ENVIRONMENTAL IMPACT ASSESSMENT

For the Development of a City Hotel at

Athireege Aage, Malé, Maldives

March 2008

Proposed by

Aage Hotels Pvt. Ltd.

Signature:

Prepared by

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Water Solutions Pvt. Ltd.

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Non Technical Summary

Aage Hotels is proposing to build a 14 storey hotel at H. Athireegeaage. This Environmental Impact Assessment (EIA) report has been prepared in order to meet the requirements of Clause 5 of the Environmental Protection and Preservation Act of the Maldives to assess the impacts of proposed city hotel at H. Athireegeaage, Male'. The report has looked at the justifications for undertaking the proposed project components. Alternatives to proposed components or activities in terms of location, design and environmental considerations were suggested. A mitigation plan and monitoring programme before, during and after the works has also been proposed.

The project component that has the greatest potential for environmental impact is the foundation component. The foundation type has been considered taking into consideration the noise and vibration impact from the deep pile foundation construction of project which is currently implement in the vicinity to the proposed site. The proposed project has proposed raft foundation where silent piling technology has been chosen as a mechanism for shoring for the foundation construction process.

A geotechnical investigation of the proposed project site was undertaken by the Engineering & Laboratory Services of Sri Lanka in August 2006. The geotechnical investigation included the borehole investigation and a Mackintosh Probe testing. The geotechnical investigation revealed that the estimated settlement under the foundation would be 50mm which is acceptable for the type of foundation chosen for the building. Since the settlement under the foundation is small and a set back of 1 m has been provided between the plot boundary and the foundation, the ground settlement beyond the limits of the boundary would be too small to induce any significant damage to the neighbouring structures. A survey of the existing structural damage was carried out for all buildings that were located within a radius of 20m from the proposed building.

The proposed project is expected to increase the tourist beds available in Malé and add value to the tourism product in line with the National Tourism Policy. It is inevitable that there would be some negative environmental impacts, especially when excavation is undertaken. Nevertheless, these negative impacts are not so severe to the extent that the project should not be allowed to take place. As a result, a comprehensive monitoring component has been suggested which takes in to consideration the most important elements that require regular checks. This monitoring component will be adhered and will allow the assessment of long term changes, despite the limited nature of the impact. The most important consideration is the socioeconomic impacts that have been assessed

mainly as positive in nature. Not only are they positive, but most importantly would they remain positive for a long term.

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

1 Introduction

1.1 Introduction

This Environmental Impact Assessment (EIA) report has been prepared in order to meet the requirements of Clause 5 of the Environmental Protection and Preservation Act of the Maldives to assess the impacts of proposed city hotel at H. Athireegeaage, Male'. This report will identify the potential impacts (both positive and negative) of proposed project. The report will look at the justifications for undertaking the proposed project components. Alternatives to proposed components or activities in terms of location, design and environmental considerations would be suggested. A mitigation plan and monitoring programme before, during and after the works would also be included. Monitoring would ensure that the proposed activities are undertaken with caution and appropriative care so as to protect the built environment of areas in proximity to the site.

The impact assessments provided in this report are based on some of the information given in the Geotechnical Investigation Protection of Basement and Foundation of 14 Storey Hotel Building at Athireege Aage undertaken by Engineering & Laboratory Services Pvt Ltd and Building Structural Condition Assessment Report for Adjacent Buildings to Aage Hotel Development prepared by ArchEng Studio. Also, findings of additional site investigations undertaken in November 2007 will be provided in this report and impact assessment would be based on field data and past studies. Some of the impacts have also been assessed based on professional experience and judgement of the EIA consultants. Experience from similar developments in the area such as Velaanaage office building and Holiday Inn hotel development currently underway have also been considered as relevant to the proposed project.

Aims and Objectives of the EIA

This report addresses the environmental concerns of the proposed project for the development of a 14 storey hotel at Aathireege Aage. It helps to achieve the following objectives.

- Allow better project planning
- Assist in mitigating impacts caused due to the implementation of the project without compromising environmental damage.
- Promote informed and environmentally sound decision making
- Demonstrate the commitment by the proponent on the importance of environmental protection and preservation.

Methodologies

Internationally recognized and accepted methods have been used in this environmental evaluation and assessment.

This EIA is based mainly on data collected during a fact finding/field investigation mission in November 2007 by a team consisting of an environmental engineer, socio economist and a GIS consultant. The data collection methods are described in detail in Section 5.

The information and data were collected on areas that were requested by Ministry of Environment, Energy and Water on November 2007 and Terms of Reference approved on 5 November 2007. The data collection methods are described in detail under "Methodology".

Conditions of the existing environment were analysed by using appropriate scientific methods. In addition, data from similar EIA reports and studies were used to aid in assessing the environmental impacts of the proposed activities. Additionally, impact predictions have been based on experience gained by the consultants from similar projects.

EIA Implementation

This EIA has been prepared by Water Solutions represented by the following registered EIA consultants working with the firm with additional assistance from a socio-economist.

- Ahmed Zahid (Registration number: EIA 08 / 07,
- Ahmed Jameel (Registration number: EIA 07 / 07),
- Abdul Aleem (Registration number: EIA 09 / 07)
- Hassan Shah (Registration number: EIAT02 / 07)
- Aminath Latheefa – Socio Economist (see Annex for the CV)

1.2 EIA Scope

The scope of this assessment has been based on the terms of the reference that was provided by the Environment Research Centre. The TOR has been included in the appendix of this report.

2 Project Description

2.1 The Proponent

This project is proposed by Aage Hotels which is owned by Mr. Ismail Hilmy.

2.2 Project Location

The project site is located at Atheerige Aage as shown in Figure 2-1. The proposed project site has an area of 517.85 square meters.

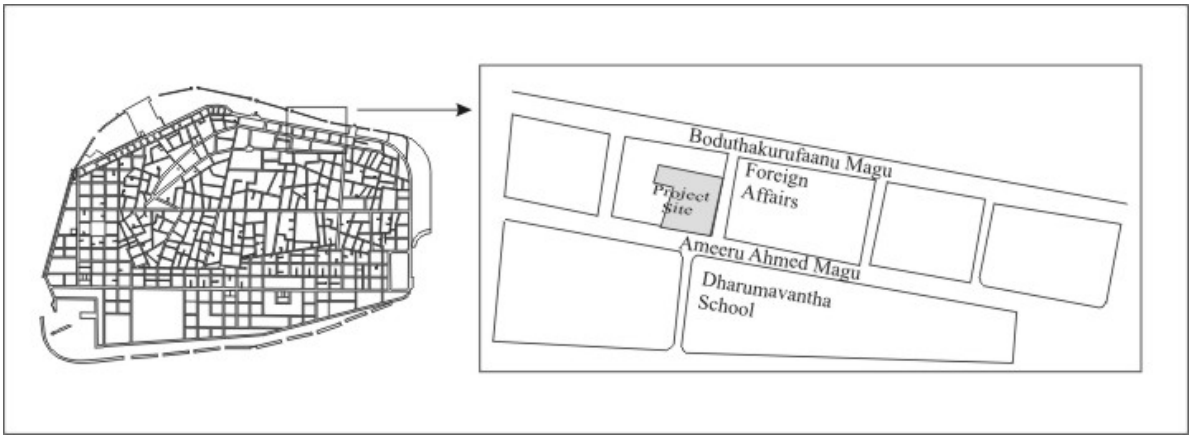


Figure 2-1: Project Locations

2.3 Legal status of the land

The project site is owned by Mr. Ismail Hilmy and land is leased to Aage Hotels to develop a city hotel.

2.4 The Project

The proposed project involves building a 15-storey building which will be used as a city hotel. The building would occupy a 5000 square feet of land. The following tables provides a summary of the project.

Parameters	details
Number of floors	14
Type of foundation	Mat footing for the entire extent of the building
Total foot print area	5000 sqft

1.1.1 Site Preparation

The proposed building has a raft foundation. To lay the raft foundation, site has to be excavated to a depth of three meters. This is made by piling around the site. Piling will be undertaken using silent piling technology.

The silent piling principle has advantages, considering the two factors, environmental impact and structural quality, and what is more, the silent piling method which embodies the press-in principle has many practical strong points developed from the advantages of the principle. The most appropriate method is to be selected out of construction method variations according to the requirements and conditions of projects and each method has its own particular features. The advantages of the silent piling techniques are stated below following the Five Construction Principles.

The Principles	Features	Description
Environmental Protection	**Silent & Vibration-free Piling**	Due to hydraulic pile jacking the silent piling Method is ultra low in noise output and vibration-free.
	Minimum Work Space	The compact and lightweight Silent Piler limits work space to just the area ultimately required and it minimizes the effects on the environment.
	Free of Environmental Disruption	Physical disruption such as ground settlement, soil disturbance and damaging neighboring structures is avoided protecting both public and private assets.
	Nuisance-free	The silent piling Method allows locals to carry out their daily lives without being subjected to noise and vibration.
Safety	**High Quality Structural Materials**	Use of prefabricated piles applying industrial standards guarantees construction of strong, stable and long lasting structural walls.
	Machine Stability	The Silent Piler is absolutely stable because it grips fully installed anchor piles, normally close to ground level without danger of the machine overturning.
	Pile Stability	The pile being pressed-in is fully encompassed and hydraulically grasped by the Chuck of the Silent Piler just above the specified height of the pile top.
Speed	**Simple Procedure**	The Silent Piler does not need piling templates, work platforms or temporary works and it carries out the press-in operation accompanied by just one pile pitching crane.
	Self-moving	Prior to completion of every pile, the Silent Piler raises its main body and travels forward to the next position without crane support.
	No Time Restriction	There is no need to restrict working times with the silent and vibration-free Press-in Method even in environmentally sensitive night works.
	Multiple Units Mobilization	Simultaneous use of multiple Silent Piler enables urgent completion of emergency restoration works caused by natural disasters.
Economy	**Prefabricated Structural Materials**	The appropriate use of prefabricated piles attains overall cost savings through a shortening of the work duration and a reduction of labour.
	Free of temporary works	The whole press-in procedure is carried out from the top of the fully installed piles and the need for expensive and troublesome temporary works is eliminated.
	Labor-saving Operation	The simple press-in procedure requires the minimum number of personnel and a relatively lightweight pile pitching crane owing to the Self-moving.
	Disturbance-free	During construction work the Press-in Method maintains the functional needs of the city such as existing traffic, infrastructures and daily business activities.

Aesthetics	**Work Site Cleanliness**	The simple and systematic operation of the Press-in Method makes the site much cleaner, more efficient and more professional than conventional methods.
	Accurate Pile Control	Piles are accurately controlled as to height and direction enabling curves, corners, cofferdams and other complicated configurations to be constructed with ease.
	High Quality Finishes	The hydraulically silent piling piles achieve a high quality permanent structural wall and the finished project is aesthetically acceptable.
	Aesthetically Decorated Materials	Newly designed structural materials applied with an anti-corrosive coating laminated with photographic film provide further aesthetic finishes.

Table 2-1: The Advantages of the Silent Piling technology

1.1.1.1 Principles of Silent Piling

The ultimate environmentally friendly principle of piling is to utilize the Earth itself as the base of reaction force to hydraulically jack a pile silently and without vibration into the ground. The available force for silent piling is determined by the amount of reaction force. Therefore the Silent Piler relies on the greatest reaction force provided by the Earth to achieve the highest performance. The mechanism of the silent piling principle and the reason why it is superior to all other piling methods are reviewed from five different aspects.

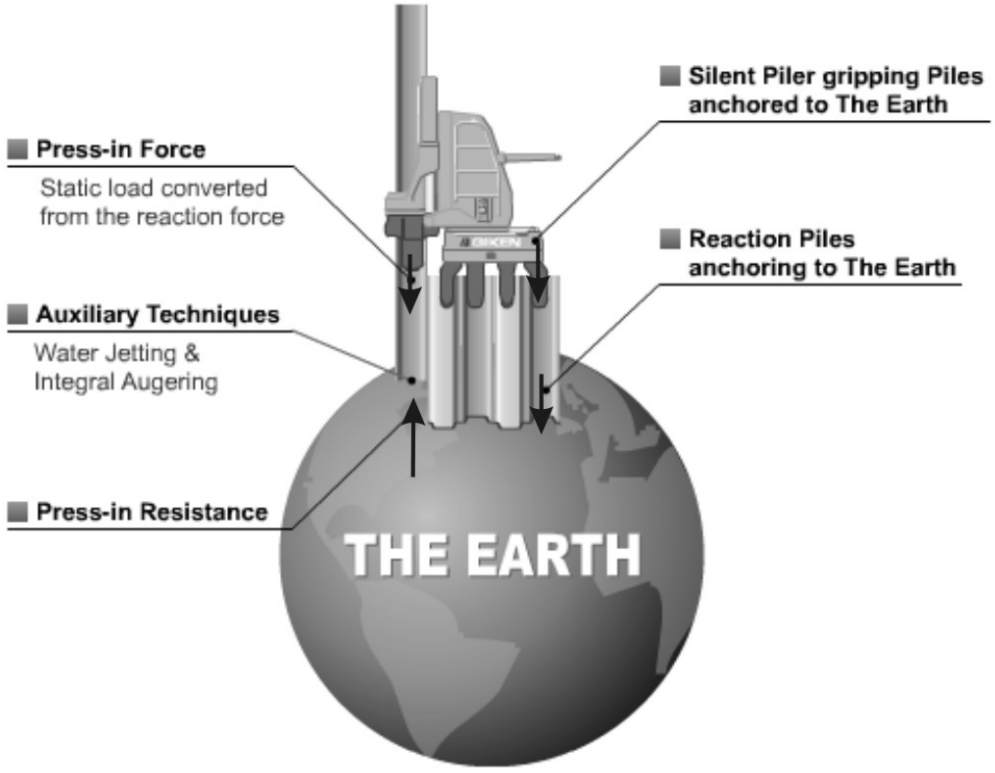


Figure 2-2: Principles of Silent Piling

The silent piling principle is to utilize reaction force derived from fully installed piles, which are anchored into the ground and regarded as a united part of the Earth, and hydraulically press- in subsequent piles. The Silent Piler works on top of the reaction piles and self-moves to the next position gripping the pile being pressed-in. Technical details of the silent piling mechanism are illustrated in Figure 2-3 .

In practical terms, the Silent Piler grips previously installed piles with hydraulic jaws. The next pile is hydraulically gripped by the Chuck at proper pressing-in point and jacked into the ground with a static load generated by the main hydraulic rams.

While a pile is being pressed-in, press-in resistance comprising skin friction, toe resistance and interlock resistance occurs. However, the Silent Piler derives reaction force, which is greater than the up-lift force, from skin friction and interlock resistance of the reaction piles and its press-in force surpasses the press-in resistance. Installing the pile to the designed depth by accurate hydraulic control, the Piler repeats the same press-in procedure until the last pile of a project is put into the ground.

Since the piles are pressed-in, the Silent Piler does not cause any damage to the environment including neighbouring structures and local residents through noise and vibration. The Press-in Method allows pile installation in areas where environmental disruption is strictly precluded.

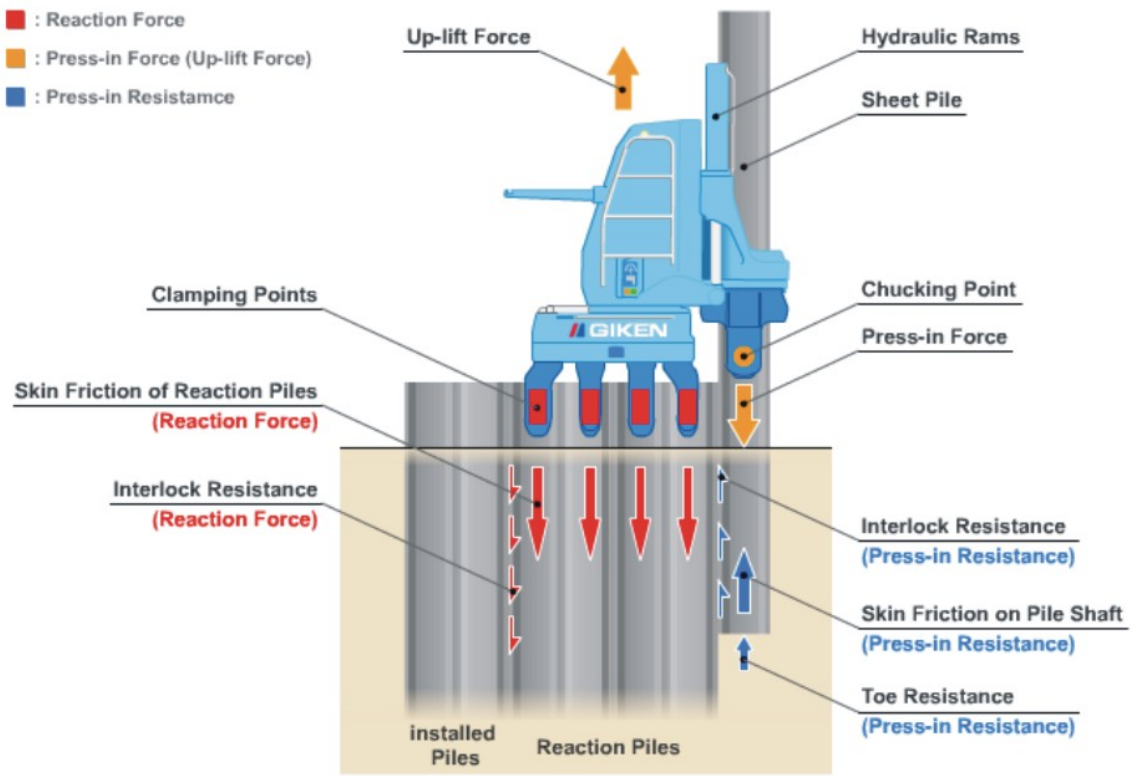


Figure 2-3: Silent Piling Mechanism

1.1.2 Building Foundation

The foundation of the proposed building would have a raft foundation. Raft foundations are used to spread the load from a structure over a large area, normally the entire area of the structure. They are used when column loads or other structural loads are close together and individual pad foundations would interact.

A raft foundation normally consists of a concrete slab which extends over the entire loaded area. It may be stiffened by ribs or beams incorporated into the foundation. Raft foundations have the advantage of reducing differential settlements as the concrete slab resists differential movements between loading positions. They are often needed on soft or loose soils with low bearing capacity as they can spread the loads over a larger area.

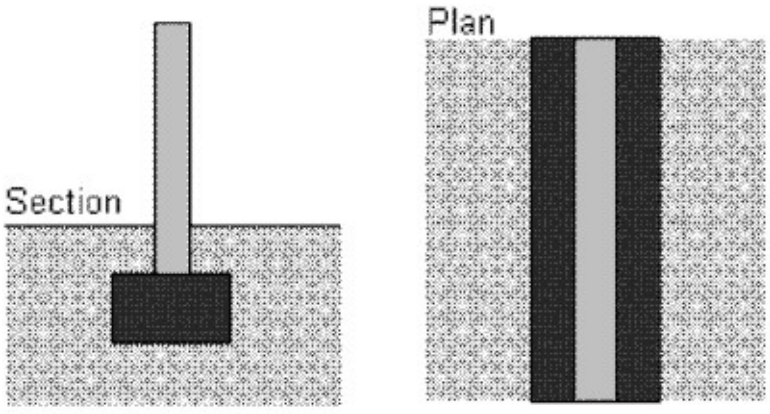


Figure 2-4: Raft Foundation

1.1.3 Structure of the Building

The foundation plan for the proposed building has been appended with this report

1.1.4 Environmental Infrastructure of the Building

1.1.4.1 Energy Consumption

It is anticipated that the project site will require 30 kW of power during the construction phase and 420 kW of power during the operation phase of the operation at its maximum occupancy. STELCO has indicated that they would be able to supply required electricity to the project site during construction and operation of the hotel. Please refer to Appendix for letter from STELCO.

1.1.4.2 Water and Wastewater

It is estimated that the project site will require 25 m3 of desalinated water during the construction stage of the development and 156 m3 of desalinated water during the operation phase of the development at its maximum capacity on a daily basis.

During the construction, the amount of wastewater generated would be relatively low compared to its generation during the operation phase of the development. Malé Water and Sewerage Company (MWSC) has indicated that they would be able to supply and collect the water and wastewater that is generated at the project site during construction and operation of the hotel respectively. Please refer to Appendix for letter from MWSC.

1.1.4.3 Waste Management

It is estimated that during the construction phase, the project will generate around 4.47 tonns/1000 sq feet during the construction phase and 2.6 kg/guest/day during the operation of the project which will be transported to the waste collection centre at Male' and finally disposed at Thilafushi. Waste Management Section of Malé Municipality has indicated that they would be able to manage the waste that is generated at the project site during construction and operation of the hotel. Please refer to Appendix for letter from Waste Management Section.

1.1.5 Material specification and load estimations

The building structure will be a reinforced concrete frame building with masonry infill. Light-weight aerated concrete blocks would be used for all walls with cement rendering on both sides.

The foundation is designed for a safe bearing capacity of 150 kN/m2. The estimated settlement is 50mm. Characteristic compressive strength of concrete used in design is 30MPa. Steel strength used in the design is 400MPa.

2.5 Project Implementation

The project is expected to be implemented 2008. The project will be undertaken according to the schedule given in Table 2-2.

Table 2-2: Schedule of implementation of proposed activities`

2.6 Project Justification

1.1.6 Why this EIA?

This EIA fulfils the requirements of the Malé Municipality that was mandated as part of issuing of a permit for the development of a 15 storey building in Malé. This is the second time that the Government has imposed to develop an EIA for the development of a building in Malé.

1.1.7 Why City Hotel in Malé?

The Maldives is known as the Paradise for the holiday makers. A large number of tourists visit the Maldives each year. Most of these tourists sometimes have to transit through Malé either to spend few hours before catching their flight or to spend the night before flying to their resorts. Others visit the island of Malé specifically for conferences, business and banquettes.

It is estimated that every day more than 10,000 people visit to Male' for various reasons. Presently Male' has 12 hotels and 24 guests houses which have a total of 703 hotel beds and 400 guest house beds respectively (MOTC 2007). It has been reported in the media when big events such as Hotel Asia Expo or other such events, it is hard to get rooms in Malé indicating there is a strong demand for city hotel kind of development in Malé. This is not only to increase the number of beds in Malé but also provide the appropriate facilities for conferences and banquette.

The Third Tourism Master Plan which is presently being implemented by the Government identifies that the Maldives will need to capture a higher share of the Meetings Incentives Conventions and Exhibitions (MICE) market, especially from source markets closer to the destination such as Asia (Singapore, China, Hong Kong, and Japan) and the Gulf and the Middle East (Dubai and Doha). The proposed project is in line with the tourism development goals of the Maldives to develop conference facilities designed to attract meetings and conferences market segments. The Third Tourism Master Plan calls for the development of the community based tourism in the Maldives. Hence the development of a city hotel which adequate conference and banquette facilities is a step taken in the direction as outlined in the Third Tourism Master Plan. Hence, the development is in line with the national vision of the expansion and development of the tourism in the Maldives.

The development of a city hotel in Malé would also create employment opportunities for the residents of Malé, especially women, who have several restrictions on working in resorts. Therefore, women's role in the tourism sector would be strengthened. It is expected that 30 jobs would be created from the development of proposed Aage Hotel.

1.1.8 Why Raft Foundation

Raft Foundation has been an adopted method of construction for high rise buildings in the Maldives. Deep Pile Foundation type of construction was tried for the Proposed Holiday Inn at Athireege Aage. The hotel is the first building on Malé's coral island to be built using the "deep piling" method in which metal load-bearing piles are driven to depths of 30 to 40 metres. The deep piling, which began

in October 2007 using 'hammer' was stopped by the Government in December 2007 when neighbours complained of tremors and cracks in their walls. The unpopularity of this technology for the neighbours and its potential to cause damage to the natural and built environment questions whether deep pile foundation would be a socially acceptable type of construction technology that could be used for the high-rise buildings in Male' or elsewhere in the Maldives.

Raft Foundation technology has been adopted for the proposed building, not only, based on the experience gained in the construction of the 15 storey building at Athireege Aage, but successful projects that have been undertaken in Male' including the construction of 14 storey building at Velaanage and many buildings that have been constructed to a height of 100 ft from ground.

1.1.9 Why Silent Driven Piling for site preparation

The proposed building would have raft foundation with a mat footing for the entire extent of the building. To lay the mat footing, the site needs to be excavated to depth of 3 meters from the ground level. For this to happen sheet piling will be used for shoring. Silent pile driving will be used to minimize the impact on the adjacent buildings.

3 Alternatives

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

3.1 No Development option

The developer may chose not to carry out the proposed development at the proposed project site. This option would not increase the economic value of the land and do not create employment opportunities in the short and medium terms. This option may, however, help to minimize the population burden on Malé, although it is not necessarily due to high rise buildings or city hotels. Since there are more disadvantages that can be listed than advantages of the no development option, the following table presents the disadvantages of this option.

Indicator	Disadvantages
Employment	• Will not create employment for skilled and non skilled professions during construction • Will not create employment for skilled and non skilled professions during the operation
Real estate value	• The value of the land will remain low as it is.
Utilities	• Large demand for electricity and water will help attain economies of scale and would help to drive the cost of the unit production down. Lowering the cost of generation will help to reduce the cost of the services to the public
Traffic	• The parking situation on the streets around the proposed project site would deteriorate and would find difficult to use the Naadhee Goalhi due to the growing traffic problem.
Noise	• The noise level around the project site would increase due to the traffic problems due to the steady growth of the traffic flow around the site.

Table 3-1: Identified disadvantages for not proceeding with the project

3.2 Alternative Construction Technologies

1.1.10 Site Preparation

The project requires that foundation to be laid at a depth of 3 m below the ground level. Hence this requires excavation of the site as site preparation work. Excavation to such a depth requires building

of retention wall or shallow pile the area to hold the trench. An alternative to piling is to build a retention wall all around the site.

According to Engineers, retention walls are built in excavated buildings which are less than 30 m tall. Retention wall does not give enough strength to hold the soil when the building is greater than 30 m which requires the foundation to be laid at a deeper depth.

Hence shallow depth piling using silent pressing technology is a more appropriate method for site preparation for proposed building foundation.

1.1.11 Foundation

1.1.11.1 Deep Pile Foundation

Deep foundations are those founding deeply below the ground surface for their base bearing capacity to be affected by surface conditions, this is usually at depths >3 m below ground level. Deep pile foundation consist of may types including piles, piers and caissons or compensated foundations using deep basements and also deep pad or strip foundations. Deep foundations can be used to transfer the loading to a deeper, more competent strata at depth if unsuitable soils are present near the surface.

The present building which is been constructed on Ameeneege premises on Ameeru Ahmed Magu for Holiday Inn utilises the deep pile foundation where the piles terminate in hard, relatively impenetrable material such as rock or very dense sand and gravel at a depth of 30 – 35 meters below the ground level. They derive most of their carrying capacity from the resistance of the stratum at the toe of the pile.

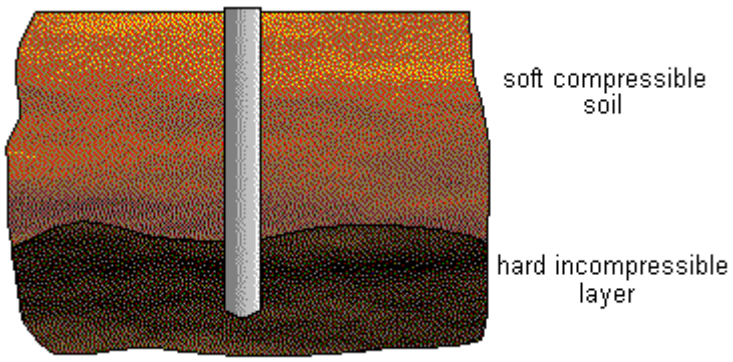


Figure 3-1: End bearing piles

The disadvantage of this type of foundation is that piles need to be driven deep into the ground. Piling to this kind of depth creates excessive noise and vibration which have a huge impact on the

neighbouring buildings and local communities, especially due to high population density, noise sensitive nature of places in the vicinity such as schools, residential areas, People's Majlis and government and privates offices, and quite importantly the poor construction practices underway in Malé. Hence, taking these into consideration, deep piling does not seem to be a promising option for laying foundations for high rise buildings in Malé.

1.1.11.2 Friction Pile

For places where there is soft soil, friction pile are some times used as a type of foundation. This type of foundation was used for the construction of the famous building, Burj Al Arab in Dubai. Friction piles obtain a greater part of their carrying capacity by skin friction. This tends to occur when piles do not reach an impenetrable stratum but are driven for some distance into a penetrable soil. Their carrying capacity is derived partly from end bearing and partly from skin friction between the embedded surface of the soil and the surrounding soil.

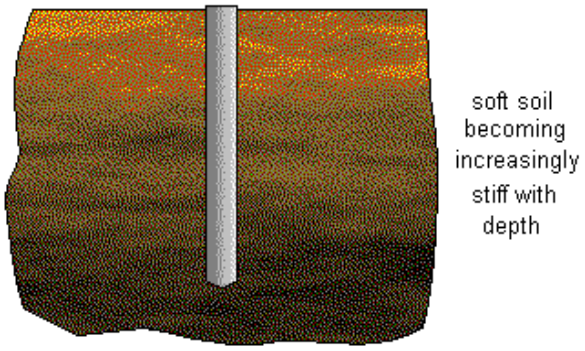


Figure 3-2: End bearing piles

The disadvantage of this kind of foundation is that piles need to be driven very deep into the ground to a depth of around 20 - 25 meters. Piling this depth would generate excessive noise and vibration that can exceed 94 – 122 dB (A) and 0.15 mm/s at frequencies of 80 Hz.

Most of the energy from a pile-driver goes into temporary compression of the pile and penetration of piles through the ground. As the pile penetrates into the ground, the driving hammer generates a body wave with the pile, which travels along the shaft to the interface between the pile base and the soil. A part of the wave energy is reflected within the pile, but most is transmitted to the soil.

The human body is very sensitive to vibration. The threshold of perception is about 0.15 mm/s at frequencies between 8 and 80 Hz. When vibration exceeds the threshold, complaints may arise. High level of vibration is unpleasant and even painful, and it can have physical effects on heath. Such levels of motion are very unlikely to be induced outside the confines of a construction site

4 Policy, Legal and Administrative Framework

This section looks at government policies, plans and legislation that are of relevance to the proposed project.

The enforcement of EIA regulation in the country began with the formulation of the Environmental Protection and Preservation Act (Law 4/93) in April 1993 in order to protect, preserve and safeguard the fragile environment of the country. The Environmental Act gives very high prominence towards safeguarding the environment with regard to all the development activities.

According to article 5 (a) of the Act, an Environmental Impact Assessment shall be submitted to the Ministry of Environment, Energy and Water according to guidelines formulated by the Ministry before implementing any activity that may have an adverse impact on the environment. The Ministry shall determine projects that need such assessment. This umbrella law gives the Ministry the right to terminate projects that have undesirable impacts or claim compensation for damages caused by activities that are detrimental to the environment.

The following sections provide a brief overview of the Environmental Protection and Preservation Act and the EIA Regulation, which are of specific relevance to this EIA report. Other relevant policies, plans and guidelines are also covered in this section.

4.1 Environmental Protection and Preservation Act

The main legal document that makes this EIA a legally binding document is the umbrella law on environmental protection, Law No. 4/93, enacted by the People's Majlis in 1993. The Articles of the Environmental Protection and Preservation Act addresses the following aspects of environmental management:

- Guidelines and advice on environmental protection shall be provided by the concerned government authorities.
- Formulating policies, rules and regulations for protection and conservation of the environment in areas that do not already have a designated government authority already carrying out such functions shall be carried out by MEEW.
- Identifying and registering protected areas and natural reserves and drawing up of rules and regulations for their protection and preservation.

- An EIA shall be submitted to MEEW before implementing any developing project that may have a potential impact on the environment.
- Project that has any undesirable impact on the environment can be terminated without compensation.
- Disposal of waste, oil, poisonous substances and other harmful substances within the territory of the Maldives is prohibited. Waste shall be disposed only in the areas designated for the purpose by the government.
- Hazardous / Toxic or Nuclear Wastes shall not be disposed anywhere within the territory of the country. Permission should be obtained for any transboundary movement of such wastes through the territory of Maldives.
- The Penalty for Breaking the Law and Damaging the Environment are specified.
- The government of the Maldives reserves the right to claim compensation for all damages that are caused by activities that are detrimental to the environment.

4.2 Environmental Impact Assessment Regulation

The Ministry of Environment, Energy and Water has issued the Environmental Impact Assessment Regulation (EIA Regulation) on 1 May 2007, which came into force on 15 May 2007. According to the EIA Regulation, only registered consultants can submit EIAs and they will be held responsible for the accuracy of the data provided in the EIA report. The regulation provides details of the EIA process, screening and application forms and criteria for submission, review and approval/rejection. Although the Regulation is not without drawbacks, it is an important first step towards improving the quality of the EIA process and responsible dissemination of accurate information and expert opinion with regard to environmental protection.

This EIA is also subject to the requirements of the Environmental Impact Assessment Regulation. Since the Regulation came into force, the Proponent is required to give a stronger commitment to undertake impact mitigation measures and longterm monitoring than ever before. However, the implementation of the regulation would be a tough task for the authorities.

4.3 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, conveyancing, 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, sliver, 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 Male' Municipality, and in accordance with the regulations made under this Act.

Since, excavation is part of the proposed project, all items found during excavation would be handed over to the government and soil excavated would not be sold.

4.4 Regulation on the Construction of Buildings in Malé

Ministry of Housing and Urban Development implements a regulation on the construction of buildings in Malé. The regulation states that any building could be developed with a building permit. The building permit must be displayed at all times in the construction site. The proposed project has been approved for the development of 15 stories based on this regulation.

4.5 Tourism Act

The Maldives Tourism Act provides for the determination of zones for development as tourist hotels and tourist guesthouses, the management of all such facilities and the regulation of persons providing such services. The act stipulates that a hotel can be used as a tourist facility after the facility is registered at the Ministry of Tourism and Civil Aviation and the Ministry of Tourism and Civil Aviation issues a license to operate the facility. The Ministry of Tourism and Civil Aviation will provide such a license when the facility is in accordance with guidelines of the Ministry of Tourism and when the establishment is situated on an island determined for the development of tourism. The proposed hotel is developed in conformity of the Tourism Act and Regulations.

4.6 Environmental Permits required for the Project

1.1.12 EIA Decision Statement

An important environmental permit to initiate the proposed project would be a decision regarding this EIA from the Ministry of Environment, Energy and Water. The EIA Decision Statement, as it is referred to, shall govern the manner in which the project activities must be undertaken. This EIA report assists decision makers in understanding the existing environment and potential impacts of the project.

4.7 Roles and Responsibilities of Groups involved

There are various organizations and parties involved in the EIA process. There are national agencies responsible for environmental protection as well as the key stakeholders and the project proponent, each with a role and responsibility within the EIA process. One key principle in EIA implementation is to involve these groups and provide them the opportunity to participate in the EIA process so that their concerns are addressed. Table 4-1 provides a summary of the roles and responsibilities of each group in the different stages of the EIA process.

Table 4-1: Roles and responsibilities by EIA process stage

Stage	Environment	Proponent	EIA Consultants	Other Govt Agencies	Public and Interest Groups
Screening	Screen Project	Provide necessary information	Provide technical advice	Raise issues and concerns	
Scoping	Approve TOR	Provide TOR	Prepare TOR	Provide comments/ feedback	Participate in consultation
EIA study	Provide scope/ Approve TOR	Provide EIA	Prepare EIA		Participate Comment
Review	Review EIA		Revise EIA	Assist in review Comment	
Approval	Approve EIA Attach terms		Provide technical advice	Approve relevant components	
Environmental Management		Implement mitigation measures and monitoring programme	Conduct monitoring	Implement Monitoring	
Post Audit and Evaluation	Evaluate project	Provide necessary information			

This section further discusses the roles and responsibilities of groups involved in the implementation of EIA for the proposed project.

1.1.13 Ministry of Environment, Energy and Water

The Ministry of Environment, Energy and Water plays the main role within the Government for implementing EIA and other environmental matters. It has central control over environmental protection and related issues.

The Environment Research Centre of the Ministry has responsibility for efficient operation of the EIA process. This encompasses a number of tasks, including screening of projects and provision of general procedural advice to the project proponents throughout the EIA process. The ERC manages the review of the EIA report and is responsible for any approvals or recommendations associated with the EIA. It is also responsible for verifying that environmental protection measures are properly

implemented by undertaking environmental audits in collaboration with other government as well as non-government agencies with a role for environmental protection and preservation.

It is important that ERC undertakes adequate monitoring of the project during the construction phase, especially during the foundation works to ensure that public complaints can be verified in advance and minimize unnecessary public attention and project delays as was the case for Holiday Inn development in front of proposed Aage hotel premises.

1.1.14 Ministry of Housing and Urban Development

The Ministry of Housing and Urban Development has two main overall responsibilities. That is to oversee and regulate the physical development for the whole country and to facilitate housing delivery through development projects. The Ministry is also mandated to establish and execute land development regulations for all parts of the country.

1.1.15 Malé Municipality

The Male' Municipality is the municipal authority of Male' which is an office administered under the Ministry of Home Affairs. Male' Municipality is mandated for the management of land in the Malé. Male' Municipality regulates the building permits, land plot boundary delineation and land registration. Male Municipality has a more of an implementation and enforcement role of the urban development plans in Male`. Malé Municipality will closely monitor public safety and physical development related aspects of the implementation of the proposed project.

1.1.16 Ministry of Tourism and Civil Aviation

Ministry of Tourism and Civil Aviation is the main agency responsible for tourism in the Maldives. Hence they are responsible for regulating the development of the proposed city hotel.

1.1.17 Ministry of Transport and Communication

Ministry of Transport and Communication is the main government agency responsible for the management of the traffic in Malé. They have a regulatory role in the allocation of parking zones on the streets of Malé.

1.1.18 Ministry of Construction and Public Infrastructure

Ministry of Construction and Public Infrastructure is responsible for the development of standards and guidelines for the structural safety of buildings in the Maldives. Hence their role involves to assess whether the proposed building is constructed as proposed and the building process does not compromise the structural integrity of the surrounding buildings.

1.1.19 Ministry of Health

The Food and Drug Authority of the Ministry of Health would be responsible for the hygiene of the premises that would serve food to public/guest. Hence their role would be in the operational stage of the proposed hotel.

1.1.20 Maldives Water and Sanitation Authority

The regulation on the construction of buildings in Malé states that the Maldives Water and Sanitation Authority shall be consulted in the dewatering process for site preparation for foundation. MWSA, however, does not have a regulation on dewatering. Current practice is governed by a public announcement which requires an application for dewatering to be submitted to MWSA. MWSA will then determine how the dewatering shall be undertaken after assessing the water quality of the site, especially salinity (electrical conductivity).

1.1.21 Henveiru Ward Office

Henveiru Ward Office would be involved in obtaining permits to close the streets on temporary basis for construction work. This includes excavation for foundation and concrete laying of the slabs of the building as well as any blocking of the road for construction purposes.

1.1.22 Project Proponent

The project proponent, Aage Hotels, is the party responsibility for the effective implementation of the project. The proponent of this project is a private sector developer who is responsible for providing the scientific and technical information necessary at all stages of the EIA process. The Proponent contracted outside experts skilled in EIA to assist them in this task. The proponent provided the EIA consultants access to information about the project activities and the environmental setting of those activities. The proponent assisted the consultants to discuss the project activities with the project

planners, architects and engineers. As the EIA forms an integral part of the project, some of the data needs of the EIA team would be provided by other members of the project team.

Upon review of the EIA, the proponent may be required to answer questions about the project, its potential impacts, and the proposed environmental protection measures. The proponent may answer these personally or by engaging the services of the EIA consultants. The proponent is responsible for the implementation of mitigation measures and shall implement the proposed monitoring measures if it was required to conduct environmental monitoring.

1.1.23 Environmental Consultants

The Environmental Consultants for the proposed project is Water Solutions Pvt. Ltd. Water Solutions will undertake the EIA on behalf of the Proponent and also liaise with government agencies as well as with persons undertaking other components of the project feasibility and concepts. The EIA consultants would also provide necessary technical advice and guidance in the design of the project and undertake supervision and environmental monitoring during the implementation of the project activities.

1.1.24 The Public

Public consultation is an important element of Environmental Impact Assessment. Public consultations were undertaken during project preparation as the project components directly influence public interests and involvement. The extent and level of the involvement of public in the consultation process were limited to the level as outlined in the Terms of Reference for this assessment. The public will also have a role during the review stage, where public comments to the report is welcomed by the Ministry of Environment, Energy and Water.

5 Methodologies

The section covers methodologies used to collect data on the existing environment. The key environmental and socio-economic components of the project that were considered are physical environment, social and economic environment.

Hence, data collection was undertaken for the above components. In order to study the existing environment of the island, the following data collection methodologies were used during the site visit undertaken in November 2007.

1.2 General Methodologies of data collection

Conditions of the existing environment were studied by using appropriate scientific methods. The environmental components of the study area were divided into physical and human environment. Although terrestrial component was not considered as important for this project, baseline environmental conditions were appraised. The physical environment covered the buildings in vicinity to the project site. The human environment covered the traffic, noise, water and other parameters that have a direct impact on the human.

The different methods used in assessing and reporting the conditions of the existing environment of the island are outlined in the following subsections.

1.2.1 Mapping and Location identification

Mapping was undertaken using hand held differential GPS. The location of data collection sites were marked using handheld GPS. These data collection points included water sampling locations.

1.2.2 Traffic Counting

Transport planning requires understanding of actual conditions of traffic movement. This involves determination of vehicle or pedestrian numbers, vehicle types and vehicle speeds. The data dealing with the characteristics of vehicle or people movement is obtained by undertaking traffic counts. Non-intrusive methods was used in this study which involved remote observational techniques. Due to low traffic and pedestrian volume involved method of manual observation will be used for traffic counting at the proximity to the proposed project site.

Manual observation for traffic counting is a method involving placing observers at specific locations to record vehicle or pedestrian movements. Tally sheets will be used to record the traffic volume.

The data for this assessment was collected and analyzed by Water Solutions using observers to record the distribution of traffic at mid at the two intersection of the proposed development site. The data is summarized to show the peak weekday characteristic of the traffic volume and its direction.

1.2.3 Noise

Noise level was measured using a digital sound level meter Q 1362 from Dick Smith Electronics. The noise level was measured using A weighting, 'A' weighting was used as this enables sound level meter to respond in the same manner as the human ear, which increases and decreases amplitude over the frequency spectrum. The sound level meter that was used for the part of the assessment had an accuracy of ±2 dB.

The noise level was measured for day time which coincides with the maximum level of noise in Malé. The position where the noise level was measured was marked using a handheld GPS. These were later integrated into one map.

6 Existing Environment

6.1 Introduction

This section covers the existing environmental conditions of proposed project site, especially those areas which may be impacted by the proposed project. The key environmental, social and economic components of the project under consideration are:

Vital Environmental, Social and Economic Components

- Human environment including sensitive categories such as schools and offices
- Geology of the proposed site
- Groundwater condition
- Built Environment
- Traffic and Noise

6.2 Proposed Project Site Geology

A geotechnical investigation of the proposed project site was undertaken by the Engineering & Laboratory Services of Sri Lankan in August 2006. The geotechnical investigation included the borehole investigation and a Mackintosh Probe testing.

The geotechnical investigation determined a profile of the sub-surface conditions of the proposed project site. The investigation showed that the groundwater level was at a depth of 1.38 m from the mean sea level. The top layer of soil consisted of a loose slightly clayey coral sand which was found to a depth of 4.00 m. This layer was followed by medium dense silty coral sand layer to a depth of 8.5 meters. Then very dense silty coral sand layer was found to a depth of 14.0 m. This layer was followed by a dense slightly clayey silty coral sand layer which was extending to a depth of 25.0 m.

1.2.4 Borehole Investigation

A borehole was drilled at the site as shown in the Figure 6-1 which was carried out in August 2006. The borehole was made using rotary drilling machine using overburden cutting tools and adopting the wash boring process to remove the cuttings from the bottom of the borehole. The borehole was drilled to a depth of 25.0 m before the drilling bit reached the basement rock at that depth. The borehole has a diameter of 80 mm and is supported with casing. For methodology details used for the

borehole investigation please refer to the geotechnical investigation report which is annexed to this report.

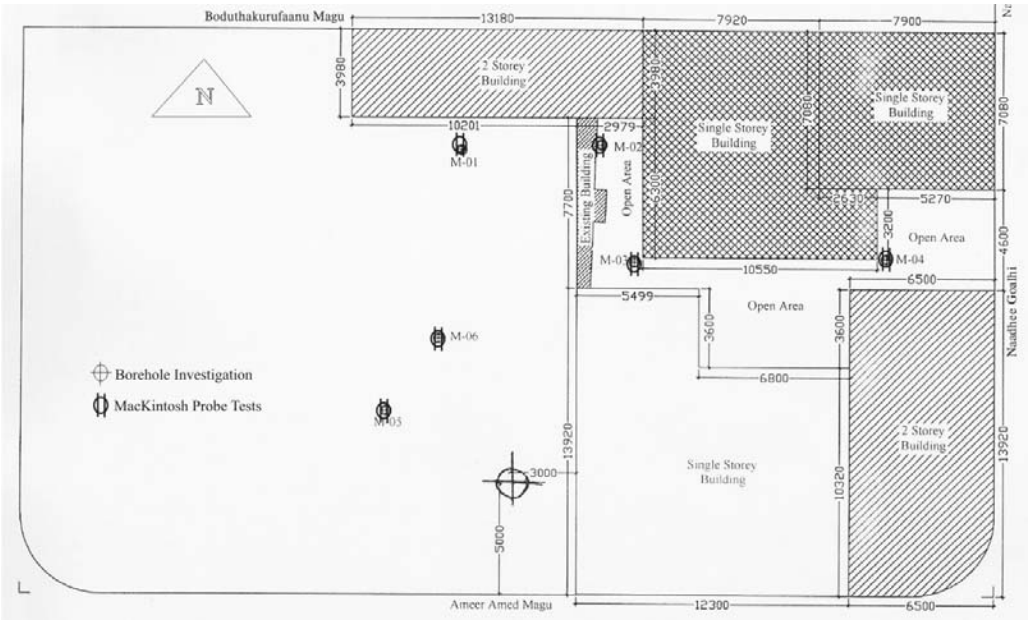


Figure 6-1: Locations of the geotechnical investigations

1.2.5 Makintosh Probe Tests

Makintosh Probe Tests were carried to determine the type of soil on the proposed project site. The test involve, driving the Mackintosh probe into the ground using a standard hammer falling through a standard height. The resistance to penetration was measured and the number of blows which had 30 cm penetration of the probe into the ground was recorded. Six consecutive Mackintosh tests were carried out at the site as shown in Figure 6-1.

6.3 Groundwater

The groundwater level at the proposed project site was determined from the borehole that was drilled for the geotechnical investigation. At the time of the investigation, groundwater level was at 1.38m from mean sea level.

In 1974, a study by Binnie and Partners of Male's groundwater found the salinity (measured in electrical conductivity or EC units) to range between roughly 750 μS/cm at the centre of the island and 2,500 μS/cm at the periphery. A 2001 study by MWSA found the salinity to have increased to the point where EC was as high as 35,000 μS/cm (70% seawater) at the centre of the island (see Figure 6-2).

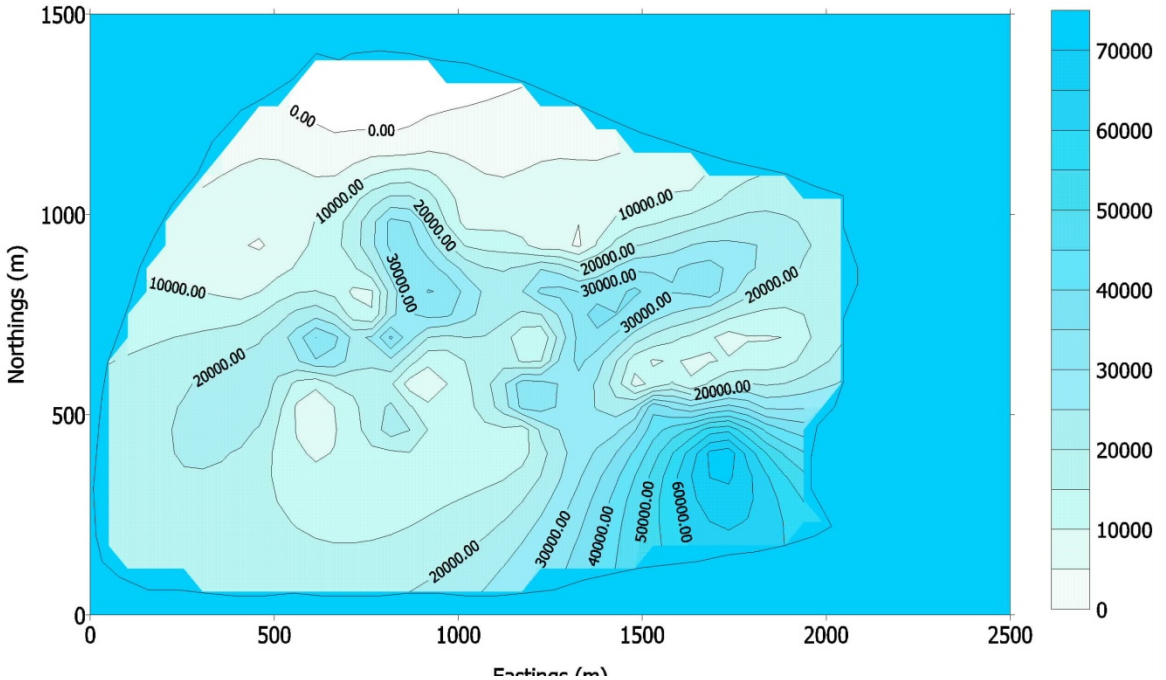


Figure 6-2: Electrical conductivity of groundwater in Male' in January 2001 (ESCAP, 2007)

6.4 Built Environment

The buildings which are found in proximity to the proposed project site are shown in Figure 6-3. The main buildings which are in the vicinity of the proposed project site includes 8 storey building of Ministry of Foreign Affairs, which is located on north eastern side of the proposed project site, 7 storey building of Aage which is located on north western side of the proposed project site, 8 storey Bank of Maldives building which is located on fur north western side of the site.

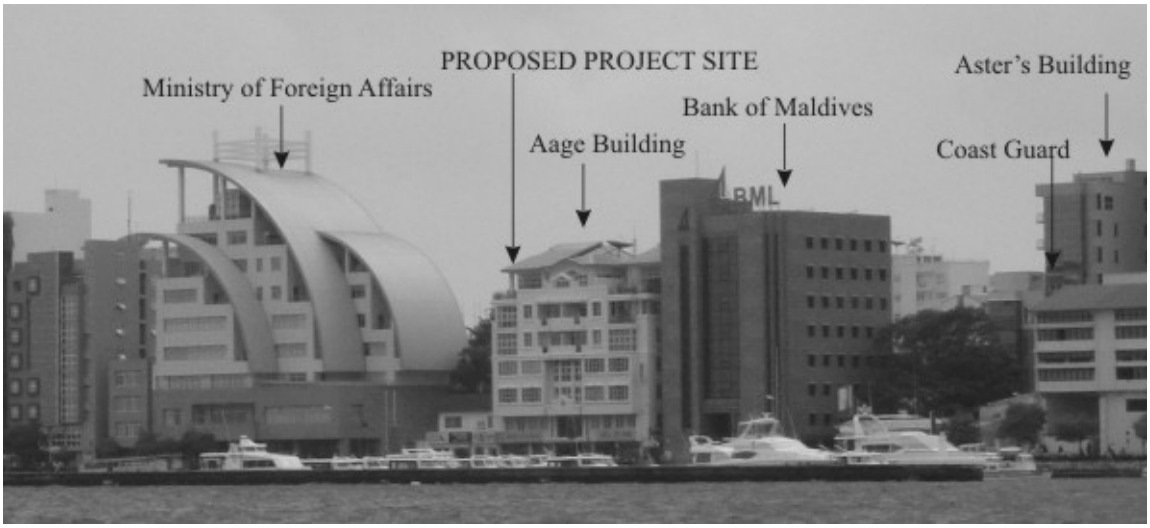


Figure 6-3: Built environment around the proposed project site

6.5 Structural Condition of the Adjacent Buildings

ArchEng Studio Pvt Ltd undertook an assessment of the structural conditions of the adjacent buildings which were located with a locus of 20 m. The assessment focused on the buildings shown in Table 6-1. The assessment was undertaken using BS 7385-2 1993: Evaluation and Measurement for Vibration in Buildings Part 2: Guide to damage levels from groundborne vibration, Annex: Cracking in Buildings and Annex B: Data to record during a survey (ArchEng, 2008).

The objective of the assessment was to take a snapshot of the existing damage in structures adjacent to and within the limit of the requirement stated in the TOR in a manner such that the data can be compared to damage levels at a later period during the construction of the Aage Hotel to try and gauge the impact of the new construction on any of these structures. The assessment was undertaken with full realisation that cracks in the assessed building may have propagated and increased in width during the construction of the Aage hotel, unless a direct cause can be proven for any adverse affects on the adjacent structures due to the proposed construction.

Building	Storeys	Type
Ministry of Foreign Affairs	7	RC, masonry & glass
Sifa	2	RC, masonry & glass
Akiri Building	6	RC, masonry & glass
Bank of Maldives	6	RC, masonry & glass
Indian High Commission	Single	Masonry structure
Centre for Quran	Single	Masonry structure

Table 6-1: Buildings adjacent to the proposed site specified in the TOR

Dharumavatha School and Athiriveli were not assessed as part of this assessment as it was determined that these buildings are continually being stressed and cosmetic damage to the fabric due to the piling works at Ameeneege and hence this negated the need for any snapshot inspection while the work continued. Vibration leading to soil compaction can result in differential settlement of foundation and consequent building damage. The effect of vibration damage and soil compaction might not be visible for some time and the impact on these two buildings from Aage Hotel works would be insignificant and negligible compared to the works done at Ameeneege and hence the assessment and monitoring of these two structures ought to be the responsibility of the developers of Ameeneege site (ArchEng, 2008).

Building	Storeys	Age	Observation
Ministry of Foreign Affairs	7	5	Structure: no significant structural cracks Masonry wall: hairline cracks found in all masonry walls
Sifa	2	30	Structure: external columns have cracked Masonry wall: upkeep has been generally good though cracking exists in walls Separation: a toilet has separated from the main buildings and owner attributes to the piling works at Athireege
Akiri Building	6	5	Structure: no significant structural cracks Masonry wall: external walls on lower floors have cracked extensively
Bank of Maldives	6	7	Structure: no significant structural cracks Masonry wall: limited cracking in the walls
Indian High Commission	Single	70	Structure (masonry walls): where masonry walls are exposed, walls have cracked extensively
Centre for Quran	Single	20	Structure (masonry walls): cracking is numerous in the building

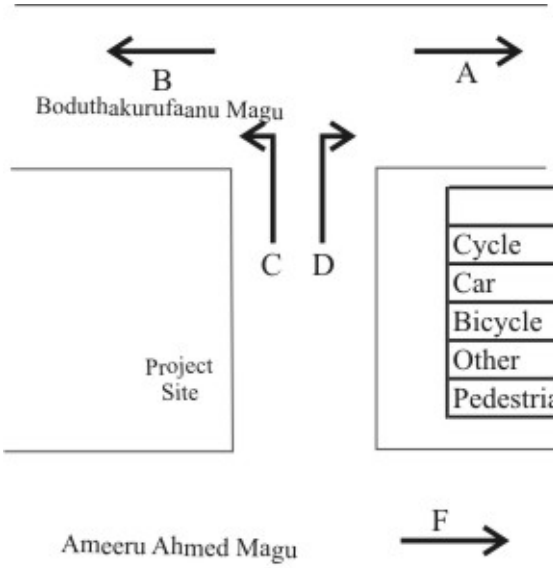
ArchEng has produced a comprehensive report '*Building Structural Condition Assessment Report for Adajacent Buildings to Aage Hotel Development*, which has been submitted as Appendix to this report. For details please refer to Building Structural Condition Assessment Report for Adajacent Buildings to Aage Hotel Development.

6.6 Human Environment

1.2.6 Traffic

Traffic study was undertaken to study the traffic flow near the streets of the proposed project site. The traffic study was undertaken using manual counting method to determine the traffic flow in the peak time on a weekday. For details refer to the section on methodology.

A traffic study was undertaken as described in methodology section. Figure 6-4 presents the findings of the study. From this study it was found that 8.4% of cycles, 19.4% cars, 11.7% of bicycles and 6.6% of pedestrians which uses this intersection use the narrow street between the proposed project site and the Centre for Holy Quran.



	A	B	C	D	F
Cycle	456	252	96	12	456
Car	72	12	12	36	120
Bicycle	60	24	12	12	96
Other	288	84	12	12	60
Pedestrian	48	36	12	12	252

Figure 6-4: Traffic count at the proposed project site for one hour at the peak time

1.2.7 Noise

Noise level was measured using a digital sound level meter Q 1362 from Dick Smith Electronics. The noise level was measured using A weighting, 'A' weighting was used as this enables sound level meter to respond in the same manner as the human ear, which increases and decreases amplitude over the frequency spectrum. The sound level meter that was used for the part of the assessment had an accuracy of ±2 dB.

The noise level was measured for day time which coincides with the maximum level of noise in Malé. The position where the noise level was measured was marked using a handheld GPS. These were later integrated into one map.

Figure 6-5 presents the ambient noise level surrounding the project site during the peak time of the day. The ambient noise levels which were measured during the day time were higher than expected. During field measurement, 63.3 dB (A) was measured in side Dharumavantha School. The desired noise level on a quiet street would be 50 dB (A) and quiet place such as mosque, offices, schools and houses would be 40 dB (A).

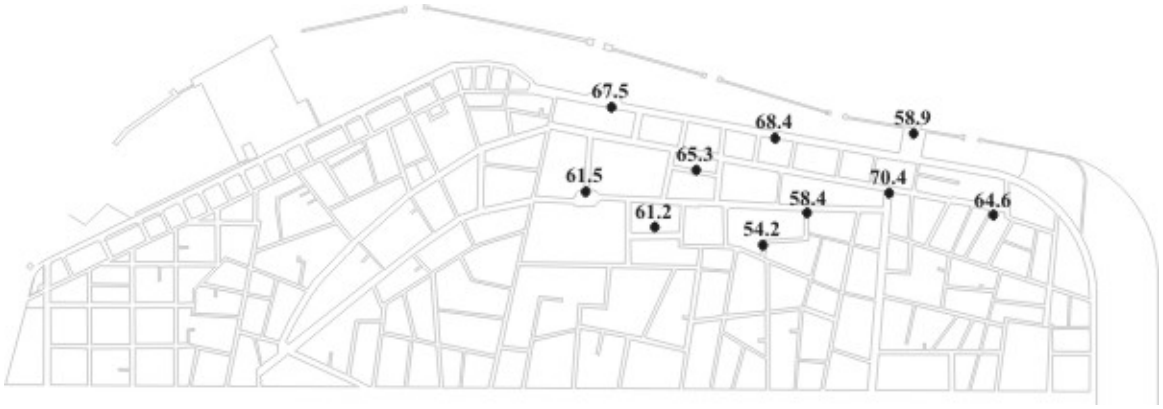


Figure 6-5: Ambient noise at day time measured in dB (A)

The high noise levels which were observed during the noise level measured as presented in Figure 6-6 is mainly due to the high volume of traffic on the streets of Malé. Car and motocyles can produce noise level up to 80 dB (A) at the vehicle.

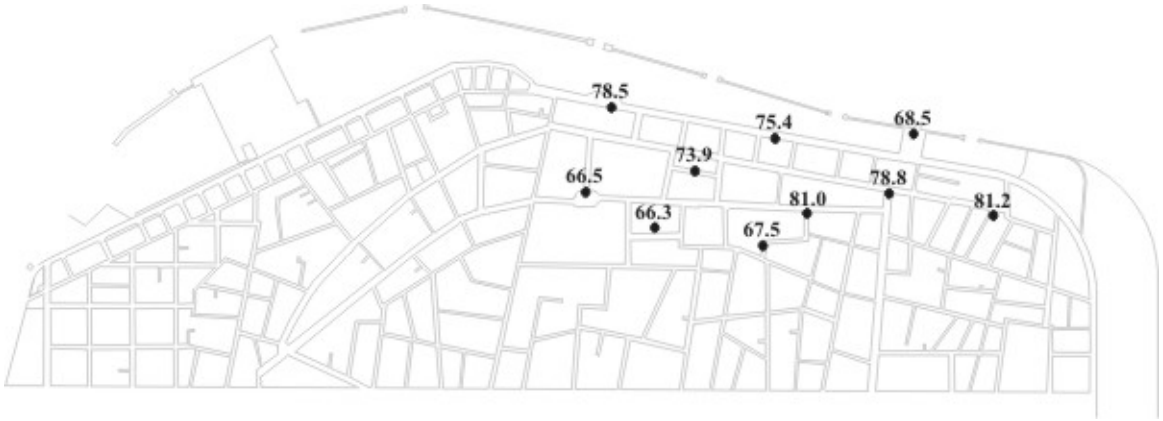


Figure 6-6: maximum observed noise during the ambient noise measurement in dB (A)

6.7 Socio-economic Status of Male'

The analysis of the socio-economic profile of Male' will outline the bigger picture necessary to understand the general situation and the context in which the 15 storey hotel with 86 rooms is being built. In this regard the following six issues are discussed outlining the baseline socio economic situation within which the hotel is being built; (1) population, (2) land use plan and hotel development, (3) urbanization and related issues, (4) employment, (5) transport and (6) major public utilities: water and energy.

1.2.8 Population

The total population of Male stands at 103,693 by 2006 and the land area being 192.07 hectares the population density is 540 people per hectare. Graph 1 illustrates the increasing trend of the urban population of Male'. With continuing migration from the islands the growth rate of Male is estimated at 5.57 per annum compared to the atoll growth rate of 1.68 per annum. According to the 2006 Census, more than one third of the Maldivian population is now living in Male', compared with only one-quarter ten years back.

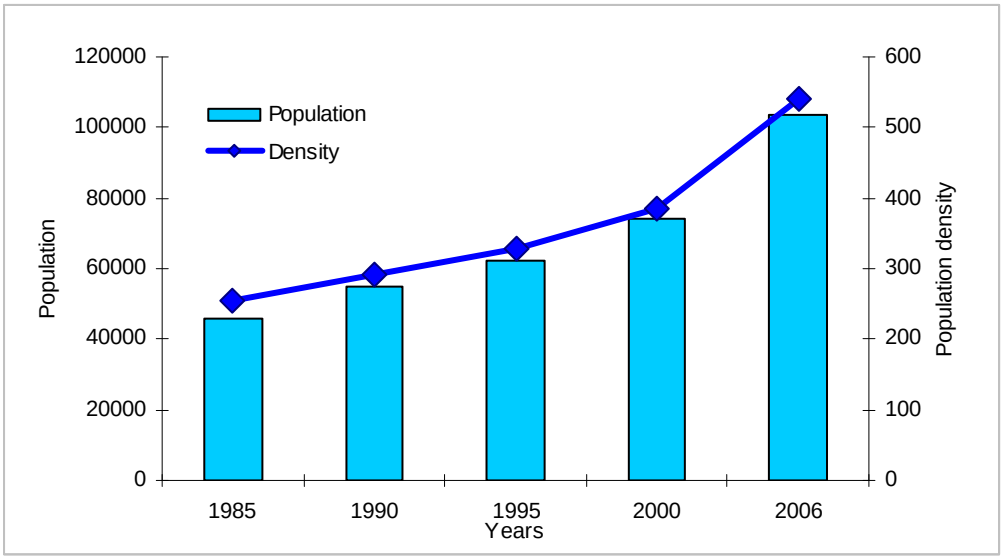


Figure 6-7: POPULATION AND POPULATION DENSITY OF MALE 1985-2006 (Source: Ministry of Planning and Development, 2006)

To ease the urban density and its related issues of Male, the government has focused the development of Hulhumale and efforts are being made to establish regional urban areas within the country.

1.2.9 Land use Plan and hotel development in Malé

Hotels have been developed in Male on land owned by private individual in the past. Central Hotel, Relax Inn, Mookai Hotel and KAM hotel are some of the hotels built in Male. All these hotels are built on land owned by private individuals.

Review of the procedures adopted in developing these hotels clearly shows that in the case of the land owned by private individuals, the responsibility for the planning and development of the land rests on the landowner in accordance with the regulation and rules laid by the agencies responsible for the land management. In the absence of land use plan of Male' the agencies responsible for land management do not have blueprint solution for granting permission. The Land Act (1/2002) is focused on the processes and procedures for holding, acquiring and transferring land, mainly for residential purposes. As highlighted in the Seventh National Development Plan 2006-2010 and by Male' Municipality the laws and regulations are still very new and untested, needs further modifications and streamlining to enable them to be fully supportive of the transformation of land as a commercial and economic investment and opportunity.

Noteworthy is also the fact that so far developments of city hotels in Malé have been without an Environmental Impact Assessment process. However, Malé being the home of over 103,000 people and with a growing urbanization and its related issues the need for the application of the Environment Impact Assessment process prior to the building of the present hotel is felt and taken into consideration by the concerned government authorities regarding the development of the present city hotel, especially following complaints related to the development of Holiday Inn at Ameeneege.

1.2.10 Urbanization and its related issues

Urbanization and its related issues can be stated as severe in Malé. High population density, increasing migration, unemployment with unfulfilled expectation have increased social problems in Male'. Many young secondary school graduates from atolls are ambitious and have high expectations with many preferring to seek employment in Male' or close to Male', where urbanization is at peak. With not enough employment youth unemployment are on the rise along with associated social issues.

Today, the country is witnessing an alarming increase in drug abuse among adolescents and young people, with 46 percent of drug abusers being aged between 16 and 24 years. Drug trafficking and abuse are causes of serious and growing concern for the socio-economic development of Maldives.

The number of drug abuse cases reported to the Police has more than tripled between 2000 and 2004, from 220 to 697 cases respectively. Close to 50 percent of drug abusers are aged between 16-24 years.

Similarly, increase in crimes and violence have been observed during recent years. Urbanisation also has resulted in increasing prevalence of mental and physical ill-heath. Acute respiratory infections in children are on the rise at an alarming rate.

1.2.11 Employment

The country's labour force participation rate is 62.6 percent in 2006 which is an improvement from 54.6 percent in 2000. Today, three key challenges are at the forefront with regard to employment.

a. There is a large disparity between male and female participation rates with males accounting for 72 while females stand at 52.

b. Youth employment stands at 16.2 percent in 2006.

c. Increase in number of the expatriate workers.

According to the VPA II of 2004, about 40 percent of the young women and over 20 percent of the young men are unemployed, not only because they lack the skills required in the labor market but also because of limited job opportunities. These two areas are stated as key challenges in the Seventh National Development Plan. To alleviate this, one of the major economic goals put forward is to create an environment conducive for growth and generate employment.

With regard to expatriate labour force it is noted that between 2000 and 2006 the number of expatriates increased from 27,716 to 53,901 respectively. In 2006, 30.5 percent of expatriates were engaged in construction sector, 20.6 percent in tourism and 15.4 percent in community, social and personal services. All these issues are challenges that required efforts towards creating new job opportunities and skilled labour within all sectors and needs an integrated approach between the government, public and the private sector.

1.2.12 Transport

Malé lacks an integrated public transportation system and number of privately owned vehicles is on an increasing trend. The statistical year book does not provide data on the number of vehicles registered in Male, however review of the vehicles registered in the whole country reflect the increasing trend with the total number of registered traffic increasing by 24 percent per annum within

2003 to 2005 period. Similarly newly registered vehicles are increasing by 23 and 26 % respectively in 2004 and 2005 (see table 1). As captured by these figures, traffic in Male is a major concern and the increase in the number of vehicles, especially motor cycles and cars, is threatening the safety on roads and the quality of the environment. The introduction of a public transport system and the use of renewable energy sources have been identified as a solution in the sector plans, the implementation of which depends on tackling several related issues including reduction in number of vehicles on the road, appropriate financing mechanisms as well as public awareness.

	2003	2004	2005
Registered	15,181	18,831	23,324
% change over previous year		24	24
Newly registered	2892	3650	4493
% change over previous year		26	23

Table 6-2: REGISTERED VEHICLES 2003-2005 (Ministry of Planning and Development 2006)

1.2.13 Major Public Utilities

1.2.13.1 Water

In Male heavy reliance is placed on desalination using increasingly expensive imported diesel oil for fresh water supplies. The use of desalinated water has been on an increasing trend and has reached 1,890.7 thousand metric tons by 2005.

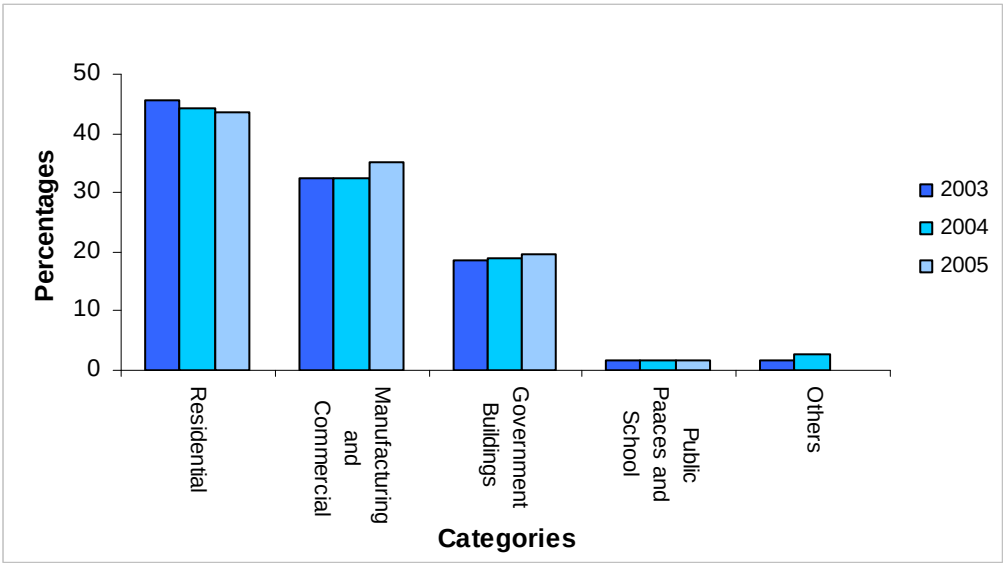


Figure 6-8: BILLED WATER CONSUMPTION 2003-2005 (Ministry of Planning and Development, 2006)

As revealed from Figure 6-8, 68% of the desalinated water is used by the residential population, 15% by institutions and 13% by commercial users. As of 2006, average desalinated water consumption in Male' is 5960 cbm/day.

1.2.13.2 Electricity

In 2006 the total installed capacity of STELCO is 52MW. Approximately 72 percent of the total STELCO power production of 185,553 MWh in 2006 was consumed by the Male' urban region. With the increase in the number of high-rise air-conditioned buildings in Male' and the increasing use of electrical appliances in residential and commercial sectors, the demand for electricity has been rising steeply in the recent years and is recorded more than 11 percent per annum. As illustrated in graph 3, 44% of electricity is used by residential users while commercial users accounts for 35% of uses

The government anticipates that the electricity consumption will continue to increase and the power requirements of Male' may reach twice the currently installed capacity within the next 5-7 years. However, possibility of expanding the power station to cater to this growth on the congested Male is very limited and in the Seventh National Development Plan 2006-2010 it is reflected that the only possible alternative is to explore the possibility of housing a power generation system off Male' that could extend the power supplies to Male and nearby islands.

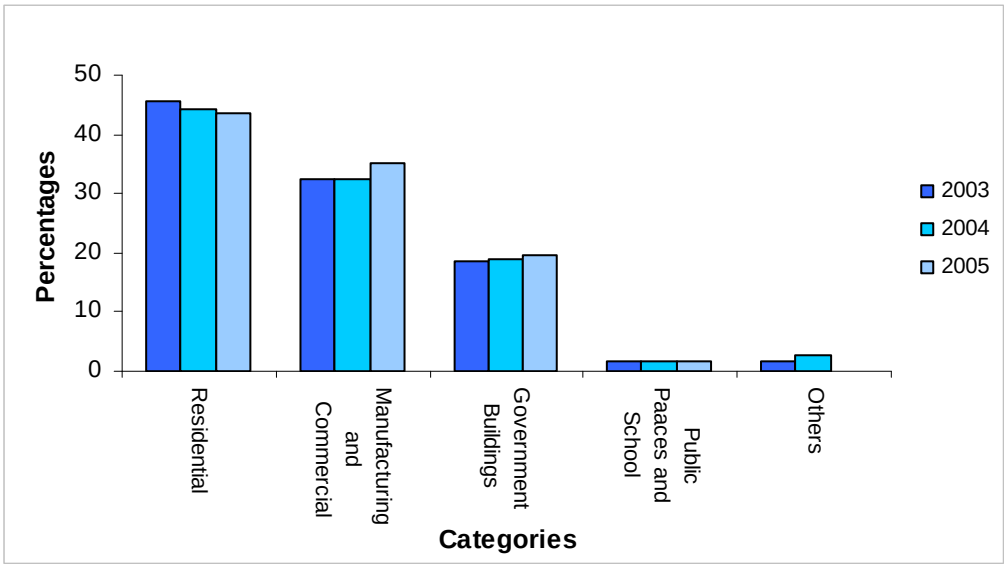


Figure 6-9: ELECTRICITY UTLISATION IN MALE' (Ministry of Planning and Development, 2006)

7 Environmental Impacts and Mitigation Measures

7.1 Introduction

This section covers potential environmental impacts due to proposed project at Athireegeaage. The section also describes the mitigation measures for each identified impact.

Analysis of environmental issues within the lifecycle of the project identifies the major issues and concerns that are likely to evolve over the life of a project. For the proposed project, these issues include location and design, construction of the structures and longevity of the structures and their impacts. The environmental impacts of the project would be upon or due to the following resources or elements of the project.

- Silent piling during the site preparation for the foundation
- Laying of the raft foundation of the building
- Noise and vibration during construction phase
- Traffic and parking
- Aesthetic due to the construction of the building
- Demand for water and the management of wastewater
- Management of the solid waste

The potential environmental impacts of various activities pertaining to project components during planning and construction phase of the proposed project components and appropriate mitigation measures are elaborated in this Section.

7.2 Impact Identification

7.3 Silent Piling for site Preparation

The project requires piling 10 meters of piles into the ground all around the project site. The piling would be done using silent piling technology as described in section 1.1.1.1. Critical impacts that are anticipated from this activity are related to the issue of generation of noise and vibration. However, it is not expected that the project activity would generate excessive noise and vibration that would exceed the high ambient noise levels that are recorded on streets of Malé.

The silent piling technology is known for its low noise generation and vibration free features that make it more attractive than drop hammer technology. Table 7-1 presents the impacts that are identified due to piling component of the project.

Impact characteristic	Project Activities
Cause	*Silent piling for site preparation for the building's foundation*
Nature	Noise and vibration
Magnitude	insignificant
Geographic range	0.5 meters on either side of the pile
Duration	Long-term
Reversibility	irreversible
Significance	Moderately Significant

Table 7-1: Impacts due to silent piling

1.2.14 Mitigation Measures

Silent piling has been adopted as a mitigation measure to reduce the impact of the noise and vibration. This method of piling has been adopted following the excessive noise and vibration generated due to the use of drop hammer piling on the construction of Holiday Inn at Ameeneege in Malé.

7.4 Foundation of the Building

Impact characteristic	Project Activities
Cause	*Excavation of the site for the laying of the raft foundation*
Nature	Removal of the top soil and dewatering for the excavation process
Magnitude	Moderately significant
Geographic range	Lowering of the water table due to cone of depression
Duration	Long-term for the removal top soil and short term impact due to dewatering
Reversibility	Irreversible for the removal of the top soil and reversible for the dewatering process
Significance	low significant

Table 7-2: impacts due to excavation

The long term impact for the removal of top soil is considered to have low significance given that the value of top soil in the project site is low. The short term impacts due to dewatering can be said to be mainly the impact on the groundwater lens due to saline intrusion resulting from coning (Geiben-Hertzberg principle) and the impact of such sudden increase in salinity on the freshwater plants in the vicinity of the site. There are, however, a few mature trees in the area that may be impacted due to this. These include the few mango trees in the area.

1.2.15 Mitigation Measures

Procedure for development of foundation: (a) sheet piling around the plot for retaining the earth to a depth of 10 meters below the ground level (b) excavation to the required level and leveling of ground at around 4 meters below ground level, (c) dewatering - The water table in Male is about 1.5 meters below the ground and hence excavation needs to go below 2.5 meters below the groundwater level. Groundwater would be lowered by dewatering at a 0.05 cubic meters per second per pump using 4 pumps, (d) placing of lean concrete, (e) placing of reinforcement iron bars and (f) pouring of concrete

Dewatered water will either be discharged into the ground on the streets of Ameeru Ahmed Magu and Bodu Thakurufaanu Magu or will be discharged into the lagoon on northern side of Male' via a pipe laid along the Naadhee Goalhi, buried across the Boduthakurufaanu Magu. Discharging water on the streets will cause flooding on these streets and hence to reduce the flooding risk it would be more appropriate to go to the option of discharging the water out into the lagoon, especially given that the groundwater in the area has high level of salinity, not suitable for domestic use.

The impact on the few freshwater trees such as mango trees in the vicinity would be minimized by watering these trees during the construction stage. Owners of the trees would be informed of the impact and if they so require, they will be compensated by providing water or watering of the plants in order to make sure that the plants do not die off due to salt intolerance.

The impact of site preparation for laying of the foundation would be minimized by sheet piling around the plot for retaining the earth to a depth of 10 meters below the ground level. This will help the foundation laying process by shoring. The impact mitigation for the sheet piling and the type of technology adopted for the sheet piling has been discussed separately in a different section of the report.

1.2.16 Construction and Materials

Impact characteristic	**Project Activities**
Cause	*Construction*
Magnitude	Short tem
Geographic range	Project site
Duration	Short term
Significance	Moderately Significant during the construction stage

Table 7-3: impacts due to construction activities

The construction material for proposed building include cements, steel gravels and river sand. All the materials for the construction will be imported.

1.2.17 Mitigation Measures

To minimize the impact on the local environment, imported construction material will be used for the construction of the proposed building.

1.2.18 Noise and Vibration

Presently there are no guidelines on noise levels in working area in the Maldives and hence the ambient noise level around the project site was determined as a bench mark as part of this study. The presently ambient noise level recorded at daytime at the site is 63.4 dB(A) which is considered as high for a sensitive area where schools, office and residential areas are located.

The TOR for this study specifically requested to determine the impact of piling on the noise and vibration due to this project. However, the technology that will be used for the piling for this project utilizes silent piling which is considered as environmentally friend due to its low level of noise generation and vibration free nature of piling.

Stationary equipment such as air compressors, cranes, and generators generally run continuously at relatively constant power and speed, although sound levels may vary according to the work cycle (e.g., loading). Construction related noises are usually of a temporary duration and can be, relatively intermittent. Also, given the high ambient noise, construction noise of this nature would not be of concern.

Impact characteristic	Project Activities
Cause	*Noise and Vibration*
Nature	*Noise and Vibration machinery operated at the site*
Magnitude	ultra low in noise output and vibration-free
Geographic range	20 m radius of the project site
Duration	Only during the piling activity
Reversibility	reversible
Significance	Moderately Significant

Table 7-4: Noise and Vibration impact

1.2.19 Mitigation Measures

Silent piling has been adopted as a measure to reduce the noise and vibration due the implementation of the project.

Workers operating equipment that generate noise would be equipped with noise protection gear.

7.5 Traffic and Parking

The traffic study which was undertaken has been described in a different section. The traffic study showed that 8.4% of cycles, 19.4% cars, 11.7% of bicycles and 6.6% of pedestrians which uses intersection at the project site. This traffic flows through the narrow street, Naadhee Goalhi between the proposed project site and the Center for Holy Quran. The study found that Naadhee Goalhi was used to get access to Bodutakurufaanu Magu from Ameeru Ahmed Magu.

Naadhee Goalhi, which is on east of the proposed project site is a narrow street. The street has a parking zone marked for motor cycles. The parking zone uses around 30 cycles. The street is also wide enough to be used by cars.

In early stage of the construction of the building, temporary fence will be constructed on western side of the street, on the boundary of the project site. It is not anticipated at this stage of the project planning, that cars would be able to use the street due to the implementation of the new parking regulation which requires that motor cycles to be parked, strictly, in the zone provided.

During peak construction days such as casting of columns and slabs, the traffic flow have to be managed as Naadhee Goalhi and Ameeru Ahmed Magu would be blocked to be used for the temporary stacking of the construction materials and equipments. The traffic would be managed as outlined in mitigation section below.

Impact characteristic	Project Activities
Cause	*Traffic flow and parking*
Nature	Blocking of the Naadhee Goalhi and part of Ameeru Ahmed Magu during casting of the slabs and columns of proposed building
Magnitude	Parking spaces of 35 cycles and diversion of the traffic due to blocking of the Naadhee Goalhi and Ahmeeru Ahmed Magu
Geographic range	Ahmed Ahmed Magu: east of Lotus Goalhi to Finihiyaa Goalhi
Duration	Only during casting of slabs and columns of proposed building
Reversibility	Reversible
Significance	Significant

Table 7-5: traffic and parking impacts due to construction activities

1.2.20 Mitigation Measures

Some of the streets would be blocked for the construction activities on days that require intensive construction activities. These days would be notified to the Ward Office with enough lead time and would take necessary permission. The traffic flow would be managed as shown in Figure 7-1. It is not expected that this would have a major impact on the flow of the traffic.

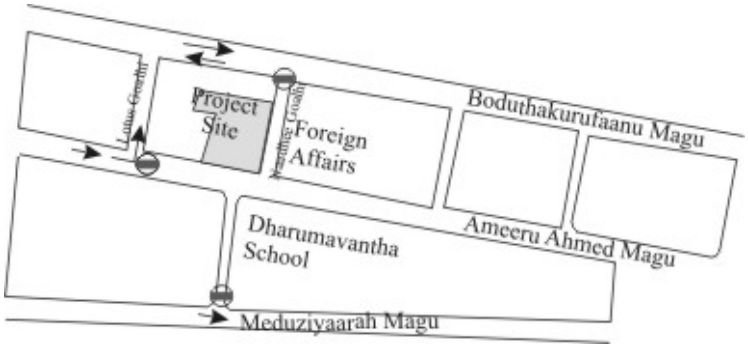


Figure 7-1: Diversion of traffic as tool to manage the traffic during peak construction times

7.6 Water Supply and Demand

Impact characteristic	Project Activities
Cause	*Water Supply*
Nature	The concrete works would require large amount of water during construction phase and operation phase requires water for the hotel operation
Magnitude	25 cubic meters per day during the construction phase of the development
Duration	During construction and operation phase of the development
Reversibility	Reversible
Significance	Significant

Table 7-6: impact on water resources

1.2.21 Mitigation Measures

To reduce the demand for water, curing of concrete on rainy days will be carried using rainwater. Using rainwater, the demand for desalinated water will be reduced by 40% when rainwater will be used for curing of columns and slabs, when such activity coincides with rainy days. Water conservation measures will also be adopted to conserve the water during construction and operation of the facility

7.7 Solid Waste Management

Impact characteristic	Project Activities
Cause	*Solid waste*
Nature	Generation of the construction waste during construction and solid waste during the operation
Magnitude	2.6 kg/guest/day during the operation of the project and 4.47 tonns/1000 sq feet during the construction phase
Duration	During construction and operation phase of the development
Reversibility	reversible
Significance	Significant

Table 7-7: impact on solid waste generation

1.2.22 Mitigation Measures

The generation of solid waste would be minimised by recovering the reusable waste from the construction waste that would be generated at the site. The recovered waste includes wood, blocks and others as presented in Table 7-8.

The amount of solid waste generated during the construction phase

Material	tons/1,000 sq. ft.
wood	0.4
drywall	0.92
metal	0.09
concrete	1.79
other	1.54
Total	4.74

Table 7-8: typical waste generation rates (adopted from green building programme, 2007)

1.2.23 Employment

1.1.1.1.1. Potential increase in employment opportunities

Impact characteristic	Project Activities
Cause	*Employment*
Nature	Creation of skilled and non skilled demand for employment during construction and operation of the proposed project
Magnitude	It is expected 75 jobs will be created during the construction and 45 jobs will created during the operation of the facility
Duration	During construction and operation phase of the development
Reversibility	reversible
Significance	Significant

1.2.24 Creation of employment opportunities for women

As highlighted in section 3.4 a stark contrast in female and male labour force participation rate exists. Reviewing on the tourism sector which is the most significant industry in the Maldives, contributing 27 of GDP in 2006, share of women in paid jobs is the lowest. Women do not participate mainly due cultural and societal restrictions on mobility of women working away from their home island. Tourist resorts are located away from home islands. In the case of Male' opportunities for women to work in this area is limited to a few city hotels located in Male.

For women who are living in Male working in a hotel in Male' unlike working in resorts is associated with lot of advantages. It offsets the cultural and societal restrictions that exist in working away from Male. Hotels in Male are home-island based, and with spouse support and extended families assistance, child support facilities are not necessary, providing an encouraging and conducive environment for mothers to work. This justifies that developing a city hotel in Male has the potential of significantly contributing in providing employment opportunities for women thereby assisting in achieving one of the major goals outlined in the Seventh National Development Plan.

1.2.25 Increasing the share of locals in the economic sector

Developing a hotel in Male also has the potential of increasing the share of locals in the economic sectors. In the case of the tourism industry direct employment accounts for around 22,000 jobs and only half of these employment opportunities are taken by locals. Various reasons such as staying away from family in a different islands has hindered in the low employment opportunities for the locals. Greater local participation is foreseen if the hotel is built in Male where majority of the locals are seeking job opportunities

1.2.26 Creation of employment opportunities for youth

As highlighted youth unemployment rate stands at 16.2 percent in 2006, and is critical challenge that needs to be addressed. Over the next three years, it is projected that 29,237 young people will complete secondary education. A significant number of school leavers will continue to tertiary education and at least 40 to 60 percent of them will potentially enter the labour market annually. The expanding labour force demands a corresponding increase in job opportunities and it is obvious that developing a city hotel in Male will contribute towards this, easing the unemployment rate of Male. Many people reflect that this will help in contributing the alleviation of the major social problems such as drug abuse and violence faced by the community of Male.

1.2.27 Potential increase in economic benefits

The establishment and the operation of the hotel will have a positive impact on the sectors that supports the establishment and operation of the hotel ranging from the construction industry, other business and service producers. The money injected to these sectors creates new money flowing, resulting in multiplier effects. The initial spending is circulated through businesses which serve as suppliers to the hotels increasing the income of the general population of the city.

In a similar manner guests out of the country brings in money with them which are spent in Male by staying there for several days. This money coming in filters from the hands of the guests into the souvenir market, restaurants, coffee shops and other areas creating a more sustained and even economic impact within the city of Male'.

1.2.28 Increased pressure on the carrying capacity of Male'

With a population density of 540 per hectare and with an increasing immigration trend the carrying capacity of Male is at its peak. Continued development activities without suitable land use planning will certainly aggravate the already overloaded situation. The disparity of Male and the atolls is the main reason for the urban pull toward Male. Creation of more employment opportunities through the development of hotel in Male will continue the inward migration towards Male increasing the pull factor. Many respondents are concerned about Male being over-burdened by the growing population and the subsequent deterioration of both the physical and social conditions on the island. Nonetheless many felt that the initial step towards finding a solution requires a good landuse plan as blueprint solution in planning the city.

1.2.29 Providing opportunities for the tourist to see the capital city of Maldives

In Maldives the city of Male itself is generally a contrasting attraction for the ordinary tourists who mainly spend their time in island resort-oriented setting. Male being a small island city with one of the highest population densities in the world, also has a culture of its own which can be an appeal for the outsider. The vulnerability and uniqueness of these low lying islands are seen in a different form in Male compared to the island resorts. The city's adaptations with the protective structures of tripods around the city are distinctive compared to the other islands of the country. The exceptionality and the rarity of the city can be tapped as an attraction for both the intellectual and ordinary outsider.

Even at present there exists a yearning to see and experience the fascinations of this unique city which needs to be tapped and explored. Tourists returning to Hulhule Airport from their resorts by Air taxi are often curious and inquisitive about the capital city which they see over air. Many do not have the luxury of seeing this small packed city during their stay in resorts. Some express their view of staying a day or two in Male before they head back to their home destination. Certainly an increase in the tourist that visits Male would provide conditions which the local population of Male would benefit. City hotels pave way for these outsiders to see a glimpse of this beauty of the world which they would cherish.

1.2.30 Contribute in facilitating a conducive environment for the foreign investor

Development of city hotels will contribute in achieving a cosmopolitan city. The importance of the cosmopolitan city is of utmost significance to attract knowledge, activity, skilled labour, international tourists and business elite. This will have the potential to introduce new ideas of creativity and generate a demand for quality and high value added goods and services, creating a more attractive environment capable of attracting more economic benefits. Such a virtuous cycle of growth creates conditions in which the local population of Male and the adjoining island benefits.

According to the Seventh National Development Plan 2006-2010, Maldives is also well positioned to take advantage of long political stability, high economic growth, social harmony and strategic geographical location to act as a point for distribution of goods. Private sector dynamism and a sound investment climate are critical for embracing these opportunities. A hotel in Male' will facilitate the foreign investors, traders and clients the ease in finding accommodation and proximity to the concerned government agencies based in Male'. This will provide sound investment climate that are critical for embracing investment in the country. The Doing Business Indicators places Maldives in a fair position for investments. The entry regulations of the Maldives have one of the lowest costs of registering a company at 15.6 percent of per-capita income, in comparison to the rest of the South Asia at 45 percent. This requires a corresponding ease in finding good accommodations within the capital city of Male which will contribute to the development of the proposed hotel.

1.2.31 Promote image of the city of Malé

Building of good quality city hotel also has the potential of enhancing the general tourism profile of the country. This in turn can attract more tourism business, which can expand the tax base at the same to enhance the appeal of the city and the country.

7.8 Impact on the Adjacent Buildings and Residential Area

The technology adopted for the proposed project has been decided in order to minimise the impact on the adjacent buildings. Unlike the deep pile foundation, the raft foundation is shallow and does not require deep piling.

Impact characteristic	**Project Activities**
Cause	*Impact on adjacent buildings*
Nature	Sheeting piling
Magnitude	Silent piling technology would be used to drive the piles in order to reduce noise, vibration and hence disruption to other neighbouring structures
Duration	During construction of the foundation
Reversibility	reversible
Significance	In-significant

1.2.32 Mitigation Measures

The piling is only required for shoring of the foundation. The piling would be done using silent piling technology. This is to reduce noise, vibration and hence, disruption to the neighbouring structures.

8 Environmental Management

Reducing the environmental impact of the construction process begins with managing necessary demolition responsibly. Many materials can be salvaged for reuse or collected for recycling, often by specialized waste receivers. These services can actually save money for the contractor or owner, because transportation costs and dumping fees are reduced and some items are worth cash.

Protecting the site from undue damage to soils and air quality and preventing stormwater contamination during excavation and construction is the second part of responsible construction.

The third part is ensuring that construction waste is minimized, recyclables are recovered and toxic releases on site are minimized.

The final part is ensuring that building occupants are protected from construction-related health hazards during construction phase development.

8.1 Reducing and Recycling Construction Waste

80% of waste generated during construction is reusable or recyclable since it is relatively clean and therefore marketable. Recyclers purchase metal scrap from structural steel, piping, concrete reinforcement and sheet metal work. Corrugated cardboard and gypsum are highly recyclable if uncontaminated, and will also be picked up by buyers. A great deal of wood scrap can be reused on site, while excess is accepted as fuel or fiber by many businesses. The main wastes that are difficult to recycle are plastics, mineral and glass fiber insulation, roofing and containers for paints, adhesives and caulking.

Construction and demolition waste recycling is most effective if it is included in the construction contract specifications, because many key steps in successful recycling programs, such as separation, occur on the construction site.

8.2 Minimizing the Handling and Release of Toxics on the Construction Site

Construction sites are sources of many toxic substances, such as paints, solvents, wood preservatives, pesticides, adhesives and sealants. Even with careful management, some of these substances are released into air, soil and water, and many are hazardous to workers. For these reasons, the best

choice is to avoid their use as much as possible by using low-toxicity substitutes and low VOC (volatile organic compound) materials. Many new materials and methods are now available that are less toxic and safer for workers..

Many other activities on site will also release toxic pollutants. For example, trucks and machinery use fuels, hydraulic fluids and coolants that can leak if equipment breaks down, or may be spilled on site. Planned maintenance and worker training must be employed to minimize release of these toxic materials.

Using low-pollution construction equipment such as electric motor-driven equipment and propane-powered engines also helps to reduce pollution on the jobsite.

8.3 Minimizing Energy and Water Use during Construction

Energy-efficiency and water-conservation measures are generally applied only to finished buildings, but some steps can also be taken during construction. Using high-efficiency sources and automatic controls can reduce electricity used for temporary and security lighting. Water use for washing, irrigation and dust control on site can also be reduced by conservation and recycling.

8.4 Protecting Building Occupants from Health Risks during Construction

Workplace safety regulations protect the health of construction workers, but an adequate degree of protection should also be provided for occupants of buildings undergoing remodeling or renovations. Dust and vapors from construction areas are easily transported into occupied zones by air currents, people moving between zones, and by ventilating and air-conditioning systems.

Another step is providing independent ventilation of the construction zone to maintain negative air pressure relative to occupied areas. Finally, scheduling unavoidably dusty and high-emission operations during unoccupied hours allows clean-up and curing to occur before occupants return, which helps to avoid health risks and liability.

8.5 Protecting Building Occupants from Health Risks during Early Occupancy

Indoor air quality is often poorest in buildings immediately after construction is complete; however few regulations exist to protect building occupants during this period. Liquid finishes such as paints,

sealers and adhesives release volatile gases during curing that cling to carpets, gypsum board and other porous surfaces and are then released over time. Dusty operations, such as finishing gypsum board, installing insulation and ceiling tile, and sanding or grinding hard floor surfaces leave large residues of nuisance or hazardous dust that accumulate on interior finishes, in ceiling cavities and ducts, to be released later into the occupied zone. A proactive approach that minimizes occupant exposure to health hazards through careful construction procedures will go far toward reducing complaints and limiting owner and contractor liability.

9 Environmental Monitoring

9.1 Introduction

The parameters that are most relevant for monitoring the impacts that may arise from the proposed project activities are included in the monitoring plan. These include amount of waste generated, demand for water, demand for electricity, noise level, traffic and parking. Monitoring will be carried out as part of the environmental impact assessment and mitigation of possible negative impacts from the proposed hotel development.

It is important that information and experience gained through the monitoring activities are fed back into the EIA evaluation and analysis system to improve the quality of future assessment studies.

9.2 Aim of monitoring

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

9.3 Objectives of monitoring

The following monitoring plan is used to measure impacts that occur during the proposed project activities and determine the accuracy of impacts that are predicted and the effectiveness of mitigation measures. The objectives of the monitoring plan are to measure: waste generated, demand for water, demand for electricity, noise level, traffic and parking to ensure that these measurements are kept within the baseline limits and predicted impacts are accurate and mitigation measures taken are effective.

9.4 Monitoring time frame

Monitoring could begin soon before civil works are undertaken and will be done throughout the construction period once in every two months. Summary monitoring reports could be compiled every 2 months during the construction period and a final report could be prepared at the end. Monitoring could also follow every six months during the operational phase of the project.

9.5 Monitoring report

A detail monitoring report could be compiled after the completion of the civil works based on the data collected for monitoring the parameters included in the monitoring plan. The report will include details of the site, data collection and analysis, quality control measures, sampling frequency and monitoring analysis and details of methodologies and protocols followed. In addition to this more frequent reporting of environmental monitoring will be communicated among the project proponent, the contractors and supervisors to ensure possible negative impacts are mitigated appropriately. These reports will also be submitted to the relevant Government authorities when necessary.

9.6 Impact Monitoring Plan

MONITORING REQUIREMENTS	INDICATORS	TECHNIQUE	RESPONSIBLE PERSON	FREQUENCY
Waste	Generation of waste	Qualitative	Env Consultant	Every 3 month
Water	Daily demand for water	From water meter	Env Consultant	Every 2 months during construction stage. Once a year thereafter
Noise	Noise level	Noise Meter	Env Consultant	Every 2 months during construction stage. Once a year thereafter
Traffic	Flow of traffic	Traffic counting	Env Consultant	Every two months during work once a year thereafter

Table 9: Impact monitoring plan

9.7 Cost of monitoring

The proponent has committed fully for the monitoring programme outlined in this report (Commitment letter from the proponent is attached as an annex). The proponent would allocate US$ 12,000 for the environmental management of the project. The cost indicated is for monitoring the project during the construction stage and operational stage. Summary monitoring reports will be provided every two months during the construction stage and final report will be provided at the end of the construction stage and will adhere to Schedule M of the EIA Regulations, 2007.

Sources of Information

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ESCAP (2007) *Country Paper of the Maldives*

MOTC (2007) Registered Facilities at Male', http://www.tourism.gov.mv/article.php?aId=42,

Riyaz (2007) *Environmental Impact Assessment Report for Development of Holiday Inn Geoenvironmental and Geotechnical Aspects, Ameeneege, Male` Maldives, (Part I).*

US Army Corps of Engineers (1998) *CEMP-E technical Instructions, Pile driving Equipments*

Appendix 1: Terms of Reference

Environment Research Centre
Ministry of Environment, Energy & Water
Male', Republic of Maldives

Terms of Reference for Environmental Impact Assessment

The following is the TOR for undertaking the EIA of the **proposed fifteen-storey hotel development project at Athireegeaage**, Henveiru, Male'.

1. *Introduction - Identify the development project to be assessed and explain the executing arrangements for the environmental assessment. Describe the rationale for the development and its objectives.*

2. *Study Area - Specify the boundaries of the study area for the assessment as well as any adjacent areas that should be considered with respect to the project.*

3. *Scope of Work - The following tasks will be performed:*

Task 1. Description of the Proposed Project – Description of the location, legal status of the land, building structure, construction methodology, construction materials, maximum occupancy, employment, water supply requirement, sewage management, duration of construction works, project life cycle.

Task 2. Description of the Environment - Assemble, evaluate and present baseline data on the relevant environmental characteristics of the study area, including the following:

a) *Physical environment: A Geotechnical investigation of the site should be conducted and ambient noise levels at noise sensitive areas of Dharumavantha School, Majeedhiyaa School, Centre for Keerithi Quruan, Peoples Majilis shall be determined.*

b) *Socio-cultural environment: traffic, land use, planned development activities in the area, employment, and community perception of the development. Building architectural design and integration with the character of the area should be addressed.*

Task 3. Legislative and Regulatory Considerations - Describe 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.

Task 4. Determine the Potential Impacts of the Proposed Project – Distinguish between significant impacts that are positive and negative, direct and indirect, and short and long term. Identify impacts that are cumulative, unavoidable or irreversible. Identify any information gaps and evaluate their importance for decision-making. Special attention will be paid to:

a) *Visual intrusion (Construction phase).*
b) *Land preparation and piling works (Construction phase).*
c) *Water supply and demand (Construction & operation phase).*
d) *Sewage and waste water treatment (Construction & operation phase).*
e) *Solid waste management (Construction & Operation phase).*
f) *Impacts related to construction works on land including materials.*
g) *Sourcing, transport and storage, building construction methodology & piling.*

h) Noise, fugitive dust, traffic obstruction (Construction phase) and employment (Construction & operation phase)
i) Impacts related to vehicular traffic induced by the project (Construction & operation phase).
j) Potential impacts of the development on adjacent properties and residential areas (Construction & operation phase).

Task 5. Analysis of Alternatives to the Proposed Project. – Describe the alternatives examined for the proposed project that would achieve the same objective including the "no action alternative. This should cover alternative piling technologies. Distinguish the most environmentally friendly alternatives.

Task 6. Mitigation and Management of Negative Impacts – Identify possible measures to prevent or reduce significant negative impacts to acceptable levels with particular attention paid to dredge spoil disposal and dispersal/sedimentation control. Cost the mitigation measures, equipment and resources required to implement those measures. A compensation plan should also be included.

Task 7. Development of a Monitoring Plan – Identify the critical issues requiring monitoring to ensure compliance to mitigation measures and present impact management and monitoring plan for construction & operation phase.

Task 8. Assist in Inter-Agency Coordination and Public –Structural survey of the nearby buildings shall be included in this section of the report. Relevant government authorities shall be consulted and their opinion included.

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 for any references used in interpreting those data. The environmental assessment report will be organized according to, but not necessarily limited by, the outline given in the Environmental Impact Assessment Report, 2007.

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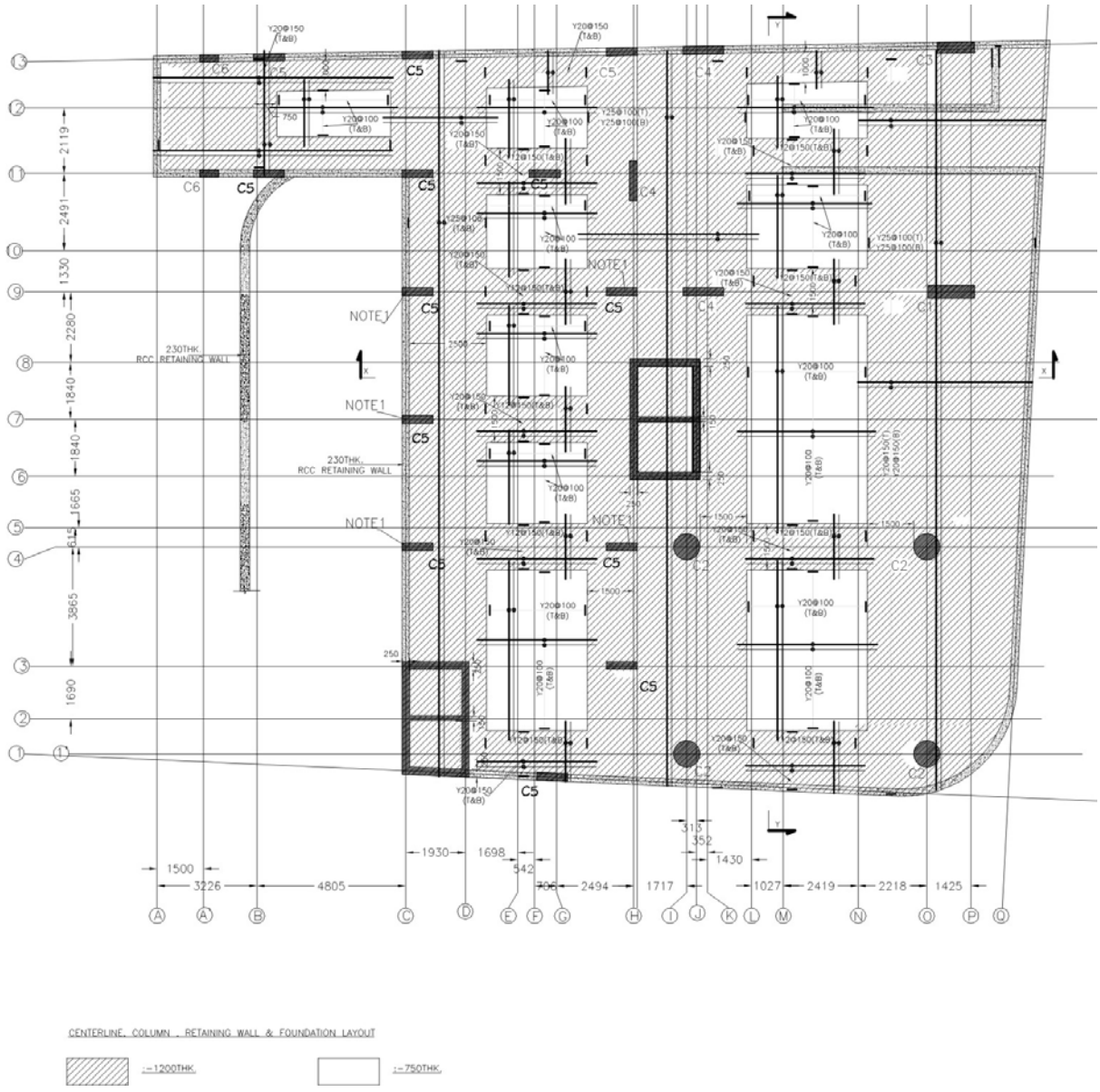
(05 November 2007)

Appendix 2: Foundation Plan



CENTERLINE, COLUMN , RETAINING WALL & FOUNDATION LAYOUT

:-1200THK. :-750THK.

Appendix 3: Procedure for Excavation and Foundation Construction

ArchEng studio

Proposed 15 storey Building at Athireegeaage

Procedure for excavation and construction of foundation

The following procedure will be used for the excavation and construction of foundation for the proposed building.

1. Sheet piles would be driven at the edge of the proposed foundation (ie. At 1m from the plot boundary of adjacent buildings). A silent-piling technology would be used to drive the piles in order to reduce noise, vibration and hence, disruption to other neighbouring structures.
2. Lateral bracing of sheet piles would be provided to minimize horizontal deflection of sheet piles and hence any significant ground movement would be avoided. To support the bracings, temporary piles would be driven inside the sheet piled area prior to excavation.
3. Excavation of the foundation area and dewatering would be carried out to the required 4m depth.
4. 100mm thick lean concrete would be placed at 4m depth.
5. Bar bending and making of formwork for the foundation beams and slabs would be completed before dewatering in order to reduce the duration of dewatering.
6. Dewatering would be carried out continuously by four pumps each with a pumping capacity of 50litres per second until the concrete is properly set. Ground water during dewatering would be discharged into the sea.

Mohamed Ahsan

Civil Engineer

Appendix 4: Settlement induced damage to neighbouring structures

ArchEng studio

Proposed 15 storey Building at Athireegeaage

Settlement induced damage to existing neighbouring structures

The Geotechnical investigation carried out at the proposed building site revealed that the estimated settlement under the foundation is 50mm which is acceptable for the type of foundation chosen for the building (refer to attached Geotechnical Investigation Report). Since the settlement under the foundation is small and a set-back of 1m would be provided between the plot boundary and the foundation, ground settlement beyond the limits of the boundary would be too small to induce any significant damage to the neighbouring structures. A survey of existing structural damage has been carried out for all buildings that fall within a distance of 20m from the proposed building. This assessment would be used to compare the condition of these buildings for the purpose of monitoring for any additional damage caused due to construction of the proposed building.

Mohamed Ahsan

Civil Engineer

Appendix 5: Letter from Waste Management Section

27/01 2008 14:06 FAX 9603323463 EASTINVEST PVT LTD/MALE' 001

بسم الله الرحمن الرحيم

Waste Management Section
Malé Municipality
Malé, Maldives

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99-F/VST/2008/04

[illegible]
[illegible] F-2008/10 (15 [illegible] 2008) [illegible]
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23 [illegible] 2008 م

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Email: admin@wms.gov.mv [illegible] 3323859 [illegible] 3313801

Appendix 6: Letters from STELCO

20/01 2008 17:16 FAX 9603323463 EASTINVEST PVT LTD/MALE' 002

AAGE HOTELS

ކުރިން ތާވަލަށް ތާރީޚަކަށް ތަކުރާރުކޮށް ދަންނަވަން ބޭނުންވެއްޖެ.

ފުރާނ ހަވާލުކުރުމަށް ތަންދައްކަވައިދޭ.

ތިރީ ނަންބަރުގެ 6-E/MIS/2008/33 ލަވައާ ހަވާލުކުރާ ކަމަށް ވާ
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ތިލައިގެންވާ ގޮތުގައި ކަންތައް ކުރުމަށް ދަންނަވަ.

15 ފެބްރުވަރީ 2008
07 ފަގުނާ 1429

ވަފާތެރިކަމާ ދެކޮޅަށް

AAGE HOTELS PVT LTD MALDIVES

ތާރީ ސަލާ

ސްޓޭފް ތަންދައްކަވައިދޭ ކަމަށް
ފަ
ތިލައިދިން

Aage Hotels Pvt. Ltd., 2nd Floor, West Wing # 02-04, Aage, 12, Boduthakurufaanu Magu, Male 20094, Republic of Maldives
Tel: +960 3322719, +960 3320850 Fax: +960 3323463, Email: admin@aage.com, Website: www.aagehotels.com

20/01 2008 17:16 FAX 9603323463 EASTINVEST PVT LTD/MALE' 003
20/01/08 16:56 STELCO → 9603323463 NO. 210 001

بسم الله الرحمن الرحيم

STELCO
STATE ELECTRIC COMPANY LIMITED

ސްޓޭޓް ޢިލެކްޓްރިކް ކުންފުނި ލިމިޓެޑް
STATE ELECTRIC COMPANY LTD

ތިލަފުށި ސަބްސްޓޭޝަން ކޮމްޕްލެކްސް

6-E/MIS/2008/32 ނަންބަރު

ތާއީދު ކުރެވޭ ފަދަ ކުންފުނިތަކުން ހުށަހަޅާ ތަންތަނުގައި ތަކެތި ވިއްކުމަށް ދެވޭ ހުއްދަ
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15 ފެބްރުއަރީ 2008 ވަނަ ހުކުރު ކައުންސިލްގެ ކޮންފަރެންސް ރޫމުގައި ބޭއްވި
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ކައުންސިލްގެ ނަންބަރު 6-E/MIS/2008/33 (15 ފެބްރުއަރީ 2008) ގެ ދަށުން
ކައުންސިލްގެ ތަންތަނުގައި ތަކެތި ވިއްކުމަށް ދެވޭ ހުއްދަ ފާސްކުރުމަށް ގެނައި
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ތަކެތި ވިއްކުމަށް ދެވޭ ހުއްދަ ދެއްވާ ގޮތުގެ ތެރެއިން،
1429 ދުއްވަނަ 12
2008 ފެބްރުއަރީ 20

ކ. ދ.

ތާއީދު ކުރެވޭ ފަދަ ކުންފުނިތަކުން
ތ.ތ.
ތިލަފުށި

AMEENEE MAGU, P.O.BOX 2184, MALE', 20349, REPUBLIC OF MALDIVES. REG/1597/03 TEL:(960) 332 0089 FAX:(960) 332 0087

Appendix 7: Letter from MWSC

08/01 2008 15:35 FAX 9603323463 EASTINVEST PVT LTD/MALE' 001/001

MALE' WATER & SEWERAGE COMPANY PVT. LTD.
5th floor, Fen Building
Ameenee Magu, P.O.Box: 2148
Male', 20375, Republic of Maldives
Tel: (+960)3323209, Fax: (+960)3324306
E-mail: malk@mwsc.com.mv
Web site: www.mwsc.com.mv
Reg. No. C-47/96

MWSC-70/2008/0126

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6 ޖެނުއަރީ 2008

156 ،101.26 ،14 ،10 ،5% - 10%

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08 2008

Appendix 8: Commitment Letter

11/03 2008 12:15 FAX 9603323463 EASTINVEST PVT LTD/MALE 001

AAGE HOTELS

AH/MISC/ 008/01
March 11, 2008

Mr. Ahmed Saleem
Director General
Environment Research Centre
Male'

Dear Mr. Saleem,

SUB: COMMITMENT TO UNDERTAKE THE ENVIRONEMTAL MONITORING PROGRAMME

Reference is made to the proposed development of a 14-storey hotel at H. Athireegeaage by Aage Hotels.

Hence, we would like to confirm our commitment to the proposed monitoring programme highlighted in the EIA report that has been specifically prepared for the development of the Aage Hotels at H. Athireegeaage.

Thanking you,

Yours faithfully,

AAGE HOTELS PVT LTD MALDIVES

Mohamed Haleem
Director

Aage Hotels Pvt. Ltd., 2nd Floor, West Wing # 02-04, Aage, 12 Boduthakurufaanu Magu, Male' 20094, Republic of Maldives
T: +960 3322719, +960 3320850 Fax: +960 3323463, Email: admin@aage.com, Website: www.aagehotels.com

Appendix 9: Declaration of the consultants

This EIA has been prepared according to the EIA Regulations 2007, issued by the Ministry of Environment, Energy and Water. The EIA was carried out by a multidisciplinary consulting team representing Water Solutions Private Ltd.

We certify that the statements in this Environmental Impact Assessment study are true, complete and correct to best of our knowledge and our abilities.

Name: Abdul Aleem (EIA 09/07)

Signature:

Date:

Name: Ahmed Jameel (EIA 07/07)

Signature:

Date:

Name: Ahmed Zahid (EIA 08/07)

Signature:

Date:

Name: Hassan Shah (EIAT 02/07)

Signature:

Date:

Appendix 10: CV's of unregistered consultants

Aminath Latheefa, +(960) 7788608

Education

- Masters in Sustainable Development, The University of Staffordshire (Sep 2005, UK)
- Masters of Applied Science in Natural Resource Management, The University of James Cook (2002 – 2004 , Australia ,Townsville)
- Bachelor of Business major in Economics, The University of Edith Cowan (Jan 1994 – 1996 Dec, Perth Western, Australia)
- Diploma In Statistics, The Institute of Indian Statistical (1987–1988, Calcutta, India)

Professional Training

- Certificate in Damage and loss Estimation for Risk Management 2005 Thailand, Bangkok (5 days)
- Certificate in Public Management: course on National Economic Management (Malaysia 1999) 12days
- Certificate in General Statistics (Tokyo, Japan 1989-1990) 6 months
- Certificate on Extension Methodology and the Socio – Economic aspects of small

Projects Undertaken

September 2007 Socio economic Assessment towards the establishment of sewerage system in Ga Vilingili, Gdh Gadhdhoo and Gdh Dhaandhoo (prepared for Riyan Design Pvt Ltd in collaboration with Cardno, Australia), January 2007 Social Impact Assessment of establishing sewerage system in Ugoofaaru Island in Thaa Atoll (prepared for Water Solutions Pvt Ltd), January 2007 Social Impact Assessment of establishing a sewerage system in Manadhoo in Thaa Atoll (prepared for Water Solutions Pvt Ltd), December 2006 Social Impact Assessment of Naridhoo (Water Solutions Pvt Ltd), September 2006 Social Impact Assessment of Post Tsunmai Reconstruction of Vilufushi Island in Thaa Atoll (prepared for Boskalis International, Netherlands), July 2005 Benefit Monitoring and Evaluation (BME) of the Regional Development Project, Phase 1 (prepared for Ministry of Planning and Development), Latheefa. A. Dec 2003 A review of Addu Atolls fishery, Marine Research Bulletin, Marine Research Centre, Male Maldives, May 2003. Southern Atolls Development Project Evaluation prepared for Ministry of Finance and Treasury, January 2003.Evaluation of the Regional Seminars on Reproductive health held for sport Managers of R, K, AU and M atoll under the advocacy program of "Population and Reproductive Health Advocacy Aimed at Influential Groups" project implemented by the Ministry of Atolls Administration. (Prepared for the AXE private limited), Maniku. M.H., Faiz, M. Zahir, H & Latheefa. (2000)A, Study on the Feasibility of Establishing Sustainable Income Generating Activities by the Production and Marketing of Local Products, -Southern Atolls Development Project (prepared for the for the Ministry of Atolls Administration), Maniku. M.H., Faiz, M. Zahir, H & Latheefa.(2000).A, Study on the Feasibility of Establishing Sustainable Income Generating Activities by the Production and Marketing of Handicraft Items , -Southern Atolls Development Project (prepared for the for the Ministry of Atolls Administration), Maniku. M.H., Faiz, M. Zahir, H & Latheefa.(2000).A, Study on the Feasibility of Establishing Health Services, -Southern Atolls Development Project. (prepared for the Ministry of Atolls Administration), Latheefa. A., Uphadhaya, S. (1999) Tourism Expenditure Survey 1997 Research Paper prepared under the National Accounts Project of the Ministry of Planning and Development, Latheefa. (1997) Koodoo Cold Store Impact Survey, Ministry of Fisheries, Agriculture and Marine Resources, Latheefa, A.(1997) Fisheries Management System. Ministry of Fisheries Agriculture and Marine Resources. Paper presented to the BOBP Workshop on Precautionary Approach to Fisheries Management, Medan Indonesia February 1997

Hashim. A., Latheefa, A. Parry, G., (1994) Koodoo Cold Store Baseline Survey. Ministry of Fisheries Agriculture and Marine Resources