INITIAL ENVIRONMENTAL EXAMINATION

For Development of
11 Storey Building at H. Feyruvaadhee

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2011

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Executive Summary

This Initial Environment Examination is an evaluation of the potential environmental, socio-economic and natural impacts for the development of an 11 storey hotel at H. Feyru Vaadhee. This Initial Environmental Examination is 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 development at H. Feyru Vadhee, 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.

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

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

Chapter 1

Introduction

1.1 Background, Project Need and Justification

This report is an Initial Environmental Examination for the proposed 11 storey building with a basement parking at H. Feyru Vadhee, Male'. This document has been produced to fulfill the requirements under Article 5 of the Environment Protection and Preservation Act (4/93) of the Maldives and has been structured to meet the requirements of the EIA Regulations 2007.

The proposed project site has an area of 123.65$m^{2.}$ The objective of the project is to increase land available for commercial purposes in Male. The project will also improve living standards and create opportunities for income for the family.

1.2 Structure of the EIA

The structure of this report conforms to the necessary provisions of the Environmental Impact Assessment Regulation 2007, which is outlined below;

- Information about the existing baseline environmental conditions of the site
- An assessment of the potential impacts during both construction and operational stages
- Identification of the potential mitigation measures to prevent or reduce significant negative impacts during these phases
- Assessment of alternatives and
- Details of the environmental monitoring plan.

1.3 Terms of Reference

The terms of reference for this IEE have been attached as an annex in Appendix A. This EIA has been prepared based on these terms of reference.

1.4 EIA Team Members

Team members of this EIA are:

- Miruza Mohamed (EIA Registration No: EIA 01/10)
- Ali Shareef (Climatologist)
- Ahmed Ali (Energy Engineer)
- Hussain Lirar (Civil Engineer)
- Zammath Khaleel (Environmental Analyst)

Chapter 2

Policy, Legal and Administrative Framework

2.1 Overview

This section outlines the relevant environmental legislations that have to be respected in carrying out the proposed development.

2.2 Applicable Policies Laws and Regulations

2.2.1 Environmental Protection and Preservation Act

According to Article 5.(a) of the Environmental Protection and Preservation Act (Law No. 4/93) an Environment Impact Assessment study shall be submitted to the Ministry of Housing and Environment before implementing any development that may have a potential impact on the environment.

2.2.2 Regulation on sand and aggregate mining

This regulation addresses sand mining from uninhabited islands that have been leased; sand mining from the coastal zone of other uninhabited islands; and aggregate mining from uninhabited islands that have been leased and from the coastal zone of other uninhabited islands.

This regulation would not have any implication on the project as sand and aggregate mining will not be carried for this project.

2.2.3 Environmental Impact Assessment Regulation 2007

New EIA regulations were issued by the Ministry of Housing and Environment on May 2007, which guides the process of undertaking the Environmental Impact Assessment in the Maldives.

This guideline outlines every step of the IEE/EIA process including the roles and responsibilities of the consultants and the proponents. This report adheres to the guidance provided in this Regulation.

2.2.4 The Land Act

The Land Law of the Maldives which was passed in 2002 deals with issues of land in the Maldives. The Land Law concerned with identifying the lands of Maldives for different

purposes and uses, allocating such land, allocating government owned land for living, government land allocated for living, owning and using private land, selling, conveyance, leasing lands and other related matters. The law stipulates that except for trees and coconut palms owned by person, all other natural resources in the ground, gold, silver, jewellery, money, artefacts found during excavation of the Maldivian soil, and all metal found in the Maldivian soil are government property. The law also states that soil excavated from the plot can been distributed or sold with the approval of the 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.

2.2.5 Regulation on the Construction of Buildings in Malé

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

2.2.6 Montreal Protocol on Substances that Deplete the Ozone layer

Maldives is a party to the Vienna Convention and the Montreal Protocol on Substances that Deplete the Ozone Layer. Maldives is classified as an Article 5 country of the Montreal Protocol, and has ratified all the amendments, including London, Copenhagen, Montreal and Beijing Amendments. The upgrade and redevelopment considers the Maldives commitment to the implementation of the Montreal Protocol on Substances that deplete the Ozone Layer. The accelerated HCFC phase-out schedule for Maldives is given Table 1. Hence, the new infrastructure that would be added for the development in the area of cooling and refrigeration systems would comply with the national requirements that has been outlined and communicated by the Ministry of Tourism,.

Table 1: HCFC phase-out schedule.

Control measure	Schedule
Baseline	Average 2009-2010 consumption
Freeze at baseline level	2011
10 % reduction	2013
20% reduction	2015
35% reduction	2016
67.5 % reduction	2018
100 % reduction	2020 except 2.5% for servicing use until: 2025

Chapter 3

Project Description

3.1 Project Proponent

This project is proposed by Mr.Ismail Waheed, H.Feyru Vaadhee

3.2 Location and Study Area

The project site is located at H. Feyru Vaadhee as shown in Figure 1. The proposed project site has an area of 123.65m^2.

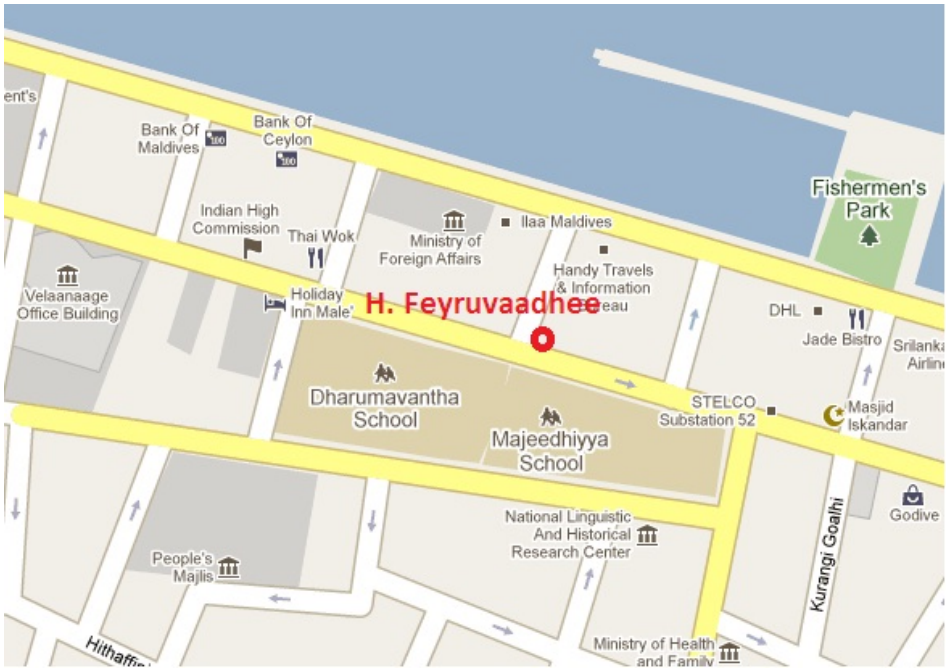

Figure 1: Location of the Project site.

Figure 2: Front view of the project site.

3.3 Project Duration and Schedule

The project is expected to commence as soon as EIA clearance is sought and will be completed within 24 months.

3.4 Existing Site Conditions

- Part of the site has been already demolished except for a two storey building of approximately 60m^2.

- The boundary walls are intact with a steel gate on the corner facing Ameeru Ahmed Magu.
- The Figure 2 shows the existing condition of the site.

3.5 Work Methodology

The following description attempts to capture the work methodology of the sub-structures that would have the highest impact on the environmental setting of the locality.

3.5.1 Decision on type of foundation:

Based on the assessments carried out on the project site, a raft foundation was found to be the most suitable type of foundation for the building .The raft foundation will be laid at 1.2 m depth. Excavation for this building will be done in stepped vertical units, and be propped with filled masonry blocks with a 300mm toe below the excavation level. This propped masonry blocks will be properly braced and fixed against movements by providing a GI pipe structure on all sides.

3.5.2 Depth of the foundation:

Based on the previous load testing at various localities in Male', the bearing capacity requirement is achieved at about 1.60 - 1.80 m depth with adequate soil stabilization in the form of layered compaction. This is employed after removal of garbage and other deleterious substance that may not withstand long-term pressure. For a raft foundation, as is designed for this structure, no unappreciable settlement is anticipated. Should any event of a physical soil disturbance leads to settlement; it will be of uniform settlement that will have the least impact on the structural stability.

3.5.3 Site Preparation:

All existing infrastructure at the site will be demolished and cleared for excavation. In order to lay the raft foundation site will be excavated to 1.2m depth. Since there are number of buildings adjacent to the project site, proper measures have to be taken to avoid any adverse affect during excavation. Therefore, retention structure to prevent collapse of soil is required. In addition to this precautionary notices and adequate lighting will be in place to minimize any likely incidences. Adequate site security will also be in place to prevent unauthorized access.

3.5.4 Trial pit examination:

The ground conditions from a trial pit dug at the proposed site revealed that the top layer (300mm) consisted of black sand followed by uniform sand layer (white coral sand) down

to the proposed foundation level 1.5m. No garbage has been observed and the water table is at 1300m.

3.5.5 Dewatering process:

Dewatering will remove ground water from construction site allowing construction to be conducted in dry environment. It is necessary to do dewatering before substructure works are started. For dewatering series of sumps will be placed at predetermined locations allowing water to be drawn continuously from water table. Due to high salt quality of water the ground water removed cannot be disposed in to the ground. It has to be disposed into drainage. Dewatering will continue till sub-structure works are completed. Possible impacts which might occur due to the process of dewatering are:

- Increased noise level due to the continuous operation of generators to operate dewatering pumps.
- Partial loss of stability and subsequent settlement due to loss of fines from the soil medium.
- Water shortage due to dewatering at nearby wells.

3.5.6 Lean concrete and base preparation:

In the process of dewatering layered compaction and removal of loose patches has to be carried out to allow pouring of concrete for lean concrete base. Enough time has to be given for this layer to be hardened enough for the workers to perform their activities for the purpose of casting.

3.5.7 Mobilization of mechanical equipments:

The project site being not large enough to accommodate materials stockpiled for concrete mixing some of the materials have to be stocked outside the project site. These stocks and heavy vehicles that are required to be used during construction would cause inconvenience for the traffic and pedestrians. To minimize the inconvenience, proper measures such as road blocks could be used to re-route the traffic.

3.5.8 Casting of concrete:

To prevent ingress of water through capillaries formed within the concrete matrix during its hardening stage proper admixtures in their correct proportions in the concrete mix will be used. The engineer would exercise caution to ensure this material does not adversely affect the water table. The management team would work in coordination with the contractor to maximize the concrete production potential of the Contractor and achieve smooth continuity during casing time. This is to ensure that the work consumes less time. Proper planning and care has to be taken to avoid the inconvenience caused to common public due to the long hours required for the concrete pouring.

3.5.9 Backfilling of site:

Once the foundation casting and column stumps are completed, adequate form of concrete surface treatment will be given prior to backfilling. For the backfilling purposes excavated materials will be used. As a near-thorough segregation of contaminated soil would be in place from the first excavation date, the suitable back-filling material will be reused and the contaminated soil disposed. This would also contribute to remediating the soil condition in the long run.

3.6 Material Specifications and Load Estimations

The main construction materials are:

- Cement BS12 (ordinary Portlant cement); Coarse sand Gr 1; Coarse aggregate Gr 1;
- Mild steel round bars BS4449 (6mm steel); and High tensile reinforced steel bars BS4461 (10mm, 12mm, 16mm, 20mm)
- High tensile reinforced steel bars BS4461 (10mm, 12mm, 16mm, 20mm)

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.

Load estimation are as follows.

- Estimated final settlement of the depth = 65mm.
- Dead Load = 12.5 KN/m^2
- Live Load
- Apartments = 2.0 KN/m^2
- Shop = 5.0 KN/m^2

3.7 Emergency Power System

The power demand for the proposed building was considered an important factor. Thus an estimate was made for power requirements of the building as shown in the Table 2.

Table 2 : Estimated Power Demand

Item#	Power Demand / (kVA)
Basement floor	2.58
Ground Floor	49.59
First Floor	12.05
Second to Ninth Floor	21.59
Terrace	9.99
Emergency services	54.15
Total	**149.95**

The primary power source would be from the STELCO grid. In case of power failure from STELCO, an emergency power system will be installed to provide emergency services within the building. The emergency power would be provided by a Yanmar Silent diesel generator. The specification of the proposed generator is provided in Table 3.

Table 3 : Generator Specification

Generator Specifications	
Model #	YW-56T5
Frequency	50Hz
Standby rating (KVA/KW)	61.9 / 49.5
Voltage	240V/230V
Power Factor	0.8
Cooling Method	Open/Closed circle Water-cooled
Specific Fuel Consumption	11.85 L/h
Operating Noise Level	75dB
Dimensions (mm)	2500×1050×1700
Weight (kg)	1400

The generator will be accompanied by a 200 litre capacity storage tank. With this capacity, the generator could be operated for continuous 8 hours with no disturbance during an emergency. The generator set is placed at the basement floor and connected to the distribution panel. The allocated place for the generator set is shown in Figure 3.

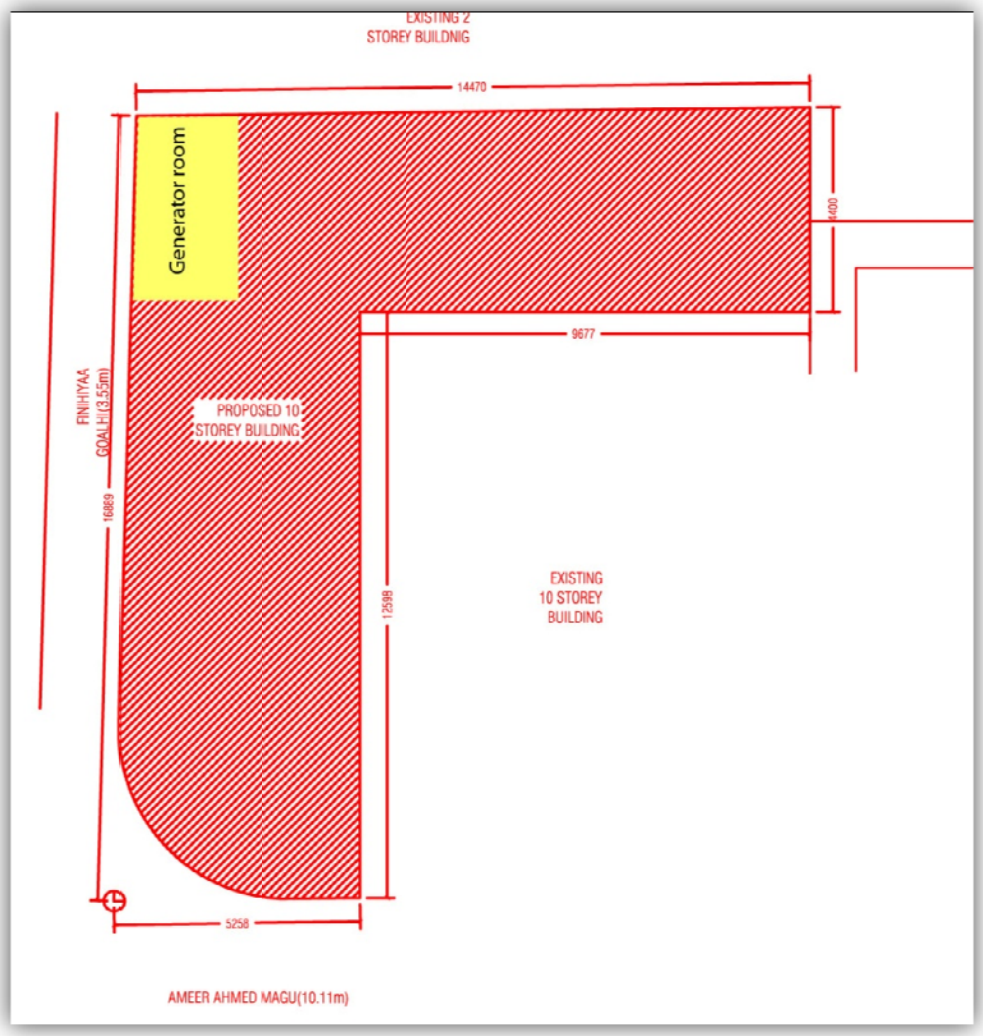

Figure 3: Location of the Emergency generator.

3.8 Project Inputs and Outputs

3.8.1 Project Inputs

The types of materials that will go into the development and from where and how this will be obtained are given in Table 4.

Table 4: Major Inputs

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

3.8.2 Project Outputs

The major output of the project is an 11 storey hotel building with 32 guest rooms, Office, reception, meeting rooms, Kitchen and car parking. Major outputs are summarized in Table 5.

Table 5: Major Outputs

Products and waste Materials	Anticipated quantities	Method of disposal
Construction waste	10 cubic meters	Transferred to Male' waste yard
Waste oil	Small quantities	Contained and transferred to Male' waste yard
Hazardous waste (diesel)	Small quantities	Contained and transferred to Male' waste yard
Noise	Only localized	Consideration will be given to minimize the noise level and works will be arranged in such a way to minimize the works during night and school hours.

Chapter 4

Existing Environment

4.1 Introduction

This section covers the information regarding the existing environmental conditions for the proposed project site. It provides a brief outline of the methodology adopted in data collection, information about the physical and human environment. The physical environment consists of assessment of ground water conditions and an observation of the buildings in proximity (30 m radius) of the projects site. Factors such as traffic condition and the noise levels are considered to be human affecting environment.

4.2 Methodology

Sound levels were measured within a 30 m radius of the project site. Locations of the positions where sound were measured were taken by a hand held GPS. Since there was a water well which is already in use, ground water samples were collected from this well. Water samples were taken to the Maldives Food and Drug Authority laboratory to test the quality of the water. Traffic was counted for duration of 1 hour and the time of observation was around 11 am on a Saturday.

4.3 Groundwater

Ground water samples were collected on 24 April 2011. The water quality test results provided by the laboratory are presented in Table 6 (Full report is attached in Appendix C) and WHO standard levels have been shown for reference.

Table 6: Water quality test results.

Parameter	Result	WHO reference
Physical Appearance	Pale yellow with suspended particles	
Temperature	27.6°C	
pH	9.3	6.5-8.5
Color, Apparent	71 mg/L	
Electrical Conductivity	7290 µs/cm	< 1500 mg/L
Turbidity	9 NTU	< 5 NTU
Salinity	3900 mg/L	< 500 mg/L
Iron (Total)	0.37 mg/L	
Oxygen Demand, Biological (BOD)	22 mg/L	

The results show that the ground water is Electrical Conductivity (EC) is 7290 µs/cm with a turbidity of 9 NTU and a salinity of 3900 mg/L. With reference to the WHO standards of the water quality, it could be concluded that the water at the site should not be used for domestic purposes.

4.4 Buildings in the vicinity

Buildings within a 30 m radius from the project site were observed. Figure 4 shows the location of the project site and the buildings within the 30 m radius. The project vicinity consists of a mixture of residential, commercial and social infrastructure. Main buildings of concern during construction are the two schools, Dharumanvantha and Majeedhiyaa School as these two schools are on the opposite side of the road of the project location. However, should a road or traffic block be required for construction, this could be carried out during weekends to minimize the inconvenience due to construction work.

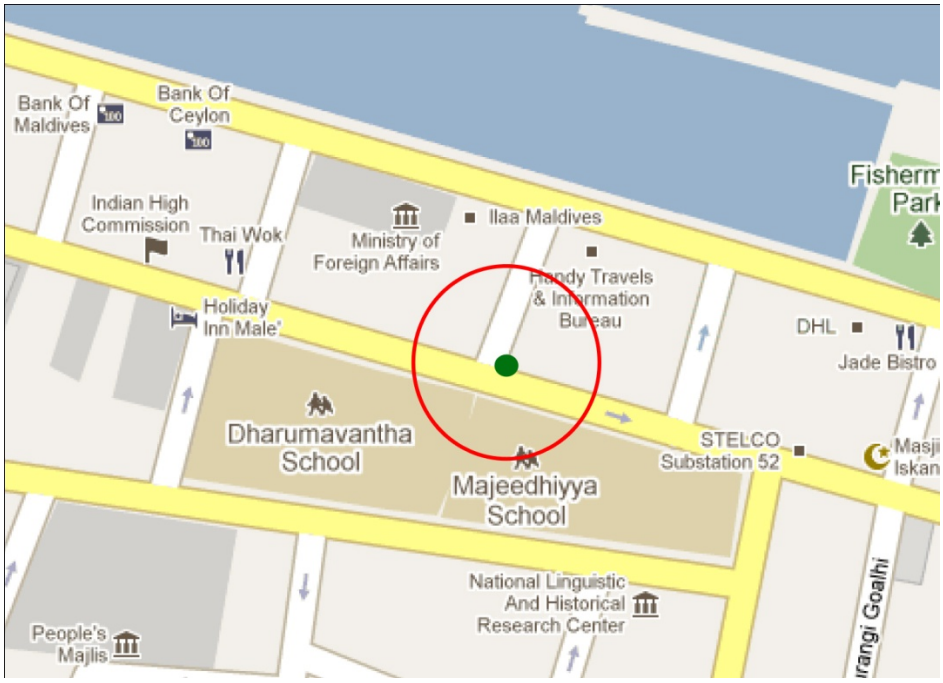

Figure 4: Location of the project site (green) and the 30 m radius (red) with main surrounding land marks.

A trial pit was dug to assess the soil condition. The results showed that the top layer (300 mm) consist of black sand and underneath is a uniform layer of white coral sand down to the depth of the proposed foundation of 1.5 m. There was no garbage found within the soil layers. Since the water table is shallow and the proposed depth for the foundation is below, de-watering will be required.

4.5 Human Environment

4.5.1 Traffic

The traffic was counted for duration of 1 hour. It was counted in front of the project site. Since this was a Saturday the amount of traffic observed was significantly less than that would be during a week day. As there are two schools on the opposite side of the project location, significant amount of traffic on the road would be expected during the week days during the starting and finishing hours of school sessions.

During the construction phase, use of heavy vehicles in the vicinity of the project site would be more. This would cause inconvenience for the traffic and pedestrians. To minimize the inconvenience, proper measures such as road blocks could be used to re-route the traffic.

4.5.2 Noise

Noise level was monitored using a hand held device. It measures the ambient noise which is always present. Since this is a residential area, the environmental noise composes of noise from transport, construction and human. The largest contribution comes from the transport. Noise levels were measured during the day time at 1100 AM. The average noise level measured is 65 dBA. Since there is no standard for noise levels in Maldives, noise levels in OECD countries are used for a reference. Table 7 shows the noise levels observed in most of the OECD countries. Comparing these noise levels to that measured in the field, it could be concluded that the noise level at the project site is more representative of mixed residential area. The observed sound level could be slightly higher during the use of heavy vehicles during the construction period for a limited number of hours.

Table 7: Standard noise levels in OECD countries.

Category of Area	Limits in dB (A)	
	Day Time	Night Times
	(6 am – 9pm)	(9 pm – 6am)
Industrial area	75	70
Commercial area	65	55
Mixed residential areas	60	45
Residential area	55	45
Silence Zone	50	40

Chapter 5

Environmental Impacts & Mitigation Measures

5.1 Introduction

This section covers the potential environmental impacts (positive and negative) which could be associated with the proposed project. It also describes the mitigation measures which could be undertaken to minimize the impacts. Impact identification and mitigation measures are based on literature reviews, professional judgment and past experience from similar projects.

The environmental impacts of the project would be upon or due to the following elements of the project. A summary of the potential impacts is shown in Table 8.

- Site preparation
- Laying of the raft foundation of the building
- Construction of the building

Table 8: Summary of the potential impacts.

Site preparation

Impact	Nature	Duration	Magnitude	Significance	Mitigation Cost (USD)
Loss of vegetation	N/A	N/A	N/A	N/A	N/A
Loss of top soil	Direct	Long term	Minor	Insignificant	N/A
Generation of waste	Direct	Short term	Moderate	Insignificant	200

Laying of Raft Foundation

Impact	Nature	Duration	Magnitude	Significance	Mitigation Cost (USD)
Loss of groundwater	Direct	Long term	Moderate	Significant	1000 (if complained by neighbour)
Generation of waste	Direct	Short term	Moderate	Significant	100

Construction of the building

Impact	Nature	Duration	Magnitude	Significance	Mitigation Cost (USD)
Generation of waste	Direct	Short term	Moderate	Significant	200
Noise pollution	Direct	Short-term (during project only)	Minor	Significant during construction	N/A
Air pollution	Direct	Long term	Moderate	Insignificant	N/A
Disruption to traffic and availability of parking space	Indirect	Short term (during project only)	Minor	Insignificant	N/A

5.2 Impact Identification and Mitigation Measures

Following sections provide the details of potential environmental impacts and its associated mitigation measures which could be undertaken to minimize the environmental impacts due to the proposed project.

5.2.1 Loss of Vegetation and Soil

The site does not have any vegetation to be cleared since there was an infrastructure at the location before it was demolished and there was no vegetation there before. The soil test revealed that it was white coral and sand is the dominant types.

Mitigation measure

Loss of sand is unavoidable and impact due to soil loss is insignificant. No mitigation measures have to be considered.

5.2.2 Loss of Ground Water

Laboratory tests revealed that the ground water at the site is not safe for domestic purposes. Since the site would be de-watered, there is possibility of water draining out from wells within the neighbourhood. Furthermore, de-watering can introduce saline water into the water table and this could have an effect on the vegetation within the vicinity.

Mitigation measure

De-watering would be planned during the low tides and would be carried out in the shortest time possible. Trees within the vicinity will be watered to minimize the effect due to introduction of saline water into the water lens. Furthermore, the client would be responsible for the valid complaints of water loss from the neighbours.

5.2.3 Waste Generation

Construction projects produce a large amount of waste. The quantity of waste generated depends on various factors such as type, quality and contractor to mention a few. Possible type of waste generated could be wood, concrete, metal, brick plastic etc... If the waste is not managed properly, this could be of nuisance to the neighbourhood.

Mitigation measure

Reusable construction materials would be isolated with much effort as possible. Collected waste would be carried to the dump yard on a regular basis. A cleanup of the adjoining roads would be carried at the end of each day and adequate number and capacity of vehicles for removal would be maintained.

5.2.4 Noise Pollution

Operation of machineries and activities of foundation lying will generate considerable noise within the vicinity of the project site. However, noise related to construction would there be for a temporary duration. The noise level measured at the site is representative of that in an industrial area. This is considered high for the project site where two schools are located.

The emergency generator is an electronic fuel system and is built with a special noise elimination setting and the operating noise level is 75 dB within 7 meters. With the built-in special sound filter of the generator, any impact from the sound would be negligible.

Mitigation measure

All the machineries used on site would be properly maintained to prevent unnecessary noise. The workers operating the machines would be wearing the proper protection gears. During the construction phase, work would be scheduled for the use of heavy vehicles (e.g. casting of slabs and beams could be carried out during the weekends to minimize noise impact on schools).

5.2.5 Air Pollution

Land clearing, demolition, operation of diesel engines and use of toxic materials are some of the major activities that could lead to air pollution during construction. Dust from cement, wood and aggregates are considered to be PM10 or particulate matter less than 10 microns. This could be carried to long distances and is harmful for humans causing respiratory disease.

Another type of PM10 is exhausted from the use of diesel known as diesel particulate matter (DPM). Use of diesel machines can exhaust toxic gases such as carbon monoxide, hydrocarbons, nitrous oxides and carbon dioxide. Noxious vapours from oils, glues, thinners, paints, treated woods, plastics, cleaners and other hazardous chemicals that are widely used on construction sites, also contribute to air pollution.

Mitigation measures

The amount of dust released could be minimized by spraying water to dampen the site. Dust sources will be screened by placing fine mesh over them. Other materials which could cause air pollution would be used covered and dampened down with use of water.

5.2.6 Traffic and Parking

During week days and especially during school days Ameeru Ahmed Magu has a heavy traffic. Parking spaces available on this road around the vicinity of the project site is almost fully utilized during the week days. Therefore management of traffic during construction would be crucial. During peak construction days such as casting of columns and slabs, the traffic flow have to be managed as Ameeru Ahmed Magu in front of project site is a one way.

Mitigation measure

During heavy construction days (e.g. casting of slabs and columns) traffic flow would have to be diverted and should be carried during weekends. Proper permission should have to be obtained from the City Council office with enough lead time. With the diversion of the traffic, it is not expected to have major impact on the traffic although it might cause some inconvenience.

Chapter 6

Stakeholder Consultations

6.1 Consultation with the Proponent

The consultation with the proponent was done at the site visit. The proponent outlined his purpose for the building after completion of the project. His need for the building and the urgency to start the project was expressed in the discussions.

6.2 Consultation with EPA

The scoping meeting was held on 17th April 2011 at the Environmental Protection Agency. The main points of discussions are as follows:

- Project description in the IEE Report must provide details on the foundation used.
- The IEE should focus on the construction stage specifically noise levels, road closures, construction waste and inconveniences to public.
- The IEE should consider a radius of 30m from the project site for impact assessment
- Groundwater quality and noise level should be considered in the report. .

6.3 Consultation with Engineers

Consultation with the engineers was done on 19th April 2011. The main points of discussion are as follows:

- The details of the foundation (type, depth) were discussed.
- Expected duration and how the work would be carried out.
- The type of machineries and how those would be utilized was briefed
- Some possible impacts and alternatives of construction methods were discussed.
- Details of the emergency generator to be used were discussed and how the setup and operation would be handled was also discussed.

Chapter 7

Alternatives

7.1 No Project Option

One of the alternatives considered is the no project option. Pros and Cons for this option are discussed. The pro identified is below:

- There will be no environment and social impact arising from the implementation of the project.

The cons identified are below:

- Possible revenue for the proponent after the project is lost
- A piece of land in Male' would be left un-utilized which could collect waste overtime and become environmental and social hazard in the long term.
- The real estate price for the land would drop if the land is left un-used.

7.2 Foundation

An alternative to raft foundation is deep pilling.

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

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

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

activity will also disrupt the commercial atmosphere of the project area. Therefore, deep piling technology may not be socially acceptable to Male'.

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

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

Chapter 8

Environment Management & Monitoring Plan

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

8.1 Objectives of the Monitoring Plan

The main objectives of the monitoring plan are to:

- identify whether the predicted impacts are accurate and mitigation measures taken are effective
- identify any unforeseen impacts so that appropriate mitigation measures can be taken at the earliest
- identify and resolve any issues of social unrest at the earliest
- eliminate or reduce environmental costs

8.2 Aspects of the Monitoring Plan

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

- Ground water condition to be measured once at midpoint of construction phase of construction and once upon completion of the project
- It is recommended to maintain a log of waste generated and disposed at the project site
- Maintain a log of the volume of water pumped out and the velocity/ speed during dewatering process
- Compile a midterm monitoring report and submit to relevant authorities to check compliance.

8.3 Monitoring Report

Based on the data collected, a mid-term monitoring report will be compiled and submitted to the relevant authorities for compliance. This report shall include methodologies and protocols followed for data collection and analysis, quality control measures.

8.4 Commitment by the Proponent

The proponent is fully committed to undertaking the monitoring program outlined in this Chapter (refer **Appendix D** of this report).

Chapter 9

Conclusion and Recommendations

9.1 Conclusions and Recommendations

Mr.Ismail Waheed, is proposing to build a 11 storey hotel at H. Feyru Vaadhee. This Initial Environmental Examination is 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 development at H. Feyru Vadhee, 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 proposed project is expected to increase commercial floor area available in Malé. It is inevitable that there would be some negative environmental impacts, especially when excavation and dewatering is carried out. After a survey and the study undertaken for this IEE, these negative impacts identified are not severe enough to not allow the project. In light of possible impacts assessed, a comprehensive monitoring component has been suggested to monitor environmental (natural and social) impact during the course of this project. This monitoring component will be adhered and will allow the assessment of long term changes, despite the limited nature of the impact. In addition, the socioeconomic impacts that have been assessed have been identified as mostly positive impacts, not just in short term but also in long term. Therefore, in conclusion the proposed project is justified both technically and environmentally in light of the existing socio-economic developments.

9.2 Declaration of the Consultant

This EIA has been prepared according to the EIA Regulations 2007.

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

Name: Miruza Mohamed (EIA Registration No: EIA 01/10)

Reference:

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

Appendix A – Terms of Reference

Environmental Protection Agency

بسم الله الرحمن الرحيم

EPA

Terms of Reference for Initial Environmental Examination

The following is the TOR based on the scoping meeting held on 6th April 2011 for undertaking the IEE of the proposed Development of a Residential Building at H.Faarugasdhoshuge, Male', Maldives.

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

1. *Introduction – Identify the development project to be assessed. Provide background information on the project and its cost, the proponents and their experience with similar projects. Provide an executive summary of the IEE report highlighting important findings from the IEE study.*

2. *Study Area - Submit an A3 size scaled plan with indications of all the proposed infrastructures. Specify the boundaries of the study area for the intial environmental examination highlighting the location and size of all proposed developments. The study area should include adjacent and nearby environmentally important areas (if any) (e.g. coral reef, mangroves, marine protected areas, special birds site, sensitive species nursery and feeding grounds).*

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

***Task 1. Description of the Proposed Project** – Provide a brief description of the proponent, location of the proposed project, how the project will be undertaken and full description of the relevant parts of the project using clearly labeled maps and scaled site plan. Inputs and outputs of the project, a detailed project schedule and life span of the project should be presented.*

Provide details of emergency power generation arrangements in the building. In this respect, provide details of the area of power generator set, number of and capacity of generator sets, height of smoke stack, method of generator sets cooling water discharge outfall if any, details of emissions. Provide a brief description of the existing safety measures in place in case of an emergencies (this shall include the details of availability of fire fighting equipment and measures taken to prevent any spills).

4th Flr Jamaaluddeen Complex
Nikagas Magu
Male', Rep. of Maldives
Tel: 333 5949 / 333 5951
Fax: 333 5953
Email: secretariat@epa.gov.mv
Website: www.epa.gov.mv

Task 2: Description of the Environment *– Present baseline data on the following environmental characteristics:-*

- *Groundwater quality prior to the beginning of construction activities. Parameters shall include physical appearance, salinity, THC and ph.*
- *Noise before construction activities.*
- *Traffic flow in the project site before construction, number and type of vehicles during peak hour.*
- *Social impact arising from construction activities within a 30 metres radius of project site.*

Absence of facility in the country will not exempt the proponent from providing the requested water quality data.

Task 3: Legislative and Regulatory Considerations *– Describe the legislations, regulations, polices, standards and international conventions relevant to the proposed project.*

Task 4: Determine the Potential Impacts of the Proposed Project *– Use a checklist of parameters to identify impacts of significance. Impacts on the physical and human environment shall be explored. Distinguish between significant positive and negative impacts, short term and long term impacts during construction. Identify impacts that are cumulative, unavoidable or irreversible. Identify any information gaps and evaluate their importance for decision making.*

Task 5: Mitigation and Management of Negative Impacts *- Identify possible measures to prevent or reduce significant negative impacts to acceptable levels during construction. Cost of mitigation measures and commitment of the proponent to undertake the mitigation measures should be included.*

Task 6: Analysis of Alternatives to the Proposed Project *– Describe the alternatives examined for the proposed project that would achieve the same objective including the 'no project' alternative.*

Task 7: Environmental Monitoring *– Provide monitoring details for water quality monitoring, noise monitoring (during construction activities and during operational phase noise of the generators) and traffic monitoring during construction. Provide commitment of the propoenent to conduct monitoring and costs associated with it.*
A guideline for monitoring is attached to this ToR (Appendix-1). Relevant components of this ToR must be followed.

Task 8: Stakeholder Consultations *– Provide a list of persons consulted, information on how, when and where the consultations were conducted and a summary of the outcome of the consultations including the main concerns identified.*

4th Flr Jamaaluddeen Complex
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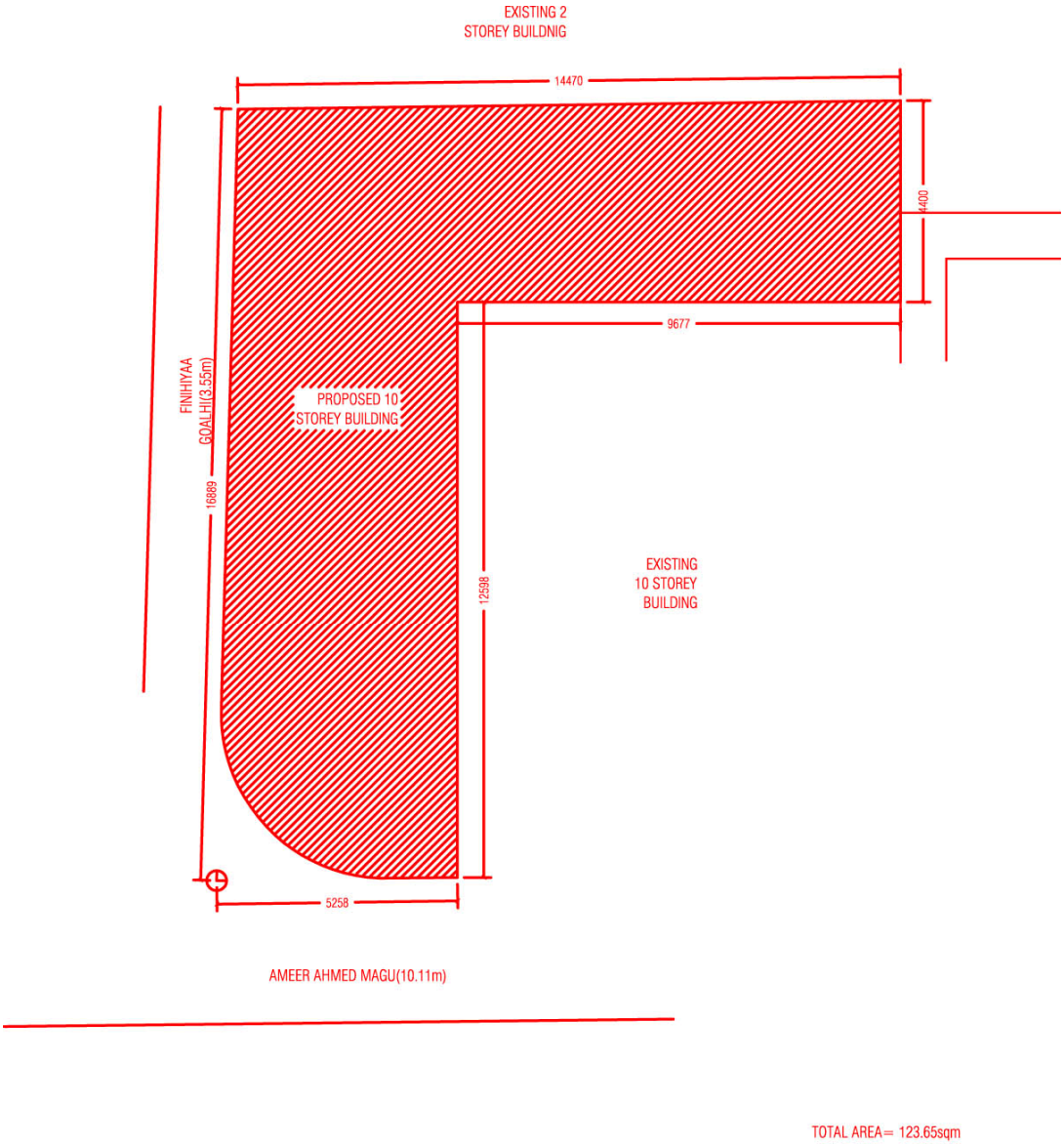
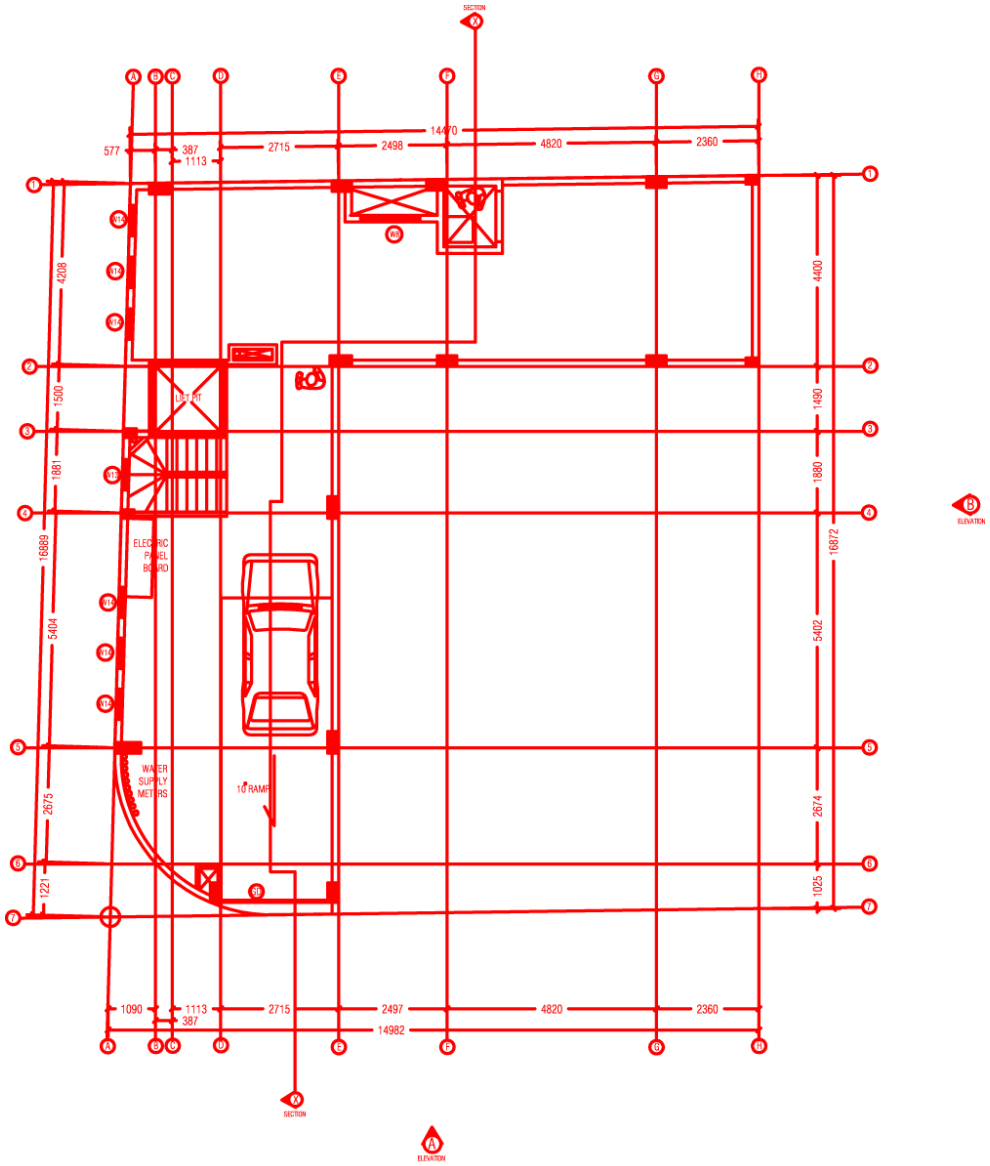
Tel: 333 5949 / 333 5951
Fax: 333 5953
Email: secretariat@epa.gov.mv
Website: www.epa.gov.mv

Appendix B – Layout Plans





* TOTAL AREA SHOULD BE WATERPROOFING CHEMICAL APPLIED

BASEMENT

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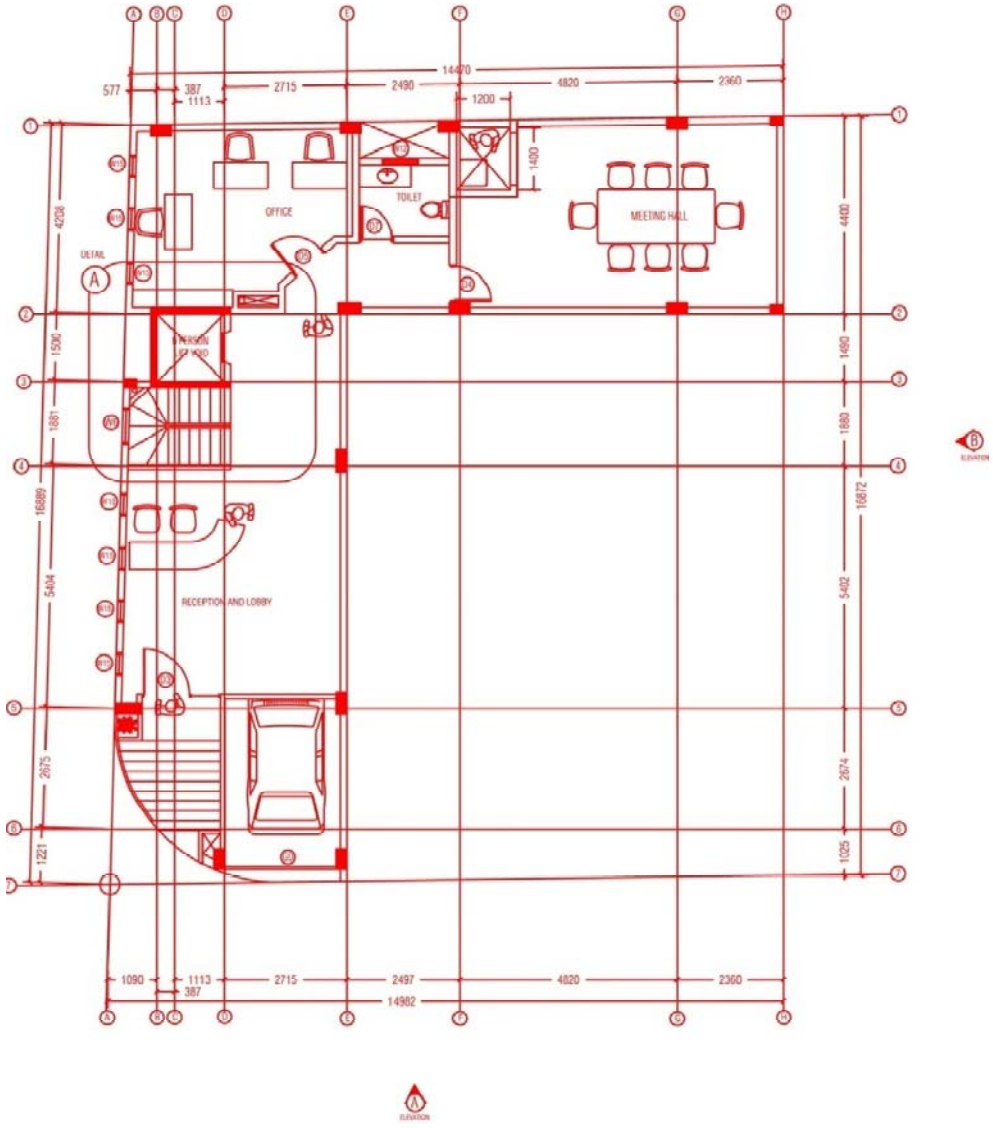

LEVEL – A

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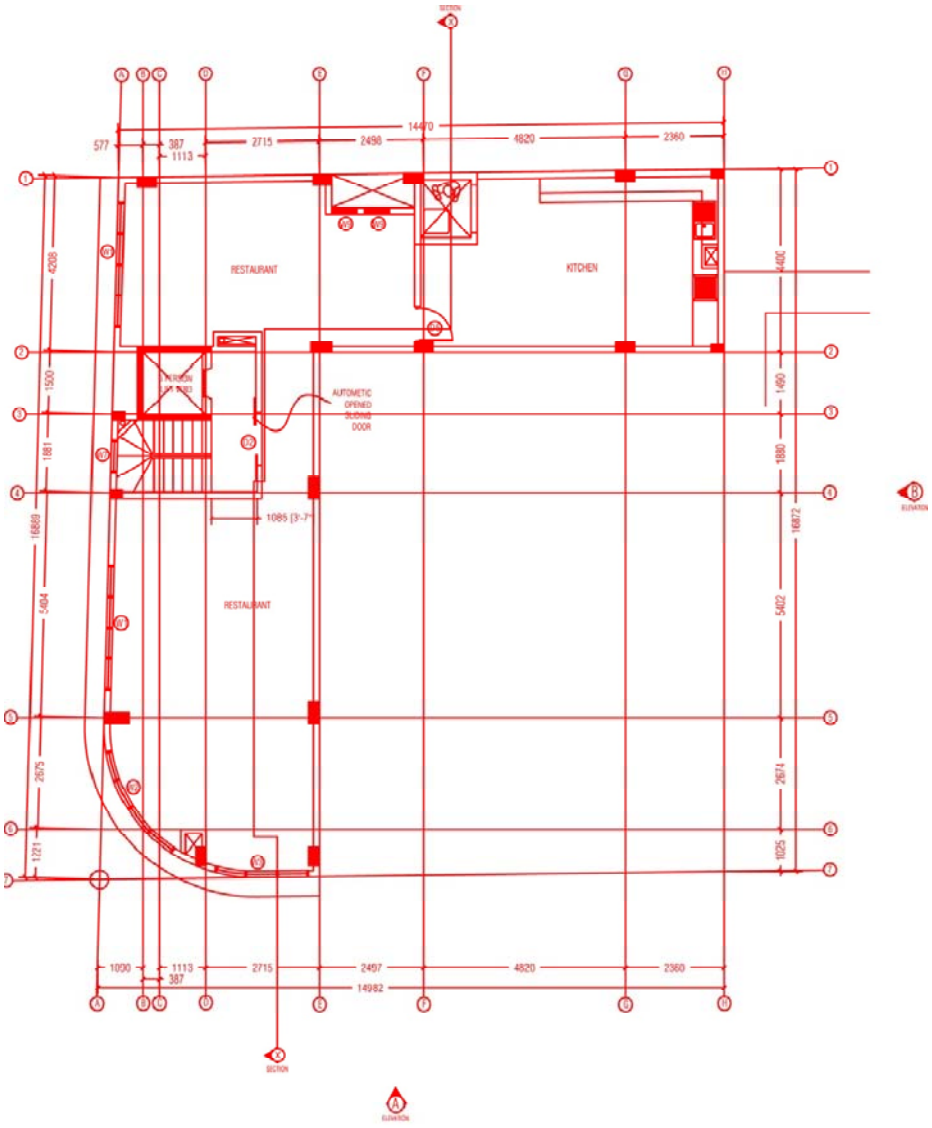
RESTAURANT
KITCHEN
AUTOMETIC OPENED SLIDING DOOR
RESTAURANT
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1113
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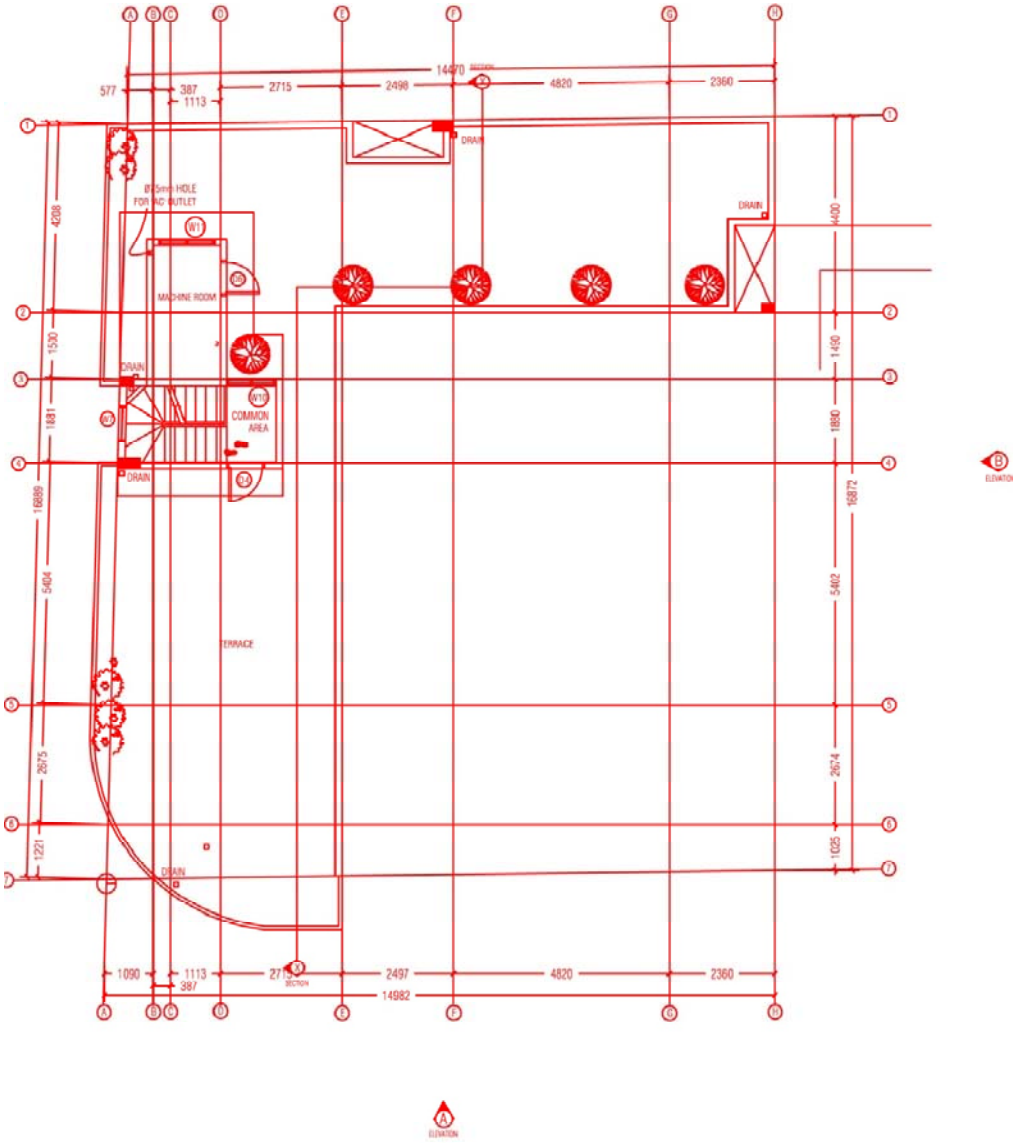
4820
2360
1000
2457
14982
1085 [3'-7"]

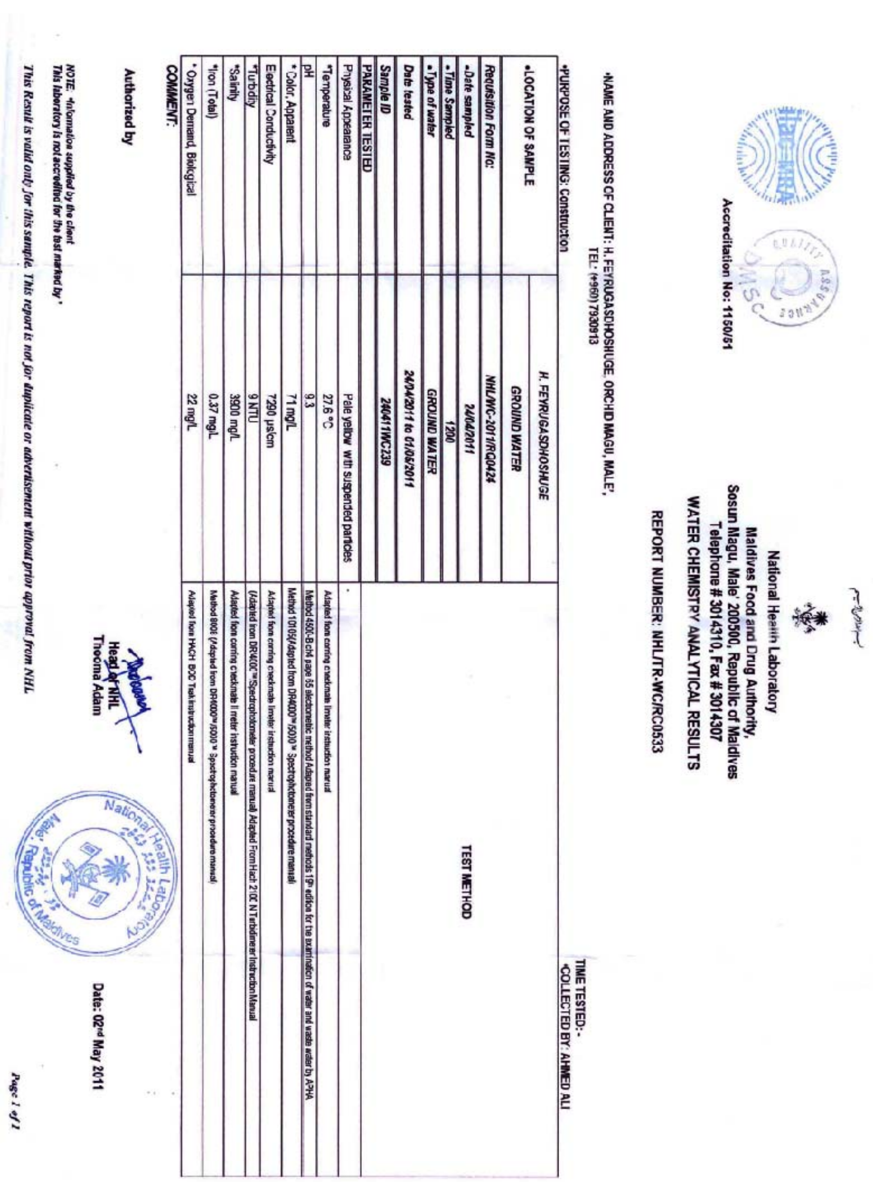
1st FLOOR



TERRACE PLAN

SCALE 1:100

Appendix C – Water Quality Test Results



Accreditation No: 1150/51

National Health Laboratory
Maldives Food and Drug Authority,
Sosun Magu, Male' 200500, Republic of Maldives
Telephone # 3014310, Fax # 3014307

WATER CHEMISTRY ANALYTICAL RESULTS

REPORT NUMBER: NHL/TR-WC/RC0533

•NAME AND ADDRESS OF CLIENT: H. FEYRUGASDHOSHUGE, ORCHID MAGU, MALE',
TEL: (+960) 7930913

•PURPOSE OF TESTING: Construction

TIME TESTED: -
•COLLECTED BY: AHMED ALI

•LOCATION OF SAMPLE	H. FEYRUGASDHOSHUGE GROUND WATER	TEST METHOD
Requisition Form No:	NHL/WC-2011/RQ0424	
•Date sampled	24/04/2011	
•Time Sampled	1200	
•Type of water	GROUND WATER	
Date tested	24/04/2011 to 01/05/2011	
Sample ID	240411WC239	
PARAMETER TESTED		
Physical Appearance	Pale yellow with suspended particles	-
*Temperature	27.6 °C	Adapted from corring checkmate Imeter instruction manual
pH	9.3	Method 4500-B ch4 page 65 electometric method Adapted from standard methods 19th edition for the examination of water and waste water by APHA
* Color, Apparent	71 mg/L	Method 10105(Adapted from DR4000™/5000™ Spectrophotometer procedure manual)
Electrical Conductivity	7290 μs/cm	Adapted from corring checkmate Imeter instruction manual
*Turbidity	9 NTU	(Adapted from DR4000™/Spectrophotometer procedure manual) Adapted From Hach 2100 N Turbidimeter Instruction Manual
*Salinity	3900 mg/L	Adapted from corring checkmate II meter instruction manual
*Iron (Total)	0.37 mg/L	Method 8008 (Adapted from DR4000™/5000™ Spectrophotometer procedure manual)
* Oxygen Demand, Biological	22 mg/L	Adapted from HACH BOD Trak instruction manual

COMMENT:

Authorized by

Head of NHL
Thooma Adam

National Health Laboratory
Male', Republic of Maldives

Date: 02nd May 2011

NOTE: •Information supplied by the client
This laboratory is not accredited for the test marked by *

This Result is valid only for this sample. This report is not for duplicate or advertisement without prior approval from NHL

Page 1 of 1

Appendix D – Letter of Commitment

Hon.Mohamed Aslam, Minister,
Ministry of Housing and Environment,
Male', Republic of Maldives.

30th May 2011

Dear Sir,

Initial Environmental Examination for Development of 11 Storey Building at H. Feyruvaadhee

As the developer of the above mentioned project, I hereby confirm my commitment to carry out and bear costs of environmental mitigation measures and monitoring outlined in the audit report.

Yours sincerely

Ismail Waheed/Feyruvadhee

ދިވެހިރާއްޖެ ފޮލިސް ތަކެތި

ލިޔުންތެރި

ތަކެތީގެ ނަންބަރު:

ތަކެތީގެ ބަޔާން: ފެންވަރުގެ ކޮޓަ

ތަކެތީގެ ގާތް: 66

އިސްލާހުތައް

1- ޓެކްސީ ހައްދަވާ ކުންފުނިތަކުގެ ތެރޭގައި ... ޓެކްސީ ހައްދަވާ ކުންފުނިތަކުގެ ތެރޭގައި ހިމެނޭ ވާނަމަ، ހުއްދަދޭ އިދާރާއިން ޓެކްސީ ހައްދަވާ ކުންފުނިތަކަށް ދޫކުރެވޭ ހުއްދަ ބާޠިލުކުރެވޭނެއެވެ.

2- ޓެކްސީގެ ވެހިކަލާއި ޑްރައިވަރުން ކުރުމުގެ ... ޓެކްސީ ހައްދަވާ ކުންފުނިތަކުން ... ފިޓްނަސް ސެޓްފިކެޓް ... އަދި ... އެއްގޮތަށް ... ކުރާނެއެވެ.

3- ޓެކްސީގެ އިން ... ޓެކްސީ ... 1 (އެކެއް) ... ކުރެވިދާނެއެވެ.

4- ... ޓެކްސީ ... ނަމްބަރު ... ކުރާނެއެވެ.

5- ... ޓެކްސީ ހައްދަވާ ކުންފުނިތަކުގެ ... ކުރާނެއެވެ. ... ޓެކްސީ ... ނަންބަރު ... ކުރާނެއެވެ.

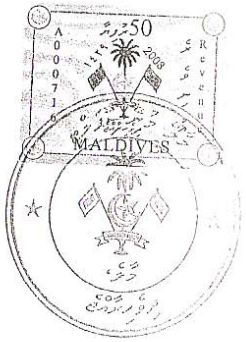
6- ... ޓެކްސީ ... ފިޓްނަސް ސެޓްފިކެޓް ... ކުރާނެއެވެ. ... ކަމަށް ކަނޑައަޅާފައިވާ ... ކުރާނެއެވެ.

- ޓެކްސީ ... ހުއްދަ ... ކުރާނެއެވެ.

- ... ކުރާނެއެވެ.

- ޓެކްސީގެ ... ޓެކްސީ ... ހައްދަވާ ... ކުރާނެއެވެ. ... ކުރާނެއެވެ.

ނ. 4571



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ތަރިން ލިސްޓުގައި ނަންބަރު: ނ. 4571

ފަރާތްތެރި ނަންބަރު: 18376

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ގައުމީ ނަން: ފާތުމަތު ރިނާ

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ގައުމީ ވަގުތު: ތެދުވެ

ގޮތް ބަލާގެންދާނެ ފަރާތުން.

ކަނޑައެޅުނު ބައި	ފުރިގަނޑު ކަންކަން	ބަލައިގަތުމަށް ކަނޑައެޅުނު ބައި ތާރީޚު
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ބިލްގެދާ ގުޅިގެންވާ ފަރާތުން.

ކަނޑައެޅުނު ބައި	ފުރިގަނޑު ކަންކަން	ބަލައިގަތުމަށް ކަނޑައެޅުނު ބައި ތާރީޚު
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ހެންވޭރު އަވަށު ގޯއްޗަކީ އިސްލާމީ ވަގުފުގެ މުދަލުން ރަޖިސްޓަރީ ކުރެވިފައިވާ އަމިއްލަ ގޯއްޗެކެވެ.

އެއީ ހެންވޭރު ސޯސަންމަގު އަވަށު ގޯތި 15 ސްކުއެއަރފޫޓުގެ 1985 ވަނަ މުހައްރަމް ވަގުތު، އިސްލާމީ ވަގުފު، ހާލަތު ވަގުފުގެ މުދަލުން ރަޖިސްޓަރީ ކުރެވިފައިވާ ގޯތި ބައިކޮށްގެން އުފައްދާފައިވާ އިދާރާއިން ދޫކުރި، ގޯތީގެ އަމިއްލަ ދުވަސްވަރު ރަށުގެ ތަރުތީބު ދޭން ގޯތި ހަމައެކަނި ފިރިހެނުން ވިޔަފާރިކުރުން އިންތިޒާމުކޮށް ހުށަހެޅުމުން ބިމުގެ އިސްލާމީ ވަގުފުން، އެއާ ދެމެދުގައި ބިމުގެ އިދާރާގެ ހާލަތު ވަގުފުގެ، އެއާ ދެމެދުގައި އެއްބަސްވުން މުޤައްރަރު ވަގުފުން ހަވާލުކުރެވިފައިވާ އިދާރާތަކުގެ ތަފާސީލު ވަސީލަތް އަދި ދުވަސް ލިޔެކިޔުމުގެ ކަންތައްތައް ހިންގާ އެއް މަސައްކަތް ކުރުމުގެ އިސްލާމީ ޝަރީޢަތް / ކޯޓު ނަންބަރު 4 އަށް 21 ޖަނަވަރީ 1995 ވަނަ ނިންމައިފައިވާ ފޮނުވައިދީ ނަންބަރު 428/JC-4/95 ގެ ޝަރީޢަތުގެ ނިޔާގެ ގޯތީގެ ރަޖިސްޓަރީ ހެދުމަށް ހެންވޭރު ސޯސަންމަގު އަވަށު ގޯތި ބިމުގެ ވަސީލަތް އިންތިޒާމު ކުރުމަށް ހުށަހެޅި އިސްލާމީ ވަގުފުން "ވެރިފާދި" މުޤައްރަރު ރަޖިސްޓަރީ ކުރެވިފައިވާ މިގޯތި އަދި އެކަމާ ގުޅޭ ލިޔެކިޔުން ރަޖިސްޓަރީ ކުރުމަށް ހުށަހެޅުމުން (ޝަރީޢަތުގެ ފަރާތުން ނިންމި ގޮތަށް) ނަންބަރު 2010/0011 ގެ ބަޔާނާ ގޯތި އަދި އޭގެ ކަންކަމުގެ ވަނަ މި ގޯތި އަދި އޭގެ ކަންކަމުގެ ތަރުތީބު ރަޖިސްޓަރީ ކުރުމަށް ނިންމާފައިވެއެވެ.

މިރަޖިސްޓަރީ ހަދައިދިނުމުން 02 ފެބުރުއަރީ 1998 ވަނަ މިއަދުން ހެންވޭރު އަވަށު ގޯއްޗަކީ ހަދައިދީފައިވާ ނަންބަރު ބ.11212 ދިވެހިރާއްޖޭގެ ގޯތީގެ ރަޖިސްޓަރީ ބާޠިލުވެއެވެ.

މިއީ، މިގޯއްޗަށް މިއަދުން ހަދައިދިން ދާއިމީ ރަޖިސްޓަރީއެވެ.

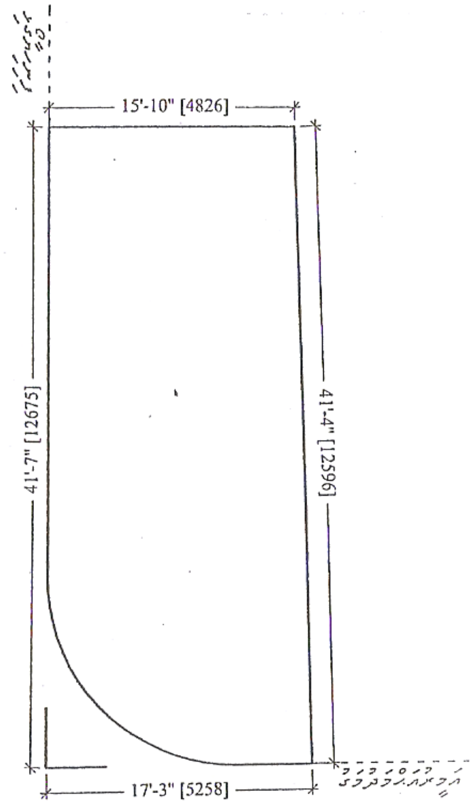
22 ރަބީޢުލްއާޚިރު 1431

07 އޭޕްރީލް 2010

އިސްމާޢީލް ނާޞިރު
އެސިސްޓެންޓް އެގްޒެކެޓިވް ޑިރެކްޓަރ
(ޕްލޭނިންގ ޑިވިޝަން)

މަޖީދު ފައިސަލް
އެސިސްޓެންޓް ޑިރެކްޓަރ

އުތުރު



ހ. ވެރިފާދި

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ބޮޑުމިން : 652.33 އަކަފޫޓު