Study for proposed Integrated Water Resource Management (IWRM) project in R. Maduvvari
    - **Overview:** Conduct field data collection and the analysis including describing the existing environment and proposing of mitigation options.
    - **Client:** Development Advisory Services (DAS) Pvt. Ltd
    - **Proponent:** Ministry of Environment and Energy (MEE)
    - **Timeline:** March 2017 to Present
8. Environmental Impact Assessment Study for proposed jetty construction and access channel for V. Fulidhoo
    - **Overview:** Conduct field data collection and the analysis including describing the existing environment and proposing of mitigation options.
    - **Client:** Ministry of Housing and Infrastructure (MHI)
    - **Proponent:** Ministry of Housing and Infrastructure (MHI)
    - **Timeline:** June 2017 to Present

9. Environmental Impact Assessment Study for proposed 13-storey building at M. Dhimyaath.
    - **Overview:** Conduct field data collection and the analysis including describing the existing environment and proposing of mitigation options.
    - **Client:** Water Solutions
    - **Proponent:** Dr. Mohamed Muizzu
    - **Timeline:** August 2017 to Present

9. Environmental Impact Assessments (EIA)

- **EIAs contributed as a RESERACHER;**

1. Environmental Impact Assessment Study for Rehabilitation and Repair of GA. Kanduhulhudhoo Harbour.
2. Environmental Impact Assessment Study for development of a tourist resort in N.Huivani.
3. Environmental Impact Assessment Study for development of a sewerage facility in L. Gan.
4. Environmental Impact Assessment Study for the proposed construction of a sheltered berth for Hithadhoo regional port.
5. Environmental Impact Assessment Study for the proposed Jetty Construction Project in N. Fodhdhoo.
6. Environmental Impact Assessment Study for the proposed Integrated Water Reosurse Management (IWRM) project in R. Maduvvari.
7. Environmental Impact Assessment Study for the proposed jetty construction works in V. Fulidhoo.
8. Environmental Impact Assessment Study for the proposed 13 – storey building at M. Dhimyaath.

- **Reviewed EIAs as a certified EIA reviewer for Environmental Protection Agency (EPA)**

1. Environmental Impact Assessment for the Proposed Agriculture Development Project Aligau, Lhaviyani Atoll, Maldives
2. Environmental Impact Assessment for development of a aquatic animal quarantine facility at Ibrahim Nasir International Airport, Maldives.
3. First addendum to the environmental impact assessment of ocean side channel dredging project in Meedhoo island, Addu city, Maldives.
4. Environmental and Social Impact Assessment for the proposed construction of sewerage system in Maamigili, Alif Dhaalu Atoll, Maldives.
5. Environmental Impact Assessment for proposed water aerodrome and access channel development in the lagoon near St. Regis Maldives (Vommuli Resort), Maldives.
6. Environmental Impact Assessment Report for Coastal Protection at Gn. Fuvahmulah, Maldives.
7. Environmental Impact Assessment for Relocation of Power Houses at Th. Omadhoo, Sh. Lhaimagu, Dh. Hulhudheli, R. Rasmaadhoo, Ha. Maarandhoo, Ha. Uligamu and Sh. Bileffahi, Maldives.

8. Environmental Impact Assessment – Development of a Sewerage System at Veymandoo, Thaa Atoll, Maldives.
9. Environmental Impact Assessment (EIA) Report for the creation of an artificial reef by sinking a ship off the house reef in Hondaafushi island, Haa Dhaalu Atoll.
10. Environmental Impact Assessment for the proposed agricultural development in N. Minaavaru Island, Noonu Atoll.

10. Conferences and Workshops.

1. Attended the Informal consultation to prepare for a Ministerial Roundtable on building health system resilience to climate change from 14th to 15th July in Male', Maldives.
2. Attended the National Adaptation Plans (NAPs) Expo organized by UNFCCC from 11th to 15th July in Bonn, Germany.
3. Attended the Global Environmental Facility (GEF) Expanded Constituency Workshop organized by Global Environmental Facility (GEF) from 29th March to 1st April 2016 in Bangkok, Thailand.
4. Attended the Regional Workshop on making UNFCCC work for agriculture in Asia and Pacific Region organized by FAO from 19th to 20th November 2015 in Bangkok, Thailand.
5. Attended the workshop for countries of Asia and Pacific region on Advancing National Adaptation Planning in Asia-Pacific Aligning national, local, and sectoral initiatives for maximum impacts organized by Ministry of Environment, Japan from 29th to 30th October 2015 in Pattaya, Thailand.
6. Attended the meeting for Global INDC forum organized by European Union and UNDP held from 12th to 13th September 2015 in Rabat, Morocco.
7. Attended the workshop for UNEP funded countries on Intended Nationally Determined Contribution (INDC) organized by UNEP DTU Partnership held from 30th June to 2nd July in Copenhagen, Denmark.
8. Attended the UNFCCC workshop for the Asia-Pacific and Eastern Europe on Nationally Appropriate Mitigation Action (NAMAs) organized by UNFCCC held from 12th to 14th June 2015 in Bonn, Germany.
9. Attended the Global Workshop on Indented Nationally Determined Contribution (INDC) organized by United Nations Development Programme and GIZ held from 14th to 17th April 2015.
10. Completed a study tour on Joint Crediting Mechanism (JCM) project formulation organized by Pacific Consultants Pvt Ltd from 23rd to 26th February 2015 in Tokyo, Japan.
11. Attended the 16th Meeting of Global Clean Development Mechanism (CDM) Designated National Authorities (DNA) Forum organized by United Nations Framework Convention on Climate Change (UNFCCC) held from 13th to 14th November in Bonn, Germany.
12. Attended the Asian Regional Workshop on GHG and Non GHG indicators: Making climate change for sustainable development measurable organized by Climate Change Commission of Philippines held from 4th to 5th November 2014 in Manila, Philippines.

13. Completed Certificate Course on Genetic Engineering conducted by St. Joseph's College, Bangalore in 2008 held at Bangalore, India. This course is approved by University Grants Commission of India.
14. Attended 2nd National Conference on recent trends in plant science organized by St. Joseph's College Bangalore in 2008 at Bangalore, India.
15. Attended Seminar on Bio information organized by St. Joseph's College, Bangalore in 2008 at Bangalore, India.

11. Referees

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